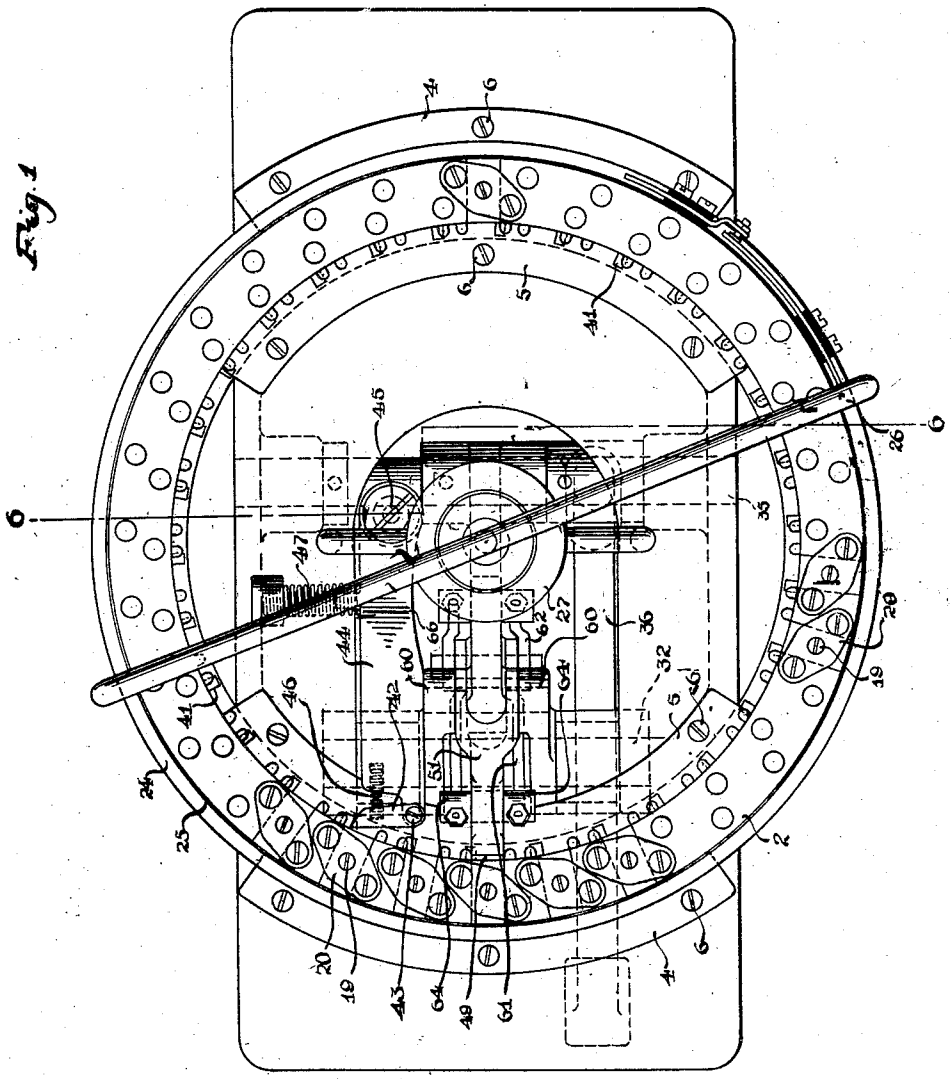
June 10, 1930. W. A. RANKIN 1,763,255

METHOD OF BINDING THE ENDS OF ELECTRICAL CONDUCTOR CORDS AND TO AN APPARATUS USED IN SUCH METHOD

Filed April 20, 1927 5 Sheets-Sheet 1

Fig. 1



