Aug. 2, 1927. 1,637,445

A. W. FRANKLIN

VARIABLE MICA CONDENSER

Filed Oct. 11, 1923

Fig. 1.

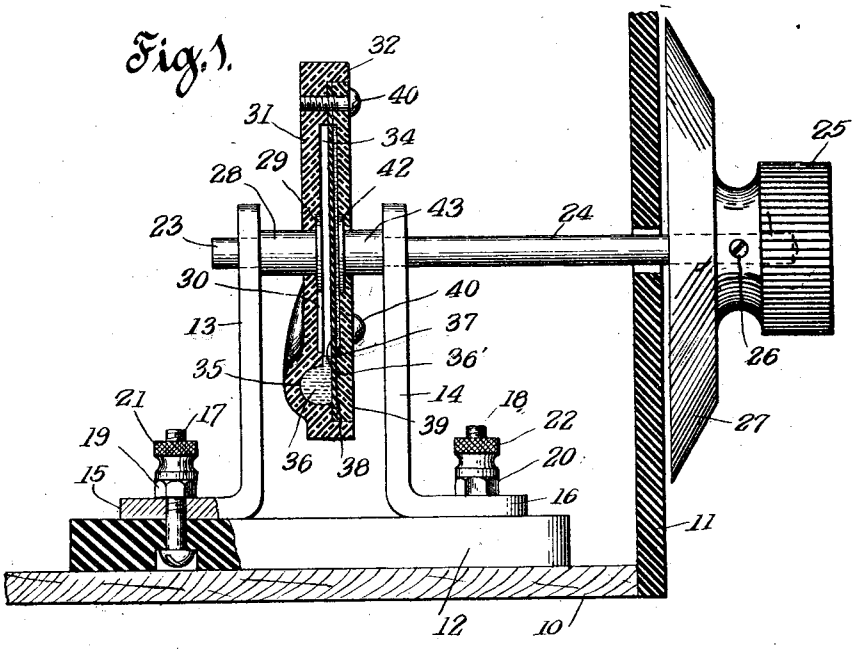


Fig. 2.

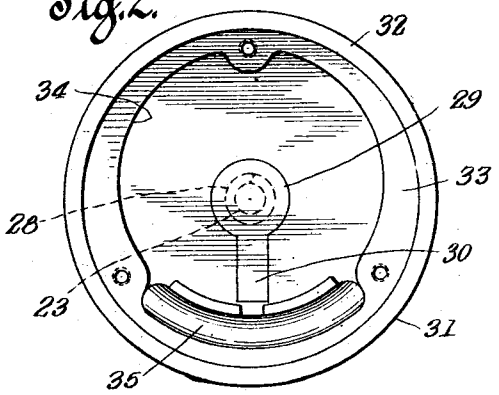


Fig. 3.

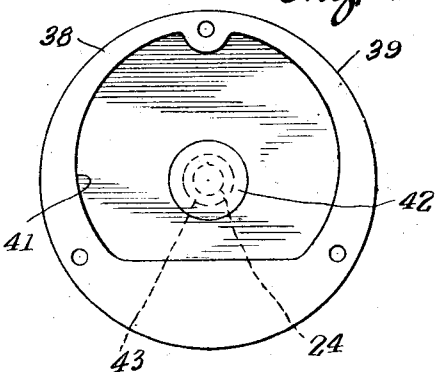


Fig. 4.

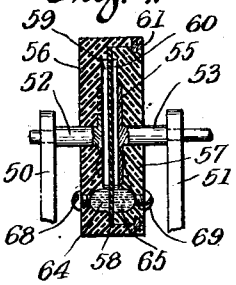


Fig. 5.

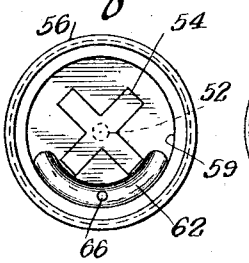
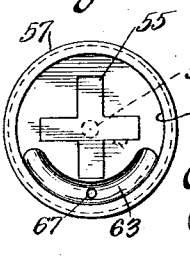


Fig. 6.



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UNITED STATES PATENT OFFICE.

ALBERT W. FRANKLIN, OF NEW YORK, N. Y., ASSIGNOR TO CHAS. FRESHMAN CO. INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

VARIABLE MICA CONDENSER.

Application filed October 11, 1923. Serial No. 667,879.

This invention relates to improvements in that class of apparatus used for varying the capacity in an electric circuit, commonly known as variable condensers.

One of the objects of the invention is to provide a device for this purpose that is compact in form, easily assembled and operated, not readily liable to derangement and which is capable of producing minute variations between zero and full capacity.

Another purpose is to produce an apparatus having a sealed chamber containing a liquid conductor and contacting element free from dust, corrosion or coatings ordinarily gathered by exposure to the air, thereby assuring proper and uniform electrical contact and consequently attaining a predetermined result in accordance with the position of its parts.

A further object is to secure intimate contact between the conductors and the intervening dielectric or insulating material, thus avoiding variation in capacity resulting from irregularity of the spaces so often found between these elements of condensers of the prior art. The conductor being liquid, its physical area may change to vary the capacity, it contacting readily with and taking the form of the container or enclosure, filling interstices and preventing air gaps, etc.

A further aim is in the provision of an apparatus of unusual simplicity, well suited for use in connection with the various forms of telephony now in common vogue.

These and analogous aims and objects are accomplished by the novel construction, combination and arrangement of parts hereinafter fully described and illustrated in the accompanying drawing, forming a material part of this disclosure, and in which:—

Figure 1 is a partial side elevational, partial sectional view of an embodiment of the invention as completely assembled.

Figure 2 is a plan view of the dielectric chamber looking from the open inner side.

