Oct. 2, 1962 P. BRIENZA 3,056,221

ILLUMINATED SIGNS

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FIG. 1

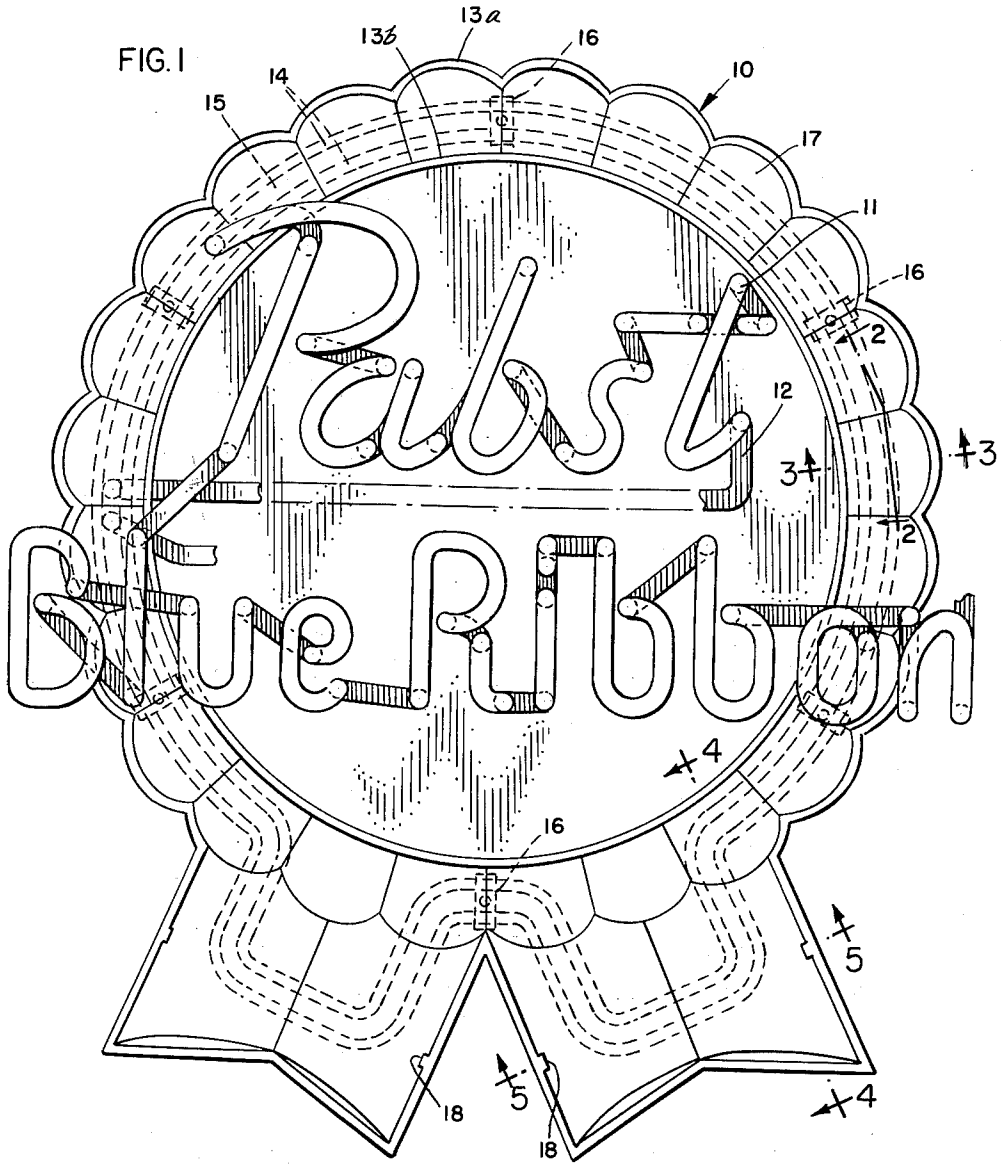

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FIG. 2

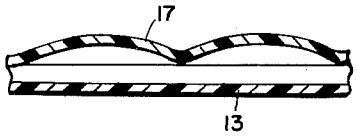


FIG. 3

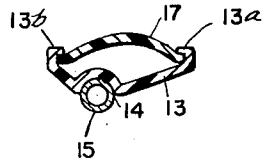


FIG. 4

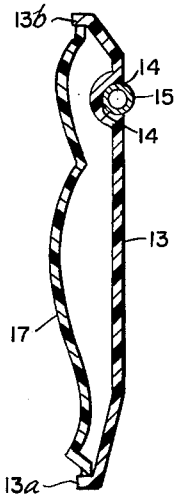
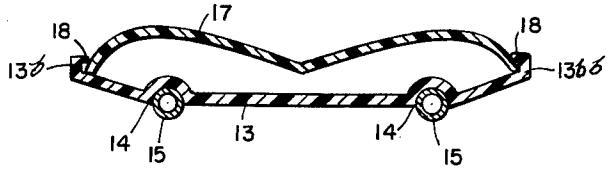


