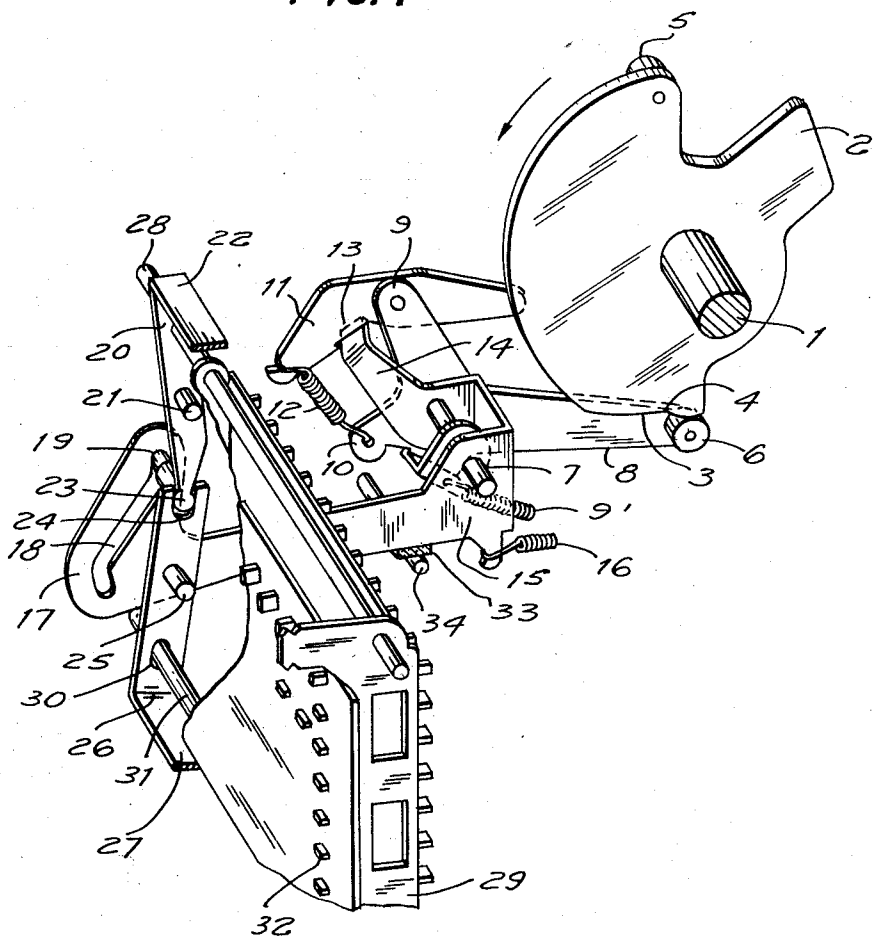
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EARLY SETTING KEYBOARD MECHANISM

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FIG. 1



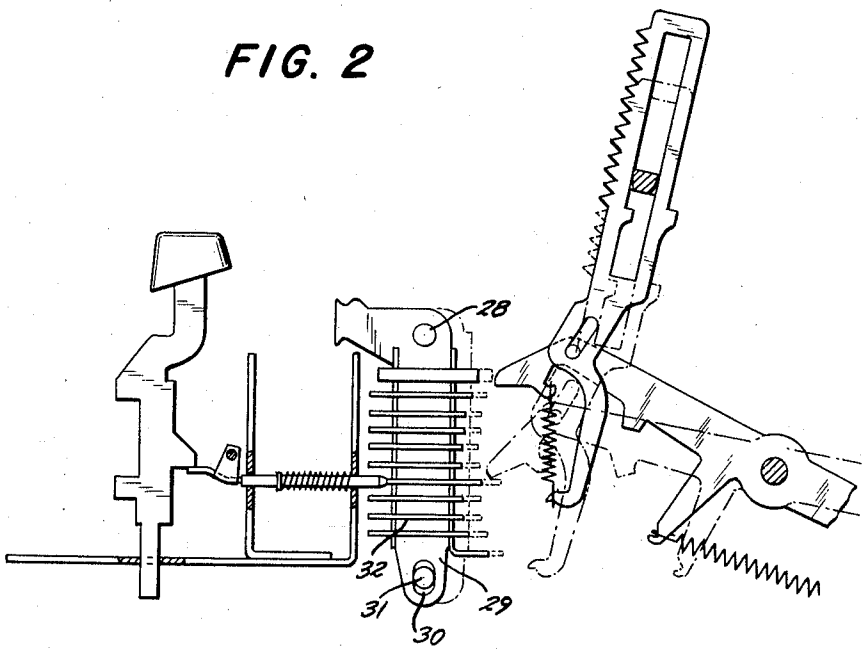

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FIG. 2




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2,905,381

# EARLY SETTING KEYBOARD MECHANISM

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6 Claims. (Cl. 235—60)

