

Dec. 27, 1949

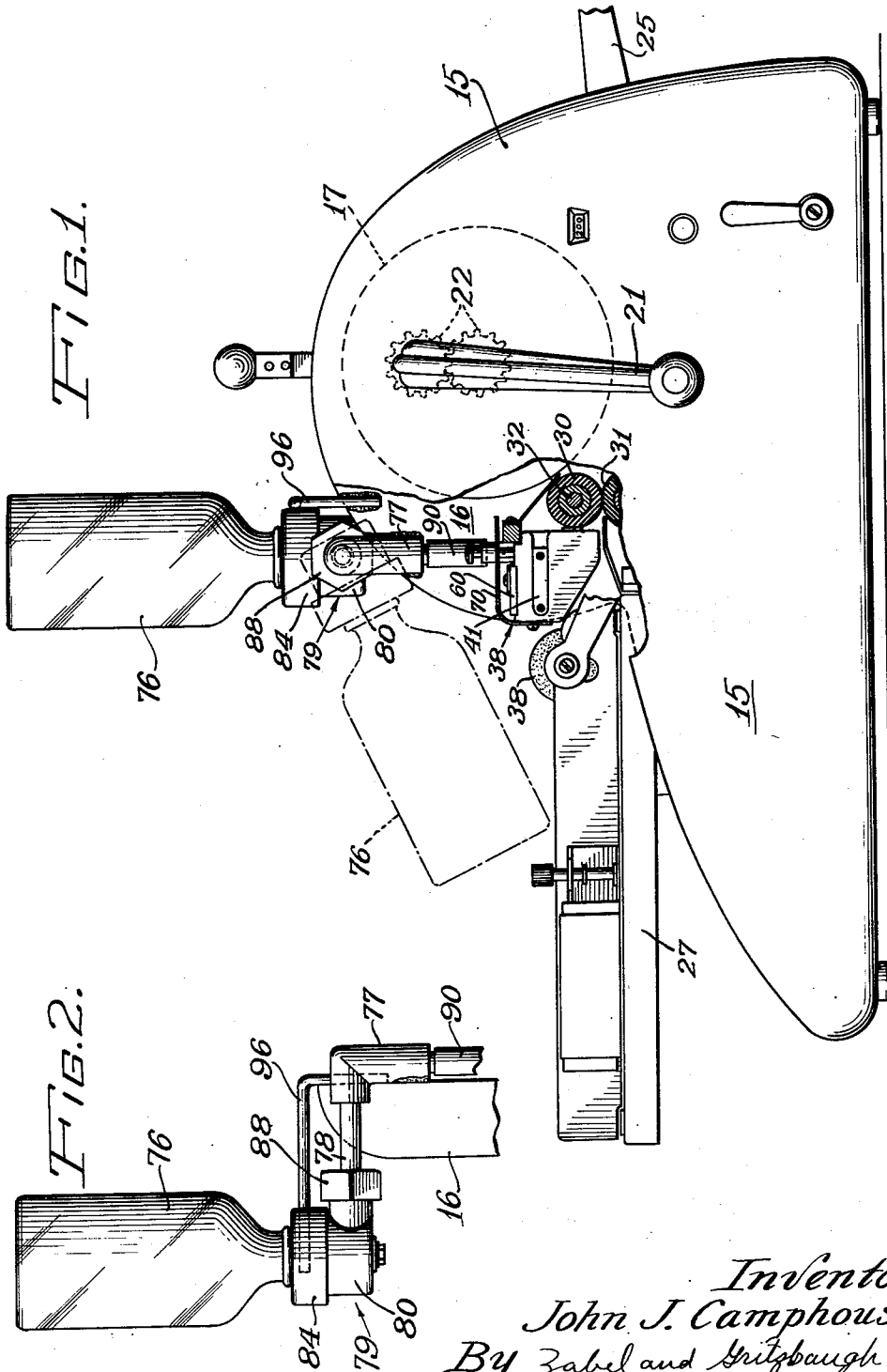
J. J. CAMPHOUSE

2,492,377

MOISTENER FOR DUPLICATING MACHINES

Filed April 30, 1945

4 Sheets-Sheet 1



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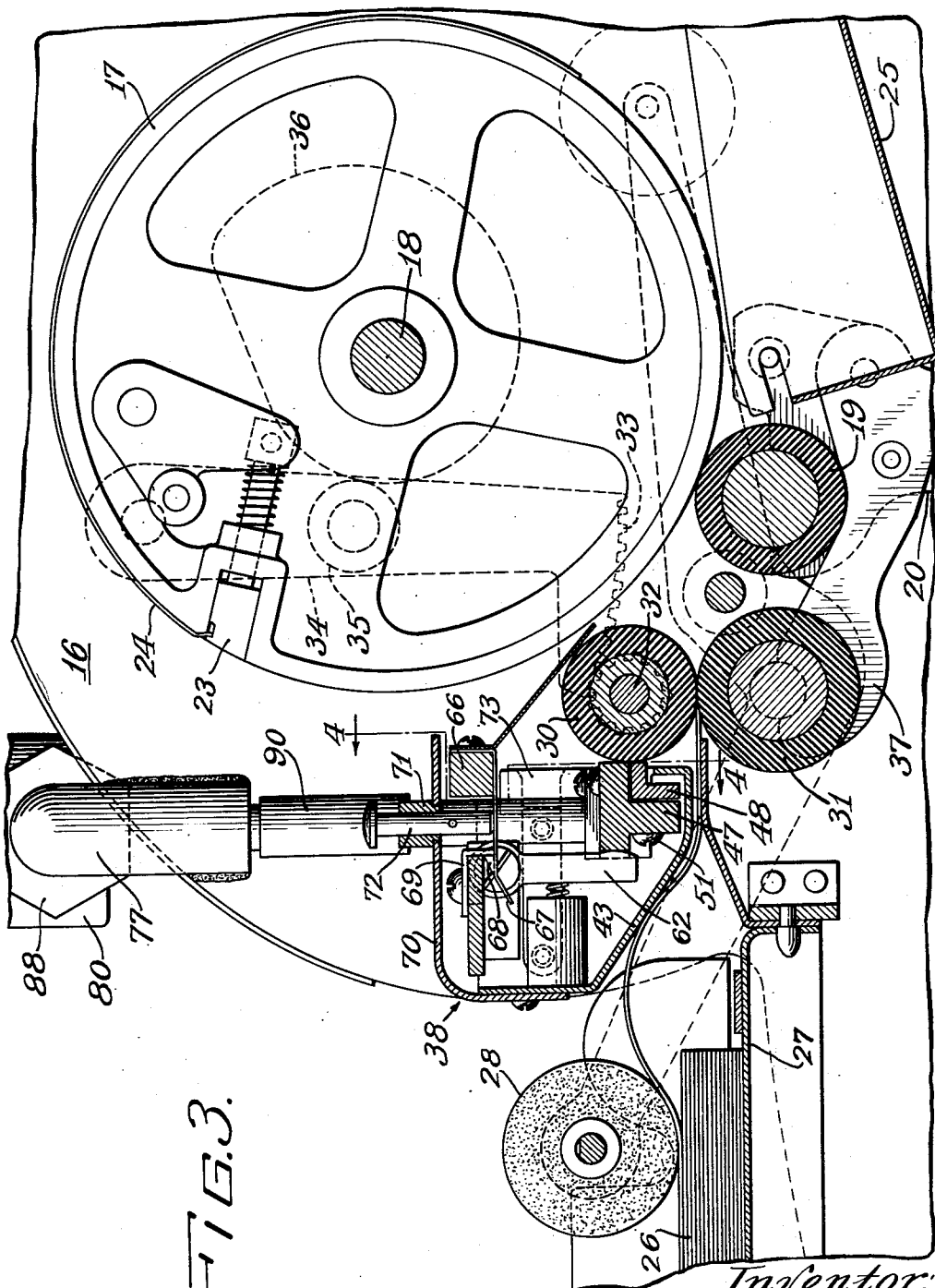
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MOISTENER FOR DUPLICATING MACHINES

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4 Sheets-Sheet 2



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MOISTENER FOR DUPLICATING MACHINES

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4 Sheets-Sheet 3

FIG. 4.

