

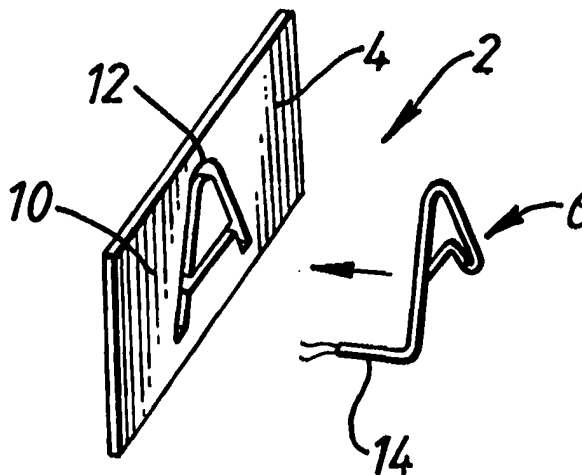


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/GB98/00545 (22) International Filing Date: 20 February 1998 (20.02.98) (30) Priority Data: 9704166.9 28 February 1997 (28.02.97) GB 9706272.3 26 March 1997 (26.03.97) GB (71) Applicant (for all designated States except US): MINIFLAME LIMITED [GB/GB]; Selectron House, Springhead Enterprise Park, Gravesend, Kent DA11 8HD (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): WATSON, Peter, Matthew [GB/GB]; Reynolds Farm, Luddesdown, Gravesend, Kent DA13 0XB (GB). HUCK, Lennox, Mark [GB/GB]; 30 Linden Road, Gillingham, Kent ME7 2PH (GB). (74) Agent: JONES, Graham, Henry; Graham Jones & Company, 77 Beaconsfield Road, Blackheath, London SE3 7LG (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: SIGN APPARATUS**(57) Abstract**

Sign apparatus (2) comprising a substrate (4) and a sign (6) on the substrate (4), the sign (6) comprising a flexible strip of electroluminescent material which is bent to the shape of the sign (6) and which becomes illuminated consequent upon receiving an electrical current from a power source.



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SIGN APPARATUS

This invention relates to sign apparatus and, more especially, this invention relates to sign apparatus which is able to be illuminated.

There are many different types of sign apparatus which are able to be illuminated. Usually the lighting employed to illuminate the sign apparatus becomes hot. This may present a problem if the lighting apparatus is likely to be touched by persons, or if the lighting apparatus is being used in a place where a build up of heat is to be avoided. Still further, the light sources employed often fail and need replacing.

It is an aim of the present invention to reduce the above mentioned problems.

Accordingly, in one non-limiting embodiment of the present invention there is provided sign apparatus comprising a substrate and a sign on the substrate, the sign comprising a flexible strip of electroluminescent material which is bent to the shape of the sign and which becomes illuminated consequent upon receiving an electrical current from a power source.

The sign apparatus of the present invention is advantageous in that the strip of electroluminescent

material is able to become illuminated without also becoming hot. Still further, the strip of electroluminescent material is robust in use and is much more unlikely to become broken than light sources in the form of filament bulbs or neon tubes. Still further, because the strip of electroluminescent material is flexible, it is easily bent to the shape of the sign. The sign may be any suitable and appropriate sign including letters, words, logos, abstract or pictorial designs, or combinations of the aforesaid. The sign can be used for any purposes currently used by signs, for example for advertising or promotional purposes.

Preferably, the flexible strip of electroluminescent material is of substantially circular cross sectional shape.

The flexible strip of the electroluminescent material may comprise a first electrode which is a centrally positioned longitudinally extending electrode, and a second electrode which is a helically wound electrode. The first and the second electrodes may be separated by a phosphor coating with a metallic sheet. The second electrode may be surrounded by a sheath of an indium tin oxide. The first electrode is preferably a copper wire electrode. The second electrode is preferably a fine wire electrode.

The flexible strip of the electroluminescent material preferably comprises an outer plastics layer. The outer plastics layer is preferably made of polyvinyl chloride but other plastics materials may be employed.

The sign apparatus may include an electronic circuit for causing the strip of electroluminescent material to emit a continuous light. Alternatively, the sign apparatus may include an electronic circuit for causing the strip of electroluminescent material to emit a pulsating light. The electronic circuit emitting the pulsating light may include timer means for causing the pulsating light.

The sign apparatus may be one in which the power source is at least one battery, and in which the sign apparatus includes an inverter for providing power for the electroluminescent material from the battery. Alternatively, the sign apparatus may be one in which the power source is a mains power source, and in which the sign apparatus includes a mains transformer and an inverter for providing power from the mains for the electroluminescent material.

The sign apparatus may include a panel for providing back lighting for the sign apparatus.

The panel is advantageously made of a sheet of electroluminescent material. The sheet of

electroluminescent material is able to provide the back lighting, whilst at the same time being such that it does not become hot during use, and also being such that it is robust and unlikely to break in use.

The panel may comprise a transparent plastics face sheet, a plastics backing sheet, and the sheet of electroluminescent material positioned between the face sheet and the backing sheet. The panel providing the back lighting may be a rigid or a flexible panel. Similarly, the entire sign apparatus may be arranged to be flexible or rigid. Thus, the substrate can be of any suitable material dependent upon the intended use of the sign apparatus. The substrate may thus be made of a plastics material, a metal or wood. The sign apparatus may be made to be of any suitable and appropriate size, shape and construction.

