

[54] APPARATUS FOR TANNING SKINS

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[52] U.S. Cl. 69/32

[58] Field of Search 69/28, 29, 30, 31, 32

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Primary Examiner—Patrick D. Lawson

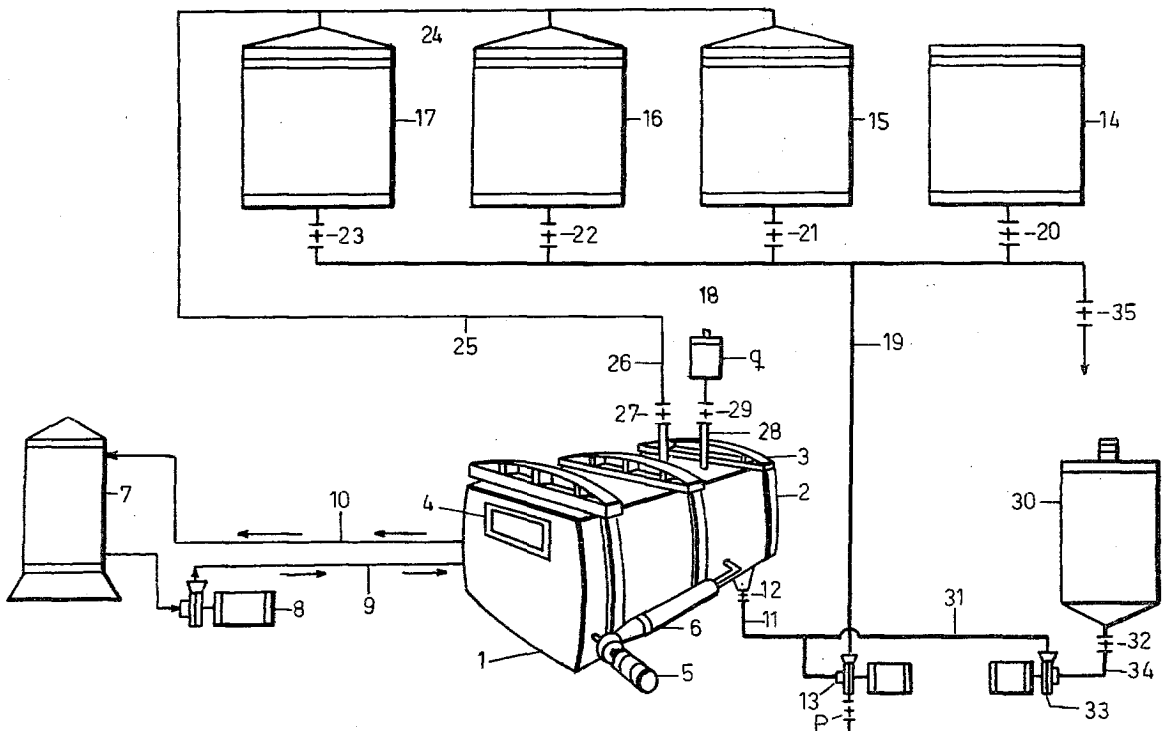
Attorney, Agent, or Firm—Roylance, Abrams, Berdo & Farley

[57] ABSTRACT

An apparatus for tanning skins in a rapid and efficient manner includes a closed tanning tank and a plurality of

storage tanks for storing the various liquids employed in tanning skins. The skins to be tanned are hung in the tanning tank. An air tight door is provided in the tanning tank for loading and unloading the skins. The tanning tank also has an inlet/outlet pipe for filling and emptying the tanning tank, which pipe is connected through a valve to an elevation pump. A respiration pipe having means for producing a gas which is chemically inert to tanning liquids is also provided on a tanning tank. Each of the storage tanks has an outlet pipe with a valve for controlling the flow of liquid there-through which is connected to the elevation pump. Some of the storage tanks are airtight and have outgoing pipes connected to an outgoing pipe on the tanning tank to permit gases to flow between each of those storage tanks and the tanning tank. Other devices which may be operably coupled to the apparatus include an internal stirring system, an internal heating system and a dissolution tank. Also, a plurality of tanning tanks may be provided.

