Nov. 16, 1965 R. G. McLAGAN 3,217,903

SEGREGATING CONTROL

Original Filed Jan. 19, 1961 2 Sheets-Sheet 1

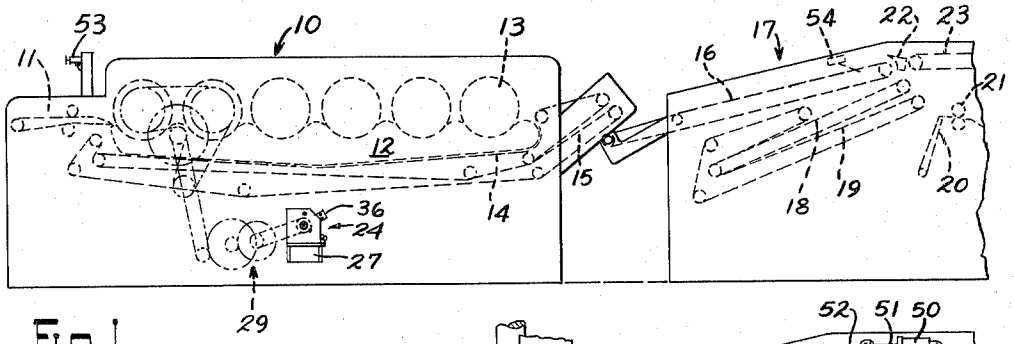

Fig. 1

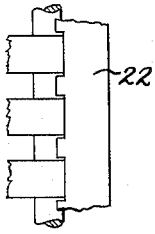

Fig. 3

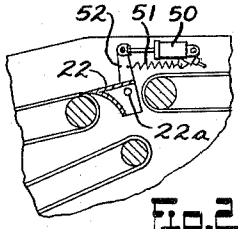

Fig. 2

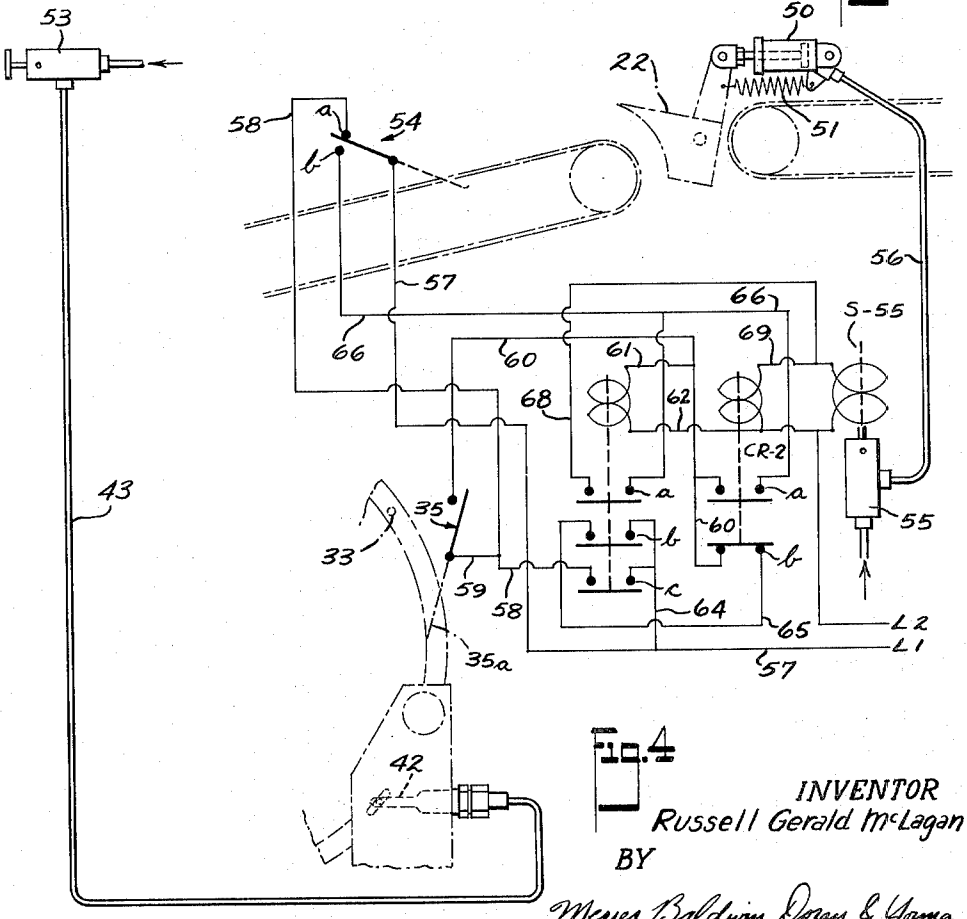

Fig. 4

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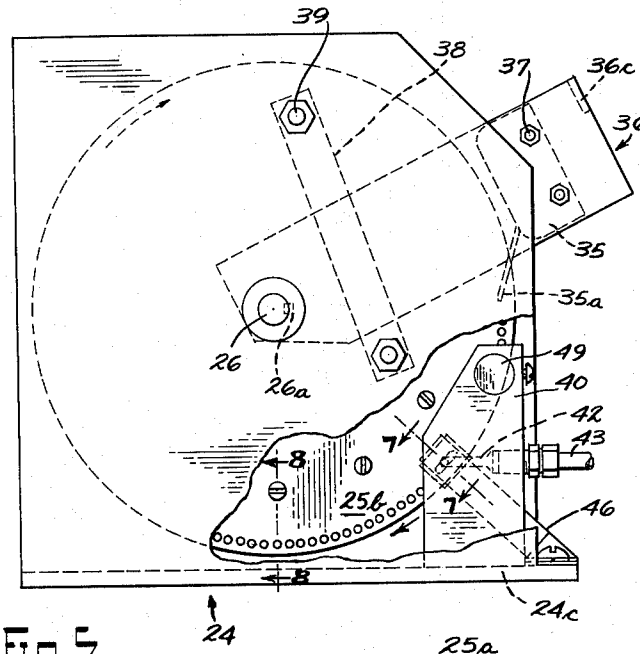

Fig. 5

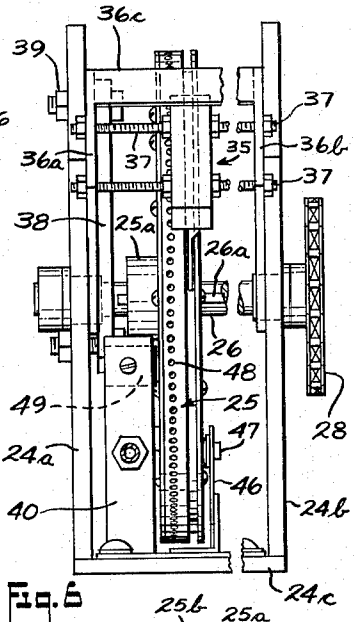

Fig. 6

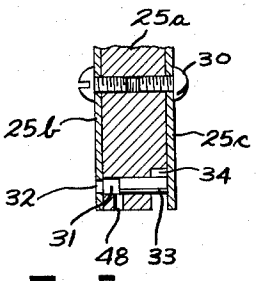

Fig. 8

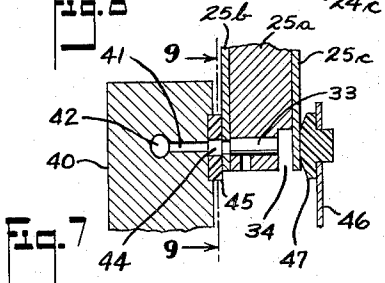

Fig. 7

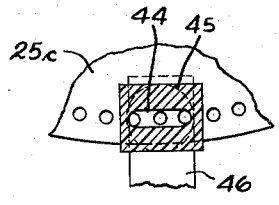

Fig. 9

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SEGREGATING CONTROL

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Original application Jan. 19, 1961, Ser. No. 83,777. Divided and this application Jan. 22, 1964, Ser. No. 339,525

3 Claims. (Cl. 214—11)

This application is a divisional application of my copending application Serial No. 83,777 filed January 19, 1961, now abandoned.

