

April 29, 1952

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2,594,486

SPLASHPROOF PAPER MOISTENER

Filed March 26, 1949

2 SHEETS—SHEET 1

Fig. 1.

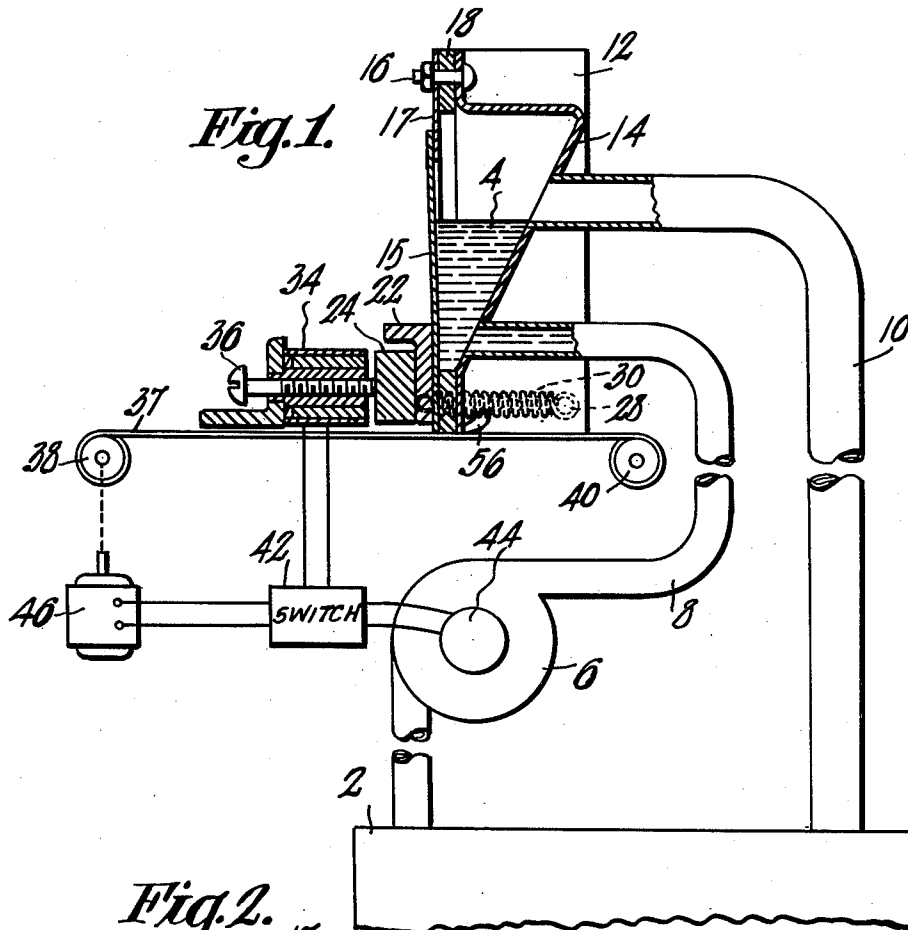
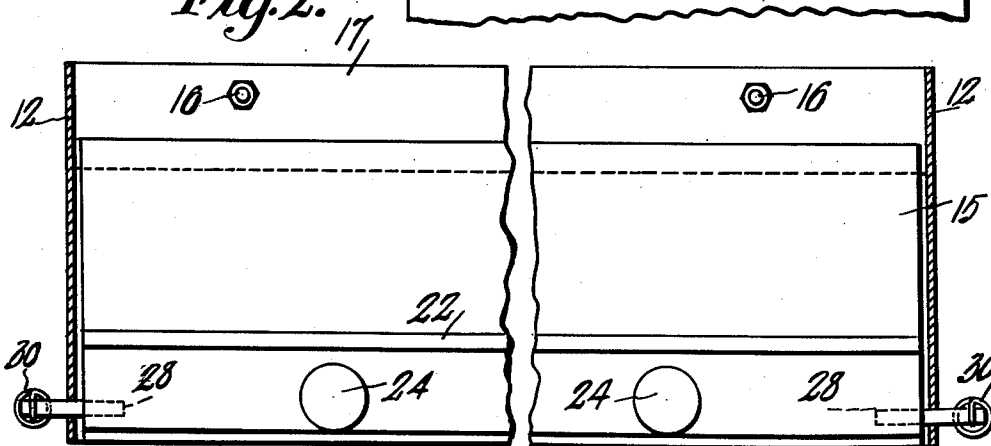


Fig. 2.



