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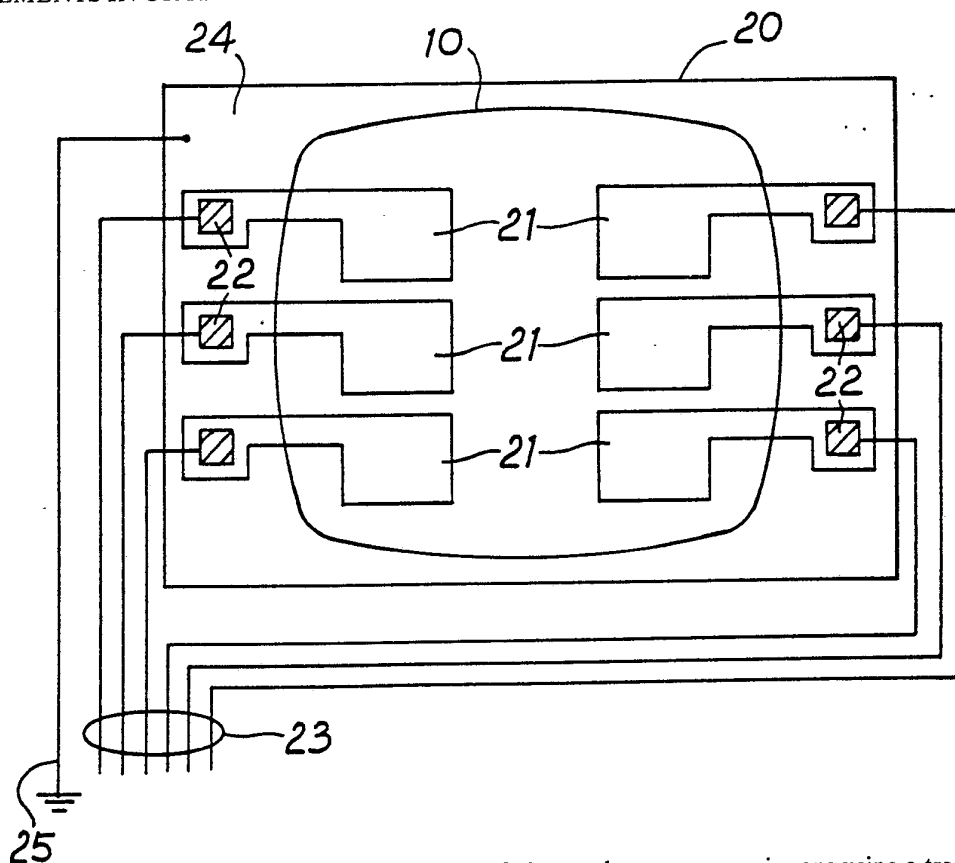
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<p>(21) International Application Number: PCT/GB88/00021 (22) International Filing Date: 14 January 1988 (14.01.88) (31) Priority Application Number: 8700849 (32) Priority Date: 15 January 1987 (15.01.87) (33) Priority Country: GB (71)(72) Applicant and Inventor: BINSTEAD, Ronald, Peter [GB/GB]; 15 Seely Road, Radford, Nottingham NG7 1NU (GB). (74) Agent: GOODMAN, Christopher; Eric Potter & Clarkson, 14 Oxford Street, Nottingham NG1 5BP (GB). (81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB, GB (European patent), IT (European patent), JP, LU (European patent),</p>		<p>NL (European patent), SE (European patent), US. Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: IMPROVEMENTS IN OR RELATING TO TOUCH KEYPAD SYSTEMS



(57) Abstract

A display can be controlled through one or more thicknesses of glass and one or more air gaps using a transparent keypad through which the display can be observed. The display may be a TV type or LCD, etc.

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IMPROVEMENTS IN OR RELATING TO TOUCH KEYPAD SYSTEMS

The present invention relates to touch keypad systems and more particularly to systems which include a transparent or semi transparent keypad allowing a viewer to see through the keypad to a display situated behind the keypad. The term "touch" is defined to include proximity wherein no actual contact need occur. The keypad may therefore be situated behind a sheet of glass or plastics material which can be of the double glazed type and the keypad may be spaced away from the rear face of the glass.

The invention requires the provision of one or more sensitive areas which operate as individual keys. In its simplest form only one area may be provided but normally several areas are provided thereby providing a plurality of keys. To be able to detect and distinguish between areas touched selection circuitry such as described in my PCT Patent Application No. GB85/00168 is preferably used.

