Aug. 7, 1956 E. H. YONKERS 2,758,199

OPEN TYPE LUMINAIRE REFLECTOR

Filed Sept. 30, 1950 3 Sheets-Sheet 1

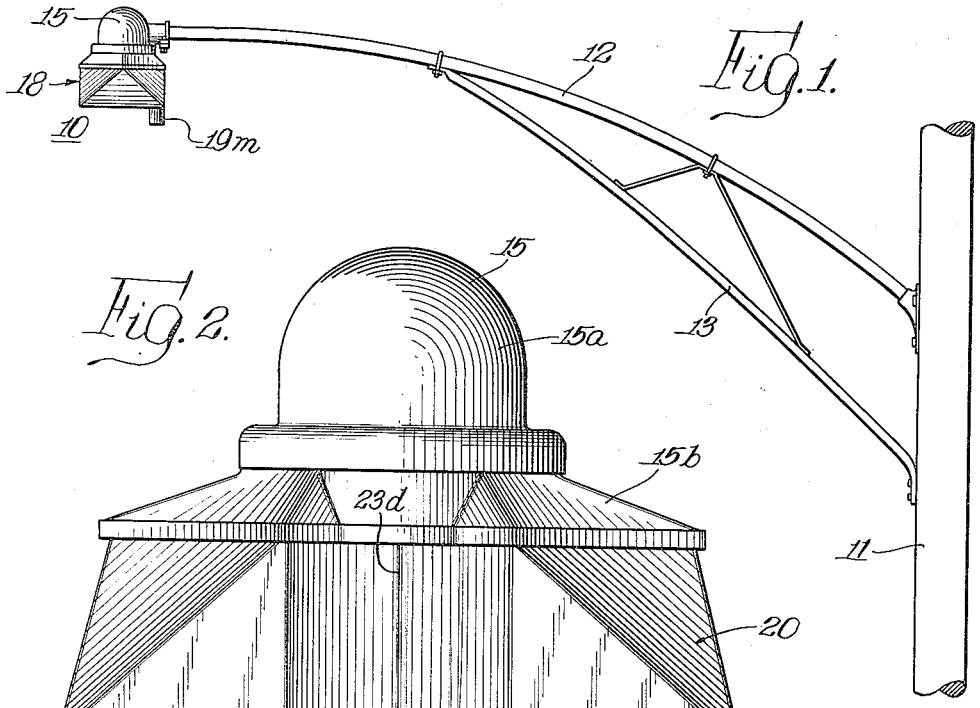

Fig. 1.

Fig. 2.

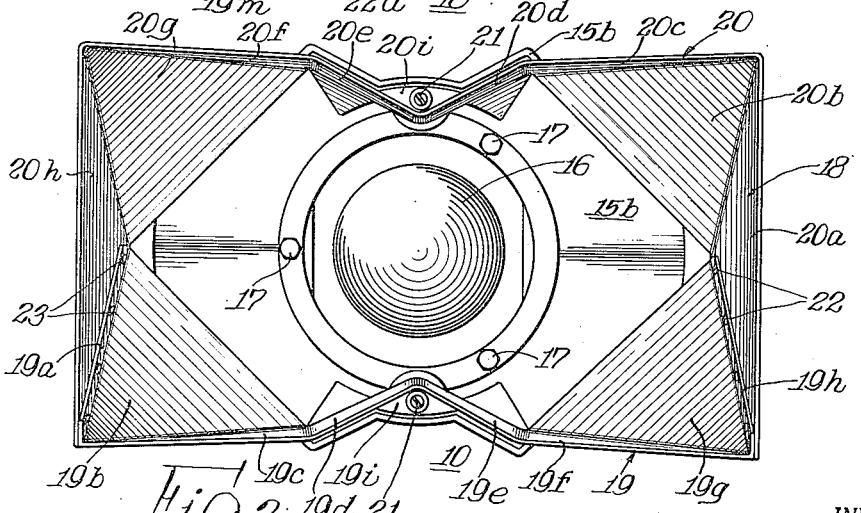

Fig. 3.

