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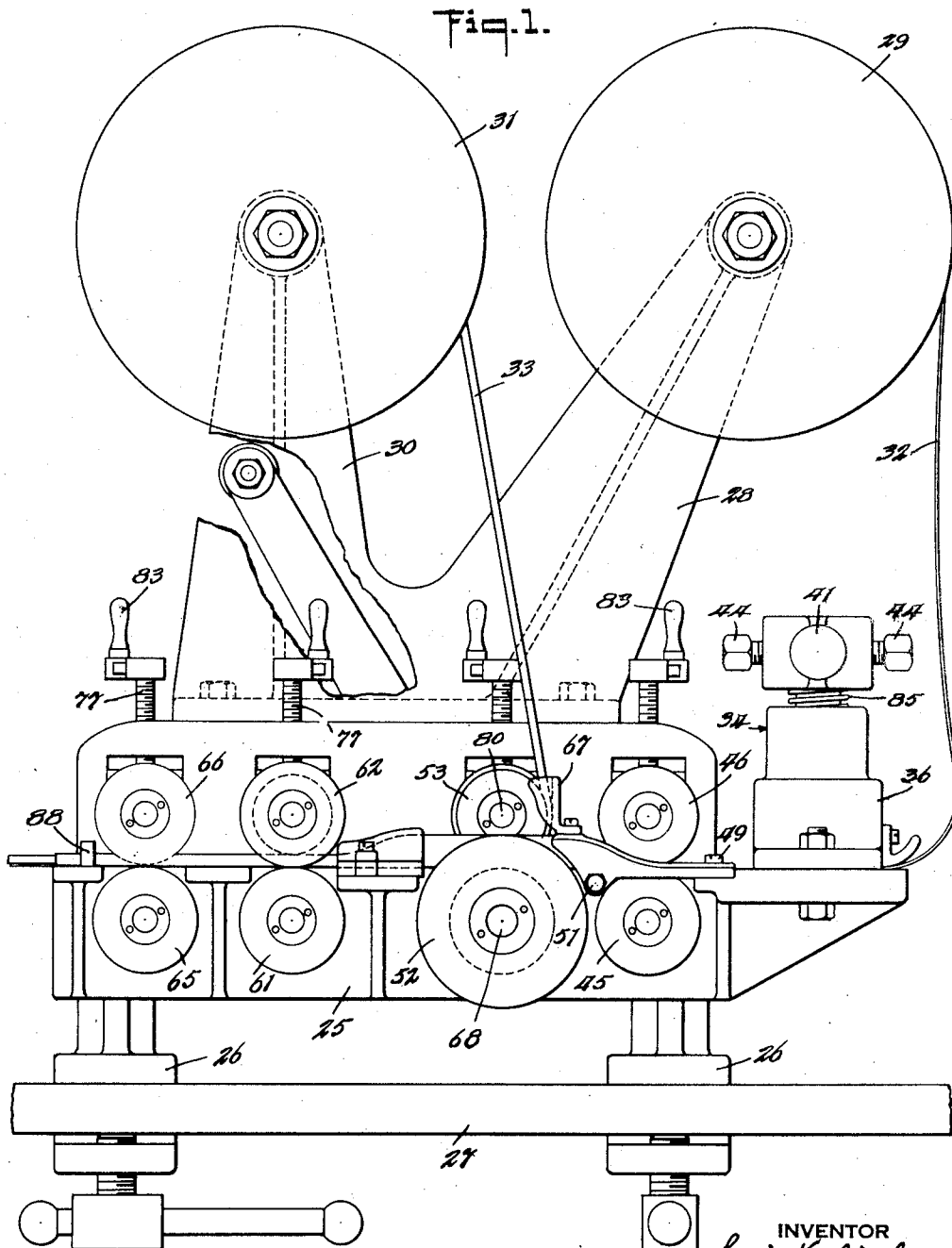
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1,949,077