The present invention relates to calculating machines. In calculating machines it is in general customary for the operator to actuate keys for inserting the digits of a given number into the machine. These digits are received by a value storage device of some sort and transferred from the value storage device to the calculating mechanism. If the entire calculating operation must be carried through before the value storage device is capable of receiving the next number to be set into the machine, the operation of the calculating machine requires an undesirably long time.

One of the objects of the present invention is to provide a mechanism which enables the operator to set a number into a value storage device while a number previously set into the latter device is being handled by the calculating mechanism of the machine, or, in other words, during the calculating operation.

Another object of the present invention is to provide a calculating machine with a means which very quickly returns a value storage device to a position for receiving a number immediately after the calculating mechanism has sensed the value storage device to receive the number previously set into the same by the operator.

A further object of the present invention is to use for the return of the value storage device to its digit receiving position a device which requires no outside source of energy.

An additional object of the present invention is to provide a relatively simple structure capable of accomplishing all of the above objects and at the same time being very reliable in operation.

With the above objects in view the present invention mainly consists of a calculating machine which includes a value storing means for storing a number set into the machine and a support means supporting the value storing means for movement from a receiving position, where a number may be inserted into the value storing means by the operator, to a transfer position, where the number is sensed by a calculating mechanism of the machine. A moving means is carried by the support means and is operatively connected to the value storing means for moving the same between its positions. An actuating means is carried by the support means for actuating the moving means to move the value storing means from its receiving position to its transfer position. A releasable interlock means releasably interlocks the moving means with the actuating means during movement of the value storing means from its receiving position to its transfer position. A power accumulating means is operatively connected to the moving means for actuating the latter to return the value storing means from its transfer position to its receiving position and for storing power during movement of the value storing means from its receiving position to its transfer position. An automatic release means automatically releases the interlock means when the value storing means has reached its transfer position to separate the moving means from the actuating means and release the moving means to the influence of power accumulating means, so that the latter is free to actuate the moving means for returning the value storing means to its receiving position.



The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantage thereof, will be best understood from the following description of a specific embodiment when read in connection with the accompanying drawing, in which:

Fig. 1 is a fragmentary perspective illustration of that part of a machine which includes the structure of the invention;

Fig. 2 is a fragmentary, partly sectional side view of the structure of the invention schematically showing how a key cooperates with this structure.

Referring now to the drawing, and to Fig. 1 in particular, it will be seen that the structure of the invention includes a main shaft 1 which is rotatable about its axis in the direction of the arrow through approximately 120° in order to carry out a cycle of operations. The structure illustrated in the drawing may form part of a 10-key adding machine, for example, and only sufficient structure is shown to afford a complete understanding of the invention, additional details known to those skilled in the art being omitted in the interest of conciseness. The illustrated structure may be used with machines of the type shown in U.S. Patents 2,247,938 and 2,708,550. The main shaft 1 may be rotated either manually or through any suitable power means. This shaft 1 carries a cam 2 which is rotatable therewith so that the shaft 1 forms a support means which rotatably supports the cam 2 for movement about the axis of the shaft 1. The cam 2 has a camming portion 3 which is interconnected by a recess portion 4 to the end of the cam shown in the drawing in engagement with a cam follower 6 in the form of a roller rotatably carried by the free end of a bell crank 8. The cam 2 further carries a projection 5 which is fixed thereto for a purpose described below.

The bell crank 8 is freely pivoted about a stationary shaft 7 which thus forms part of a support means for pivotally supporting the bell crank 8. This bell crank 8 is in the form of a bail having a pair of side walls through which the shaft 7 extends, and a spring 9' is connected to the bell crank 8 between the side walls thereof for urging the bell crank 8 in a counterclockwise direction about the shaft 7.

