Oct. 11, 1938. J. L. BLACKSHAW 2,132,457

METHOD OF AND MEANS FOR ORIENTING STRAND MATERIAL

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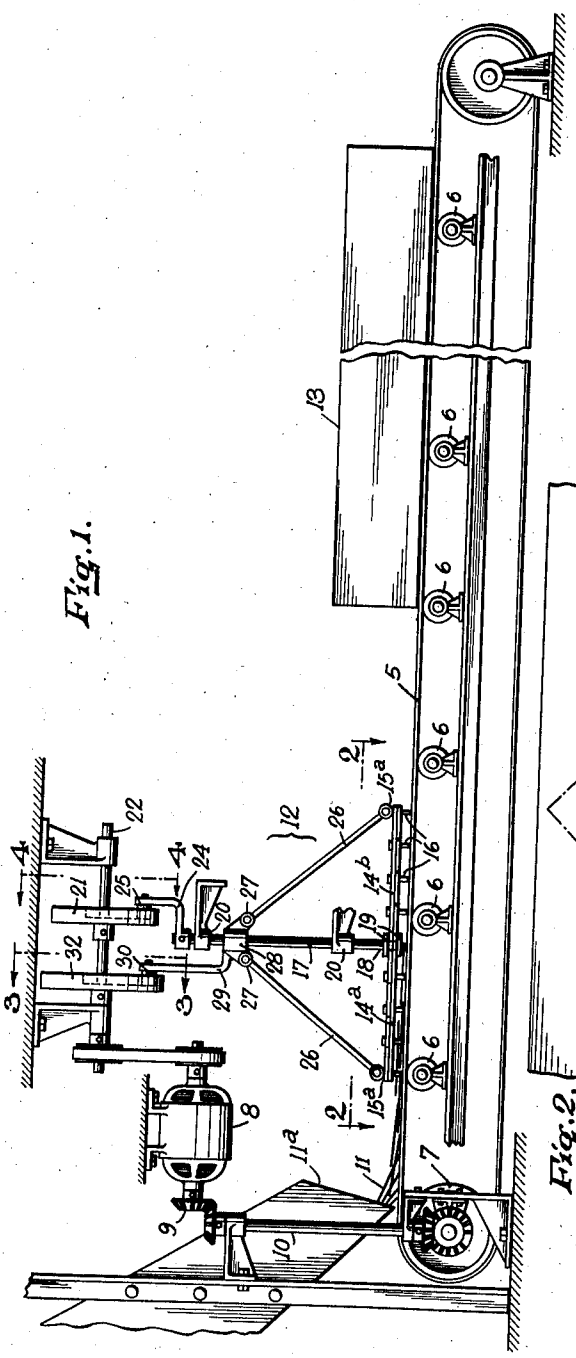

Fig. 1.

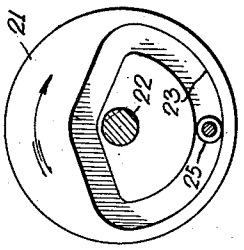

Fig. 4.

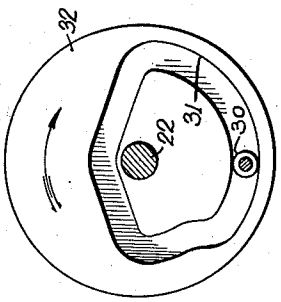

Fig. 3.

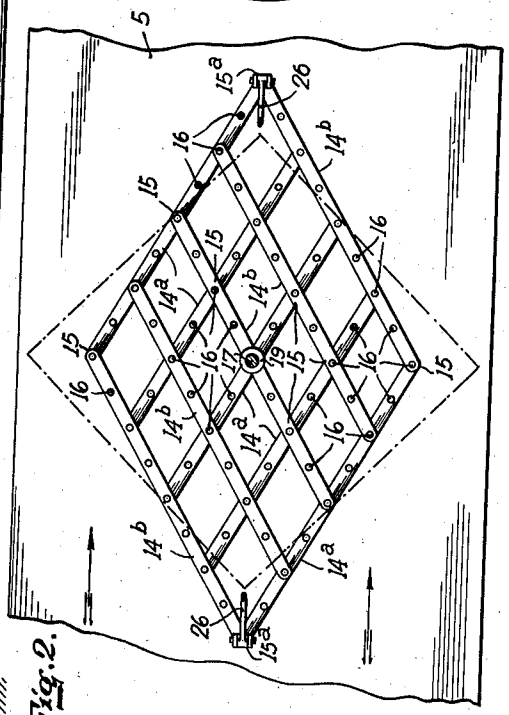

Fig. 2.

