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(54) Title: BALL MOUNTED MOUNTING DEVICE

(57) Abstract: An adaptable mounting apparatus for hand-held electronic device(s) includes at least one mounting fixture connected by a positionable support arm; wherein the support arm is capable of clamping or locking either end to a spherical ball-mounting future and the support arm is in a non-axial alignment between the mounting fixtures.

BALL MOUNTED MOUNTING DEVICE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to an adaptable mounting apparatus for hand-held electronics, and more particularly to an adaptable mounting apparatus including mounting fixtures connected by a positionable support arm. The support arm, may be arranged to clamp or lock by either end to a variety of mounting fixtures, e.g., including a spherical ball-mounting fixture.

DESCRIPTION OF THE BACKGROUND ART

[0002] It is often desirable to provide a mount for a hand held electronics so that they can be placed in comfortable and advantageous position. A variety of devices have been developed to provide supports for hand held electronics and other similar sized objects and they are often difficult to position or difficult to control. Some of these devices are mechanically complex and expensive.

[0003] U.S. Patent No. 4,493,344 describes a mechanical plug device which is used to seal the end of a piper conduit. The device uses a seal which is placed between the pair of plate members which are tightened through a screw in order to perform a tight seal.

[0004] U.S. Patent No. 6,666,420 describes a suction cup device used for moving glass windows or the like.

[0005] While these two devices have relevance to their own fields of interest, they are not commonly used in support devices for hand held electronics. Thus, the prior devices all have the shortcomings of not being easily adjustable and being mechanically complex.

SUMMARY OF THE INVENTION

[0006] The present invention overcomes the shortcomings associated with the background art and achieves other advantages not realized by the background art.

[0007] A first object of the present invention is to provide a support arm with a non-axial alignment between the mounting fixtures. In other words, to offset the body of the arm in such a way that a rotation around the connector means at one or both ends can be positioned substantially beyond 90 degrees.

[0008] A second object of the present invention is to provide a non-axial alignment of the ball "mounting fixture" at one or both ends to further enhance positionability. This approach to adaptability is readily apparent in a mechanics wrench set wherein a curved handled wrench is more adaptable to reaching a confined bolt head than a straight wrench.

[0009] A third object of the present invention incorporates a cam-over-center, locking mechanism that works like vise-grip pliers. This arrangement differs from other well-known cam-over-center locking apparatus in that it clamps on a spherical surface with a substantially mating face.

[0010] A fourth object of the present invention includes a sphere-gripping clamp at one end that also grips the arm body along a hexagonal surface, e.g., the actual surface can be any number of sides, with at least one of the clamping members having an internal contour to allow half-positioning on the six sides (in the exemplary hexagonal surface). In other words, internal contour will allow the sphere-gripping clamp to index to twelve positions on six surfaces of the arm. This approach to indexing is readily apparent in a mechanics wrench set wherein a twelve point socket or wrench will allow access to a hexagonal bold head from twice as many radial positions. Prior designs provide for a degree of vibration isolation between the two mounting fixtures. In one arrangement a known product incorporates rubber balls molded onto a rigid mounting fixture. However, this method is expensive to produce and replace.

[0011] A fifth object of the present invention includes a clearance allowance in the gripping area of each support arm clamp to accommodate a rubber pad as a vibration buffer between the mounting fixture ball and the mating support arm clamping surfaces. These rubber pads are easily replaced when worn or decayed, (unserviceable). The basic configuration of the present invention is comprised of the described "support arm" and two "ball mounting-fixtures," which position a bolt-on flange, as part of each mounting fixture, at either end of the support arm.

[0012] A sixth object of the present invention is to provide a "suction mount", at one or both ends of the support arm, to replace the bolt-on flange.

[0013] A seventh objective is to provide "friction mount," at one or both ends of the support arm, to replace the bolt-on flange.

[0014] An eighth objective is to provide a "multi-conforming mount" at one or both ends of the support arm, to work in cooperation with the bolt-on flange.

[0015] One or more of these and other objects are accomplished by a device as shown or described in the accompanying drawings.

[0016] One or more of these and other objects are further accomplished by a method of holding and mounting a device.

[0017] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The present invention will become more fully understood from the detailed description given hereinafter and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

[0019] FIG. 1 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0020] FIG. 2 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0021] FIG. 3 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0022] FIG. 4 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0023] FIG. 5 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0024] FIG. 6 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0025] FIG. 7 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0026] FIG. 8 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0027] FIG. 9 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0028] FIG. 10 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0029] FIG. 11 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0030] FIG. 12 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0031] FIG. 13 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0032] FIG. 14 is side, sectional view of a mounting device according to an embodiment of the present invention;

[0033] FIG. 15 is side, sectional view of a mounting device according to an embodiment of the present invention;

[0034] FIG. 16 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0035] FIG. 17 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0036] FIG. 18 is an enlarged side, perspective view of a portion of the mounting device shown in FIG. 17;

[0037] FIG. 19 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0038] FIG. 20 is a partial, sectional view of a suction mount for a mounting device according to an embodiment of the present invention;

[0039] FIG. 21 is an exploded, perspective view of a suction mount for a mounting device according to an embodiment of the present invention;

[0040] FIG. 22 is an exploded, partial sectional view of a suction mount for a mounting device according to an embodiment of the present invention;

[0041] FIG. 23 is an exploded, perspective view of a friction mount for a mounting device according to an embodiment of the present invention;

[0042] FIG. 24 is side, perspective view of a mounting device according to an embodiment of the present invention;

[0043] FIG. 25 is bottom, perspective view of a mounting device according to an embodiment of the present invention;

[0044] FIG. 26 is side, perspective view of a mounting device according to an embodiment of the present invention; and

[0045] FIG. 27 is side, perspective view of a mounting device according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0046] The present invention will hereinafter be described with reference to the accompanying drawings, wherein the mounting device for the present invention is shown as 10 in FIG. 1.

[0047] As seen in FIG. 1, a basic support arm 14 and bolt-on mounting fixture assembly 12 with an axis drawn between the ball pivot and contact surface of each fixture is shown. One of skill in the art will appreciate that the intended offset of the Support Arm Assembly in the exemplary embodiment shown is above the axis, i.e., although

offsets may be in alternative positions with respect to the axis. This arrangement is both pivotable, in relation to the Mounting Fixtures, around the center of each spherical contact surface, and rotatable around the sphere-to-sphere axis. By avoiding a mechanism with the bulk of the arm body between, or axially aligned with the ball pivot points, a greater combination of mounting angles may be accommodated over the previous attempts of the background art. Thus, the body of the arm is offset so that the rotation around the connector means one or both ends can be positioned substantially beyond 90°.

[0048] FIG. 2 shows the same arrangement as FIG. 1 except that the left hand mounting fixture has been rotated so that the mounting surface is directed to the left rather than being directed downwardly. This can be accomplished by merely rotating the ball of the mounting fixture. Note also that the neck portion between the mounting surface and the ball causes the mounting surface to be angled more upwardly rather than downwardly as in FIG. 1.

[0049] FIGS. 3-7 show a series of perspective views of a similar apparatus where the assembly has been arranged by manipulating the balls of each mounting fixture so that the mounting surfaces on both ends are in the same plane but laterally offset. This kind of arrangement would allow the electronic device which is being held for mounting on a desk surface with the electronic device being placed at the same height as the desk surface but toward the user and could also be used in other similar situations where it is easier to have the electronic device mounted at the same height but being laterally offset. In FIG. 7, the use of space that crosses the axis between the spheres of rotation is shown in greater detail.

[0050] Basic Support Arms with bolt-on Mounting Fixtures are shown in FIGS. 8 and 9. The Mounting Fixtures shown have a spherical clamping surface and support post aligned with an axis perpendicular to the base of the fixture. Thus, in this arrangement, the neck portion between the wall and the mounting surface does not cause angular displacement. In FIG. 9, the ball has been mounted so that the mounting surface is to the left of the clamping cap that holds the ball and thus this allows for further variation in mounting.

[0051] FIGS. 10-13 show the same mounting assembly as in FIGS. 1 and 2 with the neck portion having an angular displacement. Each of these figures show differing arrangements of the mounting fixtures so as to allow the electronic device to be mounted in different positions. As compared with the arrangements of FIGS. 8 and 9, a larger number of positions are possible because of the angular displacement of the neck.

[0052] FIGS. 14 and 15 are side sectional views of the present invention showing the internal workings of the support arm assembly. The assembly includes a support arm 20 which forms the main support for the device. An adjusting bolt 22 is threaded into a tubular portion of the support arm and operates against the lock to tighten or loosen the grip of the jaws on the ball of the left hand mounting fixture.

[0053] Cap 24 is formed from two halves that are bolted together to form a clamp on the bolt portion of the right hand mounting fixture. The upper portion of the caps also extend around the adjusting bolt 22 and lock it into position.

[0054] Lock 26 is a rigid member that connects with latch 30 on pin (d) and slides in a guide channel in the support arm to operate against the adjusting bolt. The arrangement of the lock causes the latch to be forced toward the left hand mounting fixture when the adjusting bolt is screwed inwardly so that the grip on the ball is tightened. The lock is also arranged so when the center of pivot pin (d) passes through the center line between the contact point of the adjusting bolt and the latch pivot pin, (a), the mid-surface of the lock contacts an internal surface of the latch to create a stop in the locked position. When the latch is pulled away from the spring pin (d) again passes through the center line to a free and unlocked condition causing an cam-over-center locking arrangement.