26 Claims, 17 Drawing Figures



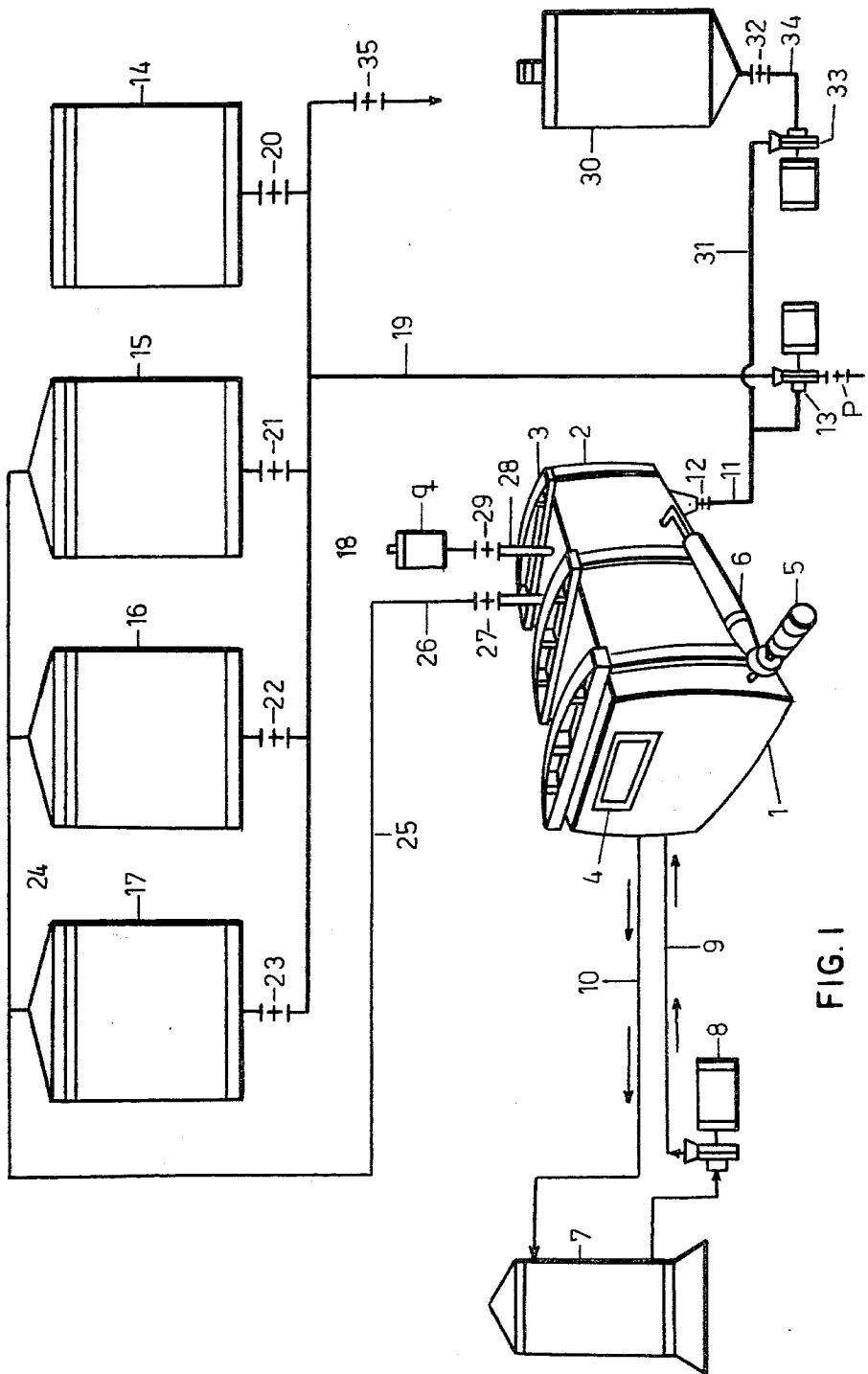


FIG. 1

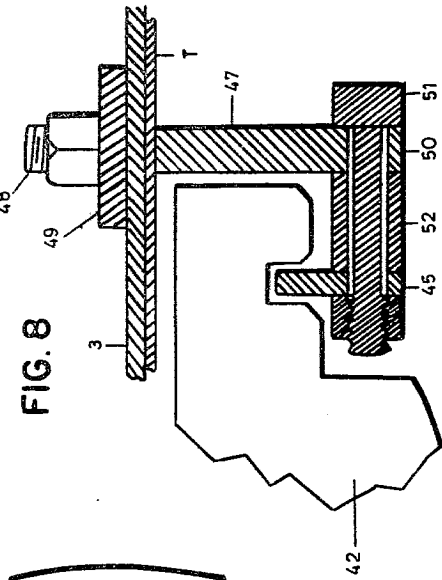


FIG. 8

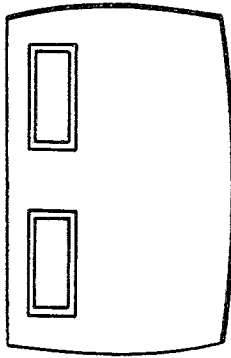


FIG. 4

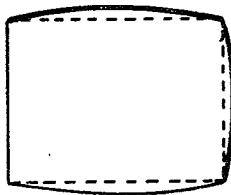


FIG. 3

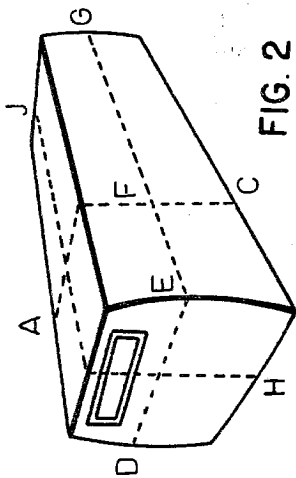


FIG. 2

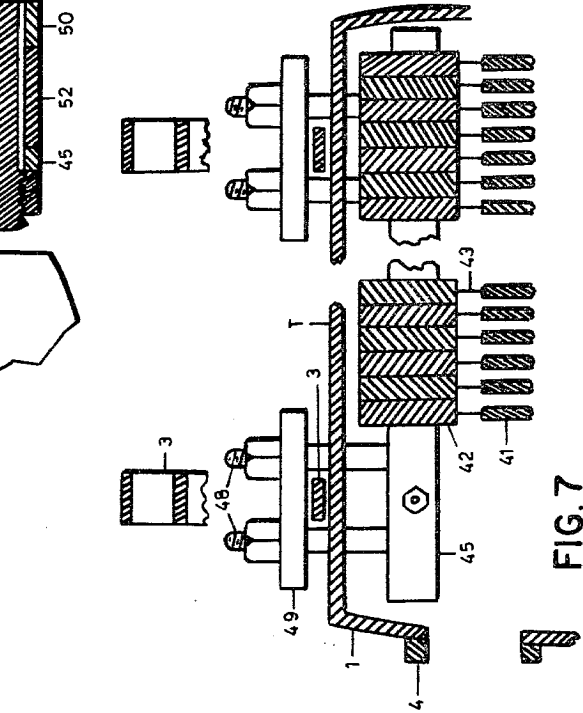


FIG. 7

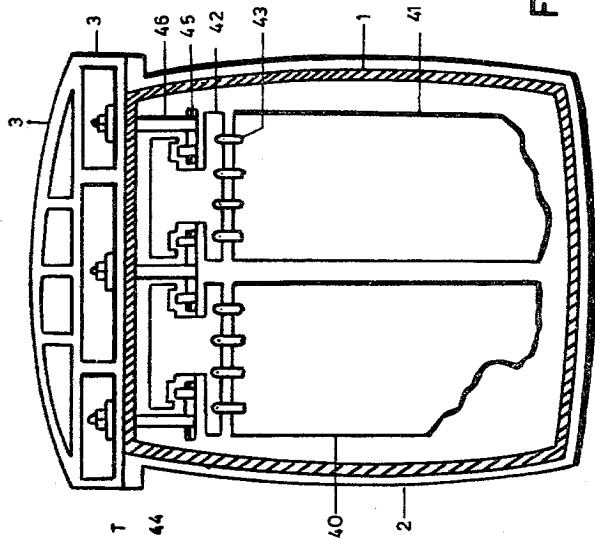


FIG. 6

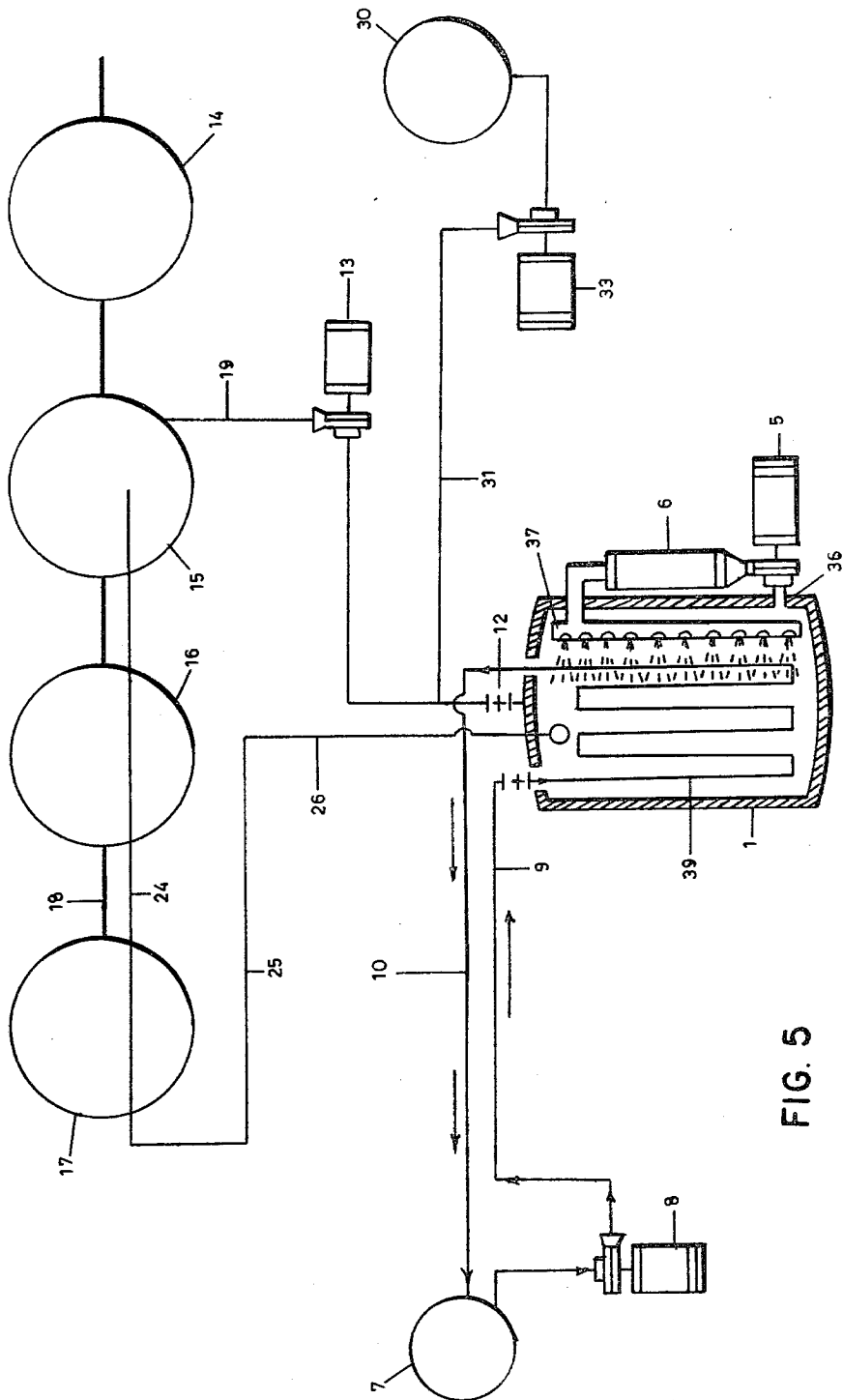


FIG. 5

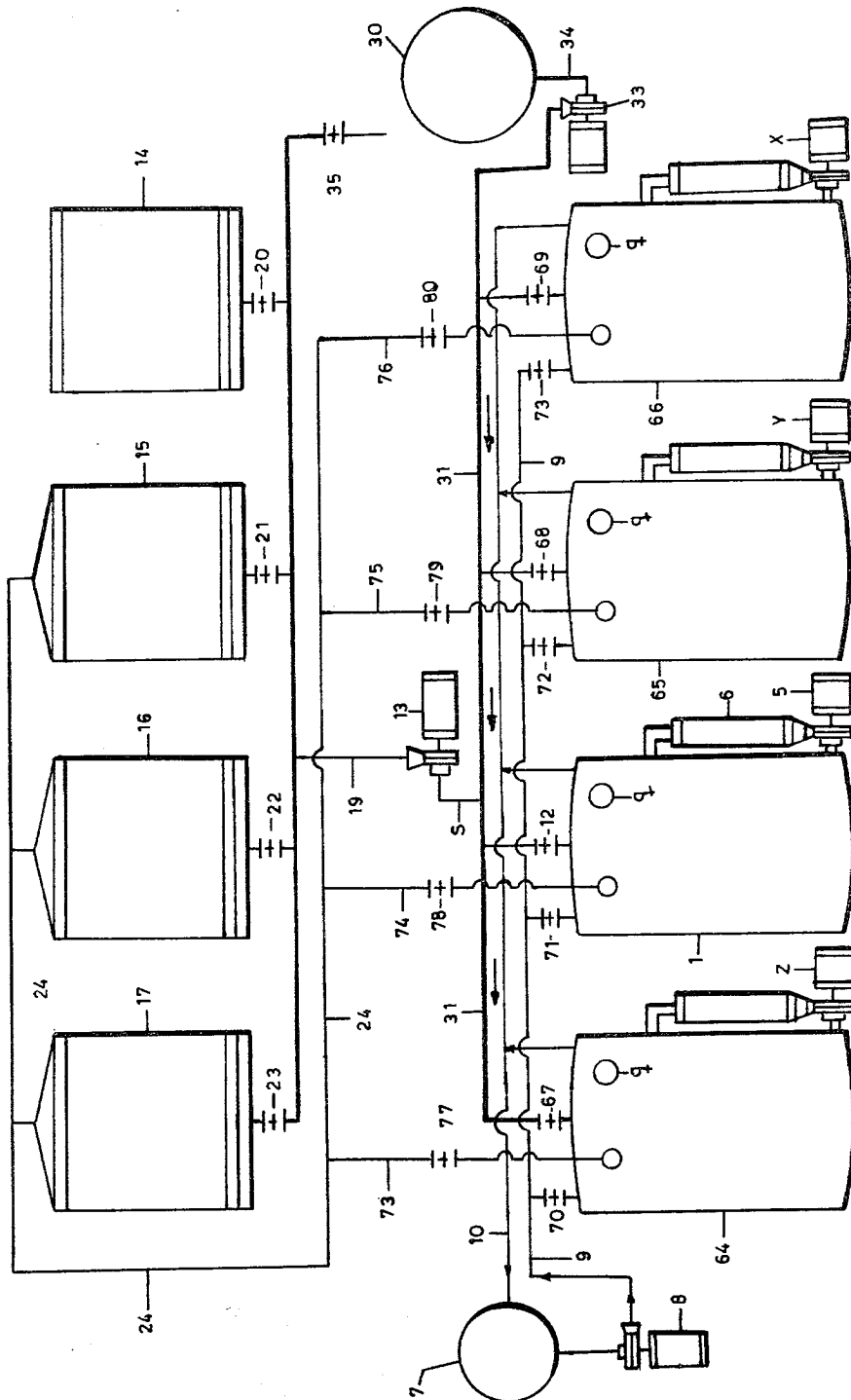


FIG. 9

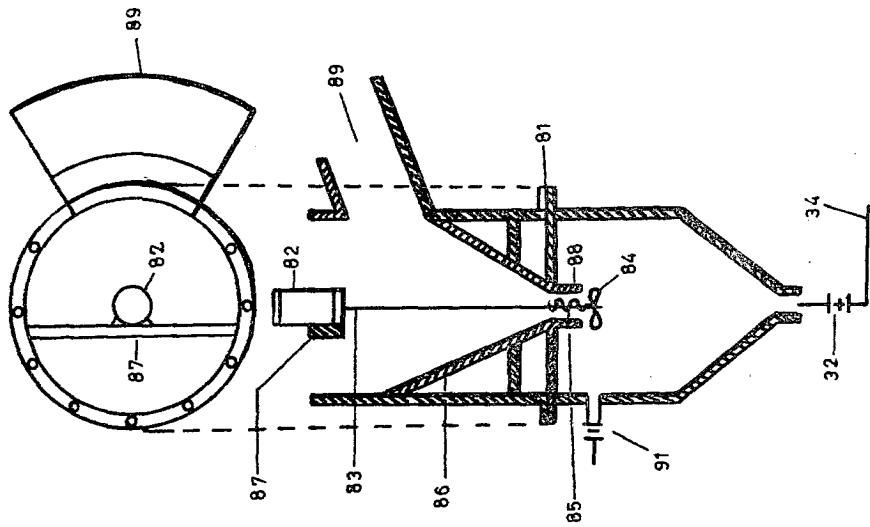


FIG. 10

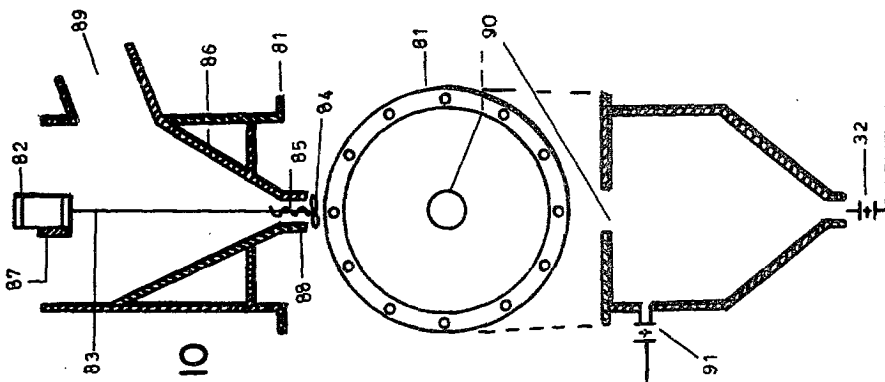


FIG. 11

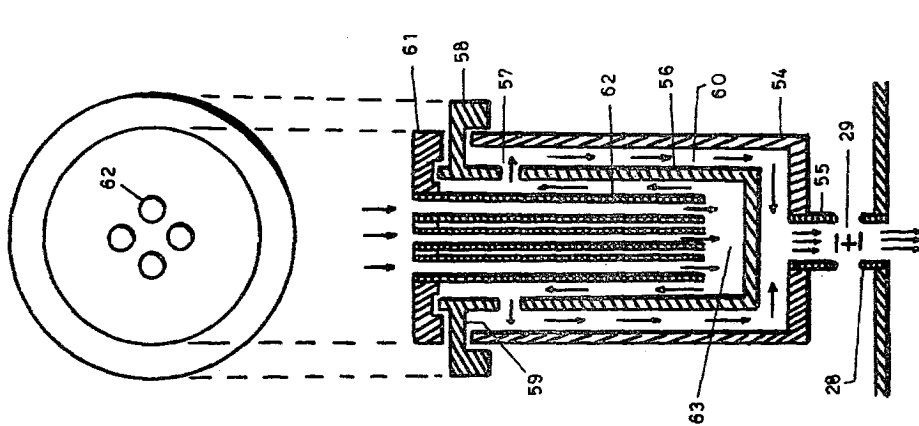


FIG. 12

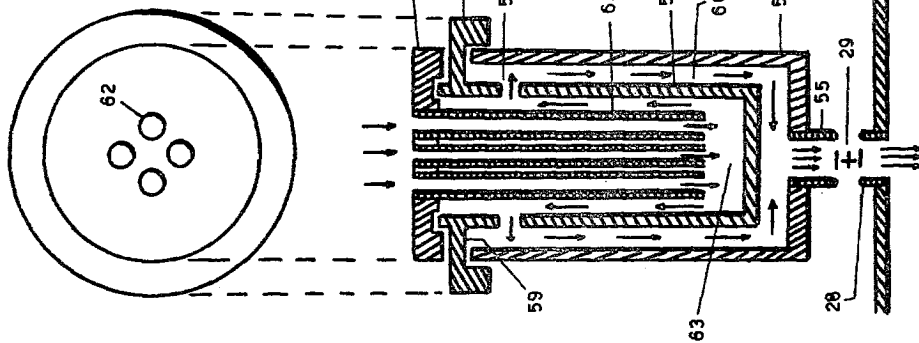


FIG. 13

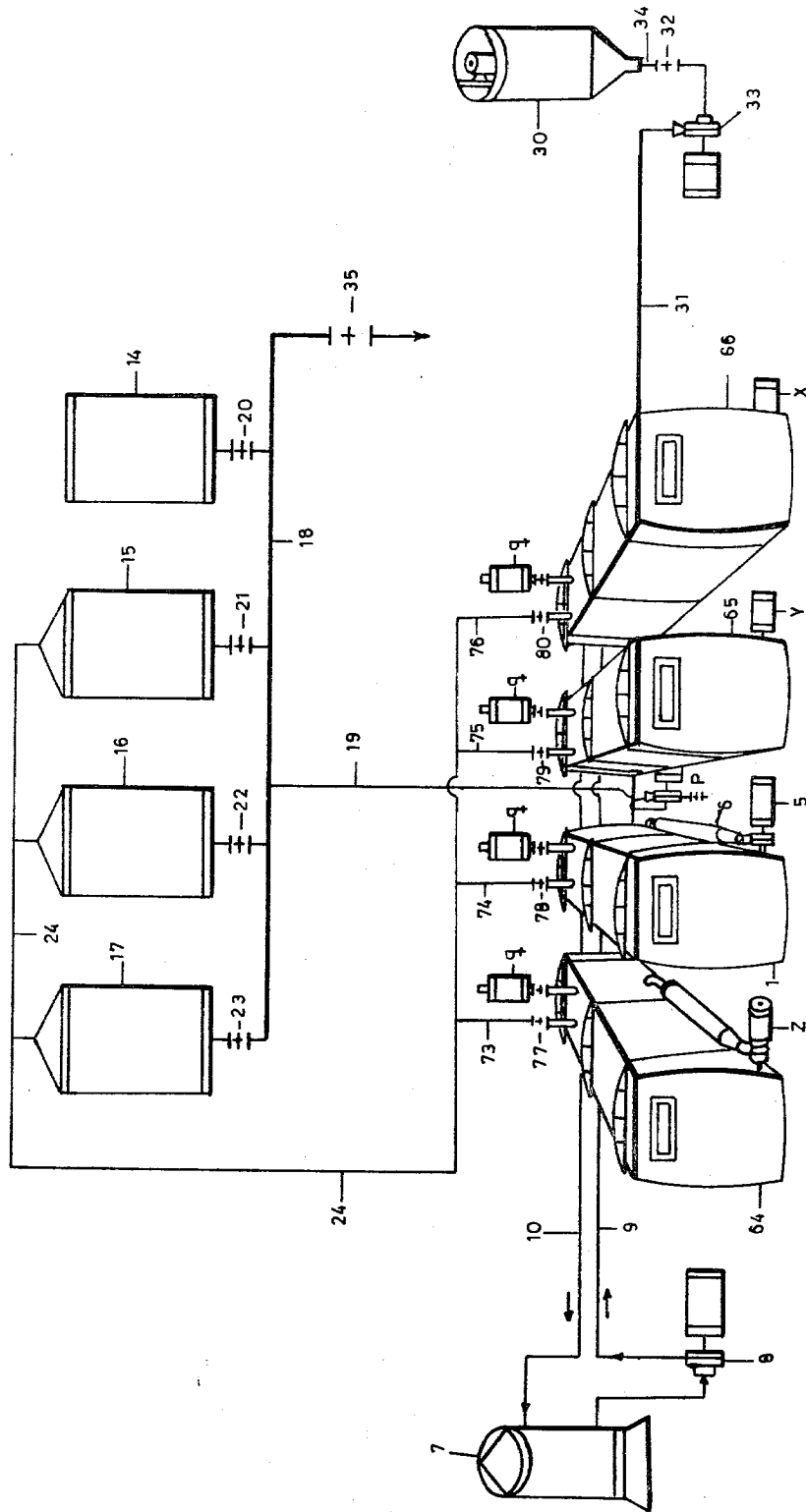


FIG. 14

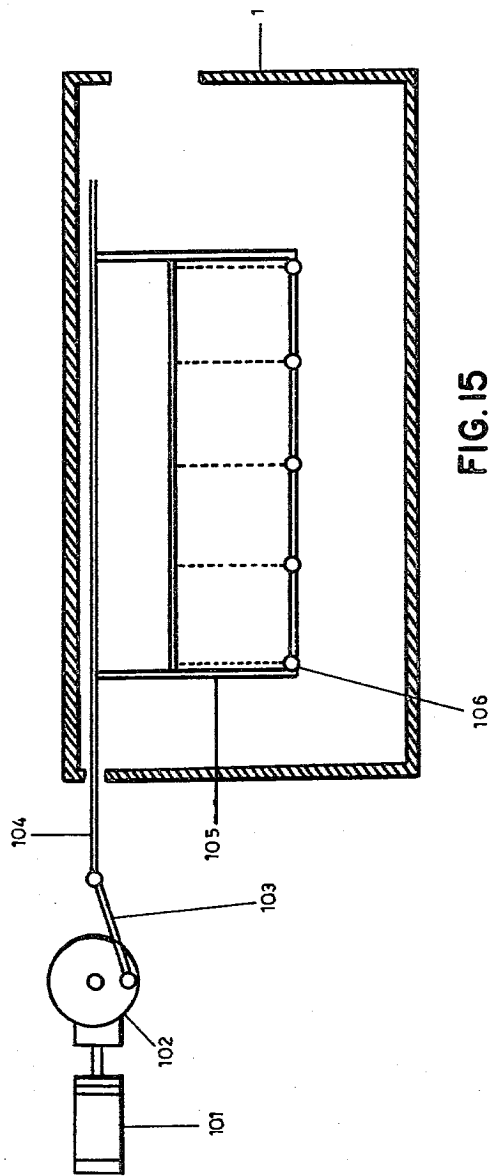


FIG. 15

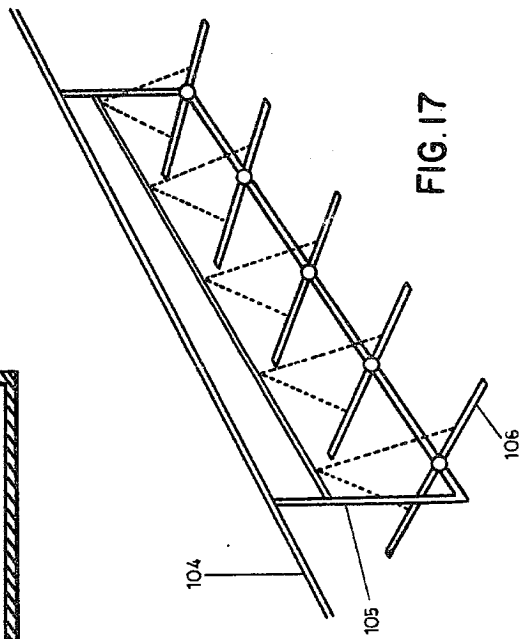
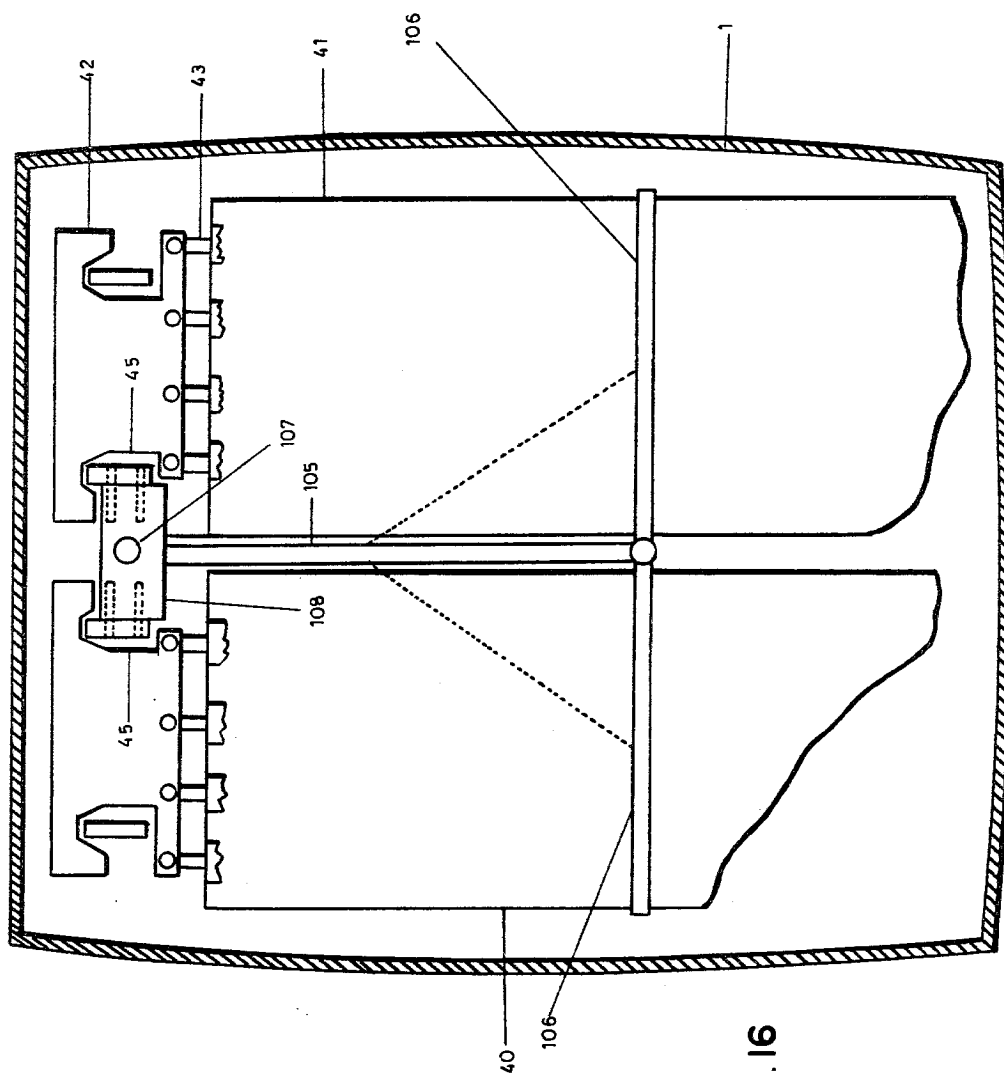


FIG. 17



APPARATUS FOR TANNING SKINS

This unit is an apparatus, a special installation for tanning heavy cow skins in a fast economic manner, for the manufacturing of leather soles.

Tanning in this unit has, in comparison with traditional tanning methods in our country, the following advantages: economy of time, materials and labor, with the additional advantage of a better yield and a better appearance of the finished leather.

I. **ECONOMY IN TIME.**—Tanning is carried out in a period of no more than two or three days, according to the skin thickness. As a consequence of this rapidity in tanning, the investment on skins subject to the manufacturing process is considerably reduced since the tanning "chain" is considerably shortened. The volume of tanning liquids to keep in use is highly reduced, all of this in comparison with the skin tanning method for soles most used in our country, which is the combined tanning in suspension piles and drums or fulling mills, that is, the so called "counterstream" tanning.

II. **ECONOMY OF MATERIALS.**—Economy in this aspect is very important. To begin with, it allows the recovery of the loosening and cleansing liquids, which may be used again with a mere reinforcement of materials. However, the most important part in this aspect is the economy of tanning liquids: according to some researchers, the losses of tanning materials that take place in a tannery are of the order of 25% of all the tanning material used, said percentage being subject to increases in warm climates; this is due to the channeling (drainage) of liquors; to the oxide-reduction reactions caused by the oxygen in the air, and to the fermentation and bacterian actions of different sorts. All of this would cause the degradation of the tanning material, transforming it into non-tanning material and precipitating it under the form of "sludge."

Tanning in the unit completely eliminates the causes for the aforementioned losses; on one side, since it is a closed system which works in complete absence of air, there is no oxidation. For the same reason, anti-bacterian control is perfect, it being possible to use bactericides in the required measures and amounts without danger for anyone. Operators, during the discharge, handle skins that have already been washed and drained.

Losses due to drainage or channelings can be reduced almost to zero, as shall be seen later.

III. **ECONOMY OF LABOR.**—Tanning in this unit simplifies considerably all the operations performed in an ordinary Tannery. The unit receives the skins after the alkaline stream works. The unit is loaded with these skins and, once in there, they are loosened and softened; if so desired, they may be tarnished with some special material, and then the tanning, from beginning to end, that is, it performs the works that are equivalent to the softening drums, the suspension piles and the tanning drums. Furthermore, the skins can also be dephlegmated and left to drain off, so that they come out without liquid dripping, ready to press out and for the works of bleaching and finishing.

All these operations are carried out successively, one after the other, without any movement of the skins. The only works that require labor are the loading and unloading of the tanning tank and the reinforcement of liquors, which is carried out in this unit more rapidly, effectively and with the minimum of labor.

In this unit skins are never moved while the tanning process is going on; it is the liquids that move. This is a basic difference with respect to all the known tanning methods.

IV. **BETTER WEIGHT YIELD.**—This is very important when skins are sold by weight. Experimental tests carried out in a pilot plant have shown a high weight yield in natural skin. This may be due to the fact that in the unit the operation is conducted at high temperatures in the tanning work, of up to 40°–42° C. in the final tanning stages. A more complete saturation of the skin fiber by the tannin is achieved thereby, and a skin with very saturated cut, heavier and water-resistant is obtained.

The leather obtained in this unit has a better "look," since sandpapered flower and the foldings that are produced in the drums are eliminated due to the fact that there are no frictional movements among the skins or against the drum walls.

The most used sole tanning method in our country is the one called "counter-stream." In this method, the skins, after the stream works, are loosened and softened in drums. Thereafter, the skins are passed to a series of suspension piles, the number of which varies from one tannery to another. There, the skins are treated for tanning, first in piles with spent liquors and thereafter, as the tanning progresses, the skins are put in troughs with more and more concentrated liquors. After the last suspension trough, the skins are taken out and the tanning process is completed in drums, treating them with highly concentrated solutions. Thereafter, they are unloaded from the drums and they are dephlegmated in troughs or in drums, after which they are unloaded and piled up. All of this implies considerable time and labor, as is well known, and it also involves a larger number of skins in the process and a considerable volume of tanning solutions.

Before ending this chapter, it should be mentioned that there exists a fast tanning method which, according to the information obtained, is widely used, mainly in some countries of Europe. We are referring to the so called "dry" tanning. In this process, the softening—conditioning—pre-tanning to be performed, as well as the tanning itself is carried out in drums, in "dry," that is, without a bath. The skins as tripe, alkaline, are introduced in drums and, once in there, the powders are added, that is, the softening and conditioning salts; all of this without water. After a certain number of hours of rotation, when the operation is considered as completed, the skins are dumped on the floor to get rid of the liquid formed due to the dehydration of the tripe. Thereafter, the skins are loaded again in the tanning drums and the tanning substance is added in the form of powder, without water. The addition of the tanning substance is carried out by lots, while the drum is turning around until the skins are "passed," which takes around 24 hours according to the information we have; the whole process may last one or two days. With this process a loss of tanning substance is produced which is not negligible, since during the tanning a new dehydration of the skin is produced which at the end leaves in the drum a certain amount of liquor which, together with that formed in the dephlegmation constitutes a certain amount of liquor that is economically relevant, since it must be thrown down the drain. With this and with the high cost of the products to take the lime off and the conditioning products, that must necessarily be used because they are products which are specifically

developed for the purpose, an increase in costs is produced instead of a decrease of same.

Furthermore, the skins suffer certain deleterious effects due to the excessive dry beating, sandpapered flower, foldings, etc., and the different components of a skin cannot be tanned together, as is the case with croups, the front parts, the bellies; one is forced to tan only croups, fronts or bellies, which is another disadvantage.

Tanning in this unit does not present any of these disadvantages: the same traditional products to take lime off and to soften can be used in the purge. The tanning substance is handled in a very rational manner, without any waste, and last, the different components of a skin can be tanned together without any problem and without deleterious effects on the skins, as is the case with "dry" tanning drums.

Making a comparison between the methods or processes to tan skins for sole known in the art, that is, the "counter-current" or "upstream" tanning process and the "dry" tanning process and tanning in our unit, we find the following advantages and novel features in the latter:

ADVANTAGES OF THE PRESENT INVENTION

(a) It substitutes completely and with great advantage the suspension troughs and the tanning drums in a Tannery. The unit contains all the necessary elements to carry out, with the exception of the stream and the finishing steps, all the operations that are performed in a Tannery that works with suspension troughs and tanning drums, such as: taking lime off and purging, the whole tanning process with its change sequence, reinforcement of liquors, that cleaning or filtering of same and finally the dephlegmation of skins. Although it employs the same counter stream tanning principle, it is essentially different because of its rapidity and economy and because instead of moving the skins as the tanning progresses, the liquids are moved by means of pumps. The skins always remain in the same place. In the unit work is performed in the same way as in the counter stream tanning process, with two or more liquors of increasing density, in order to facilitate the depletion and subsequently the renewal of the liquors. Although in the UNIT work can be performed with two liquors, one weak and one strong, the use of three liquors has been selected due to its advantages and to facilitate their renewal: one of low density (weak), another of medium density and one more of high density. Thus, number one is used until its depletion and is set aside; number two takes its place; with a portion of liquor number three a new liquor is prepared for number two and finally fresh liquor is prepared to replace the one that was spent. This represents a perfect rotation of the liquors, which in this case is highly facilitated due to the small amount of liquors in comparison with troughs.

(b) Another advantageous novel feature is the used of closed tanks of special design for tanning, and that of elevated tanks for liquor storage, and the way they are interconnected which is through double connections: one that connects them at their lower part, with a pump in the middle, and another that connects them at their upper part, in such a way that when a liquid is pumped from an elevated tank to an empty tank located at a lower level or viceversa, the liquid displaces the gaseous content from the latter to the former.

With this device, since the skins as tripe are loaded for tanning, upon introducing the bath to take lime off,

same expels air from inside the tanning tank, and from then on until the skins are unloaded, tanned and washed, they have no further contact with air, and this is so for skins as well as for liquors, even while changes take place. This makes possible to maintain a clearer color in the liquors, as if they had been just prepared. The skin obtained has also a clearer color, which is an additional advantage.

(c) Another novel feature of the system is the simultaneous stirring and self-cleaning thereof. This makes it possible to keep the liquors free of solids in suspension, which constitutes a double advantage, since it speeds up tanning and economizes labor. In troughs, liquors are cleaned up by decantation, with more labor and tanning substance requirements.

(d) Due to the fact that the tanning tanks are tightly sealed, as well as the storage tanks, tanning at high temperatures without danger can be considered as another advantage for an operation of this kind. Tanning in the unit can be started at a temperature between 34° and 35° C., at which it generally, for instance in drums, it has to be stopped, since the rotation of the drum creates heat which makes it necessary to stop same in order to regulate the temperature; this means that the tanning process must be interrupted in its normal course.

Heat in the unit is regulated at will with great accuracy, turning a nuisance into an advantage, for it is well known that at high temperatures, particularly during the last tanning stages, the affinity between tannins and skin proteins is increased. This would represent a better weight yield and a better saturation of the skin fiber.

Several years ago, the tanning system in a HOT TROUGH was presented as a novelty, as an "advancement." As far as I know, it apparently has had no acceptance in our country, probably due to the important problems oxidation involves.

(e) Another and last novelty and advantage is the device for and the manner of carrying out the "reinforcement" of liquors. This operation is carried out in the unit through a "dissolution tank" in a fast, effective and comfortable way, and with a minimum of labor, since it is not necessary, as in the case of troughs, to take the skins out beforehand.

Referring to the drawings which form a part of this original disclosure:

FIG. 1 is a graphic illustration of an apparatus for tanning skins according to one embodiment of the present invention;

FIGS. 2-4 illustrate various views of the tanning tank of the present invention;

FIG. 5 is a plan view of the apparatus of FIG. 1, illustrated partially in cross section;

FIG. 6 is a cross sectional view of the tanning tank;

FIGS. 7 and 8 are cross sectional views of details of the structure for hanging skins in the tanning tank;

FIG. 9 is a partial plan view and a partial elevational view of an apparatus for continuous production of tanning skins according to another embodiment of the present invention;

FIGS. 10-12 illustrate various views of the dissolution tank;

FIG. 13 is a plan and vertical section view of the sulfur burner;

FIG. 14 is a perspective graphic illustration of the apparatus for continuous production of tanning skins;

FIG. 15 is a side elevational view in longitudinal section illustrating the mechanism for moving the skins in the tanning tank;

FIG. 16 is a perspective view of the frame for hanging skins in the tanning tank; and

FIG. 17 is an elevational view in longitudinal section of the tanning tank with skins mounted therein.

In FIG. No. 1 we have, in the first place, a tanning tank or chamber 1, which is the receptacle where the skins to be tanned are introduced. This tank 1 is provided on the outside with steel belts 2 the number of which varies according to the size of the tank. The upper part of these belts adopts the form of a structure with an arch shape 3 which is also made of steel. These arches support the weight of the skins, which are suspended on them through the tank "roof," as shall be seen later on. The tank dimensions, width and length, are variable according to the desired capacity. Height may be constant. No. 4 is a door.

Tank 1 also has an internal stirring and liquid conditioning system which consists of the following: (a) a recirculating pump 5 and a filter 6 to keep in constant movement the different liquids inside by means of a procedure that consists of extracting same from the tank and re-injecting them therein, passing them before through the aforementioned filter, and (b) a device, FIG. No. 15, for the internal movement of the skins subject to tanning such device consisting of a motor-reductor 101 with an eccentric 102 conveniently placed on the outside, on the upper central portion of the tanning tank; the eccentric, by means of a connecting rod 103 transmits a swinging movement to the shaft (104); this shaft forms part, inside the tank, of a frame 105, one of the sides of which, the lower side, has a number of hinged cross-members 106, FIG. No. 17, so that they can be folded in, that is, placed vertically so that they are not in the way when loading and unloading the skins. In a horizontal position, these cross-members are placed among the skins suspended from the "roof," as shown in FIG. 16. These cross-members, with the swinging movement of the frame, the shaft of which 104 moves through the drill 107 of plate 108 mounted between the two rails 45, give the skins a pendular movement.

Tank 1 also has a heating system which operates by means of hot water or steam, which in FIG. 1 is only partially shown; to the left of the drawing we can see heater 7, pump 8 for recirculating hot water, pipe 9 through which hot water goes into tank 1, and pipe 10 through which cooled water comes back to heater 7.

On its lower part, tank 1 has an ingoing pipe 11 for liquids which also functions for outgoing liquids and which has a valve 12 for flow control. Pipe 11 is connected to the suction of a pump 13. This pump is located on a level that is lower than the "floor" or bottom of the tank 1.

On the upper part of the drawing of FIG. 1 four elevated tanks 14, 15, 16 and 17 are shown, which are located on a higher level than the tanning tank and which contain the different liquids that are used in the several operations or tanning stages. Said elevated tanks have on their lower part an output pipe each with its respective valve, marked with numbers 20, 21, 22 and 23, in the same order.

A pipeline 18 connects them among themselves, said pipeline being in turn connected through another pipeline 19 to the discharge of pump 13.

