Nov. 13, 1934. W. L. CULLEN ET AL 1,980,188

PRINTING MACHINE

Filed May 16, 1932 3 Sheets-Sheet 1

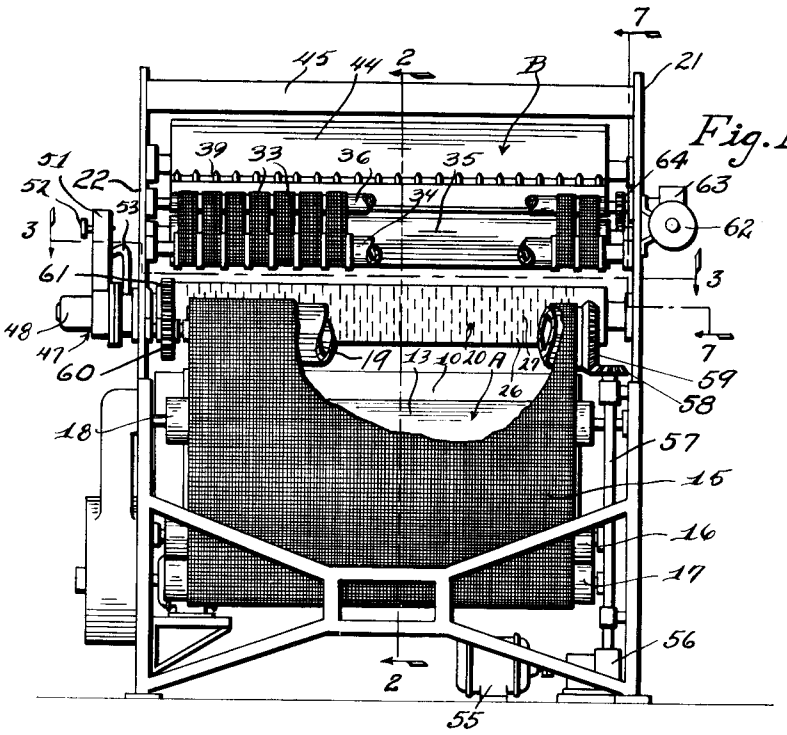


Fig. 1.

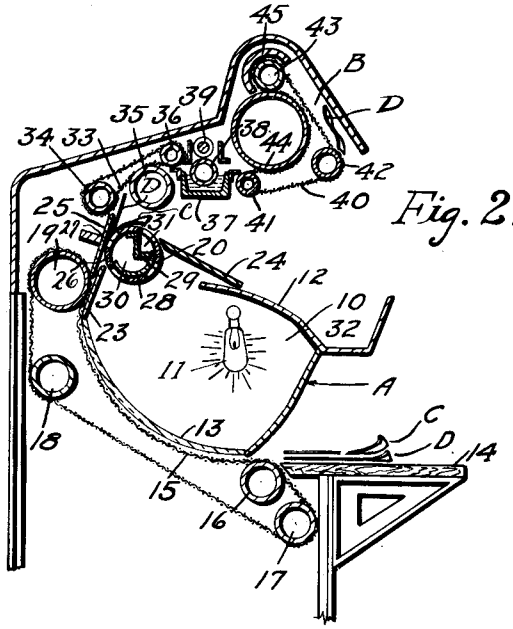


Fig. 2.

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Fig. 3.