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OPEN TYPE LUMINAIRE REFLECTOR

Filed Sept. 30, 1950 3 Sheets-Sheet 2

Fig. 4.

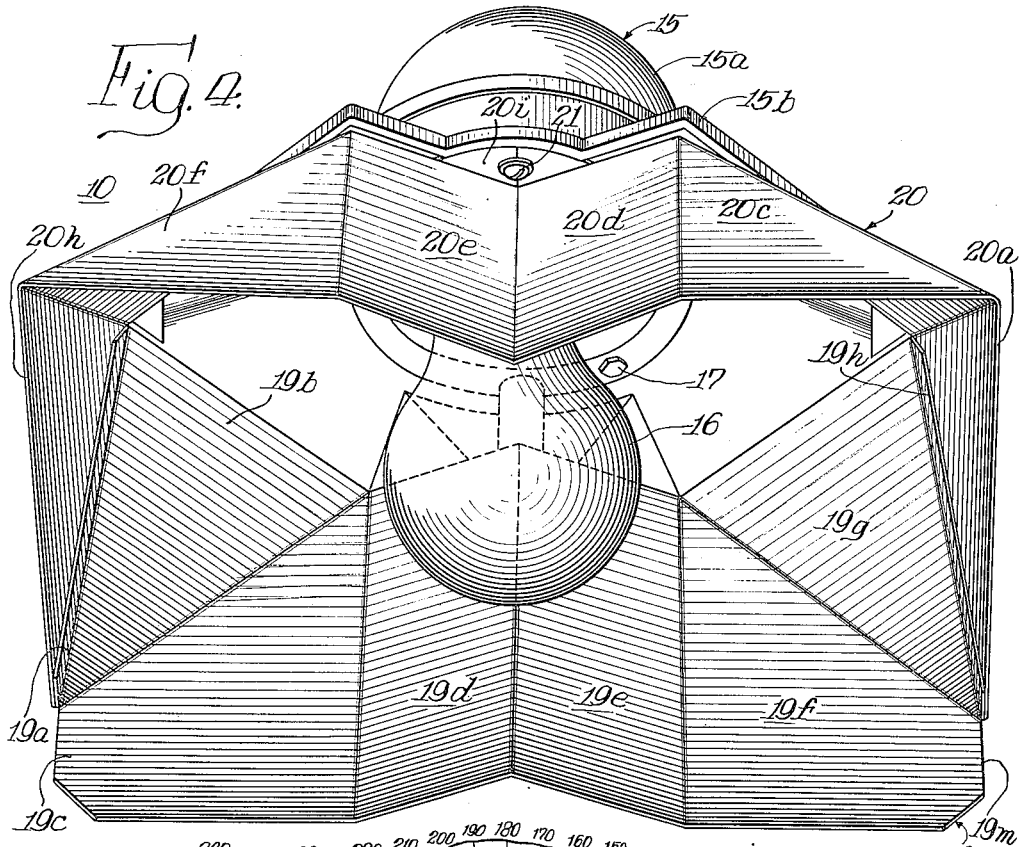
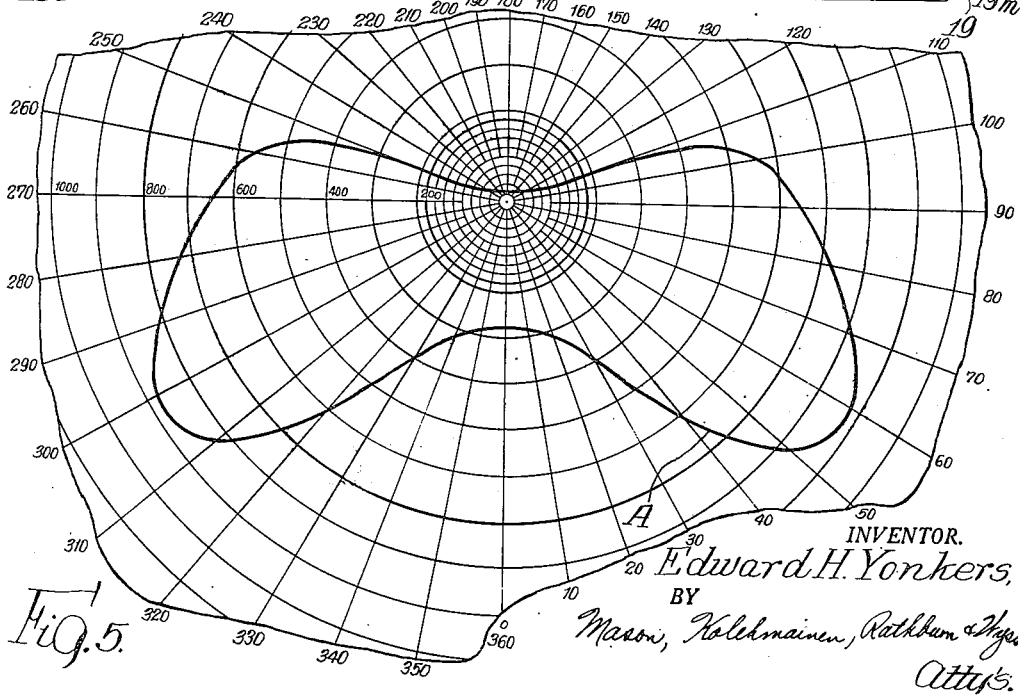


