

Jan. 19, 1954

E. C. MATTSON  
TRAFFIC MARKER

2,666,373

Filed June 29, 1950

2 Sheets-Sheet 1

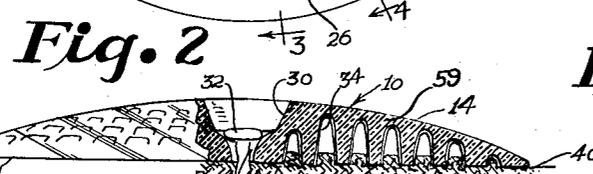
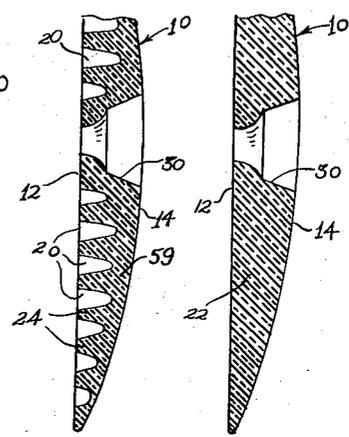
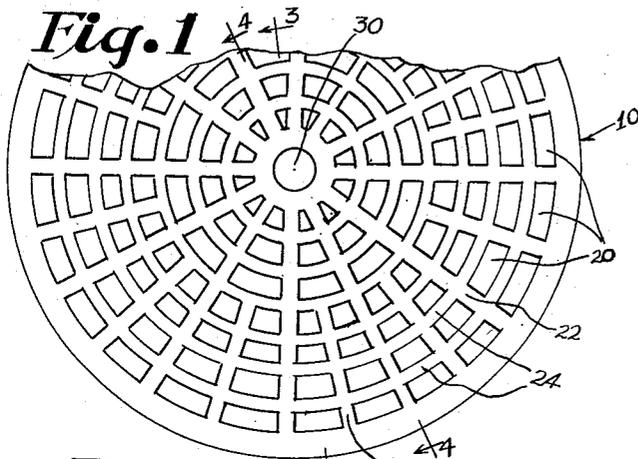
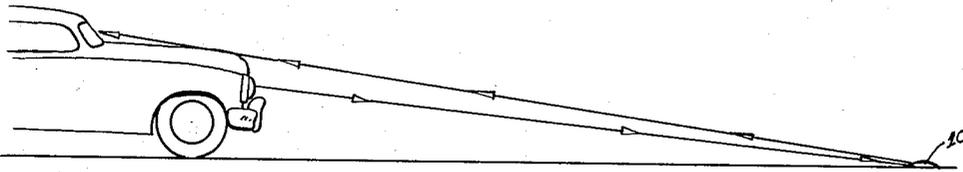


Fig. 3 Fig. 4

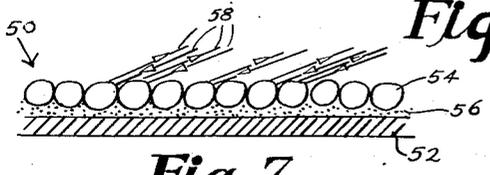
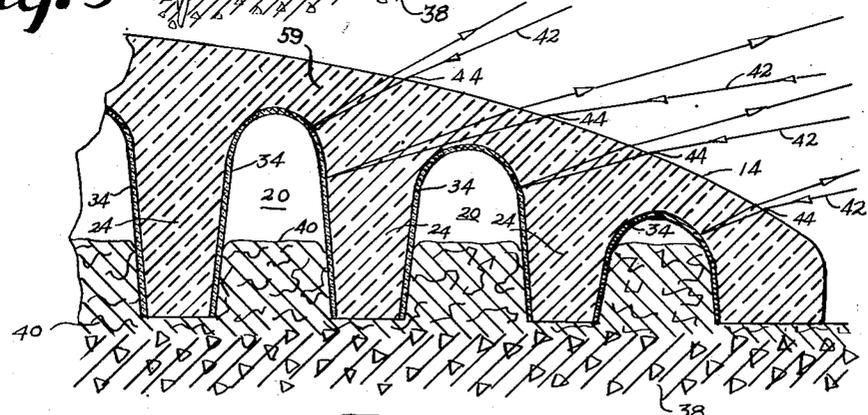


