

May 17, 1955

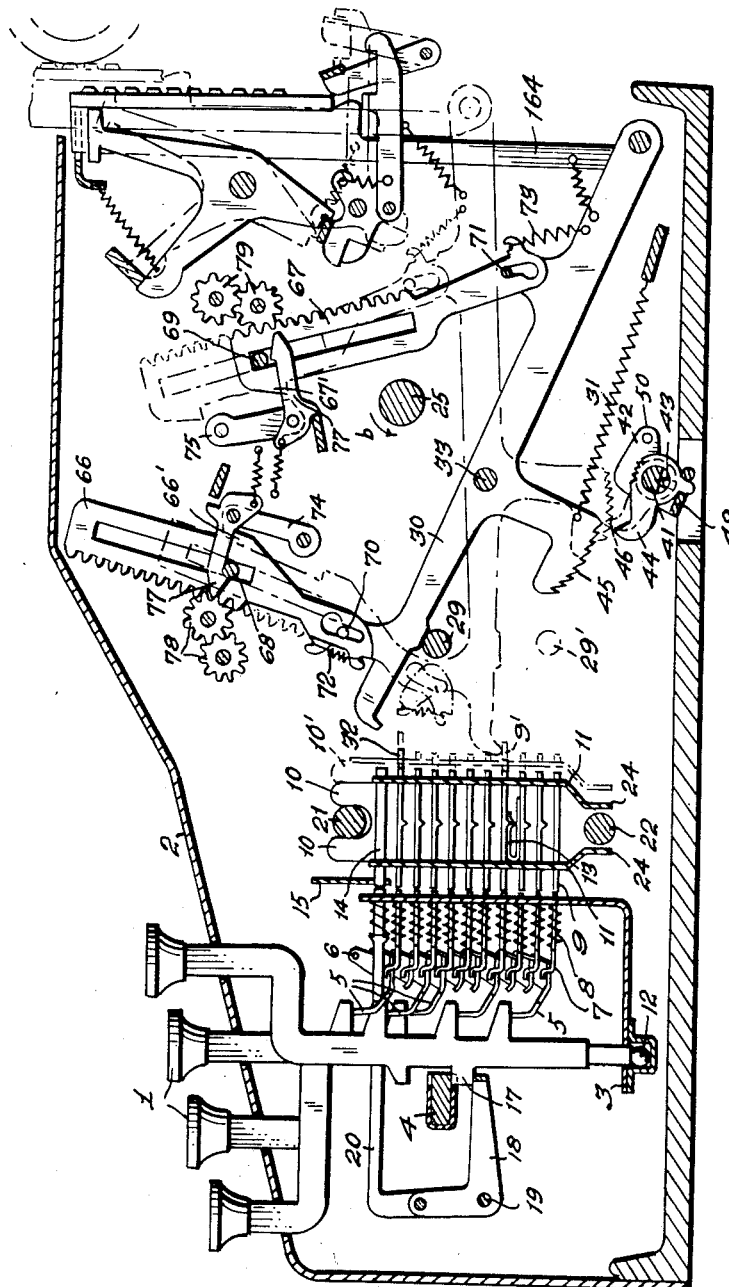
L. MAIER
VALUE SETTING AND TRANSMITTING MECHANISM
FOR A TEN KEY MACHINE

2,708,550

Filed Aug. 4, 1950

