Oct. 28, 1941. R. J. COPELAND ET AL 2,260,659

DUPLICATING MACHINE SHEET FEEDING DEVICE

Filed Feb. 19, 1940 2 Sheets-Sheet 1

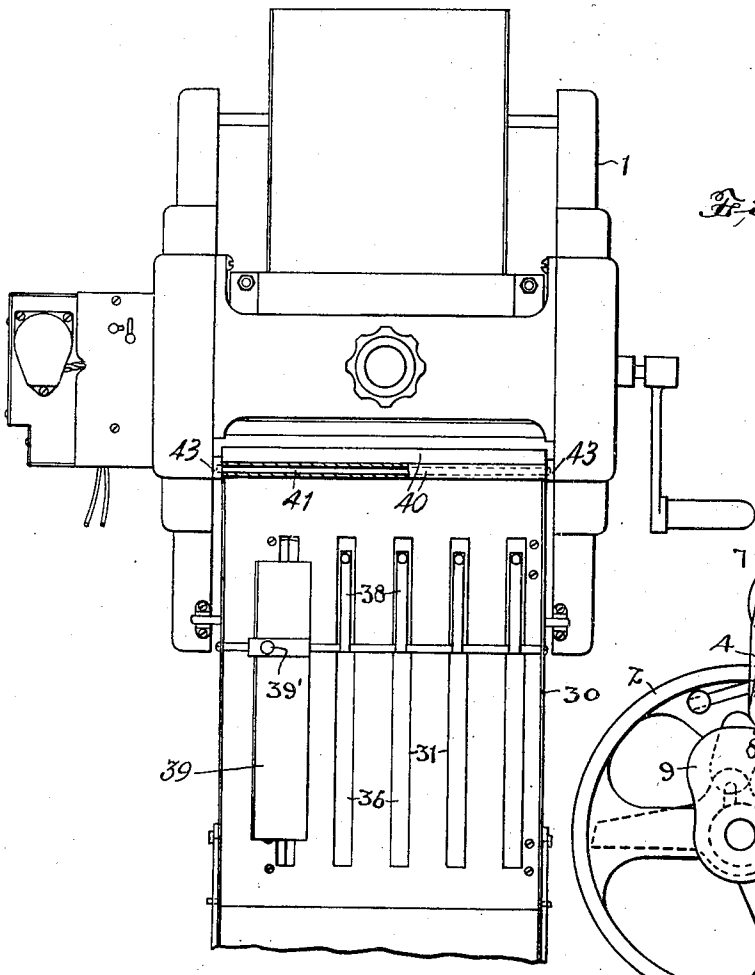
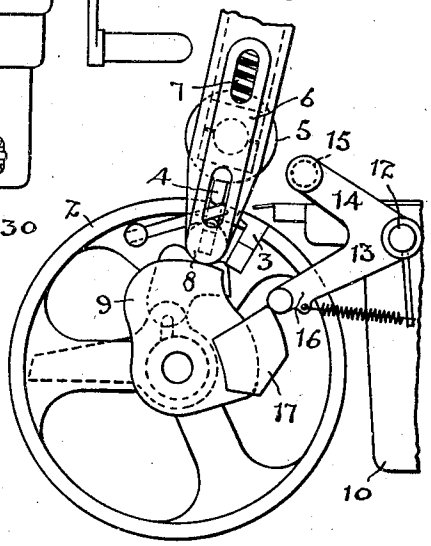


Fig. 1.

Fig. 6.



