May 18, 1943 D. RAY 2,319,476

COATING MACHINE

Filed Jan. 6, 1939

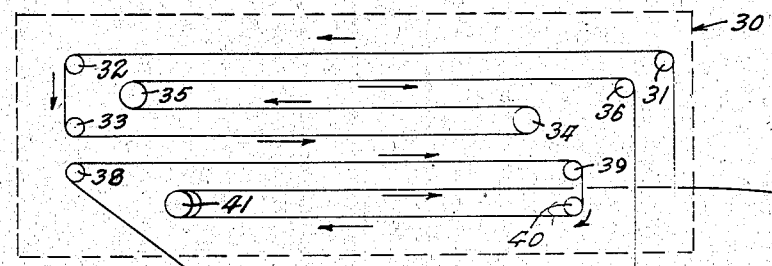



Fig. 1.

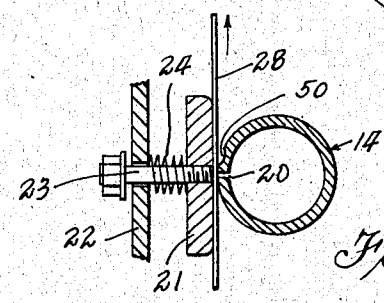
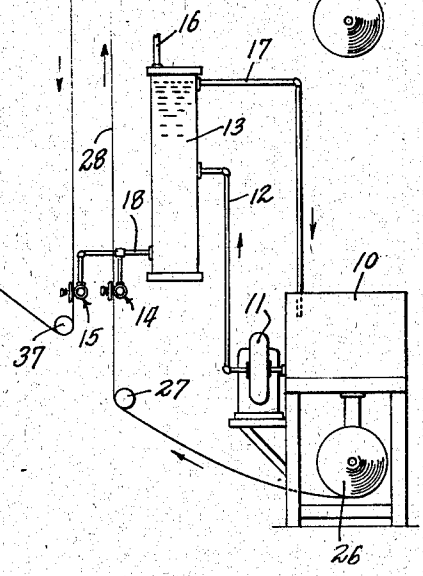



Fig. 2.



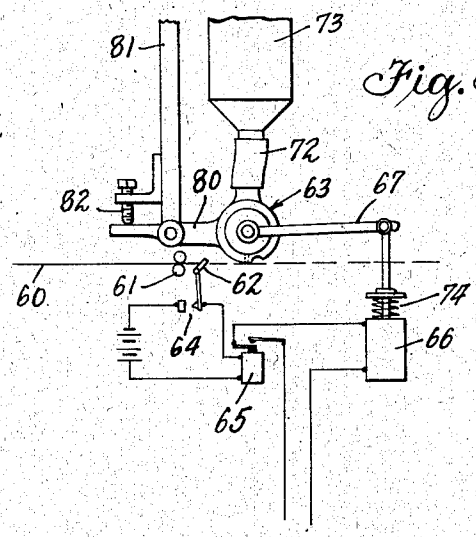




Fig. 3.

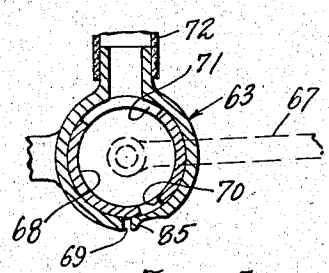



Fig. 4.

Inventor

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Patented May 18, 1943 2,319,476

# UNITED STATES PATENT OFFICE

2,319,476

## COATING MACHINE

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Application January 6, 1939, Serial No. 249,574

4 Claims. (Cl. 91—30)

This invention pertains to improved means for forming films or coatings on various materials such as continuous strips of paper or other fibrous bodies, cards or blanks, strips of Celluloid, wood, veneer, etc.

The invention is particularly directed toward the application of films or coatings of resinous compositions upon strips, blanks or the like. In the manufacture of boxes, hoods for bottles, cartons and various other containers it is desirable to render the boxes and containers water resistant. Various lacquers, resinous coating compositions or compositions containing waxes, latex, rubber condensation products, etc., have been applied. In most instances these resinous, rubbery or waxy compositions contain a volatile solvent at the time they are applied to the paper or other stock from which the box or container is to be made. Numerous problems are encountered in the applying process, among which is the problem of forming a film of uniform thickness. Another problem is the control of solvent vapors.

