

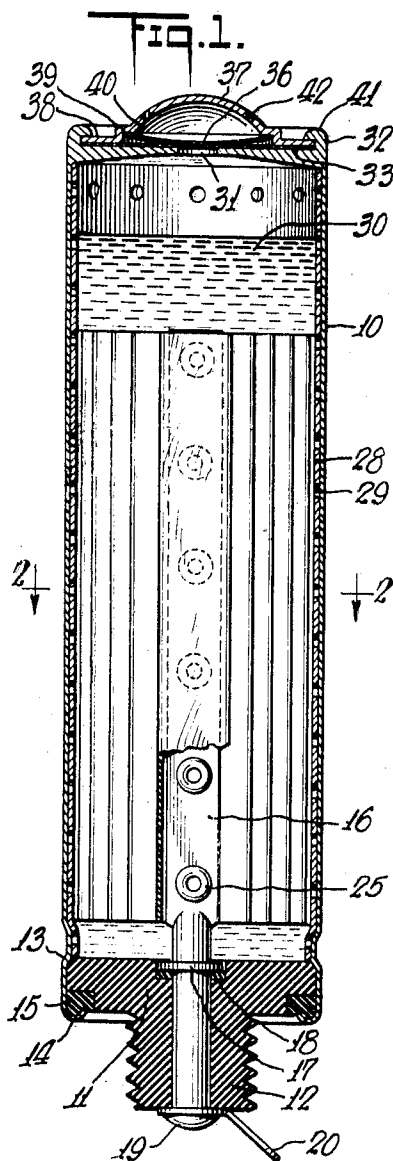
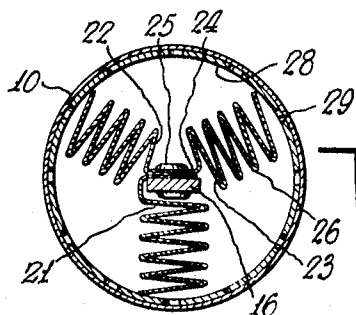
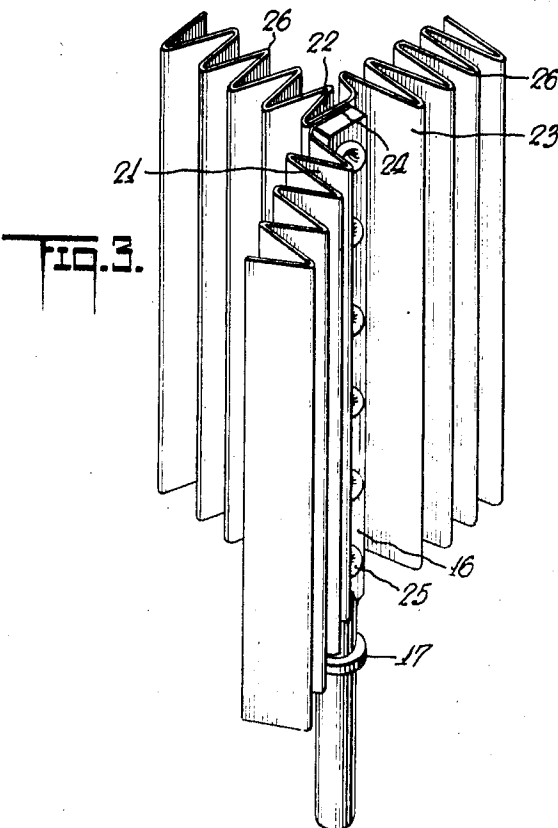
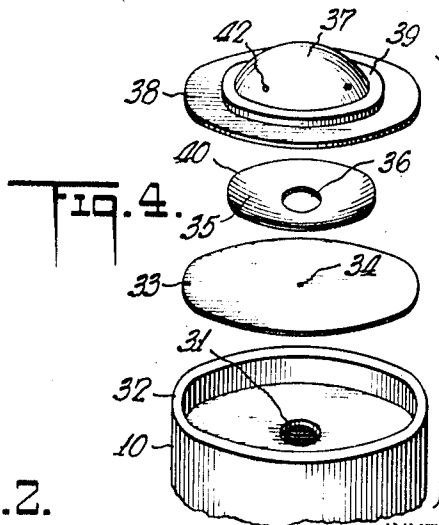
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H. E. RHODES

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ELECTROLYTIC CELL

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INVENTOR
Howard E. Rhodes
 BY
Dean, Fairbank, Hinch & Foster
 ATTORNEYS

UNITED STATES PATENT OFFICE

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ELECTROLYTIC CELL

Howard E. Rhodes, Floral Park, N. Y., assignor to
Aerovox Corporation, Brooklyn, N. Y., a corporation of New York

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7 Claims. (Cl. 220—44)

My present invention relates to electrolytic cells, and primarily to electrolytic condensers of the so-called wet type.

An object of the invention is to provide a venting device for an electrolytic cell, more especially of the wet type, which precludes the leak or escape of the liquid contents or any part thereof, even though the vent be held downward, and yet affords adequate escape for gas pressure that may be evolved during use.

