July 25, 1967 H. A. HOOVER 3,332,393

APPLICATOR FOR COATING FLEXIBLE STRANDS

Filed Oct. 1, 1964

FIG. 1

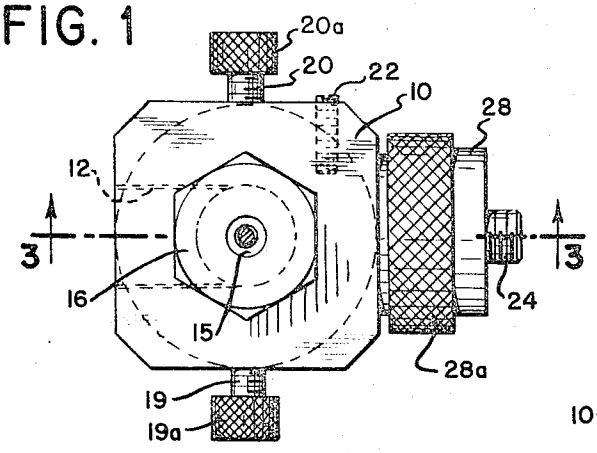


FIG. 2

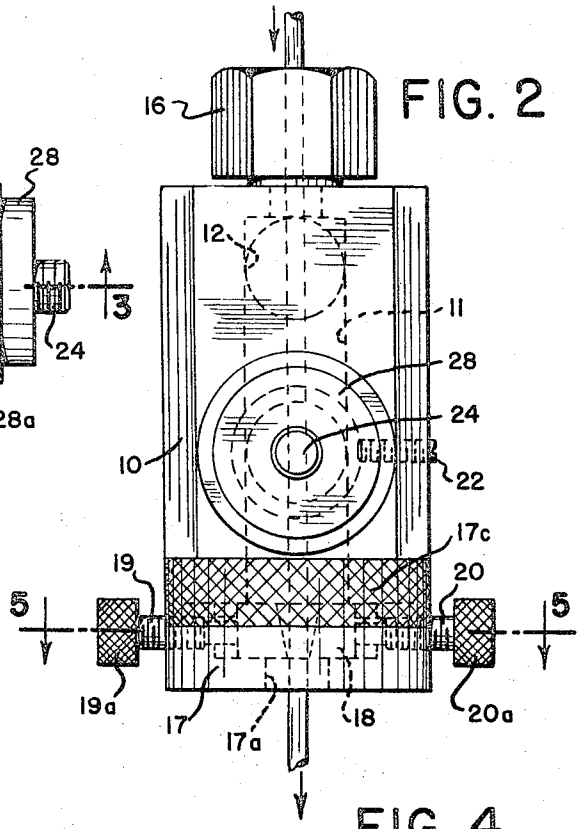


FIG. 3

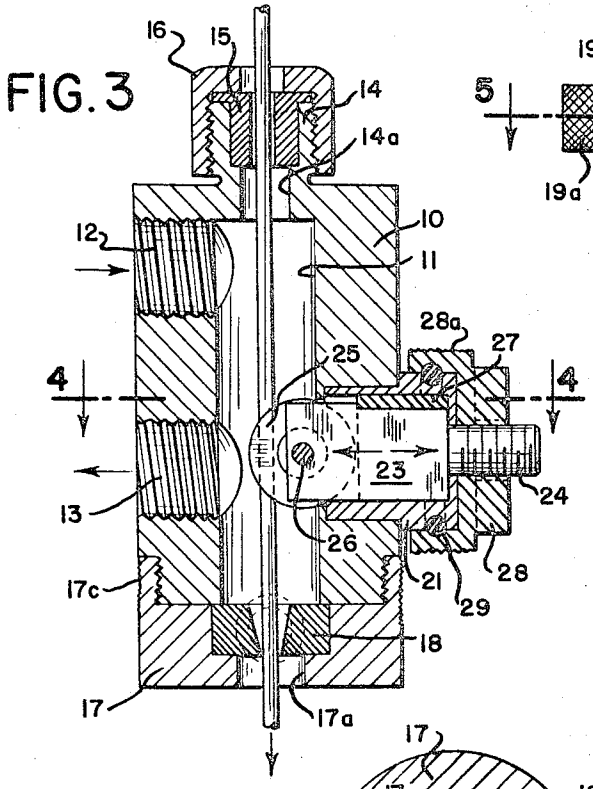


FIG. 4

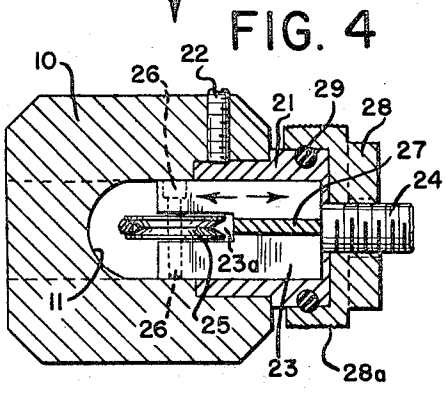
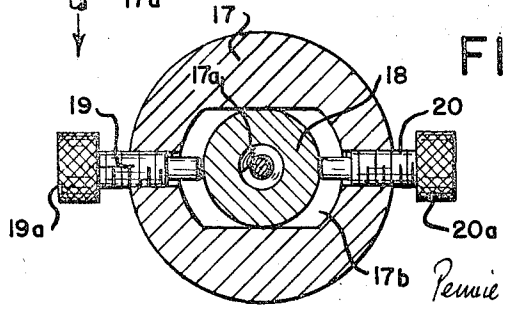


FIG. 5



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APPLICATOR FOR COATING FLEXIBLE STRANDS

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This invention relates to the application of coatings to flexible strands, of which wire and cable are examples. More particularly, the invention is concerned with a novel applicator by which liquid materials of different viscosities may be applied to flexible strands to form coatings varying in thickness through a substantial range. The applicator of the invention is not limited in utility to the coating of strands of any particular kind, but, since all the advantages of the invention are realized in a form of the applicator for coating wire, an applicator for that use will be illustrated and described in detail for purposes of explanation.

A wire coating applicator embodying the invention includes a housing containing a chamber for holding coating material and provided with an inlet and an outlet for the material and aligned inlet and outlet openings for the passage of the wire through the material. The thickness of the coating applied to the wire is in part determined by means of a wiping die in the wire outlet opening and, as the coated wire passes through the die and out of the chamber, material is removed from the wire by the die. To insure the formation of a coating of uniform thickness on the wire, it is necessary that the wire pass through the die in close concentricity therewith and, to obtain such concentricity, the relative positions of the wire and die are adjustable in the new applicator along paths lying at right angles to each other. The adjustment along one path is effected by means of a rotary guide engaging the wire within the chamber between the aligned wire openings, the guide being carried by a mounting movable along a path parallel to a diameter of the die. To provide the adjustment along the second path, the die is mounted for movement along a diameter at right angles to the first path. The means for moving the rotary guide and the die are operable outside the housing and may be constructed to give as exact adjustments as may be desired. As the wire is engaged and movable only by the guide rotating in a plane through the wire, the possibility of injury being done to a priming coating on the wire is eliminated.

