May 24, 1932. B. M. A. TREBES 1,859,901

EXTRUDING APPARATUS

Filed April 5, 1930

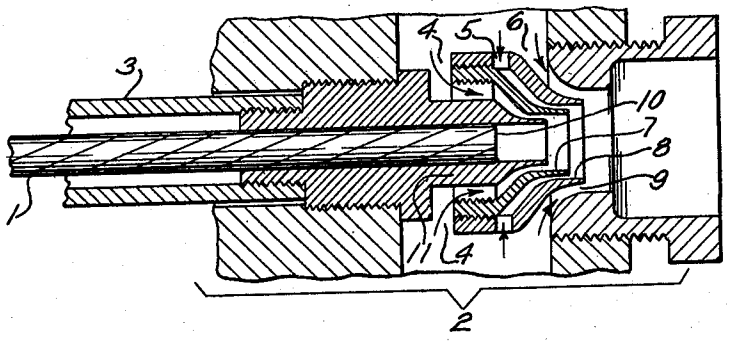


Fig. 1.

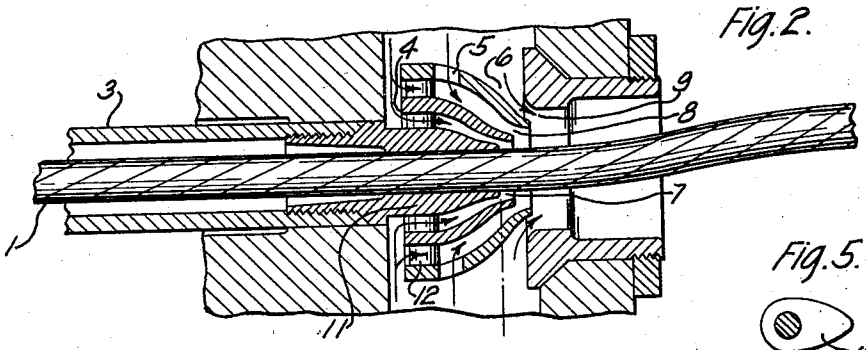


Fig. 2.

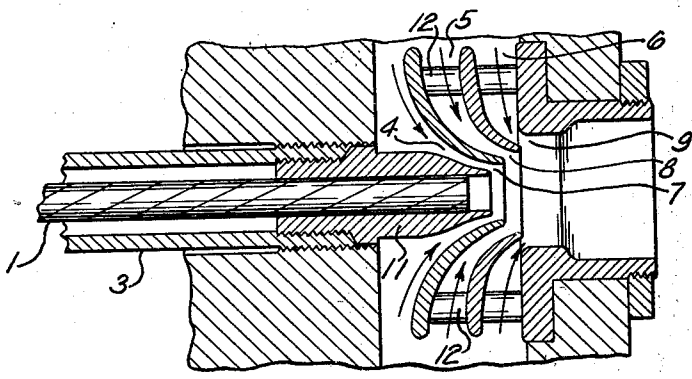


Fig. 3.

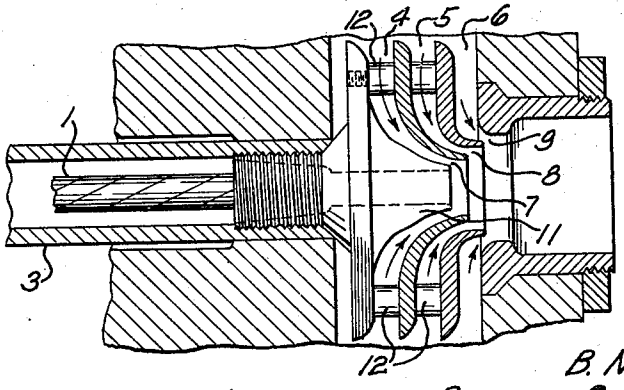


Fig. 4.


Fig. 5.

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# UNITED STATES PATENT OFFICE

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## EXTRUDING APPARATUS

Application filed April 5, 1930, Serial No. 441,791, and in Great Britain September 11, 1929.

This invention relates to extruding apparatus for extruding insulating material upon cores and more particularly to improvements in extruding devices for applying insulating material in a plurality of layers.

It has been heretofore proposed to form several layers of material from a core by passing a core through two dies of different diameters.

It has also been proposed to pass a core through a plurality of die members of different diameters which are coaxially mounted together with a guide member for the core. In such apparatus a tubular member together with the die members has been provided as a guide which may be removable from the apparatus for adjustment purposes. In apparatus as heretofore employed a bending of the core after it passes out of the guide member and before it arrives at the last die member causes the coating material to be eccentrically applied.

