

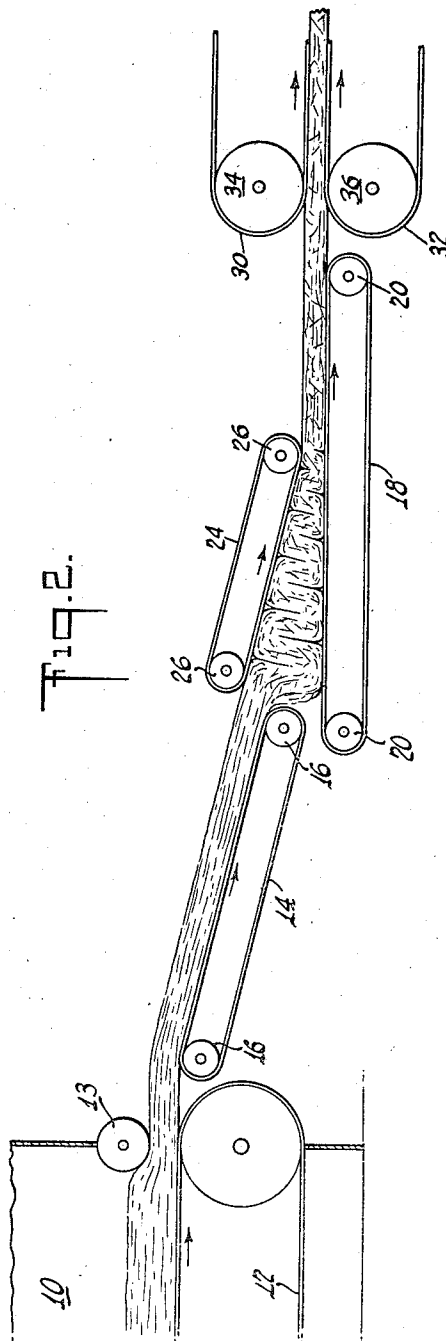
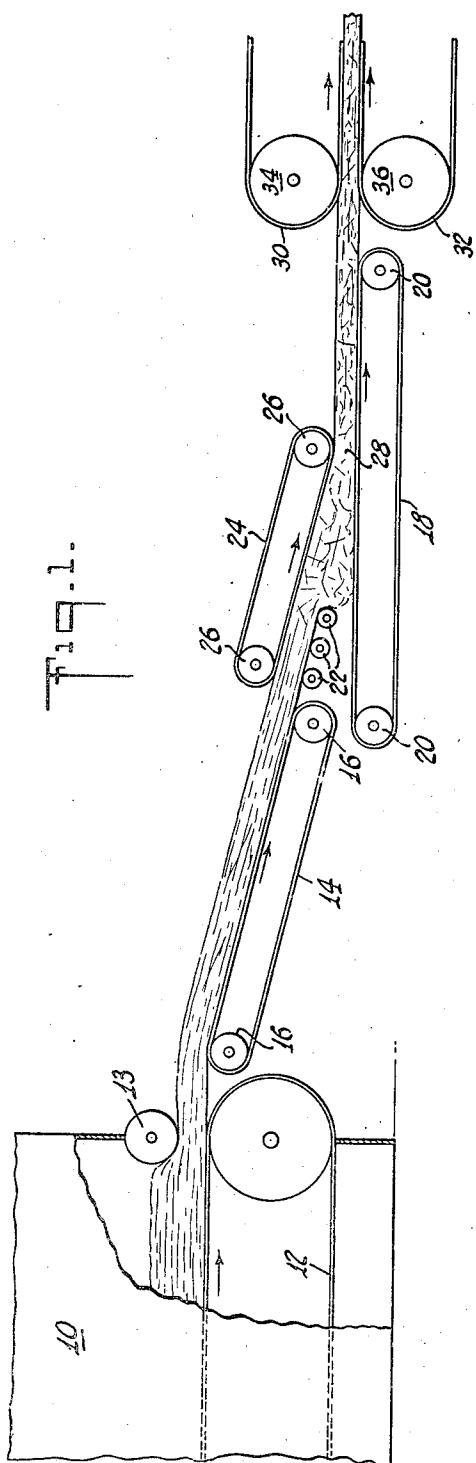
Oct. 8, 1946.

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2,409,066

MANUFACTURE OF FELTED PRODUCT

Filed Jan. 23, 1943



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2,409,066

MANUFACTURE OF FELTED PRODUCTS

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Application January 23, 1943, Serial No. 473,368

7 Claims. (Cl. 154—28)

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The instant invention relates to improvements in the manufacture of felted products and more particularly to a method and apparatus for the production of a felt or mat of mineral wool fibers, the felt having improved structural characteristics. The invention has found a principal field of use in connection with mineral wool fibers, by which term is included fibers formed from rock, slag, glass and the like, but may be employed with other types of fibers where similar problems are encountered.

