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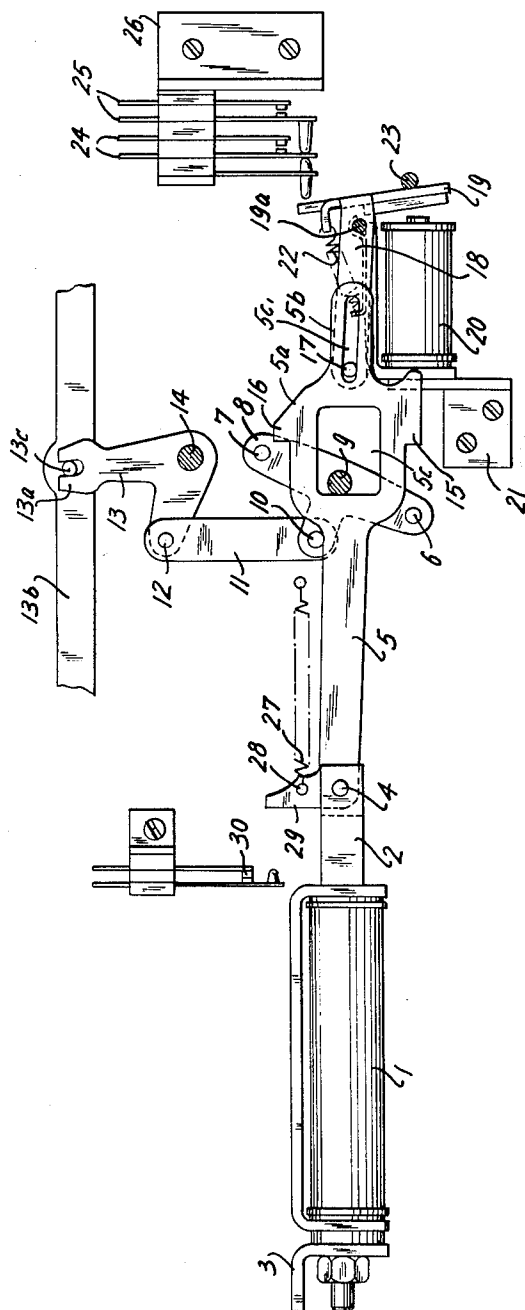
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F. FISCHER
COLOR CHANGING ARRANGEMENT FOR A COMBINED
CALCULATOR AND TYPEWRITER

3,139,964

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FIG. 1



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FIG. 4

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COLOR CHANGING ARRANGEMENT FOR A COMBINED CALCULATOR AND TYPEWRITER

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The present invention relates to a color changing arrangement for a combined calculator and typewriter, and more particularly to an apparatus for automatically actuating the means by which a two-color ribbon of a typewriter which is controlled by a calculator is shifted. When a combined calculator and typewriter is set, for example by operation of a subtraction key, to an operational condition in which a negative value is calculated, or a negative total is formed, it is desired that the ribbon of the calculator controlled typewriter is shifted from the normal position in which black imprints are made to a shifted position in which red imprints are produced by a red portion of the ribbon. It is necessary to shift the ribbon again to the position in which the black portion is operative, when the respective negative value has been printed on a record sheet.

According to one arrangement of the prior art serving this purpose, the ribbon is shifted to the position "red" by a first electro-magnetic means, and is shifted back to the position "black" by another electro-magnetic means. One of the electro-magnetic means is controlled by the calculator, and the other electro-magnetic means is energized by contacts controlled by tabs on the paper carriage of the typewriter.

It is one object of the invention to improve known apparatus serving the purpose of effecting the printing of negative values in a color different from the color in which positive values are printed by a combined calculator and typewriter.

Another object of the present invention is to control a first electro-magnetic means from the calculator to provide a preliminary operational condition when the calculator contains a negative value, but to effect the actual shifting of the machine to printing in a different color by a second electro-magnetic means.

Another object of the present invention is to provide a simple and reliable mechanism for shifting the ribbon of a combined calculator and typewriter between a position printing in one color and a position printing in a different color.

Another object of the invention is to provide an electro-magnetic shifting arrangement in which a first smaller electro-magnetic means shifts an actuating means between two positions while a second electro-magnetic means operates the actuating means in either position to effect two different operations, for example the shifting of an operated means between two positions.

