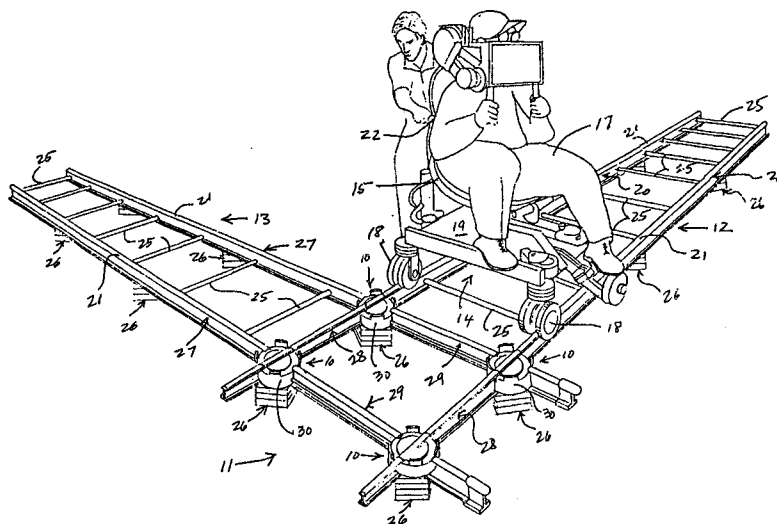




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US00/04000</p> <p>(22) International Filing Date: 16 February 2000 (16.02.00)</p> <p>(30) Priority Data: 60/120,855                      19 February 1999 (19.02.99)      US</p> <p>(71)(72) Applicants and Inventors: SPIELBERG, Steven [US/US]; 10345 Olympic Boulevard, Los Angeles, CA 90064 (US); MCKIE, Peter [GB/AU]; Suite 102, 2629 Main Street, Santa Monica, CA 90405 (US).</p> <p>(74) Agents: SMALL, Thomas, M. et al.; Small Larkin, LLP, 18th Floor, 10940 Wilshire Boulevard, Los Angeles, CA 90024-3945 (US).</p>		<p>(81) Designated States: AU, CA, CN, DE, ES, GB, IN, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: SWITCHING DEVICE



(57) Abstract

A motion picture camera dolly (14) supported on a dolly track assembly in which two double-rail tracks (12, 13) intersect at a rectangular switching assembly having a switch (10) at each corner to lie under the four wheels (18) of the dolly when it is positioned on the switching assembly. The switches have short pieces of rail (32) that are movable between two angularly spaced positions, in alignment with the rails of the two tracks, and are held yieldably by over-center springs (54) in one position, in alignment with the track currently supporting the dolly, until moved into alignment with the other track. The illustrative embodiment uses a conventional dolly, in which the wheels are manually turned ninety degrees from a normal mode to a "crabbing" mode of operation, and the turning of the wheels turns the switches into alignment with the second track. Links are provided between the switches so that switching of one by one wheel of the dolly will switch the others at the same time.

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## SWITCHING DEVICE

### Reference to Related Application

This application claims priority based upon copending U.S. provisional application Serial No. 60/120,855, filed 02/19/99, entitled "Camera Switching Device".

### Background of the Invention

5 This invention relates to motion picture photography, or cinematography, and has particular reference to the movement of a motion picture camera on a dolly or other car into different positions during the shooting of a motion picture. The invention has specific reference to the changing of direction of movement of a dolly-mounted motion picture camera for filming of a scene from different camera paths or directions of motion.

10 As is well known in the film industry, there are various ways to carry and position a motion picture camera during the shooting of a film, ranging from hand-held cameras and body mounts to more complex carriers such as camera cranes, dollies, and even remote-controlled robotic cameras. Different carriers are selected for different filming requirements. Hand-held cameras typically are used in circumstances where mobility  
15 over irregular terrain is required, and wheeled carriers are used where the surfaces are smooth enough for their operation.

One well known type of carrier is the so-called "dolly", which is a car or cart having a body that may be a flat platform supported on a plurality of wheels, typically four, and carrying means for supporting a camera above the platform. Such supporting  
20 means may be a complex pedestal or other camera mount upstanding from the platform, or may be simply a seat for a cameraman with a hand-held or body-mounted camera.

Dollies have been known and used in the film industry for many years, and typically have been equipped with wheels having tires for rolling on the ground or floor. Directional control of the travel of dolly-mounted cameras during filming has been limited  
25 by the capabilities of the dollies to be steered, and this typically has been restricted by the construction of the dolly, which usually is moved manually by an attendant, call the "dolly grip" in industry terms. One capability of the dolly is movement from a normal, forward direction to a transverse, ninety-degree direction, in what is called the "crabbing

mode" of the dolly. This change is accomplished by the dolly grip with a crank on the dolly, called a "T-Handle," for turning or "crabbing" the wheels of the dolly ninety degrees to the transverse positions. Stops on the dolly's wheel mounts position the wheels in the selected "normal" or "crabbing" position.

5 For smooth and steady camera movement on a dolly over somewhat irregular but generally horizontal terrain, it sometimes has been the practice to provide track that can be laid with generally parallel rails defining a preselected path for the camera, and to equip the dolly with grooved wheels, like railroad wheels, to ride on the rails. Such track rails are supported on and secured to mounts, like railroad ties, on ground-engaging bases  
10 that are adjustable to position the track rails for smooth dolly movement. A camera supported by a track-mounted dolly is readily and smoothly movable along the dolly track.

The general objective of the present invention is to increase the versatility and capabilities of such dolly track cameras, and thereby to enhance the artistic abilities of the  
15 film-maker.

