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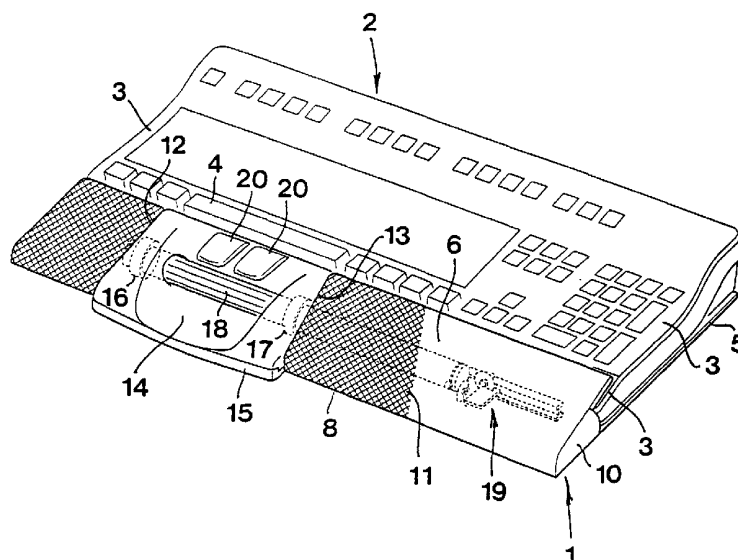
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WRIST-SUPPORTING ACCESSORY FOR KEYBOARDS



(57) Abstract: The invention concerns a wrist-supporting accessory (1) for computer keyboards (2) of the kind that comprise a space bar (4) adjacent a front border portion (3) on the board. The accessory comprises a bottom plate (5) and a flange (6) directed rearwardly from the front edge of the plate, a recess (14) delimited by two spaced-apart lateral edges (12, 13) being formed in said flange (6). Bearings (16, 17) on either side of the recess support a control roller (18) housed in the space underneath the flange (6), said control roller arranged for rotational and translating movements and being connected to a decoding device (19) hidden underneath the flange (6). By means of the part of the roller (18) that is exposed in the recess (14), a pointer may be shifted between various coordinate positions on the screen of a monitor. In the same recess (14) is also arranged two click buttons (20) for transfer to a computer of commands and the like.



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WRIST-SUPPORTING ACCESSORY FOR KEYBOARDSTechnical Field of Invention

The present invention relates to a wrist-supporting accessory for keyboards of the kind that co-operate with a computer and a monitor and that comprise a set of keys surrounded by free border portions on the keyboard, said accessory being configured as a plate, which is attachable underneath the keyboard and which is formed at its front with a rearwardly directed flange below which is delimited a slot-shaped space for reception therein of the front border portion of the keyboard, the upper face of said flange designed to support the operator's two wrists, a recess delimited by spaced-apart lateral edges being formed in said flange to house a control roller extending inside the space below the flange, said control roller arranged for rotational as well as axial movements and for co-operation with a device mounted in the space below the flange for decoding the momentary axial and angular positions of the roller, said decoding device being electrically coupled to the computer to displace a pointer between different coordinate positions on the monitor screen base in response to said roller positions.

Background of the Invention

Computer workplaces comprise a plurality of co-operating units one of which is a keyboard and another a computer or PC unit, the latter in turn connected to a monitor with a screen on which a large number of different signs and symbols may be visualised. On the screen is shown also a so called pointer, which may be moved between different coordinate positions on the

screen to find and/or activate said signs or symbols. In order to effect the pointer displacements on the screen a separate, manually operable pointing means is used, a very common version of which is a mouse of mobile or  
5 stationary type.

As the data technology has developed and an increasing number of people work at computerised workplaces it has become apparent that such work frequently is ergonomically strenuous and tiring and in  
10 addition may lead to temporary as well as chronic physical injuries and ailments. One of the reasons for the ergonomic hazards of computer work is that when working with conventional, simple keyboards the computer operator is forced to hold both forearms and hands in an  
15 unsupported position, in which only the fingertips are in contact with the various keys. In order to eliminate this disadvantage separate accessories have been developed in the past to serve as supports and relieve the stress on the two wrists of the operator. More precisely, such  
20 accessories consist of a plate of e.g. thin sheet-metal or plastics, which may be attached underneath the keyboard and which is bent upwards/rearwards at a front edge whereby a rearwardly directed flange is formed, underneath which it is possible to insert the front  
25 border portion of the keyboard. In this manner, the upper face of the flange forms a face of support located in close proximity to the front row of keys of the set of keys on the keyboard, on which face the operator's wrist may rest.