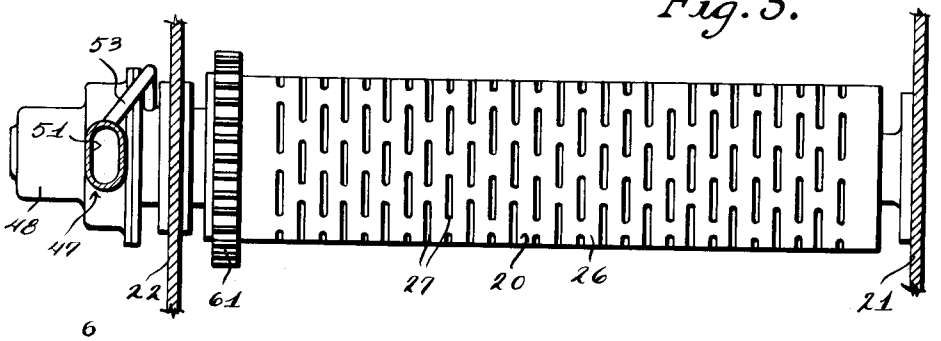
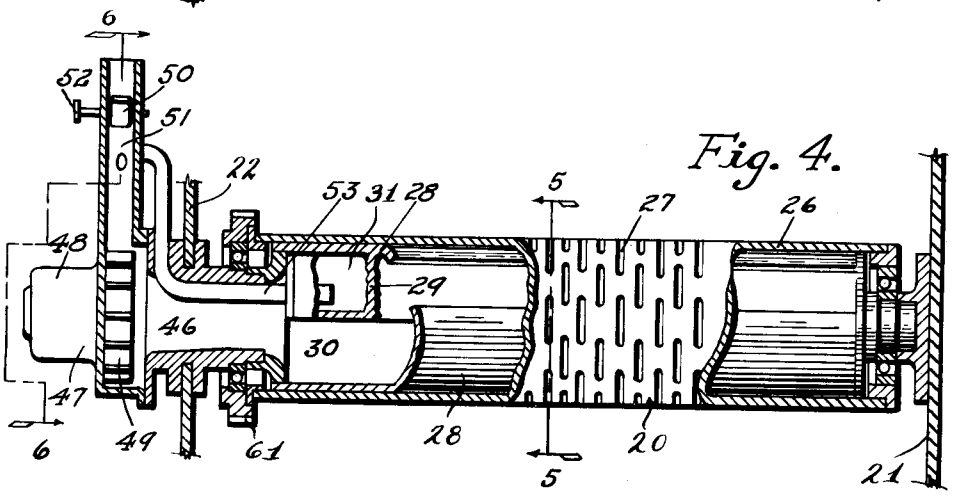


Fig. 4.



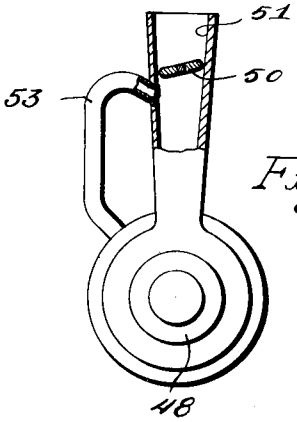
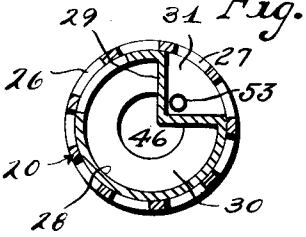


Fig. 6.

Fig. 5.



