Aug. 14, 1945. C. F. SCHAEFER 2,382,920

STENCIL COATING MACHINE

Filed Nov. 18, 1941 6 Sheets-Sheet 1

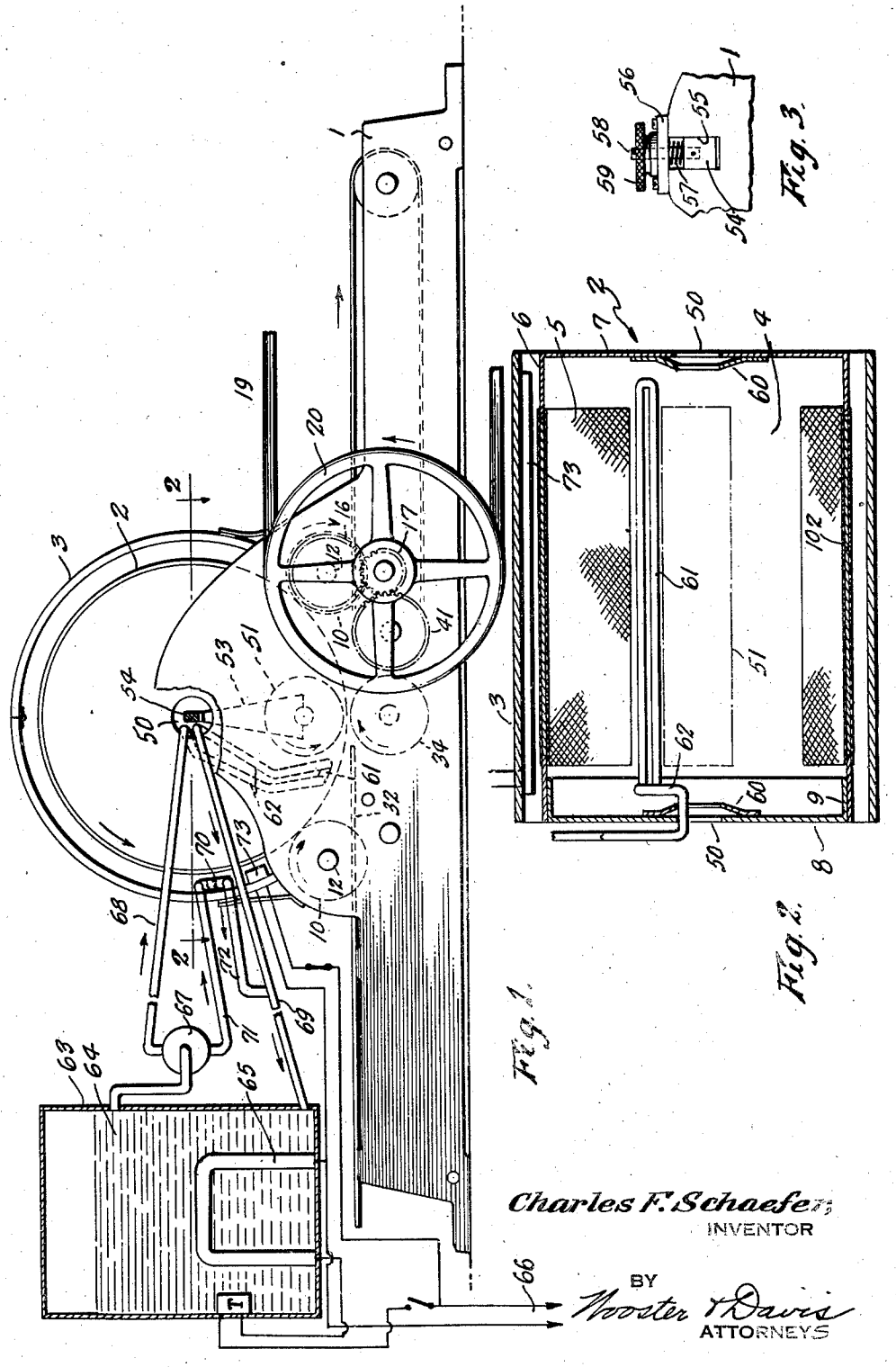


Fig. 1.

Fig. 2.

Fig. 3.