The arm 9 of the bell crank 8 is pivotally connected to a pawl 11, and a spring 12 is connected to the pawl 11 and to a free end portion 10 of the bell crank 8 for urging the pawl 11 in a counterclockwise direction about the pivot pin carried by the arm 9 and pivotally supporting the pawl 11. This pawl 11 is formed with a notch 13 into which an arm 14 extends.

The arm 14 is integral with and forms part of a lever 15 which is also in the form of a bail having a pair of side walls, and these walls are respectively formed with openings through which the shaft 7 also extends freely. In this way the lever 15 and the bell crank 8 are pivotable about a common axis. It will be noted that the arm 14 of the lever 15 is located between the two side walls of the bell crank lever 8. A spring 16, which forms a power accumulating means as will be apparent from the description which follows, is connected to the lever 15 for urging the latter in a counterclockwise direction about the axis of the shaft 7. This lever 15 carries a cushion 33 of any resilient material which is fixed to the lever 15 for pivotal movement therewith and which engages a stationary bar 34 so that elements 33 and 34 serve as a stop means for limiting the pivotal movement of the lever 15 under the influence of the spring 16.

The left free end portion 17 of the lever 15, as viewed in Fig. 1, is formed with an elongated slot 18 through which a pin 19 freely extends. This pin 19 is fixed to and extends from a side arm 20 of a bail 22, part of this bail 22 being omitted for the sake of clarity. The bail 22 is carried by a pin 21 for pivotal movement about an axis parallel to the shafts 7 and 1 which are parallel to each other. The bottom end of each of the side arms 20 of the bail 22 is formed with a circular extremity 23 extending into a notch 24 formed at the extremity of each arm of a second bail 27 pivotable about stationary pin 25 which is parallel to the pin 21. It is to be understood that a second pin 21 and a second pin 25 engage the arm 20 and the arm 26, respectively, of the bails 22 and 27, which are not shown in the drawing. Thus, it will be seen that whenever the lever 15 is pivoted about the shaft 7 the slot 18 moves along the pin 19 to cause the latter to pivot the bail 22 which in turn causes the bail 27 to pivot in an opposite direction, the connection 23, 24 between the bails 22 and 27 being similar to a toggle joint.

The side arms 20 of the bail 22 are formed with openings through which a shaft 28 extends, and the side arms 26 of the bail 27 are formed with slots 30, respectively, through which the shaft 31 extends, the shafts 28 and 31 being parallel to each other as well as to the shaft 7. These shafts 28 and 31 support a pin carriage 29 for shifting movement along the shafts 28 and 31 as a series of digits are placed into the machine, in a well known way not forming part of the present invention. The pin carriage 29 carries a plurality of pins 32 which extend from left to right, as viewed in the drawing, and it will be seen that the pivoting of the bails causes the carriage 29 to be shifted in the direction in which the pins 32 extend.

When the pin carriage 29, which forms a value storing means for receiving digits set into the machine by the operator, is in its leftmost position shown in Fig. 1 and shown in solid lines in Fig. 2, it is in a position to be acted on by the keys of the machine for storing a particular number. When the pin carriage 29 is in its rightmost position, shown in dot-dash lines in Fig. 2, it is in a transfer position where a particular number set into the pin carriage may be sensed by and transferred to a calculating mechanism which then carries through a calculating operation. This calculating mechanism also is purely conventional and forms no part of the present invention so that it is not illustrated in the drawing.

The above-described structure operates as follows:

