March 15, 1927. 1,620,957

H. A. GENEST

METHOD OF AND APPARATUS FOR SHRINKING AND FELTING FELT ARTICLES

Filed Feb. 1. 1924 3 Sheets-Sheet 1

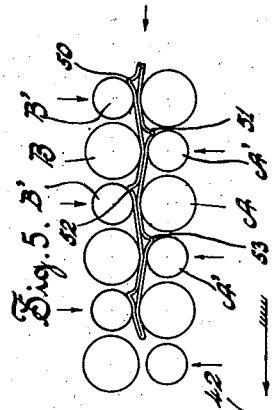


Fig. 5.

Fig. 1.

Inventor

Homer A. Genest

by W. Clay Lindsey

His Attorney

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H. A. GENEST

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Filed Feb. 1. 1924 3 Sheets-Sheet 2

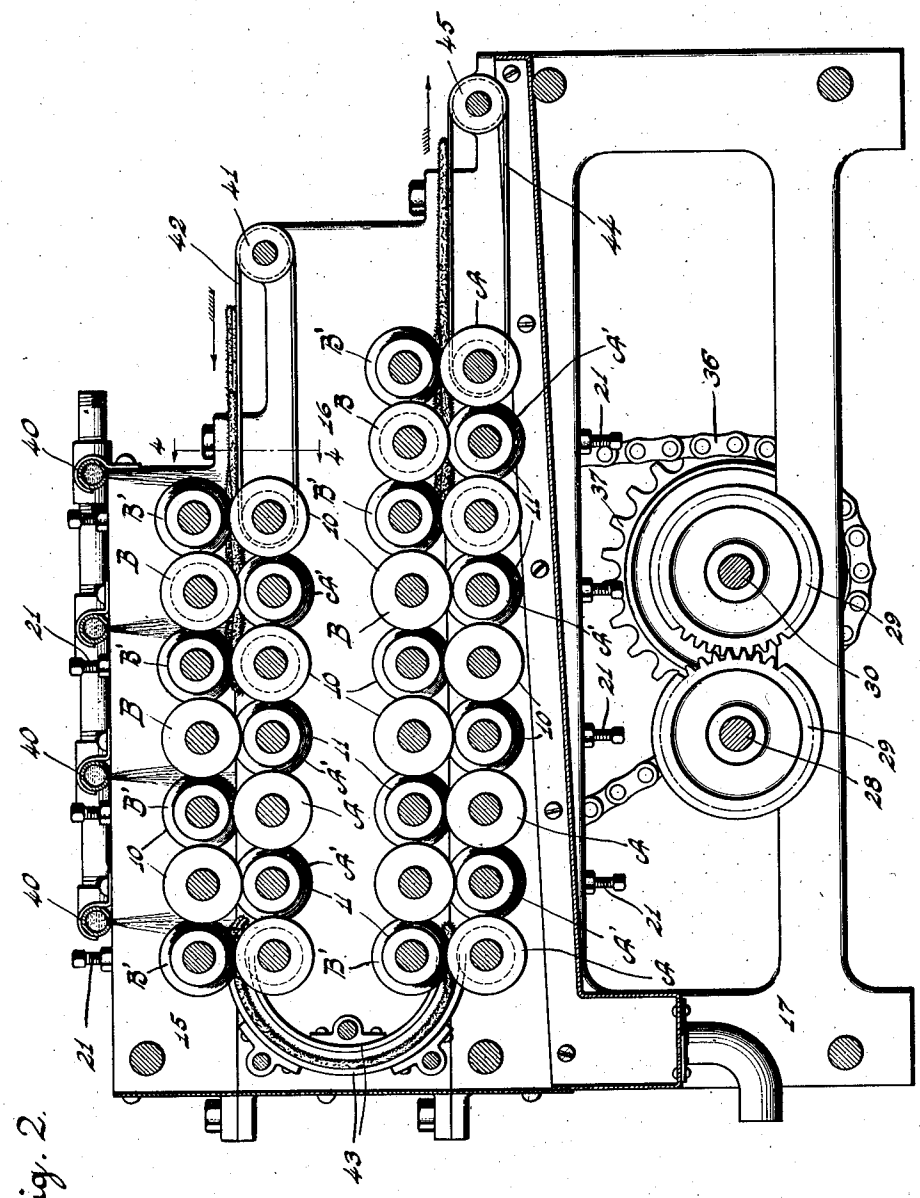


Fig. 2.

