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H. G. MACDONALD ET AL

2,373,040

COMBINED PRINTING AND DEVELOPING MACHINE

Filed March 28, 1942

2 Sheets-Sheet 1

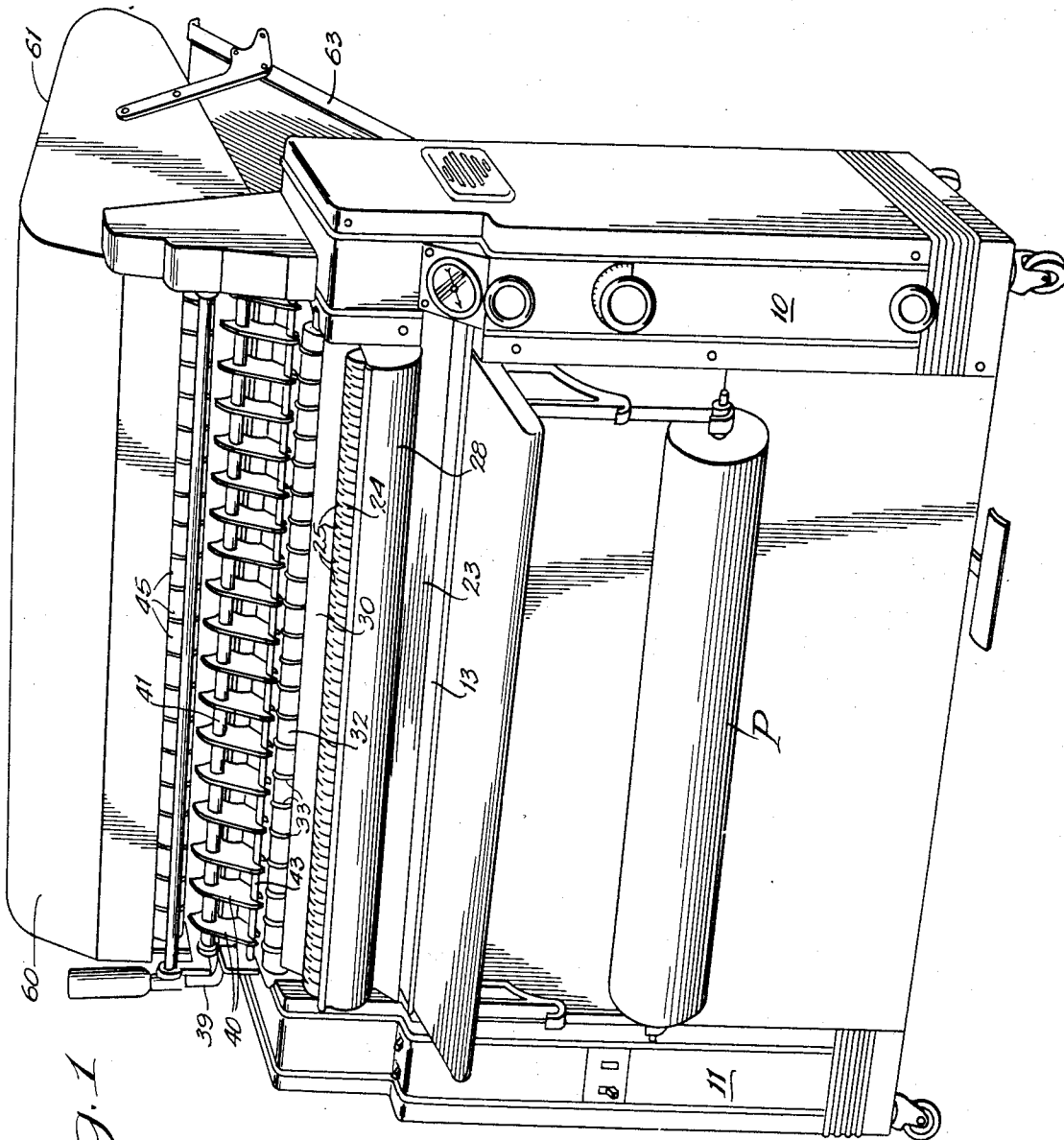


Fig. 1

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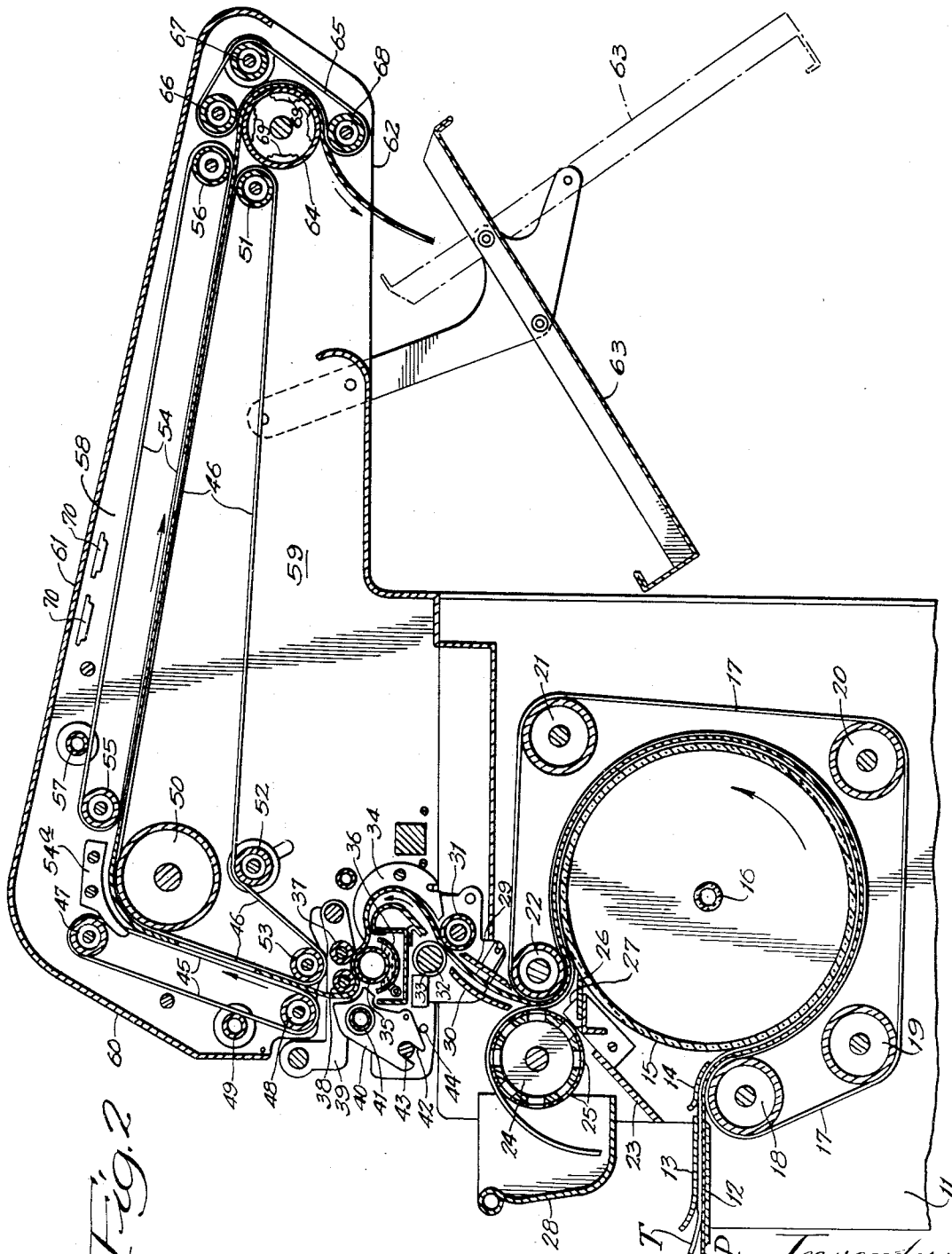


Fig. 2

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UNITED STATES PATENT OFFICE

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COMBINED PRINTING AND DEVELOPING MACHINE

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Application March 28, 1942, Serial No. 436,702

3 Claims. (Cl. 95-77.5)

This invention is directed to a machine which by continuous operation performs all the steps in the photo-printing, developing and drying of developed diazo type prints taken from tracings or like impressions which for convenience are to be included under the term "tracings."

The machine is so designed that the only work required of the operator is to introduce the tracings and print sheets in registering relation into the machine at the feeding point, after which the tracings and print sheets will be momentarily subjected to the required degree of illumination to register the impression on the sensitized surface of the sheets, after which the tracings will be promptly discharged from the machine so that they may be immediately employed in succeeding operations while the prints proceed onwardly to receive a coating of the liquid developer on the sensitized side, after which they are carried through a drying chamber and around a heated roller which contacts the rear unmoistened faces of the sheets and reversely bends them, and in drying sets the fibers of the sheets in such a way as to prevent upward curling of the sheets after they are delivered from the machine.