30 Another reasons for the difficulties of an ergonomic nature in computerised workplaces is that the necessary pointing means is a separate unit, spaced from the keyboard, and usually positioned on an adjacent desktop

(not infrequently there is a difference of levels between the pointing means and the keyboard, when the latter is sunken relative to the surrounding desk). Some types of computer operations require that the pointer and the associated pointing means are used extremely frequently, which means that repeatedly one of the operator's hands must be shifted back and forth between the keyboard and the pointing means situated laterally thereof. Only too often are these alternating movements the cause of stress injuries (known as mouse elbow) to arms and shoulders. With a view to solve this problem and to eliminate the need for moving the hand laterally between the keyboard and the pointing means, keyboards have been developed lately, in which the pointing means is integrated in one way or the other with the keyboard itself. Examples of keyboards of this kind are disclosed in e.g. EP 0382350 and US 4712101. These keyboards are formed with a roller serving as a pointing means, said roller being positioned at the front edge of the keyboard in close proximity to the front row of keys of the set of keys for rotational and simultaneously axial translating movements. From US 5600311 is also known a keyboard in the set of keys of which is arranged a so called joy stick by means of which the pointer may be displaced across the screen of the monitor. However, all these prior-art constructions require re-designing of the keyboards and therefore fail to solve the problems found in the large number of existing and well-functioning keyboards on the market today.

30       An additional disadvantage found in the use of the separate pointing means (mouse) is that it encroaches on the space on the desktop in addition to which is may

easily be unintentionally hidden underneath sheets of paper and the like.

From SE 9402858-6 (Published Specification No. 502 108) is previously known an accessory designed for use  
5 with a computer keyboard and comprising a control roller to be positioned in the area in front of the keyboard and arranged for rotational as well as axial movements. In this case, however, the control roller is designed to be connected to a pointing means placed laterally of the  
10 keyboard, which pointing means preferably is in the form of a mouse, in turn occupying space laterally of the keyboard.

An accessory to be positioned in front of the keyboard and comprising a control roller that is  
15 rotationally mounted and arranged to perform translating movements is also known from US 5115231. In this case, however, the roller is exposed upwards, and the accessory therefore has no useful support faces on which the operator's wrists may rest.

20 A keyboard accessory of the kind defined in the introduction is previously known from WO 98/29946. However, in this prior-art accessory the decoder device is fixedly mounted in the interior of the accessory, and the control roller is connected to a first decoder via a  
25 disk moving axially as well as radially along a shaft in said decoder. This arrangement causes problems both as regards mounting of the control roller relative to the accessory and transfer of the rotational and translating movements of the control roller to the decoding device in  
30 a precise and at the same time neat manner.

Objects and Characteristics of the Invention

The object of the present invention is to eliminate the above problems inherent in the prior-art keyboard accessory disclosed in WO 98/29946 and to suggest an improved keyboard accessory. A fundamental object of the invention therefore is to provide a structurally simple accessory, wherein the transfer to the decoder device of the simultaneous rotational and translating movements of the control roller may be effected in a convenient and precise manner.

In accordance with the teachings of the invention, the above objects are achieved in an accessory presenting particular features defined in the characterising clause of claim 1. Advantageous embodiments of the inventive accessory are furthermore defined in the dependent claims.

Brief Description of the Drawings

In the drawings:

Fig 1 is a perspective view of a computer keyboard having connected thereto an accessory in accordance with the invention,

Fig 2 is an enlarged lateral view of the keyboard and the accessory,

Fig 3 is another perspective view of the accessory from which some parts have been removed,

Fig 4 is an enlarged, partly cut perspective view showing a decoder device incorporated in the accessory,

Fig 5 is a perspective view of an alternative, further developed embodiment of the inventive accessory, shown together with a keyboard, and

Fig 6 is a simplified cross-sectional view through the accessory.

Detailed Description of Preferred Embodiments of the  
Invention

In Figs 1 and 2 numeral 1 designates generally an  
5 accessory devised in accordance with the teachings of the  
invention and connected to a computer keyboard designated  
generally by numeral 2. The keyboard is of conventional  
type and comprises a set of keys, some of which are  
illustrated schematically and some of which are left out  
10 altogether for purposes of simplification. The set of  
keys is surrounded on all sides by free border portions  
3. A front row of keys located immediately behind the  
free long-side border portion 3 of the keyboard comprises  
a space bar 4, the length of which considerably exceeds  
15 that of the rest of the keys and which is located to the  
left of an imaginary median plane passing through the  
keyboard. In practical terms, the space bar could have a  
length in the order of 100-130 mm with the right-hand end  
of the key being located near the centre of the keyboard.

20 The accessory 1 comprises a bottom plate 5 formed  
along its front long-side edge 8 with a rearwardly  
directed flanged 6. The shape of plate 5 is identical to  
the basic elongate rectangular shape of the keyboard 2  
but its depth somewhat exceeds that of the keyboard. In a  
25 simple version, this basic plate, which may be made from  
thin sheet-metal or plastics, could be bent at its front  
edge so as to form the rearwardly directed flange 6 at a  
level above the plate. In the exemplified version it is  
preferred, however, to manufacture the flange 6 as a  
30 separate front piece, which in turn is connected to the  
plate 5 in any suitable manner. For this reason, the  
plate 5 is in this case formed with a secondary flange 7  
spaced a predetermined distance rearwardly from the front

edge 8 of the plate. When the separate front piece is applied on the plate, a space 9 is delimited underneath the flange 6, the rear border portion of the primary flange 6 covering the secondary flange 7. The front  
5 border portion 3 of the keyboard may be received in said space when the keyboard is applied on the bottom plate 5 (in a manner identical to that described with respect to the keyboard accessories mentioned in the introduction). At both opposed ends of the flange 6 transverse end walls  
10 10 preferably are formed. The upper face of the flange 6 serves as a supporting face on which the two wrists of the operator may rest while his fingers manipulate the various keys. A grid pattern 11 indicates that the external face of the flange advantageously may be covered  
15 by a suitable soft material for contact with the operator's wrists.

