Feb. 8, 1949. C. C. HERSKIND 2,461,275

POOL-TYPE ELECTRIC DISCHARGE DEVICE

Filed Nov. 8, 1946

Fig.1.

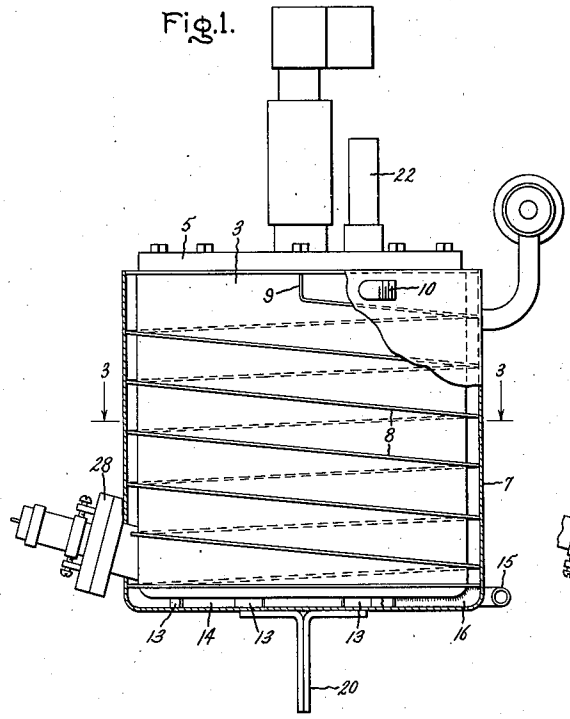


Fig.2.

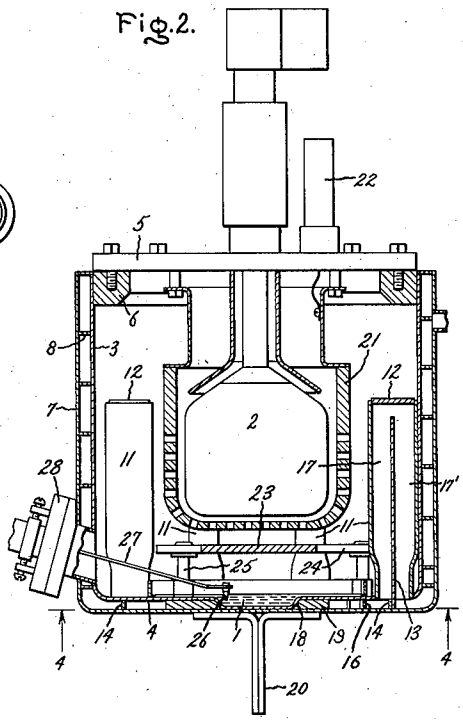


Fig.3.

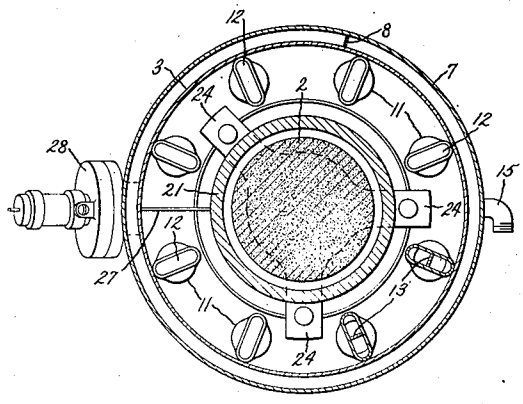
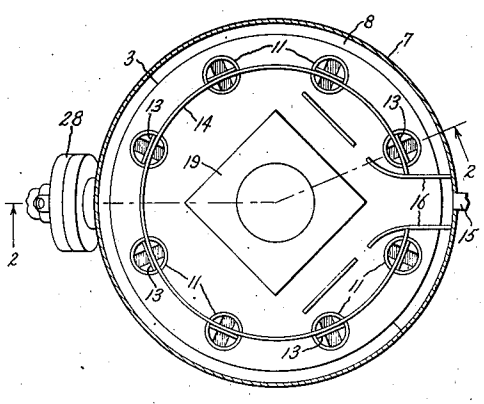


Fig.4.



