

Dec. 10, 1963

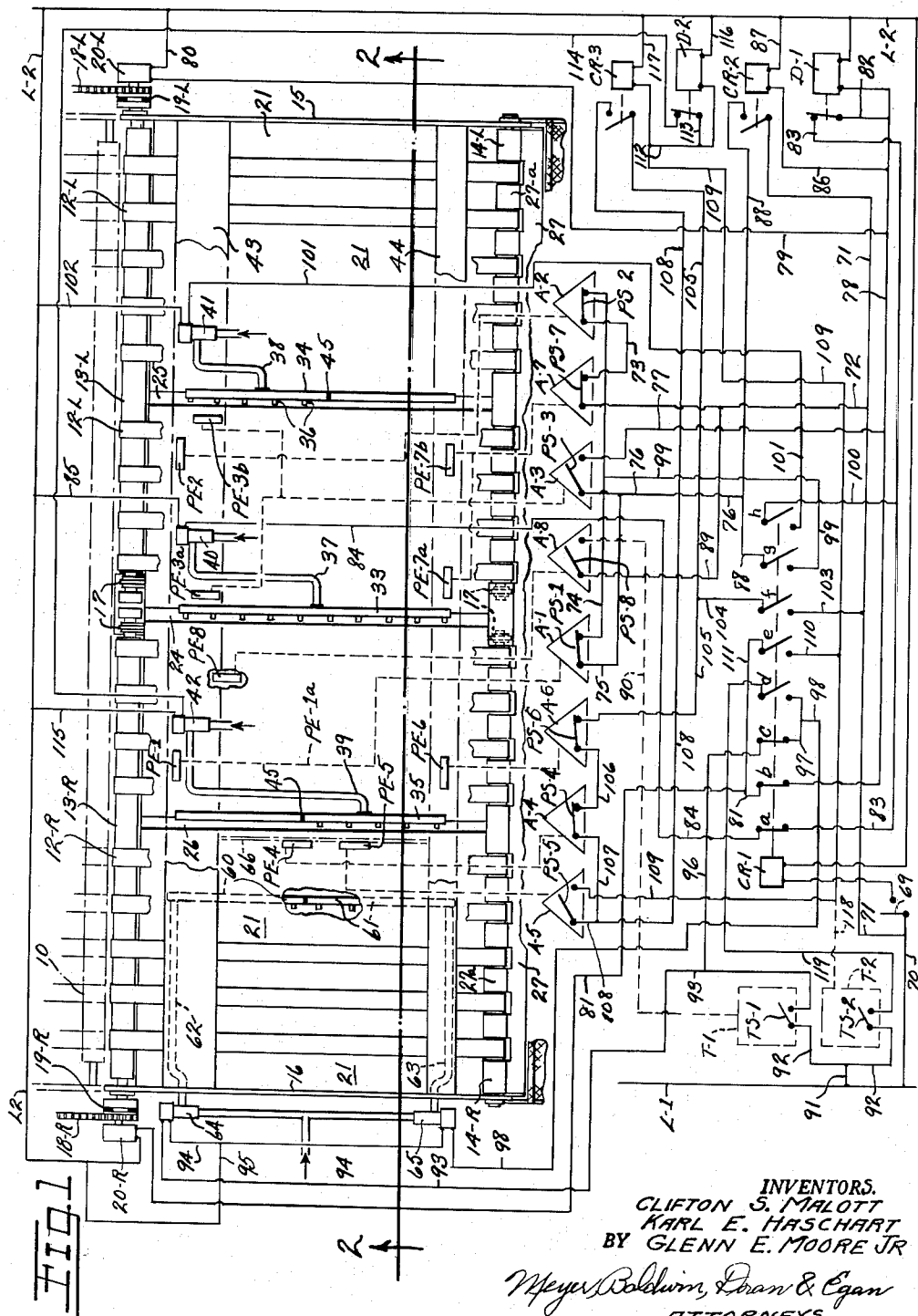
C. S. MALOTT ETAL

3,113,772

CROSS-FOLDER CONTROL

Filed Sept. 24, 1962

3 Sheets-Sheet 1



Dec. 10, 1963

C. S. MALOTT ET AL
CROSS-FOLDER CONTROL

3,113,772

Filed Sept. 24, 1962

3 Sheets-Sheet 2

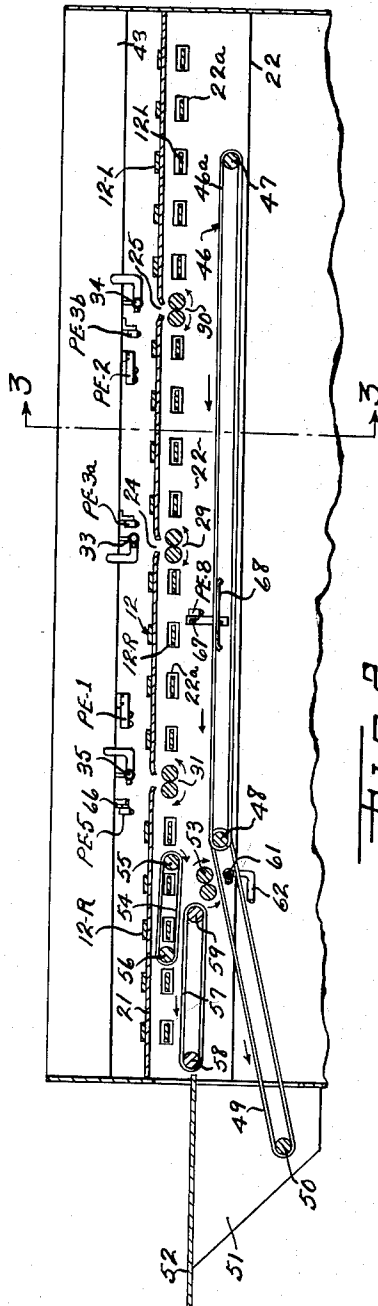


FIG. 2

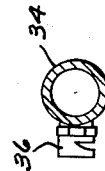