Inventor
Homer A Genest
by H. Clay Lindsey
His Attorney

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H. A. GENEST

METHOD OF AND APPARATUS FOR SHRINKING AND FELTING FELT ARTICLES

Filed Feb. 1. 1924 3 Sheets-Sheet 3

Fig. 3.

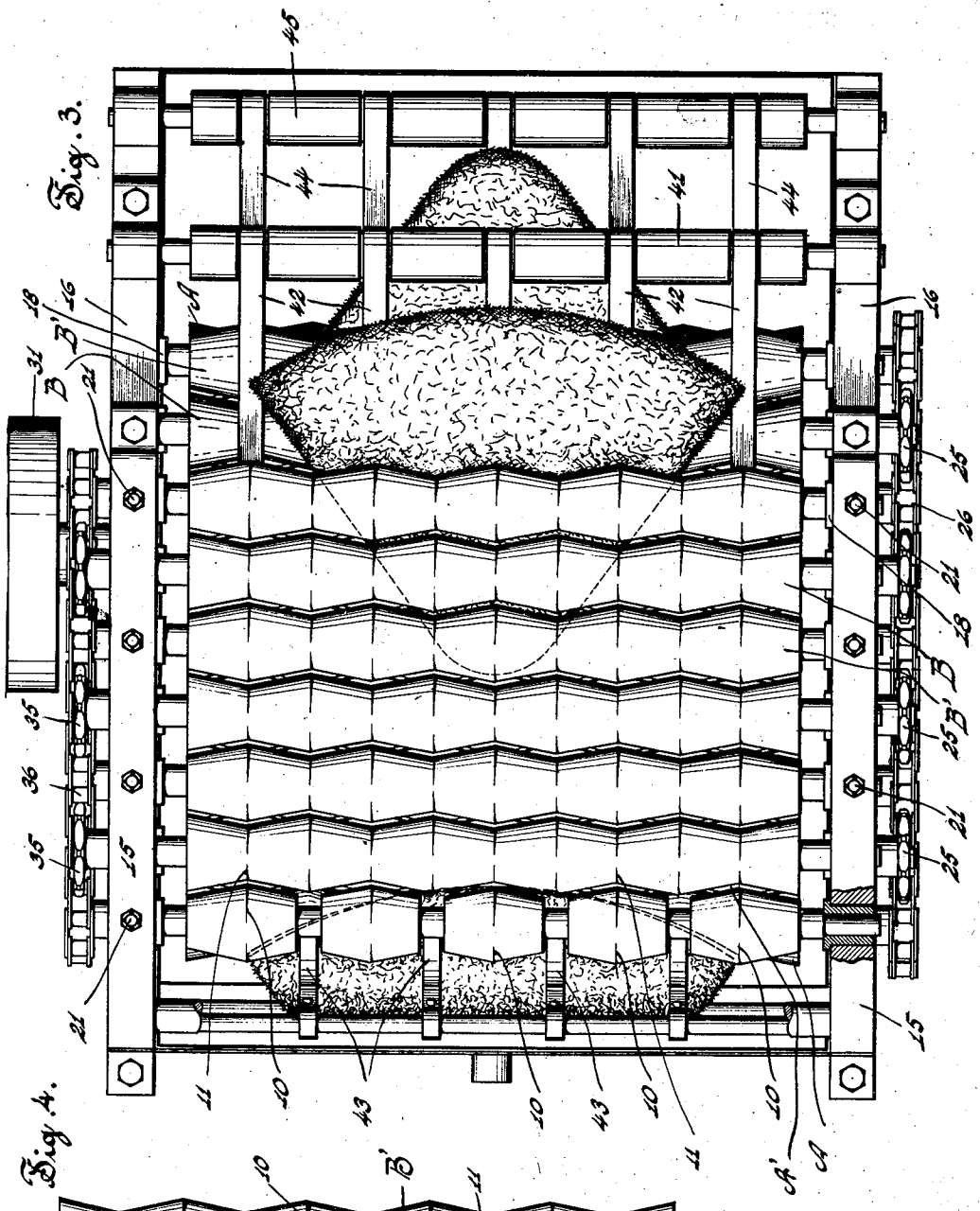
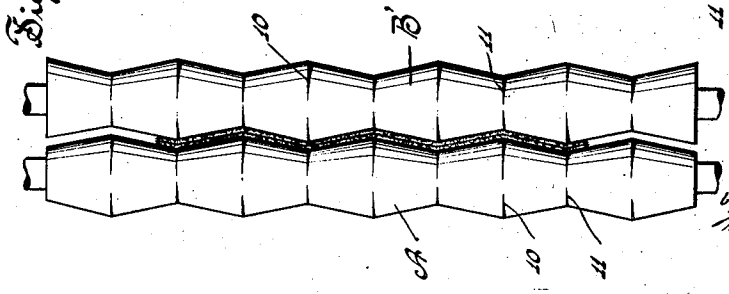


