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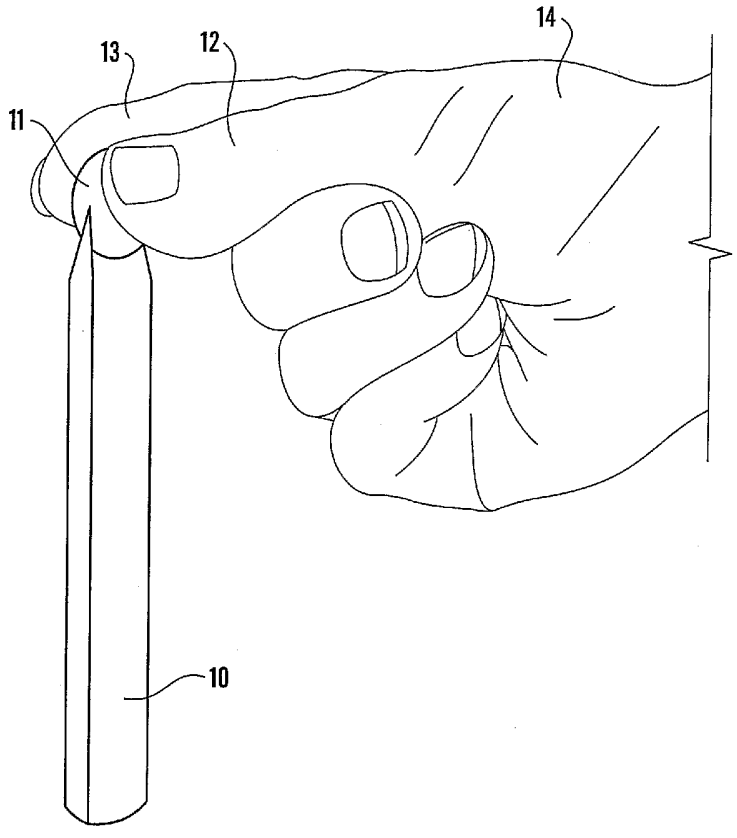
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[Continued on next page]

(54) Title: CONTROL DEVICE FOR PROVIDING POSITION INFORMATION



(57) Abstract: The invention relates to a control device for providing position information comprising: a body (10, 30, 42), a positioning means (11,31,40) connected to the body and adapted so as to be capable of being positioned by simultaneous use of a user's thumb and index finger (12 and 13 respectively), sensor means for detecting the movement of the positioning means, and transmitting means for transmitting the sensor signals to a receiver.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Control device for providing position information

The invention relates to a control device for providing position information.

Today there is a number of different technical solutions for the remote control of electronic and mechanical devices. One example are the so-called mouse pointing devices. Such devices may, for example, comprise a ball that is rolled across a surface or moved by the whole or parts of the hand. One example are the so-called mouse pointing devices/computer mice. Other types of remote control devices include joysticks, pens whose tip can be rolled across a surface, touch-sensitive panels and levers that are moved by a finger.

The most common mouse pointing devices for use with computers comprise a ball mounted in a housing that is moved across a surface, for example, a tabletop, by the user's hand. When the housing is moved, the ball will rotate in the housing and this rotational motion represents the signal from the mouse pointing device.

The use of these mouse pointing devices requires a certain angle of pronation of the forearm/hand in order to adapt to the shape of the mouse and its position on the table. When the hand is placed on the mouse pointing device, the working position also requires that the fingers, and possibly also the wrist, be lifted slightly in a ready position above the click buttons. The design of traditional mouse pointing devices is such that free rotation of the forearm/hand and free movement of the wrist are restricted. The working position involves static load on the muscles that extend the fingers and flex the wrist up and the muscles that keep the hand pronated. When this position is maintained for some time, it represents a considerable strain on the muscles of the extensor aspect of the forearm and the origin of these muscles on the outer side of the elbow. This means that many mouse users suffer from pain on the upper side of their forearm and the outer side of their elbow, so-called tennis elbow. The position could also provoke pain in the carpus/wrist in people with joint disease in that area, for example arthrosis and rheumatoid arthritis.