ELECTRIC WIRING STRIP AND METHOD FOR MAKING SAME

Filed Oct. 15, 1931

6 Sheets-Sheet 1



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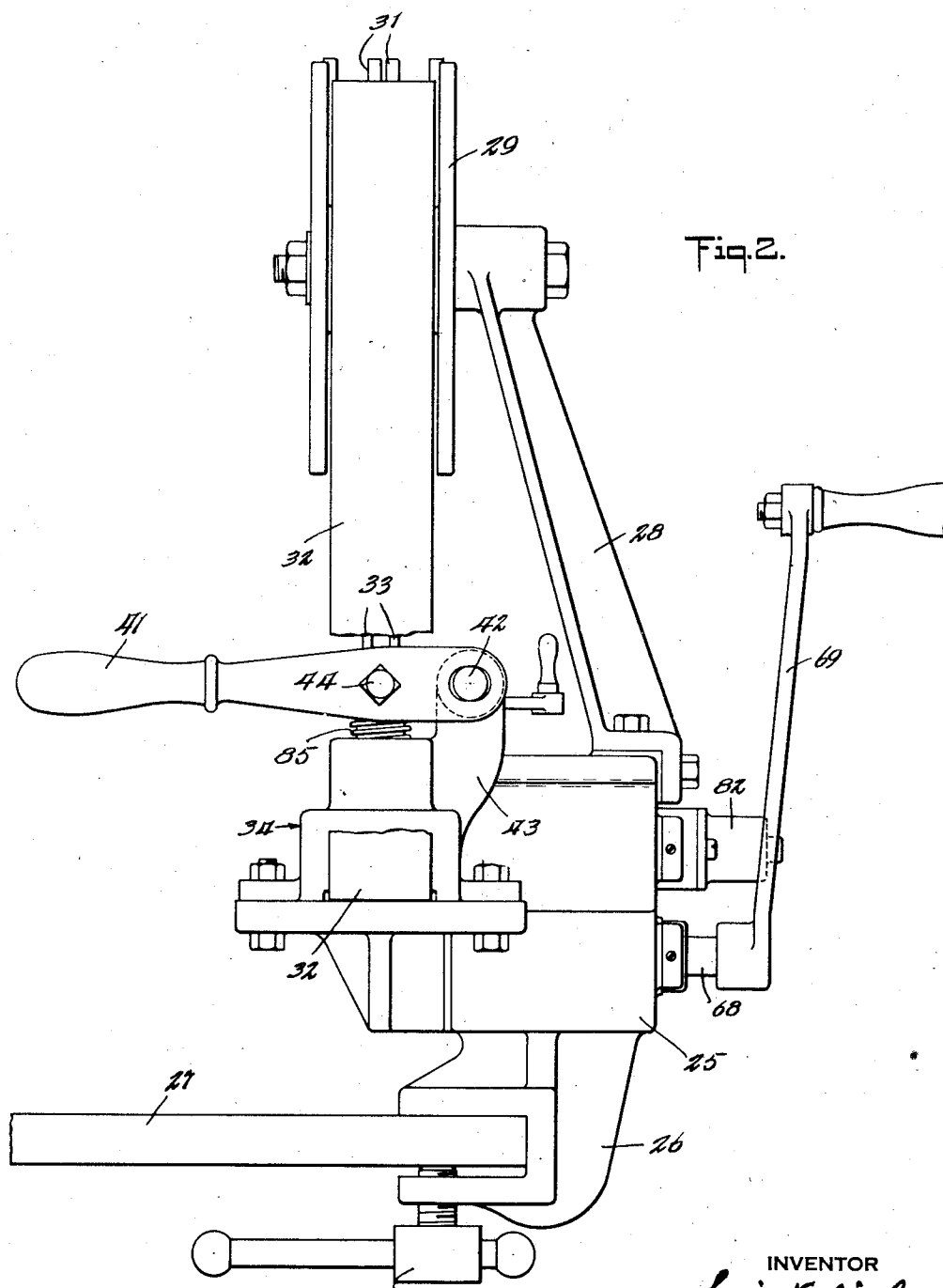
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6 Sheets-Sheet 2



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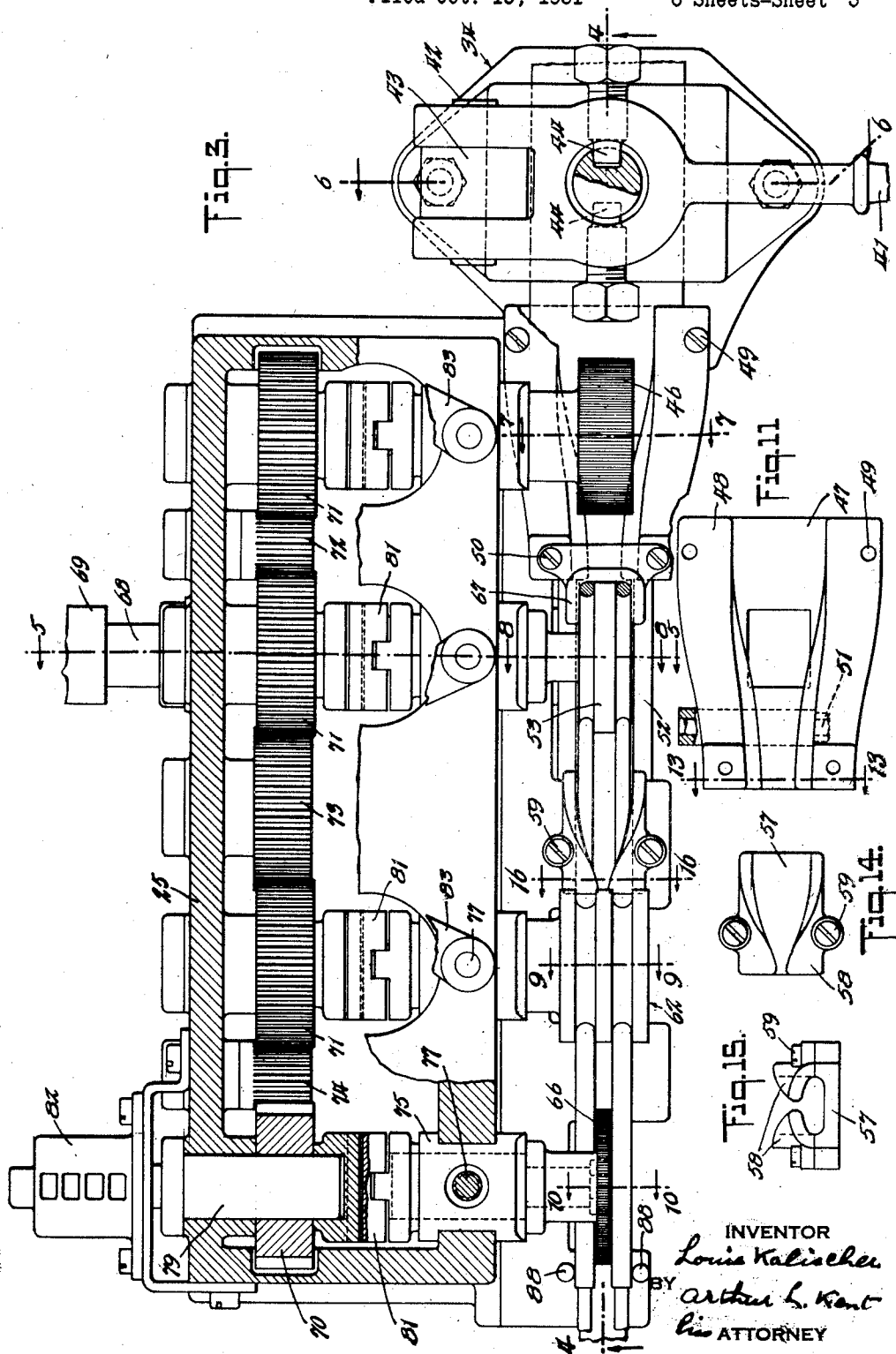
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Fig. 11.

