

[54] **APPARATUS FOR EXTRUDING CABLE JACKETS WITH EMBEDDED DRAIN WIRES**

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[58] Field of Search 425/114, 461; 156/51, 143, 156/244, 500; 72/17; 264/173, 174

[56] **References Cited**

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3,252,183 5/1966 Bronzert.....425/114

3,531,962 10/1970 Menasoff.....72/17
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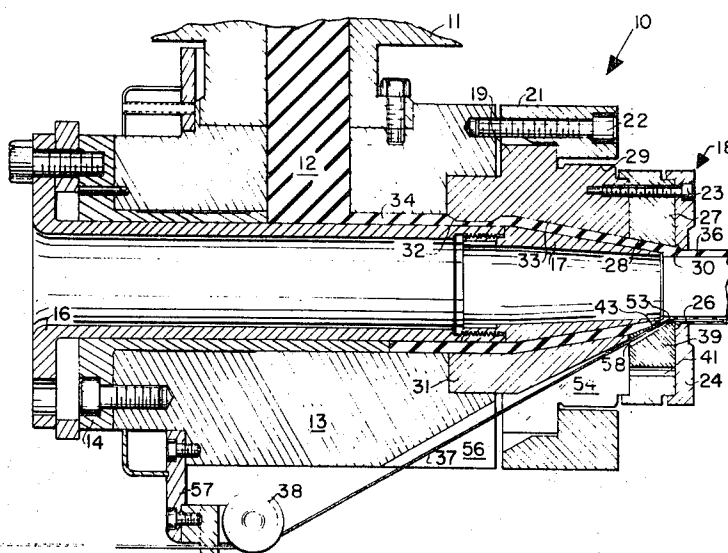
Attorney—Victor F. Volk

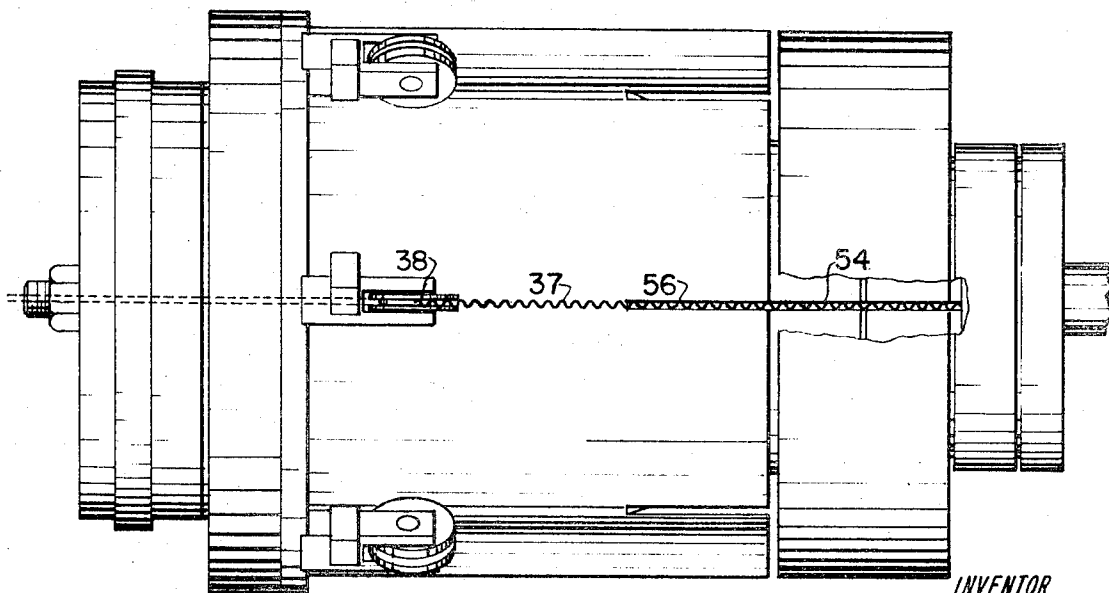
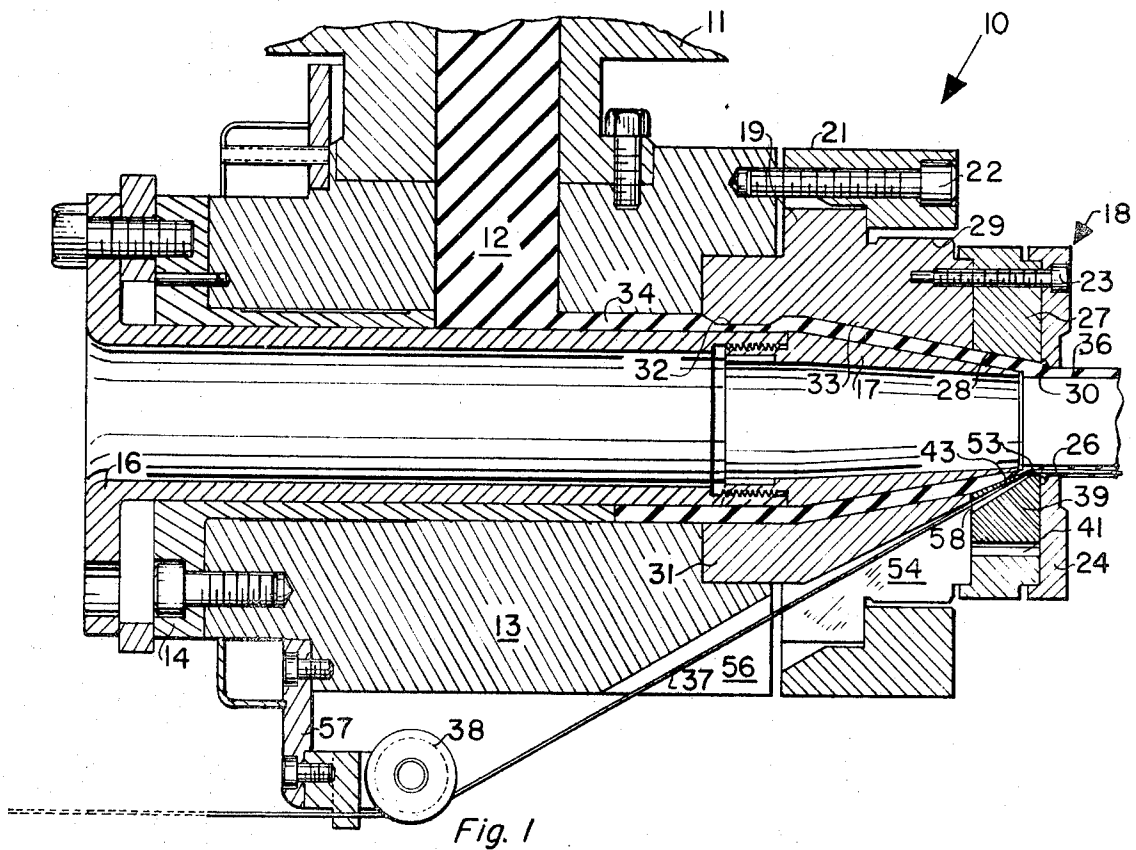
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ABSTRACT