The use of mouse pointing devices on the tabletop involves the hand being extended on the tabletop. The arm must be stabilised in this position, and since this happens in part by using the muscles of the shoulder, the muscular apparatus arranged around the shoulder joint is subjected to static load. This results in many mouse users experiencing pain around the shoulder, often radiating out into the arm and up into the neck/head.

The anatomical structure of the human being is such that the arm and the shoulder are partly supported by muscles with their origin in the neck and their attachment in the shoulder. This means that when the musculature of the shoulder joint is

strained, as described above, muscles with their origin in the neck will also be activated. Just as further down in the shoulder/arm, this will become a static load, and results in many mouse users suffering from pain in the neck, often radiating out into the shoulder, arm and down between the shoulder blades. It is common for this to also result in a headache.

The use of a mouse pointing device on the tabletop means that the working position is largely given as the hand must be placed over the mouse pointing device wherever it is on the table. That the working position is fixed in this way will to a great extent prevent a varied sitting position. Depending upon the ergonomic conditions at the workplace in general, this fixed working position could also result in a posture that is unfortunate, for example, in that the person works in a stooping position, which will result in improper use of and less support for the back muscles.

Muscle groups capable of generating a great deal of force and energy are less adapted to finer motor activities. To obtain a high degree of precision when working, for example, to move a cursor with precision on a screen, the static component of the muscular activity is increased, which further aggravates the development of strain injuries associated with the said muscle groups.

WO 98/59316 relates to a pointing device comprising a freely rotatable ball moved by the user's thumb, whilst the rest of the hand grasps around the device. This means that the user has greater freedom of choice as to the position in which he holds the pointing device. However, the thumb alone has somewhat limited precision, and to be able to use the thumb for more precise control, the remaining fingers and the hand must grip tightly around the device in order to give it sufficient support. The invention differs from this device in that it uses the so-called pincer grip, which gives more precise and steady manoeuvring with minimum strain on the surrounding muscles.

The pincer grip (also called the key grip, or in English the precision grip) is a grip in which the article is held firmly between the pulp of the thumb and the pulp of the index finger without any support from other articles or fingers, the force that the pulp of the thumb exerts on the article being as great as and oppositely directed to the force exerted on the article by the pulp of the index finger. In this grip, the article can be felt, moved and squeezed. The pincer grip is a hand function that differs anatomically and neurophysiologically from that performed if, for example, one or more fingers are placed on a movable ball or the like (which is supported against another article).

In the pincer grip, the functions of the thumb and the index finger are coordinated so that they carry out the task together, and a large part of the central nervous

system in human beings is devoted to this coordination of the two fingers' sensory and motor functions. A grip where the thumb and the index finger perform different tasks is functionally not a pincer grip, although the position of the fingers give the impression that it is.

The pulps of the fingers are extremely sensitive and the muscles that control the thumb and the index finger are adapted to small movements. The pincer grip is therefore highly suitable for moving an article/control device with precision.

Human beings develop the pincer grip during their first and second year of life. In terms of evolution, this hand function is associated with the development of intelligence and language in human beings. The key grip may be in use with small precise movements over a long period of time without the working muscles being strained. This will give ergonomic advantages which result in less discomfort and fewer strain injuries than the use of conventional mouse pointing devices.

The object of the invention is to provide a control device that can be controlled by the hand in an ergonomically non-straining manner.

The object of the invention is obtained by means of the patent claims.

The control device according to the invention comprises a body, a positioning means connected to the body and adapted so as to be capable of being positioned by the simultaneous use of the user's thumb and index finger, sensor means for detecting the movement of the positioning means, and transmitting means for transmitting the sensor signals to a receiver.

The body in one embodiment of the invention is rounded and adapted to fit into the hand of a user. The body may have a different size depending on the size of the user's hand, so that, for example, there could be one size for children and another size for adults.

In one embodiment, the body is elongate. This gives the hand a natural grip about the body in that the body can be placed in the hand with one end by the user's thumb and index finger and the other end resting against the palm of the hand closest to the user's little finger.

