United States Patent

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Continuation-in-part of application Ser. No. 545,823, Apr. 25, 1966, now Patent No. 3,462,138, dated Aug. 19, 1969.

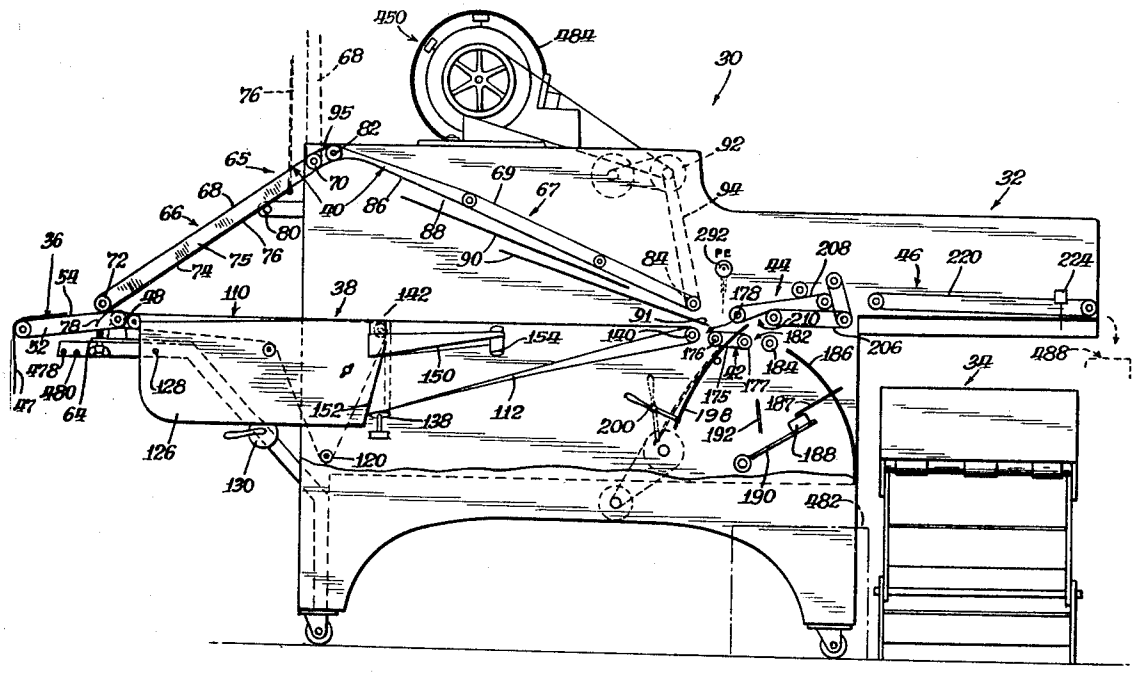
[54] **SENSING AND ACTUATING MEANS FOR LAUNDRY FOLDER**
6 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **270/66,** 270/80
[51] **Int. Cl.** **B65h 45/18**
[50] **Field of Search** ..... 270/62, 64, 69, 80—85

[56] **References Cited**
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ABSTRACT: A laundry folder for small pieces in which the pieces are folded at an intermediate point such as the middle, including a pair of sensors spaced along the line of travel of the laundry pieces, each laundry piece engaging the first one of the sensors which starts a slow speed advancement of an actuating element away from a control element, and then engaging the second one of the sensors which starts a fast speed return or retracting movement of the actuating element toward the control element, the latter controlling a folding member for folding the laundry piece at a corresponding position between the ends thereof.



