

N. CAPELLARO

MULTIFUNCTION CONTROL KEY

FIG. 1.

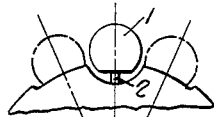


FIG. 2.

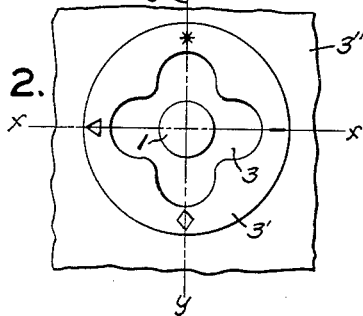


FIG. 3.

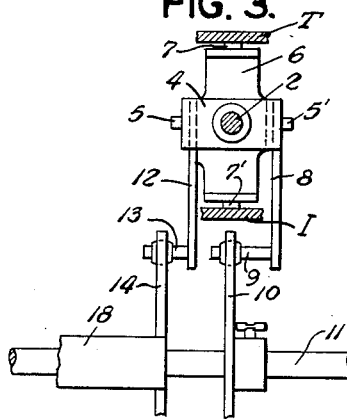


FIG. 4.

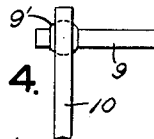


FIG. 5.

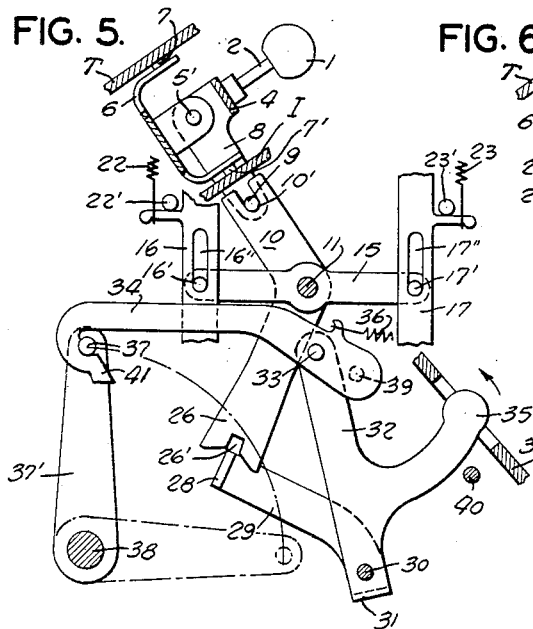
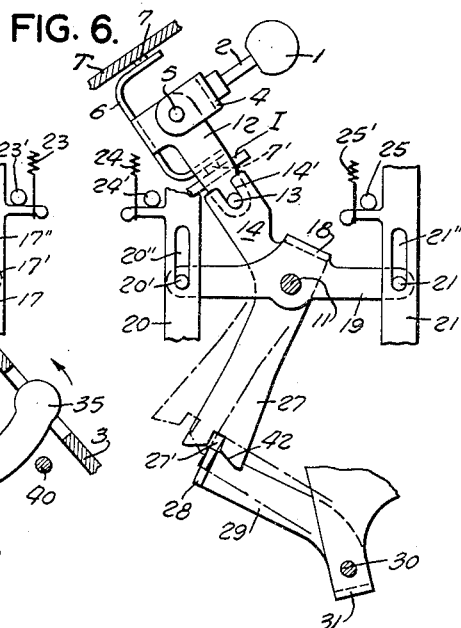


FIG. 6.



BY

Henry K. Geist

ATTORNEY

UNITED STATES PATENT OFFICE

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MULTIFUNCTION CONTROL KEY

Natale Capellaro, Milan, Italy, assignor to
Ing. C. Olivetti & C. S. p. A.

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The present invention relates to hand driven computing machines of the type having an oscillatory handle which is pulled by hand for operating the machine.

It is known that for each operation of these machines such as an addition, a subtraction, a total taking etc. said handle is caused to perform one or more oscillations, each comprising a forward and a return stroke.

This handle is normally located at the right side of the machine, at a certain distance from the key-board, which comprises, besides the selective setting keys, a subtract key, a total key etc.

If it is desired, for example, to take a total, the total key is depressed first and then the handle is pulled. The total key, as well as the subtract key, the nonadd key, etc., are located on the key-board in such a position to be easily and comfortably depressed by the hand which pulls the handle. Nevertheless, the operator is often compelled to leave the handle to reach said keys, which results in a considerable loss of time. To overcome this disadvantage double function combination keys have been constructed, movable or depressible into two different positions; these keys are located near the handle to be moved or depressed by the thumb as the hand is pulling the handle. These combination keys have the disadvantage that they must be kept in their depressed position for a certain time corresponding to at least a part of the stroke to be performed by the handle; therefore, the thumb must not leave the key whilst the hand is pulling the handle. It is evident that such a handling is rather uncomfortable, whereby the advantage of having set the key near the handle and of having doubled its functions is partly lost.

