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METHOD AND APPARATUS FOR THE MANUFACTURE OF INSULATING BODIES

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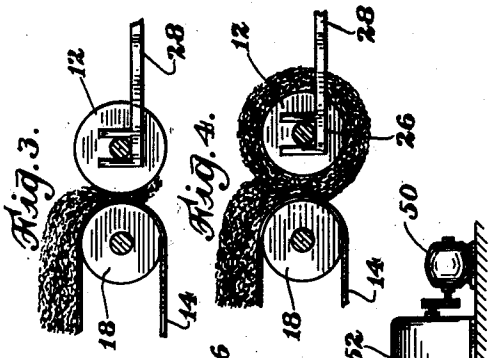


Fig. 3.

Fig. 4.

Fig. 1.

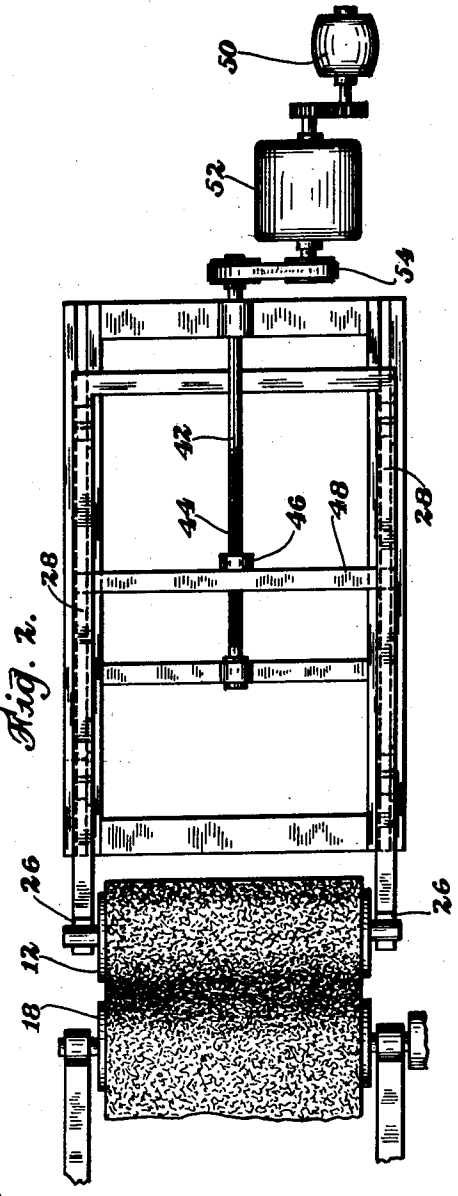


Fig. 2.

Fig. 5.

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METHOD AND APPARATUS FOR THE MANUFACTURE OF INSULATING BODIES

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6 Claims. (Cl. 154—27)

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The instant invention relates to improved methods and apparatus for the production of fibrous insulating bodies and the like and is particularly concerned with improvements in the known method of forming insulating coverings by rolling a lap or layer of relatively loose, bulky, compressible, fibrous material, such for example as asbestos fiber, on a mandrel, the layer carrying a suitable binder. Such coverings may be employed either in tubular form for pipe and tank coverings and the like, or may be slit longitudinally before the binder is set and straightened out into blanket form.

In the known methods a layer of the fibrous material is delivered by a roll or apron into position to be wound up on a mandrel. The mandrel is supported on a retractable carriage, the carriage being moved away from the delivery device solely by the force exerted by the body of material as it is built up on the mandrel. The density of the body hence will be determined by the density and compressibility of the particular material being used and the resistance to movement exerted by the carriage at any particular time, no positive control being obtainable. Under these circumstances it has been impossible from a practical standpoint to obtain low density products. It will be readily appreciated that if the mandrel carriage is of such construction that it may easily be forced away from the delivery device, wide variation in the density of the covering will result as minor factors will exert disproportionate influence on the movement of the carriage. On the other hand, if the carriage is loaded sufficiently or its resistance to movement is otherwise increased to substantially eliminate the influence of such minor factors, the density of the body will necessarily be high. Also, it has been found substantially impossible to secure uniformity between successive covering sections, even at the densities ordinarily desired for insulation, due to the lack of control of the system.

A principal object of the instant invention is the provision of a method and apparatus by which positive control of the density of the covering may be maintained. More particularly it is an object of the invention to provide a method and apparatus in which the withdrawal movement of the mandrel is mechanically controlled.

