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FLUID APPLICATOR

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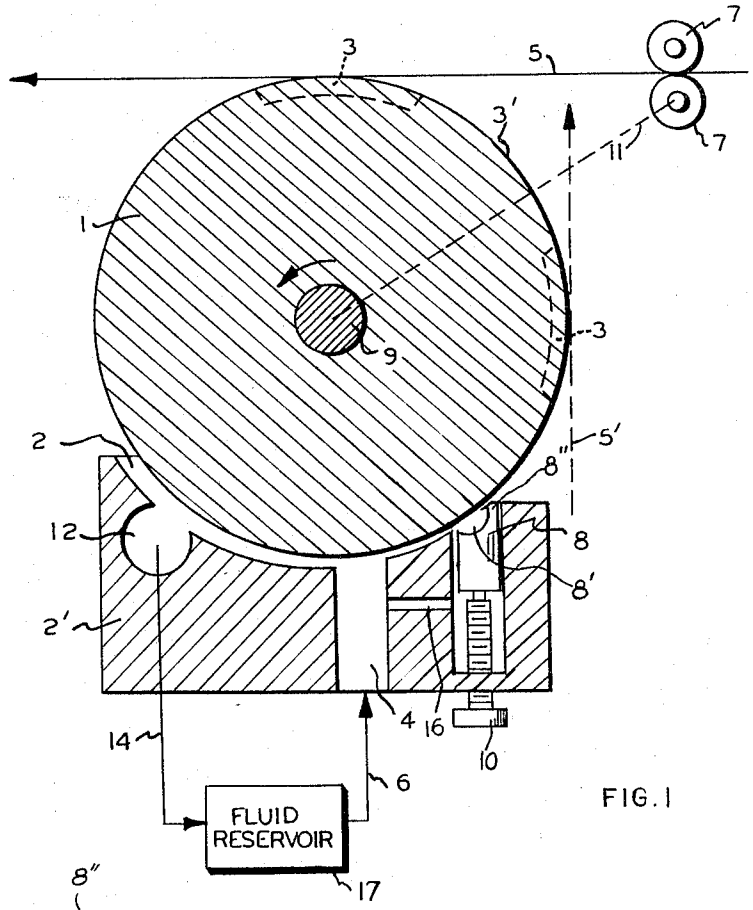


FIG. 1

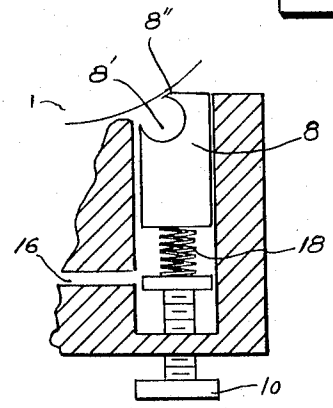


FIG. 2

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FLUID APPLICATOR

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4 Claims. (Cl. 118—261)

This is a continuation of application Serial No. 281,623 filed April 20, 1963 and now abandoned.

The present invention relates to fluid applicators, and, more specifically, to systems for applying predetermined patterns of adhesive melts and similar fluids to web surfaces and the like.

While wheel-type adhesive and similar fluid dispensers have been employed for many decades, the construction of such applicators has required a relatively fixed position of operation thereof to prevent fluid leakage and thus has inherently seriously restricted the possible orientations or directions of travel of surfaces, such as paper webs or the like, that are to be coated with fluid from the applicators or dispensers. In addition, the thickness of fluid applied has often varied.

An object of the present invention, accordingly, is to provide a new and improved fluid applicator that is not subject to these disadvantages, but that, to the contrary, is orientable in many different positions and is adapted for coating paper webs or the like that are traveling along widely different directions.

A further object is to provide a novel fluid applicator that, while particularly useful for the coating of adhesive melts at predetermined regions, is of more general utility, also; it being understood that the subsequent description of the invention in terms of the preferred adhesive-coating application is but illustrative of the many different kinds of fluid-application systems that may advantageously use the novel construction of the invention.

Another object of the present invention is to provide a novel fluid applicator which may be used to apply a thin, highly uniform coating of fluid to a paper web or the like, or which may be used to apply such fluid to predetermined regions only of the web.

Other and further objects will be explained hereinafter and will be more particularly pointed out in connection with the appended claims, the invention now being described in connection with the accompanying drawing, FIG. 1 of which is a longitudinal section of a preferred embodiment; and

FIG. 2 is a fragmentary similar view of a modification.

A fluid-applicator wheel **1**, as of metal or the like, is shown containing a plurality of peripheral fluid-receiving gravure-like depressions **3** distributed about the circumference of the wheel in accordance with a predetermined pattern corresponding to predetermined spaced regions along a sheet-material web **5**, illustrated as horizontally tangentially contacting the wheel at its uppermost point. As later pointed out, where a continuous coating is desired, the depressions **3** may be omitted. The web **5** is driven in the direction of the arrow as by drive rolls **7**, the speed of which may be synchronously adjusted, by conventional means, with respect to the rotating shaft **9** of the wheel **1** (indicated by the schematic synchronizing connection **11**), to insure that the successive fluid-filled depressions **3** contact the successive predetermined regions of the web **5** to coat such regions with fluid.

