

ABSTRACT

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**A SPLIT GRIP CANE HANDLE UNIT WITH TACTILE FEEDBACK FOR
DIRECTED RANGING**

The present invention relates to a cane handle unit for the visually impaired person. The handle is having split design architecture with a cross-sectional cut within the interior of interconnectable halve sections. Handle unit fits to almost any type of cane tops. Handle unit in its outer periphery includes a detection module which has multiple sensors for detecting distance of the object in a direction and produce different vibratory patterns according to the position of object.

5 I/We Claims

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1. A cane handle unit disposed at and detachably secured to the proximal end of the cane comprising:

10 two longitudinal halve sections interconnectable with one another by an integrally formed hinge arrangement, wherein said halve sections are joined together to constitute a longitudinal hollow cross section, said halve hollow sections provided with a cross-sectional cut towards inner side of the halve sections for placing of different shaped cane tops;

15 a hinge mechanism, wherein said hinge mechanism without an attachment point facilitates the opening of the halve sections and complete closure upon locking;

20 a locking mechanism with flexible hinge for the locking of said longitudinal halve sections upon closure; and

25 a detection module provided to be located in a recessed section formed in an outer peripheral edge of said halve section.

2. The cane handle unit of claim 1, wherein cross-sectional cut is asymmetric cross sectional cut or eccentric split separating the grip halves such that the major arc forms the lower grip.

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3. The cane handle unit of claim 1, wherein locking mechanism provides split line between two longitudinal halve sections upon closure.

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- 5 4. The cane handle unit of claim 3, wherein controlled separation at
split line maintained by providing a spacing lip.
- 10 5. The cane handle unit of claim 1, wherein recessed section on outer
peripheral edge of halve section is provided with an adjustment
mechanism for detection module that allows varying the angle in
which the distance ranging sensors are mounted within the module
with respect to the handle unit to further allow correction directivity
of the detection cone for varying the angle of detection cone with
reference to the ground.
- 15 6. The cane handle unit of claim 5, wherein angle adjustment provided
with a manually operated mechanism to allow one hand operation
for changing the angle.
- 20 7. The cane handle unit of claim 6, wherein angle adjustment
mechanism provided with a push or pull activated sensor setting
lock.
- 25 8. The cane handle unit of claim 1, wherein said halves having top and
bottom grips for easy removal and adjustment of the cane.
- 30 9. The cane handle unit of claim 8, wherein grip design contain hand
profile which is ergonomic for providing multiple holding or gripping
and tapping styles.
- 35 10. The cane handle unit of claim 8, wherein grip design contain a cut
at periphery of at least one halves section for natural protrusions or
strings attached to cane to come out and retained on attachment of
cane to handle unit.

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- 5 11. The cane handle unit of claim 8, wherein grip design provided with textures and guidelines to identify and maintain correct orientation direction and provide intuitive sense where the sensor is facing.
- 10 12. The cane handle unit of claim 11, wherein grip design provided with textures and guidelines to prevent inadvertent rotation of handle in hand.
- 15 13. The cane handle unit of claim 1, wherein different shaped cane tops are ball head, flask shaped head, T-shaped and one or more combination of said shapes.
- 20 14. The cane handle unit of claim 1, wherein outer surface of one or both longitudinal halve section is embossed with one or more symbols for tactile based identification.
- 25 15. The cane handle unit of claim 1, wherein detection module comprises one or more ranging sensor and a controlling unit.
16. The cane handle unit of claim 15, wherein one or more ranging sensor produces vibration output on entire handle unit.
17. The cane handle unit of claim 1 further comprises a battery pack
- 30 18. A handle unit disposed at and detachably secured to the proximal end of a elongate tube structure comprising:
two longitudinal halve sections interconnectable with one another by an integrally formed hinge arrangement, wherein said halve sections are joined together to constitute a longitudinal hollow cross section, said halve hollow sections

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are provided with a cross-sectional cut towards inner side of the halve sections for placing of different shaped tube tops;

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a hinge mechanism, wherein said hinge mechanism without an attachment point facilitates the opening of the halve sections and complete closure upon locking;

15

a progressive or simultaneous locking mechanism with flexible hinge for the locking of said longitudinal halve sections upon closure; and

20

a detection module provided to be located in a recessed section formed in an outer peripheral edge of said halve section, wherein said module includes one or more mountable sensor and produce vibratory patterns.

Dated this 12th day of February, 2014

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Rashmi Tyagi

RASHMI TYAGI

(IN/PA 1594)

AGENT FOR APPLICANT

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EIGHT SHEETS 12 FEB 2014
SHEET 1

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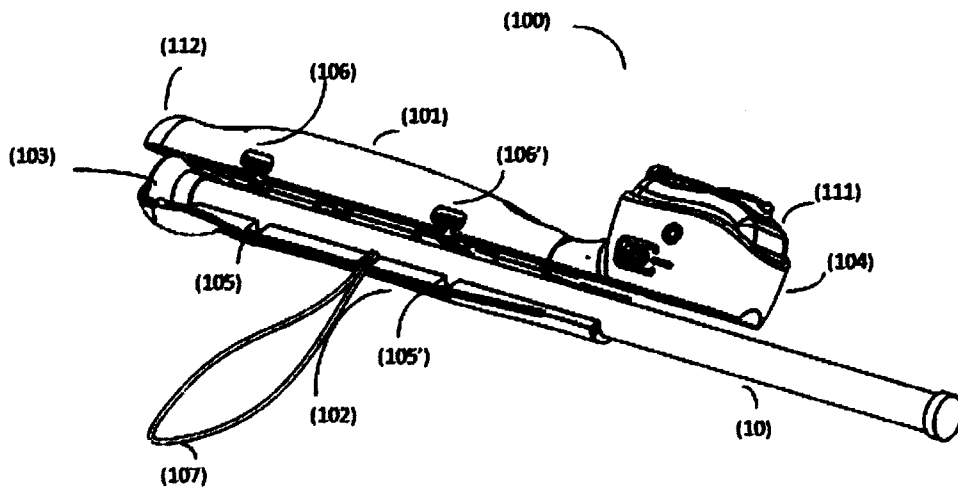


