

Oct. 13, 1953

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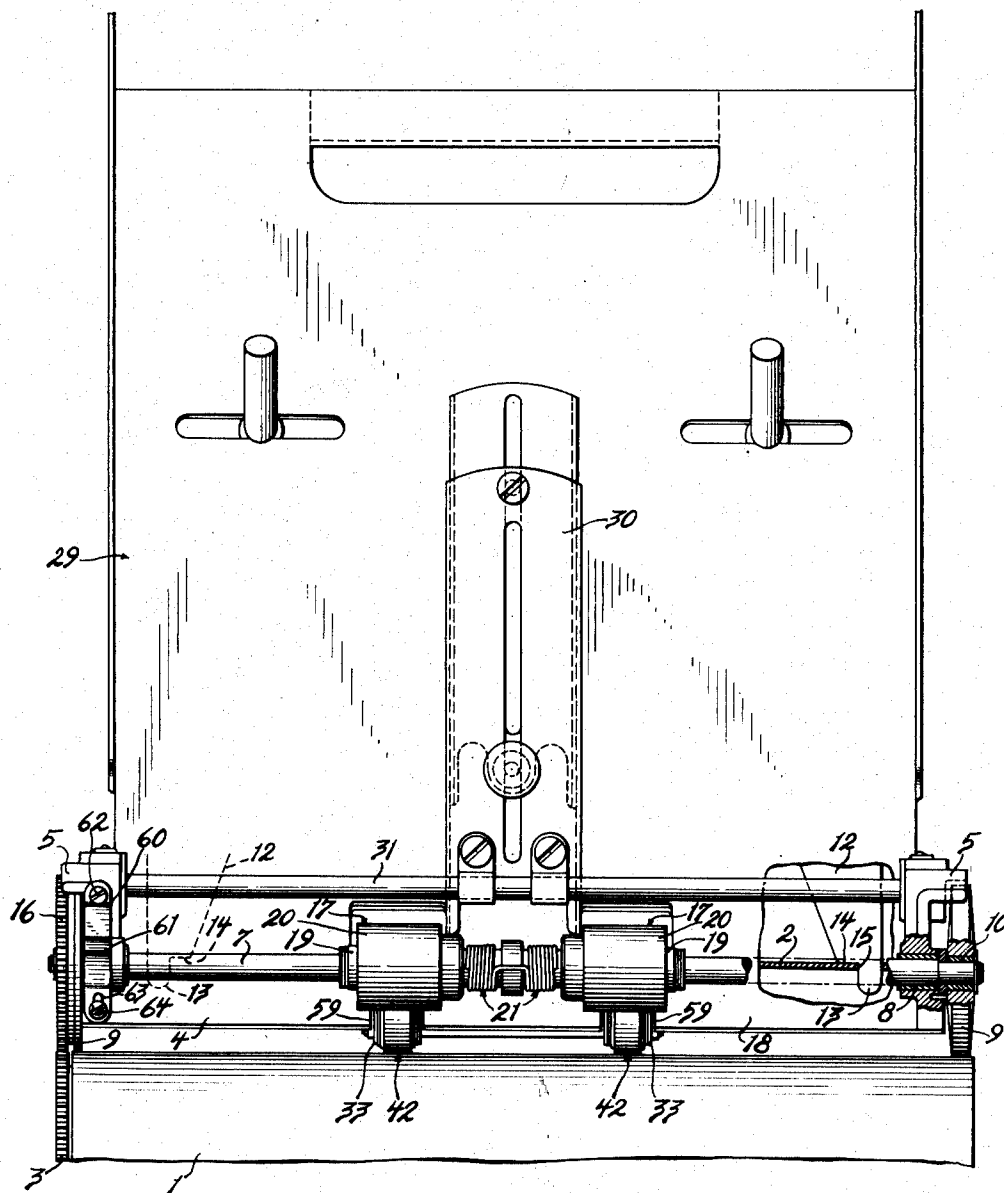
2,655,374

AUTOMATIC SHEET FEEDING MECHANISM

Filed March 24, 1950

3 Sheets-Sheet 1

FIG. 1.



