Aug. 9, 1938. B. K. FORD 2,126,250

APPARATUS FOR HANDLING STRANDS

Filed Oct. 9, 1936 2 Sheets-Sheet 1

FIG. 1

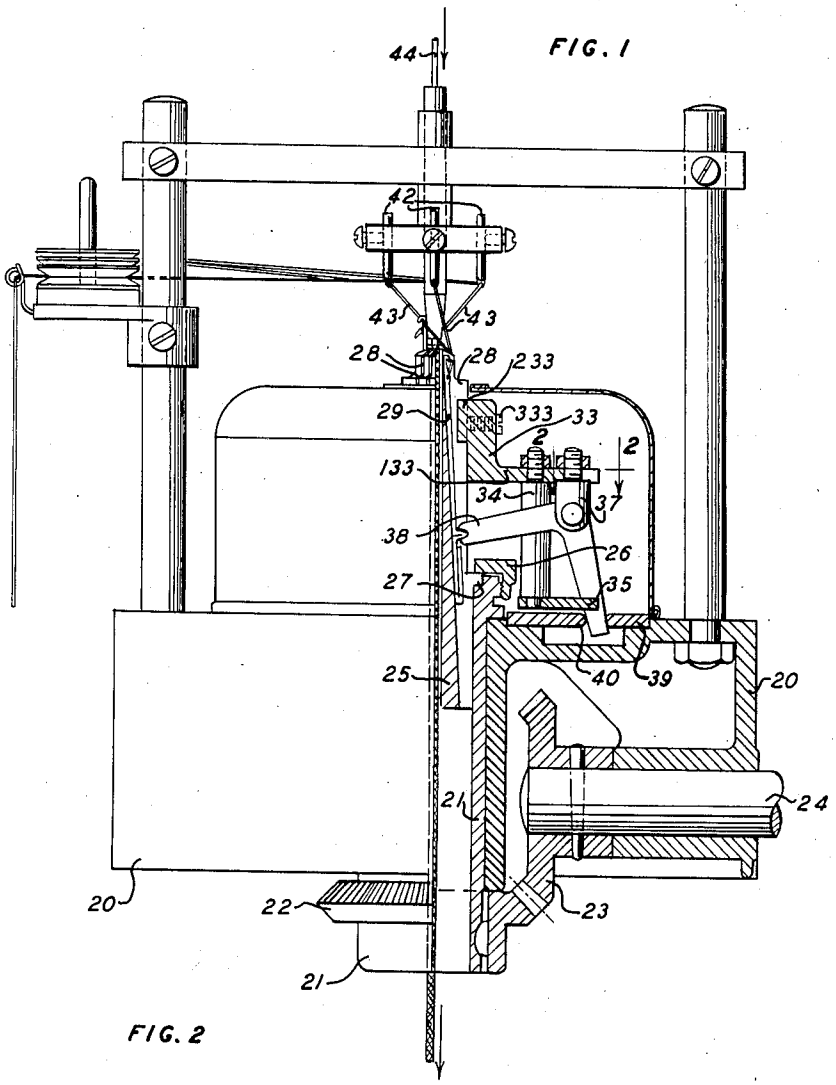


FIG. 2

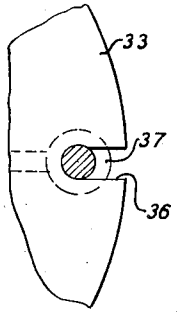
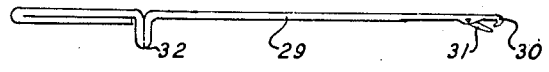


