Aug. 6, 1940. B. K. YOUNG, JR 2,210,157

EXTRUDING METAL SHEATHS ON ELECTRICAL CABLES

Filed Aug. 12, 1939 3 Sheets-Sheet 1

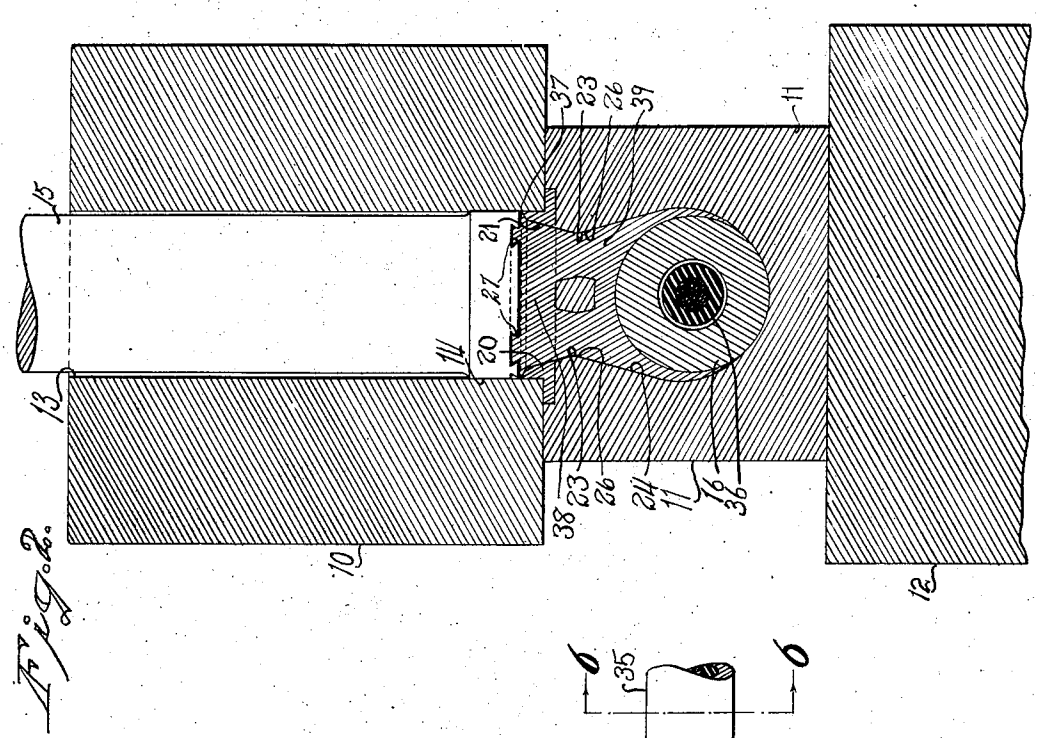


Fig. 2.

