June 10, 1924.

1,497,095

W. DUBILIER

ELECTRICAL CONDENSER

Original Filed May 23, 1922

Fig. 1.

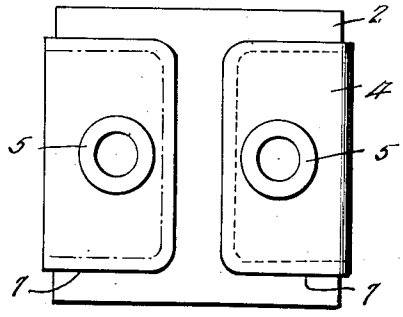


Fig. 2.

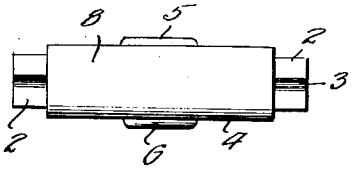


Fig. 3.

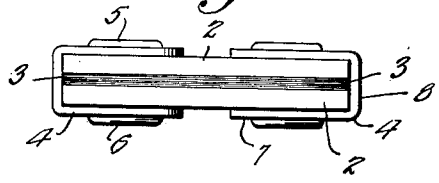


Fig. 4.

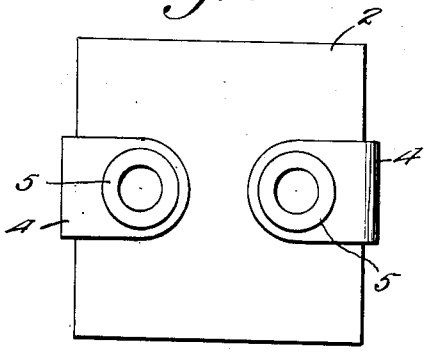


Fig. 7.

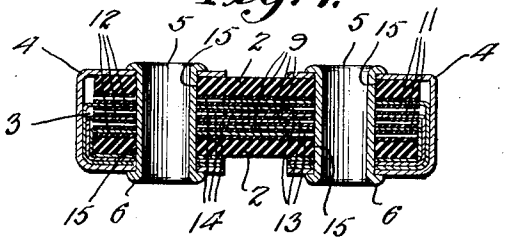


Fig. 5.

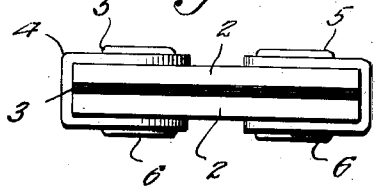
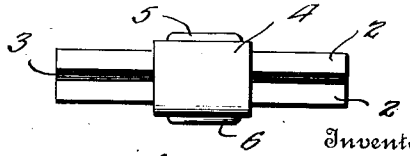


Fig. 6.



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Atty

Attorney

Patented June 10, 1924. 1,497,095

UNITED STATES PATENT OFFICE.

WILLIAM DUBILIER, OF NEW YORK, N. Y., ASSIGNOR TO DUBILIER CONDENSER AND RADIO CORPORATION, A CORPORATION OF DELAWARE.

ELECTRICAL CONDENSER.

Continuation of application filed May 23, 1922, Serial No, 562,945. This application filed January 9, 1924. Serial No. 685,207.

To all whom it may concern:

Be it known that I, WILLIAM DUBILIER, citizen of the United States, residing at New York, in the county of New York, and State of New York, have invented certain new and useful Improvements in Electrical Condensers, of which the following is a specification.

This invention relates to improvements in electrical condensers, particularly condensers for use in radio and other electrical apparatus.

This application is a continuance of my application Serial No. 562,945, filed May 23, 1922.

An object of my invention is to provide a condenser which is simple and easy to manufacture. which is capable of being made in any size required. and designed so as to be readily connected with the circuit in which it is to be placed, and which will maintain its durability and efficiency under all conditions of service.

A further object of the invention is to provide a condenser in which the conducting and insulating sheets are held together with the required degree of firmness so as to enable the condenser to have a constant and permanent capacity, and be kept in the best operative condition.