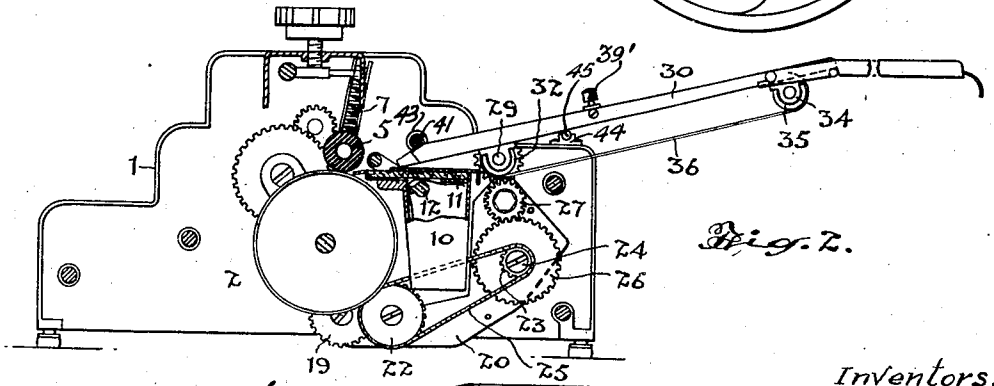


Fig. 2.

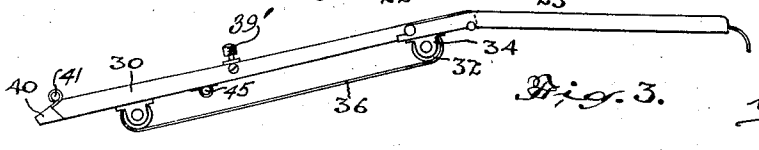


Fig. 3.

Inventors.
Robert J. Copeland.
Ernest J. Bloore.
by A. J. Dunnion
Atty.

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Fig. 5.

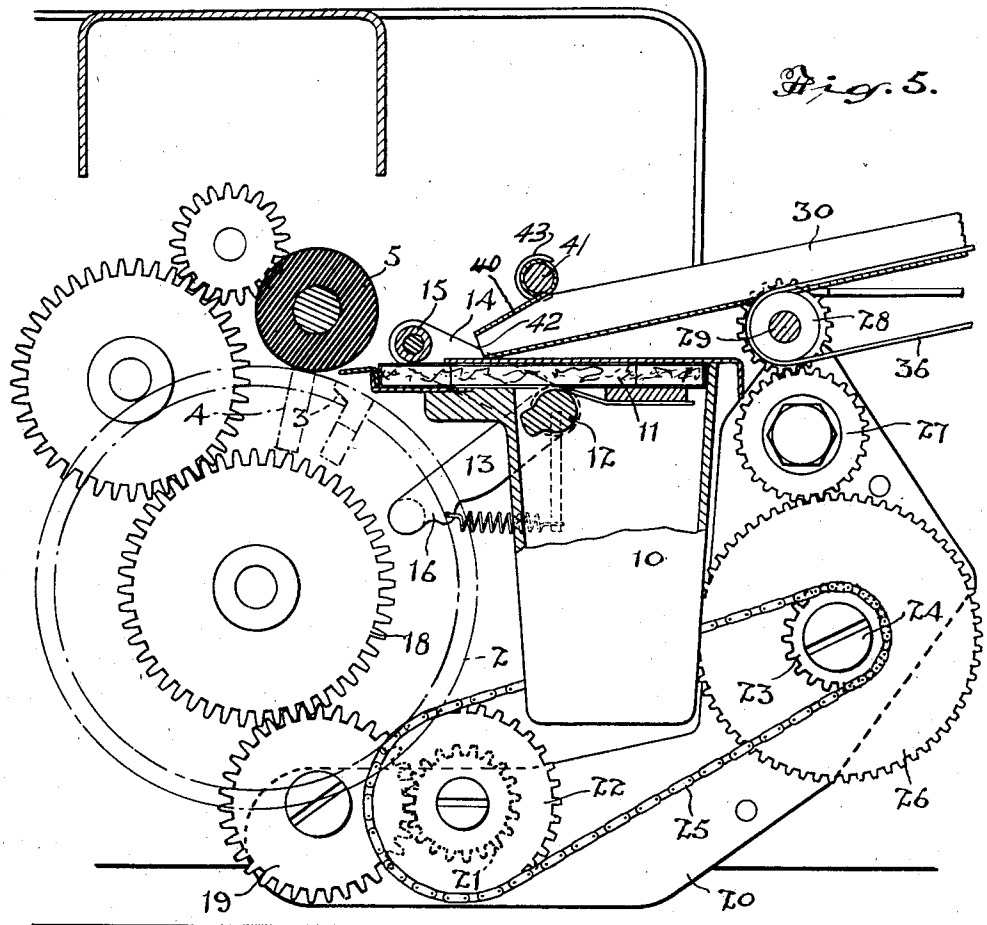
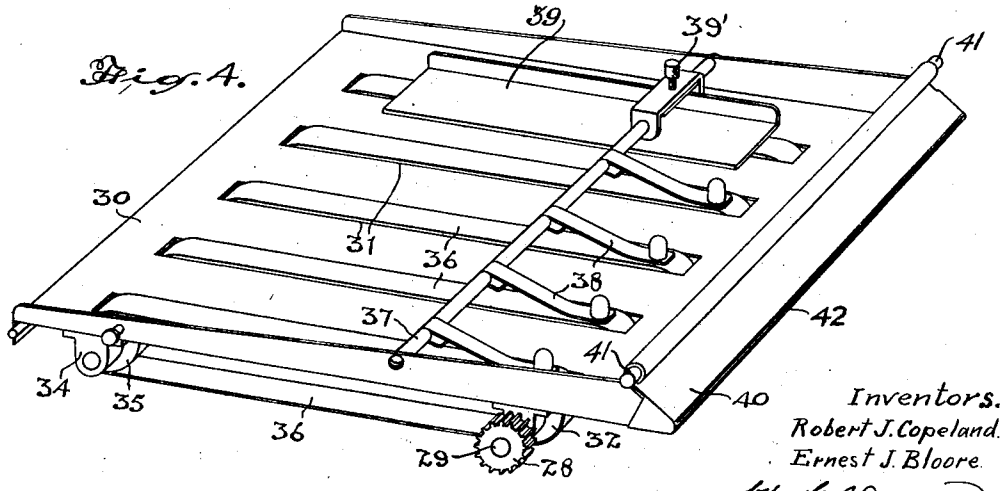


