



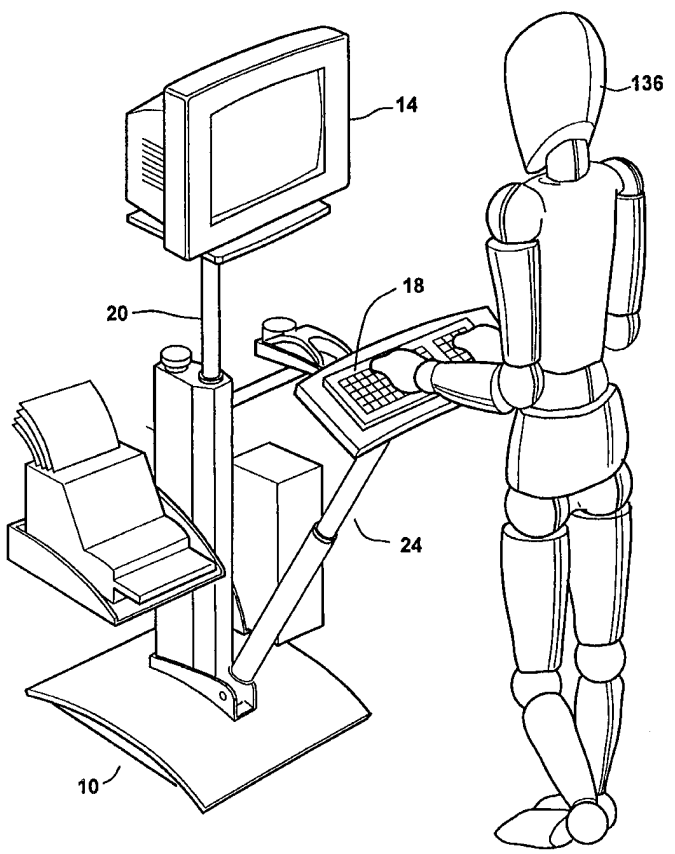
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(54) Title: A STAND FOR A MONITOR AND A KEYBOARD

(57) Abstract

A stand (10) for a monitor (14) and a keyboard (18), which can be used to hold a computer monitor (14) and a keyboard (18) so that a human operator may comfortably use the computer in a variety of positions, including sitting in a conventional chair and standing. The stand (10) includes two shelves (12, 16), each of which is attached to a post. The posts (20, 24) are then attached to a base (22). One shelf (12) is designed to hold a monitor, while the other (16) is designed to hold a keyboard. The keyboard shelf (16) itself is tiltable about its post (24), such that the angle between the keyboard shelf and its post is adjustable. Both the post (24) attached to the keyboard shelf, and the post (20) attached to the monitor shelf, are independently extensible, such that the length of each post, and hence the vertical position of each shelf, can be adjusted independently. The post (24) attached to the keyboard shelf is also pivotable about the base (22), such that the angle between the post and the base, as well as the horizontal distance between the keyboard shelf and the monitor shelf, is adjustable.



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A STAND FOR A MONITOR AND A KEYBOARD¹FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to a stand for a computer monitor and a keyboard and, more particularly, to a stand which can be adjusted as necessary
5 for an individual human operator.

A stand for a computer typically includes two shelves for holding the computer monitor and keyboard in a position which allows the operator to sit while using the computer. Hereinafter the term "stand" refers to an assembly for supporting key components of a computer, including a monitor and a
10 keyboard, and optionally including a CPU. These stands can be differentiated from an ordinary desk, in that the monitor shelf is held above the keyboard shelf. This is necessary because the operator must be able to comfortably type on the keyboard while simultaneously looking at the monitor. Thus, the monitor is held at eye level, while the keyboard is held at the level of the
15 operator's hands.

These stands may also include additional shelves, for holding the main body of the computer or a printer, or for holding a telephone, coffee mug and the like. These additional shelves provide a convenient work surface, thereby making the stand a self-contained unit which may be used in place of a
20 conventional desk.

The structure of some of these stands is almost identical to a conventional desk, except that a monitor shelf is provided which is held above the surface of the desk. These stands are inconvenient because the support for the keyboard is not adjustable, since this support is the surface of the desk
25 itself. The inability to adjust the angle of the keyboard can place a significant strain on the operator's wrists. Some stands attempt to alleviate this problem by providing an adjustable section of the desk surface for supporting the keyboard. For example, U.S. Patent No. 5,483,898 describes a stand with a conventional desk structure, an adjustable section for a keyboard, and a shelf for a monitor
30 which is not adjustable. The keyboard section is tiltable and horizontally

slidable, and the support for this section is extensible, which enables the operator to adjust the keyboard section so as to minimize wrist strain. However, the monitor shelf is not adjustable, which may cause the neck of the operator to become strained. Furthermore, the conventional desk structure of the stand of U.S. Patent No. 5,483,898 restricts the range of the adjustments to the keyboard section.

U.S. Patent No. 5,041,770 discloses a stand with a conventional desk structure, which is an improvement over the stand of U.S. Patent No. 5,483,898. The vertical position of the monitor shelf and of the keyboard section are both adjustable in the stand of U.S. Patent No. 5,041,770. The keyboard section is also tiltable. However, the conventional desk structure of the stand of U.S. Patent No. 5,041,770 again restricts the range of adjustments. Thus, the stand cannot be comfortably used while the operator is standing up or sitting on the floor, for example.

Although these stands are clearly more convenient for computer operators than a conventional desk, these stands are still not fully adaptable to the needs of the human operator, largely because these stands still retain a number of characteristics of the conventional desk. However, the conventional desk is not the ideal structure for such a stand, because conventional desks are not adjustable. Computer operators frequently complain of neck strain caused by holding the neck at an uncomfortable angle in order to gaze at the monitor, and of wrist strain from holding the wrists at an uncomfortable angle in order to type on the keyboard. These problems could be alleviated or eliminated if the stand had two independently adjustable shelves, so that the vertical position of each shelf and the degree of tilt of the keyboard shelf could be adjusted to meet the needs of every individual operator.

The stand disclosed in U.S. Patent No. 4,567,835 moves away from the conventional desk structure, in that both shelves are attached to separate posts. Both posts are extensible; that is, the length of each post, and hence the vertical position of each shelf, may be independently adjusted. In addition, the monitor

shelf is tiltable; that is, the angle of the monitor shelf relative to the post is adjustable. Finally, the keyboard shelf is horizontally slidable, such that the horizontal distance between the keyboard shelf and the monitor shelf is adjustable. However, no provision is made for tilting the keyboard shelf to
5 reduce the strain on the wrists of the operator. Furthermore, in spite of these many adjustments, the stand of U.S. Patent No. 4,567,835 is similar to a conventional desk in that the operator must sit in a conventional chair to use this stand.

There is no reason, however, why computer operators should need to sit
10 in a conventional chair in order to use a computer. Conventional chairs themselves may cause back strain and a host of other problems. The computer operator should be able to stand or even sit in a low chair while comfortably using the computer. A conventional desk structure certainly restricts the position of the operator, since it requires the operator to sit in a conventional
15 chair. Such a requirement can be very inconvenient.

Certain stands do not appear to place such restrictions on the position of the operator, yet these stands are also not sufficiently adjustable. For example, neither U.S. Patent No. 4,638,969 nor U.S. Patent No. 4,815,391 explicitly states the position which the operator must adopt to use the disclosed stands.
20 However, each stand clearly has a number of disadvantages. First, the height of each shelf of U.S. Patent No. 4,638,969 cannot be independently adjusted. Thus, if the stand of U.S. Patent No. 4,638,969 were adjusted to a height which minimizes neck strain for the operator, the keyboard shelf might be placed at a height which causes wrist strain, and vice versa. Second, the stand of U.S.
25 Patent No. 4,815,391 also has a restricted range of adjustments which may be made to the shelves. As the height of the monitor and keyboard shelves is increased, the horizontal distance between the two shelves is decreased. Thus, both the stand of U.S. Patent No. 4,815,391 and the stand of U.S. Patent No. 4,638,969 restrict the range of adjustments which may be made to the monitor

and keyboard shelves, thereby reducing the number of positions in which these stands may be used.

The ability of the operator to sit in a conventional chair, stand, or sit in a chair which is lower to the floor than a conventional chair, while using the computer depends upon the availability of a stand which can adjust to suit each of these positions. Such an adjustment requires more than a simple alteration in the height of the stand. The horizontal and vertical distances between the monitor and the keyboard need to be adjustable, as does the angle between the keyboard and the floor. These separate adjustments are necessary because as the operator moves from sitting in a low chair to sitting in a conventional chair to standing, the distance between the hands and the eyes of the operator also changes. Thus, simply raising the vertical position of the monitor and keyboard is not enough to allow an operator to comfortably use the computer in such a variety of positions. The horizontal and vertical distances between the monitor and the keyboard must also be adjusted to match the relative position of the operator's eyes and hands. Thus, the overall distance between the operator and the monitor and keyboard must be adjustable.

There is thus a widely recognized need for, and it would be highly advantageous to have, a stand for a monitor and a keyboard which permits a variety of independent adjustments to the position of the monitor and the keyboard, so that the operator may comfortably adopt a variety of positions while using the computer.

SUMMARY OF THE INVENTION

According to the present invention there is provided a stand for a monitor and a keyboard, including: (a) a base; (b) a first substantially vertically oriented post, the first post being extensible, and the first post being attached to the base; (c) a first shelf for holding the monitor, the first shelf being attached to the first post; (d) a second post, the second post being extensible, the second post being attached to the base and the second post being pivotable about the

base; and (e) a second shelf for holding the keyboard, the second shelf being attached to the second post and the second shelf being tiltable about the second post.

According to further features in preferred embodiments of the invention described below, the first post further includes a rod and a sleeve dimensioned to receive the rod, the sleeve being slidable over the rod, such that the first post is extensible. Preferably, the second post further includes a rod and a sleeve dimensioned to receive the rod, the rod being slidable within the sleeve, such that the second post is extensible.

Hereinafter, the term "rod" refers to a component capable of insertion within a "sleeve", in which either the rod is slidable within the sleeve while the sleeve remains substantially stationary, or the sleeve is slidable over the rod while the rod remains substantially stationary, such that the rod and the sleeve are capable of movement relative to each other. For the following discussion of the present invention, it is understood that both possibilities are operable.

The present invention successfully addresses the shortcomings of the presently known configurations by providing a stand for a monitor and a keyboard which allows the computer operator to comfortably use the stand in a variety of positions. The stand includes a shelf for the monitor and a shelf for the keyboard, each of which is attached to a post. The term "attached" is hereinafter defined as integrally formed with, or connected to. Both posts are attached to a base and both posts are independently extensible. The term "extensible" is hereinafter defined as enabling the length of the post, and hence the height of the attached shelf, to be adjustable. The post attached to the keyboard shelf is also pivotable about the base. The term "pivotable" is hereinafter defined as enabling the angle between the post and the base, as well as the horizontal distance between the monitor shelf and the keyboard shelf, to be adjustable. Finally, the keyboard shelf is tiltable. The term "tiltable" is hereinafter defined as enabling the angle between the shelf and the base to be adjustable. These adjustments allow the operator to adopt a variety of

positions, including standing, sitting in a conventional chair, and even sitting in a low chair.

BRIEF DESCRIPTION OF THE DRAWINGS

5 The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIGS. 1A and 1B show an illustrative stand for a monitor and a keyboard according to the present invention, Figure 1B also showing a monitor, a keyboard and various accessories supported by the stand;

10 FIGS. 2A-2G illustrate the adjustment mechanisms of the stand of Figure 1;

FIGS. 3A-3D shows four illustrative adjustments which can be made to the stand of Figure 1;

15 FIGS. 4A-4C illustrate three of the positions which the operator can adopt while using the stand of Figure 1;

FIG. 5 illustrates a preferred embodiment of the stand of Figures 1A and 1B;

FIGS. 6A-6E illustrate five of the positions of a portion of a preferred embodiment of the stand of Figure 5;

20 FIG. 7 illustrates a second embodiment of the adjustment mechanisms of the stand of Figure 1; and

FIGS. 8A-8D show a more detailed illustration of the mechanisms of Figure 7.

25 DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is of a stand for a monitor and a keyboard. Specifically, a stand according to the present invention can be used to hold a computer monitor and keyboard so that a human operator may comfortably adopt a variety of positions, including sitting in a conventional chair and
30 standing. The stand includes two shelves, each of which is attached to a post.

The posts are attached to a base. One shelf is designed to hold a monitor, while the other shelf is designed to hold a keyboard. The keyboard shelf itself is tiltable about its post, such that the angle between the keyboard shelf and the post is adjustable. Both the post attached to the keyboard shelf, and the post
5 attached to the monitor shelf, are independently extensible, such that the length of each post, and hence the vertical position of each shelf, can be adjusted independently. The post for the monitor shelf is substantially vertically oriented. The post attached to the keyboard shelf is also pivotable about the base, such that the angle between the post and the base as well as the horizontal
10 distance between the keyboard shelf and the monitor shelf are adjustable.

The present invention preferably includes a third substantially vertically oriented post attached to the base. A first auxiliary shelf is preferably attached to the third post by a first substantially horizontally oriented arm. Optionally, a second auxiliary shelf is attached to the third post by a second substantially
15 horizontally oriented arm. The second auxiliary shelf is also supported by two wheels, and the second arm is preferably pivotable about the third post. Also optionally, a third auxiliary shelf for supporting a computer CPU (central processing unit) or a printer is directly attached to the third post.

The principles and operation of a stand for a monitor and a keyboard
20 according to the present invention may be better understood with reference to the drawings and the accompanying description.

Referring now to the drawings, Figures 1A and 1B show an illustrative stand for a monitor and a keyboard, according to the present invention. Figure 1A shows the stand without a monitor, a keyboard and various accessories
25 placed on the shelves. Figure 1B shows the stand with these objects on the shelves. A stand 10 includes a monitor shelf 12 for supporting a monitor 14, and a keyboard shelf 16 for supporting a keyboard 18. Monitor shelf 12 is attached to a first substantially vertically oriented post 20, which is attached to a base 22. Keyboard shelf 16 is attached to a second post 24, which is also
30 attached to base 22. Both first post 20 and second post 24 are extensible.

Optionally, base 22 can include at least two, and preferably four, wheels 25 which are attached to base 22 for rolling stand 10, as shown in Figure 1A.

The preferred mechanism for adjusting first post 20 and second post 24 is shown in Figures 1A and 1B, and in Figure 2A. Preferably, first post 20 has a rod 26 (see Figure 2A), a sleeve 28 and a substantially vertically oriented cover 30. One end 32 of cover 30 is attached to base 22. Both rod 26 and sleeve 28 are disposed within cover 30, but rod 26 is attached to base 22. One end 34 of sleeve 28 is formed to receive rod 26, such that sleeve 28 is able to slide over rod 26, thereby adjusting the length of first post 20, and hence the vertical position of monitor shelf 12 (see Figures 2A-2C). Preferably, the maximum length of first post 20 is about 1115 mm, and the minimum length is about 800 mm.

Preferably, second post 24 has a rod 36 and a sleeve 38. A first end 40 of sleeve 38 is attached to base 22. A second end 42 of sleeve 38 is formed to receive rod 36. Unlike first post 20, the length of second post 24, and hence the axial position of keyboard shelf 16, may be adjusted by sliding rod 36 into sleeve 38 (see Figures 2A, 2D and 2E). Keyboard shelf 16 is also tiltable about second post 24, as shown in Figure 2F below. Finally, second post 24 is also pivotable about base 22, by a mechanism described in Figure 2G below. Preferably, the maximum length of second post 24 is about 900 mm, and the minimum length is about 660 mm.

