

Nov. 19, 1946.

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2,411,222

HIGHWAY REFLECTOR SIGN AND THE LIKE

Filed Dec. 26, 1942

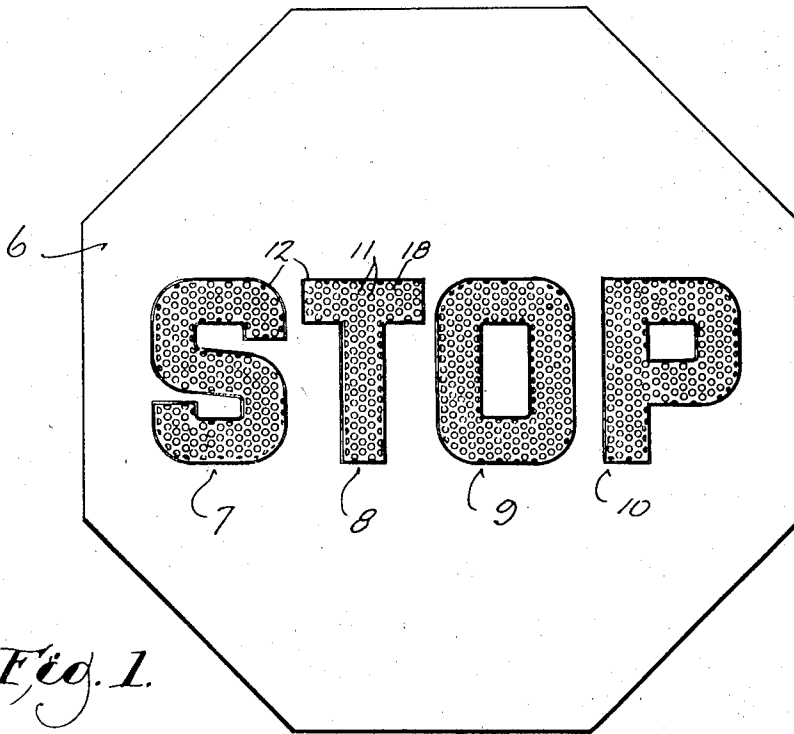


Fig. 1.

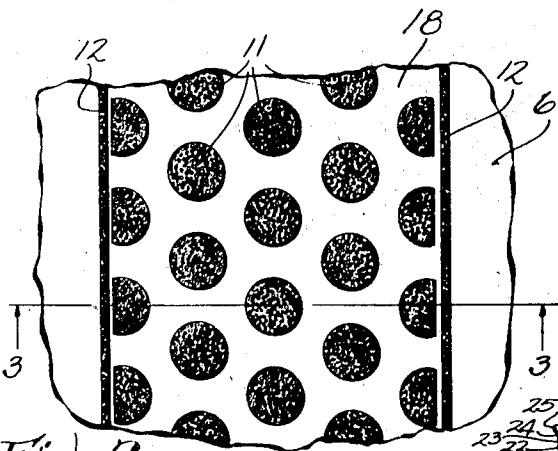


Fig. 2.

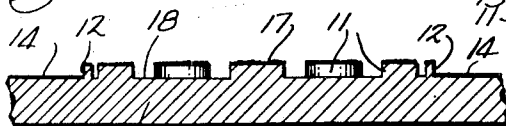


Fig. 3.

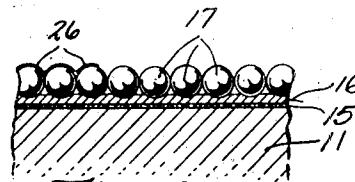


Fig. 4.

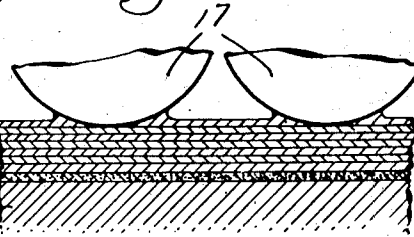


Fig. 5.

