

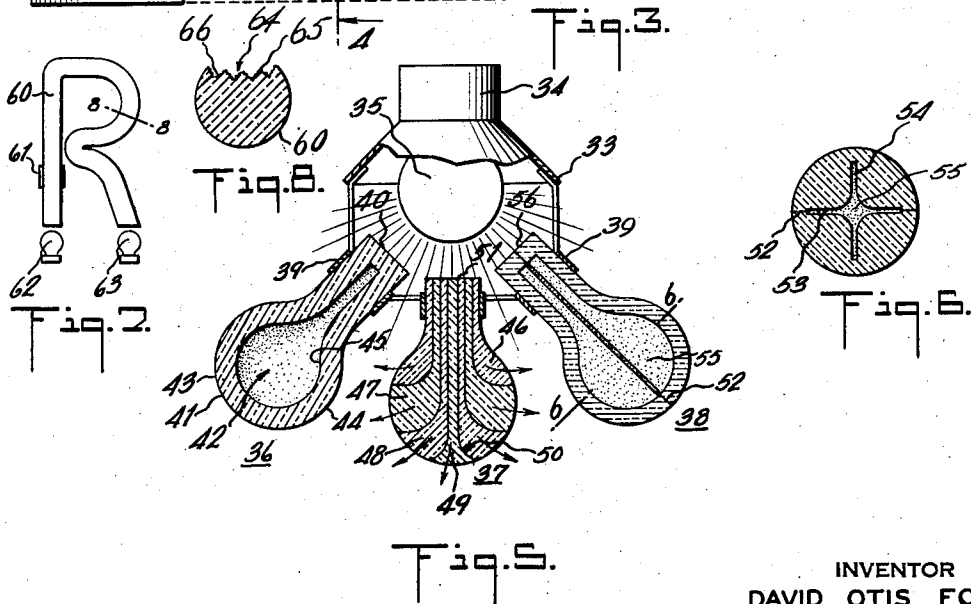
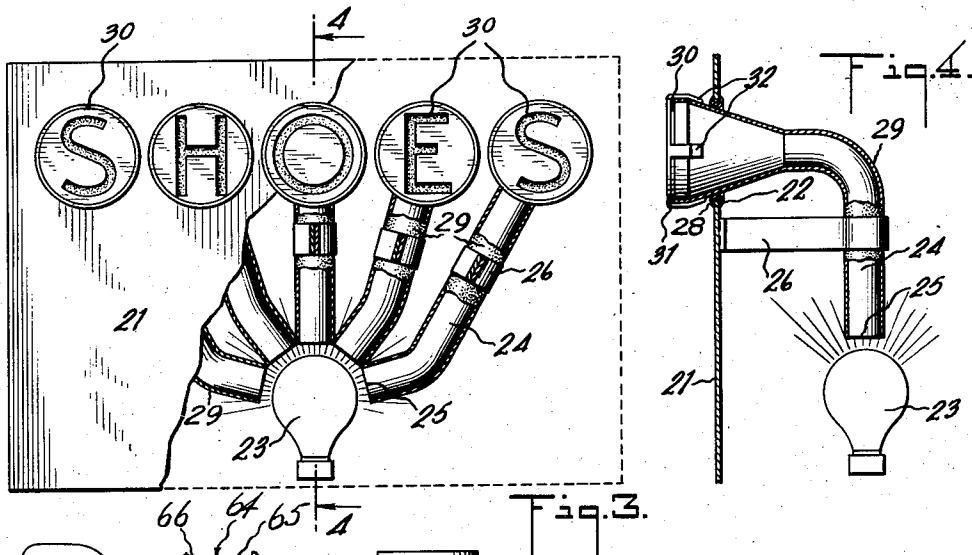
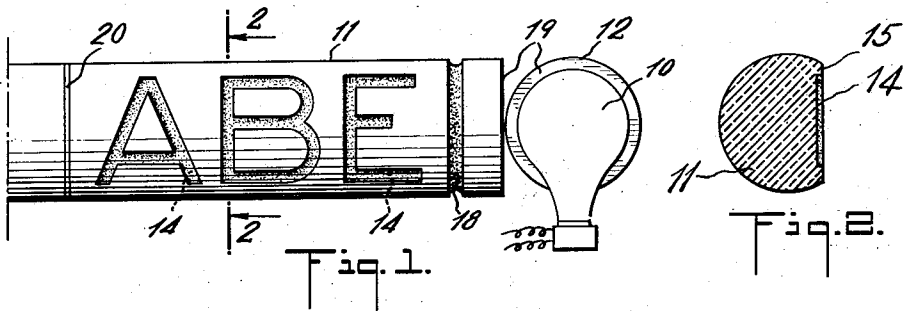
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DISPLAY SIGN

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DISPLAY SIGN

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19 Claims. (Cl. 41—39)

The invention relates in general to a sign or other illuminated article and specifically relates to a combined light transmitting and sign character providing element of a sign formed of thermoplastic material and to a method of producing such element.

