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APPARATUS FOR EXTRUDING COATING ON A TRAVELING CORE

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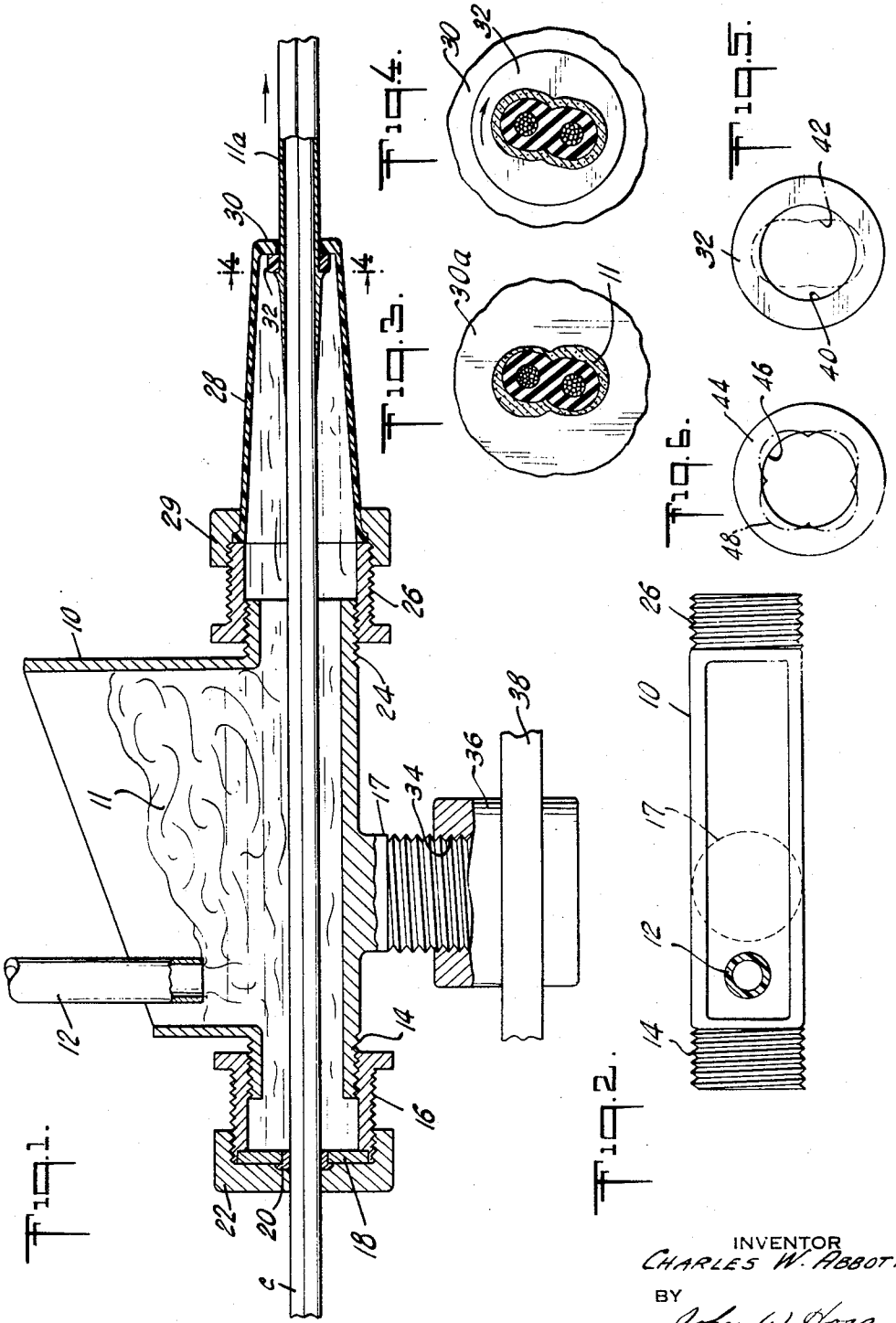


FIG. 1.

FIG. 4.

FIG. 3.

FIG. 5.

FIG. 6.

FIG. 2.

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APPARATUS FOR EXTRUDING COATING ON A TRAVELING CORE

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3 Claims. (Cl. 118—405)

This invention relates to means for extruding a liquid covering or coating on a traveling cord such for example as insulated conductors and particularly conductors insulated with rubber, neoprene and the like including cords of non-circular cross-section such as telephone cord, lamp cord and the like which have a plurality of conductors enclosed in a common jacket, and is a division of copending application, Serial No. 638,507, filed Feb. 6, 1957. The coating may be applied for various reasons as for example to provide a desired color, or to give added wear resistance or for both color and wear resistance.