#### Brief Summary of the Invention

The present invention resides in a novel switching device and switching assembly for track-mounted camera dollies and the like, permitting a dolly first to be moved along one path for the filming of a scene from one perspective, and then switched quickly,  
20 easily and smoothly to an intersecting, transverse path for continued filming of the scene from another perspective. The invention is particularly well suited for use with conventional dollies having "normal" and "crabbing" modes of operation, so that the dolly can be operated in normal mode along one path and simply crabbed onto and along the second path, using pre-existing capabilities of such dollies.

25 For these purposes, the switching device of the invention has a body that is adapted to be positioned at the intersection of the two paths, in the gap between two rails of the two tracks, and a rotary switching element on the body having a short switching rail section that is level with the two track rails and movable alternately between two angularly spaced positions in alignment with the respective track rails, so that a turnable  
30 dolly wheel can be moved onto the switching section from one track and then turned into alignment with the other track. Preferably, means are provided for holding the switching

element yieldably in each of the switching positions and permitting movement of the switching element by the dolly wheel into the other switching position, this being an over-center spring mechanism in the preferred embodiment of the invention.

5 The novel switching assembly uses four of the switches in combination with four short sections of the rails arranged in a rectangle that is sized to lie under a selected dolly with the four corners of the rectangle at the positions of the wheels of the dolly, the four switches being connected to the four rail sections to join and hold the assembly together. In the preferred embodiment of the switching assembly, each of the switches may have a stub rail section projecting outwardly for connection to the main track sections leading to  
10 the switching assembly, and connecting links may be provided to join the switches together for operation in unison from one of the switches.

Other aspects and advantages of the invention will become apparent from the following detailed description, in conjunction with the accompanying drawings.

#### Brief Description of the Drawings

15 FIGURE 1 is a perspective view of a dolly track and a switching assembly, equipped with track switches embodying the present invention shown in one of the switching positions, and shown with a representative dolly carrying a cameraman positioned on one of the tracks;

20 FIG. 2 is an enlarged perspective view of one of the track switches shown in FIG. 1, with the switching element turned to a different switching position and with connected tracks shown in broken lines;

FIG. 3 is a top plan view of the track switch;

FIG. 4 is a side elevational view of the track switch;

FIG. 5 is a bottom plan view of the track switch;

25 FIG. 6 is an exploded perspective view showing the basic components of the track switch, with stub sections of track rails; and

FIG. 7 is a somewhat schematic view from the bottom of the switching assembly showing representative spring-loading and linking arrangements of the four switches in the assembly.

Detailed Description of the Preferred Embodiment

As shown in the drawings for purposes of illustration, the invention is embodied in a track switch, indicated generally at 10 in the drawings, and in a switching assembly indicated generally at 11, for use in combination with tracks 12, 13 for a conventional camera dolly 14 or the like. The dolly is shown with a seat 15 supporting a cameraman 17, and with a second person, called a "dolly grip", manually moving the dolly along the track 12.

The illustrative dolly has four wheels 18 located near the four corners of a platform 19 and equipped with peripherally grooved rims for riding on rails 20 forming the upper sides of the tracks. The illustrative rails have convexly curved upper surfaces 21, as shown in FIG. 2, for maintaining engagement with the dolly wheels as they roll along the tracks 12 and 13.

A dolly of the type shown is supplied by Chapman/Leonard Studio Equipment, Inc., North Hollywood, California, and elsewhere, as the "Pee Wee II Dolly". This dolly is relatively small, having dimensions of 24½ inches wide and 31½ inches long (lengthwise of the track 12), with the wheels spaced accordingly. This dolly is standardly equipped with rubber-tired wheels (not shown) and for "crabbing"--that is, for turning of the wheels ninety degrees relative to the normal operating mode shown in FIG. 1. The crabbing mode has been conventionally used on flat surfaces for filming in the past when it is desired to change the perspective of a scene being filmed. The dolly grip typically turns the wheels to the crabbing mode with a T-bar crank 22 located at one corner of the dolly for convenient access by the dolly grip.

When use of a dolly is desired on irregular terrain, a track has been laid on the ground to establish a smooth and generally level path for the dolly, for smooth and steady filming. Such a track typically has two generally parallel rails 20 constructed of elongated lengths joined end-to-end, herein by pin connectors 23 (FIG. 6), fitting into openings 24 in the ends of the rails, forming an arrangement much like railroad tracks. Cross-supports 25 functioning like railroad ties are spaced at regular intervals along the length of the track, and are connected to the rails to hold them parallel as well as to support them vertically. Rather than constructing a smooth bed for the ties, pedestal-like mounts 26 of variable height are built up under the track and the ends of selected cross

supports. These may be stacks of flat plates or blocks. The path established by such a track is generally straight and horizontal, but moderate slopes can be accommodated.

In accordance with the present invention, the second track 13 is provided to define a second path for the dolly 14, intersecting the path defined by the first track 12, and the switching assembly 11 is provided at the intersection of the two paths to received the dolly moving along one path with the four wheels 18 of the dolly positioned on the four switches 10, and to permit turning of the wheels of the dolly ninety degrees into the crabbing mode and into alignment of the rails of the second track. This assembly is designed specifically to accommodate and take advantage of the existing features of conventional dollies such as the "Pee Wee II", but is not to be limited to such dollies. It is within the scope of the invention to design a special carrier with wheels of any desired configuration and arrangement and operable to be turned through any selected angular displacement for alignment with intersecting paths at the desired angle to each other.

