

July 30, 1940.

J. A. FLANZER

2,209,546

CONDENSER

Filed Dec. 3, 1938

2 Sheets-Sheet 1

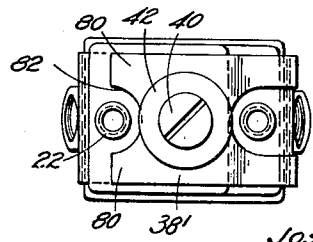
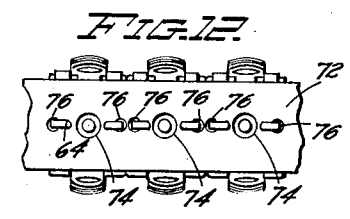
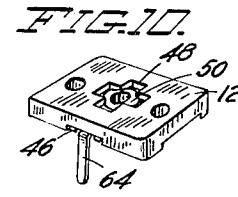
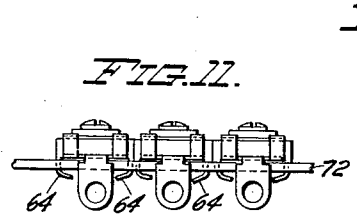
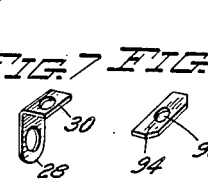
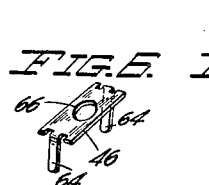
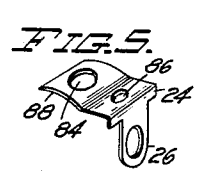
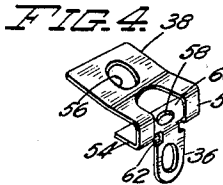
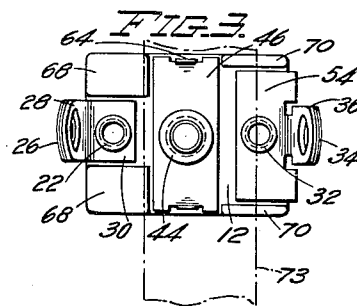
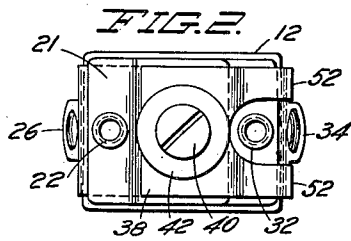
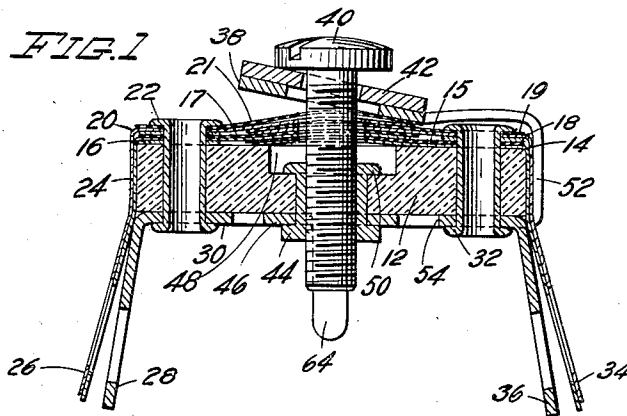


FIG. 13

INVENTOR
JOSEPH A. FLANZER
BY *James & Franklin*
ATTORNEY

July 30, 1940.

J. A. FLANZER

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FIG. 14.

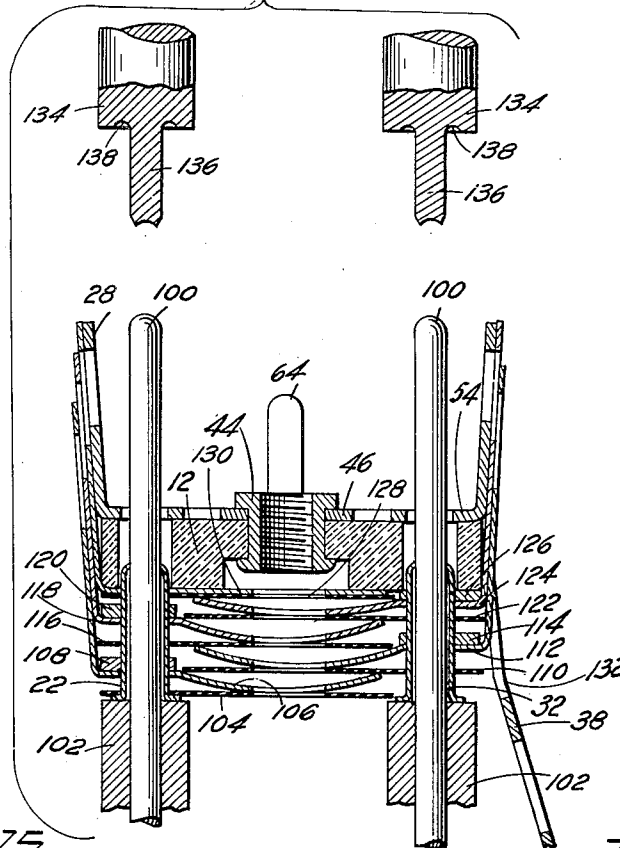


FIG. 15.