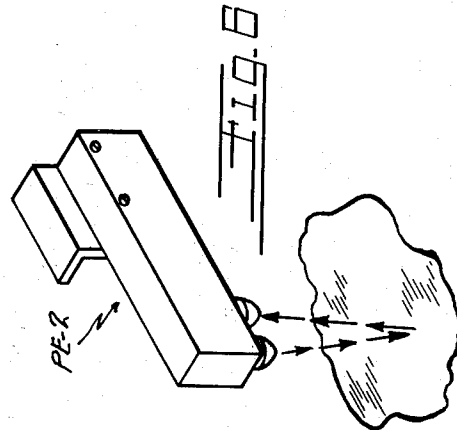


FIG. 7

INVENTORS.
CLIFTON S. MALOTT
KARL E. HASCHART
BY GLENN E. MOORE JR.

Meyer, Robinson, Doran & Egan
ATTORNEYS

Dec. 10, 1963

C. S. MALOTT ETAL
CROSS-FOLDER CONTROL

3,113,772

Filed Sept. 24, 1962

3 Sheets-Sheet 3

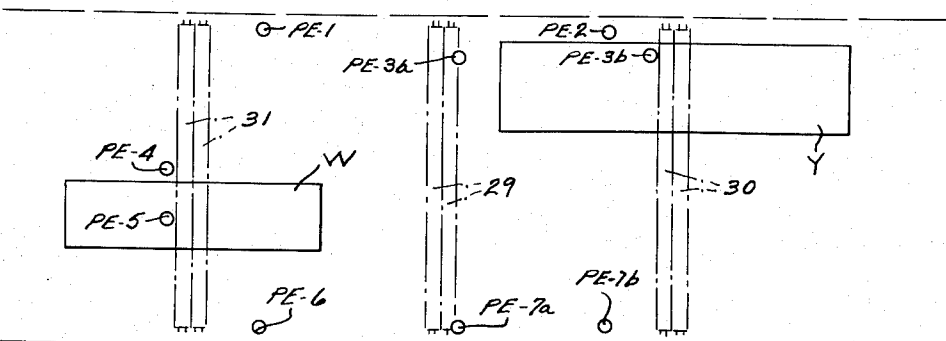
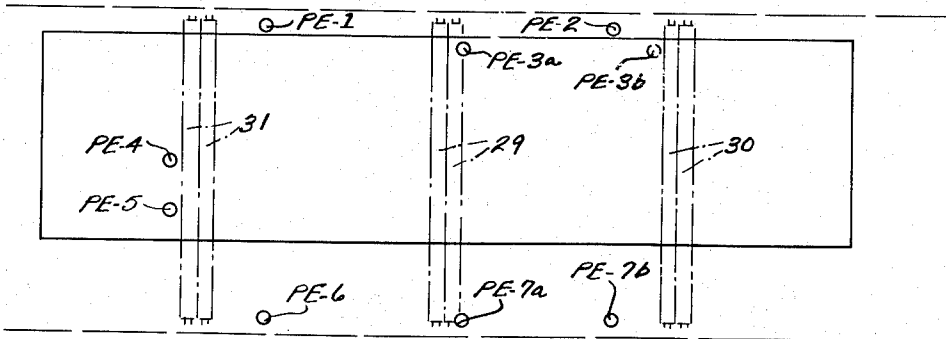
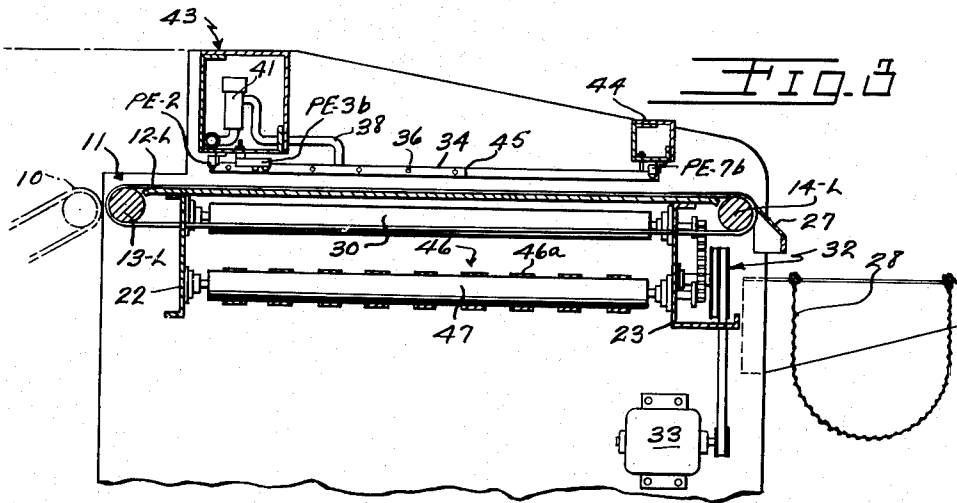


