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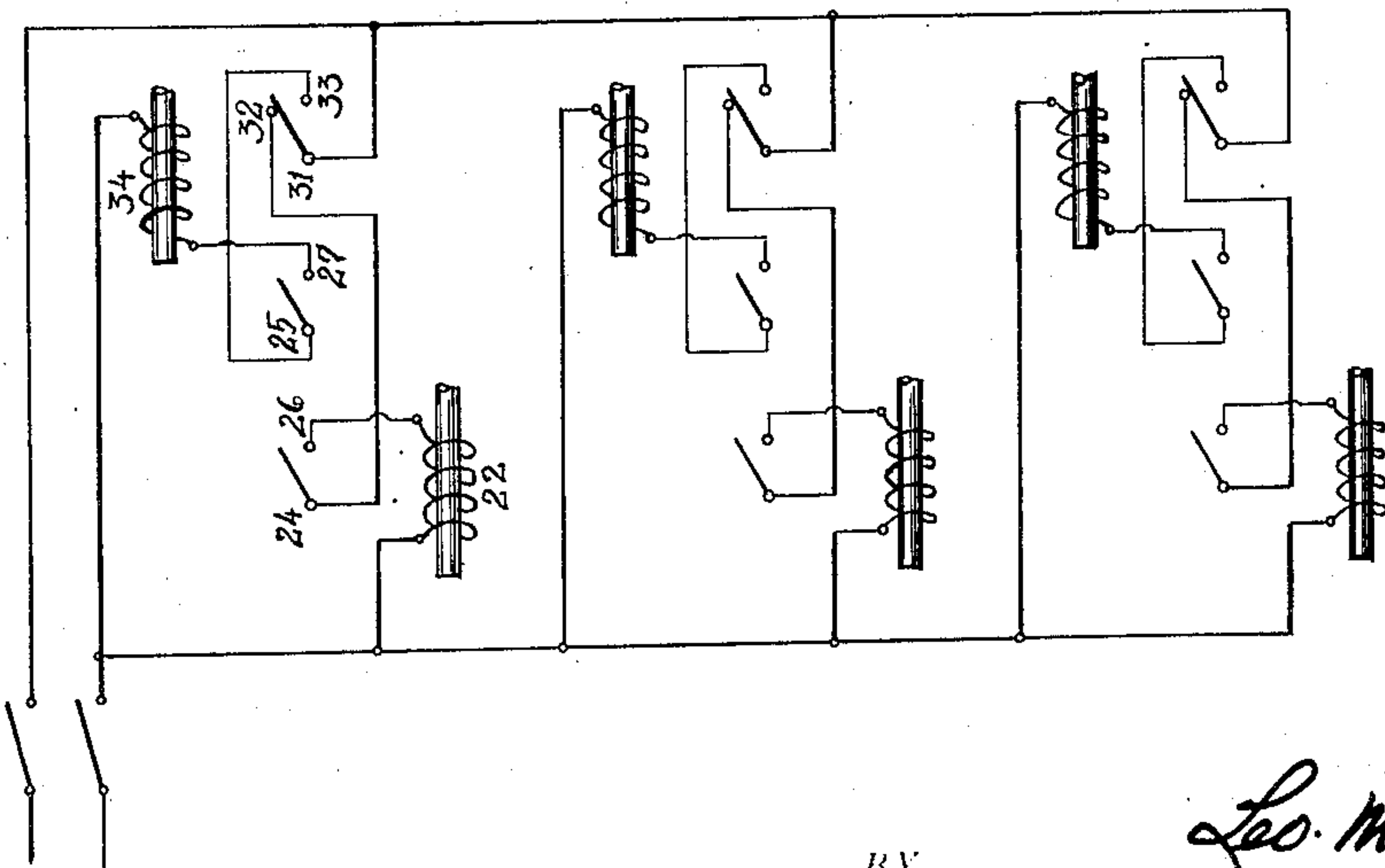
