April 7, 1959 O. WERNECKE 2,880,931

CONTROL MECHANISM FOR A DIFFERENTIAL ACTUATING DEVICE

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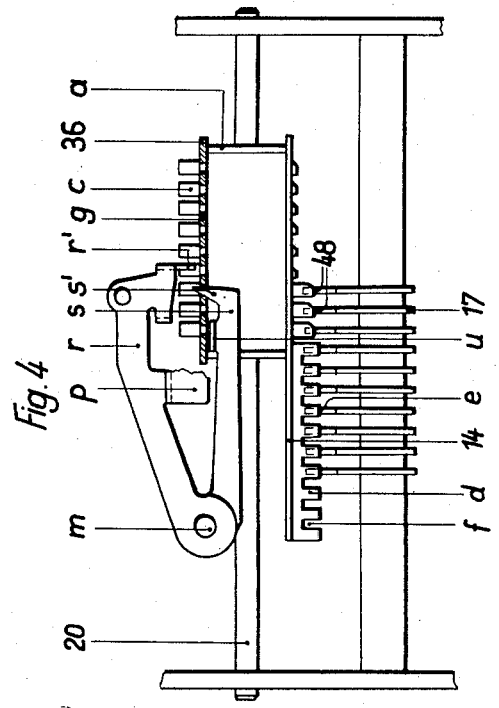

