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Sugarman et al.

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[54] COMPACT LIQUID TONER APPARATUS WITH STRAIGHT-THROUGH FEED

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Related U.S. Application Data

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[52] **U.S. Cl.** .....**118/637**, 95/89, 117/37 LE

[51] **Int. Cl.**.....**B05b 5/02**, B05c 3/02

[58] **Field of Search** .....118/637, 410; 117/17.5, 37; 96/1; 95/84, 94; 347/74 ES

[56] **References Cited**

UNITED STATES PATENTS

1,927,886	9/1933	Burns et al.	118/DIG. 23
3,192,846	7/1965	Wight	95/94
3,245,330	4/1966	Okishima	118/637 UX
3,344,729	10/1967	Kitrosser	95/89
3,392,707	7/1968	Marx	118/DIG. 23
3,405,683	10/1968	Jons et al.	118/637
3,442,254	5/1969	Akiyama et al.	118/637
3,448,720	6/1969	Graham	118/637 UX

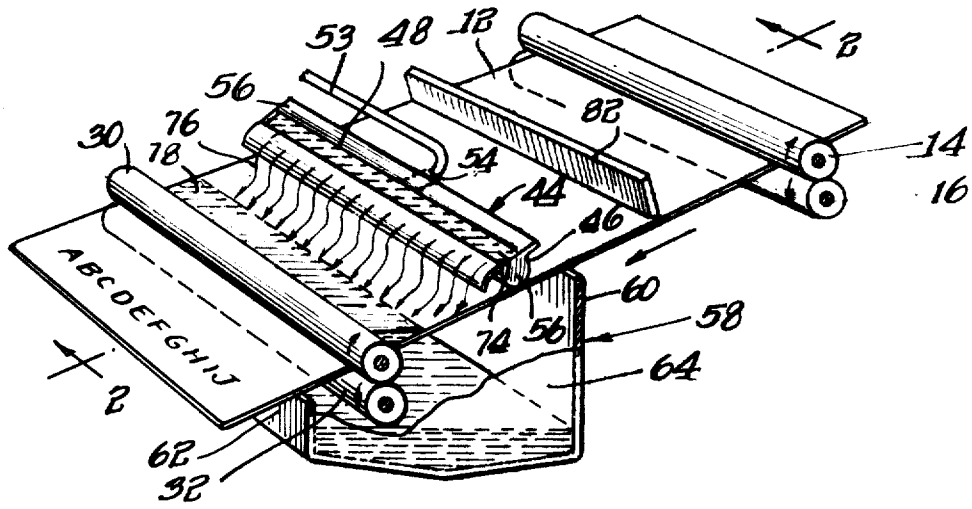
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[57] **ABSTRACT**

Apparatus for applying a liquid toner only to the surface of a sheet of paper or the like for developing an electrostatic image thereon, the paper being fed in a rectilinear path, and the liquid toner being supported on the surface of the paper or the like, with a roller or other means serving as a dam.

3 Claims, 13 Drawing Figures



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SHEET 1 OF 4

Fig. 1

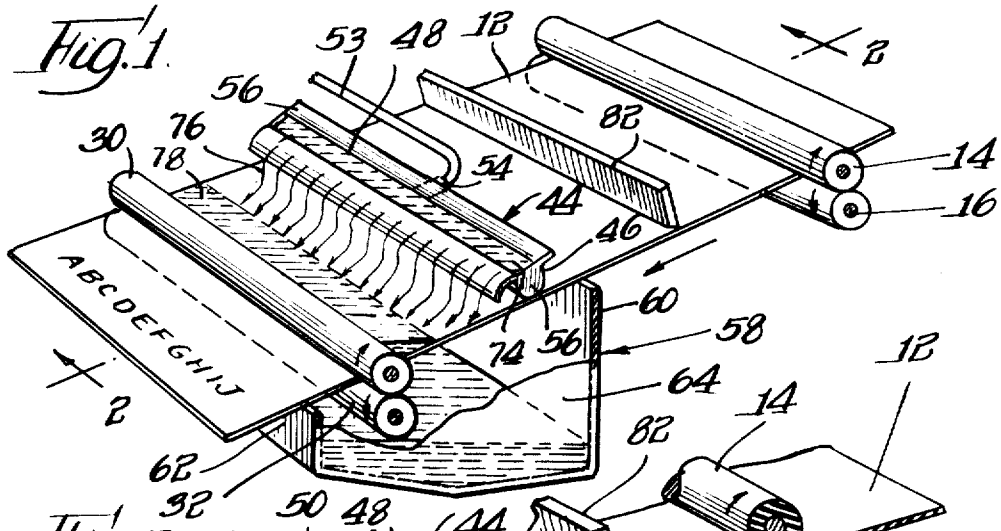
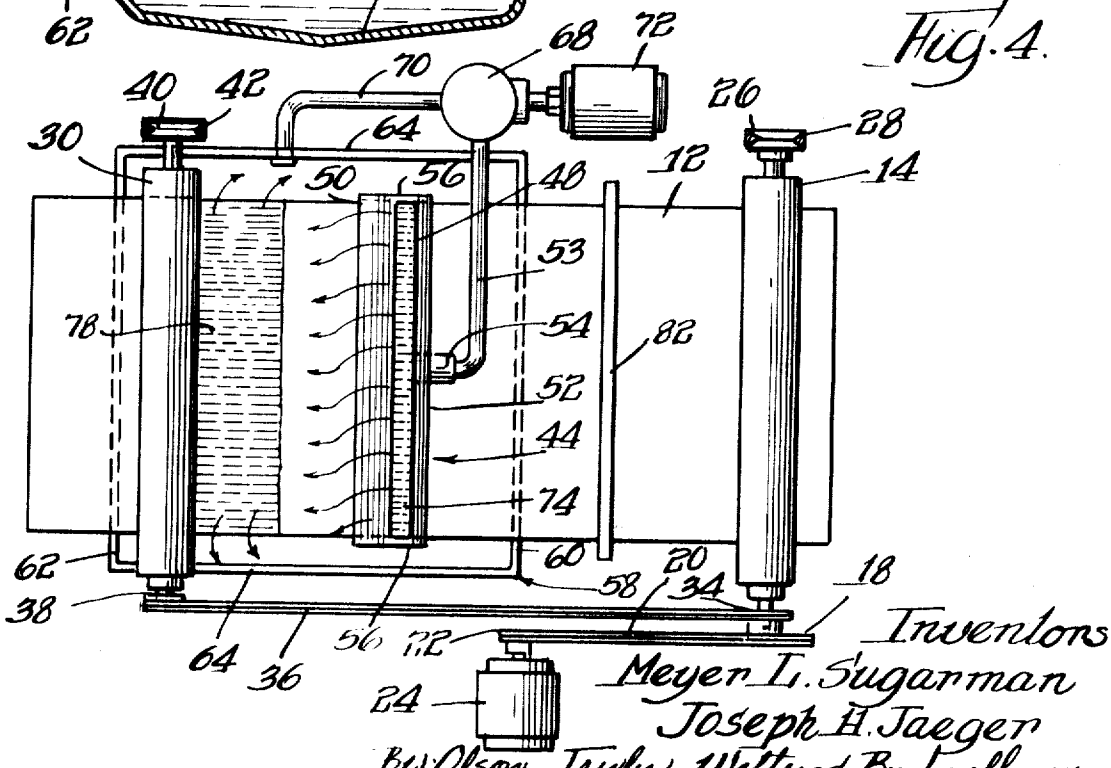