FIG. 5

FIG. 6

INVENTORS.
CLIFTON S. MALOTT
KARL E. HASCHART
BY GLENN E. MOORE JR.
Wygert, Baldwin, Doran & Egan
ATTORNEYS

1

3,113,772

CROSS-FOLDER CONTROL

Clifton S. Malott and Karl E. Haschart, Cincinnati, and Glenn E. Moore, Jr., Maineville, Ohio, assignors to McGraw-Edison Company, Elgin, Ill., a corporation of Illinois

Filed Sept. 24, 1962, Ser. No. 225,584
8 Claims. (Cl. 270-69)

The invention relates to flatwork folding machines and more particularly to that development of flatwork folders known as crossfolders wherein a large workpiece such as a bed sheet or table cloth is carried by an endless tape conveyor through one or more "primary" folding zones wherein it receives primary folds in a direction at right angles to its direction of movement after which it is usually transversely folded by transverse folding means in a direction at right angles to the primary fold lines. This second type of fold is usually termed a cross fold, the part of the apparatus whereby the cross fold is achieved being termed a cross folder.

An object of the present invention is to provide a novel and improved crossfolding machine which avoids some of the operating difficulties incident on previous crossfolders known or used in the prior art.

Another object of the invention is to provide a cross folding machine having means which substantially completely avoid interference to the folding operation by closely-following articles.

Other objects and advantages will be apparent from a study of the following description of one embodiment of the invention in conjunction with the accompanying drawings wherein:

FIGURE 1 is a plan view of the crossfolding machine in semi-diagrammatic form, also showing the electrical and pneumatic control and operating system thereof.

FIGURE 2 is a transverse sectional view approximately on the line 2-2 of FIG. 1, looking toward the feed end.

FIGURE 3 is a sectional view on line 3-3 of FIGURE 2.

FIGURES 4 and 5 are diagrammatic views showing the position of the article-sensing devices in relation to the workpieces.

FIGURE 6 shows one of the sensing means, which in the embodiment are photo-electric.

FIGURE 7 shows one of the air jet nozzles.

FIGURE 8 shows the primary folds made in the article prior to its delivery to this machine for crossfolding.

Articles coming from a primary folder, as by way of conveyor 10, will usually have received two parallel folds, being therefore reduced to one quarter of their original length, as shown in FIG. 8. The article moves onto conveyor 11 comprising a group of flat endless belts 12. The disclosed machine is a two-lane type, either half of which can be used separately for narrow articles, so there are two sets of belts 12-L (left), 12-R (right). The left hand set runs on a driving roll 13-L at the feed or forward end, and on an idler roll 14-L at the rear. The right hand set runs on driving roll 13-R and an idler roll 14-R.

In FIG. 1 the article starts from top to bottom of the figure when held so that the reference characters can be read, and the terms "right" and "left" are as seen from the top, looking in the direction of article travel. The rolls are journaled at one end in the side frames 15 or 16, FIG. 1, and in bearings 17 adjacent to the center line of the machine, so that the left and right lanes are independent. The rolls 13-L, 13-R normally are driving, but stop during the time a fold is being made. The drive can be, for instance, from the drive of the associated

2

primary folder by way of a chain 18-L, 18-R, and an interposed clutch 19-L, 19-R, which clutches are normally engaged but adapted to be disengaged when an electrical actuator 20-L or 20-R is energized. This is indicated semi-diagrammatically, for clarity, since any suitable means may be used. In the present embodiment the clutch is operated by an air cylinder and the air thereto is controlled by a solenoid valve.

