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(54) **DUAL CABLE ZIPLINE HAVING MECHANICAL ASCENSION AND BRAKING SYSTEMS**

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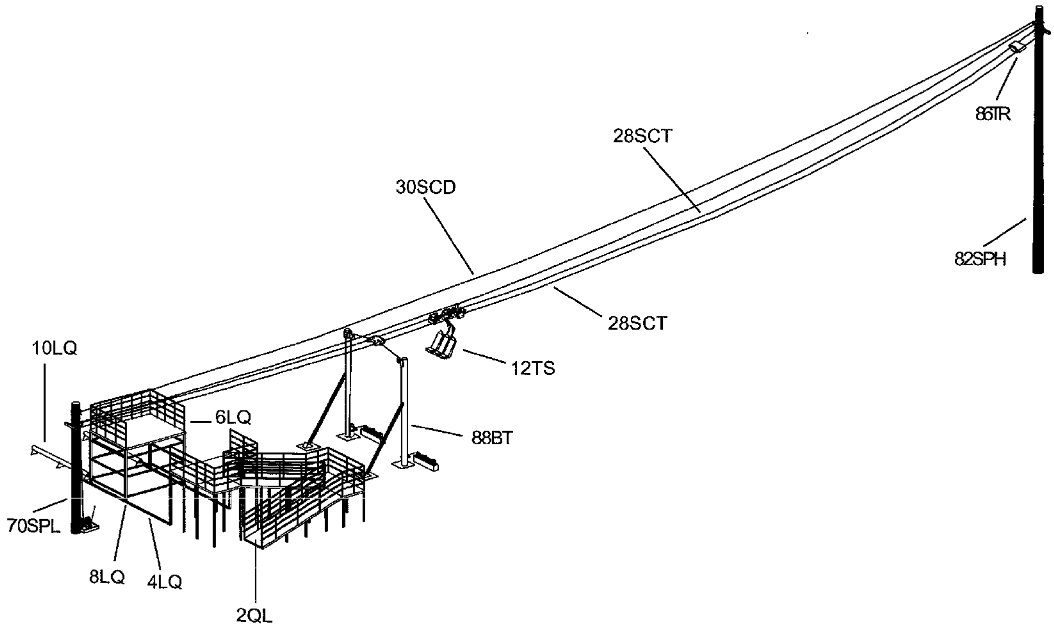
(57) **ABSTRACT**

This invention is a high speed dual cable zip line ride whereby the participant(s) ascends by a mechanical motor drive system and descend using a combination of mechanical and gravitational forces. The participant(s) will be secured in either a harnessed or a seated tram configuration. The control of the deceleration and stopping of the ride will be performed by one of four mechanical configurations depending on the dimension of the ride (i.e. Length and height of the ride). These configurations will be an air shock system, a nitrogen shock system, a hydraulic disc braking system, or a magnetic disc braking system. In all embodiments of the ride appropriate platforms and procedures for safely embarking and disembarking will be utilized.



