

July 28, 1953

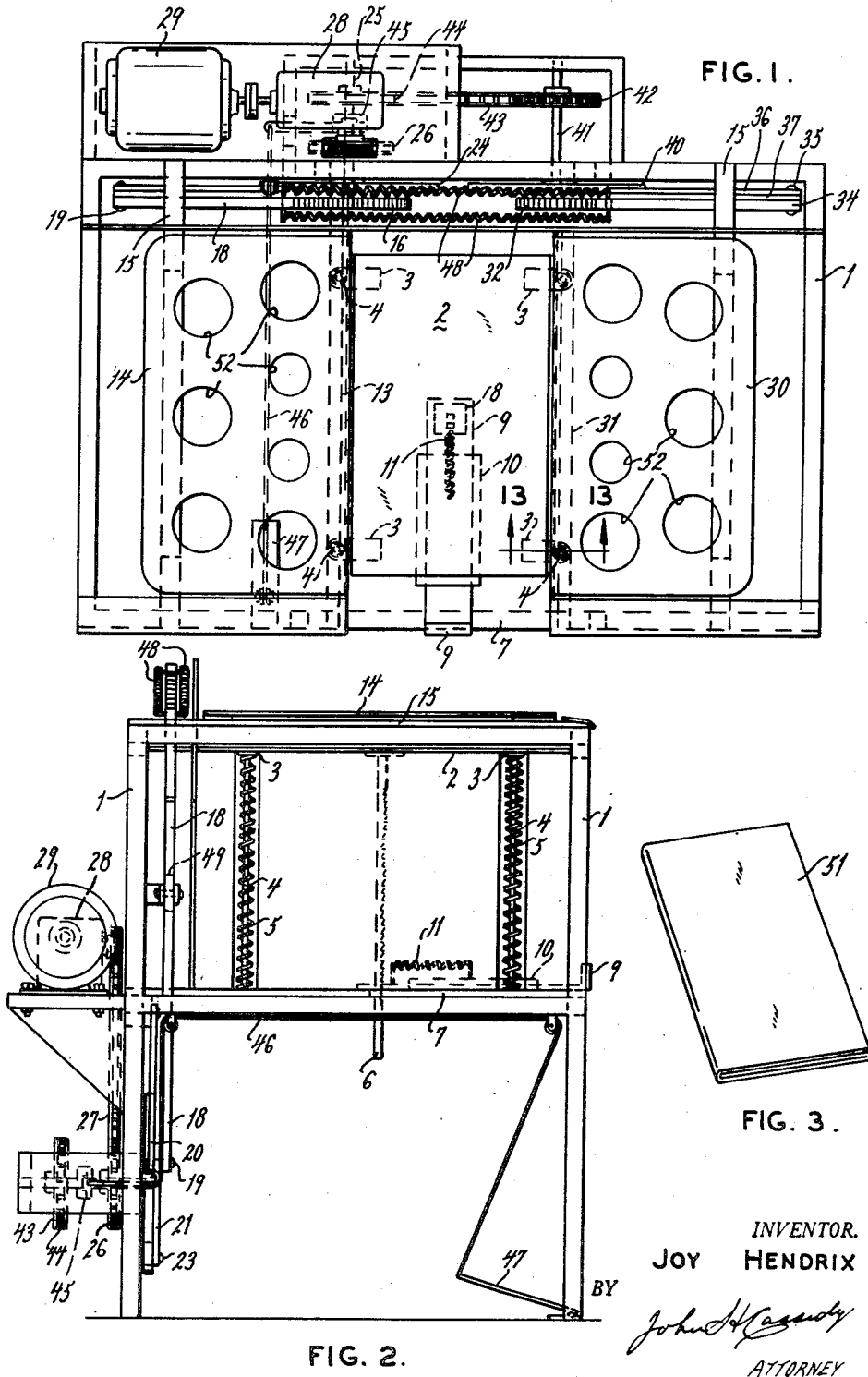
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2,646,982