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METHOD OF AND MEANS FOR ORIENTING STRAND MATERIAL

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8 Claims. (Cl. 19—115)

This invention relates to a method of and means for orienting strand material, and more particularly to a method of and means for orienting glass filaments.

In air conditioning equipment of the type illustrated in U. S. Patent No. 2,054,809, backets filled with oriented glass filaments or the like, are used. In the manufacture of these glass filaments, they are delivered in a state of disorder in which the filaments lie in different directions, although in planes substantially parallel to a common plane, and the filaments tend to intertwine and interlock with each other. Due to the tendency of the filaments to interlock with each other, it has proven an extremely difficult task to orient these strands so that their axes are parallel or substantially parallel, as is required in order that they may be used in accordance with the teachings of said patent. Heretofore, there has been devised no mechanical means for effecting such orientation of glass filaments and the like, although considerable effort has been directed toward the attainment of this end; and in order to accomplish such orientation, it has been necessary manually to manipulate the filaments. Such operation is both expensive and slow, and not conducive to the inexpensive production of oriented glass fibers or the like in substantial volume.

The general object of the present invention is to provide an improved method of and means for orienting fibers or filaments of material such as glass.

Another object of the invention is to provide an improved method of and means for orienting glass filaments or the like, which are relatively simple, yet highly effective, and which accomplish this result without breaking or in any other way impairing the utility of the filaments.

Another object of the invention is to provide an improved method of and means for orienting glass filaments or the like, which render the orientation of glass filaments both rapid and inexpensive.

In carrying out this invention, applicant utilizes a lattice-work comprising a plurality of cross bars parallel to each other in a first direction and another plurality of cross bars parallel to each other in another direction, the first-mentioned and the last-mentioned parallel cross bars being in superposed relation. Where the upper and lower cross bars cross each other they are jointed by pivot pins or the like, which extend therethrough. The pins are relatively loose within the cross bars so that the cross bars form a plurality of parallelograms whose major and minor axes may readily be changed by elongation of the cross bar structure. Extending from beneath the cross bar structure are a plurality of depending fingers or pins, which may constitute extensions of the pins joining the cross bar members and/or extend from the cross bars.

In operation of the device, the cross bar structure is lowered upon a heterogeneous mass of glass filaments which are to be oriented, so that the depending fingers or pins extend within the mass of material and between the filaments thereof. The cross bar structure is then elongated in the direction in which it is desired to orient the filaments, and the resultant motion of the depending pins will have the effect of narrowing and elongating the heterogeneous mass and of aligning the filaments thereof.

While a single operation of the cross bar structure will effect substantial parallelism of the filaments, the operation may be repeated if a greater degree of orientation is desired and/or to insure a more uniform distribution and arrangement of the filaments in the finished product. This repetition may be accomplished by using the same cross bar structure over again or by passing the filaments to be acted upon by a second cross bar structure. This latter method may be preferred where the glass filaments are handled upon a conveyor belt or the like, as is customary in large scale production.

While the invention is described with particular reference to the orientation of glass filaments, it is to be understood that its application is not so limited, and that the invention may be utilized to orient strands of various types of material.

Other objects and features of the invention will be more apparent from the following description, to be read in connection with the accompanying drawing, in which

Fig. 1 is a diagrammatic elevational view of the invention as applied to the orientation of strands being moved upon a conveyor belt;

Fig. 2 is a plan view of applicant's cross bar structure, taken on the line 2—2 of Fig. 1, and showing the cross bar structure in slightly elongated condition;

Fig. 3 is a view taken on the line 3—3 of Fig. 1 showing the cam which controls the elongation and contraction of the cross bar structure; and

Fig. 4 is a view taken on the line 4—4 of Fig. 1 showing the cam which controls the raising and lowering of the cross bar structure.

