Feb. 13, 1940. W. W. DAVIDSON, JR 2,190,417

FOLDING MACHINE

Filed July 5, 1938 5 Sheets-Sheet 1

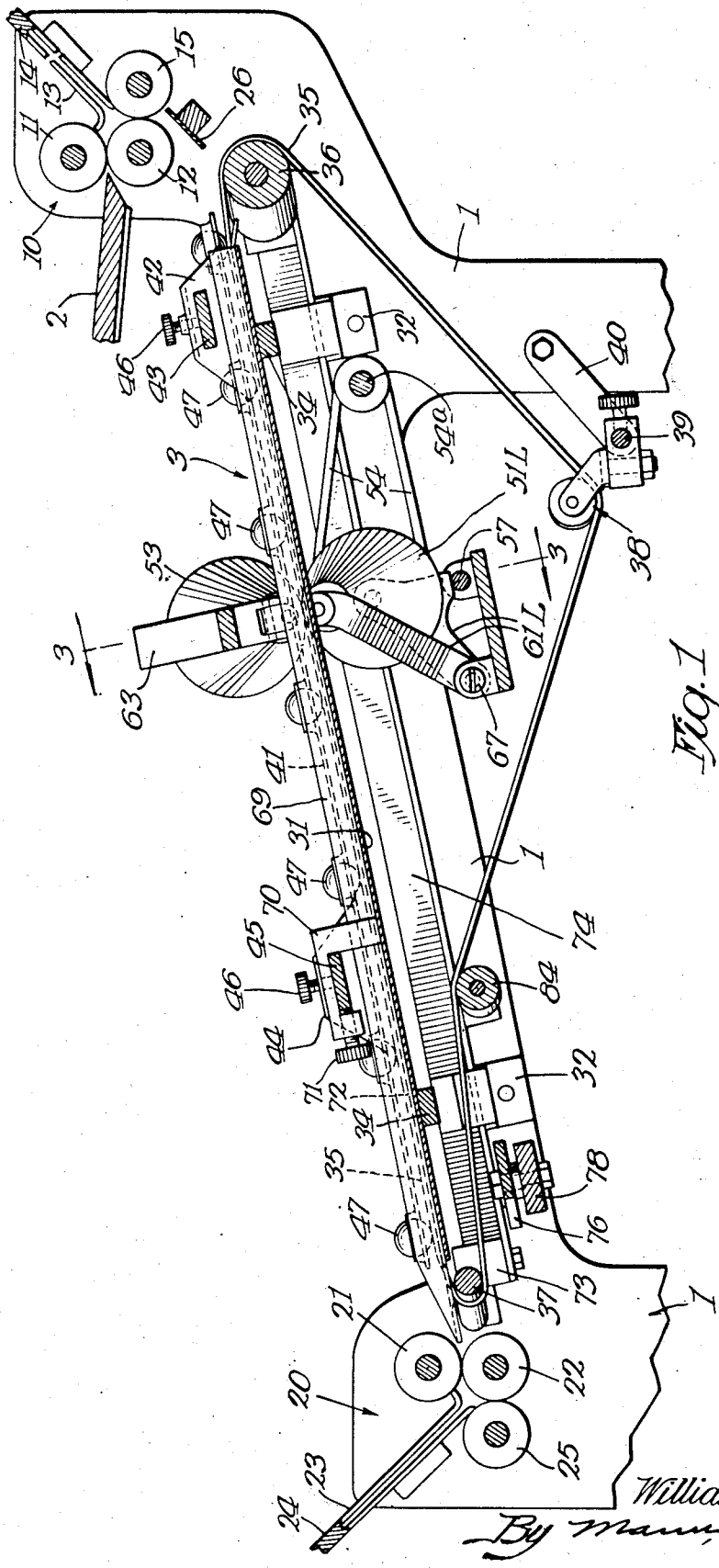


Fig. 1

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FOLDING MACHINE

Filed July 5, 1938 5 Sheets-Sheet 2

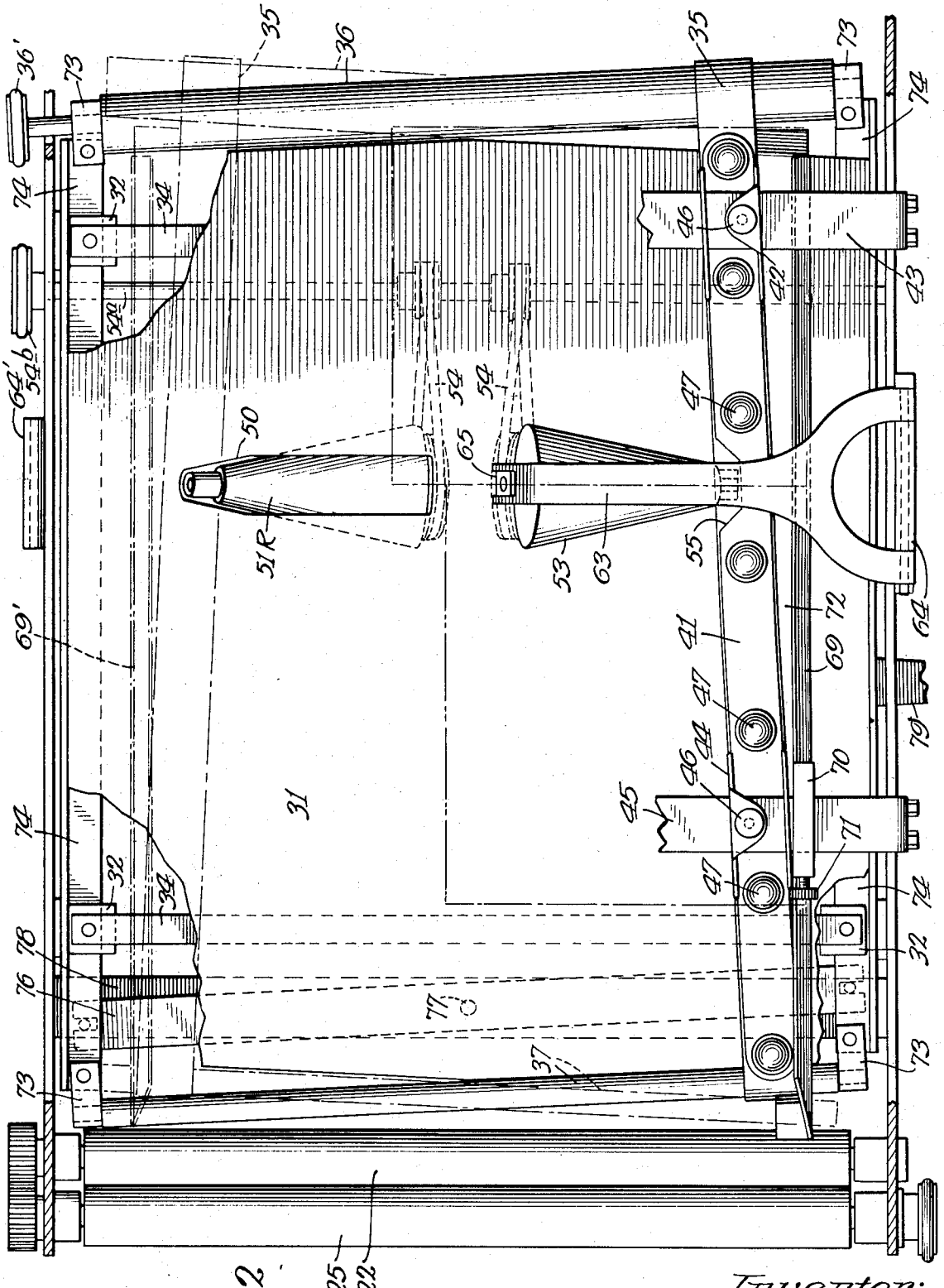


Fig. 2.