Figures 2A-2G shows cut-away views of first post 20 and second post 24, with their respective preferred adjustment mechanisms. Figure 2A shows a cut-away view of both first and second posts 20 and 24, while Figures 2B-2G are magnifications of portions of Figure 2A.

The adjustment mechanism of first post 20 is shown in Figures 2A-2C. As noted above, sleeve 28 can slide over rod 26 of first post 20, thereby adjusting the vertical position of monitor shelf 12. However, monitor 14 (not shown) is relatively heavy, typically 10-25 kg, so that it is difficult to both permit sufficient adjustments to sleeve 28 relative to rod 26, and to hold

monitor shelf 12 in the desired vertical position once these adjustments have been made. Therefore, a counterbalance assembly 44 is required. Counterbalance assembly 44 is housed within cover 30. Counterbalance assembly 44 has at least one, and preferably two springs 46, each of which is
5 attached at one end to a first spring bracket 48, and at the opposing end to a second spring bracket 50. The force exerted by springs 46 acts as a counterbalance to the weight of monitor 14 (not shown), so that sleeve 28 is held substantially immobile over rod 26 by a pulley assembly 52.

Pulley assembly 52 has a first cable 54, which is attached at one end to a
10 cable holder 56. Cable holder 56 is attached to sleeve 28. First cable 54 is engaged by a first pulley 58, which is attached to first spring bracket 48. First cable 54 is then engaged by a second pulley 60, which is attached to a pulley stand 62. Pulley stand 62 is attached substantially to base 22. First cable 54 transfers the force from springs 46 to sleeve 28, thereby supporting sleeve 28
15 and maintaining the position of sleeve 28 relative to rod 26. However, a further mechanism is needed to ensure that the force delivered by springs 46 is constant. Otherwise, as the length of springs 46 is altered, as for example if the vertical position of monitor shelf 16 is adjusted, the amount of force delivered by springs 46 will change, so that sleeve 28 may move over rod 26. Thus, a
20 third pulley 64, a fourth pulley 66 and a second cable 68, of pulley assembly 52 are needed so that the force delivered by springs 46 is constant. Second cable 68 is attached at one end to second pulley 60, and at the other end to pulley stand 62 by a connector (not shown). Second cable 68 is engaged by third pulley 64, which is attached to second spring bracket 50. Second cable 68 is
25 then engaged by fourth pulley 66, which is attached to second pulley 60. Fourth pulley 66 is characterized by having a changing radius. Thus, if the length of springs 46 changes, second pulley 60 begins to rotate, potentially changing the force on first cable 54 and thereby changing the position of sleeve 28 relative to rod 26. However, this is counteracted by fourth pulley 66, which

changes radius, maintaining force on second cable 68 and thereby keeping the force exerted by springs 46 constant.

Optionally, sleeve 28 is also held substantially immobile relative to cover 30 by a tightener assembly 69 (see also Figure 2B). Tightener assembly 5 69 includes a casing 70 which is attached to cover 30, and a shaft 72 which is held against sleeve 28, preventing sleeve 28 from freely sliding over rod 26. Tightener assembly 69 may be adjusted by turning a knob 74. As knob 74 is turned, a spring 76 is either elongated or compressed. Preferably, spring 76 is a leaf spring. The force exerted by spring 76 holds shaft 72 against sleeve 28, 10 providing a further degree of adjustment for the weight of monitor 14 (not shown).

Counterbalance assembly 44 and tightener assembly 69 are used in the following manner. If, for example, a monitor 14 (not shown) is to be placed on monitor shelf 12, counterbalance assembly 44 and tightener assembly 69 must 15 be adjusted to accommodate the weight of monitor 14 (not shown). A handle 78 of counterbalance assembly 44, which is attached to first spring bracket 48, must be turned, changing the amount of force exerted by springs 46 on first cable 54. By turning handle 78, the amount of force exerted by springs 46 is adjusted, so that sleeve 28 is held in a substantially constant position relative to 20 rod 26. This keeps monitor shelf 12 in a substantially constant vertical position. Optionally, tightener assembly 69 may be used, in addition to counterbalance assembly 44, in order to make sufficient adjustments for the weight of monitor 14 (not shown). Although counterbalance assembly 44 alone can be adjusted to support the weight of monitor 14 (not shown), a finer degree 25 of adjustment is made possible by tightener assembly 69, so that it is easier to adjust for the weight of monitor 14 (not shown).

If the position of monitor shelf 12 is to be raised or lowered, the position of sleeve 28 relative to rod 26 must be altered. Monitor shelf 12 is grasped, and monitor shelf 12 is raised or lowered to the desired vertical position. Once the 30 desired vertical position has been achieved, monitor shelf 12 is released, and

counterbalance assembly 44 holds sleeve 28 in a substantially constant position relative to rod 26.

Second post 24 has a different mechanism for adjustment, as shown in Figures 2A, 2D and 2E. Within sleeve 38 of second post 24 is an axial
5 adjustment assembly 78. The bottom part of rod 36 rests against axial adjustment assembly 78, such that the position of rod 36 relative to sleeve 38 is determined by axial adjustment assembly 78. Axial adjustment assembly 78 includes a spring assembly 79. Spring assembly includes a spring 80,
10 preferably a leaf spring, and a spring casing 81. Spring 80 is attached at one end to spring casing 81. Spring 80 is attached at another end to, and exerts force against, two L-shaped wedges 82. Each L-shaped wedge 82 pushes against a ring holder 84, which in turn pushes against an abutment member 86, which is preferably an annular ring, causing abutment member 86 to expand. Abutment member 86 abuts the inner surface of sleeve 38. Thus, the force
15 exerted by spring 80 pushes abutment member 86 against the inner surface of sleeve 38, holding axial adjustment assembly 78 immobile against sleeve 38, and thereby holding rod 36 substantially immobile within sleeve 38.

In order to move rod 36 within sleeve 38, a lever 88 on the underside of keyboard shelf 16 must be moved (see Figure 2E). The movement of lever 88
20 causes a piston 90 to pump oil into a tube 92. Tube 92 runs from underside of keyboard shelf 16 to a second piston 94. As oil is pumped into tube 92, second piston 94 moves down. The downward movement of second piston 94 pushes a cylinder 96 upward via a connector 97, thereby adjusting the axial position of cylinder 96. The upward movement of cylinder 96 compresses spring 80 of
25 axial adjustment assembly 78, so that L-shaped wedge 82 no longer presses against ring holder 84. Ring holder 84 then ceases to press against abutment member 86, so abutment member 86 contracts and no longer abuts inner surface of sleeve 38. Rod 36 is now freely movable within sleeve 38. After rod 36 has been moved to the desired position relative to sleeve 38, so that
30 keyboard shelf 16 is in the desired axial position, lever 88 on underside of

keyboard shelf 16 is released. Now the oil leaves piston 94 and returns to piston 90. Piston 94 no longer pushes cylinder 96 upward, so cylinder 94 returns to its former position. As cylinder 94 returns to its former position, spring 80 relaxes. The relaxation of spring 80 exerts force against L-shaped wedge 82 and ring holder 84, so that abutment member 86 expands and abuts the inner surface of sleeve 38, holding rod 36 substantially immobile within sleeve 38.

Additionally, keyboard shelf 16 is tiltable about second post 24, by a universal joint 98, as shown in Figure 2F. Universal joint 98 includes a ball clamp 100 which attaches keyboard shelf 16 to a ball 102. Ball 102 is rotatable within a ball seat 104, which includes two rings 106 and 108. Upper ring 106 is located substantially near the upper pole of ball 102, closest to ball clamp 100, and a lower ring 108 which is closer to the lower pole of ball 102. A spring assembly 110 propels lower ring 108 toward upper ring 106, preventing ball 102 from rotating. Spring assembly 110 includes a spring 112, within a spring casing 114. A portion of spring 112 abuts lower ring 108. Most preferably, spring 112 is a leaf spring.

In order to tilt keyboard shelf 16, lever 88 on the underside of keyboard shelf 16 must be moved. As noted above, the movement of lever 88 causes piston 90 to pump oil into tube 92. Tube 92 runs from underside of keyboard shelf 16 to second piston 94. As oil is pumped into tube 92, second piston 94 moves downward, causing a hollow rod 115 to move downward. Hollow rod 115 is attached at one end to second piston 94 and at the other end to lower ring 108. The downward movement of hollow rod 115 pulls lower ring 108 from upper ring 106, compressing spring 112. Now ball 102 is able to rotate within ball seat 104, so that keyboard shelf 16 may be tilted to the desired position. After lever 88 is released, as noted above second piston 94 returns to its original position. Spring 112 relaxes to its original position, and lower ring 108 is pushed toward upper ring 106, so that ball 102 is no longer rotatable within ball seat 104. Keyboard shelf 16 is now held substantially immobile.

Second post 24 is also pivotable about base 22, by a mechanism shown in Figure 2G. End 40 of sleeve 38 is attached to base 22 by a friction joint 116, which enables second post 24 to be moved alternately towards first post 20 and away from first post 20, such that the angle between second post 24 and base 22 is adjustable (not shown, see Figure 2A and Figures 3A-3D). Friction joint 116 includes a plurality of friction plates 118. At least one, and preferably three friction plates 118 are attached to a first screw 120. Screw 120 is attached to end 40 of sleeve 38. At least one other, and preferably three other friction plates 118, are attached to a second screw 122. Screw 122 is attached to a projection 124 of base 22. A spring 126 is arranged around an axle 128. Spring 126 pushes friction plates 118 together, preventing end 40 of sleeve 38 from pivoting about axle 128. In order to pivot sleeve 38, and by extension second post 24, about base 22, the operator (not shown) pulls or pushes second post 24, or alternatively keyboard shelf 16, toward, or away from, first post 20. The force exerted by the operator (not shown) overcomes the friction caused by spring 126 pushing friction plates 118 together, so that sleeve 38 pivots about axle 128. After second post 24 has been placed in the desired position, the operator (not shown) stops exerting force against second post 24 or keyboard shelf 16, and spring 126 again holds friction plates 118 substantially immobile, holding second post 24 substantially immobile.

Preferably, the maximum angle between second post 24 and base 22 is about 90 degrees, and the minimum angle between second post 24 and base 22 is about 48 degrees.

Figures 3A-3D show schematic side views of the stand of Figure 1, showing some of the various adjustments which can be made to the stand by using the adjustment mechanisms shown in Figures 2A-2G. In Figure 3A, first post 20 and second post 24 are shown at relatively short lengths, such that the vertical position of monitor shelf 12 and keyboard shelf 16 is relatively close to base 22. sleeve 28 has slid over rod 26, such that substantially the majority of rod 26 is within sleeve 28. Similarly, substantially the majority of rod 36 is

within sleeve 38. Second post 24 has been pivoted towards first post 20 so that a horizontal distance 130 between monitor shelf 12 and keyboard shelf 16 has been reduced, and so that an angle 132 between second post 24 and base 22 is relatively large.

5 In Figure 3B, the length of first post 20 has been increased, by sliding rod 26 out from sleeve 28, such that a portion of rod 26 is no longer within sleeve 28. Similarly, the length of second post 24 has been increased, by sliding rod 36 out from sleeve 38, such that a portion of rod 36 is no longer within sleeve 38.

10 In Figure 3C, second post 24 has been pivoted forward, such that angle 132 has been reduced, and such that horizontal distance 130 has been increased.

In Figure 3D, keyboard shelf 16 has been tilted about second post 24, such that a second angle 134 between keyboard shelf 16 and second post 24 has been reduced.

15 Figures 4A-4C illustrate three of the positions which the operator can adopt while using the stand of Figure 1, due to the adjustability of the stand. In Figure 4A, the length of first post 20 and second post 24 has been increased to enable an operator 136 to type on keyboard 18 and view monitor 14 while standing up. In Figure 4B, operator 136 is sitting in a conventional chair 138. Post 20 and post 24 have been adjusted so that operator 136 may type on keyboard 18 and view monitor 14 while sitting in chair 138. Finally, in Figure 4C, chair 138 has been adjusted so that operator 136 is now leaning back. Again, first post 20 and second post 24 have been adjusted so that operator 136 may type on keyboard 18 and view monitor 14 while leaning back in chair 138.

25 In the preferred embodiment shown in Figures 1A and 1B, stand 10 includes a plurality of auxiliary shelves attached to cover 30. Preferably, a first auxiliary shelf 140 is attached to cover 30 by a first substantially horizontally oriented arm 142. First arm 142 is preferably about 730 mm in length. First auxiliary shelf 140 can be used to hold a telephone, for example.

Preferably, second auxiliary shelf 144 has two wheels 146 attached by a substantially vertically oriented carriage 148, as shown in Figure 5. A second substantially horizontally oriented arm 150 is attached at one end to carriage 148, and at the other end to cover 30. Second arm 150 is pivotable about cover 30, and carriage 148 is pivotable about second arm 150 (see also Figures 6A-6E). Wheels 146 rollingly support second auxiliary shelf 144 as second arm 150 pivots about cover 30. Carriage 148 is preferably extensible, preferably with a maximum length of about 900 mm and a minimum length of about 660 mm. Preferably, second arm 150 is pivotable by about 180 degrees about cover 30.

Preferably, third auxiliary shelf 152 is directly attached to cover 30, and third auxiliary shelf 152 is adapted to hold a printer 154. Optionally, a fourth auxiliary shelf 156 may hold a CPU 158. Fourth auxiliary shelf 156 is also directly attached to cover 30.

Figures 6A-6E illustrate five of the positions of second auxiliary shelf 144 and second arm 150. In Figure 6A, second auxiliary shelf 144 is shown resting substantially adjacent to keyboard shelf 16. In Figure 6B, carriage 148 (not shown), and by extension second auxiliary shelf 144, has been pivoted by about 90 degrees about second arm 150. In Figure 6C, carriage 148 (not shown), and by extension second auxiliary shelf 144, has again been pivoted by about 90 degrees about second arm 150. In Figure 6D, second arm 150 has been pivoted about cover 30, such that the angle between second arm 150 and keyboard shelf 16 has been increased. Carriage 148 (not shown), and by extension second auxiliary shelf 144, has again been pivoted by about 90 degrees about second arm 150. Finally, in Figure 6E, carriage 148 (not shown), and by extension second auxiliary shelf 144, has been pivoted about second arm 150, so that second auxiliary shelf 144 is partially overlapping keyboard shelf 16.

Figure 7 shows a cut-away view of another embodiment of the computer stand of the present invention. Again, stand 10 includes a monitor shelf 160

attached to sleeve 28. To adjust the height of monitor shelf 160, a handle 164 is squeezed. Handle 164 is pivotably attached to monitor shelf 160 by a hinge 162. Squeezing handle 164 releases a lock 166 by pulling a lock cable 168. Lock cable 168 is attached at one end to handle 164 and at the other end to lock 5 166. Lock 166 includes a spring 170 pushing sleeve 28 against rod 26. Spring 170 is released when handle 164 is squeezed, thereby allowing sleeve 28 to slide relative to rod 26 and adjust the height of monitor shelf 160.