The present invention is directed towards means whereby a continuous, uniform, homogeneous film of coating material may be applied without permitting large quantities of solvents to be lost. The apparatus is particularly adapted to the application of a film or coating to continuous strips of paper or the like.

Generally stated, the invention comprises supplying a coating liquid in the form of a continuous stream through a narrow aperture onto the surface to be coated and maintaining yielding contact between the surfaces to be coated and the aperture, the liquid being discharged through the aperture under a predetermined or desired gravity head.

Preferably the strip of material to be coated is moved past the discharge aperture in a direction at right angles to the aperture. In this manner a uniform film of the coating composition is applied to the surface of the strip, a portion of that surface (opposite said aperture) being in direct contact with a body of coating liquid.

An object of this invention, therefore, is to provide an improved apparatus for coating paper, wood and other fibrous materials with a sealing or coating composition.

Another object is to provide an apparatus whereby continuous strips of fibrous material may be coated on one or both sides with a water resistant or other sealing or coating composition in a continuous manner.

A further object is to provide means whereby sealing or coating compositions may be applied to individual cards or pieces of fibrous material.

These and other objects, uses, advantages and adaptations of the invention will become apparent to those skilled in the art from the following detailed description of certain illustrative forms.

In order to facilitate understanding, reference will be had to the appended drawings, in which:

Fig. 1 diagrammatically illustrates an arrangement of elements whereby a continuous strip of fibrous material may be coated on both sides.

Fig. 2 is an enlarged view of one form of applicator which may be used in the arrangement shown in Fig. 1.

Fig. 3 diagrammatically represents a form of apparatus for use in applying a sealing coating to individual blanks of material to be coated.

Fig. 4 is an enlarged vertical section through a portion of the device shown in Fig. 3.

The arrangement shown in Fig. 1 is particularly adapted for use in coating a continuous strip of material on both sides with a suitable sealing or coating composition. A tank for this sealing solution is indicated at 10. As stated hereinbefore, the sealing solution may comprise a solution of gums, resins, lacquers, waxes and rubber or rubber-like products in a suitable solvent. Ordinarily, relatively volatile solvents are employed. An acryloid type of resin or synthetic plastic in a volatile solvent such as butyl acetate, is an example of one form of coating solution. The coating solution from tank 10 may then be circulated by a pump 11 through lines 12 into a surge tank 13 which is preferably positioned above the level of the applicators 14 and 15. The surge tank 13 may be provided with a vent pipe 16 and with a return overflow line 17 leading back to the tank 10. In this manner a continuous head of coating solution is maintained in the surge tank 13. A line or lines 18 connect the lower portion of the surge tank 13 with the applicators 14 and 15.

Fig. 2 is an enlarged vertical section through one of the applicators, say applicator 14. As there shown the applicator is in the form of a horizontally extending tube, one end of which is in communication with the supply line 18 and the other end of which is preferably closed. Longitudinally extending along the tube 14 is a slot or aperture 20. Opposing said slot or aperture is a presser plate 21 slidably mounted upon suitable guides which permit the presser plate 21 to move toward and away from the aperture 20 of the applicator. A stationary supporting

member 22 is diagrammatically illustrated, the presser plate 21 being attached to the bolt 23 extending through the stationary support. Spring means 24 yieldably press the presser plate against the aperture.