An object of the present invention is to provide a device which enables the control of more than two machine functions by means of one combination key only.

Another object is to provide a combination key connected by means of a Cardan joint to various machine function actuating means, and which is movable to and fro along two axes of movement, whereby, when said key is positioned along one of said axes, two machine function actuating means are selectively operable and when said key is positioned along the other axes two further machine function actuating means are selectively operable.

Another object is to provide means for locking the key according to the invention in each of its

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active positions as well as in its inactive position. Therefore, the thumb of the hand pulling the handle being not compelled to be kept on the key, the hand is free to immediately concentrate its power on the handle only, which results in a more comfortable and speedy handling. Releasing means associated with the handle provide the releasing of said locking means at the end of the return stroke of said handle, whereby the key is permitted to automatically return to its initial position.

Another object is to provide a release key to release the means locking the combination key by hand without pulling the handle.

With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, an embodiment of the same being described in the specification and being illustrated in the accompanying drawings forming part of the specification, wherein:

Fig. 1 is a fragmentary elevation of the combination key,

Fig. 2 is a fragmentary plan view of the casing of the machine, showing the combination key at its centre,

Fig. 3 is a plan view of the mechanism controlled by the combination key,

Fig. 4 is an enlarged detail view of parts shown in Fig. 3,

Fig. 5 is an elevation of the means associated to the combination key and controlling two distinct functions of the machine,

Fig. 6 is a view similar to Fig. 5 and showing the means controlling two further functions of the machine.

As said hereinbefore, the invention relates to hand driven computing machines of the type having an oscillatory handle. It is not necessary either to outline the means through which the motion of the handle is transmitted to the operating mechanisms of the machine or to describe these operating mechanisms themselves. There are many types of computing machines having an oscillatory handle, such as listing adding machines, non-listing adding machines etc., and the combination key according to the invention is applicable to any type of these machines.

The following description is limited, therefore, to the only parts directly interesting the operation of the combination key.

From the outside of the machine is visible a spherical key 1 secured to a stem 2 and laying at the centre of a cross-shaped window 3 in plate

3' fastened to the casing 3'' (Fig. 2). Through its stem 2 the key 1 is connected to a bail 4 (Figs. 3, 5 and 6) pivoted at 5 and 5' upon a second bail 6. The bail 6 is pivoted at 7 and 7' upon the frame T of the machine.

The axes 5—5' and 7—7' are perpendicular to each other and they meet at a point lying in the prolongation of the axis of the stem 2. The combination of the bails 4 and 6 acts as a Cardan joint, so that the key 1 can be displaced from its central position to any direction. However, the cross-shaped window 3 (Fig. 2) allows four different displacements only, which are given by the two directions of the axes $x-x$ and $y-y$, which are perpendicular to each other.

From bail 4 projects an arm 8 (Figs. 3 and 5) having a pin 9 which cooperates with a slot 10' provided in a lever 10, this lever is secured to a shaft 11 journaled in the frame of the machine.

From bail 6 projects in a similar way an arm 12 (Figs. 3 and 6) having a pin 13 which cooperates with a slot 14' provided in the lever 14; this lever is loosely mounted upon the shaft 11.

By moving the key 1 along the axis $y-y$ the bail 4 is swung round pins 5—5' whilst the bail 6 stands still. The pin 9 cooperating with the slot 10' rocks lever 10 clockwise or counterclockwise (Fig. 5) in dependence of the direction of movement of key 1 along the axis $y-y$.

By moving the key 1 along the axis $x-x$, no relative movement takes place between bails 4 and 6 and the whole swings round the pins 7—7'. Through the pin-and-slot-connection 13—14' the arm 12 rocks the lever 14 clockwise or counterclockwise (Fig. 6) in dependence of the direction of movement of key 1 along the axis $x-x$.

It will be seen that in swinging the bail 6 round the pins 7—7' lever 10 is not affected and stands still, as the portion of the pin 9 which cooperates with the slot 10' of the lever 10 lays in the prolongation of the axis 7—7'. However, for securing a reciprocating constant contact between pin 9 and slot 10', said portion is ball-shaped at 9' as shown in Fig. 4, the centre of the ball laying in the axis 7—7'.

