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Brideau et al.

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[54] **APPARATUS FOR COATING WIRE FILAMENT WITH LIQUID**

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[52] **U.S. Cl.** **118/234;** 118/104; 118/118; 118/266

[51] **Int. Cl.** **B05c 1/06**

[58] **Field of Search** ..... 118/118, 234, 264, 18, 118/22, 266, 123, 104; 118/118, 234, 264, DIG. 18, DIG. 22, 266, 123, 104

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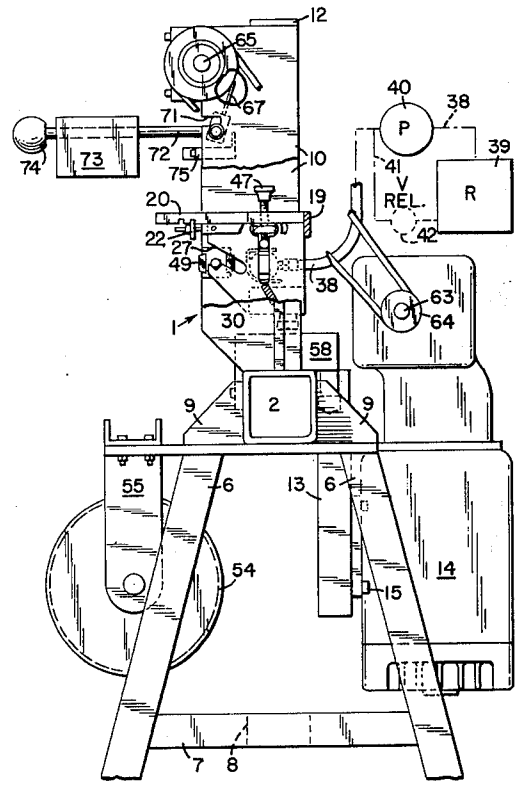
Attorney, Agent, or Firm—Merchant, Gould, Smith & Edell

[57] **ABSTRACT**

A pair of soft elastic porous bodies disposed in face-to-face engagement for movement therebetween of a wire filament. One of the bodies is saturated with wire coating liquid under pressure from a manifold on which the saturated body is mounted, the other body absorbing coating liquid from the saturated body. The manifold with the one body is mounted for adjustment movements toward and away from the path of movement of the wire filament, and the other porous body is biased toward engagement with the manifold mounted body and the wire passing between the bodies. A wiping roll is positioned to tangentially engage the wire filament as it moves away from the porous bodies and rotates in a direction to wipe the wire filament in a reverse direction to that of movement of the filament.