Another object is to provide a device of the above type which shall be inexpensive in construction, which affords no protrusions mechanically vulnerable in handling or of ungainly appearance, but which on the contrary affords an attractive all-metal exterior, not subject to appreciable deterioration after successive ventings and which affords substantial venting protection throughout the effective life of the cell.

Another object is to provide a device of the above type in which no visible deposit occurs of salt entrained residue from droplets of electrolyte with gas during venting.

Another object is to provide an anode structure for a wet cell such as an electrolytic condenser which is simple and inexpensive in construction, the elements of which are mechanically secure and not subject to deterioration after extensive use, and which affords a condenser of superior power factor.

In the accompanying drawing, in which are shown one or more of various possible embodiments of the several features of the invention,

Fig. 1 is a view in longitudinal cross-section of a condenser according to the present invention,

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1,

Fig. 3 is a perspective view of the anode unit, and

Fig. 4 is a dropped perspective view of the parts making up the venting unit.

Referring now to the drawing there is shown in Fig. 1 a wet electrolytic condenser comprising the cathode can 10, ordinarily of aluminum, the open end of which is illustratively shown with a rigid insulating closure plug 11 which may be of vulcanite, hard rubber or the like, and which has a threaded extension 12 that serves for mounting the unit in conventional manner. The plug rests against a unitary shoulder 13 in the can and is secured in place by rolling the rim of the can, as at 14, against a soft rubber gasket 15 lodged in a rabbet in the plug 11.

Mounted on the rubber plug is the anode structure, which according to the present invention

is of special design. The riser in this embodiment comprises a metal rod 16 having an enlargement 17 resting in a corresponding depression 18 in the closure plug and having its lower end upset at 19 over the terminal lug 20 against the lower end of plug 11.

The riser, the main length of which is preferably flat mounts the anode plates proper. For this purpose it is ordinarily preferred to employ three generally identical plates 21, 22 and 23, the inner ends of which are superposed as at 24 over the riser and are rigidly attached thereto by hollow rivets 25 extending through the riser and said superposed plates to connect the elements into a rigid assembly.

Preferably the anode plates are in undulatory form, deeply corrugated as at 26 to afford an increased surface area of anode within the space confines of the container. The general plane of each of the plates preferably radiates from the axis of the riser and said plates are spaced at uniform angular intervals 120 degrees apart as shown, although of course different spacing could be employed, and four or more of said plates could be used, if desired. Preferably the riser, the plates and the rivets are all of the same film forming metal, ordinarily aluminum, and the plates, rivets and riser are all formed with the usual dielectric film.

The outer ends of the corrugated anode plates would press against the inner wall of the can 10 in the assembled construction and tend to short-circuit the condenser. To prevent such short-circuiting an insulating liner sleeve 28 perforated as at 29 is disposed within the can and is contacted by the outer extremities of the several anode plates.

The cell is charged with a liquid electrolyte solution 30 to a point above the level of the anode which it submerges. This solution ordinarily is an aqueous one and may be the conventional one of boric acid and sodium borate.

According to the present invention, the average distance from the anode plates to the can is relatively small, for which reason the course of current flow between the anode and the cathode has a short average path through the electrolyte, so that the series resistance is kept at low value and the condenser with the present anode structure therefore has superior power factor characteristics.

In the operation of electrolytic condensers, gas pressure may develop from time to time while the condenser is on voltage. This may result from excessive heat in the condenser caused

by current leakage through the film, or by the proximity of other heat generating apparatus such as transformers and tubes. The expansion of the liquid and especially of the air inside the condenser results in the evolution of pressure which must be relieved, without, however, affording any opening that might permit any of the liquid electrolyte to leak out.

In the specific embodiment shown, the closed end of the container, shown uppermost in Fig. 1, has a central aperture 31 therein of $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter and an uprising peripheral lip 32. A flexible rubber washer 33 rests on the end wall with its periphery substantially in contact with the inner wall of the lip 32. Said washer has a minute pinhole shown exaggerated in size at 34 which, by virtue of the elasticity of the rubber, is normally closed and invisible. Superposed over the rubber washer 33 is a dished spring metal washer 35 of smaller diameter, preferably of phosphor bronze with a central aperture 36 therein of substantially the size of the aperture 31 in the end wall of the can. Superposed over the rubber washer 33 and spring washer 35 is a protective sheet metal domed hood 37 which has a flat rim 38, superposed over the rubber washer 33 and a concentric shoulder 39 engaging the upstanding rim 40 of the dished washer 35.

The upstanding lip 32 of the can is rolled inward as at 41 to engage the flange 39 of the dome and to exert pressure against the rim of the rubber washer 33, and incidentally to press the dished metal washer 35 against rubber washer 33 about the aperture 34. Minute venting apertures 42 are provided near the outer part of the dome 37.

The construction described has the advantage that the simple rubber washer 33 is cut from rubber sheet stock and that the washer 35 and the hood 37 are simple metal stampings. The can structure set forth is quite simple and inexpensive; the extruding die being simply constructed with a peripheral depression to permit some of the metal from the slug to be forced thereinto to form the lip 32.