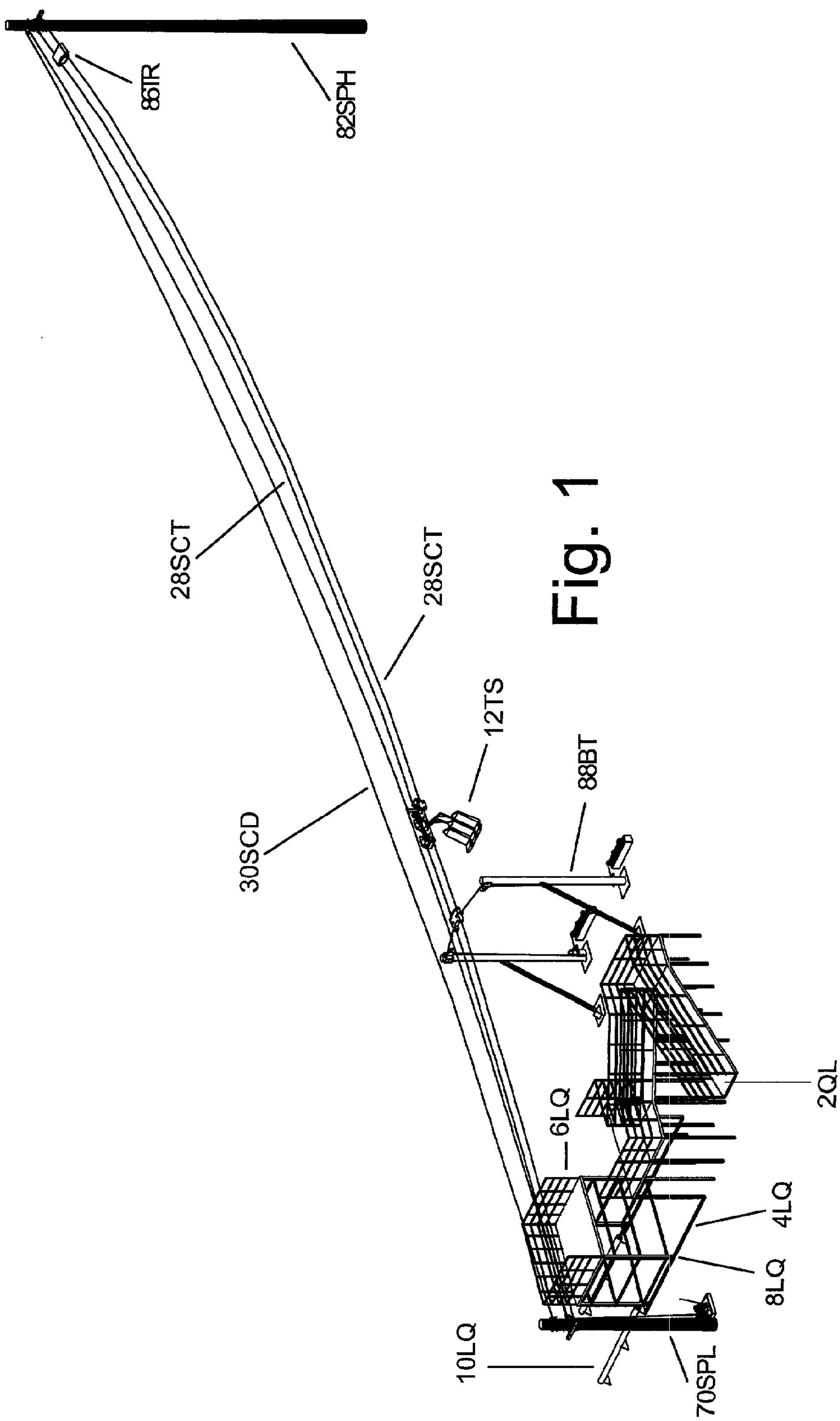
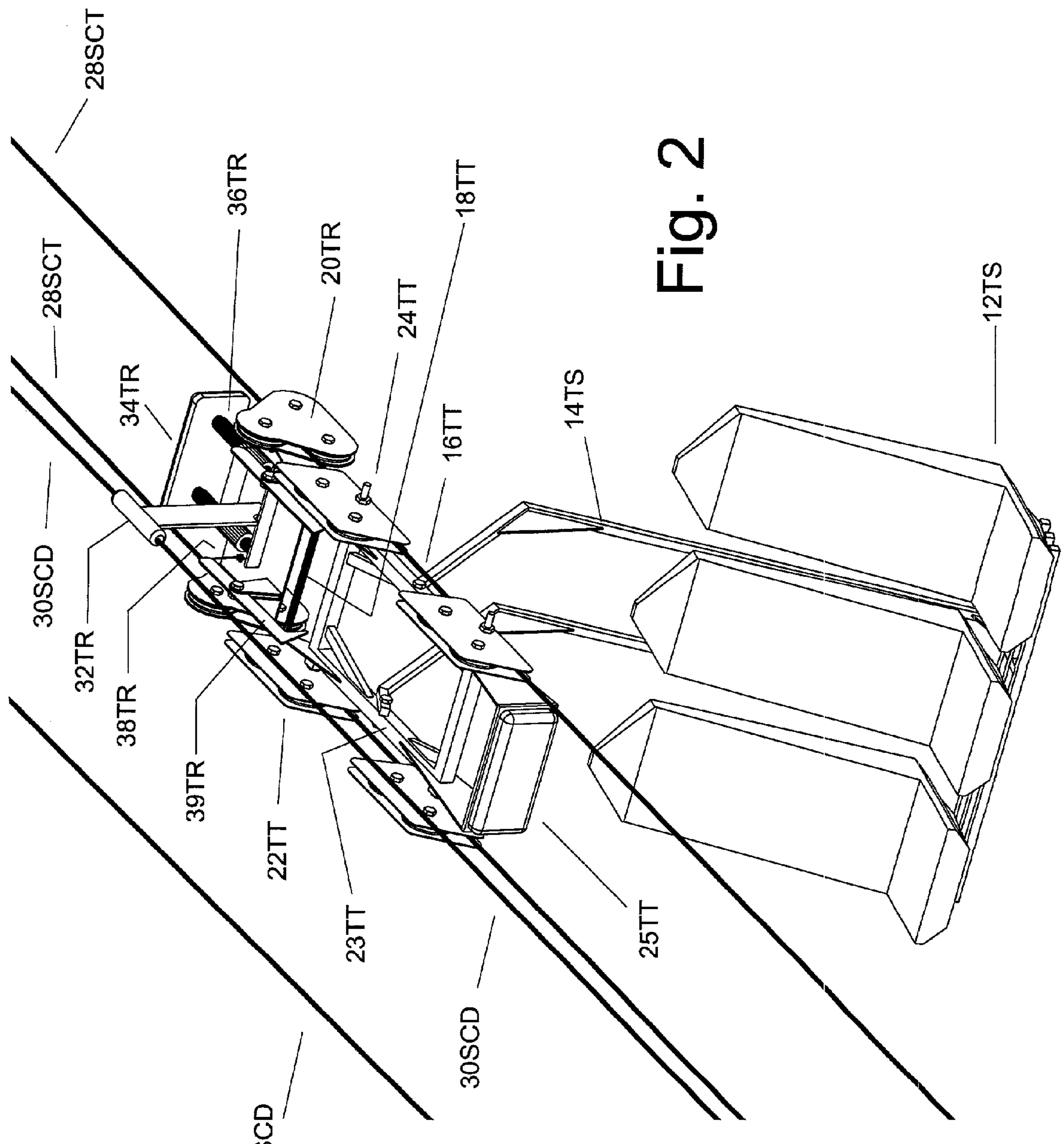