The parts are shown in Fig. 1 in their position of rest where the pin carriage 29 is located in its position for receiving a number set into the machine by the operator. Assuming that the operator has placed a number into the machine in this manner so as to shift certain of the pins 32 to the right, as viewed in Fig. 2 which shows in solid lines how a selected pin 32, e.g. the fourth pin from the bottom in Fig. 2, is selectively shifted upon actuation of its key, then the operator either manually rotates the shaft 1 through 120° in the direction of the arrow or presses a button which closes a switch for energizing a motor or the like to rotate the shaft 1 together with the cam 2 through this angle. During this rotation of the cam 2 together with the shaft 1 the camming portion 3 of the cam 2 engages the follower roller 6 to depress the latter together with the bell crank lever 8 so as to pivot this lever in a clockwise direction about the axis of the stationary shaft 7. The arm 14 remains in the notch 13 of the pawl 11 and thus the pawl 11 pivoting together with the lever 8 transmits its motion to the arm 14 and the lever 15 which also pivots in this way together with the lever 8 in a clockwise direction about the shaft 7, as viewed in Fig. 1. It will be noted that during this pivoting of the lever 15 the power accumulator 16 is tensioned so as to have power stored therein. This clockwise pivoting of the lever 15 results in upward movement of the end portion 17 of the lever 15 and thus the slot 18 moves upwardly with respect to the pin 19. The shape of this slot 18 causes the lever 15 to shift the pin 19 to the left, as viewed in Fig. 1, during upward movement of the free end portion 17 of lever 15, and this movement of pin 19 to the left causes the bail 22 to pivot in a clockwise direction about the axis of the pins 21 and the bail 27 to pivot in a counterclockwise direction about the axis of the pins 25, the pivoting movement of bail 22 being transmitted to the bail 27 through the engagement of the ends 23 of arms 20 in the notches 24 of arms 26, this connection acting similarly to a toggle joint. Thus, during the clockwise pivoting of lever 15 produced by rotation of the cam 2 in the direction of the arrow the upper portion of the bail 22 and the lower portion of the bail 27 move to the right, as viewed in Fig. 1, and carry the shafts 28 and 31 to the right so as to shift the carriage 29 from its digit receiving position, shown in solid lines in Fig. 2, to a transfer position, shown in dot-dash lines in Fig. 2, where the pins 32 are sensed by a calculating mechanism in order to transfer into this calculating mechanism the number set into the pin carriage.

As the cam 2 turns in the direction of the arrow shown in the drawing, the projection 5 fixed to the cam 2 rotates together with the latter along a path intersected by the right free end portion of the pawl 11, as viewed in the drawing. When the projection 5 has reached a position where it is adjacent to the pawl 11 the carriage 29 has reached its rightmost transfer position and the calculating mechanism senses the number which is in the carriage and the calculating mechanism is thus in a position to use this number in the calculations. Immediately after the number is thus transferred from the carriage 29 to the calculating mechanism the projection 5 engages the pawl 11 and pivots the latter in a clockwise direction, as viewed in the drawing, so as to raise the notch 13 away from the arm 14 against the action of the spring 12. Thus, the projection 5 forms a release means for releasing the interlock between the carriage moving means formed by the lever 15 and the actuating means for actuating this moving means, this actuating means being formed by the cam 2. Once this interlock is released by pivoting of the pawl 11 in a clockwise direction, the lever 15 is released to the influence of the spring 16 which has been tensioned by pivoting of the lever 15 in a clockwise direction, and thus the energy stored in the spring 16 is released to very quickly pivot the lever 15 in a counterclockwise direction about the shaft 7, as viewed in Fig. 1, until the cushion 33 engages the stop bar 34. During this very sudden quick return of the lever 15 to the position shown in the drawing the left edge of the slot 18, as viewed in Fig. 1, engages the pin 19 to shift the latter to the right, as viewed in the drawing, and thus the upper portion of bail 22 and the lower portion of bail 27 shift to the left so as to carry the shafts 28 and 31 to the left and in this way quickly separate the carriage 29 from the calculating mechanism and return it to its receiving position, shown in solid lines in Fig. 2, where the operator may insert any number into this carriage. This return of the carriage 29 takes place in such a short period of time that the calculating operation is still going on in the machine and during this calculating operation the operator may set the next number into the pin carriage 29, so that in this way a great deal of time is saved and with the structure of the invention an operator may accomplish much more work than with conventional structures where the operator must wait until one calculating operation is complete before setting the number for the next calculating operation into the machine.

After the shaft 1 and cam 2 have rotated in the direction of the arrow to their end position through an angle of approximately 120°, the cam 2 and the shaft 1 are rotated back to the position of Fig. 1 in a direction opposite to the arrow shown in the drawing, and the spring 9' maintains the follower roller 6 in engagement with the cam so that the lever 8 now pivots in a counter-

clockwise direction back to the position of the drawing. During this pivoting movement of the lever **8** back to its rest position the pawl **11** again engages the arm **14**, and the recessed camming portion **4** of the cam **2** guarantees that the arm **14** will properly enter into the notch **13**.

