March 19, 1940. A. C. DICKIESON 2,194,296

SELECTIVE SWITCHING DEVICE

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FIG. 1

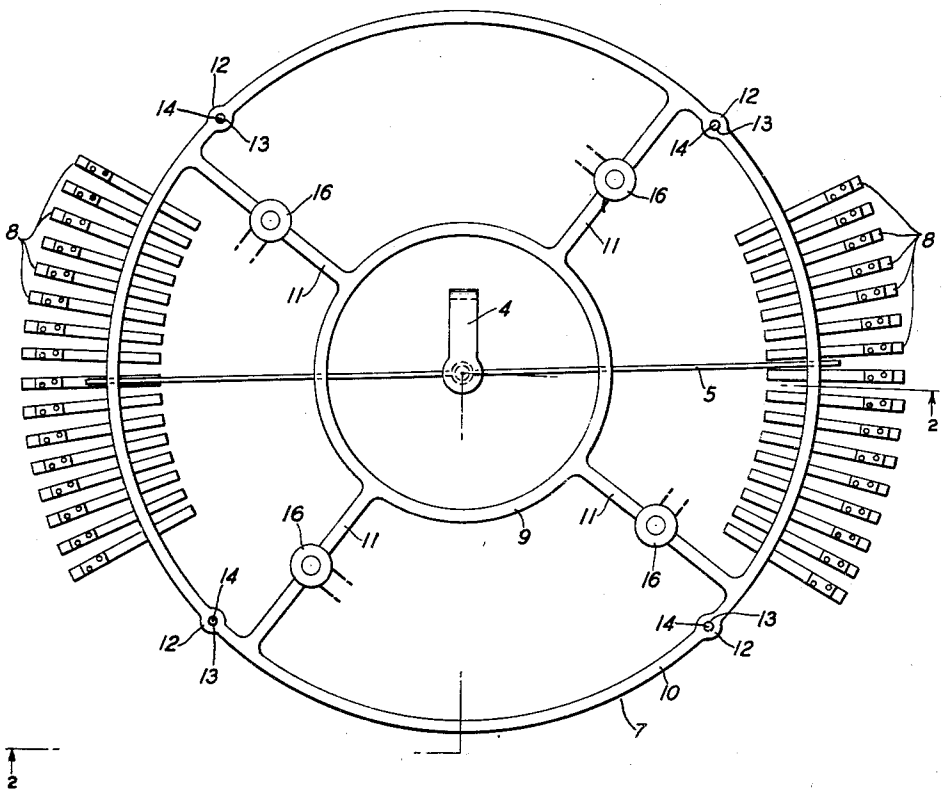
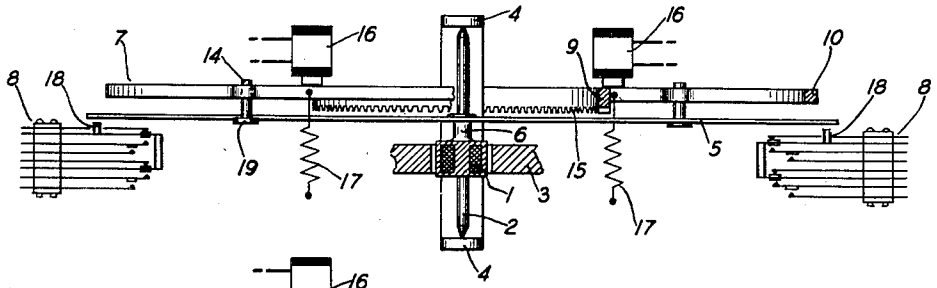