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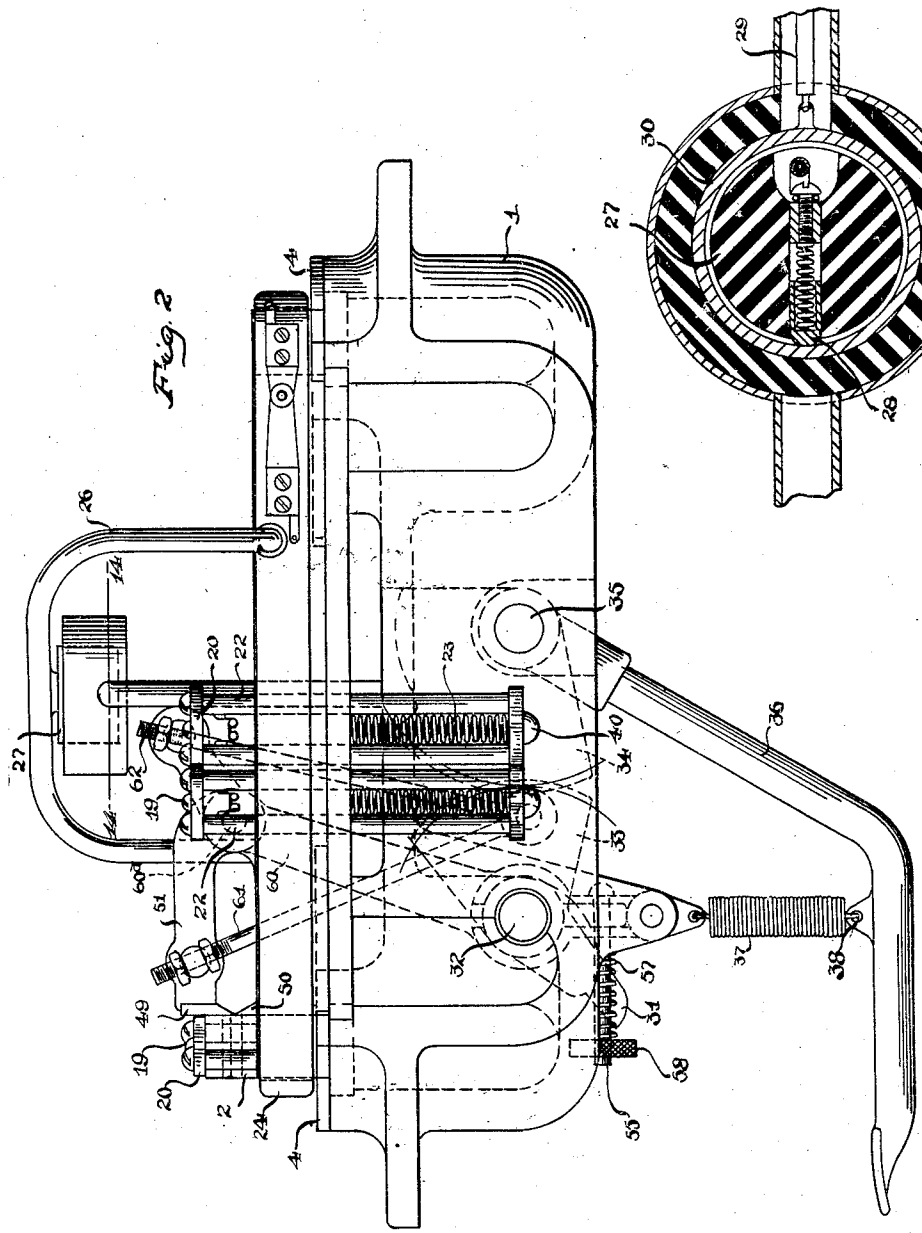


Fig. 2

Fig. 4

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METHOD OF BINDING THE ENDS OF ELECTRICAL CONDUCTOR CORDS AND TO AN APPARATUS USED IN SUCH METHOD

