Jan. 17, 1956 H. A. HIDDE NIJLAND 2,731,105

ELECTRIC APPARATUS, SUCH AS LIQUID IMMERSED SWITCHES, COMPRISING MEANS FOR DISCHARGING GASES PRODUCED DURING OPERATION OF THE APPARATUS

Filed Aug. 23, 1954

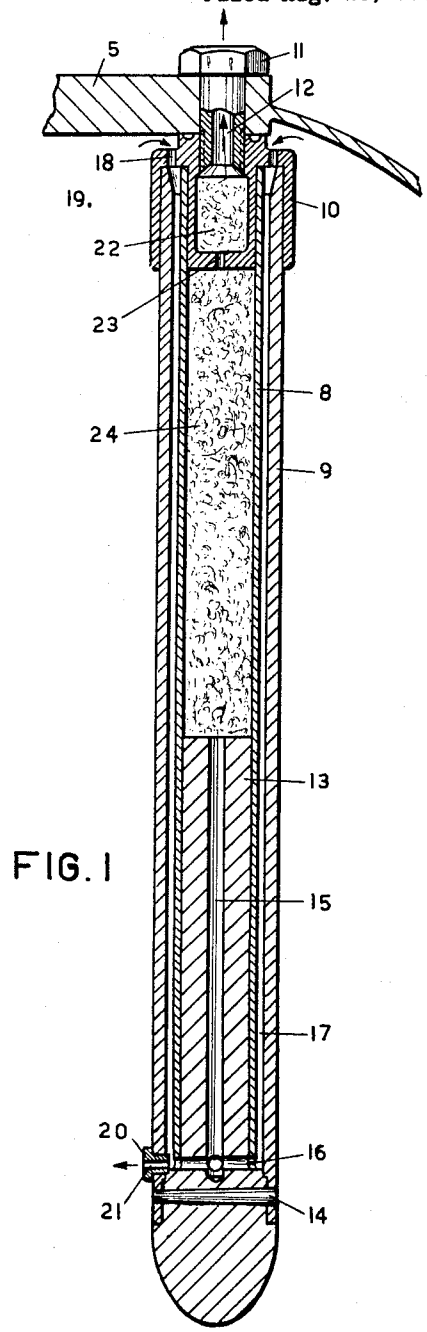

FIG. 1

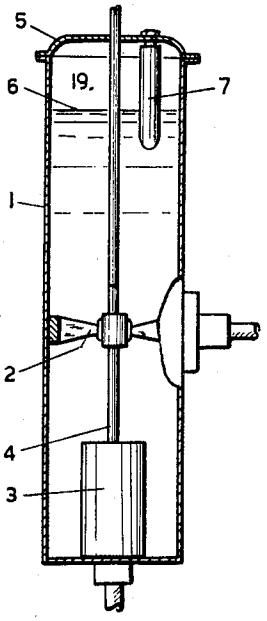

FIG. 2

United States Patent Office 2,731,105 Patented Jan. 17, 1956

2,731,105

ELECTRIC APPARATUS, SUCH AS LIQUID IMMERSED SWITCHES, COMPRISING MEANS FOR DISCHARGING GASES PRODUCED DURING OPERATION OF THE APPARATUS

Hendrik A. Hidde Nijland, Laren, Netherlands, assignor to N. V. "COQ," Utrecht, Netherlands, a company of the Netherlands

Application August 23, 1954, Serial No. 451,587

Claims priority, application Netherlands August 24, 1953

4 Claims. (Cl. 183—45)

The invention relates to an electric apparatus, such as a liquid immersed switch or circuit breaker, whose live parts are accommodated in an insulating liquid such as mineral oil contained in a substantially closed casing provided, in or close to its top wall, with an opening for discharging gases produced, for instance, during a switching operation.

