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71 Applicant: **Kusan, Inc.**
Seven Maryland Farms
Brentwood Tenn. 37037(US)

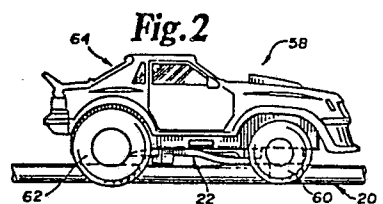
72 Inventor: **Kubiatowicz, James F.**
1630 N.E. Rice Creek Road
Fridley, Minn. 55432(US)

72 Inventor: **Jezierski, Dennis R.**
12-98th Lane N.W.
Coon Rapids, Minn. 55433(US)

74 Representative: **Strehl, Schübel-Hopf, Groening, Schulz**
Widenmayerstrasse 17 Postfach 22 03 45
D-8000 München 22(DE)

64 **Toy vehicle guidance system.**

57 A toy vehicle guidance system is disclosed that is especially designed to confine a toy vehicle (58) to a predetermined path of travel, while minimizing the repetitiousness of operation characteristics of previous toy vehicle track systems. The guidance system hereof comprises segments (20) of flexible tubing, links for interconnecting the tubing segments (20) into a vehicle track, a tube capturing guidance element (22) connectable to a self-powered toy vehicle (58), and a variety of mechanisms for randomly and selectively altering the path of travel of the toy vehicle along the track.



TOY VEHICLE GUIDANCE SYSTEM

Technical Field

This invention pertains to toy vehicles. In particular, it pertains to a mechanism for guiding a self-powered toy vehicle along a predetermined path of travel.

Background Art

5 Self-powered toy vehicles are well-known. Such toys are typically powered by a small electric motor, a fly wheel, or a coiled spring. Self-powered toy vehicles may be allowed to run along a random path of travel, or may be contained to predetermined path of travel by a track
10 or the like. The play value of free running self-powered toy vehicles is often reduced when the toy vehicle must be operated within a confined area. On the other hand, the play value of self-propelled toy vehicles confined to a fixed track is reduced by the repetitious nature of
15 their operation.

Summary of the Invention

The toy vehicle guidance system disclosed herein is especially designed to confine a self-powered toy vehicle to a predetermined path of travel, while minimizing repetitiousness of operation characteristic of previous toy
20 vehicle track systems. The guidance system hereof broadly includes segments of flexible tubing, connecting links for interconnecting the flexible tube segments into a toy vehicle track, a tube capturing guidance element carried by the self-powered toy vehicle, and a variety of mechanisms
25 for randomly and selectively altering the path of travel of the toy vehicle along the track.

Brief Description of the Drawings

Fig. 1 is a perspective, exploded view of the underside of a toy vehicle and the guidance element;

Fig. 2 is a right side elevational view of the toy vehicle thereto set upon a length of track tubing with
5 the guidance element in place;

Fig. 3 is an enlarged, vertical, cross sectional view of a track tube segment;

Fig. 4 is a plan view of a track tube segment connector link;

10 Fig. 5 is a plan view of a track intersection connector;

Fig. 6 is a sectional view taken along the line 6-6 of Fig. 5;

15 Fig. 7 is a sectional view taken along line 7-7 of Fig. 6;

Fig. 8 is a perspective, exploded view of a lap counter track connector;

Fig. 9 is a perspective view of a track switching connector;

20 Fig. 10 is a bottom, fragmentary view of the track switching connector depicted in Fig. 9;

Fig. 11 is a sectional view taken along line 11-11 of Fig. 10;

25 Fig. 12 is a sectional view taken along line 12-12 of Fig. 10;

Fig. 13 is a perspective view of a three into one track connector;

Fig. 14 is a perspective view of an over-pass/underpass track connector;

Fig. 15 is a perspective view of an obstacle course track connector;

Fig. 16 is a sectional view taken along 16-16 of Fig. 15;

5 Fig. 17 is a sectional view taken along line 17-17 of Fig. 16; and

Fig. 18 is a sectional view of a track tube segment connector link interconnecting two tube segments.

