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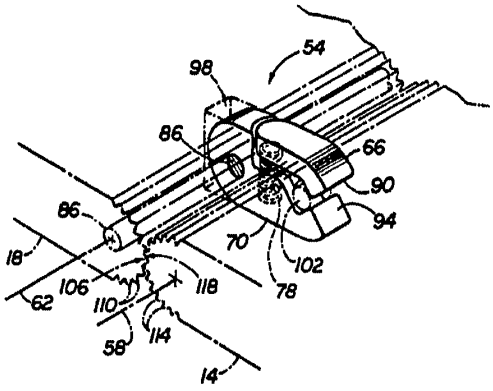
(71)(72) Applicant and Inventor: LANE, Jeffrey, P. [US/US]; 395 Otter Creek Court, Atlanta, GA 30328 (US).

(74) Agents: PRATT, John, S. et al.; Kilpatrick & Cody, Suite 2800, 1100 Peachtree Street, Atlanta, GA 30309-4530 (US).

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(57) Abstract

A modular, reconfigurable system designed to permit coupling and decoupling of devices or components (14, 18) of varying types, including portable computers or other electrical devices, is disclosed. The system also is adapted to rotate about two adjacent, parallel axes (58, 62) permitting components to be positioned throughout approximately 0-360 degrees. The components (14, 18) are coupled by a connector (54).

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MODULAR, RECONFIGURABLE DEVICES

FIELD OF THE INVENTION

This invention relates to modular devices and more particularly to reconfigurable portable computers and other electronic or similar apparatus.

BACKGROUND OF THE INVENTION

Technological advances in the computing, electronics, and telecommunications industries have created devices useful to an ever-expanding number of users in a wider variety of operating situations. Increased memory capacities, processing speeds, and telecommunications capabilities of "portable" computers, for example, have combined with decreased size and weight to contribute to greater use of these devices. The advent of multi-media apparatus and component commonality has also augmented the usefulness of many electronic devices, as has rapid improvement in quality and capability of individual components. These rapid improvements to components of an overall device have contributed to consumers desiring periodically to upgrade their systems merely by purchasing the improved components. Consumers also appear eager for access to reconfigurable components to meet the requirements of the varied locations and situations in which the components operate. Many existing electronic systems have components which can neither be decoupled nor reconfigured, however, and thus fail to address these and other consumer needs.

U.S. Patent No. 5,103,376 to Blonder (incorporated herein in its entirety by this reference), for example, provides a laptop computer having keyboard and display portions whose

positions relative to a user can be reversed. The computer includes a pair of dual-pivoting hinges, each capable of rotation about respective pins, to permit the reversal. According to the Blonder patent, however, the reversing portions are designed merely to facilitate information entry via both the keyboard and a graphics pen associated with the computer. As a result, neither the keyboard nor display is detachable from the remainder of the device, and their reconfigurability is severely limited.

U.S. Patent No. 5,034,858 to Kawamoto, et al., also incorporated herein in its entirety by this reference, discloses electronic equipment having a separable keyboard. The equipment also includes a display that can be both rotated about an axis and tilted into place about a perpendicular axis for use. As with that disclosed in the Blonder patent, however, the display cannot be detached from the main equipment body. Additionally, neither the Blonder nor Kawamoto patent contemplates rotation about two adjacent, parallel axes to permit reconfiguration of components throughout approximately 0-360°.

SUMMARY OF THE INVENTION

The present invention, by contrast, provides a modular, reconfigurable system designed to permit mechanical (and, if necessary, electrical) coupling and decoupling of devices or components of varying types. Because system elements can be decoupled, consumers can upgrade individual components as desired without having to purchase an entirely new system. Component redundancy can also be decreased, as a single electronic display, for example, can be coupled for use not only with computers but with appropriate audio-visual or

telecommunications equipment as well. In essence, the invention permits a user to "mix and match" electronic or other devices and components as needed.

The innovative system also is adapted to rotate about at least two adjacent, parallel axes. Consequently, the present invention permits components to be repositioned about each other throughout approximately 0-360°, allowing use of a visual display not only in a standard laptop computer format but also in formats facilitating use of the display as, for example, a television or telecommunications monitor or a pen-based computing tablet.

It is therefore an object of the present invention to provide a system composed of reconfigurable modules.

It is another object of the present invention to provide a modular system permitting coupling and decoupling of devices and components, particularly electronic devices and components.

It is also an object of the present invention to provide a system having two adjacent, parallel axes of rotation to facilitate component rotation about approximately 0-360°.

Other objects, features, and advantages of the present invention will become apparent with reference to the remainder of the written portion and the drawings of this application.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an exemplary modular device incorporating the technology of the present invention shown in a nominally "open" position.

FIG. 2 is a perspective view of the device of FIG. 1 shown in a nominally "closed" position.

FIG. 3 is a fragmentary perspective view of a connector of the present invention.

FIG. 4 is a cross-sectional view of the connector of FIG. 3.

FIGS. 5-9 are a series of fragmentary side cross-sectional views of the device of FIG. 1 shown in various configurations.

FIG. 10 is a perspective view of the device of FIG. 1 having a support.

FIG. 11 is an exploded perspective view of a mechanism connected to the support of FIG. 10.

FIGS. 12-13 are a series of side elevational views of the device of FIG. 10 shown in various configurations.

FIG. 14 is a perspective view of an alternate coupling mechanism forming part of the present invention.

FIG. 15 is a perspective view of an alternate exemplary modular device incorporating the technology of the present invention shown in a nominally "open" position.

FIG. 16 is a perspective view of the device of FIG. 15 shown in a nominally "closed" position.

FIG. 17 is a perspective view of the device of FIG. 15 illustrating a coupling mechanism.

FIG. 18 is a perspective view of the device of FIG. 15 illustrating an alternate coupling mechanism.

FIGS. 19-28 are a series of side elevational views of an exemplary modular device incorporating the technology of the present invention shown in various configurations.

FIG. 29 is an elevational view of a position indicator that can be incorporated in the modular devices of the present invention.

DETAILED DESCRIPTION

FIGS. 1-2 illustrate generally an exemplary modular device 10 consistent with the present invention. As shown in FIG. 1, device 10 may be a portable computer comprising first module 14 (e.g. a keyboard) and second module 18 (e.g. a display). Also appearing in FIG. 1 are disk 22, a magnetic storage device which may be loaded into port 26, and compact disc 30 (which may be loaded into another port not shown in FIG. 1). An electronic mouse or other pointer 32 adapted to convert manual pressure to electronic signals capable of moving a cursor about the visual display 35 provided by second module 18 may also be included, as may video camera 34. FIG. 1 illustrates device 10 in a nominally "open" position permitting access both to visual display 35 and keys 36, while FIG. 2 shows device 10 in a nominally "closed" position. Torque-generating device 37, such as a spring, is designed to retain second module 18 in a selected position relative to first module 14 when device 10 is in use.