Inventor:
Carl C. Herskind,
by Merton D Morse
His Attorney.

Patented Feb. 8, 1949 2,461,275

UNITED STATES PATENT OFFICE

2,461,275

POOL-TYPE ELECTRIC DISCHARGE DEVICE

Carl C. Herskind, Niskayuna, N. Y., assignor to General Electric Company, a corporation of New York

Application November 8, 1946, Serial No. 708,537

9 Claims. (Cl. 250—27.5)

1

My invention relates specifically to improved baffle arrangements for pool-type rectifiers and more generally to improved structural features for gaseous electric discharge devices.

In the operation of electric discharge devices employing a pool-type cathode, it is desirable to reduce the arc drop to a minimum and also to insure that current is not conducted during an interval of inverse voltage on the anode-cathode circuit. In accordance with an important aspect of my invention, I provide an improved water-cooled baffle construction which reduces the arc drop and insures a division of the arc and a distribution of the arc stream over the anode surface.

It is an object of my invention to provide a new and improved gaseous discharge device having a low arc drop.

It is another object of my invention to provide an improved electric discharge device of the gaseous discharge type in which the arc is cooled by an extended surface which also insures distribution of the arc over the anode surface.

My invention will be better understood by reference to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims. In the drawing Fig. 1 is an elevational view partially broken away illustrating one embodiment of my invention; Fig. 2 is an elevational view in section of the device illustrated in Fig. 1, the section being taken along the line 2—2 of Fig. 4; Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1; and Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2.

Referring now to the drawing, I have shown my invention applied to a gaseous electric discharge device employing a pool-type cathode 1 which may be of suitable conducting liquid such as mercury and a cooperating cylindrical anode 2 which may, to advantage, be formed of graphite. The anode and cathode are housed within a generally cylindrical casing or tank provided by a cylindrical inner wall 3, closed at one end by an end wall 4. The upper end of the casing is closed by a suitable cover plate 5 bolted to a mounting ring 6 which is secured to the inner wall of casing 3. The cover supports the anode 2 in spaced and insulated relation with respect to the cathode 1 in a manner well understood in the art. The tank for the device is completed by an outer cylindrical wall 7 conforming generally to the shape of the inner casing 3 and spaced therefrom to provide a water jacket. As indicated in the drawing a spiral cooling passage is provided by a helical fin or separator 8 secured between the inner and outer casings 3 and 7. The separator 8 terminates at the upper end of the tank as illustrated at 9 and the passage thus formed communicates with an outlet fitting 10.

2

In accordance with an important feature of my invention, I provide a plurality of vertical extending baffle members which function to cool and divide the arc and to insure that the arc is distributed over the active surface of the anode 2. These baffles are in the form of vertically extending tubes 11 arranged in equally spaced relation around the discharge region of the device. Each baffle is suitably closed at the upper ends by means of a plate 12 which is welded within a flattened portion of the tube. The tubes are welded to the bottom wall 4 of the inner case and open into the region between the bottom end walls of the casings 3 and 7. As illustrated, each of the baffle members is provided with a centrally located transverse vane 13 which terminates short of the upper end wall 12 and which extends to the bottom of the outer casing 7. A circular metal ring 14 is arranged between the inner and the outer end walls of the tank and connects with the vanes 13 of the baffles 11. This ring requires that the water introduced into the center portion of the ring circulate through each of the vertically extending baffles before entering into the helical passage between the inner and outer casing and effectively providing inlet and outlet headers for the baffles 11. As best illustrated in Fig. 4, an inlet connection 15 communicates with the space between the inner and outer casing and on the inside of the ring 14 through a passage defined by partition members 16 which as shown in Fig. 1, extend upwardly at their outer ends to join with the bottom surface of the separator 8 and along the rest of their length with the wall 4 of the inner casing. With this arrangement water introduced into the passage defined by the members 16 and the end walls of casings 3 and 7 is required to flow to the center portion of the casing and upwardly in parallel paths through the passages 17 defined by the tubular baffles and the vanes 13. The water continues to flow over the ends of vanes 13 down through passages 17' to the header or space on the outside of ring 14 and then upwardly through the spiral passage between casing 3 and 7 to the outlet fitting 10.

