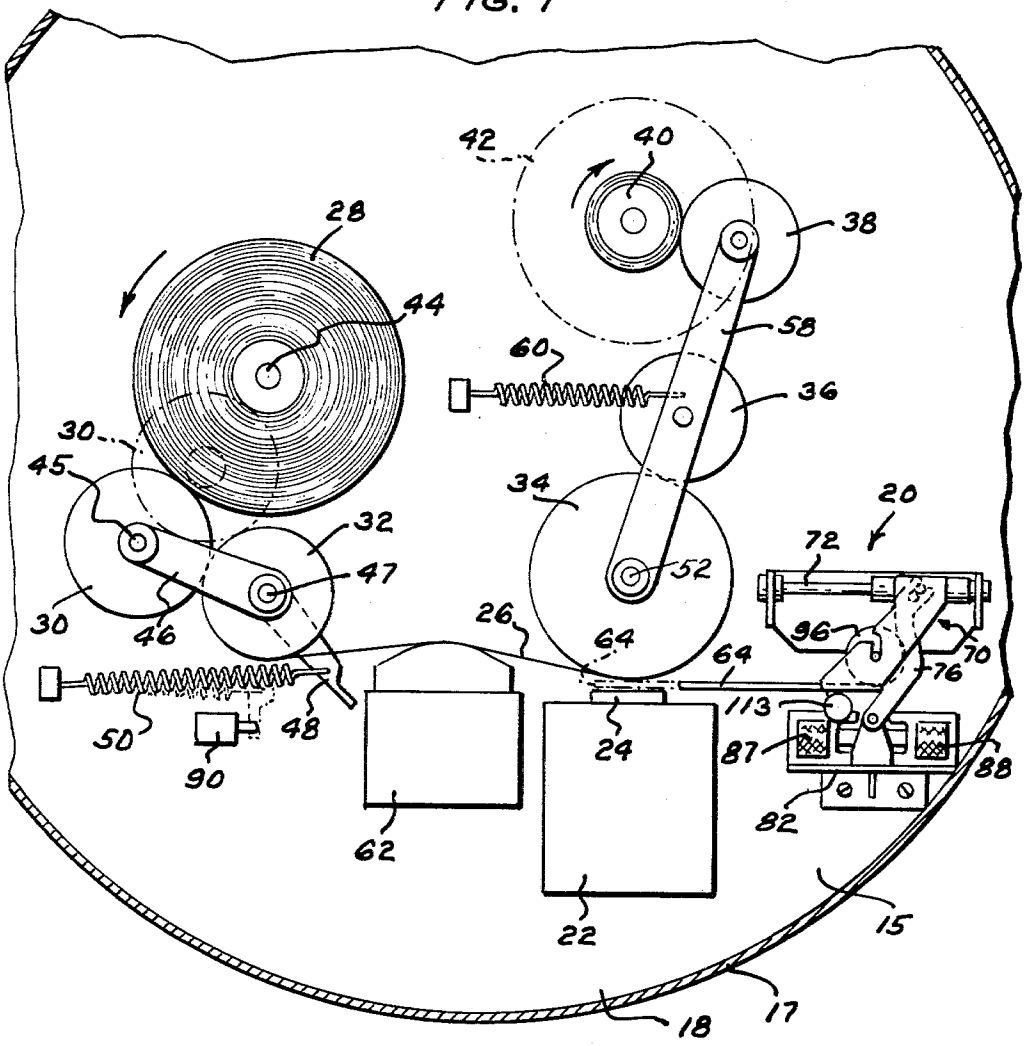
May 3, 1966 G. P. McGRAW, JR 3,249,087

CONTROLLED VAPOR SHIELDING DEVICE FOR METALLIZING APPARATUS

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FIG. 