Oct. 20, 1931. S. S. CRAMER 1,828,027

ELECTRICAL CONDENSER AND PROCESS OF ASSEMBLY THEREOF

Filed Feb. 27, 1929

FIG. 1

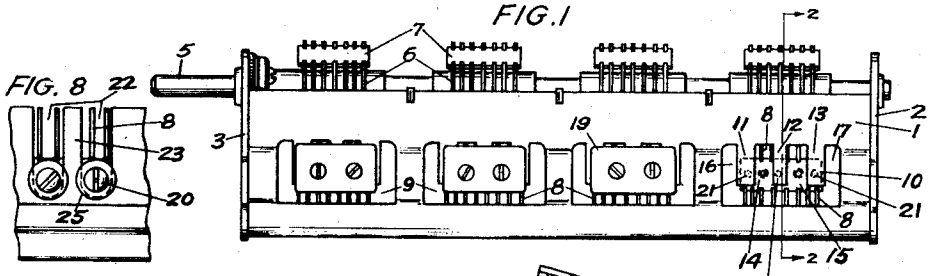


FIG. 8

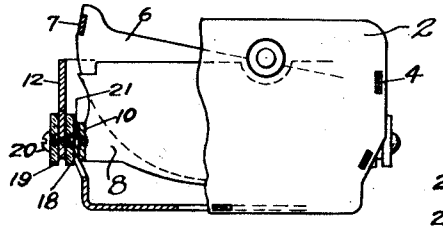


FIG. 2

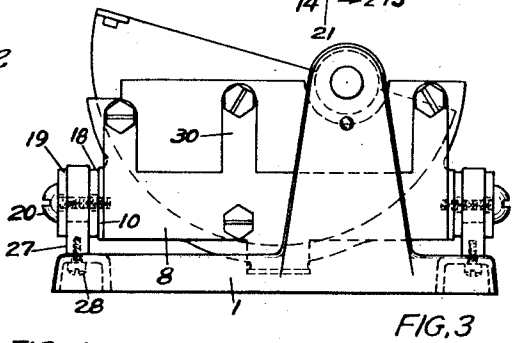


FIG. 3

FIG. 4

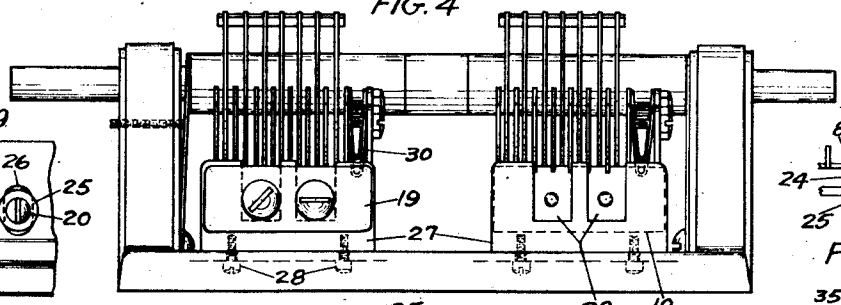


FIG. 9

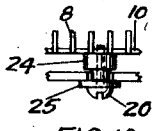


FIG. 10

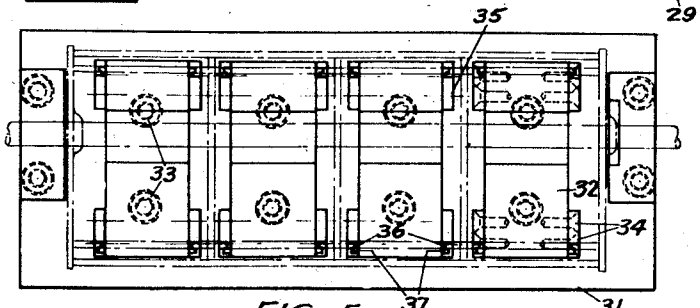


FIG. 5

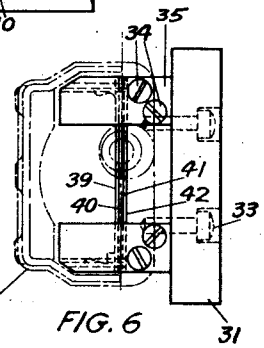


FIG. 6

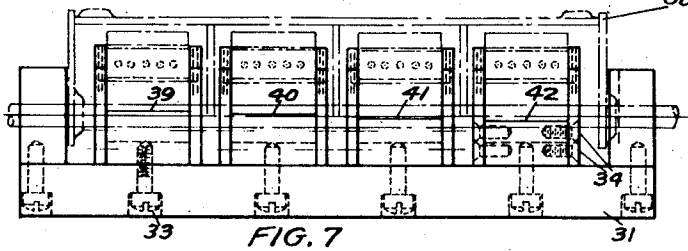


FIG. 7

INVENTOR
STANLEY S. CRAMER
BY
A. D. Libby
ATTORNEY

Patented Oct. 20, 1931

1,828,027

UNITED STATES PATENT OFFICE

STANLEY S. CRAMER, OF HADDON HEIGHTS, NEW JERSEY, ASSIGNOR TO RADIO CONDENSER COMPANY, OF CAMDEN, NEW JERSEY

ELECTRICAL CONDENSER AND PROCESS OF ASSEMBLY THEREOF

Application filed February 27, 1929. Serial No. 343,200.

This invention relates to improvements in electrical condensers of the variable type such as are used in connection with tunable circuits of radio apparatus, particularly the kind used for receiving purposes.

In the construction of such condensers, it is now quite customary to assemble a plurality of such condenser units comprising stator and rotor plates upon a common frame-work, so that one control means such as a knob, may serve to actuate all of the condensers simultaneously.

Due to the fact that there are bound to be variations in the manufacture of each condenser making up the whole assembly and further due to the fact that there are bound to be manufacturing differences in the tuning coils and the circuits connecting these coils with the condensers and other parts of the receiving set, it becomes apparent that the maximum resonance of each tunable circuit will not be obtained for each dial setting without the use of some compensating means whereby each individual condenser may be adjusted so as to bring all of the tunable circuits to substantially the maximum point on the resonance curve of each circuit as the common dial is operated.

Part of this trouble is due to the fact that the initial capacity of each of the condenser units is not what it should be, and therefore the condenser is off on its resonance curve throughout the entire range of movement of the dial. It is therefore the principal object of my invention to provide a construction in which these difficulties may be overcome or at least reduced to a minimum, by providing ready means for changing the initial capacity of each condenser and the slope of the resonance curve, and for compensating for inaccuracies in manufacture, etc.

Another object of my invention is to provide a condenser in which the leakage losses are reduced to a minimum.

Another object of my invention is to provide a process which will materially speed up the operation of assembly and which will assist in positioning the separate stator groups so as to aid in the final setting of the condensers.

