March 19, 1940. G. A. SEELEY 2,193,887

STRAND HANDLING APPARATUS

Filed May 14, 1938

FIG. 3.

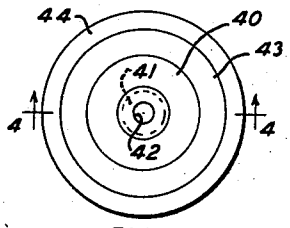


FIG. 4.

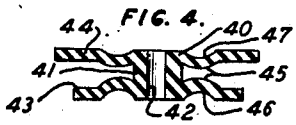


FIG. 1.

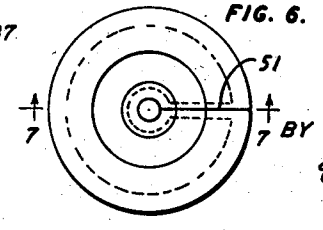
FIG. 5.

FIG. 2.

FIG. 7.



FIG. 6.



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STRAND HANDLING APPARATUS

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7 Claims. (Cl. 91—53)

This invention relates to strand handling apparatus and more particularly to apparatus for coating strands, especially wire as used in the electrical arts.

Many kinds of strands used in various arts and manufactures are coated with a great variety of different kinds of substances for various purposes. In particular electrically conductive wires of metal, both bare and sheathed with such materials as textile fiber strands, paper tapes or pulp, rubber or gutta percha containing mixtures, and the like, may be desired to be coated with compositions which are applied to them raw in a more or less liquid or plastic state and which are then hardened into dense, continuous, solid sheathings. Such compositions are frequently used as, for example, various kinds of enamels, paints, varnishes and the like, and other mixtures in which a normally solid portion is dissolved, emulsified or suspended in a liquid vehicle which is driven off after application to leave the solid material as a coating. Or the liquid may be one which is itself polymerizable or otherwise convertible into a solid phase during the hardening procedure.

Generally such raw coating mixtures in the past have been applied in a relatively highly fluid state, requiring a relatively great volume of liquid vehicle to be driven off or hardened. Strands have been coated with such liquid preparations by being dipped into or drawn through a bath of the liquid which then adheres as a thin film of which a portion must generally be scraped or squeezed off to ensure uniformity, before it is hardened, and several repetitions of the process may be necessary to build up a coating of the desired thickness. This is because the drying out or hardening of a thick coating of mixture having a large proportion of vehicle may be a long and difficult matter.

An object of the present invention is to provide an apparatus or device whereby coating mixtures heretofore used in a relatively highly fluid state, enamels, paints, varnishes, and the like, may be used in a thickly viscous state for the coating of strands and especially electrical conductor strands.

With this and other objects in view, the invention may be embodied in an apparatus comprising means such as a reservoir or tank to contain a supply of coating material such as a thickly liquid paint for coating an electrical conductor wire which is drawn through the material via entrance and exit apertures in the tank walls, there being wiper dies mounted in these apertures, of which each die is a member of compressible material such as soft vulcanized rubber, with the wire passing through a bore, in combination with means to provide controllable fluid pressure on the member to control the diameter of the bore and hence the severity of the wiping action on the strand.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof in an apparatus for applying thick paint, enamel, varnish, or the like, to an electrical conductor, taken in connection with the accompanying drawing in which the same reference numerals are applied to identical parts in the several figures, and in which;

Fig. 1 is a view in side elevation and partly in section of the apparatus;

Fig. 2 is an enlarged sectional detail of the exit wiper die in position;

Fig. 3 is an enlarged detached face view of the die;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a view similar to Fig. 2 showing a modified form of die;

Fig. 6 is an enlarged detached face view of a modified form of die; and

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6.

In the embodiment of the invention herein disclosed a closed reservoir or tank 20 is suitably supported upon a vertical bracket or the like and is provided with a door or closure 22 controlled by a handle 23 to give access to the interior of the tank. The lower portion of the tank is normally filled with the thickly fluid strand coating material 24 to a convenient level indicated at 25.