1



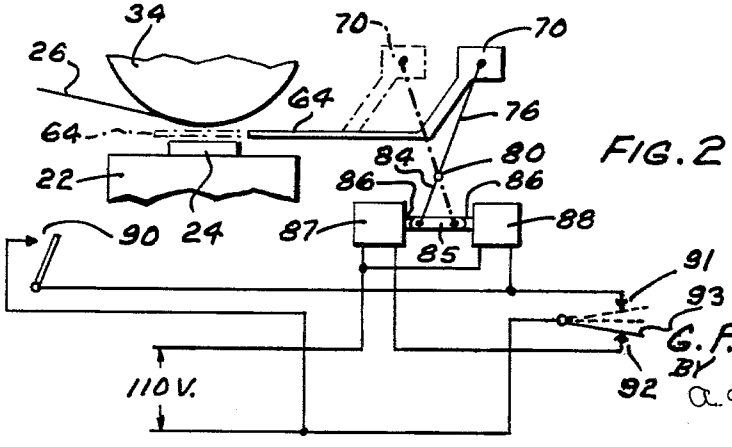


FIG. 2

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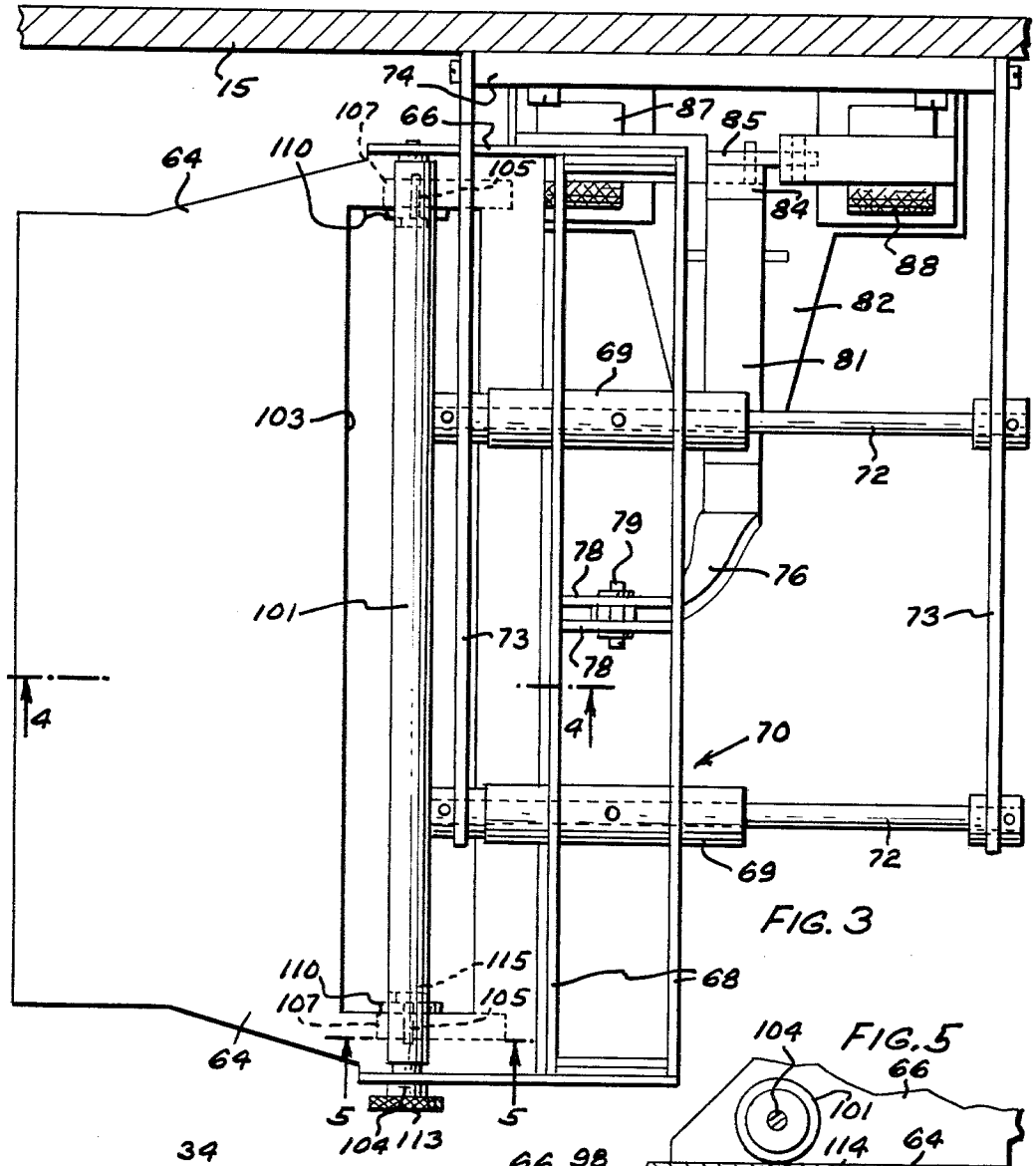