Connected in this way, any of the liquids contained in any of the elevated tanks can go down, by gravity, to tank 1; for example by opening valve 20 of tank 14 and valve 12 of tank 1, the liquid contained in said tank 14 goes down and fills tank 1, going into same through pump 13. Or opening valve 23 of tank 17 and valve 12 of tank 1, the liquid contained in said tank 17 shall go down to tank 1. In any case, pump 13 or elevation pump may return the liquids to the same elevated tank from which they came.

Of the four elevated tanks, one, number 14, has atmospheric communication on its upper part; the other three, numbers 15, 16 and 17 are tightly sealed, but they are intercommunicated and each of them has an output pipe on its upper part; a pipeline 24 communicates them among themselves, and said pipeline in turn is connected, through another pipeline 25, to a pipe 26 which starts at the upper part of tank 1. In this way, elevated tanks 15, 16 and 17 are intercommunicated and also connected to the tanning tank 1, the upper part of the former with the upper part of the latter; valve 27 of pipe 26 serves to interrupt said communication when so desired.

Tanning tank 1 has on its upper part a pipe 28 which we call "respiration pipe" and which serves to let air out or in when a liquid goes in or out of tank on its lower part. A valve 29 can close said atmospheric communication. On its upper portion, said respiration pipe has a sulphur burner "q" to produce SO₂, the description and operation of which shall be made later on.

On the right lower extreme of FIG. 1 is shown a tank 30 which we call the dissolution tank. It is of a smaller size than tank 1 and it is located at the same level. This tank 30 serves to dissolve and introduce to tank 1 the tanning extracts that are used for tanning and it has on its lower portion an output pipe 34 with a valve 32 for flow control. Both tanks, numbers 1 and 30, are communicated on their lower portion by means of a pipeline 33 placed in between and connected in the following manner: discharge of pump 33 is connected with the pipeline that comes from tank 1, and the suction of the pump with the lower output pipe of tank 30.

Connected in this way, said tanks 1 and 30, a liquid from tank 1 can pass by gravity to tank 30 by opening valves 12 and 32. The passage of liquid is through pump 33. Actuating the latter, the liquid shall return to tank 1.

Although the tanning tank may have any shape, the one that has been adopted is that which accommodates the largest number of skins in the smallest space. This shape is that of a parallelepiped, FIG. 2, that is, an elongated tank with a rectangular ABFC cross-section, FIG. No. 3, although with its side walls and "floor" slightly arched. The upper wall or "roof" of the tank may be flat.

Door 4 of tank 1 is for loading and unloading the skins, it being possible to have more than one depending on the width of the tank. See FIG. No. 4.

In order to show some of the parts of the unit which cannot be seen on the drawing of FIG. No. 1, FIG. No. 5 shows the same drawing as a plan drawing. In this drawing, tank is shown in a plan and in cross-section following line DEFG of FIG. No. 2 in order to present the inside; we can see recirculating pump 5, suction 36 of pump 5, and filter 6 and the discharge of said pump, which is carried out inside the tank through pipe 37 which we call the distribution pipe. This pipe 37 has several outlets, or nozzles, throughout its length in

order to achieve a better and more uniform movement of all the liquid mass.

We also see a pipeline or coil 39 drawn schematically, as a part of the heating system of the unit. The other parts shown in FIG. 5 are already known and perfectly identifiable.

In order to show the inside of tank 1 and the way to hang or suspend the skins in same, let us look at FIG. Nos. 6 and 7. FIG. No. 6 is a vertical projection of a cross-section following line ABFC of FIG. No. 2. FIG. No. 7 is a part of a vertical projection of a longitudinal section following line HIJ of the same FIG. No. 2.

It is pertinent to make a statement here: although skins can be introduced complete or cut in halves for the manufacture of soles, said cutting being made in any case to obtain the different components such as croups, etc., it is more practical and convenient, due to easier handling and better accommodation, and to make better use of the inside space, to put in the unit skins that have already been cut up, whether they are salted or as tripe, after taking away the meat or before, as is most convenient. In FIG. Nos. 6 and 7 we can see the inside of tank 1 with a front part of a skin and a croup of same, 40 and 41, suspended from special hangers 42 made of wood, by means of tongs 43. Hangers have two notches or guides 44 in order to lie on steel pieces which have the form of "rails" 45 which run throughout the length of the tank. These "rails" are in turn suspended, throughout the "roof" T of tank 1, from the lower portion of arch or belt 3 by means of special pieces 46, as shown in FIG. 7. In FIG. No. 8 some of these pieces 46 are shown. This FIG. No. 8 is a vertical projection of a longitudinal section of one of these pieces 46. They are formed by a metal plate or steel piece 47 with two screws 48 welded to the sides of one of its edges. With these two screws 48 and plates 49 with two holes a clamp is formed with which they are mounted on the lower part of arch 3, from the inside of tank 1 and through roof T of the tank.

The lower edge of plate 47 has a hole 50 through which a screw 51 holds rail 45 on bushing 52. The latter is a simple separator.

Skins or their parts are suspended as shown in FIG. Nos. 6 and 7 as close together as possible, taking care that they are not pressed too tightly among themselves. In actual practice, for thick skins, a distance of one inch from center to center of the skins has proved to be quite satisfactory. Thinner skins can be placed closer, with the use of thinner hangers, for said hangers serve as separators of the skins.

OPERATION OF THE TANNING UNIT

We shall hereinafter proceed to explain the operation of the tanning unit, referring for such purpose to FIG. No. 1.

Let us assume that we have tank 1 already loaded with the skins, as previously mentioned, and duly closed.

Elevated tank 14 contains the solution to take lime off already prepared, and the other elevated tanks have the following contents:

Tank No. 15 has liquor No. 1, weak, for example, Be. 4

Tank No. 16 with liquor No. 2, medium, for example Be. 8

Tank No. 17 with liquor NO. 3, strong, for example, Be. 12-14.

Let us proceed now with the first operation: taking the lime off and purging the skins.

We open valves 20 and 12 and 29 of the respiration pipe 28. The content of tank 24 goes down by gravity and through pump 13 fills up tank 1. The entrance of liquid is through the lower portion of the tank; the displacement of air contained in the tank is through pipe 28, which is the only way out for same since valve 27 is closed. Liquid is let in until it covers the skins, and thereafter valves 20 and 12 are closed. The stirring system of the tank, that is, the recirculating pump 5 and motor-reductor 101, for the internal movement of the skins, are actuated, and if there is a need to heat up the bath heater 7 is started up and its recirculating pump 8 is actuated as long as it is necessary to obtain the desired temperature.

The stirring movement may continue almost without interruption until the operation is considered completed.

Once the above is finished, valves 12 and 20 are opened and the liquid is displaced through pump 13, which pumps it up to its corresponding tank No. 14. This purging bath may be used for another batch of skins, with a small salt reinforcement. If such is not the case, it can be let out down the drain by opening valve 35.

Normally, upon drainage of the purging bath, an equal volume of air shall come in through the respiration pipe; if instead of air we let any other gas come in, which can be achieved by connecting this pipe 28 with a receptacle containing for example nitrogen, CO₂ or SO₂, or any gas that does not oxidate or react chemically with the tanning liquids, when the bath has been completely drained out tank 1 shall be filled up with the skins and with the gas that has been let in, but without air.

Once the bath to take lime off has been completely drained out, valve 29 of the respiration pipe 28 is closed up, as well as valve 20 of tank 14. On the lowest part of pump 13 there is a purging cock P through which the leakage of the tank and the liquids remaining in the pipe are let out. Said cock P is closed up.

Tanning as such is now begun: valve 21 of elevated tank 15 is opened; valve 12 is already opened. Valve 29 of the respiration pipe 28 should be closed, but instead we open valve 27 which communicates on the upper part with the upper tanks.

The content of tank 15, which is tanning liquid No. 1, comes down and goes into tank 1 on its lower part, pushing out any gases same may contain, which shall go out through their only possible exit, valve 27, and through pipes 26, 25 and 24 shall reach tank No. 15. An exchange of liquid-gaseous content takes place now between tanks 1 and 15; in the end, tank 1 has the liquid of tank 15 and tank 15 has the gaseous content of tank 1. It should be noted that in this movement there has been absolutely no contact with external air, either by the tanning liquid or by the skins.

Tanning liquor is let in to reach a level to cover only the skins. Valves 12 and 21 are closed up. The stirring system is actuated. In case heat is required, since tanning with this first liquor can be started safely at a temperature of 33°-35° C., heater 7 is started up as well as its pump 8 until the desired temperature is reached. The stirring system is kept in operation almost continuously for approximately 24 hours.

Once such period has lapsed, tanning is continued with liquor No. 2. Liquor No. 1 is drained out first,

sending it to tank 15, which is achieved by means of pump 13, previously opening the corresponding valves, that is, valves 12 and 21. This liquor 1, as a result of its return to its tank through the lower portion of same, displaces the gaseous content of said tank through its upper part, and said gaseous content returns through pipelines 24, 25 and 26 to tank 1. This new content exchange between tanks 1 and 15 takes place without any contact with outside air, and valve 21 is closed up.

We now make liquor No. 2 go down from tank 16 by opening valve 22.

Said liquor No. 2 fills up tank 1 and displaces and pushes its gaseous content upwards to tank 16, in an identical operation to the one that took place with the first liquor.

The stirring system and heater 7 with its pump 8 are actuated once more; in this second tanning stage, liquor No. 2 can be heated up to a temperature of 34°-36° C. without danger, according to experiments performed.

The stirring system should work another 24 hours almost uninterruptedly, or following time intervals.

Once said time has lapsed, liquor No. 2 is let out in order to continue tanning with liquor No. 3. Liquor No. 2 is first drained out by means of pump 13, opening valves 12 and 22. When said liquor goes up to its tank 16, it displaces the gaseous content thereof and sends it to tank 1, repeating again the same operation. Valve 22 is closed up and valve 23 is opened up in tank 17, and liquor No. 3 goes down, sending the gaseous content to tank 17. In all cases, the liquor should be let into tank 1 only in enough quantity to cover up the skins. Valves 23 and 12 are closed up. Tanning continues with liquor No. 3. The heater and the stirring system are actuated. This last liquor can also be heated as the other two to temperatures of 38°-40° C. and up to 42° C. towards the end, without any problem according to experience.

After 24 more hours the skins should be well tanned and the last tanning liquor, No. 3, can be let out. Opening up valves 23 and 12, this liquor is sent to its tank No. 17 through pump 13. Gas shall again return to tank 1. Valve 23 is closed up. Skins are left to drain in the tank and the remaining liquids are extracted through purging cock P of pump 13.

The last operation takes place now: washing or dephlegmation of the skins. We use as washing liquid liquor No. 1. This liquid is let down by opening valve 21; the gaseous content of tank 1 goes up to tank 15. Valve 21 is closed up.

Washing is carried out with the stirring pump 5. When washing is completed, liquor No. 1 is returned to its tank 15 enriched with the tanning liquor extracted in washing. In the end, tank No. 1 remains with the gases.

Skins are let to drain inside tank 1 enough time to stop leaking. Leakage is extracted through purging cock P. Tank 1 is ventilated for a while and skins are unloaded. Tank 1 and pipelines are washed with abundant water and the unit is ready to receive another batch of skins.

The gas to be used in this tanning unit should be an inert gas with respect to the tanning liquors used, that is, it should not react chemically with same, as is the case with oxygen. Convenient for the purpose are, for example, nitrogen, CO₂ and SO₂; the latter seems to be specially appropriate due to its chemical properties which are opposite to those of oxygen. Instead of oxidating, it reduces the tanning material and consequently it clarifies the liquors and skins instead of darkening same; it also possesses a certain bactericidal action which is highly beneficial.

Regardless of the gas that may be selected, since it has to be wasted with each batch of skins, an apparatus has been designed in order to obtain sulphur oxide at low cost which can adequately be adapted to the unit, or more precisely to the tanning tank. This apparatus is a burner which can use sulphur as fuel and which sends combustion gases into the tank instead of letting them out into the air. This burner is fixed to the respiration pipe 28 of tank 1 and it operates with the air drafts that are produced towards the inside of tank 1 when letting out the bath after purging, as previously explained when describing the operation of the tanning unit.

DESIGN OF THE SULPHUR BURNER

As shown in FIG. No. 13, the burner consists of three pieces. First, a cylindrical piece 54 which has the form of a glass with a hole on the bottom center. This hole has a nipple 55 welded onto it.

A second piece 56 which is the combustion chamber and has the same shape as the first piece but smaller dimensions, diameter and height than same, so that it will fit into the first piece. This piece 56 has a number of holes 57 approximately two thirds from its bottom. On the upper end which is the open end, there is a flange with circular shape 58 and with a guide and a seat 59 with which the first piece 54 can be sealed completely if it is superimposed within it.

Placed in this way, there is a free space 60 between both pieces 54 and 56 due to the difference in size. The holes 57 communicate the insides of these two pieces 54 and 56. Last, there is a third piece 61 which has the shape of a disc and which serves as a lid for piece 56, which it can seal completely.

This lid 61 has a number of holes on which pipes of small diameter 62 are inserted, said pipes being long enough to have their lower ends close to the bottom of piece 56 when same is sealed by piece 61.

The burner operates in the following manner: The first two pieces 54 and 56 are placed mutually superimposed.

Sulfur is placed on the bottom 63 of the second piece 56, fire is put on it and lid 61 is put on its place at the same time an air draft is let in through pipes 62. This air feeds the combustion of sulfur and the gases from this combustion have no other way out except holes 57, through which they move on to piece 54 and exit through its bottom through nipple 55. If this burner is connected to respiration pipe 28 of tanning tank 1, screwing its nipple 55 onto valve 29 of this pipe, same can be actuated as previously mentioned with the air draft that is formed towards the inside of tank 1 when the purging bath is let out. In this way, sulfur dioxide is obtained easily and economically and the entrance of oxygen into the tank is prevented.

TANNING UNIT ADAPTED FOR CONTINUOUS PRODUCTION:

With a cost that is relatively low, a unit such as the one described can be adapted for continuous production. The only thing that is required is an increase in the number of tanning tanks. The rest of the installation remains unchanged, as shall hereinafter be seen. In FIG. No. 9 a unit of this type is shown. In order to show on same all its parts and the way they are connected, in this FIG. 9 part of the installation is drawn in plan drawing and the other part is presented in elevation. In the plan drawing we see four tanning tanks 64, 1, 65 and 66 with their respective lower output valves 67, 12, 68 and 69.

Also in the plan drawing water heater 7 and its pump 8, dissolution tank 30 for the reinforcement of liquors and its pump 33 can be seen.

In elevation we can see the four elevated storage tanks 14, 15, 16 and 17 with their respective lower output valves 20, 21, 22 and 23 and a lower pipeline 18 that interconnects them.

The contents of each of the elevated tanks is as follows:

No. 14 for the purging bath

No. 15 for liquor No. 1 (weak), for example 4° Be.

No. 16 for liquor No. 2 (medium density), for example 8° Be.

No. 17 for liquor No. 3 (high density), for example 12°-14° Be.

No. 14 is opened on its upper portion and the other three are tightly sealed.

The same water heater 7 with its pump 8 for circulation serves the four tanning tanks: its pipeline that goes from the heater to the tanning tanks connects with the entrances of the coil of each of said tanks. Each one of these entrances has its corresponding flow control valve under numbers 70, 71, 72 and 73, in that same order. The outgoing pipeline for water that comes from these coils connects with pipeline 10 for the return of water to the heater.

Connected in this way, the water heater serves the four tanning tanks: for example, the content of tank 64 would be heated by opening only its valve 70. If the content of tank 65 is the one to be heated, only valve 72 is opened, etc.

In a similar way, the same dissolution tank 30 for tanning extracts serves to reinforce the liquors of all the tanning tanks: it should be noted that the four lower output pipelines of the four tanning tanks are connected to a main pipeline 31 which is the same that goes to dissolution tank 30. Thus, if for example it is desired to reinforce the liquor of tank 64, its valve 67 and valve 32 of the dissolution tank shall be opened up. The liquor comes out and by gravity moves into tank 30 filling it up. If the liquor to be reinforced is that of tank 65, its valve 68 and valve 32 are opened up, etc.; with the aid of pump 33 these liquids return to their original tank.

Pipeline 31, which is the main one, is common to the four tanning tanks and connects, through line S, with the suction of the elevation pump 13. Lower line 18, which is common to the four elevated tanks, connects through line 19 with the discharge of the same pump 13.

This allows any of the liquids contained in any of the tanks to come down by gravity and to fill up any of the tanning tanks; for example, the liquid contained in elevated tank 14 can come down to tank 64 by opening valve 67, to tank 65 by opening its valve 68; or the liquid contained in elevated tank 17 can come down by opening its valve 23 and fill up tank 66 when its valve 69 is opened up, or fill up tank 1 when its valve 12 is opened up.

The passage of liquids is through pump 13, and with this same pump these liquids can go back to their original tanks through the same route. Each of the elevated tightly sealed tanks 15, 16 and 17 has on its uppermost part an output nipple. A pipeline 24 interconnects them and connects them with the four tanning tanks, also on the uppermost part thereof, by means of lines or branches 73, 74, 75 and 76 which correspond to tanks 64, 1, 65 and 66, respectively, and each of which has a valve numbered 77, 78, 79 and 80, in the same order. Thus, it is possible to communicate the inside of the

three elevated tanks 15, 16 and 17, which are tightly sealed, with the inside of any of the four tanning tanks 64, 1, 65 and 66. This intercommunication is between the upper part of the elevated tanks with the upper part of the tanning tanks. Thus, for example, when valve 77 is opened up, the inside of tanks placed above is communicated with the inside of tank 64, and when valve 80 is opened up, the inside of the elevated tanks is communicated with the inside of tank 66, etc.

Furthermore, each of the tanning tanks has its own stirring system, coil and a burner "q" for sulfur, such as the one previously described.

It should be kept in mind that this burner is only used once with each batch of skins, and such step takes place when the purging bath is let out upon completion of said operation.

OPERATION OF THE TANNING UNIT ADAPTED FOR CONTINUOUS PRODUCTION

In order to explain the operation of the tanning unit for continuous work we use the same FIG. No. 9.

Let us assume that the liquors are already prepared and located in their respective tank:

Elevated tank No. 15 with liquor No. 1.

Elevated tank No. 16 with liquor No. 2.

Elevated tank No. 17 with liquor No. 3.

Elevated tank NO. 14 with the solution to take lime off.

FIRST WORKING DAY

We load with skins from lot No. 1 in tripe form, without meat but alkaline, the first tanning tank No. 64. The loading door is closed and the liquid to take lime off is sent down opening valves 20 and 67 and that of the sulfur burner "q" of this tank 64, which in the drawing is not shown because the tank is drawn up in plan view. This burner serves as respiration pipe in this case, since upon entrance of the liquid to take lime off into tank 64, displaced air comes out through said pipe, that is, through the burner, as previously explained. Valves 20 and 67 are closed up.

In case it is necessary, the purging bath is heated, for which purpose heater 7 and its pump for recirculation 8 are actuated, and valve 70 is opened up. The stirring system of tank 64 is left working almost uninterruptedly until next day.

SECOND DAY

Batch No. 2 of skins is loaded into tank No. 1 and the loading door is closed up.

By then, the skins of tank 64 should be without lime and duly softened. The sulfur burner of this tank is prepared and lighted up at the same time that the purging bath is let out through pump 13, for which valves 20 and 67 are opened up. When displacement of the bath is completed, tank 64 is filled up with the sulfur combustion gases, purging bath remains in its tank No. 14 and valve 20 is closed up.

This purging bath can be let out down the drain by opening valve 35, and a new one is prepared, or else it may be reinforced and used again. In any of these cases, it is let down now into tank 1, for which valves 20 and 12 and that of the sulfur burner of this tank 1 are opened, the latter in order to let the air of tank 1 come out.

In case of need, the purging bath is heated lighting up heater 7 and actuating its pump 8 as long as is necessary.

The stirring system of tank 1 is left working as usual.

Tanning of batch 1 is started in tank 64 when valves 21 and 67 are opened up so that liquor No. 1 can come down, at the same time that valve 77 which communicates with the elevated tanks is opened up, and valve of burner of tank 64 is dosed up. The result of this is that the gaseous content produced by sulfur combustion of this tank 64 goes up into elevated tank 15.

Liquor is let in only in enough quantity to cover the skins. If so desired, liquor No. 1 is heated actuating heater 7 and its pump 8. The stirring system is left to work until next day.

At the end of this day's journey we have:

Tank No. 64 with batch of skins No. 1 and liquor No. 1.

Tank No. 1 with batch of skins No. 2 and bath to take lime off.

Tank 15 with combustion gases from sulfur.

Third Day

Batch of skins No. 3 is loaded into tank 65 and loading door is closed up. Purging bath is taken up from tank 1 to 14 by actuating the sulfur burner of tank 1 so that same is filled up with combustion gases. The bath to take lime off, which can be a new one or the old one reinforced, is taken down once more, this time to tank 65. If necessary, the bath is heated as usual. The stirring system is left to work in tank 65.

Tanning of the skins in tank 64 is continued now with liquor No. 2. First, liquor No. 1, which fills up tank 64, is taken up to tank 15. Gases in tank 15 go down to tank 64. Liquor No. 2 is taken down to tank 64 opening valves 22 and 67. Gases from tank 64 go up to tank 16.

We start tanning in tank 1 taking down liquor No. 1 from tank 15 to tank 1. Gases from tank 1 go up to tank 15. Liquors in tanks 64 and 1 can be heated as usual, if so desired; the stirring systems in these two tanks are left working until next day.

At the end of this day's work we have:

Tank 65 with batch of skins No. 3 and the purging bath. Tank No. 1 with batch of skins No. 2 and liquor No. 1. Tank 64 with batch of skins No. 1 and liquor No. 2. Elevated tanks 15 and 16 with combustion gases.

Fourth Day

Batch No. 4 of skins is loaded into tank No. 66. The solution to take lime off is taken up from tank 65 to tank 14. Said tank 65 is filled up with gases due to the fact that its sulfur burner has operated.

The liquid to take lime off, either fresh or reinforced, is taken down from tank 14 to tank 66. If necessary, this bath is heated. The stirring system of tank 66 is left to work until next day.

Tanning is started in tank 65 with liquor No. 1: first, it is moved up from tank 1 to tank 15; gases go down from tank 15 to tank 1. Then, it is moved down from tank 15 to tank 65; gases in tank 65 move up to tank 15.

Tanning is continued to tank 1, now with liquor No. 2. First, said liquor is moved up from tank 64 to tank 16. Gases in tank 16 go down to tank 64. Now, said liquor No. 2 is sent down from tank 16 to tank 1. Gases in tank 1 move up to tank 16.

Tanning is continued in tank 64, now with liquor No. 3; said liquor is moved down from tank 17 to tank 64, opening valves 23 and 67. Combustion gases move up from tank 64 to tank 17.

Stirring systems of tanks 64, 1 and 65 are left working until next day. If necessary, these liquors shall be heated as usual.

At the end of this day's work we shall have:

Tank 66 with batch of skins No. 4 and the purging bath.

Tank 65 with batch of skins No. 3 and liquor No. 1.

Tank 1 with batch of skins No. 2 and liquor No. 2.

Tank 64 with batch of skins No. 1 and liquor No. 3.

Elevated tanks 15, 16 and 17 remain filled up with sulfur combustion gases.

Fifth Day

By then, batch of skins No. 1 of tank 64 should be well tanned.

Liquor No. 3 contained therein is let out and sent to its tank No. 17. Gases in this tank go down to tank 64. Skins are let to drain inside the tank as long as necessary for them to stop dripping.

Drippings are extracted through the purging cock P.

DEPHLEGMATION

Liquor No. 1, which is in tank 65, may be used as washing liquid. Liquor is first moved up to tank 15. Gases contained in tank 15 are taken down to tank 65.

This liquor No. 1 is then moved down to tank 64 and the gases in tank 64 are moved to tank 15.

With the stirring system, tanned skins are washed up as required. Thereafter, the washing liquid is sent back to its tank No. 15. Tank 64 remains with the sulfur gases.