[0055] Spring 28 is a tension spring connecting the support arm at pin (e) and the jaw at pin (b) to cause an opening action by pivoting around pin (c). The spring opposes the latch in lock operating against the adjusting bolt.

[0056] Latch 30 provides an operating surface for the operator to lock and unlock the support arm assembly in regard to the left hand mounting fixture. The latch is retained within the recess in jaw 32 and pivots on pin (a) to operate the lock against the adjusting bolt. The latch provides an internal guide channel and stop surface for the lock toward the assembly in the locked position when the latch is closed.

[0057] Jaw 32 has a substantially spherical surface to form one side of the grip on the ball of the left hand mounting fixture. The jaw is retained in the recess within the support arm and pivots around pin (c). The jaw is pulled into an open position by the spring at pin (b) and is forced against the spring tension into a closed position by the cam-over-center relationship between the latch lock and adjusting bolt.

[0058] The other side of the grip on the ball of the left hand mounting fixture is provided by the support arm which has a similarly shaped spherical surface at the left hand end. The support arm also has a recess to retain the jaw 32, a recess to retain tension spring 28, an inner channel to guide lock 26 and a tubular portion threaded on the inside to retain the adjusting bolt 22.

[0059] As described above, the mounting fixture has a spherical surface which matches a surface on the support arm assembly by which is gripped. The neck which connects the ball with the mounting surface may be angled with respect to the mounting surface so as to provide an angular offset. The neck portion may also have a built in loophole for connecting a lanyard. This lanyard connects to the mounted electronic device as a safety from loss by inadvertent release of the Support Arm. This Mounting Fixture also has recesses and through holes in the mounting face to accommodate a variety of mounting arrangements to include a standard camera mounting screw, U-bolt clamps, a plumbing floor flange, and a conforming mounting plate for variable surfaces.

[0060] FIG. 15 shows the Support Arm assembly in the unlocked position. The Lock pivots at Pin (d) outside of the line between the Contact Point, of the Lock and Adjusting Bolt, and the Latch pivots at Pin (a). When the center of Pin (d) passes outside of this line, away from the Spring, the device is unlocked. When the center of Pin (d) passes inside of this line, toward the spring, the device is locking. The device becomes locked when it is closed on the spherical surface of the left hand Mounting Fixture with enough force against the Latch to move Pin (d) past the centerline toward the Spring while retaining enough force to keep Pin (d) in that position, cam-over-center.

[0061] Shown in FIG. 16 is a Support Arm Assembly with a partially disassembled Mounting Fixture clamp including two opposing Caps 24, a left hand Mounting Fixture with a spherical clamping surface, two Grip Pads 36, and the necessary nuts and bolts for assembly (unnumbered). The adjusting bolt 22 has a shaft having a hexagonal shape.

The sides of the hexagonal shaft interact with contours 30 on the inside of the clamp 34 and this clamp is extension of cap 24 which holds the ball on the mounting fixture. The contours of the clamp are twice the number of the corners of the hexagonal shaft so that it is possible to clamp the shaft in twelve positions. As seen in FIG. 18, the corners of the hexagon may be placed in the valleys of any of the contours. Since the distance between the contours is only half of the distance between the corners of the hexagon, twelve positions of the shaft are possible. Thus, by having twelve clamping positions rather than six, better control of the grip of the support arm assembly on the ball of the mounting fixture is possible. This arrangement is similar to a twelve point socket in a wrench set which allows the wrench to access a hexagonal bolt in twice as many positions.

[0062] FIG. 17 shows in phantom the twelve different positions through which the hexagonal shaft can be moved.

[0063] It is desirable to provide a degree of vibration isolation between the two mounting fixtures. Previously, it was known to incorporate rubber balls mounted onto a rigid mounting fixture. This procedure is expensive for production and replacement. The present invention utilizes grip pad 36 as a vibration buffer between the ball of the mounting fixtures and the support arm clamp surfaces. These pads can be easily replaced, thus avoiding expensive replacement. FIG. 19 shows the arrangement of such grip pads which may be made up of rubber, cork, a positive grip mesh or other materials which would produce the desired characteristics.

[0064] The mounting fixtures may include a suction mount at either or both ends to either hold an electronic device to the mounting device or hold the mounting device to a fixed surface. Such a suction mount may be used in place of the bolt-on flange. The "suction mount" is made up of five basic components in a preferred embodiment, e.g., more or less components may be incorporated into alternative embodiments: a housing, which includes a spherical clamping surface; a flange sleeve, which slides over a cylindrical surface of the housing; a cam, which operates against the flange and rotates around the axis of the cylindrical portion of the flange and housing; a suction cup which has an integral center shaft and cross mounting hole, which nests in a recess in the bottom of the housing and is retained by the fifth component, the assembly pin. The assembly pin both retains the suction cup within the housing and acts as the actuating member by

which rotation of the cam exerts pressure against the flange, this to increase the seal of the suction cup. This mounting fixture is for mounting to glass or other smooth surfaces.

[0065] The Suction Cup 40 has a raised boss in the center that acts as an attachment/drive shaft 42. This boss mates inside of a Mounting Ball recess and is fixed in relation to the mounting sphere body by a Drive Pin 44. A radial fingered Flange Housing 66 rides over a cylindrical portion at the base of the Mounting Ball. The Flange Housing is rotationally fixed by a slot around the Drive Pin, but slides up or down in relationship to the axis of the mounting sphere cylinder.

[0066] A Cam 48 having a lower drive surface sits atop the Flange on the Flange drive surface. This Cam operates against the flange and Suction Cup rim while lifting the center of the Suction Cup via the center boss, and the Mounting Sphere body, and Drive Pin. In this arrangement a clockwise rotation of the Cam causes the center of the Suction Cup to rise, hence tightening the seal of the Suction Cup. The Flange has a recess in the bottom to provide clearance for the raised area of the Suction Cup while holding the rim tightly sealed.

[0067] FIG. 21 is an exploded, perspective view showing a relationship between the components. If only the Suction Cup pinned to the Mounting Ball were used it would be functional, though somewhat unstable. By adding only the Flange around the cylindrical Mounting Ball body, being guided by the pin in the Flange guide slot, the assembly becomes more stable. Omitting the Cam, one could press the center of the Suction Cup down for a seal by pressure on the Mounting Ball. As this is done the Pin would be pressed into the bottom of the Flange Guide Slot. This would transfer some lateral pressure on the Mounting Ball to the Suction Cup Rim by the Flange Fingers. However, the Flange would not be tightly fixed. By introducing the Cam around the Mounting Ball Body and in between the Pin and Flange a means of tightening this stabilizing relationship is provided. The Cam operates by an inclining surface with positioning notches. In this example, when the Cam is rotated clockwise the Cam surface gets thicker under the pin thereby driving the Pin, Mounting Ball and Suction Cup Attachment Boss upward in relationship to the Flange. The Flange remains in place holding the Rim of the Suction Cup against a smooth surface maintaining the seal and enhancing stability.

[0068] Another feature of this flange is the Finger arrangement that contacts the Suction Cup Rim, shown in FIG. 22. In prior designs the flange rim is continuous and applies best to a perfectly flat surface. Many intended mounting surface are curved, such as vehicle windshields. This Flange is made of an elastic material in a preferred embodiment so that it will cause the Suction Cup Rim to better conform to a non-planar surface with these Fingers.

[0069] The Mounting Ball Stabilizer is shown as 50. This internal boss with a concaved surface mates with the inside of the Suction Cup Boss and saddles the assembly Pin. By increasing the surface contact with the pliable material used in the Suction Cup, stability is enhanced. The simplicity of the assembly is shown here and in other parts of the Support Arm Assembly. These simple components and assembly methods are purposeful in that it is anticipated the assembly of this devise will be contracted to physically challenged workers. This philosophy of simplicity has dictated this design.

[0070] In place of suction mount, a friction mount may instead be used. The "friction mount" of a preferred embodiment is made up of six basic components, e.g., more or less components may be incorporated into alternative embodiments: a housing, which includes a spherical clamping surface; an upper mounting flange with a conical surface, and having an anchoring boss with a cross hole for an assembly pin; the anchoring boss mates with a recess in the housing and is retained in place by a third part, the assembly pin; a lower mounting flange is provided with a conical surface opposing the upper mounting flange; a friction ring of elastic material rides between the upper and lower mounting flanges and is expanded as the flanges are drawn together; and a bolt retained by lower mounting flange and threads into the upper mounting flange to expand the friction ring. This mounting fixture is for mounting in a cup-holder recess commonly found in vehicles, and is fixed by frictional pressure radially exerted against the inside walls of the pocket.

[0071] FIG. 23 shows an exploded view of the friction mount. An upper flange 52 and lower flange 56 are on opposite sides of the friction ring 54 and are held together by a nut and bolt. Pin 58 extends through a hole in the mounting ball and the hole in the upper flange. This arrangement is similar to that shown in U.S. Patent 4,493,344 as described

above. This plug device may be adapted for providing a removable anchor in a cup holder recess such as found in vehicles.

[0072] It is also possible to use a multi conforming mount to mount the mounting device. The "multi-conforming mount" is made up of three basic components, e.g., more or less components may be incorporated into alternative embodiments: a bolt-on ball mounting fixture, (as described earlier); a bendable contour sheet with forming memory and retention holes; and one or more retention screws for attaching the contour sheet to the ball mounting fixture.