Fig. 5.



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OPEN TYPE LUMINAIRE REFLECTOR

Filed Sept. 30, 1950 3 Sheets-Sheet 3

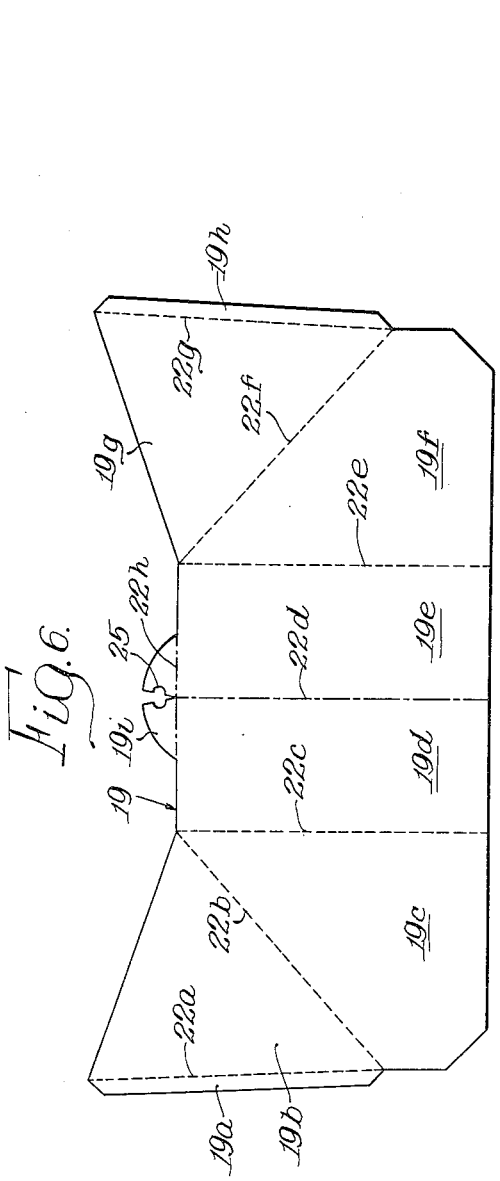

FIG. 6.

