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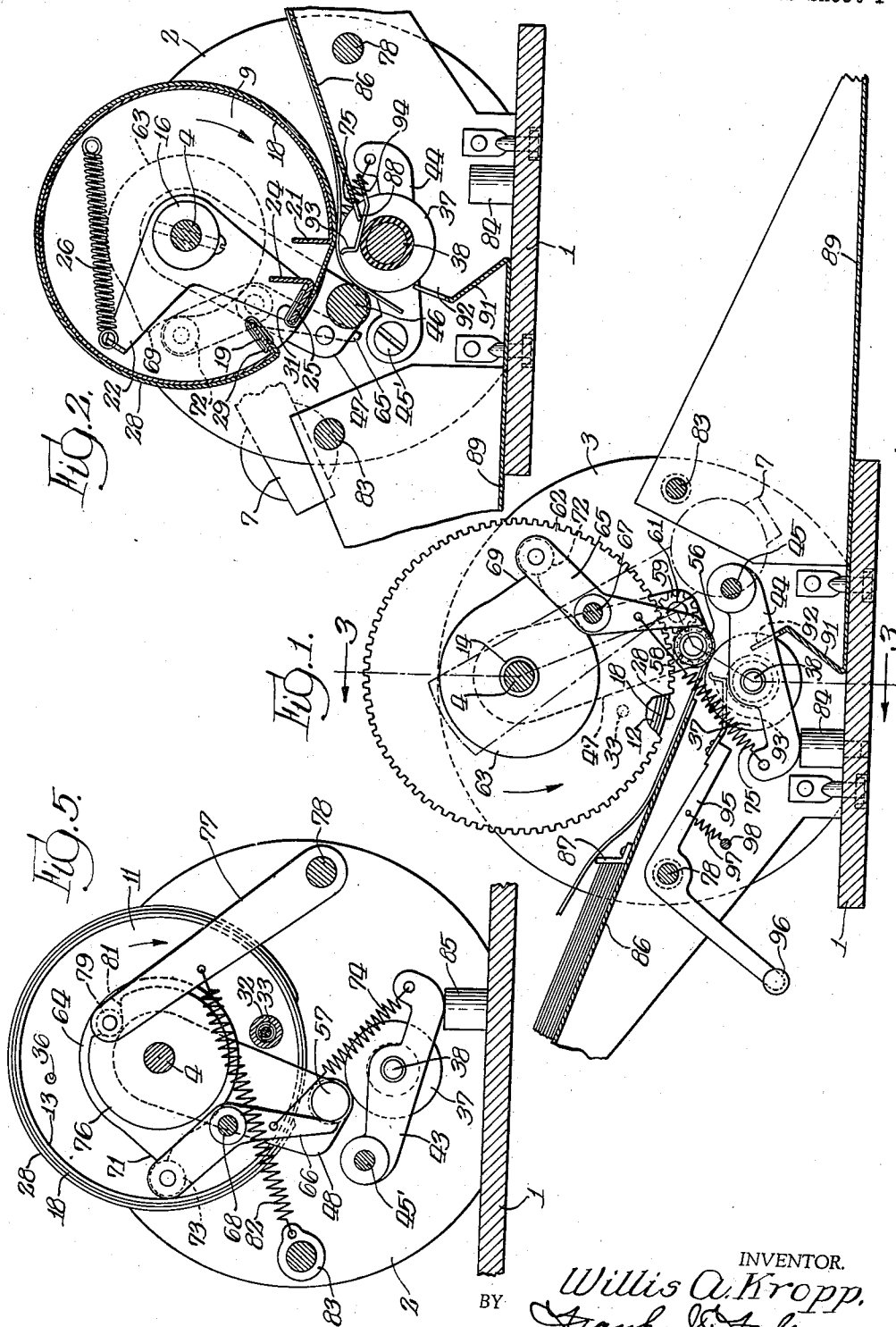
W. A. KROPP

