

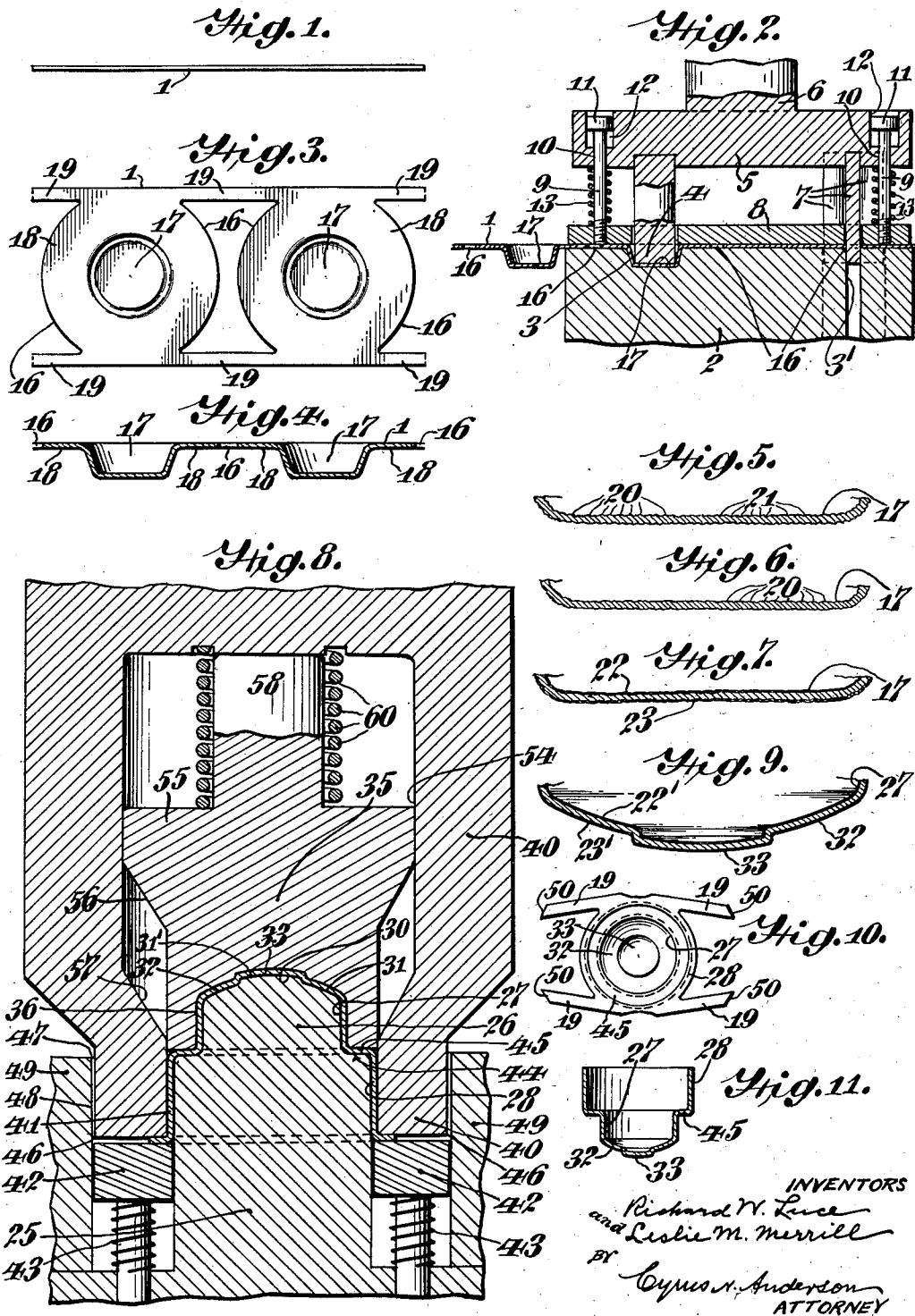
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METHOD OF MAKING LIGHT REFLECTORS

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# UNITED STATES PATENT OFFICE

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## METHOD OF MAKING LIGHT REFLECTORS

Original application filed September 5, 1929, Serial No. 390,480. Divided and this application filed December 26, 1930. Serial No. 504,780.

Our invention relates to the method of making light reflectors adapted for use as aids to traffic upon highways, streets and the like, the said reflectors being of a type or character which fits them for use not only as stationary signs or signals upon highways and streets but also for use upon automobiles and other like vehicles.