Conventionally mineral wool felts are formed by subjecting a molten stream of the selected raw material to the action of a steam jet. The jet disintegrates the stream into a great multiplicity of fine fibers which are carried in air suspension into a blow chamber or other suitable collecting means where they are gathered in interfelted relationship. Usually a binder of a suitable type is employed, the binder being sprayed into the suspension of fibers adjacent their place of formation, the binder particles settling with the fibers to become interspersed throughout the felt. The felted material thus formed may be conveyed to suitable treating means where it is compressed and the binder set to form resilient blocks or felts. Due to the settling of the fibers from the air suspension onto the blow chamber floor, usually a continuously traveling conveyor, a resilient but relatively compressible mat is obtained in which the fibers lie predominantly in planes parallel to the faces of the mat producing a laminar type felted structure.

A principal object of the instant invention is the provision of a method and apparatus for modifying the above-referred-to fiber relationship to obtain a felted material which will withstand greater loads without undue distortion and which will be resistant to delamination. A more specific object of the invention is the provision of such apparatus and method which will provide a more heterogeneous arrangement of the fibers in the felt with a consequent reduction of the laminar characteristics and a higher resistance to compression.

A further object of the invention is to provide a method and apparatus for the above purposes, adapted to be continuously operated in conjunction with the normal fiber-forming and felting operations.

Our invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description thereof which is to follow, and to the accompanying drawing, in which:

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Fig. 1 is a diagrammatic side elevational view of an apparatus in accordance with the invention and to be employed for carrying out the method; and

Fig. 2 is a view similar to Fig. 1 illustrating a modification of the invention.

Referring now to the drawing, there is illustrated at 10 a portion of a conventional blow chamber or other collecting apparatus for fibers such as mineral wool fibers of the type previously referred to. It will be understood that suitably the fibers may be those newly formed by disintegrating a molten stream of the material issuing from a cupola or other melting furnace of conventional type, the fibers being carried into the blow chamber 10 in air suspension and falling onto a continuously moving conveyor 12 forming the floor of the blow chamber. A binder of any suitable type may be applied to the fibers. Due to the falling movement of the fibers and also to the forward travel of the conveyor, a predominant number of the fibers will lie in planes parallel to the faces of the felt. The parallel relationship of the fibers is accentuated by the compressing action of a roll 13 placed, as is conventional, adjacent the exit of the blow chamber.

Adjacent the end of conveyor 12 there is provided a transfer conveyor 14 supported on rollers 16. The upper reach of conveyor 14 is driven in the same direction as the upper reach of conveyor 12 as indicated by the arrows and at the same speed. Suitably conveyor 14 is inclined downwardly from conveyor 12 as illustrated in the drawing. Located to extend below conveyor 14 is a third conveyor 18 supported on rolls 20 and adapted to be driven at a speed slower than that of conveyors 12 and 14 for a purpose later to be described. Between the forward roll 18 supporting conveyor 14 and the upper reach of conveyor 18, a plurality of freely rotatable rollers 22 are supported on suitable shafts (not shown). Rollers 22 lie in substantially the plane of the upper reach of conveyor 14 as shown, and support the felt in its travel from transfer conveyor 14 to conveyor 18. Located above conveyor 18 is a fourth conveyor 24 supported on rollers 26 and adapted to be driven at the same speed as conveyor 18. Conveyor 24 is preferably supported in a plane parallel to the plane of conveyor 14 and is spaced from conveyor 14 a distance approximately equal to the thickness of the felt issuing from the blow chamber 10. Conveyors 18 and 24 converge, the lower end of conveyor 24 approaching conveyor 18 to provide a gap or bight 28 of

appreciably less width than the original thickness of the felt.

Although no driving means for the several conveyors has been shown in the drawing, it will be appreciated that any conventional apparatus may be employed for this purpose. Separate drives may be used or the different conveyors may all be driven at the required relative speeds from one main drive. The belts are of wire mesh or other suitable construction as normally employed in mineral wool manufacture.

In the operation of the apparatus described above and in the carrying out of the method of the invention, conveyors 18 and 24 are driven at a relatively slower speed than conveyors 12 and 14. Suitably a speed of 1.25 feet per minute may be employed for conveyors 12 and 14, and a speed of one foot per minute for conveyors 18 and 24. It will be understood that the speed relationships given are merely illustrative and that others may be employed depending upon the particular conditions of operation. The felt issuing from the blow chamber is carried by conveyor 14 into the gap defined by the lower reach of conveyor 24 and rollers 22. When the felt comes into contact with the belt 18 as well as belt 24, the lower speed of these belts, and hence of travel of the felt, causes the felted material to jam together into small heterogeneously arranged noids and lumps effectively breaking the continuity of the laminations. In this way a uniform overall felted structure is obtained with excellent delamination resistance.

