

Oct. 28, 1958

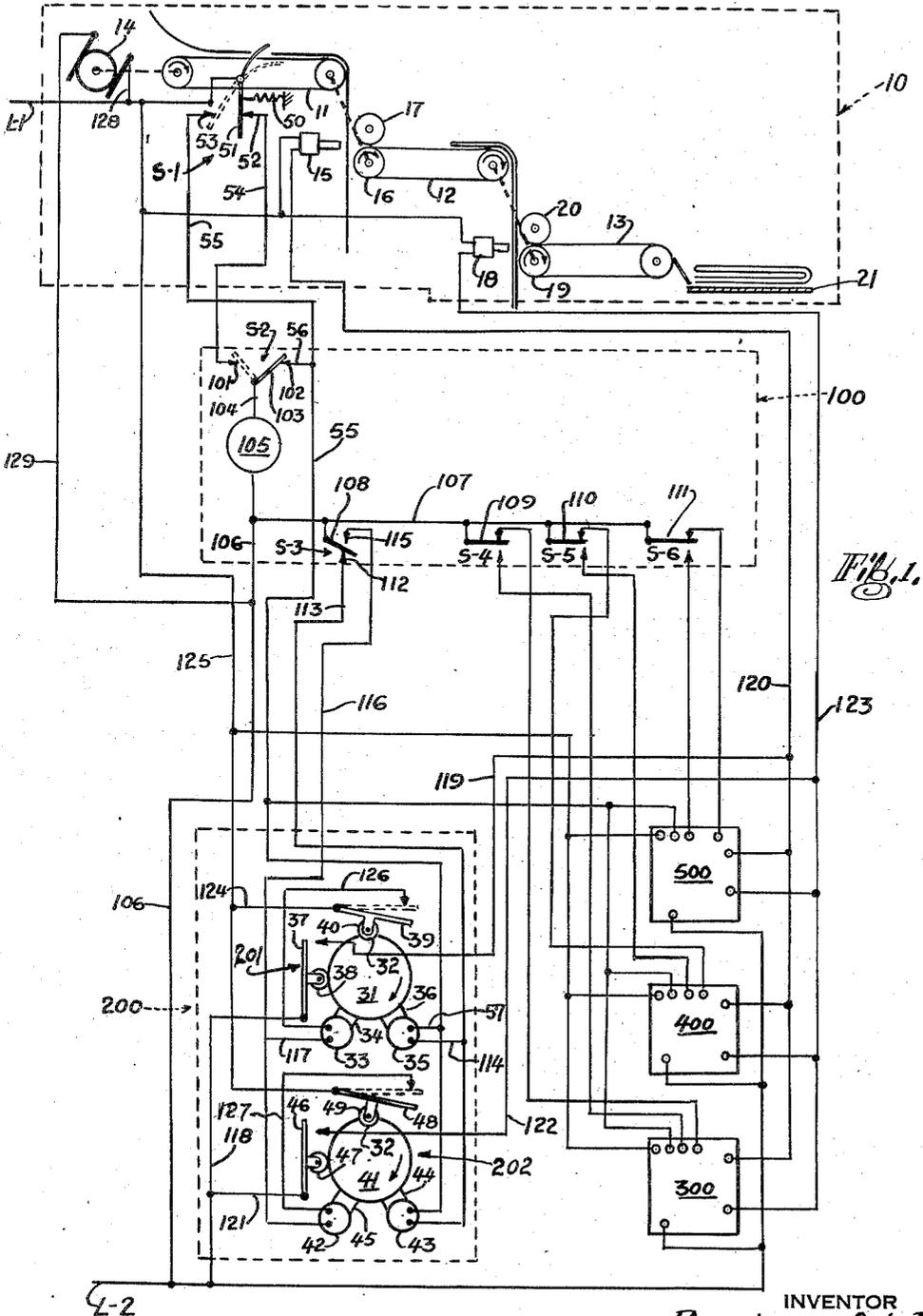
B. A. BUSS

2,858,129

CONTROL SYSTEM FOR FOLDING MACHINES

Filed Nov. 9, 1955

2 Sheets-Sheet 1



INVENTOR
BENJAMIN ALVIN BUSS
BY
Pollard, Johnston, Smythes & Robertson
ATTORNEYS

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2 Sheets-Sheet 2

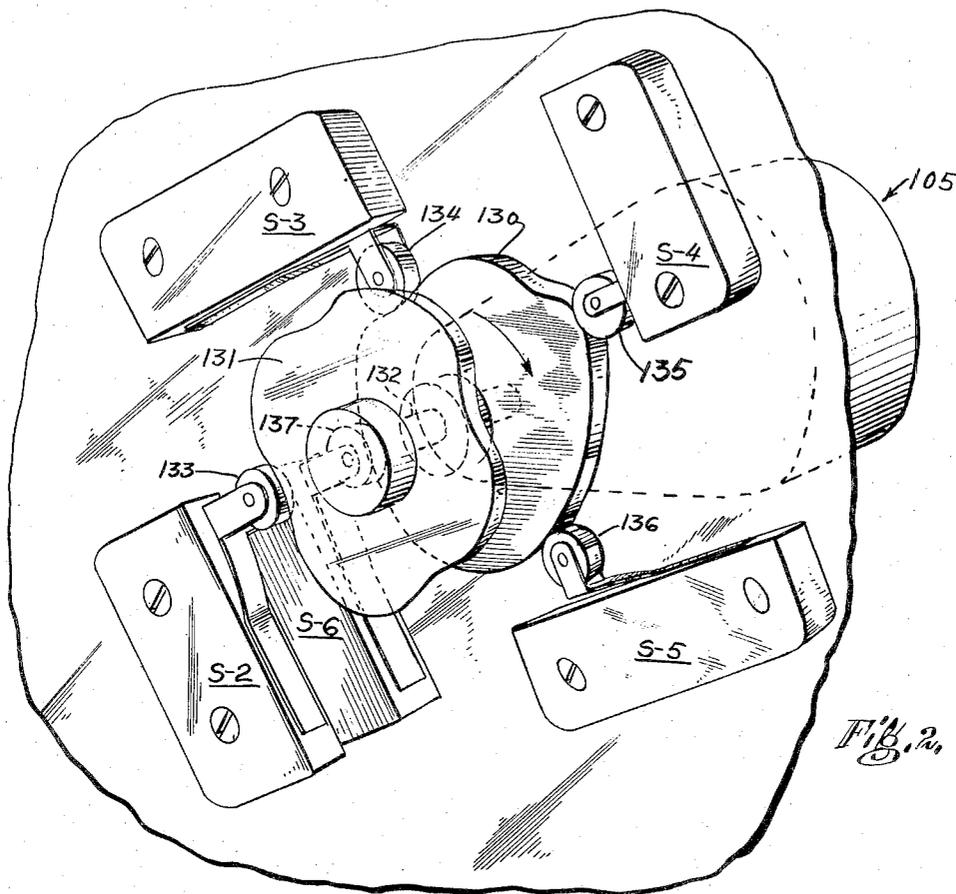


FIG. 2.

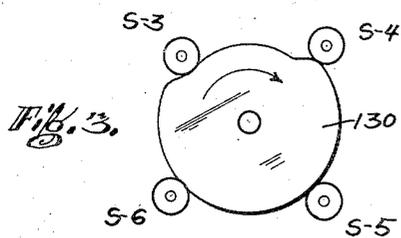


FIG. 3.

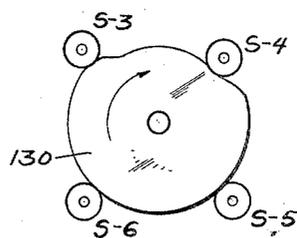


FIG. 4.

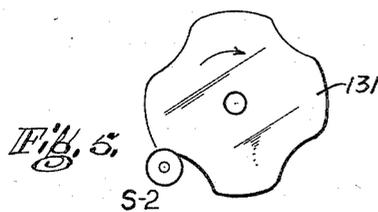


FIG. 5.

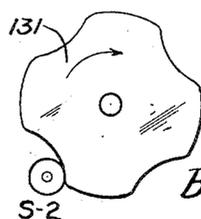


FIG. 6.

INVENTOR
BENJAMIN ALVIN BUSS
BY
Pollard, Johnston, Smythe & Robertson
ATTORNEYS

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2,858,129

CONTROL SYSTEM FOR FOLDING MACHINES

Benjamin Alvin Buss, East Moline, Ill., assignor to American Machine and Metals, Inc., New York, N. Y., a corporation of Delaware

Application November 9, 1955, Serial No. 545,872

9 Claims. (Cl. 270—81)

This invention relates to a control system for article processing apparatus, and more particularly to a control system of the type wherein a sequence controller governs the operation of a plurality of timing mechanisms employed in such apparatus.

In modern industry, it is often desired to perform a series of timed or spaced operations upon articles which are successively fed into processing equipment of various sorts. For example, in commercial laundries the pieces of laundry such as sheets are washed, ironed and folded by automatically operated equipment. The automatic sheet folding apparatus employed requires the use of a control system which insures that the successive folding operations will be performed at selected proportionately spaced points on each sheet regardless of the size thereof. To accomplish this, a suitable control system may include a timing mechanism which controls the operation of one or more folding devices that actually perform the folding operations. The number of folding devices employed in such a system usually corresponds to the number of folds desired in the sheets being folded.

