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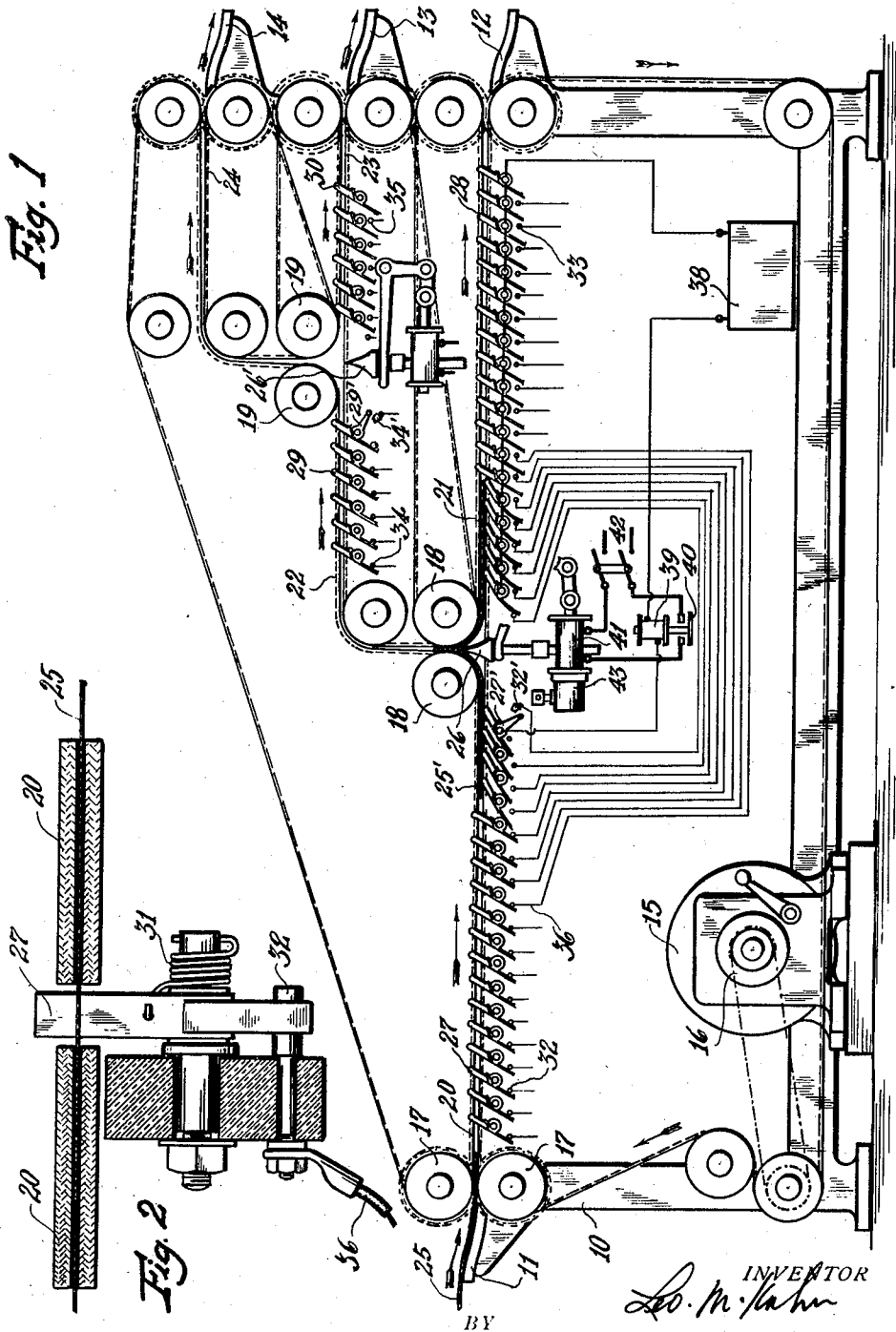
L. M. KAHN