In the flange 6, between spaced-apart lateral edges 12, 13, a recess 14 is formed, which in the shown embodiment is placed opposite the space bar 4 as the  
20 accessory is connected to the keyboard. For this purpose, the delimiting lateral edge 12 is located at a comparatively short distance from the left-hand end of the flange 6 whereas the distance from the lateral edge 13 to the right-hand end of the flange is considerably  
25 larger. Although it would be conceivable to delimit the recess 14 by means of simple vertical walls adjoining the edges 12, 13, in the preferred embodiment the recess is formed in a separate casing 15 mounted between the lateral edges 12, 13.

30 A control roller 18 is supported in bearings 16, 17 on each side of the recess 14, said roller arranged in a manner known per se not only for turning or rotational movements but also for axial movements to and fro



relative to the recess. The bearings 16, 17 as well as the control roller 18 essentially are cylindrical in shape. In practice, the roller 18 advantageously may be formed from a thin-walled and thus lightweight cylinder tube. At its right-hand end the control roller 18 is connected to a device, generally designated by numeral 19, serving to decode or sense the various axial and angular positions of the roller. Together with the roller, this device 19 is housed in the space 9 underneath the flange 6. More precisely, the decoding device 19 is positioned in the comparatively long space available to the right of the right-hand delimiting edge 13 of the recess 14. The nature of the decoding device 19 will be described in closer detail further on with reference to Fig 4.

The length of the control roller 18 should be at least double the width of the recess 14 to allow the roller to bridge the recess at all times, irrespective of whether the roller is moved to an end position to the left of the recess or to an end position to the right thereof. Together with the decoding device 19 the control roller serves to effect displacement of a pointer between different coordinate positions on the screen of a monitor (not shown), which is coupled to a computer or PC unit (not shown) controlled by the keyboard. In the immediate vicinity to the control roller 18 two click buttons 20 are arranged in the recess 14, said keys in the conventional way serving to effect for instance commands or other processing operations associated with the signs or symbols shown on the monitor screen. Although it is possible to position the click buttons 20 in front of the roller 18, the preferred position in accordance with the shown example is behind the roller. When the accessory is

connected to the keyboard, the click buttons 20 therefore will be located between the control roller and the space bar 4 on the keyboard. In this connection should also be pointed out that the width of the recess 14 - calculated  
5 as the distance between the delimiting edges 12, 13 - does not significantly differ from the length of the space bar 4.

Reference is now made to Figs 3 and 4 illustrating the structure of the decoding device 19. To the control  
10 roller 18 is connected an accompanying carrier 21, which is axially displaceable along a guide 22 which extends in parallel with the roller and which is fixed relative to the accessory 1, for example by being attached to the bottom plate 5. In the shown example, the guide 22 is a  
15 straight guide rail configured as an I-iron. Parts of the carrier 21 grips the rail 22, such that the carrier may slide along the rail via suitable bearings, such as slide bearings. The roller 18 is connected to the carrier 21 via a centre pin 23, which projects from an end wall 24  
20 on the roller and is mounted in a thrust bearing 25, which on the one hand allows the pin together with the roller to rotate but on the other prevents axial relative movements of the roller and the carrier.

Two decoders 26, 27 are mounted on the carrier, the  
25 first one of which co-operates with a disc 28 mounted on a first rotatable shaft 29 that extends in parallel with the roller and mechanically engages the latter so as to be forced to rotate in response to the rotation of the roller. In the shown example, the shaft 29 engages the  
30 roller via a frictional coupling in the form of a resilient ring 30, such as an O-ring, which is mounted on the cylinder face of the roller and which is kept pressed against a rough race face 29' formed on the shaft and

offering good frictional contact. Indexing marks on the disc 28 allow the decoder 26 to read, in the conventional manner, the momentary angular position of the roller.

The second decoder 27 co-operates with a disc 27  
5 mounted on a second shaft 32 extending at right angles to the longitudinal extension of the roller and mechanically engaging the rail 22 so as to be rotated in response to the the axial displacements backwards and forwards of the carrier and the roller along rail. In this example, also  
10 the connection between the shaft 32 and the rail 22 is by means of a friction coupling in the form of a rubber cover 32' or the like arranged on a part of the shaft that abuts against the rail 22. By means of a printed circuit card 33 and a cable 34, the two decoders 26, 27  
15 are electrically connected to the control unit of the computer in order by means thereof to shift the monitor screen pointer between various coordinate positions.