3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

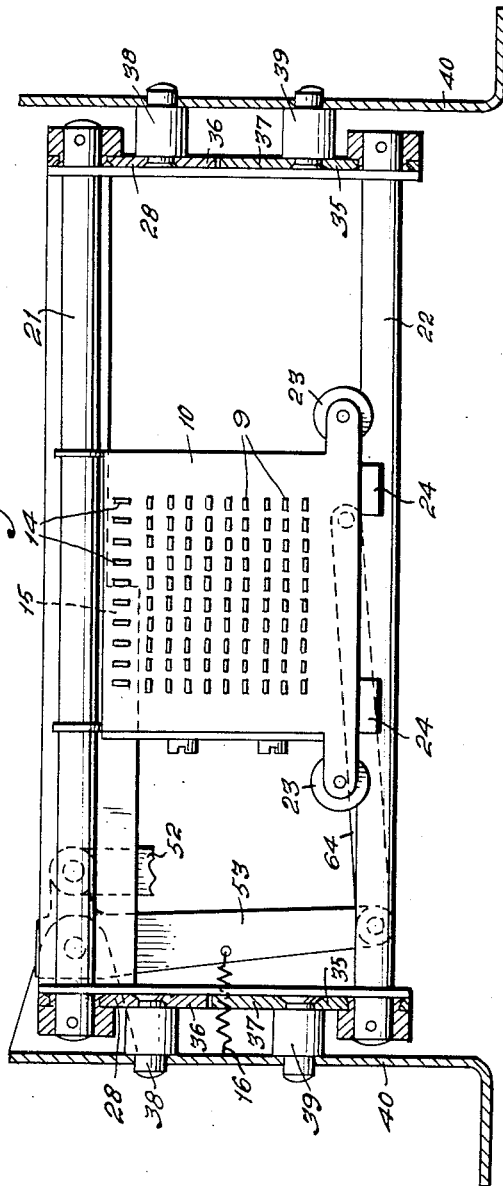
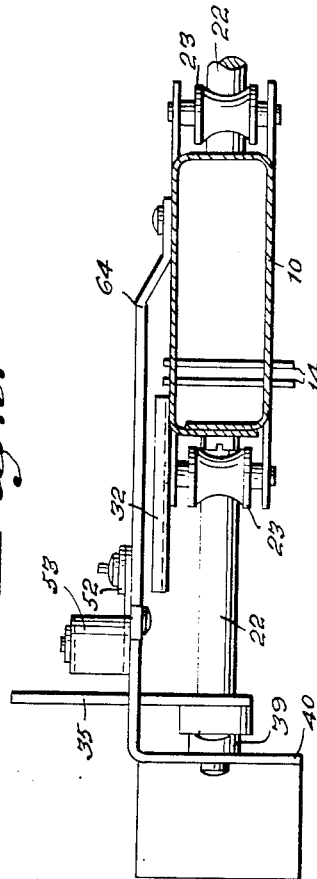


Fig. 3.