It is an object of the present invention to provide a transparent touch keypad system which is operable through glass or transparent plastics material. It is also an object of the present invention to provide a transparent keypad which can be attached to the front screen of a VDU for viewing the VDU through the keypad.

The present invention provides a touch keypad system including a visual display system unit, a transparent keypad comprising a plurality of sensitive areas, in which the keypad is operable through glass by touching the glass the display being viewed at least in part through the keypad.

For the purposes of the present invention glass is defined to include plastic.

In a preferred embodiment the keypad is attached to the front of the VDU and the VDU is positioned adjacent

to one side of a sheet of glass or plastic the VDU being controllable by touching the opposite side of the glass or plastic.

In this preferred embodiment the system includes means for distinguishing the touching of a key of the keypad attached to or in close proximity to the screen of a VDU in the presence of static developed by the VDU.

Embodiments of the present invention will now be described with reference to the accompanying drawings in which:-

Figure 1 shows diagrammatically in side cross section a display system according to the present invention;

Figure 2 shows diagrammatically the visual display unit VDU and transparent keypad in front elevation;

Figure 3 shows in greater detail a keypad used in the system of Figure 2;

Figure 4 shows an alternative design of keypad;

Figure 5 shows in cross section a first design of keypad;

Figure 6 shows in cross section a second design of keypad; and

Figure 7 shows diagrammatically an electrical circuit of the keypad of the present invention.

Figures 8 to 13 show in cross section various designs of keypad and display. With reference now to Figure 1 the display system comprises a visual display unit 10 a transparent keypad 20 and a sheet of glass (as defined), for example a window 30 against which the keypad 20 is in a first embodiment affixed. The keypad is operated by touching the window 30 with for example a finger F. The keypad may be operated by bringing the finger F into close proximity to the glass window 30 without actually touching the window. The glass may be single, double or triple glazed, the keypad being sensitive enough to work through several layers of glass and the air gaps in between. The VDU can be any type of display, e.g. CRT liquid crystal, fluorescent or projected, etc.

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The keypad has, associated therewith a control box 40 which is able in known manner to control the VDU either directly or for example to control a video recorder (not shown) associated therewith. The keypad is stuck or otherwise fixed to the window 30 or is in proximity behind the window being supported by separate means and by touching the window the display on the VDU 10 may be changed. The VDU display may be used to indicate the areas of the screen to be touched to alter the display. To suit various mounting techniques the VDU and keypad may be positioned as shown pressed against the glass 30 without any substantial gaps or spaced apart as indicated by gaps 50 and/or 60. The keypad is sufficiently sensitive to be operable with a substantial gap 50. Gap 60 is preferably small to prevent parallax between displayed touch area and the keys.

The sensitive areas of the keypad in front of the display may be constructed by for example sputter coating indium oxide onto a polyester film or depositing tin onto glass.

In an alternative embodiment the keypad may be fixed to the front of the VDU 10. The VDU 10 may then be positioned close to the inside of a window 30 and providing the air gap between the window glass and the keypad is relatively small the keypad and hence the VDU may be operated by touching the window as shown. Fixing the transparent keypad to the front of a CRT display (e.g. a TV) however causes the keypad to be subjected to the static produced by the TV and it is necessary to counter this as shown in Figure 7 by for example connecting a capacitor C in the output lead from each key to isolate the detection circuitry in control box 40 from the static (d.c.) voltage.

With reference now to Figure 2 the keypad 20 is shown as viewed through window 30. The sensor areas are indicated at 21 and contact areas are shown at 22.

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Individual output leads 23 join the contact areas 22 with the control box 40 which may be of the form as described in co-pending British Patent Application No.

The control box may be provided with appropriate output drives for control of the VDU (or video recorder). An
5 area 24 surrounding the sensor areas 21 may be connected via lead 25 to ground to improve the sensitivity of the keypad and help eliminate static.

An individual key is shown in greater detail in Figure 3, the sensitive area 21 extending as shown over
10 the contact area 22. The conductive sensor area 21 is isolated from other sensors by a non-conductive zone 26.

In Figure 4 the sensor areas 21 are within a central area 27 which is visible in front of the VDU. The contact areas 22 may be screened behind an opaque
15 surround 28 for cosmetic purposes.

The contact areas 22 may be glued to the sensor areas 21 as shown in Figure 6 or may be glued to the opposite side as shown in Figure 5.