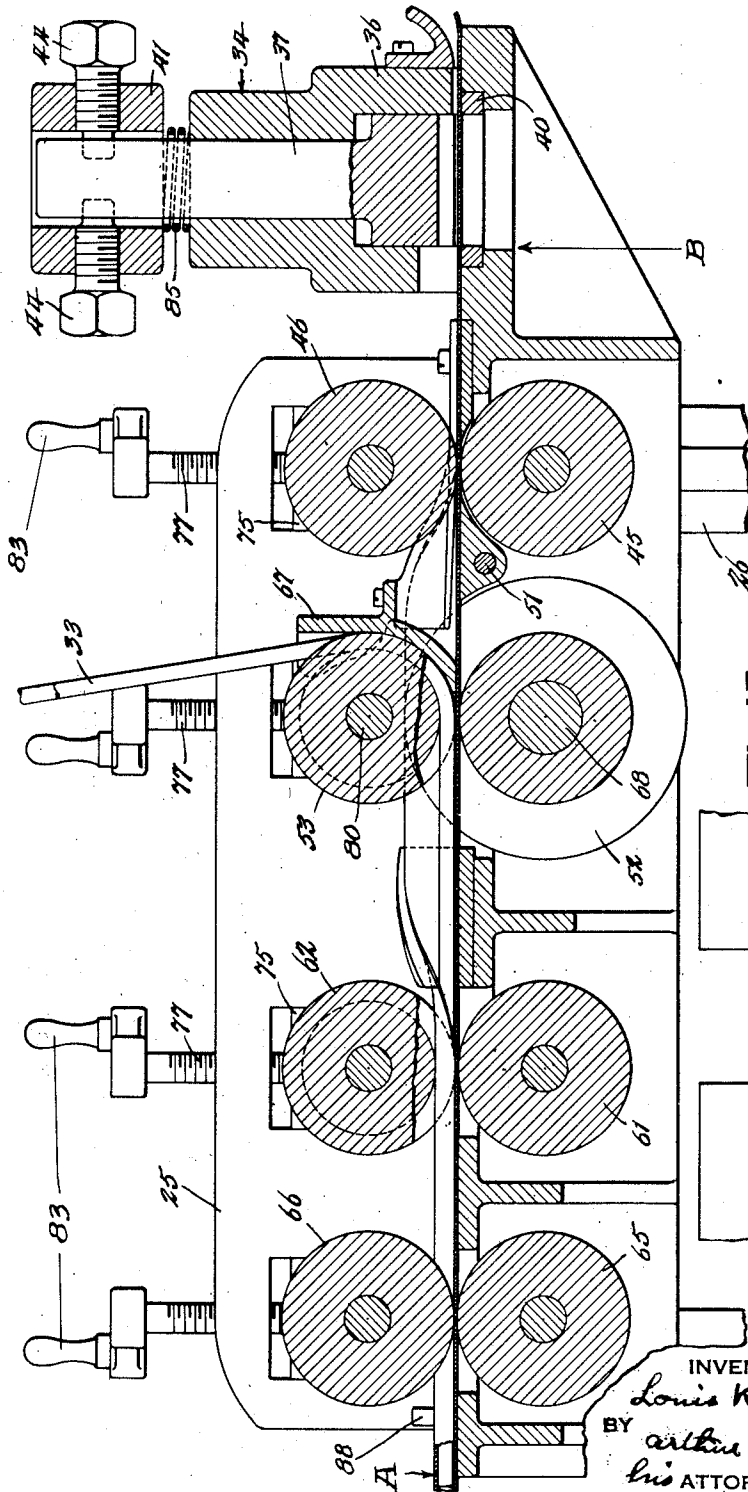
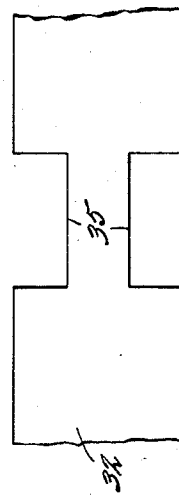


Fig. 12.