5 Claims, 6 Drawing Figures



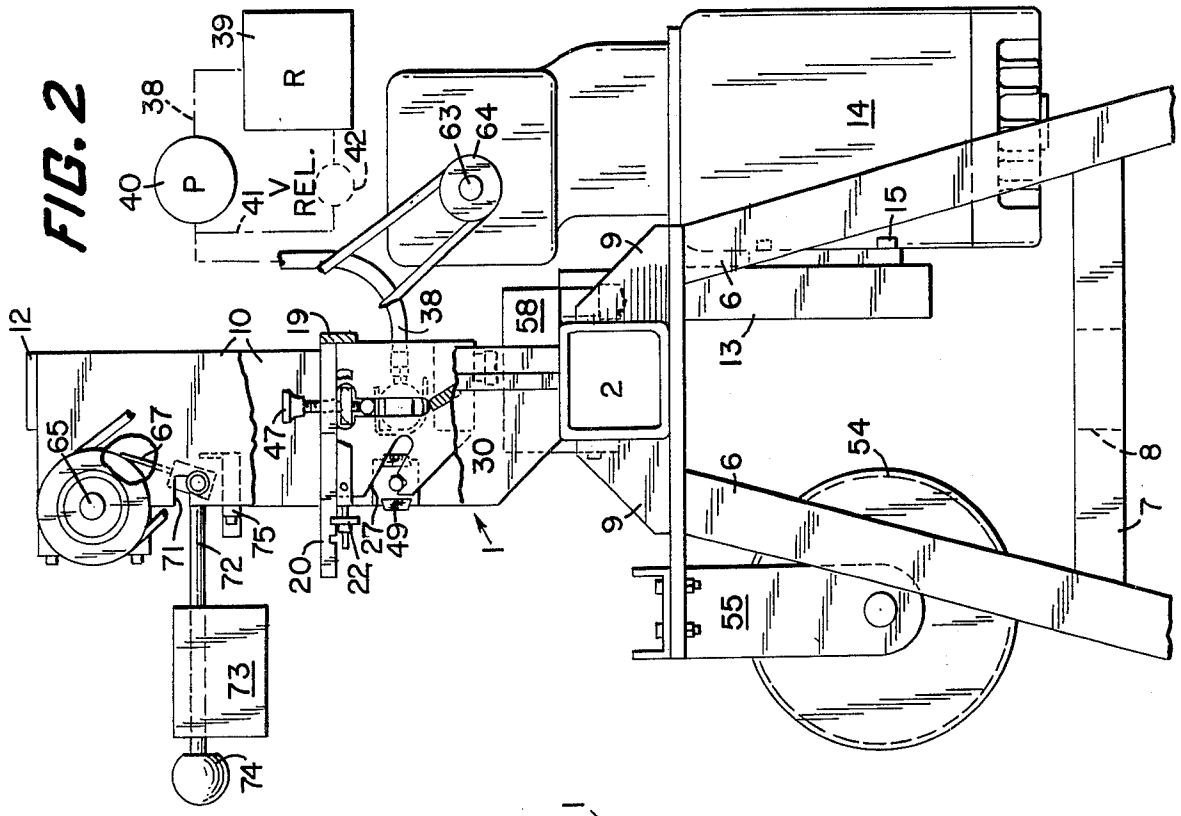


FIG. 2

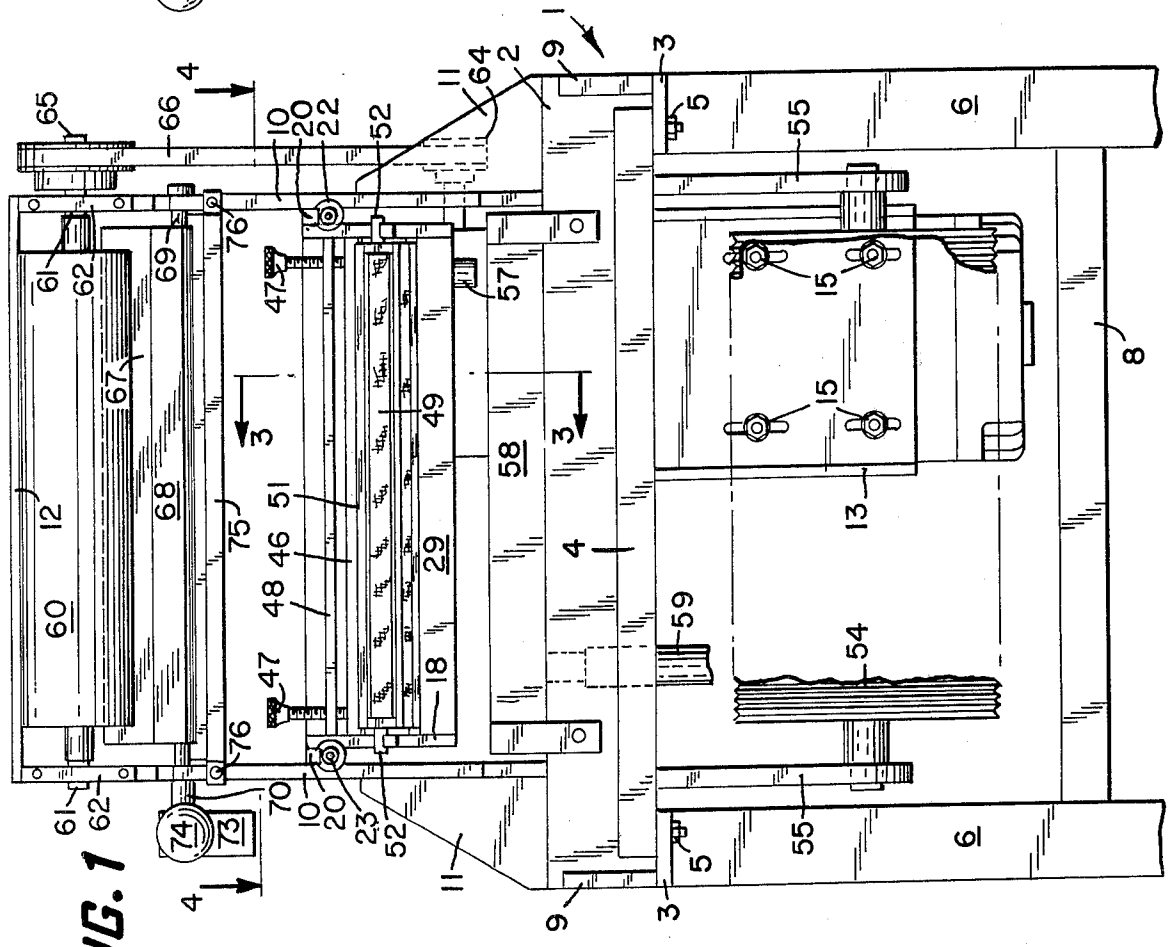


FIG. 1

FIG. 5

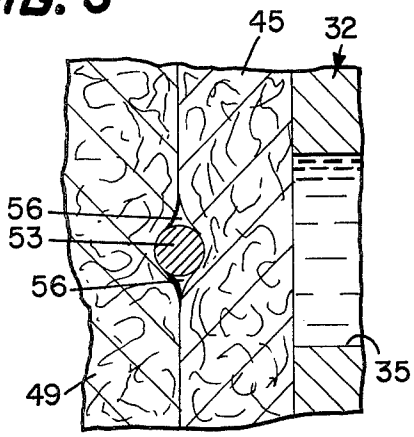


FIG. 3

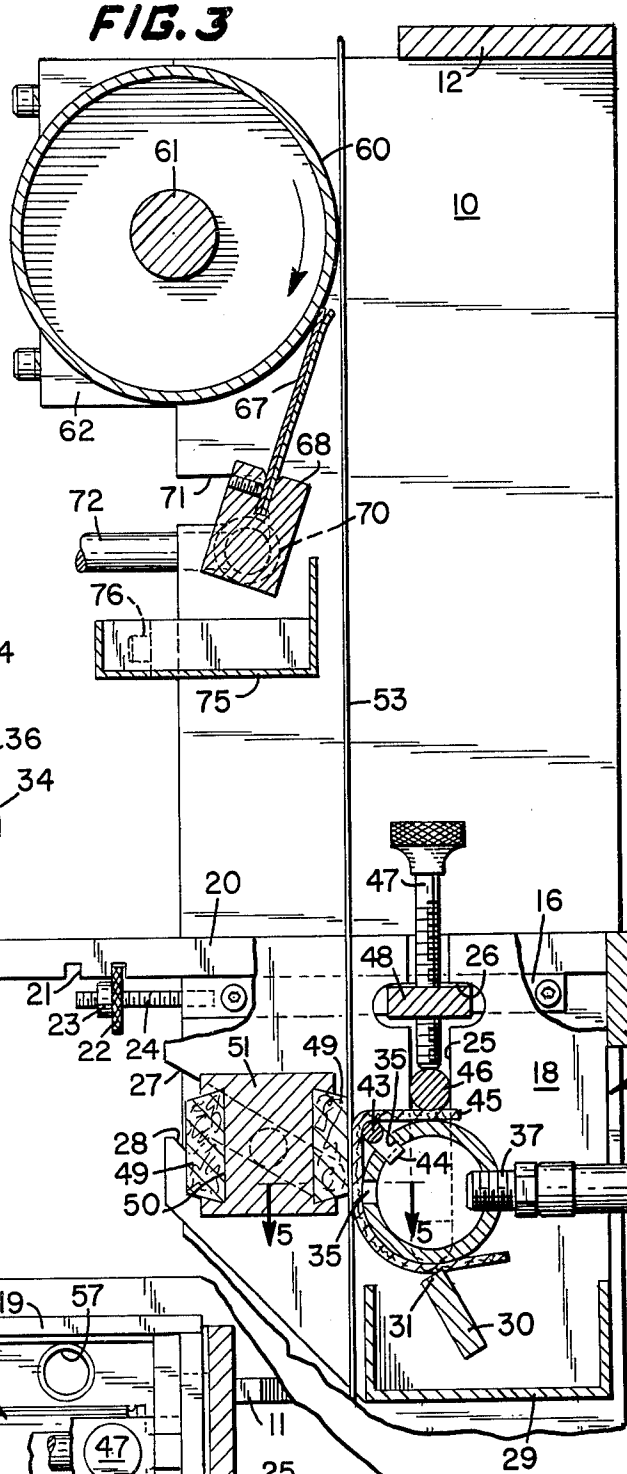


FIG. 6

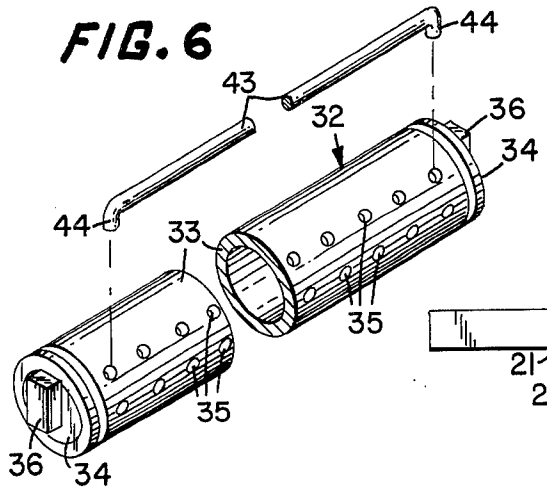
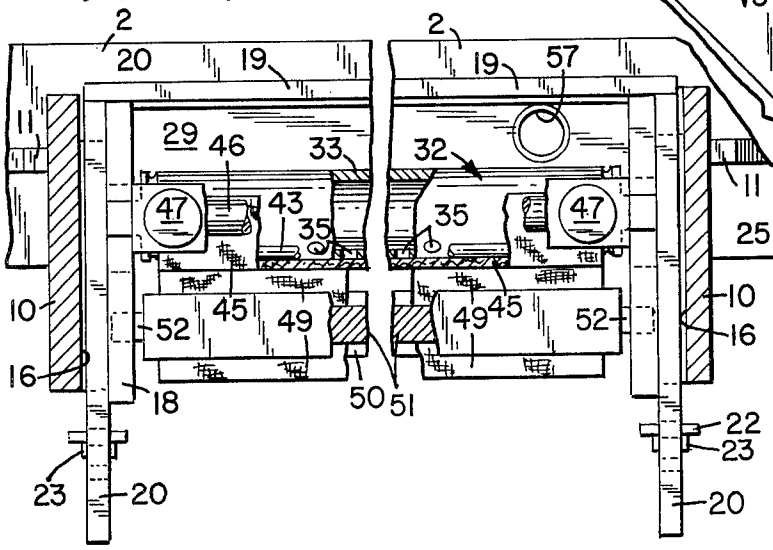


FIG. 4



APPARATUS FOR COATING WIRE FILAMENT WITH LIQUID

BACKGROUND OF THE INVENTION

This invention is in the nature of an improvement over prior wire coating or enameling devices using rotary metallic cylindrical applicators, die applicators of the type using metal or felt wiping dies or pads, some having apertures through which a wire filament moves, and bath or spray-type coating applicators. Examples of such prior applicators are disclosed in U.S. Pat. Nos. 1,968,687, 1,994,802; 2,394,066; 2,740,373 and 3,194,210. In some prior structures, wire must be threaded through small apertures; in others using metallic applicator rolls, replacement of the rolls when worn is expensive; and in others, difficulty has been experienced in obtaining a uniform coating over a length of wire filament.