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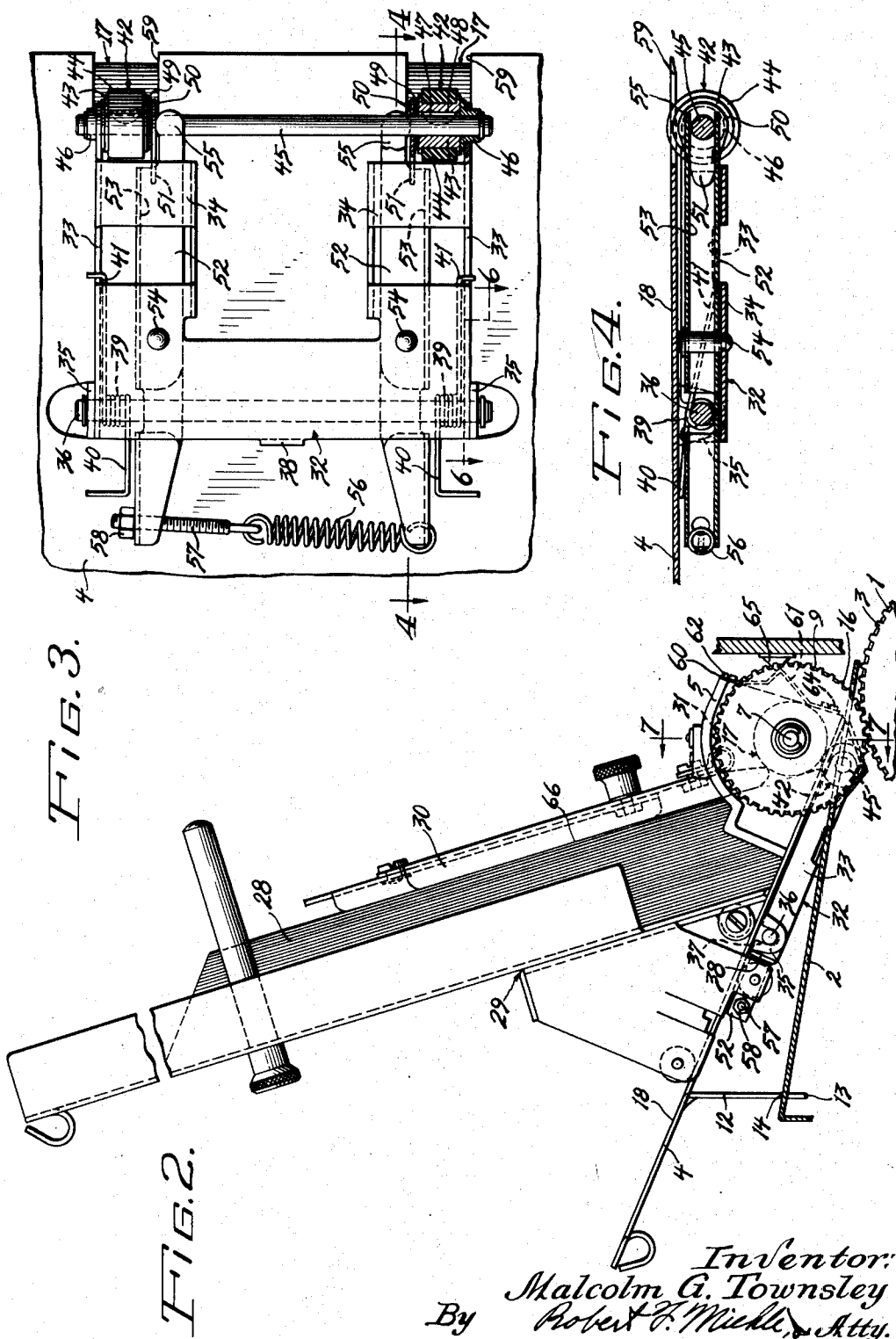
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3 Sheets-Sheet 2



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AUTOMATIC SHEET FEEDING MECHANISM

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3 Sheets-Sheet 3

FIG. 5.

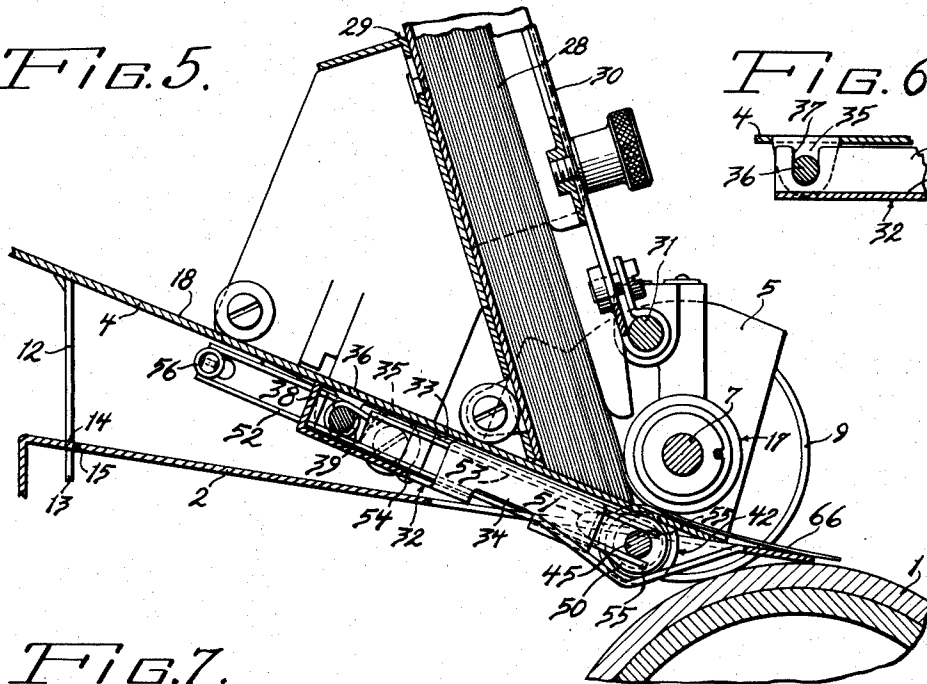


FIG. 6.

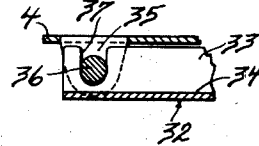


FIG. 7.