With these objects in view, the present invention relates to a shifting arrangement which is preferably used in a combined calculator and typewriter for setting the combined calculator and typewriter either to a normal condition in which it prints a first color, such as black, or to another condition in which it prints in a second color, such as red. One embodiment of the invention comprises actuating means shiftable between a first and a second position, and being movable in each of these positions between an inoperative position and an operative position, first electro-magnetic means for moving the actuating means between first and second positions, second electro-magnetic means for moving the actuating means in the first or in the second position to the operative position, and an operated means, such as means controlling the shifting of a typewriter ribbon between a normal position "black" and another position "red."

The operated means is shifted by the actuating means when the same is moved by the second electro-magnetic means in said first position, or in said second position, from the inoperative position to the operative position.

Operation control means effect the energizing and de-energizing, respectively, of the first electro-magnetic means, and include a switch for connecting the first electro-magnetic means to a source of voltage when the combined calculator and typewriter assumes an operational condition for effecting subtractions.

Another switch means is operated by the first electro-magnetic means when the same is energized, and is connected to the second electro-magnetic means to energize the same after the first electro-magnetic means has shifted the actuating means between said first and second positions.

In the preferred embodiment of the invention, the actuating means is pivotally connected to the armature of the second electro-magnetic means and performs an angular movement in a first direction between the first and second positions. When the second electro-magnetic means is energized, the actuating means is moved from the inoperative position to the operative position in a second direction which is transverse to the first direction of movement.

The first electro-magnetic means preferably has a spring-loaded pivoted armature which is connected by a pin-and-slot connection to the actuating means so that during pivotal movement of the armature of the first electro-magnetic means, the actuating means is shifted in the above-mentioned first direction between the first and second positions, while the pin-and-slot connection permits movement of the actuating means in the transverse direction between the inoperative and operative positions thereof.

Spring means act on the actuating means to return the same to the inoperative position, and other spring means act on the armature of the first electro-magnetic means to turn the same with the actuating means to the first position of the actuating means when the first electro-magnetic means is de-energized.

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 advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a side view illustrating a shifting arrangement according to a preferred embodiment of the invention;

FIG. 2 is a diagram illustrating the circuit of the electro-magnetic means and including the switches and contacts by which the combined calculator and typewriter controls the operation of the apparatus;

FIG. 3 is a perspective view of the shifting arrangement and of parts of the typewriter and ribbon shifting mechanism operated thereby; and

FIG. 4 is a fragmentary perspective view illustrating parts of the counter mechanism by which the shifting arrangement of the present invention is controlled.

Referring now to the drawings, an electro-magnetic means 1 is secured by bracket 3 to the frame of the combined calculator and typewriter. The armature 2 carries a pivot pin 4 on which an actuating means 5 is mounted for pivotal movement. Actuating means 5 has a wider head portion 5a having an opening 5c and terminating in an elongated projection 5b which is formed with a slot 5c₁.

Another electro-magnetic means 20 is mounted on a bracket 21 which is secured to the frame of the combined

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calculator and typewriter, and has a movable armature 19 which is mounted on a fulcrum pin 19a for pivotal movement and is urged by a spring 22 to move to the position illustrated in FIG. 1 in which the armature 19 abuts a stop 23. An arm 18 is secured to armature 19 and carries a slide pin 17 which projects into slot 5c₁ of actuating means 5.

When electro-magnetic means 20 is energized, armature 19 is attracted and turns in clockwise direction with arm 18 and pin 17 so that actuating means 5 is turned in counterclockwise direction about pivot pin 4 from the illustrated position to a second position.

A double-armed lever 8 is turnably mounted on a shaft 9 which is secured to the frame of the machine and passes through cutout 5c. A projecting portion of lever 8 is articulated by a pin 10 to a link 11 which is articulated by a pin 12 to an angular lever 13 mounted on a fixed shaft 14. Lever 13 has a forked end portion forming a slot 13a in which a pin 13c is located so that turning of lever 13 will displace rod 13b. Rod 13b is connected to the means by which the ribbon of the combined calculator and typewriter is shifted from the normal "black" position to the "red" position. Whenever lever 8 is turned about shaft 9 in counterclockwise direction, lever 13 turns in counterclockwise direction so that rod 13b is operated to set the typewriter to the conditions in which red numbers, signs, or characters are printed under control of the calculator.