Fig. 4.



Inventor
Homer A Genest
by H. Clay Linskey.
His Attorney

Patented Mar. 15, 1927. 1,620,957

UNITED STATES PATENT OFFICE.

HOMER A. GENEST, OF HARTFORD, CONNECTICUT, ASSIGNOR TO UNITED STATES HAT MACHINERY CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF VIRGINIA.

METHOD OF AND APPARATUS FOR SHRINKING AND FELTING FELT ARTICLES.

Application filed February 1, 1924. Serial No. 689,940.

This invention relates to the shrinking of felt articles, for example bats from which fur or felt hats are made. According to the usual method heretofore practiced, after a bat has been blown upon the forming cone, it is dipped into scalding water and then given a preliminary manipulation so as to harden it sufficiently to permit it to be handled with safety. Then the bats are given a first sizing operation, this being done by taking a number or bats, usually six, placing them one upon another, rolling them in a blanket, and manipulating the rolled blanket and bats (while in a saturated condition) by rolling the assembly back and forth by hand at varying pressures. The blanket and bats are unrolled, the bats are examined and shifted in position, they are then again rolled up and manipulated, and this sequence of steps is repeated until the bats have been shrunk to within an inch or so of the final desired size. The bats are then given a second sizing operation in which they are subjected to more severe treatment. Usually, in this operation, the bats are rolled up and placed between a pair of supporting rolls having cleats on their surfaces. A pressure roll is brought to bear upon the rolled up bat, and the pressure is gradually increased until the bat has been brought to the desired size. This old method of operation is open to many obvious and well-known disadvantages and objections.

The aim of the present invention is to provide an improved method of and apparatus for shrinking and felting hat bats and the like in a more economical and effective manner. By the use of my improved method and apparatus, felt articles may be very speedily and uniformly felted and shrunk, and superior hat bats, uniform in quality, may be obtained.

My improved apparatus, together with the method involved in its use, may be employed at any stage of the shrinking or felting operation. It is, however, particularly adapted for use in the second or final sizing operation, because it treats the bats with that degree of severity which, owing to the fact that the fur or felt of the hats has been felted to a considerable extent, is necessary. The present machine gives to the hat bats the desired severe treatment, but, at the same time, it does not tear or in any way damage them. The machine may, of course, be made so as to give the bats a more or less severe treatment, as desired.

In the accompanying drawings, wherein I have shown, for illustrative purposes, one embodiment which the machine of the present invention may take, and which machine is particularly adapted for use in carrying out my improved method of shrinking;

Figure 1 is a side view showing, more or less diagrammatically, my improved machine;

Fig. 2 is a vertical longitudinal section therethrough;

Fig. 3 is a top plan view of the machine with parts broken away;

Fig. 4 is a detail view of a pair of rollers with a hat bat therebetween. It may be assumed that this view is taken on line 4—4 of Fig. 2; and

Fig. 5 is a diagrammatic view illustrating the manner in which the plies of a bat are shifted relatively to one another.

In the illustrative showing of the drawings, the machine is provided with rollers between which the bats are passed in an unrolled and saturated condition, the construction and arrangement of the rollers being such as to bend or flex the bat back and forth in a plurality of directions, and to shift each ply, progressively, relative to the other one. In the present instance, each of the rollers is provided with spaced apart circumferential grooves, thus providing crowned portions of enlarged diameter between which are portions of reduced diameter. In the drawings, the rollers of that set which support the bats are designated by the letter A, and those of the set beneath which the bats pass are designated by the letter B. I have shown two series of such sets of rollers A and B but, of course, but one or more than two series can be employed, as preferred. The bats are passed through the upper series in one direction and then return through the lower series in the opposite direction to the forward end of the machine. The high portions, or portions of greater diameter, of the rollers are designated by the numeral 10, and the low portions, or portions of reduced diameter, by the numeral 11. It will be seen from the drawings, that the rollers are inter-nested or interlocked with one another, so to speak;

