July 14, 1931. F. MEIWALD 1,814,324

MACHINE FOR KNITTING TUBULAR ENVELOPES

Filed Nov. 22, 1929 2 Sheets-Sheet 1

Fig. 1. Fig. 2.

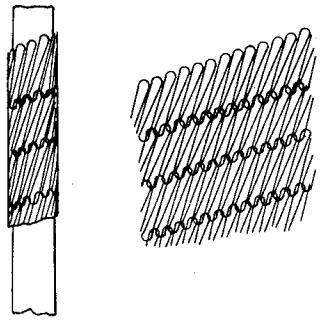


Fig. 3.

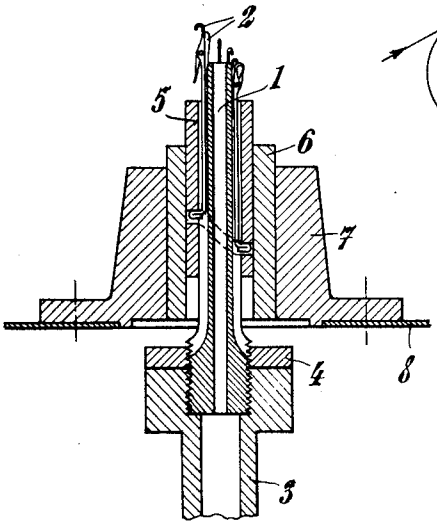
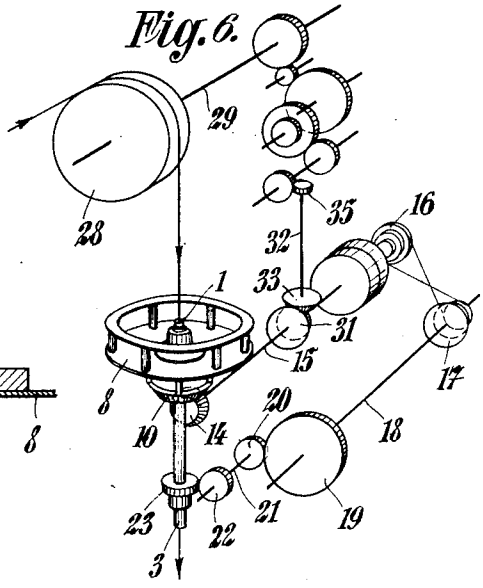


Fig. 6.



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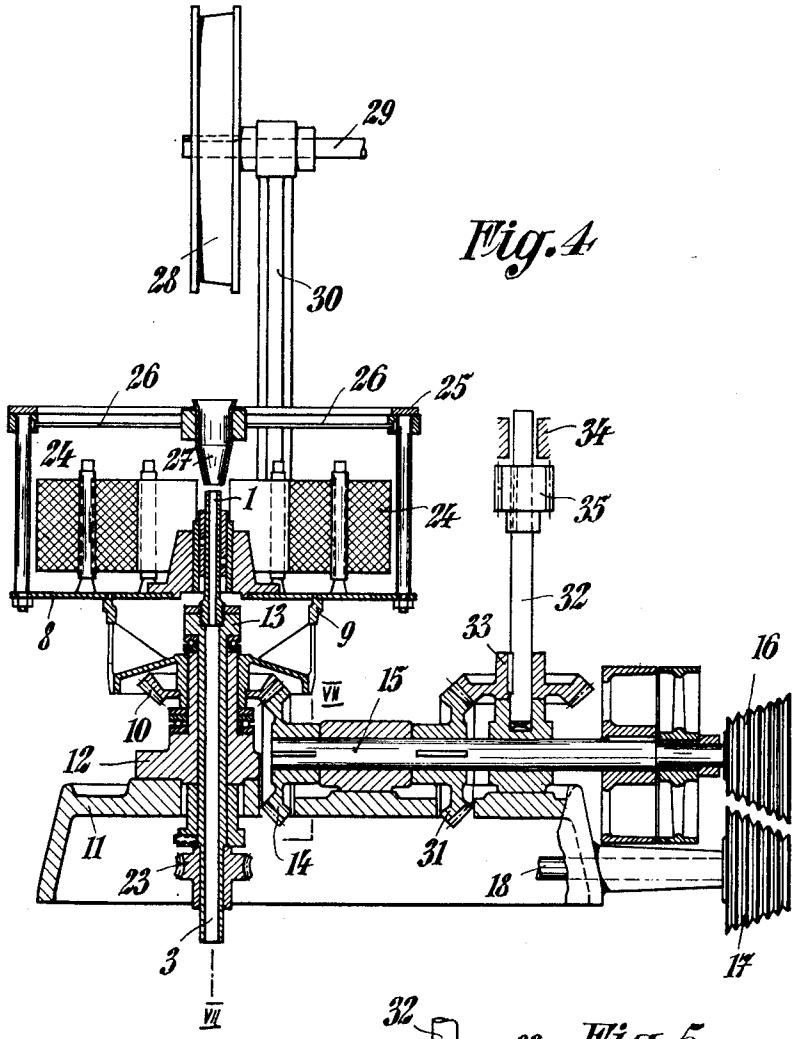

