June 17, 1941. W. S. ROBINSON 2,245,874

CURLED FIBER MATERIAL AND METHOD OF MAKING SAME

Filed May 4, 1939

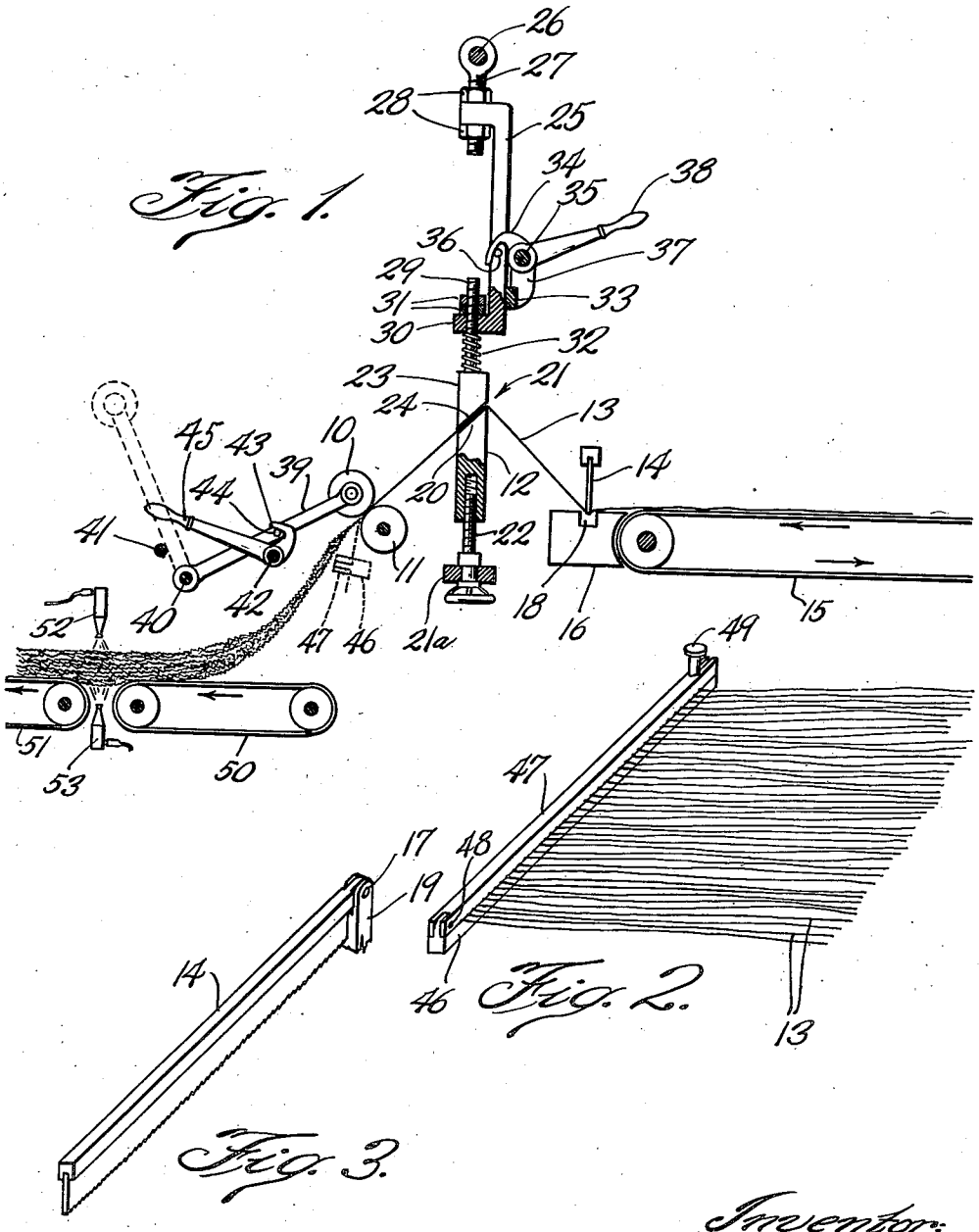


Fig. 1.

Fig. 2.

Fig. 3.

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Patented June 17, 1941 2,245,874

UNITED STATES PATENT OFFICE

2,245,874

CURLED FIBER MATERIAL AND METHOD OF MAKING SAME

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Application May 4, 1939, Serial No. 271,676

12 Claims. (Cl. 19—66)

My invention relates to curled fiber material suitable for cushioning, acoustical insulation, air filtration or other purposes, composed of loosely assembled curled fibers which are preferably, although not necessarily, bonded together at the places where they cross one another or intersect, and this invention has reference more particularly to the method of curling the fibers and to the curled fiber product.

The principal objects of my invention are to provide an inexpensive material suitable for cushioning and other purposes; to impart a permanent curl to fibers in an expeditious manner; to produce a fibrous cushioning material or the like in continuous lengths from which cushions or other articles may be made; and to apply a bonding material to the fibers in a manner to insure uniform distribution thereof throughout the fibrous mass without wastage or imparting unnecessary weight thereto, these and other objects being accomplished as pointed out hereinafter and as shown in the accompanying drawing in which:

Fig. 1 is a side view showing somewhat diagrammatically equipment which may be employed for preparing the curled fiber material;

Fig. 2 is a perspective view of the clamp for starting the fibers over the curling member and between the rollers; and

Fig. 3 is a perspective view of the comb member under which the fibers pass to the curling member.