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FOLDING MACHINE

Filed July 5, 1938 5 Sheets-Sheet 3

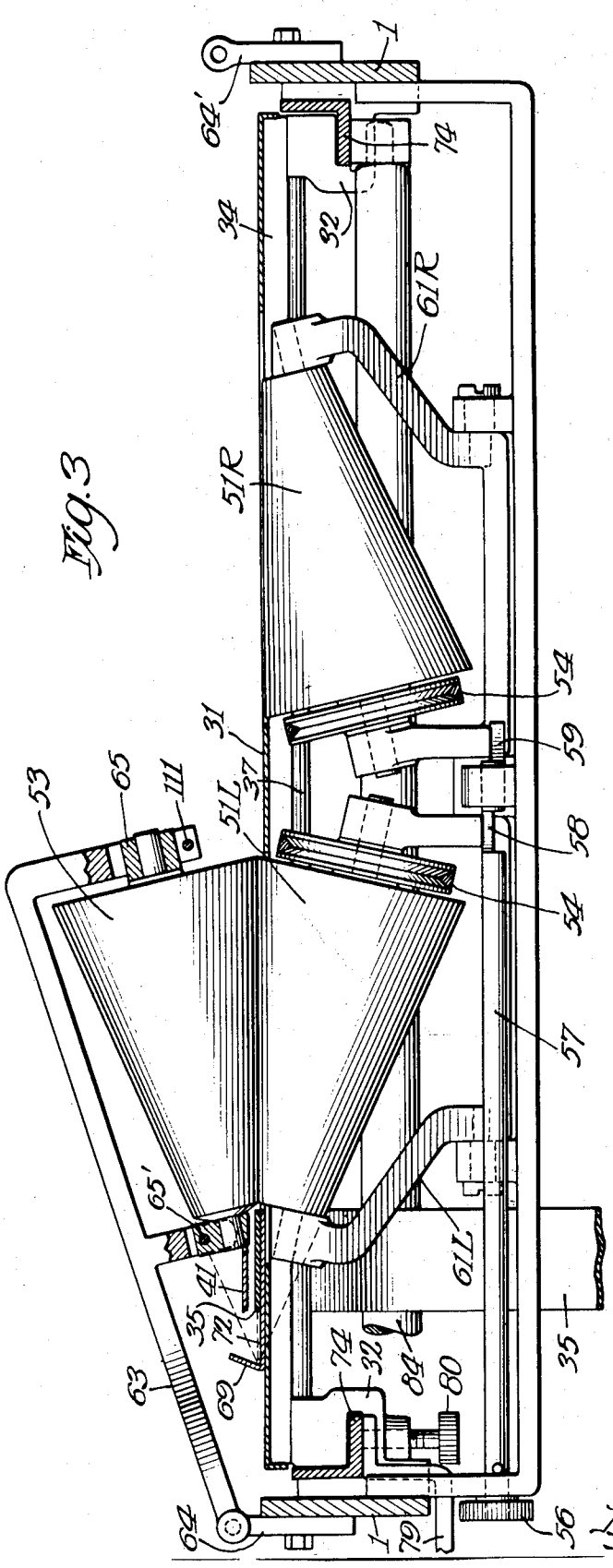


Fig. 3

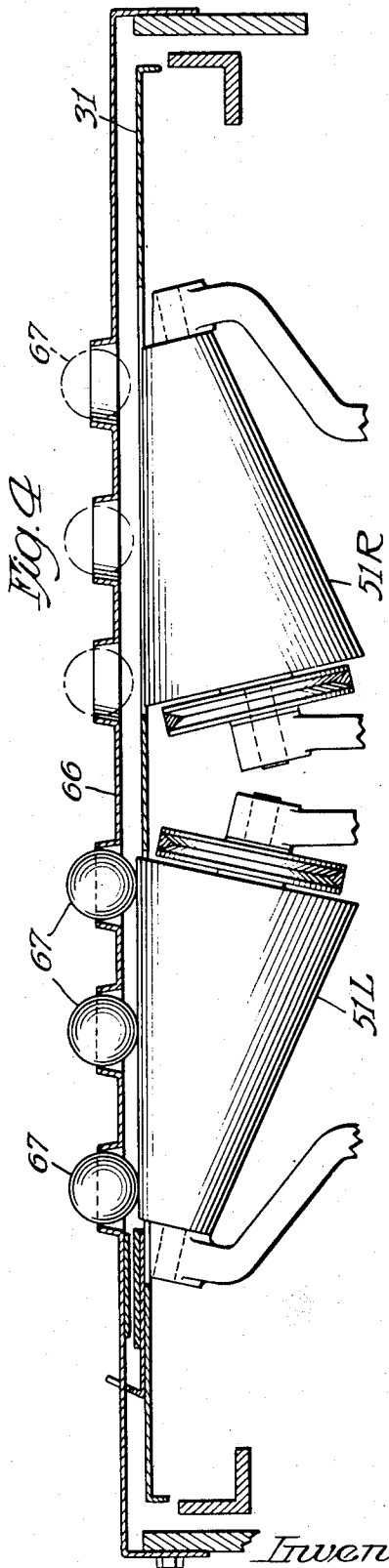


Fig. 4

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FOLDING MACHINE

Filed July 5, 1938 5 Sheets-Sheet 4

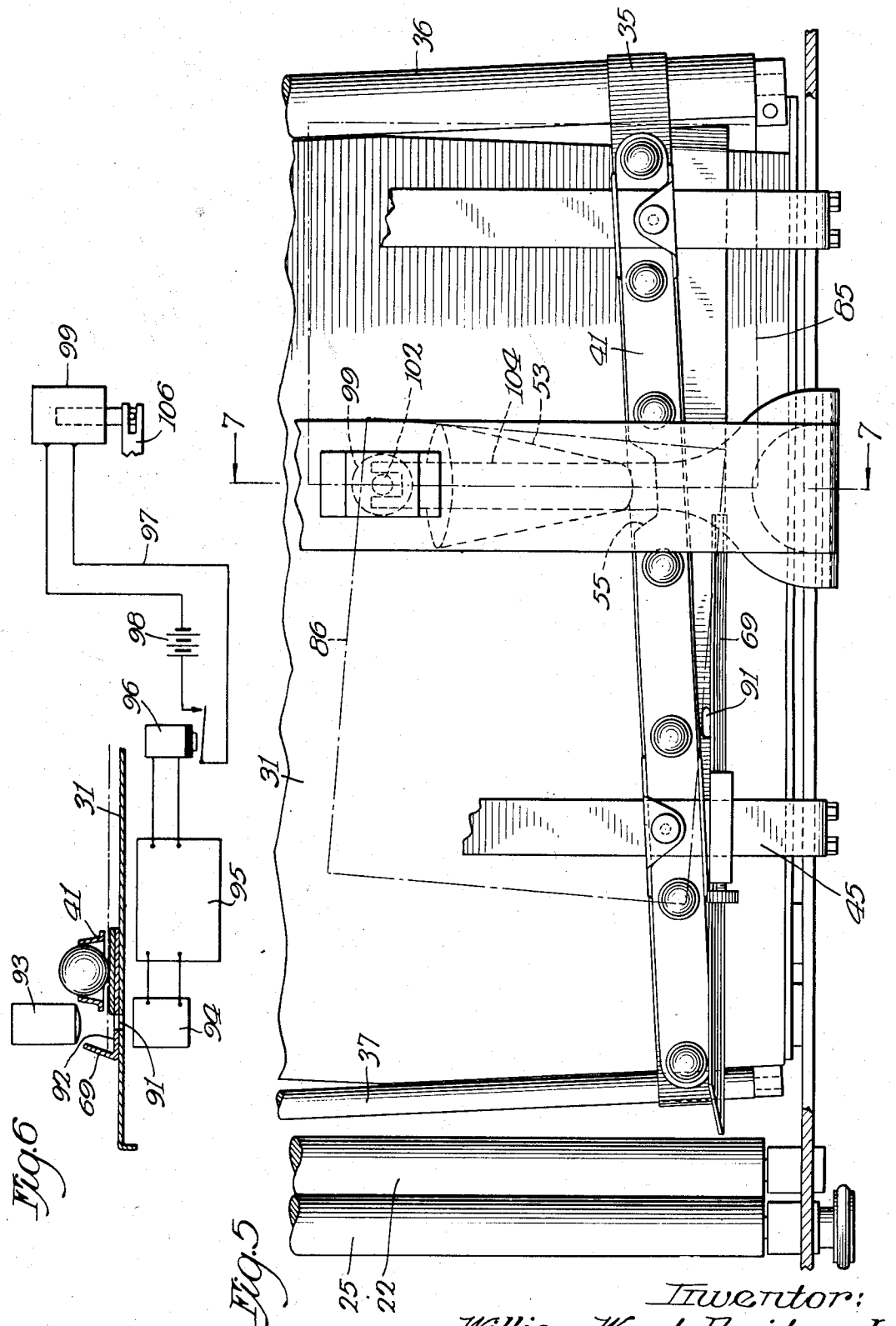


Fig. 6

Fig. 5

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FOLDING MACHINE

Filed July 5, 1938 5 Sheets-Sheet 5

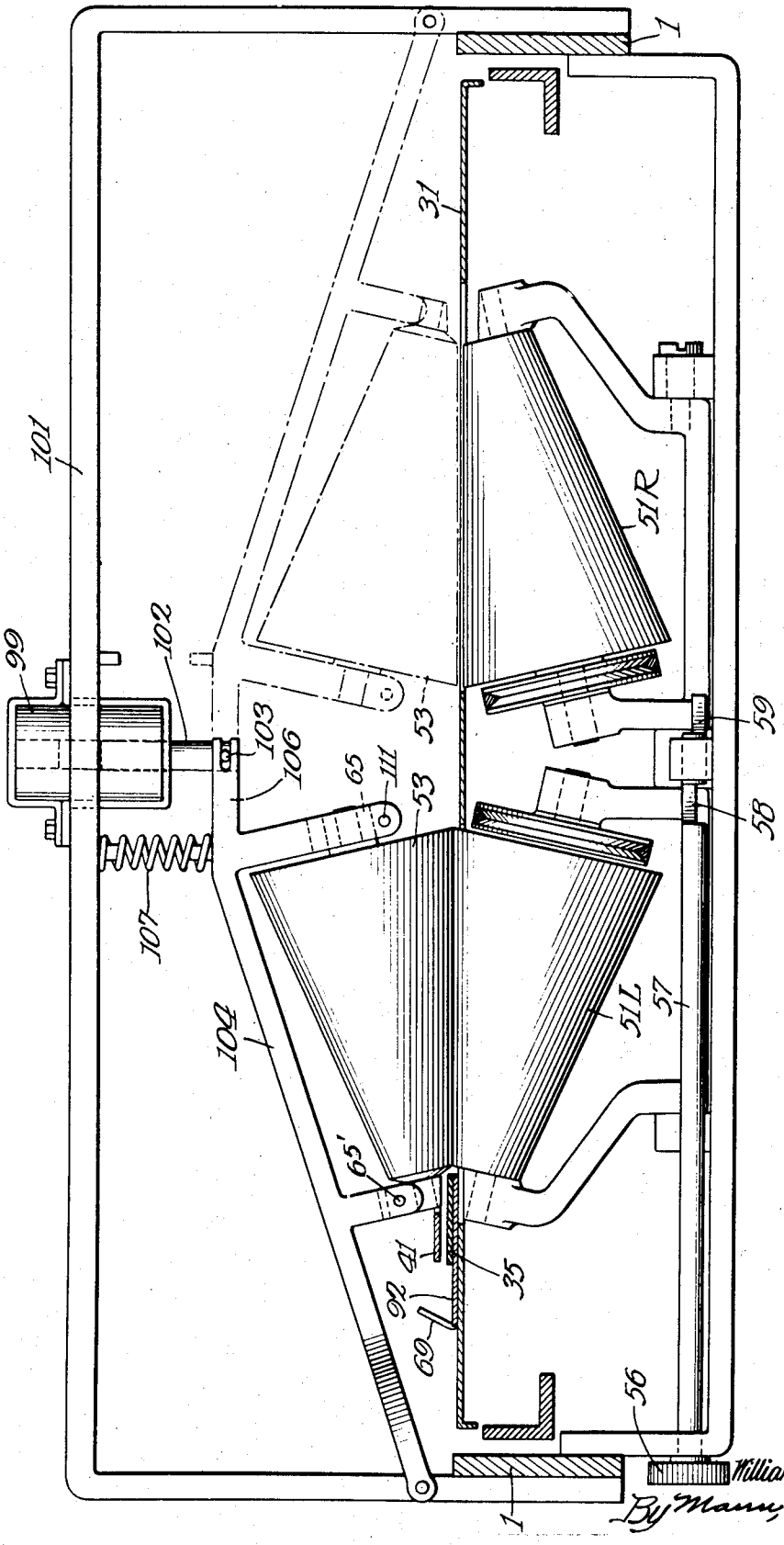


Fig. 7

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Patented Feb. 13, 1940 2,190,417

UNITED STATES PATENT OFFICE

2,190,417

FOLDING MACHINE

William Ward Davidson, Jr., Niles Center, Ill., assignor to Davidson Manufacturing Corporation, a corporation of Illinois

Application July 5, 1938, Serial No. 217,423

21 Claims. (Cl. 271—52)

Commercial folding machines for folding printed sheets into pamphlets or book sections have been very complicated and expensive. When a single sheet is folded into a form having a large number of pages, some folds must be in one direction and some in another. Commercial folding machines have therefore usually required successive feeding tables extending at right angles to one another so as to present the sheet to the folding units in the proper successive directions. Such a machine had relatively little adaptability unless it had so many alternative units that many of its units were idle most of the time. A greatly simplified folding machine which has recently been perfected makes use of one or more special conveying and turning tables located between the folding units so that the sheets could be turned or not or turned in either direction as required for a given job. With three such conveying and turning tables and a suitable number of folding units a very large variety of folding procedures can be followed. The result is that a very simple machine will perform a variety of functions which otherwise would require an extremely complicated and expensive machine.