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Fig. 3

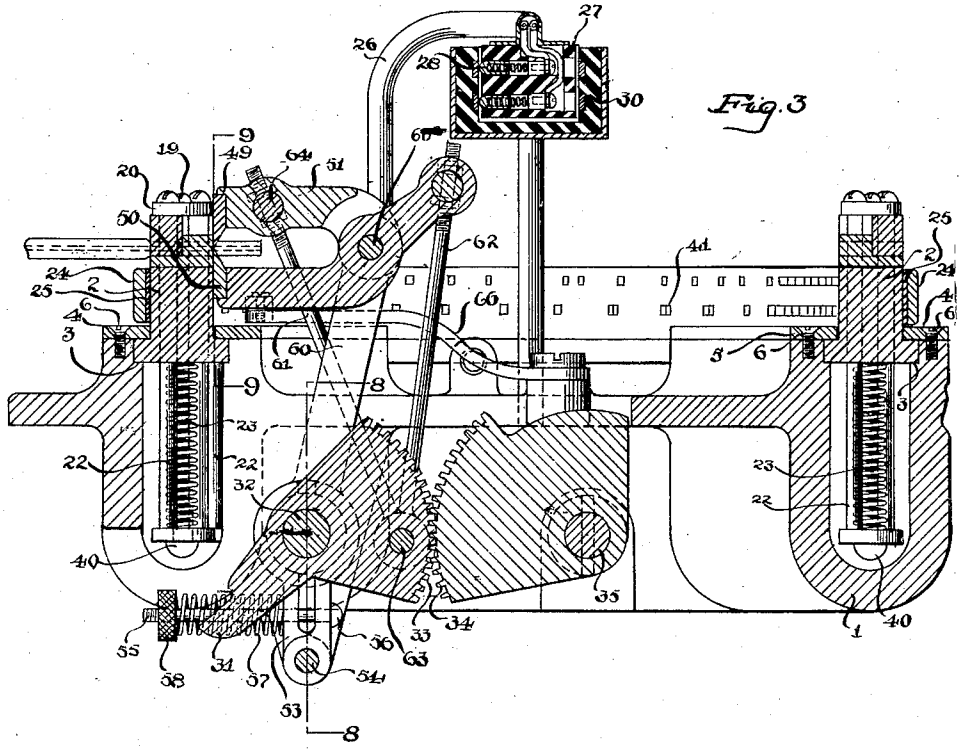
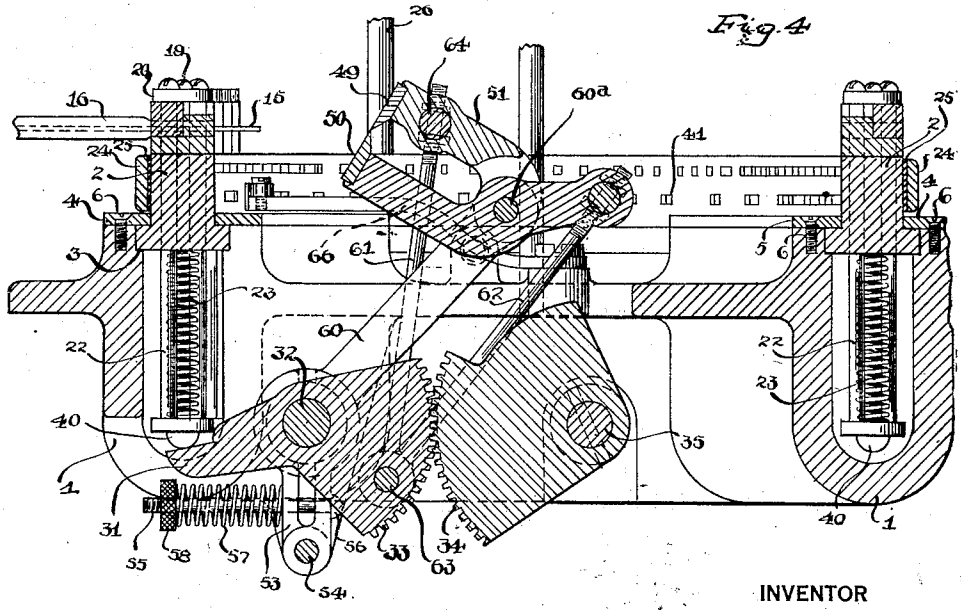


Fig. 4



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METHOD OF BINDING THE ENDS OF ELECTRICAL CONDUCTOR CORDS AND TO AN APPARATUS USED IN SUCH METHOD

