MOISTENING MECHANISM FOR DUPLICATING MACHINES

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3 Sheets-Sheet 2

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This invention relates to moistening mechanisms for duplicating machines, and it has for its object the provision of an improved form and arrangement of parts of the type disclosed by the application of Stephen Kokay, Serial No. 403,355, filed July 21, 1941. We do not claim as our invention any of the subject matter shown and described by said earlier application.

It is one of the objects of our invention to provide a greatly simplified and improved arrangement of parts by which solvent is delivered to a roller or other suitable means by which a thin even film of solvent may be applied to the face of a copy sheet, by which the return of any surplus solvent from the distributing and applying means is brought about by a pumping and siphoning action after the completion of the passage of a copy sheet thereby, by which the desired flushing action is attained for cleaning the rollers or other distributing and applying means for preventing the collection of lint thereon, and by which a suitable screening effect is secured for separating out the lint which is picked up by the solvent so as to prevent clogging of the mechanism.

It is another object of our invention to provide an improved arrangement for the escape of air from the liquid entering the pump chamber so as to render the action of the pump more even and more positive with respect to the feed of solvent to the moistening mechanism.

It is another object of our invention to improve mechanisms of this type in sundry details hereinafter pointed out. The preferred means by which the several objects have been attained are illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical sectional view through a duplicating machine embodying our improvements, being substantially a section taken at the line 1—1 of Fig. 3;

Fig. 2 is a vertical cross sectional view taken substantially at the line 2—2 of Fig. 3;

Fig. 3 is a vertical cross sectional view taken substantially at the line 3—3 of Fig. 1;

Figs. 4 and 5 are horizontal sectional views taken substantially at the line 4—4 and the line 5—5, respectively, of Fig. 3; and

Fig. 6 is a horizontal sectional view taken substantially at the line 6—6 of Fig. 2.

Referring now to the several figures of the drawings, in which corresponding parts are indicated by the same reference characters, 10 and 11 indicate side frame members at opposite sides of the machine connected rigidly together by crossbars 12 and 13, as is best shown in Fig. 1. Between the standards 10 and 11, we have mounted a duplicating drum 14 by means of a heavy shaft 15, such drum being provided with grippers 16 of any suitable type movably mounted thereon for securing the usual master sheet in position on the face of the drum so as to be carried around thereby. In the arrangement shown, the drum 14 is driven by a motor 17 by means of driving pulleys 18, 19, 20 and 21 and cooperating endless belts 22 and 23, the pulley 21 being provided with a gear 24 which meshes with a gear 25 fixedly connected with the drum. The arrangement is such that the drum 14 is driven in counterclockwise direction in Fig. 1.

As is usual in this type of machine, an impression roller 26 is provided in position for pressing against the face of the drum, such impression roller being rotatably mounted between arms 27 pivotally mounted at opposite sides of the machine so as to swing about an axis 28. Each of the arms 27 is provided with a downwardly extending arm 28, which arms engage bars 30 mounted at their rear ends upon eccentrics 31 carried by a transverse shaft 32. At their forward ends, the bars 30 are provided with coiled springs 33 which press the arms 29 yieldingly toward the shaft 32. The arrangement is such that by rotary movement of the shaft 32 the yielding pressure of the impression roller 28 against the drum may be controlled.

A short distance to the rear of the impression roller 26, we have provided the usual forwarding rollers 34 and 35, the roller 34 being mounted upon a fixed axle, while the roller 35 is mounted by means of a shaft 36 between bell-crank levers 37 which are pivotally mounted upon the standards 10 and 11 at 38, the downwardly extending arm portions of the levers 37 being adjustably connected with coiled springs 39 which normally hold the levers and the roller 35 upwardly in pressure relationship to the roller 34. The roller 34 is driven in counterclockwise direction in Fig. 1 by means of a pinion 40 meshing with an idler pinion 41 which in turn is driven intermittently by a multialeted gear 42 adapted to rotate with the drum, the arrangement being such that the roller 34 when driven moves at substantially the same surface speed as that of the drum.

A short distance to the rear of the forwarding rollers 34 and 35, we have provided a table or tray 43 in position for holding a pile 44 of copy sheets to be fed one at a time into the bite of the rollers 34 and 35 for movement forwardly toward the left in Fig. 2. A short distance in
front of the impression roller 26, we have provided a tray 45 in position to receive the copy sheets as they move forwardly toward the right in front of the impression roller 26.

