Nov. 5, 1935. N. C. SCHELLENGER 2,020,000

CIRCUIT CONTROLLER

Original Filed Feb. 25, 1931 2 Sheets-Sheet 1

Fig. 1.

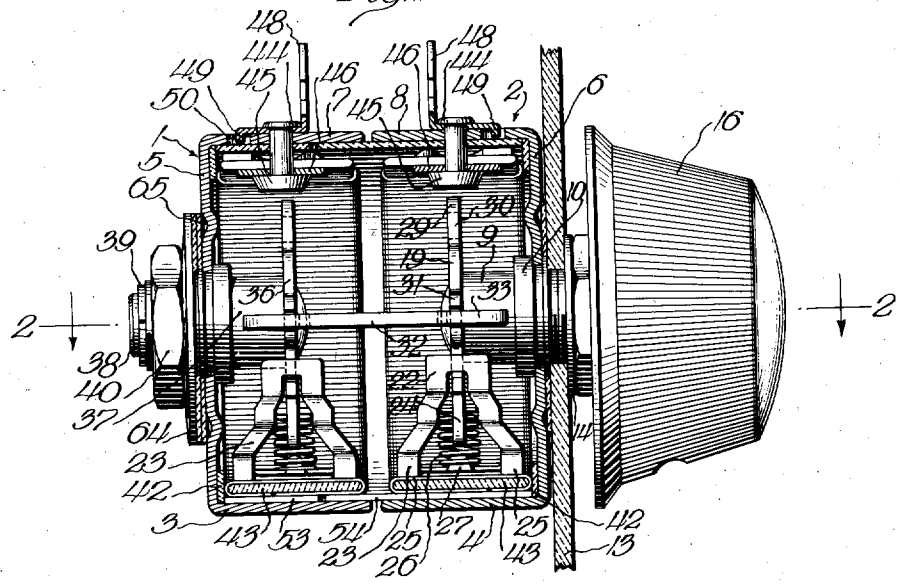
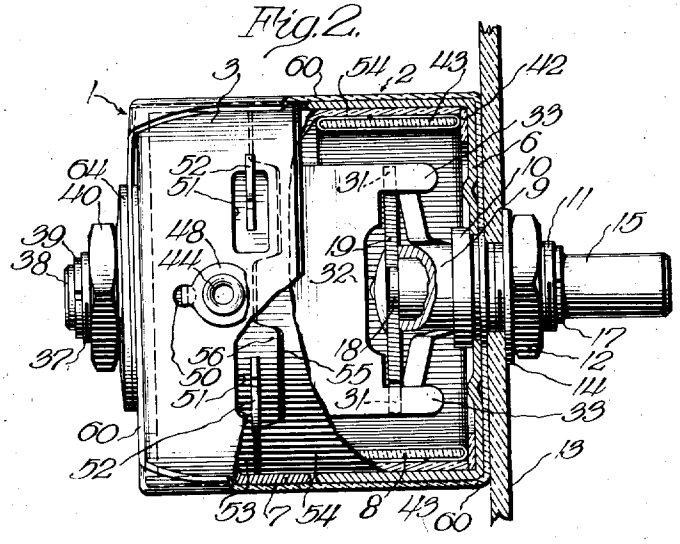


Fig. 2.



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Fig. 3.

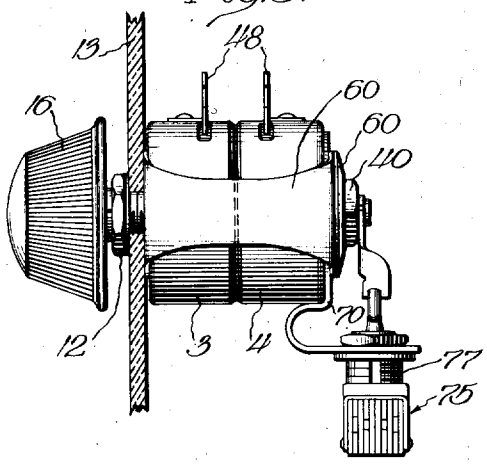


Fig. 7.

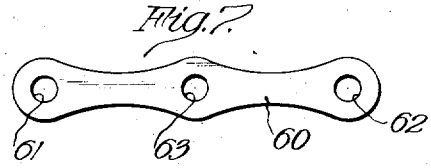


Fig. 6.