This invention relates to machines for folding laundered flatwork articles, hereinafter usually termed workpieces. It relates more particularly to novel and improved means for by-passing or segregating selected workpieces past the folding mechanism so that they are delivered, unfolded, at some discharge point apart from the location at which the folded, non-segregated workpieces are delivered. The latter workpieces, after folding, are sometimes delivered to a stacker, especially those within certain size limits.

In commercial laundries it is customary to combine, in a more or less unitary set-up, means for ironing, for folding, and sometimes for stacking the workpieces such as sheets, towels, pillow slips or the like. They are carried in a processing path through and between a bed and a series of ironing rolls, as will later appear, being thereafter delivered to the folding means, and eventually, after one or more folds, are stacked or otherwise discharged in finished condition.

It may occasionally happen that the operator, in feeding workpieces to the ironing rolls, observes that a piece is torn, discolored, obviously worn, or otherwise defective. It is desirable that such defective piece be by-passed so that it will not be folded or stacked with the acceptable pieces. It is therefore desirable that means be provided for interposing, between the feeding position and the folder, a selector mechanism which is adapted to be activated so as to divert the article out of the train of fully processed workpieces. The most convenient location for such by-pass means is in the zone where the workpiece has issued from the ironer and before it reaches the folder.

Since there is a time lapse between the moment when the operator observes that a workpiece which is being fed is defective, and the time when such workpiece reaches the by-pass means, and since articles are following each other in a lane as fast as the operator can dispose them on the feeding tapes, the by-pass arrangement is not without difficulty. A time delay must be interposed between the time of feeding and the moment for by-passing. If for example the operator moves a valve control or presses a button at the time he notes a defective workpiece, there may be a sequence of moving workpieces at that time between the feeding end and the by-pass zone, and it is necessary that the time delay be carefully controlled so that the by-pass means will operate at the correct instant, so that all preceding undamaged workpieces have safely cleared the by-pass means, and the damaged workpiece has not yet arrived at the by-pass means. In the absence of accurate automatic control one of several undesired situations might arise, namely (1) a preceding workpiece may be passing over the by-pass means when it operates, or attempts to operate, thereby jamming the by-pass

means; (2) the operator's personal reaction time may be slow, and the defective article may overlie the by-pass means when the time delay expires, which again jams the by-pass means; (3) obviously other possibilities may arise as a result of defective timing, or defective machine operation wherein a damaged workpiece escapes by-passing and is folded and stacked, or a perfectly good workpiece is by-passed just before or just after passage of the defective workpiece.

Various by-pass control mechanisms have heretofore been known and used, with varying degrees of success.

It is an object of the present invention to provide novel and improved control means for operating a by-pass element at the proper moment to remove a defective workpiece from a moving line.

A further object of the invention is to provide a by-pass control means of the character defined in the last preceding paragraph which permits normal processing of acceptable workpieces but rejects and segregates defective workpieces after an automatically controlled time delay initiated by an operator.

A further object of the invention is to provide by-pass control means as defined in the last preceding paragraph which causes a workpiece to be by-passed only when the by-pass mechanism is properly cleared for the desired operation.

A further object of the invention is to provide by-pass means as defined in the last two preceding paragraphs, which comprises, in combination, an article-actuated electrical switch and a timer-actuated electrical switch, and of which both switches must be actuated in proper sequence to cause suitable actuation of the by-pass control.

