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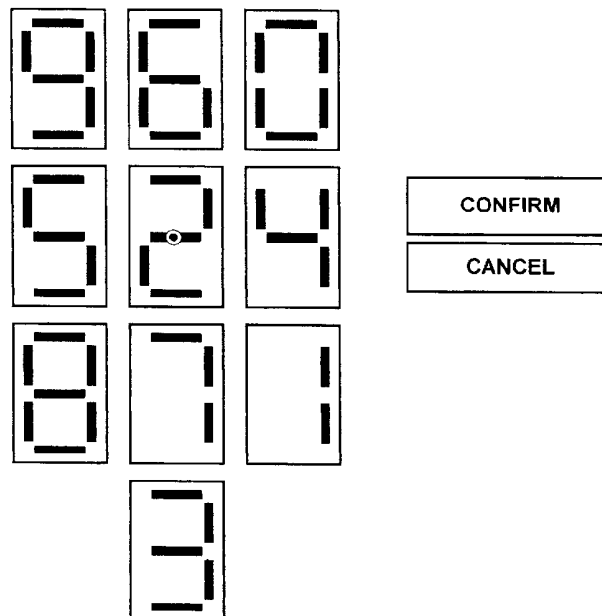
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| (72) Inventor(s):<br><b>Mathew Jonathan Dawson</b>  | (58) Field of Search:<br>UK CL (Edition V ) <b>B6F, G4H</b><br>INT CL <sup>7</sup> <b>B41J, G06F, G07F</b><br>Other: <b>Online: EPODOC JAPIO WPI</b> |
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(54) Abstract Title: **Personal identification code entry device**

(57) A data entry device e.g. a keypad, used to enter a personal identification code or Personal Identification Number (PIN), which incorporates features to aid the prevention of disclosure of the PIN, to unauthorised persons, as the PIN is being entered. The keypad has an arrangement as indicated in figure 1, but instead of the characters being fixed in this position, by using buttons that incorporate a light emitting display within their construction, different numbers /symbols can be displayed by every button of the keypad, as figure 2.

Two options, selectable by the user when the entry of a PIN is required are available, as indicated by the example in figure 3. These comprise of either a randomising facility, where the control system will randomly position the various numbers on the keypad, as indicated by the example in figure 4 or the traditional arrangement of numbers, as indicated in figure 1.

Figure 4



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Figure 1

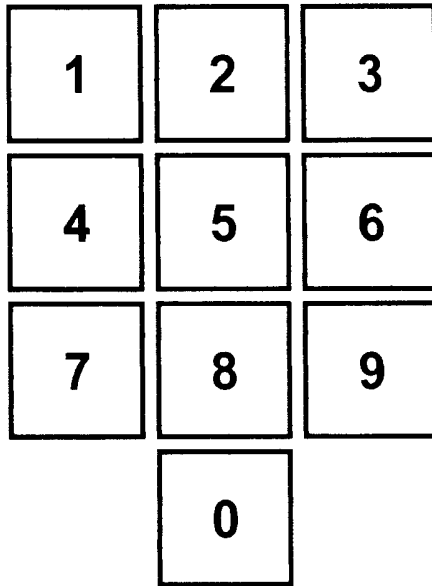


Figure 2

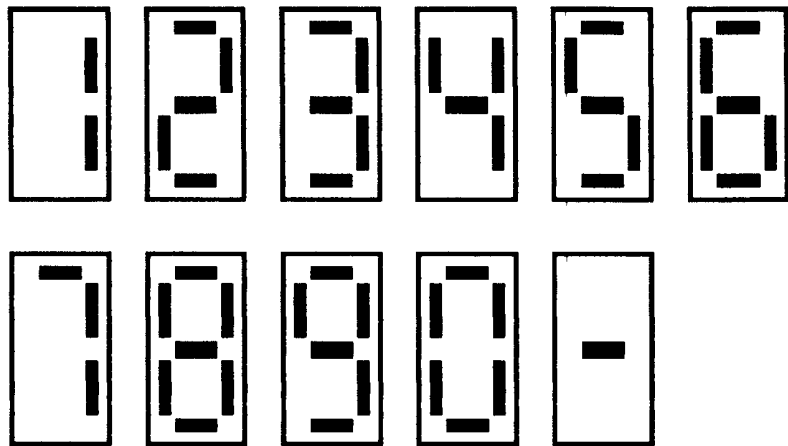
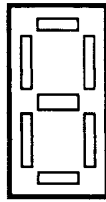