2,022,352

FOLDING MACHINE

Filed Aug. 20, 1930

2 Sheets-Sheet 1



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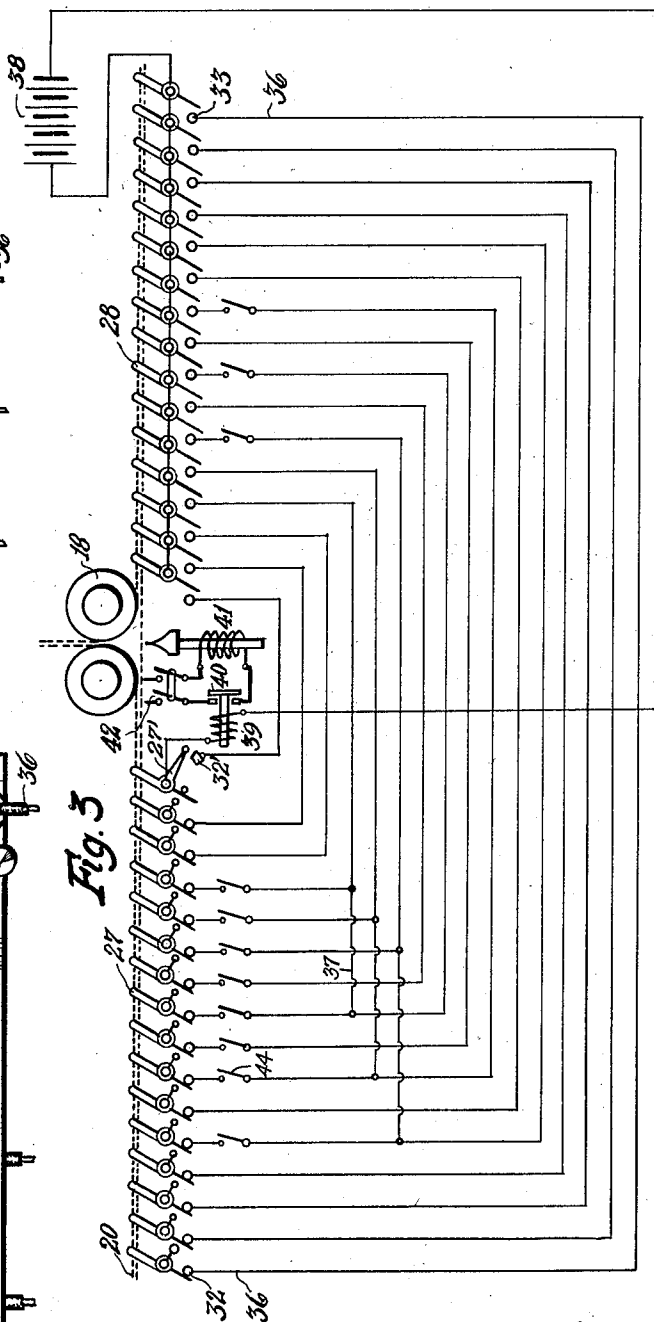
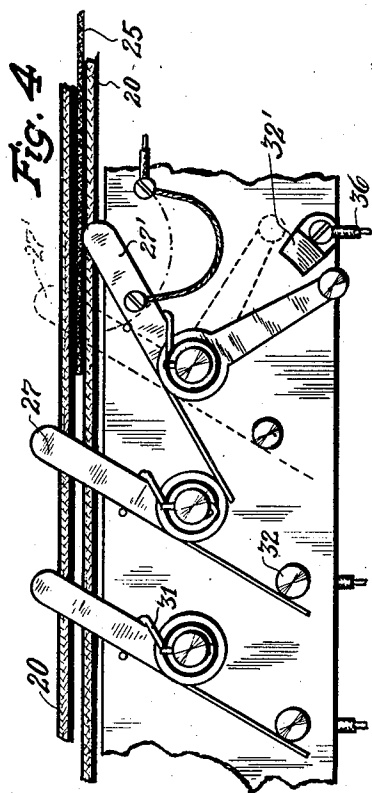
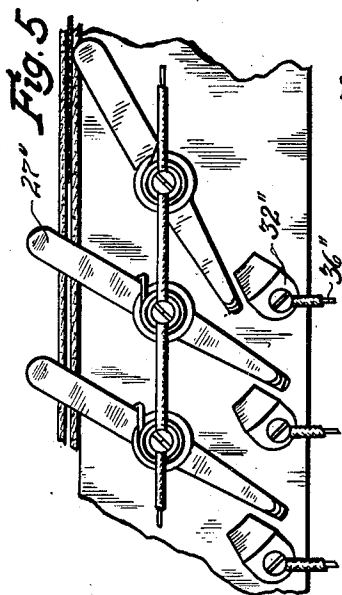
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2 Sheets-Sheet 2

 \mathcal{BY}

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2,022,352

FOLDING MACHINE

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Application August 20, 1930, Serial No. 476,465

12 Claims. (Cl. 270-84)

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

Among the objects of this invention are the following:

To provide for the automatic folding of articles, fed in succession, in any desired ratio of division proportionate to their lengths.

To provide for the automatic selection of the ratio of division.

To provide for the automatic prevention of the folding of articles of small size or already folded to sufficiently small size.

To assure the positive actuation of the folding device at the proper moment by a static system of interconnections on each side of the folding device.

To provide such system of interconnections that will allow for no possible misfolds.

To achieve the functions mentioned hereinabove with mechanism taking up the minimum space and that will be simple and cheap of construction.

And to provide other advantageous features through a novel arrangement of parts and combination of elements.

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

In the drawings:

Fig. 1 shows a longitudinal view of a folding machine embodying the invention parts being shown schematically to clearly illustrate the invention.

