Aug. 28, 1928. 1,682,031

G. E. BLIZIOTIS

ELECTRIC CONDENSER AND PROCESS OF MANUFACTURE

Filed March 21, 1927 2 Sheets-Sheet 1

Fig. 1.

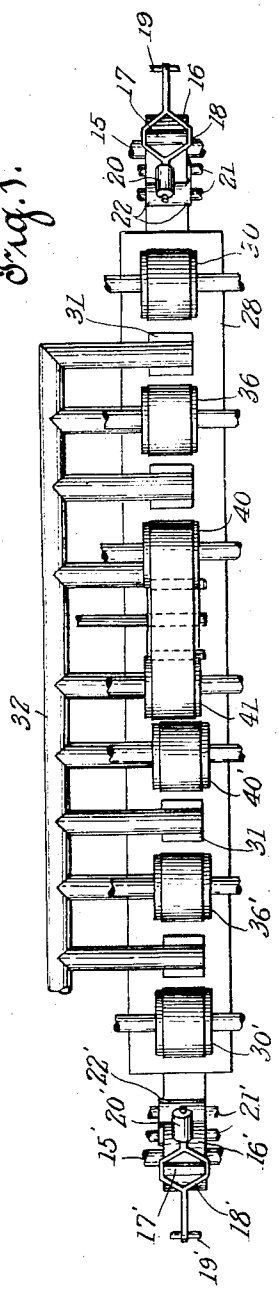
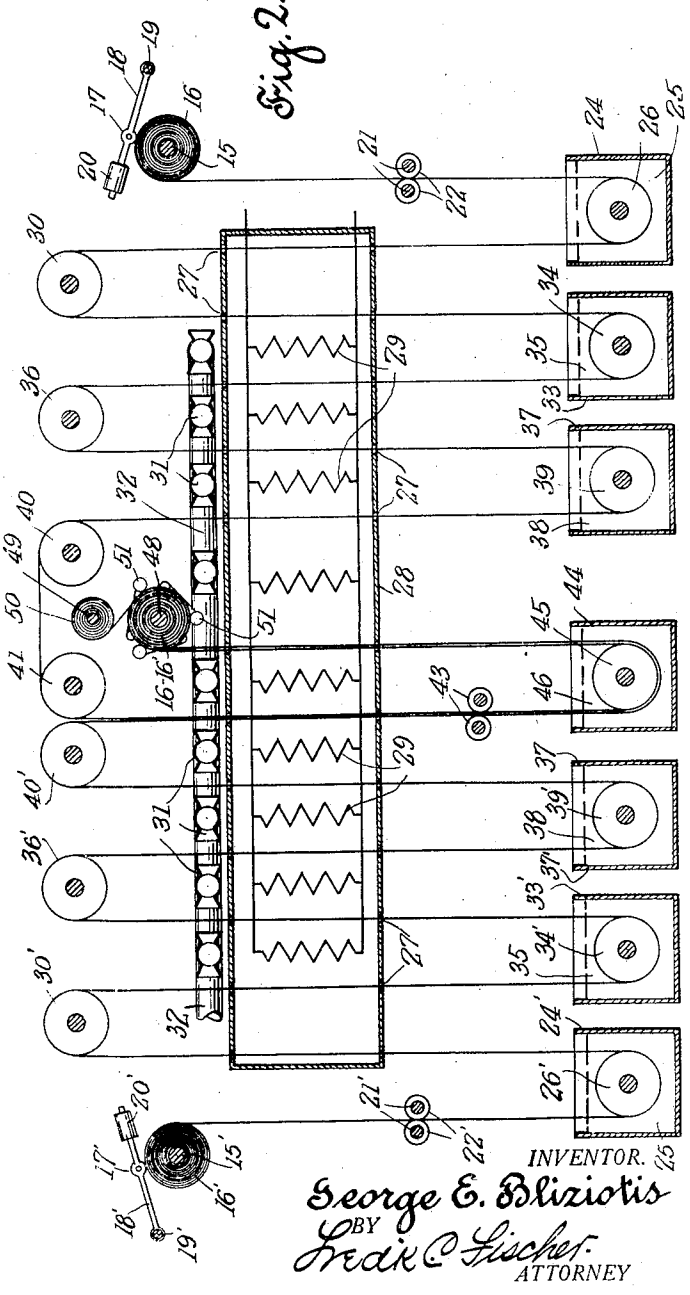


Fig. 2.



