March 22, 1938. H. A. GENEST 2,112,207

METHOD OF AND APPARATUS FOR SHRINKING FELT ARTICLES

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Fig. 1

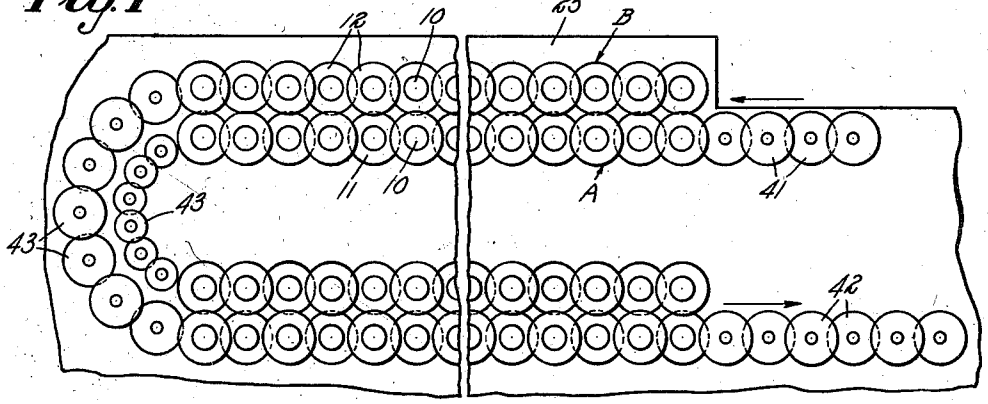
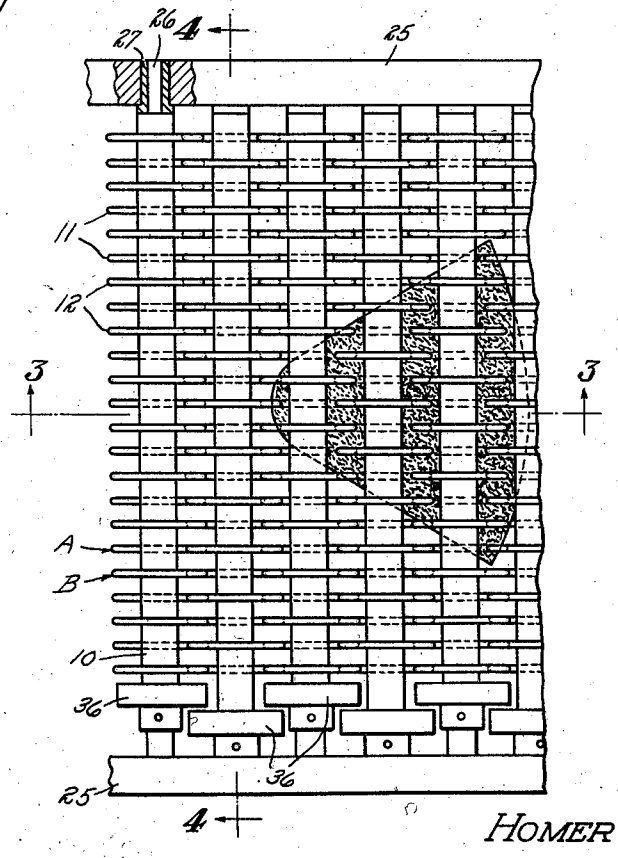


