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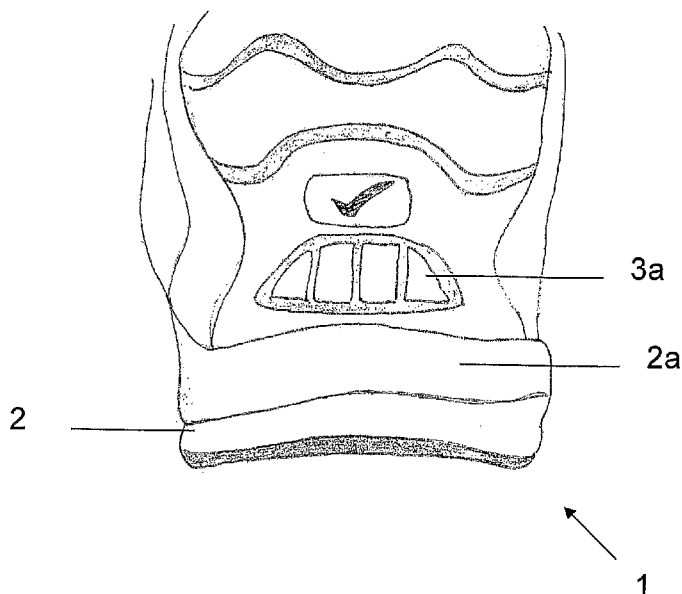
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(54) Title: FOOTWEAR WITH COLOUR INDICATING MEANS TO INDICATE A VARIETY OF CONDITIONS



(57) Abstract: In a first broad form, the present invention provides an apparatus for use with a shoe having a sole, the apparatus including: at least one display adapted for mounting on a surface of the shoe; and a means of adjusting the at least one display between at least a first and a second colour state.

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## FOOTWEAR WITH COLOUR INDICATING MEANS TO INDICATE A VARIETY OF CONDITIONS

### Technical Field

- 5 The present invention relates to the field of footwear and, in particular, relates to the field of sporting and/or recreational type footwear.

### Background of the Invention

- 10 The soles of shoes tend to wear out over time as they are used. However, such deterioration is not always readily apparent to the user by visual inspection, and as such, the user may inadvertently continue to use the shoe which may be detrimental to the user's physical well-being.
- 15 In particular, the failure to replace a shoe once its cushioning capacity has deteriorated to a potentially harmful extent, may result in excessive stress being transferred to the user's joints by continual use of the worn out shoe.

### Summary of the Invention

20

The present invention seeks to alleviate at least one of the problems discussed above in relation to the prior art.

- 25 The present invention involves several different broad forms. Embodiments of the invention may include one or any combination of the different broad forms herein described.

In a first broad form, the present invention provides an apparatus for use with a shoe having a sole, the apparatus including:

- 30 at least one display adapted for mounting on a surface of the shoe; and

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a means of adjusting the at least one display between at least a first and a second colour state.

In a second broad form, the present invention provides a shoe including:

- 5           a sole; and  
          at least one display disposed on a surface of the shoe; and  
          a means of adjusting the at least one display between at least a first and a second colour state.

10   Typically, the display includes at least one of:

- (a)    an Electro-Chromic Polymer (ECP) type display; and/or
- (b)    a Controlled Release Polymer (CRP) type display.

Typically, the ECP display includes a polymer material that is adapted to change  
15   colour when a charge is applied to the polymer material. Advantageously, ECP displays tend to be flexible and resilient such that they lend themselves to be integrated into the structure of a shoe. In contrast, prior art displays such as LCD displays tend to be relatively rigid, prone to damage, and/or relatively inflexible in terms of being integrated into a surface of the prior art shoe. A further advantage  
20   in the use of an ECP-type display in contrast to that of an LCD or LED type display is that a constant electrical signal does not need to be applied to the ECP display in order for it to retain its colour state.

Also typically, the CRP display includes a material that changes its colour  
25   permanently when a charge is applied to the polymer material. Typically, upon exposure to an electrical charge, a dye is released permanently altering the colour of the polymer.

Typically, the display may be disposed on an outward-facing surface of the shoe.  
30   In certain embodiments, the display may be formed as a "mask" which overlays the upper surface of the shoe. In alternative embodiments of the present

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invention, the display may be incorporated into a heel of the shoe.

Preferably, the present invention includes a processing device adapted for, amongst other things, controlling the adjustment of the display between the at  
5 least first and second colour states. Typically, the processing device may be operatively connected with the display and is able to provide control signals to the display in order to control adjustment of the display between colour states.

Typically the processing device may include a microprocessor fabricated on an  
10 integrated circuit chip. Typically the microprocessor may also include a power supply for powering the microprocessor.

Preferably, the processing device may be programmable by a user. For instance, the present invention may include a user control device operatively interfaced with  
15 the processing device via which the user may be able to input instructions to the processor including instructions for controlling adjustment of the display.

Typically, the user control device may include at least one of:

- (a) a key pad;
- (b) a graphical user interface;
- 20 (c) a joystick;
- (d) a mouse;
- (e) a switch; and
- (f) a button.

25 Typically, the user control device may include a purpose-built device, or alternatively, may include a mobile phone, PDA or other computing device which may be programmed to operate as the user control device. For instance, application-specific software may be downloaded into either one of a mobile phone or a PDA adapted for interfacing with the processor via either a wired or wireless  
30 signalling link. Thus, instructions may be conveniently entered into the processor via the mobile phone or PDA by a user activating the keypad on the mobile phone

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or PDA without the user necessarily having to purchase a purpose-built user control device.

Typically, an input jack may be disposed on a surface of the shoe which enables the user control device to be interfaced with the processing device via a cable. For instance, the input jack may include a USB or Firewire® type input jack. The jack may for instance be disposed upon a relatively inconspicuous surface of the shoe heel.

Alternatively, the user control device may be interfaced with the processing device via a wireless signalling link. Typically, the wireless signalling link may include at least one of:

- (i) a signalling link based on a Bluetooth® communication protocol;
- (ii) a signalling link based on a Wi-Fi® communication protocol;
- (iii) a signalling link based on an infra-red communication protocol;
- (iv) a radio-frequency based link.

Preferably, the means of adjusting the display includes at least one of:

- (i) an automatic adjustment means; and/or
- (ii) a manual adjustment means.

Preferably, the automatic adjustment means includes:

a sensor adapted for sensing an operating characteristic of the shoe and outputting an output sensor signal in response to the sensed operating characteristic; and

a processing device adapted for receiving the output sensor signal and providing a control signal in response to the received output sensor signal, whereby the display is adapted to receive the control signal and adjust between the first and second colour states by reference to the received control signal.

