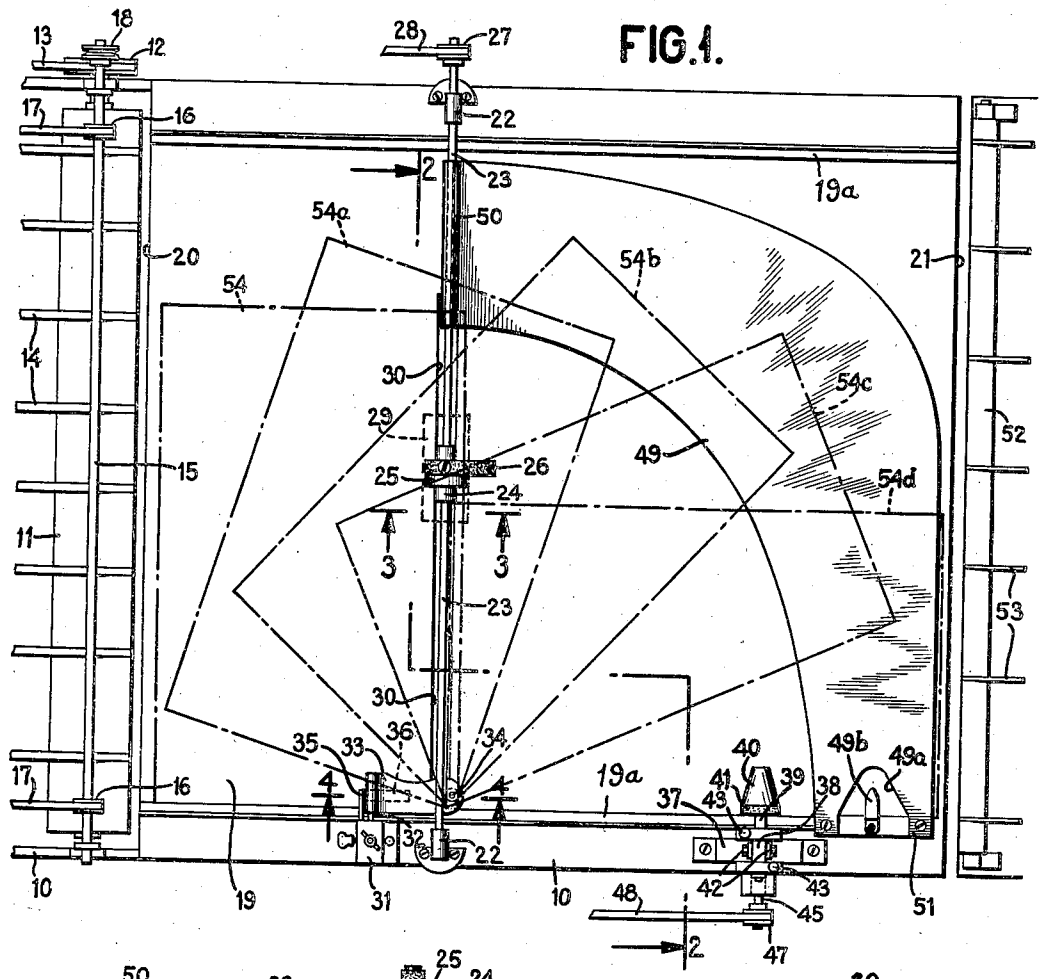
May 27, 1941. R. F. FINSTER 2,243,557

DEVICE FOR HANDLING SHEET MATERIAL

Filed Dec. 11, 1939

FIG. 1.



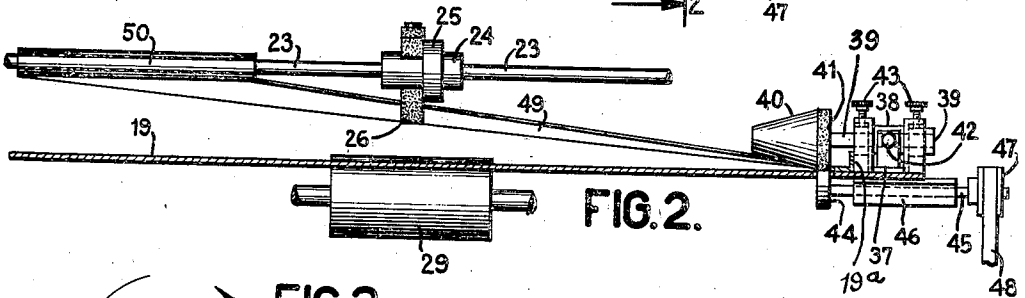
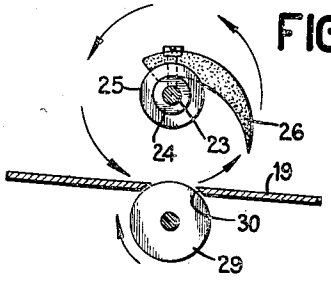


FIG. 2.