Fig. 6

Fig. 7

INVENTOR  
Elbert C. Mattson  
By  
Cook and Schermerhorn  
ATTORNEYS

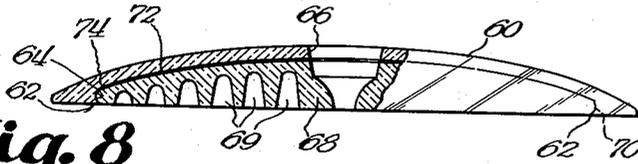
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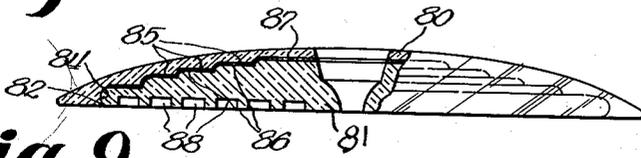
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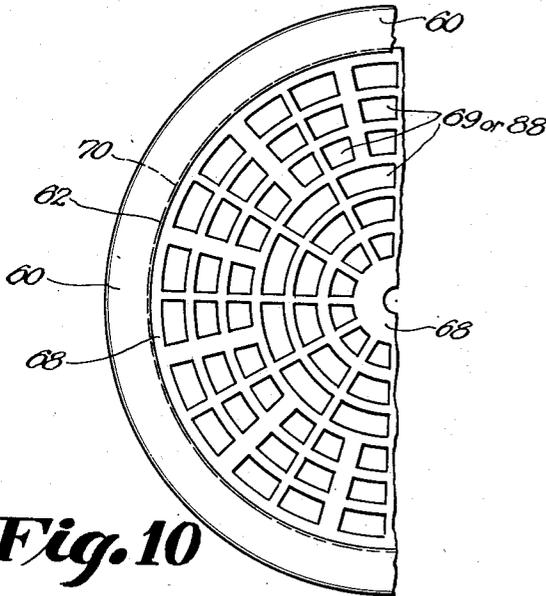
2 Sheets-Sheet 2



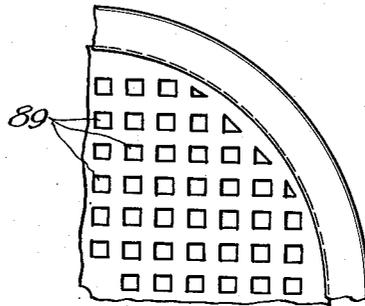
**Fig. 8**



**Fig. 9**



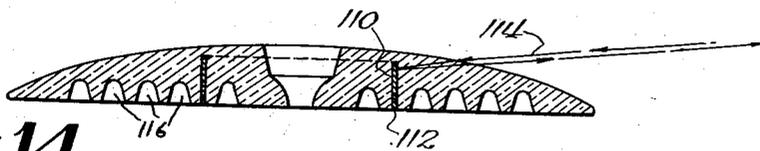
**Fig. 10**



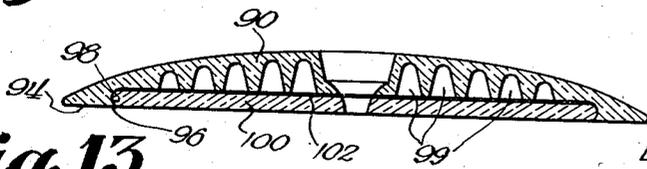
**Fig. 11**



**Fig. 12**



**Fig. 14**



**Fig. 13**

INVENTOR.  
Elbert C. Mattson  
BY  
Cook and Schermerhorn  
ATTORNEYS

# UNITED STATES PATENT OFFICE

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## TRAFFIC MARKER

Elbert C. Mattson, Portland, Oreg.