For a better understanding of the invention, reference may be made to the accompanying drawing, in which

FIG. 1 is a plan view of an applicator embodying the invention;

FIG. 2 is a side elevational view of the applicator; and

FIGS. 3, 4, and 5 are sectional views on the lines 3—3 of FIG. 1, 4—4 of FIG. 3, and 5—5 of FIG. 2, respectively.

The applicator for coating wire shown in the drawing comprises a housing **10**, preferably polygonal in cross-section, which contains a chamber **11** for holding coating material. The housing has an inlet opening **12** and an outlet opening **13** for the material and the openings may be conveniently disposed in the same wall of the housing and may be internally threaded to receive pipe nipples or unions.

At one end, the housing has an externally threaded extension **14** formed with a passage **14***a* leading to the chamber and providing an inlet opening for the wire to be coated. The outer end of the passage is enlarged and a bushing **15** is removably mounted in the enlargement and is held in place by a nut **16** threaded on the extension and overlying the rim of the outer edge of the bushing. The bushing restricts the inlet passage to prevent leakage of coating material and also acts as a guide for the wire.

At the other end, the housing is closed by a cap **17** threaded on the end of the housing and formed with a wire outlet passage **17***a* from the chamber in alignment with the inlet passage **14***a*. The inner end of the passage **17***a* is enlarged to form a recess **17***b* which is elongated in a plane normal to the common axis of the passages **14***a* and **17***a* and preferably has its long dimension parallel to one of the side walls of the housing. A wiping die **18** is mounted in the recess and is held in adjusted position by screws **19**, **20** mounted in threaded openings in the cap coaxial with the longitudinal axis of the recess and with the inner ends of the screws entering the recess to engage the die. The screws have knurled heads **19***a*, **20***a* and the cap **17** is formed with a knurled circumferential area **17***c* by which it may be gripped to screw it on and off the housing to permit substitution of one wiping die for another.