As best seen in FIG. 3, a key means 37 is secured to rod 13b and permits manual operation of the same. A rockable bar 33 is controlled by the typewriter keys, not shown, to be rocked in clockwise direction upon actuation of any typewriter key. The arm 33a is articulated to a lever 33b which is also articulated to rod 13b. Lever 33b carries a pin 33c which slides in a slot 34a in one arm 34b of a rockable member 34 which has another arm 34c articulated to the guide member 35 in which the two-color ribbon 36 is guided. A shaft 34d supports member 34 for pivotal movement so that ribbon 36 can be raised from a position in which the type of a type lever is located opposite the black portion of the ribbon, to a position in which the type is located opposite the red portion of the ribbon.

If the typewriter is to be set to writing in red color, the manually operated member 37 may be actuated so that rod 13b is shifted to the left whereby slide pin 33c is shifted in slot 34a to a position in which the effective lever arm of lever 34b is shortened. When a typewriter key is actuated, member 33 is rocked, and since the lever arm of lever 34b was shortened, member 34 will turn through a greater angle effecting raising of guide member 35 to a higher position than as if shifted in the illustrated position of slide pin 33c, so that instead of the black ribbon portion, the red ribbon portion is placed in the effective position opposite the types. When it is desired to write in black color, member 37 is shifted to the position illustrated in FIG. 3, so that slide pin 30c acts again on a long effective lever arm so that guide member 35 is raised a shorter distance when a key lever actuates member 33.

Since lever 13 of the shifting mechanism of the present invention engages pin 13c on the rod 13b, turning of lever 13 will effect shifting of the typewriter between the "black" and "red" positions.

FIG. 3 also shows the platen 50 on the paper carriage 51, and a program control bar 39 mounted on the carriage 51. Tabs 38 are mounted on program control bar 39 and are movable between an inoperative position, and an operative position, as shown for tab 38a. A tab 38a in operative position will engage the projection 40 of a stationary switch 32 when the carriage moves from a column position to the next column position so that switch 32 will be shifted for a purpose which will be explained hereinafter with reference to FIG. 2.

Head portion 5a has two lateral projections 15 and 16

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which are positioned to cooperate with pins 6 and 7, respectively. In the first normal position of the mechanism illustrated in FIG. 1, shoulder 15 is located opposite pin 6, and when electro-magnetic means 20 is energized, and armature 19 attracted to turn actuating means 5 to its second position, shoulder 16 is located opposite pin 7, while shoulder 15 is transversely displaced relative to pin 6, as shown for the first position for shoulder 16 and pin 7.

If electro-magnetic means 1 is energized while actuating means 5 is in the position shown in FIG. 1, and moves to the left, shoulder 15 will stop short of pin 6 and have no effect on lever 8. However, when actuating means 5 is shifted to the second position in which shoulder 16 is located opposite pin 7, shoulder 16 will engage pin 7 when actuating means 5 moves to the left, and turn lever 8 in counterclockwise direction through a corresponding angle. Lever 13 will turn through a corresponding angle in counterclockwise direction, and shift the ribbon to a position in which the typewriter prints red.

A spring 27 is secured to a hole 28 in a transverse projection 29 of actuating means 5, so that actuating means 5 assumes the inoperative position shown in FIG. 1 when electro-magnetic means 1 is not energized.

A normally closed contact means 30 is located in the region of projection 29, and is engaged and opened by the same when actuating means 5 is moved by electro-magnetic means 1 to its operative position. Armature 19 of electro-magnetic means 20 operates and closes two contact means 24 and 25 when electro-magnetic means 20 is energized.

As shown in FIG. 2, electro-magnetic means 1 is connected to a source of voltage over switch means 25 which is controlled by electro-magnetic means 20 so that electro-magnetic means 1 is energized when electro-magnetic means 20 is energized and closes switch means 25. However, even if switch means 25 is open, electro-magnetic means 1 can be connected by the control switch 32 to the source of voltage.

Contact 24 is a holding contact connected to contact means 30 and to the winding of electro-magnetic means 20, by which it is also operated.

Contact means 30, which is operated by the projection 29 of the actuating means 5, is normally closed. Control switch 32, which is operated by a tab 38a on the paper carriage 51, is normally in a position connecting electro-magnetic means 20 through contact means 30 to the source of voltage.

An operation control switch 31 is also connected in series with electro-magnetic means 20, and is normally open.

As shown in FIG. 4, operation control switch 31 is operated by the counter mechanism of the calculator. In a counter frame 41 is mounted an additive set of counter gears 42, and a subtractive set of counter gears 43. Frame 41 is pivotally mounted on pivot pins 44 carried by arms 45 which are secured to a shaft 46. A link 47 is articulated to frame 41, and turns frame 41 to a position in which the subtractive counter gears are operative, when link 47 is shifted in direction of the arrow 47a, which occurs when the calculator is set to subtraction, or to a negative total. In this position of frame 41, projection 48 engages a button 31a of operation control switch 31, and closes the same. Turning of shaft 46 will shift frame 41 to a position in which the selected counter gears 42, or 43, mesh with the drive means by which they are turned to register a value.