Figure 3

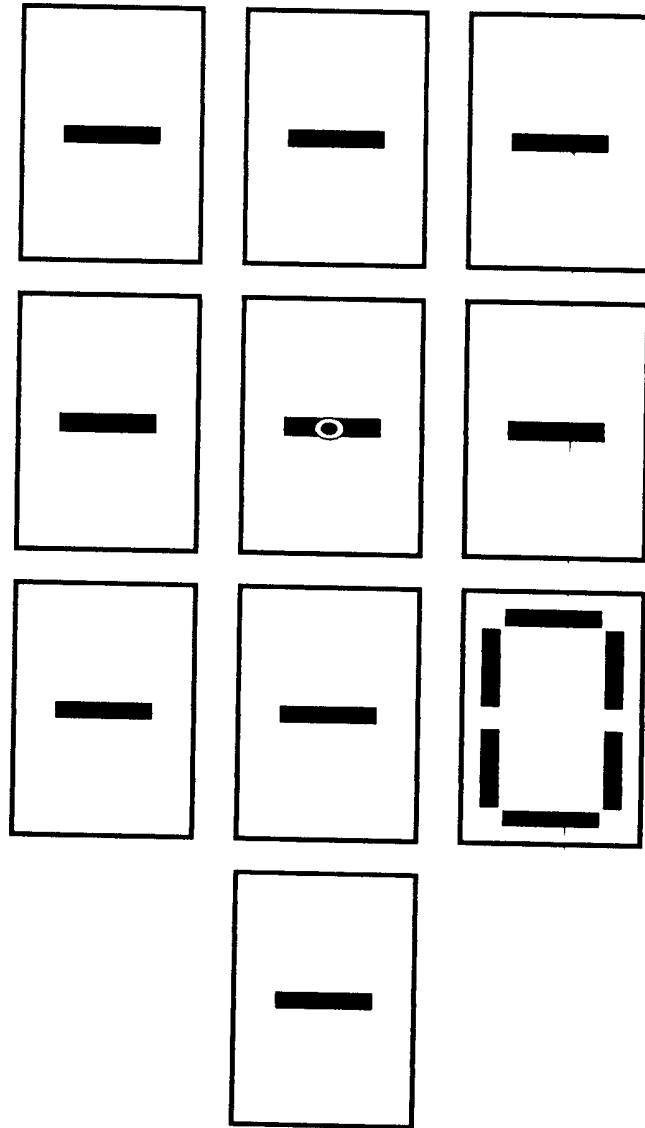
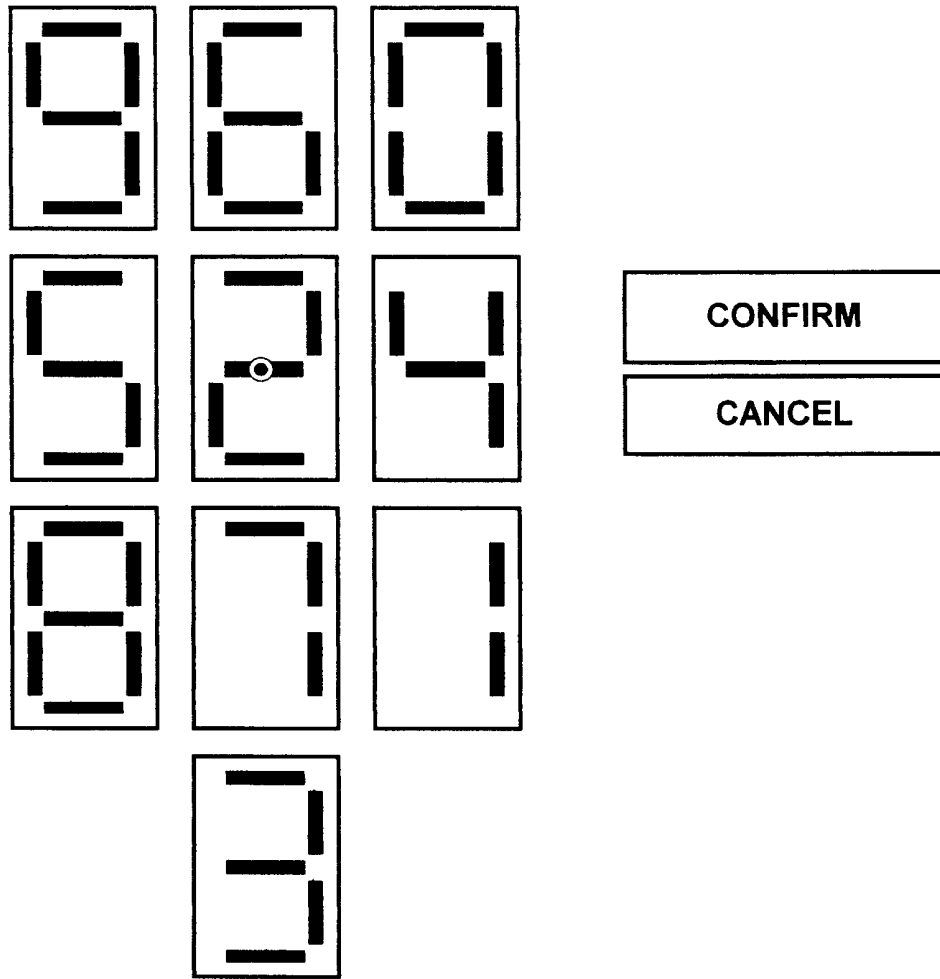