In certain machines of this general type, it has been customary to moisten the rear or non-sensitized surface of the sheet to compensate for the moistening of the sensitized surface, but this method of treating the sheets is in some respects unsatisfactory, since the moistening of the sheet on each side wets the paper throughout, causing it to become sticky and soggy, thereby requiring the use of strippers or the like to prevent adhesion to the feeding rolls and also reducing its tensile strength, thereby rendering the smooth and even feeding of the sheets more difficult. At the same time, the excessive moistening of the sheets renders the drying operation more difficult and is wasteful in the expenditure of heat while the employment of reverse moistening rolls or the like complicates the structure and increases the overall dimensions of the machine and is otherwise objectionable.

By the use of what may be conveniently termed a heated bending or setting roll, the individual sheets are delivered from the machine in a smooth dry condition, and substantially flat, although they may normally have a slight rearward bend, which, however, is not objectionable, since they will lie substantially flat when stacked, and will not tend to curve upwardly and thus interfere with the easy and convenient reading or inspection of the sheets.

Further objects and details will appear from

the description of the invention in conjunction with the accompanying drawings, wherein—

Figure 1 is a perspective view of the front of the machine; and

Fig. 2 is a sectional elevation through the center of the machine.

The operating portions of the machine are mounted within a cabinet which includes end housings 10 and 11 for enclosing the light and speed controls and the driving train which need not be described in detail. The superposed and registered tracings T and print sheets P are laid upon a forwardly projecting shelf 12 and fed inwardly in unison beneath throated guide plates 13 and 14, the latter of which deflects the tracing-print assembly downwardly against the surface of a pyrex cylinder 15, which is transparent to the ultra-violet rays from a centrally disposed mercury vapor quartz lamp 16 of high intensity, which provides high speed printing and uniform light distribution without flickering. Contact with the cylinder is maintained by endless tapes 17 which pass around guide rolls 18, 19, 20, 21, 22, so disposed that the active turns of the tapes surround about four-fifths of the cylinder at the rear, leaving the front of the cylinder open save for the presence of a light shield 23 so disposed as to protect the eyes of the operator. The return of the tapes is behind the cylinder.

For purposes of clarity, the length and thickness of the tracings and the sheets are exaggerated, but it will be understood that the length is not limited, and the width is limited only by the width of the machine, so that the smallest sheets as well as continuous strips may be accommodated. After the tracing-print assembly has been fed around the light cylinder and returned to the front of the machine, with the tracing in contact with the cylinder, the printing is complete and the tracing is immediately returned for re-use. The separation is effected at this point by a vacuum separator roll 24 provided in its wall with a multiplicity of slots or apertures 25 of any suitable shape or arrangement, which afford a suction against the surface of the tracing, without, however, diverting the printed sheet from its upward path which is initiated by the contact of a stripper bar 26 and an oblique guide blade 27 which turn the sheet upwardly between the vacuum stripper roll 24 and the tape guide roll 22. In these circumstances, the sheet will continue its upward travel while the tracing is discharged into a pan 28 within convenient reach of the operator.

The upwardly traveling print sheet is separated

from the tapes 17 by the action of a stripper 29, and passes upwardly behind a guide plate 30 and between feed rolls 31 and 32, the latter of which may be faced with rubber strips 33 to afford the necessary friction. The sheet is diverted forwardly by a series of crescent shaped guide fingers 34 and over the top of an applicator roll 35 which dips down into a trough 36 to which a constant supply of developer is fed. The sheet is held against the applicator roll by feed and contact rolls 37 and 38 carried by frame members 39, and the sheets are diverted upwardly by a bank of guide fingers 40 strung upon a rod 41 and held in position by the provision of notches 42 which straddle a fixed bar 43 cooperating with a stop rod 44 which holds the curved acting edges of the guide fingers in close proximity to the roll 38, and at the same time permits the entire bank of guide fingers to be readily removed in order to secure access to the interior of the machine.

The leading end of the upwardly traveling sheet is next engaged by the adjacent turns of outer and inner tapes 45 and 46. The outer tapes pass around upper and lower feed rolls 47 and 48 and behind a tensioning roll 49. The inner tapes 46 pass over a forward feed roll 50 and around a rear feed roll 51 over a tensioning roll 52 and under a lower forward roll 53. The inner tapes 46 coact with upper tapes 54 carried by forward and rear feed rolls 55 and 56 and carried under a tensioning roll 57. In order to guide the sheets as they enter between the tapes 46 and 54, a bank of arcuate guide fingers 54^a is provided which strip the sheets from the tapes 45 and divert them rearwardly toward the tapes 54. The tapes 46 and 54 run in a substantially horizontal direction and within an enclosed drying chamber 58 which extends rearwardly from the cabinet of the machine and which comprises side walls 59, a forward hood 60, and a top or roof 61. The heating chamber is open at its rear under portion 62 for the discharge of the sheets into an adjustable pan or tray 63.