Other objects and advantages will be apparent from a study of the following specification in conjunction with the accompanying drawings, in which:

FIG. 1 schematically illustrates a conventional chest type flatwork ironer and a folding machine, showing the location of the various components of the segregating or by-pass control.

FIG. 2 is a fragmentary vertical section taken at the by-pass point of the folder, near the right end of FIG. 1.

FIG. 3 is a fragmentary top plan view showing parts of the by-pass member and conveyor tapes.

FIG. 4 is a diagrammatic showing of fluid power control elements and suitable electric circuits for energization thereof.

FIG. 5 is a side elevational view of the timer with a housing wall partially broken away.

FIG. 6 is an end elevational view of the timer as seen from the right of FIG. 5.

FIG. 7 is a fragmentary sectional view, somewhat enlarged from the scale of FIGS. 5 and 6, and taken through the air passage and timer wheel on the line 7—7 of FIG. 5.

FIG. 8 is a fragmentary sectional view on the same scale as that of FIG. 7, and taken on the line 8—8 of FIG. 5, showing a switch-actuating pin in projected, actuating position.

FIG. 9 is a sectional view taken on the line 9—9 of FIG. 7.

The main feature of the present improved by-pass control is an electrical system incorporating an article-actuated switch adjacent to the by-pass point, the switch being interconnected with the timer operated switch in such manner as to prevent jamming. In the preferred arrangement shown, both the article-actuated switch and the

timer-actuated switch must be operated in the proper sequence to activate the by-pass member.

Proceeding now to a description of the illustrated embodiment, and referring first to FIG. 1, which more or less schematically shows an ironer-folder assembly, the arrangement is conventional, apart from the by-passing or segregating system. Workpieces are fed into the ironer **10** at point **11**, travel over heated chest **12** under rolls **13**, back along the bottom of the chest on apron **14**, and forward on apron **15** from which they feed onto conveyor ribbons **16** of folder **17**, back on conveyor **18** and forward on conveyor **19** to be folded by reciprocable blade **20** through rolls **21** and out to a receiving point, table, etc.

A by-pass device **22** is provided for purposes hereinbefore discussed. Devices of this nature have previously been used. They have been often arranged to be manually shiftable from the receiving station, or in some cases by remote control from the feeding station, mainly to divert a series of articles differing from another group in some manner. Isolated pieces can, of course, also be by-passed in the same way, although it is inconvenient for one or the other of the operators to watch for the piece to approach the by-pass point. The by-passed piece is diverted from the normal path and directed either to the receiving table by way of a conveyor **23** (sometimes merely a slide) or to a stacking bar in machines so equipped.

As previously herein indicated by-passing can be accomplished by what might be considered a delayed-action operation of the by-pass, so that the feeding operator can actuate a control when a certain piece is fed into the ironer, and a timer shifts the by-pass when the piece arrives at that point. However, passage of laundry pieces through an ironer and folder is attended by certain factors that make accurate synchronization and by-pass operation somewhat uncertain. For one thing, the controller is started on its timing not by accurate automatic means but at the discretion of the feeding operator. There is no problem in synchronizing the timing speed with the travel through the ironer, but the independently driven folder is ordinarily operated at a higher speed for the purpose of creating greater spacing between pieces. This in itself is a problem, and it is further complicated in that many ironers can be run at varying speeds, which changes the ironer-folder speed ratio. As a result of this, there will be rather frequent occasions when the by-pass member may swing down and jam a piece that is moving down into the folder.

The present control was designed to improve the operation and accuracy of the timing mechanism, and, more important, to provide an additional means in the system for determining operation of the by-pass and thereby eliminate malfunctions. The underlying idea consists in having an article-actuated switch just in advance of the by-pass and so tied in electrically with the timer switch and the by-pass operating means as to require consecutive operation of the switches, and to prevent operation of the by-pass member while an article is moving through that point.