#### Functions and Advantages of the Invention

20 When working with the keyboard 2 such as the latter is applied to the inventive accessory 1, the operator's hands and fingers are able to move in an ergonomically purposeful manner, because the wrists may rest on the flange 6 on either side of the recess 14. For example, by  
25 means of the thumb of one of his hands, the operator may rotate and/or axially displace the control roller 18 between different set positions in order to produce different desired coordinate pointer positions, during which operation the wrists may be supported on the flange  
30 in much the same way as when the other fingers manipulate the keys of the keyboard. Thus, the control roller 18, serving as a pointing device, is available in close proximity to the frequently used space bar 4.

Consequently, the disadvantages inherent with the use of a separate pointing device located laterally of the keyboard are eliminated. In addition, the click buttons 20, essential to the work to be performed with the computer, are accessible in close proximity to the control roller as well as to the space bar. An essential advantage obtained with the invention is that the described decoding device 19 provides a technically simple solution to the problem of transferring to the control unit of the computer, information on the momentary position of the control roller, during which operation not only the decoding device itself but also the part of the control roller that does not need to be in contact with the operator's fingers is housed in and protected inside the space 9 below the flange 6 that serves as a support to the operator's wrists.

Consequently, only the part of the roller 18 that is required for manipulation by means of the fingers is exposed in the recess while other parts are hidden inside said space. Because the two decoders forming part of the decoding device are mounted on a common carrier that accompanying the control roller, the rotational and translating movements of the roller may be transferred in a precise manner to the respective decoder. With respect to existing keyboards of conventional type the inventive accessory constitutes not only an excellent wrist support but also offers convenient possibilities of operating the pointing device as well as the click buttons without the operator having to let his fingers leave the basic finger positions of the well-known touch-method typing system, when he wishes to effect respectively displacement of the pointer and transfer of commands to the control unit and the screen.

Reference is now made to Figs 5 and 6 illustrating a further development of the inventive accessory. In this case the wrist-supporting flange 6 generally is deeper than the flange described previously. In the area in front of the recess 14 housing the control roller 18 the flange is designed with two softly curved sections 35 the right-hand one of which merges into a straight section 36, which is essentially parallel to the rear straight edge 37 of the flange. Precisely in the area of the bow-like curved sections 35 the wrist-supporting part of the accessory may have a depth of 150-160 mm, calculated as the distance from the rear edge 37 of the flange to the front edge 38. In this case, the flange 6 itself is parallel with the bottom plate 5 and merges at its front with a slanting front wall 39. The angle of inclination of said front wall advantageously amounts to about 45°, and the transition between the flange and the front wall is formed by a softly rounded border portion 40. The vertical spacing from the flange 6 to the bottom plate 5 in practice could amount to 25-30 mm. The depth or spacing between the right wall portion 36 and the rear edge 37 of the flange in practice could be in the range of 100-120 mm.

In the embodiment shown in Figs 5 and 6, the recess 14 is located closer to the centre of the accessory than in the case of the embodiment of Figs 1-4, the recess being located somewhat to the right relative to the space bar 4. This arrangement means that the exposed part of the control roller 18 is located closer to the number keys that are located to the right on the keyboard.

Adjacent the control roller 18 two pairs of click buttons 20' and 20'', respectively, are provided. Of these buttons, the left button 20' of the left pair of buttons

has a function identical to that of the right button 20' of the right pair of buttons just like the right button 20" of the left pair of buttons has a function identical to that of the left button 20' of the right pair of  
5 buttons. In other words, for one and the same click function may be used either a key of the left pair of buttons operable by the left hand or an analogous key of the right pair of buttons operable by the right hand, all depending on which hand the operator wishes to use. In  
10 the same manner as in the case of the embodiment of Figs 1-4 these click buttons 20', 20" are located behind the control roller 18. In addition, in front of the control roller 18 is also arranged a centrally placed scroll  
15 roller 41 by means of which rows of text appearing on the display screen in question may rapidly be moved upwards or downwards on the screen. The scroll roller could also be placed elsewhere, for instance behind the control roller.

In the same manner as in the case of the previously  
20 described embodiment, the control roller 18 is connected at one of its ends to a decoding device (not shown) of the kind described with reference to Fig 4.

#### Possible Modifications of the Invention

25 The invention is not limited to only the embodiments described in the foregoing and shown in the drawings. For instance, instead of a simple rail it is possible to use other guide devices for the carrier of the decoding device. Thus a U-shaped profile section could be used,  
30 which is fixed to the bottom plate of the accessory, the spaced-apart flanges of the U-section serving as tracks on which run the wheels of a carrier designed as a carriage. In addition, the shape and dimensions of the

accessory may differ from those exemplified in the drawings. For example, the length of the wrist-supporting flange need not, as not either the length of the bottom plate itself, necessarily agree with length of the

5 keyboard. In special versions, designed for operators that frequently execute calculating operations rather than word-processing operations, the recess could be positioned considerably closer to the right-hand end of the accessory in order to minimise the distance between

10 the control roller and the number keys of the keyboard.

