Sept. 12, 1950 J. B. CATALDO ET AL 2,521,688

CUTTING TOOL FOR INSULATION

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FIG. 1

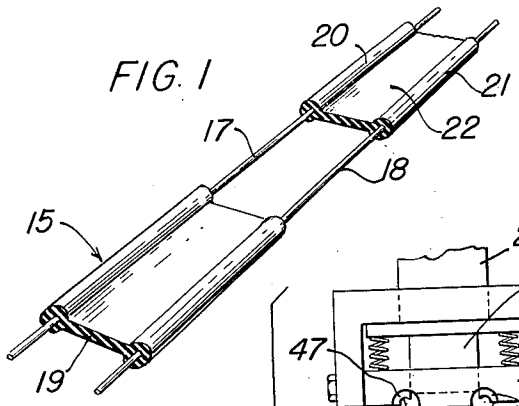



FIG. 2

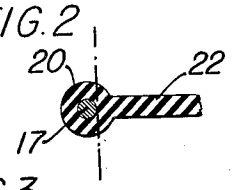



FIG. 3

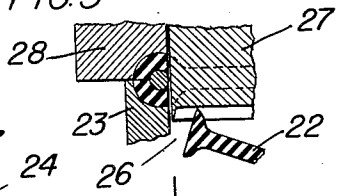



FIG. 4

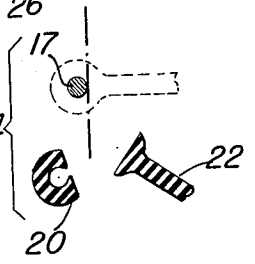



FIG. 5

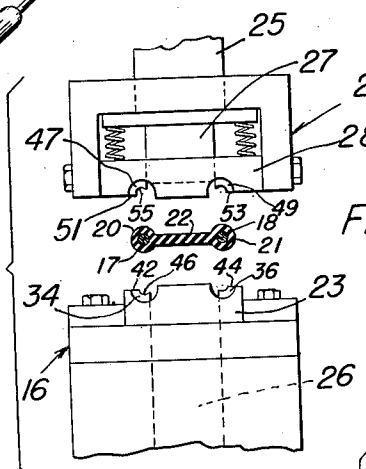



FIG. 6

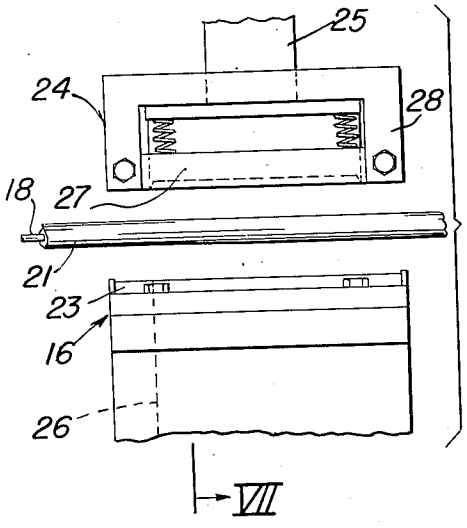
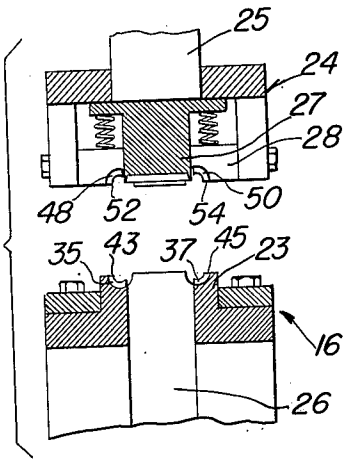



