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(54) Title: ADJUSTABLE SHOE AND METHOD FOR ADJUSTING A SHOE

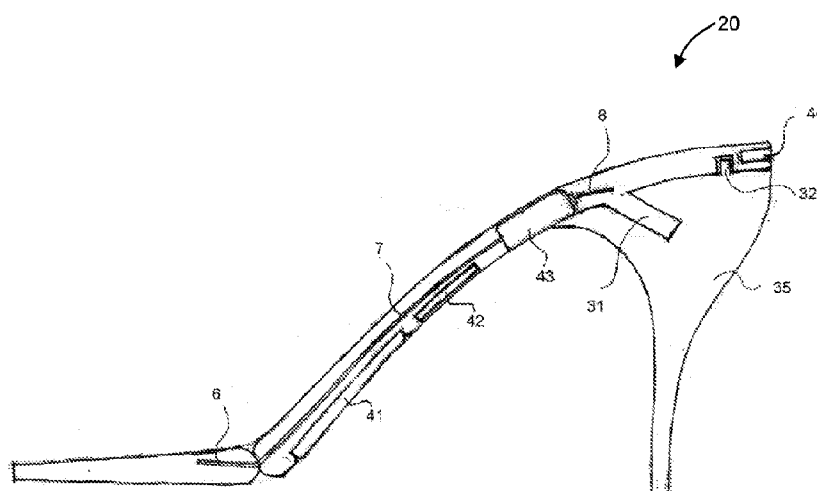


FIG. 4B

(57) Abstract: An adjustable shoe includes an outsole having a middle portion hingedly attached to a forefoot portion and a heel portion. A segmented driveshaft spans from the forefoot portion of the outsole to the heel portion. Rotation of a front segment of the driveshaft causes the forefoot portion of the outsole to rotate about a hinge axis thereby adjusting a forefoot angle. A first motor is connected to the driveshaft and operable to rotate the driveshaft. A processor is in communication with the first motor and programmed to operate the first motor to provide adjustment to the shoe. A method of adjusting a shoe includes receiving a signal representing a measured force on a portion of an outsole of the shoe. If the measured force exceeds a pre-determined threshold, a motor is activated to change an angle of a forefoot portion of the outsole relative to a middle portion.



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ADJUSTABLE SHOE AND METHOD FOR ADJUSTING A SHOE

Cross-Reference to Related Applications

[0001] This application claims priority to U.S. Provisional Application No. 62/147,846, filed on April 15, 2015, now pending, the disclosure of which is incorporated herein by
5 reference.

Field of the Disclosure

[0002] The present disclosure relates to shoes, and more particularly to shoes having adjustable heels and/or sole contours.

Background of the Disclosure

10 [0003] Foot pain by wearing high heels is a common problem among women. New York Times reports that about 75% of people in the United States have foot pain, which a large portion can be attributed to women wearing high heel shoes. High heel shoes are known to cause pain, in particular to the balls of user's feet.

[0004] According to statisticbrain.com, women's dress shoes occupy 35% of the overall
15 women's shoes market. This ranks dress shoes as the number two category of women's shoes (women's casual shoes is ranked first, occupying 42.5% of the market).

Brief Summary of the Disclosure

[0005] The present application can include an automatic heel height adjustment system to help women solve this serious problem. The application can be embodied as a shoe having an
20 automatic heel height adjustment system. The shoe can include rotatable outsole portions and a removable heel to allow the state of the shoe to switch between, for example, a flat shoe and a high heel automatically in few seconds. Embodiments of the application can help relieve foot pain by changing the state of the shoe according to the wearer's needs.

[0006] In some embodiments, the outsole can be rotatable. For example, portions of the
25 outsole may rotate relative to other outsole portions. A sensor can be used to signal a change in the state of the shoe. In one particular example, a pressure sensor can be located on the shoe such

that the state of the outsole can be changed in response to signals from the sensor. The state may be changeable in seconds, or as little as one second or less.

[0007] The shoe can have a modular, interchangeable design. This can be embodied by a removable heel that allows for quick adjustment of the height of the heel.

- 5 [0008] The shoe may also have an internal battery that is charged by a standard connection port. For instance, the shoe can be connected to a USB charging device to charge the internal battery using electronic devices, such as a laptop or other portable computer appliance. In this manner, the shoe can have an internal battery that is readily chargeable.

Description of the Drawings

- 10 [0009] For a fuller understanding of the nature and objects of the disclosure, reference should be made to the following detailed description taken in conjunction with the accompanying drawings, in which:

Figure 1A is a side elevation view of an outsole according to an embodiment of the present disclosure;

- 15 Figure 1B is a side elevation view of the outsole of Figure 1A, wherein the outsole is in a high heel state;

Figure 1C is a top view of the outsole of Figures 1A and 1B;

Figure 2A is a side elevation view of an outsole according to another embodiment of the present disclosure, wherein the outsole is in a low heel state;

- 20 Figure 2B is a side elevation view of the outsole of Figure 2A, wherein the outsole is in a high heel state;

Figure 2C is a top view of the outsole of Figure 2A;

Figure 2D is a top view of the outsole of Figure 2B;

Figure 2E is a rear view of the outsole of Figures 2A and 2C;

- 25 Figure 2F is a rear view of the outsole of Figures 2B and 2D;

Figure 3A a side elevation view of a shoe according to another embodiment of the present disclosure, showing a removable heel disconnected from a heel portion of the outsole, and wherein the outsole is in a high heel state and the removable heel is a high heel;

- 30 Figure 3B is a side elevation view of the shoe of Figure 3A showing the removable heel partially connected to the heel portion of the outsole;

Figure 3C is a side elevation view of the shoe of Figures 3A and 3C showing the removable heel connected to the heel portion of the outsole;

Figure 3D is a side elevation view of a shoe according to another embodiment of the present disclosure, showing a removable heel disconnected from a heel portion of the outsole, and wherein the outsole is in a low heel state and the removable heel is a low heel;

Figure 3E is a side elevation view of the shoe of Figure 3D showing the removable heel partially connected to the heel portion of the outsole;

Figure 3F is a side elevation view of the shoe of Figures 3D and 3E showing the removable heel connected to the heel portion of the outsole;

Figure 4A is a top view of a shoe according to another embodiment of the present disclosure;

Figure 4B is a side elevation view of the shoe of Figure 4A;

Figure 4C is an orthogonal view of the shoe of Figures 4A and 4B;

Figure 5A is an orthogonal view of a prototype shoe according to another embodiment of the present disclosure;

Figure 5B is an orthogonal view of the prototype shoe of Figure 5A;

Figure 5C is an orthogonal view of the prototype shoe of Figures 5A and 5B;

Figure 5D is an orthogonal view of the prototype shoe of Figures 5A-5C;

Figure 6A is an illustration of foot pressure data of a subject wearing a traditional high-heel shoe;

Figure 6B is an illustration of foot pressure data of a subject wearing shoes of an embodiment of the present disclosure;

Figure 7A is a side orthogonal view of a shoe according to another embodiment of the present disclosure, showing the heel detached from the outsole;

Figure 7B is a side orthogonal view of the shoe of Figure 7A, showing the heel attached to the outsole;

Figure 7C is a side orthogonal view of the shoe of Figures 7A and 7B, showing the heel attached to the outsole;

Figure 7D is a top view of the shoe of Figures 7A-7C;

Figure 7E is a bottom orthogonal view of a portion of the shoe of Figures 7A-7D;

Figure 8A is a rear view of a shoe according to another embodiment of the present disclosure;

Figure 8B is a side elevation view of the shoe of Figure 8A;

Figure 8C is a perspective view of the shoe of Figures 8A and 8B;

Figure 9 is an exploded view of the outsole of the shoe of Figures 8A-8B;

Figure 10A is an orthogonal view of a prototype shoe according to another embodiment of the present disclosure, showing a 30° angle of the heel portion relative to the horizontal;

Figure 10B is an orthogonal view of the prototype shoe of Figure 10A, showing a 5° angle of the heel portion relative to the horizontal;

Figure 10C is an orthogonal view of the prototype shoe of Figures 10A and 10B, showing a 30° angle of the forefoot portion relative to the horizontal;

Figure 10D is an orthogonal view of the prototype shoe of Figures 10A-10C, showing a 5° angle of the forefoot portion relative to the horizontal; and

Figure 11 is a chart depicting a method according to another embodiment of the present disclosure.

Detailed Description of the Disclosure

[0010] With reference to Figure 1A-1C, the present disclosure may be embodied as an adjustable shoe having an outsole **10**. The outsole **10** has a middle portion **2**, which is hingedly attached to a forefoot portion **1** at a forefoot angle. The middle portion **2** of the outsole **10** is also hingedly attached to a heel portion **3** at a heel angle. Figure 1A depicts the outsole **10** configured in a low-heel state (*e.g.*, a flat shoe configuration). Figure 1B depicts the outsole **10** configured in a high-heel state.