When the back lighting panel is employed, then this panel may comprise a dielectric layer with a light-emitting phosphor layer sandwiched between two conductive surfaces. The primary purpose of the dielectric layer is to allow the sheet of electroluminescent material to withstand voltages without shorting between the conductive surfaces. The sheet of electroluminescent material illuminates to provide the back lighting when powered with alternating current from the power source.

In a further embodiment of the invention, the sign apparatus may include an edging strip of electroluminescent material.

The edging strip may be one continuous strip of electroluminescent material, bent to a desired shape on the sign apparatus. Thus, for example, the edging strip may follow a path around the periphery of the sign apparatus. The edging strip will then usually be visible from many angles. By following the periphery of the sign apparatus, the edging strip is able to illuminate the outline of the sign apparatus.

The edging strip of electroluminescent material may be of the same construction as the flexible strip of electroluminescent material used to form the sign.

Embodiments of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is a perspective view of first sign apparatus;

Figure 2 is a perspective view showing the composition of flexible strip electroluminescent material from which the sign shown in Figure 1 is made;

Figure 3 is a cross section through the flexible strip of electroluminescent material shown in Figure 2;

Figure 4 illustrates how the sign apparatus of Figure 1 can be battery powered;

Figure 5 illustrates how the sign apparatus of Figure 1 can be mains powered;

Figure 6 is the front view of an adaptor plug used in Figure 5;

Figure 7 is an inside rear view of electrical components used in the adaptor plug shown in Figure 5;

Figure 8 shows second sign apparatus;

Figure 9 shows third sign apparatus;

Figure 10 is a cross section through part of the sign apparatus shown in Figure 9;

Figure 11 shows fourth sign apparatus;

Figure 12 shows fifth sign apparatus;

Figure 13 shows sixth sign apparatus; and

Figure 14 shows an electronic circuit for use in the sign apparatus of the invention.

Referring to Figure 1, there is shown sign apparatus 2 comprising a substrate 4 and a sign 6 which is in the form of a letter A. As shown in Figure 1, the substrate 4 has had its front face 10 provided with a recessed formation 12 in the shape of the sign 6, that is in the shape of the letter A. The sign 6 thus fits neatly into the recessed formation 12 on the front face 10 of the substrate 4.

The sign 6 is made of a flexible strip of electroluminescent material 14. The flexible strip of electroluminescent material 14 is easily bent to the required shape to fit in the recessed formation 12. The strip of electroluminescent material 14 is such that it becomes illuminated consequent upon receiving an electrical current from a power source.

As shown in Figures 2 and 3, the strip of electroluminescent material 14 is of substantially circular cross sectional shape. The strip of electroluminescent material 14 comprises a first electrode 16 which is made of copper and which is a centrally positioned longitudinally extending electrode as shown. The strip of electroluminescent material 14 includes a second electrode 18 which is a fine wire helically wound electrode. The first and the second electrodes 16, 18 are separated by a layer 20 which is made up of a phosphor coating with a minute metallic sheath. The assembly of the first and the second electrodes 16, 18 and the layer 20 is surrounded by a layer 22 which is an indium tin oxide layer. An outer layer 24 forms an outer protective sheath. The layer 24 is made of a polyvinyl chloride plastics material. The measurements shown in Figures 1 and 2 are given by way of example only to illustrate

the overall thickness of the strip of electroluminescent material 14.

Figure 4 is a rear view of the sign apparatus 2 shown in Figure 1. The substrate 4 has a rear face 26 provided with a battery housing 28. The battery housing 28 contains a battery and also an inverter. The sign 6 is such that its strip of electroluminescent material 14 passes through the substrate 4 and into the battery housing 28.

Figure 5 shows a modification to the sign apparatus 2 shown in Figure 4. In Figure 5, the strip of electroluminescent material 14 is connected by a lead 30 to an adaptor plug 32. The adaptor plug 32 is shown in Figure 5 plugging into a socket 34.

The adaptor plug 32 is shown in more detail in Figures 6 and 7. More specifically, it will be seen that the adaptor plug 32 comprises a housing 36 from which projects a plug portion 38 having three pins 40. The housing 36 contains a printed circuit board 42 on which is mounted a circuit 44. Also provided in the housing 36 is a mains transformer 46 and an inverter 48. Figure 7 shows the lead 30 to the electroluminescent material 14. Figure 7 also shows how the housing 36 fits together using screws fitting in four apertures 50.

Referring now to Figure 8, there is shown sign apparatus 52 having the substrate 4 and a sign 6 in the form of the letters PM. The sign 6 is made of a strip of electroluminescent material 14 as described above in connection with Figures 1 - 3. The sign 6 is surrounded by a border strip of electroluminescent material 44 which is of the same construction as the strip of electroluminescent material 14. As can be seen from Figure 8, the letter P is formed on one strip of electroluminescent material 14, the letter M is formed of another strip of electroluminescent material 14, and the strip of electroluminescent material 54 forms a third strip of electroluminescent material. The three strips of electroluminescent material can be connected together and they can be powered by a battery as shown in Figure 4, or by a mains adaptor as shown in Figures 5, 6 and 7.

Referring to Figure 9, there is shown sign apparatus 56 which is like the sign apparatus 52 shown in Figure 8 except that the substrate 4 is larger and it is provided with a panel 58 for providing back lighting for the sign apparatus 56. The panel 58 is made of a sheet of electroluminescent material and it contains a logo 60.