While the use of a single timing mechanism is adequate for laundries with a relatively low output, it is not suitable for high production laundries wherein the time interval between successively fed sheets is extremely small. For example, if a single timing mechanism were employed for a folding machine, the time interval between successively fed sheets would have to be large enough to permit the operations on a single sheet to be completed before the next succeeding sheet could be introduced into the machine. To avoid this limitation on production, a plurality of timing mechanisms are utilized in conjunction with a sequence controller that governs their operation. The sequence controller functions to insure that control of the folding devices for a single sheet is exercised by one of the timing mechanisms, thus theoretically enabling the folding operations to continue at their normal rate irrespective of the time interval between successively fed sheets.

The sequence controller utilized must be capable of providing correct sequential operation of the timing mechanisms and associated folding devices should a power failure occur. This problem imposes serious limitations on the use of sequence controllers of the type wherein solenoids or thyatronns are employed. Such controllers may be falsely actuated upon failure and subsequent re-application of their supply voltages, thus producing inaccurate folds in the articles being folded.

Accordingly, it is an object of this invention to provide a control system for article processing apparatus which is accurate in operation and possesses a small operating time delay characteristic.

A further object of this invention is the provision of a control system which is suitable for use with sheet folding apparatus employing folding devices of the pneumatic type.

A still further object of this invention is the provision of a control system for sheet folding apparatus wherein

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the accuracy of said system is unimpaired by power supply failures.

Another object of this invention is the provision of an improved sequence controller for use in article processing apparatus control systems of the type employing a plurality of timing mechanisms.

Still another object of this invention is the provision of a sequence controller which possesses a small operating time delay characteristic and performs each of its sequential transfer functions in two discrete steps.

Briefly, the control system of the invention comprises one or more article operating means which are adapted to perform selected operations on articles being processed in article processing apparatus. A plurality of timing mechanisms are arranged to selectively control the operation of said article operating means in accordance with control information obtained from sensing means, responsive to a physical characteristic of the articles being processed. Sequence controller means are provided to sequentially transfer control by said sensing means to each of the timing mechanisms so that one timing mechanism controls the article operating means for a particular article being processed.

The sequence controller means comprises sequence switch means, motor means and timer switch means. The sequence switch means perform the actual switching or transfer function of the controller and may comprise a plurality of cam operated switches. First cam means are provided on the shaft of the motor means to selectively actuate the cam operated switches. Second cam means are provided on the shaft of the motor means to alternately actuate the timer switch means. The timer switch means is electrically connected to the sensing means and operates jointly therewith to control said motor means such that the motor means operates in two discrete steps to effect a single sequential transfer of the control function by said sequence switch means.

These and other objects, advantages and features of the invention will become apparent from the following description and drawings which are merely exemplary.

In the drawings:

Fig. 1 illustrates a circuit diagram of a control system according to the invention which is suitable for use in sheet folding apparatus;

Fig. 2 illustrates in perspective an improved sequence controller utilized in the control system of Fig. 1; and

Figs. 3 to 6 illustrate positions of the cam operated switches and cams at various stages of the folding operation.

Referring first to Fig. 1 of the drawing, there is shown a control system for sheet folding apparatus 10. The sheet folding apparatus comprises a series of endless conveyor belts 11, 12 and 13 which are driven by a constant speed motor arrangement 14 through suitable mechanical connecting means illustrated by the dotted line constructions. The constant speed motor arrangement may comprise a synchronous motor as shown, or other devices capable of producing a constant speed output. As sheets are placed on the endless conveyor belts, they are transported to a point wherein folding means 15 operates to produce a first fold at any desired point on the sheet by forcing the sheet between oppositely rotating rolls 16 and 17. The folded sheet is then transported along belt 12 to another folding means 18 which operates to force the sheet between oppositely rotating rolls 19 and 20 to produce the next fold. The completely folded sheet is conveyed along belt 13 to a suitable stacking platform 21.

Folding means 15 and 18 may comprise any device capable of forcing the sheets between the associated oppositely rotating rolls such as conventional solenoid operated "folding knives." If desired, pneumatic folding

means may be employed of the type wherein a controlled jet blast of air forces the sheets between the rolls. A suitable pneumatic folding means for this purpose is disclosed in copending patent application Serial No. 545,042, filed November 4, 1955.