Charles F. Schaefer
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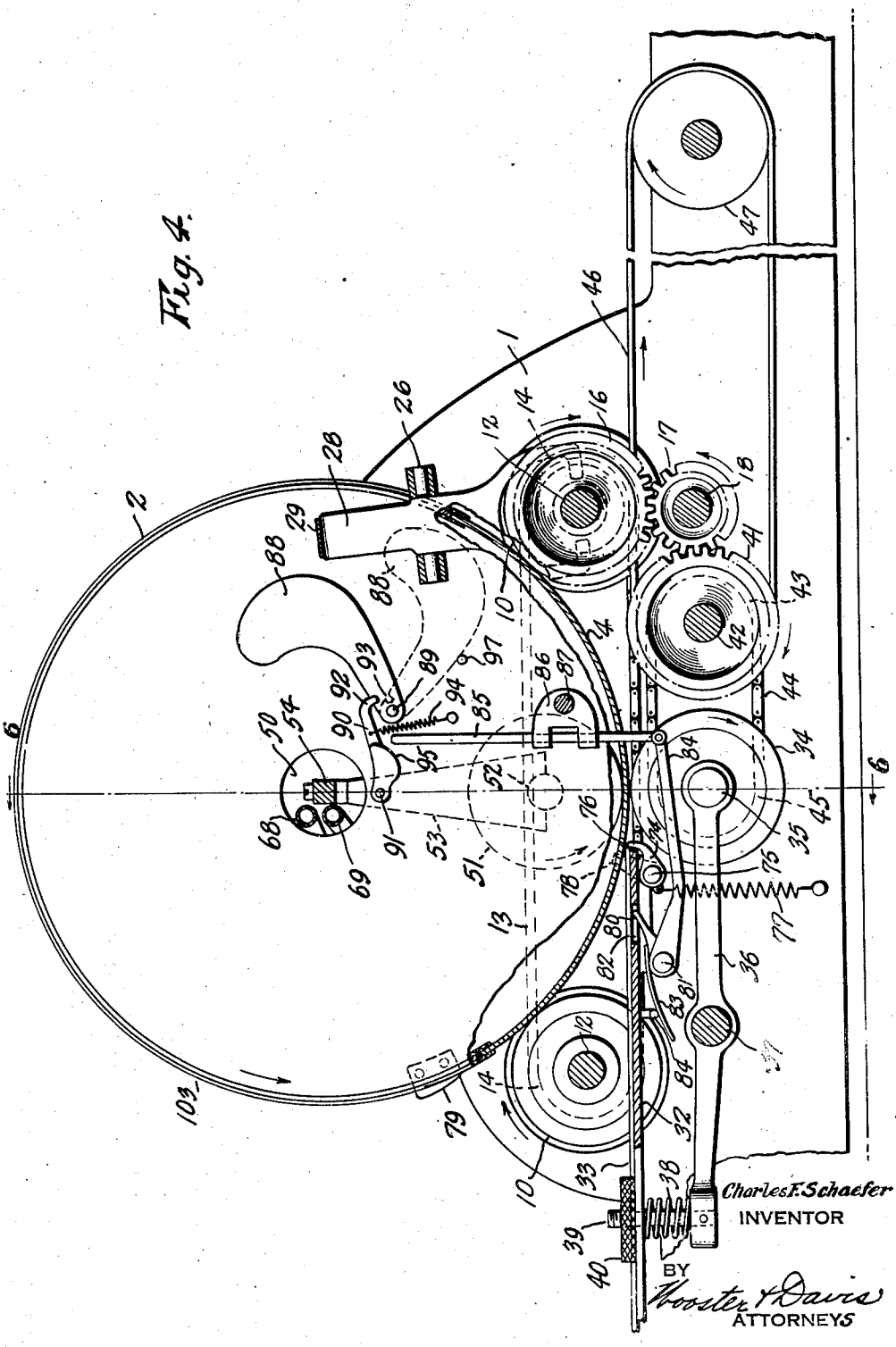
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STENCIL COATING MACHINE

Filed Nov. 18, 1941 6 Sheets-Sheet 2

Fig. 4.



Aug. 14, 1945. C. F. SCHAEFER 2,382,920

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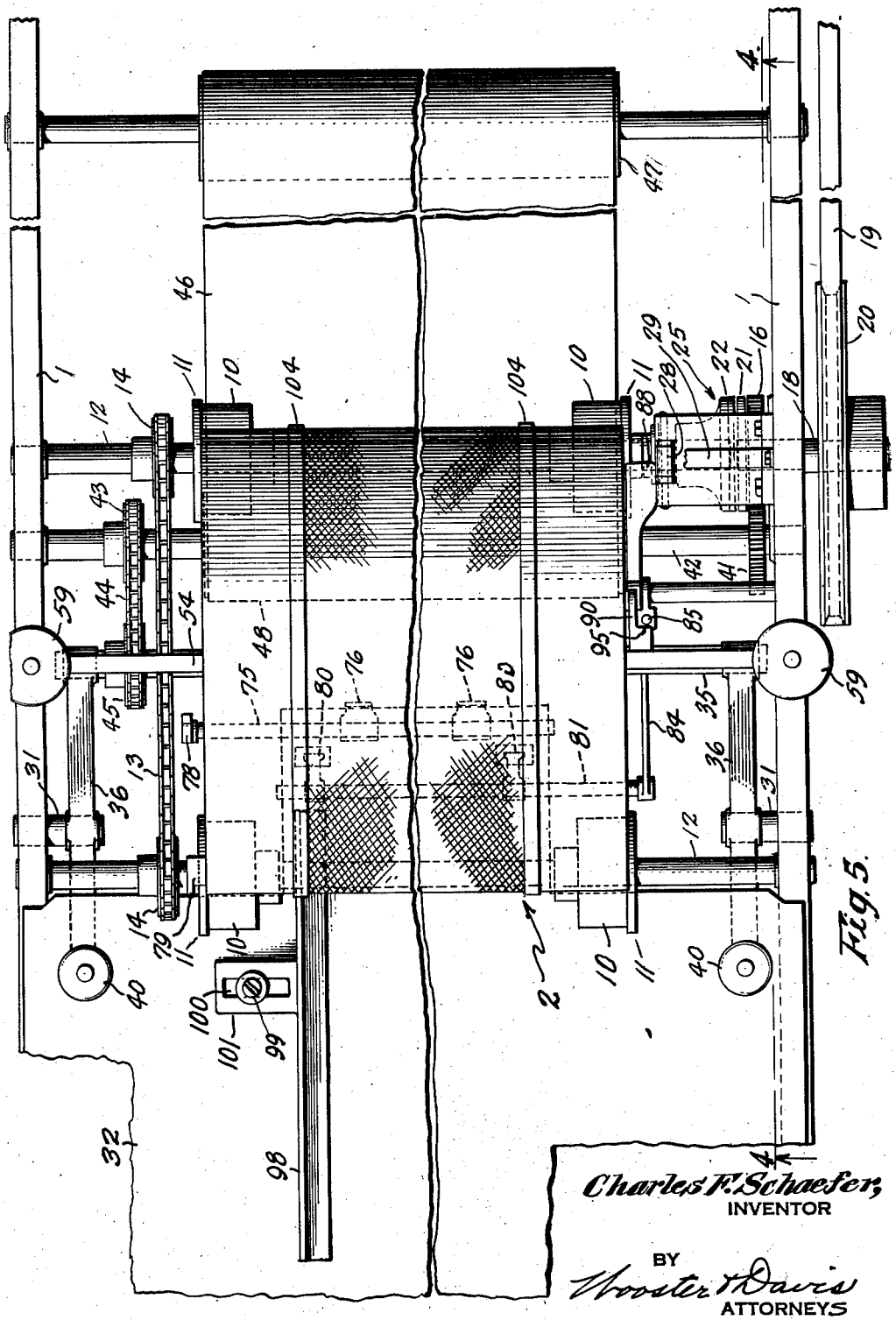


Fig. 5.