Fig. 4



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Fig. 5.

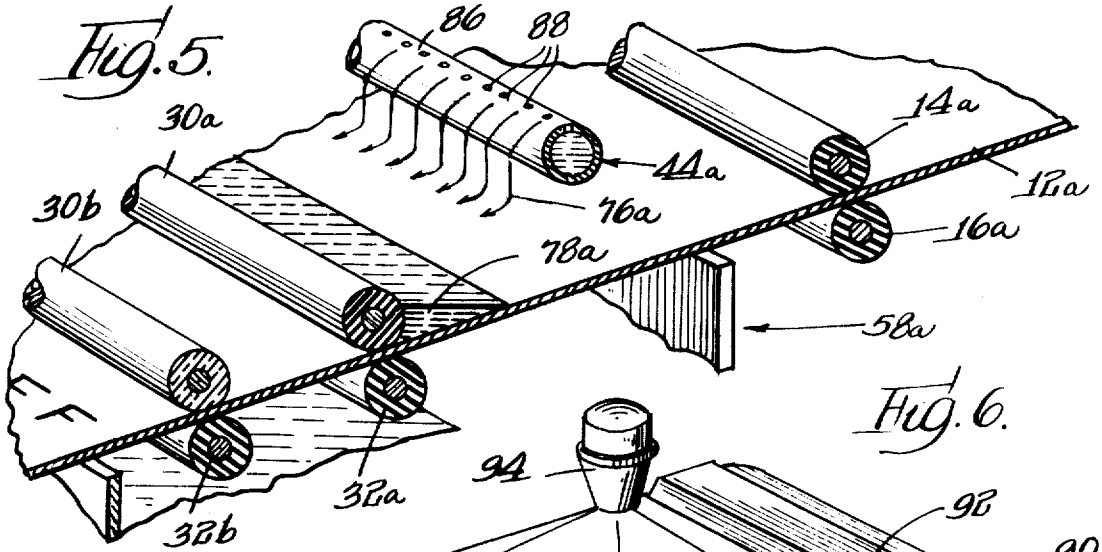


Fig. 6.

