

(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. AU 199716238 B2
(10) Patent No. 710582

(54) Title
Body-worn computer

(51)⁶ International Patent Classification(s)
G06F 001/18

(21) Application No: 199716238 (22) Application Date: 1997 .03 .12

(30) Priority Data

(31) Number (32) Date (33) Country
08/698319 1996 .08 .15 US

(43) Publication Date : 1998 .02 .19
(43) Publication Journal Date : 1998 .02 .19
(44) Accepted Journal Date : 1999 .09 .23

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(56) Related Art
US 5305244
US 5285398
US 5416730

ABSTRACT

This computer structure provides a body-worn computer that is easily converted into a conventional or laptop computer. Also, the housing for this computer is symmetrical so that when turned upside down the cables and cable connections always face the back of the user. A stand is provided in the housing for use when converting to a conventional computer. This stand doubles as a belt loop when the computer is used as a mobile body-worn computer.



AUSTRALIA
Patents Act 1990

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

5

Invention Title: TORSO-WORN COMPUTER WHICH CAN STAND ALONE

Applicant: XYBERNAUT CORPORATION

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The following statement is a full description of this invention, including the best method of performing it known to me:



TORSO-WORN COMPUTER WHICH CAN STAND ALONE

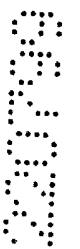
This invention relates to a computer and, more specifically, to a user-supported mobile computer.

5 Background of the Invention

There are known computers that have been used and disclosed involving wearable computers and computer components. The feature of these prior art computers is that they permit the user to have freedom to use his or
10 her hands for repairing or other functions while using a fully functional computer. One of the most commercially successful and well known of these computers is the Mobile Assistant® available from Xybernaut Corporation of Fairfax, Virginia. Mobile Assistant® is a registered
15 trademark of Xybernaut Corporation (formerly Computer Products & Services, Inc.)

U.S. Patent 5,305,244 (Newman, et al.) describes the details of the Mobile Assistant® and fully discloses the components and function of such user-supported
20 computers. Also, co-pending patent application SN 08/538,194 describes and claims further improvements and modifications to the Mobile Assistant®. Both U.S. 5,305,244 and SN 08/538,194 are owned by the assignee of the present application.

25 Also disclosing wearable computers are U.S. Patents 5,285,398 (Janik I) and 5,491,651 (Janik II). Both of these patents disclose a belt computer containing



the elements or components of a computer. In Janik I the plurality of computing elements are located on the belt and a flexible signal relaying means connects all of the elements for computing. A protective covering is used for enclosing said computer elements. In Janik II a similar belt computer is described and claimed
5 in which the signal relaying means, the length of which between any two computing elements is greater than the length of the wearable number between any two computing elements. In both Janik I and Janik II the flexible wearable computer is in the form of a belt comprising around its periphery sequentially positioned computer elements.

10 In both Newman, et al. and Janik I and II, a body-worn computer is disclosed that has utility only as a body-worn mobile computer.

Summary of the Invention

It is therefore an object of the present invention to alleviate the above noted disadvantages.

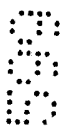
15 According to one aspect of the present invention there is provided a mobile torso-worn computer including a housing, activation means, means for connection to a head mounted display, means for attaching said housing to the torso of a user, said housing having a front portion and a back portion, means for wearing said housing on the right or left side of the torso of a user whereby said back
20 portion always points towards the back of the user and said front portion always points away from the back of the user, means attached to a bottom portion of said housing for converting said mobile torso-worn computer to a conventional stand alone computer, said housing containing substantially all of the components of a conventional computer except for a monitor, said housing having peripheral
25 connector means on its back portion, said peripheral connector means having means for connection to cables that will always extend from said back portion to said head mounted or other display means, and wherein said housing has torso attaching means that will fit adjacent said user, said attaching means also including means for converting said mobile torso-worn computer to a stand alone
30 computer.

According to another aspect of the present invention there is provided a mobile waist worn computer including a housing, activation means, means for connection to a head mounted display, and means for attaching said



housing on the waist of a user, said housing having a front and a back portion, said back portion containing peripheral outlets having means for receiving cables for connection to said head mounted display and other desired external functions, means for wearing said housing on a portion of the right or left side of a user's
5 waist, whereby said back portion always points toward the back of the user and said front portion always points away from the back of the user and wherein said cables always extend from the back portion of said housing when worn on both said right or said left side waist of the user, attached to said housing is a lift stand
10 which also acts as a belt loop which is located on the lower portion of said housing that when in a down position converts said mobile waist worn computer into a stand alone computer, and wherein said activation means is selected from the group consisting of an audio activation means, mouse activation means and combinations thereof.

