

Sept. 15, 1953

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2,652,248

AUTOMATIC SHEET SEPARATING AND FEEDING MECHANISM

Filed Oct. 9, 1948

4 Sheets-Sheet 1

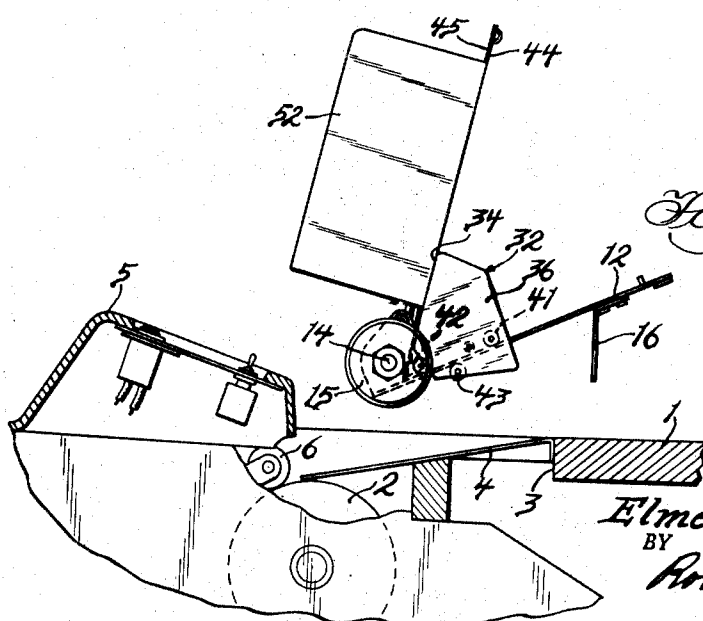
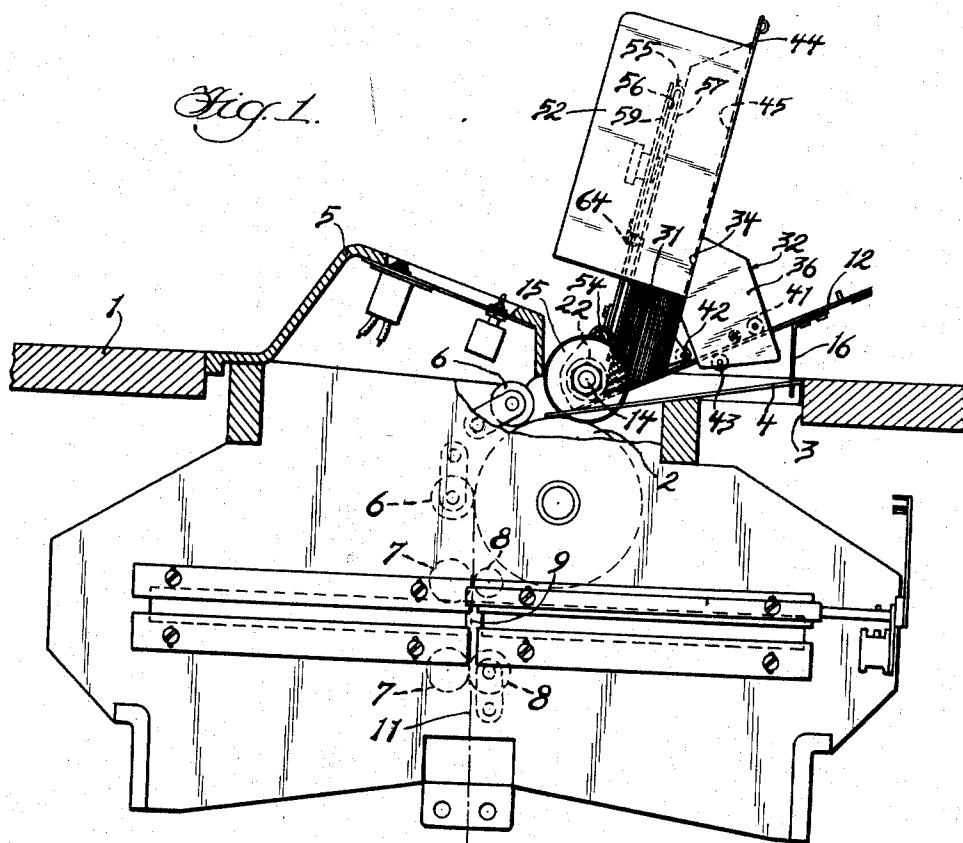


Fig. 2.