The wheel **1** rotates through a cavity **2** in a block **2'**, with successive peripheral portions of the wheel receiving fluid introduced into the cavity **2** at an inlet **4**. In the preferred hot-melt adhesive application, the inlet **4** communicates by a conduit, schematically shown at **6**, with a heated adhesive-melt reservoir **17**. Gravity or pressure inlet feed may be employed.

A doctor blade **8** is disposed adjacent the wheel **1** at the right-hand end of the cavity **2** a predetermined small distance from the said wheel in a recess near the region at which successive peripheral portions of the wheel emerge from the cavity **2** during rotation thereof. The doctor blade **8** is adjustable toward or away from the wheel by a set screw **10**. A cutter edge or projection **8''**, substantially tangential to the wheel **1**, serves to slice the fluid carried between the cavity **2** and the smooth surface **3'** of the wheel **1**. At or near the region of the edge or projection **8''**, the speed of rotation of the wheel **1** and of the fluid approximate to each other so that the fluid is not substantially impeded by the presence of the doctor blade **8**, but is actually sliced at **8''** and set into a vortex spin, rotating clockwise within the substantially circular duct **8'** and returning to the wheel periphery ahead of or preceding the cutter edge or projection **8''**. This serves to break surface tension by the differential velocity created by the vortex and insures complete fluid filling of the depressions **3'**; or, in the absence of depressions **3'**, a uniform coating or layer of predetermined thinness along the smooth surface **3'** of the wheel **1**. The cutter edge **8''** is shown preferably extending rearwardly into the upper end of the duct **8'**, which, as shown, has a cross-section extending progressively farther away from the periphery of the wheel and then progressively closer to the periphery of the wheel. It has also been found appropriate, in some applications, resiliently to urge the doctor blade **8** against the wheel, as by a spring **18**, FIG. 2, in which event substantially the only fluid remaining on the periphery **3'** of the wheel **1** after it passes the doctor blade **8** is the fluid received within the depressions **3**. Unlike prior-art doctor-blade systems, moreover, the construction **8–8'–8''** forces the doctor blade in the direction toward the wheel **1** instead of away therefrom. While such prior-art blades can be used for speeds up to about 350 feet per minute before voids appear in the coating of the wheel, speeds of over 700 feet per minute, without voids, have been attained with the present invention.

By limiting the transverse width of the cavity **2** to just slightly greater than the width of the wheel **1**, and providing an overflow outlet **12** near the left-hand end of the cavity **2**, negligible adhesive-melt leakage is produced. When the outlet **12** is connected, as at **14**, back to the reservoir **17**, a complete closed-loop system is provided that has been found, in practice, to operate with the system **1–2'** oriented through a wide range of angular positions of mounting. By making the diameter of the wheel **1** greater than the length (horizontal) of the cavity **2** and block **2'**, moreover, the web **5** may tangentially contact the wheel **1** from the vertical direction **5'** (on either side of the wheel **1**) to the horizontal direction at **5**, thus removing restrictions on the direction of web travel. Excess fluid built up to the left of the doctor blade **8** may be removed through a pressure-relief channel **16** communicating with the inlet **4**.

Clearly, a pair of oppositely constructed systems **1–2'** may be used for such purposes as providing spaced parallel adhesive coatings for book edges or the like; and other arrangements of pluralities of such systems may also be employed.

Further modifications will also occur to those skilled in the art and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A fluid-applicator system having, in combination, a wheel for receiving fluid along the peripheral surface thereof, means for rotating the wheel to contact surfaces-to-be-coated by the fluid, a block housing a fluid-containing cavity through which the successive peripheral por-

tions of the wheel may pass during rotation of the wheel, and a doctor blade supported by the block and disposed adjacent the wheel substantially at the end of the cavity from which the successive peripheral surface portions of the wheel emerge during the said rotation, the doctor blade having a cutter edge oriented to slice the fluid carried thereto to a predetermined thickness, the blade having a duct preceding the cutter edge to receive the sliced fluid and re-deliver the same to the wheel peripheral surface ahead of the cutter edge, said blade being supported on said block for movement toward and away from the periphery of said wheel, said cutter edge having a projection extending substantially tangential to said wheel at said end of the cavity and extending rearwardly a predetermined distance into said duct, said duct having a substantially circular cross-section which extends from said edge progressively farther away from the periphery of said wheel and then progressively closer to the periphery of said wheel.

2. A fluid-applicator system as claimed in claim 1 and in which the wheel is provided with fluid-receiving gravure-like depression means.

3. A fluid-applicator system as claimed in claim 1 and in which means is provided for resiliently urging the doctor blade toward the wheel.

4. A fluid-applicator system as claimed in claim 1 and in which the cavity is provided with a fluid inlet and an overflow outlet, said blade being supported in a recess in said block connected to said inlet by a pressure relief channel in said block, and closed-loop fluid supply means being connected to said inlet and said outlet to enable multiple-position orientation of the system.

References Cited by the Examiner

UNITED STATES PATENTS

1,143,385	6/1915	Haberle et al.	118—261 X
1,932,727	10/1933	Faulkner	118
2,349,732	5/1944	Howard	118—261 X
2,573,336	10/1951	Holmood	118—261 X
2,641,220	6/1953	Weber et al.	118—261 X
2,787,244	4/1957	Hickin	118—212 X

FOREIGN PATENTS

593,341	5/1959	Italy.

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