The computer structure of the present invention may be usable as both a
15 mobile body-worn computer and as a component for a stand alone, laptop or desktop computer, or any other conventional computer. By "conventional computer" is meant any computer known and used today such as those available from IBM, Dell, Apple, Compaq, Toshiba, Micron, Hewlett-Packard etc. The computer structure of this invention in one embodiment has a computer housing
20 that can be worn around the waist of a



user and is curved on its inner side (the side that
contacts the user's waist) to be contoured in accordance
with the curvature of the user's waist. It has
structural dimensions or area that occupies only a
5 portion of said user's waistline. Thus, unlike Janik I
and II above discussed, does not encircle the entire
waist of the user. When used as a waist-worn computer, it
is important that cables and other electrical connections
extend from the back portion of the computer so as to be
10 out of the way and not interfere with the user's hands
when he or she is attempting to repair an object or
machine or otherwise use their hands. The computer
structure preferably is symmetrical so that the computer can be
turned upside down as a unit for left-hand operation; the
15 cable outlets in this manner always face the back of
the user. Conversely, the mouse controls (when converted
to a conventional computer) may be positioned in
the front of the computer housing convenient for the
right-or left-handed user. The housing of the computer
20 of this invention may have outlets for connection to other
components such as power supplies, monitors, keyboards or
any other required component. All embodiments of a
mobile computer described in co-pending application SN
08/538,194 and U.S. Patent 5,305,244 are included in
25 those structures usable in the present invention with the
modification described and claimed herein. The
disclosure of SN 08/538,194 is incorporated by reference



into the present disclosure.

The embodiment of this invention that includes voice activation when the computer is body-worn, also includes a body-worn display screen such as a head-worn or arm-worn display. The computer housing in the present invention may include all of the components found in a conventional computer such as a storage means, processor means, audio transducer and converter means, and recognizing means, all of which are described in detail in U.S. Patent 5,305,244. Also included in this embodiment may be means for mounting the computer housing onto a user; generally, attachment may be made on a belt worn by a user such as around the waist, over the shoulder or on to a vest or other wearable means. The sides of the computer housing may be ribbed or louvered to permit heat to be dissipated from the interior of the housing and to allow proper internal temperature best suited for computer operation. The computer housing generally may be made of a lightweight yet rigid plastic or other suitable material. It may be contoured or curved to follow the curvature of the human body such as the waistline. The portion of the computer housing that contacts the user's body may have a movable stand that doubles as a belt loop (when used as a body-worn computer) and a lift stand when used as a conventional computer. The electrical cord conduit connections found in the back portion of the housing may also be contoured to parallel the curvature of

the waist. Once placed on a flat supporting surface for use as a conventional computer, the conduits may point downwardly at an angle which would make it difficult to connect cables for monitor, power or keyboard connection.

5 To correct for this, a movable lift stand may be located on the rear underside of the computer housing. When this lift stand is moved down, it may lift the rear or back portion of the computer housing so that the conduits are on a plane substantially parallel with the supporting
10 surface and are pointed straight out. This may allow easy insertion of cables and electrical connectors into the conduits. The front underside of the housing may in the preferred embodiment also have a loop through which a belt will fit when attaching to a user. The conduits
15 which are preferably located in the rear side of the housing may be used for cable connection to the body or head-mounted display or conventional monitor. Another aperture may be used for connection to a power supply and a third aperture may be used for connection to a keyboard
20 when used as a stand alone, laptop or desktop computer.

When the structure of this invention is used as a conventional computer, there may be located on the top section of the housing three movable levers, joy sticks or buttons or other means, one to operate a mouse and the
25 other two for program execution or cursor manipulation. When the mobile function is desired, the top, movable button or lever may be used in the same manner

whether worn on the right or left-hand side of the user.

Preferred embodiments of the present invention will now be described with reference to the accompanying drawings wherein:

Figure 1 is a side view of the convertible body-worn computer of the
5 present invention.

Figure 2 is a side plan view of the present body-worn computer when converted into and used as a desktop or laptop computer with the lift stand in the down position.

Figure 3 is a left top perspective view of the convertible body-worn
10 computer with the lift stand in the up position.

Figure 4 is a right top perspective view of the convertible body-worn computer without the lift stand.

Figure 5 is a bottom perspective view of the convertible body-worn computer with the lift stand folded up and a second belt loop on the opposite end.