Apparatus for extruding a cable jacket with embedded drain wires comprises a die with radial recesses into which are fitted hardened guide blocks with passages for the wires.

5 Claims, 5 Drawing Figures





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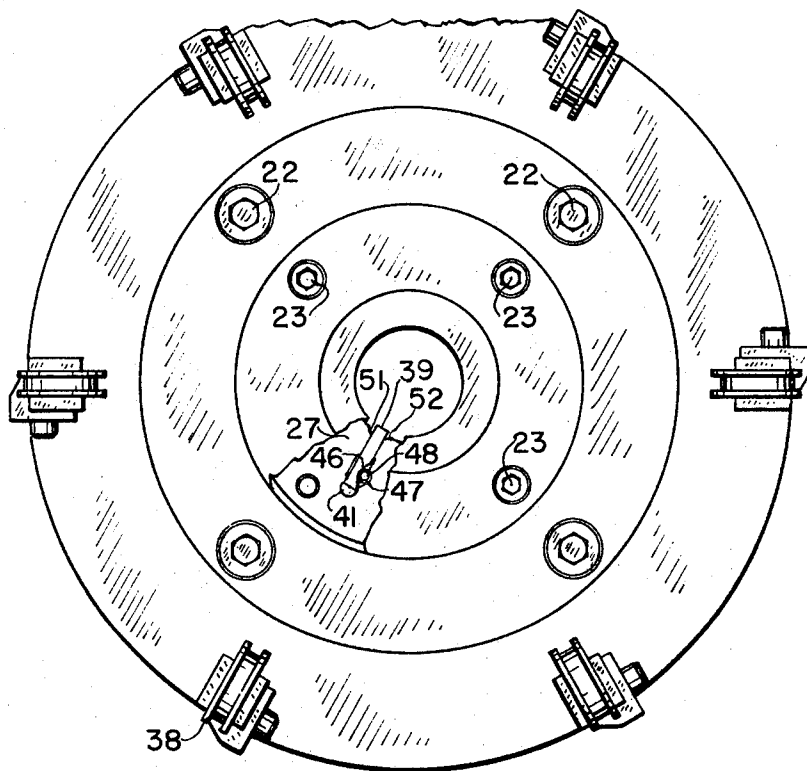