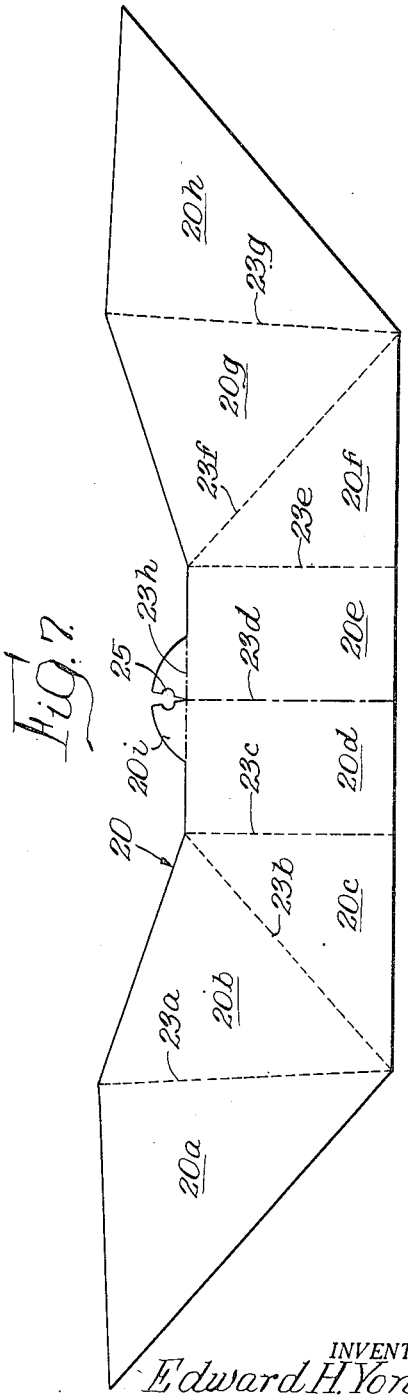

FIG. 7.

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2,758,199

Patented Aug. 7, 1956

2,758,199

OPEN TYPE LUMINAIRE REFLECTOR

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Application September 30, 1950, Serial No. 187,800

6 Claims. (Cl. 240—103)

The present invention relates to luminaires and more particularly to open type street lighting luminaires particularly adapted for lighting suburban areas. Specifically, the present invention is a continuation-in-part of Yonkers application Serial No. 122,883, filed October 22, 1949, now abandoned.

Street lighting originally employed open type reflectors which were developed as a cheap means of controlling light on overhead systems. Such open type luminaires came into extensive use primarily because of (1) low first cost and (2) low maintenance cost due to their sturdy construction resulting in very little breakage and due also to the ease with which lamps could be replaced therein merely by employing replacer sticks. It is only within a period of a little more than a decade that specular reflectors with a definite light control have been employed for street lighting purposes. Such use followed the development of a particular type of aluminum reflector formed of a sheet of highly polished anodized aluminum. Heretofore luminaires capable of producing a definite light control were relatively expensive and were generally of the fully enclosed type. Due to their high cost they were not employed for lighting suburban areas or the like, and the open type reflector continued to be used for this purpose. It was attempted to employ specular metal reflecting surfaces in open type luminaires in an attempt to improve suburban lighting. Unfortunately the specular metal in such open type reflectors did not retain sufficient reflectivity after being exposed to the atmosphere for any length of time, and this was particularly true in adverse weather conditions such as in salt-fog atmosphere along seacoast areas. Furthermore, even if the specular reflectors used in open type luminaires were not subjected to fog corrosion they deteriorated by virtue of abrasion when dust was wiped off, which is obviously necessary on occasion. Open type luminaires have also been developed for suburban lighting in which glass reflectors having an aluminum coating on the outside were employed. This type of reflector completely obviated the corrosion problem and abrasion problem referred to above but unfortunately the frangible reflectors of glass were readily broken. As a result of this the greatest portion of street luminaires in service today for suburban lighting are of the overhead type using open non-specular enameled surface reflectors, which do not give any real control or distribution of the available light.

It has been suggested that stainless steel reflectors be employed since polished stainless steel is not affected by adverse weather conditions like specular reflectors such as mentioned above. They are furthermore not affected by abrasion, at least not to anywhere near the extent of the specular type reflector, and they furthermore are permanent in that they are not likely to be broken like the glass reflectors. Unfortunately stainless steel reflectors are costlier particularly since stainless steel does not lend itself to drawing into the irregular shapes

required to give the desired light control. Even if it could be shaped economically, it is so hard that buffing the inside of the irregular surface to a specular finish after shaping would be completely outside the realm of reasonable cost, and the use of prepolished sheets is unsatisfactory since the polish is lost in drawing or distorting the same.

