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APPARATUS FOR DRYING TANNED SKINS UNDER VACUUM

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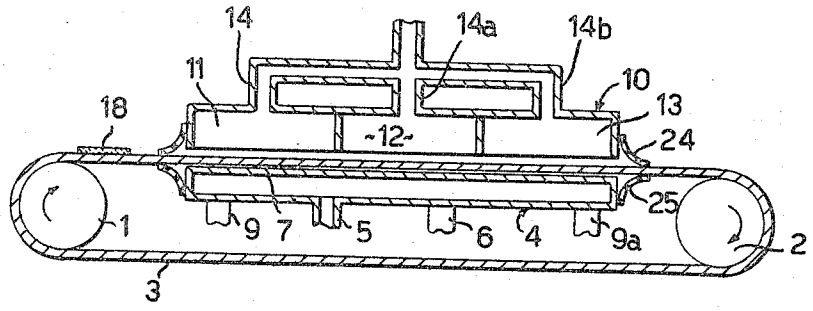


Fig.1

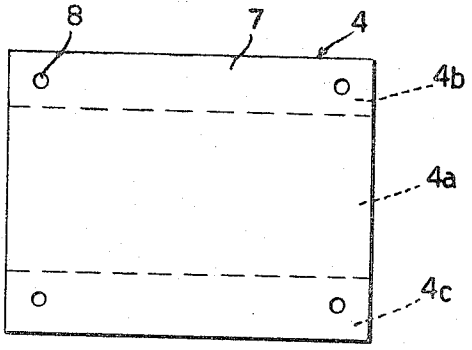


Fig.2

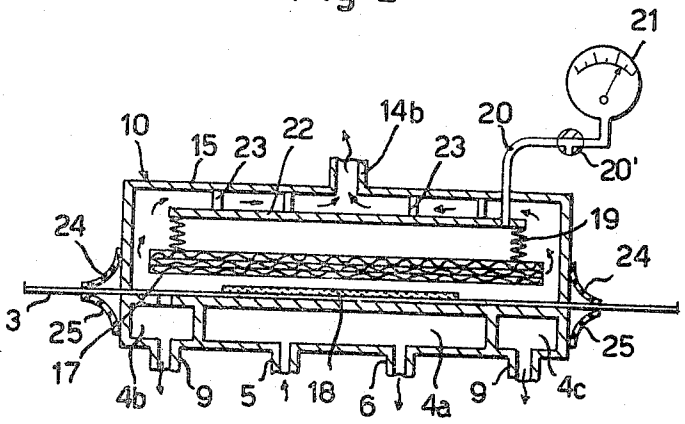


Fig.3

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APPARATUS FOR DRYING TANNED SKINS UNDER VACUUM

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The present invention relates to apparatus for drying tanned skins and refers more particularly to apparatus for drying tanned skins under vacuum in a continuous operation.

Machines for drying tanned skins under vacuum are known in the prior art. These machines generally comprise upper and lower plate members with the skins being supported between the plate members during drying. The lower plate member is heated by suitable means and the upper plate member is provided with means for establishing a vacuum over the skins to facilitate evaporation of moisture from the skins. The major drawback of prior art construction is that the machine is not suited for continuous operation. Thus, the men who operate these machines (generally two operators for each machine) are forced to stand about idle as the drying takes place.

It is, therefore, the primary object of the present invention to provide apparatus for the continuous drying of tanned skins under vacuum.

Another object is to provide apparatus for the continuous drying of tanned skins under vacuum which makes more economical use of labor than prior art drying apparatus.

Still another object is to provide apparatus for the continuous drying of tanned skins which has a number of separate drying stations and which includes means for varying the degree of heat and level of vacuum at each station.

Other objects of the present invention will become apparent in the course of the following specification.

In achieving the aforementioned objectives of the present invention, it was found advantageous to provide apparatus which comprises a lower heated plate member and an upper, vertically movable plate member. A conveyor belt which supports the skins to be dried passes between the plate members. Means are provided for establishing a vacuum in the space between the plate members so that the conveyor belt moves, during the drying process, through a vacuous atmosphere. Means are also provided for maintaining a seal between the plate members and the conveyor belt. According to the invention, the upper plate member is preferably divided into a number of drying sections or stations wherein the vacuum may be varied independently of that in the other section. In addition, means are provided to maintain the conveyor belt in contact with the lower plate member during drying to provide optimum heating of the skins.

The invention will appear more clearly from the following detailed description when taken in conjunction with the accompanying drawing showing, by way of example, a preferred embodiment of the inventive concept.