Detailed Description of the Drawings

10 Referring to the drawings, the toy vehicle guidance system in accordance with the present invention broadly includes connectable, tubular track segments 20, track tube receiving vehicle guidance element 22, and tube segment connecting links 24. The toy vehicle guidance system also
15 includes a variety of track connectors, including track intersection connector 26, lap counter track connector 28, track switching connector 30, three into one junction track connector 32, underpass/overpass track connector 34, and obstacle course track connector 36.

20 Track segments 20 are preferably comprised of tubular, flexible, synthetic resin. Referring to Fig. 3, the track segments 20 include internal and external cylindrical sidewalls 38, 40. The diameter of the internal tube sidewall is generally uniform along its length, as
25 is the tube external sidewall diameter.

Track tube segment connecting links 24 are comprised of integrally molded synthetic resin. Each connecting link 24 includes a central, cylindrical, main body portion 42. The diameter of the body portion 42 is equal

to the diameter of the tube segment external sidewalls.

Insertion pins 44 extend longitudinally from each end of the main body portion 42. Each insertion pin 44 includes cylindrical portion 46 connected to the link main body

5 portion 42 by frusto-conical portion 48. The diameter of the pin cylindrical portion 46 is equal to the diameter of the tube segment internal sidewall. Each end of the connecting link 24 terminates in a bifurcated tip 50.

Each tip 50 is made of tube prongs 52, each prong comprising
10 a semi-sphere 54 integrally supported on a semi-cylindrical post 56. The diameter of the tip 50, as measured between the arcuate surfaces of the prong semi-spheres 54, is slightly larger than the internal tube segment sidewall diameter.

15 Referring to Fig. 1, the toy vehicle 58 includes front and rear ground engaging wheels 60, 62 that support toy vehicle chassis 64. Rear wheels 62 are supported by rear axle 66. An electrical motor (not shown) is drivingly coupled to the rear axle 66 for propelling the toy vehicle
20 58 along a path of travel. Front ground engaging wheels 60 are separately supported by wheel posts 68, and are interconnected by steering mechanisms 70. Steering mechanism 70 includes shiftable cross bar 72, wheel pivot arms 74, 76 connected to individual front wheels 60, and steering
25 arm 78. Steering arm 78 is pivotally coupled to the front underside of chassis 64 at pivot pin 80, and receives cross bar pivot boss 82 within slot 84. Steering arm 78 is supported by a bracket 86 that depends downwardly from the chassis underside.

30 The guidance element 22 comprises bifurcated clip portion 88 receivable within and supported by bracket

86, forward support portion 90, and guidance flanges 92,
94 that define track capturing channel 96. Guidance element
clip portion 88 comprises spaced apart arms 98, 100 defining
a U-shaped prong. Each arm 98, 100 includes a raised boss
5 102 snapably receivable through the underside chassis bracket
86.

Forward support portion 90 of guidance element
22 includes support arm 104 extending in the opposite direction
of clip arms 98, 100, such the combination of the
10 clip arms 98, 100 and support arm 104 forms a Y-shaped
guidance element. As best seen in Fig. 6, support arm
104 is shifted downwardly from the plane defined by clip
arms 98, 100, such that the support arm 104 does not interfere
with the operation of steering mechanism cross bar
15 72. Braces 106, 108 extend from support arm 104 in contacting
relationship with the underside of chassis 64. Guidance
flanges 92, 94 extend downwardly from support arm 104.
The leading edges 106, 108 of guidance flanges 92, 94 are
separated further apart than the trailing edges 110, 112
20 are, thereby defining track capturing channel 96 as funnel,
or V-shaped. The internal edges 114, 116 defined by the
intersection of guidance flanges 92, 94 with support arm
104 are preferably arcuate.

Track intersection connector 26 comprises synthetic
25 ic resin plate 118 with integrally molded center boss 120,
and connecting link receptacles 122. The plate 118 comprises
center panel 124, and ramped margin panels 126,
128, 130, 132. As depicted in Fig. 5, receptacles 122
are oriented at 90° intervals about the center boss 120.

Referring to Figs. 6 and 7, receptacles 122 comprise raised, elongated projections on each of the margin panels 126, 128, 130, 132. Each receptacle 122 includes longitudinal, connecting link receiving channel 134 opening on the periphery of the plate 118, and radially, downwardly extending channel 136. The center boss 120 comprises a cylindrical projection with a semi-spherical top portion. Each of the receptacles 122 includes arcuate, inwardly facing end walls 130 aligned with the center boss 120.