More specifically, the track 13 comprises two rails 27 that are constructed and supported in the same manner as in the rails 20 of the track 12, the same reference numbers therefore being used for the parts of the second track. The only significant difference to be considered is the lateral spacing of the rails 20 and 27 for a elongated dolly with different longitudinal and lateral spacing of its wheels, the rails of the second track are spaced to accommodate the length of the dolly rather than the width of the dolly used for the track 12. If a square dolly is used with wheels that are arranged in a square pattern, the tracks will be of the same width.

As best seen in FIG. 1, the switching assembly 11 comprises four short rail sections 28 and 29 in a rectangular arrangement in alignment with the rails 20 and 27 as extensions of the two intersecting paths of the tracks 12, 13, and four switches 10 at the corners of the assembly positioned to lie under the wheels of the dolly 14 when it is positioned on the assembly 11. The switches have bodies 30 that are connected to the ends of the rail sections 28 and 29, joining them together, and have switching elements 31 mounted on the bodies for rotation between two angularly spaced positions and including short pieces of rails 32 on the upper sides of the switches level with the rail sections 28 and 29 . In the first positions (FIG. 1), the switching elements are aligned with the rail sections 28 and the rails 20 of the first track 12, and in the second positions (FIG. 2), the

switching elements are aligned with the rail sections 29 and the rails 27 of the second track 13.

As shown in FIGS. 2 through 5, the presently preferred embodiment of the switch 10 has a body 30 in the form of a drum, preferably cylindrical in shape, with grooves or slots 33 in the side of the drum arranged at angular intervals, herein of ninety degrees, to be aligned with the tracks 12 and 13 to receive the adjacent ends of the track continuation sections 28 and 29. The illustrative rails are shaped like "I" beams, having flat bases 34 (FIGS. 2 and 6), upright central walls 35 and tops defining the curved surfaces 21, and the slots 33 are key-hole shaped to receive correspondingly shaped ends of the rails. Notches 36 in the lower end wall 37 of the drum are shaped to receive the ends of the bases 34, which are connected to the wall 37 by bolts 38 (FIG. 5).

The upper end of the switch body 30 has four upstanding peripheral flanges 38 which define notches for the four track rails, which preferably are formed with ends 39 (FIGS. 2 and 6) extending into the notches, as shown in broken lines in FIG. 2. These ends stop short of the inside wall 40 of the body 30, and rest on abutments 41 at the upper ends of the slots.

As shown in FIG. 6, the switching element 31 is a disk that is fitted into the upper end of the body 30 and rotatably supported therein to turn about an axis that is upright when the switch 10 is in use with generally horizontal tracks. The top wall of the disk has two transverse grooves 42 on opposite sides of a diametrically extending center bar 43, and the short piece of rail 32 is secured to this bar. As can be seen in FIGS. 2 and 3, the pieces of rail extend partially across the upper end of the drum, with ends 44 close to and level with the ends of the rails 20 and 27. As shown in FIGS. 1, 6 and 7, short stub sections of the rails can be included in the switching assembly 11 for connection to the remainder of the tracks 12 and 13.

FIGURE 6 shows a representative supporting arrangement for the switching element 31, including a bearing ring 45 disposed between the disk and an inside partition wall 47, for free turning of the disk relative to wall. A coaxial stub shaft 48, the end of which appears in FIG. 7, extends downwardly from the underside of the disk through a hole 49 in the partition wall, into a compartment 50 between this wall and a cap 51 (FIG. 5) in the lower end 37 of the drum. This shaft carries a crank and over-center spring 52 that is used to hold the switching element 31 yieldably in the two switching positions.



As can be seen in each of the four switches 10 shown in FIG. 7, the crank assembly 52 includes an elongated arm 53 extending radially away from the stub shaft 48 along the underside of the partition wall 47 and a coiled extension spring 54 stretched between the free end of the arm and an anchor 55, a connector set in the partition wall.

5 The anchor is positioned so that the crank 53 swings the spring 54 over-center as the switching element 31 moves between the two switching positions. The spring therefore holds the element yieldably in each of the switching positions after it is moved, and yields to permit movement to the other position. Stops 55 on the stationary wall limit rotation in each direction and thus establish the switching positions of the crank assembly.

10 When it is desired to operate all of the switches 10 in unison from one wheel 18 of the dolly 14, the four switches of the assembly 11 can be linked together in the manner shown in FIG. 7. Each crank assembly 52 has two additional crank arms 57, herein shorter than the arm 53 and extending laterally from it near the shaft 48, thus forming, in effect, a double bell crank. In two of the four switches, the two short arms 57 are

15 pivotally connected to elongated links 58 that extend along the sides of the switch assembly to the adjacent switch, thus interconnecting three of the crank assemblies. The remaining switch is connected to one of those two switches by an identical link 59. Connected in this manner, all four switches will move together in corresponding directions when one is activated.

20 Referring again to FIG. 1, it will be seen that the two tracks 12 and 13 have been set up on a supporting surface which may be grassy field, to define two paths intersecting at ninety degrees, with the switching assembly 11 at their adjacent ends where the paths intersect. The switching rails 28 and 29 of the switching assembly form continuations of the rails 20 and 27, and one switch 10 is positioned at each intersection of the rails along

25 the two paths. It should be noted that all of the various rails can be of the same configuration, and are indicated by the same reference numbers.

