

July 7, 1970

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3,518,964

COATING APPLICATOR WITH SURROUNDING CHAMBER

Filed May 2, 1968

3 Sheets-Sheet 1

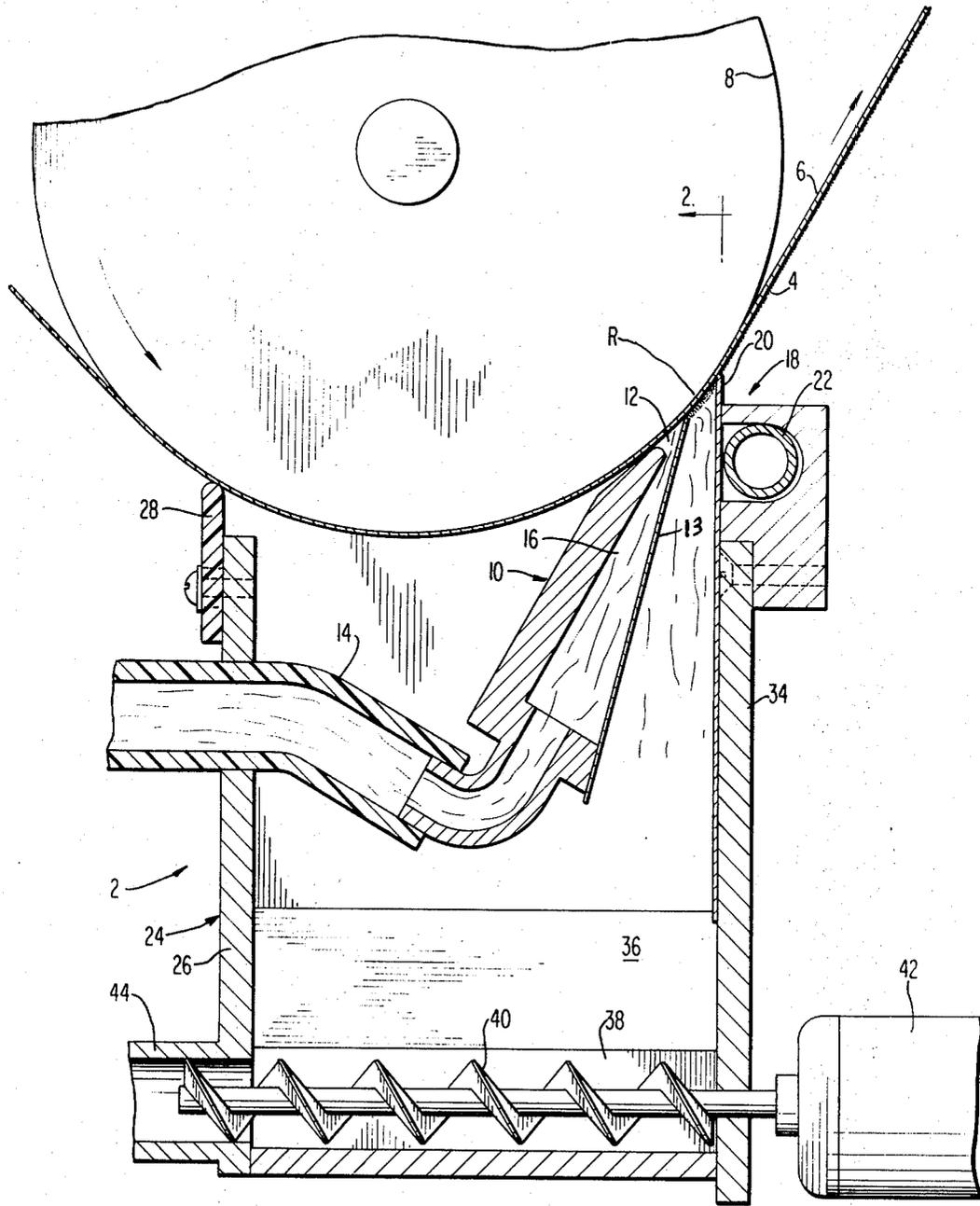


FIG. 1

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