Also shown in FIG. 1 (and FIG. 29) as part of second module 18 is position-indicating mechanism 38. Mechanism 38 includes a moveable conductor 42 (such as liquid mercury) in a spherical cavity 46 having contacts 50 spaced about its periphery. Conductor 42 responds via gravitational forces to spatial reorientation of mechanism 38 by moving relative to contacts 50 (to contact at least one contact 50 to close its respective circuit). Including mechanism 38 as a component of either first or second modules 14 or 18 would thus permit it to indicate the spatial orientation of that module. Doing so would also allow mechanism 38 to assist device 10 (and its associated software) in determining, for example, whether the information

to appear on visual display 35 should be in "landscape" or "portrait" position as the visual display 35 is spatially configured, the direction in which to move a curser of second module 18 when a visual display, or whether to render keys 36 of first module 14 inoperable when unused.

One or more connectors 54 operate to attach first and second modules 14 and 18. As shown in FIG. 3, for example, first module 14 defines a primary axis of rotation 58, while second module 18 defines a corresponding primary axis of rotation 62 parallel to axis 58. In some embodiments of device 10, the size of connector 54 is designed to be approximately equal to the combined thicknesses of first module 14 and second module 18. As a result, in these embodiments the size of connector 54 is significantly less than the length of either first module 14 or second module 18, placing parallel axes 58 and 62 essentially adjacent each other. Connector 54 mechanically couples first module 14 and second module 18 and can provide electrical coupling of the modules as well. Alternatively, first and second modules 14 and 18 may be coupled electrically using conventional means.

FIGS. 3-4 detail connector 54 of the present invention. Connector 54 comprises (moveable) leg 66, (fixed) leg 70, pin 74, and spring 78 and defines tube 82 for permanently receiving axle 86 embedded within second module 18. Leg 66 is designed to pivot about pin 74, with its flared end 90 biased by spring 78 toward a similar flared end 94 of leg 70. As a consequence, legs 66 and 70 of connector 54, when fitted into slots 98 of first module 14, snap, or clamp, onto axle 102 of that module and thereby connect first and second modules 14 and 18. The camming action of connector 54

forces axles 82 and 94 toward each other, facilitating attachment of the modules.

Edge 106 of second module 18 may also include teeth 110 which are complementary to and designed to engage corresponding teeth 114 of edge 118 of first module 14. If present, teeth 110 and 114 permit more consistent rotation of first and second modules 14 and 18. Engaging the teeth 110 and 114 also permits use of a torque-generating device 37 in only one of first and second modules 14 and 18, providing a commensurate savings in space, weight, and cost. Use of teeth 110 and 114 may also reduce stress on connectors 54, stabilizing device 10 when in use by supporting the upper of first or second modules 14 or 18 along a greater length of the lower of axes 58 or 62. Teeth 110 and 114 additionally provide a convenient hand-grip surface for carrying first and second modules 14 and 18 when device 10 is configured as in FIG. 2.

Although slots 98 are shown in FIGS. 1-3 as formed at edge 118 of first module 14, they may additionally or alternatively appear along other edges or portions of first module 14 (e.g. slots 98A of FIG. 1). If so placed, the slots would permit device 10 to be configured in other ways, including, for example, as illustrated in FIGS. 22-23. Connector 54 could, moreover, be permanently connected to axle 102 rather than axle 86 or not permanently connected to either.

FIGS. 5-9 show first and second modules 14 and 18 of device 10 in various configurations accessible using the present invention. FIG. 5 shows second module 18 in an unrotated, or nominally closed, position relative to first module 14, placing the first and second modules 14 and 18 in parallel planes respectively intersecting axes 58 and 62. This position protects visual display

35 and keys 36 from damage by securing them within the interior of device 10. FIG. 6, by contrast, illustrates second module 18 rotated about axis 62 to form an obtuse angle relative to first module 14 (described above as a nominally "open" position), positions representative of those assumed by the displays and keyboards of many operating laptop computers.

FIG. 7 illustrates an alternative positioning, in which second module 18 has been rotated approximately 180° relative to first module 14 to expose visual display 35. In FIG. 8, the rotation of second module 18 exceeds 270°, useful particularly when only visual display 35 need be accessible. FIG. 9, finally, shows second module 18 rotated approximately 360° relative to first module 14 (or vice-versa), exposing visual display 35 for use as, for example, a tablet for pen-based computing. Providing an upper surface 120 for keys 36 of first module 14 essentially flush with (or not protruding beyond) its upper surface 121 reduces the likelihood of damage to keys 36 in this configuration.

FIG. 10 details support 122 that may be incorporated into device 10. Support 122 rotates away from second module 18 and is held in position by mechanism 126 either to brace second module 18 (see FIG. 12) or elevate, for instance, a keyboard used as first module 14 (see FIG. 13) to facilitate information or data entry. By positioning support 122 other than at edge 106 of second module 18, the edge 106 continues to be available for locating ports, jacks, or other useful or necessary devices. If present, knobs 128 of support 122 may be fitted into recesses 130, with key 134, spring 138, and tension-adjustment screw 142 of mechanism 126 utilized to retain them in place. As shown in FIG.

11, key 134 includes radial teeth 146 that engage similar teeth 150 on knob 128, with protrusion 154 of key 134 fitting into keyway 158 for rotational stability.

FIG. 14 details an alternative connector 162, such as a ball joint, of the present invention. Unlike connector 54, connector 162 permits rotation about an axis perpendicular to axes 58 and 62. This in turn increases the versatility of device 10, allowing a wider variety of possible configurations to be assumed without having to detach first and second modules 14 and 18.

FIGS. 15-19 illustrate more of the modular, reconfigurable nature of devices made according to the present invention. Shown in FIGS. 15-19 is device 210, which may include first, second, and third modules 214, 218, and 222, respectively. First and second modules 214 and 218 may be connected as described earlier or using either of the mechanical connectors 226 and 230 shown in FIGS. 17 and 18. If mechanical connectors 226 or 230 are employed, electrical connections between first and second modules 214 and 218 may be made using conventional ribbon cable 234, for example. Third module 222 may be connected to either first module 214 or second module 218 (and switched back and forth as desired), with slots 238 along edges 242 and 246 receiving connectors 250. Although keys 254 appear on first module 214 and visual display 258 is shown on second module 218, either or both modules could be electronic tablets, videotape or compact disc players, radios, television receivers, video game players, or other entertainment, educational, or scientific instrumentation modules. Among other devices conceivable as first, second, and third modules 214, 218, and 222 are communications modules

(including cellular telephones, portable facsimile, copying, scanning, and printing devices, digital dictaphones), digital still or video cameras, digital transducers and data recorders, bar-code readers, and other electronic equipment. FIG. 16 illustrates recess 260 formed when device 210 is nominally "closed," which provides an area to which a user can apply pressure when opening the device 210 manually.

