

Aug. 27, 1935.

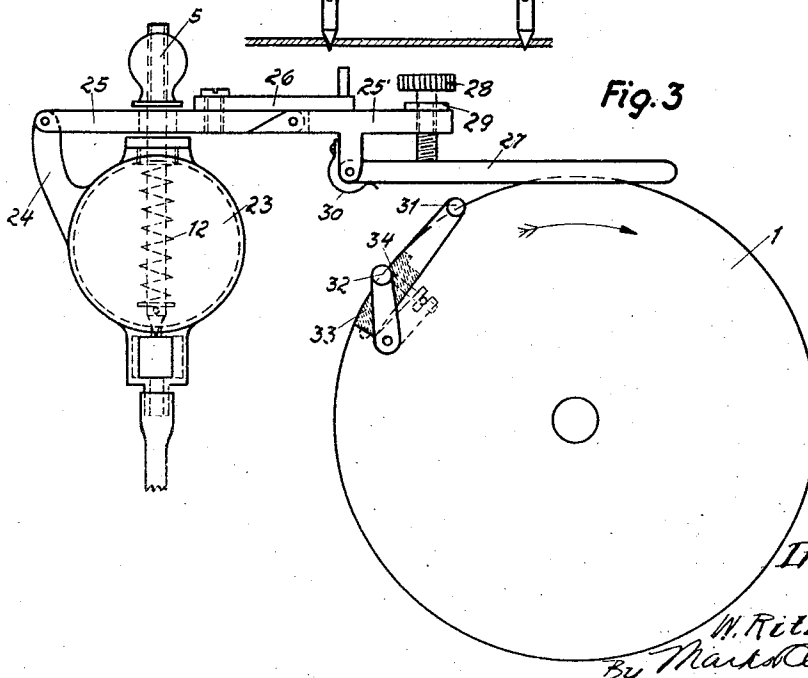
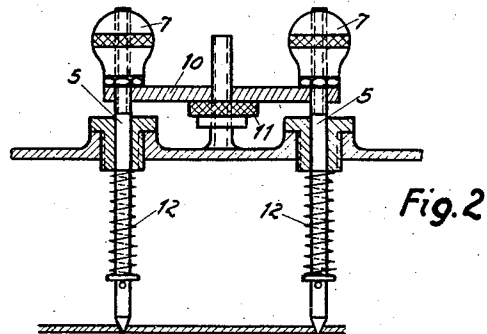
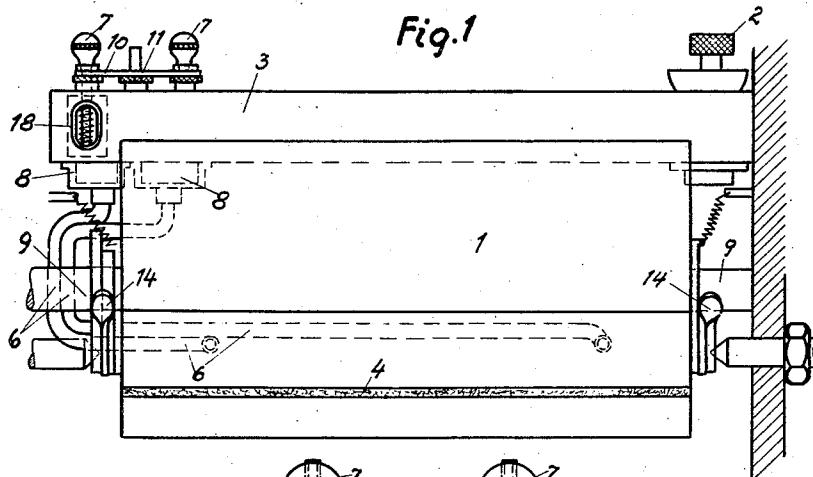
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2,012,619