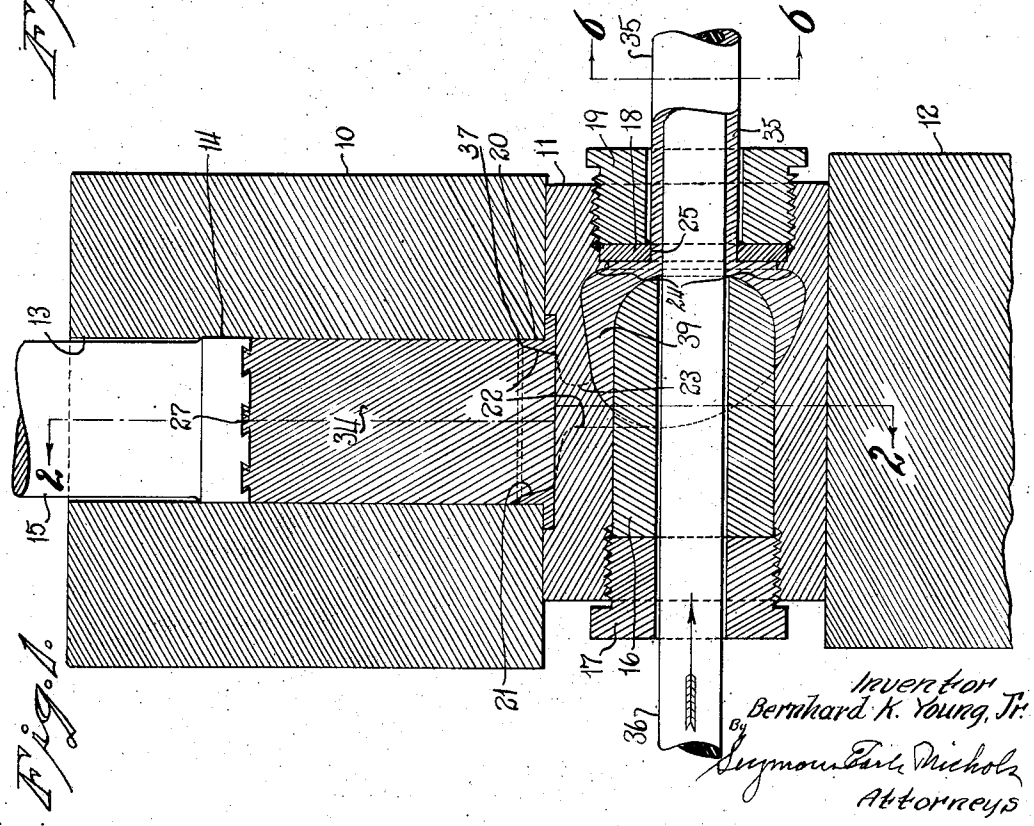


Fig. 1.

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Filed Aug. 12, 1939 3 Sheets-Sheet 2

Fig. 3.

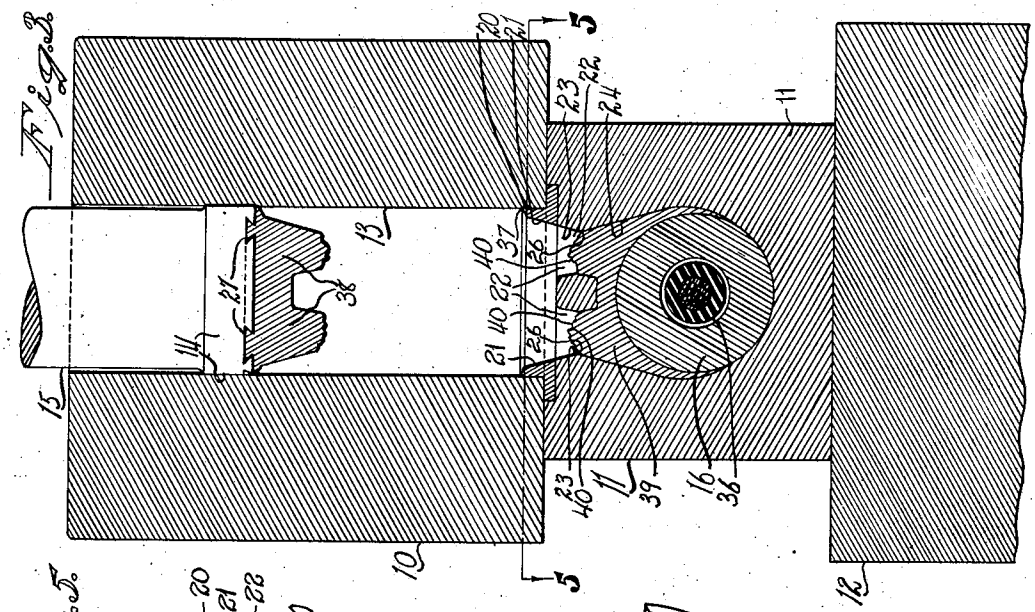


Fig. 5.

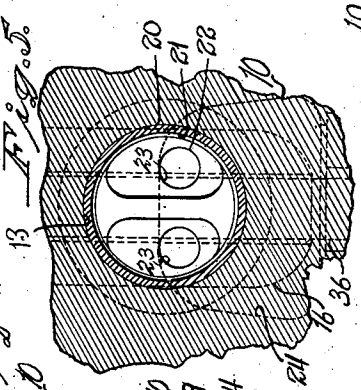


Fig. 7.