When handle 164 is not being squeezed, monitor shelf 160 remains substantially stationary because the monitor (not shown) is balanced according to weight, thereby enabling sleeve 28 to remain substantially stationary relative 10 to rod 26. The weight of the monitor can be determined from the size, preferably from about 9 inch to about 29 inch diagonal length. This balance is achieved through a balance mechanism 172. Balance mechanism 172 includes a power spring 174 and a pulley 176. Pulley 176, as shown in cross-section, 15 has a plurality of slots 178, which enable pulley 176 to have different diameters according to the size of the monitor. Pulley 176 is horizontally slidable, such that a cable 180 is able to wrap around a particular slot 178 to achieve the desired diameter for pulley 176. A handle 182 is twisted to alter the force exerted by spring 174 by pulling on cable 180, until monitor shelf 160 and 20 sleeve 28 are vertically elevated while the monitor is sitting on monitor shelf 160. Cable 180 goes from pulley 176 to a secondary pulley 184, and then is attached to the lowest portion of sleeve 28, such that when spring 174 is tightened and exerts more force, cable 180 causes monitor shelf 160 to be elevated. Monitor shelf 160 then remains balanced, even if the height of 25 monitor shelf 160 is manually adjusted by manually moving sleeve 28 relative to rod 26.

Figure 8A shows a second embodiment of the keyboard shelf adjustment mechanism, which is similar in operation to that of Figure 2F. A keyboard shelf adjustment mechanism 186 for keyboard shelf 189 includes a universal 30 joint 188. Universal joint 188 features a plurality of springs 190 pushing a

housing 192 against a ball 194, so ball 194 cannot move because of friction. A handle 196 is squeezed to push housing 192 and so to push springs 190, thereby releasing the force on ball 194. Ball 194 can now rotate and tilt freely, thus allowing keyboard shelf 189 to be rotated and tilted to a new position. One
5 advantage of mechanism 186 is that mechanism 186 requires relatively little force to operate, approximate 4 kg, and thus can be operated even by users with relatively low strength in the hands and arms.

A left handle 198 attached to keyboard shelf 189 operates two mechanisms: the rotation of second post 24 and the tilt of second post 24. The
10 mechanism for the rotation of second post 24 is as follows. As shown in Figure 7, base 22 of stand 10 has a plurality of friction plates 200 and a plurality of Belleville springs 202. The force of springs 202 against plates 200 provides a constant frictional force which substantially prevents second post 24 from rotating. If sufficient force is provided to overcome this frictional force, then
15 second post 24 is able to rotate about rotational axis 204 on base 22.

The mechanism for the tilting of second post 24 is as follows. A cable 206 goes from handle 198 to base 22 of computer stand 10, shown in a cross-sectional view in Figure 8B. Cable 206 then divides into two parts at a junction 208. The first part, a cable 210, is connected to a spring 212. Spring 212 acts
20 as a preload to a main spring 214. Main spring 214 is wrapped around a shaft 216. The preload enables first post 20 to be tilted backward and up relatively more easily than to be tilted forward and down. When cable 206 is pulled, cable 210 pulls on spring 212, thereby reducing the preload on main spring 214 and enabling second post 24 to be more easily tilted. When cable 206 is no
25 longer pulled after handle 198 is released, then main spring 214 again holds second post 24 in place.

The other side of spring 214 is connected to a safety device 218, as shown also in Figure 7. Safety device 218 includes a plurality of springs 220, preferably Belleville springs, and two brackets 222 and 224 to hold springs 220.
30 If an excess load is placed upon keyboard shelf 189, such that the force exerted

downwards against keyboard shelf 189 is greater than the force exerted by springs 220, then safety device 218 will be released and keyboard shelf 189 on second post 24 will sink to the ground.

Figure 8C shows a sliding mechanism for adjusting the horizontal
5 position of the keyboard shelf and post. A separate handle 226 is attached to keyboard shelf 189. When handle 226 is squeezed, a lock 228 is released. Lock 228 includes a spring 230 pushing a pin 232 against keyboard shelf 189. Squeezing handle 226 pulls spring 230, moving pin 232 away from keyboard shelf 189. The horizontal position of keyboard shelf 189 is then adjusted by
10 sliding keyboard shelf 189 along a track 234 which rests on a support 236. A stop 238 prevents keyboard shelf 189 from sliding off of track 234. Preferably, the maximum horizontal distance for which keyboard shelf 189 is slidable is about 350 mm either to the right or to the left of second post 24. An example of keyboard shelf 189 at the maximum horizontal distance is shown in Figure
15 8D.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made.

WHAT IS CLAIMED IS:

1. A stand for a monitor and a keyboard, comprising:
 - (a) a base;
 - (b) a first substantially vertically oriented post, said first post being extensible, and said first post being attached to said base;
 - (c) a first shelf for holding the monitor, said first shelf being attached to said first post;
 - (d) a second post, said second post being extensible, said second post being attached to said base and said second post being pivotable about said base; and
 - (e) a second shelf for holding the keyboard, said second shelf being attached to said second post and said second shelf being tiltable about said second post.

2. The stand of claim 1, further comprising
 - (a) a first substantially horizontally oriented arm, said first arm being attached to said first post; and
 - (b) a first auxiliary shelf attached to said arm.

3. The stand of claim 1, further comprising:
 - (a) a second substantially horizontally oriented arm, said second arm being pivotable about said first post;
 - (b) a carriage being attached to said second arm, said carriage being pivotable about said second arm and said carriage including two wheels for rollingly supporting said carriage; and
 - (c) a second auxiliary shelf attached to said carriage.

4. The stand of claim 1, further comprising a third auxiliary shelf attached to said first post.

5. The stand of claim 1, wherein said first post further includes a rod and a sleeve dimensioned to receive said rod, said sleeve being slidable over said rod, such that said first post is extensible.

6. The stand of claim 5, further comprising a counterbalance assembly for supporting said sleeve, said counterbalance assembly including:

- (a) at least one spring;
- (b) a first spring bracket for holding one end of said spring, said first spring bracket being attached substantially near the top of said first post;
- (c) a second spring bracket for holding the other end of said spring;
- (d) a first cable for transferring a force exerted by said spring to said sleeve and for pulling said sleeve, said first cable being attached at one end to said sleeve;
- (e) a first pulley and a second pulley for engaging said first cable, said first pulley being attached to said first spring bracket, and said second pulley being attached substantially near the bottom of said first post;
- (f) a second cable for modulating said force exerted by said spring, said second cable being attached at one end to said second pulley;
- (g) a third pulley and a fourth pulley for engaging said second cable, said third pulley being attached to said second spring bracket, and said fourth pulley being attached to said second pulley, said fourth pulley being characterized by having an alterable radius, said radius of said fourth pulley being determined by said force exerted by said spring; and
- (h) a handle for adjusting said force exerted by said spring, said handle being attached to said first spring bracket.

7. The stand of claim 6, wherein said spring is two springs.

8. The stand of claim 6, wherein said second post further includes a tightener assembly for holding said sleeve substantially immobile, said tightener assembly including:

- (a) a casing attached to said first post;
- (b) a shaft located substantially within said casing for holding said sleeve substantially immobile;
- (c) a spring for exerting a force against said shaft and holding said shaft against said sleeve; and
- (d) a knob for adjusting said spring.

9. The stand of claim 8, wherein said spring is a leaf spring.

10. The stand of claim 1, wherein said second post further includes a rod and a sleeve dimensioned to receive said rod, said rod being slidable within said sleeve, such that said second post is extensible.

11. The stand of claim 10, wherein said second post further includes an axial adjustment device, said axial adjustment device including:

- (a) two annular rings for holding said rod substantially immobile within said sleeve when said rings abut substantially opposing sides of an inner surface of said sleeve;
- (b) two wedges for holding said annular rings against said inner surface;
- (c) a spring assembly for supporting said rod, including:
 - (i) a spring casing attached to said rod; and
 - (ii) a spring attached at one end to said wedges, and at another end to said spring casing, such that when said spring is

relaxed, said annular rings abut said inner surface, and when said spring is compressed, said rod is slidable within said sleeve;

- (d) a cylinder for compressing said spring when said cylinder is in a first axial position, and for relaxing said spring when said cylinder is in a second axial position, said cylinder being attached to said wedges;
- (e) a first piston being attached to said cylinder, said first piston determining said axial position of said cylinder;
- (f) a tube for delivering oil to said first piston, such that said first piston moves down and pushes said cylinder from said second axial position to said first axial position, one end of said tube being attached to said first piston;
- (g) a second piston for delivering said oil to said tube, another end of said tube being attached to said second piston; and
- (h) a lever for compressing said second piston, such that when said lever is moved, said rod is slidable within said sleeve, and such that when said lever is released, said rod is held substantially immobile within said sleeve.

12. The stand of claim 11, wherein said second post further includes a universal joint for tilting and rotating said keyboard shelf about said second post, such that a position of said keyboard shelf relative to said second post is adjustable.

13. The stand of claim 12, wherein said universal joint includes:
- (a) a ball for rotating;
 - (b) a ball clamp for attaching said ball to said keyboard shelf;
 - (c) a lower ring for holding substantially the lower portion of said ball;

- (d) an upper ring for holding substantially the upper portion of said ball;
 - (e) a spring assembly for propelling said lower ring towards said upper ring; and
 - (e) a hollow rod being attached at one end to said spring assembly and at another end to said first piston, such that when said first piston moves down, said hollow rod pulls said spring assembly down and said lower ring moves away from said upper ring, such that said ball is rotatable.
14. The stand of claim 13, wherein said spring assembly includes a leaf spring.
15. The stand of claim 12, wherein said universal joint includes:
- (a) a ball for rotating;
 - (b) a housing for being attached to said keyboard shelf and for holding said ball;
 - (c) a spring for pressing said housing against said ball, such that said ball is held substantially immobile; and
 - (d) a handle connected to said spring, such that when said handle is squeezed, said spring is unable to press said housing against said ball and said ball is substantially mobile and such that when said handle is released, said spring presses said housing against said ball.

16. The stand of claim 1, wherein said second post further includes a friction joint, said second post being pivotable about said base by said friction joint, said friction joint including:

- (a) a plurality of friction plates, at least one of said friction plates being attached to said base, and at least a second of said friction plates being attached to said second post;
- (b) a spring for holding each of said friction plates against another of said friction plates, such that said second post is held substantially immobile by friction; and
- (c) an axle attached to said base, said second post being pivotable about said axle when a force is applied against said spring, such that said friction is overcome by said force.

17. The stand of claim 16, wherein said spring is a leaf spring.

18. A counterbalance assembly for supporting a post, said counterbalance assembly including:

- (a) at least one spring;
- (b) a first spring bracket for holding one end of said spring;
- (c) a second spring bracket for holding the other end of said spring;
- (d) a first cable for transferring a force exerted by said spring to said post, said first cable being attached at one end to said post;
- (e) a first pulley and a second pulley for engaging said first cable, said first pulley being attached to said first spring bracket;
- (f) a second cable for modulating said force exerted by said spring, said second cable being attached at one end to said second pulley; and
- (g) a third pulley and a fourth pulley for engaging said second cable, said third pulley being attached to said second spring bracket, and

said fourth pulley being attached to said second pulley, said fourth pulley being characterized by having an alterable radius, and said radius of said fourth pulley being determined by said force exerted by said spring.

19. An axial adjustment device for supporting a rod within a sleeve, said axial adjustment device including:

- (a) two abutment members for holding said rod substantially immobile within said sleeve when said abutment members abut substantially opposing sides of an inner surface of said sleeve;
- (b) a spring assembly for supporting said abutment members, including:
 - (i) a spring casing attached to said rod; and
 - (ii) a spring attached at one end to said abutment members, and at another end to said spring casing, such that when said spring is relaxed, said abutment members abut said inner surface, and when said spring is compressed, said rod is slidable within said sleeve;
- (c) a first piston being attached to said spring assembly;
- (d) a tube for delivering oil to said first piston;
- (e) a second piston for delivering said oil to said tube; and
- (f) a lever for compressing said second piston, such that when said lever is moved, said rod is slidable within said sleeve, and such that when said lever is released, said rod is held substantially immobile within said sleeve.

20. A balance mechanism for supporting a weight on a sleeve over a rod, the rod and the sleeve being substantially vertically oriented, the rod being substantially immobile and the sleeve moving relative to the rod, the mechanism comprising:

- (a) a cable attached to the sleeve, such that the sleeve moves upward when said cable is pulled;
- (b) a first pulley attached to the rod near an upper portion of the rod, said cable being wrapped around said first pulley;
- (c) a second pulley attached to the rod below said first pulley, said second pulley having a plurality of slots such that said second pulley has a plurality of diameters, said cable being wrapped around said second pulley at one of said plurality of slots according to the weight on the sleeve;
- (d) a spring for being attached to said cable and for exerting force on said cable; and
- (e) a handle for tightening said spring, such that when said spring is tightened, said cable pulls on the sleeve, the sleeve moves upward and then remains substantially immobile relative to said rod.

21. A sliding mechanism for adjusting a horizontal position of a shelf, the mechanism comprising:

- (a) a track for slidably holding the shelf, such that the shelf is able to slide along said track;
- (b) a lock for holding the shelf at a particular portion of said track, said lock featuring:
 - (i) a pin for pushing against the shelf and holding the shelf substantially immobile; and

27

- (ii) a spring for holding said pin against the shelf, such that when said spring is pulled, said pin moves away from the shelf;

and

- (c) a handle for being squeezed, such that when said handle is squeezed, said handle pulls said spring to release said lock.