Fig. 2



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METHOD OF AND APPARATUS FOR SHRINKING FELT ARTICLES

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Fig. 3

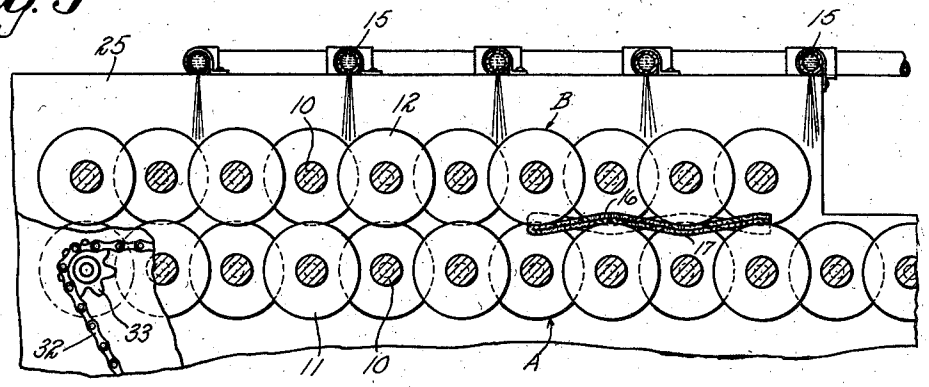


Fig. 4

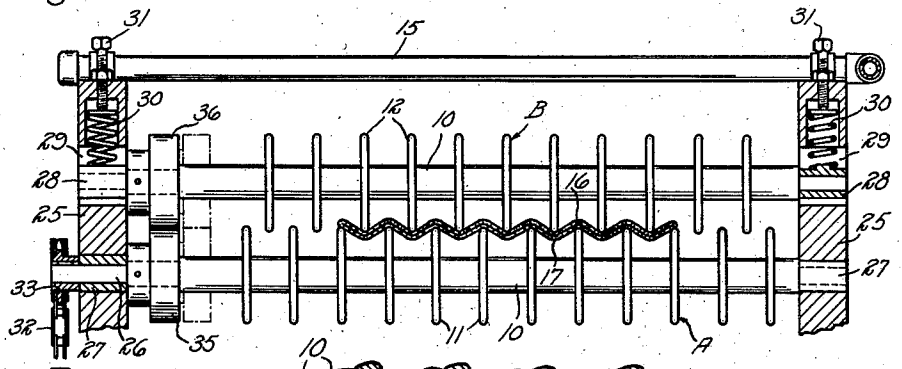
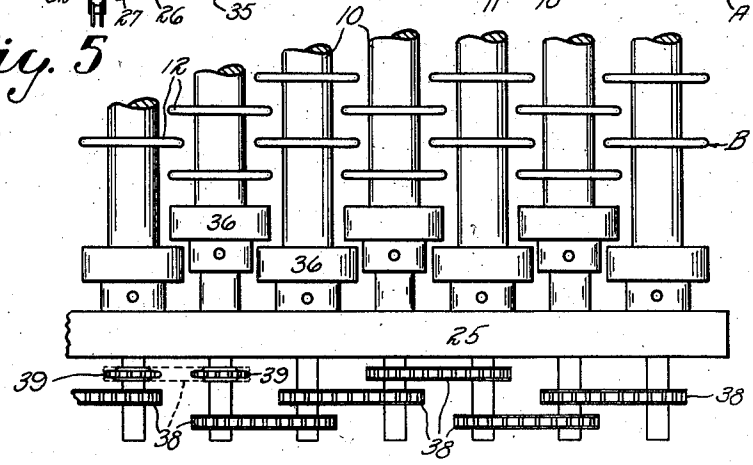