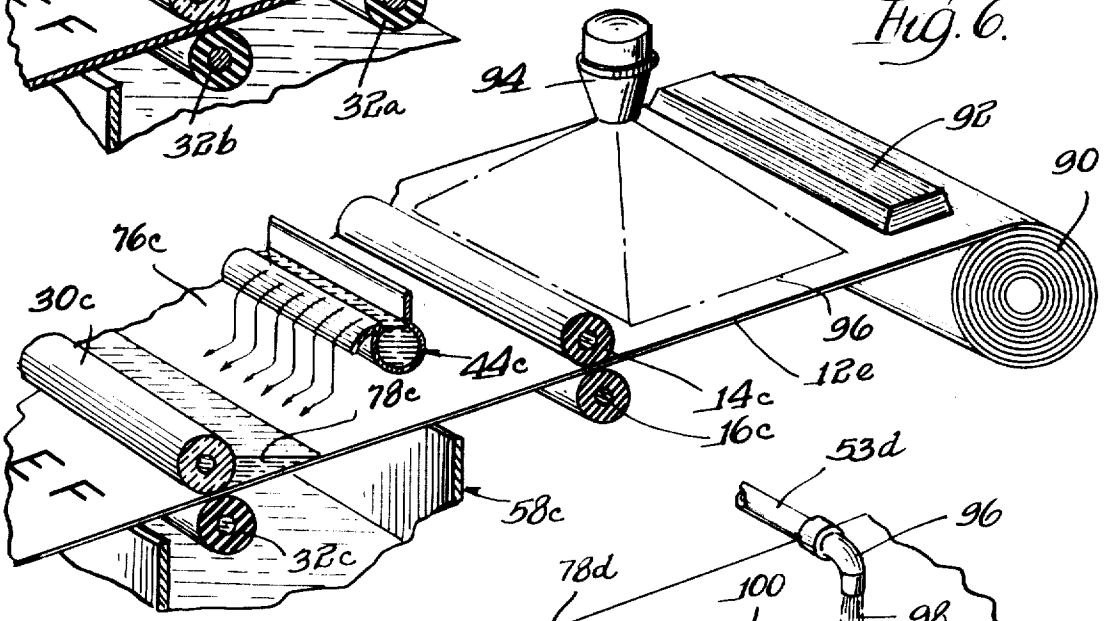
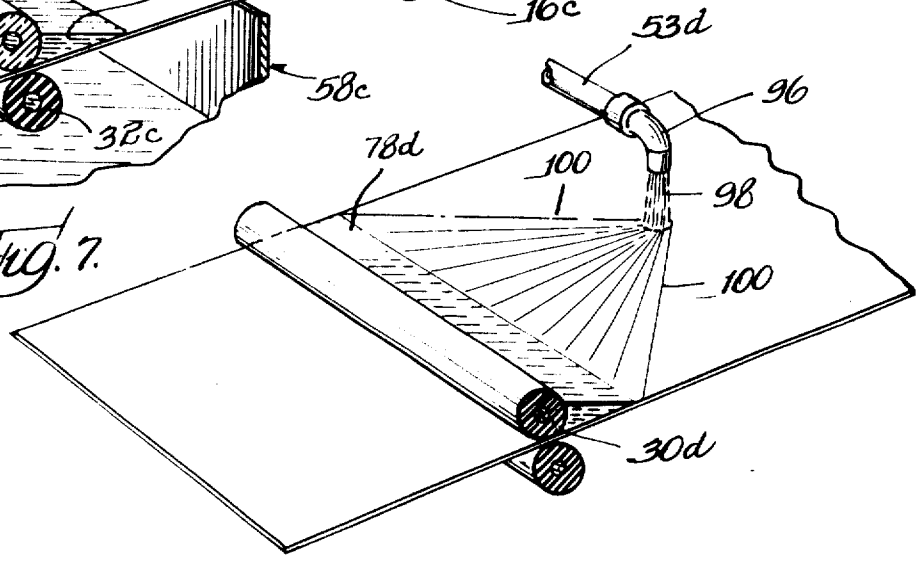
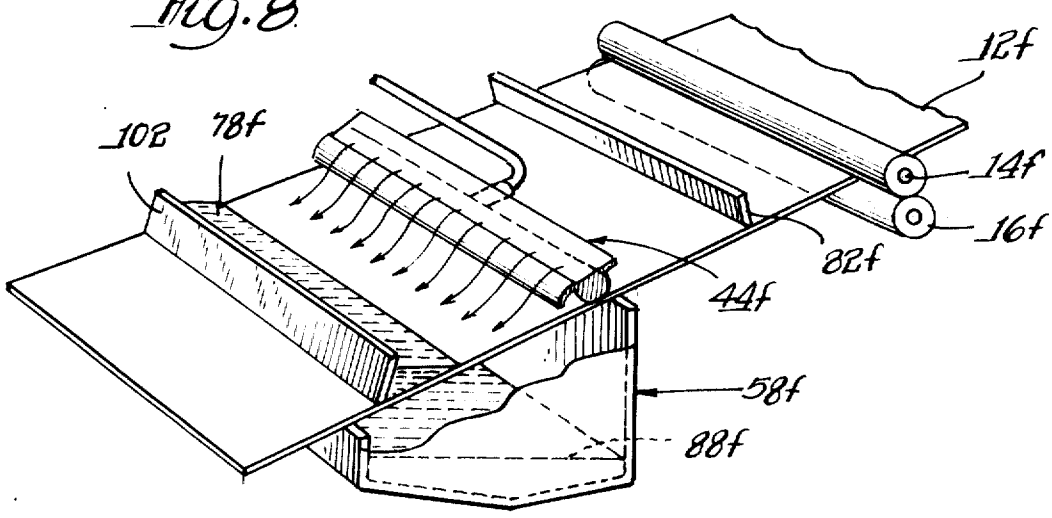


Fig. 7.



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Fig. 8



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Fig. 9.

