Dec. 24, 1935. P. D. CANNON 2,025,038

APPARATUS FOR MAKING A BRAIDED PRODUCT

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Fig. 1.

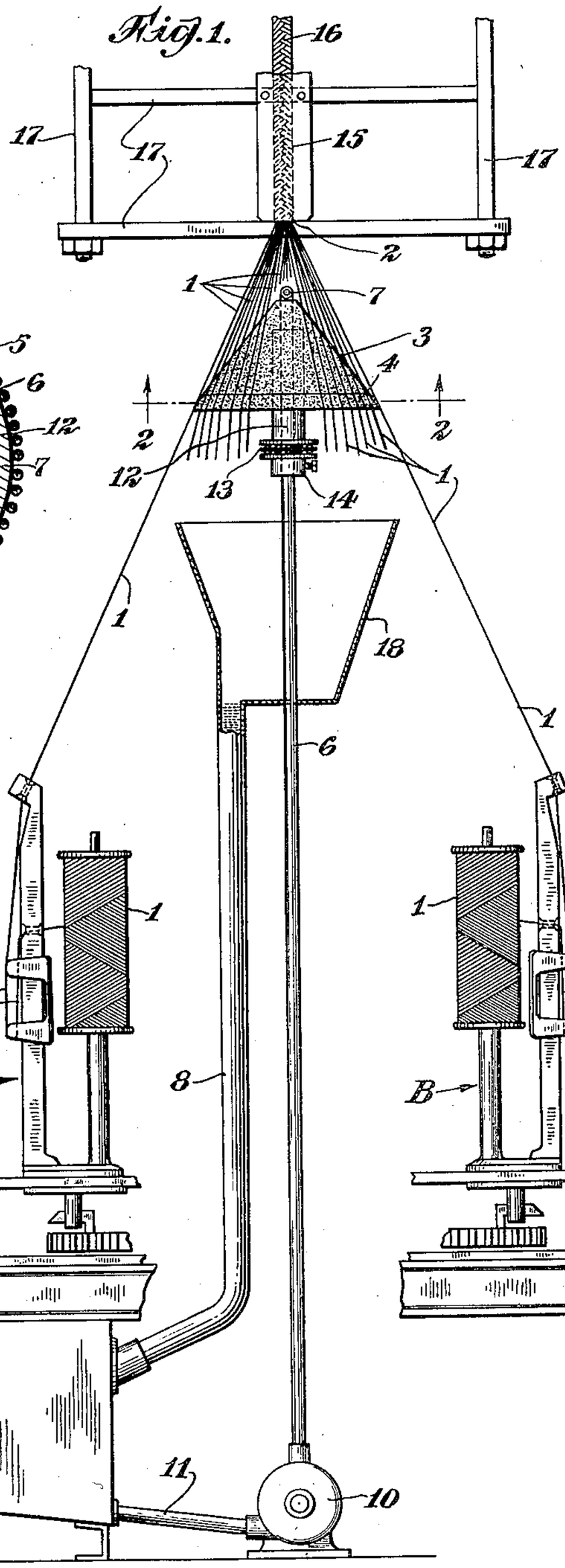
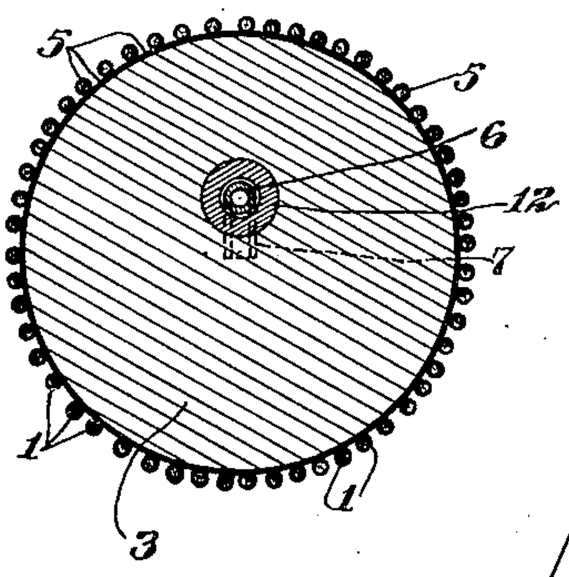


Fig. 2.



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APPARATUS FOR MAKING A BRAIDED PRODUCT

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4 Claims. (Cl. 96—3)

This invention relates to an apparatus for making a braided product, particularly an impregnated braided asbestos fabric suitable for use as friction or packing material.

Briefly, the invention comprises providing individual strands of asbestos yarn or other suitable material with a continuous coating of a friction material, such as a rubber compound or the like, and then forming the coated strands into a braid.

An object of the present invention is to provide a method and apparatus by means of which a viscous impregnating material may be coated substantially uniformly over individual strands of yarn before the yarn reaches the braiding point and is pressed into the final braid. Another object is to provide an impregnated braided product and method and apparatus of making the same, in which braid the individual strands are not only uniformly coated but also are spaced more or less regularly from one another in the finished product. Other objects and advantages will appear as the invention is described.

A preferred embodiment of the invention is illustrated in the drawing.

