May 20, 1958 E. J. STRANDINE ET AL 2,834,994

DEHAIRING APPARATUS AND METHOD

Filed Oct. 20, 1955 2 Sheets-Sheet 1

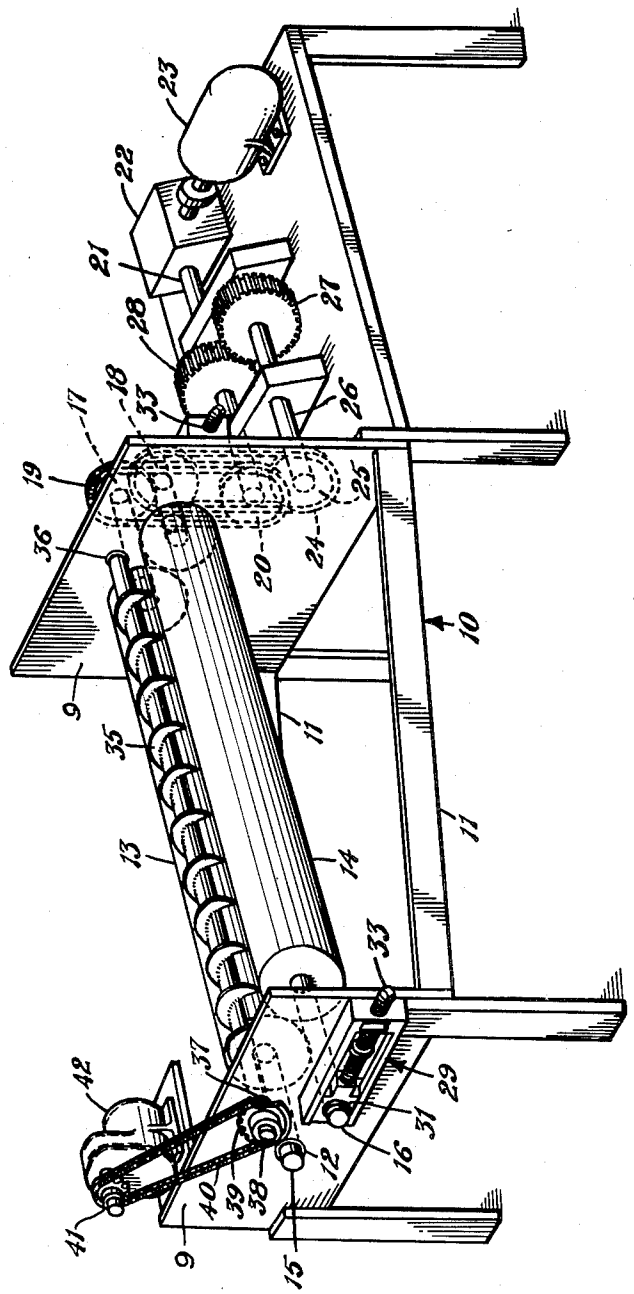


Fig. 1

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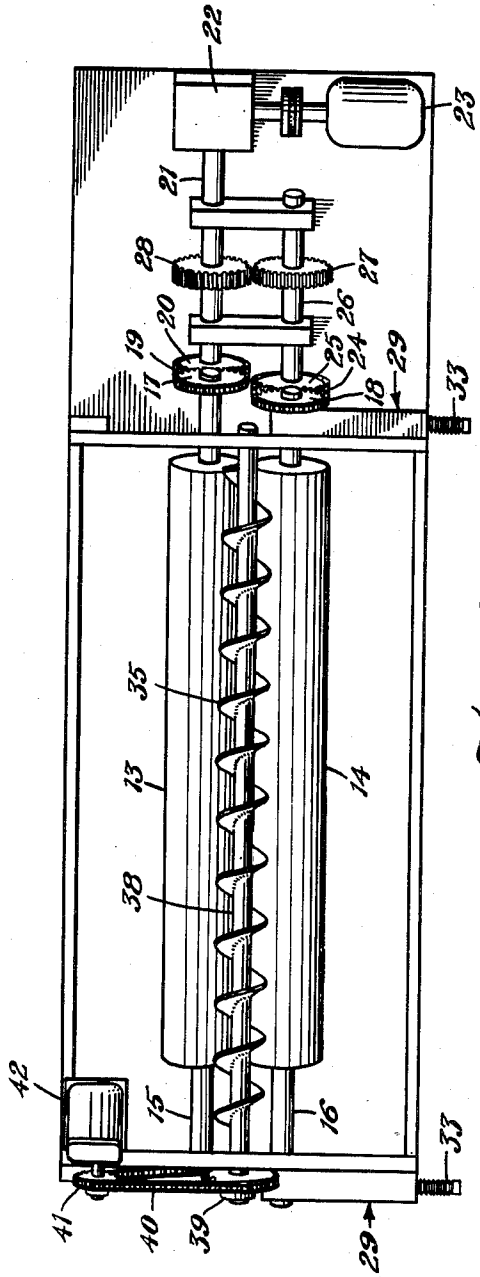


