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[54] **APPARATUS FOR AUTOMATICALLY REMOVING THE COVERING FROM COVERED WIRE AND WINDING THE UNCOVERED WIRE ON A ROD MEMBER**

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[52] **U.S. Cl.** ..... **29/203 D**

[51] **Int. Cl.** **H01r 43/04**

[58] **Field of Search** ..... 29/203 D, 203 DT, 29/203 S, 203 B

[56] **References Cited**

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Primary Examiner—Thomas H. Eager

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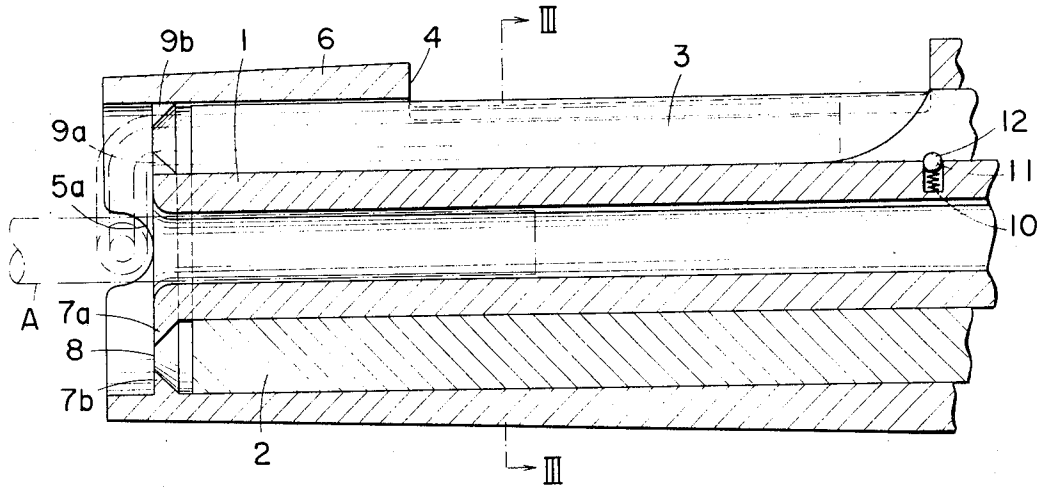
[57] **ABSTRACT**

An apparatus having three coaxial tubular members. The intermediate tubular member is formed therein with an axial slot opening in the free end face of the member for receiving an end portion of a covered wire and is rotatable relative to the inner and outer tubular members which are held stationary against rotation and which have annular knife edges radially extending toward each other to define therebetween an annular gap of a radial dimension substantially equal to the diameter of uncovered wire. The knife edges are formed therein with radially aligned arcuate notches defining together a substantially circular opening with which the slot can be moved into axial alignment and through which the covered wire can be axially received at one end into the slot. The inner tubular member is adapted to axially receive a rod member. When the intermediate tubular member is rotated relative to the other tubular members with the portion of the covered wire outward of the knife edges being engaged with the rod member, the wire is wound on the rod member and drawn through the annular gap whereby the covering is removed from the covered wire located within the slot and the uncovered wire is successively wound on the rod member.