Figure 4



## PERSONAL IDENTIFICATION CODE DATA ENTRY DEVICE

This invention relates to a device of the type, used in most instances in association with a card or other means of personal identification (it may also be used as the sole means of identification), to enter a personal identification code, usually via a keypad, in order to obtain authorisation for the purchase of goods / services / cash etc, or to arm / disarm systems such as alarms or door entry.

Such devices are well known, in particular those that use Personal Identification Numbers (PIN), but suffer from the disadvantages that unscrupulous or unauthorised persons can obtain a users code, as it is being correctly entered into existing systems. The code can be obtained by several methods including but not limited to; looking over the shoulder of the user or spying remotely with the use of visual aids.

The code (PIN) in most instances is identifiable without the actual numbers being seen, by the recognition of the positions of the individual keystrokes, as they are entered onto existing devices. These traditionally have the following layout, i.e. 1, 2, & 3 are on the top line (read left to right), 3, 4 & 5 are on the next line down (read left to right), 6, 7 & 8 are on the next line down (read left to right) and zero is on the bottom line. This information can then be used to gain unauthorised access to the authorised users accounts / systems / locations etc.

The use / requirement of personal identification code entry devices is increasing and they are scheduled to replace the use of a signature when using a credit / debit / store card etc. With this increase in use comes a corresponding increase in the risk of associated misdemeanours, crime, financial loss and inconvenience etc.

An object of this invention is to provide facilities, which give the user / purchaser the option of extra levels of security (selectable by the user, as some people may be uncomfortable with new / unfamiliar processes), which is user friendly, gives additional reassurance to the user / purchaser and minimises the risk of a personal identification code being disclosed accidentally or of being obtained by unauthorised persons, at its point of entry.

Also, the use of this device is likely to mean that unauthorised persons will not attempt to obtain a personal identification code or other form of pass code / pass word, as it is being entered, as it will be difficult to determine which option has been selected and therefore what code has been entered.

Accordingly this invention provides an interface that works in a similar manner and is both physically and visually similar to existing devices (hand held versions connected to the host system via a cable or other means of secure data transfer / electrical supply could also be used). The device could be incorporated into new systems or used to replace existing personal identification code entry devices. Their use is not just limited to existing systems. They could also be used to authorise access to anything that requires a particular level of security, could be used as the sole means of recognition or could be used in conjunction with other methods, for instance (but not limited to); cards, keys and retina scans, finger print scans or some other means of biological identification.

This new device incorporates additional features that can minimise the likelihood of the personal identification code being identified by unauthorised persons, as follows.

At the point of a transaction, where the code is required, the user will be given the choice of inputting their code, using

either a traditional format of character positions or by using the random character position option. The facility that determines which option is required can also be randomised, if required.