2,264,386

DUPLICATING MACHINE

Filed Nov. 2, 1939

3 Sheets-Sheet 1



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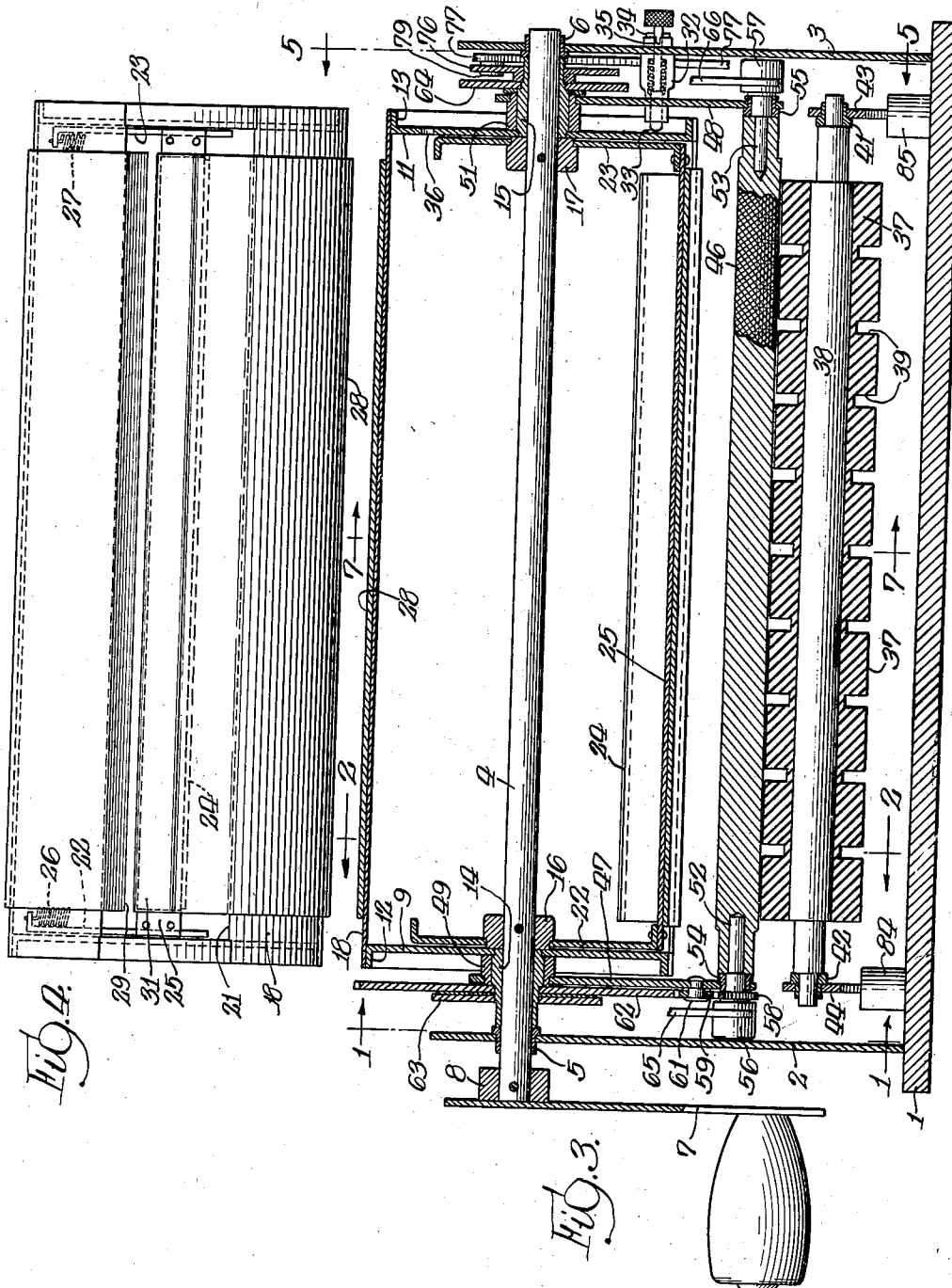
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