An additional object of this invention is to provide a condenser having exterior engaging members capable of bearing descriptive or advertising matter relating to the condenser, to present such matter on one, or both faces of the condenser.

Still another object of this invention is to provide specifically a condenser having at each end exterior engaging means or clamping members, each of which extends substantially from one side edge of the condenser to the other and their combined area being nearly equal to the outside area of the condenser, said means being separated by a relatively narrow space at the middle of the condenser, and being so secured as to cause the conducting and insulating sheets to be held firmly together over substantially their total area.

These and other objects and advantages of my invention will appear from the following detailed description taken with the accompanying drawings which show a preferred form of my invention, but I of course do not wish to be limited to the exact details of structure herein set forth, as I wish my invention to be construed as broadly as it is expressed and defined in the appended claims; and I reserve the right to make any changes which the nature and scope of the invention permit.

On the drawings, Figure 1 is a top plan of a condenser according to my invention.

Figure 2 is an end view, and

Figure 3 a side view thereof.

Figure 4 is a view similar to Figure 1 of a modification; Figures 5 and 6 are respectively an end view and a side view thereof; and Figure 7, is a section taken horizontally on a line through the center of the condenser as shown in Figure 4.

The same numerals identify the same parts throughout.

It is well known that condensers especially intended for use in radio must be easy to handle and mount in any desired relation; and, for any given capacity, must possess sufficient strength and durability to reduce the liability of derangement of structure or function to a minimum. For this purpose the structure of the condenser must be as compact as possible, and be finished in such a manner that any loosening of the parts is rendered impossible. It is therefore desirable that such condensers be provided with means which will keep the elements constituting the stack or body of the condenser pressed together with firmness, and prevent any loosening or separation of the plates, by which the performance of the condenser would be seriously impaired.

The condenser, comprises relatively thick upper and lower exterior holding plates or bearing members 2 of suitable insulating material such as bakelite, between which are alternate thin leaves of metal and some suitable dielectric constituting a so-called stack indicated at 3, the members 2 overlying opposite faces of the stack. As is well known, such stacks can be made up of conducting sheets of tin-foil, interleaved with insulating sheets of thin mica, and the sheets of foil will be in two groups of opposite polarity, so that one group can be connected to one terminal of the electric circuit and the other group to the remaining terminal. The internal construction of

the condenser stack is not a part of the invention herein set forth and need not be more fully explained.

The condenser will be provided at each end with exterior means of strong, stiff material, such as metal, for engaging the bearing members 2 in the form of U-shaped retaining or clamping members or clips 4, of a width nearly as great as the width of the condenser itself, measured from top to bottom in Figure 1; and each clip will have both arms perforated to give passage to a tubular element or member, such as an eyelet rivet 5, which will go through the clip and the body of the condenser, and be expanded at both extremities so as to engage the clip tightly and make it exert the required degree of pressure on the two opposite faces of the condenser. One-half of the layers of tin-foil between the plates 2 will be in electrical contact with one rivet 5, and the other half will be out of contact with this rivet but in electrical contact with the other rivet. This object may be accomplished, as is well known, by providing one-half of the sheets of tin-foil with openings larger than the rivet 5 at the right, for example, so that they will not make contact with this rivet at all, while the other half of the sheets will be perforated in such a manner that the edges of their perforations will afford good contact with this rivet. Therefore, half the sheets will be connected to the rivet 5 at the right and the other half will not. In the same way, this other half of the sheets of metal foil will be caused to make contact with the rivet 5 at the left, while the remaining sheets will be separated from the rivet 5 at the left. If desired, the sheets of foil in electrical contact with the rivet 5 at the right, may have projections to be turned over and folded down upon the top plate 2, so that the upper arm of the adjacent clip 4 will press firmly down upon these projections; and the remaining half of the sheets of foil may have projections which can be folded over at the left of the condenser in Figure 1 and down upon the same piece of insulation 2, to be gripped by the clip 4 at the left in the same way. Thus perfect electrical contact is obtained between each clip and the two complemental sets of opposite polarity of conductive elements of the condenser, while these conductive elements are perfectly insulated from one another by the layers of mica between them.