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SHEET 1 OF 3

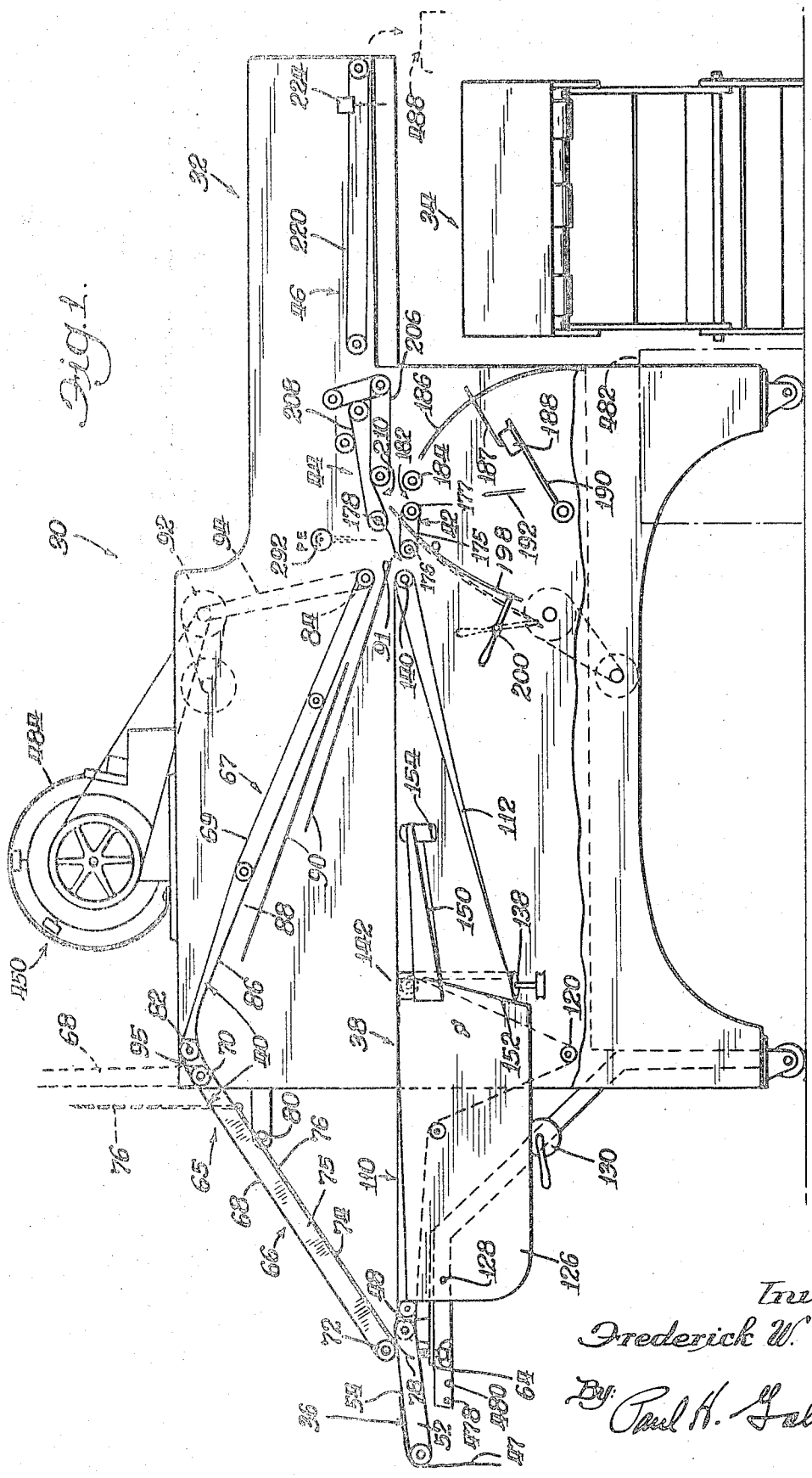
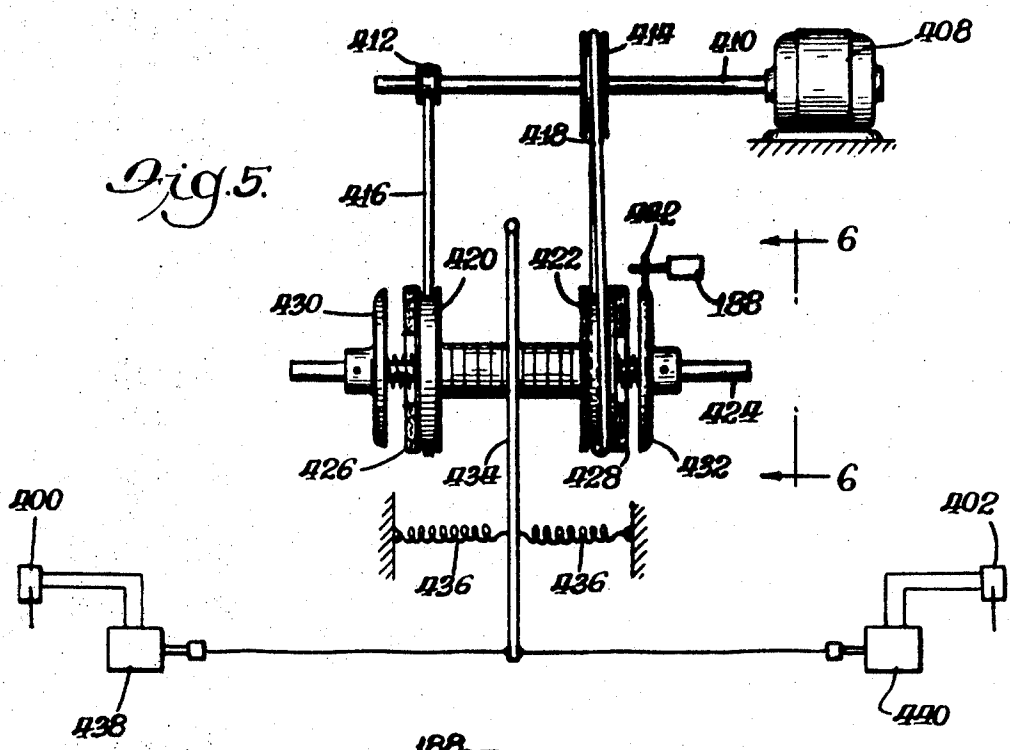