As the felt with the fibers reoriented, as described above, approaches and enters the bight 28 between roll 26 and conveyor 18, it is substantially compressed to consolidate the fiber mass. The felt then passes from conveyor 18 to any suitable finishing apparatus which, as illustrated, may comprise compression belts 30 and 32 supported on rollers or drums 34 and 36 respectively. As the felt passes between belts 30 and 32, it is compressed to a desired finish thickness, and the binder is set in any suitable manner, depending on the particular type of binder employed. The felt may then be subdivided into blocks or sheets of desired size by suitable means not shown, or may be subjected to further finishing steps.

Referring to Fig. 2, a modification of the invention is illustrated. In this instance the blow chamber conveyor 12, transfer conveyor 14, and conveyors 18 and 24 are provided as before. However, rollers 22 are eliminated and the blow chamber conveyor belt and transfer conveyor 14 are run at a considerably higher speed than conveyors 18 and 24. For example, the blow chamber conveyor and the transfer conveyor may travel at a rate of three feet a minute, while conveyors 18 and 24 are traveling at the rate of one foot per minute. The felt drops over the end of conveyor 14 and forms large corrugations or loops on the slow moving conveyor 18. The corrugated felt is compressed between the adjacent reaches of conveyors 18 and 24 to a thickness as determined by the space or bight between the lower end of conveyor 24 and conveyor 18. As before, a heterogeneous arrangement of the fibers in the felt results, and delamination resistance and resistance to compression are greatly increased.

Having thus described our invention in rather full detail, it will be understood that these details need not be strictly adhered to, but that various changes and modifications will suggest themselves to one skilled in the art, all falling within

the scope of the invention as defined by the subjoined claims.

What we claim is:

1. A method of reorienting the fibers of a traveling mat of felted mineral wool in which the fibers lie predominantly in planes parallel to the faces of the mat, said method comprising moving said mat to means traveling in a plane at an angle to the plane of such movement of said mat, but in the same general direction as, and at a slower speed than, such movement of said mat, and substantially simultaneously therewith confining the upper surface of said mat by means traveling in the plane of the upper surface of said mat and in the direction of movement of said mat.

2. A method of reorienting the fibers of a traveling mat of felted mineral wool in which the fibers lie predominantly in planes parallel to the faces of the mat, said method comprising projecting the mat from the end of a traveling web onto a conveyor traveling at a lower speed than and located below said traveling web whereby said mat forms loops, and substantially simultaneously with its formation compressing said looped mat between converging surfaces.

3. An apparatus comprising driven means for conveying a felted mat, a conveyor underlying an end of said means, and a second conveyor overlying said first mentioned conveyor in a plane inclined with respect to the plane of said first mentioned conveyor and extending substantially to said means, whereby said means conveys the felted mat directly between said first and second conveyors, and means for driving said conveyors at a slower speed than that of said first mentioned means.

4. An apparatus comprising a conveyor for carrying a felted mat, a second conveyor underlying an end of said first conveyor and spaced therefrom, a third conveyor overlying said second mentioned conveyor in a plane inclined with respect to the plane of said second mentioned conveyor and extending substantially to said first conveyor whereby said first conveyor deposits the mat directly between said second and third conveyors, and means for driving said second and third mentioned conveyors at a slower rate than the rate of movement of said first mentioned conveyor.

5. An apparatus comprising a conveyor carrying a felted mat, a second conveyor underlying an end of said first mentioned conveyor and spaced therefrom, a third conveyor overlying said second mentioned conveyor in a plane inclined with respect to the plane of said second mentioned conveyor to define a restricted space between the ends thereof, said third conveyor extending substantially to said first conveyor, non-driven means for supporting the felted mat between the end of said first mentioned conveyor and a point adjoining the second mentioned conveyor, and means for driving such second and third mentioned conveyors at slower speeds than said first mentioned conveyor.

6. An apparatus comprising a conveyor for carrying a felted mat, a second conveyor underlying an end of said first mentioned conveyor and spaced therefrom, a third conveyor overlying said second mentioned conveyor in a plane inclined with respect to the plane of said second mentioned conveyor to define a restricted space between the ends thereof, said third conveyor extending substantially to said first conveyor, and means for driving said second and third men-

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tioned conveyors at such lower rate of speed than said first mentioned conveyor that the felted mat is deposited on said second mentioned conveyor in the form of corrugations.

7. An apparatus for producing a compacted 5
mat of mineral wool fibers or the like comprising a conveyor, means for driving the same, a second conveyor in advance of said first conveyor for receiving material discharged therefrom, a third conveyor positioned above said second conveyor 10
and extending substantially to said first conveyor to overlie and confine said mat against upward movement, said third conveyor defining with said

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second conveyor a zone of gradually decreasing thickness through which said mat is carried, means for driving said second and third conveyors at slower speeds than said first conveyor to accumulate additional material in said advancing mat, and means cooperating with said third conveyor to support and confine said mat during a portion of its travel beneath said third conveyor to facilitate the uniform forcing together of the fibers in the mat as it passes through said zone of gradually decreasing thickness.

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