SUMMARY OF THE INVENTION

An important object of this invention is the provision of apparatus for coating a moving wire filament with liquid, which applies a coating having a uniform thickness over the entire surface of the filament.

Another object of this invention is the provision of wire coating apparatus, utilizing wire-engaging applicator elements which are inexpensive and easy to replace when worn.

Still another object of the invention is the provision of wire coating apparatus which has a minimum of moving parts, which is highly efficient in operation, and which can coat wire filament of various diameters with a minimum of adjustment.

To the above ends, there is provided a wire filament coating apparatus which includes a pair of coater bodies of soft elastic porous material having outer opposed wire filament engaging surfaces, a frame structure mounting the porous bodies and including a manifold for delivering coating liquid to one of the porous bodies and for movement of the other of the bodies toward and away from engagement with the one body. A pump is provided for delivering coating liquid to the manifold under pressure, and a guide roll is journaled in the frame structure for guiding wire filament between the porous bodies. A rotatively driven wiper roll is journaled in the frame structure for tangential engagement with coated wire filament moving away from the coating bodies and rotates in a direction wherein the filament engaging portion of the roll moves rearwardly or reverse to the direction of movement of the filament. A doctor blade is utilized to remove coating liquid from the wiper roll. One of the porous bodies, in the nature of a sheet of felt, is held on the manifold by a clamp arrangement, whereby the sheet may be quickly and easily removed and replaced when necessary. The opposite body, in the nature of a strip or block of felt, is one of a pair mounted in grooves on opposite sides of a mounting bar that is slidably mounted in the frame structure for movements sloping downwardly toward and upwardly away from the felt sheet mounted on the manifold.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary view in front elevation of a wire filament coating apparatus produced in accordance with this invention;

FIG. 2 is a fragmentary view in side elevation, some parts being broken away and some parts being shown in section, and some parts being shown diagrammatically;

FIG. 3 is an enlarged fragmentary section taken substantially on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary section taken substantially on the line 4—4 of FIG. 1, some parts being broken away;

FIG. 5 is a greatly enlarged fragmentary section taken substantially on the line 5—5 of FIG. 3; and

FIG. 6 is a view in exploded perspective of the manifold of this invention, some parts being broken away and some parts being shown in section.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, a supporting frame structure is indicated generally at **1**, the same comprising a horizontally disposed main frame member **2** in the nature of a heavy metallic cross-sectionally rectangular tube, a pair of horizontal forwardly and rearwardly extending plate-like members **3** welded or otherwise rigidly secured to opposite end portions of the main frame member **2**, a channel member **4** having opposite ends secured to the front end portions of the plate-like members **3** by nut equipped bolts or the like **5**, and supporting legs **6** extending downwardly from the members **3** and connected by end members **7** and a lower cross frame member **8**. The plate-like members **3** are reinforced by gussets **9** that are welded to the members **3** and to the opposite ends of the main frame member **2**. The frame structure **1** further includes a pair of laterally spaced parallel side frame members **10** that are welded or otherwise anchored at their lower ends to the main frame member **2** and extend upwardly therefrom, a pair of reinforcing gussets **11** each welded to the lower end portion of a different one of the side frame members **10** and to the adjacent end portion of the main frame member **2**, and a top frame member **12** having opposite ends welded or otherwise anchored to the upper ends of the side frame members **10**. Further, the frame structure **1** includes a channel-like support member **13** that is rigidly secured at its upper end to the main frame member **2**, and which extends downwardly therefrom to support a geared head motor **14** by means of nut-equipped bolts **15**.

