Oct. 12, 1926.

1,602,497

S. D. LIVINGSTON

VARIABLE RESISTANCE UNIT

Filed Sept. 26, 1923

FIG 1

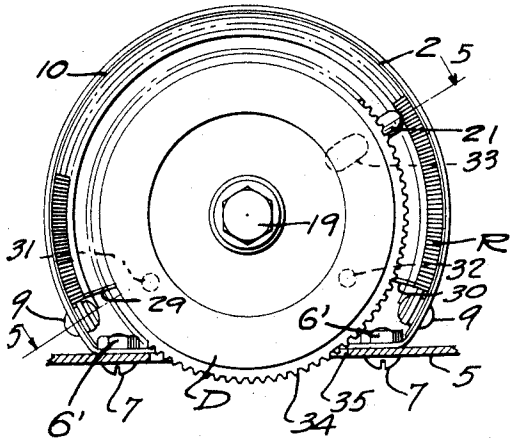


FIG 2

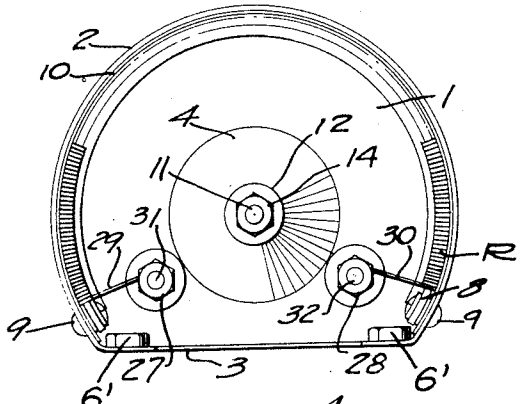


FIG 3

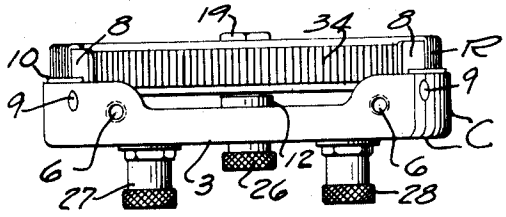


FIG 4

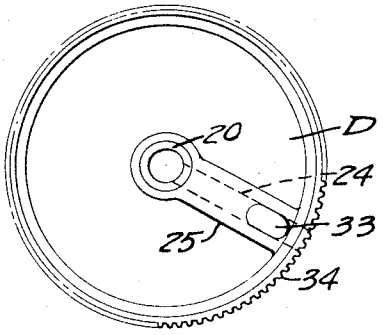
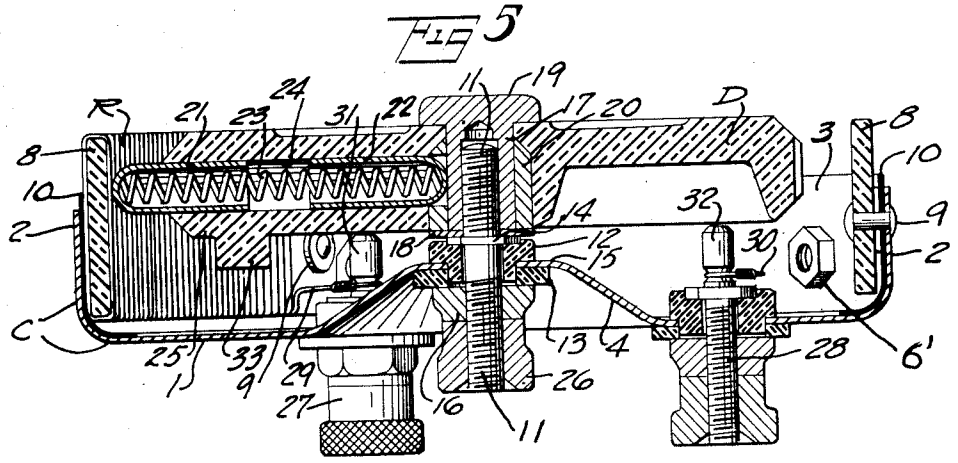


FIG 5



INVENTOR

Stanley D. Livingston

BY

Adolph A. Thomas

ATTORNEY

Patented Oct. 12, 1926. 1,602,497

UNITED STATES PATENT OFFICE.

STANLEY D. LIVINGSTON, OF FREEPORT, NEW YORK, ASSIGNOR TO EISEMANN MAGNETO CORPORATION, OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

VARIABLE-RESISTANCE UNIT.

