United States Patent

Schaefer

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[45] **Feb. 8, 1972**

[54] CIRCULATING DEVICE

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[52] **U.S. Cl.** **118/259**

[51] **Int. Cl.** **B05c 1/08**

[58] **Field of Search** 118/203, 227, 259, 261; 117/111

[56] **References Cited**

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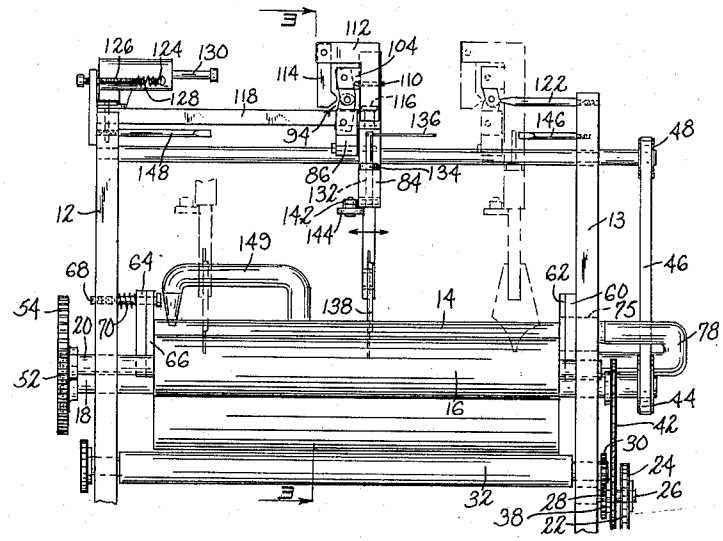
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Primary Examiner—Louis K. Rimrodt
Attorney—Delio and Montgomery

[57] **ABSTRACT**

This disclosure relates to a device for preventing adhesive in an adhesive coating mechanism from thickening and decreases the problem of air drying of such adhesive. A mechanism is provided to constantly recirculate liquid adhesive which is deposited between a pair of cooperating rolls so that excess liquid is removed from between the rolls and air drying thereof is substantially decreased.

10 Claims, 6 Drawing Figures



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SHEET 1 OF 2

Fig. 1.