Within the same tank 64, skins are left to drain off as desired or as long as dripping continues. Drippings are extracted through purging cock P, and skins are unloaded. Tank 64 and its pipelines are washed up with water and the tank is loaded again with batch No. 5 of skins.

The "work chain" is hereinafter established. The unit delivers every day a batch of tanned skins and a new batch goes into the process.

DISSOLUTION TANK

The liquors used in tanning must be "reinforced" daily between each batch of skins, in order to maintain the density they should have.

For this operation, the unit has the so-called dissolution tank 30 (See FIG. No. 1).

This tank has a cylindrical shape, but has the form of a cone on its lower end. Its capacity can be between 25 and 30% that of tanning tanks.

It has two sections A and B which are placed one on top of the other. FIG. 10 shows section A in a vertical projection of a longitudinal section.

Said section A has inside it the mixing equipment formed by a motor 82, shaft 83 and propeller 84, and a helicoidal piece 85; also inside it is the deposit 86 for the tanning powder to be dissolved.

Motor 82 is placed vertically with respect to its shaft, in the center of the deposit, and it is held in place by a cross piece 87 the ends of which are fixed to the deposit walls.

Powder deposit 86 is a receptacle which has the shape of a truncated cone, with its smaller base 88 projected down in a cylindrical shape.

On the upper side portion of this section A is hopper 89 for loading powder.

In lower section B of the dissolution tank we observe (FIG. 11) also a vertical projection of a longitudinal section in a plan view, which shows the dissolution tank as such, that is, the deposit for the liquid that is to be reinforced. This tank is also cylindrical, but with the form of a cone on its lower end. Through this lower

end, the liquids to be reinforced go in and out of the deposit.

The upper portion of this section B is closed, but bears a circular opening 90 in its center. On its upper side portion, there is an output pipe, with a valve 91, which is connected by means of a hose to a receptacle that contains some gas such as SO₂ or nitrogen.

The two sections A and B are placed one on top of the other as shown in FIG. No. 12 and are screwed up with flange 81.

When they are placed in this way, propeller 84 of motor 82 and the lower portion of the powder deposit 86 of section A go in through the circular opening 90 of section B, remaining inside it and closing it up.

Helicoidal piece 85 is located at the bottom of the powder deposit and serves as a gate therefor.

OPERATION OF THE DISSOLUTION TANK

This tank operates in the following manner: valve 32 is opened (See FIG. No. 12), as well as that of the tanning tank in which we want to reinforce the liquor; liquid is allowed to go in until the deposit is completely filled up, that is, section B or lower section thereof; with this, we make sure that air is expelled completely. Valve 32 is closed up and deposit 86 is loaded with tanning powder.

A small amount of liquid is let out through pump 33, taking care only that propeller 84 is covered; at the same time, valve 91 is opened up to let in SO₂ gas, which shall occupy the space of the displaced liquid. With same, entrance of air is prevented and dissolution without air is assured.

Motor 82 is started up. Helicoidal piece 85 introduces powder into the liquid deposit, said power falling on top of the propeller to be dissolved by it. After dissolving the amount of powder that is to be added, motor 82 is stopped, and opening up valve 32, with pump 33 liquid is sent back, with the powder incorporated into it, to the tank where it came from.

FIG. 14 is a composite view, drawn in conventional perspective, of a tanning unit for continuous production, formed by four tanning tanks and four elevated tanks for the storage of liquids, and all the other fittings and connections that constitute said unit. This drawing requires no additional explanation, since all its parts have already been referred to in the previous explanation and everything is well known and perfectly identifiable.

In FIG. Nos. 9 and 14, recirculating pumps of the corresponding stirring systems are indicated as Z, 5, Y and X.

I claim:

1. An apparatus for tanning skins in a rapid and efficient manner comprising

a closed first tanning tank where skins to be tanned are hung, said first tanning tank having at least one airtight door for loading and unloading the skins, an inlet/outlet pipe with a valve for filling and emptying said first tanning tank, and an elevation pump operatively connected thereto, and a respiration pipe to permit gas to enter and exit said first tanning tank;

said respiration pipe having means for producing a gas which is chemically inert to tanning liquids;

first, second and third storage tanks for storing different liquids used in tanning, said first storage tank being open on its upper portion, said second and third storage tanks being airtight;

each of said first, second and third storage tanks having an output pipe with a valve for controlling the flow of liquid therethrough, said output pipes being connected to said elevation pump through a pipe system;

said second and third storage tanks and said first tanning tank having outgoing pipes, said outgoing pipes of said second and third storage tanks being connected to said outgoing pipe of said first tanning tank to permit gases to flow between each of said second and third storage tanks and said first tanning tank.

2. An apparatus according to claim 1, wherein said first tanning tank has steel belts coupled thereto for preventing deformation of and for hanging skins in said first tanning tank.

3. An apparatus according to claim 1, wherein said first tanning tank includes an internal stirring system.

4. An apparatus according to claim 3, wherein said internal stirring system comprises a recirculating pump for extracting and reinjecting liquids into and out of said first tanning tank and a filter for cleaning the liquids.

5. An apparatus according to claim 3, wherein said internal stirring system comprises means for moving the skins in said first tanning tank during treatment thereof.

6. An apparatus according to claim 5, wherein said skin moving means comprises

a motor mounted outside said first tanning tank; an eccentric member coupled to said motor to be rotated thereby;

a connecting rod coupled at one end thereof to said eccentric member at a point spaced from the axis of rotation of said eccentric member; and

a skin hanging frame connected to the other end of said connecting rod and movably mounted in said first tanning tank.

7. An apparatus according to claim 6, wherein said skin hanging frame has a plurality of retracting cross pieces from which skins are hung vertically, whereby the skins are moved in a pendular manner upon actuation of said skin moving means.

8. An apparatus according to claim 1, wherein said first tanning tank has an internal heating system to heat the liquids therein during treatment of the skins.

9. An apparatus according to claim 8, wherein said heating system employs steam.

10. An apparatus according to claim 8, wherein said heating system employs hot water.

11. An apparatus according to claim 1, wherein said elevation pump is located below the bottom of said first tanning tank with the suction of said elevation pump adjacent said first tanning tank inlet/outlet pipe valve.

12. An apparatus according to claim 1, wherein said gas producing means comprises a sulfur burner for producing sulfur dioxide.

13. An apparatus according to claim 12, wherein said sulphur burner comprises

a first cylindrical member having a bottom with an opening therein, and a nipple fixedly connected to said opening;

a second cylindrical member forming a combustion chamber, being of smaller diameter than and mounted within said first cylindrical member, and having a closed bottom; said second cylindrical member having a plurality of apertures therein spaced from the bottom thereof approximately two-thirds of the length of said second cylindrical member; and

a third member forming a lid to close said second cylindrical member; said lid being circular and having several holes therein in which air pipes are located for admitting air into said sulphur burner; said air pipes extending into said second cylindrical member to a point between said aperture and said second cylindrical member bottom.

14. An apparatus according to claim 1, wherein said first storage tank contains a solution for taking lime off the skins, said second storage tank contains a relatively weak tanning liquid to begin tanning and said third storage tank contains a relatively strong tanning liquid to finish the tanning.

15. An apparatus according to claim 1, wherein said first, second and third storage tanks are located above said first tanning tank; said outgoing pipes are connected to the upper portions of said second and third storage tanks and said first tanning tank; and said output pipes are connected to the lower portions of said first, second and third storage tanks.

16. An apparatus according to claim 1, wherein a dissolution tank for preparing and reinforcing tanning liquids is connected through a pipeline to said first tanning tank.

17. An apparatus according to claim 16, wherein said dissolution tank and said first tanning tank are located on the same level and said pipeline is coupled to the lower portions thereof; said pipeline includes a pump and a valve to control flow therethrough.

18. An apparatus according to claim 16, wherein said dissolution tank comprises

a vertical upper body having a cone-shaped lower end, stirring means and a hopper located adjacent the upper end of said upper body;

a lower body coupled to the lower end of said upper body; said lower body having a truncated cone-shaped lower end with an outlet pipe at the apex thereof connected through a valve to said pipeline and having a closed upper end with a central opening through which part of said stirring means extends; a gas pipe is connected to said lower body adjacent said closed upper end for supplying therein a gas which is chemically inert to tanning liquids.

19. An apparatus according to claim 1, wherein an airtight fourth storage tank is provided adjacent said second and third storage tanks, said fourth storage tank has an output pipe with a valve for controlling the flow of liquid therethrough and an outgoing pipe connected to said outgoing pipe of said first tanning tank to permit gas to flow therebetween; said fourth storage tank output pipe is connected to said elevation pump; and

said first storage tank contains a purging solution, said second storage tank contains a tanning liquid of relatively low density, said third storage tank contains a tanning liquid of medium density, and said fourth storage tank contains a tanning liquid of relatively high density.

20. An apparatus according to claim 1, wherein closed second and third tanning tanks are provided

adjacent said first tanning tank; said second and third tanning tanks each having at least one airtight door for loading and unloading the skins, an inlet/outlet pipe with a valve for filling and emptying said second and third tanning tanks, a respiration pipe to permit gas to enter and exit said second and third tanning tanks with means for producing a gas chemically inert to tanning liquids; and an outgoing pipe connected to said outgoing pipes of said second and third storage tanks to permit gas to flow therebetween;

said inlet/outlet pipes of said second and third tanning tanks are connected to said elevation pump; whereby the apparatus may continuously tan skins and the liquids in said first, second and third storage tanks may each flow into each of said tanning tanks through the same elevation pump.

21. An apparatus according to claim 19, wherein a single dissolution tank for preparing and reinforcing tanning liquids is connected through a pipeline to each of said tanning tanks.

22. An apparatus according to claim 20, wherein said storage tanks are located above said tanning tanks.

23. An apparatus according to claim 20, wherein a single heating means is provided for heating a fluid and conduit means connects each of said tanning tanks to said heating means for selectively conveying heated fluid to each tanning tank to heat same.

24. An apparatus according to claim 20, wherein an airtight fourth storage tank is provided adjacent said second and third storage tanks, said fourth storage tank has an output pipe with a valve for controlling the flow of liquid therethrough and an outgoing pipe connected to said outgoing pipes of said tanning tanks to permit gas to flow therebetween; said output pipe is connected to said elevation pump; and

said first storage tank contains a purging solution, said second storage tank contains a tanning liquid of relatively low density, said third storage tank contains a tanning liquid of medium density, and said fourth storage tank contains a tanning liquid of relatively high density.

25. An apparatus according to claim 1, wherein said first tanning tank is formed from a material selected from the group consisting of fiberglass and stainless steel.

26. An apparatus according to claim 1, wherein said first tanning tank is generally in the shape of a parallelepiped with an elongated rectangular cross section, flat roof and slightly bulged side walls and bottom;

a plurality of steel belts are provided on the outside of said first tanning tank, the upper portion of said belts being arch-shaped;

skin hanging means mounted inside said first tanning tank for suspending skins from the roof of said first tanning tank comprising a rail suspended from said belts by a framework, said rail extending along the length of said first tanning tank; and hangers for suspending skins from said rail.

* * * * *

[54] **METHOD FOR CLEANSING CATTLE HIDES AND APPARATUS FOR REALIZING SAME**

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[58] Field of Search **8/94.15, 139, 150.5**

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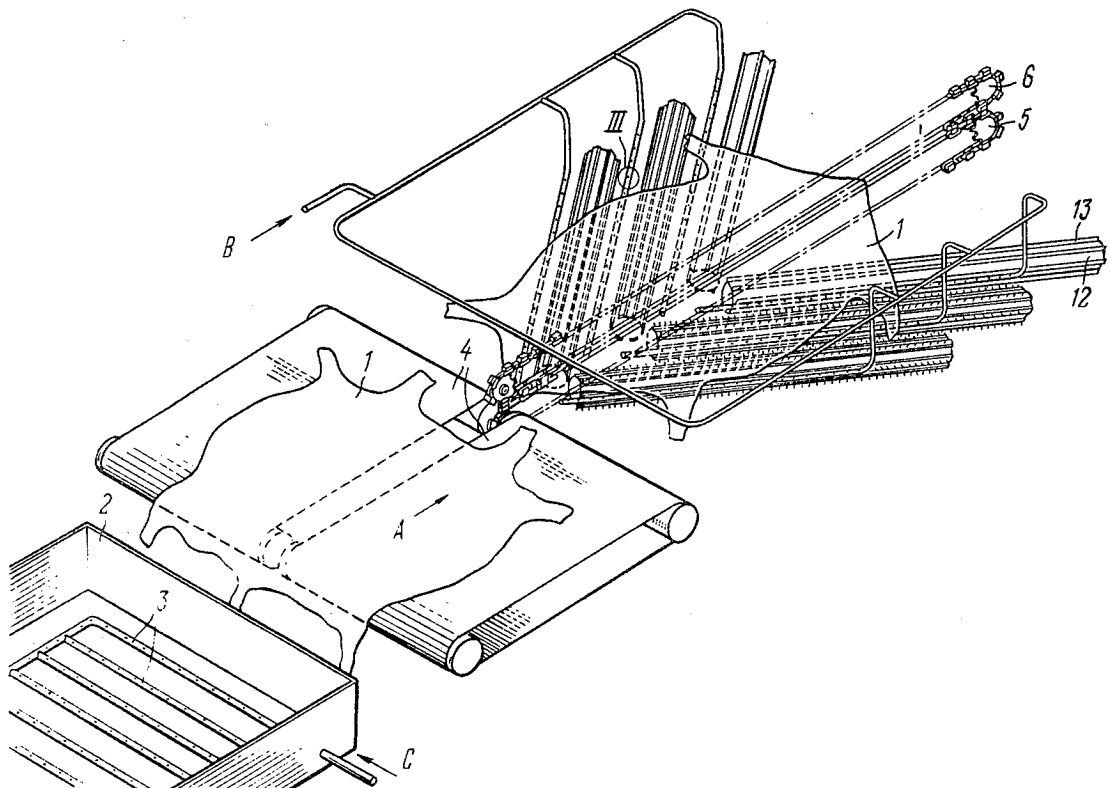
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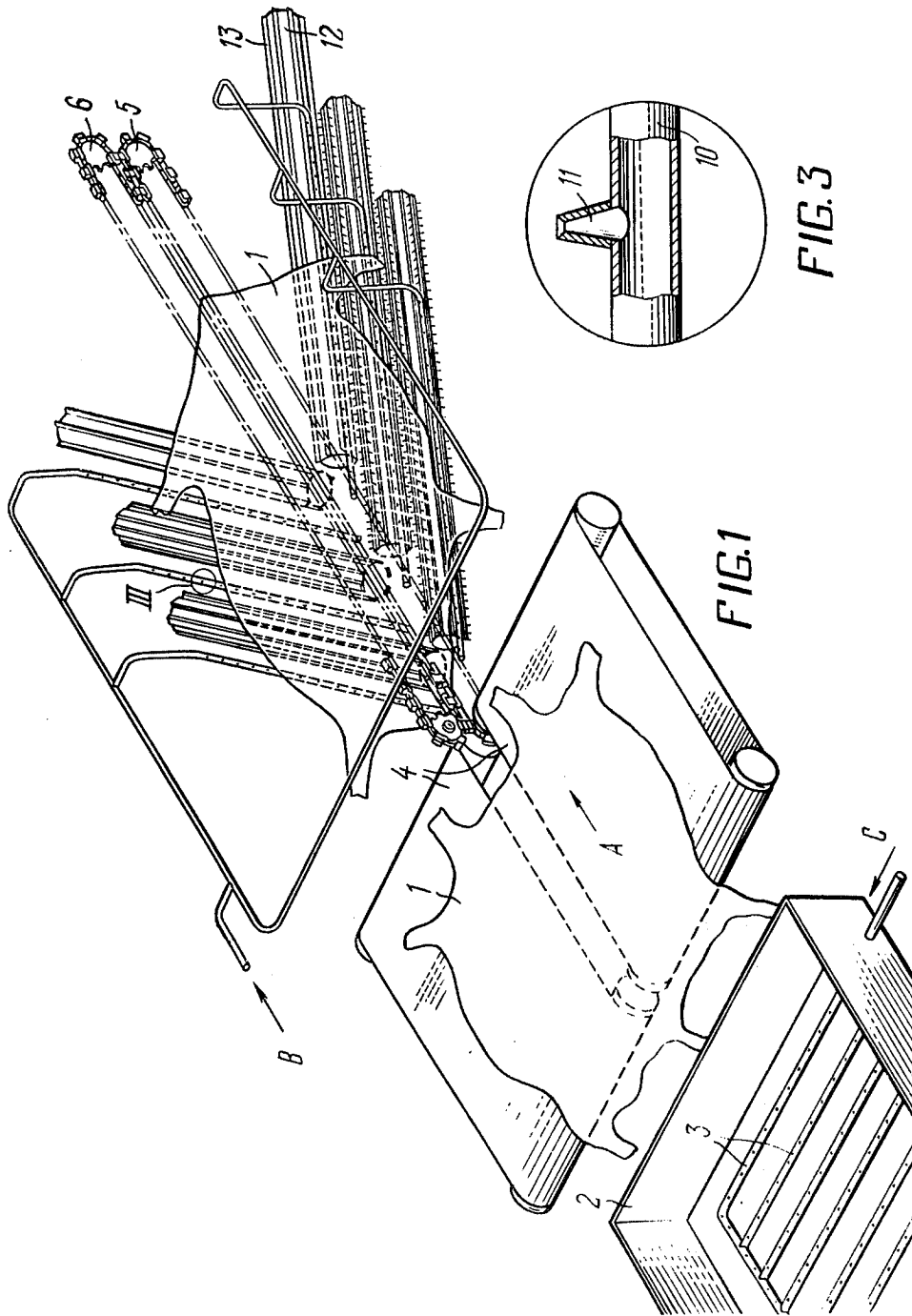
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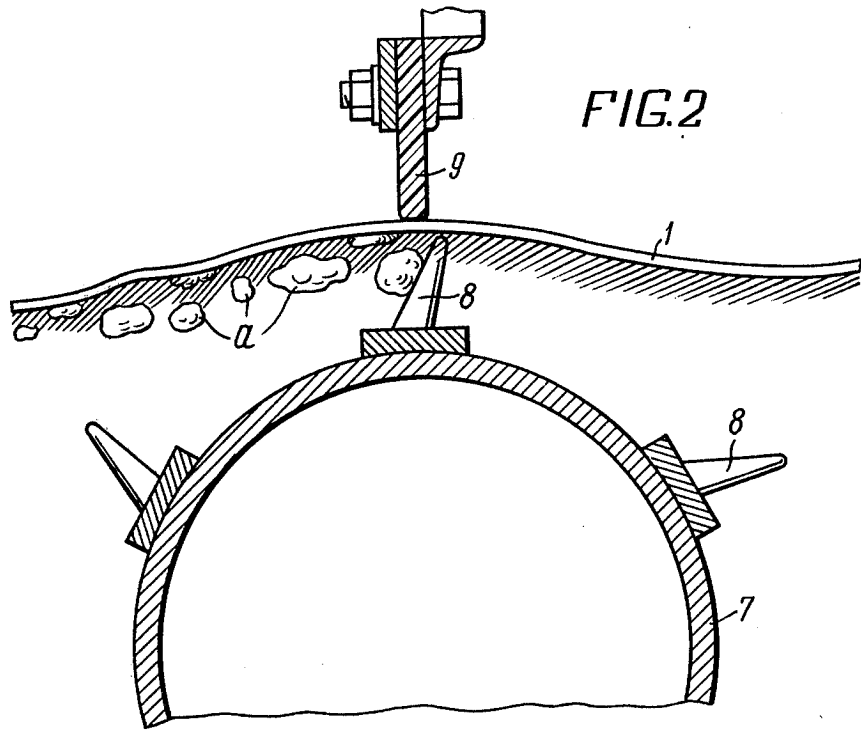
[57] **ABSTRACT**

This invention relates to primary processing of animal hides and more particularly to methods for cleansing cattle hides and to apparatus for carrying out same. According to the proposed method, washing, soaking and removal of dung from the surface of the hides are carried out simultaneously and continuously under copious irrigation of the moving hides with water and the hides are then clamped in position essentially along the axis of movement, while the removal of dung is effected by carding their hair covering and subsequent removal of surface moisture. An apparatus for carrying out said method comprises a tank for washing hides, a pair of belt conveyers arranged parallel to each other, and a pair of chain conveyers for grasping a hide and clamping it along its axis with its hair covering downwards during travel, and shafts with carding teeth are situated on either side of said chain conveyers, set at an angle sufficient for the maximum coverage of the surface of the hide being processed, said teeth being also set at an acute angle to the tangent to the surface of the shaft in a direction opposite to its rotation. The apparatus comprises also a pair of rolls with ribs arranged along the generatrix on the surface of said rolls and coming in contact with the hide for the wringing of surface moisture therefrom. This design provides for higher productivity and better quality of the hides being processed.