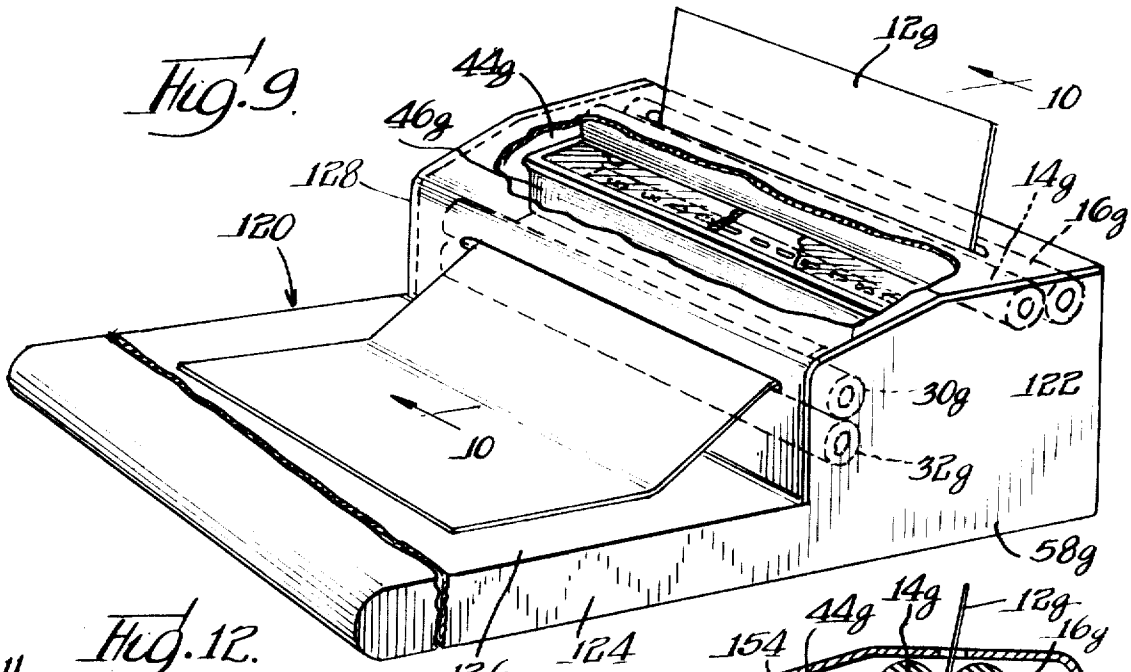


Fig. 12.

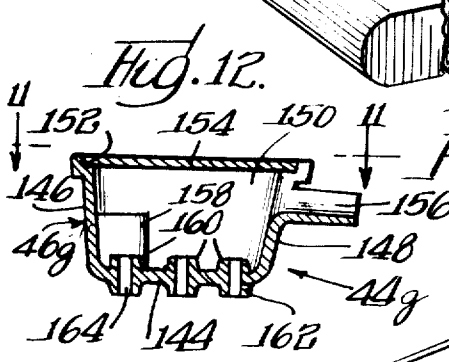


Fig. 10.

Fig. 11.

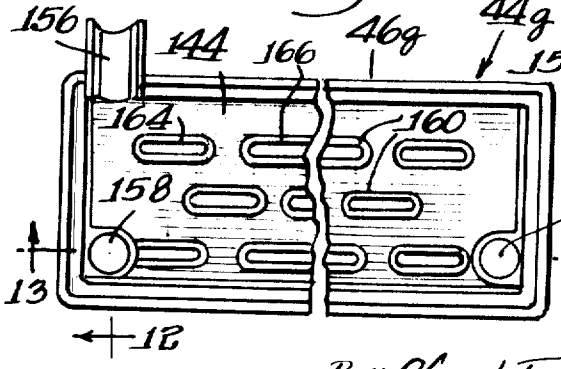
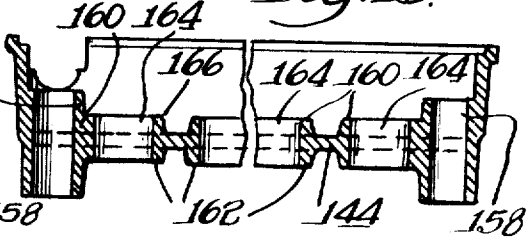


Fig. 13.



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COMPACT LIQUID TONER APPARATUS WITH STRAIGHT-THROUGH FEED

This application comprises a continuation-in-part of our application, Ser. No. 692,234, filed Dec. 20, 1967, for COMPACT LIQUID TONER APPARATUS WITH STRAIGHT THROUGH FEED.

The art of electrostatic printing is generally well known. In this art, either an insulating surface with selectively produced conductive areas (such as paper or metal coated with photoconductive zinc oxide) or some other suitable plate or cylinder is used as a printing base, or a plate or roller capable of transferring electrostatic charge patterns is used. In the first case, the photoconductive surface is electrostatically charged in the dark, and an image is projected optically thereon. Photoconductive properties of the light sensitive coating cause the charge to be dissipated where the coating is struck by light, and to remain where it is not so struck. A toner of either liquid or dry nature then is applied to the base, and adheres selectively according to its nature either to the charged area or to the discharged area. The application of heat to bond toning particles to the base is generally necessary with a dry toner, but is not necessary with a liquid toner. With a liquid-type toner, the toner particles become affixed to the underlying surface, upon drying of the liquid suspension medium.

Typically, in prior art liquid toner apparatus, a supply of liquid toner has been maintained in a tank. Guides of one sort or another have been provided going in and out of the tank, and curved therethrough, to direct the electrostatically charged and exposed paper through the liquid toner in the tank. Generally speaking, squeegee rollers have been provided at the outlet from the tank to squeeze at least some of the liquid from the paper or other base. However, it is apparent in the dip systems that the base is exposed to a liquid toner on the back side as well as on the face side. Paper is the most common base material, and the paper becomes rather wet upon being passed through the toner. Squeegee rollers are not capable of removing all of the liquid, and it therefore has been necessary to provide relatively strong means for adequately drying the toned paper, such as infrared heaters, strong air pressure, or a combination thereof. This is obviously undesirable in that it requires an additional step of handling the paper, it requires drying room, and it delays availability of the finished print.

