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AUTOMATIC SHEET FEEDING MECHANISM

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2 Sheets-Sheet 1

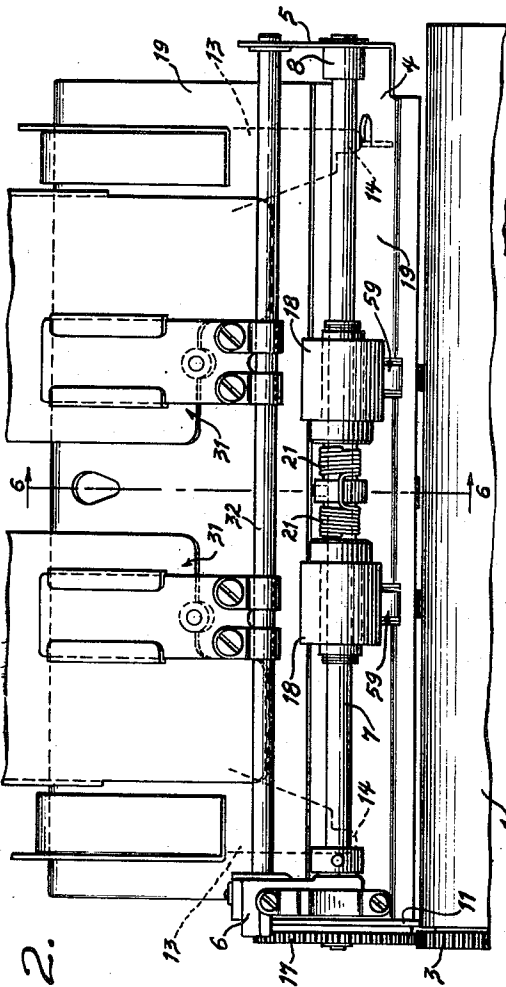


FIG. 2.

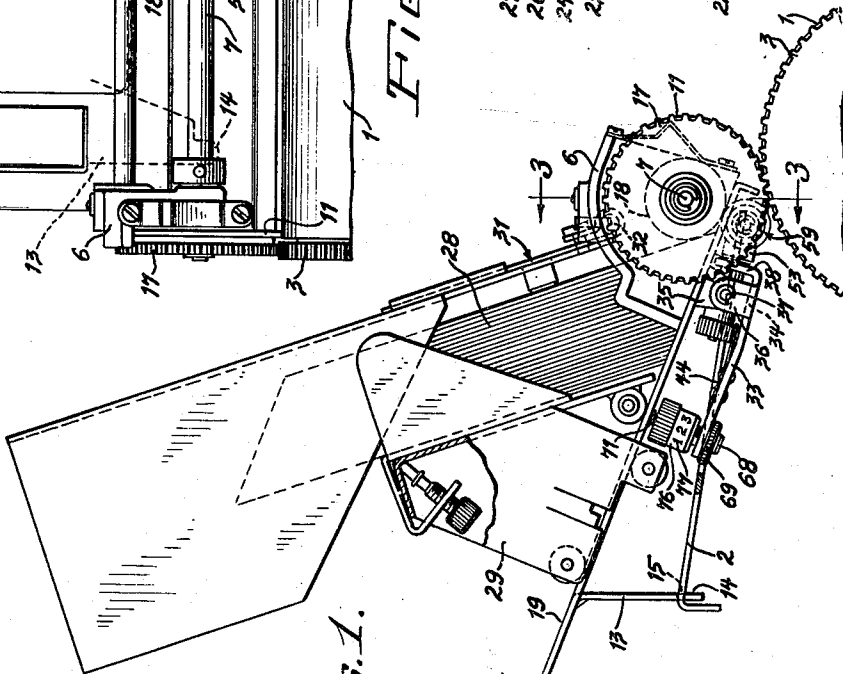


FIG. 1.

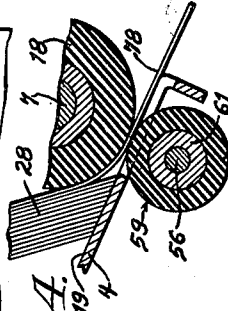


FIG. 4.

