Feb. 25, 1930. E. A. BOHLMAN 1,748,104

CONDENSER

Filed May 28, 1924

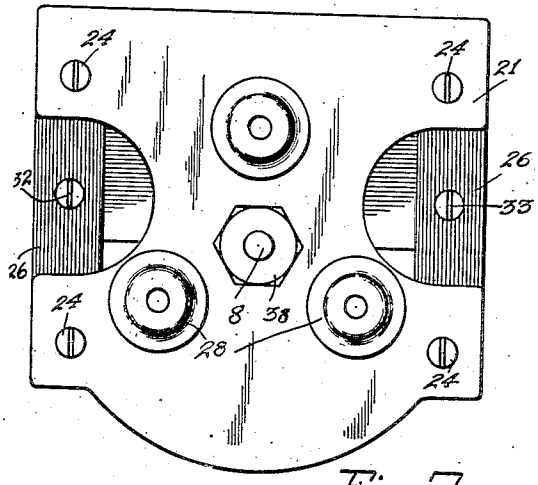

Fig. 2.

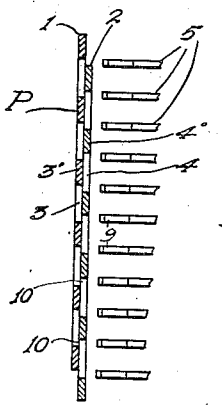

Fig. 5.

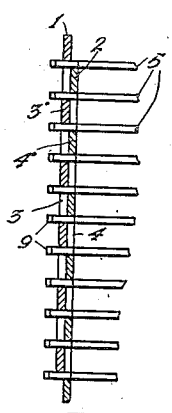

Fig. 6.

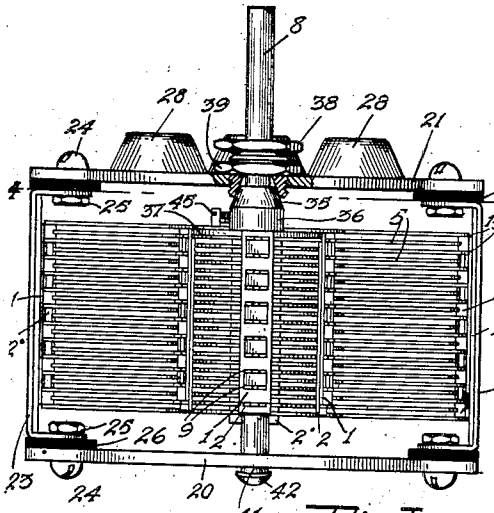

Fig. 1.

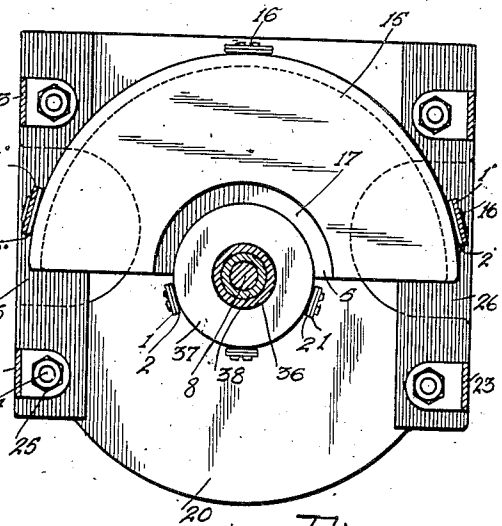

Fig. 4.

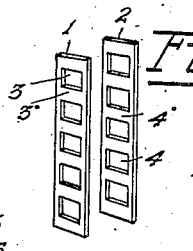

Fig. 7.

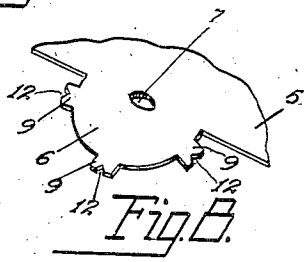

Fig. 8.