The primary object of the invention is to provide a simplified form of display or illuminated article, specifically a combination of transparent bodies which can be assembled at will in order to provide different showings and novel and pleasing forms of sign display and to effect a brilliantly illuminated showing of sign characters while minimizing in the amount of light usually necessary for such illumination, and thus an important object of the invention is to provide a form of sign which can be economically operated.

Another object of the invention is to provide for what may be called a cold light sign or illuminating device and thus permit the installation of a sign or illuminating device in places where it would not be convenient or desirable to have a source of light as in a refrigerator or compartment containing combustibles and which sign can be illuminated from a remote or otherwise convenient location outside of the limits of the sign proper and outside of the space illuminated thereby. Such form of device, of course, requires the use of some form of light transmitting element and the present disclosure particularly relates to the providing of an improved form of such light transmitting element which can be easily constructed to disclose any desired sign character or symbol.

The invention has for another object the providing of a sign in which the sign characters can be readily replaced in case of damage or to form different words and in the invention herein disclosed this is most easily obtained by the use of readily replaceable light transmitting elements each one of which is provided with its own sign character.

The present disclosure accordingly features a light transmitting element for a sign which can be conveniently assembled with other similar light transmitting elements each forming a sign character or each provided with its own sign character formed thereon as a permanent part thereof. It has been suggested that this light transmitting element be formed of glass, quartz and like transparent materials but it has been found difficult, if not impossible, to form such materials into sign characters or to form the necessary sign characters on such hard frangible material which

does not lend itself readily either to bending or to machine operation, and machine operations are necessary especially where such sign elements must be produced on transparent material economically as a factory proposition.

Accordingly, the invention features the forming of the sign elements from a plastic form of transparent material identified as methyl-methacrylate or equivalent polymerized derivative of methacrylic acid and marketed under the trademark designation of "Lucite." This particular material has been specifically selected due to its optic characteristics and to the fact that it can be readily machined or bent to shape particularly under certain circumstances.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawing and in part will be more fully set forth in the following particular description of one form of apparatus embodying the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawing:

Fig. 1 is a fragmentary view in side elevation of one of the combined light transmitting and sign character forming elements and showing an end view of another similar element shown associated with a source of light and constituting a preferred embodiment of the invention;

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1 looking in the direction indicated by the arrows;

Fig. 3 is a view in front elevation of another form of sign illustrating another embodiment of the invention with part of the sign face broken away to show the normally hidden parts of a set of elements and a source of light;

Fig. 4 is a vertical transverse sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is another embodiment of the invention in the form of three bulb-like members shown for the most part in horizontal section and grouped about a single source of light;

Fig. 6 is a detailed transverse sectional view of one of the bulb-like elements and taken on the line 6—6 of Fig. 5;

Fig. 7 is an elevational view of a sign character bent to shape, shown associated with two light sources at opposite ends; and

Fig. 8 is an enlarged transverse sectional view taken on the line 8—8 of Fig. 7.

Referring first to the form of the invention

shown in Figs. 1 and 2, there is shown part of a four-arm sign including a centrally positioned source of light 10 specifically shown to be an electric light bulb and which may be regarded as a street indicator. Extending radially from the source 10 is a plurality of bars or rods of which two are shown extending at right angles to each other, one of which marked 11 is shown in front elevation and the other marked 12 is shown in end elevation. It is suggested that the complete sign comprise four such rods or bars extending radially from the light source 10. These bars or rods are of similar construction so the detailed description of one will suffice for any number grouped about the source 10. The bar 11 is of substantially cylindrical form and is formed from a bar of methyl-methacrylate initially having a highly polished outer surface.