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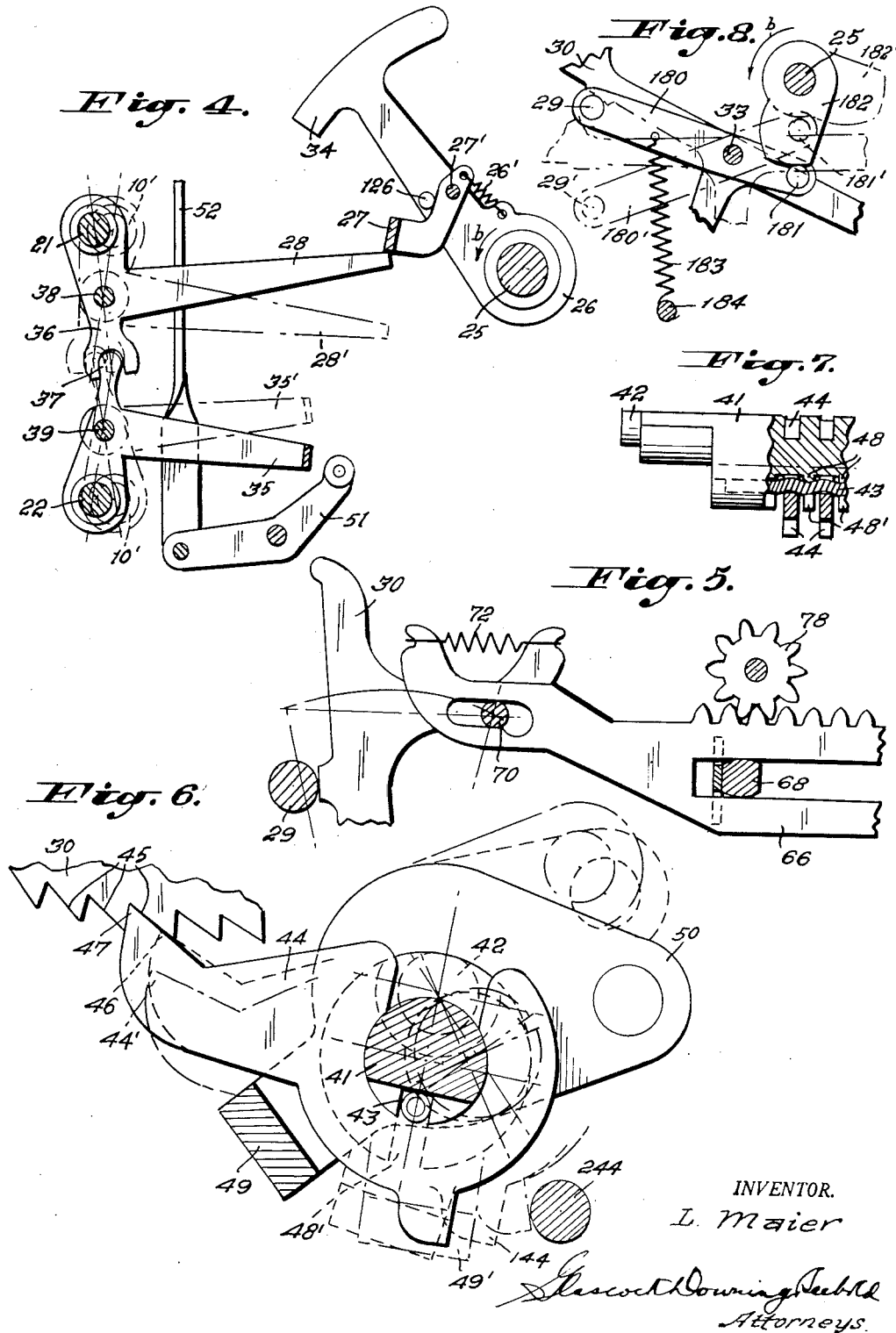
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VALUE SETTING AND TRANSMITTING MECHANISM FOR A TEN KEY MACHINE

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Application August 4, 1950, Serial No. 177,683

Claims priority, application Germany October 26, 1949

10 Claims. (Cl. 235—60)

This invention relates to an office machine with a single keyboard having one set of keys and one or more totalizers or counters.

In adding machines with a single keyboard, more particularly in electrically operated machines of this kind, it is a generally accepted rule that the operator on operation of an actuating key has to wait until the working cycle of the machine is finished before setting a new number. In order to accelerate continuous adding operations, the drive of the machines and the mechanisms thereof were designed in such a way that the working cycles were carried out in a shorter period of time, i. e., the machines were made to run at a higher rate of speed. However, various drawbacks, such as, non-reliable operation, higher wear and tear or extra expenditure to avoid such increased wear and tear were involved in such a course. Only in case of machines with a complete keyboard, arrangements are known which permit the resetting of new numbers before completion of the previous working cycle. These installations offer considerable advantages since the efficiency of the machine can be considerably increased without the said drawbacks. However, said installations cannot be transmitted to adding machines with a single keyboard.

As a rule, the working cycle of a machine of this type includes all of the operations necessary to complete recording of a single number, regardless of the sequence in which they occur. This is generally accomplished by to and fro rotation of a main shaft, actuated either electrically or manually. In the prior devices having a differential mechanism and a transferring mechanism, such as a pin carriage, to transfer a number set up by the keyboard to the differential mechanism this transfer can take place during the first movement of the main actuating member, but the disengagement of the transfer mechanism, and its return to the position for engagement by the keyboard, cannot take place until the main actuating member is moved in the reverse direction. In the present device the pin carriage (a number having been set in it by the keyboard) is moved into engagement with the differential mechanism and back into position to receive another number from the keyboard all during the forward rotation of the main shaft, this forward rotation of the main shaft being considered as the first half of the working cycle. The remainder of the working cycle will take place during backward rotation of the main shaft to its initial position, to complete a series of operations for recording the number set by the keyboard.

It is an object of the present invention to provide means by which new numbers can be set in machines with a single keyboard before the previous working cycle is completed.