The rather well-known arcuate toning apparatus as outlined immediately above is limited to the use of flexible material, such as paper, for the printing base. This is necessary because the paper or other base must enter the liquid toner in the tank from the top, and also exit from the top, passing along a curved path in between. This prevents prior art liquid toning apparatus from being used on various rigid printing base materials, such as metal plates or heavy card stock materials. Also, the distance from entrance to exit, due to the curved path, seriously limits the minimum length of copy possible to be processed in such developer units.

Accordingly, it is an object of the present invention to provide a liquid toning apparatus having a straight-through or rectilinear feed path for the exposed paper or printing base.

It is another object of the present invention to provide a liquid toning or developing apparatus wherein the exposed paper or other printing base is contacted by the liquid developer medium only on the electrostatically active or exposed face thereof.

More specifically, it is an object of the present invention to provide a liquid toner apparatus wherein the exposed paper or other printing base passes between exit rollers either horizontally or at an angle to the horizontal, with the upper exit roller acting as a dam for the retention of liquid toner on the active surface of the paper. Alternately, a sheetlike rubber, plastic, metal, or other dam may be employed to contain the liquid.

Furthermore, it is an object of the present invention to provide a liquid toner apparatus wherein the squeegee roller engaging the charged face of the paper or other printing base is of hard, insulating material, as opposed to the metallic, conductive squeegee roller used in prior apparatus.

Various additional objects and advantages of the present invention will be apparent to those skilled in the art when the accompanying drawings are considered in connection with the balance of the present specification, wherein:

FIG. 1 is a perspective view of a liquid toner apparatus constructed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary perspective view of the apparatus of FIG. 1 taken substantially along the line 2—2 in FIG. 1;

FIG. 3 is an enlarged detail of FIG. 2 in across section;

FIG. 4 is a top view of the apparatus of FIG. 2;

FIG. 5 is a view generally similar to FIG. 2 and showing a modification of the apparatus;

FIG. 6 is a view generally similar to FIG. 2 and showing a complete printing system with printing paper fed from a supply roll;

FIG. 7 is a fragmentary view somewhat similar to FIG. 1 and showing a modification of the invention;

FIG. 8 is a fragmentary perspective view generally similar to FIG. 2 and showing a further modification of the invention;

FIG. 9 is a perspective view of a commercial form of the invention;

FIG. 10 is a longitudinal sectional view substantially along the line 10—10 in FIG. 9;

FIG. 11 is the top view of the trough taken substantially along the line 11—11 in FIG. 12 and with the cover removed;

FIG. 12 is a cross-sectional view substantially along the line 12—12 in FIG. 11;

FIG. 13 is a transverse sectional view substantially along the line 13—13 in FIG. 11.

Turning now in greater particularity to the drawings, and first to FIG. 1, reference is made initially to the workpiece which comprises a sheet of paper or other printing base 12. The sheet is shown as being of rectangular form, and is shown as being elongated rather considerably relative to its width. It will be understood that this is for illustrative purposes only, and that the paper typically would be a letter-size sheet, 8½×11 inches, or perhaps a slightly longer legal-size sheet, although other sizes and shapes are contemplated. In a common embodiment, the paper would be in web form and would be fed from a supply roll into the various processing stations. Subsequent to production of the copy or other electrostatic printing, it may be rerolled or cut into sheets or other form. Both the paper and the parts have been stretched somewhat in the longitudinal direction of the paper for purposes of illustration.

The paper is fed in through a pair of input rollers comprising an upper roller 14 and a lower roller 16, gripping the paper between them. These rollers preferably are of a rather soft rubber or other material, preferably being nonconductive to avoid lateral dispersion of an electrostatic charge previously established on the right side or working face of the paper. As will be understood, the electrostatic image typically may be produced as outlined heretofore, as by electrostatic charging of the surface of the paper and partial dissipation of the charge by optical projection of an image thereon, or by any other means of selectively producing electrostatic charge patterns, such as electrographic systems laying down charges only on desired areas of an insulating surface.

One or both of the rollers 14 and 16 may be driven to advance the paper, and if only one is driven, the second is indirectly driven by engagement with the first. A simple drive is indicated in FIG. 4, including a pulley 18 fixed with the roller 14 and driven by a belt 20 from a drive pulley 22 on a motor 24, such as an electric motor.

Means is shown at the opposite end of the rollers 14 and 16 for also driving the roller 16, and this comprises gears 26 and 28, the gears respectively being fixed with the rollers 14 and 16, and of such size as to mesh and drive the circumferential surfaces of the two rollers at the same speed but in opposite directions.

Spaced downstream from the rollers 14 and 16 is a pair of output or squeegee rollers 30 and 32. The upper squeegee

roller 30 is preferably of a hard insulating material, such as Bakelite (phenolic), or other hard nonconductive plastics, or of glass, though it may be metallic resins. The roller need not be solid insulating material, but may be provided with an insulating outer sleeve. A hard roller is desirable to minimize carryout of liquid by the paper or other base 12. However, soft rollers may be used. The surface material of the roller should also be selected so as not to attract the toner, either triboelectrically or by adhesion. The lower output or squeegee roller 32 is of rubber. The rollers 30 and 32 are driven in synchronism with the input rollers 14 and 16, as by a pulley 34 on the shaft of the roller 14 driving a belt 36 which, in turn, drives a pulley 38 on the shaft of the squeegee roller 30. The rollers 30 and 32 also can be positively driven relative to one another by means such as respective pulleys, although one of the rollers could be driven indirectly by friction from the other, or from the sheet material passing between them. In certain systems, the input rollers 14 and 16 may be omitted and the drive accomplished through the exit rollers 30 and 32, or by other means.

