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LUMINAIRES PROVIDED WITH COOLING SYSTEMS

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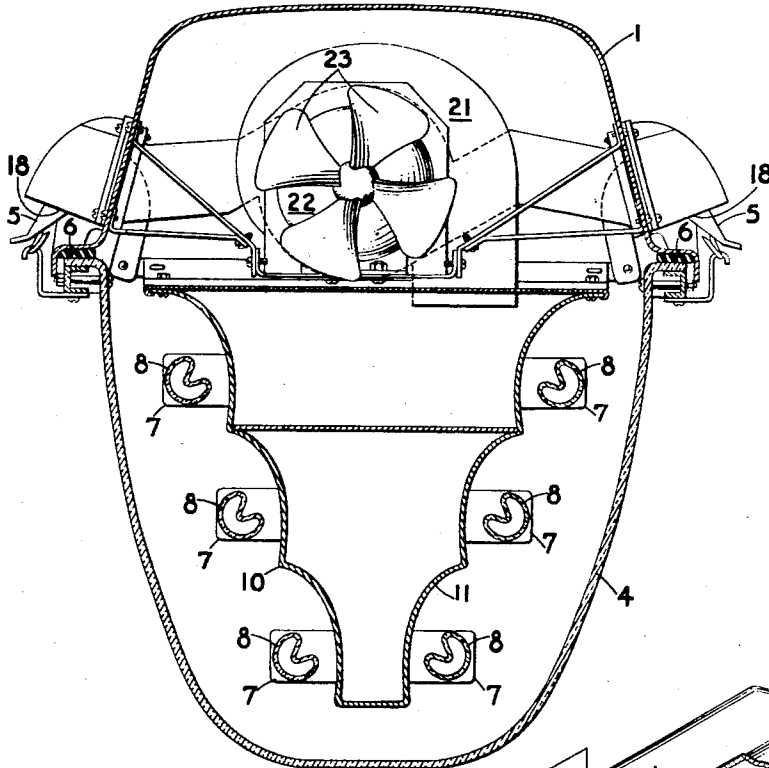


Fig. 1

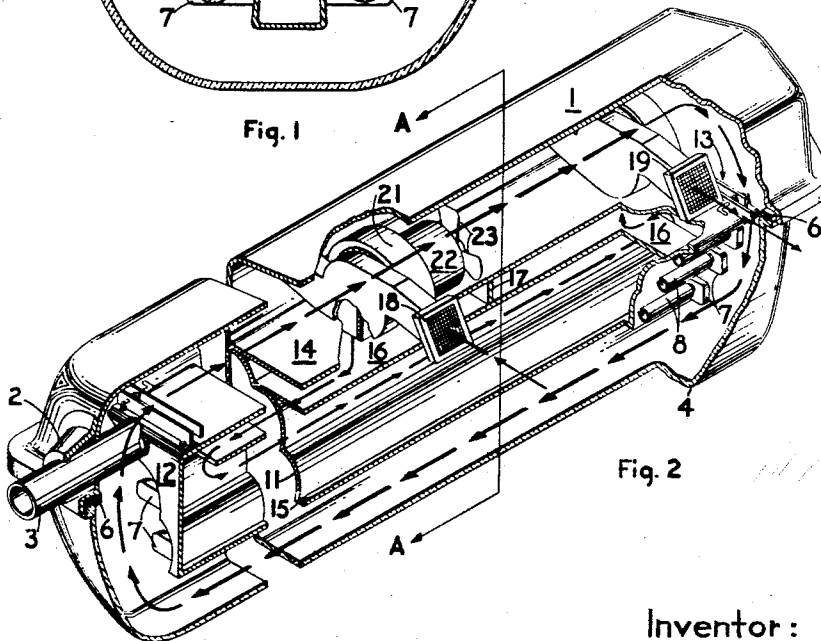


Fig. 2

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LUMINAIRES PROVIDED WITH COOLING SYSTEMS

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5 Claims. (Cl. 240-47)

This invention relates to luminaires and, in particular, to luminaires provided with cooling systems.

