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2,324,533

COOLING MEANS

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Fig. 1.

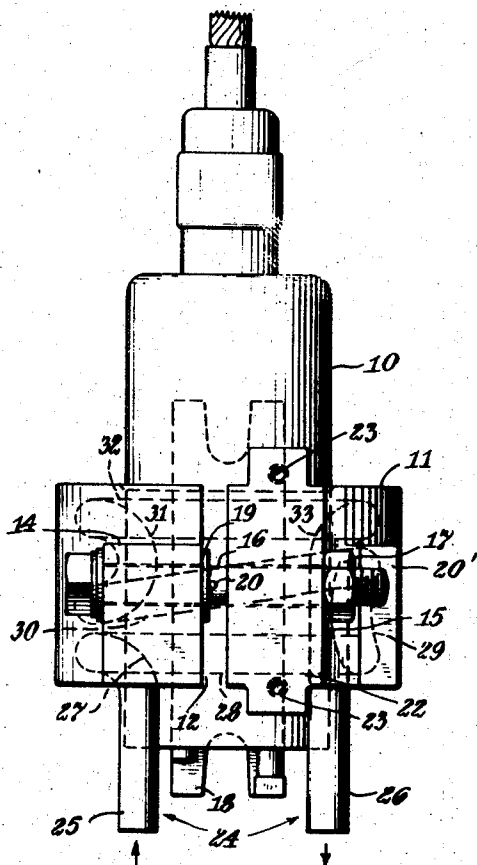


Fig. 2.

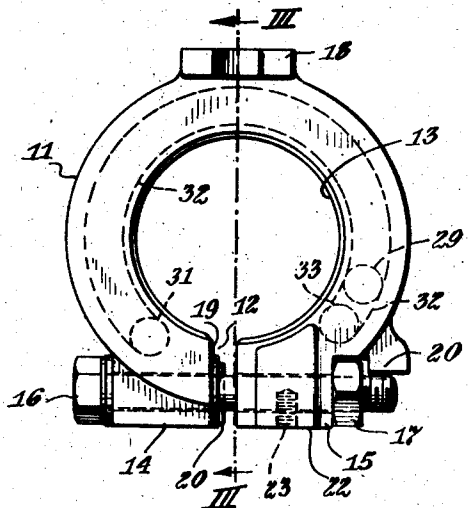


Fig. 4.

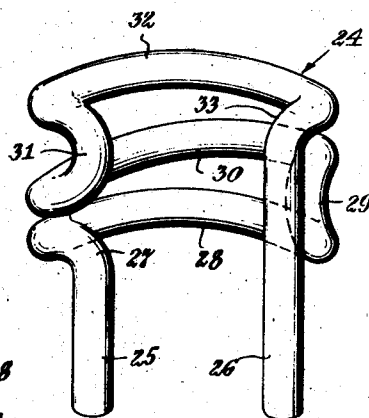
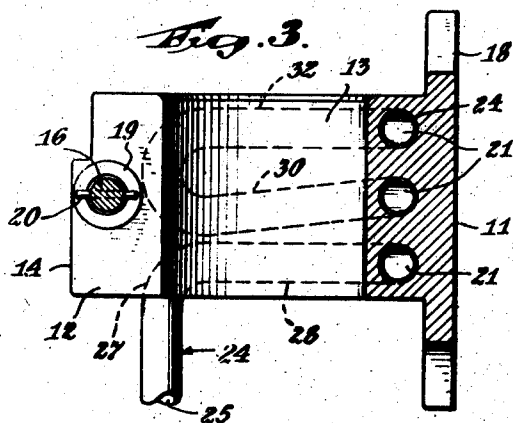


Fig. 3.



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COOLING MEANS

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7 Claims. (Cl. 250—27.5)

This invention relates to cooling means for such devices as ignitrons and the like wherein is produced undesired heat which it is sought to dissipate.