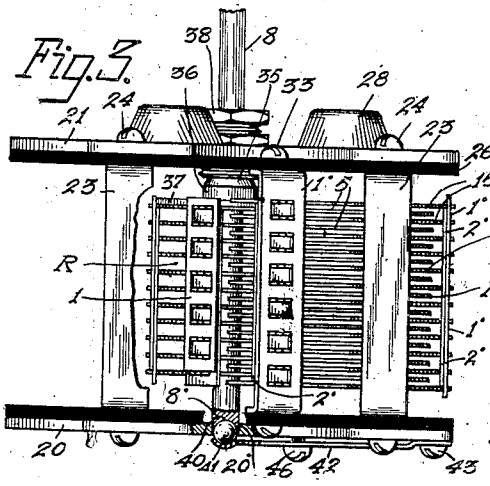

Fig. 3.

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UNITED STATES PATENT OFFICE

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CONDENSER

Application filed May 28, 1924. Serial No. 716,342.

My invention relates to condensers and has to do more particularly with variable condensers having an air dielectric, such as are shown in general use in wireless sets; and an object of my invention is the provision of an improved condenser of the variable type, which is provided with structural features in combination with novel assembly features, which combination produces an improved condenser of the above type which is efficient in its operation and inexpensive to manufacture.

An object of my invention is the provision of simple means for properly spacing and supporting the plates of the stator element and of the rotor element of my condenser; and also the provision of means for supporting and operatively associating the stator and rotor elements of my condenser.

Another feature of my invention is the provision of means in the plates of the stator and rotor elements for permitting their supporting and spacing means to be soldered together and also the said plates soldered to said supporting and spacing means.

Still another feature of my invention is the provision of an end thrust bearing for the shaft of the rotor element of my invention which end thrust bearing is provided with a ball bearing for engaging an arcuate shaped opening in the end of said shaft to permit easy rotation of said shaft.

The above features, as well as others, will be more specifically pointed out in the ensuing specification and appended claims, and for a clearer understanding of the same reference may be had to the accompanying drawings in which like reference characters in the several views denote like parts.

Referring to the drawings,

Fig. 1 is a view in elevation of the condenser of my invention;

Fig. 2 is a plan view of the condenser of my invention;

Fig. 3 is a right side view of Fig. 2 looking to the left;

Fig. 4 is a plan view along the line 4—4 of Fig. 1;

Fig. 5 is a sectional view of a pair of the supporting and spacing members of my invention showing the same in position for receiving the integrally formed members of the plates shown in the right of this figure;

Fig. 6 is a view similar to Fig. 5 but showing the integrally formed members of the plates engaging the pair of supporting and spacing members in assembled position;

Fig. 7 is a perspective view of a pair of the supporting and spacing members for the condenser plates of my condenser; and

Fig. 8 is a partial perspective view of one of the plates of the rotor element of my invention showing the integrally formed ears or members for engaging the pairs of supporting and spacing members of my condenser.

Referring now in detail to my invention as illustrated in the drawings I will first describe the construction of the supporting and spacing means of my invention and the manner in which I utilize the same for supporting and spacing the plates of the rotor element and the plates of the stator element of the condenser of my invention.

Referring to my spacing means P, the same comprises a pair of oblong rectangular members 1 and 2, each of which is provided with a plurality of rectangular openings or windows 3 and 4 respectively. The size of the openings 3 and 4 are substantially the same, and the portion 3′ and the portion 4′ between the openings 3 and 4 respectively, are slightly smaller in width than the width of the said openings 3 and 4 respectively so that when the members 1 and 2 are placed together as shown in Fig. 5 the said portions 3′ will come opposite the openings 4. and the portions 4′ will come opposite the openings 3 but not so as to completely close the said openings 3 and 4.

