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(54) SWITCHER TRACK AND SLED

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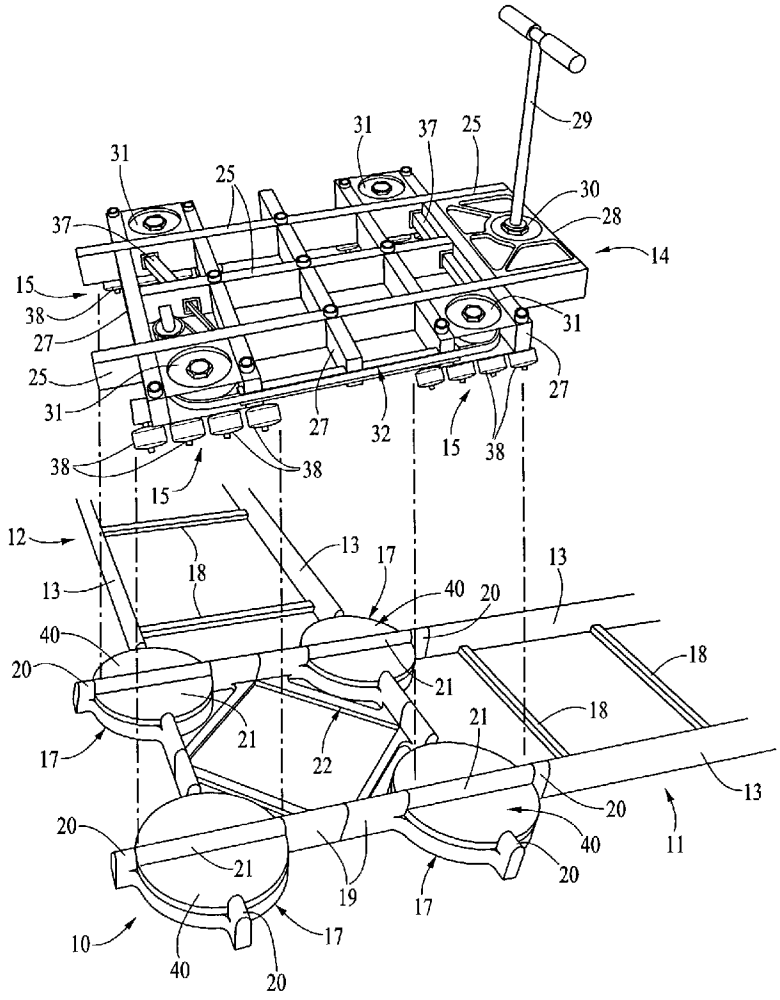
(57) **ABSTRACT**

A switcher track apparatus comprising four switch units having precisely supported turntables at the intersections of the rails of two tracks, with switch sections of the track on the turntables movable into alternate switching positions in alignment with the two tracks and with magnet assemblies for establishing and releasably holding precise alignment. A dolly or sled for riding on the tracks has four wheel assemblies at its corners each comprising two rows of four roller wheels in a V-shaped arrangement for engagement with curved rail surfaces. The wheel assemblies are carried on sprockets that are tied to a driver sprocket on a T-bar for operation in unison.