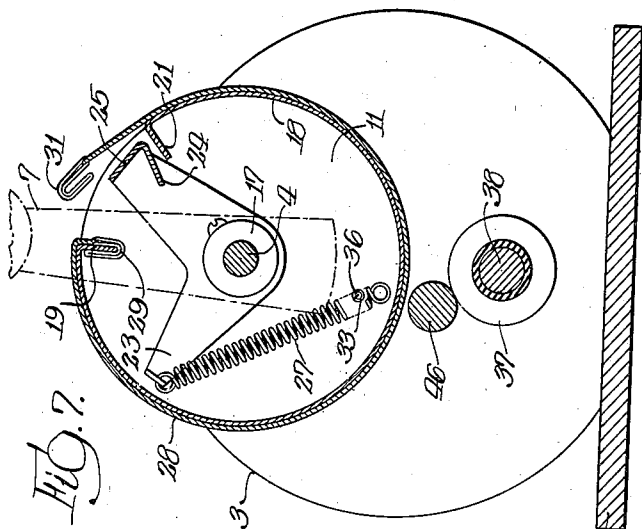


Fig. 7.

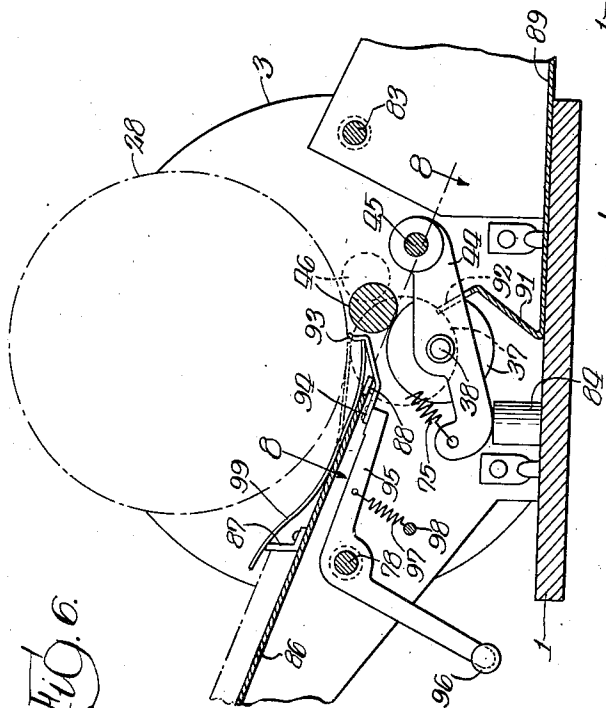
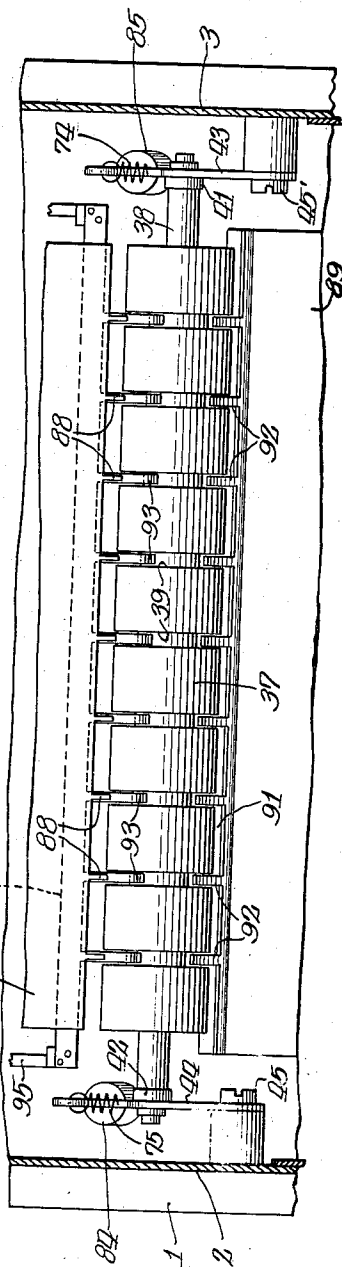


Fig. 6.

Fig. 8.