86TR
82SPH
28SCT
28SCT
12TS
30SCD
88BT
2QL
6LQ
4LQ
8LQ
10LQ
70SPL

Fig. 1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28SCT
36TR
20TR
18TT
24TT
34TR
16TT
14TS
12TS
30SCD
32TR
38TR
39TR
22TT
23TT
25TT
30SCD
30SCD

Fig. 2

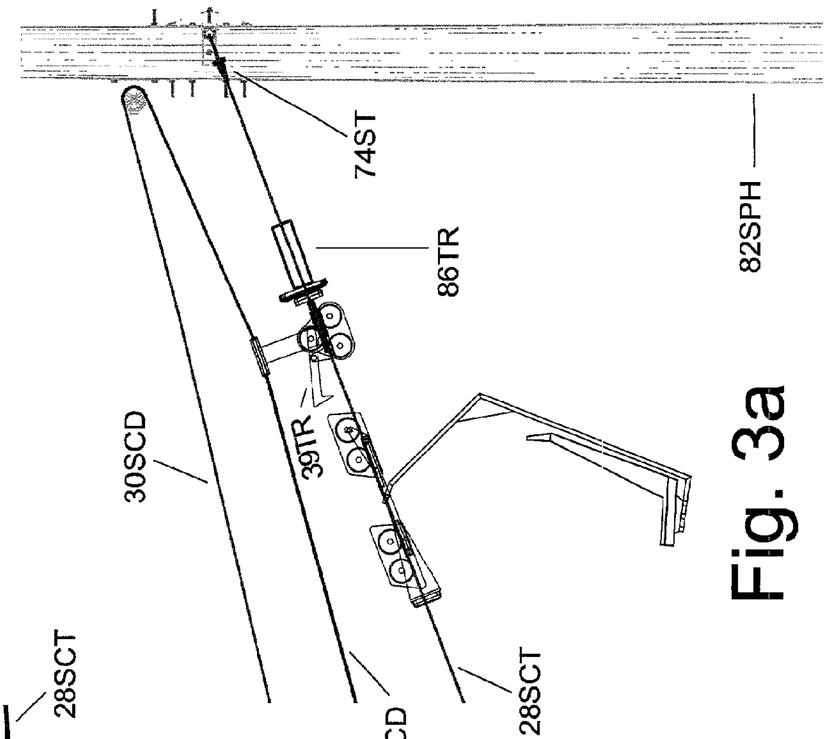

74ST
82SPH
86TR
39TR
30SCD
30SCD
28SCT

Fig. 3a

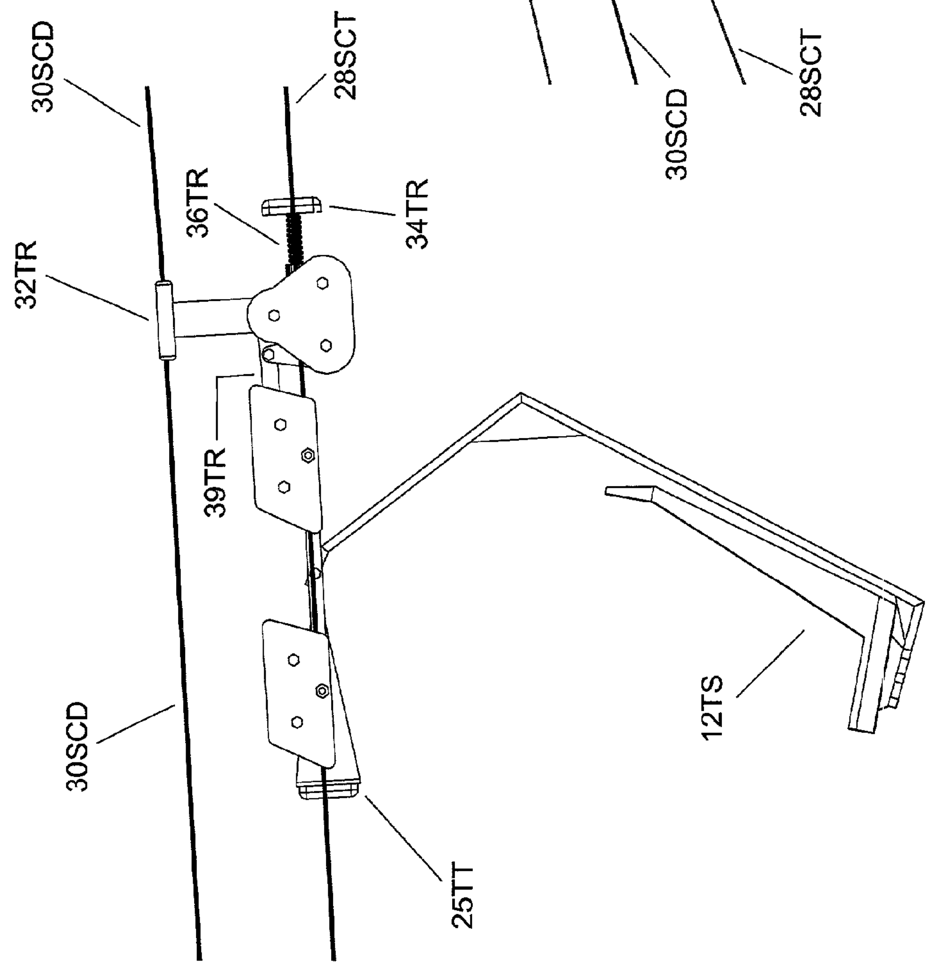

30SCD
28SCT
32TR
36TR
34TR
39TR
12TS