APPARATUS FOR FOLDING CLOTH FLATWORK

Filed April 28, 1950

3 Sheets-Sheet 1



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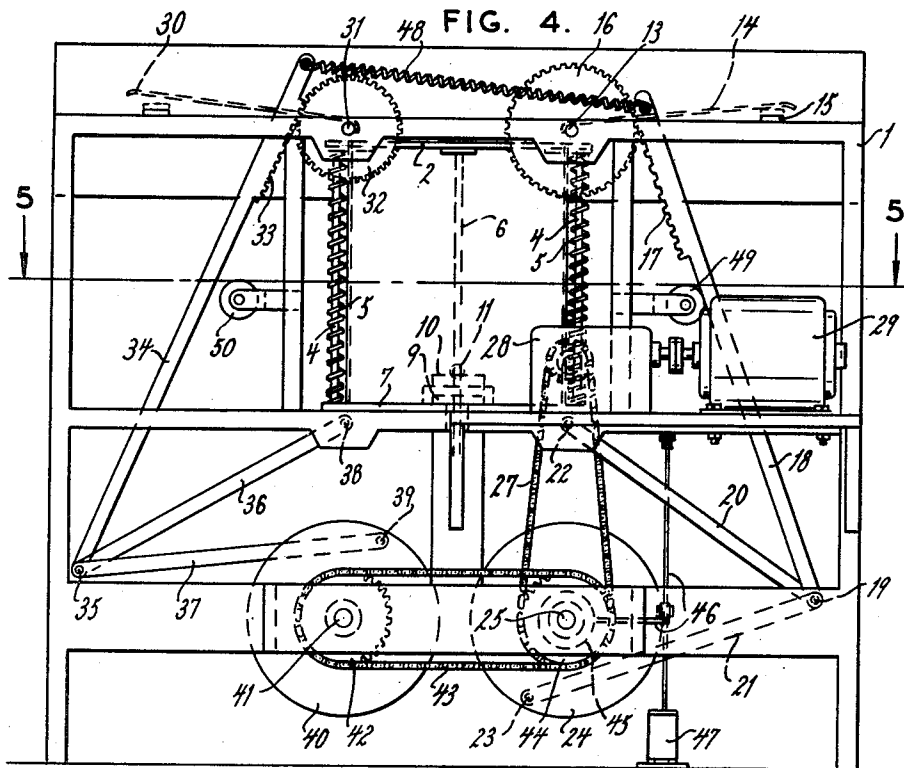
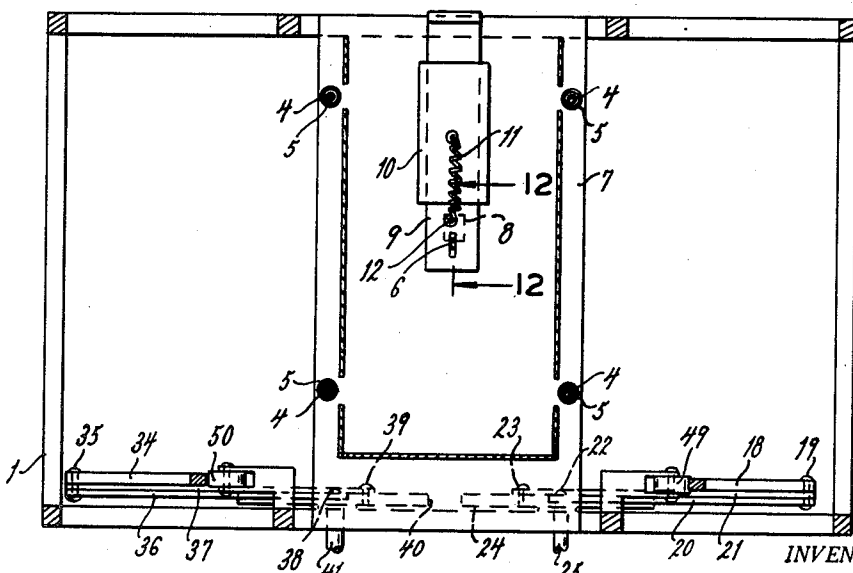
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APPARATUS FOR FOLDING CLOTH FLATWORK

