

July 31, 1928.

1,678,892

H. J. WIEGAND

RESISTANCE CONTROL DEVICE

Filed May 15, 1922

2 Sheets-Sheet 1

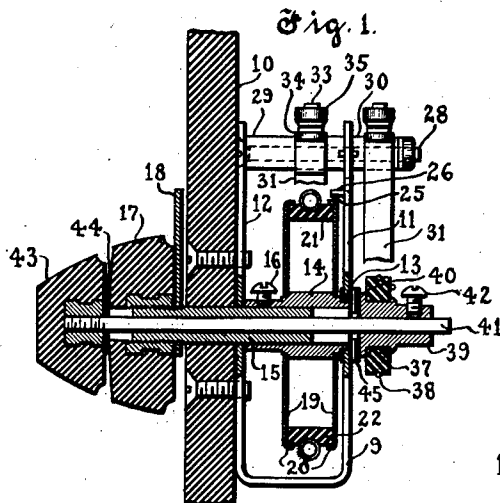
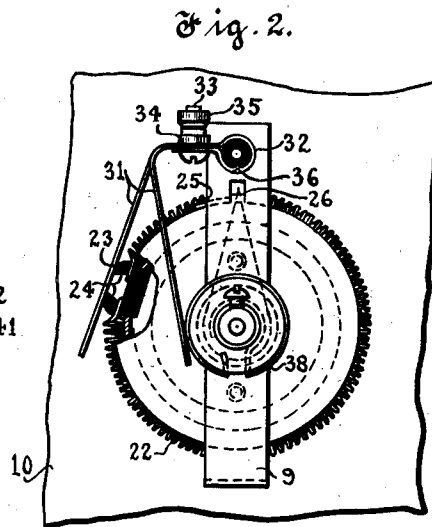


Fig. 3.

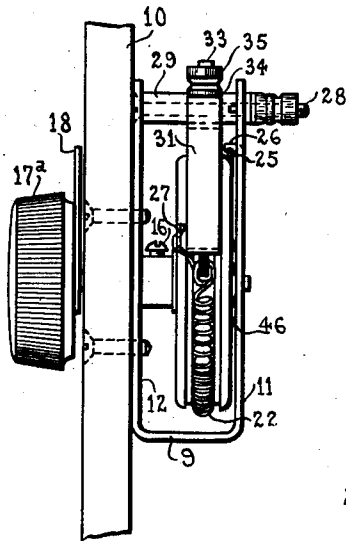


Fig. 4.

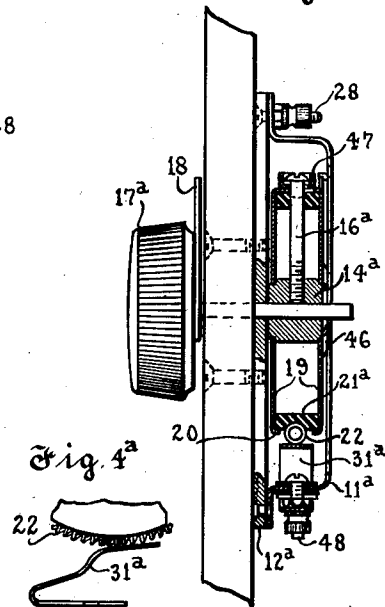


Fig. 1^a

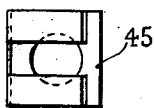


Fig. 3^a



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2 Sheets-Sheet 2

Fig. 5.

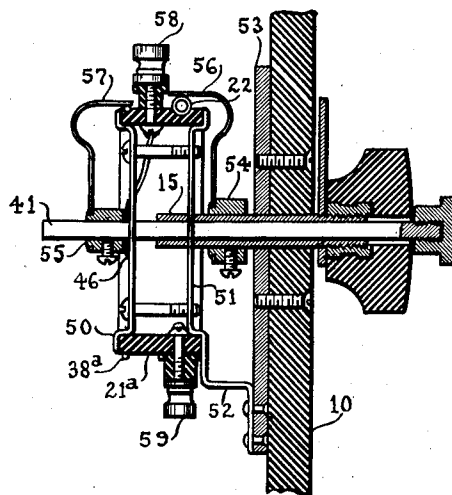
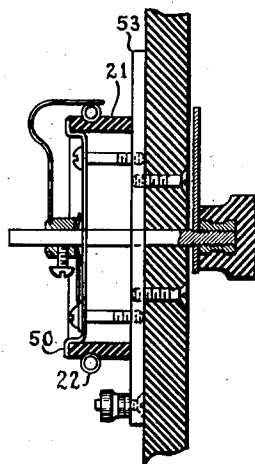


Fig. 6.