## CLAIMS

1. A wrist-supporting accessory for keyboards (2) of the kind that co-operate with a computer and a monitor and that comprise a set of keys surrounded by free border portions (3) on the keyboard, said accessory being  
5 configured as a plate (5), which is attachable underneath the keyboard and which is formed at its front with a rearwardly directed flange (6) below which is delimited a slot-shaped space (9) for reception therein of the front  
10 border portion (3) of the keyboard, the upper face of said flange (6) designed to support the operator's two wrists, a recess (14) delimited by spaced-apart lateral edges (12, 13) being formed in said flange (6) to house a control roller (18) extending inside the space below the  
15 flange (6), said control roller (18) arranged for rotational as well as axial movements and for co-operation with a device (19) mounted in the space below the flange (6) for decoding the momentary axial and angular positions of the roller, said decoding device  
20 being electrically coupled to the computer to displace a pointer between different coordinate positions on the monitor screen base in response to said roller positions, characterised in that with one end of the control roller (18) is connected a carrier (21) which  
25 accompanies the roller and supports the decoding device (19), said carrier arranged for movement axially along a guide (22) extending parallel with the roller and fixed relative to the accessory (1), said decoding device (19) comprising two decoders (26, 27) the first one (26) of  
30 which co-operates with a disc (28) mounted on a first rotatable shaft (29), which extends in parallel with the roller and mechanically engages said roller in order to be forced to rotate in response to the rotation of the



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roller, and the second (27) one of which co-operates with a disk (31) mounted on a second rotatable shaft (21), which extends at right angles to the longitudinal axis of the roller and mechanically engages the guide (22) to be  
5 rotated in response to displacement movements of the carrier and the control roller backwards and forwards along the guide.

2. An accessory as claimed in claim 1, c h a r a c  
10 t e r i s e d in that the guide consists of a straight guide rail (22), which extends between the recess (14) and the area of one end of the flange (6) and on which rail the carrier (21) is axially displaceable in a sliding manner.

15

3. An accessory as claimed in claim 1 or 2, c h a r  
a c t e r i s e d in that the control roller (18) is connected to the carrier (21) by means of a central pin (23) projecting from one end of the roller and being  
20 mounted in a thrust bearing (25), said bearing on the one hand allowing rotation of the pin and the roller relative to the carrier but on the other hand preventing axial relative movements between the roller and the carrier.

