

Sept. 13, 1938.

G. R. WILSON

2,130,256

LIGHT REFLECTING DISPLAY DEVICE AND MANUFACTURED BLANK THEREFOR

Filed Nov. 29, 1935

2 Sheets-Sheet 1

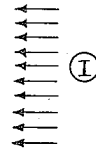
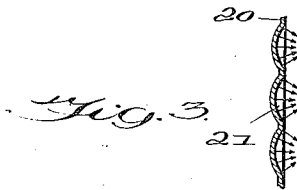
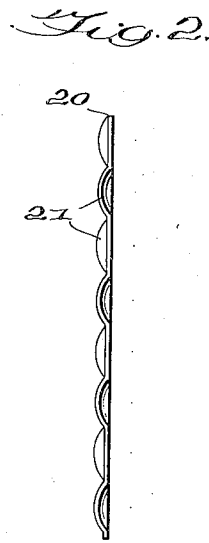
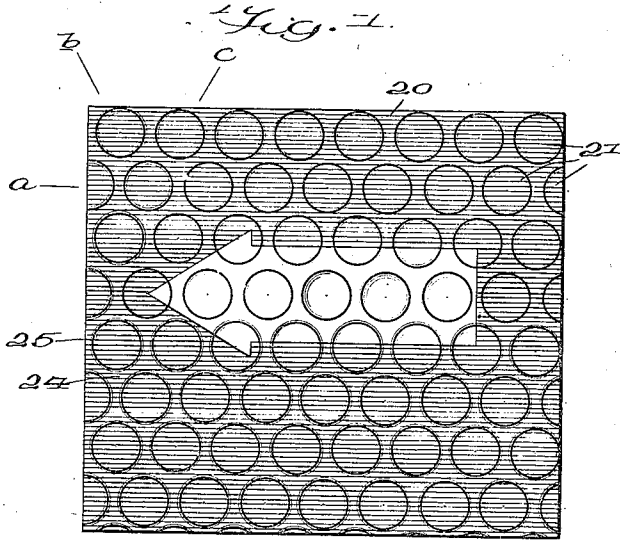


Fig. 4.

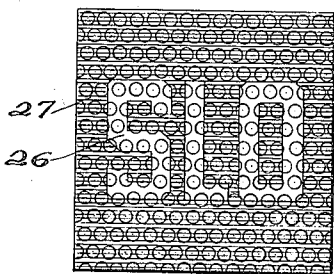


Fig. 5.

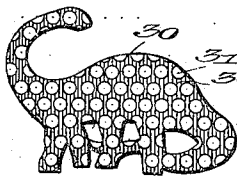
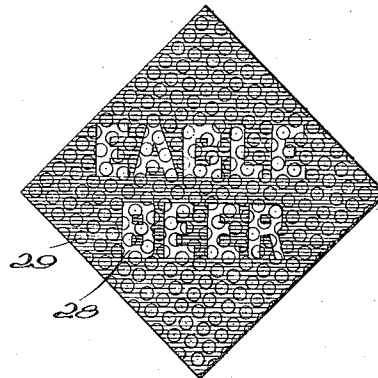


Fig. 6.

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2 Sheets-Sheet 2

Fig. 7.

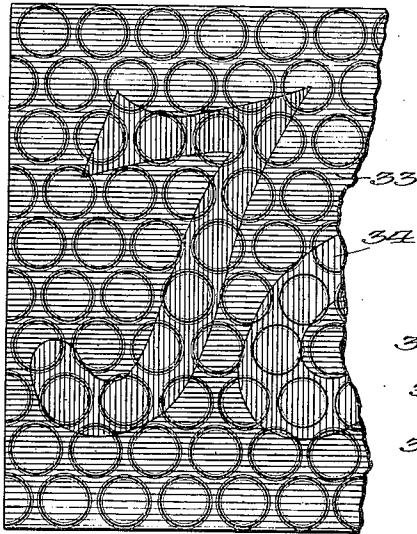


Fig. 8.