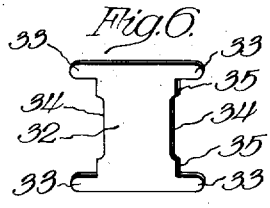


Fig. 5.

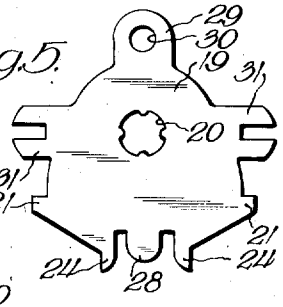


Fig. 4.

Fig. 8.

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UNITED STATES PATENT OFFICE

2,020,000

CIRCUIT CONTROLLER

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Original application February 25, 1931, Serial No. 518,281. Divided and this application March 31, 1932, Serial No. 602,363

8 Claims. (Cl. 201—55)

This invention relates to circuit controllers, and more particularly to circuit controllers arranged for tandem operation through rotation of a single control member, for use in radio equipment and the like.

This invention is a division of my copending application, Serial No. 518,281, filed February 25, 1931, and in its preferred embodiment, is directed to a plurality of circuit controllers provided with coupling members therebetween, and housed in an enclosed dust-proof casing, the coupling member between the respective controllers being so constructed as to prevent lost motion therebetween, and to provide positive conjoint movement of both controllers upon the rotation of the actuating member.

One object of my invention is to provide a pair of rheostats or circuit controllers, of similar design, and possessing the same operating characteristics, each mounted within a cup-shaped shell, the open ends of the shells being in facing concentric relation. A coupling member, preferably formed of insulating material, and comprising a stamped planar strip, is positioned between, and engages the respective actuating arms of the rheostats. The housing or shells are held in firm concentric engagement by means of a binding strip of fiber which encircles the shells and is secured thereto. The enclosed casing is made dustproof by means of the notched engagement of the insulating liners disposed within each of the respective shells.

Another feature of the present invention resides in the particular formation of the actuating arms of the rheostat to receive the coupling member therebetween in such manner that lost motion between the rheostats during conjoint movement thereof will be prevented. As more fully disclosed in my copending application, mentioned above, the contacting means carried by the actuating arms have certain novel features of operation which are retained in the present invention, such as the manner of making contact, and the switching arrangement for short circuiting only a portion of each turn of the resistance wire as the contactor is moved therealong. Also, the particular formation of the operating parts of the rheostat, and the manner of assembling the parts, are more fully discussed in my copending application, Serial No. 602,007, filed March 30, 1932.

In connection with the provision of a plurality of controllers mounted for conjoint movement, I also provide an operating mechanism for opening and closing the circuit in which the controllers are connected. This mechanism comprises an operating lever adapted for conjoint rotation with the actuating shaft, which lever is adapted to engage a snap switch carried by the controller assembly for closing the circuit upon initial movement of the controller away from its off position, and before the resistance has been appreciably varied, and which opens the circuit as the controller returns to its off position. It is contemplated that the end turns of the rheostat may be short circuited as by means of a metal foil, contact member or the like, as described more fully in my copending application, Serial No. 602,362 filed March 31, 1932, in order that no resistance change will be effected during opening or closing of the switch. Numerous other objects and advantages of my invention will appear more fully from the following detailed description, which, taken in connection with the accompanying drawings, will disclose to those skilled in the art the particular construction and operation of a preferred form of the invention.

In the drawings:

Figure 1 is a sectional view of one form of my invention;

Figure 2 is a partial sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is an elevational view of circuit controller provided with a switch operating mechanism;

Figure 4 is an enlarged partially sectioned view of the controller shown in Figure 3;

Figure 5 is a detail plan of the actuator arm for the rheostats;

Figure 6 is a perspective elevation of the coupling member disposed between the actuator arms of the respective rheostats;

Figure 7 is a detail view of the fiber binding strip for coupling the rheostat housing or shells together; and

Figure 8 is an end view of the shaft and switch operating lever.

Referring now in more detail to the drawings, in Figure 1 I have shown the dual or tandem unit, comprising the circuit controllers or variable resistance devices indicated generally by the reference numerals 1 and 2. Each of these units is provided with a cup-shaped shell member, the shell member for unit 1 being indicated by the reference numeral 3, and the shell member for unit 2 being indicated by reference numeral 4, which shell units have the end walls 5 and 6 respectively and the cylindrical flange portions 7 and 8.