An alternative solution to the static problem is to
20 provide a sheet 31 of plastics material with a conductive coating of for example indium oxide 32 which is grounded. The coating 32 will remove the static from the VDU allowing the keypad to sense in a normal manner.

If there are no problems of static or a separate in
25 line capacitor is used the connector 22 may be directly connected to the transparent conductive film 21 by for example conductive adhesive or a push on connector.

In the upper key contact of Figure 5 the transparent conductive coating forming the sensitive area 21 is
30 applied for example by sputtering indium oxide onto one side of a glass or plastics sheet 29, the contact 22 being affixed to the other side. The glass or plastic sheet 29 forms the dielectric capacitor C required for anti-static properties as referred to with reference to
35 Figure 7.

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In Figure 6 the sheet 29 forms a shield or guard sheet in front of for example a VDU 10 enabling the sensitive areas and contacts to be protected against damage.

5 The capacitor C may be formed as shown in the upper contact by introducing a sheet of for example polyester 41 to form a dielectric between the sensitive areas 21 and contact area 22 at the point of the contact area. Conveniently the sheet 41 may be double sided tape
10 providing adhesive contact on both sides.

Figures 8 to 13 show various possible exemplary key arrangements for displays where static voltages are present and for those where there is no problem of static such as in LCD displays. The same reference numerals are
15 used to designate the various parts as in figures 1 to 7.

Figures 8, 9 and 10 show possible construction methods where there is no problem of static.

Figure 8 is a cross section of a display unit 10, such as a fluorescent or liquid crystal display where the
20 sensors are on the inside of the front glass panel of the unit.

Figure 9 is a cross section of a display unit where the sensors are on the outside of the front glass panel of the unit.

25 Figure 10 shows sensors mounted on a separate sheet of glass or door plastic and situated between the viewer/operator and the display.

Figures 11, 12 and 13 show possible construction methods where there is a problem of static.

30 Figure 11 shows the construction of the pick-up terminals where they are isolated from the sensor areas by a thin sheet of non-conductive material. This prevents high voltages reaching the electronic circuit.

Figure 12 shows a layer of transparent conductive
35 material 31 placed between the VDU and the sensors. When this is grounded the static is eliminated.

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Figure 13 shows how the grounded transparent shield and the sensors may be mounted on either side of the same sheet of glass or clear plastic.

CLAIMS

1. A touch keypad system including a visual display system unit, a transparent keypad comprising a plurality of sensitive areas, in which the keypad is operable through glass by touching the glass the display being
5 viewed at least in part through the keypad.
2. A touch keypad system as claimed in Claim 1 in which the keypad is attached to the front of the VDU and the VDU is positioned adjacent to one side of a sheet of glass the VDU being controllable by touch the opposite
10 side of the glass or plastic.
3. A touch keypad system as claimed in Claim 1 or Claim 2 in which the system includes means for distinguishing the touching of a key of the keypad attached to or in close proximity to the screen of a VDU in the presence of
15 static developed by the VDU.
4. A touch keypad system as claimed in claim 1 or claim 2 in which the display is an incandescent, fluorescent, LCD or other display in which static voltages are not generated.
- 20 5. A touch keypad system as claimed in claim 1 in which the visual display unit is positioned behind a sheet of glass close to the glass but not touching such that there is an air gap between the VDU and the glass.
- 25 6. A touch keypad system substantially as described with reference to the accompanying drawings.