FIG. 3

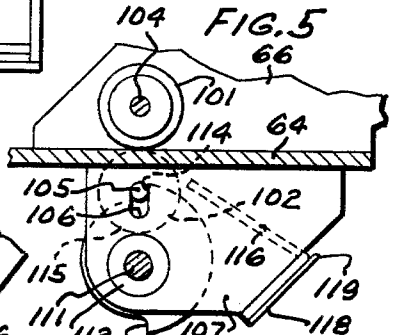


FIG. 5

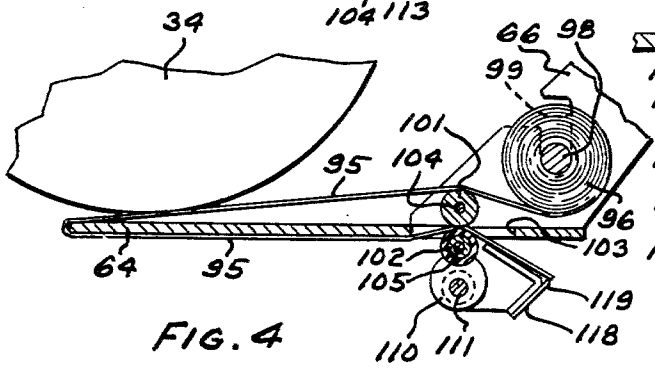


FIG. 4

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CONTROLLED VAPOR SHIELDING DEVICE FOR METALLIZING APPARATUS

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FIG. 6

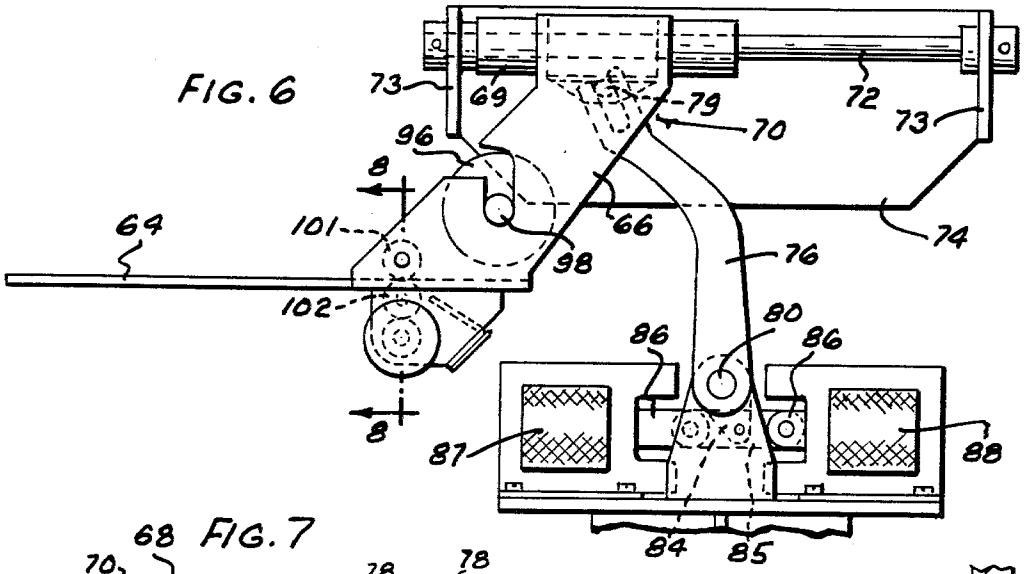


FIG. 7

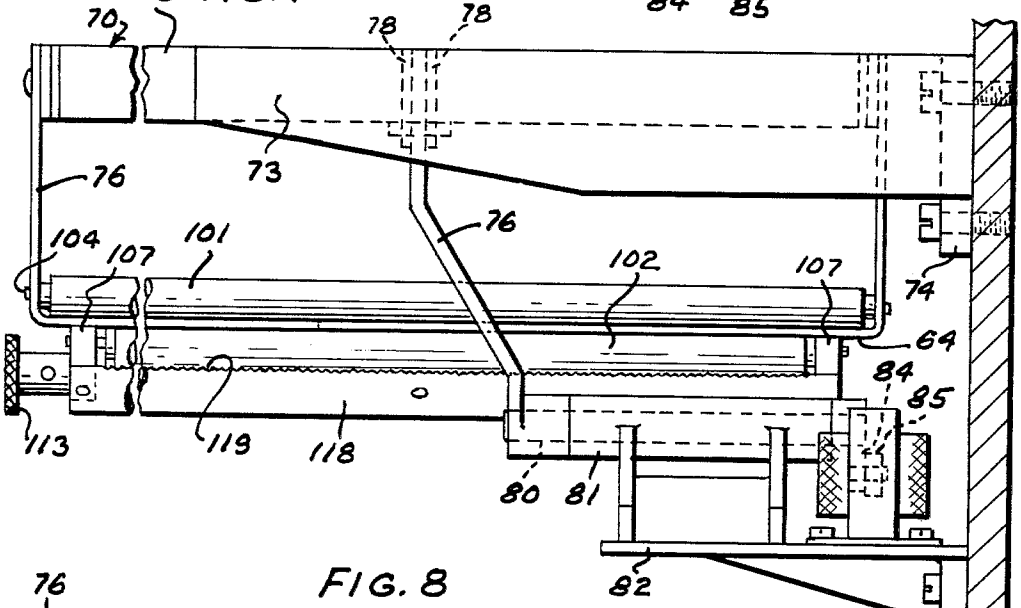
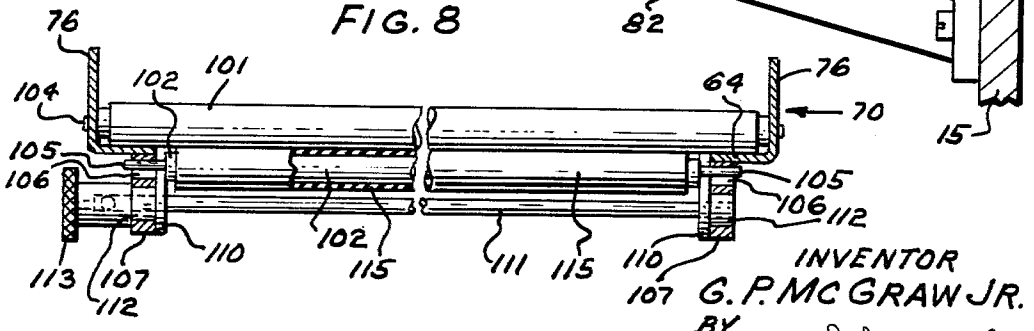


FIG. 8



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United States Patent Office 3,249,087 Patented May 3, 1966

3,249,087

CONTROLLED VAPOR SHIELDING DEVICE FOR METALLIZING APPARATUS

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Filed July 20, 1962, Ser. No. 211,329
6 Claims. (Cl. 118—8)

This invention relates to a vapor shielding device for a metallizing apparatus, and more particularly to a device for intercepting vaporized material in a vapor depositing apparatus in response to the depletion of the supply of web onto which the vaporized material is deposited.

An object of the invention is to provide a device for intercepting vaporized material in a vapor depositing apparatus to protect the apparatus from the vaporized material when the supply of web is depleted.

Another object of the invention is to provide a shield and mechanism for moving it selectively between a vaporizer and the web on which the vaporized material is being deposited to intercept the vaporized material when the web supply is depleted and to provide a removable, disposable sheet of material on the shield for receiving the vaporized material thereon.

