

July 15, 1924.

W. E. FLINT

1,501,764

COATING DEVICE FOR METALLIC STRIPS

Filed April 8, 1922

2 Sheets-Sheet 1

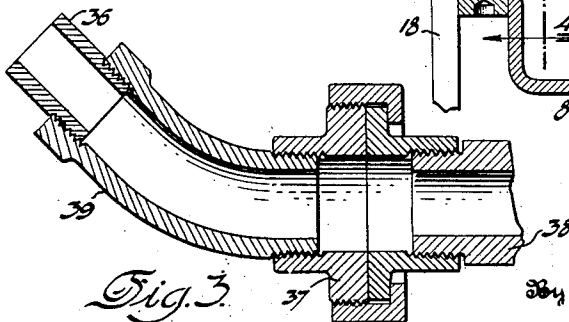
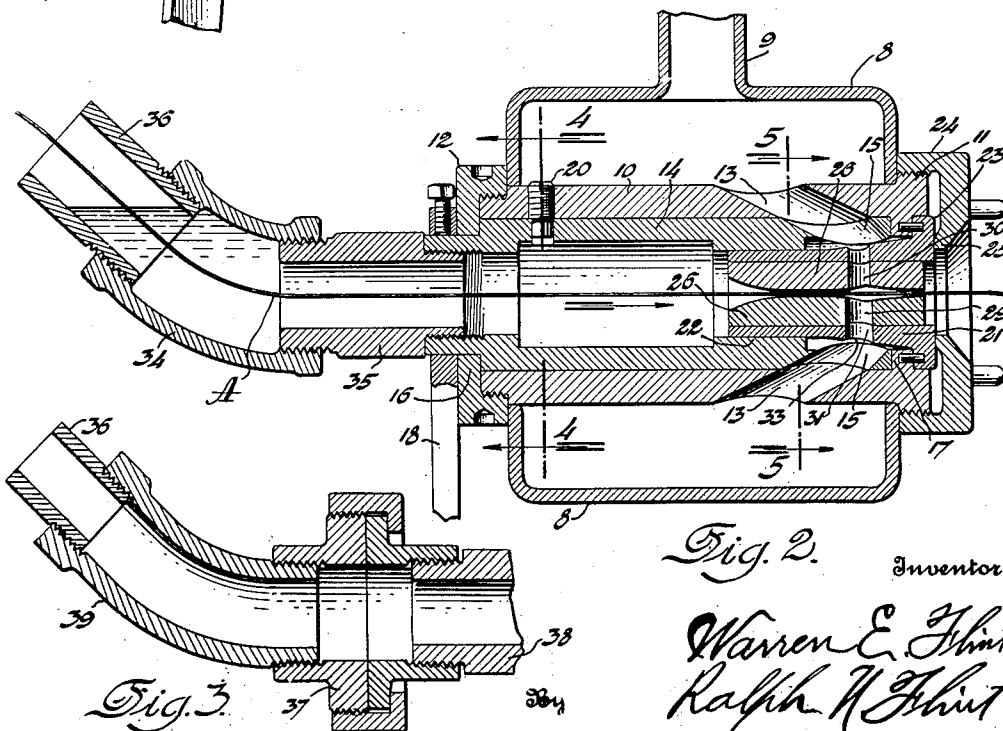
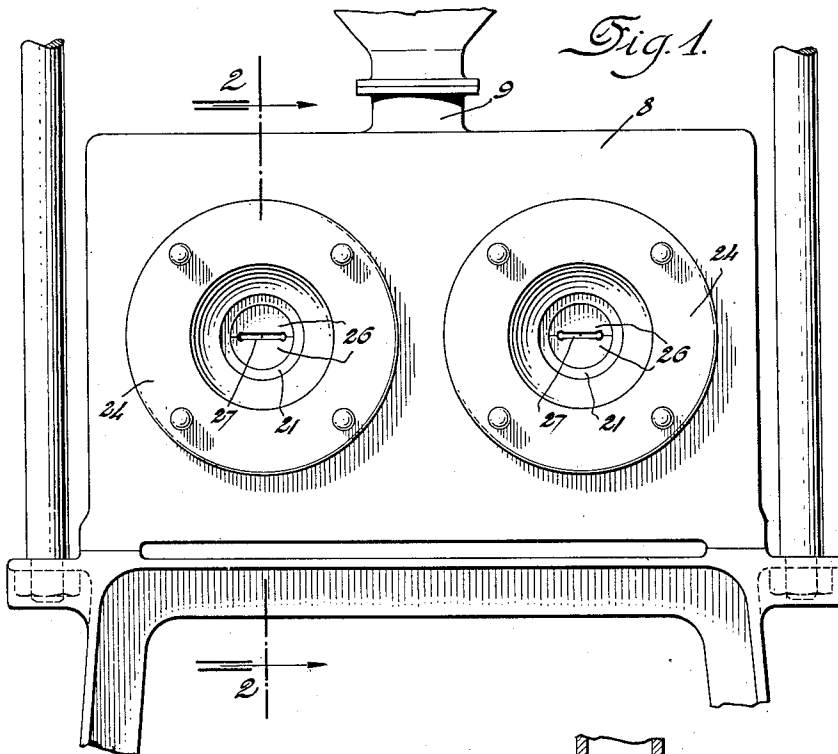