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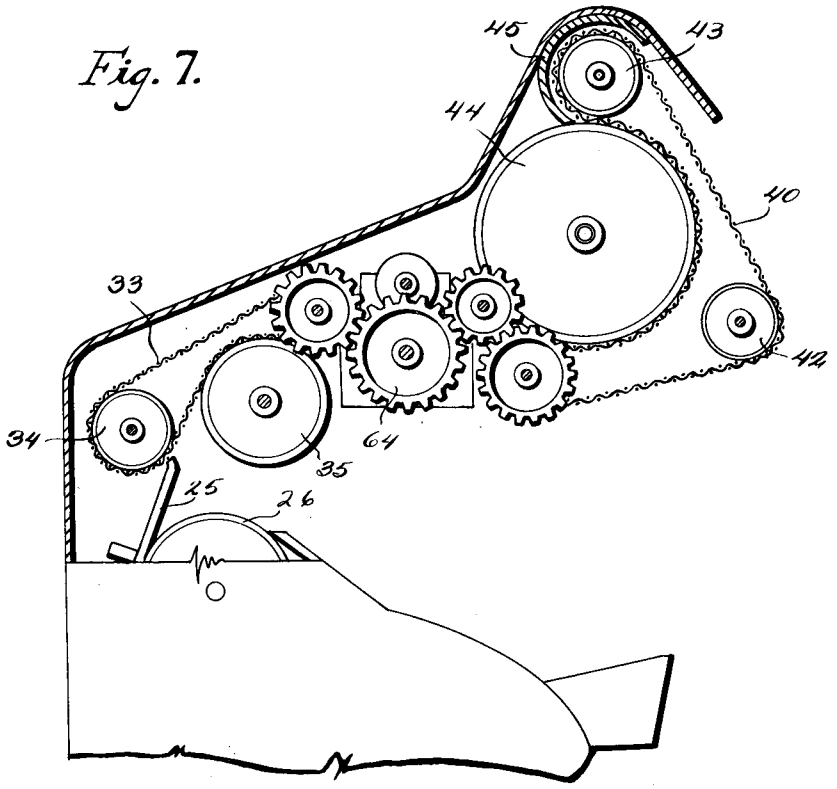
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Fig. 7.



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UNITED STATES PATENT OFFICE

1,980,188

PRINTING MACHINE

William L. Cullen, Dearborn, and Simon Roth and Carl Hoefler, Detroit, Mich.

Application May 16, 1932, Serial No. 611,658

7 Claims. (Cl. 271—74)

The invention relates to apparatus for printing or reproducing manuscript, drawings, etc.

The primary object of the invention is to provide a machine for the purposes mentioned which will be completely automatic and will deliver the original copy and the reproduced sheet to the proper receptacle without requiring manual aid.

Another object is to provide an automatic machine capable of feeding a plurality of independent sheets of varying sizes when both the original copy and the reproduced sheet are of approximately the same size.

A further object is to construct a machine adapted for conveniently making a plurality of copies successively from the same original sheet.

Another object is to provide a mechanism for separating the original and reproduced sheets and to automatically feed the same to different mechanism whereby the original sheet is returned to a convenient point for again being reproduced and the exposed sheet is fed to a developing mechanism for completing the reproduction process.

These and other objects are accomplished by a machine hereinafter more fully described and illustrated in the accompanying drawings, wherein

Figure 1 is an elevation of the machine with portions thereof broken away;

Figure 2 is a transverse section on the line 2—2 of Figure 1;

Figure 3 is an enlarged sectional elevation on the line 3—3 of Figure 1 showing the rollers with the perforations exaggerated in size for the purposes of illustration;

Figure 4 is a longitudinal section through the roller of Figure 3;

Figure 5 is a transverse section on the line 5—5 of Figure 4;

Figure 6 is an end view of the structure shown in Figure 4 as viewed from the line 6—6 of Figure 4;

Figure 7 is a transverse section on the line 7—7 of Figure 1.

Referring now to the machine as illustrated in the drawings, the letter A designates generally the printing portion of the mechanism and the letter B the developing portion thereof. The printing portion A is in general of known construction and comprises the printing compartment 10 having suitable incandescent bulb 11 or other lighting devices within a housing 12 which includes the curved transparent face 13. 14 is a feeding platform on which the operator may arrange the work to be reproduced. The work comprises the original sheet C and the blank D of sensitized paper, the sheets being superposed and fed simultaneously to the printing device. The feeding mechanism comprises the endless belt conveyor 15 which travels over the rollers 16, 17, 18 and 19 and is caused to slide over the convex outer surface of the transparent panel 13. Thus the sheets C and D are caused to travel between the endless belt conveyor and the transparent panel 13, and the rate of feed is such as to expose the sensitized paper D for the proper length of time during its travel in contact with the panel 13.