30SCD
25TT

Fig. 3

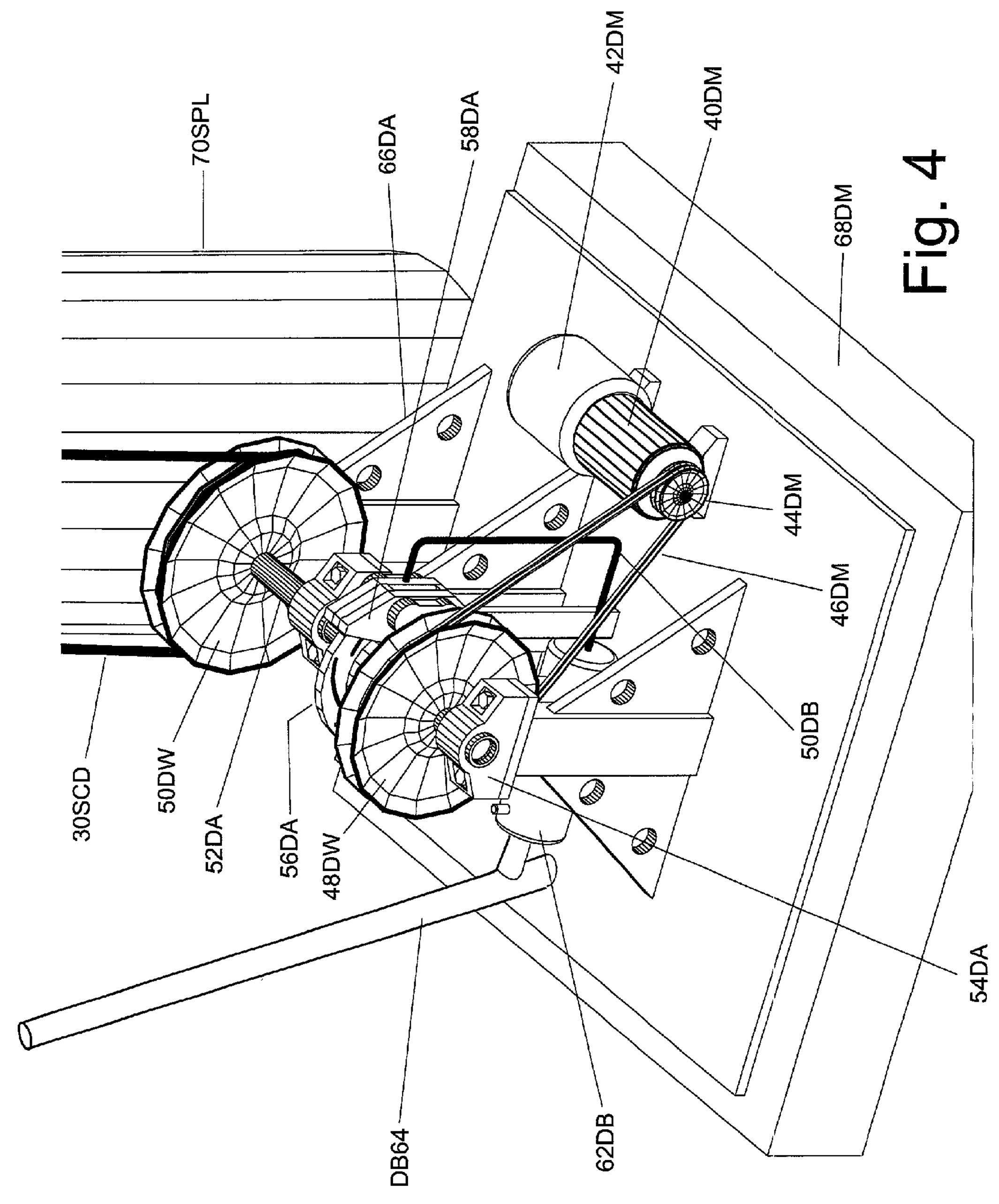

70SPL
66DA
58DA
42DM
40DM
68DM
44DM
46DM
50DB
54DA
62DB
DB64
48DW
56DA
52DA
50DW
30SCD

Fig. 4

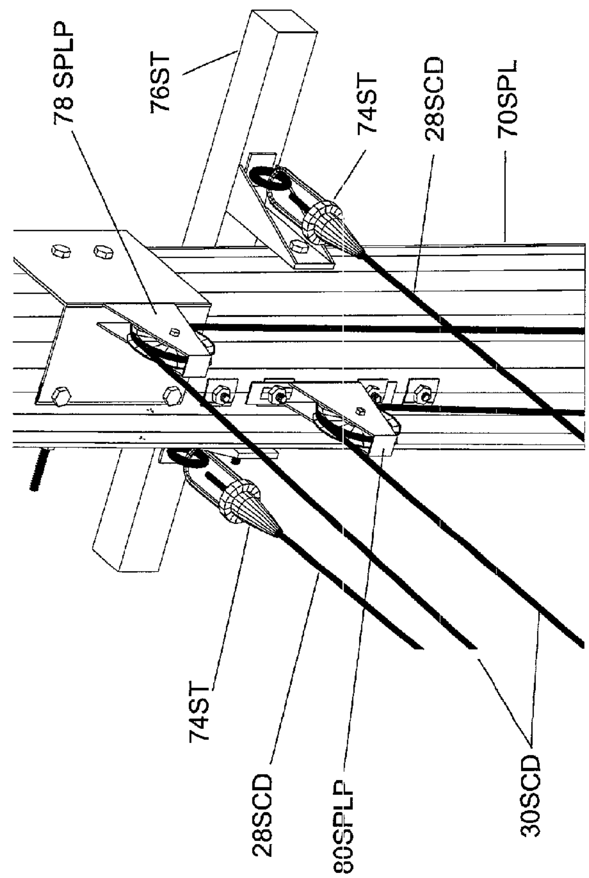

