



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.03.2002 Bulletin 2002/13

(51) Int Cl.7: **G09F 19/00, G09F 27/00**

(21) Application number: **01307067.7**

(22) Date of filing: **20.08.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
 Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: **12.09.2000 GB 0022331**

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(54) **Display stand incorporating an internet server**

(57) A display device is provided which includes a data processor (4) such that the display can function autonomously. The display may form an interactive sign

which exchanges data with other appliances using internet connectivity. The sign includes an embedded web host and web client software enabling the sign to interrogate other devices and to act as a server.

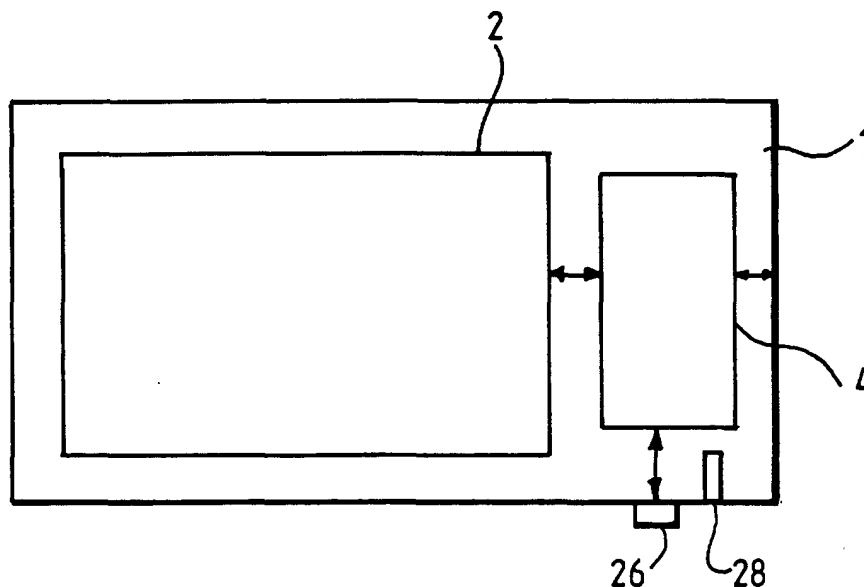


Fig.1.

Description

[0001] The present invention relates to a display device. Such a display device may incorporate Internet connectivity and may communicate with other devices either on a master-slave type arrangement or on a peer to peer basis. The invention further relates to a home page appliance, which appliance may be embodied within the display device and also to a web host, which web host may also be embodied within the display device.

[0002] As used herein the term "web host" describes a device which enables web pages to be made available across the internet or a similar distributed data communication network. A "web host" can thus exhibit the functionality of a server, but is a small dedicated or substantially dedicated device rather than a general purpose computer.

[0003] Building signage has traditionally been wholly non-interactive, that is to say signs have typically been formed by printing characters onto a suitable substrate. However, some signs, such as meeting rooms signs have also included a slideable element such that the meeting room can either be marked as occupied or vacant.

[0004] Furthermore, signs, of the "pegboard" type, that is movable signs which are often used in lobbies or reception areas are known wherein a message can be placed on the sign, often by using adhesive or mechanically engageable letters to create a temporary message. Such signs are non-interactive.

[0005] Airports and railway stations have utilised electromechanical or electronic signs in order to display information concerning arrival and departure times. Such signs are directly connected to a centralised data system and act as slaves to that data system.

[0006] According to a first aspect of the present invention, there is provided an electronic display device having a data communication device for exchanging data, and memory for storing said data and a display for displaying said data, in which said device further includes an embedded server for enabling the display device to exchange data with other devices incorporating clients.

[0007] It is thus possible to provide a display device which includes a web host such that the device can function as a host server and enable itself to be interrogated by other data processors, computers or display devices acting as web clients. Thus specific information held within the memory of the display device can then be accessed and providing certain security protocols (if any) are successfully completed, that information may then be reviewed or downloaded at a remote location.

[0008] Additionally the display device is able to receive and display data, and to act in an autonomous manner. Such a display device should not be confused with a monitor, which is a screen attached to a computer as a peripheral in order to provide part of the user interface to that computer. The display device of the present

invention is a stand alone device.