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AUTOMATIC SHEET SEPARATING AND FEEDING MECHANISM

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4 Sheets-Sheet 2

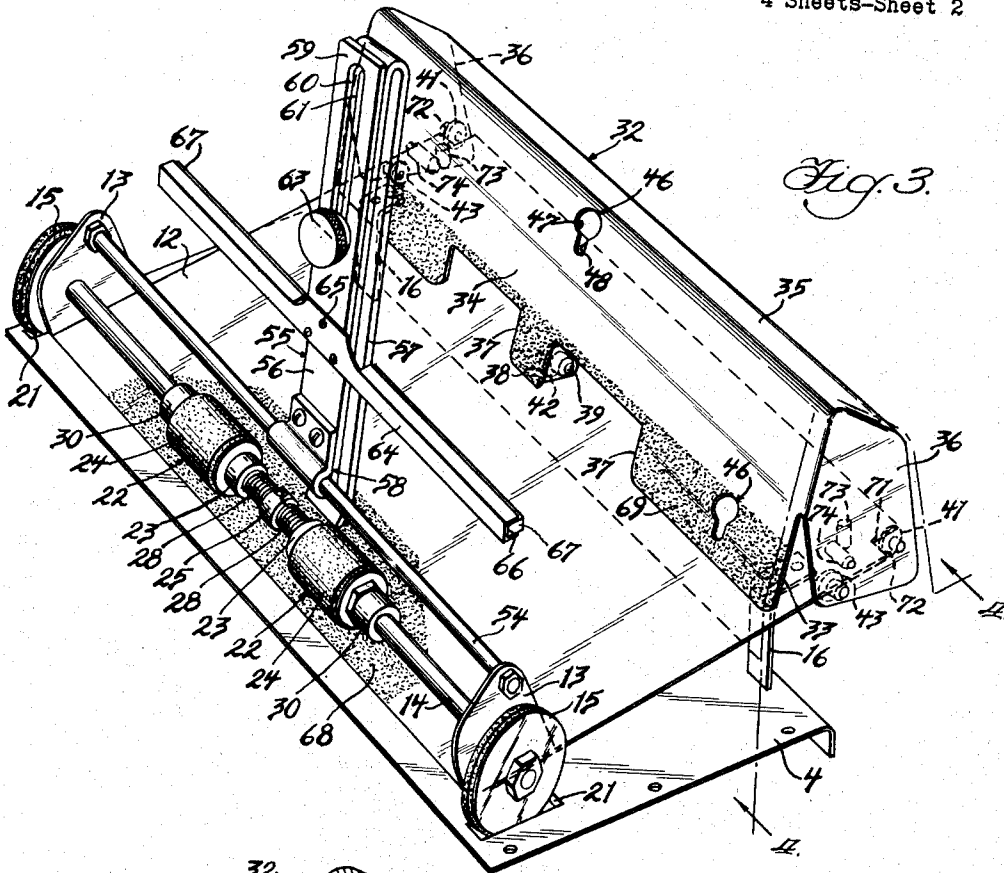


Fig. 3.

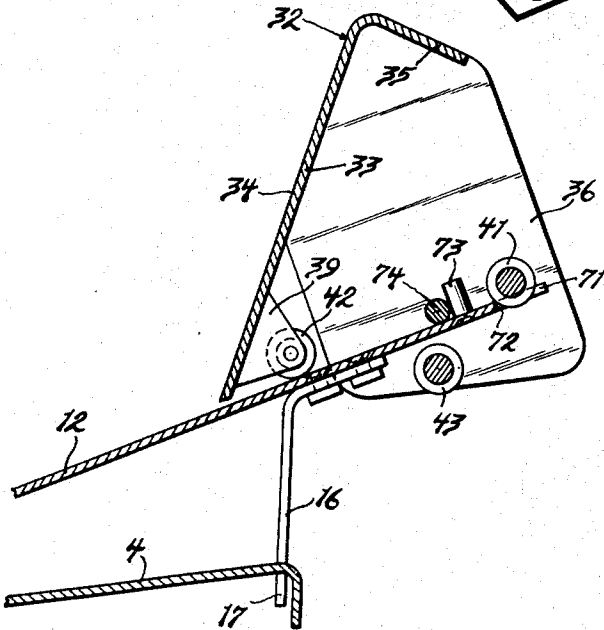


Fig. 4.