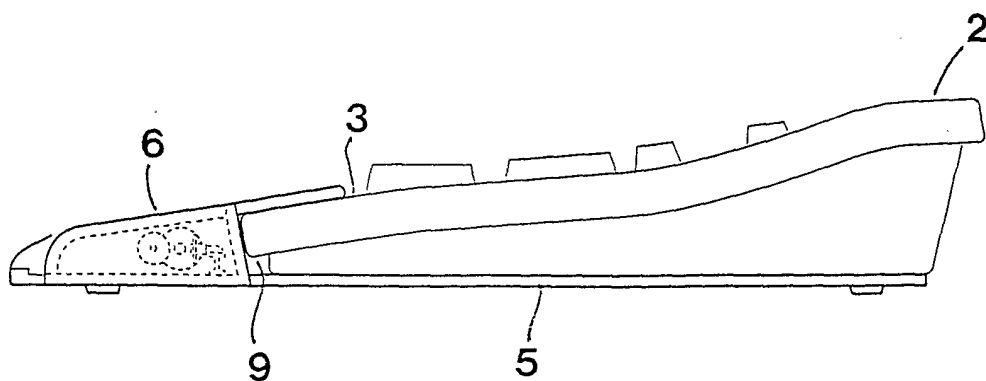
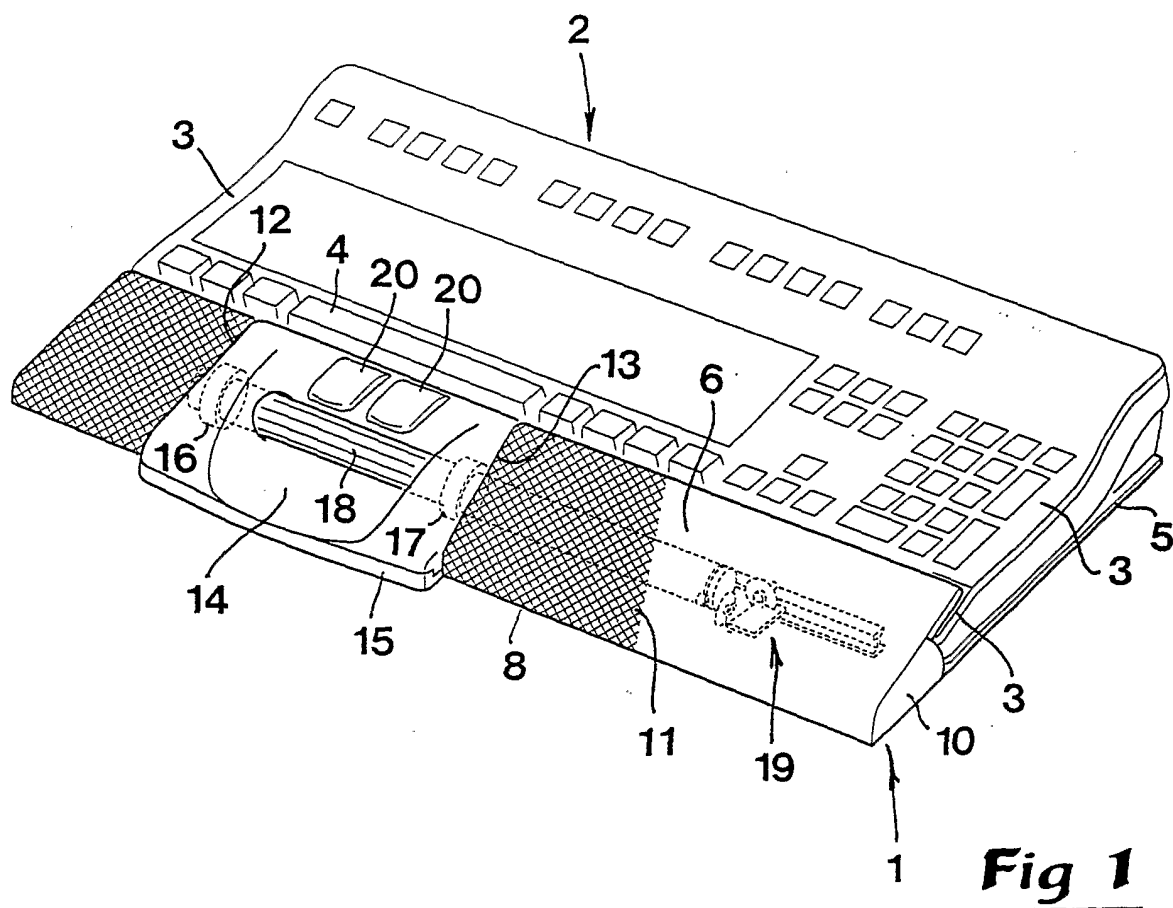
25 4. An accessory as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that said first rotatable shaft (29) engages the control roller (18) via a friction coupling in the form of a resilient ring (30), which is formed on the cylinder face of the  
30 control roller and which is kept pressed against a rough race face (29') arranged on the shaft.

17

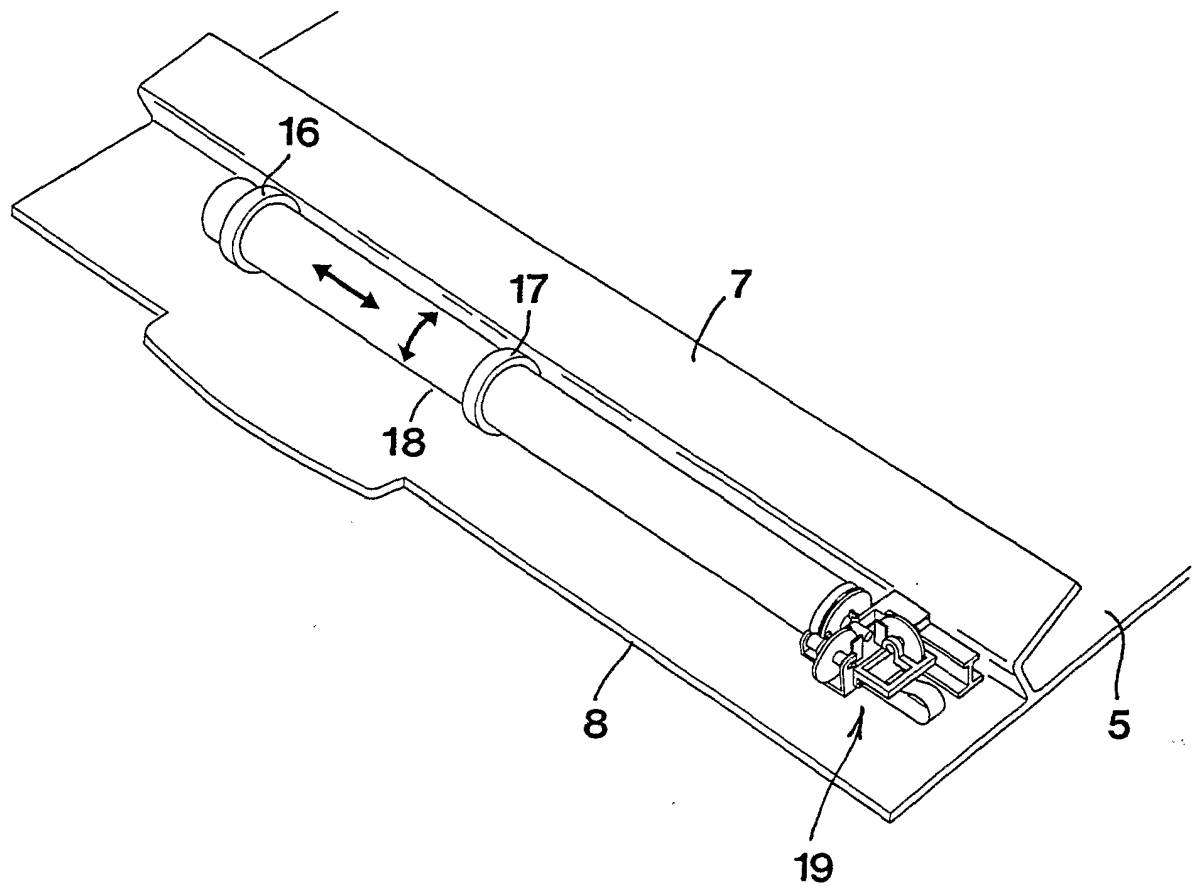
5. An accessory as claimed in any one of the preceding claims, characterised in that the length of the control roller (18) is at least twice the width of the recess (14) to ensure that the control  
5 roller bridges the recess at all times, irrespective of whether it is moved to an end position to the left of the recess or to an end position to the right of said recess.