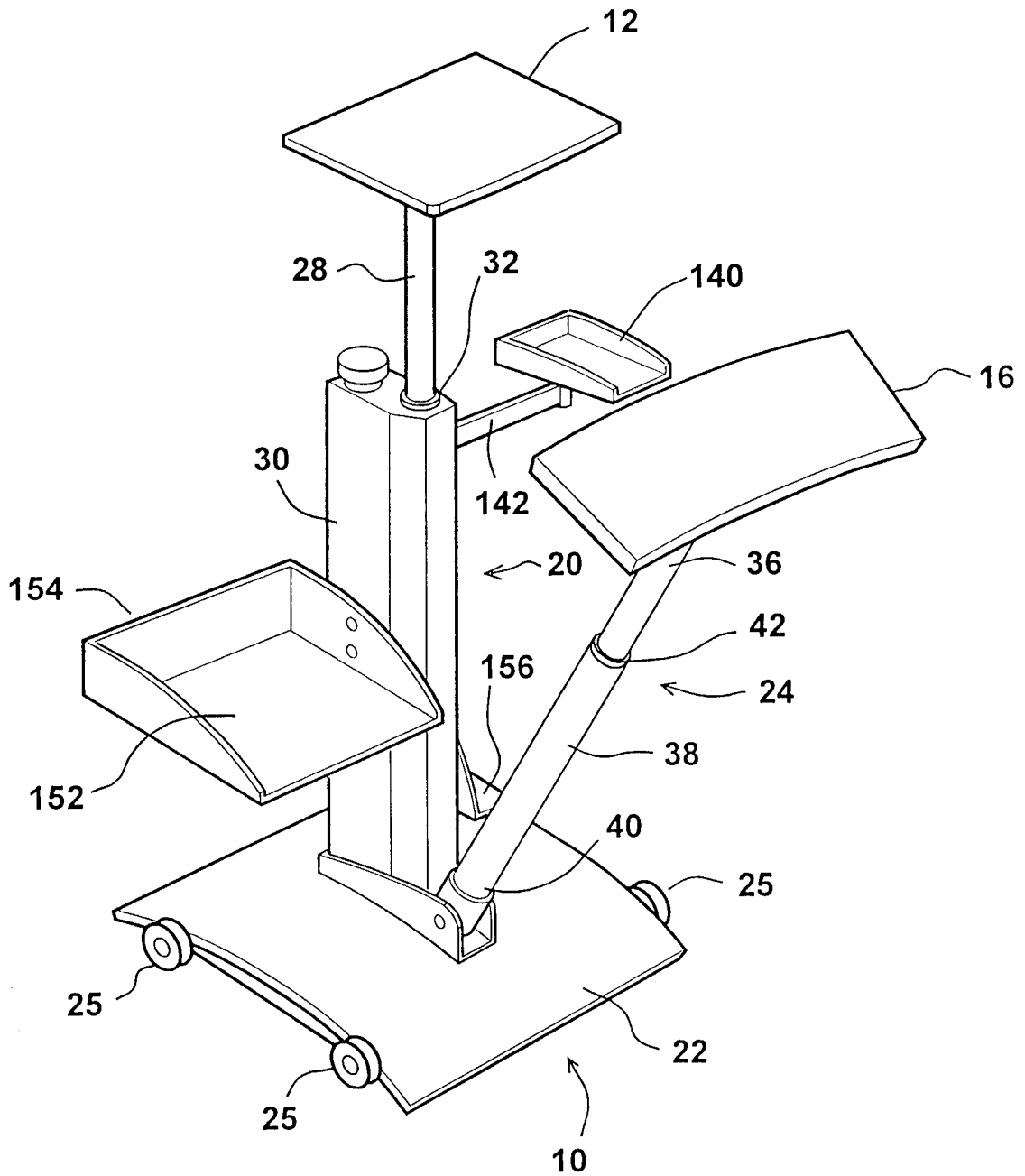


FIG. 1A

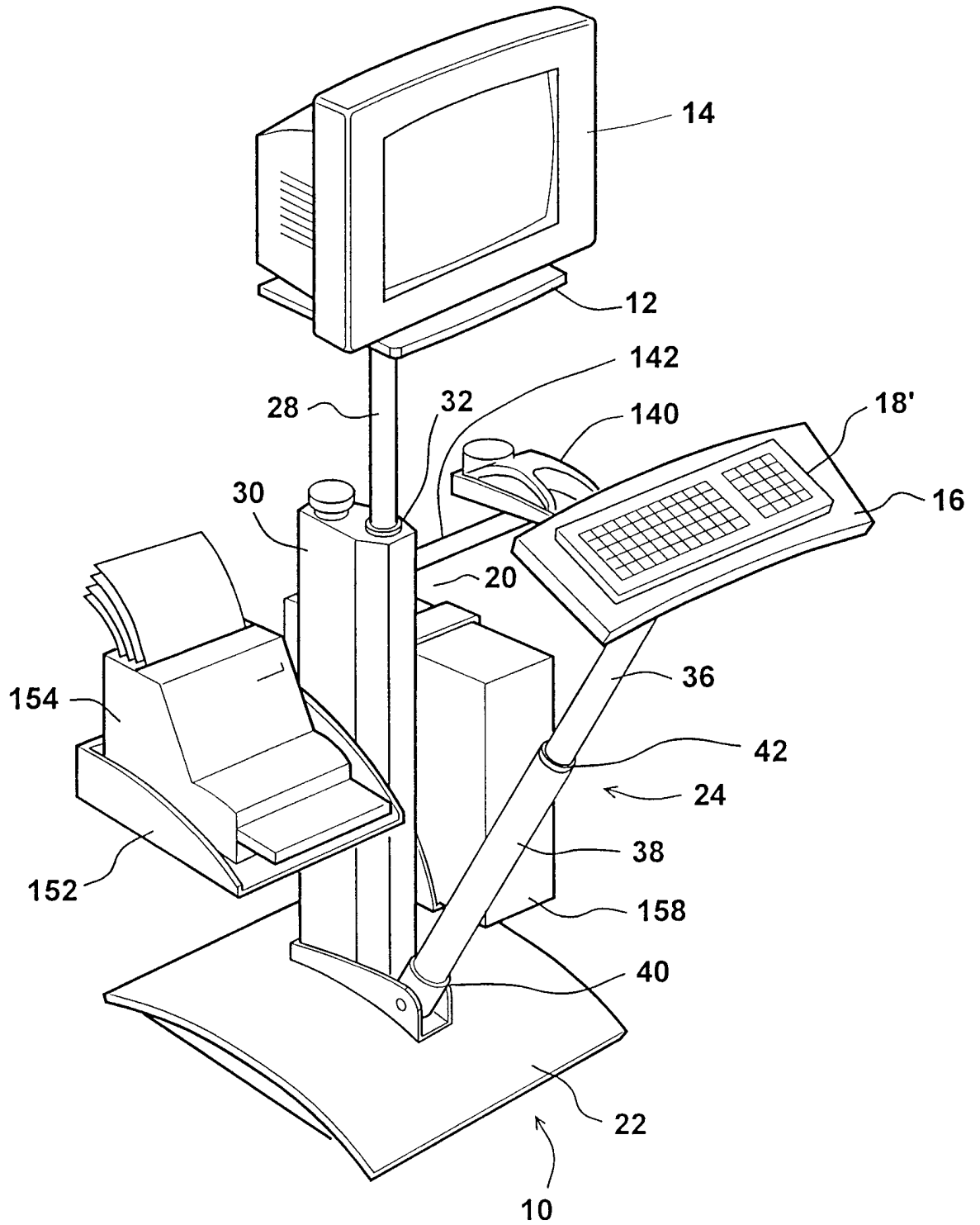


FIG. 1B

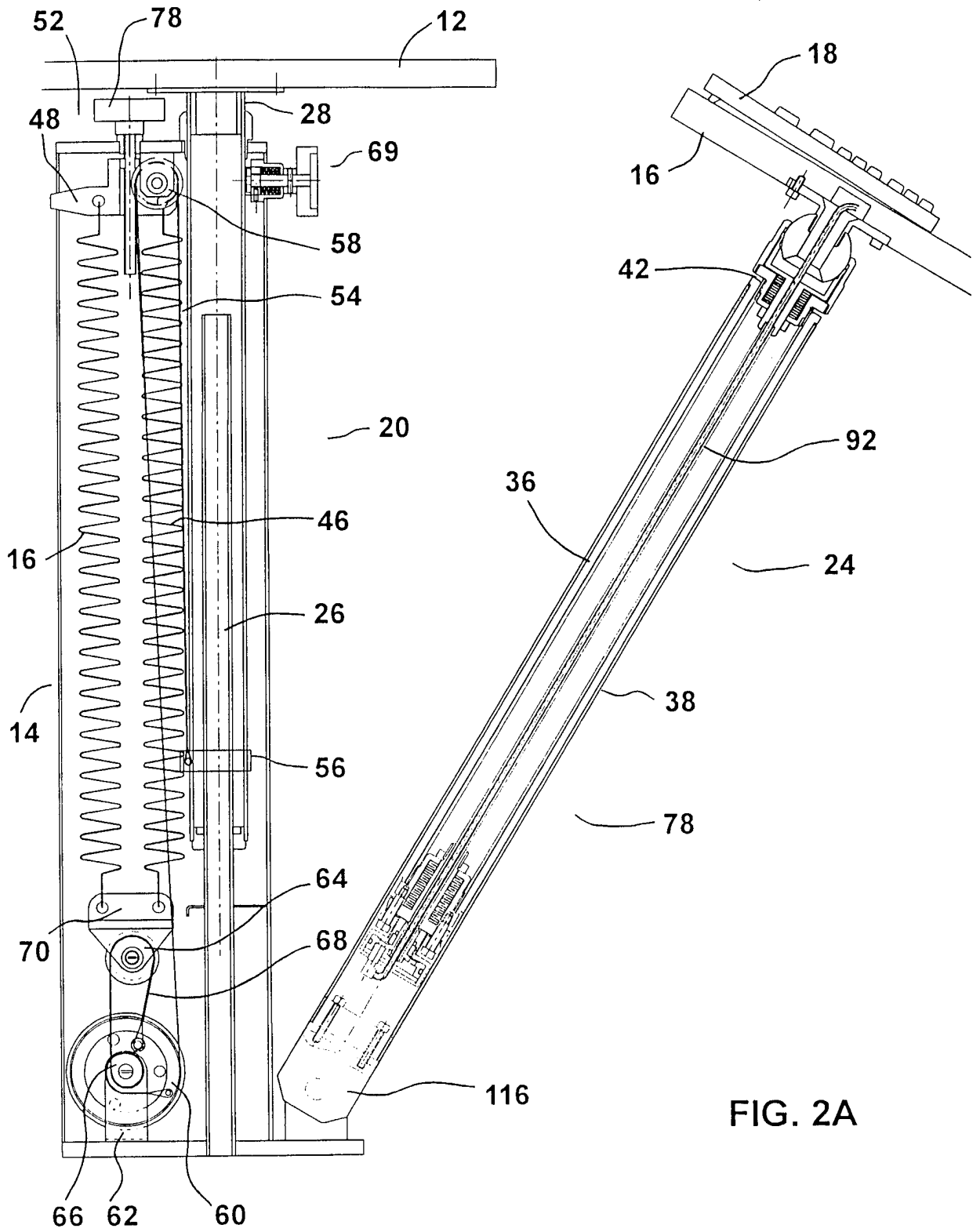


FIG. 2A

FIG. 2B

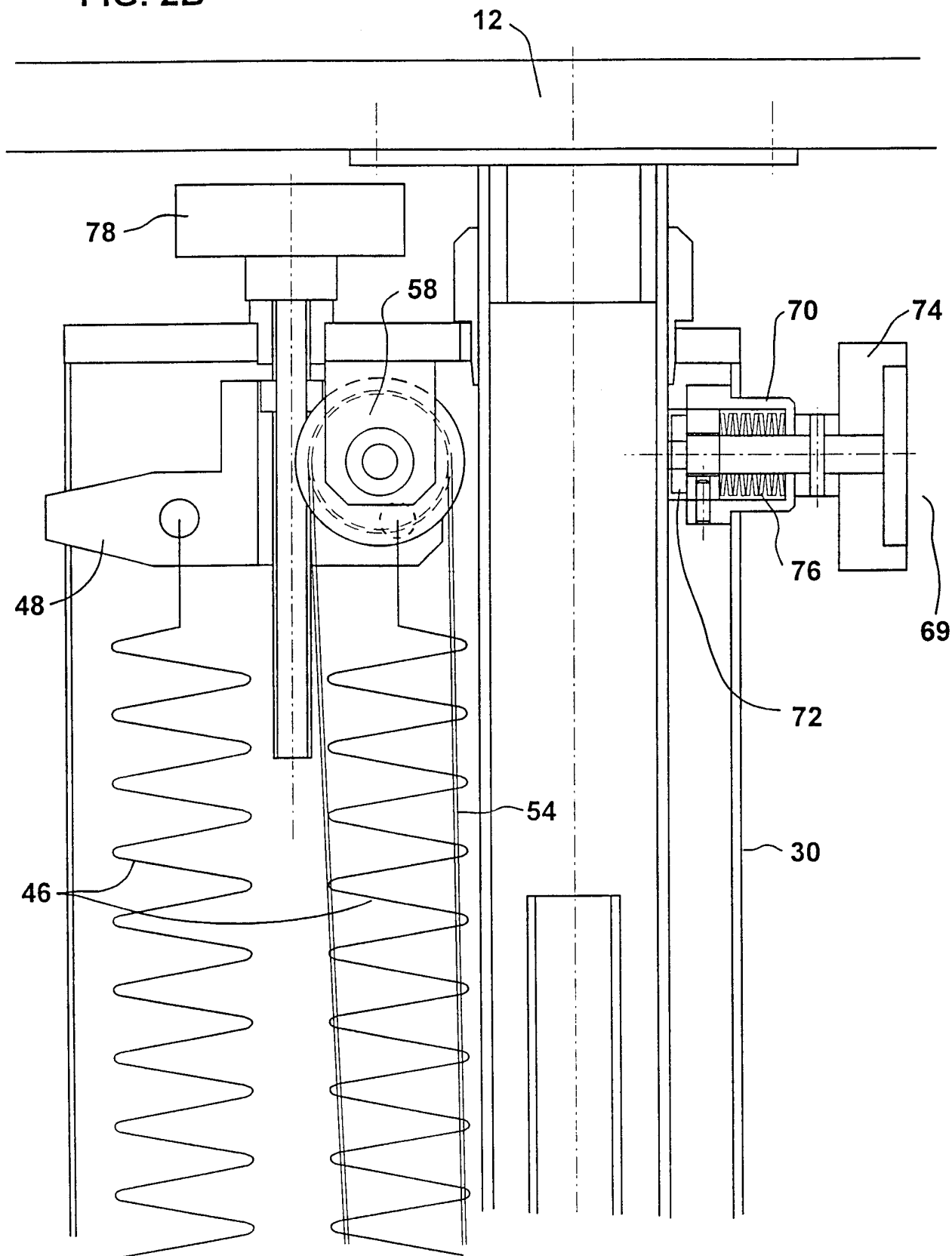
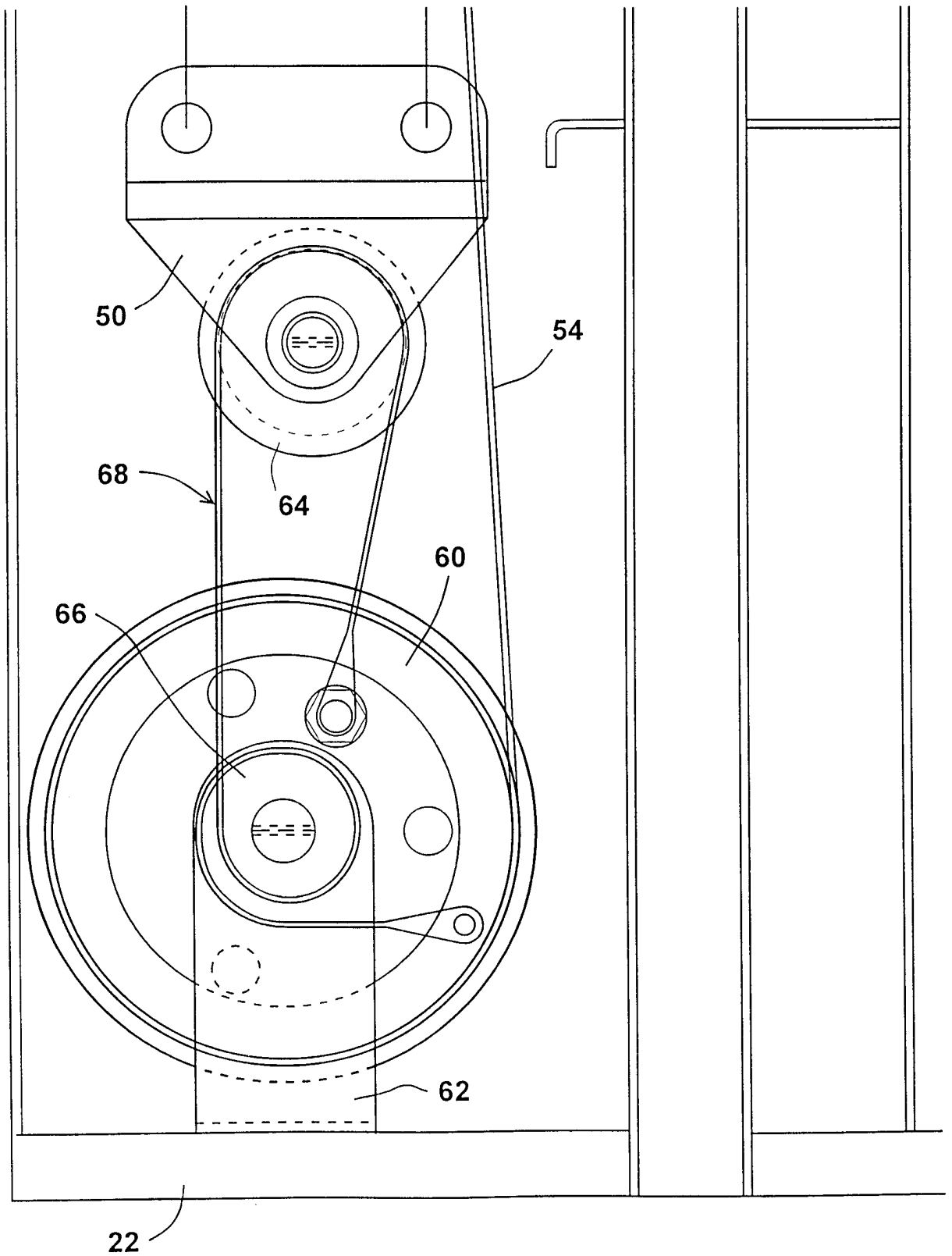