78 SPLP
76ST
74ST
28SCD
70SPL
74ST
28SCD
80SPLP
30SCD

Fig. 6

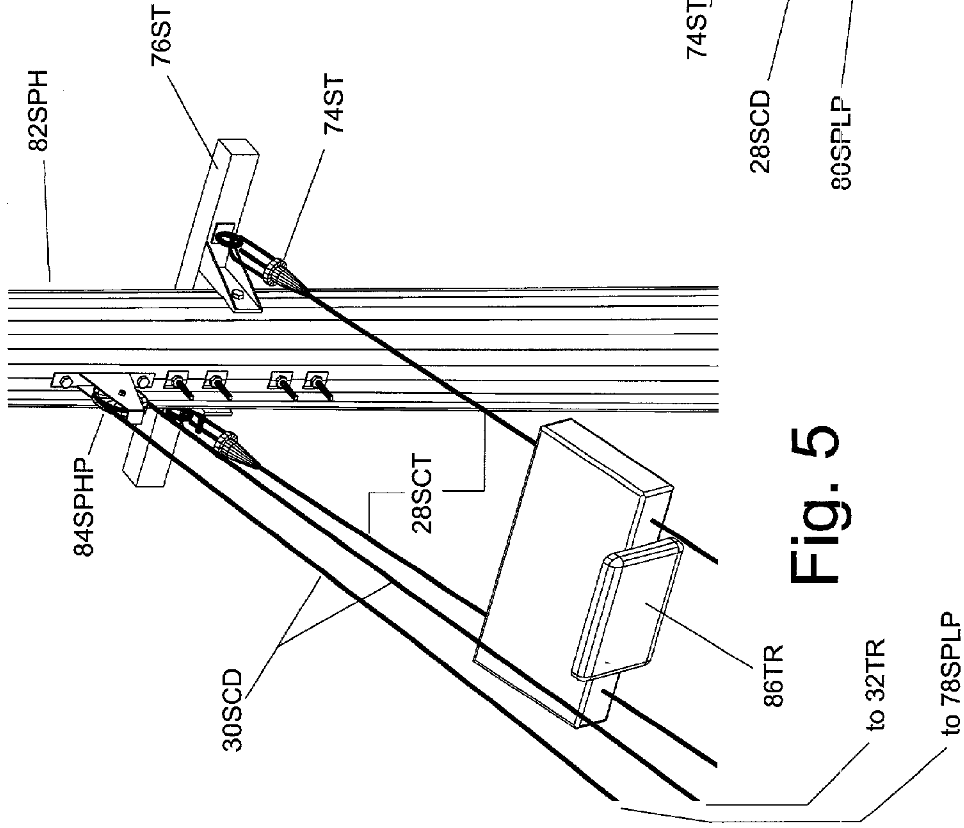

82SPH
76ST
74ST
84SPHP
28SCT
30SCD
86TR
to 32TR
to 78SPLP

Fig. 5

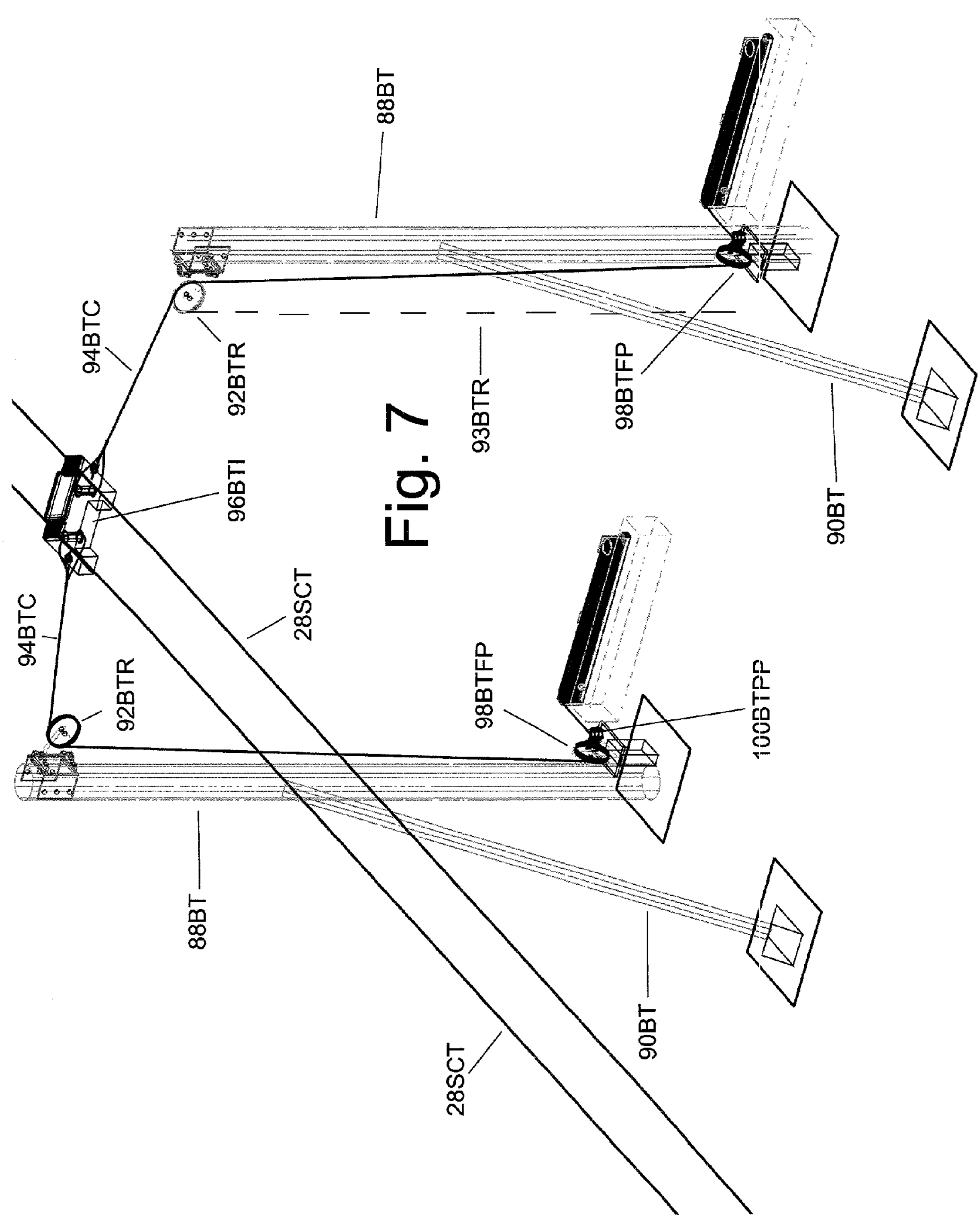