Referring to the drawing, the numeral 5 desig-

nates a conveyor belt carried upon rollers 6 and adapted to be driven by drive roller 7. Drive roller 7 is driven by motor 8, or the like, through gears 9 and drive shaft 10. Glass strands or filaments 11 are deposited upon the belt 5, as indicated at 11a, and form a heterogeneous mass upon the surface of belt 5. Due to the motion of the conveyor belt the thickness of the heterogeneous mass is desirably limited, but the filaments which comprise this mass lie in all directions, although most of the filaments will lie in planes substantially parallel to a common plane.

In order to effect orientation of these filaments, the apparatus generally designated 12 is employed. Subsequent to orientation, the glass filaments may be passed through an annealing chamber 13 and upon their emergence therefrom will be ready for use. As illustrated, the apparatus 12 orients the filaments before they are supplied to the annealing chamber 13, but it is to be understood that the orientation may be accomplished subsequent to the annealing step if such operation is preferred. Moreover, any desired number of orienting devices such as 12, may be provided and used, and these may be adapted to act upon the filaments prior and/or subsequent to the annealing step, the number of these devices which is employed depending upon the degree of orientation and/or the uniformity of the product which is desired.

If desired, a binder, preferably of the water-soluble type, may be sprayed upon the filaments after they have been oriented to the desired degree, in order that they may readily be handled as they reach the end of the conveyor belt, and to facilitate their packing and shipment.

The cross bar lattice of device 12 comprises a plurality of cross bars 14a parallel to each other and a plurality of cross bar members 14b parallel to each other, these two sets of cross bars being in superposed relation. Bars 14a and 14b are pivotally connected together at any desired number of points, by pins 15 extending therethrough. Thus, the lattice may be elongated and contracted along the line of travel of the belt 5. Depending from the lattice structure are a plurality of fingers or pins 16. These pins 16 may constitute extensions of the pins 15 which pivotally connect the members 14a and 14b. Also, pins 16 may depend from the bars 14a and 14b at points intermediate of the points of interconnection between these bars. Thus, the cross bars are constituted coarse combs.

Support 17 is attached to the lattice, preferably at the central portion thereof as indicated at 18, in any suitable manner, as by the collars 19. Support 17 is adapted to move up and down within the guides 20 which insure its travel in a vertical direction. Support 17 is moved upwardly and downwardly by cam 21 carried on shaft 22, which is driven preferably by motor 8. Thus, the upward and downward motion of the lattice is in timed relation with the movement of material upon the conveyor belt 5. To insure positive motion of the lattice upwardly and downwardly, cam 21 is preferably of the cored type in which a groove 23 is formed. The path of this groove within the cam determines the vertical movement of the support 17, which is secured, as by arm 24, to roller 25 disposed within the groove 23.

Pivotally connected to the extremities 15a of the lattice, preferably to the tops of the pins 15 connecting the members 14a and 14b at these points, are control rods 26, adapted to control the elongation and contraction of the lattice. The other ends of control rods 26 are pivotally connected, as at 27, to a collar 28 slidably carried on support 17. Collar 28 is connected by extension 29 to a roller or the like, 30, disposed within the groove 31 of cam 32. Cam 32 is carried on and rotated by shaft 22, and thus the elongation and contraction of the lattice is in timed relation with the movement of glass filaments on the conveyor belt and in timed relation with the up and down movement of the lattice. The cams 21 and 32 are so formed and arranged that the lattice is lowered in contracted condition upon the mass of filaments to be oriented, so that the pins 16 depending from the lattice extend into the mass of filaments; so that while the lattice is in lowered position it is elongated by a downward movement of collar 28, whereby the strands or filaments upon the conveyor belt 5 are oriented; so that the lattice is raised from the filaments while in elongated condition; so that the lattice is contracted while in raised position; and so that this cycle of operation may then be repeated.