FIG. 1a

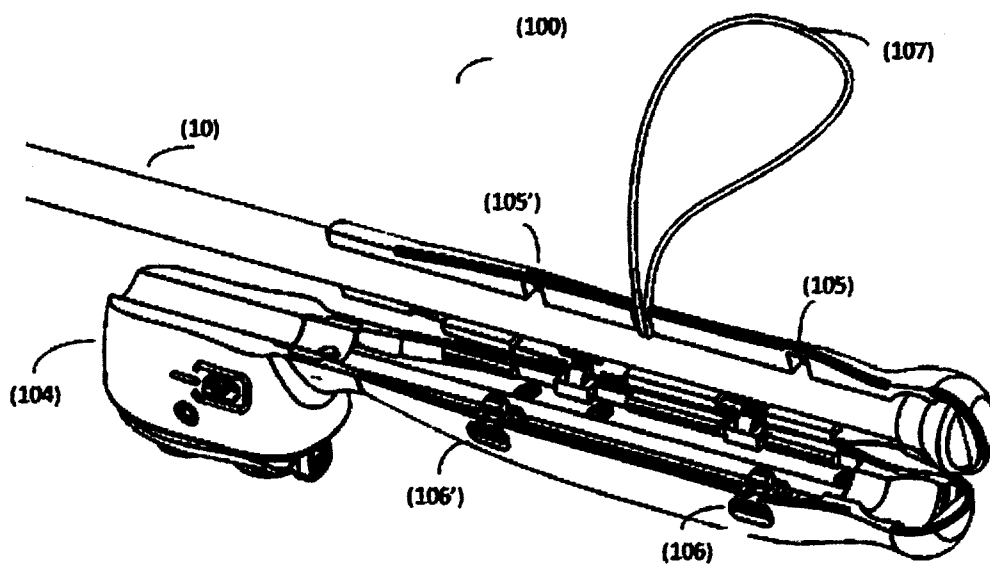


FIG. 1b

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RASHMI TYAGI
AGENT FOR APPLICANT

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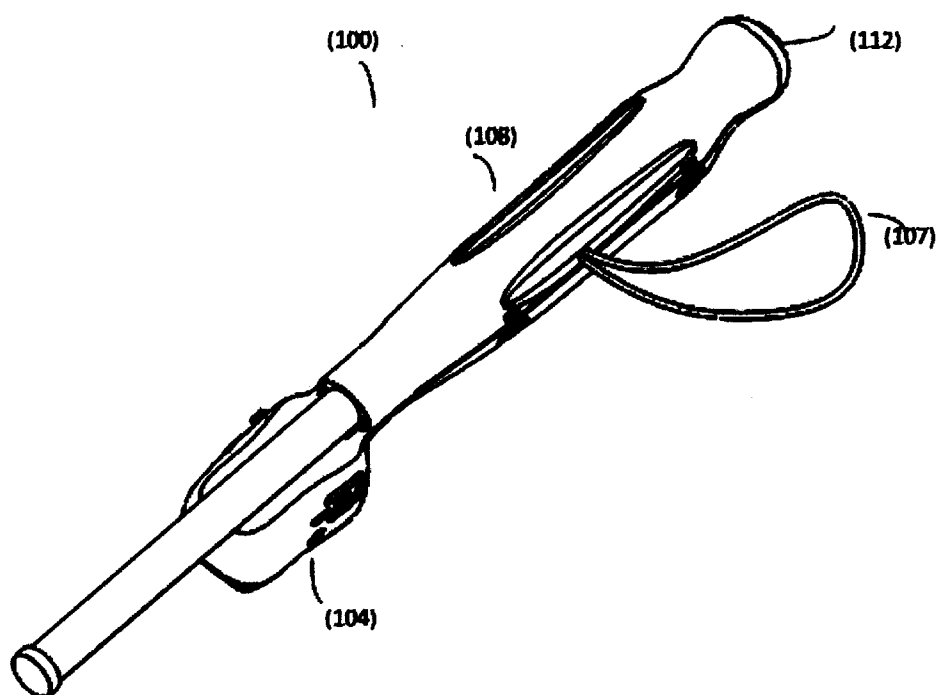


FIG. 1c

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RASHMI TYAGI
AGENT FOR APPLICANT