[0009] The display device according to the present invention may be used as an item of building signage. Thus the device may be located in a corridor, and outside offices, meeting rooms or other shared spaces in order to provide information concerning location of objects, rooms, and utilisation of resources such as an office or a meeting room. The device may also indicate where the occupant of an office is, or whether he is to be disturbed or not. This list should not be regarded as exhaustive.

[0010] The display device may also be used within the home, and for example may function as a picture frame, or a fridge display. The device may also be used within shops or other retail environments and also within bus stations, railway stations, airports and the like in order to provide information to travellers.

[0011] Preferably the data communications device allows the display device to connect to a telecommunications network. Thus the display device, which may for example be embodied as a sign, may be accessed remotely in order to update the information displayed thereon. The telecommunications network may be a point to point style network where, for example, the sign is addressed directly by virtue of its telephone number, or it may be in the form of a more distributed network, such as the internet/world wide web. Additionally both point to point and internet style communication may be supported by the same device. The telecommunication network may comprise a LAN and/or a WAN.

[0012] Advantageously the display device includes a client, such as an internet client and preferably a web client therein such that the device is able to receive information in a suitably defined and encoded form. Thus the client can handle the hand shaking, authentication and verification of identities between the display device and other data processors in order that data may be transferred between one or more data processors and the display device. These data processors may be computers, user terminals, web servers or other display devices.

[0013] Preferably the display device further includes browser or other embedded software object for interpreting instructions or data received by the display device and rendering these into a displayable form. Thus, for example, a display device may receive updated information in a predefined file format or encoding scheme, such as hypertext mark-up language (HTML) and may then use its embedded browser to interpret the instructions in the HTML document and to display the interpreted result on the display element of the display device. Other file formats other than HTML may, of course, be used. An example of a current rival to HTML is Macromedia's "Flash format".

[0014] Advantageously display devices may be able to communicate with one another on a peer to peer basis. Such communication may be provided via a telecommunications network, such as the internet. Such

display devices may then negotiate on a peer to peer basis to exchange information with one another. Thus each device, which might be a sign, may hold a local replica of the data contained within one or more signs, or, if requested to provide data not within its own memory, may poll the other display devices in order to ascertain if they can provide the demanded information. Additionally and/or alternatively, the display device may further include a second communications means, for example in the form of a radio transmitter, infrared or ultrasonic link, such that display devices within a certain proximity to each other may communicate with one another or other suitably enabled devices via this further communication means.

[0015] A display device constituting an embodiment of the present invention may further include an interface for exchanging data with a physical removable data carrier, non-limiting examples of which include magnetic disks and solid state memory cards, such that data can be stored on the data carrier for archiving, back-up and transportation purposes.

[0016] Preferably the display device is implemented as an item of room signage. Thus the sign may, for example, have a display, such as an LCD display, for displaying availability of a room. It is worth emphasising that other display technologies may be used and that the present invention is not limited to the use of LCD displays. The display device may be interactive such that a person can enquire as to the availability of a room and make bookings for that resource. Before accepting such a booking, the sign may poll or negotiate with adjacent signs in order to determine if they have received any conflicting bookings for that resource. Furthermore, if a plurality of signs are provided, each one associated with a respective meeting room, then the signs may negotiate amongst themselves in order to suggest alternative meeting rooms if the first meeting room is unavailable. It should be noted that this meeting room example is only one example where signs are associated with a respective resource, and that this example can be extended by way of analogy to any other resource which may be associated with a display device constituting an embodiment of the present invention. The device is not limited to the booking of meeting rooms but can control availability for other resources, such as meeting areas, cubicles, desks, chairs, computers, video conferencing equipment, cars and so on.

[0017] Where the display device is implemented as an item of signage associated with a room, the device may also include or be responsive to sensors or user operated input devices, for example a switch for determining whether that room is occupied or not. Thus if the room is occupied, this condition can be detected and information concerning the status of the room updated. If the room is a conference room, and the room is occupied even though it has not been booked, the sign may issue a warning, either audibly or visually, in order to indicate that the person should either book the room or

vacate the room, the latter for example if a meeting is scheduled to start in the room soon. Such sensors may include motion sensors, heat sensors or microphones. Where a user operated switch is provided (which may for example be the room's light switch) this may be used to judge when a meeting is in progress. The status of the user operated switch may be combined with data from other sensors and the booking schedule for the room to derive an expectation value that a meeting is in progress. Thus, if a user finishes a meeting but forgets to operate the user switch, the display device will modify the expectation value with the passage of time to indicate that the room is not in use. The display device may request a user input to prevent the room or resource as being marked as available.