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STENCIL COATING MACHINE

Filed Nov. 18, 1941 6 Sheets-Sheet 4

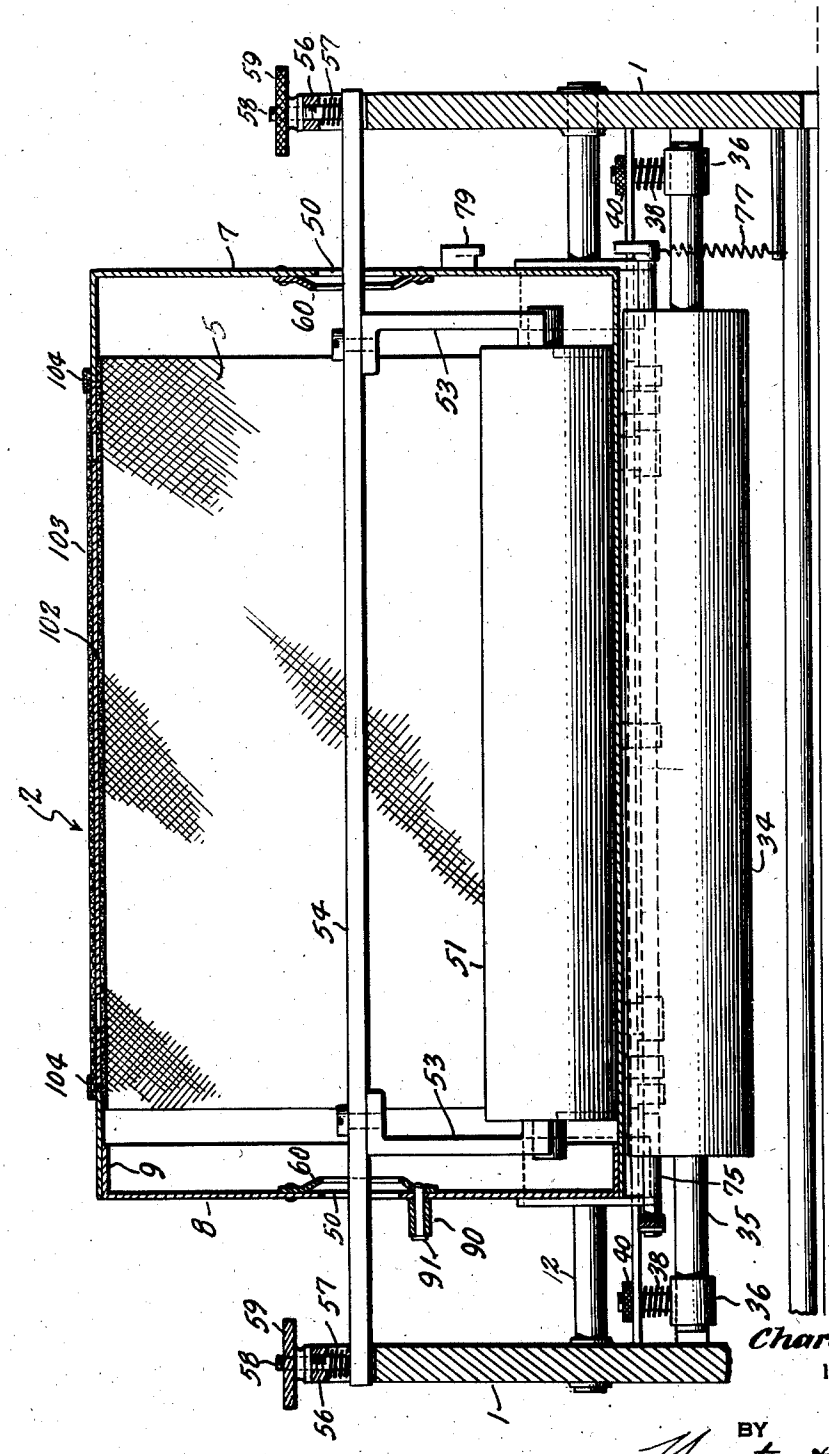


Fig. 6.

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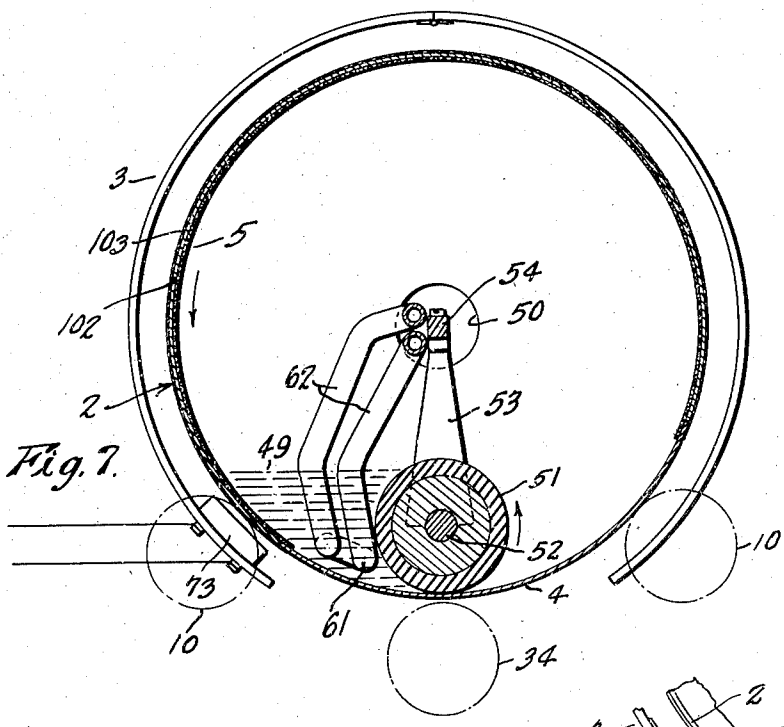


Fig. 7.