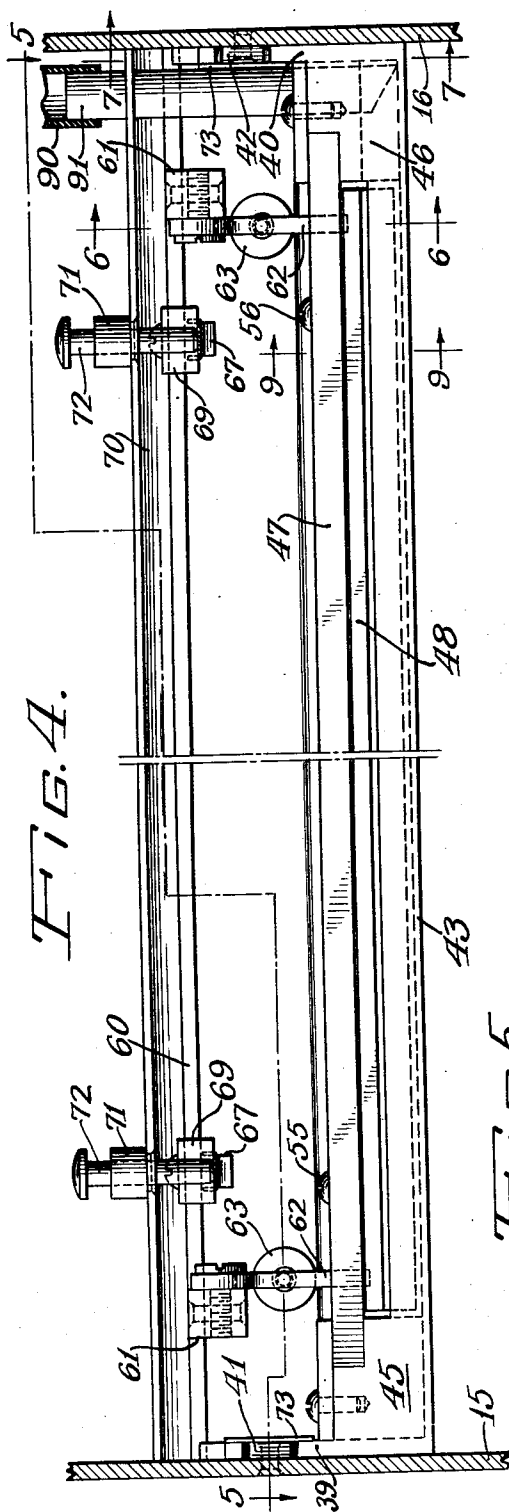
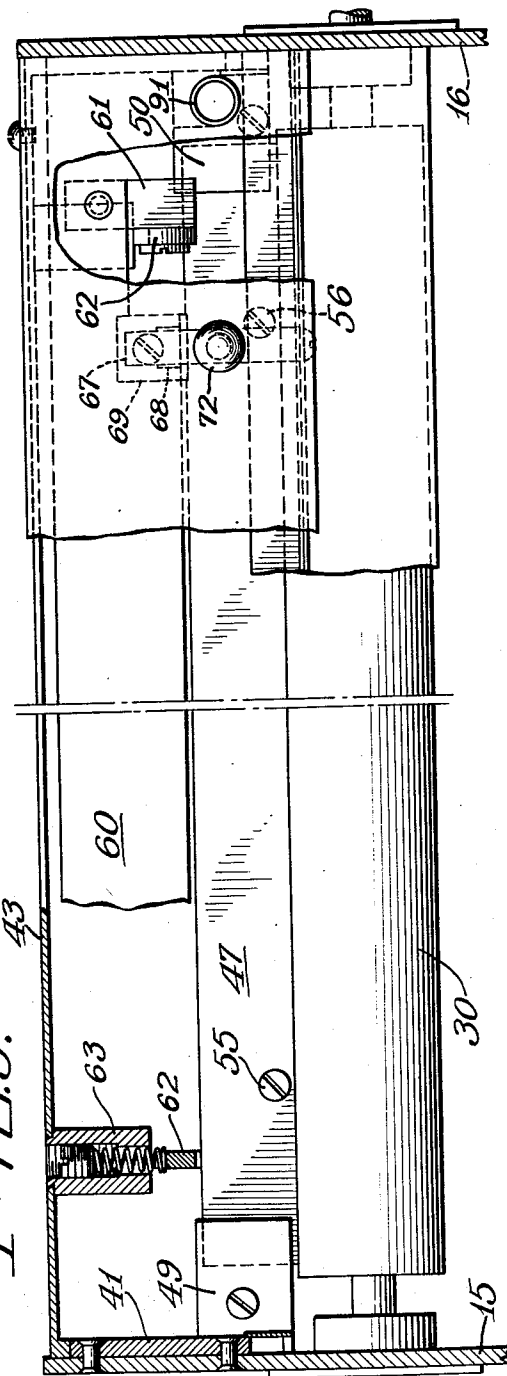


FIG. 5.



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MOISTENER FOR DUPLICATING MACHINES

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4 Sheets-Sheet 4

FIG. 6.

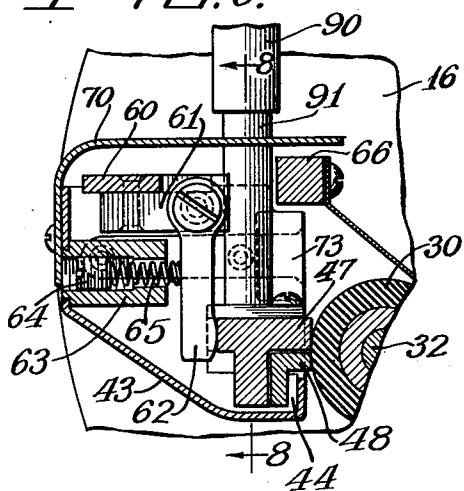


FIG. 7.

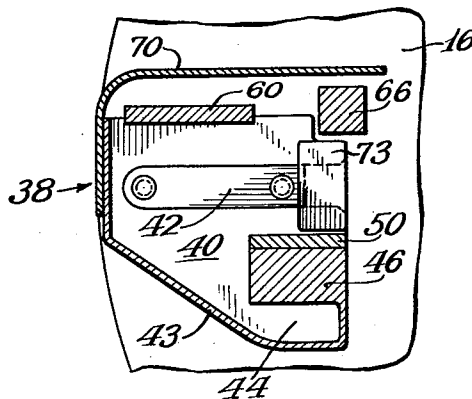


FIG. 8.