Fig. 2

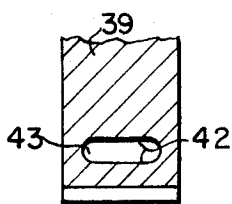


Fig. 5

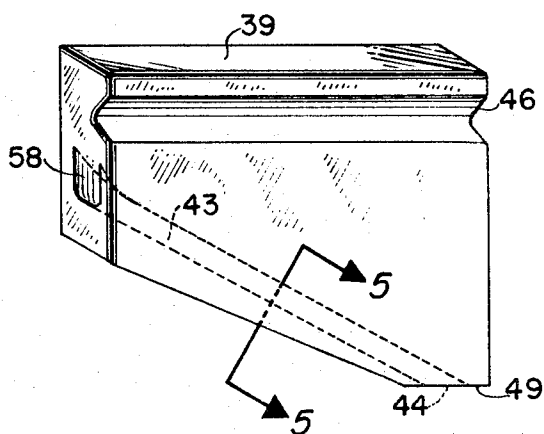


Fig. 4

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APPARATUS FOR EXTRUDING CABLE JACKETS WITH EMBEDDED DRAIN WIRES

BACKGROUND OF THE INVENTION

This invention is directed toward apparatus for making electric cables such as those described in U.S. Pat. Nos. 3,473,189, 3,571,613 and 3,582,417 wherein drain wires are embedded in the cable jacket. In U.S. Pat. No. 3,531,962 apparatus is described for paying the drain wires through a slotted guider tube in an extruder head. I have found, however, that apparatus paying the wires through an extruder guider tube is troublesome in that the jacket material being extruded may block a slot in the guider tube if there is a break in one of the wires. Because of the inaccessibility of the plugged area of the slot it is then necessary to shut down the extrusion machine, unplug the slot, and rethread another wire through it before production of cable can continue.

SUMMARY

In the apparatus of my present invention a wire can be introduced without stopping the extrusion operation at all. My new apparatus has the further advantage that it does not apply a tension to undulatory drain wires that will change the pitch of the undulations.

My new apparatus comprises a die with a tapered interior surface and a cylindrical land communicating with the tapered surface. A plurality of radial recesses open on the surface and a like plurality of removable guide blocks fit into these recesses. The guide blocks comprise walls that define passages for the drain wires with the walls of the blocks projecting radially inwardly of the die land. The blocks are made of material that is harder and more wear resistant than the material of other portions of the die. Preferably my apparatus comprises tapered grooves in the interior surface immediately adjacent to the blocks to increase the flow of jacket material over the drain wires during extrusion, and the blocks are fixed in position by means of cooperating lengthwise grooves in both the recess walls and the blocks. Advantageously my die may comprise three separable sections with the land in the first section, the recesses in the second, and slots in the third section which communicate with the passages in the blocks to admit the wires. A tubular housing in which the die is mounted may also comprise walls defining slots that communicate with the slots in the third section of the die.

A more thorough understanding of my invention can be gained from a study of the appended drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a lengthwise section of the apparatus of my invention.

FIG. 2 shows a partial front view of the apparatus of FIG. 1.

FIG. 3 shows a lengthwise bottom view of the apparatus of FIG. 1.

FIG. 4 shows a pictorial side view of my removable guide block.

FIG. 5 shows a section through the lines 5—5 of FIG. 4.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring first to FIG. 1 my apparatus indicated generally by the numeral 10 comprises an extruder cross head bolted to an extruder barrel 11 of conventional construction from which it receives jacket material 12 being urged outward by a screw, not shown. The apparatus 10 comprises a tubular housing 13 of substantial wall thickness so that it can withstand high internal pressure of the material 12, a flanged spacer and flow diverter 14 is bolted to the housing 13 and a core tube 16 is bolted, in turn to the spacer 14. A tapered guider 17 threads onto the core tube 16. A die 18 with a flange 19 is bolted against the housing 13 by means of a retaining ring 21 and bolts 22. The die 18 is formed of three annular members bolted together by bolts 23. The first of these members 24 has the least thickness and comprises the land 26 of the die 18. A second of these members 27 comprises an interior tapered surface 28 communicating with a tapered surface 30 in the member 24 that terminates at the land 26. A third member 29 has the greatest thickness or length and includes the flange 19 and a cylindrical portion 31 with a projection 32 for equalizing material flow. The member 19 has an interior tapered surface 33 continuous of the surface 28.

The housing 13 and die 18 together combine with the core tube 16 and guider 17 to define an annular channel 34 for the material 12 which is extruded finally as a jacket 36 over a cable core, not shown, with outer dimensions determined by the land 26. Six undulatory drain wires 37 are paid over plastic guide sheaves 38 from a supply not shown to be embedded in the jacket 36.