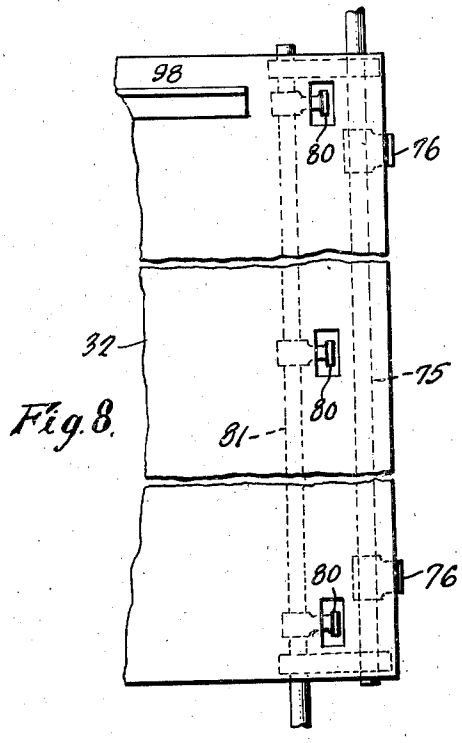


Fig. 8.

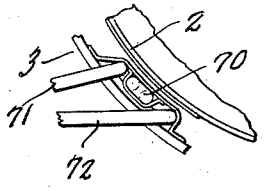


Fig. 9.



Fig. 10.

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Aug. 14, 1945. C. F. SCHAEFER 2,382,920

STENCIL COATING MACHINE

Filed Nov. 18, 1941 6 Sheets-Sheet 6

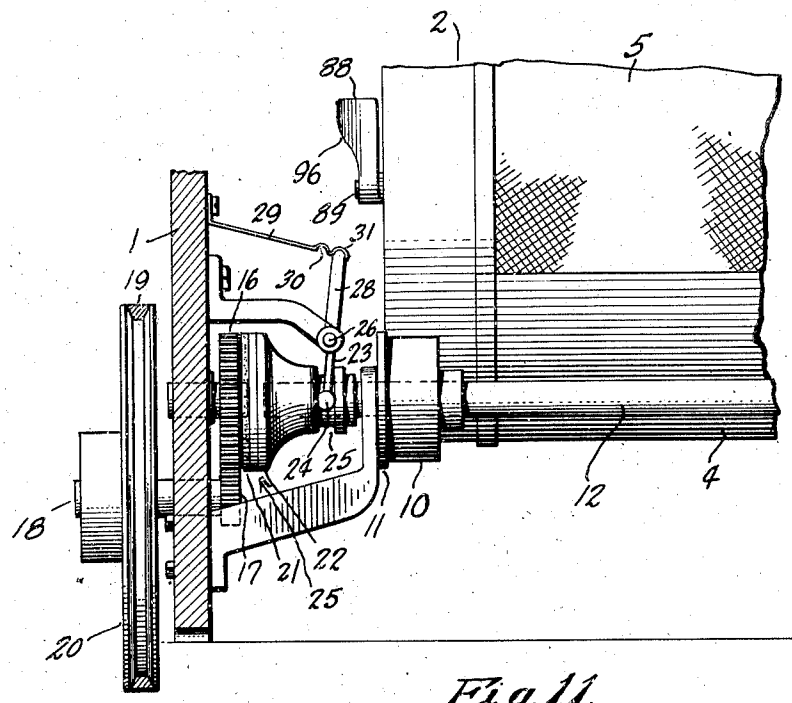


Fig. 11.

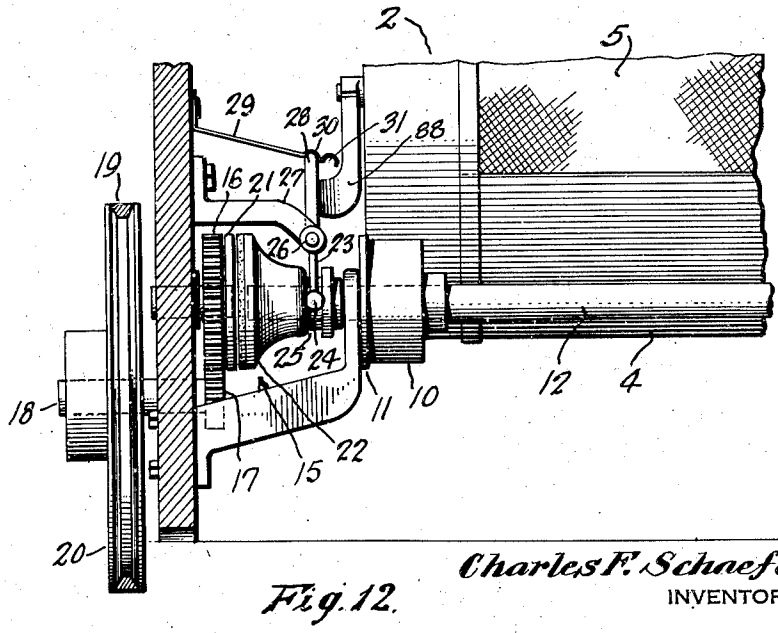


Fig. 12.

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Patented Aug. 14, 1945

2,382,920

UNITED STATES PATENT OFFICE

2,382,920

STENCIL COATING MACHINE

Charles F. Schaefer, Westport, Conn.