FIG. 2C



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FIG. 2D

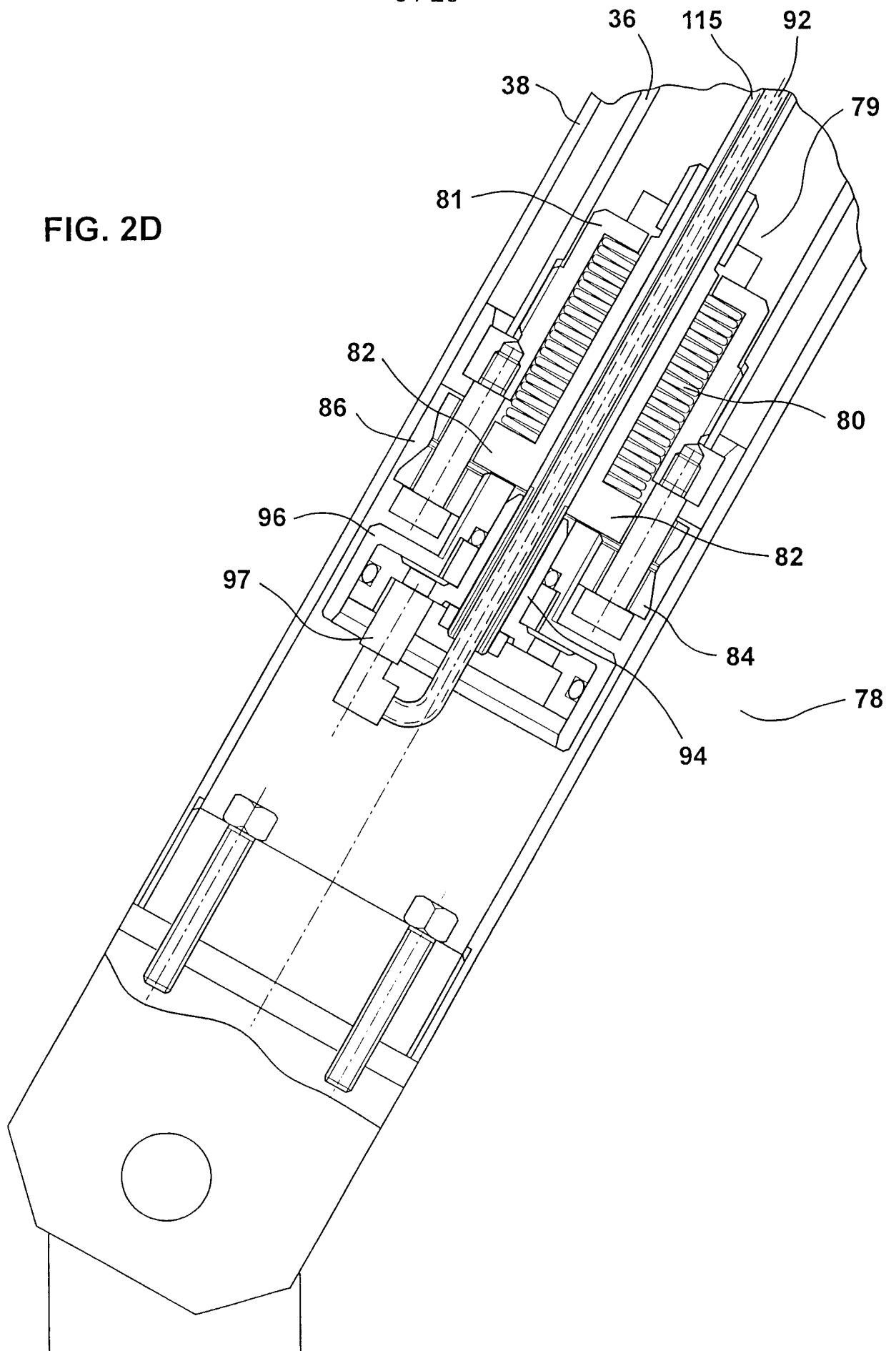
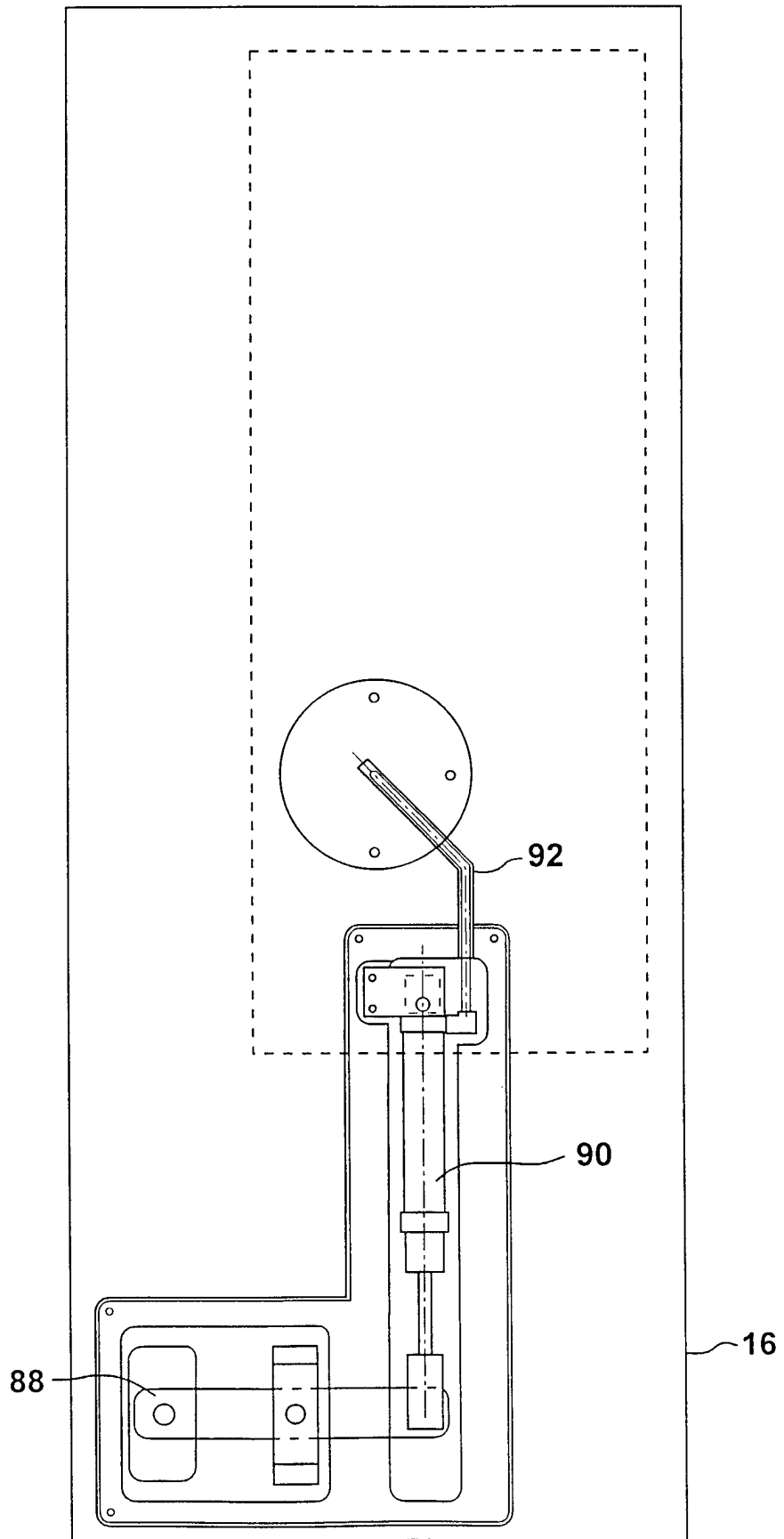