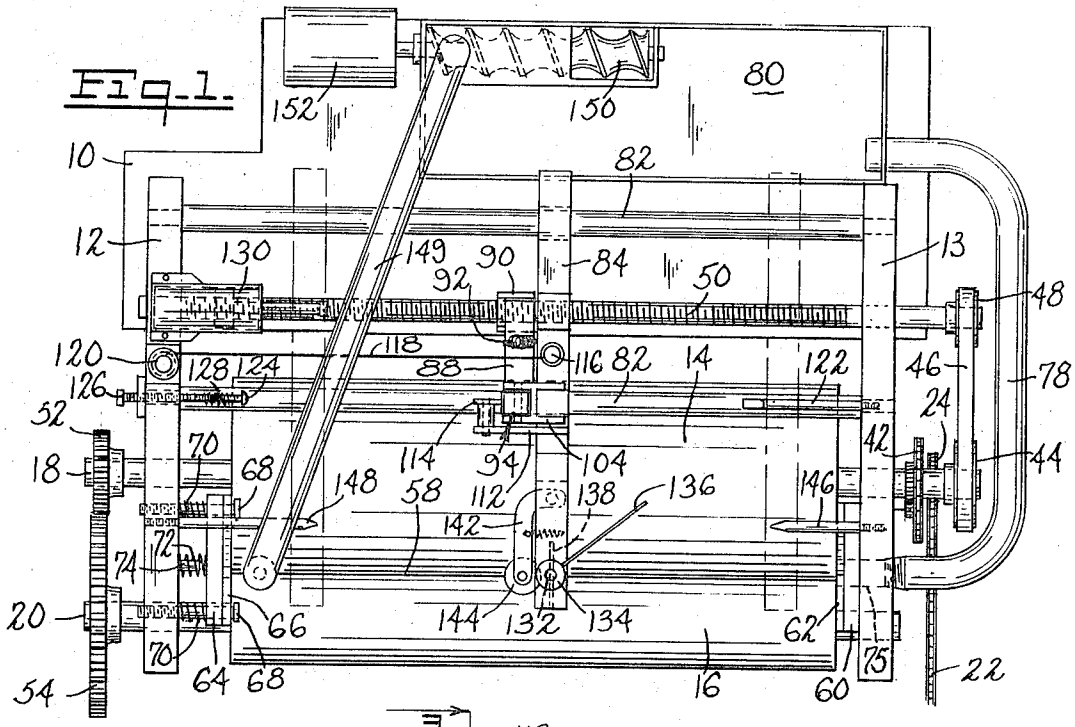


Fig. 2.

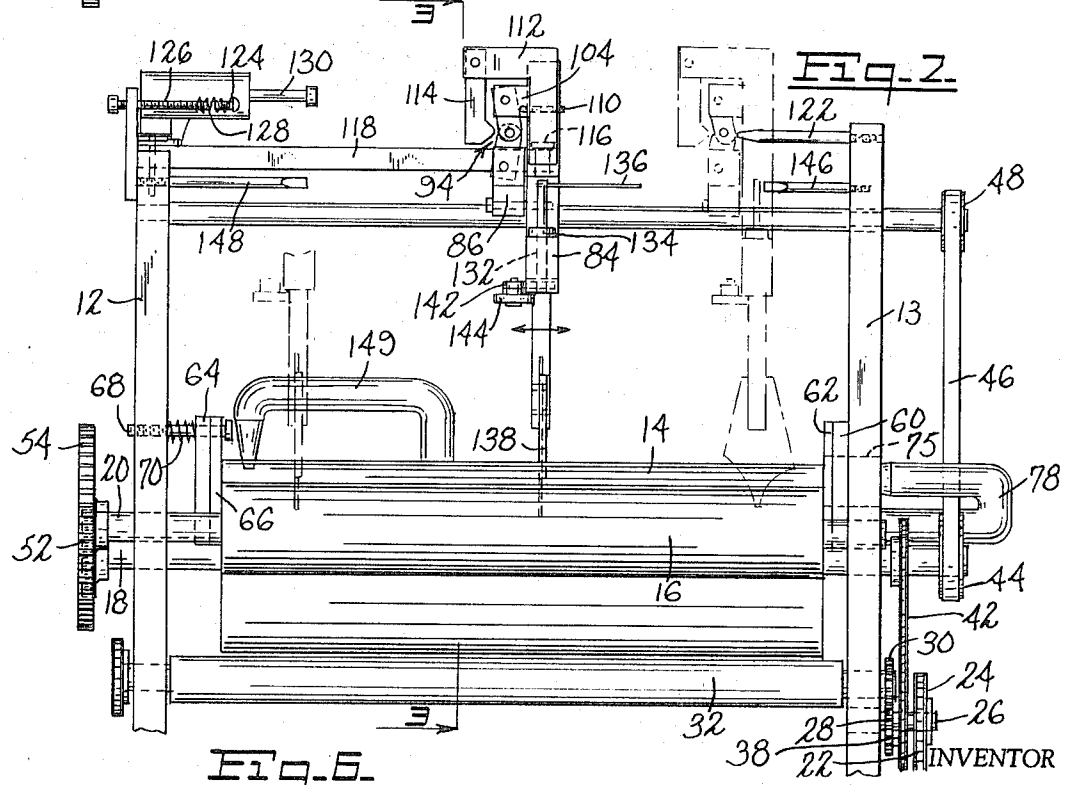
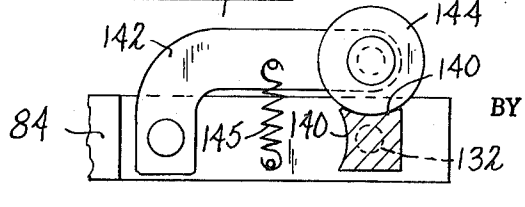


Fig. 6.



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Fig. 3.