The conveying and turning table of this simplified folding machine works on the principle of carrying the sheet forward against a stop which engages one corner thereof so that as the conveyor urges the sheet forwardly it is rotated by the conveyor around the stop, thus turning approximately a quarter turn, and the sheet being brought to registry with its desired final position by being urged against a guide plate at the side. There have been various other proposals for turning sheets between folding units. One such proposal has contemplated the use of a pair of conical rolls which would rotate the sheet as it is conveyed between them. A pair of conical rolls is a very positive turning device, and a very satisfactory folding machine can therefore be built with such a device as the turning unit therein if proper use is made of its potentialities, and if the defects of prior proposals for conical roll turners are overcome. An object of the present invention is therefore to provide a folding machine including a satisfactory conveying and turning unit which utilizes the positive turning principle of conical rolls.

Another object of the invention is to provide a conveying and turning unit which utilizes the principle of conical rolls but which is free from the defects which have made such turning units unsatisfactory or inoperative heretofore.

Additional objects and advantages of the invention will be apparent from the following description and from the drawings, in which:

Fig. 1 is a fragmentary longitudinal sectional view of one form of folding machine chosen for illustration of this invention.

Fig. 2 is a plan view of the structure shown in Fig. 1.

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

Fig. 4 is a view similar to Fig. 3 but showing a modified form of the invention in which marbles are substituted for the pressure roll of Fig. 3.

Fig. 5 is a fragmentary plan view showing another modified form of the invention in which the pressure roll is automatically released as the paper approaches its turned position.

Fig. 6 is a largely diagrammatic view showing the control circuit for Fig. 5 whereby the pressure roll is controlled by a photo-electric cell.

Fig. 7 is a transverse sectional view taken on the line 7—7 of Fig. 5.