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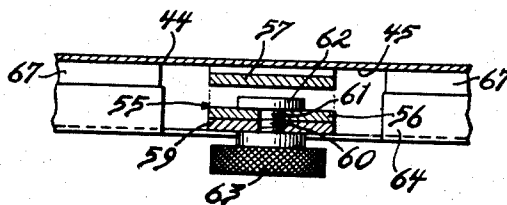
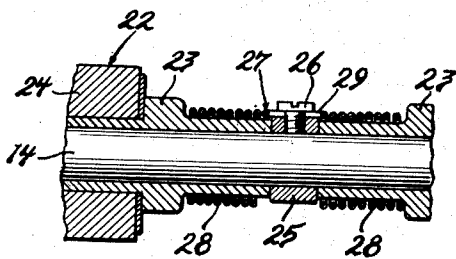
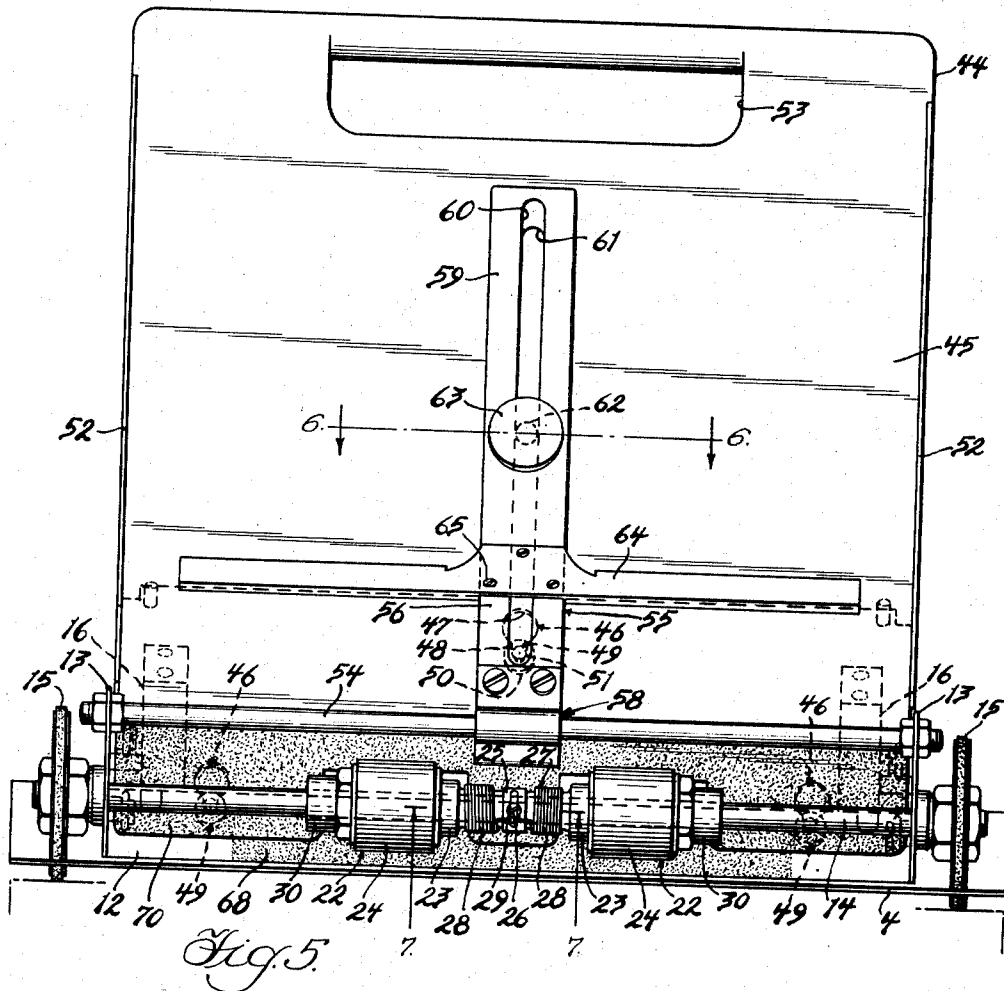
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AUTOMATIC SHEET SEPARATING AND FEEDING MECHANISM

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4 Sheets-Sheet 3



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AUTOMATIC SHEET SEPARATING AND FEEDING MECHANISM

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4 Sheets-Sheet 4

Fig. 8.