Fig. 2.

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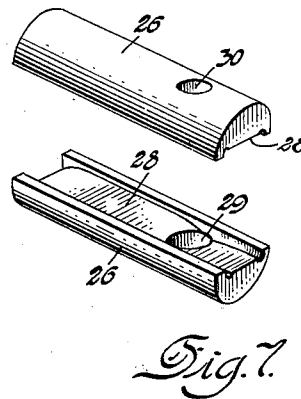
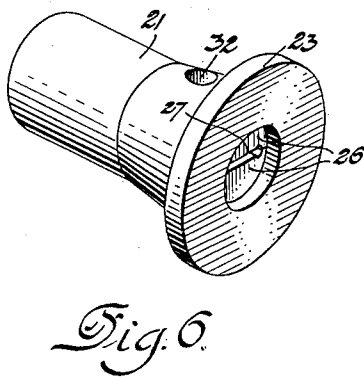
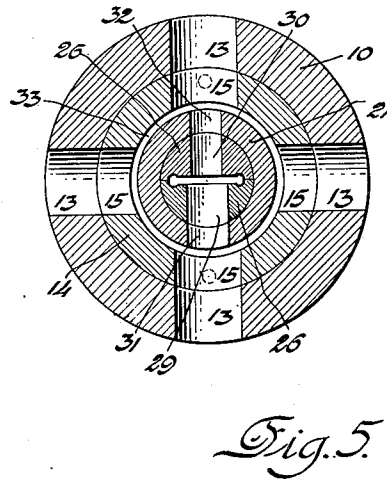
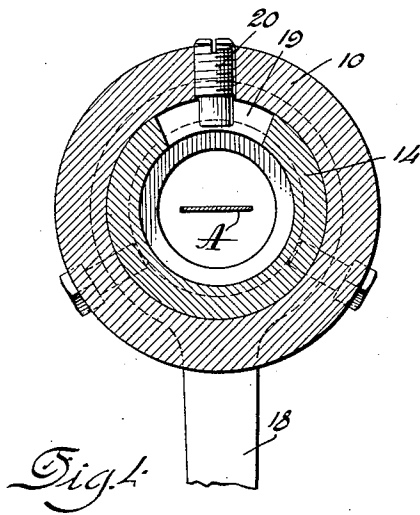
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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COATING DEVICE FOR METALLIC STRIPS.

Application filed April 8, 1922. Serial No. 550,825.

To all whom it may concern:

Be it known that I, WARREN E. FLINT, a citizen of the United States of America, and a resident of Palisades Park, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in and Relating to Coating Devices for Metallic Strips; of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

My invention relates to the art of coating thin ribbons or strips of metal or wire with a plastic material such, for example, as celluloid dissolved in a volatile liquid, with or without suitable coloring materials; and inert loading or thickening materials; and the principal object of my invention is to provide a device or machine for such purposes which may be more conveniently operated and controlled, and which will be more reliable in its operation than prior machines; and which will apply the coating to the strip in a more perfect manner, and produce a better and more uniform product, than has heretofore commonly been the case.

A further object of my invention is to provide an improved form of die and holder therefor through which the strip passes in such machines; the same, in addition to having features of construction whereby the parts are better held in proper relation to one another, having also features whereby uniformity in the thickness of the material upon both surfaces of the strip is more certainly secured than in dies as heretofore made and used.

A further object of my invention is to provide certain improvements in and relating to coating applying devices and to the coating art whereby the presence of air bubbles beneath the coating, with resulting roughness in the coating and holes therein due to the breaking of the thin walls of the bubbles, is avoided, and a smooth and uniform coating thus secured.