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3 Sheets-Sheet 2



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APPARATUS FOR FOLDING CLOTH FLATWORK

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3 Sheets-Sheet 3

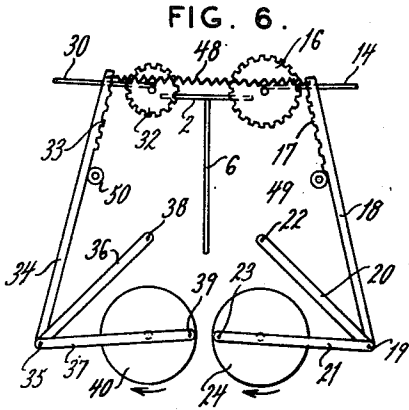


FIG. 6.

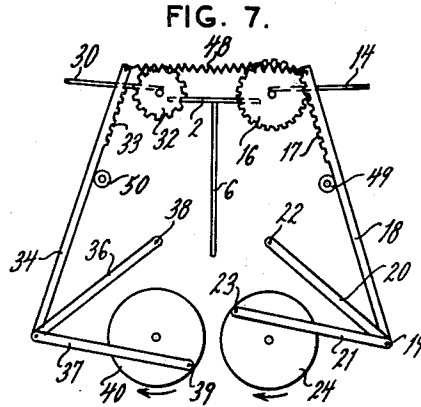


FIG. 7.

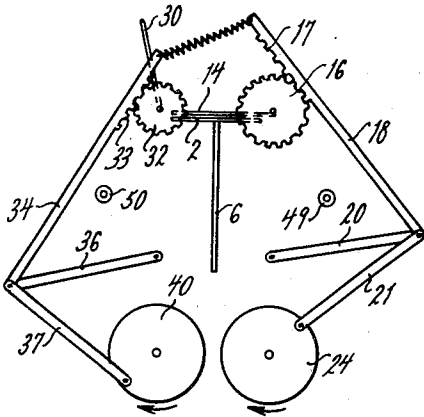


FIG. 8.

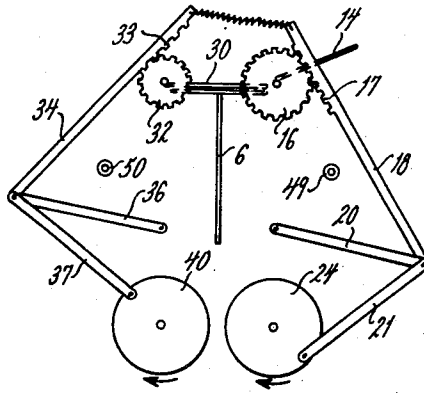


FIG. 9.

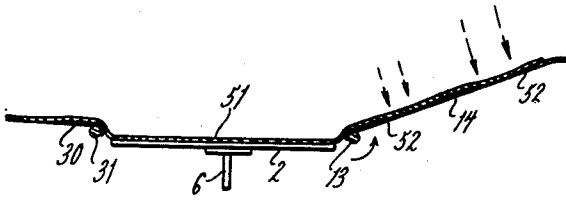


FIG. 10.

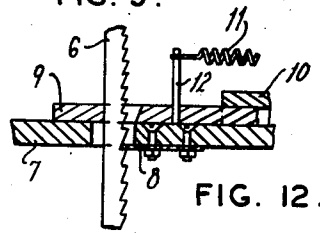


FIG. 11.

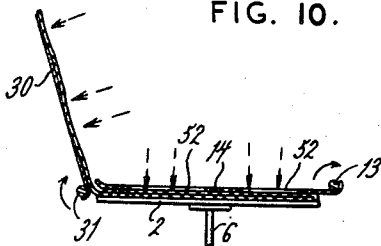


FIG. 12.