7 Claims, 9 Drawing Figures







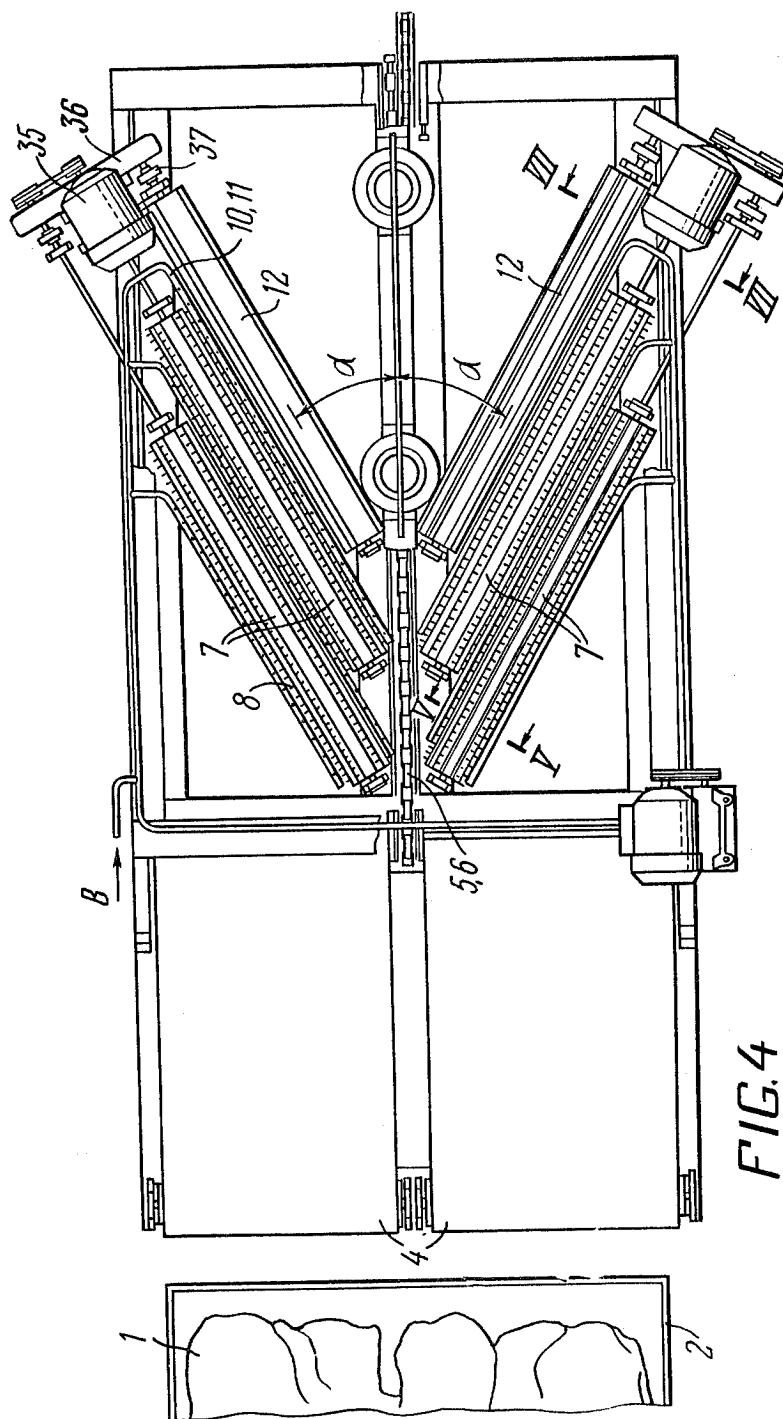


FIG. 4

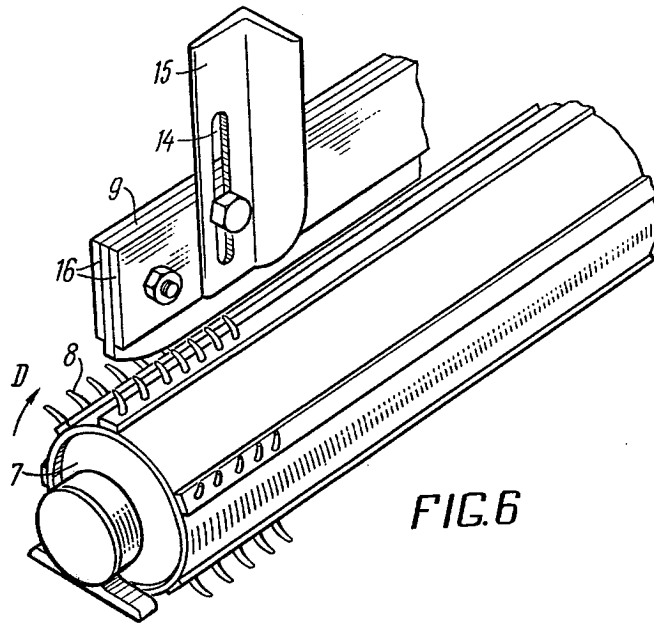


FIG. 6

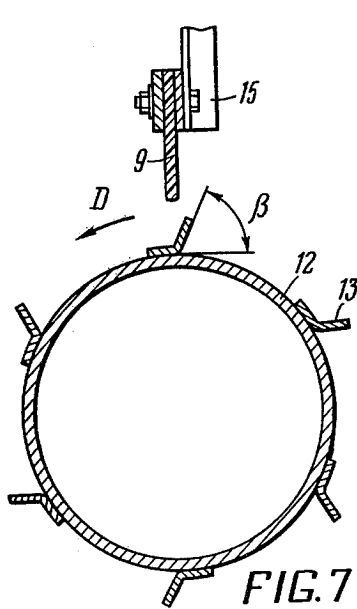


FIG. 7

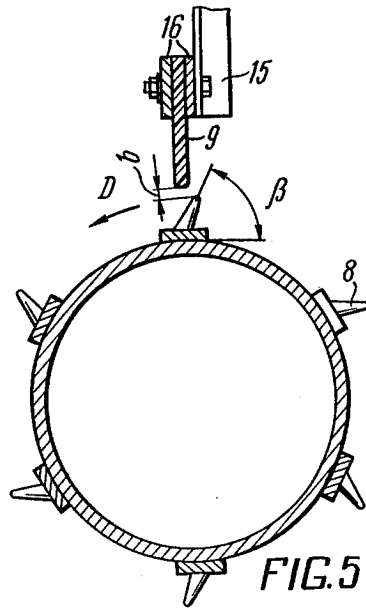
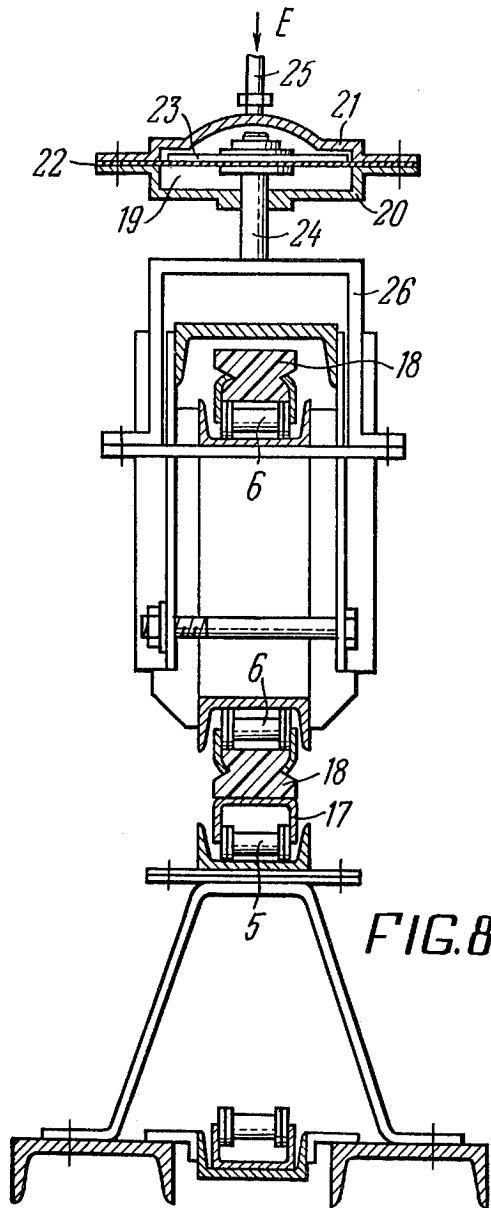


FIG. 5



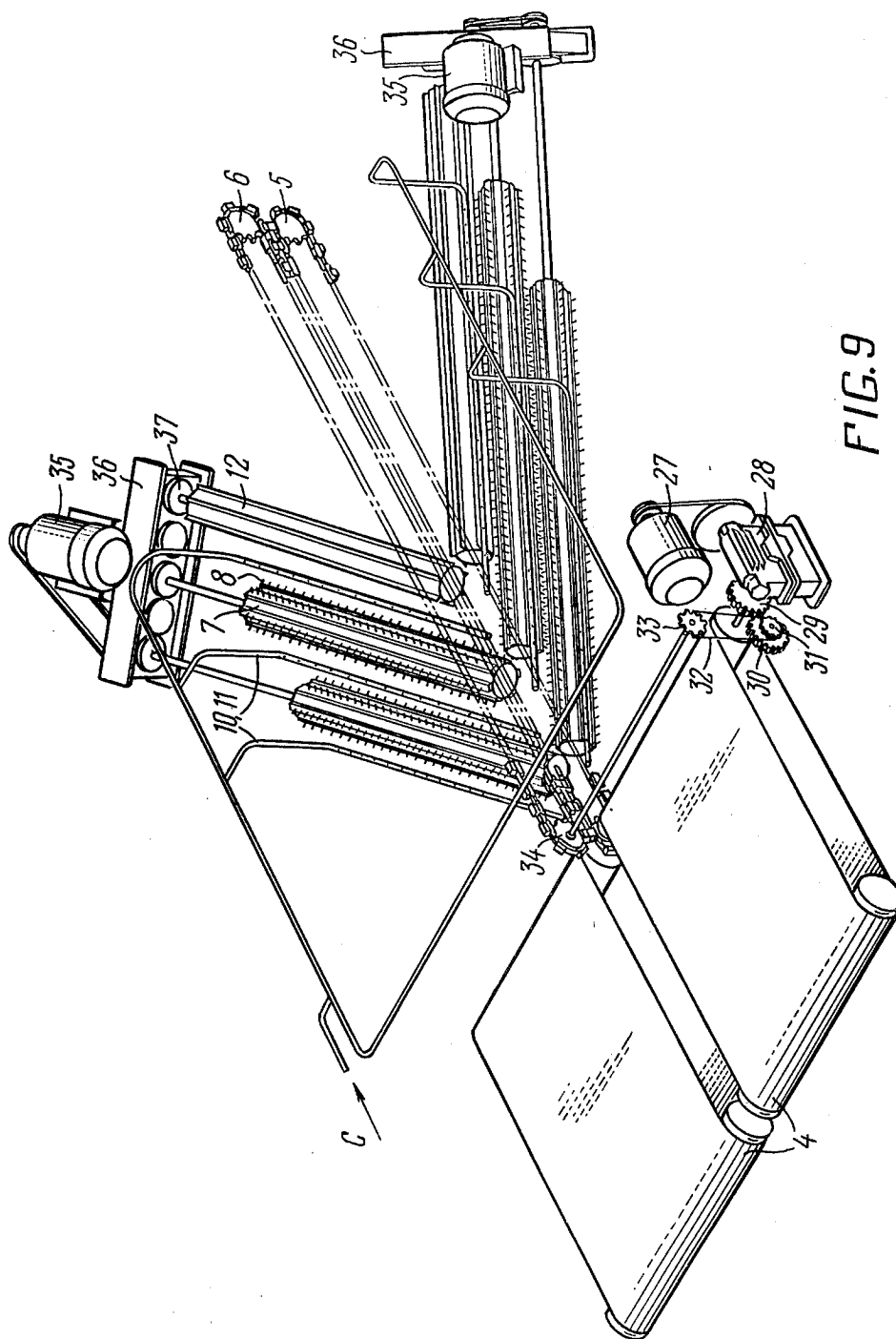


FIG. 9

METHOD FOR CLEANSING CATTLE HIDES AND APPARATUS FOR REALIZING SAME

FIELD OF THE INVENTION

This invention relates to primary processing of animal hides, and more particularly to methods and means for cleansing cattle hides.

The invention can be most effectively used in the meat and leather industries, which set increased demands for surface cleanliness and cleansing quality.

BACKGROUND OF THE INVENTION

A method of hide cleansing is known, residing in washing the hides, soaking the dung with laying, knocking (scraping) the dung off, and repeated washing of hides with laying for the drip-off of the moisture.

This method fails to ensure adequate quality of hide processing, since scraping cannot completely remove the dung and a considerable part of it remains on the hair of the hide.

Besides, the hides contain after processing a considerable amount of surface moisture, requiring greater expenditure of salt and sodium fluosilicate during subsequent curing.

Another disadvantage of this method is the need for laying the hides for 60 to 90 minutes to soak the dung after washing, which prolongs the production cycle, increases labour intensity and rules out continuity of the process.

These drawbacks are partially removed in another prior art hide cleansing, whereby hides are washed in washing machines for soaking the dung, after which they are fed to a dung removing (or fleshing) machine intended for knocking or scraping the dung off. In this method, the washing of the hides in the washing drum takes place simultaneously with the soaking of the dung, which is then removed in an intermittent-action apparatus comprising a pair of transporting shafts for feeding the hides and shafts with a blade for removing the dung by scraping. (cf. U.S. Pat. No. 3,319,442; cl. 68-42, and the washing machine manufactured by the Stehling company, USA). Washing the hides in the washing drum makes it possible to partially mechanize the cleansing of hides, but the method entails increased expenditure of water though the soaking of the dung is inadequate. Moreover, during the rotation of the washing drum, an intensive mixing of hides takes place, resulting in the soiling of the flesh side of the hides with no way of cleaning them later, which impairs the hides' market value.

The above-described dung removing (or fleshing) machine does not provide for adequate hide treatment quality, since scraping off (knocking off) cannot fully remove the dung, a considerable part of which remains on the hair of the hide. Besides, this dung removal process involves much manual labour for loading the hides into the dung removing machine and unloading them therefrom. The method does not provide for the operation of removing surface moisture from the hides, which subsequently requires increased salt expenditure for curing them.

Thus, prior art cattle hide cleansing methods and equipment fail to ensure adequate hide cleansing quality; they prolong the production cycle, increase labor intensity and the expenditure of curing materials, and

also rule out the performance of these processes in a continuous flow-line.

It is an object of the present invention to obviate the above disadvantages.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method for cleansing cattle hides and apparatus for carrying out same, that would ensure continuous treatment of hides with adequate quality of processing their surface.

A further object of the invention is to ensure a high market value of the processed hides.

Another object of the invention is to ensure high-quality processing of hides while preserving their epidermis intact.

These and other objects are achieved by that in a method for cleansing cattle hides, their washing and soaking, and the removal of dung from their surface, according to the invention, are carried out simultaneously and continuously under copious irrigation with water, and, by moving the hides, their axis being essentially arranged along the direction of movement and secured in this position, while the removal of dung from the surface of the hides is effected by carding their hair covering with subsequent removal of the surface moisture.

An apparatus for carrying out the above method comprises a tank for washing the hides and soaking the dung and a means for removing the dung from said hides, and mounted, according to the invention, after said washing and soaking tank is a pair of belt conveyers parallel to each other and transporting the hides emerging from said tank to said dung removal means which comprises a pair of chain conveyers for grasping the hides and securing them along their axes, hair covering downwards, arranged one above the other, with one of them entering a clearing between said belt conveyers, and shafts bearing carding teeth are arranged on either side of the chain conveyers at an angle to the longitudinal axis of the apparatus, sufficient for said teeth to cover the maximum surface area of the hide being processed, each tooth being set at an acute angle to the tangent to the shaft's surface in a direction opposite to its rotation, and mounted above each of the shafts, along its longitudinal axis, is a hold-down member for maintaining the hide at the same distance from the teeth, adapted to move to and from the teeth to adjust the clearing therebetween according to the hide thickness, and having, after the last pair of shafts with carding teeth in the direction of hide travel, a pair of rolls with ribs arranged along their generatrices, on the surfaces thereof and coming in contact with the hides for removing surface moisture therefrom, and a means for spraying water onto the hides' hair covering is mounted between each pair of shafts and rolls.

The proposed method and apparatus provide for high-quality hide processing in a continuous flow and simultaneously, as a result of the hides being spread with their hair covering downwards on the continuously moving belt conveyers which feed them to the chain conveyers, likewise in continuous movement at a speed synchronous to that of said belt conveyers, for fixing the hides along their axial line and transporting them to the shafts with the carding teeth set at an angle to the apparatus longitudinal axis, each tooth being arranged in a staggered manner on the perimeter of the shaft and at an acute angle of about 50° to 70° to its

tangent, pointing in the direction opposite to its rotation. It is precisely this arrangement of the shafts and teeth, that makes it possible to keep a hide stretched out and fully remove dung from the hide's hair covering without damaging it.

Quality cleansing of the hide is further facilitated by the presence of hold-down members above each of the shafts for keeping the hide at the same distance from the teeth, and the constant irrigation of said hides with water which, simultaneously with the carding, washes their surface and carries away the detached dung. Then, the chain conveyers move the hide on towards the ribbed rolls which wring out the surface moisture and carry said hide over a distance necessary for the next technological process, for example, curing.

According to the invention, the carding of a hide's hair covering is carried out at a given speed of the shafts and an angle of inclination of each tooth of about 50° to 70° to the longitudinal axis of the shaft in the direction opposite to the rotation thereof and to a depth essentially close to the hide's epidermis and adequate for the proper cleansing of the hide without damaging its surface.

According to the invention, the clamping of a hide by the chain conveyers is effected strictly along its axial line in the direction of its movement, which provides for complete cleansing of its more dirty lateral and marginal parts.

For loosening the dung simultaneously with soaking during the preliminary washing of the hides, according to the invention, compressed air is fed in under a pressure between 1.5 and 3 atm, since a pressure below 1.5 atm is not effective, while a pressure in excess of 3 atm causes the water in the tank to stir up and mix with the dung settling on the bottom and soil the hide's flesh side.

For reliable fixation of a hide between the links of the upper and lower chain conveyers, according to the invention, and also for excluding any damage to the hide by the chain conveyers during clamping, the lower chain conveyer has rubber cushions and pneumatic chambers consisting of a rubberised diaphragm, a metal disk, a rod and a thrust bearing, transmitting the pressure of the incoming compressed air to the rubber cushions.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, a specific example of its embodiment will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatical representation of the apparatus for carrying out the proposed method for cattle hide cleansing;

FIG. 2 shows the interaction of the teeth and the hold-down plate with a hide being processed;

FIG. 3 is a view, on an enlarged scale, of unit A of FIG. 1;

FIG. 4 is a top diagrammatical view of the apparatus for carrying out the method of hide cleansing;

FIG. 5 is a section along line V—V of FIG. 4;

FIG. 6 shows the arrangement of the hold-down plate and the toothed shaft in relation to each other;

FIG. 7 is a section along line VII—VII of FIG. 4;

FIG. 8 is a cross-section view of the chain conveyers;

FIG. 9 is a kinematic diagram of the proposed apparatus.

DETAILED DESCRIPTION OF THE INVENTION

Cattle hides are processed in the following way: Hides 1 (FIG. 1) are continuously fed into a tank 2 with running water for the preliminary washing and partial soaking of dung. Compressed air is fed into the tank via a pipeline 3 for accelerating the process of loosening the dung. The constant passage through the water of bubbling compressed air under a pressure of 1.5 to 3 atm accelerates its movement, thus speeding up the loosening and softening of the dung on the hide.

Then the spread-out hides 1 are continuously fed onto belt conveyers 4 moving in parallel at a preset speed allowing complete cleansing of the hides.

Further on, each hide 1 in the flow along its axial line is grasped by a pair of chain conveyers 5 and 6 and is reliably clamped.

One of the chain conveyers 5 enters the clearing between the belt conveyers 4, while the other chain conveyer 6 is situated above the chain conveyer 5. Due to synchronous operation of the belt and chain conveyers, the clamped hide 1 is smoothly drawn into the cleansing zone where it travels over shafts 7 with teeth 8 (FIG. 2), its hair covering downwards, while the teeth 8 completely remove dung "a" from the hide 1.

Maximum cleanliness of the hide surface is attained by carding the hide's hair covering with the teeth 8 secured on the shafts 7 and set at an acute angle in the direction opposite to the rotation of the shaft. This facilitates smooth entry of the teeth 8 into the hair covering of the hide 1, and removal of the dung "a", while the provision of a hold-down plate 9 ensures the penetration of the teeth into the hair covering to a depth close to its epidermis, without damaging it.

Meanwhile, a system of pipelines 10 and nozzles 11 copiously irrigates the hide surface being processed with water fed under a definite pressure (FIG. 3).

Further on, the chain conveyers 5 and 6 move the hides 1 over rolls 12 with ribs 13 (FIG. 1) for the removal of surface moisture.

Surface moisture is wringed from the hide 1 due to the latter being pressed by the hold-down plate 9 to the ribs 13 secured on the rolls 12 at the same angle as the teeth 8 on the shafts 7 and which rotate at the same speed.

Thus, high-quality cleansing of the hair covering of hides without damaging them can only be carried out by the above described method of processing, whereby the carding shafts are arranged at a pre-set angle to the axial line of the apparatus in the horizontal plane, all the teeth being set on the perimeter of the shaft in a staggered manner at an acute angle, pointing in the direction opposite to the rotation of the shaft, and the carding of the hair covering goes on simultaneously with the irrigation of the hide surface with water, said surface being kept by the hold-down members at the same distance from the carding teeth, according to the thickness of the hide.

The thoroughly cleansed and wringed hide 1 is moved on by means of the chain conveyers 5 and 6 for the next technological operation, for example, curing.

The movement of the hide is conditionally designated in the drawing by arrow A, the water supply, by arrow B, and the air supply, by arrow C.

The apparatus for carrying out the above method comprises a tank 2 (FIG. 4) intended for preliminary washing and partial soaking of dung on hides 1.

Mounted after said tank, in the direction of the hide's movement, are belt conveyers 4 for transporting the hides and feeding them to the pair of chain conveyers 5 and 6, situated behind said belt conveyers 4. The conveyer 5 enters the clearing between the belt conveyers for grasping the hides. Situated on either side, of the chain conveyers 5 and 6 are the horizontally arranged shafts 7 with the teeth 8, secured in a staggered manner on the surface of the shafts.

The shafts 7 are set at an angle α to the apparatus' longitudinal axis, sufficient for covering the maximum surface area of the hide being cleansed by the teeth 8 and for keeping the hide stretched while being treated.

The teeth 8 (FIG. 5) are set at an acute angle β to the tangent to the surface of the shaft, pointing in the direction opposite to its rotation. The rotation of the shaft is conventionally indicated in the drawing by arrow D. The angle β lies within the range from 50° to 70° and is selected such as to ensure the penetration of the teeth 8 close to the epidermis and adequate for high-quality cleansing of the hide without damaging its surface.

A hold-down member in the form of a plate 9 is mounted over each shaft 7 along its longitudinal axis and intended for keeping the hide at an equal distance from the teeth 8.

The plate 9 (FIG. 6) is mounted movably to or from tooth 8, for which it is set in a slot 14, made in a bracket 15 and secured between metal plates 16.

This movability of the plate is necessary for adjusting the clearance b (FIG. 5) between said plate and the tooth, depending on the thickness of the hide, and also to compensate for the wear and tear of the plate and teeth.

Following the last pair of the shafts 7, in the direction of the hide's movement, a pair of rolls 12 (FIG. 1) is set with ribs 13 arranged on their surfaces along the generatrices. The ribs 13 (FIG. 7) are inclined to the longitudinal axis of a roll 12, just as the teeth 8 are, at an angle β and are intended for the removal of surface moisture from the hide. The hide is pressed against the ribs 13 of the rotating rolls 12 by the hold-down plate 9 similar to the way it is pressed to the shafts 7.

A means for water spraying, comprising a system of pipelines 10 and nozzles 11 (FIG. 3) is set between each pair of shafts 7 and rolls 12.

To exclude any damage to the hides by the chain conveyers 5 and 6 (FIG. 8) and for reliably clamping them therebetween, the lower conveyer 5 has bracket-shaped plates 17, and the upper conveyer 6 has rubber cushions 18 and pneumatic chambers 19 intended for feeding compressed air to the rubber cushions 18.

A pneumatic chamber consists of half-chambers 20 and 21 with a diaphragm 22 and a metal disk 23 therebetween. The pneumatic chamber also has a rod 24 and a pipeline 25 for feeding compressed air in the direction conventionally indicated by arrow E. The rod 24 actuates a yoke 26 fastened on the frame of the chain conveyer 6.

The apparatus is fitted with means for driving the belt conveyers 4 and the chain conveyers 5 and 6. The belt conveyers 4 are driven by an electric motor 27 (FIG. 9) through a reducing gear 28. A gear 29 on the output shaft of the reducer 28 is engaged with a gear 30 which is blocked with a sprocket 31, linked through a chain 32 with another sprocket 34 which actuates the chain of the upper conveyer 6.

The shafts 7 and rolls 12 are rotated by an electric motor 35 through a reducing gear 36 which has a clutch 37 set on its output shaft.

OPERATION OF THE APPARATUS

The belt conveyers 4 and chain conveyers 5 and 6 are actuated from the electric motor 27 through the reducing gear 28 and further by means of the elements 31 to 34.

The shafts 7 with the carding teeth 8 and the rolls 12 with the ribs 13 are rotatable upon the switching on of the electric motors 35, transmitting rotation to the reducing gears 36 through the clutch 37.

Water is simultaneously fed into the pipeline system 10 with the nozzles 11 for spraying the hides in the process of their cleansing.

In order to secure the hides between the chain conveyers 5 and 6 along the axial line for their further transportation, compressed air is fed into the pneumatic chambers 19, which through the rod 24 and yoke 26 acts upon the upper chain conveyer 6, thereby ensures the clamping of the hide to the lower chain conveyer.

Upon starting the apparatus, a hide 1 is placed with its hair covering downwards onto the belt conveyers 4 which feed it to the chain conveyers 5 and 6 for clamping and further transportation to the shafts 7 with the teeth 8 and the rolls 12 with the ribs 13, rotating at a preset speed in a direction opposite to the movement of the hides which are subjected all the time to carding by the teeth 8, irrigation with water from the nozzles 11 and wringing by the ribs 13, all of which ensures proper cleanliness of the hair covering of the hides 1 and the wringing of surface moisture therefrom.