As the development of the ignitron progresses, more efficient ways of cooling the same become desirable. It is a demonstratable fact that the cooling effect of a fluid medium depends to a very great extent on the velocity of that medium through the cooling passage or chamber. The velocity must be maintained at all parts of the passage where the maximum absorption of heat is required, and not merely a high velocity of the fluid at its entrance and exit from the cooling chamber. The cooling effect is also more pronounced where the conduction path to the cooling medium is minimized. Due regard for the construction of the device to be cooled must be taken into consideration, not only as to its strength but as to its effective useful life, that the cost of the cooling appurtenance shall not be in excessive proportion to the cooled device nor of a character which will lessen the useful life of the device.

The most commonly employed cooling apparatus for ignitrons has been in the nature of a tank in which the ignitron is immersed, the flow of cooling fluid entering and mingling with the volume of the fluid in the tank, and drawn off at another part of the tank. This popular type of cooling means is lacking in efficiency due to the lack of velocity of the cooling medium around the ignitron, and is objectionable due to the deterioration by rust or other deleterious effects on the ignitron body from contact with the water or other cooling medium employed. There is also a tendency in such means for the fluid to boil from the heat absorbed as a result of the sluggish movement of the fluid within the tank.

While some attempts have been made to provide flow passages to increase the velocity of the cooling medium at the areas of heat transfer, the structures so far developed in the prior art have been inefficient, clumsy, expensive, and otherwise failed to achieve the optimum results outlined herein.

Accordingly an object of the present invention is to provide a cooling means for such devices as ignitrons overcoming the disadvantages of prior art constructions.

Another object of the invention is to provide a cooling means from which the ignitron or other device is removable for inspection, repair, adjustment and replacement.

A further object of the invention is to provide

a cooling means which will make tight surface contact with the ignitron or other device for obtaining maximum heat transfer by conduction from one juxtaposed surface to the other.

A still further object is to reduce the conductive path to a minimum from the ignitron surface to the cooling medium passage commensurate with provision of adequate strength and maximum surface contact for the cooling device.

Again an object of the invention is to provide a smooth-wall curvilinear passage free from constrictions, angular corners, and volume enlargement tending to vary, hinder or decelerate the cooling medium while, passing through the said means.

Still further objects will appear to those skilled in the art as the description progresses, both by direct statement thereof and by implication from the context.

Referring to the accompanying drawing, in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is an elevation of our improved cooling means applied in place on an ignitron;

Figure 2 is a plan of the said cooling means;

Figure 3 is a sectional view on the line III—III of Figure 2; and

Figure 4 is a perspective view of a certain coil forming the passageway of the cooling medium.

In the specific embodiment of the invention illustrated in said drawing, the reference numeral 10 designates the device to be cooled by our improved cooling means. By way of illustration said device is shown as an ignitron, a device used in the arts as a current rectifier for one purpose or another, and in the operation of which the outside wall becomes exceedingly hot. That wall is usually of cylindrical configuration, and in view of that fact we have shown our cooling means providing a housing 11 likewise of generally cylindrical shape. It is to be understood, however, that the invention is applicable to devices and corresponding housings of other shapes. Although the cylindrical shape has been arbitrarily selected for purposes of this disclosure, use of such terms as "peripheral" or "circumferential" or "convolutions" while often regarded as applicable only to circular or other bodies of revolution, are employed herein as applicable to other geometric shapes.

Said housing 11 is in the form of a clamping collar, having its body portion extending around the device 10 to be cooled and having a substantially radial split 12 at what may be termed the

front of the housing. Said split effects a complete severance of the continuity of the ring-like shape, enabling the housing to be sprung diametrically for gaining slight enlargement or contraction of the engirdled cavity 13. By virtue of such enlargement of the cavity 13, the housing may be freely applied in place on the device to be cooled, and thereafter said housing may be contracted into close fitting engagement with said device.