that is to say, the enlarged portions of one roll extend into the grooves of the rollers positioned thereabout. With this arrangement, the supporting rollers A provide a surface having a regular or checkerboard-like pattern of depressions and elevations, and over this surface the bats are passed. The surface provided by the under side of the rollers B is complementary to the upper surface provided by the rollers A; that is to say, on the surface provided on the under side of the rollers B are a plurality of spaced projections or elevations which extend downwardly into the depressions in the surface provided by the rollers A. The rollers are suitably driven so as to advance the bats therebetween. Preferably, the rollers A and B are urged towards each other so as to exert pressure on the bats as they pass therebetween, and to this end the springs 20 may be provided.

It will be noted, particularly from Fig. 3 of the drawings, that the depressions formed by the reduced portions of the rollers are diagonally arranged; that is to say, the upper surface provided by the rollers A has diagonal grooves at an angle to each other. Likewise, the elevations provided by the rollers A are arranged in diagonal lines which are at an angle to each other. Since an upper roll B is disposed with its enlarged portions engaging in the reduced portions of the under roll, the passage or space between the two rollers is of substantially uniform thickness throughout its length, which means that the bat will be compressed along a line extending lengthwise of the rollers and through the depressed or hollow portions of the bat as well as the raised portions thereof. It will further be observed that the elevations are convex on every line of cross section so that they have the general appearance of a dome or of a segment of a hollow globe; that is, they are bulged elevations. The depressions are in the form of hollows or cavities concave on every line of cross section. In one manner of speaking, the depressions are cup-like.

It will be seen, with the construction so far described, that as the bat is fed through the machine, the first pair of rollers will wave or bend the bat in the direction of the length of these rollers (see Fig. 4). As the bat is advanced, the second pair of rollers will wave the bat in the opposite direction; that is to say, those portions of the bat which formed the crests and the depressions of the preceding wave, respectively become the depressions and crests of the wave made by the second pair of rollers. Each succeeding pair of rollers will change a crest into a depression, and a depression into a crest. As the bat passes between the rolls, it is repeatedly compressed, and it is maintained in a wet condition. Thus, as the bats are advanced, they are repeatedly waved or bent back and forth, under pressure, in the direction of the length of the rollers and in the direction in which the bats pass through the machine. If the bat is examined, at any given moment, as it passes through the machine, it will be seen that its upper surface has a plurality of alternate depressions and elevations arranged along lines at right angles to each other; that is, it has a checkerboard-like appearance. As the bat moves between the rollers, these depressions and elevations progress in regular order from one edge of the bat to the other. It will be observed that the depressions are interposed between elevations both in the direction in which the bat is advanced and transversely to that direction, and that the depressions are disposed along lines which are inclined to the direction of travel of the bat. Each portion of the bat is progressively and alternately domed into convex shape and hollowed into concave shape, and pressure is progressively applied to the bat at intervals. This means that the bat is repeatedly bent back and forth at a plurality of points distributed over its entire surface so that the fibres are so manipulated that they work into each other, thereby becoming very securely interlaced with the final result that the bats are firmly felted and reduced to the desired size.

Furthermore, in accordance with the present invention, the arrangement is such that, as the bats pass between the rolls, each ply of the bat is progressively shifted relative to the other ply. In the present instance, this is brought about by alternately forming waves or ripples in the plies, and progressing these ripples from one edge of the bat to the other. To this end, the alternate rollers of the upper set B are mounted for movement, under pressure, towards the opposing rollers A of the lower set, and the intervening rollers A of the lower set are urged, under pressure, towards the opposing rollers of the upper set. These rollers are, for convenience, termed as pressure rollers. The pressure rollers of the upper set are designated by the letter B′, and those of the lower set by the letter A′. These pressure rollers are, preferably, not driven. It will be seen that they are in staggered relation. The other rollers, which are driven, may be, for convenience, termed as guide rollers. The pressure rollers may be urged towards the opposed rollers in any suitable manner, and to this end, they may be weighted or spring pressed, the latter arrangement here being adopted. The ends of the pressure rollers are journalled in suitable bearing boxes 18 slidably mounted in the frame of the machine, and behind these bearing boxes are springs 20 the tension of which may be

adjusted by screws 21. The guide rollers of the upper series are driven by a chain 36, and those of the lower series by a chain 26, as hereinafter described more in detail.