FIG. 2E



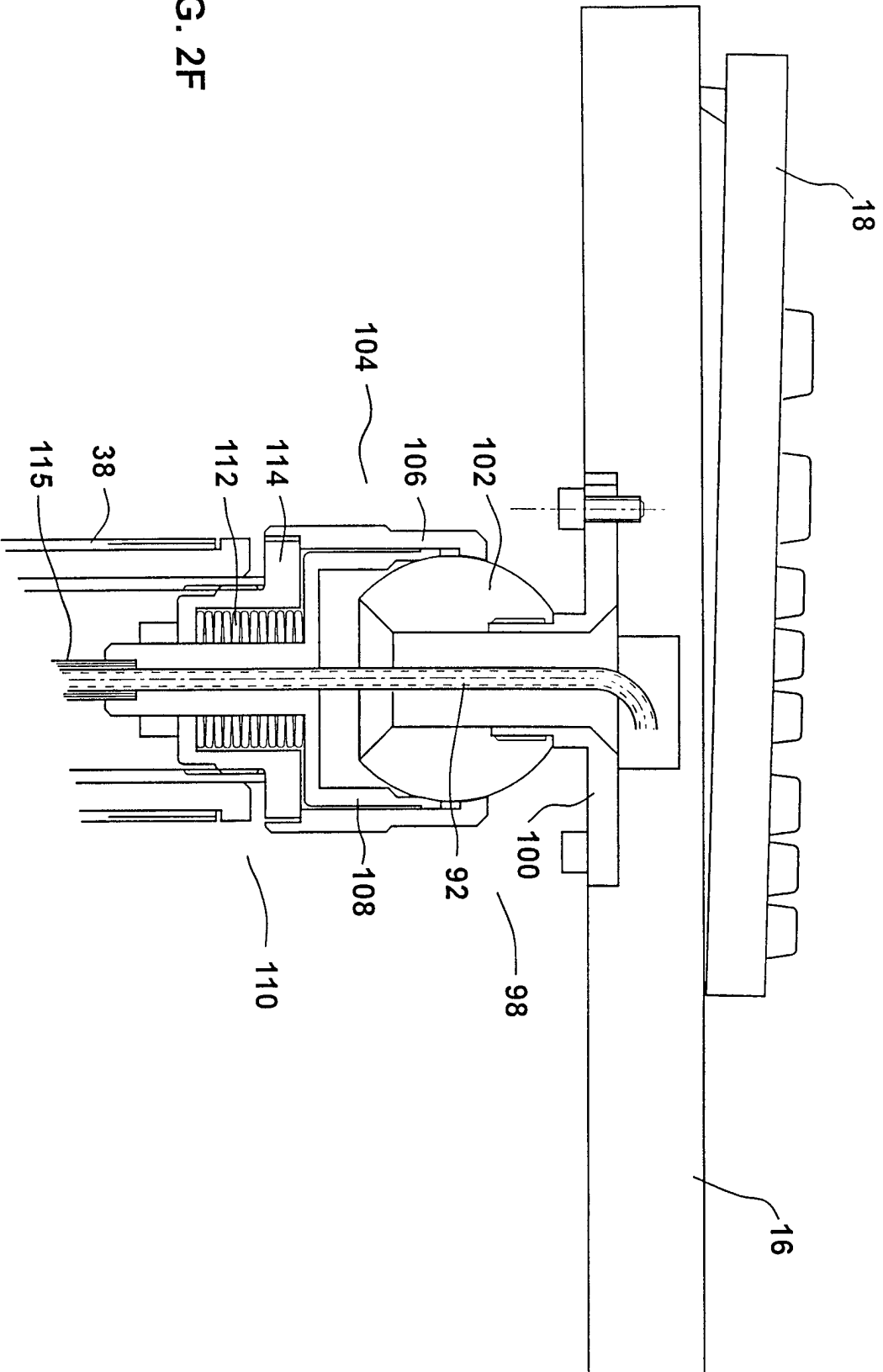


FIG. 2F

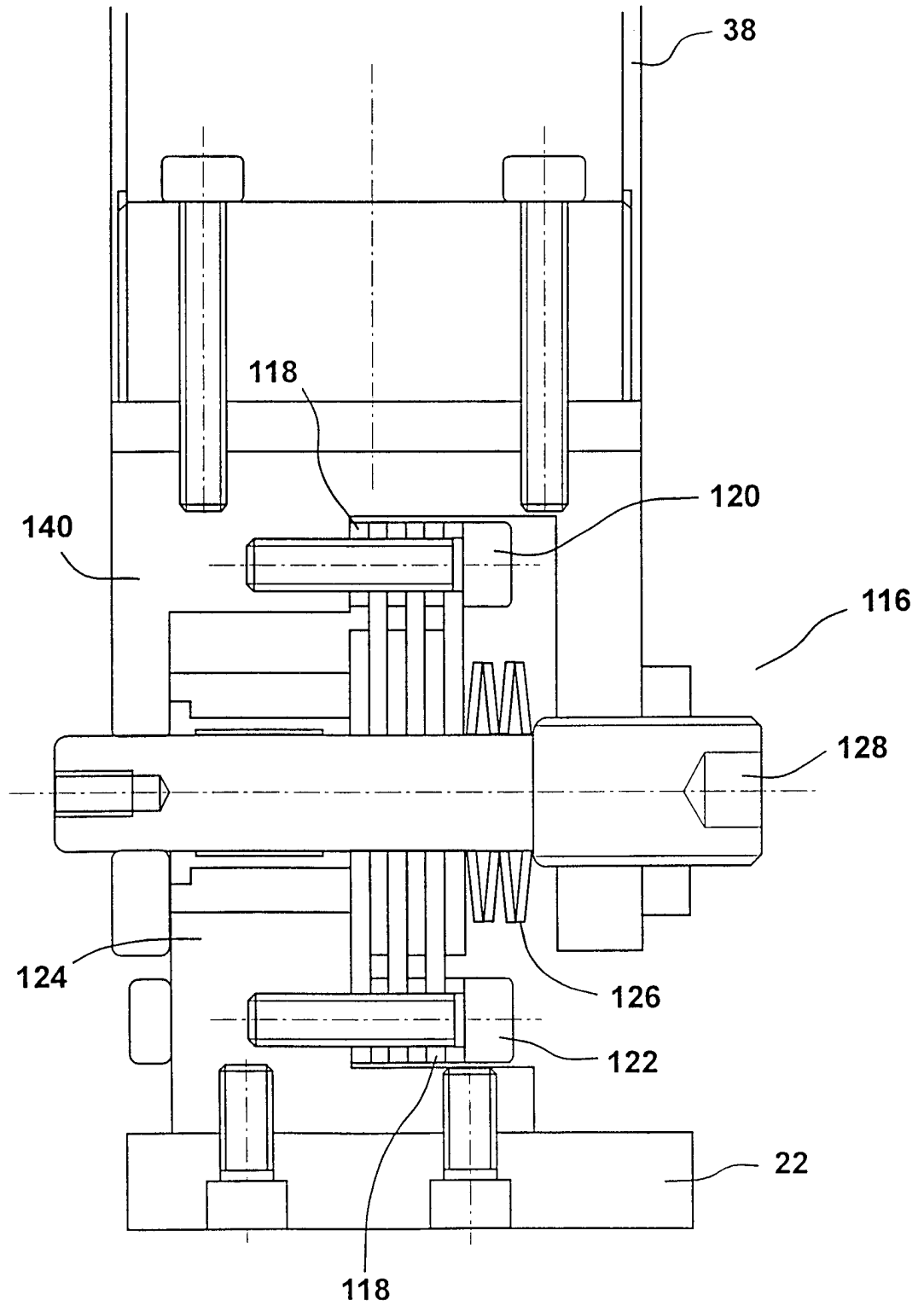


FIG. 2G

FIG. 3A

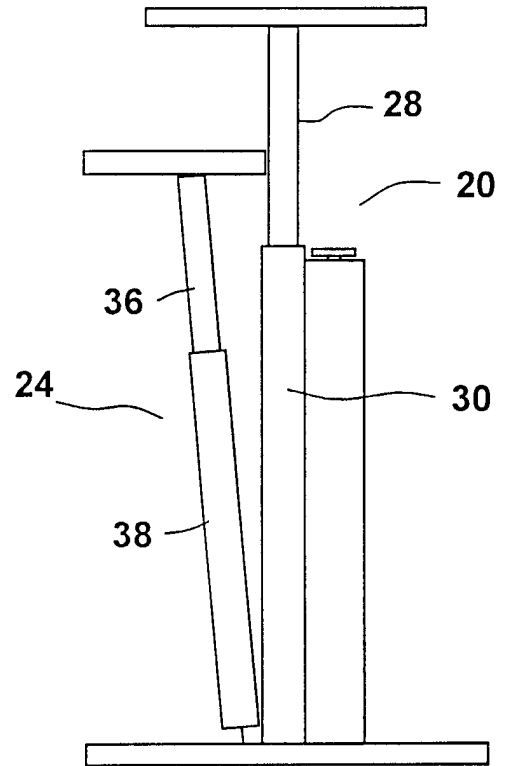
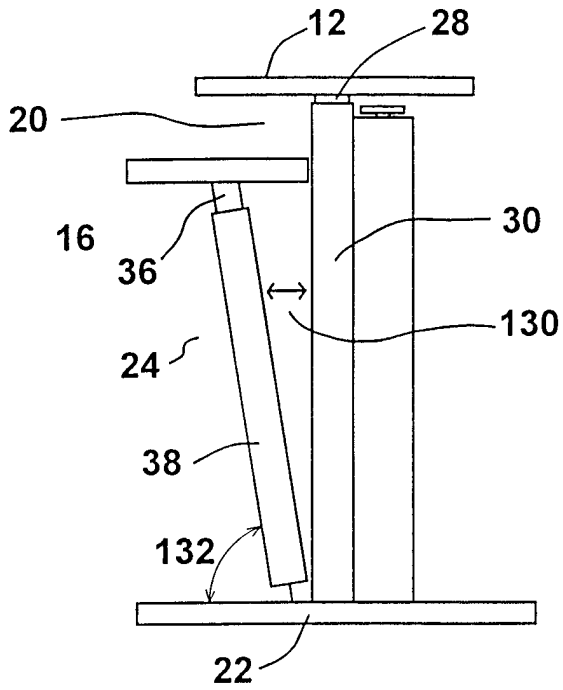


FIG. 3B

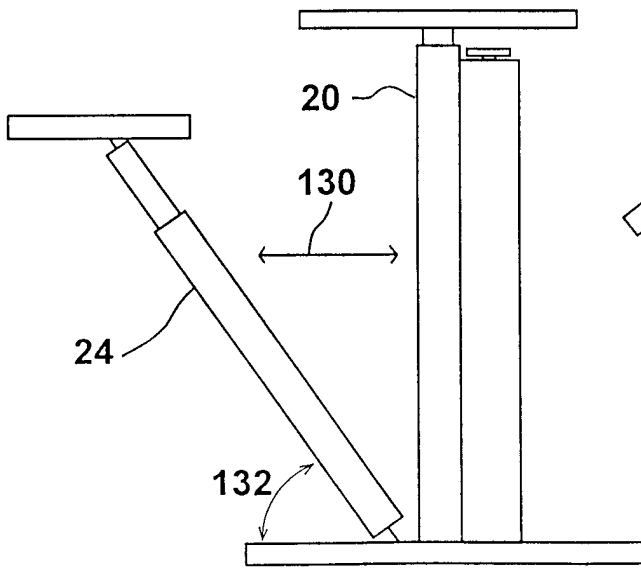


FIG. 3C

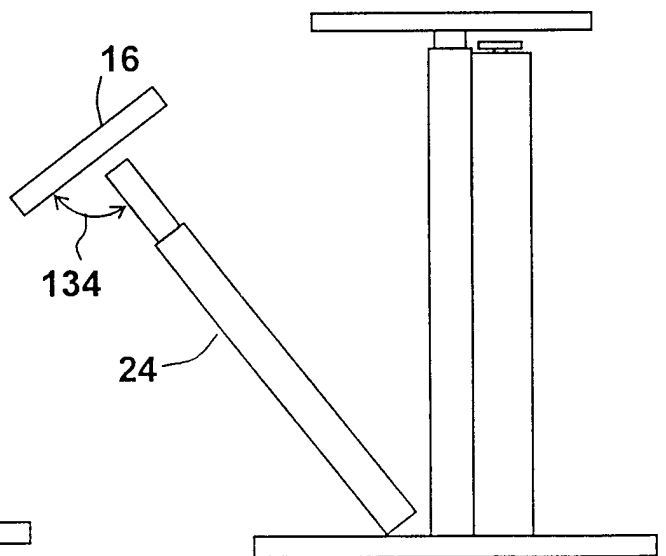


FIG. 3D

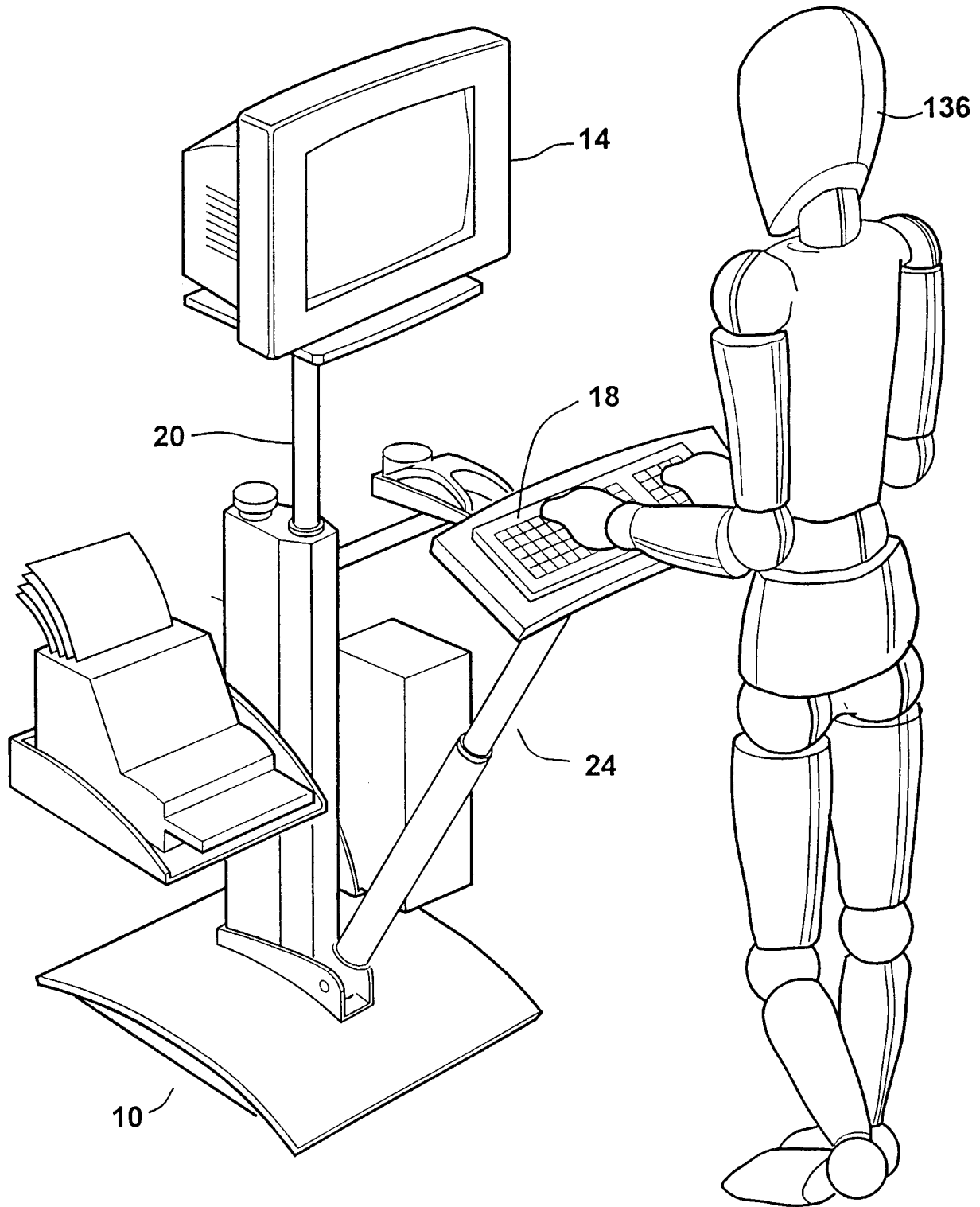


FIG. 4A

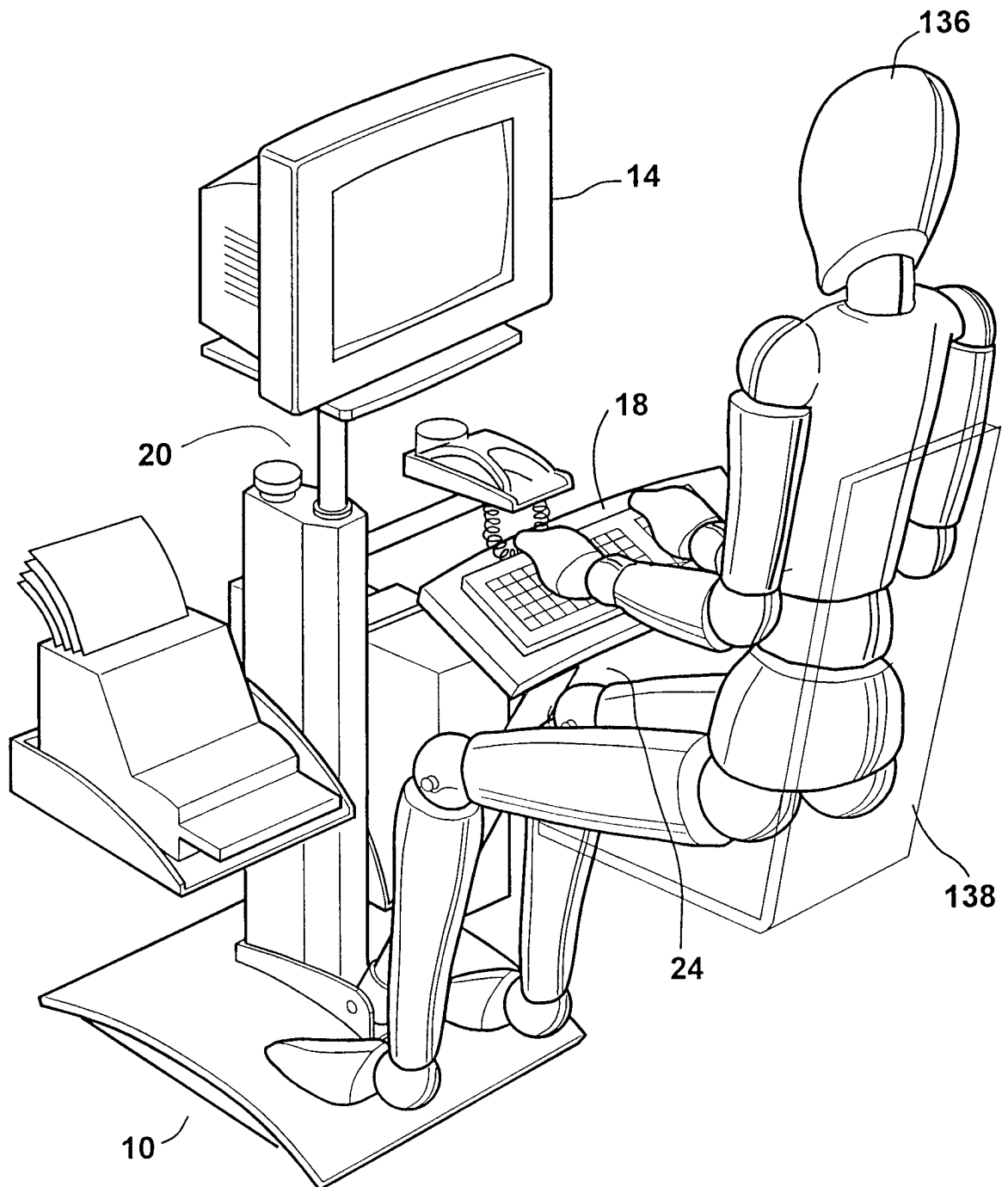
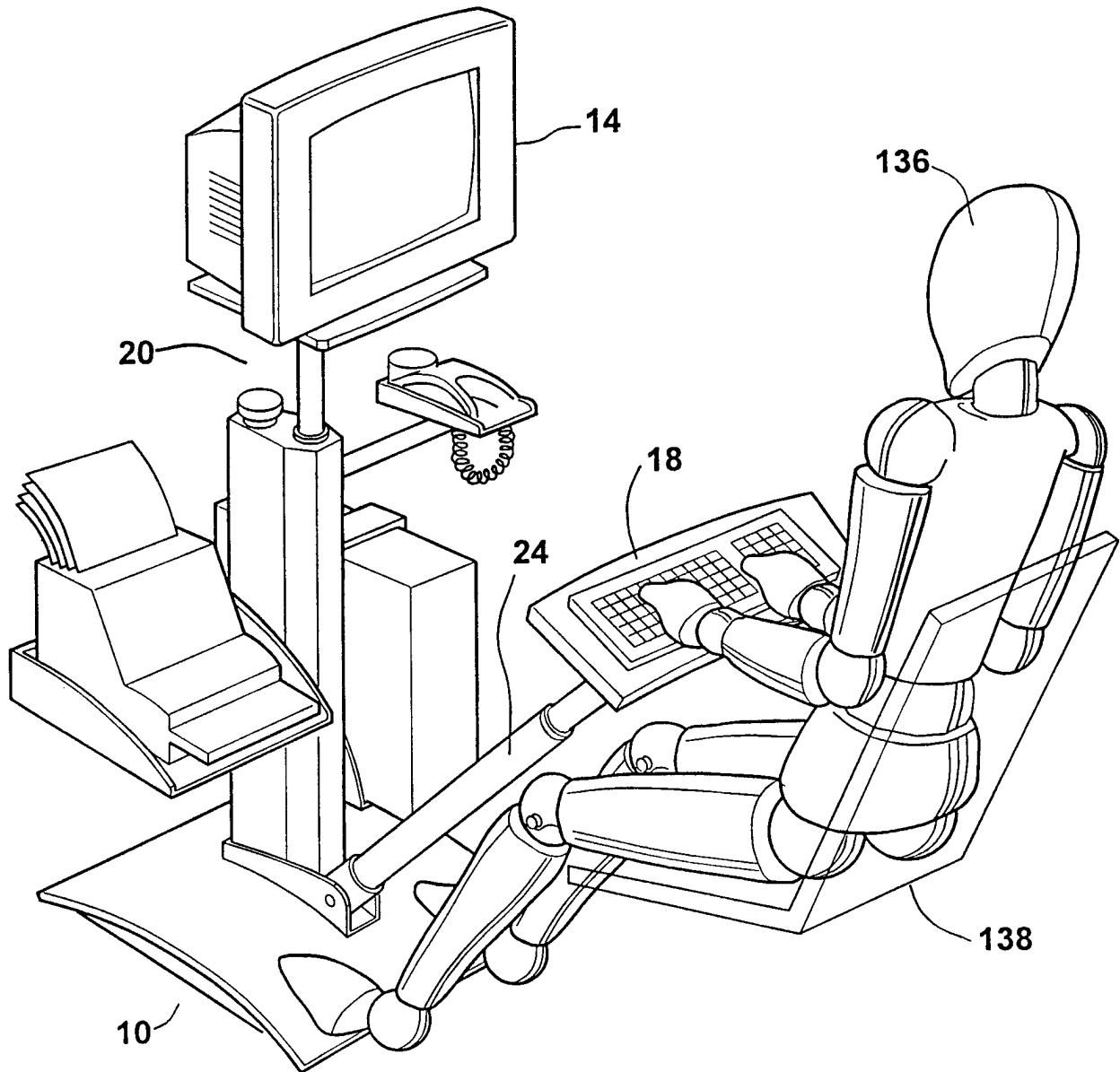