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UNITED STATES PATENT OFFICE

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DUPLICATING MACHINE

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Application November 2, 1939, Serial No. 302,489

14 Claims. (Cl. 101—132)

This invention relates to improvements in duplicating machines and particularly to machines of the type provided with rotary drums on which are secured duplicating belts of gelatin or other suitable material for receiving ink im-
5 pressions to be transferred to copy sheets.

One of the objects of this invention is to provide in such machines simple and inexpensive apparatus to facilitate the feeding and the strip-
10 ping of the copy sheets.

Another object of the invention is to provide improvements in the construction of the drum and the mechanism for attaching the duplicat-
15 ing band thereto.

Various other objects and advantages of the invention will be described hereinafter or will become apparent from a perusal of the specifi-
20 cation herein.

The drawings illustrate a preferred embodiment of the invention which is herewith de-
25 scribed for the purposes of explaining the nature of the invention and the manner of its use, without, however, intending that the invention should be considered as limited to the details of construction herein disclosed.

In the drawings,

Fig. 1 is a sectional view on the line 1—1 of
Fig. 3.

Fig. 2 is a sectional view on the line 2—2 of
Fig. 3.

Fig. 3 is a sectional view on the broken line
3—3 of Fig. 1.

Fig. 4 is a plan view of the drum itself looking
downwardly upon the mechanism for clamping the
duplicating band.

Fig. 5 is a partial sectional view on the line
5—5 of Fig. 3.

Fig. 6 is a sectional view on the plane of the
line 1—1 of Fig. 3, illustrating the feeding of a
master sheet to the drum.

Fig. 7 is a sectional view on the line 7—7 of
Fig. 3, illustrating the securing of the duplicating
band to the drum.

Fig. 8 is a sectional view on the line 8—8 of
Fig. 6.

Referring now to the drawings, the base 1 sup-
ports a pair of side frame plates 2 and 3 secured
thereto in any suitable manner. A shaft 4 is
supported in the plates on bearings 5 and 6 and
is rotated by means of a handle 7 the hub 8, of
which, is pinned to the shaft.

The drum, as shown in Fig. 3 is preferably
constructed as follows: a pair of circular end
plates 9 and 11 having outwardly turned flanges
12 and 13 are fixed and supported upon the
55

sleeves 14 and 15, the sleeves being rotatably
carried on the shaft 4 between the bearings 5
and 6 and a pair of sleeves 16 and 17 which latter
are pinned to the shaft. A sheet 18 of metal or
other suitable material is secured to the flanges
of the drum by spot welding or in any other ap-
propriate manner, and forms a generally cylin-
drical drum having a gap therein extending the
length of the cylinder. Flanges 19 and 21 turned
inwardly as shown in Fig. 2 constitute the mar-
gins of this gap.

Fixed upon the hubs 16 and 17 to rotate there-
with along with the shaft 4 are a pair of bell
cranks 22 and 23. The bell cranks are rigidly
secured to an angle iron having one flange 24
which extends inwardly into the drum while the
other flange 25 extends generally parallel to the
periphery of the drum and slightly inside thereof.
To the opposite end of each of the bell cranks
there are connected springs 26 and 27 anchored
on the inside surfaces of the drum end walls.
These springs urge the angle iron 24 and the
drum flange 21 away from each other, as the
drum and the bell cranks are free to rotate rela-
tively to each other.

As illustrated in Fig. 2 a duplicating band 28
is secured to the drum by engaging hook 29 of
the band over the flange 19 after which the band
may be carried around the drum and the hook
31 engaged over the edge of the flange or bar 25.

Before the hook 29 may be placed over the
flange 19, it is necessary first to lock the drum
and rotate the bar 25 away from the flange 19.
For this purpose the drum is held stationary as
follows. A bushing 32 is secured to the plate
3 and carries a spring loaded plunger 33 of ordi-
nary construction. When the pin 34 in the
plunger is positioned as shown in Fig. 3 the
plunger is held retracted. When the plunger is
rotated so that the pin may drop into the slot
35 in the bushing, the plunger will then move
inwardly and will engage the hole 36 in the drum
end wall when the hole is brought into registra-
tion with the plunger. Thus, the drum will be
held stationary by the plunger, in the position
shown in Fig. 7.