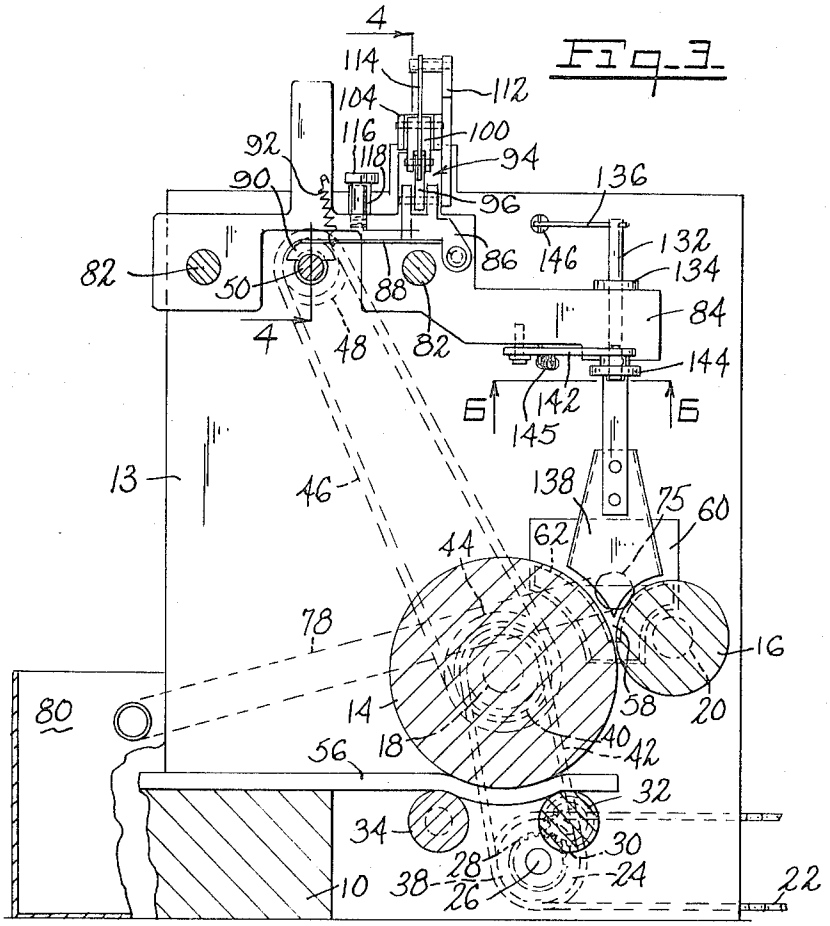


Fig. 4.

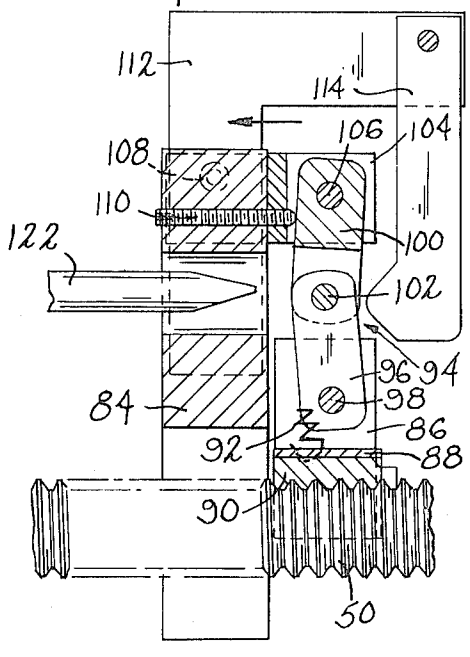
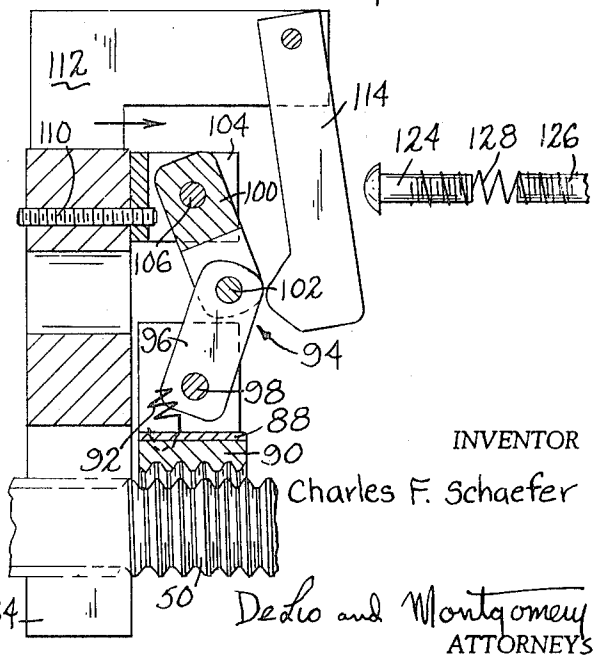