In order to control the successive operations of the folding means 15 and 18, a plurality of timing mechanisms 200, 300, 400 and 500 are provided. Each of the timing mechanisms governs the folding operations of folding means 15 and 18 for a single sheet regardless of length. A suitable timing mechanism for this purpose may be that disclosed in copending patent application Serial No. 312,834 by Benjamin S. Kagan, deceased, and entitled Timing Mechanism to Divide Sheets Proportionately, now Patent No. 2,774,592. The timing mechanism of the aforesaid Kagan patent consists of a plurality of sub-timing devices, one for each of the folding means employed. In Fig. 1 of the drawing, the details of a single timing mechanism 200 only are illustrated for simplicity, it being understood that the remaining mechanisms 300, 400 and 500 are similarly constructed. Each of the sub-timing devices 201 and 202 in the timing mechanism 200 is controlled by switch means S-1 and S-3, of which S-1 may be designated the sensing switch and S-3 a cam actuated switch.

The sub-timing device 201 which controls folding means 15 is composed of a circular cam 31 which contains a notch or indentation 32 therein. A high speed motor 33 is adapted to drive cam 31 through overrunning clutch means 34, while low speed motor 35 is adapted to also drive cam 31 through overrunning clutch means 36 so that cam 31 may be driven by either of motors 33 or 35. A switch 37 is placed at a predetermined location on the periphery of cam 31 and serves to operate the folding means 15 when the indentation or notch 32 on the cam engages the follower 38 of the switch. Further along the periphery of cam 31 is located switch 39 with associated follower 40. Switch 39 is operable to control the energization of motor 33 by means of the action of notch 32 and follower 40.

The other sub-timing device 202 controls the operation of folding means 18, and is composed of cam 41 and motors 42 and 43 which correspond to the similar elements in device 201. Overrunning clutch means 44 and 45 permit rotation of cam 41 by either of the motors 43 or 42. Switch 46 with its associated follower 47 serves to control the energization of folding means 18, while switch 48 with associated follower 49 provides control of high speed motor 42.

The electrical connections for sub-timing devices 201 and 202 are as follows. Switch 37 has its movable member connected to supply line L-2 by lead 118 and its fixed contact connected to folding means 15 by leads 119 and 120. The movable member of switch 39 is connected to supply line L-1 by leads 124 and 125, while the fixed contact is connected to high speed motor 33 by lead 126. Switch 46 has its movable member connected to supply line L-2 by leads 118 and 121 and its fixed contact connected to folding means 18 by leads 122 and 123. The movable member of switch 48 is connected to supply line L-1 by lead 125 and the fixed contact is connected to high speed motor 42 by lead 127.

In order to provide the control information necessary for the operation of timing mechanism 200, there is employed a sensing switch S-1 which is adapted to be actuated by a sheet or other article placed on conveyor belt 11. To accommodate the sensing switch, conveyor belt 11 is formed of a plurality of belts, two of which are horizontally spaced a fixed distance to permit the article engaging portion of the switch to be located therebetween. A spring 50, or other suitable biasing means, is provided to keep switch S-1 in such a position that its article engaging portion projects upwardly a fixed distance between the conveyor belts. In this position, the movable member 51 of the sensing switch engages a

fixed contact 52, whereas when a sheet is placed on conveyor belt 11 and subsequently depresses the article engaging portion of the switch, the member 51 engages fixed contact 53. Switch member 51 is directly connected to supply line L-1, while contact 52 is connected to contact 101 of timer switch S-2 by lead 54. Contact 53 is connected to the other contact 102 of timer switch S-2 by leads 55 and 56. Leads 55 and 57 further connect contact 53 with one terminal of low speed motors 35 and 43. A movable member 103 of timer switch S-2 is connected to one terminal of motor 105 by lead 104. The other terminal of the motor is connected to supply line L-2 by means of lead 106. Leads 106 and 107 connect the movable members 108, 109, 110 and 111 of cam actuated switches S-3, S-4, S-5, and S-6 with the supply line L-2. Contact 112 of cam actuated switch S-3 is connected to low speed motor 35 by leads 113 and 114 and to low speed motor 43 by lead 113. The other contact 115 of switch S-3 is connected to high speed motor 33 by leads 116 and 117 and to high speed motor 42 by lead 116. The remainder of the cam actuated switches S-4, S-5 and S-6 are similarly respectively connected to timing mechanisms 300, 400 and 500.

It will be noted from the above description that each of the four motors 33, 35, 42 and 43 in timing mechanism 200 is energized by the supply lines L-1 and L-2. To provide for correct synchronous operation of the folding apparatus and control system, the drive motor 14 is energized from the same supply lines L-1 and L-2 through leads 128, 129 and 106. These connections effectively relate the speeds of the conveyor belts to the speeds of rotation of the cams 31 and 41. The speeds of the drive motor 14 and high speed motor 33 are so related that a sheet placed on conveyor belt 11 would have its trailing edge positioned adjacent the point at which folding means 15 is to operate, when cam 31 has completed a predetermined portion of a revolution. The speed of low speed motor 35 is related to the speed of high speed motor 33 in such a manner as to permit cam 31 to actuate switch 37 at a time when the proportionately spaced fold point of the sheet on belt 11 passes folding means 15. The speeds of motors 42 and 43 of sub-timing device 202 are similarly related to each other and to the speed of drive motor 14, so that comparable operation is effected for folding means 18.