[0018] The sign may act as a office sign identifying the occupant of an office and/or other parameters such as that person's position within an organisation, responsibilities or skills. Such a sign may include one or more further inputs, for example switches, touch sensitive elements on the sign, or a link to a computer within the office such that the occupant may set or remove instructions such as "do not disturb" or messages such as "out to lunch", "on holiday" or the like. The display device may be arranged to interrogate and/or communicate with a calendar or scheduler based on a diary system for the occupant such that it can update automatically in order to provide an indication of when that person will be in the office or out of the office. This information can be viewed at the display device itself or browsed over the Internet.

[0019] Preferably the display device also incorporates a memory for storing data set by the user. The memory may be permanently provided in the display device, or may be in the form of a removable storage element, such as a solid state card or the like which may be moved from display device to display device. The display device may allow the user to store personal data within the memory, for example in the form of one or more web pages, such that information concerning the individual, his/her likes or dislikes, responsibilities, areas of interest, data regarding projects or groups to which that individual belongs, and/or links to other selected sites or web pages may be held within that memory in order to give an enhanced picture of the capabilities of that individual. Thus, the user can retain physical control of the data maintained within the removable memory device in order to control their own web page, and the web page may become available to other web users once the memory device has been inserted into the display device. The web page becoming available by virtue of the fact that the display device is connected to the telecommunications network, and more specifically the internet, and includes a web host therein.

[0020] The display device may further be enabled to negotiate with other data processors to allow the display of the display device, or a portion thereof, to become subservient to the further data processor in order that

information contained within that data processor can be displayed. Similarly, the display device may also become subservient to other items of equipment which may or may not include data processors. Thus, for example, the display element of the display device could be used to display images in a digital camera, or to be used as a display for a hand held or lap top computer. Similarly the display may also be enabled to display video feed or other information received over the data communications link. Thus the display device and in particular a sign constituting an embodiment of the display device, may also function as a video phone or web conferencing tool.

[0021] According to a second aspect of the second invention, there is provided an item of building signage including internet connectivity.

[0022] According to a third aspect of the present invention, there is provided a display device in which each display device can negotiate with other display devices on a peer to peer basis, and in which each display device includes a web client and a web host.

[0023] Advantageously the web client is associated with a browser such that the display device can receive data over the world wide web and render the data into a form suitable for display.

[0024] Advantageously the web host allows information contained within the display device to be made available via the internet for distribution to and/or interrogation by other web clients/servers.

[0025] According to a further aspect of the present invention, there is provided a web host appliance comprising memory for storing at least one web page, a communications device, and a data processor able to interact with said memory and with said communications device in order to enable the at least one web page to be accessed via the communications device, said web host further including a display device such that the at least one web page, or a subset of the data contained therein, can be viewed via the display device.

[0026] The present invention will further be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 schematically illustrates a display device constituting an embodiment of the present invention;

Figure 2 schematically illustrates the internal configuration of the display device shown in Figure 1 in greater detail; and

Figure 3 schematically illustrates a information display system utilising the display device shown in Figure 1.

[0027] The display device 1 shown in Figure 1 comprises a video display 2 in co-operation with a data processing device 4. The display 2 can be formed of any

suitable display technology, and liquid crystal display technology is the presently preferred implementation of the display 2. The data processor 4 controls the driving of the display 2 and the interface between the display device 1 and the world around it.

[0028] The functionality of the data processor 4 is described in greater detail with reference to Figure 2.