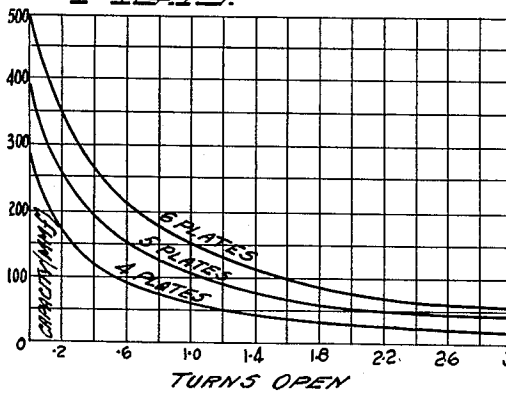
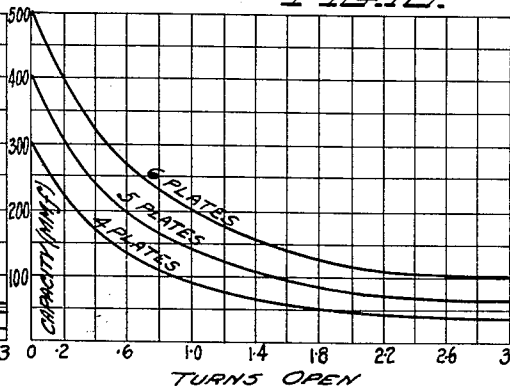


FIG. 16.



INVENTOR

JOSEPH A. FLANZER

BY

James K. Franklin
ATTORNEY

UNITED STATES PATENT OFFICE

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CONDENSER

Joseph A. Flanzer, Laurelton, Long Island, N. Y.,
 assignor to Electro-Motive Manufacturing Co.,
 Inc., New York, N. Y., a corporation of New
 York

Application December 3, 1938, Serial No. 243,757

20 Claims. (Cl. 175—41.5)

This invention relates to condensers, and more particularly to so-called "trimmer condensers" for radio and similar purposes. The primary object of my invention is to generally improve such condensers.

The conventional trimmer condenser comprises metal plates riveted or eyeleted at opposite ends of an insulation base, said plates being extended to form lugs for soldering. The top plate is so shaped as to tend to move upwardly, and it is drawn down by means of an adjusting screw passing through the plates and base. Considerable difficulty has arisen because of the effect of bending the extension or soldering lug formed on the plate. This may be bent, either intentionally, or accidentally by a workman soldering a connection to the lug. Outward bending of the lug tends to bend the top plate downwardly so that it no longer springs upwardly as it should when pressure of the adjusting screw is relieved. This sharply reduces the range of adjustment of the condenser and may completely spoil the same for its intended purpose.

One object of my invention is to overcome the foregoing difficulty. This I do by extending the top plate not only downwardly along the edge of the base, but also inwardly beneath the bottom of the base. This inwardly bent bottom portion is eyeleted to the base while the top plate is left entirely free of the base. A soldering lug is struck from the top plate to a point immediately adjacent the eyelet at the bottom of the condenser, and this lug is bent outwardly and downwardly away from the base. The result of this construction is that the eyelet holds the plate at the weakest point of the soldering lug, and bending of the lug is arrested at the eyelet and is incapable of moving the top plate. The connection of the lug is solely to the intumed bottom part of the plate, and that part of the plate is locked in position by the eyelet. A further advantage of this new construction is that there is a reduction in the length of the blank from which the plate is formed. Hence, there is considerable saving in metal cost, because the metal is preferably phosphor-bronze for permanent resilience.

As so far described, the invention is applicable to a simple two-plate trimmer condenser, but of late, a demand has arisen for multiplate plate trimmers of greatly increased capacitance, and further features and objects of my invention center about such multiplate plate trimmer condensers. In some condensers extra plates have been added beneath the two original main plates, but this prevents proper opening up of the plates, and

while producing a desired maximum capacitance, does not produce a large range of capacitance, for it is impossible to get down to a low minimum capacitance. In accordance with my invention, only the top plate is a thick plate. All of the remaining plates are made of exceedingly thin resilient metal. Moreover, these plates, or all except the bottom plate, are preferably curved or bowed upwardly so that the plates tend to open out. Thin sheets of mica, or so-called "films," are disposed between the plates, and in accordance with a further feature of the present invention, these films are eyeleted to the base at only one end, alternate films being eyeleted at the opposite ends of the condenser. In this way, the films do not prevent bowing or upward spreading of the plates, except insofar as they resist bending. This resistance is small because the mica films are made particularly thin, say, only half the thickness of the metal plates. The straight films being disposed between the curved plates, the films help produce a wide opening or spread of the plates, but the films are not thick enough to prevent some necessary bending at the eyelets during opening of the condenser.

As so far described, the condenser might be initially open, yet might not return to fully opened position after being screwed up tight to closed condition. The reason for this is that the free edges of one set of plates may sometimes tend to become wedged into the other plates near the eyelet holding the latter plates together. When the condenser is screwed up tight, the plates tend to become bound together and do not open up freely when the adjusting screw is released. Thus, a desired low minimum capacitance may not be obtained after the condenser has been adjusted to maximum capacitance. Moreover, the condenser should be substantially insensitive to temperature change. With the condenser as so far described, there is little or no change in temperature when the condenser is screwed up tight, but substantial changes of capacitance will result from temperature changes when the condenser is partially or fully open.