Fig. 5.



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CIRCULATING DEVICE

This invention relates to machines for applying liquid coatings such as adhesives to sheet material, and more particularly relates to such machines wherein the liquid is deposited between two cooperating rolls which define a liquid reservoir therebetween.

A device of the type to which the present invention is applicable is generally shown in U.S. Pat. No. 3,097,968. In such a coating applying apparatus there is provided a pair of cooperating rolls wherein one roll is utilized to place an adhesive coating or layer on strip material passing thereby. The second roll which is generally of smaller diameter is in rolling contact with the coating roll and may be termed a coating control roll. The two rolls define a reservoir or cavity therebetween which, together with suitable damming means placed at each end, retains a liquid adhesive in the reservoir.

In operation, liquid adhesive is deposited in the reservoir through a conduit and as the two rolls rotate the coating control roll causes a thin coating of the liquid adhesive to be spread evenly along the coating roll which then contacts the sheet material passing thereby.

Where the adhesive is of the solvent-containing cement type a problem is presented due to air drying of adhesive on the rollers, and the agitation in the adhesive produced by the rotation of the rollers hastens evaporation of the solvent.

Thus, the adhesive will quickly thicken beyond the point of practical use. Dependent upon the type of adhesive, this thickening may take place in as little as 15 minutes. Where the adhesive is thin with a high percentage of solvent, the adhesive will flow to the sides of the rolls and then down to a catch tank at a substantially controlled rate. However, the solvent type adhesives generally must be used in a mixture with a high percentage of solids and a low percentage of solvents, and the adhesives will not flow freely towards the end of the rolls or pass through a drain hole at a practical rate. The wider the sheet material to be processed the greater the problem. For example, the roll lengths may vary from 15 up to 42 inches or greater.

The present invention is designed to overcome the problems presented by the use of viscous liquids.

Accordingly, an object of this invention is to provide a new and improved machine for applying a liquid coating to sheet or strip material.

Another object of this invention is to provide a new and improved adhesive applying machine including apparatus for recirculating the adhesive to prevent rapid air drying thereof.

A further object of this invention is to provide a new and improved device to be used in combination with a pair of rolls defining a liquid reservoir which includes a liquid moving means which moves along the length of the reservoir to remove excess liquid therefrom and decrease the amount of adhesive exposed to the air.

Briefly stated, the invention in one form thereof comprises an adhesive coating roll and a coating control roll disposed in rotating contacting relation and defining a reservoir which holds the adhesive to be coated. The apparatus further comprises an adhesive tank together with a lead-in conduit and also a return conduit to the tank. A paddlelike member is provided which will sweep down the length of the roll defined reservoir to remove excess liquid therefrom and propel it into the return conduit. On the return path, mechanism is provided for rotating the paddle 90° so that it will not produce flow of the liquid in the opposite direction.

The features of the invention which are believed to be novel are particularly set forth and distinctly claimed in the concluding portion of the specification. The invention, however, both as to its organization and operation, together with further objects and advantages thereof, may best be appreciated by reference to the following detailed description taken in conjunction with the drawings, wherein:

FIG. 1 is a top plan view of the preferred embodiment of the invention, as combined with a plurality of rollers for applying glue;

FIG. 2 is a front elevational view of the preferred embodiment of the invention shown in FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3, showing the toggle lever means in a locked position;

FIG. 5 is a view similar to FIG. 4, showing the toggle lever means in a released position about to be engaged by an abutment member; and

FIG. 6 is a view taken along line 6—6 of FIG. 3.