FIG. 2



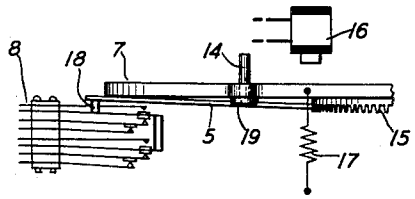


FIG. 3

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FIG. 4

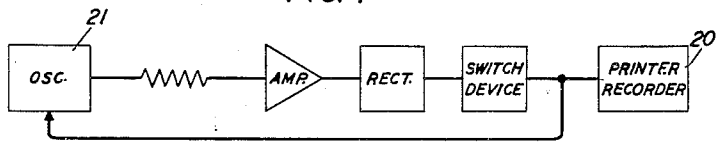


FIG. 5

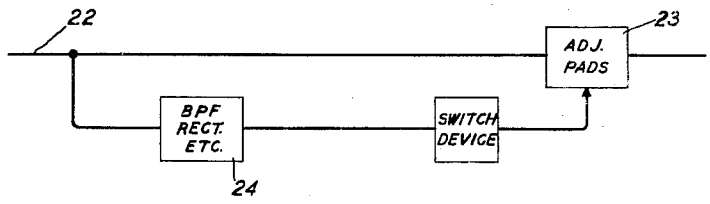
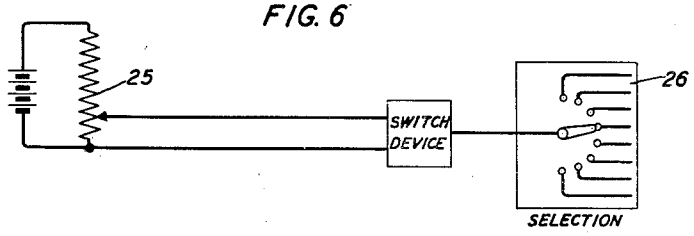


FIG. 6



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Patented Mar. 19, 1940

2,194,296

UNITED STATES PATENT OFFICE

2,194,296

SELECTIVE SWITCHING DEVICE

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Application March 4, 1937, Serial No. 128,967

3 Claims. (Cl. 200—56)

This invention relates to switching devices and more particularly to a selective switching device.

The object of the invention is to provide a selective switching device in which only a comparatively small electrical current is required for selective operation and in which the selected contacts are moved by means not subject to the current applied to the selective member.

In the drawings:

Fig. 1 is a top plan view of the switching device;

Fig. 2 is a side view partly in section of the device shown in Fig. 1, the section being taken along lines 2—2;

Fig. 3 is a side view of a portion of Fig. 2 and showing the switch parts in operated positions;

Fig. 4 is a view in schematic form of an arrangement in which the invention may be used in connection with a recording device to make records of gains and losses in an electrical system;

Fig. 5 is a view in schematic form of another application of the device, the device in this case being used to selectively control the application of electrical pads to a system; and

Fig. 6 is a view in schematic form of another application of the device, the device in this case being used to selectively operate switch contacts in accordance with an adjustment made at some remote point in an electrical system.

In electrical communication systems such, for instance, as telephone systems, changes sometimes occur in the transmission characteristics of the systems. The changes may be only slight or of considerable magnitude, but in either case making the system not normal. When gains or losses occur in the transmission characteristics of a system it is desirable to compensate for these changes and to thereby adjust the system to its normal transmission characteristic. To make the necessary adjustment it is essential that the amount of adjustment required be determined and that the switching device used in making the adjustment operate in accordance with the change occurring in the system.

The invention is a switching device which will operate to measure the amount of change in the electrical condition of a system even though the change be of only slight magnitude and will select and operate required contacts so that the change will be recorded or corrected. The portion of the device moved in accordance with the amount of change selectively moves to a position for operating switch contacts. A pressure device independent of the measuring portion of the switching device then presses the measuring portion against the switch contacts selected. The switch contacts may control a registering device to record the amount of change in the system, or may switch into or out of the system an electrical pad, the removal or insertion of the pad serving to bring the system back to its normal transmission characteristic.