A supply reel 26 of continuous strip material to be coated may discharge the strip of material over a suitable roller, such as the roller 27, and then past the applicator 14, the strip material extending between the applicator and the presser plate 21 so as to assume the position indicated at 28 in Fig. 2. This continuous strip material 28 then passes into a drier, diagrammatically outlined at 30. In such drier the continuous strip material passes over rollers 31, 32, 33 and 34, attention being called to the fact that these rollers are so arranged that the coated side of the strip of paper does not come in contact with the rollers even though such continuous strip reverses its direction. For example, between the rollers 31 and 32 it travels from right to left whereas between the rolls 33 and 34 it travels from left to right. Thereafter the continuous strip material may pass over the rollers 35 and 36 and be discharged from the drier. This strip material now passes past the applicator 15 which applies another film of sealing and coating material to the opposite side of such continuous strip 28 whereupon the strip passes over a roll 37 and returns to the drier 30 wherein it is trained over rollers such as the rollers 38, 39, 40 and 41. Eventually the continuous strip is discharged from the drier 30 and collected upon a take-up reel 42 which is positively driven. During the entire operation the continuous strip material 28 is maintained under tension and is progressed past the applicators and through the drier by reason of the pull exerted upon the take-up reel 42. If desired, certain of the rollers, such as the rollers 37 and 39, may be frictionally driven so as to facilitate the forward travel of the continuous strip through the machine.

By again referring to Fig. 2 it will be noted that the trailing edge of the aperture 20 is relatively narrow, the exterior of the tubular casing of the applicator being milled out slightly as indicated at 50. In other words, the trailing edge adjacent the longitudinal aperture 20 preferably has an action similar to that of a knife for smoothing out the applied composition or solution. The outer edge of the applicator on the lower side (facing the oncoming strip 28) may be smooth and gradually approach the paper or strip but the rear or trailing edge should more rapidly leave the paper.

The operation of the apparatus shown in Figs. 1 and 2 will be evident to any one skilled in the art from the description given. It is to be noted that the coating solution is supplied to the applicators under a constant gravity head so that no pulsations or changes in pressure exist. Furthermore, the disadvantages incidental to spraying or painting by hand are not encountered, the entire system being totally enclosed. The surface of the paper 28 is in communication with the interior of the applicator 14 and a relatively thin but solid body of fluid is in contact with such surface through the slot 20. Ordinarily the slot 20 may measure from about 0.05 to 0.1 inch in width, it being understood that the width of this slot will depend upon the viscosity and other characteristics of the sealing solution and the head or pressure at which it is supplied to the interior of the applicator.

Figs. 3 and 4 particularly relate to a device adapted to coat individual sheets or blanks of fibrous material. One such blank is indicated at 60 and such blank passes through feed rolls 61; the blank may be fixed to progress from left to right (Fig. 3) in any suitable manner, as for example by means of a conveyor belt or belts, feed rolls, or the like. As the leading edge of the blank 60 contacts a pivoted key 62 in the form of a bell crank lever and moves toward the applicator 63, the key 62 closes the contact 64 and a relay 65 is energized. This relay then closes a circuit to a solenoid 66 which pulls down the lever arm 67. The lever arm 67 is connected to an interior rotatable member 68 within the applicator 63. The applicator 63 is provided with the narrow aperture 69 through which the sealing solution may be discharged. The tubular member 68 acts as a valve and is provided with a discharge slot 70 and an inlet opening 71. The inlet opening 71 is always in communication with the main supply line 72 which, for purposes understood later, may be a flexible tube or hose connecting the applicator 63 with a supply tank 73. When the solenoid 66 is actuated and the lever 67 is pulled down, the discharge opening 70 of the rotary valve member 68 places the interior of the applicator in communication with the aperture 69.

The position of the original contact 62 is correlated with the lag of the relay 65 so that by the time the leading edge of the blank 60 assumes a position immediately below the slot 69 of the applicator 63, the rotatable valve 68 has been moved into its operative position and the sealing fluid is being discharged through the slot 69. As soon as the trailing edge of the blank 60 releases the contact 62, the solenoid 66 is deenergized and the valve returns to its original closed position (indicated in Fig. 4) by reason of the spring 74.

In order to accommodate blanks 60 of varying thickness, the entire applicator 63 may be pivotally suspended as upon the lever arm 80 from a stationary support 81. One end of the lever arm 80 may be held down by means of a set screw 82. By adjusting the set screw 82, the entire applicator 63 may be caused to rise or fall and thereby positioned at any desired height with respect to the table, conveyor belt or other plane through which the blanks 60 move. Since the storage tank 73 may also be stationary, the flexible tube 72 accommodates for differences in operative height assumed by the applicator 63.