In accordance with the present invention the several die members are arranged with their exit orifices very nearly in the same plane taken transversely of the core. For example, in a device for extruding insulating material upon a submarine cable conductor of ordinary diameter, the distance between the exit orifices of the first and third of three die members are arranged to lie in two planes not in excess of about 10 to 15 m. m. apart.

In extruding insulation such as gutta percha or rubber-balata compounds upon a continuously magnetically-loaded conductor which has a considerable layer of viscous pressure equalizing material about it, it has been noticed that whirls or eddies occurring at the outlet of the extruding die cause the pressure equalizing substance to come through the insulating material in streaks. These streaks represent inferior spots in the insulation. In order to reduce this tendency, extruding dies in accordance with the present invention are provided with streamlined exit orifices which cause the insulating material to flow on to the conductor in uniform and continuous layers.

In the Figures 1–4 inclusive, various forms of the invention are disclosed in cross-section and in Fig. 5 is shown the form of a stream lined stud which connects the bell-shaped separators forming the die blocks of Figs. 2, 3 and 4.

In Fig. 1 is shown a conductor 1 passing through the extruding head 2 for the purpose of being covered with three layers of insulating material. The conductor 1 is understood in this case to consist of a copper conductor surrounded by spirally applied magnetic tape which is thoroughly covered and underlaid with pressure equalizing viscous or semi-liquid pressure equalizing material. Usually also a layer of the pressure equalizing substance about .2 m. m. thick is adherent to the outside of the magnetic tape. The pressure equalizing material may be applied, under pressure in the pipe 3 which may be elongated for that purpose or connected to pressure applying apparatus in a known manner. The insulating material flows onto the conductor through three orifices 4, 5 and 6. The thickness of the first layer is determined by the inner diameter at the exit of the die 7; the thickness of the second layer by the inner diameter of the die 8 and the thickness of the last layer by the inner diameter of the sizing die 9. A bend in the conductor as it issues from the opening 10 or a sidewise bending of the part outside of the opening, as shown in Fig. 2, will have little or no effect upon the centering of the conductor in the insulating material. In Fig. 1 the various parts of the die block are indicated as being assembled together by being threaded into one another but this is not essential as the parts may be cast or made

in any desired form and assembled in any workmanlike manner.

Instead of having the parts of the die blocks tapered off in the fashion of Fig. 1 they may be given various stream-lined shapes as indicated in Figs. 2, 3 and 4 wherein similar reference characters indicate the same parts as in Fig. 1.

These various shapings of the parts are designed to cause the insulating material to flow on to the conductor in a straightforward direction with the least possible whirling or eddying motion.

In Fig. 3 the tube 3 is made adjustable with respect to the other elements of the extruding head so that it may be moved to a position to give the best results because it is specially desirable to cause the first layer of insulating compound to cover the pressure equalizing substance in a continuous and uniform manner. In each of the other modifications the tube 3 may likewise be made adjustable.

In Figs. 2, 3, and 4 the cone-shaped separators which lie between the various extruding orifices are spaced apart by studs 12 which are preferably stream-lined as shown in Fig. 5. The parts may be assembled by bolts or rivets passing through the studs 12 and holding the separators 7, 8 and 9 rigidly in position. Any bolt or rivet head extending through the right-hand end of the separator 8 should be smoothly finished to conform to the surface of the separator. As shown in Fig. 2 the distance between the exit end of the guiding block 11 and the exit end of the sizing die 9 is shown to be about 10 to 15 m. m. for a submarine cable conductor of ordinary size but this dimension may be varied considerably, depending upon the size of the conductor, the total thickness of the insulation, number of layers, and other circumstances, without departing from the essential principles of the invention.

Any of the openings 4, 5 and 6 may be connected to a separate chamber filled with a different material than the others, for example, in case it is desired that the various layers of plastic material should differ in composition.

What is claimed is:

1. An extrusion die for applying a plurality of layers of plastic insulation such as gutta percha to a conductor in which the die comprises several parts having coaxial exit orifices, the exit orifices of the several parts being arranged so nearly in the same plane that the distance between the first and the last thereof is not greater than the thickness of the insulation applied to the conductor whereby a bend in the conductor as it passes through the die will not result in eccentric application of the plastic insulation.

2. An extrusion die according to claim 1 wherein the operating surface of a central guide tube constituting the innermost member and the operating surfaces of the other members are stream-lined to prevent whirls or eddies in the plastic material as it flows onto the core.

3. An extrusion die according to claim 1 wherein the several members are connected to each other and spaced apart by studs, characterized in that the studs are stream-lined in the direction of flow of the material to be extruded.

In witness whereof, I hereunto subscribe my name this 19th day of March, 1930.

BRUNO M. A. TREBES.