March 30, 1965 A. R. SCHROETER 3,175,431

SHIELDED WIRE DIELECTRIC EXTRACTOR

Filed June 27, 1962

FIG. 1

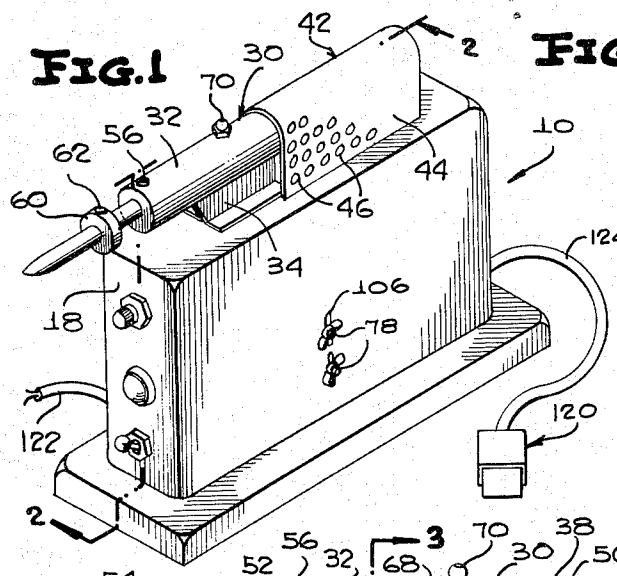


FIG. 3

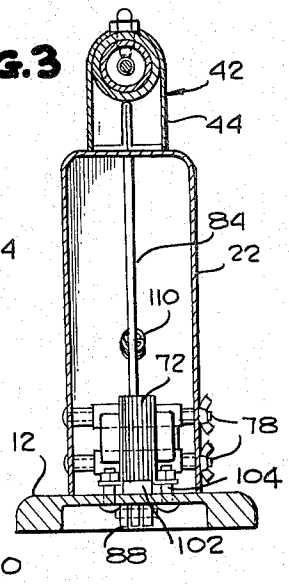


FIG. 2

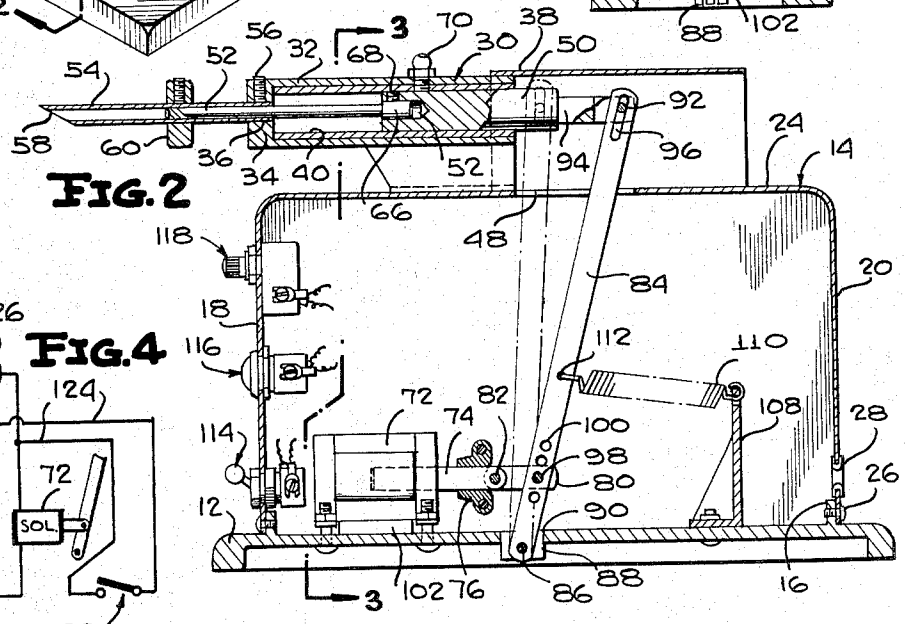
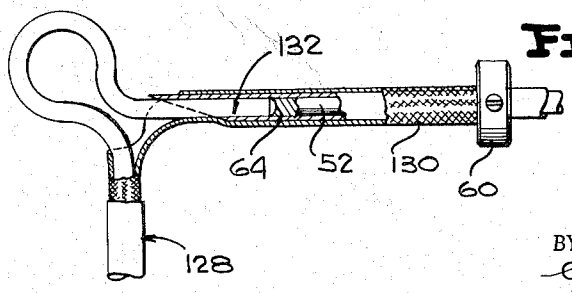