Three into one junction track connector 32 comprises synthetic resin plate 131, outward bound link receptacle 133, and inward bound link receptacles 135, 137, 140. Plate 132 includes center panel 142, and inclined marginal panels 144, 146, 148, 150, 152, 154. Outward and inward bound receptacles 133, 135, 137, 140 are constructed similar to the receptacles 122 described above and depicted in Figs. 6 and 7, and similar structural features are delineated by similar numerals as those used to describe receptacles 122. Referring to Fig. 13, inward bound receptacles 135, 137, 140 are longitudinally aligned with and directed at the end wall 138 of outward bound receptacle 134.

Track switching connector 30 comprises plate 156, shifting mechanism 158, inward bound connecting link receptacle 160, and outward bound connecting link receptacles 162, 164, 166. Plate 156 includes center panel 168, inclined inward bound panel 168, and inclined, arcuate, outward bound panel 172. Each of the connecting link receptacles 160, 162, 164, 166 are similar in construction to the receptacles 122 described above and depicted in Figs.

6 and 7, and similar structural features are identified with like numbers. Outward bound receptacles 162, 162, 166 are longitudinally aligned with and directed at end wall 138 of inward bound receptacle 160.

5 The shifting mechanism 158 of track shifting connector 30 comprises rigid, pivotally shiftable track portion 174, and hand graspable shifting lever 176. The rigid track portion 174 is pivotally connected to plate 156 by pivot pin 178. Pivot pin 178 is located adjacent
10 end wall 138 of inward bound link receptacle 160. Referring to Fig. 10, shifting lever 176 is slideably retained along the bottom wall of center panel 168 by confining ridges 180, and attachment arms 182, 184. Lever 176 includes pivot slot 186. Pivot pin 188 is received through
15 slot 186, and is retained within pivotal track portion 174 at the track portion's approximate midpoint.

 Lap counter track connector 28 is depicted in Fig. 8. Lap counter 28 broadly includes base plate 190, dial 192, dial shifting mechanism 194, and top plate 196.
20 Shifting mechanism 194 includes generally C-shaped pawl 200, having an integrally molded, resilient, leaf spring 202, and pawl actuating gate 204. Pawl 200 is pivotally mounted to plate 190 at pivot post 206, and gate 204 is pivotally mounted to the base plate 190 at pivot post 208.
25 Leaf spring 202 abuts against spring retaining post 210. Top plate 196 is received by upwardly projecting attachment posts 211.

 Lap counter pawl 200 includes dial turning arm 212, dial stopping ratchet arm 214, and alignment arm 216
30 interconnecting the actuating and stopping arms. Gate

204 includes arcuate, pawl abutting surface 218, and toy
vehicle contacting lever arm 218. Dial 192 includes num-
bered surface 220, ratchet wheel 222, and hand graspable
knob 224. Lever arm stop 226 projects upwardly from the
5 plate 190.

Track defining rib 228 projects upwardly from
base plate 190, and extends between the inbound edge 230
and outward bound edge 232 of the plate 190. The leading
and trailing edges 234, 236 of the rib 228 comprise connect-
10 ing link receptacles having longitudinal and radial channels
similar to the channels 134, 136 described in conjunction
with receptacles 122 above and depicted in Figs. 6 and
7. The inbound and outbound edges 230, 232 of plate 190
comprise inclined panels.

15 The underpass/overpass track connector 34 includes
sidewalls 238, 240, inclined ramps 242, 244 leading upwardly
to overpass panel 246, and underpass panel 248 located
beneath overpass panel 244. Sidewalls 238, 240 extend
above the surfaces of the ramp and overpass panels, and
20 include arcuate leading edges 250. Track defining rib
252 projects upwardly from inclined ramps 242, 244 and
overpass panel 246, and underpass track defining rib 254
projects upwardly from the surface of the underpass panel
248. The underpass track rib 252 is oriented generally
25 perpendicular to the overpass track rib 254. The terminal
ends of the overpass and underpass ribs 252, 254 comprise
track connecting link receiving receptacles. The under-
pass/overpass connecting link receptacles include longitu-
dinal and radial channels similar to those described in
30 connection with receptacles 122, and depicted in Figs.
6 and 7.

