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V. L. OESTNAES ET AL
METHOD OF MAKING REFLECTORS

1,982,318

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Fig. 1.



Fig. 2.

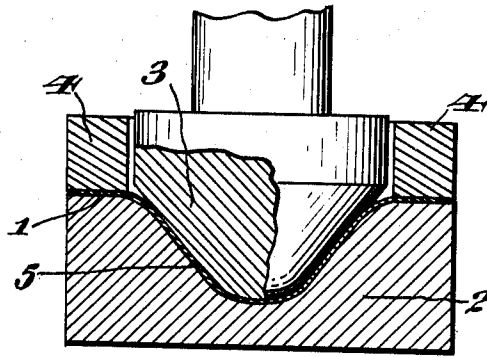


Fig. 3.

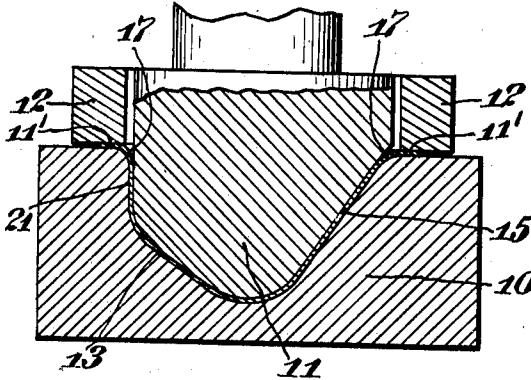


Fig. 4.

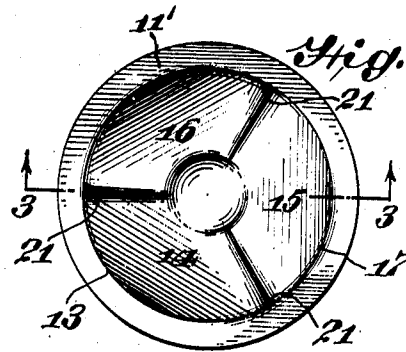


Fig. 5.

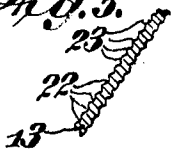


Fig. 6.

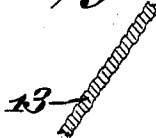


Fig. 7.



Fig. 8.

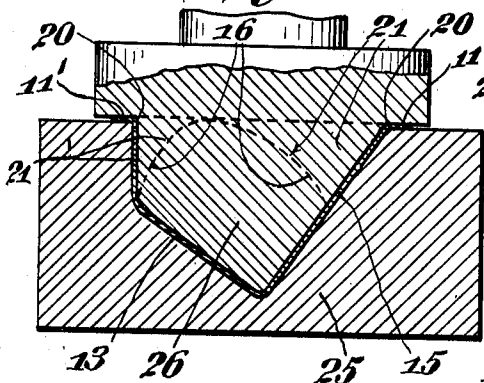


Fig. 9.

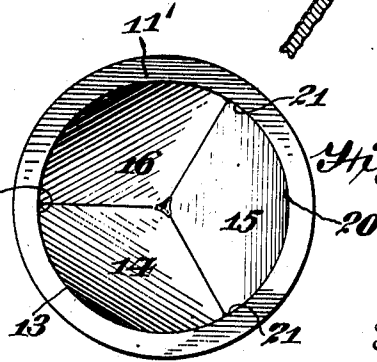


Fig. 10.



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UNITED STATES PATENT OFFICE

1,982,318

METHOD OF MAKING REFLECTORS

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Application August 30, 1929, Serial No. 389,355

5 Claims. (Cl. 113—51)

Our invention relates to a method of making light reflectors, but more particularly to reflectors of triple reflector type wherein the reflecting surfaces are arranged in right angular relation to each other, as, for example, the three sides of the corner of a cube.

The general object of the invention is to provide a method of making a reflector of the type indicated, the front end or side of which is of circular shape.

It also is an object of our invention to provide a method of making a reflector wherein the outer edge portions of the reflecting surfaces are of curved shape and wherein the portions of the structure intermediate the adjoining edges are of circular shape and extend outwardly or toward the front in directions substantially parallel with the axis of the reflector structure.

Other objects and advantages of the invention will be pointed out in the detailed description thereof which follows or will be apparent from such description. In order that the invention may be more readily understood and its practical advantages fully appreciated reference should be had to the accompanying drawing, wherein we have illustrated a reflector structure made by our invention and wherein also we have illustrated the method at present preferred by us which may be employed in the making of the said reflector.

In the drawing:—

Fig. 1 is a view in edge elevation of a circular disk of sheet metal which may be employed in the manufacture of the reflector;

Fig. 2 is a view in central vertical section indicating the first step in the method of making the said reflector.