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Fig. 3.

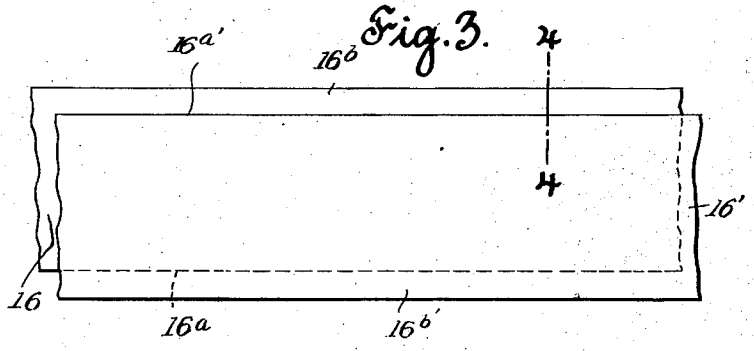


Fig. 4.

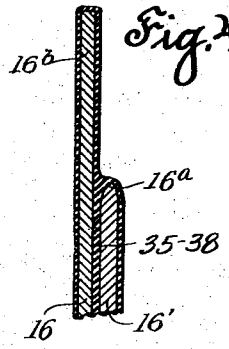


Fig. 5.

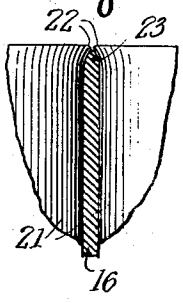


Fig. 7.

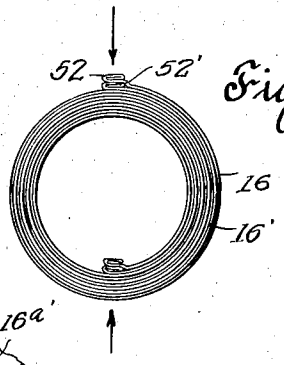


Fig. 6.

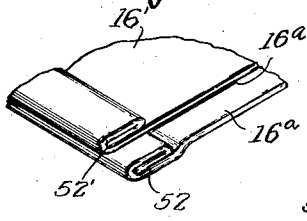


Fig. 8.

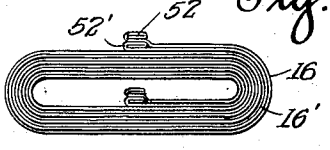


Fig. 9.

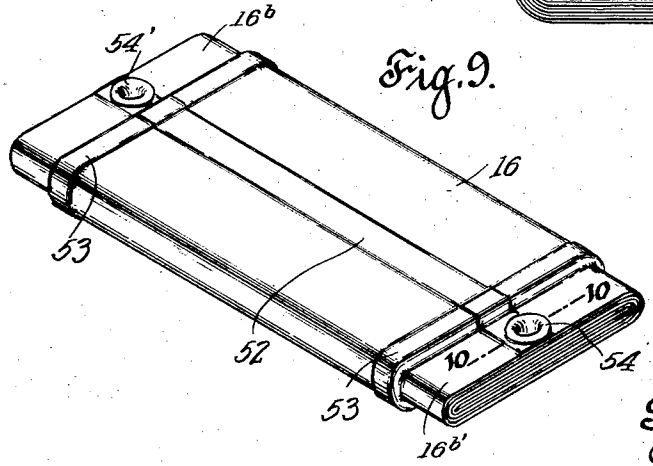
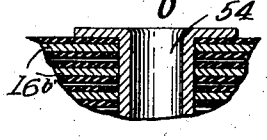


Fig. 10.



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UNITED STATES PATENT OFFICE.

GEORGE EPAM BLIZIOTIS, OF NEWARK, NEW JERSEY, ASSIGNOR TO CONSOLIDATED RESEARCH LABORATORIES, INC., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELECTRIC CONDENSER AND PROCESS OF MANUFACTURE.

Application filed March 21, 1927. Serial No. 176,896.

This invention relates to electric condensers of the type used in connection with radio and like apparatus for well known purposes.

Such condensers ordinarily consist of flattened coils produced by winding two strips of thin sheet metal foil in layered relation and having interposed between the layers some form of insulation, as by covering each strip with a coating of lacquer or like enamel varnish, by an intervening strip of waxed paper, or other non-conducting material between the layers.

