May 12, 1959 R. H. DITTMORE ET AL 2,885,735

DIELECTRIC SHEATH SPLICING MOLD FOR COAXIAL CABLES

Original Filed June 28, 1954

FIG. 1

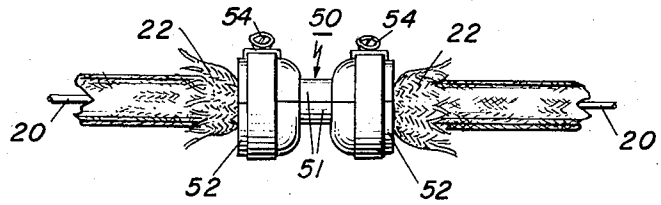


FIG. 2

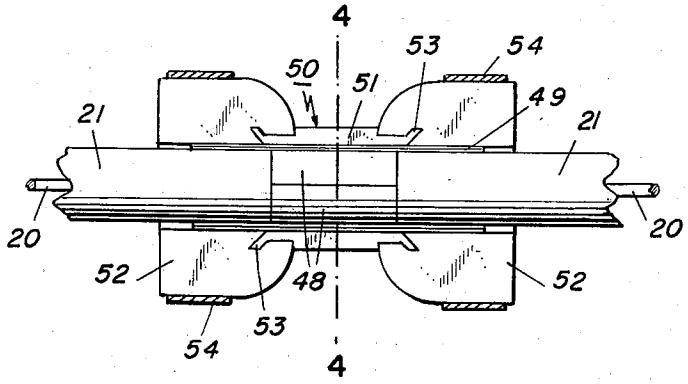


FIG. 4

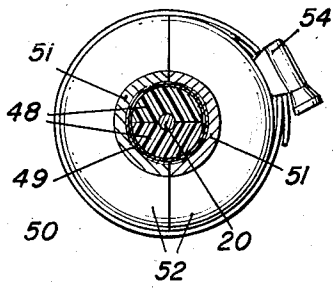


FIG. 3

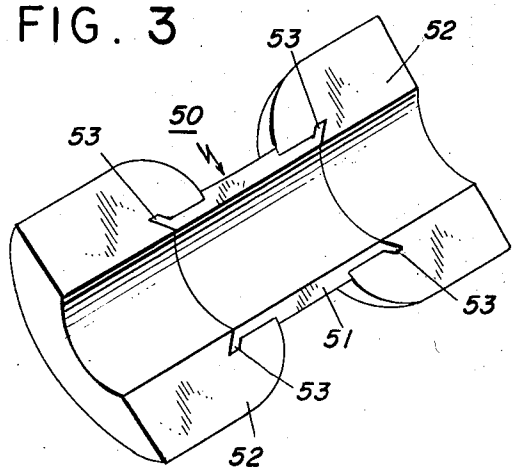
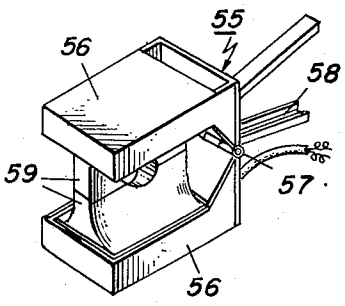


FIG. 5



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DIELECTRIC SHEATH SPLICING MOLD FOR COAXIAL CABLES

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Original application June 28, 1954, Serial No. 439,752, now Patent No. 2,768,105, dated October 23, 1956. Divided and this application January 10, 1955, Serial No. 480,934

3 Claims. (Cl. 18—36)

This invention is a division of our application Serial No. 439,752 filed June 28, 1954, now Patent No. 2,768,105, for Method of and Means for Splicing Coaxial Cables. In that application there is disclosed a method step of splicing the dielectric sheath which separates the inner conductor from the braided outer conductor of a coaxial cable, and an improved mold structure used in making the dielectric splice.

The object of this invention is to provide a new splicing mold which will enable unskilled workers to quickly and easily splice the thermoplastic dielectric sheath on the inner conductor of a coaxial cable and reliably obtain a splice which will ensure the concentricity of the two conductors of the cable ends so that there will be no attenuation of the signal at the splice or any reflected waves traveling back to the source, from the splice.

In the accompanying drawings which show the present preferred construction of the mold:

Fig. 1 is a side elevation of the mold applied to the two cable ends to be spliced;

Fig. 2 is an enlarged longitudinal section through the parts shown in Fig. 1;

Fig. 3 is a perspective view of one of the half sections of the mold;

Fig. 4 is a detail transverse section taken on the line 4—4 in Fig. 2; and

Fig. 5 is a perspective view of an electric heater which may be applied to the metal portions of the mold.

