

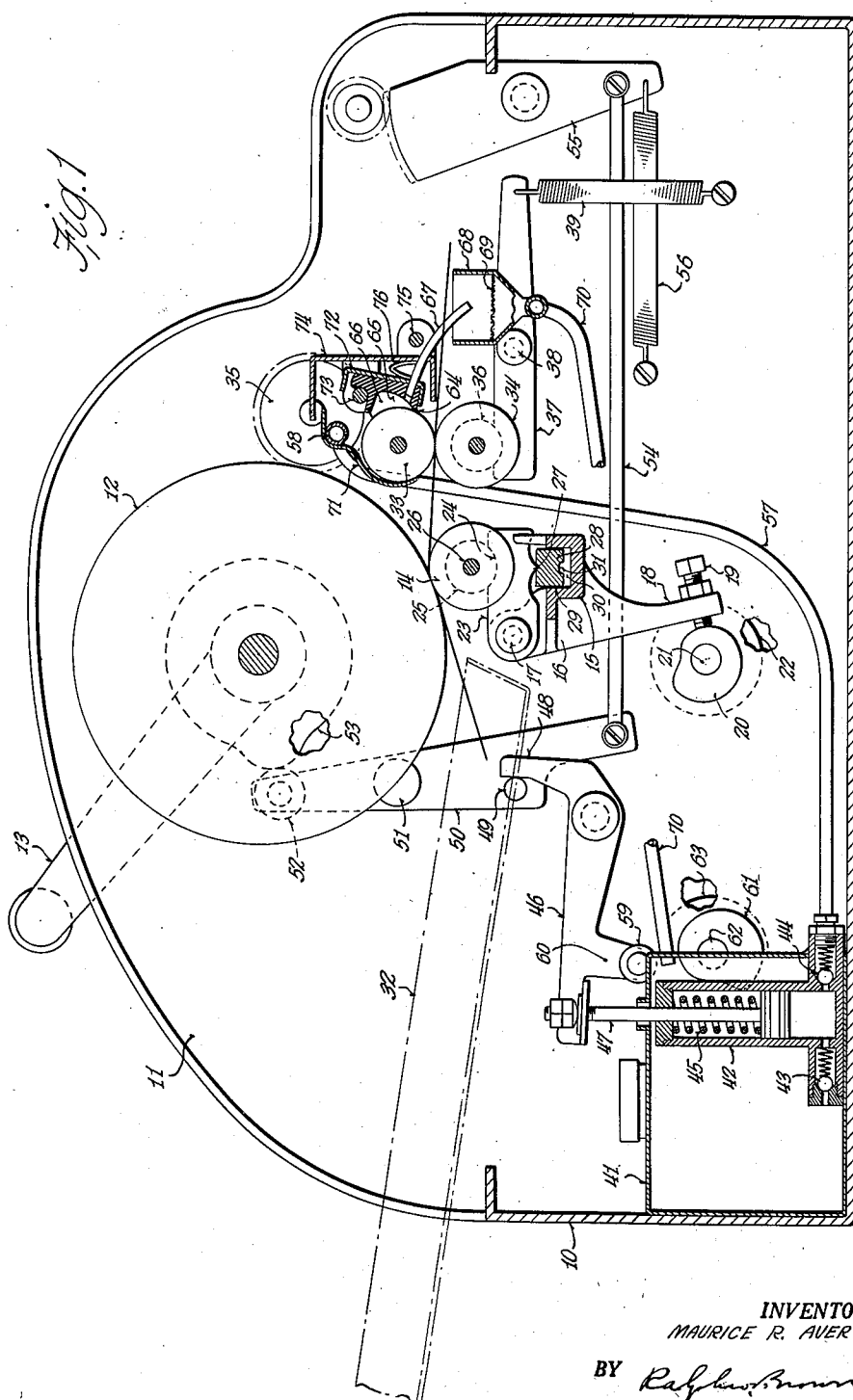
April 12, 1949.

M. R. AVERY
DUPLICATING MACHINE

2,466,873

Filed Sept. 27, 1941

2 Sheets-Sheet 1



INVENTOR.
MAURICE R. AVERY

BY *Ralph Brown*
ATTORNEY.