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Fig. 5

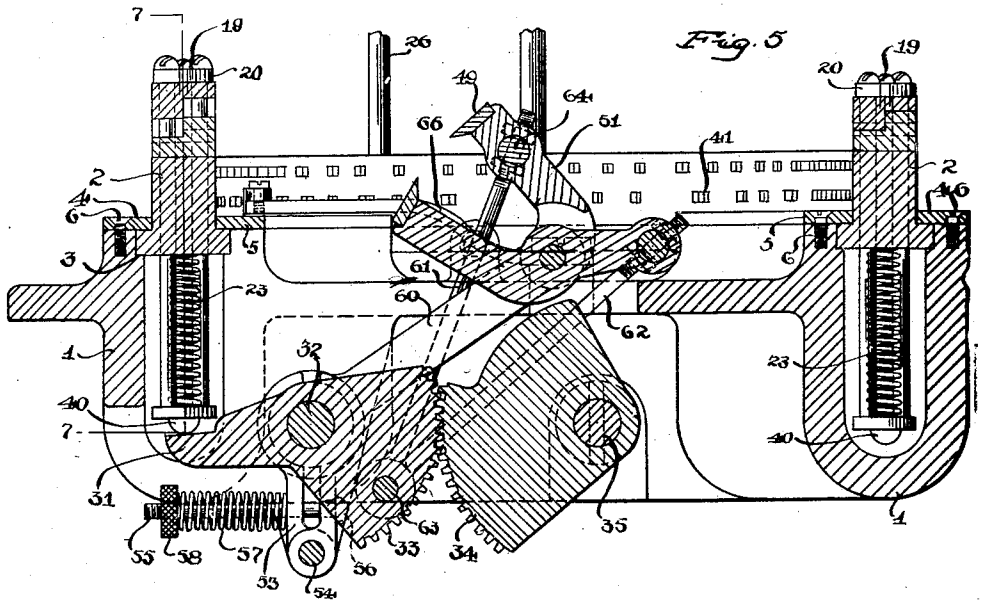
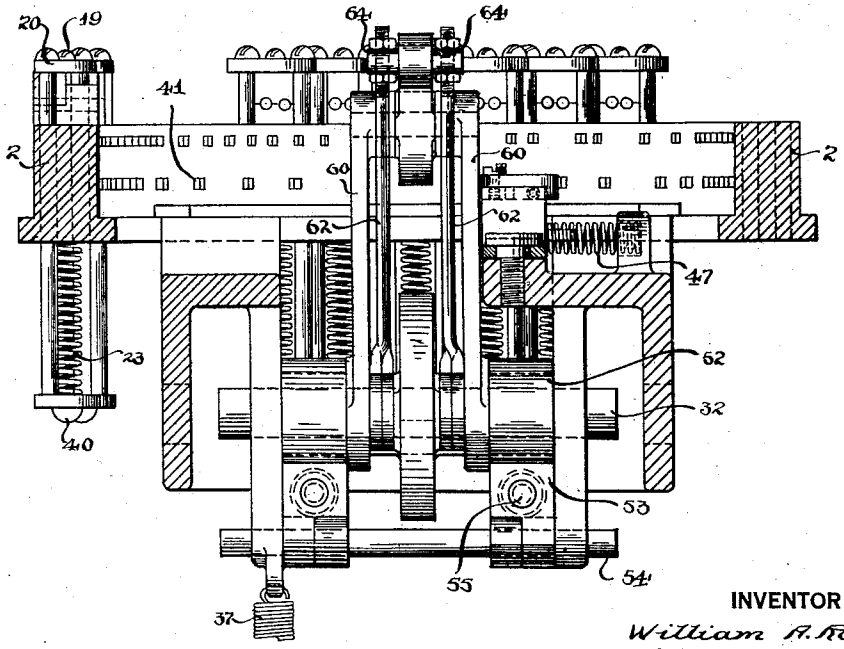


Fig. 6



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METHOD OF BINDING THE ENDS OF ELECTRICAL CONDUCTOR CORDS AND TO AN APPARATUS USED IN SUCH METHOD

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Fig. 10

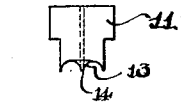


Fig. 11

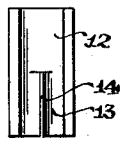


Fig. 12

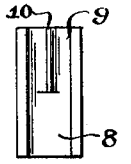


Fig. 13

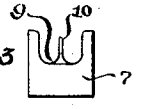


Fig. 10a



Fig. 11a

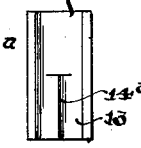


Fig. 12a

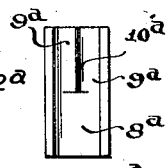
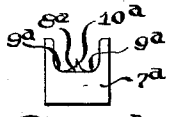


Fig. 13a



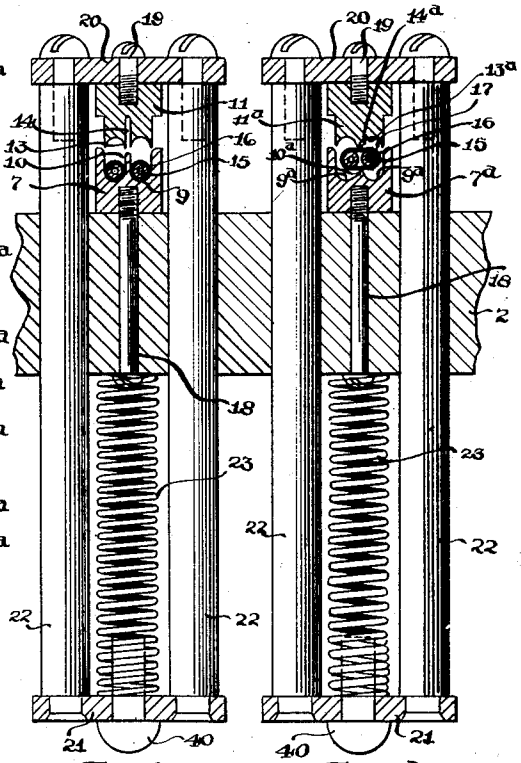
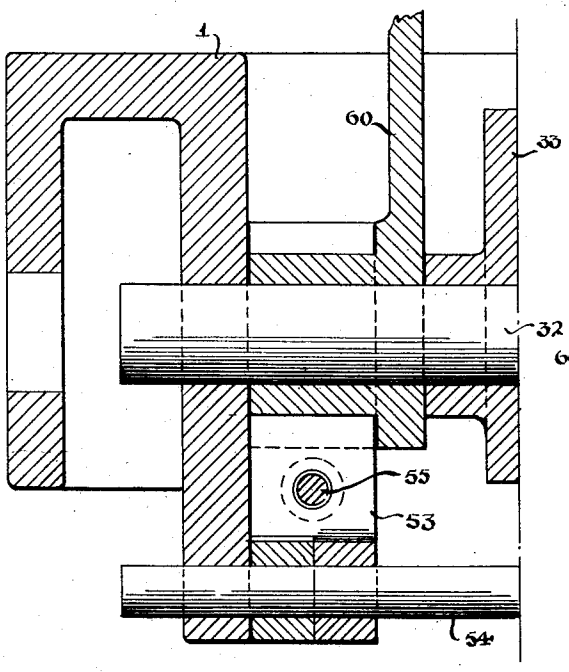