Application November 18, 1941, Serial No. 419,540

10 Claims. (Cl. 101—120)

This invention relates to a stencil coating machine, more particularly to a machine of this character employing a rotary stencil drum for applying semi-liquid material or material sufficiently viscous so that it must be forced through the stencil or screen, such for example as adhesives, paints, varnish, waxes and paraffine, lacquers, enamels, cements, wax-carbon solutions, and similar materials, applied either at normal temperatures, or heated or cooled to proper working temperature, and has for an object to provide such a machine with improved and more efficient means for forcing the material through the stencil to the article to be coated to give a more uniform application of the material. The coatings can be applied in spots, stripes, irregular designs, as well as full coverage on one side of sheets. The problems involved in this type of coating are quite different from the mimeograph machine intended for printing purposes with thin inks.

It is also an object of the invention to provide a construction which will maintain the temperature of the coating solution at substantially the constant and desired degree to maintain the solution at the proper and uniform consistency, and this may involve either cooling or heating the solution, but more generally heating. It is a further object of the invention to provide a simplified construction, especially a simplified stencil drum operating as a container for a quantity of the coating solution, which may be easily removed and dismantled for cleaning purposes and changing the stencil. Another object is to provide an improved construction and arrangement whereby should an article to be coated fail to be fed to the machine the stencil drum will be automatically stopped with an imperforate portion at the lower part thereof and opposite the feeding roll so that the coating solution will not be forced onto the feeding roll.

Still another object is to provide an arrangement for uniformly carrying the coated articles from the machine at the proper speed to prevent smudging or irregular application of the coating solution, and involving a movable conveyor operated at the desired speed.

With the foregoing and other objects in view I have devised the construction illustrated in the accompanying drawings forming a part of this specification. It, however, is to be understood that the invention is not confined to the exact details and arrangement shown, but may include various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a side elevation of the machine with parts broken away;

Fig. 2 is a detail horizontal section substantially on line 2—2 of Fig. 1;

Fig. 3 is an elevation of one mounting for the pressure roller;

Fig. 4 is a vertical longitudinal section substantially on line 4—4 of Fig. 5, the hood being omitted, and with various parts broken away;

Fig. 5 is a top plan view, the hood enclosing the drum and the heating means for the solution being removed;

Fig. 6 is a vertical transverse section substantially on the line 6—6 of Fig. 4, the hood being omitted;

Fig. 7 is a transverse section through the drum showing the hood in elevation;

Fig. 8 is a top plan view of one end of the feed table;

Fig. 9 is an end elevation of a portion of the drum and hood showing one form of heating means;

Fig. 10 is a perspective view of one of the automatic control stops for the feed;

Fig. 11 is a partial vertical section and partial elevation of the drive means and automatic control showing it in operative or driving position, and

Fig. 12 is a similar view showing it in released or stopped position.

This device was developed primarily for applying relatively heavy coating materials to various articles, or that is solutions in semi-liquid condition or sufficiently viscous to be required to be forced through the stencil or screen in being applied to the article, such for example as paper, leatherette and cardboard articles. The material applied may for example be adhesives, including glues and similar materials or pastes, either clear or with pigments for coloring purposes, etc., examples being spot gluing for double easels, cardboard cartons, containers, leatherette and similar articles.

The device includes a suitable base comprising upright side members 1 in which the various elements of the device are mounted, including the rotatable stencil drum 2 enclosed in a suitable hood 3 spaced outwardly a suitable distance from the drum. The drum comprises a hollow shell having a portion 4 imperforate and another portion either perforate or covered by a suitable screen 5, the perforate or screen portion comprising about two-thirds of the face of the drum. The drum may be of various constructions, but

is preferably made of two sections comprising the body section 6 closed at one end by the wall 7 and a closure 8 at the other end having flanges 9 telescoping with the open end of the body 6 and secured by any suitable means, such as screws for example, not shown, for easy application and removal. The drum is mounted on suitable rollers 10, there being two of these rollers at each of the opposite ends of the drum and spaced on opposite sides of the vertical plane through the axis of the drum so that the drum may be removed by merely lifting it from the rollers. It is rotated by friction from these rollers which are driven by a suitable driving means presently to be described, the rollers preferably being rubber covered to give the proper grip on the drum to frictionally drive it and may have flanges 11 at the ends of the drum to maintain the drum in proper position. The pair of rollers on each side of the drum are mounted on a shaft 12 running in suitable bearings in the side members 1, and the two shafts are connected together so as to be driven at the same speed by a chain drive 13 running over suitable sprockets 14 on the shafts.

One of these shafts, in the present case the shaft on the outlet side of the drum, is driven through a releasable friction clutch 15 which is in turn driven through suitable gears 16 and 17 from the main drive shaft 18 driven from any suitable source of power, not shown, by means of a suitable belt 19 running over the pulley 20 on this shaft. The clutch 15 comprises a friction disc 21 rotatable with the gear 16 and sliding friction member 22 splined on the shaft so as to be slidable longitudinally thereon but to drive the shaft when in engagement with the disc 21. The member 22 may be shifted to or from engagement with the disc 21 to drive or stop the drum by means of a lever 23 having rollers 24 running in a groove 25 in the shiftable element and pivoted at 26 on a bracket 27. The upper arm 28 of this lever is located a short distance from one end of the stencil drum 2 in a position to be operated by an automatic stop mechanism to shift the element 22 to stop rotation of the drum under certain conditions. The clutch element is held in the on and off positions by a spring 29 having recesses or notches 30 and 31 engaging the lever 23 to hold it in the two positions.

During operation the drum 2 is rotated counterclockwise as viewed in Figs. 1, 4 and 7, and on the forward side is a feed table 32 to support the article 33, such for example as a sheet of cardboard or a carton or container in the flat condition, and it is fed by hand between the drum 2 and the pressure feed roller 34 under the drum and extending longitudinally thereof throughout the length of the drum. This feed roller is mounted on a shaft 35 supported at its opposite ends in supporting levers 36 pivoted at 37 in the side members 1. Yieldable spring pressure is applied to this roller by the coil springs 38 on screws 39 carried by an arm of the lever 36 on the opposite side of the pivot 37 and passing through the feed table 32. Adjustable nuts 40 are threaded on the screw 39 and engage the top of the table 32 to limit downward movement of the screw and thus limit upward movement of the feed or pressure roller 34 toward the stencil drum, and the limit of this movement may be varied by adjusting the nuts 40. They are usually adjusted so that when there is no article to be coated between the stencil drum and the roller 34 the roller is spaced a short distance from the drum so as not to contact the drum to pick up coating solution therefrom, but the spacing is less than the thickness of the article to be coated so that when the article is fed between the stencil drum and the roller the roller is forced downwardly against the pressure of the springs 38, which thus apply pressure to the roller to press the article against the lower side of the stencil drum for the feeding and coating operation.