7 Claims, 4 Drawing Figures



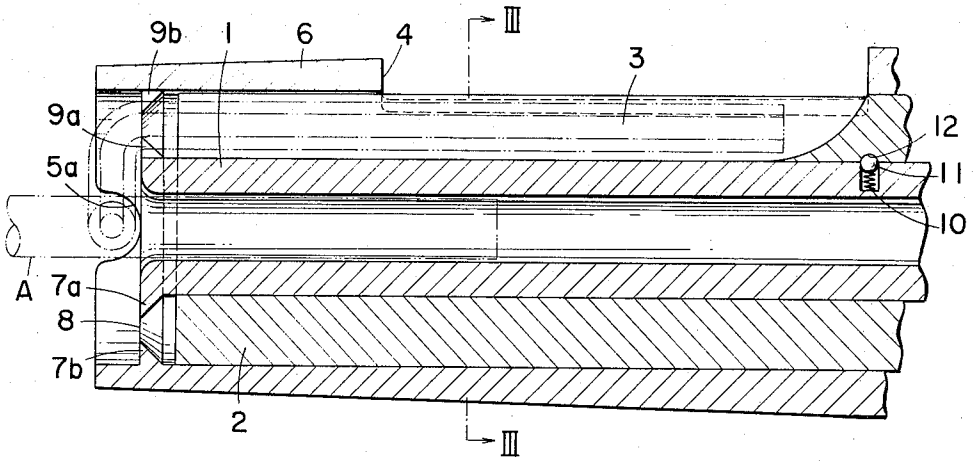


FIG. 1

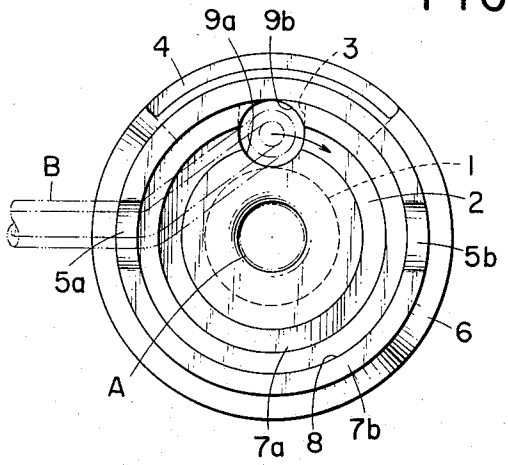


FIG. 2

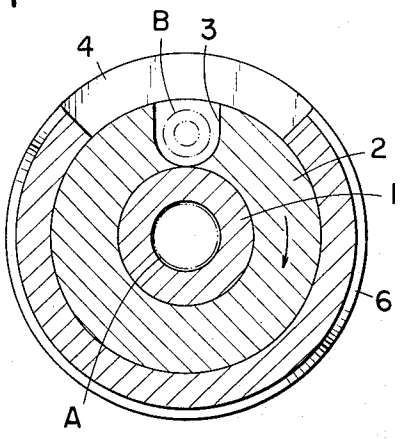


FIG. 3

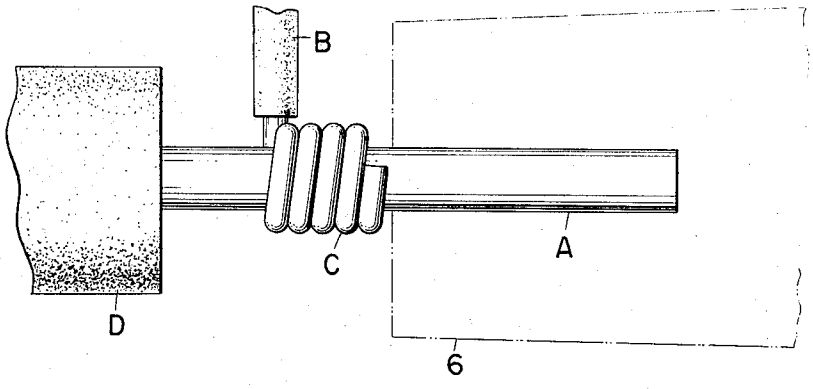


FIG. 4

APPARATUS FOR AUTOMATICALLY REMOVING THE COVERING FROM COVERED WIRE AND WINDING THE UNCOVERED WIRE ON A ROD MEMBER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for automatically removing the covering or insulating layer from a covered wire and winding the uncovered wire on a cylindrical rod member to form an electrical connection between the wire and the rod member.

2. Description of Prior Art

It is frequently required to remove or peel off the covering or insulating layer from a length of covered wire and tightly wind the uncovered wire on an electrical conductive elongated member such as rod member so as to form an electrical connection beween the wire and the rod member.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel and advantageous apparatus which has a simple construction and which is operative to automatically remove the covering from a length of covered wire and tightly wind the uncovered wire on a rod member.