FIG. 4

FIG. 5



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SHIELDED WIRE DIELECTRIC EXTRACTOR

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This invention relates generally to apparatus used in connection with the assembling of electric equipment and is directed more particularly to a new and novel apparatus for extracting from a shielded wire cable, through the shielding braid thereof, the dielectric and inner conductor of the cable.

As is well known shielded wire cable is extensively used in connection with the manufacture and installation of electrical equipment and in the use of such cable it is frequently necessary to extract the inner conductor and dielectric from the shielding braid in which it is encased.

Various implements or devices have been designed for extracting the wire dielectric from or through the shielding braid but there are certain drawbacks to the use of these prior devices which the apparatus of the present invention definitely avoids or overcomes.

It is a particular object of the present invention, accordingly, to provide a new and improved shielded wire dielectric extractor which avoids the undesirable features associated with the use of prior devices and in which, particularly, there is provided a means for applying a positive impact to the end of the inner conductor and dielectric whereby to effect the desired removal or extraction of the latter through the braided metal covering or shield without damaging the braided shield.

Another object of the invention is to provide an apparatus for effecting the extraction of the dielectric through the shielding braid wherein the cable may be held in both hands while the desired force is being applied to the end of the inner conductor and the dielectric, whereby a better control is had over the operation than is had by the use of hand held tools or implements in which one hand must be employed for holding the cable while the other hand is employed for manipulating a plunger or pusher element of the tool.

Still another object of the invention is to provide an apparatus for extracting shielded dielectric wherein a power actuated mechanism is associated with an ejector element for applying a positive force or thrust to the ejector element while both hands are employed for holding the shielded cable in position upon a guide tube through which the ejector element in the form of a rod, is forced or moved.

Still another object of the invention is to provide an improved tip design for an extractor tube, such that strands of the metal braid will not be caught while the shielded wire is being inserted into the tube.

Another object of the invention is to provide a mechanically actuated apparatus wherein the extractor pin or rod and the tube in which it operates, are easily removable from the apparatus to facilitate the use of tubes and rods of different sizes to accommodate different wire sizes and wherein, also, such tube and rod or pin can be easily and quickly replaced in the event of damage.

A still further object of the invention is to provide an improved extractor pin in which the inner conductor engaging end of the pin is depressed or slightly concave, whereby the centering of the end of the inner conductor is effected during the extraction cycle for application of the power stroke to the inner conductor and dielectric.

Another object of the invention is to provide in an apparatus of the character stated, a means whereby the stroke of the extractor pin, actuated by power means

such as suitable electric power means or other suitable means, can be readily changed and also wherein a means is provided whereby a vibrating or pulsating force may be applied to the mechanism to assist in separating the strands of the wire comprising the shielding, prior to the application to the dielectric of the positive power thrust by which the dielectric is forced through the shielding.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection wth the accompanying drawing, wherein:

FIG. 1 is a view in perspective of the extractor apparatus constructed in accordance with the present invention.

FIG. 2 is a longitudinal section taken in a vertical plane substantially on the line 2—2 of FIG. 1.

FIG. 3 is a vertical section taken transversely of the apparatus substantially on the line 3—3 of FIG. 2.

FIG. 4 is a diagram of the electric circuit for the apparatus.

FIG. 5 is an enlarged, slightly exaggerated detail illustrating the removal or extraction of the inner conductor and dielectric from the shielding braid.

Referring now more particularly to the drawing the numeral 10 designates as a whole the dielectric extraction apparatus of the present invention.

The numeral 12 designates the base of the apparatus while the numeral 14 designates a housing or casing in which certain of the parts are enclosed.

As illustrated the base 12 is provided with means for securing the housing 14 thereto, in the form of an upstanding flange 16 adjacent to each of the ends of the elongated base.

The housng also is relatively narrow and of elongate form and shown as comprising the front and back end walls 18 and 20 respectively, the side walls 22, and the top wall 24.