At opposite sides of split 12, the housing is formed with approximately tangential bosses 14, 15 having alined holes therein for reception of a clamping bolt 16 therethrough which is perpendicular to and crosses through split 12. Tightening nut 17 on said bolt will squeeze the engirdling portion of the housing so that its entire inner wall forming cavity 13 will be juxtaposed tightly upon the outer cylindrical wall of the ignitron with surface-to-surface contact. In view of this secure engagement of housing and ignitron, the housing may also be conveniently formed with a bracket 18 at its rear by which the assembled structure may be conveniently supported and given electrical connection through the metal of the housing to the metal body of the ignitron. Furthermore, split 12 is shown of adequate width so as not to be entirely closed when the housing is gripping the ignitron, and accordingly leaves adequate room for inclusion of a washer 19 therein upon the bolt, as well as a transverse pin 20 through the bolt next the washer for purposes of keeping the bolt from removal when loosening the nut. Furthermore, by casting or otherwise providing an overlapping tongue 20' on the housing at the far side of nut 17, the housing may be spread open to increase its diameter and release the ignitron by unscrewing the bolt or nut, the said pin 20 and washer 19 taking up the thrust at such time.

Within the body portion of the housing 11 is provided a circuitous fluid passage 21 situated as close as practicable to the inner wall of the housing next the cavity 13. The partial convolutions of the passage in its circuitous course likewise approach within practical limits toward but without arriving at or crossing the split. The thermal conductivity of the metal forming the housing transmits the heat from the wall of cavity 13 for absorption by the cooling medium flowing in said passage. In this connection, it may now be noted that the front of the housing next one side of the split provides a plane surface 22 with appropriate screw holes 23 for mounting a thermal relay (not shown) thereon by which the ignitron may be thrown out of circuit in event heat dissipation becomes inadequate. It is, accordingly, preferable not to interpose the cooling-medium passage between the thermal relay mounting surface and the ignitron, since it is desired that the said thermal relay may be affected by the general resultant temperature of the housing.

Manufacture of the cooling means is preferably carried out by first bending a length of metal tubing 24 into the desired circuitous course desired for the flow passage, this bent tubing being referred to in a general sense as a coil. Such a prepared length of tubing or coil is shown in Figure 4. Partial convolutions are shown successively curved laterally at ends thereof to connect in series from an entrance end 25 to an exit end 26.

In greater detail the entrance end 25 of the tubing is vertical, bends laterally at 27 to start the lower forward partial convolution 28 which

curves in a horizontal arc somewhat less than a complete circle, and there makes a first return bend 29 laterally or upward to connect with and begin another partial or return convolution 30 spaced above the lower one 28 and arriving in the vicinity of the beginning of the first one. There the return convolution 30 bends laterally upward again, forming the second return bend 31, to connect with and begin a third, or in this case, a top forward partial convolution 32 likewise arcuate and returning to a position just beyond but above the first return bend 29. The forward end of this top partial convolution makes a downward bend 33 to connect with and begin the vertical exit end 26 of the tubing. As assembled, the vertical entrance end 25 of the tubing depends from housing 11 at one side of split 12, and the vertical exit end 26 of the tubing depends from the housing at the other side of said split. The protruding entrance end 25 of the tubing in use is connected to a suitable source of supply (not shown) of the cooling medium which may be water, oil, anti-freeze or other solution or fluid.

After the tubing has been bent to the desired shape to form the coil as above outlined, the body of the housing is cast, molded or otherwise applied thereto so as to completely enclose the partial convolutions and bends of the tubing and with split 12 situated appropriately between opposed ends of the partial convolutions and between the end bends of the same as well as between the vertical end portions 25, 26 of the tubing. The metal thus encompassing the coil may be machined, if desired, to provide a proper inner wall for engagement with the ignitron in use.