[0073] Shown in FIG. 24 is a typical arrangement of a mobile mount for a DVD Player 62 comprised of a Support Arm Assembly and a Conforming Plate 60. FIG 25 is of the same arrangement from a lower-rear angle. FIG. 26 shows an exploded view of these parts with the conforming plate in a flat, pre-bent, configuration.

[0074] FIG. 27 shows the Conforming Plate in a bent condition ready to cradle the DVD Player. This Conforming Plate is can be of different sizes and shapes for varied families of hand-held electronic devices. This plate offsets the need for custom cradles required for each device, thereby reducing the tooling requirement for accommodating new product designs and providing for a lower cost solutions.

[0075] The Conforming Plate is intended to be of a relatively thin material easily hand bent, and with good memory for retaining shape. It also features a series of holes for screws (not shown) to attach the cradle to the Ball Mounting Fixture described earlier.

[0076] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

WHAT IS CLAIMED IS:

1. An adaptable mounting apparatus for hand-held electronics comprising:

at least one mounting fixture connected by a positionable support arm; wherein the support arm is capable of clamping or locking either end to a spherical ball-mounting fixture and the support arm is in a non-axial alignment between the mounting fixtures.

2. The adaptable mounting apparatus according to claim 1, wherein the ball mounting fixture is in a non-axial alignment at one or both ends to further enhance positionability.

3. The adaptable mounting apparatus according to claim 1, further comprising a cam-over-center, locking mechanism having mating face capable of engaging a spherical mounting surface.

4. The adaptable mounting apparatus according to claim 1, further comprising a spherical shaped clamp at one end that also grips the arm body along a hexagonal surface, with at least one of the clamping members having an internal contour to allow half-positioning on the six sides.

5. The adaptable mounting apparatus according to claim 1, further comprising a rubber pad secured within a clearance allowance in the gripping area of each support arm clamp, wherein said rubber pad is a vibration buffer between the mounting fixture ball and the mating support arm clamping surfaces.

6. The adaptable mounting apparatus according to claim 1, further comprising a suction mount at one or both ends of the support arm.

7. The adaptable mounting apparatus according to claim 1, further comprising a friction mount at one or both ends of the support arm.

8. The adaptable mounting apparatus according to claim 1, further comprising a multi-conforming mount at one or both ends of the support arm to work in cooperation with a bolt-on flange.

9. The adaptable mounting apparatus according to claim 6, wherein said suction mount further comprises:

a housing including a spherical clamping surface;

a flange sleeve capable of sliding over a cylindrical surface of the housing;

a cam capable of operating against the flange and rotating around the axis of the cylindrical portion of the flange and housing; and

a suction cup which has an integral center shaft and cross mounting hole which nests in a recess in the bottom of the housing and is retained by an assembly pin.

10. The adaptable mounting apparatus according to claim 7, wherein said friction mount further comprises:

a housing including a spherical clamping surface;

an upper mounting flange with a conical surface and having an anchoring boss with a cross hole for an assembly pin, wherein the anchoring boss mates with a recess in the housing and is retained in place by an assembly pin;

a lower mounting flange being provided with a conical surface opposing the upper mounting flange;

a friction ring of elastic material riding between the upper and lower mounting flanges and capable of being expanded as the flanges are drawn together; and

a bolt retained by lower mounting flange and threads into the upper mounting flange to expand the friction ring, wherein the friction mount is capable of mounting in a cup-holder recess commonly found in vehicles, and is fixed by frictional pressure radially exerted against the inside walls of the pocket.

11. The adaptable mounting apparatus according to claim 8, wherein the multi-conforming mount further comprises:

a bolt-on ball mounting fixture,

a bendable contour sheet with forming memory and retention holes; and

one or more retention screws for attaching the contour sheet to the ball mounting fixture.

12. A method of adaptably mounting a hand-held electronics device, comprising mounting said hand-held electronics device within the adjustable jaws of the mounting apparatus of claim 1.

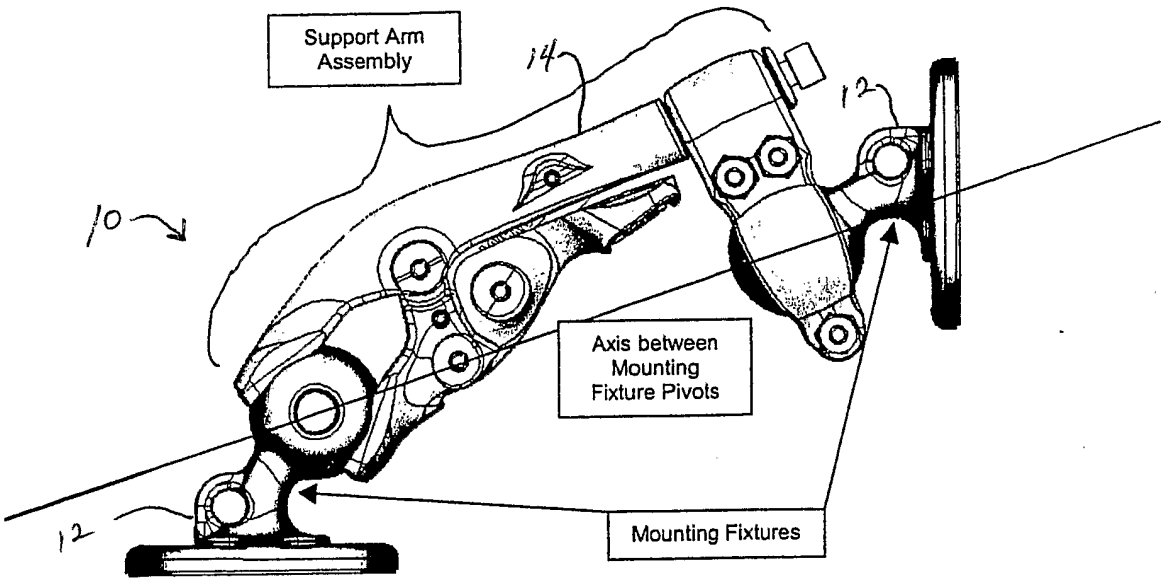

Support Arm Assembly
14
12
10
Axis between Mounting Fixture Pivots
12
Mounting Fixtures

