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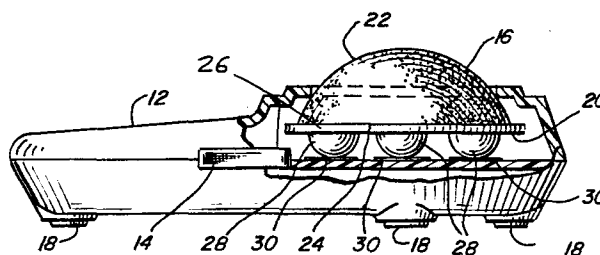
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⑤④ **Data input apparatus.**

⑤⑦ Data input apparatus (10) comprises transducer means (30) for converting a physical displacement applied to actuator means (16) into an electrical parameter and transmission means (20) for communicating the physical displacement from the actuator means (16) to the transducer means (30), characterised in that the actuator means (16) has a substantially part-spherical surface (22). The actuator means (16) may be a body shaped as a segment of a sphere, with at least a portion of the substantially part-spherical surface (22) of the actuator means protruding through an opening in a hand holdable housing (12), to provide an effective alternative to the known joystick devices and similar.



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ILLINOIS TOOL WORKS INC.

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DATA INPUT APPARATUS

The present invention is directed to apparatus for providing data input to an electrical device such as a data processing device.

The present invention is designed to facilitate and render more transparent the interface between the operator and the electrical device, and provides a novel alternative to such data input devices as are presently encountered in the marketplace, such as joystick devices, track ball devices, electronic mouse input devices and the like.

Data input apparatus, in accordance with the present invention, comprises transducer means for converting a physical displacement applied to actuator means into an electrical parameter and transmission means for communicating the physical displacement from the actuator means to the transducer means, characterised in that the actuator means has a substantially part-spherical surface.

Preferably: the substantially part-spherical surface is accessible to an operator's finger; the actuator means is a body shaped as a segment of a sphere and thus has a substantially planar surface as well as the substantially part-spherical surface; the substantially planar surface is affixed to the transmission means and the physical displacement is applied by an operator's finger to the substantially part-spherical surface.

In a preferred embodiment, the actuator means responds to the physical displacement in a tilting motion about a point and the transmission means communicates with the transducer means to indicate the physical displacement in two dimensions, the transducer means is substantially planar and the point about which the

actuator means is tiltable is displaced from the transducer means.

5 The actuator means, the transmission means and the transducer means may all be carried by a hand holdable housing with at least a portion of the substantially part-spherical surface of the actuator means protruding through an opening in the housing.

10 The substantially part-spherical surface of the actuator means may be constructed of material having a coefficient of friction appropriate to limit slip between the actuator means and an operator's finger.

15 In a preferred embodiment, the conversion of the physical displacement to the electrical parameter is achieved in the manner disclosed in our UK patent publication GB 2 124 777 A (claiming priority from US patent application 404 266 of 2 August 1982) or our European patent publication EP 0 119 673 A1 (claiming priority from US patent application 455 443 of 3 January 1983). The reader is instructed to refer to those 20 publications for further information. Briefly, in the present invention, the transmission means is responsive to the physical displacement to move towards the transducer means and couple electrically with the transducer means, the electrically coupled electrical 25 properties of the transmission means and the transducer means varying progressively and increasingly as the transmission means is moved progressively and increasingly towards the transducer means. The transducer means may be connected within an electrical 30 circuit so that an electrical potential difference is connected across the transducer means regardless of whether or not the transducer means is electrically coupled with the transmission means.

Data input apparatus in accordance with the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 shows the data input apparatus in top plan view;

Figure 2 shows a side view taken as indicated from 2-2 of Figure 1; and

Figure 3 shows a front view, in partial section, taken as indicated from 3-3 of Figure 1.

Data input apparatus 10 is shown in Figure 1 in top plan view. The apparatus 10 includes a housing 12. Extending from the housing 12 are control buttons 14, actuator means 16 and a connection cord (not shown) for connection of the apparatus 10 to an electrical device such as a data processing device. As is best seen in Figures 2 and 3, also extending from the housing 12 are a plurality of supporting structures 18 in order that the apparatus 10 may be alternatively hand held or placed in a stable position upon a planar surface during operation.

Referring now to Figure 3, it may be seen that the actuator means 16 is secured to transmission means 20. The actuator means 16 is a body shaped as a segment of a sphere, quite possibly being hemispherical, and includes a substantially part-spherical surface 22 and a substantially planar surface 24. The actuator means 16 is affixed to the transmission means 20 by its planar surface 24. The transmission means 20 includes a substantially planar transmission plate 26 with a plurality of protuberances 28 attached to the transmission plate 26. The transmission plate 26 communicates through the protuberances 28 with transducer means 30 and the transducer means 30 is electrically attached (not shown) to an electrical device in order that the electrical signals produced by the transducer means 30 in response to physical displacement of the

actuator means 16, and communication of that physical displacement via the transmission plate 26 and the protuberances 28 to the transducer means 30, may be provided as an input to the electrical device (not shown).

Of course, it will be immediately apparent to one skilled in the art that the present invention may be incorporated in environments other than the housing 12 as shown. For example, the present invention may be incorporated in a keyboard as a cursor control input apparatus for an electrical device such as a data processing device, or as an input device for an electronic game, or the like.

In the preferred embodiment of the present invention it is contemplated that at least the surface 22 of the actuator means 16, and quite possibly the entire actuator means 16, will be constructed of material having a coefficient of friction appropriate to limit slip between the actuator means 16 and the means employed to impart physical displacement to the actuator 16, such as a human operator's finger or the like.

The actuator means 16 may respond to the physical displacement in a tilting motion about a point and the transmission means 20 communicates with the transducer means 30 to indicate the physical displacement in two dimensions, such as the x and y axes of a cartesian coordinate system, and the transducer means 30 may be substantially planar, with the point about which the actuator means 16 is tiltable being displaced from the transducer means 30.

CLAIMS

1. Data input apparatus (10) comprising transducer means (30) for converting a physical displacement applied to actuator means (16) into an electrical parameter and
5 transmission means (20) for communicating the physical displacement from the actuator means (16) to the transducer means (30), characterised in that the actuator means (16) has a substantially part-spherical surface (22).

10 2. Data input apparatus according to claim 1, characterised in that the substantially part-spherical surface (22) is accessible to an operator's finger.

15 3. Data input apparatus according to claim 1 or claim 2, characterised in that the actuator means (16) is a body shaped as a segment of a sphere and thus has a substantially planar surface (24) as well as the substantially part-spherical surface (22).

20 4. Data input apparatus according to claim 2 and claim 3, characterised in that the substantially planar surface (24) is affixed to the transmission means (20) and the physical displacement is applied by an operator's finger to the substantially part-spherical surface (22).

25 5. Data input apparatus according to any preceding claim, characterised in that the actuator means (16) responds to the physical displacement in a tilting motion about a point and the transmission means (20) communicates with the transducer means (30) to indicate the physical displacement in two dimensions.

30 6. Data input apparatus according to claim 5, characterised in that the transducer means (30) is substantially planar and the point about which the actuator means (16) is tiltable is displaced from the transducer means (30).

35 7. Data input apparatus according to any preceding claim, characterised in that the actuator means (16), the

transmission means (20) and the transducer means (30) are all carried by a hand holdable housing (12) with at least a portion of the substantially part-spherical surface (22) of the actuator means (16) protruding through an opening in the housing (12).
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8. Data input apparatus according to any preceding claim, characterised in that at least the substantially part-spherical surface (22) of the actuator means (16) is constructed of material having a coefficient of friction appropriate to limit slip between the actuator means (16) and an operator's finger.
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9. Data input apparatus according to any preceding claim, characterised in that the transmission means (20) is responsive to the physical displacement to move towards the transducer means (30) and couple electrically with the transducer means (30), the electrically coupled electrical properties of the transmission means (20) and the transducer means (30) varying progressively and increasingly as the transmission means (20) is moved progressively and increasingly towards the transducer means (30).
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10. Data input apparatus according to claim 9, characterised in that the transducer means (30) is connected within an electrical circuit so that an electrical potential difference is connected across the transducer means (30) regardless of whether or not the transducer means (30) is electrically coupled with the transmission means (20).
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FIG. 1