Control switch 31 is a conventional switch of the type which assumes a circuit closing position only for a short time after actuation, even if its button 31a is held depressed. Also, upon release of button 31a by projection 48, the circuit remains interrupted.

The apparatus operates as follows:

The drawing shows all parts of the device in the normal position in which the combined calculator and type-

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writer is set to print in black color which is accomplished by holding a two color ribbon in a position in which the type levers fit the black portion thereof.

If a minus value is computed in the calculator, or if a negative total is obtained, the respective counter mechanisms is set to subtraction in a conventional manner. The mechanical shifting of the calculator is transmitted by frame member 41, 48 to the operation control switch 31 which is closed. Electro-magnetic means 20 is energized through contact means 30, 32 and operation control switch 31, and attracts its armature 19 so that holding contact 24 and switch means 25 are closed. Holding contact 24 connects electro-magnetic means 20 directly to the source of voltage, so that operation control switch 31 may open while electro-magnetic means 20 remains energized, and holds switch means 25 in the circuit closing position in which electro-magnetic means 1 is energized. Before armature 19 closes switches 24 and 25, it shifts through arm 18, pin 17 and slot 5c₁, actuating means 5 to the position in which shoulder 16 is located opposite pin 7. Consequently, when armature 19 then closes switch means 25, and electro-magnetic means 1 is energized, actuating means 5 will turn lever 8 in counterclockwise direction while moving to the left to its operative position. Lever 13 will also turn, and set the mechanism of the ribbon to a position in which its red portion is effective so that the result of the subtraction, or a negative value, is printed in red color.

After shifting of the operating means 8, 11, 13 and 13b, actuating means 5 arrives in a position in which it opens contact means 30 so that the circuit of electro-magnetic means 20 is interrupted. Electro-magnetic means 20 is de-energized, and switches 24 and 25 open since spring 22 retracts armature 19.

Electro-magnetic means 1 is de-energized by the open switch means 25 so that the spring 27 returns actuating means 5 to its normal inoperative position. The negative value stored in the calculator, is now printed by the typewriter in red color. After this operation, the carriage of the typewriter moves to another column, where a tab on the program control means on the paper carriage effects shifting of control switch 32 to its other position in which it connects electro-magnetic means 1 to the source of voltage.

Due to the fact that spring 27, and also spring 22 exert a turning moment in clockwise direction on actuating means 5, actuating means 5 has assumed its first position illustrated in FIG. 1 in which shoulder 15 is located opposite pin 6. Consequently, when control switch 32 effects energizing of electro-magnetic means 1, and actuating means 5 moves to the left as viewed in the drawing from its inoperative position to an operative position, shoulder 15 engages pin 6 of the displaced lever 8, and shifts lever 8 in clockwise direction to its initial position illustrated in FIG. 1 in which the black portion of the typewriter ribbon is effective.

When the control tab passes beyond control switch 32, the same returns to its normal position illustrated in FIG. 2, and the circuit of electro-magnetic means 1 is interrupted so that spring 27 returns actuating means 5 to its inoperative position shown in FIG. 1. All parts of the mechanism are in the initial normal position, and remains in this position until another subtraction operation causes shifting operation control switch 31 to a circuit closing position energizing electro-magnetic means 20.

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 electro-magnetic shifting arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in an apparatus for setting a combined calculator and typewriter automatically to a position in which a negative value is printed in red, it is not intended

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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.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

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

1. A shifting arrangement for a combined calculator and typewriter which prints in two colors, comprising, in combination,

- (a) an actuating means shiftable between a first position and a second position, and being movable in each of said first and second positions between an inoperative position and an operative position;
- (b) a first electro-magnetic means for moving said actuating means between said first and second positions;
- (c) operation control means for effecting energizing and de-energizing of said first electro-magnetic means and including a switch connected to the same, said switch effecting energizing of said first electro-magnetic means when the combined calculator and typewriter assumed an operational condition for effecting subtractions;
- (d) a second electro-magnetic means for moving said actuating means in each of said first and second positions to said operative position;
- (e) a switch means operated by said first electro-magnetic means when the same is energized, and connected to said second electro-magnetic means to energize the same after said first electro-magnetic means has shifted said actuating means between said first and second positions; and
- (f) an operated means shiftable between a normal position for setting the combined calculator and typewriter to a normal condition in which it prints in a first color, such as black, and another position for setting the combined calculator and typewriter to another condition in which it prints in a second color, such as red, and being operatively connected to said actuating means to be shifted by the same from said normal position to said other position when said actuating means is moved by said second electro-magnetic means in said first position from said inoperative position to said operative position, and from said other position to said normal position when said actuating means is moved by said second electro-magnetic means in said second position from said inoperative position to said operative position.

