Dec. 23, 1958 B. A. PURDY 2,866,054

MULTIPLE VARIABLE VOLUME CONTROL STRIP

Filed Sept. 16, 1955

Fig. 1

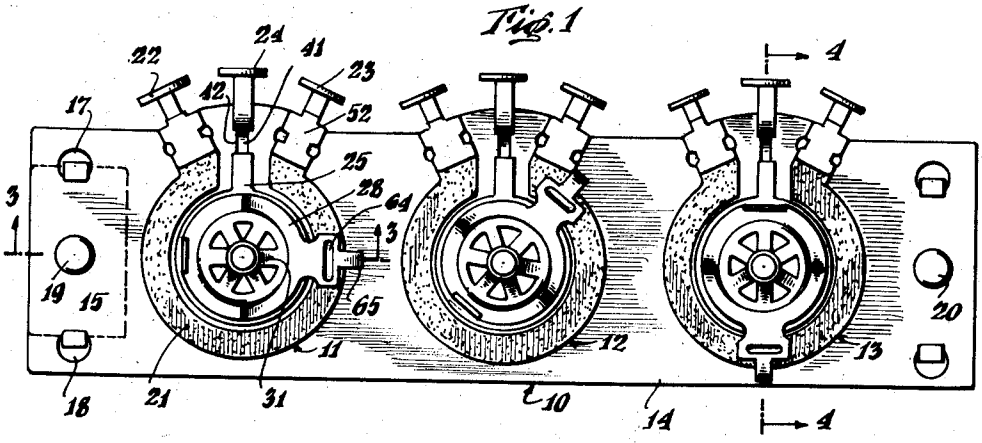


Fig. 2

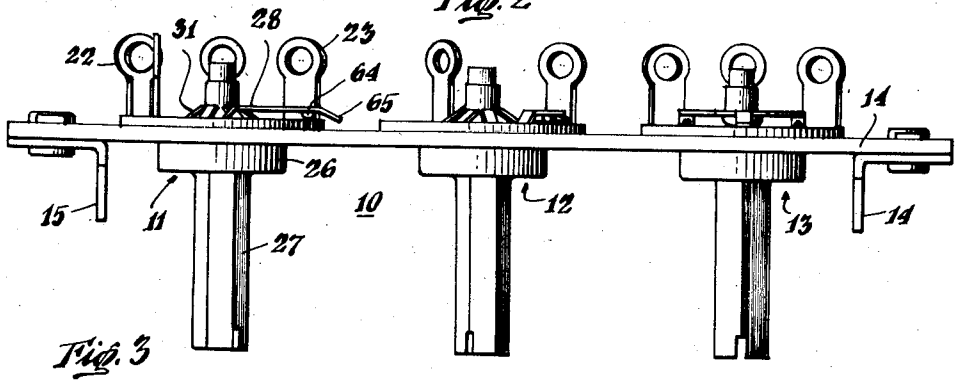


Fig. 3

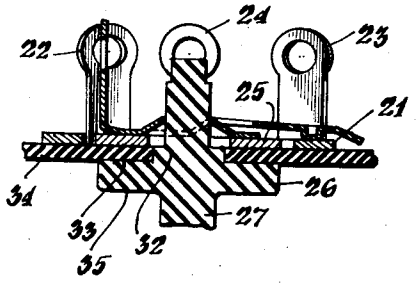


Fig. 4

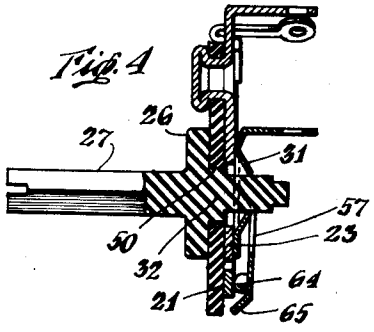


Fig. 5

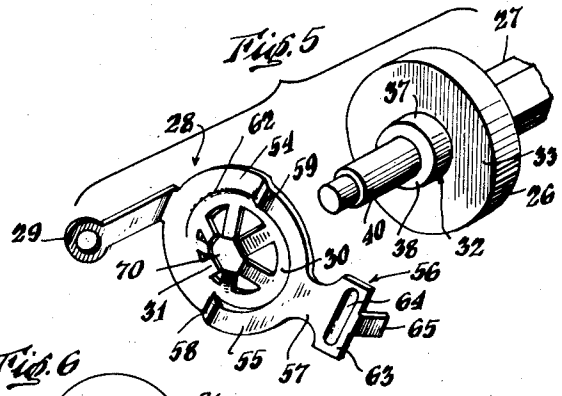
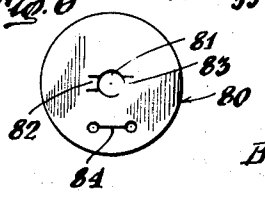


Fig. 6



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MULTIPLE VARIABLE VOLUME CONTROL STRIP

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Application September 16, 1955, Serial No. 534,813

4 Claims. (Cl. 201—55)

This invention relates generally to electrical control devices and has more particular reference to such means including those directed to improvements in variable resistance controls, such as are used in communication equipment and apparatus.