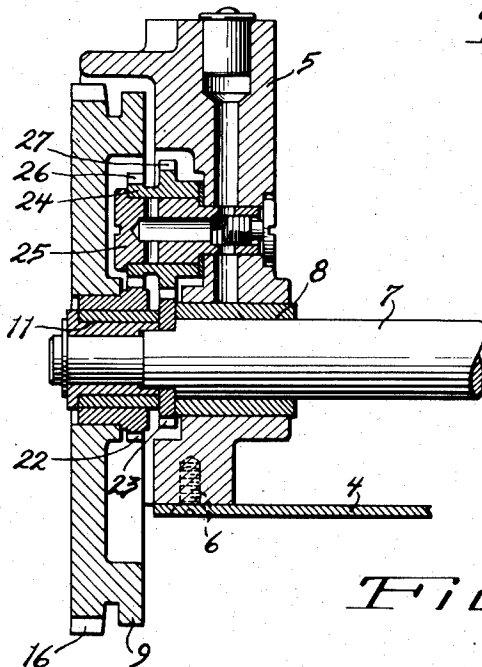


FIG. 8.

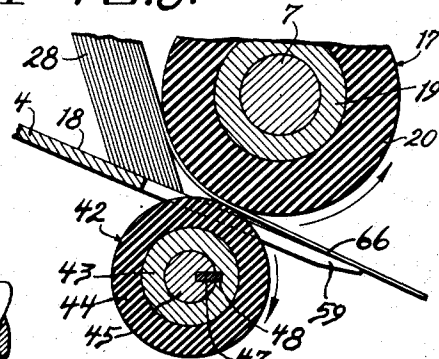
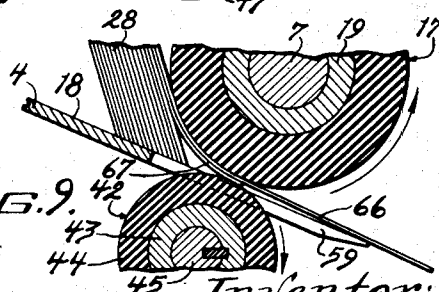


FIG. 9.



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UNITED STATES PATENT OFFICE

2,655,374

AUTOMATIC SHEET FEEDING MECHANISM

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Application March 24, 1950, Serial No. 151,751

17 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 horizontal 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 U. S. applications for Letters Patent of Elmer L. Johnson, 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, both for improvement in Automatic Sheet Feeding Mechanism, on which this invention may be considered an improvement.

Objects of the invention resides 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, which provides for the driving of the feed roll or feed device thereof from the feed drum of the sheet handling mechanism in a positive manner, which is conveniently portable, which is readily installed on and removed from a sheet handling machine, which provides for desirably closely spacing the sheets as they are fed, which includes means for preventing, at least to a large extent, the undesired feeding of superposed sheets instead of single sheets, and which means is simple and compact and well adapted for feeders of the above type.

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

Figure 1 is a front elevation of an automatic sheet feeding mechanism embodying my invention and showing it in mounted association with parts of a microfilm recorder, parts being broken away and shown in section;

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

Figure 3 is a partial bottom plan view of said feeding mechanism;

Figure 4 is a sectional view taken substantially on the line 4—4 of Figure 3;

Figure 5 is a sectional view of said feeding mechanism, taken similarly to Figure 2 and showing the feeding mechanism in mounted association with parts of a microfilm recorder;

Figure 6 is a partial sectional view taken substantially on the line 6—6 of Figure 3;

Figure 7 is a partial sectional view taken substantially on the line 7—7 of Figure 2; and

Figures 8 and 9 are partial sectional views

taken similarly to Figure 5 and showing different conditions of operation.

Referring to the drawing and particularly Figures 1, 2 and 5, the sheet handling machine on which my automatic sheet feeding mechanism is shown to be used, is a microfilm recorder which includes a horizontal rotatable sheet feed drum 1 which is driven in a clockwise direction in Figures 2 and 5, 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 the diameter of the feed drum.

My automatic sheet feeding mechanism comprises as follows:

A rectangular support plate 4 is provided with upwardly extending projections 5 at opposite sides of the front end thereof, these projections being bearing brackets secured downwardly on the support plate by screws 6 as shown in Figure 7. A rotatable shaft 7 is arranged transversely of and above the support plate at said end thereof, see Figure 1, and extends through and is journaled in the bearing brackets as designated at 8 in Figures 1 and 7. Two rotatable drum engaging rollers 9, respectively disposed at the sides of the support plate and at the outsides of the bearing brackets 5, are rotatably mounted on opposite ends of the shaft 7 in coaxial relation herewith and for rotation independently thereof as respectively designated at 10 and 11, these rollers being of relatively large diameter and projecting below the support plate for rolling engagement downwardly on the feed drum 1.

Two support legs 12, see Figures 1, 2, and 5, 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 the lower end portions 13 of the legs 12 are reduced, see Figure 1, and form shoulders 14. The portion of the hand sheet feed plate 2 remote from the feed drum 1 is provided with transversely spaced apertures 15 downwardly into which the reduced end portions 13 of the legs loosely engage with the shoulders 14 engaged downwardly on the feed plate 2 for positioning the support plate 4 above the feed plate 2 and

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inclined downwardly toward the upper portion of the feed drum 1 in tangential sheet feeding relation therewith and with the drum engaging rollers 9 in rolling engagement downwardly on the feed drum. See Figures 1 and 5.