Figure 6 is a right bottom perspective view of the convertible body-worn
15 computer with the lift stand folded up and a belt fitted through the lift stand and the opposite belt loop.

Figure 7 is a left bottom perspective view of the convertible body-worn
20 computer with the lift stand folded up and a belt fitted through the lift stand and the opposite belt loop.

Figure 8 is a perspective view of the body worn computer as worn on the waist on the left-hand side of the user.

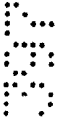


Figure 9 is a perspective view of the body-worn computer as worn on the waist on the right-hand side of a user.

5 Figure 10 is a perspective view of the body-worn computer of this invention as worn over the shoulder of a user.

Description of the Drawing and Preferred Embodiments

10 In figure 1, the computer 1 of this invention is shown from the side. The computer housing 2 contains all of the components needed for a conventional computer but having outlets 3 for connection to any desired function such as a head set or additional power supply, monitor, keyboard or any other desired function or means. The peripheral outlets or conduits 3 shown in dotted lines are slanted upwardly at an angle so as to conform to the human body (or waistline) when the computer 1 is worn. The cables or other connectors 4 will fit into conduits 3 and be conveniently extended from the back portion 5 of the computer 1. The outlets 3 are located in the bottom extension 6 which is also curved at 7 to fit comfortably around the waist or shoulder or other portions of the human body. Also located in the lower back section 5 of the computer is a movable lift stand 8 which is folded up when worn and folded or moved down when converted into a laptop, desktop or other conventional computer. When the lift stand 8 is moved down, the apertures or outlets 3 are easily accessible (as shown in fig. 2) as the



computer is used as a conventional computer. The lift stand acts not only as a stand but also double acts as a belt loop as shown in figures 6 and 7. The belt loop (one or both) have gripping teeth 21 in one embodiment. These teeth 21 are used to hold tight against a belt and prevent sliding of the computer housing 2 when worn. On the top rear portion 5 of the computer housing 2 in one embodiment is a door 9 which is used to house two PCMCIA card slots. On the top front portion 10 of the computer housing 2 are central buttons 11 and joy stick or lever 12. The lever 12 is used to move and control a mouse pointer when the computer 1 is used as a mobile or conventional computer. The control buttons 11 are used for program execution or menu selection when the computer 1 is used as a conventional computer. These controls 11 and 12 are clearly illustrated in figs. 3 and 4. On the sides of the computer 1 are located vent louvers (or a heat sink) 13 which allow the heat from inside the computer housing 2 to be dissipated or vented out to the atmosphere. These ribbed side vents or louvers 13 help reduce the inside heat which heat could cause malfunctioning or slowing down of the computer functions. The computer housing 2 is symmetrical so that when it is worn on either the right-hand side or left-hand side of the user's waist, the back section 5, peripheral connector means 3 and cables 4 will always face the back of the user; see figs. 8 and 9. When the computer 1 is



used or converted into a conventional computer and placed on a flat desk or other surface 26 as shown in fig. 2, a stationary stand 14 is used to support the front section 10 of the computer. This front stand 14 is also used as a belt loop (or handle) as shown in figs. 6 and 7. In figure 2, lift stand 8 is moved down to permit easy connection of cables 4 to outlets 3. It can be seen that without lift stand 8, connection of cables would be very difficult because of the extreme angle of outlet conduits 3. When computer 1 is used or converted to a conventional computer, cables 4 connect to components of a conventional computer such as monitors, keyboards, power supplies or any other desirable component. The stand 8 when down permits easy access to conduits 3 and allows the computer 1 to be used on a flat surface 26 as is customary when using a conventional or laptop computer. The louvered sides or vents 13 allow heat dissipation in this mode of use.

In figure 3, the top front 10 of the computer is illustrated wherein control buttons 11 are easily accesible to both right- and left-handed users. When the computer housing 2 is turned upside down in changing from right-hand to left-hand use (see fig. 8 and 9), the controls of buttons 11 and mouse lever 12 always face the front of the user for easy access and use. Conversely, when right side 15 is facing up or down when worn, the controls 11 and 12 always face the front and cables 4 and

outlets 3 always face the back of the user. Controls or software can be provided to convert or reverse the functions of controls or buttons 11. Versa Point® mouse pointing technology may be used as one suitable means in controls 11 and 12. Versa Point® is a trademark of Interlink Electronics of 547 Flynn Rd., Carnarillo, CA 93012. Opening 22 is IrDA port that can be used for wireless communications.

