Dec. 24, 1940. H. A. ELLIOTT 2,225,739

MACHINE FOR APPLYING TIPS TO ELECTRIC CONDUCTORS

Filed Feb. 15, 1940 2 Sheets-Sheet 1

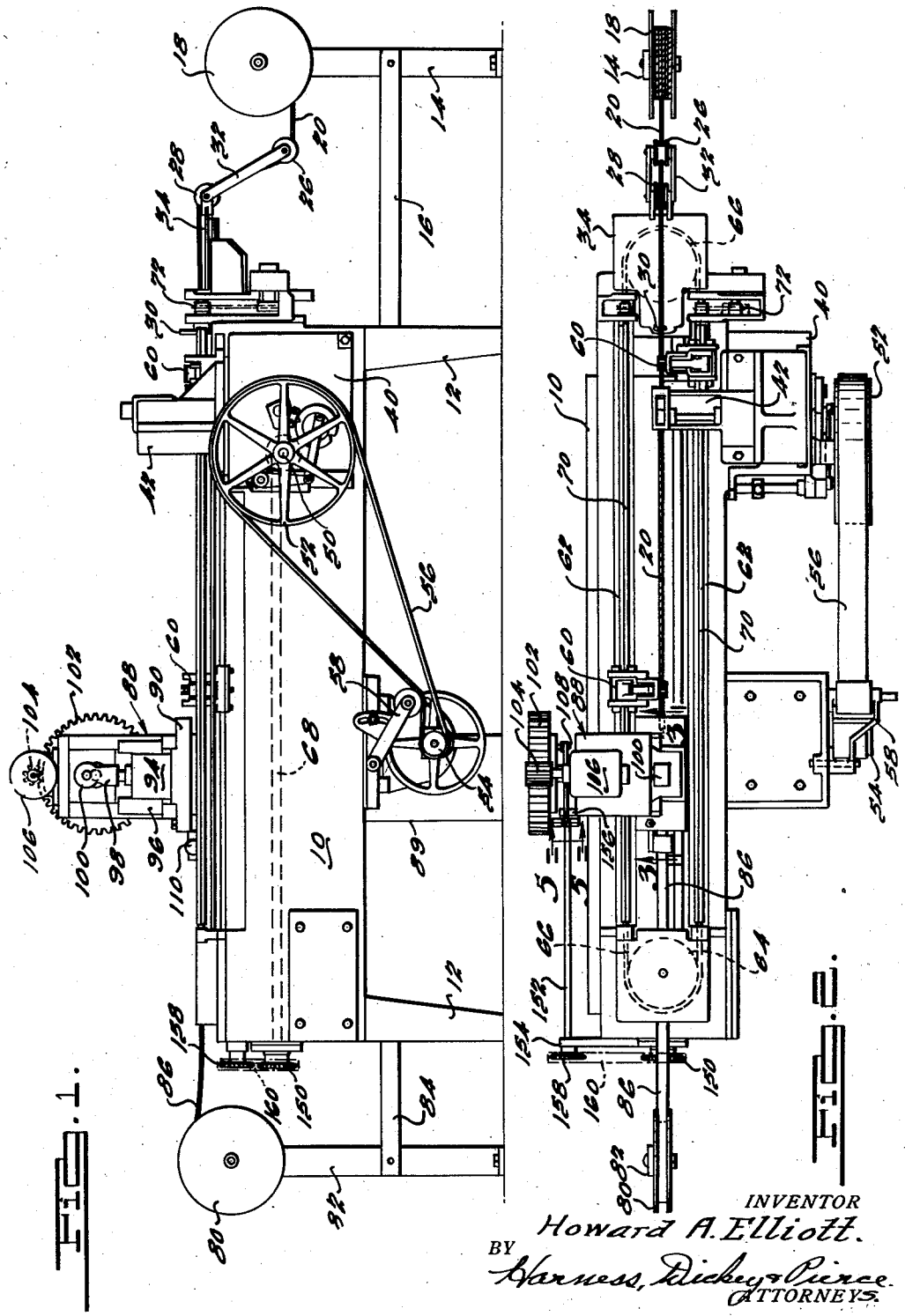


Fig. 1.

Fig. 2.

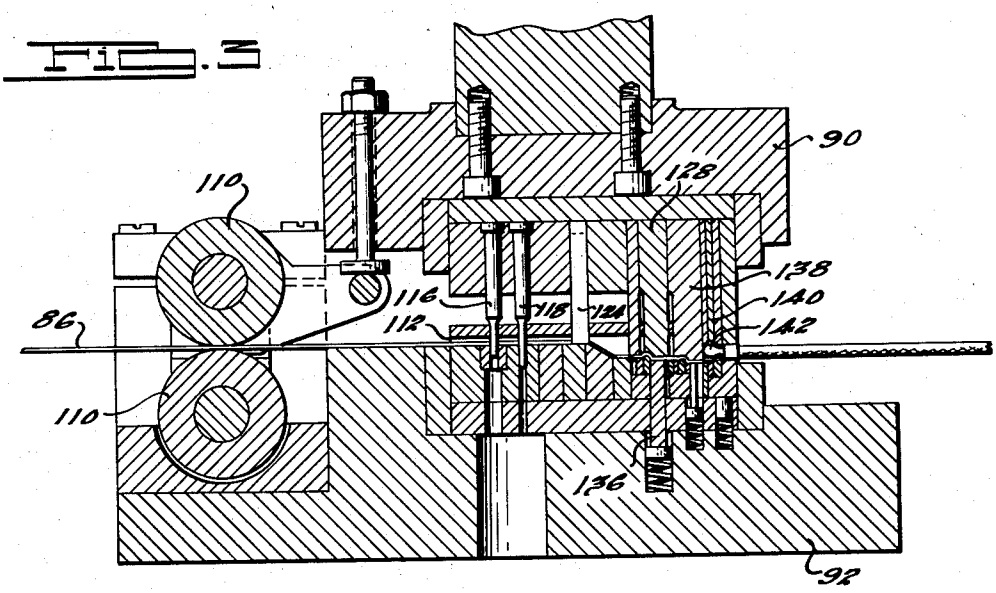
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FIG. 3.