After selecting the traditional format the characters will be displayed in their traditional positions (the central button will still incorporate a raised pimple – to aid identification of character positions, for users with visual impairment) and the data entry device will then work in the traditional manner. Also, an audible or visual signal could be used to identify that the host system has recognised that an input has been made.

If the random character option is chosen the numbers or characters will be displayed at random positions, within or on the buttons of the display, of the data entry device. The user will then be prompted to enter the first character of their code by pushing, touching or clicking on the appropriate button (depending on the type of user interface), which is displaying the appropriate character.

After each individual entry of the code, the characters will randomly alter positions. This process will continue until the appropriate number of code entries has been made.

In both cases, if the code is entered correctly the transaction / action will be allowed to continue (using whatever options are required by the host system).

If the code is entered incorrectly, there can be a design option for the number of retries that will be permitted before no further entries will be allowed (this may be specified by the purchaser of the system).

The individual data entry buttons of a particular type of data entry device can be designed / tailored to display every possible character that is required for a given circumstances / system / language and also as specified by the purchaser of the system.

This will be achieved using an appropriate light emitting character display technology (also liquid crystal displays),



incorporated within the design of the buttons. All of the buttons of the data entry device will have a similar construction / format / appearance (when inactive). The buttons, when active, will display the appropriate characters as necessary and as directed by an electronic control system. A device to automatically adjust the parameters of the light emitted by the displayed characters could be used / incorporated as part of the device, this could be controlled by a suitable sensor together with an appropriate electrical control system and adjustments made based on the ambient lighting levels.

The control system can be programmed / configured to control what is displayed on the buttons of the data entry device and will have the ability to recognise which character has been entered by the user, when a button is used. The control system will be designed to process this information and use this to determine whether the correct code has been entered.

After each keystroke the system will reconfigure the display (if the random option has been chosen).

The data entry device can be configured / programmed to communicate with the host system, using an appropriate format / interface / method, as specified / required by the purchaser.

A physical shield may also be incorporated; as part of the construction of the buttons, around individual buttons, parts of or all of the data entry / display etc. Also, the buttons could be set at an angle, in relation to the user. The emitted light's wavelength, colour, brightness, contrast and intensity etc, together with the use of appropriate filters, will be designed / tailored, to suit various circumstances and conditions. The purpose of the above would be to limit the field of view in which the characters could be seen, so that only the user would be easily able to recognise them.

The background appearance / colour of the buttons would be designed to provide an appropriate contrast to the characters,

when they are being displayed, to ensure that they are only easily recognised by the users.

The device would be designed to cater for various climates, atmospheres and or other conditions as required by the purchaser.

The device would be designed to accommodate reasonable levels of wear, tear and other abuse, without their function being affected.

The device would be designed to use components that are as energy efficient as is practicable. Solar cells or other such equipment could also be used in conjunction with a mains / battery electrical supply.

The device will be designed so that it does not detrimentally affect other electrical or mechanical devices / systems.

The device would be designed to facilitate maintenance, by appropriately authorised and skilled persons.

The device could have the ability to determine / record how many uses of each format have taken place and other such information, for research purposes. This information could be securely transmitted to an authorised facility for assessment.

The device could incorporate the facilities for automatic shut down / isolation, from the host system, if predefined parameters are satisfied. For instance following the detection, using an appropriate system, of unauthorised access by physical, electronic or other means. This information could be securely transmitted to an authorised facility for assessment.

An embodiment of the invention will now be described by way of an example with reference to the accompanying drawings in which: -

Figure 1: Illustrates an example of the arrangement of a traditional PIN keypad.

Figure 2: Illustrates an example of the basic button design that incorporates a seven-segment, light emitting display together with the various figures that can / need to be displayed for this particular application.

Figure 3: Illustrates an example of a keypad, which following activation by the host system is displaying either dashes or a zero.

Figure 4: Illustrates an example of a keypad that is displaying the numbers in a random position.

As shown in figure 1, there is an example of the arrangement of a PIN keypad currently in use. The numbers one to nine together with zero are fixed in this traditional format. NB the button at position “5” sometimes incorporates a raised pimple (omitted for clarity in this example); this may be used by people with a visual impairment as a tactile aid to identify the positions of the other numbers.