DUPLICATING APPARATUS

Filed July 22, 1932

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 4

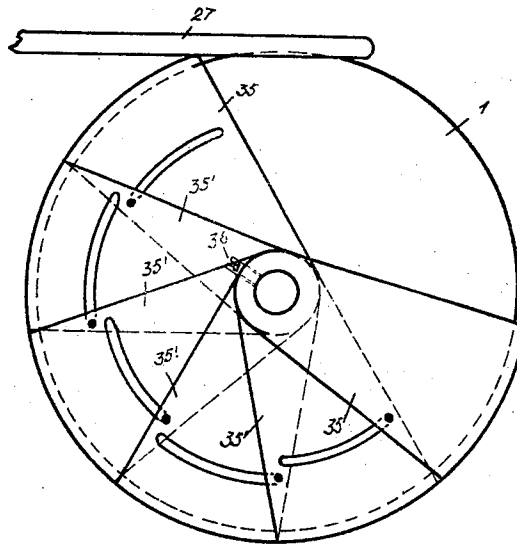
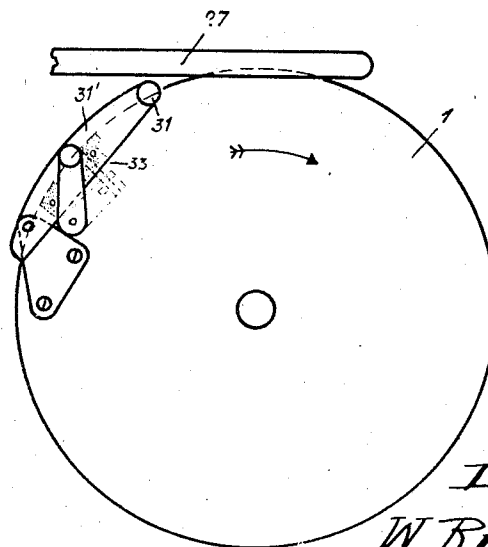