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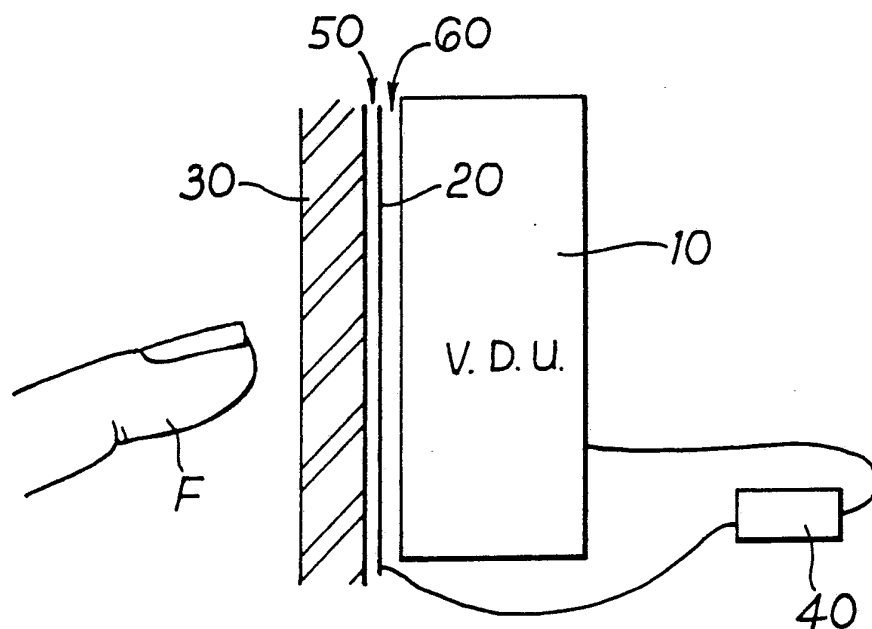
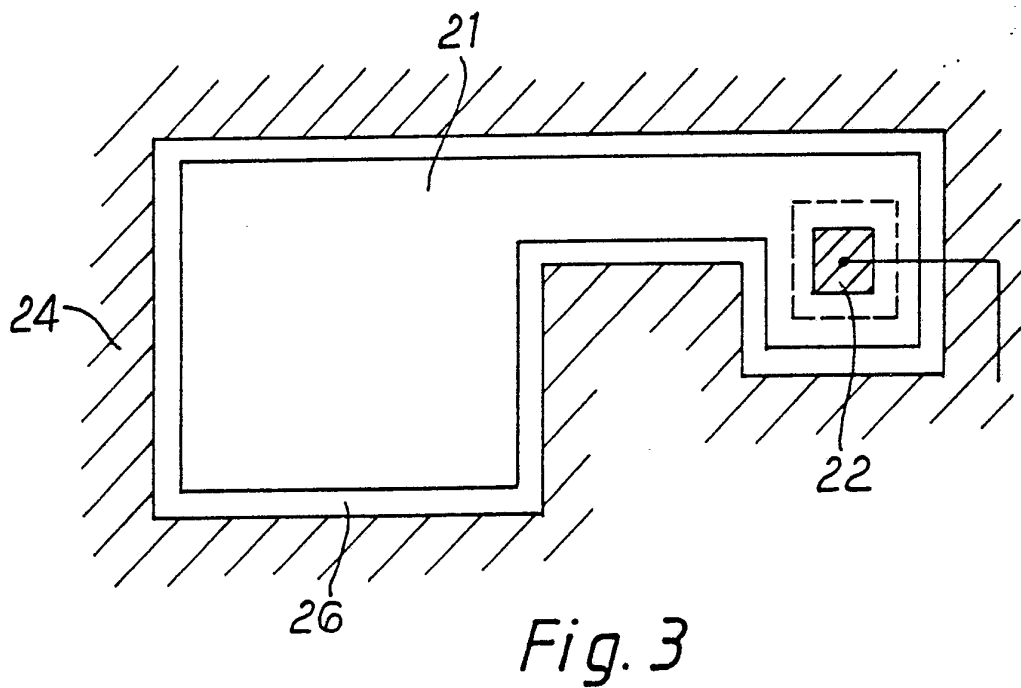
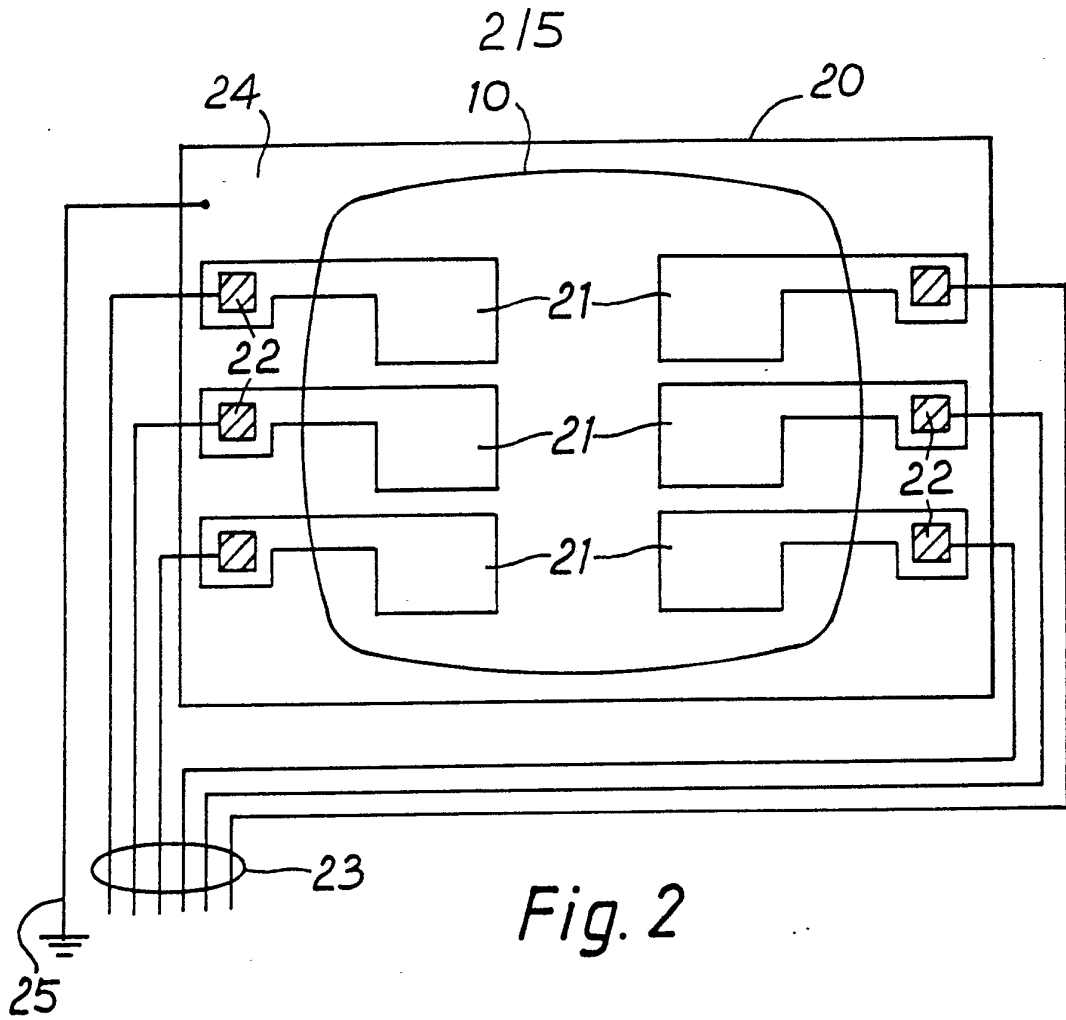