Figure 10 shows a cross section through the top part of the sign apparatus 56 and it will be seen that

the panel 58 comprises a plastics backing sheet 62, a plastics face sheet 64, and a sheet 66 of electroluminescent material positioned between the backing sheet 62 and the face sheet 64. The backing sheet 62 and the face sheet 64 are sealed at their edges 68 to form a sealed structure.

The panel 58 is provided with a lead portion 70 which enables the panel 58 to be powered from the same power source as that used for the sign 6.

Figure 11 shows sign apparatus 72 which is like the sign apparatus 56 shown in Figure 9 except that the logo 60 is simply engraved, printed or otherwise provided on the substrate 4, instead of forming part of the electroluminescent panel 58. Figure 11 also shows an edging strip 74 of the electroluminescent material provided around the edge of the substrate 4 in order to highlight the outline of the sign apparatus 72. The strip of electroluminescent material 74 is of the same construction as the strip of electroluminescent material 14 and is powered from the same power source.

Figure 12 shows sign apparatus 76 which is a combination of the sign apparatus 56 and the sign apparatus 72. More specifically, the sign apparatus 76 has the electroluminescent panel 58 and the edging strip 74.

Referring to Figure 13, there is disclosed sign apparatus 77 having a sign 60 and two grooves 79 in the substrate 4. The logo 16 may be engraved, printed or otherwise provided on the substrate 4.

The grooves 79 receive two or more of the flexible strips of electroluminescent material 14. The flexible strips of electroluminescent material 14 may be placed adjacent each other, for example, back to back. The flexible strips of electroluminescent material 14 may be of different colours, thereby giving interesting visual effects.

Referring now to Figure 14, there is shown an electrical circuit 78 which is a low power electrical circuit 78 and which is employed for providing electricity as required to the various strips of electroluminescent material 14, 54, 74 and where appropriate to the electroluminescent panel 58.

The circuit 78 comprises resistors R1, R2, R4, R5 and R6, capacitors C1, C2, C3 and C4, transistors T1 and T2, and a transformer TF1. An on-off switch 80 is formed by a pair of contacts 82. The capacitors C2 and C3 and the resistor R4 form an oscillator circuit which is completed by the primary of the transformer TF1. The primary of the transformer TF1 is driven by transistor T2. Power for the circuit 78 comes from a battery in the embodiment of the invention shown in

Figure 4. Alternatively, power for the circuit 78 may come from the mains as shown in the embodiment of Figures 5, 6 and 7.

The circuit 78 operates such that the inverter means (not shown) is kept in the off position by the resistor R6 which ensures that the transistor T1 is normally in the off condition. When the contacts 82 are made, then the transistor T1 is switched on. The transistor T1 then fires, through the resistor R1, the oscillator circuit formed by the capacitors C1, C2 and the resistor R4. The primary of the transformer TF1 completes the oscillator circuit. The primary of the transformer TF1 is driven by the transistor T2 as shown. The completed oscillator circuit is tuned to capacitor C2. The capacitor C4 removes ripples in the direct current. The capacitor C3 matches the capacitance required for the electroluminescent material and stops the circuit 78 from generating high off load voltages. The resistor R5 adjusts the current required. By using the centre tap to feed back, it is able to create effectively 9v-0-9v with a 9 volt battery.

The electroluminescent material illuminates when powered by the alternating current from the inverter means. The circuit 78 gives a continuous light from the electroluminescent material.

It is to be appreciated that the embodiments of the invention described above with reference to the accompanying drawings have been given by way of example only and that modifications may be effected. Thus, for example, if it should be desired to cause the electroluminescent material to provide a pulsating light instead of a continuous light, then a timer device may be connected in the circuit 78. The grooves 79 may be in other places in the substrate 4 and the grooves 79 may be curved if desired.

CLAIMS

1. Sign apparatus comprising a substrate and a sign on the substrate, the sign comprising a flexible strip of electroluminescent material which is bent to the shape of the sign and which becomes illuminated consequent upon receiving an electrical current from a power source.
2. Sign apparatus according to claim 1 in which the flexible strip of the electroluminescent material is of substantially circular cross sectional shape.
3. Sign apparatus according to claim 1 or claim 2 in which the flexible strip of electroluminescent material comprises a first electrode which is a centrally positioned longitudinally extending electrode, and a second electrode which is a helically wound electrode.
4. Sign apparatus according to claim 3 in which the first and the second electrodes are separated by a phosphor coating with a metallic sheath.

5. Sign apparatus according to claim 3 or claim 4 in which the second electrode is surrounded by a sheath of an indium tin oxide.
6. Sign apparatus according to any one of claims 3 - 5 in which the flexible strip of electroluminescent material comprises an outer plastics layer.
7. Sign apparatus according to claim 6 in which the outer plastics layer is made of polyvinyl chloride.
8. Sign apparatus according to any one of the preceding claims and including an electronic circuit for causing the strip of electroluminescent material to emit a continuous light.
9. Sign apparatus according to any one of claims 1 - 7 and including an electronic circuit for causing the strip of electroluminescent material to emit a pulsating light.
10. Sign apparatus according to claim 9 in which the electronic circuit includes timer means for causing the pulsating light.