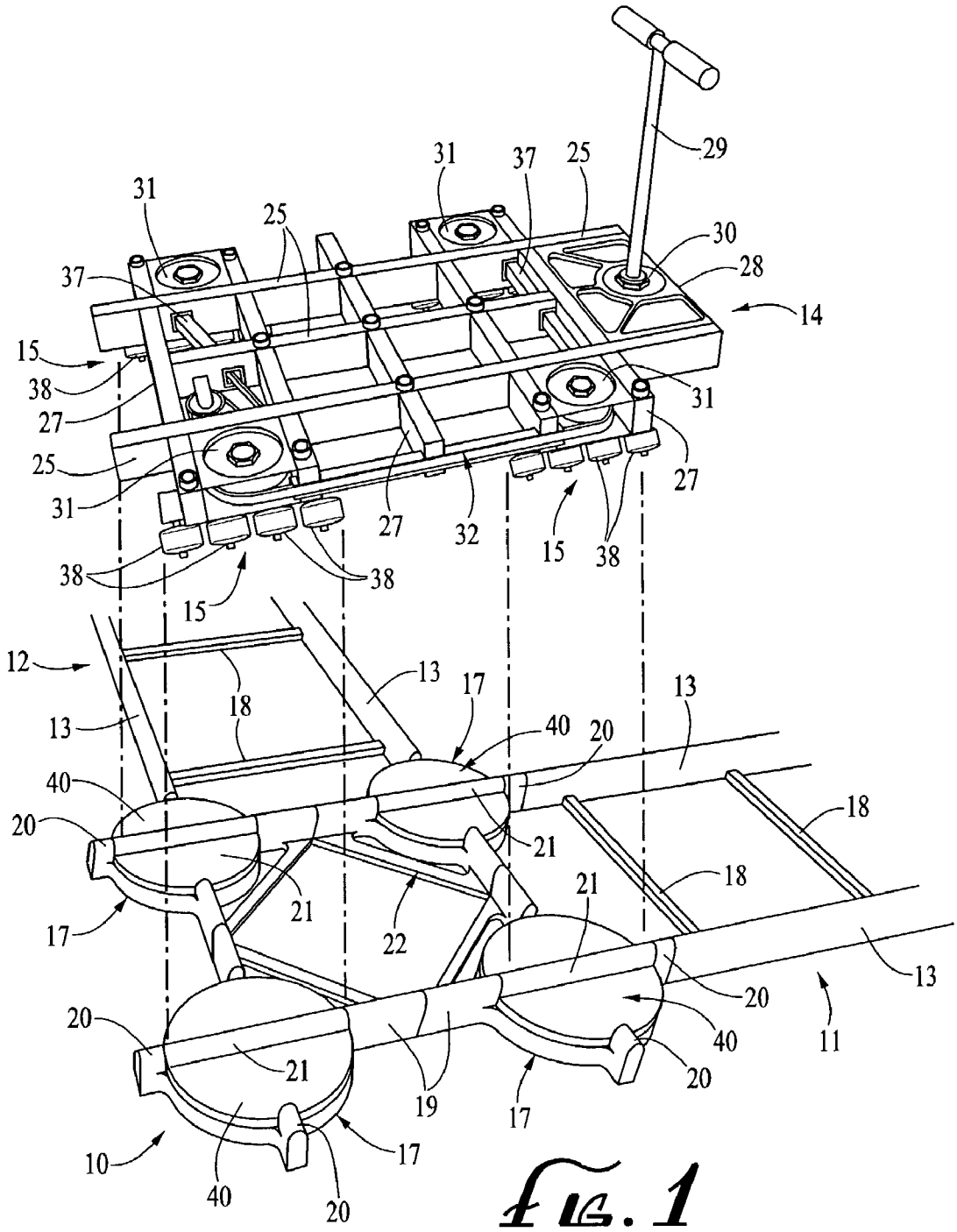

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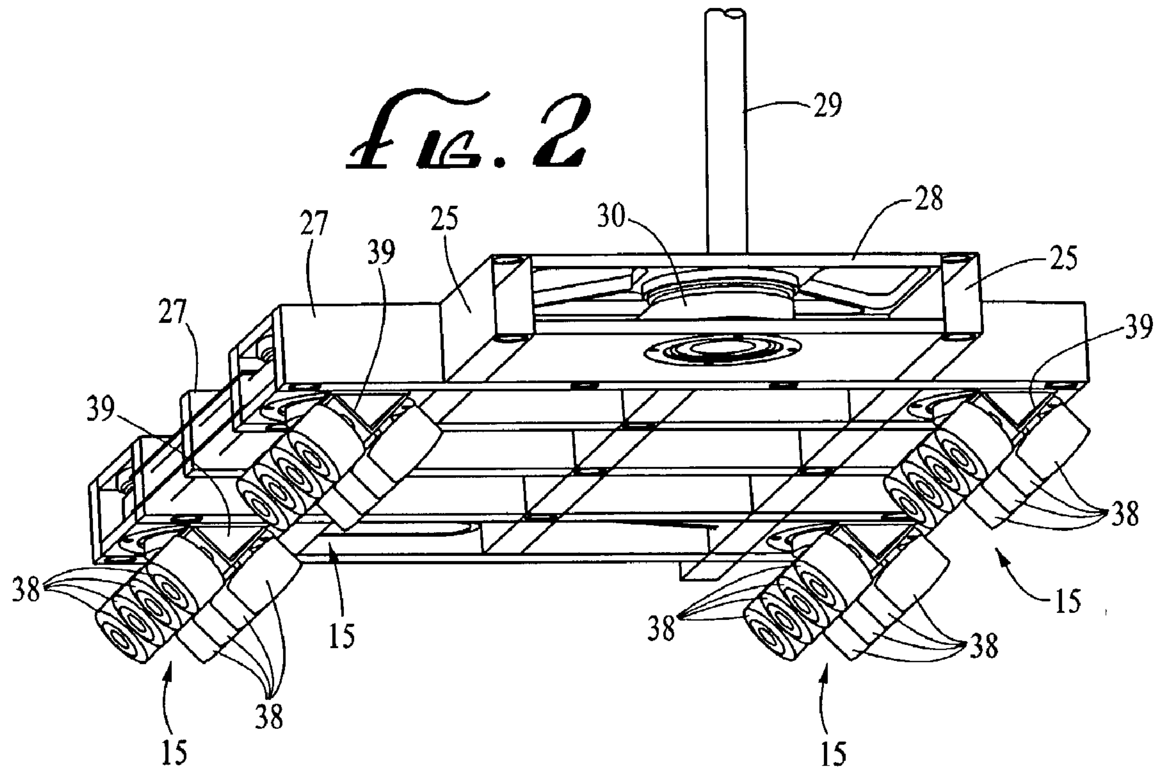
FIG. 1