A further object of the invention is the provision of such method and apparatus in which the mandrel is carried by a movable carriage and mechanism is employed to withdraw the carriage at a predetermined rate which may be

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either constant or variable, depending upon the particular type of product desired. The instant invention thus eliminates the disadvantages of the known systems and permits coverings to be made which are of a controlled density, successive coverings made by the machine under the same conditions having substantially the same properties.

My invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description of a preferred embodiment of the invention which is to follow and to the accompanying drawings in which:

Fig. 1 is a diagrammatic, side elevational view of an apparatus in accordance with the instant invention and for carrying out the method thereof;

Fig. 2 is a top plan view of the apparatus of Fig. 1;

Fig. 3 is a side elevational view, on an enlarged scale, of a portion of the apparatus illustrating one stage in the operation;

Fig. 4 is a view similar to Fig. 3 illustrating a later stage in the operation; and,

Fig. 5 is a perspective view of a pipe covering as made by the instant invention.

Referring now to the drawings and particularly to Figs. 1–4 inclusive, the apparatus shown comprises a device indicated generally at **10** for forming a lap or layer of insulating material, such as asbestos fiber or other loose, fibrous material, and conveying it into position to be picked up by a mandrel **12**. In the apparatus specifically illustrated, device **10** includes an apron **14** supported on spaced rolls **16** and **18**, at least one of the rolls being driven to cause the upper reach of the apron to move in the direction indicated by the arrow (see Fig. 1). The drive, which may take any suitable form, is not illustrated. Supported above the apron and extending substantially the width of the apron is a fiber supplying device **20** suitably in the form of a cabinet or box and having a mouth or opening **22** above the surface of the apron. The cabinet deposits opened, dispersed fiber onto the apron in controlled quantities to provide a substantially uniform thickness and density layer. Also, supported above the apron and in position to discharge a binder onto the layer of fibers is a binder applying device **24**. As will be appreciated, this device may vary depending upon the particular type of binder to be used but preferably consists of a nozzle member extending the width of the layer on the apron and having a

plurality of spray openings. The nozzle may be connected to any suitable source of binder supply (not shown). It will be understood that the construction of device 10 described above is for purposes of illustration only and that any suitable or conventional apparatus may be used to provide a fibrous, binder-containing layer of substantially uniform density in position to be picked up by mandrel 12. The particular fibrous material may be any bulky, readily compressible material which is adapted to be used with equipment of the above type for the production of insulating tubes, blankets, and the like. Asbestos fibers are a preferred example. Also, substantial proportions, say up to 50% or more by weight of a powdered or fibrous filler, may be employed with the asbestos fibers if desired.

In accordance with the instant invention mandrel 12 is mounted for free rotation in bearings 26 supported on a carriage 28. Carriage 28 is movable toward and away from roll 18 and preferably for this purpose includes wheels or rollers 30 mounted to ride on tracks 32 forming the upper rails of a table 34.

The device for mechanically retracting the carriage is indicated generally at 36, the device in the embodiment shown comprising front and rear bearings 38 and 40, respectively, and a rotatable but longitudinally fixed rod or shaft 42 mounted in the bearings. Shaft 42 includes a threaded section 44 received in a nut 46 carried by a frame member 48 of carriage 28 and in fixed relationship thereto. Shaft 42 is adapted to be positively driven in a direction to cause rearward movement of the carriage by any suitable means, such as motor 50, operatively connected to the shaft through speed control device 52 of any suitable type and belt drive, or the like 54.