FIG. 7




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FIG. 8

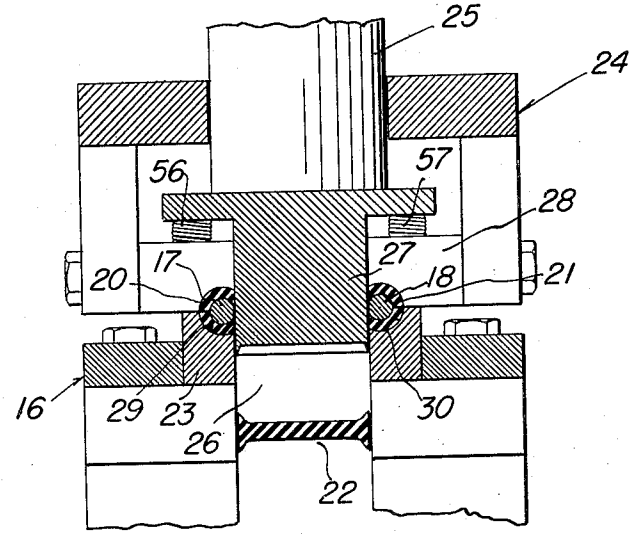



FIG. 9

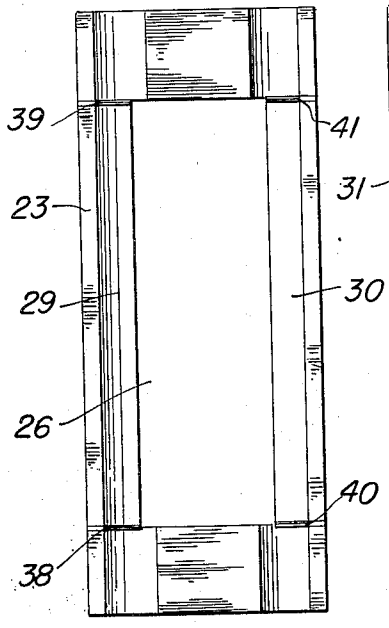



FIG. 10

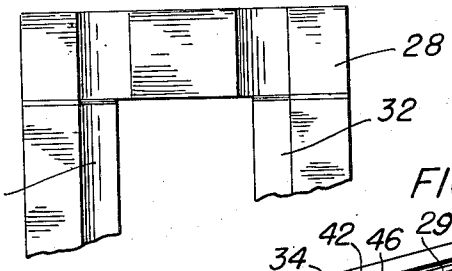



FIG. 12

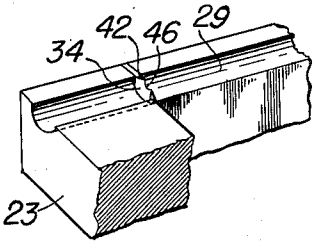
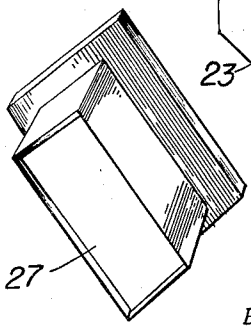



FIG. 11




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Patented Sept. 12, 1950 2,521,688

# UNITED STATES PATENT OFFICE

2,521,688

## CUTTING TOOL FOR INSULATION

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Application April 8, 1948, Serial No. 19,656

2 Claims. (Cl. 81—9.51)

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This invention relates to a cutting tool for insulation, and more particularly a tool for cutting insulation from an electrical conductor strip in which a plurality of substantially parallel spaced conductors are embedded in insulating material. The invention is especially useful in its application to a machine tool, to which use however it is not restricted.

One method of wiring a house for lighting fixtures, electrical appliances, and the like, is to fasten an electrical conductor strip along inner surfaces of the house, especially baseboards and interior trim. A usual form of conductor strip consists of two electrical conductors embedded in a strip of insulating material. The strip is ordinarily formed with cylindrical portions surrounding the conductors, and an integral web extending between the cylindrical portions and spacing the conductors uniformly in the strip. The web thus forms a longitudinal section for attaching the strip, as by nails, screws, and the like. In order to connect outlet boxes to the strip it is necessary to remove sections of the insulating material at the desired locations of the outlet boxes. Removal of such sections of insulation with a knife consumes time, makes difficult the performance of a neat job, and is likely to damage the strip conductors. Less time is required to remove the insulating material with a wire clipping tool, but there is greater likelihood of damaging the conductors.

In our co-pending application Ser. No. 13,288, filed March 5, 1948, "Tool for Cutting Insulation," there is described a hand tool for effectively removing the insulating material at desired points from an electrical conductor strip. Such a tool has marked advantages over known apparatus for performing a similar function, being almost as portable as a pair of pliers and making possible the removal of insulation, quickly, neatly, and without damage to the conductors. However, the use of such a hand tool requires the performance of at least four operations to remove a section of insulating material, and the tool is not adapted for use under production conditions.

We have now found that it is possible to construct a tool which will remove a section of insulation from such an electrical conductor strip in a single operation. The tool contemplated by the present invention is not as portable as that described in our co-pending application. It is, however, preferable for production in the shop, and may even be used "on the job" where conductor strips are being installed. Although the

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tool of the present invention may be embodied in a hand tool, it is more particularly adapted for use in a machine tool.

According to the present invention the insulating material is cut from the strip conductors by means of a punch and die which cooperate to shear the insulating material from between the strip conductors for the desired length, and to cut the insulating material from around the conductors at the ends of the section from which the insulation is removed.