The upper runs of the conveyor belts ride on a polished table 21, FIGS. 1 and 2. This is supported on front and rear cross members 22, 23, FIGS. 2 and 3. There are gaps or slots 24, 25, 26 in the table at the central, left, and right lane folding points. A member 27, FIGS. 1 and 3, having arcuate portions 27a fitting over the rolls 14-L, 14-R between the conveyor belts, guides any bypassed usually off-size articles into a receptacle 28, FIG. 3. The lower runs of the conveyor belts pass through openings such as 22a in the cross members, FIG. 2.

Below the table at each gap is a pair of folding rolls, 29, 30, 31, FIGS. 2 and 3. These rolls are journaled between the cross members and rotated continuously from the rear end by a suitable drive means such as the chain-and-belt drive indicated at 32, which extends across the machine and connects to the several rolls and cross conveyors shown in FIGURE 2, giving them the rotation or travel indicated by the various arrows, the drive being powered by motor 33. Above the table at each of the three folding zones is an air pipe 33, 34, 35, provided with nozzles 36 for delivering an air blast against a workpiece, forcing it down through the gap in the table and into the grip of the cross folding rolls. Air is supplied by way of pipes 37, 38, 39 from respective solenoid valves 40, 41, 42, located within the front, upper cross member 43, which is of boxed construction, FIG. 3. There is also a smaller, rear, upper cross member 44, FIGS. 1 and 3, and the air jet pipes are supported from and beneath these cross members, as shown in FIG. 3. It will be noticed that the central air pipe for the combined single lane has nozzles along its full length (FIG. 1), while left and pipe 34 has nozzles only on the forward (upper) half of its length and right lane pipe 35 has them only on the rear (lower) half of its length. These two pipes 34, 35, could, of course, be shorter, but for uniformity and as a convenience in mounting, they are made full length, but plugged approximately at the center of the length, as indicated at 45. As will be later described, the articles in the left lane are folded when they are in the forward part of the conveyor folding zone, and articles in the right lane are folded when in the rear part of the folding zone, and the operating air pipes 34 and 35 are disposed accordingly.

A transversely-extending conveyor 46, comprises belts 46a running on rollers 47, 48, journaled in lower cross supports 22, 23 (FIGS. 2 and 3). This receives the articles as they emerge from the cross fold rolls 29, 30 or 31 and carries them toward the side discharge point. The first crossfold control arrangement is of course a primary factor in the procedure. As to the second crossfold, another set of belts 49 runs on roll 48 and on a roll 50 journaled in brackets 51 that support the delivery table 52. Above these belts is a pair of rolls 53 or effecting the second crossfold. Above the folding rolls is a set of short belts 54 carried on rolls 55, 56. A set of belts 57 on rolls 58, 59 form the delivery conveyor which discharges the twice-crossfolded article onto the delivery table. The air jet pipes, consisting of the forward half 60 and rear half 61 (seen through the cut-away in FIG. 1) are separated by a plugged part or can be two independent pipes located below the upper run of the belts 49. Pipes 60 and 61 are respectively supplied with air by way of pipes 62, 63 from solenoid valve 64, 65.

The sensing elements could be micro-switches operated by the article, but as here disclosed photoelectric means are employed. Here, again, any suitable type could be used, such as a light beam traversing the path of article travel and impinging on a photocell. Our control uses a number of commercially obtainable photocell units PE of compact design each incorporating both the light source and the light-sensitive element, whereby relative reflectance is sensed. With no work going through the folder, the light reflects from the polished supporting table, FIGURE 6 (could be small, separate polished part), and the photocell, through its associated amplifying means indicated by the triangular symbols A1, A2, etc. in FIG. 1, which holds a switch either in open or closed condition. When an article comes through on tapes 12-L or 12-R, the reflectance is different and any controlled switch or switches moves to a condition other than as shown. The units are located as indicated, all, except two of the right lane units and one for the second fold, being mounted under the upper cross members 43, 44. The right lane first limit switch PE-4 and fold switch PE-5 are mounted on an angle member 66 (FIGS. 1 and 2) between the cross members 43, 44. Second cross fold photoelectric switch PE-8 is mounted on an angle member 67 (FIG. 2) between cross supports 22, 23, there being also a section of polished support 68 underlying the upper run of belts 46. The photo-electric sensing units are indicated as PE-1, PE-2, etc., the associated amplifying means as A-1, A-2, etc., and the switch controlled thereby as PS-1, PS-2, etc.