Referring to the rotor element R of my invention, it comprises a plurality of semi-circular plates 5, suitably formed of aluminum, each of which is provided with a reduced semi-circular portion 6, in which is provided a suitable opening 7 for receiving the rotatable shaft 8. Ears or lugs 9 are integrally formed on the periphery of the said reduced semi-circular portion 6 of the plate 5 and extend in the same plane as the said plate. Concave grooves 12 are provided in the ears

9 for purposes to be pointed out later. In assembling the rotor element R, the pair of members 1 and 2 are placed together as shown in Fig. 5, (there being a pair of these members 1 and 2 provided for each ear 9 of the plate 5,) and an ear 9 of the plate 5 is inserted into the aligned opening 10 provided by the aligned end portions of the openings 3 and 4 of said members 1 and 2 as shown in Fig. 6, the ear 9 protruding through and resting between the portions 3′ and 4′ of said members 1 and 2. When all of the plates 5 of the rotor element R have their ears 9 engaging the pairs of members 1 and 2, the members 2 of the spacing means P will engage the peripheral edge of the reduced semi-circular portion 6 of the plates 5 adjacent the ears 9, and the openings 7 in the said plates 5 will be in alignment with each other to permit the insertion of the rotatable shaft 8 of the rotor element R. A thin strip of solder is now placed in the aligned grooves 12, formed in the ears 9 of the plates 5 and a soldering iron applied thereto whereupon said solder will engage the members 1 and 2 and also the ears 9 of the plates 5 to secure the members 1 and 2 together and the ears 9 of the plates 5 in their assembled position in the pairs of members 1 and 2. By having the grooves 12 provided in the ear 9 and in vertical alignment with each other when the plates 5 are assembled, a thin strip of solder may be laid in the aligned grooves 12 and a hot soldering iron run over said strip of solder by one movement of the hand thereby saving time, and the grooves 12 also act as guiding means or as a chute for guiding the melted solder between the ears 9 and the members 1 and 2 thereby avoiding the smearing of solder all over the plates 5. A disk 37 is provided which is adapted to engage the top plate 5 and to also engage the extending ends of the members 1 of the spacing means P, whereupon solder is applied to secure the said disk 37 to the said extending ends of said members 1. The disk 37 has a hub member 36 integrally formed therewith which is provided with a central opening in alignment with an opening in said disk 37 for purposes which will be set forth in the ensuing specification. After the above described assemblage has been performed a single rotor element unit R is effected as will be clearly understood from the foregoing description.

Referring now to the stator or stationary element S of my condenser the same comprises a plurality of semi-circularly shaped plates 15 formed of aluminum and are provided with integrally formed ears 16. The plates 15 are assembled, secured, and supported as well as spaced by pairs of spacing members 1′ and 2′ in substantially the same manner as plates 5 of the rotor element R are supported and spaced by the pairs of members 1 and 2 as described above and a detail description of the same is not thought necessary. Each plate 15 has a portion of its body cut away to form an arcuate opening 17 for receiving the semi-circular portion 6 of a plate 5 and is of a size to permit the rotation of the plate 5 within the open space provided by a pair of the plates 15. The member 1′ of two pairs of the supporting and spacing members 1′ and 2′ are heavier in weight than the member 2′ and are also long enough to have their ends turned over at right angles for purposes to be pointed out later.

For supporting the rotor element R and the stator element S in operative position relative to each other, a pair of supporting members 20 and 21 are provided which are secured together and separated from each other by bridge members 23, which have their ends turned over and provided with suitable openings for receiving the screws 24, said screws extending through suitable openings in the bridge members 23 and insulating strips 26 and have screw-threaded engagement with the nuts 25. The supporting member 21 is provided with members 28 integrally formed therewith for mounting purposes.

In mounting the stator element S of my condenser the same is inserted between the supporting members 20 and 21 so that the turned over ends of the member 1′ of the spacing members will engage the insulating strips 26, and to secure the stator element S betwen the supporting members 20 and 21, screws 32 and 33 are provided which extend through suitable openings in the insulating strips 26 and then have screw-threaded engagement with suitably tapped orifices in the turned over ends of the spacing members 1′. The heads of the screws 32 and 33 occupy openings in the members 20 and 21 respectively, but do not have contactual engagement with said members 20 and 21 to prevent the stator element S from being connected in circuit with the rotor element R. Thus it will be seen that the stator element S is secured and supported between the mounting members 20 and 21 by a pair of the spacing members 1′ and are insulated therefrom by the insulating strips 26 and the said pair of members 1′ are heavier in weight compared with the members 2′ since they serve to support the stator element S.

