

(21) Application No: **0522725.1**

(22) Date of Filing: **08.11.2005**

(30) Priority Data:
(31) **0507531** (32) **14.04.2005** (33) **GB**

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(51) INT CL:
H01R 13/70 (2006.01) **H04B 1/16** (2006.01)
H04N 5/63 (2006.01)

(52) UK CL (Edition X):
H2H HAS H25Q

(56) Documents Cited:
EP 0120507 A1 **EP 0093810 A1**
WO 2004/027749 A1 **WO 2001/030070 A1**
DE 010008934 A1 **US 6509658 B1**
US 4585339 A

(58) Field of Search:
UK CL (Edition X) **G4N, H2H**
INT CL **H01R, H04B, H04N**
Other: **EPODOC, WPI**

(54) Abstract Title: **Power distribution device having light and sound sensors and timing means**

(57) A power distribution device for saving power consumed by electrical appliances which are placed in standby mode has a power input connection 3 and at least one power output 5. A light detector 6 and a sound detector 7 monitor activity in the vicinity of the device. If a period of inactivity exceeds a set time delay a switching means (14, fig. 2) removes or reduces the power supply to any connected appliances. The time delay can be manually adjusted by a control 9, and an override 8 allows the appliances to remain on if required. The power input connection may comprise an electrical plug and the power outlet may be an electrical socket.