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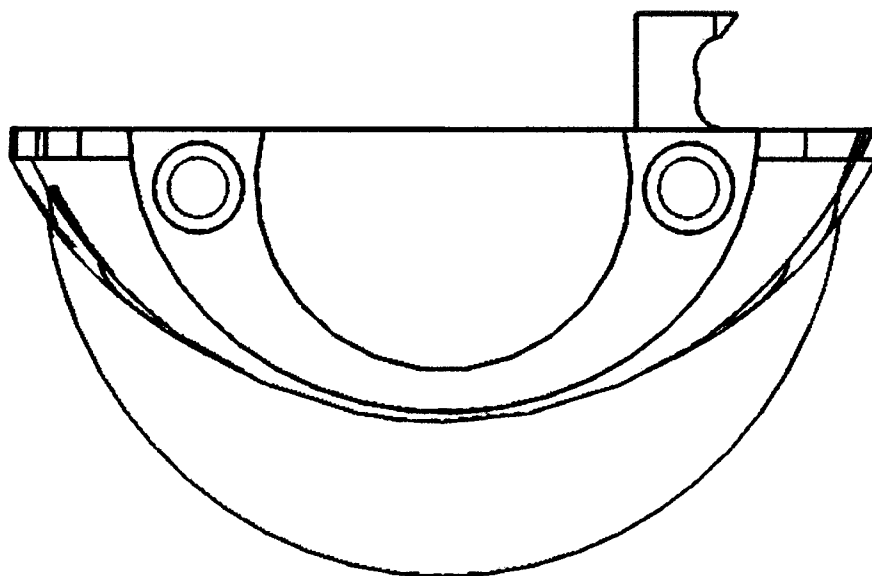


FIG. 2

Rashmi Tyagi

RASHMI TYAGI
AGENT FOR APPLICANT

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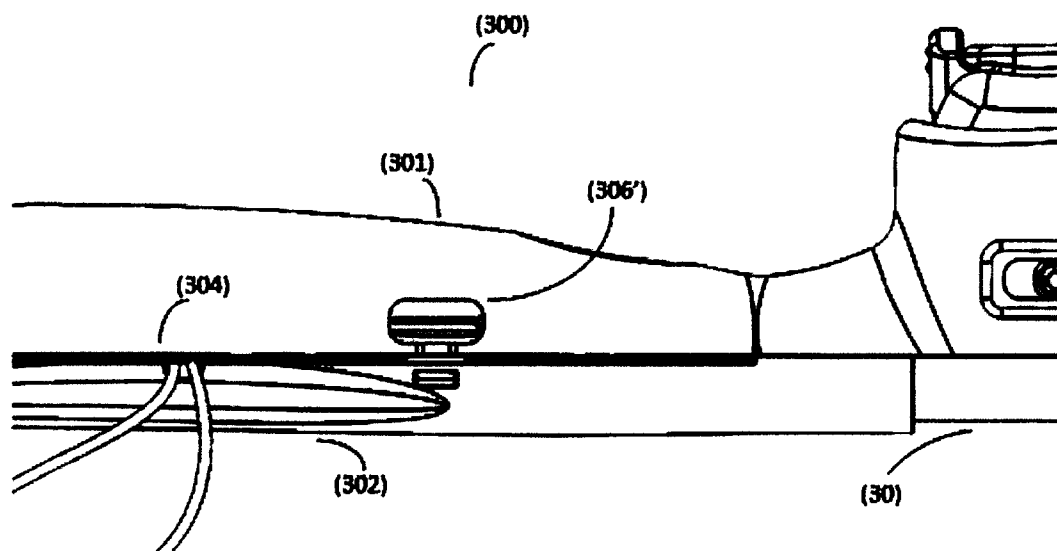


FIG. 3

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RASHMI TYAGI
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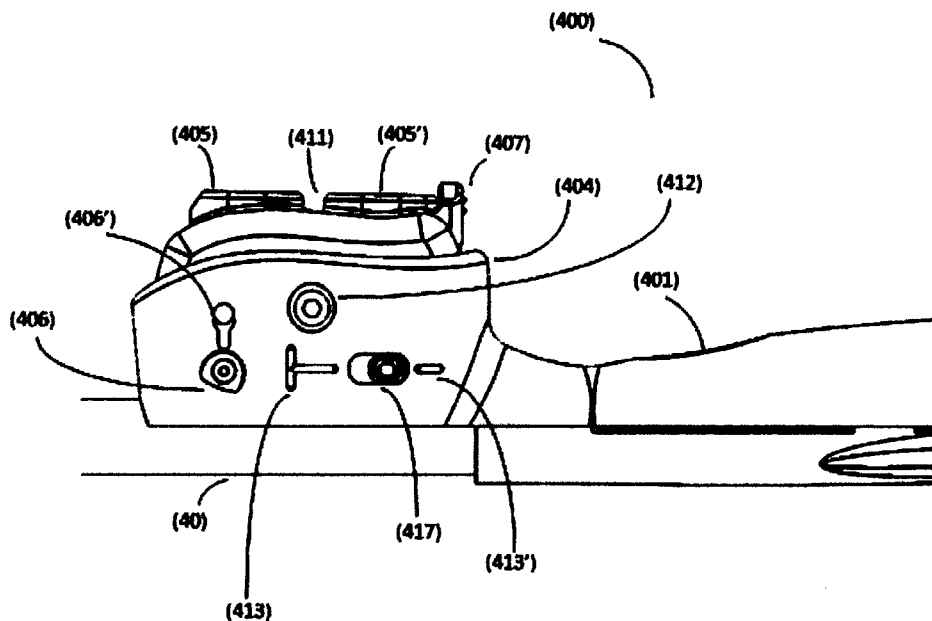


