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DISPLAY DEVICE

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Fig. 1.

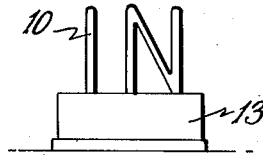
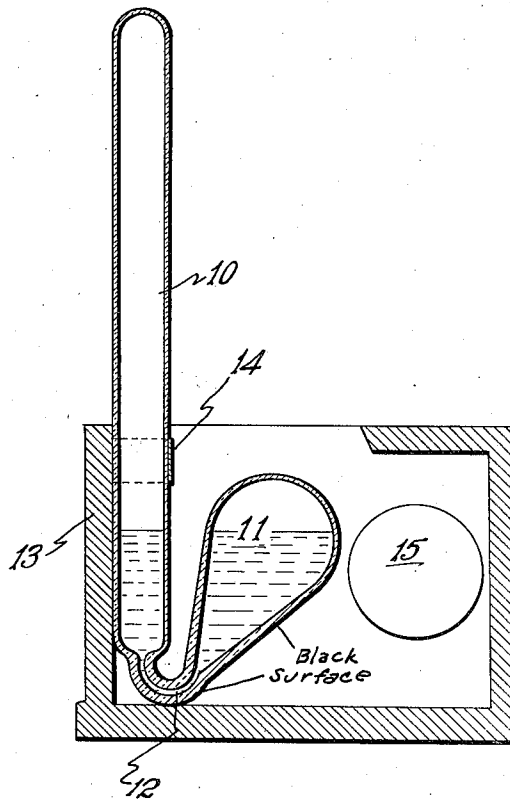


Fig. 2.



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## DISPLAY DEVICE

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5 Claims. (Cl. 40—130)

This invention relates to display devices and more specifically to illuminated signs.

In general, it is an object of the invention to provide a device of the character described, which will more efficiently perform the purposes for which it is intended, which is simple and economical of construction, which can be expeditiously, conveniently and safely used, and which can be readily manufactured and assembled.

Another object of the invention is to provide a translucent sign having moving gas and liquid elements therein; to provide such a sign wherein the gas has an intermittent but regular motion within the liquid; and to provide such a sign wherein the liquid is colored but wherein the coloring does not become localized by the heat which generates the gas.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawing, in which:

Fig. 1 is a front view in elevation of a device embodying one form of the invention; and Fig. 2 is an end view in elevation and partly in section of the device shown in Fig. 1.

This invention contemplates a display device mounted preferably in a casing and having an exposed translucent part in which a liquid may be seen to bubble. Heat is supplied to give the energy required to produce the bubbling and light may be supplied to illuminate the liquid and the bubbles. The translucent part is in the form of a character such as a letter, a numeral, a sign, an emblem or a design or any combination thereof. The term "translucent" is intended to embrace the term "transparent".

The liquid occupies but part of the space within the device, the pressure within the remainder of the space being at less than atmospheric at room temperature. A volatile liquid such as acetone or ether is preferably employed. This may have sufficient natural color for display purposes, or coloring matter may be added. The bubbling is attained by heating the lower end of the device, whereby, as described below, a part of the liquid is gasified and passes through the remainder of the liquid to the top of the device when the normal room temperature causes the gas to condense and fall back as a liquid toward the bottom of the device.

The liquid in the device may be colored in any convenient way as by having a dye in solution

as a constituent. Colored suspensions or powders may be used. There is a tendency for the dye or other source of color to bake out into that part of the device which is exposed to heat with a result that, after a time, the liquid in the translucent part of the device returns to its normal condition which may be colorless. It is within the contemplation of the present invention to permit the liquid to remain in contact with the heated portion for a relatively short period and to change constantly the liquid which is so in contact. The liquid in the herein described device retains its color after long use, neither dye nor suspended coloring matter baking out on the walls of the heated reservoir.