FIG. 3



INVENTOR
B. K. FORD

BY
E. R. Moulton

ATTORNEY

Aug. 9, 1938. B. K. FORD 2,126,250

APPARATUS FOR HANDLING STRANDS

Filed Oct. 9, 1936 2 Sheets-Sheet 2

FIG. 4

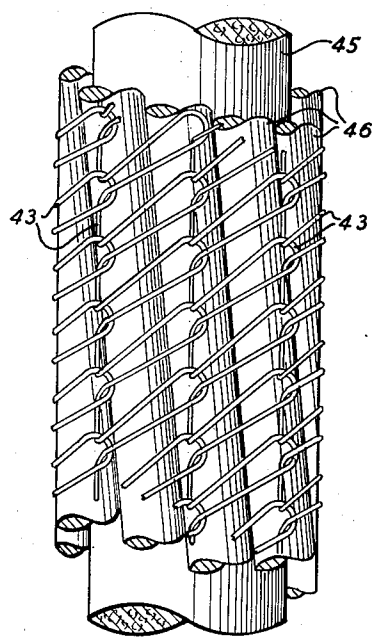
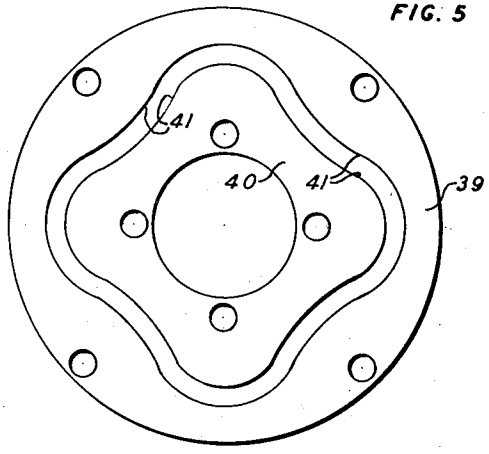


FIG. 5



INVENTOR
B. K. FORD
BY
E. R. Newman
ATTORNEY

Patented Aug. 9, 1938 2,126,250

UNITED STATES PATENT OFFICE

2,126,250

APPARATUS FOR HANDLING STRANDS

Ben K. Ford, Westfield, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application October 9, 1936, Serial No. 104,774

4 Claims. (Cl. 66—9)

This invention relates to apparatus for handling strands and more particularly to apparatus for knitting a cover or sheath of textile strands on an electrical conductor strand.

In the manufacture of certain types of insulated electrical conductors, e. g. the conductor cords used in connection with telephone instruments, switchboards and the like, it is highly desirable to have the cords as flexible and enduring under repeated flexure and torsion as possible. It has been found that a cord having a conductor comprising tinsel strands carried on a central textile core strand and a sheath or cover of textile strands knitted over the tinsel conductor when provided with the customary layer of rubber insulating compound and outer braided textile sheath has the desired properties of flexibility and endurance to a high degree.

An object of the present invention is to provide an apparatus for knitting a seamless tube of textile strands as a sheath about a central core strand, the apparatus to be simple and rugged in construction and rapid and reliable in operation.

One embodiment of the invention contemplates a knitting machine having a hollow rotatable carrier supporting a plurality of needles in a ring about a core passing therethrough, stationary strand supply and guide means to feed strands to be knitted about the core to the needles, and stationary cam means, in combination with a plurality of levers rotatable with the needles, actuated by the cam to operate the needles, and adjustable together with the needles with respect to the cam.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawings in which the same reference numerals are applied to identical parts in the several figures and in which

Fig. 1 is a diagrammatic view in elevation and partly in central vertical section of a knitting machine constructed in accordance with the invention;

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detached view of one of the needles;

Fig. 4 is an enlarged view of a portion of the product of the machine, and

Fig. 5 is a detached plan view of the control cam.

The embodiment herein disclosed comprises a circular knitting machine of generally conventional construction of which only sufficient is shown in the drawings to enable a clear understanding of the novelty embodying the invention. There is a stationary base member, in this instance having the general form of a closed cylindrical box, which is supported by any suitable means not shown. Axially of the box and passing therethrough is journalled a hollow shaft 21 driven in rotation by gears 22 and 23 from a drive shaft 24, which is in turn driven by power means not shown. Within the upper end of the shaft 21 is secured a hollow extension 25 by means of a threaded collar 26 which engages the complementarily threaded top of the shaft 21 and clamps an annular ledge 27 formed on the extension 25 between itself and the shaft.