A further object of the present invention is to overcome the foregoing difficulties. This may be done by the introduction of spacing means at the eyelets to space apart the plates at the eyelet. I prefer to use inserted strips of metal or spacers, these preferably being thicker than the metal plates and mica films. The spacers are preferably disposed at the free ends of the plates and films, and successive spacers are secured at opposite ends of the condenser. These spacers pre-

vent catching or wedging of the ends of the plates between the surrounding plates, and thus facilitate full opening of the condenser. They also produce an initial spacing which itself helps opening of the condenser to a small minimum capacitance. This initial spacing does not prevent closing under the extreme pressure produced by the adjusting screw, and the plates bend downward slightly to attain full closing or maximum capacitance. Temperature response is minimized, and the condensers may be brought to an accuracy of, say, one per cent, instead of, say, ten per cent, in respect to variation with temperature. The spacers increase the range of capacitance adjustment of the condenser by lowering the minimum capacitance for a condenser having a predetermined maximum capacitance.

Still another object of the present invention concerns the mounting of a plurality of the condensers on a common mounting strip. Heretofore, the condensers have been assembled to such a strip as a part of the regular eyeleting or manufacturing operation. The condensers have never been completed except as mounted on the strip. This makes it difficult to fill orders quickly. It results in numerous rejections, for a defect in one condenser causes a rejection of the assembly of condensers. The entire strip of condensers must be handled through all of the manufacturing operations, and this makes the manufacture highly variable and non-uniform, for the strips are different in length, may differ in material, and have different numbers of units mounted thereon.

A further object of the present invention is to overcome the foregoing difficulties and to provide a new, simple, and extremely inexpensive means for mounting individual and previously completed condensers on a strip. For this purpose, I provide an inexpensive sheet metal staple which is secured to the base of the condenser by means of the regular bushing which is anyway provided for the adjusting screw. The condensers are handled as single units throughout all manufacturing operations. Jigs and dies may be provided and set up to properly handle the single units. These units may be made up and kept in stock, the units having different numbers of plates ranging from, say, two to seven. When orders are received, the appropriate units are quickly and readily assembled on strips in accordance with the requirements of the customer. These requirements may differ as to the number of condensers and may also differ as to the number of plates in each of the battery of condensers on the strip. Such highly variable requirements are readily fulfilled when, as in the present case, the condensers are made up separately and are assembled on strips only after orders are received. If a unit fails under test and is rejected, only that unit or condenser is rejected and not a whole battery of condensers. For example, there is a very severe breakdown voltage test which causes, say, five per cent rejections. With, for example, five condensers on a strip, the old practice would increase the percentage possibility of rejection from, say, five per cent, to twenty-five per cent, for any one of the five units on the strip may break down. The highly competitive conditions under which these condensers are made would make it prohibitive to use screws, bolts, or any "screw machine" parts for attaching individual condensers to a mounting strip. The staple of the present invention, however, is inexpensive, and the condenser is attached to the strip by a single movement of a comparatively small

hand-press or foot-press which bends the ends of the staple. The staple may be opened to replace a condenser, if a final breakdown voltage test is performed after assembly of the units on a strip.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, my invention consists in the condenser elements and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawings, in which:

Fig. 1 is a section taken in elevation through a five-plate condenser embodying features of my invention;

Fig. 2 is a plan view of the same;

Fig. 3 is a bottom view of the same;

Fig. 4 is a perspective view of the top plate;

Fig. 5 is a perspective view of one of the thin upwardly bowed lower plates;

Fig. 6 is a perspective view of a staple for mounting the condenser on a strip;

Fig. 7 is a perspective view of a soldering lug support used with the lugs of the thin plates;

Fig. 8 is a perspective view of a spacer strip;

Fig. 9 is a perspective view of a mica film;

Fig. 10 is a perspective view of the base with the staple secured to the bottom thereof;

Fig. 11 is a side elevation showing a plurality of condensers secured to a mounting strip;

Fig. 12 is a bottom elevation of the same;

Fig. 13 is a plan view of a modification which may be used with a condenser having only two, or, at most, say, three plates;

Fig. 14 is a section illustrating the preferred method of assembling the parts of the condenser; and

Figs. 15 and 16 are graphs illustrating the tuning curves of two different types of my improved condenser.

Referring to the drawings, and more particularly to Fig. 1, the condenser comprises an insulation base 12 which is preferably made of ceramic material. A plurality of exceedingly thin resilient condenser plates are mounted on base 12. In the present case, there are four such plates numbered 14, 16, 18, and 20 respectively. Mica films are disposed therebetween, these films being numbered 15, 17, 19, and 21. Alternate plates and films are eyeleted to the base near one edge of the base, and the plates are bent downwardly at that edge and extended for soldering. Thus, in the present case, plates 16 and 20, and films 17 and 21, are all eyeleted near one edge of the base by means of the eyelet 22. The plates 16 and 20 are bent downwardly against the edge of the base, as is indicated at 24. This prevents oscillation of the plates about the eyelet 22 so that a single eyelet is adequate. The soldering lugs projecting from the downturned portions 24 are indicated at 26. Inasmuch as the plates are preferably made of exceedingly thin metal (having a thickness of, say, three-thousandths of an inch), I find it desirable to back up or reinforce the soldering lugs 26 by means of a generally similarly shaped lug 28 (see Fig. 7) struck of heavy metal, the upper end 30 of lug 28 being secured to the underside of base 12 by means of the eyelet 22.

