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(71) Applicant: SC & T INTERNATIONAL, INC. [US/US]; 15695 North 83rd Way, Scottsdale, AZ 85260 (US).

(72) Inventors: MUERZL, Klaus; 3910 E. Taro Lane, Phoenix, AZ 85024 (US). COPLAND, James, L.; 4302 E. Beryl Lane, Phoenix, AZ 85028 (US).

(74) Agent: OGRAM, Mark, E.; 8040 S. Kolb Road, Tucson, AZ 85706 (US).

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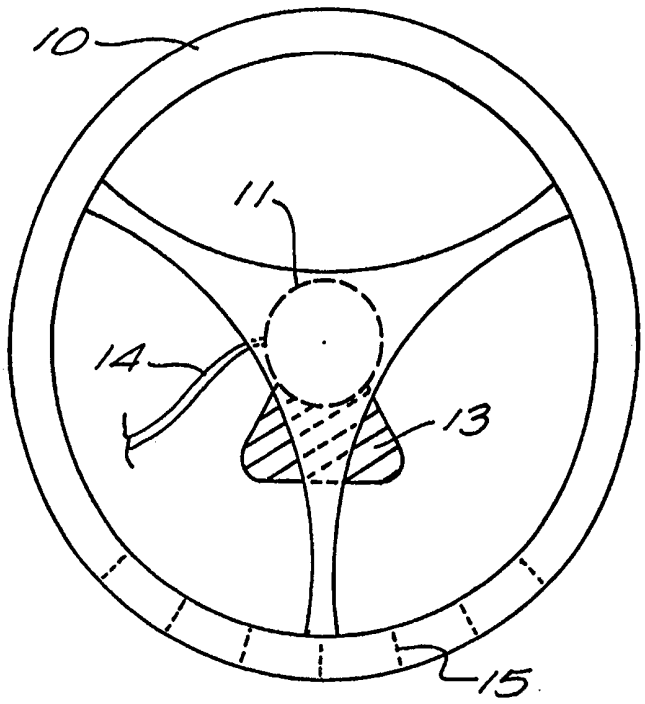
(54) Title: AN INPUT APPARATUS FOR A COMPUTER OR GAME

(57) Abstract

An input apparatus (10) adapted for use with electronic games and computers (14) in which the entire assembly is housed within a handheld housing. Within the housing unit are sensors (11) which monitor movement of the housing (10) and communicate these movements to the electronic game or computer (14). Movement of the housing is monitored in all directions and distance together with the angle of the housing unit. Communication with the remote computer/game (14) is accomplished using wires, radio frequency, or infra–red transmissions. The housing unit (10) is ideally structured to resemble an item normally associated with the game being played (i.e. a steering wheel for a race game, an airplane's joystick for an air–combat game).



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AN INPUT APPARATUS FOR A COMPUTER OR GAME

Background of the Invention:

This invention relates generally to computers and electronic games and more particularly to input apparatus for computers and electronic games.

The popularity of computer or electronic games continues to grow. Their appeal seems to be limitless and is only constrained by the content imagination of the games' developers; these developers though are limited by the hardware upon which they must place their software.

While great strides have been made recently in the development of faster processors and improved memory apparatus, technically the input apparatus hasn't changed much since the early "PONG" game.

Input into the computer or the game has been significantly limited. The standard QWERTY keyboard is often used, but, joysticks, mice, rollerballs, and directional arrows have all been attempted.

These devices though do little to enhance the player's feeling or excitement as the player still "feels" they are operating a computer, not "driving" the car around the race-track.

To create a slightly higher simulation, a line of "steering wheel" input devices have been created. These "steering wheels" are mounted onto a stand and are positioned, usually, directly in front of the monitor or computer screen.

Because of their physical restraints though, the operator is forced to sit in front of the monitor; hence, the freedom and pleasure that the player is able to derive from the game is limited.

It is clear that there is a need for an input device/ controller which addresses the limitations discussed above.

Summary of the Invention:

The invention creates an input apparatus adapted for use with electronic games and computers in which the entire assembly is housed within a handheld housing.

In this manner, the input device is truly portable allowing the user to lay back, sit up, or even wander around the room while still playing the game. No base member is provided.

Within the housing unit are sensors which monitor movement of the housing and communicate these movements to the electronic game or computer. As the player moves the housing (i.e. to "steer" around a corner), the sensors pick up this movement and communicate it to the computer/electronic game which reacts accordingly.

Movement of the housing is monitored in all directions and distance together with the angle of the housing unit. In the ideal embodiment, motion is monitored in two orthogonal planes allowing all motion of the housing to be properly "modeled" and communicated as control inputs for the game.

Communication with the remote computer/game is accomplished using wires, radio frequency, or infra-red transmissions. Those of ordinary skill in the art readily recognize that a variety of different mechanisms can be utilized to perform this task and any of them are acceptable for this invention.