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RESISTANCE-CONTROL DEVICE.

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This invention relates to resistance control devices and, while not limited thereto, is particularly applicable to filament or other rheostats employed in radio and similar apparatus.

In such apparatus, wherein many delicate and extremely sensitive instrumentalities are necessarily employed, it is essential that all the associated parts, including particularly the control rheostats, be of absolute reliability, smooth and substantially noiseless in operation and capable of critical adjustment without subjecting the controlled circuit to sudden changes in electrical condition.

The present invention has as an object that of providing an improved resistance control device for such and similar purposes exhibiting the foregoing desirable characteristics among others.

Another object is that of providing a rheostat, particularly applicable to control of audion filament currents and the like comprising simple, durable and rugged parts compactly and conveniently arranged.

Another object is that of providing such a rheostat possessing over other types certain novel structural and operative advantages.

Another object is that of providing such a rheostat wherein provision is made for ready mounting upon and assembly with reference to a suitable panel or other support and for easy and accurate range adjustment with respect to a fixed dial or the like.

Another object is that of providing such a rheostat wherein the various circuit making and circuit maintaining parts are of improved construction affording ease and convenience of installation and complete reliability of operation.

Other objects and advantages will hereinafter appear.

In the accompanying drawing, wherein are illustrated certain of the embodiments which the invention may assume in practice,

Figure 1 is a vertical sectional view of a device constructed in accordance with my invention;

Fig. 1^a comprises a front and an end view illustrating in detail an element of Figs. 1 and 2;

Fig. 2 is a rear elevational view of the construction of Fig. 1;

Fig. 3 is a side elevational view of a simplified construction;

Fig. 3^a comprises a front and a sectional view illustrating in detail an element of Fig. 3;

Fig. 4 is a vertical sectional view illustrating a slightly modified construction;

Fig. 4^a is a side view illustrating certain details of Fig. 4; while,

Figs. 5 and 6 are side elevational views illustrating further slightly modified constructions, certain portions being shown in section.

Referring to the drawing, and particularly to Figs. 1 and 2 thereof, the construction there depicted comprises essentially a frame member 9 to be secured to a mounting plate or panel 10, ordinarily upon the back thereof, a main rheostat and an associated vernier rheostat supported by said frame, and independent operating devices for the rheostats. Each rheostat comprises a resistor and a contactor carried by the frame in a manner providing for relative movement of such resistor and contactor.

More specifically the frame 9 is preferably of U-formation the parallel portions 11 and 12 thereof being provided with centrally located aligned openings, the opening in the portion 11 being relatively enlarged to receive and provide a bearing for a reduced portion 13 of hub member 14 and the opening in the portion 12 of the frame similarly providing a support and bearing for a tubular shaft 15 which is adapted to extend within the hub 14 and to be rigidly clamped thereto for movement of the latter by the former. A set screw 16 or similar device provides for such clamping and also provides for axial and angular relative adjustment of said hub and shaft. In practice the shaft 15 preferably extends through the mounting plate 10 and carries therebeyond a perforated knob 17 and a pointer 18.

Said hub 14 is provided with an enlarged portion located intermediate its ends and provided with abrupt outwardly facing shoulders. A pair of similar and interchangeable end caps 19 which in practice may preferably comprise metal stampings,

are carried by the hub member, being swaged, spun or otherwise rigidly held against the aforementioned shoulders of the hub, whereby said shoulders serve for accurate spacing of the end caps from one another. Each of said caps is provided with a circumferential flange 20 extending inwardly toward the other.

