April 11, 1944. H. T. HALLOWELL, JR 2,346,575

TRANSFER MECHANISM

Filed Jan. 23, 1943 4 Sheets-Sheet 1

FIG. 10.

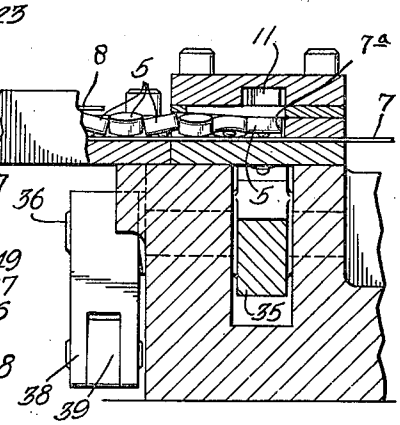


FIG. 1.

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TRANSFER MECHANISM

Filed Jan. 23, 1943 4 Sheets-Sheet 2

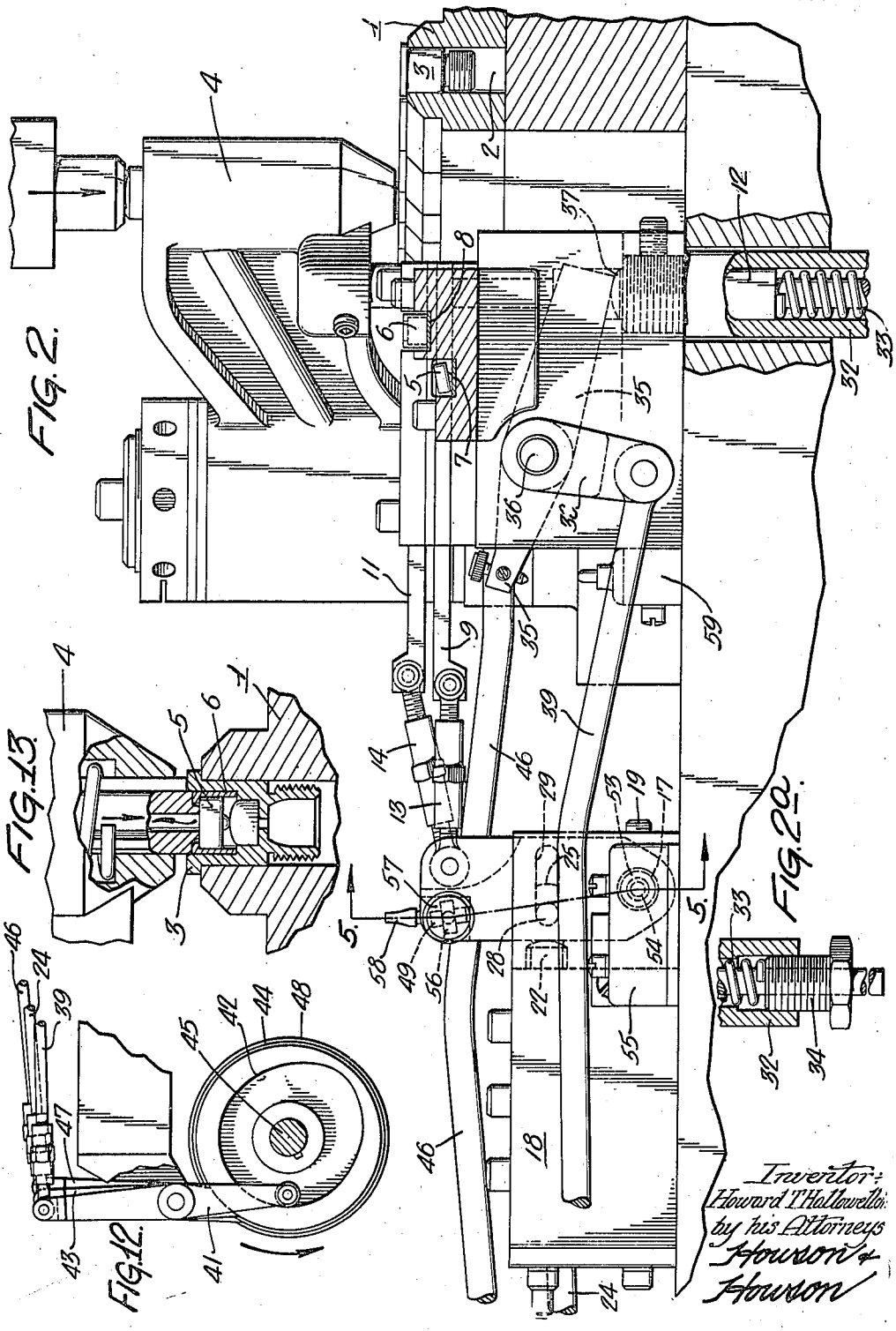


FIG. 2.