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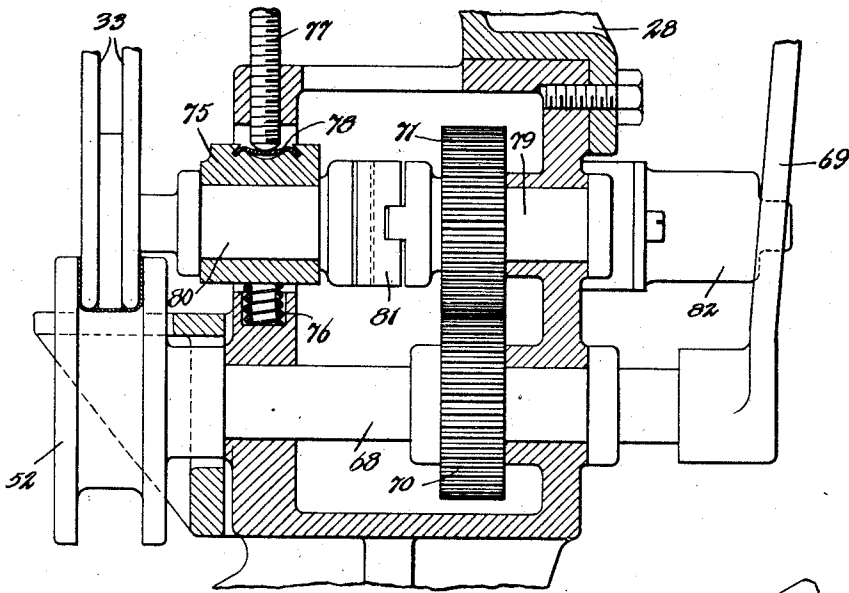


Fig. 5.

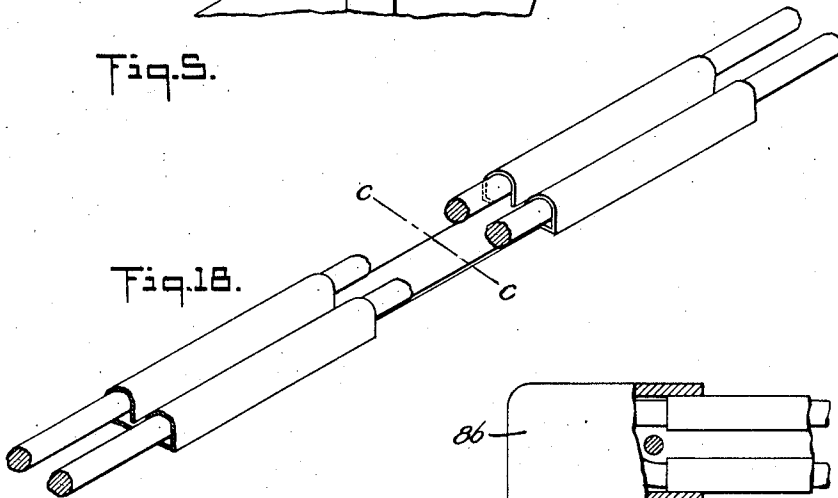


Fig. 18.

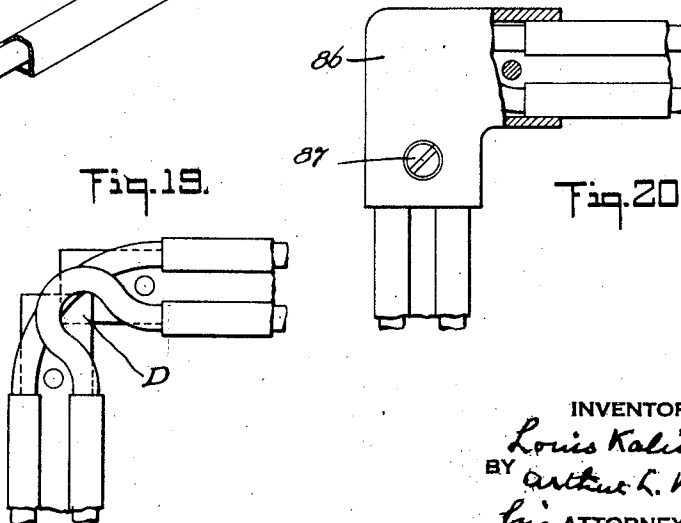


Fig. 19.

Fig. 20.

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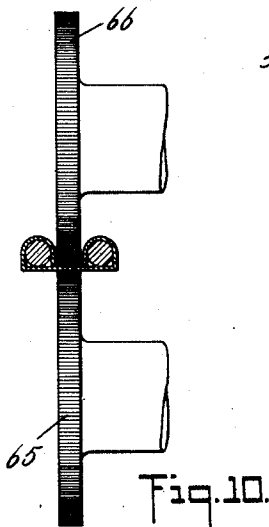
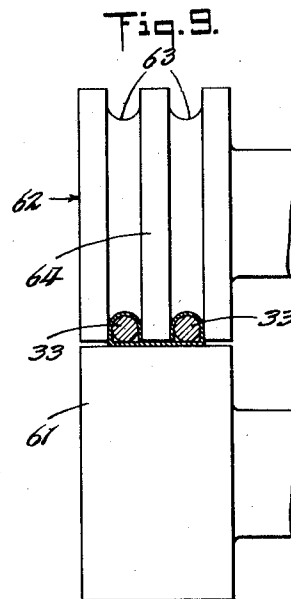
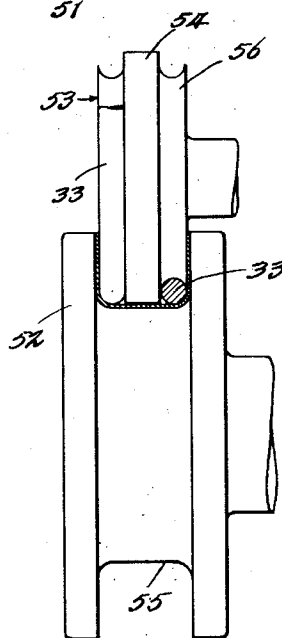
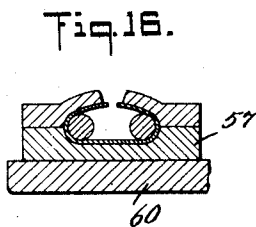
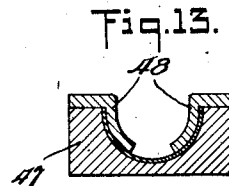
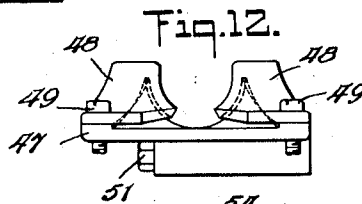
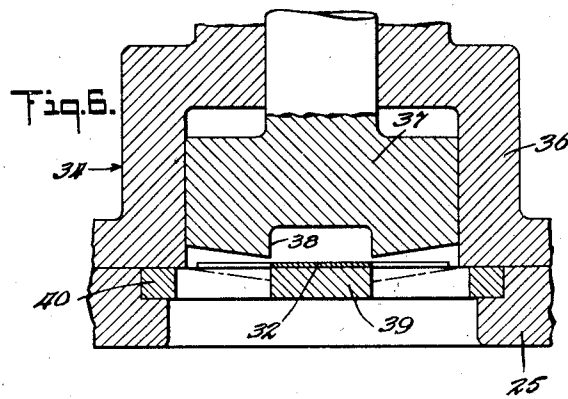
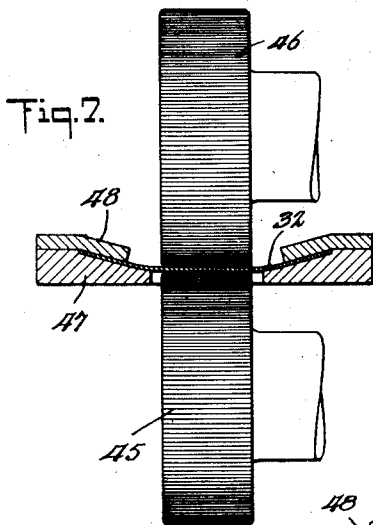
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ELECTRIC WIRING STRIP AND METHOD FOR MAKING SAME

