

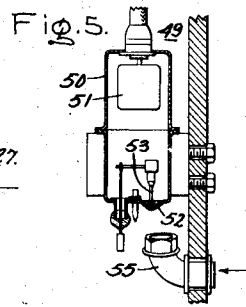
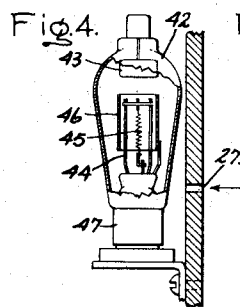
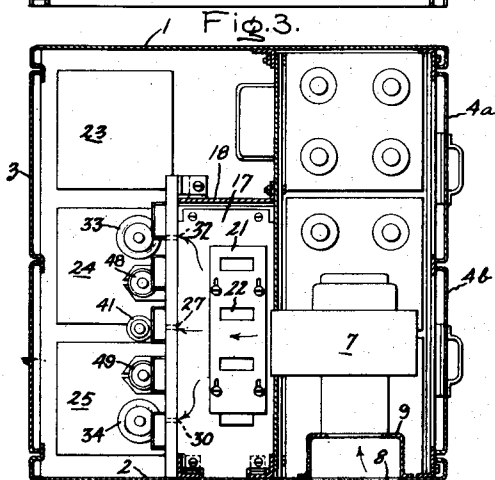
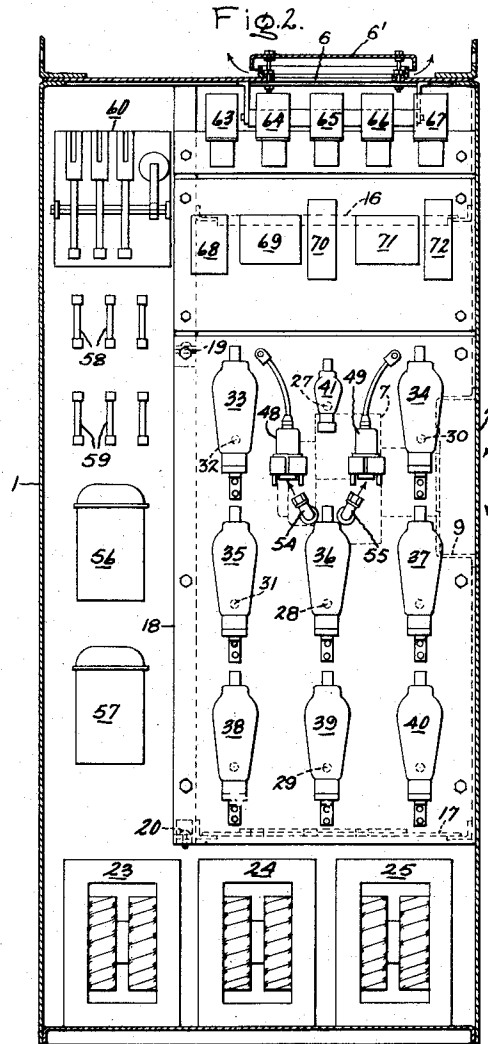
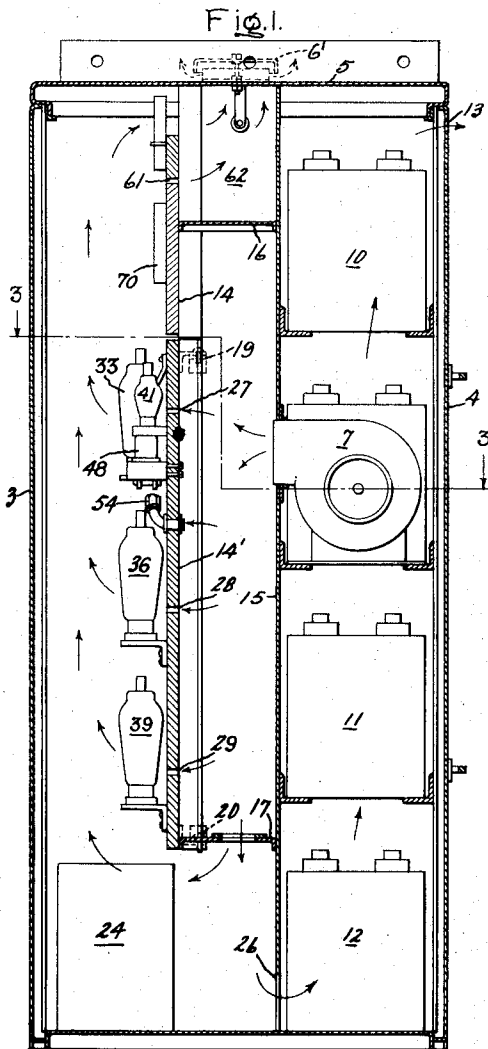
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2,394,060

CABINET FOR ELECTRICAL APPARATUS

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CABINET FOR ELECTRICAL APPARATUS

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My invention relates to a cabinet or structure for electrical apparatus, and more particularly to a ventilating structure for electric discharge devices.