An insulating annulus 21, composed preferably of fibre, is adapted to be held between the end caps and within the circumferential flanges thereof, whereby the end caps provide for permanent and rugged mounting of said annulus and maintain the shape thereof against any tendency toward distortion, whereas additional interior supporting and holding means for the annulus may be employed. Said annulus is provided with an exterior circumferential groove located preferably midway of the axial length thereof, said groove being adapted to receive a helically coiled resistor 22 and to maintain the latter permanently spaced from both of said end caps. Said annulus 21 is further provided within the groove thereof with a suitable mortise or depression to receive an insulating link 23, also preferably composed of fibre, said link having substantially radial projections 24. The resistor element is provided terminally with suitable loops or eyes to engage about said projections whereby the link provides for holding the resistor stretched about the annulus and within the groove of the latter, whereas the tension of the resistor serves to maintain the link seated within its mortise. The projections 24 of the link are further preferably elongated beyond the contour of the resistor whereby in a given relative position of the annulus and the rheostat contactor as illustrated in Fig. 2, said projections serve to lift said contactor out of engagement with the resistor thereby interrupting circuit through the rheostat.

The end caps are furthermore each provided with an outstruck lug 25, such lug of one of said end caps being adapted to cooperate with an instruck lug 26 of the frame member 11 for limiting rotation of the resistor support and its connected parts as illustrated in Figs. 1 and 3.

Each of the end caps is further provided with a suitable projecting tongue 27 or the like, the tongue of one of said end caps being adapted to receive and retain a terminal portion of the resistor for permanent electrical connection therewith.

The parallel portions 11 and 12 of the frame 9 are further provided respectively with terminally located openings to receive a screw bolt 28 having a nut. Insulating spacer sleeves 29 and 30 are mounted upon said bolt 28 respectively within and without the frame 9 as illustrated, whereby said bolt, sleeves and nut serve to maintain the

formation of the frame and to lend rigidity thereto. The frame member 11 is provided at a point adjacent its aforescribed terminally located opening with an instruck lug and an outstruck lug adapted to take within corresponding notches of the respective insulating sleeves 29 and 30 for fixing the relative angular position of said elements. The frame member 12 is additionally provided on either side of the shaft with suitably spaced screw threaded openings to receive mounting screws substantially as illustrated.

The rheostat fixed contactors 31 are mounted upon the respective insulating sleeves 29 and 30 as illustrated particularly in Fig. 1, and each comprises an integral strip of resilient conductive material, such for example as phosphor bronze, shaped to provide a loop or eye 32 to surround its associated insulating sleeve the parallel reflexed portions of the contactor being provided with openings to receive a screw bolt 33 having a nut 34 and a further terminal cap 35, whereby said bolt serves both for clamping the contactor in position about the sleeve and also as a conductor terminal for the rheostat all as illustrated particularly in Fig. 2.

The looped portion of each contactor is provided with an instruck portion 36 adapted to take within a suitable recess in its associated sleeve for fixing the relative angular position of said elements. The extended portion of the contactor is bent to make a suitable angle with the securing portion thereof, the resilience of the material being utilized for maintaining a positive resilient contact with the resistor element. In practice the contactors may be preferably formed by a stamping operation and constructed similar and interchangeable.

The vernier rheostat may preferably comprise an annular base 37, preferably of fibre, having a circumferential groove and a resistor 38 lying in said groove and adapted to coact with its associated fixed contactor 31 in a manner quite similar to that of the main rheostat just described, it being observed that the vernier resistor comprises but a single turn of resistance material encircling the base and of a length preferably equal to that of several individual turns or coils of the main resistor.

Said base 37 is mounted upon a hub member 39, the latter being provided with an annular flange 40 against which the base 37 is swaged, spun or otherwise rigidly held, one end of the resistor 38 being preferably clamped between said base and said flange as illustrated for securely anchoring this terminal of the resistor in permanent electrical contact with said hub. The other resistor terminal is preferably inserted and clinched within a suitable opening in the

base 37 as illustrated particularly in Fig. 2.

The hub member 39 is adjustably mounted outside the frame 9 upon a reduced shaft 41 by means of a set screw 42, the manner of mounting being similar to that of the hub member 14. The shaft 41 in practice is of such length as to extend entirely through and beyond the frame 9 within and through the tubular shaft 15 and through the knob 17, a vernier knob 43 being rigidly secured upon the extreme forward end of said shaft 41. A relatively thin washer 44 of steel or the like is preferably interposed between the knobs 17 and 43 as illustrated.