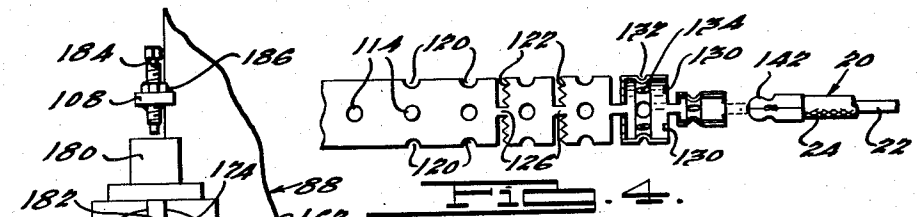


FIG. 4.

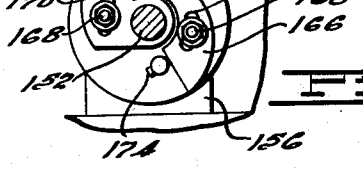


FIG. 5.

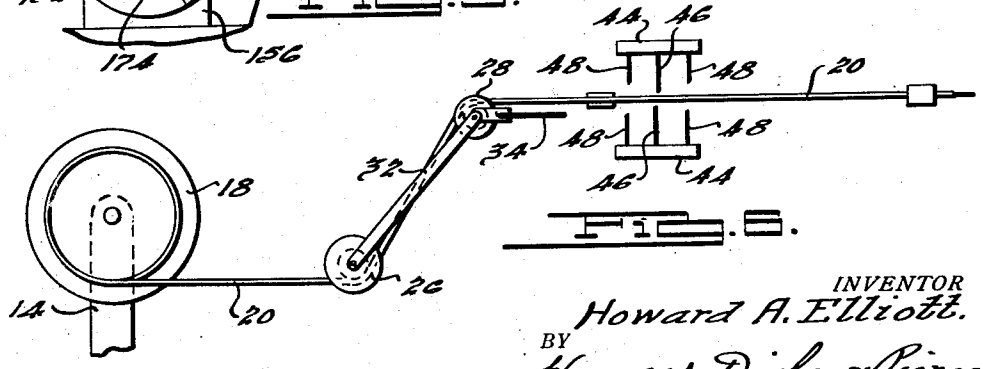


FIG. 6.

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UNITED STATES PATENT OFFICE

2,225,739

MACHINE FOR APPLYING TIPS TO ELECTRIC CONDUCTORS

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Application February 15, 1940, Serial No. 319,066

6 Claims. (Cl. 29—33)

This invention relates to electric conductors of the insulated type such as are commonly employed in the automobile, radio, or like industries, and particularly to such insulated conductors as are provided with a terminal tip on at least one end thereof, the principal object being the provision of mechanism whereby a section of insulated conductor of predetermined length may be automatically severed from a roll or the like of such conductor and the insulation thereon may be automatically stripped from the ends thereof, and the thus severed and prepared lengths automatically provided with a metal tip on at least one end thereof.

Other objects of the invention include the provision of mechanism whereby a strip of metal may be fed into a suitable press mechanism and therein operated upon to automatically form a succession of conductor tips therefrom, and simultaneously a length of insulated conductor may be fed into another portion of the mechanism where it is severed into successive sections of predetermined length and the insulation adjacent at least one end thereof stripped from the conductor, the severed lengths of the conductor being fed into the press mechanism where one of the tips formed therein is automatically applied to an end of each conductor and the conductors with such tips applied thereto are discharged from the mechanism; and the provision of a mechanism into which a strip of metal from a roll may be fed and into which a length of insulated electric conductor from a roll may be fed, the metal strip being acted upon by a multiple die to form successive lengths of the same into conductor tips and the conductor being acted upon to sever successive lengths of the same and to strip the insulation from at least one end thereof of each length, together with means for automatically feeding such severed lengths of the conductor toward the multiple die in timed relation therewith and to insert the stripped end of the conductor into a cooperating tip being formed in the die immediately before the final closing operation thereon by the multiple die, whereby during the final closing operation of the tip the same will be secured to the end of the conductor and the tip will be severed from the remainder of the strip of metal.