With the drum locked the handle 7 will be
rotated in a clockwise direction as Fig. 7 is
viewed to move the bar 25 away from the flange
19. The hook 29 will then be engaged over the
edge of the flange and the plunger 33 unlocked.
The bar 25 will then be drawn by the springs 26
and 27 against the hook to hold it in position.
The drum will then be rotated by means of the
handle in a clockwise direction to thereby wind

the band about the drum. As the drum again approaches the position shown in Fig. 7 the plunger will again be unlocked and allowed to engage the hole 36 in the drum to lock the drum again at the position shown in Fig. 7. Further rotation of the handle 7 in a clockwise direction will move the bar 25 to the position shown in Fig. 7 whereupon the hook 31 on the duplicating band may be dropped down in position to be engaged by the bar 25 when the handle is allowed to rotate back in a counter-clockwise direction. In this manner the springs 26 and 27 will cause the band to be held snugly on the drum under constant tension and when the plunger is unlocked the drum will thereafter be driven indirectly through the pull of the bar 25 on the duplicating band.

To remove the duplicating band after use, the above steps are performed in the reverse order.

In duplicating machines of this general class it is common to provide a soft pressure roller whose sole function is to press copy sheets against the duplicating band. However, in a machine made in accordance with this invention a soft roller is provided which not only presses copy sheets against the duplicating band, but also assists in performing the several additional functions of positioning, feeding and stripping the copy sheets. For this purpose I provide a molded, soft rubber roller 37 mounted on a shaft 38 and having annular grooves 39. The roller 37 is preferably quite soft, but the degree of softness is not critical. The shaft 38 is supported in bearings 41 and 42 carried by the arms 43 and 44, which are pivotally supported on the side frame plates 2 and 3. Arm 44 is pivoted at 45, while the other arm is pivoted in a corresponding position at 45. The free end of each arm is held up by a spring which will later be described.

Cooperating with the soft roller in several of its functions is a roller 46, preferably having a smaller diameter and a knurled steel surface. This latter roller is positively driven when the drum is rotating, and for this purpose is mounted as follows. A pair of arms or plates 47 and 48 are fixed and supported on sleeves 49 and 51, which are free to rotate on the sleeves 14 and 15. The roller 46 is rotatably supported at the lower ends of those arms by means of pins 52 and 53 which extend through bearings 54 and 55. Upon the outer ends of the pins are roller bearings 56 and 57 whose purpose will later be described. Splined or otherwise non-rotatably secured on the pin 52 is a gear 58 meshing with a gear 59 carried by the post 61 on the plate 47. The gear 59 meshes with a gear 62 fixed in any suitable manner upon the sleeve 14 to rotate therewith along with the drum whose end walls are likewise fixed on the sleeves 14 and 15. Thus the steel roller 46 is positively driven whenever the drum is rotated.

The arms 47 and 48, being free to oscillate upon the sleeves 14 and 15, are caused to do so by means of cams 63 and 64 which are non-rotatably fixed on the sleeves 14 and 15, the cams acting upon the cam levers 65 and 66 whose lower ends bear against the bearings 56 and 57, rotatably connected with the steel roller 46. The cam lever 65 is pivotally supported on the frame plate 2 at 67 while the cam lever 66 is pivotally supported at 68 on the frame plate 3. The cams are identically shaped and positioned, and as their high points 69 and 71 reach the positions shown in Figs. 1 and 5, the cam follower rollers 72 and 73 will rotate the cam levers and push the knurled

steel roller into the position in Fig. 1. During this movement the steel roller will force the soft roller 37 downwardly into the position shown in Fig. 1. Springs 74 and 75 connected as shown to the arms 43 and 44 and to the cam levers 66 and 65 hold the soft roller and the steel roller constantly in contact with each other and, at the same time, hold the cam levers in contact with their respective cams and with the end pins of the steel roller.

The cam levers and the arms which support the soft roller are so arranged that when the cam followers ride down onto the circular portions of the cams, the springs 74 and 75 will pull the soft pressure roller upwardly into contact with the drum and force the steel roller toward the rear of the machine, as shown in Fig. 2.