A strand 19 to be coated with the material 24 passes vertically through the tank, emerging from the tank through an aperture 26 in the top tank wall. The strand enters the tank through a similar aperture at the bottom. Since the structures at the bottom entrance are identical in form and arrangement with those at the strand exit at the top, only the latter are shown and described in detail.

A compound mounting block 30, 31 is rigidly secured to the tank wall outside the aperture 26 and is formed with a tapering bore 32 coaxial with the aperture 26 and leading to a coaxial die seating recess 33 formed on the outer side of the outer member 31 of the block.

A generally spool shaped wiper die 40 is made preferably of soft, vulcanized rubber, although

it may be of any comparably suitable, elastically deformable material, such as vulcanized corn oil, gutta percha compound, polymerized isoprene, or the like. This die has a substantially cylindrical body portion 41 with a central axial bore 42, and circular flanges 43 and 44 at the ends of the body which flanges define a relatively deep peripheral groove or chamber 45. The flanges are further formed with peripheral, radially incurved portions 46 and 47, respectively. Also the flange 44 is radially larger than the flange 43.

The body and the flange 43 lie in the recess 33, while the outer rim of the flange 44 rests on the outer end of the circular side wall 34 of the recess. A centrally perforated cap 35 screws down over the wall 34 and thus clamps the rim of the flange 44 between the cap and the wall. The central perforation 36 of the cap registers with the bore 42 of the die but is measurably larger. Its rim, however, lies over the body of the die and thus the cap may give support to the entire flange 44 if need be.

A peripherally grooved metal ring 50 lies between the flanges 43 and 44 and in contact with the outer wall of the recess 33, the peripheral groove of the flange and the wall 34 defining a peripheral passage 51. At some convenient point on the ring, a radial passage 52 communicates from the passage 51 to the annular chamber 45.

A passageway 37 formed in the wall 34 and in the members 31 and 30 leads to and communicates with a compressed air supply pipe 60 fed through a control valve 61 from some supply not shown.

The control valve 161 for the lower die (whose visible parts 130, 131, 133 and 135 are respectively identically similar to 30, 31, 33 and 35) is any suitable form of three way valve whereby air can be admitted to the die, shut off from it without release of pressure, or shut off and released to the die.

In operation, the wire 19 will be moving up from a supply not shown to advancing means and take-up means also not shown. The untreated wire enters through the lower die, which is not under pressure and whose bore is normally sufficiently snug to the wire to prevent leakage of the paint down between the die and the wire so long as the wire is moving up. It is found that the soft die may be made loose enough on the wire to avoid any damage to any coating already on the wire, and yet be snug enough to prevent loss of coating material so long as the wire is moving up. If it be desired to stop the progress of the wire, air is admitted to the lower die through the valve 161 and the die is thus tightly sealed to the wire. When operation is resumed, the air is released and the normal conditions supervene.

The wire passes up from the entrance die, through the body of coating material 24 and via the tapering passage 32 into the bore 42 of the die 40, and thence out to be disposed of elsewhere. The die 40 is originally molded to be used with one only or with a small range of wire diameters. The bore 42 is made to be originally not less in diameter than the value known by trial to be the minimum satisfactory for use in the given case, and preferably a trifle larger. Thus the die, in its normal, unstressed state will be a little oversized as to bore.

Compressed air is, therefore, supplied to the chamber 45 under control of the valve 61. By this means the body portion 41 of the die is compressed and the diameter of the bore 42 is diminished, until it is found that the wire is emerging from the die with the desired quality of coating. Were it not for the annular flutes or incurved portions 46 and 47 of the flanges 43 and 44, the compression of the body 41 would be confined largely to its central portion, since if the flanges were normally flat they would have to stretch to allow the ends of the body to shift radially inwardly. As it is, the air pressure flattening the flutes tends to push the material of the body ends radially in, and assists in compressing the body uniformly. It will be self-evident that in place of compressed air or other gas under pressure a liquid under pressure may be used to control the dies through the valves 61 and 161.