With the above and other objects of invention in view my invention consists in the improved coating applying machine, mechanism or device, and in improvements in and relating to the coating art illustrated in the accompanying drawings and hereinafter described and finally claimed; and in

such variations and modifications thereof, within the scope of the concluding claims, as will be obvious to those skilled in the art to which my invention relates.

In the drawings accompanying and forming a part of this specification and wherein the preferred embodiment of my invention is illustrated:

Figure 1 is a view showing my invention in front elevation.

Figure 2 is a view showing a section thereof upon a vertical plane indicated by the line 2, 2, Figure 1.

Figure 3 is a fragmentary view showing a modified form of inlet conduit through which the metallic tape or ribbon to be coated enters the coating applying device.

Figure 4 is a view of the valve or cut-off mechanism of the device upon a vertical transverse plane indicated by the line 4, 4, Figure 2, upon a larger scale than said Figure 2.

Figure 5 is a view similar to Figure 4 but showing a section upon planes indicated by the broken line 5, 5, Figure 2.

Figure 6 is a view showing the die carrying sleeve of my improved coating applying mechanism in perspective.

Figure 7 is a perspective view showing the two die members of my device separated from one another.

Referring now to the drawings wherein like parts are designated by the same reference numerals in the various views: The reference numeral 8 designates a suitable hollow housing or casing to which the coating material is supplied through a suitable pipe 9; the material being in a plastic or semi-liquid condition, and the same being supplied to the casing and to the coating applying elements or dies under pressure produced, for example, by supplying air under pressure to a closed storage reservoir which contains the plastic material, and from which the pipe 9 leads to the casing 8, as will be understood.

Extending across the housing 8 and preferably made separate therefrom is a valve casing 10 circular in cross section, and shown as in the form of a tube the ends of which extend through openings in opposite walls of said housing 8; said tubular valve casing being held in assembled relation with the housing in any way, as by means of a flange 11 at one end thereof and a collar 12 at the other end, which collar is in threaded

engagement with said tubular casing, as shown. Preferably the housing and the receptacle from which the plastic material is supplied thereto is made large enough to accommodate a plurality of valve casings and coating applying dies associated therewith, so as to provide for the coating of several strips or ribbons at the same time; the housing illustrated being provided with two such valve casings so that two strips may be coated simultaneously.

The valve casing 10 is stationary or non-rotatable, and the same is provided with a plurality of circumferentially arranged ports 13 spaced apart from one another, and preferably inclined in the direction in which the strip moves through the machine, as shown in Figure 2; and the reference numeral 14 designates a hollow tubular member fitting loosely within the member 10 so as to be capable of rotary movement therein (or rather of angular movement limited in extent by suitable stops as will hereinafter appear), and which valve member has a series of ports 15 adapted to register with said ports 13, as shown in Figure 5, or to move out of registry with said ports 13 upon angular movement being imparted to the valve. This valve 14 is retained in place within the casing 10 in any suitable way as by an inwardly extending flange 16 of the collar 12 which overlies a shoulder at one end thereof, and a ledge 17 integral with the member 10 at the other end of the valve; and an operating handle 18 is operatively connected with said valve whereby angular movement may be imparted thereto to move its ports 15 into and out of registry with the ports 13 in the valve casing 10, as will be appreciated. Figure 4 shows the handle in an intermediate position; and suitable means such as a slot 19 in the valve and a set screw 20 extending through the casing thereof are provided for limiting the angular movement of the said valve. In the embodiment of my invention illustrated an angular or rotary movement of about 30 degrees is provided for, which is sufficient to secure the registration of the ports and the cutting off action for which the valve is provided; although it will be understood that the amount of angular movement necessary in any particular case is dependent upon the circumferential extent of the ports which, as well also as the number of pairs of registering ports, may be varied without departing from my invention; as the same is in no way limited to these details of construction and arrangement of rotatable or angularly movable valve mechanism provided as hereinbefore explained.

The reference numeral 21 designates a die carrying member or sleeve shown as tubular in form with its inner end extending into and fitting closely within the valve 14 as

at 22, and the outer end of which is flanged at 23 and fits within a recess in the casing member 10; said sleeve being readily removable from the valve and casing so that different sizes of dies (which are permanently assembled with their respective sleeves) may be readily used in any particular machine. The die carrying sleeve is preferably properly positioned by one or more dowell pins; and the same is held in place by a readily removable ring 24 in threaded engagement with the flange 11, and having an inwardly extending flange which engages the outer end of the die carrying member at 25. Obviously the die carrying member is nonrotatably held in position when in use, while the valve member 14 is freely rotatable about said member at the joint 22.