Fig. 3 is a similar view illustrating a second step, the section of the partially formed reflector shown therein being taken along a line corresponding to the line 3—3 of Fig. 4;

Fig. 4 is a view in front elevation of the partially formed reflector shown in Fig. 3;

Figs. 5, 6, and 7 are views in cross section, enlarged, of fragmentary portions of the reflector structure indicating intermediate successive steps involved in the method of manufacturing the said reflector;

Fig. 8 is a view similar to Fig. 3, illustrating the final step of the method of making the reflector;

Fig. 9 is a view in front elevation of the completed reflector; and

Fig. 10 is a view in transverse section of a fragmentary portion of the wall of the reflector,

showing thin layers of silver or other metal on the opposite sides of the said wall, which are adapted to become highly polished and light-reflecting as the result of pressure applied thereto.

It may be noted that the thickness of the sheet metal which is employed may be substantially as illustrated in Fig. 1 of the drawing, and it may be further noted that the metal employed for the base or main wall structure of the reflector should be relatively soft, so that it may be easily worked, and it also should be relatively cheap. Copper may be mentioned as a suitable metal to be employed.

I have shown at 1 a circular sheet metal plate or disk which is adapted to be manipulated by suitable dies to form a reflector of the shape indicated or illustrated in Figs. 8 and 9 of the drawing. The circular sheet metal plate or disk 1 of Fig. 1 is subjected first to the action of dies, as indicated in Fig. 2, whereby it is given an initial bowl or cone shape as shown in said figure. The structure illustrated in Fig. 2 comprises a stationary female die member 2, a plunger member 3, and a draw ring 4. The latter engages the outer edge of the plate or disk 1 in the usual known manner. The plunger moving toward the die member 2 presses the central portion of the sheet or disk 1 thereinto. The outer or working surface of the plunger 3 is of a shape corresponding to that of the concavity of the die member 2. In the operation as illustrated in Fig. 2 the pressed portion of the sheet 1 is of circular shape in cross section, but it will be understood that the die members 2 and 3 may be of a configuration to impart to the said sheet a different shape in cross section. For example, the partially formed reflector structure as shown at 5 in Fig. 2 may be of triangular shape in cross section. The subsection of the plate 1 to the pressure action of the die members 2 and 3 results in a hardening of the metal of the said plate, so that preferably the partially formed reflector member 5 should be subjected to an annealing operation. After the latter operation the partially formed reflector structure is subjected to the action of the female and male die members 10 and 11. The flange 11' of the partially formed reflector structure 5 is clamped between the upper side of the outer portion of the female die member 10 and a draw ring 12. The latter ring as well also as the ring 4 acts and operates in the usual manner of such rings. The shapes of the die members 10 and 11 are such as to impart to the member 5 a shape more nearly approaching that of the reflector in

its final form. The lower or rear portion of the partially formed reflector structure 13 is of triangular shape in cross section and it comprises the right angularly related portions 14, 15, and 16. The upper edges of these portions are curved, as indicated at 17 in Fig. 3. The forming cooperating surfaces of the die members 10 and 11 are of a shape to provide in the resulting partially formed reflector structure 13 not only the plane portions 14, 15, 16 arranged in right angular relation to each other as stated, but also to provide the said portions with circular edges which merge at their apexes or highest points with the circular outer portion 20 of the reflector, and also with portions 21 intermediate the circular edges of adjoining plane portions 14, 15, 16. The portions 21 are circular in transverse cross section and extend in directions parallel with the axis of the partially formed reflector structure 13. After the partial formation of the reflector structure by the operation indicated in Fig. 3 the partially formed structure is annealed and then subjected to the action of a pickling liquor of any known composition, and following that it is subjected to what is known as a "bright dipping" operation. The latter consists in submerging the partially formed and previously pickled reflector structure in a liquid bath, which may consist of a composition of nitric acid, sulphuric acid, and water, to which small quantities of hydro-chloric acid may be added from time to time.

In Fig. 5 we have endeavored to indicate in a broad and general way the surface configuration upon opposite sides of the sheet metal of the structure after the pickling operation by means of alternate depressions and projections 22 and 23. It will be understood that these depressions and projections are greatly enlarged and also that no attempt has been made to show them identically as they may appear.

As above suggested, after the pickling treatment the reflector is subjected to a "bright dipping" treatment or operation, and in Fig. 6 of the drawing we have attempted to indicate the surfaces upon opposite sides of the sheet metal of the structure as modified by the action of the chemicals of the liquid constituting the "bright dipping" bath. It will be observed that the rather sharply defined depressions and projections 22 and 23 of Fig. 5 have been flattened out and rendered less sharply defined. After the "bright dipping" operation or treatment the reflector structure, consisting of sheet metal, is provided with a very thin coating of silver or other material which is adapted to take a polish and be rendered light-reflecting upon being subjected to high pressure. The deposition of the coating of silver or other suitable metal upon the partially completed or formed reflector structure as shown in Figs. 3 and 4 may be effected electro-chemically or in any other way which may be found to be practical.

In the operation as illustrated and described, it is contemplated that the thin coating of silver or other suitable metal shall be applied to both sides of the partially completed structure as illustrated in Fig. 7, but it will be understood that, if desired, means may be provided whereby the deposition of the silver or other metal may be made only upon the inner surface of the reflector structure which is the surface used for reflecting the light in the use of the same. However, it is preferred that the silver or other thin metal coating be placed upon both sides of the sheet metal of the structure.

