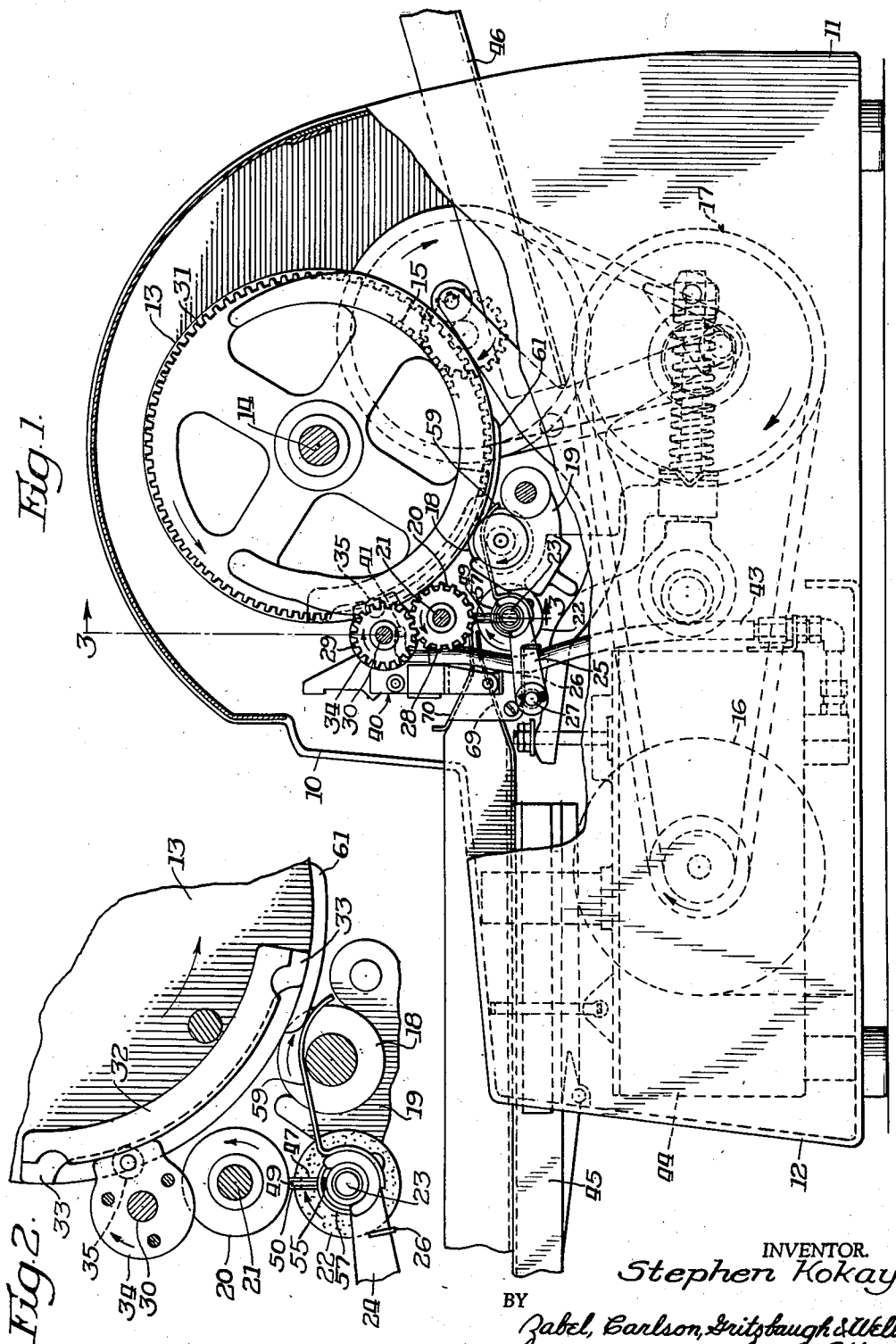
June 30, 1942. S. KOKAY 2,288,287

SHEET POSITIONING MEANS

Filed Aug. 4, 1941 3 Sheets-Sheet 1