Fig. 7

Fig. 7a

Fig. 8



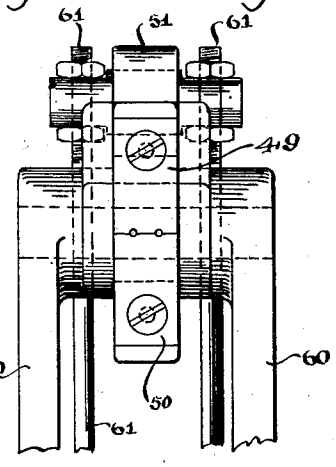


Fig. 9

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UNITED STATES PATENT OFFICE

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METHOD OF BINDING THE ENDS OF ELECTRICAL CONDUCTOR CORDS AND TO AN APPARATUS USED IN SUCH METHOD

Application filed April 20, 1927. Serial No. 185,326.

The present invention relates to a method of binding the ends of electrical conductor cords and to an apparatus used in such method. An object of this invention is to provide an improved method and means for the binding of the ends of an electrical conductor cord so as to secure the braid and confine stray strands of the same and of the insulation in order to aid in assembly and present a neater appearance in the finished cord.

To these and other ends, the invention consists of the novel features in the method and in the apparatus pointed out in the appended claims.

In the drawings:

Fig. 1 is a plan view of one embodiment of the invention;

Fig. 2 is a side view of the same embodiment, part of the molding devices being removed so as not to complicate the illustration;

Fig. 3 is a vertical section through the center of the machine showing the stripping jaws in operative position;

Fig. 4 is a similar view showing the jaws just prior to their opening movement;

Fig. 5 is a similar view showing the jaws in open position;

Fig. 6 is a section on the line 6—6, Fig. 1;

Fig. 7 is a fragmentary sectional view on the line 7—7, Fig. 5 showing one form of molding device;

Fig. 7[a] is a similar view showing another form of molding device equipped with a cutting means;

Fig. 8 is a section on the line 8—8, Fig. 3;

Fig. 9 is a fragmentary view on the line 9—9, Fig. 3;

Figs. 10 to 13 inclusive are respectively an end and bottom view of a male die and a top and end view of a female die such as are employed in Fig. 7;

Figs. 10[a] to 13[a] inclusive are similar views of the die employed in Fig. 7[a]; and

Fig. 14 is a section on the line 14—14, Fig. 2.

Prior to this invention the braid and frayed parts of electrical conductor cords have been secured by sodium silicate or other quick drying binder without the action of pressure or heat. This aids in the assembly but it lacks in strength and is not permanent as the binder soon permits the braid to fray.

According to this invention the cord ends, preferably before the insulation is removed to provide terminals, are dipped in a binder and then subjected to pressure in mold preferably in spaced relation to the extreme ends which are to form the terminals. While in the molds, the latter are preferably subjected to heat to cure or set the binder. The binder which it is preferred to use is a phenol formaldehyde condensate but rubber or other cement preferably requiring heat to cure or set may be employed. It is preferred to remove the insulation from the cords to form the terminals while the cords are in the molds and after the curing of the binder as this eliminates the reclamping of the cords for a separate insulation removing step. The best results are secured by leaving the ends of each mold open so that the main portion of a cord may extend from one side and a terminal forming portion may extend from the opposite side for the removal of the insulation. For treating cords having two conductors each mould may have adjacent one end a wide portion to receive both conductors and adjacent the opposite end two separated spaces one for each conductor. When two parallel conductors are employed each mold may be equipped with a cutting means adjacent one side for cutting the braid between the conductors.