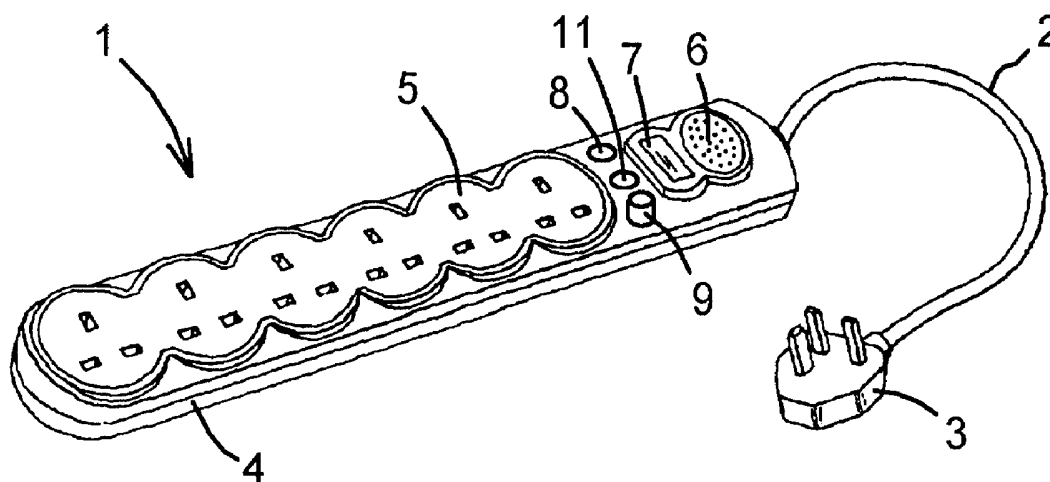


Fig. 1

1/2

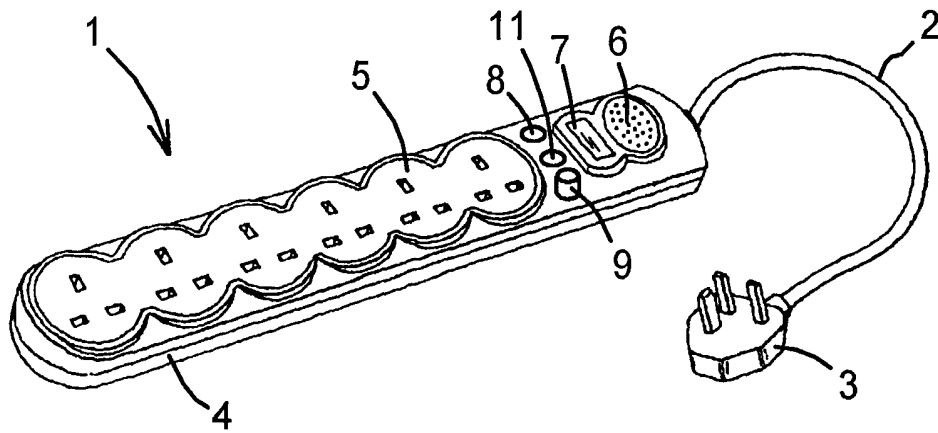


Fig. 1

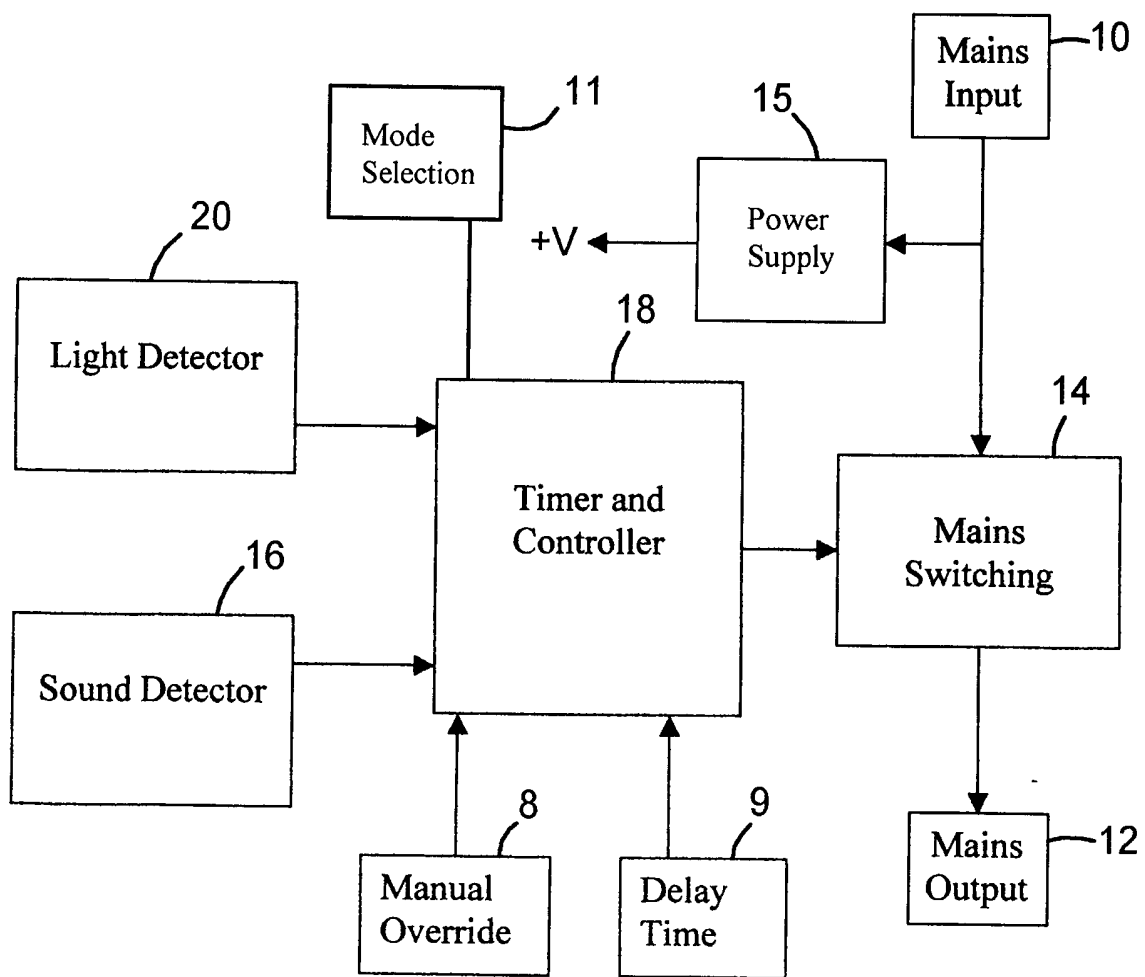


Fig. 2

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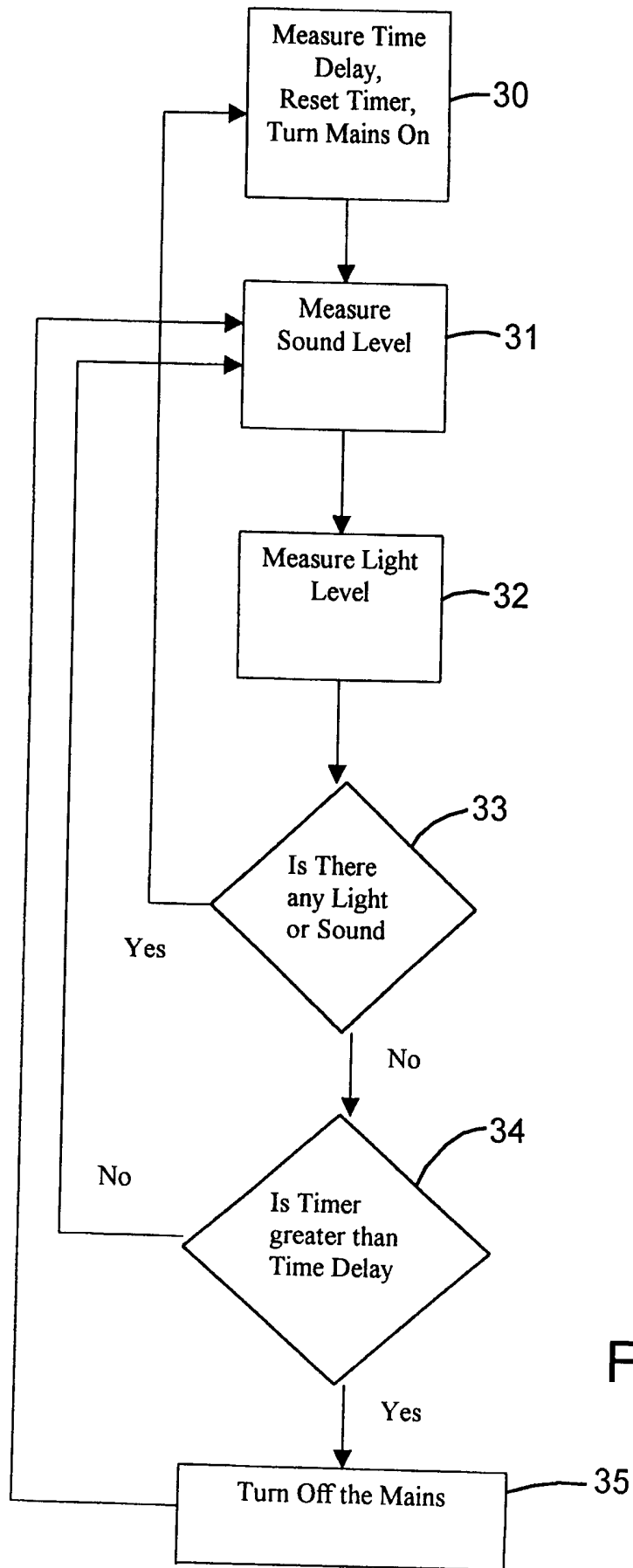


Fig. 3

POWER SAVING DEVICE

TECHNICAL FIELD OF THE INVENTION

This invention relates to a device for reducing the power consumption of one or more electrical appliances when they are not being used.

BACKGROUND

Many domestic appliances still draw a considerable amount of power even when they are ostensibly turned off. For example, digital television decoders may draw up to 30 watts in standby mode. DVD players, VCR recorders, audio systems, kitchen appliances and office equipment may also draw considerable amounts of power in standby, so that the total amount of energy wasted when household equipment is not being used may be very substantial. On the other hand, the amount of power drawn in standby can vary considerably from one appliance to another.