[0011] By hingedly attached, it should be noted that the outsole portions may be attached to one another using a traditional hinge with a hinge pin or the outsole portions may be attached using another hinge configuration. For example, the outsole portions may be continuous so as to form an integrated outsole, with the forefoot, middle, and heel portions attached to one another by a flexible connection thereby being rotatable with respect to each other (*i.e.*, hingedly attached). Other techniques for hingedly attaching the outsole portions will be apparent to one having skill in the art in light of the present disclosure.

[0012] In some embodiments, for example, the embodiment depicted in Figures 8A-8C and 9, each outsole portion are made in two halves. This is most readily seen in Figure 9, wherein the forefoot portion is made up of a forefoot top **110** and a forefoot bottom **111**, the middle portion is made up of a middle top **112** and middle bottom **113**, and the heel portion is made up of a heel top **114** and a heel bottom **115**. In this way, recesses may be created for insertion of other shoe components further described below.

[0013] The shoe further comprises a driveshaft 7 disposed within the outsole 10 (see, for example, Figure 2A). The driveshaft 7 spans from the forefoot portion 1, through the middle portion 2, and to the heel portion 3. The driveshaft 7 is made up from a number of segments—*i.e.*, the driveshaft is “segmented.” Segments of the driveshaft 7 may be joined to one another by gears or other joint configurations. A front segment 6 of the driveshaft 7 is disposed in a forefoot recess 4 and a rear segment 8 of the driveshaft 7 is disposed in a heel recess 5. The driveshaft 7 is able to rotate about a primary longitudinal axis.

[0014] The driveshaft 7 is configured such that rotation of the front segment 6 of the driveshaft 7 causes the forefoot portion 1 of the outsole 10 to rotate about the hinge axis. In this way, the forefoot angle is changed (*i.e.*, the angle of the forefoot portion 1 is changed relative to the middle portion 2). The driveshaft 7 may be further configured such that rotation of the rear segment 8 of the driveshaft 7 causes the heel portion 3 of the outsole 10 to rotate about the hinge axis. In this way, the heel angle is changed (*i.e.*, the angle of the heel portion 3 is changed relative to the middle portion 2). For example, in Figures 2A-2F, it can be seen that the front segment 6 of the driveshaft 7 is angled such that rotation about the longitudinal axis from 0° to 90° (from the position in Figure 2E to the position of Figure 2F) will cause the front segment 6 to urge the forefoot portion 1 to rotate relative to the middle portion 2. In this way, the forefoot angle is changed from a flat configuration shown in Figure 2A to a high heel configuration shown in Figure 2B. Similarly, rotation of the rear segment 8 will urge rotation of the heel portion 3 (*see, e.g.*, the change from Figure 2C to Figure 2D). Where the segments of the driveshaft 7 are interconnected by gears, the gear ratio between segments can be configured such that rotation of the driveshaft will change the forefoot angle at a rate of change which is different from a rate of change of the heel angle.

[0015] With reference to Figures 4A-4C, the shoe 20 further comprises a first motor 43 in mechanical communication with the driveshaft 7, the first motor 43 operable to rotate the driveshaft 7. The first motor 43 could be any type of motor, including, for example, an electric motor. The first motor 43 is operably connected to the driveshaft 7. For example, the first motor 43 may be configured to provide a torque to the driveshaft 7, so as to rotate the driveshaft 7. The first motor 43 and driveshaft 7 may be directly connected to each other or indirectly connected. For example, in the first motor 43 may be in mechanical communication with the driveshaft 7 by way of a transmission comprising a plurality of gears. For example, in a

particular embodiment built as a prototype, seven gears were used for transferring mechanical power to the forefoot portion **1** and the heel portion **3** to rotate the outsole portions.

[0016] In another embodiment, the shoe further comprises a second motor in electronic communication with the processor. The second motor is operably connected to a second driveshaft. In such an embodiment, the first motor and driveshaft can provide adjustment for the forefoot angle, and the second motor and second driveshaft provides adjustment for the heel angle. As such, the second driveshaft can be configured such that rotation of the second driveshaft causes the heel portion of the outsole to rotate about the hinge axis. In this way, the heel angle is changed by the second driveshaft (as operated by the second motor).

[0017] In embodiments using an electric motor **43**, the first motor **43** is connected to a battery. In embodiments having more than one motor, each motor can be connected to the same battery, or one or more of the motors may be connected to separate batteries. The battery may be external or the motor **43** may be connected to an internal battery **41**. The shoe may further comprise a charging circuit. The charging circuit may be configured to be connected to a power supply by an electrical connection such as, for example, a USB connection.

[0018] The shoe further comprises a processor **42** in communication with the motor **43**. The processor **42** may be a microcontroller or another suitable processor. The processor **42** is programmed to operate the motor to provide adjustment to the shoe.

[0019] The adjustable shoe may further comprise a heel configured to be removably attached to the heel portion **3** of the outsole **10**. The heel may be configured to have any height. For example, the heel may be configured as a high heel **35**, such as that depicted in Figures 3A-3C. In another embodiment, the heel may be configured as a low heel **38** such as that depicted in Figures 3D-3F. The heel may comprise a coupler configured to be attached to a mating coupler of the heel portion of the outsole. For example, Figures 3A-3C show the high heel **35** being attached to the heel portion **3** by way of couplers **32, 33** and mating couplers **34, 31**. In the embodiment depicted in Figures 3D-3F, the same mating couplers **34, 31** of the heel portion **3** are attached to corresponding couplers **37, 36** of the low heel **38**.

[0020] The adjustable shoe may further comprise a first sensor **44** configured to measure a force applied to an area of the outsole **10**. For example, the first sensor **44** may be located in the heel portion **3** of the outsole **10** and configured to measure a force applied to at least a portion

of the heel portion **3**. Such an applied force may be caused by the weight of the wearer. The first sensor **44** is in communication with the processor **43**. In this way, the first sensor **44** may provide a signal to the processor **43** indicating the measured force, and the processor **43** may respond accordingly. For example, if the measured force exceeds a pre-determined threshold, the processor **43** may adjust the forefoot angle and the heel angle to decrease the force measured by the first sensor **44**.

[0021] Similarly, additional sensors may measure forces applied to other portions of the outsole. For example, a second sensor may be located in the forefoot portion **1** of the outsole **10** and configured to measure a force applied to at least a portion of the forefoot portion **1**. In this way, the forces measured by the first and second sensors (and any additional sensors) may be used to determine a distribution of the forces (*i.e.*, the distribution of the wearer's weight) across the outsole **10**.

[0022] In another embodiment, a manually actuated sensor may be provided. For example, the shoe may comprise a switch that can be manually actuated by the wearer to adjust the shoe as desired.

[0023] Figure 6A illustrates the foot pressure of a subject wearing traditional high-heel shoes. High foot pressures can be seen at the forefoot of the subject. Figure 6B illustrates the foot pressure of a subject wearing shoes according to an embodiment of the present disclosure. In Figure 6B, low forefoot pressures can be seen, relative to the forefoot pressures apparent in Figure 6A.

[0024] In the embodiment depicted in Figures 5A-5D, the heel portion **51** of the outsole includes a rotary table **54** in mechanical communication with a heel motor **56** by way of a shaft **55**. In such an embodiment, the rotary table **54** can change the height of the heel so as to adjust the heel angle.

[0025] The forefoot portion **53** of the outsole includes a first motor **57** (*i.e.*, a forefoot motor) and a driveshaft **58**. In such an embodiment, the angle of the forefoot portion **53** can be adjusted by rotating the shaft **58** by way of the forefoot motor **57**.

[0026] The shoes described herein can include an automatically rotating outsole and modular design high heel. These features can allow the shoes to have an adjustable heel height

such that the shoes can interchange between high heel shoes or flat shoes depending on the user's preference or need. In one embodiment, the shoe can have an automatic rotating system, including one or more of the following components: (1) one or more motors including corresponding driveshaft(s); (2) a driveshaft including a plurality of gears (*e.g.*, seven gears); (3) a driveshaft configured to adjust a rear sole section (heel) and a front sole portion (forefoot); (4) a microcontroller connected to one motor, one pressure sensor, one battery and one USB charger; (5) a sole including a plurality of cavities (*e.g.*, six cavities). In one particular example, a first cavity can be used to house a motor; a second cavity can be used to house a front part of the drive shaft; a third cavity can be used to house the battery; a fourth cavity can be used to house the microcontroller; a fifth cavity can be used to house the USB charger; and a sixth cavity can be used to house a rear part of the driveshaft. In some embodiments cavities may be combined to house more than one component.

[0027] An automatic rotation mechanism for automatically rotating the outsole can be in controlled via a microcontroller. The microcontroller can be in communication with a sensor, such as a pressure sensor. When a user activates the sensor (*e.g.*, the pressure sensor), the automatic rotating mechanism can be configured to move the shaft according to the information received from the sensor. The movement of the shaft can cause the rotation of the rear sole section (heel) and the front sole portion (forefoot). In this manner, a flat shoe can be converted to a high heel shoe by attaching the high heel bodily to the low heel.