The cooling means thus constructed and fabricated is both economical from material and labor standpoints, and may be used over and over again by removing worn out ignitrons or like devices and replacing new ones in the same cooling housing. The structure is one which avoids all possibility of water, when used as the cooling medium, from rusting the ignitron, and avoids possibility of other mediums, when used, from chemically or otherwise affecting that device. The formation of the cooling-medium passage without angular bends and of circular cross-section, as well as smooth and of a continuous character without seams, joints, obstructions or pockets, prevents clogging and secures maximum velocity of the cooling medium the full length of the passage. The housing has a shape, resiliency and temperature gradient enabling said housing to be clamped tightly to the ignitron with maximum surface to surface juxtapositioning and consequent heat transfer by conduction.

Since the various details of construction, as well as the precise relation and functioning of parts are subject to variation and change without departing from the inventive concept or scope of the invention, it is intended that all matter contained in the specification or illustrated in the drawing, shall be interpreted as exemplary and not in a limiting sense. It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein shown and described and all statements of the scope of the invention herein set forth as a matter of language which might be said to fall therebetween.

We claim:

1. A cooling means for devices of the character of ignitrons and the like, comprising a split housing having a cylindrical device-engirdling

interior surface for circumferential surface engagement with said device, said housing adapted to be spread and contracted, means for contracting and clamping said housing tightly in place on said device with juxtaposed surfaces intimately engaged, and a cooling-medium flow-passage coil embedded in said housing, said coil spreading and contracting with said housing.

2. A cooling means for devices of the character of ignitrons and the like, comprising a clamp-like housing split longitudinally at one side enabling said housing to be spread and contracted, said housing having a cylindrical device-engirdling interior surface for circumferential surface engagement with said device, means for clamping said housing tightly in place on said device with juxtaposed surfaces intimately engaged, and a cooling-medium flow-passage coil embedded in said housing, said coil spreading and contracting with said housing and having its ends protruding from the housing at opposite sides of the split.

3. A cooling means for devices of the character of ignitrons and the like, comprising a clamp-like housing split longitudinally at one side and having an interior surface for circumferential surface and substantially complete engirdling engagement with said device, means for clamping said housing tightly in place on said device with juxtaposed surfaces intimately engaged, and a cooling-medium flow-passage coil having partial convolutions extending substantially to the split in the housing and there turning back to form a further partial convolution with the convolutions in proximity to the engirdling surface and thereby also substantially engirdling said device.

4. A cooling means for devices of the character of ignitrons and the like, comprising an engirdling housing having a radial slit interrupting the continuity thereof, said housing having an interior surface for circumferential surface engagement with said device, bosses on the outside of said housing next opposite sides of said

slit, a bolt extending through said bosses transverse to and through said slit for clamping said housing tightly in place on said device, and means rendering said bolt non-slidable but rotatable by which the bolt is also usable to spread the housing, said housing having a cooling-medium flow passage therein.

5. A cooling means for devices of the character of ignitrons and the like, comprising a clamp-like housing having an interior surface for circumferential surface engagement with said device, means for clamping said housing tightly in place on said device with juxtaposed surfaces intimately engaged, and means for spreading said clamp-like housing for releasing engagement thereof from said device.

6. A cooling means for devices of the character of ignitrons and the like, comprising a clamp-like housing split longitudinally at one side and having an interior surface for circumferential surface engagement with said device, a bolt for clamping said housing tightly in place on said device by forward screwing of said bolt, and means for spreading said clamp-like housing for releasing engagement thereof from said device as the bolt is unscrewed.

7. A cooling means for devices of the character of ignitrons and the like, comprising a clamp-like housing having an interior surface for circumferential surface engagement with said device, a bolt and nut for clamping said housing tightly in place on said device, means permitting rotation of the bolt and preventing longitudinal movement thereof with respect to one part of the clamp-like housing, and a tongue on another part of the clamp-like housing overlapping the nut and stopping longitudinal movement thereof with respect to the part of the housing having said tongue, whereby the said parts of the housing may be spread with respect to each other by unscrewing the bolt with respect to the nut.

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