Various devices are already known for reducing power consumption of an appliance when not in use. **DE 100 08 934 A1** discloses a power switching device which has a remote infrared sensor. A sound detector is also provided to enable the controlled appliance to be turned on using hand claps. Infrared sensors are responsive to heat and are therefore prone to false triggering by any heat source. Such sensors could not

therefore be used to reliably power-down equipment which is not being used, even in combination with a sound detector.

WO 2004/027749 A1 discloses a power saving device which removes power from a television receiver when no movement is detected in the vicinity. The device may include an infrared detector. The use of motion and infrared sensors is similarly disclosed in **WO 2001/30070 A1**. The use of a motion sensor to control the supply of power to a television receiver is also disclosed in **JP 2000-295543**. As already noted, heat sensors are prone to false triggering. Furthermore, since people are often motionless for considerable periods whilst watching television for example, the use of movement sensors to remove power from a device when no movement is detected could be a considerable nuisance for the user.

Another device disclosed in **EP 120 507 A1** is intended for turning off lamps when no sound has been detected for a period of four minutes. A light-sensitive element may be included such that the lamp is only switched on if sound is detected when light levels are low. **EP 93 810 A1** contains another proposal for powering down equipment when no sound is detected. However, although sound level can be a fairly reliable indicator of human activity there are circumstances in which domestic equipment may be used under quiet conditions. For example, televisions are often used by the deaf with no sound and teletext subtitles, and the volume may be reduced when young children are sleeping nearby. -

US 4 585 338 describes a power controller for a copying machine which removes power from parts of the machine in response to light reduction. Furthermore, another device for shutting off equipment in the absence of light is proposed in **GB 2 345 809 A**. Since many domestic appliances

are used under low light conditions a device which removes power under low light conditions would be worse than useless. For example, people may wish to listen to music under subdued light, or from another room, in which case there would be a temptation to leave a light on unnecessarily or simply stop using the power saving device under any circumstances

The present invention seeks to provide a new and inventive form of device for reducing the power consumption of one or more electrical appliances when they are not being used and which is capable of operating reliably under a wide range of conditions so that in most circumstances the user can simply install the device and then forget about it.

SUMMARY OF THE INVENTION

The present invention proposes a power saving device having a power input for connection with an electrical power source and a power output to which at least one electrical appliance can be connected to receive power from the power input, and the device includes a first sensor responsive to visible light levels, a second sensor for detecting activity in the vicinity of the device, and timing means responsive to the first and second sensors to remove or substantially reduce the supply of power to the appliance or appliances when a low ambient light level has been maintained and no activity has been detected for the duration of a timing period.

The second sensor preferably includes a device for converting sounds into electrical signals

BRIEF DESCRIPTION OF THE DRAWINGS

The following description and the accompanying drawings referred to therein are included by way of non-limiting example in order to illustrate how the invention may be put into practice. In the drawings:

Figure 1 is a general view of one possible embodiment of the device which is capable of controlling several appliances;

Figure 2 is a schematic block diagram of the device;

and

Figure 3 is a software flow diagram to illustrate the operation of the device.

DETAILED DESCRIPTION OF THE DRAWINGS

The particular embodiment of the device which is shown in **Fig. 1** takes the form of a socket assembly 1 having a power input cable 2 ending in an electrical plug 3 for connection to a conventional domestic electrical power outlet such as an a.c. wall socket. The socket assembly includes a housing 4 which carries a group of electrical power outlet sockets-5 (six in this particular embodiment) into which up to six electrical appliances may be plugged. In a typical domestic situation such appliances may, for example, comprise a television receiver, a digital television decoder, a DVD player, a VCR, a game console etc. The housing also includes a microphone 6 and a light sensor 7 which is responsive to light in the

visible region of the spectrum. Additional manual controls are provided in the form of an override button 8, a delay adjustment 9 and a mode selection button 11.

Fig. 2 shows a schematic electrical circuit diagram of the device, including the electronics which are contained within the housing 4. The mains input 10 represents the plug 3 and cable 2 whereas the mains output 12 represents the sockets 5. The transmission of electrical power between the mains input 10 and the mains output 12 is controlled by a switching stage 14, which may comprise an electromagnetic relay having a solenoid which is operated by a switching transistor. The switching stage could, alternatively, comprise a semiconductor power switching arrangement. A power supply unit 15, capable of converting a.c. power into a low voltage d.c. supply, +V, is connected to the mains input 10 prior to the switching stage 14 to continuously provide power to the electronic circuits regardless of the state of stage 14.