April 12, 1949.

M. R. AVERY
DUPLICATING MACHINE

2,466,873

Filed Sept. 27, 1941

2 Sheets-Sheet 2

Fig. 2

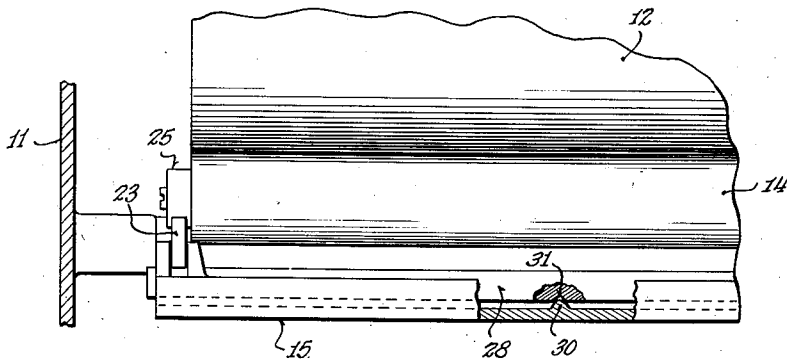


Fig. 3

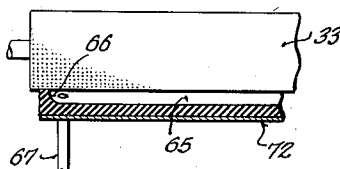
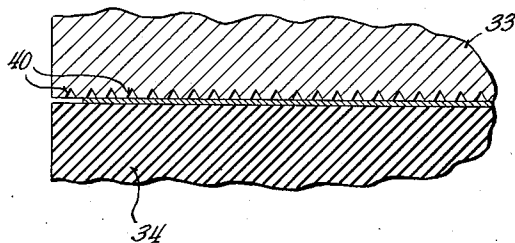


Fig. 4



INVENTOR.
MAURICE R. AVERY

BY

Ralph Brown

ATTORNEY.

UNITED STATES PATENT OFFICE

2,466,873

DUPLICATING MACHINE

Maurice R. Avery, Wauwatosa, Wis., assignor of
one-half to Richard A. Miller, Chicago, Ill.

Application September 27, 1941, Serial No. 412,551

4 Claims. (Cl. 101—132.5)

1

This invention relates to duplicating machines of the type in which reproductions of script contained on a master sheet are produced by pressing successive copy sheets, previously moistened with volatile ink solvent, into surface contact with the master sheet.

Machines of this type ordinarily include a rotary drum for carrying the script-bearing master sheet and a coacting impression roller between which the copy sheets are successively passed, together with some form of means for automatically applying moisture to each copy sheet during advance of the latter toward and into the light between the drum and roller.

In such machines it is important that the proper degree of pressure be maintained between the impression roller and drum and that this pressure be substantially uniform throughout the lengths thereof, and even more important to the production of good copies is the application of correct amounts of moisture to the copy sheets and a uniform distribution of such moisture throughout the area of each. Excess moisture materially reduces the number of copies that can otherwise be made from a single master copy, and excess moisture is also a common cause of objectionable blurring. On the other hand reduction in the amount of moisture applied greatly aggravates the serious problem of effecting uniform distribution throughout each sheet.

One object of the present invention is to provide, in a duplicating machine of the type mentioned, an improved means and method for applying moisture to the copy sheets by which the amount of moisture applied may be maintained at a minimum required for successful copying and at the same time evenly distributed throughout each sheet.

Another object is to provide in a duplicating machine, of the type mentioned, an improved means for regulating and distributing the pressure between the impression roller and drum.

Other more specific objects and advantages will appear, expressed or implied, from the following description of a duplicating machine embodying the present invention.

In the accompanying drawings—

Figure 1 is a fragmentary longitudinal sectional view of a duplicating machine constructed and equipped in accordance with the present invention.

Fig. 2. is a fragmentary front view of the impression roller and its support shown in Fig. 1.

