Aug. 12, 1947. P. F. McDERMOTT 2,425,293

METHOD AND APPARATUS FOR MAKING FLEXIBLE INSULATION

Filed July 8, 1944

Fig. 2.

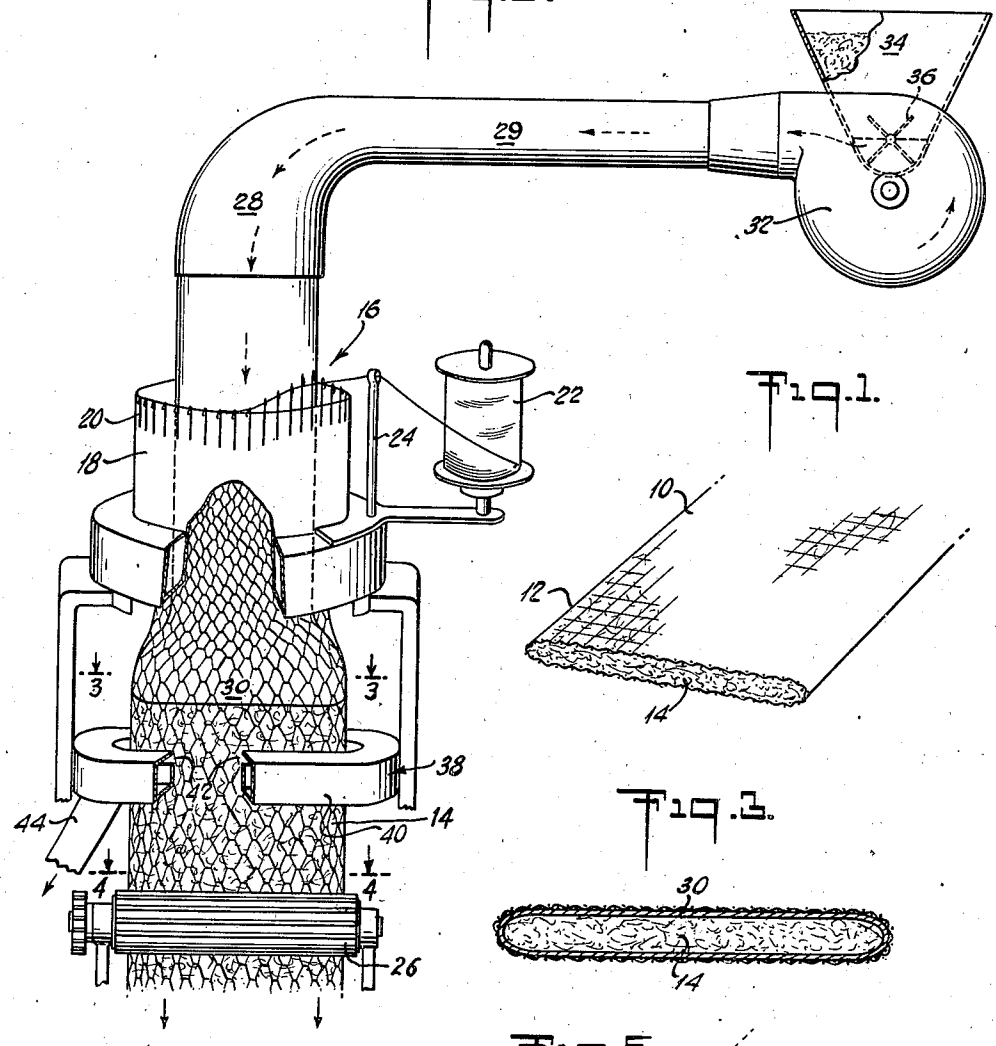


Fig. 1.

Fig. 3.

Fig. 4.

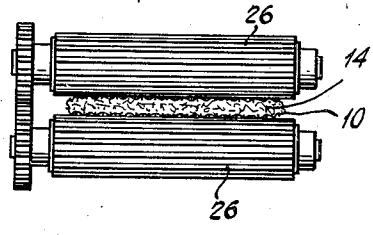
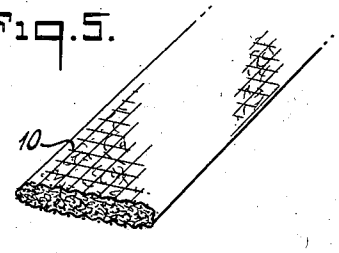


Fig. 5.