In many industrial applications, it is desirable to provide enclosing structure for electrical apparatus so that the entire system may be positioned and arranged as a distinct unit, thereby occupying a minimum amount of space, and at the same time it is important that the individual elements of the apparatus be positioned so that sufficient cooling facilities are provided in order to prevent injury to the apparatus by virtue of inordinate temperature rises.

It is an object of my invention to provide a new and improved compartment or cabinet for electrical apparatus.

It is another object of my invention to provide a new and improved ventilating structure for housing electrical apparatus such as electrical discharge devices.

It is a further object of my invention to provide new and improved cooling structure for electric discharge devices of the type employing an ionizable medium, such as a mercury vapor, and wherein jets of cooling fluid are directed at those parts of the discharge apparatus at which it is desired to effect the maximum cooling so that the mercury condenses at a desired place.

Briefly stated, in the illustrated embodiment of my invention I provide a new and improved enclosing structure or cabinet for housing a number of electrical elements constituting parts of an electrical system, and which includes electric discharge devices of the type employing an ionizable vapor within the enclosing receptacles. More particularly, I provide an enclosing structure having therein a plurality of vertically positioned partitions to define three vertical regions. A fluid impelling means, such as a fan, is employed for establishing a zone of relatively high fluid pressure within the intermediate region. The fan may be located in one of the outer regions to extract air from the atmosphere and supply it at a relatively high pressure to the intermediate zone which acts as a reservoir of sufficient reserve capacity to assure a substantially continuous supply of air or cooling fluid. The electric discharge devices are positioned within the other outer region and are supported by the partition between the intermediate region and that outer region. Communicating channels, such as openings or conduits, are provided in this partition to direct jets of air to the vicinity of the electric discharge devices and preferably

against that portion of the enclosing envelopes of the discharge devices at which it is desired to effect the condensation of the ionizable medium. The partitions are arranged so that streams of air are derived from the intermediate region and supplied to the outer regions from the bottom of the intermediate high pressure region so that vertical cooling of the electrical apparatus positioned in the outer region is obtained.

For a better understanding of my invention, reference may be had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims. Fig. 1 is a side view of an embodiment of my invention as applied to an enclosing structure for housing electrical apparatus for a capacitance discharge welder. Fig. 2 is a front view of the same system and Fig. 3 is a plan view. Figs. 4 and 5 are enlarged detailed views of several types of electric discharge devices which may be employed in a system of this nature.

Referring now to Figs. 1, 2 and 3, I have there illustrated my invention as applied to an enclosing structure or cabinet for housing the electrical apparatus, principally the capacitances, the electric discharge devices, transformers, contactors and fuses, which may be employed in a capacitance discharge welding system. The enclosing structure which I provide may be constructed of a suitable material such as metal, plywood or plastic such as a phenolic condensation product, and includes side walls 1 and 2, front and rear walls 3 and 4 which may be hinged to permit ready access to the outer compartments. For example, the rear wall 4 may constitute separate doors 4a and 4b. The top of the enclosing structure is closed by means of a member 5 provided centrally with an outlet opening 6 covered by a raised shield 6' to prevent settling within the cabinet of dust or dirt from the atmosphere. The bottom may be enclosed by a suitable base member.

I provide within such an enclosure three vertically defined regions, one of the outer regions including a fluid impelling means such as a centrifugal blower or fan 7 which may be employed to supply a ventilating or cooling fluid, such as air, to the intermediate region to be described presently. Fan 7 when it is employed to impel air may derive the air from atmosphere through an opening 8 in side wall 2 and through a conduit 9. There is also positioned within this outer chamber other electrical apparatus such as capacitances 10, 11 and 12 which are suitably vertically displaced and supported within this outer

chamber. These capacitances are positioned relative to the dimensions of the chamber so that air is circulated vertically throughout the compartment around the apparatus to obtain the desired cooling effect. The outlet for this region may be obtained by providing an opening 13 in wall 4, or the doors 4a and 4b may be constructed to provide sufficient outlet openings to permit exit of the air to atmosphere after it has performed its desired cooling function.