As in the case of the applicator described in connection with Figs. 1 and 2, the trailing edge adjacent the discharge slot 69 is relatively thin and cut back as shown at 85. This groove adjacent the rear edge of the opening or port acts as a doctor knife and prevents accumulation of coating composition in frictional contact with the freshly coated sheets.

The coating compositions may therefore be applied to one or both sides of a continuous strip or to pieces of sheet material. The coating compositions may be water proof, water-resisting, waxy, of a nature adapted to strengthen the fibrous sheet material, or of a nature permitting the sheet material to become adhesive upon the further application of solvents, heat or heat and pressure. Some coating compositions need not contain a volatile solvent at the time of their application to the sheet material. When compositions of the type described by Abrams in Patent #2,054,115 are applied, for example, it may be desirable to use a steam jacket or other heating

means around the applicators for the purpose of liquefying the composition and facilitating coating. Coatings of this last mentioned type are particularly of advantage where the coated material is to be used in making bottle hoods and containers since blanks cut from such coated sheet material can later be preheated and then pressed to the desired shape, the composition acting as a thermoplastic or vulcanizing substance bonding the folded or pressed portions together without the use of added adhesives. Resinous compositions in hot or melted condition can also be applied by the method or apparatus of my invention.

I claim:

1. In an apparatus for coating sheet material with protective coatings, an applicator comprising a tubular member provided with a longitudinally extending slot having substantially parallel walls, said slot forming an applicating port defined by edge portions, a gradually curving surface on said tubular member leading to the front edge portion of said slot, said tubular member being provided with a re-entrant curved surface adjacent the rear edge portion of said slot, said re-entrant curved surface being parallel to said slot but spaced therefrom whereby said rear edge portion is rendered narrow and is adapted to act as a smoothing knife edge, a rotary valve in said tubular member, said valve being adapted to open and close said applicating port, means for moving sheet material along a line of travel past said port, and means operated by sheets of material advancing toward said port for actuating said rotary valve to open said port.

2. An apparatus for applying coating in liquid form to the surface of sheet material comprising: an applicator having a transversely rounded surface provided with a slot extending lengthwise thereof, means for supplying liquid coating material to the slot, means for drawing sheet material substantially transversely to the axis of the slot and in contact with the edges thereof and substantially tangentially to the rounded surface of the applicator, said rounded surface having a longitudinally extending recess formed therein and parallel to such slot and closely adjacent that edge of the slot which is last in contact with the sheet material and coating applied thereto, whereby said last-named edge of the slot is thin and adapted to act as a smoothing knife edge.

3. In an apparatus for coating sheet material with protective coatings: an applicator comprising a tubular member provided with a longitudinally extending slot in communication with the interior of said member, the slot having plane, substantially parallel walls, the slot forming an applicating port defined by edge portions integral with said tubular member; a gradually curving surface on said tubular member leading to the front edge portion of the slot; a reentrant surface adjacent the rear edge of the slot and parallel to the slot, said reentrant surface defining a narrow rear edge portion to the slot, such narrow rear edge portion being adapted to act as a smoothing knife edge; means for drawing sheet material across the slot and virtually tangent to the applicator at said slot; and means for supplying liquid coating to the tubular member and slot by gravity.

4. In an apparatus for coating sheet material with protective coatings: an applicator comprising a tubular member provided with a longitudinally extending slot having substantially parallel walls, said slot forming an applicating port defined by edge portions, a gradually curving surface on said tubular member leading to the front edge portion of said slot, said tubular member being provided with a reentrant curved surface adjacent the rear edge portion of said slot, said reentrant curved surface being parallel to said slot but spaced therefrom whereby said rear edge portion is rendered narrow and is adapted to act as a smoothing knife edge; a rotary valve in said tubular member, said valve being adapted to open and close said applicating port; a lever arm pivotally supporting said applicator; means for adjustably positioning the lever arm and applicator with respect to a line of travel of sheet material; means for moving sheet material along the line of travel past said port; and means operated by sheets of material advancing toward said port for actuating said rotary valve to open said port.

DON RAY.