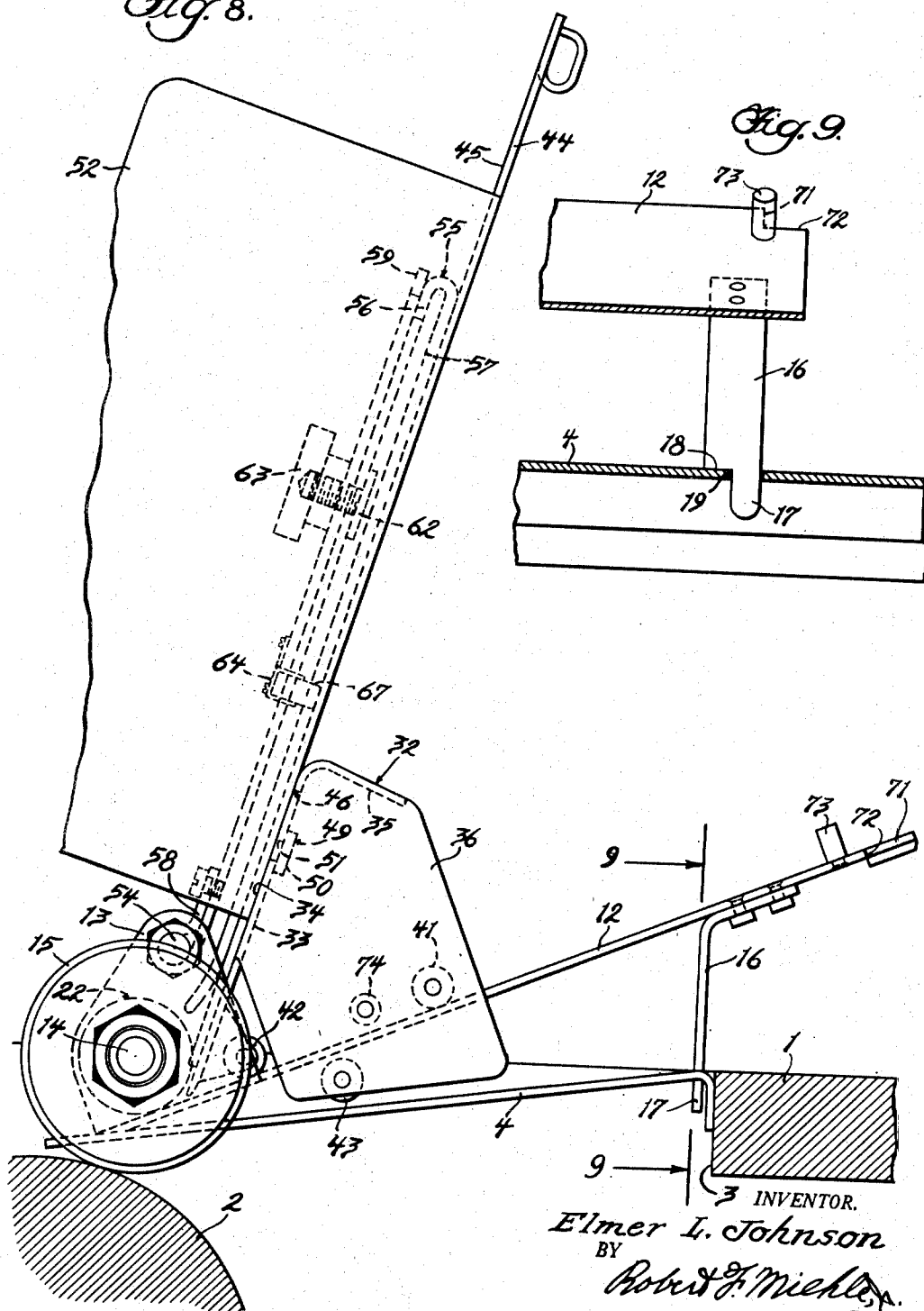


Fig. 9.

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AUTOMATIC SHEET SEPARATING AND FEEDING MECHANISM

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7 Claims. (Cl. 271-39)

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My invention relates particularly to automatic sheet feeding mechanism adapted for use on a microfilm recorder embodying sheet handling or feeding mechanism provided with a horizontal driven rotatable sheet feed drum to which sheets are sequentially fed, although not limited to this use alone.

Objects of the invention reside in the provision of a simple and effective automatic sheet feeding mechanism for sequentially feeding sheets from a stack thereof, which is well adapted for the above use and adapted for installation on a certain currently available microfilm recorder with only minor alteration of the recorder, which provides for the driving of the feed roll or feed device thereof from the feed drum of a sheet handling mechanism, which is conveniently portable, which is readily installed on and removed from a sheet handling machine at will so that sheets may be readily fed to the sheet handling machine either automatically or by hand, which is dependable as to sequentially feeding sheets singly, which accommodates for differences in sheet velocity as control of the sheet speed passes from the feeding mechanism to the sheet handling mechanism, which provides for properly feeding small and large sheets, and which provides for convenient loading of the feeding mechanism with stacks of sheets to be fed.

The invention will be more readily understood by reference to the accompanying drawing forming a part hereof and in which—

Figure 1 is a partial sectional view of a microfilm recorder on which an automatic feeding mechanism embodying my invention is installed;

Figure 2 is a similar view showing the automatic feeding mechanism partially removed from the microfilm recorder;

Figure 3 is a perspective view of the automatic feeding mechanism and showing it in mounted relation with the hand sheet feed plate of the microfilm recorder;

Figure 4 is a partial section substantially on the line 4-4 of Figure 3;

Figure 5 is front elevation of the automatic feeding mechanism;

Figure 6 is a partial sectional view substantially on the line 6-6 of Figure 5;

Figure 7 is a partial sectional view substantially on the line 7-7 of Figure 5;

Figure 8 is an enlarged view similar to Figure 1; and

Figure 9 is a partial section substantially on the line 9-9 of Figure 8.

Referring to the drawing and particularly to

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Figures 1 and 2, the sheet handling machine on which my automatic sheet feeding mechanism is shown to be used, is a microfilm recorder the major portion of which is enclosed within a cabinet including a top 1.

A horizontal rotatable sheet feed drum 2 is disposed within the recorder cabinet immediately below an opening 3 in the cabinet top 1 and a generally horizontal hand sheet feed plate or chute 4, carried on a support 5 arranged in the opening 3, is inclined downwardly toward the upper portion of the feed drum in tangential sheet feeding relation therewith for the sequential hand feeding of sheets to the feed drum.