[0029] As shown in Figure 2, the data processor 4 comprises a CPU 6 which is arranged to control and implement the various functions within the display device. Thus the CPU may execute instructions from a memory 8 in order to provide the functionality of a web host 10 which enables the sign to implement the functionality of a server on the web such that data contained within the sign can be interrogated remotely. The CPU 6 can also execute instructions from the memory 8 (which may comprise both solid state and magnetic memories) to implement the functionality of a web client 11 such that the sign can communicate with a web server or web host in order to receive web pages and the web client can include the functionality of a browser such that the downloaded data, which may for example be in HTML format, can be interpreted and rendered into a form suitable for display. The interpreted web pages may be transferred to a video memory 14 where the video image for display can be repeatedly accessed by a display driver 16 which performs the control functions required to cause the image to be displayed on the display 2. The memory may also contain user data 12, for example a user's own web page, and one or more application programs 13, such as a calendar. The CPU 6, memory 8 and video memory 14 interconnect with one another via a data bus 18. The data bus also enables these devices to be connected to a first input/output port 20 which is in turn connected to a telecommunications network (i.e. phone, LAN, internet) such that the display device can communicate with other data processors or signs via the telecommunications network. The connection to the network will in general, though not exclusively, be by way of a cable 22 although wireless exchange of data is also possible. A second communication port 24 is connected to a wireless data exchange device such as an infrared transmitter/receiver 26 such that communication between the display device 1 and other suitably enabled devices can be conducted via an infrared link. Other schemes such as "Bluetooth" and IEEE802.1 may also be used. One or more removable memory elements, such as a data card 28 may also be connected to the bus 18 (via a suitable interface) such that information stored on the data card can be presented to and removed from the display device 1. The card 28 may, for example, engage in a slot or other suitable recess formed in the display.

[0030] One or more displays, 1a and 1b may, as shown in Figure 3, communicate with one another via the infrared links provided therein. Thus sign 1a and sign 1b can exchange information on a peer to peer basis without recourse to the telecommunications network.

However, each sign is also connected to a communications network such as the internet 30 via its respective communications link 20a and 20b. Signs 1a and 1b are within close proximity to each other. A further sign 1c which need not be anywhere near the signs 1a and 1b is also connected to the telecommunications network 30 (which can include mobile links such as GSM and third generation mobile telephone links) via its communication link 20c.

[0031] Each sign, as noted hereinabove includes both web client and web host capability. Thus a user at sign 1c may wish to check the availability of a booking room associated with sign 1a. The user at sign 1c can instruct the sign 1c to establish communication with the sign 1a, with the sign 1a acting as a web host and the sign 1c acting as a web client. Thus the sign 1a contains the "master" set of information displayed on the sign 1c. The user at the sign 1c can then enquire as to the status of the conference room and make bookings or not as appropriate. This functionality can be provided via a series of menus presented to a user. Should the user at the sign 1c find that the conference room associated with the sign 1a is unavailable at the time he requests, the sign 1a can establish a communications link with the sign 1b associated with a further conference room, either via the infrared link or via the internet 30 in order to assess the availability of that conference room and make a suggestion to the user at sign 1c that an alternative resource is available should he so desire.

[0032] A further user operating a conventional desktop or lap top computer 32 may also connect to any one of the signs 1a, 1b and 1c in order to act as either a web client or web server for those signs.

[0033] Suppose that sign 1c is an office sign for a particular individual within an organisation. The individual may use the computer 32 in order to generate a web page which may display either predetermined or self selected information, such as the user's name, function, projects he is associated with, likes, dislikes, and so on and that information in the form of a web page may then be uploaded to the communications network 30 and downloaded to the web sign 1c and stored on the data card 28 and/or within the memory 8. Additionally/alternatively, the web sign 1c may allow direct connection to the computer 32 and/or may enable home pages to be constructed thereon via a menu displayed on the display screen.

[0034] Once the web page has been downloaded onto the data card 28, the "owner" of the office may choose to remove the data card if he so wishes at times which seem appropriate to that person such that he maintains physical ownership of the memory device storing his or her web page. This device can be inserted into other signs when that person is at a suitably enabled sign. The entire identity of a sign may be replaced by modifying its data via this mechanism. This can be beneficial where a worker swaps offices as he does not need to move his old physical office sign with him. The identity

of a sign may also be swapped via the telecommunication network.