In the form of the invention illustrated in Figs. 1 and 2, the upper portion of the device comprises a hollow glass display character 10, which may represent a letter of the alphabet, or a display unit of any desired shape. An upturned vapor chamber 11 is connected with the interior of the character 10 by means of a narrow capillary passageway 12. The diameter of the passageway is small as compared to the internal diameter of the character 10. The former may be 1 mm. and the latter 6 mm. Letters such as R, N or X have a vapor chamber at the lower end of each leg. The vapor chamber 11 should be so proportioned that a bubble of vapor remains in it in order to quickly start the operation of the device. A quantity of liquid is introduced which is slightly less than the interior volume of the character when the liquid is heated and expanded during operation. The device is then evacuated and sealed off. The particular liquid employed is determined by the available heat and the degree of vacuum in the device and may contain a dye or other ornamental substances. Ether, acetone and such highly volatile fluids will operate satisfactorily under conditions of low heat. A casing 13 is provided and the character 10 supported therein by a spring clamp 14 which may be mounted to slide laterally and afford adjustable spacing between the different characters. An electric lamp 15 is placed in the casing 13 in close relation to the vapor chamber 11 and is arranged so that light is directed upwardly against the character 10 while the light source is concealed. The lamp 15 also provides the heat necessary to cause operation of the device.

The operation is as follows:

The lamp 15 is lighted and communicates heat to the chamber 11 in which most of the liquid has settled. As chamber 11 becomes warmer the volume of contained vapor is expanded and the

rate of vaporization increased. The increasing pressure of the vapor forces all of the liquid out of the chamber 11 and into the passageway 12 and character 10. As the last of the liquid passes the lowest point of the passageway 12, a bubble of vapor is released into the character 10 where it rises to the top surface of the liquid and condenses against the relatively cool upper surfaces which form a condensing chamber for the device. The bubbles are released in spaced succession, the action being due to a pressure difference between the two bodies of vapor, with periodic discharges of vapor from the warm, higher pressure body to the cooler, low pressure body.

As illustrated in Fig. 2, the under surfaces of the chamber 11 and capillary passage 12 are blackened. In an assembled sign the rate of bubble discharge in the various characters may be equalized by varying the area of the blackened surfaces, and so varying the amount of effective heat applied.

The frequency of bubble discharge is increased by the capillary passage, and a much more effective display results than when the passage is of the same internal diameter as the character. Under identical temperature conditions the device having a small capillary passage will release a constant succession of bubbles whereas the device having the larger passage will not operate. Identical temperature conditions may easily be provided by applying a covering of moist paper to the upper portion of the device and allowing evaporation to produce a lower temperature at that point than prevails at the lower vaporizing chamber, whereupon the device operates by atmospheric heat.

The particular size of the vapor chamber 11 is not a critical factor provided a bubble of vapor remains in it to serve as a nucleus when heat is applied since it is essential to quick operation that there be vapor at each end of the liquid column.

Many changes and modifications may be made in the device here shown and disclosed without departing from the spirit and scope of the invention as expressed in the following claims:

1. In a bubbling display device, a plurality of hollow translucent display characters, a liquid contained in each of said characters, a vapor chamber adjacent the lower end of each character and a passageway joining said chamber with the interior of said character, means for

generating a vapor pressure in said chambers whereby a succession of bubbles rises through said characters, and means for equalizing the rate of bubble discharge in said characters which includes a removable heat absorbent surface adjacent the lower portion of said device.

2. In a bubbling display device, a plurality of hollow translucent display characters, a liquid contained in each of said characters, a vapor chamber adjacent the lower end of each character and a passageway joining said chamber with the interior of said character, means for generating a vapor pressure in said chambers whereby a succession of bubbles rises through said characters, and means for individually regulating the heat absorption of said vapor chambers whereby the rate of bubble discharge in said characters may be equalized.

3. In a bubbling display device, a plurality of hollow translucent display characters, a liquid contained in each of said characters, a vapor chamber adjacent the lower end of each character and a passageway joining said chamber with the interior of said character, means for generating a vapor pressure in said chambers whereby a succession of bubbles rises through said characters, and means including a removable coating on each vapor chamber whereby the rate of bubble discharge in said characters may be equalized.

4. In a bubbling display device, a hollow translucent display character, a liquid contained in said device, a vapor chamber extending upwardly adjacent the lower end of said character, a passageway of substantially smaller cross section than the interior of said character, said passageway extending between said vapor chamber and the interior of said character, and means for generating vapor pressure in said character whereby a succession of bubbles rises through the liquid in said character.

5. In a bubbling display device, a hollow translucent display character, a liquid contained in said device, a vapor chamber extending angularly upward adjacent the lower end of said character, a passageway of substantially smaller cross section than the interior of said character, said passageway extending between the lower ends of said character and said vapor chamber, and means for generating vapor pressure in said character whereby a succession of bubbles rises through the liquid in said character.

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