Patented June 12, 1934

1,962,864

UNITED STATES PATENT OFFICE

1,962,864

ELECTRICAL CONTROL APPARATUS

Louis Gilman, Chelsea, Mass.

Application December 9, 1933, Serial No. 701,620

7 Claims. (Cl. 178—33)

The present invention is an improvement upon that disclosed in my U. S. Letters Patent No. 1,938,899, issued December 12, 1933.

In the drawing accompanying and forming a part of this specification—

Figure 1 is a perspective view of an electrical control apparatus embodying my invention;

Fig. 2 is a fragmentary perspective view on an enlarged scale;

Fig. 3 is a diagram of circuits that may be used in connection with the apparatus shown in Fig. 1.

In the particular drawing selected for more fully disclosing the principle of my invention, 10 is an aggregate motion selector consisting in the present instance of a vertically-disposed tubular member carrying at its upper end a rectangular platen 11 having a blank at the center thereof and arranged for movement substantially in a single plane. Said selector is connected for universal motion by the gimbal 12 to a suitable support 13, the pin 14 passing through the selector and having its bearings in the ring 15 and the oppositely-disposed pins 16 pivotally connecting said ring and support.

Two sets of electromagnetically-operable mechanisms, herein shown as solenoids, are disposed substantially in quadrature and operatively associated with the selector. The solenoids A, B, C constitute one set and the solenoids D, E, F the other.

In the present instance the solenoids A and B of one set and E and F of the other are shown as connected to the selector on opposite sides of its point of connection to the support, and the solenoid C of the first set and the solenoid D of the second set connected similarly thereto. This, however, is not essential and the relative position of the gimbal 12 with respect to the points of attachment of the solenoids to the selector is immaterial. This will be apparent when it is considered that in no case do the solenoids move the selector about the pins 14 or 16 as pivots. For example, if the letter to be selected requires the energization of the solenoids C and D, the former will act on the selector about the point of connection of the rod 18 thereto as a fulcrum and the latter will act thereon about the point of connection of the rod 20 thereto as a fulcrum with the result that not only is the selector tipped in two different directions by said solenoids but also there is produced a sliding movement of the ring 15 over the pins 16 and a sliding movement of the selector along the pin 14. The result of the several movements is that the selected letter is brought under the actuator 23.

By way of further example, if the selected letter requires the energization of the solenoids A, B, C and D, it will be apparent that the action of the solenoids A, B and C will cause the ring to slide along the pins 16 and the action of the solenoid D acting on the selector against the point of connection of the rod 20 thereto as a fulcrum will tilt or swing the selector and that the result of these motions will be such as to bring the desired letter under the actuator. In other words, the said gimbal is merely a support for the selector and its function is to prevent axial or rotational movement of the same.

The solenoids aforesaid correspond to the electromagnets shown in Figs. 5 and 9 of my patent aforesaid. As explained in said patent the simultaneous actuation of all six magnets will result in no movement of the platen.

In the present instance the simultaneous actuation of the six solenoids A–F will in like manner result in no movement of the platen and this result is effected by adjusting the throw of the solenoids with respect to the distances from the platen to their respective points of attachment to the selector. In the form of the invention shown in Fig. 1 the throw of the solenoids A, B, D is less than that of the solenoids C, E. F.

By any suitable means such as linkage systems the solenoids may be operatively associated with the selector. In the present instance the solenoids A, B are connected to the link 17 and the latter by the rod 18 to the selector; similarly the solenoids E, F are connected to the link 19 and the latter to the selector by the rod 20.

In the particular embodiment shown in the drawing the solenoids C and D are connected to the selector by the rods 21, 22, respectively. The rods aforesaid preferably are slightly flexible.

By selectively energizing at least one of the solenoids of each set the platen is moved from its neutral position at which the blank at the center thereof is under the core of the electromagnetic actuator 23 to such position as to bring the selected letter under said actuator, as explained in detail in the above-mentioned patent.

In the present instance a strip of carbon paper 24 is caused by suitable mechanism to move intermittently over the face of the platen and the tape 25 disposed over the carbon strip and under the actuator is caused to move intermittently in a direction at right angles to that of said carbon strip.