Referring to the timing device **24**, this comprises a wheel or drum **25** having a hub **25***a* and mounted on a shaft **26** journalled in side frame plates **24***a*, **24***b*. The latter are solidly secured to a base plate **24***c*, and the unit may be supported on or adjacent to the ironer, as on bracket **27**. Shaft **26** has a sprocket wheel **28** to be driven from some suitable part of the ironer drive train, as at **29**, to provide the calculated speed ratio, or a set of gears could be mounted on the timer frame.

There may be just one timing wheel, or the frame may be wider and several wheels mounted on shaft **26** if the timer is used with a multi-lane ironer-folder. In that case, of course, the folder has two or more independent side-by-side folding blades, by-pass members, etc., and the operators feed corresponding zones or lanes in the ironer width. In that case, too, the disclosed segregation control is duplicated for independent operation in each lane, having in common only the mounting of the wheels on the same drive shaft, since all of them rotate constantly.

Wheel **25** consists of a body or core **25***a* (FIGS. 7 and 8) and thin side plates **25***b*, **25***c* secured thereto as by screws **30**, all of non-magnetic material. Body **25***a* has a closely set series of small transverse holes **31** adjacent to the peripheral edge around the entire circumference, and side plate **25***b* has a registering set of slightly smaller holes **32**. A pin **33** slidably fits in each hole **31**, and is shiftable from the inactive position of FIGURE 7 to the position in FIGURE 8 where it protrudes in the grooved space **34** that encircles the wheel. The actuator finger **35***a* (FIG. 5) of a switch **35** fits down in this groove, and thus will be operated by a pin in the active position.

Switch **35** is carried in a frame **36** by a pair of threaded rods **37** fastened in the frame sides **36***a*, **36***b*. The latter are joined by a cross brace **36***c* and are pivotally supported in the unit frame on the same axis **26** as the wheel. The switch is thus adjustable concentrically with the wheel in relation to the starting point of timing. The switch frame is secured in adjusted position by a clamp bar **38** which draws frame side member **36***a* tight against the unit side plate by bolts **39**

Projection of a pin into active position is done by an air jet. A block **40**, also non-magnetic, is positioned alongside the wheel and is drilled to provide an air passage **41** running over to the side facing the wheel, in line with the pin holes, and a connecting passage **42** communicating with the fitting of air tubing **43** (FIG. 5). Passage **41** opens into a slot **44** in a plastic piece **45** secured in a recess in the block **40**. A spring finger **46** (FIGS. 6 and 7) on the opposite side holds a button **47**, which may be formed from plastic material, pressed against the wheel. The wheel is mounted on shaft **26** with a key **26***a* free enough to permit endwise movement. The wheel is thereby maintained in light contact with jet piece **45**, wear being negligible since the wheel rotates quite slowly. The reason for the elongated jet opening or slot **44** is, of course, to make sure that a pin will be moved out. Since the slot always registers with two or three holes (FIG. 9), two or three directly adjacent pins will therefore be set by the air blast. The radial holes **48** communicating with pin holes **31** (FIG. 8) were found desirable. In the groove **34** a suction may develop which would cause displacement of one or more pins at an undesirable distance from the pin in direct registry with the air jet aperture **31**. This appeared to be due to a suction produced in the groove **34** by the air escaping around the pin **33**. By providing the holes **48** the excess air is vented and the difficulty overcome.

A permanent magnet **49** (FIG. 5) mounted in block **40** retracts the pins from the active position as they rotate along past the magnet in their constant circular path after operating switch **35**. It might be noted, too, that the magnet insures the maintaining of the pins in a fully retracted position, preventing their creeping out during protracted inactive periods. The use of magnetism and an air jet to shift the pins eliminates any possible catching, missing, or binding that could occur with a physical shifting means.