What is claimed is:

1. A method for cleansing hair covered hides comprising the steps of:
 - fixing a hide for movement and moving the hide substantially along its axis of symmetry;
 - simultaneously irrigating the hide and carding the hide's hair covering while the hide is moving along its axis of symmetry, thereby washing the hide and soaking while simultaneously removing foreign material adhering to the hair side of the hide; and removing surface moisture from the hide.
2. A method as recited in claim 1 including the further step of prior to substantially irrigating and carding the hide, subjecting the hide to a preliminary washing.
3. A method as recited in claim 2 wherein said preliminary washing step comprises disposing the hide in a liquid-filled tank and introducing compressed air into the tank under a pressure of between 1.5 to 3 atmospheres.
4. A method as recited in claim 1 wherein said carding step is effected by moving a plurality of teeth through the hide hair in a direction opposite to the direction of travel of the hide, the teeth extending to a depth close to the epidermis of the hide.
5. A method as recited in claim 4 wherein said carding step further includes urging the hide towards the teeth to a predetermined extent so that the teeth extend to said depth.
6. A method as recited in claim 1 wherein said simultaneous irrigating and carding steps are effected by locating a plurality of rotatable carding rolls beneath the hide and spraying the hide from locations interposed between the carding rolls.
7. A method as recited in claim 6 wherein said carding rolls are located in a manner whereby each of their longitudinal axes extend at an acute angle with respect to the direction of movement of the hide.

* * * * *

[54] **METHOD AND APPARATUS FOR THE MANUFACTURE OF TANNED HIDES AND SKINS**

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[22] Filed: **Jul. 12, 1979**

[30] **Foreign Application Priority Data**

Jul. 19, 1978 [DE] Fed. Rep. of Germany 2831617

[51] Int. Cl.³ **C14C 15/00; C14C 1/04; C14C 1/06; C14C 3/30**

[52] U.S. Cl. **8/436; 8/94.15; 8/94.17; 8/94.21; 8/94.22; 8/94.27; 8/150.5; 69/32**

[58] Field of Search **8/12.5, 94.27, 150.5, 8/94.17, 94.21, 94.22, 94.15; 69/32**

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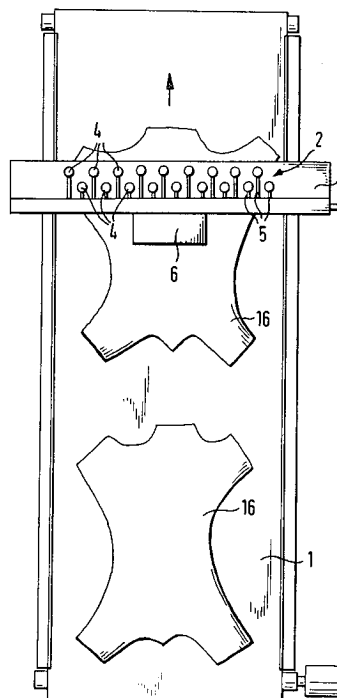
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Primary Examiner—Maria Parrish Tungol
Attorney, Agent, or Firm—Craig and Antonelli

[57] **ABSTRACT**

A method for the wet processes in tanneries, e.g. soaking, liming, deliming, bating, pickling and tanning, wherein the liquids or solutions necessary for these processes are injected by high pressure into the hide or skin, and an apparatus for the realization of said method, wherein piston-type shooting devices are arranged in rows and a conveyor is provided receiving the hide or skin conveying it stepwise below the shooting devices and having holding-up members for pressing the hide against the shooting devices while the injection of said liquids or solutions takes place.

12 Claims, 4 Drawing Figures



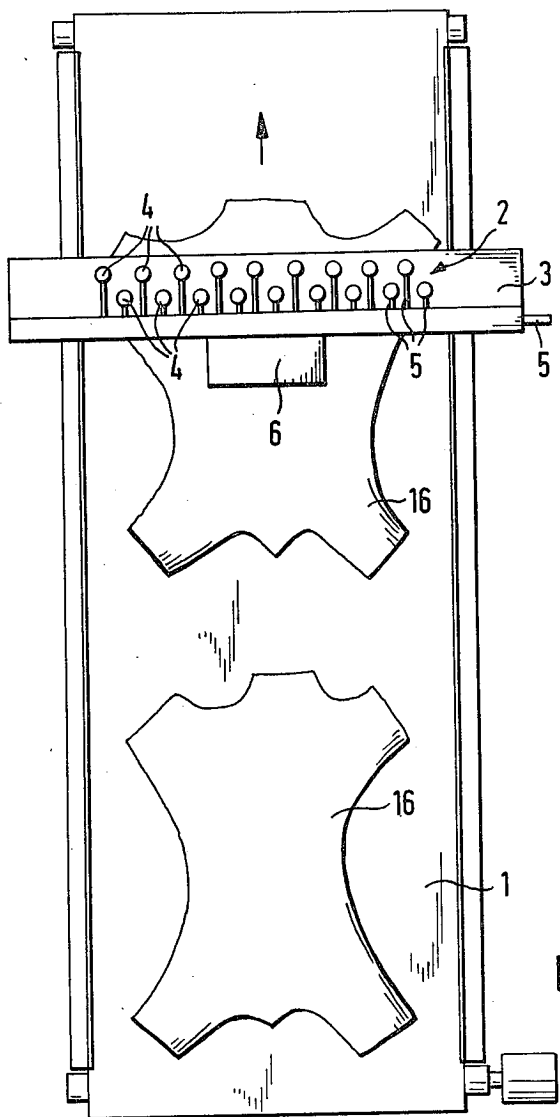
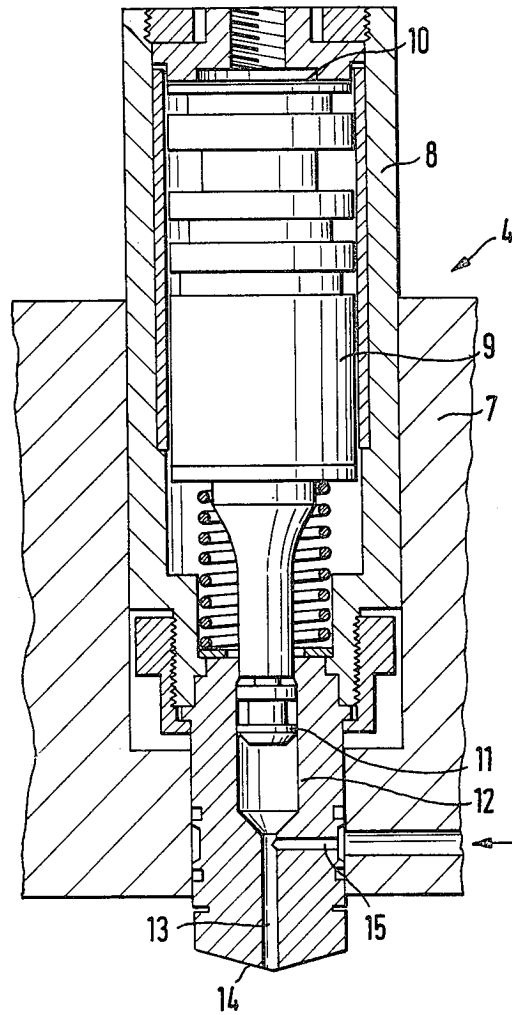


FIG.1



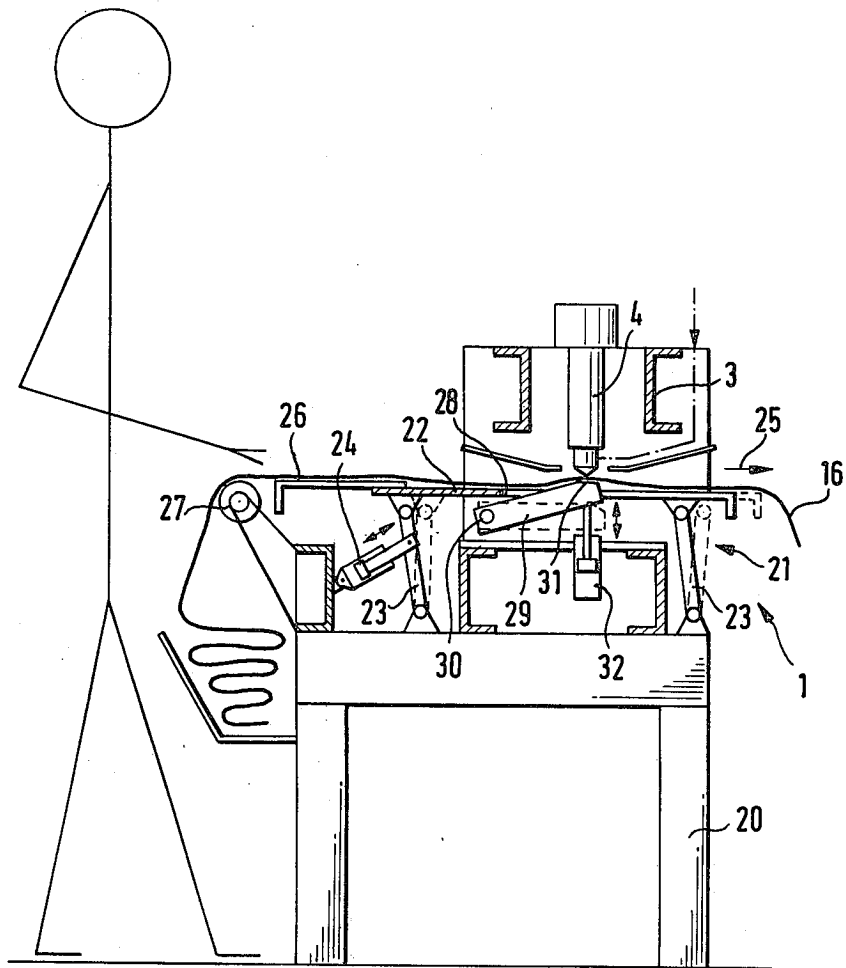


FIG. 3

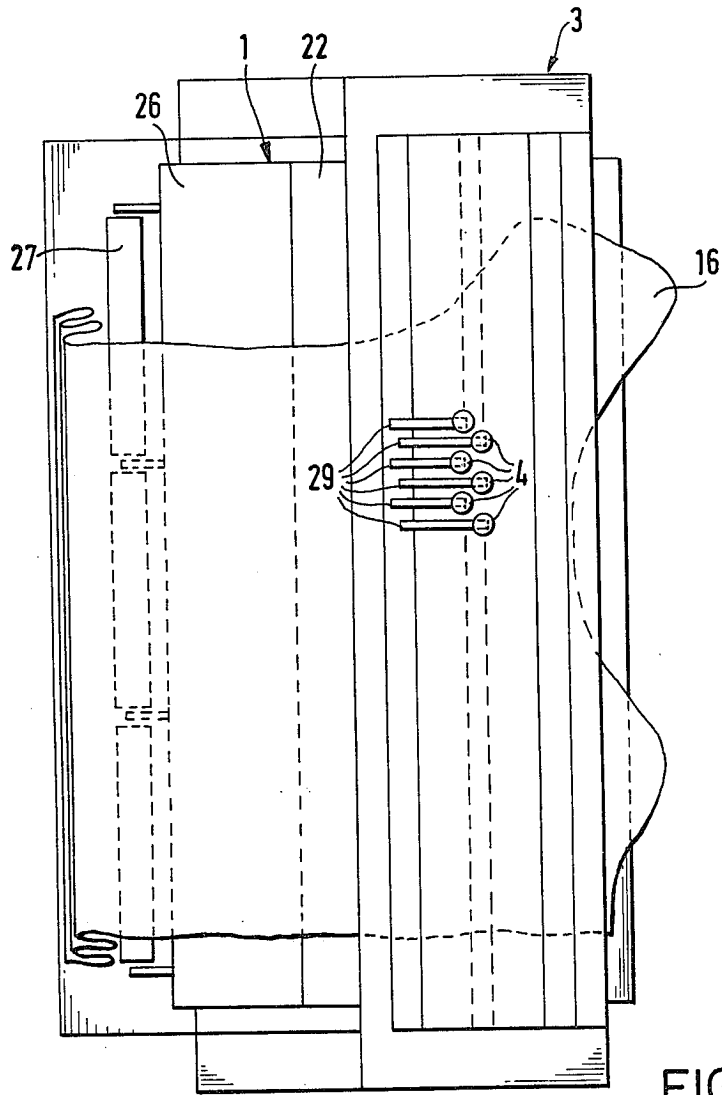


FIG. 4

METHOD AND APPARATUS FOR THE MANUFACTURE OF TANNED HIDES AND SKINS

This invention relates to a method and an apparatus for the manufacture of tanned hides and skins with the following steps of procedure the so called wet processes: soaking of the hide, liming in a concentrated alkaline solution, deliming in an acid solution, bating, for example by means of proteolytic enzymes, pickling by means of acids and salts, tanning, for example by means of trivalent chromium salts, retanning, fatliquoring of the hide and, if necessary, dyeing.

Wet processes of a tannery are effected in drum-type containers with numerous revolutions and varying reaction periods. Besides these wet processes there are also sequences of mechanical treatment by machines such as fleshing, splitting of the leather, etc. In the following the wet process steps are explained separately:

The fresh hides are conserved by salt and in this condition enter into the tannery. Salt conservation serves to extract water from the hide. This is reabsorbed during soaking, the first process effected in the tannery. Soaking is carried out in very long floats of 200-400% meaning that a quantity of water of two or four times the weight of the hide is required. After soaking, the original moisture content of the hide is nearly restored.

During the following liming process, a treatment using concentrated alkaline up to pH 14 is carried out in floats of about 150-300%, normally containing sulfide ions. During liming the hair is dissolved chemically and natural grease is saponified. Furthermore the protein of the hide is attacked and changed in its structure, and the hide is prepared (developed, disintegrated) for the leather manufacture. While the waste water from soaking is comparatively harmless and only polluted to a lesser extent with organic substances, waste water from the lime contains above all saponified grease and dissolved hair in addition to the sulfides, thus leading to a considerable chemical and biological pollution of the waste water.

After liming, the back side of the hide is cleaned mechanically of subcutaneous tissue. Then the hide is splitted, i.e. it is reduced to uniform thickness to get the so called pelt. The ensuing tanning is effected in floats between 30 and 200% in the following sequences: during deliming the alkaline hide is neutralised by adding acids and acid salts. The resulting neutral salts are washed out. During the subsequent bating process proteolytic enzymes are fed into the hide to continue changing the protein of the hide and to disintegrate it. Finally the hide is treated with acids and salts during pickling and acidified, a prerequisite for chrome tanning.

Generally chromium -III- salts are used, preserving the normally perishable hide. This stops the growth of bacteria and prevents decay processes, etc. Also chrome-tanning produces problematic waste water containing, in the first plan, trivalent chromium.

Chrome-tanning is followed by a retanning process, for which there are different formulas, to give the hide its final look. Then the hides are fatliquored one after the other at a float length of 50 to 300% and dyed if necessary. During fatliquoring the leather is given the necessary softness and flexibility. The waste water resulting also contains a high degree of organic and inorganic substances.

For several reasons the wet processes in the tannery are technically unsatisfactory. The hide must go through various steps of procedure partly realized in charges of up to 20 tons weight of hide (wet processes) and partly by individual treatment (mechanical treatments). This requires taking the charges apart, separating and aligning the hides (head and butt,) consuming time and labour. Large hides may have a surface of up to 6 square meters and weigh up to 100 kg depending on their moisture content. As transportation must be effected manually in many parts of a tannery, a corresponding number of workers is required. Because of the aggressive chemicals and the organic substances originating from the hide hygienic working conditions can hardly be provided for the operators.

It is the primary object of the invention to propose wet processes reducing manpower and improving working conditions.

According to the invention the solutions or liquids of one or more of the said procedure steps are introduced into the hide or skin by injection under high pressure, such as 50 to more than 100 bars.

With the injection provided for individual steps as well as for all steps of the procedure the floats and the rotating drums can be eliminated. For saving costs for working materials, it is important that the quantities of solutions and liquids injected into the hide do not exceed precise requirements, and workers are hardly exposed to occupational hazards common in wet processes. As injection of the hide can be carried out on continuous transportation units there is no need for manual handling. Both water consumption and waste water production are considerably reduced. As the effectiveness of the processes no longer depends on the natural penetration of liquids into the hide, other and more efficient chemicals can be used to increase economy and improve the properties of the product. Finally the procedure according to the invention renders it possible for the entire width of the hide to undergo different types of treatment. This is important because for example the structure of the back parts is completely different from that of the neck and belly parts of the hide. As tumbling by means of revolving processes is eliminated the natural fibrous structure remains intact and there is no damage to the hide.

According to a preferred embodiment of the invention injection is provided from the flesh side of the hide. In this way the grain side of the hide, so decisive for the appearance and the value of the leather, is not attacked. Moreover, during liming, the hair is attacked from the root, is loosened and removed chemically. The hair can be used for technical (production of brushes and felts) or agricultural purposes (fertilizers of lasting effect). There is no longer any pollution of waste water by protein emanating from the chemical dissolution of the hair.

As already stated, some wet processes can be integrated into the procedure according to the invention in a conventional way, particularly liming, where each tanner has his own formula. Another advantage is that the lime, no longer containing any dissolved protein, can be reused.

Moreover the invention relates to an apparatus for the realization of the procedure, embodiments of which are given below, together with the drawings.

FIG. 1 is a top schematic view of a whole plant;

FIG. 2 is a schematic lateral sectional view of a version of the piston-type shooting unit;

FIG. 3 is a partly broken end view of an embodiment of the plant; and

FIG. 4 is a top view of the embodiment shown in FIG. 3.

The apparatus essentially comprises a base (1) and an injection unit (2) arranged on a portal-like beam (3) extending over the whole width of the base. In the embodiment of FIG. 1 the base (1) is an endless stepwise driven conveyor belt and the beam is stationary. It is obvious to provide the base (1) as a stationary table and the beam (3) as a sliding carriage.

The base (1) can be made of felt, rubber or some other material of minor elasticity and can be moved over a rigid holding-up member, such as a plate, arranged at least within the area of the injection unit. The injection unit comprises several piston-type shooting devices (4) arranged in two parallel offset rows as shown in FIG. 1. The piston-type shooting devices (4) are acted upon by a pressure medium flowing through tubes (5) while injection solutions or liquids are fed to the shooting cylinders of the piston-type shooting devices from a storage bin (6) via tubes not shown in the drawing.

FIG. 2 is a close-up view of one of the piston-type shooting devices (4) comprising a casing (7) with pressure cylinder (8) containing a piston. The pressure medium (tube 5 in FIG. 1) acts intermittently upon its one front end (10). The piston (9) extends to form a shooting piston (11) on its opposite front end, projecting into a shooting cylinder (12). The latter is tapered off to form a nozzle (13) with a convex nozzle tip (14) at the end. Channel (15) connected with a storage bin (6) (FIG. 1) enters the channel of the nozzle (13) from the side. A spring can be used to reset the shooting cylinder (11) or the piston (9).

The hides (16) are placed on the base (1) (FIG. 1) with the hair or grain side down and are stepwise moved along with the injection unit above, at a rate commensurate with the number of the rows of the shooting units on the beam (3). When the base (1) stops the injection unit (2) is lowered or the holding-up member is raised until the convex nozzle tips (14) press against the hide. Liquid is injected through all nozzles simultaneously. After the injection unit (2) has been raised or the holding-up member has been lowered, the hide is indexed one step forward and a new shooting cycle may begin.

In operation a shooting pressure of about 100 bars has proved to be optimal. Moreover, good results have been obtained with the nozzles spaced at 2 to 5 cm and a shooting volume of 0.5 and 2 ml for each nozzle. The hide was penetrated down to its hair- or grain side and the diameter of the penetration radius was 20 to 35 mm for each nozzle.

In the embodiment of FIG. 3 and 4 the apparatus comprises a floor mounted frame 20 supporting the base 1. The beam 3 supporting the shooting devices 4 extends over the whole width of the base (1) (s. FIG. 4). An essential part of base 1 is a stepwise working conveyor 21 with a plate 22 connected to rockers 23 which are pivotably mounted at the frame 20. At least two pairs of rockers are provided, whereby one pair is driven by a pneumatic or hydraulic cylinder 24. By means of this cylinder 24 the rockers 23 are movable to and fro between the inclined position of FIG. 3 and the vertical position shown with dotted lines, whereby the plate 22 is raised and moved in the direction 25. By the return stroke of the cylinder 24 and its piston, respectively, the

plate 22 is lowered and moved backwards. The hide 16 is conveyed in a manner known from sewing machines.

In front of the plate 22 is mounted a stationary dish 26 and in front of this a roller 27 for leading the hide to be treated. The plate 22 is provided with an opening 28 and below this opening a holding-up member for each shooting device 4 is arranged. Each counter member consists of a pivoting lever 29, articulated at 30 on the frame 20 and provided with a supporting surface 31 for the hide at the other end. This end is engaged by a hydraulic or pneumatic driving means, raising the holding-up member through the opening 28 of the plate 22 and lowering this member (dotted in FIG. 3).

The driving means for the shooting device 4, the plate 22 and the counter member 29 are coupled by known control means in such a way that after an injection shot at first the counter members 29 are lowered into the position shown with dotted lines (FIG. 3) and then the rockers 23 are pivoted in the vertical position (dotted lines), whereby the hide 16 is moved forward by one step and an untreated strip of the hide passes under the shooting devices 4. Thereupon the counter members 29 are raised again engaging the strip of the hide to be treated and pressing it against the nozzles. At the same time the plate 22 is returned and lowered without moving the hide which is clamped between the counter member 29 and the shooting devices 4 and an injection shot by all nozzles takes place. Because the hides are of different shape and form and because every hide has an irregular surface a collecting basin is mounted below the opening 28 (not shown).

We claim:

1. Method for the manufacture of tanned hides and skins with the following steps of procedure:

- (a) Soaking of the hide,
- (b) Liming in alkaline medium,
- (c) Deliming in acid medium,
- (d) Bating by proteolytic enzymes,
- (e) Pickling by means of acids and salts,
- (f) Tanning by means of chromium -III- salts,
- (g) Retanning, and
- (h) Fatliquoring of the hide,

wherein the solutions or liquids used in one or more of the procedure steps are introduced into the hide or skin by injection of the solutions or liquids into the hide or skin under a pressure of greater than 50 bars.

2. Method according to claim 1, wherein said pressure exceeds 100 bars.

3. Method according to claim 1, wherein said solutions or liquids are introduced into the hide in dosed quantities.

4. Method according to claim 1, wherein said solutions or liquids are introduced into different parts of the hide or skin in quantities of varying dosages.

5. Method according to claim 4, wherein said solutions or liquids are introduced in different parts of the hide such that the thicker part of the hide, the larger the dosage introduced therein.

6. Method according to claim 1, wherein said injection is effected from the flesh side of the hide.

7. Method according to claim 1 or 6, wherein each of the solutions or liquids introduced by injection are introduced using injection means pressed against the hide.

8. Method according to claim 7, wherein said injection means for each of the solutions or liquids introduced by injection comprises nozzles.

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9. Method according to claim 7, wherein said injection means for each of the solutions or liquids introduced by injection comprises a plurality of nozzles extending in rows which traverse the hide.

10. Method according to claim 9, wherein the hide is conveyed past said injection means on a conveyor means.

11. Method according to claim 10, wherein the hide on said conveyor means is positioned adjacent said injecting means and said injecting means introduces said solutions or liquids into said hide, whereby a portion of

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said hide has said solutions or liquids introduced therein, and then the hide is repositioned, by moving said conveyor means, so that a different portion of said hide is adjacent said injecting means, and said injecting means introduces further solutions or liquids into said hide, whereby another portion of said hide has said solutions or liquids introduced therein.

12. Method according to claim 1, wherein, after the step of fatliquoring the hide, the hide is dyed as a further step of procedure.