FIG. 13.

FIG. 12.

FIG. 20.

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TRANSFER MECHANISM

Filed Jan. 23, 1943 4 Sheets-Sheet 3

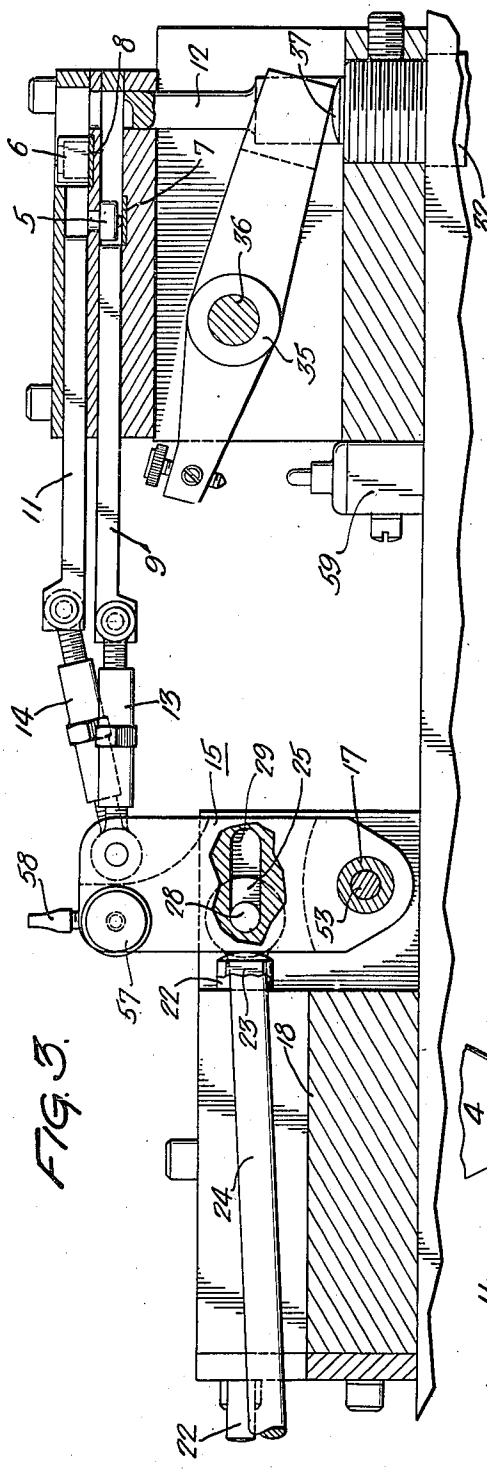


FIG. 5.