As will be described in detail hereinafter, a liquid reservoir is defined between a coating roll **14** and a coating control roll **16** together with damming plates **60** and **64** at the ends of the roll. Liquid is supplied to the reservoir through a conduit **149** from a tank **80**, and a return to the tank from an overflow conduit **78** leading from plate **60**. To move excess liquid to the overflow conduit, a support or carrier member **84** carries a paddlelike member **138** along the length of the reservoir in a liquid sweeping position toward the overflow conduit. On the return path the paddlelike member is rotated 90°. When the paddlelike member returns to its starting point it is rotated back to its sweeping position and the cycle is then repeated.

With reference to FIGS. 1–3, the apparatus comprises a frame **10** having spaced apart upright side frame members **12** and **13**. A coating roll **14** and a coating control roll **16** are rotatably mounted between side frames **12** and **13** on shafts **18** and **20**, respectively. A drive means (not shown) drives a sprocket chain **22** received on a sprocket wheel **24** on a shaft **26** rotatably carried by side frame **13**. Shaft **26** has a gear **28** thereon in driving relation with a gear **30** on the shaft of a roll **32**. A roll **34** is driven by similar means (not shown). Rolls **32** and **34** cooperate with coating roll **14** to apply a liquid coating to strip material passing therebetween.

Shaft **26** carries a second sprocket member **38** which is connected to a sprocket member **40** by means of a sprocket chain **42**. Sprocket **40** is on the shaft **18** of coating roll **14**.

Also carried on shaft **18** is a pulley **44** which drives a belt **46** about a pulley **48** mounted on a rod **50** which is rotatably carried by side frames **12** and **13**. Rod **50** is threaded and serves as a lead screw, as will hereinafter be explained. Gear **52** is mounted on shaft **18** so as to engage and drive a gear **54** on shaft **20** of roll **16**. As sprocket chain **22** is driven it drives shaft **26** and, in turn, roll **14**. Roll **16** in contact with roll **14** is driven thereby and acts to control the layer of adhesive that passes between the nip of the rolls. Sheet material **56** to be coated passes beneath roll **14** and over rolls **32** and **34**. In this manner, the liquid deposited in the reservoir between rolls **14** and **16** is carried down to the upper surface of material **56** and evenly applied thereto by roll **14**.

Rolls **14** and **16** define a liquid cavity or reservoir **58** therebetween which receives the coating liquid. The liquid in cavity **58** is maintained therein by a plate **60** having thereon a wear layer **62** of hard fibrous material, and a plate **64** also having thereon a wear layer of hard fibrous material. Layers **62** and **66** contact the ends of rolls **14** and **16**.

Plate **64** is resiliently mounted on bolts **68** carrying springs **70** to insure a tight seal between the rolls and damming plates. A spring **72** is located on a guide **74** to maintain layer **66** in contact with the ends of rolls **14** and **16**. The pressure of the damming means provided by plates **60** and **64** is not sufficient to hinder rotation of the rolls **14** and **16**. Plate **60** and layer **62** thereon define an aperture **75** therethrough which lead to a conduit **78**. Conduit **78** leads to a liquid tank or reservoir **80**. This permits excess liquid in cavity **58** to pass into conduit **78** and return by gravity to tank or reservoir **80**.

Carried between side frames **12** and **13** are a pair of rods **82** which slidably carry a support or carrier member **84**. A member **86** is pivotally mounted to support member **84** as more clearly shown in FIG. 3. Member **86** carries a cantilever spring member **88** which is attached to a threaded shoe **90** which rides on shaft **50** as more clearly seen in FIGS. 4 and 5. When shoe **90** is in engagement with shaft **50**, rotation of shaft **50** will produce motion of carrier member **84** from side frame **12** towards side frame **13**. Cantilever spring **88** is biased up-

wardly by means of a spring **92** connected to member **84**. A toggle linkage **94** acts to either lock shoe **90** on shaft **50** or upon release of the toggle permits spring **92** to lift spring **88** and shoe **90** therewith out of engagement with shaft **50**. Toggle **94** includes a lower lever **96** pivotally mounted to member **86** by means of a pin **98**. Lever **96** is pivotally connected at its upper end to a lever **100** by means of a pin **102** and lever **100**, in turn, is pivotally mounted to a block **104** carried on member **84** as by means of bolts **108** and studs **110**. Stud **110** is also adjustable to limit the pivotal movement of lever **100**.