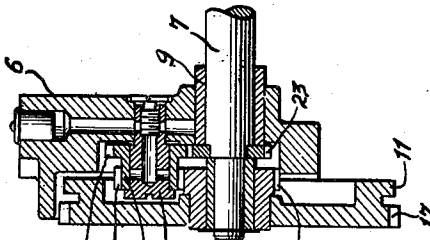


FIG. 3.

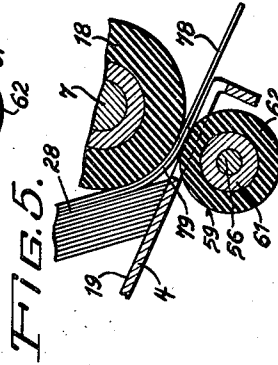


FIG. 5.

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2 Sheets-Sheet 2

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UNITED STATES PATENT OFFICE

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AUTOMATIC SHEET FEEDING MECHANISM

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14 Claims. (Cl. 271—36)

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My invention relates particularly to automatic sheet feeding mechanism for use on a microfilm recorder embodying sheet handling or feeding mechanism provided with a horizontally driven rotatable sheet feed drum to which sheets are sequentially fed, although not limited to this use alone, and particularly concerns a feeder of the type described and claimed in my U. S. applications for Letters Patent, Serial No. 53,646, filed October 9, 1948, now Patent No. 2,652,248, and Serial No. 147,498, filed March 3, 1950, now Patent No. 2,626,148, and U. S. application for Letters Patent of Malcolm G. Townsley, Serial No. 151,751, filed March 24, 1950, now Patent No. 2,655,374, all for improvement in Automatic Sheet Feeding Mechanism, on which this invention may be considered an improvement.

Objects of the invention reside in the provision in an automatic sheet feeding mechanism of a novel, simple, compact and effective means for preventing, at least to a large extent, the undesired feeding of superposed sheets instead of single sheets, which is well adapted for feeders of the above type, and which is preferably conveniently adjustable for maximum functioning under various conditions.

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

Figure 1 is a side elevation of an automatic sheet feeding mechanism embodying my invention and showing it in mounted association with parts of a microfilm recorder, one of which parts is partially broken away;

Figure 2 is a front elevation of said feeding mechanism and also showing it in mounted association with parts of a microfilm recorder;

Figure 3 is a partial sectional view taken substantially on the line 3—3 of Figure 1;

Figures 4 and 5 are partial sectional views taken similarly to Figure 1 and showing different conditions of operation;

Figure 6 is a partial sectional view taken substantially on the line 6—6 of Figure 2;

Figure 7 is a partial bottom plan view of the feeding mechanism with parts broken away and shown in section; and

Figure 8 is a partial section taken substantially on the line 8—8 of Figure 7.

Referring to the drawing and particularly Figures 1, 2 and 6, the sheet handling machine on which the automatic sheet feeding mechanism embodying my invention is shown to be used, is a microfilm recorder which includes a horizontal rotatable sheet feed drum 1 which is driven

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in a clockwise direction in Figures 1 and 6, a generally horizontal stationary hand sheet feed plate or chute 2 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 which in cooperation with pressure rollers, not shown, feeds the sheets downwardly for the photographing of the sheets by the recorder, and a driving gear 3 secured at one end of the feed drum for rotation therewith and disposed in concentric relation with and having its pitch diameter the same as that of the feed drum.

The automatic sheet feeding mechanism embodying my invention comprises as follows:

A rectangular support plate 4 is provided with upwardly extending bearing brackets at opposite sides of the front end thereof, of which one, designated at 5 in Figures 2 and 6, comprises an upturned portion of the support plate, and of which the other, designated at 6 in Figures 1, 2 and 3, comprises a separate bracket secured downwardly on the support plate. A rotatable shaft 7 is arranged transversely of and above the support plate at said end thereof, see Figure 2, and is journaled at one end thereof on the bracket 5, as designated at 8 in Figure 2, and is journaled adjacent the other end thereof on the bracket 6, as designated at 9 in Figure 3. A drum engaging roller 11, disposed adjacent and on the outside of the bracket 6, is rotatably mounted on the shaft 7 as designated at 12, this roller being of relatively large diameter and projecting below the support plate for rolling engagement downwardly on the feed drum 1.