The microphone 6 is incorporated in the sound detector 16, which also incorporates an audio amplifier and optional filtering or other analogue signal processing. The amplified sound output from the sound detector is fed to a controller 18 which may, for example, take the form of a microcontroller with an in-built or external timer. The controller also receives input from a light detector 20 which incorporates the light sensor 7 with optional signal amplification. The light sensor may be a light dependent resistor, a photovoltaic cell, a phototransistor, etc. . The controller 18 operates the switching stage 14 to control the supply of power to the output stage 12 depending on input signals received from the light detector 20 and sound detector 16. Additional manual inputs are provided to the controller in the form of the manual override button 8, potentiometer 9 which allows manual adjustment of the timer period, and

mode selection button 11.

The basic operation of the controller 18 is illustrated in **Fig. 3**. Upon initial power up via the mains input stage 10 and power supply 15, the controller enters an initialisation step 30 in which it determines the time delay set by the time adjustment 9, resets the timer and operates the switching stage 14 to supply full electrical power to the output stage 12 and hence to any appliances which are connected thereto. The appliances will therefore operate as normal, i.e. as if they were plugged directly into a wall outlet. The controller then starts to measure the sound level at the input from the sound detector 16 (step 31) along with the ambient light level reading provided by the light detector 20 (step 32). When the required readings have been obtained, the controller decides whether there is light or sound present, according to threshold levels which are preset to take account of background levels, amplification noise etc. If either light or sound is detected (or both) the program returns the controller to the initialisation step 30, so that repeated readings will be taken until such time as no light or sound is present, resetting the timer after each set of readings. In the event that the light and sound readings both fall below the preset thresholds the controller progresses to step 34 and checks whether the time period as set by the adjuster 9 has expired. If not, the controller returns to step 31 to take further sound and light readings. It will be noted, however, that the timer is not reset at this stage, so that provided the light and sound levels remain low the timer will continue to increment while the controller loops between steps 31 and 34. When the controller eventually determines that the time delay period has been reached, or exceeded, the controller will then proceed to the final step 35 wherein the switching stage 14 is operated to turn off power to the appliances connected to the output stage 12.

The absence of light and sound generally indicates two things. Firstly, it will usually be night, and secondly, there is no human activity in the vicinity. If people are present they will generally have lights on, and they usually make some kind of sound, and provided the period set by the adjuster is long enough (at least several minutes) the activity will be detected and the appliances will remain operative. Under normal circumstances the incidences of false shut down will usually be very low. However, should it be necessary to disable the device the manual override button 8 can be pressed to enter an "always on" condition, and the controller will continue to supply power to the output stage 12 until the button is depressed again. An LED or other indicator could be provided to show whether the device is in power saving mode or in override.

Once the controller 18 has shut off power to the output 12 the program returns to step 31. Again, it will be noted that the timer has not been reset. Provided sound and light levels remain low, the controller will continuously loop between stages 31 and 35 and the power will remain off. However, should sound or light be detected as the controller passes through step 33 the controller will immediately activate the switching stage 14 and power will be restored to the appliances without appreciable delay.

Shutting off power to most appliances during the night when they are not being used is not detrimental to their normal function, and may in fact be recommended for safety purposes, but could often result in a considerable saving in electrical power usage. Even devices which include clocks normally have battery back-up to retain their settings in the event of a power cut, and many video devices are now designed to reset their time from received television signals. Devices such as satellite decoders which periodically update their settings when in standby will usually update themselves shortly after they are powered up again.

The present device will thus reliably switch off electrical appliances at night when there is no activity regardless of the current which is drawn by the appliances. Although the device is primarily intended to reduce the power consumption of appliances which are placed in standby mode the device can also be used to ensure that appliances are turned off during the night even if they do not draw appreciable power when switched off. The device will thus ensure that such appliances are not inadvertently left on overnight.