Fig. 4.



Inventors.
Robert J. Copeland.
Ernest J. Bloore.
by H. J. S. Drummond
Atty

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UNITED STATES PATENT OFFICE

2,260,659

DUPLICATING MACHINE SHEET FEEDING DEVICE

Robert J. Copeland, Toronto, Ontario, and Ernest J. Bloore, Brampton, Ontario, Canada; said Bloore assignor to said Copeland

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5 Claims. (Cl. 101—132.5)

This invention relates to duplicating machines of the type wherein a master sheet having an inked impression of the matter to be printed is mounted on a cylinder and the sheets to be printed upon are fed individually thereto and in the feeding operation are moistened with a fluid which effects the transposition of an inked impression from the master sheet thereto, and the principal objects of the invention are to simplify and reduce the cost of the printing operation which is highly desirable where large quantities of duplicate sheets are required to be produced, and a further object is to provide a means for automatically feeding individual sheets of paper to the printing roll of the duplicating machine.

The principal features of the invention consist in the novel construction and arrangement of a gear mechanism co-operating with the driving mechanism of a duplicating machine and operating means for propelling the paper sheets to the printing device, together with means co-ordinated with the printing mechanism for definitely spacing and placing the sheets in co-operative relation with said printing mechanism.

A further feature of importance consists in the novel arrangement of operating mechanisms for spacing the sheets and effecting the moistening of the sheets in their passage to the printing roller.

In the accompanying drawings

Figure 1 is a plan view of a duplicating machine showing the application of our improved feeding device thereto.

Figure 2 is a longitudinal mid-sectional view through the device illustrated in Figure 1.

Figure 3 is a side elevational detail of the removable tray portion of the feeding mechanism.