Preferred embodiments of the invention have been shown in the drawings and will hereinafter be described all as required by section 4888 of the Revised Statutes, but the appended claims are not to be limited by the specific disclosure except as required by the prior art.

The general assembly contemplated for all forms can be understood best by reference to Fig. 1. The frame 1 carries a feeding unit represented by the table 2 which feeds a sheet of paper to folding unit 10 from which it is passed to a conveying and turning unit 3 which feeds the sheet to a second folding unit 20. The folding unit 10 includes rolls 11 and 12 which carry the sheet into a buckle chute 13 wherein it strikes an adjustable stop 14 which causes the sheet to buckle so that the buckled portion of the sheet is caught between folding rolls 12 and 15. Although additional folding units may be provided at this point, the illustrated form of the invention provides the next folding unit 20 at a remote point beyond the conveying and turning table 3, which is the heart of this invention. It may be noted that the folding unit 20 includes folding rolls 21, 22 and 25 corresponding to rolls 11, 12 and 15, and also a buckle chute 23 with an adjustable stop 24. It may also be noted that as the sheet leaves the rolls 12 and 15 it is normally directed toward the conveying table by means of a deflector 26 which may be turned if desired to eject the sheet from the machine at this point if there is to be only one fold instead of directing it onto the conveying and turning table. The conveying and turning unit 3 includes the table top 31 which may be supported

from the frame 1 in any suitable manner as by brackets 32 and cross bars 34. A feed belt 35 slides over table top 31, being driven by roll 36, which is driven by a drive belt 36'. The belt 35 passes around an idler roll 37 at its lower end and may be tightened and positioned laterally of the table by a tightener and guide 38, which may be adjustable on a rod 39 extending transversely of the table and carried by pivoted or adjustably secured links 40. The tightener 38 is preferably in the form of a swivelly mounted roll as shown.