Fig. 5



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3 Sheets-Sheet 3

Fig. 6

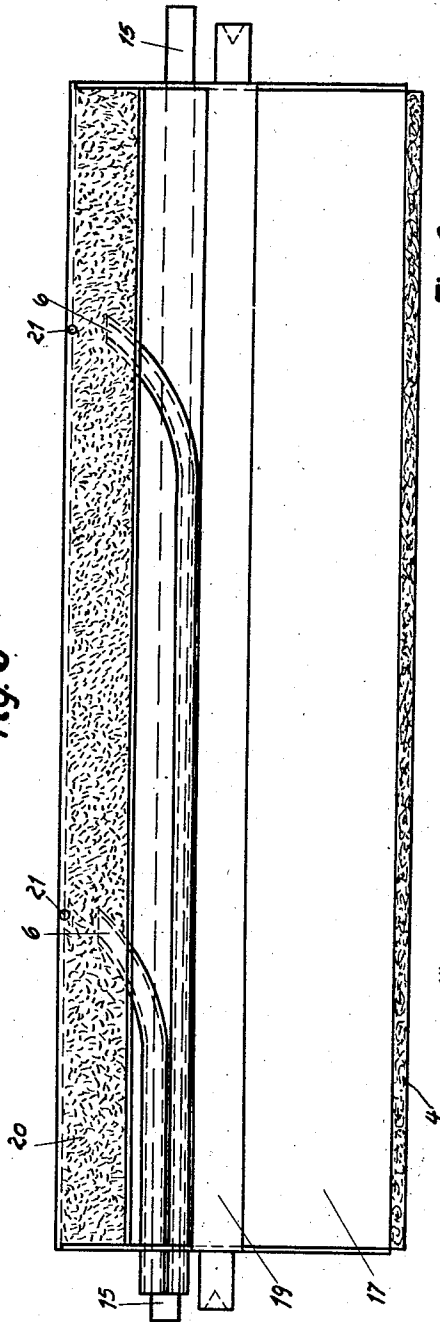


Fig. 9

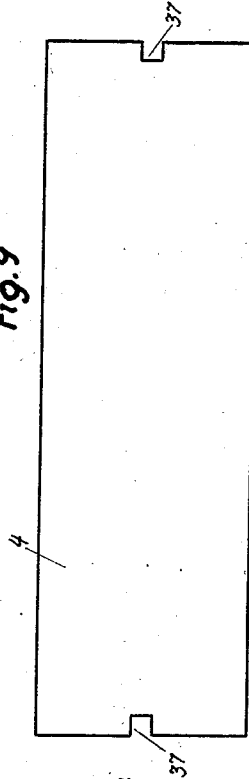


Fig. 10

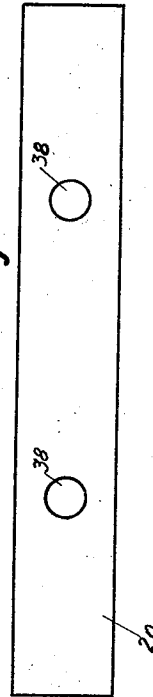


Fig. 7

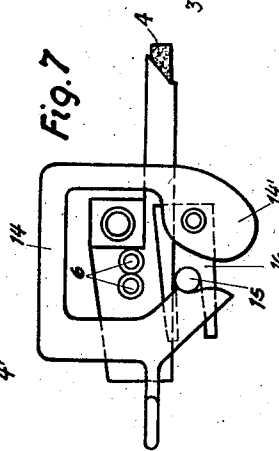
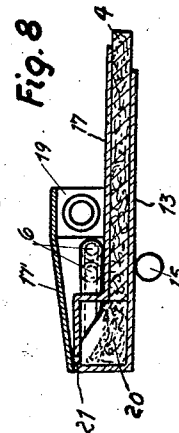


Fig. 8



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UNITED STATES PATENT OFFICE

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DUPLICATING APPARATUS

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Application July 22, 1932, Serial No. 624,125
In Germany July 22, 1931

34 Claims. (Cl. 101—132)

This invention relates to an apparatus for copying on to sheets, cards, etc., from an original or master sheet or card furnished with reverse script capable of transfer by impression.

5 Duplicating apparatus are quite well known, in which a sheet of paper, card or the like bearing the script, characters, signs or other matter concerned in reverse form is tensioned in the apparatus, and moved into contact with sheets, cards, etc., which have previously been moistened on their surface with a readily evaporable liquid which dissolves the copying ink on the master or original sheet or card in ready and even fashion. The moistened sheets are thus furnished
15 with an impression from the master sheet or card in proper disposal, for example in the case of script in legible form, and in this manner there may be obtained from one original or master sheet perfectly true and distinct copies up to several hundred in number.

The quality of these copies depends to a very large extent on gentle and perfectly even moistening of the surface of the copy sheets. If the latter are moistened excessively, the copying ink
25 on the master sheet or card is dissolved too rapidly, the lines in the copy are thick and untidy, and the number of copies capable of being obtained from this particular card is relatively small. Beyond this, excessive moisture may tend to attack
30 the copy sheets or even the original. If on the other hand too little moisture is supplied, the copies are too faint. If single points of a sheet are more lightly moistened than others, the copy is not of a uniform kind and therefore unpleasant in appearance. Gentle and even moistening
35 is, therefore, essential as regards successful operation.

On the other hand it is not sufficient if the moisture is applied to the copy sheets or cards
40 in invariable amount, and the same must be capable of increase or decrease as desired. Thus, for example, to obtain a large number of copies, it is essential at the commencement to moisten the copy sheets merely very weakly, and to increase the amount of liquid later when a certain
45 proportion of the ink has been dissolved away from the master sheet, in order in this manner to obtain clear and distinct copies throughout.

The moistening devices heretofore known in
50 conjunction with apparatus of the type referred to comprise a casing of sheet metal or the like extending transversely across the apparatus immediately in front of the point where copying is performed, and containing felt and an evaporable
55 liquid. The felt, which is saturated with the

evaporable liquid, protrudes from the casing on the side directed towards the copy sheet. At the moment when a copy sheet is fed to the master sheet this felt moves against the copy sheet and moistens the same as it passes away below. Fresh liquid is conducted to the moistening container by a flexible pipe or tube from a glass reservoir mounted in elevated position on the one side of the apparatus. The glass reservoir possesses a valve, which may be opened or closed by hand, i. e., may be adjusted for continuous or drip feed.

This moistening device does not fulfil the above requirements in wholly satisfactory manner, and also in other respects possesses certain disadvantages, which will be referred to in the following:

In the first place there is associated with the glass reservoir mounted in laterally elevated position the disadvantage that this reservoir constitutes an obstruction, and is extremely liable to damage, particularly when being packed. The same moreover merely contains a relatively small amount of liquid, so that frequent re-filling is necessary if the machine is used for any length of time.

Further, owing to the fact that the liquid is supplied to the actual moistening container through one single small tube, i. e., at one single point, to wit, at the centre, there is also the disadvantage that the liquid first requires to become distributed towards all sides before the felt is capable of moistening the copy sheet over its entire width. This distribution of the liquid in the felt is frequently not of a sufficiently satisfactory nature as to ensure a faultless operation, as the felt usually contains adequate moisture at the centre, but not at the two ends; or by the time the ends are sufficiently moist the liquid commences to drip at the centre.