In one embodiment, the positioning means is arranged at one end of the body so that it can be gripped by the thumb and the index finger. The body tapers towards this end to permit the grip. The positioning means may be a ball, a cylinder or the like that can be rotated freely in all directions and/or about all axes. Alternatively, the positioning means may consist of touch-sensitive surfaces that sense the movements of the fingertips. The size of the positioning means may be different in the same way as the size of the body may be different, for use by different people.

In one embodiment, the positioning means is a ball, in another embodiment it is a cylinder and in a third embodiment it is a rod-shaped elongate element. The diameter of the ball, or the length of the cylinder or the rod-shaped element may, for example, have a suitable size of 5-15mm, for example, 10mm, but larger or smaller sizes are also possible.

The positioning means is movably connected to the body, so that the thumb and the index finger can have contact with two parts of the positioning means and thus move the positioning means. These two parts may be separate parts, or may be arranged adjoining each other.

As previously mentioned, in one embodiment of the invention, the positioning means is a ball arranged in a retaining ring so that the thumb and the index finger come into contact with the ball on either side of the retaining ring.

In one embodiment equipped with a cylinder, or a rod-shaped element, the cylinder or the rod-shaped element is connected to the body in the central part thereof, whilst the end surfaces of the cylinder or the element are adapted to rest against the thumb and the index finger. Thus, the positioning means may be gripped at the end surfaces by the thumb and the index finger and moved.

In all the embodiments of the invention, the positioning means is moved/positioned by the index finger and the thumb gripping around the positioning means in a so-called pincer grip, and being moved simultaneously and in a coordinated manner. The advantages of the pincer grip are described above.

The sensor means are provided to detect the movements of the positioning means and may be optical sensors, roller sensors or other suitable sensors. One example of suitable sensors can be found in standard mouse pointing devices of the tabletop type equipped with a ball, or of the stick type.

In one embodiment, the body comprises a depression adapted to accommodate the little finger, the depression being arranged close to the end of the body that is farthest from the positioning means. Placing the little finger in a depression gives a support effect, so that the body has a good stable position in the hand. The location of the depression close to one end of the body results in an enhanced balancing of the body.

The control device may also comprise one or more push buttons for activating various functions. Pressing the push buttons releases a signal that can be transmitted via the transmitting means. For example, pressing the push buttons could change the state of a switch. The push buttons may be ordinary buttons such

as those on standard computer mouse pointing devices, pressure-sensitive panels, optical sensors or other suitable devices that are known per se.

The push button or buttons may be arranged on one or more parts of the body. For example, they may be arranged along the length of the body in positions adapted to the position of the fingers along the body when it is held in the hand. In one embodiment, several sets of buttons are provided symmetrically about a centre plane that extends along the centre line of the body, so that the control device can be used by the left or right hand as desired. A push button may also be provided at the end of the body that faces away from the positioning means, wherein such a button can be pressed by pressing the button against a surface or another article, or by depressing it using the other hand. It is also possible to equip the body with roller means for providing a scroll function.

The invention will also be suitable for use where there is a need for a mouse pointing device during laboratory presentations, lectures etc. In such cases, the invention would advantageously be equipped with a microphone, so that the lecturer has only one item to deal with. The microphone could be fastened to the body, or could be an integral part of the body.

The transmitting means that transmit the signals from the sensors to a receiver may be a cable for the transmission of electrical signals, an optical cable, or wireless transmitting means such as infrared transmission or radio transmission. The transmitting means may also be used to transmit signals from the push buttons.

The invention may also comprise signal processing means adapted for the processing of the sensor signals and/or the push buttons. Generally, the signals from the sensor means and/or push buttons will be transmitted to a processor which processes and interprets the signals. For example, when the control device is to be used to control a pointer on a computer screen, the computer comprises means for processing and interpreting the signals from the sensor means. However, in one embodiment, the signal processing can be carried out in the control device before the signals are transmitted to the receiver.

The control device according to the invention can be used for a number of control purposes. One example is to use it as a mouse pointing device for a computer. Other examples of areas of application include the remote control of articles such as machines or toys, the control of vehicles or aircraft etc. The invention will be suitable for virtually all purposes that require precise control.

