Feb. 2, 1932. O. SEITZ 1,843,176

ELECTRIC CURRENT RECTIFIER COOLING SYSTEM

Filed Jan. 3, 1927

Fig. 1

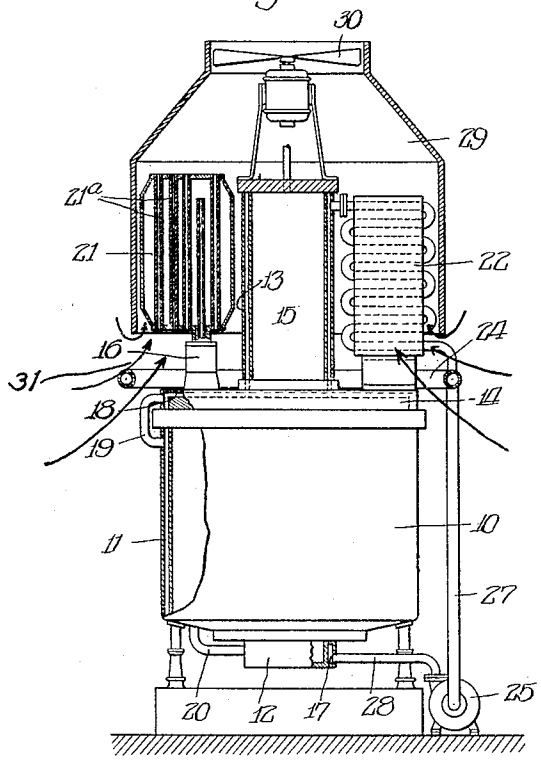
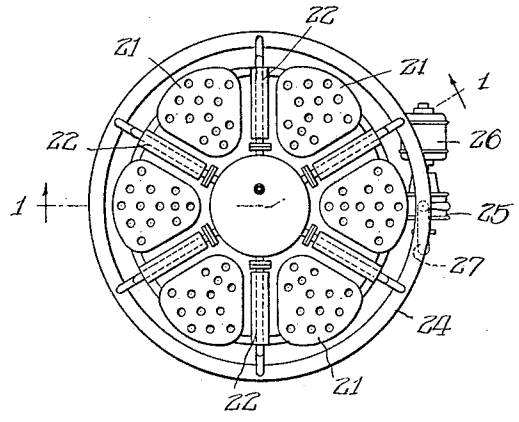


Fig. 2.



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UNITED STATES PATENT OFFICE

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ELECTRIC CURRENT RECTIFIER COOLING SYSTEM

Application filed January 3, 1927, Serial No. 158,720, and in Germany January 11, 1926.

This invention relates to electric current rectifiers of the mercury vapor type and pertains particularly to the cooling of that kind of apparatus. In the operation of mercury vapor rectifiers a great deal of heat is generated and must be disposed of with sufficient rapidity to maintain the apparatus in proper operative condition. Where a suitable water supply is available, cooling may be effected conveniently by continuous flow from the service line. However, in many instances a suitable water supply is not available, as, for example, in the case of isolated substations, or in instances where the water of the service supply carries minerals or foreign matter which may be detrimental to the apparatus.

The general object of the present invention is the provision of an apparatus whereby the rectifier may be cooled by circulation and recirculation of a cooling medium in a closed system which constitutes an adjunct of the rectifier itself.

A particular object of the invention is the provision of such an apparatus which forms a unitary installation and occupies but little space, so that the entire apparatus may be installed in approximately the same floor space required by the rectifier alone.

Another object is the provision of an apparatus which will serve conjointly the portions of the apparatus included in the circulating system and those which are equipped individually with separate cooling devices.

Still another object is the provision of an apparatus wherein the rectifier is cooled by both air and water circulation.

Other and further objects will be pointed out or indicated hereinafter or will be obvious to one skilled in the art upon an understanding of the invention or its employment in practice.

In the drawing forming a part of this specification, I illustrate one structural embodiment of the invention, but it is to be understood that this is presented for purpose of illustration only and is not to be accorded any interpretation calculated to limit the claims short of the true and most comprehensive scope of the invention in the art.

In the drawings,

Fig. 1 represents an elevational view of a rectifier including its cooling elements, parts being shown in sectional elevation on substantially line 1—1 of Fig. 2; and

Fig. 2 is a top view of the installation with the hood and air circulating fan removed.