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2 SHEETS—SHEET 2

Fig. 3.

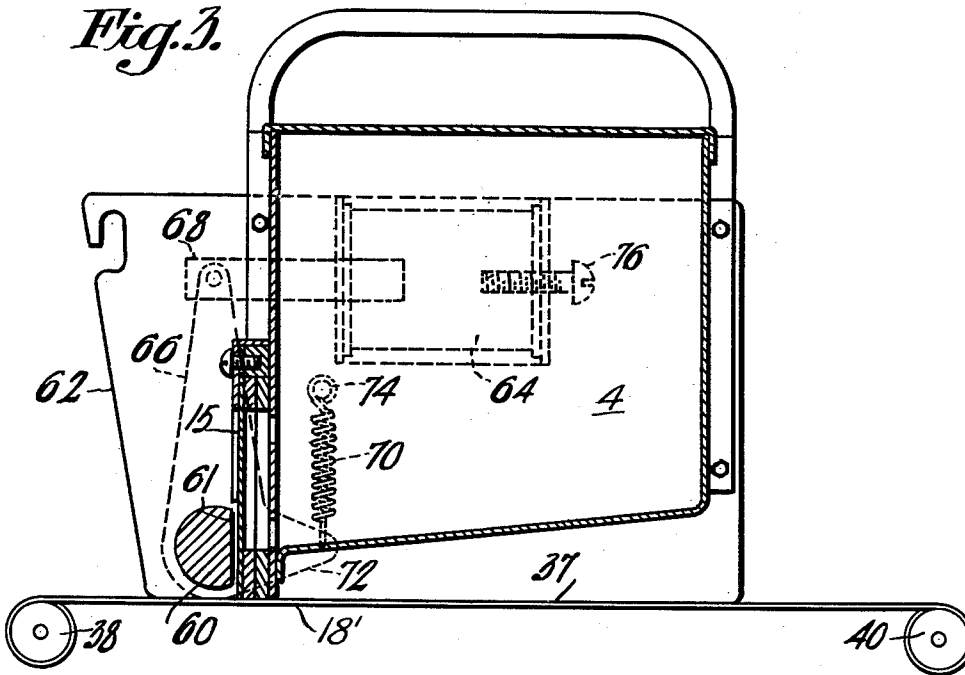
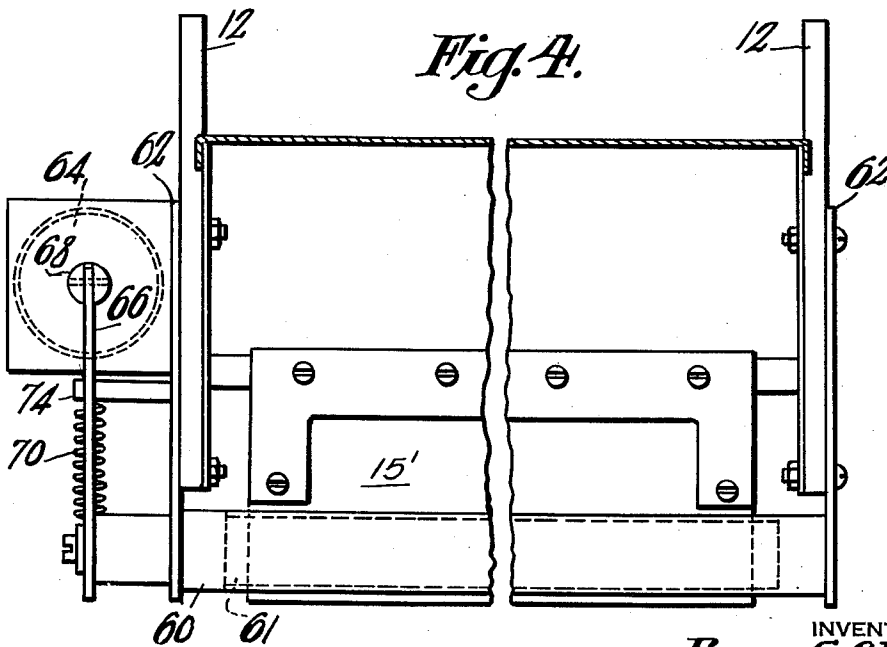