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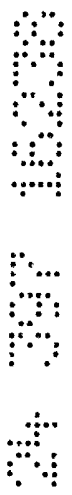
In figure 4, a top back view of the computer 1 is shown without the lift stand 8 and front stand 14 for clarity. The positioning of bottom extension 6 is shown slightly indented and below back portion 5 of the computer housing 2. The curvature 17 of housing 2 which is adjacent to the user's body is shown in figure 4. While figure 4 and the other figures all show (for clarity purposes only) a rectangular configuration for housing 2, other shapes or configurations may be used if desirable; for example, an oval or circular configuration may be used if the other specifics of this invention as claimed are present. Openings 16 and 17 provide means for connecting to computer 1 other peripheral equipment such as floppy drives, bar code scanners, VGA port or external monitor connectors. Housing 2 preferably is constructed of a lightweight, structurally strong plastic. Outlets 3, any suitable number of them, may be used and are positioned in bottom extension 6 but are not visible in figure 4. Figures 5-7 clearly show the

location of these electrical outlets or conduits 3. Opening 23 is a cable opening for cables used with PCMCIA card slots.

5 In figure 5, the bottom of housing 2 is shown in a preferred embodiment having front stand-front loop 14 located in a position in front 10. An easy access door 18 is located in the bottom section and provides an access cover for insertion into the bottom of housing 2 of storage means or non-volatile storage means. Four
10 screws 19 are easily removed to permit access therein. Movable lift stand 8 is shown folded up (body-worn mode) but is conveniently moved downward as shown in figure 2 (conventional computer mode) when desired. As shown in figure 5, lift stand 8 and front stand 14 act as loops or
15 belt guides when computer 1 is worn around the waist or elsewhere on the user's body. Stands 8 and 14 are shown protruding in an exaggerated manner to show the structure and function; however, any comfortable arrangement may be used for the comfort and convenience of the user. Outlet
20 24 is used to connect a head-mounted display (HMD) to the computer 1 when it is used as a body-worn computer.

Figure 6 shows a belt 19 fitted through loops 8 and 14 which also act as the computer housing stands earlier discussed. Notice that a left-handed user would
25 mount the computer 1 in this fashion so that front computer section 10 faces his or her front and conduits or outlets 3 face his or her back. In lieu of or

together with teeth 21, the loops 8 and 14 could be made smaller to fit tighter with a belt if desired. In all of the figures 1-9, the computer 1 is used with hands-free activation means as disclosed in U.S. Patent 5,305,244 and co-pending application SN 08/538,194. Figure 7 shows the computer housing 2 when worn by a right-hand user; notice that right side 15 is up in this configuration, and side 15 is facing down in the left-hand belt mounting of figure 6. This is accomplished since, as earlier mentioned, the computer housing is symmetrical. "Symmetrical" as used herein means symmetry of longitudinal sides 15 and 20, ie. are alike in size, shape and position. Left side 20 in figure 7 is facing downward.



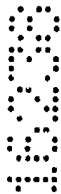
In figures 8 and 9, the computer 1 is shown when used as a mobile body-worn computer around the waist of a user. A belt 19 encircles the waistline of the user with computer 1 occupying only a portion of the waistline, unlike the computer of Janik I and II which encircles and occupies substantially the entire waistline. Also all of the computer components necessary for a conventional computer are compactly located in one housing in the present invention. Notice that as earlier stated, the cables 4 always face the back or rear of the user so that they are out of the way when the user is using his or her hands for the task at hand, ie. repairing a machine, etc. When this disclosure uses the term "waist" or

"waistline", it is understood to include other parts of the human body in which it would be desirable to wear this computer. In figures 8 and 9, the belt buckle 25 is shown as worn around the waist and facing the front of the user.

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In figure 10, for example, the body worn computer 1 is shown as it is worn over the shoulder of a user. In this situation, front side 10 still points to the front (but downwardly) and the back or rear side 5 of the computer faces the back (but upwardly) of the user. In this embodiment, if desirable, the computer housing 2 can be used whereby front portion 10 can face the front or back of the user.

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The preferred and optimum preferred embodiments of the present invention have been described herein and shown in the accompanying drawing to illustrate the underlying principles of the invention, but it is to be understood that numerous modifications and ramifications may be made without departing from the spirit and scope of this invention.