In Fig. 5 is shown a slightly modified form of compressible die 140. In this the two flanges of the die are joined by a vertical wall 148 at the periphery of the narrower flange, so that the chamber 145 now becomes an annular passage completely enclosed within the material of the die. The passage 37 then terminates in a nipple 38 entering a corresponding perforation in the flange 143 to communicate with the chamber 145.

With either type of die, 40 or 140, if the strand 19 be advanced downwardly instead of upwardly, if the cover 22 of the tank be made to seal the tank gas tight, and if compressed air, carbon dioxide or the like be supplied to the space above the level 25, e. g., from any suitable source through a nipple 27, the material 24 may be so thick as to be even a semi-solid or plastic paste. Hence in the appended claims where the material 24 is described as "plastic", this is intended to mean having any viscosity from true fluidity to semi-solid pastiness.

In the modification of the invention shown in Figs. 6 and 7 the die is split as shown at 51, and at this point walls 52 are provided on each side of the split in order to prevent the escape of the pressure fluid. The split rubber die makes it possible to replace a die without restringing the entire apparatus.

By means of this invention a paint or other coating material of heavier consistency may be used which results in a saving of the amount of solvent or thinner used in the paint. The coated strand passes from the upper die into an air conditioned heating chamber in which the excess solvent is expelled. The expulsion of this excess solvent is also greatly facilitated by the fact that the fluid pressure operated die described is capable of effectively operating with a coating material of a much heavier consistency having less solvent therein than other types of dies.

While three specifically detailed forms of dies and their applications are disclosed herein, it will be evident that the disclosed embodiments of the invention are illustrative only and may be modified and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. In an apparatus for coating strands with plastic materials, a die comprising a body of compressible material formed with a bore to pass a strand, in combination with means to apply fluid pressure to the lateral outside walls of the body to compress the body and thereby to diminish the diameter of the bore.

2. A die for coating strands with plastic materials and comprising a body of compressible material formed with a bore to pass a strand, and also formed with a recess independent of the bore

and encircling the bore to receive fluid under pressure to compress the body and thereby diminish the diameter of the bore.

3. In an apparatus for coating strands with plastic materials, a die comprising a body of compressible material formed with a bore to pass a strand axially therethrough and also formed with a slit from the bore through one side of the body in a plane containing the axis of the bore through which slit a strand may be passed from outside the body to lie in the bore.

4. In an apparatus for coating strands with plastic materials, a die comprising a body of compressible material formed with a bore to pass a strand axially therethrough and also formed with a slit from the bore through one side of the body in a plane containing the axis of the bore through which slit a strand may be passed from outside the body to lie in the bore, in combination with means to apply pressure to compress the body and thereby to diminish the diameter of the bore.

5. In an apparatus for coating strands with plastic materials, a die comprising a body of compressible material formed with a bore to pass a strand axially therethrough and also formed with a slit from the bore through one side of the body in a plane containing the axis of the bore through which slit a strand may be passed from outside the body to lie in the bore, in combination with means to apply fluid pressure to the lateral outside walls of the body to compress the body and thereby to diminish the diameter of the bore.

6. A die for coating strands with plastic materials and comprising a body of compressible material formed with a bore to pass a strand axially therethrough and also formed with a slit from the bore through one side of the body in a plane containing the axis of the bore through which slit a strand may be passed from outside the body to lie in the bore, and also formed with a recess independent of the bore and encircling the bore to receive fluid under pressure to compress the body and thereby diminish the diameter of the bore.

7. A die for coating strands with plastic materials and comprising a body of compressible material formed with a bore to pass a strand axially therethrough and also formed with a slit from the bore through one side of the body in a plane containing the axis of the bore through which slit a strand may be passed from outside the body to lie in the bore, and also formed with a recess independent of the bore and encircling the bore to receive fluid under pressure to compress the body and thereby diminish the diameter of the bore, there being radial walls across the recess at either side of the slit.

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