FIG. 1

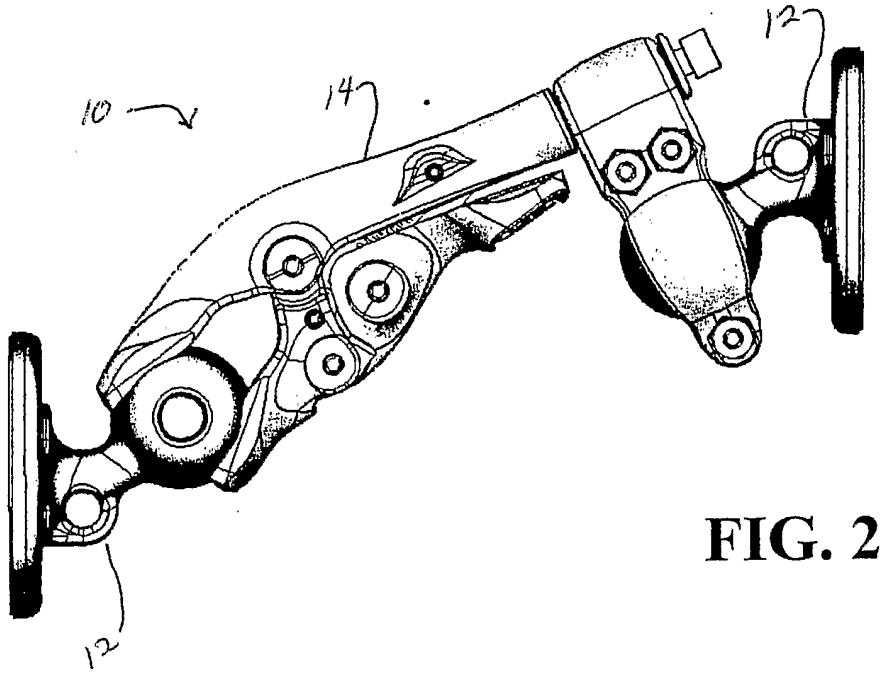

12
10
14
12

FIG. 2

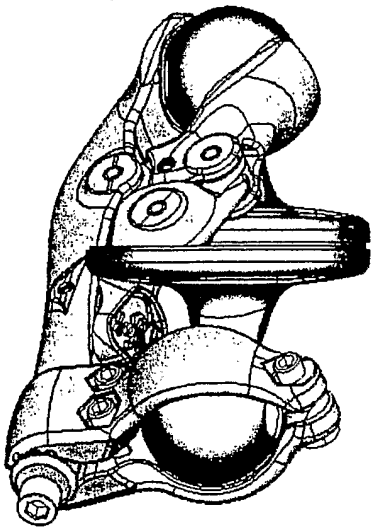


FIG. 3

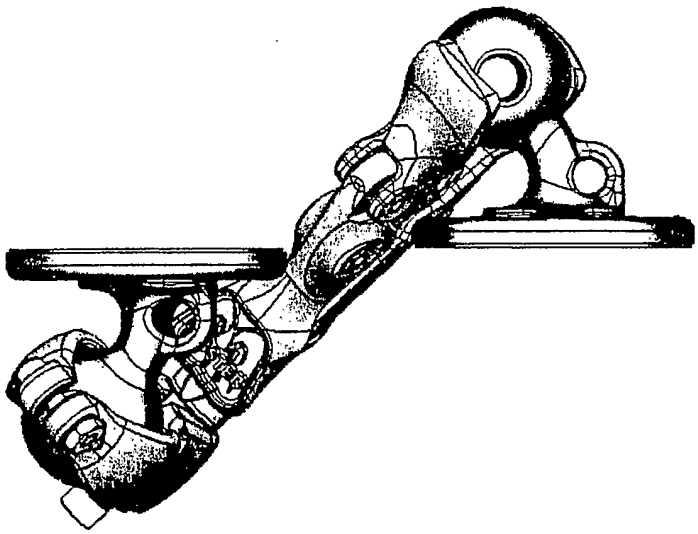


FIG. 4

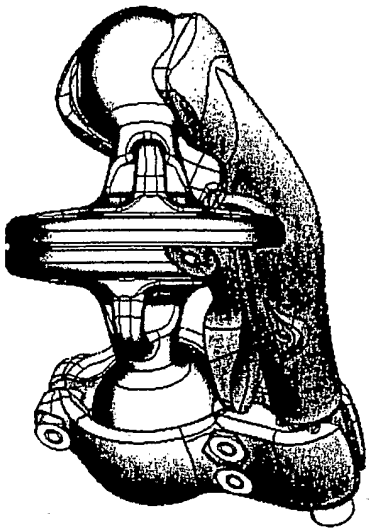


FIG. 5

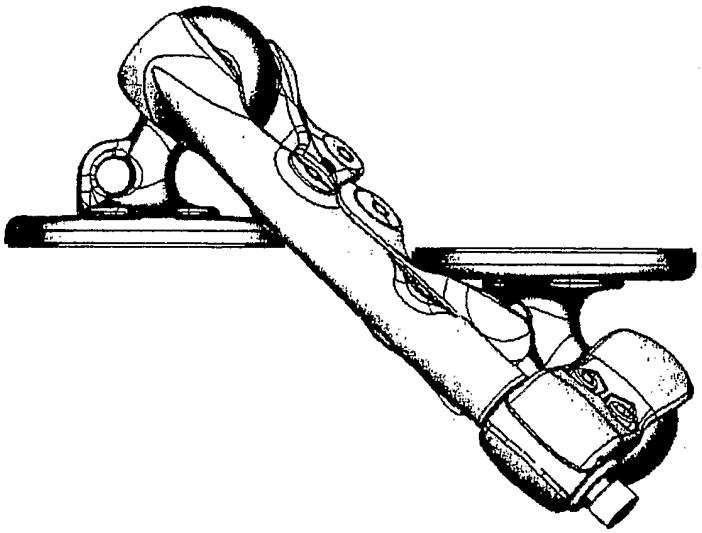


FIG. 6

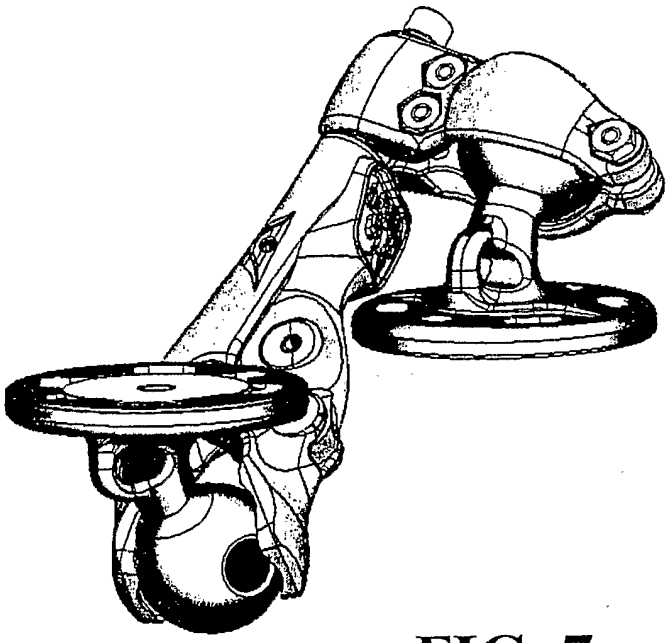


FIG. 7

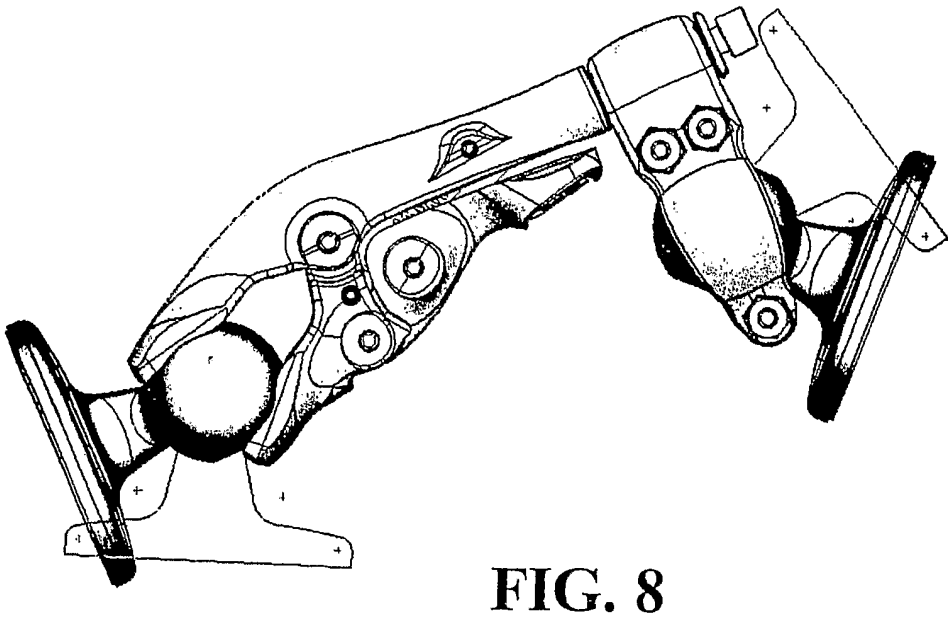


FIG. 8