Typically the operating characteristic which may trigger an adjustment in the

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display may include at least one of:

- (I) a detection of pressure being applied to the sole of the shoe;
- (II) a detection of a threshold amount of deterioration in a cushioning capacity of the sole; or
- 5 (III) a detection of a colour characteristic of an adjacent environment relative to the shoe, the colour characteristic including at least one of:
  - (a) a colour characteristic of an item of clothing worn by the user of the shoe; or
  - 10 (b) a colour characteristic of physical surroundings in which the shoe is located; and
- (IV) a user-designated operating characteristic of the shoe.

Typically, where the operating characteristic relates to a detection of a threshold  
15 amount of deterioration in a cushioning capacity of the sole, the present invention further includes:

a means of determining a degree of deterioration in a cushioning capacity of the sole; and

a means of comparing the degree of deterioration in the cushioning  
20 capacity against a predetermined threshold value, wherein an output signal is generated which is indicative of the comparison; and

whereby, the display is adapted to receive the output signal and change state between at least the first colour state and the second colour state in response to the received output signal, wherein when the output signal indicates  
25 that the determined deterioration in the cushioning capacity is less than the threshold value, the display outputs the first colour state, and, when the output signal indicates that the determined deterioration in the cushioning capacity is greater than the threshold value, the display outputs the second colour state.

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Typically, the determined deterioration in the cushioning capacity of the sole may be estimated using a pedometer or other suitable measuring device which is adapted to monitor at least one of:

- (i) a distance travelled by the shoe in use;
- 5 (ii) a number of impacts absorbed by the sole; and
- (iii) a force of impact.

Typically, the threshold value of deterioration in the shoe may be pre-programmed into the processor device and may be determined by using an impact tester to  
10 estimate the number of impacts which may typically be absorbed by a sample shoe sole before an "unacceptable" deterioration in the cushioning capacity of the sole is incurred. The threshold value may therefore correspond to the approximate number of impacts which are absorbed by the sole in use before the unacceptable deterioration in the cushioning capacity occurs.

15 Typically, the present invention includes a colour detection device for detecting a colour characteristic of the adjacent environment relative to the shoe in use. For instance, this may include a colourimeter device, a "light wand", or the like. Typically, the colourimeter may provide an output signal to the processor which in  
20 turn may output a control signal to the display which instructs the display to adjust to a colour state which approximates the detected colour characteristic. Advantageously, the ability of the display to adaptively change to a colour state which approximates a colour characteristic of the surroundings may assist the shoe in being camouflaged within its surroundings. Typically, in this type of  
25 application, a plurality of displays may be disposed upon the shoe surface so as to substantially cover the shoe surface. This may for instance be particularly useful as an application for combat-related footwear where the ability to "blend in" to surroundings may be crucial. Alternatively, the "camouflaging" ability of the present invention may also be advantageous in a civilian capacity whereby the  
30 shoe may be adapted to change colour to match any number of coloured outfits which may be worn by the user.

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Typically, the present invention may include at least one sensor adapted for detecting when pressure is being applied to the sole of the shoe. Typically, the sensor(s) may include at least one of the following:

- (a) a pressure sensor;
- 5 (b) a piezo-electric sensor.

Typically, the sensor(s) may be disposed in a mid-sole section of the shoe sole. Typically, the sensor(s) may be operatively connected to the processing device and the processing device is able to be programmed to cause adjustment in the display whenever a threshold pressure value is detected upon the shoe sole. The processing device may typically compare received sensor output signals with the threshold pressure value and cause adjustment in the display dynamically as the shoe is being worn about by a user. Typically, the threshold pressure value may be pre-programmed into the processor whereby the threshold pressure value may be selected to approximate an amount of pressure which may typically be applied to the sole of the shoe in use by an arbitrarily determined average user of the shoe.

Typically, the processing device may calculate an average pressure reading based on all of the sensor readings before comparing the average pressure reading against the threshold pressure value to determine if the display needs to be adjusted.

Alternatively, in certain embodiments, the plurality of sensors may each be uniquely associated with its own independent corresponding display. In such an arrangement, the processing device may compare the readings of each sensor independently against the threshold pressure value, and, cause the corresponding displays to adjust accordingly. Thus, for example, if the magnitude of any pressure applied to the sole were to gradually shift along the length of the sole, and if the corresponding displays were arranged in substantially the same order as the sensors, then the displays may be caused to adjust in real-time from the first

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colour state into the second colour state in a wave-like or rippling fashion along the shoe which is indicative of the transfer of pressure along the sole of the shoe.

Also typically, the display includes an ECP-type display or the like which may be  
5 able to continuously toggle back and forth between at least 2 different colour states.

In yet alternative embodiments of the present invention, the display may be caused to adjust automatically between colour states by reference to an output  
10 signal from a timing device. The timing device may for instance be integrated into the processing device. In use, the processing device may send a control signal to the display to change colour state upon detection of completion of a countdown which may be pre-programmed into the processing device by a user.

15 Preferably, the present invention includes a plurality of displays disposed on the shoe surface. Typically, the plurality of displays may be configured to operate either independently wherein each of the plurality of displays may adjust between different colour states and/or commence adjustment in response to different control signals. Alternatively, each of the plurality of displays may be configured to  
20 operate in unison with each other – for instance, they may change colour simultaneously in response to a commonly detected operating characteristic.

Typically, the wireless link may also be configured to operatively interface at least one of:

- 25 (a) the processor with the display; and/or  
(b) the at least one sensor and/or pedometer with the processor.

Preferably, the means of manually controlling adjustment of the display includes the user control device. For instance, a user may communicate an instruction to  
30 the processing device, which is programmed to interpret the received instruction, so as cause the display to toggle between a first colour state and a second colour

state by sending an appropriate control signal to the display. Alternatively, the user may seek to deactivate the adjustment capability of the display for a give period of time by communicating an instruction to this effect to the processing device via the user control device.

5

In certain embodiments of the present invention, the processing device may be programmed to provide the user with an option of selecting a particular operating format from a series of pre-defined operating formats wherein each of the pre-defined operating formats may be adapted to suit a particular class of user. For  
10 instance a first operating format may adapted to suit users falling within a relatively light weight range of between 50-65 Kg whilst a second operating format may be adapted to suit users falling within a relatively heavier weight range of between 66-85 Kg and so on. In respect to the first operating format, the predetermined threshold value against which deterioration of the shoe's cushioning capacity is  
15 compared may be set at a higher level taking into account that the relatively lower weight range of the user may result in a prolonged cushioning life of the sole throughout its use. Conversely, where the second operating format is selected, the predetermined threshold value against which deterioration of the shoe's cushioning capacity is compared, may typically be set at a relatively lower level in  
20 view of the relatively shorter cushioning life expectancy of the sole throughout its use. User selection of a particular operating format may be facilitated by having the options displayed to the user, for instance, in the form of an interactive menu displayed on GUI of the user control device.