The feed and pressure roller 34 is driven from the main drive shaft 18 by a gear 41 meshing with the drive pinion 17 mounted on a transverse shaft 42. This shaft carries a sprocket 43 in turn driving a chain 44 running over a sprocket 45 on the shaft 35 carrying the roller 34, the gearing driving this roller and the drum being so proportioned that the surface speed of the roller is the same as that of the stencil drum.

On the outlet side of the stencil drum is mounted a movable conveyor 46 for receiving the coated article and carrying it away from the drum at the proper speed so that it is neither pulled too rapidly or retarded to cause smudging or irregular application of the coating, as might occur where the article is removed by hand. This conveyor is preferably an endless conveyor, either a strip of canvas or other suitable material, running over drums 47 and 48, or it could comprise any suitable number of narrow strips spaced laterally, and it is driven with a surface speed substantially that of the stencil drum. The drum 48 is mounted on the shaft 42 so that the conveyor is driven from the main drive shaft 18 by the gears 17 and 41.

The drum 2 forms a container for a quantity of the coating solution indicated at 49 Fig. 8. The relatively large openings 50 in the end walls of the drum provide easy access to the interior of the drum for feeding the material thereto and maintaining the proper amount of the material in the drum. Means is provided submerged in this material for forcing it through the screen and the stencil on the surface of the drum comprising a rubber covered pressure roller 51 extending longitudinally throughout substantially the full length of the drum and engaging the lower interior wall of the drum so as to be frictionally driven thereby, this roller acting as the drum rotates to force the proper amount of the coating solution through the stencil onto the article to be coated, passing between the drum and the pressure or feed roller 34. This roller 51 is mounted on a shaft 52 having bearings at its opposite ends in upright standards 53 secured to a transverse bar 54. This bar is preferably noncircular and is held against turning but to permit vertical movement by being guided in upright notches 55 (Fig. 3) in the side members 1. A block 56 extends across over the top of each of these notches and forms an abutment for a spring 57 resting at its other end on the bar 54 and embracing a threaded stud 58 secured to the bar and passing through the block 56 with an adjusting hand nut 59 threaded on the stud above the block to adjust the tension of the spring and therefore the pressure of the roller 51 against the inner surface of the drum 2. The bar 54 extends longitudinally through the drum and the openings 50 in the end walls thereof so as to be supported on the side members 1. As the openings 50 are of relatively large size it is preferred to provide a deflector disc 60 on the inner side of the end walls of the drum surrounding this opening and at its central portion being spaced from the end walls of the drum to prevent the

solution dripping or splashing through the end openings 50.

Means is provided for maintaining the temperature of the coating solution 49 substantially constant and at the proper degree. This may comprise various constructions or arrangements to employ various heating or cooling mediums such as electricity, steam, hot water, oil or other fluid. It could be an electric heater in the drum 2 and immersed in the solution, but because with such an arrangement the material might burn or char on the heater it is preferred to use a fluid heater, such for example as steam, water or oil pipes immersed in the coating solution, as shown in Figs. 1, 2 and 7, at 61. The arrangement shown comprises a pipe extending longitudinally of the drum immersed in the solution in front of the pressure roller 51. Two runs of this pipe are shown, but of course any number may be used as desired to secure the proper amount of surface for either heating or cooling the solution, usually heating being required to maintain it at the proper consistency to be forced through the stencil uniformly and at the proper rate for most satisfactory results. The pipe 61 connects with substantially radially extending pipes 62 extending upwardly in the drum and passing outwardly through the opening 50 in one end of the drum to a suitable heater or cooler 63. As the solution is generally heated the drawing illustrates heating means, but it will be understood that should the conditions require cooling of the solution a cooling medium can be circulated through the pipes 61 instead of a heating medium. The heater 63 may contain water or oil 64 heated by any suitable means, preferably an electric heating unit 65 supplied from any suitable source of current 66, and the operation of this heater is automatically controlled by a thermostat T immersed in the liquid to maintain it automatically and uniformly at the proper temperature. Heated liquid is circulated from this heater to the pipes 61 by means of a pump 67 driven by any suitable means such as an electric motor, not shown, and discharging through a pipe 68 connected to one of the upright pipes 62. After passing through the submerged pipe 61 it passes to the other pipe 62 and return pipe 69 back to a heater 63. It may be desirable to also supply heat to the outside of the stencil drum 2 and within the hood 3. For this purpose there may be one or more pipes 70 mounted on the inside of the hood in the space between the hood and drum and extending longitudinally thereof having its ends connected to the pump 67 and return pipe 69 by the pipes 71 and 72 to form a supply and return for circulation of the heating or cooling medium through the pipes 70, or if preferred an electric heater 73 mounted on the inner side of the hood may be used either with and as a supplement to the heater 70 or instead of the heater 70, and controlled by the thermostat and supplied with current from the source of supply. These effectively supply heat to the space between the hood and drum and to the outside of the drum.