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

1,949,077

ELECTRIC WIRING STRIP AND METHOD
FOR MAKING SAME

Louis Kalischer, Brooklyn, N. Y.

Application October 15, 1931. Serial No. 568,900

10 Claims. (Cl. 247—3)

This invention relates to electric wiring strip and a method for making the same. The use of ordinary insulated wires without any protective covering is dangerous. Efforts have been made to avoid the danger of exposed wiring in various ways, such as encasing the insulated wires in an outer casing or covering of flexible fabric or in rigid strip casings of metal comprising a base strip and a cover strip.

One of the objects of the present invention is to provide a simple inexpensive form of wiring strip in which the wires are fully protected against injury by a metallic casing and which may be readily installed.

Wiring strip has been made by rolling the edges of a flat ribbon of metal around a pair of insulated wires, the metallic ribbon being wide enough to leave a flat web between the rolled-over edges through which nails may be driven to attach the strip to the wall or the like. Such an armored strip is, however, stiff, and cannot, in view of the rolled-over edges, be bent at any considerable angle either in the plane of the central part of the strip or in a plane perpendicular thereto. In wiring a house it is necessary, however, to make numerous right-angle or other more or less sharp turns to follow the contour of a wall, door, or the like.

It is not possible practically to cut the formed metallic armoring at the point where a turn is to be made without injuring the insulation of the wires. This is due to the fact that as the edges of the metal ribbon forming the armor are rolled around the insulated wires it is not possible to insert shears or the like between the metal and the insulation. The cutting must be done wholly from the outside, and the tool in passing through the metal almost necessarily injures the relatively soft insulation therebeneath.

According to the present invention, provision is made for making bends in the wiring strip by forming the wiring strip of a plurality of both armored and unarmored sections of insulated wire arranged alternately, the wires being continuous throughout all sections of the strip and the armor being permanently and non-slidably secured to the wires in the armored sections. The unarmored sections are spaced apart the distance between bends or turns, switches or the like, and consequently the wiring strips are made to fit the requirements of each and every installation.

The best method known to me for making a strip having alternate armored and unarmored sections is to make in the metal ribbon before its edges are turned about the wires oppositely

arranged cutouts at the points where bends are to be made. These cutouts are deep enough so that the intervening metal has a width less than that of completed strip. Hence, when the margins of the metallic ribbon between these cutouts are rolled over the insulated wires, the portion of such ribbon between the cutouts is unaffected by the rolling action and remains as a flat narrow ribbon or web underlying the insulated wires. The wiring strip, therefore, comprises a series of armored sections in which the insulated wires are fully protected by the rolled margins of the metal ribbon connected by exposed lengths of insulated wire and narrow underlying portions of metal. These connecting narrow portions or webs may be cut by shears without injury to the insulated wires, as shears can be readily inserted between such portions and the insulated wires thereabove. After the connecting portion has been cut, the adjacent armored sections of the wiring strip can be placed in any desired angular position with respect to each other. A cover plate of the requisite angular form is then placed over the exposed portions of the wires and adjacent ends of the armored sections.

It is also desirable that there be loose ends of exposed unarmored insulated wires extending from the ends of the wiring strip by which the latter may be attached to outlet boxes, switches and other parts.

Each installation requires bends, outlet boxes, switches, etc., at different varying distances apart, with the result that standard wiring strip with unarmored sections at fixed regular intervals cannot be used. The wiring strip must be made to suit each installation, preferably on the spot. A further object of the invention, therefore, is the production of a simple and preferably portable machine for making the improved wiring strip.