The folded sheet is passed onto the belt or tape 35 from the deflector 26 and is carried under a traction plate 41 which may be positioned in any suitable means as by brackets 42 and 44 slidable on transverse bars 43 and 45. This traction plate 41 could be in two separate parts on opposite sides of the conical rolls but has been shown in one piece which is easily alined over the belt 35 by securing it in one position by screws 46. The traction plate 41 may be provided with any suitable means such as the marbles 47 for pressing the sheet against the belt 35 with relatively little restraining friction so as to insure the proper movement of the sheet by the belt.

Positioned at an intermediate position along the length of the table top 31 and positioned to extend upwardly through holes 50 therein are two conical rolls 51L and 51R, being respectively left and right hand turning rolls. As seen in Fig. 3, the left hand turning roll 51L is positioned a little higher than the right-hand turning roll 51R and is fitted with a pressure roll 53 so that it will be operative to act upon the sheet passing thereover while the roll 51R would be idle. Both of rolls 51L and 51R may be driven constantly by belts 54 which are driven by pulleys on a shaft 54a which may be driven by a belt 54b. The roll 51L operates to rotate the sheet in a left-hand or counterclockwise direction while the roll 51R would operate to rotate it in a right-hand or clockwise direction. The holes 50 are shaped fairly closely to the rolls so the sheets will not catch on the edges of the holes. The various conical rolls have the small ends of the cones omitted since the portions shown give adequate traction with the sheet, and since this omission leaves a passage for belt 35 and traction plate 41 at the most desirable place for these members, namely near the edge of the sheet. The plate 41 is notched at 55 to pass around the journal of roll 53.

Reversed turn

When additional folds are to be made subsequent to the fold made at the unit 20, the direction in which the sheet is turned on the turning and conveying table 3 makes a great deal of difference. Turning it to the left by the roll 51L is essential for some folding operations, while turning it to the right by roll 51R is essential for other folding operations. The provision of satisfactory means for turning the sheet in either direction is therefore an important part of this invention. Part of the alternative folding arrangement is found in the provision for rendering either roll 51L or roll 51R effective.

The vertical positions of the rolls 51L and 51R are controlled by a knob 56 which operates a shaft 57 having angularly separated and overlapping recesses to form cranks 58 and 59 thereon. The rolls 51L and 51R are carried respectively by pivoted frames 61L and 61R, which are pivoted by turning the shaft 57, as may be seen more clearly in Fig. 1. As seen in Fig. 3, when the crank 59 is lowermost, this permits the frame 61R carrying roll 51R to drop below the level of the table top 31 while roll 51L is held above the level of this table top. If the knob 56 were turned half a revolution, the crank 58 would be lowermost with the result that the vertical positions of the two rolls 51L and 51R would be reversed. By turning knob 56 to an intermediate position both rolls would preferably be lowered to permit a sheet to pass over them without being turned, the cranks 58 and 59 being located in adjacent quadrants of the shaft 57. The frames 61L and 61R are pivoted on pins 62 which are so located that the line of engagement of each roll with a sheet is horizontal when the roll is in its upper position so that the roll will engage the sheet evenly.

It is of course desirable that the active roll 51L or 51R engage the sheet quite firmly. It is for this reason that the pressure roll 53 is provided. This roll is journaled in a frame 63 which is pivoted to a bracket 64 so that it is urged by gravity toward the roll 51L. If the knob 56 were turned to raise the roll 51R and drop the roll 51L, the pressure roll 53 with its frame 63 would be removed from bracket 64 and shifted over to the right to the bracket 64' so as to co-act with the roll 51R.

The pressure roll 53 should be so mounted that its line of engagement with a sheet will be horizontal and parallel to that of roll 51L or 51R in spite of the angular movement of bracket 64 as roll 53 is raised and lowered by the sheets, which may be quite thick in some runs. For this reason the bearing block 65 is slidable vertically in the bifurcated end of bracket 63, while the other bearing block is pivoted to the bracket as seen at 65'.

In place of the shiftable pressure roll 53 there may be provided a transverse pressure plate 66 having apertures therein for receiving a plurality of marbles 67 which will press the sheet against the turning roll 51L as seen in full lines in Fig. 4. If the sheet is to be turned to the right so that the roll 51R is being used, the marbles 67 will be lifted out of the position shown in full lines in Fig. 4 and moved to the position shown in dotted lines where they will co-act with the roll 51R.

After the sheet has been turned by the roll 51L it will pass therefrom and will be urged by the belt 35 against a side guide 69 which will accurately position it angularly so that the subsequent fold will be at exactly right angles to the previous fold as the sheet is presented to the folding unit 20. The side guide 69 is supported from bar 45 by a bracket 70 and held at the desired angle by screw 71. The side guide 69 is preferably formed as a flange on a supplemental table top 72 extending under belt 35 and also bridging between the roll 37 and the folding unit 20.

When the roll 51R is used to turn the sheet to the right, it may be impractical to use the side guide 69. It is always preferred to thrust the folded edge of the sheet against the side guide, and if the sheet is turned to the right the folded edge which was the leading edge will be on the right. Furthermore, a sheet turned by roll 51R would ordinarily be too far removed from the side guide 69 to be thrust against it by the belt 35 in the short forward movement remaining. Accordingly, when the roll 51R is used, a side guide 69' similar to the side guide 69 must be provided along the opposite edge of the table adapted to

engage the right-hand folded edge of the sheet. Such a side guide may of course be supported in the same manner as the side guide 69. However, in order for the sheet to be thrust against such a side guide to the right of the sheet it is necessary for the inclination of the belt 35 to be reversed.

With the structure of the illustrated embodiment of the invention this is accomplished very easily by pivoting the rolls 36 and 37. These rolls are suitably journaled in bearing blocks 73 which are pivotally secured to slide bars 74 which slide on brackets 32 supported by the main frame 1. The slide bars 74 are controlled to move in unison in opposite directions by a connecting bar 76 which is pivoted at 77 midway between the slide bars 74 to a suitable frame member 78. A suitable handle 79 may extend outwardly from one of the slide bars to facilitate shifting the slide bars and the rolls 36 and 37. Any suitable means may be provided for locking the rolls in either of their extreme positions, such as a hand screw 80 screwing through a bracket 32 against a slide bar 74. The belt of course extends perpendicularly to the axes of the rolls 36 and 37 and therefore, as these rolls are shifted, the inclination of the belt will likewise be shifted to the inclination shown in dotted lines in Fig. 2 so that it will urge the sheets against the right-hand side guide 69', also shown in dotted lines in Fig. 2. In order to position the belt 35 sufficiently close to the right-hand side guide 69' it will be shifted laterally along the rolls by loosening a thumb screw 83 and sliding the belt guide 38 along the rod 39. If a guide roll 84 is provided to keep the belt clear of other parts of the machine, it may be swivelly mounted on the slide bars 74 in a manner similar to the mounting of rolls 36 and 37 so that it may always be perpendicular to the belt.