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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A mobile torso-worn computer including a housing, activation means, means for connection to a head mounted display, means for attaching
5 said housing to the torso of a user, said housing having a front portion and a back portion, means for wearing said housing on the right or left side of the torso of a user whereby said back portion always points towards the back of the user and said front portion always points away from the back of the user, means attached
10 to a bottom portion of said housing for converting said mobile torso-worn computer to a conventional stand alone computer, said housing containing substantially all of the components of a conventional computer except for a monitor, said housing having peripheral connector means on its back portion, said peripheral connector means having means for connection to cables that will
15 always extend from said back portion to said head mounted or other display means, and wherein said housing has torso attaching means that will fit adjacent said user, said attaching means also including means for converting said mobile torso-worn computer to a stand alone computer.

2. A computer according to claim 1 wherein said stand alone computer comprises connection means to be used with a power supply, a keyboard or a
20 monitor.

3. A computer according to claim 1 wherein said means for attaching said housing to a user is in the form of a plurality of belt loops having belt teeth retaining means therein, at least one of said belt loops having a structure wherein
25 it can act as a lift stand when folded down to convert said mobile torso-worn computer into a stand alone computer.

4. A computer according to claim 1 having a movable lift stand movably attached to a bottom portion of said housing to convert said mobile torso-worn computer to a conventional stand alone computer.

5. A computer according to claim 1 wherein said housing has mouse
30 control means on its front portion.

6. A computer according to claim 1 wherein said housing has longitudinal side portions that are symmetrical.

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7. A computer according to claim 1 wherein said housing has heat venting means on at least one side portion thereof.

8. A mobile waist worn computer including a housing, activation means, means for connection to a head mounted display, and means for
5 attaching said housing on the waist of a user, said housing having a front and a back portion, said back portion containing peripheral outlets having means for receiving cables for connection to said head mounted display and other desired external functions, means for wearing said housing on a portion of the right or left
10 side of a user's waist, whereby said back portion always points toward the back of the user and said front portion always points away from the back of the user and wherein said cables always extend from the back portion of said housing when worn on both said right or said left side waist of the user, attached to said housing is a lift stand which also acts as a belt loop which is located on the lower portion of said housing that when in a down position converts said mobile waist worn
15 computer into a stand alone computer, and wherein said activation means is selected from the group consisting of an audio activation means, mouse activation means and combinations thereof.

9. A mobile torso-worn computer substantially as hereinbefore described with reference to the accompanying drawings.

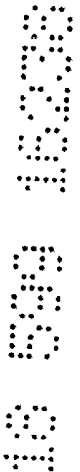
20 10. A mobile waist-worn computer substantially as hereinbefore described with reference to the accompanying drawings.

DATED: 18 May 1999

PHILLIPS ORMONDE & FITZPATRICK

25 Attorneys for:

XYBERNAUT CORPORATION



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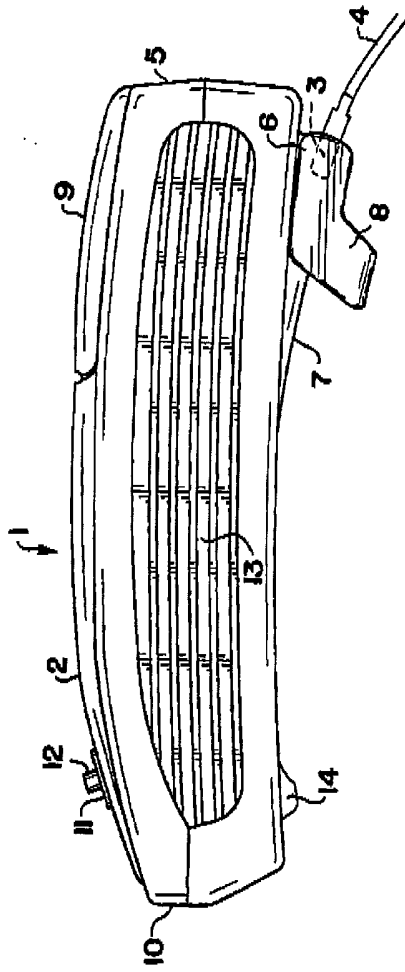