Assuming initially that only timing mechanism 200 is operated, it can be seen that both low speed motors 35 and 43 are energized when the leading edge of the sheet engages the article engaging portion of sensing switch S-1. At that time, the circuits for the motors would be as follows: Supply line L-1, movable member 51 of switch S-1, contact 53 of switch S-1, leads 55 and 57, motors 35 and 43, leads 113 and 114, contact 112 of cam actuated switch S-3, movable member 108 of switch S-3, leads 107 and 106, and supply line L-2. It will be noted that as soon as cams 31 and 41 start to rotate, that the notches 32 therein, are moved out of engagement with followers 40 and 49 of switches 39 and 48, thus closing both of said switches. High speed motors 33 and 42 are not energized at this time, however, since the movable member 108 of cam actuated switch S-3 is connected to contact 112 rather than contact 115. Cams 31 and 41 continue to rotate at their low speeds until the trailing edge of the sheet passes the article engaging portion of sensing switch S-1, at which time the biasing means 50 forces the movable member 51 into engagement with contact 52. At this point, cam actuated switch S-3 is operated by the sequence controller 100, as later explained, to connect movable member 108 with contact 115 and thus energize the high speed motors 33 and 42. The circuits for motors 33 and 42 at this time would be as follows: Supply line L-1, leads 125 and 124, switches 39 and 48, leads 126 and 127, motors 33 and 42, leads 116 and 117, contact 115 of switch S-3, movable member 108 of switch S-3, leads 107 and 106, and supply line

L-2. When the high speed motors 33 and 42 are thus energized, the cams 31 and 41 are rotated at high speeds until followers 38 and 47 of switches 37 and 46 are engaged by the notches 32 to operate folding means 15 and 18. Thus, it is evident that timing mechanism 200 operates in conjunction with sensing means S-1 to selectively control the operation of folding means 15 and 18. For a more detailed description of the construction and operation of the timing mechanisms employed herein, reference is made to the aforesaid Kagan Patent No. 2,774,592.

It will thus be seen from the above description, that if a single timing mechanism were to be employed, a new sheet could not be fed into the folding apparatus until the previous sheet had completed its travel past folding means 15 and 18, and the cams 31 and 41 returned to their starting positions, at which time, notches 32 would engage followers 40 and 49 to open switches 39 and 48 controlling the high speed motors. For this reason, sequence controller 100 is provided to sequentially transfer the control information obtained from sensing switch S-1 to each of the timing mechanisms 300, 400 and 500 for successively fed sheets. In order to describe the physical construction of the sequence controller 100, reference will now be made to Fig. 2 of the drawing. As shown in Fig. 2, motor 105 has a shaft 132 upon which are mounted cams 130 and 131. The cam actuated switches S-3, S-4, S-5 and S-6 are positioned equidistantly around the periphery of cam 130 to form sequence switch means. The timer switch S-2 is positioned on the periphery of cam 131 for actuation thereby. Each of the switches S-2 to S-6 may be conventional switches of the "microswitch" type and are of the single pole-double throw variety. In order to actuate switches S-2 to S-6 upon movement of shaft 132, each of the said switches is provided with a follower arrangement designated respectively as 133-137. It will be noted that at any instant of time normally only one of the cam operated switches S-3 to S-6 is in an actuated position wherein the low speed motors of the timing mechanism can be operated by the sensing switch. This may be clearly seen by reference to Figs. 3 and 4, which show the positions of the switch followers for different positions of the cam 130. As seen in Figs. 5 and 6 of the drawing, timer switch S-2 is alternately actuated to one or the other of its two positions by rotation of cam 131.

Referring again to Fig. 1 of the drawing, it can be seen that the motor 105 is connected across the supply lines L-1 and L-2 by a circuit consisting of the movable member 51 of sensing switch S-1, either of leads 54 or 55, the movable member 103 of timer switch S-2 and lead 106. The relative positions of the movable members 51 and 103 of switches S-1 and S-2, respectively, determine whether lead 54 or lead 55 will complete the energizing circuit to the motor. When both switches S-1 and S-2 are in their normal positions as shown by the full line construction in the drawing, the energizing circuit for motor 105 is open and the sequence controller inoperative. Should the leading edge of a sheet placed on belt 11 actuate sensing switch S-1, an energizing circuit for the motor 105 would be completed through lead 55 causing the motor to rotate. At this time, the low speed motors of timing mechanism 200 would also be energized as hereinbefore explained. The motor 105 will continue to rotate until timer switch S-2 is actuated to the dotted line position shown in Fig. 1 of the drawing, when the energizing circuit for the motor will be broken. The position of follower 133 of timer switch S-2 with respect to cam 131 at this point in the operation, is shown in Fig. 5 of the drawing. As seen in Fig. 3, cam 130 has been rotated to a position wherein cam actuated switch S-3 is operative to allow continued energization of the low speed motors 35 and 43 of timing mechanism 200 but not the high speed motors 33 and 42. The remainder of cam actuated switches S-4, S-5, and S-6 are all in

their inoperative positions wherein the low speed motors cannot be energized by movement of the sensing switch S-1.