25 Alternatively, the present invention may include a computer program which is operable on the processor to prompt the user to enter specific details regarding, amongst other things, the user's weight and height. The program may be adapted to automatically process the received user inputs so as to calculate, amongst other things, a predetermined threshold value against which deterioration in the  
30 cushioning capacity of the shoe may be compared. Similarly, the computer program may also be adapted to calculate in real-time other operating parameters

- 10 -

such as the threshold value of pressure which may be applied to the shoe before the display may be caused to toggle between colour states.

The computer program may also be adapted to receive user input instructions so as to select the colour of the at least first and second colour states in use. For instance, the user may seek to have the display provide a green colour state when the predetermined threshold cushioning capacity has not been exceeded, and, to adjust into a red colour state when the predetermined threshold cushioning capacity has been exceeded. It would be apparent to a person skilled in the art that any colour combinations may be selectively programmed into the processing device by a user in this manner.

Advantageously, by providing the user with a means of selecting a more suitable operating format to suit his or her needs, this may allow greater flexibility in the commercialisation of the present invention in that a single shoe may be able to accommodate a broader cross-section of the market.

Typically, the present invention may be at least partially housed within a heel of the shoe. Preferably, at least the processing device may be housed within the heel of the shoe.

In a third broad form, the present invention provides a shoe including:

- a sole; and
- a means of determining a degree of deterioration in a cushioning capacity of the sole; and
- a means of comparing the degree of deterioration in the cushioning capacity against a predetermined threshold value, wherein an output signal is generated which is indicative of the comparison; and
- a display which is adapted to receive the output signal and change state between at least a first colour state and a second colour state in response to the received output signal, wherein when the output signal indicates that the

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determined deterioration in the cushioning capacity is less than the threshold value, the display outputs the first colour state, and, when the output signal indicates that the determined deterioration in the cushioning capacity is greater than the threshold value, the display outputs the second colour state.

5

In a fourth broad form, the present invention provides an apparatus for use with a shoe having a sole, the apparatus including:

a means of measuring a degree of pressure being applied to the sole; and

a means of comparing the degree of pressure being applied to the sole

10 against a predetermined pressure threshold value, wherein an output signal is generated which is indicative of the comparison; and

a display adapted for mounting to a surface of the shoe, wherein the display is adapted to receive the output signal and change state between at least a first colour state and a second colour state in response to the received output signal, 15 wherein when the output signal indicates that the determined degree of pressure being applied to the sole is less than the threshold value, the display outputs the first colour state, and, when the output signal indicates that the determined degree of pressure being applied to the sole is greater than the threshold value, the display outputs the second colour state.

20

In a fifth broad form, the present invention provides a shoe including:

a sole; and

a means of measuring a degree of pressure being applied to the sole; and

a means of comparing the degree of pressure being applied to the sole

25 against a predetermined pressure threshold value, wherein an output signal is generated which is indicative of the comparison; and

a display adapted for mounting to a surface of the shoe, wherein the display is adapted to receive the output signal and change state between at least a first colour state and a second colour state in response to the received output signal, 30 wherein when the output signal indicates that the determined degree of pressure being applied to the sole is less than the threshold value, the display outputs the

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first colour state, and, when the output signal indicates that the determined degree of pressure being applied to the sole is greater than the threshold value, the display outputs the second colour state.

- 5 In a sixth broad form, the present invention provides an apparatus for use with a shoe having a sole, the apparatus including:

a sensor for detecting a colour characteristic of an adjacent surface relative to the shoe, wherein the sensor outputs a sensor signal indicative of the detected colour characteristic; and

- 10 a display adapted for mounting to a surface of the shoe, wherein the display is adapted to receive the sensor signal and adjust to a colour state which approximates the detected colour characteristic.

Preferably, the sensor may include at least one of :

- 15 (I) a colourimeter;  
(II) a "light wand"; or  
(III) an optical sensor.

In a seventh broad form, the present invention provides a shoe including

- 20 a sole: and

a sensor for detecting a colour characteristic of an adjacent surface relative to the shoe, wherein the sensor outputs a sensor signal indicative of the detected colour characteristic; and

- 25 a display adapted for mounting to a surface of the shoe, wherein the display is adapted to receive the sensor signal and adjust to a colour state which approximates the detected colour characteristic.

In an eighth broad form, the present invention provides a method including the steps of:

- 30 (i) mounting at least one display on a surface of a shoe; and

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- (ii) adjusting the at least one display between at least a first and a second colour state.

### **Brief Description of the Drawings**

5

The present invention will become more fully understood from the following detailed description of a preferred but non-limiting embodiment thereof, described in connection with the accompanying drawings, wherein:

- 10           -       Figure 1 depicts a rear view of a first embodiment of the present invention;
- Figure 2 depicts a partial side view of the first embodiment;
- 15           -       Figure 3 depicts a transparent view of a heel portion of the first embodiment;
- Figure 4 depicts a top view of an aspect of the first embodiment;
- 20           -       Figure 5 depicts a further aspect of the first embodiment;
- Figure 6 depicts a functional block diagram of the first embodiment.

### **Modes for Carrying out the Invention**

25

Figures 1 to 6 depict various aspects of a first embodiment of the present invention.

The first embodiment includes a shoe (1) having a sole (2) and first and second  
30 ECP displays (3a,3b) mounted on the shoe (1) which are operatively interfaced with the microprocessor unit (4).

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The first display (3a) is mounted on a rear surface of the shoe (1) as shown in Fig. 1, and, the second display (3b) is mounted on an outward-facing surface of the shoe (1) as shown in Fig. 2.

- 5 The microprocessor (4) is housed within a hollow compartment of a heel (5) of the shoe (1) along with a power supply (6) for powering the microprocessor (4). The power supply (6) includes a compact 3-volt battery.

- Both the first and second ECP displays (3a,3b) are adapted to adjust between first and second colour states. The microprocessor (4) is interfaced with the first and second displays (3a,3b) via a first pair of electrodes (11a,11b) and a second pair of electrodes (12a,12b) respectively. The microprocessor (4) is able to provide control signals to the displays (3a,3b) in the form of electrical signals having specific voltage characteristics whereby, the displays (3a,3b) are configured to adjust colour between the first and second colour states in response to the received control signals. The ECP displays (3a,3b) in this embodiment are adapted to receive control signals from the microprocessor (4) independently of each other and to adjust colour state independently of each other.