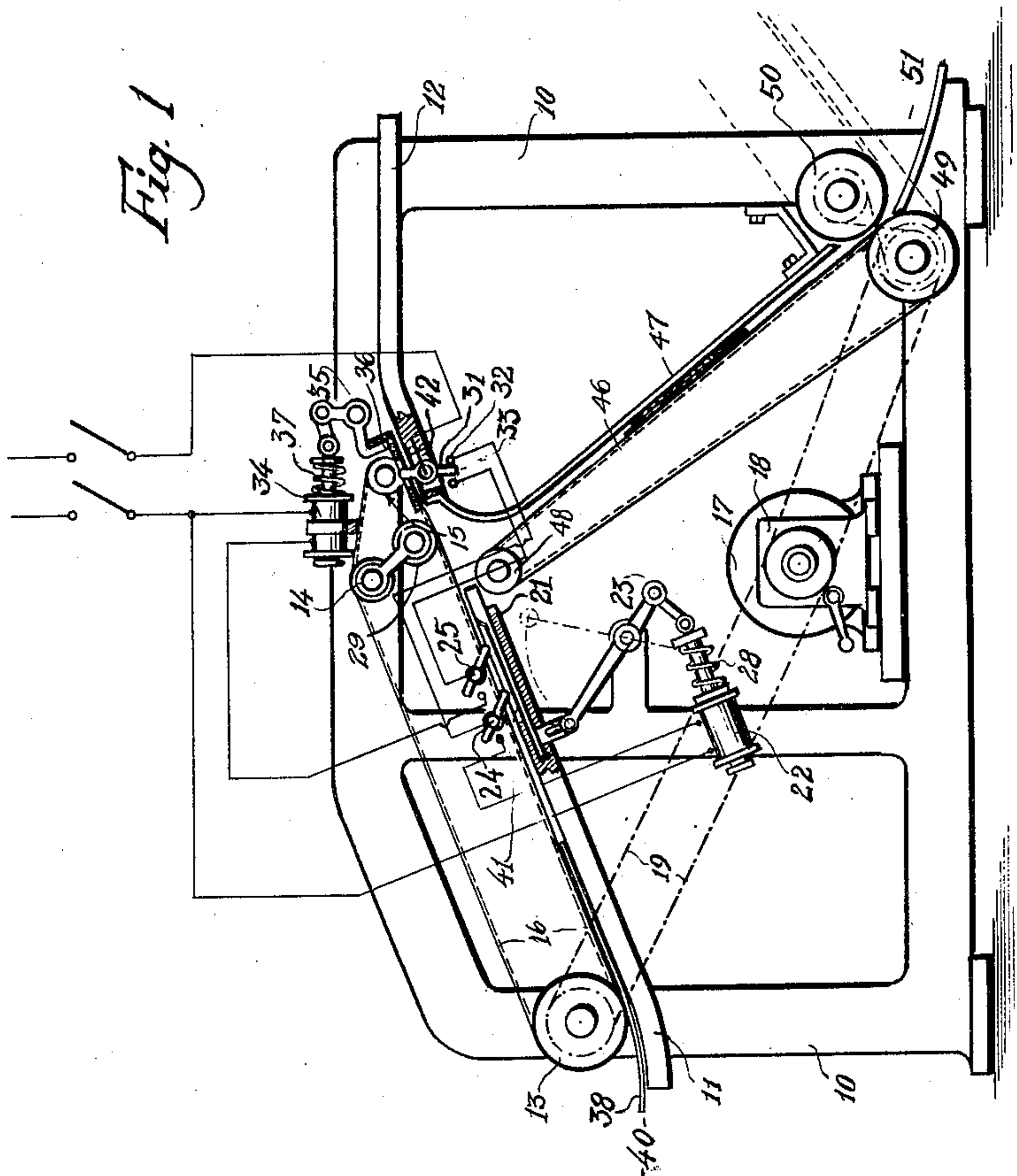
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2,022,351

