Jan. 24, 1939. C. M. BLACKBURN 2,144,959

CONDENSER CONSTRUCTION

Filed Sept. 24, 1937

Fig. 1

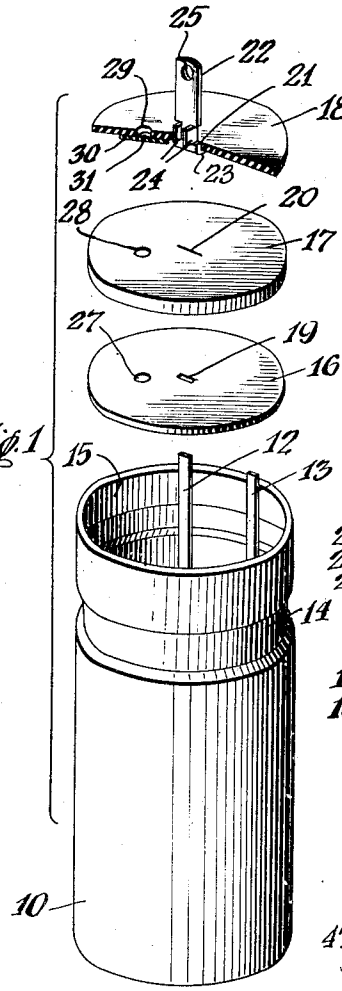


Fig. 3

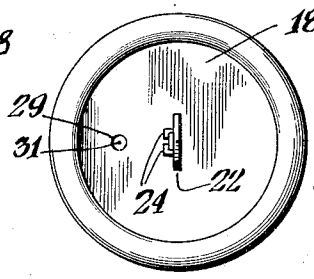


Fig. 6

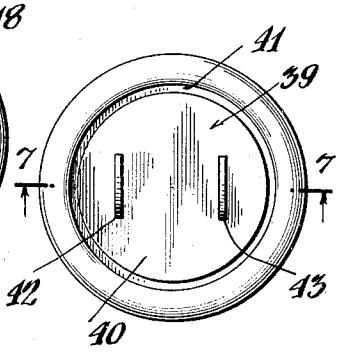


Fig. 4

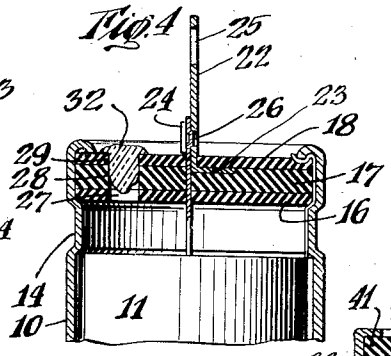


Fig. 7

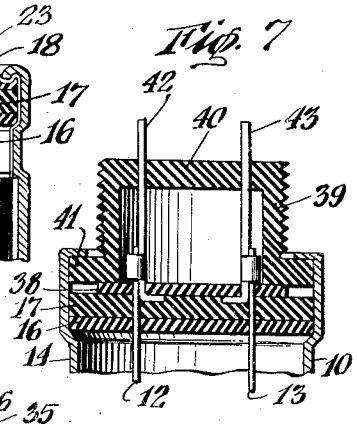


Fig. 5

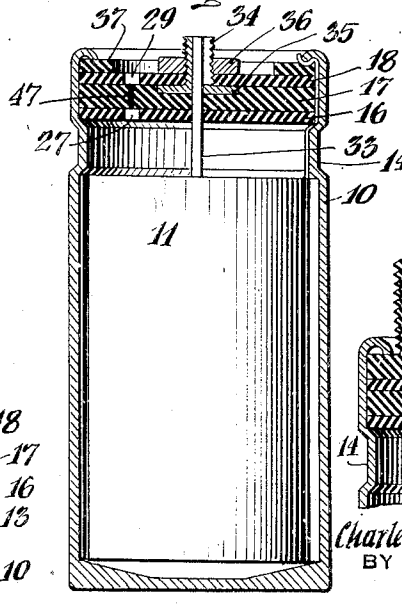


Fig. 8

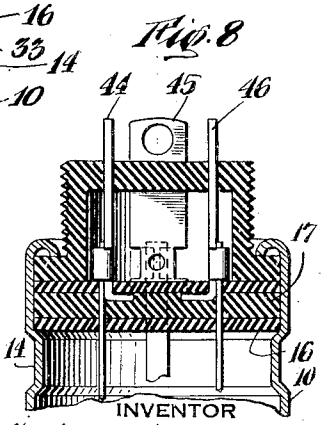
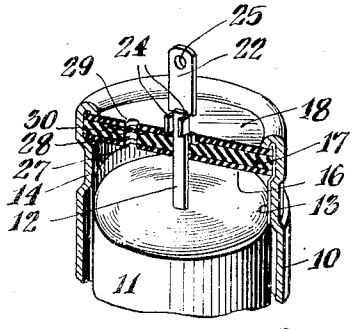