FIG. 4B

FIG. 4C



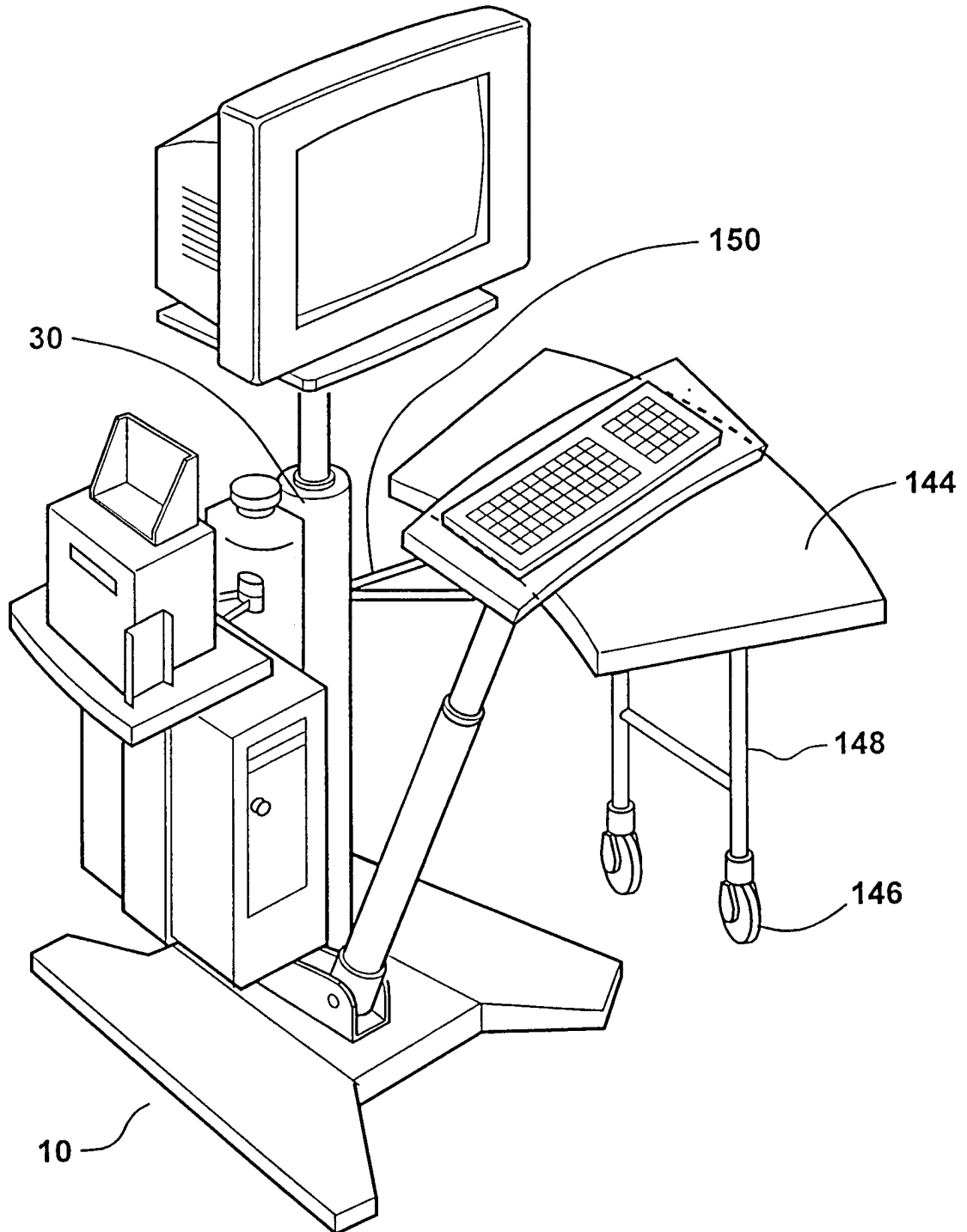


FIG. 5

FIG. 6A

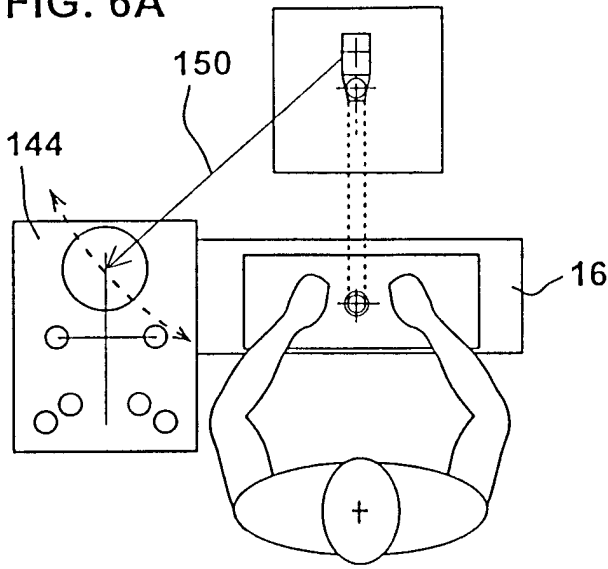
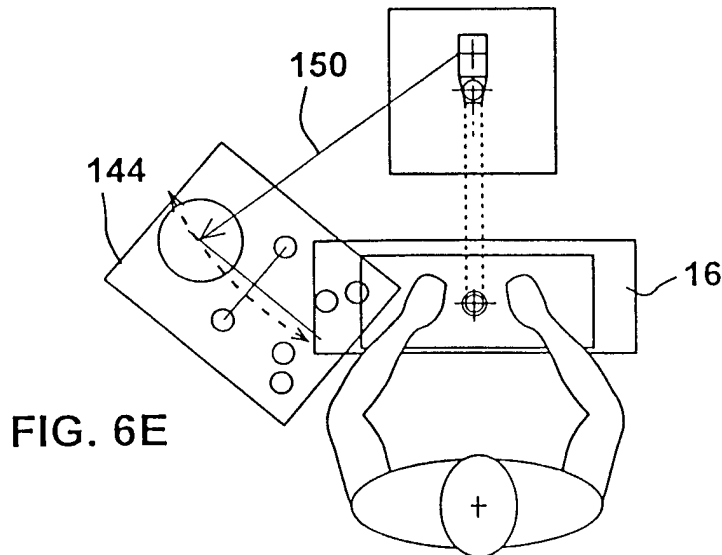
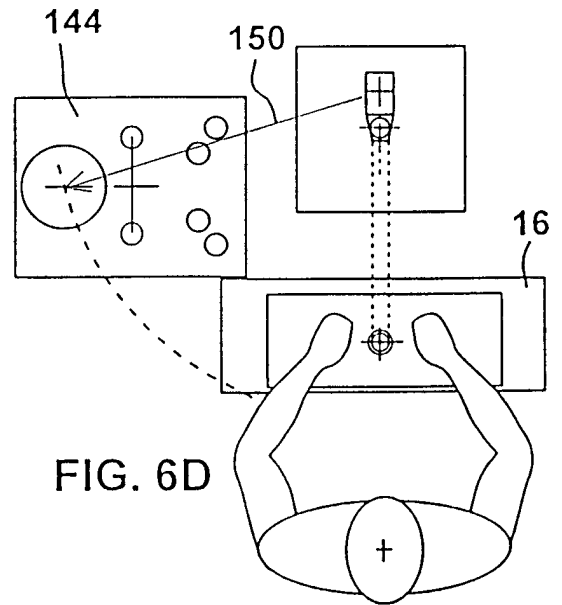
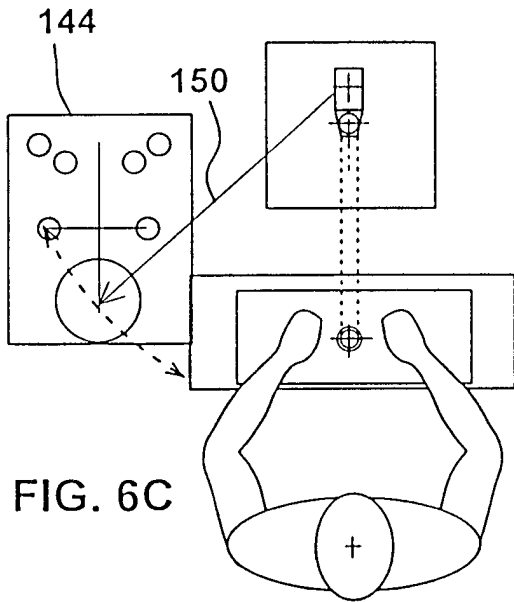
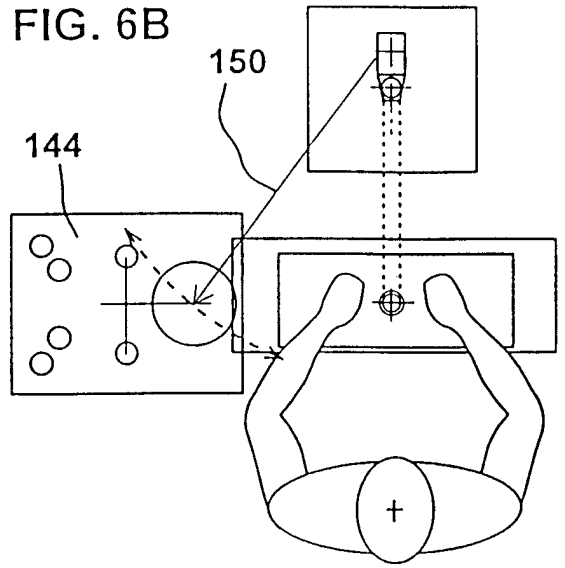


FIG. 6B



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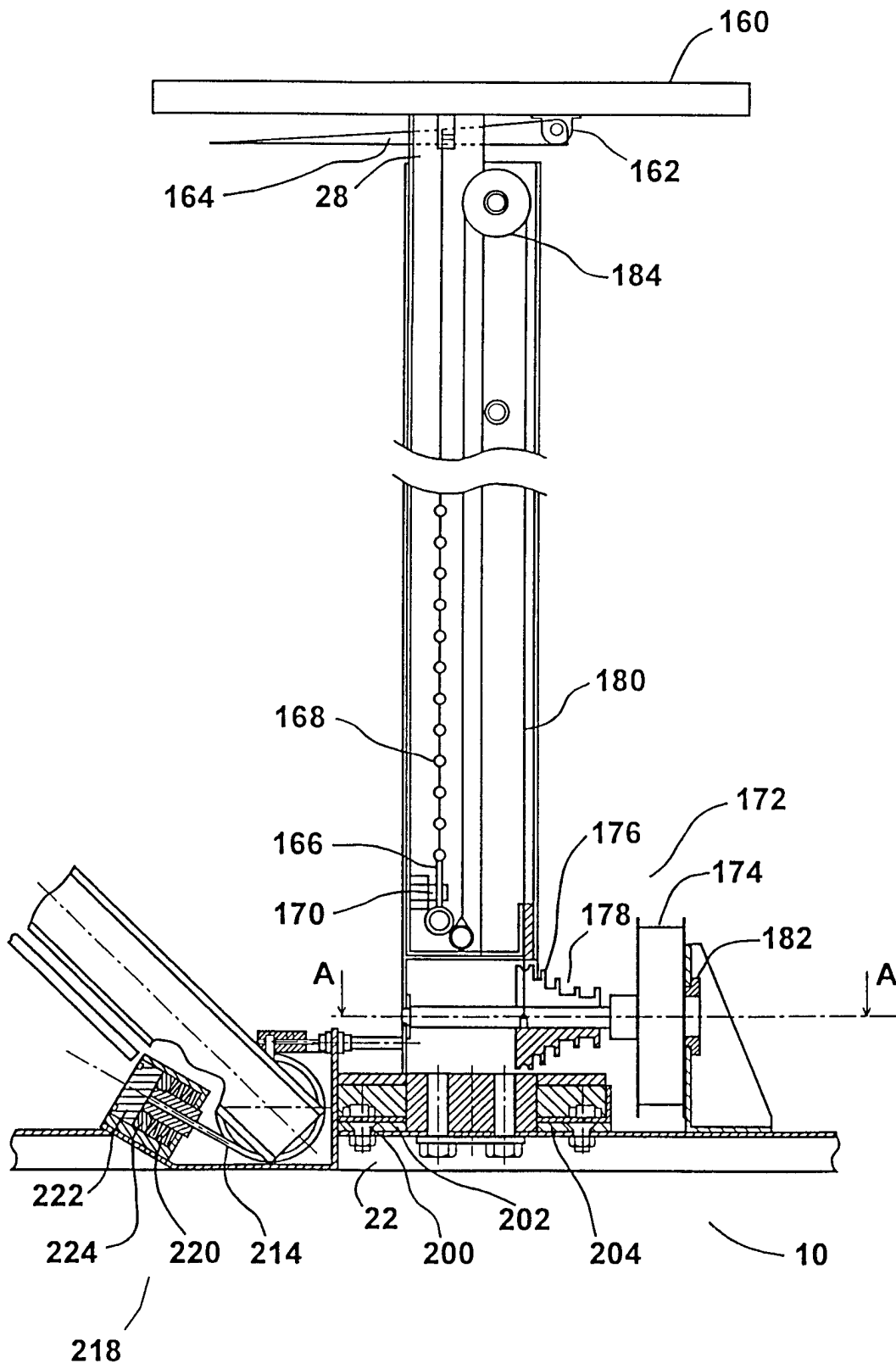