Application filed September 26, 1923. Serial No. 664,947.

My invention relates to electrical resistance devices, and its object is to provide a variable resistance unit of improved construction and operation. The device of my invention is particularly applicable in radio circuits, but it may be used in any electric circuit requiring resistance control.

The various features of novelty and advantages of my invention will become apparent from a detailed description of the accompanying drawings, which illustrate a preferred embodiment of my invention. In these drawings—

Fig. 1 is a top plan view of my new resistance unit, showing the same attached to a panel and also showing the controlling disk projecting through a slot in the panel;

Fig. 2 is an inside view of the device with the controlling disk removed;

Fig. 3 is a front view of the device;

Fig. 4 is a detached bottom plan view of the controlling disk, and

Fig. 5 is a cross-section on line 5—5 of Fig. 1 on an enlarged scale, the view of the section being in the direction of the arrows marked on the section line.

The parts which go to make up the resistance unit are mounted on a casing or support indicated as a whole by C. This casing, which may conveniently be stamped out of a single piece of sheet metal, comprises a base 1, a circular flange 2 and a straight edge or shoulder 3. At the center the base 1 is formed with an inwardly projecting boss 4, the purpose of which will presently be described. The straight edge 3 serves as a means for attaching the unit as a whole to a suitable support, such as a panel indicated at 5 in Fig. 1. As shown in Fig. 3, the edge 3 has a pair of holes 6 and bosses 6′ for receiving suitable fastening devices 7. The bosses 6′ may be permanently attached to the inner face of front edge 3. In this way, it is a very simple and easy matter to attach the unit to a supporting panel.

In the casing C is mounted a resistance element indicated as a whole by R. In the present instance, this element consists of a coil of fine wire wound on a core or strip 8 of suitable insulating material. I prefer to use a strip of flexible material, such as fiber. The resistance wire is wound by machine on a straight strip and then the wire-wound strip is flexed into shape to fit against the flange or wall 2 of the casing. The inherent tension of the flexed strip holds the resistance element firmly against the flange 2. This method of preparing and mounting the resistance element R lowers the cost of manufacture and promotes simplicity of structure. If desired, additional fastening means, such as bolts or rivets 9, may be used for locking the resistance in the casing. When the casing C is of sheet metal, I interpose an insulating strip 10 between the resistance coil and the flange 2. The strip 10 is preferably of asbestos or other heat-resisting material. It will be seen from Figs. 3 and 5, that the resistance element projects to a considerable extent beyond the flange 2 and is thus open to the surrounding air. This has the effect of increasing heat radiation from the resistance wire.

On the boss 4 of the casing is mounted a screw-threaded pin 11, which is insulated from the metal of the casing by a bushing 12 and washer 13, both of suitable insulating material. The bushing 12 is preferably molded around the hexagonal flange 14 of the pin 11, and constitutes an insulating support for the pin. The bushing 12 has a hub 15 which projects into a hole in washer 13. A screw-threaded ring or nut 16 holds the parts 12 and 13 clamped on opposite sides of the boss 4, whereby the pin 11 is rigidly mounted on the base 1 of the casing and insulated therefrom.

On the upper end of pin 11 is mounted a metal bearing sleeve or stud 17, the lower end of which bears against a metal washer 18 resting on the hexagonal flange 14 of pin 11. Or, the stud 17 may directly engage the flange 14. The stud 17 is preferably provided with a hexagonal head 19, so that it may easily be inserted and removed.

On the bearing stud 17 is mounted a rotary disk indicated as a whole by D. In the particular construction illustrated in the drawings, the disk D is molded from a suitable insulating composition, such as bakelite. Disk D has a central opening which is preferably lined with a metal bushing 20. As seen from Fig. 5, the stud 17 and bushing 20 form a metallic bearing for the disk, which is rotatably held between the head 19 and the washer 18.