Commonly, the layers are arranged one directly over the other, with their edges in register, and if the edges are not amply insulated leakage of current occurs rendering the condenser quite useless.

If the insulation used is of a liquid nature, as a varnish, and the thin metal strips have square edges, which they invariably do, the thin edge surfaces do not receive so thick and effective coatings as are deposited on the broader superficial areas on the sides of the strip and the sharp corners are found to be substantially bare.

This condition also occurs at the cut ends of the paired strips unless provision is made to avoid such occurrence.

It is therefore among the advantageous objects of the present invention to provide a condenser that is essentially leak-proof, by reason of arranging metal strips of uniform thickness and width in offset or staggered relation in each layer, each strip being individually insulated in addition to a coating deposited on the combined strips comprising the layer prior to its being coiled.

A further feature of importance is to avoid all sharp corners on the inner edge of each strip by shaping the same in a manner to receive and retain a uniform thickness of the enamel as applied to the strips before coalescing, these inner edges at the junction of adjacent flat surfaces, eventually receiving a fillet of the insulating material prior of winding, thus avoiding all possibility of leakage.

Another object is to arrange the ends of the coalesced strips in a manner to prevent leaking thereat.

Other objects are, to compress the condenser layers by pressure applied on their sides after winding, the extreme ends receiving less pressure than the main central portion; to permanently connect the opposite, single strip elements by terminals for the attachment of conductors, and finally, in the provision of a compact, efficient and inexpensive condenser, together with the process of its manufacture.

These aims are accomplished by the novel construction and combination of parts and definite processes as hereinafter described and shown in the annexed drawings, forming an essential part of this disclosure, and in which:—

Figure 1 is a plan view of an approved form of the apparatus used in the construction of the condenser plates.

Figure 2 is a side elevational view of the same, partially in section and largely diagrammatical.

Figure 3 is a plan view of a fragment of the strip from which the condenser is formed.

Figure 4 is a greatly enlarged transverse section of a portion of the coalesced strip taken on line 4—4 of Figure 3.

Figure 5 is a similar sectional view of a single strip of the film, showing the manner in which the inner edge is prepared.

Figure 6 is a fragmentary perspective view of the end of the doubled strip prior to coiling.

Figure 7 is an end view of the condenser in the form of a cylindrical coil.

Figure 8 is a similar view showing the coil as flattened.

Figure 9 is a perspective view of a completed condenser as ready for use.

Figure 10 is an enlarged fragmentary transverse section, taken on line 10—10 of Figure 9.

In the drawing, the numerals 15—15′ designate rollers carrying coils 16—16′ of metallic foil, as aluminum, tin, etc., and in order to prevent too rapid unrolling of the coiled foil, there is provided idlers 17—17′ journalled in supporting levers 18—18′ pivoted at 19—19′, the outer ends of the levers being furnished with adjustable weights 20—20′.

From the rollers 15—15′, the foil strips 16—16′ pass between rolls 21—21′ having oppositely disposed enlarged ends 22—22′ to pinch the strips, presenting one of their longitudinal edges 16^a and $16^{a'}$ rounded, as seen in Figures 4 and 5, such convex shape readily retaining a coating, the opposite edges 16^b and $16^{b'}$ being left untreated.

The strips then enter tanks 24—24′ containing any preferred solvent 25 such as alcohol, benzene, etc. to remove any dirt, grease

and the like therefrom, passing around rolls 26—26′, to cause complete submergence, and up through openings 27 in the bottom and top of a drying oven 28 provided with any preferred heating means, as high resistance coils 29, steam pipes or hot air, by which the strips are dried, thence over rolls 30—30′ and back through the oven again to become completely dried, the oven having adjacently above it, a plurality of suction inlets 31 connected with a main flue 32 to carry off exhaled vapors.

Thence the strips enter tanks 33—33′ under submerging rolls 34—34′ to be held below the surface of liquid enamel 35 of a certain density, to repass through the oven 28,—the drippings of enamel being returned to the tank,—over rolls 36—36′, back through the oven again, entering tanks 37—37′ containing enamel 38 of a different density and around submerging rolls 39—39′.

From the last named tanks, the strips again pass through the oven and over rolls 40—40′, the strip 16 passing over an additional roll 41 to meet the strip 16′ and, because of the still tacky surface, adhere thereto.