During the interruption of power of large capacity, a considerable amount of high temperature gases is produced in a liquid immersed switch, which gases forcibly tend to make their way out. If such a switch is provided with a vent, this discharges not only the gases, but also a relatively considerable amount of liquid taken along with the gases. It has already been suggested to provide the vent with cooling ribs or other means for increasing the cooling surface thereof, so as to cool the very hot gases as quickly as possible. By the interruption of short-circuit currents of great intensity the amount of insulating liquid so discharged by the escaping hot gases may be so great that the insulation of the live parts is impaired.

The invention contemplates providing an electric apparatus with a device adapted to discharge the gases produced, for instance, during a switching operation, but to withhold and to return to the casing, the liquid taken along by said gases. It consists herein, that the vent in the wall of the casing communicates with the upper end of a chamber provided within the casing and enclosing a great number of baffling surfaces formed by baffle plates, a filling of metal chips, Raschig rings, marbles or like bodies, and in that the lower end of said chamber communicates with the liquid space of the casing not only, on an upper level, through a passage of relatively great cross sectional area for the discharge of gases from said liquid space, but also, on a lower level, through a passage having a relatively small cross sectional area for discharging liquid from said chamber.

With this device, gases produced in the liquid will, through inlet openings provided closely below the top wall of the casing, flow into the said relatively wide passage of the liquid separator and drive the comparatively small amount of liquid present therein into the said chamber, in which the liquid is withheld by the filling and from which the gases are discharged by the vent in the wall of the casing, whereas the liquid withheld by the filling returns to the casing, on a lower level, through the relatively narrow passage referred to.

The device for separating the liquid from the gases may be so arranged that the chamber for receiving the baffling means is accommodated in the inner one of two concentric suitably spaced tubes, the upper ends of said tubes being secured to a cap connected to the top wall of the casing and provided with a passage opening both into the space outside the casing and into the upper end of said chamber, the bottom ends of said tubes being closed by a plug, the lower end of said chamber communicating with the annular space intermediate said tubes, and said annular space communicating with the liquid space of the casing both through a plurality of apertures in or close to said cap and through a narrow aperture at or close to its lower end.

The aforesaid and other features of the invention will appear from the following description of the embodiment of the invention that is illustrated, by way of example, in the annexed drawing. In said drawing:

Fig. 1 is a vertical sectional view of part of the top wall of the casing of an electric liquid immersed switch provided with a liquid separator in accordance with the invention, and

Fig. 2 is an elevational section, drawn to a reduced scale, of the said switch provided with the separator illustrated in Fig. 1.

In the drawing, **1** is the casing of an electric immersed switch, comprising stationary contacts **2**, **3** and a movable contact **4** cooperating therewith. The casing is closed by a cover **5** and filled with mineral oil, whose surface is indicated by **6**. Suspended from the cover, which is provided with a vent passage, is the separator **7** partly immersed in the liquid.

The separator comprises two concentric, suitably spaced tubes **8**, **9** whose upper ends are fixed to a cap **10** secured, through a screw **11** having a central bore **12**, to the cover **5** of the casing **1**. The lower ends of the tubes are closed by a plug **13**, which extends upwards to a relatively high level into the inner tube **8** and which is secured to the outer tube **9** by means of a conical pin **14**. The plug **13** is provided with a central passage **15** communicating at its lower end, through lateral passages **16**, with the lower end of the annular space **17** between the tubes **8** and **9**. The upper end of the said space **17** communicates, through a circular series of holes **18** in the top wall of the cap **10**, with the space **19** above the surface **6** of the liquid in the casing **1**. At the lower end of the annular space **17** the wall of the tube **9** is provided with a nipple **20** having a comparatively narrow passage **21**. The cap **10** accommodates a relatively small chamber **22** communicating at its top with the bore **12** of the screw **11**, and at its lower end, through a relatively narrow passage **23**, with the chamber **24** enclosed by the tube **8**. Both chambers **22** and **24** are filled with metal chips.