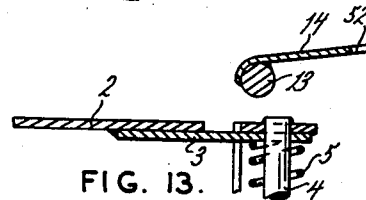


FIG. 13.

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APPARATUS FOR FOLDING CLOTH
FLATWORK

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5 Claims. (Cl. 270—61)

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This invention pertains to a machine for folding cloth and more particularly modern diapers which come in sizes of about twenty by forty inches, the purpose being to fold such a diaper in three folds to make a folded three-ply garment approximately thirteen by twenty inches.

Generally stated, the machine comprises three panels, a center panel and two side panels, the latter being pivoted or hinged at their inner edges along the opposite side edges of the center panel so that, with a garment placed to spread over the three panels the side panels may be folded over the center panel one after the other, folding the cloth therewith at the side edges of the center panel.

Mechanism is provided to impart the folding movement to the panels successively and in such a manner that they do not interfere with each other. This mechanism is so arranged that there is a pause at the end of the folding operation with both side panels in unfolded position. This pause permits the operator to place another garment in position on the panels.

The center panel is so mounted that it may be depressed vertically, being supported on springs or the like, and a stop is provided to retain it in any depressed position. By this arrangement, as each garment is folded, the pressure of the folding panels on the top of the garment operates to depress the center panel by an amount equal to the thickness of the folded garment. The stop then holds it in that position until another garment is folded, whereupon this panel is further depressed in like manner. Thus successive garments may be folded by operation of the machine and stacked on the center panel. When the desired number has been placed in the stack, the machine may be stopped long enough to permit the operation to remove the stack and place it in a suitable package.

While the invention is susceptible of various embodiments, a preferred embodiment is illustrated in the accompanying drawings, in which

Fig. 1 is a plan view of a folding machine embodying this invention;

Fig. 2 is a lefthand end view of Fig. 1;

Fig. 3 is a perspective view of a folded garment;

Fig. 4 is a rear view as seen from the top of Fig. 1;

Fig. 5 is a horizontal section on line 5—5 of Fig. 4;

Figs. 6, 7, 8 and 9 are diagrams showing the linkage connections for moving the side panels in different positions during a cycle;

Fig. 10 is a fragmentary sectional view of the

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center and two side panels with the garment thereon to illustrate the action as will be explained hereinafter;

Fig. 11 is a similar view with one side panel in folded position;

Fig. 12 is a detail section on line 12—12 of Fig. 5; and

Fig. 13 is a detail section on line 13—13 of Fig. 1.

Referring to the drawings, 1 designates a frame of any suitable construction which may be of angle iron or the like, with suitable bracing to make it rigid. Mounted in a horizontal position at the top of the frame 1 and in the middle thereof is the center panel 2. This may be provided at each of the four corners with a wing 3 perforated to receive a vertical rod 4 supported on the frame 1 and on which this wing may slide up and down. The wing 3 rests on a coil spring 5 surrounding the rod 4. In this way a panel 2 is yieldingly supported at its four corners so that it may be depressed as the successive garments are folded down upon it.

Near the center of the panel 2 a ratchet bar 6 is fixed to extend downward therefrom and pass through a perforation in a plate 7 forming part of the frame 1. Attached to the lower face of the plate 7 is a thin plate 8 adapted to engage in the teeth of the ratchet bar 6 as shown in Fig. 12. A plate 9 is slidable in a guide 10 on the upper surface of the plate 7 and has a perforation through which the bar 6 passes. A spring 11 attached to a pin 12 on the plate 9 is secured at its other end to the guide 10. This spring draws the plate 9 to the right (Fig. 12) so that the bar 6 passing through the perforation in said plate is forced against the retainer plate 8 by the spring pressure. By this arrangement, as the rod 6 is moved downward its teeth successively pass over the edge of the plate 8 and catch beneath it so as to hold the panel 2 in depressed position. By pushing the plate 9 to the left (Fig. 12), or forward as in Fig. 1, the bar 6 is released from the plate 8 so that the force of the springs 4 will lift the panel 2 back to its normal position at the top of the frame.