Two support legs 13, see Figures 1 and 2, are spaced transversely of the support plate 4 and are formed integrally therewith and extend downwardly therefrom in the region of the rear end thereof, and reduced shoulder forming lower end portions 14 thereof are loosely engageable in apertures 15 through the portion of the feed plate 2 remote from the feed drum 1 and thus provide a pivotal mounting for the support plate on an axis parallel to and horizontally spaced from the feed drum. These support legs cooperate with the roller 11 in its rolling engagement downwardly on the feed drum 1 and with a downwardly projecting support leg 16, on and formed integrally with the support plate in the region of the shaft 7 and at the side of the support plate opposite that at which the roller 11 is disposed and bearing downwardly on the feed plate 2, to position the support plate above the feed plate and inclined downwardly toward the

upper portion of the feed drum in tangential sheet feeding relation therewith.

The drum engaging roller 11 is disposed to engage the feed drum 1 adjacent the driving gear 3 of the feed drum, and is provided at the outer side thereof with a driven gear 17 which is fixed with this roller for rotation therewith and is disposed concentric thereto and has its pitch diameter the same as the diameter of the drum engaging roller, see Figures 1 and 3, so that when the roller 11 is engaged downwardly on the feed drum, the driven gear 17 is downwardly engaged in proper mesh with the feed drum drive gear 3 for driving the driven gear and its roller from the drive gear and feed drum in a positive manner, the weight of the feeding mechanism tending to maintain the roller 11 and driven gear 17 in engagement with the feed drum 1 and drive gear 3.

The support plate 4 forms the base of the automatic feeding mechanism and carries the mechanism thereof including the drum engaging roller 11, the driven gear 17 and the shaft 7 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 13 with the apertures 15 with vertical movement of the feeding mechanism.

Two axially spaced bored friction feed rolls 18, see particularly Figures 2 and 6, are rotatably mounted on the shaft 7 between the bearing brackets 5 and 6, they being surfaced with a friction material, such as soft rubber and being of smaller diameter than the drum engaging roller 11 and arranged above the support plate 4 in approximately tangential relation with the upper or sheet supporting surface 19 of the support plate 4. The feed rolls 18 are connected with the shaft 7 to be driven therefrom in the direction to feed sheets by means of automatic overrunning clutches generally designated at 21.

A speed increasing spur gear transmission serves to drive the shaft 7 and consequently the feed rolls 18 from the driven gear 17 and the roller 11 and comprises, see Figure 3, relatively large and small spur gears 22 and 23 disposed coaxially of the shaft 7 and respectively secured with the driven gear 17 and roller 11 and with the shaft 7, and a counter gear member 24 rotatably mounted in parallelism with the shaft 7 on a stud 25 secured on the bracket 6 and provided with relatively small and large spur gears 26 and 27 respectively meshing with the gears 22 and 23.

The support plate 4 is adapted to support, on the upper or sheet supporting surface 19 thereof, a stack of sheets 28 on edge, see Figure 1, and a pusher 29 is mounted on the support plate for movement longitudinally thereof, in a manner unnecessary to be described, and is yieldably urged by gravity, because of the inclination of the support plate, to advance the stack of sheets facewise against the feed rolls 18. Positioning devices, generally designated at 31, are mounted on a rod 32 extending between and secured to the brackets 5 and 6 above the feed rolls 18, and extend upwardly from this rod for forward engagement of the front of the sheet stack thereagainst as the pusher 29 advances the stack against the feed rolls 18. The feed drum 1 and drive gear 3 rotate clockwise in Figures 1, 4, 5 and 6 and the drive gear rotates the driven gear 17 and the feed rolls 18 counter clockwise in these figures through the transmission 22-23-25-75

26-27 and overrunning clutches 21, and the feed rolls grip and sequentially feed the sheets at the front of the stack edgewise and over the forward portion of the support plate 4, as shown in Figure 4, to the feed drum on which they are gripped by pressure rollers, not shown, and their feeding is thereby continued.