The die proper of my improved coating applying device is shown as cylindrical in form and as permanently assembled within the die carrying member 21, and as made up of or comprising two semi-cylindrical die members or parts 26, 26 which when assembled within the die carrying sleeve provide a rectangular passage extending between the die members and through which the ribbon or strip of material to be coated passes, the strip being identified by the letter —A—, and the passage by the numeral 27 in Figure 1; said passage being preferably provided by registering grooves 28 extending along the meeting faces of the die members and the inner end of said passages being flared as shown in Figure 2, so as to facilitate the threading of the advancing end of the strip through the die and the forward movement thereof without binding at the entrance end of the die. These die members have holes 29, 30 formed in them and which register with holes 31, 32 provided in the die holding sleeve 21; whereby the passage 27 is placed in communication with an annular space 33 surrounding the die holder 21 so that the coating material which enters said space through the several pairs of ports 13, 15 may flow to the upper and under sides of the strip being coated, and around the edges thereof as the strip is narrower than the width of the opening in the die, as will be understood.

In strip coating mechanisms having dies as above described and in which the strip is subjected to opposing forces acting upward and downward thereupon it is found in practice that if the passages through which the coating material flows to the upper and under surfaces of the strip are of equal areas, the coating upon the upper surface of the strip is thicker than that upon the under surface; this being due, according to my understanding, to a settling of the strip within the die passage accentuated, probably, by a pulling down action of the unsupported portion of coated strip beyond

the die; the usual practice being to provide an unsupported length of some fifty feet of strip between the die and the drying reels upon which it is wound, so as to secure as much preliminary air drying and setting of the coating as practicable. Whatever, however, may be the ultimate cause of the unequal thickness of the coating upon the upper and under sides of the strip I have found that the same may be remedied, and a coating of substantially equal thickness upon both sides of the strip secured, by making the passage through which the coating flows to the under side of the strip of greater area than the passage through which the material flows to the upperside of the strip; thus according to my understanding subjecting the under surface of the strip to an upward pressure greater than the downward pressure acting upon the upper surface of the strip and counteracting the tendency of the strip to settle within the die opening. This difference in area is preferably secured by making the hole 29 in the lower die member slightly larger than the hole 30 in the upper member and, while the sizes of the holes and the difference in their areas necessary to equalize the thickness of the coating varies in different widths of strip, and with the areas of the holes, I have found that when coating a strip approximately half an inch (1/2") wide, and fifteen thousandths of an inch (.015") thick, holes fifteen sixty-fourths of an inch (15/64") in diameter in the upper die member, and three eighths of an inch (3/8") in diameter in the lower member, will secure substantially a uniform thickness in the coating upon each side of the strip; the coating upon each surface of the finished strip being about five thousandths of an inch (.005") in thickness upon each surface.

It will be appreciated that the die hereinbefore described and which constitutes one feature or part of my invention has no separate and distinct guide for the strip, the entire passage along which the strip passes being provided by the die members 26, 26 and located between them; and that inasmuch as these die members are held in permanently fixed relation to and within the die supporting sleeve 21 there is no possibility of parts of the die portion of the device (regarded in its entirety and as including the sleeve) becoming misplaced relative to one another in removing and replacing the dies; it being appreciated that it is frequently necessary to cut off the supply of plastic material by rotating the valve 14 and remove the die carrying member, in order to clean the die or to substitute another of different size therefor to thereby provide for the coating of a different size of strip; and that upon such occasions the

entire die mechanism of the machine is removable and replaceable as a single unitary structure.

In order to prevent air from being carried along with the strip into the vicinity where the coating is being applied thereto where it would be trapped (because of the high pressure and viscous character of the coating material) and result in bubbles in the coating, I pass the strip through a body of sealing liquid just before it reaches the die; so that the strip is thoroughly wetted and carries a thin film of the sealing liquid along with it and into the vicinity at which the coating material is supplied thereto.