Thus, all of the parts are returned to the rest position shown in the drawing and the above operation may again be repeated.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of calculating machines differing from the types described above.

While the invention has been illustrated and described as embodied in a quick return mechanism for calculating machines, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a calculating machine, in combination, value storing means for storing a number set into the machine; means supporting said value storing means for movement from a receiving position, where a number may be inserted into said value storing means by the operator, to a transfer position where the number is sensed by a calculating mechanism of the machine; moving means operatively connected to said supporting means for moving said value storing means between said positions; actuating means for actuating said moving means to move said value storing means from said receiving position to said transfer position; releasable interlock means releasably interlocking said moving means with said actuating means during movement of said value storing means from said receiving position to said transfer position; power accumulating means operatively connected to said moving means for actuating the latter to return said value storing means from said transfer position to said receiving position and for storing power during movement of said value storing means from said receiving position to said transfer position; and automatic release means for automatically releasing said interlock means when said value storing means has reached its transfer position to separate said moving means from said actuating means and release said moving means to the influence of said power accumulating means, whereby the latter is free to actuate said moving means for returning said value storing means to its receiving position.

2. In a calculating machine, in combination, a pin carriage for storing a number set into the machine, said carriage carrying a plurality of elongated pins; support means supporting said carriage for movement along a path substantially parallel to said pins between a digit receiving position, where a number may be inserted into said pin carriage by the operator, and a transfer position where the number is sensed by a calculating mechanism of the machine; moving means operatively connected to said supporting means for moving said carriage between said positions; actuating means for actuating said moving means to move said carriage from said receiving position toward said transfer position; releasable interlock means releasably interlocking said moving means with said actuating means during movement of said carriage from said receiving position to said transfer position; power accumulating means operatively connected to said moving means for urging the latter to return said carriage from said transfer position to said receiving position and for storing power during movement of said carriage from said receiving position to said transfer position; and automatic release means carried by said actuating means for automatically releasing said interlock means when said carriage has reached its transfer position.

3. In a calculating machine, in combination, a pin carriage; a pair of parallel shafts slidably supporting said pin carriage for movement along said shafts; a first bail having a pair of side arms respectively formed with openings through which one of said shafts extends and respectively having free end portions directed toward the other of said shafts; a second bail having a pair of side arms formed with openings through which said other shaft extends and having free end portions extending toward said arms of said first bail and respectively formed with notches into which the free ends of said arms of said first bail respectively extend; support means supporting said bails for respective pivotal movement about a pair of parallel axes which are parallel to said shafts, so that said bails simultaneously turn in opposite directions about said axes due to the interconnection of said arms of said bails; moving means operatively connected to one of said bails for rotating the latter; spring means operatively connected to said moving means for urging the latter to turn said bails in one direction; cam means for rotating said bails in an opposite direction; releasable interlock means interlocking said moving means with said cam means for transferring from said cam means to said moving means a motion which turns said bails in a direction which tensions said spring means; and release means carried by said cam means for releasing said interlock means from said cam means after said spring is tensioned and said moving means has turned said bails to locate said carriage in a given position.



4. In a calculating machine, in combination, a pin carriage; a pair of parallel shafts slidably supporting said pin carriage for movement along said shafts; a first bail having a pair of side arms respectively formed with openings through which one of said shafts extends and respectively having free end portions directed toward the other of said shafts; a second bail having a pair of side arms formed with openings through which said other shaft extends and having free end portions extending toward said arms of said first bail and respectively formed with notches into which the free ends of said arms of said first bail respectively extend; support means supporting said bails for respective pivotal movement about a pair of parallel axes which are parallel to said shafts, so that said bails simultaneously turn in opposite directions about said axes due to the interconnection of said arms of said bails; a pin fixed to and extending from one of said arms; a first lever pivotally supported for turning movement about a third axis parallel to said pair of axes, said lever being formed with a cam slot through which said pin extends so that when said lever turns said slot moves with respect to said pin and engages the latter to turn said bails; a cam rotatably supported for movement about a fourth axis parallel to said third axis; a second lever pivotally supported for movement about said third axis and engaging said cam to be turned about said third axis when said cam turns about said fourth axis; a pawl pivotally carried by said second lever; an arm fixed to said first lever and engaging said pawl so that rotary movement of said cam is transferred through said second lever, said pawl, and arm to said first lever for rotating the latter to turn said bails; first spring means urging said pawl into engagement with said arm; second spring means maintaining said second lever in engagement with said cam; third spring means engaging said first lever for urging the latter in a direction opposite from that in which it is turned by said cam; and a projection carried by said cam for movement therewith along a path intersecting said pawl for turning the latter away from said arm to release said first lever to said third spring means.