Referring to Figures 1, 6 and 7, a support arm 33, preferably in the form of a stamping, is arranged below the support plate 4 in correspondence therewith and extends transversely of the axis of the shaft 7 and feed rolls 18, and is provided with aligned oppositely extending transverse branches 34 adjacent its forward end. The arm is pivotally mounted on the support plate on an axis parallel to and spaced rearwardly from the feed rolls 18 by means of spaced lugs 35 struck downwardly from the support plate and upturned outer ends 36 of the branches 34 respectively pivotally mounted on the lugs 35 as designated at 37.

Referring particularly to Figure 6, the forward end of the arm 33 is upturned, as designated at 38, and is bored, as designated at 39, on an axis transverse to the pivotal axis of the arm, and an internally threaded shouldered bushing 40 is secured in the bore 39. An elongated cylindrical adjusting member 41 is provided with an axial bore 42, and its relatively small forward portion 43 is externally screwthreaded and screwthreaded into the bushing 41 for axial adjustment of the adjusting member relative to and transversely of the pivotal axis of the arm 33. A leaf spring 44 is arranged above the arm 33 and has its rear end secured on the arm and has its front end tensioned against the periphery of the rear end of the adjusting member 41 to retain it in adjusted position.

A bored friction bearing 45, provided with a bearing bushing 46 of friction material such as leather, is arranged forwardly of the arm 33 and is provided with a shank 47 extending radially thereof, and this shank extends through the bore of the bushing 40 of the arm 33 and through the bore 42 of the adjusting member 41, the shank being engaged in the bore 42 for rotation and longitudinal movement and preferably being smaller than this bore as shown in Figure 6.

A helical compression spring 48 is arranged in an enlarged rear bore portion 49 of the bore 42 of the adjusting member 41 and encircles the shank 47, and is engaged between a shoulder 50, on the adjusting member and formed by the enlarged bore portion 49 thereof, and a split spring washer 51 engaged in a circumferential groove 52 on the rear end of the shank, so that the spring 48 urges the shank and with it the friction bearing 45 rearwardly.

An elongated support 53, see Figures 6 and 7, extends transversely of the shank 47 and is provided with a bore 54 through the intermediate portion thereof and through which the shank extends, this support being arranged between the bearing 45 and the bushing 40, and the bore 54 being preferably larger than the shank 47. The end portions of the support 53 are turned forwardly and are provided with forwardly facing recesses 55 as best shown in Figure 8. A shaft 56 is arranged longitudinally of the support 53, and bearings 57 are engaged on this shaft respectively in the regions of the ends thereof and are respectively rearwardly engaged in the bearing recesses 55. The friction bearing 45 is disposed intermediate the bearings 57 and the shaft 56 extends through and is thus radially engaged by the bearing 45, and the spring 48, reacting

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on the adjusting member 41 and through it on the support arm 33, draws the shank 47 and with it the bearing 45 rearwardly and thus maintains the bearings 57 engaged in the bearing recesses 55, presses the support 53 rearwardly against the bushing 49 to yieldably position the support with the shaft 56 parallel to the pivotal axis of the support arm 33, and presses the friction bearing 45 radially against the shaft 56 to provide a yieldable friction brake retarding rotation of this shaft.

Two axially spaced friction retard rolls 59 are secured respectively on opposite ends of the shaft 56 for rotation therewith, see particularly Figure 7, and each retard roll comprises a bored metal core 61 and a rim 62 of friction material such as soft rubber. The core 61 of each retard roll is engaged on a reduced end 63 on the shaft 56 and is provided at its inner end with a diametrical slot 64 which engages a cross pin 65 on the shaft to angularly fix the retard roll on the shaft, and a split spring washer 66 is engaged in a circumferential groove 67 on the end of the shaft to retain the retard roll thereon.

A vertically disposed adjusting screw 68 is screwthreaded downwardly through the rear end of the support arm 33, as best shown in Figure 6, and a lock nut 69 is screwthreaded on the adjusting screw below the support arm and is engageable upwardly thereagainst to retain the adjusting screw in adjusted position. A helical compression spring 71 is arranged coaxially of the screw 68 and in a blind axial bore 72 of the adjusting screw, and is engaged between the screw and the support plate 4 to urge the rear end of the support arm 33 downwardly and the forward end of this arm and the retard rolls 59 upwardly.