FIG. 4a

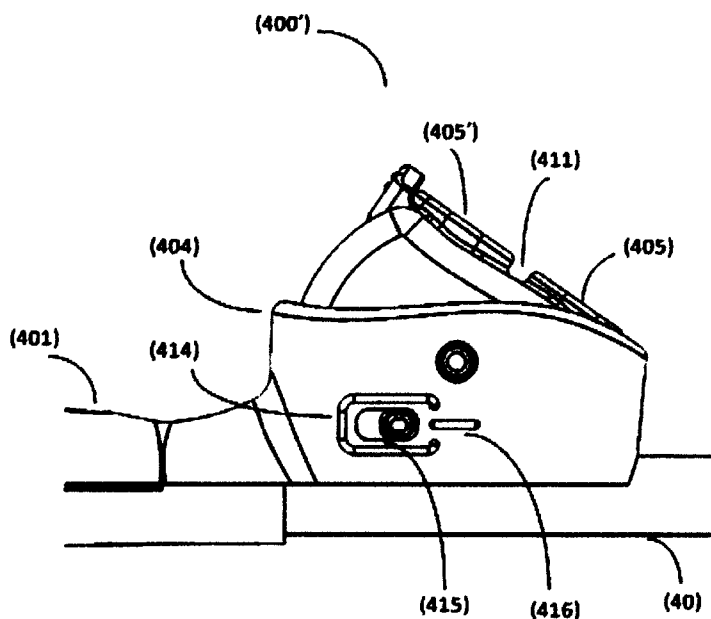


FIG. 4b

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RASHMI TYAGI
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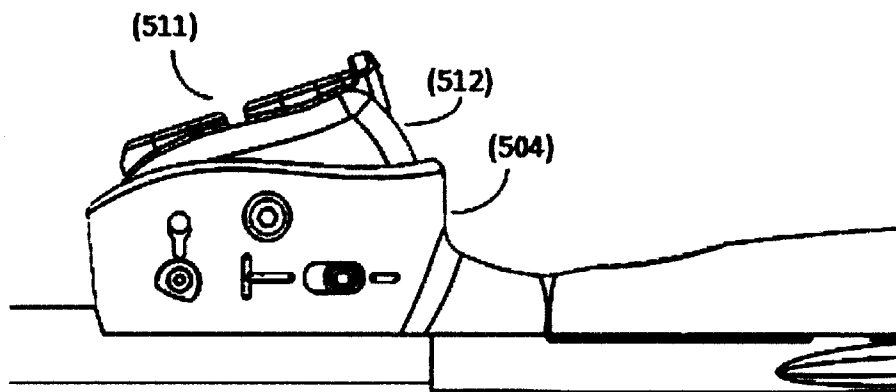


FIG. 5a

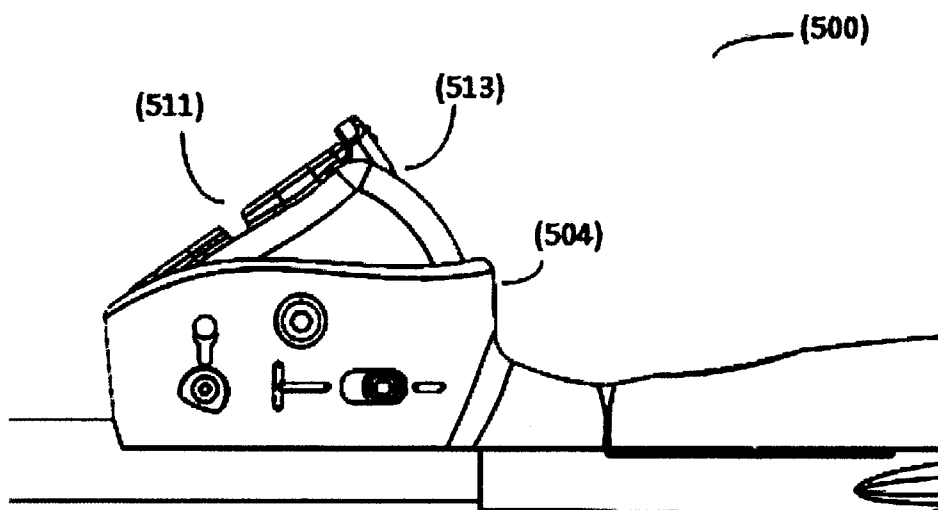


FIG. 5b

Rashmi Tyagi
RASHMI TYAGI
AGENT FOR APPLICANT

Indian Institute of Technology Delhi

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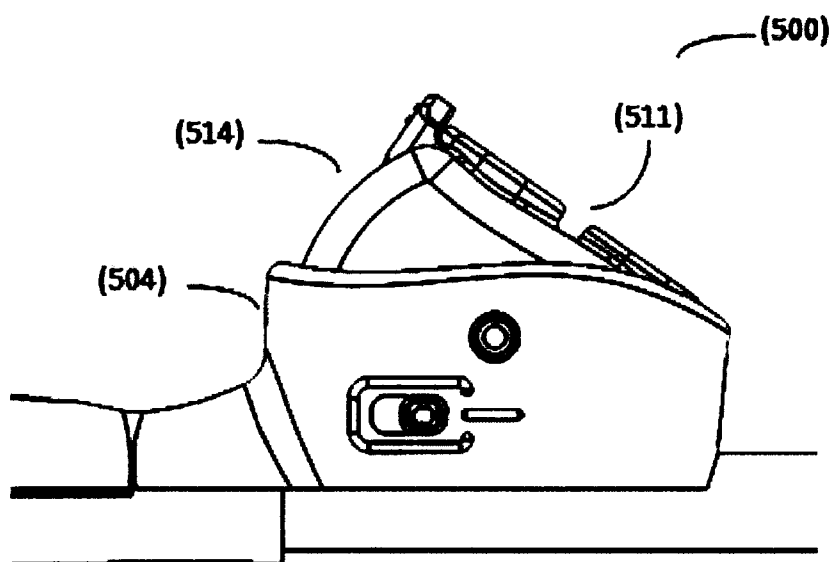