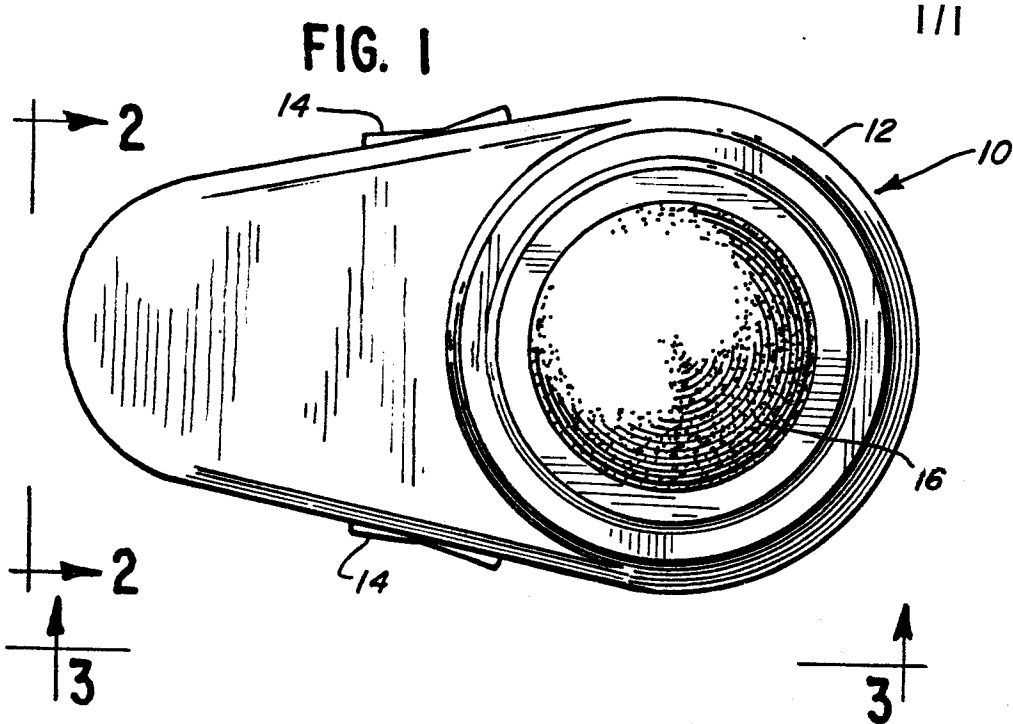


FIG. 2

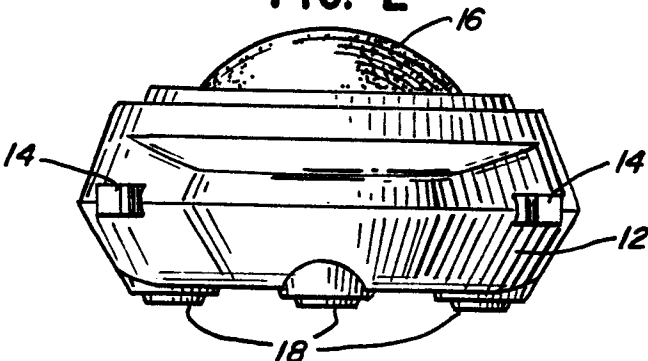
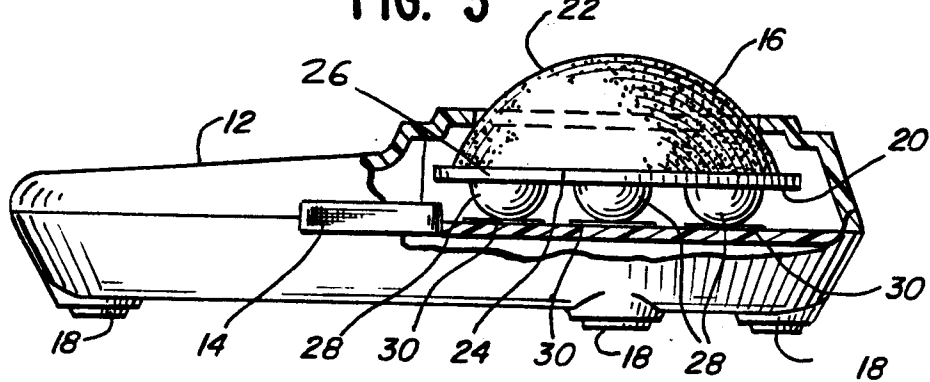


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

0143563

Application number

EP 84 30 7539

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	CH-A- 461 124 (GUTOR RESEARCH) * Column 3, lines 15-67 *	1,2,5,7	H 01 H 25/04
Y	---	3,4	
Y	US-A-2 863 010 (A.J.RIEDL) * Column 1, line 60 - column 2, line 29 *	3,4	
A	FR-E-2 405 000 (SIEMENS) ---		
A	GB-A-2 057 192 (INTERSTATE INDUSTRIES) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4) H 01 H 25/00
Place of search THE HAGUE		Date of completion of the search 19-02-1985	Examiner P.JANSSENS DE VROOM
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			