Fluorescent light sources are known to have optimum operating temperatures above and below which the intensity of the emitted light decreases. The optimum condition of light output in most fluorescent lamps employing mercury vapor to conduct the current occurs when at least a portion of the lamp is maintained at about 38° centigrade. Enclosing fluorescent light sources within a closed luminaire naturally creates an insulated environment about the sources in which the heat developed by the operation of the light sources may accumulate, raising the temperature of the lamps much above 38° centigrade. The effective insulation of the luminaire enclosure is even higher where, as is often the case, a dead air space exists between the external protective hood and the internally mounted reflectors. Now in some light fixtures, the rate of heat dissipation is rapid enough so that the temperature of the light source does not rise high enough to merit the employment of a separate cooling system. In others, however, and particularly in enclosed luminaires mounting a plurality of the newer high wattage fluorescent lamps, cooling of the fixture becomes a very desirable expedient.

Any cooling system applied to a luminaire should naturally be as efficient as possible. Of course, if the luminaire enclosure could simply be opened to the outside, cooling could be easily accomplished; but in such an event, the lamps and globe would become dirty and the specular surfaces of the reflector dull when thus exposed to the atmosphere. There would consequently be a reduction in the efficiency of the luminaire and the principal purpose of cooling the luminaire would be defeated.

It is therefore an object of this invention to provide an enclosed luminaire with a simple and efficient cooling system not requiring the specular surfaces of the internal reflectors to be exposed to the atmosphere.

By way of a brief summary of a single aspect of this invention, there is provided an elongated luminaire having a protective hood to which is fastened, by releasable latches, a dependent light transmitting globe. To protect the specular surfaces of a pair of reflectors mounted within the luminaire, gasketing is provided as a weather seal between the hood and the globe. The two reflectors are positioned in spaced-apart relationship to reflect light in opposite directions through the transparent globe from a plurality of fluorescent lamps supported adjacent the specular surfaces of the reflectors. The space between the reflectors is converted into an enclosed chamber by end walls and top and bottom walls and is further subdivided within by partitions dividing the enclosed space into an elongated circuitous path. Opposite ends of the path thus enclosed are vented to the exterior of the luminaire by passages communicating with parts in the hood. To ensure the circulation of a cooling stream of outside air in heat-exchanging relationship with the back surfaces of the reflector, one or more centrifugal blowers are pro-

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vided within the space under the hood powered by a small motor to force air through the enclosed chamber. The reflectors and the chamber they enclose are dimensioned to provide clearances around their ends so that air may be circulated from the space adjacent the lamps and specular surfaces of the reflectors around the ends and up into heat-exchanging relationship with the hood. To effectuate this purpose, the same small motor which powers the aforesaid centrifugal blower mounts a fan to force a continuous circulation of trapped air within the luminaire.

This construction permits the circulation of an efficient cooling stream of outside air along a confined closed path in avoidance of the optical elements of the luminaire to keep them clean. It also promotes transfer of heat from the luminaire by permitting a circulation of enclosed trapped air in a path which is in alternate heat-exchanging relationship with the hood and with the lamps and specular surfaces of the reflector.

Although the scope of this invention should not be limited except by a fair interpretation of the appended claims, further details of the invention, as well as additional objects and advantages thereof, may better be understood in connection with the accompanying drawings wherein:

Figure 1 is a lateral cross-sectional view of a luminaire constructed in accordance with these teachings; and

Figure 2 is an isometric view, partially cut away, of the same luminaire, showing the sectional line A-A of Figure 1.

The luminaire shown is constructed in an elongated form to house a plurality of tubular fluorescent lamps and comprises a protective hood 1 attached by means of a slipfitter 2 and other internal mechanical elements, not shown for the sake of clarity, to a supporting pipe or truncheon 3. An elongated light-transparent globe 4, preferably of clear plastic, is fastened against the lower opening of the hood by means of releasable latches 5 and forms a weather-tight enclosure with the hood by reason of the gasket 6 which may be formed of rubber, foamed polyurethane, or any equivalent material. Means 7 are provided within the luminaire for the support and energization of several tubular fluorescent light sources 8, positioned in two banks opposite the specular surfaces of the reflectors 10 and 11. This arrangement permits the luminaire to distribute symmetrical beams in opposite directions from its lateral axis of symmetry. The electrical connections to the lamps, as well as the ballast elements, which would normally be located in the space beneath the hood 1, have been omitted from these drawings for the sake of clarity since they form no part of the invention disclosed herein.