The means for applying moisture to the forwarding roller 34 for transfer to the face of a copy sheet moving forwardly between the rollers 34 and 35 comprises a spreader roller 46 which is rotatably mounted between arms 41 depending from sleeves 48 which are rotatably mounted upon the rounded end portions of a crossbar or shaft 49 which is mounted rigidly in position between the standards 10 and 11. The means for pressing the roller 46 forwardly against the roller 34 comprises lugs 51 carried by arms 52 pivotally mounted at 53 on brackets 64 mounted upon the standards 10 and 11. The lugs 51 in turn are pressed forwardly by coil springs 55 bearing at their front ends on the lugs and bearing at their rear ends on nuts 56 mounted by means of screw-threaded on links 57 pivotally mounted on said brackets 54. The arrangement is such that the springs 55 serve effectively for pressing the spreader roller 46 against the forwarding roller 34, the degree of pressure being controlled by the adjusted position of the nuts 56. It is believed to be unnecessary to describe this arrangement further in detail herein, since it is substantially the same as the arrangement shown in said prior Kokay application 403,355.

In the arrangement shown, the upper forwarding roller 34 is preferably formed of rubber or neoprene having a Shore hardness of about 45, the lower forwarding roller 36 being formed of sponge rubber or neoprene. The roller 46 has a hardness comparable to that of brass, being considerably harder than the roller 34, and is preferably formed of "Rouilene" which is the trade name of a resin composition. The rollers 34 and 36 are substantially smooth on their surfaces, while the spreader roller 46 is provided with a series of fine grooves extending longitudinally of the roller, such grooves having preferably a depth of about .003 inch and being closely spaced. The arrangement is such that the roller 34 and 46 cooperate to form a trough between which is adapted to hold a supply of solvent such as is ordinarily used in connection with liquid process duplicating machines.

For preventing the solvent delivered into the trough between the rollers 34 and 46 from running off at the ends of the rollers, we have provided disks or washers 58 on the ends of the rollers 34 of a size to overlap the ends of the roller 46. The washers 58 are preferably formed of metal and chromium plated so as to have a smooth and hard non-corrosive surface.

The means for delivering solvent into the trough provided by the rollers 34 and 46 comprises a tank 59 located at a lower level than that of the rollers, such tank being closed by a non-sealing top plate 60. Within the tank, there is provided a pump comprising a cylinder 61 which extends downwardly through the bottom wall of the tank, being provided with a plurality of openings 62 through its wall immediately above the bottom wall of the tank. Within the pump cylinder 61 a plunger 63 is slidably mounted being connected with an operating rod 64, a coiled spring 65 being mounted between the plunger and the upper end of the cylinder for holding the plunger normally in lowered position. The plunger 63 and rod 64 are moved upwardly against the action of the spring 65 by means of a lever 66 pivotally mounted upon a horizontal axis at 67 as shown in Fig. 1, such lever 66 being connected with an extension 68 which is provided at its upper end with a roller 69 in position to engage a cam 70 mounted so as to revolve with the drum 14. The arrangement is such that upon each revolution of the drum the roller 69 is moved inwardly by the action of the spring 66 when the low portion 71 of the cam is brought into engagement with the roller 69 as the drum rotates. When thereafter the outwardly trending face portion 72 of the cam 70 is brought into engagement with the roller 69, the rod 64 and plunger 63 are moved upwardly to the limit of their motion against the action of the spring 65.

At its lower end portion, below the tank 59, the cylinder 61 is provided with an opening in its side wall in which a combination nipple and check-valve 73 is mounted, such nipple in turn being connected with a line of piping 74 which leads upwardly for connection with a pipe 15 mounted in position above the rollers 34 and 46. A pipe 76 of increased size is mounted about the transversely extending portion of the pipe 15 in centered position with respect thereto, as is clearly shown in Figs. 2 and 3, being engaged in position by mounting blocks 76a which are rigidly carried by the shaft 49. The pipe 76 is provided with openings 77 in its bottom face for spraying into the trough liquid delivered through the pipe 76, the pipe 15 having openings 78 in its upper face portion for permitting the escape of the liquid to the interior of the pipe 76. The arrangement is such that upon each revolution of the drum 14 a measured quantity of liquid is delivered upwardly through the piping 74 and sprayed through the openings 77 into the trough between the rollers 34 and 46.