A liquid toner distributor 44 is disposed above the upper surface of the paper between the input and output rollers. In FIGS. 1 through 4 this distributor is illustrated as a trough 46 extending transversely across the paper and space thereabove, the trough being open at the top 48. On the downstream side the trough is provided with a downwardly curved lip 50. An upwardly, angularly directed lip 52 is provided along the upstream side of the open top 48 of the trough. A conduit or pipe 53 is connected to the trough at 54 midway between the ends thereof, although it is contemplated that there could be two pipes or conduits 53 feeding to opposite ends of the trough, or one pipe feeding into one end, the opposite end being closed. It will be seen that in FIGS. 1 and 4 both ends of the trough are closed at 56.

The distributor may also be a simple tube with a longitudinal slot possessing no lips. An open top sump 58 is provided below the paper 12 and extends in the direction of feed from somewhat upstream of the liquid toner distributor 44 to a position downstream of the output or squeegee rollers 30 and 32. Since the paper 12 is preferably oriented at a shallow angle with the horizontal, conveniently the first or upstream wall 60 may be of greater height than the downstream wall 62, though they may also be of the same height when the paper is developed in a horizontal plane. Both extend laterally of the paper 12 beyond the limits of the paper and of the liquid toner distributor 44. The sump further is provided with end walls 64 and with a bottom 66, which preferably is of more or less V-shape section to provide a low spot for draining of the sump.

An outlet pipe or conduit 70 leads from the low part of the sump bottom or floor to the inlet of a pump 68, the outlet of which is connected to the previously mentioned pipe or conduit 53. The pump conveniently is driven by an electric motor 72, and this motor also preferably is of a type susceptible to speed control.

Liquid toner is pumped by the pump 68 into the distributor 44, and is indicated at 74. The liquid toner 74 overflows the distributor 44, and runs down the lip, cascading or falling as a curtain somewhat in the nature of a waterfall at 76 onto the surface of the paper. The liquid toner runs downhill along the surface of the paper until it encounters the upper squeegee roller 30, the latter serving as a dam, whereby a lake, pond, or puddle of liquid toner is formed at 78, supported by the paper and held back by the upper squeegee roller 30. The liquid toner in the lake 78 runs over the sides of the paper 12 and down into the sump 58 where it is collected at 80 for recirculation by the pipe 70, pump 68, and pipe 53. Instead of, or in addition to, the exit rollers acting as a dam, a rubber or plastic "wall" may be inserted to hold back the liquid.

As will now be apparent, the paper 12 comes into contact with the toner only on the upper face of the paper, and hence the paper is wet only slightly. Furthermore, many of the papers used in the electrostatic printing process have both a pigmented photoconductive coating, such as zinc oxide in a resin binder, and a toner barrier back coating of a suitable resinlike material on the back surface, whereby the liquid toner does not penetrate the paper at all. In any event, the paper as it exits between the squeegee rolls 30 and 32 is substantially dry, and needs little or no special drying procedures.

As will be understood, the paper is wet at least by a film of liquid toner from the cascade or waterfall area 76 to the lake 78. It is the wetting of the surface that is important, and not the depth of the lake 78. However, the depth of the lake is determined by the speed at which the liquid toner is pumped, by the diameter of the upper squeegee roller 30, and by the angle and speed at which the paper is fed.

In different types of equipment, different angles of feed may be desired. A downwardly inclined feed direction is in most cases desirable, since the squeegee rollers serve as a dam, as indicated, and since it normally is not necessary to support the paper between the input and output rollers. However, in some instances it may be found desirable to feed the paper horizontally, or even uphill.

In order further to guard against the possibility of any liquid toner working back upstream along the paper, there may be provided a squeegee blade 82 extending transversely completely across the paper, and in contact with or spaced slightly from the paper as indicated at 84 in FIG. 3.

A modification of the invention is shown in FIG. 5. Like parts therein are identified by the use of similar numerals with the addition of the suffix *a*. Repetition and prolixity of description are thereby avoided. Differences reside in the specific construction of the liquid distributor 44*a*, which in this instance comprises a tubular pipe or conduit 86, fed at the center as in the previous illustration, or by any other suitable method, said pipe having along its upper edge a row of holes or apertures 88 through which the liquid toner flows. Preferably the holes 88 are not quite at the highest part of the pipe 86, but are slightly downstream therefrom so that the liquid toner will cascade only from the downstream side thereof as indicated at 76*a*.

A further distinction of the embodiment of the invention illustrated in FIG. 5 is that the rollers 30*a* and 32*a* both are rubber rollers, and serve as dam rollers and to some extent also serve as squeegee rollers. Somewhat downstream therefrom a pair of final squeegee rollers 30*b* and 32*b* is provided, the uppermost of which is of hard material, preferably insulating, and the lower of which is rubber, whereby to further squeegee the liquid from the paper. The sump 58*a* is somewhat extended in the direction of feed of the paper due to the spacing of the squeegee rollers 30*b* and 32*b* downstream from the dam rollers 30*a* and 32*a*.