The housing unit is ideally structured to resemble an item normally associated with the game being played (i.e. a steering wheel for a race game, an airplane's joystick for a air-combat game). In the steering wheel shaped embodiment, the housing is to be grasped by both hands of the player.

Switches placed on the housing allow the player to adjust "speed" and also provide another source of data input for the player.

The invention, together with various embodiments thereof will be more fully explained by the accompanying drawings and the following description thereof.

Drawings in Brief:

Figures 1A and 1B are frontal and side views of the preferred embodiment of the invention.

Figures 2A and 2B are frontal and side views of the preferred motion sensor.

Figures 3A, 3B, and 3C diagram the operation of the preferred motion sensor.

Figure 4 illustrates a vibration mechanism used for one embodiment of the invention.

Figure 5 illustrates a table mount for an embodiment of the invention.

Figure 6 diagrams a tension control mechanism used in the table mount embodiment of the invention.

Figure 7 is a frontal view of an alternative embodiment of the invention.

Figure 8 illustrates the use of the preferred embodiment.

Drawings in Detail:

Figures 1A and 1B are frontal and side views of the preferred embodiment of the invention.

In this embodiment, grip 10 is shaped as a traditional steering wheel and is intended to be grasped by both of the user's hands.

Sensor 11 is attached substantially at the center of grip 10 and is rotatably connected to center pin 12. Weight 13, attached to center pin 12, maintains center pin 12 at a pre-defined location relative to the earth; hence, as grip 10 is rotated, relative motion is created between sensor 11 and center pin 12. This rotation is identified and electronically communicated to game 14.

In this embodiment, the lower part of grip 10 is weighted 15. Use of weights 15 assure that grip 10, when grasped with a single hand, has a natural tendency to rotate into a "start" position.

Figures 2A and 2B are frontal and side views of the preferred motion sensor.

Photo sensor 11 uses slotted disc 20 which is secured to center pin 12. Center pin 12, through the use of weight 13, is maintained in a "fixed" relative position to the earth. As the apparatus is moved (as discussed relative to figures 1A and 1B), photo sensor 11, being affixed to the grip, is moved relative to slotted disc 20. Photo sensor 11 identifies the passage of slots within slotted disc 20 and thereby identifies the direction and distance of rotation.

In the preferred embodiment, two motion sensors are utilized and are orthogonally opposed to each other. In this manner, both rotation of the grip and the tilting of the grip are gauged and used for input to the electronic game.

In the case of the rotational sensor, a total of 129 slots are established over a 180° arc. Two physical stops are also established (110 degrees left, 110 degrees right). Slotted disc 20 has a physical rotation range of 110 degrees to left and right. Any movement beyond 90 degrees is in the "deadzone" of

disc 20 (no slots).

The above example provides the preferred embodiment's structure, those of ordinary skill in the art readily recognize that the number of slots and their range are chosen to meet the specific demands of the apparatus.

The "windows" or slots on slotted disc 20 have an optical radius "Ro" of 20.4mm; slotted disc 20 has a preferred radius of 21.4mm... (Ro + ½ window length + outer ring). The window's width is 0.25mm; the length of the window is 1.2mm; and the distance between windows is 0.25mm.

It has been found that slotted disc 20 ideally has varying thickness. The thickness of disc 20 at the outer perimeter is 0.6mm with a thickness at the windows being 0.35mm.

Optical sensor 11 is located on a printed circuit board (PCB). The center of optical sensor 11 sits in the symmetric center line of the PCB, 52mm above the base line of the PCB, and 4.5mm away from the PCB's surface.

If the sensor is to be used for tilt input, the parameters of the disc are ideally changed to meet the demands of this task. To this end, the total number of slots is only 41 which are spread over a 110 degree arc. The physical stops in the tilt sensor are 20 degrees beyond the slot range.

For the tilt sensor, the optical radius "Ro" is 10.2mm and the radius of the disc is 11.2mm

Those of ordinary skill in the art readily recognize that the specifics of the tilt sensor can be chosen from a wide range of characteristics and that the invention is not intended to be limited merely to the preferred embodiment described herein.

The preferred tilt sensor has a window width/length of 0.25mm and 1.2mm. The distance between windows is 0.25mm.

The disc of the tilt sensor has a preferred thickness at its outer perimeter of 0.6mm and a thickness at the windows of 0.35mm.

The center of an optical sensor used to measure tilt sits in the symmetric center line of its PCB and 102mm above the base line of the PCB. The disc is positioned 5mm away from the

PCB's surface.

Since a "comfort" position for holding the grip varies from user to user, the preferred embodiment includes the ability to "recalibrate" the tilt sensor by adjusting its 0° location.

Figures 3A, 3B, and 3C diagram the operation of the preferred motion sensor.