Fig. 4

Fig. 1

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Fig. 2

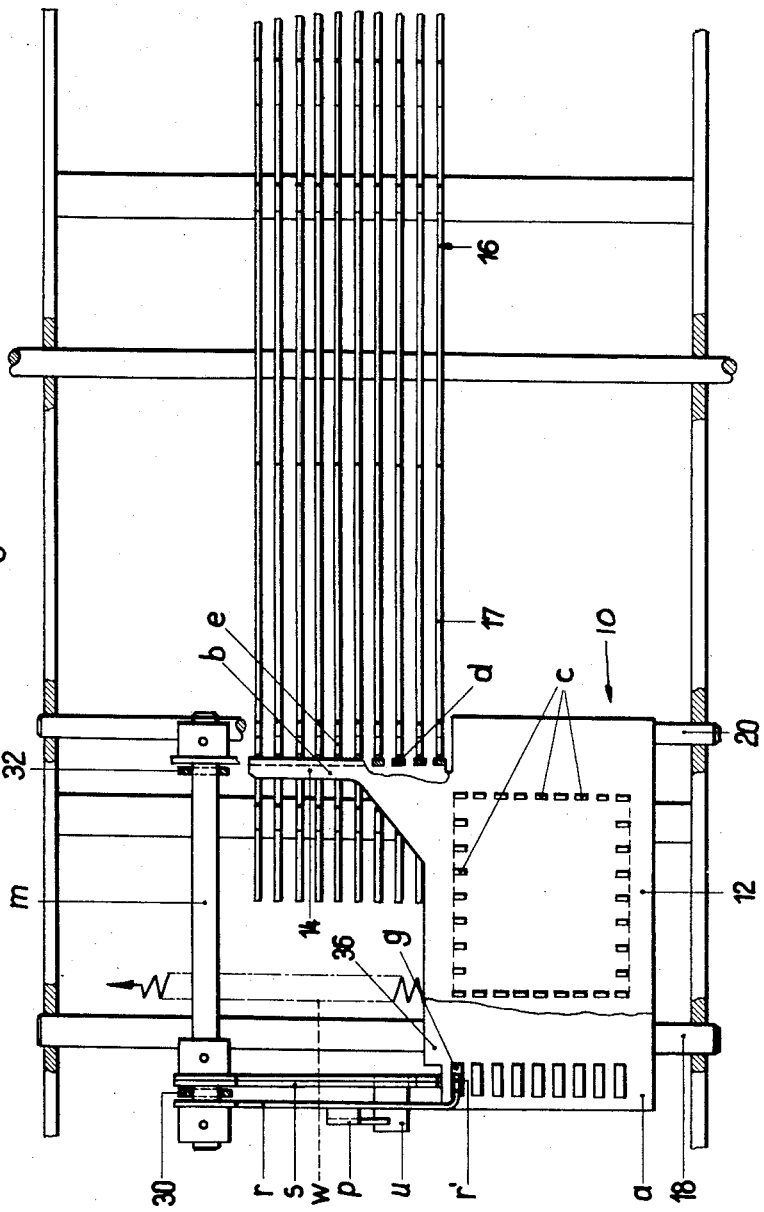

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Fig. 3

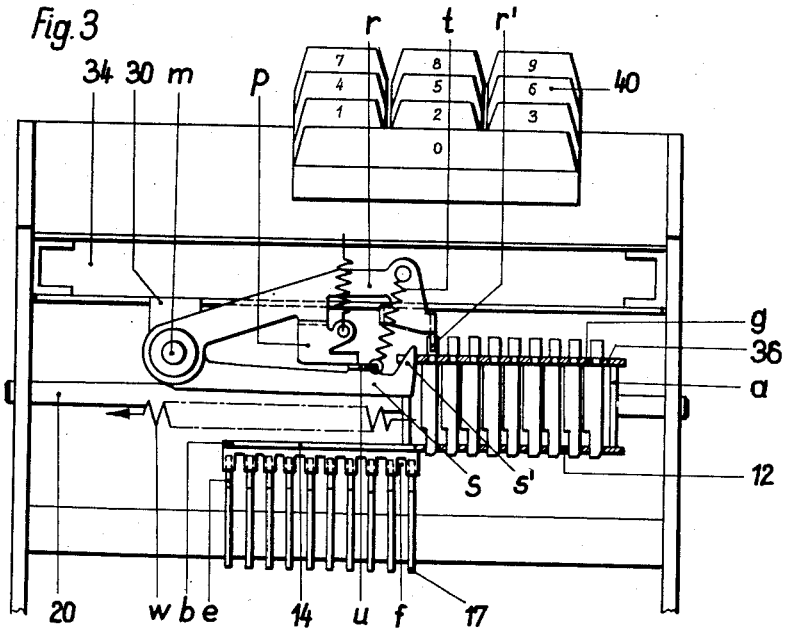
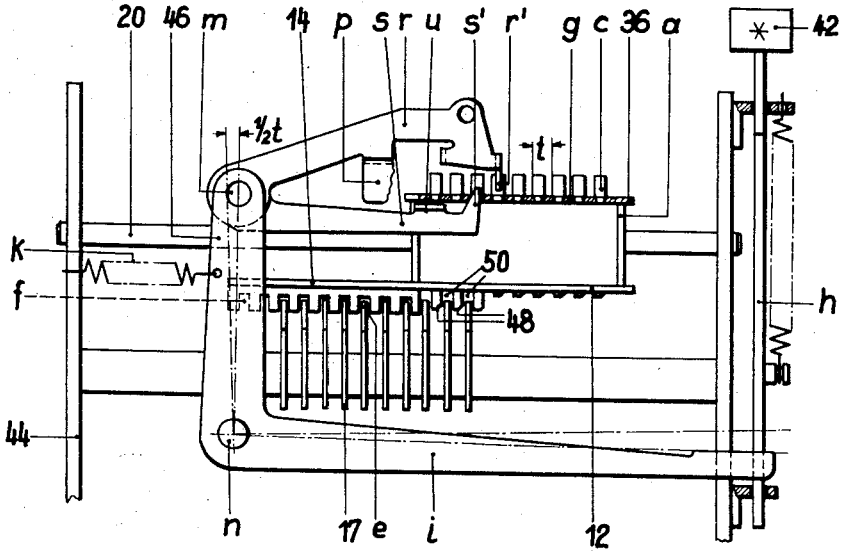


Fig. 5



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2,880,931

CONTROL MECHANISM FOR A DIFFERENTIAL ACTUATING DEVICE

Otto Wernecke, Braunschweig, Germany

Application November 30, 1954, Serial No. 472,140

4 Claims. (Cl. 235—60)

The present invention relates to a control mechanism for a differential actuating device such as used for the actuation of the type sector wheels in ten-key keyboard adding machines having a settable pin carriage.

This application is a continuation-in-part application of my prior patent application Serial No. 289,340, filed May 22, 1952, for an Adding Machine, now abandoned.

An adding machine of this kind has been disclosed in United States Patent 2,486,959, issued on November 1, 1949, to T. O. Mehan, for Calculating Machine.

It is an object of the present invention to provide a mechanism which allows a total-taking operation to be performed with the value set up by the keys of the calculating machine being retained.

Other objects and advantages of the present invention will become apparent from the following detailed description thereof, in in connection with the accompanying drawings showing, by way of example, an embodiment of the present invention. In the drawings

Fig. 1 is a side view, partly in section, of the principal parts of a mechanism according to the present invention;

Fig. 2 is a plan view of the lower portion of the mechanism shown in Fig. 1;

Fig. 3 is a front elevation of the mechanism shown in Fig. 1 in the normal position thereof;

Fig. 4 is a front elevation of the lower part of Fig. 3 in an off-normal position thereof; and

Fig. 5 is a front elevation similar to that shown in Fig. 4, with some additional parts, the elements of Fig. 4 being in another off-normal position.