In order to achieve the above object, the present invention provides an apparatus for automatically removing the covering from a length of covered wire and winding the uncovered wire on a rod member, said apparatus including a first stationary tubular member having an inner diameter somewhat greater than the diameter of said rod member so as to axially receive said rod member, a second tubular member rotatably mounted on and extending around said first tubular member, said second tubular member having peripheral wall of a thickness somewhat greater than the diameter of said covered wire, means for momentarily holding said second tubular member at a stationary position with respect to said first tubular member, a slot formed in the portion of the peripheral wall of said second tubular member adjacent the forward end thereof, said slot having circumferential and radial dimensions both somewhat greater than the diameter of said covered wire, a third stationary tubular member mounted on and extending around said second tubular member, said third tubular member having its forward end face disposed adjacent said forward end of said second tubular member, at least one recess in said forward end of said third tubular member, a first annular knife edge on the outer peripheral surface of said first tubular member adjacent the forward end thereof which is disposed adjacent said forward end of said second tubular member, a second annular knife edge on the inner peripheral surface of said third tubular member, said first and second annular knife edges being substantially radially aligned and spaced from each other to define therebetween an annular gap of a radial dimension substantially equal to the diameter of said uncovered wire, radially aligned arcuate knotches respectively formed in said annular knife edges at the portions thereof which are axially aligned with said slot in said second second tubular member when the latter is in said stationary position, said arcuate notches each having its radius of curvature substantially equal to the radius of said wire, said arcuate notches defining a generally circular opening in said knife edges through which said covered wire is adapted to be axially received at one end into said slot, a portion of said covered wire outward of said knife edges being adapted to be held in engagement with said recess in said forward end of said third tubular member, the rotation of said second tubular member relative to said first and third tubular members in one direction causing the portion of said covered wire within said slot to be withdrawn through said annular gap between said knife edges while the covering of the last said portion of said covered wire is successively removed by said knife edges whereby the uncovered wire is successively wound on the portion of said rod member outward of said first tubular member.

The above and other objects, features and advantages of the invention will be made apparent by the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary axial sectional view of an embodiment of the apparatus according to the present invention;

FIG. 2 is an end view of the apparatus as viewed from the left of FIG. 1;

FIG. 3 is a cross-section taken along the line III—III in FIG. 1; and

FIG. 4 illustrates in side view a rod member on which a length of uncovered wire is wound.

DESCRIPTION OF A PREFERRED EMBODIMENT

The apparatus of the invention includes an inner tubular member **1** fixed at one or rearward end (not shown) to a machine frame (not shown) and having an inner diameter somewhat greater than the diameter of a rod member on which a length of uncovered wire C is to be wound by the apparatus. A second tubular member **2** is mounted on and extends around the outer peripheral surface of the tubular member **1** for rotation with respect to the tubular member **1.** The other or forward end of the first tubular member **1** extends axially outwardly beyond the forward end of the second tubular member **2** a distance. The rearward end of the second tubular member **2** is omitted from the illustration on the drawings.

Means are provided to momentarily hold the second tubular member **2** at a stationary position with respect to the first tubular member **1.** Preferably, these means may comprise a compression spring member **10** received in a recess formed in the outer peripheral surface of the first tubular member **1,** a steel ball **11** radially outwardly biased by the spring member **10,** and a spherical recess **12** formed in the inner peripheral surface of the second tubular member **2.** The arrangement is such that the ball **11** is urged into locking engagement with the recess **12** when the second tubular member **2** is rotated to said stationary position. It is, however, to be understood that the ball **12** will be disengaged from the recess **12** when the second tubular member **2** receives a torque of a magnitude which is greater than the locking force generated by the spring member **10,** the ball **11** and the spherical recess **12.**

The second tubular member **2** has a wall thickness slightly greater than the diameter of the covered wire B and is formed with a slot **3** advantageously extending axially in the portion of the peripheral wall of the tubular member **2** adjacent the forward end thereof and opening in the end face of the forward end of the tubu-

lar member 2 for the purpose to be made apparent later. Preferably, the slot 3 has a generally U-shaped cross-section and radial and circumferential dimensions, i.e., depth and width, both substantially equal to the diameter of the covered wire.