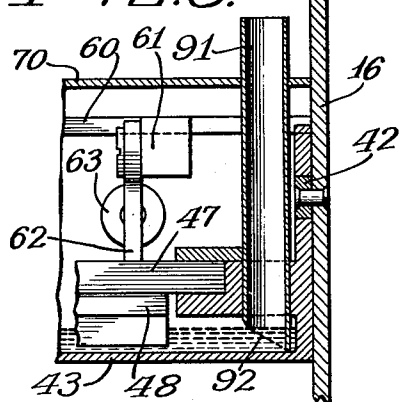


FIG. 9.

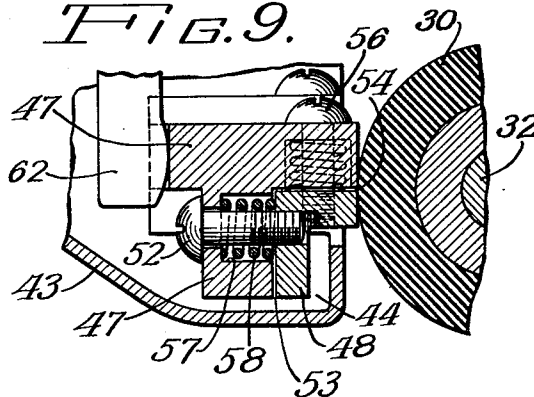


FIG. 11.

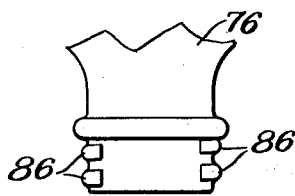
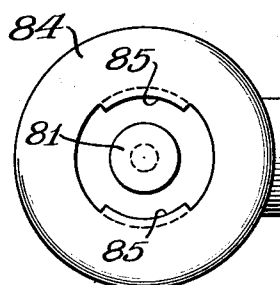
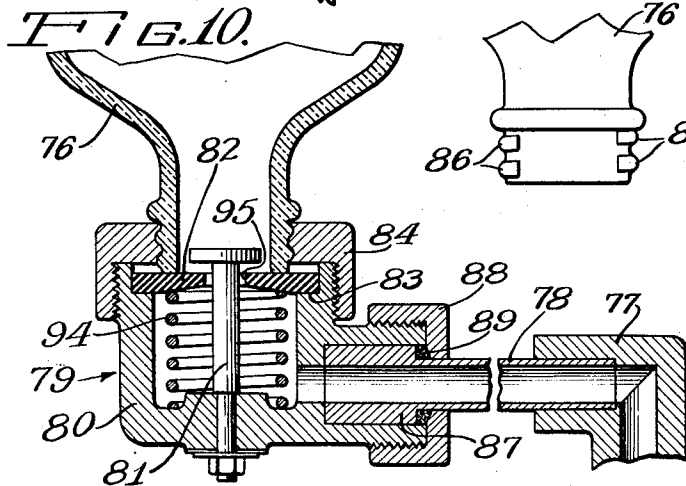


FIG. 12.



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UNITED STATES PATENT OFFICE

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MOISTENER FOR DUPLICATING MACHINES

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Application April 30, 1945, Serial No. 591,179

10 Claims. (Cl. 91—49)

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This invention relates to duplicating machines of the wet process type.

It is one of the objects of this invention to provide an improved moistening and feeding means which is effective to apply a thin film of solvent to the surface of a copy sheet as it is being fed into pressure contact with the master sheet.

Previous devices of the roller moistener type employ as an agency for transferring solvent to the surface of the moistening roll, either a fibrous material, or a pump. Both of these expedients are undesirable in certain respects; the fibrous material is subject to wear and requires frequent adjustment, and occasional replacement; and a pump is a comparatively costly item which is subject to mechanical difficulties, such as breakage or wear. Furthermore, both of these expedients, unless subject to continuous control, tend to oversupply liquid or solvent to the moistening roll. Furthermore, when the moistening roll is stationary, certain kinds of solvent exhibit a tendency to creep along the surface of the roll and collect at the bite of the feeding rolls.

I have found that if a small body of liquid is maintained under subatmospheric pressure against the surface of the moistening roll, that creepage is eliminated when the roller is stationary, but that rotation of the roll causes liquid to be withdrawn from the small body of liquid and to be spread over the surface of the roll in a very thin and uniform film.

Other objects are to provide an improved moistening means which is of simple construction, to provide one which does not embody parts which are subject to wear, to provide one which renders a duplicating machine ready for instant operation without the necessity of priming, to provide one which is in the form of a removable unit to facilitate inspection or cleaning thereof, and to provide an improved means for feeding the solvent to the moistening unit.