One form of the invention is shown by way of illustration in the accompanying drawings, wherein—

Fig. 1 is a perspective view of an electrical conductor strip from which sections of the insulating material have been cut;

Fig. 2 is a broken transverse section through one of the strip conductors and a portion of the insulating material;

Fig. 3 is a fragmental view illustrating the shearing of the insulating material from the strip conductor illustrated in Fig. 2;

Fig. 4 is an exploded view illustrating the removal of the insulating material from the conductor shown in Figs. 2 and 3 after the simultaneous shearing and cutting operations;

Fig. 5 is a broken end view showing the die and plunger employed for shearing and cutting the insulating material from a strip conductor which is illustrated in transverse section;

Fig. 6 is a broken side elevation of the same apparatus, the strip conductor being shown in side elevation;

Fig. 7 is a vertical section taken on the line VII—VII of Fig. 6;

Fig. 8 is an enlarged mid-section of the apparatus illustrated in Figs. 5, 6, and 7 in the position in which it has completely severed the insulating material from the electrical conductor strip;

Fig. 9 is a plan view of the die shown in Fig. 8;

Fig. 10 is a broken view of the cutting part of the plunger shown in Fig. 8, as seen from beneath;

Fig. 11 is a perspective view on a reduced scale of the shearing part of the plunger shown in Fig. 8; and

Fig. 12 is a broken perspective view of the die illustrated in Fig. 9.

In the embodiment of the invention which is illustrated in the drawings, there is shown an electrical conductor strip 15 and a tool 16 for cutting insulation therefrom.

For simplicity, the particular electrical con-

ductor strip 15 here described is a two-conductor strip; and such strips are usual. However, it will be understood that the invention is equally applicable to strips including a greater number of conductors. The strip 15 comprises two conductors 17 and 18 which are embedded in insulating material 19. The insulating material surrounds the conductors 17 and 18 in cylindrical portions 20 and 21, respectively, and has an integral web 22 extending between the two cylindrical portions to space the conductors and provide a section through which nails or screws may pass to fix the strip in place.

The tool 16 is constructed and arranged to remove the insulating material 19 from the conductors 17 and 18 and provide a conductor strip section to which an outlet box or the like (not shown) may be electrically connected. The tool here shown comprises a die 23 and a coacting plunger 24. Means is provided for reciprocating the plunger with respect to the die, and is here indicated by a ram 25, by which the plunger 24 is carried.

The die 23 has a passage 26 therethrough, the width of which is equal to the net distance between the strip conductors 17 and 18. See Fig. 8. The length of the passage 26 is equal to the length of the insulation to be cut away for electrical connection of a junction box or the like to the conductor strip.

The plunger 24 has a shearing portion 27 of length and width substantially equal to the length and width of the passage 26 through the die 23. With the conductor strip 15 properly positioned (see Figs. 5, 6 and 8) the shearing portion of the plunger may be moved by the ram 25 into the passage 26 through the die to shear the insulation from between the strip conductors. See Fig. 8. The upper edges of the die immediately about the passage 26, and the lower edges of the shearing portion 27 of the plunger thus constitute shearing edges whereby the central part of the insulating material between the conductors is sheared away.

The plunger 24 has a cutting portion 28 which coacts with the die for transversely severing the insulating material 19 of the conductor strip about the conductors 17 and 18 in the planes of the ends of the passage 26. See Figs. 1, 5 and 8. In the embodiment of the invention here illustrated, the conductor strip 15 is supported at the top of the die 23. The cylindrical portions 20 and 21 of the strip are accordingly positioned in channels 29 and 30, respectively, which extend along the respective longitudinal shearing edges of the die and have a contour complementary to that of the cylindrical portions in order to accommodate them therein. Beyond the ends of the passage 26 through the die, the channels 29 and 30 continue to both ends of the die in semicylindrical form. See Fig. 12. The cutting portion 28 of the plunger 24 is similarly formed, having longitudinal channels 31 and 32 therein which register with the die channels 29 and 30, respectively, to enclose the cylindrical portions 20 and 21 of the conductor strip completely, except for the part of each which lies in the path of the shearing portion 27 of the plunger 24.

Cutting elements 34 and 35 extend into the channel 29 in the die to provide transverse cutting edges in the plane of each end wall of the passage 26 through the die. Similarly, cutting elements 36 and 37 extend into the channel 30 to provide transverse cutting edges in that channel in the plane of each end wall of the passage 26.