I provide a pair of partitions 14 and 15 which define three vertically disposed regions within the enclosing structure, one of the outer regions being defined by wall 4 and partition 15, and the other outer region being defined by partition 14 and wall or door 3. The region between walls or partitions 14 and 15 between the horizontal partitions 16 and 17 defines an intermediate region or zone of relatively high pressure, the side dimensions of which are established by side wall 2 and a partition 18. This intermediate region acts as a reservoir of appreciable size to assure a supply of ventilating fluid, such as air, even though there is a temporary or intermittent interruption in the operation of the fan 7, and consequently assures a sufficient supply of cooling fluid to the electric discharge devices to be discussed presently. A portion of the partition 14 may be hinged to permit rotation of this part so that access is obtained to the intermediate region. For example, the part 14' may be provided with hinges 19 and 20.

At the bottom of the intermediate region and supported by partition 17, I provide means for controlling the flow of cooling fluid to the outer regions. This controlling means may comprise an adjustable shutter 21 having a plurality of openings 22 to control the amount of the ventilating fluid transmitted therethrough.

At the bottom of the compartment I may also position other electrical elements, such as transformers 23, 24 and 25, which are positioned in the path of one of the air streams derived from the intermediate region. Partition 15 at its lower extremity may be provided with an opening 26 so that the other stream of air derived from the intermediate region is introduced at the bottom of one of the outer compartments and supplies the ventilating fluid for the capacitances 10-12 and fan 7.

Within the other region or compartment, namely the left-hand compartment as viewed from Fig. 1, I position a plurality of electric discharge devices which are supported by partition 14. The part 14' of partition 14 includes therein a plurality of ventilating channels or openings, such as 27, 28, 29, 30 and 31, each associated with a different one of the electric discharge devices and which are intended to direct jets of air to that vicinity or part of the enclosing envelope at which it is desired to effect condensation of the ionizable medium enclosed therein. For example, I may position on the door partition 14' a plurality of electric discharge devices 33-41, inclusive, which are of the type employing mercury vapor as the ionizable medium, and which are shown in detail in Fig. 4. These discharge devices comprise an enclosing envelope, such as a glass envelope 42, an anode 43, a cathode 44, a cathode heating element 45 and a grid 46. Mercury vapor enclosed within the envelope 42 and constituting the ionizable medium, of course, tends to condense on that inside part of the envelope where the temperature is a minimum, and consequently it is desirable to control

mercury vapor pressure and the point of minimum temperature so that the mercury is not condensed at a point which would cause it to fall upon the electrodes of the device, thereby resulting in arc-back or other type of failure. For this reason, as illustrated in Fig. 4, the opening 27, for example, associated therewith is positioned near the bottom of the glass envelope 42 within the vicinity of base 47 to effect the condensation of the mercury near the base of the discharge device, or near the bottom of the envelope.

I may also position within the left-hand outer chamber electric discharge devices of other types, such as a pair of ignitrons 48 and 49. The ignitrons 48 and 49 may be of the type shown in detail in Fig. 5 and which comprise a metallic enclosing envelope 50, an anode 51, a mercury pool cathode 52 and an immersion-ignitor type control member 53 extending into the surface of the mercury. Of course, the ionizable medium in this instance is mercury vapor and in order to control the point of minimum temperature, and thereby establish the point of mercury condensation, I provide a plurality of conduits extending between the intermediate region and the outer regions for directing jets of air against the bases of the discharge devices 48 and 49. For example, these conduits may comprise tubular conductors or pipes 54 and 55 having the desired curvature and position to direct the jet to the proper point of the enclosing envelope.

Within the left-hand outer compartment I may also position other apparatus to be used as control means for the electrical system as a whole, and this apparatus may include transformers 56 and 57, fuses 58 and 59 and an electromagnetic contactor 60. In order to obtain the desired cooling or ventilation of these elements, partition 14 may be provided with an opening 61 above partition 16 so that the air passing through the left-hand outer compartment flows to a zone 62 and to the atmosphere through the opening in the top plate member 5. Other elements of the system, such as fuses 63-67, inclusive, and electromagnetic contactors 68-72, inclusive, may also be positioned in the left-hand outer region as viewed from Fig. 1 and shown in detail in Fig. 2.