With reference now to the drawings, in which like reference numerals designate like parts,

Fig. 1 is an elevation of a duplicating machine embodying a preferred form of this invention;

Fig. 2 is an end view of the solvent reservoir shown in Fig. 1;

Fig. 3 is an enlarged sectional elevation through the machine shown in Fig. 1;

Fig. 4 is a section taken along line 4—4 of Fig. 3;

Fig. 5 is a section taken along line 5—5 of Fig. 4;

Fig. 6 is a section taken along line 6—6 of Fig. 4;

Fig. 7 is a section taken along line 7—7 of Fig. 4;

Fig. 8 is a section taken along line 8—8 of Fig. 6;

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Fig. 9 is an enlarged sectional elevation taken along line 9—9 of Fig. 4;

Fig. 10 is a section through the lower part of the reservoir showing the valve therefor and the mounting thereof; and

Figs. 11 and 12 are details of certain of the parts shown in Fig. 10.

With reference now to Figs. 1 and 3, the duplicating machine comprises a pair of side frames 15 and 16 between which a drum 17 is mounted on a shaft 18. A pressure roll 19 is disposed beneath the drum and is urged into pressure contact therewith by suitable means, not shown herein, the pressure roll being mounted on arms 20.

A crank 21 is disposed at the exterior of side frame 15 and is adapted to drive the drum through suitable gearing 22. The drum is provided with the usual gripper 23 which grips the leading edge of a master sheet 24.

The operation of the device is such that when a moistened copy sheet passes through the bite of the drum 17 and pressure roll 19, it is urged into contact with the master sheet 24. The surface of the master sheet is provided with the usual inked characters, and the nature of the solvent is such that a small amount of the ink is dissolved each time a copy sheet is pressed against the master sheet, the dissolved ink being transferred to the surface of the copy sheet. After the copy sheets have passed through the bite of the drum and pressure roll, they drop into the usual receiving tray 25.

The duplicating machine is provided with a feed tray 27, upon which the copy sheets may rest in a stack 26, and a suitably driven feed roller 28 is provided to remove the top sheet from the stack at the proper intervals.

Between the stack 26 and the bite of the drum and pressure roll, are mounted a pair of feed rolls 30 and 31, the upper feed roll 30 also serving to apply a thin film of moisture to the surface of a copy sheet. The feed roll 30 is mounted on a shaft 32, there being a free wheeling connection between the two so as to permit unidirectional rotation of the feed roll. The shaft 32 may be driven in any suitable manner, as by a rack 33 mounted on a bell crank 34 which is pivoted on the side frame 16. The bell crank carries a cam follower 35 which engages a cam 36 mounted on the drum shaft 18 and rotating therewith. Rotation of the drum and of the cam 36 will cause reciprocation of the rack 33, thus driving the shaft 32 through a suitable pinion, and hence driving the feed roll 30.

The lower feed roll 31 is mounted in a pair of

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arms which may be suitably pivoted with respect to the side frames and biased into contact with the feed roll 30 so that the feed roll 31 is driven by frictional contact with feed roll 30.

The arrangement is such that the feed rolls are stationary during a portion of each revolution of the drum. The feed rolls start to rotate as the drum passes through a given angular position, and the timing is such that the leading edge of the copy sheet is advanced by the feed rolls so that it will engage the master sheet in the desired registry. After the leading edge of the copy sheet has been engaged by the bite of the drum and the pressure roll, the pull of the copy sheet causes the continued rotation of the feed rolls 30 and 31 even though there is no driving connection between the shaft 32 and the feed roll 30, due to the free wheeling connection and the reverse motion of the rack 33.

A moistening unit designated generally by the reference numeral 38 is disposed adjacent the feed roll 30. The moistening unit comprises a pair of slotted end members 39 and 40 which are slidably mounted on lugs 41 and 42 attached to the side frames 15 and 16. A transverse member 43 connects the end members 39 and 40 and also forms the bottom and side wall of the moistening unit. The forward edge of the transverse member 43 is turned up as indicated in Figs. 6, 7 and 9 to provide a trough 44 for the reception of liquid.

The end members 39 and 40 include bosses 45 and 46 which are recessed to accommodate the projecting end portion of an L-shaped block 47. Plates 49 and 50 are screwed to the upper surfaces of bosses 45 and 46 and serve to confine the projecting end portions of the L-shaped block 47 within the recesses. The arrangement is such that the L-shaped block is enabled to slide toward and away from the feed roll 30, as shown in Figs. 6 and 4.

A second L-shaped block 48, smaller than the first, is mounted within the angle of the first, the two outer surfaces of the block 48 being spaced from the two inner surfaces of block 47 to form an L-shaped passageway leading from the trough 44 to the surface of roll 30. The dimensions of this passageway, which include a vertical leg 53 and a horizontal leg 54, which intersect, are small and form a narrow fissure which runs the whole length of the L-shaped blocks 47 and 48, and which is practically as wide as the roll 30.

