

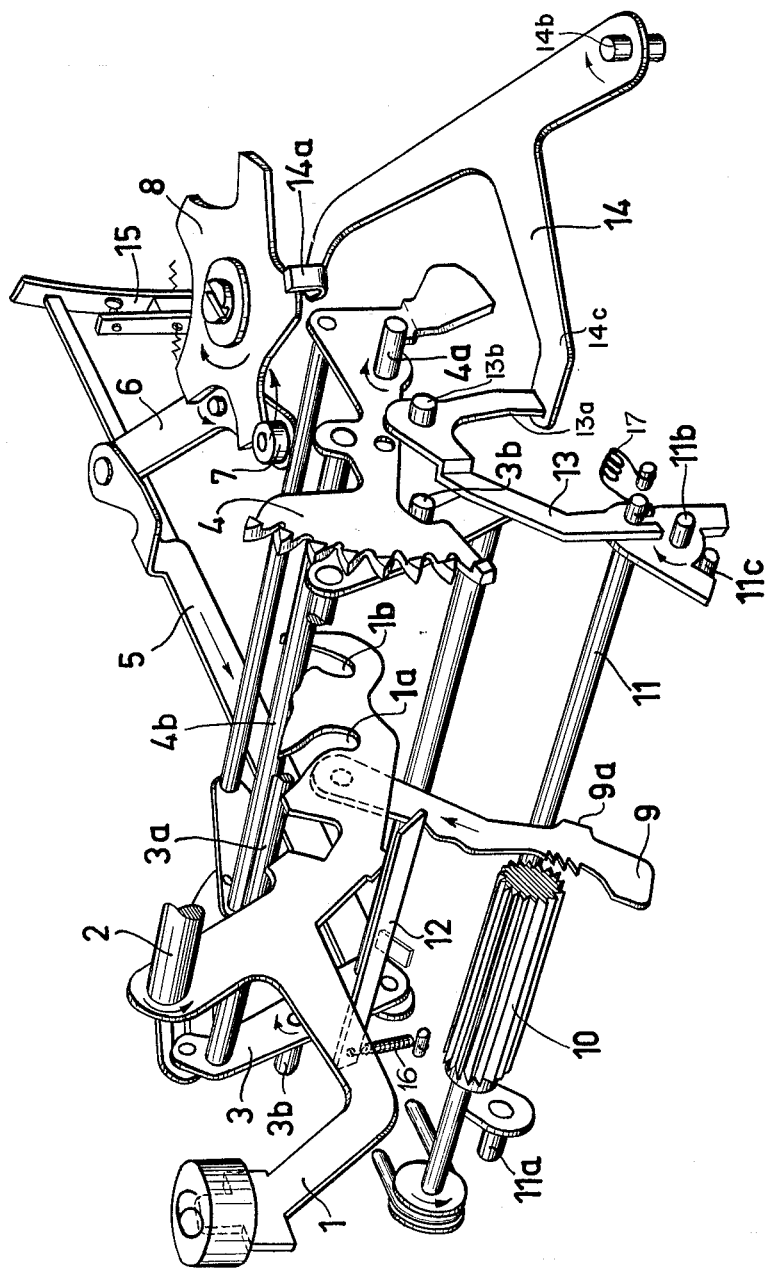
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KEYBOARDS FOR POWER-OPERATED CALCULATING MACHINES

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KEYBOARDS FOR POWER-OPERATED CALCULATING MACHINES

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This invention relates to power-operated calculating machines of the pin-wheel type, and is particularly concerned with calculating machines of the said type which are equipped for performing certain functions automatically.

In the operation of calculating machines of the type referred to it occurs frequently that numerals are to be set up at the same time in a setting-up register and in one or more storing registers. If several such setting-up operations are to be carried out simultaneously, they tend to become onerous as the keys require rather heavy operating pressures. In a power-operated machine of this kind it is desired, however, that the key touch shall be at least as easy and comfortable as in a simple manually-operated calculating machine.

Earlier attempts to overcome this inconvenience have involved, for example, the provision in the keyboard mechanism of one or several electro-magnets for assisting in carrying out the setting-up operations. For that purpose, the electromagnets must be fed with direct current to give smooth operation so that their energization will not be disturbed by the sinusoidal wave of an alternating current. The calculating machines must accordingly be equipped with rectifiers, and as a consequence become costlier in manufacture and heavier and require more space.