The end wall 6 of unit 2 is provided with an

opening to receive the sleeve 9, the sleeve having a flanged collar 10 adapted to engage the inner surface of the end wall 6. The projecting threaded portion 11 of the sleeve 9 receives a nut member 12 for securing the sleeve to a panel member 13, there being a washer 14 interposed between the nut 12 and the panel 13. This provides means for securing the sleeve securely to the panel member, and for thus securing the shell 4 of the unit 2 to the panel member, which panel member may preferably comprise a metal plate, suitably grounded, or an insulating panel.

Extending through the sleeve 9, and rotatable therein, is the actuator shaft 15, which is provided at its outer portion with a control or actuating knob 16 suitably secured thereto in a known manner. The shaft 15 is provided with an annular groove, which receives a split ring clamping member 17, the member 17 being adapted to be shrunk or deformed into the groove to form a collar therewith, this collar bearing against the end of the threaded portion 11 of the sleeve 9 for the purpose of preventing longitudinal movement of the shaft 15 inwardly through the sleeve.

At its inner end, the shaft 15 is provided with a reduced portion 18, which receives an actuating arm or plate 19, the plate 19 bearing against the shoulder formed on the shaft 15 and also against the inner end of the sleeve 9 for the purpose of preventing endwise movement outwardly of the housing by the shaft 15, the plate 19 and the split ring 17 serving to limit end play of the shaft in either direction. The inner end of the shaft 15 is spun over or riveted to engage the surface of the actuator arm 19, and suitable radial projections formed in the aperture of the arm 19, this aperture being indicated by the reference numeral 20 in Figure 5, are engaged thereby to secure the plate 19 in non-rotative engagement with reference to the shaft 15.

As shown more clearly in Figure 5, the plate 19 is provided with the radially angularly spaced hook members 21, 21, which are adapted to be engaged by suitable yokes 22 carried by the contact shoe 23. The yokes 22 engage over the hooks 21 and the stop projections 24 of the actuator arm are adapted to project therethrough for the purpose of limiting rotation of the arm. As shown in more detail in Figure 1, the contactor shoe 23 is provided with the runners or contacting surfaces 25, and is telescopically mounted with respect to the actuator arm 19 by means of the spring pressure member 26, which fits about a suitable extending lug portion 27 provided between the contact engaging surfaces 25, and which is formed integral with an equalizer bar extending therebetween for equalizing the spring pressure between the two contacting surfaces 25. The spring is biased at its other end about a projecting tab member 28 formed on the plate member 19, and the shoe is so mounted with respect to the arm 19 as to have universal movement thereabout.

The particular construction of the contacting shoe, and its mounting with reference to the actuator arm is more fully disclosed in my copending application, Serial No. 518,281, filed February 25, 1931.

Referring again to Figure 5, it will be noted that the actuator arm 19 is also provided with an extending tongue member 29, which has an aperture 30 formed therein. The aperture 30 is adapted to receive an operating pin for operating a snap switch, when the rheostat or circuit controller 2 is used as a single unit volume control and switch. The arm 19 is also provided with a pair of oppositely extending slotted tongues 31, 31, which, as shown in Figures 1 and 2, are adapted to receive the coupling member 32, the coupling member 32 being provided with extending tongue portions 33 which engage the slotted tongues 31 for the purpose of non-rotatably securing the coupling member to the actuator arm 19.

Referring in detail to Figure 6, it will be noted that the coupling member 32 is provided with four such extending tongue members 33, and is provided with a central portion of reduced width, having the cut-out portions 34 formed therein, these portions 34 fitting over the riveted heads of the actuating shaft 15. The coupling member is adapted to be supported in a plane normal to the plane of the actuator arm 19 by the engagement of the tongues 33 in the slotted members 31. The thickness of the coupling member 32 is such as to provide a very small clearance with the width of the slotted notches in the tongues 31. The shoulders 35 formed between the tongues 33 and the notched portion 34 of the coupling member 32 are spaced a slight distance from the corresponding face of the actuator 19, and the distance between the inner edges of the ears or projections 33 is substantially the same as the distance between the notches in the slotted tongue 31 of the actuator, providing only a slight clearance necessary for universal joint action. The coupling member 32 is composed of an insulating material, such as a phenolic compound, which may be molded to form, or it may comprise a stamped piece of fiber, or the like.