The rotor element R is now inserted between the members 20 and 21, and the plates 5 are inserted between the plates 15 of the stator element S, so that a portion of the cone-shaped end 35 of the hub 36 engages the convex end of the adjustable tubular screw 38, which screw extends through and has screw-threaded engagement with a lock nut 39 and a suitably tapped orifice in the member 21. The nut lock 39 serves to lock the adjustable screw 38 in its adjusted position. The shaft 8 is now inserted through the adjustable tubu-

lar screw 38 and through the central opening provided in the hub 36 and member 37, and then through the aligned openings 7 in the plates 5 of the rotor element R. One end 8' of the shaft 8 extends slightly into an opening 20' in the member 20 and is provided with a semi-circular recess 40 which is adapted to receive a ball bearing 41, the said ball bearing being held in the said recess 40 in engagement with the end of the shaft 8 and in the opening 20' by a spring member 42, which spring member 42 has its one end secured to the member 20 by a screw 43, and its other end shaped to form a convex recess for receiving the ball bearing 41. Due to the spring effect of the spring member 42 the ball bearing 41 is maintained in the recess 40 formed in the end of the shaft 8. The shaft 8 will tend to be moved upward due to the spring pressure exerted by the spring member 42, so that the cone-shaped end 35 of the hub 36 is forced upwardly and maintained in engagement with the convex opening of the tubular screw 38, the hub 36 being secured on the shaft against movement thereon by the set screw 45. To adjust the plates 5 of the rotor element R relative to the plates 15 of the stator element S all that is necessary is to loosen the lock nut 39 and rotate the adjustable tubular screw 38 in a clockwise or counter clockwise direction depending on the desired adjustment, which will move the hub 36 and shaft 8 downwardly, if the said screw 38 is rotated in a clockwise direction, or to permit the said hub 36 and shaft 8 to be moved upwardly by the spring member 42 in case the said screw 38 is rotated in a counter clockwise direction. When the desired adjustment of the plates 5 relative to the plates 15 is obtained the lock nut 39 is screwed down against the member 21 to hold the screw 38 in its adjusted position. Thus it will be readily apparent that I provide simple means for adjusting the plates of the rotor element R relative to the plates of the stator element S.

The rotor element R may be rotated by rotating the shaft 8 to position the plates 5 relative to the plates 15 of the stator element S for the well known purposes. When the shaft 8 is rotated the ball bearing 41 permits easy rotation of the said shaft 8, and when the rotor element R is adjusted in a rotary direction relative to the stator element S, the rotor element R is held in its adjusted position due to the frictional engagement of the cone-shaped end 35, of the hub 36, and the walls of the convex opening in the tubular screw 38, the spring member 42 maintaining the end 35 of said hub 36 in frictional engagement with the tubular screw 38. The shaft 8 of my condenser may be suitably adjusted by loosening the set screw 45.

My condenser may be mounted on a suitable panel or mounting member by suitable screws which may extend through suitable openings in said panel or mounting member and then have screw-threaded engagement with suitably tapped orifices in the members 28 formed integrally with the plate 21, the said members 28 abutting against the said panel or mounting member.

A screw 46 passes through a suitable orifice in the spring member 42 and has screw threaded engagement with a suitable tapped orifice in the plate 20. The screw 46 serves as an adjusting screw for placing the proper tension upon the free end of the spring 42 which bears against the bearing 41 in the end 8' of the shaft 8 so that the rotor element R will be maintained in any of its adjusted positions.

While I have described and illustrated a preferred embodiment of my invention it is to be understood that I do not wish to be limited to the exact structure, as shown and described, but that I intend to cover all that may come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by United States Letters Patent is:

1. A device of the class described including a plurality of plates, a pair of members having openings placed together so that the openings of said members are in zigzag relation relative to each other, said plates divided into pairs so that a pair of said plates will extend through the same opening in one of said members and through different openings in the other of said members whereby said members support and separate said plates.