For the purpose of illustration, but not limitation, the invention is described herein in connection with coating insulated conductors and particularly cord of the kind mentioned above. The cross-sectional shape of such cord is characterized by slightly protruding longitudinal ridges or ribs, equal in number to the conductors enclosed in the common insulating jacket.

Great difficulty has been encountered in the coating of conductor structures of non-circular cross-section including those generally oval in shape such as lamp cord (PO cord), which comprises two insulated conductors in a common jacket, and telephone cord including retractile cord commonly used with telephone sets, which comprises a plurality of insulated conductors, usually three or four conductors, each comprising a conductive core of several small gauge tinsel wires individually insulated and twisted together with all the conductors enclosed in a tight fitting insulating jacket, thus forming a non-circular core having larger and smaller diameters and a cross-sectional shape which is very broadly similar to a three-leaf clover or a four-leaf clover.

In some jacketed cords comprising two, three or four conductors the conductors are intentionally twisted together at a fairly short lay to make the cords flexible. In other cords the conductors are usually twisted at irregular intervals, either because of the difference in feed tension during manufacture or carelessness of operators which permits twisting during the course of a reeling-up operation. When coating compound has been applied to the surface of such a cord and the cord is passed through rigid, fixed wiping means of the prior art for the purpose of leveling the coating and imparting an even coating of the thickness desired for the final product, coating is removed from the high portions or "ridges" of the structure where it is out of alignment with the orifice of fixed wiping mens, causing the coating to be unevenly applied with little or no coating on the "ridges" and too much in the "valleys," and rotation of the cord within the wiper orifice and relative to the wiper will cause speedy wear of the wiper and undesired enlargement of the orifice therein.

Furthermore, wipers of the prior art have been made of materials not able to withstand the corrosive action of solvents of the kind presented in the coating material which I prefer to use.

This invention overcomes this difficulty by providing a

wiper, which is rotatable and slightly yielding and yet highly resistant to wear and the action of solvents. Provision of a wiper which is slightly yieldable enables the orifice in the wiper to expand and deform as required to pass and satisfactorily coat a cord of non-circular cross-section. Provision of a wiper which is rotatable as well as yieldable greatly reduces friction between the cord and the wiper as the latter is able to rotate with twists in the cord and is thus self-adapting to "ridges" and "valleys" or twists in the cord.

Is is an object of this invention to overcome the deficiencies of the prior art and provide improved means for extruding coating on cords and particularly electrical conductors or cords of non-circular cross-section, including novel wiper and wiper nozzle means.

Another object of my invention is to provide improved apparatus for coating such cores, insulated conductors and cords.

Another object of my invention is to provide an applicator pot of improved structure and composition.

The invention will best be understood if read in connection wtih the accompanying drawings, in which:

Fig. 1 is a side elevation mostly in cross-section showing apparatus embodying my invention for coating a traveling cord;

Fig. 2 is a plan view of a portion of said apparatus;

Fig. 3 is a perspective view partly cut away of a non-circular cord, showing the unevenness of coating at the high points of the cord obtained by extrusion of coating using extrusion devices of the prior art, due to portions of the cord being out of alignment with the orifice of a fixed wiper.

Fig. 4 is a similar view showing that the wiper of the apparatus disclosed herein having a non-circular orifice, rigid or yielding has rotated to conform to a twist in the cord, after coating by the apparatus disclosed herein.

Fig. 5 is a plan view of a wiper disc showing how a circular, yielding orifice has deformed to conform to the cross sectional shape of the cord shown in Figures 3 and 4, and Fig. 6 is a view similar to Fig. 3 but showing how the circular, yielding orifice of a wiper disk has deformed to conform to a telephone cord having four ridges corresponding to four conductors enclosed in a common insulation jacket.

In the illustrated embodiment of the invention I pass the traveling cord through a container having therein a supply of desired coating composition. This container, which will be referred to as an applicator pot, comprises both entrance and exit ports each containing wiper means. The wiper means in the entrance port serves to prevent the escape of coating material in a direction opposite to the direction of travel of the cord, and the wiper means in the exit port controls the thickness and even application of coating material to the cord. If a plurality of coatings are desired a plurality of applicator pots of the kind described herein may be employed and in my copending application Serial No. 638,507, filed Feb. 6, 1957, I have described and claimed a process of coating a previously insulated core with one or more coating layers using apparatus including applicator pots of the kind disclosed herein.

The present application is directed to the structure of an applicator pot for obtaining even distribution of coating of the desired thickness on a traveling core including cores of non-circular cross section which because of having twists at intervals along their lengths cannot be successfully coated by the methods or apparatus heretofore available.