Upon the top face of the squared central portion of the bar or shaft 48, we have mounted an obliquely positioned guard plate 79 extending downwardly and forwardly underneath the pipe 76 so as to cause the liquid from the pipe to be sprayed thereon. Above and about the bar 49 and the pipe 76, an inverted U-shaped housing 80 is mounted by means of a screw 81, with a spacer 82 interposed between the member 80 and the bar 49, as is clearly shown in Fig. 2. Immediately in front of the spray pipe 76, a vertically disposed guard plate 83 is mounted in position, such plate being secured at its ends to the mounting blocks 76a. The arrangement is such that the plates 79 and 83 and the housing member 80 prevent the splashing of liquid as it is delivered from the pipe 76 into the trough between the rollers 34 and 46. Immediately in front of the spreader roller 46, a vertically positioned plate 86c is provided, depending from the shaft 49, having bracket means 80d secured therefor for supporting a guide plate 80c in upwardly spaced relation to the table 48.

Means is provided for taking the surplus liquid from the trough between the rollers 34 and 46 upon each revolution of the drum so as substantially to empty the trough at about the time when the copy sheet passes out of engagement with the forwarding roller 34. This means comprises a combination nipple and check-valve 84 mounted in an opening in the lower end portion of the pump cylinder 61 opposite to the nipple 73. The nipple 84 differs from the nipple 73 in that the check-valve opens in the opposite direction. That is to say, the check-valve permits the escape of liquid from the cylinder and through
the nipple, while the check-valve 84 permits the movement of liquid through the nipple and into the cylinder. At its outer end portion, the nipple 84 is connected by a line of piping 85 which is connected at its upper end with an air-tight tank 86 removably mounted in a socket in the top wall of the tank 86. Immediately below the open end of the pipe 85 within the tank 86, we have provided a screen member 87 which is removably mounted in position, being held rigidly in position by means of a screw-threaded cap 88 by which the tight closure of the tank is effected. Another line of piping 88 is connected with the interior of the tank 86 with its open end at the opposite face of the screen 87 from that at which the open end of the pipe 85 is located. The pipe 88 is connected at its upper end with a transversely positioned suction head 90 which is supported in position on the lower edge of the plate 91, as is clearly shown in Fig. 2. The suction head 90 is provided with a series of openings 91 in its bottom face in close proximity to the bottom of the trough between the rollers 34 and 46.

The arrangement of the pump 61 and its cooperating parts is such that upon a downward movement of the plunger 63 by the spring 65 the liquid trapped in the lower end of the cylinder 64 is forced outwardly through the nipple 73 so as to be sprayed from the pipe 75 into the trough between the rollers 34 and 46. The arrangement is such that the full force of the pump is applied for delivering the liquid to the trough, this result being attained by reason of the fact that the pipe 75 connected with the pressure side of the pump through the nipple 73 is continuous and unbroken to its point of connection with the spray pipe 75. When thereafter the plunger 63 is moved upwardly against the action of the spring 65, a suction effect is exerted upon the piping 66, the air-tight tank 64, the piping 66 and the suction head 90 for taking from the tank the supply liquid therein. For this purpose the full suction effect of the pump is applied upon the head 90 by reason of the fact that the line of piping 66 connecting the suction side of the pump through the nipple 64 with the suction head 90 through the air-tight tank 64 is continuous and unbroken. The construction is such that the initial movement of the plunger 63 upwardly from the bottom of the cylinder 64 serves to start the movement of the liquid downwardly through the pipe 85. After the suction stroke of the pump is completed, the movement of the solvent through the pipe 85 continues by reason of a siphoning effect, such flow of the solvent back to the air-tight tank 86 continues until the flow is broken by the admission of air through the openings 91 in the suction head. The arrangement is such that upon an upward movement of the pump plunger 63 a suction effect is exerted upon the suction head 90 through the air-tight tank 64 whether or not there is a supply of solvent in said tank 86. As the flow of solvent into the tank 86 continues through the pipe 85, the level of the solvent rises in the tank 86 and the open upper end of the piping 85 until the pipe 85 acts as a siphon means for returning the solvent to the pump and the tank 86.

As is best shown in Fig. 3, the openings 77 in the spray pipe 76 are arranged closer together at the middle portion of the pipe 76 so that the solvent is delivered to the trough between the rollers 34 and 46 more rapidly at the middle of the machine than at opposite sides of the machine. The result is that there is a tendency for the solvent to flow toward the ends of the rollers 34 and 46. The openings 91 in the suction head 90 on the other hand are arranged closer together at the ends of the suction head 90 than at its intermediate portion, this arrangement serving to encourage the flow of the liquid toward the ends of the rollers 34 and 46. In the preferred arrangement, a substantial surplus of solvent is delivered to the trough upon each downward stroke of the pump plunger 63, whereas, by a substantial amount of the solvent is caused to flow along the rollers 34 and 46 toward the ends of the rollers and an effective flushing action is brought about, tending to clean the rollers and to carry any lint or other foreign matter out of the trough with the stream of solvent flowing back through the pipe 85. As such lint is delivered by the solvent to the tank 86, such lint is trapped beneath the screen 87 and is prevented from flowing back through the pipe 85 to the pump and the tank 86. At suitable intervals, the tank 86 can be opened up by the removal of the cap 88, whereupon the tank and the screen can be very readily cleaned, the screen being lifted out of position for a cleaning operation.

