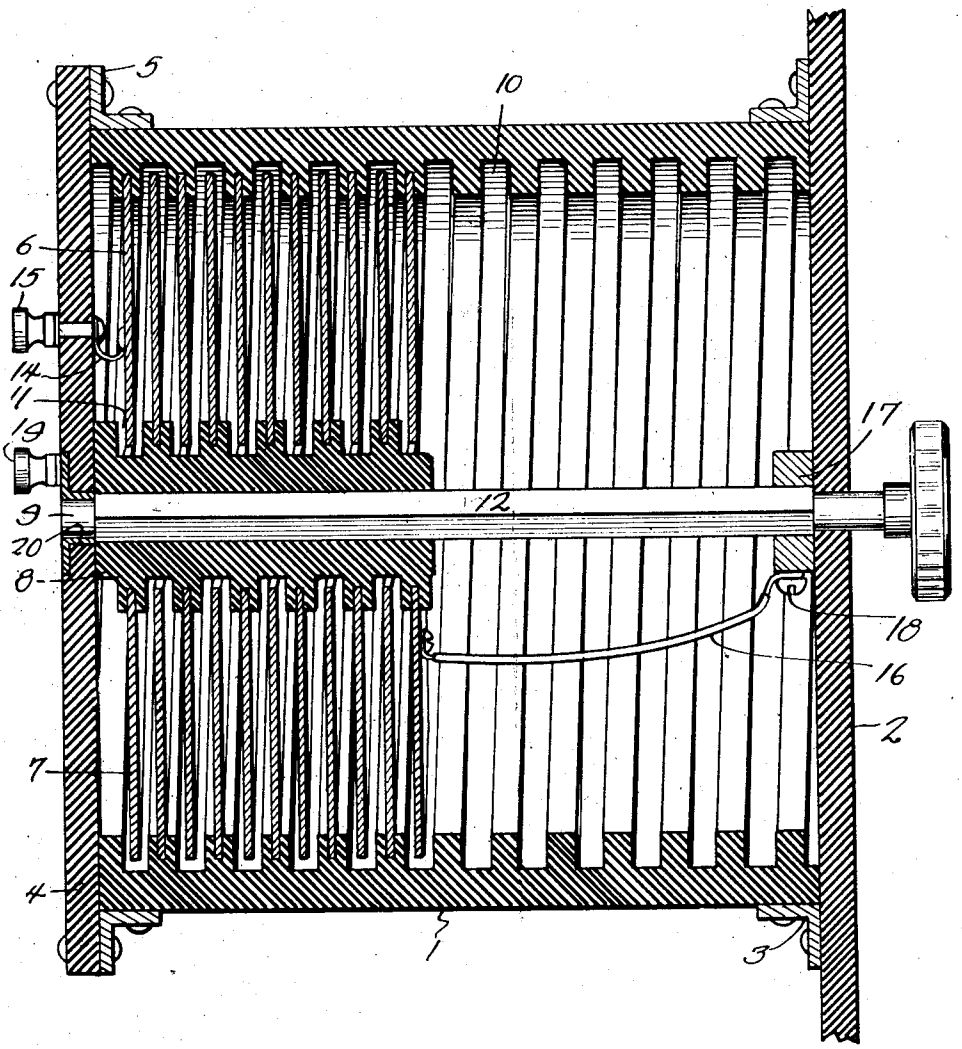
Nov. 26, 1929. L. A. BRAND 1,737,074

RADIO CONDENSER

Filed March 9, 1929



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Patented Nov. 26, 1929 1,737,074

UNITED STATES PATENT OFFICE

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RADIOCONDENSER

Application filed March 9, 1929. Serial No. 345,691.

My invention relates to variable, electrical condensers of the type used in radio receiving outfits and has for its primary object to provide a condenser which does not have dead end losses.

Another object of my invention is to provide a condenser wherein the inductive capacity may be changed through very minute variations and wherein the capacity may be reduced at one end of the scale to a minimum.

More particularly my invention refers to that type of condenser employing the helical screw type plate, one plate screwing into the other. In this type of condenser, the minimum capacity may be brought to a very small figure, owing to the fact that the condenser may be constructed with only two plates, one a fixed and the other a movable plate and these may be so rotated that at the beginning of their overlapping engagement only two edges are brought into proximity, whereas in the ordinary condenser of the movable, parallel plate type, the edges of a plurality of plates approach each other simultaneously as the condenser is turned toward full capacity position.

Another object of my invention is to provide a condenser of the screw type, in which there will be no dead end losses, whereas in the ordinary condenser of the parallel plate type, there are as many loose ends as there are plates.