In a similar way, the other or remaining plates and films are eyeleted to the base near the opposite edge. More specifically, the plates 14 and 18, and the films 15 and 19, are eyeleted to base 12 means of the eyelet 32. Plates 14 and 18 are bent downwardly against the edge of base 12 and

are extended to form the soldering lugs 34. These are backed up by a thick soldering lug 36 which, however, is formed integrally with the thick top plate 38 of the condenser, as is hereinafter described.

The top plate 38 is preferably made of phosphor-bronze metal in order to give the same a permanent resiliency. The thin plates are also preferably made of phosphor-bronze, but in the case of these plates I find that springy brass is also satisfactory. The plate is so shaped that it tends normally to rise upwardly against the restraining influence of adjusting screw 40. A washer 42 is preferably disposed between the head of the adjusting screw and the top plate 38. The adjusting screw is threadedly received in a metallic bushing 44, the lower end of which is disposed beneath the base, and also preferably beneath an attaching staple 46, while the upper end is riveted outwardly in a recess 48 at the top of the base, as is indicated at 50.

The top plate 38 extends over the top of the condenser and is then bent downwardly along the edge of the condenser, as is indicated at 52, following which it is bent inwardly beneath the bottom of the condenser, as is indicated at 54. In accordance with the present invention, the top plate is free of the eyelet 32, and it is solely the inwardly bent bottom portion 54 that is eyeleted to the base. Moreover, the soldering lug 36 is struck out of the top plate and bent outwardly and downwardly away from the base, it being attached to the top plate solely at the lower end of eyelet 32, and solely to the inwardly bent part 54. With this construction, bending of lug 36 has no effect on the position of top plate 38. Lug 36 may be bent upwardly to horizontal position without moving top plate 38 downwardly, and without robbing the top plate of any of its natural resilience tending to cause opening of the same. The bend of lug 36 is limited to lug 36 and is prevented from being transmitted to the remainder of the top plate by the action of eyelet 32.

The construction of the top plate will be readily understood from inspection of Fig. 4 of the drawings showing the same in perspective. The top plate 38 is cut away at 56 to clear the adjusting screw. The plate is bent downwardly at 52 and inwardly at 54. The inturned part 54 is perforated at 58 to receive the eyelet. The soldering lug 36 is struck from plate 38, as is indicated at 60. The plate is cut away all the way down to the inturned part 54 and to a point immediately adjacent the eyelet hole 58. The lug may, if desired, be necked at its point of connection to inturned part 54, this being indicated at 62. With this construction, lug 36 may be bent without affecting the position of the plate in the slightest degree. Moreover, the cutting away of the side wall 52 of the plate, as shown, provides a passage for the soldering lug extensions 34 of the subjacent thin plates, these coming outside the thick lug 36, as is clearly shown in Fig. 1.

The attaching staple 46 is best shown in Figs. 3 and 6. It comprises a flat portion with two legs or prongs 64 turned downwardly at the end thereof. The staple 46 is apertured at 66 to receive the bushing 44. Moreover, the ceramic base 12 is preferably molded with a recess extending thereacross to receive the staple 46 and thereby prevent oscillation of the same about bushing 44. Similar recesses may be provided for other parts of the condenser, and, referring

to Fig. 3, the final construction may be described as involving projections 68 and 70 on the base, these projections being so shaped and dimensioned as to form a space between projections 70 for the inturned part 54 of the top plate; a space between projections 68 to receive the upper part 30 of soldering lug support 28; and a space between the inner ends of all four projections to receive the staple 46.

The staple is, of course, secured to the insulation base at the same time that the bushing 44 is secured in place. Thus, referring to Fig. 10, the insulation base 12 carries the staple 46 at its bottom, this staple being secured in place by riveting of the upper end of the bushing, as is indicated at 50.

The manner in which the staple is used to secure a row of condensers to a mounting strip will be clear from inspection of Figs. 11 and 12. The mounting strip 72 is provided with holes 74 to receive the lower ends of the bushings. The strip is also provided with smaller holes 76 to receive the staple legs 64. The condensers are assembled on strip 72 by simply passing the staple legs 64 through the holes 76 and thereupon bending the legs 64 toward one another, as is clearly shown in the drawings. This is preferably done by means of a small hand-press or foot-press and results in a tight and secure mounting of the condenser on the strip while requiring only a few seconds for the mounting operation. It will be understood that the strip 72 may be a wide strip made of insulation such as Bakelite, or may be a narrow strip made of metal, or, if desired, may be angle or channel metal, all in accordance with the requirements or preferences of the manufacturer of the radio equipment using the condensers. The wide strip shown at Figs. 11 and 12 is insulation because it bridges the opposite sides of the condenser. When using metal, the strip must be narrowed to avoid short-circuiting the condenser. It may, for example, have a width and be disposed as indicated by the strip 73 shown in broken lines in Fig. 3. Contact with part 54 is permissible, for the top plate is ordinarily grounded, and, in any event, there is a connection through the adjusting screw and staple. However, contact with the part 30 must be avoided. It will also be understood that while only three condensers are shown on the drawings, the strip may be provided with four or many more condensers, as desired.