For this purpose six guide blocks 39 (FIGS. 4 and 5) are inserted in a like member of radial recesses 41 in the member 27. The blocks 39 are machined from highly abrasion resistant material such as tungsten carbide or steel reinforced with carbide particles such as Ferro-Tic C, available from the Sintercast Division of West Nyack, N.Y.

Interior walls 42 (FIG. 5) of the block 39 define a passage 43 in the nature of a slot with rounded edges for guiding the undulatory wires 37 into the jacket being extruded. For this purpose it is necessary that openings 44 in the blocks should project radially inwardly beyond the land 26. To establish the proper position of the blocks 39 lengthwise grooves 46 are cut in one wall. Grooves 47 are also cut in the walls of the recesses 41. The blocks can then be firmly fixed in proper positions by inserting split hollow pins 48 into the bore formed by the cooperating grooves.

The inwardly projecting face of the blocks 39 are long enough to provide flat portions 49 over which the wires 37 are bent and caused to lie parallel to the axis of the cable.

Since the blocks 39 project into the flow of material through the channel 34 I have found it advantageous to compensate for the interruption to assure that a fully continuous layer of the material 12 is deposited over and around the wires 37. For this purpose my die 18 has tapered grooves 51, 52 formed in the surfaces 28, 30 of the members 29, 27. As an example of the depth I have found satisfactory for the grooves 51, 52,

where the width of a block 39 is about 0.218 inch the depth of the grooves 51, 52 will taper from zero at upstream end of the member 27 to about 0.0237 inch wide at the downstream end of the member 27. The grooves 51, 52 are conveniently made with a $\frac{3}{8}$ inch cylindrical cutting tool mounted at an 8° angle to the axis of the member 27. Spherical reliefs 53 in the member 24 are continuous with the grooves in the member 27.

On leaving a sheave 38 a wire 37 follows a straight path until it bends at the surface 49. So that this can occur the member 29 has radial slots 54 which communicate with the passages 43 and the housing 13 has radial slots 56 that communicate with the slots 54. Conveniently, to obtain the proper angle of entrance of the wires 37 into my apparatus I have mounted the sheaves 38 on supports 57 bolted directly into the housing 13. From FIG. 1 it can be seen that the wires 38 enter the jacket 36 at a section downstream of the guider 17. Surprisingly there is no tendency of the jacket material 12 to plug up the passages 43 even if the wires 38 are interrupted. To introduce a new wire after one has broken the extrusion need not be stopped but the wire can be manually inserted through the passage 43, which has a flared opening 58 when it will be seized by the advancing jacket material. In the operation of my apparatus the member 27 is first assembled with the blocks 39 being fixed by the pins 48. The members 29, 27, and 24 are then assembled and locked together by means of the bolts 23. The assembled die 18 is fitted into the extruder head by means of the retaining ring 21. The wires 37 are all threaded over their respective sheaves 38 through the slots 56 and 54 through the passages 43 and tied around the core of a cable to be jacketed. This can be done with straight wire, that is without operating the corrugator which applies the wire undulations. After the extruder is operating and jacket material is being affixed the corrugator is activated and undulatory wire continues to pay through the passages 43. My apparatus is particularly adopted to the embedment of undulatory wires inasmuch as it

does not tend to stretch out or change the pitch of the undulations.

The foregoing description has been exemplary rather than definitive of my invention for which I desire an award of Letters Patent as defined in the following claims.

I claim:

1. Apparatus for extruding a cable jacket with embedded drain wires comprising a die comprising:

- A. a tapered, interior surface,
- B. a cylindrical land communicating with said surface,
- C. a plurality of radial recesses opening on said surface, and

D. a like plurality of removable guide blocks fitting into said recesses, said blocks comprising walls defining passages for said wires, said walls projecting radially inwardly of said land, and said blocks being comprised of a material more wear resistant than the material of other portions of said die.

2. The apparatus of claim 1 comprising tapered grooves in said surface immediately adjacent said blocks thereby increasing the flow of jacket material over said drain wires.

3. The apparatus of claim 1 wherein said die comprises three separable annular members said land being comprised in the first of said members, said recesses being comprised in the second of said members and said third members comprising a plurality of slots communicating with said passages for the admission of said wires into said jacket.

4. The apparatus of claim 3 comprising a tubular housing mounting said die, said housing comprising walls defining a plurality of slots communicating with said slots in said third member.

5. The apparatus of claim 1 wherein said recesses comprise walls comprising first lengthwise grooves, said blocks comprise second lengthwise grooves cooperating with said first grooves to define bores, and said apparatus comprises locking pins fitting said bores, thereby fixing the positions of said blocks.

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