Fig. 5



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METHOD OF AND APPARATUS FOR SHRINKING FELT ARTICLES

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Fig. 6

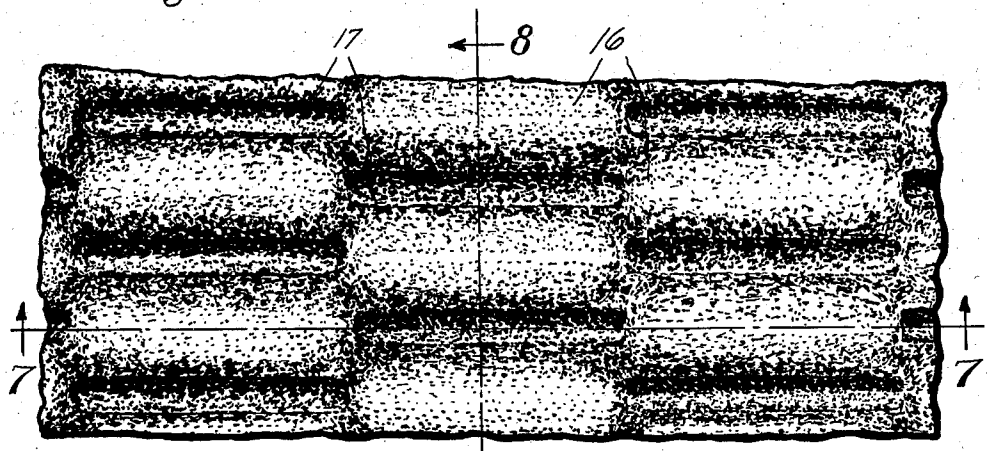


Fig. 7

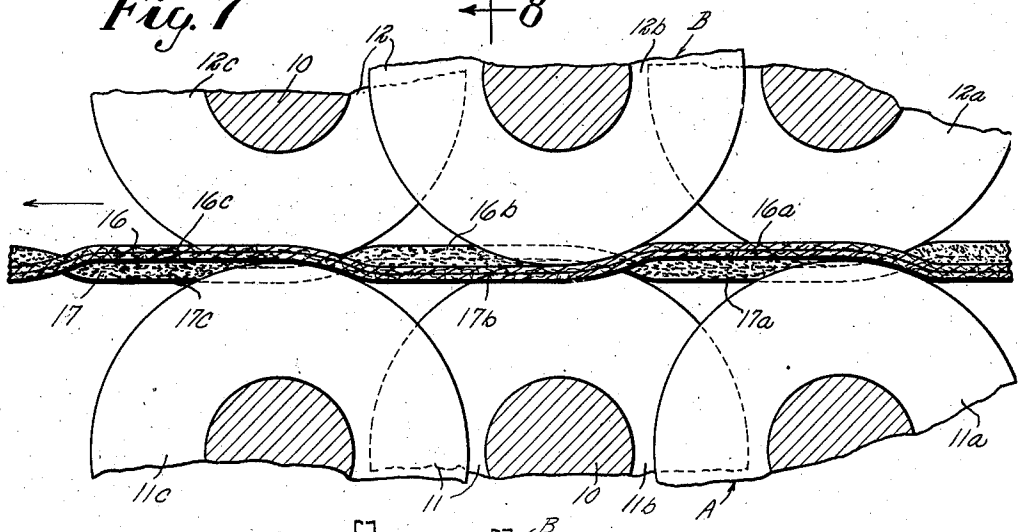
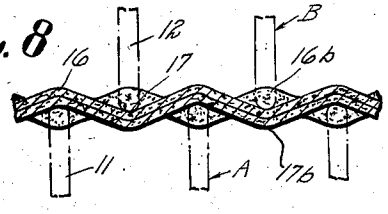


Fig. 8



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Patented Mar. 22, 1938

2,112,207

UNITED STATES PATENT OFFICE

2,112,207

METHOD OF AND APPARATUS FOR SHRINKING FELT ARTICLES

Homer A. Genest, Danbury, Conn., assignor to United States Hat Machinery Corporation, New York, N. Y., a corporation of Virginia

Application September 24, 1936, Serial No. 102,281

15 Claims. (Cl. 28—5)

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

It is customary, in the manufacture of fur or felt hats, to form a bat by blowing the fur upon a forming cone, and then, after the bat has been stripped from the cone and while the bat is wet and hot, to gently manipulate it so as to harden it sufficiently to permit it to be handled with safety. This first manipulation is known as "hardening". Then the bats are shrunk in a series of separate and distinct operations known as "starting", "stumping", "first sizing", and "second sizing". During the starting operation, the bats are quite tender and are, therefore, more or less gently manipulated. During the successive operations, the severity of the manipulation is increased until the final sizing operation where the action is quite severe. The extent to which these various operations are carried out and the sizes to which the bats are carried down during each operation varies in different factories and in accordance with the kind of fur employed and the quality of hat desired. Before the development of the so-called "Genest" process, it was customary, during each of the several shrinking operations, for the operator to superimpose a plurality of bats upon a blanket or apron, curl the assembly into a roll, manipulate the roll and then unroll the assembly, croze, and rearrange the bats; and repeat these steps until the bats were brought down to the desired size for the particular operation. In some instances, the manipulation was effected by rolling the assembly back and forth by hand at varying pressures, but usually it was customary to employ a so-called three roll machine arranged so as to give different degrees of action for the several operations, but in all instances pressure being repeatedly applied to the assembly while the rolled bats were in hot, wet condition. This old method of operation was open to many obvious and well-known disadvantages and objections, many of which were avoided in the so-called "Genest" process.