The features of the invention so far described are applicable to a small condenser having only two plates, as well as to condensers having a much larger number of plates. When only two or three plates are provided, the top plate may, if desired, be modified slightly, as shown in Fig. 13, in order to increase the area of the top plate and thereby increase the capacitance of the condenser. Specifically, referring to Fig. 13, it will be seen that the top plate 38' is adjusted by means of a screw 40 acting on a washer 42, all as was previously described. In Fig. 13, however, the plate 38' instead of ending at the washer 42, is extended or projected, as is indicated at 80. The projection of the top plate is cut away at 82 to safely clear the eyelet 22, which is, of course, at opposite polarity. These extensions 80 are preferably not used when the condenser is a multiple condenser having spacers between the plates, for, as will subsequently appear, the extensions 80 would in such case interfere with tight closing of the condenser and would there-

fore prevent the attainment of desired maximum capacitance.

The construction of the thin plates will be evident from inspection of Fig. 5. The plate is cut away at 84 to clear the adjusting screw. It is perforated at 86 to receive the eyelet. It is bent downwardly at 24 to bear against the edge of the base. It is extended at 26 to provide a soldering lug. By extending each of the plates, it is unnecessary to connect the plates at any other point than at the soldering lug, and the mica films may, therefore, be extended between the plates and eyeleted in position even though this tends to insulate plates of common polarity from one another. It is important to notice the upward bowing of the plate, as is indicated at 88. The plate is springy, and may, for example, be phosphor-bronze, and this bowing of the plate tends to cause the condenser to open out when pressure of the adjusting screw is relieved.

The mica film is illustrated in Fig. 9. It is a thin rectangular film cut away at 90 to clear the adjusting screw and at 92 to receive the eyelet. The mica films, like the plates, are held at one end only, the opposite end being free and therefore not interfering with opening up of the condenser except as a result of its own resistance to bending. This is but slight, for the plates are only, say, one and one-half thousandths of an inch in thickness. The metal plates are also exceedingly thin, but are, say, double this thickness, being, preferably, three-thousandths of an inch in thickness. The metal plates open up despite the interposed mica films. In fact, the films help produce more opening of the condenser than would otherwise take place. This will be apparent if it is kept in mind that the metal plates all curve upwardly or in the same direction. The interposition of straight mica films between the curved plates causes a wide separation of the plates when the plates are permitted to curve at all, as by relieving the pressure of the adjusting screw.

To effectually prevent binding of the plates together when the adjusting screw is tightened all the way down, and also, to help attain a desired low minimum capacitance for the condenser, I find it of great help to initially space the plates apart at the eyelets. This may be done, for example, by appropriately deforming the plates immediately at or around the eyelet holes, but I believe it more satisfactory to use real spacers between the plates. These spacers are preferably formed of metal strip, say, brass, having a thickness greater than that of the condenser plates and the mica films. Specifically, I prefer to use spacers having a thickness of, say, six-thousandths of an inch, while using plates having a thickness of three-thousandths of an inch, and films having a thickness of one and one-half thousandths of an inch. A typical spacer is shown in Fig. 8. It comprises a tiny strip of brass 94 apertured at 96 to receive the eyelet. Three such spacers are shown in Fig. 1, one at the right hand side of the condenser between film 15 and plate 18; and the other two at the left-hand side of the condenser, one at the bottom directly above ceramic base 12, and the other between film 17 and plate 20. It will thus be seen that these spacers are disposed opposite the free ends of the plates and films which are eyeleted at the opposite end of the condenser. It will also be seen that successive spacers are eyeleted at opposite ends of the condensers.

The method of assembling the parts of the

condenser may be explained with reference to Fig. 14 of the drawings. This figure will also be helpful in understanding the construction of the condenser. The condenser is assembled in inverted position. The eyelets 22 and 32 are first slipped over, retractable or disappearing pins 100 passing slidably through bottom anvils 102 which project upwardly from the base of a suitable fixture secured in a small press. In the present case, a six-plate condenser is shown, rather than a five-plate condenser, as shown in Fig. 1. Films, plates, and spacers are dropped over the pins 100 and the eyelets in proper sequence to build up the desired condenser. Specifically, film 104, then plate 106, and then spacer 108 are dropped over eyelet 22. Then film 110, plate 112, and spacer 114 are dropped over eyelet 32. Next, film 116, plate 118, and spacer 120 are dropped over eyelet 22. Then film 122, plate 124, and spacer 126 are slid over eyelet 32. Then film 128 and bottom plate 130 are placed over eyelet 22. Base 12 is already provided with staple 46 and bushing 44, and this assembly is then placed over pins 100. Finally, the lug support 28 and the inturred part 54 of top plate 38 are slid over the pins 100. It is important to note that at this time the top plate 38 projects downwardly and even outwardly somewhat, there being a slight bend at the point 132. This assembly is then squeezed together by the operator by pushing the base downwardly in order to flatten out the condenser plates and to expose the upper ends of the eyelets 22 and 32. The press is then operated to cause a forcible descent of top pins or curling anvils 134. These have projections 136 which push the disappearing pins 100 downwardly out of the way and which themselves enter the eyelets. The upper ends of the eyelets are then spread and curled outwardly by the curling surfaces 138. The force of the press rivets the parts tightly together.

The top anvils rise out of the way, and the assembled condenser is then removed from the bottom anvils. The next step in the assembly operation is to bend the plate 38 around over the top of the condenser, whereupon the adjusting screw is passed through the plates and screwed into the threaded bushing. The screw holds the top plate in position and, of course, the natural resiliency of the top plate causes it to tend to open out at all times.