As shown in figure 3A, the sensor is "at rest", that is the grip is in a "straight" configuration and has not been rotated. Remember, photo sensor 11 is secured to grip 10. Slotted disc 20 is fixed to center pin 12 and weight 13; these three items remain in a fixed position relative to the earth due to the gravitational pull of the earth.

In figure 3B, grip 10A has been rotated to the left causing relative motion between photo sensor 11A and slotted disc 20A. The passage of the slots or windows of slotted disc 20A is picked up and communicated by photo sensor 11A.

In similar fashion, as shown in figure 3C, a movement to the right of grip 10B, causes photo sensor 11B to move in the opposite direction relative to slotted disc 20B.

In this manner, rotational movement of grip 10 in either the left direction or the right direction is sensed and quantitized.

Figure 4 illustrates a vibration mechanism used for one embodiment of the invention.

To simulate "vibration" in the electronic game (i.e. a rough road or airplane vibrations), in one embodiment of the invention motor 40 with cam 41 is positioned within the grip (not shown) to periodically engage the grip's housing and cause a "thumping" or vibration.

The speed of vibration or rotation of motor 40 is dictated by the electronic game; hence, a car moving faster around the track would have a higher level of vibration.

Figure 5 illustrates a table mount for an embodiment of the invention.

Mount 51 is adapted to be placed on an edge of table 50. Mount 51 is secured to table 50 using suction cups, adhesive,

and other techniques well known to those of ordinary skill in the art.

Connector 52 is adapted to inserted into sleeve 52 of grip 53. Once so secured, grip 53 is effectively secured to table 50. In this manner, grip 53 is no longer portable but includes a base.

Figure 6 diagrams a tension control mechanism used in the table mount embodiment of the invention.

Connector 52 is connectable to the grip (not shown) and by pulling on the grip, yoke mechanism 62 is engaged. Belt 61 provides tension or movement resistance to operator movement of the grip. Weight 60 is used to automatically reposition the grip in a neutral position when the grip is released by the operator.

Figure 7 is a frontal view of an alternative embodiment of the invention.

Input apparatus 70 is shaped to resemble a motorcycle handle-bar having two opposing grips 72 and 76. Grip 76 is rotated 75 to actuate the "braking" action; grip 72 is rotated to "accelorate".

Finger buttons 74A, and 74B are used for secondary input from the operator. Slide or push control 73 also provides the operator with additional control functions for the electronic game.

Rotation of input apparatus 70, as illustrated by arrow 71A, either to the right or left by 110°. Rotation 71B is also sensed and communicated to the electronic game, not shown.

When not in use, input apparatus 70 rests on its back side. Sensor switches (either pressure or "mercury"-type of switches, not shown) identifies when the input apparatus 70 is in this "off" position and communicates this state to the electronic game.

Figure 8 illustrates the use of the preferred embodiment.

Operator 80 is able to grasp input apparatus 81, as described above, and move it without any base member to create rotational and tilt signals which are then used by electronic

game 83 in creating the desired display 82.

It is clear that the present invention provides for a highly improved controller or input apparatus for a computer or an electronic game.

What is claimed is:

1. An input apparatus for a remote computer, said input apparatus comprising:

a) a handheld housing member adapted to be grasped by a user;

b) an inertia sensor contained within said handheld housing member and generating an indicia representative of movement of said handheld housing member in a predefined plane; and,

c) means for transmitting said indicia to a remote computer.

2. The input apparatus according to claim 1, wherein said indicia from said inertia sensor includes data representative of direction and distance of movement of the handheld housing member.

3. The input apparatus according to claim 1, wherein said indicia from said inertia sensor includes data representative of an angle of said handheld housing member.

4. The input apparatus according to claim 2, wherein said inertia sensor includes:

a) a weighted disk having a plurality of slots positioned at a periphery thereof, said disk being swivelly connected to a center location of said handheld housing; and,

b) optical sensor means fixed to said handheld housing member for identifying movement of said weighted disk relative to said optical sensor means.

5. The input apparatus according to claim 3, wherein said handheld housing member is a single rigid body.

6. The input apparatus according to claim 5, further including a second inertia sensor positioned within said handheld housing member and generating a second indicia representative of movement of said handheld housing member in a

second plane.

7. The input apparatus according to claim 6, wherein said second plane is substantially perpendicular to said predefined plane.

8. The input apparatus according to claim 5,

a) further including at least two user activated finger switches positioned on said handheld housing member; and,

b) wherein said means for transmitting includes means for communicating signals indicative of user activation of said at least two user activated finger switches.

9. The input apparatus according to claim 8, wherein said handheld housing member is structured to be grasped by both hands of a user.

10. The input apparatus according to claim 9, wherein said handheld housing member is shaped to resemble a steering wheel.