Besides shifting the belt 35 to the dotted line position shown in Fig. 2, the knob 56 is turned to raise the conical roll 51R and lower the conical roll 51L, the pressure roll 53 will be shifted to the right-hand side to be hinged to bracket 64', and the traction plate 41 will be moved to again lie over belt 35. The machine will then be ready for operation. Sheets will be fed to the right-hand roll 51R and will be turned through 90° thereby, after which they will be accurately positioned by being urged against the side guide 69' by the inclined belt 35. If the marbles 67 are used instead of the pressure roll 53 they will of course be shifted to the dotted line position shown in Fig. 4.

Accurate termination of turning

Although the inclined belt 35 in cooperation with the side guide 69 or 69' will correct any slight inaccuracies in the angular position of the sheets after they leave the conical roll 51L or 51R, it is important that the inaccuracy should not be too great. It is particularly important that the sheet should not be turned too far so that it will be unduly buckled by being pressed too firmly toward the side guide. For example, if a sheet were fed to the conical roll with its side edge say one or two inches outside of the apex of the roll, as seen at 85 in Fig. 5, it would not merely be turned to the approximate position shown at 86 in Fig. 5, but, since the marginal inch or two which was on the outside of the apex of the conical roll would have swung around so that it would still have to pass through the conical rolls, the conical rolls would tend to keep on turning the sheet so that it would be turned much too far and in fact would be buckled by being pressed against the side guide 69. Two different ways have been shown for overcoming this difficulty.

In Fig. 2 the side guide 69 has been shown extended to the receiving end of the table and accurately alined with the imaginary apex of the cone formed by the conical roll 51L, so that in cooperation with the slanting belt 35 the sheets will be fed to the conical rolls with the side edges of the sheets accurately alined with the imaginary apex of the roll. The result is that, assuming the sheets to have been properly positioned laterally as they were fed to the folding unit 10, the sheets will each be pressed against the preliminary portion of side guide 69 by the inclined belt 35 and will pass out of the grip of the conical rolls when it has been turned by them exactly 90°. In other words, since the original side edge of the sheet is alined with the apex of the cone it will still be alined therewith when the sheet has been turned 90°, and since this edge will then comprise the back edge of the sheet, there will be no additional marginal length of the sheet to pass through the conical rolls.

A modified arrangement for preventing excess turning of the sheet has been shown in Figs. 5 to 7. Alined apertures 91 are provided through the bottom 92 of the side guide and through the table top 31 so that light can pass therethrough except when the light is blocked off by a sheet which has been turned and pressed approximately against the side guide 69. A lamp or other source of light 93 is placed on one side of the apertures 91, and a photo-electric cell 94 is arranged on the other side to receive light only through the apertures 91. The photo-electric cell is connected with a suitable amplifying unit 95 so that when the light is shut off there- from a relay 96 will be energized. The relay 96 closes a circuit 97 including battery 98 or other source of power for energizing a solenoid 99, which will operate to release the conical pressure roll so as to release the sheet.

One form of pressure roll release mechanism is seen best in Fig. 7. The solenoid 99 is supported by a cross bar 101 carried by the main frame 1. Its plunger 102 is provided with a pin 103 projecting from opposite sides thereof. The frame 104, corresponding to frame 63 in Fig. 3 and carrying pressure roll 53, is provided with an extension 106 which is bifurcated in both directions so as to receive the plunger 102 between its horizontally separated arms and to receive the pin 103 between its vertically separated arms. The frame 104 may be pivoted to a vertical portion of the cross bar 101 so that the pressure roll 53 will normally either by its own weight or under the influence of a spring 107 press the sheet against the driven conical roll 51L. When the solenoid 99 is energized by the circuit indicated in Fig. 6, the plunger 102 will be raised and it in turn will raise the frame 104 and the roll 53, thus releasing the sheet of paper so that it may be carried forwardly and to the left by the belt 35 which will press it against the side guide 69 to complete the 90° turn and accurately position the sheet both angularly and laterally.

As indicated in dotted lines in Fig. 7, the frame 104 with the roll 53 could be positioned on the right to cooperate with driven conical roll 51R, in which case it would function and be released in the same manner. Of course, if desired, two

pressure rolls could be provided one on each side, but it is preferred not to do so since it is advantageous to have the table top 31 as clear of obstructions as possible so that there will be no opportunity for a sheet being turned or fed to the conical rolls to catch on such obstructions.

It is necessary that the solenoid 99 raise both ends of the roll 53, and yet the ends must be independently movable with respect to their pivoted supporting frame 104 so that a thick sheet will not raise the frame so high as to lift from the sheet the end of roll 53 remote from the pivot of frame 104. To this end the construction shown in Fig. 3 is used. Although the bearing block 65 is slidably mounted in frame 104 (63 in Fig. 3), the pin 111 will engage it when frame 104 is raised by solenoid 99, and thus raise the roll 53.

In this form of the invention, as in that of Figs. 1 to 3, the conical rolls should be positioned so that the imaginary apex of each roll is in alinement with the edge guide 69. The sheets pivot about the imaginary apex as an axis with the result that when the sheet has been turned through 90° the edge which was the front edge will be the side edge and will coincide with the apex and hence will naturally be adjacent the edge guide alined therewith.

It will be noted that the rolls 51L or 51R and 53 grip the sheets quite firmly and hence take complete and dependable control of the sheets, removing them from the influence of the conveying belt 35 as long as they are gripped by the rolls. It is practical to have this dependable gripping with the sheets because of the fact that the nature of the conical rolls is such that there need be no slippage between them and the sheets while they are turning the sheets. In other words, the sheets are turned independently of the conveyor, thus making it possible for the conveyor to be designed purely for the functions of conveying the sheet and urging it against the edge guide. In this connection it should be noted that the belt 35 is positioned immediately adjacent the edge guide 69 at its delivery end, this being the most desirable position for it from the standpoint of urging the sheet against the edge guide. At the same time the conical rolls grip the sheet at points remote from the turning axis of the sheet so that they get the advantage of a long torque arm with respect thereto. The conical rolls may be driven faster than the conveyor belt 35 since they are independently driven, though of course the drive belts 36' and 54b will be driven by some joint driving unit, not shown.