FIG. 5



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ILLUMINATED SIGNS

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2 Claims. (Cl. 40—130)

The present invention relates to improved illuminated sign structures. More particularly, the invention is directed to novel display signs which use elongated tubes as a source of illumination.

Since the discovery of inert gases over fifty years ago, elements such as argon, neon, and helium have been widely employed in advertising signs. If an inert gas is placed in a glass tube and if a current of electricity is passed through the gas, a bright glow is produced. The color formed by passing the current through the gas is dependent both upon the particular gas and upon the particular tube coating that is used. If neon gas is activated, for example, a bright red glow usually results, whereas a blue color is obtained from mercury vapor and neon, a yellow color from helium in a yellow glass tube, and green from neon and mercury vapor in a yellow tube.

Inasmuch as window display signs, for example, often are illuminated for long periods of time, it is important that the cost of the operation of the sign for a given period be kept as low as possible. Additionally, because the function of the sign is to attract attention, it is likewise important that the sign be appealing and distinctive.

It is an object of the present invention to provide an improved illuminated sign structure which can be operated economically.

Another object of the invention is to provide a novel sign arrangement wherein light from one or more elongated tubes is distributed throughout the body of the sign.

Another object is to provide a sign structure which is unique and which can be used to form unusual and advantageous color combinations.

Other objects will become apparent to those skilled in the art from the following detailed description of the invention.

In general, it has been found that a plastic backing of a methyl methacrylate polymer coupled with a translucent, dyed overlay material provides a unique and advantageous combination for use in forming illuminated signs. More particularly, if a luminescent tube is placed in contact with a sheet of methyl methacrylate polymer and if a translucent and dyed overlay material is placed on the sheet of methyl methacrylate polymer unusual lighting effects can be produced at a low expenditure of energy for a given degree of effective light.

Methyl methacrylate polymers are well known in the plastics industry. They are sold in the form of tubes, sheets, etc., under the trademarks Lucite, Plexiglas, and Perspex. These polymers possess many useful properties such as excellent clarity, stability to light and heating, and moderately high softening temperature which makes them a satisfactory synthetic glasslike plastic for most operations.

Methyl methacrylate monomers can be prepared in many ways. They can be formed, for example, by dehydrating hydroxyisobutyric acid esters according to the following equation:

$$CH_3C(CH_3)OHCOOR \longrightarrow CH_2{=}C(CH_3)COOR + HOH$$

The dehydration can be carried out in vapor phase over catalysts such as phosphates at 320° C. The monomer can also be produced by dehydrohalogenating an alpha

or beta halogen isobutyric ester (see U.S. Patent 2,013,048).

Methyl methacrylate syrup that is used to cast sheets of a polymer can be prepared by heating the monomer with or without an added catalyst and by using well controlled agitation. In one process, 0.02 to 0.5% of benzyl peroxide is dissolved in the monomer after which the material is heated at 80 to 100° C. until a syrup forms. The syrup is then quickly cooled and degassed before pouring into a mold. A continuous process for preparing methyl methacrylate syrup is described in U.S. Patent 2,391,393. In this process, a monomer is added continuously to a large mass of slowly polymerizing syrup at constant temperature. The product is withdrawn and cooled continuously at the same rate as the monomer is added.

Among the synthetic plastics, methyl methacrylate polymers have unusual stability and unusual optical properties. This material has the ability to pipe light from one end of a sheet or tube of plastic to the other end. The transmission of the light is accomplished by multiple internal reflection from air-plastic surfaces. The light can be conducted around curves so long as the outer radius of the curve is not less than three times the thickness of the sheet or the diameter of the rod.

The accompanying drawing serves as an illustration of the invention. In the drawings:

FIG. 1 is a front elevation of a display sign;

FIG. 2 is a cross-sectional view taken on section **2—2** of FIG. 1;

FIG. 3 is a cross-sectional view taken on section **3—3** of FIG. 1;

FIG. 4 is a cross-sectional view taken on section **4—4** of FIG. 1; and

FIG. 5 is a cross-sectional view taken on section **5—5** of FIG. 1.