Fig. 2 is a fragmentary end view of a preferred construction of one of the switch mechanisms to an enlarged scale.

Fig. 3 is an electric circuit diagram.

Figs. 4 and 5 are fragmentary views to enlarged scale of the switch mechanism assembly, showing alternate methods of effecting the closing of the circuits.

The folding machine includes a base 10 having an intake table 11 and delivery tables 12, 13 and 14. A motor 15 through its transmission and belting 16 drives the pairs of rollers 17, 18, 19 and others over which are carried sets of the tapes 20 and 21, 22 and 23 and 24. Fabric articles 25 particularly of the type of flat sheets, table cloths, towels, etc. are adapted to be fed on the intake table 11 between the two rollers 17, and the tapes 20 propel the articles by virtue of the frictional contact between them toward the folding device 26.

Between certain pairs of adjoining tapes 20, 21,

22 and 23 and normally protruding above the tapes in the path of the fabric articles 25, are mounted in close proximity to each other a plurality of switches 27, 28, 29 and 30 which are resiliently held in position preferably by means of torsion springs 31. Terminals 32 and 34 on one side of the folding devices 26, 26' respectively are each individually connected with corresponding terminals 33 and 35 respectively on the other side of the said folding devices by connectors 36, and among themselves on the approaching side of the folder by connectors 37. Switches 27 and 29 are preferably normally adapted to contact with terminals 32 and 34 respectively but as each switch is depressed it will make electrical connection with the adjoining switch next away from the folder 26, 26' as clearly shown in Fig. 4. Switches 28 and 30 are on the other hand normally out of contact with their respective terminals 33 and 35 but are electrically connected one to the other and to one terminal of the source of power 38 which is connected through a relay 39 to the first switch 27', 29' on the approaching side of the folders.

The first switches 27' and 29' on the approaching side of the folders 26, 26' are preferably adapted when depressed to make a wiping contact with their respective terminals 32', 34', the advantage becoming evident from an understanding of the operation of the device as hereinafter explained.

The relay switch 40 is connected in series with the folder operating solenoid 41 to the source of the power 42. The folders 26, 26' are here illustrated in the form of a plurality of wedge-shaped members adapted to be moved up between the tapes, in order to wedge the article 25 between the rollers 18 or 19 when the desired line of fold is in line with these members. A dash pot 43 or similar device may be used to delay the plunger action of the solenoid 41.

The operation of the device hereinabove described is as follows:

Articles 25 are fed in succession from the table 11, placed between the rollers 17 and are carried by the frictional grip of the moving upper and lower tapes 20 toward the folder 26. The leading edge of article 25 strikes the protruding switches 27 in succession and the article in passing on holds the switches depressed throughout its length, the switches being released to resume their normal position when the rear edge of the article has passed by them.

The folder members 26 are normally below the level of the tapes, so that the article continues

in its travel between the tapes 21 on the other side of the folder 26, and depresses switches 28 as it comes in contact with them. The article continues until the leading edge depresses a switch 28 to contact with the terminal 33 which is connected with terminal 32 corresponding to the particular one of switches 27 which had been just released by the rear edge of the article. At that moment, it will be noted, the relay 39 circuit will be closed, and the relay becomes energized—and in thereby pulling up its plunger closes the switch 40. This effects the closing of the solenoid 41 circuit and consequent actuation of the folder 26, which lifts the article along its line of fold until the article is gripped by rollers 18 and is carried away by tapes 22 to repeat the operation if so desired.

It is the present practice to fold such articles as sheets, towels, handkerchiefs etc., in halves, thirds or quarters, and certain very small articles not at all. Automatic selection of the ratio of fold is therefore very desirable. To that end, connectors 37 are provided in addition to connectors 35, to provide zones for the various ratios that may be desired, and switches 44 are provided to vary the zoning at will.

If article 25 is of a size to be folded along its center line, then the leading and rear edges must be equi-distant from and on opposite sides of the folder 26, and the switch 28 depressed by the leading edge must make connection with the switch 27 last released by the rear edge of the article. Since the intervening depressed switches 27 become disconnected from their respective terminals 32, closing of the solenoid actuating circuit is positively prevented except when the desired position of the article is reached relative to the folder.

If however the article is to be folded say one-third its length from its leading edge, then it is merely necessary to connect the terminal 33 corresponding to the switch 28 which is one third of the article's length from the folder with the terminal 32 corresponding to switch 27 two-thirds of the article's length from the folder. Connectors 37 perform that function by connecting the terminals 32 on the approaching side, a different ratio being obtained for every additional interconnection. Switches 44 are provided to effect these additional interconnections at will of the operator, who thereby creates zones for articles of different sizes for folding the articles in the ratio desired for each zone.