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SHEET POSITIONING MEANS

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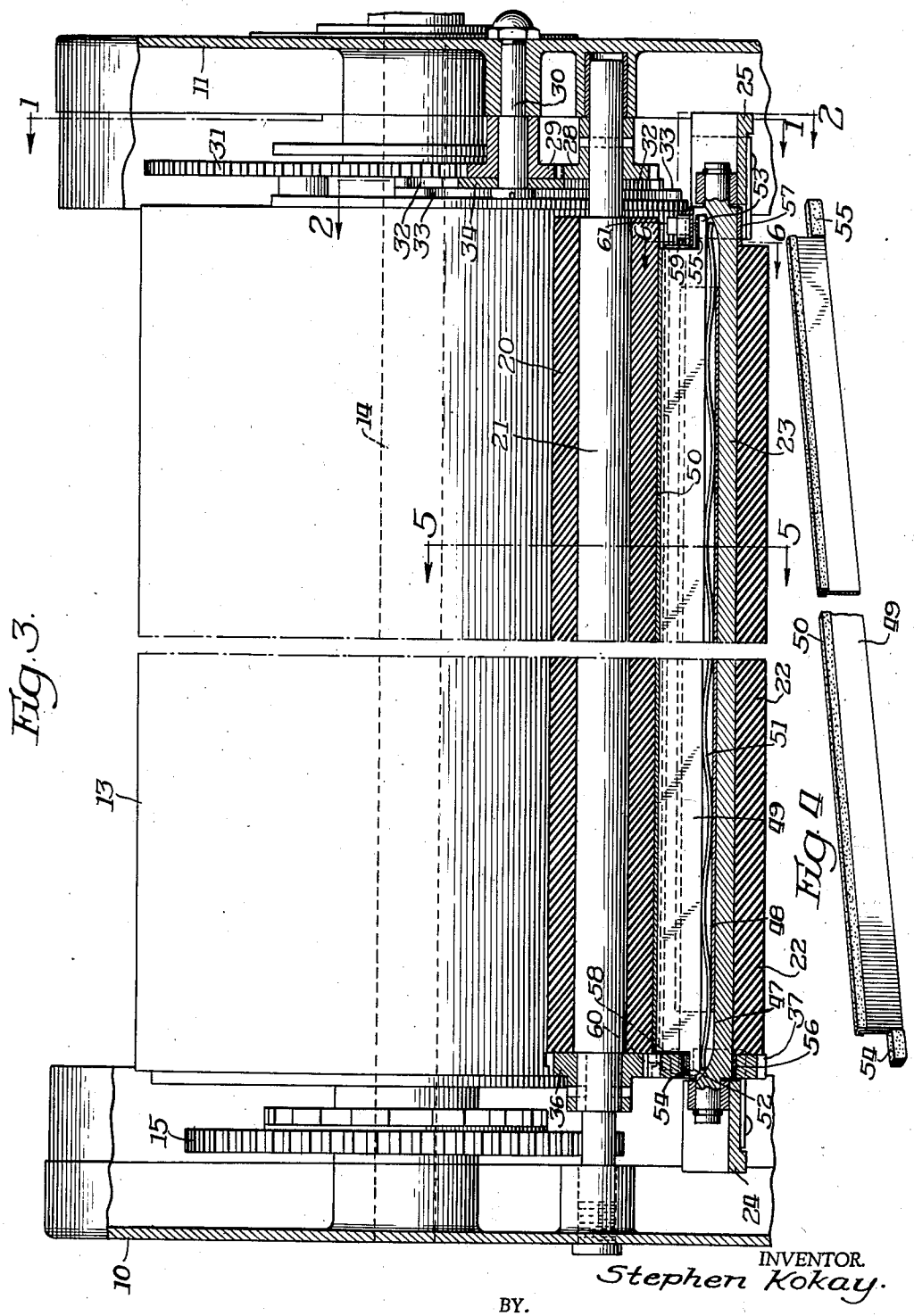


Fig. 3.