Fig. 3 is a fragmentary plan view of the moistening roller and its wiper shown in Fig. 1,

2

with the wiper appearing in horizontal longitudinal section.

Fig. 4 is a magnified fragmentary sectional view of the moistening roller and coacting pressure roller shown in Fig. 1.

The duplicating machine selected for illustration comprises a frame 10 having upright side walls 11 which provide support for a conventional rotary drum 12 journaled at opposite ends therein. The drum 12 is adapted to carry a script-bearing master sheet applied and fixed to the periphery thereof in the customary manner and is in this instance manually rotated clockwise by an appropriate handle 13.

The drum coacts with an idle impression roller 14 which in this instance is arranged beneath the drum for pressure contact therewith throughout its length. The impression roller 14 is preferably of yieldable rubber and is supported and pressed against the drum 12 preferably by mechanism which will now be described. The mechanism shown for this purpose comprises an elongated carrier frame 15 which extends horizontally beneath and parallel to the impression roller 14 throughout its length. The frame 15 is provided at each end with an integral supporting bracket 16 rockably mounted on a pivot pin 17 anchored in a side wall 11 of the main frame so positioned as to permit the frame to swing vertically about a horizontal axis laterally offset from the roller 14 and frame. The frame 15 is additionally supported and positioned by an arm 18 that extends downwardly from one of the end brackets 16 and carries a set screw 19 that bears against a cam 20. The cam 20 is carried by one end of a stub shaft 21 journaled in and extending through the side wall 11 and provided at its other end with a knob 22 or other appropriate device by which the cam 20 may be rotatively adjusted. The arrangement is such that by rotation of the knob 22 and cam 20, the arm 18 may be adjusted in such direction as to elevate or depress the frame 15 toward or from the roller 14.

Each pivot pin 17 also provides support for a horizontally extended upright blade 23 rockable thereon and guided in a vertical saw cut provided in the adjacent end bracket 16 of the frame 15. The upper edge of each blade 23 is cut away to provide an arcuate seat 24 for the outer race of an anti-friction bearing 25 in which an end trunnion 26 of the roller 14 is journaled, and by which the roller is supported. The lower edge of each blade 23 is also fashioned to form a lug 27 that rests upon the adjacent end of an equalizer bar 28 carried by the frame 15. The frame 15 con-

3

tains a longitudinally extended channel formation 29 adapted to loosely receive and position the bar 28 and having midway of its ends a transverse rib 30 spanning the bottom thereof and functioning as a fulcrum support on which the bar 28 is freely rockable. An intermediate key or lug 31 on the rib 30 loosely engages a socket in the bar 28 to retain the bar against end play.

The arrangement is such that as the carrier frame 15 is urged upwardly toward the roller 14 by the reaction of the cam 20 against the set screw 19, this upward thrust is transmitted through the frame 15 and fulcrum 30, equalizer bar 28, blades 23, and bearings 25 to the roller 14 to press the latter against the drum 12. It will of course be understood that since the blades 23 are independently rockable and supported by the opposite ends of the equalizing bar 28 at equal distances from the fulcrum 30, the pressure thus developed between the roller 14 and drum 12 must be substantially uniform throughout the length of the roller 14; and that the degree of pressure thus developed may be regulated by rotation of the knob 22 and cam 20.

In the machine shown, the copy sheets *a* pass from right to left between the impression roller 14 and drum 12 and ultimately enter a tray 32 provided therefor. Before entering the bight between the roller and drum, each copy sheet is automatically and progressively moistened preferably by improved means, such as now will be described.

The moisture applying means shown includes a moistening roller 33, journaled at opposite ends in the side walls 11 of the main frame, and a coating pressure roller 34 arranged therebeneath. The moistening roller 33 is driven in the same direction and at the same peripheral speed as the drum 12 through an appropriate gear train connected with the drum and including an intermediate gear 35. The rollers 33 and 34 are arranged to receive the copy sheets therebetween and to feed them into the receiving bight between the drum 12 and roller 14.