A device illustrating certain features of the invention, as applied to a metallizing apparatus, may include a shield mounted for movement from a normal retracted position to an advanced position between a vaporizer of the apparatus and a web onto which the vaporized metal is deposited. As the supply of web is about to become depleted, the shield is actuated to the advanced position to intercept the vaporized metal from the vaporizer and thus protect the apparatus therefrom after the web moves past the vaporizer.

A strip of foil from a supply roll thereof mounted on the shield is releasably supported on opposite sides of the shield for receiving the vaporized metal on the lower side thereof when the shield is in its advanced position. When the shield is returned to its retracted position, the foil strip is withdrawn from the roll and advanced around the shield, and the portion with the vaporized metal thereon is severed from the strip.

Other objects, advantages and novel aspects of the invention will become apparent upon consideration of the following detailed description, in conjunction with the accompanying drawings, in which:

FIG. 1 is a fragmentary elevational sectional view of a metallizing apparatus embodying the present vapor intercepting device;

FIG. 2 is a diagrammatic view of the control mechanism for advancing the shield of the vapor intercepting device between the vaporizer and the web supporting drum of the apparatus;

FIG. 3 is an enlarged plan sectional view of the vapor intercepting device;

FIG. 4 is a fragmentary vertical sectional view of the device taken on line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary vertical sectional view of the device taken on the line 5—5 of FIG. 3;

FIG. 6 is an end view of the vapor intercepting device;

FIG. 7 is a fragmentary side view of the vapor intercepting device; and

FIG. 8 is a fragmentary vertical longitudinal sectional view through the device taken on line 8—8 of FIG. 6.

Referring to the drawings, particularly FIG. 1, the metallizing apparatus shown therein comprises a stationary vertically disposed frame plate 15 of circular contour which cooperates with a dome-shaped cover 17 to form a chamber 18 from which the air is evacuated and in which the metallizing operation occurs and the vapor intercepting device 20 is mounted. A vaporizer 22 is fixedly mounted on the frame plate 15 for vaporizing a quantity of zinc, the vapors of which pass through an opening 24 in the upper portion of the vaporizer and is deposited on a web 26 of dielectric material such as paper or plastic film. The web 26 is withdrawn from a supply roll 28 thereof and is guided by rollers 30 and 32, a hollow drum 34, rollers 36 and 38, onto a take-up spindle 40. The take-up spindle 40 is supported on the frame plate 15 and is driven by a suitable drive including a motor indicated diagrammatically at 42.

The supply roll 28 of web is supported on a spindle 44 which is rotatably mounted on the vertical frame plate 15 and has an electrically controlled brake (not shown) associated therewith for applying tension to the web. The roller 30 engageable with the supply roll 28 of web is rotatably supported on a shaft 45 that is mounted on the outer ends of a pair of arms 46. At their other ends the arms 46 are pivotally mounted on a shaft 47 that is supported on the frame plate 15 and supports the roller 32 for rotation thereon. An arm 48 extending from one of the arms 46 is connected to a spring 50 that stresses the arms 46 for clockwise rotation about the shaft 47, as viewed in FIG. 1, to urge the roller 30 into engagement with the supply roll 28 of the dielectric web 26.

The hollow drum 34 which has a coolant therein is rotatable on a shaft 52 that is supported on the frame plate 15. The rollers 36 and 38 are rotatably supported on a pair of arms 58 which are pivotally supported on the shaft 52 and are stressed by a spring 60 for rotation in a counterclockwise direction as viewed in FIG. 1 to maintain the roller 38 in engagement with the take-up spindle 40.

As it is unwound from the supply roll 28 the dielectric web 26 passes over portions of the rollers 30 and 32 and moves over a silver vaporizer 62 which is fixedly mounted on the vertical frame plate 15 and serves to vaporize a minute quantity of silver metal, which vaporized silver passes through masked openings in the upper portion thereof onto limited areas of the dielectric web to form an extremely thin film of silver thereon. As the web advances over the zinc vaporizer 22, the zinc vapor therefrom is deposited onto the web in the areas defined by the thin coating of silver thereon.