FIGS. 19-28 detail various couplings of the first and second modules 14 and 18 (or 214 and 218) useful with the present invention. In the nominally closed position of FIG. 19, second module 18 is unrotated relative to first module 14, protecting visual display 35 of second module 18 from damage by securing it within the interior of device 10. FIG. 27 shows second module 18 rotated approximately 360° relative to first module 14 (or vice-versa), exposing visual display 35 for use as, for example, a tablet for pen-based computing. FIG. 21 illustrates an alternative positioning, in which second module 18 has been rotated approximately 180° relative to first module 14 to expose visual display 35. Other alternative positionings involving rotation of second module 18 about axis 62 are detailed in FIG. 20 (in which second module 18 is rotated more than 90° to provide a standard "desktop" orientation) and in FIGS. 25 and 28 (in which second module 18 is rotated more than 270°, when only the visual display 35 need be accessible).

FIG. 22, 23, and 24 detail additional alternative positionings of first module 14 and second module 18. Detaching connector 54 from first module 14 and reattaching it about a secondary axis 262 of that module (if first module 14 is adapted for such axis to be present) permits

device 10 to be configured as shown in FIG. 22, while thereafter detaching connector 54 from second module 18 and reattaching it about secondary axis 266 (again if that module is adapted to permit attachment about the axis) reconfigures device 10 as illustrated in FIG. 23. Similarly, reattaching connector 54 about secondary axis 266 of second module 18 while retaining its connection about axis 58 of first module 14 configures device 10 according to FIG. 24. FIG. 26, finally, illustrates the detachable mechanical connection between first module 14 and second module 18, permitting visual display 35 to be visible and device 10 to operate with merely an electrical connector 270 between the first and second modules 14 and 18.

The foregoing is provided for purposes of illustrating, explaining, and describing embodiments of the present invention. Modifications and adaptations to these embodiments will be apparent to those skilled in the art and may be made without departing from the scope or spirit of the invention.

I claim:

1. A modular, reconfigurable system comprising:
   a. a first electronic module defining a first axis of rotation;
   b. a second electronic module defining a second axis of rotation parallel to the first axis of rotation;
   c. means for connecting the first and second electronic modules; and
   d. means for retaining the second electronic module in a selected position relative to the first electronic module.

2. A system according to claim 1 in which the connecting means intersects the first and second axes of rotation and permits rotation of the second electronic module approximately 0-360° about the first electronic module.

3. A system according to claim 1 further comprising means for hindering the first electronic module from rotating about the first axis of rotation.

4. A system according to claim 1 further comprising means for hindering the second electronic module from rotating about the second axis of rotation.

5. A system according to claim 1 in which the connecting means comprises means for detachably connecting the first and second electronic modules.

6. A system according to claim 1 in which the first electronic module defines a secondary axis of rotation.

7. A system according to claim 6 in which the connecting means intersects the secondary axis of rotation.

8. A system according to claim 1 in which:
   a. the first electronic module comprises a curved surface radial to the first axis of rotation, which curved surface includes a plurality of first teeth; and
   b. the second electronic module comprises a curved surface radial to the second axis of rotation, which curved surface includes a plurality of second teeth complementary to and engaging the first teeth.

9. A system according to claim 1 in which the second electronic module comprises an integral position indicator, which position indicator comprises:
   a. a fluid conductor;
   b. a housing for the conductor, which housing:
      i. is adapted to permit the conductor to move responsive to reorientation of the second electronic module; and
      ii. comprises a plurality of electrical contacts, each adapted to contact the fluid conductor as a function of the orientation of the second electronic module.

10. A system according to claim 1 further comprising means, connected to the second electronic module, for supporting the first electronic module.

11. A system according to claim 10 in which the supporting means comprises:
    a. an extension adapted to rotate about the second axis of rotation; and
    b. means for retaining the extension in a selected position.

12. A system according to claim 1 in which the first electronic module:
    a. defines a surface; and
    b. comprises a keyboard having a plurality of keys, each key having:
        i. an upper surface not protruding beyond the surface of the first electronic module; and
        ii. a recessed portion for accommodating a fingertip of a user.

13. A system according to claim 12 in which the first electronic module further comprises an electronic cursor-moving device comprising:
    a. an upper surface flush with the surface of the first electronic module, for receiving pressure from the fingertip of the user; and
    b. means for translating the fingertip pressure into motion of an electronic cursor.

14. A system according to claim 1 further comprising means for selectively hindering the first electronic module from rotating about the first axis of rotation and in which the connecting means:
    a. intersects the first and second axes of rotation; and
    b. comprises means for detachably connecting the first and second electronic modules.

15. A system according to claim 14 in which the first electronic module defines a secondary axis of rotation and the connecting means intersects the secondary axis of rotation.

16. A system according to claim 14 further comprising means, connected to the first electronic module, for supporting the first electronic module, which supporting means comprises:
    a. an extension adapted to rotate about the first axis of rotation; and
    b. means for retaining the extension in a selected position.

17. A system according to claim 1 in which (1) the second electronic module defines a third axis of rotation perpendicular to the first and second axes of rotation and (2) the connecting means permits rotation of the second electronic module about the third axis of rotation.

18. A system according to claim 1 in which the connecting means comprises:

a. a fixed leg connected to the second electronic module and having a length and a recess;
b. a spring positioned within the recess;
c. a pin spanning at least a portion of the length of the fixed leg; and
d. a moveable leg contacted by the spring and adapted to pivot about the pin.

19. A system according to claim 11 in which the extension-retaining means comprises a key positioned within the second electronic module and having a surface adapted to engage the extension.

20. A system according to claim 1 in which the first electronic module comprises a generally curved surface radial to the first axis of rotation, which generally curved surface comprises a recess.

21. A modular system comprising:
a. a keyboard;
b. a visual display mechanically and electrically connected to the keyboard; and
c. a telephone mechanically connected to at least one of the keyboard and visual display.

22. A modular, reconfigurable system comprising:
a. a first module defining:
i. a first primary axis of rotation;
ii. a secondary axis of rotation; and
iii. a curved surface radial to the first primary axis of rotation,

which curved surface includes a plurality of first teeth;

b. a second module defining:
   i. a second primary axis of rotation parallel to the first primary axis of rotation; and
   ii. a curved surface radial to the second primary axis of rotation, which curved surface includes a plurality of second teeth complementary to and engaging the first teeth;

c. means, intersecting at least two of the first and second primary axes of rotation and the secondary axis of rotation, for detachably connecting the first and second modules;

d. torque-generating means for retaining the second module in a selected position relative to the first module;

e. means for selectively hindering the first module from rotating about the first primary axis of rotation; and

f. means, connected to the first module, for supporting the first module, which means comprises:
   i. an extension adapted to rotate about the first primary axis of rotation; and
   ii. means for retaining the extension in a selected position.