FIG. 3.



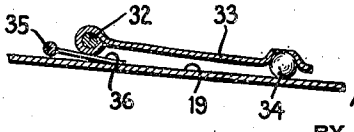


FIG. 4.

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DEVICE FOR HANDLING SHEET MATERIAL

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Application December 11, 1939, Serial No. 308,566

10 Claims. (Cl. 271—52)

This invention relates to devices for handling light sheet material, such as paper, and more particularly for rotating a sheet of such material in its own plane in the course of its advance through a machine.

While the invention is of broad application to a wide variety of machines, it is especially suited for use in connection with ruling machines for the cross-ruling of sheets of paper, otherwise commonly referred to as two-way ruling. Heretofore it has been the common practice in cross-ruling paper to adopt either of two expedients. In the first, the paper is simply fed twice through the same machine, the pile of sheets being turned by hand through 90° before the second passage. The second expedient involves the use of an L-type machine which is equivalent to two ruling machines disposed at 90° with respect to each other. It will be apparent that the first expedient requires an excessive amount of time, more than twice the time required for a single ruling operation. The second expedient requires expensive equipment which occupies a considerable amount of floor space.

In accordance with the present invention, a plurality of ruling devices may be placed in line in a single machine and devices for rotating each sheet of paper through an appropriate angle, say 90°, after passing through the first ruling device and before entering the second, may be provided.

An object of the invention has been to devise simple and efficient means, which will always be reliable in action, for rotating individual sheets of paper or the like in the plane of the sheets through any appropriate angle, such as 90°.

Other objects and advantages of the invention will appear from a detailed description of an illustrative form of the same, which will now be given in conjunction with the accompanying drawing, in which:

Fig. 1 is a plan view of the improved sheet-rotating means in association with sheet feeding devices forming part of a ruling machine.

Fig. 2 is a detail in vertical section along the line 2—2 of Fig. 1.

Fig. 3 is a detail in vertical section along the line 3—3 of Fig. 1, and

Fig. 4 is a detail in vertical section along the line 4—4 of Fig. 1.

Referring now to the drawing, the machine comprises a supporting frame 10. Suitably journaled in this frame is a roller 11 which carries at one end a pulley 12 arranged to be operated by a belt 13 connected with a suitable power source associated with the ruling machine, or the like, to which the invention is applied. A series of tapes 14 serves to support and convey successive sheets of paper, or similar material to be handled, which are transferred one by one to the tapes from a pile by means of any well known mechanism (not shown). It will be understood that in the application of the invention to a ruling machine, the successive sheets of paper will be carried by the tapes 14 beneath a number of ruling pens or disks which will apply to the surface of the sheets a desired series of lines extending in one direction. Moreover, it will be understood that after the lines have been ruled upon a sheet, the latter is carried by the tapes 14 through a path which is sufficiently long to insure substantial drying of the ink before the sheet reaches the roller 11. While we have indicated that the roller 11 is driven, this may, if desired, simply be an idler roll and the tapes 14 may be driven at some other point in their travel.

Above the roller 11 there is mounted, in suitable bearings in the frame 10, a shaft 15 carrying a plurality of pulleys 16 adapted to support and drive a series of tapes 17. At one end of the shaft 15 there is mounted a pulley 18 which is connected by a belt (not shown) with the power or driving means of the machine. The tapes 17 are driven at the same linear speed as the tapes 14 and are arranged to engage the upper surface of the successive sheets carried by the tapes 14 and thus retain the sheets on the supporting tapes and insure their proper advance. While only two pulleys 16 and tapes 17 have been shown, a greater number may be employed, if desired, or these pulleys and tapes may be made adjustable transversely of the machine to enable them to be brought into cooperation with sheets of different widths.

An inclined table 19, formed of wood or metal or the like and having a smooth upper surface and guides 19a at one or both of its edges, is arranged to receive the sheets as they are discharged from the supporting tapes 14. The inclination of the table 19, downwardly from its left end 20 toward its right end 21 (Fig. 1), is best shown in Fig. 4. It is preferably sufficient to cause gravity to assist substantially in the movement of the sheets along the surface of the table. In suitable bearings 22, carried by the frame 10 of the machine, a shaft 23 is mounted some distance above the surface of the table 19 and parallel therewith. Intermediate the bearings 22 there is mounted on the shaft a sleeve 24 having a collar or hub 25 integral therewith or otherwise secured thereto. The sleeve 24 and hub