A lever **114** is pivotally mounted to an overhanging support member **112** carried on member **84**. Lever **114** is adapted to reset or relock toggle **94**, as will be hereinafter described.

A boltlike securing member **116** is located on arm member **84** and extending therefrom is a spring strip **118** which winds about a spool **120** carried on the left upright **12**, FIG. **1**. Toggle **94** as shown in FIG. **4** is adapted to be broken by an abutment member **122** carried on the right upright **12**, FIGS. **1** and **2**, when arm member **84** travels to the extreme right position shown in dotted line in FIGS. **1** and **2**.

When arm **84** travels to the extreme left position shown in FIGS. **1** and **2**, lever **114** carried on extension **112**, engages an abutment in the form of a bolt **124** which is resiliently mounted to a supporting member in the form of another bolt **126** by means of a spring **128**. This will again lock the toggle **94**. When toggle **94** is an unlocked or raised position, as shown in FIG. **5**, nut **90** is out of engagement with shaft **50**. Conversely, when toggle **94** is in a locked position, as shown in FIG. **4**, nut **90** is held in threadable engagement with shaft **50**.

When nut **90** is out of engagement with shaft **50**, the tension in spring strip **118** will return carrier member **84** on slides **82** from the right-hand position to the left-hand position as shown in FIGS. **1** and **2**.

With the mechanism thus described, it will be seen that carrier member **84** initially travels from left to right, as viewed in FIG. **1**, until abutment member **122** breaks the lock of toggle **94**. Then spring **118** returns support arm **84** along rod **82** to the left-hand position, as shown in FIG. **1**, while nut **90** is withdrawn from engagement with shaft **50**.

As will now be described, the support arm carries a paddlelike member which acts to return excess liquid back through conduit **78** through reservoir **80**, and is then rotated 90° as it returns through the roll cavity or reservoir to its initial position to commence another cycle of operation.

A shaft **132** is rotatably mounted in arm member **84** and supported therein as by means of a washer **134**. A member **136** is carried on shaft **132** which is adapted to produce rotation thereof as hereinafter described. At the bottom of shaft **132** is a paddle member **138**.

As more clearly shown in FIG. **6**, shaft **132** has a portion **140** of generally rectangular cross section but with two concave portions essentially 90° apart which are adapted to be engaged by a roller **144** carried on a lever **142**. Lever **142** is pivotally mounted to arm member **84** on the lower surface thereof.

Lever **142** is biased towards arm member **84** by means of spring **145**. Shaft **132** is adapted to be in either of one of two positions which are 90° apart and the arrangement of lever **142**, roller **144** and spring **145** in conjunction with the concavities **140** acts as a detent to releasably lock shaft **132** in either one of these two positions.

When arm member **84** moves to the right as viewed in FIGS. **1** and **2**, such that member **136** is struck by abutment **146**, shaft **132** will be rotated by the torque exerted thereon to member **136**. This force will be sufficient to cause portion **140** to turn against the bias of spring **145**, FIG. **6**, and then roller **144** will fall into the other concavity in portion **140**. When the support arm travels sufficiently to the left in the opposite direction, arm **136** which will be 90° disposed from the position shown in FIG. **1**, will hit an abutment member **148** which will then rotate shaft **132**, 90° in the opposite direction.