A bushing **21** is mounted in an opening in one of the side walls of the housing **10** with its axis at right angles to the longitudinal axis of the recess **17***b* and the bushing is held in the opening by a set screw **22** threaded through an opening in a wall of the housing to engage the bushing. The bushing projects out of the opening in the housing and its outer end is closed by a radial flange except for a central opening. A plug **23** is mounted in the bushing and it has a threaded extension **24** which projects through the opening in the outer end of the bushing. At its inner end, the plug is formed with an axial slot **23***a* and a sheave **25** is mounted on a pin **26** in an opening transverse to the slot to project out of the slot. The sheave has a circumferential groove, which is preferably of V-shape. The plug is movable lengthwise in the bushing but is prevented from rotation relative to the bushing by a key **27** disposed partly in a keyway in the outer surface of the plug and partly in the inner surface of the bushing. Movement of the plug relative to the bushing is effected by a cap **28**, which is threaded on the extension **24** and encloses the exposed end of the bushing. The cap is held in place in the bushing by a pair of pins **29** lying partly in an internal channel in the skirt of the cap and partly in a channel in the exposed part of the bushing. The cap is provided with a knurled circumferential area **28***a* by which it may be turned to adjust the position of the bushing.

In the coating of a strand, such as a wire, by means of the applicator, the end of the wire is passed through the guide bushing **15**, the chamber **11**, and the wiping die **18** and, between the guide bushing and the die, the wire lies within the groove of the sheave **25**. The plug **23** and the die are then adjusted in position to insure concentricity of the wire with the opening through the die, and coating material is introduced into the chamber through the opening **12** to fill the chamber with the excess material escaping through the opening **13**. The wire is moved through the chamber and picks up a coating of the material and excess coating material adhering to the wire is removed by the wiping action of the die as the wire leaves the applicator. During the coating operation, the chamber is kept filled with coating material introduced by means of a pump and a slight positive pressure is maintained in the chamber. By selection of a guide bushing **15** of proper internal diameter, leakage around the wire through the bushing can be prevented. In coating wires of different diameters, it is occasionally necessary to replace one bushing by another but, in practice, it has been found that bushings of two different internal diameters may be used in the coating of wires ranging in diameter from 0.050″ to 0.200″.

When coatings of heavy thickness are being applied, the wiping action of the sheave **25** may result in the application of an inadequate coating on the wire but such a condition may be overcome by interchanging the inlet and outlet connections to the chamber. The difficulty may also be overcome by maintaining a uniform pressure of the

coating material at the inlet by the use of a pressure regulator.

In the new applicator, concentricity of the coating with the wire is insured by the adjustments of the plug **23** carrying the sheave **25** in a plane through the wire and of the wiping die **18** in a plane at right angles to the first. Since the concentricity of the wire with the wiping die is obtained by adjusting only one guide element in contact with the wire and forming that element to rotate, damage to an inner or priming coating on the wire by the scraping action of a guide is avoided.

The applicator may be used in applying coatings varying in thickness from 0.001" or less to one equal to 20% of the bare wire diameter and, in all cases, a close concentricity of the coating with the wire is obtainable. The applicator may be used with coatings varying widely in viscosity and it may be employed in different positions with a wire traveling through it along any desired path from vertical to horizontal. The applicator may also be employed in reversed position with the wiping die at the top. The amount of coating applied is controlled by the size of the opening through the wiping die, the viscosity of the wiping material, and the speed of the wire. The applicator is not limited to the application of non-metallic materials, such as plastics, but may be made of ceramic materials so that it may be employed in the application of coatings of molten metals, such as zinc and aluminum, on steel wires.

I claim:

1. An applicator for applying a coating to a flexible strand, which comprises a housing containing a chamber for holding coating material, the chamber having inlet and outlet openings for the material and aligned inlet and outlet openings in opposite walls for the passage of the strand through the material, an element defining an orifice and mounted in the strand outlet opening for movement along a diameter of the orifice, means operable outside the housing to move the element, a rotary guide for engaging the strand between the strand openings, a mounting for the guide movable along a path at right angles to the path of movement of the element, and means operable outside the housing to move the mounting.

2. The applicator of claim **1**, in which the element is a wiping die.

3. The applicator of claim **1**, in which a bushing removably mounted in a passage through a wall of the chamber defines the strand inlet opening.

4. The applicator of claim **1**, in which the outlet opening for the strand is elongated and a pair of adjusting screws are mounted in openings through the housing wall coaxial with the longitudinal axis of the strand outlet opening and engage opposite sides of the orifice element.

5. The applicator of claim **1**, in which the rotary guide is a sheave with a peripheral channel adapted to receive the strand.

6. The applicator of claim **5**, in which the mounting for the sheave is a plug mounted in an opening through the wall of the chamber and the plug is movable endwise in the opening by means engaging a portion of the plug outside the opening.

7. The applicator of claim **6**, in which the axis of the opening, in which the plug is mounted, is at right angles to the longitudinal axis of the outlet opening, in which the orifice element is mounted.

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