[0028] In another aspect, the present disclosure may be embodied as a method 200 of adjusting a shoe. The method 200 comprising receiving 203, at a processor, a signal representing a measured force on a portion of an outsole of the shoe. For example, the signal may be received 203 from a sensor, such as pressure sensor. Such a sensor may be located at a position of the outsole to measure the force applied to at least a portion of the outsole. For example, the sensor may be located in a heel portion of the outsole to measure the force applied by the weight of a wearer at the heel of a shoe.

[0029] The method 200 includes determining 206 whether or not the measured force exceeds a pre-determined threshold. Where the measured force is determined 206 to exceed the threshold, a motor is activated 209 to change an angle of a forefoot portion of the outsole relative to a middle portion of the outsole. The motor may also change an angle of a heel portion of the outsole relative to the middle portion. In an embodiment, the method 200 further comprises

activating **212** a heel motor to operate a rotary table, where the rotary table is configured to alter a heel height of the shoe. In this way, the angle of the heel portion relative to the middle portion is adjusted by the changing heel height. As such, the forefoot portion, the middle portion, and the heel portion are operable to change the state of the shoe between a high heel state and a low heel state. The low heel state may be a flat shoe state.

[0030] The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. Moreover, in the figures, like reference numerals designate corresponding parts throughout the different views.

[0031] Although the present disclosure has been described with respect to one or more particular embodiments, it will be understood that other embodiments of the present disclosure may be made without departing from the spirit and scope of the present disclosure. Hence, the present disclosure is deemed limited only by the appended claims and the reasonable interpretation thereof.

What is claimed is:

1. An adjustable shoe, comprising:

an outsole having a middle portion hingedly attached to a forefoot portion at a forefoot angle,
and the middle portion is also hingedly attached to a heel portion at a heel angle;

5 a segmented driveshaft spanning from the forefoot portion of the outsole to the heel portion
of the outsole, wherein rotation of a front segment of the driveshaft causes the forefoot
portion of the outsole to rotate about the hinge axis thereby adjusting the forefoot angle;

a first motor operable to rotate the driveshaft; and

10 a processor in communication with the first motor, wherein the processor is programmed to
operate the first motor to provide adjustment to the shoe.

2. The adjustable shoe of claim 1, wherein rotation of a rear segment of the driveshaft causes the
heel portion of the outsole to rotate about the hinge axis thereby adjusting the heel angle.

3. The adjustable shoe of claim 1, wherein the heel portion includes a rotary table in
communication with the processor, the rotary table being operable by a heel motor to adjust the
15 heel angle.

4. The adjustable shoe of claim 1, further comprising a second motor operable to rotate a second
driveshaft, wherein rotation of the second driveshaft causes the heel portion of the outsole to
rotate about the hinge axis thereby adjusting the heel angle.

5. The adjustable shoe of claim 1, further comprising a first sensor in communication with the
20 processor, the first sensor configured to measure a force applied to an area of the outsole; and
wherein the processor is further programmed to adjust the forefoot angle and the heel angle
according to a signal received from the first sensor.

6. The adjustable shoe of claim 5, wherein the first sensor is configured to measure a force
exerted on at least a portion of the heel portion of the outsole.

25 7. The adjustable shoe of claim 6, further comprising a second sensor in communication with the
processor, the second sensor configured to measure a force applied to at least a portion of the
forefoot portion; and wherein the processor is further programmed to adjust the forefoot angle
and the heel angle according to a signal received from the second sensor.

8. The adjustable shoe of claim 1, further comprising a heel configured to be removably attached to the heel portion of the outsole.

9. The adjustable shoe of claim 8, wherein the heel includes a coupler configured to attach to a mating coupler of the heel portion of the outsole.

5 10. The adjustable shoe of claim 1, further comprising a battery.

11. The adjustable shoe of claim 10, further comprising a charging circuit for charging the battery, the charging circuit configured to be connected to a power supply by a USB connection.

12. A method of adjusting a shoe, comprising:

10 receiving, at a processor, a signal representing a measured force on a portion of an outsole of the shoe;
determining that the measured force exceeds a pre-determined threshold; and
activating a motor to change an angle of a forefoot portion of the outsole relative to a middle portion of the outsole.

15 13. The method of claim 12, wherein activating the motor further changes the angle of the heel portion relative to the middle portion.

14. The method of claim 12, further comprising activating a heel motor, based upon the threshold determination, to operate a rotary table thereby altering a heel height and adjusting the angle of the heel portion relative to the middle portion.

20 15. The method of claim 12, wherein the forefoot portion, the middle portion, and the heel portion are operable to change the state of the shoe between a high heel state and a flat shoe state.

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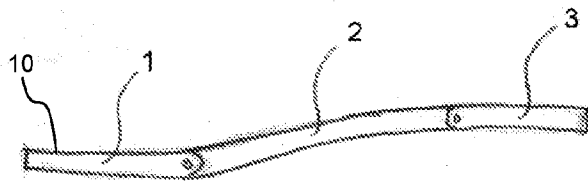