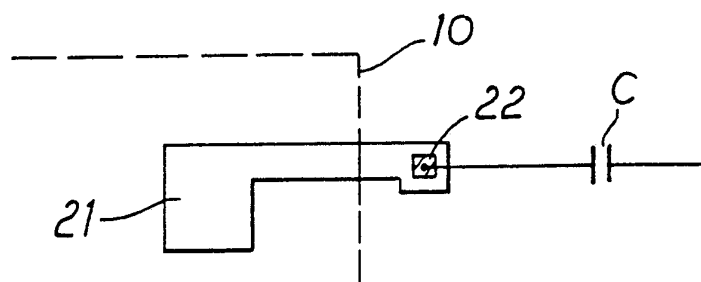
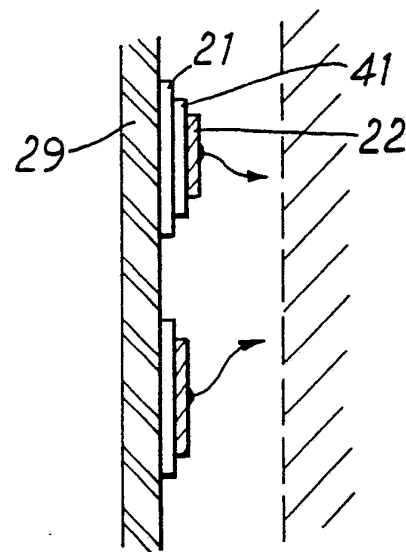
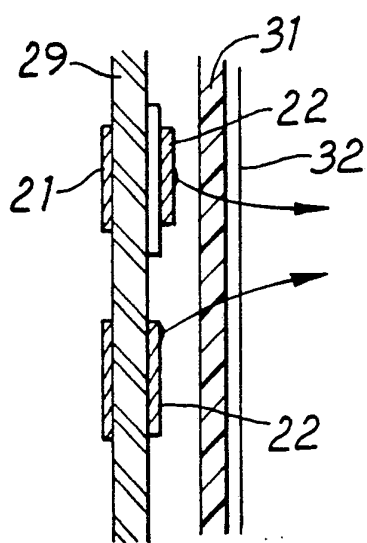
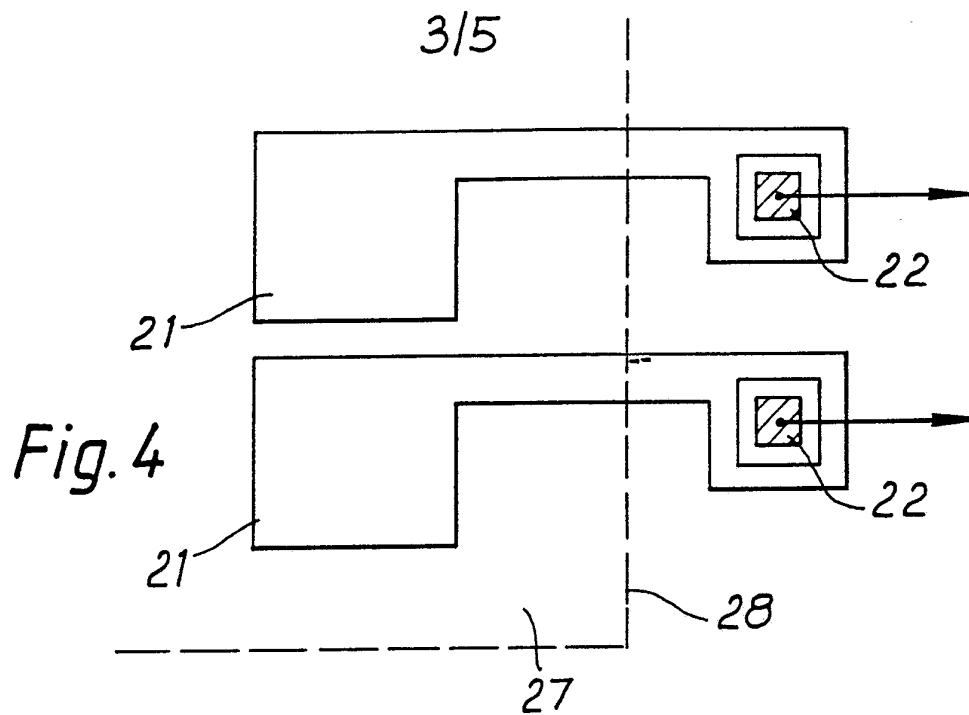


Fig. 1





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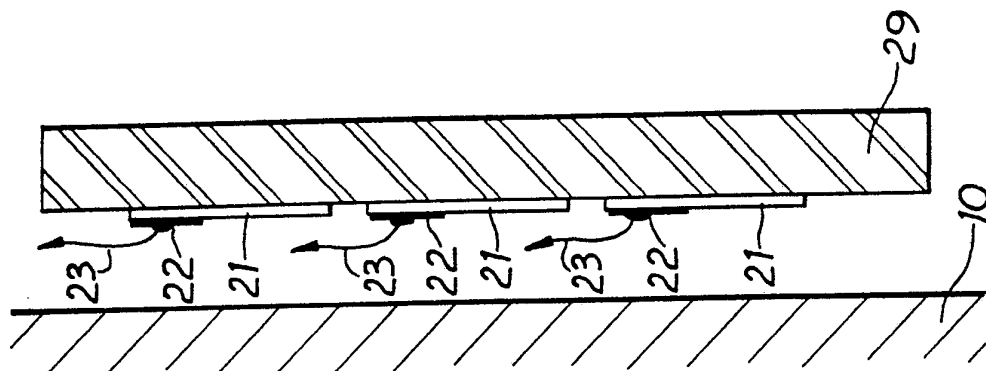


Fig. 10

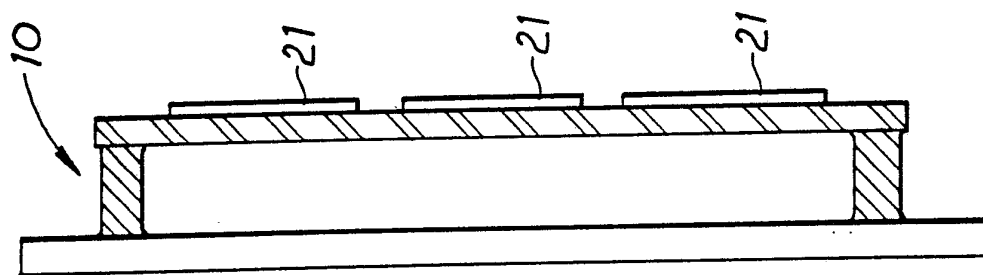


Fig. 9

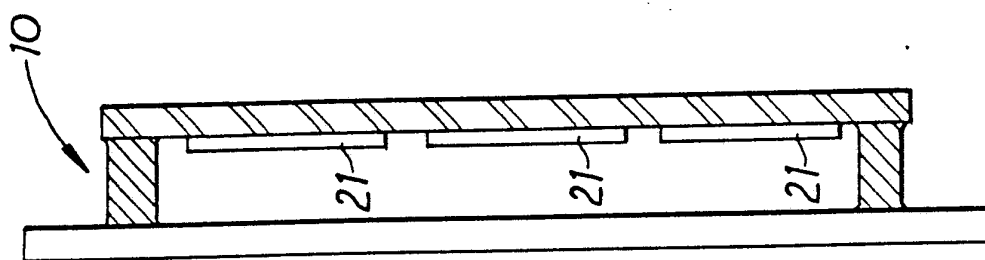


Fig. 8

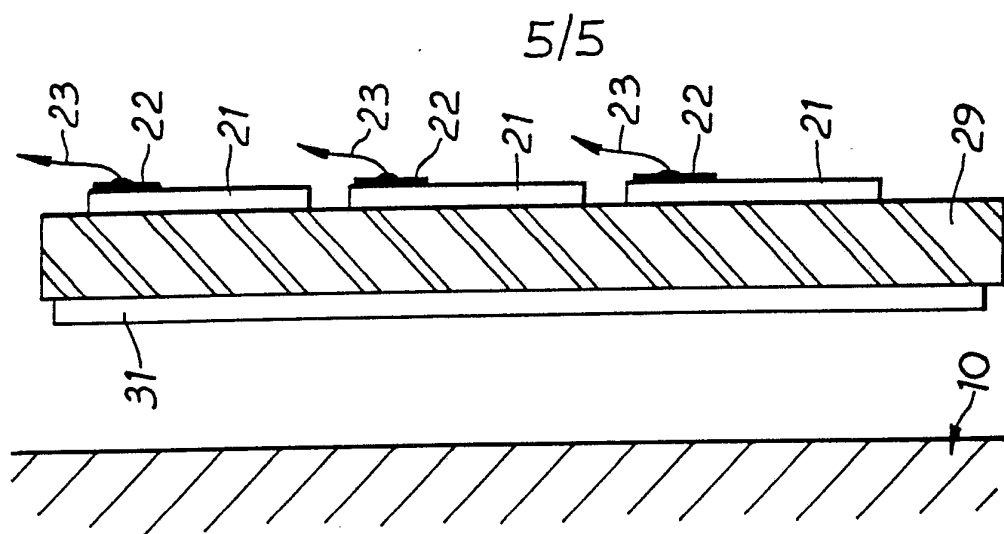


Fig. 11

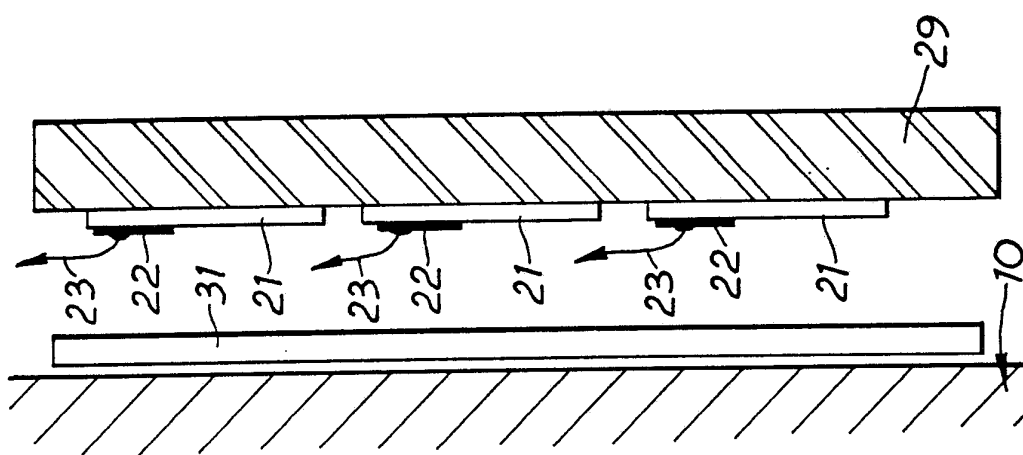


Fig. 12

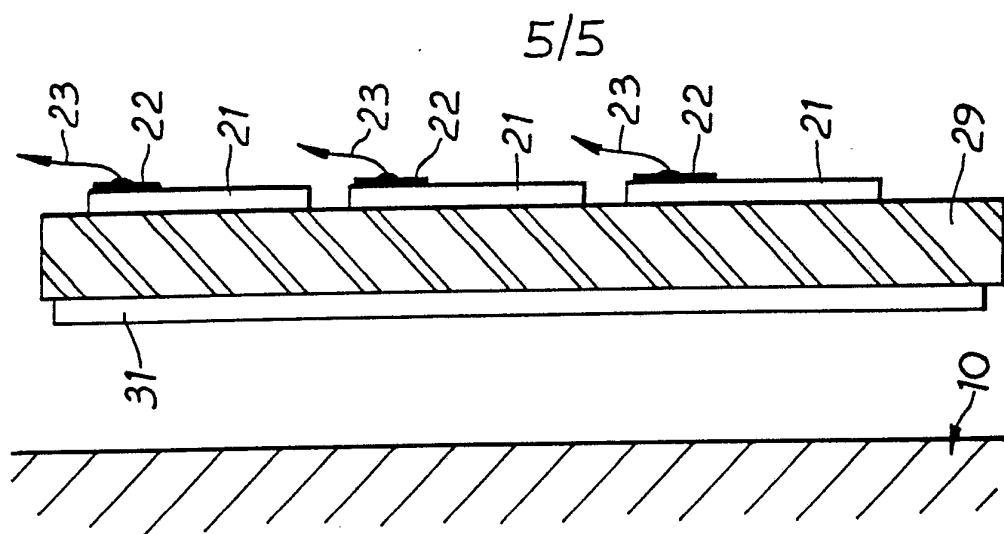
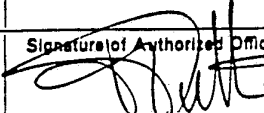


Fig. 13

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 88/00021

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : G 06 K 11/06; H 03 K 17/96		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴	G 06 K 11/06; H 03 K 17/96	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	US, A, 4186392 (HOLZ) 29 January 1980 see abstract; figure 1; column 1, line 26 - column 2, line 9	1,2
Y	--	3,4
X	US, A, 4205418 (PRZYBYLEK) 3 June 1980 see abstract; figure 1; column 1, line 30 - column 2, line 8	1,2
Y	--	3,4
X	WO, A, 85/04994 (BINSTEAD) 7 November 1985 see abstract; figures 2-5; page 6, line 21 - page 8, line 34 cited in the application	1,2
X	WO, A, 85/03820 (ANTIKIDIS) 29 August 1985 see abstract; page 1, line 1 - page 4, line 13; figures 2,6; page 5, line 18 - page 6, line 3; page 9, lines 10-33	1,2
X	US, A, 4561002 (CHIN) 24 December 1985 see figures 3A,8A,9; column 5, ./.	1,2
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
12th April 1988		27 MAY 1988
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		 P.C.G. VAN DER PUTTEN

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
	line 37 - column 6, line 2; column 11, lines 1-48 --	
X	US, A, 4290052 (EICKELBERGER et al.) 15 September 1981 see abstract; figures 1A,B; column 3, line 6 - column 4, line 55 --	1,2
X	GB, A, 2156993 (RENARD) 16 October 1985 see abstract; figures 1-3; page 1, line 113 - page 2, line 11; page 3, line 80 - page 4, line 4 --	1,2
P,X	DE, U, 8627673 (SCHAULANDT) 21 May 1987 see the whole document --	1,2,5
Y	EP, A, 0150421 (EVANS) 7 August 1985 see abstract; figure 4; page 13, lines 1-16 -----	1-5

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

GB 8800021

SA 20242

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 02/05/88
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US-A- 4290052	15-09-81	None	
GB-A- 2156993	16-10-85	None	
DE-U- 8627673	09-04-87	None	
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