Application June 29, 1950, Serial No. 171,014

5 Claims. (Cl. 94—1.5)

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This invention relates to a traffic marker of the type used for marking lanes on highways, safety zones, intersection zones, parking stall areas and the like, for the guidance of traffic.

It is an object of this invention to provide a traffic marker of the class described having a high degree of reflectivity of light.

It is a further object of the invention to construct a traffic marker of the class described having a multiplicity of recesses in its under side designed to receive cementitious material used to secure the marker to the road surface, thereby to increase the bond between said marker and said road surface, and also to constitute a corresponding multiplicity of facets for reflection of received light.

It is yet another object to provide a transparent traffic marker with a plurality of peripherally presenting, internally disposed facets for reflecting received light.

Another object of the invention is to provide a traffic marker of two parts, one a body member and the other a cover member, so that only the cover member need be made of more expensive, wear resistant material; and when said cover member is transparent, a light reflecting coating or film may be disposed between the two members.

Another object is to provide means for positioning a light reflecting coating or film within the body of a transparent traffic marker.

Additional objects, features and advantages of the invention will become apparent from a consideration of the specification and the accompanying drawings, wherein like reference characters designate corresponding parts throughout the several views, and wherein:

Figure 1 is a view showing the light reflecting characteristics of the marker in operation, as illuminated by an automobile;

Figure 2 is a bottom plan view, in fragment, of the traffic marker, showing a preferred arrangement of the recesses on the under side;

Figure 3 is a section view on the line 3—3 of Figure 2;

Figure 4 is a section view on the line 4—4 of Figure 2;

Figure 5 is a side elevation view, partly in section, showing a preferred embodiment of the marker as installed on a road surface;

Figure 6 is a fragmentary section view, similar to the section view in Figure 5, but on enlarged scale, showing a film of light reflecting coating material on the walls of the recesses, and the light reflecting characteristics of the marker;

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Figure 7 is a detail view, greatly enlarged, showing a film of coating material used on the under side of the marker for reflecting light, and also illustrating the light reflecting characteristics of the material;

Figure 8 is a side elevation view, partly in section, showing a modified form of the traffic marker;

Figure 9 is a side elevation view, partly in section, showing a further modification of the traffic marker;

Figure 10 is a bottom plan view in half fragment, common to both the traffic markers shown in Figures 8 and 9;

Figure 11 is a bottom plan view in quarter fragment of a modified form of grid surface for the bottom of the traffic marker;

Figure 12 is a bottom plan view, in quarter fragment, of a further modified form of grid surface for the bottom of the traffic marker;

Figure 13 is a diametrical sectional view, showing another modification of the invention; and

Figure 14 is a diametrical sectional view showing yet another modification of the invention.

Referring to the drawings, particularly Figures 2, 3 and 4, it will be seen that the traffic marker 10 is a plate-like body, and, in the preferred embodiment illustrated, is a circular disc, sometimes referred to herein as a "button" having a flat under side 12 and a curved upper surface 14 with a curvature such that the point of greatest thickness is at the center and the thinnest portion is at the periphery. The marker is made of transparent plastic material having a high, wear-resistant quality under the conditions of use, which includes the extremes of winter cold and summer heat, subjection to hydrocarbon compounds such as gasoline and oil, the destructive force of sunlight, and spalling under traffic impact. Since the marker is secured to the pavement by a suitable mastic, discussed hereinafter, the capacity of the plastic material to form a cohesive bond with the mastic is also a characteristic to be taken into consideration. Thermoplastic materials of the cellulose acetate butyrate type of plastic are recommended as possessing the desired physical characteristics outlined above. In practice, I have found that plastic material sold by Tennessee Eastman Corporation under the trade name "Tenite II, Formula 265A," to be very satisfactory.