In the fields of communication, such as radio and television, it is desired that material and fabrication costs be maintained at a minimum and reduced wherever possible. The instant invention of multiple control assembly units incorporating individual novel carbon controls to form a bank of resistive devices of simplified construction meets the stated features of economy and flexibility. The strips of multiple carbon control units are adapted, moreover, for quick mounting and connection on printed circuits, the prevalence of which has greatly increased in electrical circuit fabrication and techniques. In addition, the multiple carbon control strips can be mounted in tandem to take up minimum space on crowded chassis.

By the present invention, new economies in the production of conventional, as well as printed electronic circuits, are made possible. The strips are adapted for single or multiple unit mounting. The novel construction of each control reduces the carbon control to its simplest form. The resistance wafers are mounted directly on a phenolic panel, whereby the cost for multiple units is substantially lower than that of a similar assembly of single controls. Further, the mounting of the controls is simple and fast. Shouldered tabs fixed to the ends of the control strip are adapted to mount the complete assembly to a chassis, as desired. The novel construction of the multiple units, moreover, provides a low cost method to obtain close tolerance fixed resistors in which highly constant resistance values are assured.

It is therefore an object of the present invention to provide a simplified construction of a variable resistance control device having characteristics of great stability and offering great economies in fabrication.

Still another object of the present invention is to provide a multiple resistance control device adapted for facile and ready mounting on conventional and printed circuit chassis.

Yet another object of the present invention is to provide a new and novel low cost, close tolerance type of variable and fixed resistor available in single and multiple units, which units are easily mounted in a most compact and efficient manner onto conventional and/or printed electronic circuit assemblies.

Another object of the present invention is to provide a new, simple and novel resistance control made and fabricated with a minimum of parts, yet having features of quality and construction commensurate with more expensive controls heretofore used to provide the same functions and results.

Another object of the present invention is to provide an efficient carbon control adapted for use in tandem or multiple configurations, which control, per se, is economically and simply constructed, providing savings in cost,

material and production, and which is adapted for use either as a variable or fixed control as mounted on conventional or printed circuit assemblies.

The invention, in another of its aspects, relates to the novel features and principles teaching the objects of the invention and to the novel principles employed herein whether or not these features and principles may be used in the said objects or in the said fields.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction and arrangement of parts substantially as hereinafter described, and as more particularly defined by the appended claims, it being understood that such in the precise embodiment of the disclosed invention may be made as come within the scope of the claims.

The accompanying figures of the drawing illustrate embodiments of the invention constructed in accordance with the best mode of the invention as presently devised for the practical application of the principles thereof, and wherein:

Fig. 1 is a plan view of a multiple control strip incorporating the novelly constructed carbon control resistances having the resistance wafers mounted directly on an insulative panel;

Fig. 2 is a vertical, perspective view of the multiple control strip as illustrated in Fig. 1 and as particularly adapted to show the simplified mounting of a plurality of carbon controls constructed in accordance with the invention and wherein the shaft and wiper relationship to the phenolic insulative panel is shown;

Fig. 3 is a horizontal, cross-sectional view of one of the controls of the invention as taken along line 3—3 of Fig. 1 as adapted to more fully show the many novel constructional features thereof;

Fig. 4 is a vertical, cross-sectional view of one of the controls of the invention as taken along line 4—4 of Fig. 1 and as adapted to more fully show the many novel constructional features thereof;

Fig. 5 is an exploded elevational view of the wiper mechanism of the novel carbon resistor control of the present invention as particularly adapted to illustrate the improved and novel constructional features thereof and as affording means whereby said wiper is held on the shaft of said control without the need for cumbersome riveting or staking means; and

Fig. 6 is a pictorial illustration of a dust cover placed over the carbon track of the control in order to prevent the accumulation of dust therein.

Generally speaking, the construction of the present multiple electrical control assembly, comprising individual controls such as carbon controls for use in television and radio apparatus, fulfills the long felt need for a bank of individual controls of low cost without any reduction in quality. The individual controls of the present invention have been so constructed that fewer parts are necessary and assembly costs are lessened by fabricating the resistance carbon wafers directly onto their insulative backing. These features in the control have been further enhanced by developing a novel sliding contactor assembly for wiping the wafer. The contactor assembly is held on a rotatable shaft by means of a plurality of upwardly converging ears which grip the lateral faces of an extension provided by a moulded shaft. Thus, in connecting the contactor assembly to the shaft, all that is needed is to press the contactor down on the shaft, whereby the ears will dig into the side faces of the shaft extension and will securely attach the contactor thereto, thus eliminating the need for costly staking or riveting means, formerly required.