Referring more in detail to the drawings, the numeral **20** denotes the inner or central conductor of a coaxial cable, **21** the concentric polyethylene or similar dielectric sheath surrounding the inner conductor and **22** the outer braided conductor which is separated from the inner conductor by the sheath **21**. The cable also includes at least a polyvinyl or other thermoplastic sheath over the braided conductor and a lead sheath on the polyvinyl but these parts are not shown. As disclosed in our said application, when two cable ends are to be joined, the outer sheaths are stripped back and the braided conductors are folded back to expose portions of the dielectric sheaths **21**. Then the ends of these portions are cut off to expose short lengths of the inner conductors leaving short portions of the dielectric sheath extending beyond the folded back ends of the braided conductors for the application of the mold, as will be understood on reference to Figs. 1 and 2.

In splicing two cables the ends of the inner conductors are abutted and electrically connected by solder as disclosed in said application. The soldered joint is made of the same diameter of the inner conductors and the ends of the two dielectric sheaths **21** are cut off square to provide a cylindrical space between the opposed ends of these sheaths. That space is completely filled by a premolded cylindrical slug **48** of the same dielectric material as that of the sheaths and of the same external diameter as the latter. While this slug may be a one-piece longitudinally

split body to be sprung over the joined inner conductor, it is preferably made in two semi-cylindrical half sections which have their opposed faces grooved to receive the conductor. After the slug or slugs are tightly fitted between the ends of the sheaths **21**, a rectangular piece of foil of copper or other metal **49** of a thickness of .002", is wrapped around both the slugs and the exposed ends of the sheaths **21**, as seen in Figs. 2 and 4. The two sections of the mold later described are placed over the foil which forms a liner for the mold, and when the latter is heated, the foil keeps the melted dielectric material in the mold and also prevents sticking so that the mold may be stripped off without damage to the splice.

The sectional mold which surrounds the foil liner consists of two similar transversely separable half sections **50** and two clamps to hold the sections together. Each of the half sections comprises a central metal body portion **51** and two enlarged end portions **52** of heat insulating material. The metal portion **51** is a semi-cylindrical sleeve of limited thickness so that when the half sections are applied the mold will have a minimum amount of metal to be heated. The insulator portions **52** are molded on the metal portion by providing the latter with reduced and outwardly flared ends **53** which are embedded in the insulation. The three portions of each section form a semi-cylindrical bore to receive one half of the splice, and when the sections are applied they are clamped by split bands with threaded connectors such as any of the well known hose clamps, one type of which is shown at **54** in Figs. 1 and 4. These clamping bands engage semi-cylindrical outer surfaces of the heat insulators **52**. The length of the metal portion of the mold is such that it is opposite the slugs and the abutting ends of the dielectric sheaths, as seen in Fig. 2, so that when an electric heater **55** such as shown in Fig. 5, is applied between the insulators **52**, the heat will quickly melt those dielectric portions and produce a good joint or bond. The heater **55** comprises two sections **56** connected by a spring hinge **57** and provided with handles **58**. An electric cord supplies current to resistance coils in opposed aluminum heating elements or blocks **59** on the hingedly connected sections **56**. These heating elements are of a size to fit between the insulators **52** and have semi-cylindrical recesses so that when the heater is applied to the mold the elements will contact the exposed metal portions of the mold sections. It will be noted that the metal portions **51** between the insulators **52** are of uniform thickness and that the projection of the insulators radially outward beyond the outer surface of those metal portions serves to guide and properly position the jaws of the heater. The heater is thermostatically controlled and the heating elements are brought to a temperature of 890° F. before the heater is placed on the mold where it is left for 3½ minutes and then removed. After ten minutes the mold cools to about 200° F. and is removed, and the foil may then be easily stripped off of the polyethylene joint without sticking. The hose clamps cause the mold halves to tightly bind the foil on the dielectric sheaths, and the primary purpose of the foil is to seal the mold cracks to prevent any escape of the dielectric either between the mold sections or at the ends of the mold even though the unmelted portions of the dielectric sheaths on the conductors **20** may be pushed back slightly along the cable due to the expansion of the heated dielectric material of the slugs and the adjacent portions of the sheaths. The procedure requires only a small amount of the dielectric material to be melted and permits that to be quickly done and the splice to be quickly cooled. The bond may be improved by the application to the polyethylene dielectric portions to be united, of a solvent such as toluol immediately before applying the foil.

It has been found that by the use of the sectional

mold with a minimum amount of metal which may be quickly heated by a separate electric heater and as quickly cooled, by and the use of the above described procedure, an extremely satisfactory splice of the thermoplastic dielectric sheath may be made by an unskilled person and with a considerable saving in time and materials. It will be seen that the metal of the mold is only opposite the slugs and the adjacent extremities of the two sheaths so that only a small amount of dielectric need be heated to obtain an effective bond and there will be no likelihood of damage to the sheaths beyond the splice. The use of the mold further insures the dielectric splice having the same diameter as the sheaths and permits of quick removal of the heated mold sections after the dielectric material has bonded.

From the foregoing, taken in connection with the accompanying drawing, it will be seen that novel and advantageous provision has been made for carrying out the objects of the invention, and while preferences have been disclosed, attention is invited to the possibility of making variations within the scope of the invention as claimed.