There is herein shown and described a desirable form for an apparatus constructed in accordance with this invention and capable of carrying out the method herein set forth. In this illustrated embodiment, there is employed a base frame or bed piece 1 supporting a movable mold carrier 2 which, in this instance, is of annular formation and is rotatable on the base frame. In order that the mold carrier may rotate on the base frame, the latter is provided with an annular groove or way 3 on which the mold carrier 2 moves, retaining pieces 4 and 5 being removably secured by screws 6 in overhanging relation with reference to the groove 3 and also to the mold carrier 2 to hold the mold carrier to the bed piece 1.

The mold carrier has mounted thereon a plurality of molds of any suitable construction, one form of molds being shown in Fig. 7 and 10 to 13 inclusive and another form being shown in Fig. 7ª and 13ª inclusive both of such constructions having open ends.

The mold shown in Figs. 7 and 10 to 13 inclusive embodies a lower female member 7 having a wider part 8 adjacent its outer end and a part adjacent its opposite end divided into two grooves 9 by a partition 10. The male member 11 fits within the female member and is provided with a wide groove 12 adjacent its inner end for cooperation with the groove 8 of the female member and is divided into two grooved projections 13 by a slot 14 which receives the partition 10 of the female die. This particular embodiment of the dies is designed for cords having two strands, each provided with its conductor 15 insulation 16 and braid 17.

In the embodiment of the invention shown in Figs. 7ª to 10 to 13ª inclusive the female member 7ª has a wide portion or groove 8ª near one end and near the opposite end a knife or cutting edge 10ª which divides the die into two channels 9ª. The male member 11ª fits within the female member 7ª and has a wide portion at its inner end while adjacent its opposite ends it is divided into two channels 13ª by a knife edge 14ª. This form of mold is designed for that type of cord in which two electric conductors 15 are surrounded by their individual insulating materials 16 and both are enclosed in a single braid 17. The knife edges 10ª and 14ª severs the braid and then forces the two conductors into their respective channels and molds the severed portions of the braid about the two conductors.

In both illustrated embodiments the female mold members are secured to the mold carrier 2 by bolts 18 which pass through said carrier. The male members are secured by bolts 19 to a male member carrier of which there is one for each mold. In this instance, each male member carrier embodies two cross pieces 20 and 21 connected by two parallel guide rods 22 passing through the die carrier 2. The male member is secured to the cross piece 20 above the carrier and a spring 23 is interposed between the carrier 2 and the cross piece 21 and acts normally to hold the male member toward the female member.

A heating means for the mold may consist of a ring 24 surrounding the mold carrier and turning therewith, said ring being insulated from the mold carrier at 25 and carrying any suitable electrical resistance and a thermostat 24ª being connected to the ring to cut out the resistance when the heat becomes excessive. As this ring rotates with the mold carrier some means could be provided for connecting the resistance with a stationary electrical source. To this end a tubular yoke 26 is connected at opposite ends to the ring 24 and this yoke supports an insulating block 27 having two movable contacts 28 thereon connected by conductors 29 to the terminals of the resistance in the heating ring 24. The insulating block 27 rotates with the die holder 2 and depends into a receptacle 29 having internal conductor rings 30 which are engaged by the contacts 28. The rings 30 connect with any suitable electrical source.

For effecting the opening of the molds in order to receive and to discharge the cords an opening means may be employed comprising, in this instance, a lever 31 on a shaft 32 having a segmental gear 33 with which a segmental gear 34 cooperates. The gear 34 is pinned to a shaft 35 to which is connected a foot treadle 36, the latter being acted upon a spring 37 secured to one end of the foot treadle at 38 and at the opposite end of the frame 1. The end of the lever 31 cooperates with the head of pin 40 which also acts as a centering pin for the springs 23. When a lever 31 is raised it pushes upwardly on a male member carrier and compresses a spring 23 thus separating the male member from the female member. With the lowering of the lever 31, the spring 23 moves the male member toward the female member and holds it there until the lever 31 acts on the male member carrier.

The different molds are successively presented to the mold opening means. This result is obtained in this instance, by providing teeth or projections 41 on the inner periphery of the mold carrier 2, and engaging said teeth successively by a pawl 42 pivoted at 43 to a lever 44 which in turn is pivoted at 45 to the main frame or bed piece 1, the lever 44 being mounted to swing horizontally and a spring 46 being interposed between the lever and the pawl for holding the pawl toward the die carrier 2 in the path of the teeth 41. A spring 47 acts on the lever 24 and also against an abutment of the bed piece 1. This latter spring moves the lever 44 in the direction to cause the pawl 42 to ride over the teeth 41 in order to engage behind the same. Movement of the pawl operating lever 44 in the opposite direction may be effected in any suitable manner, one form of operating mechanism being hereinafter described.