The switching device, the structure of which is shown in Figs. 1, 2 and 3, operates in the manner of a galvanometer, comprising, for instance, a movable coil 1 supported on a shaft 2 and operating in a magnetic field provided by the magnet 3. The shaft 2 is supported at its end portions in a bracket 4, suitable bearing surfaces being provided at the points of support so that the coil 1 and its supporting shaft 2 will rotate axially under the influence of current applied to the coil 1. The invention is not limited to the particular moving coil structure above described since other equally well-known galvanometer arrangements may be employed for the same purpose.

An arm 5 which preferably is in the form of a needle is attached at its central portion to a hub 6, the hub 6 being supported on the moving coil structure and rotating therewith. The arm 5 extends radially from the hub 6 and parallel to a ring 7 or other comparatively light-weight frame structure and between the ring 7 and sets of spring contacts 8. The ring 7 comprises an inner ring portion 9 and an outer ring portion 10, the ring portions being joined in spaced relation by means of the spokes 11. Enlarged portions 12 are provided on the outer ring portion 10 and the enlarged portions 12 are apertured at 13 to receive guide pins 14. The guide pins 14 are supported on a frame, not shown, and prevent rotation of the ring 7 and also serve as stops to limit movement of the ring 7 under the action of a spring. The lower surface of the inner ring portion 9 of the ring 7 is provided with teeth 15 the purpose of which will be subsequently explained.

The ring 7 may be made of magnetic material or may have pieces of magnetic material provided thereon so that it may be attracted by means of suitable electromagnets. The ring 7 is normally held in a downward position by means of springs 17, the springs 17 being attached to the ring 7 and to a frame, not shown. Electromagnets 16 are provided to move the ring 7 to an elevated position against the action of the springs 17. The springs 17 serve to move the ring 7 downwardly when the electromagnets 16 are deenergized. Under the action of the springs 17 the

ring 7 is moved downwardly so that the teeth 15 on the lower surface of the inner ring portion 9 engage the arm 5. When the ring 7 is moved downwardly by means of the springs 17, the arm 5 is pressed downwardly by means of the ring 7. When the arm 5 is pressed downwardly it engages an insulating button 18 on the spring contacts 8 lying beneath the arm 5 and moves the spring contacts selected by the arm 5. The spring contacts 8 may be arranged to control a registering device or the circuit to any other apparatus desired. The sets of spring contacts 8 are supported on any suitable means beneath the outer ring portion 10 of the ring 7 and below the arm 5. The spring contacts 8 are arranged in groups, each group being served by a separate end of the arm 5. Under the action of current applied to the galvanometer portion of the apparatus, the arm 5 is moved to select the required spring contacts 8.

When the ring 7 is moved downwardly under the action of the springs 17, the arm 5 passes between adjacent teeth 15 so that the arm 5 is held against further rotation while in its downward position and if not in exact alignment with the set of spring contacts 8 selected, it moves into exact alignment therewith due to the teeth 15 and the particular form thereof. In Fig. 3 the ring 7 is shown in the downward position. The arm 5 is pressed by means of the ring 7 into engagement with the insulating button 18 in the set of spring contacts 8 and the selected spring contacts 8 are operated by means of the arm 5. The teeth 15 are so spaced that the rod 5 will fit between adjacent teeth. The outer ends of the teeth are sufficiently pointed or rounded that should the rod 5 be not in exact alignment with the nearest insulating button on a set of spring contacts 8 and in alignment with the outer end of a tooth 15, the arm 5 will slide off the outer end of the tooth and between adjacent teeth and thus be centered relative to the nearest insulating button 18. The teeth 15, therefore, act as centering means to align the arm 5 with a set of contact springs and also as holding means to prevent rotation of the arm 5 while in its downward position. The guide pins 14 are flanged or shouldered at 19 to limit the downward movement of the ring 7 to prevent operation of all of the spring contacts simultaneously, the spring contacts operated being only those in alignment with the position of the arm 5. As shown particularly in Fig. 1, there are two groups of spring contacts 8 each served by a separate end of the arm 5. The contacts on the left side are shown as not being in alignment with the contacts on the right side. With this arrangement only one set of spring contacts 8 will be operated at a time. In case it is desired to have the device operate two sets of spring contacts at a time, the contacts would be arranged in alignment. While only two groups of spring contacts are shown, it is obvious that by providing more groups of spring contacts and additional arms 5 the capacity of the switching device may be increased. For instance, the arm 5 might have two more free ends spaced 90 degrees from the two ends shown and groups of contact springs might be arranged under the two additional ends of the arm 5.