The so-called "Genest" process and the apparatus for carrying the same out is exemplified by, among others, the Homer A. Genest Patents Nos. 1,533,349, 1,533,350, 1,533,351, and 1,821,432 and the William A. Lorenz Patent No. 1,535,324. These machines contemplate, generally, the employment of a belt or apron having a bat carrying surface provided with a multiplicity of kneading elements or knuckles, and, by preference, the belts and the bats carried thereby are caused to follow a wavy path. These machines have practically displaced earlier practices wherein the bats were rolled and manipulated either by hand or by three roll machines. However, while these machines have proved highly practical and of big commercial value, they have certain limitations, among which may be mentioned the cost of replacing the belts as they become worn, and the machines are not particularly adapted for the starting operation. In actual practice, the machine exemplified by Patent No. 1,533,350 is in general use for stumping operations, and the machine exemplified in Patent No. 1,821,432 is in general use for carrying out the first and second sizing operations. It may be stated here that in each of these machines it is contemplated that a squeezing pressure be exerted on the bats at intervals.

In my Patent No. 1,620,957 granted March 15, 1927, I show a method of and apparatus for shrinking and felting felt articles and wherein the use of a kneading belt for carrying the bats through the machine in a flat condition is eliminated. While that machine has many practical features of novelty and importance which are taken advantage of in the invention disclosed in the present application, it has not proven entirely satisfactory due, possibly, to the severity with which it treats the bats and to the fact that the fibers have not sufficient freedom of action when the bats are compressed as they pass between the rollers.

The aim of the present invention is to provide a more practical and efficient method and machine wherein the felt articles may be more speedily and uniformly felted and shrunk with better results.

More particularly, an object of the invention is to provide an improved method and apparatus which have a wide range of use and flexibility in adaptation for effecting the shrinking and felting of felt articles in their various stages; which have a high rate of production in that the felt articles may be more speedily felted and a larger number of articles may be operated upon within a given time, and which will produce felted articles of a uniform character and high quality.

A further aim of the invention is to provide an improved machine which is characterized by various features of novelty and advantage and which is relatively simple in construction and economical in operation, and the upkeep of which is relatively low.

A more particular aim of the invention is to provide certain improvements in the method and machine shown in my said Patent No. 1,620,957

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 side elevational view showing, more or less diagrammatically, my improved machine;

Fig. 2 is a top plan view of a portion of the machine;

Fig. 3 is a vertical longitudinal section therethrough, the same being taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a transverse vertical section taken through the machine on substantially line 4—4 of Fig. 2;

Fig. 5 is a fragmentary detail view, similar to Fig. 2, and showing an arrangement whereby the spring pressed rollers may be positively driven.

Fig. 6 is a plan view of a portion of a bat showing its condition as it passes between the rollers;

Fig. 7 is a sectional view taken longitudinally through the bat on the line 7—7 of Fig. 6; and

Fig. 8 is a similar view taken transversely through the bat on the line 8—8 of Fig. 6.