Hinged on a rod 13, Fig. 4, journaled in the frame 1, is a side panel 14 which rests at its other edge on a cross bar 15 on the frame. The hinge bar 13 runs along the extreme inner edge of the panel 14 so that the edge of that panel is very nearly in the axis of rotation during the folding movement of the panel. It has been found that this is necessary to obtain a correct fold in the garment. Fixed to the rod 13 is a gear

16. Arranged for engagement with the gear 16 is a rack 17 mounted on or forming part of a bar 18 pivoted at 19 to a pair of links 20 and 21. The link 20 is pivoted at 22 to a fixed point on the frame 1. The link 21 is pivoted at 23 to a disk 24 fixed on a shaft 25 journaled in the frame 1. The shaft 25 has fixed thereto a sprocket 26 driven by a chain 27 from a gear box 28 connected to be driven by an electric motor 29.

Similar linkage connections are provided for moving the other side panel 30 which is hinged on a rod 31 also journaled in the frame 1. This rod carries a gear 32 meshing with a rack 33 on a bar 34 pivoted at 35 to links 36 and 37. The link 36 is pivoted at 38 on the frame 1 and the link 37 is pivoted at 39 to a disk 40 on a shaft 41 also journaled on the frame 1. The shaft 41 carries a gear 42 connected by a chain 43 to a similar gear 44 on the shaft 25 so that the shaft 41 is driven to rotate at the same speed as the shaft 25. The shaft 25 may be provided with a suitable clutch 45 having operating connections 46 to a treadle 47 which may be moved by the foot of the operator to start and stop the machine. The upper ends of the rack bars 18 and 34 are connected by a tension spring 48 which tends to hold the racks 17 and 33 in engagement with their respective gears.

In the operation of this machine, when the clutch 45 is engaged, the disks 24 and 40 run at the same speed and in the same direction as indicated by arrows in the several figures.

In the operation of the linkage connections between the shaft 25 and the panel 14, the disk 24 serves as a crank of which the crank pin 23 moves the end of the link 21 in a circular orbit. This movement causes the link 20 to swing in an arc on the pivot 22 as the center. The pivot 19 at the outer end of this link is, therefore, moved in said arc in an up and down oscillation as the disk 24 rotates. This movement of the pin 19 moves the lower end of the bar 18 in the same path. The upper end is held by the spring 48 with the rack 17 in mesh with the gear 16. Accordingly, this rack has an endwise movement which rotates the gear 16 and with it the bar 13 and the side panel 14. This is an oscillating movement timed by the rotation of the disk 24. The movement of the parts is such that the panel 14 is swung on its hinge 13 through an arc of substantially 180° so as to form a fold in a garment laid thereon. Tracing the connections between the shaft 41 and the panel 30 in the same manner will show that this panel has a similar folding movement imparted to it. Since these linkage connections are substantially alike the movements imparted to the panels 14 and 30 will be similar. However, it will be noted that the two sets of linkage connections, including on the one hand the members 18, 20 and 21 and, on the other hand, the members 34, 36 and 37, are arranged in perverted relation to each other. The term "perverted" is here used in its geometric sense, meaning that these two sets of connections bear the same relation to each other as is shown by an object to its optical image in a plain mirror, that is, the positions of the several parts are reversed in respect to their right and left relation but not in their up and down relation. This perverted relation of two linkage sets results in a difference in timing of the folding movements as will be explained in connection with Figs. 6 to 9 inclusive.

In order to provide a pause in the movement of these panels so as to permit the operator to

place another garment in position, an abutment roller 49 is positioned for engagement by the bar 18 and a similar roller 50 is positioned for engagement by the bar 34.