Fig. 2

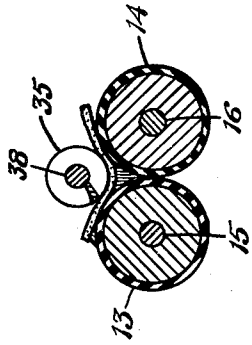


Fig. 3

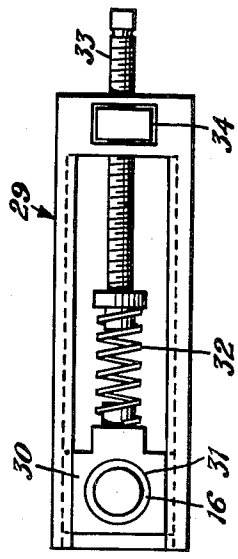


Fig. 4

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DEHAIRING APPARATUS AND METHOD

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11 Claims. (Cl. 19—2)

This invention relates generally to an apparatus and method for removal and recovery of undamaged hair or wool and skins for glue stock from animal pelts. More particularly, the invention relates to a method and apparatus adapted for removing and recovering wool from relatively small pieces of sheepskin, for example, the scraps which originally cover the head, shanks, tail, and any other pelt trimmings.

The conventional method of removing wool from whole sheepskin involves painting the pelts on the flesh side with a depilatory solution of sodium sulphide, calcium hydroxide and water. The pelt so treated is generally allowed to stand for a sufficient period under high humidity conditions to completely destroy the wool roots as well as a portion of the wool fiber adjacent to the roots. This practice, of course, results in a loss of a portion of the wool fiber and further necessitates considerable manipulation to completely separate the wool from the skin or slat. In the case of relatively small scraps of the pelt, for example, those covering the shanks, tail and the head portion of the animal, wool removal is somewhat more difficult as these smaller pieces cannot be easily handled. Furthermore, in the case of that portion covering the head region, complete wool removal is rendered difficult by virtue of the fact that the skin is unusually thick and covered with fat and resists the action of the depilatory.

Since the wool on the heads is only partially removed by conventional pulling methods, it is advantageous to sever the heads and shanks from the rest of the pelt before painting, providing that a method for removing this wool is available. With our apparatus and method it is possible to remove the heads, eliminate the hand painting of the heads, yet recover the wool and glue stock (dehaired skins).

Historically, there have been two general lines of approach to the problem of treating pelt or hide trimmings. One line has been to destroy the wool and save the glue stock, while the other line has been to destroy the glue stock and save the wool. With our invention and method it is possible to save both the wool and the glue stock. Some of the methods used to remove either wool or tissue from trimmings are as follows:

Additional depilatory or sulphide may be added so as to completely destroy any residual hair. Alternatively, the trimmings may simply be allowed to putrefy until the remaining wool is loose enough to be separated by hand. This practice is common in Australia and is generally referred to as "pieing." As is readily apparent, both of these methods damage the remaining wool to some extent.

Similarly, the residual wool is damaged or destroyed entirely when most of the other commonly used loosening methods are employed; for example, when the skin trimmings are heated with acids to neutralize the alkali depilatory and to hydrolyze and digest or dissolve the tissues. Also, if strong alkalis are not employed at all but rather an enzyme digestion or simple hydrolysis is alone used, the remaining wool is damaged to one degree

or another and, furthermore, is not entirely freed of undesirable pieces of flesh or skin.

Ammonium hydroxide solutions will partially loosen wool in the hair follicles but will not destroy or dissolve the roots. But this treatment is ordinarily inadequate where methods involving hand pulling are practiced, since the wool roots are still imbedded in the hair follicles. Cost considerations due to slow pulling as well as the great amount of physical labor involved have discouraged widespread use of processes of this type.

It is therefore an object of this invention to provide an apparatus for removing hair or wool from skins in such an effective fashion that it is unnecessary to treat the skins with strong acids and alkalis.

It is a further object of this invention to provide a novel process for removing hair from hides and particularly sheepskins wherein moderate quantities of a solution of ammonium hydroxide or ammonium hydroxide and a trace of sodium hydroxide adequately serve as an agent for loosening the hair in the follicles.