With this and further objects in view, according to the present invention the efficiency of office machines, more particularly adding machines, cash registers, bookkeeping machines or the like with a single keyboard, i. e. with one key each for the numerals from 0 to 9 and with a movable pin carriage can be increased in a similar man-

ner as in the above mentioned machines having a complete keyboard, by providing the machines with facilities which permit resetting of a new number on operation of the actuating keys, after a partial completion of the working cycle. This is achieved by a special arrangement and control of the pin carriage. To this end, the same according to a preferred embodiment of the invention is arranged and controlled in such a way that it is possible to impart to said pin carriage, in addition to the stepwise lateral movement for setting the number, an adjustment transversely to the step motion. One position is intended for setting the pins by the keys and the second position serves to feel out the set pins by the transmitting members to the printing mechanism and to the totalizers. At the beginning of the cycle of operations the pin carriage is automatically moved into the feeling-out position while towards the end of one half cycle it is moved into the setting position and simultaneously the previous number is cleared. Thus a new figure can be adjusted when one cycle is half completed.

This arrangement requires a new design of the transmitting elements. Levers pivoted on a fixed fulcrum, having toothed racks and type carriers linked to them on a suitable radius, cooperate with retaining pawls maintaining the actual position of the transmitting levers after the removal of the pin carriage and aligning the same. These retaining pawls which are new per se not only prove to be advantageous in office machines with a single keyboard, but generally wherever accuracy of adjustment of the transfer by sets of numerical values is required, e. g., in calculating machines, cash registers, bookkeeping machines or similar machines with any desired type of keyboard.

The retaining pawls are displaced from their engaging position only towards the end of the cycle by the transmitting members as the same are returned. Provided at the transmitting members, at a suitable part thereof, are teeth for engagement of the retaining pawls. The new arrangement of the transmission members with the toothed racks is simplified by the fact that the racks on the one hand are driven on an arcuate line and on the other hand are additionally supported by a second bearing formed by a straight slot on a stationary guideway. This constructional adaptation of the arcuately moved fulcrum to the guides of the toothed racks and to the pitches thereof is important not only for office machines with a single keyboard, but also for gears of other office machines in which accuracy of transmission is important in connection with a simple construction.

The retaining pawls, one for each transmission lever, are mounted on an eccentric shaft and are driven partly by friction (drag spring) and partly by positive coupling, so that the transmission members are aligned to their accurate pitch by the pawls.

Other and further objects, features and advantages of the invention will be pointed out hereinafter and appear in the appended claims forming part of the application.

In the accompanying drawings a now preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

Fig. 1 is a vertical section through a machine having the invention applied thereto, showing only those parts which are pertinent in connection with the present invention,

Fig. 2 is a front view of the pin carriage mounted in its frame,

Fig. 3 is a top view of the pin carriage,

Fig. 4 is a diagrammatic view showing the parts for moving the pin carriage, in their feeling-out and adjusting position,

Fig. 5 is a diagrammatic view showing the arrangement and movement of the racks,

Fig. 6 is a diagrammatic view showing the retaining pawls in various positions,

Fig. 7 is a detail, partly in section, showing the retaining pawl shaft with the retaining pawls, and

Fig. 8 is a fragmentary detail view showing the means by which the collecting bar is driven from the main shaft.

Similar reference numerals denote similar parts in the different views.

Referring now to the drawings in greater detail, and first to Fig. 1, it will be seen that the keys 1 are supported in the casing 2 and in the guide 3. Their uppermost and lowermost positions are defined by the stop 4. On depression of one of the keys the link 5 cooperating therewith is swung about its pivot 6, so that the part 7 connected with the link 5 is forced against the corresponding pin 9 of the pin carriage against the pressure of its spring 8. The pins 9 pass through the side walls 11 of the carriage. The springs 8 act to return the keys 1 elastically to their uppermost position with the aid of the pins 7 and the links 5. The ball type locking device 12 permits the depression of one key only at a time. Each key 1 has associated to it a link 5, a part 7 and a spring 8. On operation of one of the keys the respective pin 9 is pressed to its front position 9' and locked by the plate spring 13. A spring 16, Fig. 2, acts to pull the pin carriage to the left in Fig. 2, through a lever 53 and a link 80. Under action of the spring 16 one of the pins 14 engages the stop 15, thus defining the lateral position of the pin carriage 10. The noses 17 of the keys 1 act upon the link 18 which is mounted on a shaft or pivot 19. The link 18 has mounted to it a toggle actuating link 20 acting to push back the pin 14 actually engaging the stop 15, so that on rising of the respective key 1 the pin carriage springs to the left by one pin distance (one decimal). Thus, any desired number up to the maximum capacity of the pin carriage can be set.