A further modification of the invention is shown in FIG. 6. Many of the parts are identical with those previously described in connection with FIGS. 1 through 4, and similar numerals are used with the addition of the suffix *c*. In the present instance the paper or other printing base 12*c* is shown as coming from a supply roll 90. The paper, as it passes from the supply roll, passes beneath an electrostatic charging unit or device 92 of known design. A photographic enlarger 94 or the like is used to project an image on the charged photoconductive surface of the paper as indicated at 96. The paper 12*c* then goes to the infeed rollers 14*c* and 16*c*, and continues as previously described. Various techniques can be used for printing while the paper is moving, such as incorporation of a loop (not shown) in the paper between pairs of infeed rollers, somewhat in the nature of motion picture photography and projection. Alternatively, the enlarger can be moved at a speed correlated to that of the paper strip, the positive or negative from which the image is projected can be scanned, or the exposure simply can be so short relative to the speed of movement of the paper as to be insignificant.

A further modification of the invention is shown in FIG. 7. Most of the parts are similar to those shown and described in connection with FIGS. 1 through 4, and similar numerals again are used with the addition in this instance of the suffix *d*. In the present embodiment of the invention the liquid distributor is eliminated. The pipe 53*d* is spaced above the paper and

is provided with a downwardly directed nozzle **96** from which the liquid exits at **98** as a low-velocity stream to fall upon the paper, and then spread out at **100** to form the lake **78***d*, which, as before, overflows into the sump and is recirculated through the pipe **53***d*. Alternately, a series of such pipes, laterally disposed across the width of the paper, may be employed as a liquid supply source.

Turning now to FIG. **8** wherein like parts are identified by similar numerals with the addition of the suffix *f*, the embodiment illustrated is similar to that in FIG. **1** except that the squeegee rollers are omitted. (However, it is contemplated that a pair of output rollers could be provided, if desired.) Instead, a squeegee or doctor blade **102** is provided which may be approximately at right angles to the web **12***f*. The doctor blade **102** is in contact with the web to prevent passage of liquid toner under the blade, or is close enough to the web for the meniscus of the liquid to prevent passage, the lake **78***f* forming against this blade and running over the edges of the web.

Turning now to FIGS. **9—13**, a commercially successful embodiment of the invention is shown. Most of the principles of the invention as heretofore shown and described are applicable, and in many instances similar numerals are utilized to identify similar parts, this time with the addition of the suffix *g*. The complete machine is identified at **120**, and includes a sheet metal case or housing having a raised receiving end portion **122**, and a lower portion **124** including a discharge shelf **126**. A cover **128** over the raised receiving end portion is broken away to show the parts therein. These parts include a pair of receiving rollers **14***g* and **16***g* on horizontally spaced axes and between which the paper **12***g* is inserted. The paper has been charged and has had the electrostatic image applied to the top surface thereof before it is inserted between the rollers **14***g*, **16***g*, and this may be in an integral part of the machine (not shown) or in a separate printer. In any event, the paper is driven nearly vertically down by the rollers **14***g* and **16***g*, which are operated by a suitable drive source, such as chains or belts (not shown) from a motor or motor and gear set **24***g*. The paper engages a guide identified generally at **130** and including a substantially vertical portion **132** leading to an arcuate or curved section **134**, the latter in turn leading to a downwardly inclined portion **136**. The downwardly inclined portion **136** has raised ribs **138** thereon. The ribs have horizontal upper edges **140**, and the downwardly inclined portion **136** drops off vertically as shown at **142**. The guide **130** and the ribs **138** thereon conveniently are an integral plastic molding.

The horizontal upper edges **140** of the ribs **138** are directly below the developer or toner distributor **44***g* which in this instance comprises a trough **46***g*, to be described later in detail. The paper is diverted from its downward somewhat vertical path by engagement with the surface **130** and ribs **138** to cause it to pass into a horizontal plane in the developing area, from which it passes between a pair of rollers **30***g* and **32***g*, likewise driven from the motor source **24***g*. The paper passes diagonally down from the rollers **30***g* and **32***g* on to the receiving shelf or tray **126**.

Although the paper is horizontal as it passes beneath the distributor or trough, it is in a straight through path throughout this area, and feeds sufficiently fast relative to the amount of liquid deposited from the trough that liquid toner **74***g* dams up against the upper roller **30***g* (serving as a squeegee roller) forming a lake, pond, or puddle of liquid toner as at **78***g*. The liquid toner in the lake **78***g* runs over the sides of the paper **12***g* and down into the sump **58***g*, comprising the entire lower portion of the machine, where it is collected at **80***g* for recirculation by the pump **72***g* (the intake of which is below the level of the liquid toner **80***g*), and through the pipe **53***g* to the trough **46***g*.

The distributor **44***g* is seen in some detail in FIGS. **11–13** to which reference should now be made. The distributor **44***g* comprises a trough **46***g* elongated transversely of the direction of travel of the paper **12***g*, and has a generally flat bottom **144** with diverging sidewalls **146** and **148** interconnected by upright end walls **150**. The various walls are provided at the upper edge with a seat **152** which receives a cover or a lid **154**.

The sidewall **148** is provided with an inlet fitting **156** receiving the upper end of the supply hose **53***g*, and substantially opposite thereto the trough is provided with an overflow pipe **158** to limit the liquid level in the trough and to prevent the development of any positive pressure on the liquid toner **74***g* within the trough, whereby the liquid falls from the trough simply by gravity. A similar overflow pipe **158** is provided at the opposite end of the trough.