Fig. 1.

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Fig.5.



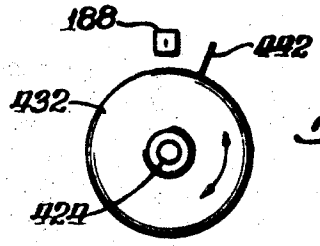


Fig.6.

Fig.2

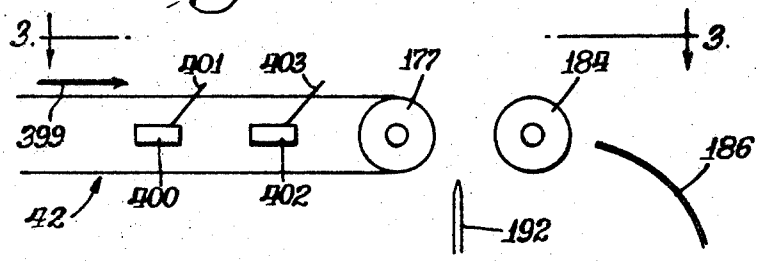
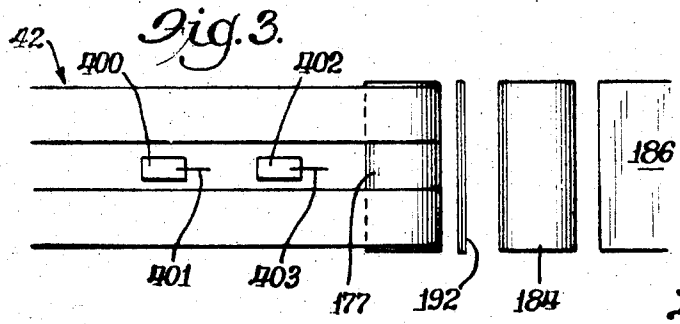


Fig.3.