FIG. 1

12 03 97 10338

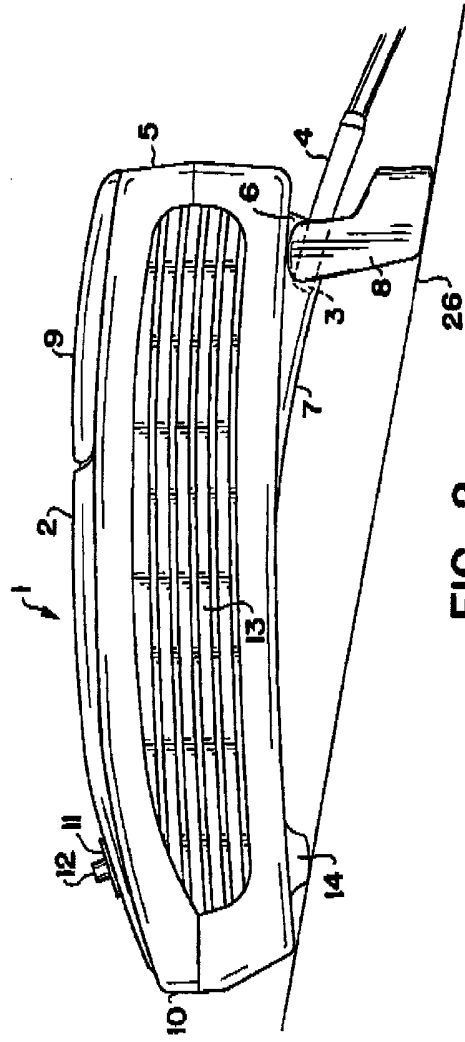


FIG. 2

12 03 97 1639

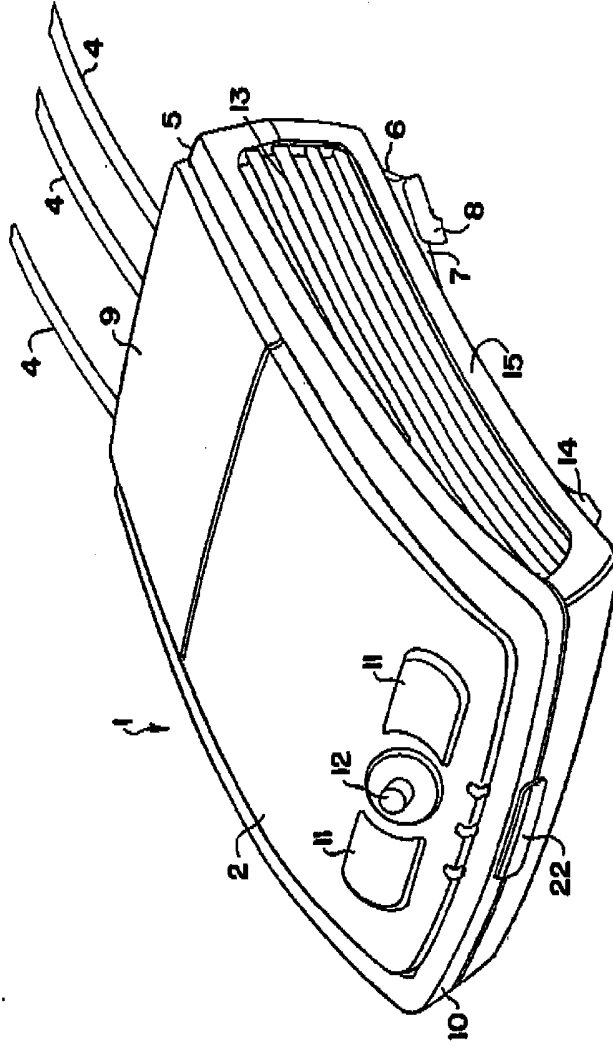


FIG. 3

12 03 97 1039

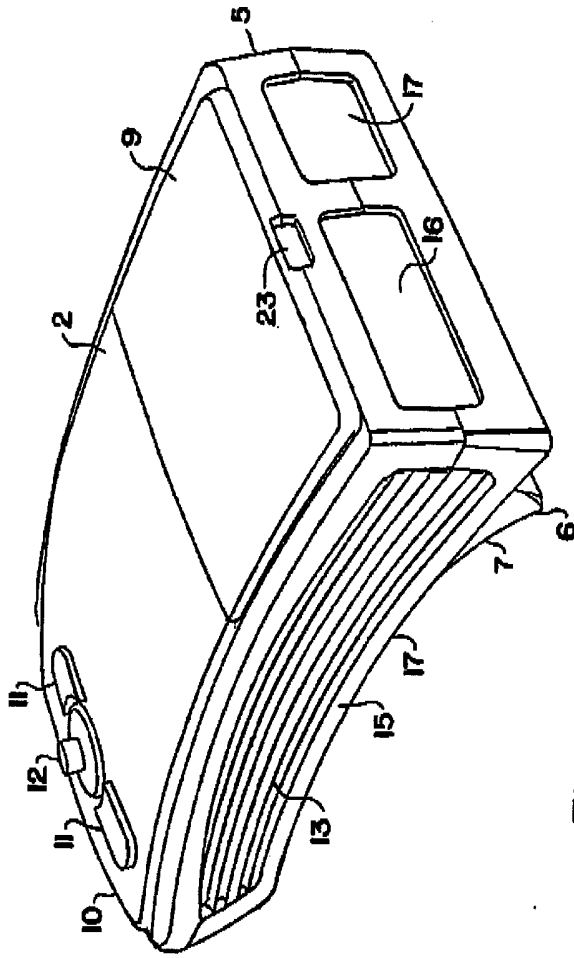


FIG. 4

12 03 97 1636