In order to provide efficient cooling of the luminaire, the enclosed volume is divided into two separate chambers to form a dual cooling system. The first of these chambers is enclosed between the reflectors 10 and 11; and for this purpose, end walls 12 and 13 are provided at opposite ends of the pair of reflectors with top and bottom partitions 14 and 15, respectively, further enclosing this chamber. To provide an elongated circuitous path in which a cooling stream of air may circulate, an internal horizontal baffle 16 is provided within the first chamber extending longitudinally of the reflectors but terminating short of their ends. An internal vertical baffle 17 further divides the enclosed space. Opposite ends of the circuitous air path thus defined are vented to the outside of the luminaire through screened and hooded ports 18 and 19 in the sides of the hood. To ensure circulation of air along the enclosed air path, a centrifugal blower 21 powered by a small motor 22 draws air into the inlet ports 18. This air circulates to the left on top of partition 16, as seen in Figure 2, around the lefthand end of the latter partition and then below parti-

tion 16; it passes from the lefthand end to the righthand end and then above the partition and out again through exit ports 19. The outside air is thus circulated into heat-exchanging relationship with the back or non-specular surfaces of the reflector and carries away large amounts of heat without affecting the optical parts of the luminaire.

In the formation of the above-described chamber, a second chamber is naturally created in the remaining volume within the luminaire; the latter chamber, however, is confined and does not communicate to the outside air. In order to make maximum use of the second chamber, and to prevent it from acting as an insulating dead air space, sufficient clearances are left at the ends of the reflectors to permit air to circulate from the lower region of the confined space adjacent the reflector surfaces and the fluorescent lamps up into the volume enclosed beneath the hood. To ensure the circulation of the trapped air in the latter chamber, the motor 22 which powers centrifugal blower 21 is provided at its opposite end with fan blades 23 forcing circulation of the trapped air. Heated air from the vicinity of the lamps is therefore transferred periodically into positions in heat-exchanging relationship with the hood itself, thus promoting heat transfer instead of impeding it.

There are thus included within the luminaire two separate chambers. In the one chamber, a trapped current of air is circulated between regions adjacent the specular sides of the reflector and the space under the hood, making of the hood a heat exchanger to the outside. In the other chamber, a stream of outside air is directed against the back or non-specular portions of the reflector and returned to the outside. By keeping the two chambers separate, it is possible to make use of the outside air which, for cooling purposes, is naturally more efficient to pump heat away from the interior of the luminaire without exposing the lamps or the globe or the specular surfaces of the reflector to the risk of being dulled or soiled thereby. Furthermore, the hood, instead of creating a dead air space between itself and the reflectors, is by this arrangement converted into a heat exchanger. This dual cooling system makes optimum use of the space within the luminaire to provide efficient cooling without requiring an unnecessary enlargement of the dimensions of the luminaire.

The motor which functions to power both parts of the dual cooling system in the preferred embodiment shown may be energized in several different ways. It might simply be connected to be switched on whenever the luminaire is turned on, especially in those instances where the temperature within the luminaire is likely to exceed the optimum operating temperature of the lamps under all or most conditions. Alternatively, a thermal switch could control its operation and energize the motor only when the temperature within the luminaire begins seriously to affect the light output of the lamps within the luminaire. Under some environmental conditions the cooling system may result in lowering the temperature within the luminaire to such a degree that some temperature sensitive means for de-energizing the motor or otherwise controlling the rate of heat transfer will naturally be desirable.

To those familiar with this art, there will doubtless occur numerous variations, modifications, and substitutions within the scope of these teachings. The embodiment disclosed herein should therefore be taken as illustrative and not necessarily limiting on the scope of the present disclosure.