As is shown in Figs. 2 and 6, the cylinder 61 is provided with a groove 92 in its outer face at one side communicating at its lower end with an opening 93 into the interior of the cylinder, a cover plate 94 being provided serving with the groove 92 and the opening 93 to form a duct leading upwardly from the interior of the cylinder at its lower end portion and opening at the top of the tank 95 above the level of the solvent in the tank. By the provision of this duct, any air drawn into the cylinder 61 with the streams of solvent entering through the openings 62 is afforded an avenue of escape to the atmosphere, there being little if any flow of solvent inwardly through the opening 93 on account of the provision of the guard plate 94. By reason of the escape of the air from the solvent, the action of the pump is made more even and positive so as to secure a better control of the movement of the solvent by the pump.

While we prefer to employ the form and arrangement of parts as disclosed in the drawings and as above described, our invention is not to be limited to such arrangement except so far as the claims may be so limited, it being understood that changes might well be made in the construction without departing from the spirit of our invention.

We claim:
1. In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, and means adapted by connection with the pressure side of said pump to apply the full suction effect of the pump on the
In a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, and means connected with said pump and adapted to apply the full suction effect of the pump on the liquid in said trough for taking the major portion of said liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.

In a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, and means connected with said pump and adapted to apply the full suction effect of the pump on the liquid in said trough for taking the major portion of said liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.

In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, and means connected with said pump and adapted to apply the full suction effect of the pump on the liquid in said trough for taking the major portion of said liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.

In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, and means connected with said pump and adapted to apply the full suction effect of the pump on the liquid in said trough for taking the major portion of said liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.

In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, and means connected with said pump and adapted to apply the full suction effect of the pump on the liquid in said trough for taking the major portion of said liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.
therefrom, a tank adapted to hold a supply of liquid at a lower level than that of said trough, a pump for taking liquid from said tank, air vent means for permitting air to escape from the liquid in said pump, and means adapted by connection with the pressure side of said pump to deliver liquid to said trough and adapted by connection with the suction side of the pump for taking the major portion of the liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.

8. In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a tank adapted to hold a supply of liquid at a lower level than that of said trough, a pump for taking liquid from said tank and comprising a cylinder in vertical position in the tank with an air vent connected with the lower end portion of the cylinder and opening above the surface of the liquid in the tank for permitting air to escape from the liquid in said pump, and means adapted by connection with the pressure side of said pump to deliver liquid to said trough and adapted by connection with the suction side of the pump for taking the major portion of the liquid from the trough at about the end of the duplicating operation on each copy sheet in turn.

9. In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, means adapted by connection with the pressure side of said pump to deliver liquid to said trough, an air-tight tank comprising a cover member removably secured in position, a screen removably held in position across said tank by the pressure of said cover member thereon, a suction head in said trough in position to draw liquid from the trough, a pipe connected with the suction side of said pump and opening into said air-tight tank at one face of said screen, and another pipe connected with said suction head and opening into said tank at the opposite face of said screen.

10. In a mechanism for moistening copy sheets in a liquid process duplicating machine, the combination of a member having a downwardly movable face portion and a member cooperating therewith to form a trough between them adapted to hold a supply of liquid and adapted upon downward movement of said face portion to pass a thin even film of liquid on said face portion below the trough, means cooperating with said movable member for carrying a copy sheet forwardly in engagement therewith for taking moisture therefrom, a pump, means for actuating said pump in timed relation to the movement of copy sheets past said moistening means, means adapted by connection with the pressure side of said pump to deliver liquid to said trough, an air-tight tank comprising a cover member removably secured in position, a screen removably held in position across said tank by the pressure of said cover member thereon, a suction head in said trough in position to draw liquid from the trough, a pipe connected with the suction side of said pump and extending into said air-tight tank through the cover member and opening above said screen, and another pipe connected with said suction head and extending into said tank through the cover member and through the screen so as to open in the tank below the screen.

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