The above being among the objects of the present invention, the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

In the accompanying drawings which illustrate a suitable embodiment of the present invention and in which like numerals refer to like parts throughout the several different views,

Fig. 1 is a side elevational view of my improved mechanism;

Fig. 2 is a plan view of the mechanism shown in Fig. 1;

Fig. 3 is an enlarged vertical sectional view taken longitudinally of the machine shown in Figs. 1 and 2, as on the line 3—3 of Fig. 2, and centrally through the multiple die portion thereof employed for forming successive lengths of a strip of metal into conductor tips, and illustrating the final operation upon one of the conductor tips during which it is applied to the end of a length of electric conductor;

Fig. 4 is a fragmentary plan view of a strip of metal which is fed through the multiple die shown in Fig. 3 and illustrating the various stages of operation thereon during its travel through the multiple die;

Fig. 5 is a fragmentary vertical sectional view taken on the line 5—5 of Fig. 2 and illustrating the adjustable type of connection employed in the drive between the conductor severing and stripping mechanism and the trip mechanism for the press; and,

Fig. 6 is a diagrammatic view of the wire severing and stripping mechanism but taken from the opposite side of the machine from the view in Fig. 1.

In the automobile, radio and other industries it is conventional practice to employ predetermined lengths of insulated electric conductor to at least one end of which a conductor tip is applied for facilitating the connection of the conductor to some object or mechanism to or from which it is desired to conduct an electric current. It will be understood that particularly in the automobile and radio industries thousands of equal lengths of such conductors having tips applied thereto are used each working day. Special machines have been designed to receive a coil of the insulated wire or conductor, automatically withdraw wire from the roll, cut it into sections of predetermined lengths and simultaneously strip a desired amount of the insulation from each end thereof so as to expose a predetermined length of the conductor at each end of the wire. Such a machine is shown and described in United States Letters Patent No. 1,787,658 to Andrén and Olsen.

Various types of tips are usually applied to one of the stripped ends of the wire to facilitate the connection of the wire or conductor to some elec-

trical instrument or the like to which or from which it is desired to convey a current of electricity. Where such tips are separately and individually formed and then later individually applied to the ends of the wires or conductors an immense amount of labor is involved where such conductors are produced in large quantities. To overcome the labor problem in connection with applying such tips to such conductors, special machines have been designed which take a coil of strip metal, usually brass, and pass it through a multiple die in a press mechanism and in which successive lengths of the strip of metal are successively acted upon to form them into conductor tips, and these machines are so constructed and arranged that just prior to the final operation on the tips an operator grasps a length of the wire or conductor and inserts the stripped end thereof into the partially formed tip in the press in such a manner that during the final operation on the tip it is closed about the stripped end of the wire and secured thereto and severed from the strip of metal. Such special machines are illustrated in applicant's own prior United States Letters Patent No. 1,976,929 and also in United States Letters Patent No. 2,169,802 to Keller.

Even by the use of the special machines above described and identified it has heretofore been necessary for an operator to gather up the lengths of the wire from which the insulation has been stripped from one end thereof and to insert such lengths of wire one at a time into the press mechanism which forms the tips in order to apply the tips to the end of the conductors. The speed of operation of the press is naturally limited by the ability of the operator to manipulate the wires at a sufficient speed to match the speed of the press. At the same time, it requires a certain amount of skill and experience on the part of the operator in order to insure that each wire or conductor is properly positioned with respect to the tip being applied to it in order to insure a commercially satisfactory product.

The above described disadvantages of the prior art are overcome by the present invention which eliminates the need of an operator in receiving the wires as delivered from the wire cutting and stripping mechanism and applying it to the press mechanism to effect the application of the tips thereto. Instead, in accordance with the present invention, the wire cutting and stripping mechanism is so associated with the press mechanism that the two are driven in timed relation with respect to each other and arranged to feed the lengths of wire from the cutting and stripping mechanism into proper relation with respect to the press mechanism so as to cause the tip to be automatically applied to each length of wire at the proper time and in the proper position thereon.

Referring now to the drawings and particularly to Figs. 1 and 2 it will be noted that the machine comprises a bed or base **10** having suitable supporting legs **12**. At one end of the machine, namely the righthand end as viewed in Figs. 1 and 2, a standard **14** extends upwardly from the floor and is fixed against movement with respect to the machine by means of a brace **16** interconnecting it to one or more of the legs **12**. The upper end of the standard **14** carries a reel **18** upon which is wound a supply of the insulated electrical conductor **20** which it is desired to sever into lengths and to the end of which lengths a suitable connector or tip is to be applied. The conductor **20** may be of any usual or conventional type of insulated electric conductors and as more specifically brought out in Fig. 4, may include a metal wire or cable **22** of either the solid, twisted or braided type, and enclosing insulation **24** which may be of any suitable or conventional type.

The wire **20** is led under a pulley **26** and then over a pulley **28** and then extends longitudinally and centrally of the upper surface of the base **10** where it is first received between a pair of guide pins **30**. The roller **26** is carried at the free end of a pair of swinging arms or links **32** pivotally secured at their upper ends to a bracket **34** projecting from the righthand end of the machine as viewed in Figs. 1 and 2. The arms **32** and pulley **26** act as a gravity tensioning device on the conductor **20** to keep the slack out of it particularly during reversal in the direction of movement of the conductor **20** during the stripping operation which will hereinafter be described.