The pin carriage 10 is supported on the guide bars 21 and 22. The bar 21 is embraced fork-fashion by its frame. The bar 22 supports the rollers 23 of the pin carriage 10 (Fig. 2 and 3). For providing a better guidance in the feeling out of the pin carriage, lugs 24 are arranged at the side walls 11 of the pin carriage. The pins 9 guided in the side walls 11 can be moved through their adjusting stroke only and are locked in either of their two end positions by the springs 13. On completion of the adjustment of the value in the pin carriage the main shaft 25 (Figs. 1 and 4) is rotated in the direction of the arrow *b*.

Fixedly connected to the main shaft 25 is the part 26, Fig. 4. The pawl 27 thereof at the beginning of the forward motion of the main shaft 25 in the direction of arrow *b* forces the lever 28 by non-positive drive into the position 28'. Then a collecting bar 29 is moved to 29' (Fig. 1) by the main shaft 25 (through means to be described below), and the transmission levers 30, pulled by the spring 31, follow, until they hit the zero plate 32 (Fig. 3) or the set pins 9. The transmission levers 30 are hinged on the pivot or shaft 33. In the due temporal sequence the projection 34, Fig. 4, of part 26 strikes against the lever 35 in the position 35' which lever had been swung by the parts 36 and 37, forming a bifurcated connection, from the position 35 to the position 35' as a result of the movement of the lever 28 from the position 28 to the position 28'. The levers 28 and 35 are fastened on the studs or pivots 33 or 39, respectively, which in turn are secured in the side walls 40. The shafts 21 and 22, being fixedly connected to the levers 28 or 35, respectively, impart to the pin carriage mounted therein a parallel sliding movement from 10 to 10' and vice versa, on swinging of the levers 28 and 35.

The means by which the collecting bar 29 is moved to its position 29' from the main shaft 25 will now be de-

scribed in connection especially with Fig. 8. A pair of cam discs 182 are secured on main shaft 25 in spaced-apart relation to engage the opposite ends of a cross-roller 181 carried at the extremities of a pair of two-armed levers 180 which, like the transfer or sensing levers 30, are pivoted on axle 33. The collecting bar or rail 29 is secured in the opposite ends of these levers 180. Each lever 180, with the roller 181 therebetween, is urged by a spring 183 to press roller 181 against the cam discs 182. The ends of springs 183 are fastened to fixed bolts such as 184. In operation, when main shaft 25 is swung in the direction of arrow *b*, each cam disc 182 moves from its full-line position to dash line position of Fig. 8. During this operation, levers 180 are swung by roller 181 contacting cams 182, to their position as indicated at 180' and 181', and collecting rail 29 arrives at its dash line position 29'. Thus the transferring or sensing members 30, under the tension of spring 31 (Fig. 1), can swing by amounts corresponding to the pressed adjusting pins 9. During retrograde motion the roller moves back to position 181 and thus the collecting rail 29 returns to its full-line position.