[0035] Each sign has the ability to hold data concerning an object associated with it, whether that object be a room, some other resource, or a person and to enable information about that object to be accessed via the telecommunications network. Thus each sign also inherently functions as a web host (which may be regarded as a web server). However, the sign as a web host also enables the information stored therein to be viewed directly on the display screen integrated with the sign. Thus each sign has the ability to act as a dedicated web host storing a limited amount of data therein. The term "limited" need not be interpreted as small but nevertheless it would be expected that a sign implementing a web host according to the present invention would store far less data than the main frame computers which act as web servers for internet service providers such as Lycos and Yahoo. Furthermore, the display device/sign acting as a web host of the present invention does not have the capability to function as a general purpose computer and therefore should be contrasted with personal computers and the like.

[0036] The flexibility of the signs according to the present invention enables data to be distributed more freely and easily within a building or organisation. Thus signs could be provided within hospitals, schools or other institutions to enable people and/or resources to be located easily or other data to be interrogated or uploaded.

[0037] The display capability of the sign may also be utilised by enabling the sign to become subservient to a user device, such as a portable computer or video camera, such that information contained therein may be displayed on the sign. Similarly signs may communicate on a peer to peer basis or on a client/server basis to create a web telephone or web video conferencing facility. Such signs would need to be enabled with audio input/output devices and video cameras. These modifications are clearly within the skill of the engineer.

[0038] The provision of a personal home page appliance, that is the feature of enabling an individual to post his own home page up via one of the display devices and to maintain ownership of the web page by virtue of maintaining ownership of the data card 28 enables users to rapidly create or modify home pages without having to rely on the centralised facilities for hosting pages on a mainframe. Similarly, should an administrator or other person within an organisation deem that the web page of a particular user is unsuitable for hosting, they can send their message to the display device acting as the host for that web page in order to disable the device from acting as the host. Furthermore, the administrator may activate a blocking code in order to ensure that the user cannot re-institute the home page by merely moving the data card to a further display device.

[0039] It is thus possible to provide a display device which can function as a sign, as a web client, as a web

host, and as a host for personalised home pages. It is also possible to provide a device in which a user can maintain ownership of the web pages by virtue of the fact that the pages are contained within the user's own display device or on a removable data card and that the data card belongs to, or at least nominally belongs to the user.

[0040] It is further possible that display devices could be used as part of a visitor management or security system. Thus, for example, a sign may be deployed in a visitor reception area. It may act as a client to a security or visitor system, or indeed may directly implement the system itself as an application run from the application memory 13 (figure 2) thereby requiring visitors to enter certain aspects of information about themselves, that is effectively to sign in to a building, and may also issue them with visitors passes. Such passes may be printed on a printer located adjacent to the sign and may include data such as time in, person visited and if a video capture facility is available may also include an image of the visitor. The sign may also keep a list of visitor movements such that, in a web host mode, it can be interrogated by persons within the building in order to discover who has visited, or where the visitors are.

[0041] The visitor's badges may include an infrared or radio device such that the position of the visitor can be periodically updated as a visitor passes one of the display devices. This can be used to provide visitor guidance, for example each display device may indicate the visitor's name as the visitor becomes adjacent to it and then indicate which direction the visitor should head in order to reach his stated destination. Such devices might also be provided for the list of areas to which a visitor is not allowed access, or should not be, such that they can alert the visitor should he stray into one of these areas and if necessary alert security personnel such that the visitor may be removed from these areas.

[0042] The provision of a plurality of signs each having host and client capability means that data processing may be distributed between a plurality of signs to give a functionality which is highly tolerant of device failure, and which may be described as "fail soft" in that, unlike mainframe systems, failure of one data processor can be tolerated without bringing the entire network to a halt.

[0043] The display device need not merely be restricted to hosting a web page for one person but could host a plurality of web pages for a plurality of individuals and/or may host web pages for a group or team of people. The device may then enable the team (which may be geographically disparate) to communicate with each other and share data via their web pages. The web pages may include security restrictions such that only authorised persons can access some of the web pages and items or objects within the pages may have ownership attributes associated with them such that modification, deletion and copying of the objects can be controlled and/or audited.