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2,411,222

HIGHWAY REFLECTOR SIGN AND THE LIKE

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Application December 26, 1942, Serial No. 470,190

7 Claims. (Cl. 40-130)

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This invention relates to improvements in highway reflector signs and the like, and methods of manufacture thereof.

The invention relates to a type of reflector sign in which a surface is rendered reflective to as high a degree as possible and thereafter coated with a transparent spacing coating and with a layer of beads which, according to my present discovery, must have a well defined minimum spacing from the reflective backing in proportion to the diameter of the bead. Preferably the sign, particularly for highway purposes, comprises a symbol made up of protuberances uniformly spaced in hexagonal pattern and only the top faces of which are highly reflective and bead coated.

While it is not essential to my invention that all of the beads should be at the same spacing from the reflective backing, I have found it extremely desirable that there should be a minimum spacing in relation to the size of the beads used. Since this minimum is very substantial, relatively speaking, it is an object of the invention to provide a means for assuring that at least the greater part of the beads used will be at the requisite minimum distance from the reflective backing. This spacing is critical in that the brilliance of reflection falls off rapidly at bead spacings less than those herein disclosed. It probably would make little or no difference if a few of the beads should be inadequately spaced, but at least the greater proportion of them should be at the specified relative distance from the reflector.

Another object of the invention is to provide a reflecting sign in which the back plate may have conventional coloration but the symbol will nevertheless provide adequate contrast whether viewed by day or by night.

Further objects of the invention have to do with means by which the signs embodying the invention can be made in commercial quantities at reasonable expense. Other objects will be apparent to those skilled in the art upon examination of the following disclosure of the invention.

In the drawing:

Fig. 1 is a front elevation of a highway sign embodying the invention, such sign being illustrated at approximately one-fourth actual size.

Fig. 2 is an enlarged detail in front elevation of a fragment of one of the symbols in the sign shown in Fig. 1, such fragment being illustrated at approximately twice actual size.

Fig. 3 is a detail view taken in cross section on the line 3-3 of Fig. 2.

Fig. 4 is a fragmentary detail in cross section on a very much enlarged scale, the reproduction being about eight times normal size.

Fig. 5 is a view similar to Fig. 4 greatly further enlarged and showing diagrammatically the built-up optical spacing layers.

Like parts are identified by the same reference characters throughout the several views.

The back plate 6 with integral protuberances and outline ribs individually comprising the symbols 7, 8, 9, 10, is preferably molded or cast or stamped in one piece. A suitable molded plastic is preferred. As clearly appears from Figs. 2 and 3, each symbol is made up of bosses or protuberances 11 bordered by an outlining rib at 12. The protuberances or bosses 11 are preferably flat topped and the surface of the rib 12 extends to the same level from the target plate 6. The bosses or protuberances 11, which are illustrated with round top, are desirably arranged, irrespective of their shape, in the hexagonal pattern in which they are illustrated in Fig. 2, each such boss being surrounded by six equidistant like bosses. (The pattern terminates, however, at a line just short of the rib 12.) In practice, while the dimensions are not critical, I make the individual bosses about $\frac{3}{8}$ " in diameter and about $\frac{1}{8}$ " high. They are so spaced as to expose an area between bosses which preferably approximately equals or exceeds the aggregate area of the boss tops. The area 18, between bosses, is preferably black or very dark in color to provide daytime contrast with the rest of plate 6, outside the symbols, which is conventionally yellow. At night contrast is provided by the brilliance of the reflection from the symbols, being a reversal of daytime contrast. The individual symbols are approximately $1\frac{1}{4}$ " in width, overall.

While the target and bosses are preferably made of plastic, they may also be made of other materials and may, if desired, be made of metal. If made of metal, the metal chosen may be of such a nature that it can be buffed or otherwise finished to render the top surfaces of the bosses 11 and the rib 12 highly polished and highly reflective. If the target plate and bosses are made of plastic, it will be necessary to apply to the top surfaces of the bosses and rib a highly reflective coating 15 (Fig. 4 and Fig. 5).