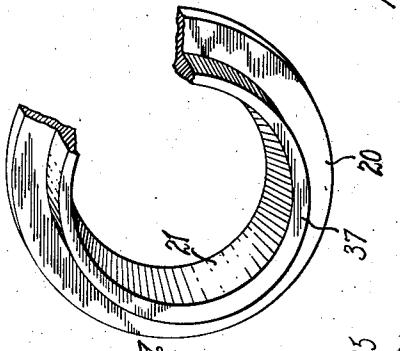


Fig. 4.

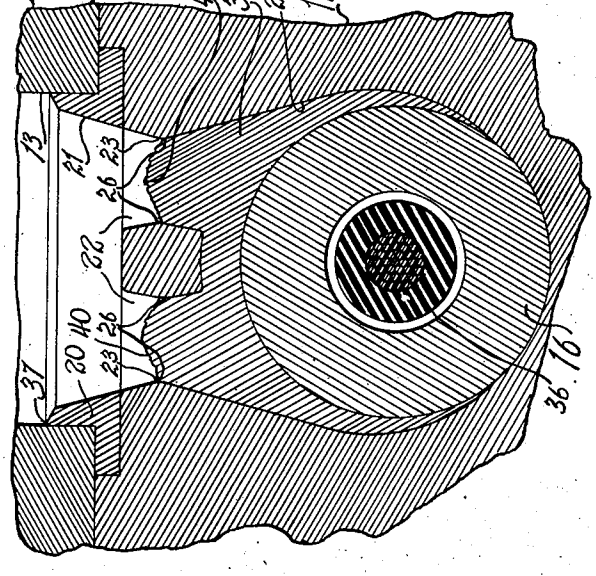
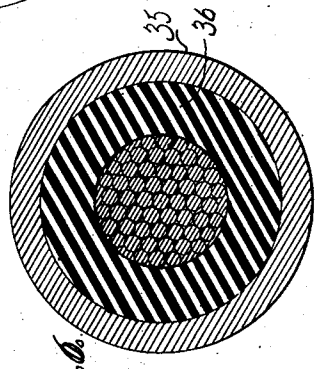


Fig. 6.



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Aug. 6, 1940. B. K. YOUNG, JR 2,210,157

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Filed Aug. 12, 1939 3 Sheets-Sheet 3