Fig. 4.



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UNITED STATES PATENT OFFICE

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SPLASHPROOF PAPER MOISTENER

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5 Claims. (Cl. 118—401)

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This invention relates to a device for applying fluid to material, and in particular to wetting a narrow strip.

In designing facsimile machines it is necessary that the rapidly moving strip of material upon which the reproductions are to be made be moistened to a proper degree before passing under the electrodes located on either side of the strip. If the strip is too wet the current fans out from the electrodes and the recording becomes blurred. On the other hand, if the strip is too dry, it has such high resistance that no current flows between the electrodes and no recording is made.

One of the methods for moistening the strip to the desired amount employs a device in which wetting rollers are immersed in the reservoir of the fluid to be applied and the strip is passed over the rollers. However, the difficulty with this type of apparatus is that, when it is not operated in substantially horizontal position, the fluid is apt to spill, and this is especially disadvantageous when the fluid is corrosive or has other undesirable qualities. Whereas, wick-type moisteners have been designed that do not spill, the capillary passage-ways in the wick become clogged with particles when the fluid evaporates thus stiffening the wick until it is incapable of applying a uniform coat of fluid.

Furthermore, because the amount of fluid deposited on the strip by these devices is not easily controlled, it has been customary to apply more than is required, and to remove the excess by the use of doctor blades, and heated rollers. One of the advantages of the present invention is that the fine control of the amount applied makes it possible to moisten the strip to the desired degree in the first instance thus eliminating the need for doctor blades and drying rollers.

This is achieved by the provision of an adjustable capillary passageway between a fluid reservoir and the moving strip such that the capillary attraction of the strip draws the fluid from the reservoir, and depending on the size of the capillary passageway controls the amount of fluid deposited. In such a device the head of fluid in the reservoir is not critical and accordingly, it may be used on ships and airplanes that pitch and roll so as to splash the liquid in the reservoir.

It sometimes becomes desirable to control the rate of flow of the fluid that is deposited upon the moving strip in accordance with the speed of the strip in order that a uniform amount of the fluid may be applied to the strip per unit area even though the speed of the strip is not

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constant. This is accomplished in this invention by placing the moving strip in frictional contact with the end of the capillary passageway so that the faster the strip moves the wider the capillary passageway is opened.

Accordingly, it is an object of this invention to provide an improved device for uniformly applying a desired amount of fluid to a moving strip of material.

A further object of the invention is to uniformly apply fluid to a moving strip of material without the danger of spilling.

An additional object of the invention is to provide an improved device for uniformly applying fluid to a moving strip of material in such manner as to eliminate the need for doctor blades and drying means.

A still further object of the invention is to provide an improved device for uniformly applying fluid to a moving strip of material at a rate proportional to the speed of the strip such that the amount of fluid applied to a unit of area is substantially constant.

A still further object of the invention is to provide a device for uniformly applying fluid to a strip of material having a ready service reservoir that is filled when in use and completely empty when not functioning.

Still another object of the invention is to provide an arrangement for applying fluid to a moving strip from an enclosed reservoir to prevent changing the pH of the fluid.