The portion of the pin 13 which cooperates with the slot 14' is likewise shaped as a ball.

Through the shaft 11 the lever 10 is rigidly connected to a double-armed lever 15; this lever has on its arms two pins 16' and 17' which cooperate with slots 16'' and 17'' provided in bars 16 and 17 respectively.

The lever 14 is likewise rigidly connected, through a bar 18, to a double-armed lever 19; this lever has mounted on its arms two pins 20' and 21' which cooperate with slots 20'' and 21'' provided in bars 20 and 21 respectively.

Each bar 16—17—20 and 21 is urged upwards by a spring 22—23—24 and 25 respectively, which holds the corresponding bar in contact with studs 22'—23'—24 and 25' respectively.

Through known means, which need not to be outlined, each bar 16—17—20 and 21, when depressed, causes the machine to perform a certain operation.

However, with the only purpose to make clear the example here described, it is assumed that bar 16 when depressed causes the machine to take a sub-total; that bar 17 when depressed causes the machine to take a total; that bar 20 when depressed causes the machine to make a nonadd stroke and that bar 21 when depressed causes the machine to make a subtracting stroke.

The four positions into which key 1 has to

be moved for correspondingly depressing the four bars 16—17—20 and 21, in the manner outlined hereinafter, are marked on the plate 3' by four conventional signs; such as: $\diamond$, $\times$, $\triangleleft$, $-$.

5 By moving the key 1 into its $\diamond$ marked position bail 4 swings clockwise upon axis 5—5' and rocks the lever 10 counterclockwise (Fig. 5); this results in a downward displacement of the bar 16, whereby a sub-total will be taken. As bail 6 stands still, the depending levers 14, 19; 10 20 and 21 are not moved. Furthermore, the bar 17 remains in its upper position owing to its slot 17''.

15 By moving the key 1 into its $\times$ marked position bail 4 rocks counterclockwise upon axis 5—5' and swings the lever 10 clockwise (Fig. 5); this results in a downward displacement of the bar 16, whereby a total will be taken. As bail 6 stands still, the depending levers 14, 19, 20 20 and 21 are not moved. Furthermore, the bar 16 remains in its upper position owing to its slot 16''.

25 By moving the key 1 into its $\triangleleft$ marked position the combination of bails 4 and 6 rocks upon the axis 7—7' and swings the lever 14 counterclockwise (Fig. 6); this results in a downward displacement of the bar 20, whereby a non-add stroke will be performed. As the centre of the ball-shaped portion 9' of the pin 9 lays on the prolongation of the axis 7—7', lever 10 30 stands still and the depending levers 15, 16 and 17 are not moved. Furthermore, the bar 21 remains in its upper position owing to its slot 21''.

35 By moving the key 1 into its $-$ marked position the combination of bails 4 and 6 rocks upon the axis 7—7' and swings the lever 14 clockwise (Fig. 6); this results in a downward displacement of the bar 21 whereby a subtracting stroke will be performed. As the centre of the ball-shaped portion 9' of the pin 9 lays on the prolongation of the axis 7—7', the lever 10 40 stands still and the depending levers 15, 16 and 17 are not moved. Furthermore, the bar 20 remains in its upper position owing to its slot 20''.

45 Having in mind the above description it is clear that by setting the key 1 any one of the four bars 16—17—20 and 21 can be depressed, leaving the three other bars in their upper position. It can be assumed, therefore, that each 50 bar substitutes the stem of the key which in a conventional machine would have controlled the corresponding function, but instead of the four keys or equivalent setting means used in the last named machine, the mechanism according to the invention enables the control of the 55 four functions by means of one combination key only.

It is not necessary either to specify the functions controlled by each bar or to outline the 60 mechanism by means of which a given function is controlled. The function controlled by the key 1 may be fixed at will, as well as, once having chosen said functions, the correspondence between the four active positions of the key 1 65 and each function may be varied at will by simply and conveniently varying the connections of the bars 16—17—20 and 21 with the means actuating the functions.

In the following the mechanism for locking 70 the key 1 in its various positions will be described. As is illustrated in the drawing (Figs. 5 and 6), lever 10 has a projecting arm 26 having a slot 26'; lever 14 likewise has a projecting arm 27 having a slot 27'. These slots 26' and 27' can 75 cooperate with a bent-over lug 28 of one single

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bail 29 rockable about a shaft 30 secured to the frame of the machine. Through a bar 31 the bail 29 is rigidly connected with a lever 32 in which a hook-shaped lever 34 is pivoted at 33. Moreover, lever 32 is provided with a key 35 projecting out of the casing 3 of the machine.