FIG. 5c

Rashmi Tyagi

RASHMI TYAGI
AGENT FOR APPLICANT

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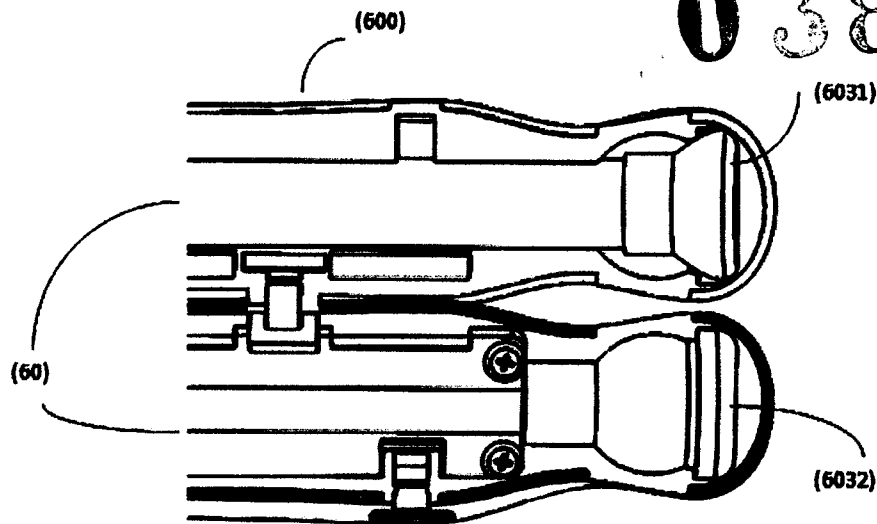


FIG. 6a

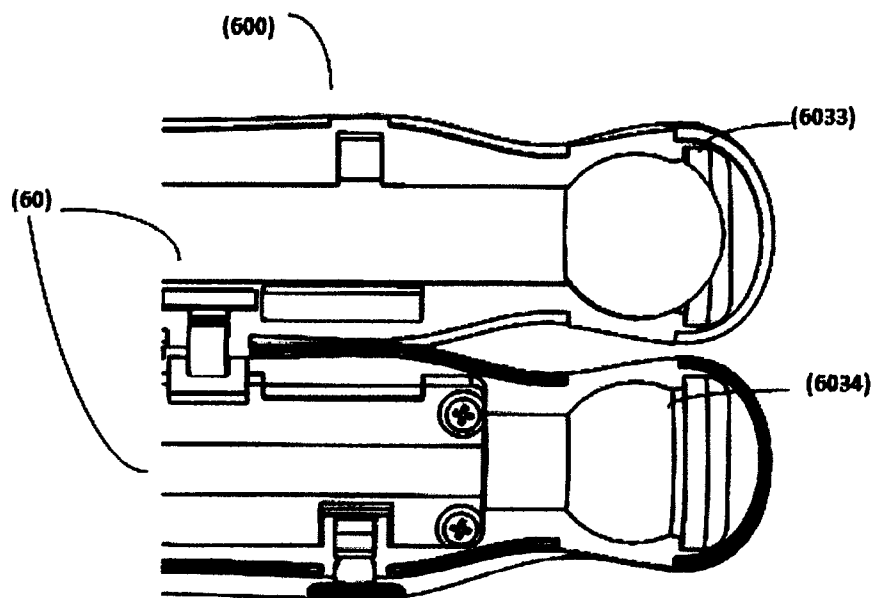


FIG. 6b

Rashmi Tyagi
RASHMI TYAGI
AGENT FOR APPLICANT

5 **FIELD OF THE INVENTION:**

The present invention relates to a cane handle unit. More particularly to a cane handle unit that is detachably mountable to an end of any type of cane tops.

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BACKGROUND OF THE INVENTION:

The white cane is the most widely used navigation tool used by the visually challenged. It enables them to effectively scan the area in front and detect obstacles on the ground like uneven surfaces, holes, steps etc. Its low cost, portability and ease of operation are some of the features that make it an extremely popular travelling aid. Further the visually impaired cane users show considerable variations in the grips used to hold the cane. The same user might use the inclined grip while moving in an open space and a straighter conservative grip in a crowded area.

US patent no. 4,280,204 describes an obstacle detecting mobility cane which is formed of a handle portion and a shank portion that can be mechanically coupled to, and uncoupled from one another and incorporates a compact, dual-mode, ultrasonic obstacle detection sensor. To separate the cane from handle portion the shank portion of cane is rotated 90 degree and hooked end of said shank portion is able to pass through slot of recess in handle portion and hence both the portions are separated. However, this mechanism of decoupling is complicated and cannot be executed by a visually impaired with ease and comfort.

In US patent no 5,482,072 a versatile and universal handle designed for use on a long cane for the blind has a bilaterally symmetrical, curvilinear shape of predetermined proportions with a tapered, variable grip is disclosed. This handle includes a proximal gripping area, an intermediate

5 area, and a distal area and may be used in different hand positions including a reversed grip. The said handle by means of its unique shape, promotes correct posture and ergonomically correct patterns of movement and can be made detachable but lacks any kind of detection unit which can detect and warn the user of obstacle in the path.