In Fig. 4 the switching device is shown as being used as a control member for a recording device 20, such for instance, as a printer recorder to record variations in an oscillator 21. In this arrangement variations in the oscillator 21 are detected and amplified and passed through a rectifier to the switching device of this invention. The switching device in this case moves its arm 5 in accordance with the variations of the oscillator 21 and selects spring contacts to be operated. When the electromagnets 16 of the switching device are deenergized, the selected spring contacts are operated and the recorder apparatus operates to make a record of the variations in the oscillator 21.

In Fig. 5 the switching device is operated in accordance with variations in a circuit wire 22 and selectively associates with the circuit wire 22 a required electrical pad in a group of electrical pads 23. The variations in the circuit wire 22 are detected and prepared for operation of the switching device through suitable electrical apparatus 24.

In Fig. 6 the switching device is remotely controlled through a variable resistance device 25 and selectively operates sets of fixed contacts 26.

The switching device may be used in checking the condition of an electrical system and automatically changing the characteristic of the system. When the galvanometer coil 1 is properly connected to the electrical system and the electromagnets 16 are energized, the arm 5 is moved in accordance with even slight variations in the system. The deenergization of the electromagnets 16 will then permit the springs 17 to move the ring 7 against the arm 5 and the arm 5 will operate the selected spring contacts 8. When the electromagnets 16 are left deenergized, the springs 17 will hold the ring 7 pressed against the arm 5 and the arm 5 will hold the selected spring contacts operated, as shown in Fig. 3.

While the device has been shown and described as performing switching operations through sets of spring contact pile-ups it may also be used to operate other switching arrangements. For instance, the galvanometer needle might be arranged to be pressed downwardly on a predetermined point of a resistance element or elements to cause a change to be made of resistance in a circuit. The device is also applicable to a wide variety of uses such, for instance, as telemetering, selective signaling, etc.

What is claimed is:

1. A switching device comprising sets of contacts arranged in the arc of a circle, a needle arranged to sweep over said contacts to select a set of said contacts, a galvanometer device operating said needle, an apertured ring supported above said needle and arranged to be moved bodily downward to press said needle against the selected set of contacts, spring means to move said ring into engagement with said needle, releasable holding means for said ring operating against the action of said spring means and a fixed shouldered pin extending through an aperture in said ring, said pin preventing rotation of said ring and limiting the movement of said ring under the action of said spring means.

2. A switching device comprising sets of spring contacts arranged in the arc of a circle, a needle arranged to sweep over said contacts to select a set of said contacts, a galvanometer device operating said needle, an apertured ring disposed above said needle and arranged to be moved bodily downward to press said needle against the selected set of contacts, releasable electromagnetic means operated to hold said ring away from said needle, spring means to move said ring against said needle upon release of said electromagnetic means, and fixed shouldered pins extending through apertures in said ring, said pins operating to prevent rotation of said ring and

limiting movement of said ring relative to said needle.

3. A switching device comprising spaced sets of contacts, a needle arranged to sweep over said contacts to a selective position relative to said contacts, a galvanometer device operating said needle, a frame disposed above said needle and lying in a plane parallel to said needle, said frame being movable bodily downward to press said needle against the selected set of contacts, a series of teeth on the under surface of said frame, said teeth being adapted to engage said needle to center said needle in the selected position, lowering means associated with said frame and constantly trying to bodily move said frame and press said frame against said needle, releasable holding means operating on said frame to hold said frame against the action of said lowering means and spaced fixed stops extending through said frame to limit the extent of movement of said frame relative to said needle.

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