Obstacle course tracks connector 36 broadly includes base plate 256, terrain simulating projections 258, track connection assemblies 260, 262, and slide assembly 264. Referring to Fig. 17, track connection assemblies 260, 262 comprise connecting link receiving receptacles having longitudinal and radial channels 134, 136, similar to the channels described in connection with the receptacles 122, and depicted in Figs. 6 and 7. The connection assemblies 260, 262 are located on inclined surfaces 266, 268, respectively. The track connection assemblies 260, 262 each include inwardly facing, track tube receiving prongs 270 having serrated surfaces. Access ports 272 are located within base plate 256 immediately below the prongs 270.

Slide assembly 264 includes track tube receiving terminal 274 and lever 276. The terminal 274 is received through slot 278 of base plate 256, and (referring to Fig. 16), is pivotally mounted to slide lever 276. The lever 276 is received within guide ridges 280 on the bottom surface of the plate 256, and by support flanges 282. The terminal 274 includes cylindrical midportion 284 having a diameter equal to the diameter of the external track sidewall 40. Opposed, serrated surface prongs 286 extend axially, outwardly from each end of the terminal midportion. The prongs 286 are integrally connected to the midportion 284 via frusto-conical portions 288. Pivot pin 290 is received within pin-receiving cavity 292 of the terminal midportion 284. Lengths of track tubing 20 extend between the terminal 274 and each connection assembly 260, 262.

In operation, vehicle guidance element 22 is snapably received within the bracket 86 of the underside of toy vehicle 58. Referring to Fig. 2, the toy vehicle 58 is positioned on track 20 with the front and rear ground engaging wheels 60, 62 straddling the tubular track 20. The track 20 is received within the track capturing channel 96 defined by the guidance flanges 92, 94 of guidance element 22. The front wheels 60 are preferably carried in noncontacting relationship with the ground when the track 20 is properly received within the track capturing channel 96. The rear wheels 62 are properly in engagement with the ground, for transmission of motive force from the vehicle's motor, through the rear wheels to the ground.

Referring to Fig. 18, two track segments 20 may be easily and quickly interconnected by a tube segment connecting link 24. In particular, insertion pins 44 of the link 24 are received within the track segments 20 in a frictional fit. The link prongs 52, and in particular the semi-spherical ends of the link prongs 52 tightly engage the internal track tube sidewall 38. As noted hereinabove, the diameter of the tip prongs 52, as measured between the external, curved surfaces of the prong semi-spherical ends 54, is slightly greater than the diameter of the internal track tube sidewall. Prong tip semi-cylindrical posts 56 are resilient, and exert an outwardly directed biasing force, through the prong ends 54, against the internal track tube sidewalls, thereby contributing to the tight fit of the connecting links 24 within the track segments 20.

Referring to Fig. 6, it will be appreciated that the resilient nature of the connecting link insertion pin

tips, and in particular the semi-cylindrical posts 56 and semi-spherical ends 54, contribute to the tight fit of the connecting links within receptacles 122 on the track intersection connector 26, receptacles 133, 135, 137, 140 5 on the three into one junction connector 32, and on all similar receptacles on the various track connector mechanisms described hereinabove.

The toy vehicle 58 is guided onto the track intersection connection 26 by the track segments 20 connected 10 to the receptacles 122. The center boss 120 of the track intersection connector 26 is positioned to be captured within the track capturing channel 96 of the vehicle guidance element 22 as the toy vehicle 58 transits across the plate 118 of the intersection connector 26. In this manner, 15 the toy vehicle 58 is guided between opposed receptacles 122 on the intersection connector 26, without the presence of interfering structure on the plate 118, to inhibit vehicle movement in the cross direction over the intersection connector 26.