25 are preferably adjustable axially of the shaft 23 but are arranged to be driven by said shaft. A flexible arm or fin 26, formed preferably of rubber or the like and converging toward its outer end, is secured to the sleeve 24 at the hub 25. At one end the shaft 23 is extended beyond the bearing 22 and carries a pulley 27 connected by a belt or rope 28 with the power means which operates the machine. Directly beneath the shaft 23 there is mounted in suitable bearings carried by the frame 10, or by the table 19, an idler roller 29 which extends through an opening 30 in the table and projects a slight distance above the top surface of the table. The roller 29 is of sufficient width to cooperate with the fin 26 in any position of adjustment of the latter, or it may be narrower and made adjustable with the fin. As will be seen from Fig. 4, the fin 26, upon each revolution of the shaft 23, presses the sheet material against the top of the roller 29 as the end of the fin passes through the lower portion of its path and thus imparts a flipping movement to the engaged portion of the sheet.

A bracket 31, carried by the frame 10 of the machine, supports a horizontally extending pin 32 which pivotally carries a plate 33. Adjacent the free end of the plate 33 it is provided with a recess or pocket adapted to receive and retain a ball 34. The ball 34 rests by its own weight upon the upper surface of the table 19. A pin 35, also extending from the bracket 31, carries a small metal finger 36, which is arranged to pivot freely and has its end resting upon the table 19 or a sheet carried thereby.

Another bracket 37, carried by the frame 10, is adapted to support a bearing sleeve 38 in which is journaled a stub shaft 39 carrying a conical member 40. Adjacent the base of the conical member there is provided a narrow band 41 of rubber or other yielding material having good friction qualities. The bearing sleeve 38 is preferably mounted adjustably on the support. It is held between two horizontally adjustable set-screws 42 which form a fulcrum about which it may be rocked in a vertical plane by means of a pair of screws 43. The adjustments of the member 40, made possible in this way, enable the handling of sheets of different sizes and thicknesses. Beneath the member 40 and in the plane of the friction band 41 there is provided a friction wheel 44 which extends through an aperture in the table 19 into engagement, or substantial engagement, with the band 41. The wheel 44 is carried by a shaft 45 mounted in a bearing 46 secured to the frame 10. At its outer end the shaft 45 carries a pulley 47 connected by a belt 48 with the power means.

Above the table 19 there is provided a thin-metal guard member 49 which has its end 50 curled around the shaft 23 and its opposite end 51 secured to the frame 10. The member 49 is of angular or elbow formation, as shown, and is arranged to form a converging passage or pocket with the top of the table. Its purpose is to insure that the sheets of paper, or the like, will be held flat against the table. It prevents the creation of air currents, which would tend to disturb the desired movement of the sheet material in a plane. It may be cut away slightly, as indicated at 49*a*, adjacent the end 51 and may be provided at this point with a light spring finger 49*b* adapted to lightly engage the sheet and prevent rebound as the sheet hits the side guide.

A roller 52, and a series of supporting ropes or tapes 53, which are driven in any convenient manner, are arranged to receive the sheet material from the table 19 and convey it to the desired point. In the application of the invention to a cross-ruling machine, the belts 53 will convey the sheets to another set of ruling pens or disks (not shown) for the cross-ruling of the sheets which have previously been ruled in one direction.

The operation of the sheet-rotating devices will now be briefly explained. A sheet, 54, of paper or similar material is delivered by the tapes 14 and 17 to the table 19 and the sheet is carried by momentum and by gravity, due to the inclination of the table, to the position indicated at 54 in Fig. 1. At this time, one of the forward corners of the sheet will have engaged the ball 34 and will have become wedged beneath this ball. The finger 36 will have previously engaged the sheet to retain it lightly against the top of the table and cause its forward edge to strike the ball correctly. As the corner of the sheet becomes wedged beneath the ball 34, it is arrested but the momentum of other portions of the sheet tends to rotate the latter about the ball 34 into the position designated 54*a* in Fig. 1. Continued movement of the sheet, due to its momentum and due to the action of gravity, is preferably supplemented by the flipping action of the fin 26, which imparts a further turning movement about the ball 34. Thus, the sheet is carried successively through the positions indicated at 54*b* and 54*c* into the final position 54*d*, which may be, for example, at 90° with respect to its original position. During this movement of the sheet the guard member 49 serves to prevent the creation of air currents, as previously explained, and causes the sheet to remain relatively flat against the top of the table 19. As the sheet approaches the position designated 54*d*, its edge is carried beneath the conical member 40 and is finally wedged between the friction band 41 of this member and the friction wheel 44. As the latter is being constantly rotated, the sheet will then be positively advanced in the same direction as it was originally being advanced by the tapes 14 and 17 and is very readily removed in this way from beneath the ball 34 and is delivered to the tapes 53 for further conveyance to any desired point as to the cross-ruling pens or disks.