Fig. 1 shows the position of the soft and the steel rollers at the time a copy sheet is positioned prior to feeding.

Fig. 2 shows the position of the rollers during the feeding and stripping of the copy sheets.

To facilitate the stopping of the drum to enable copy sheets to be positioned so that when fed to the drum they will register properly with the imprint thereon, there is provided a cam 76 fixed on the sleeve 15 to rotate therewith. A lever 77 pivoted on the cross rod 78 carries a cam follower 79 which is adapted to drop into the detent 81 whenever the drum reaches the position shown in Fig. 1. A spring 82 connected with the cam arm and anchored on the cross rod 83 holds the cam follower in contact with cam 76. The cross rods 78 and 83 also serve to connect the frame plates 2 and 3 rigidly together. When the rollers occupy the position shown in Fig. 1 the lower ends of the arms 44 and 45 rest upon the stop posts 84 and 85.

A feed table 86 is positioned as shown for holding a supply of copy sheets to be fed into the machine. Any suitable device for retaining a stack of sheets may be employed and in the drawings I have illustrated for this purpose a simple bracket 87. The lower end of the feed table is divided into a plurality of fingers 88 as best shown in Fig. 8, these fingers serving to guide the copy sheets accurately into the bight of the rollers 37 and 46, as shown in Fig. 1. When the soft roller is subsequently raised these fingers are projected in the grooves 39 on the soft roller. The copy sheets after being fed through the machine are discharged into a receiving tray 89, and to make certain that they do not tend to wind around the soft roller I provide an upwardly extending flange 91 on the receiving tray terminating in narrow fingers 92 which register with the grooves in the soft roller.

It will be apparent that when a copy sheet is fed into the bight of the rollers when the drum is stopped at the position shown in Fig. 1 the subsequent rotation of the drum will cause the sheet to be gripped by the rollers, pressed against the drum and simultaneously stripped from the drum. This action must be avoided, however, when a master copy is to be placed upon the duplicating band. To prevent the rollers from gripping and stripping the master sheet, the operator may rotate the machine to position shown in Fig. 1 and hold the master sheet slightly back out of the bight of the rollers while the rotation of the drum is initiated. When this precaution is exercised the forward end of the master sheet will be raised by the soft roller against the duplicating band and will not be gripped between the two rollers. Rotation of the drum will

cause it to adhere continuously to the duplicating band where it may be allowed to remain for such length of time as is considered necessary to transfer the copy to the duplicating band.

As an alternative method of feeding the master copy to the duplicating band, I provide a positive stop illustrated in Fig. 6 which may be employed to hold the master sheet out of the bight of the rollers. A plurality of narrow stop fingers 93 are positioned to register with the grooves in the soft roller and are connected through a common plate 94 to a bell crank 95 pivotally mounted on the cross rod 78, the lower end of the bell crank having a handle 96 which the operator may grip to raise the bell crank against the action of a spring 97 which is anchored to the side frame plate 2 on a post 98. The master sheet 99 will be positioned as shown with its leading edge against the stop fingers 93 and subsequent rotation of the drum will cause the soft rubber roller to rise past these stop fingers and press the master sheet against the duplicating band. Further rotation of the drum will cause the master sheet to be pressed upon the duplicating band to transfer the copy to the band. After a sufficient time interval the master sheet may be pulled off the duplicating band by hand. When the stop fingers 93 are not used for the above purpose the spring 97 will cause them to lie wholly within the grooves 39 to rise and fall with the roller but not interfering with the feeding of the copy sheets.

The apparatus is operated as follows. After a duplicating band has been positioned on the drum in the manner above described and an impression from a master sheet has been deposited on the duplicating band, a stack of copy sheets will be placed on the feed table 86 and allowed to rest against the stop 87. The drum will be rotated to the position shown in Fig. 1, where with the aid of the cam follower 79 and cam 76, it is stopped accurately at that position. A sheet of paper is then removed from the stack and slid down the feed table until its leading edge encounters the bight of the rollers 37 and 46. With the paper in this position the subsequent rotation of the drum will cause the copy sheet to register accurately in a desired manner with the imprint carried by the duplicating band so that the copy sheets may be printed uniformly.