Fig. 14 is interesting in showing how the alternate use of straight films with curved plates tends to cause a large separation or opening of the plates, thereby making possible a low minimum capacitance. Fig. 14 is also interesting in showing a modification of the invention in which the bottommost plate 130 is a flat plate instead of an upwardly bowed plate. This construction is used when it is of paramount importance to obtain a minimum capacitance when the condenser is opened. The minimum capacitance is obtained because of the increased spacing between a flat bottom plate, such as plate 130, and an adjacent curved plate, such as plate 124. Consider, for example, the case of a three-plate condenser. If the bottom plate is a flat plate, the middle plate a curved plate, and the top plate is the thick, self-opening plate, it is evident that the minimum capacitance will be greater than if two curved plates are used beneath the top plate. The flat bottom plate is also useful when making a condenser which has only two plates.

The effect of the flat bottom plate in a multiple plate condenser may be described by com-

parison of Figs. 15 and 16 of the drawings. Fig. 16 shows the capacitance curves for four, five, and six-plate condensers, using all curved plates. Fig. 15 illustrates the tuning curves obtained when using a flat bottom plate. It will be seen that the minimum is reduced from about 35 to 20 mmf. for the four-plate condenser, from about 60 to 40 mmf. for the five-plate condenser, and from about 100 to 60 mmf. for the six-plate condenser.

However, even the curves of Fig. 16 are impressive in showing the excellent performance of my improved condenser, for a capacitance range of from 100 to 500, or from 60 to 400, or from 35 to 300, is readily obtainable. Even more important, not only is this range obtainable, but the condenser is usefully adjustable throughout the range, for the curves are not too steep, even at the high capacitance end, for gradual adjustment. Heretofore, a tiny trimmer condenser of this character, made to attain a maximum capacitance of, say 500 mmf., was so critical that the slightest opening of the adjusting screw would drop the capacitance from, say, 500 to 250 mmf., thus making the condenser too critical to be at all manageable in the high capacitance end of its capacitance range. The present condenser, on the contrary, is usefully and readily adjustable throughout its capacitance range.

It will be understood that it is primarily because of the use of the spacers 94 between the plates that the top plate 38 is preferably kept short, as shown in Figs. 1 and 2, instead of being extended, as shown at 80 in Fig. 13. When the adjusting screw is turned up tight, the maximum capacitance is obtained by a slight downward bending of the upper plates so that the plates are brought tightly together despite the spacers at the ends of the plates. If a top plate with the projections 80 were used with a multiple plate condenser having spacers, the plates could not be squeezed tightly together for maximum capacitance, because the projections 80 would overlie the spacers and would be held upwardly thereby.

It is believed that the construction and method of assembly, as well as the many advantages of my improved trimmer condenser, will be apparent from the foregoing detailed description thereof. It will also be apparent that while I have shown and described my invention in preferred forms, many changes and modifications may be made in the structures disclosed without departing from the spirit of the invention defined in the following claims.

I claim:

1. A condenser comprising an insulation base, metal condenser plates secured thereon with dielectric films therebetween, one plate being eyeleted to the base near one edge of the base and being bent downwardly at that edge and extended for soldering, the other plate extending over the base and downwardly around the opposite edge of the base and then inwardly beneath the bottom of the base, said inwardly bent bottom portion having the full width of the plate and being eyeleted to the base and said top portion being free of the base, a soldering lug connected to said inwardly bent bottom portion at a point adjacent the eyelet by means of a necked or weakened connection such that bending of the soldering lug does not cause bending of the top portion of the plate, and an adjusting screw passing through said plates and base.

2. A trimmer condenser comprising an insulation base, metal condenser plates secured thereon with mica dielectric films therebetween, alternate plates being eyeleted to the base near one edge of the base and being bent downwardly at that edge and extending for soldering, and the other plates being eyeleted to the base near the opposite edge and being bent downwardly at that edge and extended for soldering, an adjusting screw passing through said plates and base, the top plate extending over the base and downwardly around an edge of the base and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug struck from said top plate to a point adjacent the eyelet and bent downwardly away from the base, the cut-away part of the top plate affording passage for soldering lug extensions from subjacent plates.

3. A condenser comprising an insulation base, a plurality of condenser plates thereon, mica films disposed therebetween, alternate plates being eyeleted to the base near one edge only of the base, the other plates being eyeleted to the base near the opposite edge only of the base, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of spacing means between said plates at the eyeleted ends thereof, and an adjusting screw passing through said plates and base, the spacing means between the eyeleted ends insuring movement of the free ends and consequent free opening of the condenser plates when the pressure of the adjusting screw is relieved.

4. A condenser comprising an insulation base, a plurality of resilient condenser plates thereon, mica films disposed therebetween, alternate plates and films being eyeleted to the base near one edge only of the base, the other plates and films being eyeleted to the base near the opposite edge only of the base, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of metallic spacing means between said plates at the eyeleted ends thereof, said means being thicker than the condenser plates and films, successive spacing means being provided at opposite ends of the base, and an adjusting screw passing through said plates and base, the spacing means between the eyeleted ends insuring movement of the free ends and consequent free opening of the condenser plates when the pressure of the adjusting screw is relieved.