The inner casing is depressed as shown at 18 to provide a centrally located retaining cup for a substantial portion of the cathode liquid. This depressed portion is bonded to the outer casing and is surrounded by a metal reinforcing ring 19

positioned between the inner and outer walls of the casing. A cathode connection is provided by bus bars 20 suitably bonded to the outer wall of the casing at the region of the ring 19. The anode 2 is surrounded by a grid basket 21 which may be supported from the cover 5 in insulated relation with respect thereto. A separate lead-in connection for the grid is provided by a suitable seal construction illustrated schematically at 22. Interposed between the lower face of the grid basket and the surface of the cathode pool is generally circular splash baffle 23 having three equally spaced arms 24 supported in insulated relation with respect to the tank by means of stud assemblies 25. A starting electrode 26 which, as illustrated, is of the immersion-ignitor type is supported on a conductor 27 which is in turn mounted in insulated relation with respect to the tank by a starting electrode mounting flange assembly 28.

In the operation of the illustrated embodiment of my invention, an arc discharge is established between the cathode surface and the anode 2 by forming a cathode spot on the cathode surface by energization of the starting electrode 26. The splash baffle 23 in cooperation with the vertical extending cooling baffles 11 divide the arc into a plurality of arc streams corresponding to the number of vertically extending baffles and insure that the arc is distributed over substantially the entire anode surface. The water cooled baffles are also in intimate contact with a substantial volume of the ionized vapor and provide for effective control of and reduction in the operating vapor pressure. As a result of this cooling of the arc stream and its distribution over the anode surface, it is possible to decrease the space between the face of the anode 2 and the surface of the cathode pool. As will be readily appreciated this decrease in distance reduces the arc drop of the device. As a result, this construction has been found very desirable particularly in devices for a high-current capacity rectifier. The baffles 11 also offer relatively little obstruction to the arc in that they do not increase the arc drop and the gain expected from reducing the anode-cathode spacing is fully realized.

While I have described and illustrated a particular embodiment of my invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from my invention in its broader aspects and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric discharge device of the single anode type including a generally cylindrical enclosure, a pool-type cathode in one end of said enclosure, a generally cylindrical anode supported in insulated relation with respect to said enclosure and having an end thereof in opposed spaced relation to said pool-type cathode, a baffle interposed between said anode and cathode obstructing the direct discharge path between said anode and cathode, a plurality of elongated baffle members arranged in spaced relation around the circumference of said anode and extending vertically from the region of said cathode to a point substantially above the end of said anode, said baffle members cooperating with said transverse baffle to divide the discharge and to distribute the discharge over the anode surface.

2. An electric discharge device of the single anode type comprising a pool-type cathode, an anode having an extended discharge receiving area arranged in opposed spaced relation with respect to said cathode, a plurality of vertically extending baffles arranged in spaced relation around said anode and extending towards said cathode, means for forming a cathode spot on said cathode, a transverse baffle member arranged between said anode and the cathode spot, said vertically extending baffle members cooperating with said transverse baffle to divide the discharge and distribute it over the surface of the anode, said vertically extending baffles also being fluid cooled to control the vapor pressure within said device.