To facilitate predetermined adjustment of the adjusting member 41, see Figures 6 and 7, a collar 73 is secured rearwardly on the portion 43 of this member and is provided about its periphery with a series of indexing numbers 74 which are observable through an aperture 75 in the support arm 33, and to facilitate predetermined adjustment of the adjusting screw 68, see Figures 1 and 6, a collar 76 is secured on this screw and is provided about its periphery with a series of indexing numbers 77.

The retard rolls 59 and shaft 56 are disposed below and in parallel relation with the feed rolls 18 and shaft 7 with the retard rolls in opposing relation respectively with the feed rolls for the sequential feed of sheets between the feed and retard rolls, and the pivotal axis of the support arm 33 is disposed parallel to and is horizontally spaced from the retard rolls and shaft 56 so that the retard rolls are moveable toward and away from the feed rolls. The spring 71 yieldably urges the retard rolls toward the feed rolls for pressure engagement of the fed sheets between the feed and retard rolls, and the spring 48 frictionally engages the bearing 45 radially against the shaft 56 to retard rotation of the retard rolls.

Recalling that the feed drum 1 rotates clockwise and the feed rolls 18 rotate counter clockwise in Figures 1, 4, 5 and 6, and referring to Figure 4, the feed rolls 18 normally grip and feed each foremost sheet 78 of the sheet stack 28 and feed it downwardly and about the feed rolls and over the corresponding end of the support plate 4 between the feed rolls and the retard rolls 59, and thus sequentially feed the sheets from the sheet stack to the feed drum 1

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on which they are gripped by pressure rollers, not shown, for the further feeding thereof, the sheets being under pressure between the feed and retard rolls by reason of the spring 71 urging the retard rolls toward the feed rolls. As single sheets are fed under pressure between the feed and retard rolls, the retard rolls are rotated clockwise, see Figure 4, because while the yieldable friction braking effect of the bearing 45 on the shaft 56, above described, resists rotation of the retard rolls, this resistance is overcome by the friction between the feed rolls and a single sheet and between the sheet and the retard rolls, thus promoting the uniform feeding of single sheets even though they are of random thickness. However, the yieldable friction of the bearing 45 resists rotation of the retard rolls to an extent sufficient to cause slippage between superposed sheets 78 and 79, see Figure 5, between the feed and retard rolls by stoppage of the retard rolls and consequent temporary stoppage of the sheet 79 contacting the retard rolls while the foremost sheet 78 contacting the feed roll is fed. After the foremost sheet 78 is fed from the feed and retard rolls, the sheet 79 is fed, after which the feed rolls grip the then foremost sheet of the sheet stack and feed the same.

Observing that the pivotal axis of the support 53 on the support arm 33 is disposed transversely to the common axial plane of the feed and retard rolls 18 and 59 and intermediate the retard rolls or in other words intermediate the limits of contact of the retard rolls axially thereof with sheets fed between the feed and retard rolls, the retard rolls are urged toward the feed rolls by the spring 71 in pressure equalized relation and thus act correspondingly on the sheets fed between the feed and retard rolls to minimize any tendency of the sheets to skew.

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, the combination of a rotatable driven friction feed roll means, a constantly rotatable friction retard roll means disposed similarly to and in opposing relation with said feed roll means for the sequential feeding of sheets therebetween, a first support member mounted for movement corresponding with movement of said retard roll means toward and away from said feed roll means, a second support member carrying said retard roll means for rotation and pivotally mounted on said first support member on an axis transverse to the common axial plane of said feed and retard roll means and intermediate the limits of contact of said retard roll means axially thereof with sheets fed between said feed and retard roll means, resilient means for yieldably urging said first support member in the direction to urge said retard roll means toward said feed roll means, and yieldable friction brake means for retarding rotation of said retard roll means.