The device 20 which serves to intercept the zinc vapor from the vaporizer 22 when the dielectric web supply is depleted comprises a shield or barrier in the form of a horizontally disposed plate 64 movable from a normal retracted position shown in full lines in FIG. 1 to an advanced position between the vaporizer 22 and the drum 34. The plate 64 as viewed from above (FIG. 3) is substantially rectangular and has a pair of parallel arms 66 extending upwardly at opposite ends thereof. The upper ends of the arms 66 are secured to the opposite ends of a rectangular frame 68 having a pair of horizontally disposed sleeves 69 fixedly secured thereto. The members 64, 68 and 69 form a carriage 70 which is mounted for horizontal reciprocatory movement on a pair of guide rods 72 that fit within the sleeves 69 and are secured at their ends to a pair of stationary supporting arms 73. The arms 73 are secured in parallel relation to each other to a cross member 74 to form a U-shaped supporting bracket which is fixedly secured to the vertical frame plate 15.

Reciprocatory movement is imparted to the carriage 70 by a lever 76, the upper slotted end of which fits between a pair of spaced parallel plates 78 on the frame 68 and engages a pin 79 extending between the plates 78. The lower end of the arm 76 is secured to a rock shaft 80 that is supported in a bearing 81 (FIG. 7) mounted on a bracket 82 which is secured to the vertical frame plate 15. A lever 84 fixed to the other end of the rock shaft 80 is connected through a pin and slot connection to a link

85, the opposite ends of which are pivotally connected to the armature plungers 86, 86 of a pair of solenoids 87 and 88 that are mounted on the supporting bracket 82. The solenoids 87 and 88 are selectively connectible to a suitable source of current through switches 90, 91 and 92, the switches 91 and 92 being of the single pole double throw type, located externally of the metallizing apparatus and having a movable switch blade 93 as indicated diagrammatically in FIG. 2. In response to actuation of the switch blade 93 to close the switch 92, the solenoid 87 is energized to effect the movement of the carriage 70 and the vapor intercepting shield 64 to the normally retracted position as shown in FIGS. 1 and 2.

In response to actuation of the switch blade 93 to close the switch 91 or in response to the closing of the normally open switch 90 located within the chamber, the solenoid 88 is energized to effect the movement of the carriage 70 and the shield 64 to the advanced position with the shield 64 located between the drum 34 and the zinc vaporizer 22 in position for intercepting the zinc vapor issuing from the opening 24 of the vaporizer 22. As indicated in FIG. 1, the switch 90 is fixedly mounted in the path of movement of the arm 48 associated with the roller 30 for actuation by the arm when the roller 30 is moved to the dotted line position as the web supply approaches depletion. Hence, the shield 64 is moved to its advanced position just prior to the depletion of the web supply to form a barrier for and to intercept the zinc vapor issuing from the vaporizer 22 and thus prevent the vaporized zinc from being deposited on the periphery of the drum 34 after the web 26 is depleted.

In order that the metallized vapor shall not build up a coating thereof on the shield 64, a strip 95 of disposable material, such as aluminum foil, is removably secured to the underside of the plate 64 for receiving the zinc vapor thereon. A supply of the strip 95 is provided in the form of a roll 96 which is rotatably supported on a rod 98, the ends of which are supported by the arms 66 of the carriage and fit into L-shaped slots 99 therein. From the supply roll 96, the foil strip 95 is directed onto a guide roller 101 on the carriage and extends therefrom along the upper face of the shield 64, around the forward edge thereof and rearwardly along the lower face thereof and between the roller 101 and a pinch roller 102. The latter roller is mounted on the carriage for vertical movement through a clearance opening 103 in the shield into engagement with the roller 101.

The guide roller 101 is rotatable on a shaft 104 secured at its ends to the arms 66 of the carriage 70. Rods 105 extending axially from the ends of the pinch roller 102 are guided for vertical movement in slots 106 (FIG. 5) of a pair of supporting blocks 107 secured to the underside of the carriage 70. Vertical movement of the roller 102 into and out of engagement with the roller 101 is imparted thereto by a pair of eccentric cam discs 110 which are secured to a shaft 111 and have hubs 112 that are journalled in bearing apertures in the supporting blocks 107. To permit the turning of the eccentric cam discs 110 and effect the raising and lowering of the pinch roller 102 a knurled knob 113 is secured to one end of the shaft 111. Rotation of the shaft 111 and the cam discs 110 is limited to 180° by a pair of stop shoulders 114 (FIG. 5) formed on one of the cam discs 110 and engageable with the rod 105 of the roller 102. A rubber sheathing 115 is provided on the outer periphery of the roller 102 to form a resilient cushion thereon.