The means for automatically stopping rotation of the drum when there is no article being fed to the drum and the feed roller comprises a series of stops on the feed table and trip levers operating certain control mechanism. The stops are shown at 74 mounted on a transverse shaft 75 with their free ends 76 located at the inner end of the table immediately in front of the space between the drum 1 and the feed roller 34, and a spring 77 tends to hold the free ends 76 in their upper position projecting a short distance above the top surface of the table 32. As soon as one sheet 33 passes between the drum and feed roller so as to pass off the ends 76 of these stops, the springs 77 will swing them to the upper position so their upper ends project a short distance above the table, and as the next sheet 33 is fed forwardly along the table by the operator its forward edge engages these stops, as shown in Fig. 4, to hold the sheet in this position until the proper time for feeding it to the drum for the coating operation. This time is determined by an automatic trip operated by the drum there being a pawl 78 mounted on the shaft 75, which when the stops 76 are in the upper position is raised with its free end projecting into the path of movement of a cam 79 carried by the drum. As the drum rotates to bring the stencil over the feed roller 34 this cam 79 at the proper time engages the pawl 78 forcing it forward or clockwise, as viewed in Fig. 4, and forcing the stops 76 downwardly away from the end of the article 33 to release it and permit it to be fed between the drum and roller 34. The drum continues to rotate and with the feed roller 34 to pass the articles between the drum and roller as long as they are fed along the table by the operator, the stops 76 being released on each revolution at the proper time to permit the article to be coated to be fed to the coating position. The coated sheets as they leave this position pass onto the constantly moving conveyor 46 and are carried by this conveyor away from the coating position at the proper and uniform speed so that there is no danger of smudging or otherwise marring the coating, the coated sheets being removed at the free end of the conveyor.

As above suggested, improved means is provided for automatically stopping rotation of the drum 2 with the imperforate portion 4 thereof on the bottom or lower side, should for any reason a sheet 33 not be fed to the machine. This automatic stop 79 comprises a series of trip levers 80 mounted on a transverse shaft 81 located under the table and arranged with their free ends to project through openings 82 in the table. One or more springs 83 secured to the levers and engaging a stop 84 tends to swing these levers to their upright position with the free ends extending through the openings 82 and projecting a short distance above the top of the table. Mounted on the shaft 81 is a lever 84 connected to an upright trip rod 85 mounted in a guide bracket 86 pivoted at 87 to one of the upright side members 1. Pivoted on one end wall of the drum 2 is an eccentric or weighted lever 88 pivoted to the drum at 89 and normally held in its elevated or full line position of Fig. 4 by a catch 90 pivoted to the head at 91 and having a hooked end 92 to seat in a notch 93 or engage a shoulder on the lever 88, a spring 94 tending to swing it to the holding position and hold it therein. The catch 90 also includes a cam 95 arranged with its path of movement in alignment with the free end of the trip rod 85 to engage the end of this rod and shift it under certain conditions, but to move by it without tripping it under certain other conditions. The eccentric lever 88 has a cam surface 96 (Fig. 11) to engage the arm 28 of the clutch lever 23 when this eccentric 88 is released to permit it to drop to the dotted line position of Fig. 4, this movement being limited by a suitable stop 97.

The operation of this device is as follows: As previously indicated, as long as articles 33 are being fed to the machine and there is therefore

one of these articles on the feed table 32, it will engage the free ends of the trip levers 80 and hold them depressed or in the position shown in Fig. 4. However, should the operator stop feeding articles to the machine or for some other reason an article is not placed on the feed table at the proper time, the springs 83 would raise the stop levers 80 so that their free ends will project above the table. This action will swing the free end of the lever 84 upwardly to raise the trip rod 85 so that its free end will be in the path of movement of the cam 95 carried by the drum. Then as the drum rotates beyond the position shown in Fig. 4 this cam 95 will engage the end of the rod 85 and will force the catch 90 upwardly to remove its free end 92 from the notch 93 to release the eccentric cam lever 88. This lever will therefore fall by its own weight to the dotted line position Fig. 4, and as it does so will engage the arm 28 of the lever 23 which is in the position of Fig. 11 and will swing this arm to the left as viewed in this figure, from the position of Fig. 11 to the position of Fig 12. This will shift the movable member 22 of the clutch 15 from the driving plate 21 and will thus disconnect driving connection to the supporting friction rollers 10 of the drum and will stop rotation of the drum. This trip mechanism 88 is so located on the drum 2 that it releases the driving clutch 15 at a time when the imperforate portion 4 of the drum is the lower side of the drum over the feed roller 34, and therefore coating solution cannot be forced through the drum by the pressure roller 51 when in this position to cause solution to be fed to the surface of the feed roller. The clutch lever is held in this position by the spring 29 until the clutch is again shifted to the driving position by the operator. When the operator wishes to again start the stencil drum 2 he places an article to be coated 33 on the feed table which forces the trip levers 80 downwardly and also the trip rod 85. He then swings the eccentric trip lever 88 from the dotted to the full line position of Fig. 4 where it is automatically caught and held by the catch 90. He then swings the clutch lever 23 from the position of Fig. 12 to the position of Fig. 11 again setting the drive clutch in operation to start rotation of the drum, which operation is continued until the clutch is again tripped either by hand or by the eccentric lever 88.

A guide for the articles being coated is provided on the top of the feed table 32 so that these articles will all be fed to the drum in proper relation to the stencil. In the present case this comprises an angle guide 98 mounted on the top of the table to guide one edge of the articles being fed to the machine. It is secured to the table for adjustment longitudinally of the drum by any suitable means such as a clamping screw 99 mounted on the table and passing through an elongated slot 100 in the lug 101 on the back of the guide.

The stencil indicated at 102 made of cloth, rubber, treated paper, etc., is placed over and drawn tightly around the perforated portion 5 of the drum and fastened with screw clamps. If desired there may be a fine metal or cloth screen 103 on the outer side of the stencil, the stencil, and the screen if used, being clamped to the drum by any suitable means such as clamping bands 104 clamped about the drum and the stencil by any suitable means such as screws, not shown.