A frame **40** is secured to the side of the base or bed **10** adjacent the righthand end thereof as viewed in Figs. 1 and 2 and at its upper end supports thereon a head **42**. A pair of vertically reciprocable cutter supports **44**, indicated diagrammatically in Fig. 6, are carried and guided in their movement by the head **42** centrally of the path of movement of the conductor **20** over the upper surface of the machine. The supports **44** are simultaneously reciprocable in opposite directions and each includes a central severing knife or blade **46** and a pair of insulation stripping knives or blades **48** disposed at a distance to each side of the severing knife **46** equivalent to the length of the insulation which it is desired to strip from the end of each length of wire or conductor. Each cooperating pair of these knives are slightly offset from one another so that their cutting edges overlap when the supports **44** are moved to their extreme limit of position toward one another. In such position the blades **46** serve to sever both the insulation **24** and the wire **22** of the conductor **20** and the blades **48** act to sever the insulation only but not the wire **22**. The blades **48** are preferably centrally notched or relieved to permit substantially complete severance of the insulation **24** without severing the wire **22**. After the conductor **20** has been severed by the blades **46** and the insulation at predetermined distances on either side thereof has been severed, the two parts of the conductor **20** on either side of the blades **46** are then acted upon to withdraw the wire in opposite directions away from the blades **46** so that the severed portion of the insulation is stripped from the corresponding ends of the conductor, the various blades **46** and **48**, of course, being maintained in their cutting position while the two parts of the conductor **20** are withdrawn and the stripper blades **48** acting on the severed portion of the insulation prevent its withdrawal with the corresponding parts of the conductor.

The mechanism for effecting reciprocation of the supports **44** and the knives or blades **46** and **48** is carried by the frame **40** and head **42** and is so constructed and arranged as to cause the supports **44** to approach each other so as to bring the blades **46** and **48** into cutting position, to maintain the blades in cutting position until after the stripping operation has been completed, then move the blades away from each other and hold them in separated position until such time as another length of wire has been fed between them to the desired extent upon which they are again caused to approach each other. The

specific details of the mechanism provide for obtaining this movement of the supports 44 and the blades 46 and 48 forms no part of the present invention but is fully disclosed in the Andrén and Olsen Patent No. 1,787,658 above referred to and to which reference may be made for a complete understanding of the same. In any event it will be understood that this mechanism is driven from a shaft 50 rotatably supported by the frame 40 and carrying a pulley 52 having a suitable driving connection therewith and the pulley 52 may, in turn, be driven from a suitable power driven pulley 54 by means of a belt 56 normally maintained under suitable tension by a belt type device 58. Obviously any suitable means may be employed for driving such mechanism.

In connection with the cutting and stripping mechanism above described, means are provided operating in timed relation therewith for withdrawing predetermined lengths of conductor 20 from the reel 18 and presenting it to the blades 46 and 48 for operation thereby. This mechanism includes a pair of identical gripper devices 60. The upper face of the machine is provided with a pair of parallel ways 62 extending longitudinally of its upper surface and arranged in equally spaced relation on either side of the path of movement of the conductor 20 therebetween. One gripper device 60 is carried by each of the ways 62 and is slidable therealong.

Reciprocation of the gripper devices 60 on their corresponding ways 62 is effected as follows. A pair of drums or wheels 64 and 66 are provided, one at each end of the base 10 and each arranged with its axis vertical. A flexible cable 68 is trained around the drums 64 and 66 and secured thereto for equal movement with the periphery thereof. The diameter of the drums 64 and 66 is such that the flexible cable 66 extends centrally of each way 62 and into operative engagement with each of the gripper devices 60 to which it is adjustably secured. It will be appreciated that with this mechanism oscillatory movement of the drums 64 and 66 will cause reciprocation of that portion of the flexible cable 66 positioned over each of the ways 62 and being fixed to the gripper devices 60 will cause the gripper devices to be reciprocated longitudinally of the ways 62 in opposite directions.

Oscillation of the drum 64 is effected by suitable mechanism connected thereto and specifically shown and described in said Andrén and Olsen Patent No. 1,787,658 above referred to, and such mechanism is in turn driven from a shaft 68 suitably supported for rotatable movement longitudinally of the base 10 and driven from the shaft 50 in timed relation so that the gripper devices 60 are caused to reciprocate in timed relation to the reciprocatory movement of the supports 44 and blades 46 and 48. The mechanism for oscillating the drum 66 includes suitably adjustable devices enabling the extent of reciprocation of the gripper jaws or devices 60 to be readily varied so as to permit ready adjustment of the machine to cut sections of wire of different and desired lengths from the conductor wound upon the reel 18.

Each gripper device 60 includes a pair of oppositely movable jaw members which are operated in their opening and closing movements by means of a square shaft 70 disposed over each way 62 and slidably received by each of the gripper devices 60. The shafts 70 are operated at desired intervals during the operation of the machine and in synchronism with other movements of the machine by mechanism indicated generally at 72 positioned at the righthand end of the base 10 as viewed in Figs. 1 and 2 and suitably driven from the shaft 68.