Figure 4 is an enlarged perspective view of the main tray portion of the feeding mechanism separated from the duplicating machine.

Figure 5 is an enlarged part sectional elevational detail showing the co-operative mechanism of the printing and feeding devices.

Figure 6 is an elevational detail showing the printing roller and its co-operating parts.

In the form of duplicating machine to which the present invention is herein shown as being applied the frame structure 1 has mounted therein a master roller 2 which is operated by suitable driving mechanism, either motor or hand-driven. This master roller is provided with a clamping bar 3 which grips the master sheet which has been previously prepared with an inked impression from which duplicate copies are to be made.

Adjacent to the clamp bar 3 and arranged within the master roller is a radially movable bar 4, which, at a certain period in the operation of the master roller, is extended beyond the perimeter of the roller and forms a positive stop against which the paper sheet to be printed engages.

An impression roller 5 is mounted at the ends in suitable bearings slidably arranged in guide members 6 and these bearing supports are moved radially outward against the pressure of compression springs 7 arranged in the guideways through the engagement of roller contacts 8 at the inner ends of the movable members with cams 9 mounted on the shaft of the master roller 2. These cams operate the impression roller to lift it out of contact with the master roller to permit the insertion of the sheet to be printed which is fed in against the radial stop member 4, following which the cam permits the impression roller to move into engagement with the inserted paper sheet, while the stop bar 4 is simultaneously withdrawn into its radial guideway within the master roller.

The operation of the master roller then proceeds and the paper sheet upon which the copy is to be impressed is carried around with the master roller and receives an impression from the master sheet carried thereby.

In these machines such as have been described the sheet to be printed upon is moistened with a solvent spirit which causes the moistened sheet to take an impression from the ink applied to the master sheet. In the arrangement herein shown there is provided a reservoir 10 which holds a quantity of the necessary moistening spirit which is fed to a moistening pad 11 which extends in a substantially horizontal direction across the machine adjacent to the master roller, the moistening spirit being fed thereto by means of a suitable wick feeding by capillary attraction.

A spindle 12 extends transversely of the reservoir 10 and carries at its ends the bell crank arms 13, and a bar 14 extends between the upwardly extending members of said crank arms and is preferably provided with a roller 15 which is adapted to be moved into contact with the top of the moistening pad 11.

The lower angularly extending ends 16 of the bell crank members are adapted to be engaged by cam members 17 co-operatively mounted with the cams 9 so that at a certain period in the operation of the master cylinder, that is, when the

radial stop bar 4 is extended, the crank arms are operated by the cams 17 so that the roller 15 is lifted clear of the moistening pad 11 and paper sheets may be fed thereunder so as to move freely into engagement with the stop bar 4 to be properly positioned in respect to the master roller and impression roller.

The cam 17 is so designed and located that it holds the roller 15 clear of the moistened pad until the sheet to be printed has been properly positioned and until the cams 9 lower the impression roller into operating engagement with the paper sheet. The crank arms 13 are then immediately released and are spring operated to move the roller 15 carried thereby into contact with the positioned sheet to press it against the moistening surface as it is drawn forwardly by the operation of the master and impression rollers.

It is an important feature in the operation of this type of duplicating machine that the sheets to be printed upon be fed to the master roller both accurately positioned and accurately timed, and in order to accomplish this result and to dispense with the necessity of skilled labour to carry on such positioning, a novel structure of feeding mechanism is provided.

The master roller 2 has mounted on its operating shaft a spur gear 18, and arranged to mesh with the gear 18 is a spur pinion 19 which is journalled on an auxiliary plate 20 mounted in the frame of the machine. A pinion 21 mounted on a suitable bearing pin on the plate 20 meshes with the pinion 19 and carries with it a sprocket 22. A sprocket pinion 23 is mounted on a suitable bearing pin 24 carried on the plate 20 and is connected with the sprocket 22 by a chain 25.