The sheets transported rearwardly between the tapes 46 and 54 are carried around a power driven heated bending and setting roll 64 located near the rear end of the drying chamber 58, and the sheets are compressed firmly against the surface of the roll 64 by tapes 65 which pass around rolls 66, 67, 68, the rolls 66 and 68 being disposed directly above and below the axis of the roll 64, so that the forward turns of the tapes will press firmly against the rear half of the roll 64 and hold the sheets firmly against the roll, with their moistened sensitized faces presented outwardly, so that as the sheets pass around the heated roll they will be dried from the reverse side outwardly, and the fibers will be given a permanent set, which counteracts any tendency of the sheets to curl upwardly when released.

The drying and setting roll may be heated in any suitable manner, as for instance by strip electric heating elements 69 or the like, and the drying chamber may also be heated by suitable means, as for instance strip heating elements 70 of sufficient capacity to remove most of the moisture during the passage of the sheets through the drying chamber, but leaving them in a slightly damp condition as they encounter the heated surface of the bending and setting roll which applies the final heat required in giving the desired permanent set to the sheets prior to their final delivery from the machine and into the tray 63.

It will be understood that the various feeding and tape carrying rolls are driven by suitable

gearing at a uniform feeding speed, so that the sheets will be smoothly and evenly carried through the machine without stretching or warping the sheets while in the damp condition, but in view of the fact that the sheets are moistened on the sensitized side only, they will retain much of their initial strength and toughness, so that the danger of warping or distortion is reduced to a minimum, while at the same time the rear surface of the sheets will remain in a fairly dry condition, and there will be no danger of sticking or adhering to the rolls which contact the rear surface.

By eliminating the moisteners for the rear faces of the sheets, the height of the machine is materially reduced, and likewise the length of travel through the drying chamber may also be reduced, so that the overall dimensions and general arrangement of the machine will be materially improved.

Although the invention has been described in considerable detail, it will be understood that the arrangement of the various mechanisms shown serves merely for purposes of illustration, and that numerous changes in the arrangement and location of the various mechanisms may be made without departing from the spirit of the invention.

We claim:

1. A developing machine of the type adapted to pass cut sheets of diazo printing paper and the like therethrough, including applicator means for applying a liquid developer to the sensitized face only of the printing paper, a drying chamber, a setting roll, conveying means adapted to carry a sheet from the applicator means to the setting roll while maintaining it free from the application of moisture to the back thereof; the relation of the speed and length of the conveying means and the characteristics of the drying chamber being such as to deliver the sheets to the setting roll in a slightly damp condition, means for pressing the sheet around the setting roll with its sensitized face out, means to heat the setting roll to produce a flattening set in the sheet, said apparatus being adapted to discharge the sheet without so affecting said flattening set as to cause the sheet to curl with its sensitized face inward.

2. A developing machine of the type adapted to pass cut sheets of printing paper and the like therethrough, including applicator means for applying a liquid developer to the sensitized face only of the printing paper, a drying chamber, a setting roll, conveying means adapted to carry a sheet from the applicator means to the setting roll while maintaining it free from the application of moisture to the back thereof; the relation of the speed and length of the conveying means and the characteristics of the drying chamber being such as to deliver the sheets to the setting roll in a slightly damp condition, means for pressing the sheet around the setting roll with its sensitized face out, means to heat the setting roll to produce a flattening set in the sheet, said apparatus being adapted to discharge the sheet without so affecting said flattening set as to cause the sheet to curl with its sensitized face inward.

3. A developing machine of the type adapted to pass cut sheets of printing paper and the like therethrough, including applicator means for applying a liquid developer to the sensitized face only of the printing paper, a drying chamber, a

setting roll, conveying means adapted to carry a sheet from the point at which the machine receives the sheets, past and in cooperation with the applicator means and to the setting roll while maintaining it free from the application of moisture to the back thereof; the relation of the speed and length of the conveying means and the characteristics of the drying chamber being such as to deliver the sheets to the setting roll in a slightly damp condition, means for pressing the sheet 10

around the setting roll with its sensitized face out, means to heat the setting roll to substantially dry the sheet in contact therewith and produce a flattening set in the sheet, said apparatus 5 being adapted to discharge the sheet without so affecting said flattening set as to cause the sheet to curl with its sensitized face inward.

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