April 16, 1946. H. J. BRUNK 2,398,616

BLUEPRINT MACHINE

Original Filed May 4, 1940 2 Sheets-Sheet 1

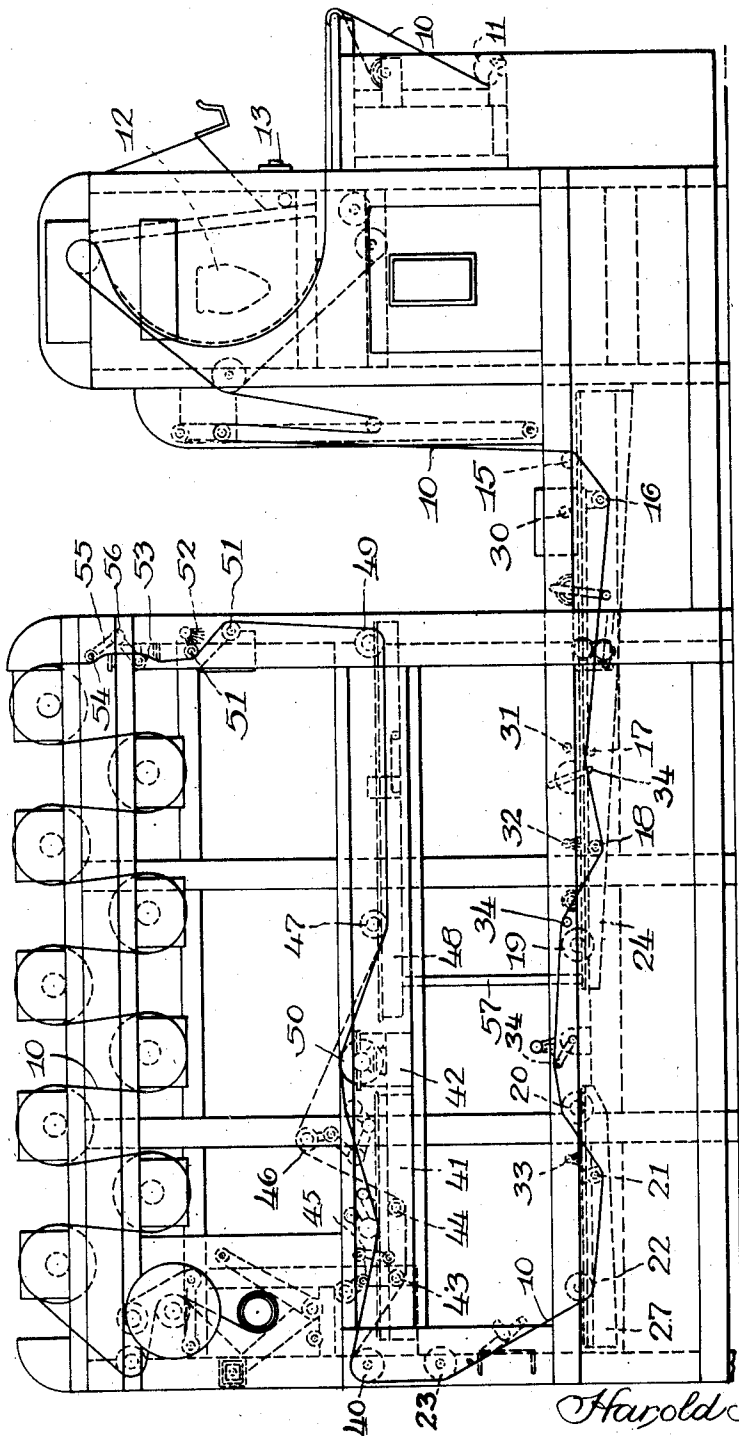


Fig. 1

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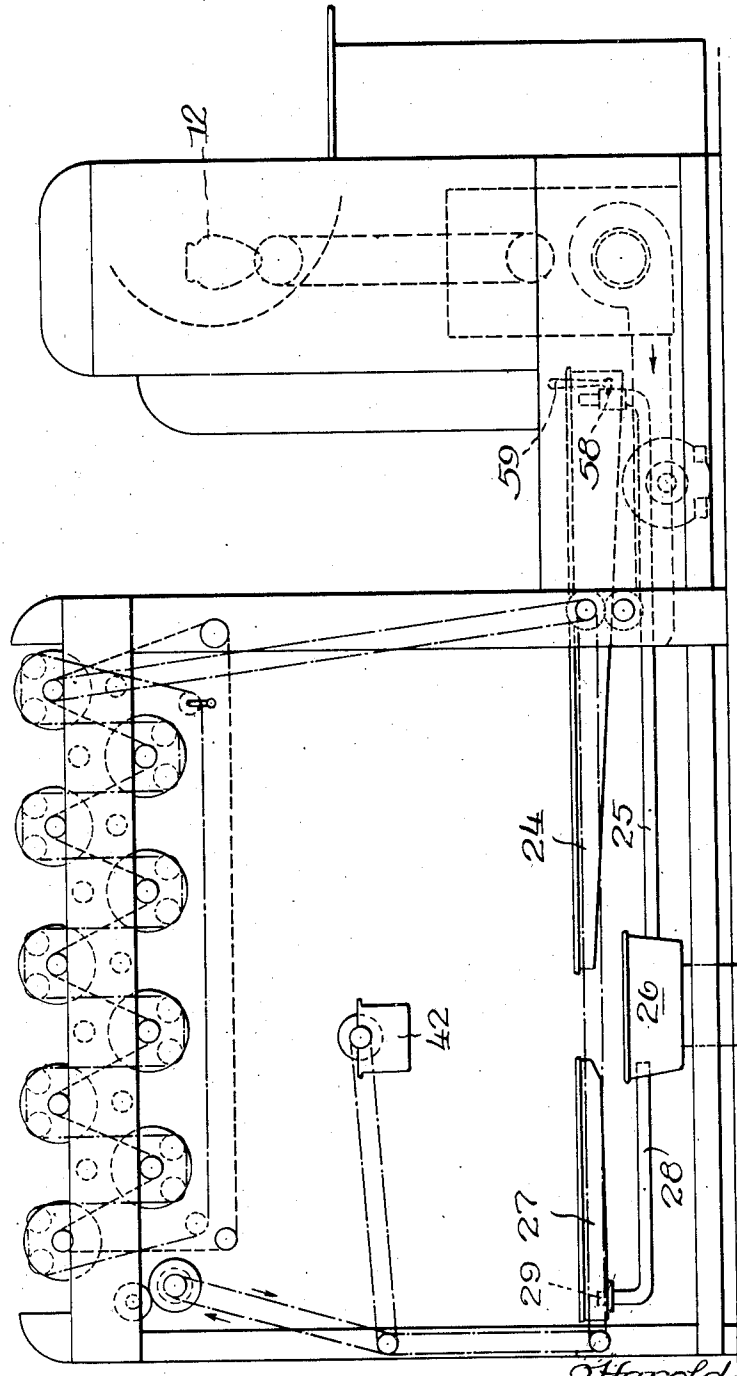


Fig. 2

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UNITED STATES PATENT OFFICE

2,398,616

BLUEPRINT MACHINE

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Original application May 4, 1940, Serial No. 333,415. Divided and this application September 16, 1943, Serial No. 502,604

3 Claims. (Cl. 95—94)

My invention relates to improvements in blue print machines and particularly to continuous machines for making blue prints and other prints, in which a sheet of light-sensitive paper is fed through the machine and is printed, developed, washed and dried automatically.

The general object of the invention is to provide a machine of this character which is capable of higher production than those used heretofore, i. e., one which will print faster, dry faster and wash more thoroughly, without sacrificing the important elements of clearness and permanence in the finished prints but on the contrary will produce prints which are clearer, flatter, and which cost less per square foot than those commercially available in the past.

This application is a division of my copending application 333,415, filed May 4, 1940, now Patent Number 2,332,296, issued October 19, 1943.

More specifically, the object of the present invention is to provide developing equipment for sensitized paper of this character which makes use of horizontal tank washes which thoroughly wet the paper and allow it to flow easily without undue tension and by means of which and the free circulation of water in all directions, bleeding is practically eliminated.

Other objects and advantages will be apparent from a consideration of a commercial embodiment of the invention, which is shown in the accompanying drawings:

Fig. 1 is a side elevation of the machine;

Fig. 2 is a similar elevation partly diagrammatic.