The extension 25 is generally cylindrical with a diminished and tapered upper end, and is formed in its outer surface with a plurality of vertical radial grooves or slots 28 whose bottom surfaces slope radially inwardly from below up. In each of the slots 28 is housed a knitting needle 29 of the conventional type having a hooked tip 30 at the top with a pivoted latch 31 and having a laterally projecting lug 32 formed in its lower portion. Each needle is freely slidable in its slot.

On the upper portion of the extension 25 is adjustably secured an annular member 33 formed with a horizontal flange 133. The member 33 has a lug or key 233 to fit slidably into one of the slots 28 to key the member 33 against rotation on the extension 25, but leaving the member 33 free to be adjusted vertically on the extension. The member 33 may be locked in position on the extension by means of a set screw 333 between two of the slots 28. A plurality of vertical dependent posts or supports 34 is secured to the under side of the flange 133, and to their lower ends is secured an annular member 35.

The flange 133 is formed in its outer periphery, opposite each slot 28 and in radial alignment therewith, with a radially disposed slot 36 (Fig. 2). A stud 37 having an upstanding threaded shank to fit slidably in the corresponding slot 36 is removably mounted under the flange of the member 33 at each slot 36 by means of a nut on the shank of the stud to ensure rigidity and accuracy of position, the under side of the flange is counterbored slightly to receive the end of the stud.

On the lower end of each stud 37 is pivoted a bell crank lever 38, whose horizontal radially inwardly extending arm enters, at the tip thereof, the corresponding slot 28 and by means of a notch in the tip of the lever arm engages the

driving lug 32 of the corresponding needle. The other and depending arm of each lever 38 extends downwardly and is confined laterally with freedom to move radially, in a corresponding radial slot formed in the annular member 35.

Below the member 35 and stationarily supported on the top of the base 20 is a pair of complementary cam members 39 and 40 whose opposed edges define between them an endless cam slot 41 in which is actuably engaged the lower end of the depending arm of each lever 38.

Coaxially above the tip of the extension 25 is stationarily supported an annularly disposed group of strand guides 42 provided with appropriate guide means such as apertures through which strands 43 drawn from supplies not shown may be drawn to be knit together as a close fitting tubular sheath about a core strand 44 drawn by means not shown from a supply not shown, travelling down through the hollow centers of the group of guides 42, of the extension 25 and the shaft 21, and passing on down to be disposed of by being further treated or being wound up on a reel or the like not shown. The strand 44 as shown comprises a textile core 45 and a plurality of tinsel ribbons 46 wound thereon, and by the operation of the machine has an outer sheath of the strands 43 knitted closely thereover.

In operation, the strand 44 is drawn down through the machine by any suitable means not shown. The shaft 21 rotates carrying with it the extension 25 and its needles 29 and the members 33 and 35 and their levers 38. The cam 39, 40 and the strand guides 42 remain stationary. Thus the depending ends of the levers 38 are carried around in and moved radially to and fro by the cam track 41.

The needles are driven up and down by this action of the levers 38; and in rising and falling and in revolving about the core strand with the rotating extension 25 in which they are carried, the needles intermesh the strands 43, 43 on the core in the manner shown in Fig. 4. As this action is broadly old and well known, it is not necessary to describe it in detail.

It is to be noted that the cam 39, 41 is stationary and the supplies and guides 42 for the strands 43 are stationary. Only the needle carrier 25 with its immediate appurtenances rotates to knit. The number of lobes in the cam track 41 is equal to the number of strands 43; and by making the cam members 39 and 40 interchangeable for others, the number of strands 43 may be increased or diminished at will to vary the circumferential closeness of the knitting.