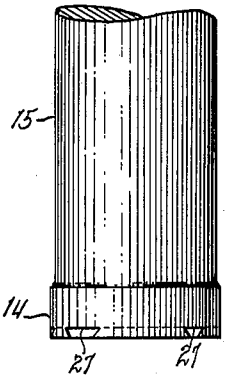
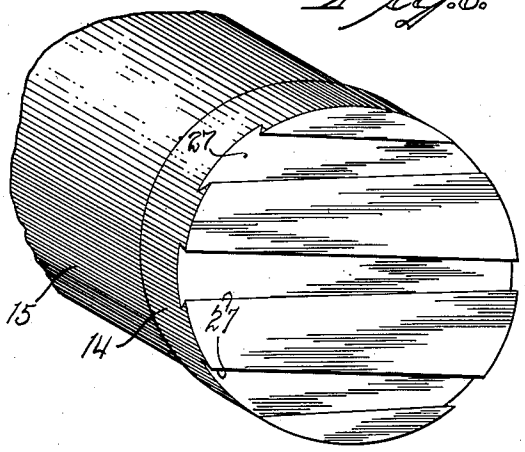
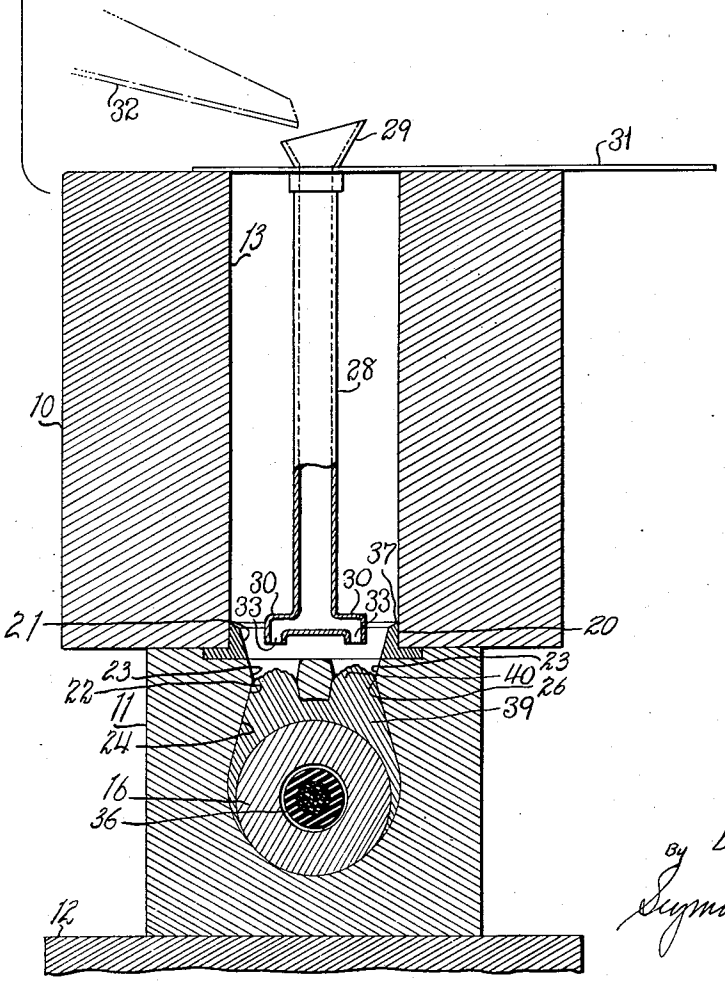


Fig. 9.

Fig. 8.





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UNITED STATES PATENT OFFICE

2,210,157

EXTRUDING METAL SHEATHS ON ELECTRICAL CABLES

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Application August 12, 1939, Serial No. 289,737

12 Claims. (Cl. 207—4)

This invention relates to improvements in methods and apparatus for extruding metal sheaths on electrical cables.

In sheathing electrical cables with metal it is usual to employ a vertical hydraulic press in which an assembly of a cylinder and extrusion-die are mounted to be moved relatively toward and from the press-ram for the purpose of extruding lead or lead alloy out of the cylinder and through the extrusion-die to form the metal sheath about the electrical cable. In order to fill the cylinder with the sheath-metal which consists of lead or lead alloy, this is usually done by pouring the metal in a molten condition in through the top end of the cylinder while the ram is in a withdrawn position above the upper end of the cylinder. In pouring the molten metal into the cylinder, the molten metal strikes the relatively-cool cylinder walls, causing the molten metal to chill thereon and entrap oxides and other foreign substances present in the metal and also to trap air bubbles therein. After the cylinder has been filled with the molten metal, the air bubbles, oxides and other impurities which are located in the central still-molten portion of the metal, being lighter than the molten metal, tend to float to the top where they are largely skimmed off, but due to rapid cooling of that portion of the metal adjacent the cylinder walls, the impurities remain entrapped there and are unable to rise to the top.

For practical reasons, it is not feasible to have a large enough cylinder to extrude a complete sheath at a single extrusion operation on an entire length of electrical cable, and therefore a length of electrical cable is sheathed by a plurality of successive extrusion operations by successively filling the cylinder with charges of molten sheath-metal and successively extruding the charges. Due to impurities remaining in the top surface portion and the trapped impurities along the cylinder walls and also to the successive extrusion steps of sheathing a complete length of cable, the metal sheath of a cable is subject to a number of objectionable defects. Some of these objectionable defects are due to the presence of air, gas, oxide and other inclusions present in the metal sheath, and another defect results from the failure of successive charges of sheath-metal to weld together perfectly.