The front and back walls are shown engaged across the outer sides of the upstanding flanges 16 to which they are detachably secured in a suitable manner as, for example, by means of screws 26.

One of the housing walls, here shown as the back wall 20, has an opening 28 therein through which electric current conductors may be passed to the control elements within the housing.

Supported upon the top wall 24 of the housing is the pin and plunger assembly which is generally designated 30. This assembly comprises the elongate barrel or tube 32 mounted upon a supporting fin 34, which extends longitudinally thereof and is supported upon the top wall 24 in the manner illustrated so that the barrel extends longitudinally of the top wall as shown.

The barrel 32 has the forward end wall 34 through the center of which is the opening 36. The opposite or rear end of the barrel is open as indicated at 38.

Within the barrel 32 is a metal liner 40 which extends the full length of the barrel and the open rear end of the barrel and the liner are directed into a guide or shield hood 42. This hood 42 is of substantial length and has the side walls 44 thereof perforated as shown at 46 and secured at their bottom edges upon the top of the housing top wall 24.

The housing top wall 24 is provided with a longitudinally extending slot 48 within the forward end portion of the hood 42 for the purpose about to be described.

Slidably mounted within the liner 40 is a plunger 50. The forward end of the plunger 50 has a socket 52 therein which is axially aligned with the opening 36 in the wall 34 of the barrel.

The pin and plunger assembly includes the extractor pin 52 and the extractor pin tube or guide 54.

As shown the extractor pin tube has its rear end positioned in the opening 36 in the forward end or wall of the barrel 34, where it is removably secured by a set screw 56 or in any other suitable manner.

The forward end of the tube 54 is cut obliquely to form the flat rounded piercing point 58 which, since the tube is cylindrical, would have a substantially arcuate cross section. This design of the tip of the extractor tube prevents the catching of strands of the metal braid while the shielded wire is being inserted into the tube as hereinafter described.

Mounted on the tube 54, for longitudinal adjustment thereon is a stop collar or ring 60 which is here shown as being secured in the desired position longitudinally of the tube by a set screw 62.

The extractor pin 52 has the forward end face thereof slightly depressed or concave as indicated at 64 in order to center the inner conductor during the extractor operation.

The inner or rear end of the pin 52 is shown as carrying the slightly enlarged tang 66 which fits in the socket 52 of the plunger 50 where it is removably held in a suitable manner as, for example, by means of a set screw 68. However any other suitable means may be employed for removably holding the extractor pin in operative connection with the plunger 50.

Means is provided for introducing lubricating oil into the liner 40, which means is here shown as a conventional fitting 70 having a part extending through the wall of a barrel and the liner.

Mounted upon the base 12 within the housing 14, is the motor means by which actuation of the extractor pin 52 is effected and this motor means is here illustrated as comprising an electric solenoid 72 in which is positioned the reciprocable armature 74, the outer or rear end of which is suitably supported by a guide means 76 mounted between the side walls 22 of the housing, in a suitable manner, as by means of transverse pins 78.

The solenoid 74 is positioned to have the axial center thereof in the central plane of the housing 14 whereby the armature 74 will reciprocate in the longitudinal center of the housing.

A link 80, pivotally connected with the rear end of the armature 74, as indicated at 82, is operatively coupled with the lower end portion of an upright lever arm 84, the lower end of which lever arm is suitably pivoted or rockably mounted on a pin 86 carried by the base 12.

Any suitable means may be provided for supporting the pin 86 transversely of the longitudinal center of the housing and base so that the arm 84 may move or swing back and forth in a vertical, longitudinal, central plane of the housing. Such mounting means for the pin 86 is here shown as comprising depending ears 88 on opposite sides of an opening 90 in the base.

The plunger 50 is operatively connected with the upper end of the lever 84 by means of a pivot pin 92. This pivot pin extends through the rear end portion of the plunger 50, which portion is here shown as a reduced extension 94 of the plunger, which extension may be slotted to receive the upper end of the lever 84.

The upper end of the lever 84 is also shown as being slotted as indicated at 96 to receive the pivot pin 92 to permit the necessary slight arcuate travel of the upper end of the lever, relative to the straight reciprocable movement of the plunger 50, in the operation of the device.