A sheet of sensitized paper, as for example a sheet of the blue print paper, is indicated in its travel through the machine by 10 and is unwound from a supply roll 11 mounted at one end of the machine which may be called the front of the machine. This sheet of paper is guided in the usual manner past a source of light such as a series of arc lamps 12 and passes over or around a number of rolls, to the rear of the machine, as hereinafter described. The arc lamps are connected in circuit to suitable resistances (not shown) and controlled by a switch 13 conveniently located near the front of the machine.

At the rear of the printing section the paper travels under the usual floating roller 14 which maintains a moderate tension thereon and after descending substantially vertically to the developing and washing section it is drawn toward the rear of the machine, under or over a number of rolls or idlers 15, 16, 17, 18, 19, 20, 21, 22 and 23. The first group of rolls 15—19 are mounted in or near a pan or tray 24 which is supplied with water to provide the initial developing liquid as in the case of blue prints. This developing pan 24, as shown also in Fig. 2, is provided with an outlet pipe 25 leading to a sump 26. The inclined bottom of this pan also serves another purpose, hereinafter described.

The paper enters this water bath freely, traveling downwardly a short space only, past roller 15 which is above the level of the liquid, and then rearwardly under the submerged roll 16, with its sensitized surface in contact with said roll, after which it travels almost horizontally but slightly upwardly over the roll 17 which is in contact with the rear surface thereof and over a transverse curved rod, well known in the art and hereinafter described, to prevent wrinkling, and then slightly downwardly under the roll 18 and then diagonally upwardly over the roll 19. This travel through the water bath in substantially horizontal position, as the print is expanding, prevents both bleeding and distortion of said print without applying any considerable tension thereto such as develops in some of the vertical washing machines used heretofore.

The next group of rolls 20, 21, 22, are mounted in or adjacent a second pan 27 which also contains water adapted to provide the usual water wash. This second pan also is provided with a drain pipe 28 which leads to the sump 26, the upper end 29 or inlet end of which is adjustable vertically to vary the water level.

The water for the initial developing operation is supplied in part by suitable pipes 30, 31 and 32, in the form of sprays which maintain the circulation, and the water for the washing operation carried out in the second tray is supplied by a suitable pipe 33. The paper in traveling to and from the various idler rolls 15—22, previously identified, passes over a number of adjustable curved rods or so-called bulger rods 34, which allows the paper to adjust itself without distortion, preventing wrinkles. The rods may be adjusted to deflect the span of paper a greater or less amount or to disengage it entirely, as is well understood.

After passing upwardly over the rear roll 23, the paper passes around the roll 40 and is guided toward the front of the machine through either of two baths, hypo or potash, contained in the pans or trays 41, 42, respectively. One of these pans is supplied with potash which is the usual fixing solution used with blue prints and the other is supplied with hypo, used with so-called

van dykes or thin, transparent prints which, after drying, may be used as negatives.

The path of the paper through the hypo tank 41 is illustrated by dashes, whereas its path through the second tank 48 is indicated by the full line. In passing through the first tank the paper passes under suitable rolls 43, 44 which are mounted on adjustable arms 45 so that said rolls may be swung up above the level of the liquid. After leaving the roll 44 the print passes over an adjustable roll 46 and thence diagonally downwardly under roll 47 in a third pan or water tank 48 and thence horizontally to another idler roll 49 at the end of said tank. When it is desired to apply to the paper the liquid potash in the tank 42, the rolls 43 and 44 are elevated above the liquid in the first tank 41 so that the paper passes under the roll 44 in its elevated position and over and in contact with a roll 50 which dips in the liquid in the tank 42 and applies the same to the under side of the paper, which at this point is traveling face downwardly, and thence under the roll 47 and through the water wash in the tank 48, as before. The mechanism for raising and lowering these various rolls is not described herein as it forms the subject matter of my Patent 2,219,620, issued October 29, 1940, and filed November 14, 1938.

From the forward end of the water wash in the tank 48, the paper travels under said idler roll 49 and thence upwardly and over two rolls 51, 51, in inclined position, and past a final water spray 52, to the heating drums. Just above said water spray are a pair of adjustable squeegees 53, 54 to remove any surplus water from the paper before it engages said drums, said squeegees are mounted on a suitable rocker arm 55 which is pivotally mounted at 56 so that the lower squeegee may press against the rear surface of the paper and the upper squeegee bear against the face thereof. The rocker arm 55 may be adjusted manually by any suitable handle or other device. The water from the spray 52 flows downwardly over the face of the substantially vertical span of paper shown in Fig. 1, and collects in the tank 48, and forms preferably the source of supply of the water in said tank. From this tank 48 the overflow is discharged downwardly through a pipe or hose 57 to the tank 24 below it. The overflow from this lower tank is controlled by a short hinged extension 58 at the end of the pipe 25, which hinged extension is operated by a small lever 59, to vary the level of the liquid in said tank.