While my invention is applicable to other kinds of fibers, it is particularly advantageous in connection with vegetable fibers, such as sisal, hemp, palm fiber, manila, algerian grass, because of the low cost and the lengths in which such fibers are obtainable. Such fibers or others which are employed are, in accordance with this invention, strained beyond the elastic limit, but below the point of fracture in such a manner that a permanent curl is imparted thereto after which these curled fibers are combined in a loosely associated manner, preferably in continuous lengths of the thickness desired to form a compressible, open texture cushion like fibrous mass, the fibers of which are preferably treated with a rubber solution, rubber latex or any other suitable adhesive by which the fibers of the mass are bonded together at the places where they cross one another or intersect. Obviously, mixtures of various kinds of fibers may be employed and incorporated in various proportions in the mass and the kind or quantity of adhesive may also be varied as well as the openness of texture according to the characteristics desired in the product and the purpose for which such product is to be used.

For curling the fibers they are drawn lengthwise in any convenient manner, as for example, by the opposed rollers 10 and 11, over a straight edge 12 as shown in the drawing, the fibers, which are indicated at 13, being passed under a comb member 14 from which they pass to the straight edge 12 and this comb member 14 being positioned and arranged to impart sufficient retardation effect on the movement of the fibers so that the pull of the rollers 10 and 11 imposes on the fibers as they pass over the straight edge 12 sufficient strain to bend and stretch the fibers sufficiently beyond the elastic limits thereof, but below the point of fracture thereof, to impart to the fibers a permanent curl. This stretching of the fibers causes a modification of the fiber structure by reason of which the normal tendency of the fibers to return to their original form is eliminated and the fiber structure is thus given a curl which is particularly important and advantageous because of its permanence which is unaffected by subsequent operations and processing and persists in the final product.

The fibers may be fed to the comb member 14 by a wide conveyor belt 15 at the delivery end of which is a cross frame member 16 to one end of which the comb member 14 is pivoted at 17, the frame member 16 being provided with a groove 18 in the upper face to accommodate the lower edge of the comb member. The comb member 14 may be pivotally attached to the frame member 16 in any convenient manner as for example by providing the latter with a post or bracket 19 with a divided upper end to pivotally accommodate the end of the comb member 14.

The straight edge 12 is in the form of a cross bar, the upper margin of which is beveled as indicated at 20 to form a blunt bending edge 21 and this straight edge is preferably mounted on a portion 21a of the machine frame by adjusting screws 22 by which the bending edge 21 may be adjusted to different elevations to provide the desired bending effect.

A companion member 23 with lower beveled face 24 to match the beveled face 20 of the straight edge 12 is located above the straight edge 12 to provide a narrow channel therebetween through which the fibers are drawn and this member is supported by a hanger 25 pivoted at 26 so that it may be swung away from the straight edge 12 to permit the fibers to be started

between the straight edge 12 and member 23. This hanger is pivotally supported through eye bolts 27 to which the hanger is secured by lock nuts 28 to permit adjustment of the member 23 to correspond to vertical adjustments of the straight edge 12 and the member 23 is yieldingly attached to said hanger 25 by stems 29 which slide through apertures in the bottom flange 30 and have lock nuts 31 thereon which limit the downward movement of the member 23 while coil springs 32 on the stems yieldingly hold the member 23 in the lowermost position permitted by the lock nuts 31.

This member 23 and its hanger 25 are held in the normal upright position against a stop 33 by latch members 34 on a shaft 35 which engage pins 36 on the hanger 25, said shaft 35 being journaled to rotate in suitable bearing extensions 37 of the stop member 33 and provided with a handle 38 whereby the shaft 35 is operable to lock and release the latches 34 from the pins 36.

The upper roller 10 which together with the roller 11 serves to draw the fibers over the curling edge 21, is arranged to swing to and from the roller 11 so as to permit starting the fibers between said rollers and accordingly said roller 10 is mounted on a frame 39 which is pivoted at 40 to swing from the full line position to the dotted line position against a stop 41. A shaft 42 which extends across under the frame 39 has latches 43 thereon which engage pins 44 on the frame 39 to hold the latter in the normal operative position and this shaft 42, like the shaft 35 has a handle 45 thereon for rotating the shaft 42 to lock and release the latches 43.

For starting the fibers through the curling mechanism, a clamp is provided as shown in Fig. 2 in which the ends of the fibers 13 are clamped, said clamp comprising strips 46 and 47 hinged together at one end as indicated at 48 with a locking means 49 at the other ends for holding the strips 46 and 47 closed together.