After the trailing edge of the sheet passes the article engaging portion of the sensing switch S-1, the biasing means 50 becomes operative to permit switch S-1 to return to its normal position. When this occurs, the energizing circuit for motor 105 is completed through lead 54 since the movable member 103 of switch S-2 is in the dotted line position shown. As is evident from an inspection of Figs. 3 and 4 of the drawing, motor 105 need only rotate cam 130 a short distance before cam actuated switch S-3 assumes its inoperative position and switch S-4 its operative position as shown in Fig. 4. This same rotation of motor 105 has also rotated cam 131 to the position shown in Fig. 6, wherein the timer switch S-2 has been returned to its normal position illustrated by the full line construction of Fig. 1. With the timer switch S-2 again in its normal position, the energizing circuit for motor 105 is broken and the sequence controller ready for the next sheet fed into the folding apparatus. It will be noted that high speed motors 33 and 42 of timing mechanism 200, are still energized through switch S-3 even though control by the sensing switch S-1 has been transferred to the low speed motors of timing mechanism 300. Thus, cams 31 and 41 of timing mechanism 200 continue to rotate at high speed and close switches 37 and 46 which control folding means 15 and 18, respectively. When cams 31 and 41 have completed one full revolution, switches 39 and 48 are opened as explained above, to deenergize the high speed motors.

From the above description, it is believed apparent that the sequence controller 100 operates in two discrete steps to transfer control by the sensing means S-1 to each of timing mechanisms 200, 300, 400 and 500 for successively fed sheets. As control by the sensing means is passed from one timing mechanism to another, the previously controlled mechanism remains operative to complete its selective control of the folding means without interruption. Accordingly, a very short interval of time occurs after a sheet passes the sensing switch S-1 and until control by the sensing switch is shifted to the next timing mechanism.

The two-step operation of the sequence controller also results in reducing its own operating time delay characteristic. To effect sequential transfer of the control function to each of the four disclosed timing mechanisms, it is obvious that cams 130 and 131 must each rotate 360° in four steps of 90°. If each 90° step were made in one angular movement of the cams 130 and 131 after the trailing edge of the sheet left the sensing means, a large time interval would occur until the next timing mechanism was connected for operation by the sensing means. In the arrangement hereinbefore described, however, the 90° movement of the cams 130 and 131 is made in two discrete steps. The larger step takes place between the time and leading edge of the sheet actuates the sensing switch S-1, and the time that timer switch S-2 is placed in the dotted line position shown in Fig. 1. Accordingly, when the trailing edge of the sheet leaves the sensing switch, only a small angular movement or step is necessary to actuate the next cam actuated switch and effect the sequential transfer of control. This permits the actual transfer to be made in a very short time, the length of time depending materially on the time constant of the motor 105. For this reason, the motor employed should have high acceleration and deceleration characteristics, such as found for example in the so-called "Cramer" timing motors or one having a relatively short coasting characteristic. It will be noted, however, that the speed of the motor selected is not critical, since the second "step" which performs the actual transfer, is accomplished by only a small angular movement of the motor shaft. Thus, variations in the speed and con-

struction of the motor 105 will not materially affect the accuracy of the control system.

It should be apparent that modifications may be made in the construction and arrangement without departing from the spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. A control system for article processing apparatus adapted to receive successively fed articles of varying length comprising article operating means adapted to perform selected operations at proportionately spaced points along the length of the articles being processed; a plurality of timing mechanisms for selectively controlling said article operating means, the rate of operation of said timing mechanisms being proportionately related to the rate at which said sheets are fed into the processing apparatus; sensing means responsive to the length of an article being processed and adapted to control the duration of operation of each of said timing mechanisms; and sequence controller means for sequentially transferring control by said sensing means to each of said timing mechanisms so that one of the timing mechanisms assumes control of the article operating means for a particular article being processed, said sequence controller means performing its transfer function in two discrete steps, the first step being performed as the article is being sensed by said sensing means by a cam means operated by said sequence controller means and the second step being performed by said cam means after the article has passed said sensing means so as to transfer control to the next timing mechanism.