The invention will now be described in more detail with reference to the attached figures.

Figure 1 illustrates the so-called pincer grip that is used with the invention.

Figure 2 illustrates the principle for the use of the pincer grip with the invention.

Figure 3 shows one embodiment of the invention.

Figure 4 shows another embodiment of the invention.

In Figure 1 the pincer grip is illustrated by a rod 10 with a ball 11 arranged at one end. The ball is held between the thumb 12 and the index finger 13 of the hand 14, and it is this grip that is called the pincer grip.

Figure 2 illustrates how the pincer grip can be maintained with the rod 10 in other positions, in this case lying along the palm 14 of the user's hand. This is the embodiment that forms the basis for the invention.

Figure 3 is a drawing of an embodiment of the invention 30 held in a hand 14. The control device 30 which, for example, can be used as a computer mouse pointing device, comprises a body 32 that is rounded and has a size adapted to be able to lie in the palm of a user's hand. At one end, the body 32 tapers to a tip 33 where a positioning means in the form of a ball 31 is attached. The ball 31 can be rotated by gripping around it with the thumb and the index finger in the pincer grip. The sensor means that sense the movement/position of the ball are arranged in the tip/attachment point 33, and the transmission of the sensor signals takes place wirelessly. The control device 30 also comprises two buttons 35, 36 which correspond to the buttons on conventional mouse pointing devices. These buttons are arranged so that they may easily be operated by the user's middle finger and ring finger. The control device 30 may also comprise roller means for providing the scroll function.

Figure 4 shows an embodiment of the invention where the positioning means is made in the form of a cylinder 40. The cylinder 40 has two end faces 41 adapted for contact with the index finger and the thumb. The cylinder 40 is fastened to a body 42 of the same type as that shown in Figure 3. The cylinder is supported in a partly spherical support part (not shown) which permits the movement.

In another embodiment of the invention (not shown), the positioning means is made in the form of a rod-shaped element. This element will be used in essentially the same way as the cylinder 40.

When it comes to the choice of materials for the positioning means and the body, these materials could vary depending upon the environment in which the control device is to be used. The material may have a rough surface and be quite soft

(rubber, plastic) or it may be smooth and relatively hard (metal). The body may be elongate or spherical, or have a shape somewhere between these two extremes.

PATENT CLAIMS

1. A control device for providing position information, characterised in that it comprises
- a body (10, 30, 42);
- a positioning means (11, 31, 40) connected to the body and adapted so as to be capable of being positioned by simultaneous use of a user's thumb and index finger (12 and 13 respectively);
- sensor means for detecting the movement of the positioning means; and
- transmitting means for transmitting the sensor signals to a receiver.

2. A control device according to claim 1, characterised in that the body (31, 40) is rounded and adapted to fit into the hand of a user.

3. A control device according to claim 1, characterised in that the body is elongate (10).

4. A control device according to claim 1, characterised in that the positioning means is arranged at one end of the body and that the body tapers towards this end.

5. A control device according to claim 4, characterised in that the body also comprises a depression adapted to accommodate the little finger, the depression being arranged close to the end of the body that is farthest from the positioning means.

6. A control device according to claim 1, characterised in that it comprises one or more push buttons and/or roller means.

7. A control device according to claim 1, characterised in that the push button or buttons are arranged on one long side or on both long sides symmetrically about a centre plane that extends along the centre line of the body.

8. A control device according to claim 1, characterised in that it further comprises signal processing means adapted for processing the sensor signals.

9. A control device according to claim 1, characterised in that the body is adapted for connection to a microphone or comprises a microphone as an integral part of the body.