The operation of the device is such that a small body of liquid is always maintained in contact with the surface of roll 30. This is due to the fact that once the liquid in trough 44, has been drawn up into the vertical and horizontal legs of the fissure and wets that portion of the roll surface which closes the end of the horizontal leg 54, the roll acts as a seal which maintains the liquid in the fissure. When the roll 30 rotates, the effect is a pumping action which withdraws liquid from the horizontal leg 54, thereby reducing the pressure within the fissure and causing an equal amount of liquid to be forced up into the fissure from the trough. The liquid within the horizontal leg 54 is under subatmospheric pressure, the pressure being equal to the atmospheric pressure less the hydrostatic head at that point. Due to this reduced pressure the liquid will not flow out of the fissure and down the surface of roll 30 when the roll is stationary. The result is that the proper amount of liquid is applied to the surface of the roll when it is rotat-

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ing but when the roll is stationary the pumping action ceases and no liquid will creep down the surface of the roll 30 into the bite between it and the roll 31. Furthermore, since the fissure is slightly shorter than the length of the roll no liquid will flow on to the end surfaces of the roll.

One of the difficulties in moistening devices used in duplicating machines arises from the fact that the solvent used has a comparatively low surface tension. This apparently explains the extremely unpredictable behavior of the solvent in various moistening constructions, because it has been found that even when the rolls are stationary, if there is a body of liquid in contact with the surface of the roll, this liquid will creep upwardly or downwardly, and will tend to collect in a bead at the bite of the two feed rolls. Thus when the leading edge of a copy sheet is advanced into the bite of the stationary rolls, the leading edge will become saturated with the solvent, and thus "crash" or dissolve an undue amount of ink from the master sheet.

With the construction herein shown and described, however, it has been found that such creeping does not occur. This may be due to the fact that the amount of liquid in contact with the surface of the roll is extremely small, or it may be due to the fact that the amount of liquid is maintained under a subatmospheric pressure, or it may be due to a combination of both of those reasons, or there may be other explanations of which I am not presently aware.

I have found that satisfactory results are obtained when the width of the vertical leg is maintained at .010 inch, and the width of the horizontal leg is .003 inch.

However, it is obvious that considerable variation may be made in the dimensions of the gap, and under varying conditions such variation may be necessary. To effect such variations adjusting screws 51 and 52 are provided for adjusting the width of the vertical leg 43 and adjusting screws 55 and 56 are provided for the horizontal leg 54. The operation of these adjusting screws is shown in Fig. 9 in which it will be seen that the shank of the screw extends through the L-shaped block 47 and the threads engage the L-shaped block 48. The block 47 is provided with a recess 57, and a small spring 58 is confined in the recess and surrounds the adjusting screw 52 and bears against the block 48. To the left of the recess 57, as shown in Fig. 9, sufficient clearance is provided around the shank of the screw to permit adjustment of the same. This same arrangement is provided for all of the adjusting screws.

A top plate 60 extends between the end members 39 and 40 and cooperates with the transverse member 43 to form a substantially rigid structure. Lugs 61 are provided on the top plate to which levers 62 are pivoted, the lower ends of the levers bearing against the L-shaped block 47. To the vertical portion of the transverse member 43 are staked threaded collars 63, as shown in Fig. 6. Set screws 64 are located within the threaded collar 63 and bear against springs 65 which serve to regulate the tension on the lever 62, thus causing the assembly comprising the blocks 47 and 48 to be resiliently urged against the surface of roll 30. It can be pointed out that close contact is desirable between the blocks and the roll, but too much pressure is undesirable because in the construction shown, the roll 30 is dragged by the copy sheet during a portion of each sheet feeding cycle.

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A cross bar 66 is disposed between the side frames 15 and 16, and carries spring latch members 67, as shown in Fig. 3. These latch members are provided with shoulders 68 which hook under an L-shaped strip 69 which is suitably secured to the top plate 60.

A cover 70 is provided for the moistening unit, and is suitably secured to the vertical portion of the transverse member 43, as shown in Fig. 3. The collars 71 are staked to the cover and serve as guides for plungers 72, the location of the collars being such that the plungers engage the latch members 67. The construction of the moistening unit 38 is such that it may be readily removed from the machine by sliding it to the left, as shown in Fig. 3, thus disengaging the slotted end members 39 and 40 from the lugs 41 and 42. This cannot be done however, until the plungers 72 are depressed to release the latch members, the moistening unit being otherwise locked in the proper position. The shape of the latch members and the shoulders 68 is such that the moistening unit may be slid into latched position without manipulation of the plungers 72. As shown in Figs. 4 and 7, brace members 73 are provided to prevent spreading of the slotted end members 39 and 40.