Referring now to Fig. 6, it will be noted that the two crank disks 24 and 30 rotate in the same direction and at the same speed. In this figure the crank pins 23 and 39 are shown in their innermost positions, that is, closest to each other. In this position the lower ends of the rack bars 18 and 34 are drawn inward. This causes them to contact the rollers 49 and 50 which rollers act as fulcrums causing the upper ends of these bars to move outward and thereby disengage the racks 17 and 33 from the gears 16 and 32 respectively. It will be seen that so long as the rack bars are in contact with the abutment rollers 49 and 50, the panels 14 and 30 will be disconnected and will have no movement. Thus, a certain range of movement of the crank pins 38 and 39 will cause disengagement of the racks and provide a pause in the operation of the panels.

In Fig. 7 the cranks have moved around to a position such that the rack 17 has been moved into engagement with the gear 16, while the rack 33 is still disengaged. Accordingly, at this point, the rack 17 will begin to drive the gear 16 so as to cause the panel 14 to execute a folding movement.

This movement continues until the position shown in Fig. 8 wherein the panel 14 is shown in folded position above the panel 2. During the movement from the position of Fig. 7 to that of Fig. 8, the crank 40 has moved around far enough to bring the rack 33 into engagement with the gear 32 and thereby to cause the panel 30 to begin to execute the folding movement. Fig. 8 shows the limiting position of the rack bar 18 which corresponds to the completely folded position of the panel 14. From this point on the unfolded movement of the panel 14 is executed. Accordingly, as the mechanism moves from the position of Fig. 8 to that of Fig. 9 the panel 14 executes its unfolding movement while the panel 30 completes the folding movement. Continued operation from the position of Fig. 9 completes the unfolding movement of the panel 14 and executes completely the unfolding movement of the panel 30 so that the mechanism returns to the condition illustrated in Fig. 6.

It will be seen that this mechanism causes the panels 14 and 30 to execute folding and unfolding movements in succession. Accordingly, a garment 51 placed so as to spread over the three panels 30, 2 and 14 will be folded into three folds as shown in Fig. 3.

As shown in Fig. 1, the panels 14 and 30 are perforated with fairly large holes 52 so as to permit air to pass therethrough freely as these panels swing about their hinge bars 13 and 31.

As will be seen from Fig. 7, as the folding movement begins the garment 51 rests on the panels 2, 14 and 30.

Fig. 10 represents an instant during the folding movement of the panel 14. As this movement has considerable velocity, the pressure of air on the garment 51 will be increased slightly on the side toward which the movement takes place. This pressure is indicated by the arrows in Fig. 10. It tends to keep the garment in contact with the panel so that it will fold evenly as the panel swings. After the panel 14 has completed its folding movement and begins its unfolding movement, the conditions illustrated in Fig. 11 obtain. As the panel 14 starts to move upward

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the atmospheric pressure is maintained on the garment at the portions exposed by the holes 52. Furthermore, as the panel moves away from the garment air can pass through these holes and into the space formed between the garment and the retreating panel. This prevents that portion of the garment already folded from being picked up again by the panel 14 as it moves upward in its unfolding movement. At the same time that portion of the garment which is carried by the panel 30 is pressed into contact with that panel by the air pressure as indicated by the arrows in Fig. 11. When the panel 30 has completed the fold and begins to unfold, the holes therein again permit the air to hold the garment down while the panel moves away. In this way, the movements of the panels may be quite rapid without danger of disturbing the folds of the garment which have been formed.

It will be seen, therefore, that this invention provides means whereby such an article can be folded rapidly and accurately without requiring any considerable skill on the part of the operator. In the usual operation, the operator stands to the right of the machine as seen in Fig. 2. After starting the machine by operation of the treadle 47, the operator moves the garment from a convenient stack and places it upon the three panels during the pause illustrated in Fig. 6. The machine immediately executes the two folds in succession and as the side panels fold the garment over their pressure tends to move the center panel 2 downward against the pressure of the springs 5. Whenever the panel 2 is moved down in this manner, a distance equal to the spacing of the notches on the bar 6, another of these teeth will catch below the plate 8 and hold the panel 2 in this depressed position.