88BT
94BTC
92BTR
93BTR
98BTFP
90BT
96BTI
28SCT
94BTC
92BTR
98BTFP
100BTPP
88BT
90BT
28SCT

Fig. 7

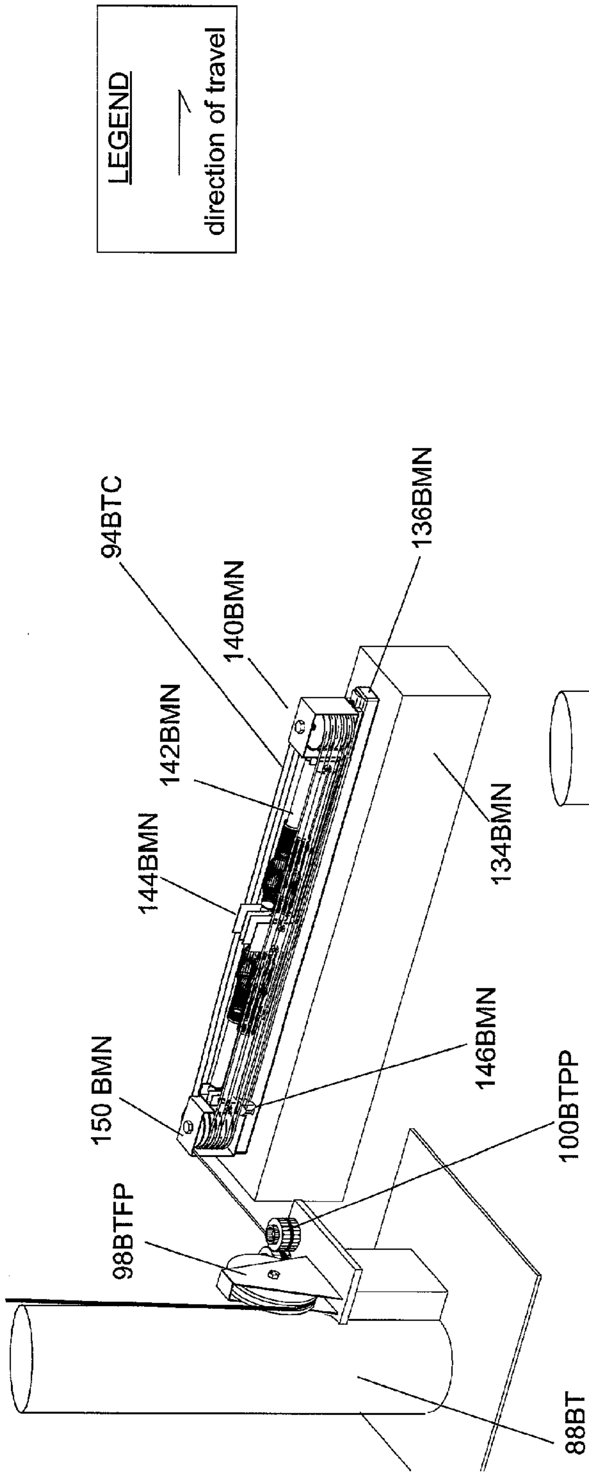
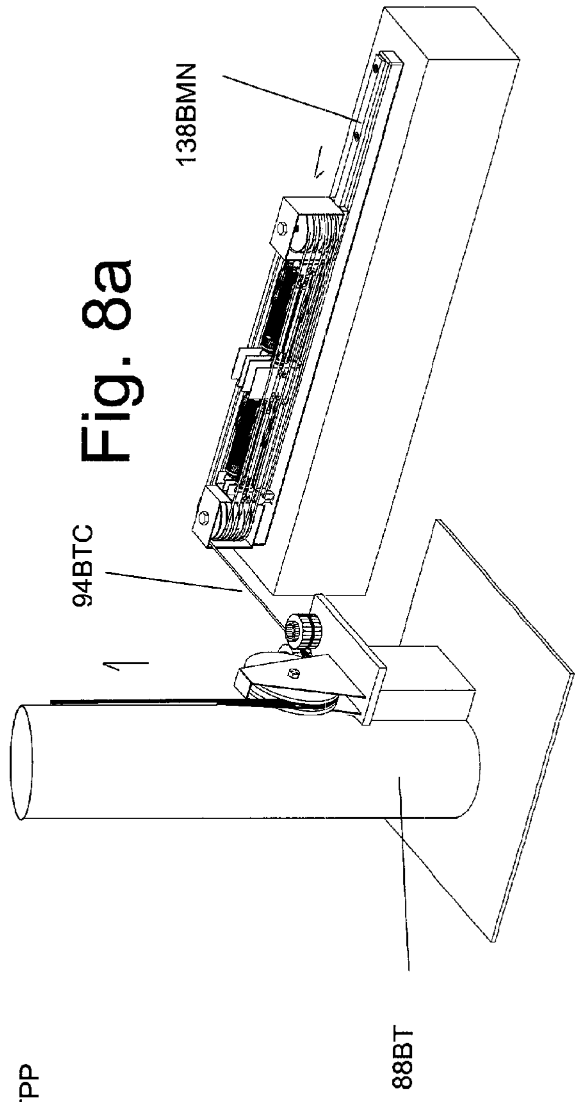