11. The input apparatus according to claim 5,

a) further including a receiver communicating with said remote computer; and,

b) wherein said means for transmitting includes means for communicating said indicia of movement to said receiver via radio waves.

12. The input apparatus according to claim 5,

a) further including a receiver communicating with said remote computer; and,

b) wherein said means for transmitting includes means for communicating said indicia of movement to said receiver via infrared beams.

13. The input apparatus according to claim 5, wherein said means for transmitting includes a wire extending from said handheld housing member to said remote computer.

14. The input apparatus according to claim 5, further including switch means for deactivating said input apparatus when said handheld housing member is in a pre-defined position.

15. An input apparatus comprising:

a) a rigid handheld housing member adapted to be grasped by a user; and,

b) an inertia sensor contained within said handheld housing member and generating an indicia representative of movement of said handheld housing member in a predefined plane.

16. The input apparatus according to claim 15, further including a second inertia sensor positioned within said rigid handheld housing member and generating a second indicia representative of movement of said handheld housing member in a second plane.

17. The input apparatus according to claim 16, wherein said second plane is substantially perpendicular to said predefined plane.

18. The input apparatus according to claim 15,

a) further including at least two user activated finger switches positioned on said handheld housing member; and,

b) further including means for transmitting said indicia and signals indicative of user activation of said at least two user activated finger switches.

19. The input apparatus according to claim 18, wherein

said rigid handheld housing member is adapted to rest on a back portion thereof when not supported by an operator.

20. An electronic game system comprising:

a) an electronic game adapted to receive input from a player;

b) an input apparatus adapted to be moved in its totality by said player and having,

1) a handheld housing adapted to be grasped by said player, and,

2) an inertia sensor contained within said handheld housing member and generating an indicia representative of movement of said handheld housing in a predefined plane; and,

c) means for transmitting said indicia to said electronic game.

21. The electronic game system according to claim 20, further including a second inertia sensor positioned within said handheld housing and generating a second indicia of movement of said handheld housing in a second plane.

22. The electronic game system according to claim 21, wherein said second plane is substantially perpendicular to said predefined plane.

23. The electronic game system according to claim 20,

a) wherein said input apparatus further including at least two player activatable switches positioned on said handheld housing; and,

b) wherein said means for transmitting includes means for communicating signals indicative of player activation of said at least two player activatable finger switches.

24. The electronic game system according to claim 23, wherein said handheld housing member is structured to be grasped

by both hands of said player.