The leading end portion of the foil strip 95 continues from the rollers 101, 102 over the upper surface of an obliquely disposed supporting member 116 of V-shape in cross section which extends between and is secured to the supporting blocks 107. A foil severing bar 118 is secured to the supporting member 116 as shown in FIG. 4 and has a serrated upper edge 119 which extends slightly above the upper supporting surface of the member 116 for severing a portion of the foil strip when the foil is moved thereagainst.

Operation

In the operation of the metallizing apparatus, a supply roll 28 of dielectric web 26 is placed on the spindle 44 and the web is threaded around the rollers 30, 32 over the silver vaporizer 62 and around the hollow drum 34 and the rollers 36 and 38, and several convolutions of the leading end thereof are wound onto the take-un spindle 40 while the shield 64 is in the forward position between the zinc vaporizer 22 and the hollow drum 34. The cover 17 is then closed and the chamber is evacuated and when the vaporizers 22 and 62 have attained the proper temperature, the motor 42 is started to effect the rotation of the take-up spindle and the advancement of the web. At this time switch blade 93 is manually actuated to close the switch 92 to effect the energization of the solenoid 87 and the actuation of the shield 64 to its retracted position.

As the metallization of the web 26 proceeds, the roller 30 moves in a clockwise direction about the axis 47 as the supply roll 28 diminishes in size. When the supply roll 28 of web approaches depletion, the roller 30 is in a position substantially as shown in dotted lines in FIG. 1, and the arm 48 closes the switch 90 to effect the energization of the solenoid 88 and the movement of the shield 64 to its forward position between the zinc vaporizer 22 and the drum 34. In this position of the shield, the zinc vapor is deposited onto the foil strip 95 (FIG. 4) on the lower side of the shield 64, so that as the trailing end of the web 26 is drawn past the opening 24 of the zinc vaporizer the zinc vapor therefrom is intercepted by the shield and is not deposited and does not build up on the peripheral surface of the drum 34.

The apparatus is then shut down and the cover 17 of the apparatus is opened after which the switch blade 93 is actuated to close switch 92, thereby effecting the energization of the solenoid 87 and the movement of the carriage 70 and the shield 64 to the retracted position. The knob 113 is then turned through 180° to cause the eccentric cam discs 110 to lower the pinch roller 102 and release the foil strip 95. A portion of the foil strip 95 is then unwound from the roll 96 thereof and advanced around the shield 64 a distance sufficient to carry the coated portion of the foil strip beyond the serrated edge 119 of the cutter bar 118. The operator then turns the knob 113 to raise the pinch roller 102 to grip the foil strip against roller 101, after which the operator pulls the overhanging free end portion of the foil strip downwardly against the serrated edge 119 to sever from the foil strip the portion thereof having the zinc coating thereon.

The roller 30 is moved to and temporarily latched in a retracted position resulting in the opening of the switch 90. Thereafter, the switch blade 93 is actuated to close the switch 91 to effect the energization of the solenoid 88, the movement of the shield 64 to its forward position between the vaporizer 22 and the drum 34 to intercept the heat emanating from the vaporizer 22 while the cover 17 is open to protect the drum 34 therefrom preparatory to the next cycle of operation. The switch blade 93 is then moved to an intermediate position between and out of contact with the switches 91 and 92 to condition the control circuit for actuation by the switch 90.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In a metallizing apparatus having:
a chamber;
a metal vaporizer in said chamber;
means for supporting a supply of web in said chamber;
take-up means in said chamber for winding the metallized web thereon; and

means in said chamber for guiding the web from the supply thereof past the vaporizer onto said take-up means; the combination therewith of:

a shield in said chamber movable to a forward position between the vaporizer and the web for intercepting the vaporized material;

means in said chamber for actuating said shield to the forward position and a retracted position; and

control means in said chamber operable when the supply of web approaches depletion for rendering said actuating means operative to move said shield to the forward position.