The method is particularly adapted to be employed in the manufacture of a light reflector having concentric circular light-reflecting areas, the surface of one circular area being located in displaced relation, front or back, with respect to the surface of the other concentric light-reflecting area, the said surfaces being spherical, all as disclosed in the drawings herein and as disclosed in our application for Letters Patent of the United States, filed September 5, 1929, Serial No. 390,480, of which this application is a division.

The general object of the invention is to provide a method novel in character by which a reflector embodying the above indicated characteristics may be manufactured expeditiously and at a minimum of expense.

Without reference to the further objects and advantages of the invention we shall now proceed with a detailed description of the said invention wherein other objects and advantages thereof either will be especially referred to or else will become apparent. To facilitate an understanding of the invention it is desirable that reference be made to some form of mechanical construction by which the steps of the method may be performed in practice, and to that end we have designed an apparatus to which reference will be made, it being understood that the steps may be carried out by other forms of apparatus and that reference to apparatus is made for the purpose of facilitating the description of the invention and not by way of limitation thereof.

In the drawings:

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

Fig. 2 is a view in sectional elevation of a

die structure by means of which initial formation of the reflector is effected;

Fig. 3 is a top plan view of a section of a strip such as is illustrated in Fig. 1 following the operation illustrated in Fig. 2;

Fig. 4 is a longitudinal sectional view of the partially formed reflectors shown in Fig. 3;

Figs. 5, 6 and 7 are transverse sectional views, respectively, of portions of a partially completed reflector, indicating certain steps of the process employed in the manufacture of the reflectors;

Fig. 8 is a vertical longitudinal sectional view of press including dies by which the final forming operation in the production of a reflector is effected;

Fig. 9 is an enlarged view of a fragmentary portion of the completed reflector;

Fig. 10 is a view of the reflector after the operation indicated in Fig. 8; and

Fig. 11 is a view in central vertical longitudinal section of the reflector embodying the invention.

It may be stated that while the reflector as illustrated in Fig. 11 is complete in so far as its reflecting qualities and characteristics are concerned, and rays of light which may impinge upon the concentrically arranged reflecting surfaces at the bottom of the reflector as shown in Fig. 11 are reflected thereby, yet, in actual practice it is customary and perhaps necessary to combine with the said reflector a condensing lens of ball or other form of suitable material through which the impinging and reflected rays of light are adapted to pass in known manner.

In the production of reflectors embodying our invention we employ preferably long strips of suitable sheet metal, such as copper, a section of which is shown at 1 in Fig. 1. Strips of this character are supplied to and fed successively through a punch and die press, as indicated in Fig. 2, comprising a stationary member 2, the upper side of which is provided with a recess 3 which is circular in cross section and may be of a depth substantially as shown. The member 2 is also provided with an opening 3' of a shape such as that of the opening shown in the metal strip, as illustrated in Fig. 3. The

forming punch member of the punch and die structure is shown at 4 with its lower end projecting into the recess 3. The said forming punch member 4 is carried upon a head 5 of a reciprocable member 6. The head 5 also supports in spaced relation to the forming punch 4 a cutting punch or element 7, located in alignment with the opening 3' in the stationary member 2, and of the same shape in cross section as that of the said opening but with dimensions slightly less than those of the said opening so that it may enter the same as indicated. A draw plate 8 is also carried by the head 5, being supported upon the lower ends of rods 9, the upper ends of which extend through openings 10 provided in the said head. The said upper ends terminate in heads 11 which are located in openings 12, provided in the upper side of the head 5. Springs 13 are coiled about the rods 9. The lower ends of said springs are seated against the upper side of the draw plate 8 while the upper ends thereof are seated against the head 5. The said springs tend to expand and such tendency operates to hold or tend to hold the draw plate 8 in its farthest position away from the head 5 with the heads 11 resting upon the bottom of the openings 12.

As has been stated already, metal strips which are relatively narrow, as indicated in Fig. 3, are fed through the punch and die device of a structure such as is shown in Fig. 2, the feeding thereof being from the right toward the left. Each strip is fed over the upper side of the member 2 and below the forming and cutting punches 4 and 7. Upon the descending movement of the head 5 the forming and cutting punches 4 and 7 likewise descend. The latter of these punches cuts out portions of the metal of the strip 1 at spaced intervals therein to leave openings of the shape indicated at 16 in Fig. 3. These openings correspond in shape to the cross section area of the cutting punch 7 and the openings 3'. Simultaneously with the cutting of the openings 16 the forming punch 4 descends and depresses the central portion of the metal of the strip between adjoining openings 16 to form cup-like portions 17 which are surrounded by relatively wide flanges 18. These flanges are connected together by the narrow connecting strips 19 at the opposite edges of the structure, as shown in Fig. 3. After the completion of the operation, as illustrated in Fig. 2 of the drawing, the portion 17 preferably is subjected first to an annealing treatment, after which it is pickled in known manner to remove the scale therefrom. In Fig. 5 of the drawing we have illustrated in section a portion of the initially formed cup-like part, indicating by means of alternate projections and depressions 20 and 21 the roughness of the surfaces of the metal. After the pickling operation