The marker is made in a mold by conventional methods well known in the art, preferably by injection molding. The mold is so constructed and designed as to provide on the under surface

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of the marker a multiplicity of concentrically arranged segmentary recesses or cells 29 which are separated circumferentially from each other by main radial bars or ribs 22 and intersecting circumferential bars or ribs 24. It will be observed that in the outer four concentric rings there is disposed auxiliary radial bars 26 between the main radial bars which further circumferentially divide the concentric recesses into additional segments.

At the center of the disc there is provided a conical recessed bore 30 in the upper surface, for receiving a screw or a pin 32 as shown in Figure 5, to assist in anchoring the marker to the pavement. It will be seen in Figure 5 that the marker, as installed, comprises in combination the disc 10 illustrated in Figures 2, 3 and 4 and a coating or film 34 of light reflecting material on the walls of the recesses.

The structural characteristics and the manner of installation of the marker are seen to advantage in the greatly enlarged fragmentary section view, Figure 6. The marker is cemented to the pavement 38 by means of cementitious or mastic material 40, described hereinafter, which enters the recesses for at least a part of their depth, and may, depending on the quantity used and the method of application, completely fill the recesses. The under side of the marker, with reference to the walls of the recesses, has been coated with a layer 34 of material to provide a light reflecting surface. Various materials may be used, for example; various paints provide a high quality, light-reflecting surface; powdered metal may be applied as a spray, or as a pigment in a vehicle; metal may be deposited by a plating process; quick silver may be employed as in a silvering process to provide a mirror surface; thin, flexible films may be impressed into the recesses to conform to the walls.

The light reflecting characteristics of the marker, with the light reflecting coating on the recess walls, are shown in general by the schematic representations of light rays in Figure 6. It will be observed that the light rays 42 from a source (not shown) impinge upon the curved upper surface 14 of the marker, are bent by the lens effect of the curved upper surface and the index of refraction of the transparent material at 44 and then fall upon the mirror-like reflecting surface provided by the coating 34 on the recess wall, and are reflected back at a slight angle of reflection in the general direction of the light source. In this connection, it is desirable to coordinate the angle of disposition of the outer (toward the peripheral edge of the marker) walls of the recess with reference to the light transmitting characteristics due to the physical shape of the upper surface of the marker, the index of refraction of the transparent material, and the general direction or angle of incidence of the normal impinging light rays to which the marker is designed to respond as a traffic guide, so that the angle of incidence will be approximately normal (perpendicular) to the outer wall surface of the recess.

A preferred light reflecting material for the coating 34 is that shown (greatly enlarged) in Figure 7. It will be seen to comprise a laminated film 50 having a flexible, elastic backing 52 and a surface layer 54 of minute glass beads of substantially uniform diameter adhesively secured to the backing material by being imbedded in a film or stratum of suitable cement 56. Such a material is that manufactured by the Minne-

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sota Mining & Manufacturing Co. of St. Paul, Minnesota, under the trade name "Scotchlite." The glass beads are so minute that they are scarcely visible as such to the naked eye, and can be seen only under a microscope. Their relative size is indicated by the fact that Figure 7 is drawn to about thirty magnifications. The laminated film has a thickness of only about ten to fifteen thousandths of an inch. This film, by virtue of the discontinuity of the reflecting surface provided by the glass beads, has the property of reflecting light rays back in substantially the same direction as the direction of incidence, as illustrated by the schematic representation of light rays 58, thereby becoming luminous as distinguished from being merely illuminated. The closeness of the angle of reflection to the angle of incidence of the light reflecting characteristics of this material are ably demonstrated by the fact that the reflected light can be seen only substantially in the vicinity of the source of illumination.

When "Scotchlite" or other prepared film of light reflecting material is used, it is impressed into the recess by suitable means, and made to conform to the walls of the recesses.