The coupling member 32 serves to couple the actuator 19 with the actuator arm 36 of the circuit controller unit 1. This actuator is the same in all respects as the actuator 19, and is provided with the same type of contacting shoe 23. A sleeve 37 extends through the end wall 5 of the unit 1, and serves as a bearing for the shaft 38 upon which the actuator 36 is mounted. The coupling member 32 engages the actuator 36 in the same manner as the actuator 19 is engaged, and serves to provide conjoint movement therebetween. The shaft 38 is locked against endwise movement by means of the split clamping ring 39, corresponding to the split ring 17 of shaft 15. The sleeve 37 is swaged into place for the purpose of securing the sleeve in abutting relation with respect to the end wall 5 of the unit. A suitable nut 40 is threaded upon the extending portion of the sleeve for a purpose to be described hereinafter. The two actuators 19 and 36 are thus accurately keyed together for angular motion, but possess a surprisingly high degree of flexibility for universal motion. The relatively great radial extent of the coupling and exceedingly small clearances which is possible to obtain without causing binding, yet allowing relatively great freedom of torque, gives close angular coupling with exceptional universal motion characteristics.

Considering now in detail the assembling of the fixed part of the circuit controllers, each of the units 1 and 2 is provided with a flat annular insulating washer 42, which is positioned against the end walls 5 and 6 thereof. The washers 42 serve to space the resistance strips 43 of each of the units from contact with the end walls. The resistance strips 43 each comprise a strip of insulating material upon which is wound a fine wire coil. The insulating strips are more fully described in my copending application, Serial No. 602,007, filed March 30, 1932. Suffice it to say that the resistance strips 43 are concentrically

disposed within the housings 1 and 2, and the abutting ends of each of the strips are held in position by means of the rivets 44, which rivets are provided with enlarged head portions 45, there being a washer 46 interposed between the heads 45 of the rivets and the end of the resistance strip for transmitting the pressure of the rivet head over the surface of the abutting ends of each of the strips.

A suitable ground terminal member 48 is secured under the peened over end of each of the rivets 44, and each terminal member 48 has an integral extending tongue portion 49 adapted to engage in the openings 50 formed in the shell members 3 and 4 for the purpose of preventing rotation of the terminal members 48.

The shells 3 and 4 of the assembly are also provided with the rectangular openings 51, through which extend terminal members 52 connected to each end of the resistance strips 43. This is all as disclosed in my copending application, of which this is a division.

Disposed between the cylindrical flanged walls 7 and 8 of each of the units 1 and 2 and the resistance strips 43 of each of the units are insulating lining members 53 and 54. The liners are cylindrical in form, but are of unequal width, and of a configuration adapted to interfit in a predetermined alinement. The two liners 53 and 54 are complementary to each other as shown in Figure 2. The liner section 54 is of a width considerably greater than the depth of the cylindrical wall 8 of the shell 3, and the liner section 53 is of a width considerably less than the depth of the cylindrical wall 7 of the shell of unit 1. The liner 54 is provided with notches 55 of truncated wedge formation along its outer extending edge, and the liner section 53 is provided with cooperating truncated wedge-shaped projections 56 along its outer edge, these projections and notches being adapted to interfit accurately to align the two units. At the same time, the line of junction, that is, the meeting edges of the two liner sections, falls within the left hand shell 3 so that no opening is presented for the entry of dust and the like between the two cylindrical flanges 7 and 8 of the units. It is apparent therefore, that the two liner sections 53 and 54 cooperate to provide a liner extending substantially cylindrically within the cooperating shell members, which liner is so disposed as to prevent any openings for the entry of dust or the like to the interior of the controller assembly. Further, the liners being of substantially non-resilient or flexible material they serve to position the two shells of units 1 and 2 in concentric, non-rotating alinement, and the coupling member 32 serves to preserve this arrangement.

The two units are assembled by telescoping the liner section 54 into the left hand shell unit 1 until the notches and projections 55 and 56 register and the edges of the two sections 53 and 54 come into abutting engagement. This abutment of the edges spaces the rims of the shells apart a sufficient distance to insure that there will be no electrical contact between them. The length of the ear projections 33 of the coupling 32 is sufficient to permit the same to enter the slotted tongue members 31 of the actuating arms 19 and 36 before the liner section 54 begins to telescope with the left hand shell as viewed in Figure 1. This facilitates the assembly of the parts in proper cooperating relationship before the units are finally assembled into operating position.