What is claimed is:

1. Means for bonding a thermoplastic slug to the thermoplastic sheaths of two electric or electronic cable ends after their inner conductors have been spliced, the slug being preshaped to fill the mold cavity and abut the sheath ends, said means comprising an elongated mold body having a cylindrical bore free of any transverse openings and of the same diameter as the sheaths to be joined, and being composed of two similar transversely-separable half sections each of which has a relatively thin central metal portion of semi-cylindrical shape and two relatively thick end portions of moldable heat insulating material and of semi-cylindrical shape, said half sections having flat longitudinal faces adapted to be engaged to form said cylindrical bore and to provide the assembled mold at its ends with two-section cylindrical enlargements adapted to be surrounded by annular clamping bands, and at its center with a two-section cylindrical heat-conducting body of metal the exterior of which is adapted to be engaged by semi-cylindrical jaws of an electric heater, said heat-insulating end portions projecting radially outward beyond the central metal portions to guide and position the jaws of the heater upon the metal portions, said central metal portions having a length slightly greater than the length of the slug and having a thickness that is uniform at points between said insulating end portions to cause an even transfer and dissipation of heat with respect to the slug, and adjustable clamping bands removably applied around the curved outer surfaces of said enlarged end portions to hold the half sections of the mold assembled.

2. Means for bonding a thermoplastic slug to the thermoplastic sheaths of two electric or electronic cable ends after their inner conductors have been spliced, the slug being preshaped to fill the mold cavity and abut the sheath ends, said means comprising an elongated mold body having a cylindrical bore free of any transverse openings and of the same diameter as the sheaths to be joined, and being composed of two similar transversely-separable half sections each of which has a relatively thin central metal portion of semi-cylindrical shape and two relatively thick end portions of moldable heat insulating material and of semi-cylindrical shape, said half sections having flat longitudinal faces adapted to be engaged to form said cylindrical bore and to provide the assembled mold at its ends with two-section cylindrical enlargements adapted to be surrounded by annular clamping bands, and at its center with a two-section cylindrical heat-conducting body of metal the exterior of which is adapted to be engaged by semi-cylindrical jaws of an electric heater, said heat-insulating end portions projecting radially outward beyond the central metal portion, said central metal portions having a length slightly greater than the length of the slug and having a thickness that is uniform at points between said insulating end portions to cause an even transfer and dissipation of heat with respect to the slug, adjustable clamping bands removably applied around the curved surfaces of said enlarged end portions to hold the half sections of the mold assembled, and means for preventing sticking of the plastic to the mold sections and for sealing both the parting line of the mold sections and the ends of the mold cavity, said means comprising a single piece of metal foil wrapped entirely around the slug and the abutting portions of the sheaths and serving as a liner for the said bore, the liner foil extending substantially from end to end of the bore and passing transversely across the parting line of the mold sections to seal the same, the end portions of the liner foil being clamped upon the cable sheaths by the insulating end portions of the mold sections to prevent the escape of any plastic from the ends of the mold as the slug and the abutting ends of the sheaths expand upon the application of heat to the metal portions of the mold.

3. Means for bonding a thermoplastic slug to the thermoplastic sheaths of two electric or electronic cable ends after their inner conductors have been spliced, the slug being preshaped to fill the mold cavity and abut the sheath ends, said means comprising an elongated mold body having a cylindrical bore free of any transverse openings and of the same diameter as the sheaths to be joined, and being composed of two similar transversely-separable half sections each of which has a relatively thin central metal portion of semi-cylindrical shape and two relatively thick end portions of moldable heat insulating material and of semi-cylindrical shape, said half sections having flat longitudinal faces adapted to be engaged to form said cylindrical bore and to provide the assembled mold at its ends with two-section cylindrical enlargements adapted to be surrounded by annular clamping bands, and at its center with a two-section cylindrical heat-conducting body of metal the exterior of which is adapted to be engaged by semi-cylindrical jaws of an electric heater, said heat-insulating end portions projecting radially outward beyond the central metal portions, said central metal portions having a length slightly greater than the length of the slug and having a thickness that is uniform at points between said insulating end portions to cause an even transfer and dissipation of heat with respect to the slug, adjustable clamping bands removably applied around the curved outer surfaces of said enlarged end portions to hold the half sections of the mold assembled, and means for preventing sticking of the plastic to the mold sections and for sealing both the parting line of the mold sections and the ends of the mold cavity, said means comprising a single piece of metal foil wrapped entirely around the slug and the abutting portions of the sheaths and serving as a liner for the said bore, the liner foil extending substantially from end to end of the bore and passing transversely across the parting line of the mold sections to seal the same, the end portions of the liner foil being clamped upon the cable sheaths by the insulating end portions of the mold sections to prevent the escape of any plastic from the ends of the mold as the slug and the abutting ends of the sheaths expand upon the application of heat to the metal portions of the mold, the ends of the central metal portions of the mold sections being reduced in thickness to form semi-annular shoulders, and such reduced ends having angularly projecting anchoring flanges, said enlarged insulating end portions of the mold sections being molded on the reduced ends of the metal portion and having their inner opposed faces extending outwardly from said shoulders.

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