It would be desirable to provide a stainless steel reflector which would be simple, economical to manufacture, and still provide the desired light control. It will be understood that in suburban areas the desired light control comprises concentrating the intensity up and down the streets and limiting the light intensity along the transverse direction.

Accordingly it is an object of the present invention to provide a new and improved stainless steel reflector for open type luminaires.

It is a further object of the present invention to provide a new method of manufacturing stainless steel reflectors which is simple and which results in an inexpensive and yet very satisfactory reflector.

Still another object of the present invention is to provide a reflector for open type luminaires formed from prepolished stainless steel sheets employing only linear bends of the sheet with no drawing or distortion of the metal which would affect the polish and necessitate buffing after completion of the reflector.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the present invention reference may be had to the accompanying drawings in which:

Fig. 1 is an elevational view of an open type overhead street lighting luminaire embodying the stainless steel reflector of the present invention with the mounting means therefor being shown;

Fig. 2 is an enlarged elevational view of the luminaire of Fig. 1 looking in a direction toward the supporting pole of Fig. 1;

Fig. 3 is a bottom view of the luminaire of Fig. 2;

Fig. 4 is a perspective view looking at the reflector from the street side and from the bottom;

Fig. 5 is a curve illustrating the light distribution; and

Figs. 6 and 7 are developed views of the sheets from which the reflector is formed prior to the bending and spot welding operations to form a reflector such as is shown in Figs. 1 to 4 of the drawings.

Street lighting units or luminaires of the open construction like street lighting luminaires of the closed construction are of various types particularly with reference to the head assembly which may comprise a metal head or a porcelain head of various forms depending upon the particular type of circuits with which such luminaires are employed. In order to illustrate the present invention a particular type of luminaire of the open construction is shown. It should be understood, however, that it is equally applicable to all styles of street lighting luminaires of the open type and the specific embodiment is merely representative of the constructions to which the present invention is applicable.

Referring now to Fig. 1 of the drawings there is illustrated a street lighting luminaire of the open type generally indicated by the reference numeral **10**. This luminaire is illustrated as being supported for overhead street lighting on a suitable support illustrated as a post **11**. A suitable pipe mast arm **12** and brace **13** are illustrated as supporting the luminaire **10** from the post **11**. The

particular construction of the supporting means forms no part of the present invention. It will be understood that conventionally the supporting means for such overhead street lighting luminaires are disposed along the sides of streets with the mast arms **12** supporting the luminaire somewhat above and to one side of the street.

Referring now to Figs. 2, 3 and 4 of the drawings, it may be observed that the luminaire **10** comprises a head **15** preferably formed of any suitable material such as metal or the like within which is mounted a receptacle assembly including a socket for a lamp **16**. It should be understood that the head **15** could comprise an integral casting portion including a sort of canopy portion for closing the top of a reflector to be described hereinafter. As illustrated the head **15** comprises two separate sections, a main head section **15***a* and a canopy section **15***b* bolted as by suitable bolts **17** to the main head section **15***a*. The canopy section **15***b* is shaped so as to enclose the upper open part of a reflector embodying the present invention in a manner which is clearly evident from the drawings. Fastened to the head **15** by suitable fastening means comprising the screws **21**, is a somewhat rectangularly shaped housing generally designated at **18** comprising the reflector of the present invention.

In accordance with the present invention the reflector **18** is formed entirely from a sheet of prepolished stainless steel having a high specular reflection factor. By that is meant that the stainless steel is polished when in the form of a flat sheet. Such polishing operation, even though the stainless steel is very hard, can be accomplished in a relatively inexpensive manner as long as the surface to be polished is a flat sheet of substantial area. Such stainless steel, however, is very difficult and costly to polish if the polishing operation must be done after the stainless steel sheet has been formed into a somewhat intricate shape.