20 The toy vehicle 58 is guided onto three into one junction connector 32 by track segments 20 connected to any of the inward bound receptacles 135, 137, 140. The path of travel of the vehicle 58 is as indicated by the arrows in Fig. 13. Each of the inbound receptacles 25 135, 137, 140 are directed towards the outward bound receptacle 133. The toy vehicle 58, therefore, transits across three into one junction connector plate 131, and is captured by the outward bound receptacle 131. As will be appreciated, more than one toy vehicle 58 may approach the three 30 into one junction connector 32 at the same time, resulting

in a collision of the toy vehicles 58 and derailment of one or both cars.

The toy vehicle 58 is guided onto the track switching connector 30 by the track segment 20 connected to inward bound receptacle 60. The path of travel of the toy vehicle 58 is as indicated by the arrows in Fig. 9. The pivotal track portion 174 can be shifted by lever 176 so as to align the inward bound receptacle 160 with any of the three outward bound receptacles 162, 164, 166. The toy vehicle 58 can therefore be selectively directed to any one of three distinct track routes by the connector 30.

Toy vehicle 58 is guided through the lap counter track connector 28, along track rib 228, in the direction of travel indicated by the arrow in Fig. 8. Gate 204 pivots about the post 208 as the vehicle contacts lever 218. The gate pawl-abutting surface 218 contacts the aligning arm 216 of C-shaped pawl 200, as the gate is pivoted about the post 208. The C-shaped pawl 200, in turn, pivots about pivot post 206, urging the pawl actuating arm 212 into contact with the ratchet wheel 222 of pawl 192. At the same time, pawl stopping arm 214 is shifted to a ratchet wheel clearing position, allowing the ratchet wheel 222 and, attached numbered surface 220, to rotate by one step. Leaf spring 202 urges the C-shaped pawl back to its rest position, after the toy vehicle 58 has passed through the gate 204, shifting the C-shaped pawl 200 back to its rest position. Shifting of the pawl 200 to its rest position in turn urges gate 204 to return to its rest position, with gate lever arm 218 abutting arm stop 226.

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Toy vehicle 58 is guided over the inclined ramps 242, 244 and overpass panel 246 of underpass/overpass track connector 34 by track defining rib 252. The toy vehicle 58 is guided along the underpass panel 248 of the underpass/overpass track connector 34 by track defining rib 254.

The toy vehicle 58 is guided through the obstacle course track connector 36 by the track tube segments 20 interconnecting the shiftable terminal 274 and the track connection assemblies 260, 262. Referring to Fig. 16, the path of travel of the toy vehicle 58 through the obstacle course can be altered by shifting slide assembly 264, and thereby repositioning the tube segments 20 on the plate 256. In particular, marker cones 294 may be randomly placed on the obstacle course base plate 256, and the track segments 20 of the obstacle course can be manipulated by the slide assembly 264 such that the toy vehicle 58 is navigated between the marker cones 294.

The unique and simple construction of the tubular track segments 20 and tube segment connecting links 24 allows a child to quickly and easily layout and change toy vehicle track configurations. Moreover, the flexible nature of the tubular segments allows for random shifting of the track as the toy vehicle 58 proceeds along the track. The various track connectors described herein allow for the selective or random shifting of the toy vehicle's path of travel. The toy vehicle guidance system herein disclosed confines a self-powered toy vehicle to a predetermined path of travel, while minimizing the repetitious nature of operation that is characteristic of previous toy vehicle track systems.

CLAIM:

1. A guidance system for a toy vehicle comprising:
a plurality of flexible, tubular segments (20);
means (24) for connecting said segments (20) into a
continuous track for said toy vehicle (58); and
5 means (22) operably coupled to said vehicle (58)
and adapted for operably capturing said tubular segments
(20) for guiding said vehicle (58) along a path of travel
defined by said track.