the strip embodying the initially formed cup-like portions is subjected to a "bright dipping" treatment, which consists in the immersion of the same in a liquid bath including suitable chemicals. The pickling and "bright dipping" operations are quite common in methods or processes of this character and need not be referred to or described in detail. It may be noted by reference to Fig. 6 that the result of the "bright dipping" operation is to modify somewhat the projections 20 by removing the outer or apical portions thereof. After the "bright dipping" operation a very thin plate or coating of a suitable metal such as silver is applied, preferably by electro-chemical deposition upon both sides of the initial cup-like structure. The presence of these silver coatings is indicated at 22 and 23 in Fig. 7 of the drawings. The same coatings are shown at 22' and 23' in Fig. 9 of the drawings after the initially formed cup-like portions have been subjected to the further pressing and forming operation indicated in Fig. 8 of the drawings.

In the structure as shown in Fig. 8 of the drawings we have provided a stationary die member 25 terminating at its upper end in a projecting portion 26 of smaller diameter than the lower portion thereof. The diameter of the portion 26 will be governed by the desired diameter of the inner portion 27 of the completed reflector, while the diameter of the outer portion of the member 25 will depend upon the desired diameter of the front portion 28 of the completed reflector. The upper or inner end of the portion 26 is provided with a circular projection 30. The annular surface 31 upon the outer portion of the projection 26 and also the outer surface 31' of the low projection 30 are spherical, so that the inner reflecting surfaces of the concentric portions 32 and 33 of the completed reflector shown in Fig. 11 of the drawings are spherical. The upper reciprocable portion 35 of the die is provided with a recess 36 the inner surface of which is the counterpart of the outer surfaces of the projecting portions 26 and 30 of the stationary die member 25. In the operation of the die press of Fig. 8 an initially formed cup-shaped member comprising the parts 17 and 18 is placed in position over the upper end of the member 25, whereupon the female die member 35 is moved downwardly so as to act upon and press the inner or rear end portion of the said cup-shaped member into form corresponding to the internal shape or configuration of the recess 36 in the member 35 and the external configuration or shape of the portions 26 and 30 of the die member 25.

A pressing and forming member 40 moves downward simultaneously with the member 35. The lower end portion of the member 40 is tubular, as indicated, and the inner edges of the lower end thereof contact with the out-

er portion of the flange 18 and bend the same downwardly, as indicated at 41, so as to form the outer or front portion 28 of the reflector of greater diameter than the inner or rear portion 27 thereof. The member 40 constitutes a drawing and shaping member and operates in the manner which will be apparent and clear to those skilled in the art. The lower end of the member 40 operates to clamp the outer portion of the flange 18 against the upper side of a holding ring 42 which is supported upon springs 43 in the usual known manner. It will be noted that the portion 41 is bent around the curved edge of a shoulder 44 provided upon the member 25 and surrounding the lower end of the projection 26. The presence of this shoulder and the cooperation of the circular open end of the member 40 therewith results in the formation of a shoulder 45 in the completed reflector, as is shown in Fig. 11 of the drawings. In the downward movement of the member 40 the outer edge 46 of the lower end thereof cooperating with the edge 47 of an opening 48 in the block 49 operates to sever, as indicated at 50, the narrow connections 19 to which reference has been made previously.

The member 35 of the die is mounted within the opening 54 in the lower end of the member 40 and is movable in the said opening axially thereof. The member 35 terminates at its upper end in an enlarged or head portion 55 the lower end of which is tapered, as indicated at 56, to form a tapered shoulder 57 which is adapted to engage with a similarly tapered shoulder 57 provided interiorly of the hollow lower end of the member 40, as shown.

The upper end of the member 35 is provided with a projection 58 of relatively small diameter, which is adapted to contact at its upper end with the member 40 at the upper end of the opening 54 in the lower end thereof. A strong spring 60 is coiled about the projection 58 with its lower end seated against the upper side of the member 35 and its upper end seated against the member 40 at the upper end of the opening 54.

Normally and at the beginning of an operation the upper end of the projection 58 is spaced from the opposing portion of the member 40 at the upper end of the opening 54 therein.

