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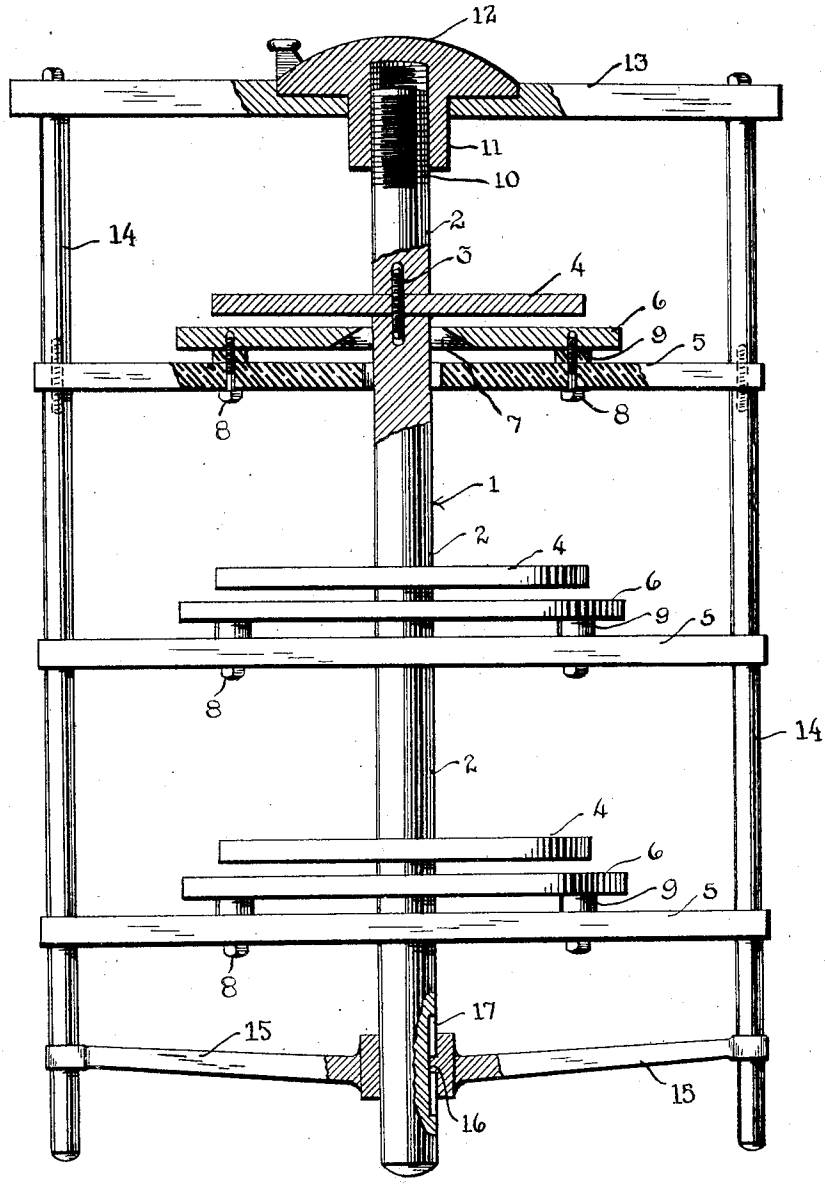
April 5, 1927. 1,623,360

T. T. RODGERS ET AL

CONDENSER

Filed Sept. 24, 1924



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UNITED STATES PATENT OFFICE.

THOMAS T. RODGERS, MARC A. GIBLIN, FRANCIS K. MOORE, AND GEORGE T. MOORE, OF MILWAUKEE, WISCONSIN, ASSIGNORS TO RODGERS RADIO CORPORATION, OF WEST ALLIS, WISCONSIN, A CORPORATION OF WISCONSIN.

CONDENSER.

Application filed September 24, 1924. Serial No. 739,491.

Our invention has reference, in its broad aspect, to improvements in variable condensers of the type wherein the dielectric medium is changed through the instrumentality of relatively adjustable opposed surfaces to affect capacity, and more particularly it is our purpose to provide means whereby the dielectric mediums of a plurality of such condensers may be simultaneously varied by equal increments through the utilization of a single means in the form of an axially movable actuating member connected to one of the condenser elements of each condenser unit.

In the art relating to improvements in radio receiving apparatus of the type exemplified by multiple stage radio frequency amplification, efforts have been made to simplify the process of tuning by the utilization of common means for manipulating the several rotors of a plurality of rotary condensers of the conventional type, but in practice this and other methods have been found impractical for the reason that any slight inaccuracies or distortion renders the system inoperative. On the other hand, we have found that by providing a common axially movable means to which certain elements of our novel condensers are connected, that the dielectric mediums of such condensers may be varied by equal increments, thereby accomplishing the desired result.

In practice we have found that excellent results and a high degree of selectivity can be attained by utilizing air dielectric condensers having opposed condenser surfaces for adjustment toward and away from each other in a common plane, and to this end we have connected a movable element of each of our condensers to an axially adjustable common shaft, through the instrumentality of which all of the said elements may be simultaneously affected to vary the dielectric mediums of the respective condensers by equal increments. Furthermore, we have provided means whereby the opposing surfaces of our respective condensers may be adjusted independently, so that absolute accuracy of adjustment is attained, and in order to prevent possibility of variation in axial alignment of our condenser elements, thereby affecting capacity, we have formed one of the elements of each condenser of a greater diameter than its opposing element.