The lever 34 is urged in a direction (Fig. 5) by a spring 36 tensioned between the lever and the frame of the machine. The hook-shaped end of the lever 34 cooperates with a stud 37 secured to an arm 37' rigidly connected to a shaft 38; this shaft may be the main operating shaft of the machine and it rocks about 90° at each machine stroke.

Furthermore on the lever 34 is secured a stud 39 adapted to cooperate with the right edge of lever 32. A further stud 40 secured to the frame of the machine limits the clockwise rockings of lever 32 about its shaft 30.

Assuming that the key 1 is in its central position, upon rocking the handle the shaft 38 rocks clockwise and the pin 37 releases the hook-shaped lever 34. This lever, being urged by the spring 36, swings clockwise until the stud 39 fixed thereon contacts the right edge of the lever 32 (Fig. 5). Then the lever 32 itself rocks clockwise around the shaft 30 until arrested by the stop 40 contacting the lower edge of the key 35. At the same time the bent-over lug 28 enters the slots 26' and 27' of the levers 26 and 27 respectively, so that the levers 10 and 14 are prevented to move and the key 1 is locked in its central position.

Near the end of the return stroke of the shaft 38 the stud 37 contacts the inclined edge 41 of the hook-shaped lever 34, which is, therefore, moved to the left (Fig. 5); at the same time the stud 37 slides upwards on the edge 41 until the lever 34 is locked again in its normal position (shown in Fig. 5).

At the same time the lever 32 is rocked counterclockwise and the slots 26' and 27' are disengaged from the lug 28 so that at the completion of the return stroke of the shaft 38 the key 1 is released again.

Upon depression of the key 1 into one of its active positions, as for example into its marked — right position (Fig. 2), the lever 14 is swung clockwise (Fig. 6) and the lever 10 stands still, as has been described hereinbefore. The edge 42 of the lever 27, which rocks clockwise with the lever 14, contacts the inner edge of the lug 28 and, in sliding on it, rocks the bail 29 counterclockwise. By the further clockwise rocking of the lever 27 the edge 42 comes out of engagement with the lug 28 and the bail 29 rocks clockwise, so that the lever 27 is locked in its rocked position by the lug 28 contacting with its outer edge the right edge of the lever 27 (Fig. 6: bail 29 fully marked out and lever 27 dotted).

At the following oscillation of the shaft 38 the stud 37 disengages the lever 34 and the bail 29 rocks clockwise so that its lug 28 enters the slot 26' of the lever 26, whilst the right edge of the lever 27 is further engaged by the outer edge of the lug 28 (in Fig. 6: bail 29 and lever 27 dotted).

Near the end of the return stroke of the shaft 38 the stud 37 contacts the inclined edge 41 of the lever 34 in the manner described before, so that the lever 32 and the bail 29 are swung counterclockwise. The amplitude of this counterclockwise oscillation is such one that the lug 28 exits from the slot 26' while its outer edge disengages the right edge of the lever 27. Urged

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by the spring 25, through the bar 21, the lever 27 is free to return to its normal position, full-lined in Fig. 6.

Upon depression of the key 1 into one of its other three active positions the devices described hereinbefore act in a similar manner.

If it is desired to restore the key 1 without rocking the handle, as for example upon depression of the key into an incorrect position, the key 35 has to be pushed in the direction of the arrow. This effects the counter-clockwise rocking of the bail 29, so that the levers 26 and 27 are released from the lug 28 and the key 1 is free to return to its central position.

While I have described what I consider to be highly desirable embodiments of my invention, it is obvious that many changes in form could be made without departing from the spirit of my invention, and I, therefore, do not limit myself to the exact form herein shown and described, nor to anything less than the whole of my invention, as hereinafter claimed.

What I claim is:

1. In a hand driven computing machine, the combination of: a machine frame, a bail rockably mounted upon said frame, a second bail rockably mounted upon the first named bail along an axis forming an angle of 90° with the rocking axis of the first bail, a setting key secured to said second named bail, a plate, a cross-shaped window in said plate, having its two axes parallel with said two rocking axes, said setting key sliding in said window, normally resting at its centre and being settable into the directions of the four arms of said cross, a double projecting lever, connecting means for connecting said first named bail with said lever, a machine function actuating means associated to each projection of and selectively operable by said lever, a further double projecting lever, connecting means for connecting said second named bail with the last named lever, and a further machine function actuating means associated to each projection of and selectively operable by the last named lever, each double projecting lever being movable by the corresponding bail, whereby, in response to the selective setting of said setting key into the four arms of said cross four machine function actuating means are selectively operable.