Owing to the fact that the valve of the glass reservoir is manipulated by hand, it may quite frequently occur that the person in charge, if suddenly called away or if his attention is distracted, omits to close the valve, so that after a brief space of time the moistening container is no longer able to hold the entire liquid, which accordingly runs out and causes contamination of the copies and the surrounding parts.

It has also been found that the moistening container, if the same, as hitherto usual, contains merely the moistening felt, or in addition thereto merely a very small quantity of soft absorptive material, such as cotton wool, is incapable of absorbing the liquid in such quantity as to ensure in the case of extended use of the apparatus an even moistening of the copy paper.

It has also been necessary heretofore, assuming the moistening felt had become worn and required renewal, to remove the entire moistening container from the apparatus, which cannot be performed without the assistance of corresponding means, and without loss of time.

Finally, the moistening felt protruding through the slot or gap in the moistening container is extremely liable to displacement, so that here again the moisture is applied unevenly.

According now to the invention the duplicating apparatus, has been so improved upon in all its parts that the various disadvantages above referred to, which oppose an even and exactly regulable moistening of the copy sheet, are overcome.

There is employed a reservoir of large capacity, which is preferably in the form of a roller and is arranged behind the printing drum between the side walls of the apparatus. This results in economy in space and a more pleasing appearance to the apparatus, whilst at the same time a much larger quantity of liquid may be held, so that refilling is only necessary at large intervals. The reservoir does moreover not form an obstruction during the operation, and is protected against damage.

The reservoir according to the invention possesses in place of one regulable outlet as heretofore a plurality of these, say 2, 3 or 4, which are arranged either adjacent to each other or in two groups, one group at each end of the container. The valves of these outlet openings may each be opened separately, i. e., adjusted for continuous or drip flow, and closed in similar fashion, or all valves or the valves of each group open and closed in common. Feed pipes (piping, brass tube, etc.) lead from the single valves to different points of the moistening container along one or both sides of the apparatus above or below the shaft of the drum, so that the moistening felt is provided with a sufficient quantity of liquid in even distribution at all points. Owing to the possibility of regulating the valves singly, it is possible, for example, to supply more liquid to any particular point of the felt as desired.

On the underside of the reservoir a window may be provided below each valve, in order to control the correct rate of flow of the liquid, i. e., drip feed or continuous run.

Since the reservoir is preferably composed of a resistant but opaque material, for example brass, a level indicator is provided thereon or it is furnished with one or more windows in order to be able to ascertain the amount of liquid in the container at any particular time.

The reservoir as described having a large capacity, composed of resistant material, and furnished with a plurality of regulable outlet apertures may naturally also be arranged at any other point, for instance at the side of the apparatus. The same will then preferably be in box form. Or the same may also be situated in front of and above the moistening container.

The disadvantage above referred to consisting in the fact that the supply of liquid from the reservoir to the moistening container if performed manually may not be shut off sufficiently early would also apply to an increased extent to the apparatus according to the invention, in which a plurality of valves are provided. This, according to the invention, is counteracted by the fact that liquid is able to flow to the moistening container only when the apparatus is in use.

The valves of the reservoir are connected through

the medium of a lever mechanism with the roller on which there is placed the master sheet. Upon each revolution of the roller the valves are lifted for a certain period and again lowered as the lever mechanism moves against cams, pins or the like provided on the roller.

To permit of exact regulation of the quantity of liquid fed on each occasion it is possible—beyond the fact that, as described above, the valves themselves may be adjusted for continuous or drip feed—to make the cams, pins, etc., on the roller against which the lever mechanism moves also adjustable, in order to vary the period for which the valves remain open. For example, the valves may be opened during a quarter, half or three-quarter revolution of the roller.

If the supply of liquid is to be interrupted entirely, that is to say—if liquid is not required to follow up notwithstanding rotation of the drum or roller, the lever mechanism may be moved out of engagement with the cam or pin device. Naturally the valves may also be lifted and lowered by hand.

Finally, fundamental improvement has also been effected as regards the part of the moistening device which performs the actual moistening of the copy sheet.

The moistening container according to the invention comprises two parts, viz., an upper and a lower part, the one of which is pressed against the other, for example by means of a lever. By moving back the lever the part in question together with the felt is moved away from the other part and caused to be advanced, so that a new felt may be fitted in ready and simple fashion without the necessity as heretofore of removing the entire moistening container from the device.