In FIGURE 1, all electrical and pneumatic control parts are in their unoperated condition, no article going through the folder. The conveyors and rolls (see also FIGURE 2) are running. The switches PS-1, PS-2, etc. are variously shown as open or closed, this being their respective normal condition when no article is passing under the associated photoelectric sensing unit. A manually operatable switch 69 (bottom, FIG. 1) adjusts the control for single lane or double lane operation. In single lane operation the right and left lanes are combined to run as a unit for wide work pieces. In double lane operation the right and left lanes run independently. When switch 69 is open, as here shown, single lane operation is in effect, the relay CR-1, controlled by switch 69, being unoperated and its contacts in their normal position. Assuming that a workpiece such as a sheet, wide but short, and already primarily folded, as shown in FIG. 8, comes along, the leading edge intercepts the beam originating at PE-1, as above described, so as to cause an operation by the resulting effect on amplifying switch PS-1, through the electrical linkage indicated by dotted line PE-1a and the amplifying means A-1. Switch PS-1 consequently opens, but without effect at this time. Similarly and simultaneously PE-2 is operated, its amplifier A-2 opening switch PS-2, also without effect. After a short further advance, the article operates fold switch PE-3a, and its amplifier A-3 closes switch PS-3, still without effect. At the same time, however, the article operates fold switch PE-3b, and since its electrical linkage is connected to that of PE-3a, it also effects closing of switch PS-3, either PE-3a or PE-3b being effective to do so. There are two of these switches since PE-3b is needed for the left lane in double lane operation, as will appear. Next, the article operates PE-4 and then PE-5, but while these right lane control switches cause their respective amplifiers A-4, A-5 to operate and respectively open and close the switches PS-4, PS-5, these do not have effect at any time during single lane operation, the circuits involved being open due to the condition of the contacts in relay CR-1, controlled by manual switch 69 as before noted. Right lane second limit switch PE-6 likewise would cause its associated amplifier A-6 to open its switch PS-6, but the further circuits are broken at relay CR-1 in its illustrated "single lane" condition.

Disregarding, therefore, switches PE-4, PE-5, PE-6,

the trailing edge of an article within the normal size range will clear the first-limit switches PE-1, PE-2 before the leading edge operates second-limit switches PE-7a, PE-7b, the situation being schematically shown in FIG. 4. As soon as PE-1 and PE-2 are released, and PE-3a and PE-3b are still operated, a folding operation is initiated. A circuit is completed from L-1, lines 70, 71, 72, PS-7 in unoperated condition, line 73, PS-2 as shown, line 74, PS-1 also unoperated, lines 75, 76, PS-3 now operated, lines 77, 78, 79, clutch release actuator 20-L, and line 80 to L-2. Actuation of the clutch stops the left lane conveyor. At the same time, the right lane conveyor is stopped, the circuit being the same to line 78, then going to closed relay contact CR-1b and line 81 to clutch release actuator 20-R and L-2. A circuit is also made, as previously traced to line 78, then line 82, normally closed contact of a delayed action relay D-1, line 83, normally closed relay contact CR-1a, line 84, the solenoid of air valve 40, and line 85 to L-2. This turns on the air for the central, single lane air jet pipe, so as to start the sheet down into the folding rolls. Another circuit that is completed is, again, the same to line 78, going then to the coil of the delayed action relay D-1, and thence to L-2. A predetermined moment later, therefore, the relay operates, opening its contact, thereby breaking the circuit to the air jet valve, the air blast not being necessary once the article is gripped in the folding rolls. Still another circuit that is made is, again, the same to line 78, then line 86, coil of relay CR-2, and line 87 to L-2. This closes the relay contact, and a circuit goes from L-1, line 71, relay contact, lines 88, 76, fold switch PS-3, and line 77 to line 78, from which the circuits hereinabove traced continue to the conveyor clutch actuators, air jet solenoid, etc. It can be seen that CR-2 connects the fold switch PS-3 directly to L-1, shunting out the limit or safety switches PS-1, PS-2, PS-7. The reason for this is that, once the fold has been initiated it has been thereby determined that the trailing edge of the article has cleared the first-limit switches PE-1, PE-2, and the leading edge has not reached the second-limit switches PE-7a, PE-7b, and thus the article is within the folding zone, that is within the extent of the folding rolls, see FIG. 3, so that folding can continue. If an article is overly long for any reason, for example if it has not been primarily folded, no cross fold will take place, because at first the first-limit or safety switches PE-1, PE-2 will be operated, then these plus the second-limit switches PE-7a, PE-7b, then finally the latter only, so that the piece passes on through into the receptacle 28. As can be seen, the circuit for fold initiating goes through switches PS-7, PS-2, PS-1 and PS-3 in series, and the first three which are limit switches must be in their closed, namely unoperated, condition and the fold switch must be closed, or operated, to complete a circuit. If any one of the front or rear limit sensing switches is operated by the article the fold circuit is broken. The purpose, of course, is to prevent folding of a piece longer than the rolls and consequent jamming. However, returning to relay CR-2, after folding has commenced and the two side portions of the sheet are being drawn over the conveyor and down through the folding rolls, a corner may happen to shift a little and come into line with one of the limit switches. If these were active, the folding operation would be thereby stopped, which, of course, is neither necessary nor desirable. Therefore, so long as the folding operation is in progress, relay CR-2 keeps the limit switches shunted out of the circuit as described.