The rolls 30, 36, 40 and 41 are offset, from the rolls 30′, 36′ and 40′, as shown in Figure 1, so that, when the strips 16—16′ meet, they are in staggered relation, presenting single thicknesses at their outer edges as seen in Figure 3.

From the rolls 40′—41 the strips pass through the oven 28 and between a pair of squeezing rolls 43, causing the strips to coalesce, thence into a tank 44 and around a submerging roll 45, the tank 44 containing enamel 46 of still different density, this coating forming a fillet between the rounded edges 16^a—$16^{a'}$ and the adjacent side surfaces of the strips as seen in Figure 4, the strips then passing through the oven for a final drying and onto a roll 48.

Disposed above the roll 48 is another roll 49 carrying paper 50 oiled, waxed or otherwise treated to prevent adhesion, and coiled over the strip 16—16′ to enter between each layer, so that the surfaces will not adhere to each other, the same being held in an even position by spring actuated guide rollers 51; other similar means, as passing the strip throughout oil bath to prevent adhesion may be resorted to.

The combined offset strip is then taken from the roll 48, cut to any desired lengths and the paper 50 discarded.

The several lengths are now split at their ends and the end edges are folded twice back upon themselves as at 52 and 52′ after which the lengths are coiled as seen in Figure 7.

The next step is to flatten the coils, as seen in Figure 8, so that the central portion of the strips will obviously be approximately twice as thick as the single edge portions, after which the central portion is further compressed, presenting miniature bands 53 adjacent the protruding, single thicknesses of the foil edges 16^b and $16^{b'}$, these bands terminating at the rounded edges 16^a and $16^{a'}$.

These extending end portions have passing through them, in electrical engagement, electrical terminals 54—54′ to which conductors may be attached.

Thus, it may be seen that an inductive condenser has been disclosed that is leak-proof, the insulation of which is evenly distributed and which is compact, efficient and inexpensive to manufacture.

As changes of construction could be made within the scope of the invention, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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

1. An electric condenser comprising a pair of insulated foil strips of equal width, said strips being disposed in staggered relation to each other and formed into a flattened coil having its central portion compressed to form bands near the ends of the coil.

2. An electric condenser comprising a pair of foil strips of uniform width arranged in staggered lateral relation, said strips having their inner edges shaped to present a rounded surface, and an adherent insulation completely covering said strips.

3. An electric condenser comprising a layered coil composed of a strip formed from two plies of metallic foil uniform in width and arranged in staggered relation, an insulative coating on each ply and over the coalesced strip, the inner longitudinal edges of each ply being shaped to retain insulation, and metallic terminals fixed in the extending single ply ends of the condenser.

4. An electric condenser comprising a layered coil composed of a strip formed from two plies of metallic foil uniform in width and arranged in staggered relation, an insulative coating on each ply and over the coalesced strip, both ends of said strip having its plies separated and folded back upon themselves to prevent current leakage.

5. An electric condenser comprising a layered coil composed of a strip formed from two plies of metallic foil uniform in width and arranged in staggered relation, an insulative coating on each ply and over the coalesced strip, the inner longitudinal edges of each ply being convexly curved to avoid sharp corners prior to being insulated, and terminal rivets fixed in the extending single plies at the ends of said coil, said coil being compressed over its main portion.

6. The process of making an electric condenser which consists of rounding one of the longitudinal edges of each of a pair of uniformly wide strips of metallic foil, pass-

ing the strips through a cleansing bath, and baths of liquid enamel of different density, drying the strips between each immersion, pressing the strips firmly together when in a tacky condition and in such manner that the rounded edges are innermost, winding a flattened coil from the coalesced strips, and inserting a terminal conductor in the outermost edge portions of the coils at the end of the condenser.

7. The process of making an electric condenser which consists of rounding one of the longitudinal edges of each of a pair of uniformly wide strips of metallic foil, passing the strips through a cleansing bath, and baths of liquid enamel of different density, drying the strips between each immersion, pressing the strips firmly together when in a tacky condition and in such manner that the rounded edges are innermost, passing the coalesced strips through a third bath of dielectric material, cutting the strip to length, folding the ends of each component of the strip re-entrantly, and winding a coil therefrom.

8. An electric condenser comprising a pair of foil strips of uniform width arranged in staggered relation, said strips having their inner edges shaped to present rounded surfaces.

This specification signed this 24th day of February, 1927.

GEORGE EPAM BLIZIOTIS.