Fig. 1 shows an elevational view of an apparatus suitable for use in the present invention. In this view parts of the apparatus are broken away for clearness or simplicity of illustration and other parts are shown diagrammatically.

Fig. 2 shows a horizontal section along the section line 2—2 of Fig. 1.

In the figures like reference characters denote like parts.

The base of a braider machine is illustrated generally at A, with parts broken away. It is not considered necessary to illustrate in detail this base, including the plate, driving gears, and other mechanism, as these parts have been previously described, as, for example, in U. S. Patent 1,742,126 to Blaisdell, particularly in his Figs. 11 and 12. Also, braider or bobbin carriers are indicated generally at B, these being suitably of a type similar to those illustrated in the said Fig. 11 of the patent to Blaisdell. The braiding machines are used in sets of two or four plates each, so that, as the yarns from the braider carriers are drawn to the overhead braiding point, the yarns form a more or less conical figure with some free space that extends from the plates of the braider upwardly towards the braiding point, in the central part of the irregular cone.

The several strands 1 of yarn are composed of a conventional material that is sufficiently strong to withstand breaking during the braiding process and has a surface adapted to be wetted and preferably to be penetrated by the impregnating material that is applied during the impregnation process. Reenforced asbestos yarn, with an inner wire enclosed by asbestos fibers, is particularly suitable, although for some purposes the reenforcing wire may be substituted by a strong textile yarn, such as cotton twine, or omitted entirely.

The strands 1 of yarn are passed each from a braider carrier B (only two of the braider carriers are illustrated in Fig. 1) to the braiding point 2. Within the more or less hollow cone formed by the various yarns and a short distance below the braiding point is placed a distributing member 3 that is suitably dome-shaped or conical. The top of the cone may be approximately three-fourths inch below the braiding point, for example. The size of the cone, like the distance below the braiding point, may be varied considerably. A cone that has been used satisfactorily is 5 inches tall and 9 inches in diameter at the base. The cone may be constructed of a material that is readily wetted by and, therefore, effective in spreading a rubber impregnating composition. Thus, I have used a cone of hard rubber. The cone may be hollow. It may be supported and also closed at the base by a solid member 4, such as a circular piece of wood. To the inclined surface of the distributing member there is supplied viscous tacky impregnating material 5, by suitable means, as, for example, by a pipe 6 with outlet 7 above the point of the distributing member. The impregnating material so supplied spreads itself over the inclined surface of the distributing member. The excess of impregnating material above that which remains on the distributor or is coated onto the strands of yarn, as will be described later, may drop from the inclined surface of the distributing member into a drip pan 18 from which it is returned through pipe 8 to the container 9. The impregnating material is supplied, by the pipe 6, to the distributor 3, by means of the pump 10, the inlet of which is connected with the supply of material in the container by a pipe 11.

The distributing member is supported, suitably in rotatable arrangement, as by the short length of brass pipe 12, suitable brass tubing, that is inserted over the top portion of the pipe 6 and supported at its lower end by a thrust ball bearing 13. The bearing is placed around the pipe 6 and may be supported on a movable collar 14, to permit adjustment of the elevation of the bearing.

The distributing member is so placed and is of

such dimensions that the sloping, coated surface, at a position suitably near the base of the cone, contacts with each of the various strands of yarn as the strands are drawn through the braiding point 2, whereby the various strands are coated with the impregnating material. The distributing member may be mounted eccentrically on the member 12 as shown in Fig. 2, to facilitate the rotation of the distributor as the strands are whipped around the base of it by the movement of the braider carriers through the traverse of the plate of the braiding machine.

The operation of braiding as described, for example, by Blaisdell, involves movement of the braider carriers in an irregularly circular manner, with attendant manipulation or movement of the strands of yarn in opposite directions and intercrossing of them. This, in turn, causes a movement of revolution of the individual strands of yarn in contact with the distributor for impregnating material. The distributors may be rotatable and mounted eccentrically, to provide preferential contact with strands moving in one direction, there is produced a rotation of the distributor. There is a rubbing action between the distributor and the strands, whereby the friction material is rubbed over the surfaces of the various strands. Furthermore, the various strands are rolled, that is, rotated around longitudinal axes during the braiding and impregnation operation. The total of these effects is that the individual strands of yarn are continuously and substantially uniformly coated with the impregnating material. If impregnant is applied initially in an uneven manner, the impregnant may be rubbed away from high or thick spots and applied in additional amounts to depressions or thinly coated areas, by the rubbing or rolling to which the strands are subjected.

The strands, as they are drawn along in the cycle and while the coating is still in the tacky condition, pass over the surface of the coating or impregnation member 3 and through the braiding point 2 in a mold or box provided with a slot 15, of selected area and shape of cross section, that serves to compact and shape the braid 16, roughly, at least, into the form desired. It is not necessary in the present invention to supply impregnating material to the mold. In fact, so much impregnating material may be coated upon the individual strands of yarn, as they pass over the impregnating or distributing member 3, as to provide some excess over the total amount of impregnating material which is desired in the finished braided product. The mold may, therefore, serve to squeeze out, scrape off, or otherwise remove from the coated yarn, the excess of impregnating material above the amount that is desired. The excess so removed may drop upon the upcoming strands 1 or upon the distributor 3. The crossing or inter-braiding of the various strands, before they reach the braiding point, is not illustrated. Also, there is not illustrated the picker or means for intermittently engaging the crossings and moving them upward towards the braiding point.

