

Feb. 22, 1938.

A. W. FRANKLIN

2,109,266

CONDENSER

Filed Dec. 3, 1936

2 Sheets-Sheet 1

Fig. 1

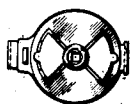


Fig. 2

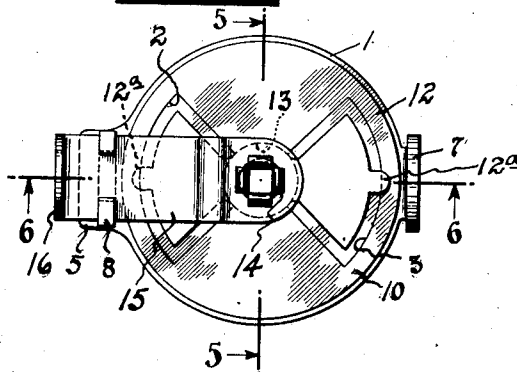


Fig. 4

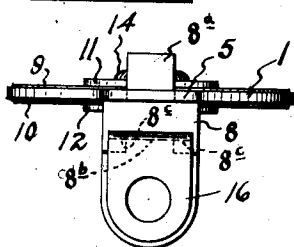


Fig. 3

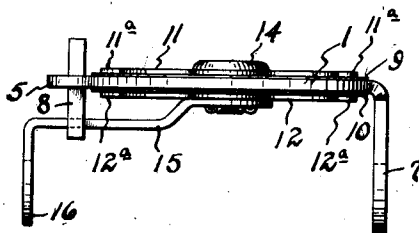


Fig. 5

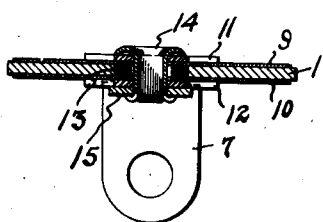


Fig. 6

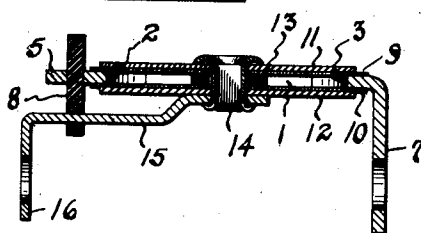
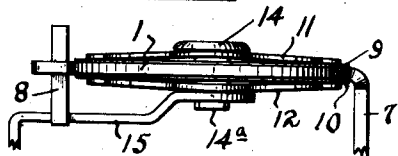


Fig. 7



INVENTOR
Albert W. Franklin
BY
Daby & Daby
ATTORNEYS

Feb. 22, 1938.