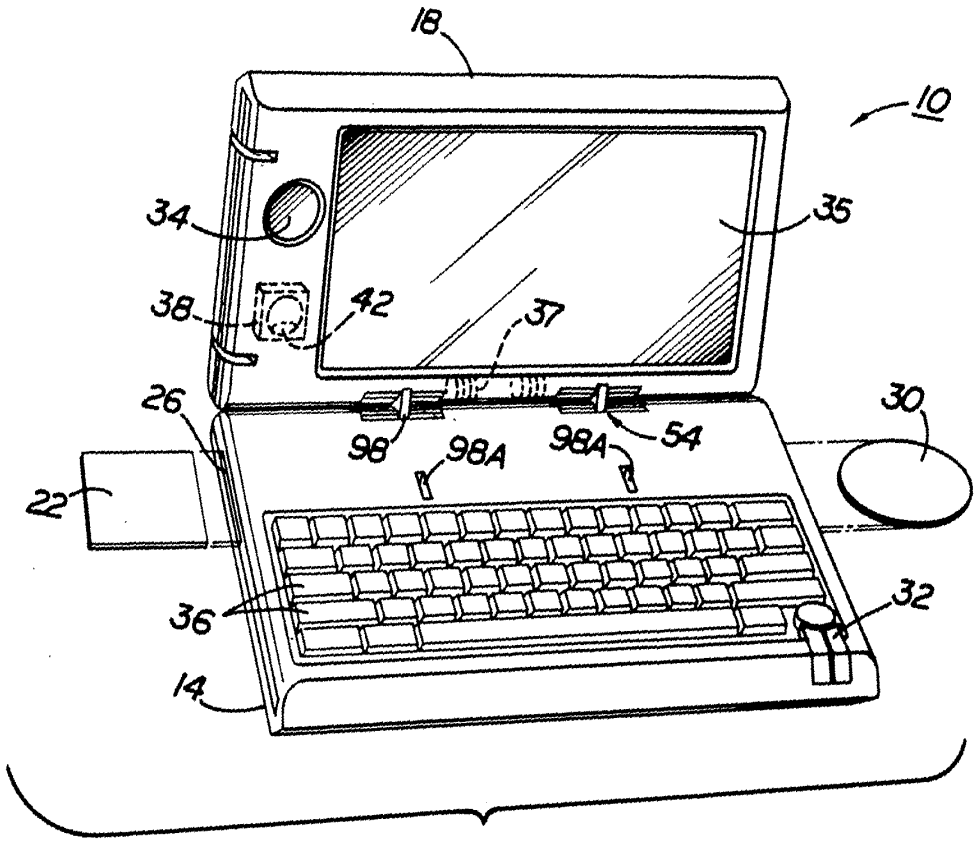


FIG 1

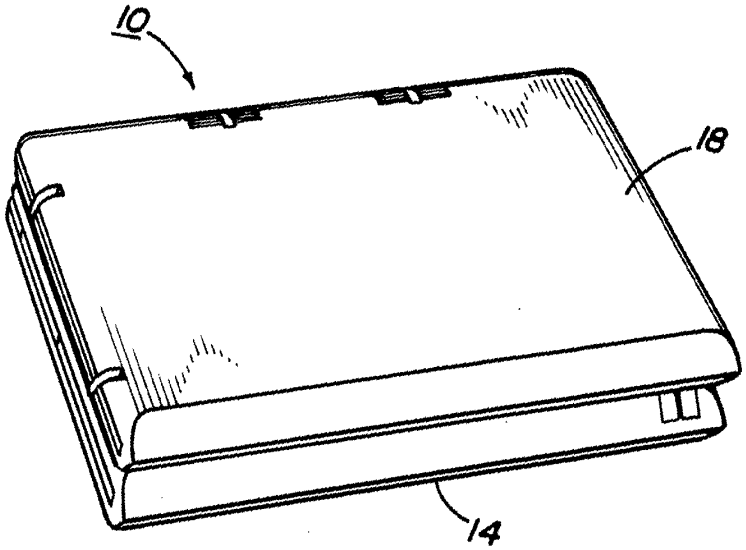


FIG 2

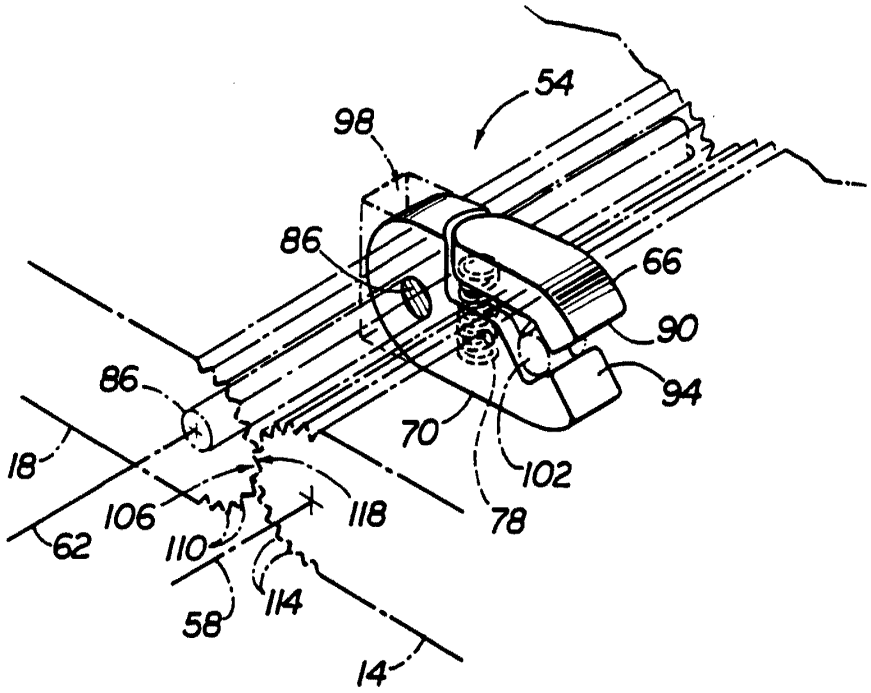

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FIG 3

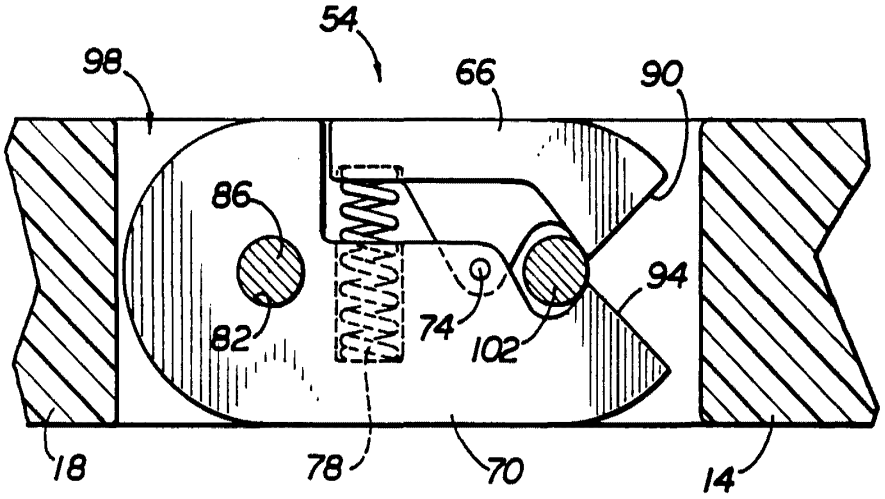

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FIG 4