Thus, the novel construction eliminates all unnecessary hardware and simplifies the assembly to such an extent

that only essential functional parts remain. On the strips of controls, moreover, to further carry out the provision for sturdy, efficient and quick mounting thereof, the construction affords a simple, inexpensive means of mounting the strips on the chassis and in tandem, so as to take up minimum space on crowded chassis through the use of a twist-tab type of mounting. Thus, in many instances control strips may be mounted each behind the other at a distance of approximately ½".

Referring now more particularly to the figures of the drawing, in which like reference numerals designate like parts, number **10** generally designates a strip of individual carbon controls **11**, **12** and **13**. The carbon controls are mounted on a thin strip of electrically insulative material **14**, here fabricated of phenol. Since each of the controls is similar in construction, the specific description of one of such controls will suffice to represent the construction of the others.

For mounting the assembly, each phenolic strip includes a plurality of mounting plates **14** and **15**, normally held within a series of apertures, such as **17** and **18**, and which may also be riveted to the strip by means of rivets **19** and **20**. Each control on the strip includes a horseshoe shaped carbon element or wafer **21**, a plurality of terminals **22** and **23** connected thereto, and a terminal **24** connected to a ground ring **25**. The rotor **26** of the control is integrally joined and moulded to a drive shaft **27** which is adapted to radially move a wiper assembly **28** along the tracks of carbon element **21**. The shaft may be of any desired length and accommodated for screw driver adjustment by means of a slot cut therein. The wiper assembly has a terminal **29** integrally joined thereto and includes an inner ring portion **30** from which extend a plurality of tongues or teeth, such as **31**, which, as hereinafter described, are adapted to clinch the wiper assembly to the moulded shaft in a substantially tight manner so as to move the assembly on the rotor upon radial excursion of the shaft.

In the construction of the multiple control strip, each resistor track **21** is directly formed on the phenolic strip in a horseshoe-like configuration and discretely spaced from one another. The track, per se, is concentric with a circular aperture **50** of a dimension just sufficient to allow an extension **32** of the rotor to penetrate therethrough in a manner such that surface **33** thereof abuts side **34** of strip **14** to rest thereagainst and to ride thereupon without wobble. As more fully shown in Figs. 3–5, the rotor and shaft are integrally moulded as a unitary assembly with shaft **27** being joined to side **35** thereof and circular extension **32** being centrally connected thereto at the opposite side **33** of the rotor. Extension **32** has a side wall **37** of a thickness substantially that of plate **14** which bears against the side of the aperture **50** to form a wobble-free joint. Extension **32** has a surface **38** to which secondary shaft **40** is centrally moulded and about which wiper **28** will be tightly held by means of spokes or fingers **31** of the inner ring portion **30** of the wiper assembly **28**. As shown in Figs. 3 and 4, a ground ring **25**, made of metal which may be silver-coated, rests underneath wiper assembly **28** and is concentric about aperture **50** formed in the phenolic base and also about secondary shaft **40**. Ground ring **25** lies flat against the phenolic base **14** and has a terminal **24** connected thereto and held by means of a portion **41** pushed through a slot **42** cut therein with the sides of the portion **41** forming overlapping ears to grip the base. Also, terminals **22** and **23** are connected to wafer **21** by means of metal bands or straps **51** and **52** staked to the phenolic base.

Wiper assembly **28**, which may be fabricated of brass, comprises an inner ring **30**, an outer semi-circular portion **54** integrally joined thereto, a semi-circular arm **55** and a finger section **56** joined to the outside circumference of the latter by means of a neck **57**. Circumference **62** of the inner ring **30** scores the metal so that arm **55** is capable of being resiliently separated upwardly from section **54** by means of inclines **58** and **59**.

As stated, finger **56** is joined to arm **55** by means of neck **57**, which at its opposite end is joined to a rectangular brush **63**, which has a declivity **64** formed therein to make contact with the carbon wafer upon rotation. An inclined stop **65** extends downwardly at an angle from the center of the brush and is adapted upon rotation of the rotor to provide limits to the radial excursion thereof by stopping against either of the terminals **22** and **23**.