FIG. 2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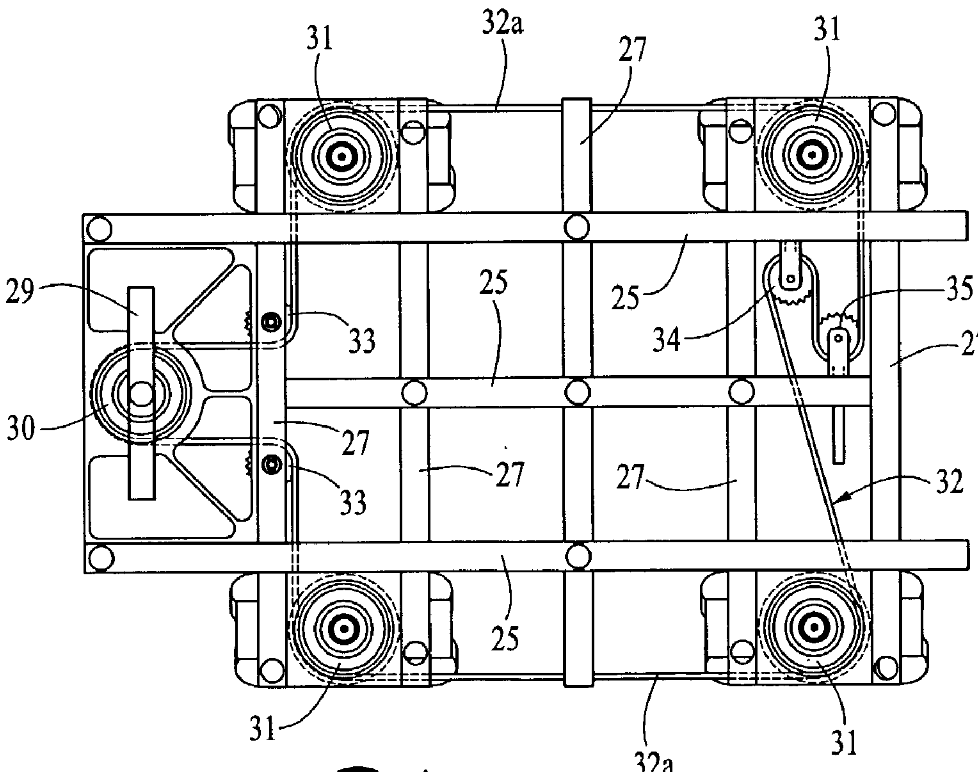
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FIG. 3