In the illustrative showing of the drawings, the machine of the present invention is similar to that disclosed in my said Patent No. 1,620,957 insofar as it is provided with rollers between which the bats are passed in an unrolled and saturated condition and the bats are repeatedly bent or flexed back and forth in a plurality of directions. As the bats are passed between the rollers, a regular pattern of elevations and depressions, spaced apart transversely and lengthwise of the direction in which the bats move, is progressed from one edge of the bat to the other. In the present instance, however, the bats at all times are maintained substantially free of pressure, the only pressure exerted on the bats being that induced by tension, and such pressure being relatively slight and being limited to the small localized points of engagement between the bats and the relatively narrow members for bending them back and forth in a plurality of directions, thus providing a structure and method in which the bats, while being shimmied or wiggled with a rapid flexing movement in all directions, are free to shrink throughout their entire areas at all times. This action is such as to impart to the fur fibers a more or less free motion without pressure so that the fibers become uniformly interlaced throughout all portions of the bat.

Further, as the bats are not squeezed between the members between which they are passed, the bats will retain the boiling water to which they are subjected so that the bats will be maintained in a thoroughly hot and saturated condition. At no time are any portions of the bats squeezed or pinched between oppositely acting members so that there is no possibility of damaging the bats, and streaks, dags, and other imperfections and marks in the bats are avoided.

Referring more particularly to the drawings, and particularly to Figs. 2 to 4, the letter A designates the set of rollers which supports the bats, and the letter B designates the set of rollers between which and the set A the bats are passed during the shrinking and felting operation. Each roller includes a shaft 10 provided with uniformly spaced apart, relatively narrow disks, the spaces between the disks of each roller being such that the bat is engaged only by the peripheries of the disks. The disks of the rollers A are designated by the numeral 11 and those of the rollers B by the numeral 12. The disks of adjacent rollers of each set are alternately arranged, that is to say, the disks of any roller of either set are disposed midway between the disks of the next succeeding roller of the same set. By preference, the disks of the rollers of each set are internested or interlocked, that is to say, the disks of one roller extend into the spaces between the disks of the next roller. The rollers of the set A are respectively positioned immediately below the rollers of the set B so that they are arranged in pairs, so to speak, and the disks of each pair are in staggered or alternate relation. In the drawings, the disks of the upper set of rollers are shown as being interlocked with the disks of the lower set of rollers but it is to be understood that the extent of such interlocking relation will depend largely upon the particular operation to be performed, the sizes of the disks, the number of superimposed bats passing through the machine, and other factors. While, in Figs. 2 and 3, I have shown a single bat as passing through the machine, it is, of course, understood that a number of bats, for example two, three, or four, may be stacked one upon the other in superimposed relation and passed in that relation through the machine. While the bats are being passed through the machine, they are maintained in any suitable manner in a hot, saturated condition as, for example, by spraying boiling water onto the bats through suitable pipes 15.

With the arrangement described, it will be seen that the disks of each roller form a transverse row of bat engaging projections or elements and adjacent rows are in staggered relation. Thus there is provided to each of the opposite sides of the bat a plurality of checkerboard-arranged bat-engaging projections or elements, the elements being relatively narrow and being spaced apart at relatively wide distances as compared to their widths, and the elements to one side of the bat being disposed between the elements to the other side of the bat. The bats, between the points at which they engage the narrow peripheries of such elements, are free of engagement with such elements so that no pressure is applied thereto and the fibers thereof may have an unretarded, interlocking motion as the bat is flexed back and forth. More particularly, as the bat passes between the rollers, the disks of the rollers A and the rollers B, respectively, form elevations 16 and depressions 17 in the bat, and these depressions and elevations are arranged in a checkerboard-like manner; that is to say, the depressions and elevations alternate with one another both in the direction in which the bat is passed through the machine and in a transverse direction. From Fig. 6, it will be noted that the depressions are diagonally arranged in both directions, as are also the elevations. In the present instance, the elevations and depressions are more or less in the form of corrugations extending in the direction in which the bat moves. As the bats are progressed through the machine, the elevations and depressions formed by one pair of rollers are respectively changed by the next pair of rollers into depressions and elevations so that the bats are rapidly flexed or bent up and down at spaced points and in all directions.