When the cords are introduced into the molds their free ends are projected slightly beyond the inner periphery of the mold carrier 2, and means is provided for removing the braid and the insulation from these projecting portions to provide the terminals for the cords. In this instance, this means comprises an upper knife or stripper 49 and a lower knife or stripper 50 both provided with recesses to conform with the conductor. The upper knife 49 is mounted on a carrier 51 pivoted at 60ª on two links 60, while an upper knife carrier 51ª is also pivoted at 60ª

on the two links 60. Each link has its lower end mounted to turn on the shaft 32 and is provided at such lower end with a sleeve 52 coaxial with the shaft and surrounding the same.

Means is provided for resisting the turning of the links 60 on the shaft 32. In this instance, this means comprises two levers 53 for each link mounted to swing on a rod 54 and held in engagement with the sleeve 52 by a rod 55 passing through both levers. A head 56 on the rod 55 cooperates with the outer side of one lever and a helical spring 57 surrounds the rod 55 and cooperates with the outer side of the other lever. A nut 58 on the rod 55 is designed to vary the tension of the spring 57.

Relative movement between the two jaw carriers 51 and 51ª may be effected through two pitmen 61 and 62 both pivoted at 63 on a common axis on the lever 31 eccentric to the turning axis of said lever. The pitman 61 is pivotally and adjustably connected at 64 to the knife carrier 51 to one side of the pivot 60ª, whereas the pitman 62 is pivotally and adjustably connected to the lever or knife carrier 51ª on the opposite side of the pivotal axis 60ª. One of the links 60 cooperates at its side with a cam portion 66 on the side of a lever 44 and through this cooperation controls the movement of the mold carrier 2. The forward movement of the links 60 moves the lever 44 against the action of the spring 47 and advances the mold carrier, whereas the rearward movement permits the lever 44 to swing under the action of the spring 47 and presents the pawl 42 to a new tooth 41. In order to hold the mold carrier against turning during the stripping and also in proper relation to the stripping mechanism, pins 63ª are projected from the inner face of the mold carrier and the lower cutter or knife 50 is adapted to pass between two of these pins as the cutters approach the mold carrier. The engagement of the pins with the sides of the cutter 50 holds the mold carrier against turning and also in proper centered relation to the stripping mechanism.

The operation of the invention is as follows: The operative first dips the end of the cord in the binding material such as a phenol formaldehyde condensate, rubber cement or other material. Then the cord end is placed in one of the molds while it is open as shown in Figs. 7 and 7ª. If the cord end has its two conductors each provided with a separate or individual braid then a mold similar to that shown in Fig. 7 is employed but if the conductors have a common braid a mold similar to that shown in Fig. 7ª is employed. Normally the parts occupy the positions shown in Fig. 3. With the depression of the treadle, the levers 60 being retarded by the brakes 53, the knives first close severing the insulation then the links 60 are swung rearwardly, thus effecting first the stripping of a cord end of its insulation and braid and then the opening of the mold to release such cord end, the cord end having been subjected previously to heat and compression after treatment with the binder. While the mold is open, another cord end dipped in bakelite, rubber cement or other binder is introduced into the open mold. Upon release of the treadle, the links 60 are held against movement by the retarding brakes 53 and so that the lever 31 moves first to permit the partial closing of the mold and thereafter the stripping knives jaws are opened through the pitmen 61 and 62. These jaws then travel in open position under the action of the spring 37 toward the inner face of the mold carrier 2. In moving toward the mold carrier, one of the links 60 engages the cam surface 66 and shifts the lever 44 to advance the mold carrier one step in order to bring another and treated cord end into position to be operated upon by the stripping mechanism. After the mold carrier 2 has been advanced one step, the stripping jaws come in contact with the rear face of the carrier and cannot proceed any further with the lever 31, with the result that the pitmen 61 and 62 come into operation and move the jaws 51 and 51ª in opposite directions to close them upon the projecting portion of the cord, ready for another operation of the machine.

What I claim as my invention and desire to secure by Letters Patent is:

1. A method of binding the ends of conductor cords having two parallel conductors enclosed in a single covering which consists in impregnating the covering adjacent the end thereof with a binder, slitting the covering on both sides between the cords in the impregnated portion, and molding the slit impregnated portion of the covering to conform to the two conductors.

2. A method of binding the end of electrical cords which consists in applying a binder to the end of a cord, subjecting the end and the binder thereon to pressure at a point in spaced relation to the extreme end of the cord while exposing the free end portion beyond the end subjected to pressure, and stripping the exposed free end portion to expose the conductor while the adjacent portion is subject to pressure.

3. A method of binding the end of electrical cords which consists in applying a heat setting binder to the end of a cord, simultaneously subjecting the binder containing portion to pressure and to heat at a point in spaced relation to the extreme end of the cord to set the binder while exposing the free end portion and stripping the exposed free end to expose the conductor while the adjacent portion is subject to pressure.