The feed drum is power driven in a suitable manner and in a counterclockwise direction in Figure 1, and spring urged rotatable pressure rollers 6 engage the feed drum, and the sheets, as they are fed to the feed drum, are gripped between the feed drum and rollers 6 and are fed downwardly by the feed drum as it is rotated. As the sheets are fed downwardly from the feed drum, they pass between vertically spaced rotatable feed rollers 7 and spring urged rotatable pressure rollers 8, and the feed rollers 7 being driven in timed relation with the feed drum 2 in a suitable manner, the sheets are fed thereby downwardly past a photographic field 9 where they are photographed, the sheet path being indicated by the dot and dash line 11 in Figure 1.

My automatic sheet feeding mechanism comprises as follows:

A rectangular support plate 12 is provided with integral upwardly extending projections 13 at opposite sides of the front end thereof. See Figures 3 and 5. A rotatable shaft 14 is arranged transversely of and spaced above the support plate and inwardly adjacent said end thereof and extends through and is journaled in the projections 13. Two rotatable friction rollers 15 are secured on opposite ends of the shaft 14 for rotation therewith respectively at the sides of the support plate and at the outsides of the projections 13 and are thus arranged on an axis above and inwardly adjacent the front end of the support plate, these rollers being of relatively large diameter and projecting below the support plate for rolling driven engagement downwardly on the feed drum 2 as hereinafter described.

Two support legs 16 are spaced transversely of the support plate 12 and are secured therewith and extend downwardly therefrom in the region of the rear end thereof, and the lower end portions 17 of the legs 16 and are reduced, see Figure 9, and form shoulders 18. The portion of

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the hand sheet feed plate 4 remote from the feed drum 2 is provided with transversely spaced apertures 19 downwardly into which the reduced end portions 17 of the legs 16 loosely engage with the shoulders 18 engaged downwardly on the feed plate 4 for positioning the support plate 12 above the feed plate 4 and inclined downwardly toward the upper portion of the feed drum 2 in adjacent tangential sheet feeding relation therewith and with the friction rollers 15 in rolling driven engagement downwardly on the feed drum for driving the shaft 14 from the feed drum, see Figures 1 and 8, the feed plate 4 being provided with transversely spaced apertures 21 through which the rollers 15 project to engage the feed drum 2, see Figure 3.

The support plate 12 forms the base of the automatic feeding mechanism and carries the mechanism thereof including the friction rollers 15 and shaft 14 as a unit, so that the automatic feeding mechanism is conveniently portable and is readily installed on and removed from the sheet handling machine by engaging and disengaging the legs 16 with the apertures 19 with vertical movement of the feeding mechanism. Figure 2 illustrates the feeding mechanism in partially removed relation with the sheet handling machine.

The loose engagement of the reduced end portions 17 of the legs 16 in the apertures 19 in cooperation with engagement of the shoulders 18 downwardly on the feed plate 4 provides pivotal engagement of the legs 16 downwardly on the feed plate 4 in the region of the other end of the support plate and thus in a region horizontally and radially remote from the end of the support plate 12 at which the friction rollers 15 are disposed to permit vertical movement of the feeding mechanism whereby weight of the feeding mechanism presses the friction rollers 15 downwardly on the feed drum 2 to provide adequate driving engagement between the feed drum and friction rollers.

Two bored feed rolls 22 are rotatably mounted on the intermediate portion of the shaft 14 between the projections 13 and friction rollers 15, they being thus arranged wholly above the support plate 12 on an axis inwardly adjacent the front end of the support plate and in coaxial relation with and being of smaller diameter than that of the friction rollers. See Figures 3, 5 and 7. These feed rolls comprise bored hubs 23 having their bores engaged for rotation on the shaft, and bored rolls 24 of friction material, such as soft rubber, secured on the hubs for rotation therewith and through the bores of which the hubs extend. A collar 25 is secured, by means of a headed set screw 26, on the shaft 14 between the hubs 23, and collars 30 are secured on the shaft at the outer ends of the hubs 23 and serve with the collar 25 as axial thrust bearings for the hubs.

A clutch spring 27, see Figures 5 and 7, has two helical oppositely coiled portions 28 respectively engaged about adjacent ends of the hubs 23 and has an intermediate looped portion 29, between the coil portions, secured under the head of the set screw 26 and consequently secured with the collar 25 and shaft 14. The coil portions 28 are arranged to grip the hubs 23 and drive the feed rolls 22 when the shaft 14 is rotated in a clockwise direction in Figures 1 and 8 and to permit overrunning of the feed rolls with respect to the shaft in the same direction, thus providing automatic overrunning clutches for driving the feed

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rolls from the shaft in the direction to feed sheets to the feed drum 2 as will hereinafter appear.

The support plate 12 is adapted to support a stack of sheets 31 on edge for the advancement thereof against the feed rolls 22, see Figure 1, and a pusher 32 serves for advancing the stack of sheets against the feed rolls.