A contacting clip 45 composed of resilient material, such for example as phosphor bronze, is sprung about the frame member 11 between the hubs 14 and 39 and provided with an opening to receive the reduced portion 13 of the former hub for permanent securing of said clip. The parallel portions of the clip are biased away from one another whereby the same are adapted to engage and electrically connect the adjacent hub faces positively yet resiliently. Also due to such resilience the contacting device serves to bias the shaft 41 and knob 43 backwardly of the panel whereby said knob is maintained at all times in close proximity to the knob 17 and the parts are held against axial relative movement.

The circuit through the rheostat device may be traced from the terminal 35 of the main rheostat contactor, through said contactor and through that portion of the resistor 22 determined by the main rheostat setting, thence by way of the permanent connection 27 to the left end cap 19, as shown particularly in Fig. 3, to hub 14, thence through the contacting clip 45 to hub 39 and the terminal of vernier resistor 38 which is clamped thereto and through that portion of said resistor determined by the vernier setting to the vernier fixed contactor and to the terminal thereof.

In assembling the complete device from its several units, the hub 14, carrying its associated parts, including the contacting clip 45, is sprung within the frame 9, thereafter the bolt 28 and insulating sleeves 29 and 30 are assembled with the frame, the latter being subsequently mounted upon the plate 10. Shaft 15 carrying its knob and pointer is then inserted through said plate and within the hub 14 and secured thereto in suitable axial and angular relation by means of the screw 16. Shaft 41 is then inserted backwardly within the tubular shaft 15, and hub 39 is assembled upon shaft 41 and secured by means of set screw 42. The fixed contactors 31 are thereafter assembled and suitably located with reference to their associated insulating sleeves by means of the lugs and depressions aforedescribed.

The construction illustrated in Fig. 3 is

in most respects similar to that just described except for omission of the auxiliary or vernier rheostat and the parts and features directly associated therewith or necessitated thereby.

A resilient cup washer 46, composed preferably of phosphor bronze or the like, is arranged to surround the reduced portion 13 of the hub 14 for insuring suitable electrical connection of said hub to the frame 9 and also for resiliently holding the rotative parts against axial movement relative to the fixed parts, the action being quite similar to that of the clip 45 of Fig. 1.

The construction illustrated in Fig. 4 is also in most respects similar to that of Fig. 3. However, in the construction of Fig. 4, certain parts have been modified to provide an exceedingly compact arrangement. Thus the set screw 16^a is arranged to extend through the annulus 21^a between the end caps 19 and through a central portion of the hub 14^a, thereby enabling material shortening of said hub with corresponding reduction in thickness of the frame structure. In practice the head of said set screw 16^a is preferably received within and in radially spaced relation to a countersunk insulating spacer or washer 47 which serves to insulate said bolt from the end caps 19 and may also serve to perform the aforedescribed circuit interrupting function of the link 23. In practice the terminal portions of the resistor 22 may be mechanically anchored either to the spacer 47 or directly to the annulus 21^a as desired.

Also in this instance the frame structure comprises separable sections 11^a and 12^a to be secured together by means of suitable screws, the upper of which corresponds in function to the screw bolt 28 of Fig. 3, and may be similarly utilized as one of the terminal studs for the rheostat. The fixed contactor 31^a is preferably of reflexed construction and is secured to the frame structure, in insulated relation thereto as illustrated, by means of a terminal screw 48.

In the construction illustrated in Fig. 5, both the main resistor 22 and the vernier resistor 38^a are mounted within suitably spaced grooves of a single insulating annulus 21^a, said annulus being rigidly clamped between a pair of flanged fixed frame members 50 and 51, the member 51 being preferably extended or continued to form an offset bracket 52 for support of the annulus and its associated parts either by direct securing of said bracket to the mounting plate 10 or to a supporting plate 53 which is itself screwed to the mounting plate substantially as illustrated.

The frame members 50 and 51 as well as the supporting plate 53 and the mounting panel 10 are all provided with aligned openings to receive the vernier rheostat shaft 41,

whereas the openings of the frame member 51 and the plates 53 and 10 are enlarged to receive also the main rheostat shaft 15, the latter being of hollow construction to surround the vernier shaft and both of said shafts being provided upon the opposite side of the plate 10 with suitable operating knobs and a pointer as aforedescribed.