4. A method of binding the ends of electrical cords which consists in applying a

binder to a cord having two parallel conductors enclosed by a single cover, slitting the cover on opposite sides between the two conductors in the binder containing portion, and subjecting the slit portion and the binder containing portion in immediate proximity thereto to a molding action so that a part of the slit cover is molded about one of the conductors and the other part is molded about the other conductor.

5. A mold for the purpose set forth having open ends and formed adjacent one end with a wide portion to receive two conductors with a common covering, and adjacent the opposite end with a partition separating the two conductors.

6. A mold for the purpose set forth having open ends and formed adjacent one end with a wide portion to receive two conductors with a common covering, the mold having two parts provided with cooperating knives adjacent the other end of the mold to cut the braid and separate the two conductors.

7. A machine of the class described comprising a mold carrier, two part open ended molds on the carrier, one of the mold parts of each mold being movable, mechanism for moving the mold carrier step by step, and mechanism for opening the molds at a common point to provide for the introduction and the removal of conductor cords, stripping means and means for causing said stripping means to operate on the projecting ends of conductors in the molds.

8. A machine of the class described comprising a mold carrier, two part open ended molds on the carrier, one of the mold parts of each mold being movable, mechanism for moving the mold carrier step by step, mechanism for opening the molds at a common point to provide for the introduction and the removal of conductor cords, means for heating the molds, stripping means, and means for operating said stripping means to cause it to remove portions of the coverings of the conductor cords projecting through open ends of the molds.

9. A machine of the class described comprising a mold having open ends and stripping mechanism arranged to cooperate with an end of a cord projecting from one of such open ends.

10. A machine of the class described comprising, an open ended mold having two parts, one of which is held toward the other with yielding pressure, a stripping mechanism arranged to remove the insulation from the end of a cord projecting from one of the open ends, and mold opening means having connection with the stripping means for effecting the operation of the latter while the mold is closed.

11. A machine of the class described comprising, a mold having a movable part, spring means holding said movable part in cooperative relation with the other part, an opening means for effecting the movement of the movable part against the action of the spring means, stripping means for cooperating with projecting portions of a cord in the mold, and a common operator for the opening means, and the stripping means.

12. A machine of the class described comprising an annular mold carrier, means for supporting said mold carrier for rotary movement, open ended molds arranged on the carrier, and a stripping mechanism operating within the central opening of the mold carrier to cooperate with ends of conductor cords projecting from the inner open ends of the molds.

13. A machine of the class described comprising a mold, a pivoted mold opener, a member mounted to turn on the axis of the pivoted mold opener, retarding means for opposing the movement of said member, a pair of stripper jaws pivoted to said member on a common axis, and two pitmen eccentrically pivoted to the pivoted mold opener and pivoted each to one of the jaws, the pivotal connection of the two pitmen with the two jaws being on opposite sides of the common pivot of the jaws.

14. A machine of the class described comprising a base frame, a mold carrier movable on the base frame, a lever pivotally supported, a pawl carried by said lever and cooperating with the mold carrier to advance the same step by step, open ended molds on the mold carrier, a stripper mechanism arranged to cooperate with projecting ends of cords extending from open ends of the mold, and cooperating portions on a stripper mechanism and the lever brought into cooperation for effecting the step by step movement of the mold carrier.

15. A machine of the class described comprising an open ended mold, mechanism for stripping ends of binder cords projecting from such mold, said mechanism embodying two stripper jaws, and mechanism for moving the stripping jaws toward and from the open end of the mold, said mechanism having means included therein for effecting the closing of the jaws when the jaws are positioned at the open end of the mold and the opening of the jaws when the jaws are positioned at the opposite end of their movement.

16. A machine of the class described comprising a mold carrier, open ended divided molds mounted on the carrier, mechanism for feeding the carrier step by step, a mold opener for individually opening the molds at a point in the travel of the mold carrier, stripping means for cooperating with projecting ends of binding cords in molds of the carrier at the same point in the travel of the mold carrier, and mechanism for operating the mold opener and the stripping means, said mechanism having provision for operat-

ing the stripping mechanism to strip a binding cord in a mold prior to the opening of such mold by the mold opener.

17. A mechanism of the class described comprising a mold carrier, a plurality of molds thereon, mechanism for feeding the carrier step by step, a stripping mechanism for stripping insulation from conductors in said molds, and means on the carrier for cooperating with portions of the stripping mechanism for holding the carrier in centered relation to the stripping mechanism.

18. A machine of the class described, comprising a molding means having relatively movable parts for clamping a conductor cord while the molding takes place, and means for stripping a portion of a covering of a conductor cord projecting from the molding means.

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