Fig. 2



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CONDENSER CONSTRUCTION

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Application September 24, 1937, Serial No. 165,553

16 Claims. (Cl. 175—315)

This invention relates to electric condensers and the structure thereof.

An object of the invention is to improve the construction of electric condensers.

Another object is to improve the terminal construction of such condensers.

Other objects of the invention will be apparent from the following description and accompanying drawing taken in connection with the appended claims.

The invention comprises the features of construction, combination of elements, arrangement of parts, and methods of manufacture and operation referred to above or which will be brought out and exemplified in the disclosure hereinafter set forth, including the illustrations in the drawing.

In the drawing:

Figure 1 is an exploded view illustrating a condenser assembly embodying features of the invention;

Figure 2 shows the condenser in assembled state;

Figure 3 is a top view of the completed condenser assembly;

Figure 4 is a section of the assembly embodying a modified vent construction;

Figure 5 is a longitudinal section through another modified form of condenser;

Figure 6 is a top view of a further modification;

Figure 7 is a section on the line 7—7 of Figure 6; and

Figure 8 is a section of part of a further modified form.

The present invention is particularly well adapted for the construction of dry electrolytic condensers. The top construction described provides an improved sealing means for such condensers and an improved terminal arrangement therefor. The invention is also suitable for wet electrolytic condensers wherein it provides an effectively sealed container and a convenient means for holding a central electrode.

It is also obvious that the invention can be used for electrostatic condensers.

While a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the construction of parts without departing from the spirit of the invention. In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring to the drawing, Figures 1 and 2 show a condenser can 10 closed at one end and having an annular, internally raised bead 14 near the open end thereof. The inside of the can is scored or roughened in the annular area 15 immediately above the bead 14.

A condenser roll 11 comprising two or more condenser electrodes spaced by suitable sheet spacers is inserted within can 10. Flat terminal strips 12 and 13 are connected to the condenser electrodes and extend toward the mouth of the can.

In the case of a dry electrolytic condenser the electrodes may be of aluminum foil or other types of sheets formed of aluminum or other film-forming metal and the terminals 12 and 13 may be flat strips of the same metal secured to the electrodes so as to provide a good electrical and mechanical connection therebetween. Terminal conductor 12, for instance, may be an aluminum wire rolled flat. Terminal 13 may be similarly formed or may comprise a strip of aluminum foil integral with or attached to its associated electrode.

According to the assembly shown in the figures, the terminal strip 13 extends upward from one of the outer turns of the condenser roll 11 along the can wall and terminal strip 12 extends upward from the middle of the roll along the axis of the can.

The open end of the can is closed by a composite cap formed of three discs 16, 17 and 18, which are of substantially the same diameter as the inside wall of the can. Discs 16 and 18 are formed of relatively rigid sheet insulating material such as sheet Bakelite, other suitable resin-impregnated fibre or ceramic. Disc 17, however, is formed of a soft deformable material such as unvulcanized rubber, partially vulcanized rubber or soft vulcanized rubber or, in some cases, other gummy, plastic or elastic materials. Disc 16 is provided with a central rectangular slot 19 of a cross section adapted to receive terminal strip 12. Rubber disc 17 has a central slit 20 which will also permit insertion of terminal 12. Disc 18 has a somewhat larger aperture 21 which will accommodate terminal strip 12 and also a metal soldering terminal 22.

Terminal 22 comprises a comparatively heavy strip of metal somewhat wider than terminal strip 12. Terminal 22 is bent at right angles at a point near one of its ends to provide an anchoring portion 23 which is disposed between discs 17 and 18 with the main body of terminal 22 extending out through the aperture 21 in disc

18. A pair of ears 24 are struck up from the edges of terminal 22 just above the surface of disc 18 and terminal strip 12 is disposed against the surface of terminal 22 between the ears 24. A hole 25 is punched in the free end of terminal 22 to aid in making connections thereto and a small hole 26 is punched in the portion of terminal 22 between the ears 24.