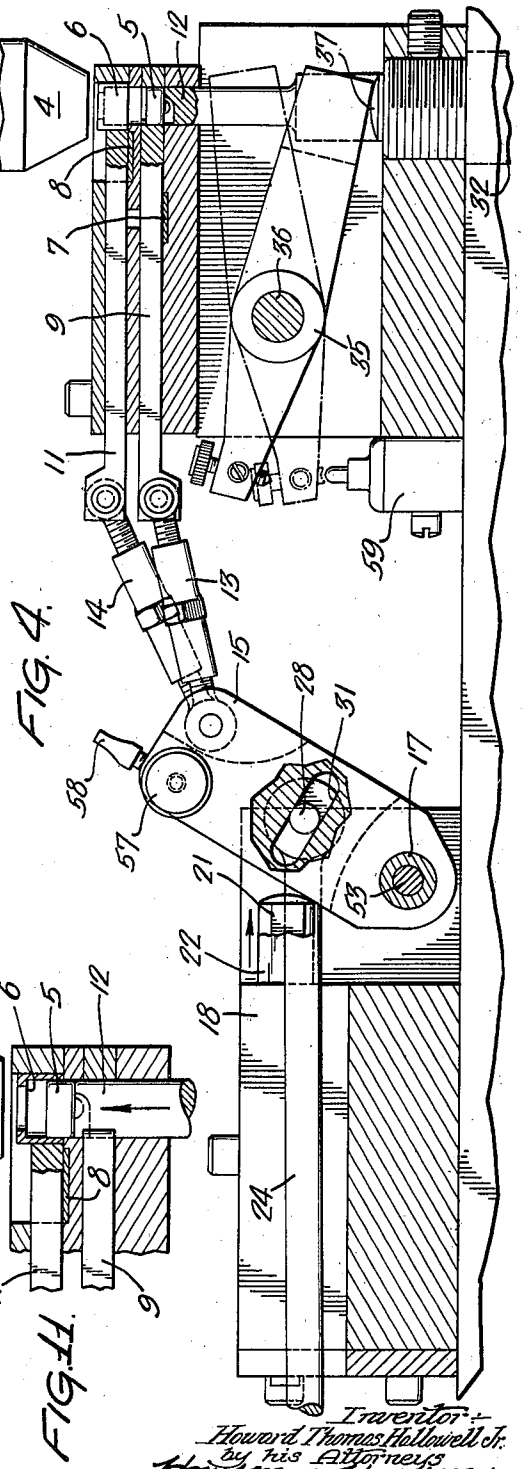


FIG. 4.

FIG. 11.

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TRANSFER MECHANISM

Filed Jan. 23, 1943 4 Sheets-Sheet 4

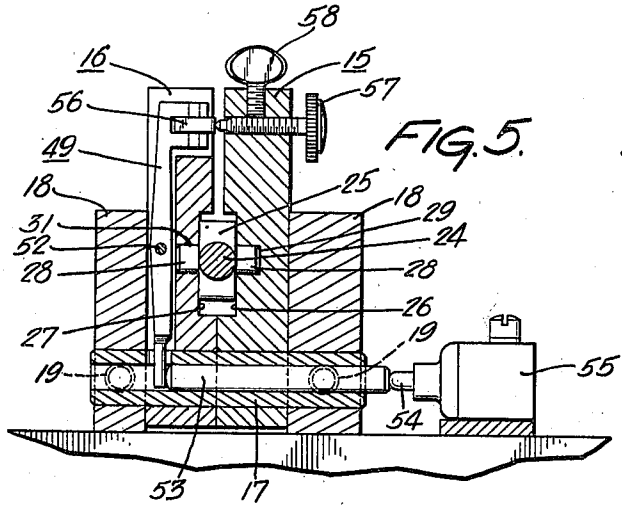


FIG. 5.

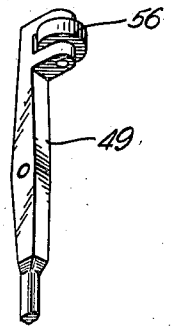


FIG. 8.

FIG. 6

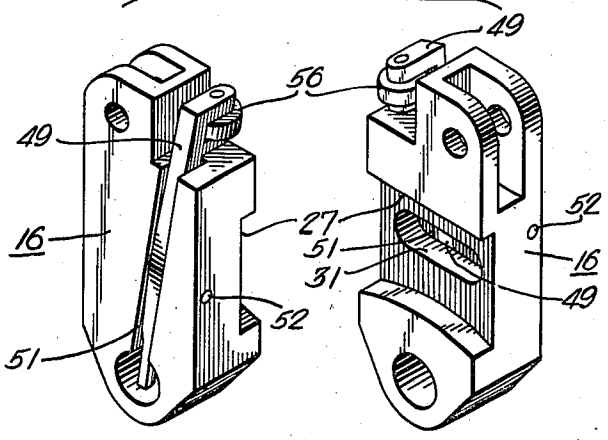


FIG. 7.

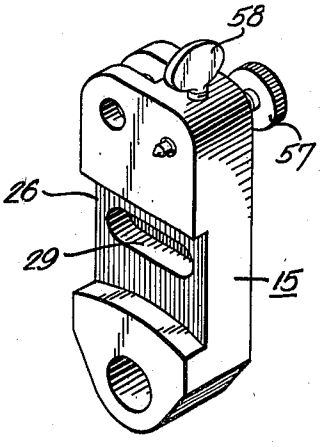
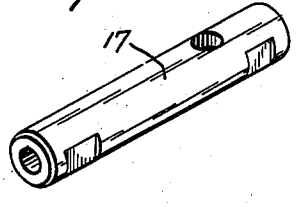


FIG. 9.