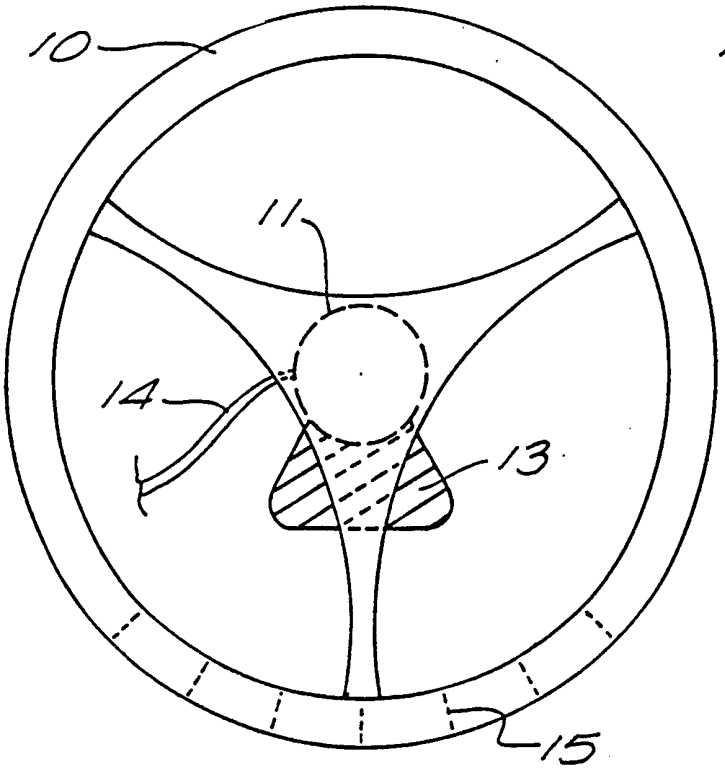


FIG. 1A

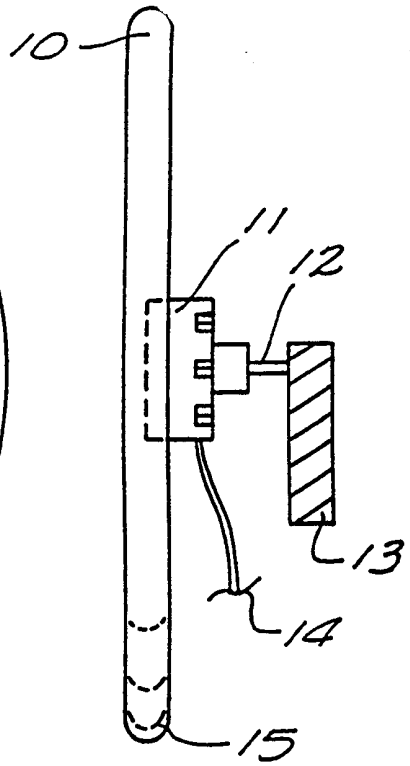


FIG. 1B

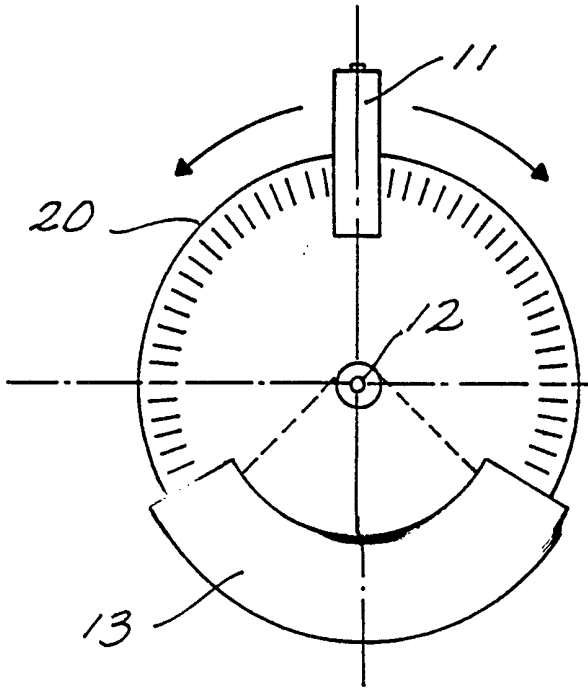


FIG. 2A

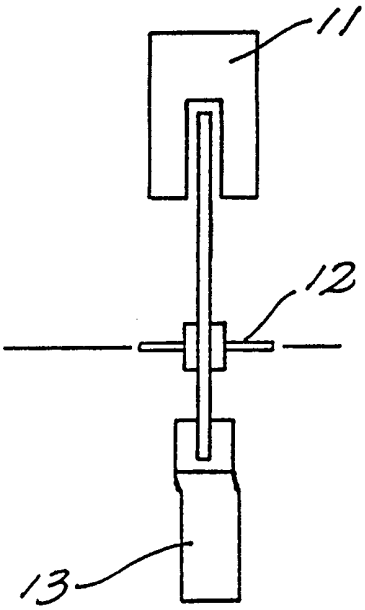