Fig. 4

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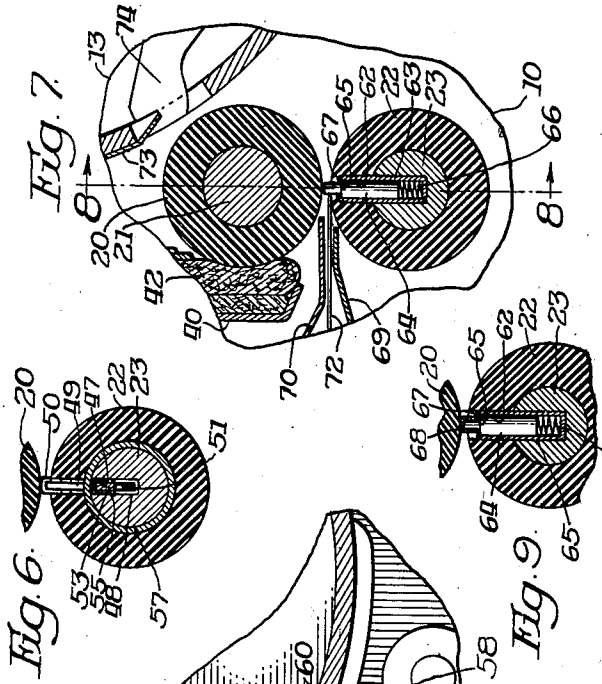


Fig. 7

Fig. 6

Fig. 9

Fig. 5

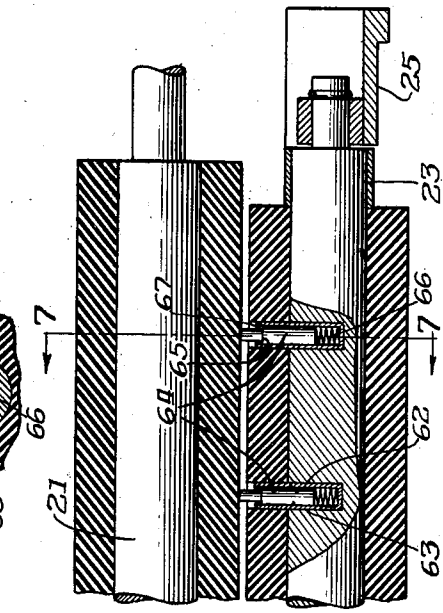


Fig. 8

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UNITED STATES PATENT OFFICE

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SHEET POSITIONING MEANS

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Application August 4, 1941, Serial No. 405,337

13 Claims. (Cl. 271—53)

This invention relates to sheet positioning means for duplicating machines and in particular to positioning means operating in conjunction with a pair of feed rollers against which positioning means the leading edge of a copy sheet may be positioned before it is grasped by the feed rollers and thereafter fed between them to the printing couple.

The preferred embodiment of my invention herein shown and described is incorporated in a wet process duplicating machine, but it is understood my invention is applicable to other types of duplicating machines.

A primary object of my invention is to provide an improved positioning means which is effective for different thicknesses of paper. It has been the practice to position a copy sheet at the bight of the feed rollers by urging it against and between the rollers at this point when they are stationary. This expedient is not satisfactory when different thicknesses of paper are used. The purpose of positioning the copy sheet is to secure the proper registration of matter to be duplicated with respect to the copy sheet which may already have other matter printed or duplicated thereon. This is done at a time when the feed rollers are stationary, the latter being driven in timed relationship to the drum.

Given two rollers in tangential relationship to each other, it is obvious that if thin paper say of a thickness of .001 or .002 inch is pushed into the bight, the leading edge thereof will be closer to the center plane of the rollers than the leading edge of card stock, which may be .01 inch or greater in thickness, when pushed into the same bight. This fact prevents uniform registration unless the angular position of the drum is adjusted with respect to the feed rollers whenever a shift is made from one thickness of copy sheet to another.

Similarly the stiffness of the copy sheet affects the position of the leading edge. Furthermore it is difficult to squarely align the leading edge of a copy sheet parallel to the center plane of the rollers, particularly if the copy sheet is not stiff.

Another object of my invention is to provide means for separating the feed rollers of a duplicating machine to permit a copy sheet to be advanced and accurately positioned against a stop located at the point where the feed rollers would normally come together, as well as to provide means for actuating the last named means in timed relationship with the rotation of the drum to secure improved registration.

Other objects, features and advantages of my invention will become apparent as the description proceeds.