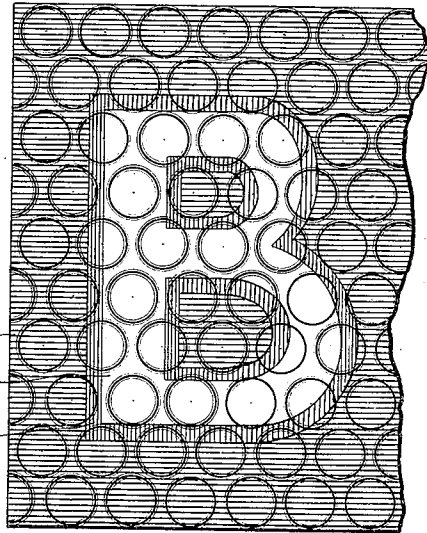


Fig. 9.

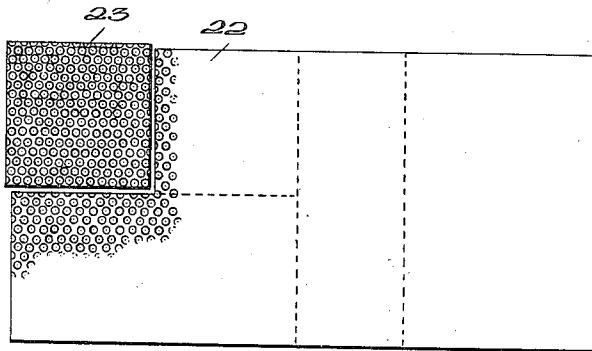


Fig. 10.

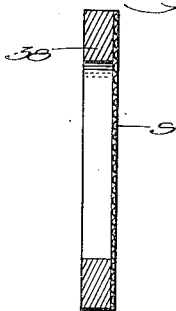
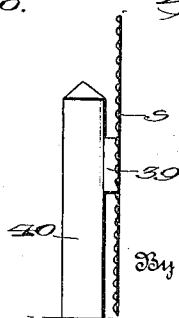


Fig. 11.



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UNITED STATES PATENT OFFICE

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LIGHT REFLECTING DISPLAY DEVICE AND MANUFACTURED BLANK THEREFOR

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Application November 29, 1935, Serial No. 52,262

8 Claims. (Cl. 40—135)

This invention relates to light reflecting display devices of durable, simple and cheap construction, suitable for indoor use but particularly adapted for use outdoors under exposed conditions, and which are equally adapted for warning, advertising and other purposes. One of the important objects of the invention is to provide a reflecting sign of generally superior light reflecting properties and construction to the types of reflecting signs now in common use.

An important concept of the invention involves the provision of manufactured reflecting units of standardized construction and of identical design throughout which may be produced and supplied in blank form in one or more stock sizes, and having universal application for all types, styles, sizes and shapes of reflecting signs, and which blanks may be completed into their final sign form anywhere both cheaply and quickly, even by unskilled persons, to provide a clear-cut display which will be visible at long distances and over a wide angular range. The sign units incorporate a multiplicity of integral and individual reflectors and have an overall light-sensitive surface. The blanks may be sold in such form for making into signs by the consumers or the signs may be readily completed from the blanks at the time of sale, and of course various signs of stock design may be made at the factory which supplies the blanks. In any event, the reflector blank units may be readily made into signs without expensive facilities or labor.

In producing a display sign it is only necessary to take one of the blank unit sheets which may constitute a stock size or be taken originally from a larger stock sheet, cutting the same if necessary to secure a special size and shape, and coating upon the reflecting face according to the intended design of the sign with paint or like material. The portions of the face which are to reflect light will preferably be left clear so that they will be directly exposed to illumination. Such portions, however, where a colored reflection is desired, may have a thin coating of very clear and transparent light colored varnish or similar coating applied thereto without absorption of light by the coating to an extent which would materially reduce the sensitivity of the face or seriously interfere with the reflection of light thereby. In the other areas of the face a solid color opaque coating, preferably a deep color may be employed to render such areas entirely non-reflecting. However, where a certain amount of reflection is desired, a clear transparent colored coating may be used in contrast with the other reflecting portions of the sign. The coating materials in any event should be of good quality to endure exposure to the atmospheric elements.

Whether the sign is to produce a clear reflected

design, or a colored or multicolored design, it will be understood that the sign is produced solely by applying the design to the manufactured blank in coating form. No glass or flexible transparent face covering is necessary. Moreover, the same is not desirable because the covering material absorbs a portion of the incoming light and, having a finely exposed surface, reflects and diffuses a portion of the light throughout the entire field of the sign face, and this results in a general glare that cuts down the clarity of outline and general visibility of the sign as well as lessening the intensity of the reflected light which the sign is capable of producing. Furthermore, the use of a cover even though tightly applied will not prevent the penetration of dirt and moisture with their dimming effect to the reflecting face of the sign. While the exposed sign of the present invention may become dirty, it will be continually washed off by rain if exposed or can be quickly cleaned manually.