The thin coating or plating of silver or other suitable metal having been applied, as above described, the partially completed reflector illustrated in Figs. 3 and 4 is subjected to a final step, as illustrated in Fig. 8, wherein the partially completed reflector structure 13 is subjected to the action of the completing die, consisting of the female and male members 25 and 26. The cooperating working surfaces or faces of these die members 25 and 26 are of a shape to impart to the partially completed reflector structure 13 its final shape, in which the lower tapered ends of the plane portions 14, 15 and 16 are brought more nearly to a point, as shown in Figs. 8 and 9, and the curved lines between the inner surfaces of the upper edges of the said portions and the portion 20 and the portions 21 are more sharply defined.

It will be understood that the material of the punch or male member 26 of the die shown in Fig. 8 of the drawing, forming or constituting the sides thereof corresponding to the plane portions 14, 15 and 16, is very hard and also that it is very smooth and highly polished, so that as a result of the heavy or high pressure which is exerted by the plunger member 26 of the die upon the plane portions 14, 15 and 16 of the reflector the surfaces of said portions are highly polished and light-reflecting as illustrated in Fig. 10. The polish of the said surfaces will correspond to the polish of the converging faces of the plunger 26.

It will be seen that by the method employed by us we are enabled to produce simultaneously both the reflecting portion of the reflector and also the front portion which is circular in shape. By thus simultaneously forming not only the reflector portion but also the circular front portion the cost of manufacture is reduced to a minimum.

The presence of the circular front end portion of the reflector provides means whereby the same may be readily mounted upon a support, which mounting is necessary when the reflector is in practical use. The presence of the flange 11' which also is formed simultaneously and integrally with the front circular portion of the structure further facilitates the mounting of the reflector upon a support and also operates to increase the rigidity of the structure, whereby it may more effectually resist distortion due to pressures or to blows to which it may be subjected.

It will be understood by those skilled in the art of reflectors of the character to which this invention relates that the removal of the corner portions of adjoining related reflecting surfaces does not or need not reduce the field or cross-sectional area of the reflected beam. In other words, the termination of the front portion of the reflector in circular form does not decrease the efficiency of the same, practically, for commercial purposes.

Generally, if not always, reflectors of this type will be provided with a cover of some kind for the front portion thereof, which may be ordinary plane transparent material, such as glass which may be colored or clear, or the cover may be of a transparent material with either one or both of its surfaces roughened, or the cover may comprise a lens structure. However, the presence or absence of such a cover does not affect in any particular the invention as disclosed herein.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. The method of producing from sheet metal a light reflector of triple type, which comprises the pressing of a sheet metal plate into shape

having three sides connected at their adjoining edges and convergent toward a common point at one end and merging into a cylindrical portion at the other, applying a coating of metal there-
 5 to which is adapted to become light-reflecting upon the subjection of the same to high pressure by means of a forming member the surfaces of which are highly polished, subjecting the partially formed reflector to pressure within a die
 10 to polish the reflecting sides thereof and simultaneously to cause the mergence of the outer edges of the reflector sides into the said cylindrical portion.

2. The method of producing a light reflector
 15 which comprises the formation of a sheet of metal into a cone shaped blank approximating the shape of the finished reflector, pressing the cone shaped blank to simultaneously produce reflector surfaces in the bottom thereof and a cylindrical end portion into which the reflector surfaces merge, applying to the reflector surfaces a coating of metal
 20 adapted to be polished upon being subjected to pressure, and subjecting the blank to pressure to complete the shaping of the reflector and to polish the reflecting surfaces.

3. The method of producing a light reflector which comprises the formation of a sheet of metal into a cone shaped blank approximating the shape of the finished reflector, pressing the cone
 30 shaped blank to simultaneously produce angularly related plane reflector surfaces in the bottom thereof and a cylindrical end portion into which the reflector surfaces merge, applying to the reflector surfaces a coating of metal adapted to

be polished when subjected to pressure, and subjecting the blank to pressure to complete the shaping of the reflector and polish the reflecting surfaces.

4. The method of producing a light reflector
 80 which comprises the formation of a sheet of metal into a cone shaped blank approximating the shape of the finished reflector, pressing the cone shaped blank to simultaneously produce three right angularly related plane reflector surfaces in the bottom thereof and a cylindrical end
 85 portion into which the reflector surfaces merge, applying to the reflector surfaces a coating of metal adapted to be polished upon being subjected to pressure, and subjecting the blank to pressure to polish the reflecting surfaces and to complete the shaping of the reflector.

5. The method of producing a light reflector which comprises the formation in a sheet of metal of a depression approximating the shape of
 95 the finished reflector and having a lateral flange on the margin thereof, simultaneously forming a plurality of angularly related reflector surfaces in the bottom of said depression and a cylindrical end portion between the reflector surfaces
 100 and the flange and into which the reflector surfaces merge, and subjecting the blank thus formed to pressure to sharply define the reflector surfaces, the cylindrical end portion, and the flange and simultaneously polish the reflector
 105 surfaces.

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