A full understanding of the invention can best be given by a detailed description of an approved wiring strip and method and machine for making the same. Such description will now be given in connection with the accompanying drawings, illustrating in the form now considered best a machine for use in practicing the new method and producing the new wiring strips, and illustrating also the new wiring strips. In said drawings:

Fig. 1 is a side elevation of the machine;

Fig. 2 is an end view of the machine looking from the right in Fig. 1;

Fig. 3 is a plan view of the machine with parts cut away to show the driving mechanism for the strip-forming rolls;

110

Fig. 4 is a vertical section on the line 4—4 of Fig. 3;

Fig. 5 is a vertical section on the line 5—5 of Fig. 3, with parts in elevation;

5 Fig. 6 is a detail section on an enlarged scale on the line 6—6 of Fig. 3 showing the ribbon cutting mechanism;

Fig. 7 is a detail section on an enlarged scale on the line 7—7 of Fig. 3 with the feed rolls in elevation;

Fig. 8 is a detail section on an enlarged scale on the line 8—8 of Fig. 3 with the forming roll and wire-feed roll in elevation;

Fig. 9 is a detail section on an enlarged scale on the line 9—9 of Fig. 3 with the forming rolls in elevation;

Fig. 10 is a detail section on an enlarged scale on the line 10—10 of Fig. 3 with the measuring rolls in elevation;

20 Fig. 11 is a plan view of the fixed horn by which the margins of the metallic ribbon are turned upwardly;

Fig. 12 is an end view of the same from the ribbon receiving end;

25 Fig. 13 is a section on the line 13—13 of Fig. 11 showing the metallic ribbon in position therein;

Fig. 14 is a plan view of the fixed horn by which the margins of the ribbon are turned inward over the insulated wires;

30 Fig. 15 is an end view of the same from the strip-delivering end;

Fig. 16 is a section on the line 16—16 of Fig. 3;

35 Fig. 17 is a plan view of a piece of the metallic ribbon showing one of the cutout portions before the margins of the ribbon have been rolled over the insulated wires;

Fig. 18 is a perspective view of a piece of the completed wiring strip;

40 Fig. 19 is a plan view of two sections of the wiring strip which have been turned to extend at right angles to each other; and

Fig. 20 is a similar view to Fig. 19 with a corner cover attached.

The operating parts of the machine are mounted within or on a frame or a casing 25 which as shown is provided with a pair of depending clamps 26 by which the machine may be secured to the edge of a table or bench 27. On top of the casing is a forked bracket, one arm 28 of which carries a spool 29 having a flat ribbon 32 of thin metal, such as aluminum, wound thereon, while the other arm 30 carries a pair of spools 31 each of which has an insulated wire 33 wound thereon.

55 The ribbon 32 passes through the cutout device indicated generally by 34. This device is designed to form the cutouts 35, as shown in Fig. 17. It comprises a box 36 bolted onto an extension of the main casing 25 and formed with a rectangularly chambered lower section and an upper section which has a cylindrical bore extending vertically therethrough. In this box the cutter 37 is mounted to be movable vertically. The upper part of the cutter is cylindrical and slides in the cylindrical aperture in the upper part of the box. The lower part of the cutter is rectangular in section and slides in the similarly shaped chamber in the lower section of the box 36. The cutter, therefore, while free to reciprocate vertically, is restrained from turning or moving laterally. The under face of the cutter has a longitudinal central slot 38 in register with a central bar 39 of a die-plate 40 (Fig. 6) so that the edges of the cutter on either side of such slot cooperate with the edges of the bar 39 to cut the 75 intervening metal ribbon 32 along longitudinal

lines parallel to each other and to the edges of the strip. The transverse edges of the cutter similarly register with the transverse edges of the die-plate to cut the ribbon transversely outwards from the ends of the longitudinal cuts and thus complete the cutout. 80

For reciprocating the cutter, a hand lever 41 is provided pivotally mounted at 42 on a bracket 43 formed on the rear side of the box 36. Pins 44 connect the lever 41 to the upper part of the cutter. A spring 85 is provided between the lever and the top of the box 36 to hold the cutter in elevated position until the handle 41 is depressed. 85

The ribbon passes from the cutout device to a pair of feed rolls 45, 46 formed with knurled peripheries to grip the ribbon. Both of these rolls are positively driven by mechanism which will be described later. 90

The ribbon is fed by the rolls 45, 46 through a fixed forming horn consisting of three parts 47, 48 and 48 connected together by bolts 49 and 50. The lower part 47 is attached to the main casing 25 by a bolt 51 and the bolts 49. 95

The part 47 is recessed at the ribbon-entry end to a depth slightly in excess of the thickness of the ribbon and to a width slightly in excess of the width of such ribbon (Fig. 12) so that the latter may slide between the lower part 47 and the inner portions of the upper parts 48, 48. At the ribbon-exit end the lower part is trough shaped, as shown in Figs. 12 and 13, and the upper parts 48, 48 are complementarily shaped. Hence, as the ribbon passes through the forming horn it is given a semi-circular form. 100

The ribbon, now in semi-circular form, passes on to a pair of rolls 52, 53. The lower roll 52 has a wide U-shaped groove 55 in its periphery of the width of the completed wiring strip. The upper roll 53 has a central cylindrical portion 54 adapted to press the central part of the ribbon against the roll 52. On either side of the central portion 54 of the roll 53 are grooves 56 having a width, depth and radius of curvature substantially equal to that of the insulated wires 33, so that, as the latter are fed under the roll 53, the contour of the roll plus the wires is substantially complementary to that of the U-shaped groove 55 in the roll 52. The metal ribbon is, therefore, bent into U-shaped form, and at the same time the insulated wires are laid in the corners so formed. A guide 67 partly encircling the roll 53 is provided for guiding the wires 33 to the roll 53. This guide is mounted on the parts 48, 48 to which it is secured by the bolts 50. 105