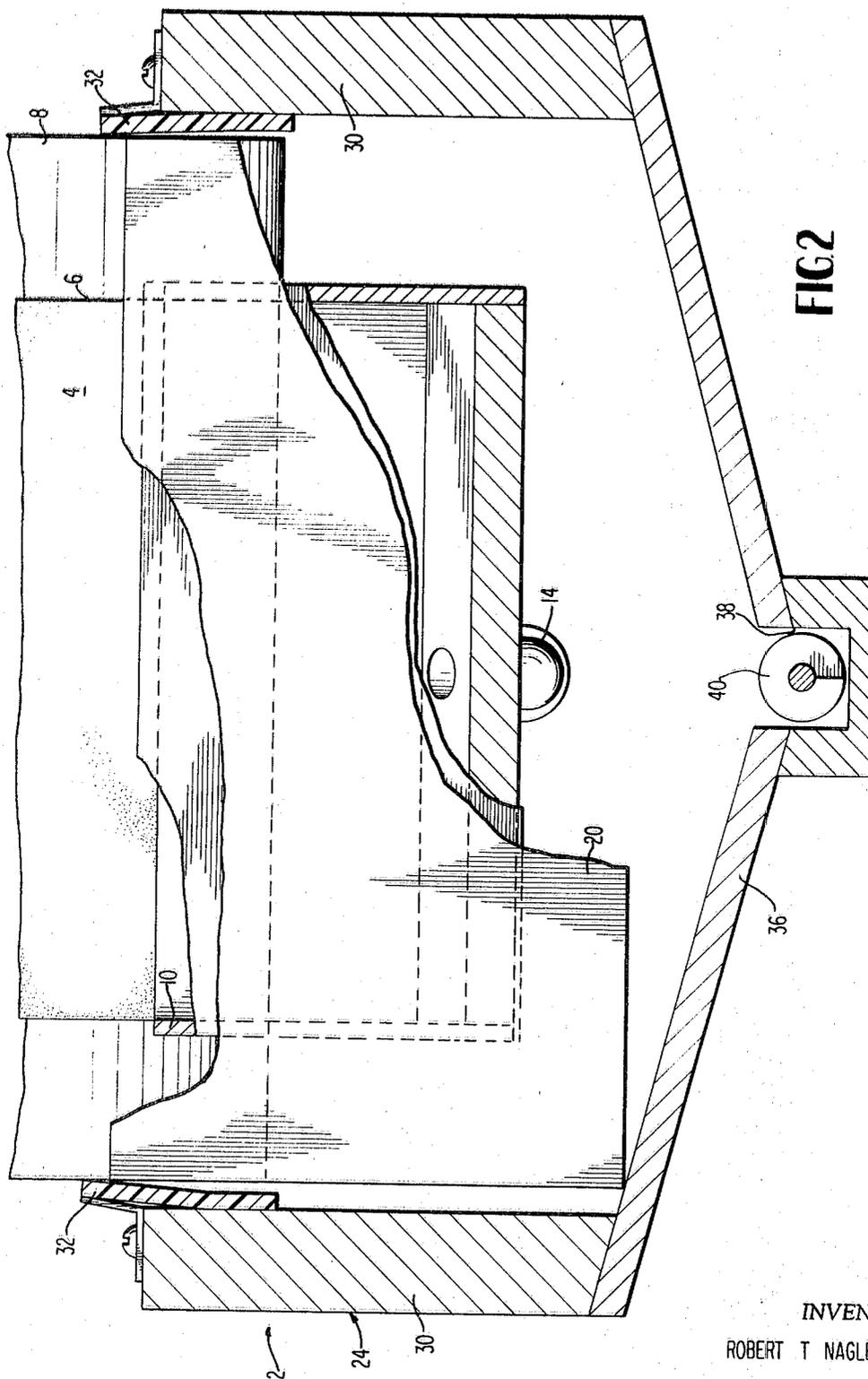
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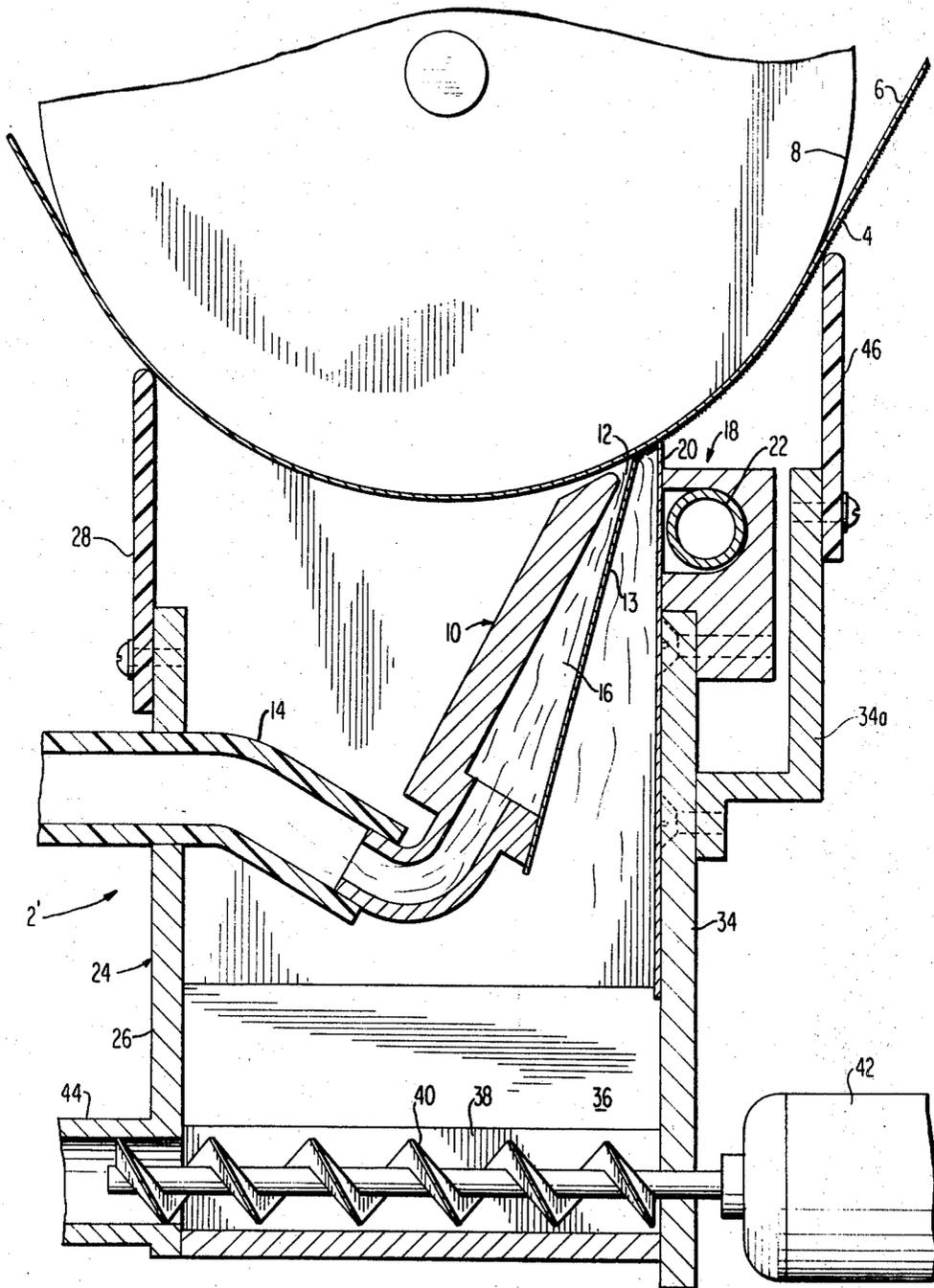