On completion of the movement of the collecting bar 29 to 29', Fig. 1, and before the projection 34 (Fig. 4) strikes against the lever in its position 35', the shaft 41 (Figs. 1, 6 and 7) is rotated about its eccentric journals 42, so that the retaining pawls 44 driven by the drag spring 43 engage the teeth 45 of the transmission parts 30 in the position 46, Fig. 6. The further rotation of the shaft 41 results in a rearward shifting or equalizing of the teeth 45 up to the respective position in which the nose 47 of the pawl 44 engages completely between the teeth 45, Fig. 6, so that all of the transmission elements are thereby aligned and take up their accurate position for printing and swinging the totalizers into, and out of, their operative position. The drag spring 43 (wound like a tension spring, but without preliminary tension) extends over all of the pawls 44, each transmission lever 30 having one pawl 44 associated to it. The eccentricity of the shaft 41 is such that the spring 43 is urged on the one hand by the pawls 44 and on the other hand by the projection 48 within the slots 48₁, into a serpentine-shaped position from which it carries along the pawls 44 by means of its spring force and the friction resulting therefrom on rotation of the shaft 41. Fixedly connected to the shaft 41 is a U-shaped stirrup member 49 whose arms or legs 50 form the driving connection to the main shaft 25. The U-shaped member 49 is controlled in such a way that it keeps the pawls 44 out of their engaging position in its position of rest 49', while forcing the pawls 44 into the toothing 45, by non-positive drive, in its position 49.

The return of the pin carriage 10 to its initial position and so the clearing of the adjusted value is effected by the main shaft 25, in such a way that in the last part of the partial rotation of the main shaft 25 in the direction *b* the part 26 (Fig. 4) presses by its projection 34 onto the roller of member 51 which thereby lifts the stem 52 and swings the lever 53 (Fig. 2) against action of its spring 16 to such an extent that the pin carriage 10 is forced back into its initial position by the link 64. This clearing of the adjusted value may be accomplished in a known way, which is therefore not illustrated in the drawing, by a fixed zero-plate which restores the adjusting pins in response to the displacement of the pin carriage into a position beneath the zero-plate.

On rearward swinging of the U-member 49 (Fig. 6) or the shaft 41, the pawls 44 are at first retained by the toothing 45 until the connecting levers 30 are swung back. By the engagement of the pawls 44 in the toothing 45 of the transmission members 30 the same are secured against any further movement, so that the pin carriage 10 can be retracted and moved to its initial position without change of the position of the members 30 during the printing and the control of the totalizers or counters.

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Besides the type carriers 64 which are jointly connected or hinged to the transmission members 30 in known manner, the toothed racks 66 or 67 are linked thereto by means of their longitudinal slot and the pins 70 or 71. By the springs 72 or 73 the slotted ends of the toothed racks are always kept in contact with the pins, and only on striking of the noses 66' or 67' of the toothed racks 66 or 67 against the noses of the supporting levers 74 or 75 the toothed racks 66 or 67 are shifted on the pins 71 or 70 through one pitch measure against action of the spring 72 or 73. Where a tens shift is required, such as, for instance, in case of the tens shift lever 77 and the supporting lever 75, the toothed rack 67 will catch up the retained step by springing. The toothed rack 67 shows the position after the tens shift and the toothed rack 66 shows the position before the tens shift. Both of the toothed racks 66 and 67 swing about their ends (about the pins 70 and 71) and on the other hand they move in a longitudinal direction in their straight slot on the strips 68 and 69. The pitch or gear is harmonized in relation to the movement in such a way that the transfer into the totalizers 78 and 79 takes place quite smoothly although the toothed racks do not move on a straight line.

The tens shift levers, supporting levers, collecting bars etc. operate in known manner and their function, therefore, need not be described in detail. The same applies for the printing mechanism.

While the invention has been described in detail with respect to a now preferred example and embodiment of the invention it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended, therefore, to cover all such changes and modifications in the appended claims.

Having thus described the invention, what is claimed is:

1. In an office machine having a single keyboard, one set of keys, at least one totalizer, a pin carriage having pins displaceable by said keys, a set of combined sensing and transmission members, the pins of the carriage cooperating directly with the said members, means for moving said carriage stepwise for setting the figures, and means for moving said carriage bodily transversely to its stepwise motion from a position in which its pins are engageable by said keys to a position in which its pins are engageable by said members to transfer the settings to said totalizer.

2. An office machine in accordance with claim 1, and a plurality of retaining pawls respectively engageable with said sensing and transmission members for retaining the latter in the positions established by the pins of said carriage.