2. In an automatic sheet feeding mechanism, the combination of a rotatable driven friction feed roll means, a constantly rotatable shaft disposed in parallelism with said feed roll means, two axially spaced friction retard rolls mounted on said shaft for rotation therewith for the sequential feed of sheets between said retard rolls and

feed roll means, a first support member mounted for movement corresponding with movement of said retard rolls toward and away from said feed roll means, a second support member pivotally mounted on said first support member on an axis transverse to the common axial plane of said feed roll means and shaft and intermediate said retard rolls, two bearings respectively disposed in the regions of said retard rolls for carrying said shaft for rotation on said second support member, a yieldable friction brake engaged with said shaft between said bearings for retarding rotation of said retard rolls, and resilient means yieldably urging said first support member in the direction to urge said retard rolls toward said feed roll means.

3. In an automatic sheet feeding mechanism, the combination of a rotatable driven friction feed roll means, a constantly rotatable shaft disposed in parallelism with said feed roll means, two axially spaced friction retard rolls mounted on said shaft for rotation therewith for the sequential feed of sheets between said retard rolls and feed roll means, a first support member mounted for movement corresponding with movement of said retard rolls toward and away from said feed roll means, a second support member pivotally mounted on said first support member on an axis transverse to the common axial plane of said feed roll means and shaft, and intermediate said retard rolls, means carrying said shaft for rotation on said second support member comprising two bearings respectively disposed in the regions of said retard rolls, a friction member engaged radially with said shaft between said two bearings, pressure means pressing said friction member radially against said shaft for yieldably retarding rotation of said retard rolls, and resilient means for yieldably urging said first support member in the direction to urge said retard rolls toward said feed means.

4. In an automatic sheet feeding mechanism, the combination of a rotatable driven friction feed roll means, a constantly rotatable shaft disposed in parallelism with said feed roll means, two axially spaced friction retard rolls mounted on said shaft for rotation therewith for the sequential feed of sheets between said retard rolls and feed roll means, a first support member mounted for movement corresponding with movement of said retard rolls toward and away from said feed roll means, a second support member pivotally mounted on said first support member on an axis transverse to the common axial plane of said feed roll means and shaft and intermediate said retard rolls, two bearings respectively disposed in the regions of said retard rolls for carrying said shaft for rotation on said second support member, a friction member engaged radially on said shaft intermediate said two bearings, resilient means pressing said friction member radially against said shaft for yieldably retarding rotation of said retard rolls and comprising a shank on and extending radially of said friction member in coaxial relation with the pivotal axis of said second support member, and resilient means for yieldably urging said first support member in the direction to urge said retard rolls toward said feed roll means.

5. In an automatic sheet feeding mechanism, the combination of claim 4 and further comprising the pivotal mounting of said second support member on said first support member comprising apertures through said first and second support

members and said shank extending through said apertures.

6. In an automatic sheet feeding mechanism, the combination of claim 4 and further comprising said first mentioned resilient means and the pivotal mounting of said second support member on said first support member comprising apertures through said first and second support members, said shank extending through said apertures, and a helical spring encircling said shank.

7. In an automatic sheet feeding mechanism, the combination of claim 4 and further comprising said first mentioned resilient means and the pivotal mounting of said second support member on said first support member comprising apertures through said first and second support members, an adjusting member screw-threaded into the aperture of one of said support members and provided with an axial bore, said shank extending through said apertures and bore, and a helical spring encircling said shank and operative between said adjusting member and shank.

8. In an automatic sheet feeding mechanism, the combination of a rotatable driven friction feed roll means, a constantly rotatable shaft disposed in parallelism with said feed roll means, two axially spaced friction retard rolls mounted on said shaft for rotation therewith for the sequential feed of sheets between said retard rolls and feed roll means, a first support member mounted for movement corresponding with movement of said retard rolls toward and away from said feed roll means, a second support member pivotally mounted on said first support member on an axis transverse to the common axial plane of said feed roll means and shaft and intermediate said retard rolls and provided with two bearing receiving recesses respectively in the regions of said retard rolls and facing said shaft, two bearings on said shaft and respectively disposed in the regions of said retard rolls and engaged in said bearing recesses for carrying said shaft for rotation on said second support member, a friction bearing engaged radially on said shaft intermediate said two bearings, resilient means pressing said friction bearing member radially against said shaft in the direction opposite that in which said bearing recesses face for maintaining said two bearings in engagement with said bearing recesses and for yieldably retarding rotation of said retard rolls and comprising a shank on and extending radially of said friction bearing in coaxial relation with the pivotal axis of said second support member and a helical spring surrounding said shank, and resilient means yieldably urging said first support member in the direction to urge said retard rolls toward said feed roll means.