Liquid is supplied to the trough 44 from a reservoir comprising a bottle 76, the arrangement being such that a substantial level of liquid is maintained in the trough 44, said level being higher than the lower surfaces of the blocks 47 and 48. Thus the fissure which, in the present embodiment, is of capillary dimensions is maintained full of liquid, and the machine is at all times ready for operation without the necessity of priming it. The bottle 76 is supported on a bracket which includes an L-shaped pipe coupling 77 suitably secured to the side frame 16, as by welding, as shown in Fig. 2. A short horizontal length of pipe 78 is securely mounted at one end in the pipe coupling 77, and at the other end supports a socket indicated generally by the reference numeral 79 for the reception of the bottle 76. As shown in Fig. 10, the socket includes a cup shaped member 80 in which is mounted a headed stem 81. A disk valve 82 surrounds the stem 81 for vertical movement, and is urged upwardly by a spring 94. A cap 84 is threaded on to the upper portion of the cup shaped member 80 and is apertured to receive the mouth of bottle 76. It will be seen that when the bottle is not in position, the spring 94 urges the valve into closed position against the head of the stem 81, and against the seat formed by the lower surface of the cap 84. When the bottle is in position, the valve is pressed downwardly against a seat 83, suitably formed in the wall of the cup shaped member 80. In this position, which is shown in Fig. 10, communication is established between the bottle 76 and the other portions of the device through the central aperture 95 of the valve disk 82.

The central aperture in cap 84 is formed with half threads 85 which cooperate with half threads 86 formed on the neck of the bottle 76, as shown in Figs. 10 and 11. Thus the bottle may be forced into the cap and against the valve disk 82, and then given a half turn to tension the parts, the valve disk preferably being made of rubber or like material which has a slight resilience and will form a good seal.

The left end of the other horizontal length of pipe 78 is enlarged as shown at 87 in Fig. 10. An apertured cap 88 is provided for the lower projecting portion of the cup shaped member 80 in

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which the enlarged end 87 is received, and cooperates with the other parts to form a packing gland 89. The arrangement is such that the socket and the bottle may be rotated about a horizontal axis, as shown in broken lines in Fig. 1. Thus the bottle may be inserted or removed when it is in the dotted line position shown without spilling any of the contents. The valve disk 82 and its associated parts prevent the spilling of the liquid remaining within the socket when the parts are in the dotted line position. A brace 96 suitably welded to the side frame 16 serves to maintain the bottle 76 and its associated parts in a substantially vertical, slightly overcenter position for normal operation of the machine.

A flexible and removable tube 90 serves as a connection between the pipe coupling 77 and a vertical length of pipe 91. The pipe 91, as shown in Fig. 9, is suitably secured to the moistening unit 38, and its lower end, which is diagonally cut as indicated by the reference numeral 92, is disposed in the trough 44. Due to the diagonal cut, the lower edge of the pipe 91 rests on the transverse member 43, and a lateral opening is provided which determines the level of the liquid within the trough 44.

The operation of the duplicating machine has been explained in detail in connection with the operation of its several parts. At this point it will be sufficient to point out merely that as the drum 17 is rotated by the crank 21, copy sheets are fed one at a time from the stack 26 through the feed rolls 30 and 31 into pressure engagement with the master sheet 24 which is disposed on the surface of the drum. A thin film of solvent is applied to the upper surface of each copy sheet as it is engaged by the feed roll 30, this thin film being drawn by the feed roll from the fissure in the correct amount. When the feed roll 30 is stationary, there is no body liquid with a free surface in contact with the roll 30, and hence there is no creeping of the solvent downwardly into the bite of the feed rolls 30 and 31. The L-shaped blocks 47 and 48 which form the walls of the fissure are resiliently urged against the surface of the roll 30 to compensate for any slight eccentricities in the cylindrical surface of the roll 30. However, the pressure between the parts is adjustable and is maintained sufficiently low as not to exert any appreciable drag on the roll 30, which drag would otherwise tend to cause slippage between the roll and the copy sheet when the former is driven by the latter.

It is obvious that various modifications and changes may be made in the preferred embodiment of my invention herein shown and described without departing from the spirit thereof. For instance, the fissure, instead of being L-shaped, could be diagonally disposed along a straight line, with the result that instead of L-shaped blocks, blocks of somewhat different shape could be used. Furthermore, in certain instances, it is desirable to seal off the side edges of the fissure and in such a construction the means for adjusting the width of the fissure could be eliminated.

This may be accomplished by inserting resilient rubber strips in the fissure adjacent the side edges thereof, the resilience of the rubber permitting minor adjustments of the width of the fissure. An alternative method is to apply a suitable adhesive, such as glue, or a thermoplastic, over the side edges of the fissure after the proper adjustment has been effected by means of the adjusting screws 51, 52, 55 and 56.

It will be understood that the foregoing de-

scription and the drawings are illustrative only and the invention is to be defined only by the appended claims.

I claim:

1. A moistener for a duplicating machine of the class described comprising a pair of feeding rolls disposed one above the other, a reservoir of liquid spaced therefrom, a means engaging the upper one of said rolls and providing a single passageway extending therethrough from said reservoir to the surface of said roll, said passageway being of capillary dimensions, said reservoir of liquid having a free surface below the level of the outlet of said passageway.

2. A moistener for a duplicating machine of the class described comprising a pair of feeding rolls disposed one above the other, a reservoir of liquid spaced therefrom, a means engaging the upper one of said rolls and having a single passageway of capillary dimensions extending therethrough, from said reservoir to the surface of said roll, and resilient means for urging said block against the surface of said roll, said reservoir of liquid having a free surface below the level of the outlet of said passageway.