While the conveyor belt 5 and the device 12, as above described, are so interconnected that the lattice descends upon a new batch of material at each downward motion, it will be understood that the lattice device 12 may be used to act upon a batch of material more than once before this batch of material is moved from beneath the device 12 by the conveyor belt. Furthermore, where such repeated operation is provided, the apparatus may be so arranged that successive elongations of the lattice are progressively greater. Again, if desired, the lattice may be contracted slightly after its elongation and while its pins are still within the filamentous mass, in order to facilitate removal of the pins and raising of the lattice. Moreover, while the device 12 and the conveyor belt 5 have been illustrated and described as being mechanically connected and driven by the same prime mover, it will be understood that they may be driven by different prime movers, and that the device 12 may be manually driven, instead of mechanically driven, if desired.

While in the foregoing description the lattice has been described as being lowered upon the filamentous mass, if desired, the lattice may be formed with upwardly extending pins, the filamentous mass in such case being placed upon the lattice. Similarly, the conveyor belt, work table or the like along which the glass travels, may be formed with suitable openings so that the pins of the lattice may extend upwardly through these openings and into the filamentous mass, the lattice being placed beneath the conveyor belt or work table and the control being the reverse of that hereinbefore described.

Since many changes may be made in the invention without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative only and not in a limiting sense, applicant limiting himself only as indicated in the appended claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. In an apparatus for arranging non-parallel filaments or strands of material in substantially parallel arrangement, a plurality of cross-members, means for pivotally connecting together said cross-members, said cross-members and connecting means being adapted to provide a plurality of

readily deformable parallelograms, and a plurality of pins secured to and extending from said parallelogram structure, said pins being adapted to penetrate within a mass of filamentous material and to orient the filament thereof upon deformation of said parallelograms.

2. In an apparatus for orienting non-parallel filaments or strands of material, means providing a plurality of readily deformable parallelograms, the sides of said parallelograms being formed of substantially rigid members, and a plurality of elements in combination with said parallelograms adapted to penetrate between said filaments and to orient said filaments upon deformation of said parallelograms.

3. In an apparatus for orienting non-parallel filaments or strands of material, means providing a plurality of readily deformable parallelograms, the sides of said parallelograms being formed of substantially rigid members, and a plurality of elements in combination with said parallelograms adapted to penetrate between said filaments and to orient said filaments upon deformation of said parallelograms, at least some of said elements being mounted upon the rigid members constituting the sides of said parallelograms.

4. In an apparatus for orienting non-parallel filaments or strands of material, a plurality of cross-members, means for pivotally connecting together said cross-members, said cross-members and connecting means being adapted to provide a plurality of readily deformable parallelograms, and a plurality of pins extending from said parallelogram structure, said pins being adapted to penetrate within a mass of filamentous material and to orient the filaments thereof upon deformation of said parallelograms, at least some of said pins constituting extensions of said cross-member connecting means.

5. In an apparatus for orienting non-parallel filaments or strands of material, means providing a plurality of readily deformable parallelograms having relatively rigid side members, a plurality of elements in combination with said parallelograms adapted to penetrate between said filaments, and means for elongating said parallelograms in a direction substantially parallel to that in which it is desired to orient the filaments.

6. In an apparatus for orienting non-parallel filaments or strands of material, means providing a plurality of readily deformable parallelograms, the sides of said parallelograms being formed of relatively rigid members, a plurality of elements in combination with said parallelograms and extending therefrom, means for moving said parallelograms into a position in which said elements extending therefrom will penetrate between said filaments, means for elongating said parallelograms in a direction substantially parallel to that in which it is desired to orient said filaments, whereby said filaments will be oriented, means for then moving said elements out of engagement with said filaments, for contracting said parallelograms, and for repeating the operating cycle.

7. An apparatus according to claim 6 including means for conveying the filaments, and means for controlling the operating cycle of the parallelograms in timed relation with the movement of the filaments.

8. An apparatus for orienting non-parallel filaments or strands of material including a readily deformable lazytongs and a plurality of pins operably associated with said lazytongs and extending away from said lazytongs substantially perpendicularly to the plane in which said lazytongs is deformable, said pins being adapted to penetrate between the filaments or strands to be oriented.

JOSEPH LOVEJOY BLACKSHAW.