The pusher as shown is formed of sheet metal blanked and formed to shape, see particularly Figures 3 and 4, and comprises a forward stack engaging portion 33 providing a forward stack engaging face 34 facing in the direction of the feed rolls for engagement with the stack, a flange portion 35 at the top of the portion 33 and projecting therefrom rearwardly at an angle thereto, and side portions 36 projecting from the portion 33 rearwardly and downwardly and respectively overlying the sides of the support plate 12 and extending below the same. The stack engaging portion 33 is provided downwardly thereon with two spaced openings 37 which aline with the feed rolls 22 so that the portion 33 does not contact the feed rolls in the extreme stack advancing position of the pusher, and the portion 38 of the portion 33 between the openings 37 is provided with a vertically disposed rearwardly extending projection 39.

The pusher 32 is mounted on the support plate 12 for stack advancing movement toward the feed rolls 22 and retracting movement away from the feed rolls by bearings comprising three roller bearings on the pusher and bearing downwardly on the support plate 12, two of these bearings, designated at 41, being spaced and alined transversely of the stack advancing and retracting movement of the pusher and disposed respectively at opposite sides of the support plate and rotatably mounted respectively rearwardly on the side portions 36 of the pusher, the third of these bearings, designated at 42, being spaced forwardly from the bearings 41 lineally of the stack advancing and retracting movement of the pusher and disposed intermediate the sides of the support plate and rotatably mounted on the projection 39 of the pusher immediately to the rear of the stack engaging portion 33, and two additional roller bearings 43 spaced and alined transversely of the stack advancing and retracting movement of the pusher and disposed respectively at opposite sides of the support plate 12 and rotatably mounted respectively on the side portions 36 of the pusher and spaced between the bearings 41 and the bearing 42 lineally of the stack advancing and retracting movement of the pusher and engageable upwardly against the support plate 12, the pusher being thus confined both downwardly and upwardly on the support plate.

By reason of the inclination of the support plate 12 downwardly toward the feed rolls 22, the pusher is yieldably urged toward the feed rolls, and the stack 31, being supported on edge on the support plate 12 between the pusher and feed rolls, see Figure 1, is advanced against the feed rolls so that the front sheet of the stack is in frictional engagement with the feed rolls, and the feed rolls, driven as above described, sequentially feed the sheets singly from the stack to the feed drum 2 on which they are gripped by the pressure rollers 6 and fed through the sheet handling machine.

The friction rollers 15, which are driven from the feed drum 2 by frictional engagement with the periphery of the feed drum, are shown as being of greater diameter than that of the feed

rolls 22, so that the peripheral velocity of the feed rolls is less than that of the feed drum, and the feed rolls are arranged to overlap their engagement with a feed sheet with engagement of the sheet between the upper pressure roll 6 and the feed drum to maintain the fed sheets under control. The greater diameter of the friction rolls 15 relative to that of the feed rolls 22 serves for effecting this difference in velocity and also serves to accommodate for the relative positions of the feed drum 2, the support plate 12 and the feed rolls 22. Consequently, when a sheet, fed by the feed rolls, is gripped between the feed drum and upper pressure roll 6, the velocity of the sheet is accelerated and being still in engagement with the feed rolls, the sheet accelerates the velocity of the feed rolls. This acceleration of the velocity of the fed sheets provides for spacing the sheets as they are fed by the feed drum and pressure rolls and is permitted without causing excessive tension on the fed sheets and slippage and wear between the feed rolls and sheets or between the feed drum and friction rollers, by the automatic overrunning clutches, comprising coiled portions 28 of the spring 27 and the hubs 23 of the feed rolls engaged in the coiled spring portions 28, which permit overrunning of the feed rolls with respect to the friction rollers 15 in the feeding direction.

The stack engaging face 34 of the pusher 32 is of limited height for feeding narrow sheets, such as bank checks, and in order to provide for feeding sheets of greater height, such as letter size sheets, a stack engaging plate 44 of greater height, and consequently having a forward stack engaging face 45 of greater height, is provided, which is detachably secured at will against the stack engaging face 34 of the pusher by means of vertically and transversely spaced apertures 46 through the stack engaging portion 33 of the pusher and having enlarged upper portions 47 and narrow lower portions 48, see Figures 3, 5 and 8, and correspondingly spaced headed studs 49 secured on the lower portion of the plate 44 and projecting from the rear face thereof. The heads 50 of the studs 49 are adapted to pass through the enlarged upper portions 47 of the apertures 46 and the shanks 51 of the studs 49 are adapted to engage downwardly in the narrow lower portions 48 of the apertures 46 with the heads 50 overlying the rear surface of the portion 33 of the pusher to detachably secure the stack engaging plate 44 against the stack engaging face 34 of the pusher, the stack engaging plate 44 being attachable on and detachable from the pusher with vertical and facewise movement. The stack engaging plate 44 is provided with forwardly projecting flanges 52 at the sides thereof for embracing the sides of a stack of sheets which is desirable with respect to long sheets, and the plate 44 is provided adjacent its upper end with a horizontally elongated handle forming opening 53 to facilitate installation and removal thereof.