The drum engaging roller 9 corresponding with the end of the feed drum 1 at which the driving gear 3 is disposed, is provided at the outer side thereof with a driven gear 16 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 rollers, see Figures 1 and 7, so that when the rollers 9 are engaged downwardly on the feed drum 1, the driven gear 16 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 support plate 4 forms the base of the automatic feeding mechanism and carries the mechanism thereof including the drum engaging rollers 9, the driven gear 16 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 12 with the apertures 15 with vertical movement of the feeding mechanism.

The loose engagement of the reduced end portions 13 of the legs 12 in the apertures 15 in cooperation with engagement of the shoulders 14 downwardly on the feed plate 2 provides pivotal engagement of the legs 12 downwardly on the feed plate 2 in a region horizontally and radially remote from the end of the support plate 4 at which the drum engaging rollers 9 and driven gear 16 are disposed to permit vertical movement of the feeding mechanism whereby weight of the feeding mechanism presses the drum engaging rollers 9 downwardly on the drum 1 for maintaining the drive and driven gears 3 and 16 in mesh for driving the driven gear and its drum engaging roller.

Two axially spaced bored friction feed rolls 17, see particularly Figures 1 and 5, are rotatably mounted on the shaft 7 between the bearing brackets 5, they being of smaller diameter than the drum engaging rollers 9 and arranged in coaxial relation therewith and being arranged above the support plate 4 in approximately tangential relation with the upper or sheet supporting surface 18 of the support plate. These feed rolls comprise bored hubs 19 having their bores engaged for rotation on the shaft 7, and bored rolls 20 of friction material such as soft rubber, secured to the hubs for rotation therewith and through the bores of which the hubs extend, and 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, which serve a purpose hereinafter appearing.

A speed increasing spur gear transmission serves to drive the shaft 7 and consequently the feed rolls 17 from the driven gear 16 and its roller 9 and comprises, see Figure 7, relatively large and small spur gears 22 and 23 disposed coaxially of the shaft 7 and respectively secured with the driven gear 16 and its roller 9 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 adjacent bearing bracket 5 and provided with relatively small and large spur gears 26 and 27 respectively meshing with

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the gears 22 and 23. This speed increasing transmission serves to drive the feed rolls 17 at a greater peripheral speed than that corresponding with the necessarily relatively large diameter of the driven gear 16 and the rollers 9 and at a peripheral speed slightly less than that of the feed drum for a purpose hereinafter appearing.

The support plate 4 is adapted to support, on the upper or sheet supporting surface 18 thereof, a stack of sheets 28 on edge 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 17. A positioning device, generally designated at 30, is carried on a rod 31 extending between and secured to the bearing brackets 5 above the feed rolls 17, and extends 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 17.

The feed drum 1 and drive gear 3 rotate clockwise in Figures 2, 5, 8 and 9 and the drive gear drives the driven gear 16 and feed rolls 17 counterclockwise in these figures, 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 to the feed drum on which they are gripped by pressure rollers, not shown, and their feeding is thereby continued.

The speed increasing transmission between the driven gear 16 and the feed rolls 17 serves to increase the speed of the feed roll to a peripheral speed slightly less than that of the feed drum 1, and as a result the sheets are desirably closely spaced as they are fed over the feed drum, because as a sheet is gripped on the feed drum its speed is slightly increased and it is advanced a short distance away from the succeeding sheet to provide the close spacing therebetween, the overrunning clutches 21 permitting the sheets to momentarily increase the speed of the feed rolls and preventing undesirable slippage between the feed rolls and sheets.

A relatively wide arm 32, see Figures 3, 4, 5 and 6, is formed of sheet metal and is of U-shape providing spaced parallel arm portions 33 which are provided intermediately thereof with channel portions 34 extending longitudinally thereof and facing in the same direction normal to the plane of the arm. The arm 32 is arranged below the support plate 4 in correspondence therewith and has the end thereof forming the base of its U-shape disposed rearwardly and pivotally mounted on the support plate on an axis disposed in parallelism with and horizontally spaced rearwardly from the feed rolls 17 by means of apertured ears 35 formed on the support plate and spaced transversely thereof and extending downwardly therefrom and between which the arm 32 is engaged, a shaft 35 extending between these ears and engaged in the apertures thereof, bearing slots 37 on corresponding ends of the arm portions 33 and disposed normal to the arm or vertically and slidably and pivotally engaged on the shaft, an upwardly extending bearing tongue 38 on the base of the U-shape of the arm in the region of the slots 37 and intermediate the arm portions 33 and engageable upwardly against the support plate 4, and two torsion springs 39 engaged about the shaft 36 and disposed adjacent respective of the arm portions 33 and having terminal arms

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40 engaging upwardly against the support plate 4 and opposite terminal arms 41 engaging upwardly against respective of the arm portions 33 of the arm 32 to maintain the pivotal mounting of the arm on the support plate and to urge the forward ends of the arm portions 33 upwardly, the forward ends of these arm portions being disposed below the feed rolls 17. The engagement of the tongue 38 upwardly against the support plate forms the pivot of the arm 32, the engagement of the slots 37 on the shaft 36 positions the arm forwardly and rearwardly, and the engagement of the arm between the ears 35 positions the arm laterally.