The by-pass member **22** may be of the type here shown, rockable on a pivot **22***a* to either the by-passing position, FIGURE 2, or the open position indicated in FIGS. 1 and 4. In the present embodiment the shifting is done by a small air cylinder motor **50** and an opposing spring **51**, both connected to a lever arm extension **52** or other convenient part of the by-pass member. At the ironer feed station a pushbutton-operated conventional air valve **53** is mounted for convenient operation. Tubing **43** conducts compressed air from the valve (when opened) to the pin-setting jet passages **41**, **42**. A switch **54** is positioned in operative relation to the folding machine conveyor a short distance in advance of the by-pass.

Starting with the control in the condition indicated in the diagram, FIGURE 4, there are two relays CR–1,

CR–2, and a solenoid-operated air valve 55, all unenergized at this time. Valve 55, when operated, supplies air to cylinder 50 through tubing 56 to close the by-pass. Assume that the operator has noticed an article that should be by-passed (segregated) and has pressed the air valve 53 as the article started into the ironer. One or more pins were thereby blown out to active position and now approach timer switch 35. The timer speed and the position of switch 35 are such that when switch 35 is operated by the pin the article will be somewhere on the folder conveyor but will not yet have reached switch 54. There will have been articles preceding the one in question, all moving along through the ironer-folder path, but there will normally be sufficient space between them that the immediately preceding article will have cleared switch 54 when timer switch 35 is actuated.

The closing of timer switch 35 does not operate the bypass, but sets up preliminary circuits as follows: L_1, line 57, switch 54 and its normally-closed contact, lines 58, 59, switch 35, lines 60, 61, coil of relay CR–1, and lines 62, 63 to L_2. This closes the three sets of contacts *a*, *b*, and *c* in relay CR–1 and establishes a maintaining circuit from L_1, lines 57, 64, relay contacts CR–1*b*, line 65, normally-closed relay contacts CR–2*b*, lines 60, 61, coil of CR–1, and lines 62, 63 to L_2.

When the leading edge of the article now contacts switch 54 and moves it from its normally-closed contact *a* to contact *b*, air valve solenoid S–55 is energized, closing the by-pass, the circuit going from L_1, line 57, switch 54 and its contact *b*, lines 66, 67, relay contacts CR–1*a*, lines 68, 69, valve solenoid S–55, and lines 62, 63 to L_2.

At the same time, relay coil CR–2, in parallel with solenoid S–55, is energized. This closes a different circuit to relay coil CR–1, which is presently maintained, as already noted, through relay contacts CR–1*b* and normally closed relay contacts CR–2*b*. The new circuit is from L_1, line 57, switch 54 (operated by the passing article) line 66, contact CR–2*a*, lines 60, 61 to coil CR–1, and lines 62, 63 to L_2. The energization of relay CR–2 thus makes this new circuit to coil CR–1 and also breaks the original maintaining circuit by opening N.C. contact CR–2*b*. To avoid dropping out Cr–1 (and consequently CR–2), relay CR–2 will be of the so-called overlapping or make-before-break type, so that CR–2*a* will close before CR–2*b* opens. Both CR–1, CR–2 and air valve solenoid S–55 are now held energized through switch 54. When the trailing edge of the article leaves the switch, therefore, everything is de-energized, the by-pass opens, and the control is in its original state.

It was previously mentioned that with normal operation, spacing, etc., the preceding article will have cleared switch 54 by the time the timer switch operates. Suppose, however, that the preceding article is still this much short of having gone down through the by-pass into the folding apparatus. In prior controls where the by-pass is controlled directly by the timer switch, actuation of the latter at this time would bring the by-pass down on the article, causing a jam. The present control prevents this because the switches 35 and 54 must be operated sequentially, in that order, to operate the by-pass. If switch 54 has been and remains operated by the preceding non-segregated article and the timer switch 35 then closes, nothing happens to either the by-pass or the control, and this piece proceeds through. The reason is that the path from L_1 to the timer switch is open at switch 54. Operation of switch 54 alone has no effect, of course, because all possible circuits are blocked at open contacts in the control.