2. A shifting arrangement for a combined calculator and typewriter which prints in two colors, comprising, in combination,

- (a) an actuating means shiftable between a first position and a second position, and being movable in each of said first and second positions between an inoperative position and an operative position;
- (b) a first electro-magnetic means for moving said actuating means between said first and second positions;
- (c) operation control means for effecting energizing and de-energizing of said first electro-magnetic means and including a switch connected to the same, said switch being closed by the combined typewriter and calculator and energizing said first electro-magnetic means when the combined calculator and typewriter assumes an operational condition for effecting subtractions, said switch opening automatically;

- (d) a second electro-magnetic means for moving said actuating means in each of said first and second positions to said operative position;
 - (e) a switch means operated by said first electro-magnetic means when the same is energized, and connected to said second electro-magnetic means to energize the same after said first electro-magnetic means has shifted said actuating means between said first and second positions, and a holding contact in the circuit of said first electro-magnetic means closed by the same when the same is energized, so that the same remains energized when said switch of said operation control means automatically opens; and
 - (f) an operated means shiftable between a normal position for setting the combined calculator and typewriter to a normal condition in which it prints in a first color, such as black, and another position for setting the combined calculator and typewriter to another condition in which it prints in a second color, such as red, and being operatively connected to said actuating means to be shifted by the same from said normal position to said other position when said actuating means is moved by said second electro-magnetic means in said first position from said inoperative position to said operative position, and from said other position to said normal position when said actuating means is moved by said second electro-magnetic means in said second position from said inoperative position to said operative position.
3. A shifting arrangement for a combined calculator and typewriter which prints in two colors, comprising, in combination,
- (a) an actuating means shiftable in a first direction between a first position and a second position, and being movable in each of said first and second positions in a second direction transverse to said first direction between an inoperative position and an operative position;
 - (b) a first electro-magnetic means for moving said actuating means between said first and second positions;
 - (c) operational control means for effecting energizing and de-energizing of said first electro-magnetic means and including a switch connected to the same, said switch effecting energizing of said first electro-magnetic means when the combined calculator and typewriter assumes an operational condition for effecting subtractions;
 - (d) a second electro-magnetic means for moving said actuating means in each of said first and second positions to said operative position;
 - (e) a switch means operated by said first electro-magnetic means when the same is energized, and connected to said second electro-magnetic means to energize the same after said first electro-magnetic means has shifted said actuating means between said first and second positions;
 - (f) a normally closed contact means connected in series with said first electro-magnetic means and being engaged and moved to a circuit-breaking position by said actuating means when the same arrives in said operative positions thereof so that said first electro-magnetic means is de-energized whereby said switch means effects de-energizing of said second electro-magnetic means; and
 - (g) an operated means shiftable between a normal position for setting the combined calculator and typewriter to a normal condition in which it prints in a first color, such as black, and another position for setting the combined calculator and typewriter to another condition in which it prints in a second color, such as red, and being operatively connected to said actuating means to be shifted by the same from said normal position to said other position when said actuating means is moved by said second electro-magnetic means in said first position from said inoperative position to said operative position, and from said other position to said normal position when said actuating means is moved by said second electro-magnetic means in said second position from said inoperative position to said operative position;