In operation, pump **152** will force the glue or other viscous liquid through a conduit **149** to the cavity or reservoir defined by rolls **14** and **16** and dams **60** and **64**. As the machine is operated, shaft **50** is driven through belt **46** with nut **90** in contact therewith. Accordingly, carrier member **84** will travel from the left to the right as viewed in FIGS. **1** and **2** with paddlelike member **138** moving broadside to the glue in the reservoir. As paddlelike member **138** moves along the reservoir it will push the liquid therein into conduit **78** and, hence, return it to tank **80**. When arm **74** has reached the right extremity of travel, member **122** breaks toggle **94** and shoe **90** is raised. At the same time, shaft **132** is rotated 90° by abutment **146** acting on member **136**. Carrier member **84** is now returned to the left under the pull of spring strip **118**. At this time, the thin edge of paddlelike member **138** travels through the liquid and thus does not move or paddle the liquid in the wrong direction. When carrier member **84** has traveled to the left most extremity, toggle **94** will be again locked by engagement of abutment bolt **124** on lever **114** and nut **90** will be forced down into engagement on shaft **50**. The described cycle of operation will then be repeated.

A further benefit from this arrangement is the substantial elimination of the normal rotary motion of the adhesive in the reservoir due to rotation of the roll. This rotary motion agitates the liquid therein and will unduly hasten solvent evaporation and thickening of the cement.

It may thus be seen that the objects of the invention set forth as well as those made apparent from the preceding description are efficiently attained. Inasmuch as other embodiments of the invention may occur to others skilled in the art, the appended claims are intended to cover all modifications of the disclosed embodiments of the invention as well as other embodiments thereof.

What is claimed is:

1. A device for use in combination with an apparatus for applying a viscous liquid through a narrow elongated orifice and having an elongated reservoir defined above said orifice, a liquid tank, a conduit leading from said tank to the reservoir, an overflow opening at one end of said reservoir defining means, a second conduit providing communication between the overflow opening and the tank together with means for moving liquid from the tank to the reservoir, comprising a carrier member, means movably mounting said carrier member above said reservoir, a generally flat surfaced paddlelike member carried by said carrier member extending into the reservoir, means for moving said carrier member on said mounting means toward the overflow aperture so that said paddlelike member forces liquid in the reservoir toward the overflow aperture, means for rotating said paddlelike member as it nears said overflow aperture and returning said paddlelike member toward the other end of the reservoir whereby a minimum surface area of said paddlelike member is presented to the liquid upon the return travel.

2. The device of claim **1** further including spaced apart frame means and support means comprising rods upon which said carrier member is slidable carried between said frame means.

3. The device of claim **2** wherein said drive means includes a threaded shaft rotatably mounted between said frame means, and a threaded member on said carrier adapted to be engaged on said shaft.

4. The device of claim **3** further including a locking mechanism for holding said shoe on said shaft, means for unlocking said locking mechanism and lifting said shoe when said paddlelike member approaches said overflow aperture.

5. The device of claim **4** wherein said locking mechanism is a two-link toggle and said means for unlocking is an abutment member which is struck by said toggle linkage as the paddlelike member approaches the overflow aperture end of the reservoir.

6. The device of claim **4** further including means disposed at the nonoverflow aperture end of the reservoir for relocking said locking mechanism.

7. The device of claim **2** wherein said paddlelike member is mounted to said carrier member for rotation between posi-

tions essentially 90° apart, means mounted to both of said frame means for rotating said paddlelike member between said two positions.

8. The device of claim 4 wherein said locking means is a two-link toggle, one end of one toggle link being pivotally mounted to said carrier member, one end of said other toggle link being pivotally mounted to said shoe, the other ends of said links being pivotally mounted to each other.

9. The device of claim 4 further including spring means for returning said carrier member toward the other end of said reservoir.

10. Apparatus for applying liquid adhesive or the like to sheet or slab material, spaced apart support means, a coating roll and coating control roll rotatably supported between said support means in rolling contact and defining a reservoir therebetween, end plates at the opposite end of the rolls extending above the line of rolling contact of the rolls and arranged to define the reservoir with the rolls, one of the end plates having an overflow opening therein, a tank, a conduit extending from the overflow opening to the tank, a pump and conduit for delivering liquid from the tank to the reservoir; a member movable back and forth over said reservoir and a generally flat surfaced paddlelike member connected to said member movable so that said paddlelike member forces liquid in the reservoir toward the overflow opening and means for rotating said paddlelike member as it nears said overflow opening and returning said paddlelike member toward the other end of the reservoir whereby a minimum surface area of said paddlelike member is presented to the liquid upon the return travel.

* * * * *