Adjacent to its lower end the lever 84 is pivotally coupled with the link 80 by means of the pin 98 which passes transversely therethrough and through the link. The pin 98 is here shown as engaging in one of a number of openings 100 formed longitudinally of the lever 84 to permit the vertical adjustment for elevation and lowering of the electric solenoid as may be desired to vary the throw of the upper end of the lever and consequently vary the stroke of the plunger 50 and the extractor pin 52.

Any suitable means may be provided for changing the elevation of the solenoid. One such means may consist of mounting the solenoid upon a block 102 and securing the solenoid on the block and to the base 12 by means of bolts 104. If a change in elevation of the solenoid is desired a thicker or thinner block may be employed or shims may be made use of as will be readily apparent.

Provision is also made for raising or lowering the guide 76 for the armature 74 such, for example, as providing vertical slots 106 in the side walls 22 of the housing.

Secured to the base 12 within the housing and rearwardly of the lever 84 is an upstanding bracket 108. Attached to the top end of this bracket is an end of a pull or contractile spring 110, the other or forward end of which spring is attached as at 112 to the lever 84. As will be apparent this spring in its contracted condition holds the lever 84 in the retracted position and this also maintains the plunger 50 and the pin 52 retracted with respect to the pin guide 54.

Energization of the solenoid 72 will effect the forward swinging of the lever 84 against the resistance of the spring 110 so as to project the pin 52 for the dielectric extracting operation.

Means is provided for effecting the energization of the electric solenoid whereby to controllably project the ejector pin 52. Such means comprises an electrical system of suitable character such, for example, as that illustrated in FIG. 4. This system includes the main on-off switch 114, a pilot light 116, a manual switch 118 and a foot control switch 120. The switches 114 and 118 together with the pilot light 116 are preferably mounted upon the front wall 18 of the housing as illustrated and the current feed line 122 may be carried to the interior of the housing through the back wall opening 28 for connection with the electrical units mounted on the front wall and the necessary conductor cable 124 for the foot switch 120 will be led out through the opening 28 to the foot switch which is to be conveniently located for use by the operator of the apparatus.

As hereinbefore stated a feature of the invention is the provision of means whereby a period of vibration may be applied to the extractor pin to assist in separating the strands of the wire comprising the shielding and such vibration may be effected by the use of a suitable vibrating unit 126 in circuit with the manual switch 118.

FIG. 5 is illustrative of the manner of effecting the extraction of the inner conductor wire and dielectric through the braided metal covering or shield of a shielded wire cable. Such shielded wire cable is generally designated, in FIG. 5, by the reference numeral 128 while the braided metal covering or shield is designated 130 and the inner shielded wire and covering dielectric are generally designated 132, the inner conductor or wire not being illustrated.

In using the apparatus the metal shielding 130 is slipped over the extractor pin tube 54 a predetermined distance as regulated by the stop collar 60. In this operation the inner conductor and dielectric enter the tube in the manner illustrated.

The shield covering on the tube is then grasped firmly with one hand and the free portion of the cable is bent and held at approximately a 90° angle as it is illustrated in FIG. 5. While holding the cable in this position with the shield on the ejector tube the foot switch 120 is closed so that the solenoid will be energized to actuate the oscillatable lever 84 and this will project the plunger 50 forwardly and force the pin 52 against the end of the dielectric and wire 132 thus resulting in pushing the inner conductor and dielectric through the shielding in the manner illustrated.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention

is defined by the appended claims rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents, are therefore intended to be embraced by those claims.

I claim:

1. Apparatus for extracting dielectric covered wire from shielding braid of a shielded wire cable, comprising a tubular guide pointed at one end, means supporting and rigidly holding the guide from the other end thereof, a pusher pin supported in said guide for reciprocable movement relative to the pointed end of the guide, a lever arm pivotally supported at one end for rocking movement of its other end toward and away from the said other end of the guide, an operative coupling between said other end of the lever arm and the pusher pin whereby rocking of the lever arm on its pivot effects reciprocation of the pusher pin in the guide, and means operatively connected with said lever arm for effecting the rocking movement thereof.