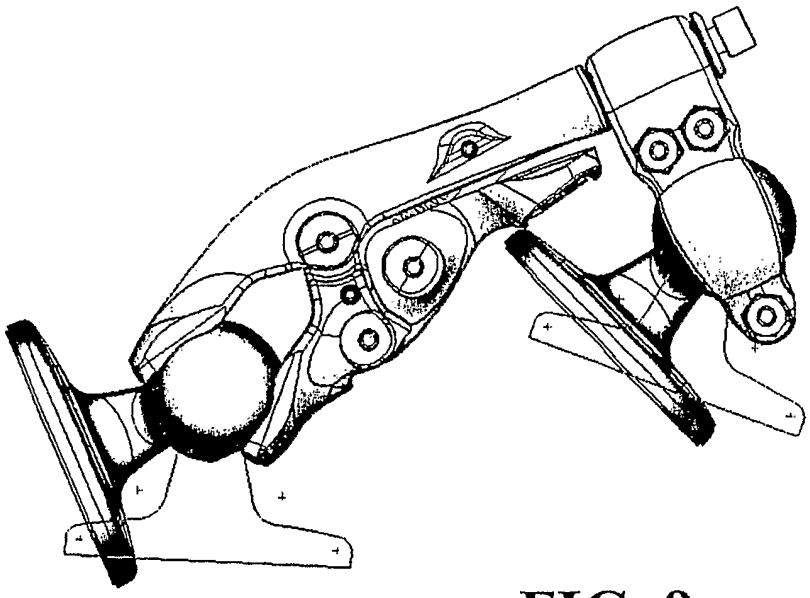


FIG. 9

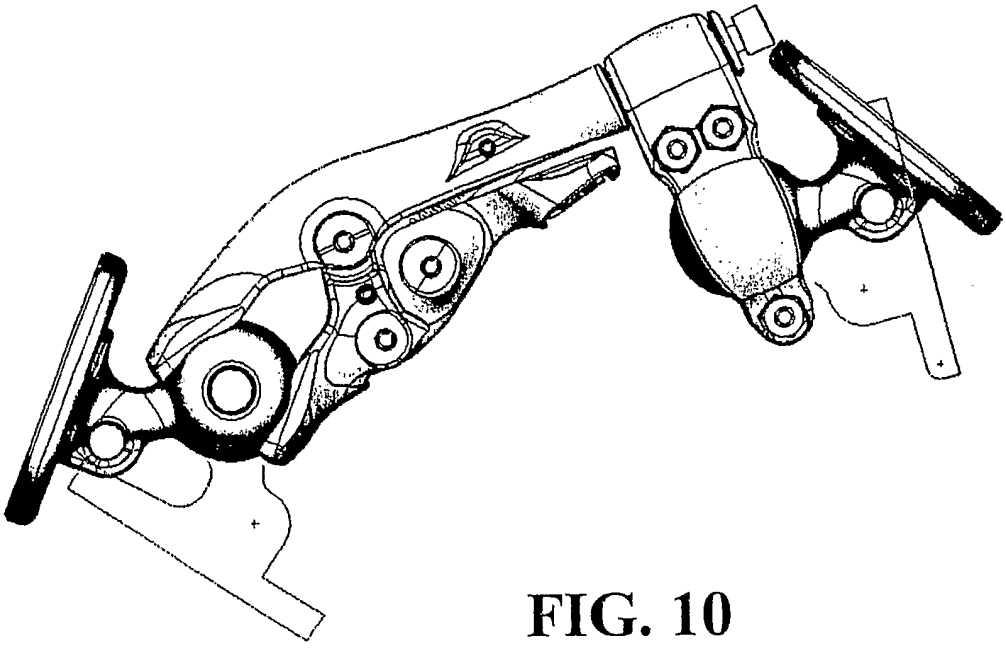


FIG. 10

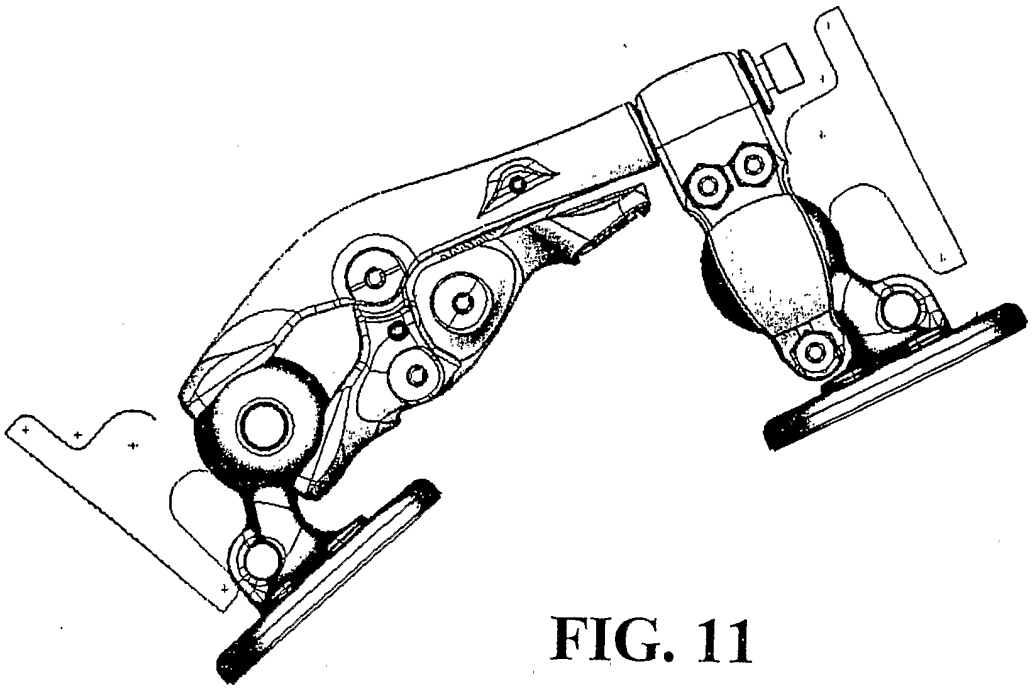


FIG. 11

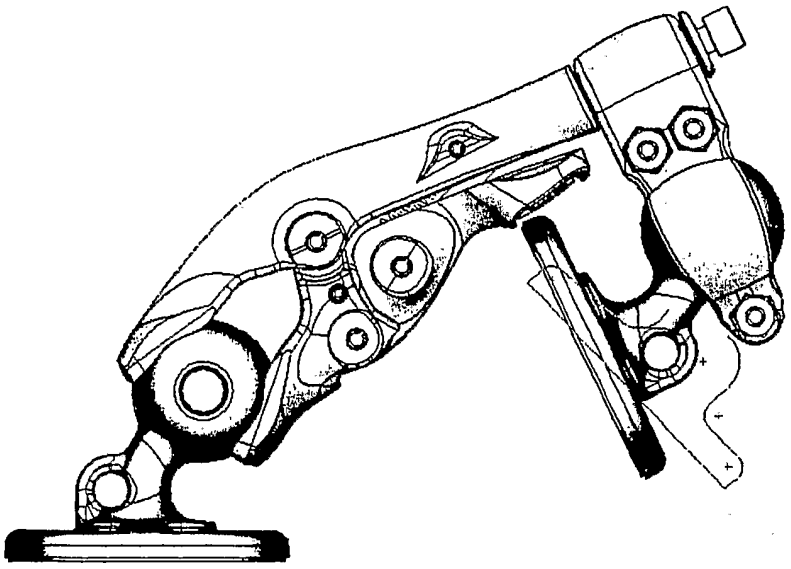


FIG. 12

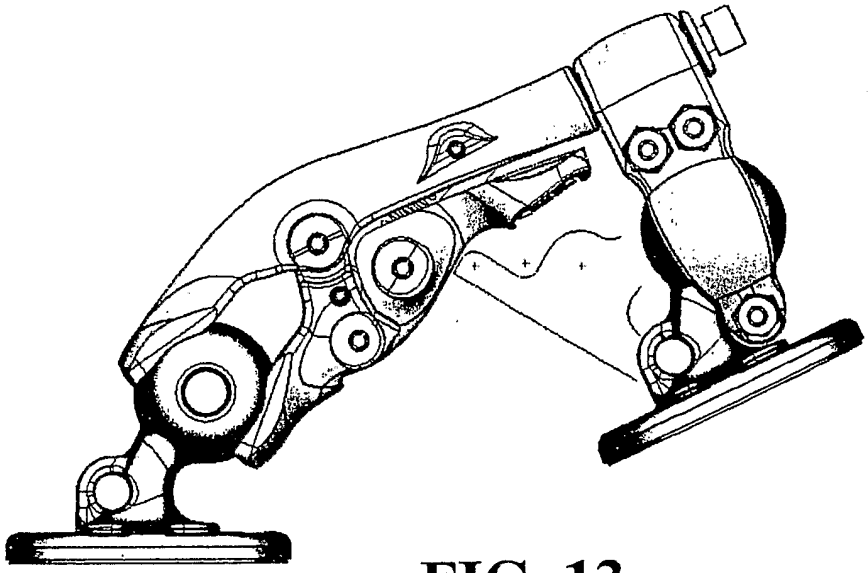


FIG. 13

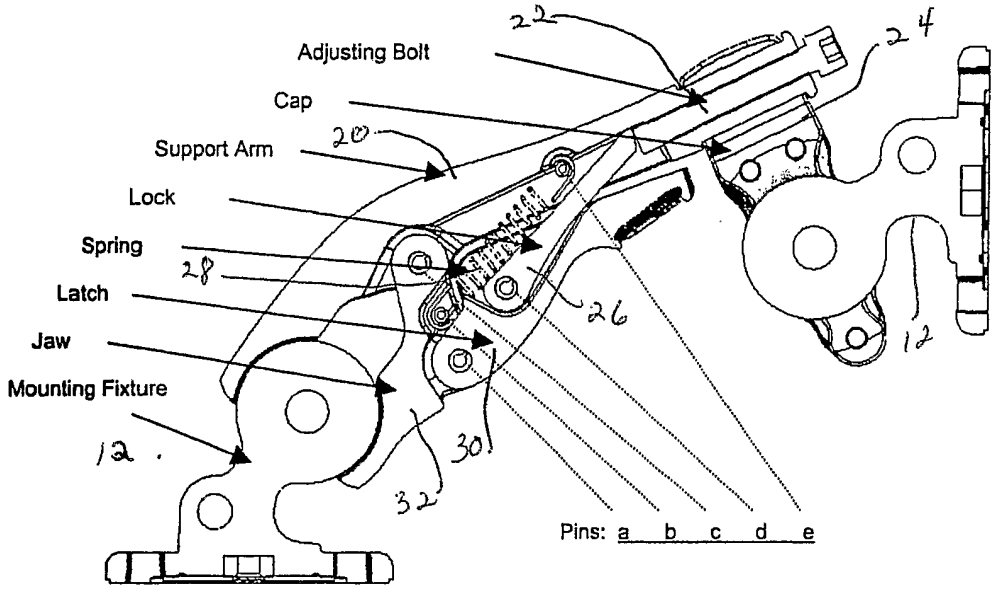

22
24
Adjusting Bolt
Cap
Support Arm
20
Lock
Spring
28
Latch
26
Jaw
Mounting Fixture
12
12
30
32
Pins: a b c d e