30 With the dolly 14 positioned on the track 12 as shown, it and the cameraman 17 can be rolled smoothly and relatively easily along the path defined by this track, for example to film a sequence in which subjects (not shown) are walking along a path generally parallel to the track 12, or perhaps converging with this path toward the switching assembly 11. The dolly 14 can be rolled along the track to the switching assembly, positioned momentarily with its wheels 18 on the four switches 10 while the

dolly grip turns the wheels with T-bar 22, simultaneously turning the switches into alignment with the track 13, and then rolled along this track to continue filming the sequence from the different perspective provided by this track. Other variations are available, for increased versatility in filming.

5           From the foregoing, it will be seen that the present invention provides novel and effective switches 10 and a switching assembly 11 for use with a camera dolly and intersecting tracks such as the illustrative tracks 12 and 13, with which the versatility of the equipment can be significantly increased. It also will be apparent that while one  
10           embodiment of the present invention has been illustrated and described in detail, various modifications and changes may be made by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. For use in combination with two dolly tracks, each comprising two generally parallel rails, defining predetermined generally horizontal paths intersecting at ninety degrees, and a camera dolly having supporting wheels in a predetermined arrangement for riding on the tracks in normal and crabbing modes of operation, a  
5 switching assembly comprising:

four switching rail sections arranged in first and second generally parallel pairs to be aligned with the rails of the dolly tracks as continuations thereof along said paths and forming four corners of the assembly positioned to lie beneath the dolly wheels  
10 in said predetermined arrangement when the dolly is positioned on the switching assembly;

and four track switches positioned at said four corners, each of said track switches having a body and a switching element rotatably supported on said body for rotation about an unright axis, said switching element having an upper end and including  
15 a short piece of rail supported on said upper end level with said rail sections and movable during rotation of said switching element between first and second angularly spaced positions in alignment with the different rail sections at the corner where the track switch is located;

whereby the wheels of the dolly are switchable from one track to the other  
20 on said switching assembly.

2. A switching assembly as defined in claim 1 wherein said rail sections have ends connected to said track switches, and said track switches have connectors for joining the track switches to the rails of the dolly tracks.

3. A switching assembly as defined in claim 1 wherein each of said track  
25 switches has a body in the form of a generally cylindrical drum, and a switching element rotatably mounted in said drum and supporting said piece of rail extending across the end of the drum to be turned between said first and second positions by rotation of the switching element in the drum.

4. A switching assembly as defined in claim 1 wherein each of said track  
30 switches has means therein for yieldably holding the switching element in each of said first and second positions.

*10*

5. A switching assembly as defined in claim 4 wherein said means for yieldably holding the switching element comprises an over-center spring assembly.

6. A switching assembly as defined in claim 1 further including means linking said track switches together for rotation between said first and second positions in response to movement of one of the switches between said first and second positions.

7. For use in combination with first and second dolly tracks each comprising two generally parallel rails defining two intersecting generally horizontal paths, and a camera dolly having supporting wheels in a predetermined arrangement for riding on the tracks, a switching assembly mountable at the intersection of said paths in the rails of said tracks, comprising:

four track switches positioned in the gaps in the rails at the intersections of said paths and each including a body to be disposed in the gap, and a switching element rotatably supported on said body to turn about an upright axis and including a short, generally horizontal piece of rail carried on said switching element level with said track sections to turn back and forth between first and second angularly spaced positions in which the piece of rail is aligned, alternatively, with a rail of said first dolly track section and a rail of the second dolly track and effectively spans the gap in which the track switch is disposed;

said gaps and said pieces of rail being positioned in said predetermined arrangement for positioning of said pieces of rail beneath the wheels of the camera dolly when the latter is moving along one of said paths on one of said dolly tracks, and for switching of said wheels to alignment with the other of said dolly tracks to move along the other of said paths.

8. A switching assembly as defined in claim 7 wherein the body of each of said track switches is a drum having connecting means for joining the body to the ends of the rails on opposite sides of the gap in which the track switch is positioned.

9. A switching assembly as defined in claim 8 wherein said connecting means include means defining recesses for receiving the ends of the dolly track rails and holding the rails in a preselected position relative to the body with the ends of the rails level with the short piece of rail on the switching element.

*11*

10. A switching assembly as defined in claim 7 wherein each of said track switches has means therein for yieldably holding the switching element in each of said first and second positions.

11. A switching assembly as defined in claim 10 wherein said means for yieldably holding the switching element comprises an over-center spring assembly.

12. A switching assembly as defined in claim 7 further including means linking said track switches together for rotation between said first and second positions in response to movement of one of the switches between said first and second positions.

13. For use in a dolly track having first and second tracks defining two intersecting generally horizontal paths for a turnable wheel on a dolly, a dolly switch comprising:

a switch body to be positioned at the intersection of the paths and having an upper end;

a switching element supported on said switch body for rotation about an upright axis and including a short switching track at said upper end and turnable between first and second switching positions in angular alignment, respectively, with said first and second tracks, said short switching track being sized to support the turnable wheel of the dolly during turning between said switching positions;

and connecting means on said body for joining said tracks to said body and holding the track level with said short switching track and in alignment with said switching positions, whereby the dolly can be positioned on one of the tracks with the turnable wheel on said dolly switch for turning from said one track to the other.

14. A dolly switch as defined in claim 13 wherein said tracks and said switching track are rails.

15. A dolly switch as defined in claim 13 further including means for holding the switching element yieldably in each of said switching positions and permitting movement of the switching element with the dolly wheel from one switching position to the other.

16. A dolly switch as defined in claim 15 wherein said means for holding the switching element yieldably in each of said switching positions is an over-center spring assembly.