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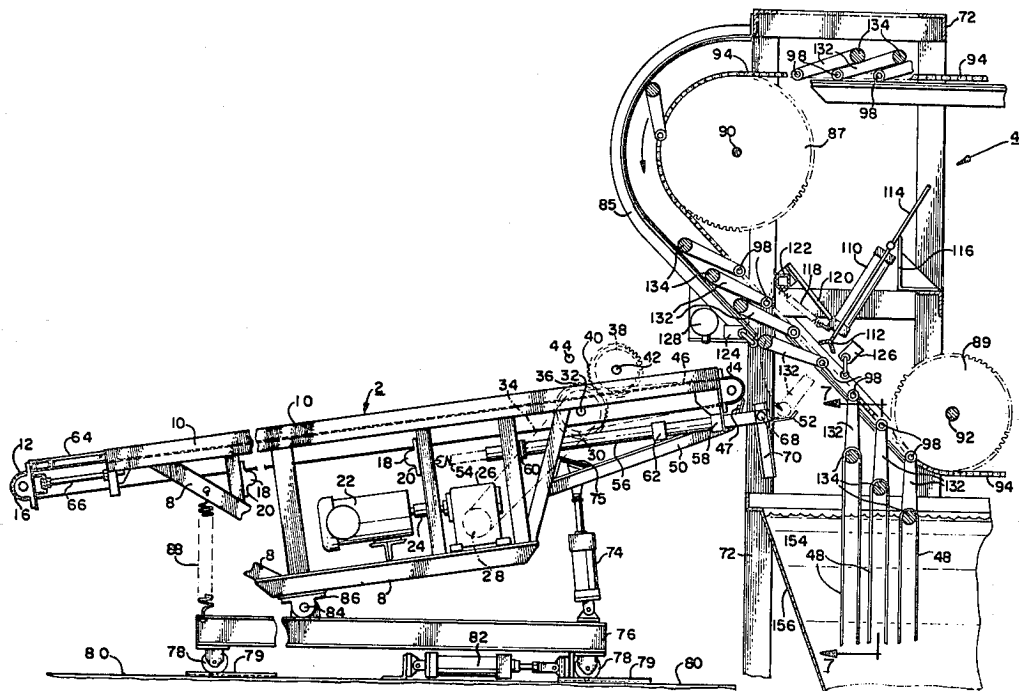
- [54] **AUTOMATIC HIDE PROCESSING APPARATUS**
- [75] Inventor: **Wolfgang K. Heiland, Trevese, Pa.**
- [73] Assignee: **The United States of America as represented by the Secretary of Agriculture, Washington, D.C.**
- [21] Appl. No.: **333,945**
- [22] Filed: **Dec. 23, 1981**
- [51] Int. Cl.³ **B65G 37/00**
- [52] U.S. Cl. **198/479; 68/158; 198/652; 198/477; 69/32**
- [58] Field of Search **198/477, 479, 695, 678, 198/651, 478, 482, 652, 797, 802; 271/205, 175; 68/158; 69/32, 33; 226/119**

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Primary Examiner—Robert J. Spar
Assistant Examiner—Dennis Williamson
Attorney, Agent, or Firm—M. Howard Silverstein;
William E. Scott; David G. McConnell

- [57] **ABSTRACT**
An apparatus for loading cattlehides and like materials automatically onto carrier bars.