In the drawings:

FIGURE 1 is a vertical schematic longitudinal section of a drying apparatus constructed in accordance with the principles of the present invention.

FIGURE 2 is a plan view of the heated lower plate member.

FIGURE 3 is a vertical transverse section, on an enlarged scale, of one of the drying sections in the apparatus.

Throughout the specification like reference numerals are used to indicate like parts.

Referring now to FIGURE 1 of the drawing, reference numerals 1 and 2 indicate, respectively, a driving drum and an idler drum on which is mounted an endless conveyor belt 3. The conveyor belt 3 is preferably made of a metallic material or other composition having a high coefficient of heat transfer.

Located inbetween drums 1 and 2 and below conveyor belt 3 is a fixed lower hollow plate member 4 which has a central compartment 4*a* wherein may be circulated a heating fluid, a supply pipe 5 for supplying the heating fluid to compartment 4*a* and a discharge pipe 6 are connected with the plate member and communicate with compartment 4*a*. The central compartment is provided for the purpose of maintaining the upper face 7 of plate member 4 (FIG. 2) at a selected temperature above room temperature for example, within the range 40–90° F.

Lower plate member 4 is also divided into marginal compartments 4*b* and 4*c*. Holes 8 are located in the corners of upper face 7 of the plate member and over the marginal compartments 4*b* and 4*c*. The marginal compartment 4*b* and 4*c* are also connected by means of pipes 9 and 9*a* with an air pump (not shown), the purpose of which wil become apparent later on in the specification.

Located above conveyor belt 3 and in alignment over lower plate member 4 is upper hollow plate member 10. Upper plate member 10 is movable vertically by means not illustrated, and is divided into a number of separate compartments or sections 11, 12 and 13 which are each used to establish the separate "drying zones" to be described later on in the specification. Each compartment is connected by means of pipes 14, 14*a* and 14*b*, with an air pump (not shown) for establishing a vacuum within the compartments. The pump (not shown) may be the same one to which lower plate member 4 is connected.

Referring new in greater detail to the compartment section 13 illustrated in FIGURE 3, numeral 15 designates the outside frame of the upper plate member (shaped as an inverted box) to which is connected pipe 14*b* for connecting the compartment with the air pump. Supported inside frame 15 is a fixed plate 22 being connected to the frame by means of spacers 23. Connected with the underside of fixed plate 22 is a deformable, bellows-type envelope 19. Supported at the bottom of the deformable envelope 19 is an elastically deformable layer realized with material which are pervious to steam, i.e. nets 17, the mesh density of the layer being of increasing order from the top towards the bottom. The layer of nets 17 rest on top of the skin being dried in the compartment and allows the steam formed during drying to move in a horizontal path as indicated by the arrows, and then upwardly at the edges of the envelope 19 into the space above plate 22 so it can freely exit through pipe 14*b*.

The interior of envelope 19 may be selectively connected by means of conduit 20 and a three-way valve 20', with an air pump (not shown), or a vacuum dial 21, or with the atmosphere.

Flexible skirts 24 and 25 are connected, respectively, with the upper and lower plate members and extend around the peripheries of the plate members. The skirts are preferably made of rubber, and act as seals to maintain the vacuum in the space between the upper and lower plate members. The skirts engage the opposite faces of conveyor belt 3 as shown.

In operation:

A skin 18 which is to be dried, is placed on top of conveyor belt 3 at the left hand end of the conveyor belt as viewed in FIGURE 1. Upper plate member 10 is then raised up and the drums 1 and 2 rotated so as to advance the conveyor belt 3 until the skin 18 is positioned below compartment 11 of the upper plate member at which point the conveyor belt is stopped. Upper plate 10 is then lowered to an operative position in which it almost contacts conveyor belt 3, in which position the flexible skirt 24 will bear against the conveyor belt. Heat-

ing fluid is piped to compartment 4*a* of the lower plate member and heat will flow therefrom, through conveyor belt **3** and into the skin to be dried. At the same time, a vacuum is established in compartment **11** and the bellows-type envelope therein. Due to the combination of the heating of the skin **18** and the reduction of head pressure (atmosphere) acting on the skin, the moisture therein will start to boil off and exit the compartment through pipe **14**. During the drying period, the weight of the layer of nets **17** will hold the skin down on the conveyor belt and the conveyor belt will remain in contact with lower plate number **4** due to the reduced pressure in compartments 4*b* and 4*c*. While this first skin **18** is being dried, a worker will spread a second skin on the conveyor belt outside the plate members.