Fig. 4

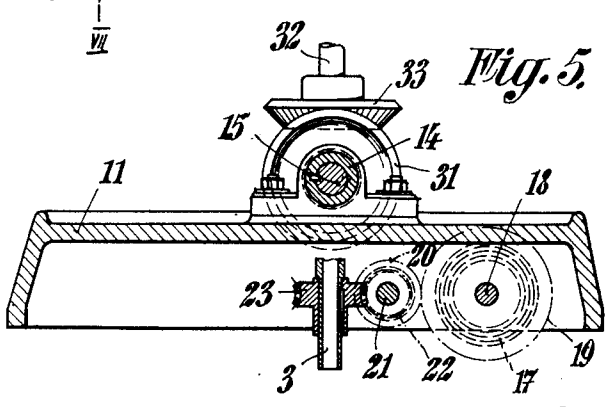

Fig. 5.

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UNITED STATES PATENT OFFICE

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MACHINE FOR KNITTING TUBULAR ENVELOPES

Application filed November 22, 1929, Serial No. 408,961, and in Austria December 18, 1928.

I have filed an application for this patent in Austria on Dec. 18, 1928; in Germany on Dec. 27, 1928; in Czechoslovakia on January 3, 1929, of which the following is a specification.

This invention relates to machines for making flexible cord-like knitted tubular envelopes, for use on sheathing electric conducting wires with a covering of knitted fabric, and has for its object to provide a machine for knitting an envelope in such a manner as to increase the durability of the knitted envelope. The knitted envelopes heretofore employed for covering a flexible electric conductor have not been of an altogether successful and practical character, for the reason that, in consequence of the indispensable impregnation of the envelope with a waterproofing agent, the threads of the fabric are rendered insufficiently elastic and yielding, so that when the conductor is bent the outer threads of the fabric of the casing, i. e. those on the convex surface of the bend, become torn and broken apart.

The present invention avoids this objection by providing that the threads of the stitching of the tubular envelope do not lie parallel to the longitudinal axis of the envelope but obliquely thereto, so that the rows follow a steep spiral curve. This arrangement of the loops prevents their becoming torn when the cord is sharply bent, since the tensile strain produced along the length of the envelope on its convex side at the bend is transferred to other portions of the outside surface of the tubular envelope. The twisting of the rows of loops in regard to each other is carried out by means of a knitting machine embodying the present invention.

In the invention as here shown, the twist is produced by providing besides the usual drive for the cam cylinder and bobbin carrier, an actuating mechanism for imparting a rotation to the needle bed which is rather slow with relation to the rotation of the cam cylinder and which causes the twist in all the mesh rows.

Fig. 1 of the drawings shows an envelope of improved construction made by a machine embodying my invention, and Fig. 2 the envelope opened out flat, both views illustrating the manner in which the loops are biased in accordance with the invention. Fig. 3 shows by way of example a form of construction of the portions of the knitting machine which effect the formation of the loops. Fig. 4 is a partial longitudinal section of the knitting machine. Fig. 5 is a section on the line 5—5 of Fig. 4. Fig. 6 shows the drive of the machine.

Whereas the successive loops in a line lie, in the case of the ordinary knitted envelope, parallel to the longitudinal axis of the tubular envelope, the lines of the loops in the envelope made on my improved machine (Figs. 1 and 2) are twisted spirally. When the cord is sharply bent, the tensile strain to which the loops on the convex side of the bend are submitted is transferred to the laterally adjacent loops, which are less strained. In the case of the impregnated protective casing for instance of electric conductors this point is of importance, since the flexibility of the threads after having been hardened by subsequent impregnation is naturally slight from the start.