A. W. FRANKLIN

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Fig. 8

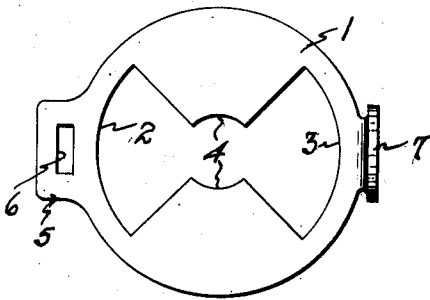


Fig. 9

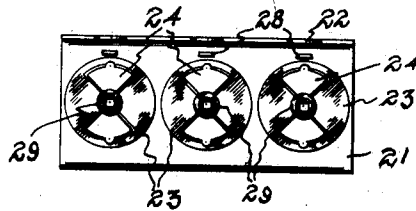


Fig. 10

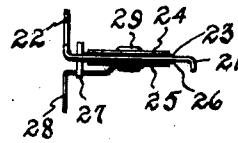


Fig. 11

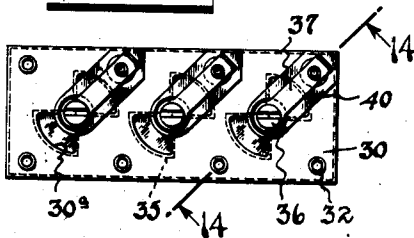


Fig. 12

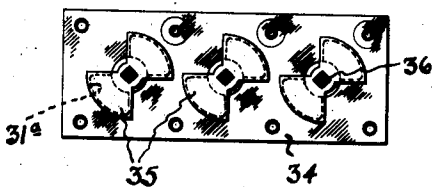


Fig. 13

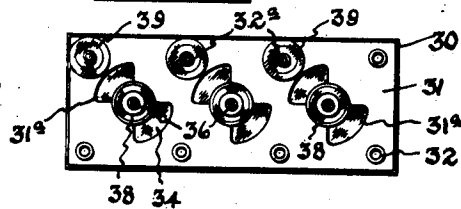
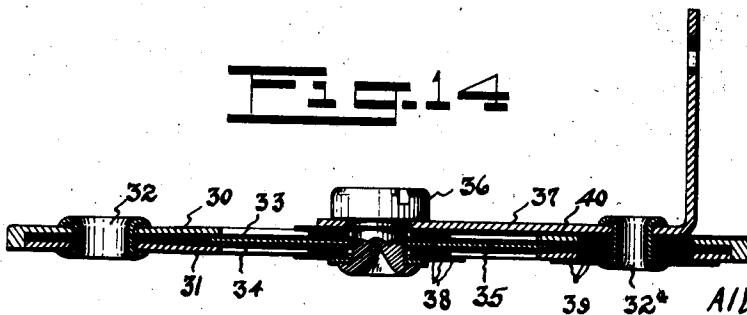


Fig. 14



INVENTOR
Albert W. Franklin
BY *Darby & Darby*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,109,266

CONDENSER

Albert W. Franklin, New York, N. Y.

Application December 3, 1936, Serial No. 113,961

4 Claims. (Cl. 175—41.5)

This invention relates to improvements in electrical condensers and particularly condensers used in radio circuits of the type known as trimming condensers.

At the present time trimming condensers, by means of which superheterodyne receiving circuits are adjusted to their final conditions, are made in many forms. Experience has demonstrated that most, if not all, of these trimming condensers are unsatisfactory for a number of reasons. They are frequently bulky, expensive to manufacture, difficult to adjust, and incapable of maintaining their adjustment. Of these weaknesses, the one concerned with the difficulty of adjustment is important. Superheterodyne circuits are critical in their adjustments. Frequently trimming condensers as now made do not have a substantially straight line characteristic so that they are exceedingly critical within this range of actual adjustment in circuits of this type. The result is that these circuits are frequently only approximately adjusted to their correct position, a highly undesirable condition in a superheterodyne circuit which to work efficiently should be very accurately adjusted.

The condenser of this invention has been devised with a view to solving all of these problems and the manner in which this has been accomplished will be apparent from the following description when taken in connection with the attached drawings.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be described in greater detail in the following specification.

In the accompanying drawings,

Figure 1 is a full sized view of a trimming condenser in accordance with this invention;

Figure 2 is a considerably enlarged view thereof;

Figure 3 is a side elevational view,

Figure 4 is a side elevational view 90° displaced from the view of Figure 3;

Figure 5 is a cross-sectional view on the line 5—5 of Figure 2;

Figure 6 is a cross-sectional view on the line 6—6 of Figure 2;

Figure 7 is a view similar to Figure 3 before the parts have been fastened together;

Figure 8 is a plan view of the fixed electrode or plate of the condenser;

Figure 9 is a plan view of a modified form of the invention embodying what is commonly known as a "gang" trimming condenser;

Figure 10 is an end elevational view thereof;

Figure 11 is a top plan view of a further modified form of "gang" trimming condenser;

Figure 12 is a cross-sectional view between the top and bottom plates of the construction of Figure 11;

Figure 13 is a bottom plan view of the construction of Figure 11; and

Figure 14 is a cross-sectional view taken on the line 14—14 of Figure 11.

An examination of Figure 1 will be persuasive of the assertion that this invention results in a trimming condenser which is not bulky, which is simple in construction, light in weight, and not critical in adjustment. This last feature, together with the other advantages gained, will become more apparent from the following description.