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Patented Apr. 11, 1944 2,346,575

UNITED STATES PATENT OFFICE

2,346,575

TRANSFER MECHANISM

Howard Thomas Hallowell, Jr., Jenkintown, Pa., assignor to Pennsylvania Manufacturing Company, Jenkintown, Pa., a corporation of Delaware

Application January 23, 1943, Serial No. 473,385

9 Claims. (Cl. 198—24)

This invention relates to assembling machines of the character disclosed in my copending application Serial No. 424,052, issued as Patent No 2,324,925, and a principal object of the invention is to provide a generally improved and more efficient means for bringing together the elements of the sub-assembly consisting of the firing pin and cap of a priming head for explosive shells.

Another object of the invention is to provide in conjunction with said assembling mechanism a highly sensitive means for detecting error in the functioning of the said mechanism or of the immediately associated parts of the assembling machine.

The invention resides further in certain novel structural and mechanical features hereinafter described and illustrated in the attached drawings, in which:

Fig. 1 is a fragmentary plan view of an assembling machine showing that portion of the mechanism forming the subject of the present invention;

Fig. 2 is a section on the line 2—2, Fig. 1;

Fig. 2a is a continuation of the partial section shown at the lower right-hand end of Fig. 2;

Figs. 3 and 4 are sections on the line 3—3, Fig. 1, said figures showing the parts in different operative positions;

Fig. 5 is a section on the line 5—5, Fig. 2;

Fig. 6 is two views in perspective and from opposite sides of one of the elements of the mechanism shown in Fig. 5;

Figs. 7, 8 and 9 are views in perspective of other elements of mechanism shown in Fig. 5;

Fig. 10 is a sectional view on the line 10—10, Fig. 1;

Fig. 11 is a fragmentary sectional view on the line 3—3, Fig. 1;

Fig. 12 is a fragmentary view illustrating a detail of the operating mechanism, and

Fig. 13 is a fragmentary sectional view showing details of the transfer device constituting an element of the assembling mechanism.

With reference to the drawings, the machine comprises a rotary work-table 1 having therein a series of sockets 2 for reception of the casings 3 of priming heads for explosive shells. The machine further comprises a transfer device 4 the function of which is to transfer to the casings 3 a sub-assembly of the priming head elements consisting of a firing pin 5 and cap 6, see Figs. 11 and 13. The specific transfer device 4 forms no part of the present invention.

The firing pins 5 and caps 6 are carried into the machine upon separate conveyers 7 and 8 which are at different levels, as shown in Figs. 2 and 3. The conveyers carry the pins and caps against suitable stops 7a and 8a, see Figs. 1 and 10, which position them in the paths of plungers, 9 and 11 respectively, which displace the elements from the conveyers and into the positions shown in Fig. 4. Herein the caps immediately overlie the pins in vertical alignment, the said cap lying directly over an aperture through which the pin may be elevated into the interior of the cap to form the aforesaid sub-assembly after the manner illustrated in Fig. 11. The elevation of the pin 5 is effected by a vertically reciprocatory plunger 12, and this plunger also operates to elevate the sub-assembly into the transfer device by means of which the sub-assembly is transferred to the casing 3 after the manner illustrated in Fig. 13. Insofar as described, the mechanism operates on the principle disclosed in my aforesaid copending application, Serial No. 424,052.

The plungers 9 and 11 are connected in the present instance, through the medium of adjustable links 13 and 14, with a pair of levers, 15 and 16 respectively, which are supported for oscillation upon a hollow pin 17, see Figs. 5 and 9. This pin is rigidly secured in relatively fixed parts 18 of the casing frame by set screws 19, as illustrated in Figs. 1 and 5. The levers 15 and 16 are independently oscillatable upon the hollow pin 17 and are urged toward an advanced position by means of spring-pressed plungers 21 and 22 which are supported and guided in the frame, as illustrated in Fig. 1. Coiled springs 23 which are associated with the plungers 21 and 22 tend through the said plunger to force the levers 15 and 16 to the right as viewed in Figs. 3 and 4, and to thereby project the plungers 9 and 11 into operative positions with respect to the pin 5 and the cap 6. Under action of the springs 23 and plungers 21 and 22 the normal positions of the plungers 9 and 11 are shown in Fig. 4. The levers 15 and 16 are retracted against the pressure of the springs 23—23 through the medium of a rod 24 the cylindrical end 25 of which lies in a socket between the levers 15 and 16 formed by recesses 26 and 27 in the respective levers, as shown in Figs. 5, 6 and 7. The rod 24 is connected to the levers by means of pins 28—28 which project laterally from the said cylindrical end 25 into slots 29 and 31 in the bottoms of the recesses 26 and 27 respectively. The rod 24 when retracted will draw the arms 15 and 16 into the positions shown in Figs. 2 and 3; and when the rod 24 is advanced, as shown in Fig. 4, the springs 23 will be