The sealing liquid employed should be one similar in character to the solvent contained in the coating material in order that the film of sealing material may not interfere with the formation of a proper bond between the coating material and the surface of the strip. Inasmuch as the coating material most frequently used consists mainly of celluloid dissolved in acetone, I employ acetone as the sealing liquid; as then the film, being identical with the solvent, combines therewith to form a more perfect bond between the coating and the strip. The sealing liquid, however, need not be identical with the solvent material so long as it is of such a character as not to act as a repellant in the formation of proper bond; as the advantages of excluding air and wetting the surface of the strip will as a matter of course be secured with sealing liquids of widely different characters.

The liquid seal is provided by a conduit made up of an angular coupling member 34 connected with the valve 14 by a short nipple 35, and having a short upwardly extending pipe section 36, so that when liquid is supplied through said section the level thereof will be well above the level of the die passage 27 or, as shown in Figure 3, a detachable union 37 may be interposed between a nipple 38 similar to the nipple 35, and a coupling member 39 similar to the coupling 34. This last described arrangement of conduit permits a new length of strip to be coated to be introduced into the die somewhat more easily than in the form shown in Figure 2, the coupling member 39 being first removed by disconnecting the union as will be appreciated; and permits increased head of sealing liquid by the use of a longer pipe section 36 without interfering with the threading of new strips into the die should a greater head of sealing liquid than indicated in Figure 2 be deemed desirable.

Having thus described and explained my invention, I claim and desire to secure by Letters Patent:

1. In a strip coating device, hollow valve casing and valve members arranged concen-

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 5 tric with one another, and means whereby one of said members may be rotated relative to the other; means for preventing longitudinal movement of the movable one of said valve members; ports in said members adapted to register with and to move out of communication with one another; a die concentrically arranged relative to said casing and valve members and having a passage through which a strip may pass; and means for supplying a plastic coating material through the passage provided by said ports and to a strip to be coated.

15 2. In a strip coating device, two concentrically arranged members one of which is rotatable relative to the other, and which members have ports adapted to register with and to move out of communication with one another; a die arranged within and extending longitudinally of the inner of said members and having a passage through which a strip may pass; and means for supplying a plastic coating material through the passage provided by said ports and to a strip to be coated.

25 3. In a strip coating device, an external hollow housing and a tubular valve casing arranged within the same; a rotatable tubular valve member located within said casing; means for preventing longitudinal movement of said tubular valve member; ports in said casing and valve adapted to register with and to move out of communication with one another; a die carrying member arranged within said valve member; a die carried by said die carrying member and having a passage through which a strip may pass; and openings in said die carrying member and through which a plastic coating material supplied through said ports may flow to a strip to be coated.

35 4. In a strip coating device, an external hollow housing and an internal tubular valve casing spaced apart therefrom, and which casing is provided with a series of ports; a rotatable tubular valve member located within and having ports adapted to be moved into and out of communication with the ports in said casing; a die carrying sleeve supported by said tubular casing and extending into and along said tubular valve member; and a die arranged within and extending along said die carrying sleeve and having a passage through which a strip may pass; said sleeve having openings through which a plastic coating material supplied through said ports may flow to a strip to be coated.

50 5. In a strip coating device, a stationary die having a passage through which a strip may pass; a rotatable valve member concentrically arranged relative to said die; means for preventing longitudinal movement of said valve member; a stationary valve casing surrounding said valve and having a

plurality of ports adapted to register with a like number of ports in said valve member; and a hollow housing surrounding said valve casing.

6. In a strip coating device, a stationary tubular die carrying sleeve having oppositely disposed openings leading thereto; a die located within and extending along said sleeve and having a passage through which a strip may pass; a rotatable tubular valve member surrounding said die carrying sleeve; a stationary valve casing having a plurality of ports adapted to register with a like number of ports in said valve member, and a hollow housing surrounding said valve casing.

7. In a strip coating device, a stationary tubular valve casing and a die carrying sleeve carried thereby and located within and spaced apart therefrom; a rotatable tubular valve arranged within said casing and between the same and said die carrying sleeve; ports in said valve and casing whereby the flow of plastic coating material to said die carrying sleeve may be controlled; a hollow housing surrounding said tubular valve casing; and a die arranged within and extending along said die carrying sleeve and having a passage through which a strip to be coated may pass.

8. In a strip coating device, a hollow member through which a strip may pass; a die having a passage through which the strip passes; means for supplying a plastic coating material to the strip to thereby coat the same; and means for providing a liquid seal within said hollow member and about the strip as it passes therethrough.

9. In a strip coating device, a hollow tubular member and a conduit connected therewith and extending upward therefrom and through which conduit and tubular member a strip may pass; a die arranged adjacent the outlet end of said tubular member; and means for supplying a plastic coating material to said strip to thereby coat the same.