No liquid will ever escape from the unit, regardless whether the device be vigorously shaken, or subjected to such heat as is incurred in transportation or use. This is due to the fact that the rubber washer 33 forms a satisfactory leak-tight gasket, not only at the inner portion thereof resiliently engaged by the depressed middle of the dished washer 35, but also at the outer periphery thereof clamped by the hood rim 38. If in the course of operation, gas pressure is evolved, the rubber washer 33 is caused to balloon or bow outward from the region of aperture 34 and through the aperture 36 of washer 35. In this bowing operation the pinhole 34 spreads open and the gas is delivered into the domed hood and thence escapes through the vents 42. After the gas pressure has been released the bowed rubber washer 33 snaps back into its plane, by virtue of its elasticity, with the original pinhole 34 closed.

In venting gas pressure, it is possible that minute droplets or spray of electrolyte will be entrained with the gas, to settle about the pinhole of the rubber washer 33, leaving a white deposit of salt thereat. Such salt deposit, however, is invisible exteriorly and the exposed vent holes 42 of the dome remain at all times clean and free from salt or other deposit.

The spring washer 35 is desirable to restrict the movement of the rubber washer according

to the operation above described, for, were said rubber washer permitted to balloon up under conditions of pressure and to conform to the shape of the inside of the hood 37 before venting, electrolyte might creep between the can and the rubber and impair the return of the rubber to its initial flat condition.

While the dished washer 35 as described is preferred, since it affords the auxiliary inner seal above described, it is understood that a flat metal washer for the rubber washer would serve and is within the scope of certain of the claims herein.

It is, of course, understood that within the scope of the invention in its broader aspects, the hood element and the auxiliary protection afforded thereby might be omitted.

It is also understood that the flexible, elastic washer and the protective washer could be disposed at parts of the can other than the end without departing from the scope of the invention in its broadest aspects, and that the entire venting unit whether at the end or at the side of the can might be made of smaller dimensions than those shown.

While the vent described and claimed is particularly applicable to wet electrolytic devices, such as electrolytic condensers, it is understood that it will perform its function also in dry cells such as dry electrolytic condensers.

It is, of course, understood that the venting arrangement shown, described and claimed may be employed with any wet electrolytic condenser construction and that the particular anode construction shown, described and claimed may be used with vents other than that made one of the subjects of this application.

It will thus be seen that there is herein described apparatus in which the several features of this invention are embodied, and which apparatus in its action attains the various objects of the invention and is well suited to meet the requirements of practical use.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing 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. A vent structure for an electrolytic cell, comprising a container having an upstanding peripheral lip at the outer end thereof and an end wall continuous except for a relatively small axial perforation, a flexible washer superposed over said perforated end wall, said washer being gas pervious near its middle, a rigid hood member protecting the exposed face of said washer and having a rim in contact therewith, said container having a lip rolled over said rim to maintain the parts in assembled relation.

2. In a wet electrolytic condenser structure, a can having a perforated end wall continuous except for a relatively small axial perforation and with a peripheral lip rising from said wall, a flexible washer centrally gas pervious under pressure and superposed over said end wall, and means clamping said washer in position immediately about said gas pervious area to limit the flexure to the region covered by said perforation in the can, and a protective hood covering said washer

and said clamping means, said lip being rolled to exert clamping pressure on the rim of said washer.

3. In a wet electrolytic condenser, a can having an end wall continuous except for a relatively small axial perforation, and a peripheral lip rising from the periphery of said end wall, a flexible rubber washer over said end wall and having a small central perforation, a metal hood member protecting said washer and having a peripheral flat rim superposed over the peripheral portion of said washer, said lip being rolled inward over said rim, said hood having small venting perforations.

4. In an electrolytic condenser, the combination of a can having an end wall continuous except for a relatively small axial perforation and an upstanding peripheral lip, a flexible rubber washer having a central minute hole superposed over said perforation, a metal washer having a central aperture and superposed over said rubber washer to protect the same, said lip being rolled over and serving to clamp said two washers in position.

5. An electrolytic condenser comprising a can having a central perforated end wall and having a peripheral upstanding lip, a flexible rubber washer having a central pinhole and resting against said end wall, a metal washer having a central aperture and superposed over said rubber washer, and a metal hood having a flat rim

superposed over said metal washer and affording minute venting apertures, said lip being rolled inward to clamp said hood against said metal and said rubber washers.

6. An electrolytic condenser comprising a can having an end wall with a perforation, a flexible rubber washer superposed over said end wall and having a pinhole at the region of said perforation, a dished spring washer having its outer rim upstanding and perforated in registry with the perforation in said end wall, and a metal hood member exerting pressure upon the upstanding rim of said dished washer and rigidly fixed at its rim to said end wall.

7. In an electrolytic condenser, the combination of a can having a central perforated unitary end wall and an upstanding peripheral lip, a flexible rubber washer resting against said end wall and substantially contacting the inner periphery of said lip and having a central pinhole, a phosphor-bronze, centrally perforated dished washer superposed over said rubber disk with its outer rim upstanding, a metal hood member having a shoulder engaging said rim and having a flat rim against said rubber washer, said lip being rolled over against said rim to retain the parts in assembled condition.

HOWARD E. RHODES.