It is an object of this invention, therefore, to provide an improved method and apparatus for extruding more perfect metal sheaths on electrical cables, substantially free from such defects as those above mentioned.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention may best be understood by reference to the accompanying drawings, in which one way of carrying out the invention is shown for illustrative purposes:

Fig. 1 is a vertical central sectional view through apparatus made in accordance with the present invention, for extruding metal sheaths on electrical cables;

Fig. 2 is a vertical sectional view on line 2—2 of Fig. 1, but with the ram shown at its lowest position at the end of extruding a charge of metal;

Fig. 3 is a view similar to Fig. 2 after a charge of sheath metal has been extruded and showing residual sheath metal in partially-lifted position by the ram;

Fig. 4 is an enlarged broken view of the lower portion of Fig. 3;

Fig. 5 is a horizontal sectional view on line 5—5 of Fig. 3;

Fig. 6 is a cross-sectional view on line 6—6 of Fig. 1, of a finished metal-sheathed cable;

Fig. 7 is a fragmental perspective view of the tapered ring for facilitating withdrawal of residual metal by the ram;

Fig. 8 is a perspective view of the slotted end portion of the ram; and

Fig. 9 is a central vertical sectional view similar to Fig. 3, but with the ram removed entirely clear of the cylinder and with a special pouring tube in place ready to pour a charge of sheathing metal in the cylinder.

In the description and claims, the various parts and steps are identified by specific names for convenience, but they are intended to be as generic in their application as the prior art will permit.

Referring to the drawings showing the particular form of the invention chosen for illustration, the cylinder 10 and the die-block 11 and related parts constitute an assembly mounted on one portion of the press 12. The cylinder 10 has a cylindrical hole or opening 13 adapted to slidingly receive the end portion 14 of a ram 15 carried by another portion of the press (not shown).

Adjustably mounted in the die-block 11 is hollow core-die 16 held in adjusted position by a hollow adjusting-nut 17 at the rear end of the die-block. At the forward end of the die-block 11, is a hollow front-die 18 held in position by a hollow adjusting-nut 19. An annular ring 20 is located at the lower end of the cylinder 10 be-

tween the cylinder 10 and die-block 11 and forms the upper portion 21 of passageway means 22 which includes the two branch throats 23 leading to the lower portion 24 of the passageway means which extends around the end of the core-die 16 and thus leads to the annular opening 25 of the front-die 18.

Each branch throat 23 includes two portions flaring oppositely away from the intermediate location 26 for a purpose to be later described. The end 14 of the ram 15 is provided with a plurality of transversely-extending dove-tail slots 27 which flare toward the left of Fig. 8 and have their longitudinal axes parallel, for a purpose to be later described.

In order to originally fill the cylinder and passageway means with lead or lead alloy sheath-metal, a pouring tube 28 is preferably employed. This pouring tube 28 preferably has an upwardly-flaring funnel or funnel-portion 29 and two branches or branch-portions 30 at the lower end thereof preferably adapted to directly overlie the two throats 23. A handle 31 secured to the pouring-tube 28 is adapted to rest upon the cylinder 10 to support the pouring-tube in position such as shown in Fig. 9.

A chute 32 is adapted to conduct molten metal or lead alloy sheath-metal from a suitable lead melting or storage kettle into the funnel 29 of the pouring-tube 28 from whence it issues through the two lower openings 33 of the branches 30, thus directing the hot molten metal into the throats 23 and thus permitting a maximum of air bubbles and oxides and other inclusions to rise through the molten metal up to the surface thereof. As the molten metal continues to issue from the branch-openings 33, it rises higher and higher in the interior 13 of the cylinder 10 until it reaches a height which is considered to adequately fill the cylinder preparatory to the extrusion operation. Inasmuch as the molten metal issues from the lower openings 33 of the pouring-tube 28 it will be observed that as the molten metal rises higher and higher in the cylinder 10, it does so with minimum of disturbance and inclusion of air bubbles and thus permits a maximum freedom of travel of air bubbles, oxide inclusions, etc., up to the top surface of the molten metal. The pouring-tube 28 and chute 32 are removed from the cylinder, whereupon the dross on the upper surface of the molten metal containing the extraneous inclusions are skimmed off as well as possible, prior to causing the cylinder 10 and ram 14 to relatively approach one another to bring the ram into the cylinder to exercise pressure upon the molten metal 34 (Fig. 1). When the ram 15 is lowered into contact with the molten lead 34, the latter passes up into the grooves 27 and fills the latter. After the ram and cylinder have stood thus together for several minutes to permit the molten lead to solidify, the ram and cylinder are forced relatively toward one another to force the lead 34 down out of the interior 13 of the cylinder and through the passageway means 22 and out through the opening 25 of the front-die 18 to thus form a section of metal sheath 35 about the cable 36 which is being forced towards the right of Fig. 1 through the die-block 11.