Still another object of this invention is to provide a method and apparatus for stripping hair or wool from particularly small scraps of skin in a largely automatic fashion and in such a way so as to avoid damage or destruction to the skin scraps themselves.

A further object is to provide an apparatus for removing hair or wool from skins which apparatus may be adjusted to accommodate skins, scraps, or remnants of various sizes and thicknesses.

Additional objects and advantages of this invention, if not specifically set out, will become apparent to one skilled in the art during the course of the following description.

Broadly, the present invention comprises an apparatus and method for gripping wool and for wrenching such wool or hair free of the treated skin in which it is imbedded. The most essential elements of the apparatus for achieving the desired results are one or more sets of two tightly set coacting rollers which rotate toward one another in a fashion similar to the wringer rolls on a washing machine, and a worm conveyor or screw mounted slightly above, parallel to and equidistant from each of the aforementioned rollers. The rollers are mounted so closely to one another that they grip only the wool or hair and refuse passage to the treated skin itself. It is the function of the worm conveyor to turn and tumble the scraps so as to bring the wool into better contact with the turning surfaces. As the rollers are mounted side by side in a substantially horizontal plane, the wool or hair is pulled between them and released beneath, while the skin pieces remain in the trough which is formed at the upper side. Preferably, these rollers are mounted at an angle of about 20–30° from the horizontal so that the liquid and solid materials can be readily discharged at one end. A complete understanding of the device and its operation may be gained by reference to the following description and accompanying drawings.

In the drawings:

Figure 1 is a side view in perspective of an apparatus embodying features of the present invention.

Figure 2 is a top plan view showing the relationship of the rollers and their driving means.

Figure 3 is a transverse sectional view through the rollers and worm conveyor illustrating the operation of these three elements.

Figure 4 is a side elevational view of one of the adjustable, spring loaded roller mounts.

Referring now to the drawings in which like characters refer to like parts throughout; the apparatus and operating means comprise a frame **10** with longitudinally placed connecting bars or braces **11**. The head plates **9** of the frame provide means for mounting suitable ax-

ially aligned bearings 12 and 31 which in turn provide mountings for rollers 13 and 14 having their respective shafts 15 and 16 extending through and journalled in the bearings. Sprocket 17 is driven by chain 19 connected by means of sprocket 20 of shaft 21 to gear reducer 22 and motor 23. The second sprocket 18 is connected by means of chain 24 to sprocket 25 of counter shaft 26 driven by gearing 27 and 28.

Roller 14 is adjustable and spring-loaded to vary the pressure on the rolls and allow for varying thicknesses of the mass of wool or hair passing between the rollers. Such an adjusting and spring-loading means is indicated at 29 and is shown in detail in Figure 4. The mechanism shown here comprises a bearing mount 30 and bearing 31 which in turn supports shaft 16. This mount in turn is slideably positioned in a rectangular frame 29. A spring 32 communicates with tightening screw 33 which passes through and coacts with nut 34. This particular type of adjusting mechanism is desirable so that one of the rollers will always be yieldably mounted to avoid jamming and possible damage to the machine.

Mounted above and parallel to rollers 13 and 14 is a worm conveyor 35 which turns and tumbles the pieces of hide which are to be dewooled. This worm conveyor is mounted in one of head plates 9 of the frame by means of bearing 36 and in the other by means of bearing 37. The shaft 38 of screw conveyor 35 is provided with a sprocket 39 which is connected by a chain 40 to another sprocket 41 mounted upon the shaft of gear motor 42.

Before going into the operation of the apparatus detailed above, it is again emphasized that pretreatment of the skins to loosen the wool or fiber somewhat is necessary. Preferred is a process involving treatment with a weak ammonium hydroxide solution. For example, the pelts may be soaked overnight in a 0.2 to 0.8 molar solution of ammonium hydroxide; the ratio of solution by weight to skin weight being about 6 to 1. If intermittent agitation is provided, the soaking time may be reduced to about four hours. The temperature of the bath will ordinarily be about 50 to 80° F. Following the chemical loosening step, warm water may be used to heat the skin to 100 to 110° F., i. e., above the melting point of the natural greases of the skin.

The successful functioning of the machine is related to the looseness of the wool, the slipperiness of the skin and the tightness of the rollers. With sufficient pressure on the rollers, the slippery wet skin will not go through the rollers, but the fibrous wool or hair will be pulled through.