In Figs. 5 and 9 of my patent aforesaid each set of electromagnets consists of two members placed side by side and extending toward the platen, and a third oppositely-disposed member extending away from the platen and serving to move the latter in a direction opposite to that effected by the energization of one or both of the other members. In the present instance the same result is accomplished by connecting two of the solenoids of one set with the selector on one side of the point of connection of the same

June 12, 1934. L. A. GRAHAM 1,962,866

CALCULATING DEVICE

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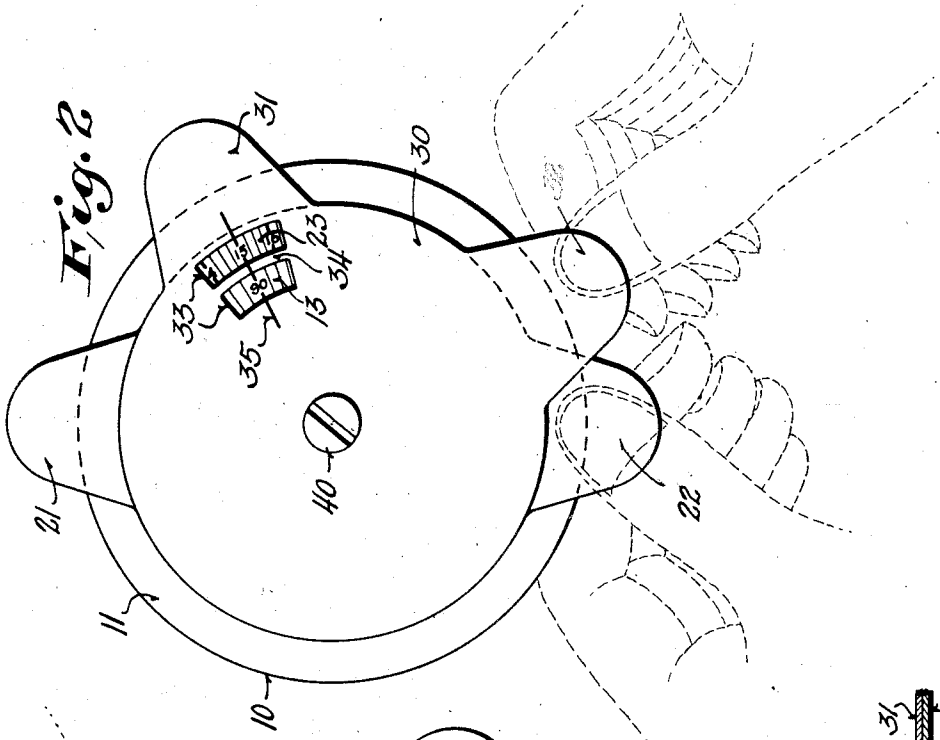


Fig. 2

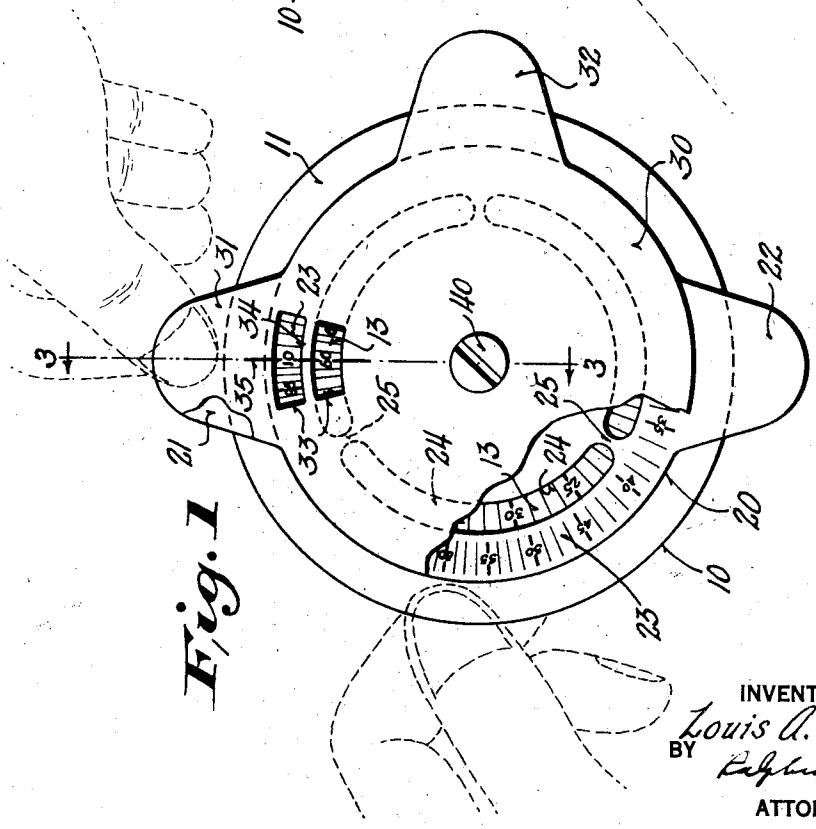


Fig. 1

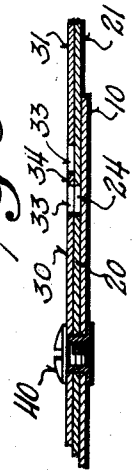


Fig. 3

INVENTOR
Louis A. Graham
BY
ATTORNEY

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CALCULATING DEVICE

Louis A. Graham, Milwaukee, Wis.