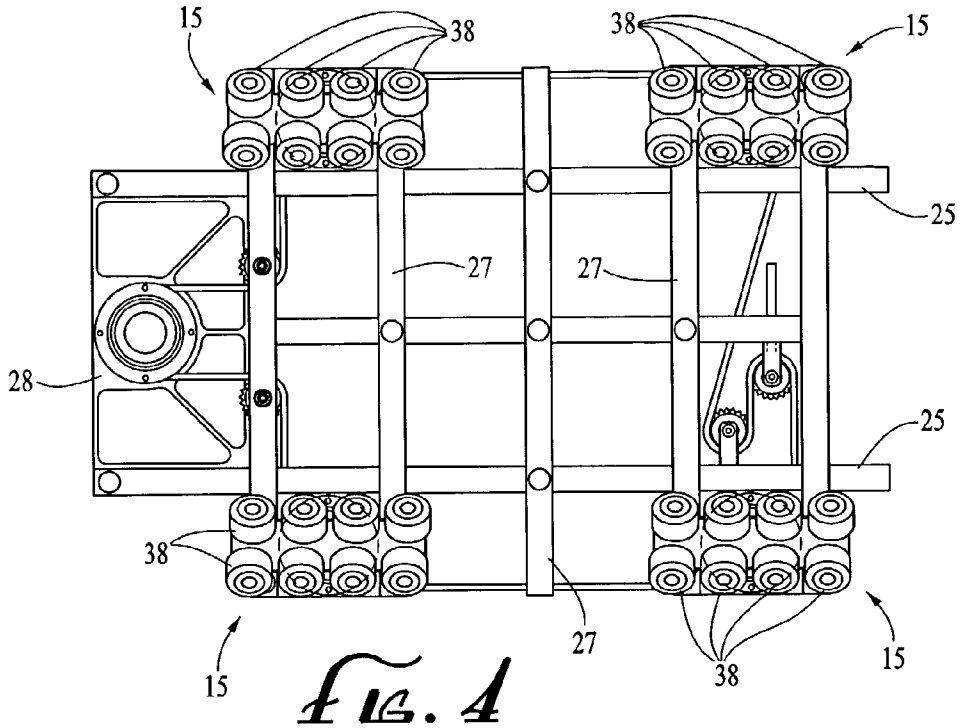


FIG. 4

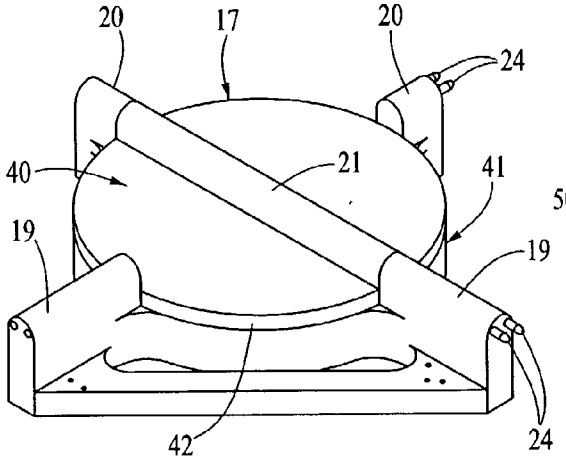


FIG. 5

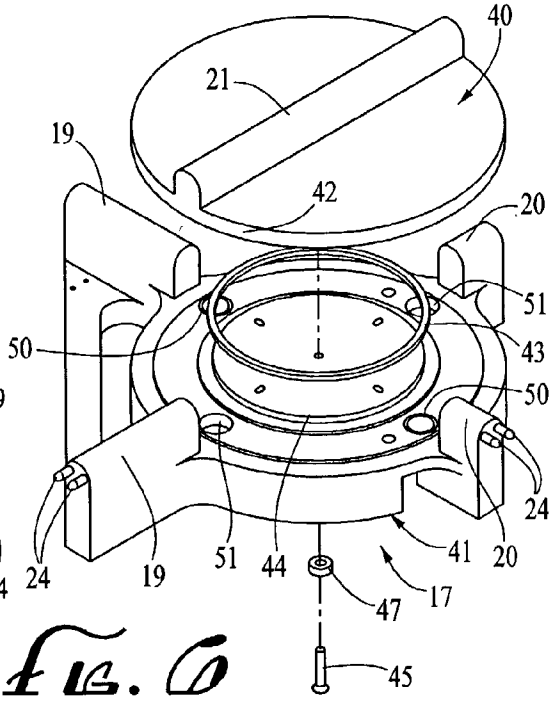
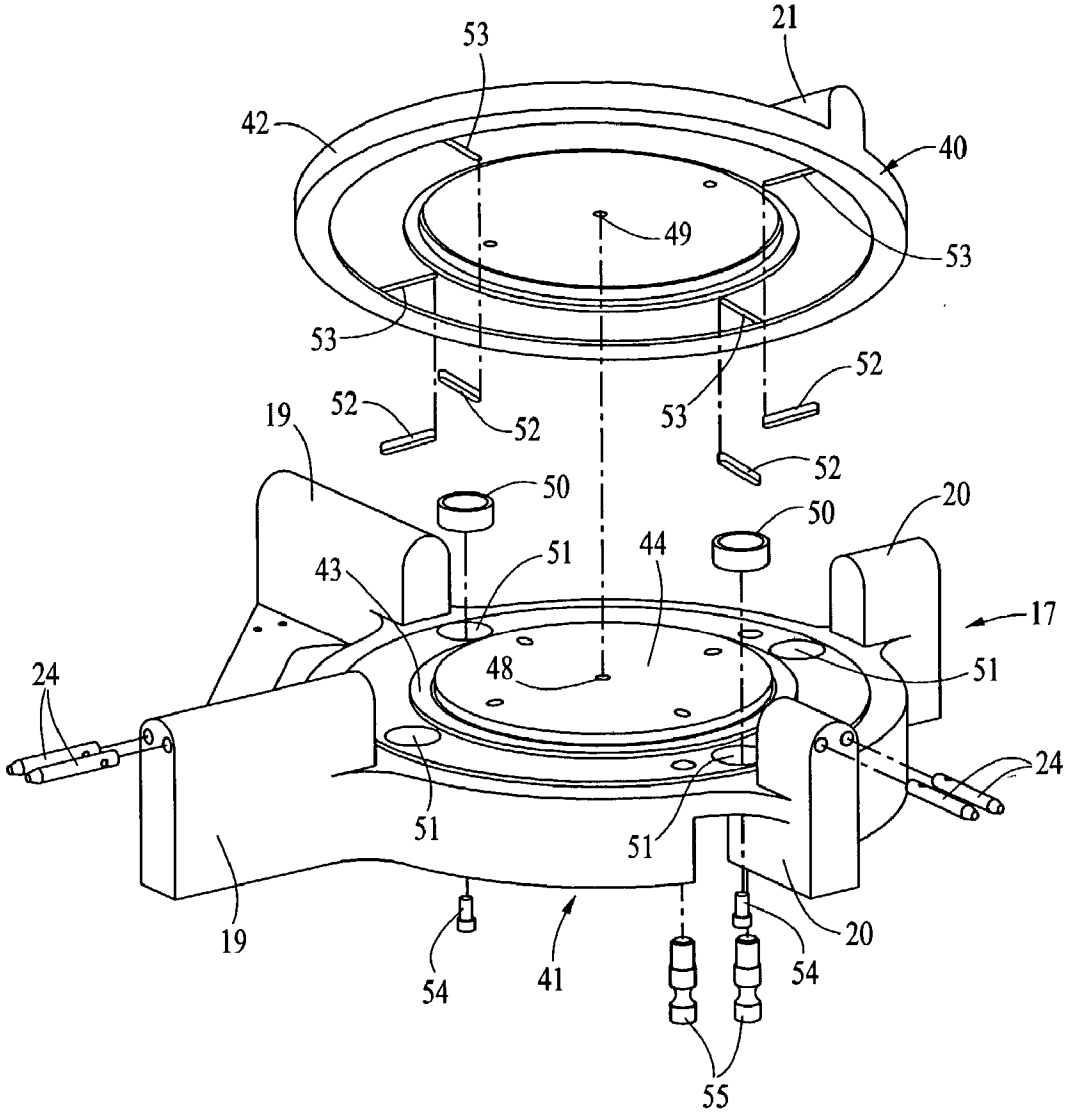