The adjustability up and down of the member 33 on the extension 25 is alone necessary and sufficient to vary the length of stitch and hence the longitudinal closeness of knitting. If the member 33 be raised, two cooperating results effect a closing together of the fabric. First, raising the fulcrums of the levers 38 lengthens the effective part of the upright arms of these levers and so diminishes the motion of the inner ends of the horizontal arms and hence shortens the stroke of the needles. Secondly, raising all the levers 38 lifts the entire group of needles correspondingly and a larger portion of the upper part of the stroke of the needles becomes idle motion above the strands, leaving a shorter part of their travel as the effective knitting part of their motion.

Thus all adjustment to vary the width and spacing of the knitted courses is effected by the single matter of adjusting the member 33 up or down on the extension 25, while the spacing of the knitted wales may be varied by simply interchanging the cam members 39 and 40 to provide a cam track 41 of more or fewer lobes. The first adjustability depends on the presence of the bell crank levers 38 which are a characteristic feature of the invention. The practicability of the second adjustment depends upon the presence of these levers also which permit the location of the cam track 31 at a sufficiently great distance from the axis of the machine to allow of a large number of lobes in the track as compared with some machines of the prior art in which a slender collar located immediately adjacent to and receiving the driving lugs of the needles is employed to drive the needles.

In the preferred form, as herein disclosed, the guides 42 and the cam members 39 and 40 are stationary, while the needle carrier 25 and its associated parts rotates. It is found in practice that such apparatus can be driven as fast as desired within reason. However, it is easily within the capacity of one skilled in the art to make the shaft 21 stationary and allow the base 20 to be rotated thereon, or to rotate the shaft 21 in one direction and the base 20 in the opposite direction.

The embodiment herein disclosed is illustrative only and may be widely modified and departed from without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. In an apparatus for knitting a tubular covering on a core, a stationary base member, a needle carrier rotatably mounted therein, an annularly disposed plurality of needles mounted in the carrier to be reciprocable individually therein and rotatable collectively therewith, stationary means mounted on the base member to supply a plurality of strands to the needles to be knitted thereby, cam means stationarily mounted on the base, and means mounted on the needle carrier to effect reciprocation of the needles by the cam means and comprising a plurality of substantially right-angled bell crank levers each having one arm engaged by the cam means and the other arm engaging one of the needles.

2. In an apparatus for knitting a tubular covering on a core, a stationary base member, a needle carrier rotatably mounted therein, an annularly disposed plurality of needles mounted in the carrier to be reciprocable individually therein and rotatable collectively therewith, stationary means mounted on the base member to supply a plurality of strands to the needles to be knitted thereby, cam means stationarily mounted on the base, and means mounted on the needle carrier to effect reciprocation of the needles by the cam means and comprising a plurality of substantially right-angled bell crank levers each having one arm engaged by the cam means and the other arm engaging one of the needles, the plurality of bell crank levers being collectively adjustable axially of the needle carrier.

3. In an apparatus for knitting a tubular covering on a core, a needle carrier, a plurality of reciprocable needles therein, means to supply a plurality of strands to the needles to be knitted thereby, cam means to reciprocate the needles, and means mounted on the needle carrier to transmit reciprocation to the needles from the cam means and comprising a plurality of levers each having one arm substantially parallel to the direction of reciprocation of the needles and engaged by the cam means and the other arm sub-

stantially perpendicular to the first named arm and engaging one of the needles, the levers being mounted on the needle carrier and adjustable axially thereof, all in combination with means to effect relative rotary motion of the needle carrier and needles with respect to the strand supply means and the cam means.

4. In an apparatus for knitting a tubular covering on a core, a needle carrier, a plurality of reciprocable needles therein, means to supply a plurality of strands to the needles to be knitted thereby, cam means to reciprocate the needles and interchangeable to vary the cam track thereof, and means mounted on the needle carrier to transmit reciprocation to the needles from the cam means and comprising a plurality of levers each having one arm substantially parallel to the direction of reciprocation of the needles and engaged by the cam means and the other arm substantially perpendicular to the first named arm and engaging one of the needles, the levers being mounted on the needle carrier and adjustable axially thereof, all in combination with means to effect relative rotary motion of the needle carrier and needles with respect to the strand supply means and the cam means.

BEN K. FORD.