The ribbon and wires then pass to a second fixed forming horn consisting of a lower part 57 and two upper parts 58 held together and attached to a bracket 60 on the main casing by bolts 59. As will be seen from Figs. 14, 15 and 16, this horn is shaped so as to turn the upwardly extending margins of the metal ribbon inwardly over the insulated wires. 110

Next in series is a pair of rolls 61, 62. The lower roll 61 has a plain cylindrical contour, while the upper roll 62 has two peripheral grooves 63 and an intervening cylindrical portion 64. The latter acts to fold the inner margins of the metal ribbon downwardly around the insulated wires and so complete the wiring strip. As the lower roll 61 has a plain cylindrical contour, the lower parts of the outer rounded portions of the metallic ribbon are forced outwardly and downwardly until they assume the right-angled cross-sectional form shown more particularly in Figs. 110 115

9 and 10. The form of wiring strip so produced has the advantage that it will fit snugly against a flat surface without leaving cracks or corners for the accumulation of dust and dirt.

5 The wiring strip then passes between a pair of draw rolls 65, 66, provided with knurled peripheries to enable them to grip the central web of the wiring strip and aid the other rolls in moving the wiring strip and its component parts through the machine. Guide pins 88 aid in keeping the wiring strip in position laterally.

10 The lower roll of each of the four pairs above described, viz: 45, 52, 61 and 65, is mounted on a shaft journaled in fixed bearings in the main frame 25. One of these shafts 68, the one on which the roll 52 is mounted, extends beyond the rear wall of the frame or casing 25 and is provided with an operating handle or crank 69. The other shafts are driven from the shaft 68. The rolls of each pair, except 65 and 66, are rotatably connected by similar pairs of gears 70, 71, one pair of such gears being shown in elevation in Fig. 5, so that the upper roll of each pair of rolls, except 66, is driven from the shaft of the lower roll. The gears 70 on the shafts of the several lower rolls 45, 52, 61 and 65 are connected by gears 72, 73 and 74 (see Fig. 3) so that the lower rolls are driven simultaneously and in the same direction by the rotation of the crank 69.

20 The upper rolls 46, 53, 62 and 66 are each mounted on a shaft 80 journaled in a bearing 75 slidable vertically in an aperture in the casing 25. One of these bearings is shown in plan in Fig. 3 and another in section in Fig. 5. Each of these bearings is yieldingly supported by a coil spring 76, and is pressed downwardly thereagainst by a screw 77, resting on a small leaf spring 78 secured to the upper part of the bearing. The screws 77 are provided with handles 83 by which they may be turned to adjust the pressure on the upper rolls.

While it is desirable to have the upper rolls movable vertically with respect to the lower rolls, it is not desirable to have the driving gears 71 of the rolls 46, 53 and 62 vertically movable. For that reason each of these upper gears is mounted on a shaft 79 separate from the shaft 80 on which the roll is mounted. Each shaft 79 is journaled in fixed bearings on the casing 25 and is connected to the shaft 80 by a double tongue and groove coupling 81 which permits the shaft 80 to be moved somewhat out of alignment with the shaft 79 without harm. A shaft 79 is also connected by a double tongue and groove coupling 81 to the shaft 80 of the roll 66. This shaft 79 is in fixed bearings similarly to the shaft 79 which drive the rolls 46, 53 and 62, but there is no gear 71 on this shaft and it does not drive its roll 66.

It will be noted that mechanically the strip-forming machine is very simple, as all of the rolls are arranged to rotate about parallel axes, an arrangement which greatly facilitates the driving of the rolls from a single source of power.

Attention is also called to the fact that the first fixed forming device moves the margins of the metallic ribbon inwardly and upwardly transversely of the ribbon. The first pair of forming rolls is employed to complete the bending of the margins of the metallic ribbon into substantially vertical planes, i. e., in a direction perpendicular to the axes of the forming rolls. The second fixed forming device moves the upper parts of the upturned margins of the ribbon inwardly and downwardly into a substantially horizontal posi-

tion. The second pair of forming rolls bend the inturned margins of the ribbon downwardly into substantially vertical planes. While the functions of the fixed forming devices and of the forming rolls overlap, it will be noted that the primary function of the former is to move the margins of the ribbon laterally, i. e., in a direction parallel to the axes of the forming rolls, while the primary function of the latter is to move the margins of the ribbon vertically, i. e., in a direction perpendicular to the axes of the forming rolls. The fixed forming devices avoid the necessity of rolls arranged to rotate about axes perpendicular to the plane of the ribbon. The forming rolls aid in moving the strip and its component parts through such fixed forming devices as well as doing their part in wrapping the margins of the metallic ribbon around the insulated wires.

The satisfactory use of the machine depends on the correct spacing of the cutouts for making bends and turns in the completed wiring strip at the requisite points therein. Measuring means, which may be of any suitable kind, are, therefore, provided for enabling the operator to determine readily when to operate the cutter to form the cutouts in the metal ribbon. The measuring means shown comprises a counting device 82, which may be of any suitable construction, arranged on the end of the shaft 79 which is connected to and driven by the upper roll 66. This roll has a knurled periphery so that it will be turned by the passage of the formed wiring strip thereunder and through its coupling 81 and shaft 79 will drive the counting device 82 by which the exact length of strip passed between roll 66 and its companion roll 65 will be shown. As the roll 66 is not connected by gearing to the other rolls, and not driven otherwise than by the wiring strip, its rotation will be unaffected by any slip of the other rolls relatively to the metal ribbon and wiring strip made therefrom.