permitted to rock the levers 15 and 16 to the advanced position, as shown in Fig. 4. The slots 29 and 31 constitute in effect lost motion means which provide for continued advance movement of the rod 24 after the advance movements of the plungers 9 and 11 have terminated.

As previously described, the movement of the plungers 9 and 11 into the advanced position shown in Fig. 4 carries one each of the firing pins 5 and caps 6 into a position wherein the plunger 12 may first elevate the firing pin into the cap and then elevate this sub-assembly into the transfer device 4. The plunger 12 is slidably supported in a sleeve 32 in the frame, and a coiled spring 33, which is held in the sleeve 32 by means of a threaded plug 34, see Fig. 2a, tends to elevate the plunger 12 into the active transfer position. This action of the spring is controlled by a pivoted lever 35 which is supported on a pin 36 in the frame and has a bifurcated end which embraces the plunger 12 and engages a shoulder 37 on the latter. Connected to this lever is an arm 38 to which is pivotally connected an operating rod 39, and this rod, as shown in Fig. 12, is connected through a lever 41 and with a cam 42 whereby the rod 39 is periodically reciprocated so as to elevate and retract the lever 35 and to thereby cause a vertical reciprocation of the plunger 12.

The rod 24 is operatively connected with a pivoted lever 43 which is connected to a cam 44, this cam being carried on the same shaft 45 which carries the cam 42. By action of the cam 44, the rod 24 is periodically reciprocated so as to advance the plungers 9 and 11 to thereby bring the elements of the aforesaid sub-assembly into a position wherein they may be acted upon by the plunger 12, as previously described.

The oscillatory movements of the transfer device 4, in the performance of the transfer function, are effected through a rod 46 which is connected through a lever 47 with a cam 48, this cam also being carried by the shaft 45. By this means, the movements of the various elements of the mechanism may be accurately synchronized.

As shown in Fig. 6, the lever 16 carries a lever 49 which is pivotally supported in a slot 51 of the lever upon a pin 52. The lower end of this lever 49 engages one end of a plunger 53 which is slidably supported in the bore of the hollow pin 17, see Fig. 5, and the opposite end of the plunger 53 engages the actuating button 54 of a microswitch 55. The upper end of the lever 49 carries a roller 56 which when the levers 15 and 16 are in a normal relative position, as shown in the drawings, is engaged by the tip of a microscrew 57 which is threaded in the upper end of the lever 15 and which is clamped in adjusted position in the lever by means of a set screw 58. When in this normal position, the axis of the screw 57 will be diametrically disposed with respect to the roller 56, so that a maximum displacement of the lever 49 in a counter-clockwise direction, as viewed in Fig. 5, will occur as a result of the engagement of the screw 57 with the roller 56. This displacement of the lever 49 will have the effect of actuating the button 54 of the microswitch to open the circuit through that switch. If the levers 15 and 16 are moved from this normal relative position, the resulting displacement of the lever 49 will effect a release of the button 54 and a closing of the switch. The switch 55 may be connected to a stop device of the character, for example, disclosed in my copending application Serial No. 424,052, whereby the failure of the lever 49 to hold the switch open as described will result in an interruption in the operation of the machine.

A second microswitch 59 may be associated with the hold-back lever 35 whereby if this lever fails to move into a position permitting proper operation of the plunger 12, the failure of the switch 59 to be actuated by the lever will also result in an interruption in the machine operation.

I claim:

1. The combination with a pair of independently movable members restrained to move in predetermined paths, of resilient means tending to force said members into advanced positions, a restraining element engaged with both of the members and normally operative with the resilient means to retain the members in a given relative position and lost motion means affording relative movements of the restraining element and each of the members in the event that the member is restrained against the pressure of the resilient means by means other than said element.