In addition to responding to light and sound levels as described above, the mode control 11 can be used to select two further modes of operation. In a "sound only" mode the controller bypasses the light detection steps so that the device may be used to turn off appliances during the daytime, when the users are out at work for example. In a further "light only" mode the sound detection steps may be bypassed so that the device will always turn off the appliances at night regardless of any sound input. Such a system might, for example, be useful in noisy locations.

The operation of the controller could be subject to further modification. For example, a further time delay could be introduced before power is restored in order to prevent transitory noises from triggering the device. Other activity sensors could also be used in place of, or in addition to, the sound detector, such as movement sensors of the kind which respond to heat, e.g. PIR sensors.

In another embodiment of the device (not shown) the plug 3 could be incorporated into the housing 4 so that the device plugs directly into a wall outlet. Such a device would normally have only a single outlet socket 5, although the device may have any number of outlets from one upwards

It will be appreciated that the features disclosed herein may be present in any feasible combination. Whilst the above description lays emphasis on those areas which, in combination, are believed to be new, protection is claimed for any inventive combination of the features disclosed herein.

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CLAIMS

1. A power saving device having a power input for connection with an electrical power source and a power output to which at least one electrical appliance can be connected to receive power from the power input, and the device includes a first sensor responsive to visible light levels, a second sensor for detecting activity in the vicinity of the device, and timing means responsive to the first and second sensors to remove or substantially reduce the supply of power to the appliance or appliances when a low ambient light level has been maintained and no activity has been detected for the duration of a timing period.
2. A power saving device according to Claim 1 in which the second sensor includes a device for converting sounds into electrical signals.
3. A power saving device according to Claim 1 or 2 which includes switching means connected between the power input and the power output and which is operable by the said timing means to control the transmission of electrical power between the power input and the power output.
4. A power saving device according to Claim 3 in which the switching means includes an electromagnetic relay.
5. A power saving device according to any preceding claim including means for manually adjusting the duration of the said timing period.

- 6 A power saving device according to any preceding claim in which the timing means comprises an electronic controller.
- 7 A power saving device according to any preceding claim which includes means for manually overriding the timing means so that the supply of power to the appliance or appliances is maintained even if the ambient light level is low and no activity has been detected for the duration of said timing period.
8. A power saving device according to any preceding claim in which the timing means restores power to the appliance or appliances if the first sensor signals an increase in ambient light levels.
9. A power saving device according to any preceding claim in which the timing means restores power to the appliance or appliances if the second sensor detects activity in the vicinity.
10. A power saving device according to any preceding claim in which the power input includes an electrical plug and the power output includes an electrical socket.
11. A power saving device according to Claim 10 in which the power output includes a plural number of electrical sockets.
12. A power saving device according to any preceding claim which includes a manual input control which can be used to select various modes of operation in which the device responds to light and sound, light only or sound only.
13. A power saving device which is substantially as described

with reference to the drawings.

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Application No: GB0522725.1

Examiner: Mr Rowland Hunt

Claims searched: All

Date of search: 3 May 2006

Patents Act 1977: Search Report under Section 17**Documents considered to be relevant:**

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
Y	1-12	EP 0120507 A1 (DIJK et al.) see whole document, particularly page 2, lines 7-10 and 25-3 and page 3, lines 22-34
Y	1-12	DE 10008934 A1 (KUGLER) see particularly fig. 3 - IR sensor 3 and microphone 26
A	-	US 6509658 B1 (KIM) see whole document
A	-	US 4585339 A (SENOO) see whole document
A	-	EP 0093810 A1 (NATIONAL TECHNICAL SYSTEMS) see whole document
A	-	WO 2004/027749 A1 (PHILIPS) see whole document
A	-	WO 01/30070 A1 (MAHVI) see whole document

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

G4N; H2H

Worldwide search of patent documents classified in the following areas of the IPC

H01R; H04B; H04N

The following online and other databases have been used in the preparation of this search report



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14

EPODOC, WPI