As previously pointed out, the marker is attached to the concrete 38 or other pavement surface by the bonding action of a mastic substance 40 and pin 32, as shown in Figure 5. The mastic provides the necessary bond of the marker to the pavement, but the marker might otherwise slide a considerable distance in the course of a year under the impacts of traffic, all the while retaining its bonding grip on the pavement. Hence, the pin 32 is used to prevent sliding of the marker.

The recesses 29 perform an auxiliary function in connection with bonding the marker to the road surface. The area of the marker for making bonding contact with the mastic is greatly increased by reason of the additional surface provided by the walls of the recesses. Not only is the area of surface contact with the marker greater, but as the mastic is received in the recesses it forms columns which are resistant to the shearing action of forces applied laterally to the marker button. The bonding effect may also be promoted by the vacuum principle if the recesses are completely filled with the mastic before applying the disc to the pavement, so that a suction effect is created between the disc and the pavement surface.

In Figures 2, 3, 5 and 6 it will be observed that the intersecting ribs or bars 22, 24 and 26 have flat bases which are narrower than the cells 20 and narrower than the height of the substantially vertical side surfaces of the bars. Thus, the cells extend upwardly considerably more than halfway through the button, leaving a relatively thin top wall covering the top ends of the cells. It will also be observed that there are a large number of the bars and recesses whereby the area of said side surfaces in the aggregate greatly increases the available surface engagement with the mastic 40, relative to the projected circular area of the button which is available in a smooth bottom type of button. In the Figure 2 embodiment there are 132 small cells forming a reticulated bottom face to receive the mastic and provide spaces to accommodate lateral distortion of the ribs or bars under heavy compression loads. The ribs or bars which serve as compression members under load are sufficiently numerous to provide good stress distribution and sufficiently

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narrow and sufficiently spaced to distort into the cell spaces under excess loading without cracking the marker.

Asphalt, tar, pitch, or other adhesive substance, which has the capacity to adhere to both the substance of the road pavement and the plastic substance of the marker button, may be used. Other desired characteristics of the binder are that it be capable of maintaining its bonding properties through year round conditions of summer heat and winter cold. In other words, it must not become too plastic in summer or too brittle in winter. I have found a mixture of rubber and bituminous asphalt to provide the above named characteristics and to be particularly satisfactory for the purpose. Such a mixture is that sold by Philip Carey Mfg. Co. of Lockland, Ohio, under the trade name of "Careylastic."

Still another function performed by the recesses in the under side of the marker is in the prevention of warping or "cupping" of the marker. Traffic markers are used, obviously, under a great range of weather conditions and temperatures. It is well known that pavements absorb the sun's heat and are frequently very hot relative to the atmosphere. Experience has shown that when markers are made of plastic materials, and solid, with both the upper and under surfaces smooth, the heat absorbed in the pavement causes the marker to expand along its bottom surface, causing it to turn up or "cup" at the edges, much in the manner of a board which warps due to absorption of a greater percentage of moisture on its bottom side than on its upper side. When the marker turns up or "cups" at its edges in the manner mentioned, it then becomes vulnerable to traffic impacts, and is quickly cracked, chipped, and broken.

The provision of the recesses 20 in the under surface of the plastic marker has been found to overcome the above-described fault. Warping of the marker due to excessive expansion of the under side is prevented by the fact that the recesses 20 in the under side constitute a plurality of spaced grooves with alternating ribs interrupting the under surface of the marker and rendering the same discontinuous. The grooves are of such spacing and frequency, and of a depth such that any expansion forces developed in the body of the marker, or within the rib projections delineated between the grooves and which constitute the under surface, cannot be combined so as to be transmitted from one to the other. In other words, the number of the grooves and their depth relative to the body of the marker is sufficient to prevent accumulation in the under side of the marker of stresses normally arising from shrinking and expansion.