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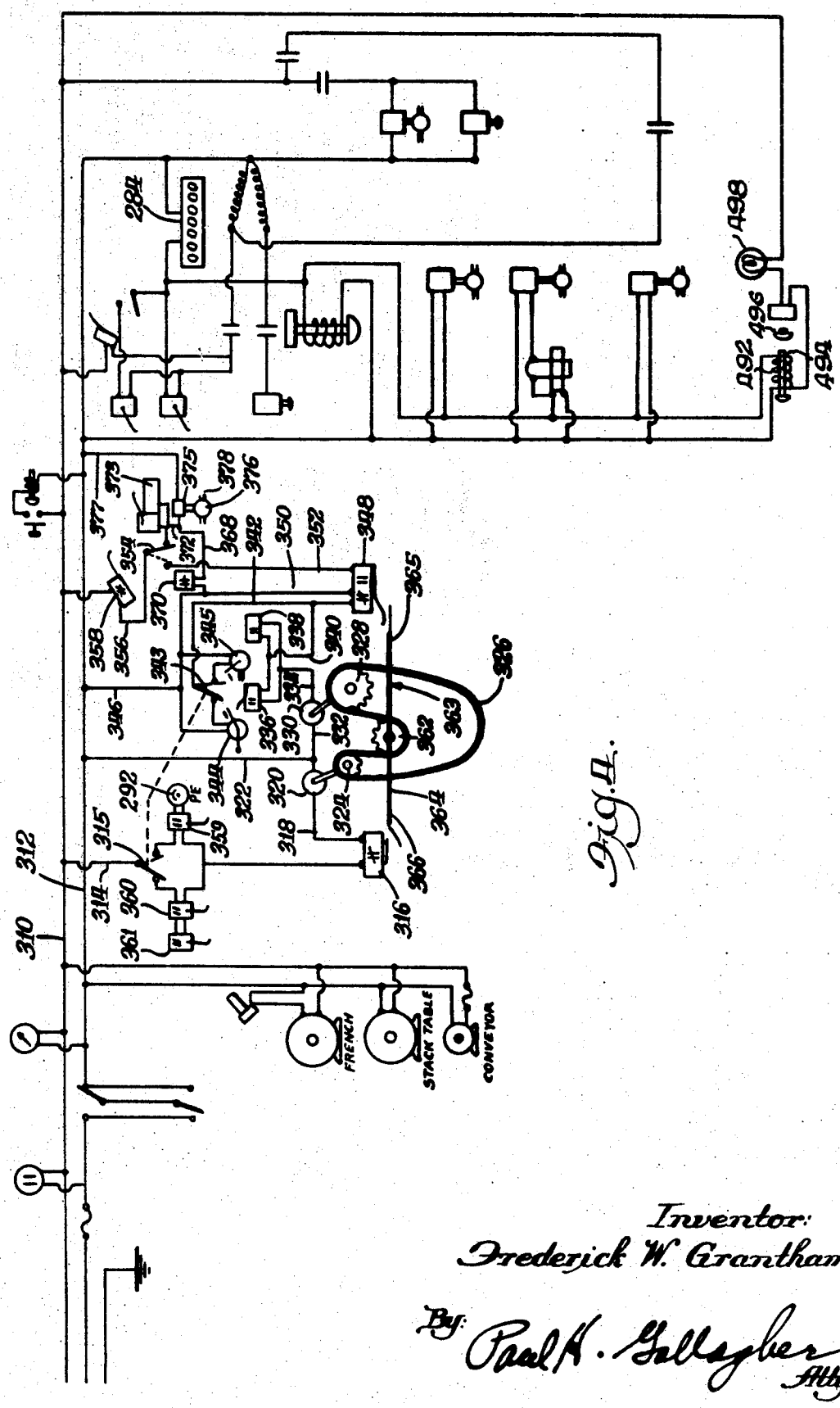


Fig. 4.

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SENSING AND ACTUATING MEANS FOR LAUNDRY FOLDER

This application is a continuation-in-part of my previous application Ser. No. 545,823 filed Apr. 25, 1966, for Laundry Folder, now U.S. Pat. No. 3,462,138, dated Aug. 19, 1969.

CROSS REFERENCES

U.S. Pat. No, 3,339,914, issued Sept. 5, 1967, to the present inventor.

BACKGROUND OF THE INVENTION

This invention relates to laundry folders for folding small pieces such as napkins, hand towels, bath towels, bath mats, etc. In the manufacture and use of folders of this general type, it is desired that the folder be adaptable to folding pieces of each of these kinds, and that it be adaptable to adjustment for each one of the different kinds.

OBJECTS OF THE INVENTION

A broad object of the invention is to provide a novel folder adaptable to folding each of a plurality of different kinds of pieces such as those referred to above.

An additional object is to provide a laundry folder for use in folding laundry pieces of various sizes such as napkins, towels, bath mats, etc., and having novel construction for folding the pieces according to their lengths without individual adjustment for the different sizes.

A still further object is to provide a laundry folder of the character just referred to in which pieces of different sizes can be folded in random order, and the folder is effective for folding each piece at a predetermined position, such as the middle, regardless of the size of the piece.

Still another object is to provide a folder of the foregoing general character which is of novel mechanical nature, and unusually effective.