11. Sign apparatus according to any one of the preceding claims in which the power source is at least one battery, and in which the sign apparatus includes an inverter for providing power for the electroluminescent material from the battery.

12. Sign apparatus according to any one of claims 1 - 10 in which the power source is a mains power source, and in which the sign apparatus includes a mains transformer and an inverter for providing power from the mains for the electroluminescent material.

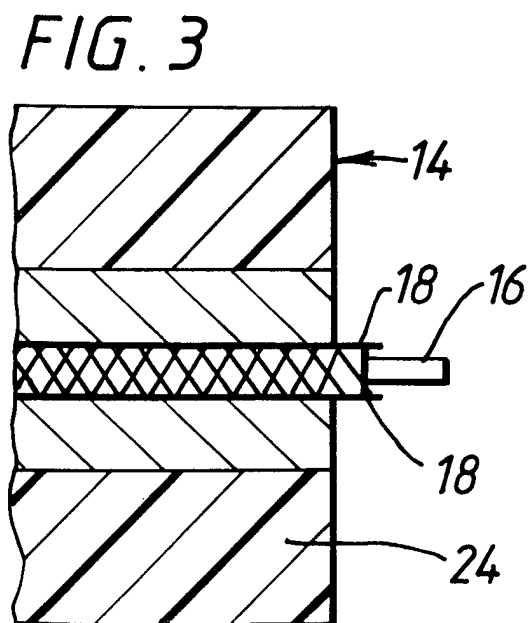
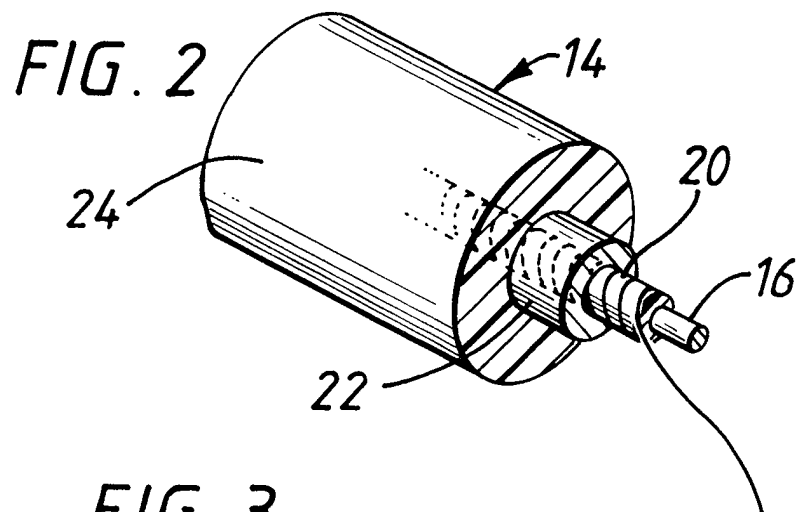
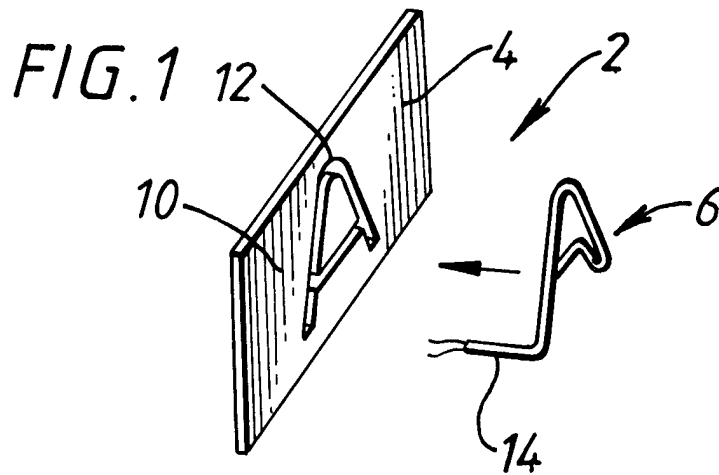
13. Sign apparatus according to any one of the preceding claims and including a panel for providing back lighting for the sign apparatus.