Said shafts 15 and 41 are provided respectively with substantially similar hub members 54 and 55 having individual set screws providing for axial and angular adjustment of the hubs with reference to their respective shafts. The contactors 56 and 57 are spun or otherwise rigidly secured upon the respective hubs 54 and 55 in such relation as to make contact respectively with the main and vernier resistors as illustrated and to be moved with reference thereto upon movement of their respective associated knobs.

A resilient cup washer 46 is interposed between the hub 55 and the frame member 50 the functions of said washer being similar to those of the correspondingly designated element of the other figures aforedescribed. Suitable terminals 58 and 59 are mounted upon opposite sides of the insulating annulus 21.

The circuit of the rheostat may be traced from terminal 59 to resistor 22 and through a portion thereof determined by the main rheostat setting, thence through contactor 56, through shafts 15 and 41 and contactor 57 to resistor 38^a, thence through a portion of said latter resistor determined by the vernier setting to terminal 58.

The foregoing construction and arrangement thus provide for rigid mounting of the resistor support and for outboard mounting of the contactor hubs with reference to such support, while affording full angular and axial adjustability of the individual knobs and shafts with reference to the other elements.

The construction of Fig. 6 is in most essential respects similar to that of Fig. 5, the vernier resistor and its associated and necessitated parts, however, being omitted. Also the frame member 51 together with its integral bracket support 52 is omitted, the mounting plate 53 being utilized in lieu thereof for providing a support upon one side of the insulating annulus 21. This construction embodies the essential advantages of the construction of Fig. 5 together with that of extreme simplicity and compactness. It is of course obvious that if desired the annulus and resistors of Fig. 5 may be substituted for the corresponding elements of Fig. 1, the frame 9 being slightly extended axially to receive both fixed contactors therewithin.

It is also apparent that other modification and arrangement including variation in size

of the interchangeable or substitutable parts may be effected without departing from the spirit and scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In resistance control apparatus, the combination with a rigid metallic frame, of a plurality of independently operable sets of resistance varying elements carried by said frame, such elements of each set comprising a resistor and a directly engaging contactor and operating means for said individual sets of elements comprising independently rotatable concentric shafts carried by said frame and means for securing certain of the elements of each set to the individual shafts and for adjusting said shafts axially and angularly with reference to said elements and said frame.

2. The combination with an insulating ring having a depression, of an insulating member having a portion located in said depression and a part projecting therefrom and a helical conductor stretched about said ring and having a loop to engage about said projecting portion of said insulating member.

3. The combination with an insulating ring having a circumferential groove and a depression, of an insulating link having a part located in said depression and spaced parts projecting outwardly beyond the base of said groove, a helical conductor stretched about said ring and having parts located within said groove, said conductor having terminally located loops to engage about the individual projections of said link for securement of said elements in assembled relation.

4. The combination with an insulating ring having a circumferential groove and a depression, of an insulating link having a part located in said depression and spaced parts projecting outwardly beyond the base of said groove, a helical conductor stretched about said ring and having parts located within said groove, said conductor having terminally located loops to engage about the individual projections of said link for securement of said elements in assembled relation, and a conductive support clamped about the ends of said ring and spaced thereby from said conductor.

5. The combination with an insulating ring having a circumferential groove and a depression, of an insulating link having a part located in said depression and spaced parts projecting outwardly beyond the base of said groove, a helical conductor stretched about said ring and having parts located within said groove, said conductor having terminally located loops to engage about the individual projections of said link for securement of said elements in assembled relation, and a pair of similar and inter-

changeable conductive supporting members clamped about the ends of said ring and spaced from said conductor by the material of the ring, the individual supporting members having means providing for permanent electrical connection of a terminal portion of said conductor thereto.

6. The combination with a rigid metallic frame of substantially U-shape, of relatively movable resistance varying elements carried by and between the parallel arms of said frame, certain of said elements being electrically connected with said frame, an oscillatable shaft carried by said frame, means for securing certain of said resistance varying elements to said shaft and resilient means to bias said shaft in a given axial direction with reference to said frame.