At the upper portion of the printing mechanism is a roller 20 which, as shown, is supported in the side frame members 21 and 22 of the machine. The roller has an entrance guide panel 23 and an exit guide panel 24, which panels are arranged to be closely adjacent the surface of the roller 20. There is also the upper guide panel 25 which is slightly spaced from the roller 20 and serves to feed the sheets into such close contact therewith as to permit the separating action hereinafter more fully described.

The roller 20 is in the form of a cylindrical shell 26 having a series of slots 27 therein extending peripherally for a portion of the circumference. The alternate rows of slots 27 are staggered and the arrangement is such that the entire surface of the roller is covered with the perforations. The width of the perforations is preferably very small as illustrated in Figure 1 and is much exaggerated in Figures 3 and 4 for the purpose of illustration. Within the shell 26 is a tubular conduit 28 having a cross-wall 29 dividing the conduit into two portions 30 and 31. The portion 30 is arranged adjacent to the guide wall 25, while the portion 31 is arranged adjacent the exit guide wall 24 and means is provided for creating a vacuum in the portion 30 and a slight pressure in the portion 31. By reason of the vacuum within the portion 30 air is drawn inwardly through the slots 27 adjacent the guide wall 25 and by reason of the pressure in compartment 31 air is forced outwardly through the same slots when they have advanced to a point adjacent the exit guide 24. The effect is such that as the two sheets C and D are fed into proximity of the roller 20, the suction through the slots causes the inner sheet C to cling to the periphery of the roller, whereas the other sheet D not being affected by the suction is allowed to continue in its original direction. Thus the two sheets C and D are caused to travel in different directions. The sheet C continues to follow the roller 20 until

it reaches the zone opposite the compartment 31 where the outward pressure through the slots causes the edge of the same to blow away from the roller and engage the exit guide 24. The sheet C thereupon slides down the guide 24 into the trough 32 which is immediately above the platform 14 at a convenient point so that the operator may again feed the sheet through the machine.

Immediately above the guide 25 and in the path of the sheet D is a second conveyor belt 33 which is arranged to seize the sheet D and feed the same through the developing apparatus. Thus as shown the belt 33 is of the endless type and is mounted to travel around the rollers 34, 35 and 36. 37 is a trough containing a solution adapted to develop the sensitized paper used in the machine and 38 is a roller continually dipping in the developer and arranged in the path of the sheet as it emerges from the conveyor 33. A cooperating roller 39 is arranged so as to permit the sheet to pass between the same and the developing roller 38, after which it is fed into the path of the conveyor 40. The latter conveyor passes the rollers 41, 42, 43 and 44 and causes the sheet D to pass around the periphery of the roller 44 and around the periphery of the roller 43 between the latter and the guide 45. After leaving the guide 45 the sheet is permitted to travel downwardly to the roller 42 where it falls by gravity into the trough 32 arranged immediately below the same.

As shown in Figure 4, the compartment 30 within the roller is connected through the interior passage 46 with a suction chain 47 which, as shown, comprises a motor 48 and an impeller 49. The amount of vacuum within the compartment 30 is regulated by means of a suitable valve 50 within the outlet conduit 51, the valve being operated externally through the handle 52.

The compartment 31 is supplied by air under pressure through the conduit 53 which may receive its supply of air from the outlet conduit 51 or from any other suitable source of pressure.

The machine is operated by suitable driving mechanism which, as shown, comprises the electric motor 55 which operates through the transmission 56 and vertical driving shaft 57 driving the bevel gears 58 and 59, the latter being on the roller 19. The roller 20 is preferably driven from the roller 19 by means of the gears 60 and 61. The developing portion of the mechanism may also be driven by suitable mechanism and, as shown, this comprises the separate motor 62 which operates through transmission 63 and gear 64 to drive the conveyors 33 and 40 and the developing roller 38.