The mold box is supported in any suitable manner as, for example, by the framework 17 of which parts are broken away in the figure, for simplicity of illustration.

The yarn and braid are drawn through the cycle that has been described, by conventional means, such as a rotating circular member (not shown) that may comprise a roll provided with pins acting upon the braid after it passes from the mold.

Also, the braided product may be submitted to conventional finishing steps. Thus, the braided product, say in the form of a somewhat irregular band may be drawn through a second mold box to increase the regularity of shape, to squeeze out excess impregnating material, and/or to supply additional impregnation if desired. Thus, additional impregnation may be made in this second mold (not shown) by supplying rubber compound to the interior of a slot therein, through which the braid is drawn. The product may be passed through calender rolls for the purpose of highly compressing it, as well as shaping it, as, for example, to give a non-porous braid of substantially rectangular cross-section. It will be understood that calenders that are conventional in the making of brake lining, for example, have not only rolls that compress the flat faces but also rolls that compress and square up the edges of the braid. Volatile materials, such as solvents, if used in the impregnating material, are removed by volatilization. Finally, the product is subjected to hardening. The hardening may be produced in a conventional process adapted for use with the impregnating material that is present in the product that is to be hardened.

The impregnating material which is used may be a customary impregnating composition, such as one containing a phenol-aldehyde condensation product, a rubber compound, or other composition of matter commonly used in friction or packing materials. I prefer at this time to use a rubber compound. Thus, I may use a composition comprising a volatile solvent and non-volatile ingredients that are common in rubber compounds for use in friction materials. I use preferably a proportion of non-volatile material to solvent that is substantially larger than that which it is possible to use in impregnating a woven fabric from the outside. Thus, I have used to advantage a viscous composition comprising 60 to 65 parts by weight of non-volatile rubber compound ingredients to 40 to 35 parts of volatile solvent such as gasoline. It is understood that the rubber compound may include conventional ingredients, as, for example, crude and/or reclaimed rubber, sulphur, pigments and fillers, stearic acid or other softener, and a vulcanization accelerator.

When the impregnating material is used in association with a volatile material, the hardening operation will be preceded by evaporation of the volatile material. Thus, when a rubber compound in gasoline has been used as the impregnating material, the gasoline is removed from the impregnated braided product at an elevated temperature, as, for example, at 165° F.

After any volatile material used in the impregnation has been removed, the product is subjected to treatment to harden the non-volatile impregnating material. Thus a rubber compound used as impregnating material, is hardened by vulcanization, as, for example, by being subjected to a temperature of 325° F. for about 20 minutes.

The vulcanization or hardening may be produced in heated dies, to establish definitely the shape and dimensions of the product during the hardening period.

The hardened product may be cooled and then trimmed, perforated, or otherwise prepared or equipped to render it readily usable as a friction

material in automotive brake linings, as clutch facing, or the like.

A product made as described above, contains a large proportion of impregnating material, strands of yarn that are individually continuously coated, and that are spaced more or less regularly throughout, as distinguished from the crowding together and irregular spacing to the degree that may prevail when a loosely fabricated article is impregnated by forcing the material into it, through its faces, from the outside towards the inside. The various strands of yarn are integrally braided in such manner that the product is not separable into laminæ.

Since many variations from the illustrative details that have been given may be made without departing from the scope of the invention, it is intended that the invention should not be restricted by such details except as they are incorporated into the claims.

What I claim is:

1. In an apparatus adapted for use in providing strands of reenforced asbestos yarn with a continuous coating of viscous impregnating material and then forming the coated strands into a braid, the improvement including a rotatable distributing member, means for supplying the impregnating material to the surface of the distributing member, and means for rolling the strands individually over the said surface.

2. In an apparatus adapted for use in providing strands of reenforced asbestos yarn with a continuous tacky coating of viscous impregnating material and then forming the coated strands into a braid, the improvement including a cone-shaped member, means for supplying the impregnating material to the surface of the cone-shaped member, means for bringing the surface of the several strands into contact with the impregnating material on the said surface and means for intercrossing the strands provided with the tacky coating and forming them into a fabricated unit.

3. In an apparatus adapted for use in providing strands of reenforced asbestos yarn with a continuous coating of viscous impregnating material and then forming the coated strands into a braid, the improvement including a rotatable eccentrically mounted distributing member, means for supplying the impregnating material to the surface of the distributing member, and means for rolling the strands individually over the said surface.

4. An apparatus adapted for use in making an impregnated asbestos product comprising means for supplying a tacky impregnating material to the surface of a distributing member, means for bringing strands of reenforced asbestos yarn into contact with the impregnating material on the surface of the distributing member, means for causing the said strands provided with the tacky coating to contact over all of their exterior surfaces with the impregnating material, and means for braiding together the thus impregnated strands.

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