In addition to the functions performed by the recesses, already mentioned, it is desired to point out that a marker having a plurality of interiorly disposed, outwardly presenting facets, as results from the provision of the recesses in a transparent body, has the distinct advantage of presenting a broken or discontinuous light reflecting surface, as will appear from the showing of the facets in the part of Figure 5 in elevation. This is particularly effective in providing greater conspicuousness at night.

While the number of facets and their disposition is variable, it is preferable that they be arranged in concentric rings or rows, with the height of each facet in one row being greater

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than the height of the facet in the next outer row, so that the top portion of the next inwardly disposed facet is visible over the next adjacent outwardly disposed facet through an arc of approximately 90 degrees. In this manner, the facets will be illuminated and visible to the eye by light rays falling thereon through the angle from horizontal to vertical.

Figures 8 and 9 illustrate modified forms of the invention wherein the marker button is made of two parts, a convex-concave cover member with an internally presenting lip, and a body member designed to conform to the concave side of the cover member and to be received within the cover member in a press or snap fit similar to the manner of a snap fastener. This embodiment of the invention is particularly designed to receive between the cover member and the body member a film of "Scotchlite" or other light reflecting material. Of course, the under surface of the cover member, or the upper surface of the body member, may be coated with light reflecting material, as previously shown in connection with the embodiment shown in Figures 2 to 5.

Referring more particularly to Figures 8 and 10, the concavo-convex cover member is designated by the numeral 60, and is provided with an internally presenting lip 62 at the inner, bottom edge. The lip 62 causes to be formed an annular recess 64 around the inner edge of the cover member. The cover member is provided with a conical bore 66 at its center for receiving the head of the pin for anchoring the marker assembly, as in the embodiment shown in Figures 2 to 5.

The body member 68 is provided with a convex upper surface corresponding in contour to the concave under surface of the cover member, and has its peripheral edges 70 designed to be received in close fitting relation within the recess 64 formed by the inwardly presenting lip 62 of the cover member. The bottom of the body member is flat, but provided with a plurality of recesses 69 formed by a grid pattern of intersecting radial ribs and circumferential ribs, in a manner similar to the under side of the marker illustrated in Figure 2. The overlap of the peripheral edge 70 of the body member 68 as received within the confines of the lip 62 of the cover member is delineated by the dotted line shown in Figure 10. A film of "Scotchlite" 72 is interposed between the cover member and body member, as illustrated. The "Scotchlite" is preferably cut in a disc of a diameter such that its edges do not extend into the recess 64 but stop at approximately the point 74 as illustrated in the drawings.

While the cover member 60 is illustrated in Figure 8 as being provided with an aperture 66 at its center, it will be understood that only the body member 68 need be provided with a conical bore for receiving the pin, and, if the bore is sufficiently recessed in the body member to completely receive the pin head, then the cover may be made completely continuous without the central opening. In such case the marker button is installed by first securing the body member to the concrete or other pavement surface, next positioning the film of "Scotchlite," and then snapping the cover member over the body member, as installed. Installation of the body member as a separate unit, or the combination of the body member and the cover member when assembled as a combined unit, is accomplished in

the same manner as previously described for the embodiment in Figure 5.

Advantages of this embodiment are that the "Scotchlite" may be used and inserted as a flat film without the necessity of pressing it into recesses in the under side of the button, as previously disclosed in connection with the embodiment described in Figures 2 to 5; and only the cover member 60 need be made of transparent plastic material having a high, wear-resistant quality, which material is usually more expensive than other plastic materials. The body member, since it is not subject to wear or spalling, may then be made of less durable, cheaper plastic materials, or of wood, metal or other suitable material. Road maintenance of the traffic marker button, as made of two parts, is cheaper because only the cover member needs to be replaced should it become worn or broken.