The upper annular edge 37 of the annular ring 20 is located preferably about ½" to 1" below the lowest position to which the lower surface of the ram 15 travels during the extrusion operation. When this place has been reached by the ram, the action of the press is reversed to cause the cylinder 10 to travel relatively away from the ram 15, and since the upper portion 38 of the residual sheath-metal in the passageway means is firmly anchored in the transverse grooves 27 of the ram, the relative upward movement of the ram 15 from the position shown in Fig. 2 to that shown in Fig. 3, causes the upper portion 38 of the residual sheath-metal to fracture or break away from the lower portion 39 of the residual sheath-metal approximately at the narrowest portions 26 of the throats 23. The ring 20 ensures that the maximum outer diameter of the slug 38 of residual metal shall be smaller than the hole 13 of the cylinder 10 so that there will be no drag of the main portion of the slug of metal 38 along the wall 13 of the cylinder as the slug is withdrawn up through the cylinder, the only portion of the slug which frictionally engages the wall of the cylinder during removal, being the ½" to 1" full diametered upper portion of the slug with a thin skim of lead which it is joined to, which skim is formed by lead being forced up between the ram and cylinder wall during the extrusion operation. When the ram has reached a point of location well above the upper end of the cylinder such, for example, as it occupies in Fig. 9, a push sidewise on the slug 38 of metal forces it along and out of the slots 27 and thus readily removes it from the ram.

Due to the chilling and quick-freezing effect of the interior wall 13 of the cylinder 10 upon molten lead when the latter is being filled into the cylinder, air bubbles and oxides and other dirt that are in the metal which happens to come into contact with the wall of the cylinder are trapped therein, as this portion of the lead chills so rapidly as not to permit the ready and free flotation of these impurities which are much lighter than the lead and which ordinarily would mostly float to the top, and do mostly float to the top in the interior mass of the molten metal where ample time is given for this action to occur before the metal solidifies. When the extrusion operation takes place and the ram moves relatively downward thus forcing the solidified hot metal out of the cylinder and through the passageway means and the extrusion-die, most of the charge of metal which is extruded to form a section of the metal sheath, is that which is located in the central portion of the cylinder, the main portion of the metal which is closely adjacent the walls and the top surface portion of the charge of metal being forced downward and becoming part of the residual metal slug 38. Therefore, it will be seen that the removal of this slug 38 instead of permitting it to remain in the cylinder to become part of the next charge of extrusion metal, results in removing a very large portion of the impurities. Thus, when about 80 to 90 per cent of the charge of lead originally in the cylinder has been extruded, substantially all of the foreign materials which were originally at the upper surface of the lead and also those adjacent the cylinder walls remain in the unextruded 10 or 20 per cent of the residual lead left after the first extrusion operation. Thus, if this 10 or 20 per cent of the original charge is removed from the cylinder and discarded or put back in the kettle for re-melting, much of the undesirable foreign material or impurities will be eliminated from the finished metal sheath.