Further advantages of the screw type condenser are as follows: Whereas a parallel plate condenser of eleven plates or more has 97 wave lengths in four inches of circumference, the screw type condenser has 97 wave lengths in 56 inches of circumference and consequently the wave lengths are fourteen times farther apart on the screw type condenser than they are on the parallel plate type. For instance, the condenser, having six turns on each helical plate, the total circumference of all of the turns is approximately 56 inches and as the movable plate is rotated six times between its two extreme positions of complete disengagement and complete engagement, the distance that it is rotated to shift from one wave length to another will be fourteen times as great as the distance that the parallel plate condenser referred to above is rotated to vary the capacity in the same amount.

Further advantages of the screw plate condenser reside in the fact that only fifteen pieces are required to construct it whereas in an 11 plate condenser, over 75 separate pieces are required.

In further reference to the elimination of dead end losses the ordinary 11 plate condenser has 11 loose load ends whereas a helical condenser has none.

A number of problems are presented in a condenser of the screw plate type. In the first place, it is a difficult matter to form the plates so that they will retain accurately the proper spacing between the convolutions and the exact helical shape which is necessary to render such spacing uniform. My invention contemplates a structure in which it is not entirely essential that the plates be given a permanent accurate form.

It is my purpose in answering this problem to provide means for mounting the plates, which is also adapted to retain them permanently in their properly spaced relation and to positively prevent contact between the plates without interfering with the rotation of the plates relative to each other on the electrical oscillation of the plates.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

The figure shows a longitudinal, sectional view through the condenser embodying my invention.

In carrying out my invention, I provide a shell 10, insulating material such as bakelite, hard rubber composition or the like, which is cylindrical in form. The shell 1 may be secured to the panel 2 of a radio set by means of a support bracket or collar 3 secured to the shell and adapted to be secured to the shell and adapted to be secured to the panel 2.

The shell is provided with an end wall 4, which may be secured in any manner such as by the collar 5.

The fixed condenser plate 6 is supported by the shell with its outer edge connected thereto in some manner such as by imbedding in the material of the shell as shown. The plate 6 is of helical form, being perpendicular to its axis along a radial, cross-sectional cut. The inner edge of the plate is spaced radially from the axis of the helix to form an axial opening.

The variable plate 7 is mounted on a sleeve 8, which in turn is mounted on a shaft 9 of conductive material. The sleeve 8 is of non-conductive material similar to that of the shell 1. The preferable manner of securing the plate 7 to the sleeve 8 is by imbedding its inner edge in the sleeve as shown. The plate 7 is of identical, helical shape, pitch, etc., with the plate 6 and is adapted to be threaded into the space between the convolutions of the plate 6 and to be spaced equidistantly at all points at adjacent convolutions thereof.

In order to space the outer edge of the variable plate from the outer edge of the fixed plate and to positively insulate said outer edges from each other, the shell 1 is provided with an interior, helical groove 10, in which the outer edge of the variable plate is received. The groove 10 is of sufficient width to allow the variable plate to move readily in a circumferential direction within the groove and is spaced equidistantly from the fixed plate convolutions so as to enforce the positioning of the variable plate convolutions substantially midway between the convolutions of the fixed plate.

In the same manner, in order to positively insulate the inner edge of the fixed plate from the inner edge of the variable plate, the sleeve 8 is provided with a helical groove 11, in which the inner edge of the fixed plate is received. The groove 11 is positioned midway between the convolutions of the variable plate.

The sleeve 8 is slidably but non-rotatably mounted on the squared portion 12 of the shaft 9 so that it may slide longitudinally of the shaft and yet be given rotative movement when the shaft is rotated.

It will now be seen that the groove construction serves three functions, namely:

1. As the shaft 9 is rotated by means of the dial knob 13 or the like, the variable plate will be fed forwardly as its outer edge threads its way forwardly in the groove 10. In this connection, it may be noted that in other condensers of the helical plate type, it has been found necessary to employ a threaded feed rod, generally formed as an extension of the shaft and a threaded sleeve or nut, into which said rod is threaded, the threads on the feed rod being pitched to correspond with the pitch of the variable plate, thereby maintaining the proper spacing of the plates relative to each other.

However, should either of the plates become bent or warped, due to injury or weathering, the threaded feed rod would not prevent contact of the plates.

2. Consequently the second function of the helical groove construction is to prevent the plates from becoming warped by positively confining the edges of the plates in their proper positions.

3. As an added protective measure, the grooves provide ridges or threads of insulating material separating the plates and insulating them from each other. These threads are not of sufficient depth to materially cut down the size of the air dielectric.