3. An electric discharge device including a doubled-walled casing of generally cylindrical shape, said casing including means providing a passage between the walls thereof for a cooling liquid, a plurality of vertically extending baffles arranged in spaced relation about the inner wall of said casing and communicating at their lower ends with the space between said inner and outer end walls of said casing, partition members within said baffles terminating below the upper ends thereof and dividing each of the baffles into a plurality of passages, a partition member positioned between the inner and outer end walls of said casing and providing headers connected respectively with the passages located on opposite sides of said partition members.

4. An electric discharge device comprising a pool-type cathode, a single anode having an extended area arranged in opposed spaced relation with respect to said cathode and a plurality of vertically extending baffles arranged in circumferentially spaced relation around said anode and extending towards said cathode, said baffles being of sufficient size to at least partially subdivide the arc discharge terminating on said anode and said cathode and to distribute the discharge over the anode surface.

5. An electric discharge device comprising a pool-type cathode of generally cylindrical shape, a generally cylindrical casing for supporting said anode and said cathode in axially spaced and mutually insulated relation, a plurality of baffles arranged in angularly spaced relation around the inside of said casing and overlapping in an axial direction a substantial portion of said anode and extending axially toward said cathode, said baffles functioning to divide the arc discharge and distribute it over the surface of said anode, each of said baffles being hollow and provided with a vane dividing the baffle into a pair of interconnected longitudinal passages, a pair of headers connected respectively with corresponding passages of the baffles, said casing including cooling passages on the side wall thereof connected with one of said headers so that fluid introduced into the other of said headers circulates through said baffles in parallel and then through the passages on said side wall.

6. An electric discharge device comprising a pool-type cathode, an anode of generally cylindrical shape, a generally cylindrical casing for supporting said anode and said cathode in axially spaced and mutually insulated relation, a plurality of baffles arranged in angularly spaced relation around the inside of said casing and overlapping in an axial direction a substantial portion of said anode, said baffle functioning to divide the arc discharge and distribute it over the surface of said anode, each of said baffles being hollow and provided with a vane terminat-

ing short of one end wall of the baffle to divide the baffle into a pair of interconnected elongated passages, a pair of headers connected respectively with corresponding passages of said baffle.

7. An electric discharge device of the single anode gaseous arc discharge type, a cathode, an anode of generally cylindrical shape, a generally cylindrical casing for supporting said anode and said cathode in axially spaced and mutually insulated relation, a plurality of baffles arranged in angularly spaced relation around the inside of said casing and overlapping in an axial direction a substantial portion of said anode, and a transverse baffle interposed between said anode and said cathode and cooperating with said angularly spaced baffles to divide the arc discharge and distribute it over the surface of said anode.

8. An electric discharge device including a double-walled casing of generally cylindrical shape, said casing including means providing a passage between the walls thereof for a cooling liquid, a plurality of vertically extending baffles arranged in spaced relation about the inner wall of said casing and communicating at their lower ends with the space between said inner and outer end walls of said casing, a partition member within each of said baffles for dividing the baffles into a pair of longitudinally extending interconnected passages, a ring positioned between the inner and outer end walls of said casing and cooperating with said partitions to divide said casing into two headers each interconnecting one passage of each baffle.

9. An electric discharge device of the single anode type comprising a pool-type cathode, an anode having an extended discharge receiving area arranged in spaced relation with respect to said cathode, a plurality of vertically extending baffles arranged in circumferentially spaced relation around said anode and extending towards said cathode, means for forming a cathode spot on said cathode, a transverse baffle member arranged between said anode and the cathode spot, said vertically extending baffle members cooperating with said transverse baffle to divide the discharge and distribute it over the surface of the anode.

CARL C. HERSKIND.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,729,463	Von Kleist	Sept. 24, 1929
2,189,612	Pakala	Feb. 6, 1940
2,275,852	Herskind	Mar. 10, 1942
2,393,390	Lang	Jan. 22, 1946

FOREIGN PATENTS

Number	Country	Date
555,126	Great Britain	Aug. 5, 1943