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

1. In a luminaire having a hood and a light transparent globe forming together a weather-tight enclosure, a shaped reflector means comprising spaced walls having specular surfaces and partitioning means forming therewith a chamber contained wholly within said enclosure and spaced from the walls of said enclosure, and means for

supporting at least one light source adjacent the specular surface of said reflector means and in the space between said chamber and said enclosure, means including ports venting the interior of said chamber to the outside of said enclosure for circulating a current of outside air against non-specular portions of said reflector for cooling purposes; and means for circulating a current of trapped air around said chamber and between regions adjacent the specular surface of said reflector and regions adjacent said hood and in heat exchanging relationship with both.

2. In a luminaire having a hood and a light transparent globe forming together a weather-tight enclosure enclosing a shaped reflector, internal baffling means dividing the space within said luminaire into two separate chambers, one of said chambers communicating with the front or specular surface of said reflector and the internal surfaces of said hood, and the other of said chambers communicating with the rear or non-specular surface of said reflector, and means supporting at least one light source adjacent the specular surface of said reflector and in the said one of said chambers; means for circulating a current of internally trapped air within said one chamber in alternate heat exchanging relationship with said reflector and hood; and means including ports opening onto the outside of said luminaire from said other chamber for circulating a current of outside air within said other chamber in heat exchanging relationship with said reflector.

3. A luminaire comprising: a hood having an opening therein; a globe formed of a light transmissive material supported in relation to said hood to close said opening and form therewith a weather-tight enclosure; a pair of reflectors supported in spaced apart relationship within the said enclosure and having their specular surfaces directed away from each other and toward said globe; means for supporting light sources adjacent the specular surfaces of said reflectors; partitioning means enclosing the space between said reflectors and forming therewith a chamber contained wholly within said enclosure and spaced from the walls of said enclosure; and means including ports venting the interior of said chamber to the outside of said enclosure for circulating a current of outside air through said chamber in heat exchanging relationship with said reflector, the space within said enclosure and at the exterior of said chamber containing trapped air for circulation from the vicinity of the lamps and the specular surfaces of the reflectors into heat exchanging relationship with said hood.

4. A luminaire comprising: a hood having an opening therein; a globe formed of a light transmissive material supported in relation to said hood to close said opening and form therewith a weather-tight enclosure; a pair of reflectors supported in spaced apart relationship within the said enclosure and having their specular surfaces directed away from each other and toward said globe; means for supporting light sources adjacent the specular surfaces of said reflectors; partitioning means enclosing the space between said reflectors and forming a first chamber therebetween contained wholly within said enclosure and spaced from the walls of said enclosure for the circulation of air in heat exchanging relationship with non-specular portions of said reflectors, the space not enclosed within said first chamber forming a second chamber which contains the said means for supporting the light sources and is in communication with the specular surfaces of said reflectors and the internal portions of said hood; means for circulating a trapped current of air within said second chamber; and means including ports venting said first chamber to the outside of said luminaire for circulating a current of outside air through said second chamber.

5. A luminaire comprising: an elongated hood having an elongated opening therein; an elongated globe formed of a light transmissive material supported in relation to said hood to close said opening and form therewith a weather-tight enclosure; a pair of elongated reflectors sup-

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ported longitudinally and spaced apart within the said enclosure and having their specular surfaces directed away from each other and toward said globe; means for supporting elongated fluorescent light sources adjacent the specular surfaces of said reflectors; partitioning means enclosing the space between said reflectors and forming a first chamber therebetween contained wholly within said enclosure and spaced from the walls of said enclosure for the circulation of air in heat exchanging relationship with non-specular portions of said reflectors, the space not enclosed within said first chamber forming a second chamber which contains the said means for supporting the light sources and is in communication with the specular surfaces of said reflectors and the internal portions of said hood; an electric motor mounted within said hood; means

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including a first fan operated by said motor arranged to circulate a trapped current of air within said second chamber and around said first chamber; means venting said first chamber to the outside of said luminaire; and a second fan operated by said motor arranged to circulate a current of outside air through said first chamber.

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