When the sheet is not to be turned, the roll 53 will be entirely removed and both of rolls 51L and 51R will be dropped to the lower position so that the sheet will at all times be under the control of belt 35, traction plate 41, and, at the delivery end of the table at least, the side guide 69 or 69'.

From the foregoing general description it is seen that a conveying and turning mechanism is provided in which the sheet may be turned in either direction or not at all at will and in which it is accurately alined as to both angular and lateral position for feeding to the subsequent folding unit.

I claim:

1. A sheet conveyor and turning mechanism comprising a substantially horizontal table, parallel rollers at opposite ends of the table set at an angle with respect to the transverse axis of the table, a conveyor tape operating between said rollers and biased with respect to the longitudinal axis of the table, conical rolls intermediate the ends of the table adapted to rotate a sheet carried by the conveyor through an angle of approximately 90°, a side guide positioned between the conical rolls and the delivery end of the table, said biased conveyor tape operating to convey the sheet to the conical rolls and carry it from the conical rolls and to urge the turned sheet against the guide.

2. A sheet conveyor and turning mechanism comprising a substantially horizontal table having feed and delivery ends, a side guide adjacent the delivery end of the table determining the final direction of movement and the rotative position of the sheet as it reaches the delivery end of the table, a conveyor tape closely adjacent to and slightly biased with respect to the guide with the smallest distance between the two existing at the delivery end of the table, sheet-turning mechanism intermediate the ends of the table operating independently of the conveyor tape for turning the sheet through an angle of approximately 90° in the direction of the guide, said conveyor tape thereafter continuously urging substantially the entire length of the turned sheet against the guide.

3. In a sheet conveying and turning mechanism, a substantially horizontal table having feed and delivery ends, a side guide adjacent to the delivery end of the table, sheet-turning mechanism intermediate the ends of the table, a conveyor tape biased toward the guide and being relatively close to the guide adjacent to the turning mechanism although still closer to the guide at the delivery end of the table, a traction device resting on the tape between the turning mechanism and the delivery end of the table, said sheet-turning mechanism engaging the sheet beyond the tape from the guide and operating to turn the sheet until the fore part of the sheet passes between the traction device and the tape whereupon the sheet is moved longitudinally along the table away from the turning mechanism.

4. In a sheet conveying and turning mechanism, a substantially horizontal table having feed and delivery ends, a side guide adjacent to the delivery end of the table, sheet-turning mechanism intermediate the ends of the table, a conveyor tape biased toward the guide and being relatively close to the guide adjacent to the turning mechanism although still closer to the guide at the delivery end of the table, said sheet-turning mechanism including cooperating upper and lower conical rolls operating to turn the sheet until the fore part of the sheet passes to the control of the tape whereupon the sheet is moved longitudinally along the table away from the turning mechanism.

5. In a sheet conveying and turning mechanism, a substantially horizontal table having feed and delivery ends, a side guide adjacent to the delivery end of the table, sheet-turning mechanism intermediate the ends of the table, a conveyor tape biased toward the guide and being relatively close to the guide adjacent to the turning mechanism although still closer to the guide at the delivery end of the table, a traction device resting on the tape between the turning mechanism and the delivery end of the table, said sheet-turning mechanism including continuously rotating upper and lower conical rolls operating to turn the sheet until the fore part of the sheet passes between the traction device and the tape whereupon the sheet is moved longitudinally

along the table away from the turning mechanism.

6. A sheet conveyor and turning mechanism comprising a substantially horizontal table having feed and delivery ends, a side guide positioned adjacent to the delivery end of the table, a conveyor biased toward the side guide, and sheet turning mechanism intermediate the two ends of the table including lower conical rolls on opposite sides of the table center line, an upper conical roll adapted to be selectively mounted for cooperation with either of the lower rolls, and means for changing the bias of the conveyor to the other side of the table.

7. A sheet conveyor and turning mechanism comprising a substantially horizontal table having feed and delivery ends, a side guide positioned adjacent to the delivery end of the table, a conveyor biased toward the side guide, and sheet turning mechanism intermediate the two ends of the table including lower conical rolls on opposite sides of the table center line, one or more cooperating upper rolls, and means for selectively raising and lowering the lower rolls to and from operative position.

8. A sheet conveyor and turning mechanism comprising conveyor means having feed and delivery ends, a side guide positioned adjacent to the delivery end of the conveyor means with the conveyor means biased toward the side guide, sheet turning means intermediate the two ends of the conveyor means including a conical roll for positively turning the sheet, pressure means for rendering the conical roll effective, and means actuated by the approach of the turning sheet toward the side guide for releasing the pressure to render the conical roll inoperative and prevent buckling of the sheet against the side guide.

9. A sheet conveyor and turning mechanism comprising conveyor means having feed and delivery ends, a side guide positioned adjacent to the delivery end of the conveyor means with the conveyor means biased toward the side guide, sheet turning means intermediate the two ends of the conveyor means including a conical roll for positively turning the sheet, pressure means for rendering the conical roll effective, and means actuated by the approach of the turning sheet toward the side guide for releasing the pressure to render the conical roll inoperative and prevent buckling of the sheet against the side guide, the release means including a photo-electric cell and means for producing a beam of light normally striking the cell but cut off by a sheet as it approaches the side guide.

10. A sheet conveyor and turning mechanism comprising a substantially horizontal table having feed and delivery ends, a side guide positioned adjacent to the delivery end of the table, a conveyor biased toward the side guide, and sheet turning means intermediate of the two ends of the table including lower conical rolls on opposite sides of the center line of the table, a cooperating upper conical roll means adapted to co-act selectively with each lower conical roll, means for selectively raising and lowering the lower rolls to and from operative position, and automatic means for raising the upper roll means to an inoperative position as a sheet being turned by the rolls approaches the side guide.

11. In a sheet conveying and turning mechanism, a substantially horizontal table having feed and delivery ends, a side guide adjacent to the delivery end of the table, parallel rolls at opposite ends of the table, a single conveyor tape extending around the rolls and along the table and biased toward the side guide, a conical roll positioned substantially below the table, having an annular portion of the cone omitted to leave a space through which the tape runs and having its smaller end toward the side guide.

12. In a sheet conveying and turning mechanism, a substantially horizontal table having feed and delivery ends, a side guide adjacent to the delivery end of the table, parallel rolls at opposite ends of the table, a single conveyor tape extending around the rolls and along the table and biased toward the side guide, a conical roll positioned substantially below the table, having an annular portion of the cone omitted to leave a space through which the tape runs and having its smaller end toward the side guide, and a plurality of traction devices distributed along the length of the table for insuring proper movement of the sheets to the conical roll and for substantially eliminating bouncing of the sheet from the side guide even at high speed operation.