The rear side of the bar, that is, the side opposite the side facing the observer is formed with a flat face 15 which is machined as hereinafter described to form thereon a plurality of sign characters 14. Forming these characters on the rear side so that they are visible through the opposite rounded side causes them to appear slightly magnified and with a brilliant lustre. For the purpose of showing that the bar may be provided with decorative effects other than sign characters, there is disclosed a groove 18 adjacent the light induction end 19 of the bar, which end faces the light source 10. The bar may be formed of two lengths of material with a screen or divider 20 positioned between the two halves and the two parts cemented or otherwise secured together to hold the screen in place. This screen is a layer of a colored material such as Cellophane but may be more or less opaque. In those cases where the screen 20 is opaque, it is suggested that another source of light be located at the left end of the bar, that is, the end opposite the end 19 so as to illuminate the portion of the bar to the left of the screen.

The sign characters 14 are formed by cutting operations, preferably on a bar of methyl-methacrylate, the outer surface of which bar is initially smooth and preferably provided with a glass-smooth or polished finish. In performing this operation, the bar is heated to a temperature above 190° F. and is preferably positioned in a bath of boiling water, and thus exposed to a temperature of approximately 212° F. for a short period of time and at least until the surface to be treated has somewhat softened to a depth of approximately one-sixth of an inch. Care is exercised not to extend the heating step for a time duration which would cause the blank bar to lose its initial configuration or to cause the surface to become so soft that it could not be cut. While this step of heating the surface is not absolutely necessary to form the best type of area desired, it has been found that a better effect is created and the surface responds more readily to the cutting operation by preheating the same than is the case when such preheating or surface softening is not employed. The surfaces are machined, cut or drilled preferably by the use of a high speed steel tool. It is suggested that an improved effect is created if the cutting tool be dull. In the usual process of machining nitrocellulose plastics and in urea-formaldehyde and phenol-formaldehyde resins, care is exercised to use high speed and lubricants to avoid chatter marks. On the contrary, in practicing the cutting operation as herein described no such care is exercised, no lubricants are used and every

effort is made to produce chatter marks and equivalent rough effects as such effects tend to create a diffusion of the light rays out of their paths. The cutting operation extends below the surface for an appreciable distance so that the resulting characters may be said to be embedded in the material rather than simply scratched or sanded surfaces. This cutting action is not a surface treatment but is a distinct deep rough cutting operation which causes the slightly plastic surface engaged by the cutting tool to become gummy with a resulting whitish or silver-like translucent area. As far as can be ascertained, this rough cutting of the surface especially when slightly soft develops a multitude of irregularly shaped and angularly disposed facets which catch the light rays passing through the bar, reflecting the same outwardly while diffusing the rays with the result that the sign character such as 14 when so formed shines prominently in strong contrast with the balance of the surface and provides a sign character which can be seen for a relatively long distance when taking into consideration the relatively small amount of light discharged from the source 10.

After the blank has been so machined, it is permitted to cool slowly to atmospheric temperature after which it will permanently retain its machined shape. In operation it will be understood that the light rays from the source 10 passing axially through the several rods 11 and 12 will be reflected by the small facets forming the several sign characters 14 and diffused in such way that the sign characters will show up as white areas brilliantly illuminated. Where the light passes through a colored screen, the areas will, of course, take the color of the screen.

Referring to the form of the invention disclosed in Figs. 3 and 4, there is shown a sign having an opaque front face 21 provided with a line of apertures 22 of which five are shown in Fig. 3 to receive the sign characters forming the word "Shoes." A source of light 23 is located in rear of the face 21 and preferably in an out-of-the-way position.

Located between the light source 23 and the apertures 22 are five combined light transmission and sign character providing elements 24. These elements are of similar construction except for differences in angle between the opposite ends thereof and different sign characters, so the detailed description of one will be sufficient for any of the other ones.

The several elements 24 are each provided with a light induction end 25 of relatively small cross-sectional area so that the several ends can be grouped closely in a circular arrangement about and in close proximity to the light source 23. The elements 24 are demountably secured to the face 21 each by means of a metal clamp 26 engaging the element at its midlength. The upper end of each of the elements is enlarged to a funnel-shaped or conical form and the enlarged end of each element is intruded through one of the openings 22. These elements are solid forms of methyl-methacrylate initially cast to form or bent to shape when first softened in a hot water bath. It is appreciated from viewing Fig. 3 that the elements which form the end characters of the sign, in this case the end "S's" of the word "Shoes" are bent more sharply than the middle "O" character and in general it will be understood that each element is bent to best fit the location in which it is intended to be used. A rubber gasket or washer 28 is used to

mount each element 24 in its associated opening 22 and to seal the joint therebetween from light filtering therethrough. It is suggested that an opaque sleeve 29, preferably of rubber, enclose the exposed side of the element 24 to avoid light leakage laterally out of the same.