Since it has furthermore been found that the liquid is distributed more evenly in the felt when the same is not supplied in direct fashion, but is first conducted to a very soft, absorptive material, such as very soft felt, cotton wool or the like, from which the liquid passes to the actual moistening felt, the invention makes provision for a relatively large space in the moistening container behind the actual moistening felt for a soft absorptive material of this nature.

Into this space there open out the pipes conducting the liquid from the reservoir to the moistening container. The outlet openings of these pipes are preferably sloped off at the front, on the one hand for the purpose of obtaining a larger outlet aperture and on the other hand to prevent choking of the aperture.

To permit of discharge of the air in the feed pipes, and to enable the outlet apertures to remain clear, small holes are provided in the container opposite to the outlet openings of the pipes. If the feed pipes should happen to become choked in any way, the same may be cleared through these holes with the assistance of a wire.

In order not to obstruct the outflow of the liquid by the absorptive material situated immediately in front of the openings of the feed pipes, recesses are provided in the absorptive material at these points.

The dismantling of the container and the exchange of the moistening felt is in no way obstructed by the provision of the soft absorptive material, as the part of the container carrying the soft felt is not fitted into the moistening container, and the absorptive material does not rest on but behind the actual moistening felt, as described later in conjunction with the drawings,

To prevent the moistening felt from becoming displaced in the container, and thus possibly moving unevenly against the copy sheet, the container is furnished on the inside with projections, which engage in corresponding recesses in the felt and hold the same in position.

By reason of the moistening device as herein described there is ensured completely even and regulable moistening of the copy sheet fully under the control of the person in charge, even when the machine is extensively used.

A possible form of embodiment of the invention is illustrated in the accompanying drawings, in which

Fig. 1 is an elevational view of the duplicating apparatus.

Fig. 2 is a section through the valves.

Fig. 3 is a side elevational view of the complete apparatus.

Fig. 4 is an adjustable cam for lifting the lever mechanism.

Fig. 5 is a permanent cam for lifting the lever mechanism.

Fig. 6 is a plan view of the moistening container.

Fig. 7 is an elevational view of the moistening container.

Fig. 8 is a cross-section through the moistening container.

Fig. 9 is a plan view of the moistening felt,

Fig. 10 being a view of the distributing felt.

Behind the drum or roller 1, between the side walls of the apparatus, there is provided a reservoir 3 for the moistening liquid having an inlet opening 2, which is capable of being closed, and possessing any desired number of valves 5 on the one or on both sides or distributed over the entire length, from which points the liquid is conducted to the absorptive material 20, and accordingly to the moistening felt 4, at several points by means of feed pipes 6 with gravity action passing below the shaft of the drum or roller 9.

The feed pipes 6 consist of two parts, the one of which is mounted firmly in the moistening container, while the other part is connected with the reservoir 3. The connection of the two parts takes place by slipping the one over the other.

The valves may be opened singly by lifting the valve stems 5. They may, however, also be opened and closed in common or in groups. The single valve stems 5 are connected by means of a plate 10 engaging below the nuts 7. By rotation of a nut 11 the plate is lifted, which in turn lifts the single valve stems 5. By lifting the stems 5 to different extent the liquid is fed in continuous or drip flow. The spring 12 returns the stem 5 into the normal position.

Below each valve there is a window 8 in order to ascertain the correct rate of drip or continuous feed of the liquid. The contents of the reservoir are controlled through a window 18.

The valves 5 of the reservoir 23 may be opened or closed by lifting or lowering by hand. For opening the valves 5 automatically the lever mechanism 25, 25', 27 pivotally mounted in a bearing 24 engages below the valves. The levers 25' and 27 are pivoted together. The lever 27 is pressed by a spring 30 against the set screw 28, which is maintained in position by a nut 29. The valves 5 are lifted to different extent by adjustment of the screw 28, so that a greater or smaller amount of liquid is capable of emerging from the reservoir 23.

Mounted laterally on the drum or roller 1 are pins 31 and 32, which perform certain functions

not associated with the present invention, but at the same time may also be employed for actuation of the lever mechanism referred to in the above. Upon each revolution of the roller 1 these pins 31 and 32 press consecutively from below against the lever 27, whereby the lever mechanism 25, 25', 27 is lifted and the valves 5 are opened. The valves 5 accordingly remain open for a certain time until the pins 31 and 32 have moved past, and are then again closed by the springs 12.