In the operation of the machine as thus far described the original sheet C and copy sheet D are superposed on the platform 14 and are fed into the conveyor 15. When the two sheets have passed by the printing device to the roller 20 the suction from the roller 20 causes the original sheet C to follow the curve contour of the roller, while the copy sheet D is permitted to pass directly into engagement with the conveyor 33. Thus a separation is effected, the original sheet being returned directly to the trough 32 where it may again be passed through the printing device and the copy sheet being sent through the developing apparatus for finishing the reproduction of the original.

While we have disclosed a single specific embodiment of our invention, it is to be understood that various modifications might be used without departing from the spirit of the invention and reservation is therefore made to use such equivalents as come within the purview of the invention as expressed in the claims appended hereto.

What we claim as our invention is:

1. Sheet feeding means including a roller, means tangent to the roller for guiding a sheet to the periphery of said roller, means for conveying a sheet to said guide means, means tangent to the roller for guiding a sheet from the periphery of said roller, and means for causing a sheet discharged onto the roller from the first mentioned guide means to become engaged with the last mentioned guide means, including means within the roller successively attracting and repelling the sheet.

2. Sheet feeding means including a roller having perforations in its periphery, means for guiding juxtaposed sheets to the periphery of said roller, and means for causing the juxtaposed sheets to be separated and respectively directed from the roller in different directions substantially at right angles to each other, including means associated with the roller for successively creating a vacuum and a pressure in said perforations.

3. Sheet feeding means including a roller, means for guiding juxtaposed sheets to the periphery of said roller, and means for causing the juxtaposed sheets to be separated and respectively directed from the roller in different directions substantially at right angles to each other, including means for successively attracting and repelling the sheet nearest the roller.

4. Sheet feeding and separating means including a roller, means for guiding juxtaposed sheets to the periphery of said roller, means for conveying juxtaposed sheets to said guide means, means associated with said guide means for conveying one of said sheets from the periphery of said roller, means for guiding the other of said sheets from the periphery of said roller, and means for causing the juxtaposed sheets discharged onto the roller from the first mentioned guide means to be separated and respectively become engaged with the second mentioned conveying means and second mentioned guide means, including means within the roller successively attracting and repelling the sheet nearest thereto.

5. Sheet feeding and separating means including a roller, means for guiding juxtaposed sheets to the periphery of said roller, means for conveying juxtaposed sheets to said guide means, means associated with said guide means for conveying one of said sheets from the periphery of said roller, means for guiding the other of said sheets from the periphery of said roller, said roller being provided with perforations, and means for causing juxtaposed sheets discharged onto the roller from the first mentioned guide means to be separated and respectively engaged with the second mentioned conveying means and second mentioned guide means, including means within the roller for successively creating a vacuum and a pressure in said perforations.

6. Sheet feeding and separating means including a roller having perforations in the periphery thereof, means including staggeredly arranged substantially parallel panels substantially tangent to said roller for guiding juxtaposed sheets to the periphery of said roller, sheet conveyer means adjacent the periphery of said roller, means for guiding sheets from the periphery of said roller, one of the panels aforesaid being also operable to guide one of said sheets from the roller to said

conveyer means, and means for separating the juxtaposed sheets so that one will be engaged with the conveyer means and the other will be engaged with the last mentioned guide means, including means within the roller for successively creating a vacuum and a pressure in said perforations.

7. Sheet feeding and separating means including a roller having perforations in the periphery thereof, means including staggeredly arranged substantially parallel panels substantially tangent to said roller for guiding juxtaposed sheets to the periphery of said roller, said conveyer means adjacent the periphery of said roller, means for guiding sheets from the periphery of said roller, one of the panels aforesaid being also operable to guide one of said sheets from the roller to said conveyer means, the sheet conveyer means extending substantially endwise from and constituting in effect an extension of the parallel panels aforesaid, the last mentioned guide means including a panel substantially at right angles to the conveyer means and tangent to the roller, and means for separating the juxtaposed sheets so that one will be engaged with the conveyer means and the other will be engaged with the last mentioned guide means, including means for successively creating a vacuum and a pressure in said perforations.

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