The embodiment of the invention illustrated in Figure 9 is a two piece traffic marker comprising a cover member 80 and a body member 81. The cover member 80 is provided with an inwardly presenting lip 82 at its inner, bottom edge, which causes to be formed an annular recess 84 around the inner edge of the cover member. It will be seen that the construction in this respect is identical to that illustrated in Figure 8. However, the cover member 80 differs from the cover member 60, illustrated in Figure 8, in that the cover member 80 is provided with a series of concentric, stepped annular channels 85, or series of other circumferentially arranged deformations on its under side. These channels may be arcuate, as illustrated in the drawing, or they may take an angular form, as desired. Each concentric ring need not necessarily be continuous, but may be discontinuous, comprising a series of arcuate segments or series of other circumferentially arranged deformations. The body member 81 is then constructed with its upper surface provided with a series of corresponding, complementary concentric ribs or projections 86 to conform in contour to the under surface of the cover member. A film 87 of "Scotchlite," or of other light reflecting material, is disposed between the two members.

Another variation in the construction illustrated in Figure 9 from that illustrated in Figure 8 is in the matter of depth of the recesses 88 provided in the bottom of the body member 81. While the arrangement and disposition of the recesses is the same as in Figure 8, and, therefore, the bottom plan view for both Figures 8 and 9 is identical, and is as disclosed in Figure 10, the recesses 88 in the under surface of the body member of Figure 9 are not constructed as deep as those in Figure 8. It will also be appreciated that the recesses may be entirely omitted, if desired, although then the bonding action of the mastic used to cement the marker to the pavement will be reduced.

An advantage of the embodiment illustrated in Figure 9 over that shown in Figure 8 is that the exterior of the marker will present to the observer a series of concentric rings, or facets if the under surface of the cover member 80 is constructed with recesses as above described, which thereby make it more conspicuous to the observer.

Figure 11 illustrates a variation in the grid pattern of the recesses with which the bottom of the body member may be constructed. In lieu of the intersecting radial and circumferentially extending ribs, the bottom surface is provided

with uniformly arranged square recesses 89, resembling a waffle iron. It will be appreciated that this design for the bottom surface may be used on any of the embodiments illustrating the invention, including the single piece body member illustrated in Figures 2 to 5.

Figure 12 illustrates still another grid pattern for the bottom surface of either the body member or for a single piece marker button.

Figure 13 illustrates still another embodiment of a two piece marker button comprising a cover member 90 and a flat disc-like plate 100 adapted to be received within the recess 98 provided in the under side of the cover member. The member 90 may be provided with a plurality of recesses 99 in its under side similar to the recesses illustrated in Figures 2-5. The periphery 94 of the cover member 90 is shaped to form an inwardly presenting lip 96 and recess 98 as described in connection with Figures 8 and 9. The relatively thin flat plate member 100 is received within the recess 98 in close fitting, snap, or detent-like action to thereby complete the bottom surface for the marker button. A film 102 of "Scotchlite" or other light reflecting material is disposed between the member 90 and the bottom plate 100 in a manner similar to the disclosure of Figure 3.

Figure 14 represents still another modification of the invention. The marker button in this embodiment is constructed quite similarly to the marker buttons of Figures 2 to 5, except that a relatively deep endless recess, illustrated in Figure 14 as an annular channel 110, is provided in the bottom of the button, between the center and peripheral edge of the button. A cylinder 112 of "Scotchlite" or other light reflecting film is then inserted in the annular channel, and light rays 114 falling on the marker button are then reflected from the "Scotchlite" in the manner shown in the drawing. It will be appreciated that the channel, recess, or groove for receiving the film of light reflecting material is preferably constructed of a width just sufficient to receive the film. The recesses 116 in the bottom side of the marker are not constructed as deep as in the case of Figures 2 to 5, so that the cylinder of light reflecting material will be clearly visible. In other respects, the construction of the marker button is similar to that of Figures 2 to 5.