FIG. 6

FIG. 7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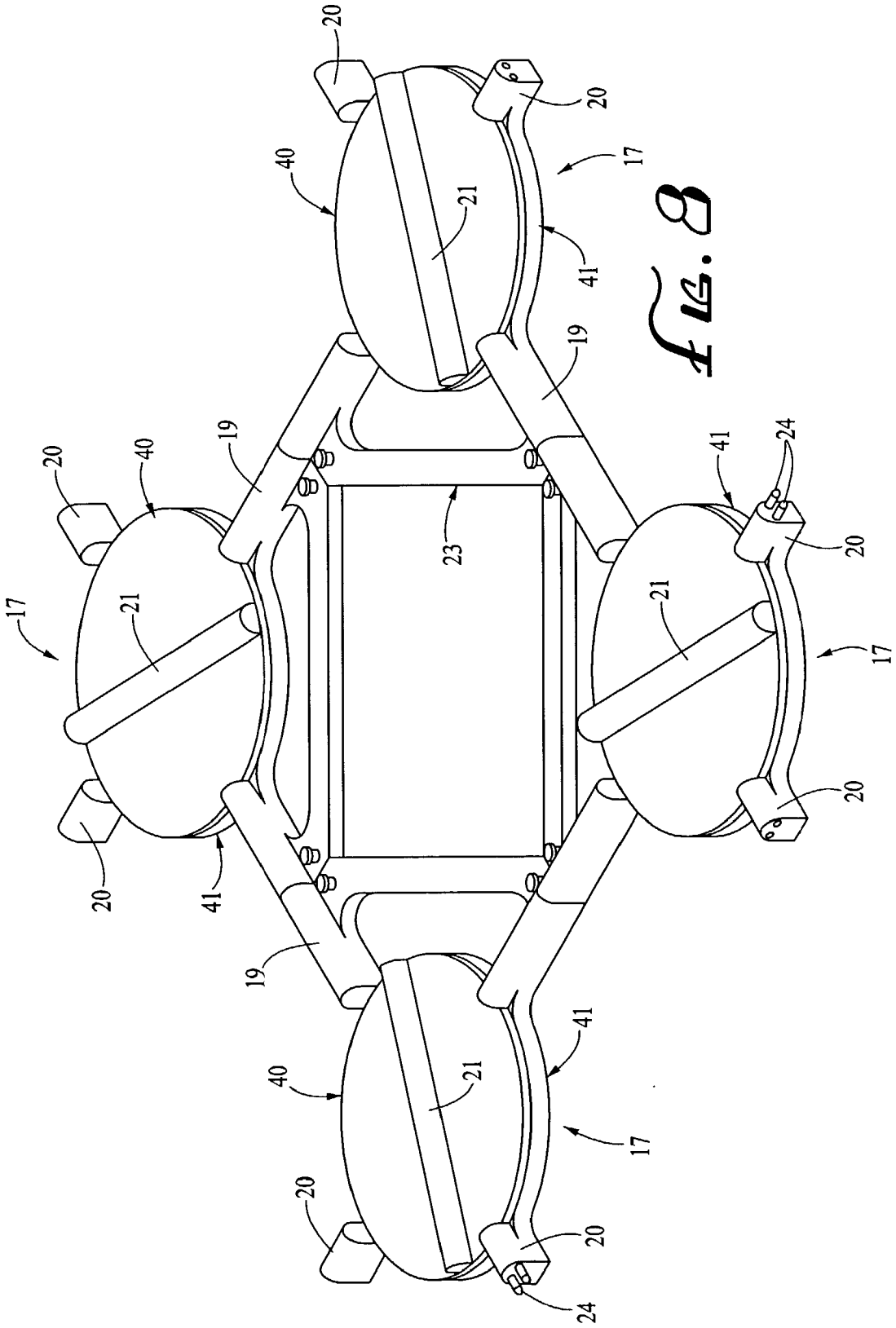

Fig. 8

SWITCHER TRACK AND SLED

REFERENCE TO RELATED APPLICATION

[0001] This application claims priority based upon copending U.S. provisional application Serial No. 60/335,661, filed Oct. 24, 2001, entitled "Switcher Track and Sled".

BACKGROUND OF THE INVENTION

[0002] This invention relates to a track apparatus for supporting and moving a wheeled dolly or sled and switching the dolly or sled from one set of parallel tracks to another set of intersecting tracks, and also relates to an improved dolly or sled for use on such a track apparatus, having wheels that are turnable from alignment with one set of tracks into alignment with the other set. The invention has particular reference to such a track apparatus and dolly or sled for use in connection with motion picture photography, or cinematography, wherein track-mounted motion-picture cameras are used to film scenes from different points along a track path or in motion along a track.

[0003] A prior track apparatus of this general type is shown in U.S. application Ser. No. 09/031,713 corresponding to application No. PCT/US00/04000, filed Feb. 16, 2000, and a switch unit for that apparatus also is shown in U.S. Patent No. Des. 401951. The present invention is an improvement over the track apparatus and dolly construction shown in the prior application, which used a conventional camera dolly with swivel wheels and track switches that were connected by linkages to transmit the motion of one switch unit in response to turning of one wheel by an operator or dolly grip to transmit the motion to the other three switch units and the wheels of the dolly that rested on those switch units.