A further advantage of the present construction is that the blank units may be renovated and reused. Assuming that one sign has been formed on a blank and has served its purpose, the coating may be removed by suitable solvents and an entirely new design applied.

From what has been said it will be understood that the sign blank and the coated complete sign of the present invention involve a simple, single ply construction having obvious advantages and economies over the usual types of reflecting signs of laminated construction or consisting of an assembly of individual dot reflectors, all of which must be factory designed and built complete, and which must be manufactured from the foundation up as special articles according to the particular design and use desired.

The general features and advantages of the invention having been set forth, reference is now made to the following detailed description of certain embodiments thereof in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a face view of a small sign according to the invention showing particularly the multiplicity of individual reflectors in actual scale;

Fig. 2 is a vertical section of a sign blank on the same scale as to Fig. 1;

Fig. 3 is a diagrammatic view illustrating schematically the manner of reflection of an incoming beam of light obtained according to the invention;

Figs. 4 and 5 show full sized signs of different form according to the invention;

Figs. 6, 7 and 8 all illustrate modified forms of sign according to the invention, the lining in Figs. 7 and 8 denoting colors;

Fig. 9 is a view of a large manufactured re-

fecting blank in sheet form which may be divided and made into signs of smaller size;

Figs. 10 and 11 are views in side elevation of completed signs, emphasizing the simplicity of construction and showing several ways in which the signs may be mounted.

As above mentioned the signs are formed from a previously manufactured blank, a small section of which is indicated at 20 in Figs. 1 and 2. Such blank constitutes a single ply of sheet metal in flat plate form. The metal should be sufficiently thick to be durable and self-sustaining. Since the blank is to constitute a reflector, it is important that its reflecting face lie in a single plane so that a light beam impinging thereon will be reflected at the same angle and with uniform intensity over the entire face. Too light gauge metal which easily breaks or bends should be avoided since it is intended that the sign blank shall not be flexible, and in many instances the sign formed from the blank will have to be mounted without any supporting backing or other reinforcing structure.

The entire front face of the blank 20 should be bright and sensitive to light. To this end the face will be plated, preferably with chromium. Nickel may be employed but the same does not maintain its brilliancy as well as chromium. In any event the bright surface, and the metal blank itself, should be non-corrosive and otherwise weather-resisting so as to adapt the same to exposure without the necessity for any protective housing or cover. While steel might be desirable because of its strength, I find it more practical to use copper metal sheeting because of its non-corrosive character and because a better and enduring face plating may be obtained thereon. Copper is of course a relatively soft metal but I find that a medium gauge sheeting thereof is sufficiently rigid and self-sustaining for my purposes.

The blank 20 is provided throughout its area with a uniform arrangement of individual reflectors comprising concave depressions 21. These may be formed by die-stamping the blank. As previously mentioned the entire face of the blank is plated so that the flat surfaces between the individual depressions as well as the depressions themselves have reflecting properties.

The size, depth and arrangement of the reflecting elements 21 are of considerable importance in the success of the reflecting sign. Such elements are quite shallow and relatively small in area. While their proportions may be varied within a limited range, it may be stated that they should be less than a hemisphere, and that the widthwise radius should be at least twice the depth and may be many times greater than the depth. The elements are of substantially parabolic form. While not necessarily lying on the arc of a circle, it may be stated that the curvature of the concave surface is such as would be determined by a radius substantially greater than half the widthwise diameter.

In Figures 1 and 2, the reflecting elements 21 and their arrangement are shown fairly accurately to scale, and in the form which I have found suited to provide a reflecting sign of any type and character which is visible for long distances and over a wide angular range. It will be observed that the reflecting elements 21 are of marble size. While not limiting myself to the exact size and depth of the elements, it may be stated that in the form shown they are approximately $\frac{3}{8}$ " in diameter with a $\frac{1}{8}$ " radius, having a depth of about $\frac{1}{16}$ " and a curvature ap-

proximating an arc having about $\frac{1}{4}$ " radius. While the formation of the depressions with the proportions indicated is satisfactory for practically all purposes, it may be mentioned that in the case of extremely large signs the reflectors may be made proportionately larger and in the case of very small signs somewhat smaller.