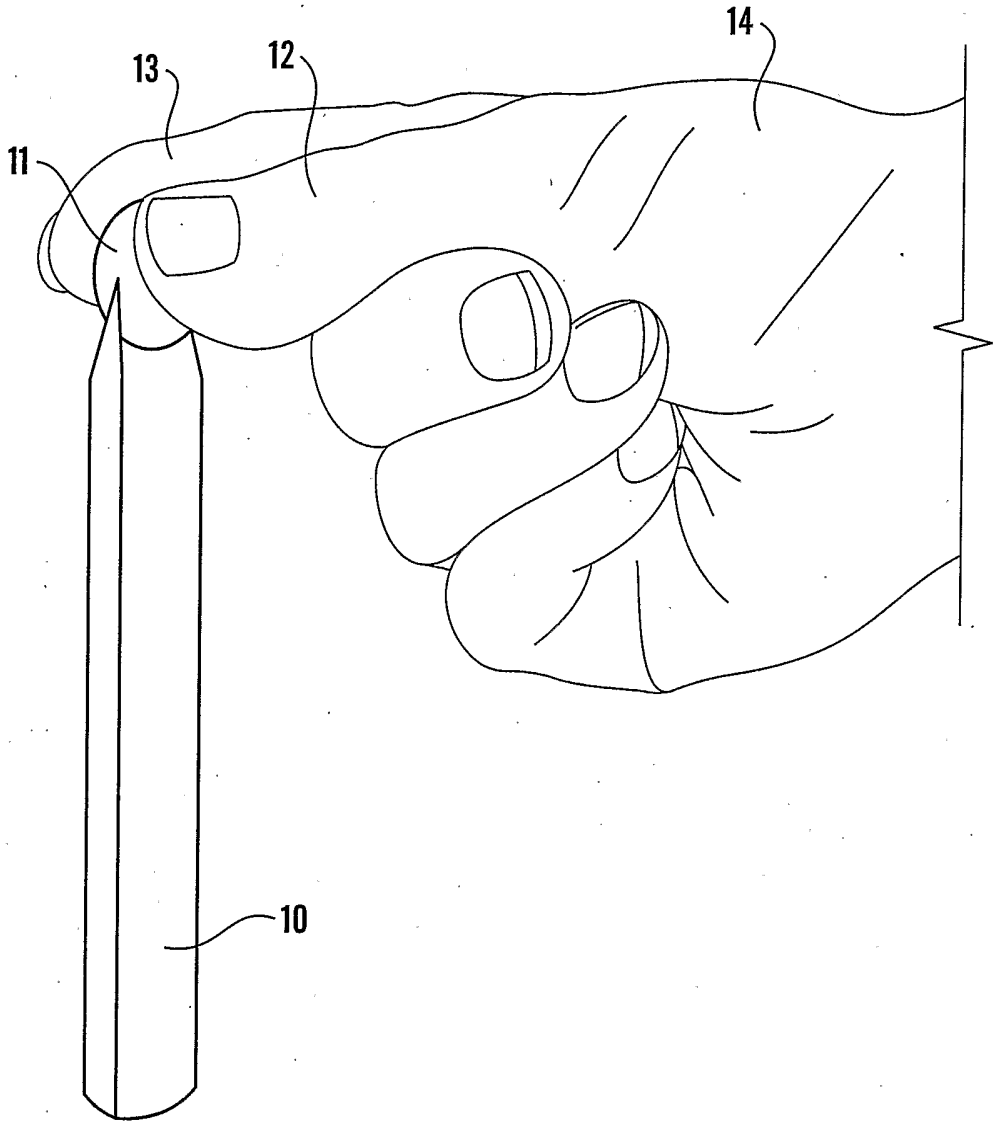


Fig. 1

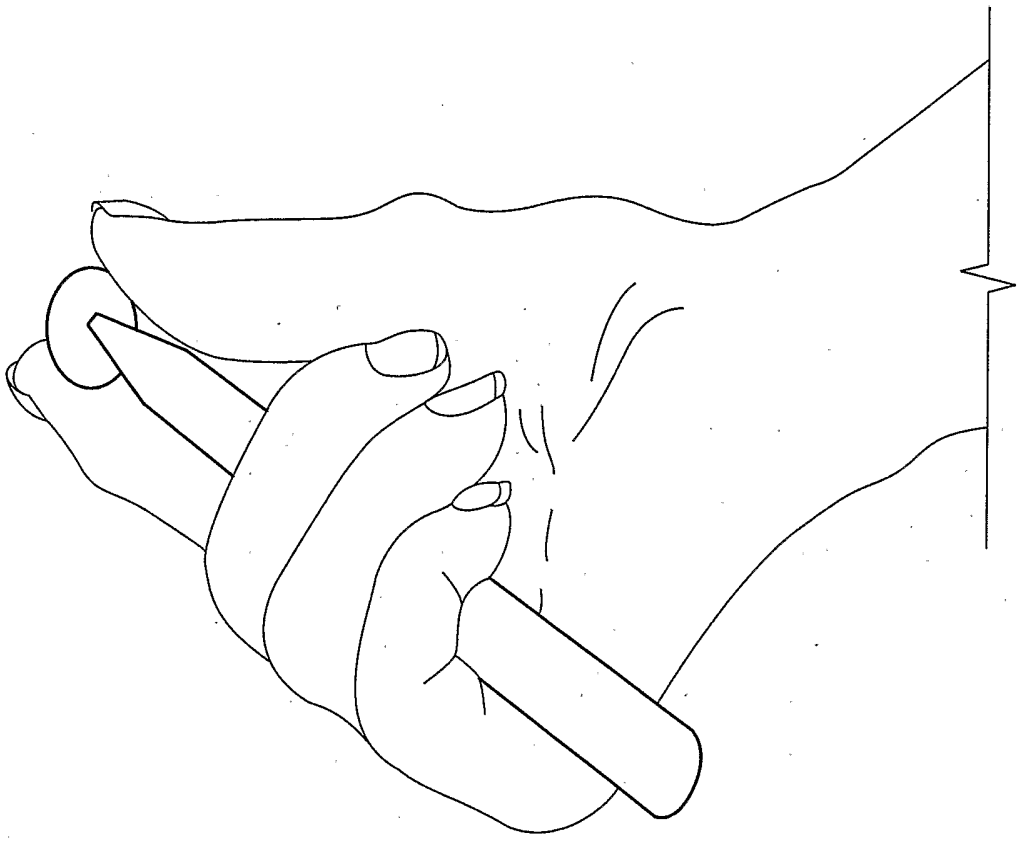


Fig.2

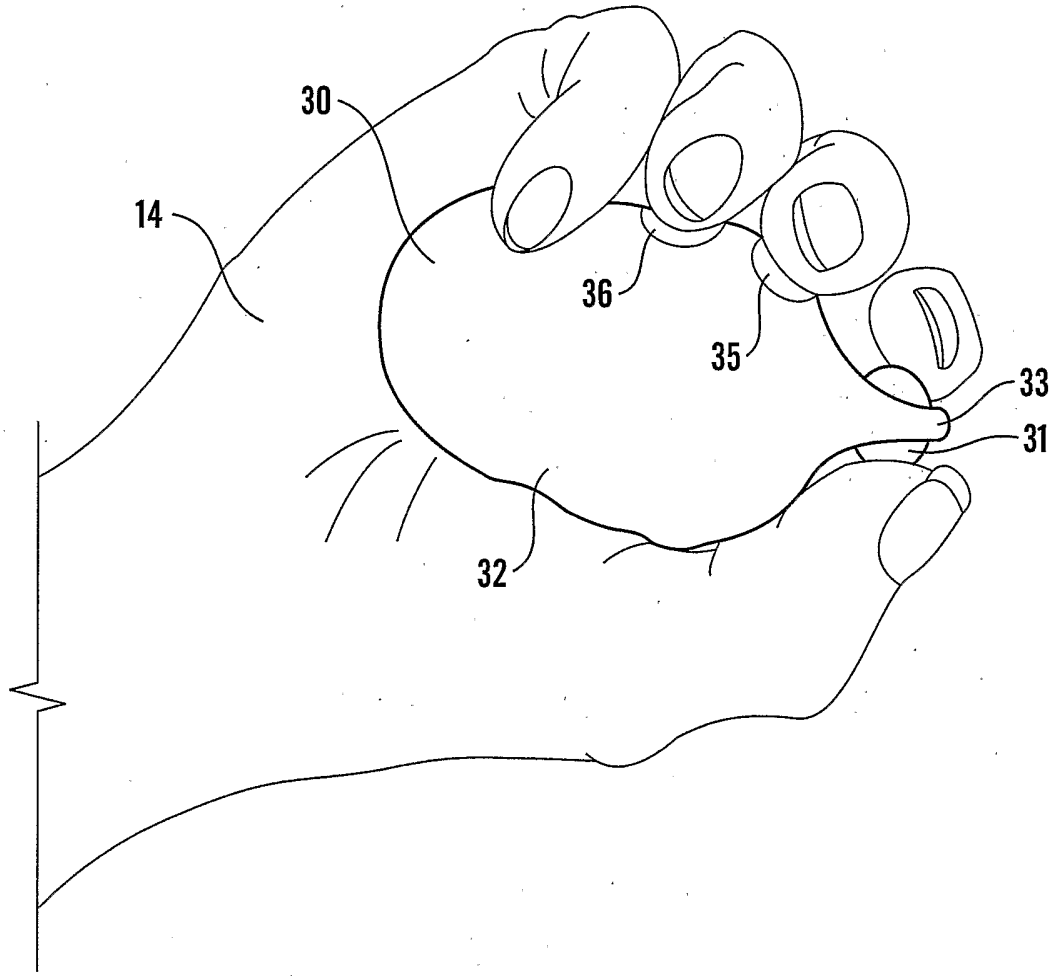


Fig.3

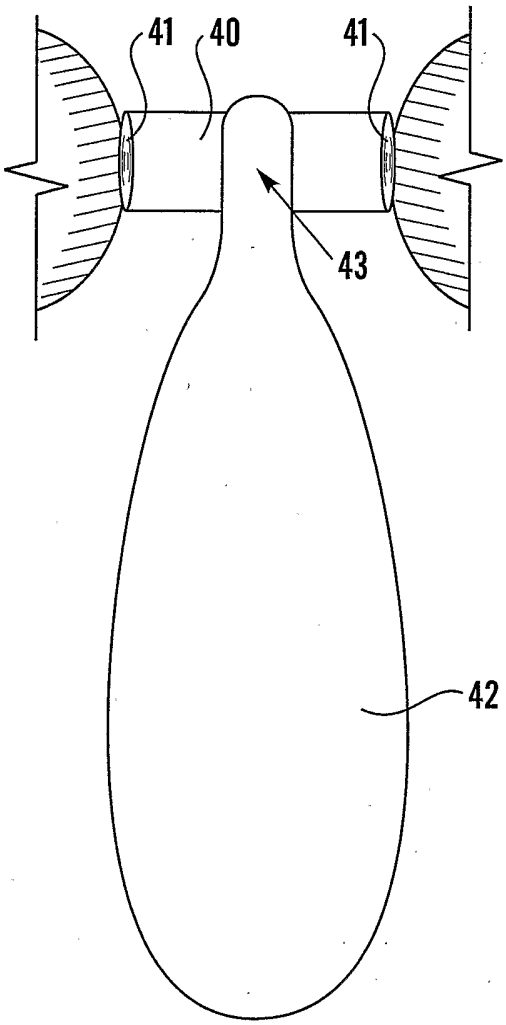


Fig.4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 2004/000248

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 3/033
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)

IPC7: G06F

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

SE,DK,FI,NO classes as above

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

WPI DATA, EPO-INTERNAL. PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0696014 A1 (HEWLETT-PACKARD CO), 7 February 1996 (07.02.1996), figure 4 --	1-9
X	US 20010040552 A1 (MEHR, M), 15 November 2001 (15.11.2001), figure 6 --	1-9
A	US 20020113775 A1 (SPENCER, R), 22 August 2002 (22.08.2002), figure 1 --	3-7
A	US 20030142069 A1 (GATTO, JR, F P ET AL), 31 July 2003 (31.07.2003), figure 4 --	3-7

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 November 2004	30 -11- 2004
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan Silfverling /LR Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 2004/000248

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5339095 A (REDFORD, P M), 16 August 1994 (16.08.1994), column 3, line 23 - line 35, figure 1 -- --------	9

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				US	5650608	A	22/07/1997
				US	5847694	A	08/12/1998
				US	5973313	A	26/10/1999