FIG. 1A

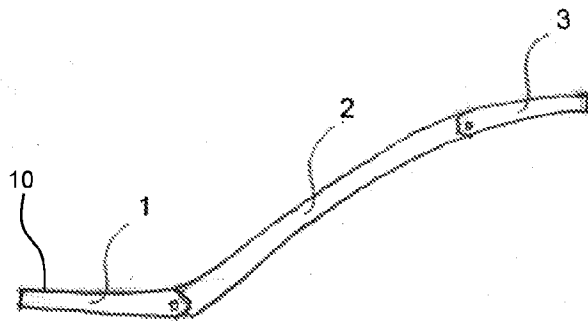


FIG. 1B

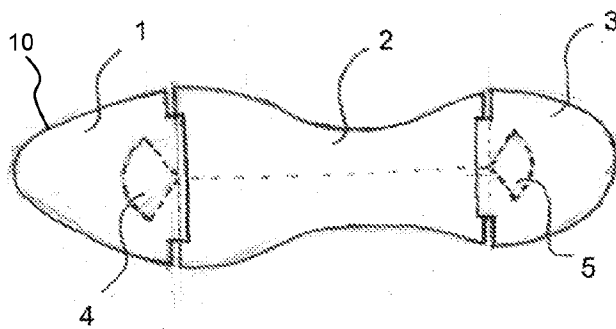


FIG. 1C

Fig. 1

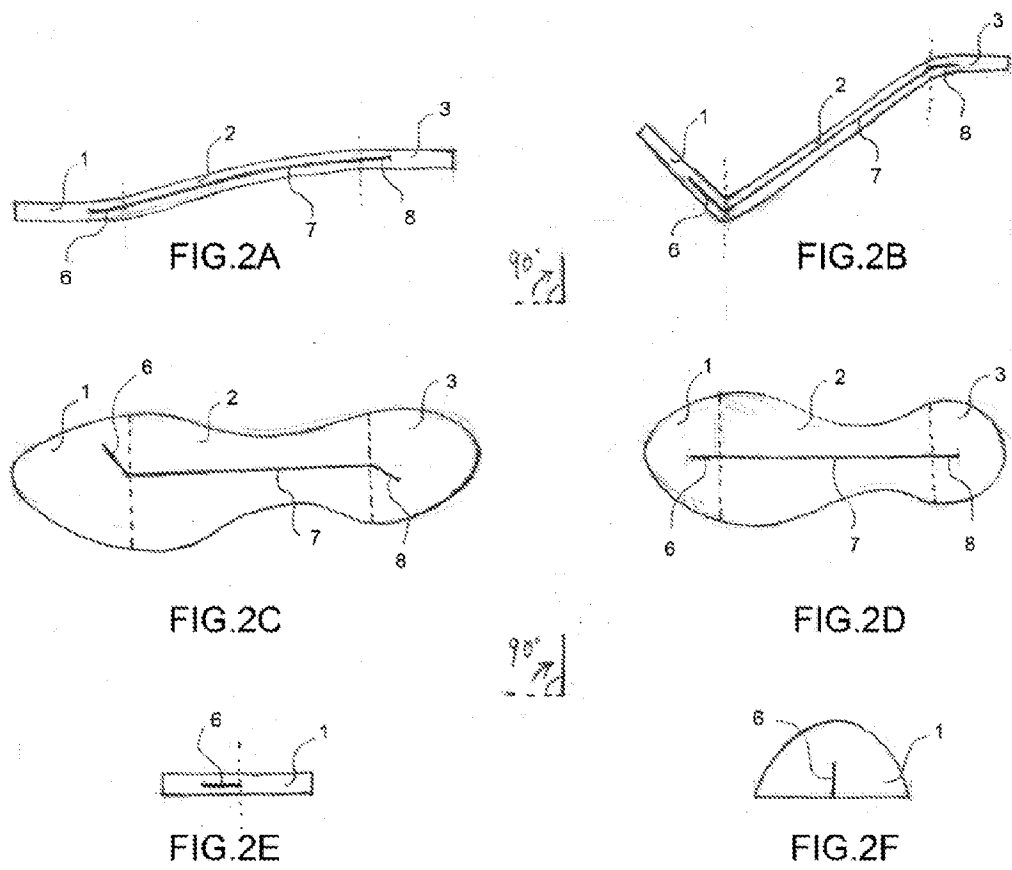


Fig. 1

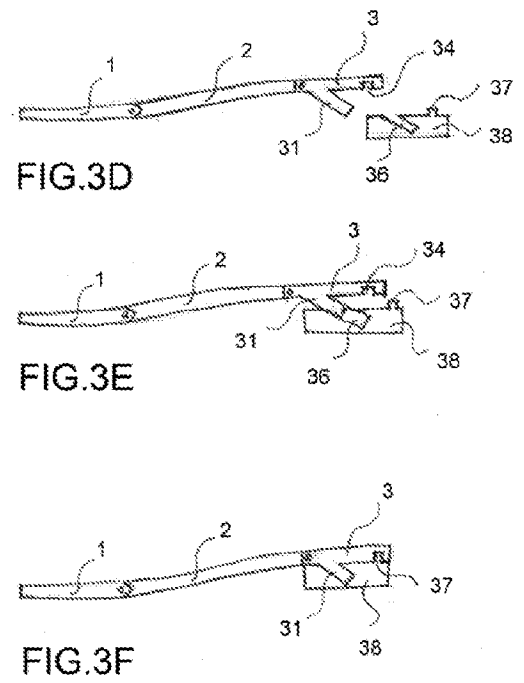
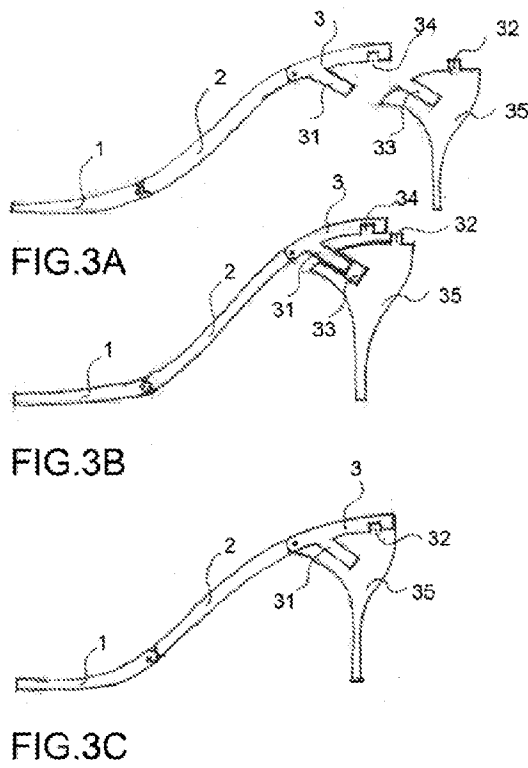