3 Claims, 8 Drawing Figures



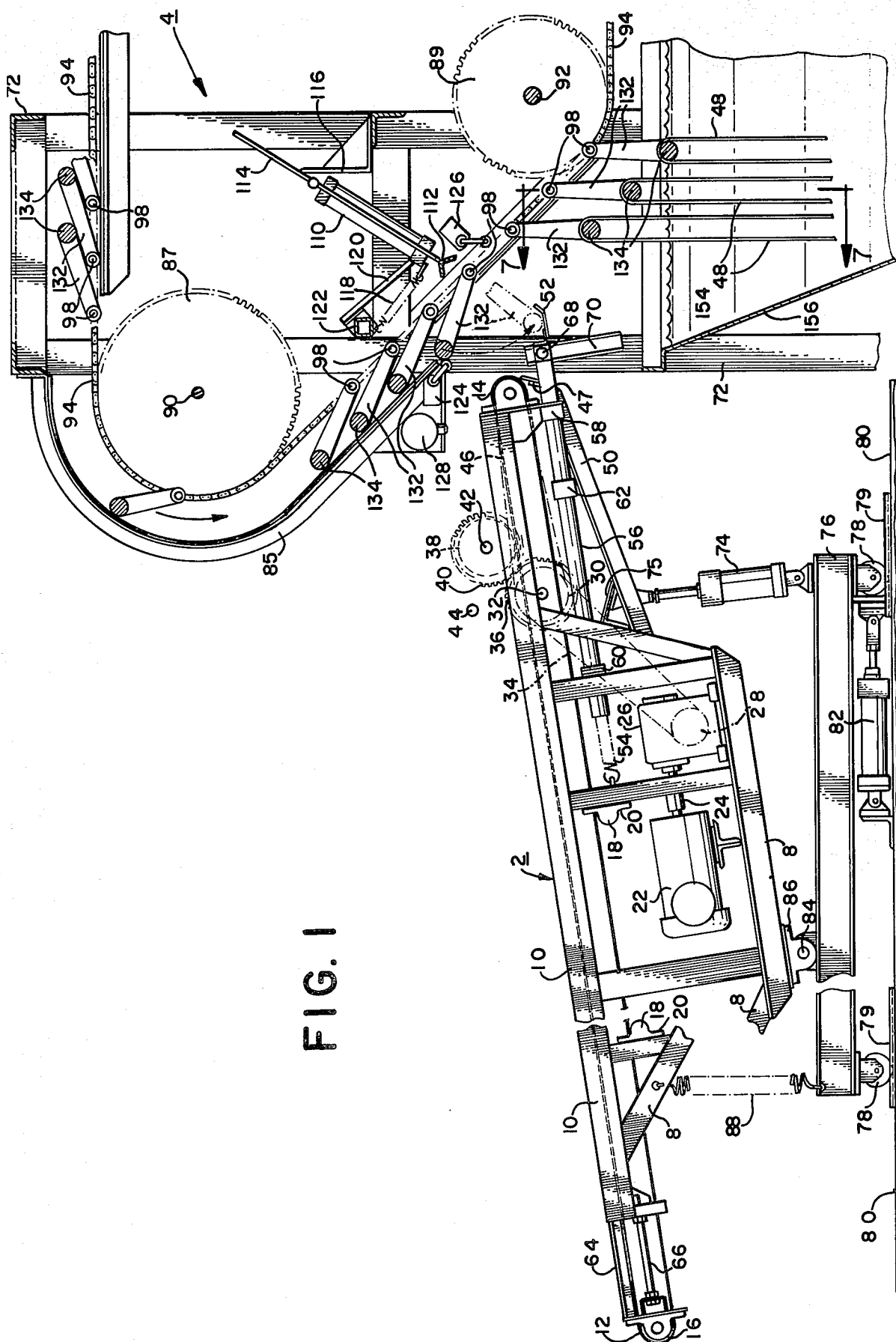


FIG. 1

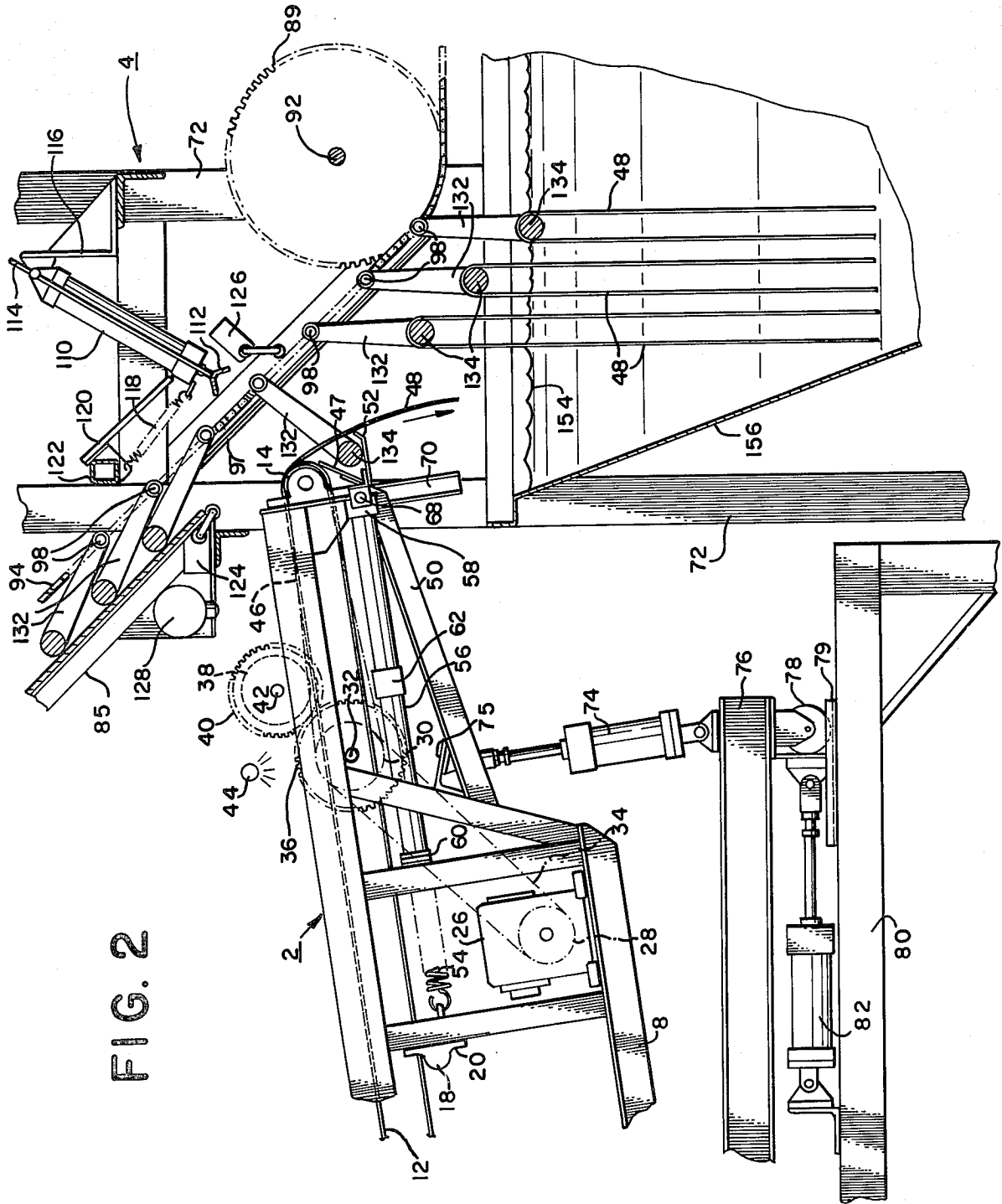


FIG. 2

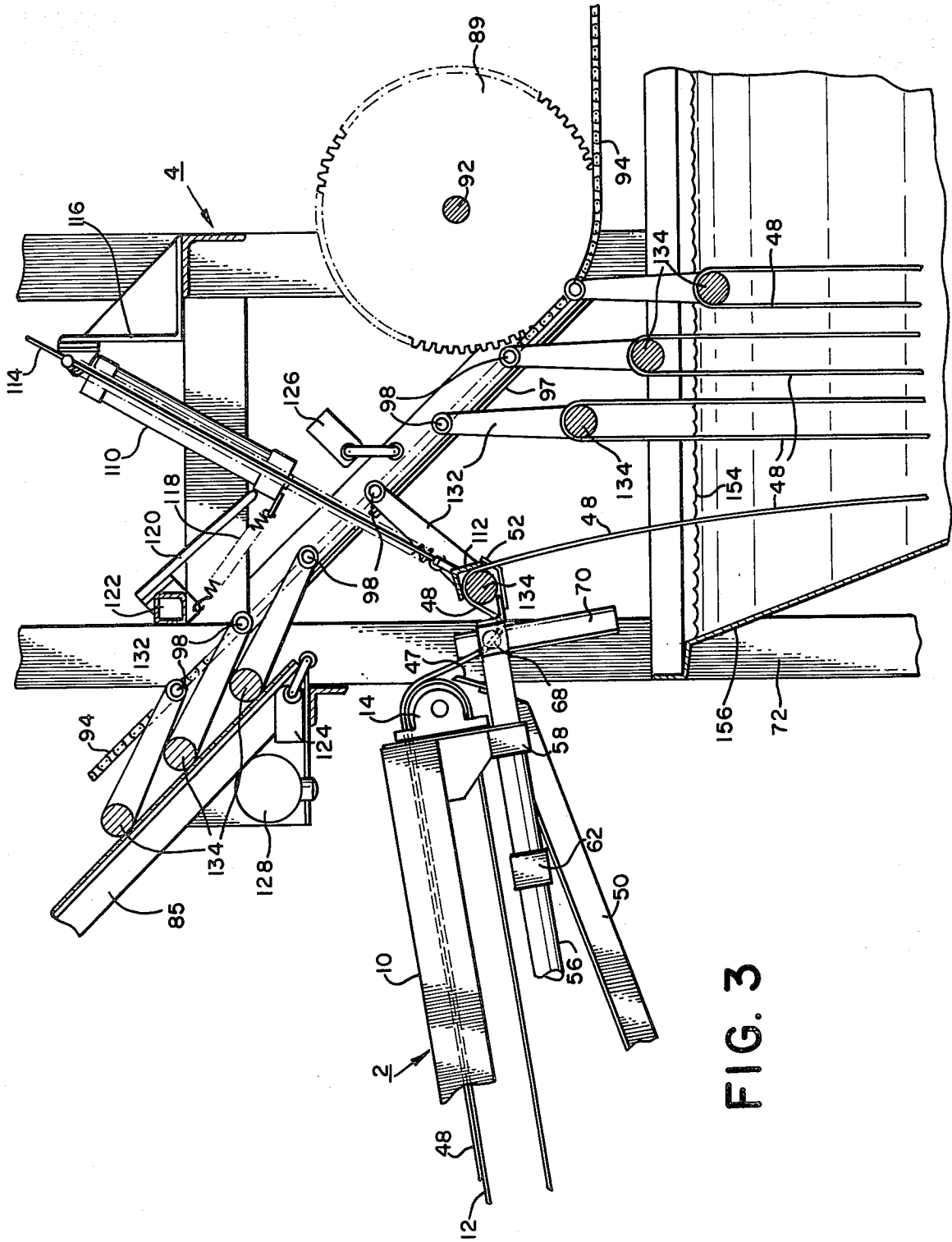


FIG. 3

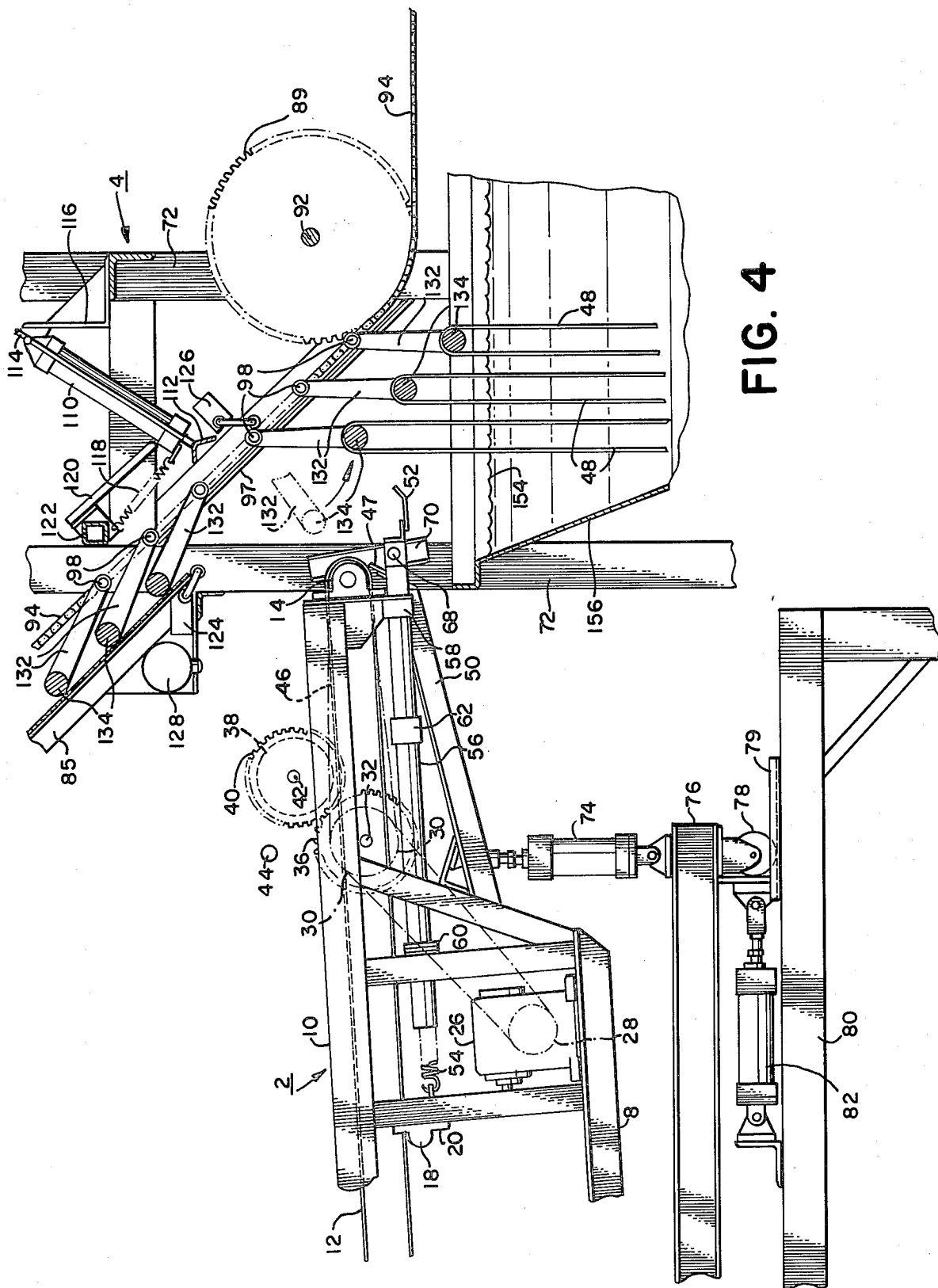


FIG. 4

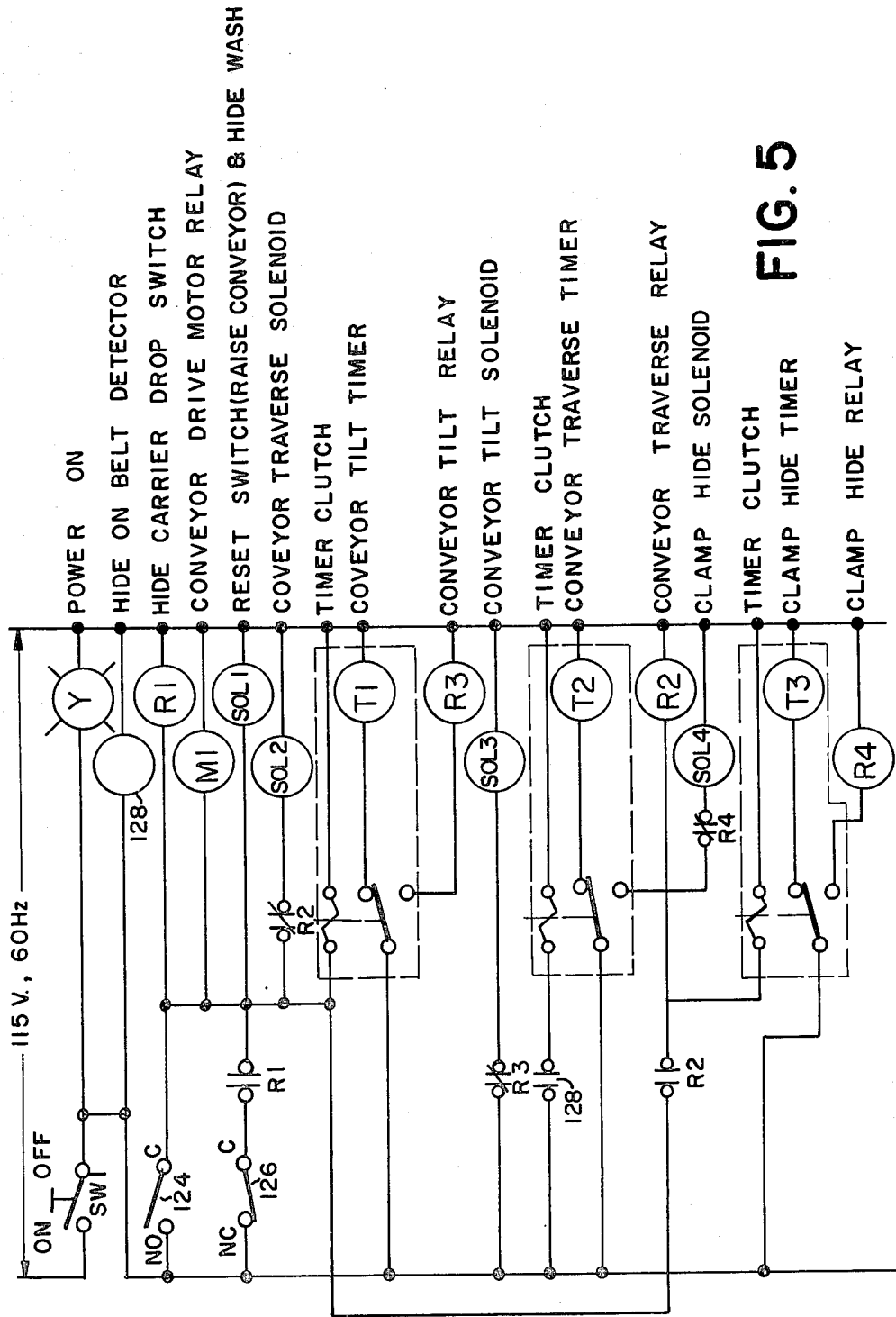


FIG. 5

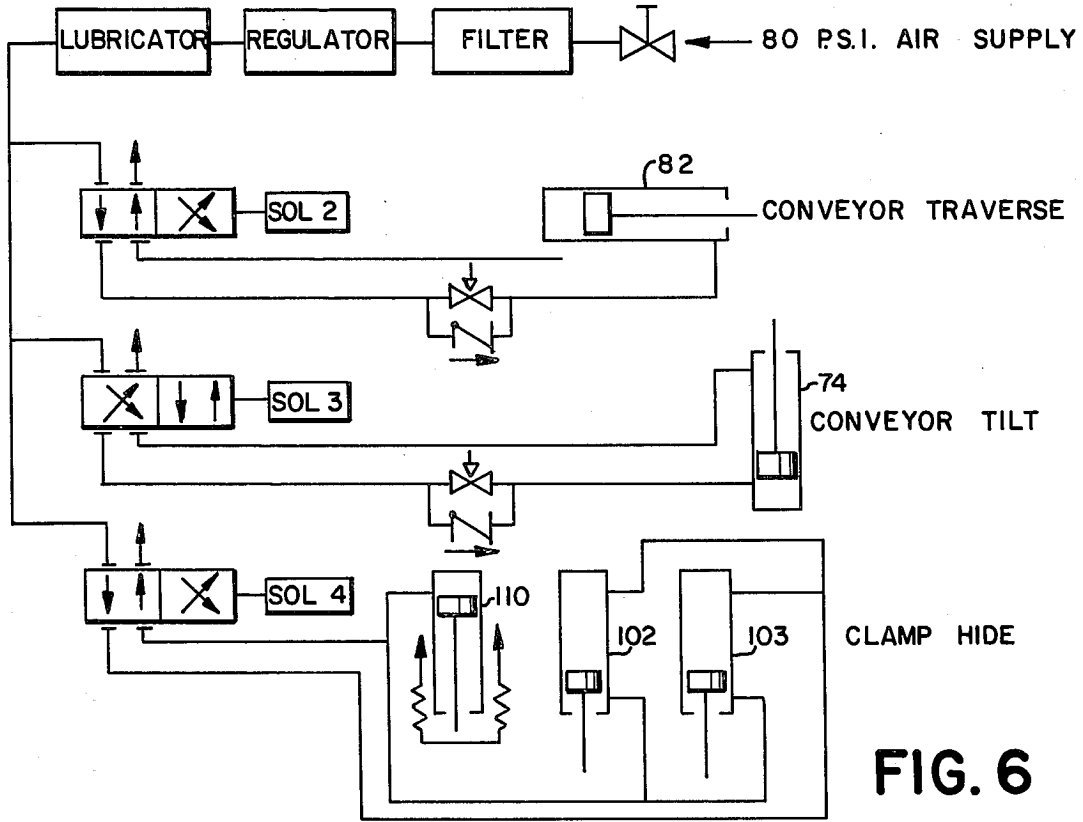


FIG. 6

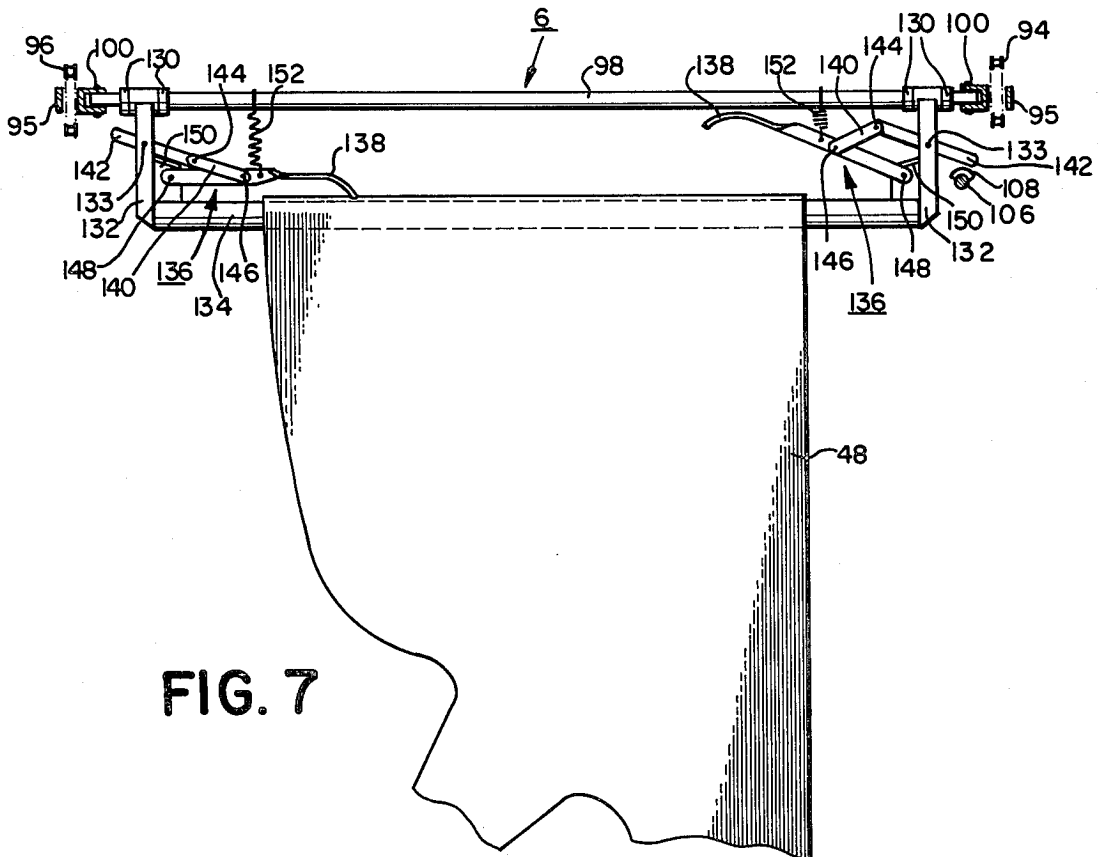


FIG. 7

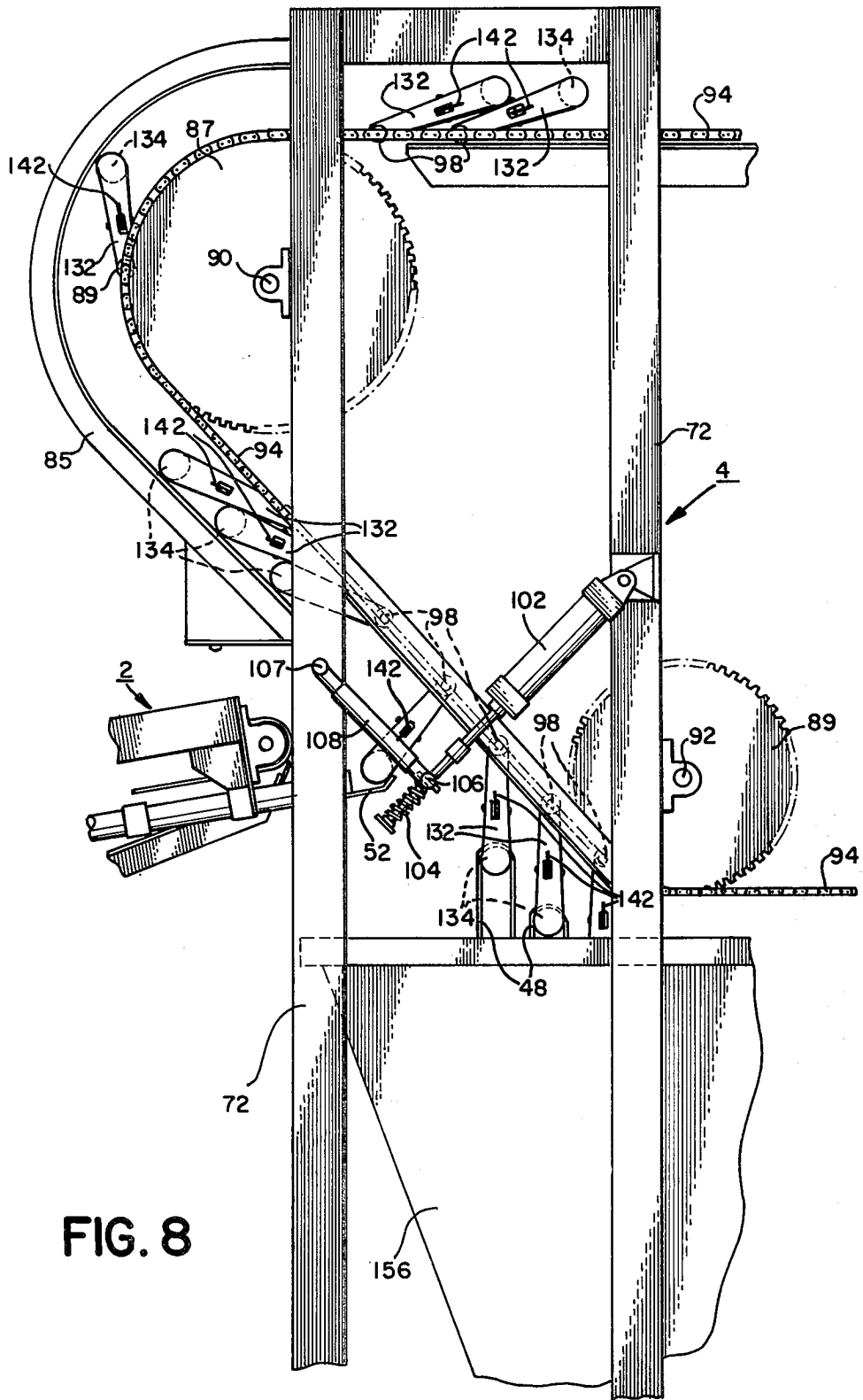


FIG. 8

AUTOMATIC HIDE PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for automatically loading cattlehides or other materials onto carrier bars for further treatment.

2. Description of the Art

Although carrier bars are used in the processing of cattlehides and other materials, the hides are loaded in the bars manually. The most relevant art known is that described in *The German Scientific Journal Das Leder* 28, 81-89, 1977, and in an abstract of the *Das Leder* article in *JALCA* 74, 140, 1979. However, in the apparatus and method described therein the hides are loaded manually onto the carrier bars.

SUMMARY OF THE INVENTION

An object of this invention is to provide an apparatus for loading cattlehides automatically onto carrier bars.

Another object is to provide an apparatus which loads cattlehides onto carrier bars automatically in such a manner that the approximate center of the lengthwise dimension of the hide is resting on the bar.

A further object is to provide an apparatus which has automatic clamping devices for preventing a hide from sliding off the carrier bar.

A still further object is to provide an apparatus for processing cattlehides and other materials automatically.

According to this invention the above objects are accomplished by an apparatus comprised of a feed conveyor mechanism provided with means for traverse movement and for raising and lowering at least one end of the mechanism, multiple hide carrier and clamping mechanisms, each of which has a carrier bar for holding a hide as it is transported through a processing operation and each of which has a pair of toggle lock clamps, and a process conveyor mechanism provided with means for transporting the hide carrier and clamping mechanisms through the processing operations and with means for actuating the toggle lock clamps and for preventing a hide from sliding off a carrier bar.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the apparatus with feed conveyor mechanism in position to have a hide placed on the conveyor belt.

FIG. 2 is a side elevation of the apparatus showing feed conveyor mechanism after it has traversed forward.

FIG. 3 is a side elevation of part of the apparatus showing a hide clamped to a carrier bar.

FIG. 4 is a side elevation showing feed conveyor mechanism in position after a hide has been loaded onto a carrier bar.

FIG. 5 is an electrical schematic.

FIG. 6 is a pneumatic diagram.

FIG. 7 is a partial section along line 7-7 of FIG. 1.

FIG. 8 is a side view showing a cylinder for actuating a toggle lock clamp. This figure shows the orientation of this actuating means with the rest of the apparatus shown in the other figures. This view was omitted from the other figures for the sake of clarity.

DESCRIPTION OF THE INVENTION

The apparatus of this invention is comprised essentially of a feed conveyor mechanism 2, a process conveyor mechanism 4, and a hide clamping mechanism 6.

Feed conveyor mechanism 2 is comprised of a welded frame 8, a slider bed 10, a belt 12, a crowned drive roller 14, a crowned take-up roller 16, idler rollers 18 for supporting belt 12 and, bearing or pillow blocks 20 for supporting rollers 14 and 16 and idler rolls 18. Drive motor 22 is connected through coupling 24 to gear reducer 26 which drives sprocket 28. Sprocket 28 is connected to and drives sprocket 30 on jack shaft 32 through timing belt 34. Sprocket 30 is provided with spur gears 36 which drive dewatering roll 38 on shaft 42 through spur gears 40. Water spray 44 is located just ahead of roll 38. Crowned drive roller 14 is driven by sprocket 30 through timing belt 46. Doctor blade 47 is in contact with the face of drive roller 14 and assures a free discharge of the leading edge of a hide 48 when it reaches that point on feed conveyor belt 12. Doctor blade 47 is supported by weldment 50 which consists of three structural angles, one to provide a mounting surface for blade 47 and two to bolt weldment 50 to welded frame 8. Mechanism 2 is also provided with a catch hook 52 on each side of the mechanism, each of which is connected to an extension spring 54 located inside a catch hook guide tube 56 and supported by a front bearing 58 and a rear bearing 60. Crossarm 62 connects the two guide tubes 56 and prevents rotation of catch hooks 52. Extension springs 54 provide for a smooth, clatter-free operation and allow feed conveyor mechanism 2 to move forward and rearward without moving hooks 52 in the same direction. A take-up unit 64 on each side of the mechanism is individually adjustable through a threaded rod 66. Take-up units 64 provide means for tracking conveyor belt 12. Catch hooks 52 are provided with cam followers 68 which move within the confines of cam follower guides 70 and allow hooks 52 to move upward and downward in a generally vertical direction. Guides 70 are immovably attached to frame 72 of process conveyor mechanism 4. Feed conveyor mechanism 2 is pivotally mounted on carriage 76 by means of pivot shaft 84 and two bearings 86 and is provided with cylinder 74 for raising and lowering the forward or discharge end of mechanism 2. Cylinder 74 is attached to crossarm 75 and connects the forward end of conveyor 2 to carriage 76 which has four casters or wheels 78 each of which rolls in an individual guide channel 79 attached to platform 80. Traverse motion of the feed conveyor mechanism 2 is provided by clevis-mounted cylinder 82 between platform 80 and carriage 76. In order that the raising and lowering or pivoting action of mechanism 2 occurs smoothly, mechanism 2 is counterbalanced by an extension spring 88 on each side of mechanism 2 connected to feed conveyor frame 8 and carriage 76.

Hide carrier and clamping mechanism 6 is comprised of rod 98 pivotally attached to a linked chain 94 and chain 96 by means of pins 100, collars 130, an end arm 132 at each end, hide carrier bar 134, and two toggle lock clamps 136. Clamp 136 is shown in locked position at the left side of FIG. 7 and in open position at the right side of the figure. Each clamp 136 consists of clamp arm 138, connecting link 140 and actuating link 142. Actuating link 142 is attached to arm 132 at pivot 133 and to link 140 at pivot 144. Link 140 is attached to clamp arm 138 at pivot 146 and clamp arm 138 is attached to mech-

anism 6 at pivot 148 which is attached to end arm 132. When toggle lock clamps 136 are caused to close to locked position, stop 150 attached to end arm 132 prevents actuating link 142 and pivot 144 from pivoting any further downward than the position shown on the left side of FIG. 7. Spring 152 keeps clamp 136 elevated when it is in open position.

Process conveyor mechanism 4 is comprised of frame 72, hide carrier bar guide 85, a first sprocket 87 on each side of mechanism 4, a second sprocket 89 on each side of mechanism 4, shaft 90 for sprockets 87, shaft 92 for sprockets 89, two pintle chains 94 (FIGS. 1 and 7) and 96 (FIG. 7), and a chain guide 97 for each of 94 and 96. Each link of chains 94 and 96 has an outer link 95. The total mechanism includes other sets of sprockets so that each pintle chain 94 and 96 is a continuous chain. Since these are conventional and not part of the inventive concept they are not shown in the figures. Chain links 94 and 96 are also attachment links for pivotally attaching hide carrier and clamping mechanism 6 to mechanism 4. A rod 98 of each mechanism 6 is pivotally attached to a link of chains 94 and 96 by means of pins 100. Cylinders 102 and 103, FIG. 8, one on each side of mechanism 4 are provided to actuate toggle lock clamps 136 of mechanism 6 into locked position. Locking or closing of clamps 136 occurs at the midpoint of the hide loading cycle, that is, at that point in the operation when about one-half of the hide has been draped on hide carrier mechanism 6. Cylinder 102 has been omitted from the other figures for the sake of clarity. However, its location and orientation with respect to the parts of the apparatus shown in the other figures is easily seen in FIG. 8. When cylinder 102 is actuated it closes against the resistance of compression spring 104 thereby raising arm 106 and pivoting arm 108 at pivot point 107 on frame 72 causing arm 108 to contact actuating link 142 of mechanism 6 with enough force to close clamp 136. After 108 contacts 142 and closes clamp 136, cylinder 102 completes its closing cycle before opening to put arms 106 and 108 in position to actuate clamp 136 on the next succeeding mechanism 6 transported into hide loading position by mechanism 4. Mechanism 4 is also provided with single acting spring return clamping air cylinder 110 with clamping angle 112 for extra clamping action to overcome the inertia of a wet hide as it is transferred from feed conveyor mechanism 2 to hide clamping mechanism 6. Cylinder 110 is shown in clamping position in FIG. 3. A guide rod 114 on each side of cylinder 110 keeps clamping angle 112 aligned with hide carrier bars 134 of mechanism 6. Cylinder 110 is pivotally mounted on crossbar 116 and attached through spring 118 and bar 120 to crossbar 122. Mechanism 4 also has a first and second limit switch 124 and 126 respectively and photoelectric unit 128, the functions of which will be explained hereafter.

Hides or any other substance or material that is folded over a bar or other suitable equivalent for subsequent processing such as dyeing, soaking, drying, sizing or that is continuously processed in vats, ovens or chambers of various sorts can be easily processed on the apparatus of this invention. Use of the apparatus will be described with reference to the processing of cattle-hides. It will also be described with reference to the electrical schematic shown in FIG. 5 and the pneumatic diagram shown in FIG. 6.

Feed conveyor mechanism 2 is shown in initial operating position in FIG. 1, that is, belt 12 is not moving and a cattlehide has been placed on it. Powered through

switch 1, SW1, FIG. 5, in the on position mechanism 5 has been tilted up through the normally closed contacts of relay 3, R3, solenoid 3, SOL3, and air cylinder 74, FIG. 6. Catch hooks 52 are in position to intercept a hide carrier bar 134 when it drops off hide carrier bar guide 85 as chains 94 and 96 of mechanism 4 move slowly at a constant speed. As a bar 134 drops off guide 85 onto catch hooks 52 the normally open contacts of limit switch 124 are momentarily closed and one automatic loading cycle is initiated. The momentary closing of the contacts of 124 energizes and closes the normally open contacts of relay 1, R1, thereby energizing conveyor drive motor relay, M1, and solenoid 1, SOL1, which causes drive motor 22 to start running and water spray 44 to operate. At the same time that motor 22 starts running solenoid 2, SOL2, is energized and activates cylinder 82 which moves feed conveyor mechanism 2 forward to the position shown in FIG. 2. At this point, the leading portion of a hide 48 is run-in over bar 134 and is submerged in solution 154 in vat 156. Just prior to being run-in over bar 134, the leading edge of hide 48 is detected by photoelectric unit 128 thereby starting timer 2, T2, by energizing its clutch. After a preset time interval which at the constant speed of belt 12 equals half the length of hide 48, T2 times out and relay 2, R2, is energized. As R2 is energized the opening of its normally closed contacts deenergize SOL2 which changes state thereby causing feed conveyor mechanism 2 to traverse back to its starting position as shown in FIG. 1. At the same time solenoid 4, SOL 4, changes state as it is energized through relay 4, R4, and activates cylinders 102, 103 and 110 which in turn actuate toggle lock clamps 136 into locked position and clamping angle 112 into hide clamping position as shown in FIG. 3, thereby arresting the movement of hide 48 over hide carrier bar 134. As mechanism 2 traverses back to its starting position a gap is opened between drive roller 14 and bar 134 and as belt 12 continues running the remaining half of hide 48 falls free into vat 156. When hide 48 falls free it is draped in about equal lengths on each side of bar 134. At this point T3 times out and cylinders 102, 103 and 110 retract. Retraction of 102 and 103 does not actuate clamps 136 into unlocked position; they are released at a later stage of the hide processing. Shortly after T3 times out, T1 times out, R3 becomes energized and its normally closed contacts are opened thereby deenergizing SOL3 and causing cylinder 74 to close and lower mechanism 2. As mechanism 2 is lowered, catch hooks 52 are also lowered and release bar 134 as shown in FIG. 4. Rod 98 of free swinging bar 134 momentarily opens the normally closed contacts of limit switch 126 deenergizing R1. Motor 22 and belt 12 stop operating and T1 and T3 reset as power is removed from their clutches. As T1 resets, R3 becomes deenergized by closing its normally closed contacts and SOL3 is energized causing cylinder 74 to open and raise mechanism 2. Prior to this, as the end of hide 48 passed under photoelectric unit 128, T2 was reset. As mechanism 2 is in the tilted up position and belt 12 not running, an operator places another hide on belt 12.

Although operation of the apparatus of the invention has been described with reference to FIGS. 5 and 6, it is recognized that the electrical and pneumatic operation are conventional and are not considered to be part of the inventive concept.

Briefly, without reference to FIGS. 5 and 6, the apparatus operates in the following manner. Cylinder 74 is activated to raise mechanism 2 to the position shown in

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FIG. 1. A hide 48 is placed on belt 12. Motor 22 starts operating, belt 12 begins moving, water spray 44 starts spraying water on hide 48. Cylinder 82 is activated and mechanism 2 moves forward to the position shown in FIG. 2. The leading edge of hide 48 passes under photoelectric unit 128 which automatically sets a timer in operation to allow about one-half of hide 48 to be draped over bar 134 before mechanism 2 traverses back to the position shown in FIG. 1. Cylinders 102, 103 and 110 have also been activated and clamp hide 48 so that it cannot slide off bar 134. As mechanism 2 traverses back the second half of hide 48 is draped over bar 134 and immersed in solution 154 in vat 156. Cylinder 74 then retracts and lowers mechanism 2 to the position shown in FIG. 4 thereby releasing bar 134 from hooks 52.

Hide carrier bar 134 which is part of hide carrier and clamping mechanism 6 is brought into position to receive a hide by mechanism 4. Rod 98 of mechanism 6 is pivotally attached to a link of chains 94 and 96 thereby providing the means for transporting mechanism 6 into position to receive a hide. When about half the length of a hide has been run over bar 134 as shown in FIGS. 2 and 3, cylinders 102, 103 and 110 are activated. Cylinders 102 and 103 actuate toggle lock clamps 136 to close and cylinder 110 opens and clamps hide 48 to bar 134 as shown in FIG. 3. Mechanism 2 is then retracted allowing the remaining half of hide 48 to be draped over bar 134 and then mechanism 2 is lowered and bar 134 released from hooks 52 allowing mechanism 6 to swing freely. This part of the operation, the loading of a hide on a carrier bar automatically and in such a fashion that the approximate center of the lengthwise dimension of the hide is resting on the carrier bar and the remainder of the hide draped about evenly lengthwise in each side of the bar, is the purpose for which the apparatus was invented.

I claim:

1. An apparatus for loading cattlehides and other like materials onto carrier bars, comprising a multiplicity of carrier and clamping means, each of which has a pair of locking clamps and a carrier bar, processing means for transporting said carrier and clamp means, for actuating the locking clamps, and for clamping a hide to a carrier bar, and means for conveying a hide to be loaded onto a carrier bar and for holding a carrier bar in position to be loaded, said conveying means having means for traverse movement and for being raised and lowered so that when the conveying means is in a forward position about one-half of the hide is run-in over the carrier bar and when the conveying means moves to a rearward position the rest of the hide is draped over the bar and the conveying means is then lowered to release the carrier bar, said apparatus being provided with means for coordinating the action of the carrier and clamping means with the processing and conveying means.

2. An apparatus for loading cattlehides and other like materials onto carrier bars, comprising:

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- (a) a multiplicity of hide carrier and clamping means, each having a carrier bar and a pair of toggle lock clamps for holding a hide on said bar;
 - (b) a process conveyor means for transporting the hide carrier and clamping means, said process conveyor means having means for actuating the aforesaid toggle lock clamps and means for clamping a hide to a carrier bar; and
 - (c) a feed conveyor means for conveying a hide to a hide carrier bar, said feed conveyor means having a pair of catch hooks for holding a carrier bar while a hide is draped over the bar and having means for traverse movement and for being raised and lowered so that after the hide is draped over the carrier bar the feed conveyor means can be lowered to release the carrier bar; said apparatus being provided with the means needed to coordinate the movements of the hide carrier and clamping means, the process conveyor means, and the feed conveyor means so that a hide can be loaded onto a carrier bar automatically.
3. An apparatus for loading cattlehides automatically onto carrier bars, comprising:
- (a) a multiplicity of hide carrier and clamping means, each of which is provided with a rod attached to a hide carrier bar and a pair of toggle lock clamps for holding a hide on the carrier bar, each of said clamps being provided with an actuating means for locking and unlocking the clamps;
 - (b) a process conveyor means for transporting the hide carrier and clamping means said process conveyor means being provided with a hide carrier bar guide, a pair of chains the links of which serve as attachment links for pivotally attaching a rod of the hide carrier and clamping means, an air cylinder assembly on each side of the process conveyor means for actuating the toggle lock clamps, and an air cylinder with clamping angle for clamping a hide to a carrier bar at a predetermined stage of the loading operation and;
 - (c) a feed conveyor means having catch hooks for holding a carrier bar for loading and having a movable belt for transporting cattlehides to the carrier bar, said feed conveyor means having means for traverse movement to allow the hide to be draped over the carrier bar and having means for being raised and lowered so that after the hide is draped over the carrier bar the feed conveyor means can be lowered to release the carrier bar; said apparatus being provided with the electrical and pneumatic means for coordinating the operations of the hide carrier and clamping means, the process conveyor means, and the feed conveyor means with respect to each other so that the hides are loaded onto the carrier in such a manner that the approximate center of the lengthwise dimension of the hide is resting on the carrier bar.

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