It will be understood that the drawing has been exaggerated somewhat for the sake of clearness and that the amount of spacing shown between the plates and the sides of the grooves in which they are received is somewhat larger than is contemplated in the manufacture of the structure of my invention. Sufficient spacing between the plates and the sides of the grooves is provided in order that friction may be reduced to a minimum. It will be understood that some variation might be made in the amount of spacing without departing from the real spirit of my invention.

The fixed plate 6 is connected as at 14 to a suitable terminal 15. The variable plate 7 is connected as at 16 to the collar 17, which is of conducting material and adapted to be secured to the shaft 12 by means of a set screw 18 in any of several adjusted positions. The collar 17 thus serves the double function of acting as an electrical connection to secure the wire 16 to the shaft 12 and to act as a stop to limit the unthreading movement of the collar 8.

In this connection, it may be noted that in many cases the lower limit of capacity desired for the condenser is a very substantial amount and there is no necessity for reducing the capacity beyond this amount. Therefore it will be desirable to limit the unthreading of the movable plate from the fixed plate at the point where this lower limit of capacity is obtained.

The shaft 12 is connected to a terminal 19 by means of a bushing 20 of conducting material in which one end of the shaft is journalled.

As the plates are threaded together, the capacity commences between the engaging extremities and is gradually increased as more convolutions are inter-engaged.

There are no dead end losses because the terminals 15 and 17 are connected to the remote extremities of the plates and no portion of either plate is ever cut out of the circuit.

Some changes may be made in the construction and arrangement of the parts of my invention without departing from the real

spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a variable condenser, a cylindrical shell of insulating material, provided with internal helical grooves, a fixed plate of helical form, mounted with its outer edge embedded in the shell, a shaft of conducting material journalled at the axis of the shell, a variable plate of helical form mounted on the shaft and threaded into the helical groove of the shell, a brush against which the shaft contacts during its sliding and rotating movement, and an electrical connection between the shaft and the variable plate at the end of the latter remote from the fixed plate, the shaft being insulated from the variable plate during the remainder of its length.

2. In a variable condenser, a cylindrical shell of insulating material, provided with internal helical grooves, a fixed plate of helical form, mounted with its outer edge embedded in the shell, a shaft journalled at the axis of the shell, and a variable plate of helical form mounted on the shaft and threaded into the helical groove of the shell, the shaft being insulated from the variable plate during the remainder of its length.

3. In a variable condenser, a cylindrical shell of insulating material, provided with internal helical grooves, a fixed plate of helical form, mounted with its outer edge supported by the shell, a shaft journalled at the axis of the shell, and a variable plate of helical form mounted on the shaft and threaded into the helical groove of the shell, the shaft being insulated from the variable plate during the remainder of its length.

4. In a variable condenser, a cylindrical shell of insulating material, a fixed plate of helical form, supported at its outer edge by the shell open at its axis, a shaft journalled at the axis of the shell, a sleeve of insulating material mounted on the shaft, a variable plate mounted on the sleeve, the sleeve being provided with a helical groove, into which the inner edges of the fixed plate is threaded.

5. In a variable condenser, a cylindrical shell of insulating material, a fixed plate of helical form, supported at its outer edge by the shell open at its axis, a shaft journalled at the axis of the shell, a sleeve of insulating material mounted on the shaft, a variable plate mounted on the sleeve, the sleeve being provided with a helical groove, into which the inner edges of the fixed plate is threaded, a brush against which the shaft contacts during its sliding and rotating movement, and an electrical connection between the shaft and the variable plate at the end of the latter remote from the fixed plate.

6. In a variable condenser, a cylindrical shell of insulating material, a fixed plate of helical form, supported at its outer edge by the shell open at its axis, a shaft journalled at the axis of the shell, a sleeve of insulating material mounted on the shaft, a variable plate mounted on the sleeve, the inner edge of the latter plate being embedded in the material of the sleeve, the sleeve being provided with a helical groove, into which the inner edges of the fixed plate is threaded.

7. In a variable condenser, a cylindrical shell of insulating material, a fixed plate of helical form, supported at its outer edge by the shell open at its axis, a shaft journalled at the axis of the shell, a sleeve of insulating material mounted on the shaft, a variable plate mounted on the sleeve, the sleeve being provided with a helical groove, into which the inner edges of the fixed plate is threaded, and the shell being provided with an internal helical groove, into which the outer edge of the variable plate is threaded, whereby the plates are reinforced in their spaced relation, by insulating mediums.

Signed this 6th day of March, 1929, in the county of Woodbury and State of Iowa.

LUDWIG A. BRAND.