When the bat is passed through the machine, the upper ply or layer thereof will be crozed or shifted a slight amount relative to the lower ply or layer each time the bat is brought into engagement with a pressure roller B′, and the lower ply will be crozed or shifted a slight amount relative to the upper ply each time the bat is brought into engagement with a pressure roller A′ of the lower set. When the forward edge of the bat is brought into engagement with a pressure roller, the movement of that portion of the bat which engages this roller is somewhat retarded so that immediately behind this roller a wave or ripple is made in the bat, and this wave is advanced or progressed throughout the ply in which it is formed. More specifically, the first pressure roller B′ will form a wave or ripple 50 in the upper ply, referring to Fig. 5; then the first pressure roller A′ will form a wave or ripple 51 in the lower ply; then the second pressure roller B′ will form another wave 52 in the upper ply; the second pressure roller A′ will form a second wave 53 in the lower ply, and so on. These waves or ripples are advanced in regular order throughout the bat from one edge to the other. Thus, it will be seen that the upper ply is crozed or shifted relative to the lower ply in small increments or in a succession of slight shifting movements, and the lower ply will be shifted relative to the upper ply in like manner. The advantage of this arrangement is that, since the plies are shifted one relative to the other, the plies will not become interlaced or felted together, and the felting action in each of the plies is accelerated. Owing to the fact that ripples are formed in each ply, and these ripples are advanced in the same direction throughout the bat, normally opposed portions of the bat are shifted relative to one another in one direction and then shifted so as to bring them again in opposed relation. So far as this feature of crozing or shifting the plies of the bat relative to one another is concerned, the guide rollers and pressure rollers may be of uniform diameters throughout their lengths. It is of advantage, however, to combine this feature with that of bending or flexing the bat back and forth in the direction of the length of the rollers as well as in the direction in which the bat is passed through the machine.

With the arrangements described, the rollers so manipulate the bat as to obtain the desired felting, shrinking, and shifting action, while, at the same time, damage to the bats, such as tearing or causing dags or weak spots, is prevented. I have found that, by employing my improved machine and method, the bats are very quickly brought down to the desired size. If the machine is used in the second sizing operation, the first sizing operation may be shortened or terminated sooner than heretofore which is of advantage because towards the end of the first sizing operation by hand, the felting progresses very slowly, whereas the present machine will very quickly complete the felting and bring the bats to final size. Thus, the machine and method not only are characterized by the superiority and uniformity of products which they produce, but by the speed and economy with which the results are obtained.

The rollers may be appropriately journalled in any suitable frame and may be driven in any desired manner. By way of illustration, I have shown the frame of the machine as comprising two side frames, each formed in sections (for instance, three sections 15, 16 and 17) in order to facilitate mounting of the bearing boxes 18 in which the ends of the pressure rollers A′ and B′ are journalled. The journal boxes are slidably mounted in grooves 19 in the frame sections, and behind each bearing box is a spring 20. As stated, the tension of, at least, some of these springs may be adjusted as by means of screws 21. As shown in Fig. 1 and 2, each guide roll A and B of the lower series has a sprocket 25 on one end, and these sprockets are driven by a chain 26 passing about a sprocket 27 fixed to a shaft 28 which is driven through gears 29 from a shaft 30 carrying a drive pulley 31. At the opposite side of the machine, the ends of the guide rolls A and B of the upper series are provided with sprockets 35 driven by a chain 36 in the same manner as does the chain 26 drive the sprockets 25. The chain 36 passes about a sprocket 37 fixed to the shaft 30. While the bats are passed through the machine, they are maintained in a saturated condition by hot water sprayed onto the rollers through the pipe 40. Positioned forwardly of the upper series of rollers is a roll 41 and about this roll and the first roller A pass tapes 42 which serve the purpose of receiving the bats and feeding them to the rollers. At the rear end of the machine are guides or deflectors in the form of curved strips 43 which serve the purpose of guiding the bats from the delivery end of the upper series of rollers to the receiving end of the lower series. At the delivery end of the lower series of rollers, and which delivery end is beneath the receiving end of the upper series, there are provided tapes 44 for receiving the bats after they have passed through the machine. These tapes pass about the last roller A of the lower series and a roll 45. After a bat has passed through the machine, it may be taken from the de-

livery tapes 44 and again placed on the receiving tapes so as to be again fed into the machine.