SUMMARY OF THE INVENTION

[0004] The present invention resides in an improved track apparatus with simplified and more precisely positioned switch units that significantly enhance the smoothness and precision of the switching operation, and an improved sled or dolly that cooperates with the track apparatus to facilitate the switching operation and maintain the smooth and precise positioning of the camera on the track apparatus.

[0005] For these purposes, the dolly or sled (hereinafter sled) has a built-in steering system for all of its wheels, in the form of a chain-and-sprocket control that ties the wheels together for turning under the positive control of a single operator on the sled, preferably a T-bar operating handle, and has improved V-shaped wheel assemblies in the form of gangs of rollers arranged in two rows to form an elongated V-shaped groove in each wheel assembly for straddling the track and rolling very smoothly over the intersections to avoid excessive vibration that would interfere with the filming.

[0006] The improved switches have turntables and bases with precisely intermitting, circular bearing surfaces for smooth rotation and solid support for each wheel assembly, and have permanent magnet assemblies that are embedded in the turntables and the bases with the polarities arranged to force the turntables into properly aligned positions with respect to the tracks in the alternate switching positions. As the turntables are turned by the sled wheel assemblies under the control of the operator from one track to the other, the magnetic fields of the magnets force the turntables into precisely aligned positions and then hold the turntables magnetically in those positions until the operator overcomes the magnetic force and moves the turntables out of the aligned positions toward the alternate positions.

[0007] Other more detailed aspects and advantages of the invention will be apparent from the accompanying drawings and the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] **FIG. 1** is an exploded fragmentary perspective view of a switch assembly at an intersection of two tracks, and a sled for riding on those tracks and supporting a cinematographer (not shown);

[0009] **FIG. 2** is a somewhat enlarged fragmentary bottom perspective view of the sled of **FIG. 1**;

[0010] **FIG. 3** is a top plan view of the sled;

[0011] **FIG. 4** is a bottom plan view of the sled;

[0012] **FIG. 5** is a top perspective view of one of the switch units of the switch assembly of **FIG. 1**, with the turntable in a turned position;

[0013] **FIG. 6** is an exploded perspective view of the switch unit in **FIG. 5**, taken from the right hand side thereof;

[0014] **FIG. 7** is a further exploded perspective view of the switch unit in **FIG. 6**, showing the underside of the turntable and the positions of the magnets of the unit; and

[0015] **FIG. 8** is a top perspective view of the switch assembly of **FIG. 1** with the turntables shown in misaligned positions (spaced from the alternate positions controlled by the magnets) this being a condition that could exist as the wheel assemblies are in the process of turning from alignment with one track to the other.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENT

[0016] As shown in the drawings for purposes of illustration, the invention is embodied in a switch assembly, indicated generally by the reference number **10** in the drawings, for connecting two tracks **11** and **12** comprising parallel rails **13**, and a sled **14** having wheel assemblies **15** for riding on the tracks and being switched from one track to the other by the switch assembly. The illustrative sled has a generally rectangular frame forming a flat platform or body, and four wheel assemblies **15** beneath the four corners of the platform. The switch assembly has four switch units, each indicated generally by number **17**, positioned to lie under the four wheel assemblies **15** when the sled is positioned over the intersection of the two tracks.

[0017] As can be seen in **FIG. 1**, each of the tracks **11** and **12** is formed by two elongated rails **13** that are held in spaced, parallel relation by transverse braces **18**. The rails can be formed in sections (not shown) joined together in end-to-end relation to cover whatever range of motion is desired for a particular filming project, and can form "through" intersections as well as corner intersections of the kind shown in **FIG. 1**. Right-angle intersections are typical, but other angles can be accommodated by adapting the equipment to those angles.

[0018] The illustrative rails **13** have upper edges that are shaped for engagement with the wheel assemblies **15**, herein being rounded as best seen in FIGS. **5** to **7** on the stub abutment sections **19** and **20** shown on the switch units **17** in those views. These abutment sections engage, and merge smoothly with, the rails **13**, and also with switching sections **21** of the rails that are mounted on the switch units to extend between aligned pairs of the abutment sections **19** and **20** on the units, as will be described. A central brace unit **22** (**FIG. 1**) or **23** (**FIG. 8**) is provided to be secured to the four switch units **17**, with various combinations of stub units and extension sections (not shown) to hold the switch units in the desired pattern for engagement with the wheel assemblies **15** of the sled **14**. Pins **24** are provided to join the various rail sections together.

[0019] The illustrative sled **14** has a rigid platform and special wheel assemblies **15** that are designed to provide solid, firm and virtually vibration-free support for a camera or camera operator (not shown) supported on the sled for movement along one of the tracks **11** or **12**, as more fully illustrated in the aforesaid PCT patent application. As can be seen in **FIGS. 1 through 4**, the platform is constructed as a grid of lightweight longitudinal and transverse tubular beams **25** and **27** respectively, that are pinned or welded together in a very solid construction to provide a flat top for supporting the load to be carried along the track, and with a central extension **28** mounted on one end, the right hand end in **FIG. 1**, between the protruding ends of two longitudinal beams **25**. This provides an out-of-the-way support for the operator, herein a T-bar operating handle **29** that extends upwardly from a driving sprocket assembly **30** that is rotatably mounted in the platform extension **28**.