A thin transparent or translucent circular disc 30 of Celluloid or equivalent material with the desired sign character corresponding to that shown at 30 in Fig. 3 printed or otherwise impressed thereon may be removably held in place by a metal clamp 31 having spring fingers 32 which engage against the receding conical side of the enlarged end to hold the disc 30 in place.

In operation, it will be understood that the light from source 23 passes axially through the several light transmitting elements to illuminate its associated character, in this case the word "Shoes," which shows brilliant white or silver-stroked letters with diffused light and acting to form a pleasing effect.

Referring to the form of the invention shown in Fig. 5, there is disclosed a frame 33 supported from a base 34 and provided with a source of light 35. Positioned in advance of the source of light is a plurality of bulb-like light transmitting elements of which three different specific forms are shown at 36, 37 and 38 and each formed of methyl-methacrylate. It is understood, of course, that usually only one form of such elements will be used at any one time. These elements are supported from the frame by brackets 39 and are preferably so arranged that the elements supported thereby may be readily replaced to change the sign display.

These elements may be free of any sign characters thereon and so form spots of light utilized in their particular grouping to form words simply by virtue of their relative arrangement.

Referring first to the elements 36 at the left of Fig. 5, there is disclosed a bulb-like body with an end 40 of reduced cross-sectional area facing the source of light 35 and located with its axis extending in a radially directed position so that the light is caused to pass axially into the end 40 of reduced diameter and outwardly through the opposite end 41 of enlarged hemispherical form. In this case, the element is provided centrally thereof with a hollow space 42 leaving a wall 43 between the hollow space 42 and the outer highly polished surface 44 of the element. The inner surface 45 of this wall 43 has been cut to form the faceted or roughened surface as described in detail for the formation of the external characters 14 in Fig. 1, before the two halves of the character have been cemented or welded together. It is further suggested that this inner surface 45 be silvered wholly or in part or painted with some substance to give color to the interior of the element.

Referring to the central element 37, it will be noted that it is of a similar bulb-shaped form as shown at 36 and is formed of three preformed concentric bell-shaped sections, 46, 47 and 48, and a centerpiece 49, with the three sections and the centerpiece assembled in telescoped relation fitted one in the other to form the bulb-shape. It is suggested that one or more of the surfaces forming the joint between the sections or between the innermost section and the centerpiece such as the surface 50 be silvered or otherwise treated with a layer of material of contrasting color to emphasize the lines of division between the several component parts of this element.

In operation, it will be understood that the light

rays from the source 35 impinging upon the end 51 of reduced cross-sectional area of element 37 will be reflected by the several jointure surfaces so that the light is diffused outwardly and downwardly, as indicated by the several arrows, and in all directions about the element. The effect produced is that the entire element 37 is luminous.

Referring to the form of element 38 at the right of Fig. 5, there is disclosed another bulb-like element initially molded of two halves cemented together along the jointure line 52. This element is provided interiorly thereof with a pair of intersecting grooves 53 and 54, the walls 55 of some of which are roughened following the method hereinbefore described to form the roughened or light reflecting surfaces forming the characters 14 and 28.

With reference to the operation of the device in so far as this form of element is concerned, it will be understood that the light rays impinging on the reduced end 56 of the element 38 tends to pass freely and axially along the intersecting grooves and these light rays being caught by the roughened surface 55 are deflected and diffused so that the entire element takes on a brilliant whitish or silvered appearance.

Referring to the form of the invention disclosed in Figs. 7 and 8, there is disclosed a sign character 60, in this case shown to be a solid bar of methyl-methacrylate bent to the form of an R, constituting one of a series of such characters arranged with a plurality of similar characters constituting letters coacting to form a complete sign.

These sign characters 60 are intended to be demountably held in place on the sign support by a mounting shown symbolically by the clamp 61 and more particularly disclosed in my pending application, Serial No. 274,643 filed May 19, 1939.

In this case both ends of the R are exposed to receive light from two sources 62 and 63 but usually one light source is all that is necessary to illuminate such a sign character.

The element 60 was initially a straight cylindrical bar of methyl-methacrylate, as commercially produced "Lucite." While still straight it was placed in a bath of hot water, preferably boiling water (212° F.) until the surface was slightly soft without effecting the rigidity of the bar as a whole.