A third or outer tubular member 6 is fixed at one or rearward end (not shown) to the machine frame and extends around the second tubular member 2. As will be seen in FIG. 1, the third tubular member 6 has an opening 4 in the portion of the peripheral wall thereof which is substantially radially and axially aligned with the rearward end portion of the slot 3 in the second tubular member 2 when the latter is in said stationary position, i.e., the ball 11 engages with the recess 12, so that the opening 4 can communicate with the slot 3. The tubular member 6 is also formed in its forward end face with a pair of recesses 5*a* and 5*b* which are preferably opposed diametrically of the tubular member 6. Each of the recesses 5*a* and 5*b* preferably has a circumferential dimension, i.e., width, somewhat greater than the diameter of the covered wire B. In addition, the forward end portion of the tubular member 6 preferably extends axially beyond the forward end of the tubular member 2 a distance substantially equal to the axial dimension, i.e. depth, of the recesses 5*a* and 5*b*.

As best shown in FIG. 1, an annular knife edge 7*a* is formed on and radially outwardly extends from the outer peripheral surface of the other end portion of the first tubular member 1. Similarly, a second annular knife edge 7*b* is formed on and radially inwardly extends from the portion of the inner peripheral surface of the third tubular member 6 which is generally radially aligned with the first annular knife edge 7*a* so that the knife edges 7*a* and 7*b* are radially aligned but radially spaced from each other to define therebetween an annular gap 8 of a width or radial dimension substantially equal to the diameter of the uncovered wire C.

In the portions of the annular knife edges 7*a* and 7*b* which are axially aligned with the slot 3 in the second tubular member 2 when it is in said stationary position, formed are generally arcuate notches 9*a* and 9*b* which are radially aligned and each of which has its radius of curvature substantially equal to the radius of the covered wire B. The notches 9*a* and 9*b* cooperate with the annular gap 8 to define a substantially circular opening.

In operation, the second tubular member 2 will be rotated in a direction to a position in which the ball 11 is engaged with the recess 12 so that the circular opening defined by the notches 9*a* and 9*b* in the knife edges 7*a* and 7*b* is axially aligned with the slot 3 in the second tubular member 2. Then, the rod member A will be inserted at one end into the bore in the first tubular member 1 to a desired depth, as shown by broken lines in FIG. 1, and will be held against rotation. Then, the covered wire B will be inserted at one end through the circular opening defined between the notches 9*a* and 9*b* into the slot 3 in the second tubular member 2 to a desired depth which corresponds to the length of the wire required to be wound on the rod member A. A portion of the covered wire B extending outwardly from the knife edges 7*a* and 7*b* will be forced into engagement with one (5*a*, for example) of the recesses 5*a* and 5*b* in the forward end face of the outer tubular member 6 and will be mannually held against removal from the recess 5*a*. The second tubular member 2 will then be rotated relative to the first and third tubular members 1 and 6 in a direction, for example in clockwise direction as viewed in FIG. 2, by any conventional means (not shown). This causes the slot 3 to be moved along a circular path parallel to the annular gap 8 between the knife edges 7*a* and 7*b*. For the reason, the portion of the covered wire B which has been engaged with the notches 9*a* and 9*b* in the edges 7*a* amd 7*b* is forced into and moved along the annular gap 8 so that the covering on the covered wire is severed by the opposite knife edges. It will also be appreciated that, since the portion of the covered wire B outward of the knife edges 7*a* and 7*b* is held in engagement with the recess 5*a* in the forward end face of the stationary third tubular member 6 while the point on the covered wire at which the covered wire is engaged with the knife edges is successively shifted circumferentially along the annular gap 8 by the relative rotation of the second tubular member 2 with respect to the first and third tubular members 1 and 6, the portion of the covered wire B which has initially been positioned outwardly of the annular knife edges 7*a* and 7*b* is first brought into engagement with the peripheral surface of the portion of the rod member A extending outwardly of the first tubular member 1. As the rotation of the second tubular member is continued, the portion of the covered wire B outward of the knife edges 7*a* and 7*b* is wound around the rod member A. This causes the portion of the covered wire B within the slot 3 to be withdrawn out of the slot through the gap 8 so that the knife edges 7*a* and 7*b* are operative to remove or peel off the covering from the covered wire B, with a result that the uncovered wire C is drawn through the gap 8 and is successively wound tightly on the rod member A to form spiral convolusion thereon. Successive increase in the axial dimension of the spiral convolusion on the rod member will generates an axially outward thrust force which acts on the rod member A to withdraw the same from the first tubular member 1.