Articles of very small dimension in their directions of travel, which will release the first switch 27' or 29' on the approaching side of the folder 26 or 26', before depressing the first switch 28 or 30 on the other side of that folder, is adapted to be passed on without being folded. This is effected by arranging for switch 27' or 29' to make a passing contact with its terminal 32' or 34', so that no circuit is closed when switch 28 or 30 is depressed. However, the relay circuit will be temporarily closed and the actuation of the folder 26 or 26' effected only when switch 27' or 29' makes a wiping contact with its terminal 32 or 34 when released by the rear end of the article and when its corresponding connecting switch 28 or 30 is depressed by the leading edge of the article making contact with terminals 33 and 35 at the instant a wiping contact is made at terminal 32 or 34, if the article is of the length to actuate both switches.

The mechanism 43 is provide to retard the action of the folder 26 when so desired, should

the irregularity of the edges of the article warrant their disalignment. The article moving at a constant speed, will cause the line of exact division to move past the folder by the time the latter is actuated. The amount of disalignment may of course be readily adjusted by adjustment of the retarding mechanism, which in the dash pot type would involve mere enlargement or contraction of the valve opening.

Accordingly, a folding machine is here presented, that automatically selects the number of folds of articles of varying lengths, the ratio of division proportional to their lengths and automatically folds them and delivers them in folded condition at the particular table corresponding to the number of folds. As illustration in Fig. 1, table 12 delivers articles which pass by unfolded; table 13 delivers articles having been folded once but are too small for additional folding; and table 14 delivers articles having been folded twice.

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

1. A folding machine having folding devices, means for conveying articles of various sizes into operative relation to said folding devices, means for selecting the division and number of folds proportional to the length of said articles, and means for actuating said folding devices when said articles have been positioned relative to said folding devices thereby to effect said fold division.

2. A folding machine having folding devices, means for conveying articles of various sizes into operative relation to said folding devices, means for selecting the division and number of folds proportional to the length of said articles, said means for selecting the division of said articles including a plurality of members adapted to be interconnected on opposite sides of said folding devices and having interconnections between members on the approaching side of said folding devices, and means for actuating said folding devices whenever a pair of interconnected members on opposite sides thereof have been suitably actuated.

3. A folding machine comprising folding devices, means for conveying articles of various sizes into operative relation to said folding devices, means controlled by said articles for actuating said folding devices to fold said articles proportionally to their length and means for automatically preventing said actuation of said folding devices when said articles are of sufficiently small size.

4. A controller for devices adapted to fold articles of varying sizes, comprising a plurality of members adapted to be actuated by said articles, and interconnections between said members to form electrical control circuits for automatically actuating said devices to fold said articles proportionally to their length, and for automatically preventing said actuation when the length of said articles is less than a predetermined minimum.

5. In a device of the class described, a plurality of folders, a plurality of delivery tables, means for conveying articles of various sizes past said folders toward said delivery tables, means controlled by said articles for successively actuating said folders to fold said articles proportionately to their length and for automatically preventing said actuation when the lengths of said articles are below a predetermined minimum whereby articles receiving a different number of folds will be delivered at different tables.

6. A controller for folding machines, including

in combination a plurality of platforms, each having means adapted to be actuated by articles to be folded for successively effecting actuation of devices to fold said articles and means for effecting delivery of articles having different number of folds at different platforms, according to the number of folds in the article.

7. A controller for folding machines, including in combination, means adapted to be actuated by articles to be folded for successively effecting actuation of devices to fold said articles and means for automatically preventing said actuation when the length of said articles is less than a predetermined minimum.

8. A controller for folding machines, including in combination, a plurality of folding devices, delivery platforms for each of said devices means for selecting the line of fold of articles, means for varying the fold division and means for effecting delivery of articles having different number of folds at different platforms, depending on the number of folds in said articles.

9. In folding machines, including in combination, a plurality of fold devices, a plurality of platforms corresponding to said fold devices, means controlled by articles to be folded for actuating said fold devices and means for automatically preventing said actuation when the actuating article is less than a predetermined size whereby articles receiving a different num-

ber of folds will be delivered to different platforms.

10. In a machine for folding articles of varying sizes, the combination of a folder, conveying means, control means for selecting the line of fold determined by the size of the article being conveyed on each side of the folder means in proportion to the size of the article, and means to determine according to the size of an article the number of folds to be made in said article when it is in operative relation to said folder.

11. A controlling device for folding machines comprising a plurality of members, interconnections between corresponding members disposed on opposite sides of a folder, contact means for actuating said folder when a pair of interconnected members have been suitably actuated, and means for preventing said folder actuation for articles of less than a predetermined size.

12. In a folding machine, in combination, a plurality of folding devices, including a conveyor for each of said devices, means adapted to be actuated by articles to be folded upon reaching operative relation with said devices for successively effecting actuation of said devices to fold said articles proportionally to their length and to deliver said articles to their respective conveyors.

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