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(71) Applicant *(for all designated States except US)*: **TALK-SIGN LIMITED** [GB/GB]; 37A College Road, Bromley, Kent BR1 3PU (GB).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **BEADMAN, Michael, Andrew** [GB/GB]; 64a High Street, Guilden

Morden, Royston, Hertfordshire SG8 OJS (GB). **SAUNDERS, Michael, Anthony** [GB/GB]; 8 Scotts Avenue, Bromley, Kent BR2 0LQ (GB). **JOHN, David, Arthur, Vaughn** [GB/GB]; 27 Westcombe Park Road, Black Heath, London SE3 7RE (GB).

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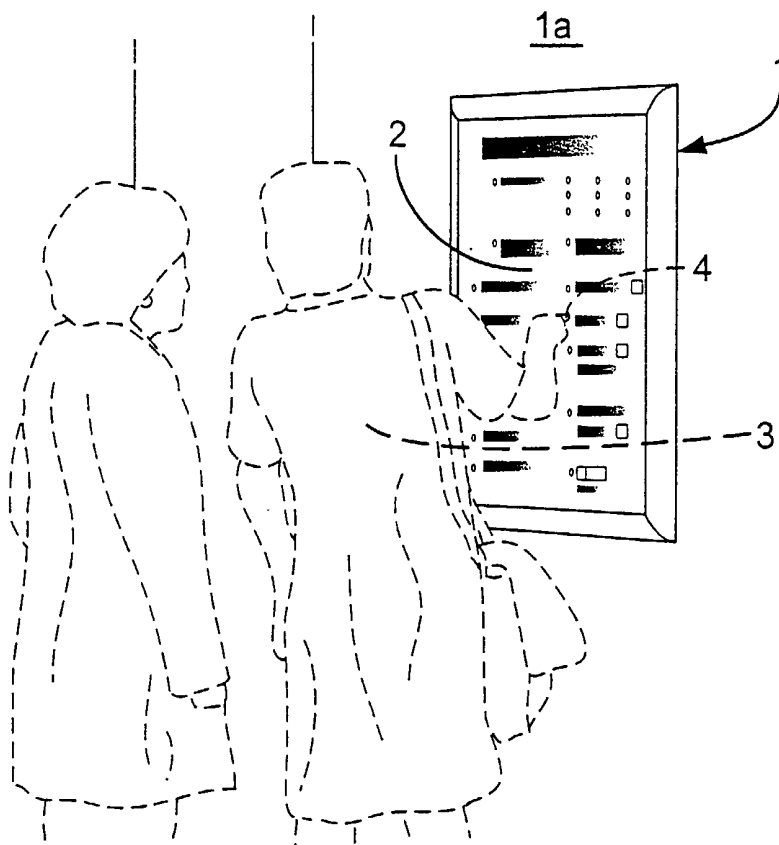
(57) Abstract: A display sign is in the form of a flat panel loudspeaker, the graphics of the display being carried on one exposed surface of the flat panel, the latter being provided with one or more transducers whereby the flat panel may be energised to transmit sound in accordance with signals supplied to the one or more transducers. The sign may also be provided with means for storing inputs made by a user for later retrieval.

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Display Signs

The present invention relates to display signs and in particular to display signs which incorporate means for giving an aural message when activated by a user and/or have the capability to log information input by a user.

It is known to provide display signs with a loudspeaker through which an aural message can be played from, for example a magnetic tape, through an amplifier when the display sign is interrogated or activated by a user such as by pressing one of a number of buttons.

Although such aural display signs are known they are relatively bulky, expensive to produce and relatively inflexible in their application.

The present invention is concerned with providing an aural display sign and one which can also log information input by a person using the display sign and which is compact, robust, low cost and constructed in a way which enables it to be easily tailored or adapted to a variety of different operational requirements.

According to a first aspect of the present invention a display sign is in the form of a flat panel loudspeaker, the graphics of the display being carried on one exposed surface of the flat panel, the latter being provided with one or more transducers whereby the flat panel may be energised to transmit sound in accordance with signals supplied to the one or more transducers.

According to a second aspect of the present invention, the one or more transducers are energised by means of a solid state energisation and control system incorporated in the display sign.

According to a third aspect of the present invention, the display sign

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is provided with a switch arrangement which is incorporated in the display sign to act as an interface between a user and the energisation and control system associated with the one or more transducers.

According to a fourth aspect of the present invention, the switch arrangement comprises one or more capacitative or proximity switches located beneath the graphic display surface whereby a user may operate the switch or switches by placing a finger in the proximity of the switch but on the graphic display side of the panel.

According to a fifth aspect of the present invention the solid state energisation and control system includes a digital audio compression signal processor/decoder through which audio signals from a memory arrangement can be supplied to the one or more transducers in order to energise the latter.

According to a sixth aspect of the present invention a micro-controller is connected between the memory arrangement and the digital audio compression signal processor/decoder in order to reformat the data so that it matches the requirements of the digital audio compression signal processor/decoder.

According to a seventh aspect of the present invention the memory arrangement comprises an SSFDC smart media flash memory which is adapted to store the audio signals in the form of files which have been previously recorded on a computer such as a PC or MAC platform.

According to a eighth aspect of the present invention the memory arrangement also comprises a buffer memory associated with the SSFDC. This buffer memory is preferably a SRAM but could be a DRAM.

According to a ninth aspect of the present invention the energisation and control system includes a remote control receiver (preferably infra-red)

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whereby the solid state control circuit may be reprogrammed remotely without the need for any physical alteration or adjustment of the display sign and its associated energisation and control system.

According to an tenth aspect of the present invention the display sign incorporates a battery power pack by which the energisation and control system is itself energised.

According to an eleventh aspect of the present invention there is a real time clock within the micro-controller.

According to a twelfth aspect of the invention, there are one or more active switches addressable by the micro-controller to cause the active switch to perform a function such as turning on a light.

According to a thirteenth aspect of the invention, the micro-controller can be placed in a switch programming mode to enable the switches to be programmed on site.

According to a fourteenth aspect of the present invention a display sign is in the form of a flat panel the graphics display being carried on one exposed surface of the flat panel and means being provided to store information which is input to the panel by interaction between the panel and a person external to the panel.

The interaction may be by the person touching the panel at one or more of a plurality of target areas marked in the panel and forming part of the graphics of the display.

How the invention may be carried out will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 illustrates how a first embodiment of the present invention may be used.

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Figure 2 illustrates in more detail and to a larger scale the graphic display carried by the front exposed surface of the display panel shown in Figure 1;

Figure 3 is an exploded three-quarters view illustrating the physical construction of the display panel of Figure 1;

Figure 4 is a cross-sectional view taken on the line A-A of the frame of the display sign;

Figure 5 is a diagrammatic block representation of the energisation and control system of the display panel of Figures 1 to 4;

Figure 6 is a block diagram illustrating the capacitative/proximity switch arrangement of the embodiment of Figures 1 to 5;

Figure 7 is an exploded perspective view of the main components of a second embodiment of the invention;

Figure 8 is an enlarged fragmentary sectional view taken on the line B-B of Figure 7;

Figure 9 is a block diagram of the electronic system incorporated in the embodiment of Figures 7 and 8; and

Figure 10 is a block diagram illustrating the flash memory arrangement of the embodiment of Figures 1 to 5.

Figures 1 and 2

A display sign 1 is mounted on a wall 2, in this case in a hospital.

The purpose of the display sign is to assist a visitor 3 to the hospital in finding and being guided to that part of the hospital which they require.

The display sign 1 has a graphical display 2 which consists essentially of the various locations 5, as shown in detail in Figure 2, within the hospital such as "Admissions", "Appointments", "Blood Tests" etc and

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also displays the nine different languages in which the display sign is capable of operating.

The purpose of the display sign **1** is to enable the hospital visitor **3** to ascertain the location of the particular hospital activity or service which that
5   visitor wishes to visit.