The essential movements of the part of the machine thus far described are as follows. Assuming that the various parts of the machine as viewed in Figs. 1 and 2 are those assumed at the end of a cutting and stripping operation, it will be understood that the length of the conductor 20 between the head 42 and the lefthand gripper device 60 has been severed from that portion of the conductor still wound on the reel 18, and that the insulation adjacent the severed ends of the wire and under the head 42 has been stripped from the wire. At such time the blades 46 and 48 are arranged in the position which they assume at the end of a cutting and stripping action and both gripping devices 60 are operatively gripping the corresponding portions of the conductor 20.

From the above described condition of the machine, as rotation of the shaft 50 continues, the blades 46 and 48 are drawn away from each other toward inoperative position and the lefthand gripper device 60 only is actuated to separate the jaws thereof and to release the severed length of the conductor 20 therebetween so as to permit it to fall out of the machine. Immediately thereafter the drum 64 is caused to rotate in a clockwise direction of rotation, as viewed in Fig. 2, whereby the righthand gripper device 60 which is still gripping the conductor 20 is caused to move to the left and the lefthand gripper device 60 is caused to move to the right, the jaws of the lefthand gripper device 60 opening wide enough during this movement to clear the righthand gripper device 60 in passing it during such movement. The righthand gripper device 60, as viewed in Figs. 1 and 2, will be carried by the flexible cables 66 to the left as viewed in these figures until a predetermined length of the cable 20 will have been drawn beyond the severing blades 46 to the left thereof, whereupon rotation of the drums 64 and, therefore, movement of the flexible cable 66 will be stopped. The lefthand gripper device 60 as viewed in Fig. 2 and which at this time will be positioned to the right of the head 42 will be operated to grip that portion of the conductor 20 to the right of the head 42 and tension the conductor between the gripper devices 60, and the blades 46 and 48 will be caused to approach each other to again sever the conductor 20 and to cut the insulation at the desired distance from the severed ends thereof.

Immediately upon the above described action occurring, a further rotational movement of the drum 64 in a clockwise direction of rotation is effected, this serving to move that part of the conductor 20 to the left of the head 42 further to the left and that portion of the right of the head 42 further to the right, thereby stripping the severed portions of the insulation from the severed ends of the conductor. As soon as sufficient movement of the drum 64 has occurred to effect this result, rotation of the drum is stopped, the gripper device 60 positioned to the left of the head 42 is operated to release the severed portion of the conductor, the blades 46 and 48 are separated, and rotation of the drum 64 in the opposite or counterclockwise direction of rotation is begun to again reverse the position of the gripper devices 60 and to effect a repetition of the operations above described. It will be appreciated from the above description that the gripping devices

60 are alternately positioned at opposite ends of the machine and reversed in direction of movement during each cycle of operation of the machine.

At the end of the machine opposite the head 42 and the reel 18 is positioned another reel 80 rotatably mounted upon the upper end of a suitable support 82 and braced with respect to the corresponding end of the machine by a member 84. The reel 82 carries a suitable strip 86 of metal wound thereon, such metal usually being brass. The strip 86 is arranged to be fed longitudinally of the upper face of the machine centrally thereof and in the opposite direction of movement to the normal feeding movement of the conductor 20 from the reel 18. A suitable and conventional type of press mechanism indicated generally at 88 is mounted in cooperative relation with respect to the bed 10 and is preferably provided with a pedestal 89 extending to the floor so as to afford the proper type of support thereto. The press mechanism 88 is provided with an upper vertical reciprocable platen 90 and a lower fixed platen 92 (see Fig. 3) in which the forming and cutting die mechanism for the strip 86 is mounted. The upper platen 90 is carried by a suitable plunger 94 arranged between vertical guide members 96 and connected by means of a suitable rod 98 with a crank 100 provided on the shaft of a bull wheel 102 driven by a suitably or conventionally power driven pinion 104. It will be understood that in the case shown the pinion 104 is driven by an electric motor 106 suitably mounted on the upper end of the press in a conventional manner. It will be understood that suitable and conventional clutch mechanism (not shown) controlled by a trip lever 108 (see Figs. 1 and 5) is operable to connect the crank 100 to the bull wheel 102 to effect one complete revolution of the crank 100 and, therefore, one complete cycle of operation of the press, and then to discontinue the driving relation between the crank 100 and bull wheel 102 until the trip lever 108 is again tripped.

Referring now to Figs. 3 and 4, it will be noted that a pair of feed rollers 110 are associated with the press and are intermittently rotated by a suitable driving link (not shown) connected at one end with the crank of the press whereby the strip material 86 is advanced a predetermined distance upon the upstroke of the press, which action may be arranged in any suitable and well known manner.

The strip stock or material 86 is transferred from rolled strip form into a completed tip and attached to the conductor by a plurality of operations which are performed on the blanks without any manual handling and which consists in a series of punching and forming operations performed in successive stages upon the down stroke of the press in a manner whereby the complete cycle of operation is performed once upon each stroke of the press as will hereinafter be described in detail. The action, including the feeding of the work, is entirely automatic throughout. The punching and forming operations and the dies employed in connection therewith may, of course, be varied in accordance with the particular type and construction of the tip to be applied to the ends of the several lengths of conductor 20, but as a matter of illustration the type of tip and die mechanism for producing the same as disclosed in my prior United States Patent No. 1,976,929 is shown and described herein.