DESCRIPTION OF A PREFERRED EMBODIMENT

In the drawings:

FIG. 1 is a vertical longitudinal view of the apparatus, partially diagrammatic in nature;

FIG. 2 is a side view, also semidiagrammatic in nature, of a conveyor means for conveying the pieces through the folder, and sensing means in association therewith;

FIG. 3 is a view taken at line 3–3 of FIG. 2;

FIG. 4 is a diagram of the main portion of the circuit utilized in the apparatus;

FIG. 5 is a view semidiagrammatic in nature including means for sensing the laundry pieces moving through the folder and elements associated therewith and controlled thereby; and

FIG. 6 is an end view taken at line 6–6 of FIG. 5.

Reference is now made in detail to the accompanying drawings, certain FIGS. of which are substantially identical to, or similar to, certain FIGS. of the parent application identified above, according to the following correlation:

This application	Parent application
FIG. 1	FIG. 1
FIG. 2	FIG. 22
FIG. 3	—
FIG. 4	FIG. 13
FIG. 5	FIG. 25
FIG. 6	FIG. 26

In the present instance FIGS. 1 and 4 are identical with the corresponding FIGS. of the parent application except that for the purposes of clarity, certain of the reference numerals and other identifications in the parent application are omitted in the present; FIG. 2 of the present application is generally similar to the corresponding FIG. of the parent application but it includes additional elements; FIGS. 5 and 6 are identical with the corresponding FIGS. of the parent application; the reference numerals utilized in the present application are the same as those utilized in the parent application, for the corresponding elements.

The apparatus including the features of the present invention is indicated in its entirety at 30 and includes two main units, namely a folder per se 32 and a stack table 34 which is a separate unit from the folder and preferably detached therefrom, but the two cooperate together as a single apparatus.

As disclosed in the parent application, the folder unit 32 includes as its main components a feedboard 36, conveyor means indicated in its entirety at 38 and made up of a pair of successive conveyors utilized in making a quarter fold, additional conveyor means indicated in its entirety at 40 utilized in making a french fold, an extension conveyor 42, an intermediate or pickup conveyor 44 and a final or delivery conveyor 46. Other elements or components are also utilized in conjunction with the foregoing components, as will be described hereinbelow. In the normal operation of the apparatus, the operator places the laundry pieces 47 on the feedboard 36 and they proceed next onto the quarter fold conveyor means 38 or the french fold conveyor means 40 according to the predetermined setting of the unit, and then proceed along the remaining conveyors until they reach the delivery conveyor 46 which, in conjunction with other elements, drops the folded laundry pieces onto the stack table 34.

In further explanation of the conveyance of the laundry pieces through the folder, the control of the laundry pieces as to whether they proceed along the quarter fold conveyor means 38 or the french fold conveyor means 40 is determined by the setting of the conveyor section 66; if that section is in its lower position as shown in full lines in FIG. 1, the laundry pieces proceed from the feedboard 36 onto that section 66, and along the conveyor means 40; on the other hand if that section is in its upper position as shown in dotted lines in FIG. 1, the laundry pieces proceed along the conveyor means 38. The arrangement which includes those two conveyor means, 38, 40, is covered in the parent case identified above and does not as such enter into the operation of the present invention.

Regardless which path, i.e. the conveyor means 38 or the conveyor means 40, along which the laundry pieces proceed, they are delivered onto the extension conveyor 42, in conjunction with which the apparatus of the present invention is preferably directly associated, as explained more fully hereinbelow.

In the normal operation of the folder, the laundry pieces are folded, as by a cross fold, or a quarter fold after proceeding beyond the extension conveyor 42, also described hereinbelow. In the progress of the laundry piece along the conveyor means, the leading edge thereof passes over a gap 182 between that conveyor and a fluted roll 184 just beyond the gap, and onto a curved apron 186. When the folding operation takes place, as described hereinbelow, a folding blade 192 is moved upwardly through the gap 182 and forms a crease and cross fold in the laundry piece, and the crease, forming a new leading edge, is moved upwardly into the bight 210 in the conveyor means 44 and the piece is then gripped by the belts of that conveyor means and carried thereby into the final conveyor means 46. The laundry piece is thereupon delivered onto the stack table 34 or elsewhere in a manner not pertinent to the present invention. The present invention is directed to the operation of the folding means at the gap 182, by means of the blade 192, and in this connection it is to be explained that FIG. 1 includes means for controlling the folding means which is not utilized in the present invention although it may be included in the physical structure thereof, and disabled. That folding control means includes a microswitch 188 having a finger 187 extending through a slot in the curved apron 186 engageable by the leading edge of the laundry pieces. The

microswitch **188** is carried by an arm **190** which is swingably adjustable to different positions for determining the position of the fold of the pieces. However this microswitch **188** is relocated in the control means of the present invention, and actuated as described hereinbelow.