The chief object of the present invention is to provide in a power-operated pin-wheel calculating machine adapted to perform one or more functions automatically and having one or more storing registers, mechanism which renders the drive motor itself effective to assist in the setting-up operations, thereby eliminating the need for additional drive means such as electro-magnets or the like.

Another object of the invention is to provide in such a calculating machine, mechanism adapted to control positively the functions performed during setting-up so that those functions will follow each other consecutively in a predetermined sequence: depressing the key—power-assisted setting-up of numerals—disconnecting the drive—stepwise displacement of the pin-wheel rotor—key return travel, thus obviating the risk of operation failure caused by the lack of proper control of the sequential order of operations.

In the improved mechanism according to this invention each numeral key is connected upon depression to a power-operated drive member which completes the initial depression of the key and performs by its operation the setting up of the selected numeral in a pin-wheel rotor or the like and, possibly, also in one or more storing registers, whereafter the key lever depressed by the drive member is adapted to initiate in its bottom position the stepwise rotor displacement after the selected numeral has been set up, the mechanism for stepwise displacement of the rotor being adapted to actuate upon rotor displacement a control member which will assume a non-active aft position on the displacement of the rotor to permit the actuated key lever to return to its normal position aided by spring means or the like.

A preferred embodiment of the invention will now be described, reference being had to the annexed drawing

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which is a perspective view of the setting-up elements in a calculating machine with a key lever shown in the initial position. For further particulars about a calculating machine adapted to embody the present invention reference is made to U.S. patent application Serial No. 725,825, filed on April 2, 1958, now Patent No. 2,981,468 issued April 25, 1961, and assigned to the assignee of the instant application.

In the drawing only one of a set of keys supported by key levers 1 is illustrated. The key lever 1 is pivoted on a transverse rod 2 secured to the machine frame (not illustrated), there being two open-ended cam slots 1a and 1b in the key lever 1. The first cam slot 1a is adapted in a manner known per se to engage a bail structure 3, 3a, and the second cam slot 1b is adapted to engage structure comprising a tooth segment 4. The bail member 3 is connected through a link member 5 to a pivoted arm 6 carrying a roller 7 mounted for rotation thereon. The roller 7 is adapted to engage an escapement wheel 8 which controls the stepwise displacement of the rotor (not shown) in a manner known per se and described in Patent No. 2,981,468. The link member 5 (or rather an extension thereof, as illustrated) also controls upon movement a switch 15 for the drive motor of the machine (not shown). The switch arrangement is such that the drive motor current is cut off only when the bail structure 3, 3a is in its normal, non-actuated position shown in the drawing.

Upon depression of the key, the cam slot 1a of the key lever 1 will engage with the rod-shaped bail cross member 3a. The bail structure will accordingly turn upon its pivots 3b, as indicated with an arrow at the left pivot 3b. Consequently, the link member 5 will move lengthwise as indicated by another arrow, and will shift the arm 6 with its roller 7 which is moved into the gap between two consecutive arms of the escapement wheel 8. When the movement of the chain of elements now described approaches its end, a non-illustrated latch mechanism (such as the latch 25 of FIG. 1 of Patent No. 2,981,468) is released, and the escapement wheel 8 will be free to turn by the action of a spring (such as spring 19 of FIG. 1 of the above-identified patent) through an angle corresponding to a fifth of a revolution, that is 72°, in the sense indicated by an arrow on the wheel 8, before being arrested next time. During the rotation of the wheel 8 the roller 7 has followed the circumferential edge of the wheel, and has been moved by the latter to a peripheral position, and by that movement the arm 6 and the link member 5 will bring the bail structure 3, 3a and consequently the key lever 1 back to the initial position.

At the same time as the operations described above are being performed, the second cam slot 1b in the key lever 1 will engage another bail structure of which the tooth segment 4 forms a part and which is pivoted on pivots 4a (only the righthand pivot shown) in the machine frame. When the key is depressed, a cross member 4b of the bail structure is engaged by the cam slot 1b, and the tooth segment turns as indicated by an arrow close to pivot 4a. When the key lever 1 has reached its bottom position the tooth segment and elements connected thereto have turned through an angle the size of which corresponds to the numeral value represented by the key depressed. The tooth segment 4 will engage upon its movement setting-up and storing registers which are not illustrated, but are in themselves of a well-known kind, and in those registers a numeral corresponding to the key depressed is now set up.