7. The combination with a rigid metallic frame, of a plurality of independently operable sets of relatively movable resistance varying elements carried by said frame, certain of said elements being electrically connected with said frame, individual operating shafts for said sets of elements also carried by said frame, and means for biasing the adjacent shafts axially and oppositely with reference to said frame.

8. The combination with a rigid metallic frame, of a plurality of independently operable sets of relatively movable resistance varying elements carried by said frame, certain of said elements being electrically connected with said frame, individual operating shafts for said sets of elements also carried by said frame, and means for biasing the adjacent shafts axially and oppositely with reference to said frame, said means comprising a resilient element surrounding certain of said shafts and tending to expand axially thereof.

9. In an audion filament rheostat or the like, the combination with a rectangular rigid frame having aligned openings in certain of its parallel sides, of a hub member located within said frame and having an enlarged central portion and a flange to be sprung within one of said openings, a shaft extending through another of said openings and within said hub, means for securing said hub to said shaft and providing for axial and angular relative adjustment thereof, a pair of flanged conductive members spun upon said hub and spaced from one another by said enlarged portion thereof, an insulating ring clamped between said conductive members for retention by the flanges thereof, a conductor carried by said ring and spaced from said conductive members by the material of the ring, a terminal contactor carried by said frame for co-operation with said resistor, and means biasing said shaft axially with reference to said frame.

10. In an audion filament rheostat or the like, the combination with a rectangular

rigid frame having aligned openings in certain of its parallel sides, of a hub member located within said frame and having an enlarged central portion and a flange to be sprung within one of said openings, a shaft extending through another of said openings and within said hub, means for securing said hub to said shaft and providing for axial and angular relative adjustment thereof, a pair of flanged conductive members spun upon said hub and spaced from one another by said enlarged portion thereof, an insulating ring clamped between said conductive members for retention by the flanges thereof, a conductor carried by said ring and spaced from said conductive members by the material of the ring, an independently operable shaft extending within and through said former shaft and hub, a second resistor carried by said second shaft and adjustable axially and angularly thereof, a pair of terminal contactors carried by said frame in insulated relation thereto and to one another for co-operation with said individual resistors, and means biasing said shafts axially in opposite directions.

11. In a resistance control device, in combination, a stationary metallic support, a plurality of contactors fixed thereto but insulated therefrom, and a plurality of electrically connected resistors movable independently of one another with reference to the several contactors while maintaining electrical contact therewith individually.

12. A rheostat for panel mounting, comprising a frame to be secured to the panel, a fixed contactor carried by the frame, a shaft journaled in the frame and adapted to penetrate the panel, a rotor to be secured to said shaft within said frame, a resistor fixed to said rotor and adapted to maintain contact with said contactor upon movement of said shaft, an operating handle fixed to said shaft and a releasable connection between said shaft and said rotor providing for both axial and angular adjustment of said handle with reference to said resistor and contactor.

13. In resistance control apparatus, the combination with a resistor element, of supporting and insulating means therefor comprising an intermediate circular member of insulating material to receive said resistor thereabout, circular end members of greater diameter than said intermediate member and means for rigidly securing said end members upon opposite sides of and substantially in axial alignment with said intermediate member.

14. In resistance control apparatus, in combination, an insulating support comprising an intermediate circular member of insulating material, circular end members of greater diameter than said intermediate member and means for rigidly securing said end members upon opposite sides of and sub-

stantially in axial alignment with said intermediate member, a resistor element to be wrapped and secured about said intermediate member between said end members and
5 having parts to project radially beyond said end members and a contactor to coact with said projecting parts of said resistor element.

10 15. The combination with a conductive supporting frame, of a plurality of independently operable sets of resistance varying elements carried thereby, and individual operating means for said elements comprising operating shafts in direct electrical con-

tact with one another and with said frame. 15
16. The combination with a rigid frame, of a plurality of independently operable sets of relatively movable resistance varying elements carried by said frame, individual operating shafts for said sets of elements also
20 carried by said frame in electrical connection therewith, and means for biasing the adjacent shafts axially and oppositely with reference to said frame.

In witness whereof, I have hereunto sub- 25
scribed my name.

HENRY J. WIEGAND.