Each side frame member **10** has mounted on its inner surface one of a pair of horizontally disposed support rails **16** on which is mounted a subframe **17** comprising a pair of laterally spaced vertical end plates **18** that are each disposed in laterally inwardly spaced parallel relationship to an adjacent one of the side frame members **10**, and a cross bar **19** disposed at the rear edges of the end plates **18** and welded at its opposite ends to the end plates **18**. Also welded to the end plates **18**, adjacent their upper edges, are a pair of mounting bars **20** each adapted to extend longitudinally of and rest upon a different one of the support rails **16**. Each of the mounting bars **20** is formed with a pair of longitudinally spaced downwardly opening notches **21** for reception of the flange **22** of a different one of a pair of threaded adjustment nuts **23** that are screw threaded on studs **24** which project forwardly from the support rails **16**.

The end plates **18** are formed to provide one of a pair of aligned vertical slots **25** that extend downwardly from the upper edge of their respective end plate **18**,

each slot being notched or widened near the upper edge of its respective end plate **18**, as indicated at **26**. Further, each end plate **18** is formed to provide a second slot **27** that slopes downwardly and rearwardly from the front edge of each end plate **18** toward the lower end portion of its respective slots **25**, as shown in FIGS. **2** and **3**. Each of the slots **27** adjacent the front edge of its respective end plate **18** is formed to provide an upwardly opening notch **28**, the slots **27** being in alignment, as are the slots **25**. The end plates **18** are connected at their lower ends by an open-topped drain pan **29** and by a rigid bar **50** that slopes rearwardly and downwardly within the tray **29**, and having its upper edge portion **31** disposed shortly below the level of the bottoms of the slots **25**, see particularly FIG. **3**.

An elongated hollow cylindrical manifold **32** includes a cylindrical wall **33** and a pair of opposite end walls **34**, the cylindrical wall **33** being provided with a pair of rows of longitudinally spaced discharged openings **35**. The end walls **34** are provided with generally rectangular guide lugs **36** each of which is slidably mounted in a different one of the slots **25** in the end plates **18**. The lugs **36** are so disposed relative to the rows of discharge openings **35** that, when the lugs **36** are properly disposed in the slots **25**, one of the rows of openings **35** is on a level with the axis of the manifold **32**, the other row of openings **35** being angularly spaced above said one row of openings **35**. Preferably, the axes of the upper row of openings **35** are disposed approximately **45** circular degrees above the horizontal. An inlet fitting **37** is mounted in the manifold **32** preferably diametrically opposite the lower row of openings **35**, the lower row of openings **35** being in the front portion of the manifold **32**, the inlet fitting **37** projecting rearwardly. A conduit **38** is secured to the fitting **37**, and is shown diagrammatically in FIG. **2** as extending to a reservoir **39** of coating liquid, such as enamel. A conventional fluid pump **40** is interposed in the conduit **38** for the purpose of supplying wire coating liquid under pressure to the manifold **32**. A by-pass conduit **41** is connected to the conduit **38** between the pump **40** and manifold **32**, and leads back to the reservoir **39**, the conduit **41** being provided with a pressure relief valve **42**.

An elongated spacer bar **43**, preferably made from round metallic rod stock, has a pair of downturned ends **44** that are received within a pair of discharged openings **35** at opposite ends of the upper row thereof, as shown in FIGS. **3** and **6**. A first coating body **45** is in the nature of a sheet of soft elastic porous material, such as felt, and is mounted on the manifold **32** by being partially wrapped around the top, front and bottom portions of the manifold **32** and in overlying relationship to the spacer bar **43**, see particularly FIG. **3**. As there shown, the lower portion of the sheet **45** is interposed between the bottom portion of the manifold **32** and the upper edge portion **31** of the rigid bar **30**. The sheet **45** is releasably held in place on the manifold **32** by an elongated clamping rod **46** having its opposite ends slidably disposed in the slots **25**, and a pair of clamping screws **47** that are screw threadedly mounted in a mounting bar **48** which overlies the clamping rod **46** and has its opposite ends disposed in the widened or notched portions **26** of the slots **25**. As shown, the clamping bar **46** and mounting bar **48** are disposed in upwardly spaced parallel relationship to the manifold **32**, the clamping screws **47** engaging the clamping rod **46** to cause the portions of the porous sheet **45** engaging the clamping rod **46** and bar **30** to be securely clamped therebetween and the adjacent portions of the manifold **32**. Also, as particularly shown in FIG. **3**, the spacer bar **43** provides for a pocket between the manifold wall **33** and the overlying portion of the porous sheet **45** which pocket becomes filled with coating liquid from the upper row of discharge openings **35** to aid in saturating the porous body or sheet **45** with coating liquid. The coating liquid, being under pressure from the pump **40**, quickly and effectively saturates the porous body **45** throughout its length and width.