The drum is then rotated by means of the handle in a counter-clockwise direction, with reference to Fig. 1, and as the rollers begin to rotate they will immediately grip and advance the copy sheet. After the paper has been positively gripped the cam followers 72 and 73 move off of the high points of their associated cams, allowing the soft pressure roller to be raised by the springs 74 and 75 and to force the steel roller to swing a short distance rearwardly until it occupies the position illustrated in Fig. 2. After the pressure roller contacts the copy sheet against the duplicating band the copy sheet is thereafter fed and pressed against the duplicating band by the pressure roller while simultaneously the two rollers strip the copy sheet from the drum as shown in Fig. 2 and discharge it into the delivery tray 89. The rotation of the drum is continued until the entire copy sheet has been pressed against the duplicating band and simultaneously stripped and discharged into the delivery tray. Further rotation of the drum will restore all the parts to the position shown in Fig. 1, whereupon the drum is stopped and a

fresh copy sheet may be positioned as above described.

While a manual feeding operation has been described above, it is evident that there may be added to the apparatus an automatic feed mechanism for delivering sheets from the stack to the bight of the rolls. However, such apparatus or any special aids to manual feeding do not form a part of this invention.

It should be understood that the invention is not limited to details of construction herein illustrated but includes such variations and modifications as are comprehended within the claims which follow.

Having shown and described my invention, I claim:

1. In a duplicating machine having a rotary drum and driving means therefor, a soft roller and a hard roller, the latter having a roughened surface, the soft roller being shiftable to one position to cooperate with the hard roller to form a bight into which copy sheets may be registered preliminary to feeding to the drum, said soft roller being shiftable to another position to press the copy sheets against said drum and simultaneously strip them from the surface in cooperation with the hard roller, and means for positively driving the hard roller.

2. In a duplicating machine having a rotary drum and driving means therefor, a pair of rollers mounted adjacent to the drum, one at least of said rollers being shiftable whereby in one position of the rollers a bight between the two rollers is provided for the registering of copy sheets prior to feeding to the drum, said roller being shiftable to another position in which it presses the copy sheets against the drum and in cooperation with the other roller strips them from the drum, and means acting in unison with the rotation of the drum for shifting said shiftable roller.

3. In a duplicating machine having a rotary drum, a pair of rollers mounted adjacent to the drum, one at least of said rollers being shiftable whereby in one position a bight is formed between the two rollers when the drum and rollers are stationary into which a copy sheet may be registered prior to feeding to the drum, said rollers being arranged to grip the copy sheet upon subsequent rotation of the drum while the first said roller presses the sheet against the drum, and means controlled by the rotation of the drum for shifting the shiftable roller.

4. In a duplicating machine having a rotary drum, a pair of shiftable rollers mounted adjacent to said drum, arms pivoted coaxially with the drum for supporting of one of said rollers, the other roller being separately pivotally mounted to maintain contact with the first said roller, means for shifting the rollers to one position whereby they form a bight into which a copy sheet may be registered preliminary to feeding, and means for shifting the rollers to another position in which one roller presses the copy sheet against the drum and both rollers strip it therefrom.

5. In a duplicating machine having a rotary drum, a pair of shiftable rollers, one of said rollers being rotatably supported on arms pivotally supported coaxially with the drum, said roller being positively driven during the rotation of the drum, the other roller being separately supported for shifting relatively to the drum to cooperate with the first roller in one position to form a bight into which a copy sheet may be

positioned prior to feeding to the drum, the second roller being shiftable to another position to press copy sheets against the drum and cooperate with the first roller to strip them therefrom.