These and other objects will be apparent from a study of the specification taken in connection with the annexed drawings wherein:

Figure 1 is a side elevation of a four-gang condenser in which some of the parts for one condenser unit have been removed.

Figure 2 is a part sectional view taken on the line 2—2 of Figure 1.

Figure 3 is an end elevation showing a different form of condenser to which my invention is applicable and to which I first applied the same.

Figure 4 is a side elevation of the form of condenser shown in Figure 3.

Figure 5 is a plan view showing certain details involved in the process of assembly of the complete condenser shown in Figure 1.

Figure 6 is an end view of Figure 5.

Figure 7 is a side elevation of Figure 5.

Figure 8 is a fragmentary view showing a modified form of construction in detail.

Figure 9 is a view similar to Figure 8, but of a still further modified form.

Figure 10 is a detailed view of the stator holding parts used in connection with Figures 8 and 9.

Referring now to the details wherein like numbers refer to corresponding parts in the various views, 1 is a frame-work having end plates 2 and 3 which may be fastened thereto in any satisfactory manner as by upset lugs 4. The rotor shaft 5 is carried between the end plates 2 and 3 in any satisfactory manner, but preferably in the manner shown and described in my application S. N. 332,700, filed January 15, 1929. The rotor shaft 5 carries, on sleeves fastened to the shaft as set forth in said application, a plurality of rotor plates 6 tied together at their outer ends by the tie bars 7.

As shown in Figure 1, the rotor plates are in a position slightly out of full engagement with their cooperating stator plates. These stator plates are shown at 8 through the openings 9 formed in the sides of the frame 1. It is to be understood that the rear side of the assembled condenser is substantially the same as the front side shown in Figure 1. The stator groups of plates have their oppo-

site sides fastened to tie bars 10 which are similar to the tie bars 7.

Fingers 11, 12, and 13 for each condenser are punched or formed in the side of the frame 1, leaving spaces 14 and 15 therebetween, and spaces 16 and 17 forming the sides of the openings 9. As will be seen more clearly in Figure 2, an insulator 18 is positioned between the tie plates 10, and the fingers 11, 12, and 13, and another insulator 19 is positioned exterior to these fingers. Screws 20 pass through the insulators 19 and 18 and through the spaces 14 and 15 into the tie bar 10, thereby holding the stator in position in the frame 1. The tie bars 10 on the stator group of plates are preferably provided with a plurality of projections 21, three being preferably used in this size of condenser shown, and these projections are the parts of the tie bars 10 which make contact with the insulator 18, whereby the surface contact of the tie bar is reduced to a very small area, thereby reducing the leakage losses of the stator through the frame-work to a minimum.