[0044] Furthermore, the display device may commu-

nicate with other user devices such as portable computers, personal digital assistants and the like to enable the display and/or the internet connectivity of the display device to be made available to the user device. Thus an individual may move adjacent a sign constituting an embodiment of the present invention, establish communication with the sign and then use the display of the sign to view data and/or use the internet connectivity of the sign to browse the internet, send or receive emails, transfer files or engage in other telecommunication activities and/or interact with other resources.

[0045] It is thus possible to provide a versatile display having internet connectivity.

Claims

1. An electronic display device (1) having a data communication device (20, 24) for exchanging data, and memory (8) for storing said data and a display (2) for displaying said data, **characterised in that** said device further includes an embedded server (10) for enabling the display device to exchange data with other devices incorporating clients (11).
2. A display device as claimed in claim 1, **characterised in that** the server (10) is an internet server (10) and the data communication device (20) exchanges data with the internet.
3. A display device as claimed in claim 2, **characterised in that** the internet server (10) is at least one of a web server, a mail server, a file transfer server and a news server.
4. A sign including a display device as claimed in claim 1.
5. A display device as claimed in any one of the preceding claims, **characterised in that** said display device is formed as an item of architectural signage.
6. A display device as claimed in any one of the preceding claims, **characterised in that** data communication device (20, 24) communicates with at least one of a telecommunications network, a local area network and a wide area network.
7. A display device as claimed in any one of the preceding claims, **characterised in that** the communication device (20, 24) communicates with a distributed network of computers.
8. A display device as claimed in claim 7, in which the network of computers is the internet.
9. A display device as claimed in any one of the preceding claims, **characterised in that** the display

device includes an embedded client (11) for receiving data

10. A display device as claimed in claim 9, **characterised in that** the client (11) is an internet client.

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11. A display device as claimed in claim 9, **characterised in that** the client (11) is a web client

12. A display device as claimed in claim 9, 10, or 11, **characterised in that** the client (11) renders data held in the memory (8) in a form suitable for display.

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13. A display device as claimed in claim 9, 10, 11, or 12, **characterised in that** the client is a browser.

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14. A display device as claimed in any one of the preceding claims, **characterised in that** the display device (20, 24) uses the data communication device to exchange data with other display devices on a peer to peer basis.

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15. A display device as claimed in any one of the preceding claims, **characterised in that** the communications device (20, 24) has first and second communications channels, said second channel enabling communication with data processors for exchange of data with the display device.

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16. A display device as claimed in any one of the preceding claims, **characterised in that** the communication device (20, 24) communicates using at least one of a radiative link and a direct connection.

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17. A display device as claimed in any one of the preceding claims, **characterised in that** the device (1) functions as a room sign conveying information about a room or an occupant of the room.

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18. A display device as claimed in claim 17, **characterised in that** the display device (1) is responsive to sensors for detecting the presence of an occupant in said room.

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19. A display device as claimed in claim 18, **characterised in that** said sensors are integrated with the display device.

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20. A display device as claimed in claim 17, 18 or 19, **characterised by** further including a calendar and an interface to the calendar such that room or occupant availability can be interrogated.

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21. A display device as claimed in any one of the preceding claims, **characterised in that** the display device further includes a user memory (28) such that a user can store personal data within the display device.

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22. A display device as claimed in claim 21, **characterised in that** the personal data comprises at least one personal home page and wherein the display device displays at least a portion of said personal data.

23. A display device as claimed in claim 21 or 22, **characterised in that** said personal data can be accessed remotely via the communications device.

24. A display device as claimed in claim 21, 22 or 23, **characterised in that** the memory (28) is dockable with the display device.

25. A display device as claimed in any one of the preceding claims, **characterised in that** the display device (1) can negotiate with or become subordinate to a user device in order to display images or data originating from said user device.

26. A memory (28) for holding data describing a user's at least one web page, said memory (28) being non-volatile and selectively engageable and disengageable with a web host (10) such that, when the memory is engaged with the web host, the at least one web page becomes accessible via the internet.

27. A web host (1) **characterised by** comprising a data (4) processor for hosting at least one web page and a display (2) connected to the web host for displaying a selection of the at least one web page.

28. A web host as claimed in claim 27, **characterised in that** the display (2) is integrated with the web host (1).

29. A web host as claimed in claim 27 or 28, **characterised in that** at least one web page is stored in a removable non volatile memory.