[0020] At each corner of the platform, a driven sprocket assembly **31** is mounted between the laterally protruding ends of two transverse beams **27** with the central axle of the sprocket assembly vertical, that is, parallel to the axis of the T-bar handle **29**, and extending downwardly beneath the platform to support one of the wheel assemblies **15**. The wheel assembly is carried on the lower end of the sprocket axle and thus is rotatable with the axle relative to the platform.

[0021] Connecting the T-bar driving sprocket **30** to the driven wheel-assembly sprockets **31** is an endless flexible chain **32**, which also could be a cog belt or other flexible driver. As shown most clearly in **FIG. 3**, this chain is trained around the driver sprocket **30**, two idler sprockets **33** journaled on the frame under the closest transverse beam **27**, then around the outer side of each of the adjacent driven sprockets **31**. From these sprockets, long runs **32***a* of the chain extend to the two driven sprockets **31** at the opposite end of the platform and around the outer sides of these sprockets to two tensioning sprockets **34** and **35** that are adjustably mounted to take up slack in the chain and maintain a preselected amount of tension. One or both of these tensioning sprockets may be spring-loaded in a conventional manner to apply the preselected tension to the chain. All of the sprockets are bearing-mounted to provide for smooth, low-friction operation in response to turning of the operating handle **29**, and guard tubes or inverted channel-shaped covers **37** (**FIG. 1**) may be provided for the runs of the chain that pass through openings in the platforms, for safety purposes.

[0022] The wheel assemblies **15** that are carried by the sprocket axles at the corners of the platform are positioned in a rectangular pattern that corresponds to the track width to dispose the pivotal axes of the wheel assemblies in alignment with the rails **13** of both tracks **11** and **12** when the sled **14** is positioned on the switch assembly **10** for switching. When the two tracks are of equal width, as preferred, the wheel-assembly pattern is a square with equal spacing of the wheel axes both longitudinally and laterally. Of course, provision can be made for switching on tracks of different widths, in which case the wheel axis pattern would be a rectangle other than a square.

[0023] As shown most clearly in **FIG. 2**, the wheel assemblies **15** comprise a plurality of bearing-supported roller wheels **38**, herein four, in each of two rows of such wheels, rotatably mounted on individual axles that are supported on carriers **39** (**FIG. 2**) of V-shaped cross-sectional shape forming the bodies of the wheels. These carriers herein are lengths of angle iron with two sides disposed at ninety degrees, and the wheel axles are perpendicular to the sides of the angle iron so that the wheels **38** of the two rows define a V-shaped groove for straddling one of the rails **13**. Blocks with beveled edges also can be used as carriers, with the same effect. The wheels ride along opposite sides of the curved upper end of the rail, engaging a substantial length of the rail to provide solid support and to minimize vibrations created by any irregularity in the track. The angle-iron wheel carriers **39** thus are turnable about the axes of the corner sprocket axles for switching of the sled from one track to the other by the switch assembly **10**.

[0024] In **FIG. 1**, the wheel assemblies **15** and the switching sections **21** of the switch units **17** are shown in alignment with the track **11** extending to the right from the switch assembly **10**. When the sled **14** is resting on the switch assembly in this condition, it can be rolled to the right onto the track **11**, and used as desired for filming along that track, or the wheel assemblies **15** can be turned by the operator **29** into alignment with the intersecting track **12**, which extends upwardly and slightly to the left as viewed in **FIG. 1**. The turntables **40** of the switch units **17** are rotatable to permit the wheel assemblies to be turned into this new position, as will be described in more detail. When so turned, the wheel assemblies **15** will roll onto the track **12** and along the path defined by that track. This transition will be made smoothly, with little or no vibration, because of the precise alignment of the various track sections and the special construction of the wheel assemblies **15** and the sled **14**.

[0025] For such precise alignment, the improved switch units **17** of the present invention generally comprise the turntables **40**, which are circular in shape with the track sections **21** extending diametrically across their upper sides, and circular bases **41** having flat undersides for resting on a supporting surface, with the track stubs **19** and **20** extending radially outwardly at ninety-degree angles for connection to rails **13** of the intersecting tracks **11** and **12**. The stub sections are of the same size and cross-sectional shape as the rails **13**, to fit flushly against the ends of the rails and be connected thereto by the pins **24**.

[0026] Each of the bases **41** is recessed below the top edges of the stub sections **19** and **20** to receive the circular turntable **40** between the stub sections with the upper edge of the switching track section **21** level with upper edges of the stub sections. The turntable has a flat circular edge **42** that fits closely between the inner ends of the stub sections, and a generally flat underside that is centrally recessed and contoured as shown in **FIG. 7** to fit over a bearing ring **43** and a raised cylindrical centerpiece **44** on the base, so that the flat underside of the turntable will turn freely and

smoothly on the base. A screw **45** extends upwardly through a bearing **47** (**FIG. 6**) and a center hole **48** in the base and is threaded into a center hole **49** (**FIG. 7**) in the underside of the turntable **40** to secure the turntable rotatably to the base.