The piece feeds down through the folding rolls 29 onto the moving conveyor 46 until, at the end, PE-3a is uncovered, and is therefore no longer operated, and PS-3 consequently opens, breaking the circuit to the clutch actuator, allowing the conveyor to restart. It also breaks the circuit to delayed action relay D-1 allowing it to close, and breaks the circuit to relay R-1 allowing it to open, breaking the shunt around the safety switches to again make them effective.

The leading edge of the cross-folded piece had operated PE-8, and thereby, through A-8, closed PS-8, completing a circuit from L-1, lines 70, 71, 72, 89, PS-8, and an electrical linkage indicated by dotted line 90 to a proportional measuring timer T-1, lower left, FIG. 1. When the midpoint of the once-crossfolded article arrives at the second-fold point, switch TS-1 closes, responsive to actuation by timer T-1. This makes a circuit from L-1, lines 91, 92, TS-1, line 93, the solenoid of air valve 64, and lines 94, 95 to L-2, turning on the air to the front part 60 of the second-fold air jet. At the same time, the other half 61 is turned on, a circuit being made from L-1, lines 91, 92, TS-1, lines 93, 96, relay contact CR-1c, lines 97, 98 solenoid of air valve 65 and lines 94 and 95 to L-2. The piece is therefore folded through rolls 53, and the leading part is guided by contact with the lower run of belts 54 onto conveyor 57 and out to table 52.

From the preceding description of the operation it will appear that the first cross fold occurs when the trailing edge of the workpiece, for example a sheet, clears the first limit switch PE-1 and PE-2, and the leading edge of the workpiece has not yet reached the limit switches PE-7a and PE-7b. If the article exceeds in length the span between these two sets of limit switches, the system is inoperative to fold. It should be noted, however that it is the position of the trailing edge of the article which is significant with respect to the folding, since, as soon as folding sensing switches PE-3a and PE-3b are operated by a travelling article, the whole control system is put "on alert," merely waiting until the trailing edge clears PE-1 and PE-2, whereupon the fold is immediately initiated.

For double-lane operation, switch 69 is manually closed, operating relay CR-1, so that its contacts in their alternate position set up new potential circuits. Taking first the left lane, the circuits and sensing switches here involved are about the same as for single lane operation, except, of course, that they now control only the left lane conveyor, and the left lane air pipe 34 instead of the central pipe. Also, limit switch PE-1 is made ineffective. This is accomplished as a result of relay CR-1 being now operated by the closing of switch 69. Contact g of relay CR-1 being closed, a shunt circuit exists around PS-1 so that PE-1 still can operate PS-1 although the latter is shunted. The shunt circuit is from PS-1 by lines 75, 76 and 88 to relay contact g, then lines 99 and 74 to the other side of switch PS-1. The reason that PE-1 must be made ineffective in double lane operation is that it is located in the right lane and would otherwise interrupt folding in the left lane whenever an article came through in the right lane. Also, it cannot be used in the right lane folding, this being done at the farther half of the conveyor.

An article, such as Y in FIG. 5, comes along in the left lane and first operates limit switch PE-2 with no effect. Next it operates fold switch PE-3b with no effect as yet. Finally, the trailing edge clears limit switch PE-2, and, since the second-limit switch PE-7b has not yet been operated, the fold is initiated. The operating circuit goes from L-1, lines 70, 71, 72, PS-7, line 73, PS-2, lines 74, 99, CR-1g, lines 88, 76, PS-3, lines 77, 78, 79, left lane conveyor clutch actuator 20-L, and line 80 to L-2, stopping the left conveyor. It will be seen that CR-1b is now open, so that no circuit will be completed to the right lane clutch control. At the same time, a circuit is completed, going similarly to line 78, then by line 82, contact of delayed action relay D-1, lines 83, 100, relay contact CR-1h, line 101 to solenoid of left lane air valve 41, and line 102 to L-2. Note that the previously described single-lane circuit to the central air pipe valve is now open at CR-1a. At the same time, a circuit from energized line 78 goes to the coil of time-delay relay D-1, then to L-2, so that, after a moment, the circuit to the air jet valve is opened. Also, as in single-lane operation, a circuit in closed, shunting out limit switches PS-7, PS-2, and PS-1, although this is already previously shunted out. A

circuit going first through these limit switches in the initiating circuit to line 78, then goes by line 86 to relay CR-2 and line 87 to L-2, closing the relay contact. This closes a circuit to fold switch PS-3 direct, the limit switches being shunted out, the circuit going from L-1, lines 70, 71, contact of CR-2, lines 88, 76, PS-3, line 77 to 78, then on to the clutch, and further to L-2 as already traced.