Fig. 1

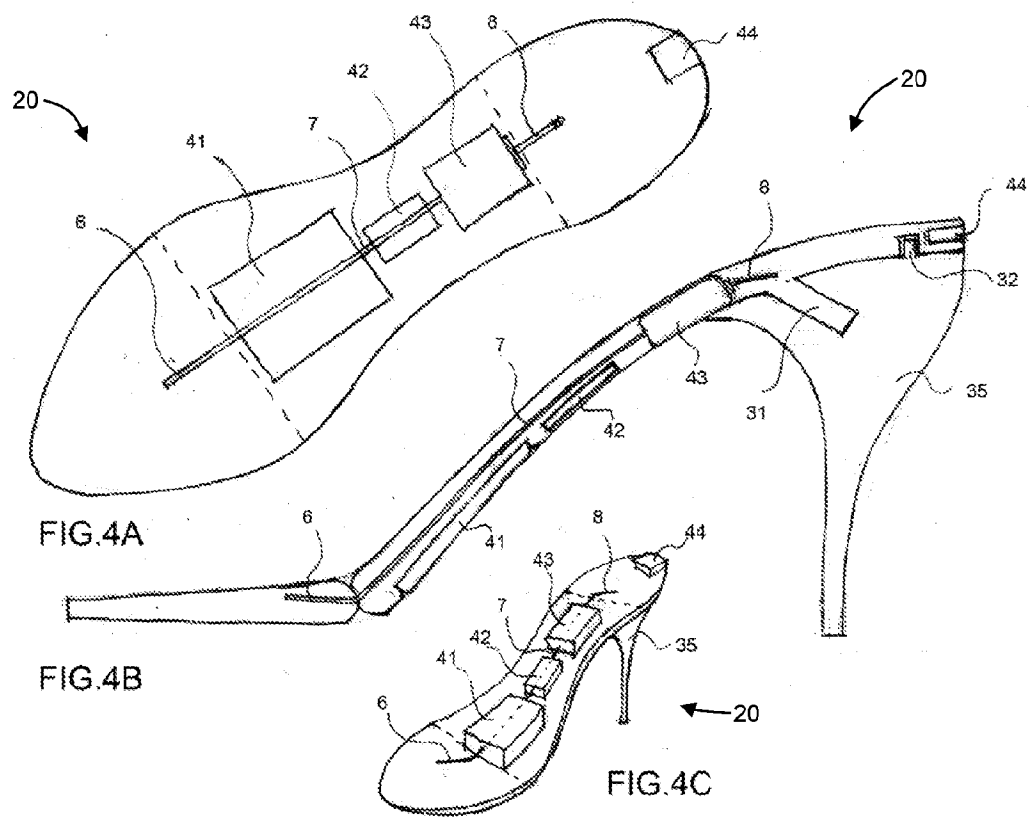


Fig. 1

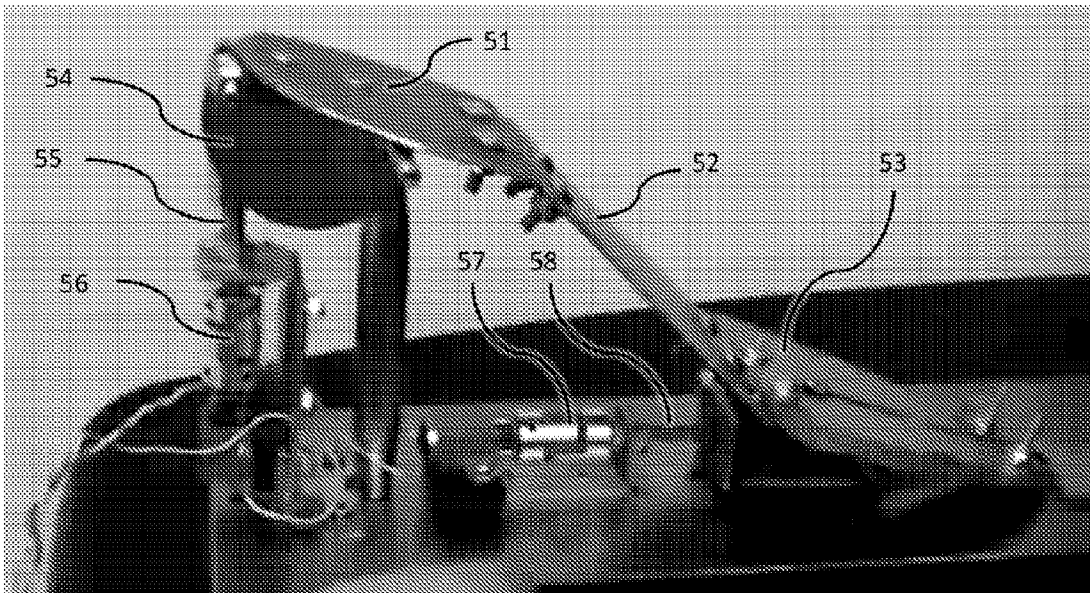


Fig. 5A

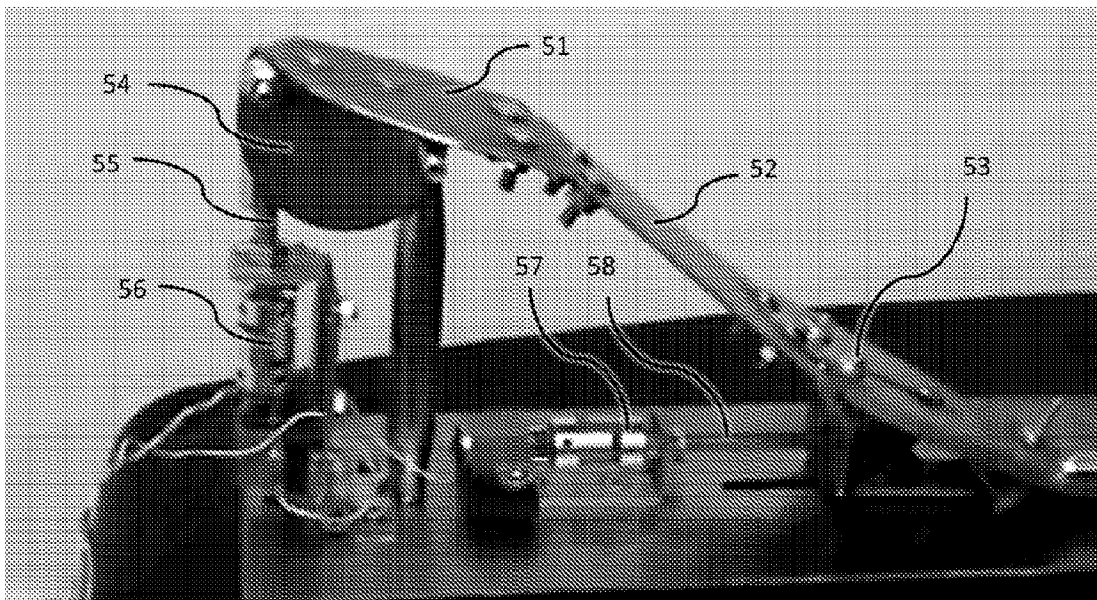


Fig. 5B

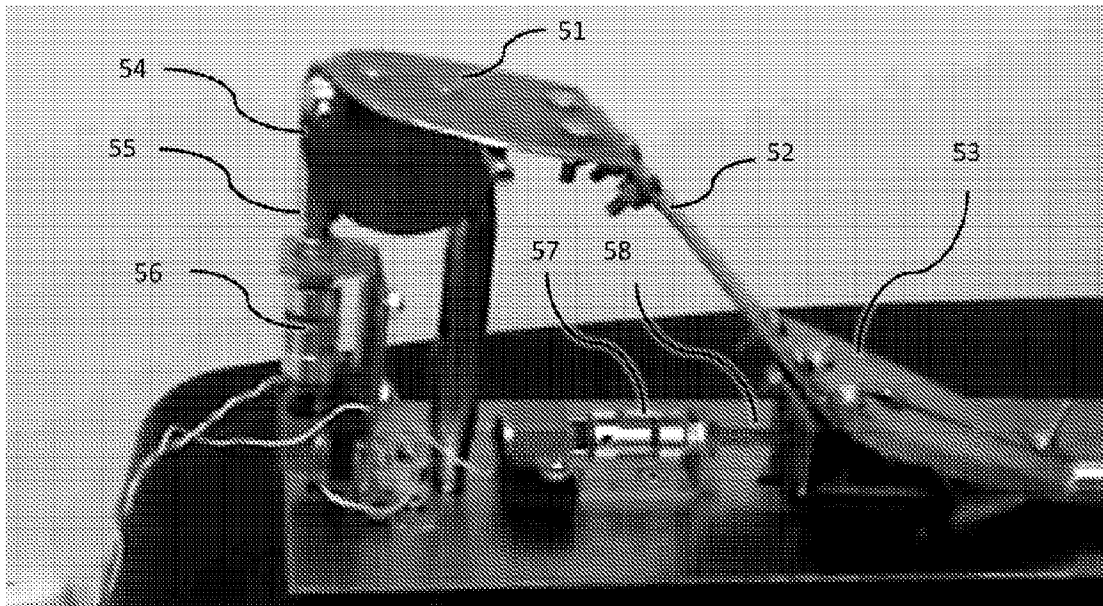


Fig. 5C

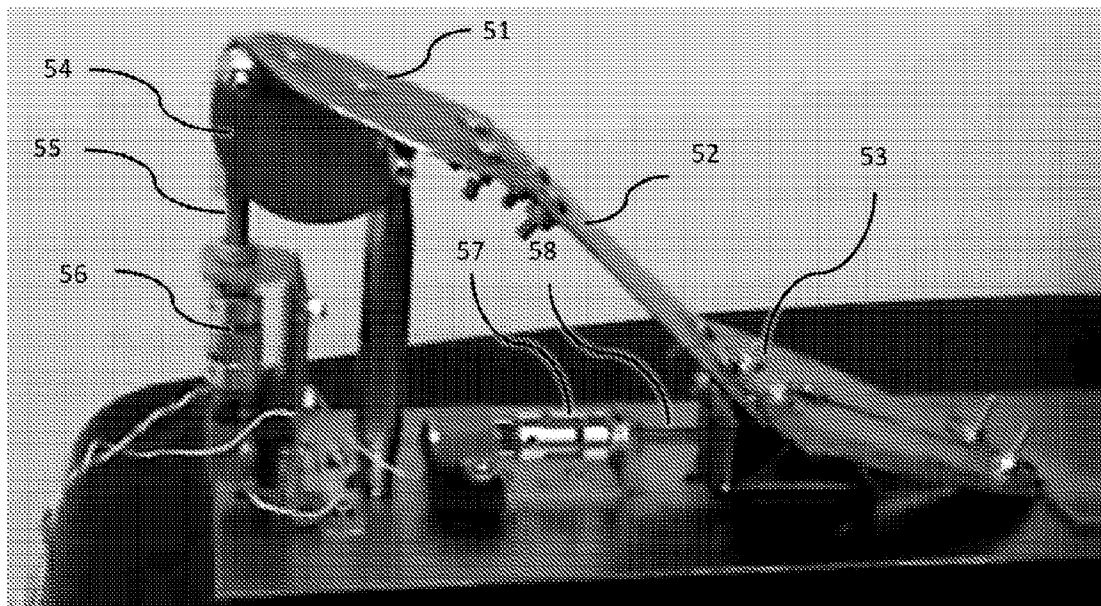


Fig. 5D

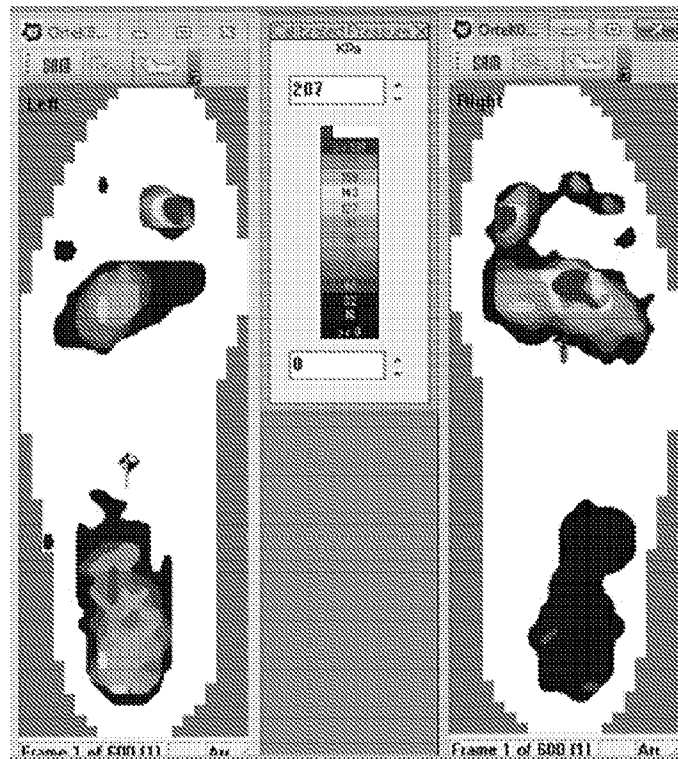


Fig. 6A

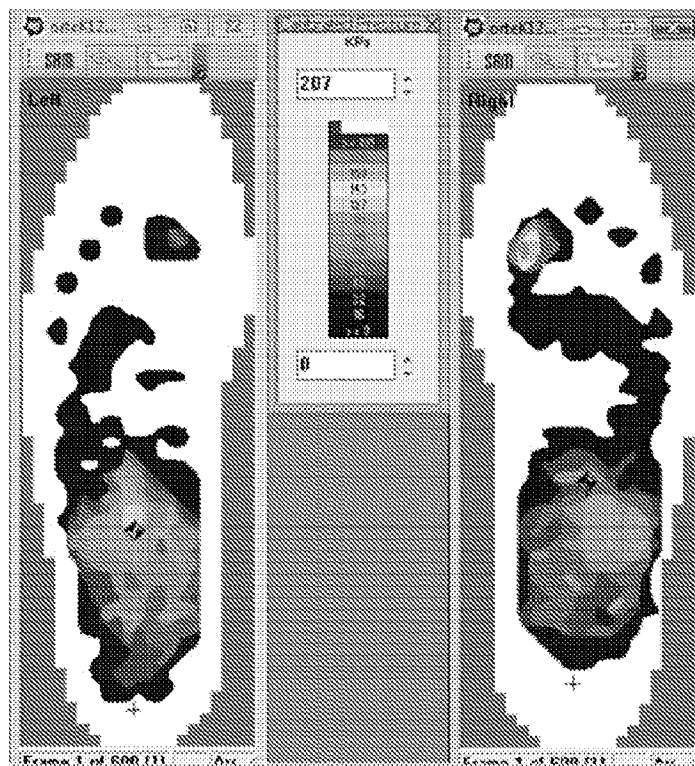


Fig. 6B

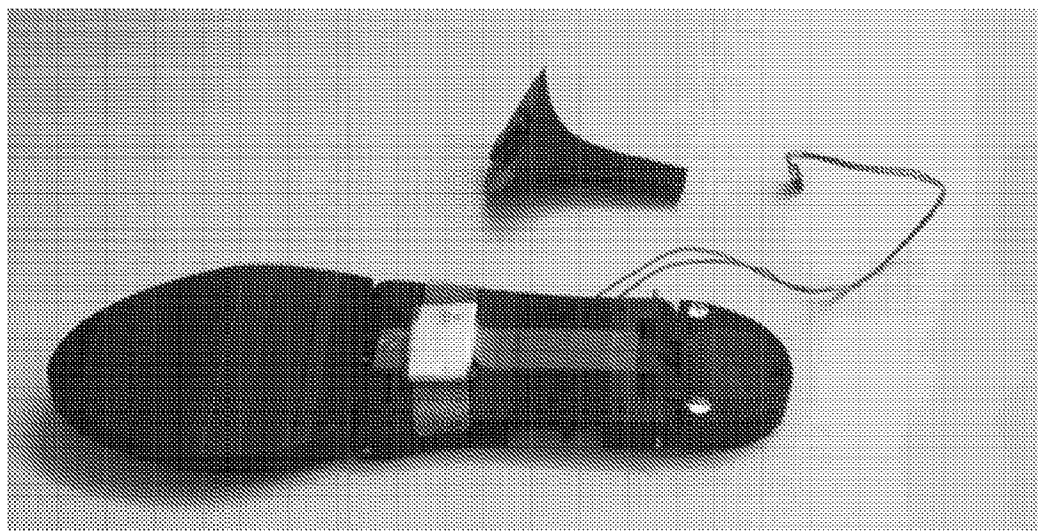


Fig. 7A

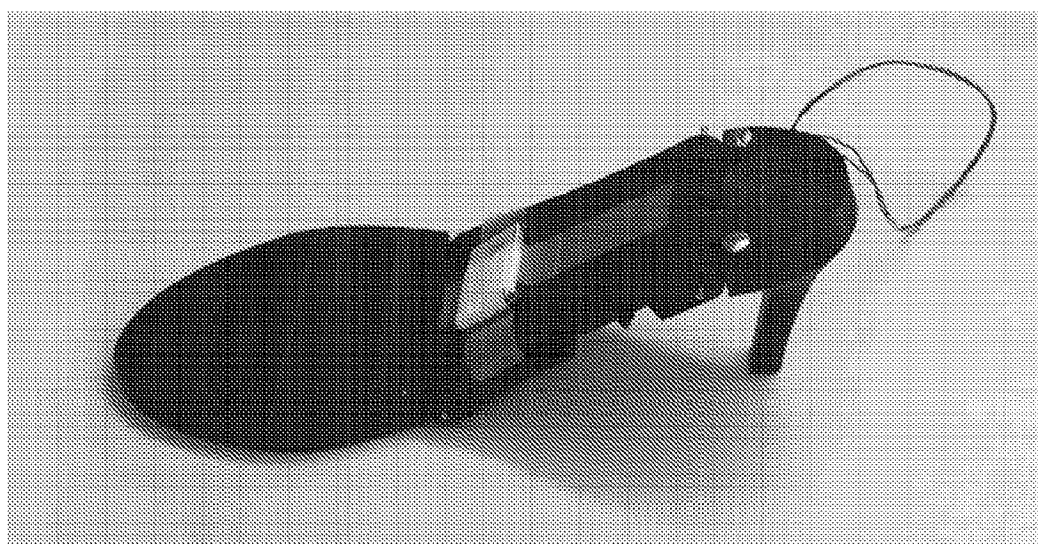


Fig. 7B

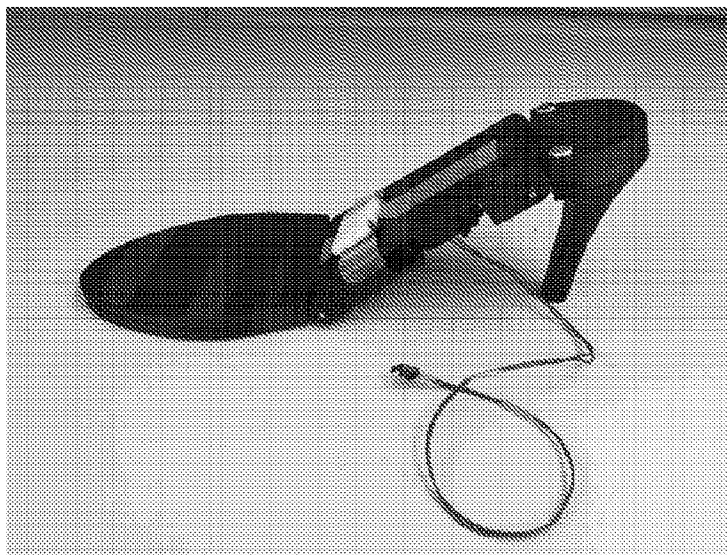


Fig. 7C

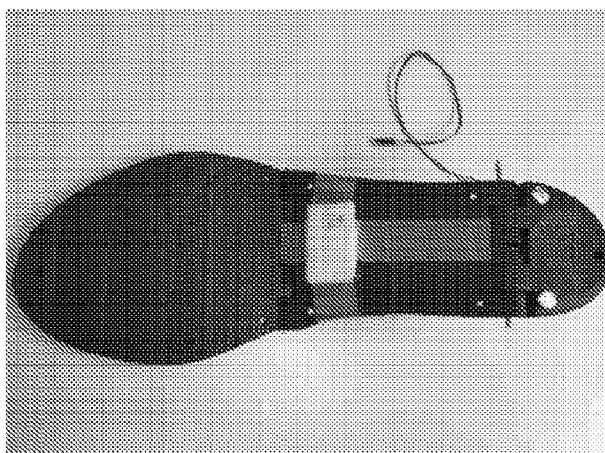


Fig. 7D

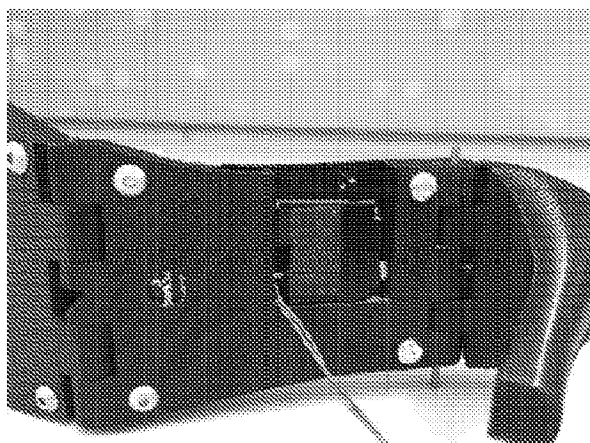


Fig. 7E

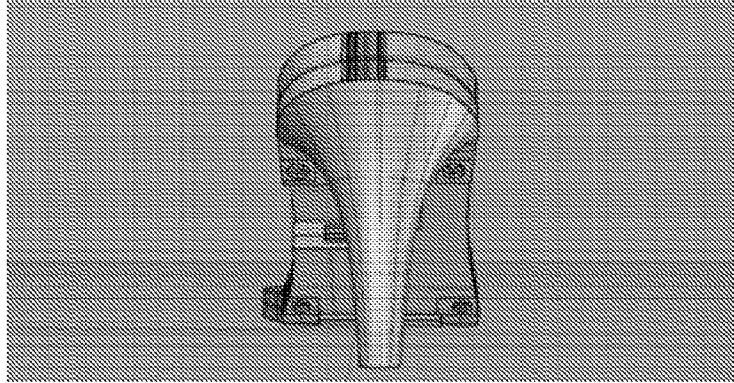


Fig. 8A

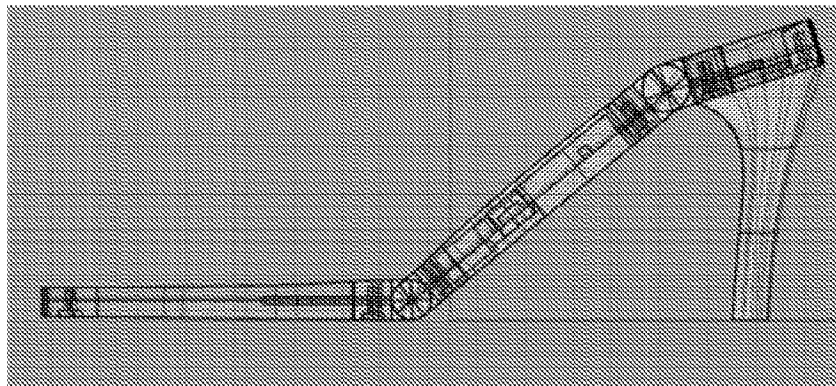


Fig. 8B

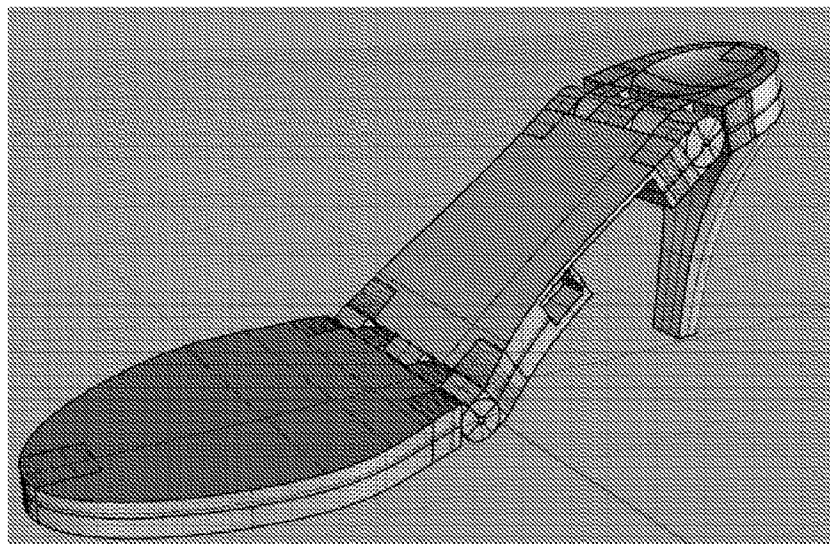


Fig. 8C

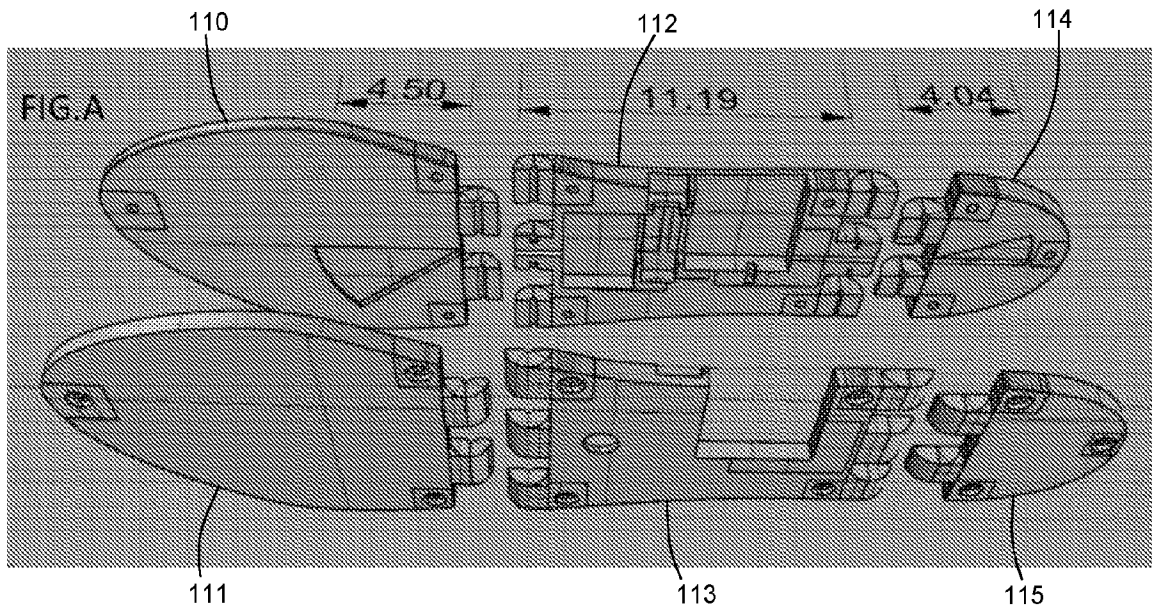


Fig. 9

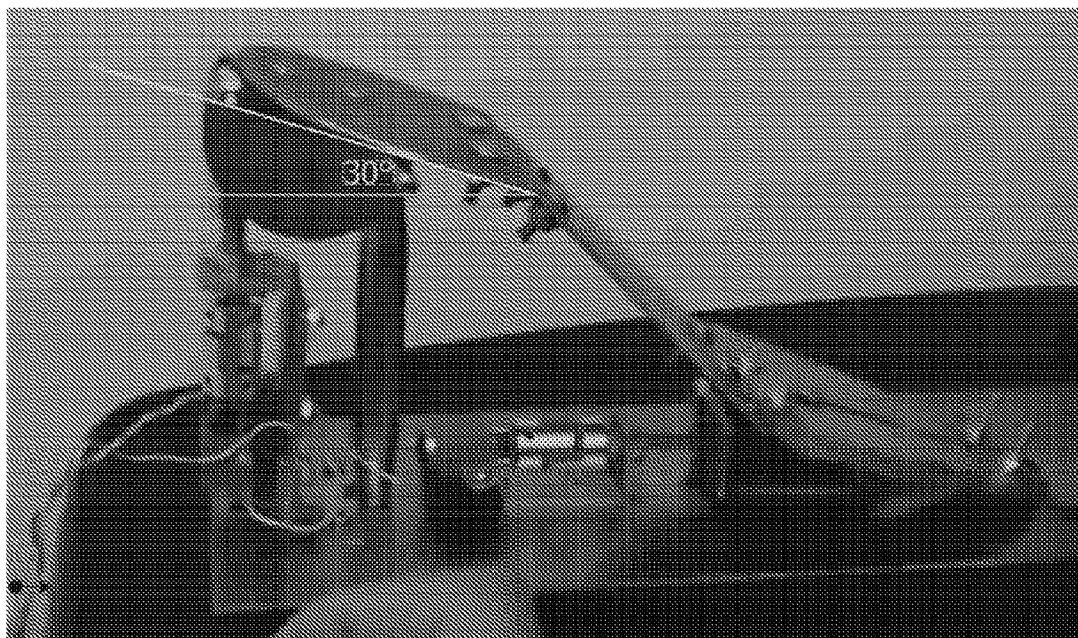


Fig. 10A

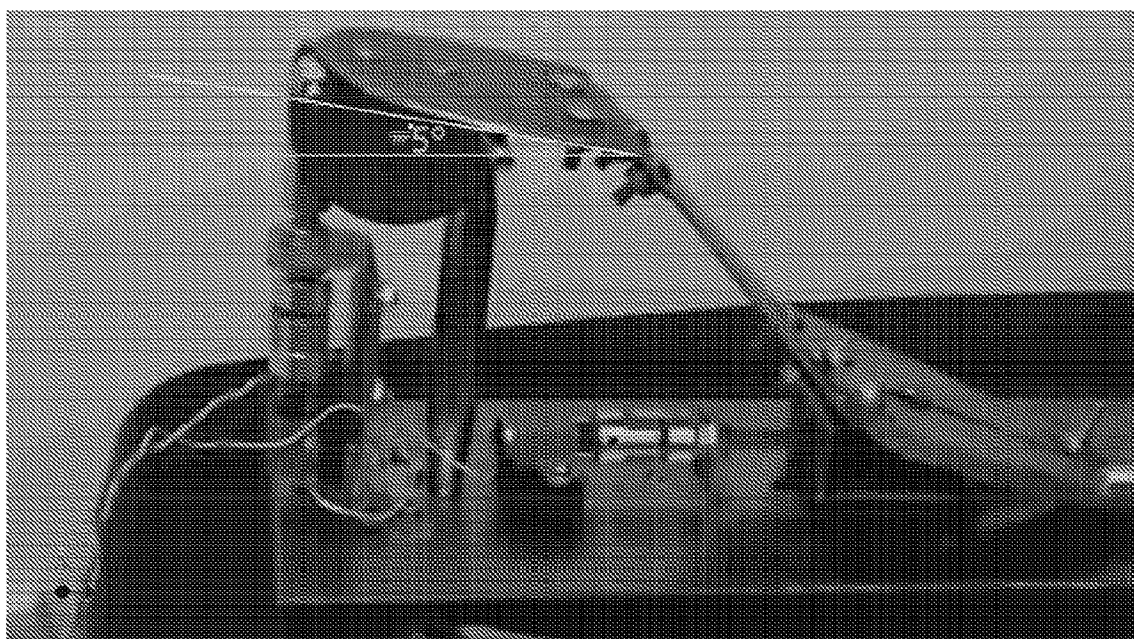


Fig. 10B

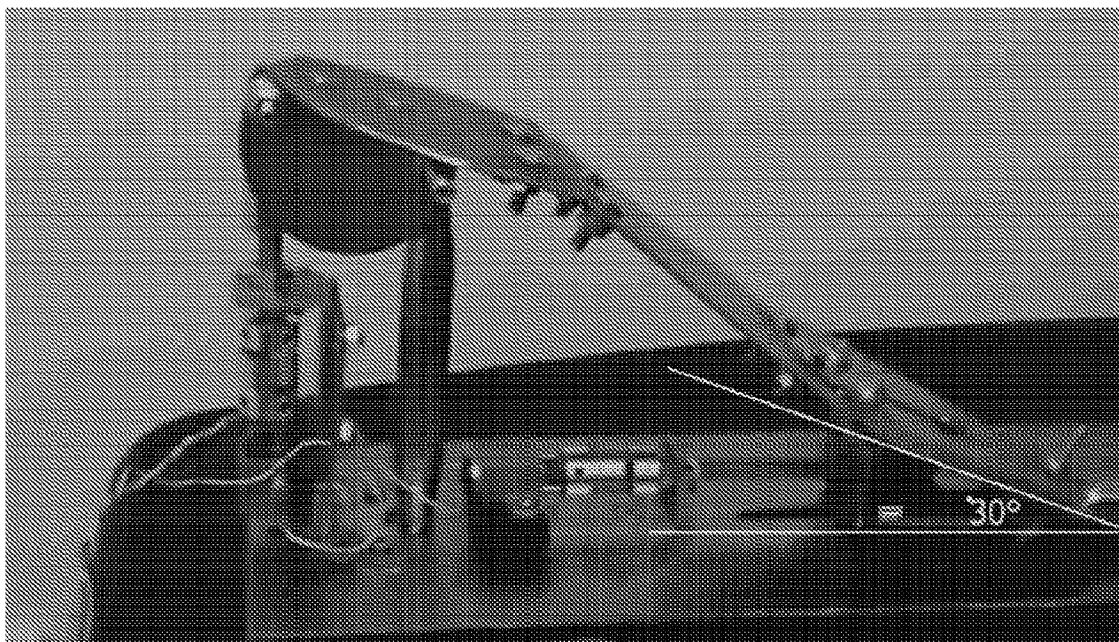


Fig. 10C

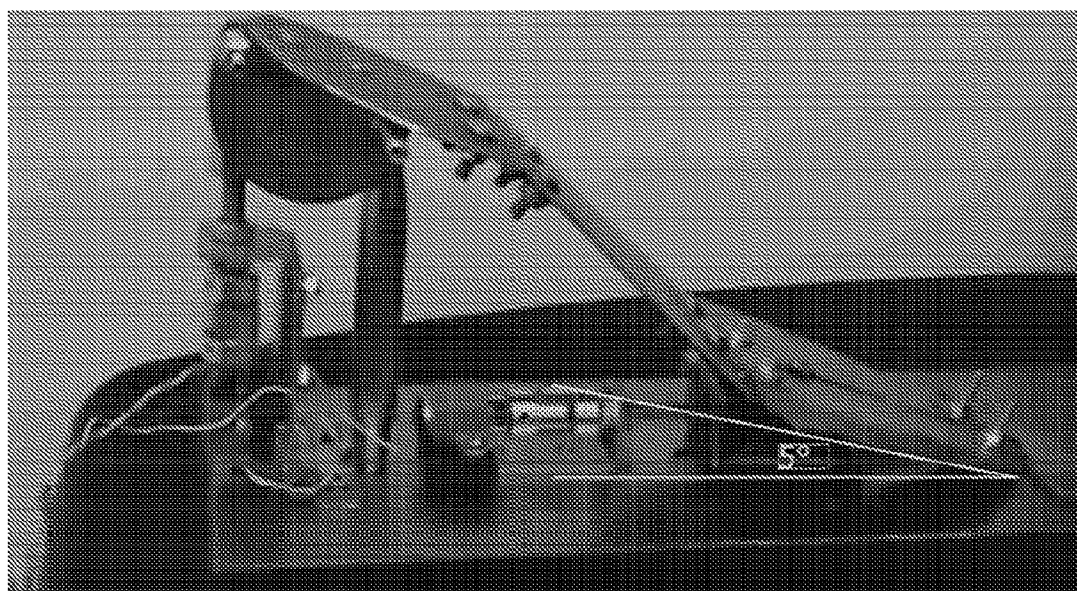


Fig. 10D

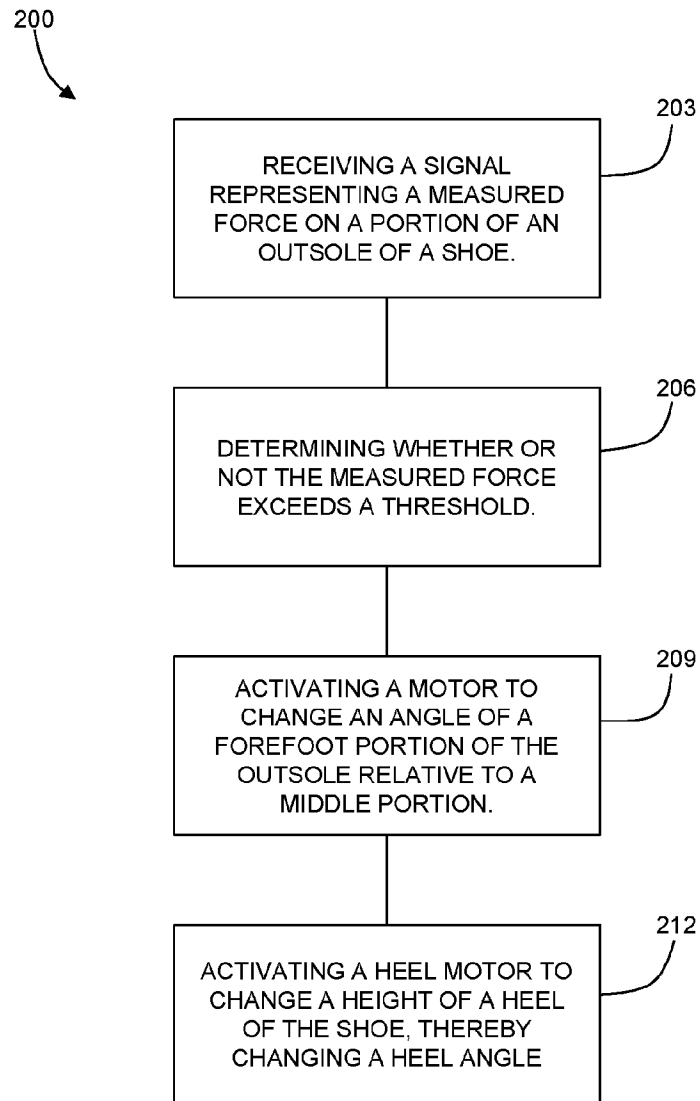


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/27991

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A43B 21/24, A43B 21/42, A43B 7/16, A43B 7/14, A43B 13/14 (2016.01)