INVENTOR
PAUL F. McDERMOTT.
BY Virgil C. Kline
ATTORNEY

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METHOD AND APPARATUS FOR MAKING FLEXIBLE INSULATION

Paul F. McDermott, Martinsville, N. J., assignor to Johns-Manville Corporation, New York, N. Y., a corporation of New York

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7 Claims. (Cl. 66—9)

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My invention relates to the manufacture of flexible insulating materials and the like in the form of blankets, tapes, ropes and similar products and, more particularly, to the production of improved articles of these types.

A principal object of the invention is the provision of a method and apparatus for the economical commercial production of such products. As distinguished from previous proposals for the manufacture of insulating materials of this general type, such proposals involving the wrapping of a sheathing or covering around a preformed filler, the instant method includes the fabricating of a flexible sheathing or sleeve by knitting or the like, and the conveying of a loose, fibrous insulating material such as asbestos into the sleeve substantially immediately after it is formed.

Another object of the invention is the provision of a method and apparatus for knitting or otherwise fabricating a sleeve around a forming member, and pneumatically conveying the filling material through the forming member into the sleeve while the latter is maintained in distended condition by said forming member.

Briefly stated, the instant process and apparatus involves preferably a circular knitting machine of substantially conventional construction adapted for the production of tubular knit fabrics. Suitably the knitting machine is of a character to handle fine metal strands whereby a protecting and confining sleeve is provided which will permit the product to be employed under relatively high temperature conditions and the like where the conventional materials fail. The apparatus includes a hollow tube extending axially through the cylinder of the knitting machine or other forming mechanism, the hollow tube terminating in an open mouth. The tube serves as a former or stretcher for the knitted sleeve and, in addition, serves as means for introducing a loose filling material into the sleeve while the latter is maintained in its distended condition on the tube.

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 the preferred embodiment thereof which is to follow, and to the accompanying drawings in which:

Fig. 1 is a perspective view of an insulating blanket or the like formed in accordance with the instant method;

Fig. 2 is a diagrammatic, perspective view of an apparatus embodying the invention;

Fig. 3 is a sectional view on an enlarged scale taken on the line 3—3 of Fig. 2;

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Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2; and

Fig. 5 is a view similar to Fig. 1 of a somewhat modified product of the apparatus and method.

Referring now to the drawings, the product 10 disclosed in Fig. 1 comprises an outer flattened, tubular sleeve 12 and a preferably compressible filling 14. The product finds its principal field of use as an insulating blanket or covering, and for this reason the description will refer to materials for the sleeve and filling which adapt the blanket for such use. It will be understood, however, that the product 10 may have other applications and that various materials may be employed in its construction to provide the required properties for different purposes.

Sleeve 12 is formed preferably by knitting one or more strands in the form of a hollow tube. Particularly where the material is to be subjected to high temperatures, as for example, where it is to be employed as an insulation on turbines or other equipment where substantially elevated temperatures are encountered, the strands making up the sleeve are preferably of heat-resistant metals or alloys of metals such as a chrome nickel steel, a nickel copper alloy and the like. The filling suitably comprises asbestos fiber of known type such as Amosite fiber, although other asbestos fibers, mineral wool fibers, glass fibers and the like may be used.

In Fig. 5 a similar construction is shown except that, in this instance the diameter of the sleeve has been reduced to provide a tape adapted to be spirally wrapped or otherwise applied around the article to be insulated.

Referring now particularly to Figs. 2–4 inclusive, the apparatus for the manufacture of products such as those shown in Figs. 1 and 5 comprises means indicated at 16 for the fabrication of a flexible, tubular sleeve or sheathing 12. Preferably means 16, as illustrated, is a circular knitting machine of known type including a knitting head 18 carrying needles 20. One or more spools of the strand material from which the sleeve is formed are supported from the machine as indicated at 22, the strand extending from the supply through guide 24 to the knitting point. The knitted fabric is withdrawn downwardly by suitable take-off means comprising, for example, knurled rolls 26 driven in timed relationship to the operation of the machine. In lieu of knurled rolls, traction belts or the like may be employed. The drive for the machine and other conventional operating parts, such as the needle cam structure and the like, have not been shown, and the parts described above have been shown dia-

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grammatically as such features are of conventional or usual type and, per se, form no part of the instant invention.

In accordance with the invention a hollow tubular member 28 is supported to extend axially through the cylinder of the machine. Member 28 includes a flattened, downwardly opening mouth section 30 below the knitting head. The opposite end of member 28 is connected through a conduit or tube 29 with the discharge side of a fan or blower 32. A supply hopper or the like, indicated diagrammatically at 34, is in communication with the intake of fan 32 through a filling material metering device 36 of any conventional or desired construction. It will be understood that alternatively the filling material may be introduced into tube 28 at the discharge side of the fan.