In operation, the fan 7 supplies air at relatively high pressure to the intermediate region which acts as a reservoir of the fluid, thereby projecting jets of air against the envelopes of the electric discharge devices 33-41, inclusive, and 48 and 49. As stated above, the jets are directed to that part of the enclosing envelopes at which it is desired to effect the condensation of the mercury vapor. In this way, the mercury vapor pressure is controlled and the condensation of the mercury near the top of the enclosing envelopes is prevented so that the possibility of drops of mercury dropping across the electrodes is substantially reduced, thereby improving the performance of the discharge devices. By virtue of the openings 22 in partition 17, air is derived from the intermediate region and forced through the two outer regions causing the air to rise therethrough and ventilating the various electrical elements positioned therein. Shutter 21 may be positioned or adjusted to control the amount of air supplied to the two outer regions.

One of the advantages of the improved ventilating structure which I provide is that incident to the provision of the shutter 21 which is a means for effecting control of the ambient tem-

perature of the air surrounding the electric discharge devices. Selection of a higher temperature may be made by lowering the pressure in the intermediate region to very low value by an increased opening of the shutter or by decreasing the fan intake in the event the ambient temperature is too low.

Although in the above description of my invention I have chosen to describe the structure in connection with an arrangement for cooling electric discharge devices, it will be appreciated that the same structure may be used with equal facility in an arrangement where it is desired to raise the temperature, or to maintain the temperature of the discharge devices at a predetermined value, in which case, of course, the temperature of the fluid employed, such as air, will be controlled by heating means (not illustrated).

While I have shown and described my invention as applied to a particular system embodying various devices diagrammatically shown, it will be obvious to those skilled in the art that changes and modifications may be made without departing from my invention, 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. In a housing structure for electrical devices comprising enclosing and partitioning members to establish outer regions and an intermediate region extending along a principal dimension of the enclosure, means positioned in one of said regions for establishing a relatively high pressure of a temperature controlling fluid within the intermediate region, the electrical devices being positioned in one of the outer regions and supported by the partitioning member between said other outer region and said intermediate region, and apertures in the last mentioned partitioning member for directing said fluid to impinge upon said electrical devices.

2. In an enclosing compartment for electrical apparatus including electric discharge devices, the combination including an enclosing structure comprising partitions to establish three vertically defined regions, means positioned in one of the outer regions for establishing a zone of relatively high pressure of a fluid within the intermediate region, the electric discharge devices being positioned within the other outer region and supported by the partition between the intermediate region and the other outer region, and apertures in the last mentioned partition to direct said fluid to the vicinity of said electric discharge devices.

3. In a cooling and enclosing compartment for electrical apparatus including electric discharge devices, the combination including an enclosing structure having partition members therein to establish three vertical regions, a fan positioned in one of the outside regions for supplying to the intermediate region air at a substantially high pressure, the electric discharge devices being positioned in the other outer region and supported by the partition between the intermediate region and the last mentioned outer region, and a plurality of communicating channels between said intermediate region and the last mentioned outer region for directing jets of air against the surfaces of said electric discharge devices.

4. In a housing structure for electric discharge devices employing ionizable mediums comprising enclosing and partitioning members to es-

tablish three segregated regions extending along a principal dimension of the enclosure, means positioned in one of said regions for establishing a relatively high pressure of a fluid within the intermediate region, the electric discharge devices being positioned in one of the outer regions and supported by the partition between said other outer region and said intermediate region, and conduits in the last mentioned partition for directing said fluid to impinge upon the bases of said electric discharge devices.

5. In a housing structure for electric discharge devices comprising enclosing and partitioning members to establish three separate regions extending longitudinally along a principal dimension of the enclosure, means positioned in one of said regions for establishing a relatively high pressure of a fluid within the intermediate region, the electric discharge devices being of the type employing an ionizable vapor and being positioned in the other outer regions and supported by the partitioning member between said other outer region and said intermediate region, and openings in said last mentioned partitioning member for directing said fluid to impinge upon that portion of the envelope of the discharge devices at which it is desired to effect condensation of the enclosed vapor.

6. In a housing and cooling compartment for electrical devices, the combination including an enclosing structure comprising partitions to establish three regions, means positioned in one of the outer regions for establishing a zone of relatively high pressure of a cooling fluid within the intermediate region, the electrical devices being positioned within the other outer region and supported by the partition between the intermediate region and the other outer region, apertures in the last mentioned partition to direct said fluid to the vicinity of said devices, and means for controlling the flow of said fluid from said intermediate region to said other outer region.