The operation of the machine may be more clearly understood upon reference to Figs. 6 to 8,

these figures showing a portion of the bat as it may appear at any one instance as it passes through the machine, it being understood that the showing is more or less for purposes of illustration and somewhat on an exaggerated scale, it being clear that the invention is not limited to the particular form or spacing of the elevations and depressions illustrated. As the bat passes between the disks 11a and 12a of the first pair of rollers illustrated in Fig. 7, the disks 11a will form spaced-apart elevations 16a, and the disks 12a will form intervening depressions 17a so that the bat is transversely waved. As the bat progresses to the next pair of rollers, the bat will be waved in the opposite direction, the disks 11b changing the depressions 17a into elevations 16b, and the disks 12b changing the elevations 16a into depressions 17b. On further progress of the bat, the disks 11c and 12c of the next pair of rollers will respectively form elevations 16c and depressions 17c which are positioned correspondingly to the elevations and depressions 16a and 17a. Thus, the bats are repeatedly bent up and down at spaced transverse points as the bats move from one pair of rollers to another, and this constant bending, while the bats are saturated with boiling water, results in a shrinking and interlocking motion of the fur fibers over the entire surface of the bat. As the bat passes between a pair of rollers, the disks thereof engage the bat at spaced points only (see Fig. 8), and the portions of the bat transversely between the disks are more or less tensioned, such portions being free of pressure or any squeezing action. Then, as the bats pass from between such disks, the tension is relieved. As the bat passes through the next pair of rollers, the bat is again tensioned on a transverse line and waved in the reverse direction, and this action is repeated throughout the machine so that there is a repeated stretching or tensioning motion at spaced apart points over the entire surface of the bat. Obviously, as the bat progresses through the machine, it shrinks in size and, therefore, the disks of one pair of rollers will engage a bat at different points than those engaged by the disks of the preceding rollers. On successive passes through the machine, the bats are preferably in different angular positions so that they are uniformly shrunk and properly crozed. The bats may be passed repeatedly through the machine until the same are brought down to the desired size. As previously stated, a number of bats in superimposed relation may be passed through the machine. It may also be noted that, due to the interlocking relation of the disks of the rollers of each set, the use of strippers or the like to prevent the bat from passing between adjacent rollers of either set is obviated.

In the drawings, I have shown the rollers as being suitably journalled in a frame which may consist of two side frame members 25, the same being more or less diagrammatically shown as the particular construction thereof is immaterial. The rollers of each set may be journalled in bearings fixedly carried by the frame, but, preferably, in order that the machine may be more flexible and require less care and experience in its operation, the rollers of one set are mounted for movement towards and from the rollers of the other set. In the present illustrated disclosure, the gudgeons 26 of the supporting rollers A are journalled in bearings 27 fixedly carried by the side frame members. The bearings or journal boxes 28 associated with the upper set of rollers B are slidably mounted in vertical slots 29 in the frame members. In some instances, the weight of the rollers B may be relied upon to urge these rollers downwardly, but, if desired, these rollers may be urged towards the rollers A by means of springs 30, the pressure of which springs may be adjusted by bolts or screws 31. By preference, the supporting rollers A may be positively driven in any suitable manner, while the upper set of rollers B may be driven through frictional engagement with the rollers A and the bats passing through the machine. It may be found desirable, under certain conditions of operation, to also positively drive the upper set of rollers. In Figs. 3 and 4, the supporting rollers A are shown as being driven by a sprocket chain 32 cooperating with sprockets 33 keyed to the gudgeons of the rollers. The rollers B, when in their lowermost position, are driven by the rollers A through the cooperating friction collars or pulleys 35 and 36. It will be noted that these collars are arranged in pairs, the collars 35 being fixed to the rollers A and the collars 36 being fixed to the rollers B.

By preference, the friction collars 35 and 36 are so proportioned that they will remain in engagement while bats of relatively light weight are being passed through the machine. When bats of heavier weight pass through the machine, each roller B will be driven from its associated roller A through the collars 35 and 36 until a bat becomes engaged with the roller B whereupon such roller will rise on the top of and be driven by the bat. After the bat passes between a pair of rollers, the roller B will again fall down and again be driven through the collars until the next bat comes along. Obviously, the size of the friction collars 35 and 36 and the spacing of the disks of the rollers will depend upon the conditions under which the machine is to be operated and the various operations to be performed. Further, if desired, the upper set of rollers may be driven in any suitable manner as, for example, by the arrangement shown in Fig. 5. In this figure, adjacent rollers B are shown as being connected by chains 38 passing about sprockets 39.