In operation of the device the ends of a series of strands are secured in the clamp 46—47 and with the comb member 14 raised, the companion member 23 of the curling straight edge 12 swung away therefrom and the roller 10 swung away from the roller 11, the series of fibers 13 are laid over the straight edge 12 and extended down beyond the roller 11 with the clamp 46—47 in substantially the position shown by the dotted lines in Fig. 1. The roller 10 is then returned to and latched in the position to engage the fibers between said roller 10 and the roller 11, whereupon the clamp 46—47 may be removed. The member 23 is then returned to and locked in position above the straight edge 12 and the comb member 14 swung down to engage the fibers after which the rollers 10 and 11 are operated to draw the fibers over the straight edge 12 at a proper angle and tension to strain the fibers sufficiently, but without breaking, to impart a permanent curl thereto.

After curling the fibers may be assembled in any convenient manner into a pad or bat and are preferably treated with an adhesive such as a rubber solution or rubber latex so that the fibers are coated therewith and adhesively secured to one another at their points of intersection or crossing. They may be dipped, sprayed or otherwise treated with the adhesive and formed in the pad or bat in any desired manner.

A convenient arrangement for assembling into a bat or pad may include a conveyor 50 onto which the curled fibers are discharged from the rollers 10—11 and operated at a sufficiently slow speed to permit accumulation of the curled fibers to any desired thickness. This accumulated thickness of the curled fibers is delivered by the conveyor 50 to another conveyor 51 between the adjoining ends of which are upper and lower spray nozzles 52 and 53 respectively which discharge atomized adhesive against the upper and lower sides of the curled hair material and into the interior thereof. Thus the curled fibers are assembled in continuous lengths and treated with the adhesive, after which the material may be compressed, if desired, to uniform thickness or any desired density and dried, after which cushion bodies may be made therefrom, or it may be used for any other purpose, such as sound insulation, air filtration and the like. Because of the permanent curl which has been imparted to the fibers the resultant material has a permanent resilience which makes it particularly suitable for cushioning purposes and the continuous length in which it is produced may be cut into any sizes or shapes that may be desired for the purpose for which it is to be used.

While I have disclosed a preferred form of the invention, I am aware that various changes and modifications may be made therein without departing from the principles of my invention, the scope of which is to be determined by the appended claims.

I claim as my invention:

1. The method of imparting a permanent curl to fibers which comprises differentially stretching the opposite sides of the fibers beyond the elastic limit but below the point of fracture.

2. The method of imparting a permanent curl to fibers which comprises permanently elongating each fiber at one side thereof to a greater length than at the other side thereof by bending and simultaneously stretching the individual fibers beyond the elastic limit but below the point of fracture.

3. The method of imparting a permanent curl to fibers which comprises permanently elongating each fiber differentially at its opposite sides by bending and simultaneously stretching the individual fibers beyond the elastic limit but below the point of fracture.

4. The method of imparting a permanent curl to fibers which comprises permanently elongating each fiber differentially at its opposite sides by progressively bending and simultaneously stretching the individual fibers beyond the elastic limit but below the point of fracture.

5. The method of imparting a permanent curl to fibers which comprises arranging separate, unconnected fibers in a group so that they extend in the same general direction, then simultaneously stretching the individual fibers of the group each unequally at its opposite sides beyond the elastic limit but below the point of fracture.

6. The method of imparting a permanent curl to fibers which comprises differentially stretching the opposite sides of the fibers beyond the elastic limit but below the point of fracture and thereafter treating the fibers with a flexible adhesive.

7. The method of imparting a permanent curl to fibers which comprises arranging separate fibers so that they extend in the same general direction, then drawing the thus arranged fibers lengthwise across a bending edge so as to progressively bend same against the bending edge,

and subjecting the fibers at the bending edge to sufficient tension beyond the elastic limit and below the point of fracture to impart a permanent curl thereto.

8. The method of making a curled fiber material which comprises bending and simultaneously straining fibers progressively throughout their length beyond the elastic limit and below the point of fracture thereof and thereby imparting a permanent curl to the fibers, and thereafter progressively combining the curled fibers in an open textured mass.

9. The method of making a curled fiber material which comprises bending and simultaneously straining fibers progressively throughout their length beyond the elastic limit and below the point of fracture thereof and thereby imparting a permanent curl to the fibers, progressively combining the curled fibers in an open textured mass and advancing the mass as curled fibers are added thereto to form a continuous length of curled fiber material.

10. The method of making a curled fiber material which comprises bending and simultaneously straining fibers progressively throughout their length beyond the elastic limit and below the point of fracture thereof and thereby imparting a permanent curl to the fibers, progressively combining the curled fibers in an open textured mass and advancing the mass as curled fibers are added thereto to form a continuous length of curled fiber material and treating the open textured mass of curled fibers with an adhesive.

11. A curled fiber material for cushioning or other purposes, said material comprising a mass of fibers, the individual fibers of the mass having the opposite sides thereof unequally stretched beyond the elastic limit but below the point of fracture so that the individual fibers are differentially elongated permanently at opposite sides.

12. A curled fiber material for cushioning or other purposes, said material comprising an adhesively combined loose textured mass of fibers, the individual fibers of the mass having the opposite sides thereof unequally stretched beyond the elastic limit but below the point of fracture so that the individual fibers are differentially elongated permanently at opposite sides.

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