The fixed plate or electrode of the condenser comprises a substantially disc-like metal member 1, see Figure 8, preferably made of aluminum. A pair of segment-like openings 2 and 3 are formed within the edge of the disc by stamping out similarly shaped portions. These openings are connected by a circular opening 4 or in other words the opening 2—3—4 is formed by stamping out a piece of metal of a shape which is clear from the figure. Integral with the plate 1 is an ear 5 which has a rectangular aperture 6 therein. Integral with the disc and diametrically opposed to the tab 5 is an ear or extension 7 which forms a connecting terminal for this plate. Mounted in the aperture 6 is a small piece of insulating material 8 which includes a portion 8a narrower than the main portion which is forced into the aperture 6 and frictionally held therein. The opposite end is notched in a longitudinal direction as shown at 8b and transversely notched at each side of the notch 8b as indicated at 8c.

Superimposed upon opposite sides of the plate 1 are a pair of discs 9 and 10 of any suitable insulating material such for example as "Cellophane", mica, celluloid, and the like. In the actual construction of a trimming condenser these discs are very thin. Superimposed upon these discs are a pair of movable plates or electrodes 11 and 12 which are substantially of the same shape as the openings formed in the plate 1 but are of a smaller size so that when they are concentric with the opening they do not overlap the metal of the plate 1, as is clear from Figure 2. These electrodes are provided with diametrically opposed tabs 11a and 12a which overlap the metal of the plate 1 to provide support for the movable plates when the movable plates do not overl

fixed plate, thereby protecting the insulating discs against damage at that time.

Freely mounted in the substantially circular opening 4 is a disc or washer 13 of insulating material. The central aperture through the washer is large enough so that the square rivet 14 may freely turn therein. The movable plates 11 and 12 have square apertures where the rivet passes therethrough so that they will turn with the rivet. The rivet also passes through a connecting lug 15 which lies in the notches 3b and 3c in the insulator 8. The end 16 of this lug provides a means for connecting the movable plates in circuit. The aperture in the lug 15 through which the rivet passes is round and large enough so that the rivet may turn therein. The parts are shown assembled in Figure 7 before the rivet is locked in place. This figure illustrates the feature that the movable electrodes 11 and 12 are longitudinally curved a slight amount so that when the parts are drawn up by the rivet these movable plates will snugly hug the insulator discs and the electrode 1, forming a fairly tight structure insuring that the movable plates will remain in adjusted position and minimizing or eliminating any air volume between the parts. To adjust this condenser it is only necessary to place a square-ended tool in the rivet and turn it. As it rotates the plates 11 and 12 move with it. As is clear from Figure 6, the apertures through the insulating discs 9 and 10 are large enough so that the rivet may turn therein. Thus these insulating discs are substantially free and may or may not move with the movable plates depending upon the frictional forces involved. This is an important feature since when the movable plates bind the insulating discs to any degree the discs may move with the plates. This insures that the plates will not scratch the insulating discs. Any scratching or marring of the insulating discs will increase the power factor of the condenser in a manner obvious to those skilled in the art. Therefore, the insulating discs are free to move or not to move depending upon the frictional engagement between them and the fixed and movable plates.

In order to protect the parts, and in a sense to lubricate them, and therefore prevent damage particularly to the insulating discs, the parts may be coated with a very thin film of any suitable wax. For example, stearic acid, dissolved in a suitable solvent such as oxydol, provides a coating compound which minimizes tarnishing of the metal and lubricates all the parts without interfering materially with the characteristics of the condenser. It may also be noted that since the movable plates are longitudinally sprung the ears on the ends serve to counteract the tendency of the plates to break and injure the insulating discs by reason of their bearing on the fixed electrode. Since this condenser is adjustable by relative movement of the electrodes in fixed planes as distinguished from some types of trimming condensers it will be apparent that the condenser is not critical in its adjustment and has a substantially straight line characteristic. By reason of the firm gripping of all of the parts and the springiness of the movable plates, there is no tendency for the condenser to get out of adjustment.