The projections above mentioned, or the projecting ends if desired, of the sheets of foil which are turned over upon the upper face of the top plate 2 under the upper arms of the clips are indicated in Fig. 1 by dotted lines at the right of the condenser and by dot and dash lines at the left of the condenser to show that the conductive sheets to which these separate tabs or projections belong are of opposite polarity. This condenser may be compressed, evacuated of all air between the plates, and impregnated with melted paraffin, as may be required, for example, as described in U. S. Patent No. 1,345,754, issued to me on July 6, 1920.

When finished, sufficient pressure may be employed to force the parts of the stack as closely together as possible. The upper and lower bearing members or plates 2, for the mica and foil sheets 3, must, of course, be of the required degree of stiffness, and the clips 4 will be attached by expanding or heading over the opposite parts or ends of the securing means or eyelet rivets 5, as at 6, to such an extent as to make these clips grip the plates 2 with the necessary degree of force, to maintain the mica and foil in the closest possible contact so as to make the condenser operate satisfactorily.

As is plainly shown in the drawings, these clips extend from the ends of the condenser towards each other, and their adjacent or opposing edges are separated by a gap only long enough to prevent sparking thereover. Rivets 5 go substantially through the centers of the clips. The clips are also of such a width that they reach almost from the edge of the condenser appearing as the upper edge in Figure 1, to the opposite edge, and thereby cover a very large part of the area of the two opposite faces of the condenser. Thus the force of compression imparted to the clips when the opposite ends of the rivets 5 are expanded, is caused to be distributed practically throughout the entire area of the condenser stack, and the pressure is thus made as uniform as possible over the whole extent of the conductive elements or sheets of foil or the like with dielectric elements between them, and the various portions of the condenser stack are maintained in even and firm engagement. Thus the formation of cracks between the sheets of foil and the layers of mica, which so greatly impairs the efficiency of the condenser and shortens the life thereof, is effectually prevented. By means of the rivets 5, which are preferably eyelet rivets, terminals of an electric circuit in which the condenser is placed, can readily be attached to the condenser, the rivets thus serving also as terminal connectors.

A further advantage of the construction above described resides in the fact that the large size of the clips affords a considerable extent of surface, upon which advertising matter and engineering and other data can be indicated, such indicia being put on by stamping or otherwise, on the upper and lower faces of the clips, or on the backs thereof.

So constructed, my condenser possesses the maximum strength and durability, and is capable of long service without getting out

of order or into disrepair. The clips 4 engage the body of the condenser tightly from end to end, except for the short or narrow space between the opposite edges of these clips at the middle of the condenser, and the narrow spaces along the top and bottom edges. The body of the condenser is thus rendered as hard and stiff as possible and precluded against bending; and as bending is always sure to result in some deformation and relative displacement of the sheets of metal foil, and mica, with the resultant formation of spaces or cracks between the layers and the admission of air to the inside of the condenser structure, the importance of this advantage will be apparent to those skilled in this art. In fact, except for the upper and lower edges, the only portion of the condenser which is not protected by the clips is the narrow portion in the middle between the two rivets 5, but as this portion is of very little width the danger of the condenser breaking at the middle is of course very slight. By the even degree of pressure which the clips exert over practically the whole extent of the condenser, there is very small risk of the elements of the condenser springing apart or getting loosened and separated, even at the corners thereof; or if such separation does occur at the corners, it will be of very small extent and produce no perceptible injury, or lessening of the utility of the condenser when it is in practical use.

The bearing members thus overlie the opposite faces of the stack, and the clips 4, as shown above, extend around the opposite ends of the condenser. I do not wish to be necessarily limited to clamping members that are fully U-shaped, or to rivets that go through the center of said members. Each member 2 may be regarded as consisting of two arms or portions 7, in the form of broad plates, united by portions 8, and the one plate of either clamping member 4 is held tightly against the one face of the condenser provided by the adjacent bearing member 2, and thus engages this bearing member while the portion 8 engages this bearing member 2 and also extends over and substantially engages the other bearing member at the end or edge thereof. On the opposite face of the condenser the other arm 7 engages the outside surface of the other bearing member and duplicates the effect of the first arm 7 by being held tightly against the other bearing member 2 by the other expanded end of the rivet 5.