FOLDING MACHINE

Filed Aug. 20, 1930

2 Sheets-Sheet 1



BY

INVENTOR  
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2 Sheets-Sheet 2

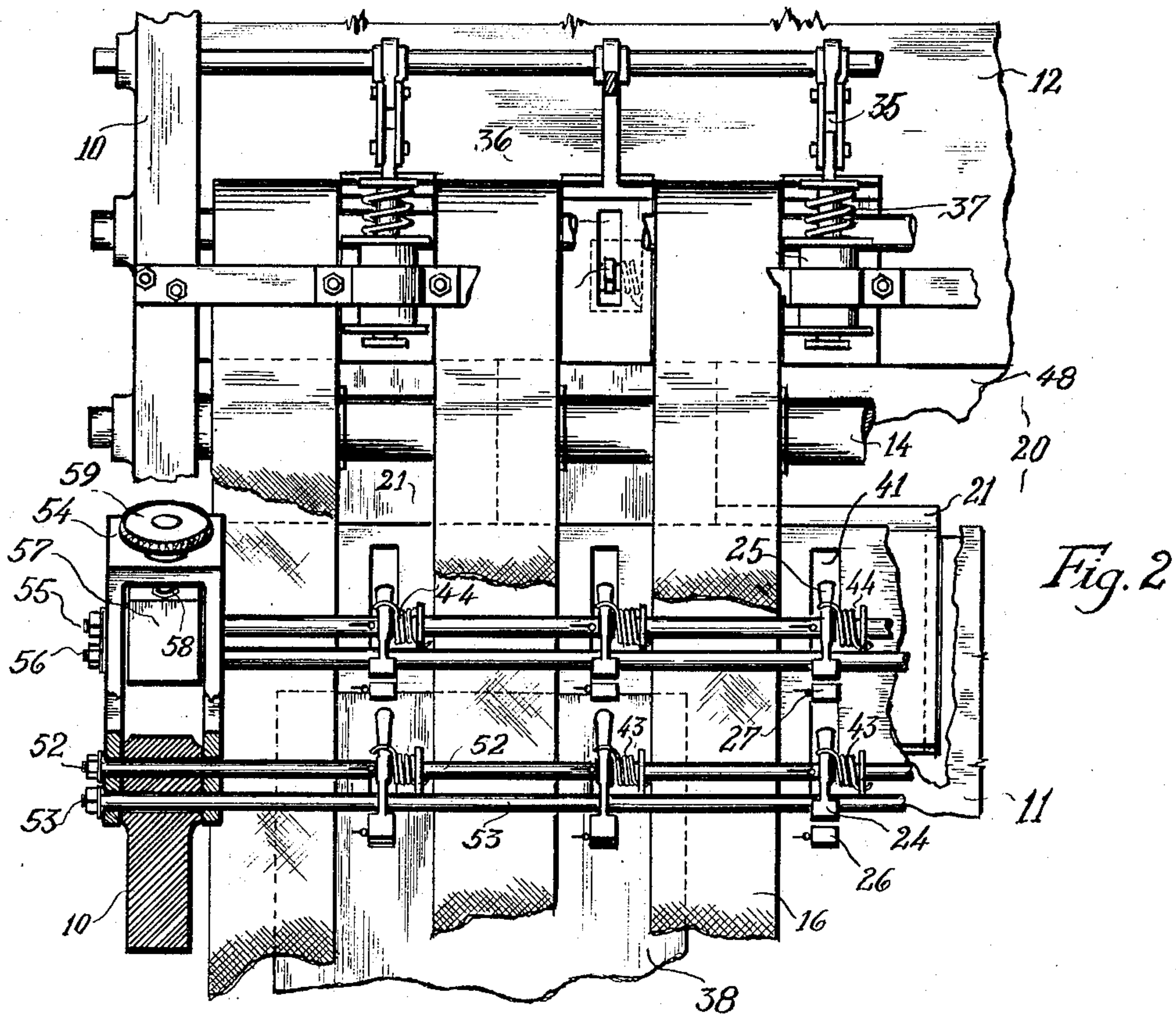


Fig. 2

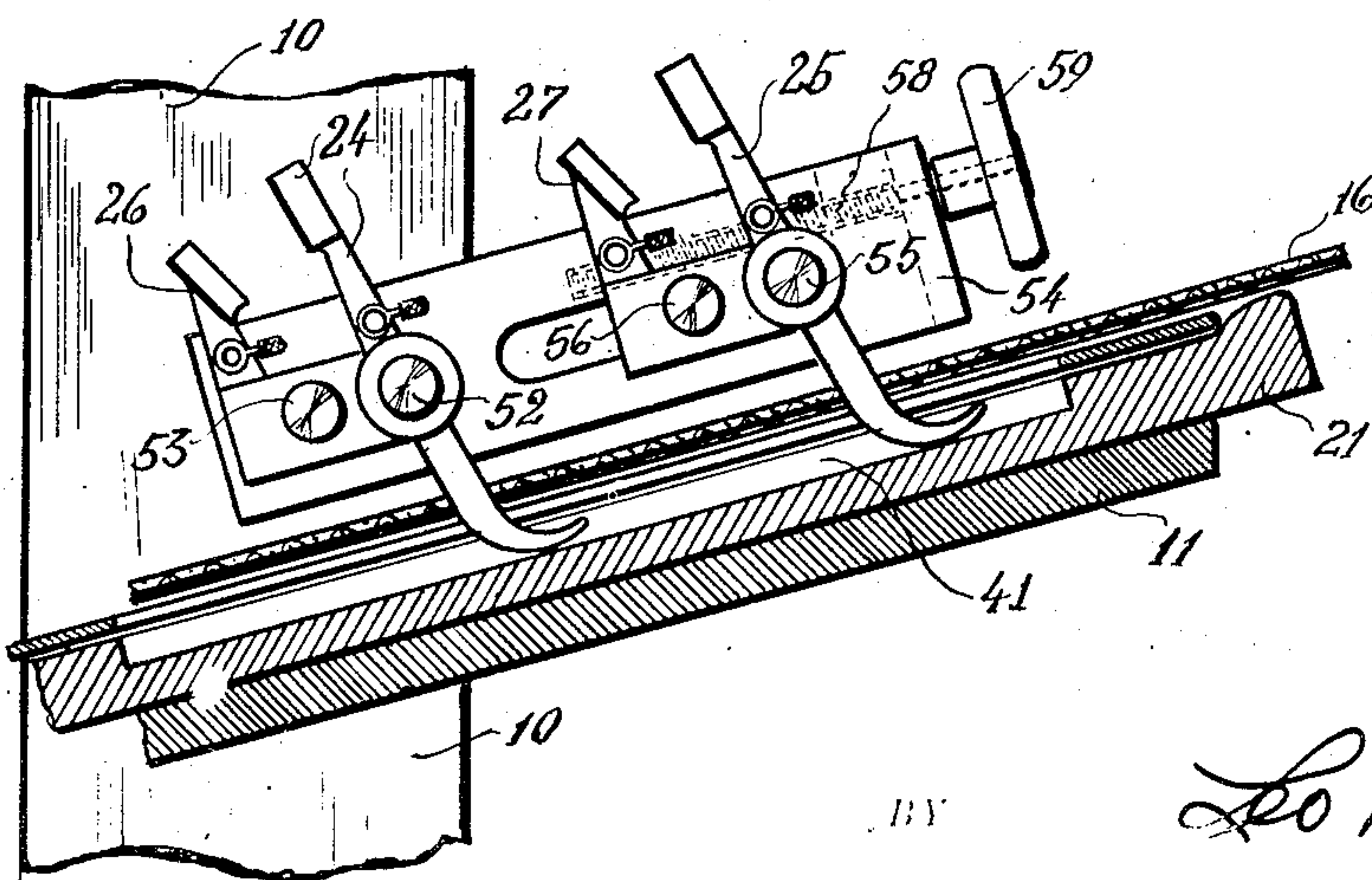


Fig. 3

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## UNITED STATES PATENT OFFICE

2,022,351

## FOLDING MACHINE

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11 Claims. (Cl. 270—68)

This invention relates to folding machines and more particularly to those adapted to automatically folding flat articles of various sizes.

Among the objects of the invention are:

- 5 To insure a positive fold regardless of any slippage of the conveying means on the article; to enable the machine to be of small dimensions by elimination of the stretched condition of an article to be folded; to provide a device which
- 10 will allow the two leaves of the folded article to be of adjustably different lengths, as is desirable when the leading and rear edges are out of alignment; and, to provide means for allowing utilization of the full width of the machine to enable
- 15 folding a number of small articles fed side by side into the machine.

These and other objects will be obvious from the description and drawings forming part of this specification, the scope of the invention being set forth in the appended claims.

In the drawings:

Fig. 1 is a side elevation of the machine embodying the invention, diagrammatically showing electrical circuits and connections and having one side frame removed.

Fig. 2 is a fragmentary top plan view showing the arrangement of a plurality of independent automatic fold-controlling mechanisms.

Fig. 3 is a side elevation of a mechanism adjusting the nature of the fold from an early to a late fold, i. e.: for retaining the edges from direct alignment when sheets are not of rectangular shape:

Fig. 4 is an electric circuit diagram.

35 A frame 10 has tables 11 and 12 preferably inclined, and carries rollers 13, 14, and 15 over which conveyors or tapes 16 run. These are driven by a motor 17 and transmission 18 through belts or chains 19. The tables 11 and 12 are spaced apart leaving a gap 20 over the full width of the machine, which is adapted to be bridged by shutter or slide 21, which is preferably operated by electro magnet or solenoid 22 over linkage 23, thus providing a continuous passage from

40 one table to the other. An idler roller 29 presses against the tapes to maintain contact with the shutter 21. Switches 24 and 25 are mounted in proximity of the shutter 21 near the edge of table 11 in the path of the articles 38, the switch

45 24 being adapted to engage contactor 26, to close the circuit for solenoid 22. A switch 31 having contactors 32 and 33 is mounted on the table 12 near its edge also in the path of articles 38, and is adapted to normally contact with con-

50 tactor 32 in the circuit of electro magnet 22 and

55

switch 24, but will, when actuated, break the circuit mentioned and contact with contactor 33 in the circuit including a solenoid 34, auxiliary switch 25 and contactor 27.

Energization of electro magnet 34 will actuate 5 linkage 35 and will cause the shield 36 to be pressed tightly against table 12, against the action of the spring 37.

Slots 41 are provided in table 11 and sliding plate 21, receiving the arms of switches 24 and 10 25, thus placing these directly in the path of articles 38. Slots 42 in table 12 and shield 36 are adapted to receive switch 31 leaving only its arm between shield 36 and table 12, also in the path of articles 38. Springs 43, 44, and 45 are 15 adapted to maintain the position of the switches 24, 25, and 31 respectively, until they are overcome by the engagement of the edge of the articles with the switch arms. In the preferred construction, to utilize the full width of the ma- 20 chine at all times regardless of the width of the sheets or articles to be folded, a plurality of the folding mechanisms may be placed transversely to the machine as illustrated in Fig. 2, operating independently of each other, so that each set of 25 conveyors 16 may carry a sheet actuating only that number of switches which fall within its width and accordingly operating only the electro magnets and mechanisms assigned to the switches actuated.

Thus a number of small sheets may be fed side 30 by side into the machine at one time, depending on the amount of independent units installed.

Extending between the mouth of opening 20 and the delivery table 51 is a continuously mov- 35 ing conveyor 46 adapted to run on rollers 48, and a coacting plate 47, between which articles 38 are folded.

When the edges of an article are irregular in contour it may be advisable to fold the article 40 so that one edge sits a distance back of the other. This may be accomplished by a form of preferred construction best illustrated in Fig. 3.

The switch 24 and contactor 26 are insulatively mounted on rods 52 and 53 respectively, 45 supported at both ends by the frame 10 above the path of the articles and extending across the full width of the machine. A support 54 is also fastened to frame 10 supporting the rods 55 and 56 which carry switch 25 and contactor 50 27 also insulatively fastened thereto. Rods 55 and 56 are sliding in slots provided on the sides of the U-shaped support 54 and carry a lug 57 held in position by a spindle 58 engaging a threaded portion of the lug 57 to render it mov- 55



able lengthwise with respect to the machine by the rotation of spindle 58 by means of a hand wheel 59. Different dispositions of lug 57, and consequently switch arm 25, with respect to the corresponding gripper or shield 36 is for providing corresponding offsets between the leading and rear edges of the article when same is folded, a larger distance between arm 25 and gripper 36 causing a larger offset between the edges.

The operation of the device constructed as explained hereinabove is as follows:

Articles 38 are fed between roller 13 and table 11 and are conveyed by tapes 16 toward the folding conveyor 46. The leading edge of each article will then actuate that number of switches 24 and 25 that lie within its path approximately simultaneously, and cause contact with contactors 26 to close the circuits for solenoids 22 and with contactor 27. The solenoid 22 becoming energized will, through the linkage 23, move the trap door 21 so as to bridge the gap 20, and thus provide a continuous passage for article 38 onto table 12. When the leading edge of the article actuates the switches 31, contact with contactor 32 is broken and that with contactor 33 is made instead. The latter contact closes the circuit including the solenoid 34 which when so energized actuates the grippers 36 so that the leading edge is prevented from further movement. Meanwhile, upon disengagement of switch 31 from contactor 32, the circuit including solenoid 22 is broken, whereupon the shutters 21 are allowed to drop back aided by the action of the released spring 28. Then, as the rear portion of the article 38 continues in its forward movement, the portion between tables 11 and 12 sags through the opening 20 until it is caught between the conveyor 46 and its coacting plate 47. A doubling up of the article is effected, as one part of the central portion is moved past the gradually increasing stationary portion until the rear edge of the article passes and thus releases contact of switches 25 with their contactors 27. Solenoid 34 thereupon is deenergized, and spring 37 being released actuates the linkage mechanism 35 and releases the grip on the front edge of the article, which is then totally conveyed in folded condition to the delivery table 51, or diverted between tapes shown dotted in Fig. 1, for another fold.

The position of switch 25 may be adjusted by turning the hand-wheel 59 so that the front and rear edges of the folded article are displaced a little.

It will thus be seen as the embodiments of the various features of this invention have been fully described, that they attain the various objects of the invention and are well suited to the requirements of practical use. Of course, many changes can be made in the above construction. Also many widely different embodiments of this invention could be made without departing from the scope thereof.

It is therefore intended that all matter contained in the description and drawings be interpreted as illustrative and not in a limiting sense.

Accordingly, what is claimed and desired to secure by Letters Patent is:

1. In a folding machine of the class described, in combination, releasing and gripping mechanism, means for conveying sheets of varying lengths, electrical contact means for controlling the gripping of the leading end of said sheets and means for automatically releasing said sheets when the rear end of said sheet is in predetermined disposition relative to said leading edge.

2. In a machine adapted to convey fabric articles of varying lengths to be folded, in combination, releasing and gripping mechanism, electrical means actuated by the article being folded, for timing the gripping of the leading edge of said article and separate electrical means for automatically releasing said article when the rear end of said article is in predetermined disposition relative to said leading edge.

3. In a machine for folding fabric articles of varying sizes, in combination, gripping and releasing means, electrical contacting means adapted to be actuated by the article being folded, for effecting the gripping the leading edge of said articles, and separate electrical contact means for automatically releasing said leading edge of said article when the rear edge of same disengages said separate electrical contacting means.

4. In a machine for folding fabric articles of varying sizes, the combination of means for conveying said articles in succession, electrical contactors adapted to be actuated by the leading edge of each of said articles, electro-magnetic means controlled by said contactors, means actuated by said electro-magnetic means for gripping the leading edge of the actuating article and separate electrical means for releasing said leading edge when the rear edge of said article passes said contactors.

5. In a machine of the class described, means for conveying articles of varying sizes introduced thereinto in succession, a plurality of electrical contactor members aligned transversely to and in the path of said articles, and each adapted to be actuated by said articles, and means controlled by said members for grippingly retaining the leading edge of each of said articles actuating said members, while the rear edges of same are conveyed toward said leading edges.

6. In a device of the class described, the combination with means for conveying fabric articles, of contactor members adapted to be actuated by said articles and means electrically operated and controlled by said contactor members for grippingly retaining the leading edge of said actuating article until the opposite edge thereof is conveyed a predetermined distance toward said leading edge.

7. In a folding machine of the class described, in combination, contactor members adapted to be actuated by the article to be folded, means controlled by said contactors for grippingly retaining the leading edge of said article, means for doubling up a gradually increasing central portion of said article upon itself and means for releasing said leading edge when the rear edge of said article is in predetermined disposition thereto.

8. A control device for folding machines including in combination electrical contacting means for effecting gripping the leading edge of the article to be folded, means for effecting a doubling up of a gradually increasing portion of said article and auxiliary contact means operatively connected to said gripping means for effecting release of said leading edge when the rear edge of said article is in predetermined disposition thereto.

9. In a folding machine of the class described, in combination electrical contact members adapted to be actuated by the sheet to be folded, means controlled by said contact members for grippingly retaining the leading edge of said sheet, means for opening a gap in the path of travel of said sheet for effecting the doubling up of the gradually increasing central portion of said sheet and



means for releasing said leading edge when the rear edge of said sheet is in a predetermined disposition thereto.

5 10. In a sheet folding machine, means for conveying sheets of varying sizes, a plurality of electrical contact mechanisms adapted to be actuated by said sheets, and electrically operated gripping means operatively connected to said contact mechanisms for gripping the leading edge of the  
10 sheet while the sheet is actuating one of said contact mechanisms, and means for releasing said gripping means when the rear edge of the sheet passes over another of said contact mechanisms.

11. In a machine for conveying fabric articles of

varying lengths to be folded, in combination a conveyor, means actuated by the article being conveyed for effecting the gripping of the leading edge of said article, and separate means for automatically causing an opening of the conveyor in the  
5 path of travel of said article after it has gripped said article, means for releasing the leading edge of said article when the rear end of said article is in a predetermined position relative to the leading edge, to cause the leading edge to travel  
10 through said opening with said rear end of said article, to cause a fold in said article in accordance to the length of the article.

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