It will be understood that various further modifications will occur to persons skilled in the art, and that various combinations of the features and embodiments disclosed herein may be made within the contemplation of the invention. For instance, the design pattern of the recesses is probably infinitely variable. The marker button may be made from a single piece of material, or may be of divided construction with a transparent outer shell or cover member. Different arrangements and designs may be provided for positioning the light reflecting material within or under the marker button so as to be visible through the transparent material of the marker button itself. The bottom surface of the marker may or may not include recesses, but recesses are preferred for the increased bonding action they provide, even if alternative means are provided for positioning the light reflecting material within the marker body. The body member, or bottom-seal member 100 of Figure 13, in the two-piece embodiments of the invention, need not necessarily be secured within the cover member in the manner herein illustrated and described, but may be secured in any other appropriate

manner, as by press fit, screwing, crimping, pinning, etc.

Having thus described the invention, what is desired to be secured by Letters Patent is:

1. A non-warping traffic marker adapted for bonding to the traffic surface of a pavement, made of molded plastic which has a coefficient of linear expansion more than five times that of steel and consequently having a tendency to curl when subject to extreme heat on a hot road surface, the marker having a reflective convex upper surface to reflect heat and a flat lower face, and a large number of independent cells in said lower face, said cells being separated by a plurality of intersecting bars, the wall of said cells as defined by said bars presenting a large substantially vertical surface area to a bonding material for securing said marker to a pavement surface, and the reduced surface contact of the bars with the pavement interrupting said lower face to reduce transfer of heat from the pavement and relieve expansion strains thereby reducing the curling tendency of the marker, said bars supporting the marker and being distortable to sustain heavy loads without damage to the marker.

2. A traffic marker as defined in claim 1 in the shape of a relatively thin circular button having a hollow central supporting boss adapted to receive a metal anchor pin.

3. A traffic marker as defined in claim 2 wherein said intersecting bars comprise radially spaced circular ribs concentric with said central boss, and arcuately spaced radial ribs radiating outwardly from said central boss.

4. A non-warping traffic marker adapted for bonding to the traffic surface of a pavement, comprising a relatively thin circular button of molded plastic material which has a relatively high coefficient of expansion, said button having a smooth, reflective convexly curved top surface and a flat reticulated bottom face to receive a mastic material for securing the marker to said traffic surface of a pavement, no portion of said plastic button projecting below said bottom face, said bottom face comprising a large number of closely spaced intersecting flat bottom supporting bars, substantially vertical side surfaces on said bars extending down to said bottom face and defining a large number of small closely spaced cells, said cells extending upwardly more than halfway

through the thickness of the marker, the flat bottoms of said bars being narrower than said cells and narrower than the height of said side surfaces, and the length of said bars in the aggregate being sufficiently great that said side surfaces of the bars present a large mastic bonding area, the reduced surface contact of the bars with the pavement interrupting said lower face to reduce transfer of heat from the pavement and relieve expansion strains, thereby reducing the curling tendency of the marker, said bars supporting the marker and being distortable into said cells to sustain heavy loads without damage to the marker.

5. A traffic marker as defined in claim 4 wherein said circular button has a hollow central integral supporting boss adapted to receive a removable metal anchor pin, and wherein said intersecting bars comprise radially spaced circular ribs concentric with said central boss and arcuately spaced radial ribs radiating outwardly from said central boss.

ELBERT C. MATTSO.

References Cited in the file of this patent UNITED STATES PATENTS

Table with 3 columns: Number, Name, Date. Lists various patents such as Durand (Sept. 25, 1928), Lee (Feb. 11, 1930), Woolums et al. (Apr. 11, 1933), etc.

FOREIGN PATENTS

Table with 3 columns: Number, Country, Date. Lists foreign patents from Great Britain (Nov. 12, 1931) and France (Oct. 25, 1937).

OTHER REFERENCES

Modern Plastics, article on page 159, vol. 27, No. 5, January 1950. Publ. by Modern Plastics, Inc., New York city.