Two axially spaced rotatable friction retard rolls 42, see Figures 3, 4 and 5, are disposed in parallelism and opposing relation with and below respective of the feed rolls 17 for the feeding of sheets between the feed and retard rolls, the pivotal axis of the arm 32 being thus disposed in parallelism with and horizontally spaced from the retard rolls. These retard rolls comprise bored flanged hubs 43 and bored rolls 44 of friction material, such as soft rubber, engaged on the hubs between the flanges of the hubs and secured therewith. A shaft 45 extends between and is mounted for rotation on the forward ends of the arm portions 33 of the arm 32 which are disposed below the feed rolls 17, by means of flanged bearing bushings 46 secured in bores through the arm portions and in which the shaft 45 is rotatably engaged, and as so mounted this shaft is disposed in parallelism with and below the feed rolls 17 and in parallelism with and horizontally spaced from the pivotal axis of the arm 32.

The retard rolls 42 are mounted on the shaft 45 adjacent and on the insides of the arm portions 33 by means of the bores of the retard roll hubs 43 being loosely engaged on this shaft for movement longitudinally thereof, and the retard rolls are preferably rotatably secured on this shaft, to rotatably secure the retard rolls together, by means of keys 47 on this shaft and slidably engaged in keyways 48 in the bores of the retard roll hubs 43, see Figures 3 and 8. The retard rolls are oppositely movable axially away from each other on the shaft 45 to engage the outer flanges of the retard roller hubs 43 against the flanges of respective of the bearing bushings 46, and two friction washers 49 of suitable friction material are loosely engaged on the shaft 45 on the insides of the retard rollers and are oppositely movable axially of the retard rollers away from each other to frictionally engage the inner flanges of respective of the retard roller hubs 43. Two apertured brake members 50 are loosely engaged on the shaft 45 on the insides of the friction washers 49 and are oppositely movable axially of the retard rollers away from each other to frictionally engage the inner faces of respective of the friction washers 49, and are provided with radial arms 51 which serve to prevent rotation of the brake members as herein-after described.

The brake members 50, the friction washers 49, the retard roll hubs 43 and the bearing bushings 46 constitute two yieldable friction brakes carried with the arm 32 and arranged adjacent respective of the retard rolls for resisting rotation of respective of the same, the brake members 50 being oppositely movable away from each other to effect engagement of respective of the brakes.

To arms 52 are formed of sheet metal and are of U-shaped cross section throughout the major portions thereof, to form longitudinally extend-

ing channels 53 within which the arms 51 of the brake members 50 are engaged to prevent rotation thereof and these arms extend in correspondence with and are spaced transversely of the arm 32 and are movably engaged in respective of the channel portions 34 of the arm 32. The arms 52 are pivotally mounted intermediately thereof on the arm 32 intermediate the retard rolls 42 and the pivotal axis of the arm 32 on respective of pivotal axes spaced longitudinally of the pivotal axis of this arm as designated at 54. The retard roll adjacent ends 55 of the arms 52 are respectively oppositely operative on the brake members to effect engagement of the brakes with opposite movement of these arms, and an adjustable spring connection is provided between the other ends of these arms for maintaining the brakes in engagement and adjusting the friction thereof, this connection, see Figure 3, comprising a helical tension spring 56 having one end thereof connected with one of the arms 52, a screw 57 having one end thereof connected with the other end of the spring and passing through an aperture in the other of the arms 52, and a nut 59 screwthreaded on the screw 57 and engaging the last mentioned arm 52 in opposition to the spring.

The retard rolls 42 being mounted on the forward ends of the arm portions 33 of the arm 32, the torsion springs 39 yieldably urge the retard rolls upwardly toward the feed rolls 17 for the passage of sheets under pressure therebetween, and the support plate 4 is provided with openings 59 through which the retard rolls project to engage sheets fed over the sheet supporting surface 18 of the support plate.

For the purpose of maintaining the driving and driven gears 3 and 16 in mesh in case the weight of the support plate 4 and the mechanism carried thereby is insufficient to maintain the driven gear 16 in mesh with the drive gear 3, see Figures 1 and 2, a vertically extending detent spring 60 is provided with an intermediate forwardly projecting vertically extending cam detent portion 61 and has its upper end secured by a screw 62 on the bearing bracket 5 which is adjacent the driven gear 16 and has its lower end mounted on this bracket for vertical movement by a vertical slot 63 through the spring and slidably engaged on a screw 64, and a rearwardly projecting cam detent 65, see Figure 2, is secured on the microfilm recorder or other mechanism on which the feeding mechanism is installed. The cam detent portion 61 of the detent spring engages under the cam detent 65 when the feeding mechanism is installed to insure maintenance of the mesh of the driving and driven gears 3 and 16, and the detent springs 60 is sufficiently yieldable to cam over the cam detent 65 during installation and removal of the feeding mechanism.