5. A trimmer condenser comprising an insulation base, a plurality of resilient condenser plates thereon, mica films disposed therebetween, alternate plates and films being eyeleted to the base near one edge only of the base, the other plates and films being eyeleted to the base near the opposite edge only of the base, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of metallic spacers also eyeleted between said plates, said spacers being thicker than the condenser plates and films, and being disposed beyond the free ends of the plates and films, so that successive spacers are provided at opposite ends of the base, and an adjusting screw passing through said plates and base, the spacers between the eyeleted ends insuring movement of the free ends and consequent free opening of the

condenser plates when the pressure of the adjusting screw is relieved.

6. A condenser comprising an insulation base, a plurality of resilient metal condenser plates, thereon, alternate plates being eyeleted to the base near one edge only of the base, and the other plates being eyeleted to the base near the opposite edge only of the base, said plate being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of mica films between said plates, spacing means between said plates at the eyeleted ends thereof, and an adjusting screw passing through said plates and base for adjusting the capacitance of the condenser, at least some of said thin plates being bowed upwardly in order to effect a spreading of the plates when the pressure of the adjusting screw is relieved, the spacing means between the eyeleted ends insuring movement of the free ends and consequent free spreading of the condenser plates.

7. A trimmer condenser comprising an insulation base, a plurality of resilient metal condenser plates thereon, said plates being made of exceedingly thin spring metal except for the top plate which is made of thicker metal, alternate plates being eyeleted to the base near one edge only of the base, and the other plates being eyeleted to the base near the opposite edge only of the base, mica films between said plates, alternate mica films being eyeleted at one edge and the intermediate films being eyeleted at the opposite edge of the base, said plates and films being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of metallic spacers also eyeleted between said plates, said spacers being thicker than the condenser plates and films and being disposed at the free ends of the plates and films so that successive spacers are provided at opposite ends of the base, and an adjusting screw passing through said plates and base for adjusting the capacitance of the condenser, at least some of said thin plates being bowed upwardly in order to effect an opening or spreading of the plates when the pressure of the adjusting screw is relieved, the spacers between the eyeleted ends insuring movement of the free ends and consequent free opening of the condenser plates.

8. A condenser comprising an insulation base, metal condenser plates secured thereon with dielectric films therebetween, said plates being made of thin springy metal except for the top plate which is made of comparatively thick metal, alternate plates being eyeleted to the base near one edge only of the base, the other plates being eyeleted to the base near the opposite edge only, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, an adjusting screw passing through said plates and base, the top plate extending over the base and downwardly around an edge of the base, and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug connected to said inwardly bent bottom portion at a point adjacent the eyelet by means of a necked or weakened connection such that bending of the soldering lug does not cause bending of the top portion of the plate, at least some of said thin plates being bowed upwardly in order

to effect a spreading of the plates when the pressure of the adjusting screw is relieved.

9. A trimmer condenser comprising an insulation base, metal condenser plates secured thereon with mica dielectric films therebetween, said plates being made of exceedingly thin springy metal except for the top plate which is made of comparatively thick metal, alternate plates being eyeleted to the base near one edge only of the base and being bent downwardly at that edge and extended for soldering, the other plates being eyeleted to the base near the opposite edge only and being bent downwardly at that edge and extended for soldering, mica films between said plates, alternate films being eyeleted at one edge and the intermediate films being eyeleted at the opposite edge of the base, said plates and films being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, an adjusting screw passing through said plates and base, the top plate extending over the base and downwardly around an edge of the base, and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug struck from said top plate to a point adjacent the eyelet and bent downwardly away from the base, the cutaway part of the top plate affording passage for soldering lug extensions from subjacent plates, at least some of said thin plates being bowed upwardly in order to effect a spreading of the plates when the pressure of the adjusting screw is relieved.

10. A condenser comprising an insulation base, a plurality of resilient condenser plates thereon with dielectric films therebetween, alternate plates being eyeleted to the base near one edge only of the base, the other plates being eyeleted to the base near the opposite edge only of the base, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of spacing means between said plates at the eyeleted ends thereof to insure movability of the free ends and consequent spreading of the plates when pressures thereon is relieved, and an adjusting screw passing through said plates and base, the top plate extending over the base and downwardly around an edge of the base, and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug connected to said inwardly bent bottom portion at a point adjacent the eyelet.

11. A trimmer condenser comprising an insulation base, a plurality of resilient condenser plates thereon with mica dielectric films therebetween, alternate plates and films being eyeleted to the base near one edge only of the base, and the plates being bent downwardly at that edge and extended for soldering, the other plates and films being eyeleted to the base near the opposite edge only of the base, and the plates being bent downwardly at that edge and extended for soldering, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of metallic spacers also eyeleted between said plates, said spacers being thicker than the condenser plates and films and being disposed at the free ends of successive plates and films so that alternate spacers are provided at opposite ends of the base, and an adjusting screw passing through said plates and

base, the top plate extending over the base and downwardly around an edge of the base, and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug struck from said top plate to a point adjacent the eyelet and bent downwardly away from the base, the cutaway part of the top plate affording passage for soldering lug extensions from subjacent plates.

12. A condenser comprising an insulation base, a plurality of thin resilient condenser plates thereon, dielectric films disposed therebetween, alternate plates being eyeleted to the base near one edge only of the base, the other plates being eyeleted to the base near the opposite edge only of the base, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of spacing means between said plates at the eyeleted ends thereof, at least some of said thin plates being bowed upwardly in order to effect a spreading of the plates, the spacing means between the eyeleted ends insuring movement of the free ends and consequent free spreading of said plates, and a special top plate made of thick resilient metal, said top plate extending over the base and downwardly around an edge of the base, and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug connected to said inwardly bent bottom portion at a point adjacent the eyelet.