FIG. 2B

FIG. 3A

CENTER POSITION

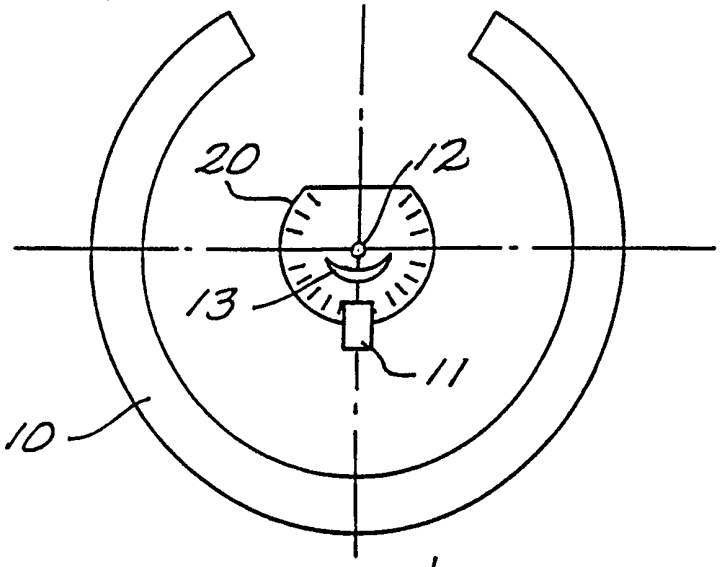


FIG. 3B

LEFT TURN

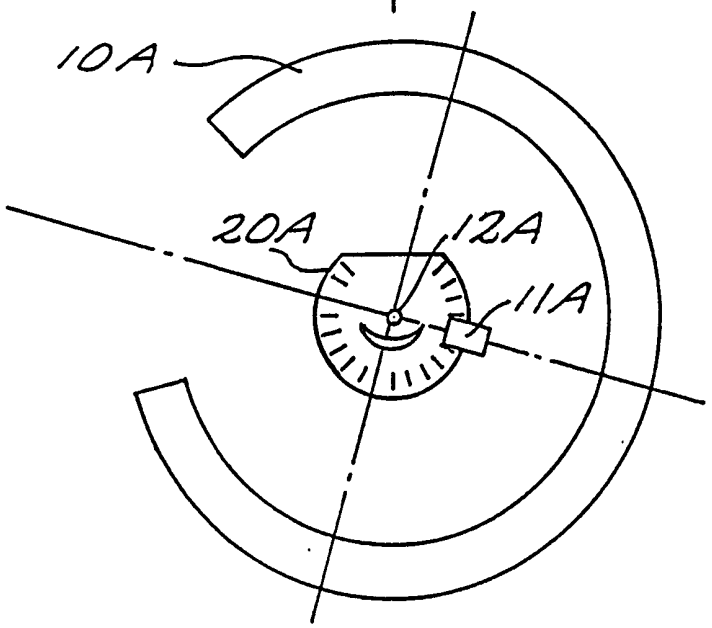
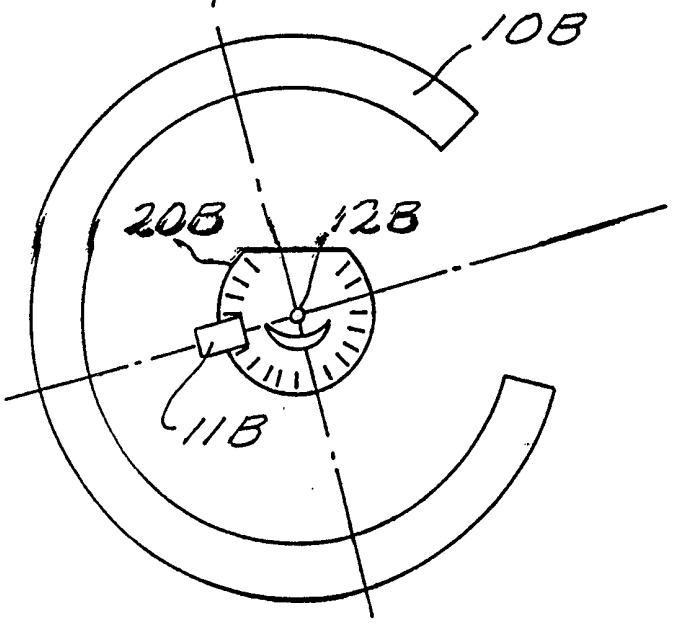