Further objects and advantages will become apparent upon consideration of the detailed description of the drawings in which:

Figure 1 shows one form of the invention in which the size of the capillary passageway is set at a predetermined value;

Figure 2 is a front view of part of the capillary valve; and

Figure 3 shows a second form of the invention for controlling the minimum size of the capillary opening which may be manually adjusted for various speeds of the moving strip of material. Figure 4 is a front view of the apparatus shown in Figure 3.

The general arrangement of the invention as shown in Figure 1 comprises a main storage tank 2, an auxiliary ready service reservoir 4, a leaky type pump 6 for forcing the fluid from the tank 2 via fluid line 3 into the bottom of the reservoir 4, and at a suitable level a return line 10 is connected to the reservoir 4, so as to conduct the fluid back to the tank 2.

The auxiliary reservoir 4 is composed of two

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side plates 12, a plate 14, therebetween that serves to cover the top as well as the back of the reservoir, and a front plate 15 that is resiliently hinged by a flexible piece of material 17. The latter is secured to the back section of the reservoir 14 by bolts 16, and the gasket 18 is provided so as to prevent the escape of the fluid. But no fluid escapes between the side walls 12 and the hinged member 15 as the latter is flexed only a small amount when the device is in operation.

As shown in Figure 1 and Figure 2, the bottom of the rigid sheet 15 is provided with a transverse stiffening member 22 on either side of which is secured a magnetic pole piece 24. In order to hold the plate 15 against the gasket 18 located between it and the bottom of the rear wall 14 of the reservoir, brackets 23 are mounted on either side of the stiffener 22 as seen in Figure 2 and are bent so as to pass around the leading edges of the side walls 12 and secured to a spring 30. Electro-magnets 34 having adjustable screws 36 are mounted so that when the electro-magnets are energized, the pole pieces are attracted until they engage the ends of the screws 36. The strip of material 37 is drawn past the lower end of plate 15 and gasket 18 at a uniform rate by rollers 33 and 40.

Upon throwing the switch 42 to a closed position, the motor 44 driving the pump 6, the motor 46 driving the roll 33, and the electro-magnets 34 are simultaneously energized, and accordingly, the fluid is pumped into the auxiliary reservoir 4, the strip is moved in the direction of the arrow, and the capillary front plate 15 is opened against the tension of the spring 30 into contact with the ends of the screws 36, thus providing a capillary channel between members 15 and 18 for the fluid to escape from the reservoir to the strip 37.

For the most advantageous operation of the device, the width of the capillary channel should be sufficient to allow capillary flow but not so large as to allow free flow of the fluid. Between these limits, extremely fine control of the amount of liquid discharged is obtained by adjusting the screws 36.

Various factors affect the size of the channel that is required to apply a given volume of fluid onto a given area of strip. Obviously, the faster the strip moves past the capillary gap or channel the greater must be the opening of the gap and variations in the absorption and capillary attraction of the material from which the strip is made affect the rate at which the fluid is attracted away from the capillary passage. The weather conditions, too, affect the size of the gap.

It should also be emphasized that the moving strip must be kept in contact with member 15 as otherwise there would be no capillary attraction, and therefore, for high speed operation a curved pressure plate 56 may be supplied so as to remove any vibrations in the strip in the vicinity of the opening without placing too much drag on it. It has been found by experiment that, if the rollers 33 are placed so that the strip is depressed between plate 56 and blade 15, that sufficient contact is made. However, the angle at which the strip is depressed must be very shallow or otherwise a pool of liquid collects on the outside of the plate 15 and the strip does not absorb sufficient moisture to form a suitably low resistance conducting path when it passes between the recording electrodes.