Figures 4, 5, 6 and 7 show a condenser of the same construction and design, but with smaller clips. In this form the clips 4 are narrower, leaving more uncovered spaces along the upper and lower edges of the plates; and the advertising matter may be stamped, printed, or otherwise put on the portions of the holding means or plates 2 not covered by the retaining means or clips 4.

The cross sectional view shown in Fig. 7 of the drawing is one taken through the form of condenser illustrated in Figs. 4 to 7 inclusive. The construction of the form of condenser illustrated in Figs. 1 to 3 inclusive is similar. There has already been given a description of the construction which this cross sectional view illustrates. The alternate thin leaves of metal and dielectric which I have designated as 3 comprise dielectric sheets 9 and sets 11 and 12 of conducting plates. The set 11 of conducting plates is connected to the eyelet rivet 5 at the right of Fig. 7 but is spaced from the eyelet rivet 5 at the left of Fig. 7. In the same manner the set of conducting plates 12 is connected to the eyelet rivet 5 at the left of Fig. 7 but is spaced from the eyelet rivet 5 at the right of Fig. 7. Thus the two eyelet rivets shown act as terminals for the condenser. As appears in Fig. 7, the conducting plates 12 have portions 13 thereof cut away adjacent the right hand eyelet rivet of such figure, while conducting plates 11 have similar cut away portions 14 adjacent the left hand eyelet rivet. In making up the condenser, the eyelet rivets which are to be connected respectively to the conducting plates may be forced through the portions of the sets of plates which are aligned with holes 15 of the insulating sheets 2 through which the eyelet rivets respectively are to be inserted. Thus each eyelet rivet will be forced against the edges of the conducting plates for which said clamping member is adapted to act as a terminal.

In making up the condenser, the conducting plates 11 will be laid down with their cut away portions 14 adjacent the left hand eyelet rivet 5, but the portions of all of the plates 11 which are aligned with the right hand apertures 15 of the insulating sheets 2 will be forced against the walls of such apertures and placed in contact with the right hand clamping member. When my condenser is made with terminal plates or clips, the conducting sheets corresponding to each eyelet are provided with tongues 16 which fold around the adjacent sides of the condenser stack and onto a face thereof. Such tongues are clamped against their respective terminal clips by the eyelet rivets 5. Thus it is doubly assured that the eyelet rivets and the terminal clips 10 will be in proper electrical contact with the conducting plates corresponding thereto.

The clips or clamping members 4 in both forms of the invention described above may each be regarded as consisting of pairs of opposite metal plates or mutually supplementary arms, such as are indicated at 7 in Figure 1, connected by portions unit-

ing these two arms as are indicated in Figure 2, by the numeral 8; the clips shown in Figures 4 to 7 inclusive having the same parts, but of relatively smaller size, and the eyelet rivets may also be regarded as clamping members, because they co-operate with the clips to secure the clamping action.

Having described my invention, what I believe to be new and desire to secure and protect by Letters Patent of the United States is:—

1. A condenser comprising a pair of plates between which are alternating conductive and dielectric sheets, a clip engaging each of the opposite ends of the condenser, a rivet passing through each of the clips to secure the clips to the condenser and cause the clips to press tightly against said plates, said clips each being of relatively great width as compared to the end which it engages, and extending towards each other to approximately the center of the condenser, the clips being separated thereat by a relatively narrow space, the clips causing the plates to hold the conductive and dielectric sheets firmly together and exert uniform pressure thereon over substantially the entire area of same.