With reference now to the drawings in which like reference numerals represent like parts:

Fig. 1 is a sectional elevation of a wet process duplicating machine embodying a preferred form of my invention;

Fig. 2 is an enlarged sectional view taken along line 2—2 of Fig. 3;

Fig. 3 is a section taken along line 3—3 of Fig. 1;

Fig. 4 is a detailed perspective view of the stop element shown in Fig. 3;

Fig. 5 is a section taken along line 5—5 of Fig. 3;

Fig. 6 is a section taken along line 6—6 of Fig. 3;

Fig. 7 is a section similar to Fig. 5, but showing a modified form of my invention, this section being taken along line 7—7 of Fig. 8;

Fig. 8 is a section taken along line 8—8 of Fig. 7; and,

Fig. 9 is a sectional view similar to Fig. 7, but showing a modification thereof.

With reference now to Figs. 1 and 3, reference numerals 10 and 11 designate the side frames of a duplicating machine, which side frames are associated with each other by a front frame member and base 12. A drum 13 is mounted on a drum shaft 14, the latter being journalled in the side frames 10 and 11. A gear 15 is also mounted on the drum shaft 14. A motor 16 mounted on the front frame member and base 12 is adapted to drive the gear 15 by means of suitable driving means which are indicated generally at 17. The gear 15 may be suitably associated with the drum either directly or by means of a suitable clutch to permit engagement of the driving means with the drum for a single revolution. Such means are not disclosed herein however inasmuch as they form no part of this invention.

A pressure roller 18 is disposed beneath the drum and is resiliently urged against the drum by means indicated generally at 19 in which the pressure roller is journalled.

Disposed rearwardly of and closely adjacent to the bight of the drum and the pressure roller are an upper feed roller 20 and a lower feed roller 22. The upper feed roller is mounted on a shaft 21 which is journalled in the side frames 10 and 11 as shown in Fig. 3. The lower feed roller

is mounted on a shaft 23 which is journalled in arms 24 and 25. These arms are suitably secured to a shaft 27, which shaft is associated with the side frames. Springs 26 urge the arms upwardly so as to cause the lower feed roller to be resiliently urged against the upper feed roller.

A pinion 28 is affixed to the shaft 21 in order to cause rotation of the upper feed roller. An idler gear 29 is suitably mounted on a stub shaft 30 which is associated with the side frame 11. An interrupted gear 31 is affixed to the drum 13 and meshes with the idler gear 29 the idler gear in turn meshing with the pinion 28. The interrupted gear is provided with a dwell so as to cause intermittent rotation of the feed rollers.

As shown in Fig. 2, a decelerating cam 32 and an accelerating cam 33 are suitably secured to the drum. A cam plate 34 is affixed to the idler gear 29 and cooperates with the decelerating cam 32 so as to lock the idler and the feed rollers in stationary position during the dwell period. The cam plate carries a roller 35 which cooperates with the accelerating cam 33 to accelerate the idler gear and the feed rollers from a stationary condition up to a point where their rotational speed is such that the idler gear may be smoothly meshed with the interrupted gear 31. A pinion 36 is secured to the opposite end of the upper feed roller shaft 21 and meshes with a pinion 37 on the lower feed roller shaft 23 so as to cause uniform rotation of the feed rollers with respect to each other.

It will be seen that as the drum is being continuously rotated by the motor, both of the feed rollers will be rotated intermittently. A copy sheet is adapted to be brought up to the bight of the feed rollers during their dwell period, after the termination of which the copy sheet will be fed forwardly into contact with the rotating drum.

Means are also provided to apply a thin film of moisture to the upper surface of the copy sheet in accordance with the wet process method of duplication. This means comprises a moistener 40 which is suitably mounted adjacent the upper feed roller 20. This moistener includes a spray tube 41 which is disposed immediately above the upper feed roller, and a felt wiper 42 which is maintained in contact with the feed roller at a point somewhat below the spray tube. A conduit 43 extends between the spray tube and a tank 44 which is mounted on the base member 12. Suitable pump means, not described herein, may be provided to force the solvent from the tank up to the spray tube so that it will be sprayed upon the surface of the upper feed roller. The felt wiper 42 serves to distribute this solvent uniformly over the surfaces of the feed roller 20 in a thin film, and this thin film is subsequently transferred to a copy sheet as it is being fed forwardly by the coaction of both of the feed rollers.

A feed tray 45 is disposed immediately behind the feed rollers 20 and 22, and a receiving tray is disposed in front of the bight of the drum 13 and the pressure roller 18. The forward end of the feed tray slopes upwardly and terminates just back of the bight of the feed rollers to form a guide 69. An upper guide 70 is disposed just above it, and these two guides cooperate to direct a copy sheet as it is moved forwardly from the top of the stack 71 against a stop member hereinafter described from which position, the copy sheet may be advanced by the feed rollers 20 and 22.