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Whereas the apparatus described above is satisfactory when the strip is moved at a substantially uniform velocity, the modification shown in Figures 3 and 4 is adapted to be used when the strip is moved intermittently, the principal difference being that the plate 15' is not opened by electromagnets but is merely released so that it can be opened against the cam member or eccentrically mounted member 60 by the frictional force of the paper 37. Forwardly extending arms 62 are secured on the outside walls 12 and each is provided with bearings 64 upon which the cylinder or cam 60 is eccentrically mounted, said cam preferably having a flat surface 61 capable of pressing against plate 15'. Arms 66 are fastened at the end of the cylinder 60 so as to rotate integrally therewith, and have a plunger 68 mounted on them in such manner that energization of solenoid 64 causes the cylinder 40 to rotate and thus release the plate 15'. Spring 70 is connected between pin 72 on arm 66 and pin 74 on one of the side walls 12 so as to keep the cylinder pressed against plate 15' when the solenoid 64 is not energized. Inasmuch as the plunger 68 is drawn into contact with the screw 76 by solenoid 64 when the latter is energized, the plate 15' is free to move between the gasket 18' and the cylindrical member 60. When the strip is not moving, and the solenoid 64 is not energized, the capillary opening is closed by means of spring 70 and no fluid escapes from reservoir 4. However, when the strip is set in motion, the plate 15' is moved against member 60 by the friction between the edge of member 15' and the strip, the maximum size of the opening being determined by amount of rotation of cam 60. Just as in the device shown in Figure 1 the plate 15' must be prevented from opening to such an extent that the liquid flows at too great a rate from the reservoir, and this is accomplished by setting the screw 76 at a proper distance. The maximum width of the gap is determined by the setting of screw 76, and it must be properly adjusted for different speeds of the paper.

It is intended that this device be used whenever it is required that a desired amount of fluid be uniformly applied to a strip of material. By use of the invention described herein the amount so applied can be controlled with extreme accuracy and means for removing excess fluid and drying the strip are not needed. For these reasons, it is believed that this invention is a marked step forward in the art of applying fluid to material.

Having described my invention, I claim:

1. An apparatus for applying a liquid to a moving strip without splashing, comprising a closed reservoir, a plate forming one side of said reservoir, a gasket mounted on the reservoir so as to be opposite the edge of said plate, said plate being hinged at the top and in contact with said strip along its bottom, means for limiting said plate to a predetermined maximum open position.

2. An apparatus for applying the proper amount of liquid to a moving strip of material comprising a reservoir, a plate mounted on one side of said reservoir, the top of said plate being resiliently hinged to said reservoir, a gasket mounted on the reservoir so as to be opposite the edge of said plate, with the bottom edge of said plate extending below the gasket, a cylinder, eccentric bearings for holding said cylinder parallel to the lower edge of said plate, a radial arm connected to one end of said cylinder, a means for rotating

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the arm and cylinder in such direction that the latter forces the plate to a closed position, means for rotating the arm and cylinder in the opposite direction a predetermined amount, and means for drawing the strip material past the lower end of the reservoir in frictional contact with the bottom end of said plate in such manner that the plate is rotated away from the gasket.

3. An apparatus for applying the proper amount of liquid to a moving strip of material comprising a reservoir, a flexible plate mounted on one side of said reservoir, the top of said plate being resiliently hinged to said reservoir, a gasket mounted on the reservoir so as to be opposite the edge of said plate, a cam mounted adjacent to the bottom of said flexible plate, means for rotating said cam so as to force the plate to a closed position, means for rotating the cam in the opposite direction a predetermined amount, and means for drawing a strip of material past the lower end of said plate and in frictional contact therewith so that the plate is rotated away from said gasket.

4. An apparatus for applying a uniform amount of fluid to a moving strip of material, a reservoir, an opening along the bottom of said reservoir, a flexible member engaging a fixed member extending across said moving strip to form an adjustable opening, means for limiting the maximum size of said opening, said flexible member

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frictionally engaging said strip whereby the size of the opening is varied by the movement of said strip.

5. An apparatus for applying fluid to a strip of material comprising in combination a closed reservoir, one side of said reservoir being hinged at the top, a cam mounted adjacent to the bottom edge of said hinged side, a spring for urging said hinged side to a closed position, a plunger of magnetic material attached to said cam, and an electromagnet mounted adjacent to said plunger in such manner as to rotate said cam away from the bottom edge of said hinged side when it is energized, and means for drawing said strip past said reservoir in contact with the lower edge of said side so that said side is pivoted by the movement of the strip.

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