[**0027**] For magnetic alignment of each turntable **40** in its alternate switching positions, permanent ring magnets **50** (**FIGS. 6 and 7**) are set into circular recesses **51** in the base **41**, beneath the turntable **40**, to interact with elongated magnet keys **52** (**FIG. 7**) that are set into slots **53** in the underside of the turntable. These magnet elements **50** and **52** are oriented and positioned to cause the turntable to be forced magnetically into each of the alternate switching positions shown in **FIGS. 1 and 5**, the magnet elements being operable to take over the positioning function as the switching rail section **21** comes close to the selected switching position, so that, upon release of the T-bar operator **29**, the precisely aligned positions will be achieved. It will be seen in **FIGS. 6 and 7** that four magnet recesses **51** are formed in the base **41**, providing alternate positions for the ring magnets **50**. Screws **54** are provided for securing the ring magnets in their recesses, and turnbuckles **55** are set in holes **57** in the base **41** for secure positioning of the switching components. All bearings and bearing surfaces of the base and the turntable are precisely machined and closely fitted for smooth movement and precise alignment of the turntables **40**.

[**0028**] From the foregoing, it will be seen that the present invention provides an improved switcher track **10** and sled **14** for the purposes that have been described, and other similar purposes requiring smooth and easy switching from one track to another. It also will be evident that one embodiment of the present invention has been illustrated and described, and various changes and modifications may be made by those skilled in the art within the scope of the present invention.

We claim as our invention:

1. A switcher track assembly for use with two intersecting tracks having parallel rails and a sled having four wheel assemblies for riding on the tracks, comprising:

four switch units positionable at the intersections of said rails to lie under the wheel assemblies of the sled that is positioned over said intersections;

each of said switch units having a rotary turntable with a switching rail section movable between alternate positions aligned with the respective tracks;

and magnet elements in said switch units oriented and positioned to move the switching rail sections into alignment with the respective tracks when the turntables are close to such alignment, and to maintain the switching rail sections releasably in precise alignment with the tracks.

2. A switcher track assembly as defined in claim 1 wherein each of said switch units comprises a generally circular base having four stub rail sections spaced ninety degrees apart and extending radially outwardly for connection to said parallel rails of the intersecting tracks, and said turntables are circular and disposed over said bases with said switching rail sections alignable alternately with different switching rail sections.

3. A switcher track assembly as defined in claim 2 wherein said magnet elements comprise at least one first permanent magnet mounted on each of said bases beneath the turntable thereof and at least one second magnet element mounted in the turntable above the base.

4. A switcher track assembly as defined in claim 3 wherein two of said first permanent magnets are recessed in recesses in said base, and a plurality of said second magnet elements are recessed in said turntable.

5. A switcher track assembly as defined in claim 1 further including a sled having four wheel assemblies for riding on the tracks and being positioned on said switcher units to be switched from one of the tracks to another, each of said wheel assemblies comprising a plurality of roller wheels disposed in two rows of wheels rotatably mounted on a carrier on said sled, said carrier being rotatably supported on the sled for turning of the wheel assembly into alignment alternately with the rails of the two tracks.

6. A switcher track assembly as defined in claim 5 wherein each wheel assembly comprises two rows of four wheels each, mounted on said carrier for rotation about axes that are angularly spaced so that the two rows of wheels define an elongated V-shaped groove for engagement with the rails.

7. A switcher track assembly as defined in claim 6 wherein said axes are spaced about ninety degrees apart.

8. A switcher track assembly as defined in claim 5 further including a chain-and-sprocket positioning mechanism for the wheel assemblies comprising a driver sprocket and four driven sprockets at the corners of said sled, an operator on the sled for turning the driver sprocket, and an endless chain connecting the sprockets for movement in unison, the driven sprockets having shafts supporting the wheel assemblies on the sled.

9. A sled for use with a switcher track assembly having switch units at the intersections of the rails of two intersecting tracks, said sled comprising:

a rectangular body forming a platform for carrying a load along the tracks; and

four wheel assemblies beneath the platform for riding on the tracks and to be positioned on the switch units at the intersections to be switched from one of the tracks to another;

each of said wheel assemblies comprising a plurality of roller wheels rotatably mounted on a carrier on said sled, said carrier being rotatably supported on the sled for turning of the wheel assembly into alignment alternately with the rails of the two tracks.

10. A sled as defined in claim 9 wherein each wheel assembly comprises two rows of four wheels each, mounted on said carrier for rotation about axes that are angularly spaced so that the two rows of wheels define an elongated V-shaped groove for engagement with the rails.

11. A sled as defined in claim 10 wherein said axes are spaced about ninety degrees apart.

12. A sled as defined in claim 9 further including a chain-and-sprocket positioning mechanism for the wheel assemblies comprising a driver sprocket and four driven sprockets at the corners of said sled, an operator on the sled for turning the driver sprocket, and an endless chain connecting the sprockets for movement in unison, the driven sprockets having shafts supporting the wheel assemblies on the sled.

* * * * *