13. A trimmer condenser comprising an insulation base, a plurality of thin resilient condenser plates thereon, mica films disposed therebetween, alternate plates and films being eyeleted to the base near one edge only of the base, and the plates being bent downwardly at that edge and extended for soldering, the other plates and films being eyeleted to the base near the opposite edge only of the base, and the plates being bent downwardly at that edge and extended for soldering, said plates being eyeleted at one end only in order to be movable at the other or free end for adjustment of the capacitance of the condenser, a plurality of metallic spacers also eyeleted between said plates, said spacers being thicker than the condenser plates and films and being disposed at the free ends of successive plates and films so that alternate spacers are provided at opposite ends of the base, at least some of said thin plates being bowed upwardly in order to effect an opening or spreading of the plates, the spacers between the eyeleted ends insuring movement of the free ends and consequent free opening of said plates, and a special top plate made of thick resilient metal, said top plate extending over the base and downwardly around an edge of the base, and then inwardly beneath the bottom of the base, solely said inwardly bent bottom portion being eyeleted to the base, and a soldering lug struck from said top plate to a point adjacent the eyelet and bent downwardly away from the base, the cutaway part of the top plate affording passage for soldering lug extensions from subjacent plates.

14. In combination, a condenser, and a mounting strip for receiving one or more of said condensers, said condenser comprising an insulation base, a metallic bushing secured to said base, said bushing being internally threaded to receive an adjusting screw for the condenser, a metallic staple having an apertured bridge with spaced legs projecting therefrom, said staple being se-

cured to the bottom of said condenser by means of said bushing passing through said aperture, said mounting strip having spaced holes receiving the spaced legs of said staple.

15. In combination, a trimmer condenser, and a mounting strip for receiving one or more of said trimmer condensers, said trimmer condenser comprising an insulation base, a metallic bushing secured to said base, said bushing being internally threaded to receive an adjusting screw for the condenser, a metallic staple secured to the bottom of said trimmer condenser by means of said bushing, the base of said condenser being recessed to receive said staple and to prevent oscillation thereof, said mounting strip having spaced holes receiving the legs of said staple.

16. In combination, a condenser, and an elongated mounting strip for receiving a plurality of said condensers arranged side by side transversely of said mounting strip, said condenser comprising an insulation base, a metallic staple having an apertured bridge with spaced bendable legs projecting therefrom, the bridge on said staple being secured to the bottom of said condenser by means of a part of said condenser structure passing through said aperture, said mounting strip having holes for receiving the spaced legs of the staple, and said legs being bent on the side of the strip opposite the condenser in order to fasten the condenser in position on the strip.

17. In combination, a condenser, and an elongated mounting strip for receiving a plurality of said condensers, said condenser comprising an insulation base, a metallic staple having an apertured bridge with spaced bendable legs projecting therefrom, the bridge on said staple being secured to the bottom of said condenser by means of a fastener passing through said aperture and having a head at its lower end larger than the aperture, said mounting strip having a hole to receive the aforesaid head, and additional holes for receiving the spaced legs of the staple, said legs being bent on the side of the strip opposite the condenser in order to fasten the condenser in position on the strip.

18. In combination, a condenser, and an elongated mounting strip for receiving a plurality of said condensers, said condenser comprising an insulation base, a metallic bushing secured to said base, said bushing having an enlarged head and being internally threaded to receive an adjusting screw for the condenser, a metallic staple having an apertured bridge with spaced bendable legs projecting therefrom, the bridge of said staple being secured to the bottom of said condenser by means of said bushing passing through said aperture, said mounting strip having a hole large enough to receive the head of the bushing and spaced holes receiving the spaced legs of said staple, said legs being bent on the side of the strip opposite the condenser in order to fasten the condenser in position on the strip.

19. In combination, a trimmer condenser and a mounting strip for receiving one or more of said trimmer condensers, said trimmer condenser comprising an insulation base, a metallic staple having an apertured bridge with spaced bendable legs projecting therefrom, the bridge of said staple being secured to the bottom of said trimmer condenser by means of a fastener having a head at its lower end larger than the aperture, the base of said condenser being recessed to receive said staple and to prevent oscillation thereof, said mounting strip having a hole for receiving the aforesaid head of the fastener, so that the

condenser will rest flat on the mounting strip, said mounting strip having additional holes for receiving the spaced legs of the staple, said legs being bent on the side of the strip opposite the condenser in order to fasten the condenser in position on the strip.

20. In combination, a trimmer condenser and a mounting strip for receiving one or more of said trimmer condensers, said trimmer condenser comprising an insulation base, a metallic bushing secured to said base, said bushing having an enlarged head at the bottom and being internally threaded to receive an adjusting screw for the condenser, a metallic staple having an apertured

bridge with spaced bendable legs projecting therefrom, the bridge of said staple being secured to the bottom of said trimmer condenser by means of said headed bushing, the base of said condenser being recessed to receive said staple and to prevent oscillation thereof, said mounting strip having a hole for receiving the aforesaid head of the bushing, said mounting strip having additional holes for receiving the spaced legs of the staple, said legs being bent on the side of the strip opposite the condenser in order to fasten the condenser in position on the strip.

JOSEPH A. FLANZER.