- 20 The first display (3a) includes a substantially "eye-shaped" strip of ECP material. The second display (3b) consists of an "ECP mask" which is adapted to overlay on an upper surface of the shoe (1) during manufacture. For instance, a suitable adhesive or stitching is able to be used to secure the "mask" to the upper surface of the shoe (1). The second ECP display (3b) "mask" is shown in stand-alone fashion connected to the microprocessor unit (4) in Fig. 4.

- A user control device (7) is provided to allow a user to input instructions into the microprocessor (4). The user control device (7) includes a GUI (7a) which allows instructions to be sent to the microprocessor (4) by a user. The GUI (7a) is implemented using application software running on a Windows CE™ operating system platform, and, in combination with suitable hardware including a touch-

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sensitive screen. The user control device (7) is operatively interfaced with the microprocessor (4) via a Bluetooth® based signalling link. However, it is also able to be interfaced with the microprocessor (4) using a physical cable via a USB port (8) disposed in an outward-facing surface of the heel (5) as shown in Fig. 2. In  
5 certain embodiments, the user control device (7) includes a keypad disposed on the shoe (1) itself. In yet alternative embodiments, the user control device (7) is able to be implemented via a mobile phone, PDA, or other portable computing device upon which appropriate software has been downloaded to allow it to interface with the microprocessor (4).

10

The microprocessor (4) is adapted to be programmed via the user control device (7) so as to select the colour of the first and second colour states of the first and second displays (3a,3b).

15 The following description will now outline a series of specific operational modes of the first embodiment. A user is able to selectively activate and/or deactivate any or all of the operational modes if so desired by providing an appropriate instruction to the microprocessor (4) via the user control device (7). A master "On/Off" switch (10) could be disposed on a surface of the heel (5) which allows the user to  
20 completely selectively activate and/or deactivate the microprocessor (4) altogether if required.

#### Operational Mode A

25 The microprocessor (4) is programmed to automatically control the adjustment of the second display (3b) between the first and second colour states depending upon a degree of pressure that is detected upon the sole (2) of the shoe (1) in use.

A plurality of pressure sensors (9a) are distributed within a mid-sole (2a) of the  
30 shoe (1) and are adapted to detect pressure that is applied to the sole (2) of the shoe (1) in ordinary use. Figure. 5 shows the mid-sole (2a) of the shoe (1) in

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stand-alone fashion with the pressure sensors (9a) distributed around the mid-sole (2a), and each pressure sensor (9a) being connected to the microprocessor (4) via separate electrical leads.

- 5 In real-time, the microprocessor (4), uses the received pressure sensor (9a) inputs to calculate an average pressure reading. The microprocessor (4) is programmed to compare the average pressure sensor reading at any given time against a predetermined pressure threshold value. If the average pressure sensor reading is determined to be greater than the threshold value, the microprocessor (4)
- 10 outputs a control signal to the second ECP display (3b) causing it to adjust from the first colour state into the second colour state. Conversely, when the average pressure reading is determined to be less than the predetermined pressure value, the output control signal of the microprocessor (4) which is received by the second ECP display (3b) instructs the second ECP display (3b) to remain in the first colour
- 15 state, or, if the second display is outputting the second colour state, revert to the first colour state.

The predetermined threshold pressure value can be pre-set into the microprocessor (4) to correspond to a pressure value which would be estimated to

20 be applied to the sole (2) when a person of average weight were stepping on the sole (2) of the shoe (1).

#### Operational Mode B

- 25 The microprocessor (4) is also programmed to automatically adjust the first display (3a) from the first colour state (eg. green), into the second colour state (eg. red) whenever it determines that a degree of deterioration of a cushioning capacity of the sole (2) has fallen below a predetermined deterioration threshold value of the sole (2) through use.

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A pedometer (9b) is disposed in the heel of the shoe (1) which is also interfaced with the microprocessor (4). The microprocessor (4) receives an output signal in real-time from the pedometer (9b) (in terms of metres travelled by the shoe) and compares the pedometer signal with the predetermined deterioration threshold value. The predetermined deterioration threshold value represents an arbitrary measure of the distance travelled by the shoe (1) before a cushioning capacity of the sole (2) is estimated to have deteriorated to an unacceptable extent. The predetermined deterioration threshold value of the cushioning capacity of the sole is generally predetermined by testing a sample sole (2) to determine an approximate distance which would be travelled in ordinary usage before the sole (2) has deteriorated.

The microprocessor (4) compares the pedometer output with the predetermined deterioration threshold value and causes the first display (3a) to change into the second colour state if the pedometer (9b) reading exceeds the predetermined deterioration threshold value – thus indicating that the cushioning ability of the sole (2) has worn out and the shoe (1) should be replaced. Conversely, if the predetermined deterioration threshold value has not been exceeded by the pedometer value, then the microprocessor (4) will automatically instruct the first display (3a) to remain in the first colour state.

#### Operational Mode C

In a further operation mode, a colourimeter (9c) is interfaced with the microprocessor (4). The colourimeter (9c) outputs a signal to the microprocessor (4) which compares the received reading with each colour state of the second ECP display (3b) and instructs the second ECP display (3b) to change to the colour state which best approximates the colourimeter reading. Thus, for instance if the user is intending to wear a blue outfit to a party and wants his/her shoe(s) to match this colour, the user is able to scan the colour of the outfit by placing the colourimeter (9c) in proximity to the item of clothing. If say the second colour state

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were approximately a similar shade of red as the outfit, the microprocessor (4) would instruct the display (3b) to toggle into the second colour state. In other embodiments of the present invention, the second display (3b) is able to be adjusted into any number of possible colour states, each of which can approximate  
5 a particular colour or shade.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication  
10 (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described  
15 without departing from the scope of the invention. All such variations and modification which become apparent to persons skilled in the art, should be considered to fall within the spirit and scope of the invention as broadly hereinbefore described. It is to be understood that the invention includes all such variations and modifications. The invention also includes all of the steps and  
20 features, referred or indicated in the specification, individually or collectively, and any and all combinations of any two or more of said steps or features.

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**Claims:**

1. An apparatus for use with a shoe having a sole, the apparatus including:  
at least one display adapted for mounting on a surface of the shoe; and  
5 a means of adjusting the at least one display between at least a first and a second colour state.
2. An apparatus as claimed in claim 1 wherein the display includes at least one of:  
10 (a) an Electro-Chromic Polymer (ECP) type display; and  
(b) a Controlled Release Polymer (CRP) type display.
3. An apparatus as claimed in claim 2 wherein the ECP display includes a polymer material that is adapted to change colour when a charge is applied to the  
15 polymer material.
4. An apparatus as claimed in claim 2 wherein the CRP display includes a material that is adapted to change its colour permanently when a charge is applied to the polymer material.  
20
5. An apparatus as claimed in claim 4 wherein when the CRP is exposed to an electrical charge, a dye is released which permanently alters the colour of the polymer.
- 25 6. An apparatus as claimed in any one of the preceding claims wherein the display is adapted for mounting on to an outward-facing surface of the shoe.
7. An apparatus as claimed in any one of the preceding claims including a processing device for controlling the adjustment of the display between the at least  
30 first and second colour states.