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 drawing 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 regular pattern of elevations and depressions from one edge of the bat to the other, the elevations and depressions being in alternating relation both in the direction in which the pattern is advanced and in a direction transverse thereto, and compressing the bat at the elevations and depressions.

2. The process of shrinking hat bats and the like which consists in progressing checkerboard-like arranged depressions and elevations throughout the bat.

3. The process of shrinking hat bats and the like which consists in passing the bat over a surface having depressions spaced apart transversely and lengthwise of the surface, and causing the bat to follow said surface.

4. The process of shrinking hat bats and the like which consists in passing a bat over, and causing the same to follow, the depressions and elevations of a surface having checkerboard-like arranged depressions and elevations.

5. The process of shrinking hat bats and the like which consists in passing the bat between a plurality of rollers, the rollers to one side of the bat forming crosswise spaced apart depressions with elevations between them, and the rollers to the other side of the bat having elevations fitting in the depressions provided by the first rollers, and pressing said rollers towards each other to compress the bat.

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 condition.

7. In a machine for shrinking hat bats and the like, means for alternately elevating and depressing a bat at crosswise spaced apart points, 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.

8. In a machine for shrinking hat bats and the like, means for alternately elevating and depressing a bat at crosswise spaced apart points, 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, and means for relatively moving said members and bat.

9. In a machine for shrinking hat bats and the like, means for alternately elevating and depressing a bat at crosswise spaced apart points, 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, means for relatively moving said members and bat, and means for pressing the bat between said members.

10. In a machine for shrinking hat bats and the like, means for alternately elevating and depressing a bat at crosswise spaced apart points, 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, and means for moving said members to advance the bat therebetween.

11. In a machine for shrinking hat bats and the like, means for repeatedly bending the bat back and forth in all directions, said means comprising a plurality of rotary members to one side of the bat forming crosswise spaced apart elevations, and members to the other side of the bat for depressing the same between the elevations provided by said rotary members; and means for driving said rotary members to advance the bat.

12. In a machine for shrinking hat bats and the like, a surface having cross-wise spaced apart depressions and elevations, and means for advancing the bat over said surface and causing the same to follow the depressions and elevations therein.

13. In a machine for shrinking hat bats and the like, a surface provided with a regular pattern of elevations and depressions, and rollers for advancing a bat over said surface and causing the same to follow the depressions and elevations therein.

14. In a machine for shrinking hat bats and the like, a plurality of rollers between which the bat is advanced, said rollers being constructed and arranged to form and advance crosswise spaced apart depressions and elevations throughout the bat.

15. In a machine for shrinking hat bats

and the like, a plurality of rollers between which the bat is advanced, said rollers being constructed and arranged to form and advance crosswise spaced apart depressions and elevations throughout the bat, and means for urging said rollers towards each other to compress the bat as it passes therebetween.

16. In a machine for shrinking hat bats and the like, a plurality of rollers, each having spaced apart reduced portions and arranged to form a surface having crosswise spaced apart depressions and elevations, and a second plurality of rollers forming a surface complimentary to the surface formed by said first rollers.

17. In a machine for shrinking hat bats and the like, a plurality of rollers, each having spaced apart reduced portions and arranged to form a surface having crosswise spaced apart depressions and elevations, a second plurality of rollers forming a surface complementary to the surface formed by said first rollers, and means for rotating said rollers to advance the bats therebetween.

18. In a machine for shrinking hat bats and the like, a plurality of rollers, each having spaced apart reduced portions and arranged to form a surface having crosswise spaced apart depressions and elevations, a second plurality of rollers forming a surface complimentary to the surface formed by said first rollers, means for rotating said rollers to advance the bats therebetween, and means for urging said rollers towards each other to compress the bats therebetween.

19. 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 alternate portions of enlarged and reduced diameters, the enlarged portions of one set of rollers extending into the grooves provided by the reduced portions of the other set of rollers, and means for rotating said rollers.

20. In a machine for shrinking hat bats and the like, two sets of rollers between which the bats are passed, each roller having spaced apart grooves with portions of enlarged diameter therebetween, the portions of enlarged diameter of each roller registering with the grooves of the adjacent rollers of that set and fitting in the grooves of the opposed roller of the other set.