14. Sign apparatus according to claim 13 in which the panel is made of a sheet of electroluminescent material.

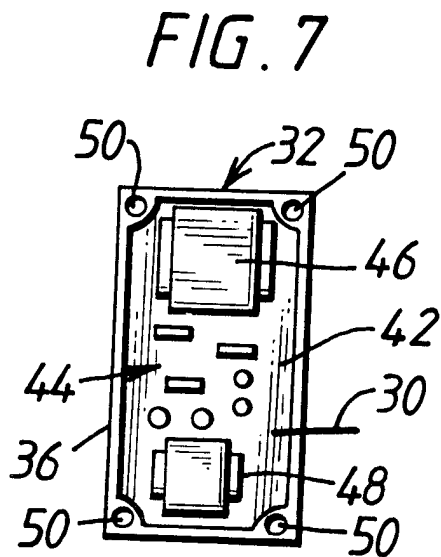
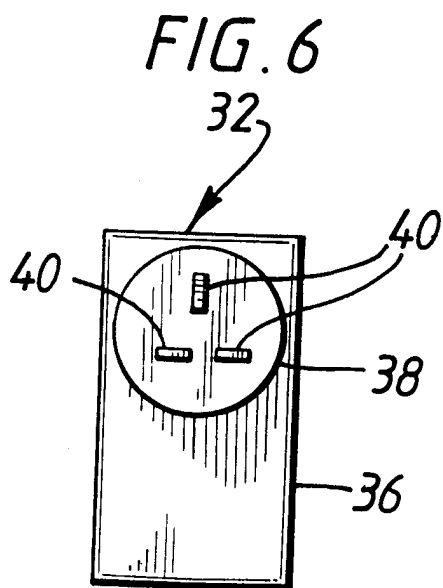
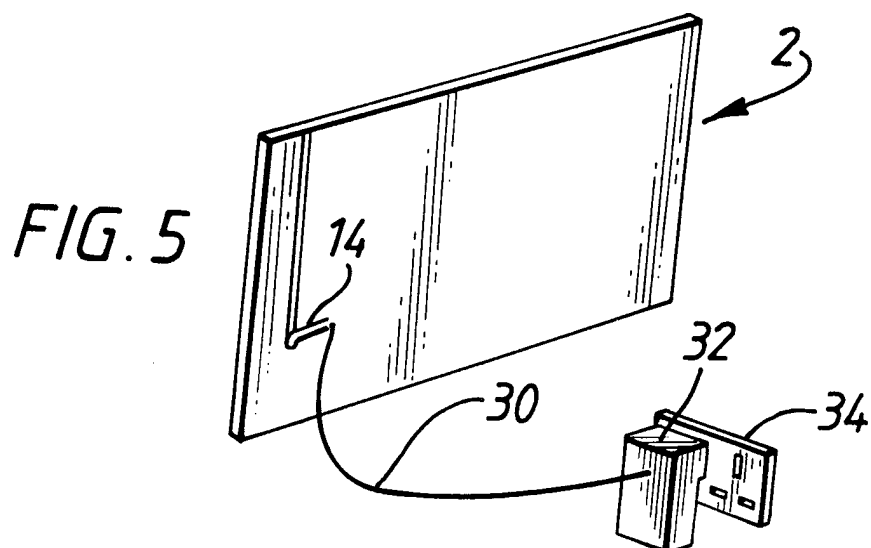
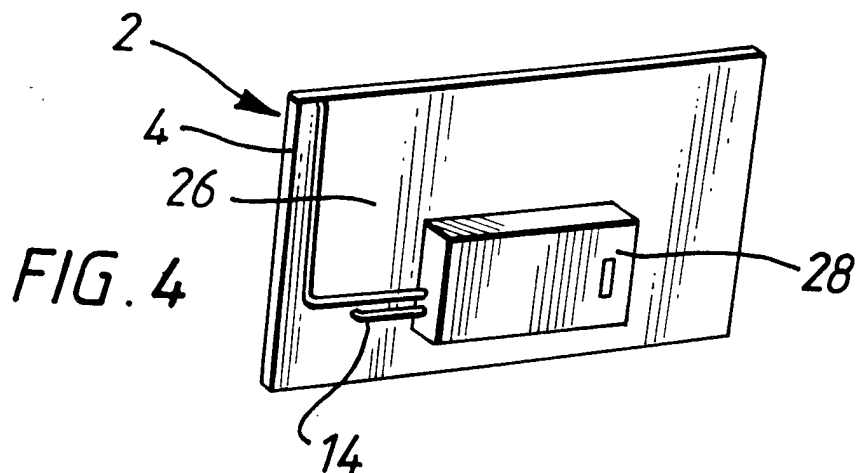
15. Sign apparatus according to claim 14 in which the panel is a sandwich construction comprising a transparent plastics face sheet, a plastics backing sheet, and the sheet of electroluminescent material positioned between the face sheet and the backing sheet.

16. Sign apparatus according to any one of the preceding claims and including an edging strip of electroluminescent material.