Referring now to the drawings, a pin carriage *a* includes a substantially horizontal frame **10** having a square first portion **12** and a second portion **14**. A plurality of settable pins *c* which are the analogs of the settable stop pins **102** described in U.S. Patent No. 2,486,959, mentioned hereinabove, and shown in Figs. 5 and 11–13 thereof, are supported in the square first portion **12** of the frame **10** of the pin carriage *a* as clearly shown in Fig. 2 of the drawings. The second portion **14** is shaped, as shown in Fig. 2 of the drawings, as a straight member projecting at right angles from one side of the square first portion **12**. A comb *b* is rigidly connected with the second portion **14** of the frame **10** and is provided with ten teeth *d* separated from one another, respectively, by nine gaps *f*. The settable pins *c* form an array of nine columns and nine rows, as clearly shown in Fig. 2, the ten teeth *d* of the comb *b* being arranged in a row parallel to the rows of pins *c*.

A differential actuating device generally denoted by **16** has ten sensing or gripping members **17** provided at the upper edges thereof, respectively, with projections *e* arranged for cooperation with the teeth *d* of the comb *b*. The sensing members **17** are the analogs of the slidable racks 169 shown in Figs. 5 and 8 of U.S. Patent No. 2,486,959, mentioned hereinabove which, however, differ from the sensing members **17** in that the racks 169 are provided with horizontal flanges 177 whereas the projections *e* are coplanar with the associated sensing members **17**.

The sensing members **17** of the differential actuating device **16** are connected in a manner analogous to that disclosed in U.S. Patent No. 2,486,959, mentioned hereinabove, with type sector wheels (not shown), respectively.

The pin carriage *a* is movably supported by two stationary shafts **18** and **20** so as to be movable, under action of a helical spring *w*, from its normal position shown in Fig. 3, toward the left by an intermittent step by step movement. Fig. 4 of the drawings shows an off-normal position of the pin carriage *a* wherein the pin carriage *a* has moved by three steps toward the left.

A shaft *m* extending parallel to the sensing members **17** is supported by brackets **30** and **32** extending downwards from the lower edge of the frame **34**. An upper pawl *r* and a lower pawl *s* are rotatably supported by the shaft *m* and provided, respectively, with catches *r'* and *s'* adapted to engage, respectively, from above and below recesses *g* provided in the upper portion **36** of the pin carriage *a*, said upper portion forming a toothed rack. The catch *s'* of the lower pawl *s* holds the pin carriage *a* against the pull exerted by the spring *w* by engaging one of the recesses *g* of the toothed rack **36** from below. In order to move the pin carriage *a* one step to the left, the upper pawl *r* is imparted a rotation about the shaft *m* in clockwise direction as seen in Figs. 3 and 4, this rotation being caused by the actuation of a separate stepping key (not shown) or by the pressing of one of the number keys such as **40**. By the clockwise rotation of the upper pawl *r* the catch *r'* of the latter is brought to engagement with the recess *g* of the toothed rack **36** next to the one engaged by the catch *s'* of the lower pawl *s* and presses by means of a member *p* rigidly connected to the upper pawl *r* the member *u* rigidly connected to the lower pawl *s* downwards so that the catch *s'* is released from engagement with the one of the recesses *g*. Thus the pin carriage *a* is brought to engagement with the catch *r'* of the upper pawl *r* after having carried out only a fraction of a step. When the upper pawl *r* is released, the catch *s'* of the lower pawl *s* engages from below the upper portion **36** between two consecutive recesses *g* so that a spring *t* connecting the upper and lower pawls *r* and *s* is extended until the catch *r'* disengages the recess *g* of the pin carriage *a* thus setting the same free to move until the catch *s'* of the lower pawl *s* engages under the action of the spring *t* the next recess *g*.

Referring now to Fig. 5 of the drawings, it will be seen that the shaft *m* of the stepping pawls *r*, *s* is rockably connected to one arm **46** of an angular lever *i* rotatable about a stationary pivot *n* arranged in the angular point of the lever *i* substantially vertically below the shaft *m*. The end of the horizontal arm of the angular lever *i* engages the lower end of a rod *h* rigidly connected to a total key **42** by the actuation of which the angular lever *i* is rotated in a clockwise direction against the force exerted by a spring *k* connected to a stationary member **44** and to the vertical arm **46** of the angular lever *i*.

The operation of this device is as follows:

When the mechanism is in the normal position shown in Fig. 3, all projections *e* of the sensing members **17** are aligned, respectively, with the teeth *d* of the comb *b*. In consequence thereof, the teeth *d* prevent the sensing members **17** from being moved toward the left as seen in Figs. 1 and 2 and the type sector wheels (not shown) remain in the initial positions thereof.

When the mechanism is in a position such as that shown in Fig. 4 of the drawings in which the pin carriage *a* has been moved by a whole number, for instance, three

steps toward the left, part of projections *e* are in a position in which they are aligned, respectively, with the lowermost parts 48 of the pins *c* which are in their lower position. The remaining projections *e* are aligned, respectively, with the rightmost teeth *d* of the comb *b*, the leftmost teeth *d* thereof having moved to a position in which they are free of the projections *e* of the sensing members 17. In this position the item corresponding to the pins *c* that are in their lower position is added to the sum stored in the machine; however, the sensing members 17 aligning with the rightmost teeth of the comb *b* and actuating the type sector wheels (not shown) remain in the initial position thereof.