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CN101721292 discloses a walking stick for the blind people in which handle is hollow and provided with an integrated circuit board, the walking stick is provided with the electronic radar and an alarming horn to avoid collisions with various forward obstacles. The upper part of the handle,
15 stick body and the main body are coupled with the screw. However in the said patent the handle and stick are detachable and comprises obstacle detecting and alarming units but it does not provide the user the flexibility in holding and gripping the stick.

20 In US publication no. 20130220392 an electronic travel aid (ETA) for blind and visually impaired persons implemented in a detachable handle of a white cane is disclosed. The white cane includes a removable cane handle which comprises a housing containing ETA. The ETA is preferably integrated in the cane handle of the white cane and mountable for use with
25 various white canes, but can alternatively also be used without the white cane. However, it does not disclose the actual mechanism of mounting or fastening the handle to the cane and employs the conventional grip for holding the handle.

30 The above mentioned systems either provides a detection and warning system for visually impaired where these systems are either permanently attached to the cane and do not allow the user to remove the device when not in use or provide the system where the detection and warning unit are integrated in the detachable handle but in such cases the mechanism of

5 mounting or detaching is quite cumbersome & complex for visually impaired users.

Also the above mentioned prior art disclosures force the user to grip the cane in only one particular manner. This involves relearning, which is
10 difficult since the visually challenged are accustomed to using the cane in a particular manner with a personalized grip. The existing systems do not give flexibility to the user to adjust the angle of inclination, holding and the gripping style device. The available cane mounted systems are not weight and torque balanced making them tiresome to use.

15

Therefore, there is a need for a cane handle unit which overcomes above-mentioned deficiencies and provides a handle unit with ergonomic grip design and integrated detection module for visually impaired to enhance their walking experience. In other words to provide a handle unit which
20 does not replace white cane but augment its functionality and hence can be mounted on any type of cane tops and has a very simple mechanism of attaching or detaching the said handle unit to a cane.

SUMMARY OF THE INVENTION:

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The object of the present invention is to provide a cane handle unit disposed at and detachably secured to the proximal end of the cane comprising two longitudinal halve sections interconnectable with one another by an integrally formed hinge arrangement, wherein said halve
30 sections are joined together to constitute a longitudinal hollow cross section, said halve hollow sections are provided with a cross-sectional cut towards inner side of the halve sections for placing of different shaped cane tops, a hinge mechanism, wherein said hinge mechanism without an attachment point facilitates the opening of the halve sections and complete
35 closure upon locking, a locking mechanism with flexible hinge for the

- 5 locking of said longitudinal halve sections upon closure and a detection module provided to be located in a recessed section formed in an outer peripheral edge of said halve section.

10 An another object of the invention is to provide a handle unit disposed at and detachably secured to the proximal end of an elongate tube structure comprising two longitudinal halve sections interconnectable with one another by an integrally formed hinge arrangement, wherein said halve sections are joined together to constitute a longitudinal hollow cross section, said halve hollow sections are provided with a cross-sectional cut
15 towards inner side of the halve sections for placing of different shaped tube tops, a hinge mechanism, wherein said hinge mechanism without an attachment point, facilitates the opening of the halve sections and complete closure upon locking, a progressive or simultaneous locking mechanism with flexible hinge for the locking of said longitudinal halve
20 sections upon closure and a detection module provided to be located in a recessed section formed in an outer peripheral edge of said halve section, wherein said module includes one or more mountable sensor and produce vibratory patterns on the handle unit.

25 Another object of the present invention is to provide a split grip design handle to allow flexible holding and gripping styles such as sideways-inclined, downward facing, clasp while maintaining the correct facing or directivity of the ranging sensors.

30 A further object of the present invention is to provide a cane handle unit which can accommodate any type of cane or tube tops.

A further object of the present invention is to provide a cane handle unit with textures and guidelines on outer surface to identify and maintain

5 correct orientation direction enabling the user an intuitive sense of where the sensor is facing and also avoids inadvertent rotation in hand.

A further object of the present invention is to provide a cane handle unit for visually impaired which allows them to mount on and detach the unit from
10 the cane or tube without any sighted assistance and does not require any modification of the existing cane or tube designs.

It is a further object of the present invention to provide a cane handle unit with integrated object detection and warning system for visually impaired.
15 Further, to provide an adjustable mechanism for adjusting the angle of detection module for the persons with different height, which is controlled by the user's cane-holding hand finger, leaving the user's other hand free.

For a full understanding of the present invention, reference should now be
20 made to the following detailed description of the preferred embodiments of the invention as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawings.

In the drawings, wherein like reference numerals denote corresponding
30 parts throughout the several views:

FIG. 1a and 1b are perspective views of a cane handle unit representing a cane holdable open structure according to the preferred embodiment of the present invention;

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5 FIG. 1c is a perspective view showing grip design structure of handle unit according to the preferred embodiment of the present invention;

FIG. 2 illustrates the lower grip cross-section with provision for the tube and the lock profile;

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FIG. 3 is a perspective view showing the positive lock with flexible hinge in handle unit of FIG. 1 according to the preferred embodiment of the present invention;

15 FIG. 4a and 4b are perspective views showing embossed symbols on handle unit according to the preferred embodiment of the present invention;

20 FIG. 5a, 5b and 5c are perspective views showing adjustment mechanism with varying the angle in which the detection module is mounted on cane handle unit according to the preferred embodiment of the present invention; and

25 FIG. 6a and 6b is a schematic view showing the handle fits different shaped cane tops according to the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 The embodiments of the present invention will be described in detail with reference to the accompanying drawings. However, the present invention is not limited to the embodiments. The present invention can be modified in various forms. The embodiments of the present invention are only provided to explain more clearly the present invention to the ordinarily

5 skilled in the art of the present invention. In the accompanying drawings, like reference numerals are used to indicate like components.