2. Apparatus for extracting dielectric covered wire from shielding braid of a shielded wire cable, comprising a tubular guide pointed at one end, means supporting and rigidly holding the guide from the other end thereof, a pusher pin supported in said guide for reciprocable movement relative to the pointed end of the guide, a lever arm pivotally supported at one end for rocking movement of its other end toward and away from the said other end of the guide, an operative coupling between said other end of the lever arm and the pusher pin whereby rocking of the lever arm on its pivot effects reciprocation of the pusher pin in the guide, means operatively connected with said lever arm for effecting the rocking movement thereof, and the end of the pusher pin nearest to the pointed end of the guide being recessed for centering engagement with the dielectric covered wire and dielectric covering thereon.

3. The invention according to claim 2, wherein the last stated means comprises a power operated mechanism having the said operative connection with the lever arm at a point between the pivot for the latter and the said other end thereof.

4. The invention according to claim 2, wherein the last stated means comprises an electric solenoid and a reciprocable armature with a pivotal connection between an end of the armature and the lever arm at a point intermediate the said other end of the lever arm and its pivot, and means for controllably delivering electric current to said solenoid.

5. The invention according to claim 2, with a stop element supported on said tubular guide with means for securing the stop element in adjusted position on the guide, said guide being designed to have its pointed end introduced into a cable shielding braid from an end of the cable with an end of the dielectric covered wire entering the guide, and said stop element functioning to determine the extent of insertion of the pointed end of the guide into the braid.

6. Apparatus for extracting dielectric covered wire from shielding braid of a shielded wire cable, comprising an elongate tubular barrel having a forward end wall with an axially directed opening therethrough, means for supporting the barrel in a substantially horizontal working position, a plunger reciprocably supported in said barrel, a relatively long tubular guide secured at one end in said opening in the said end wall of said barrel, said guide being coaxial with said barrel, said guide having its other end pointed for facilitating its insertion into an end of shielding braid of a shielded wire cable, a pusher pin reciprocably supported in said tubular guide and having a rear end extending into the barrel, means detachably coupling said rear end of the pusher pin with said plunger, a

motor supported adjacent to the barrel, an operative coupling between said motor and the plunger by which the reciprocation of the plunger and pusher pin is effected upon energization of the motor, means for controlling the energization of the motor, a casing structure and a supporting base therefor, the casing having a top wall providing the said means for supporting said barrel, said operative coupling between said motor and the plunger comprising a substantially upright lever arm and having a bottom end pivotally supported on said base within the casing, said motor comprising an electric solenoid and armature within the casing on the base, the armature being operatively coupled to the lever arm above the pivotally supported bottom end thereof, the top end of the lever arm extending through an opening in said casing top wall and having pivotal connection with the rear end of the plunger, and spring means coupling the lever arm with a fixed part of the apparatus and biased to effect retraction of the plunger and pusher pin following de-energization of the motor.

7. The invention according to claim 6 with foot pedal means for controlling the energization of said motor.

8. The invention according to claim 6 with means for adjusting the pivotal connection between the lever arm and the rear end of the plunger whereby to effect a change in the extent of throw of the lever arm and a corresponding change in the extent of reciprocable movement of the plunger and the pusher pin.

9. Apparatus for extracting dielectric covered wire from shielding braid of a shielded wire cable, comprising an elongate tubular barrel having a forward end wall with an axially directed opening therethrough, means for supporting the barrel in a substantially horizontal working position, a plunger reciprocably supported in said barrel, a relatively long tubular guide secured at one end in said opening in the said end wall of said barrel, said guide being coaxial with said barrel, said guide having its other end pointed for facilitating its insertion into an end of shielding braid of a shielded wire cable, a pusher pin reciprocably supported in said tubular guide and having a rear and extending into the barrel, means detachably coupling said rear end of the pusher pin with said plunger, a motor supported adjacent to the barrel, an operative coupling between said motor and the plunger by which the reciprocation of the plunger and pusher pin is effected upon energization of the motor, means for controlling the energization of the motor, and said pusher pin having a concavity in the forward end thereof for centering the engaged end of the dielectric covered wire.

10. The invention according to claim 9 with a stop collar on said tubular guide and means for securing the collar in a position of longitudinal adjustment thereon.

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