The particular elements of our multiple condenser assembly employed to accomplish the above and other objects attributed to it, will be hereinafter more fully described in detail and specifically pointed out in the claims appended hereunto and forming a part of this specification.

In the accompanying drawings wherein we have illustrated one of the preferred embodiments of our invention;—

The figure represents a vertical elevation of our multiple condenser system with portions thereof broken away to more clearly show the details.

Like characters of reference designate like or similar parts throughout the several views of the drawings, in which;—

The numeral (1) designates generally a sectional shaft, the sections (2) of which are connected together in axial alignment by studs (3). Interposed between each of the respective ends of the sections (2) of the shaft (1), is a disk, plate, or the like (4), the same being provided with a central opening through which the stud (3) extends in assembly. Mounted upon fixed insulating bases (5), one opposed to each of the disks or plates (4), are a plurality of similar disks, plates or the like (6). These disks or plates (6) are formed with enlarged central openings (7), the peripheral edges of which are beveled for the purpose of reducing capacity, and we have provided means in the form of screws (8) for maintaining the plates (6) upon the respective insulating members. However, interposed between each plate and its adjacent insulating member is an inherently resilient member, such as a soft rubber washer (9). Manifestly, by manipulating the screws (8), the plates (6) are drawn down against the resiliency of soft rubber washers (9) to accurately adjust the position of the same with respect to the plates (4). It will be understood that the plates (6) are supported on three-point contacts. While we have shown and described here means for individually adjusting but one of the plates, namely plate (6), it follows that the plate (4) may also be adjusted by simply mounting upon the shaft (1) a flanged collar (not shown), to which the plate (4) may be adjustably secured through the instrumentality of screws, and the inherently resilient

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members (9), such as have just been described. In practice we have found that by forming the plate (6) of greater diameter than the plate (4), that variations in axial alignment will be compensated for, which would otherwise produce variation in capacity. Of course, the plate (4) could be made of greater diameter than the plate (6), and the result would be the same.

We have shown here three condenser units, each of which is formed in the manner described above, each unit, consisting in a plate (4) and a plate (6), and an insulating member (5), but it will be understood that any number may be used and all are formed in the same manner.

The end of the shaft (1) is screw threaded as at (10), (preferably in the ratio forty-eight to the inch) and is engaged by an interiorly screw threaded sleeve (11), carried by a rotatable dial member (12) mounted for movement upon any suitable support (13), such as a cabinet top. Thus, upon manipulation of the dial (12), the rotational movement of the sleeve (11) will be translated into proportional axial movement of the shaft (1). This axial movement of the shaft will in turn move the respective plates (4) toward or away from the plates (6), thereby varying the dielectric medium between the plates (4) and (6) by equal increments. In practice such variation of the movable plates of the condenser units will result in the proper tuning of the various stages of radio frequency amplification, as in the manner described in our present pending application for patent upon radio receiving apparatus, filed September 24th, 1924.

It has been indicated that the insulating members (5) are fixedly mounted, and for this purpose a suitable frame, to which they are attached, may be provided, as is here illustrated conventionally and designated by the numeral (14). Means in the form of a spider (15) is attached to the frame and engages the end of the shaft to properly support the shaft in alignment, and the shaft is locked against rotational movement by a detent (16) on the spider working in a slot (17) in the shaft, or in any other suitable manner.

While it is believed that the operation of our invention will be apparent from the foregoing description, it is here emphasized that in tuning a multiple stage radio frequency system to which our condenser assembly is applied, it is necessary to have but one tuning dial, here designated by (12), upon the manipulation of which the proper tuning of the respective stages of amplification is affected by means of proportional variation of the dielectric mediums of the respective condensers by axial movement of the shaft (1). Thus a very much simplified multiple stage radio frequency amplification system is attained, the tuning of which should readily be accomplished by a person totally unfamiliar with the science of radio, or the manipulation of receiving sets, it simply being necessary to turn the dial until the proper station is found.

While in the foregoing there has been illustrated and described such combination and arrangement of elements as constitute the preferred embodiments of our invention, it is nevertheless desired to emphasize the fact that interpretation of the invention should only be conclusive when made in the light of the subjoined claims.

We claim:—

1. In a multiple unit variable condenser system, a plurality of condensers each being formed with co-operating plates having normally opposed surfaces, inherently resilient means for adjusting certain of said co-operating plates, and a common axially movable member to which each of said other co-operating plates is connected for moving the same in the direction of the movement of the shaft to simultaneously vary the distances between the opposed surfaces of the plates of the respective condensers by equal increments.

2. In a multiple unit variable condenser system, a plurality of condensers each having a movable condenser element and a fixed condenser element, a sectional axially movable shaft, a movable condenser element being secured to the shaft between each of the respective sections thereof, and all of said movable condenser elements adapted to be moved simultaneously and in the direction of the movement of the shaft upon manipulation thereof whereby to vary the distances between the opposed surfaces of the condenser elements of each unit by equal increments.

3. In a multiple unit variable condenser system, a plurality of condensers each having a movable condenser element and a fixed condenser element, a sectional axially movable shaft extending through all of the condenser elements, a movable condenser element being secured to the shaft between each of the respective sections thereof, and all of the said movable condenser elements adapted to be moved simultaneously and in the direction of the movement of the shaft upon manipulation thereof whereby to vary the distances between the opposed surfaces of the condenser elements of each unit by equal increments.

In testimony whereof we affix our signatures hereunto.

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