After a predetermined time, upper plate member **10** is raised up once again and conveyor belt **3** advanced until the first partly dried skin **18** is positioned under compartment **12** and the new (second) skin positioned under compartment **11**. Plate member **10** is again lowered to an operative position and the cycle of drying is repeated with the first skin being further dried and the new skin partly dried. During the latter cycle a third undried skin is placed on the conveyor. The cycle is then repeated until each skin passes into the three compartments, **11**, **12** and **13** to be successively subjected to drying therein.

As the dried skins exit from the plate members, they are removed from the conveyor belt by another worker. The drying operation is then continued so that for each raising of upper plate member **10**, a dried skin exits the apparatus so that the operation is in effect a continuous one.

During normal operation, the bellows-type envelopes in the compartments **11**, **12** and **13** are under vacuum so there is little, if any, pressure on the skins. On the other hand, it may be desirable, according to the type of skin being dried, to vary the pressure on the skin during the different phases of drying. Thus, by manipulating three-way valve **20'**, the vacuum inside the envelope may be broken, so that the envelope will swell the pressure therein bearing against the layer of nets **17** which in turn, transfers pressure to the skin. The actual pressure in the envelope may be varied from near absolute vacuum up to atmospheric pressure by appropriate manipulation of the valve, the vacuum gauge **21** being provided for ready reference to insure that the desired pressure level has been effected.

It is also possible to make the lower plate member **4** in sections with each section having its own heating compartment. In this manner the heating in the different "drying zones" can vary so that with a coordinated variation in the vacuum in the different sections **11**, **12** and **13**, various drying effects can be accomplished. In addition, the upper plate member **10** may be made in sections with each plate member section being capable of raising independently of the others.

As was previously mentioned, means (holes **8** in plate member **4**) are provided to insure that conveyor belt **3** remains in contact with lower plate member **4** during operation of the apparatus. Otherwise the vacuum above the belt would cause it to raise up and no heat would be transferred to the skin supported on the belt. It is also possible to utilize magnetic means to accomplish the same purpose. For example, electro magnets may be supported in the lower plate member and be energized so as to attract the metallic conveyor belt when the belt advances the skin to the required position under the upper plate member **10**.

The apparatus of the present invention offers the advantage of being completely automatic in operation, so that the operators may be fully employed at all times in placing skins on the conveyor belt for drying and then removing them upon completion of the drying operation.

While there is above disclosed but one embodiment of the skin drying apparatus of the present invention, it is possible to produce still other embodiments without departing from the scope of the inventive concept herein disclosed. For example, the number of sections in upper plate member **10** may be increased to four, five or even more in number.

What is claimed is:

1. Apparatus for drying tanned skin, said apparatus comprising, in combination, a pair of parallel arranged spaced apart roller drums, a heat-transmitting conveyor belt supported on said drums and extending therebetween for moving in an endless path around said drums, a lower hollow plate member located under said conveyor belt and engaging one face of said conveyor belt, the other face of said conveyor belt constituting a surface for supporting skins for drying, means for heating said lower plate member to a predetermined temperature, an upper hollow plate member located above said conveyor belt and spaced therefrom and being arranged in alignment over said lower plate member, a steam-pervious elastically deformable layer carried by said upper plate member and adapted to engage a skin carried by said conveyor belt, means connected with said upper plate member for moving said upper plate member toward and away from said conveyor belt, means connected with said upper plate member for creating a vacuum in the space between said upper plate member and said conveyor belt, and means varying the extent of this vacuum, said apparatus further comprising elastic skirts connected with the peripheries of said upper and lower plate members and engaging opposite faces of said conveying belt.

2. Apparatus for drying tanned skins as set forth in claim **1** wherein said lower plate member is provided with openings extending therethrough from top to bottom, and conduit means connecting said openings with a source of vacuum.

3. Apparatus for drying tanned skins as set forth in claim **1** wherein said upper plate member is provided with a plurality of separate compartments, each of said compartments being connected with said means for creating a vacuum.

4. Apparatus for drying tanned skins as set forth in claim **3** wherein each of said compartments is provided with a plate supported in the compartment a distance below the top of said upper plate member, and wherein said elastically deformable layer comprises a deformable bellows-type envelope connected with the periphery of said plate, a layer of mesh nets connected with the bottom of said envelope and adapted to engage said conveyor belt, an elongated conduit communicating at one end with the interior of said envelope, and a three-way valve connected to the other end of said conduit, said valve being selectively connected to a source of vacuum, the atmosphere and a vacuum gauge.

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