When the first non-segregated article then clears switch 54, the timer switch 35 will normally still be closed, because there are two or three pins active in holding this switch operated, in addition to which the space-time overlap will never be large when the operator has operated control valve 53 approximately at the right time. The control then sets up relay CR–1 in the usual way to prepare for by-passing of the oncoming article.

Relay contacts CR–1*c* have not been involved in any of the preceding circuits. They are employed to prevent a malfunction in a situation which might occasionally occur. In normal operation these contacts open and close along with the others, but with no effect. Suppose, however, that the timer switch 35 operates and an article is by-passed by operation of switch 54, etc. in the usual manner, but that the article clears switch 54 while switch 35 is still closed. As previously outlined, the two relays and solenoid S–55 are normally held energized only through operated switch 54 and are all de-energized when the trailing edge clears the switch. When timer switch 35 is still closed, however, there is a secondary path from L_1 to the relay coils and solenoid, running from L_1, lines 57, 64, contacts CR–1*c*, lines 58, 59, timer switch 35, and lines 60, 61 to coil CR–1. Also through the same circuit up to and through line 60 then through contacts CR–2*a*, lines 66, 67, contacts CR–1*a* and lines 68, 69 to coil CR–2 and solenoid S–55. Therefore, if the timer switch 35 is still operated when the article clears switch 54, the relays and solenoid are held operated until the timer switch opens.

If this alternate path from L_1 through contacts CR–1*c* were not provided, the release of switch 54 would drop out the relays and valve solenoid, but, timer switch 35 being still closed, relay CR–1 would immediately be re-energized, and remain so after the timer switch opened, resulting in unintended by-passing of the following article.

Theoretically, it would be possible for the control to miss an article, i.e., fail to by-pass the article. For this to occur, an article would have to be passing under switch 54 when the timer switch operated and still be under the switch when the timer switch opened. The article under switch 54 might be either a preceding article going down into the folder or the article intended to be by-passed. However, the actual arrangement and operation is such as to render this extremely improbable. The timer speed, position of the switches, size range of articles usually handled, etc. are all determining factors, and are, of course, calculated in setting up an installation. The significant feature is that by the use of this control, jamming and consequent tie-up of the machine are prevented because the by-pass member cannot close upon a passing article under any circumstances.

What is claimed is:

1. In an apparatus of the character described wherein workpieces are advanced in succession from a feeding zone past an operating zone to a discharge point, and wherein a by-pass member is movable at a by-pass point on said path, upstream from said operating zone, to intercept a selected workpiece and segregate it by routing it away from said operating zone to a second discharge point, control means for said by-pass member including, in combination, operator initiated time delay means effective to start a time delay interval within which a selected workpiece travels from said feeding zone towards but just short of said by-pass point, workpiece-actuated pivoted switch means in said path of travel upstream from, but adjacent to, said by-pass point and engaged by and swingably actuated by each workpiece passing thereby, a first electric circuit energized by said time delay means, and a second electric circuit energized by said workpiece-actuated means, and by-pass member operating means which is operatable only upon the sequential energization of said first electric circuit prior to the energization of said second electric circuit by the workpiece to be segregated operating said workpiece-actuated means and subsequent to the next preceding workpiece clearing said workpiece actuated means.

2. An apparatus as defined in claim **1**, wherein said workpiece-actuated means comprises a normally open switch positioned to be closable by the leading edge of a workpiece approaching said by-pass point whereby to

energize said second electric circuit, said first electric circuit includes a holding circuit portion including said switch in closed position, and said switch being opened responsive to the passing of the trailing edge of said workpiece whereby said holding circuit portion is de-energized and said first electric circuit is opened.

3. An apparatus as defined in claim 2, wherein additional means is provided for holding said first electric circuit closed, independently of said normally open switch being permitted to open by passage of the trailing edge

of a workpiece, during the period set by said operator-initiated time delay means.

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