During the developing operation, when the paper is passing rearwardly in substantially horizontal position through the tank 24, the chemicals washed from the paper tend to sink and to remain at the deep end of the tank and hence are readily drained through the outlet pipe 25 to the sump 26, wherein the heavy chemicals and paper sizing accumulate. Under the old practice these chemicals and sizing adhered in part to the drain piping below the floor whereas with the present arrangement the pipes leading to the sump from both tanks 24 and 27 are above the floor and are easily accessible for cleaning. As shown in Fig. 1, the paper enters the developing bath in a downwardly inclined span and leaves in an upwardly inclined span. In addition, as previously stated, it travels up and down somewhat between the two rolls 16 and 18. Thus if the liquid level is lowered slightly, the length of the submerged span is decreased, due to the inclined end spans. If the lowering continues until the roll 17 is exposed (and the bulger rod 34 also, in case it is adjusted to an elevated position) the paper enters and leaves the developer in four inclined spans and the aggregate submerged length is decreased to a greater extent in proportion to the vertical drop in the liquid level than where said roll 17 is submerged. By manually adjusting the height of the inlet 29, the level of the water in the tank 24 may be varied also and, in view of the inclined span of paper between the rolls 21, 22, the effective length of the horizontal water wash may also be varied, as will be evident. It is also an important feature of the invention that after the paper leaves the developer or first water wash, it is given a second or clear, fresh water wash in the tank 27.

By the use of this equipment the washing is adequate, despite the high rate of speed of the paper through the water washes. The tension on the paper, caused by washing in a vertical position, as in the prior practice, is relieved so that wrinkling and stretching are substantially obviated. The use of the horizontal water washes not only amply wets the paper at high rates of travel, and allows it to float easily without a substantial amount of tension, but the free circulation of water in all directions substantially eliminates bleeding.

Changes in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A blue print machine having a developing tank containing liquid and having parallel rollers submerged therein under which the blue print paper travels continuously from near one end toward the other in a wide span which is nearly horizontal, a second tank containing water and having substantially parallel rollers submerged therein to provide a path of travel for said paper which is nearly horizontal from near one end toward the other, said tanks being arranged at substantially the same level, and rolls between said tanks elevated above the level of the liquid therein, over which said paper travels, moving upwardly in a slightly inclined path out of the developing liquid and downwardly in a slightly inclined path into the water in said second tank, each of said tanks having an adjustable overflow to vary the level of the liquid therein and hence to regulate the length of the paths of travel of said paper through said liquid.

2. A blue print machine having a developing tank containing liquid and having parallel rollers therein, the blue print paper travelling under two spaced apart end rollers and over an intermediate roller elevated above the same, and an adjustable overflow for varying the level of the liquid in said tank, all of said rollers being submerged when said liquid is of maximum depth, said intermediate roller and the paper passing thereover, in two oppositely inclined spans, projecting out of the liquid when the level has been somewhat lowered, whereby the aggregate length of the immersed spans is decreased as said liquid level is decreased and vice versa, and means to feed said blue print paper to said developing tank so that it passes through said tank and under and over said rollers under comparatively slight tension whereby the lateral expansion of the paper and the release of the precipitated chemicals from the surface thereof is not impaired.

3. A blue print machine having a developing

tank containing liquid having parallel rollers therein, the blue print paper entering said liquid diagonally, travelling under an end roller and upwardly somewhat over an intermediate roller and downwardly under a second roller and upwardly in an inclined span out of said liquid, an adjustable overflow for varying the level of the liquid in said tank, all of said rollers being submerged when said liquid is of maximum depth, said intermediate roller and the paper passing thereover, in two oppositely inclined spans, projecting out of the liquid when the level has been somewhat lowered, whereby the aggregate length of the immersed spans is decreased as said liquid level is decreased and vice versa, and means to feed said blue print paper to said developing tank so that it passes through said tank and under and over said rollers under comparatively slight tension whereby the lateral expansion of the paper and the release of the precipitated chemicals from the surface thereof is not impaired.

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