The lower feed roller 22 and its shaft 23 are provided with a slot 47, which slot extends radially from the center to the surface of the lower feed roller 22. A U-shaped channel 48 is disposed within the slot 47, and a sliding strip 49 is disposed in the slot with its inner edge in the U-shaped channel. A rubber cap 50 in the form of a channel is provided for the upper edge of the strip 49 and is cemented thereto. A spring 51 in the form of a wavy length of steel wire is disposed within the channel 48 and bears against the sliding strip 49 so as to urge the same outwardly.

The strip 49 is provided with lugs 52 and 53 at the ends thereof, these lugs extending beyond the end surfaces of the roller proper into the ends of the portion of the slot 47 which is formed in the shaft 23. These lugs may also be provided at their outer edges with rubber caps 54 and 55. As shown in Figs. 3 and 6, rings 56 and 57 surround the shaft near either end thereof and engage the lugs 52 and 53 to limit the extent of their outward movement. The lugs are so proportioned that the total outward movement of the strip 49 is about $\frac{1}{16}$ of an inch.

The arms 24 and 25 are provided with extensions 58 and 59 which may be suitably riveted thereto, the outer end of these extensions being disposed adjacent the periphery of the drum 13 as shown in Fig. 5. Cams 60 and 61 are provided on the drum and are adapted to engage the extensions 58 and 59 so as to displace the arms 24 and 25 to which the lower feed roller is journalled, thereby separating the feed rollers. The gearing between the lower feed roller and the drum is so designed as to cause the lower feed roller to come to rest at the same position during succeeding dwell periods, and this position is the one shown in Fig. 5 in which the sliding strip 49 is opposite the upper feed roller. The angular position of the cams 60 and 61 with relationship to the interrupted gear 31 is such that the feed rollers are caused to separate at about the time they come to rest, and they are permitted to come together again just prior to the end of the dwell period.

The master sheet 73 is held in position on the drum by a gripper 74 which engages the leading edge of the master shet as shown in Fig. 5.

In operation a copy sheet 72 is fed from the top of the stack 71 and is directed by the guides 69 and 70 between the separated feed rollers and against the stop 49. It does not touch the moistening roller 20. This is effected during the dwell period in which the feed rollers are stationary, and are separated as shown in Fig. 5. In this position of the parts, the spring 51 urges the strip 49 up against the upper feed roller 20 so that it forms a stop against which the leading edge of the copy sheet 72 may be positioned. Just before the end of the dwell period, the extensions 58 and 59 drop off the cams 60 and 61 and permit the feed rollers to come together and grip the leading edge of the copy sheet 72. Subsequent rotation of the feed rollers will advance the copy sheet into contact with the drum at the desired position.

It will be seen that the stop means herein provided permits accurate positioning of the thin sheets as well as thick sheets in that the leading edge of the sheet is positioned at the same distance from the bight of the drum and the pres-

sure roller no matter whether it is thin or thick.

During the time that the copy sheet is being fed by the rotating feed rollers, it will be seen that the strip **49** is always in its extended position except for the period during which it contacts the upper feed roller **20**. As it rotates into this position, it is displaced by the upper feed roller, and as it rotates away from this position, the spring **51** again forces it outwardly. By virtue of the fact that its outward movement is limited to a small extent, such as $\frac{1}{16}$ of an inch or less on a roller of an inch or more in diameter, the displacing of the strip by the upper feed roller will not impede their rotation. Furthermore the rubber cap **50** cushions whatever slight impact there may be as the strip is rotated into contact with the upper feed roller. This assures quiet operation. The upper feed roller may be made of a hard rubber or neoprene of approximately 45° Shore hardness. The lower feed roller is preferably of a sponge rubber or neoprene. The rubber cap **50** is perferably of a soft material similar to that of the lower feed roller.

Furthermore it will be noted that although the rollers are separated by a distance which is amply sufficient to position copy sheets and cards of all thicknesses in common use, the extent of separation still is sufficiently small to prevent the pinions **36** and **37** from becoming disengaged.