After the parts are positioned as outlined above, the clamping band 60, shown in Figure 7, is applied to the assembled parts to hold the two shells with connected coupling in proper cooperating relationship. The coupling clamping band 60 is a strip of fiber insulation which is blanked or cut away from a fiber sheet so that its longest axis is parallel to the axis of greater elongation of the fiber. As formed, the difference between the holes 61 and 62 in the blank is less than the corresponding perimeter of the assembled units 1 and 2. The clamping band 60 is soaked in water until it thoroughly moistened. This causes sufficient elongation to allow the strip to reach completely around the assembled unit. The sleeve 9 is passed through the opening 63 of the band, and the ends are then brought around over the periphery of the shells 3 and 4 to the opposite sleeve 37, and the openings 61 and 62 are adapted to receive this sleeve member. A cupped washer 64 is then passed over the end of the left hand sleeve 37 and is clamped down against the ends of the fiber around the holes 61 and 62 which are in register with the sleeve 37, the edge of the cup-shaped washer 64 pressing the fiber into the groove 65 which is beaded into the end wall 5 of the left hand shell member, thereby causing greater frictional engagement between the fiber band and the end wall of the shell and giving the effect of a strengthening flange at the same time. This forcing of the fiber into the annular groove 65 by the washer 64 gives a good grip between the ends of the band. However, the provision of the groove is optional. The band is then dried out and it shrinks and moves the two parts firmly together and continues to hold them in that relation. Preferably, after the band has thus been dried out, it is coated with lacquer, varnish or the like, to exclude moisture, thus preventing elongation of the band in services which would tend to loosen it.

After the band 60 has been clamped about the shell units 1 and 2, the entire assembly is mounted upon the panel 13 by means of the nut 12 and washer 14, and the portion of the fiber band surrounding the sleeve 9 is brought into engagement with the panel by such clamping action.

In Figures 3 and 4, I have disclosed a dual circuit controller of the type shown in Figures 1 and 2, having, however, the further provision of a cut-out switch such as may be employed for opening and closing the circuit in which the variable resistance devices or controllers are connected.

In this modification, the offset bracket 70 for mounting the switch 75 is secured to the end wall of the unit most remote from the panel in substantially fixed and rigid engagement therewith, the bracket 70 having a tongue member 71 struck from the surface thereof, the tongue member 71 being adapted to engage in a suitable opening 72 formed in the end wall 6 of the unit 4. A plurality of peripherally spaced tongue members may be provided, if desired. The bracket 70 is provided with the horizontal arm 73, which arm has an aperture having a radially extending key projection engaging with the key-way 76 formed in the threaded mounting stem 77 of the switch 75. The ear member 71 is stamped or pressed downwardly to engage with the end wall 6 in such manner as to secure the bracket member 70 firmly and securely thereto to prevent shifting of the bracket member with respect to the shell or housing 4. The shell or housing 4 has extending therethrough the sleeve member 37, which sleeve member is provided with the nut 40 threaded upon the projecting portion thereof, and which engages the cup-shaped washer 64, as described in connec-

tion with Figures 1 and 2, for pressing the overlapping ends of the clamping band 68 firmly against the surface of the bracket member 70, the nut 40 also serving to secure the bracket member firmly to the outer surface of the end wall 6.

The switch 75 is clamped to the horizontally extending arm 73 of the bracket 70 by means of the threaded clamping nuts 78 and 79, which secure the threaded mounting portion 77 of the switch to the arm 73. Extending upwardly from the threaded portion 77 of the switch, and mounted for reciprocatory motion therein is the switch operating lever 80, which lever is provided with a forked end 81 adapted to receive the actuating portion 82 of an actuating lever 83. As shown in more detail in Figure 8, the lever 83 is provided with a pair of outwardly disposed wing portions 84, and with a central tongue 85. The end of the shaft 38', which shaft corresponds to the shaft 38 of Figures 1 and 2, is grooved to receive the wing members 84, which are shrunk or deformed into the groove to form a collar therewith. The tongue portion 85 enters a suitably slotted portion 86 of the shaft 38' for non-rotatively securing the lever 83 with respect thereto.