2. The combination with a pair of plungers, of a pair of levers connected respectively to the plungers, and mounted for oscillation about a common axis, resilient means tending to turn the levers about the axis in a direction to advance the plungers, and means for turning the levers against the pressure of the resilient means in a direction to retract the plungers, said means comprising a restraining member engaged with both of said levers and coactive with the resilient means to retain the levers normally in a given relative position about the axis, and lost motion means affording movements of the member independently of each of the levers in the event that the lever is restrained against the pressure of the resilient means by means other than said member.

3. In an assembling machine, a pair of plungers, a stop positioned in the path of each plunger, and means for feeding elements into the paths of the plungers for displacement by the latter to positions against the respective stops, resilient means tending to advance the plungers in the working stroke, a restraining member engaged with both plungers and operative with the resilient means to retain the plungers normally in a predetermined relative position, means for actuating said member to effect alternate advancement and retraction of the plungers, and lost motion means providing for a continued movement of the restraining member in the advance direction after the plungers have completed the said displacement movement.

4. In an assembling machine, the combination with a pair of conveyors, of a stop at one side of each conveyer, a plunger operative from the opposite side of each conveyor to displace elements from the conveyor to a position against the associated stop, resilient means tending to advance the plungers in the working stroke, a restraining member engaged with both plungers and operative with the resilient means to retain the plungers normally in a predetermined relative position, means for actuating said member to effect alternate advancement and retraction of the plungers, and lost motion means providing for a continued movement of the restraining member in the advance direction after the plungers have completed the said displacement movement.

5. In an assembling machine, a pair of plungers, a stop positioned in the path of each plunger,

and means for feeding elements into the path of the plungers for displacement by the latter to positions against the respective stops, resilient means tending to advance the plungers in the working stroke, a slotted member connected to each of the plungers, a restraining member engaged in both slots and operative at the rear ends of the slots and in conjunction with the resilient means to retain the slotted members in a predetermined relative position, and means for actuating the restraining member to effect alternate advancement and retraction of the plungers, the advance stroke of the restraining member being in excess of the corresponding strokes of the plungers whereby at the forward end of the stroke the relative position of the slotted members is determined by relative position of the plungers.

6. The combination with a pair of members restrained to move in predetermined paths, of resilient means tending to force said members into advanced positions, a restraining element engaged with both of the members and normally operative with the resilient means to retain the members in a given relative position, lost motion means affording relative movements of the restraining element and each of the members in the event that the member is restrained against the pressure of the resilient means by means other than said element, and mechanism operatively associated with said members for actuation by a relative displacement of the members from the said given relative position.

7. The combination with a pair of members restrained to move in predetermined paths, of resilient means tending to force said members into advanced positions, a restraining element engaged with both of the members and normally operative with the resilient means to retain the members in a given relative position, lost motion means affording relative movements of the restraining element and each of the members in the event that the member is restrained against the pressure of the resilient means by means other than said element, and mechanism operatively associated with said members for actuation by a relative displacement of the members from the said given relative position, said means comprising a pivoted lever on one of said members sensitive to relative movements of said members.

8. The combination with a pair of members restrained to move in predetermined paths, of resilient means tending to force said members into advanced positions, a restraining element engaged with both of the members and normally operative with the resilient means to retain the members in a given relative position, lost motion means affording relative movements of the restraining element and each of the members in the event that the member is restrained against the pressure of the resilient means by means other than said element, and mechanism operatively associated with said members for actuation by a relative displacement of the members from the said given relative position, said means comprising a pivoted lever on one of said members sensitive to relative movements of said members, and a microswitch operatively connected with the lever.

9. The combination with a pair of members restrained to move in predetermined paths, of resilient means tending to force said members into advanced positions, a restraining element engaged with both of the members and normally operative with the resilient means to retain the members in a given relative position, lost motion means affording relative movements of the restraining element and each of the members in the event that the member is restrained against the pressure of the resilient means by means other than said element, and mechanism operatively associated with said members for actuation by a relative displacement of the members from the said given relative position, said means comprising a pivoted lever on one of said members, a cylindrical element rotatably mounted at one end of the lever, a microswitch operatively connected with the other end of the lever, and an abutment on the other of said members for engagement with the cylindrical element.

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