When a key is depressed, still another operation is initiated beyond those just described. For that purpose, to each key lever is pivoted a coupling member 9 which is provided with teeth at its lower portion, said teeth fac-

ing a snatch roll 10 which is mounted for rotation in non-illustrated bearings at either side of the key mechanism and rigidly connected to a drive wheel which is power-driven from the motor by means of a drive belt.

The distance between the teeth of the coupling member 9 and the snatch roll 10 is controlled by a control member 11 pivoted on two pivots 11a, 11b journaled in the machine frame. The angular movement of the control member 11 is limited by a stationary lug 11c which engages abutment members connected to the control member 11.

Above the snatch roll 10 a spring-loaded rod member 12 is provided which rests in its non-actuated position against an abutment member (not illustrated) so as to leave some clearance between itself and the coupling member 9. The latter is shaped in such a manner that, after a certain amount of displacement in the sense of the arrow, it will be acted upon by the whole spring force on the rod member 12, and will consequently be pressed against the control member 11. The control member 11 in its turn is connected by means of lever 13, pivoted at 13b to arm 14c of lever 14 which lever is pivotally mounted at 14b. A bent-over lug 14a of lever 14 engages the circumference of escapement wheel 8 in such a manner that the control member 11 is immobilized in a non-actuated fore position in the initial position of wheel 8. When the latter begins to turn, as indicated by an arrow, during step displacement of the rotor, lever 14 will become free to move so that control member 11 may be moved to an aft position by the action of the spring means 16 loading the rod member 12.

A light spring 17 is provided which urges the control member 11 in the direction opposite to that shown by the arrow associated with control rod 11. This light spring serves to hold the end 14a of lever 14 away from the wheel 8 in order to prevent noise which might otherwise occur.

The drawing illustrates the elements in their initial, non-actuated position.

When the key belonging to key lever 1 is depressed, the coupling member 9 begins to move as indicated by the arrow, and by being shaped with a projecting cam surface 9a at its rear edge engaging the control member 11 the coupling member will be moved towards the snatch roll 10 into engagement of its teeth with the teeth of the roll. By this the snatch roll, which is already operating, takes over from the key the remainder of the setting-up operation.

When the setting-up of numerals has been finished the engagement between the coupling member 9 and snatch roll 10 ceases by reason of the shape of the edge 9a of the coupling member engaging the control member 11, and the coupling member 9 is moved away from snatch roll 10 by the spring loaded rod member 12. At the same time, the escapement wheel 8 begins to turn so that the lug member 14a of lever 14 is released and the control member 11 is moved to its aft position by rod member 12 where it remains during the time necessary for the

coupling member 9 to resume its initial position without engaging the snatch roll 10.

Immediately after the key lever 1 has returned to its initial position the stepwise displacement wheel 8 has returned the control member 11 to its fore position by means of levers 13 and 14, and the mechanism is now conditioned for setting up next numeral.

What I claim is:

1. In a motor driven calculating machine of the pin-wheel type having ten numeral key levers and an escapement mechanism controlling the axial stepwise movement of a setting up rotor, the pinwheels of which are adapted to be set by the numeral key levers, in combination, a rotatably mounted toothed snatch roll driven by the machine drive motor, a coupling member pivotally mounted on each numeral key, each coupling member having teeth thereon adjacent said snatch roll, a control member positioned adjacent said coupling members on the side opposite said snatch roll, a first cam surface on the side of each coupling member opposite said control member, a second cam surface on each coupling member on the side facing said control member, a spring pressed member adapted to engage the first cam surface of the coupling member associated with a selected key lever as said lever is initially manually operated through a small portion of its total stroke, said member pressing said second cam surface against said control member and causing the toothed portion of said coupling member to engage said snatch roll to drive the associated key lever through the remainder of a full stroke, means operated by each key lever to set a rotor pinwheel to the corresponding numerical value, common means operated by any operated key lever to initiate operation of the escapement mechanism, means operated by the escapement mechanism for normally preventing movement of said control member away from said snatch roll, said means being operated during operation of the escapement mechanism and stepwise movement of the setting up rotor to permit said control member to move away from said snatch roll under urge of said spring pressed member thereby permitting an operated key lever to return to normal position, the associated coupling member being out of contact with said snatch roll during said return movement.

2. A motor driven calculating machine as claimed in claim 1 wherein the machine drive motor is provided with an operating switch controlled by said common means whereby initial manual movement of a key lever closes said switch and sets said toothed snatch roll into rotation.

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