3. In a duplicating machine, means to supply a thin film of solvent to the surface of a copy sheet comprising a bottle shaped container, a swiveled socket for receiving the neck of said bottle shaped container, a trough spaced from said bottle and at a lower level, a conduit extending from said swiveled socket into said trough, the lower end of said conduit being spaced from the bottom of said trough in order to maintain a predetermined level of liquid in said trough, a pair of blocks extending into said trough, the adjacent surfaces of said blocks being spaced from each other so as to form a fissure, a roll mounted adjacent said blocks and contacting with the same at one end of said fissure, the other end of said fissure terminating in said trough below the liquid level thereof, and means to rotate said roll to withdraw solvent from said fissure.

4. In a moistener for a duplicating machine, solvent supply means comprising a bottle, a swiveled socket for receiving the neck of said bottle, a trough spaced from said bottle and at a lower level, a conduit extending from said swiveled socket into said trough, the lower end of said conduit being spaced from the bottom of said trough in order to maintain a predetermined level of liquid in said trough, and a valve in said socket for engagement by the neck of said bottle to prevent the escape of liquid therefrom when said bottle and socket are rotated downwardly and the bottle removed from said socket.

5. In a duplicating machine, a moisture supplying device for applying a thin film of liquid to the surface of a moistening roll comprising two L-shaped blocks, one fitting within the other, means for spacing the outer surface of one from the inner surface of the other, to form a capillary fissure having a downwardly extending vertical leg and a horizontal leg, the edges of said blocks adjacent the terminal end of said horizontal leg being substantially co-planar so as to permit substantially tangential contact with a moistening roll, whereby the liquid in said horizontal leg will be maintained under sub-atmospheric pressure.

6. A removable moistening unit for applying a thin film of liquid to the surface of the moistening roll of a duplicating machine comprising a box-like structure having a bottom wall shaped to form a trough, end walls, an L-shaped block slidably mounted in said end walls with one leg ex-

tending vertically downward into said trough and the other leg extending horizontally toward said moistening roll, and a second L-shaped block fitting within the angle of said first mentioned L-shaped block and having its outer surface spaced from the inner surface of the first mentioned L-shaped block to form a capillary fissure having intersecting vertical and horizontal legs, the horizontal legs of said blocks terminating immediately adjacent the surface of said moistening roll so that liquid in said fissure will be withdrawn by the rotation of said roll.

7. A removable moistening unit for applying a thin film of liquid to the surface of the moistening roll of a duplicating machine comprising a box-like structure having a bottom wall shaped to form a trough, end walls, an L-shaped block slidably mounted in said end walls with one leg extending vertically downward into said trough and the other leg extending horizontally toward said moistening roll, a second L-shaped block fitting within the angle of said first mentioned L-shaped block and having its outer surface spaced from the inner surface of the first mentioned L-shaped block to form a capillary fissure having intersecting vertical and horizontal legs, and a spring biased arm associated with said box-like structure and bearing against said first mentioned L-shaped block to urge the same against the surface of the moistening roll, the horizontal legs of said blocks terminating immediately adjacent the surface of said moistening roll so that liquid in said fissure will be withdrawn by the rotation of said roll.

8. A moistener for a duplicating machine of the class described comprising a roll, a reservoir of liquid spaced therefrom, a liquid conveying device having a substantially vertically disposed surface engaging said roll at a point substantially midway between the top and bottom of said roll and having a passageway of capillary dimensions extending therethrough, one end of said passageway terminating in an outlet formed in said vertically disposed surface at substantially the point where the surface engages said roll, and the other end of which passageway terminates in said reservoir at a point below the level of said outlet, said outlet being of a length substantially equal to the length of said roll and of a width such that the liquid in the upper part of said passageway will be maintained under sub-atmospheric pressure.

9. In a duplicating machine, the combination of a moistening roll and a liquid conveying device disposed adjacent thereto and having a substantially vertically disposed surface, means for urging said vertically disposed surface into contact with said moistening roll at a point substantially midway between the top and bottom of said roll, said device having formed therein a passageway of capillary dimensions having an outlet which intersects said vertically disposed surface at substantially the point where said surface contacts said roll, a container for liquid disposed above said device, and communicating means between said container and said passageway, said container being entirely closed, except for said communicating means, whereby the liquid in the outlet of said passageway will be maintained under sub-atmospheric pressure to prevent the flow of liquid therethrough when said roll is stationary.

10. In a duplicating machine having a pair of rolls disposed one above the other for feeding a copy sheet, the combination of means disposed adjacent the upper one of said feeding rolls for applying a thin film of liquid to the surface

thereof, said means including a reservoir and a liquid conveying device providing an unobstructed passageway of capillary dimensions having an inlet and an outlet, said outlet being at a higher level than said inlet and contacting the surface of said upper feeding roll, and said inlet extending into said reservoir whereby the liquid at the outlet of said passageway and in contact with the surface of said roll will be maintained under sub-atmospheric pressure.

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