The reflecting elements are arranged in uniform geometric design to extend over the entire face of the blank 20, preferably even including the edges. They are arranged in straight parallel rows *a* which, in the embodiment of Fig. 1, extend in a transverse direction. The elements of adjacent rows lie in nested relation so that the elements are very close together with their peripheries almost touching, and only narrow flat portions of the reflecting face intervening between. It will also be noted that the elements form diagonal parallel rows *b* and *c* which form a 60° angle to each other and to the rows *a*. It will be observed in Fig. 1 that the flat areas of the face between the reflecting elements 21 are extremely narrow and that it is impossible to find even a narrow band extending in a straight line across the face between the rows of depressions in any direction. The purpose of this arrangement is to insure a better reflected image with no apparent dark spaces between the beams projected by the individual reflecting elements.

The reflecting elements must be of concave form so as to reflect the incoming light in concentrated converging beams of high intensity. This effect is illustrated in Fig. 3 which schematically illustrates the reflecting action of the individual reflecting elements 21 to an incoming beam of light *I* as transmitted from a distant source. If the reflecting elements produced any scattering or diffusion of the light the reflected image of the sign would not have nearly as great intensity or visibility and the outline would be far less clear-cut.

By making the elements of relatively small size and closely grouping them together, it is possible to form practically any design of sign with letters and/or symbols of any size and shape and extending in any direction. Since the reflecting elements are uniformly arranged throughout the face of the blank, and since the face is in a flat plane, the reflected beams of light in one unit area of the face will be of the same character and have the same intensity as at any other point.

Since the flat areas of the face as well as the depressions are plated, such flat areas will give some reflection, although with a lesser intensity than the light reflected by the concave depressions. This is desirable inasmuch as the reflected design of the sign will be clearer if the light is apparently reflected as a solid large beam instead of a multiplicity of individual small beams.

I have found that a sign with reflectors composed and arranged as described is visible up to distances of 600 or more feet, and that a sign formed therefrom can also be clearly seen at relatively great distances depending upon the size of the design. The shallowness of the reflecting elements makes the sign sensitive to light transmitted over a wide angular range with respect to the plane of the reflecting face. Similarly, the sign will be intelligible over a range only slightly short of 180°, which is to say that the sign can be seen by a person in a position at only a slight angle to the plane of the face.

What I have termed the reflecting sign blank which comprises the metal sheet with its overall plated face and multiplicity of individual reflecting elements may be made in any size and shape.

In many instances the blanks will be sold for making into a sign by the purchaser. They may be supplied to retail dealers in certain stock sizes which will have the dimensions of standard size signs. Again they may be supplied in large sheets 22 such as illustrated in Fig. 9 and smaller blanks 23 of any required sign size cut therefrom on order. In making a completed sign it is only necessary to coat reflecting surface portions of the face of the manufactured blank with paint, varnish, lacquer or the like according to any desired sign design to provide contrasting areas which react differently to illumination.

An opaque coating, preferably dull and of dark color, may be applied to the reflecting surface in areas of the face which are not to be light-reflecting. In this connection it may be mentioned that the concavities of the reflecting elements in such coated areas break up the continuity of the coated surface and minimize the production of a reflected glare from the coated surface such as would detract from the clarity of outline of the reflecting areas. That is to say, by breaking up the surface of the non-reflecting areas through the presence of the concavities a better contrast is obtained between the coated and reflecting areas than if the coated areas constitute a continuous flat surface.

In Fig. 1 the lined portion 24 indicates a coated surface portion of the blank of black or other solid color. The same forms a background for and outlines the reflecting area 25, which in the illustration takes the form of a miniature arrow such as frequently found on highway markers. The exposed plated reflecting area of the arrow is uncoated so as to be directly exposed to illumination.

In Fig. 4 I have shown on a reduced scale a highway warning sign of familiar type, the exposed reflecting characters 26 being outlined by an opaque coated background 27. Fig. 5 shows an advertising sign with a visible display generally indicated by the numeral 28 and outlined by painting over the remaining area 29 of the reflecting face. It will be noted by a comparison of Figs. 4 and 5 that the sign blank may be turned in any way and the reflecting characters formed entirely without regard to the direction in which the rows of reflecting elements extend.