The same principles are embodied in "gang" trimming condensers as illustrated in Figures 9 to 14, inclusive. The "gang" condensers, as illustrated, are shown as comprising 3 sets of elements although more or less can be obviously

employed. In this case the fixed plate or electrode 21 is common to all of the condensers of the "gang" type. One or more ears 22 are formed integral with the electrode to form connection thereto. The plate is stamped out to provide three openings of the same shape as that shown in Figure 8. Upon opposite sides of these openings are applied the insulating discs of which the top discs 23 appear in Figure 9. The lower discs 26 appear in Figure 10 as well as the upper discs 23. The movable plates or electrodes of each set are shown at 24 and 25. The connecting lugs for them are shown at 28 and are supported on the insulating plates 27 which are of a similar construction and mounted in the same way as the plate 8 of the previous construction. The insulating bearing washers corresponding to the washer 13 and not shown in Figures 9 and 10 are employed as before. The rivets 29 lock the parts together in the same manner as previously described and with this arrangement there is incorporated in a single unit a plurality of individual trimming condensers.

Figures 11 to 14, inclusive, show a more complicated "gang" trimming condenser in accordance with this invention which is, therefore, more expensive in construction but which has the feature of substantially sealing all of the parts to prevent the deleterious effects of moisture and dust. In this case the common electrode comprises a bottom plate 30 and a top plate 31. The edge of the bottom plate is bent around to seal the edge of the container formed by the two plates and may be beaded over on top, if desired, or soldered. Between these two plates are a pair of insulating plates 33 and 34 of any suitable material, such as those named above, and these parts are clamped together by means of the rivets 32. The top plate 30 is provided with a plurality of openings 30a similar to the openings illustrated in Figure 8. The bottom plate has similarly shaped openings 31a of the same size as the opening 30a. When the plates are superposed these openings are in alignment. For each pair of openings or each condenser there is provided a movable plate 35 which is mounted between the insulating plates 33 and 34. A slotted rivet 36 clamps the parts together including the connector lug 37 for each unit. The necessary insulators and spacers 38 are provided as is clear from Figure 14. The connecting lugs are also secured in place by rivets 32a and the necessary insulating washers and spacers 39 are employed as is clear from Figure 14. It will be noted that each lug 37 is held out of contact with the fixed electrode casing by means of the insulating strips 40. This arrangement really comprises a reversal of the arrangement of Figure 9 and the movable plates are within a casing of metal which comprises the fixed plate. With this arrangement moisture and dust is kept out of the structure.

In the case of both of the "gang" condensers, the lubricant and protecting coating may be employed as before.

From the above description it will be apparent to those skilled in the art that this invention resides in certain principles of construction and association of parts which may be carried out in other ways without departure from the scope thereof. I do not, therefore, desire to be strictly limited to the disclosure as given for purposes of illustration but rather to the scope of the appended claims.

I claim:

1. A condenser as described comprising a fixed

metal electrode having an aperture therein and forming the main body of the condenser, an insulating plate resting thereon, a movable metal electrode of substantially the same shape as said aperture but smaller, said movable electrode having projections to overlap the fixed electrode, and means for clamping the parts together, said means comprising a rivet connected to the movable electrode and insulated from the fixed electrode by means of which the movable electrode may be moved.

2. A condenser as described comprising a fixed metal plate having a segment shaped aperture therein, an insulator journaled in said aperture, a pair of insulating plates resting on opposite faces of the said metal plate, a pair of movable electrodes shaped substantially the same as the aperture in the fixed electrode and resting on said insulating plates, a rivet for clamping the parts together, said insulating plates being free to rotate independently of the rivet and the movable electrodes being locked to the rivet.

3. A condenser as described comprising a fixed metal plate having a segment shaped aperture

therein, an insulator journaled in said aperture, a pair of insulating plates resting on opposite faces of the said metal plate, a pair of movable electrodes shaped substantially the same as the aperture in the fixed electrode and resting on said insulating plates, a rivet for clamping the parts together, said insulating plates being free to rotate independently of the rivet and the movable electrodes being locked to the rivet, said rivet also clamping a connector lug for the movable plates thereto.

4. A variable condenser comprising a metal plate having an elongated opening within its edges, plates of insulating material engaging the opposite faces of said plate and covering said opening, a pair of movable metal plates lying on the outer faces of said insulating plates and having the same shape as the opening in said metal plate, and rotatable means passing through all of said plates to hold them superposed, the movable plates being locked to said rotatable means for rotation therewith.

ALBERT W. FRANKLIN.