After the copy sheet has passed the feed rollers and after the matter on the master sheet **73** has been duplicated onto the copy sheet in a predetermined position, the copy sheet drops into the receiving tray **46**. Subsequent to this, the feed rollers come to a stop with the strip **49** in contact with the upper feed roller **20**, and are then separated so that the strip **49** is again in the extended position to serve as a stop for the succeeding copy sheet. Obviously, the feed rollers may be separated just before they come to a stop, if preferred.

As indicated above additional control means may be provided to stop the drum during the dwell period to provide a greater length of time to position the copy sheet against the strip **49**. Furthermore, although I have here shown means which is actuated by rotation of the drum for causing separation of the feed rollers, it is obvious that other means may be employed to perform this function, particularly in the event that it is desired to separate the feed rollers when the drum is stationary.

Although I have found it preferable to stop the lower feed roller in the position shown in Fig. 5, it could obviously be stopped in a position somewhat in advance of this and the same results could be obtained providing there is sufficient buckle in the copy sheet to cause the sheet to follow through into the bight of the rollers. This buckle may be caused when the sheet is positioned against the stop manually or when automatic feeding means are employed.

Figs. 7 and 8 show a modification in which the stop member comprises a series of pins **64** instead of the strip **49**. The lower feed roller **22** is provided with a plurality of apertures **62** in each of which is fitted a cylinder **63**. A pin **64** is slidably positioned in each of the cylinder **63**, the pin being provided with a shoulder **65** which cooperates with the upset or crimped-over edge **67** of the open end of the cylinder **63**. A spring **66** is disposed between the bottom of the pin and the closed end of the cylinder to urge the pin outwardly. The cooperation of the shoulder **65** with the upset edge **67** of the cylinder limits the outward movement of the pin. The modification, shown in Figs. 7 and 8 operates in substantially the same manner as that described above in connection with Figs. 1–6, inclusive.

It will be seen that the cylinder **63**, the pin **64** and the spring **66** may be assembled, and the open edge **67** of the cylinder may be upset before the assemblies are fitted into the apertures **62** of the feed roller **22**. This particular construction provides a very simple method of manufacture.

If desired the upper end of the pin **64** may be provided with a rubber cap **68** as shown in Fig. 9 which serves to insure noiseless operation

Although I have herein shown and described only certain preferred embodiments of my invention, it will be understood that various modifications and changes may be made in the particular embodiments herein shown without departing from the spirit of my invention. The description and drawings are illustrative only, and my invention is not limited thereto, but is limited only by the appended claims.

I claim:

1. In combination with a feed roller for a duplicating machine, stop means against which a copy sheet may be positioned including a stop member slidably disposed in said feed roller, and means to urge said stop member outwardly so that a portion thereof projects outwardly beyond the surface of said feed roller, the outermost portion of said stop member being formed of shock absorbing material.

2. Sheet positioning means for duplicating machines comprising a slotted roller, a strip slidably disposed in said slotted roller, a spring bearing against said strip to urge it outwardly, lugs at the ends of said strip projecting beyond the end surfaces of said roller, and means disposed at the ends of said roller to engage said lugs to limit the outward movement of the strip.

3. A feed positioning means for duplicating machines comprising a roller adapted to be stopped in a predetermined position, said roller being provided with a slot, a strip slidably disposed in said slot, a spring disposed in said slot and bearing against said strip to urge it outwardly, lugs at the ends of said strip projecting beyond the end surfaces of said roller, means disposed at the ends of said roller to engage said lugs to limit the outward movement of the strip, and a shock absorbent cap for the outer edge of said strip.

4. Sheet positioning means for a duplicating machine comprising a hollow member, a stop member slidably associated therewith, a spring disposed in said hollow member and bearing against said stop member to urge it outwardly, means to limit the outward movement of said stop member with respect to said hollow member, and a recessed roller in which said hollow member is fitted in position with the stop member normally projecting beyond the face of the roller.

5. In combination, a feed roller for a duplicating machine provided with a plurality of aligned cylindrical apertures in the surface thereof, a cylinder for each aperture, the open end of each cylinder being provided with an internal flange, a pin in each cylinder provided with a shoulder for cooperation with said flange to limit the outward movement of said pin, and a spring confined in each cylinder between the closed end thereof and the inner end of said pin

to urge the pin into a position wherein it may serve as a stop against which a copy sheet may be positioned.