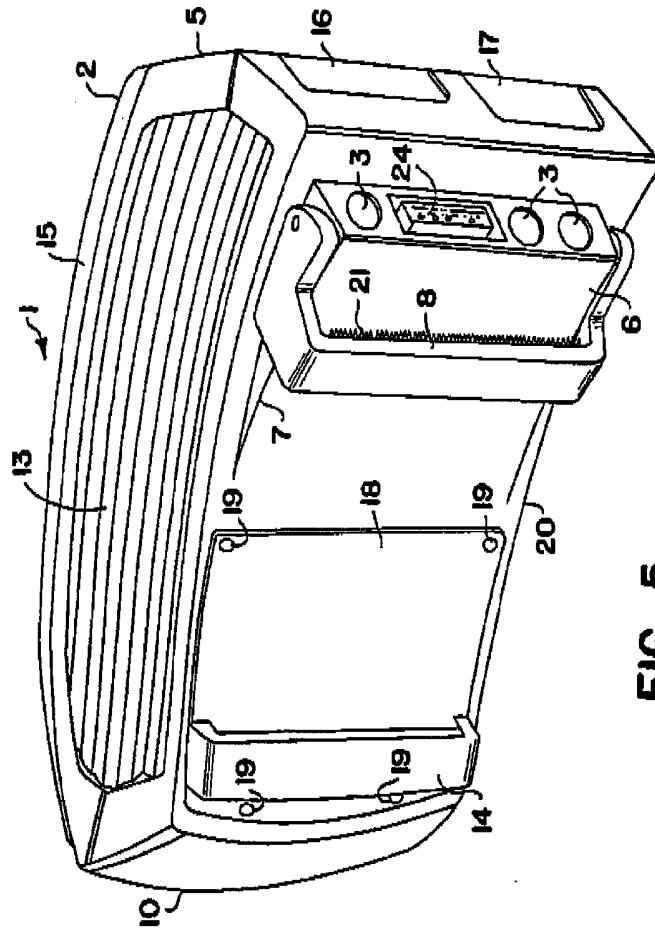


FIG. 5

12 03 07 1938

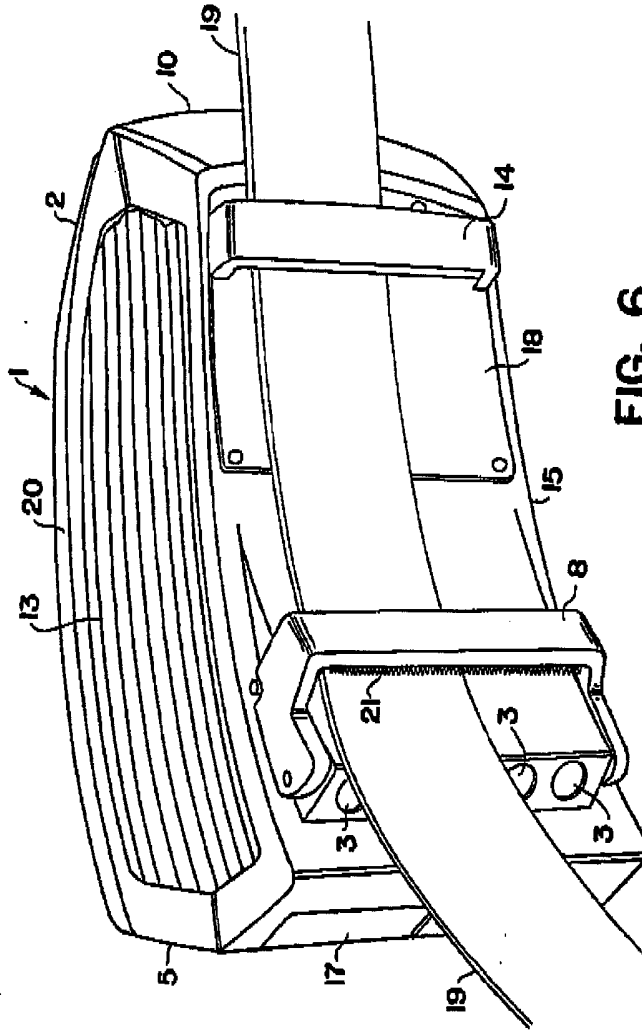


FIG. 6

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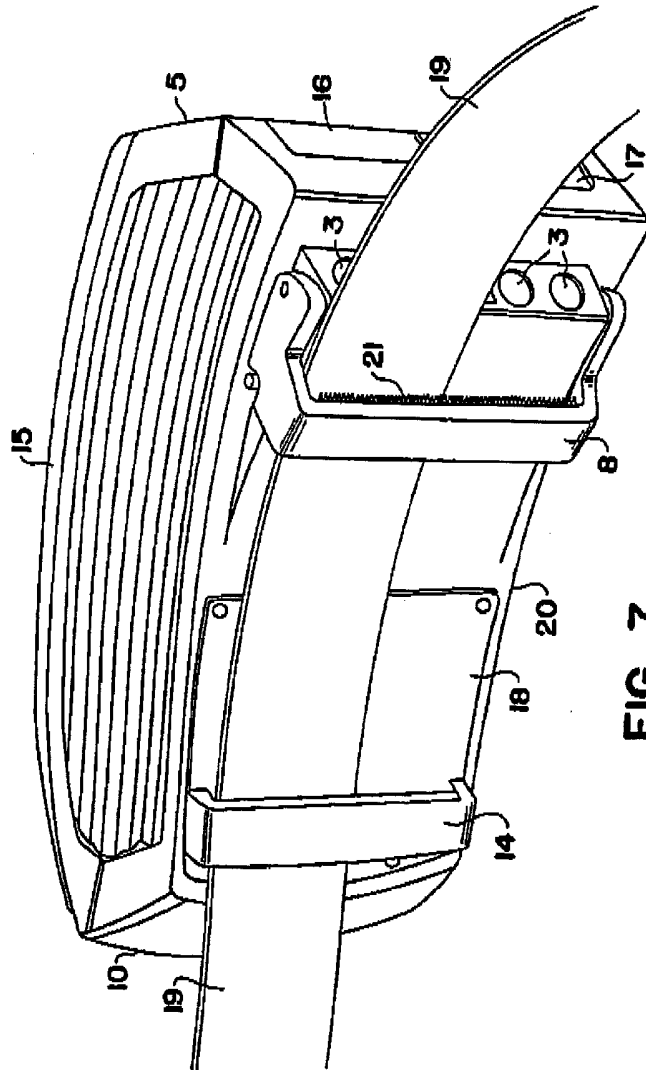