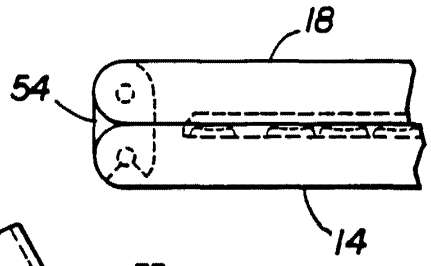


FIG 5

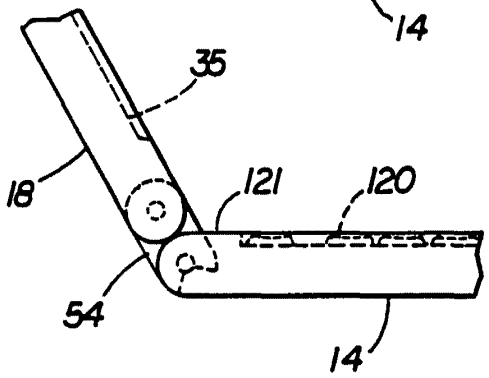


FIG 6

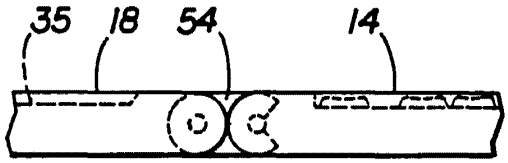


FIG 7

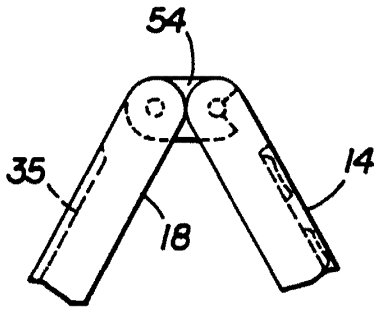


FIG 8

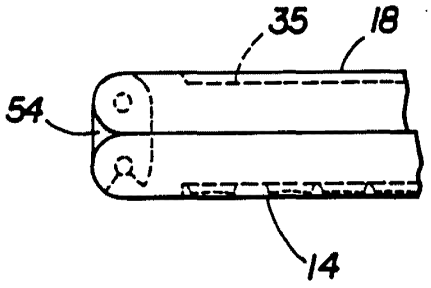


FIG 9

FIG 10

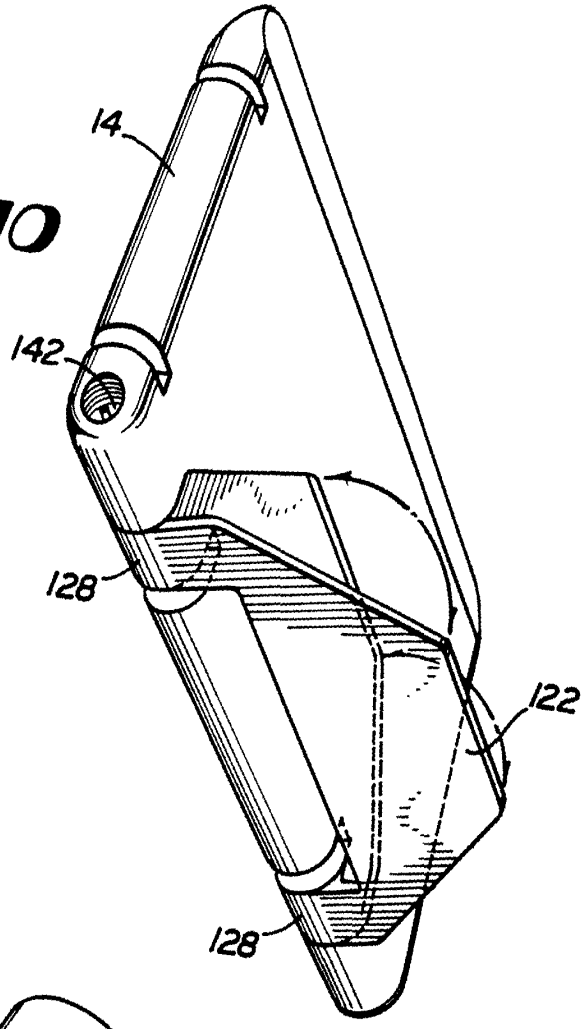
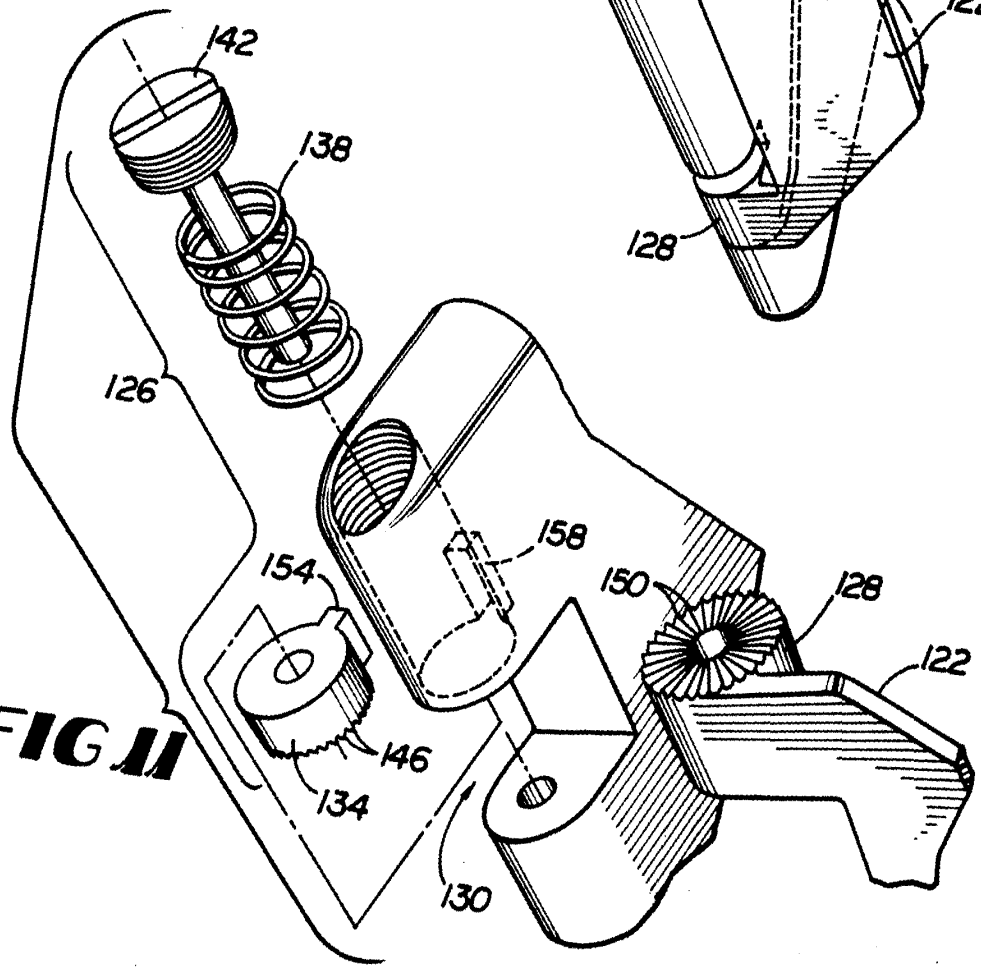