FIG. 14

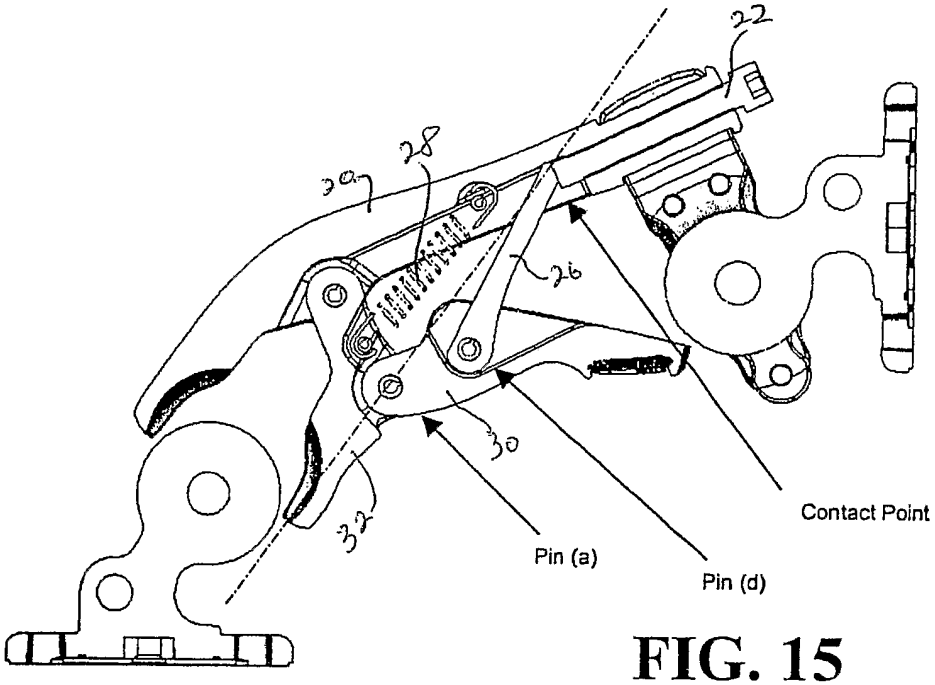

22
28
26
30
32
Contact Point
Pin (a)
Pin (d)

FIG. 15

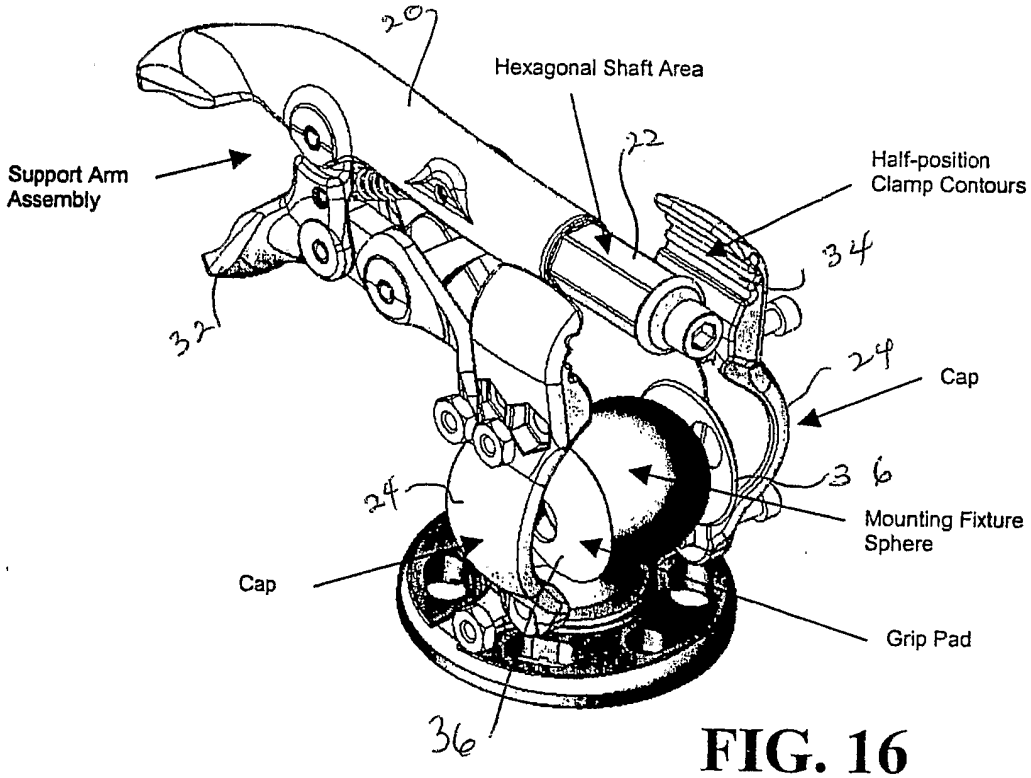

20
Hexagonal Shaft Area
22
Support Arm Assembly
Half-position Clamp Contours
34
32
24
Cap
36
24
Mounting Fixture Sphere
Cap
Grip Pad
36