In the illustrated embodiment of the invention, the rod member A is shown as being a cylindrical terminal member extending from a base D of an electric instrument (not shown).

With the foregoing description, it will be appreciated that the rotation of the second tubular member relative to the first and third tubular members 1 and 6 is operative to tightly with a length of uncovered wire C on a rod member A. The covering peeled from the wire may be conveniently discharged from the slot 3 through the opening 4 in the third tubular member when the slot 3 is bought into radial alignment with the opening 4.

What is claimed is:

1. An apparatus for automatically removing the covering from a length of covered wire and winding the uncovered wire on a rod member, said apparatus including a first stationary tubular member having an inner diameter somewhat greater than the diameter of said rod member so as to axially receive said rod member, a second tubular member rotatably mounted on and extending around said first tubular member, said second tubular member having a peripheral wall of a thickness somewhat greater than the diameter of said covered wire, means for momentarily holding said second tubular member at a stationary position with respect to said first tubular member, a slot formed in the portion of the peripheral wall of said second tubular member adjacent the forward end thereof, said slot having circumferential and radial dimensions both somewhat greater than the diameter of said covered wire, a third stationary tu-

bular member mounted on and extending around said second tubular member, said third tubular member having its forward end face disposed adjacent said forward end of said second tubular member, at least one recess in said forward end of said third tubular member, a first annular knife edge on the outer peripheral surface of said first tubular member adjacent the forward end thereof which is disposed adjacent said forward end of said second tubular member, a second annular knife edge on the inner peripheral surface of said third tubular member, said first and second annular knife edges being substantially radially aligned and spaced from each other to define therebetween an annular gap of a radial dimension substantially equal to the diameter of said uncovered wire, radially aligned arcuate knotches respectively formed in said annular knife edges at the portions thereof which are axially aligned with said slot in said slot in said second tubular member when the latter is in said stationary position, said arcuate notches each having its radius of curvature substantially equal to the radius of said covered wire, said arcuate notches defining a generally circular opening in said knife edges through which said covered wire is adapted to be axially received at one end into said slot, a portion of said covered wire outward of said knife edges being adapted to be held in engagement with said recess in said forward end of said third tubular member, the rotation of said second tubular member relation to said first and third tubular members in one direction causing the portion of said covered wire within said slot to be withdrawn through said annular gap between said knife edges while the covering of the last said portion of said covered wire is successively removed by said knife edges whereby the uncovered wire is successively wound on the portion of said rod member outward of said first tubular member.

2. An apparatus as claimed in claim **1,** in which said third tubular member is formed with an opening in the peripheral wall thereof, at least a part of said slot in said second tubular member being axially aligned with the last said opening so that the covering removed from said wire is discharged through said opening when the latter is brought into radial alignment with said slot.

3. An apparatus as claimed in claim **1,** in which said momentarily holding means comprise a recess in one of the outer peripheral surface of said first tubular member and the inner peripheral surface of said second tubular member, a compression spring member received in the last said recess, a ball member of a hard material on said spring member, and another recess in the other of said two spherical surfaces having a spherical surface, said spring member urging said ball member into locking engagement with said other recess when said second tubular member is in said other recess when said second tubular member is in said stationary position with respect to said first tubular member.

4. An apparatus as claimed in claim **3,** in which said slot extends axially of said second tubular member, said slot having a substantially U-shaped cross-section.

5. An apparatus as claimed in claim **4,** in which said third tubular member is formed with a pair of diametrically opposite recesses in the forward end face thereof.

6. An apparatus as claimed in claim **4,** in which said first tubular member has its forward end axially extending a distance beyond the forward end of said second tubular member.

7. An apparatus as claimed in claim **5,** in which said third tubular member has its forward end axially extending beyond the forward end of said second tubular member a distance substantially equal to the axial dimension of said recesses in said forward end face of said third tubular member.

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