2. In a metallizing apparatus having:

a chamber;

a metal vaporizer in said chamber;

means for supporting a supply of web in said chamber;

take-up means for winding the metallized web in said chamber; and

means for guiding the web from the supply thereof past the vaporizer onto said take-up means; the combination therewith of:

a shield in said chamber movable to a forward position between said vaporizer and the web for intercepting the vaporized material;

means in said chamber for actuating said shield to the forward position and a retracted position;

means within said chamber operable when the supply of web approaches depletion for rendering said actuating means operative to move the shield to the forward position;

means including a selectively operable first switch located externally of said chamber for rendering said actuating means operative to move said shield to the retracted position; and

means including a selectively operable second switch located externally of said chamber for rendering said actuating means operative to move said shield to the forward position.

3. In a web metallizing apparatus having:

a chamber;

a vaporizer in said chamber;

means for supporting a supply roll of web in said chamber;

take-up means in said cahmber for winding the metallized web thereon;

means in said chamber including a roller for guiding the web from said supply roll past said vaporizer to said take-up means;

means for urging said roller against the supply roll as the web is unwound therefrom;

a shield mounted in said chamber for movement to an advanced position between said vaporizer and the web for intercepting the vapor from said vaporizer;

means in said chamber including a first solenoid for actuating said shield to a retracted position spaced from said vaporizer;

means in said chamber including a second solenoid for actuating said shield to the advanced position;

means including a switch mounted in said chamber operable in response to movement of said guide roller to a predetermined position as the web supply approaches depletion for effecting the energization of said second solenoid and the movement of said shield to the advanced position; and

means including a control switch mounted externally of said chamber for effecting the energization of said first solenoid and the movement of said shield to the retracted position.

4. In a metallizing apparatus having:

a vaporizer for emitting vaporized material along a predetermined path onto a moving web; and

means for moving the web past said vaporizer; the combination therewith of:

a member;

means for moving said member to an operative position between said vaporizer and the web and into the path of the vaporized material, and to a retracted position removed from said path;

a strip of material for receiving the vaporized material thereon; and

means for releasably mounting said strip of material on said member for movement therewith so as to receive the vaporized material thereon when said member is in the advanced position and for movement of the strip relative to the member so that the portion of the strip with the vaporized material thereon may be severed from the strip.

5. In a metallizing apparatus:

a vaporizer for emitting vaporized material along a predetermined path;

means for guiding a web for movement past said vaporizer and through said path for receiving the vaporized material thereon;

a member;

means for actuating said member to a forward position between said vaporizer and the web and into the path of the vaporized material, and to a retracted position removed from said path;

a supply of foil strip;

means for releasably supporting said supply of foil strip on said member with a portion of the foil strip disposed in said path for receiving the vaporized material thereon when the member is in the advanced position and for movement of the foil strip relative to the member to permit the foil strip to be advanced from the supply thereof so as to effect the displacement of the coated portion of the foil strip and the replacement thereof with an uncoated portion of the foil strip; and

means on said member for severing the coated portion of the foil strip from the supply thereof.

6. In a metallizing apparatus:

a vaporizer for emitting vaporized material therefrom along a predetermined path;

means for guiding a web for movement past said vaporizer and through said path for receiving the vaporized material thereon;

a plate;

a carriage for supporting said plate for movement to an advanced position between said vaporizer and said web and into the path of said vaporized material, and to a retracted position removed from said path;

means for selectively actuating said carriage to effect the movement of said plate to and from the advanced and the retracted positions;

a supply roll of foil strip;

means for mounting said supply roll of foil strip on said carriage for movement therewith and for movement of said foil strip relative thereto around the plate and across the upper and lower surfaces thereof;

means on said carriage for releasably supporting said foil strip on the lower side of said plate for receiving the vaporized material thereon when said plate is in the advanced position and to permit the advancement of the foil strip on said plate when said plate is in retracted position; and

a member on said carriage having a serrated edge for severing the coated portion of said foil strip.

No references cited.

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