FIG. 16

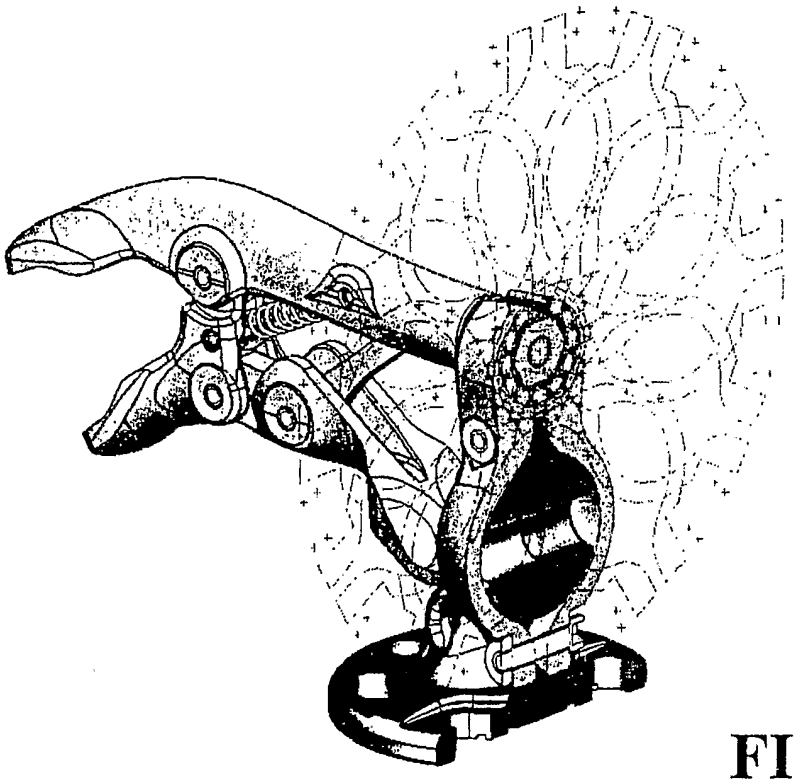


FIG. 17

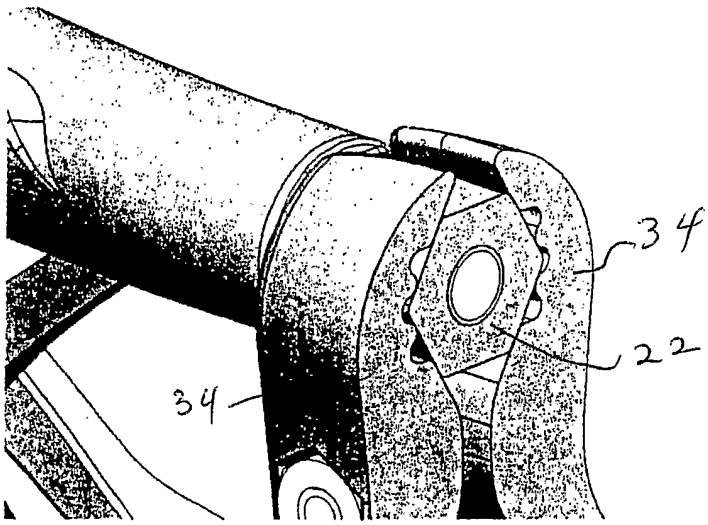


FIG. 18

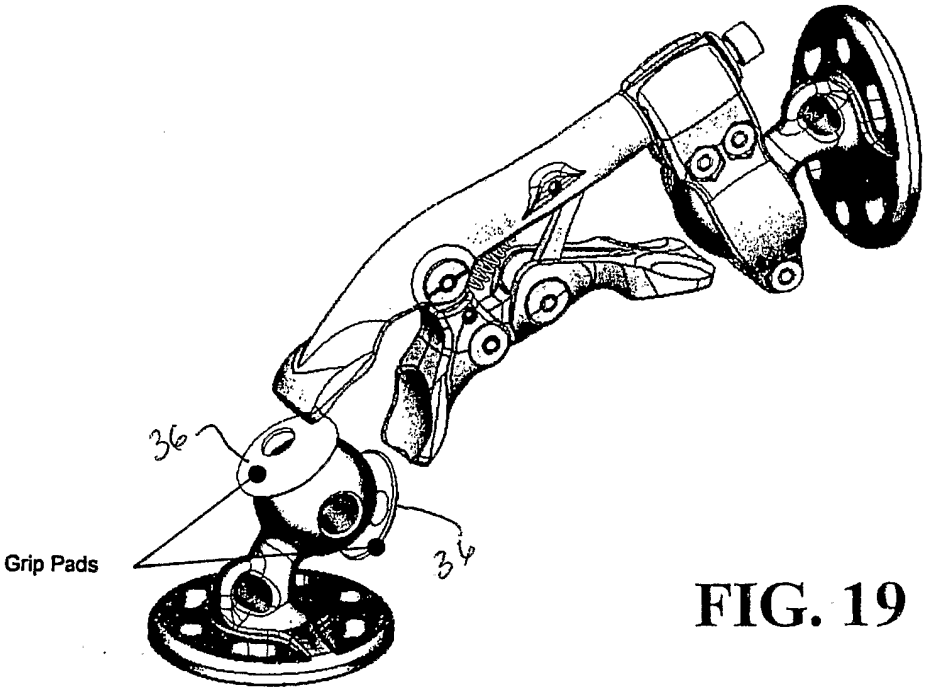

36
Grip Pads
34

FIG. 19

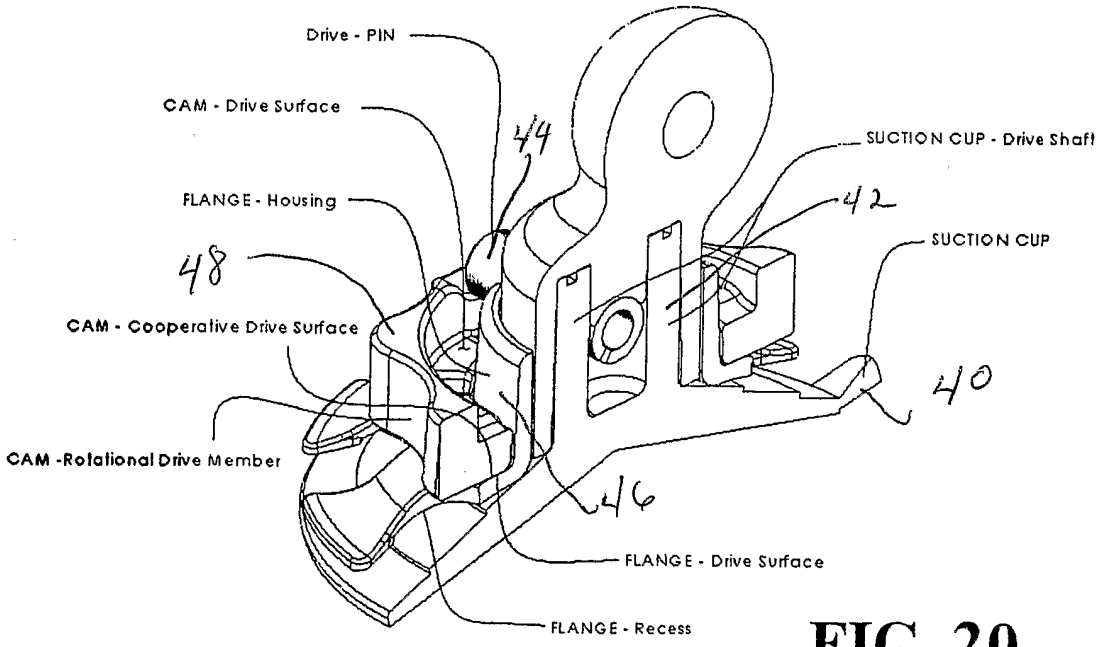

Drive - PIN
CAM - Drive Surface
FLANGE - Housing
48
CAM - Cooperative Drive Surface
CAM -Rotational Drive Member
44
SUCTION CUP - Drive Shaft
42
SUCTION CUP
40
46
FLANGE - Drive Surface
FLANGE - Recess

FIG. 20

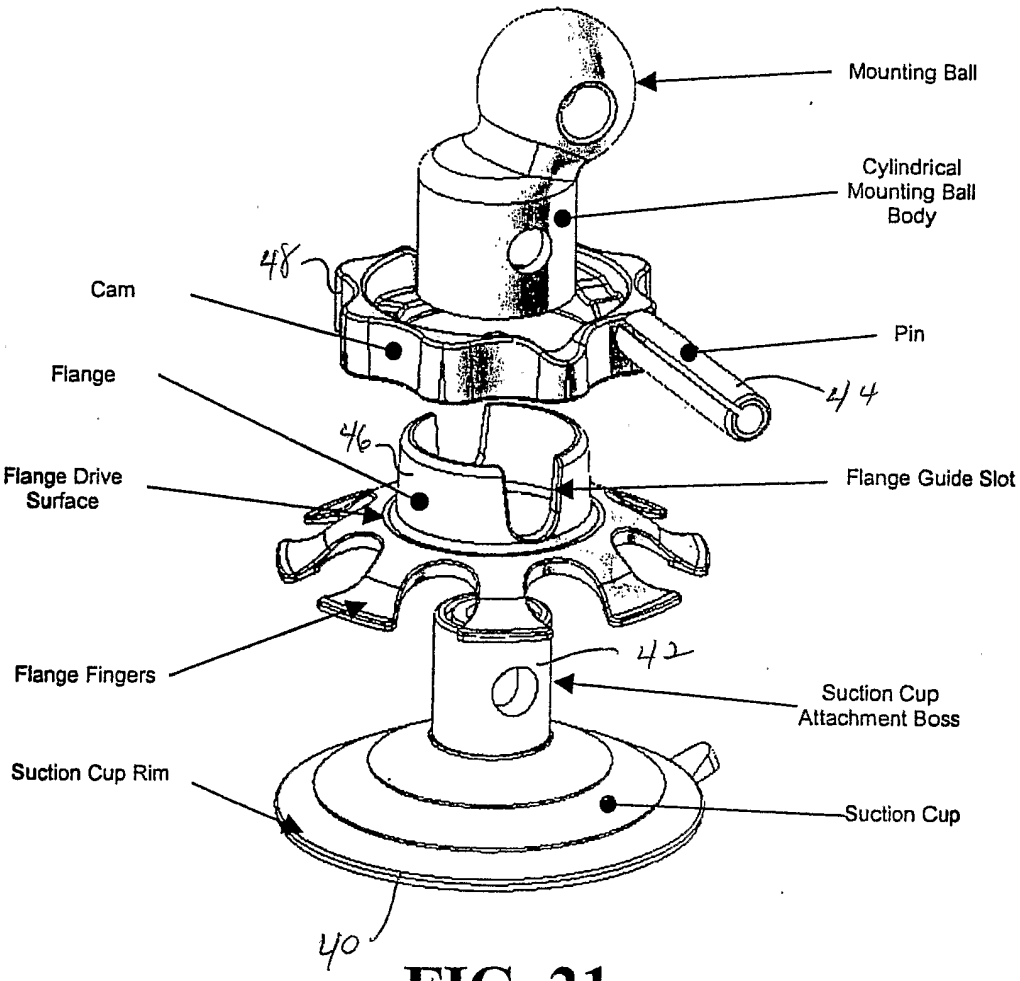

Mounting Ball
Cylindrical Mounting Ball Body
48
Cam
Pin
Flange
44
46
Flange Drive Surface
Flange Guide Slot
42
Flange Fingers
Suction Cup Attachment Boss
Suction Cup Rim
Suction Cup
40

FIG. 21

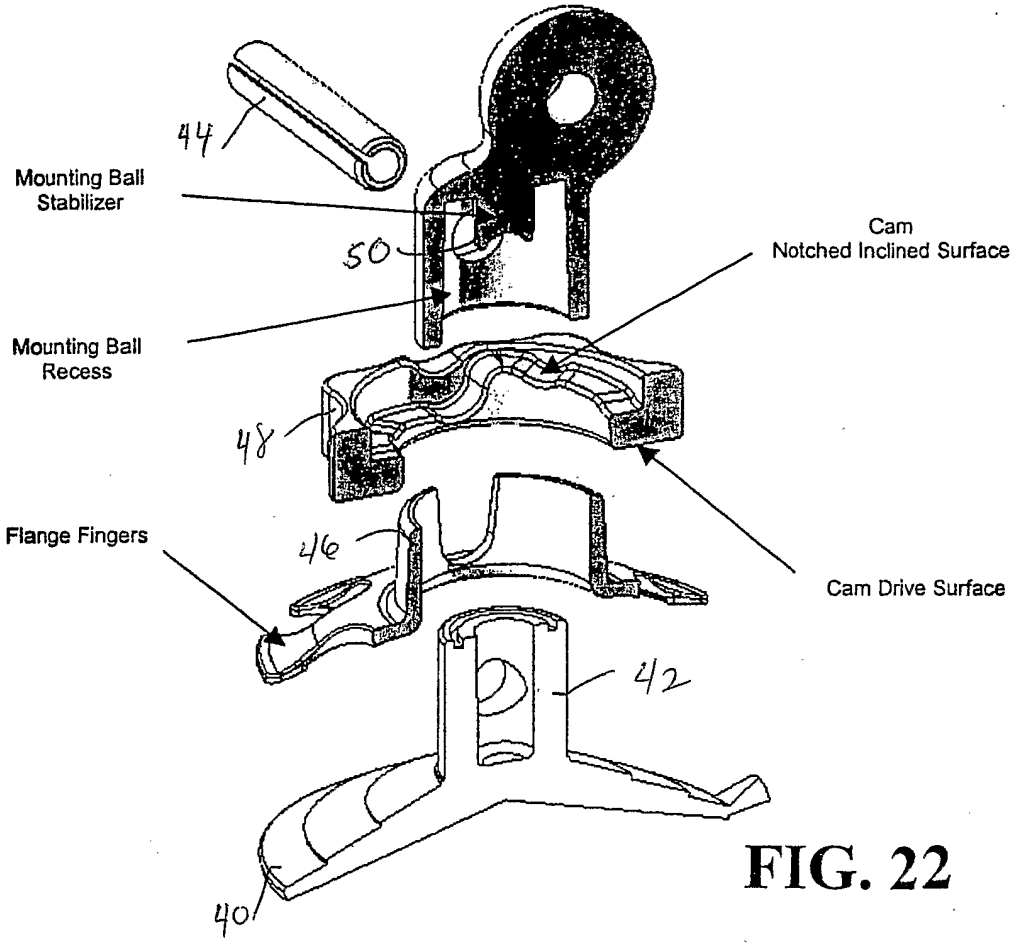

44
Mounting Ball Stabilizer
50
Cam Notched Inclined Surface
Mounting Ball Recess
48
Flange Fingers
46
Cam Drive Surface
42
40