17. A dolly track switch, comprising:  
a body adapted to be positioned along a dolly track and having an upper  
end;

5 and a switching element rotatably mounted in said body for movement  
between two angularly spaced positions relative to said body and including a short track  
section extending across said upper end to rotate to two angularly spaced track positions  
during rotation of the switching element;

10 whereby a wheel of a dolly on the dolly track may be positioned on said  
track switch and rotated between two angularly spaced positions for alignment with  
different tracks.

18. A dolly track switch as defined in claim 17 wherein said track and said  
short track section are rails.

15 19. A dolly track switch as defined in claim 17 further including an over-center  
spring assembly for holding the switching element yieldably in the two angularly spaced  
positions.

20. A dolly track switch as defined in claim 17 further including stops on said  
body limiting movement of the switching element to the two angularly spaced positions.

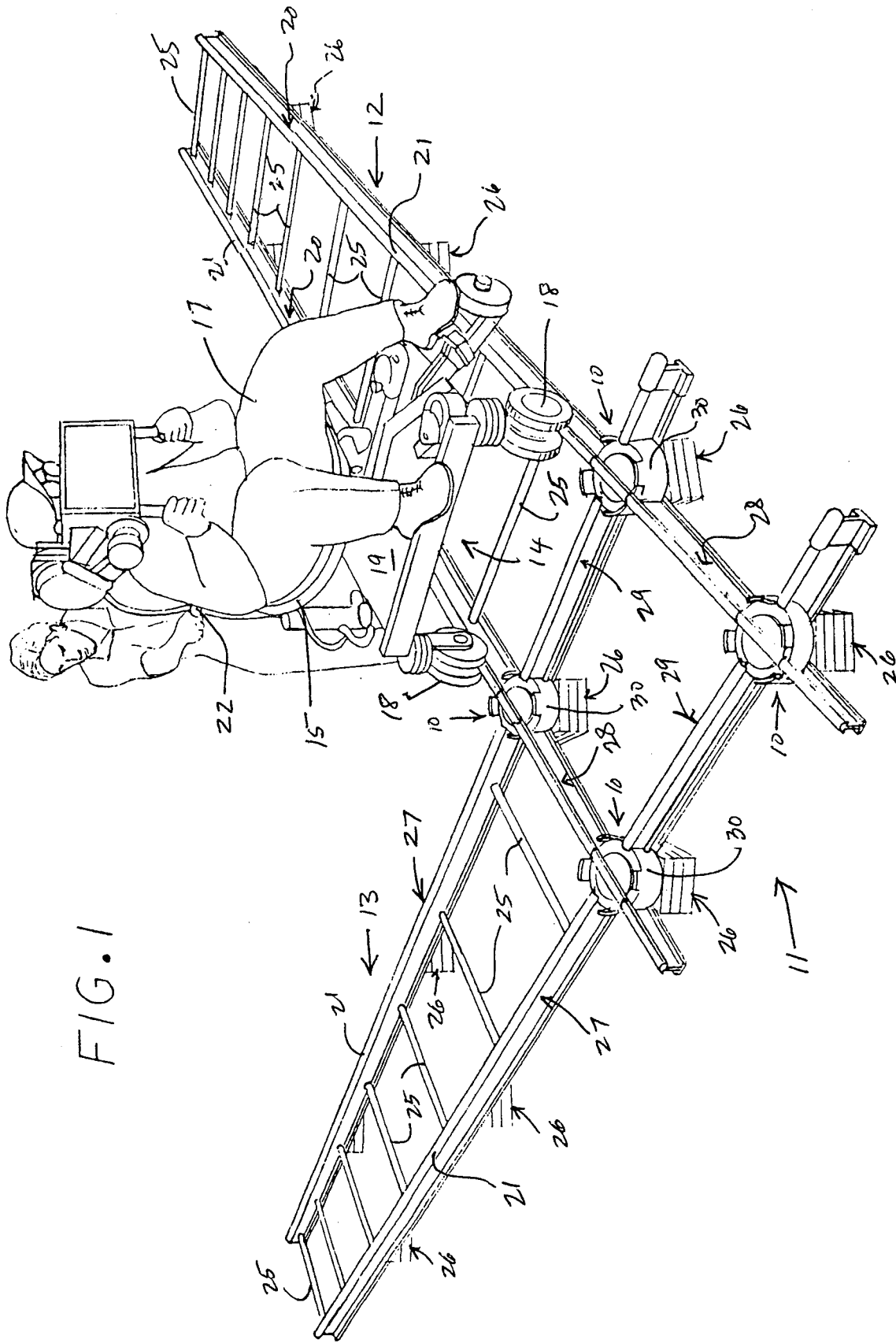
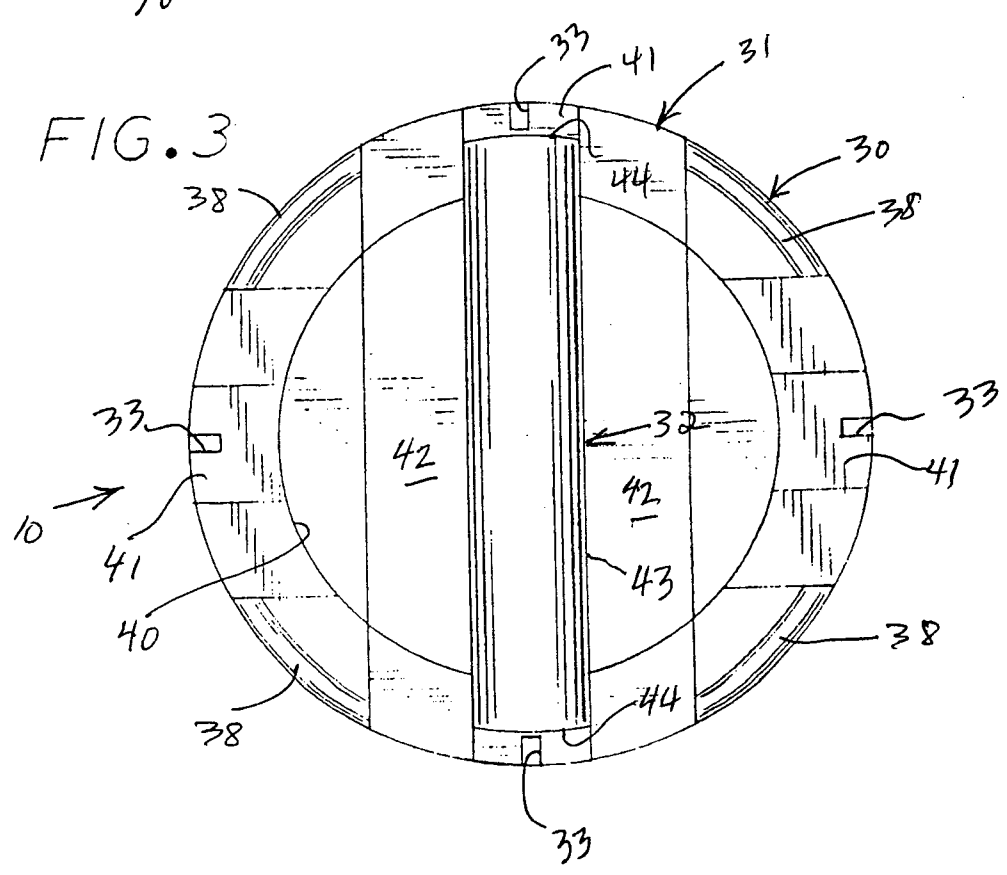
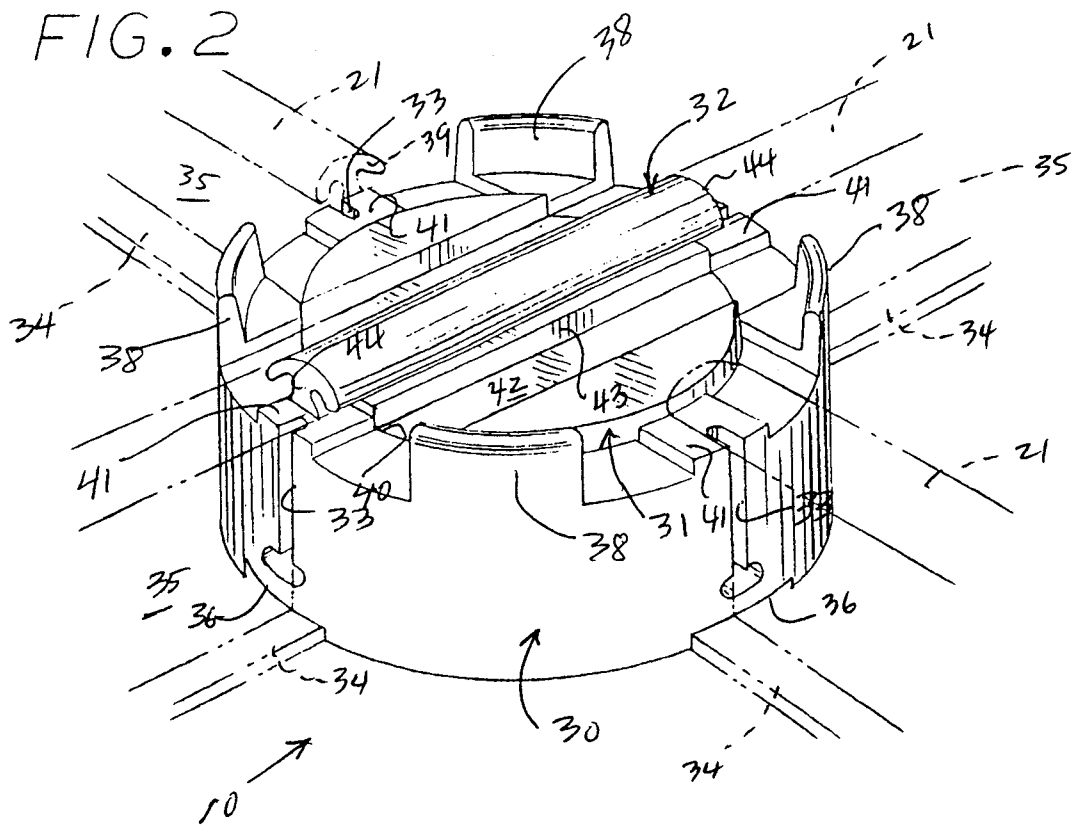