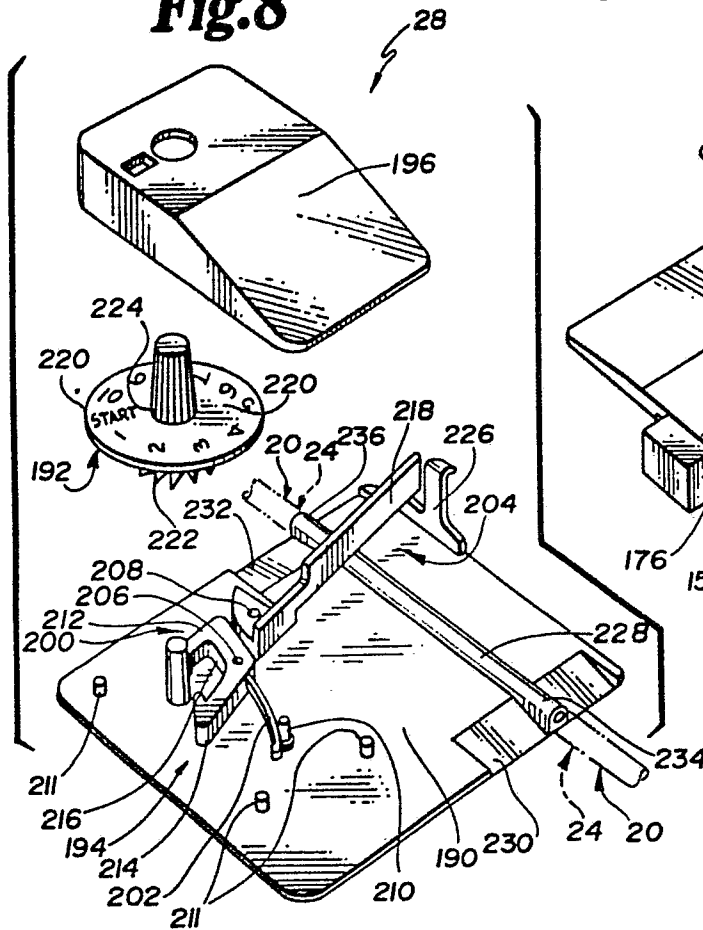
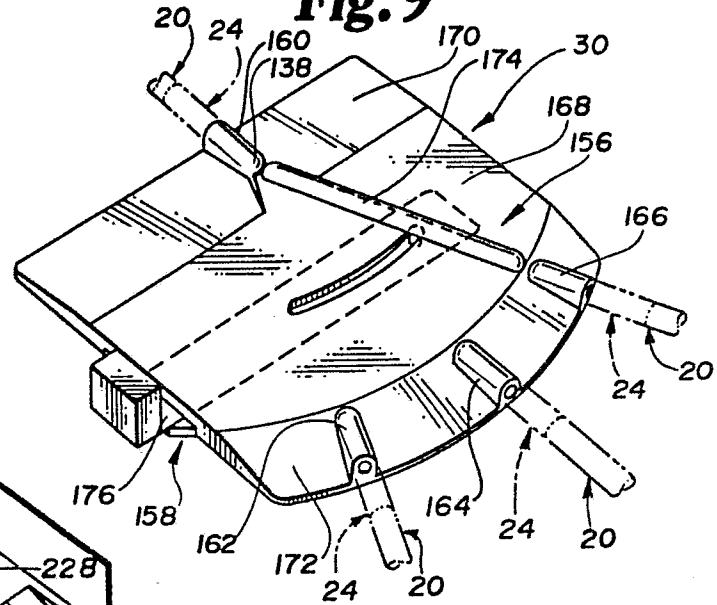
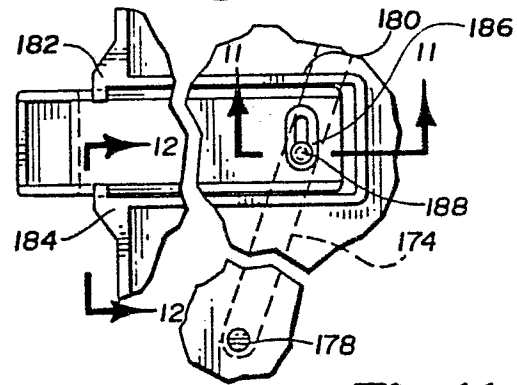
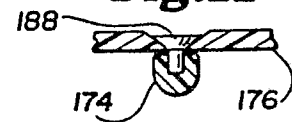