Recalling that the feed drum 1 rotates clockwise and the feed rolls 17 rotate counterclockwise in Figures 2, 5, 8 and 9, the feed rolls 17 normally grip and feed each foremost sheet 66 of the sheet stack 28 and feed it downwardly and about the feed rolls and over the corresponding end of the support plate 4 and between the feed rolls and the retard rolls 42, and thus sequentially feed the sheets from the sheet stack to the feed drum 1 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 springs 39 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 8, because while the yieldable friction brakes, above described, resist rotation of the retard rolls, their 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 thicknesses. However, the yieldable friction brakes resist rotation of the retard rolls to an extent sufficient to cause slippage between superposed sheets 66 and 67, see Figure 9, between the feed and retard rolls by stoppage of the retard rolls and consequent temporary stoppage of the sheet 67 contacting the retard rolls while the foremost sheet 66 contacting the feed roll is fed. After the foremost sheet 66 is fed from between the feed and retard rolls, the sheet 67 is fed, after which the feed rolls grip the then foremost sheet of the stack and feed the same.

The bearing tongue 32, being disposed intermediate the arm portions 33, is thus disposed intermediate the retard rolls 42 longitudinally of the axis thereof so that the arm 32 and the retard rolls are pivotally movable on an axis disposed in parallelism with and horizontally spaced from the retard rolls and are rockably movable transversely of the feed and retard rolls 17 and 42 in the common axial plane thereof, the slots 37 permitting this pivotal and rocking movement. The torsion springs 39, being disposed adjacent respective of the arm portions 33, are spaced respectively on opposite sides of the bearing tongue longitudinally of the pivotal axis of the arm 32, so that the retard rolls are urged upwardly toward the feed rolls in pressure equalized relation longitudinally thereof 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 for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, a constantly rotatable friction retard roll disposed similarly to and in opposing relation with said feed roll for the feeding of sheets under pressure between said rolls, and a yieldable friction brake device connected with said retard roll for resisting rotation thereof to an extent sufficient to cause slippage between superposed sheets between said rolls by stoppage of said retard roll and consequent temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said rolls.

2. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, a constantly rotatable friction retard roll disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said rolls and said rolls being mounted for relative movement toward and away from each other, yieldable means urging said rolls toward each other, and a yieldable friction brake device connected with said retard roll for resisting rotation thereof to an extent sufficient to cause slippage

between superposed sheets between said rolls by stoppage of said retard roll and consequently temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said rolls.

3. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, a constantly rotatable friction retard roll disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said rolls, a pivoted arm carrying said retard roll for movement toward and away from said feed roll, a spring connected with said arm for yieldably urging said retard roll toward said feed roll, and a yieldable friction brake carried with said arm and said retard roll and connected with said retard roll for resisting rotation thereof to an extent sufficient to cause slippage between superposed sheets between said rolls by stoppage of said retard roll and consequent temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said rolls.

4. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, a constantly rotatable friction retard roll disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said rolls, a pivoted arm carrying said retard roll for movement toward and away from said feed roll, a spring connected with said arm for yieldably urging said retard roll toward said feed roll, a yieldable friction brake carried with said arm and connected with said retard roll for resisting rotation thereof and comprising a friction brake member movable axially of said retard roll to effect engagement of said brake, a second arm pivotally mounted on said first mentioned arm and operative on said brake member to effect engagement of said brake, and adjustable means connected with said second arm for maintaining said brake engagement and adjusting the friction thereof.

5. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, a constantly rotatable friction retard roll disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said rolls, an arm pivotally mounted on an axis parallel to that of said retard roll and carrying said retard roll for movement toward and away from said feed roll, a spring connected with said arm for yieldably urging said retard roll toward said feed roll, a yieldable friction brake carried with said arm and connected with said retard roll for resisting rotation thereof and comprising a friction brake member movable axially of said retard roll to effect engagement of said brake, a second arm extending in correspondence with and pivotally mounted intermediate thereof on said first mentioned arm intermediate said retard rolls and the pivotal axis of said first mentioned arm and having the retard roll adjacent end thereof operative on said brake member to effect engagement of said brake, and adjustable spring means operative on the other end of said second arm for maintaining said brake engagement and adjusting the friction thereof.

6. In an automatic sheet feeding mechanism for

sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, two axially spaced constantly rotatable friction retard rolls disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said feed roll and retard rolls and mounted for movement toward and away from said feed roll and yieldably urged toward the same; two yieldable friction brakes connected with respective of said retard rolls for resisting rotation thereof and spaced longitudinally of said retard rolls and comprising friction brake members movable to effect engagement of respective of said brakes, and a connection between said brake members for maintaining said brakes in engagement.

7. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, two axially spaced constantly rotatable friction retard rolls disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said feed roll and retard rolls, a pivoted arm carrying said retard rolls for movement toward and away from said feed roll, spring means for yieldably urging said retard rolls toward said feed roll, two yieldable friction brakes carried with said arm and connected with respective of said rolls for resisting rotation thereof and spaced longitudinally thereof and comprising friction brake members movable longitudinally of said retard rolls to effect engagement of respective of said brakes, two additional arms pivotally mounted on said first mentioned arm for movement independently of each other and respectively operative on said brake members to effect engagement of said brakes, and a connection between said arms for maintaining said brake engagement.

8. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, two axially spaced constantly rotatable friction retard rolls disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said feed roll and retard rolls, an arm pivotally mounted in axial parallelism with said retard rolls and carrying said retard rolls for movement toward and away from said feed roll, a spring connected with said arm for yieldably urging said retard rolls toward said feed roll, two yieldable friction brakes carried with said arm and connected with respective of said retard rolls for resisting rotation thereof and spaced longitudinally and arranged adjacent respective thereof and comprising friction brake members oppositely movable longitudinally of said retard rolls to effect engagement of respective of said brakes, two additional arms extending in correspondence with and pivotally mounted intermediately thereof on said first mentioned arm intermediate said retard rolls and the pivotal axis of said first mentioned arm and having the retard roll adjacent ends thereof respectively oppositely operative on said brake members to effect engagement of said brakes with opposite movement of said second arms, and an adjustable spring connection between the other ends of said second arms for maintaining said brakes in engagement and adjusting the friction thereof.

9. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means for supporting and advancing a stack of sheets and comprising a stack support for supporting a stack of sheets on edge; a rotatable

driven friction feed roll arranged transversely of and above and in approximately tangential relation with the sheet supporting surface of said support and against which the sheet stack is facewise advanced; a constantly rotatable friction retard roll disposed below and similarly to and in opposing relation with said feed roll for the feeding of sheets from the stack under pressure between said rolls, and a yieldable brake device connected with said retard roll for resisting rotation thereof to an extent sufficient to cause slippage between superposed sheets between said rolls by stoppage of said retard roll and consequent temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said rolls.

10. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means for supporting and advancing a stack of sheets and comprising a stack support plate for supporting a stack of sheets on edge; a rotatable driven friction feed roll 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 friction retard roll disposed below and similarly to and in opposing relation with said feed roll for the feeding of sheets from the stack between said rolls, an arm arranged below said support plate and pivotally mounted thereon and carrying said retard roll for vertical movement toward and away from said feed roll, spring means operative between said support plate and arm for urging said retard roll upwardly toward said feed roll, and a yieldable friction brake device operative between said arm and retard roller and connected with said retard roll for resisting rotation thereof to an extent sufficient to cause slippage between superposed sheets between said rolls by stoppage of said retard roll and consequent temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said rolls.

11. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means for supporting and advancing a stack of sheets and comprising a stack support plate for supporting a stack of sheets on edge, two axially spaced rotatable driven friction feed rolls 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; two axially spaced constantly rotatable friction retard rolls disposed similarly to and in opposing relation with and below respective of said feed rolls for the feeding of sheets from the stack between said feed and retard rolls, an arm arranged below said support plate and pivotally mounted thereon on an axis disposed in parallelism with and horizontally spaced from said retard rolls and carrying the same for vertical movement toward and away from said feed rolls, spring means operative between said support plate and arm for urging said retard rolls toward said feed rolls, yieldable friction brake means carried with said arm and operative between said arm and retard rolls for resisting rotation of said retard rolls, and adjustable spring means carried with said arm for maintaining said brake means

in engagement and adjusting the friction thereof.

12. In an automatic sheet feeding mechanism for sequentially feeding sheets edgewise, the combination of a rotatable driven friction feed roll, a constantly rotatable friction retard roll disposed similarly to and in opposing relation with said feed roll for the feeding of sheets between said feed and retard rolls, a mounting carrying said retard roll for movement toward and away from said feed roll and for rocking movement of said retard roll transversely of said feed and retard rolls in the common axial plane thereof, spring means yieldably urging said retard roll toward said feed roll in pressure equalized relation longitudinally thereof, and yieldable brake means connected with said retard roll for resisting rotation therefor to an extent sufficient to cause slippage between superposed sheets between said feed and retard rolls by stoppage of said retard roll and consequent temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said feed and retard rolls.

13. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means for supporting and advancing a stack of sheets and comprising a stack support plate for supporting a stack of sheets on edge, a rotatable driven friction feed roll 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 friction retard roll disposed similarly to and in opposing relation with and below said feed roll for the feeding of sheets from the stack between said feed and retard rolls, an arm arranged below said support plate and mounted thereon for pivotal movement on an axis disposed in parallelism with and horizontally spaced from said retard roll and for rocking movement transversely of said feed and retard rolls in the common axial plane thereof and carrying said retard roll for vertical movement toward and away from said feed roll and for said rocking movement, spring means operative on said arm for yieldably urging said retard roll toward said feed roll in pressure equalized relation longitudinally thereof, and yieldable brake means connected with said retard roll for resisting rotation thereof to an extent sufficient to cause slippage between superposed sheets between said feed and retard rolls by stoppage of said retard roll and consequent temporary stoppage of the sheet contacting said retard roll while the sheet contacting said feed roll is fed and permitting rotation of said retard roll when a single sheet is being fed between said feed and retard rolls.