As shown in figure 2, there is an example of the basic button design, which incorporates a seven-segment light emitting display (the button at the top of figure 2 indicates the positions of the seven segments). The displays will be incorporated within the construction of all of the buttons.

The remaining buttons shown on figure 2 indicate the various characters that can be displayed on each button and that are required for this particular application.

Ten of these buttons will be used to display the option facilities (dashes or zero, as indicated in figure 3) and the different numbers, as required for the PIN entry (as indicated in figure 4).

As shown in figure 3 is an example of a keypad, which following activation by the host system is displaying either dashes or a zero.

The user will be directed to push the button indicating zero, if the shuffle / randomising option is required or to push any of the buttons indicating dashes if the traditional format is required. NB the button at the traditional position “5” incorporates a raised pimple (indicated by a circle).

The zero will appear at a random position each time the system is activated (in the example where “9” is traditionally located, refer to figure 1).

The only exception to this is that the button incorporating the raised pimple (position “5”, refer to figure 1) will always display a dash, this will enable persons with a visual impairment to use the system in its traditional format.

Relevant sections of all of the seven-segment displays, on this example, have been indicated with a heavy black line, to show how they would appear if they have been activated / illuminated, by the system.

As shown in figure 4 is an example of a keypad that is displaying the numbers in a random position. The user will be directed to enter the 1<sup>st</sup> digit of their PIN, by pressing the appropriate button. An audible signal will indicate that a button has been successfully pressed. The keypad will then shuffle the position of the numbers, ready for the next input. After the appropriate number of entries have made, the system will prompt the user to confirm or cancel their PIN entry using the appropriate “normal” button (indicating cancel or confirm).

## Claims

1. A data entry device used to enter a personal identification code, where the user will be given the choice of inputting their code, using either a traditional format of character positions or by using a random character position option.
2. A data entry device as claimed in claim 1 where the individual data entry buttons can be designed / tailored to display every possible character that is required for a given circumstances / system / language and also as specified by the purchaser of the system.
3. A data entry device as claimed in claim 2 where the buttons will indicate the characters using an appropriate light emitting, character display technology (also liquid crystal displays), incorporated within the design / construction of the buttons.
4. A data entry device as claimed in any preceding claim where the buttons of the data entry device will have a similar construction / format / appearance (when inactive).
5. A data entry device as claimed in any preceding claim where the buttons, when activated by the control system, will display the appropriate characters as necessary and as directed by an electronic control system.
6. A data entry device as claimed in any preceding claim where if the random character option is chosen the numbers or characters will be displayed at random positions, within or on the buttons of the display, of the data entry device.
7. A data entry device as in any preceding claim where the device, can if required, automatically adjust the parameters of the light emitted by the displayed

- characters, be controlled by a suitable sensor together with an appropriate electrical control system and adjustments made based on the ambient lighting levels.
8. A data entry device as claimed in any preceding claim where the control system can be programmed / configured to control what is displayed on the buttons of the data entry device and will have the ability to recognise which character has been entered by the user, when a particular button is used, will process this information and use this to determine whether the correct code has been entered.
  9. A data entry device as claimed in any preceding claim where the facility that determines which option is required can also be randomised, if required.
  10. A data entry device as claimed in any preceding claim where the user after selecting the traditional format the characters will be displayed in their traditional positions
  11. A data entry device as claimed in any preceding claim where the user interface works in a similar manner and is both physically and visually similar to existing devices, hand held versions connected to the host system via a cable or other means of secure data transfer / electrical supply could also be used.
  12. A data entry device as claimed in any preceding claim where the device could be incorporated into new systems or used to replace existing code entry devices.
  13. A data entry device as claimed in any preceding claim where the device is not just limited to existing systems but could also be used to authorise access to anything that requires a particular level of security.
  14. A data entry device as claimed in any preceding claim where the device could be used as the sole means of recognition or could be used in conjunction with other

methods, for instance (but not limited to); cards, keys and retina scans, finger print scans or some other means of biological identification.