If, however, it is intended to carry out a total-taking operation the pin carriage *a* is moved by one half step to the right as shown in Fig. 5. In this position, the projections *e* of the sensing members 17 are aligned with the gaps *f* between the teeth *d* of the comb *b* and with the gaps 50 formed by the lowermost parts 48 of all pins *c* that are in their lower position. Thus the sensing members 17 of the differential actuating device 16 can move freely through the gaps *f* of the comb *b*. Thus it will be understood that according to the present invention the comb *b* is fastened on the settable pin carriage *a* for locking the sensing members 17 of the differential actuating device located to the left of the value set up by the keys. In other words, the teeth *d* lock the sensing members 17 of the differential actuating device located to the left of the values set up by the keys in all positions of the carriage *a* taken up during the calculating or accumulating operation. However, the gaps *f* of the comb *b* and the gaps 50 between the pins *c* in the total-taking operation are displaced by a half-step of the settable pin carriage *a* from the usual position thereof to such an extent that the projections *e* of the differential actuating device 16 are allowed a free passage at all denominational positions of the pin carriage *a*.

Thus, total taking is rendered possible without zeroizing a value set up by the keys, such as 40, by moving the settable pin carriage *a* a half step to the right. This is particularly useful in ten-key keyboard adding machines being devoid of means for reading the value or values stored in the accumulating mechanism, and more particularly, in carrying out calculations similar to the additive or subtractive division. In an additive division it is rendered possible to determine by the taking of a sub-total to what extent the dividend has been approximated, whereas in the case of a subtractive division it is possible to determine the extent to which the zero value has been approximated. In both cases, no zeroization of the divisor set up in the settable pin carriage *a* has to be carried out.

Furthermore, the invention may be used in calculating the terms of arithmetic or geometrical progressions or in continual progressions of numbers.

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

I claim:

1. In a calculating machine, in combination: a pin carriage, a spring urging said pin carriage to the left, said pin carriage having a substantially horizontal frame having a first portion and a second portion arranged in alignment with a first edge of said first portion; a plurality of settable pins supported by said first portion of said frame

of said pin carriage, said settable pins being arranged in rows and columns, the rows extending parallel to the first edge of said first portion, each of said pins having a zero position and a value position, the value position of all pins in the same row relating to the same digit and of all pins in the same column to the same denomination, said settable pins being set according to a desired amount; a comb rigidly connected with said second portion of said frame, said comb having a plurality of teeth aligned with said columns of pins and separated by gaps; a differential actuating device having sensing members aligned with said teeth of said comb and dimensioned to enter said gaps; and means for movably supporting said pin carriage against the force exerted by said spring so that said settable pins and said teeth of said comb are movable to the left by an intermittent step by step movement from an initial position, the step length equalling the combined width of one tooth-and-gap combination; a differential actuating device having a plurality of sensing members equal to the number of said teeth, said sensing members being adapted for displacement from a zero position in a direction parallel to the pin columns, each of said sensing members being aligned with and held from displacement by one of said teeth of said comb when said pin carriage is in its initial position, said supporting means moving said pin carriage by a whole number of steps so that said sensing members of said differential actuating device at the left side of said settable pins set according to the amount given into the calculating machine are locked in said initial position by said comb whenever any accumulating operation is carried out, said supporting means after having moved said pin carriage by a whole number of steps moving the same a half step in any total taking operation position so that said sensing members coincide with said gaps between said teeth of said comb and between any of said rows of said pins when a total-taking operation is performed, said rows being separated from one another by free passages allowing a free passage of said sensing members of said differential actuating device in the half-step positions of said pin carriage so as to allow a total-taking operation to be performed with said pins remaining in their numerical value or zero positions as set up by the keys of the calculating machine.

2. In a machine as claimed in claim 1, in which said supporting means comprises two rockably supported pawls, said pin carriage being provided with a series of aligned recesses spaced by a distance equal to one step, said pawls being adapted to alternatively and from opposing sides engage one of said recesses to lock said carriage in position, said pawls being spaced to lock said carriage in positions spaced one half-step apart, an angular lever having an arm, said angular lever being rockably mounted at its angular point spaced from the rocking axis of said pawls, said arm of said angular lever being connected to one of said pawls for a common rocking motion.

3. In a machine as claimed in claim 2, a total key, and a rod connected to said total key, said rod engaging the other arm of said angular lever.

4. In a machine as claimed in claim 3, a stationary member, and resilient means connecting said stationary member with said arm of said angular lever.

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