In assembling the condenser the condenser roll 11 is first inserted in the can with its terminals 12 and 13 extending out of the mouth of the can as described. Disc 16 is then placed in the mouth of the can with terminal 12 extending through its central slot 19 and terminal 13 pressed against the wall of the can by the edge of the disc. Disc 17 is then inserted directly on top of disc 16 with the terminal 12 received in its central slot 20. Terminal 22 is inserted in top disc 18 as described above after which disc 18 is placed on top of disc 17 with terminal strip 12 passing through the disc and lying against the face of terminal 22 between the two ears 24.

The top edge of can 10 is then spun over the top surface of disc 18, as shown in Figure 2, thereby pressing the three discs tightly together between bead 14 and the spun end of the can. This pressure causes soft rubber disc 17 to expand against the inside wall of can 10 and against the terminal strip 12, thereby effectively sealing the inside of the can. Terminal strip 13 is firmly pressed against the wall of the can by this operation and due to the scoring 15 on the can wall a good electrical connection is made between terminal 13 and the can 10. Finally, the ears 24 of terminal 22 are bent over on top of terminal strip 12 and a portion of the material of strip 12 is punched into small hole 26 in terminal 22. This forms a good electrical and mechanical connection between the terminal strip 12 and terminal 22 outside of the sealed portion of the can. These last two steps are seen most clearly by reference to Figures 3 and 4.

The intermediate layer 17 of rubber or the like, due to its deformability and softness is expanded against the can wall and the terminal, as previously described to effect a seal. In most cases, particularly if unvulcanized or partly vulcanized rubber is used the layer 17 is permanently deformed and by aging by time alone at room temperature or at the usual operating temperature of the condenser the material will cure in its deformed position and effect a permanent seal of the condenser without the necessity of further maintaining pressure upon it. The material may also adhere to the can wall and the electrodes.

Instead of inside bead 14 in the can, other means can be provided to support the discs such as, for instance, point indents in the can, an outside bead providing a corresponding annular groove in the inner wall into which the disc can extend, or an internal sleeve of metal, fibre, cardboard or a resin material resting on the bottom of the can and extending to a point where its upper can support the discs.

In some applications it may be necessary to provide a pressure release valve or vent in the can top. One form of vent is shown in Figures 1 and 2 and is formed by punching three aligned holes 27, 28 and 29 in discs 16, 17 and 18. A thin rubber membrane 30 is then laid between discs 17 and 18 to close the passageway formed by the aligned holes and pinhole 31 is punched in the center of the membrane 30. The membrane 30 thereby seals the opening but allows gases to escape when any substantial pressure develops.

Another form of sealing arrangement is shown in Figure 4. In this embodiment, instead of providing a rubber membrane, the passageway provided by aligned holes 27, 28 and 29 is stopped up with a small globule of wax or other plastic material 32. Should excessive pressure develop within the condenser, the wax particle will be blown out, thereby relieving the pressure.

Figure 5 shows another form of terminal arrangement. In this form the central terminal of condenser roll 11 comprises a round wire 33 which extends out through suitable holes in the centers of discs 16, 17 and 18. Threaded metal bushing 34 is fitted into a central opening in top disc 18 and has a flange 35 integral with its inner end and disposed between discs 17 and 18. Terminal wire 33 extends through the center of bushing 34. The bushing is split longitudinally in its threaded region and tapered slightly toward its outer end. A nut 36 is screwed on to the bushing and tightened down against the top of disc 18, thereby contracting the bushing 34 on to wire 33. The wire 33 may then be clipped off above the end of bushing 34. This provides a threaded terminal.

Also shown in Figure 5 is a further form of vent arrangement which is made by simply providing aligned holes 27 and 29 in the Bakelite discs 16 and 18 and after the assembly is complete punching a pin-hole 47 in the rubber disc 17.

Figure 5 also illustrates the use of an additional soft rubber ring 37 on the top of disc 18 as a further sealing means. Obviously this expedient can also be used in the other forms described.

In some instances it is desired to have a threaded insulating top on the condenser. Such an arrangement is shown in Figures 6 and 7 wherein molded top 39 of insulating material such as Bakelite or ceramic is placed on top of the disc assembly. In this case the top disc 18 may be replaced by disc 38 of smaller diameter.