For the purpose of being able to interrupt the automatic supply of the liquid the levers 25' and 27 may be folded over towards the top after moving away the pawl 26.

To permit of exact regulation of the quantity of liquid, or the time for which the valves 5 are open, as desired, there may also be provided on the roller 1 two or more curved segments 35, which may be moved in relation to each other, in order to obtain a larger or smaller surface up to possibly one-half or three-quarters of the periphery of the roller 1. The segments 35 are maintained in their particular position by means of a screw 36.

For lifting the lever mechanism it is of course quite possible to employ in place of the pins 31 and 32 other pins or cam-like devices provided for this specific purpose. Thus, for example, the lever mechanism may be lifted by a cam 31' mounted on the clamping bar 33.

The lower plate 13 carrying the bar 15 is bent up at the front, so that behind the moistening felt 4 there is a relatively large space for the absorptive material 20 (soft felt, cotton wool or the like). This space or chamber, after it has been moved against the moistening container proper, is closed by the upright edge 17', through which there also pass the pipes 6. In the upper part of the plate 13 (Fig. 8) there are air apertures 21, which are provided opposite to the outlet apertures of the feed pipes 6. For the purpose of obtaining a larger outlet opening the pipes 6 are sloped at the ends.

In the soft absorptive material 20 there are provided opposite to the outlet apertures recesses 38, so that the material otherwise situated immediately in front of the apertures will not obstruct the discharge of liquid.

For the purpose of exchanging the felt 4 the moistening container is taken apart by removing the lower sheet 13 carrying the felt 4. By moving over the laterally mounted levers 14 in a downward direction, which levers press against the bolts 15 on the sheet 13, whereby the bolts 15 slide against the cams 16, the sheet 13 is pressed against the upper sheet 17 and the felt 4 held in position. By merely lifting the lever 14 the lower plate 13, due to the rotation of the eccentric 14' against the bolt 15, is moved towards the front, and may be removed together with the felt 4.

In the moistening container there are projections which engage in recesses 37 (Fig. 9) in the felt 4 and prevent the latter from being displaced.

It will be understood that no restriction is made to the specific form of embodiment shown, which is quoted merely by way of example, and that various modifications are quite possible within the meaning of the above description and the annexed claims without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. In duplicating apparatus in combination, a

moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening device and a separate valve associated with each pipe.

2. In duplicating apparatus in combination, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe and means for alternatively varying the operative condition of one and of a plurality of valves at a time, respectively.

3. In duplicating apparatus in combination, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and means connecting a plurality of valves for operation in common.

4. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and means associated with said printing cylinder for automatically operating said valves.

5. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and means associated with said printing cylinder for varying the period of operation of a valve.

6. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and means associated with said printing cylinder for varying the period of operation of said valves.

7. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and adjustable means associated with said printing cylinder for automatically operating said valves.

8. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and adjustable camming means associated with said printing cylinder for automatically operating said valves.

9. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and fan-like adjustable camming means associated with said printing cylinder for automatically operating said valves.

10. In duplicating apparatus in combination, a moistening device, a liquid reservoir, a plurality of pipes in two parts leading from said reservoir to different points of said moistening means, a separate valve associated with each pipe, and means for alternatively varying the operative condition of one and of a plurality of valves at a time, respectively.

11. In duplicating apparatus in combination, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening device, a separate valve associated with each pipe, funnel-shaped refilling means on said reservoir and means for closing said refilling means.

12. In duplicating apparatus in combination, a moistening device in two parts, absorptive material in one and a moistening strip in the other part, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said absorptive material, and a separate valve associated with each pipe.

13. In duplicating apparatus in combination, a moistening device in two separable parts, absorptive material in one and a moistening strip in the other part, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said absorptive material, and a separate valve associated with each pipe.

14. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a valve associated with each pipe, an opening lever associated with each valve, and camming means on said cylinder for temporarily varying the position of said levers.

15. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a valve associated with each pipe, an opening lever associated with each valve, adjustable means for varying the throw of said levers, and camming means on said cylinder for temporarily varying the position of said levers.

16. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said moistening means, a valve associated with each pipe, an opening lever associated with each valve, camming means on said cylinder for temporarily varying the position of said levers, and means for shifting said lever into inoperative position.