13. A sheet conveyor and turning mechanism comprising a substantially horizontal table having feed and delivery ends, side guide means positioned adjacent to the feed and delivery ends of the table, a conveyor biased toward the side guide means, sheet turning mechanism intermediate the two ends of the side guide means including a conical roll for positively turning the sheet, and having its surface lying in a cone whose apex is substantially in alinement with the side guide means, said conveyor operating to urge the sheet against the side guide means both before and after the sheet is acted upon by the conical roll.

14. A sheet conveyor and turning mechanism comprising a substantially horizontal table having parallel rolls at the ends thereof, a pair of oppositely disposed conical rolls intermediate of the parallel rolls, each being an incomplete cone to leave a space within the imaginary cone for receiving a tape, a tape extending along the table through one of the spaces and around the parallel rolls, means to shift the rolls to cause the tape along the top of the table to move toward the side of the table toward which the front end of a sheet is turned by the conical roll through which the tape is passing or optionally to incline the tape in the opposite direction, means for shifting the tape laterally to position it in the space within the cone of the other conical roll, edge guide means adapted to be positioned on the side of the table toward which the tape and the associated conical roll move the sheet, and means for rendering the other conical roll ineffective to interfere with the movement of the sheet.

15. A sheet conveyor and turning mechanism comprising a substantially horizontal table, a side guide positioned along one side of the table, conveyor means biased to move the sheet longitudinally of the table and urging the entire length of the sheet toward the side guide, sheet turning mechanism intermediate the ends of the side guide and intermediate the zone in which the conveying means urges the sheet toward one side including a conical roll for positively turning the sheet and having its surface lying in a cone whose apex is substantially in alinement with the side guide, said conveyor means and side guide cooperating to deliver sheets to the conical roll with their guided side edges in alinement with the apex of the cone whereby the sheet will pass from the conical roll after it has been turned 90° thereby.

16. A sheet conveyor and turning mechanism including a substantially horizontal table having feed and delivery ends, conveying means for carrying a sheet from the feed end to the delivery end and adapted to urge the sheet to one side throughout the length of the sheet, turning means positioned intermediate the length of the table and intermediate the zone in which the conveying means urges the sheet toward one side and adapted to grip the sheet and turn it independently of the conveying means, and side guide means positioned before and after the turning means and adapted to provide accurate lateral registry of the sheet under the influence of the conveying means, both as the sheet reaches the turning means and as it reaches the delivery end of the table, the position of the side guide means before the turning means being such as to insure turning of the sheet approximately 90°, and the position of the side guide means after the turning being such as to approximately engage the edge of the sheet as it leaves the turning means.

17. A sheet conveyor and turning mechanism including a substantially horizontal table having feed and delivery ends, conveying means for carrying a sheet from the feed end to the delivery end and adapted to urge the sheet to one side throughout the length of the sheet, turning means rotating about generally horizontal axes, positioned intermediate the length of the table and intermediate the zone in which the conveying means urges the sheet toward one side and adapted to grip the sheet and turn it independently of the conveying means, and side guide means positioned before and after the turning means and adapted to provide accurate lateral registry of the sheet under the influence of the conveying means, both as the sheet reaches the turning means and as it reaches the delivery end of the table, the position of the side guide means before the turning means being such as to insure turning of the sheet approximately 90°, and the position of the side guide means after the turning being such as to approximately engage the edge of the sheet as it leaves the turning means.

18. A sheet conveyor and turning mechanism including a sheet conveying unit having feed and delivery ends, conveying means for carrying a sheet from the feed end to the delivery end and adapted to urge the sheet to one side throughout the length of the sheet, means pressing the sheet against the conveying means to ensure traction, turning means rotating about axes generally parallel to the sheet, positioned intermediate the zone in which the sheet is urged to one side by the conveying means and adapted to grip the sheet and turn it independently of the conveying means, and side guide means positioned before and after the turning means and adapted to provide accurate lateral registry of the sheet under the infleunce of the conveying means, both as the sheet reaches the turning means and as it reaches the delivery end of the table, the position of the side guide means before the turning means being such as to ensure turning of the sheet approximately 90°, and the position of the side guide means after the turning being such as to approximately engage the edge of the sheet as it leaves the turning means.

19. A sheet conveyor and turning mechanism including a sheet conveying unit having feed and delivery ends, conveying means for carrying a sheet from the feed end to the delivery end and adapted to urge the sheet to one side throughout the length of the sheet, means pressing the sheet against the conveying means to ensure traction, turning means rotating about axes generally parallel to the sheet, positioned intermediate the length of the table and adapted to grip the sheet and turn it independently of the conveying means, and side guide means positioned before and after the turning means and adapted to provide accurate lateral registry of the sheet under the influence of the conveying means, both as the sheet reaches the turning means and as it reaches the delivery end of the table, the position of the side guide means before the turning means being such as to ensure turning of the sheet approximately 90°, and the position of the side guide means after the turning being such as to approximately engage the edge of the sheet as it leaves the turning means, said sheet conveying unit being further characterized by the absence of any shoulder other than the edge guide or turning means that is capable of catching or fouling the edge of the sheet as it is turned or moved along the conveying unit.

20. In a sheet conveying and turning mechanism, a conveying unit having feed and delivery ends, a side guide adjacent to the delivery end, parallel rolls at opposite ends, a single conveyor tape extending around the rolls and along the unit and biased toward the side guide, a conical roll intermediate the ends, having an annular portion of the cone omitted to leave a space through which the tape runs and having its smaller end toward the side guide, and means pressing the sheet against the tape and the conical roll to ensure traction.

21. In a folding machine, a conveying and turning combination including a conveyor having parallel rollers for moving the sheet toward a folding unit, conical rolls positioned intermediate the ends of the conveyor, one of which is adapted to turn the sheet in a clockwise direction and the other in a counter-clockwise direction through an angle of 90°, side guide means adapted to be positioned on either side of the conveyor to receive the turned sheet and guide it to the folding unit along a desired line, means for shifting at least one end of each roller longitudinally of the conveyor substantially without shifting the rollers transversely of the conveyor to bias the conveyor toward the side toward which the sheets are turned by the conical rolls, and means for selectively rendering one or the other or both of the conical rolls ineffective and for ensuring traction between the conveyor and the sheet.

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