If, during a switching operation, gases are produced in the oil, these gases will rise towards the cover **5** and flow, together with a certain amount of oil, through the holes **18**, the annular passage **17**, the transverse passages **16** and the passage **15** into the chamber **24**, where the gases and the oil encounter a great many baffling surfaces whereby the oil is withheld. The gases then flow through the passage **23** into the chamber **22**, in which the liquid that may still have reached said chamber will be withheld by the metal chips therein, and finally escape through the passage **12**. The oil trapped in the chambers **24** and **22** returns to the casing **1** through the passages **23**, **15**, **16** and **21**.

Since the separator is partly immersed in the liquid in the casing **1**, there will permanently be a small amount of oil in the passages **15**, **16**, **17** and **21**. This oil prevents the atmosphere from direct contact with the space **19** above the oil level in the casing. This small amount of oil is forced into the chamber **24** by the high pressure gases produced in the casing **1**, but since the capacity of this chamber greatly exceeds that of the said small amount of oil, the gases in the chamber **24** will readily separate from the oil therein.

What I claim is:

1. In electrical apparatus wherein electrically live parts are contained in a casing which is closed except for the hereinafter recited vent therein and said casing

contains insulating liquid having a normal level lying somewhat below the top of the casing, the improved gas venting and liquid separating device which comprises a vent in the casing wall above the normal level of the liquid, a relatively small chamber within the casing having a space therewithin communicating with the vent, said chamber having its lower end immersed in the liquid, gas permeable means in the chamber having a large number of baffle surfaces, a first passage in the chamber connecting the bottom of the baffle-containing space therein to the space in the casing above the normal liquid level, and a second passage, of smaller effective cross sectional area than the first passage, connecting the bottom of the baffle-containing space in the chamber to the space in the casing below the normal liquid level therein.

2. Gas venting and liquid separating apparatus in accordance with claim 1, in which the chamber enclosing the baffle means is an inner tube disposed with clearance in a second, larger outer tube, the upper ends of the tubes are secured to a cap connected to the top of the casing, the cap has a vent-providing opening therethrough connecting the upper end of the space in the chamber to the atmosphere, and the space between the tubes constitutes a portion of the passage connecting the space in the casing above the normal level of the liquid with the space within the chamber.

3. Gas venting and liquid separating apparatus in accordance with claim 2, in which the chamber is disposed substantially vertically, the bottom ends of the tubes are closed by a plug, said plug having a central portion extending upwardly into the lower end of the inner tube for a substantial distance, the first passage extending lengthwise of said central portion of the plug, the plug having a transverse passage adjacent its lower end of

the plug connecting the lower end of the first passage with the lower end of the space between the tubes, and there is a small opening in the wall of the outer tube constituting a portion of said second passage.

4. In electrical apparatus wherein electrically live parts are contained in a casing which is closed except for the hereinafter recited vent therein and said casing contains insulating liquid having a normal level lying somewhat below the top of the casing, the improved gas venting and liquid separating device which comprises a vent provided in an upper portion of the wall of the casing, an inner tube enclosing a space extending both above and below the normal liquid level in the casing and communicating at its upper end with said vent only, gas baffling parts contained in said space, an outer tube surrounding said inner tube and being spaced therefrom by an annular space, said annular space opening at its upper end above the normal liquid level into the casing by means of a first aperture and at its lower end below said level both by means of a second aperture into the space confined by the first tube and by means of a third aperture into the liquid body outside the outer tube, said third aperture being smaller in comparison with both said first and second apertures and the volume of all spaces contained within the outer tube below the normal liquid level being smaller than that of all spaces contained within the inner tube above said level.

References Cited in the file of this patent

UNITED STATES PATENTS

1,621,026	Pukerud	Mar. 15, 1927
2,000,862	Nichols	May 7, 1935
2,195,565	Fricke	Apr. 2, 1940
2,557,557	Newcum	June 19, 1951