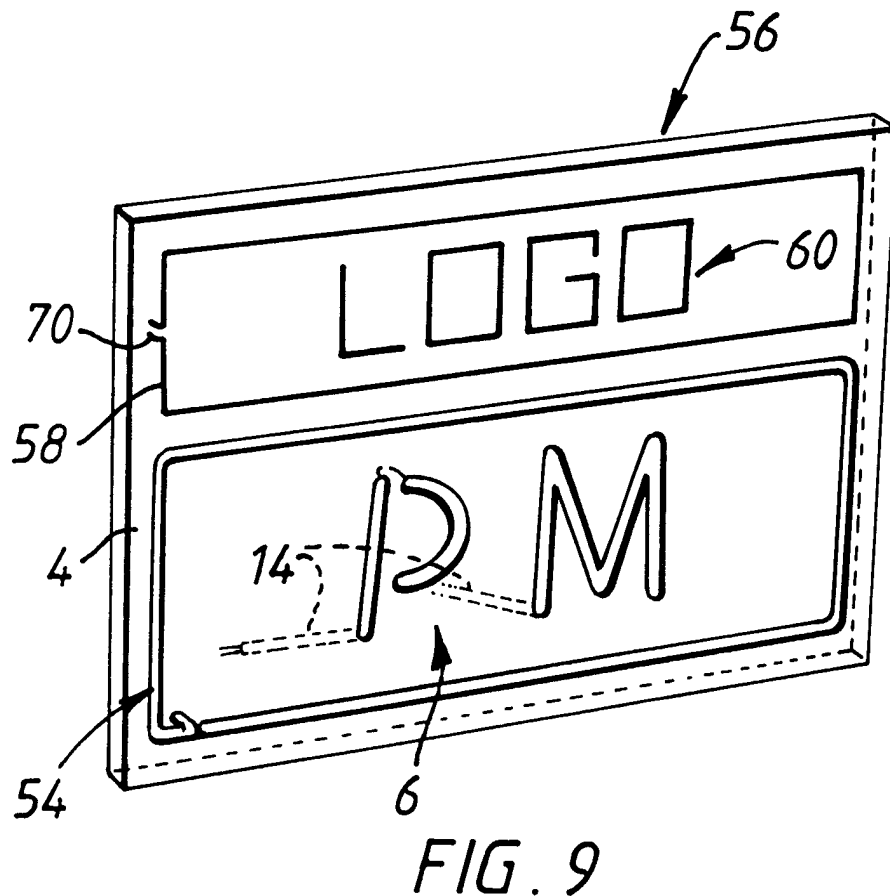
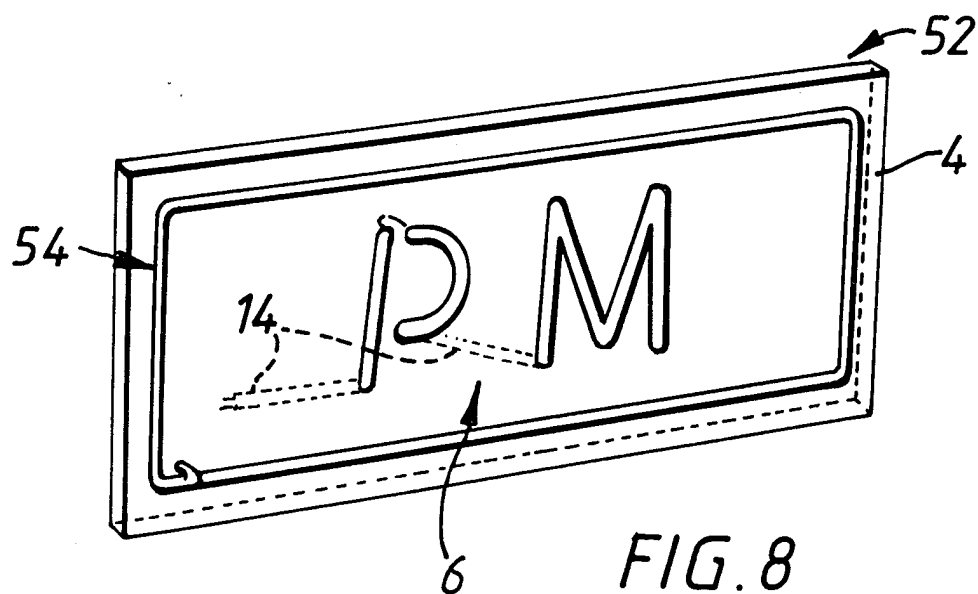
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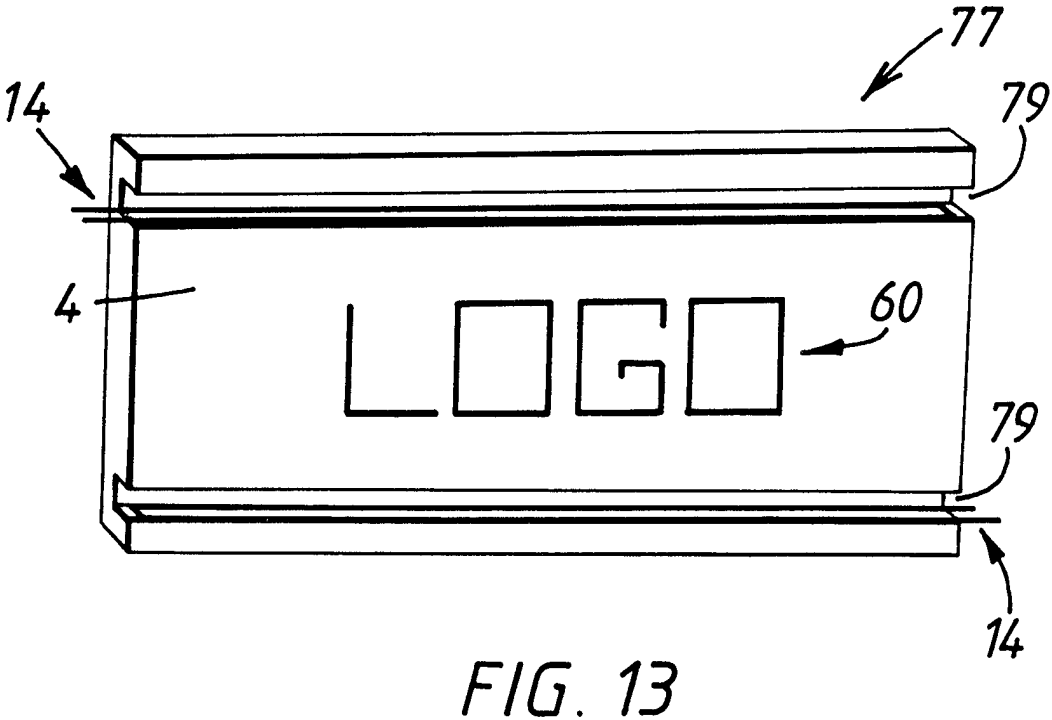
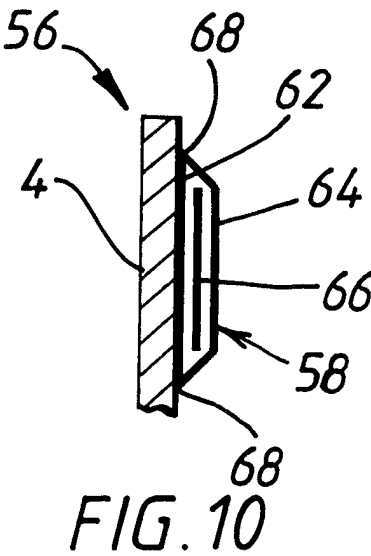