In Fig. 6 I have shown another form of sign such as particularly suited for the display of trade-marks or other symbols. Here the sign is formed by cutting the reflecting blank 30 to the desired design and all of the reflecting elements 32 are exposed and operative to produce a reflected image over the entire area of the blank 30. As in the case of the signs involving a painted outline for the reflecting surface, the fragmentary reflecting elements at the edges of the display serve to give a clear-cut outline to the reflected image. To enhance the daytime appearance of signs of this type, the flat surfaces 32 between the reflecting elements may be painted. If a light, bright colored paint be used the coloring will also show up to some extent at night at short range, particularly where a bright source of illumination is available.

In the embodiments of signs so far described the reflecting display portions have been indicated as uncoated so that the plated reflecting surface is exposed, and the coated areas indicated as opaque and non-reflecting. This is the best arrangement from the standpoint of efficiency. However, it may be desired to produce a color effect in the reflected display, and also in more elaborate signs to provide contrasting multi-color

effects in different portions of the sign. While necessarily decreasing the sensitivity of the sign to light, such effects can be produced where desired in a simple and efficient manner without the use of colored filter screens in front of the sign. Thus, in the embodiment of Fig. 7, the background area 33 and the characters 34 are both coated, contrasting colors being used in the two areas. In at least one of the areas the coating must be in the form of a very clear transparent varnish or similar coating which should have low light-absorbing properties so as to detract from the reflecting capacity of the sign as little as possible. Such coating should be of a light color such as yellow, orange or red. The second area of the sign may be in the form of an opaque coating so as not to reflect any light, in which case a single colored display will be provided, but the same may also be in the form of a transparent coating of contrasting color. In the latter case both areas of the sign will be coated and light-reflecting, so as to produce a multi-colored effect. In Fig. 7 the lining indicates black in the area 33 and red for the characters 34. As explained, however, this color arrangement may be reversed or entirely different colors utilized, and one or both of the areas made light-reflecting by employing a clear, transparent colored surface. Fig. 7 collaterally shows that script type letters may be made in signs according to the present invention with the same facility as block letters or symbols. The showing is a fragmentary portion of a sign bearing the word Tourists such as are frequently found along the highways.

In Fig. 8 I have shown a further multi-color effect wherein the portion 35 of the sign is coated with one color, the portion 36 with a second color, and the portion 37 left with the plated surface uncoated. The portion 35 forms an outline for the character 37, and the portion 35 the general background. Either or both of the portions 35 and 36 may be opaque or transparent, depending upon the particular effect desired. Of course, too, the reflecting portion 37 could be provided with a transparent coating of a color contrasting with the other areas.

From a consideration of the various embodiments illustrated, it will be evident that practically any type display, either plain or colored, may be embodied in a reflecting type sign as constructed according to the present invention. It will, furthermore, be understood that the sign comprises only the plated metal reflector blank with coating according to any desired sign design.

As will be best understood from Figs. 10 and 11 the sign is not provided with any glass or other transparent face cover, but constitutes merely a single ply flat construction, the face of which is left open for direct exposure to illumination. The efficiency of the sign is markedly greater than where a transparent cover is employed both in its sensitivity to illumination, the intensity and clarity of the display, and the distance and angle at which the sign can be read. These advantages are in addition to the fact that the present sign can be made more cheaply, economically and quickly than the usual types of reflecting signs.

With further reference to Figs. 10 and 11, it will be noted that I have therein shown several simple mountings for the sign S. In Fig. 10, the sign is mounted upon a simple wooden frame 38 to which the sign may be nailed or bolted. Such a frame is convenient, although it should be observed that since the metal blank of the sign is self-sustaining and more or less reinforced by the

presence of the reflecting depressions therein, a frame is needed for reinforcing purposes only in the case of signs of comparatively large size. In Fig. 11 the sign is fastened to a small block 39 which in turn is supported on a post 40. Such type mounting is more or less conventional for highway warning signs.

The types of mounting just referred to are merely illustrative, as in any case the manner of supporting the sign will be determined by the particular circumstances. Since the sign is equally adapted for highway warnings or other display signs along the highways, general advertising purposes at places of business, and on the sides and rear of motor vehicles, and in fact under practically any conditions where a sign can be made visible by vehicle head lights, street lights, any other artificial source of light as well as the natural illumination of the sun, numerous different types of mountings may be employed.