FIG. 3

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3,518,964

## COATING APPLICATOR WITH SURROUNDING CHAMBER

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Filed May 2, 1968, Ser. No. 726,145

Int. Cl. B05c 3/18

U.S. Cl. 118—65

3 Claims

### ABSTRACT OF THE DISCLOSURE

An applicator comprising an elongate slit nozzle for extruding a coating of pasty consistency onto a paper web is disposed beneath the web as the latter passes under a back-up roll. The nozzle is located closely adjacent a doctor so as to limit the residence time of the undoctored coating on the web. In order to eliminate pile-up and hardening of excess coating material, which contains a volatile solvent, on the applicator, the doctor, and in the space therebetween, the nozzle and the upstream side of the doctor are enclosed in a housing which becomes saturated with solvent vapors and maintains the coating material sufficiently plastic so that it drops by gravity to a trough in the bottom of the housing, from whence it is returned for remixing with the coating supply material.

Bushnell 2,831,211 and Beck 2,815,307 disclose applicators enclosed in housings which become saturated with solvent vapors from the applied material, but the applicators and housings are disposed above the web and have no comparable arrangement for the dropping of excess coating material away from the region between the applicator and doctor, nor any comparable means for returning the excess coating material to the supply.

Rhodes and McGladrey 2,285,531 shows a pool type applicator working against the underside of a web as the latter passes beneath a back-up roll, wherein an air loaded flexible doctor blade constitutes the trailing boundary of the pool. However, this applicator does not limit residence time of the coating mixture, nor does it provide a separate return path for the excess material.

The primary object of the invention is to provide an applicator capable of applying thick, viscous coating material to a paper web. The composition of the coating material is not important, other than to note that it is of about the consistency of toothpaste, and that it is resinous and contains a volatile solvent which can rapidly evaporate in air. If the coating is applied by conventional means in open atmosphere, an unmanageable build-up of excess material occurs between the applicator and the doctor, lumps and hard spots occur, and the web coating becomes streaked. More specifically, the objects are to mount the applicator beneath the paper web, provide a relatively small housing which encloses the applicator and the upstream side of the doctor so that the atmosphere within the housing stays saturated with solvent vapors, to provide a collection trough in the bottom of the housing so that excess coating material will drop into it, and to provide a feeder in the trough for forcing the excess material through a return line.

These and other objects will be apparent from the following specifications and drawings, in which:

FIG. 1 is a vertical longitudinal cross section through the applicator assembly and doctor;

FIG. 2 is a vertical transverse cross section along the lines 2—2 of FIG. 1; and

FIG. 3 is a vertical longitudinal cross section through an applicator assembly essentially like that shown in

FIGS. 1 and 2, but wherein the air-loaded doctor blade does not necessarily constitute a seal, or the only seal, at the trailing side of the enclosure.

Referring now to the drawings, in which like reference numerals denote similar elements, the applicator assembly 2 is for applying a thin coating 4 of thick viscous resinous material containing a volatile solvent to the underside of a paper web 4 as the latter runs under a back-up roll 8. The coating is applied by an elongate transverse nozzle 10 which has a slit mouth 12 pressed closely enough to web 6 so that the coating material may be extruded with considerable force against the web. Leading to the interior of nozzle 10 is a material supply tube 14 through which the material 16 is forced from a suitable source of supply, not shown. In actual practice, a plurality of supply tubes 14 would be arranged across the width of nozzle 10, due to the viscous nature of the coating material for which the applicator is designed. The source of supply is conventional, but, as will be hereinafter apparent, supply tube 14 provides a supply path for the material from the source of supply, and there is a return path for excess material to the supply source which is different from the supply path.

Nozzle 10 is disposed closely adjacent a doctor 18 whose blade 20 rides against web 6 and spreads the coating 4 uniformly. It is noteworthy that applicator 10 not only has a narrow slit mouth 12, which assists in limiting the residence time of undoctored coating material on the web, but also that the trailing side of the applicator is formed by a blade 13 which functions as a pre-doctor to limit the thickness of the coating in transit to doctor 18. Doctor 18 may be variously formed in accordance with conventional practices, the doctor diagrammatically shown being of a generally available type whose blade 20 is resiliently pressed against the web by an expansible tube 22. In the embodiment of FIGS. 1 and 2, doctor 18 forms the trailing side of an enclosure 24 which surrounds nozzle 10.