This coating may conveniently comprise either aluminum paint or silver paint. Either will be found to constitute bright flakes of metal in a suitable vehicle. The mode of applying the paint, if paint be used, should be such that the small metallic flakes or scales will be pressed flat to lie on

nearly as possible in one plane to provide as nearly as possible a continuous brilliantly reflective surface. For lack of knowledge as to the critical spacing required between such a surface and beads used therewith, previous inventors working in this field have given up the advantages of a highly polished reflective surface and have resorted to diffusing rather than brilliant backings. While diffusing light reflecting coatings are operative either with or without bead spacing, I am able to retain the advantages of a brilliant reflective backing because of the spacing I achieve between such a backing and the beads.

Since there are other ways of establishing a brilliantly reflective coating on the top surfaces of the bosses and the outlining ridges, I do not limit myself to the application of a metallic paint for this purpose, but merely use the paint as an exemplification.

The beads employed are preferably as nearly as possible true spheres of transparent material such as glass or plastic. A variety of bead sizes may be employed. The size I prefer is a so-called No. 10 bead having a diameter of .015". I have also used somewhat larger beads having a diameter of about .0175. Numerous other sizes may also be used effectively.

However, there is an apparently critical optical relationship between the bead diameter and the spacing which should be provided between the beads and the reflector 15. This spacing should preferably amount to a minimum of 20% of the bead diameter. The spacing may be increased materially above 20% without loss of brilliance but it cannot be appreciably decreased below 20% without loss of brilliance. I provide a spacing layer 16 preferably of a transparent plastic and preferably applied in successive coats as a liquid, which coats the reflector 15 and protects its brilliance, at the same time preferably serving as a means for anchoring the several beads 17. Transparent shellac, varnish, or plastic in one or several plies, may be used to constitute the spacing layer. For convenience of manufacture the layer is preferably built up of successive layers, coats or plies. However, in referring to the spacing layer as having a thickness of 20% of the bead diameter, I am including the entire thickness of the spacing layer and since the beads will be embedded in the last coat comprising such layer, the actual spacing may be slightly less than 20% on the average.

The preferred method of manufacturing my improved reflecting sign has due regard for contrast both day and night in the finished sign and for simplicity and economy of manufacture. Assuming that the target plate 6 is made of dark colored plastic, the entire area of each symbol or symbols 7, 8, 9, 10, is masked and the plate is sprayed or otherwise painted at 14 (Fig. 3) with the bright yellow color commonly employed in highway signs, or some other color which may perhaps be more suitable to the particular purpose, if such purpose be other than the provision of a highway sign. The masking is then removed and the reflecting layer 15 is applied to the tops of the bosses 11 and the ribs 12. This leaves untouched and uncolored the intervening area 18, it being assumed that the plastic will naturally be colored in contrast with the yellow paint applied to the area 14 outside of the symbols. Otherwise the areas 18 may be pointed before the painting of the rest of the plate as above described.

A roller coating operation or operations may preferably be used to apply the reflecting coat-

ing 15. For example, a roller coated with aluminum or silver paint may be rolled across the bosses and ribs at a level such as to contact only the flat top surfaces.

As soon as the reflecting surface 15 is dry, the spacing layer 16 is built up. Instead of applying the spacing layer in a solid sheet, I have found it simpler to apply a succession of coats with a roller coating apparatus, allowing each coat to dry before another is applied. Using transparent varnish or the like, I have found that it takes from five to seven coats 19, 20, 21, 22, 23, 24, 25, (Fig. 5) of varnish to build up a layer to the desired thickness of .0035. This is at least one-half thousandths of an inch greater thickness than is absolutely necessary where the small No. 10 beads are to be used.

While the last coating 25 of varnish remains tacky the beads 17 are distributed over the surface and may be pressed therein. The fact that all of the previous layers of varnish 19-24 have at least substantially dried before the last coat was applied assures against undue penetration of the beads into the spacing layer 16. Thus, all or substantially all, of the beads or spheres will be maintained at the specified minimum distance from the reflecting surface 15.