I claim:

1. A light reflecting display device comprising a stiff metal plate having a front face which is subject to direct exposure to illumination, said face having a bright reflecting surface and being provided with a multiplicity of individual light reflecting depressions in uniform closely spaced arrangement throughout the face, said face having certain light reflecting portions coated with a transparent composition adapted not to seriously interfere with the reflecting power of the bright surface of the depressions and which coating conforms to the contour of the depressions, said face having other portions of the reflecting surface adjoining the transparent coated areas coated with another composition and which react differently to illumination than said reflecting portions.

2. A light reflecting display device comprising a stiff metal plate having a front face which is subject to direct exposure to illumination, said face having a bright reflecting surface and being provided with a multiplicity of individual light reflecting depressions in uniform closely spaced arrangement throughout the face, the face being directly coated in adjoining areas with coating compositions of different contrasting colors, the colored coating in at least one of such areas being clear and transparent to provide colored reflected light in such area.

3. A light reflecting display sign sheet material comprising a self-sustaining single ply flat blank of relatively rigid and durable sheet metal stamped with a continuity of circular offset surface elements of very shallow curved contour closely arranged with only narrow sinuous flat surface areas extending between the different elements, and a light reflecting metallic plating on the entire surface of the sheet on the side formed with the concave faces of the offset elements, said elements reinforcing the sheet and constituting individual reflectors sensitive to illumination over a wide range relative to the plane of the blank and reflecting rays of light in converging beams.

4. A light reflecting sign blank consisting of relatively rigid and durable sheet metal in flat form having a light sensitive metal plated reflecting front face, and being suitable for use as a sign under exposed conditions without housing or transparent cover or backing, the reflecting front face being stamped throughout its area with a continuity of individual plated concavi-

ties of saucer-shaped form arranged uniformly throughout the face with the edge of each depression only very slightly spaced from the adjoining depressions, said depressions being very shallow in relation to their size with a depth not exceeding half their widthwise radius so as to be sensitive to light disposed at any point over an extremely wide range relative to the plane of the reflecting face and viewable over a similar wide range.

5. A light reflecting flat sign blank of stiff durable metal sheeting having a plated light reflecting front face and stamped with relatively small and extremely shallow depressions of circular shape and curved contour having a radius at least twice the depth, said depressions being crowded close together throughout the entire face of the blank in almost edge to edge relation and providing individual light reflecting elements sensitive to light over an extremely wide range relative to the face of the blank, the blank being adapted to provide reflecting designs by painting out limited portions of the reflecting face, and being constituted of metal which may be readily cut so that signs of any size and shape but with uniform optical characteristics may be formed from the blank.

6. A light reflecting sign consisting of a single ply blank of stiff and durable sheet metal having a bright metal plated face, said face being stamped with a continuity of circular depressions of relatively small size and so shallow that the depth is not more than half the radius, said depressions being uniformly arranged throughout the face with only narrow sinuous flat surface areas running between them, the blank having certain areas of its face exposed and permitting the depressions in such areas to reflect in a series of convergent beams light received from a source at any point over an extremely wide range relative to the plane of the face, the blank in adjoining areas of its front face being provided with a light absorbing coating, the depressions in said coated areas serving to break up the surface and avoid objectionable glare from light which impinges on such areas.

7. A sign comprising flat sheet metal having a front face composed of adjoining opaque non-reflecting areas and light reflecting bright plated areas in selected arrangement, said front face throughout the reflecting and non-reflecting areas having formed therein relatively small shallow depressions of circular shape and curved contour whose depth is not more than half the widthwise radius, said depressions being arranged in closely spaced uniform relation with only narrow sinuous flat surface areas of the face extending between the different depressions.

8. A sign comprising flat sheet metal having a bright metal plated front face, portions of the plated face having formed thereon an opaque surface coating rendering the same non-reflecting, and other portions of the plated face adjoining the coated portions being exposed and light reflecting, said front face throughout the reflecting and non-reflecting areas thereof having formed therein extremely shallow circular depressions of curved contour, whose depth is not more than half the widthwise radius, arranged in closely spaced uniform relation throughout the front face with only narrow sinuous surface areas of the face extending between the different depressions.

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