The addition of a trace of sodium hydroxide (0.1–0.3% basis solution) or other alkali metal hydroxide to the ammonium hydroxide solution increases the plumping as well as the slipperiness of the pelt pieces. The wool is more readily pulled through the rollers and there is less danger of the skin pieces getting caught. The combination of 0.2–.8 M ammonium hydroxide and 0.02–0.07 M sodium hydroxide produces greater loosening of wool than either of the chemicals used alone. This is reflected in the increased percentage of wool recovered from the heads.

Pre-treatment:	Percent of wool removed
1. In 0.6 M NH_4OH	80.2
2. In 0.05 M NaOH	[1] 0.0
3. #1 plus #2	93.4

[1] Wool was so tight machine could not remove it. Machine jammed and stopped.

Although it is known that caustic is detrimental to wool, the small increments of sodium hydroxide used in combination with the weak ammonium hydroxide do not appear to damage the wool on the heads. This may be due to the protective action of the grease on the wool fibers, the low temperatures used and the low concentration of alkali. The carboxyl groups of the collagen in the skin combine readily with the alkali, leaving very little alkali present to act on the wool.

The example below is for purposes of illustrating a typical chemical pretreatment operation. However, it is to be borne in mind that the invention is not limited to this specific type of chemical preloosening and that any process which does not destroy hair and skin may be used for readying skins for the machine of this invention.

Two hundred fifty pounds of sheepskin pieces were immersed in 1,500 pounds of 0.5 molar NH_4OH solution. The bath temperature was held at about 65° F. and the soaking continued for 16 hours without agitation. The skins were then removed from the vat and rinsed for about 30 minutes in 110° F. water. Following this the pieces of skin were drained and fed through the machine in the fashion described in detail below.

In one method of operation with the machine shown in the drawings, a wool containing scrap such as a piece from the head region or shank is placed between rolls 13 and 14 and beneath screw conveyor 35. The driving motor 23 operates through gear reducer 22 to drive counter shafts 21 and 26, which in turn cause sprockets 20 and 25 to rotate toward one another. Power is transmitted by their respective chains to rollers 13 and 14. These rollers turn toward one another so as to grip any wool which subtends from the pelt. As at least one roller is covered with rubber or a similar material, the gripping action is an effective one. Simultaneously, worm conveyor 35 driven through shaft 38, sprocket 39, chain 40, and motor sprocket 41 by motor 42 turns and tumbles the skin scrap and insures contact of substantially all surfaces with the contiguous portions of the turning rollers. By the time the skin reaches the lowermost end of the rollers, virtually all hair or wool has been removed and the skin in turn falls off the rollers and into a conveyor or troughs. Similarly, grease and other liquids are discharged in this fashion.

Attention is directed to Figure 3 wherein the operation of the coacting rollers and screw conveyor is clearly shown. It is seen that the wool bearing scrap rides beneath conveyor 35 and is thereby urged into intimate contact with the coacting surfaces of rollers 13 and 14. This insures substantially complete hair removal.

By the use of the apparatus and method of this invention, it is possible to eliminate the necessity for strong depilatories thereby insuring complete recovery of the available wool and preventing damage to the wool and skin. As indicated above, when the apparatus of this invention is employed, it is necessary only that the trimmings to be dewooled be subjected to treatment in dilute ammonium hydroxide solution.

Additional operating efficiency and effectiveness may be achieved in the present machine by providing a suitable cleaning means beneath each of the coacting wringer type rolls. For example, doctor blades, rotating brushes, air jets or water jets may be installed for purposes of preventing caking of wool fiber on the roller surface. Preferably, however, flutter blades, i. e., flexible, semi-stiff blades, mounted on an axis parallel to the axis of each roller are employed. The blades are mounted so that they will strike the rolls periodically thereby dislodging clumps of wool. Constant contact of the rolls with the cleaning surfaces is objectionable since the abrasion rapidly wears and damages rubber or similar surfacing material.

Also, if the skin being dewooled or dehaired is difficult to clean, it is possible to increase the effectiveness of the machine by placing a second pair of rollers directly beneath the first set. Any hair or wool left in place after completion of the first pulling operation is removed by the second set of rollers.

Obviously, many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and there-

fore only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. Apparatus for stripping hair from relatively small pieces of skin comprising: means for gripping and applying a pulling force on the hair and simultaneously preventing movement of the skin codirectionally with the said pulling force; and means to maintain intimate contact between the said skin and the gripping and pulling means and simultaneously therewith to tumble said skin whereby to insure contact of substantially the entire surface area of said skin with said gripping and pulling means.