FIG. 3C

RIGHT TURN



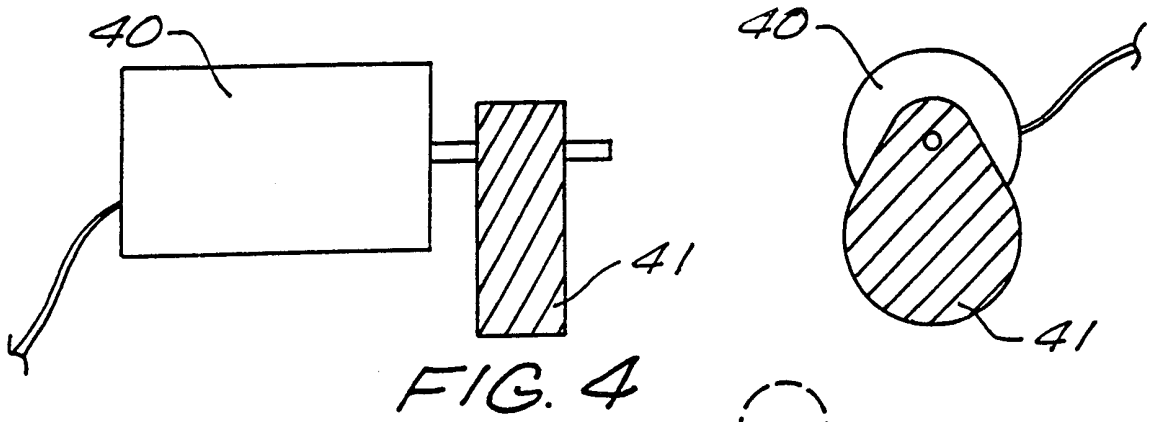


FIG. 4

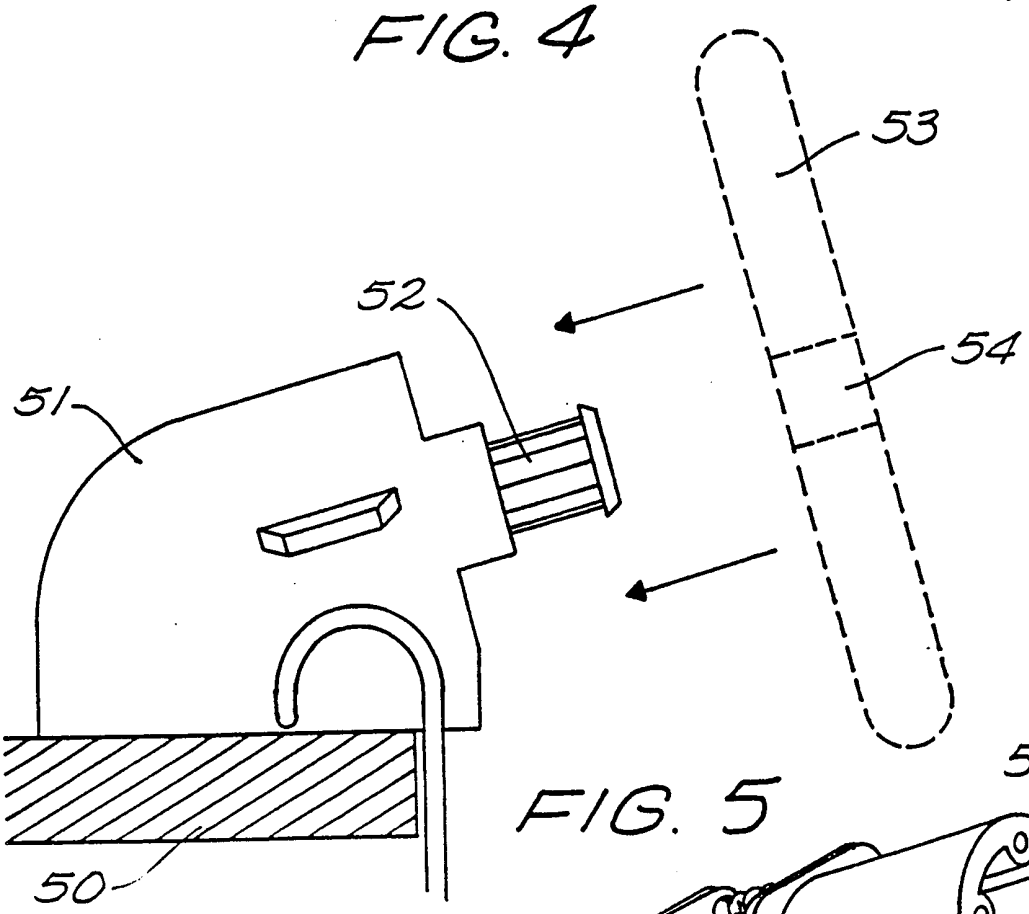


FIG. 5