FIG. 1a and 1b are perspective views of a cane handle unit that uses a cane holdable open structure according to an embodiment of the present invention. The handle unit (100) is detachably mountable on the cane (10) or tube structure. The present invention introduces a split grip design handle, having two longitudinal halve sections, front half section (101) and rear half (102) that are hinged to each other with flexible hinge provided in left side of the handle and said hinge mechanism without an attachment point also facilitates the opening of the halve sections and complete closure upon locking. The cane or tube (10) snap fits tightly between the first halve (101) and second halve (102) section. Additionally in the present invention, a recessed section (104) present at bottom of the one longitudinal halve section (101) of the handle (100) forms a box like structure for the placing of detection module (111). The recessed section (104) of the handle unit also contain embossed symbol therein on its outer surface for tactile based identification.

Also the split grip design of present invention allows an elastic string (107) of the cane or tube to come out. In other words, any natural protrusions or strings attached to the cane or tube are retained on its attachment to the handle unit as a cut is provided at the periphery of one of the longitudinal halve sections. The cane or tube is folded when not in use by using the elastic string.

The mechanism of attaching or detaching different shaped cane or tube to the handle unit (100) is simple and can be easily performed by a visually impaired. The handle is opened and closed like a pencil box, whenever a cane or tube is to be attached or detached within the halve sections of the handle (100). For opening or closing the halve sections, two grip locks

5 (106), (106') present on right side of the handle, one on top and another somewhat below it are pressed simultaneously to open the two halves of the handle and then cane or tube is taken out from the device. For reattaching, cane or tube is placed on one half of the handle and other half is pressed which closes the two grip locks. Grip locks (106), (106') forms
10 positive locking with the cuts (105), (105') in rear half section (102) of the handle (100), which will be explained later in description.

FIG. 1c is a perspective view showing grip design structure of handle (100) unit according to the preferred embodiment of the present invention. The
15 handle (100) comprising split grip design architecture is composed of a front (101) and rear (102) portions which are identified by different textures and guidelines. The rear half grip is coarse (108) whereas it is comparatively smoother in the front half and bio-compatible material has been used for designing the grip of present invention. Such textures and
20 guidelines helps visually impaired person in maintaining correct orientation direction and to provide an intuitive sense to user of where the sensor mounted in the detection module is facing and avoids inadvertent rotation in hand. The grip of the present invention has an elongated shape for comfortable gripping and ease of tapping and has depression marks in its
25 front side for maintaining a proper orientation of the device and hence allows the visually impaired person to keep the device in the right direction all the time.

The grip design of the present invention has following features:

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- a) Ergonomic design, comfortable, with no-strain, according to natural shape of the hand.
- b) Allows flexible holding and gripping styles such as sideways-inclined, downward facing, clasp while maintaining the correct
35 facing or directivity of the detection cone.

- 5 c) A split grip design with top and bottom grips for easy removal and adjustment of the cane.
- d) Grip is resistant to auto-rotation even under loose gripping as may occur during tapping use. Weight asymmetry about the cane axis is optimized to reduce the rotating moment of the unit in hand during use hence preventing inadvertent rotation and incorrect pointing during operation.
- 10 e) Cane does not fall on opening the top and bottom for convenience for the visually challenged user. Asymmetric cut/cross-sectional cut (eccentric split).
- 15 f) No skin pinching in the split line between the two grip halves during tapping. An intentional spacing lip maintains controlled separation at the split line even after wear even when grasped during use.
- g) A hinge mechanism without an attachment point that facilitates opening of the split grip and complete closure upon locking.

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FIG. 3 is a perspective view showing the positive lock with flexible hinge in handle unit (300). Two positive locks (306, 306') [306 not shown in figure] are provided on the handle (300) and have push button unlocking mechanism. The flexible grip locks (306, 306') are pressed simultaneously when both halve sections (301, 302) are joined together, to open the two halves of the handle unit (300). Further when the handle unit is grasped during use in closed position, an intentional spacing lip (304) maintains controlled separation at the split line and prevents skin pinching between the two grip halves during tapping.

30

The locking mechanism of the present invention provides the following features:

- a) Tight coupling with cane.
- 35 b) Does not open on tapping.

- 5 c) Allows progressive locking of the cane into the lower grip handle.
- d) Progressive or simultaneous or one-by-one opening using the push buttons.
- e) Auto-separation of grip halves on lock release to facilitate easy access to cane for removal or positioning by a visually challenged person.

FIG. 4a and 4b is a perspective view showing embossed symbols on recessed section of the handle unit according to the preferred embodiment of the present invention. The symbols are embossed on the handle unit to provide tactile based identification. The handle (400) unit is having a recessed section on front half section (401) which forms a box (404) like structure at the bottom portion of the cane handle unit. This box (404) is fitted with detection module (411) which includes one or more ranging sensors, and a controlling processor. The sensors are present as two circular protrusions (405, 405') as a part of detection module (411). Among these one sensor sends out ultrasonic rays and another one receives the reflected rays. The sensors (405, 405') always face in the direction of travel. Mechanism to set the angle of the sensor to make them face in the right direction is explained later.