The rotary disk D carries a contact arm arranged to move over the resistance R for controlling the amount of resistance to be cut in or out of circuit. In the preferred

form of my invention, this contact arm comprises a pair of metal caps or sleeves 21 and 22, between which is interposed a coil spring 23. These parts are housed in a substantially radial bore 24 formed in a rib 25 on the underside of the disk. The tendency of spring 23 is to push the metal sleeves 21 and 22 apart, the outer sleeve 21 against the resistance wire and the inner sleeve 22 against the metal stud 17. The bushing 20 has an opening through which the inner head of sleeve 22 projects, as may be seen from Fig. 5. The contact ends of sleeves 21 and 22 are preferably rounded, so as to offer no appreciable resistance to the rotation of the disk and at the same time preserve intimate electrical contact between the resistance wire and the metal stud through the interposed conducting spring 23. It will be seen that the parts 21, 22 and 23, which constitute my new contact arm in its preferred form, are easily assembled, and are automatically held in place without any fastening means.

Attention is called to the fact that the spring 23 does not press the inner cap 22 against the bearing bushing of disk D, but directly against the fixed metal stud 17. In other words, the pressure of spring 23 is exerted against two stationary members, the resistance R and stud 17. This means that the bearing between stud 17 and disk D can be free and loose to permit easy turning of the disk, and yet the electrical contact between cap 22 and stud 17 will always be firm. Any change in the relation of the bearing surfaces between stud 17 and bushing 20, such as might be brought about by the operator in manipulating the disk, has no effect on the electrical connection between resistance R and stud 17 through contact arm 21—23—22.

On the lower end of pin 11 is a clamping nut 26 which forms with the nut 16 a binding post or terminal. By simply clamping a wire between the nuts 16 and 26, connection is made with the resistance wire through the contact arm on disk D.

Near the front edge 3 of the casing are two insulated binding posts 27 and 28 of any suitable construction and adapted to receive the ends of the resistance element R. The end 29 of the resistance is connected to binding post 27, and the end 30 to binding post 28. These connections are preferably inside the casing, as seen from Figs. 2 and 5.

The binding posts 27 and 28 terminate inside the casing in pins or projections 31 and 32, respectively. The disk D is at its underside provided with a lug 33, which is so arranged as to engage the pins 31 and 32 when the disk reaches the limit of its travel in either direction. This double function of the binding posts 27 and 28 obviates the necessity of separate stops for the disk and so adds to the simplicity of the device.

The resistance unit as shown in the drawings may be used as a potentiometer or stabilizing resistance in radio receiving circuits. This, of course, is merely one of the uses to which my invention may be applied. When this device is used as a plain rheostat, only one of the binding posts 27 or 28 is necessary, since one wire would be connected to one end of the resistance and the other to the controlling arm.

For easy manipulation of the controlling disk D, I prefer to provide the same with a knurled or roughened rim 34, which projects through a slot 35 in the mounting panel 5 when the casing is fastened to the panel, as previously described. This projecting portion of the knurled rim of the disk is freely accessible to the finger of the operator, so that the disk may be easily adjusted to bring the controlling arm to the desired point of contact on the resistance wire. The smooth rotation of the disk permits a delicate adjustment of the resistance.

It will be seen from Fig. 5 that the resistance wire, although mounted against the flange 2, has plenty of air around it for radiating the heat developed in the resistance element by the flow of current. This adds to the efficiency of the device.

Although I have herein shown and described a specific structure, I would have it understood that I have done so merely to explain the different features and advantages of my invention, which may be carried out mechanically in other ways than herein set forth.

I claim as my invention:

1. A variable resistance unit comprising a support, a metal stud on said support, a rotary member pivoted on said stud, a circularly arranged resistance element mounted on said support, and a contact arm carried by said member, said arm having oppositely separable end portions pressed yieldingly against said resistance element and said metal stud without pressing against said rotary member.

2. A variable resistance unit comprising a support, a metal stud on said support, a rotary member pivoted on said stud, a circularly arranged resistance element mounted on said support, and a contact arm carried by said member, said arm comprising a pair of spring-pressed end pieces held yieldably against said resistance element and said metal stud without pressing against said rotary member.

3. A variable resistance unit comprising a support, a metal stud on said support, a rotary member pivoted on said stud and provided with a substantially radial bore, a circularly arranged resistance element mounted on said support, and a contact arm mounted in said bore, said arm having oppositely separable end portions pressed

yieldingly against said resistance element and said metal stud without pressing against said rotary member.

4. A variable resistance unit comprising a support, a metal stud on said support, a rotary member pivoted on said stud and provided with a substantially radial bore, a circularly arranged resistance element mounted on said support, and a contact arm mounted in said bore, said arm comprising a pair of spring-pressed caps or sleeves held yieldably against said resistance element and said metal stud.