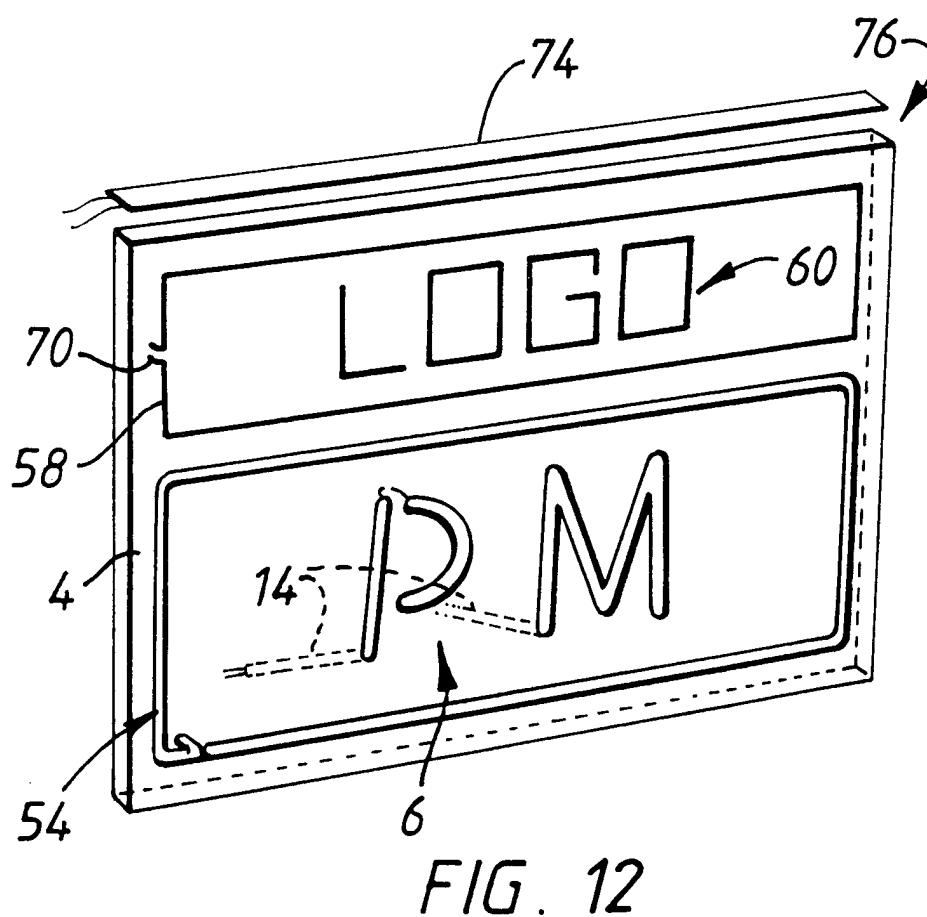
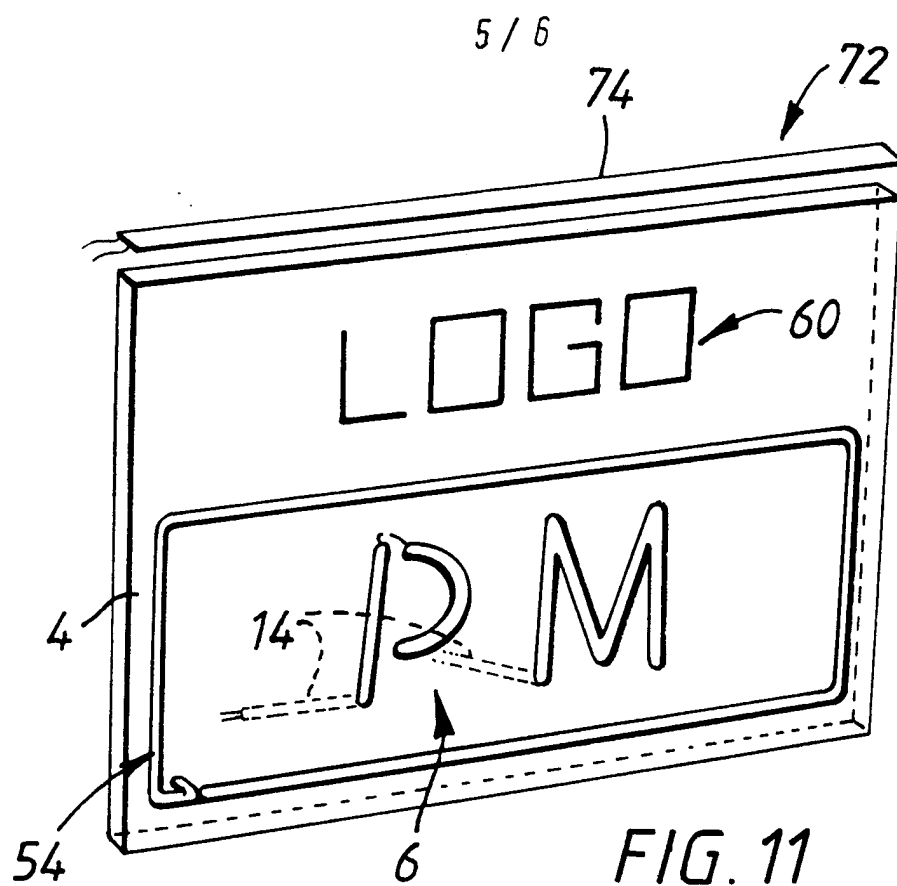
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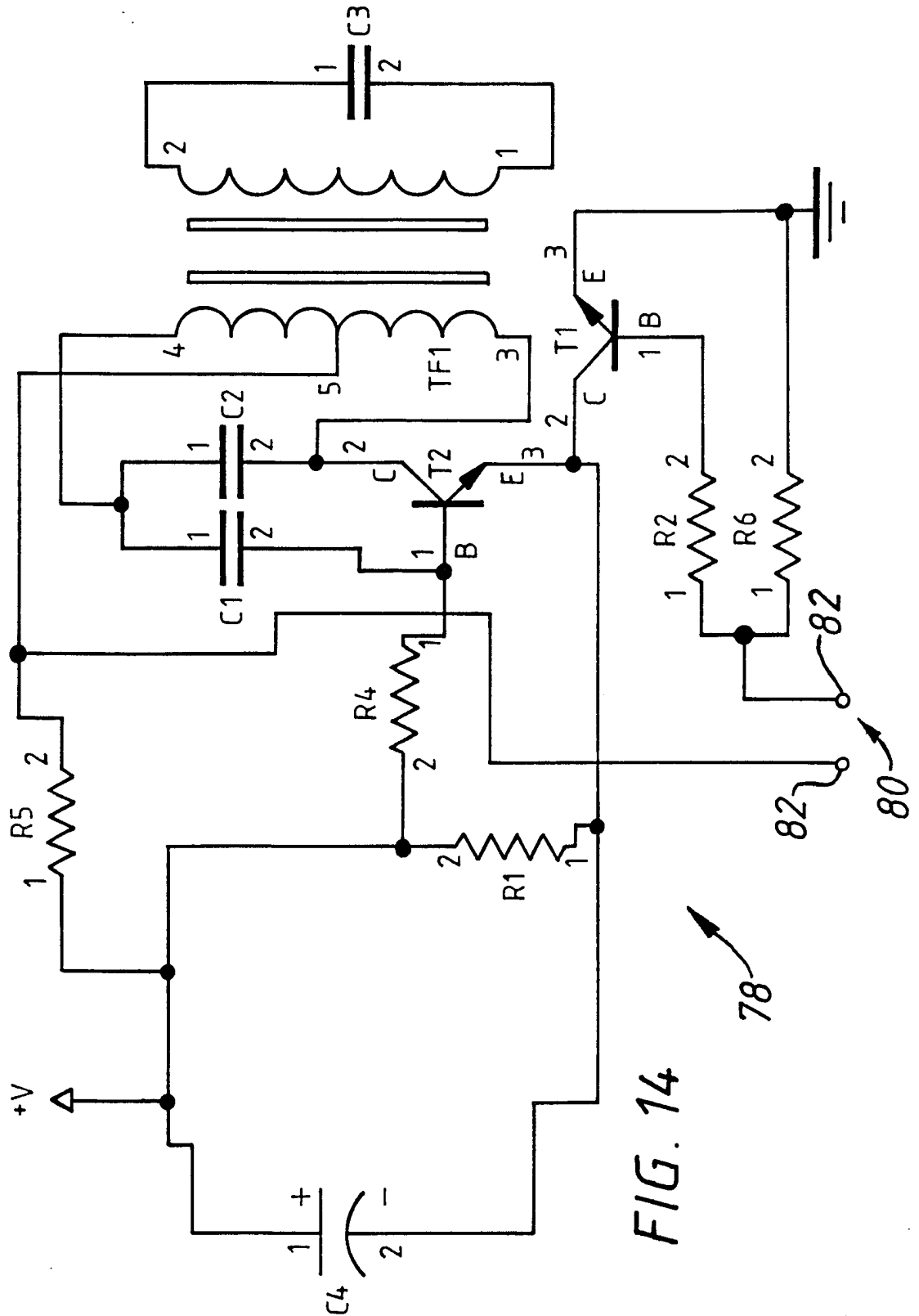


FIG. 14

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00545

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G09F13/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G09F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 273 606 A (JERUSALEM COLLEGE OF TECHNOLOGY) 22 June 1994 see page 4, paragraph 3 - page 5, paragraph 1; figures 3,4 ---	1-3,6-15
Y	US 5 533 289 A (P. HOFFMAN) 9 July 1996 see the whole document ---	1-3,6-15
A	US 3 819 973 A (A. HOSFORD) 25 June 1974 see the whole document ---	1-16
A	US 3 069 579 A (D. BERG ET AL.) 18 December 1962 see the whole document ---	1-16
A	US 3 978 599 A (B. BERGER) 7 September 1976 see the whole document ---	1-16
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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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