A spur gear 26 is operatively connected with the sprocket pinion 23 and meshes with a spur pinion 27 also mounted on a bearing pin secured in the plate 20, and this pinion in turn meshes with a pinion 28 mounted on a shaft 29 which extends transversely of and is journalled in suitable bearing brackets on the underside of a tray 30.

The tray 30 is arranged to extend between the side portions of the frame 1 of the duplicating machine, and the spur pinion 28 enters into mesh with the pinion 27 while the inner end of the tray extends close in to the moistening pad 11 and the pressure roller 15 carried by the bell crank members 13.

The tray 30 is provided with a plurality of longitudinal slots 31 and small pulleys 32 mounted on the shaft 29, on which the pinion 28 is mounted, extend upwardly through these slots.

A shaft 33 journalled in bearing brackets 34 on the underside of the upward and outward end of the tray 30, have mounted thereon a series of pulleys 35 which also extend upwardly through the outward ends of the slots 31.

A plurality of endless belts 36 are mounted on the respective pairs of pulleys 32 and 35 and their upper portions extend slightly above the top surface of the tray 30 in such a manner that a substantially uniform moving tray surface is provided.

A rod 37 extends across between the side members of the tray adjacent to the inward end and on this rod are loosely mounted a plurality of fingers 38 which are weighted at their free ends and rest upon the travelling belts 36. These weighted fingers are adapted to hold a paper sheet which comes in contact with the belt into close engaging frictional contact therewith to ensure the paper being moved by the frictional contact of the belt.

An angled guide plate 39 is pivotally and slidably supported on the rod 37 to extend over at least one of the belts 36. This plate is adapted to form a definite guide for the edge of the paper sheet as it passes over the movable belts and it can be slidably adjusted on the rod 37 to suit different widths of paper and locking in adjusted position by the clamping screw 39'.

The forward end of the tray is provided with a throat-forming plate 40 preferably secured to the forward end of the tray and having a portion embracing and supporting a rod 41, the forward edge portion of the plate 40 being disposed in close convergent relation to the top surface of the tray and providing therewith a narrow slot 42 for the free passage of the paper sheets therethrough. The ends of the rod 41 are here shown projecting beyond the side edges of the tray for detachable holding engagement with C-shaped sockets 43 suitably positioned on the frame.

Grooved support or fulcrum blocks 44 are mounted on the frame at either side in outwardly spaced relation to the C-shaped sockets 43 and pins 45 projecting from the sides of the tray are adapted to rest in the blocks 44 so that, in conjunction with the C-shaped sockets, the tray will be accurately and firmly supported in a detachable manner.

The pins 45 are so placed that the preponderance of weight of the outward end of the tray will efficiently hold the tray against displacement due to the driving thrust of gear 27 on gear 32.

The detachable support elements defined also cooperate to support the gear 32 in proper driving relation to gear 27. It will thus be appreciated that, by manipulating the tray to bring the projecting ends of rod 41 into register with the open sides of the C-shaped sockets they may be caused to enter the same by slight endwise pressure on the tray thus effectively positioning and supporting the inner end of the tray, and it will be further appreciated that the C-shaped clips may be of the resilient type tensioned on the insertion of the rod ends.

Paper sheets to be printed are fed on to the tray 30 by any suitable means, preferably a tear-off mechanism which separates individual sheets from a continuous strip. These sheets coming into contact with the moving belts 36 are carried forward under the gravity fingers 38 and pass through the slot 42 until they come into positive engagement with the roller 15 which is resting upon the moistening pad.

This roller forms a positive and definite stop for the sheet and it remains held in that position until, through the action of the cam mechanism described, the bell crank members are tilted and the roller 15 is lifted, whereupon the frictional effort of the belts 36 of the feed tray, which are continuously in motion, move the paper sheet forward under the roller 15 until it engages the stop bar 4 which at that moment is arranged to project radially from the surface of the master roller.