FIG. 7

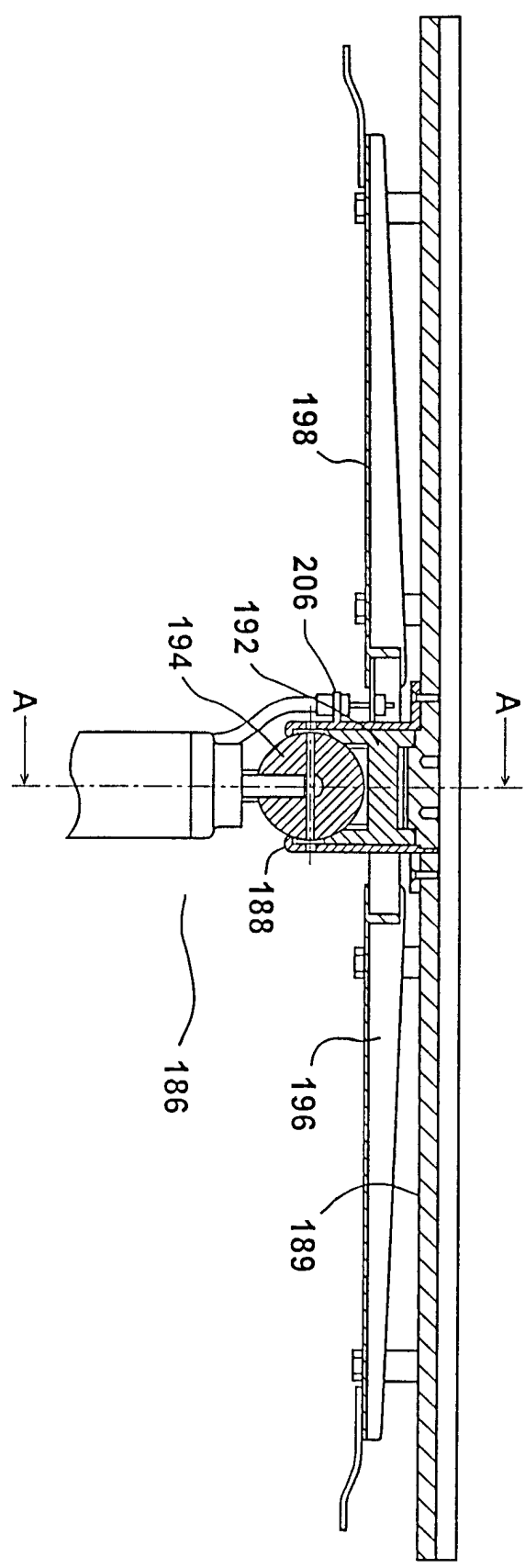


FIG. 8A

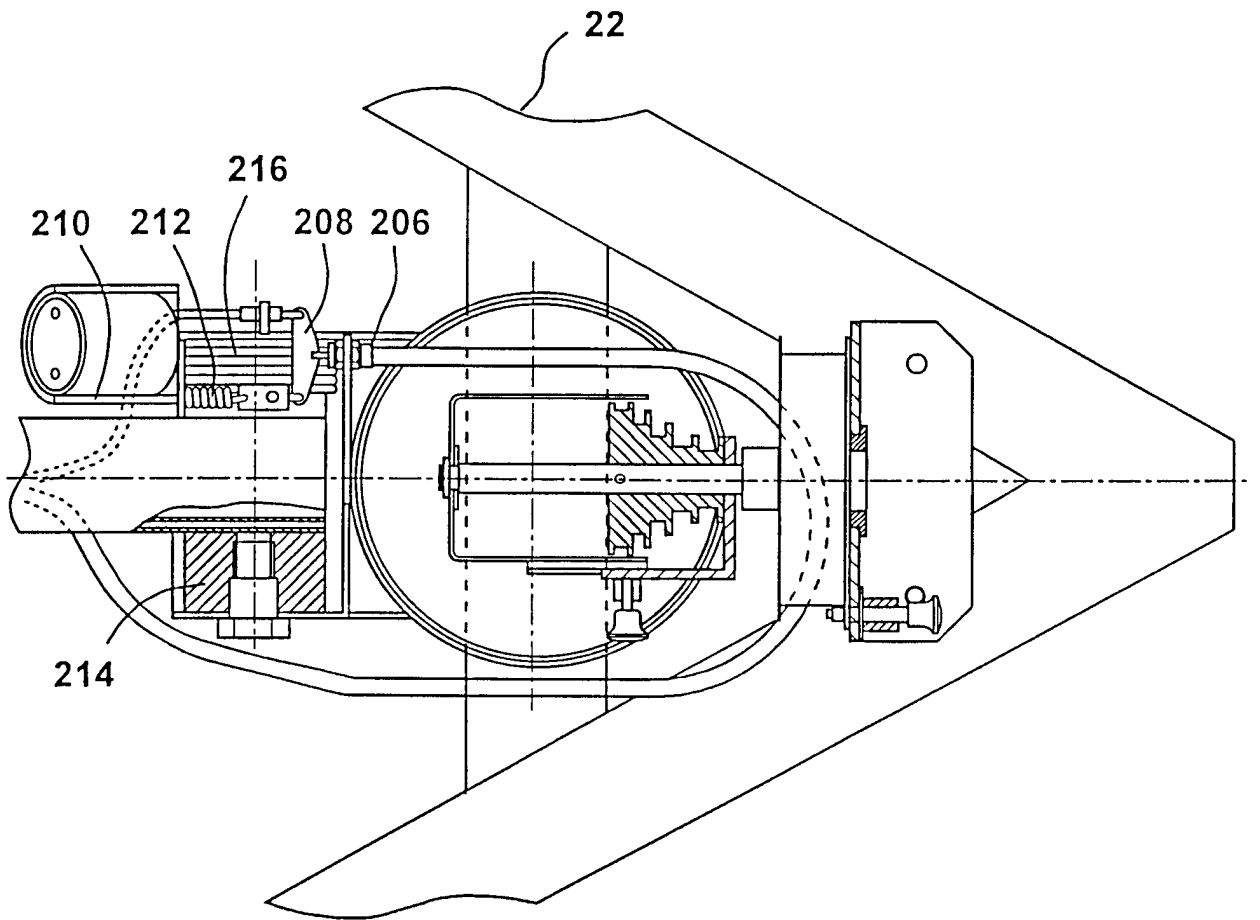


FIG. 8B

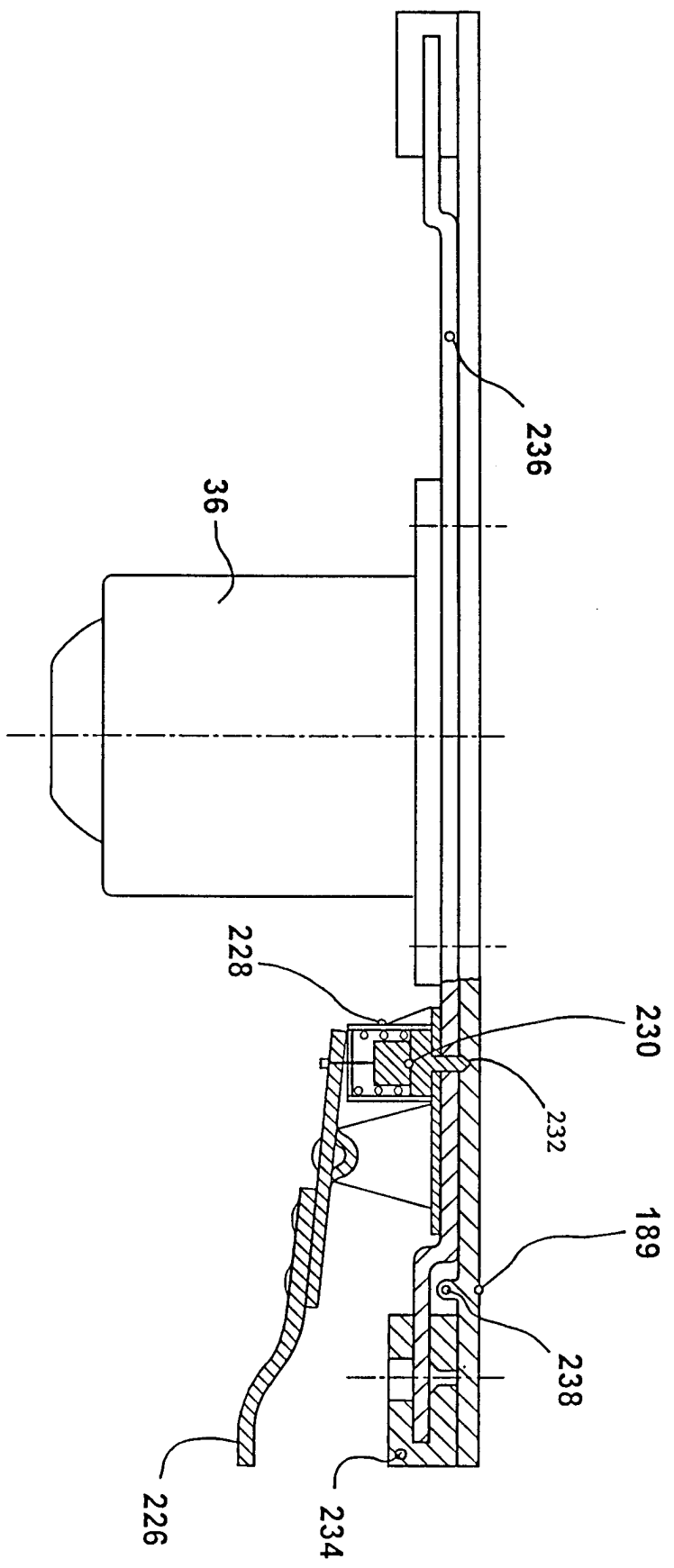


FIG. 8C

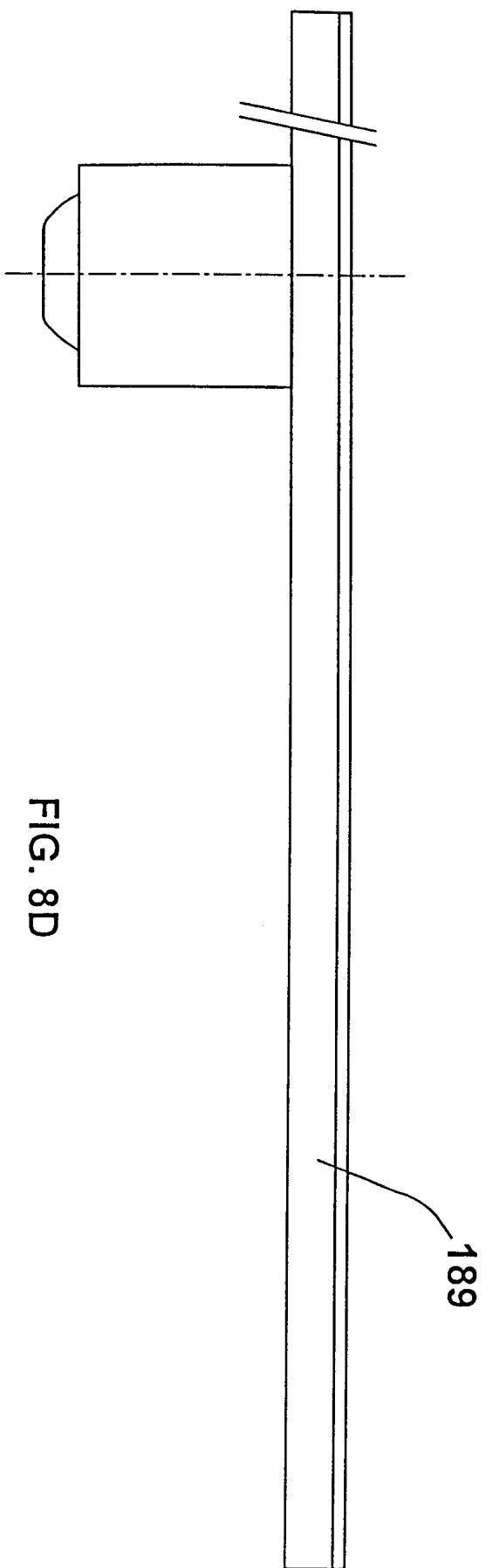


FIG. 8D

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL97/00331

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(6) :A47F 5/12; A47B 9/00; F16M 11/00 US CL :108/7, 143, 147, 147.2; 248/123.11, 162.1, 181.2, 412 According to International Patent Classification (IPC) or to both national classification and IPC</p>																				
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) U.S. : 108/7, 143, 147, 147.2; 248/123.11, 162.1, 181.2, 412; 108/147.19, 144.11, 148, 50.01; 248/125.2, 411, 404, 188.2</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p>																				
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 5,041,770 A (SEILER ET AL) 08 AUGUST 1991 (08/08/91), col. 5, lines 38-57.</td> <td>1 and 5</td> </tr> <tr> <td>Y</td> <td>US 5,357,873 A (HILTON) 25 OCTOBER 1994 (10/25/94), see entire document, especially elements shown in figure 3.</td> <td>1-2, 4 and 10</td> </tr> <tr> <td>Y</td> <td>US 4,566,741 A (ERIKSSON ET AL) 28 JANUARY 1986 (01/28/96), col. 5, lines 6-14.</td> <td>1-2, 4, 10 and 16-17</td> </tr> <tr> <td>Y</td> <td>US 4,567,835 A (REESE ET AL) 4 FEBRUARY 1986 (02/04/86), see entire document, especially columns 2 and 3.</td> <td>1 and 16-17</td> </tr> <tr> <td>Y</td> <td>US 3,362,671 A (JOHNSON) 09 JANUARY 1968 (01/09/68), see entire document, especially col. 1, lines 28-52.</td> <td>16-17</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 5,041,770 A (SEILER ET AL) 08 AUGUST 1991 (08/08/91), col. 5, lines 38-57.	1 and 5	Y	US 5,357,873 A (HILTON) 25 OCTOBER 1994 (10/25/94), see entire document, especially elements shown in figure 3.	1-2, 4 and 10	Y	US 4,566,741 A (ERIKSSON ET AL) 28 JANUARY 1986 (01/28/96), col. 5, lines 6-14.	1-2, 4, 10 and 16-17	Y	US 4,567,835 A (REESE ET AL) 4 FEBRUARY 1986 (02/04/86), see entire document, especially columns 2 and 3.	1 and 16-17	Y	US 3,362,671 A (JOHNSON) 09 JANUARY 1968 (01/09/68), see entire document, especially col. 1, lines 28-52.	16-17
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Y	US 3,362,671 A (JOHNSON) 09 JANUARY 1968 (01/09/68), see entire document, especially col. 1, lines 28-52.	16-17																		
<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.</p>																				
<table border="0"> <tr> <td>* Special categories of cited documents:</td> <td>*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</td> </tr> <tr> <td>*A* document defining the general state of the art which is not considered to be of particular relevance</td> <td>*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</td> </tr> <tr> <td>*E* earlier document published on or after the international filing date</td> <td>*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</td> </tr> <tr> <td>*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)</td> <td>*G* document member of the same patent family</td> </tr> <tr> <td>*O* document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>*P* document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			* 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)	*G* 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							
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<p>Date of the actual completion of the international search</p> <p>18 FEBRUARY 1998</p>		<p>Date of mailing of the international search report</p> <p>09 MAR 1998</p>																		
<p>Name and mailing address of the ISA/US Commissioner of Patents and Trademarks</p> <p>Box PCT Washington, D.C. 20231</p> <p>Facsimile No. (703) 305-3230</p>		<p>Authorized officer</p> <p>HANH V. TRAN <i>[Signature]</i></p> <p>Telephone No. (703) 308-2168</p>																		

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL97/00331

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,386,787 A (HALL) 07 FEBRUARY 1995 (02/07/95), columns 4-5, figures 3 and 4.	21
A	J US 2,859,983 A (MAY) 11 NOVEMBER 1958 (11/11/58), see entire document, especially columns 2-3.	12-15
A	DE 001127052 A (SCHNEE) 05 APRIL 1962 (04/05/62), figures 1-2	1-21