2. In a hand driven computing machine according to claim 1, the combination of: locking means for locking said key in each of its active positions, a main operating shaft, means associated with said shaft for releasing said locking means near the end of the return stroke of said shaft, the means associated with said shaft furthermore enabling said locking means to lock the key in its inactive position during the stroke of said shaft, and hand operable means connected to said locking means for releasing them without rocking the shaft.

3. In a hand driven computing machine, the combination of: a machine frame, a Cardan-type joint including two relatively rockable joint-members, one of said joint members being rockably mounted on said machine frame, a setting element, said setting element being attached to said other joint-member, first and second machine function control means associated with said first named joint-member and selectively operable thereby upon rocking of the latter about its rocking axis relative to said machine frame by said setting element, and third and fourth machine function control means associated with said

second named joint-member and selectively operable thereby upon rocking of the latter about its rocking axis relative to said first named joint-member by said setting element.

4. In combination with a hand driven computing machine as claimed in claim 3, locking means associated with said setting element and capable of locking the latter in each of its positions corresponding to the setting of each of said four selectively operable machine function control means, a main operating shaft capable of performing a forward and return stroke during each machine cycle, and means associated with said main operating shaft for releasing said locking means substantially near the end of the return stroke of said shaft.

5. In combination with a hand driven computing machine as claimed in claim 3, locking means associated with said setting element and capable of locking the latter in each of its positions corresponding to the setting of each of said four selectively operable machine function control means, a main operating shaft capable of performing a forward and return stroke during each machine cycle, means associated with said main operating shaft for releasing said locking means substantially near the end of the return stroke of said shaft, and manual releasing means connected to said locking means for effecting a release of the latter without rocking said shaft.

6. In a hand driven computing machine, the combination of: a machine frame, a Cardan-type joint including a first joint-member and a second joint-member rockable relative to each other about a first rocking axis, the first joint-member being rockably mounted on said machine frame for rocking movements about a second rocking axis substantially perpendicular to said first rocking axis, a setting element attached to said second joint-member, said setting element being normally in a neutral inactive position and being settable in four active positions, first and second machine function control means associated with said first joint-member and selectively operable thereby upon rocking of the latter about its rocking axis relative to said machine frame by a movement of said setting element into an active position selected from its first and second active positions, and third and fourth machine function control means associated with said second joint-member and selectively operable thereby upon rocking of the latter about its rocking axis relative to said first joint-member by a movement of said setting element into an active position selected from its third and fourth active position.

7. In combination with a hand driven computing machine as claimed in claim 6, a plate in said frame, said plate having a cross-shaped guiding window, said setting element passing through said window and extending through the center of the latter when it is in its inactive position.

8. In combination with a hand driven computing machine as claimed in claim 6, locking

means associated with said setting element and capable of locking the latter in each of its four active positions, a main operating shaft capable of performing a forward and return stroke during each machine cycle, and means associated with said main operating shaft for releasing said locking means substantially near the end of the return stroke of said shaft.

9. In combination with a hand driven computing machine as claimed in claim 6, locking means associated with said setting element and capable of locking the latter in each of its four active positions, a main operating shaft capable of performing a forward and return stroke during each machine cycle, means associated with said main operating shaft for releasing said locking means substantially near the end of the return stroke of said shaft, and manual releasing means connected to said locking means for effecting a release of the latter without rocking said shaft.

10. In combination with a hand driven computing machine as claimed in claim 6, locking means associated with said setting element and capable of locking the latter in each of its four active positions and in its inactive position, a main operating shaft capable of performing a forward and return stroke during each machine cycle, and means associated with said main operating shaft for releasing said locking means substantially near the end of the return stroke of said shaft, said last mentioned means associated with the main shaft being also arranged for enabling said locking means to lock said setting means in its inactive position during the strokes of said shaft.

11. In combination with a hand driven computing machine as claimed in claim 6, locking means associated with said setting element and capable of locking the latter in each of its four active positions and in its inactive position, a main operating shaft capable of performing a forward and return stroke during each machine cycle, means associated with said main operating shaft for releasing said locking means substantially near the end of the return stroke of said shaft, said last mentioned means associated with the main shaft being also arranged for enabling said locking means to lock said setting means in its inactive position during the strokes of said shaft, and manual releasing means connected to said locking means for effecting a release of the latter without rocking said shaft.

NATALE CAPELLARO.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,132,711	Fassett	Mar. 23, 1915
1,224,873	Walter	May 1, 1917
1,371,138	Bair	Mar. 8, 1921