In practice, the machine, by preference, will be provided with two banks of rollers as shown in Fig. 1. Each bank has two sets of rollers A and B. At the forward end of the upper bank are rollers 41 for receiving and feeding the bats into the machine. At the delivery end of the lower bank of rollers are rollers 42 for receiving the bats after the same have passed through the machine. Guide rolls 43, or other suitable means, may be provided for transferring the bats from the upper bank to the lower one. These rolls may be suitably driven.

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. The process of shrinking hat bats and the

like which consists in progressing a pattern of checkerboard-arranged elevations and depressions from one edge of the bat to the other and freely tensioning the portions of the bat between the depths of the depressions and the crests of the elevations.

2. The process of shrinking hat bats and the like which consists in progressing a regular pattern of elevations and depressions from one edge of the bat to the other, the elevations and depressions being in alternate relation both in the direction in which the pattern is advanced and in a direction transverse thereto, and progressively and successively freely tensioning the bat transversely between the depths of the depressions and the crests of the elevations.

3. The process of shrinking hat bats and the like which consists in progressing a regular pattern of elevations and depressions from one edge of the bat to the other and arranged in alternate relation both in the direction in which the pattern is advanced and in a direction transverse thereto by passing the bat in an unrolled condition between a plurality of checkerboard-arranged bat-engaging elements, the engagement between the bat and said elements being localized at spaced points, and the portions of the bat between the points of engagement with said elements being free of pressure.

4. In a machine for shrinking hat bats and the like, means for progressing a regular pattern of elevations and depressions from one edge of the bat to the other while the bat is in unrolled condition, said means consisting of members to one side of the bat for forming crosswise, spaced-apart elevations therein, and members to the other side of the bat for forming depressions therein between said elevations, said members and the spaces between the same being so arranged that said members engage the bat only at spaced points on the bat and the portions of said bat between said points of engagement being free of pressure in all directions.

5. In a machine for shrinking hat bats and the like, means for progressing a regular pattern of elevations and depressions from one edge of the bat to the other while the bat is in unrolled condition, and consisting of a plurality of checkerboard-arranged bat-engaging elements to opposite sides of the bat, the elements to one side being in opposed relation to the spaces between the elements to the other side, said elements being relatively narrow and said spaces being relatively wide and deep so that the bat has localized engagement with said elements and the portions of the bat between transversely arranged elements are free of said elements and free of pressure.

6. In a machine for shrinking hat bats and the like, means for progressing a regular pattern of elevations and depressions from one edge of the bat to the other while the bat is in unrolled and saturated condition, said means comprising two sets of checkerboard-arranged bat-engaging elements between which the bat is passed, said elements of each set being arranged in a succession of transverse rows with the elements of one row alternating with those of adjacent rows, the rows of one set being paired with the rows of the other set and the elements of each pair being in alternate or staggered relation and being spaced apart transversely a distance greater than the thickness of the bat whereby the portions of the bat between its point of engagement with said elements as it passes between each pair of rows are freely tensioned and free of pressure.

7. In a machine for shrinking hat bats and the like, means for progressing a pattern of elevations and depressions from one edge of the bat to the other while the bat is in unrolled condition and comprising a plurality of rotary members to one side of the bat for forming crosswise spaced-apart elevations and rotary members to the other side of the bat for depressing the same between said elevations, said members being relatively narrow and the transverse spaces between the members to opposite sides of the bat being greater in width and in depth than the thickness of the bat whereby the bat is engaged by said members at spaced localized points and the portions of the bat between said members are free of pressure.