CPC - A43B 21/24, A43B 21/42, A43B 7/16, A43B 7/14, A43B 13/14, A43B 13/141, A43B 3/0005

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)

IPC(8): A43B* (2016.01)

CPC: A43B*

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

IPC(8): A43* (2016.01)

CPC: A43*

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patents, Google Web

Keywords: shoe, drive, shaft, motor, processor, sole, outsole, hinge, heel, pivot, footwear, sandal, pump

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 102011108131 A1 (JOERG) 24 January 2013 (24.01.2013), entire document	1-11
A	EP 1952715 A1 (ROYAL COLLEGE OF ART) 06 August 2008 (06.08.2008), entire document	1-11
A	US 7,631,382 B2 (ADIDAS INTERNATIONAL MARKETING B.V) 04 January 2007 (04.01.2007), entire document	1-11
A	CN 2419856 Y (ZHAI) 21 February 2001 (21.02.2001), entire document	1-11
A	DE 202014002253 U1 (GASSMANN) 09 April 2014 (09.04.2014), entire document	1-11
A	US 2013/0340287 A1 (STEWART) 26 December 2013 (26.12.2013), entire document	1-11
A	US 2004/0064974 A1 (SHUSTER) 08 April 2004 (08.04.2004), entire document	1-11

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

01 August 2016

Date of mailing of the international search report

02 SEP 2016

Name and mailing address of the ISA/US