The pressure roller 34 is preferably of yieldable material, such as rubber, and is journaled at opposite ends in anti-friction bearings 36, each bearing being seated upon one end of a lever 37 rockably supported intermediate its ends upon a pivot pin 38 anchored in a side wall 11 of the main frame and connected at its other end to a tension spring 39 by which the roller 34 is urged upwardly into light pressure contact with the roller 33.

The moistening roller 33 is preferably of metal or some equivalent hard non-absorbent material. It is provided with a multiplicity of closely spaced minute pits or indentations 40 uniformly distributed through its cylindrical periphery and adapted to receive, transport, and deposit the required moisture onto the copy sheets during their passage between the rollers 33 and 34. Provision is made for supplying moisture to the roller 33 and for removing therefrom practically all moisture except that lodged in the several pits 40 in advance of the contact between roller and sheets, so that as each sheet passes below the roller 33 it absorbs from the roller only that moisture contained in the several pits. The multiplicity of pits thus serve as a meter and accurately determine the amount of moisture received by each sheet and also, by reason of their uniform distribution, insure a uniform distribution of moisture throughout the sheet. In other words each of the multiplicity of pits empties its minute charge of liquid onto the sheet at closely spaced

4

localized points on the sheet, and the liquid of these deposits promptly spreads and commingles to effect a uniform distribution of moisture throughout the sheet. In this way the amount of moisture applied is effectively limited to the minimum requirements for good copying.

Liquid may be supplied to the roller 33 in various ways. In the machine shown it is supplied from a reservoir 41 seated in the bottom of the main frame 10 at the rear thereof and containing a conventional piston-and-cylinder pump 42 having the usual intake and exhaust valves 43 and 44, respectively. In this instance a spring 45 urges the pump piston in a direction to effect a delivery stroke, the return or idle stroke being effected by cam actuated mechanism driven from the drum 12. The mechanism shown for this purpose comprises a bellcrank 46 having one arm connected to the piston rod 47 and the other arm 48 disposed within the path of an actuating pin 49. The pin 49 is carried by the lower end of a lever 50 rockably supported on a pivot pin 51 in the side wall 11 and having a cam roller 52 on its other end disposed to coact with a cam 53 which is connected to rotate with the drum 12. The cam roller 52 is held against the cam 53 by a strut 54 connecting the lever 50 to a lever 55 which is urged by a spring 56 to swing it and the lever 50 toward the left (Fig. 1). The lever 55 may be utilized to operate a counting mechanism or some other auxiliary not shown.

Liquid is supplied from the reservoir 41 to the roller 33 through appropriate tubing 57 leading from the discharge valve 44 of the pump to a tube 58 disposed above the roller 33 and having an appropriate discharge port or ports through which the liquid is discharged onto the front of the roller. The amount of liquid supplied by the pump may be modified by regulating the delivery stroke of the pump. In this instance this is accomplished by a stop member in the form of a roller 59 carried by an arm 60 depending from the bellcrank 46 and disposed to strike a cam 61 arranged therebeneath to limit the down stroke of the bellcrank and pump piston. Like the cam 20, the cam 61 is carried by one end of a stub shaft 62 journaled in and extending through the side wall 11 and equipped at its other end with a knob 63 or other device by which the shaft and cam may be manually rotated. The stroke of the pump may thus be readily regulated by rotative adjustment of the cam 61 in such manner as to determine the point at which the down stroke of the bellcrank terminates.

The means shown for removing from the roller 33 all moisture except that contained in the pits therein comprises a wiper of rubber or other flexible non-absorbent material extending lengthwise in front of the roller and having a lower wiping edge 64 in pressure contact therewith substantially throughout the length thereof. A longitudinal channel 65 formed in the wiper above the edge 64 permits free entry of liquid from the tube 58 to the roller 33 between the front of the roller and the wiper, and vertical webs 66 at the ends of this channel make contact with roller 33 and act as dams to prevent the escape of liquid from this channel onto a copy sheet below. Ports adjacent the ends of the channel 65 communicate with drain tubes 67 to permit excess liquid in the channel to escape and be returned to the reservoir 41. In this instance each drain tube 67 is disposed in discharge into a cup 68 having a strainer 69 therein and connected through appropriate tubing 70 with the reservoir 41.