8. In a machine for shrinking hat bats and the like, means for progressing a pattern of elevations and depressions from one edge of the bat to the other while the bat is in unrolled and saturated condition and comprising two sets of rollers between which the bat is passed, each of said rollers having a plurality of spaced apart disks and the disks of each roller of each set being alternately arranged with respect to the disks of the adjacent rollers of the respective set, the disks of the rollers of one set being transversely staggered with respect to the rollers of the other set and being spaced apart a distance greater than the thickness of the bat whereby transverse portions of the bat between its points of engagement with said disks are freely tensioned and free of pressure.

9. In a machine for shrinking hat bats and the like, two sets of rollers between which the bat is advanced, the rollers of each set having spaced-apart alternately-arranged disks, the disks of one set of rollers being opposed to the spaces provided between the other disks of the other set of rollers, and said spaces being of such size that the transverse portions of the bat between its points of engagement with said disks are free of pressure.

10. In a machine for shrinking hat bats and the like, two sets of rollers between which the bat is advanced, the rollers of each set having spaced-apart disks and the disks of one roller being in staggered relation to the disks of adjacent rollers, the rollers of the two sets being arranged in pairs with the disks of each roller of each pair opposed to the spaces between the disks of the other pair, said spaces being of such size that the bat, as it passes between a pair of rollers, engages only the periphery of said disks and is free of pressure between the disks.

11. In a machine for shrinking hat bats and the like, two sets of rollers between which the bat is advanced, the rollers of each set having a plurality of transversely spaced-apart disks, the disks of adjacent rollers of each set being alternately arranged and the disks of one roller extending into the spaces between the disks of adjacent rollers, the rollers of one set being paired with the rollers of the other set and the disks of each pair being in staggered relation, said disks being relatively narrow and the spaces between said disks being of such size that the bat, as it passes between a pair of rollers, is free of pressure between its points of engagement with said disks.

12. In a machine for shrinking hat bats and the like, means for progressing a pattern of elevations and depressions from one edge of the bat to the other while the bat is in unrolled and

saturated condition and comprising two sets of rollers between which the bat is passed, the rollers of one set being movable towards and away from the other set, each of said rollers having a plurality of spaced apart disks and the disks of each roller of each set being alternately arranged with respect to the disks of the adjacent rollers of the respective set, the disks of the rollers of one set being transversely staggered with respect to the rollers of the other set and being spaced apart a distance greater than the thickness of the bat whereby transverse portions of the bat between its points of engagement with said disks are freely tensioned and free of pressure.

13. In a machine for shrinking hat bats and the like, two sets of rollers between which the bat is advanced, the rollers of each set having spaced-apart alternately-arranged disks, the disks of one set of rollers being opposed to the spaces provided between the other disks of the other set of rollers, and said spaces being of such size that the transverse portions of the bat between its points of engagement with said disks are free of pressure, the rollers of one set being urged towards those of the other set, and friction means for driving the rollers of one set from the rollers of the other set.

14. In a machine for shrinking hat bats and the like, two sets of rollers between which the bat is advanced, the rollers of each set having spaced-apart disks and the disks of one roller being in staggered relation to the disks of adjacent rollers, the rollers of the two sets being arranged in pairs with the disks of each roller of each pair opposed to the spaces between the disks of the other pair, said spaces being of such size that the bat, as it passes between a pair of rollers, engages only the periphery of said disks and is free of pressure between the disks, the rollers of one set being urged towards the rollers of the other set, and engageable friction collars on the rollers of each pair.

15. In a machine for shrinking hat bats and the like, two sets of rollers between which the bat is advanced, the rollers of each set having a plurality of transversely spaced-apart disks, the disks of adjacent rollers of each set being alternately arranged and the disks of one roller extending into the spaces between the disks of adjacent rollers, the rollers of one set being paired with the rollers of the other set and the disks of each pair being in staggered relation, said disks being relatively narrow and the spaces between said disks being of such size that the bat, as it passes between a pair of rollers, is free of pressure between its points of engagement with said disks, means for supporting the rollers of one set towards and away from the rollers of the other set, means for positively rotating a roller of each pair, and engageable friction collars on the rollers of each pair whereby one roller of each pair is driven through the positively driven roller.

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