6. An accessory as claimed in any one of the  
10 preceding claims, characterised in that click keys (20) for effecting commands or the like are positioned behind the control roller (18) so as to be accessible to the operator's fingers in the area between the roller (18) and the front row of keys on the keyboard  
15 during work with the computer.

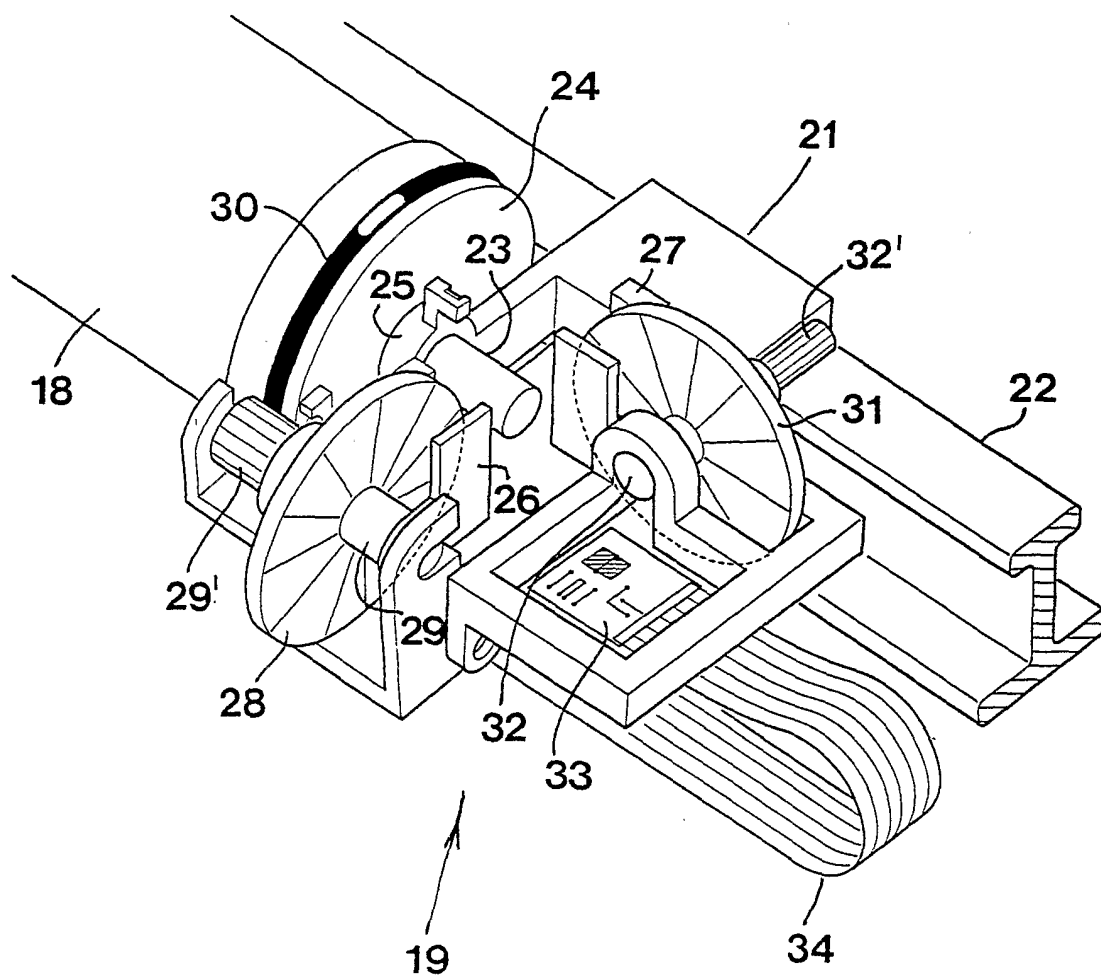
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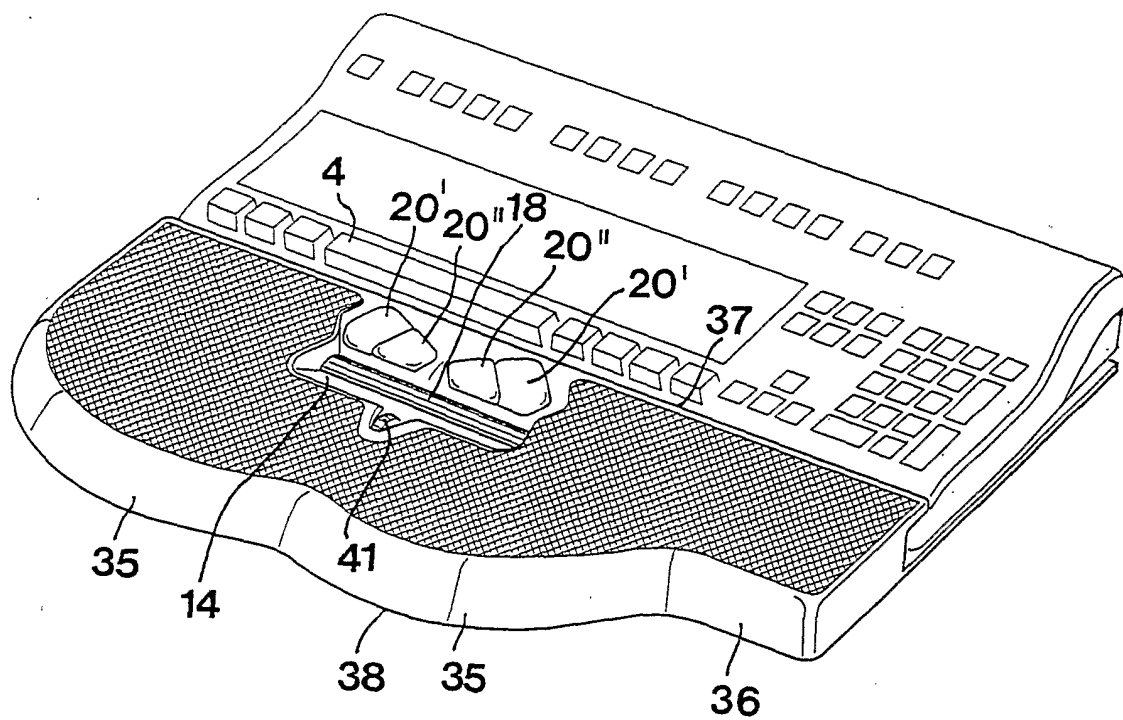
2 / 4