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10 Claims. (Cl. 235—84)

This invention relates to calculating devices of the circular "slide rule" type.

Slide rules, of the circular as well as the straight type, ordinarily include three relatively movable members, commonly known as the stationary member or base, the slide, and the runner. The base and slide are equipped with coacting logarithmic scales relatively movable by adjustments of the slide to effect the calculations, and the runner is equipped with an indicator or finder which facilitates the calculating process. The runner and slide are ordinarily independently mounted on the base in accurately formed guideways provided for the purpose, special provision being usually made to retain each against accidental displacement relative to the base during adjustment of the other. The accuracies and mechanical refinements in the guideways and retainers, necessary for accurate results, are the primary cause of the high cost of slide rules now in general use.

An object of the present invention is to provide a circular slide rule which may be inexpensively produced without sacrificing ease of operation or accuracy of results. This I accomplish by the use of three superposed members, corresponding respectively to the base, slide, and runner of an ordinary slide rule, connected for relative rotation by and about a common central pivot, and so constructed as to readily effect selective manual adjustment of any one of said members relative to the other two, while the other two are manually held against adjustment relative to each other. By that arrangement it is possible to eliminate the expensive guides and retainers heretofore required for accurate results.

Other more specific objects and advantages will appear from the following description of a circular slide rule constructed in accordance with the present invention.

In the accompanying drawing:—

Figure 1 is a plan view of a slide rule embodying this invention, showing a part thereof broken away to facilitate illustration.

Fig. 2 is a plan view showing the parts in different positions of adjustment.

Fig. 3 is a section on the line 3—3 of Fig. 1.

The slide rule selected for illustration comprises three superposed members 10, 20, and 30, connected by an appropriate pivot 40 for free independent rotation about a common center. These members are preferably, though not necessarily, in the form of disks, and correspond, respectively, to the base, slide, and runner of an ordinary slide rule.

Although they may be variously arranged, the bottom or "base" disk 10 is of a diameter somewhat greater than the others, so as to provide an exposed marginal portion 11. This disk is provided with a circular logarithmic scale 13 concentric with the pivot 40.

The intermediate or "slide" disk 20 is provided with a circular logarithmic scale 23 adjacent, parallel to, and surrounding the scale 13. The scale 13 is visible through the disk 20, either by making the disk 20 of transparent material, or by the provision of a circular slot 24 therein overlying the scale 13, and bridged by narrow connectors 25, which sustain the outer scale carrying portion of the disk 20.

The top or "runner" disk 30 covers both scales to protect the same from dirt and from injury. Although this disk may also be formed of transparent material, it is preferably opaque and equipped with a window 33 through which a portion of each scale is visible, the window preferably being divided by a narrow arcuate strip 34 overlying the adjacent edges of the scales. A radial line 35 applied to the face of the disk 30, centrally of the window, provides a finder or indicator for coaction with the scales in the usual manner.

The bottom disk 10 is manually actuated and controlled by its exposed marginal portion 11, and the intermediate and top disks 20 and 30 are independently actuated by projecting tabs preferably arranged in the manner now to be described.

In the slide rule shown, the several tabs are identical in form and all project beyond the bottom disk 10. Two tabs 21 and 22 are provided on the intermediate disk 20, spaced one hundred and eighty degrees apart, the tab 21 being symmetrically disposed or aligned with the unity graduation on the scale 23. Two tabs 31 and 32 are also provided on the top disk 30, spaced ninety degrees apart, the tab 31 being symmetrically disposed or aligned with the finder line 35 on the disk 30. The fact that the tabs on each disk are differently spaced from those on the other disk, assures that one tab is always available for the actuation of its disk without interference with a tab on the other disk, and, due to the particular arrangement of tabs 21 and 31, the finder line 35 may be readily registered with the unity graduation on scale 13, by merely registering the tab 31 with tab 21, as indicated in Fig. 1. With the tabs 21 and 31 thus positioned, the device is ready to perform a calculation.