Threaded top 39 comprises a threaded cylindrical portion closed at one end with a plane end wall 40 and having an external flange 41 at the other end. Flange 41 rests against the top of disc 38, the edge of can 10 being spun over the top edge of the flange. The terminals 42 and 43 are generally similar in construction to terminal 22 but are somewhat longer so that they will extend up through suitable slots in the end wall 40 of the bushing 39. The condenser terminal strips 12 and 13 are secured to terminals 22 and 23 within the chamber formed inside of threaded cap 39 so that only the ends of terminals 42 and 43 are exposed.

Figure 8 illustrates a condenser construction in which three terminals 44, 45 and 46 are provided in the can top, all of which are insulated from the can 10.

It will be obvious that any desired number of terminals can be provided with any of the constructions illustrated and that the venting arrangements may or may not be used, as required. It is also contemplated that a metal tube can be used instead of can 10 and both ends be sealed by the sealing discs as herein described.

Among other advantages the present invention provides a simple and economical sealing means readily adapted to a variety of terminal and vent arrangements and suited for condensers of the dry electrolytic, wet electrolytic and electrostatic type.

The construction can be made of standard ma-

terials without the necessity of expensive specially formed or molded parts.

An excellent and permanent seal is obtainable by the invention.

While the present invention, as to its objects and advantages, has been described herein as carried out in specific embodiments thereof, it is not desired to be limited thereby but it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A condenser comprising a metal can, a condenser roll therein, an internally raised bead near the open end of said can and a laminated sealing cap for said can comprising a pressure deformable central lamina and relatively stiff substantially undeformable laminae on both sides thereof, said cap fitting snugly within the open end of said can and resting on said bead, the end of said can being spun over the edge of said cap, and at least one terminal connected to said condenser roll and passing through an opening in said cap.

2. A condenser comprising a metal can, a condenser roll therein, internal shoulder means near the open end of said can and a laminated sealing cap for said can comprising a soft rubber central lamina and Bakelite laminae covering practically all of both sides thereof, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap, and at least one terminal connected to said condenser roll and passing through an opening in said cap.

3. A condenser comprising a metal can, condenser electrodes therein and a cap sealing the open end of said can, said cap comprising a stack of at least three discs, the middle disc being of soft pressure deformable material and the other two discs being of stiff relatively non-deformable material, a terminal strip connected to one of said electrodes and extending through said cap and a terminal connected to said strip, said terminal comprising an anchoring portion wedged between said soft layer and the outer one of said stiff layers and a terminal portion extending out through said outer layer, said can having portions exerting pressure on said disc stack to compress said middle disc between said stiff discs.

4. A condenser comprising a metal can, condenser electrodes therein, and sealing means for the end of said can comprising at least three discs superimposed one upon the other, the middle one of said three discs being formed of pressure deformable material and the other two of said discs being of relatively stiff hard material, and at least one terminal for one of said condenser electrodes passing through said discs and a threaded cap of insulating material having a flange thereon resting on the outer one of said discs, said terminal passing through said cap.

5. A condenser comprising a metal can, a condenser roll therein, internal shoulder means near the open end of said can and a laminated sealing cap for said can comprising a curable rubber central lamina and Bakelite laminae covering practically all of both sides thereof, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap, and at least one terminal connected to said condenser roll and passing through an opening in said cap.

6. A condenser comprising a metal can, condenser electrodes therein, and sealing means for the end of said can comprising at least three discs superimposed one upon the other, the middle one of said three discs being formed of pressure deformable material and the other two of said discs being of relatively stiff hard material, and at least one terminal for one of said condenser electrodes passing through said discs, and another terminal for said electrodes comprising a strip of metal wedged between said discs and the inside wall of said can, said can being roughened in the region of contact with said terminal.

7. A condenser comprising a cylindrical metal can, a condenser electrode assembly therein, an internal shoulder near the open end of said can and a laminated sealing cap for said can comprising a central lamina of pressure deformable material and relatively stiff substantially undeformable laminae on both sides thereof, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap, and at least one terminal connected to said electrode assembly and passing through an opening in said cap, said pressure deformable lamina being spread by the pressure supplied by the spun-over edge of said can so as to press against said terminal and also press against said can wall as a seal.