7. In an enclosing and cooling compartment for electrical devices, the combination including an enclosing structure comprising partitions to establish three vertically defined regions, fluid impelling means centrally positioned in one of the outer regions for establishing a zone of relatively high pressure of a cooling fluid within the intermediate region, the electrical devices being positioned within the other outer region and supported by the partition between the intermediate region and the other outer region, apertures in the last mentioned partition to direct said fluid to the vicinity of said devices, and a horizontal partition including an adjustable shutter for directing cooling fluid from the bottom of the intermediate region to said other outer region whereby said fluid flows around said devices vertically as well as transversely.

8. In an enclosing compartment for electrical devices, the combination including an enclosing structure comprising partitions to establish three vertically defined regions, a fan centrally positioned in one of the outer regions for deriving air from the atmosphere and supplying it to the intermediate region at a substantially high pressure, the electrical devices being positioned in the other outer region and supported by the partition between the intermediate region and the last mentioned outer region, a plurality of openings in said last mentioned partition for directing jets of air against the surfaces of said devices, an opening near the bottom of said

intermediate chamber for directing a stream of air upward from said intermediate chamber through said last mentioned outer chamber, and means for controlling the amount of air derived from said intermediate region.

9. In a cooling and enclosing compartment for electrical devices, the combination including an enclosing structure having partitioned members therein to establish three vertical regions, a fan centrally positioned in one of the outer regions for supplying to the intermediate region air at a substantially high pressure, said intermediate region serving as a reservoir to supply jets of air to said devices through openings in the partition between the intermediate region and the other outer region, and output openings in the structure defining said compartment for returning the air to atmosphere.

10. In a cooling and enclosing compartment for electric apparatus including electric discharge devices, the combination including an enclosing structure having partitions therein to establish three ventilating regions, a fan centrally positioned in one of the outer regions for supplying air to the intermediate region at a substantially high pressure, outlet means at the top of the intermediate region, the electric discharge devices being positioned in the other outer region and supported by the partition between the intermediate region and the last mentioned outer region, a plurality of openings in the last mentioned partition to direct jets of air against said discharge devices, an opening near the bottom of said intermediate region whereby air is derived therefrom and which flows upwardly through said other outer region, and a communicating channel near the top of said other outer region through which the air returns to the atmosphere by way of said outlet means.

11. In a cooling and enclosing compartment for electric apparatus including electric discharge devices, the combination including an enclosing structure having partitions therein to establish three vertical regions, a fan positioned in one of the outer regions for supplying to the intermediate region air at a substantially high pressure, the electric discharge devices being positioned in the other outer region and supported by the partition between the intermediate region and the last mentioned outer region, a plurality of communicating channels between said intermediate region and the last mentioned outer region for directing jets of air against the surfaces of said electric discharge devices, and an opening near the bottom of said intermediate region whereby

air is supplied to said outer regions and which rises vertically therethrough.

12. In a housing structure for electrical apparatus comprising enclosing structure and spaced partitions to establish three vertically defined regions, means positioned in one of the outer regions for establishing a zone of relatively high pressure of a fluid within the intermediate region, the electrical apparatus including an electrical device positioned within the other outer region and supported by the partition between the intermediate region and the other outer region, and an aperture in the last mentioned partition to direct said fluid to the vicinity of said electrical device.

13. In an enclosing structure for electrical apparatus, the combination including an enclosing wall structure and a plurality of partitions to establish three vertically defined regions, means positioned in one of the outer regions for establishing a zone of relatively high pressure of a fluid within the intermediate region, the electrical apparatus including electrical devices positioned within the other outer region and supported by the partition between the intermediate region and the other outer region, and a plurality of apertures in the last mentioned partition to direct individual jets of said fluid against the electrical devices.

14. In an enclosing structure for electrical apparatus, the combination including enclosing wall members and a plurality of partitions to establish within the structure three vertically defined regions, and means positioned in one of the outer regions for establishing a zone of relatively high pressure of a fluid within the intermediate region, one of said partitions defining the boundary between the intermediate region and the other outer region comprising a hinged door to support a plurality of electrical devices, said door being provided with a plurality of apertures to direct individual jets of air against the respective electrical devices.

15. In a structure for cooling electric discharge devices of the type employing an ionizable vapor capable of supporting an arc discharge, the combination including a wall constituting one boundary of a chamber, fluid impelling means for establishing a region of relatively high fluid pressure within said chamber, said electric discharge devices being supported by said wall which is provided with a plurality of openings through which said fluid is directed toward the enclosures of said discharge devices.

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