21. In a machine for shrinking hat bats and the like, two sets of rollers between which the bats are passed, each roller having spaced apart circumferential V-shaped grooves, the rollers of each set being arranged to provide spaced apart elevations and depressions with the elevations of one set fitting in the depressions of the other set.

22. In a machine for shrinking hat bats and the like, two sets of rollers between which the bats are passed, each roller having spaced apart circumferential grooves, the rollers of each set being arranged to provide spaced apart elevations and depressions with the elevations of one set fitting in the depressions of the other set, and means for urging at least some of the rollers of one set towards the rollers of the other set so as to compress the bat as it passes therebetween.

23. In a machine for shrinking hat bats and the like, two sets of rollers between which the bats are passed, each roller having spaced apart grooves with portions of enlarged diameter therebetween, the portions of enlarged diameter of each roller registering with the grooves of the adjacent rollers of that set and fitting in the grooves of the opposed roller of the other set, and means for pressing the alternate rollers of one set and the intervening rollers of the other set towards the rollers opposed thereto.

24. In a machine for shrinking hat bats and the like, a plurality of rollers between which the bat is advanced, said rollers being arranged in pairs one above the other and the space between each pair being of substantially uniform thickness and of wave-like shape, the spaces between adjacent pairs of rollers being of reverse shape.

25. The method of treating hat bats and the like, which consists in felting the bat and successively and progressively shifting, under pressure, one ply of the bat relative to the other one and, at the same time, successively and progressively shifting, under pressure, the second ply of the bat relative to the first one.

26. The method of treating hat bats and the like, which consists in shrinking and felting the bat, progressively applying pressure thereto while maintaining the same in wet condition, shifting, in a series of small increments, one ply relative to the other, and shifting the other ply relative to the first one in a series of small increments, the shifting movements in one ply alternating with those in the other ply.

27. The method of treating hat bats and the like, which consists in shrinking and felting the bat and advancing, through each ply of the bat and at the same time, a succession of ripples.

28. The method of treating hat bats and the like, which consists in shrinking and felting the bat in an unrolled condition by applying pressure to successive portions of the bat while maintained in a wet condition, and crozing the bat by a succession of slight shifts in each of the plies.

29. The method of treating hat bats and the like, which consists in shrinking and felting the bat in an unrolled condition by applying pressure to successive portions of the bat while maintained in a wet condition, and crozing the bat by a succession of slight shifts in each of the plies, the successive

shifts of one ply alternating with those of the other ply.

30. The method of treating hat bats and the like, which consists in shrinking and felting the bat and creating a succession of ripples in each ply, the ripples of one ply alternating with those of the other, and advancing said ripples.

31. The process of shrinking hat bats and the like which consists in repeatedly bending the bats back and forth in all directions and progressively shifting, at the same time, each ply of the bat relative to the other ply.

32. The process of shrinking hat bats and the like which consists in giving a wave to the bat in one direction and alternately changing the crests into hollows and the hollows into crests in another direction, and in advancing ripples in both of the plies at the same time.

33. The process of shrinking hat bats and the like which consists in successively advancing throughout the bat rows of elevations and depressions spaced apart transversely to the direction in which they are advanced, applying pressure to the bat, and advancing, through each ply of the bat and at the same time, a succession of ripples.

34. The process of shrinking hat bats and the like which consists in advancing the bat, flexing or bending the same in a direction transverse to that in which it is advanced, flexing or bending the bat in the direction in which it is advanced, creating a succession of ripples in each ply, the ripples of one ply alternating with those of the other, and advancing said ripples.

35. A bat shrinking machine including two sets of rollers between which the bat is passed, some of said rollers of each set being driven and the other rollers being adapted to rotate at a lesser peripheral speed than, and being urged under pressure towards, said driven rollers.

36. A bat shrinking machine including two sets of rollers between which the bat is passed, the alternate rollers of one set and the intervening rollers of the other set being urged, under pressure, towards the opposed rollers.

37. In a machine for shrinking hat bats and the like, means for alternately elevating and depressing a bat at crosswise spaced apart points, 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, and means for moving said members to advance the bat therebetween, some of said members to each side of the bat being pressed towards opposed members whereby to successively and progressively shift each ply of the bat relative to the other ply.

HOMER A. GENEST.