8. A condenser comprising a cylindrical metal can, a condenser electrode assembly therein, an internal shoulder near the open end of said can and a laminated sealing cap for said can comprising a central lamina of pressure deformable soft rubber and relatively stiff substantially undeformable Bakelite laminae on both sides thereof, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap, and at least one terminal connected to said electrode assembly and passing through an opening in said cap, said pressure deformable rubber lamina being spread by the pressure supplied by the spun-over edge of said can so as to press against said terminal and also press against said can wall as a seal.

9. A condenser comprising a cylindrical metal can, a condenser electrode assembly therein, an internal shoulder near the open end of said can and a laminated sealing cap for said can comprising a central lamina of pressure deformable material and relatively stiff substantially undeformable laminae on both sides thereof, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap, and at least one terminal strip connected to said electrode assembly and passing through openings in said three discs, and a terminal lug comprising a strip of sheet metal bent to provide an anchoring area at one end angularly disposed with respect to the remainder of the body of said strip, said terminal lug passing through the same opening as said terminal strip in the outermost of said three discs with said anchoring area wedged between said outermost disc and said central deformable lamina and the body of said strip projecting beyond the end of the can, said terminal strip being secured to said terminal lug outside said cap, and said pressure deformable lamina pressing against said terminal strip and the anchoring area of said terminal lug so as to effect a seal where the terminal passes through the cap.

10. A condenser comprising a metal can, a condenser roll therein, an internally raised bead near the open end of said can and a laminated sealing cap for said can comprising a soft rubber central lamina and ceramic discs on both sides thereof,

said cap fitting snugly within the open end of said can and resting on said bead, the end of said can being spun over the edge of said cap, and at least one terminal connected to said condenser roll and passing through an opening in said cap.

11. A condenser comprising a can, condenser electrodes therein, internal shoulder means near the open end of said can, and sealing means for said can comprising a cap of at least three laminae superimposed one upon the other, the middle of said laminae being formed of a pressure deformable material having an adhesive surface and the other laminae being of relatively stiff hard material, at least one terminal for said condenser electrodes passing through said cap, said cap resting on said shoulder means and portions of said can applying pressure to the outer face of said cap.

12. A condenser comprising a can, condenser electrodes therein, internal shoulder means near the open end of said can, and sealing means for said can comprising a cap of at least three laminae superimposed one upon the other, the middle of said laminae being formed of at least partially unvulcanized soft rubber and the other laminae being of relatively stiff hard insulating material, at least one terminal for said condenser electrodes passing through said cap, said cap resting on said shoulder means and portions of said can applying pressure to the outer face of said cap.

13. A condenser comprising a can, condenser electrodes therein, internal shoulder means near the open end of said can, and sealing means for said can comprising a cap of at least three laminae superimposed one upon the other, the middle of said laminae being formed of pressure deformable sealing material and the other laminae being of relatively stiff hard material, said cap resting on said shoulder means and other portions of said can applying pressure to the outer surface of said cap, at least one terminal for said condenser electrodes passing through said cap and being formed of difficulty solderable metal and a soldering lug anchored in said cap and electrically and mechanically connected to said terminal externally to the sealed portion of said can.

14. A condenser comprising a metal can, a condenser roll therein, internal shoulder means near the open end of said can and a laminated cap for said can comprising a circular soft rubber central lamina and stiff circular laminae on both sides thereof, all of said laminae being of substantially the same outside diameter, said diameter being substantially that of the interior of said can above said shoulder, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap and pressing against the top surface of the outer stiff laminae, and at least one terminal connected to said condenser roll and passing through said cap.

15. A condenser comprising a metal can, a condenser roll therein, internal shoulder means near the open end of said can and a laminated cap for said can comprising a circular central lamina of pressure-deformable material and stiff circular laminae on both sides thereof, all of said laminae being of substantially the same outside diameter, said diameter being substantially that of the interior of said can above said shoulder, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap and pressing against the top surface of the outer stiff lamina, and at least one terminal connected to said condenser roll and passing through said cap.

16. A condenser comprising a metal can, a condenser roll therein, internal shoulder means near the open end of said can and a laminated cap for said can comprising a circular soft rubber central lamina and stiff circular laminae on both sides thereof, all of said laminae being of substantially the same outside diameter, said diameter being substantially that of the interior of said can above said shoulder, said cap fitting snugly within the open end of said can and resting on said shoulder, the end of said can being spun over the edge of said cap and pressing against the top surface of the outer stiff lamina, an L-shaped terminal lug having an anchoring portion secured to said cap and terminal portion projecting outward from said cap, and a terminal connection between said condenser roll and said lug.

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