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8. An apparatus as claimed in claim 7 wherein the processing device is operatively connected with the display and is adapted to provide a control signal to the display which controls adjustment of the display between colour states.
- 5 9. An apparatus as claimed in claims 7 or 8 wherein the processing device is user-programmable.
10. An apparatus as claimed in claim 9 wherein the processing device is programmable by a user via a user-interface including at least one of:
- 10 (a) a key pad;  
(b) a graphical user interface;  
(c) a joystick;  
(d) a mouse;  
(e) a switch; and  
15 (f) a button
11. An apparatus as claimed in claim 10 wherein the user-interface includes at least one of a mobile phone, PDA, and a notebook computer.
- 20 12. An apparatus as claimed in claims 10 or 11 wherein the user interface is able to be operatively connected to the processing device via cable.
13. An apparatus as claimed in claims 10 or 11 wherein the user interface is able to be operatively connected to the processing device via a wireless  
25 communication link including at least one of:
- (a) a Bluetooth connection;  
(b) a Wi-Fi connection; and  
(c) an Infra-red connection.
- 30 14. An apparatus as claimed in any one of the preceding claims wherein the adjustment means includes at least one of:

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- (i) an automatic adjustment means; and
- (ii) a manual adjustment means.

15. An apparatus as claimed in claim 14 wherein the automatic adjustment  
5 means includes:

a sensor adapted for sensing an operating characteristic of the shoe and outputting an output sensor signal in response to the sensed operating characteristic; and

a processing device adapted for receiving the output sensor signal and  
10 providing a control signal in response to the received output sensor signal, whereby the display is adapted to receive the control signal and adjust between the first and second colour states by reference to the received control signal.

16. An apparatus as claimed in claim 15 wherein the operating characteristic  
15 which triggers an adjustment in the display includes at least one of:

- (I) a detection of pressure being applied to the sole of the shoe;
- (II) a detection of a threshold amount of deterioration in a cushioning capacity of the sole; and
- (III) a detection of a colour characteristic of an adjacent environment  
20 relative to the shoe.

17. An apparatus as claimed in claim 16 wherein where the operating characteristic which triggers and adjustment in the display includes a detection of a colour characteristic of an adjacent environment relative to the shoe, the colour  
25 characteristic includes at least one of:

- (a) a colour characteristic of an item of clothing worn by the user of the shoe; and
- (b) a colour characteristic of physical surroundings in which the shoe is located.

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18. An apparatus as claimed in claims 16 or 17 wherein, where the operating characteristic relates to a detection of a threshold amount of deterioration in a cushioning capacity of the sole, the present invention further includes:

5 a means of determining a degree of deterioration in a cushioning capacity of the sole; and

a means of comparing the degree of deterioration in the cushioning capacity against a predetermined threshold value, wherein an output signal is generated which is indicative of the comparison; and

10 whereby, the display is adapted to receive the output signal and change state between at least the first colour state and the second colour state in response to the received output signal, wherein when the output signal indicates that the determined deterioration in the cushioning capacity is less than the threshold value, the display outputs the first colour state, and, when the output signal indicates that the determined deterioration in the cushioning capacity is  
15 greater than the threshold value, the display outputs the second colour state.

19. An apparatus as claimed in claim 18 wherein the threshold value of deterioration in the shoe is measured in terms of at least one of:

- 20 (i) a distance travelled by the shoe in use;  
(ii) a number of impacts absorbed by the sole; and  
(iii) a force of impact.

20. An apparatus as claimed in claim 18 or 19 wherein the threshold value of deterioration in the shoe is pre-programmed into the processor device.  
25

21. An apparatus as claimed in any one of claims 16 to 20 including a colour detection device for detecting the colour characteristic of the adjacent environment relative to the shoe.

30 22. An apparatus as claimed in claim 21 wherein the colour detection device includes at least one of:

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- (a) a colourimeter; and
- (b) a light wand.

23. An apparatus as claimed in any one of claims 16 to 22 including at least  
5 one sensor adapted for detecting when pressure is being applied to the sole of the shoe.

24. An apparatus as claimed in claim 23 wherein the sensor includes at least one of:

- 10 (a) a pressure sensor; and
- (b) a piezo-electric sensor.

25. An apparatus as claimed in any one of the preceding claims including a plurality of sensors.

15

26. An apparatus as claimed in claim 25 wherein the plurality of sensors are positioned in proximity in a mid-sole of the shoe.

27. An apparatus as claimed in claims 25 or 26 wherein each of the plurality of  
20 sensors are associated with at least one of a plurality of displays mounted on the shoe, and each display is independently adjustable between at least a first and a second colour state, by reference to a sensor output signal produced by a sensor associated with the display.

25 28. An apparatus as claimed in any one of the preceding claims including a means of automatically adjusting the display between colour states by reference to an output signal from a timing device.

29. An apparatus as claimed in claim 28 wherein the means of automatically  
30 adjusting the display, automatically adjusts the display between colour states

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when an output signal is detected from the timing device indicating that a countdown has ended.

30. An apparatus as claimed in any one of claims 18 to 29 wherein the  
5 predetermined threshold value against which the degree of cushioning capacity of the sole is compared, is adjustable depending upon a specific weight of the user.

31. An apparatus as claimed in claim 30 wherein the predetermined threshold  
10 value is adjusted by the processing device.

32. An apparatus as claimed in claims 30 or 31 wherein the user's weight is  
able to be entered into the processing device for processing via the user interface.

33. A shoe including:  
15 a sole; and  
at least one display disposed on a surface of the shoe; and  
a means of adjusting the at least one display between at least a first and a second colour state.

20 34. A shoe including:  
a sole; and  
a means of determining a degree of deterioration in a cushioning capacity of the sole; and  
a means of comparing the degree of deterioration in the cushioning  
25 capacity against a predetermined threshold value, wherein an output signal is generated which is indicative of the comparison; and  
a display which is adapted to receive the output signal and change state between at least a first colour state and a second colour state in response to the received output signal, wherein when the output signal indicates that the  
30 determined deterioration in the cushioning capacity is less than the threshold value, the display outputs the first colour state, and, when the output signal

- 25 -

indicates that the determined deterioration in the cushioning capacity is greater than the threshold value, the display outputs the second colour state.