The type of knitting machine taken for the example shown in the drawings of a type of construction of a knitting machine for producing the envelope according to the invention is that in which the cam box and reel plate are rotating.

Referring particularly to Figs. 3 to 6, inclusive, the needle cylinder 1 fitted with the needles 2 is screwed into a hollow shaft 3 and held in its position of vertical adjustment by a nut 4. A knitting cam 5 of the usual construction is inserted in a cam box 6, which is connected for rotation to a block 7 attached to the reel plate 8. The cam box 6 together with the knitting cam 5 and the needle cylinder 1 are interchangeable. Cam boxes and needle cylinders of different diameters can be inserted in the machine. The reel plate 8 is attached to a drum 9 (Figs. 4 and 6), the hub of which carries a bevel wheel 10 and is freely rotatable on a bearing-block 12 mounted on the bed-plate 11. A ball bearing is interposed between the hub of the drum 9 and the bearing-block 12. The shaft 3 of the

needle cylinder 1 is passed through the bearing-block 12. The shaft 3 is fitted with a collar 13 with which it is supported by means of a ball bearing on the bearing-block 12. The bevel wheel 10 engages a bevel wheel 14 on a shaft 15, which is mounted on the bed-plate 11 and carries fast and loose pulley wheels.

For the purpose of the slow drive of the needle cylinder 1, the shaft 15 is provided with a cone pulley 16, which co-operates with a cone pulley 17 on a shaft 18 mounted in bearings on the bed-plate 11. The shaft 18 drives through the agency of the toothed wheels 19, 20 a shaft 21, which carries a worm 22, which engages a worm-wheel 23 attached to the lower end of the shaft 3.

A guide 27 is attached by means of spokes 26 to the upper ring 25 of the reel plate 8 carrying the reels 24 and ends in a cone immediately above the needle cylinder 1, and serves for the feeding in of the core, which is brought up over the guide-wheel 28. The guide-wheel 28 is secured to a shaft 29, which is mounted in a bracket projecting upwards from the bed-plate 11, and is set in rotation by the main drive. For this purpose the shaft 15 is fitted with a bevel wheel 31, which engages a bevel wheel 33 attached to a vertical shaft 32. The shaft 32 is mounted at its upper end in a bearing 34 in a bracket (not shown in the drawings) of the bed-plate 11 and is fitted with a worm 35, by means of which through the agency of a worm-wheel and gearing (Fig. 6) the guide-wheel 28 is driven at a speed corresponding to that of the production of the finished envelope. The ratio of the speed of the reel plate 8 to that of the needle cylinder 1 is regulated with the help of the cone pulleys 16, 17. If the needle cylinder, which is stationary in ordinary knitting machines, is driven in the same direction of rotation as the cam box 6 but at a comparatively slow speed, the ratio of the two speeds being preferably 1:10, the loops are formed in the manner shown in Figs. 1 and 2, the lines of the consecutive loops following a steep spiral round the tubular envelope.

The same effect can of course be achieved by means of a machine with rapidly rotating needle cylinder by the slow rotation of the cam box and reel plate. The same effect can also be achieved irrespective of the construction of the knitting machine by imparting an additional rotating movement to the core, which then, in consequence of friction, produces the twisting of the envelope; this method, however, is seldom attempted, since it implies the rotation of the supply drum and the entire guiding machinism of the core.

For the carrying out of the invention a single knitting machine is sufficient, since the latter is capable of meeting all needs within wide limits by the changing of the cylinder and of the cam box. The degree of the obliqueness of the loops can be varied by adjustment of the speed of the needle cylinder and of the cam box and reel plate. When the core is of larger diameter the loops will naturally be formed longer and vice versa, this result being achieved by lowering or raising the position of the needle cylinder.

I claim:—

1. Machine for circum-knitting tubular cords for electric conductors, including a needle bed, a cam cylinder, and a spool carrier, drive means for the cam cylinder, and an additional drive means which is adapted to impart to the needle bed a rotary movement which is slow relative to the rotary speed of the cam cylinder and which causes the tubular cord to be twistedly deformed.

2. In a machine for knitting a tubular cord for electrical conductors, a knitting mechanism including a rotating cam cylinder and a rotatable spool carrier, a rotatable needle bed, and means for rotating the needle bed at a slow speed relating to that of the cam cylinder.

In testimony whereof I affix my signature.

FRANZ MEIWALD.