Enclosure 24 has a front wall 26 provided at its top with a seal 28 which rides against web 6, and side walls 30, 30 with seals 32, 32 which seal against the sides of back-up roll 8. The bottom 36 of the enclosure is pitched downwardly towards a trough 38 in which runs a suitable impeller, such as screw 40 driven by a suitable source of power 42. Various types of impellers may be used, so long as they force the excess coating material which gravitates to trough 38 into a return pipe 42 which leads eventually to the source of coating material.

Nozzle 10 is supported within enclosure 24 by suitable means, not shown, preferably so that it may be adjusted towards and away from doctor 18, but in any event the nozzle should be close to the doctor so that the residence time of the undoctored coating material is relatively short. But for this invention, an unmanageable mass of coating material would build up and harden between the nozzle and doctor in the region generally designated R and therebelow. The excess coating material would harden, and lumps would form, thereby not only rendering it difficult if not economically unfeasible to reclaim, but also causing streaks in the doctored coating. However, due to the enclosure, the interior thereof rapidly becomes saturated with solvent vapors. The excess coating material remains sufficiently plastic so that it drops down between nozzle 10 and doctor 18 and drains into trough 38, from where it is driven by impeller 40 into return tube 44. After web 6 passes beyond doctor 18 the remaining solvent in the coating is driven off by conventional heating means and recovered.

FIG. 3 shows an applicator essentially like the one previously described, wherein similar reference numerals denote similar elements. However, instead of using doctor

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18 as the seal, or the only seal for the downstream side of enclosure 24, there is an additional trailing wall portion 34a supporting a seal 46 downstream of doctor 18. Seal 46 should not frictionally engage coating 4 but, by being spaced a few thousandths of an inch away, it provides a sufficient barrier so that loss of solvent vapor can be held to tolerable levels. In this example, the side seals 32 would extend around to seal 46, and the doctor blade 20 need not extend so far across the width of the back-up roll 8.

In both embodiments there is provided a vapor-saturated, enclosed return path for the excess coating material, and a separate path for the excess material from the enclosure. Return by separate path rather than immediate recombination with a bulk supply of coating material makes it possible to remove contamination, such as paper fibers, from the return material and it also makes it possible to add additional solvent to the returned material to make up that which is lost by absorption into the web. Also, in both instances, solvent strike-in is limited by the short residence time and limitations of thickness of undoctored coating material on the web. This is particularly important in an applicator such as this which is designed for coating media using non-aqueous solvents which dissolve organic polymeric binder material, wherein solvent strike-in involves not only a cost penalty due either to loss of solvent or increased expense of solvent recovery, but also control of the depth of penetration of dissolved binder into the web. Since the pigment component remains on the surface, binder carried into the fibrous substrate contributes little or nothing to the adhesion of the pigment layer to the paper surface.

I claim:

1. An applicator assembly for applying a thin coating of viscous pasty material containing a volatile solvent to a moving web of paper traveling under a back-up roll comprising:

applicator means having a mouth extending transversely of the web and disposed on the underside of the web beneath the back-up roll for applying said material onto the underside of said web, coating material supply conduit means for supplying said material to said applicator,

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doctor means for forming a thin coating of the applied material on the underside of said web,

said doctor means being spaced beyond said applicator means in the downstream direction of web travel from said applicator means,

means including a wall spaced from the applicator means in the upstream direction of web travel and having an upper edge sealingly engaging against the underside of said web forming an enclosure surrounding said applicator means and the space between said applicator means and said doctor means for confining solvent vapor from said material,

said enclosure having a lower portion disposed below said applicator means and the space between said applicator means and the doctor means,

means in the lower portion of the enclosure for collecting excess material dropping from between said applicator means and said doctor means, and means for exhausting collected material from said enclosure.

2. The combination claimed in claim 1, the mouth of said applicator means being of substantially slit form and including a blade forming the trailing side thereof as determined by direction of web travel.

3. The combination claimed in claim 1, said enclosure further including a wall spaced from the doctor means in the downstream direction of web travel and having an upper edge closely spaced from the underside of the web.

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U.S. Cl. X.R.

118—126, 410