9. In an automatic sheet feeding mechanism, the combination of claim 8 and further comprising said first mentioned resilient means and the pivotal mounting of said second support member on said first support member comprising apertures through said first and second support members, an adjusting member screw-threaded into the aperture of said first support member and provided with an axial bore, said shank extending through said apertures and bore, and a helical compression spring encircling said shank and operative between said adjusting member and shank.

10. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means comprising a stack support plate for supporting a stack of sheets on edge, a rotatable driven friction feed roll means arranged transversely of and above and in approximately tan-

gential relation with the sheet supporting surface of said support plate and against which the sheet stack is facewise advanced, a constantly rotatable retard roll means disposed below and similarly to and in opposing relation with said feed roll means for the sequential feeding of sheets therebetween from said stack, a first support member arranged below said support plate and pivotally mounted thereon for movement on an axis parallel to and horizontally spaced from the axis of said retard roll means, a second support member arranged below said support plate and carrying said retard roll means for rotation and pivotally mounted on said first support member on an axis transverse to the common axial plane of said feed and retard roll means and intermediate the limits of contact of said retard roll means axially thereof with sheets fed between said feed and retard roll means, resilient means operative between said support plate and first support member for yieldably urging said first support member in the direction to urge said retard roll means toward said feed roll means, and yieldable friction brake means for retarding rotation of said retard roll means.

11. In an automatic sheet feeding mechanism, the combination of claim 10 and further comprising said resilient means comprising an adjusting member screwthreaded on said first support member on an axis spaced from and transverse to the pivotal axis of said first support member and a helical compression spring arranged coaxially of said adjusting member and engaged between said support plate and adjusting member.

12. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means comprising a stack support plate for supporting a stock of sheets on edge, a rotatable driven friction feed roll means arranged transversely of and above and in approximately tangential relation with the sheet supporting surface of said support plate and against which the sheet stack is facewise advanced, a constantly rotatable shaft disposed below and in parallelism with said feed roll means, two axially spaced friction retard rolls mounted on said shaft for rotation therewith for the sequential feeding of sheets between said retard rolls and feed roll means, a first support member arranged below said support plate and pivotally mounted thereon for movement on an axis parallel to and horizontally spaced from the axis of said retard roll means, a second support member arranged below said support plate and pivotally mounted on said first

support member on an axis transverse to the common axial plane of said feed roll means and shaft and intermediate said retard rolls, two bearings respectively disposed in the regions of said retard rolls for carrying said shaft for rotation on said second support member, a friction member engaged radially on said shaft intermediate said two bearings, resilient means pressing said friction member radially against said shaft for yieldably retarding rotation of said retard rolls and comprising a shank on and extending radially of said friction member in coaxial relation with the pivotal axis of said second support member, and resilient means operative between said support plate and first support member for yieldably urging said first support member in the direction to urge said retard rolls toward said feed roll means.

13. In an automatic sheet feeding mechanism, the combination of claim 12 and further comprising the pivotal mounting of said second support member on said first support member comprising apertures through said first and second support members and said shank extending through said apertures.

14. In an automatic sheet feeding mechanism, the combination of claim 12 and further comprising said first mentioned resilient means and the pivotal mounting of said second support member on said first support member comprising apertures through said first and second support members, an adjusting member screw-threaded into the aperture of said first support member and provided with an axial bore, said shank extending through said apertures and bore, and a helical compression spring encircling said shank and operative between said adjusting member and shank, and said second mentioned resilient means comprising an adjusting member screwthreaded on said first support member on an axis spaced from and transverse to the pivotal axis of said first support member and a helical compression spring arranged coaxially of said last mentioned adjusting member and engaged between said support plate and last mentioned adjusting member.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,089,946	Davidson	Aug. 17, 1937
2,224,138	Trydal	Dec. 10, 1940
2,359,856	Morse	Oct. 10, 1944