The piece folds down through rolls 30 and finally uncovers sensing switch PE-3b, causing PS-3 to open, breaking the traced circuits, and the conveyor restarts, the safety or limit switches again becoming effective. Since the second-crossfold switch PE-8 is located towards the front, it will intercept and control the crossfolding of the left lane pieces. PS-8 closes, making a circuit from L-1, lines 70, 71, 72, 89, PS-8, and dotted electrical connection or linkage 90 to measuring timer T-1. The measuring and timing devices herein used need not be explained in detail since they are previously known in the art. When the midpoint of the article reaches the second fold point, the timer will close switch TS-1, making a circuit from L-1 to lines 91, 92, TS-1, line 93, solenoid of air valve 64, and lines 94, 95 to L-2.

Going now to the right lane, a piece w such as shown in FIG. 5 comes along and first operates limit switch PE-1 without effect, this switch being cut out of the circuits in double-lane operation as already noted. The first-limit switch, PE-4, in this lane is not at the forward edge of the folding zone but near the middle so that folding will occur when the piece is in the rear or egress half of the zone. Thus, small pieces being folded independently in the left and right lanes will be carried on the front and rear parts of conveyor 46 and be folded by the front or rear second-crossfold air jets 60, 61 respectively. When the piece now operates limit switch PE-4, nothing happens. Likewise, nothing happens when fold switch PE-5 is operated. Now, when the trailing edge leaves PE-4 (assuming the piece is of normal size and does not overlie second-limit switch PE-6), the fold is initiated. A circuit goes from L-1, lines 70, 71, 103, contact CR-1f at present closed, lines 104, 105, PS-6, line 106, PS-4, lines 107, 108, PS-5, lines 109, 110, contact CR-1e, lines 111, 81, right lane clutch controller 20-R to L-2, stopping the right lane conveyor. Also, a circuit goes from L-1, lines 70, 71, 103, contact CR-1f, lines 104, 105, PS-6, line 106, PS-4, lines 107, 108, PS-5, lines 109, 112, 113, contact of delayed action relay D-2, line 114, solenoid of right lane air jet valve 42, and line 115 to L-2, turning on the folding air in jet pipe 35. At the same time, on this circuit, line 112 connects to the coil of time delay relay D-2, then by line 116 to L-2, so that, after a moment, the relay contact opens breaking the circuit to the air valve. Also, line 109 goes to the coil of a relay CR-3 then to L-2 by line 117, closing the contact. This shunts out the first and second limit switches A-4, A-6 during the folding operation, the circuit going to the fold switches A-5 directly instead of through the two limit switches: L-1, lines 70, 71, 103, CR-1f (closed), lines 104, 105, contact of CR-3, line 108, PS-5, line 109, and then on to the clutch control, etc. The piece folds down through rolls 31 onto conveyor 46, and finally uncovers fold switch PE-5, and PS-5 opens, breaking the circuits to the clutch controls, etc.

There is not much travel space between the right lane folding point, rolls 31, and the second-fold point, rolls 53. If a measuring switch such as PE-3 were used for the right lane second fold, there would hardly be enough room to measure the pieces. Therefore, the operation of right lane first crossfold switch PE-5 is utilized to initiate the operation of the second crossfold measuring timer T-2. When PE-5 closes PS-5, starting the first crossfold, the circuit is completed from PS-5 through line 109 to actuate the clutch, air valve, etc. as previously traced. The dotted line connection 118 from line 109 to timer T-2 indicates that the timer is concurrently started. When

7

the first fold is completed and PS-5 opens, this stops the measuring part of the timer function. When the midpoint of the piece reaches the second-fold roll point, timer T-2 closes switch TS-2, completing a circuit from L-1, line 92, TS-2, line 119, relay contact CR-1d, lines 97, 93, solenoid of right lane second crossfold air valve 6S, and lines 94, 95 to L-2. The electrical connections or linkages to the timers T-1 and T-2 are shown dotted because there are auxiliary means for maintaining the timers in operation after the measuring phase controlled by PE-3 and PE-5 is completed, for finally turning off the timer, etc.