The bottom of the trough **46***g* is provided with a series of raised bosses **160** and corresponding depending bosses **162**. The bosses are arranged in three rows respectively transverse of the direction of movement of the paper, and are elongated transversely of the direction of movement or feed of the paper. Each pair of aligned bosses is provided with a slot **164** extending therethrough from top to bottom, and likewise elongated transversely of the direction of paper feed. As will be seen, the center of the three rows has the bosses and slots thereof offset from the first and third rows, the latter two being aligned with one another. Hence, there is continuous coverage of the paper passing beneath the trough.

Normally, the liquid level will lie between the tops of the bosses **160** and the tops of the overflow tubes **158**, whereby there is no pressure head developed in the trough, and the liquid flows over the lips **166** at the top edges of the bosses, and down through the slots **164** for free fall as a series of curtains on to the surface of the paper **12***g* passing therebeneath.

In each form of the invention as heretofore shown and described, the paper either runs downhill, or is otherwise correlated to the speed of flow of the developer such that an excess of developer is applied, which might be termed to be greatly in excess of the amount required for development, whereby a lake or pool is dammed up against a squeegee, preferably an outlet roller. The liquid developer flows over the edges of the paper from the lake and is collected in the sump for reuse. The important thing is that the paper is wet only on the active surface, and then not to too great an extent. It is the paper and the squeegee that act in combination to support the developer.

In all embodiments of the invention the feed of the paper in the developing area is straight through. With the exception of FIGS. **9–13** the feed is entirely straight through, whereby rigid printing bases can be used. Paper is the most common printing base, but the principles of the present invention equally well embrace metal, rigid plastic, etc. Although reference has been made to toning or developing of images on electrostatically charged paper or the like, the principles of the invention are applicable also to the chemical development and other processing of conventional photographic printing papers such as those of the silver chloride or silver bromide type. In each and every instance only the active face is contacted with the toner or developer, the squeegee rollers serving as a dam. The paper is not wet on the back surface, or in any way soaked, whereby the squeegee rollers dry the paper sufficiently that no special handling is necessary It is also to be noted that the squeegee roller contacting the active face is in each instance preferably, although not necessarily, of an insulating material, whereby it does not dissipate charges before the toner has had an opportunity to set properly.

The paper or other printing base can be supplied as discrete sheets, or it can be fed from a roll as a continuous web. It is to be noted that in many current developer apparatus in which paper is fed through a tank containing developer, thereby wetting the back of the paper, not only is handling of the wet paper difficult, but often unsightly markings are left on the back side of the paper. The present invention completely eliminates this back marking problem.

The invention is claimed as follows:

1. Apparatus for development of images on sheetlike printing base comprising input guide means, output guide means aligned with said input means on a straight-through path,

means disposed along said straight-through path for flowing liquid developer onto the active face of said printing base in quantities substantially in excess of the amount required to develop an image, with said printing base feeding substantially straight through from said input guide means to said output guide means, and means spaced from said liquid flow means in the direction of printing base travel for subsequently removing excess developer, said liquid developer depositing means comprising distributing means disposed along one side of said printing base adjacent to the active face thereof and extending across said active face transversely of the direction of feed, said distributing means further including a liquid receptacle elongated transversely of the direction of feed and having an opening at the top thereof extending longitudinally of said receptacle whereby there is produced a curtain of developer descending on the active face of said printing base, said liquid receptacle having a lip spaced a substantial distance above said path and extending longitudinally of said receptacle and transversely of the direction of feed, developer flowing from said opening at the top of said receptacle cascading over said lip as a curtain.

2. Apparatus for development of images on sheetlike printing base comprising input guide means, output guide means aligned with said input means on a straight-through path, means disposed along said straight-through path for flowing liquid developer onto the active face of said printing base in quantities substantially in excess of the amount required to develop an image, with said printing base feeding substantially straight through from said input guide means to said output guide means, and means spaced from said liquid flow means in the direction of printing base travel for subsequently removing excess developer, said liquid developer depositing means comprising distributing means disposed along one side of said printing base adjacent to the active face thereof, and extending across said active face transversely of the direction of feed, said distributing means further including a liquid receptacle elongated transversely of the direction of feed and having lip means extending longitudinally of said receptacle over which developer flows and descends gravitationally on to the active face of said printing base, the bottom of said receptacle being provided with a plurality of raised bosses having openings therein elongated longitudinally of said receptacle, said bosses providing said lip means.

3. Apparatus for development of images on a sheetlike printing base comprising, input guide means, output guide means aligned with said input guide means along a predetermined straight-through planar path, with said printing base feeding along said straight-through path from the input guide means to said output guide means, distributing means disposed transverse to said path of feed and on one side thereof, said distributing means including means for producing a vertical free-falling curtain of liquid developer for depositing said developer directly on the active face of said printing base, said output guide means spaced downstream from said distributing means in the direction of travel of said printing base, said output guide means further including means providing a dam extending across said printing base transversely of the direction of feed and engaging with said active face for damming up liquid developer on said face in quantities substantially in excess of the amount required to develop an image and adapted to remove excess developer from said base upon completion of the development of said image and movement of said base relative thereto, said distributing means including trough means for receiving a quantity of said liquid developer, said trough means having raised edge means defining an opening, whereby the liquid developer can flow upwardly and over said edge means to provide said vertical free-falling curtain of liquid developer.

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