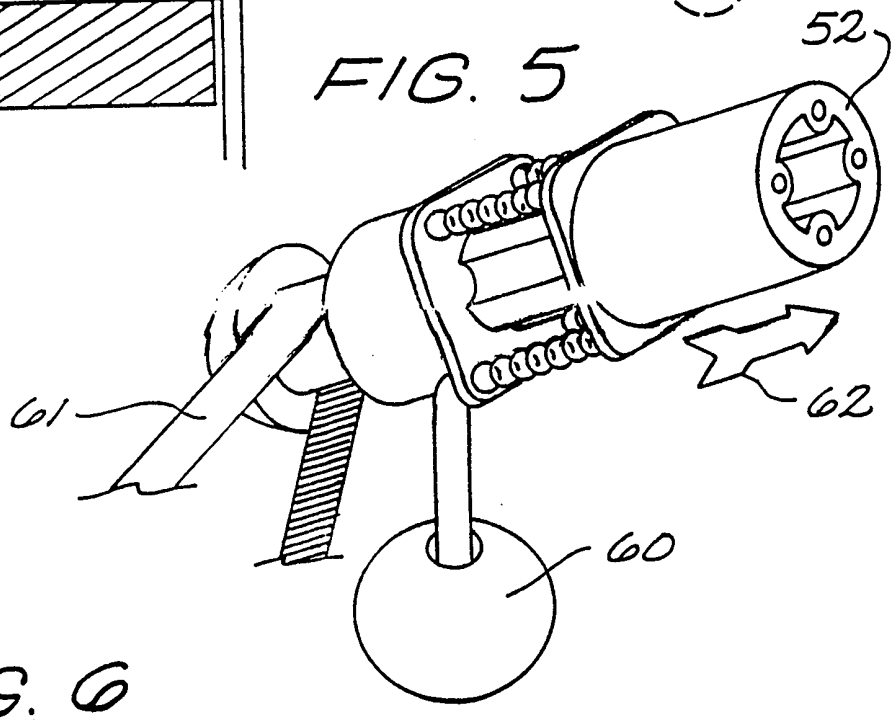


FIG. 6

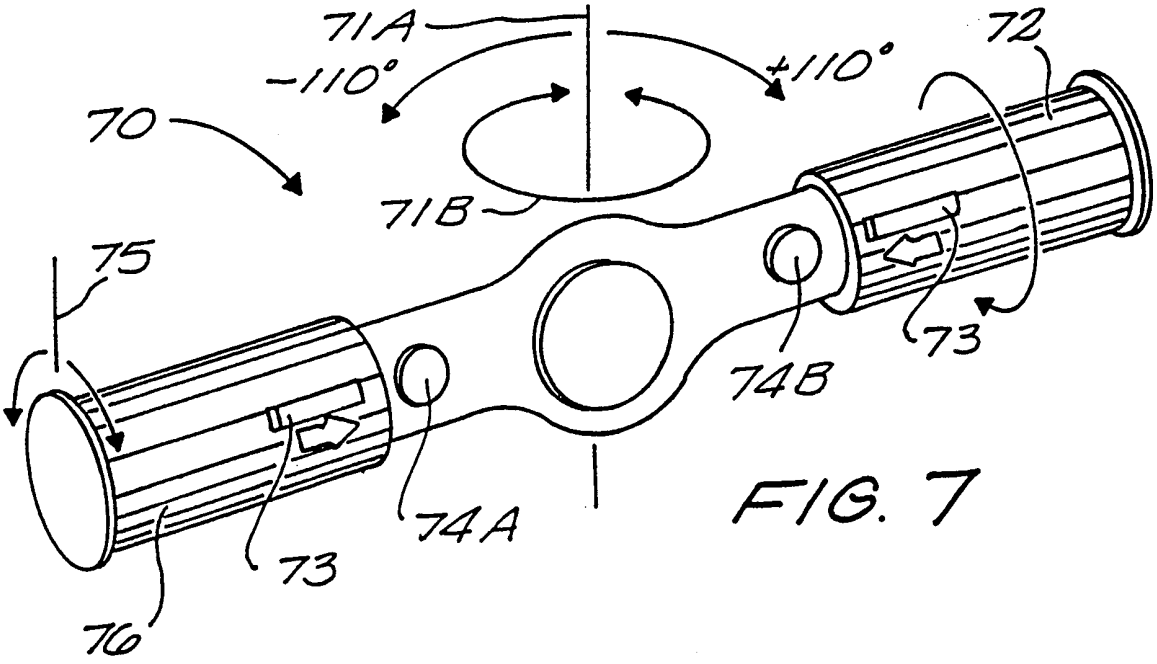


FIG. 7

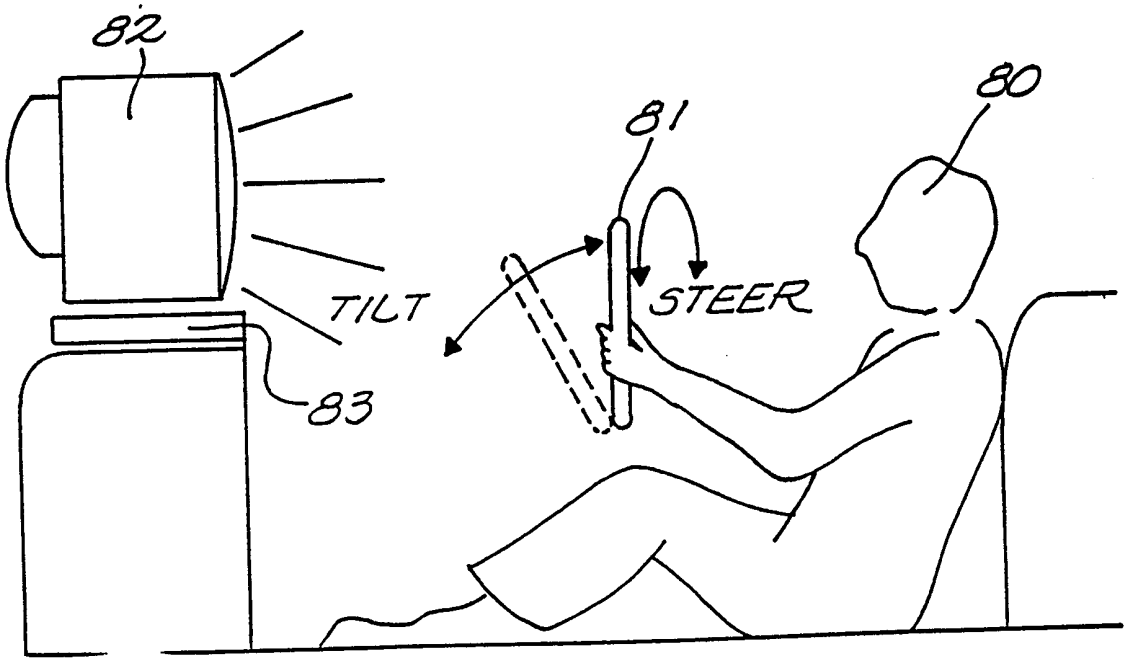


FIG. 8