The bar with its surface so softened was inserted in a milling machine, with a dull milling tool and one side of the soft surface cut more or less deeply to form a half moon shaped groove or depression 64 extending as far as desired along the length of the rear side of the bar. The face of the groove 64 is in turn grooved with a plurality of relatively small V-shaped grooves 65, the surface of which is roughened as shown at 66, to form a cut faceted area on the rear side of the finished character. This produces a whitish background which gives the impression that the transparent letter is formed of a milk white substance. The bar is then reheated, preferably by leaving it in a hot water bath for a longer time than was necessary for the surface softening as above described but at a less temperature, for example, about 175° F. and until the entire bar becomes bendable without breaking or cracking. The bar so softened is carefully bent to fit a suitable mold or templet, such for example, as a mold for forming the R of Fig. 7, care being exercised to locate the grooved side rearwardly of the front or forwardly exposed face of the character. "Lucite"

has been found a particularly suitable material for use in forming such characters as it can be readily bent to shape when slightly softened and lends itself to being shaped to form letters and similar sign characters, even those with relatively sharp bends in the succeeding strokes of the letter.

In operation, it will be understood that light from each source 62 or 63 or both pass into the adjacent end or ends of the character. The light rays are caught by the multitude of facets formed incidental to the rough grooving of the rear side of the character and are reflected toward the front or exposed side of the character with incidental diffusion of the light giving the entire element a soft white, opal effect.

In any of these forms of the invention illustrated, the indicated source of light may be a neon, argon or similar luminescent gas tube so that it is possible by using "Lucite" elements to provide a "neon" sign as elements ramifying from a single active neon tube.

By constructing a sign as herein suggested and, of course, using a white light at the source, it is possible to obtain the equivalent of a neon sign in the production of a soft-non-glare light with the additional advantage that the sign will show with a white light in place of the usual colored light characterizing present forms of neon lights.

The invention has been described particularly in connection with the use of polymethyl-methacrylate, a colorless resin, as it produces high light transmission with crystal clear transparency but it is within the scope of the disclosure to utilize a form of "Lucite" or equivalent form of thermoplastic material of either the soft or hard grades and which contains dyestuffs and pigments capable of producing brilliant transparent and translucent tints adding to the effectiveness of the sign display.

It is also suggested that particles of foreign bodies capable of reflecting light be either embedded in the surface of the bar while soft to give the desired sign characters, or diffused throughout the interior of the bar in the process of molding the bar to shape as in the case of the Fig. 7 disclosure.

These particles may be cracked pieces of a hard grade of "Lucite" mixed with the molding powder of a softer grade, or they may be formed of glass or other crystals mixed into the powder before molding. It is also suggested that moist air be forced under pressure through the molten mass of "Lucite" to form air pockets or bubbles in the molded article so as to give the desired internal light reflection and diffusion.

I claim:

1. In the art of preparing a light transmitting sign element, the method which consists in heating a blank formed of a polymerized derivative of methacrylic acid to about 212° F. to soften a surface area of the blank and raggedly cutting a sign character of desired form into said soft surface area for an appreciable depth to form a roughened area beneath the level of the surface capable of disclosing the sign character as a whitish area when light is passed through the blank parallel to said cut surface.

2. In the art of forming a light transmitting sign element, the method which consists in subjecting a blank of polymerized derivative of methacrylic acid to the heating effect of boiling water for a period of time sufficient to soften one of its exposed surfaces without changing the

initial configuration of the body and drilling, grooving or similarly machining said soft surface with roughened areas to form therein a desired form of sign character having a silver-like reflecting surface comprising a multitude of angularly disposed facets capable of reflecting light passed through the blank parallel to said surface.

3. In the art of preparing an article from a transparent body of methyl-methacrylate, the method which consists in heating the body sufficient to soften one of its faces without affecting the original configuration of the body, machining said face while soft with a dull tool to cut therein a translucent area formed of a multitude of gummy-like angularly disposed facets and permitting the cut body to cool to atmospheric temperature.

4. The method which consists in heating a body of methyl-methacrylate having a highly polished surface to a temperature of approximately 212° F. and machine cutting a design into a portion of said polished surface while at such temperature.

5. In the art of forming sign characters, the method which consists in surface heating a bar of methyl-methacrylate, subjecting one side of the heated bar to the action of a dull tool of a high speed milling machine operating under conditions to form in the surface grooves having chatter marks and bending the grooved bar while soft into the shape desired.