17. In duplicating apparatus in combination, a moistening device in two separable parts, absorptive material in one and a moistening strip in the other part, and means pivoted to one of said parts for holding same applied against the other part.

18. In duplicating apparatus in combination, two plates arranged to coact to form a chamber and a channel communicating with said chamber, means for holding said plates applied against one another, absorptive material in said chamber, a moistening strip in and projecting from said channel, and means for feeding a liquid to said chamber.

19. In duplicating apparatus in combination, a moistening device, absorptive material in one and a moistening strip in the other part, a liquid reservoir, a plurality of pipes leading from said reservoir to different points of said absorptive material, a valve associated with each pipe, and indentures in said absorptive material facing the ends of said pipes.

20. In duplicating apparatus in combination, a revoluble printing cylinder, a moistening device, a liquid reservoir arranged to the rear of said cylinder, a plurality of pipes leading from said reservoir to different points of said moistening means, and a valve associated with each pipe.

21. The combination of claim 20, in which the free ends of said pipes are cut off at a pointed angle to the pipe axes.

22. The combination of claim 20, in which the moistening device is formed with vents.

23. The combination of claim 20, in which a window is arranged below each valve.

24. The combination of claim 20, in which projections are formed on said moistening device engaging the moistening strip to prevent displacement thereof.

25. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing a copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, conduit means for said liquid connecting said reservoir to said moistening device, valve means associated with said conduit means, and means associated with said printing cylinder for automatically actuating said valve means.

26. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing a copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, conduit means for said liquid connecting said reservoir to a plurality of points of said moistening device, control means associated with said conduit means for regulating the flow of said liquid, and means operatively associated with said printing cylinder for actuating said control means.

27. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing a copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, conduit means for said liquid connecting said reservoir to a plurality of points of said moistening device, control means associated with said conduit means for regulating the flow of said liquid, and means operatively associated with said printing cylinder for intermittently actuating said control means when said printing cylinder is rotated.

28. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, at least one pipe connecting said reservoir to said moistening device, valve means associated with said pipe, and means associated with said printing cylinder for controlling the operation of said valve means.

29. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing a copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, conduit means connecting said reservoir to different points of said moistening devices, valve means associated with said conduit means, and means operatively associated with said printing cylinder for automatically controlling the time and the length of the actuation of said valve means and the quantity of liquid dispensed by each actuation.

30. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing a copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, conduit means connecting said reservoir to different points of said moistening means, valve means for controlling the flow of said liquid through said conduit means and cam-like means operatively associated with said printing cylinder for actuating said valve means when said printing cylinder is rotated.

31. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing a copyable mirror-script original, a reservoir for a rapidly volatilizing liquid, a moistening device for dispensing said liquid, said moistening device including two separable parts, conduit means connecting said reservoir to the one of said parts and a moistening strip in the other of said parts, means for holding said parts together, valve means associated with said conduit means, and actuating means for said valve means operatively associated with said printing cylinder.

32. In a duplicating apparatus, the combination comprising a rotatable printing cylinder bearing copyable mirror-script original, a moistening device dispensing a rapidly volatilizing liquid, a reservoir for said liquid, conduit means connecting said reservoir to different points of said moistening device, valve means for said conduit means, a lever adapted to open said valve means, and cam-like means operatively associated with said printing cylinder capable of actuating said lever when said printing cylinder is rotated.

33. In a duplicating apparatus having a printing cylinder bearing a copyable mirror-script original, the combination comprising a pair of plates adapted to form a chamber and a channel communicating with said chamber, releasable means for holding said plates in position with respect to each other, an absorptive material in said chamber, a moistening strip in said channel and protruding therefrom, means for feeding a rapidly volatilizing liquid to said chamber, said means including a needle valve, and operating means for said needle valve actuated by the rotation of said printing cylinder.

34. In a duplicating apparatus, the combination comprising a printing cylinder bearing copyable mirror-script original, a moistening device adapted to dispense a rapidly volatilizing liquid, a reservoir for said liquid, a pair of pipes connecting said reservoir to said moistening device, a needle valve controlling the flow of said liquid for each of said pipes, a lever for each of said valves adapted to open said valve when actuated, and cam-like means operatively associated with said printing cylinder for actuating said levers when said printing cylinder is rotated.

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