As the press operates, the feed rollers 110 feed the strip 86 from which the conductor strips are to be formed through a guide slot 112, formed in the die assembly which is supported in the lower platen 92 of the press and which properly positions the strip between the punching and forming members and the matrix dies.

The first step of the process consists in the operation of punching a center hole 114 (see Fig. 4) in the blank strip 86 by means of a punch 116, upon the down stroke of the press. Upon the upstroke of the press the material is advanced the necessary predetermined distance, which is equal to the length of one of the blanks, to assume a position below the next punch for the succeeding operation. Upon the next stroke of the press the second step is performed by a notching punch 118 which cuts notches 120 on the opposite edges of the strip of material 86 in alignment with the center hole 114. This punch may be provided with a conventional centering member (not shown in the drawings) for engaging the center hole 114 to insure perfect alignment of the notches 120 with the hole 114 if desired.

The third step or operation is performed after the blank strip has been advanced two positions by two movements of the feed rollers 110 as shown by the spacing of the punches in Fig. 3, so that two successive notching operations have been performed, as above described, before the blank reaches the position under the punch which is to perform the third operation. This step consists in the punching of transverse serrated edges 122, as illustrated in Fig. 4, by a punch 124 which cuts a series of points transversely of the forward edge of the blank. A narrow center tongue 126 is left to join the blank to the strip of material 86.

The blank strip is then advanced two more positions by the feed rollers 110 in the same manner that it is advanced between the second and third steps as hereinabove described. The fourth step is then performed which consists in forming the blank by a forming punch 128 which curves or bends the side edges of the blank upwardly, bends the serrated edges 122 upwardly into a vertical position, and embosses the rear edge of the blank at 130, forms a groove 132 entirely across the blank, in alignment with the hole 114 and notches 120, embosses the blank at 134, forming inwardly extending projections within the groove 132, and causes the blank to assume a general arcuate form as illustrated in Fig. 4. The blank remains attached to the material strip by the tongue 126. A suitable spring pressed knockout punch 136 of any well known design may be employed to raise the blank from the matrix die after the fourth operation has been performed so that it may be advanced to the next position.

The fifth step consists in forming and inwardly bending the blank by a forming punch 138. In this position the blank is still attached to the strip 86 by the tongue 126 but is nearly completely formed and nearly closed, being open only at the top to receive the conductor or wire end which is to be attached by the next step or operation.

The sixth step consists in inserting the end of a severed length of the conductor 20 from which the insulation 24 has been stripped, as previously described, into the partially closed blank

formed by the fifth step of my process. A closing and shearing die 140, then closes the blank tightly about the end of the conductor 20, folding it over to assume an annular or rounded form indicated at 142 in Figs. 3 and 4. This die also severs the tongue 126 from the strip 86 and folds this tongue over the butt end of the finished terminal tip 142, thus completing the formation and securely attaching the tip to the end of the conductor.

It will be noted that in the attaching of the tip the embossed points 130 become embedded in the insulation of the conductor and the points 134 are firmly in contact with the wire. The serrated edges 122 together with the folded over tongue 126 completely close the butt end of the tip. The groove 132 assumes an arcuate shape in its completed form to cooperate with attaching devices in the receiving members with which the tip is to be associated when in use. No other attaching medium, such as solder or like bonding material, is required.

Upon each down stroke of the platen 90, each of the punches and dies will perform one step of the process, and upon the upward stroke of the platen 90 the feed rollers 110 will advance the blank strip 86 one position forward. A progression of the successive stages of operation will be performed, and a completed terminal tip attached to a conductor upon the completion of each downward stroke of the press. All of the six steps of the process of forming an attaching terminal tip will be performed in their respective successive stages upon each stroke of the press.

It will be understood that the die members are so arranged that the axis of the almost completed tip blank is arranged concentrically with the end of the conductor 20 which is carried toward the die members by whichever one of the gripping devices 60 is positioned at the lefthand end of the machine at the completion of any cycle of operation of the cutting and stripping portion of the machine. It will also be understood that the relation of the press mechanism and the cutting and stripping mechanism is such that upon completion of movement of the severed portion of the conductor 20 to the left, at the end of a stripping action, that portion of the wire 22 of the conductor 20 from which the insulation 24 has been stripped will be inserted within the constricted throat portion or groove 132 of the tip 142 and the extremity of the corresponding end of the insulation 24 will have been received within the open or base end of the partially completed tip or terminal. With the partially completed terminal or tip thus arranged with respect to the cooperating end of the conductor, during the next cycle of operation of the press the partially completed tip or terminal will be completely formed about and secured to the corresponding end of the severed lengths of the conductor 20 and the completed terminal will be sheared off of the strip 86.

It is, of course, essential in the carrying out of these operations that the operation of the press be synchronized with the operation of the cutting and severing mechanism and this is effected in the following manner.