10. In a strip coating device, a hollow tubular member and a conduit connected therewith and extending upward therefrom, and through which conduit and tubular member a strip may pass; a die carrying sleeve extending into said tubular member; a die located within said sleeve and having a passage through which a strip may pass; a hollow housing surrounding said tubular member; and a passage leading from said housing to said die and through which a plastic coating material may be supplied to a strip as it passes therethrough.

11. In a strip coating device, a hollow member through which a strip may pass, and a die having a passage through which the strip passes; a conduit communicating with said hollow member in line with said

die, and extending upwardly from said member to thereby provide a liquid seal within said member; and a union included in said conduit and whereby the upwardly extending portion thereof may be detached from the portion connected with and leading into said tubular member.

12. In a strip coating device, a die having a passage through which a strip may pass; means for supplying a plastic coating material to the strip; and means for providing a liquid seal about the strip and through which the same passes before the coating material is applied thereto.

13. In the art of coating a strip with a plastic material containing a volatile solvent by supplying the material to the strip as the same passes through a suitable die, the step which consists in causing the strip to pass through a liquid seal of the same general character as the solvent before the coating material is supplied to the strip; and then applying the coating material to the strip.

14. In the art of coating a strip with a plastic material containing acetone by supplying the material to the strip as it passes through a suitable die, the step which consists in causing the strip to pass through an acetone bath before the coating material is supplied thereto; and then applying the coating material to the strip.

15. In a strip coating device, a die through which a strip may pass; and passages through which a plastic coating material may be supplied simultaneously to both the upper and the under surfaces of the strip, the area of the last mentioned passage being greater than that of the first mentioned passage.

16. In a strip coating device, a die having a passage through which a strip may pass, and oppositely located holes through which a plastic coating material may flow simultaneously to both the upper and the under surfaces of the strip; the latter of said holes being of greater area than the former.

17. In a strip coating device, a die having a passage through which a strip may pass; means for supplying a plastic coating material simultaneously to both the upper and under surfaces of the strip as it passes through the die; and means whereby a preponderance of force acting upwardly upon the under surface of the strip is secured during the coating operation.

18. In a strip coating device, a tubular die carrying sleeve; and two die members located within said sleeve and having longitudinally extending grooves which register to provide a passage through which a strip may pass; said die members having each a hole through which plastic coating material may flow into said passage.

19. In a strip coating device, a tubular die

carrying sleeve; and two die members located within said sleeve and having longitudinally extending grooves which register to provide a passage through which a strip may pass; said die members having each a hole intermediate its ends and through which plastic coating material may flow into said passage and one of which holes is larger than the other.

20. In a strip coating device, an external hollow housing and means for supplying a plastic coating material thereto under pressure; a tubular valve casing extending across and the ends of which are supported in openings in oppositely disposed walls of said housing; a rotatable tubular valve member operable within and having ports co-operating with ports in said valve casing; operating means whereby said valve may be rotated to an extent sufficient to move the ports therein into and out of communication with the ports in said valve casing; a die carrying sleeve supported by said valve casing and extending into said valve, and the inner end of which forms a tight sliding joint with the inner surface of said valve; a holding ring having a threaded connection with said valve casing, and a flange engaging said die carrying sleeve to thereby hold it in place; and a die carried by said die carrying sleeve and through which a strip to be coated may pass, and which die is in communication with the ports aforesaid in said valve and casing members.

21. In a strip coating device, an external hollow housing and means for supplying a plastic coating material thereto under pressure; a tubular valve casing extending across and the ends of which are supported in openings in oppositely disposed walls of said housing; a rotatable tubular valve member operable within and having ports co-operating with ports in said valve casing; operating means whereby said valve may be rotated to an extent sufficient to move the ports therein into and out of communication with the ports in said valve casing; a die carrying sleeve supported by said valve casing and extending into said valve, and the inner end of which forms a tight sliding joint with the inner surface of said valve; a holding ring having a threaded connection with said valve casing, and a flange engaging said die carrying sleeve to thereby hold it in place; a die carried by said die carrying sleeve and through which a strip to be coated may pass, and which die is in communication with the ports aforesaid in said valve and casing members; and a conduit connected with the interior of said tubular valve member and extending upwardly above the level thereof, and through which the strip to be coated may pass to said die.

In testimony whereof I affix my signature.

WARREN E. FLINT.