The stack engaging plate 44 is shown attached on the pusher 32 in Figures 1, 2, 5 and 8, in which case the stack engaging surface 45 engages the rear of the stack 31, and in Figures 3 and 4 the pusher 32 is shown with the stack engaging plate 44 removed therefrom in which case the stack engaging surface 34 of the pusher engages the rear of the stack of sheets.

A support rod 54 extends transversely of the support plate 12 between the projections 13 and above the feed rolls 22 and is secured on these

projections, and an elongated flat positioning member 55 is doubled back on itself facewise to form two spacedly overlying portions 56 and 57, see Figures 3, 5 and 8, and the free end of the portion 56 is secured, as designated at 58, on the rod 54 with the member 55 disposed intermediate the sides of the support plate 12 and extending upwardly from the feed rolls 22 and with the portion 57 overlying the portion 56 in the direction of said pusher and disposed in approximately tangential relation with the feed rolls 22 for forward engagement of the front of the stack 31 thereagainst as the pusher advances the stack against the feed rolls 22, the portion 57 being resiliently yieldable forwardly and rearwardly to accommodate itself with the front of the stack 31 as the stack is pressed against the feed rolls 22.

An elongated flat support member 59 overlies the front face and extends longitudinally of the portion 56 of the positioning member 55, and it and the portion 56 are provided with longitudinal slots respectively designated at 60 and 61. See Figures 3, 5 and 6. A headed screw 62 extends forwardly through the slots 61 and 60, and a nut 63, screwthreaded on its screw in front of the support member 59, releasably secures this support member on the portion 56, so that the support member 59 may be vertically adjusted on the positioning member 55.

A positioning member 64 extends transversely of the support plate 12 in upwardly spaced relation with the feed rolls 22 and is intermediately secured, as designated at 65, on one end of the support member 59, so that it extends on both sides of the intermediately disposed positioning member 55 and is adjustable vertically with the support member 59. The extending portions of the member 64 are provided with longitudinal rearwardly facing grooves 66 in which are secured strips 67 of frictional material, such as soft rubber, against which the stack 31 engages as the pusher advances the stack against the feed rolls 22 with a view toward decreasing any tendency to feed more than one sheet at a time from the stack.

The stack supporting surface of the support plate 12 in the region of the feed rolls 22 comprises a friction surface, as designated at 68, see Figures 3 and 5, which as shown is provided by sandblasting the surface, this friction surface serving to decrease any tendency to feed more than one sheet at a time. The lower portion of the stack engaging surface 34 of the pusher 32 comprises a friction surface, as designated at 69, see Figure 3, and the lower portion of the stack engaging surface 45 of the stack engaging plate 44 comprises a friction surface, as designated at 70, see Figure 5, which as shown are provided by sand blasting, these friction surfaces serving to decrease any tendency to feed the last sheet of a stack thereof with the second to the last sheet thereof.

The support plate 12 is provided at its rear corners with notches 71, see Figures 3, 4 and 5, forming shoulders 72 facing rearwardly or in the direction of retracting movement of the pusher 32 and with which the roller bearings 41 are engageable, as shown in Figures 3 and 4, when the pusher is in retracted position to releasably position the pusher and thus facilitate the loading of the feeder with a stack of sheets. The support plate 12 is provided in the region of its rear end with two transversely spaced stop studs 73 projecting upwardly therefrom in the regions of the sides thereof, see Figures 3, 4, 8 and 9, and two trans-

versely spaced stop studs 74 are respectively secured on the side portions 36 of the pusher 32 and project inwardly therefrom above the support plate and are adapted to engage the stop studs 73 to limit retracting or rearward movement of the pusher at the position thereof where the bearings 4f are engaged in back of the shoulders 72, the stop studs 74 engaging downwardly on the support plate to limit downward movement of the pusher.

While I have thus described my invention, I do not wish to be limited to the precise details described, as changes may be readily made without departing from the spirit of my invention, but having thus described my invention, I claim as new and desire to secure by Letters Patent the following:

1. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge and arranged with one end thereof in adjacent tangential sheet feeding relation with the upper portion of said drum, a rotatable feed roll arranged transversely of and wholly above said support plate on an axis inwardly adjacent said end of said support plate and against which said sheet stack is advanced, and feed roll drive means for driving said feed roll from said feed drum for the sequential feeding of sheets from said sheet stack to said feed drum and comprising a rotatable roller arranged on an axis above said support plate and inwardly adjacent said end thereof and projecting below said support plate and having rolling engagement downwardly on said feed drum.

2. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge and arranged with one end thereof in adjacent tangential sheet feeding relation with the upper portion of said drum, a rotatable feed roll arranged transversely of and wholly above said support plate on an axis inwardly adjacent said end of said support plate and against which said sheet stack is advanced, and feed roll drive means for driving said feed roll from said feed drum for the sequential feeding of sheets from said sheet stack to said feed drum and comprising a rotatable roller of greater diameter than said feed roll and arranged in coaxial relation with said feed roll and projecting below said support plate and having rolling engagement downwardly on said feed drum.

3. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge, a rotatable shaft carried with and arranged transversely of and spaced above said support plate and inwardly adjacent one end of said support plate, a rotatable feed

roll arranged wholly above said support plate and mounted on said shaft and against which said sheet stack is advanced, feed roll drive means for driving said feed roll from said feed drum for the sequential feeding of sheets from said sheet stack to said feed drum and comprising said shaft and a rotatable roller of greater diameter than said feed roll and mounted on said shaft and projecting below said support plate for rolling engagement downwardly on said feed drum with said support plate positioned with said end thereof in adjacent tangential sheet feeding relation with the upper portion of said feed drum, and positioning means for positioning said support plate as aforesaid on said sheet handling machine with said drive means roller engaged downwardly on said feed drum and comprising a support carried with said support plate and detachably pivotally engageable downwardly on said sheet handling machine in a region horizontally spaced from said drive means roller whereby weight of said support plate and the mechanism carried therewith presses said drive means roller downwardly on said drum.

4. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum, pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, and a generally horizontal hand sheet feed plate arranged in tangential sheet feeding relation with the upper portion of said feed drum, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge, a rotatable feed roll carried with and arranged transversely of and wholly above said support plate on an axis inwardly adjacent one end of said support plate and against which said sheet stack is advanced, feed roll drive means for driving said feed roll from said feed drum for the sequential feeding of sheets from said stack to said feed drum and comprising a rotatable roller carried with said support plate on an axis above and inwardly adjacent said end thereof and projecting below said support plate for rolling engagement downwardly on said feed drum with said support plate positioned above said feed plate and with said end of said support plate in adjacent tangential sheet feeding relation with said drum, and positioning means for positioning said support plate as aforesaid on said feed plate with said drive means roller engaged downwardly on said feed drum and comprising a support on and extending downwardly from said support plate and detachably pivotally engageable downwardly on said feed plate in the region of the other end of said support plate whereby weight of said support plate and the mechanism carried therewith presses said drive means roller downwardly on said drum.

5. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge and arranged with one end thereof in adjacent tangential sheet feeding relation with the upper portion of said drum, a rotatable feed roll arranged transversely of and wholly above said support plate on an axis inwardly adjacent said end of said support plate

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and against which said sheet stack is advanced and arranged to overlap its engagement with a fed sheet with engagement of the sheet between said gripping means and feed drum, and feed roll drive means for driving said feed roll from and at a peripheral velocity less than that of said feed drum for the sequential feeding of sheets from said sheet stack to said feed drum and comprising a rotatable roller of greater diameter than said feed roll and arranged on an axis above and inwardly adjacent said end of said support plate and projecting below said support plate and having rolling engagement downwardly on said feed drum and an automatic overrunning clutch for driving said feed roll from said drum engaging roller in the direction to feed sheets to said feed drum.

6. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge and arranged with one end thereof in adjacent tangential sheet feeding relation with the upper portion of said feed drum, a rotatable feed roll arranged transversely of and wholly above said support plate on an axis inwardly adjacent said end of said support plate and against which said sheet stack is advanced and arranged to overlap its engagement with a fed sheet with engagement of the sheet between said gripping means and feed drum, and feed roll drive means for driving said feed roll from and at a peripheral velocity less than that of said feed drum for the sequential feeding of sheets from said sheet stack to said feed drum and comprising a rotatable roller of greater diameter than said feed roll and arranged in coaxial relation with said feed roll and projecting below said support plate and having rolling engagement downwardly on said feed drum and an automatic overrunning clutch arranged in coaxial relation with said feed roll for driving said feed roll from said drum engaging roller in the direction to feed sheets to said feed drum.

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7. In an automatic sheet feeding mechanism adapted for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and pressure gripping means for gripping sequentially fed sheets between it and said drum for the feeding of the sheets, the combination of sheet stack supporting and advancing means comprising a support plate for supporting a stack of sheets on edge and arranged with one end thereof in adjacent tangential sheet feeding relation with the upper portion of said drum, a rotatable shaft arranged transversely of and spaced above said support plate and inwardly adjacent said end of said support plate, a rotatable feed roll arranged wholly above said support plate and rotatably mounted on said shaft and against which said sheet stack is advanced and arranged to overlap its engagement with a fed sheet with engagement of the sheet between said gripping means and feed drum, and feed roll drive means for driving said feed roll from and at a peripheral velocity less than that of said feed drum for the sequential feeding of sheets from said sheet stack to said feed drum and comprising said shaft, a rotatable roller of greater diameter than said feed roll and mounted on said shaft and connected therewith for driving the same and projecting below said support plate and having rolling engagement downwardly on said feed drum, and an automatic overrunning clutch carried with said shaft for driving said feed roll from said shaft in the direction to feed sheets to said feed drum.

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