FIG. **1** also shows a deflecting device **198** which does not enter into the present invention. This deflecting device includes prongs projectable through the extension conveyor **42** for deflecting the laundry pieces from the gap **182**, and the folding means, and deflecting them directly into the pickup conveyor **44**. In FIG. **1** this deflecting means is shown in full lines in active position in which it deflects the pieces as just referred to, and in inactive position in dotted lines in which it is withdrawn from the upper surface of the intermediate conveyor **42**, and in that case the laundry pieces are conveyed the full length of the conveyor **42** and thus into operating engagement with the sensing means associated therewith as described hereinbelow.

The sensing means utilized in the construction of the present invention may be located at any of various positions along the line of progress of the laundry pieces through the folder, and it has been found that a most convenient location is in or at the intermediate conveyor **42** for the reason that all of the laundry pieces are conveyed on that conveyor regardless of other treatment of the pieces in the handling of them in the folder. The intermediate conveyor **42** may be of any desired length, since its length as such does not enter into the function of the folder in the conveyance of the laundry pieces from the conveyor means **38** or **40**, and the conveyance of them after leaving the conveyor **40** such as being delivered into the pickup conveyor **44**. Thus the conveyor means **42** may be of a relatively great length such as represented in FIGS. **2** and **3**. In these FIGS. the conveyor **42** is of much greater length and they include the switches **400** and **402** incorporated in FIG. **22** of the parent application. As represented in FIGS. **2** and **3** the laundry pieces move from left to right as indicated by the arrow **399**, this being also from left to right as oriented in FIG. **1**, and in this case the switch **400** is first engaged by the laundry pieces and then the switch **402**, these switches having fingers **401** and **403** respectively extending through and above the upper run of the conveyor means **42** for engagement by the laundry pieces conveyed on that conveyor.

The same two switches **400** and **402** are incorporated in the construction of the parent application and in that case they control the corresponding components of each of the various folding means utilized therein, one of which is the control means of FIGS. **5** and **6** in the present instance. This control means is of novel mechanical nature and includes a constantly operating motor **408**, having a drive shaft **410** with small and large driving pulleys **412** and **414** thereon. Trained on these pulleys are belts **416** and **418**, one of them being twisted, which are also trained on driven pulleys **420** and **422** slidably and rotationally mounted on a driven shaft **424**. The driven pulleys **420** and **422** have friction clutch elements **426** and **428** thereon engageable respectively with driven elements or discs **430** and **432** fixed on the driven shaft **424**. The driven pulleys **420** and **422** are slidable together by an arm **434** biased to a neutral position by springs **436**, but swung in one direction or the other by solenoids **438** and **440** which in turn are controlled by switches **400** and **402** identified above. One of the discs, e.g., **432**, is provided with a finger **442** arranged for actuating the microswitch **188** identified above for controlling the folding blade **192**.

In the operation of the apparatus of FIGS. **5** and **6**, as a laundry piece is placed on the conveyor and it engages the first switch **400** it energizes the solenoid **438**. The solenoid draws the arm **434** and shifts the pulley **420** into driving engagement with the corresponding disc **430** which in turn rotates the driven shaft **424** and advances the finger **442** from its normal stationary position indicated (FIG. **6**) in an arbitrarily selected direction such as clockwise. When the laundry piece then engages the finger of the second switch **402**, the solenoid **440** overpowers the first solenoid **438** and draws the arm **434** in the opposite direction, withdrawing the driven pulley **420** from its driven disc and shifting the other driven pulley **422** into driving engagement with the disc **432**. Because of the larger size of the driving pulley **414** relative to the other pulley **412**, the driven shaft **424** is driven at a correspondingly greater speed, such as twice the speed, in the opposite direction, and the finger **442** is moved back (counterclockwise) at a greater speed until it actuates the microswitch **188**. The resulting folding operation is that the faster travel of the actuating finger **442** produced by the larger pulley **414** effects the folding step at an intermediate position, such as the middle. Upon removal of the laundry piece from the conveyor the switches **400** and **402** move to their normally open position. The foregoing cycle is repeated in response to another laundry piece again progressing along the conveyor.