FIG. 7

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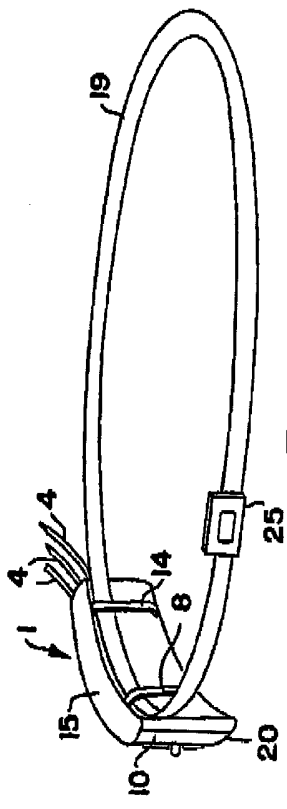


FIG. 9

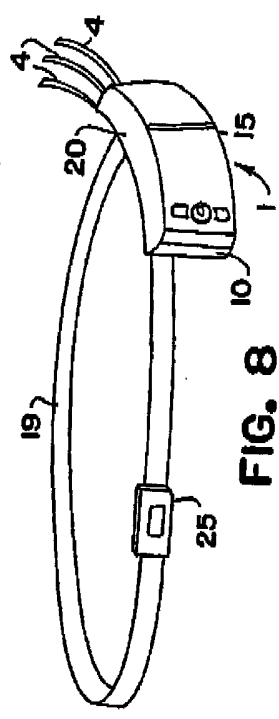


FIG. 8

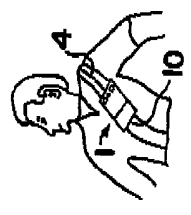


FIG. 10