5. A variable resistance unit comprising a support, a metal stud on said support, a rotary member pivoted on said stud, a circularly arranged resistance element mounted on said support, and a contact arm carried by said member, said arm consisting of a pair of caps or sleeves with rounded ends and a coil spring arranged between said caps to press one against said resistance element and the other against said metal stud.

6. In a variable resistance unit, a casing having a substantially circular flange and a straight edge, a resistance element mounted in said casing along said circular flange and providing a substantially circular space or chamber, a rotary disk pivoted on said casing and movable in said circular space, the rim of said disk projecting beyond said straight edge of the casing as a means for rotating said disk, and a contact arm carried by said disk and yieldably engaging said resistance element.

7. A variable resistance unit comprising a support, a metal stud on said support, a rotary member pivoted on said stud, a circularly arranged resistance element mounted on said support, a contact arm carried by said member and arranged to engage said resistance element without interfering with the rotation of said member, a pair of oppositely arranged binding posts on said support and having the ends of said resistance element connected thereto, and a stop on said rotary member for engaging said binding posts to limit the rotary movements of said member in either direction.

8. In a variable resistance unit, a casing comprising a substantially circular base provided with a peripheral flange and with a straight edge, said edge providing means for securing said casing to a support, an insulated resistance element extending along said flange, a pair of insulated binding posts mounted on said base and having the ends of said resistance element connected thereto, an insulated metal pin on said base, a metal stud on one end of said pin, a disk pivoted on said stud and having its rim projecting beyond said edge as a means for rotationg said disk, a contact arm carried by said disk for electrically connecting said resistance element with said metal stud without interfering with the rotation of said disk, and a binding post on the other end of said pin.

9. In a variable resistance unit, a casing comprising a substantially circular base provided with a peripheral flange and with a straight edge, said edge providing means for securing said casing to a support, an insulated resistance element extending along said flange, a pair of insulated binding posts mounted on said base and having the ends of said resistance element connected thereto, a central boss or projection on said base, an insulated metal pin on said boss, a metal stud on one end of said pin, a disk pivoted on said stud and having its rim projecting beyond said edge as a means for rotating said disk, a contact arm carried by said disk for electrically connecting said resistance element with said metal stud without interfering with the rotation of said disk, a binding post on the other end of said pin, and a lug on said disk arranged to engage said pair of binding posts to limit the rotary movement of the disk in either direction.

10. In a resistance unit, a one-piece sheet-metal casing having a substantially circular base with a section cut away to provide a straight edge, said base having a flange around the circular edge, a circular resistance element mounted in said casing adjacent said flange, a contact member for said resistance element, and a wheel projecting beyond said straight edge for manually adjusting the position of said member.

11. In a resistance unit, a one-piece sheet-metal casing having a substantially circular base with a section cut away to provide a straight edge, said base having a flange around the circular edge, a circular resistance element mounted in said casing adjacent said flange, an inwardly extending boss formed at the center of said base, a stud carried by said boss, a wheel pivoted on said stud and projecting beyond said straight edge of the casing, and means operated by said wheel for varying the resistance value of said element.

12. In a variable resistance unit, a circularly arranged resistance element, a manually rotatable disk arranged within the circular space defined by said element, said disk being provided with a radial bore within its periphery, and a yieldable contact arm mounted in said bore and pressed outwardly against said element.

13. In a variable resistance unit, a contact arm consisting of a pair of metal sleeves and a coil spring arranged between said sleeves, the ends of said spring being housed in said sleeves which are thus held apart by the spring, and a support for the parts of said arm.

14. In a variable resistance unit, a casing, a rotary disk mounted on said casing, a

resistance element mounted on said casing in such a way as to present a cylindrical wall around said disk, and a yieldable contact arm mounted loosely in the body of said disk and projecting from the edge thereof against said cylindrical resistance wall.

15. In a variable resistance unit, a pair of concentrically mounted conductors, a contact arm arranged radially between said conductors and having ends held yieldably against said conductors, and a rotary support for said arm for controlling the position thereof, said contact arm and said rotary support being so arranged that the contact arm exerts no pressure against said support.

16. The combination with a panel having a slot, of a casing secured to said panel adjacent said slot, a rotary disk mounted on said casing so that the rim of said disk extends through said slot for manual operation of the disk, a resistance element on said casing, and a contact arm carried by said disk and yieldably engaging said resistance element as the disk is rotated.

STANLEY D. LIVINGSTON.