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P.O. Box 1450, Alexandria, Virginia 22313-1450

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PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/27991

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-11 directed to an adjustable shoe comprising a segmented driveshaft.

Group II: Claims 12-15 directed to a method of adjusting a shoe comprising a signal.

—See Supplemental Box—

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Claims 1-11

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/27991

—Continued from Box III—

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features for the following reasons:

Group I does not include the technical feature of a signal, as required by Group II.

Group II does not include the technical features of a segmented driveshaft, as required by Group I.

The common features between Group I and Group II of:

an adjustable shoe comprising an outsole having a forefoot portion and a middle portion, a motor, and a processor, wherein the forefoot portion and the middle portion are configured at a changable angle with respect to one another are taught by US 2007/0261271 A1 to KROUSE (hereinafter 'Krouse').

Krouse teaches an adjustable shoe (abstract: an active shoe cleat system) comprising an outsole (shoe sole layer 20) having a forefoot portion (left side of 20 in Figure 1 including forefoot set of active cleats 22) and a middle portion (middle portion of sole 20 in Figure 1), a motor (para [0027]: various motors, transmission gears, and drive shafts or cables (not shown) are located at strategic locations about the active cleats 22 for controlled responsive activation of the cleats), and a processor (abstract: a processor in the shoe operably connected to cleats on the bottom of the shoe), wherein the forefoot portion (forefoot set of active cleats 22) and the middle portion (middle portion of sole 20 in Figure 1) are configured at a changable angle with respect to one another (abstract: a projection within the cleats that are deployed in response to control signals from the processor generated in response to data from information provided in part by the sensor, and means for urging the projection outward from within the cleat).

Therefore, the common features are not an improvement over the prior art.

Unity of invention is lacking under PCT Rule 13.2, because Groups I and II do not share a same or corresponding special technical feature providing a contribution over prior art.