Apparatus for and Method of Shrinking Felt Articles
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APPARATUS FOR AND METHOD OF SHRINKING FELT ARTICLES

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Fig. 3

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This invention relates to the shrinking of felt articles, for example, bats from which fur or felt hats are made.

More particularly, the present invention relates to certain improvements in the machine and the method for shrinking hat bats and the like, disclosed in my Patents Nos. 1,533,350 and 1,533,351, granted April 14, 1925.

The general aim of the invention is to provide an improved apparatus for and an improved method of shrinking hat bats and the like wherein the articles are felted and shrunk in a more effective and satisfactory manner.

By proceeding in accordance with the present invention, the felting and shrinking operations are accelerated, while at the same time, the action on the article is such as not to injure the article or leave any undesirable marks thereon.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings, Figure 1 is a top plan view of a portion of the machine in which are incorporated the improvements of the present invention;

Fig. 2 is a side view showing the machine more or less diagrammatically;

Fig. 3 is a vertical sectional view taken transversely of the machine and on substantially line 3—3 of Figure 1;

Fig. 4 is a detailed view showing the manner in which the deflecting rolls form transversely spaced-apart depressions or hollows in the bat carrying belt, this view being taken substantially on line 4—4 of Figure 1;

Fig. 5 is a detailed view showing, more or less diagrammatically, the manner in which a depression is formed in the belt by one of the ring-like members of one of the deflecting rolls, this view being taken substantially on line 5—5 of Figure 4;

Fig. 6 is a perspective view of the bat supporting face of one form of belt which may be employed;

Fig. 7 is a view similar to Figure 6, but showing the bat carrying face of the belt as having diamond shaped cups or recesses; and,

Fig. 8 is a view similar to Figures 6 and 7, but showing the bat carrying face of the belt as having triangular shaped recesses or cups.

In accordance with the present invention, the machine is provided with a flexible member or blanket in the form of a belt adapted to carry the bats, flatwise or in unrolled condition, in a wavy or zig-zag course over and beneath a succession of guide rolls, the bat supporting face of the belt being provided with means for locally manipulating or kneading the bats thereon in order to facilitate vermicular movement of the fibres, and the bat being subjected to pressure at intervals and being always maintained in a hot saturated condition. To this extent the present machine is generally similar to the machine disclosed in my said patents. In said patents, the belts are shown as having, on their bat supporting faces, a multiplicity of pyramidal projections or knuckles for the purposes of manipulating the bats carried thereby, and that arrangement has proved a very practical one from a commercial standpoint, a relatively large number of machines constructed in accordance with said patents now being in general use. However, one objection to a belt of that particular construction is that the pyramidal knuckles may mar the bats to the extent of leaving thereon marks of the apron. In order to overcome this objection, I provide, in accordance with the present invention, a belt having on its bat supporting face a multiplicity of cups or recesses packed closely together, the cups or recesses being surrounded by walls or ribs which serve to knead and manipulate the bats over their entire surfaces. With this new arrangement of belt the leaving of apron marks in the bats is entirely eliminated, and the belt will carry a larger amount of water (which is a decided feature of advantage as it results in a better felting action and gives to the apron a longer life), while at the same
time the felting action is as good or better and is as rapid as in the case where a belt with individual pyramidal knuckles is employed.

Furthermore, in accordance with the present invention, the arrangement and construction of certain of the guide rolls are such that not only are the belt and the bats carried thereby subjected to a bending action back and forth in the direction in which the belt and bats move (as in my said patents), but also in the flexing or waving of the belt and the bats back and forth transversely. In accordance with the present invention, the arrangement is such that transversely spaced apart hollows or depressions are progressively and alternately formed and ironed out in the bats and the belt, so that not only is there a movement of the kneading elements on the belt towards and away from each other in the direction in which the belt is advanced, but there is a somewhat similar movement transversely of the belt resulting in a uniform felting action throughout the bats. The felting action is thus accelerated and a better and more desirable shrinking operation is obtained. Further features of improvement will be pointed out as the following detailed description proceeds.

In the accompanying drawings, the machine is shown more or less diagrammatically and only in part as obviously it may be variously constructed and the parts variously arranged.

Referring to the drawings in detail, 10 designates, generally, a bat carrying or supporting member in the form of an endless travelling apron or belt passing around suitable drums 11, either or both of which may be driven in any desired manner. The upper run of this belt is caused to take a wavy or zig-zag course by guide rolls arranged in staggered relation so that the belt and the bats carried thereby are progressively and alternately bent to and fro. The guide rolls, which support the upper run of the belt 10 and which, for convenience, are referred to as supporting rolls, are designated generally by the letter A. These rolls extend transversely of the belt and are preferably of smooth cylindrical form. The intervening rolls, which engage the working face of the belt 10 and which, for convenience, are termed deflecting rolls, are designated generally by the letter B. It is desirable that all of the guide rolls be positively rotated and while this may be accomplished in any suitable manner, I have shown the shafts or gudgeons of the supporting and deflecting rolls as having gears 14 in intermeshing relation, as will be readily understood from an inspection of the drawings. In addition to the guide rolls, there are provided a plurality of pressure rollers C which engage the working face of the belt 10. In the present illustrative disclosure, the pressure rollers C are respectively above and normally pressed towards the supporting rolls A so that as the belt and a bat carried thereby pass over a supporting roll they are subjected to a squeezing action. Also these pressure rollers result in the plies of the bats being shifted or crozed in a succession of small increments, as described in said patents. The pressure rollers may be urged towards the respective supporting rolls in any suitable manner, but I have shown, in Figure 3, springs 15 for this purpose. The compression of the springs may be regulated by screws 16, or in any other appropriate way. The shafts or gudgeons of the guide rolls are journaled in bearings in the side frames 17. The shafts or guides of the pressure rolls are vertically movable in slots or guide ways 18. The machine may be provided with one or more bat carrying belts which may be of the same or dissimilar constructions, in the present instance two belts being shown. In addition to the belt 10 is a belt 25 which passes about drums 26. The upper run of this belt 25 is paired with the lower run of the belt 10 so as to carry the bats from the rear end of the machine to a point forwardly of the front end of the belt 10. With this arrangement, the operator may stand at the front of the machine and take off the returned bats from the forward end of the belt 25 and replace them on the upper run of the belt 10. The lower run of the belt 10 and the paired upper run of the belt 25 may be caused to take a tortuous or zig-zag course by passing them between the supporting rolls A and supplementary guide rolls A' which, if desired, may be positively driven as shown. For the purpose of maintaining the bats, as they are carried through the machine, in a hot saturated condition, scalding hot water may be discharged by pipes 27 onto the bats and the bat carrying belts. The general construction so far described, (except for the shapes or configurations of the deflecting roll B, the pressure rollers C, and the bat carrying face of the belt 10) is generally similar to that disclosed in my said patents.

In accordance with the present invention, the bat carrying face of the belt 10 (and the corresponding face of the belt 25, if desired) is provided with a multiplicity of cups or recesses of suitable size and packed closely together. These cups or recesses may be of any suitable shape or construction. For example, they may be round, square, pyramidal or diamond shape. In the embodiment shown in Figures 5, 6, and 6, the recesses 30 are pyramidal. In Figure 7 the recesses 30' are diamond shaped, while in Figure 9 the recesses 30'' are triangular. The walls of the recesses may be tapered as shown in Figure 6, or they may be square or perpendicular as shown in Figures 7 and 8. The disclosures in these drawings, insofar as the
cups or recesses in the belt or belts are concerned, are solely by way of exemplification; the essential feature being that the bat carrying face of the belt has a multiplicity of closely packed recesses or cups bounded by ribs or ridges. These ridges or ribs are designated by the numeral 31. These ribs or ridges are angularly disposed relatively to one another so that they cross. They act in the nature of kneading members as will hereinafter be explained more in detail. By preference these ribs of boundary walls are relatively narrow in order that they may be flexed and distorted when the belts are pressed thereagainst. The belt or belts, as the case may be, are preferably formed with a smooth back which may be reinforced by a strip of canvas or other woven material, the backing or base being indicated by the numeral 32 in Fig. 6. The body portion of the belt is preferably formed of a relatively yielding material, such as soft vulcanized rubber in order that the belt may give or stretch and recover its shape and form.

Furthermore, in accordance with the present invention, means are provided for progressively and repeatedly forming in the belt and the belt depressions spaced-apart transversely to the direction in which the belt is advanced, so that not only is there a bending back and forth of the bat and the belt in a direction longitudinal of the machine, but there is also a bending or flexing of the belt and the belt, generally transversely of the machine. To this end, each of the deflecting rolls comprises a plurality of spaced-apart disk-like members 40 carried by a shaft 41. The peripheries of the members 40 are rounded transversely so as not to injure the belts.

By preference, the pressure rollers are similarly formed, each roller having a central shaft 42 and a plurality of circular disk-like members 43 carried thereby. The members 43 of the pressure rollers are disposed between and overlap the members 40 of the deflecting rolls, as will be seen most clearly from Figure 1.

In the operation of the machine, it will be observed that the belts are supported on the cupped face of the belt 10 and are carried by that belt in a wavy course between the guide rolls A and B, and beneath the pressure rollers C. When the belts reach the rear end of the machine, they are carried between the belts 10 and 25 and then advanced to the forward end of the machine where the operator may again place the bat on the upper belt in a different position. The bat may be passed through the machine as many times as desired. As the bat and the belt pass between the guide rolls, they are given a wavy zig-zag course; the belt and bat being flexed or bent concavely as they pass under a deflecting roll B and then being bent in the opposite direction as they pass over a supporting roller A. As the belt is thus flexed or bent back and forth alternately, the cups or recesses in the belt, and also the ribs or boundary walls of these recesses, elongate and contract alternately so as to effect a progressive working and kneading action which results in a vermicular movement of the fibres, and greatly facilitates the shrinking operation. For example, when the belt passes over a supporting roll, the cupped surface of the belt is stretched, the cups 30 elongate together with the ribs 31, and the ribs are moved further apart; and then when the belt is bent in the opposite direction, that is as it passes beneath a deflecting roll, the cupped surface of the belt is contracted; the cups are foreshortened, so to speak, and the ribs 31 move towards one another. It will further be observed that each deflecting roll forms and progresses in the belt a transversely extending wave, and between such waves the belt is transversely flattened as it passes over a succeeding supporting roll A. This action of alternately forming a transverse wave and then ironing the wave out results in a constant contraction and expansion of the cups and surrounding ribs, generally transversely of the direction of movement of the belt. This action will be clearly understood from an inspection of Figs. 3, 4 and 5. As the belt passes over a supporting roll, it is flat or straight transversely, as shown in Fig. 3; the cups 30 are of normal width, and the ribs 31 are uniformly spaced apart transversely. Then, as the belt passes beneath a deflecting roll, as shown in Fig. 4, a series of transversely spaced apart depressions or hollows and intervening crests are formed. As the hollows are formed, the cups in the hollows are narrowed in width and the ribs are moved towards each other, while the cups on the convex crests are widened and the side ribs move away from each other. Then, after the portion of the belt passes from under the wave roll and towards the succeeding supporting roll, it is gradually flattened out, the cups which were in the bottom of the hollows being gradually widened and the cups which were on the crests being gradually contracted transversely. This results in a kneading or manipulating action of the fibres of the belt transversely of the manipulation due to the waving of the belt in the direction of its length. Actually, it is found that, due to these major flexures and bending of the belt, the bats are manipulated and kneaded more or less uniformly in all directions.

Moreover, the bat is subjected to innumerable minor manipulations by the distortion and recovery of the ribs 31. The bats and the belt are intermittently and progressively subjected to pressure as they pass between the guide rolls and under the pressure rolls. When pressure is exerted against these
ribs, they are distorted, and when pressure is relieved the ribs assume their normal shape, and in so doing effect a kneading operation. It will be observed that the pressure members or disks 43 of the pressure rollers C are interposed between the bat engaging members 40 of the deflecting rolls.

It will be seen that in proceeding in accordance with the present invention the bats are subjected to a multiplicity of relatively local kneading manipulations by the ribs or kneading members with which the belt is provided, and that the bats are also subjected to general kneading and flexing actions in substantially all directions so that the shrinking and felting operations are substantially uniform and these operations are very rapidly and effectively carried out, resulting in a product of uniform and superior quality. As previously stated, it is of advantage to provide the bat supporting face of the belt with cups or recesses, as by so doing, the bats are effectively manipulated while any danger of leaving apron marks on the bats is avoided. Also, the recesses or cups will carry and retain a greater amount of water which has a decided advantage in that the requirements as to moisture and heat are more effectively met. Also the life of the bat will be increased.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. A bat carrying belt for use in hat shrinking machines and comprising a member of yielding material having a bat carrying face provided with a multiplicity of closely packed together recesses bounded by substantially continuous walls, the rear face of said belt being smooth.

2. A bat carrying belt for use in hat shrinking machines and comprising a member of yielding material having a bat carrying surface provided with a plurality of closely placed together cups and ribs between and surrounding the cups.

3. A bat carrying belt for use in hat shrinking machines and comprising a member having a yielding bat carrying surface provided with a plurality of intersecting ribs forming cups therebetween said ribs being lesser in thickness than the width of said cups.

4. A bat carrying belt for use in hat shrinking machines and comprising a yielding member having a smooth back surface and a bat carrying face provided with a multiplicity of pyramid cups.

5. The process of shrinking hat bats and the like which consists in placing the bat flatwise upon a yielding belt provided with a plurality of cups on its bat carrying face, and intermittently and progressively applying pressure to the bat and belt.

6. The process of shrinking hat bats and the like, which consists in placing a bat flatwise upon a yielding belt provided with a plurality of cups on its bat carrying face, intermittently and progressively applying pressure to the bat and belt, and progressively and alternately bending the bat and belt back and forth.

7. A machine for shrinking hat bats and the like, and including a belt adapted to support a bat in unrolled and substantially flatwise condition and having on its bat carrying face a multiplicity of recesses bounded by narrow ribs, and means for bending under pressure said bat and the bat thereof progressively and repeatedly back and forth to cause said recesses to alternately elongate and contract.

8. A machine for shrinking hat bats and the like, and including a belt adapted to support a bat in substantially flatwise and unrolled condition and having on its bat carrying face a multiplicity of closely packed together recesses bounded by ribs, and means for guiding said belt in a wavy path whereby said belt with the bat thereon is alternately bent back and forth.

9. A machine for shrinking hat bats and the like, and including a plurality of rolls, and a belt guiding alternately over and under said rolls and having a bat carrying face provided with a multiplicity of closely packed together cups and ribs between and surrounding the cups, said rolls being arranged to guide said belt in a wavy path.

10. A machine for shrinking hat bats and the like, and including a plurality of supporting rolls, a plurality of deflecting rolls in staggered relation to said supporting rolls, a belt passing over said supporting rolls and under said deflecting rolls and having a bat carrying face provided with a multiplicity of cups and ribs between the cups, and pressure rolls adapted to engage said bat carrying face of said belt and to press the belt and the bats thereon between themselves and said supporting rolls.

11. The process of shrinking hat bats and the like, which consists in placing the bats flatwise upon a yielding member provided on its bat carrying face with a plurality of kneading elements, progressively and alternately bending said member with the bats thereon back and forth, and alternately and
1,884,913 repeatedly bending said member and bats back and forth in a direction transverse to that in which the first bending action is progressed.

12. The process of shrinking hat bats and the like, which consists in placing the bats flatwise upon a yielding member provided on its bat carrying face with a plurality of kneading elements, progressively and alternately bending said member with the bats thereon back and forth, alternately and repeatedly bending and flexing said member and bats back and forth in a direction transverse to that in which the first bending action is progressed, and progressively and successively applying pressure to said member and bats.

13. The process of shrinking hat bats and the like, which consists in placing the bats flatwise upon a belt having on its bat carrying face a multiplicity of yielding kneading elements, progressively and alternately bending the belt and bats thereon back and forth, successively forming in said belt and bats a plurality of transversely extending spaced apart rows of depressions and crests, and progressively said depressions and crests through the belt and bats in the direction of the first bending action.

14. The process of shrinking hat bats and the like, which consists in placing the bats flatwise upon a belt having on its bat carrying face a multiplicity of yielding kneading elements, progressively and alternately bending said belt and bats back and forth thereby said kneading elements are moved towards and away from each other alternately in one direction, and alternately and progressively waving said belt and bats and straightening out said belt and bats transversely to the direction in which the first bending action is progressed.

15. A machine for shrinking hat bats and the like, and including a plurality of rolls arranged in staggered relation, and a belt passing in a wavy path between said rolls and having a bat carrying face provided with a multiplicity of kneading elements, alternate rolls being provided with spaced apart members arranged to form depressions and intervening crests in the belt and the intervening rolls being arranged to flatten out the belt transversely.

16. A machine for shrinking hat bats and the like, and including a plurality of supporting rolls of cylindrical form, a plurality of intervening deflecting rolls in staggered relation to said supporting rolls and having spaced apart circular members, and a belt passing over said supporting rolls and beneath said deflecting rolls and having on its bat carrying face a multiplicity of kneading elements.

17. A machine for shrinking hat bats and the like, and including a belt adapted to support bats in unrolled and flatwise condition and having on its bat carrying face a multiplicity of elastic kneading elements, a plurality of supporting rolls, a plurality of deflecting rolls arranged in staggered relation to said supporting rolls, said supporting rolls and deflecting rolls being arranged to cause said belt to take a wavy course, said supporting rolls being of cylindrical form and said deflecting rolls having spaced apart members thereon for forming transversely spaced apart depressions in the belt, and pressure rollers adapted to engage the bat carrying face of the belt.

18. A machine for shrinking hat bats and the like, and including a plurality of supporting rolls, a plurality of deflecting rolls between and in staggered relation to said supporting rolls, and each having a plurality of spaced apart disk like members, a bat carrying belt arranged to pass over said supporting rolls and under said deflecting rolls in a wavy course, and having on its bat carrying face a multiplicity of kneading elements and pressure rollers opposed to said supporting rolls and each having a plurality of spaced apart disk like members adapted to engage the belt, the disk like members of said supporting rollers being transversely staggered to the disk like members of said deflecting rolls.

19. A machine for shrinking hat bats and the like, and including a plurality of cylindrical supporting rolls, a plurality of deflecting rolls between and in staggered relation to said supporting rolls and each having a plurality of spaced apart disk like members or ribs, a bat carrying belt adapted to pass over said supporting rolls and under said deflecting rolls in a wavy course and having in its bat carrying face a multiplicity of closely packed together recesses, pressure rollers between which and said supporting rolls the belt is squeezed, and means for maintaining the bats carried by the belt in a hot moist condition.

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