35. An apparatus for use with a shoe having a sole, the apparatus including:
- 5 a means of measuring a degree of pressure being applied to the sole; and  
a means of comparing the degree of pressure being applied to the sole against a predetermined pressure threshold value, wherein an output signal is generated which is indicative of the comparison; and  
a display adapted for mounting to a surface of the shoe, wherein the display  
10 is adapted to receive the output signal and change state between at least a first colour state and a second colour state in response to the received output signal, wherein when the output signal indicates that the determined degree of pressure being applied to the sole is less than the threshold value, the display outputs the first colour state, and, when the output signal indicates that the determined degree  
15 of pressure being applied to the sole is greater than the threshold value, the display outputs the second colour state.

36. A shoe including:
- a sole; and
- 20 a means of measuring a degree of pressure being applied to the sole; and  
a means of comparing the degree of pressure being applied to the sole against a predetermined pressure threshold value, wherein an output signal is generated which is indicative of the comparison; and  
a display adapted for mounting to a surface of the shoe, wherein the display  
25 is adapted to receive the output signal and change state between at least a first colour state and a second colour state in response to the received output signal, wherein when the output signal indicates that the determined degree of pressure being applied to the sole is less than the threshold value, the display outputs the first colour state, and, when the output signal indicates that the determined degree  
30 of pressure being applied to the sole is greater than the threshold value, the display outputs the second colour state.

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37. An apparatus for use with a shoe having a sole, the apparatus including:  
a sensor for detecting a colour characteristic of an adjacent surface relative to the shoe, wherein the sensor outputs a sensor signal indicative of the detected colour characteristic; and  
5 a display adapted for mounting to a surface of the shoe, wherein the display is adapted to receive the sensor signal and adjust to a colour state which approximates the detected colour characteristic.
38. An apparatus as claimed in claim 37 wherein the sensor includes at least  
10 one of:  
(I) a colourimeter;  
(II) a "light wand"; and  
(III) an optical sensor.
- 15 39. A shoe including  
a sole; and  
a sensor for detecting a colour characteristic of an adjacent surface relative to the shoe, wherein the sensor outputs a sensor signal indicative of the detected colour characteristic; and  
20 a display adapted for mounting to a surface of the shoe, wherein the display is adapted to receive the sensor signal and adjust to a colour state which approximates the detected colour characteristic.
40. A method including the steps of:  
25 (i) mounting at least one display on a surface of a shoe; and  
(iv) adjusting the at least one display between at least a first and a second colour state.

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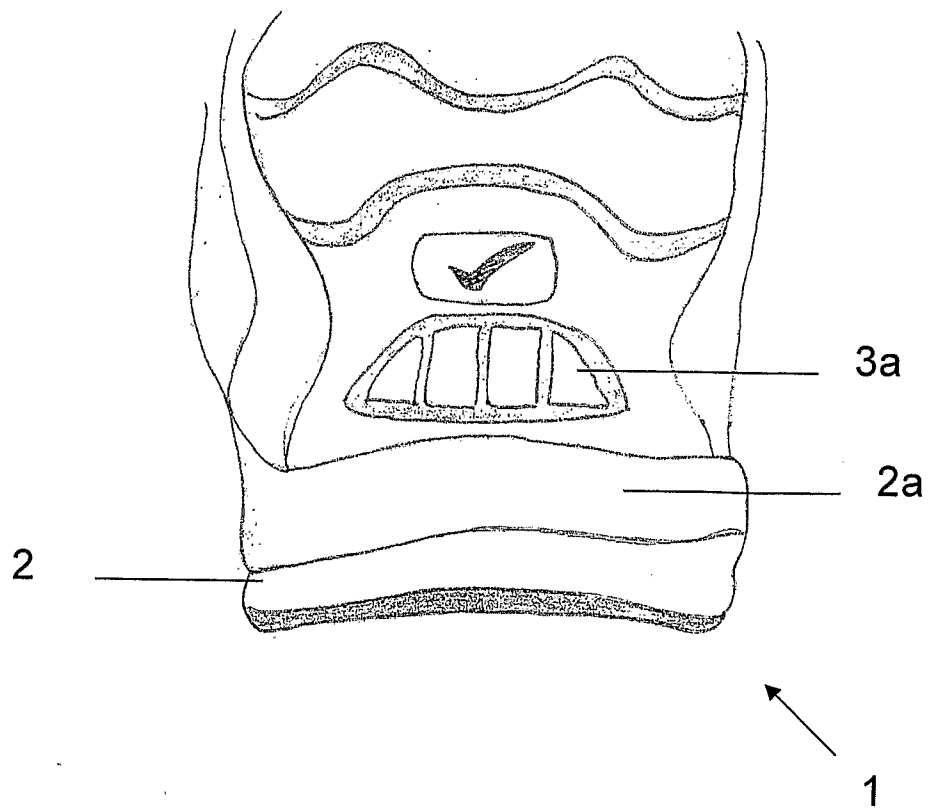


FIG. 1

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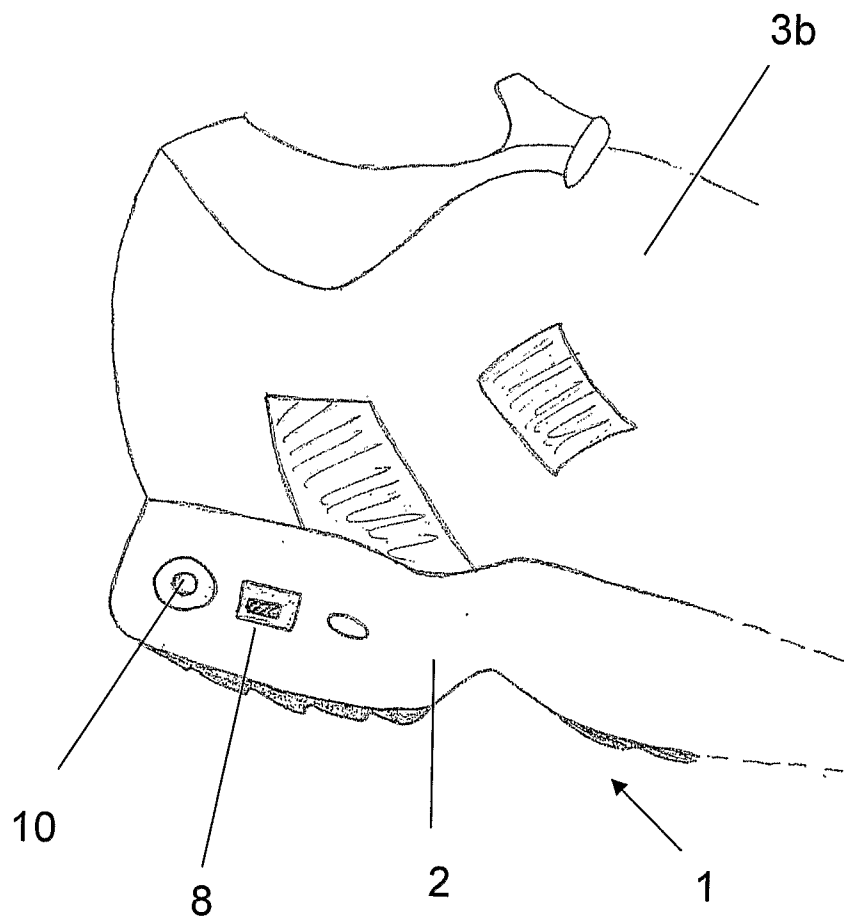