2. An electrical condenser comprising a stack of conducting and insulating sheets, relatively heavy and stiff insulating bearing members overlying opposite faces of said stack, clamping members of relatively stiff material extending around the opposite ends of the condenser and stack and of substantially the same width as the condenser with their opposing edges on the opposite faces of the bearing members separated by only a narrow space, whereby said clamping members can exert a uniform pressure over substantially the entire area of the condenser, tubular members passing through said stack, said bearing members and said clamping members at opposite ends of the condenser and having parts engaging with said clamping members to clamp the active area of the sheets making up the stack, said tubular members being electrically connected with conducting sheets of different polarities to serve as terminal connectors and to enable conducting members to be inserted into such tubular members to make electrical connection thereto.

3. An electrical condenser comprising a stack of conducting and insulating sheets, relatively heavy and stiff insulating bearing members overlying opposite faces of said stack, members of relatively stiff material at the opposite ends of said condenser and its stack, said members being of substantially the same width as the width of the condenser, with their opposing edges separated by only a narrow space adjacent the middle of the condenser, whereby uniform pressure is exerted over substantially the entire area of the condenser, each of said last named members having a portion engaging one of the bearing members, and a portion extending over substantially into engagement with the other bearing member, tubular elements passing through said stack, said bearing members and said last named members adjacent the opposite ends of the condenser and having parts for causing said bearing members and said members engaging the bearing members to be secured together to clamp the active area of the sheets making up the stack, said tubular members being electrically connected with conducting sheets of different polarities to serve as terminal connectors and to enable conducting members to be inserted into such tubular members to make electrical connection thereto.

4. An electrical condenser comprising a stack of insulating and conducting sheets, stiff insulating bearing members overlying opposite faces of said stack, clamping members of relatively stiff material extending around the opposite ends of the condenser and stack and of substantially the same width as the condenser, with their opposite edges on the opposite faces of the bearing members separated by only a narrow space, whereby said clamping members can exert a uniform pressure upon substantially the entire surface of the bearing members and therethrough over substantially the entire area of the conducting and insulating sheets, and securing means engaging each of the clamping members to hold them in firm engagement with the bearing members, said clamping members being connected with conducting sheets of opposite polarities in said stack.

5. An electrical condenser comprising a stack of conducting and insulating sheets, relatively heavy and stiff insulating bearing members overlying opposite faces of said stack, tubular members passing through said stack and bearing members adjacent opposite side edges of the stack and having parts engaging with said bearing members to clamp the active area of the sheets making up the stack, said tubular members being electrically connected with conducting sheets of different polarities to serve as terminal connectors and to enable conducting members to be inserted into such tubular members to make electrical connection thereto.

6. An electrical condenser comprising a stack of conducting and insulating sheets, spaced metal plates overlying said stack, tubular members passing through the stack and respectively through said plates adjacent opposite side edges of the stack, said tubular members being riveted over to clamp the active area of the sheets making up the stack and being electrically connected with

conducting sheets of different polarities to serve as terminal connectors and to enable conducting members to be inserted into such tubular members to make electrical connection thereto.

7. An electrical condenser comprising a stack of conducting and insulating sheets, relatively heavy and stiff insulating bearing plates overlying opposite faces of the stack, conducting clips each shaped to pass around the side of the stack into engagement with the outer faces of said bearing plates and tubular members extending through said stack, bearing plates and respectively through one of said conducting clips, said tubular members being riveted over to clamp the active area of the sheets making up the stack and being electrically connected with conducting sheets of different polarities to serve as terminal connectors and to enable conducting members to be inserted into such tubular members to make electrical connection thereto.

8. An electrical condenser comprising conducting plates and insulating sheets interleaved to form a stack, relatively thick and stiff bearing plates of insulating material disposed on opposite sides of the stack to build up the condenser to substantial thickness and rigidity, and clamping members extending through said stack and bearing plates, to exert compression upon the stack through said bearing plates, said clamping members comprising rivets headed over to exert compression as aforesaid and said clamping members being hollow and being respectively in circuit with conducting plates of different polarity to enable the members to serve as terminals.

In testimony whereof I affix my signature.

WILLIAM DUBILIER.