FIG 11



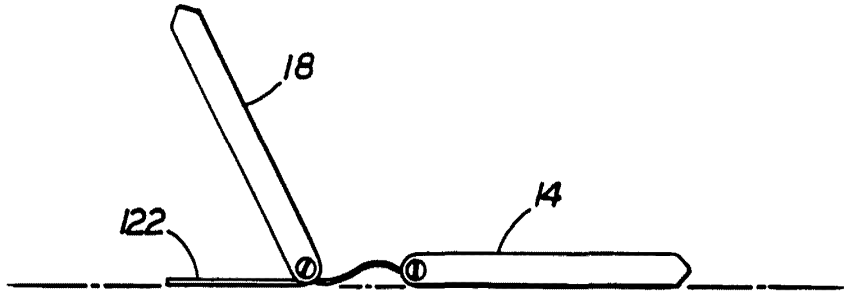


FIG 12

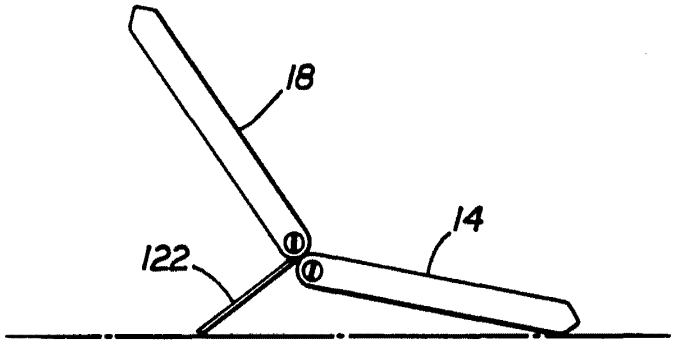


FIG 13

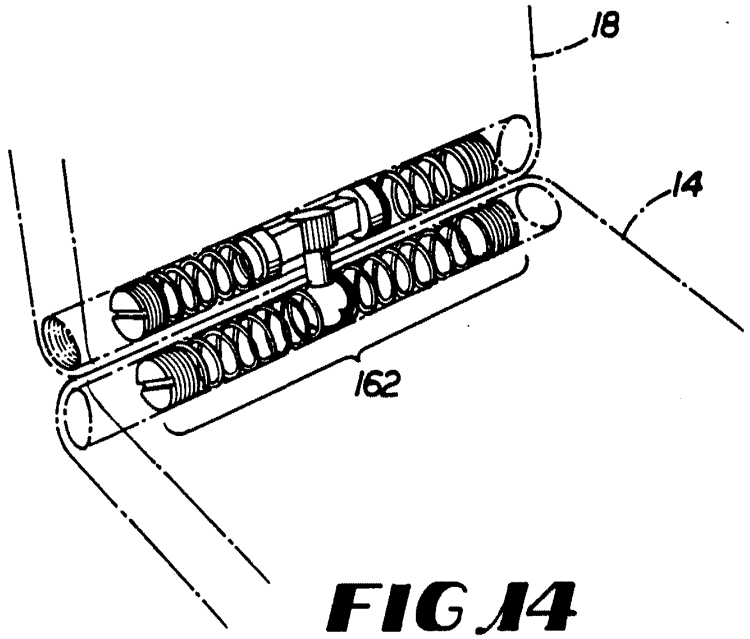


FIG 14

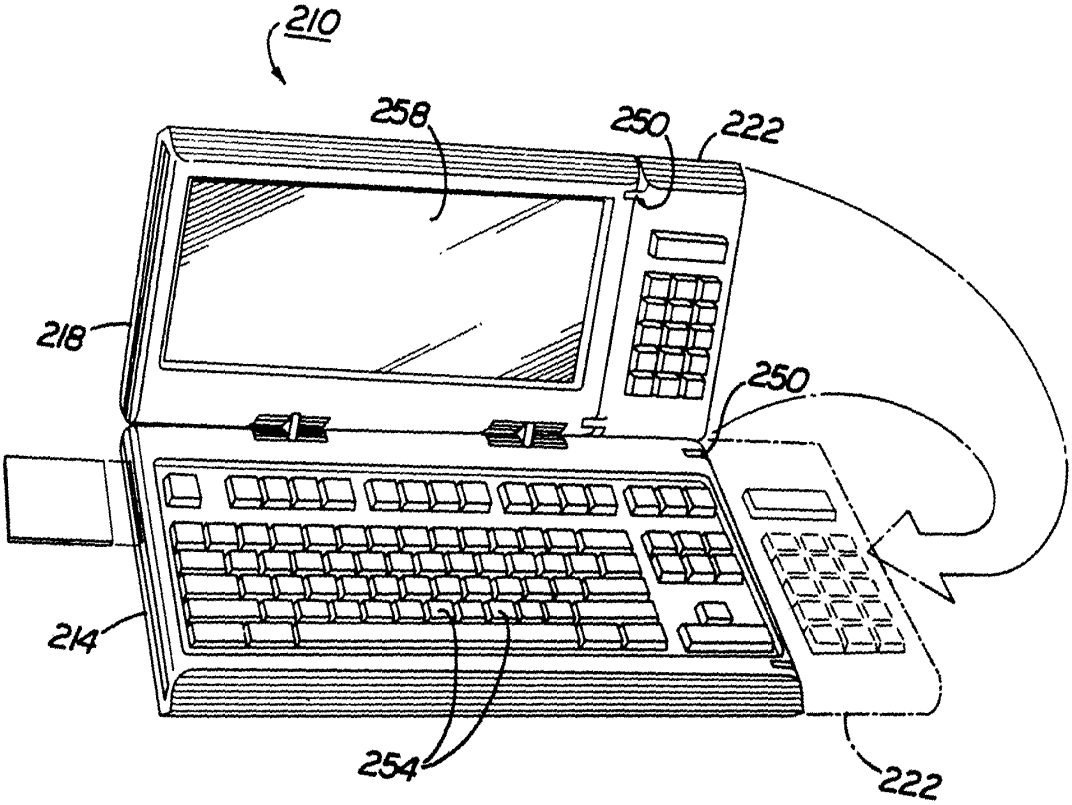


FIG 15

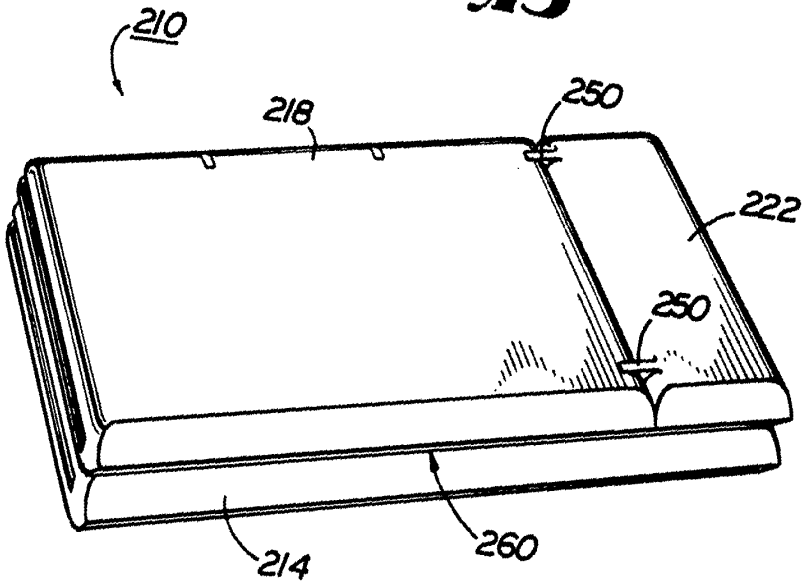


FIG 16

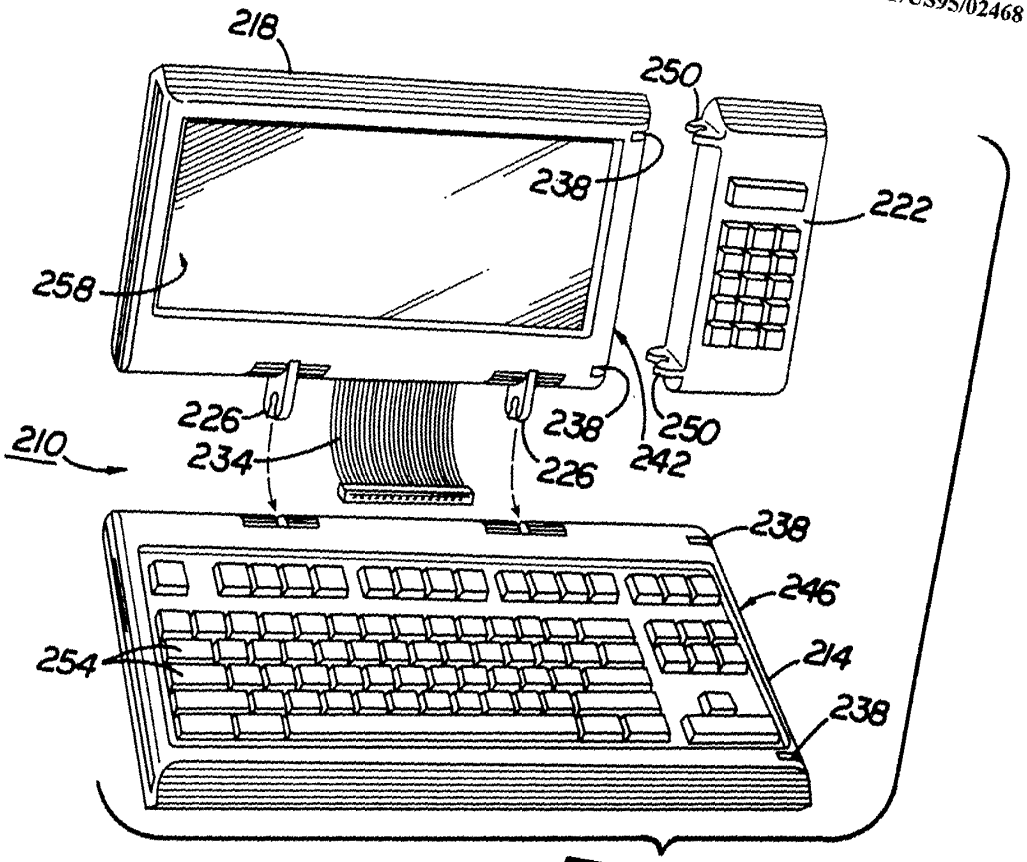

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FIG 17

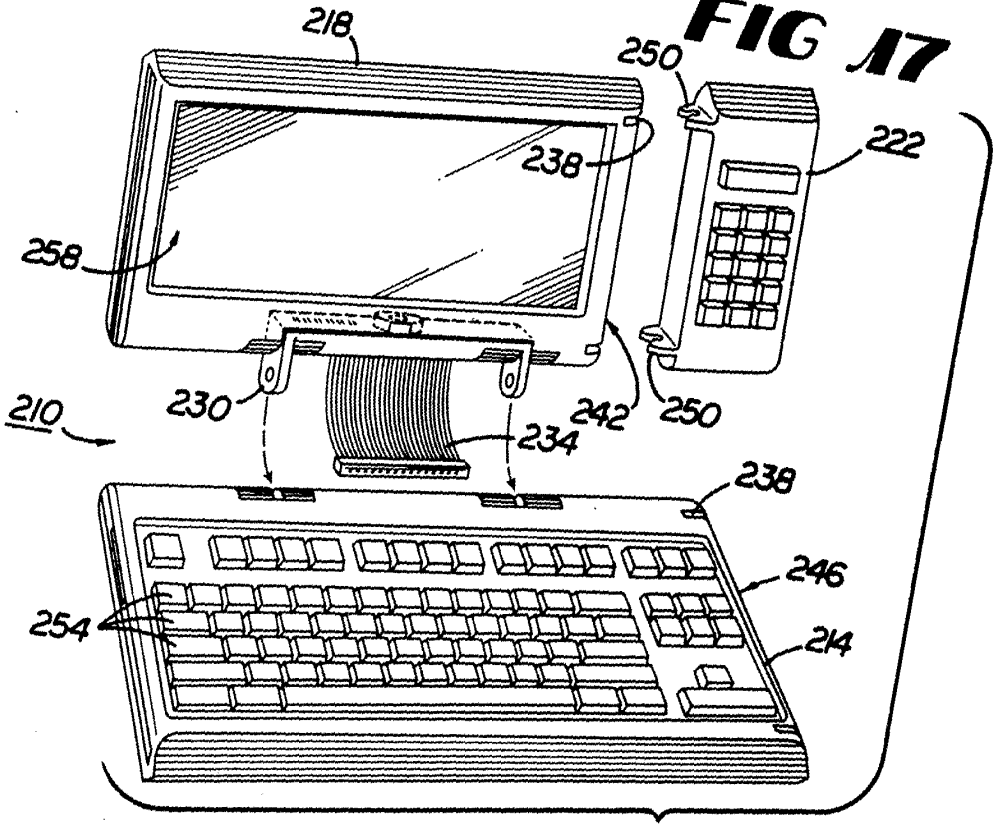

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FIG 18

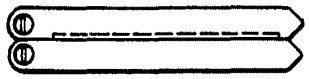


FIG 19

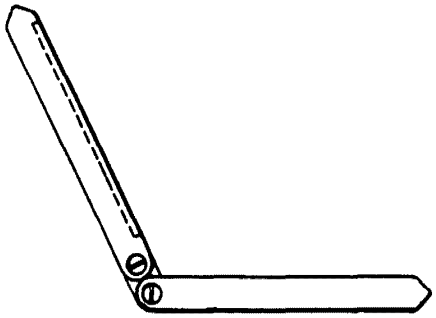


FIG 20



FIG 21

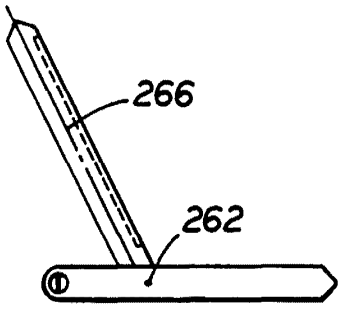


FIG 22

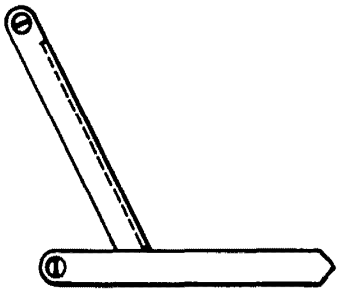


FIG 23

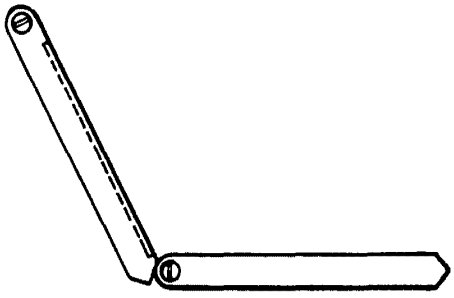


FIG 24

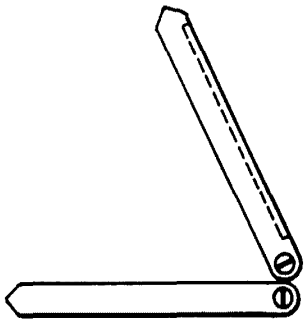


FIG 25

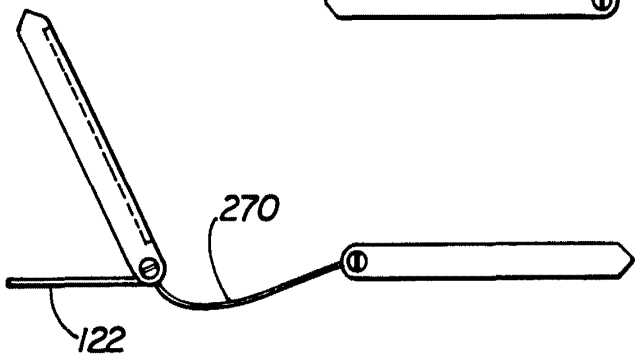


FIG 26

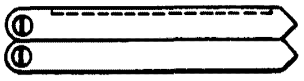


FIG 27

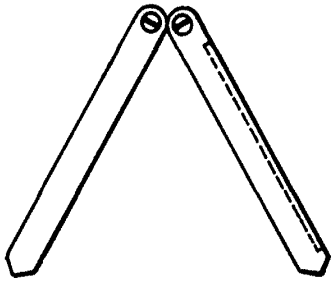


FIG 28

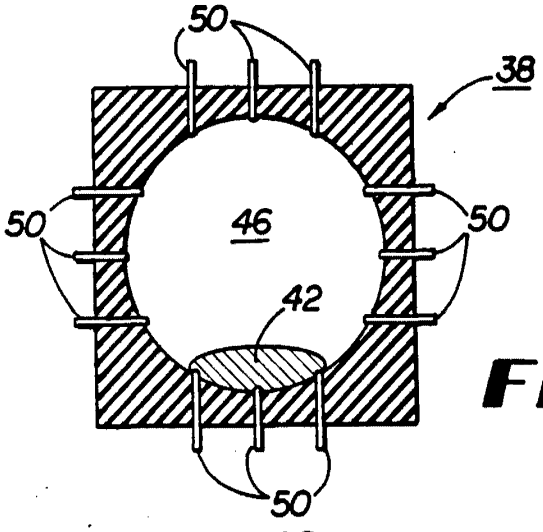


FIG 29

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02468

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 1/16; H05K 7/12

US CL :361/683

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)

U.S. : 361/680-683; 364/708.1; 439/928