In the control arrangements described hereinabove, one of the significant features, distinguishable from prior art practice, is the placement of the fold switch or switches a short distance downstream from the initial limit switch or switches. These two sets of switches co-operate whereby the trailing edge of the article rather than the leading edge determines the exact moment of folding. This arrangement has a distinct practical advantage, which is especially appreciated in respect to the single lane and left lane folding. Using as an example one previously known commercial crossfolder, the article travelled across the folding zone to arrive at the fold switch. The conveyor then stopped while the fold took place. All this time a following article was approaching from the primary folder, and, unless the spacing between articles was relatively wide, the succeeding article arrived at the stopped conveyor causing wrinkling or crumpling. By arranging the controls in the present improved embodiment so that the fold occurs as soon as the trailing edges of the work pieces clear the initial safety sensing switches to enter the folding zone (namely the zone between initial and final safety switches, as previously described) the chances of a succeeding piece arriving before the preceding piece is folded are quite remote.

As can be seen from FIG. 1, in conjunction with the description of the various operations hereinabove, the folding zone determinants are at the front (top of FIG. 1) for single lane operation and left lane operation, and towards the rear for right lane operation.

What is claimed is:

1. An apparatus of the character described wherein a flat work article is advanced along a path on a conveyor and wherein crossfolding means is provided to cross fold the article, folding control means including an initial limit switch sensitive to passage thereby of the article on said path, a final limit switch spaced downstream on said path from said initial limit switch and also sensitive to passage thereby of the article, a folding switch disposed adjacent to said path between said initial and final limit switches, first electrical circuit means effective upon said crossfolding means and including said folding switch, second electrical circuit means including said initial and final limit switches and operatively effective on said first circuit means to render the first circuit means ineffective while either of the limit switches is intercepted by passage thereby of the article, said first electrical circuit means being completed to initiate a crossfolding operation after the trailing edge of the article terminates its interception of the initial limit switch and before the leading edge of the article intercepts said final limit switch, the distance between the said initial limit switch and the said folding switch along the path of article advance being less than the length of any minimum length article capable of being folded, whereby to assure actuation of said folding switch by the leading edge of such article before the trailing edge leaves the said initial limit switch.

2. Folding control means as defined in claim 1 including, in combination therewith means for stopping the conveyor, and wherein said first electrical circuit means is effective upon the means for stopping the conveyor simultaneously with actuation of the folding means.

8

3. Folding control means as defined in claim 2 wherein timed means is interposed to control operation of the folding means.

4. Folding control means as defined in claim 1 wherein means is provided for rendering the initial and final limit switches ineffective upon inception of the folding operation.

5. Folding control means as defined in claim 2 including, in combination therewith means for re-starting the conveyor as soon as the trailing edge of the article terminates its interception of the folding switch.

6. Apparatus of the character described for crossfolding flatwork articles as they advance along a path on a conveyor, and wherein crossfolding means is provided, said conveyor being arranged for operation in a plurality of independent lanes, or for interconnection of the lanes to operate as a combined lane, each said lane having respective stopping means and crossfolding means, each said lane having adjacent thereto an initial limit switch sensitive to passage thereby of an article on its respective lane, and a final limit switch spaced downstream on its path of travel and also sensitive to passage thereby of an article on its respective lane, each said lane having a respective folding switch disposed adjacent to said path between its respective initial and final limit switches, each said lane having respective control means including first electrical circuit means effective upon respective crossfolding means and including its respective folding switch, each said lane having second electrical circuit means including its respective initial and final limit switches, and operatively effective upon its respective first circuit means to render its first circuit means ineffective while either of its limit switches is intercepted by passage of an article thereby, the first electrical circuit means in each lane being completed to initiate a crossfolding operation in its respective lane after the trailing edge of an article in the last said lane terminates its interception of the initial limit switch in its respective lane and before the leading edge of the last said article interrupts said final limit switch in its respective lane, and linking switch means which, in one position associates the lanes to operate as a unit on articles wide enough to span more than one lane and which, in another position, permits each lane to operate independently, the distance between the said initial limit switch and the said folding switch along the path of article advance being less than the length of any minimum length article capable of being folded, whereby to assure actuation of said folding switch by the leading edge of such article before the trailing edge leaves the said initial limit switch.

7. Folding control means as defined in claim 6 wherein each lane is provided with means for rendering its initial and final limit switches ineffective upon inception of its respective folding operation.

8. Apparatus as defined in claim 6 including a second conveyor for receiving articles crossfolded on said first conveyor, second crossfolding means adjacent said second conveyor, time delay control means effective on said second crossfolding means and adapted to actuate said second crossfolding means, and means responsive to operation of the folding control switch in one of said lanes in conjunction with release of the initial limit switch and adapted to initiate operation of said time delay control means for effecting a second crossfold on an article arriving from said last named lane.

References Cited in the file of this patent

UNITED STATES PATENTS

2,022,352	Kahn	Nov. 26, 1935
2,743,924	Elliott et al.	May 1, 1962