5

The tube 58 is preferably arranged to discharge liquid onto the front of the roller 33 intermediate the ends thereof so as to insure that all of the liquid enters the channel 65 between the end webs 66 thereof, and a shield 71 overlying the tube 58 and wiping against the upwardly moving rear face of the roller 33 insures against loss of liquid past that side of the roller.

It will be noted that the lower edge 64 of the wiper and the vertical end webs 66 thereof co-operate with the front face of the roller 33 to retain a small longitudinally extended body of liquid thereagainst, the level of this liquid being determined by the positions of the drain ports and tubes 67, thereby insuring that all the pits in the roller surface receive their full share of liquid before they pass downwardly past the wiping edge 64 and into contact with the copy sheet. An effective distribution of the liquid across the copy sheet is thus assured.

In the machine shown, the wiper is seated in a shallow, longitudinally extended box-like structure 72 rockably supported at its ends upon pivot pins 73 adjacent the upper edge thereof and anchored in the adjacent ends of an enclosing box-like structure 74. The structure 74 is shown rockably supported at its opposite ends by pivot pins 75 disposed adjacent the lower edge thereof and anchored in the side walls 11 of the main housing. A spring 76 within the structure 74 bears against the lower edge of the structure 72 to force the wiper 64 against the roller 33.

Various changes may be made in the embodiment of the invention hereinabove specifically described without departing from or sacrificing the advantages of the invention as defined in the appended claims.

I claim:

1. In a duplicating machine the combination of a roller having a substantially cylindrical pitted surface for contact with a copy sheet, a rubber-like wiper extending lengthwise of said roller and contacting said surface in advance of the zone of contact between said surface and sheet, means for supplying moisture to said surface in advance of the zone of contact between said wiper and surface, and means on said wiper coacting with said surface to limit the spread of moisture lengthwise of said surface.

2. In a duplicating machine the combination of a sheet moistening roller having a substantially cylindrical pitted surface for contact with the upper surface of a copy sheet, means including a liquid reservoir for supplying moisture to said surface in advance of the zone of contact between said surface and sheet, wiper means coacting with said roller to determine the amount

6

of moisture transmitted from said roller to the sheet, and means for returning excess moisture to said reservoir.

3. In a duplicating machine the combination of a sheet moistening roller having a substantially cylindrical pitted surface for contact with the upper surface of a copy sheet, means including a pump and reservoir for supplying moisture to said surface in advance of the zone of contact between said surface and sheet, means for regulating the rate of supply of moisture to said surface, wiper means coacting with said pitted surface to determine the rate of transmission of moisture from said surface to the sheet, and means for returning excess moisture from said surface to said reservoir.

4. In a duplicating machine the combination of a rotary drum for carrying a master sheet, a coating impression roller for pressing a copy sheet against the master sheet, a carrier extending lengthwise of said roller and rockably supported at its ends to swing toward and from said drum, independently movable elements for supporting the opposite ends of said roller, an equalizing bar interposed between said carrier and said elements, said bar being fulcrumed intermediate its ends in said carrier with its ends in supporting engagement with said elements, and cam means operable on said carrier to force the same toward said drum and thereby develop pressure contact between said roller and drum.

MAURICE R. AVERY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
176,193	Rhell	Apr. 18, 1876
2,072,534	Terry	Mar. 2, 1937
2,094,348	Carlson	Sept. 28, 1937
2,135,824	Marchev	Nov. 8, 1938
2,142,666	Bucy	Jan. 3, 1939
2,157,385	Gessler et al.	May 9, 1939
2,161,795	Benello	June 13, 1939
2,185,682	Pittman	Jan. 2, 1940
2,226,086	Wilkinson	Dec. 24, 1940
2,267,982	Kokay	Dec. 30, 1941
2,292,569	King	Aug. 11, 1942
2,293,690	Harrigan	Aug. 18, 1942
Re. 19,951	Storck	Apr. 28, 1936

FOREIGN PATENTS

Number	Country	Date
187,708	Switzerland	Nov. 30, 1936