30. A building sign **characterised by** having an electronic display device as claimed in claim 1 and Internet connectivity so as to enable information displayed by the sign to be read or modified via the internet.

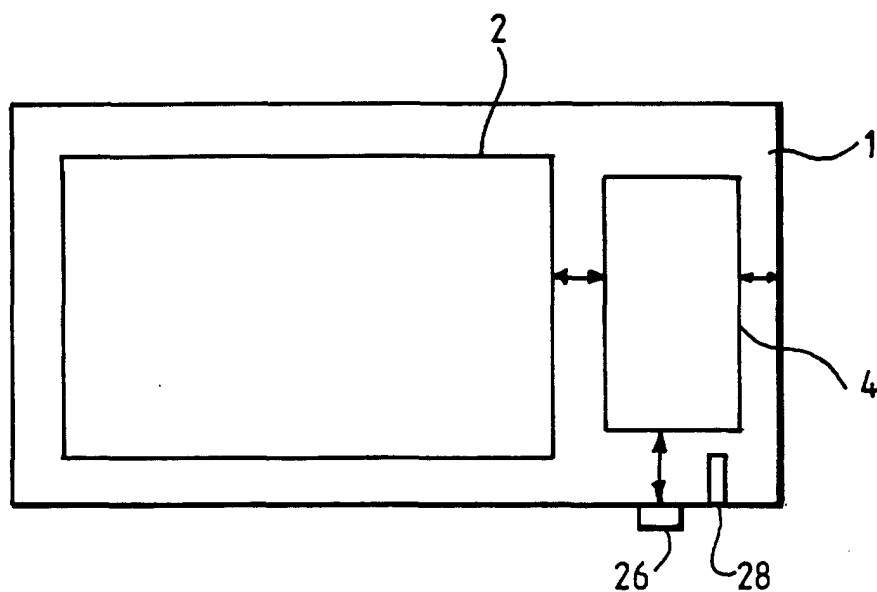


Fig.1.

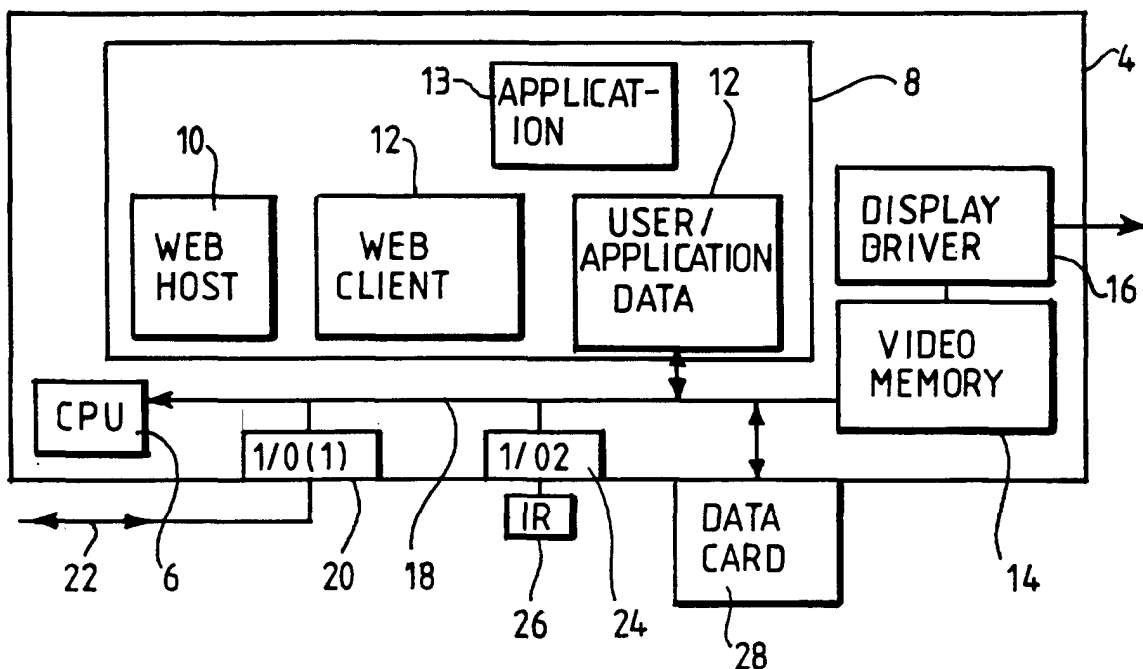


Fig.2.