The operation of the mechanism which has previously been described is then continued, that is to say, the impression roller is lowered to engage the sheet to be printed upon concurrently with the withdrawal of the stop bar 4, and concurrently with this operation the roller 15 is lowered to engage the top of the sheet being fed from the feed tray 30 and presses it into moistening engagement with the moistening pad 11.

This operation continues in synchronism with the operation of the master roller as the feed belts **36** of the tray **30** are directly connected with the master roller through the gear mechanism described.

It will be noted that the sheet feeding mechanism is entirely supported as a unit with the removable guide tray and the act of placing the tray in position automatically establishes a driving connection with the master printing roller by the intermeshing of the pinions **27** and **28**.

The device herein described is of a very simple nature but it performs a very desirable service in the operation of a duplicating machine in accurately feeding the sheets to be printed upon in synchronism with the printing device and as it operates automatically it will effect a considerable saving in time and labour.

Moreover the removability of the feed tray permits the duplicating machine to be quickly adapted for hand feeding if desired for certain classes of work.

What we claim as our invention is:

1. In a duplicating machine having a master printing roller and an impression roller movable out of contact therefrom, said master roller having an extensible stop member cam-operated in synchronism with the movement of the pressure roller, said duplicator machine having a moistening pad extending thereacross to the printing roller, a member extending across said moistening pad and forming a stop for paper sheets, arms supporting said stop member, and cam means for operating said arms to periodically raise said stop member and to return it into engagement with the moistening pad, a tray for guiding sheets over the moistening pad, and means adapted to be operatively connected with the master printing roller for feeding sheets over said tray.

2. In a duplicating machine having a master printing roller and operating mechanism including sheet-arresting means co-operating with the master roller for periodically arresting paper sheets fed to the said roller, said roller having a spur gear connected therewith, a plate adapted to be secured to the frame of the duplicating machine having a plurality of journal studs mounted thereon, a spur pinion mounted on one of said journals and meshing with the spur gear of the master roller, a spur pinion meshing with the aforesaid spur pinion and carrying a sprocket wheel, a sprocket pinion mounted on another of said journal studs and carrying a spur gear, a spur pinion mounted on another of said journal studs and meshing with the latter spur gear, a tray mounted in the frame of the duplicating machine for directing paper sheets toward the master printing roller, a shaft mounted on said tray having a spur pinion adapted to engage and mesh with the latter-mentioned spur pinion of the train of gears hereinbefore defined, a plurality of endless belts operatively connected with the shaft mounted on said tray and extending above the surface of the tray for directing sheets to said sheet-arresting means.

3. A sheet feeding attachment for duplicating machines of the type having a master printing roller, comprising a sheet feeding unit for detachable mounting on said duplicating machine, and means for automatically operatively connecting said feeding unit with the master printing roller on mounting said unit in place, including gear wheels, and means dependent on a downward tilting displacement of said unit to effect intermeshing engagement of said gear wheels.

4. A sheet feeding attachment for duplicating machines of the type having a master printing roller, comprising a sheet feeding unit for detachable mounting on said duplicating machine, and means for automatically operatively connecting said feeding unit with the master printing roller on mounting said unit in place, including a pinion mounted on said detachable unit and connected with the sheet feeding means, and a drive pinion operatively connected with the master roller and arranged to detachably intermesh with the aforesaid pinion.

5. A sheet feeding attachment for duplicating machines of the type having a printing roller and a sheet arresting and releasing means, comprising a guide plate for detachable mounting in said machine having sheet-advancing means solely supported on said tray as a complete unit, means for supporting said guide plate including fulcrum supports co-operating with the said plate at the inward side of its centre of gravity in positioning contact whereby the overhanging weight of the plate tends to tilt the plate and maintain the same in positioning relation to the said fulcrum support, and means dependent on the unbalanced tilting effect of said plate for operatively connecting said sheet advancing means with the said printing roller as the tray is placed in position.

ROBERT J. COPELAND.
ERNEST J. BLOORE.