2. A control system for article processing apparatus adapted to receive successively fed articles of varying length comprising article operating means adapted to perform selected operations at proportionately spaced points along the length of the articles being processed; a plurality of timing mechanisms for selectively controlling said article operating means, said timing mechanisms being of the type having one sub-timing device included therein for each of the article operating means being controlled, the rate of operation of said timing mechanisms being proportionately related to the rate at which said sheets are fed into the processing apparatus; sensing means responsive to the length of an article being processed and adapted to control the duration of operation of each of said timing mechanisms; and sequence controller means for sequentially transferring control by said sensing means to each of said timing mechanisms so that one of the timing mechanisms assumes control of the article operating means for a particular article being processed, said sequence controller means performing its transfer function in two discrete steps and in such manner as to permit uninterrupted control of the article operating means by each of said timing mechanisms, the first step being carried out by a cam means operated by said sequence controller means as the article is being sensed and the second step being carried out by said cam means in a shorter space of time relative to the first step so as to transfer control to the next timing mechanism.

3. A control system for article processing apparatus adapted to receive successively fed articles of varying length comprising article operating means adapted to perform selected operations upon the articles being processed at proportionately spaced points along the length thereof; a plurality of timing mechanisms for selectively controlling said article operating means and being of the type having one sub-timing device included therein for each of the article operating means being controlled, each of said sub-timing devices having two related rates of operation which are proportionately related to the rate at which said articles are fed into said processing apparatus and which permit it to actuate its associated article operating means at such time as to cause the selected operation to be performed at one of said proportionately

spaced points on an article being processed; sensing means responsive to the length of an article being processed and adapted to control the duration of operation of said sub-timing devices at one of their two related rates of operation; and sequence controller means for sequentially transferring control by said sensing means to each of said timing mechanisms so that each of the timing mechanisms assumes control of the article operating means for a particular article being processed, said sequence controller means performing its transfer function in two discrete steps and in such manner as to permit uninterrupted control of the article operating means by each of said timing mechanisms, the first step being carried out by a cam means operated by said sequence controller means as the article is being sensed and the second step being carried out by said cam means in a shorter space of time relative to the first step so as to transfer control to the next timing mechanism.

4. A control system for article processing apparatus of the type adapted to receive successively fed articles of varying length, comprising article operating means adapted to perform selected operations at proportionately spaced points along the lengths of said articles; a plurality of timing mechanisms for selectively controlling said article operating means and being of the type having one sub-timing device included therein for each of the article operating means being controlled, each of said sub-timing devices having two rates of operation which are proportionately related to the rate at which said articles are fed into the processing apparatus and which permit it to actuate its associated article operating means at such time as to cause the selected operation to be performed at one of said proportionately spaced points on an article being processed; sensing means responsive to the length of an article being processed and adapted to control the duration of operation of said sub-timing devices at each of their rates of operation; sequence switch means operable to sequentially transfer control by said sensing means to each of said timing mechanisms so that each timing mechanism controls the article operating means for a particular article being processed; motor means for operating said sequence switch means; and timer switch means operated by said motor means, said timer switch means and said sensing means being jointly operable to control said motor means such that said motor means operates in two discrete steps to effect each sequential transfer by said sequence switch means, the first step taking place as an article is being sensed and the second step taking place in a shorter interval of time relative to the first step so that control is transferred to the next timing mechanism for the next article reaching the sensing means.

5. A control system for sheet folding apparatus of the type adapted to receive successively fed sheets of varying length, comprising pneumatic folding means adapted to fold said sheets at proportionately spaced points along their lengths; a plurality of timing mechanisms for selectively controlling said pneumatic folding means and being of the type having one sub-timing device included therein for each of the pneumatic folding means being controlled, each of said sub-timing devices having two rates of operation which are proportionately related to the rate at which said sheets are fed into the folding apparatus and which permit it to actuate its associated pneumatic folding means at such time as to cause the folding operation to be performed at one of said proportionately spaced points on a sheet being folded; sensing switch means responsive to the length of a sheet being folded and adapted to control the duration of operation of said sub-timing devices at each of their rates of operation; sequence switch means operable to sequentially transfer control by said sensing switch means to each of said timing mechanisms so that each timing mechanism controls the pneumatic folding means for a particular sheet being folded; motor means for operating said se-

quence switch means; and timer switch means operated by said motor means, said timer switch means and said sensing switch means being jointly operable to control said motor means such that said motor means operates in two discrete steps to effect each sequential transfer by said sequence switch means, the first step taking place as an article is being sensed and the second step taking place in a shorter interval of time relative to the first step so that control is transferred to the next timing mechanism for the next article reaching the sensing means.