**Fig 3**

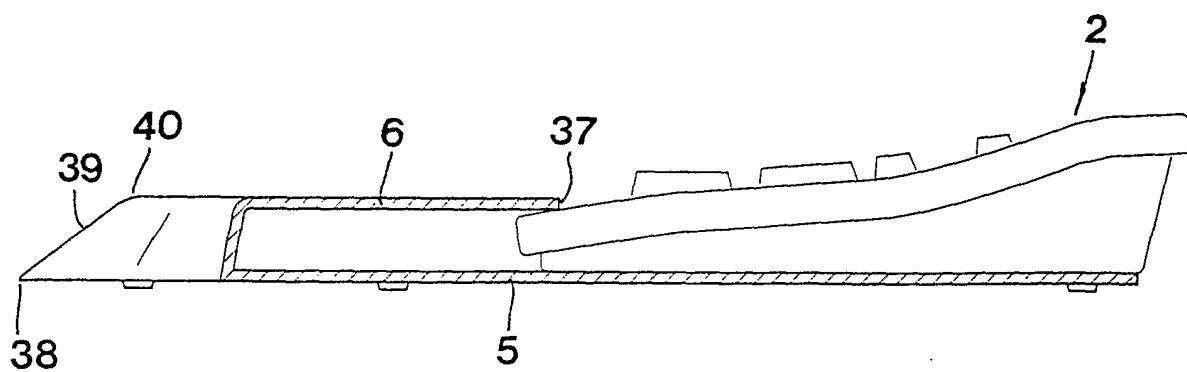
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**Fig 4**

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**Fig 5**



**Fig 6**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/01249

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B41J 5/10, G06K 11/18, 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, G06K, B41J

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)

EPO-INTERNAL

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5126723 A (S.L.LONG ET AL.), 30 June 1992 (30.06.92), column 4, line 58 - column 5, line 35, figure 6 --	1-6
A	WO 9829946 A1 (K.K.LI), 9 July 1998 (09.07.98), figures 1B,2, abstract --	1-6
A	US 4712101 A (C.F.CULVER), 8 December 1987 (08.12.87), figures 3,7b, abstract -- -----	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents:

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Information on patent family members

03/09/01

International application No.

PCT/SE 01/01249

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