As shown in Figure 8, the side of the frame-work 1 is provided with a pair of slots 22 through each of which, two of the stator plates 8 are shown. This construction has a finger 23 and between the tie bar 10 and this finger, and the sides of the slots 22, a bushing 24 (see Fig. 10) is positioned. This bushing 24 cooperating with the insulating washer 25, acts to insulate the stator from the frame.

In Figure 9, oblong slots 26 are used in place of the open slots 22.

In the form of condenser shown in Figures 3 and 4, the frame 1 is a die casting instead of a punched construction, as illustrated in Figure 1. As shown in Figure 3, a block 27 is fastened to the frame 1 by screws 28 positioned in a channel portion of the frame, but it is to be understood that the block 27 may be made integral with the frame. In this construction, as shown at the right-hand part of Figure 4, two slots 29 corresponding with the slots 22 of Figure 8, are provided, but the same sort of insulators 18 and 19 as shown in Figure 2 are used to engage the tie bars 10, which are the same as in the constructions previously described. It is to be understood that in the form shown in Figures 1, 2, 3, and 4, the widths of the slots 14, 15, and 29 are such as to provide considerable clearance for the screws 20, so that by loosening the screws 20, say on one side of the frame, this end of the stator may be raised or lowered or moved laterally to position the stator at any desired point with respect to the rotor plates. Likewise, the opposite side of each group of stator plates may be shifted, or the entire group of stator plates may be shifted. This provides a construction which will attain the objects heretofore expressed. As shown in Figures 3 and 4, a special compensating means generally referred to by the numeral 30, is shown, but since this form is the subject matter of a separate application, it will not be further described herein.

Coming now to the process part of my present application, I have shown in Figures 5, 6, and 7, how the form of condenser shown in Figure 1 may be rapidly and accurately assembled. For this purpose, I provide an assembling fixture including; a base 31 to which are fastened blocks 32 by means of screws 33. As shown in the various figures, there are four of these blocks corresponding to the four condensers shown in Figure 1, and these blocks are positioned on the base 31 at points corresponding to the proper location of the stator groups 8.

Fastened by screw 34 to opposite sides and at opposite ends of the blocks 32, are uprights 35. Each of the uprights 35 is provided with a notch 36 which is adapted to receive the tie bars 10 of the stators. Another notch 37 is provided to receive the insulator 18. In the assembly of the condenser, the stator groups are placed on the blocks 32 so the tie bars enter the notches 36, and then the frame-work 1 is placed upside down over the stator groups as shown by the dotted lines 38. The insulators 18 are dropped into position in the grooves 37 and the insulators 19 are then applied exterior to the fingers 11, 12, and 13, and the screws 20 inserted into position and tightened up, thereby locking the stator groups to the frame-work. The frame-work is then turned right side up and the rotor groups of plates, previously assembled to their mounting sleeves, are placed in interleaved position with their respective stator groups of plates, and the shaft 5 is then inserted through the end plate 3 and the various sleeves of the rotor groups, and into the end plate 2.

In the case of Figure 1, the bearing races may then be filled in the manner set forth in my copending application Serial No. 466,871, filed July 9, 1930. In the case of Figure 4, the shaft 5 is simply inserted through one pedestal of the frame and through the rotor sleeves into the other pedestal. In both cases, after the shafts and rotors have been properly positioned, the rotor sleeves are fastened to the shaft 5 by any suitable means as by set screws.

As has been explained, when the time comes to adjust each condenser in the radio receiving set, the stator groups may be adjusted as has been described. It sometimes happens that in different sets due to the arrangement of the tuning coils and other apparatus, more or less initial capacity must be given each condenser, and to roughly approximate this in the assembly operation, the blocks 32 may be of different thicknesses as indicated by the lines 39, 40, 41, and 42, which are shown in Figures 6 and 7. It will

be clear from what has just been said that the blocks 32 may be quickly changed on the base 31, so as to accommodate the assembly fixture for condensers having various dimensions in which the rotor shaft height varies from that shown.

Other changes of course are contemplated in the details for carrying out my invention.

Having thus described my invention, what I claim is:

1. A condenser including a frame structure having end bearing supports, a rotor and shaft carried by said end supports, spaced metallic parts extending from the frame and located on opposite sides of the rotor shaft, a stator consisting of a plurality of plates held together at least in part by a tie bar across opposite ends of said plates, an insulator between each tie plate and said spaced frame parts, an insulator on the opposite side of said spaced frame parts and screws going through both said insulators and between said spaced frame parts into the tie bars for adjustably clamping the stator in position.