FIG. 22

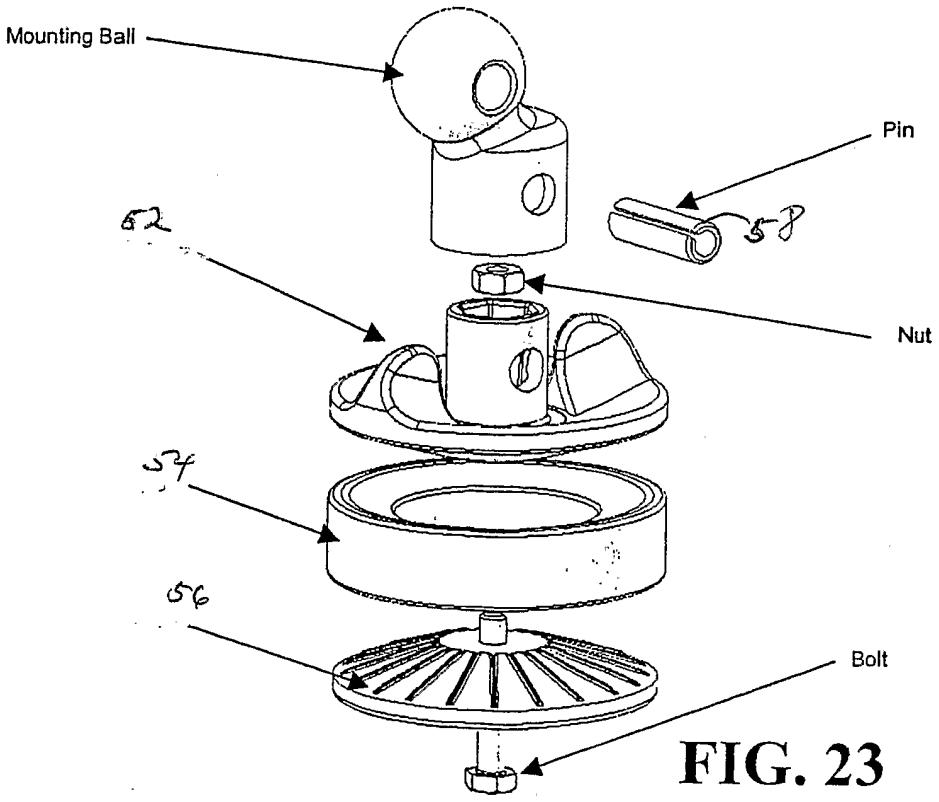

Mounting Ball
Pin
52
58
Nut
54
56
Bolt

FIG. 23

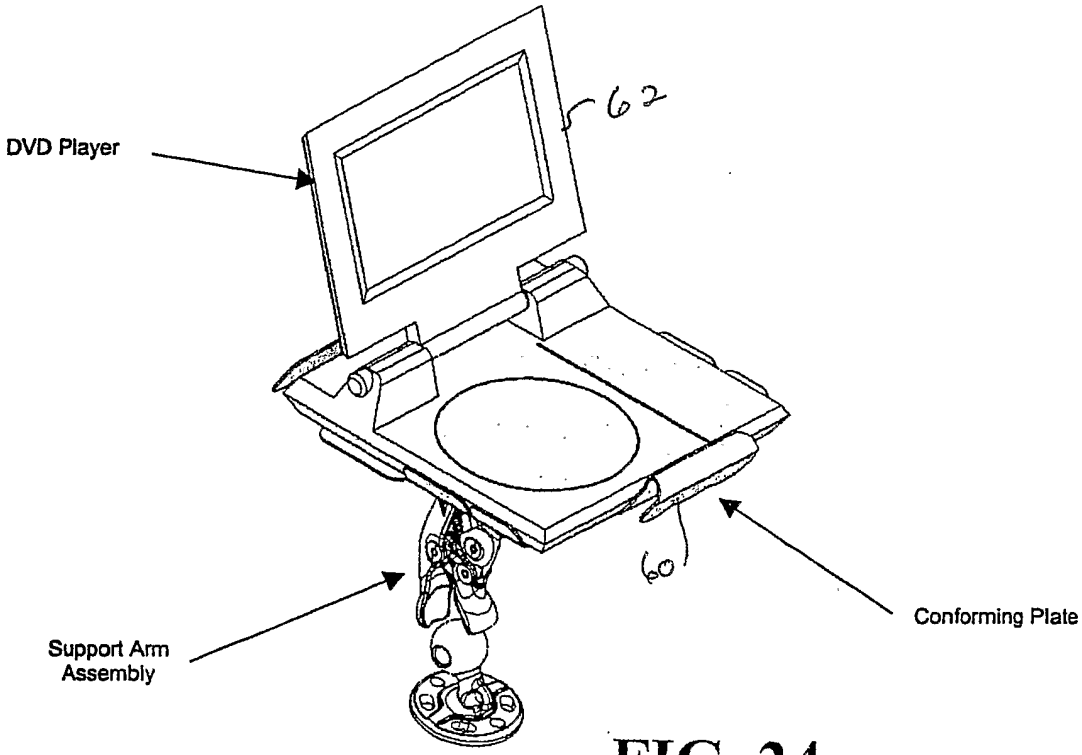

DVD Player
62
60
Support Arm Assembly
Conforming Plate

FIG. 24

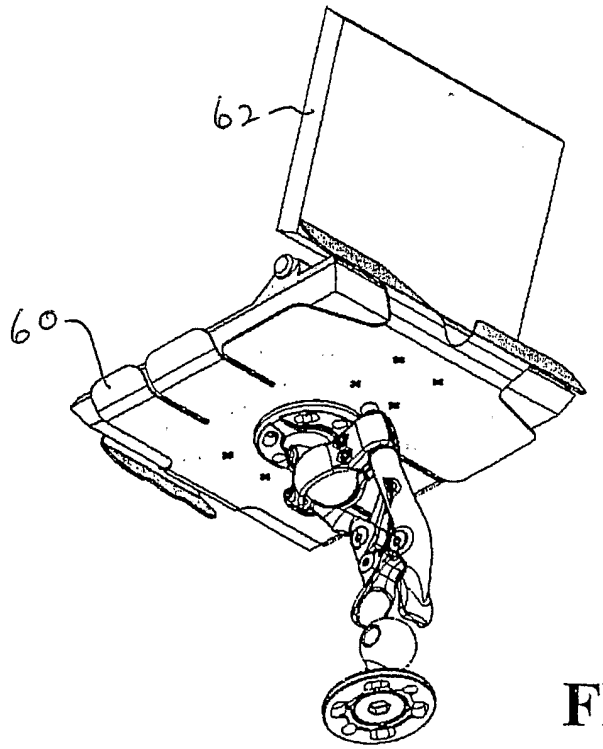

62
60

FIG. 25

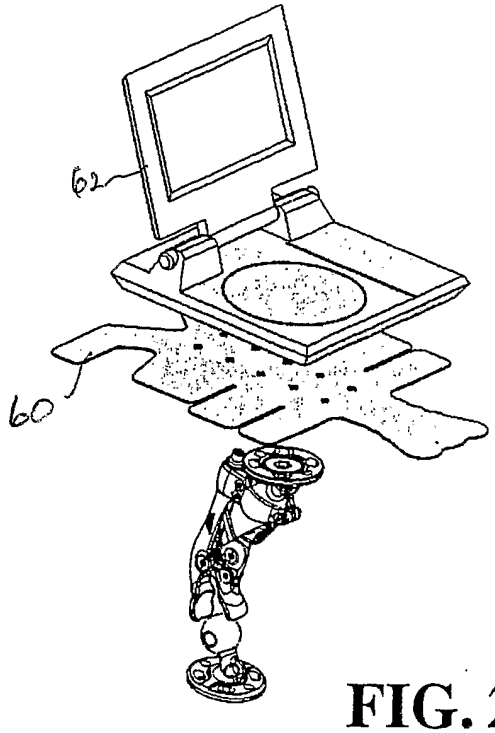


FIG. 26

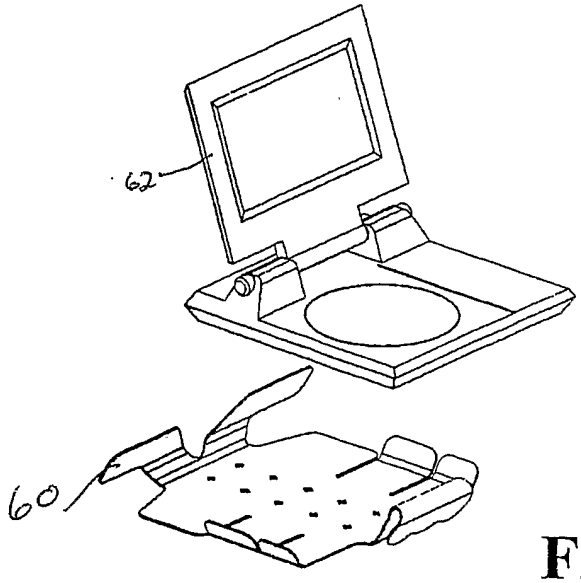


FIG. 27