FIG. 2

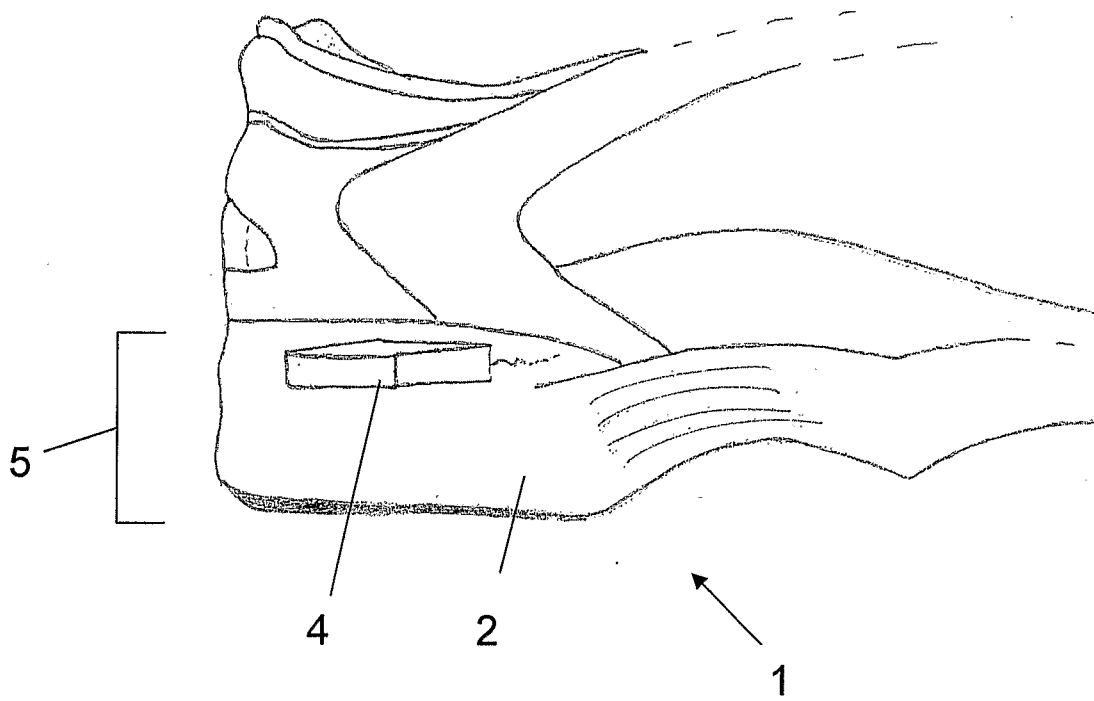


Fig. 3

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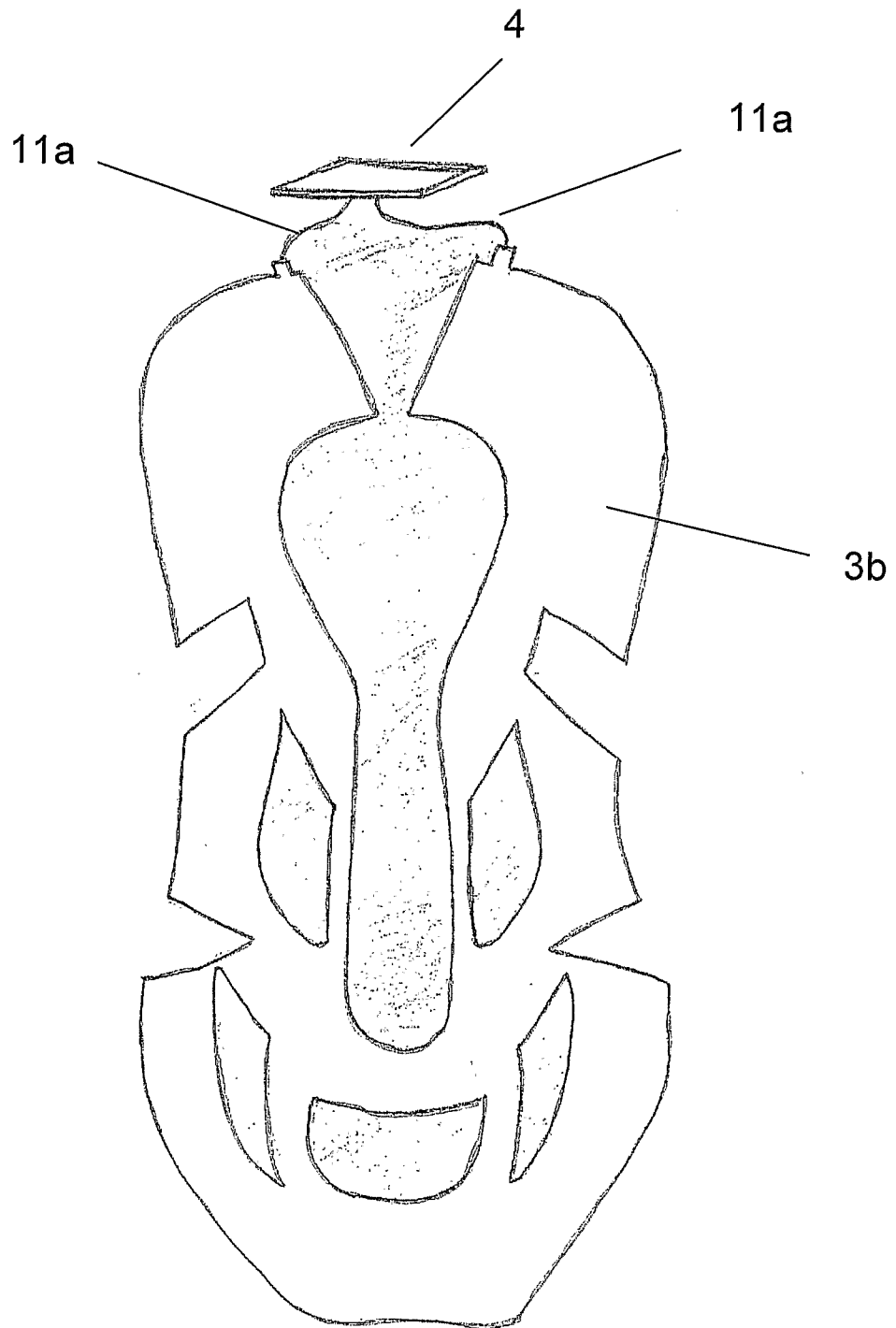