The thickness of the reflecting layer 15 is not crucial and has been unavoidably exaggerated in Figs. 4 and 5. Of course, if the reflecting surface is made by simply burnishing or otherwise exposing the surface of the several bosses and ribs (as when these may be made of aluminum, stainless steel, or silver) there will be no separate coating as such and the reflector will then constitute a mere surface of the plate. Every effort has been made, however, to show a spacing layer 16 which is accurately representative of the critical dimension, such layer having an overall thickness equal at least to approximately 20% of the diameter of the beads to be carried thereby in spaced relation to the reflector.

Since the aggregate thickness of the several coats comprising the spacing layer 16 is 20% or more of the thickness of the bead, and since such layer comprises five to seven coats, in the last of which the beads are embedded, the clear spacing required for the results sought is obviously about $\frac{1}{5}$ to $\frac{1}{4}$ less than 20% of the bead diameter. Thus, the preferred spacing is never less than 16%, nor do I prefer that it exceed 25% of bead diameter. While the successive coatings are diagrammatically illustrated separately in Fig. 5, it will be understood that actually they tend to merge into a homogeneous composite coat in practice.

While I regard it as not particularly desirable, it is possible to apply over the beads a retaining coating of varnish or the like at 26 (Fig. 4).

A sign made as herein disclosed will have important advantages in that it will not merely show considerable brilliance from a close viewpoint, but will also have very high "target" value. That is to say, it will show a brilliant reflection at a considerable distance. A practicable highway sign or like device should have brilliance both from a distant viewpoint substantially normal to the sign, and from a closer viewpoint at a considerable angle. The combination of a brilliant reflecting surface and transparent balls or beads at a proper spacing therefrom gives the desired characteristics. The critical spacing has been found to be much more important even than the character of the reflecting surface.

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I claim:

1. In a sign, the combination with a target plate provided with a rib outlining a symbol and with projecting bosses in predetermined pattern within the rib in mutually spaced relation respecting each other, said bosses and said rib having surfaces in substantially the same plane raised above said plate, the aforesaid surfaces comprising reflectors, a protective transparent spacing and bead mounting layer on said surfaces and beads adhering to said layer and thereby spaced outwardly from the reflecting surfaces in said plane.

2. The device of claim 1 in which said layer has a minimum thickness between the beads and the reflecting surfaces exceeding 16% of the diameter of the beads.

3. In a sign, the combination with a target plate having bosses projecting from its face in a predetermined pattern outlining a predetermined symbol on the face of the plate, said plate being exposed between said bosses in a color contrasting with the color of said plate outside of the symbol, said bosses having reflecting faces substantially in a common plane, transparent spacing layers coating the respective reflecting faces of the bosses and protecting such faces while providing means for spacing beads therefrom, and a layer of beads carried on the respective spacing layers of the respective bosses, each such layer of beads comprising beads of approximately uniform diameter between .015 and .02, said beads and layer being transparent and the layer having a thickness of at least approximately .003.

4. The device of claim 3 in which said symbol is outlined by a rib projecting from the face of

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the plate in spaced relation to the bosses and terminating in a face substantially at the level of the faces of said bosses and likewise constituting a reflecting surface provided with a spacing coating and with a coating of beads like those of the respective bosses.

5. The device of claim 3 in which the transparent spacing layers are multiple ply layers and the beads are embedded in the outermost ply for adhesive connection with such layers and for spacing from the reflecting faces by the intervening layers.

6. In a highway sign, the combination with a target plate having a general target area light in color and having in an intermediate portion of said area at least one symbol of a sharply contrasting dark color, said symbol having a predetermined pattern throughout its area bosses projecting substantially to a common plane and having reflecting faces provided with bead coatings, the spacing of said bosses exposing the darker color of the symbol intervening between such bosses, and the reflecting beaded bosses providing at night a reverse contrast with the general area of said plate from that provided by daylight.

7. The device of claim 6 in which the reflecting surfaces of the respective bosses are brilliant, and a spacing layer approximating in thickness one-fifth of the diameter of the beads intervenes between the reflecting surfaces and the beads, whereby the beads are spaced from the reflectors at a distance approximating one-fifth of their size.

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