14. In an automatic sheet feeding mechanism, the combination of stack supporting and advancing means for supporting and advancing a stack of sheets and comprising a stack support plate for supporting a stack of sheets on edge, two axially spaced rotatable driven friction feed rolls 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, two axially spaced constantly rotatable friction retard rolls disposed similarly to and in opposing relation with and below respective of said feed rolls for the feeding of sheets from the stack between said feed and retard rolls, a shaft

below said support plate and mounted thereon and disposed in parallelism with and horizontally spaced from said retard rolls, an arm arranged below said support plate and carrying said retard rolls and provided with a vertical slot formation horizontally spaced from said retard rolls and movably engaging said shaft and confining said arm horizontally and permitting vertical movement of said arm and said arm being provided with a bearing element horizontally spaced from said retard rolls and disposed in the region of said slot formation and intermediate said retard rolls longitudinally of the axis thereof and upwardly engageable against said support plate to provide a bearing whereby said arm and retard rolls are pivotally movable on an axis disposed in parallelism with and horizontally spaced from said retard rolls and whereby said arm and retard rolls are rockably movable transversely of said feed and retard rolls in the common axial plane thereof, two torsion springs spaced respectively on opposite sides of said bearing element longitudinally of the pivotal axis of said arm and engaged about said shaft and having their opposite terminal portions engaged upwardly against said support plate and upwardly against said arm to maintain engagement of said bearing element upwardly against said support plate and to urge said retard rolls upwardly toward said feed rolls in pressure equalized relation longitudinally thereof, and yieldable brake means carried with said arm and connected with said retard rolls for resisting rotation thereof to an extent sufficient to cause slippage between superposed sheets between said feed and retard rolls by stoppage of said retard rolls and consequent temporary stoppage of the sheet contacting said retard rolls while the sheet contacting said feed rolls is fed and permitting rotation of said retard rolls when a single sheet is being fed between said feed and retard rolls.

15. In an automatic sheet feeding mechanism for use on a sheet handling machine provided with a horizontal driven rotatable sheet feed drum and a rotatable driving gear disposed similarly to said 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 above said support plate on an axis inwardly adjacent one end of said support plate and against which said sheet stack is facewise advanced, a rotatable drum engaging 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 with said end thereof in adjacent tangential sheet feeding relation with the upper portion of said feed drum, a rotatable driven gear carried with said support plate on an axis above and inwardly adjacent said end thereof and connected with said feed roll for driving the same and projecting below said support plate for downward engagement in proper mesh with said driving gear when said drum engaging roller is engaged with said drum and said support plate is positioned as aforesaid, and positioning means for positioning said support plate as aforesaid on said sheet handling machine with said drum engaging roller engaged downwardly on said feed drum and with said driven gear downwardly engaged in mesh with said driving gear and adapted to permit vertical movement of said support plate whereby

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weight of said support plate and the mechanism carried therewith presses said drum engaging roller downwardly on said drum.

16. In an automatic sheet feeding mechanism for use on a sheet handling machine provided with a horizontal rotatable sheet feed drum and a rotatable driving gear disposed concentric to said 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 above said support plate on an axis inwardly adjacent one end of said support plate and against which said sheet stack is facewise advanced, a rotatable drum engaging roller carried with said support plate and disposed concentric to said feed roll and having a greater diameter than that of said feed roll 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, a rotatable driven gear carried with said support plate and disposed concentric with said feed roll and connected therewith for driving the same and having a greater diameter than that of said feed roll and projecting below said support plate for downward engagement in proper mesh with said driving gear when said drum engaging roller is engaged with said drum and said support plate is positioned as aforesaid, and positioning means for positioning said support plate as aforesaid on said sheet handling machine and comprising a pivot disposed horizontally and radially remote from said driven gear and drum engaging roller and permitting vertical movement of said support plate whereby weight of said support plate and the mechanism carried therewith presses said drum engaging roller downwardly on said drum.

17. In an automatic sheet feeding mechanism for use on a sheet handling machine provided with a horizontal rotatable sheet feed drum and a rotatable driving gear adjacent and disposed concentric to said drum and fixed therewith and having its pitch diameter the same as the diameter of said drum, the combination of sheet stack supporting and advancing means comprising a

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support plate for supporting a stack of sheets on edge, a rotatable feed roll carried with and arranged transversely of and above said support plate on an axis inwardly adjacent one end of said support plate and against which said sheet stack is facewise advanced, a rotatable drum engaging roller carried with said support plate and disposed concentric to said feed roll and having a greater diameter than that of said feed roll 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, a rotatable driven gear carried with said support plate and disposed concentric with said feed roll and connected therewith for driving the same and having its pitch diameter the same as the diameter of said drum engaging roller and disposed adjacent thereto and projecting below said support plate for downward engagement in proper mesh with said driving gear when said drum engaging roller is engaged with said drum and said support plate is positioned as aforesaid, and positioning means for positioning said support plate as aforesaid on said sheet handling machine and comprising a pivot disposed horizontally and radially remote from said driven gear and drum engaging roller and permitting vertical movement of said support plate whereby weight of said support and the mechanism carried therewith presses said drum engaging roller downwardly on said drum.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
584,073	Dexter	June 8, 1897
2,089,946	Davidson	Aug. 17, 1937
2,214,752	Pierce	Sept. 17, 1940
2,224,137	Breman et al.	Dec. 10, 1940
2,224,138	Trydal	Dec. 10, 1940
2,351,854	Hall	June 20, 1944

FOREIGN PATENTS

Number	Country	Date
380,443	Germany	Sept. 7, 1923