In order to do this the visitor **3** first selects the language they require, by touching with their finger **4** a graphical representation of one of the nine buttons 6a, 6b, 6c, 6d, 6e, 6f, 6g, 6h or 6i on the display associated with the national flag of the relevant language, as shown in *Figure 2*.

10   Having done this the display sign will now be set up to give aural information in the selected language.

Having selected the appropriate language the visitor then selects the location which they wish to visit. In this embodiment, there are twelve locations,   as   illustrated   in   *Figure   2*,   comprising   "Admissions",
15   "Appointments", "Blood Tests", "Clinics" etc.

Each of these locations has a virtual "button" 5a, 5b, 5c, etc associated with it. When the visitor touches this virtual "button" the arrangement shown diagrammatically in *Figure 5* is then brought into operation.

20   For example, if a visitor wishes to visit the Pharmacy Department they will touch the virtual "button" 5h. This will then cause the display sign **1** to give aural directions as to how the visitor can find the Pharmacy Department starting from the location of the display sign.

Thus, the display sign as shown in *Figure 1* and *2* provides a
25   hospital visitor with sound/aural directions as to how to find the various locations within the hospital, instead of, or in addition to, providing a purely visual map of the layout of the hospital from which the visitor must work out

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their own route.

The display sign is also provided with a virtual "button" **7** by which a visitor can obtain "Interpreters and Advocates".

A virtual "button" **8** is also provided for visitors who require further
5   help and a virtual "button" **9** to provide aural directions to the nearest toilets.

Figures 3 and 4

The physical construction of the display sign will now be described with reference to *Figures 3* and *4*.

10   There is a rectangular frame **31** made from aluminium and having the cross-section shown in *Figure 4*.

This frame **31** contains, firstly, a graphics laminate **32** on the front face of which are carried the graphics shown in *Figure 2*. This laminate will typically be made of a plastic sheet.

15   Behind the graphics laminate **32** is a switch assembly **33** which will be described later in relation to *Figures 5* and *6*.

Behind the switch assembly **33** is a loudspeaker panel **34** which comprises a Formica (RTM) sheet which carries one or more (in this case two) exciters or transducers **35**. Material other than Formica (RTM) may be
20   used.

Finally, behind the loudspeaker panel **34** is a backing panel **32** which typically is made of cardboard or hardboard.

The energisation and control system for the exciters/transducers **35** is carried by the frame **31** and is generally indicated at **36** in *Figure 3*, this
25   arrangement being shown in more detail, but diagrammatically, in *Figures 5* and **6**.

The exciters/transducers **35** are energised by a battery/batteries

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which form part of the energisation and control system and are mounted within the display sign.

Although the various components making up the display sign are shown in an exploded format in *Figure 3* when they are assembled in their operative positions, the display sign is very compact and in this embodiment, has an overall thickness of just under five centimetres.

The switch arrangement **33** is the mechanism by which the touching by the visitor of the relevant virtual "button" on the graphic display shown in *Figure 3* is translated into a signal or signals which control the exciters/transducers **35** to cause the loudspeaker panel **34** to be energised and thus emit the appropriate aural directions/instructions.

As indicated earlier in this patent specification it is known to provide visual display signs with aural facilities whereby a person "interrogating" the sign will be provided with information in sound form as opposed to visual form. However, such known "speaking signs" utilise conventional loudspeakers which are either completely separate from the sign itself or which are mounted on the sign or carried by the sign, the sound typically emanating through openings or apertures formed in the front face of the sign behind which openings or apertures the conventional loudspeaker is mounted.

Such arrangements are relatively bulky, expensive to manufacture and do not have very good sound quality particularly where the sign is located in a public area where there is typically a relatively high level of ambient random noise.

This embodiment of the present invention utilises so-called flat panel loudspeakers which operate in a different way from conventional loudspeakers employing conventional substantially conical sound radiators.

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An example of a flat panel type of loudspeaker is disclosed in international patent application WO 97/09845.

In such a speaker one or more transducers **35a**, **35b** in *Figure 3*, are physically connected to the speaker panel **34**.

5   The positions of the transducers **35a**, **35b** are calculated such that the resulting displacement of the panel **34** sets up random vibrations within the panel **34** due to reflections from the edge of the panel **34** interacting with each other in an apparently random way. At a fixed frequency specific modes of vibration can be seen with nodes and anti-nodes occurring at

10   fixed points on the panel **34** but, due to the wide range of frequencies used in practice, these nodes and anti-nodes constantly move on the surface of the panel **34**. Due to the importance of edge reflections in the operation of this type of speaker it is important to ensure that the edge of the panel **34** is free to move as far as possible. To achieve this the panel **34** is mounted

15   around its outer periphery in a compliant foam tape (not shown).

In order to provide the desired level and quality of sound reproduction, via the loudspeaker panel **34**, the exciters/transducers **35** need to be placed in the correct positions in relation to that panel.

These positions are chosen so that virtually random motion of the

20   panel **34** is achieved without there being cancellation of some frequencies due to reflections from the edges of the vibrating panel.

Figures 5 and 6

The electronic solid state system for energising the

25   exciter/transducer elements **35** will now be described with reference to *Figure 5*.

Each of the exciters/transducers indicated at **35** in *Figure 3* and

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indicated at **501** in *Figure 5*, is energised by means of the energisation and control circuit shown in *Figure 5*.

The exciters/transducers **501** are energised by a digital-to-analogue converter **502** which is supplied with data from a digital signal processor **503**. This DSP is preferably an MPEG Audio Layer **3** (known as an MP3) decoder. Other digital audio compression technologies may be employed such as MPEG Audio Layer 4 (known as AAC).

The MP3 **503** provides audio data compression which enables the volume of data necessary in order to provide the variety of aural signals to be provided economically in terms of the amount of memory that the system requires.

The input to the DSP **503** is from a micro-controller **504** the function of which is to reformat the data so that it matches that required by the DSP and enables the system to operate in real-time.

The micro-controller **504** has a number of inputs which comprise a control and programming interface **505**, an infrared remote control receiver **506**, an SSFDC smart media flash memory **507**, a static random access memory (SRAM) **508**, a serial E2 programmable read-only memory (E2PROM) **509**, a bi-directional multi-drop key interface **510** and a PIR, remote trigger interface **511**. The functions of these various inputs to the micro-controller **504** will now be described.

Music data stored in the SSFDC **507** energises the transducers **501** through the micro-controller **504**, the DSP **504** and the DAC **502**.

The SSFDC **507** could be any suitable solid state non-volatile storage medium which does not require permanent power.

The SRAM **508** is provided to act as a buffer memory if the SSFDC **507** is programmed in situ.

10

Data from the micro-controller **504** is logged in the serial E2PROM **509**.

Data from the micro-controller **504** is also logged at the control and programming interface **505**. This data can consist of the tracks played when a track was requested, and error data.

Audio programming data is input to the micro-controller **504** from the control and programming interface **505** and is output from the micro-controller **504** to the SSFTC **507**.

Control data can be input to the micro-controller **504** from the control and programming interface **505**, from the infrared remote control receiver **506**, from the bi-directional multi-drop key interface **510** and from the PIR, remote trigger interface **511**.

How the system shown in *Figure 5* operates will now be described.

The micro-controller, **504**, detects a key press from the key interface **510** and from this key number determines which audio track number is required. The micro-controller, **504** then uses the P.C. compatible look-up table contained within the Smart Media memory, **507**, to find the memory address of the start of the audio track within the Smart media memory **507**. The micro-controller then turns these eight-bit wide data bytes into serial data which is transmitted serially to the MP3 decoding DSP, **503**.

A separate control bus is also used to configure the DSP from the micro-controller such that the DSP decodes the MP3 data into a standard I²S serial digital audio stream. The DSP outputs a clock and I²S data to the Digital to Analogue convertor, DAC, **502**, that converts this data into a voltage which is amplified by the stereo amplifiers, **501**.

One channel of this analogue signal is finally amplified through a power amplifier, **515**, and used to drive the flat panel transducers **35a, 35b**.

The second channel can be used with an additional amplifier to drive a second flat panel or conventional speaker.

As mentioned earlier the mechanism by which the display sign is rendered sensitive to the hospital visitor's input comprises a number of capacitative/proximity switches which are distributed around the display sign behind the loudspeaker panel itself at locations corresponding to the virtual "buttons" described in connection with *Figure 2.*

In other words the locations of the numerous proximity switches are tailored to the particular requirement of the display sign.

This approach contrasts with an alternative which would involve having a very large membrane switch, mounted between the loudspeaker panel and the laminated graphic typically with 800 x 600 "cells" covering the whole of the display area and not just those parts of it which happen to correspond to the particular virtual "buttons" of the embodiment shown in *Figure 2.*

The advantage of such a very large membrane switch is that it would have universal application irrespective of the graphical display employed and the actual location of the virtual "buttons". The disadvantage is that its cost is relatively high.

Therefore, the preferred approach is the one which will now be described in more detail in relation to *Figure 6,* namely one employing a relatively few "targeted" proximity switches which are located in the specific locations required in relation to a particular display sign.

More specifically, each of the virtual "buttons" shown in *Figure 2* would have associated with it a single proximity switch.

Figure 6 illustrates the operation of a single proximity switch for use in the system of *Figure 5* and incorporation in the display sign shown in

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Figures 2 to 4.

Figure 6 illustrates diagrammatically an intelligent fault-tolerant proximity switch arrangement.

Those elements of the arrangement shown in *Figure 6* which correspond to elements in the system shown in *Figure 5* are indicated with the same reference numerals.

The proximity switch comprises essentially a capacitative proximity sensor detector **601** which is connected to an astable trigger **602**.

The output of the trigger **602** is connected to a circuit comprising an E2PROM **604** and an open collector/open drain **603**.

The already described multi-drop bidirectional micro-interface **510** is connected to the E2PROM **509** and the open collector/open drain **603**.

The way in which the arrangement shown in *Figure 6* operates will now be described.

When the hospital visitor places their finger on or near the virtual "button" on the display sign this causes the proximity sensor **601** to be activated.

This activation triggers the astable trigger **602** to cause a pulse of between five and ten milliseconds. This pulse enables the E2PROM **509** and triggers the open collector/open drain **603**.

In a normal operating condition the system controller **504** (*Figure 5*) will receive an interrupt from the key **510** via the multi-drop open collector/open drain **603** collector line going low. In addition the multi-drop line falling also causes all the other proximity switches to be inhibited.

The multi-drop bidirectional micro-interface **510** then sends a read data command to the E2PROM **604**, that will be the only device enabled and reads back the proximity switch number in question.

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This arrangement enables multiple proximity switches to be used with a wiring system which comprises only three wires plus a power interface and connected to the micro-controller **504**. There is virtually no software timing overhead associated with the scanning and debouncing of a large number of switches because the micro-controller is only required to act on a single interrupt when the switch is operated rather than continuously scan a large number of switches.

If a fault develops in the system in *Figure 5*, such as where a particular proximity switch is permanently energised due to something adhered to the front of the display panel, after the initial five to ten milliseconds trigger period the astable trigger **602** will not retrigger thus allowing other switches to operate after this initial trigger period. This inhibit function also prevents multiple proximity switches triggering at the same time.

The micro-controller **504** incorporates a real time clock which enables:

i.   the time stamping of all switch hits to allow determination of both the time when the sign is mainly in use and to determine if a user is just messing about or if he is listening to the information (by looking at the time between switch presses); this information is logged and can be presented back to the sign sponsor or owner;

ii.   the provision of real time announcements eg as a speaking timetable at a bus stop with an estimate of the time to the next bus on a specific route; and

iii.   the provision of timed announcements to attract users to the sign, e.g. "This is a talking sign please press a button for information".

The system may include one or more active switches where the micro-

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controller can directly address individual active switches to enable functions within the switch e.g. turn on a light. These active switches are on the same bus as the standard switch and may also be used as ordinary switches although they can be configured as only lights from the micro-controller. These lights can be used to highlight areas of the sign.

The switch system described with reference to the drawings has a further advantage. Because the ordinary switches are all identical the main micro-controller can be placed in a switch programming mode (using the control and programming interface, **505**) and then the ordinary switches can be programmed in situ. This makes the manufacture of individually tailored or customised signs very efficient as all the parts are standard and are only configured once they are in the sign.

Instead of utilising digital audio compression e.g. the above described MP3 arrangement, the invention may utilise sampled audio.

The first embodiment just described with reference to *Figure 1* to *6* places the emphasis on the display sign generating an aural output in response to a user interacting with the sign typically by "touching" a virtual button. However, as indicated earlier the display sign of the present invention may also log information produced as a result of the users' interaction with the display sign.

In contrast the second embodiment of the present invention which will now be described with references to *Figures 7* to *10* places the emphasis on the information logging capability of the display sign rather than on its aural capability.

This second embodiment is suitable for, in effect, conducting surveys of users of a facility, such as a restaurant or chain of restaurants. It therefore has greatly increased data logging capacity and greatly reduced aural/audio

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capacity when compared with the embodiment of *Figures 1* to *6*.

<u>*Figures 7 and 8*</u>

The display sign's mechanical structure comprises in essence a box

5   like base or rear unit **701**, and front frame member **702**, which is a snap fit

onto the base unit **701**, a transparent window **703** and a graphics laminate

704. The window **703** and graphics laminate **704** are sandwiched between

the base unit **701** and the front frame **702**. In addition to the snap-fit other

additional means may be used to securely lock the units **701** and **702**

10   together.

A flexible seal **705** is carried by the frame **702** and the whole of the

latter's inner periphery **702a**. The seal **705** makes a waterproof contact with

the periphery of the window **703**.

The electronic control system is indicated at **706** and the battery

15   power supply at **707**.

In this embodiment the base unit **701** is manufactured from aluminium

extrusions having the cross-sections shown in *Figure 8*. The front frame **702**

is also manufactured from an aluminium extrusion. The window **703** is

manufactured from a transparent polycarbonate or acrylic material.

20   As indicated earlier the frame **702** is a snap-fit onto the base unit **701**,

the latter being secured to a wall by appropriate means such as screws (not

shown). Access can then be easily gained to the graphical display, electronic

control system and the batteries by simply detaching the frame **702**, and

window **703**, from the base unit **701**, the latter remaining secured to the wall

25   or other mounting.

Although not shown in *Figures 7* and *8*, the display sign also

incorporates the equivalent of the exciters or transducers **35** of *Figure 3* in

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order to make the assembly operate as a loudspeaker in the manner already described.

Figures 9 and 10

5   These illustrate the essential elements of the electronic control system shown at **706** in _Figure 7._

There are three ways in which inputs can be made to the sign's electronic system, these being shown at **910**, **911a, b, c** and **d** and **912** respectively.

10   The inputs are fed into a microprocessor **913** which controls a) an output to an E^2 PROM **814** (erasable programmable read-only memory); b) an output to a flash memory **915**; c) and an output to a digital-to-analogue converter (DAC) **916**.

The output from the DAC **915** is fed to a power amplifier **917** and

15   thence to an audio driver/exciter/transducer **918** which is the equivalent of **35** in _Figure 3._

Input **910** is a so-called serial button that is capable of inputting a variety of commands to the microprocessor **913** depending, for example, on the number of times it is pressed.

20   Inputs **911a** to **911d** are hard-wired buttons each of which is then only capable of making a single type of predetermined input to the microprocessor **913**.

The third type of input **912** comprises an Infra-Red Data Association (IRDA) transceiver operable by means of a hand-held remote controller **919**.

25   However, the IRDA's main purpose in many applications is to enable the logged information to be downloaded from the display sign.

The IRDA transceiver **912** is connected to a serial I/F unit **920** which in

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turn is connected to the microprocessor **913**.

On receipt of an input either from the hardwired switch inputs **911** or the serial switch inputs **910** or the IRDA link **912** the microcontroller **913** powers up the amplifier **917** and peripherals, logs the key hit in the E 2PROM

5   **914** and, depending on the content of the flash memory **915** Table of Contents, plays audio by consecutively addressing the flash memory **915** and latching the resulting data into the digital-to-analogue converter **916**, which converts the 8-bit level information into an analogue output to feed into the power amplifier **917** and from this to the audio driver **918** as an analogue

10   audio signal.

The system of *Figure 9* may be simplified by omitting the flash memory **915** and then the audio is played directly out of the microcontroller memory **913**. This simpler system is suitable for a short beep or other simple sampled audio message.

15   The microcontroller **913** includes a real time clock such that all logging can be linked to real time.

The IRDA **912** is to be used to download logging information to a remote handheld computer such as a laptop or Palm Pilot type system **919**. It will also be used to upload new audio data to either the flash memory **915** or

20   to the microcontroller **913** together with control and real time setup information as necessary.

The internal logging data is stored in I²C interfaced E²PROM **914**. This technique allows use of variable sizes of E²PROM depending on the application requirement.

25   This arrangement is more efficient than a logging system which logs the time and date of each switch push together with the switch number. This is very wasteful of which with each entry consisting of several bytes of data.

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The system of the present invention is a flexible system utilising all the E²PROM memory, configurable to suit the application. The memory is divided up into sections by time; with each time slot consisting of 2-bytes for each switch i.e. three switches require 6 bytes. With a 2-byte slot up to 65536 single switch presses can be recorded in one time slot. When the switch is operated the microcontroller **913** uses its real time clock to determine which slot to use and increments the correct switch counter in the correct time slot.

For a high throughput application where accurate understanding of the timing of the presses is required the system can be configured with very small time slots e.g. five minutes. Ion the other extreme where an understanding of slow trends is required the system may have a two hour time slot with data collected over days or weeks.

For example a system with a 4K E²PROM configuration to a one hour timeslot could log information on three buttons for twenty-eight days. At the end of the twenty-eight days the system allows several options in the setup.

- The data can be overwritten with new switch presses.
- The data can be cumulative i.e. the time "rolls over" and new switch presses are incremented in addition to those of twenty-eight days before.
- The logging can stop.

To avoid losing the setup during power down the system setup is stored in the E²PROM with the log and to avoid confusion when downloading the setup data is included in the download.

In the system setup the following data is included:

- Serial Number - unique sign serial number is programmed at manufacture to ensure multiple signs using the same download software are never confused.

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- Time Granularity - time slot size.

- Maximum number of Time Slots - included such that the rollover point can be predicted

- Key Factor - Minimum time between logged keys.

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- flags - Data Overwrite, Data Accumulate, Stop on Max Time Slots...........

It is possible to add further E²PROM devices to extend the logging time.

Figure 10

10   The flash memory **915** contains the audio data. The format of the data is such that consecutive addresses read out of the memory at the correct sample rate will make up the original audio signal.

In this embodiment a IMB device consisting of eight blocks of 128 KB is used. This has determined that the maximum number of different audio

15   clips is eight although the format allows almost the entire memory to be configured as one clip. A Table of Contents, is included at the end of block eight, defining the Start point of each clip, the sample rate of each clip and the length in bytes of each clip. This allows the microcontroller **913** to determine the parameters of each audio clip to be played when a switch is

20   activated and maintains a flexible format that can be expanded if more memory and audio is required.

With a IMB device the maximum amount of audio using 8KHz sample rate is sixteen seconds and using a 4KHz sample rate the maximum is thirty-two seconds.

25

Manner of Use

The embodiment of *Figures 8* to *10* is designed to canvas users of a

20

facility, such as a restaurant, as to their views on various matters related to that facility. This is achieved by the customer making inputs to the display sign through the inputs **910** and **911**.

The user is presented with a simple statement and large graphic showing a number of switch areas. The user can select one of these switch areas by pushing the area itself. If more than one is selected then the first will be logged and any further pushes will operate the audio but are not logged until there is a predetermined time gap.

The logged information from the customers can be downloaded, for example by the manager of the facility by means of the hand held device **919**.

The unit **912** will be accessed through the window **703** using the handheld device **919** such as a Palm Pilot or PC based laptop.

On command from the handheld device **919** the IRDA interface will start communications and wait for the IRDA timeout (10s default) for a command from the handheld device **919**.

Each sign will have unique identity (programmed at manufacture) and this will be transmitted to the handheld device **919** on start up of communications. This identity can have a "real name" associated with it on the setup screen. This will allow one handheld device **919** to be used with many display signs and the data from each display sign stored uniquely thus avoiding the manager accidentally overwriting the logging data.

The manager may also use the hand held device **919** to input new data into the system of *Figure 9*.

In this embodiment the valid commands are:

L   Download Log Data   Log Data comma delimited between keys,
                                   New line delimited by granularity. Final

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byte is system status byte consisting batter life indication.

E	Erase	Erase log data.
S	Upload Setup Data	Log Granularity, Key Factor, IRDA Timeout, Current Time.
A	Upload Audio Data	Custom Format Sampled Audio.
P	Play Audio Data	Must be followed by key number (1,2,3)

The E, erase, command is a separate function to the L,Log, command to allow the data log to accumulate or be restarted as required, allowing the manager to check the data without erasing in between official collection periods.

The IRDA Port software will consist of two screens.

Command Screen	Issuing commands as shown above with a window for feedback information and confirmation of operation being completed. This screen will also show a list of sign setups with a "real name" of each sign such that the sign being communicated with can be verified.
Setup screen	Granularity, key factor, timeouts etc for each sign in the system can be set.

The power supply is designed to maximise the battery life. The main system runs at 3.3V, with the amplifier running directly from the battery **707** which is compensated to prevent audio volume change over the battery's life.

During operation the system wakes up on receipt of a key hit, logs the hit according to the microcontroller simulated real time clock, plays the

22

required track and returns to sleep. The main battery use is powering the amplifier during playback, with the real time click and key circuitry using negligible power continuously.

Compared with the first embodiment of *Figures 1* to *7* the second

5   embodiment of *Figures 8* to *10* has reduced audio capability which is limited essentially to acknowledging to the user/customer the fact that the user/customer has entered data.

23

Claims

1.   A display sign in the form of a flat panel loudspeaker, the graphics of the display being carried on one exposed surface of the flat panel, the latter being provided with one or more transducers whereby the

5   flat panel may be energised to transmit sound in accordance with signals supplied to the one or more transducers.

2.   A display panel as claimed in claim **1** in which one or more transducers are energised by means of a solid state energisation and control system incorporated in the display sign.

10   3.   A display sign as claimed in claims **1** and **2** in which the display sign is provided with a switch arrangement which is incorporated in the display sign to act as an interface between a user and the energisation and control system associated with the one or more transducers.

4.   A display sign as claimed in any previous claim in which the

15   switch arrangement comprises one or more capacitative or proximity switches located behind the flat panel loudspeaker surface whereby a user may operate the switch or switches by placing a finger in the proximity of the switch but on the graphic display side of the panel.

5.   A display sign as claimed in any previous claim in which the

20   solid state energisation and control system includes an MP3 digital signal processor/decoder through which audio signals from a memory arrangement can be supplied to the one or more transducers in order to

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energise the latter.

6.   A display sign as claimed in any previous claim in which a micro-controller is connected between the memory arrangement and the MP3 digital signal processor/decoder in order to reformat the data so that it matches the requirements of the MP3 digital signal processor/decoder.

7.   A display sign as claimed in any previous claim in which the memory arrangement comprises an SSFDC smart media flash memory which is adapted to store the audio signals in the form of files which have been previously recorded on a computer such as a PC or MAC platform.

8.   A display sign as claimed in any previous claim in which there are one or more active switches addressable by the micro-controller to cause the active switch to perform a function such as turning on a light.

9.   A display sign as claimed in any previous claim in which the micro-controller can be placed in a switch programming mode to enable the switches to be programmed in situ.

10.   A display sign as claimed in any previous claim in which the memory arrangement also comprises a buffer memory associated with the SSFDC.

11.   A display sign as claimed in any previous claim in which the energisation and control system includes a remote control receiver (preferably infra-red) whereby the solid state control circuit may be

25

reprogrammed remotely without the need for any physical alteration or adjustment of the display sign and its associated energisation and control system.

12. A display sign as claimed in any previous claim which incorporates a battery power pack by which the energisation and control system is itself energised.

13. A display sign in the form of a flat panel the graphics display being carried on one exposed surface of the flat panel and means being provided to store information which is input to the panel by interaction between the panel and a person external to the panel.

14. A display sign as claimed in claim **13** in which the said means comprises a control circuit having one or more first input switches operable by said person and a second input switch operable by an infra-red signal generated externally of said display sign by a remote control device.

15. A display sign as claimed in claim **14** in which said input generates a signal or signals within the control circuit mounted in or on said display sign, said signal or signals being input to a microprocessor/microcontroller which forms part of said control circuit and a first memory for storing the input signals.

16. A display sign as claimed in claim **15** also comprising a flash memory for storing audio data for outputting to an outer transducer or driver mounted on the display sign.

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17.   A display sign as claimed in any one of claims **14** to **16** in which said remote control device is also adapted to download the data stored in said first memory.

18.   A display sign as claimed in any of claims **15** to **17** in which said first memory comprises an erasable programmable read-only memory (EPROM).

19.   A display sign as claimed in any one of claims **16** to **18** in which data from said microprocessor is input to a digital-to-analogue converter the output of which is input to said audio driver through a power amplifier.

20.   A display sign as claimed in any one of claims **14** to **19** in which the control circuit includes an infra-red data association transceiver.

21.   A display sign as claimed in any one of claims **15** to **20** in which the microcontroller incorporates a real time clock so that all the logging of incoming data can be linked to real time.

22.   A display sign as claimed in any one of claims **15** to **21** in which the first memory is divided up into sections by time with each time slot consisting of a plurality of bytes for each said first input switch.
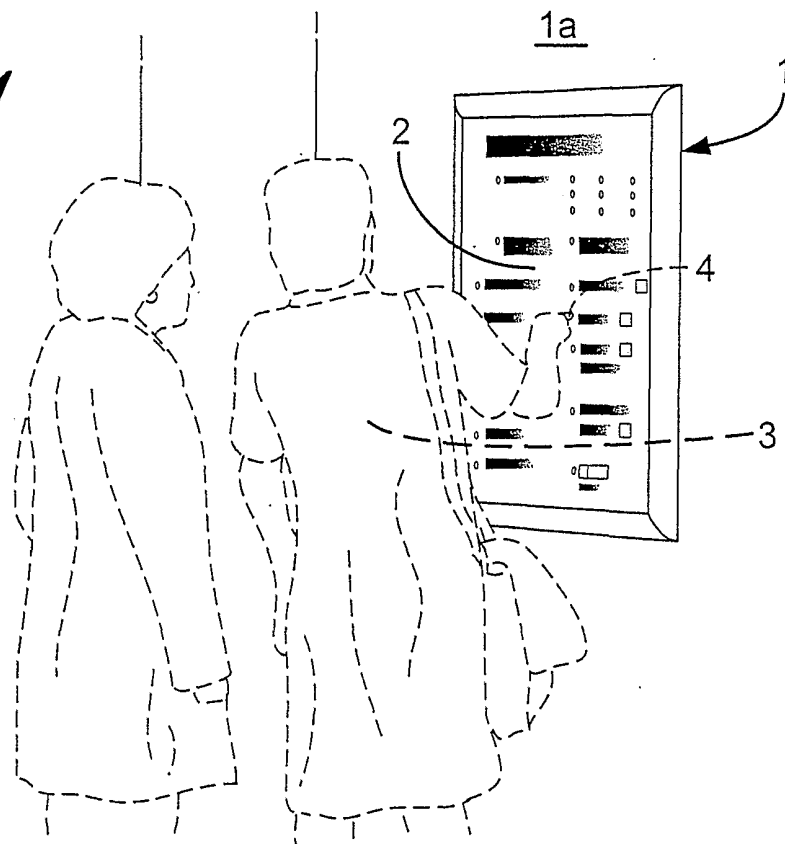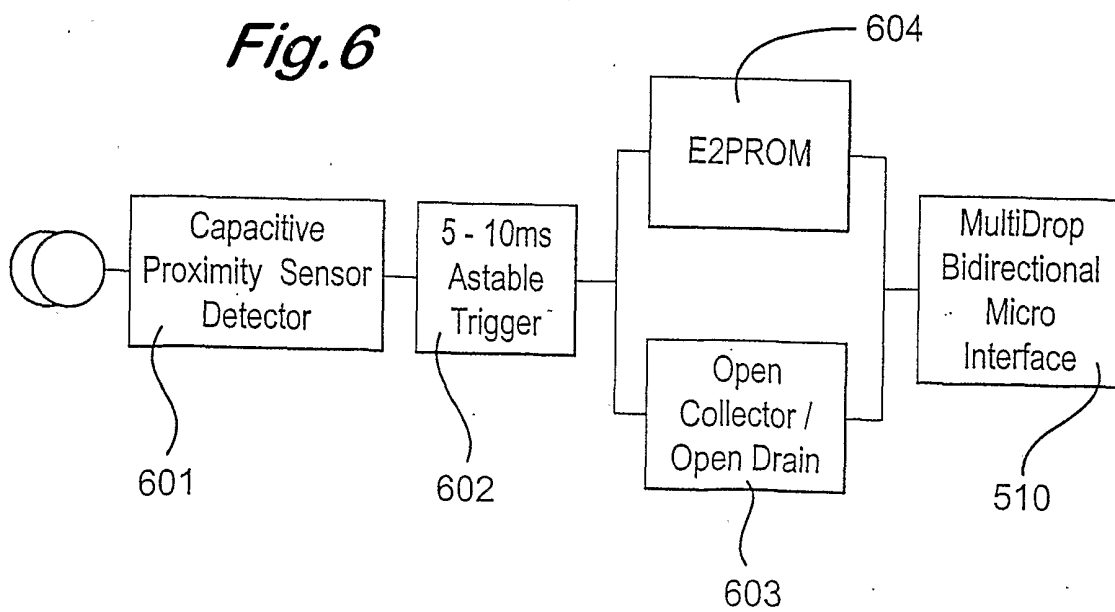
23.   A display sign as claimed in any one of claims **13** to **22** comprising a box-like base member having detachably connected thereto a frame member, a window laminar and a graphics laminar being sandwiched
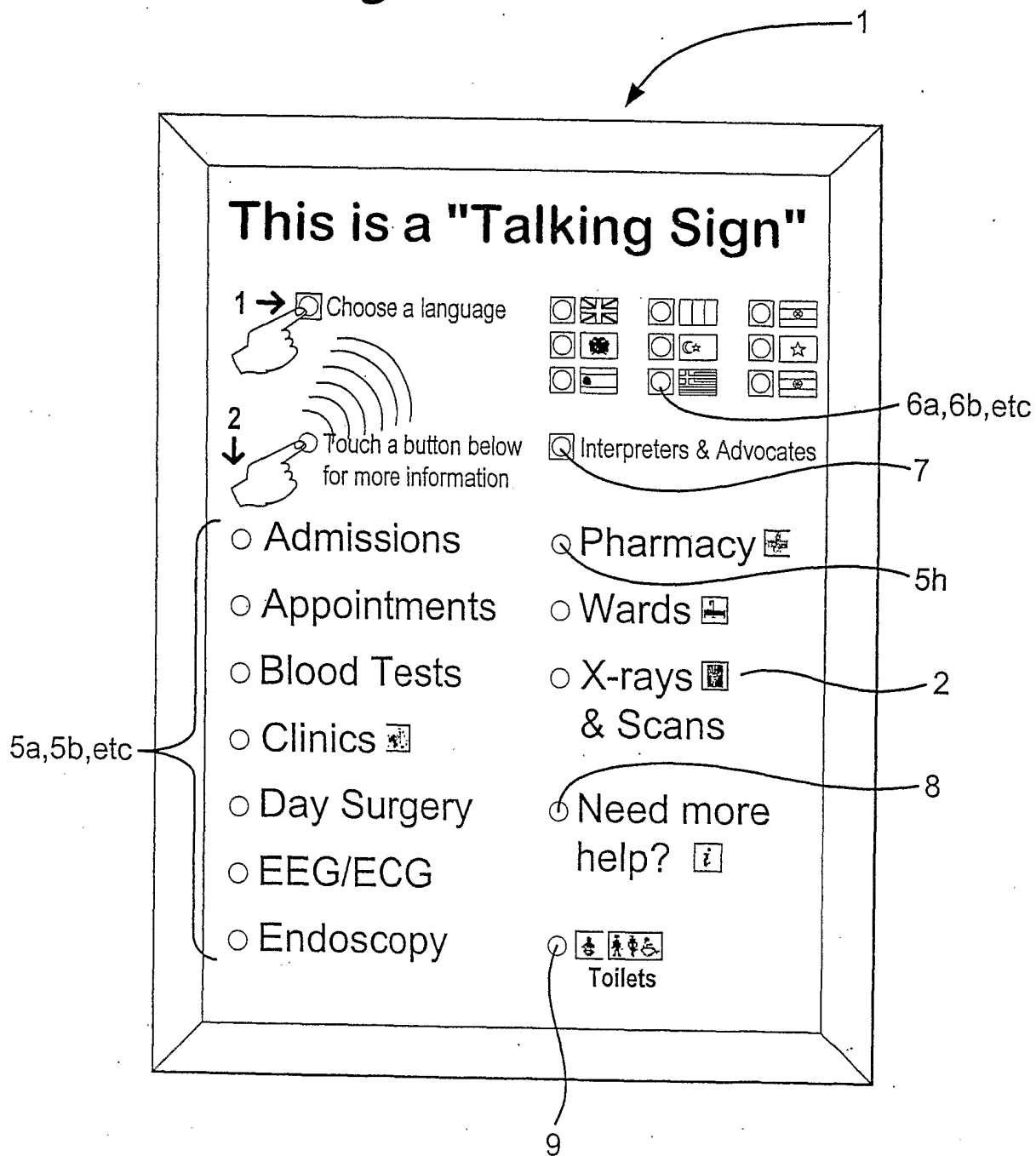
27

between said frame member and said box-like member.

24.   A display sign as claimed in claim **23** in which the box-like base member and said frame member are fabricated from extruded metal sections.
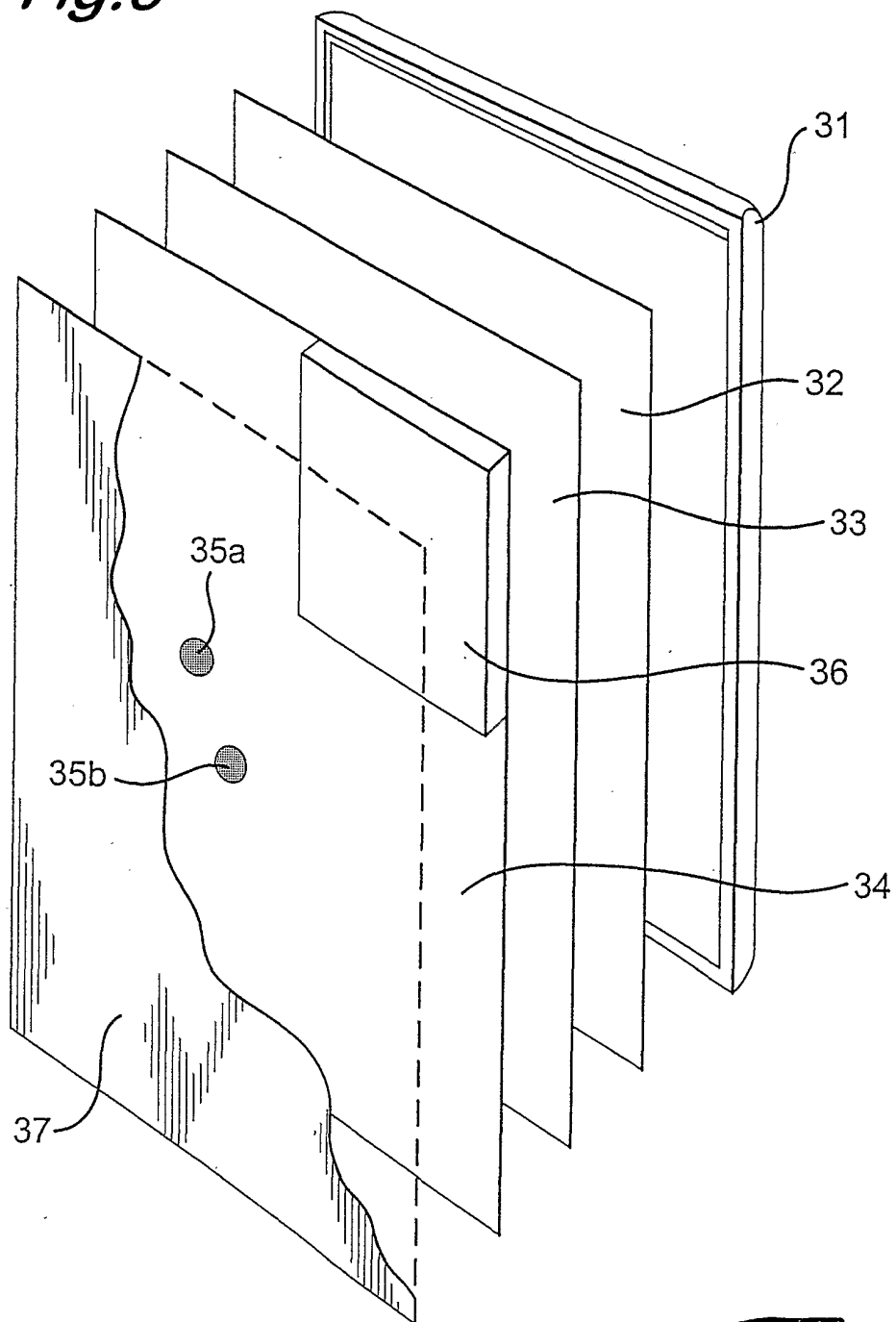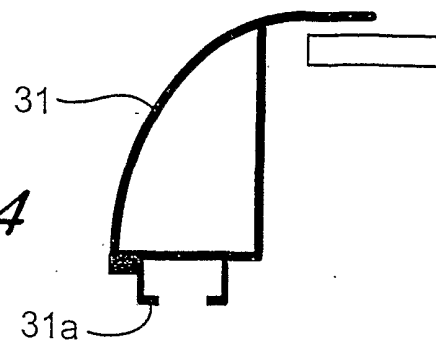
5   25.   A display as claimed in claim **23** or **24** in which the window lamina comprises a transparent plastic material.
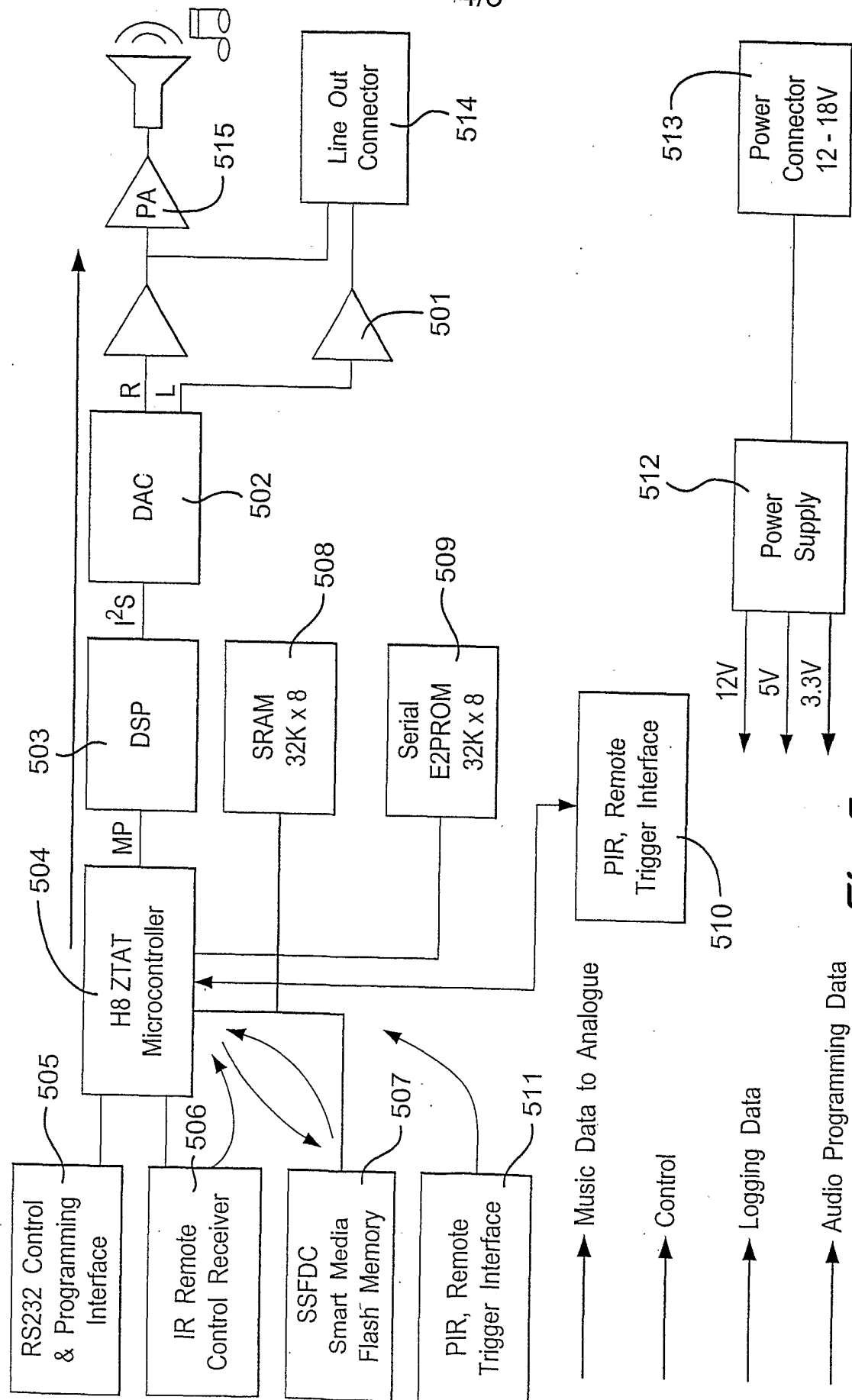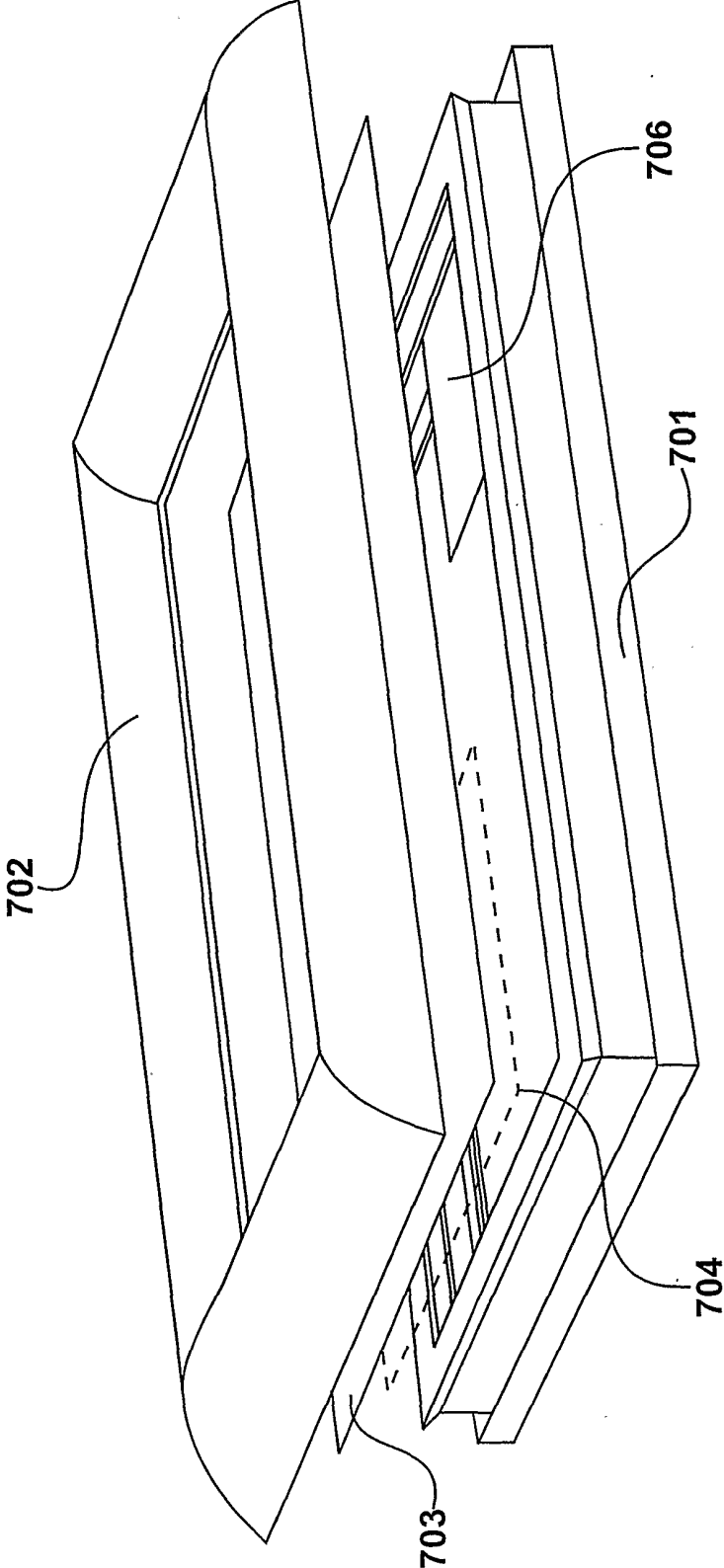
Fig.1

Fig.6

Fig.2

This is a "Talking Sign"

1 → 🔊 Choose a language

2 ↓ 🔊 Touch a button below
    for more information

🔊 Interpreters & Advocates

○ Admissions   🔊 Pharmacy

○ Appointments   ○ Wards

○ Blood Tests   ○ X-rays
                        & Scans
○ Clinics

○ Day Surgery   🔊 Need more
                        help?
○ EEG/ECG

○ Endoscopy   🔊 Toilets

6a,6b,etc

7

5h

2

8

5a,5b,etc

9

Fig.3

Fig.4

4/8

Fig.5

Figure 7

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702

705

703

704

701

707

Figure 8

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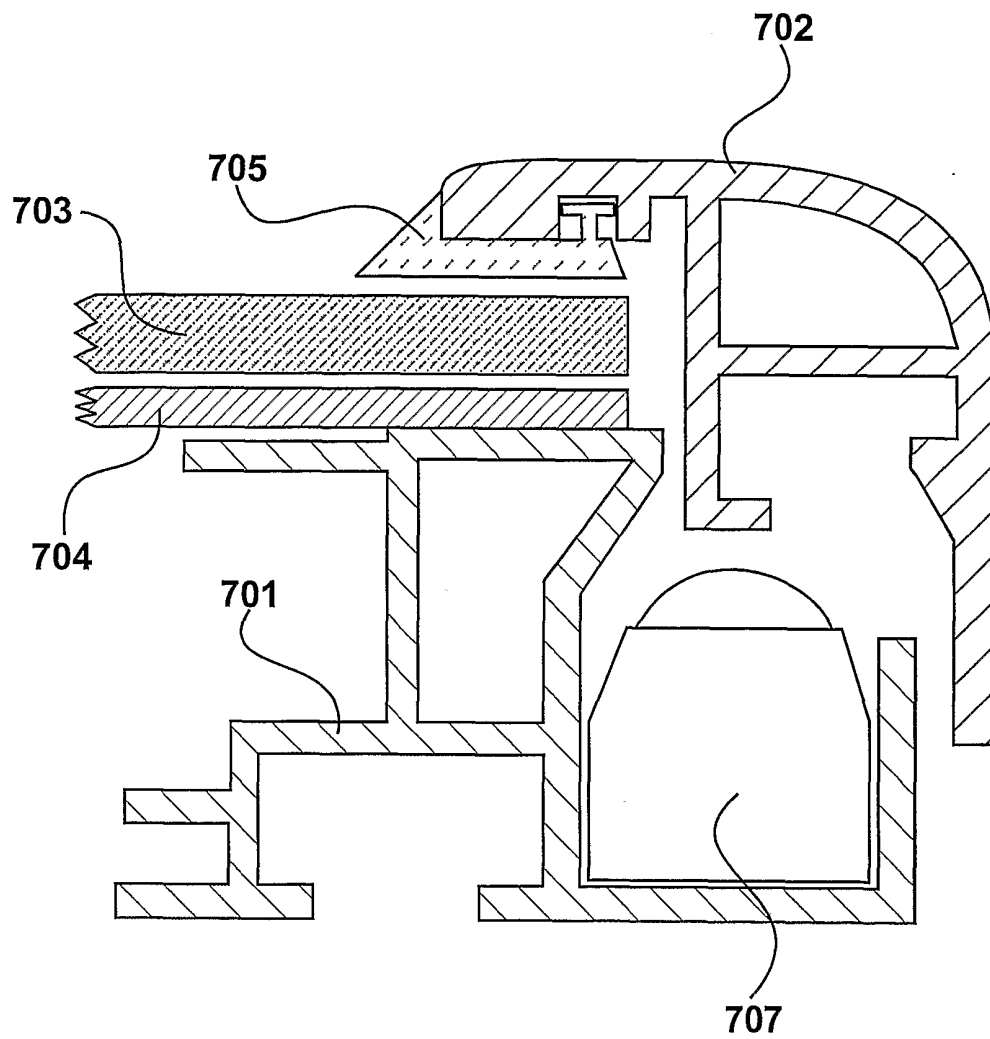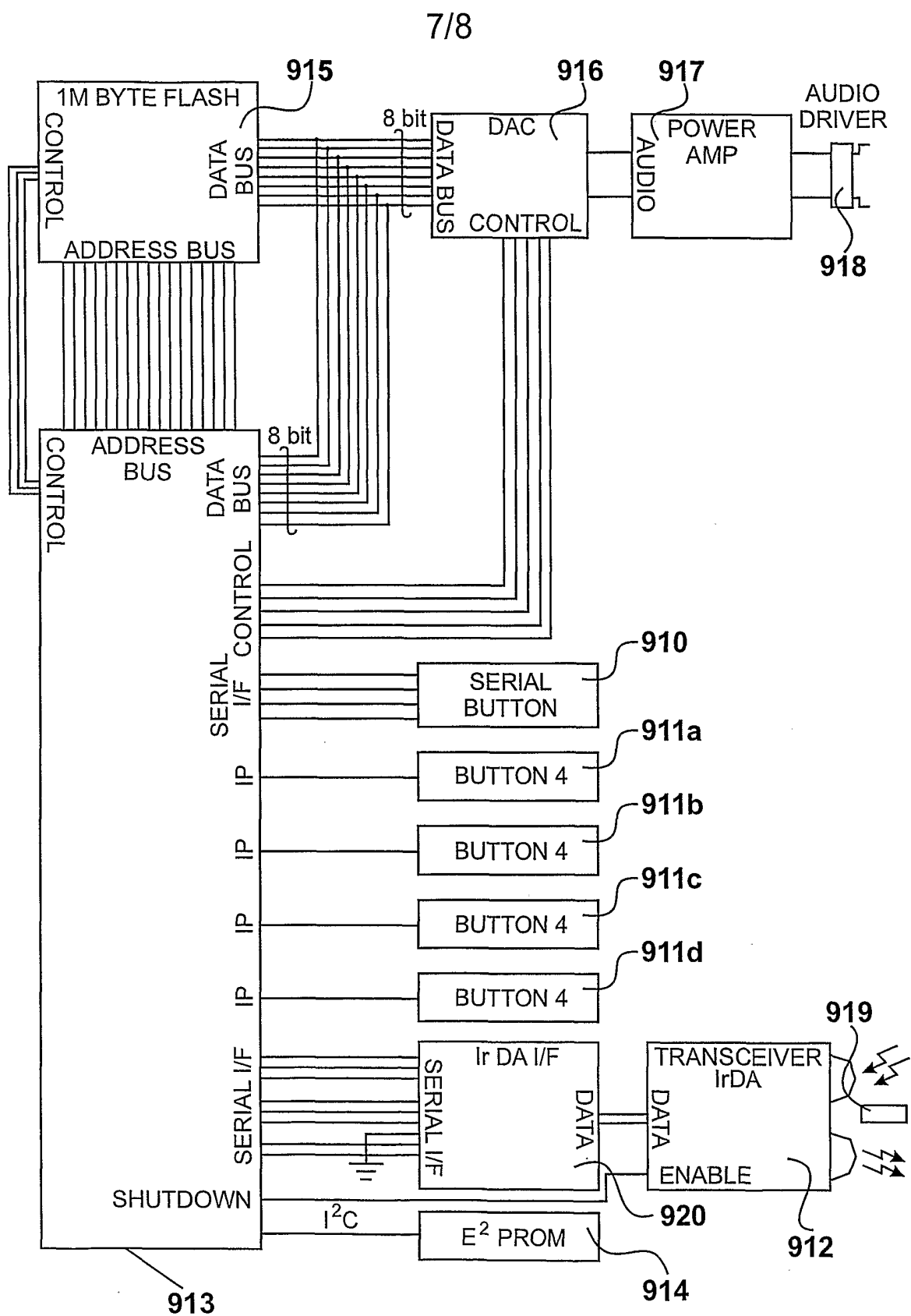
Figure 9

TABLE OF CONTENTS	
	CLIP 1 LENGTH CLIP 1 RATE CLIP 1 ADDRESS
	CLIP 2 LENGTH CLIP 2 RATE CLIP 2 ADDRESS
	CLIP 3 LENGTH CLIP 3 RATE CLIP 3 ADDRESS
	CLIP 4 LENGTH CLIP 4 RATE CLIP 4 ADDRESS
	CLIP 5 LENGTH CLIP 5 RATE CLIP 5 ADDRESS
	CLIP 6 LENGTH CLIP 6 RATE CLIP 6 ADDRESS
	CLIP 7 LENGTH CLIP 7 RATE CLIP 7 ADDRESS
	CLIP 8 LENGTH CLIP 8 RATE CLIP 8 ADDRESS

1MBYTE FLASH
MEMORY BLOCK 1
MEMORY BLOCK 2
MEMORY BLOCK 3
MEMORY BLOCK 4
MEMORY BLOCK 5
MEMORY BLOCK 6
MEMORY BLOCK 7
MEMORY BLOCK 8
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Figure 10