6. In a duplicating machine, a pair of rotatable feed rollers normally in contact with each other, means to separate said feed rollers, a stop member against which a copy sheet may be positioned movably disposed in one of said feed rollers, means to move said stop member outwardly so that a portion thereof projects outwardly beyond the surface of said feed roller and means to stop the rotation of said last mentioned feed roller when said stop member is in a position substantially opposite the other of said feed rollers.

7. In a duplicating machine having a drum carrying matter to be duplicated and a cooperating pressure roller, a pair of feed rollers disposed adjacent thereto, and driven in timed relationship therewith, means to stop the rotation of said feed rollers, means to separate said feed rollers, a stop member movably disposed in one of said feed rollers, and means to move said stop member outwardly so that a portion thereof projects outwardly beyond the surface of said feed roller and contacts the other of said feed rollers when said feed rollers are separated whereby a copy sheet may be positioned against said stop member.

8. Sheet positioning means for duplicating machines comprising a pair of feed rollers, one of said feed rollers being a moistening roller, and the other being radially recessed, a stop member slidably disposed in said recess, means to limit the radial sliding movement of said stop member, means to extend said stop member to operative position, means to separate said feed rollers, and means to maintain said recessed feed roller in a stationary position in which said stop member is substantially opposite said moistening roller to permit a copy sheet to be positioned against said extended stop member without contacting said moistening roller.

9. Sheet positioning means for duplicating machines comprising a pair of feed rollers, one of said feed rollers being provided with a radial slot, a strip slidably disposed in said slot, means to limit the radial movement of said strip, a spring confined between the lower edge of said strip and the bottom of said slot to urge said strip outwardly to a sheet engaging position, means to separate said feed rollers, and means to maintain said feed rollers in a stationary position in which said strip contacts the opposite feed roller in order to permit a copy sheet to be positioned against said strip when said feed rollers are separated and stationary.

10. In a duplicating machine comprising a rotatable drum carrying matter to be imprinted and a pair of rollers for feeding a copy sheet to said drum, means for positioning said copy sheet with respect to said drum, said means including a stop member slidably disposed in one of said rollers, means to maintain said last mentioned roller stationary in a position wherein said stop member projects from the surface thereof and engages the surface of said other roller, means to cause said rollers to rotate when said drum is rotated beyond a predetermined angular position and means to hold said rollers in position to engage each other during at least the initial period of their rotation whereby a copy sheet may be advanced to said drum after the leading edge thereof has been positioned against the projecting stop member when said rollers are stationary.

11. In a duplicating machine comprising a rotatable drum carrying matter to be imprinted and a pair of rollers for feeding a copy sheet to said drum, means for positioning said copy sheet with respect to said drum, said means including a stop member slidably disposed in one of said rollers, means to maintain said last mentioned roller stationary in a position wherein said stop member is opposite said other roller, cam means on said drum to cause said rollers to be separated for a portion of the time during which said roller is stationary, and means to move said stop member outwardly from the surface of the roller whereby the leading edge of a copy sheet may be positioned against the projecting stop member when said roller is stationary.

12. Duplicating apparatus comprising a duplicating drum adapted to mount a master copy having the matter to be duplicated thereon in reverse, means to press a copy sheet against said master copy on the drum, feeding and moistening means cooperating to advance a copy sheet to said drum, said last named means including two feed rollers, means to separate said rollers to permit a copy sheet to be placed therebetween, and stop means for aligning the advancing edge of the copy sheet, said stop means comprising a member within the peripheral outline of one of said rollers and movable with respect to said roller beyond the peripheral outline thereof, said roller being cut away to permit said movement of the stop means.

13. Duplicating apparatus comprising a duplicating drum adapted to mount a master copy having the matter to be duplicated thereon in reverse, means to press a copy sheet against said master copy on the drum, feeding and moistening means cooperating to advance a copy sheet to said drum, said last named means including two feed rollers, means to separate said rollers to permit a copy sheet to be placed therebetween, stop means for aligning the advancing edge of the copy sheet, said stop means comprising a member within the peripheral outline of one of said rollers and movable with respect to said roller beyond the peripheral outline thereof, said roller being cut away to permit said movement of the stop means, and means to position the cut away roller with the cut away portions facing the other roller, so that the stop means projects toward the other feed roller.

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