2. A device of the class described including a stationary element, a rotor element comprising a plurality of conducting plates, members provided with openings and arranged in pairs to place the openings of said members in zigzag relation relative to each other for supporting and spacing said plates, a disk, having a hub member integrally formed therewith, secured to said pairs of members, a mounting frame, means for supporting said stationary element in said frame, adjustable means secured in said frame, a shaft for extending through said adjustable means and through said hub member, disk and rotor element, said disk serving as means operatively connecting said shaft and rotor element, means including said hub member and said adjustable means for securing said shaft in said rotor element against rotary and longitudinal movement, and yielding means for maintaining said member in frictional engagement with said adjustable means.

3. A device of the class described including a rotor element, a plurality of plates comprising said rotor element, means for securing said plates together in spaced relation to prevent said plates moving relative to each

other, a mounting frame. adjustable means secured in said frame adapted to maintain said rotor element in any of its adjusted positions, said frame having an opening, a ball bearing spring supported therein, a shaft extending through said adjustable means and said rotor element and into the opening in said frame, said ball bearing adapted to engage the end of said shaft, and means comprising a disk secured to said rotor element having a hub portion adapted to be operatively connected to said shaft and said adjustable maintaining means for securing said rotor element and shaft together against rotary movement relative to each other.

4. A device of the class described including a mounting frame, a fixed element secured in said mounting frame, a movable element, a plurality of plates comprising said movable element, means for securing said plates together in a spaced relation to prevent said plates moving relative to each other, a disk, having a cylindrical member integrally formed therewith, for said movable element, adjustable means secured in one side of said frame. said frame having an opening in the other side thereof, a shaft extending through said adjustable means, said cylindrical member and disk. and through said movable element and into said opening in said frame. and a ball bearing for engaging the end of said shaft in said opening, said cylindrical member having frictional engagement with said adjustable means for holding said movable element in any of its movable positions, and means for said cylindrical member for securing said movable element on said shaft against rotary movement relative to said shaft.

5. A device of the class described including conducting plates, ears formed with said plates, said ears having grooves formed therein, members, provided with openings, arranged in pairs so that said openings are in zigzag relation relative to each other, the ears of said plates adapted to engage said zigzag openings whereby said plates are supported and separated by said members to form an air dielectric between said plates, said grooves adapted to receive solder and to guide the same to said pairs of members and said ears whereby said plates and said pairs of members are soldered together to form a single unit.

6. A device of the character described including a plurality of members adapted to be secured together in spaced relation, a pair of strips provided with openings and adapted to cooperate with each other whereby a pair of said members extends through the same opening in one of said strips and different openings in the other one of said strips so that one strip operates to prevent two of said members from separating while the other strip prevents said members from contacting.

7. A device of the character described including a pair of members adapted to be held in spaced relation, a supporting element provided with openings and cooperating with said members to prevent separation of said members, and a second supporting element provided with openings for holding said members in spaced relation, said pair of members adapted to extend through the same opening in said first element and through adjacent openings in said second supporting element, said elements lying adjacent each other and secured together.

8. A device of the character described including a plurality of members adapted to be held in spaced relation, a supporting element provided with openings and adapted to prevent every other one of said members from moving in one direction, and a second supporting element provided with openings for preventing the other of said members from moving in said direction, adjacent members adapted to extend through the same opening in one of said supporting elements and through different openings of said other supporting element, said first element preventing said last members from moving in the opposite direction and said second element preventing said first members from moving in said opposite direction.

9. A device of the character described including a plurality of plates each provided with extended portions, a pair of flat supports cooperating to hold said plates in spaced relation, each of said supports having notches for receiving extended portions of said plates, said notches being substantially equal to the spacing between said plates plus the thickness of two of said plates.

10. A device of the character described including a pair of plates each provided with an integrally formed ear, a flat support having a rectangular notch for receiving said ears to hold said plates in spaced relation, said notch being substantially equal to the spacing between the plates plus the thickness of said plates.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 26th day of May, 1924.

ERNEST A. BOHLMAN.