In the operation of the apparatus described above and in carrying out the method of the instant invention, carriage 28 is first moved forwardly to bring the mandrel in contact with the apron on roll 18. This may be effected through the medium of motor 50 and the drive connection or, alternatively, nut 46 may be of a conventional type which permits release of its threaded relationship to the shaft, in which event the carriage may be quickly moved to bring the mandrel into starting position by manual or mechanical operation, as desired. Device 20 is operated to deliver a layer of fibrous material, with or without a filler, as desired, and carrying a binder applied by spray device 24, to the bight between the apron and the mandrel, the mandrel rotating through its contact with the apron. After the layer reaches the bight and the first layer is wound thereon, the drive mechanism is operated to cause gradual retraction of carriage 28 and, hence, of mandrel 12 as the body builds up on the mandrel. The rate of retraction of the carriage and, hence, of the mandrel from the vicinity of end roll 18 of the apron conveyor, is adjusted to the value required, the latter depending upon the thickness, bulkiness and compressibility of the layer of material to be delivered by the apron and the desired density of the finished product. Due to the light, fluffy, open condition of the fibrous material issuing from box 20, the layer on the apron is relatively thick and bulky, the layer becoming compressed as it is applied to the mandrel but the degree of compression is under the positive control of the retraction means. If a light density product is desired the mandrel is relatively rapidly withdrawn. On the other hand, the rate of retraction of the mandrel relatively to the deposit of the fibrous material may be reduced to produce substantial compression of the material and hence a product of greater density. Thus, where the layer is supplied at a given thickness and density, the control of mandrel movement provides control of density of the product.

When a sufficient number of convolutions has been built up on the mandrel to produce a covering of the selected thickness and density, the withdrawal movement of the mandrel is stopped and the mandrel lifted out to permit the tubular product to be stripped from it. Where the product is to be used for a pipe covering or the like in tubular form, the binder is dried or cured and the tube then divided longitudinally on diametrically opposite lines to produce semi-cylindrical pipe covering sections 54 and 56, as illustrated in Fig. 5. If a blanket type product is desired the tubular covering is longitudinally slit before the binder can take a permanent set and the tube is flattened out. The binder is then dried or cured.

After removal of the covering from the mandrel the carriage is moved forwardly to again bring it into contact with the apron at roll 18 and the operation is repeated. Forward movement of the carriage may be caused by reversing the drive, or nut 46 may be of such construction that it can be released from shaft 44 to permit the carriage to be manually or otherwise quickly moved to bring the mandrel into operating position, as previously pointed out.

The method and apparatus described above provide accurate control of the properties of the product and insure that a succession of products can be made having substantially identical properties. The coverings can be made within a wide range of densities and may be of non-uniform densities if desired. For example, a product of gradually decreased density outwardly from the center may be obtained by withdrawal movement of the mandrel at a constant rate. On the other hand, if the density of the covering is to be uniform throughout its thickness, the rate of withdrawal of the mandrel will be gradually decreased. Also, a product may be made with higher densities at the inner and outer faces with an interior section of lower density by first withdrawing the carriage at a relatively slow rate, then at a higher rate and finally again at a slower rate.

Having thus described my invention in rather full detail, it will be understood that these details need not be strictly adhered to but that various changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. In a method of producing an insulating body including delivering a layer of compressible material between a surface and a rotatable mandrel, the improvement comprising, winding the layer on the mandrel and simultaneously moving the mandrel away from the surface under positive control at a uniform predetermined rate.

2. In a method of producing an insulating body including delivering a layer of compressible insulating material between a moving surface and a rotatable mandrel, the improvement comprising, supporting the mandrel for movement away from the surface, winding the layer on the mandrel and simultaneously moving said mandrel

under positive control to withdraw said mandrel from said surface at a uniform predetermined rate during the winding operation.

3. In an apparatus for producing an insulating body including means for delivering a layer of insulating material to a surface and a mandrel for picking up the layer from said surface, the improvement comprising, a movable mounting for supporting the mandrel for free rotation, and driven means for moving said mounting at a predetermined rate away from said surface.

4. In an apparatus for producing an insulating body including means for delivering a layer of insulating material to a surface and a mandrel for picking up the layer from said surface, the improvement comprising, a movable mounting supporting the mandrel for free rotation, and means for moving said mounting away from said surface at a predetermined rate, said last named means including a positive drive mechanism.

5. In an apparatus for producing an insulating body including means for delivering a layer of insulating material to a surface and a mandrel for picking up the layer from said surface, the improvement comprising, a carriage, bearings on said carriage for supporting said mandrel in

fixed relative position thereto and for free rotation, and means for retracting said carriage at a predetermined rate.

6. In an apparatus for producing an insulating body including means for delivering a layer of insulating material to a surface and a mandrel for picking up the layer from said surface, the improvement comprising, a carriage, a frame supporting the carriage for travel thereon, bearings on said carriage for supporting said mandrel in fixed relative position thereto and for free rotation, a nut fixed to said carriage, a shaft rotatably supported on the frame and threaded into said nut, and means for rotating the shaft.

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