The shaft 68 which is driven from the shaft 50 in timed relation therewith and which is employed for driving the drum 64 and the mechanism for operating the square shafts 70 controlling the opening and closing of the jaws of the gripping devices 60, is projected out beyond the lefthand end of the base or bed 10 as viewed in Figs. 1 and 2 and is provided with a sprocket 150 fixed to such end. A shaft 152 located on the far side of the machine as viewed in Figs. 1 and 2 in parallelism with the shaft 68 is supported from the base or bed 10 and the pedestal 89 by means of an arm 154 and a support 156, respectively, and on its lefthand end has fixed thereto a sprocket 158 connected to the sprocket 150 by means of a chain 160. That end of the shaft 152 immediately to the left of the support 156, and as best illustrated in Fig. 5, is provided with a disc 162 fixed thereto. Secured to the face of the disc 162 are a pair of cam members 164 and 166, respectively, arranged in diametrically opposite relation with respect thereto and fixed to the disc 162 by means of bolts 168. The bolts 168 extend through circumferentially extending slots 170 in the cam members 164 and 166 so that upon loosening of the cooperating nut the cam members 164 and 166 may be adjusted angularly with respect to the shaft 152. Stop screws 174 are preferably provided to assist in the adjustment of the cam members 164 and 166 and to back them up against movement after adjustment.

A guide member 180 is carried by the upper end of the arm or support 156 and receives therein a vertically reciprocable plunger 182 in vertical alignment with the cam members 164 and 166 and positioned in the path of movement thereof so as to be projected upwardly thereby each time one of the cams 164 and 166 passes under the same. The free end of the trip lever 108 projects over the upper face of the guide 180 and in vertical alignment with the plunger 182 is provided with a vertically adjustable screw 184 which is locked in adjusted position thereon by means of a lock nut 186. With this construction as one of the cams 164, 166 rotates below the plunger 182 it contacts such plunger and forces it upwardly and the upper end of the plunger 182 contacts the lower end of the screw 184 and causes the trip lever 108 to be lifted so as to trip the clutch of the press mechanism and connect the bull wheel 102 with the crank 100 thereof during the succeeding revolution of the bull wheel. Thus the press 88 is caused to operate in synchronism with the severing and stripping portion of the machine. The belt 160 may be shifted relative to one of the sprockets 150 or 158 to obtain an approximate desired synchronism between the operation of the press and of the severing and stripping mechanism upon which the cam members 164 and 166 may be adjusted to provide a fine degree of adjustment between these portions of the machine to insure the proper synchronism and relation of the phases of operation of one with respect to the other.

From the above description it will be appreciated that by the practices of the present invention lengths of insulated electrical conductor and lengths of strip metal are automatically fed into the machine from suitable coils or rolls of the same, the insulated cable is severed into sections of predetermined lengths and the insulation is stripped from the ends thereof, the strip of metal is acted upon to continuously and automatically form terminal tips and the stripped ends of the severed sections of the conductor are fed into partially formed tips which are thereafter completely formed about and secured to them, sev-

ered from the strip of metal, and the assembly discharged from the machine. The machine thus provides for the automatic severing of the lengths of the conductor cable and the application of conductor tips thereto without the need of any manual labor in the performance of these operations. Consequently the machine may be operated at a considerably higher rate of production than could be possible where the manual handling of the severed sections of the conductor is necessary as heretofore, and the errors liable to arise because of errors of judgment of an operator entirely eliminated.

Formal changes may be made in the specific embodiments of the invention described without departing from the spirit and substance of the broad invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. In a mechanism of the type described comprising, in combination, mechanically operated means for withdrawing an insulated conductor from a source of supply, cutting successive sections of predetermined length therefrom and stripping limited lengths of insulation from at least one end of said sections, a mechanically driven press mechanism, means for feeding a strip of metal in step-by-step relation into said press mechanism, a multiple die carried by said press mechanism and operable thereby to act upon said strip in stages to form terminal tips from successive lengths thereof, said terminal tip in one of said stages being partially completed and open to the reception of said stripped end of said conductor therein, and said cutting and stripping mechanism and said press mechanism being so arranged that the stripped end of one of said conductor sections is automatically fed into one of said terminal tips when at said partially completed stage, and said terminal tip is automatically closed about said stripped end of said conductor section during a subsequent cycle of operation of said press mechanism.

2. In a machine of the type described, in combination, cutting and stripping mechanism comprising means for receiving a length of insulated conductor from a source of supply, mechanically actuated means for severing successive sections of predetermined length from said conductor, mechanically driven means synchronized with said severing mechanism for stripping short lengths of insulation from said conductor on each side of the line of severance thereof and moving said severed sections away from the position of severance, press mechanism, means for feeding a strip of metal in step-by-step relation into said press mechanism, a multiple die carried and operated by said press mechanism receiving said strip of metal and acting thereon in successive stages to transform successive lengths thereof into terminal tips for said sections of conductor, said die mechanism being positioned to present said terminal tips in alignment with the direction of movement of said conductor sections away from said position of severance and in a position to receive the stripped ends of said conductor sections in a terminal tip within said die mechanism at an intermediate stage of completion thereof, and means interconnecting said severing and stripping mechanism with said press mechanism for effecting operation of one in synchronism with the operation of the other whereby to cause the stripped ends of each said severed sections of conductor to be fed into one of said conductor tips at said intermediate stage of completion whereby the succeeding cycle of operation of said press will complete the formation of said tip and secure it to said stripped end of said conductor section.