The cutting elements may be inserted through transverse slots 38, 39, 40 and 41 in the die 23, where they may be wedged in place. The cutting elements 34, 35, 36 and 37 have cutting edges 42, 43, 44 and 45, respectively thereon. Each cutting edge has thereon a segmental recessed portion as the portion 46 of the cutting edge 42. The segmental recessed portions are of substantially the diameter of the strip conductors, and the cutting edges are spaced to embrace such conductors. Likewise, cutting elements 47 and 48 are positioned in the longitudinal channel 31 in the cutting portion 28 of the plunger in a position to coact with the cutting elements 34 and 35 in the channel 29 of the die. Like cutting elements 49 and 50 are disposed in the longitudinal channel 32 of the cutting portion 28 of the plunger in a position to coact with the cutting elements 36 and 37 carried by the die. The cutting elements 47, 48, 49 and 50 have transverse cutting edges 51, 52, 53 and 54, respectively, thereon for coacting with the transverse cutting edges of the respective cutting elements carried by the die. Each of these transverse cutting edges has a segmental recessed portion, as the portion 55 of the cutting edge 51, of substantially the diameter of the strip conductors. Like the segmental recessed portions of the cutting elements carried by the die, these segmental recessed portions are spaced to embrace the strip conductors. Accordingly, when the cutting portion of the plunger is moved against the die the cutting edges thereon will coact with the cutting edges carried by the die to cut the insulation transversely of the conductors at the ends of the section of insulation to be removed. However, the cutting edges will not cut the conductors themselves.

From the foregoing the action of the tool 16 will be understood. With the conductor strip 15 in place on top of the die, and the plunger withdrawn therefrom, the ram 25 may depress the plunger and bring it into contact with the die. In so doing the shearing portion 27 of the plunger enters the passage 26 through the die, thereby shearing away a section of the cylindrical portion from between the conductors together with the integral web 22 connecting them. See Figs. 3 and 8. Simultaneously with such movement of the shearing portion 27, the cutting portion 28 of the plunger moves until it is in contact with the upper surface of the die. The cutting edges of the die and the cutting edges on the cutting portion of the plunger thereby make a transverse cut through the insulation forming the cylindrical portions of insulating material 20 and 21 surrounding the strip conductors. These cuts are made in the plane of each end wall of the passage 26, and complete the severence of the insulating material from the strip conductors. The integral web 22, together with the inner sections of the cylindrical portions 20 and 21, thereupon drops out of the die through the passage 26. As the ram 25 withdraws the plunger, the remaining part of each cylindrical portion may be easily pulled away from the conductor which it has surrounded. See Fig. 4.

Although the shearing portion 27 and the cutting portion 28 of the plunger 24 may be unitary, the form of the invention here disclosed embodies separate shearing and cutting portions, together with a resilient connection between the cutting element and the shearing element. As here shown, this resilient connection comprises helical springs 56 and 57 which are compressed as the plunger is moved against the strip. Accordingly,

the cutting edges of the die and those carried by the cutting portion of the plunger will first come in contact with the insulation of the conductor strip and will begin to sever the insulation transversely as the shearing portion of the plunger shears away the central section of the insulating material 19. This form of the invention tends to prevent distortion of the electrical conductor strip, as might be the result were the shearing portion of the plunger to act prior to contact between the cutting portion and the strip.

Thus, a tool constructed in accordance with the invention cuts the insulating material from a strip conductor for the desired length in a single operation which may be easily performed. Under production conditions it is merely necessary to advance the strip into position in the tool and then to reciprocate the plunger with respect to the die. Sections of insulating material are thereby easily removed at the desired locations of the outlet boxes.

The form of the invention here described and illustrated in the accompanying drawings is presented merely as an example of how the invention may be applied. Other forms and embodiments of the invention which come within the proper scope of the appended claims will readily suggest themselves to those skilled in the electrical wiring art.

We claim—

1. A tool for cutting insulation from the conductors of an electrical conductor strip consisting of a plurality of substantially parallel spaced conductors embedded in insulating material, said tool comprising a die having a passage therethrough of a width equal to the distance between the strip conductors and a length equal to the length of the insulation to be cut away; a two part plunger comprising a cutting element reciprocable with respect to said die to cut insulation about the circumference of the conductors without cutting the conductors, and a shearing element reciprocable with respect to said cutting element and also reciprocable into and out of the passage through said die to shear away insulating material from between the strip conductors; and means for reciprocating said plunger with respect to said die.



2. A tool for cutting insulation from the conductors of an electrical conductor strip consisting of a plurality of substantially parallel spaced conductors embedded in insulating material, said tool comprising a die having a passage therethrough of a width equal to the distance between the strip conductors and a length equal to the length of the insulation to be cut away; a two part plunger comprising a cutting element reciprocable with respect to said die to cut insulation about the circumference of the conductors without cutting the conductors, a shearing element reciprocable with respect to said cutting element and also reciprocable into and out of the passage through said die to shear away insulating material from between the strip conductors, and a resilient connection between said cutting element and said shearing element whereby movement of said shearing element toward said die will move said cutting element in like direction; and means for reciprocating said plunger with respect to said die.

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