Below, but adjacent the mouth section 30 of the forming tube, and of similar flattened shape, is a suction device 38, comprising a housing 40, having a preferably continuous inwardly opening air intake port 42. Housing 40 is connected through line 44 to a suction fan or the like to provide constant withdrawal of air through port 42.

In the operation of the apparatus described above, and in carrying out the method of the invention, strand material of selected type is supplied from spool 22 and is fabricated into a seamless, tubular fabric, around forming member 28 by means 16. As previously stated such means is preferably a knitting machine but may constitute braiding equipment or the like. The tubular fabric is flattened and preferably somewhat distended as it is drawn by take-off members 26 over the mouth section 30 of the forming member. A filling material such, for example, as asbestos fibers, is supplied in loose or nodule form to supply hopper 34 and is fed therefrom at a predetermined rate by metering device 36. As the fibrous material enters duct 29 it is picked up by the airstream created by fan 32, and is carried therealong in air suspension into the forming member and through the open mouth thereof into the newly formed flattened sleeve.

The quantity of the filling material may be controlled as desired, as indicated above, but is preferably sufficient to snugly fill the distended sleeve, the airstream serving, in addition to its carrying function, as an impacting medium to compress the material within the sleeve. The air carried with the filling material escapes through the open mesh of the sleeve and is drawn off by suction means 38. The suction means additionally serves to collect and remove the dust given off by the fibrous filling.

The flexible filled sleeve formed in a continuous length as described above, may be cut lengthwise into units of any suitable size for any selected purposes. If desired, the ends of the severed sections may be closed as, for example, by stitchings or any other suitable means. As indicated by Figs. 1 and 5, the material may be made either in the form of a relatively large blanket or as a narrow tape or the like, merely by selection of the proper size knitting machine and forming member, and by controlling the flow of the filling material. Also the thickness and shape of the blanket or tape may be controlled by properly shaping the mouth section 30 of member 28. For example, products of approximately round or square cross-section can be made. It will also be understood that any of the products made as described above can be covered with additional

knitted or braided jackets or otherwise further protected.

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 making a blanket or tape, the steps comprising knitting a tubular sleeve around a hollow forming member having an open end, drawing said sleeve from said forming member over said open end as it is knitted, pneumatically delivering a loose fibrous material through said forming member and introducing it into said sleeve as said sleeve is drawn from said forming member, and withdrawing air through said sleeve adjacent the end of the forming member.

2. In a method of making a flexible insulation, the steps comprising knitting a tubular sleeve around a hollow forming member having a flattened mouth section, drawing said sleeve from said forming member as it is knitted, pneumatically conveying a loose insulating material through said forming member and introducing it into said sleeve as said sleeve is drawn from said forming member, and withdrawing air through said sleeve adjacent the end of the forming member.

3. In a method of making a flexible insulation, the steps comprising forming a seamless, flexible sleeve around a hollow forming member having a flattened mouth section, drawing said sleeve from said forming member, pneumatically conveying a loose, fibrous insulating material through said forming member and forcing it into said sleeve as said sleeve is drawn from said forming member, the air employed for the pneumatic delivery of said fibrous material serving as an impacting medium against the material within the sleeve.

4. In an apparatus for the manufacture of flexible insulating materials and the like, a hollow forming member including an open mouth, means for fabricating a tubular sleeve around said forming member, means for drawing said sleeve over said open mouth, pneumatic means for delivering a loose filling material through said forming member and introducing it into said sleeve through said open mouth, and means for withdrawing air through said sleeve adjacent said open mouth.

5. In an apparatus for the manufacture of flexible insulation and the like, a hollow forming member including an open mouth, means for knitting a tubular sleeve around said forming member, means for drawing said sleeve as it is knitted over said open mouth, and means for pneumatically delivering a loose insulating material through said forming member and forcing it into said sleeve to fill the same at a point adjacent said open mouth.

6. In an apparatus for the manufacture of flexible insulating materials and the like, a hollow forming member including a flattened mouth section, means for knitting a tubular sleeve around said forming member above said mouth section, means for drawing said sleeve over said mouth section, means for pneumatically delivering a loose insulating material through said hollow forming member and forcing it into said sleeve, and means for withdrawing air through said sleeve adjacent said mouth section.

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7. In a method of making flexible insulation, the steps comprising fabricating a tubular sleeve around a hollow forming member having an open end, drawing said sleeve from said forming member as it is fabricated, pneumatically delivering a loose, compressible fibrous insulating material into said forming member and filling said sleeve therewith as it leaves said forming member, the air employed for the pneumatic delivery of said fibrous material serving as an impacting medium against the material within the sleeve.

PAUL F. McDERMOTT.

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