In the present modification, the notched ears 31' of the actuator arms 19' and 36' are bent substantially at right angle to the body of the actuator arm, the ears of one actuator being bent toward the other actuator so as to provide a closer degree of coupling, that is, a coupling with less spring to it than that which is employed, for example, in the circuit controller shown in Figures 1 and 2, where the necessary force to operate the switch is not required. The bending of the ears or slotted notches 31' into substantial parallel planes gives the effect of a greater width bearing upon opposite sides of the coupling member 32, which coupling member is the same as that shown in connection with Figures 1 and 2. This tends to permit a greater degree of force to be applied with less tendency to spring the flat coupling member.

The resistors 43 are so formed as to cut out those turns of the winding which are engaged throughout the extent of angular motion required to operate the switch. This is for the purpose of preventing any resistance change in the circuit during the opening or closing of the switch circuit.

It is thus apparent that I have provided a circuit controller comprising a plurality of rheostats adapted for universal coupling engagement in order to permit conjoint movement therebetween upon actuation of one of said rheostats, which circuit controller may or may not be provided with means for opening and closing a switch in the circuit in which the controller is connected. It is to be understood that I do not intend to limit my invention to the details of construction and operation disclosed in the preferred embodiment of my invention, but only in so far as defined by the scope and spirit of the appended claims.

I claim:

1. In combination, a pair of cup-shaped shell members having their open ends facing each other, cylindrical liners disposed within the shell members, one of the liners being longer than its shell member and the other liner being shorter than its shell member, resistors comprising cylindrical wire wound strips in engagement with the liners, said liners having interlocking serrations upon their edges for registering the shell members in angular position, said abutting liners holding the margins of the shell members out of contact, and a tension member of insulation wrapped around the shell members and holding the same together.

2. In combination, a pair of cup-shaped shells having their rims facing each other in alinement, liner strips disposed on the cylindrical interior walls of the shells, one of the liners being longer than its corresponding shell and the other being shorter than its corresponding shell, said liners being brought into edgewise alinement and having interlocking projections for securing angular alinement of the shells, cylindrical resistor members mounted within the shells, one of said resistor members covering the joint between said liners, insulating means in tension holding the shells together axially in insulated relation, contactors rotatably mounted for engagement with the corresponding resistors, a common means for actuating said contactors extending through the end wall of one of the shells, and an insulating coupling for connecting the contactors for joint angular motion.

3. A tandem variable resistance device comprising a pair of cupped metallic housing members disposed with their rims mutually facing, terminal members extending laterally from the side walls of said housing members and spaced from the rims respectively, means for spacing said housing members including a strip of insulating material disposed in said housing members and means for maintaining said housing members in spaced relation including a flat fibrous tension strip engirdling said housing members.

4. The combination with a supporting member of a variable resistance device comprising a pair of cupped housing members disposed with their open ends mutually adjacent, one of said housing members having a wall adjacent said supporting member, means retaining said housing members in spaced alinement and comprising a flat tension strip of fibrous insulating material engirdling said housing members and passing between said wall and said supporting member to space said variable resistance device from said supporting member, and means securing said variable resistance device to said supporting member.

5. In a circuit controller, in combination, a pair of cup-shaped housing members having their open ends facing each other, resistance elements in said housing members, contacting means for each of said resistance elements, means for spacing said housing members from each other, a fibrous strip engirdling said housing members for maintaining the same in spaced relation, means for causing a greater frictional engagement between the fiber band and the end wall of one of said housing members, and means for actuating said contacting means.

6. In a device of the class described, a pair of cup-shaped housings having their open ends facing each other, insulating liners disposed within said housings and engaging to space said housings apart, sleeve members extending through the end walls of each of said housings, and a tension member extending about said housings and engaging over said sleeve members for holding said housings together.

7. In a device of the class described, a pair of cup-shaped housings having their open ends facing each other, insulating liners disposed within said housings and engaging to space said housings apart, sleeve members extending through the end walls of each of said housings, and an insulating band extending about the perimeter of said assembled housings and engaging over said

sleeve members for holding said housings together.

8. In a device of the class described, a pair of metallic cup-shaped housings having their open ends facing each other, insulating liners disposed within said housings and engaging to space said housings apart, sleeve members extending through the end walls of each of said housings, and an insulating band having a central aperture receiving one of said sleeve members, and having ends provided with apertures, said ends overlapping and engaging about the other of said sleeve members.

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