The coating applicator which is the subject of this invention comprises a receptacle or body portion 10 which

may be of any suitable material, such for example as stainless steel or aluminum, to which the desired coating material is supplied through a feed pipe 12 from a supply reservoir (not shown). The feed pipe is preferably of polysulphide elastomer, such as is commercially available under the trademark Thiakol, which is practically impervious to coating solvents, and is controlled by any suitable means, preferably a squeeze type valve (not shown).

Each coating applicator comprises a tubular entrance portion 14 on which is screwed a bushing 16 having at its rear extremity an annular desk wipe 18, the central opening of which is preferably defined by a copper eyelet 20, the orifice of which is of the diameter adapted to pass the insulated conductor or cord without permitting escape of coating material from the applicator. Member 18 and its central copper eyelet are held in place by means of a threaded lock nut 22 which screws over the rear end of said bushing 14.

In order to feed the coating material evenly the lower end of the feed pipe 12 enters the reservoir portion 10 of the applicator pot near its rear end, as illustrated in Fig. 1, at a non-turbulent point behind the turbulence which is set up toward the front end of the applicator by the motion of the insulated conductor passing through the specially designed, narrow applicator at speeds within ranges set forth herein.

At the discharge end of the coating applicator is a threaded flange 24 on which is screwed a bushing 26 having a threaded outside face to permit ready assembly thereon of the tubular nozzle 28 in which is the floating wipe 32, which as illustrated herein is an annular disk. Nozzle 28 is supported only from its rear end, by screwing its internally threaded coupling flange 29 on bushing 26, and it is tapered from an internal diameter of about 7/8" to one of about 5/8". At its discharge end holder 28 is partly closed by the end flange 30, the opening of which is of course smaller than the outside diameter of wipe 32 but larger than the orifice in wipe 32. For telephone cords and lamp cords (PO cords) I have had good results using a floating wipe disk about 7/16" in outside diameter and about 1/10" in thickness, of from 55 to 60 durometer hardness, and having an orifice which is deformable and able to conform itself to the cross section of the cord passing through it.

I make both the wiper disk 32 and the holder 28 of material which is flexible, i.e. yielding so that the orifice in the wiper disk 32 can enlarge and deform to pass enlarged and twisted portions of a cord, and so that the holder 28 can yield or bend a little to better align itself with bent or offset portions of a cord passing through it.

I prefer also to mold inlet wipe 18 from yielding material for self alignment with bent or offset portions of a cord, and to make the feed pipe 12 somewhat flexible for convenience in cleaning it.

I have found that parts molded of a polysulphide elastomer such as in commercially available under the trademark Thiakol are both tough and yielding and are remarkably impervious to solvents and in particular to the solvents employed in a coating composition comprising chlorosulphonated polyethylene, which, as stated in my said copending application, I prefer to employ for coating telephone cord. I have obtained very excellent results with the parts 12, 18, 28 and 32 molded of polysulphide elastomer Type 500–A or Type PR–1 to which has been added ethylene diochloride to produce a formal reaction with sodium polysulphite of rank 2.0 cross linked through the use of trichloropane, which is the compound commercially available under the trademark Thiakol. Because of the resistance of this material to solvents, its inherent toughness, and its ability to bend and to be deformed, the parts mentioned above have unusual life when made of it, in addition to having the very important advantage which results from the unusual combination of toughness and deformability and great resistance to frictional wear by the cord being coated.

I have been able to compare the life of yielding wipes of from 55 to 60 durometer hardness molded from a polysulphide elastomer, with rigid wipes molded from butyl rubber, neoprene and the like and have found that the former give much longer wear than the latter.

Since disk 12 is of lesser diameter than the holder 28 it is free to move radially within the nozzle-like holder and since it is of yielding material and its orifice is able to change its size and shape to conform to a cord passing through it, it is able to compensate both for movement of the cord within the holder and the small irregularities and differences in diameter characteristic of the insulated cords being coated. Furthermore, floating disk 32 is arranged to rotate freely within holder 28 and thus when its orifice is deformed to conform, for example, to the shape of a cord of slightly ribbed, non-circular cross section, it tends to rotate with twists in the cord thus avoiding the fictional wear to which a fixed wipe is subject.

In Figure 5 I have illustrated an oval wipe 32 with its orifice 40 deformed as indicated by dotted line 42 to pass a lamp cord comprising two conductors enclosed in a common insulating jacket. It takes the shape indicated in dotted lines because being stretched chiefly in one direction, in the direction of its larger dimension, it will be stretched less transversely and will tend to fill in around the narrowest portion of the lamp cord, where the surface is slightly indented between the two cores of the lamp cord.