5. In a calculating machine, in combination, a pin carriage; a pair of parallel shafts slidably supporting said pin carriage for movement along said shafts; a first bail having a pair of side arms respectively formed with openings through which one of said shafts extends and respectively having free end portions directed toward the other of said shafts; a second bail having a pair of side arms formed with openings through which said other shaft extends and having free end portions extending

toward said arms of said first bail and respectively formed with notches into which the free ends of said arms of said first bail respectively extend; support means supporting said bails for respective pivotal movement about a pair of parallel axes which are parallel to said shafts, so that said bails simultaneously turn in opposite directions about said axes due to the interconnection of said arms of said bails; a pin fixed to and extending from one of said arms; a first lever pivotally supported for turning movement about a third axis parallel to said pair of axes, said lever being formed with a cam slot through which said pin extends so that when said lever turns said slot moves with respect to said pin and engages the latter to turn said bails; a cam rotatably supported for movement about a fourth axis parallel to said third axis; a second lever pivotally supported for movement about said third axis and engaging said cam to be turned about said third axis when said cam rotates about said fourth axis; a pawl pivotally carried by said second lever; an arm fixed to said first lever and engaging said pawl so that rotary movement of said cam is transferred through said second lever, said pawl, and arm to said first lever for rotating the latter to turn said bails; first spring means urging said pawl into engagement with said arm; second spring means maintaining said second lever in engagement with said cam; third spring means engaging said first lever for urging the latter in a direction opposite from that in which it is turned by said cam; a projection carried by said cam for movement therewith along a path intersecting said pawl for turning the latter away from said arm to release said first lever to said third spring means; and stop means for limiting movement of said first lever under the influence of said third spring means.

6. In a calculating machine, in combination, a pin carriage; a pair of parallel shafts slidably supporting said pin carriage for movement along said shafts; a first bail having a pair of side arms respectively formed with openings through which one of said shafts extends and respectively having free end portions directed toward the other of said shafts; a second bail having a pair of side arms formed with openings through which said other shaft extends and having free end portions extending toward said arms of said first bail and respectively formed with notches into which the free ends of said arms of said first bail respectively extend; support means supporting said bails for respective pivotal movement about a pair of parallel axes which are parallel to said shafts, so that said bails simultaneously turn in opposite directions about said axes due to the interconnection of said arms of said bails; a pin fixed to and extending from one of said arms; a first lever pivotally supported for turning movement about a third axis parallel to said pair of axes, said lever being formed with a cam slot through which said pin extends so that when said lever turns said slot moves with respect to said pin and engages the latter to turn said bails; a cam rotatably supported for movement about a fourth axis parallel to said third axis; a second lever pivotally supported for movement about said third axis and engaging said cam to be turned about said third axis when said cam rotates about said fourth axis; a pawl pivotally carried by said second lever; an arm fixed to said first lever and engaging said pawl so that rotary movement of said cam is transferred through said second lever, said pawl, and arm to said first lever for rotating the latter to turn said bails; first spring means urging said pawl into engagement with said arm; second spring means maintaining said second lever in engagement with said cam; third spring means engaging said first lever for urging the latter in a direction opposite from that in which it is turned by said cam; a projection carried by said cam for movement therewith along a path intersecting said pawl for turning the latter away from said arm to release said first lever to said third spring means; and stop means for limiting movement of said first lever under the influence of said third spring means, said stop means comprising a stationary stop member located in the path of movement of said first lever and a cushion member carried by said first lever for engaging said stop member.

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