Although the reflector of the present invention may be formed entirely from a single piece of stainless steel, the invention has been specifically illustrated as being formed from two pieces of stainless steel cut from a flat sheet in the manner shown in Figs. 6 and 7 of the drawings where the two pieces each cut to a predetermined configuration are respectively designated as flat sheets **19** and **20**. Consequently, the first step in constructing the reflector **18** in accordance with the present invention comprises cutting to the external configuration shown in Figs. 6 and 7 two flat sheets of prepolished stainless steel. An important feature of the present invention concerns deforming the flat sheets **19** and **20** which are highly polished while still flat without destroying the polish and consequently the high specular reflection factor. It has been found that the drawing of polished stainless steel destroys the polish and for this reason stainless steel reflectors have not been used where controlled lighting is desired. By controlled lighting is meant directing the light rays so that the light is concentrated in certain areas over what would otherwise be the case and is reduced in certain other areas, such areas of course being adjacent the light source. For example, in the lighting of streets, it is desirable that the light be directed up and down the streets and not transversely thereof where it would be ineffective to cause satisfactory lighting of the street.

It has been discovered that the high factor of specular reflection is not impaired if the reflector is fabricated from a flat sheet with no drawing or distortion of the metal other than linear bends and spot welding. Accordingly the sheet or piece of stainless steel sheet **19** is provided with linear bends along the dotted or dotted and dashed lines indicated in Fig. 6 designated respectively as **22***a*, **22***b*, **22***c*, **22***d*, **22***e*, **22***f*, **22***g*, and **22***h*. Similarly, the flat stainless steel sheet **20** shown in Fig. 7 of the drawings is provided with a plurality of linear bends along the dotted or dotted and dashed lines shown in Fig. 7 specifically designated as **23***a*, **23***b*, **23***c*, **23***d*, **23***e*, **23***f*, **23***g* and **23***h*. The linear bends shown in dotted and dashed lines in Figs. 6 and 7, i. e., bends **22***d*, **22***h*, **23***d* and **23***h*, are designated as reverse bends in that the metal on either side of the bend is moved in a direction into the plane of Figs. 6 and 7 while the place where the bend occurs is assumed to remain in the plane of the drawing. All the other bends shown by dotted lines are termed forward bends since the metal on either side of the bend is moved up from the plane of Figs. 6 and 7 assuming the bend remains in the plane of the drawing.

Upon the completion of the bending operation the sheet **19** comprises a plurality of contiguous plane surfaces designated as **19***a*, **19***b*, **19***c*, **19***d*, **19***e*, **19***f*, **19***g*, **19***h* and **19***i* deformed so as to form part of a rectangular enclosure while the sheet **20** comprises a plurality of contiguous plane surfaces **20***a*, **20***b*, **20***c*, **20***d*, **20***e*, **20***f*, **20***g*, **20***h*, and **20***i* deformed so as to form the remainder of a rectangular enclosure. The surfaces **19***i* and **20***i* effectively comprise lateral flanges for attaching the reflector **18** to the portion **15***b* of the head 15. As illustrated, these flanges each include a small opening **25** for receiving the fastening means **21** referred to above.

To prevent the light from being distributed to any substantial extent transversely of the street where the luminaire is employed, the stainless steel sheet **19** is somewhat longer than the sheet **20** so as to provide a depending portion **19***m*, the purpose of which will become clearly apparent from an examination of Fig. 1 of the drawings.

As illustrated, the rectangular reflector **18** comprises two ends each comprising three triangular plane surfaces and two sides each comprising two triangular plane surfaces and two rectangular plane surfaces. The intersection of each adjacent two plane surfaces throughout the reflector is a straight line in each case, thus comprising only linear bends with no deleterious effect to the high factor of specular reflection of the highly polished stainless steel sheets. The small surfaces **19***a* and **19***h* at each end of the sheet **19** are provided so as to be joined by riveting or spot welding, preferably the latter, with the surfaces **20***h* and **20***a* respectively.

With the arrangement disclosed, the central rectangular shaped surfaces **19***d* and **19***e* and **20***d* and **20***e* are joined along lines parallel to each other and disposed more closely adjacent to the light source **16** than any other portion of the reflector effectively providing two V-shaped surfaces with the points of the V's directed toward the light source **16**. Obviously these reflecting surfaces will tend to direct the light away from the transverse direction of the street and along the longitudinal direction thereof.