- and typewriter which prints in two colors, comprising, in combination,
- (a) an actuating means shiftable in a first direction between a first position and a second position, and being movable in each of said first and second positions in a second direction transverse to said first direction between an inoperative position and an operative position;
- (b) a first electro-magnetic means for moving said actuating means from said first to said second position, when energized;
- (c) operation control means for effecting energizing and de-energizing of said first electro-magnetic means and including a switch connected to the same, said switch effecting energizing of said first electro-magnetic means when the combined calculator and typewriter assumes an operational condition for effecting subtractions;
- (d) spring means for returning said actuating means from said second position to said first position when said first electro-magnetic means is de-energized;
- (e) a second electro-magnetic means for moving said actuating means in each of said first and second positions to said operative position, when energized;
- (f) a switch means operated by said first electro-magnetic means when the same is energized, and connected to said second electro-magnetic means to energize the same after said first electro-magnetic means has shifted said actuating means between said first and second positions;
- (g) other spring means for returning said actuating means from said operative position to said inoperative position when said second electro-magnetic means is de-energized by said switch means upon de-energization of said first electro-magnetic means;
- (h) a normally closed contact means connected in series with said first electro-magnetic means and being engaged and moved to a circuit-breaking position by said actuating means when the same arrives in said operative positions thereof so that said first electro-magnetic means is de-energized whereby said switch means effects de-energizing of said second electro-magnetic means so that the same is returned by said other spring means to said inoperative positions thereof;
- (i) an operated means shiftable between a normal position for setting the combined calculator and typewriter to a normal condition in which it prints in a first color, such as black, and another position for setting the combined calculator and typewriter to another condition in which it prints in a second color, such as red, and being operatively connected to said actuating means to be shifted by the same from said normal position to said other position when said actuating means is moved by said second electro-magnetic means in said first position from said inoperative position to said operative position, and from said other position to said normal position when said actuating means is moved by said second electro-magnetic means in said second position from said inoperative position to said operative position; and a control switch adapted to be connected to a source of voltage and having a first position connected in series with said contact means and said first electro-magnetic means, and a second position connected in series with said second electro-magnetic means so as to directly connect said second electro-magnetic means to said source of voltage when said switch means disconnects said second electro-mag-

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netic means when said first electro-magnetic means is de-energized, said control switch being adapted to be controlled by a tab on a carriage of the combined calculator and typewriter whereby said actuating means is shifted from said inoperative position to said operative position by said second electro-magnetic means while being in said second position so that said combined calculator and typewriter is set back to said normal condition in which it prints in the first color, such as black.

5. A shifting arrangement as set forth in claim 1 and including a normally closed contact means connected in series with said first electro-magnetic means and being engaged and moved to a circuit-breaking position by said actuating means when the same arrives in said operative positions thereof so that said first electro-magnetic means is de-energized whereby said switch means effect de-energizing of said second electro-magnetic means.

6. A shifting arrangement as set forth in claim 5 and including a control switch adapted to be connected to a source of voltage and having a first position connected in series with said contact means and said first electro-magnetic means, and a second position connected in series with said second electro-magnetic means so as to directly connect said second electro-magnetic means to said source of voltage when said switch means disconnects said second electro-magnetic means when said first electro-magnetic means is de-energized, said control switch being adapted to be controlled by a tab on a carriage of the combined calculator and typewriter whereby said actuating means is shifted from said inoperative position to said operative position by said second electro-magnetic means while being in said second position so that said combined calculator and typewriter is set back to said normal condition in which it prints in the first color, such as black.

7. A shifting arrangement as set forth in claim 6 wherein said control switch de-energizes said second electro-magnetic means when shifted back to the position connected in series with said contact means; spring means for returning said actuating means to said first position, and other spring means for returning said actuating means to said inoperative position; said first electro-magnetic means including a pivoted armature connected to said

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actuating means for movement with the same between said first and second positions so that said first-mentioned spring means also returns said armature to a normal position when said first electro-magnetic means is de-energized.

8. A shifting arrangement as set forth in claim 7 wherein said armature of said first electro-magnetic means is mounted for pivotal movement, and includes an arm having a pin thereon; and wherein said actuating means includes a portion having a slot engaging said pin of said first electro-magnetic means, said actuating means being pivotally mounted at a fulcrum spaced from said slot thereof.

9. A shifting arrangement as set forth in claim 8 wherein

(a) said actuating means has a pair of lateral projecting shoulders; and

(b) wherein said operated means includes a double-arm lever having two projecting pins respectively located in the region of said projecting shoulders of said actuating means, one of said shoulders cooperating with one of said pins in said first position of said actuating means, and the other of said shoulders cooperating with the other of said pins in the second position of said actuating means so that said double-armed lever is turned in opposite directions when said actuating means is moved from said inoperative position to said operative position in said first position, or in said second position thereof.

10. A shifting arrangement as set forth in claim 9 and including a normally open holding contact operated by said first electro-magnetic means for holding said first electro-magnetic means in energized condition when said switch of said operation control means opens after the combined calculator and typewriter has assumed the operational condition for effecting subtractions.

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