A pair of second bodies of soft elastic porous material, such as wool felt, are indicated at face of and are mounted each in a dovetail groove **50** in an opposite side of an elongated rigid mounting block or bar **51**, disposed forwardly of the manifold **32** and first porous body **45**. At its opposite ends, the mounting bar **51** is provided with aligned longitudinally outwardly projecting stub shafts **52** each of which is slidably mounted in a different one of the slots **27** in the end plates **18**. The stub shafts **52** not only permit the mounting bar **51** to gravitate downwardly into engagement of the outer faceof one of the second bodies **49** with the front or outer surface of the first body or sheet **45**, but also permit the mounting bar **51** to be rotated on its own axis so that either one of the bodies **49** may be disposed selectively in face-to-face engagement with the porous body or sheet **45**. The notches **28** in the slots **27** provide support for the mounting bar **51** in forwardly spaced relation to the porous body **45** to provide for easy threading of wire filament, indicated at **53**, between the opposed first and second bodies **45** and **49**.

In the coating operation, the wire **53** moves upwardly between the inter-engaging porous bodies **45** and **49** from a source of supply, not shown, of the wire **53**, and toward a curing oven, not shown, but wherein the enamel or other coating substance on the wire is cured or dried. Means for guiding the wire **53** toward the coating bodies includes a circumferentially grooved guide roll **54** that is journalled in bearing brackets **55** carried by the channel member **4**, as shown in FIGS. **1** and **2**. While but one strand or filament of wire **53** is shown, it will be appreciated that a plurality of filaments or lengths thereof may be fed through the coating apparatus as far as the lengths of the porous bodies **45** and **49** can accommodate them. With refernece to FIG. **5**, it will be seen that the soft yielding characteristics of the felt bodies **45** and **49** cause the same to yield to form channels for reception of the wire filament **53** when the bodies **45** and **49** are in face-to-face engagement. The coating liquid, being under pressure from the pump **40**, thoroughly saturates the porous body **45**, as above indicated, some of the coating liquid being absorbed by the adjacent second porous body **49**. Thus, as the wire **53** moves upwardly between the bodies **45** and **49**, coating liquid is wiped thereupon by the saturated bodies **45** and **49**, surface tension of the coating liquid causing the same to adhere to the wire **53** in the minute apertures adjacent the wire **53**, indicated at **56**. These small apertures are formed by distortion of the bodies **45** and **49** around the wire filament **53**. In view of the fact that fluid is being constantly supplied to the body **45**, through the manifold **32**, the liquid seeps downwardly through the body **45** and drops into the drain pan **29**. From thence, the excess coating liquid descends through a drain tube **57** into a tray **58** that is

mounted on the main frame member **2** and which is provided with a return conduit **59**, by means of which the coating liquid may be assumed to be returned to the reservoir **39**.