15. A data entry device as claimed in any preceding claim where after each code entry the system will reconfigure the display (if the random option has been chosen).
16. A data entry device as in any preceding claim where the data entry device can be configured / programmed to communicate with the host system, using an appropriate format / interface / method, as specified / required by the purchaser.
17. A data entry device as claimed in any preceding claim where a physical shield may also be incorporated; as part of the construction of the buttons, around individual buttons, parts of or all of the data entry / display etc.
18. A data entry device as in any preceding claim where the display's emitted light's wavelength, colour, brightness, contrast and intensity etc, together with the use of appropriate filters, will be designed / tailored, to suit various circumstances and conditions, to limit the field of view in which the characters could be seen, so that only the user would be easily able to recognise them.
19. A data entry device as claimed in any preceding claim where the background appearance / colour of the buttons would be designed to provide an appropriate contrast to the characters, when they are being displayed, to ensure that they are only easily recognised by the users.
20. A data entry device as claimed in any preceding claim where a central button will incorporate a raised pimple – to aid identification of character positions, for users with visual impairment.
21. A data entry device as claimed in any preceding claim where an audible or visual signal could be used to

identify that the host system has recognised that an input has been made.

22. A data entry device as claimed in any preceding claim where the user will be prompted to enter the first character of their PIN by pushing, touching or clicking on the appropriate button (depending on the type of user interface), which is displaying the appropriate character.
23. A data entry device as claimed in any preceding claim where after each individual entry of the code, the characters will randomly alter positions, this process will continue until the appropriate number of code entries has been made.
24. A data entry device as claimed in any preceding claim where following the entry of the correct code the transaction / action will be allowed to continue, using whatever options are required by the host system.
25. A data entry device as claimed in any preceding claim where following the entry of an incorrect code, there can be a design option for the number of retries that will be permitted before no further entries will be allowed, this may be specified by the purchaser of the system.
26. A data entry device as claimed in any preceding claim where the device would be designed to cater for various climates, atmospheres and or other conditions as required by the purchaser.
27. A data entry device as claimed in any preceding claim where the device would be designed to accommodate reasonable levels of wear, tear and other abuse, without their function being affected.
28. A data entry device as claimed in any preceding claim where the device would be designed to use components that are as energy efficient as is practicable, solar cells or



other such equipment could also be used in conjunction with a mains / battery electrical supply.

29. A data entry device as claimed in any preceding claim where the device will be designed so that it does not detrimentally affect other electrical or mechanical devices / systems.
30. A data entry device as claimed in any preceding claim where the device would be designed to facilitate maintenance, by appropriately authorised and skilled persons.
31. A data entry device as claimed in any preceding claim where the device could have the ability to determine / record how many uses of each format have taken place and other such information, for research purposes, this information could be securely transmitted to an authorised facility for assessment.
32. A data entry device as claimed in any preceding claim where the device could incorporate the facilities for automatic shut down / isolation, from the host system, if predefined parameters are satisfied, following the detection, using an appropriate system, of unauthorised access by physical, electronic or other means, this information could be securely transmitted to an authorised facility for assessment.
33. A personal identification code entry device substantially as herein described and illustrated in the accompanying drawings.



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Application No: GB 0313407.9  
Claims searched: 1-33

Examiner: Marc Collins  
Date of search: 16 July 2003

### 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   |
|----------|--------------------|--|
| A        | -                  | WO 98/27518 A1 (SIAB ITALIA S.P.A.)<br>See whole document.   |
| A        | -                  | US 6549194 B1 (MCINTYRE et al.)<br>See whole document.   |
| A        | -                  | US 4502048 (REHM)<br>See whole document.   |
| A        | -                  | US 4479112 (HIRSCH)<br>See whole document.   |
| A        | -                  | DE 029613938 U1 (MENNE) 31.10.96<br>See whole document and WPI Abstract<br>Accession No. 1996-486929 [49].     |
| A        | -                  | JP 620242219 A (MATSUSHITA) 22.10.87<br>See whole document and WPI Abstract<br>Accession No. 1987-337900 [48]. |
| A        | -                  | JP 600134317 A (HITACHI) 17.07.85<br>See whole document and PAJ Abstract.                                      |

#### 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<sup>v</sup>:

B6F; G4H

Worldwide search of patent documents classified in the following areas of the IPC<sup>7</sup>:

B41J; G06F; G07F

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



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INVESTOR IN PEOPLE

**Application No:** GB 0313407.9  
**Claims searched:** 1-33

**Examiner:** Marc Collins  
**Date of search:** 16 July 2003

EPODOC, JAPIO, WPI