To clean the stencil all that is necessary is to release the blocks 56 when the drum and the bar 54 together with the pressure roller 51 may be lifted from the machine by merely lifting it off the supporting rollers 10. Then the head 8 may be removed from the drum permitting removal of the bar 54 and the roller 51 by drawing it out through the open end of the drum. This exposes all parts of the drum so that it may be readily and easily cleaned and then the roller and its supporting bar 54 may be reinserted in the drum, the removable head 8 placed in position and the assembled drum again mounted on the rollers 10 and the bar 54 secured in position. A suitable amount of coating solution can then be supplied to the drum through the end openings 50 and kept at the proper temperature and consistency indefinitely throughout the entire operation by means of the temperature control elements 61, 70 and 73. The stencil drum may then be rotated and articles fed to the machine and coated, as above described. This permits uniform and proper coating of the articles regardless of outside temperatures. Especially important features which are believed to be novel are the rotatable stencil drum forming a container for a quantity of the coating solution within the drum and means for maintaining the temperature of the coating solution at the proper degree, and particularly for heating it and thus maintaining it at the proper and a uniform consistency for best and most effective coating operations. Another feature is the pressure roller in a rotatable stencil drum forming a container for a quantity of the coating solution, the roller operating in this solution to force it through the stencil to give a uniform coating. Still another feature is the improved automatic stop means for the drum. Also, so far as I am aware, it is novel to have a continuously operating conveyor to remove the coated article at the proper speed from the rotating stencil drum in this type of machine.

Having thus set forth the nature of my invention, what I claim is:

1. A stencil coating machine comprising a hollow rotatable stencil drum adapted to hold in its interior chamber a quantity of the coating material, a pressure roller within the chamber in the drum at the lower part thereof and immersed in the material to force the material through the stencil, a heater within the drum to maintain the material at the desired temperature, means for retaining the article to be coated against the outer surface of the drum, and means for rotating the drum.

2. A stencil coating machine comprising a hollow rotatable stencil drum forming an interior chamber adapted to hold a quantity of a coating solution, means within the chamber in the drum at the lower part thereof to force the solution through the stencil, a heating pipe immersed in the solution in the drum, means for circulating a heating medium through the pipe to maintain the solution at the desired temperature, means for retaining the article to be coated against the outer surface of the drum, and means for rotating the drum.

3. A stencil coating machine comprising a hollow rotatable stencil drum having a portion of its wall perforated and adapted to carry a stencil, the interior chamber of said drum forming a container for a quantity of semi-liquid coating solution, a roller within the chamber in the drum extending longitudinally thereof and immersed in said solution at the lower part of the drum to force the solution through the stencil as the drum rotates, means for rotating the drum, and means

for retaining the article to be coated against the outer surface of the drum.

4. A stencil coating machine comprising a hollow rotatable stencil drum having a portion of its wall perforated and adapted to carry a stencil, the interior chamber of said drum forming a container for a quantity of semi-liquid coating solution, a roller within the chamber in the drum extending longitudinally thereof and immersed in the solution at the lower part of the drum, means for yieldingly pressing the roller against the inner wall of the drum to force the solution through the stencil as the drum rotates, means for rotating the drum, and means for retaining the article to be coated against the outer surface of the drum.

5. A stencil coating machine comprising a hollow rotatable stencil drum having a portion of its wall perforated and adapted to carry a stencil, the interior chamber of said drum forming a container for a quantity of semi-liquid coating solution, a roller within the chamber extending longitudinally thereof and immersed in the solution at the lower part of the drum, said roller pressing against the inner wall of the drum to force the solution through the stencil as the drum rotates, a pipe immersed in the solution at one side of the roller and extending longitudinally thereof, means for circulating a temperature control medium through said pipe to maintain the solution at the desired temperature, means for rotating the drum, and means for retaining the article to be coated against the outer surface of the drum.

6. A stencil coating machine comprising a hollow rotatable stencil drum in which the interior chamber of the drum forms a container for a quantity of semi-liquid coating solution, means immersed in the solution within the drum chamber at the lower part thereof to force the solution through the stencil, a temperature control means immersed in said solution to maintain the solution at the desired temperature, means for rotating the drum, and means for retaining the article to be coated against the outer surface of the drum.

7. A stencil coating machine comprising a hollow rotatable stencil drum the interior chamber of which forms a container for a quantity of semi-liquid coating solution, means immersed in the solution within the drum chamber at the lower part thereof to force the solution through the stencil, a hood enclosing the drum and spaced from the outer surface thereof, a heating means located within the space between the hood and the drum to maintain the desired temperature, means for rotating the drum, and means for retaining the article to be coated against the outer surface of the drum.

8. A stencil coating machine comprising supporting rollers, a hollow rotatable stencil drum mounted on said rollers, means for driving the rollers to rotate the drum, said drum comprising a hollow shell closed at one end and a removable cover forming an end wall for and closing the other end, said end walls each having a large central opening, a bar extending longitudinally through the drum and said openings, means outside the drum for supporting the bar, depending supports carried by the bar, and a pressure roller held by said supports against the inner wall of the drum at the lower part thereof.

9. A stencil coating machine comprising supporting rollers, a rotatable stencil drum mounted on said rollers, means for driving the rollers to rotate the drum, said drum comprising a hollow shell closed by end walls, a bar extending longitudinally through the drum and said end walls, upright supports outside the drum having upright guides in which the bar is mounted for vertical sliding movements, depending supports carried by the bar within the drum, a pressure roller held by said supports against the inner wall of the drum at the lower part thereof, and springs pressing downwardly on the bar to hold said roller against the drum.

10. A stencil coating machine comprising supporting rollers, a rotatable stencil drum mounted on said rollers, means for driving the rollers to rotate the drum, said drum comprising a hollow shell closed at one end, a removable cover forming an end wall for the other end, a bar extending longitudinally through the drum and projecting beyond said end walls, supports outside the drum having upright guides in which the bar is mounted for up and down movements, removable blocks over the guides, springs between the blocks and the bar tending to force the bar downwardly, depending supports carried by the bar within the drum, and a pressure roller held by said supports against the inner wall of the drum at the lower part thereof to force coating solution in the drum through a stencil on the drum, and said drum, bar and pressure roller being removable by lifting from the supporting rollers for disassembling and cleaning.

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