In Fig. 6 I have illustrated in an exaggerated manner an annular wipe 44 with its circular orifice 46 deformed as indicated by the dotted line 48 to pass a telephone cord having 4 ridges corresponding to 4 conductors enclosed in a common insulating jacket. This wiper tends to rotate with twists in the cord and it thus subject to much less friction and does a far better job than if it were rigid and unyielding.

The apparatus I have described herein makes it possible to extrude continuous coatings on cords of non-circular cross section including telephone cord, and PO cord, in an economical and satisfactory manner and without the unevenness of coating and the excessive wearing out of wipers which have characterized prior art attempts to coat such cords.

An important structural feature of the applicator is the narrowness of the container portion 10 in relation to the cord, conductor or other core traveling through it, taken together with the increased height of the front end of the container. Prior art applicators have been of greater width, usually three to four inches, and often circular, and are unsatisfactory because the rather large volume of compound contained therein is not thoroughly mixed and agitated by movement of the conductor traveling through it and the upper surface of the compound tends to thicken and form a crust.

The container portion 10 of the applicator pot disclosed herein is sufficiently narrow so that the conductor or other core traveling through it, sets the whole body of compound therein into a rotary motion and the increased height of the front end portion of the container permits the rising of the level of the compound within the front portion of the container due to this whirling or rotary agitation of the compound, without spilling over. The travel of the core through this applicator pot keeps the compound therein well mixed and of even viscosity and prevents it from scaling over.

The rolling action of the compound obtained in a narrow container not only keeps the components of the compound well blended but works out of the compound small air bubbles which may have become entrapped in it, due for example to air being drawn into the feed line or entrapped by even slightly blocked air vents in the supply reservoir from which the compound is fed.

The feed pipe 12, the nozzle 28, and the wipers 18 and 32 or 44 when moulded of Thiakol as described above have amazing and unexpected resistance to solvent

deterioration. The flexibility of nozzle 28, and wipes 32 or 44, and the ability of the wipes 32 or 44 to rotate and to move laterally within nozzle 28 enables these parts to adapt themselves instantly to ribbed or irregular contours and to bends and offsets in cords or other cores passing through them.

The applicator pot may be supported in any suitable way. As illustrated herein a downwardly projecting hub 17 is provided which is externally threaded to engage in an internal threaded bore 34 provided in the clamp 36 by which the applicator assembly may be supported at the desired height, as for example, on the horizontal extending support member 38.

There has thus been disclosed means in which the above stated objects are realized in a thoroughly practical manner.

What I claim is:

1. Apparatus for extruding a coating of controlled diameter on a travelling core which comprises, in combination, a coating container through which the core is passed, said container comprising a flexible exit nozzle with an end wall partially closing its extremity and a flexible wiper which is free within said nozzle but is urged into functional engagement with the end of the nozzle by a travelling core passing through the wiper orifice, said flexible wiper being free to rotate relative to said flexible nozzle to compensate for twists in the core passing through it, and being free to move laterally with respect to the longitudinal axis of the flexible nozzle to compensate for irregularities in the core, and coacting with said flexible nozzle to compensate for bends in the core by transmitting to said nozzle, through the end portion of the nozzle with which it is frictionally engaged, forces applied to the wiper by bends in said travelling core.

2. Apparatus for extruding a coating of controlled diameter on a travelling core which comprises, in combination, a coating container through which the core is passed, said container having an exit end in the form of a flexible nozzle, with an end wall partially closing its extremity, and a flexible floating wiper wholly contained within said flexible nozzle and having a non-circular orifice through which the core is passed, said

combination being characterized by the wiper being unrestrained around its periphery and free to rotate and to move laterally within said nozzle, and at the same time being adapted to overlie the inner surface of said end wall and to be pressed frictionally against it by the action of a travelling core passing through its orifice and to coact with it in completing the closure of the exit end of the container and in transmitting to said flexible nozzle forces tending to bend the nozzle to compensate for bends in said travelling core.

3. Apparatus for extruding a coating of controlled diameter on a travelling core, which comprises, in combination, a coating container through which the core is passed, said container having a flexible exit nozzle with an end wall partially closing its extremity, and a floating wiper disposed within said flexible nozzle and having an orifice through which the core is passed and which is of less diameter than the opening in said end wall, the material forming the orifice in said wiper being distortable to permit the orifice to conform to the cross-section of the core passing through it, said combination being characterized by the wiper having an outside diameter which is less than the diameter of said coating container adjacent its said end wall, but larger than the diameter of the opening in the end wall, whereby the wiper overlies the inner surface of said end wall, and is urged into frictional engagement with said end wall by the action of a travelling core passing through the wiper orifice and coacts with said nozzle in completing the closure of the exit end of the container and in transmitting to it from said travelling core forces tending to bend the nozzle.

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