In order to now introduce a new or replenished charge of sheath-metal into the cylinder 10, the pouring-tube 28 is again inserted in the cylinder 10 in a position such as shown in Fig. 9, and hot metal is introduced along the chute 32 and into the pouring-tube 28, from thence it issues through the two lower openings 33 directly above the broken top surfaces 40 of the lower portion of residual metal 39, thus causing the hot molten lead as it emerges from the openings 33 to wash over and melt and autogenously weld the new charge of replenished metal to the top surface portions 40 of the residual portion 39 of sheath metal. This mode of introducing the hot molten lead directly against the surfaces 40 of the residual metal 39 not only cleans away oxides and other impurities on the surface thereof, but raises the temperature of the entire surfaces of these portions so high as to melt them and thus form perfect joints with the new charge of metal introduced into the cylinder. This perfect welding is further greatly aided by the fact that the weld areas 40 total greatly less than the area of the cylinder 10, being only about 6 to 15 per cent of the cylinder area, thus making a relatively small area that it is necessary to melt to secure a perfect weld.

When the new charge of metal has risen to a point to adequately fill the cylinder 10, the pouring-tube 28 and chute 32 are removed and the ram 14 and the cylinder 10 are moved relatively toward one another to again bring them into cooperative relation to extrude the new charge of sheath-metal to form another portion of sheath upon the cable 36, after which a similar slug of residual sheath-metal 38 is removed in the manner previously described, and discarded or introduced into the lead melting or storage kettle.

It is desirable to have the slug of residual metal 38 break away from the remaining portion 39 of residual metal at locations 26 which are well above the location of the cable 36 which is passing through the extrusion-die, since this minimizes the number of air and gas pockets formed between the old and new charges, permits more readily and completely melting the surfaces 40 of the residual metal 39, and brings about a smaller crystal size in the portions of the new charge immediately above the residual metal 39 due to the working of this portion of the charge during the extrusion operation more than would be the case if the lower portion of the new charge were lower down nearer the cable and thus subject to less extrusion working. Also, by having the position of break occur well above the location of the cable, the cable is less subject to the high temperature of the new charge of metal, and also there is less unequal heating of the core-die with consequent avoidance of unequal thermal expansion of the latter which might produce a sheath of non-uniform wall thickness.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, comprising: filling said chamber with molten sheath-metal; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder and withdrawing part of said residual sheath-metal which is adjacent the inner end of said ram at the end of said extrusion operation, out of said chamber; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

2. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, and said ram having its inner end adapted to engage against, and become firmly attached to, initially-molten sheath-metal in said cylinder, comprising: filling said chamber with molten sheath-metal; moving said ram into contact with the surface portion of said sheath-metal and causing said ram and sheath-metal to become attached together; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder with an attached part of said residual sheath-metal; removing said attached part of sheath-metal from the ram; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

3. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, and said ram having mechanical means at its inner end

adaptable to become firmly interlocked with initially-molten sheath-metal in said cylinder, comprising: filling said chamber with molten sheath-metal; moving said ram into contact with the surface portion of said sheath-metal and causing said ram and sheath-metal to become attached together; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder with an attached part of said residual sheath-metal; removing said attached part of sheath-metal from the ram; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

4. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, and said ram having slot means extending transversely of its inner end adapted to become firmly interlocked with initially-molten sheath-metal in said cylinder, comprising: filling said chamber with molten sheath-metal; moving said ram into contact with the surface portion of said sheath-metal and causing said ram and sheath-metal to become attached together; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder with an attached part of said residual sheath-metal; removing said attached part of sheath-metal from the ram; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

5. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, a portion of which passageway means is of relatively-small area compared to the area of the interior of said cylinder, and having a ram adapted to move forward into, and back out of, one end of said cylinder, comprising: filling said chamber with molten sheath-metal; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder and withdrawing part of said residual sheath-metal which extends from said cylinder to said relatively-small area of said passageway means, out of said chamber; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

6. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, said passageway means beginning closely adjacent the inner face of said ram at its inner limit of movement and being of such size and shape that sheath-metal filling the portion of said passageway means adjacent said inner face of said ram can easily be passed out through said cylinder, comprising: filling said chamber with molten sheath-metal; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder and withdrawing part of said residual sheath-metal which is adjacent the inner end of said ram at the end of said extrusion operation, out of said chamber; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

7. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, a portion of which passageway means is of relatively-small area compared to the area of the interior of said cylinder to provide a residual-metal fracture area which is located well away from the cable being sheathed, and having a ram adapted

to move forward into, and back out of, one end of said cylinder, comprising: filling said chamber with molten sheath-metal; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder and withdrawing part of said residual sheath-metal which extends from said cylinder to said relatively-small area of said passageway means, out of said chamber; inserting a pouring-tube into said cylinder with its inner end adjacent, and adapted to direct liquid sheath-metal directly against, the free surface of the remaining residual sheath-metal; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube to wash over and melt and autogenously weld the replenished charge of metal to the free surface portion of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

8. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means dividing into a plurality of branch-throats of relatively-small total area compared to the area of the interior of said cylinder leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, comprising: filling said chamber with molten sheath-metal; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder and withdrawing the part of said residual sheath-metal extending from the lower face of said ram into said branch-throats, out of said chamber; inserting a pouring-tube having lower-end branches corresponding in number and spacing to said branch-throats into said cylinder with said branches adjacent, and adapted to direct liquid sheath-metal directly against, the free surfaces of the remaining residual sheath-metal in said branch-throats; replenishing the charge of sheath-metal in said chamber by pouring molten sheath-metal through said pouring-tube and causing said molten sheath-metal on its initial exit from said tube branches to wash over and melt and autogenously weld the replenished charge of metal to the free surface portions of said remaining residual metal; removing said pouring-tube from said cylinder; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

9. The method of extruding a metal sheath on an electrical cable by apparatus having a sheath-metal chamber including a cylinder and passageway means leading to an extrusion-die, and having a ram adapted to move forward into, and back out of, one end of said cylinder, comprising: filling said chamber with molten sheath-metal; forcing sheath-metal out of said cylinder and along said passageway means by said ram, to extrude sheath-metal through the extrusion-die to form part of a sheath; stopping said extrusion operation while residual sheath-metal remains in said chamber; withdrawing said ram out of said cylinder and withdrawing part of said residual sheath-metal which is adjacent the inner end of said ram at the end of said extrusion operation, out of said chamber; replenishing the charge of sheath-metal in said chamber; and again forcing sheath-metal out of said cylinder by said ram, to extrude sheath-metal through the extrusion-die to form an additional portion of said sheath.

10. Apparatus for extruding lead or the like metal sheaths on electrical cables comprising: an extrusion-die; a cylinder for sheath-metal; passageway means leading from said cylinder to said extrusion-die; and a ram having a sliding fit over a substantial distance in said cylinder and adapted to move forward into and back out of, one end of said cylinder, and said ram having mechanical means at its inner end designed and adapted to become firmly interlocked with initially-molten sheath-metal in said cylinder and withdraw from said cylinder, a portion of solidified sheath-metal interlocked with said mechanical means.

11. Apparatus for extruding lead or the like metal sheaths on electrical cables comprising: an extrusion-die; a cylinder for sheath-metal; passageway means leading from said cylinder to said extrusion-die; and a ram having a sliding fit over a substantial distance in said cylinder and adapted to move forward into and back out of, one end of said cylinder, and said ram having slot means extending transversely of its inner end designed and adapted to become firmly interlocked with initially-molten sheath-metal in said cylinder and withdraw from said cylinder, a portion of solidified sheath-metal interlocked with said slot-means, such withdrawn solidified sheath-metal being detachable from said slot means by moving such solidified metal transversely relatively to said ram.

12. Apparatus for extruding lead or the like metal sheaths on electrical cables comprising: an extrusion-die; a cylinder for sheath-metal; passageway means leading from said cylinder to said extrusion-die; and a ram having a sliding fit over a substantial distance in said cylinder and adapted to move forward into and back out of, one end of said cylinder, and said ram having mechanical means at its inner end designed and adapted to become firmly interlocked with initially-molten sheath-metal in said cylinder and withdraw from said cylinder, a portion of solidified sheath-metal interlocked with said mechanical means, said passageway means beginning closely adjacent the inner face of said ram at its inner limit of movement and being of such size and shape that sheath-metal filling the portion of said passageway means adjacent said inner face of said ram can easily be passed out through said cylinder.

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