

Sept. 13, 1960

W. S. PAJES
CURVED REFLECTOR
Filed Dec. 15, 1955

2,952,189

Fig. 1.

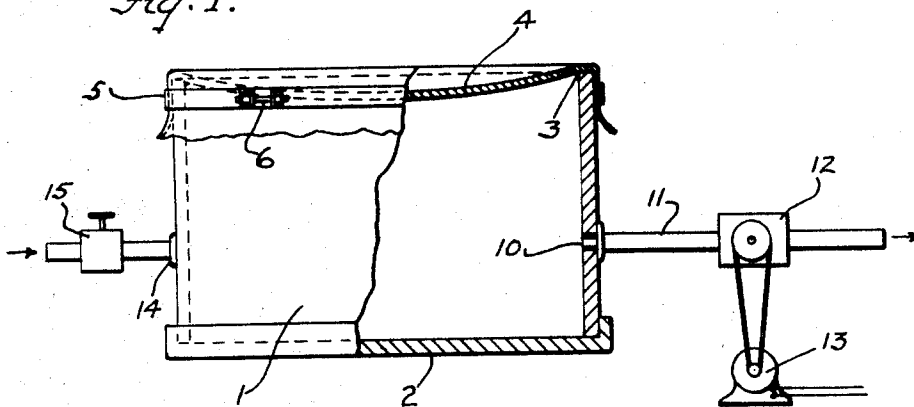
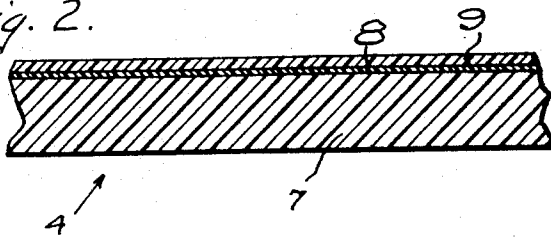


Fig. 2.



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CURVED REFLECTOR

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Filed Dec. 15, 1955, Ser. No. 553,289

2 Claims. (Cl. 88—73)

This invention relates to curved reflectors and particularly to curved reflectors of relatively large size. Such reflectors may find use in astronomy, concentration of solar energy, control of ultra-high frequency radio waves and sound waves, and wherever an outsize reflector is needed.

The object of the invention is to provide a large and true curved reflector of simple and inexpensive construction and light in weight.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a sectional elevational view of a reflector embodying the invention; and

Figure 2 is an enlarged, cross-sectional view of the structure of the reflecting membrane of Figure 1.

Large size lenses have been made by supporting transparent membranes in spaced relation and filling the space in between the membranes with a transparent liquid, the focal length of the lens, thus obtained, being adjusted by adjusting the pressure of the liquid. Lenses of this nature have been disclosed in United States Patent No. 2,300,251. However, the weight of such lenses grows approximately with the third power of their linear dimensions, and necessitates a rugged apparatus to support the weight of the liquid. In lenses of such construction it becomes increasingly difficult to maintain their optical characteristics as the size is increased owing to the weight of the liquid used.

The present invention overcomes these difficulties and brings the weight down to easily manageable values, even for outsize reflectors, while maintaining a substantially true curved reflecting surface. At the same time the maintenance of the focal length is automatic as the medium which creates the necessary loading is the same outside as inside of the membrane and so it depends only on the pressure differential control.

The apparatus for carrying out the invention is illustrated in Figure 1 wherein is shown a rigid drum 1 having a closure 2 at one end thereof and being open at the other end 3. Across this open end 3 I support a flexible, preferably elastic, laminated, and prestretched reflecting membrane 4, securing the membrane at the rim of the drum 1 in any suitable manner to form a substantially gas-tight connection. This may be accomplished by folding the edges of the membrane 4 over the end of the drum and securing these edges against the drum wall with a strap 5 which may be tightened against the drum wall by means of a clamp 6, similar to the clamp used on ordinary commercial drums.

The reflecting membrane may be formed of a smooth base 7 of a flexible, elastic material, such as plastic, as shown in Figure 2, having a layer 8 of silver deposited thereon as by the vaporization process; the silver being covered by a layer 9 of plastic to protect the silver, the layers thus forming a laminated structure. Such membrane is now available on the market and the ratio of the

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thicknesses of the base, silver layer, and protective coating is substantially 100:2:5.

The drum 1 is provided with an opening 10 to which is connected a pipe 11 leading to an exhaust air pump 12 which is maintained in operation by means of the motor 13. Another opening 14 in the drum wall is provided with valve means, such as the stop cock 15, and is intended to allow air to enter the drum at a measured, controllable rate. In preliminary experiments the pumping was done with a vacuum cleaner. Except for noise this means was highly satisfactory.

As long as the pressure within the drum 1 is only slightly less than atmospheric pressure, the pressure of the air outside the drum will exert a uniform pressure on the membrane 4 which will cause it to assume a true spherical curvature. As the pressure is decreased inside the drum, the amount of curvature increases and the focal length of the spherical mirror, thus formed, becomes shorter. It is therefore possible to adjust the focal length of the reflector by adjusting the pressure within the drum. This may be done by controlling the speed of the pump or, preferably, by adjusting the stop cock 15 to let more or less air leak back into the drum.

A relatively small air pump 12 may be used with the invention (even a vacuum cleaner is more than sufficient), since a slight pressure differential is all that is necessary to produce the spherical shape of the reflector and it is not necessary that the pump be highly efficient. It is only necessary that it be run at a uniform speed. The stop cock 15 may then be adjusted to maintain the desired pressure differential. Of course, the larger the volume of the drum, the less the air pressure differential will be affected by a non-uniform action of the pump.

It should be noted that, once the desired focal length is obtained, changes in barometric pressure or temperature changes will have no effect on the curvature of the reflecting surface, since only the air pressure differential comes into play.

It is understood that by pumping air into the drum, i.e. by making the pressure inside the drum slightly higher, a convex reflector of true spherical shape will be obtained.

While one embodiment of the invention has been shown and described, I do not intend to limit the invention except by the limitations contained in the appended claims.

What I desire to claim and secure by Letters Patent is:

1. A reflector comprising a flexible elastic membrane, a reflecting coating on said membrane, an open-ended drum, means for supporting said membrane across the open end of said drum, so as to make a substantially gas-tight connection with said drum, an air pump connected to said drum, and means for operating said pump so as to maintain the air pressure within said drum at a predetermined, adjustable, difference from atmospheric pressure.

2. A reflector, as defined in claim 1, further comprising a bleeder orifice in the wall of the drum, the pump being adjusted to operate at a higher speed than would be required without said orifice, and valve means to adjust the area of said orifice.

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