Figure 3 is a similar view of the chamber cover.

Figure 4 is a vertical transverse sectional view showing a modified form of chamber complete with its mountings, drawn to a smaller scale.

Figure 5 is an interior plan view of one of the chamber sides.

Figure 6 is a like view of the other side of the chamber.

By further reference to the drawing it will be seen that Fig. 1 illustrates a common application of the invention, the numeral 10 designating a conventional type of radio base board and 11 the front panel of the same.

Fixed on the board 10 is a base plate 12 made of non-conducting material and secured on its upper surface are two uprights 13 and 14 having oppositely bent feet 15 and 16 clamped to the base plate by bolts 17 and 18; the bolt heads are entered in counterbored openings in the bottom of the plate and their bodies provided with clamp nuts 19 and 20, above which are thumb nuts 21 and 22 constituting, in combination with the bolts, a common type of binding post.

The upper ends of the uprights are bored in register, the upright 13 rotatably supporting a stem 23 and the mating upright having mounted in it a spindle 24, extending through an opening in the front plate 11 and fixed to its extending end is a knurled knob 25 held by a set screw 26 and formed with a bevelled disc 27, which may be graduated to read in connection with a pointer or mark (not shown) on the face of the element 11.

The stem 23 is integral with a stud 28 having a thin disc-like head 29 and a single radial plate-like extension 30.

A circular member 31 of dielectric material, as bakelite or similar substance of the resin group, is moulded concentrically on the disc 29 and plate 30 so that their respective inner faces are flush and level, firmly securing the parts as shown.

The member 31 has a raised peripheral ring 32 and interjacent seat 33 of lesser height surrounding a narrow chamber 34 of uniform depth except for an arcuate depression 35 which acts as a reservoir for a quantity of mercury 36 therein.

The mercury may be entered when the member is held level, and sealed by a mica plate 37 held on the seat 33 by a suitable adhesive and clamped by the raised element 38 of a disc 39 made of similar material as the member 31, fitted to the ring 32 and held

by screws 40 passing through opening in the disc to engage in registering threaded openings in the member 31, there being a very narrow space 41 between the inner surface of the disc 39 and mica plate 37.

Held in the space 41 is a conductor 36', which may be a film of mercury or other metallic plate, covering the entire area presented in the space, the lower extremity of this space however being slightly above the level of the mercury in the reservoir 35 in the mating element.

The disc 39 is moulded on the thin, enlarged head 42 of a cylindrical extension 43 of the spindle 24, said extension 43 and stud 28 having distinct shoulders abutting the inner faces of the uprights 13 and 14 to prevent end motion of the device.

It will now be apparent that upon turning the knob 25 and graduated disc 27 integral with it, the spindle 24 will convey rotary motion to the disc 39, which motion is transmitted by the screws 40 to the chambered member 31, stud 28 and stem 23.

It will also be obvious that as the chambered plate is rotated, ever so little, that the mercury in the reservoir 35 will flow out into the space 34, making contact with the plate 30, and covering a portion of the mica plate 37, and when the condenser is in an electrical circuit causing an induced current to pass through the plate in extent depending on the amount of rotation imparted, the mercury also making a direct electrical contact with the disc 29 and arm 30.

If connected in electrical circuit by the binding posts 17 and 18, with the mercury 36 at the lowest point in the reservoir 35, there will be no capacity effect, there being no conductor opposite the reservoir and the dial should register zero capacity. If rotated 180° the maximum capacity is reached, the mercury having run out of its reservoir by gravity into the chamber 34 forming a thin sheet whose area is equal at least to the area of the opposed conductor 36'.

In the modification shown in Figs. 4, 5 and 6 a quite similar device is shown, except that both plates are variable in area, the upright supports 50 and 51 carrying shouldered spindles 52 and 53 having heads 54 and 55 cross shaped and arranged in staggered relation in dielectric elements 56 and 57, to avoid capacity effect.

These elements having between them a mica plate 58, present spaces 59 and 60, the latter being sealed, as at 61, by T shaped inserts such as asphaltum or pitch and have, in their inner adjacent sides, chambers 62 and 63 containing mercury, as at 64 and 65, the same being entered through openings 66 and 67 eventually plugged by screws 68 and 69.

When the condenser is connected in an electrical circuit it will be apparent that when the device is partially rotated, causing the mercury to flow into the spaces 59 and 60, induction will take place through the plate 58 in the manner before described.

The foregoing disclosure is to be regarded as descriptive and illustrative only, and not as restrictive or limitative of the invention, of which obviously an embodiment may be constructed including many modifications without departing from the general scope herein indicated and denoted in the appended claims.

An instance of another embodiment which I have discovered works very well is one in which the area of the mercury conductors or plates may be changed to vary the capacity of the condenser by varying the space or distance between the dielectric and the casing thus raising the level of the mercury in its chambers and in that way eliminating the reservoir.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A variable condenser, comprising liquid condenser plates of variable area, separated by a dielectric plate, said condenser plates mounted in dielectric containers, said dielectric plate and containers secured to each other, and shafts placed in tandem relation forming electrical conductors from each of the condenser plates.

2. In a variable condenser, a dielectric base, supports secured thereto, shafts in tandem relation journaled in said supports, a dielectric plate secured to each of said shafts, one of said plates formed with a flange to overlie the other and having a crescent shaped well formed in it, both of said plates recessed for housing enlarged portions on said shafts, enlarged substantially circular recesses in each of said plates a thin dielectric plate secured between the first mentioned plates, and variable mercury condenser plates in the spaces formed between said three dielectric plates.

Signed at New York, in the county of New York and State of New York, this 6th day of October, A. D. 1923.

ALBERT W. FRANKLIN.