2. Apparatus for stripping hair from relatively small pieces of skin comprising: coacting surfaces adapted to close upon and grip said hair and applying a pulling force to said hair through said gripping surfaces while simultaneously preventing movement of the skin codirectionally with the said pulling force; and means to maintain intimate contact between the said skin and said gripping and pulling means and simultaneously therewith to tumble said skin whereby to insure contact of substantially the entire surface area of said skin with said gripping and pulling means.

3. Apparatus for stripping hair from relatively small pieces of skin comprising: a pair of rollers rotatable in opposite directions toward one another and mounted in parallel, substantially contiguous fashion in a side by side relationship; said rollers being adapted to close upon and grip said hair and apply a pulling force to said hair while simultaneously preventing the movement of said skin codirectionally with said pulling force; and means for forcing said skin into intimate contact with said rollers substantially at the point of contiguity of said rollers and simultaneously therewith to tumble said skin whereby to insure contact of substantially the entire surface of said skin with said rollers at said point of contiguity.

4. Apparatus for stripping hair from relatively small pieces of skin comprising: a frame; a roller rotatably mounted in said frame beside said first roller; a second roller rotatably mounted in said frame, said second roller being positioned substantially parallel to and contiguous with said first roller, said rollers being mounted in a substantially horizontal plane; means to rotate said rollers in opposite directions; a third rotatable frame-mounted member positioned parallel to said rollers substantially adjacent the point of contiguity of said rollers to maintain said skin in close contact with said rollers at the point of contiguity thereof and simultaneously to insure contact of substantially the entire surface area of said skin with said rollers at said point of contiguity; and means to rotate said third rotatably mounted member.

5. Apparatus for stripping hair from relatively small pieces of skin comprising: a frame; a roller rotatably mounted in substantially horizontal fashion in said frame; a second roller rotatably mounted in said frame, said second roller being spaced laterally from said first roller and positioned parallel to and substantially contiguous with said first roller; means to vary the proximity of the two roller surfaces; a rotatable frame-mounted worm conveyor positioned slightly above said rollers substantially equidistant from each of said rollers to tumble said pieces of skin and simultaneously to insure contact of substantially the entire surface area of said skin pieces with said rollers at said point of contiguity; and means to drive said worm conveyor and rotate said rollers.

6. Apparatus for stripping hair from relatively small pieces of skin comprising: a frame; two substantially

coextensive parallelly mounted rollers in said frame, said rollers being substantially contiguous with one another at points along the surfaces thereof; means to rotate each of said rollers in opposite directions; a frame-mounted worm conveyor substantially coextensive with said rollers positioned equidistant from each of said rollers substantially adjacent their points of contact to tumble said pieces of skin and simultaneously to insure contact of substantially the entire surface area of said skin with said rollers at said point of contiguity; and means to drive said worm conveyor.

7. A method of stripping hair from relatively small pieces of skin comprising: treating said skin pieces with dilute ammonium hydroxide solution whereby to partially loosen the hair; thereafter placing said skin so treated in a zone wherein said hair is gripped and pulled by coacting arcuate surfaces; holding said skin throughout the gripping and pulling operation whereby to prevent movement codirectionally with said hair; and simultaneously therewith tumbling and turning said skin whereby to insure contact of substantially the entirety of said skin surface with the said arcuate gripping and pulling members.

8. A method of stripping wool from pelt trimmings which comprises: treating the trimmings with dilute ammonium hydroxide and sufficient alkali metal hydroxide to increase the slipperiness of the skin and then pulling the wool from the skins by rollers whereby the tendency of the rollers to engage the skins is reduced.

9. Apparatus for stripping hair from relatively small pieces of skin comprising: means for gripping and applying a pulling force on the hair, means for preventing movement of the skin codirectionally with said pulling force, and a rotatable member positioned above said means to tumble said pieces of skin whereby to insure contact of substantially the entire surface area of said skin with said gripping and pulling means.

10. Apparatus for stripping hair from relatively small pieces of skin comprising: means for gripping and applying a pulling force on the hair, means for preventing movement of the skin codirectionally with said pulling force, and a rotatable worm conveyor positioned above said means to tumble said pieces of skin whereby to insure contact of substantially the entire surface area of said skin with said gripping and pulling means.

11. Apparatus for stripping hair from relatively small pieces of skin comprising: means for gripping and applying a pulling force on the hair, means for preventing movement of the skin codirectionally with said pulling force, a rotatable member positioned above said means to tumble said pieces of skin whereby to insure contact of substantially the entire surface area of said skin with said gripping and pulling means, and power means to drive said gripping and pulling means and rotate said rotatable member.

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