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 5,268,817 (MIYAGAWA ET AL) 07 December 1993, Figures 8A-11B and column 6, line 66- column 9, line 59.	1-5, 14 --- 6, 7, 15, 16
Y	US, A, 5,034,858 (KAWAMOTO ET AL) 23 JULY 1991, Figures 9-15 and column 4, line 1- column 5, line 23.	6, 7, 15
Y	US, A, 5,235,495 (BLAIR ET AL) 10 August 1993, see the entire document.	16

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 06 JUNE 1995	Date of mailing of the international search report 10 JUL 1995
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer MICHAEL W. PHILLIPS Telephone No. (703) 308-3191

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02468

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-7, 14-16, and 22

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02468

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s)1-7, 14-16, and 22, drawn to a system having the special technical feature of a means for detachably connecting modules.
Group II, claim 8, drawn to a system having the special technical feature of teeth.
Group III, claim 9, drawn to a system having the special technical feature of a position indicator.
Group IV, claims 10, 11, and 19, drawn to a system having the special technical feature of means for supporting.
Group V, claims 12 and 13, drawn to a system having the special technical feature of a keys with a recessed portion for accommodating a fingertip.
Group VI, claim 17, drawn to a system having the special technical feature of a third axis of rotation.
Group VII, claim 18, drawn to a system having the special technical feature of a fixed leg.
Group VIII, claim 20, drawn to a system having the special technical feature of a recess.
Group IX, claim 21, drawn to a system having the special technical feature of a telephone.
The inventions listed as Groups I-IX do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: a special technical feature is a technical feature which defines a contribution over the prior art. The technical features in claims 1-4 are not special technical feature because they do not define a contribution over the prior art as shown by Figures 8A-11B of U. S. Patent No. 5,268,817 to Miyagawa et al., issued 07 December 1993. These Figures show two modules connected, retained, and hindered from rotation as claimed in claims 1-4 (and also claim 6). Thus claim 5 is the first claim with a special technical feature, i.e. a means for detachably connecting modules.

Groups II-IX do not include the special technical feature of a means for detachably connecting modules. Thus unity of invention is lacking.