It will be noted that the cutout mechanism is at a distance from the measuring roll 66, and, hence, the determination of the time at which the cutout device is to be operated involves some such procedure as the following. The distance between the points A and B on the machine (see Fig. 4) is determined and is, say, 15 inches. Then, when starting to make a wiring strip of a desired length with cutouts at certain known points in the length of the strip, the crank is turned to bring the rear edge of a cutout in register with the point A, and the reading on the counting device is noted. To that reading is added the desired distance between the rear edge of the first cutout and the front edge of the next cutout, less 15 inches. The algebraic sum of these quantities is the reading of the counting device at which the cutout device should be operated. The crank is then turned until that reading is reached and a cutout is made. Then the crank is again turned until, as shown by the counting device, a length of the strip equal to the desired distance to the next cutout has passed the cutting die. Then the cutter is again operated to make another cutout, and this procedure is repeated until the desired wiring strip has been made.

It will be understood that cutouts of any desired length, in excess of that made by a single operation of the cutout device, may be made by repeated operation of the latter, the strip being moved forward a short distance each time. Cutouts of more than the minimum length are often required to provide sufficient slack wire for outlet or junction boxes.

A section of the completed wiring strip, showing a cutout or unarmored section and parts of the two adjacent armored sections, is illustrated in Fig. 18. To make a right-angle turn in the plane of the wiring strip, for example, the metallic ribbon is cut by shears along the line C—C, at about the mid-point of the unarmored section. The adjacent armored sections are then turned at right angles to each other to bring the parts into the position shown in Fig. 19. It will be noted that the cut ends of the metallic ribbon overlap at the point D and thereby electrically connect the metallic armor of the adjacent sections. This is important as it is desirable that the metallic armoring should be grounded electrically. The exposed sections of the wires are then covered by an angle piece 86 of metal, fibre, Bakelite or other suitable material, held in place by screws 87.

Right-angle turns in directions perpendicular to the plane of the wiring strip can be readily made. If the turn is around a projecting corner, the connecting web of metallic ribbon is either cut and the ends lapped over or else a pleat is formed therein to adjust for the fact that the path occupied by the wires is longer than that occupied by the connecting web. If the turn is around a receding corner, the connecting web must be cut if it is desired to avoid buckling of the wires. With this type of turn the cut ends of the web are separated, due to the fact that the path occupied by the connecting web is longer than the path occupied by the wires. Hence, to complete the grounding of the armoring of the wiring strip, a metal strip or wire must be placed across the space between the cut ends of the web.

The metallic armor is usually pliable enough to allow slight angular changes to be made therein without resort to unarmored sections as above described.

What is claimed is:

1. A wiring strip, comprising a pair of insulated wires and a metallic ribbon having portions of reduced width at predetermined distances therealong, the margins of the ribbon between such portions of reduced width being folded over said wires individually, the ribbon being of sufficient width to leave an unobstructed central space between the folded-over portions.

2. A wiring strip, comprising a pair of insulated wires and a metallic ribbon having pairs of oppositely arranged marginal cutouts at predetermined distances therealong, the margins of the ribbon between such cutouts being folded over said wires individually, and the depth of the cutouts being such that the intervening portion of metal has a width not substantially greater than that of the completed armored sections of the wiring strip.

3. A wiring strip, comprising a pair of insulated wires and a metallic ribbon having pairs of oppositely arranged marginal cutouts at pre-

termined distances therealong, the depth of each of the cutouts being of the order of magnitude of one third of the width of the metallic ribbon when flat, the margins of the metallic ribbon between the cutouts being folded over the insulated wires individually.

4. A wiring strip, comprising a pair of insulated wires and metallic armor in strip form with its margins folded around each wire individually and holding the same in fixed parallel relation for a plurality of portions of the length of such wires, such armored portions being at an angle to each other and connected together by unarmored and unsevered portions of the wires.

5. A method of making wiring strips, comprising making pairs of oppositely arranged cutouts in a metallic ribbon at predetermined distances therealong, and then folding the margins of such ribbon between the cutouts over a pair of insulated wires individually.

6. A wiring strip, comprising a pair of insulated wires, and a metallic ribbon having end portions of reduced width, the margins of the ribbon between such portions of reduced width being folded about said wires individually.

7. A wiring strip, comprising a pair of insulated wires, and a metallic ribbon having portions of reduced width at predetermined distances therealong, the margins of the ribbon between such portions of reduced width being folded about said wires individually.

8. A wiring strip, comprising a pair of insulated wires and a metallic ribbon having pairs of oppositely arranged marginal cutouts at predetermined distances therealong, the margins of the ribbon between such cutouts being folded over said wires individually, and the depth of the cutouts being such that the intervening portion of metal has a width less than that of the armored sections of the wiring strip.

9. The method of making wiring strip comprising cutting out opposite marginal portions of a metallic ribbon at predetermined distances therealong, and then wrapping the uncut margins of such ribbon about a pair of insulated wires individually, the depth of the cutouts being such that the intervening portion of metal has a width less than that of the armored sections of the wiring strip.

10. The method of making wiring strips, comprising cutting out opposite marginal portions of a metallic ribbon while the latter is stationary, then moving the ribbon and a pair of superimposed insulated wires longitudinally and simultaneously folding the margins of the ribbon following such cutouts about the insulated wires individually, stopping the ribbon after it has been moved a predetermined distance, and again cutting out opposite marginal portions of the ribbon.

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