FIG. 4

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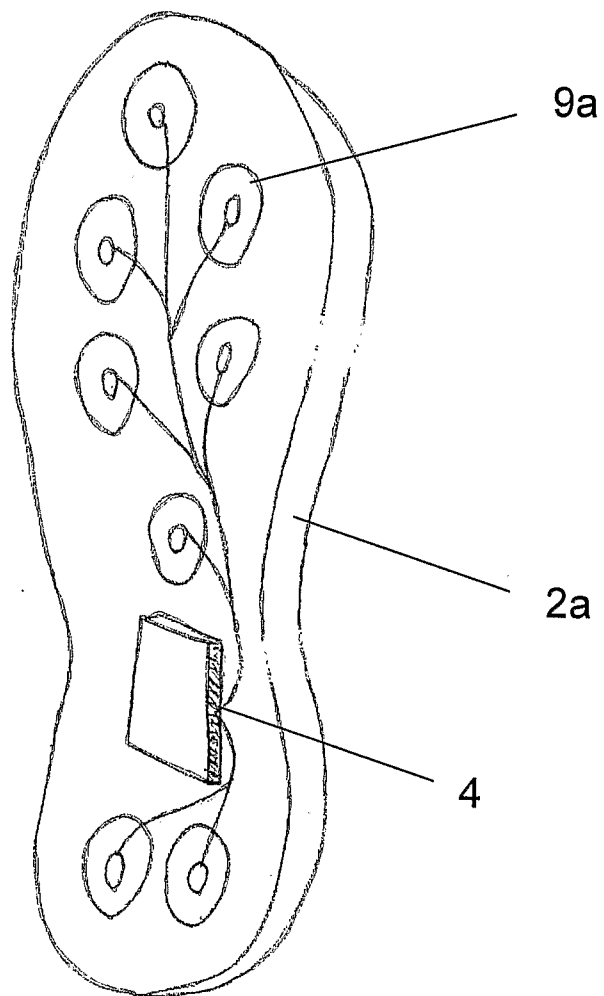


FIG. 5

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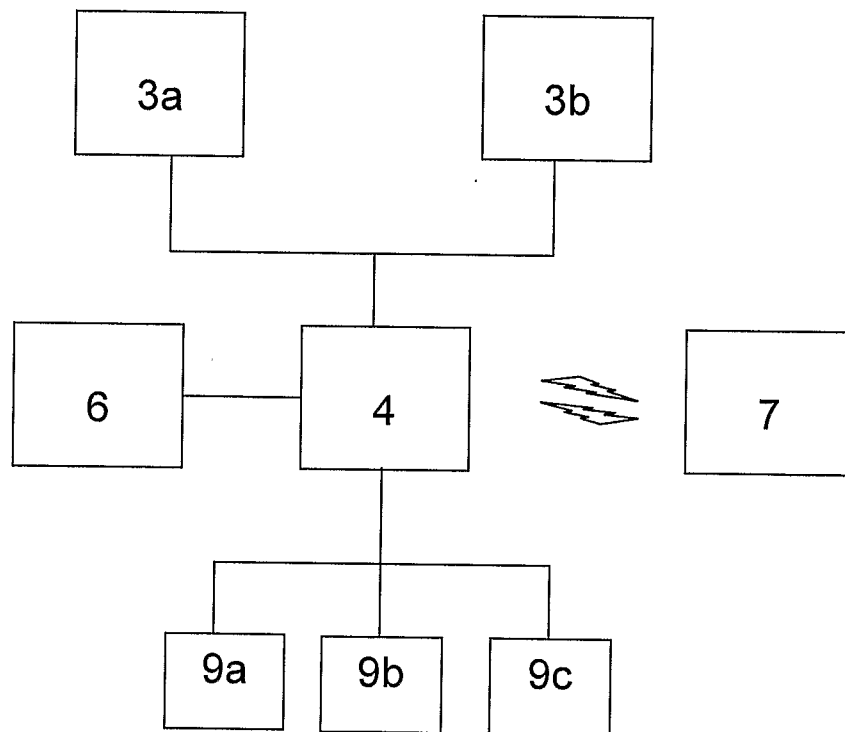


FIG. 6

# INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/AU2007/000579**

## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. **A43B 3/00** (2006.01) **A43B 5/00** (2006.01) **A43B 7/00** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Derwent file dwpi - A43B and keywords, shoe, footwear, colour and like terms inc spelling variations

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	FR 2869684 A (NAPPA) 4 November 2005. All document.	1,6,33,40. 24, 35, 36
X	US 2004/187184 A (RUBIN et al) 30 September 2004. All document.	1, 6-13,33,40
X	US 6764193 B (WEI) 20 July 2004. All document.	1, 33, 40
X	WO 1986/001084 A (WALTER) 27 February 1986. All document.	1, 40
X	US 2005/091884 A (OMSTEAD et al) 5 May 2005. All document.	1, 33, 40
X	EP 751010 A (THE PILOT INK CO. LTD) 2 January 1997. All document.	1, 2

☒ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
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Date of the actual completion of the international search <b>30 May 2007</b>	Date of mailing of the international search report <b>02 JUN 2007</b>
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized officer <b>DAVID LEE</b> AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : (02) 6283 2107

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2007/000579

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 400460 B (SASAKI CHEMICALS CO. LTD) 5 April 1995. All document.	1, 33
X	US 2005/018417 A (CHIEN) 27 January 2005. All document.	1, 33, 40
X A	US 4112601 A (CHIARAMONTE Jr) 12 September 1978. All document.	1, 33, 40 37, 39
Y	US 2005/192129 A (KUWABARA) 1 September 2005. All document.	1,24,33,40

# INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/AU2007/000579

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
FR	2869684				
US	2004187184				
US	6764193				
WO	8601084	AU	46749/85	CH	665096
				EP	0190232
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EP	0751010	CA	2179699	JP	9010013
				US	5858914
EP	0400460	JP	3109916	JP	3109917
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				US	2004022052
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		US	2006072346	US	2006073731
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		US	2006221617	US	2006227573
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		US	2007076438	US	2007076439
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		US	2007081423	WO	02072378
				WO	03077288
US	4112601				
US	2005192129	CN	1679986	JP	2005270640
				KR	2006004311

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX