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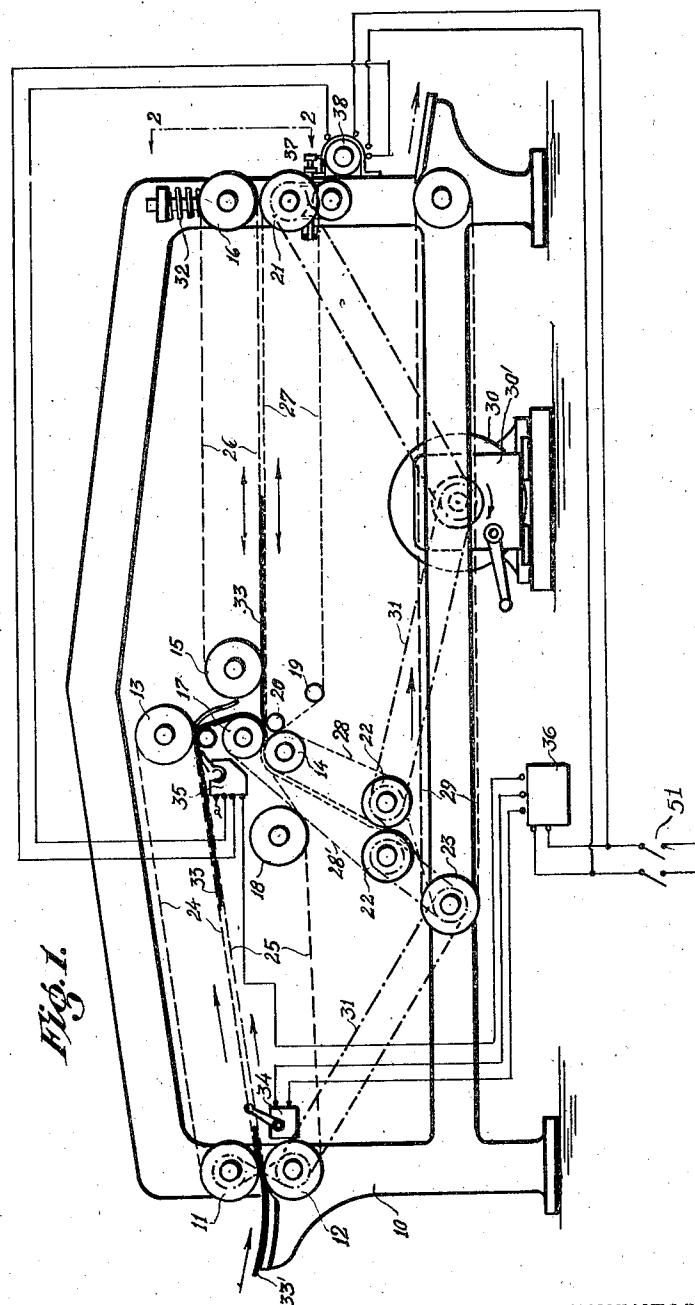
L. M. KAHN

2,011,934

FOLDING MACHINE

Filed May 31, 1930

3 Sheets-Sheet 1



INVENTOR  
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Aug. 20, 1935.

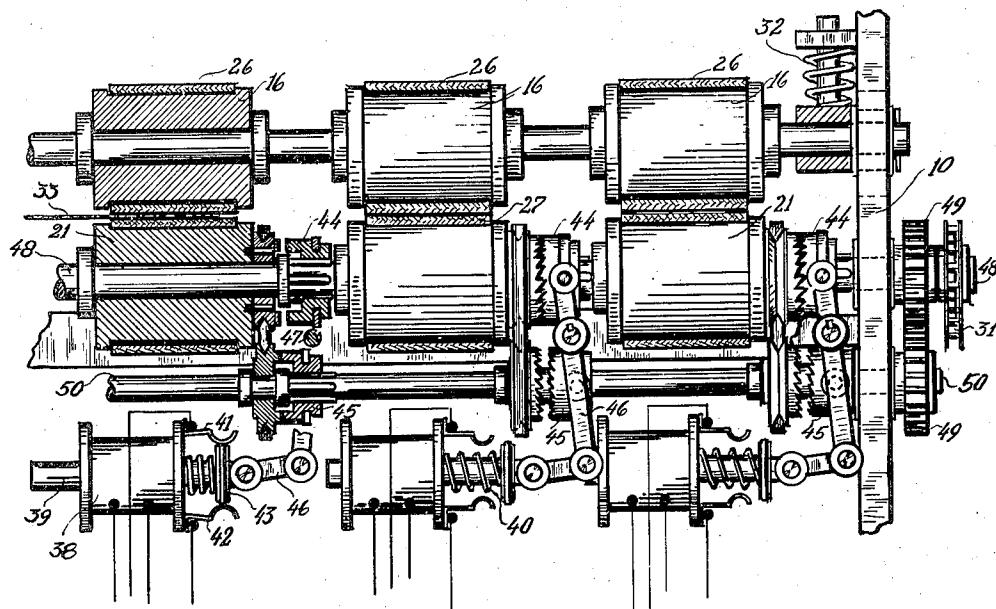
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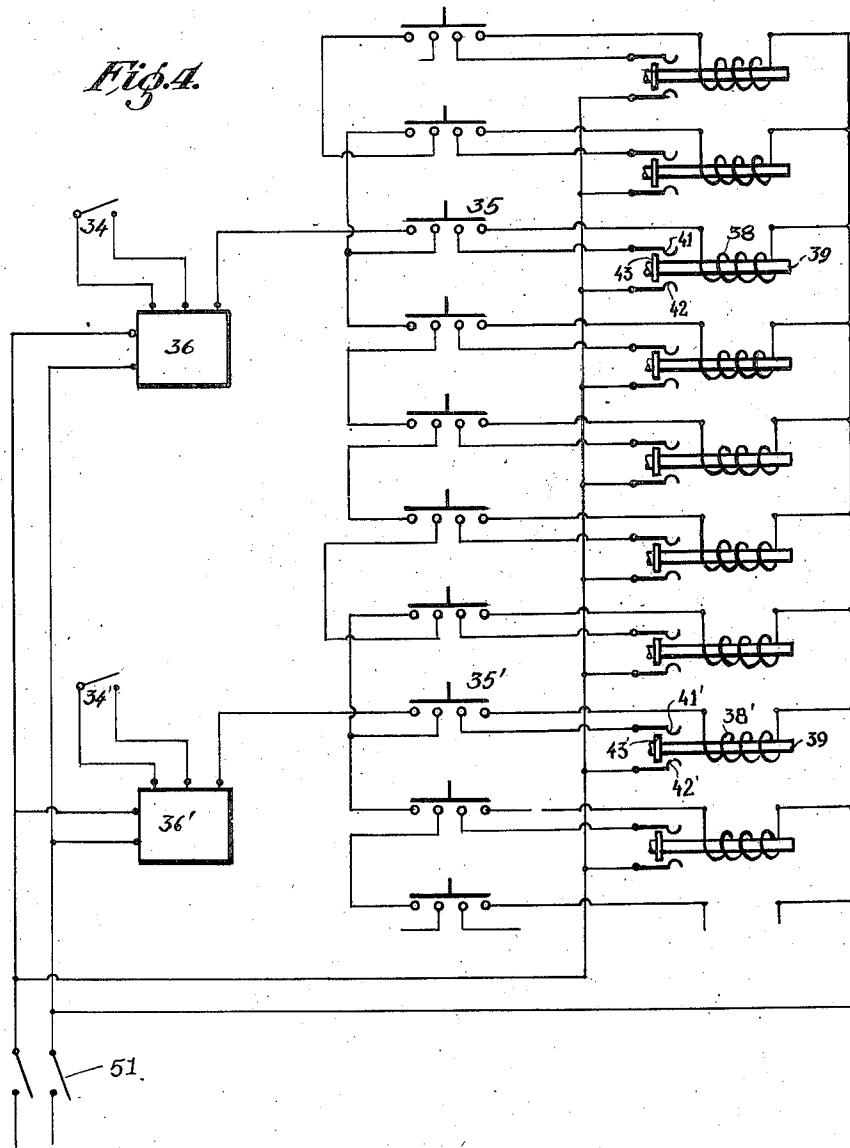
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3 Sheets-Sheet 3

Fig. 4.



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## UNITED STATES PATENT OFFICE

2,011,934

## FOLDING MACHINE

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Application May 31, 1930, Serial No. 457,760

8 Claims. (Cl. 270—68)

This invention relates to folding devices and particularly to the type used in the laundry industry where flat articles of varying sizes are adapted to be folded.

5 One of the objects of this invention is to provide a novel and effective means for folding the articles fed into the device in succession.

Another object is to provide for the actuation of only the width of folder corresponding most 10 nearly to the width of the article to be folded.

A further object is to provide for positive coupling means of the unit comprising the folder.

These and other objects are attained by means 15 of a device described in the specification and illustrated in the drawings forming part thereof, the novel features and improvements in construction being set forth in the claims.

In the drawings—

20 Fig. 1 is a side elevation view of the improved folding machine mainly in schematic form.

Fig. 2 is an end view of the actuating mechanism viewed on line 2—2 in Fig. 1 with parts removed.

25 Fig. 3 is a plan view thereof with parts removed to clearly illustrate the invention.

Fig. 4 is an electric circuit diagram of the device.

One particular form of construction embodying the invention will now be described:

30 Rotatably mounted on frame 10 are rollers 11 to 23 inclusive which carry tapes 24 to 29 inclusive. A motor 30 is the driving means acting through transmission 30' and belts or chains 31 whereby, the tapes 24, 25, 28 and 29 are driven 35 continuously in one direction. A spring 32 causes tapes 26 to be driven by friction against tapes 27 in the same direction therewith. Articles 33 are adapted to be fed between tapes 24 and 25 at rollers 11 and 12 and to be carried 40 forward by the tapes 24 and 25. The front and rear edges of the articles 33 are adapted to depress or otherwise actuate the controlling switches 34 and 35 in the path of travel of the articles. These switches are connected with the timing device 36 and the roller clutch mechanisms 37 respectively. The purpose of the timing device 36 is to time the reversing of the travel 45 of the tapes 27 and thereby of 26. The roller clutch mechanism 37 actuates the tapes selected 50 by the switch 35, the number to correspond most nearly to the width of the article.

The roller clutch mechanism 37 in the particular construction here illustrated, comprises 55 a solenoid 38 having a plunger 39 operating

against a spring 40; contactors 41 and 42 adapted to be bridged by switch 43 on plunger 39; a pair of driving clutch couplings 44 and 45 adapted to be actuated by plunger 39 through linkage 46 pivoted at 47 so that when one coupling is in, the other is out of engagement with its mate. 5

The rollers 21 are loosely mounted on shaft 48 which is driven by one of the chains 31, the coupling 44 revolving with shaft 48. Suitably geared to shaft 48 through gears 49 is another 10 shaft 50 which revolves in the opposite direction to shaft 48, and coupling 45 on shaft 50 therefor likewise revolves in the opposite direction to coupling 44. The females of the coupling 44 are keyed to the rollers 21, so that when clutch 44 is engaged, the roller revolves therewith. The female of 45 idles on shaft 50 and is belted to the roller 21, so that when clutch 45 is engaged and 44 therefore is disengaged, the roller 21, hence tapes 27 will revolve in the opposite direction from that when 44 is engaged. 20

The various terminals are numbered clearly and their interconnections will be evident from a study of the circuit diagram.

The timing mechanism may comprise any 25 standard timing mechanism such as that shown in the patents to MacFarland #1,313,713 or Mayer #1,581,753, and may comprise as is well understood an element actuated by the closing of the switch 34 by the front end of the article to travel at a speed corresponding to half of the speed of the sheet until the end of the article is reached by the switch 34, whereupon the release of this switch causes the element to travel at the full speed of the sheet for a distance corresponding to the distance required to bring the center of the sheet to the folding point, at which time the element makes contact to send an impulse to one of the switches 35. 30

If that switch 35 be closed, this impulse passes 35 through the switch through the coil of the solenoid 38 to actuate the solenoid to reverse the travel of the tapes 27. As soon as the solenoid is actuated, it is held actuated by a contact between the fingers 41 and 42 energized through the switch 35. 40 When this particular construction is employed, therefore, the tape 27 will remain reversed so long as switch 35 is depressed.

Each switch 35 is also adapted when depressed by an article, to actuate a free contact of each 50 adjacent switch 35 in such a manner that if such adjacent switch is also closed, the solenoid 38 corresponding to said adjacent switch will also be actuated but if the said adjacent switch 35 be not 55

depressed, no energy will flow to the adjacent solenoid.

With this construction, the closing of the switch 34 starts the travel of the timing element which 5 sends out an impulse at the time the midpoint of the sheet reaches the folding position. This impulse is controlled at the switches 35.

When the front end of the sheet reaches the switches 35 a number of these switches is operated 10 corresponding roughly to the width of the article to be pressed and all of those switches so depressed condition their corresponding solenoids to be actuated by the impulse sent out by the timing mechanism. Those of the switches 35, however, which 15 are not encountered by the article to be pressed, will not be depressed so that the corresponding solenoids will not be actuated. This feature is important because to actuate a folding mechanism which was under control of another sheet would 20 cause it to fold falsely.

As illustrated, four contacts are provided upon the switch 35 connected respectively to the source of energy to the solenoid to the holding switch and to the next adjacent switch, and all of these contacts are connected together by the depression of the switch. It is not necessary in order to effect a fold that switch 35 hold the plunger 39 closed for the full travel of half the sheet. In many cases a momentary reversal of the feeding rolls 17 and 20 is sufficient to cause the article to be gripped at its center to be drawn back between the roller 17 and 14.

The operation of the folding machine herein above described is as follows:—Articles 33 of varying sizes are successively fed between tapes 24 and 25, their front end rear end actuating the switch 34 and thereby actuate the timing mechanism 36. The article having actuated the timing mechanism 36, passes over the switch 35 over roller 17 and is 40 carried between tapes 26 and 27 to the right as viewed in Fig. 1 because that is their normal direction of travel, i. e. clock-wise for 27, and counter-clockwise for 26.

When the article has reached the folding position 45 so that the desired line of fold is say midway between rollers 17 and 20, the timing device 36 will automatically cause the closing of the solenoids 38 through switches 35 so that they become energized and actuate the plungers 39 to disengage 50 couplings 44 and engage couplings 45, thereby effecting the reversal of travel of rollers 21 and hence of tapes 27 and 26. The rear portion of the article being fed forwardly while the leading portion is fed in the reverse direction. A dent is thus 55 produced in the article 33 along its line of fold and it is fed between rollers 17 and 20, carried down to rollers 22 and onto conveyor 29 which carries it off in folded condition and delivers it on a table at the delivery end of the conveyor 29.

Tapes 27 continue traveling in their reversed 60 direction as long as the article being folded depresses switch 35. When the rear end of the article being folded leaves switch 35, the solenoids 38 lose their hold on plungers 39 because of the break caused in their circuit and springs 49 cause 65 plungers 39 to reverse engagements of couplings 44 and 45 so that the front end of the next article will travel between tapes 26 and 27. Once the article folded has passed between rollers 17 and 20 and between tapes 28 and 28', it will continue in 70 its travel to the delivery table even though tapes 27 had been reversed again to clockwise direction of travel, because the pressure between tapes 26 and 27 is small compared to that between the other rollers and tapes.

Due to the fact that a separate clutch mechanism is provided for every tape 27—of course each mechanism may be adapted to control a plurality of tapes as well—that number of tapes 27 5 are controlled in their direction of travel as are actuated by the article through switches 35. Thus only the number of tapes are actuated that most clearly correspond to the width of the article being folded. This permits a number of articles 10 to be fed alongside of each other. The articles to be folded must be fed so as to actuate at least one switch 34 so that the timing device 36 may be actuated to control along with the switches 35, the energization of the solenoids 38. In the preferred 15 construction here shown, one switch 34 controls a number of solenoids 38 through interconnections not shown between adjacent switches 35. For that reason, articles fed alongside of each other should have at least one switch 35 between them, so that the reversal of the tapes under one will 20 not affect the other.

Moreover, switch 34 may be contacted by a 25 succeeding article before the article to be folded had left switch 35. In order to hold the plungers 39, while the timing device is actuated by the succeeding article, the plungers 39, once drawn in by the energized solenoids cause a bridging of contacts 41 and 42 and thereby the circuit through the solenoids 38 is not broken until switch 35 is released by the rear end of 30 the article. Thus the solenoids are kept energized until the articles being folded have been practically entirely drawn away in folded condition by the tapes 28, 28'.

It will thus be seen as the embodiments of the 35 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 40 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. A folding machine comprising a system of 50 conveyors for fabric articles, and means for reversing the direction of travel of one of said conveyors to effect the folding of said articles.

2. In a folding machine, in combination, a plurality of sets of rollers, means for conveying articles to and from said rollers, and means for reversing the direction of the portion of one set of rollers to effect the passage of the article between another set of rollers, that most nearly corresponds to the width of said article.

3. In a device of the class described, in combination, a plurality of continuously moving tapes for transporting articles of varying sizes over a roller, a second set of moving tapes adapted to receive the front ends of said articles from said first tapes and means for reversing the direction 60 of movement of said second set of tapes when an article is in folding relation thereto.

4. A folding machine comprising a system of 70 conveyors for fabric articles and means for reversing the direction of travel of that transverse portion of one of said conveyors most nearly corresponding to the width of said articles to effect the folding thereof.

5. A folding machine, comprising a system of 75 conveyors for transporting flexible articles, means

controlled by said articles when disposed partially on each of two conveyors in folding relation thereto, for causing reversal of the direction of movement of the leading conveyor to effect the folding of said articles.

6. A folding machine, comprising a system of conveyors of fabric articles, one of said conveyors adapted for reversal in direction of its travel, means for effecting said reversal when said article is in operative relation to said conveyors and means for feeding the forwardly and reverse moving portions of said article simultaneously onto one of said other conveyors.

7. Sheet-folding apparatus comprising a belt conveyor for transmitting a sheet of material, a second belt conveyor, said conveyors being so

disposed that said sheet of material is transferred from said first conveyor to said second conveyor, and means for reversing the direction of motion of said second conveyor after a predetermined length of said sheet has been transmitted from said first conveyor to said second conveyor.

8. Sheet-folding apparatus comprising a conveyor for advancing unfolded sheets, a second conveyor for advancing folded sheets, means, responsive to the presence of an unfolded sheet adjacent to said second conveyor, for reversing the direction of motion thereof, said means being effective to reverse the direction of motion to its original condition after a predetermined length of said sheet has passed to said second conveyor.

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