For the purpose of more closely controlling the distribution of the enamel coating on the wire **53**, a wiping roll **60** is provided in upwardly spaced relation to the subframe **17** and coating parts carried thereby. The wirping roll **60** is provided with aligned axial stub shafts **61** that are journaled in suitable bearings **62** at the upper end portion of the side frame members **10**, for tangential engagement of the outer cylindrical surface of the roll **60** with the wire **53**. The drive motor **14** is provided with an output shaft **63** on which is mounted a drive pulley **64**. A driven pulley **65** is mounted on one of the shafts **61**, and an endless flexible drive belt **66** is entrained over the pulleys **64** and **65**. Preferably, the motor **14** operates to rotate the wiper roll **60** in a direction wherein the wire engaging surface portion thereof moves in a direction reverse to the direction of movement of the wire **60**, to wipe excess coating liquid from the wire **53**. Coating liquid is removed from the wiper roll **60** by a doctor blade **67** that is mounted in an elongated mounting block **68** having shaft portions **69** and **70** at its opposite ends, these being pivotally mounted in L-shaped notches or slots **71** in the side frame members **10**. A normally generally horizontally disposed rod **72** projects forwardly from the shaft **70**, and has adjustably slidably mounted thereon a weight **73** which urges the holder **68** in a direction of rotation on the common axes of the shafts **69** and **70** to move the doctor blade **67** toward engagement with the wiping surface of the wiping roll **60**. A knob **74** at the outer end of the rod **72** limits forward movement of the weight **73**, and is used as a handle when it is desired to swing the doctor blade **67** out of engagement with the wiper roll **60**. An open-topped tray **75** underlies the bar **68**, and is rigidly secured at its opposite ends to the frame side members **10**, by machine screws or the like **76**.

Due to the fact that the coating enamel or liquid is delivered to the porous body **45** under pressure, the effects of coating materials of different viscosities on the thickness of each coat placed upon the wire **53** are minimized. We have found that, in the above-described arrangement, cheaper grades of felt can be used in the applicator bodies than must be used in present day felt-wiping dies. Further, the soft and elastic character of the bodies **45** and **49** permits the same to be used with wires **53** of various diameters, and effectively coat the same.

While a commercial form of the wire coating apparatus of this invention has been shown and described, it will be understood that the same is capable of modification without departure from the spirit and scope of the invention, as defined in the claims.

What is claimed is:

1. Apparatus for coating a moving wire with liquid comprising:

a. an elongated manifold having a plurality of spaced outlet openings arranged in a longitudinally extending row, and a liquid inlet opening spaced from said row of outlet openings;

b. a first body comprising a sheet of felt cloth partially encompassing said manifold and having an inner surface overlying said openings and a wire engaging outer surface;

c. means for releasably holding said sheet in engagement with said manifold;

d. a second body of soft elastic porous material having a wire-engaging outer surface;

e. means mounting said second body in wire engaging face-to-face engagement with said first body whereby said second body absorbs coating liquid from said first body;

f. and means for guiding said wire between said bodies;

g. the elasticity of said bodies being such that each thereof yields to partially encompass said wire moving therebetween.

2. Apparatus for coating a moving wire with liquid, comprising:

a. a supporting frame structure;

b. means for guiding wire for longitudinal movement thereof relative to the frame structure;

c. a first body of soft elastic porous material having a wire-engaging outer surface;

d. body mounting means on said frame structure mounting said first body for wiping engagement of said first body with said wire and comprising, a sub-frame mounted on the frame structure for movements transversely of the path of movement of said wire, and a manifold carried by said sub-frame;

e. means for holding said sub-frame in desired positions of said movement thereof;

f. means including said manifold for delivery of a constant supply of wire coating liquid under pressure to said first body;

g. a second body of soft porous material having a wire-engaging outer surface;

h. and mounting means mounting said second body for movements toward and away from engagement of the outer surface thereof with said wire and with the outer surface of said first body, said mounting means being yieldingly urged in a direction toward said engagement of said outer surface;

i. the elasticity of said bodies being such that each thereof yields to partially encompass the wire moving therebetween.

3. The apparatus defined in claim **2** in which said mainfold defines fluid inlet and outlet passage means, said first body overlying said outlet passage means, said body mounting means further including clamping elements carried by said subframe for clamping said first body on said manifold.

4. The apparatus defined in claim **2** in which said mounting means for the second body comprises a rigid mounting bar, said sub-frame including spaced portions defining guideways, said mounting bar having opposite end portions disposed in said guideways and supported therein.

5. The apparatus defined in claim **4** in which said guideways slope downwardly toward said manifold, whereby said mounting bar is gravity biased toward face-to-face engagement of said second body with said first body.

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