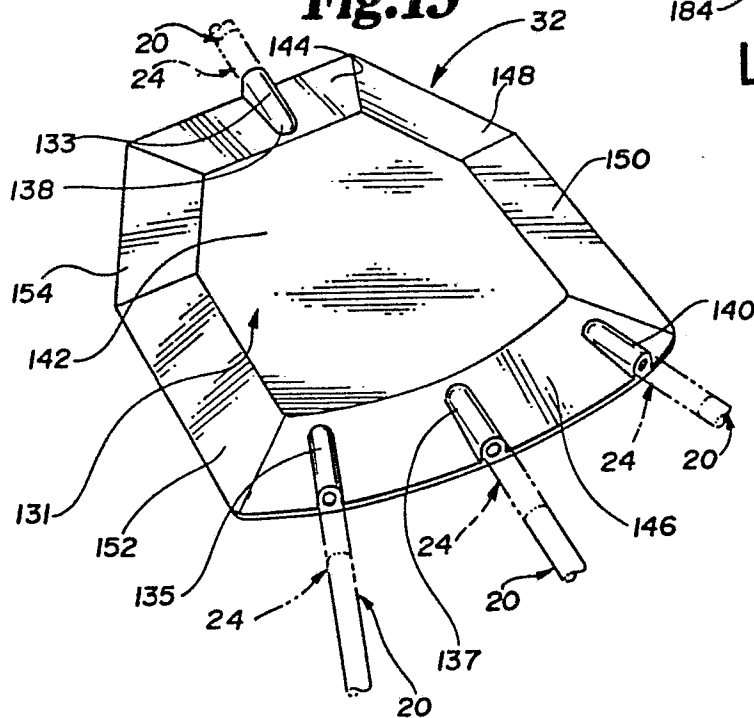
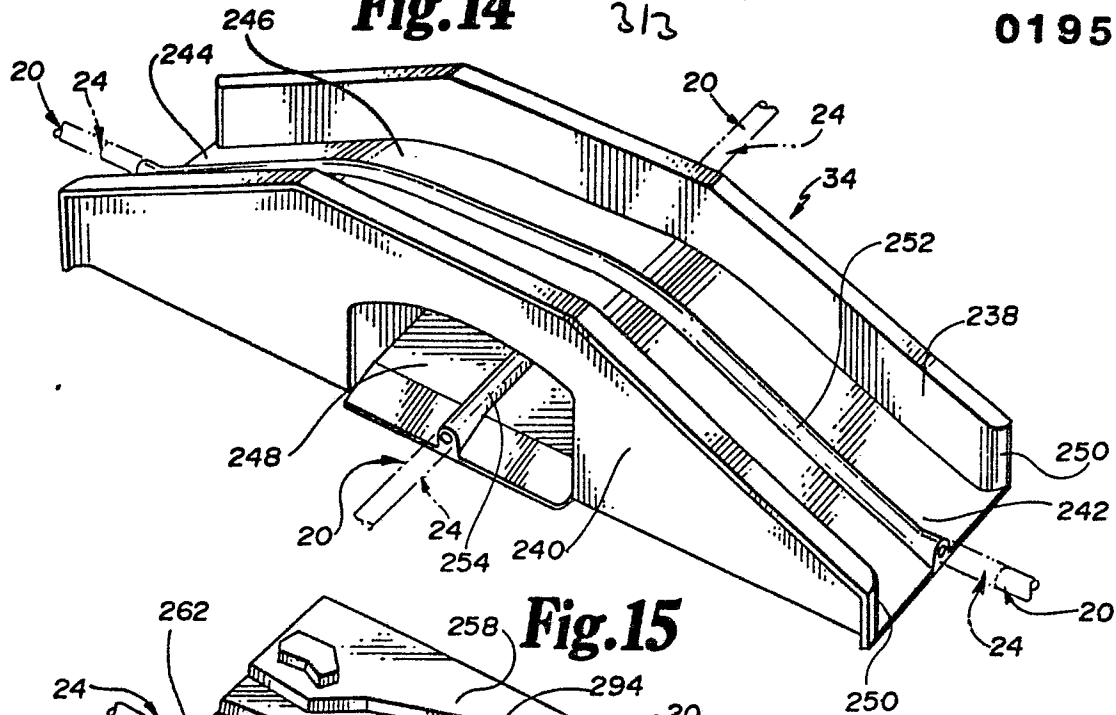
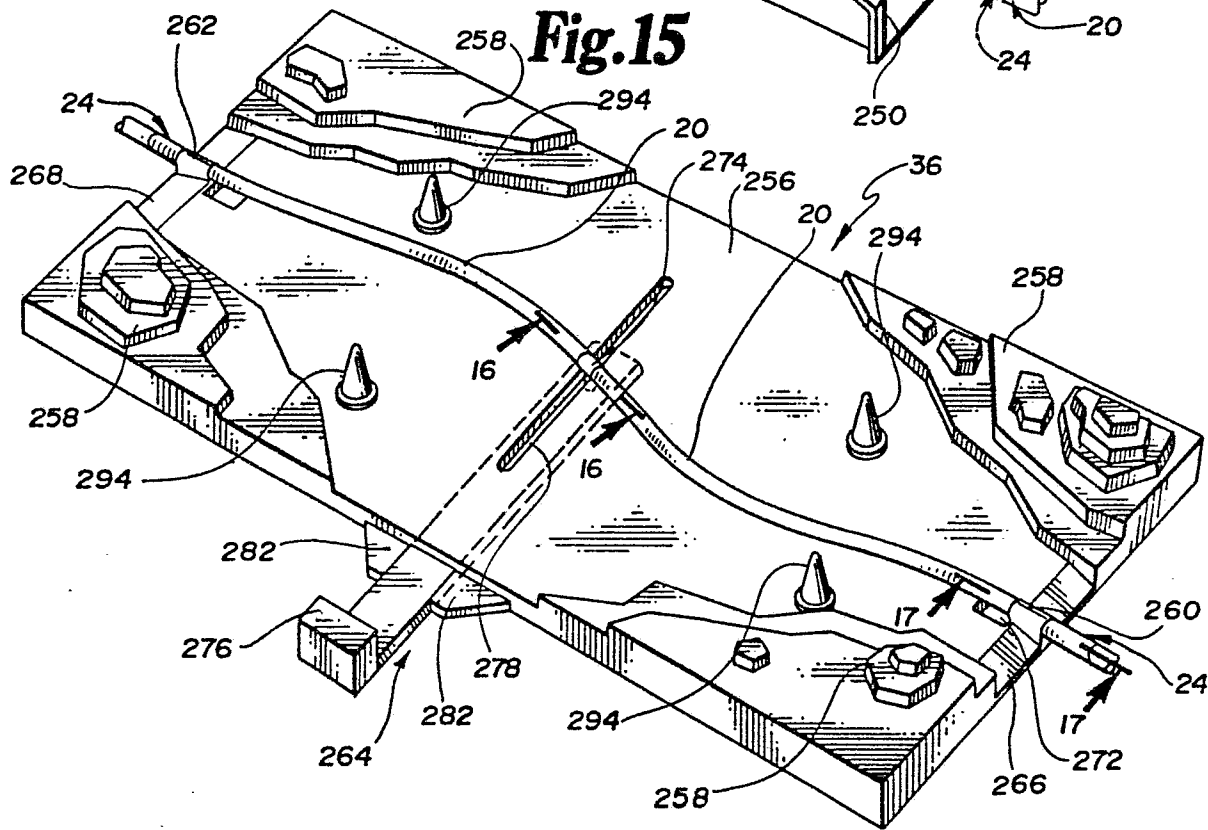
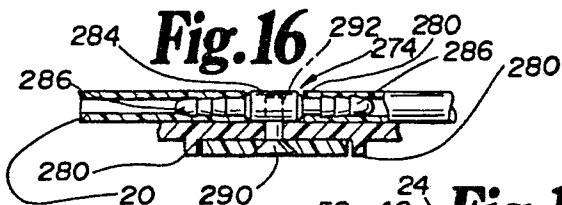
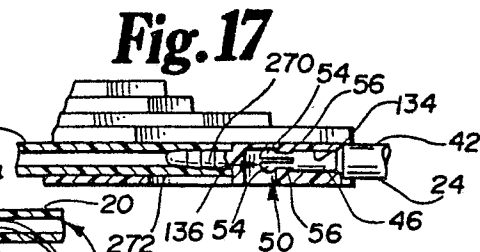
Fig. 8**Fig. 9****Fig. 10****Fig. 11****Fig. 12****Fig. 13**

Fig. 14

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Fig. 15**Fig. 16****Fig. 17****Fig. 18**