In FIG. 4a of the handle unit (400), on the lower left side of the box (404) further, a small hole (406) as an input charging port is provided with a cover (406') and the cover is closed when the charger is not plugged in. According to an embodiment of the present invention, the charging device of the handle (400) unit is similar to charging device of any cell phone device, which is preferably an in-built rechargeable battery with an enclosable connector for charging with an external cable. An additional cover (406') for charging port is provided to avoid accidental exposure to water and dust during usage.

5 On the same side of the box (404) to control the operation modes of
detection module (411) fitted in recessed box section (404) another switch
(417) is provided towards its upper side. In a preferred embodiment of the
present invention the handle unit (400) operates in two modes namely
10 indoor mode and outdoor mode. Indoor mode can be used when the user
is indoors and likely to encounter many obstacles at a shorter range.
Whereas, the outdoor mode should be used when outside and the number
of obstacles are lesser and are placed at greater distance in comparison to
the indoor environment. In indoor mode, obstacles are detected only up to
1.8 meters of distance, whereas, in outdoor mode obstacles up to 3.0
15 meters are detected. To set to indoor mode, the switch (417) is slid in
backward direction to the position where a short line (413') is present. To
set the outdoor mode, the switch is slid in forward direction to the
position where a long line (413) with bar is present. Whenever, the
operating mode is changed by the user, the detection module (411)
20 generates a small beep indicating success of operation.

In FIG. 4b of the handle (400'), on the right side of the box (404) a switch
(415) is provided which is a power on-off switch and is used to switch ON
and turn OFF the detection module. It is in the form of a rounded rectangle
25 (414). Further, to distinguish between ON and OFF positions of power
switch (415) a line symbol (416) is provided. The switch (415) is slid in
forward direction to the position where a line (416) is present to turn ON
the device and subsequently the module (411) generates few beeps and
vibration to signal that power is turned ON.

30

FIG. 5a, 5b and 5c are perspective views showing adjustment mechanism
with varying the angle in which the detection module (511) is mounted on
cane handle unit (500) according to the preferred embodiment of the
present invention. A recessed section (504) on outer peripheral edge of
35 front halve section is provided with an adjustment mechanism for detection

- 5 module. The adjustment mechanism allows varying the angle in which the distance ranging sensors are mounted within the module with respect to the handle unit to further allow to correct directivity of the detection cone for varying angle of the cane or tube with the ground.
- 10 The handle (500) unit is provided with a recessed section (504), in which detection module (511) fits. The detection module (511) comprises one or more ranging sensors and controlling unit. The controlling unit controls the operation of ranging sensor(s) and vibration output. The purpose of these range sensors is to detect object coming in path of the handle unit (500).
- 15 Further, as handle (500) of the present invention is capable of mounting over the different lengths of cane or tube and therefore it is necessary to adjust the orientation of range sensors in right direction. As different users have different types of grips, range sensor orientation will be different in each case. For this purpose sensor angle adjustment mechanism is
- 20 provided in the handle (500).

Sensor orientation can be changed by using the sensor setting lock (407) as shown in FIG. 4a which is provided at the top portion of the sensor box present within box (404) like structure of the recessed section and can be

25 felt in the form of small rectangular protrusion. The sensor setting lock (407) is a manually operated push or pull activated mechanism to allow one hand operation for changing the orientation of the sensors. By pushing or pulling the sensor setting lock (407) the sensors swivel and move angularly with respect to the recessed section. By using this

30 mechanism three possible angle adjustments of the sensors in the handle unit design of the present invention are possible. FIG. 5a, 5b and 5c are showing different angle position (512, 513, and 514) which can be set for distance ranging sensors. During use, the sensor is always pointed towards the chest of the person standing in front of the user up to 4m.

5 The angle adjustment mechanism for sensors fitted in recessed section of the handle unit of the present invention has following features:

- 10 (a) It works under varying holding styles (angle of inclination). This is accomplished by an adjustment mechanism that allows varying the angle in which the distance ranging sensors are mounted. Also allowing correction directivity of the detection cone for varying angle of the cane with the ground.
- (b) It is resistant to accidental change in the field of ranging due to tapping. This is accomplished by using a positive lock mechanism.
- 15 (c) Allows one hand operation for changing the angle using a manually operated pull or push activated mechanism.
- (d) Can be used by persons with a wide range of heights and cane lengths which is accomplished by adjusting the direction angle of the centre plane of the sensing field from 0 to 36 degrees.

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FIG. 6 is a schematic view showing the handle fits different shaped cane or tube tops according to the preferred embodiment of the present invention. The handle unit (600) has split grip design and is having two halve sections. Each of halve section is provided with asymmetric cross sectional cut or eccentric split towards the inner side of the halve sections to fit different shaped cane or tube tops. The major arc of asymmetric cross sectional cut or eccentric split the forms the lower grip to prevent the cane or tube from falling out when opened.

30 In FIG. 6a and 6b different cane or tube tops (6031, 6032, 6033, and 6034) fitted within the halve sections are shown. Further, the cuts are so provided that original string (107) as shown in FIG. 1a is not required to be cut and can be folded easily. According to an embodiment of the present invention, different shaped cane or tube tops supported by this handle unit

- 5 (600) are ball head, flask shaped head, T-shaped or a combination of said shapes etc.

There has thus been shown and described a novel cane handle unit with mechanical elements and electronic detection module mounted therein.

- 10 Cane handle unit with detection module for visually impaired user which fulfils all the objects and advantages is sought therefore. Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering this specification and the accompanying drawings which
- 15 disclose the preferred embodiments thereof. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention, which is to be limited only by the claims which follow.

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