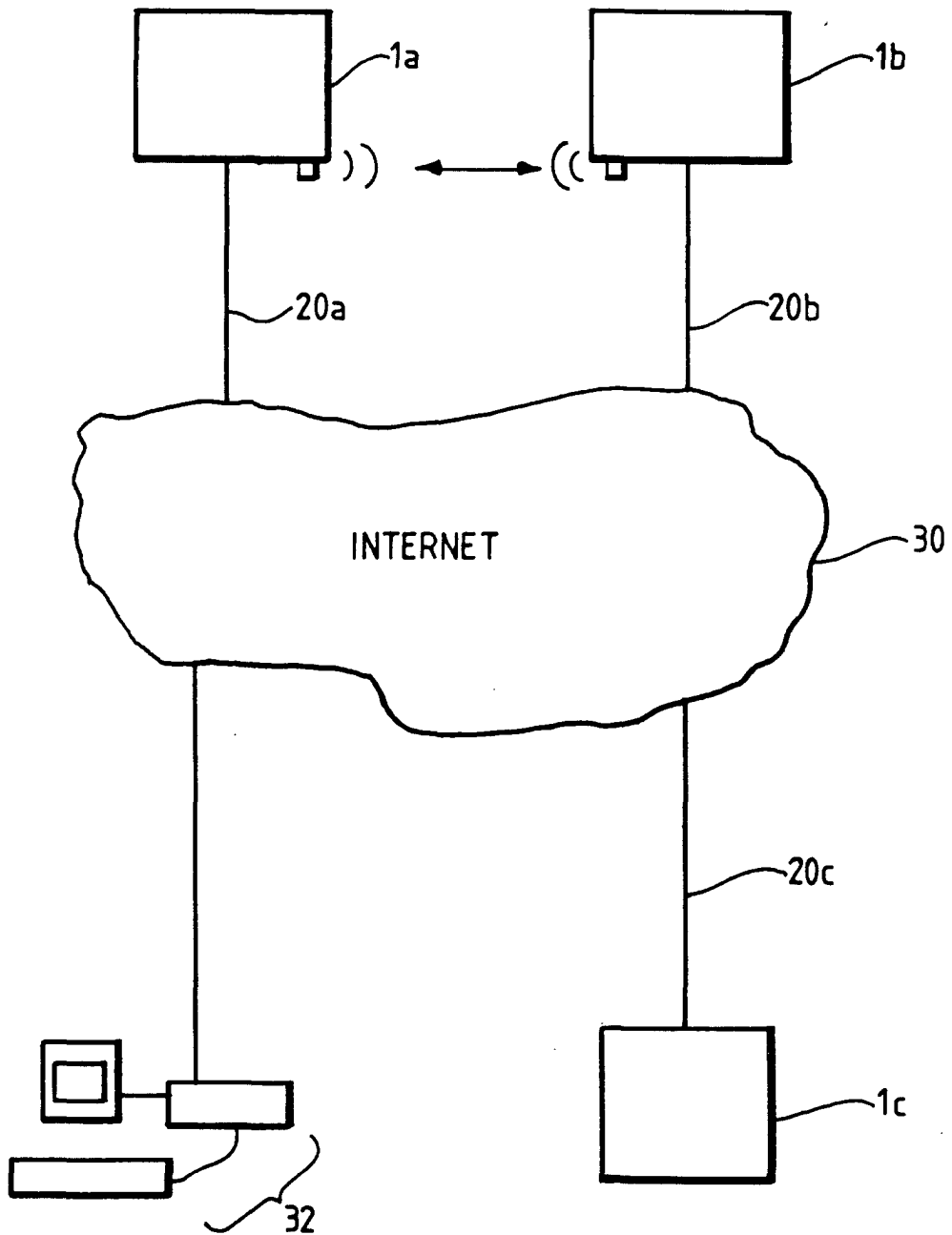


Fig.3.