3. In a calculating machine having a plurality of sensing levers, teeth on each of said levers, a shaft, and retainer pawls pivotally movable on said shaft to engage the teeth of respective sensing levers; a device for the control of said pawls, comprising a spiral drag spring extending lengthwise of said shaft and positioned for frictional engagement between the shaft and all of said pawls, and a member rotatably movable to drive said pawls into and out of operative teeth-engaging positions.

4. In a calculating machine having a plurality of sensing levers, teeth on each of said levers, a shaft, and retainer pawls pivotally movable on said shaft to engage the teeth of said respective sensing levers; friction means between said pawls and said shaft to oppose free movement of said pawls on said shaft, eccentric bearing formations on said shaft, and means for rotating said shaft to move all of said pawls bodily toward and away from the teeth of said respective sensing levers.

5. In an office machine having a plurality of transmission levers, a shaft extending at right angles to said transmission levers, a retaining pawl for each of the

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transmission levers pivoted on said shaft, axially extending spring means disposed in frictional engagement with the pawls to yieldably resist rotation of the pawls, and journal means to position the shaft for rotation about an axis eccentric to the axis of rotation of the pawls, so that when the shaft is rotated about said eccentric axis the pawls will engage teeth provided in said transmission levers to swing said levers out of engagement with the setting pins.

6. In a drive mechanism for totalizers having an input gear rotatable about a fixed axis, a rack movable substantially in a longitudinal direction to actuate the totalizer, a fixed guide member spaced from said input gear, said rack being provided with a longitudinally extending toothed section adapted to pass between said guide member and said input gear to operatively engage said gear, a rotatable sensing and transmission element pivotally connected to one end of said rack to move said one end of the rack along an arcuate path, whereby said rack will be supported for slidable rotatable movement about said fixed guide member.

7. In a calculating machine, the combination of a plurality of totalizers, a set of keys, a member carrying a field of stops displaceable to set-up position by said keys and said member being movable step by step in a first direction for setting up the stops for respective orders, means for moving said member bodily in a second direction transverse to said first direction to bring the set-up stops into a sensing position, a set of sensing elements each having a single stop-engaging surface and movable from unoperated normal position to a position to engage respective of said set-up stops, means for driving said totalizers from said sensing elements, and means for retaining said sensing elements substantially in the positions defined by the stops to free said member for retraction from its sensing position during an initial part of the operation cycle of the machine.

8. A calculating machine in accordance with claim 7, in which said retaining means comprises a set of pawls coacting respectively with said sensing elements, a shaft carrying said pawls, and means for moving said pawls to align said sensing elements by motion thereof in the direction tending to disengage said sensing elements from said stops.

9. In an office calculating machine of the ten-key keyboard type, a set of ten keys, at least one totalizer, a single pin carriage mounted for movement stepwise in one direction relative to said keys for setting its pins in accordance with successive digits, a group of sensing members positioned to cooperate directly with the set pins of said pin carriage, means for moving said carriage bodily transverse to its stepwise motion from a first position in which its pins are engageable by said keys to a second position in which its pins are engageable by said members to sense the settings, means for canceling the set positions of said pins, a main drive element movable through a complete working cycle first to operate said sensing members to positions defined by said pin carriage and thereafter to operate them to transfer positions transferring the sensed values to the totalizer, and means operable by said drive element for restoring said carriage to its first position, and thereupon operating said canceling means, prior to the operation of said sensing members to their transfer positions and within the first half of the said complete working cycle.

10. In an office machine of the ten-key keyboard type, a set of keys, at least one totalizer, a single pin carriage mounted for movement stepwise in one direction relative to said keys for setting its pins in accordance with successive digits, a group of sensing members positioned to cooperate directly with the set pins of said carriage, means mounting said carriage for movement bodily transverse to its stepwise motion from a first position in which its pins are engageable by said keys to a second position in which its pins are engageable

by said members, a main drive element movable through a complete working cycle, and means controlled by said drive element for sequentially moving said carriage from its first position to its second position, moving said members into sensing contact with the pins of said carriage, thereafter restoring said carriage to its first position and canceling the set positions of said pins, and finally returning said members to transfer their settings to said totalizer.

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