FIG. 1





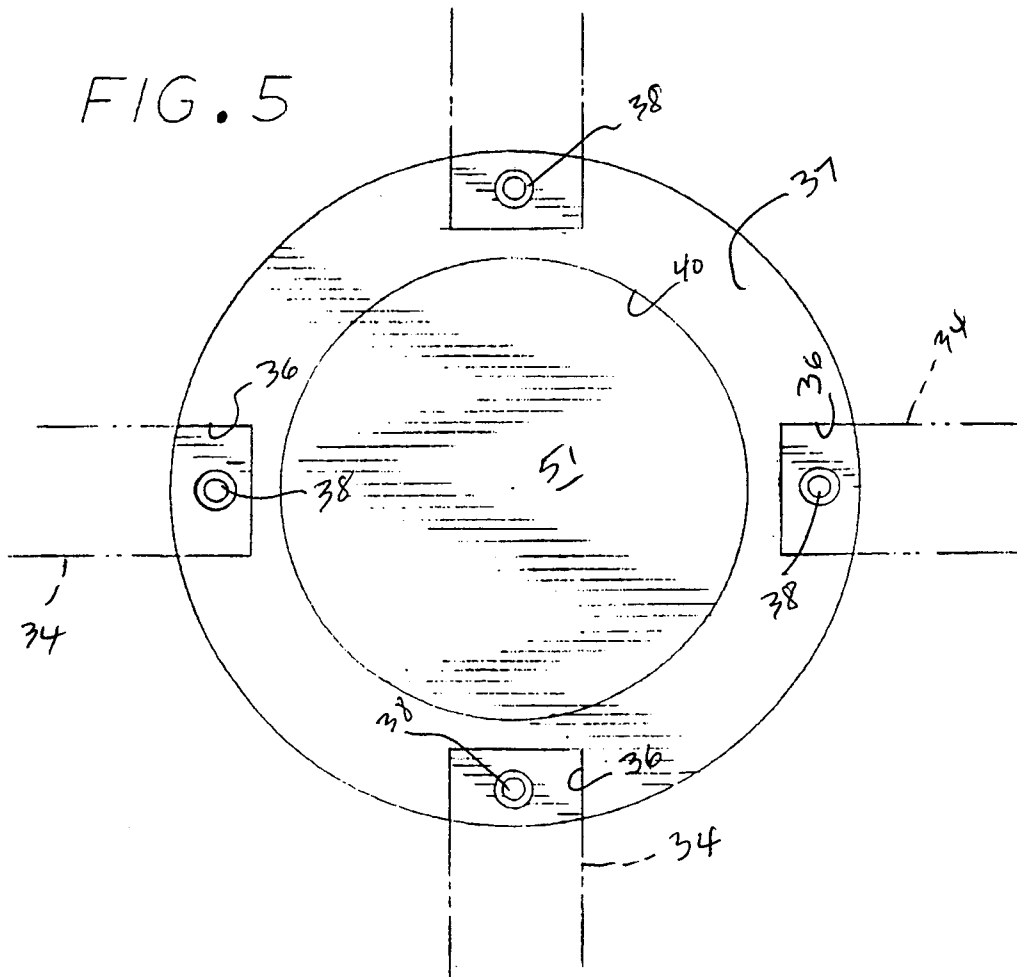
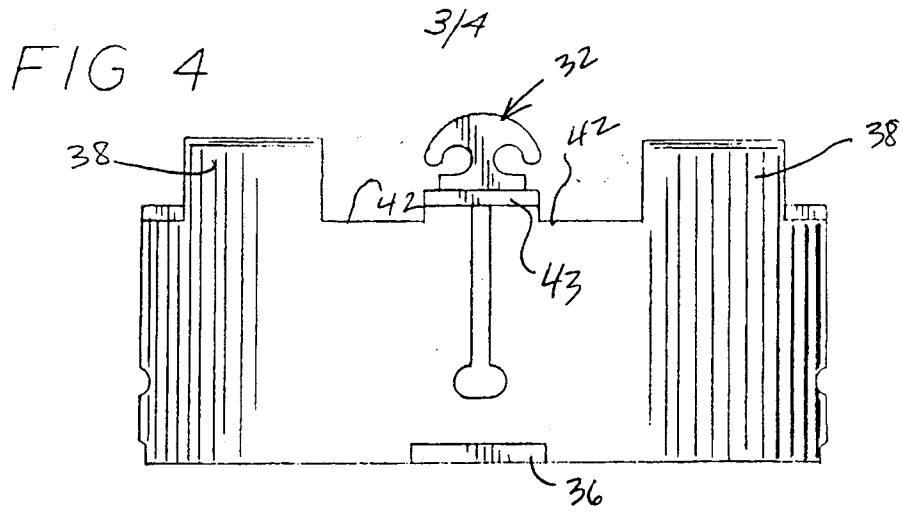