In the operation of the die press shown in Fig. 8 the member 40 is moved downwardly by means of usual construction (not shown) provided for that purpose, and initially the spring 60 operates to transmit pressure from the member 40 to the member 35 to cause the latter to act upon the upper closed end portion of the reflector and press and draw the same so as to cause the inner portion of the flange surrounding the initially formed cup-like portion previously referred to to seat upon the shoulder 44. Simultaneously the lower annular end portion of the member 40

contacts with the outer portion of the said flange and bends and draws the same around the outer edge of the shoulder 44 and presses the same against the portion of the member 25 of larger diameter below the said shoulder 44. It will be understood also that at the beginning of its action upon the outer portion of the said flange the connecting strips 19 are severed, as above described. Just prior to the completion of the downward movement of the member 40 the upper end of the projection 58 comes into contact with the said member 40 at the upper end of the opening 54 therein, so that during the latter part of the operation of the dies the portions 32 and 33 of the reflector are subjected to high positively or unyieldingly exerted pressure, so that a polish is imparted to the inner spherical surfaces thereof corresponding to the polish of the surfaces 31 and 31'. During that period the pressing outwardly or rearwardly of the portion 32 of the reflector beyond the plane of the annular portion 33 thereof is completed.

The spherical surfaces 31 and 31' have the same center, with radii of different lengths. It follows that the inner reflecting surfaces of the corresponding portions 32 and 33 of the reflector also have the same center, with radii of different lengths. From that arrangement it follows that when the reflector is embodied in a device for use upon highways, streets and the like, and is combined with a condensing lens of ball or other form as above indicated and assuming that the incident rays of a beam of light from a distant source focus upon the reflecting surface of the part 33, it will be apparent that the rays of a beam of light under like conditions which impinge upon the reflecting surface of the part 32 will be relatively widely dispersed, so that the beam which is reflected is in the shape of a widening cone. By this means the presence of the sign or signal is apparent to persons who may occupy an automobile or the like not only when the sign or signal is located a relatively great distance in front of the automobile but also after the automobile has reached a position either directly in front of the reflector or upon one side or the other of a line extended axially of the reflector.

It will be seen that by our invention we are enabled to produce practically and at reasonable or minimum cost a reflector having desirable characteristics of construction as set forth in our original application previously referred to herein.

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

1. The method of producing a light reflector from sheet metal, which comprises the successive formation of cup-like members having outwardly extending lateral flanges

at its outer edges in a strip of sheet metal, subjecting the said cup-like members thus formed successively to the die members of a die press, and applying first a yielding pressure to the cup-like portion thereof and simultaneously an unyielding pressure to the flange portion, and finally applying to the cup-like portion an unyielding pressure force to give final shape to the bottom of said cup-like member and to impart a high polish to the inner surface thereof.

2. The method of producing a light reflector from sheet metal which comprises the subjecting of sheet metal to pressure by means of dies to form a centrally located depression therein, applying a yielding pressure to the depressed portion and simultaneously an unyielding pressure to the portion of the said sheet surrounding the depressed portion, and finally applying to the bottom of the said depression an unyielding pressure force to give final shape thereto and to impart a high polish to the interior surface thereof.

3. The method of producing a light reflector from sheet metal which comprises the subjecting of the same to forces extending in opposite directions transversely of the said sheet to form a centrally located depressed portion therein, thereafter initially subjecting the said centrally located depressed portion to compressive yielding pressure, simultaneously subjecting the portion of said sheet surrounding the said depressed portion to a positive unyielding pressure and finally subjecting the bottom of the centrally located depressed portion to unyielding pressure and thereby imparting to the inner surface thereof a polish which is light reflecting.

4. The method of producing a light reflector from sheet metal which comprises the formation by pressure in a piece of sheet metal of a centrally located depressed portion, thereafter applying an initially yielding compressive and drawing pressure to the said depressed portion and causing the projection of a central portion of the bottom of the said depression to provide a depression upon the inner side of said bottom, simultaneously applying a positive unyielding pressure to the portion of said sheet surrounding the said first named depressed portion and forming it into cylindrical shape in cross section and finally applying an unyielding compressive pressure to the bottom of the said depressed portion and thereby imparting to the inner surface thereof a polish which is light reflecting.

In testimony that we claim the foregoing as our invention, we have hereunto signed our names this 22 day of Dec., A. D. 1930.

RICHARD W. LUCE.  
LESLIE M. MERRILL.

**CERTIFICATE OF CORRECTION.****Patent No. 1,837,720.****Granted December 22, 1931, to****RICHARD W. LUCE ET AL.**

**It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 114, after the word "position" insert the words quite near to the said sign or signal and occupies a position; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.**

**Signed and sealed this 16th day of February, A. D. 1932.**

**(Seal)**

**M. J. Moore,  
Acting Commissioner of Patents.**