In the operation of the device the disc **432** may be prepositioned for correspondingly positioning the finger **442** relative to the switch **188**, and preferably is so positioned closely adjacent that switch. If it is desired to fold the piece in the middle, the pulley **414** would be twice the size of the pulley **412**, and the rearward or retracting movement of the disc **432** would be twice that of its forward movement. Either of the pulleys **412** or **414** could be interchangeable so as to provide a pulley of different size so that the two pulleys then would not be same 2 to 1 ratio but of different ratios whereby to fold the pieces at different positions relative to their leading and trailing edges.

It will be understood that the microswitch **188** upon actuation thereof effects actuation of the folding blade **192** by suitable means such as that disclosed in my prior patent referred to above.

I claim:

1. A laundry folder comprising conveyor means for conveying laundry pieces singly and successively therethrough, the conveyor means including a component over which all of the laundry pieces are conveyed, a pair of anterior and posterior electric switches associated with said conveyor component and having actuating elements extending thereabove for engagement and actuation by the laundry pieces passing over that component, folding means operatively associated with said conveyor component and when actuated operative for forming a fold in each laundry piece at a predetermined position relative to that conveyor component, control means for controlling the folding means and in turn controlled by said electric switches, said control means including a constantly operating motor and a pair of driving pulleys of different sizes, a pair of driven pulleys, belts interconnecting the corresponding driving and driven pulleys and one of the belts being twisted relative to the other for correspondingly driving the driven pulleys in opposite directions, a driven shaft, discs mounted on the driven shafts, clutch means mounted on each driven pulley, means for shifting the driven pulleys and the clutch means thereon into clutching engagement with the respective driven discs, each to the exclusion of the other, switch means for controlling the folding means, an actuating finger on one of the driven discs operative for actuating the switch means, the first switch means in the conveyor means being operative for energizing the first clutch means operating at a slow speed and thereupon energizing the second switch means for correspondingly energizing the second clutch means for driving the driven member at a greater speed and in the opposite direction, the second driven element being operative upon continued movement in driven direction for actuating the switch means for controlling the folding means.

2. A laundry folder comprising means for conveying laundry pieces therethrough, means for folding the laundry pieces in their progress along the conveying means, means for controlling the folding means including an actuatable member having a normal inactive position and movable into an active position, an actuator movable in a first direction away from the actuatable member and in the opposite direction toward and into actuating engagement therewith, driving means for

moving the actuator in each direction and in said opposite direction at a faster rate than in said first direction, and means for controlling the driving means including a first and second sensing means at the conveying means spaced longitudinally therealong and operatively engaged successively by the laundry pieces, the sensing means being operatively associated with respective ones of the driving means for said first and opposite directions.

3. A laundry folder according to claim 2 wherein the driving means is of electrical character, and the sensing means include switch means with arms projecting into the path of the laundry pieces on the conveying means.

4. A laundry folder according to claim 2, wherein the driving means includes a pair of motion transmitting members running constantly, in opposite directions, and at different speeds, said motion transmitting members being mounted as a unit and so shiftable selectively into clutching engagement with the actuator, and means responsive to control of said sensing means operative for shifting said motion transmitting members in respective directions.

5. A laundry folder according to claim 4 wherein the driving means includes a pair driving and driven pulleys with belts drivingly interconnecting them in relatively twisted attitudes for providing opposite direction of movement in the driven pulleys.

6. A laundry folder comprising means for conveying laundry pieces therethrough, means for folding the laundry pieces in their progress along the conveying means, means for energizing the folding means including driving means incorporating a pair of electrical switch means having sensing elements positioned for sequential actuation by the laundry pieces moving along the conveyor, a pair of mechanical clutch members running in opposite directions and at different speeds, and means actuated by the switch means including a mechanical member moving away from the switch means and moving reversely into actuating engagement with the switch means in respectively opposite directions.