At each pause of the machine, the operator places another garment in place which is immediately folded in like manner and stacked upon the preceding one on the panel 2. In this way a succession of garments may be folded individually, each one in the shape shown in Fig. 3 and the folded garments stacked one upon the other on the panel 2, the latter moving downward as the thickness of the stack grows. When a desired number of garments has been accumulated in the stack, the operator stops the machine and presses the plate 9 back to release the ratchet bar 6. The springs 5 then raise the panel 2 with its stack of garments and the operator can remove the stack and place it in the package or make other disposition, as desired.

Various changes may be made in the details of construction, within the scope of the appended claims, without departing from the spirit of this invention. Parts of the invention may be used without the whole and improvements may be added while retaining some or all of the advantages of the invention.

I claim:

1. A cloth folding machine of the character described comprising: a center supporting panel, side panels hinged along opposite sides of said center panel for folding thereover, mechanism connected to said side panels operating to fold and unfold said side panels successively, means guiding said center panel for vertical movement, yielding supporting means for said center panel permitting the same to be depressed by pressure of a side panel on a folded cloth thereon, and a releasable detent adapted to hold said center panel in depressed positions.

2. A cloth folding machine of the character

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described comprising a horizontal supporting panel adapted to receive and support thereabove a portion of a flatwork article with a second portion of the article extending laterally therebeyond, a folding panel hinged adjacent to a lateral edge of said supporting panel for simple pivotal movement independently of said supporting panel, means for moving said folding panel inwardly whereby to fold said second portion of the article inwardly over and upon said first named portion, means guiding said supporting panel for vertical movement, yieldable means permitting lowering of said supporting panel by the pressure of said folding panel at each such folding operation by an amount substantially equivalent to the thickness of a folded article, and releasable detent means for retaining said supporting panel in a plurality of successive depressed positions between successive folding operations.

3. Means for successively folding individual laundry flatwork articles comprising a horizontal center panel adapted to receive and support thereabove the central portion of an article with the side portions of the article extending laterally therebeyond, a pair of side panels hinged one at each side of said center panel adjacent thereto for simple pivotal movement independently of said center panel, means for sequentially moving said side panels inwardly whereby to sequentially fold inwardly first one said side portion and then the other said side portion over and upon said central portion, means guiding said center panel for vertical movement, yieldable means permitting lowering of said center panel by the pressure of said folding panels at each such folding operation by an amount substantially equivalent to the thickness of a folded article, and releasable detent means for retaining said center panel in a plurality of successive depressed positions between successive folding operations.

4. Means for successively folding individual laundry flatwork articles comprising a horizontal center panel adapted to receive and support thereabove the central portion of an article with the side portions of the article extending laterally therebeyond, a pair of side panels supported one at each side of said center panel for simple pivotal movement independently of said center panel, all of said panels being arranged to lie in a single substantially horizontal plane to receive an article spread thereover, means for sequentially swinging each side panel over the center panel to fold an end portion of the article over a central portion thereof, and then return the side panel to its original horizontal position, means guiding center panel for vertical movement yieldable means permitting lowering of said center panel by the pressure of said folding panels at each such folding operation by an amount substantially equivalent to the thickness of a folded article under the impact of the swinging panels, and a releasable detent for retaining said center panel in a plurality of successive depressed positions.

5. A cloth folding machine of the character described: comprising a horizontal center supporting table, side panels supported to lie in a single horizontal plane alongside the table, the panels and the table thereby being adapted to receive an article spread thereover, mechanism connected to said side panels to swing sequentially each of them over and upon the table and return the panel to its original horizontal posi-

tion, means guiding said table for vertical movement yielding means for supporting the table and permitting it to be depressed under the impact of the swinging panels, and a releasable dent for holding the table in a plurality of successive depressed positions.

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