6. In a duplicating machine, a frame, a horizontal drive shaft rotatably supported in said frame, a duplicating drum mounted on said shaft, a spur gear fixed on said shaft, a pair of arms swingably suspended coaxially with said shaft at opposite ends of said drum, a roller rotatably mounted on said arms, a gear on said roller and a gear pivoted on one of said arms meshing with said spur gear for positively driving the roller during rotation of said shaft, a soft platen roller, means for mounting said platen roller for shifting to and from contact with said drum, means for resiliently holding the two rollers in contact with each other, and means for shifting the platen roller away from the drum to provide a bight into which copy sheets may be positioned when the rollers are stationary and for subsequently shifting the platen roller against the drum for feeding and pressing copy sheets against the drum.

7. In a duplicating machine having a rotary drum, a stripping roller and means for supporting the same adjoining the drum, means for positively driving the stripping roller during the rotation of the drum, a soft platen roller mounted for shifting to and from the drum, means for resiliently holding the two rollers in contact, and means for shifting the platen roller whereby in one position a bight between the rollers is provided into which a copy sheet may be registered when the rollers are stationary, said shifting means being further adapted to shift the roller into contact with the drum to press the copy sheets thereagainst and in which latter position the two rollers strip the copy sheets from the drum.

8. In a duplicating machine, a frame and a horizontal drive shaft rotatably supported therein, means for rotating the shaft, a cylindrical drum rotatably supported on said shaft and having a longitudinally extending gap in its peripheral surface, means controllable at will for locking the drum against rotation during placement or removal of a duplicating band, means adjacent one edge of the gap for attaching one end of a duplicating band, and means positioned adjacent the opposite edge of said gap for retaining the other end of a duplicating band and operatively connected with said shaft to be moved by the shaft to or from the adjacent gap edge.

9. In a duplicating machine having a rotary drum, a pair of rollers mounted adjacent the drum the rollers being shiftable to one position to form a bight into which copy sheets may be registered for feeding to the drum and shiftable to another position in which one of the rollers presses the copy sheets against the drum and both rollers strip the sheet from the drum, and means for positioning a master sheet adjoining but spaced from the bight of the rollers when in said first position whereby the shifting of the

rollers to the second position will press the master sheet against the drum without stripping it therefrom.

10. In a duplicating machine having a rotary drum, a pair of rollers and means for shiftable mounting them adjacent the drum in continuous rolling contact with each other, said mounting means being adapted when shifted to one position to place the bight of the rollers in position for receiving and stopping the leading edge of a copy sheet and further adapted when shifted to another position to cause the rollers to press the copy sheet against the drum and to strip it therefrom.

11. In a duplicating machine having a rotary drum, a pair of rollers, means for mounting one of said rollers out of contact with the drum, means for mounting the other roller in continuous rolling contact with the first roller, the mounting means for both rollers being shiftable relatively to each other and arranged for retaining the rollers in one position where the bight between the rollers serves as a margin stop for copy sheets, said mounting means being shiftable to another position to place the second roller in contact with the drum to press copy sheets thereagainst and to cooperate with the first roller to strip the sheets from the drum.

12. In a duplicating machine having a rotary drum, a roller and means for mounting it for shifting movement in an arc concentric with the drum axis, a second roller and means for mounting it shiftable in continuous rolling contact with the first roller, the two means being arranged to co-act when adjusted to one position to present the bight of the rollers in position to serve as a margin stop for copy sheets being fed to the drum, said means when shifted relatively to each other to another position causing the second roller to press the copy sheets against the drum and the two rollers to strip the sheets from the drum.

13. In a duplicating machine having a rotary drum, a pair of rollers, mounting means for said rollers adapted to maintain the rollers in rolling contact with each other, said means being shiftable to one position to locate the bight of the rollers in position to marginally stop a copy sheet prior to feeding to the drum and being shiftable to another position to cause one of said rollers to press the copy sheet against the drum and both rollers to strip it therefrom.

14. In a duplicating machine having a horizontal drive shaft, a drum rotatably supported on said shaft and having a longitudinally extending gap in its peripheral surface, means for temporarily locking the drum against rotation, means fixed on the drum adjacent one edge of said gap for retaining one end of a duplicating band, oscillatable means fixed on the shaft and rotatable thereby when the drum is locked for releasing or engaging the opposite end of a duplicating band, and means resiliently connecting said oscillatable means to the drum for normally holding the band taut on the drum.

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