3. In a machine of the type described, in combination, conductor severing mechanism, mechanically actuated means for feeding an insulated electrical conductor to said severing mechanism in step-by-step relation and effecting actuation of said severing mechanism to sever successive sections of predetermined length from said conductor, mechanically actuated means operated in synchronism with said feeding and severing mechanism for stripping limited lengths of insulation from said conductor adjacent the points of severance thereof and moving the severed sections thereof away from the point of severance, a press mechanism including a movable platen and a fixed platen and means including a trip lever for initiating a cycle of operation of said press mechanism, means for feeding a strip of metal in step-by-step relation into said press mechanism, a multiple die carried by said press mechanism and operable thereby, said die arranged to receive said strip of metal and to operate thereon in stages to form successive lengths through intermediate stages of operation into a completed terminal tip, said multiple die arranged to present a terminal tip being formed thereby in an intermediate stage of operation to the stripped end of a section of said conductor for reception of one by the other and said press being operable to move said multiple die to complete the formation of said terminal tip about said stripped end of said section of conductor and secure it thereto, a shaft driven in synchronism with the feeding, cutting and stripping mechanism, and means driven in synchronism with said shaft operable to actuate said trip lever in synchronism therewith.

4. In a machine of the type described, in combination, conductor severing mechanism, mechanically actuated means for feeding an insulated electrical conductor to said severing mechanism in step-by-step relation and effecting actuation of said severing mechanism to sever successive sections of predetermined length from said conductor, mechanically actuated means operated in synchronism with said feeding and severing mechanism for stripping limited lengths of insulation from said conductor adjacent the points of severance thereof and moving the severed sections thereof away from the point of severance, a press mechanism including a movable platen and a fixed platen and means including a trip lever for initiating a cycle of operation of said press mechanism, means for feeding a strip of metal in step-by-step relation into said press mechanism, a multiple die carried by said press mechanism and operable thereby, said die arranged to receive said strip of metal and to operate thereon in stages to form successive lengths thereof through intermediate stages of operation into a completed terminal tip, said multiple die arranged to present a terminal tip being formed thereby in an intermediate stage of operation to the stripped end of a section of said conductor for reception of one by the other and said press being operable to move said multiple die to complete the formation of said terminal tip about said stripped end of said section of conductor and secure it thereto, a shaft driven in synchronism with the feeding, cutting and stripping mechanism, and means driven in synchronism

with said shaft operable to actuate said trip lever in synchronism therewith including means angularly adjustable relative to the last mentioned shaft for adjusting the timed operations of said press mechanism with respect to the timed operation of said severing and stripping mechanism.

5. In a machine of the type described, in combination, conductor severing mechanism, mechanically actuated means for feeding an insulated electrical conductor to said severing mechanism in step-by-step relation and effecting actuation of said severing mechanism to sever successive sections of predetermined length from said conductor, mechanically actuated means operated in synchronism with said feeding and severing mechanism for stripping limited lengths of insulation from said conductor adjacent the points of severance thereof and moving the severed sections thereof away from the point of severance, a press mechanism including a movable platen and a fixed platen and means including a trip lever for initiating a cycle of operation of said press mechanism, means for feeding a strip of metal in step-by-step relation into said press mechanism, a multiple die carried by said press mechanism and operable thereby, said die arranged to receive said strip of metal and to operate thereon in stages to form successive lengths thereof through intermediate stages of operation into a completed terminal tip, said multiple die arranged to present a terminal tip being formed thereby in an intermediate stage of operation to the stripped end of a section of said conductor for reception of one by the other and said press being operable to move said multiple die to complete the formation of said terminal tip about said stripped end of said section of conductor and secure it thereto, a shaft driven in synchronism with the feeding, cutting and stripping mechanism, means driven in synchronism with said shaft operable to actuate said trip lever in synchronism therewith including a second shaft, means drivingly connecting said shafts, a plunger associated with said trip lever, and means operable by said second shaft for effecting operation of said plunger at predetermined angular positions of said second shaft.

6. In a machine of the type described, in combination, conductor severing mechanism, mechanically actuated means for feeding an insulated electrical conductor to said severing mechanism in step-by-step relation and effecting actuation of said severing mechanism to sever successive sections of predetermined length from said conductor, mechanically actuated means operated in synchronism with said feeding and severing mechanism for stripping limited lengths of insulation from said conductor adjacent the points of severance thereof and moving the severed sections thereof away from the point of severance, a press mechanism including a movable platen and a fixed platen and means including a trip lever for initiating a cycle of operation of said press mechanism, means for feeding a strip of metal in step-by-step relation into said press mechanism, a multiple die carried by said press mechanism and operable thereby, said die arranged to receive said strip of metal and to operate thereon in stages to form successive lengths thereof through intermediate stages of operation into a completed terminal tip, said multiple die arranged to present a terminal tip being formed thereby in an intermediate stage of operation to the stripped end of a section of said conductor for reception of one by the other and said press being operable to move said multiple die to complete the formation of said terminal tip about said stripped end of said section of conductor and secure it thereto, a shaft driven in synchronism with the feeding, cutting and stripping mechanism, means driven in synchronism with said shaft operable to actuate said trip lever in synchronism therewith including a second shaft, means drivingly connecting said shafts, a plunger associated with said trip lever, means operable by said second shaft for effecting operation of said plunger at predetermined angular positions of said second shaft, and means for adjustably securing the last mentioned means angularly of said second shaft for equal rotation therewith.

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