The nature of the invention may be most quickly ascertained by reference immediately to this illustrative construction. As shown in the drawings, let it be understood that the reference numeral 10 designates the rectifier cylinder or operating casing having the cathode basin 12, the anode plate 14 and the condensing dome 15. A plurality of anode holders 16 are mounted on the anode or top plate 14 and support the anodes within the cylinder 10. The cylinder 10 and condensing dome 15 are formed with water jackets 11 and 13 respectively, and the cathode basin 12 and anode plate 14 with channels 17 and 18 respectively for circulation of cooling fluid. The water channels 18 of the anode plate communicate with the water space of the jacket 13, and also, by way of the pipe 19, with the water space of the cylinder jacket 11. The water space of the cylinder jacket 11 likewise communicates with the channel 17 of the cathode basin by way of a pipe 20. The anodes are provided with individual cooling radiators 21 for containing a cooling liquid, each of said radiators serving its respective anode by gravity circulation, and having the air circulation tubes 21a. Between the anode radiators 21 are disposed the circulation radiators 22 which have communication with the upper portion of the water jacket of the condensing dome 15 and with a header ring 24. A pump 25, driven by a motor 26, has an inlet pipe 27 leading from the header ring 24 and has its outlet connected with the cathode water jacket by a pipe 28. The water jackets and the circulation radiators 22 are filled with a suitable cooling medium such as water, which is circulated by the pump 25 first to the cathode jacket 17, then by way of pipe 20 to the cylinder jacket 11, thence by pipe 19 to the water channels 18 of the anode plate 14, thence to the water jacket 13 of the condensing dome, thence into the circulation

radiators 22, and from them to the header ring 24 and back to the pump inlet through pipe 27. A hood 29 is common to and receives and is arranged in covering relationship to the radiators 21 and 22 and the condensing dome, and is supported, as shown, above the top plate 14 with its lower edge portion in spaced relation with respect to the adjacent edge portion of the plate to provide an inlet passage 31 for cooling air. A fan 30, supported at the upper outlet end of the hood, operates to draw the relatively cool exterior air inwardly through inlet passage 31, as indicated by the arrows shown, and to effect upward flow of the cooling air through hood 29 and over the cooling surfaces provided by the anode-cooling means or radiators 21 and the radiator elements 22. By operation of the fan a circulation of air is maintained over the exposed surfaces of the rectifier cylinder, anode plate and condensing dome, and through the air tubes 21^a of the anode radiators and over the surfaces of the circulation radiators 22, for the purpose of carrying away heat from the metal surfaces and the contained cooling liquid. The forced circulation of the cooling liquid in the circulating system displaces the heated liquid from the water jacket 13 into radiators 22, wherein it is cooled by the air circulation before passing to the inlet of the pump 25.

The apparatus thus provides a self-contained installation adapted for operation independently of an external source of cooling liquid supply. The arrangement illustrated is attended with particular advantage by virtue of the fact that the entire apparatus requires no more floor area than does the rectifier alone, and that all of the cooling surfaces are served conjointly by the same air circulating device.

What I claim is:

1. The combination with a rectifier having a water-jacketed portion and an anode holder, of a radiator serving the anode holder, a radiating device communicating with the water-jacketed portion, a pump for circulating cooling liquid through the water-jacketed portion and radiating device, and an air-circulating device for moving air in contact with the radiator, the water-jacketed portion and the radiating device.

2. The combination with a rectifier having a water-jacketed portion and a plurality of anode holders, of radiating devices arranged intermediate the anode holders and communicating with said water-jacketed portion, radiators associated with respective anode holders, means for circulating cooling liquid through the water-jacketed portion and radiating devices, and means for circulating air in contact with the radiators and radiating devices.

3. The combination with a rectifier having a water-jacketed portion and a plurality of anodes, of radiating devices communicating with the water-jacketed portion and arranged intermediate the anodes, radiators associated with respective anodes, a hood enveloping the radiators and radiating devices, and means for passing air through the hood.

4. The combination with a rectifier including the rectifier casing and a water-jacketed condensing dome surmounting the same, of radiating devices having communication with the dome water-jacket and distributed about the same over said casing, and a pump having inlet connection with the radiating devices and outlet connection with the dome water-jacket.

5. The combination with a rectifier having a cover plate and a water-jacketed condensing dome supported thereon, of radiating devices communicating with the dome water-jacket and supported on the cover plate, and means for circulating cooling liquid through the said water-jacket and radiating devices.

6. In rectifying apparatus, an operating casing having a top plate, anode-cooling means supported above said plate, means providing passages for cooling liquid disposed in such manner as to render such liquid effective with respect to said casing, said last-named means including an air-cooled radiator element supported above said plate, and means common to said anode-cooling means and said radiator element for effecting flow of cooling air over the same.

7. In rectifying apparatus, an operating casing having a top plate, anode-cooling means supported above said plate, means providing passages for cooling liquid disposed in such manner as to render such liquid effective with respect to said casing, said last-named means including an air-cooled radiator element supported above said plate, and means common to said anode-cooling means and said radiator element for effecting flow of cooling air over the same and comprising a vertically-disposed hood common to and receiving said anode-cooling means and said radiator element and supported with its lower edge portion in spaced relation with respect to the adjacent edge portion of said plate to provide an air-inlet passage, and means operable to induce air flow into said hood by way of said air-inlet passage.

In testimony whereof I have hereunto subscribed my name this 14 day of December, A. D. 1926, at Zurich, Switzerland.

OSKAR SEITZ.