With the simple configuration described above, it has been found that a very satisfactory light distribution is obtained as is indicated by the light curve A shown in Fig. 5 of the drawings. This butterfly shaped light distribution is desirable since when converted to isolux charts the pattern is almost rectangular on the illuminated area.

It will be understood that refinements in the design, particularly by complicating the geometry of the reflector while still utilizing only linear bends may be employed to more closely approach the ideal spheroid or paraboloid surfaces now used to accomplish the desired light distribution. However, with the arrangement disclosed the desired light distribution has been closely approached in a manner completely satisfactory for suburban lighting, for example, while employing a reflector of very simple geometry which is especially desirable when constructed from prepolished stainless steel.

In view of the detailed description included above, it is apparent that there has been provided an open type luminaire which has great advantages over open type luminaires employed heretofore. It furthermore has the inherent characteristic of easy lamp removal which is the desirable feature of the open type reflector and yet provides the desired light control with a permanent reflector substantially incapable of being broken and furthermore being substantially permanent from the standpoint of use in a corrosive atmosphere and where abrasion is

likely. The present construction is especially adapted for converting previously employed unsatisfactory luminaires used in suburban areas for example, with a minimum expense to the construction of the present invention providing the desired controlled lighting.

While there has been illustrated and described a particular embodiment of the present invention, it should be understood that the present invention is not limited to the construction shown or described and that changes and modifications will occur to those skilled in the art without departing from the spirit and scope of the present invention. It is intended in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A reflector for an open type luminaire capable of providing definite light control comprising a plurality of contiguous adjoined plane surfaces of prepolished stainless steel interconnected to form a rigid somewhat rectangular enclosure open at the bottom, all the light reflecting surfaces of said reflector comprising only plane surfaces with each peripheral side of said enclosure consisting of a pair of adjacent rectangular plane surfaces intermediate two triangular plane surfaces and each end of said housing consisting of three triangular plane surfaces, the intersection of adjacent plane surfaces comprising a straight line in every case, each pair of rectangular surfaces being folded inwardly along vertical jointure lines, the line joining each said pair of rectangular surfaces being parallel to that of the other pair and relatively close to the center of the enclosure so as to define two V's with the apices thereof directed toward each other.

2. The apparatus defined by claim 1 wherein one of the peripheral sides of said enclosure is deeper than the other.

3. A reflector for the light source of an open type luminaire capable of providing definite light control comprising a plurality of contiguous adjoined plane surfaces of reflecting material interconnected to form a rigid somewhat rectangular housing open at the bottom and partially enclosing said light source, all the light reflecting surfaces of said reflector comprising only plane surfaces with each peripheral side of said housing comprising two adjacent rectangular plane surfaces interposed between triangular

plane surfaces and each end of said housing comprising three triangular plane surfaces, the intersection of adjacent plane surfaces comprising a straight line in every case and the rectangular surfaces on each of the sides of said housing being angularly disposed with respect to each other in order to define a pair of V-shaped light reflecting surfaces extending inwardly of the housing adjacent the light source.

4. The apparatus defined by claim 3 wherein one of the peripheral sides of said enclosure is deeper than the other.

5. A reflector for an open type luminaire capable of providing definite light control comprising a plurality of contiguous adjoined plane surfaces of reflecting sheet material interconnected to form a rigid somewhat rectangular enclosure open at the bottom, all the light reflecting surfaces of said reflector comprising only plane surfaces with the intersection between adjacent plane surfaces comprising a straight line in each case, the plane surfaces along each end of the rectangular enclosure each being triangular in shape, and the plane surfaces along each peripheral side of the enclosure comprising a pair of adjacent rectangular surfaces interposed between plane triangular surfaces, the rectangular surfaces along each of said sides being folded inwardly along vertical jointure lines extending parallel to each other, thereby forming a pair of V's having apices near the center of said enclosure in order to reduce the light reflecting qualities of said reflector in a direction extending transversely of said sides.

6. The apparatus defined by claim 5 wherein one of the peripheral sides of said enclosure is deeper than the other.

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