It will be understood that the sheet 54 might, if desired, be rotated through more or less than 90°. The conical member 40 need simply be disposed at the appropriate point to receive the edge of the sheet after it has been rotated through the desired angle. The direction of feed imparted to the sheet by the conical member 40 and the tapes 53 may also be varied, if desired. These devices might, for example, be adapted to receive and advance the sheet longitudinally from the position indicated at 54*c* in Fig. 1. If desired, an appropriate guide may be provided adjacent the side frame 10 to cooperate with the edge of the sheet as it advances along the table top.

While an illustrative form of the invention has been described in considerable detail, it will be understood that numerous changes may be made without departing from the general principles and scope of the invention. The terms and expressions employed herein have been used as terms of description and not of limitation.

What I claim is:

1. In apparatus of the class described means

for rotating sheet material in its own plane which comprises a stationary support, means for advancing a sheet of material onto and along said support, means associated with said support arranged to engage and arrest an advancing corner of said sheet, means for engaging said sheet at a point removed from said corner and imparting a sudden, more rapid movement thereto at said point thereby causing the sheet to pivot about said corner, and means arranged to engage said sheet and advance the same along said support after it has been rotated through the desired angle.

2. In apparatus of the class described means for rotating sheet material in its own plane which comprises a support, means for advancing a sheet of material onto said support, means arranged to engage and arrest an advancing corner of said sheet, means for engaging said sheet at a point removed from said corner and causing the sheet to pivot about said corner, means arranged to engage said sheet and advance the same after it has been rotated through the desired angle, and a guard over said support extending over a substantial portion of the turning arc and forming a passage with said support converging toward said last-mentioned means and through which a portion of said sheet sweeps as the sheet is rotated, said guard being constructed and arranged substantially to prevent the lifting effect of air currents upon rotation of the sheet.

3. In apparatus of the class described means for rotating sheet material in its own plane which comprises a stationary support, means for advancing a sheet of material onto and along said support, a ball urged toward said support in the path of an advancing corner of said sheet and arranged to hold said corner stationary, and means for engaging said sheet at a point removed from said ball for imparting rotation thereto at an increased rate about said ball as a pivot.

4. In apparatus of the class described means for rotating sheet material in its own plane which comprises a stationary support, means for advancing a sheet of material onto and along said support, means arranged to engage and arrest an advancing corner of said sheet, and means for momentarily engaging said sheet at a point removed from said corner for imparting movement thereto at an increased rate at said point and relative to said support.

5. In apparatus of the class described means for rotating sheet material in its own plane which comprises a stationary support, means for advancing a sheet of material onto and along said support, means for arresting the advance along said support of one point on said sheet, and means for momentarily engaging and imparting a flip to said sheet at another point.

6. In a machine of the class described a plurality of spaced means for advancing a sheet of material in one direction, a stationary support intermediate said spaced means, means associated with said support for rotating said sheet in its own plane through a predetermined angle, and means above said support forming a converging pocket with relation thereto for maintaining the sheet thereon as it is being rotated.

7. In apparatus of the class described a stationary support inclined at a small angle to the horizontal, means for advancing a sheet of material onto said support adjacent its upper end, means arranged to engage and arrest an advancing corner of said sheet, the momentum of said sheet and the action of gravity due to the inclination of said support inducing pivotal movement of the sheet about said corner, and means for advancing the sheet along said support after it has been rotated through a predetermined angle.

8. In apparatus of the class described a support inclined at a small angle to the horizontal, means for advancing a sheet of material onto and along said support adjacent its upper end, means arranged to engage and arrest an advancing corner of said sheet, the momentum of said sheet and the action of gravity due to the inclination of said support inducing pivotal movement of the sheet about said corner, and means including a conical feed member for advancing the sheet bodily after it has been rotated through a predetermined angle.

9. In apparatus of the class described means for rotating sheet material in its own plane which comprises a support, means for advancing a sheet of material onto said support, means arranged to engage and arrest an advancing corner of said sheet, means including a revolving flexible fin for engaging said sheet at a point removed from said corner and causing the sheet to pivot about said corner, and means arranged to engage said sheet and advance the same after it has been rotated through the desired angle.

10. In apparatus of the class described means for rotating sheet material in its own plane which comprises a support, means for advancing a sheet of material onto said support, means arranged to engage and arrest an advancing corner of said sheet, means including a roller beneath said support and a revolving flexible fin for engaging said sheet and forcing it against said roller at a point removed from said corner and causing the sheet to pivot about said corner, and means arranged to engage said sheet and advance the same after it has been rotated through the desired angle.

ROBERT F. FINSTER.