2. A compound condenser structure including; a frame having end bearing supports, a shaft extending between said supports and carrying a plurality of rotors, a plurality of fingers formed in groups on said frame opposite each rotor, a plurality of stators each consisting of a plurality of plates held together at least in part by a tie bar across opposite ends of said plates, a pair of insulators for each stator embracing each of said finger groups, and screws going through each pair of insulators between the associated fingers into the associated stator tie bars.

3. A condenser including a frame structure having end bearing supports, a rotor and shaft carried by said end supports, at least one metallic portion formed by two slots in a part of the frame and located on opposite sides of the rotor shaft, a stator consisting of a plurality of plates held together at least in part by a tie bar across opposite ends of said plates, screws passing through said slots into said tie bars, and insulators for receiving said screws and for insulating the tie bars and stator from the frame, said slots having dimensions so as to allow the stator to be adjusted up and down, laterally, as well as slightly oscillatory.

4. A compound condenser structure including; a frame having end bearing supports, a shaft extending between said supports and carrying a plurality of rotors, at least one portion formed by two slots in a part of the frame and located on opposite sides of the rotor shaft, a plurality of stators each consisting of a plurality of plates held together at least in part by a tie bar across opposite ends of said plates, screws passing through said slots into said tie bars, and insulators for receiving said screws and for insulating the tie bars and stators from the frame, said slots having dimensions so as to allow the stators to be adjusted up and down, laterally, as well as slightly oscillatory.

5. A condenser including a frame structure having end bearing supports, a rotor and shaft carried by said end supports, spaced metallic parts extending from the frame and located on opposite sides of the rotor shaft, a stator consisting of a plurality of plates held together at least in part by a tie bar across opposite ends of said plates, an insulator between each tie plate and said spaced frame parts, an insulator on the opposite side of said spaced frame parts and screws going through both said insulators and between said spaced frame parts into the tie bars for adjustably clamping the stator in position, and means for reducing the area of contact of the tie bars with their respective insulators including a plurality of projections extending between each insulator and its associated tie bar for spacing one from the other.

6. A compound condenser structure including; a frame having end bearing supports, a shaft extending between said supports and carrying a plurality of rotors, said frame on opposite sides of the rotor having openings punched therein forming a plurality of fingers, a group of stator plates having their opposite ends anchored together by a tie bar, screws passing through said openings between the fingers into the tie bars, and a pair of insulators for each tie bar disposed on opposite sides of the fingers adjacent each tie bar to insulate the same from the frame, said opening being sufficiently large to allow the stators to be adjusted in three directions.

7. The process of assembly of a compound condenser including; a plurality of groups of stator and rotor plates having tie bars and a frame, which consists in providing an assembly fixture having a base with blocks spaced thereon of a width and length to support the stator groups, said blocks having uprights on opposite sides and corners with notches in the uprights, placing said stator groups onto said blocks in reverse position so the tie bars thereof are positioned in a part of said notches, then placing the frame over the stator groups, placing insulators into the other of said notches between the tie bars and frame, applying insulators to the exterior of the frame adjacent the first insulators, applying holding means to the insulators and tie bars, placing a group of rotor plates, previously assembled on their respective sleeves, in interleaved position with the groups of stator plates, then inserting an operating shaft through one end support and all of the rotor sleeves, into the other end support, and fastening said sleeves to said shaft.

8. The process of assembly of a compound condenser including; a plurality of groups of stator and rotor plates having tie bars and a

frame, which consists in providing an assembly fixture having a base with quickly removable blocks spaced thereon of a width and length to support the stator groups and a thickness to approximate the final adjustable position of the stator groups, said blocks having uprights on opposite sides and corners with notches in the uprights, placing said stator groups onto said blocks in reverse position so the tie bars thereof are positioned in a part of said notches, then placing the frame over the stator groups, placing insulators into the other of said notches between the tie bars and frame, applying insulators to the exterior of the frame adjacent the first insulators, then applying holding means to the insulators and tie bars, placing a group of rotor plates, previously assembled on their respective sleeves, in interleaved position with the groups of stator plates, then inserting an operating shaft through one end support and all of the rotor sleeves, into the other end support, and fastening said sleeves to said shaft, and finally shifting one or more of the stator groups to obtain the desired capacity curve of each individual condenser comprising the whole compound condenser.

In testimony whereof, I affix my signature.

STANLEY S. CRAMER.