6. In a sign, the combination of an elongated light transmitting element formed of methyl-methacrylate, with one surface having a translucent area with tool markings thereon, said element being otherwise transparent, and a light source for directing a ray of light through said element, and against said tool markings in said translucent area to cause the light rays to be reflected by the tool markings to show a sign character.

7. A body of methyl-methacrylate having a translucent area of prescribed form in one face thereof and within the outlines of said face and the balance of the body being transparent, said translucent area being located a material distance below the surface of the transparent face and forming a multitude of minute light reflecting facets disposed at a multitude of angles to the general plane of the translucent area and means for directing light rays through the body and on to said minute reflecting facets to be diffusely reflected therefrom.

8. An element of a sign comprising a cylindrical bar constructed of a polymerized derivative of methacrylic acid having a sign character formed in a rear face thereof and extending for a material distance below the surface of said face in distinction from being merely a roughening of the surface of said face and the front face of said bar being highly polished the strokes forming said sign characters being each formed primarily of a flat layer of irregularly shaped and angularly disposed facets, said sign characters being slightly magnified when viewed through the rounded front polished face of the bar.

9. A sign including a sign face provided with a plurality of openings, a plurality of solid light transmitting elements one for each opening and each having an end of enlarged cross-sectional area protruding through one of the openings, and provided with a sign character at its enlarged exposed end, the opposite end being of relatively small cross-sectional area whereby a

large number of said small ends may be grouped closely together about a point, said sign characters coacting to form a word, a single source of light at said point in rear of the sign face and disposed to direct light into the ends of the elements of small cross-section opposite the enlarged end whereby the sign elements are illuminated from a single light source.

10. A light transmitting element of bulb-like form constructed from a polymerized derivative of methacrylic acid and having a light receiving end of small cross-sectional area and a light discharging end of relatively large cross-sectional area, the exterior surface of said element being smooth and having within its outline and thus spaced from its exterior surface, a roughened surface capable of reflecting and diffusing light as it passes through the element from end to end out through said smooth exterior surface.

11. A light transmitting element constructed from a polymerized derivative of methacrylic acid having a recess within its outlines outlined by a plurality of relatively flat walls, and otherwise solid and a source of light for directing light through the element and through said recess, at least one wall of said recess having thereon machine markings to render the same translucent to diffuse the light passing through the same.

12. A light transmitting element having its exterior surface smooth and provided with an interior recess and otherwise solid, said recess being outlined by a wall, at least a portion of which is silvered.

13. A bar-like length of methyl-methacrylate bent to form a sign character and having a machined face constituting a three dimensional means for reflecting light laterally out of the character and incidentally diffusing light rays passing longitudinally through the bar-like length.

14. A luminous sign including a translucent element composed of methyl methacrylate resin fashioned to disclose a display character, a source of illumination to illuminate and irradiate said display character and a colored transparent member carried by said element and placed be-

tween said source and said display character to irradiate said color through that portion of said translucent element beyond said screen.

15. A luminous sign comprising a casing, a plurality of translucent hollow elements composed of methyl methacrylate resin and having their bases secured to said casing, said translucent elements scored on the inside to reflect light from a source of illumination, and a source of illumination in the casing and external to said elements for irradiating the same.

16. A luminous sign comprising a casing, a plurality of translucent elements each composed of methyl methacrylate resin and certain of said elements having an angled form in which one part extends at an angle to another part, means for mounting the elements in the casing to locate a part of each exteriorally of the casing and a part intruded within the casing, the parts of the elements exterior of the casing provided with light reflecting parts and a single source of illumination in the casing facing the intruded ends of the elements to irradiate said light reflecting parts.

17. A sign element formed entirely of methyl methacrylate resin forming a connected arrangement of strokes and bends shaped to form a display character, with one end forming a light induction and straight stroke forming end adapted to be exposed to a source of illumination and means for mounting the element in place.

18. A sign element formed entirely of methyl methacrylate resin and displaying a sign character, one side of said element provided with a groove in turn grooved with a plurality of relative small grooves forming a whitish field visible through the front face of the element.

19. In the art of forming a sign character, the method which includes the step of forcing air under pressure through a molten mass of transparent methyl-methacrylate to form light reflecting air pockets or bubbles therein and molding the resulting molten mass into a desired form of homogeneous material.

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