The wiper assembly **28** is affixed to the rotor **26** by seating aperture **70** down over shaft **40**. Aperture **70** is the focus point for all the gripping fingers **31** of wiper assembly **28** and has a hexagonal aspect. As the assembly is pushed down over the moulded shaft, the tips of fingers **31** will tightly grip the outside surface of the shaft to dig into the same with a retention characteristic capable of firmly holding the wiper assembly to the rotor. This, thus, is a great advantage in that no other soldering, welding or staking means becomes necessary. This, of course, obviates costly assembly procedures and problems, heretofore necessary. In addition, the entire assembly has a resilience which makes for greater efficiency in wiper operation.

To preclude dust from gaining access to the control, a simple fiber-board dust cover is provided. The dust cover **80** comprises an annular fiber-board disc of thin cross-section. An aperture **81**, of a dimension capable of tightly fitting over the shaft, is provided centrally. Ears **82** and **83** are struck out from the sides of the aperture and these function to grip the circumference of the shaft. A dumb-bell shaped slot **84** is cut from the disc above the central aperture, which is thus capable of allowing terminal **29** to pass therethrough. All that remains is to slide the dust cover down over the shaft to shield the control and carbon wafer.

From the foregoing description of the novel control assembly, as taken together with the accompanying drawing, it will be evident that the invention provides improved resistance devices featuring aspects of simplicity of construction, ruggedness and low cost without sacrificing efficient operation and quality.

I claim:

1. An electrical resistance device comprising a phenolic insulative base of thin cross-section having a top and bottom side, said base having a circular aperture formed therethrough, a carbon resistive wafer concentric thereabout, a ground ring also concentric about said aperture, a rotor for said device riding on said top side of said base, a shaft connected to said rotor, said rotor further having an annular extension adapted to fit within said aperture with a surface of the rotor abutting said insulative base and riding thereon, the side wall of said aperture and said extension forming a bearing socket precluding wobble on the rotation of said shaft, a round secondary shaft connected to said extension, a wiper assembly having an inner ring, a contact arm integrally connected thereto with said wiper assembly joined in a hexagonal fashion to said secondary shaft by means of a plurality of separated fingers to turn with said rotor and to wipe said resistive track, said wiper assembly also riding on said ring, and terminals for said wiper assembly and said resistive track adapted to connect said device in an electrical circuit, one of said terminals being unitarily connected to and rotating with said assembly.

2. An electrical resistance device comprising an electrical insulative base having a top and bottom side, said base having a circular aperture formed therethrough, a resistive carbon track concentric thereabout on said bottom side, a rotor for said device, a shaft moulded to said rotor to form a one-piece construction, said rotor comprising a disc and having an annular extension centrally moulded thereto adapted to fit within said aperture with a surface of the rotor disc abutting said top side insulative base and riding thereon, the side wall of said aperture

and said annular extension forming a bearing socket precluding wobble on the rotation of said shaft, a round secondary shaft moulded to said extension to be unitarily formed therewith, a wiper assembly having a contact arm and a wiper finger connected to said secondary shaft by means of a plurality of integrally formed spring fingers gripping the same at a multiplicity of places thereabout so as to turn with said rotor and to wipe said resistive track, and terminals for said wiper assembly and said resistive track adapted to connect said device in an electrical circuit, one of said terminals being unitarily joined to said assembly.

3. An electrical resistance device comprising an electrical insulative base, said base having a circular aperture formed through the thickness thereof, a resistive horseshoe configured track concentric thereabout, a moulded rotor for said device, a shaft moulded to said rotor to form a one-piece construction, said rotor further having an annular extension of a thickness substantially the same as said base adapted to fit within said aperture with a surface of the rotor abutting said insulative base and riding thereon, the side wall of said aperture and said extension forming a bearing socket precluding wobble in the rotation of said shaft, a round secondary shaft connected to said extension, a wiper assembly having a contact arm connected to said secondary shaft by a plurality of gripping fingers so as to turn with said rotor and to wipe said resistive track, and terminals for said wiper assembly and said resistive track adapted to connect said device in an electrical circuit, one of said terminals rotating with said assembly.

4. An electrical resistance device comprising an electrical insulative base of a small thickness, said base having a circular aperture formed therethrough, a carbon track concentric thereabout, a one-piece moulded disc-like rotor and shaft for said device, said rotor further having an annular extension on said disc adapted to snugly fit within said aperture with a surface of the disc abutting said insulative base and riding thereon, the side wall of said aperture and said extension forming a bearing socket precluding wobble on the rotation of said shaft, a round secondary shaft moulded to said extension, a wiper assembly comprising an inner ring connected to a semi-circular concentric section, said latter section connected to a contact wiping arm joined to said secondary shaft by means of spring fingers only so as to turn with said rotor and to wipe said resistive track, a stop unitarily joined to said wiping arm for limiting the radial excursion thereof, and terminals for said wiper assembly and said resistive track adapted to connect said device in an electrical circuit, one of said terminals being connected to and rotating with said assembly.

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