6. In a control system for article processing apparatus adapted to receive successively fed articles of varying length, the combination comprising article operating means; a plurality of timing mechanisms for selectively controlling said operating means, the rate of operation of said timing mechanisms being proportionately related to the rate at which said sheets are fed into the processing apparatus; sensing switch means actuated in response to the length of an article being processed and adapted to control the duration of operation of each of said timing mechanisms; sequence switch means for sequentially transferring control by said sensing switch means to each of said timing mechanisms, said sequence switch means comprising a plurality of cam operated switches; motor means; first cam means mounted on the shaft of said motor means and operable to actuate said cam operated switches; and timer switch means operable in response to movement of the shaft of said motor means, said timer switch means being electrically connected to said sensing switch means and said motor means such that said motor means operates in two discrete steps to effect each sequential transfer by said sequence switch means, the first step taking place as an article is being sensed and the second step taking place in a shorter interval of time relative to the first step so that control is transferred to the next timing mechanism for the next article reaching the sensing means.

7. In a control system for sheet folding apparatus adapted to receive successively fed articles of varying length, the combination comprising folding means; a plurality of timing mechanisms for selectively controlling said folding means, the rate of operation of said timing mechanisms being proportionately related to the rate at which said sheets are fed into the processing apparatus; sensing switch means actuated in response to the length of the sheets being folded and adapted to control the duration of operation of each of said timing mechanisms; sequence switch means for sequentially transferring control by said sensing switch means to each of said timing mechanisms, said sequence switch means comprising a plurality of cam operated switches; motor means having a shaft thereon; first cam means mounted on said shaft for movement thereby and operable to selectively actuate said cam operated switches; second cam means mounted on said shaft for movement thereby; and timer switch means operated by said second cam means, said timer switch means being electrically connected with said sensing switch means to jointly control therewith the operation of said motor means such that said motor means operates in two discrete steps to effect each sequential transfer by said sequence switch means, the first step taking place as an article is being sensed and the second step taking place in a shorter interval of time relative to the first step so that control is transferred to the next timing mechanism for the next article reaching the sensing means.

8. In a control system for sheet folding apparatus adapted to receive successively fed articles of varying length, the combination comprising folding means; a plurality of timing mechanisms for selectively controlling said folding means and being of the type having one sub-timing device included therein for each folding means to be controlled, the rate of operation of said timing mechanisms being proportionately related to the rate at which

said sheets are fed into the processing apparatus; sensing switch means operable in response to the length of the sheets being folded and adapted to control the duration of operation of each of said timing mechanisms by controlling the rates of operation of the sub-timing devices located therein; sequence switch means for sequentially transferring control by said sensing switch means to each of said timing mechanisms, said sequence switch means comprising a plurality of cam operated switches; electric motor means having a shaft thereon; a first cam mounted on said shaft for movement thereby and operable to sequentially actuate said cam operated switches; a second cam mounted on said shaft for movement thereby; and timer switch means alternately actuated by movement of said second cam, said timer switch means and said sensing switch means being electrically connected to said electric motor means for control thereof in accordance with the relative positions of said timer switch means and said sensing switch means such that said motor means operates in two discrete steps to effect each sequential transfer by said sequence switch means, the first step taking place as an article is being sensed and the second step taking place in a shorter interval of time relative to the first step so that control is transferred to the next timing mechanism for the next article reaching the sensing means.

9. In a control system for sheet folding apparatus of the type adapted to receive successively fed sheets of varying length and produce folds therein at proportionately spaced points thereon, the combination comprising pneumatic folding means; a plurality of timing mechanisms for selectively controlling said folding means and being of the type having one sub-timing device included therein for each pneumatic folding means being controlled, each of said sub-timing devices being operable at either of two rates of operation which are proportionately related to the rate at which the sheets to be folded are fed into the folding apparatus; sensing switch means actuated in response to the length of the sheets being folded and adapted to control each of said timing mechanisms, said sensing switch means operable when in a first position to produce a first rate of operation of said sub-timing devices and operable in a second position to produce a second rate of operation of said devices; sequence switch means comprising a plurality of cam operated switches, each of said cam operated switches when in a first position being operable to permit operation of the sub-timing devices of one timing mechanism at their first rate of operation and when in a second position being operable to permit operation of said devices at their second rate of operation; electric motor means having a shaft thereon; a first cam mounted on said shaft for rotation thereby and sequentially operable upon rotation to cause one of said cam operated switches to assume its first position and the remainder of said cam operated switches to assume their second positions; a second cam mounted on said shaft for rotation thereby; and timer switch means alternately operable to first or second positions by rotation of said second cam, said timer switch means and said sensing switch means being electrically connected to each other and to said motor means such that the motor means is energized for rotation when both said sensing switch means and said timer switch means are in their corresponding first or second positions, the first step taking place as an article is being sensed and the second step taking place in a shorter interval of time relative to the first step so that control is transferred to the next timing mechanism for the next article reaching the sensing means.

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