FIG. 6

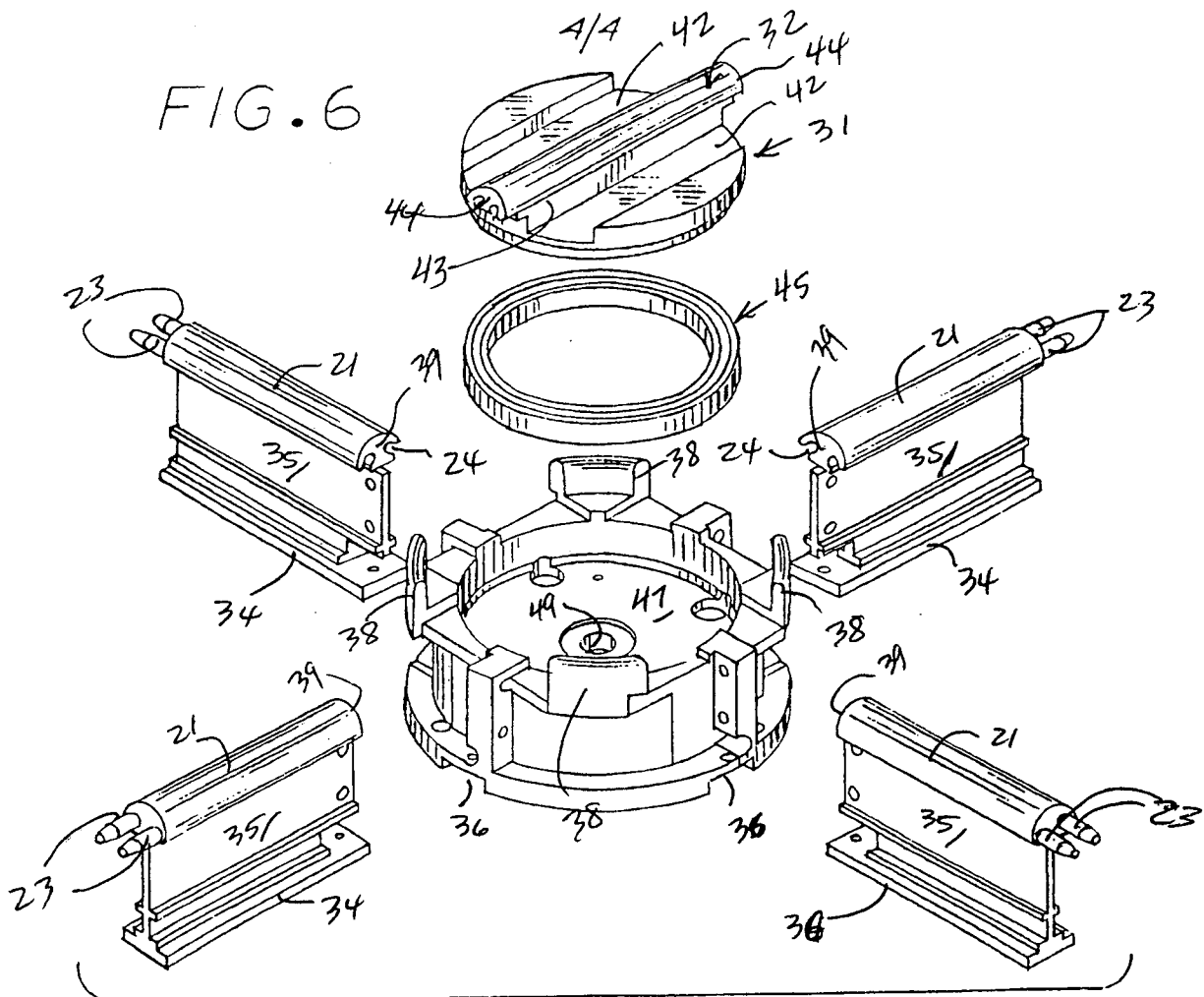
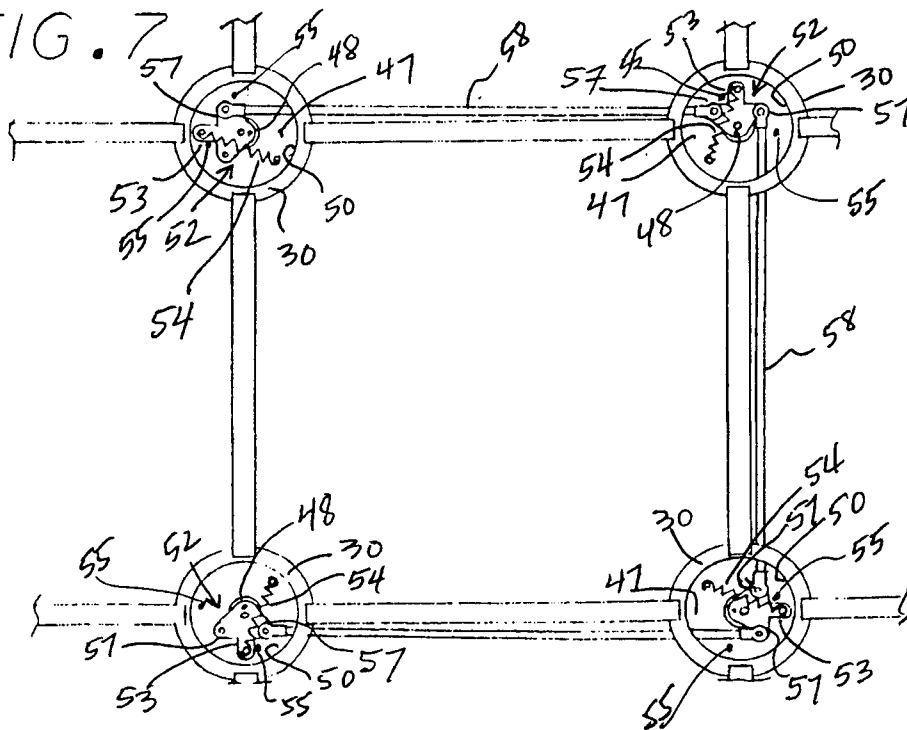


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/04000

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC(7) : B60S 13/02  
US CL : 104/35  
According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**  
Minimum documentation searched (classification system followed by classification symbols)  
U.S. : 104/35, 36, 48, 50

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

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 5,957,055 A (BAUER et al.) 28 September 1999, Figures 5,7 and 9.	1,2,4,6,7, 10,12-15, 17,18,20
A	US 5,857,413 A (WARD) 12 January 1999, see entire document.	
A	US 4,787,802 A (VACCARO et al.) 29 November 1988, see entire document.	

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

* "A"	document defining the general state of the art which is not considered to be of particular relevance	"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
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Date of the actual completion of the international search 31 MAY 2000	Date of mailing of the international search report <b>21 JUN 2000</b>
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