In FIG. 1, sign **10** is shown as consisting of neon tubing **11** which is formed in the shape of the particular trademark to be displayed partly by means of blocked out portions **12**. The blocking out can be accomplished by painting, taping, or otherwise treating various sections of the tube. One end of tubing **11** is connected to a conventional transformer which is not shown. The outer portions of the sign consist of layers of plastic material. A backing of clear methyl methacrylate polymer **13** includes a channel which is defined by ridges **14** for accommodating a tube **15**. The tube is maintained in the channel by means of retainer clips **16**. This tube can be a continuation of the luminescent tube **11** or can be a separate luminous tube. An overlay of translucent, colored plastic **17** is seated within the outline of sheet **13**. The two layers of plastic are held together by lugs **18**. When the luminous material is activated in tube **15**, light is transmitted through sheet **13** to borders **13***a* and **13***b*. It is important that the borders not be sanded or engraved inasmuch as this would destroy the light transmitting properties of the polymer. Improved results are obtained when the edges are polished. Overlay **17** is also illuminated by light passing through sheet **13**; the amount of illumination, of course, depends upon the particular material and shade of dye used in preparing plastic layer **17**. Borders **13***a* and **13***b* are as bright as tube **15** even though they are some distance removed from the source of light. An arrangement of this sort conserves electrical energy and provides a uniformly illuminated sign.

In FIG. 2, the relationship between the methyl methacrylate polymer and the overlay plastic is shown. The plastic sheet **17** can, of course, assume any number of desired shapes.

FIG. 3 is a cross-sectional view taken along section **3—3** of FIG. 1. This figure shows tube **15** resting within

the channel defined by ridges **14** of sheet **13**. Borders **13***a* and **13***b* are also illustrated in this figure. Plastic overlay **17** is illuminated by light transmitted from tube **15** through methyl methacrylate layer **13**.

FIG. 4 is a sectional view taken along line **4—4** of FIG. 1 which again shows the relationship of light transmitting base **13** and overlay **17** of the sign.

FIG. 5 is still another sectional view which is taken along section **5—5** of FIG. 1. In this instance, two portions of tube **15** are shown as well as the relationship between parts **13**, **17**, and borders **13***a* and **13***b*.

It is obvious that the subject invention can be utilized with a great variety of display signs. It is essential, however, that a backing of methyl methacrylate polymer be used in combination with a translucent overlay of plastic. The translucent overlay can also be a methyl methacrylate polymer which has been dyed a particular color, or it can be any one of several other types of plastic or glass. The luminous tubes can be filled with neon or another inert gas or can be elongated incandescent tubes. Similarly, the tubing can be coated on its inner surface with a fluorescent material and can contain mercury vapor. In this instance, a flow of electrons through the tube gives ultraviolet light which, in turn, enables the coating (phosphor) to emit visible light.

The overlay material as well as the tubing can be any one of several colors. Conventional methods of dyeing plastic are suitable for use in the subject invention in preparing the overlay plastic.

It is apparent that the use of sheets of methyl methacrylate with their ability to transmit light greatly reduces the amount of electrical energy needed to produce a given amount of light. The sign can be uniformly illuminated from a single course which makes it unnecessary to use several luminescent tubes. Improved results are obtained where the tube is in contact with the polymer. The illuminated border of the sign created by extending the methyl methacrylate sheet beyond the plastic overlay produces an edge effect which is very desirable. In this instance, the borders are substantially as bright as the tube itself.

Obviously, many modifications and variations of the above invention can be made without departing from the spirit and scope of the invention. For this reason, only such limitations should be placed on the invention as are indicated by the following claims.

The invention is hereby claimed as follows:

1. An improved illuminated sign having a display pattern formed from an elongated luminous tube which comprises: a translucent, dyed plastic member; a sheet of clear methyl methacrylate polymer surrounding said plastic member on all but its front side and having end portions engaging the edge portions of said dyed plastic member forming a closed envelope therewith and exposing a border of said methyl methacrylate sheet around said dyed plastic member, a portion of the back of said methyl methacrylate sheet being so shaped as to define a channel; an electric discharge tube of the neon type in contact with said sheet and lying within said channel, said sheet of clear methyl methacrylate polymer being between said electric discharge tube and said dyed plastic member; and means for activating said electric discharge tube, said electric discharge tube serving to illuminate said dyed plastic member and said border of said methyl methacrylate sheet.

2. An illuminated sign as in claim 1 wherein the luminous tube which forms the display pattern is a continuation of the tube which lies within the channel in the back of said sheet of methyl methacrylate.

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