LEGEND
direction of travel
94BTC
136BMN
140BMN
142BMN
144BMN
134BMN
150 BMN
146BMN
100BTPP
98BTFP
88BT

Fig. 8


138BMN
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88BT

Fig. 8a

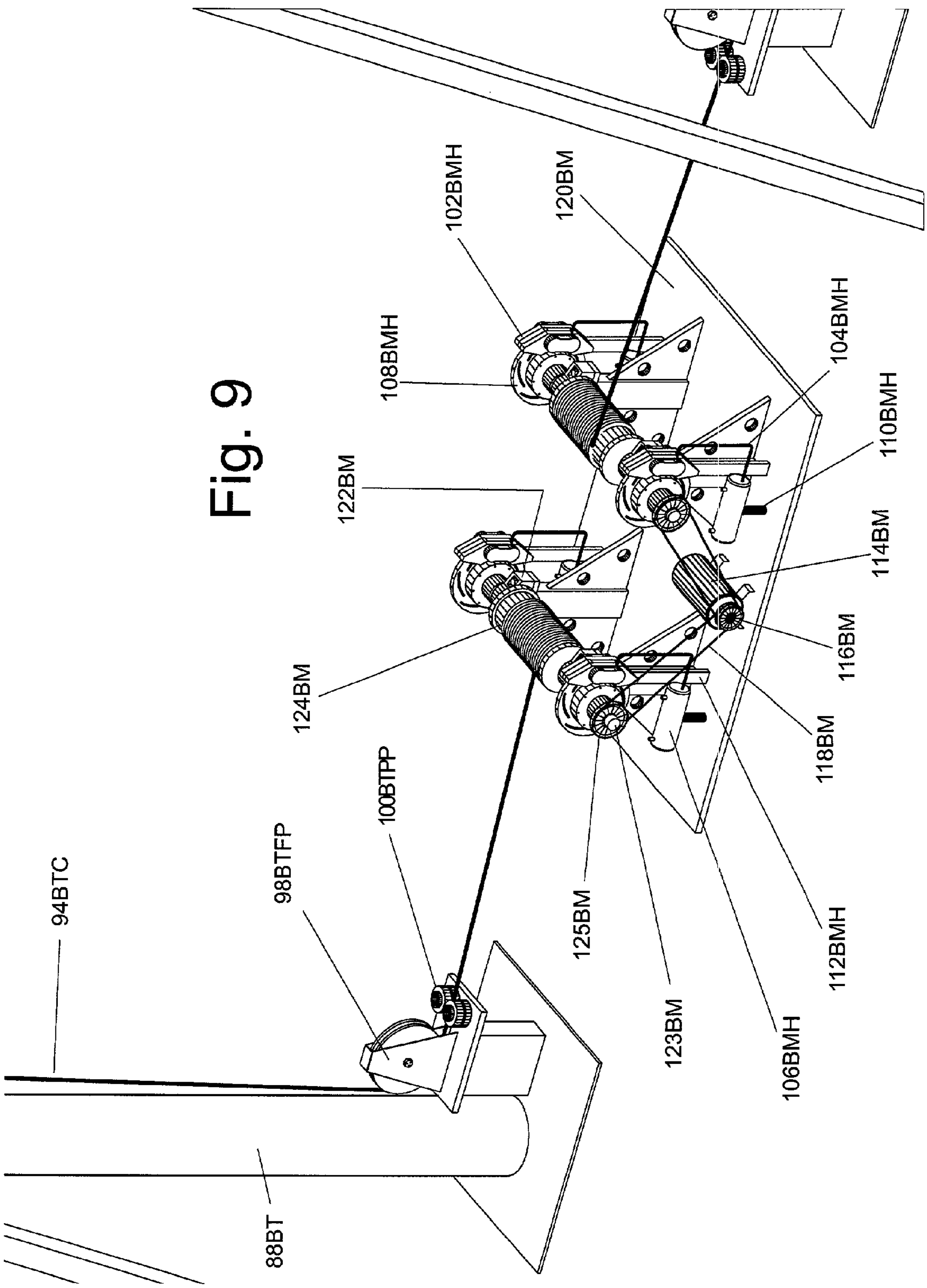
102BMH
120BM
108BMH
104BMH
110BMH
122BM
114BM
116BM
124BM
118BM
100BTPP
98BTFP
94BTC
125BM
123BM
112BMH
106BMH
88BT

Fig. 9

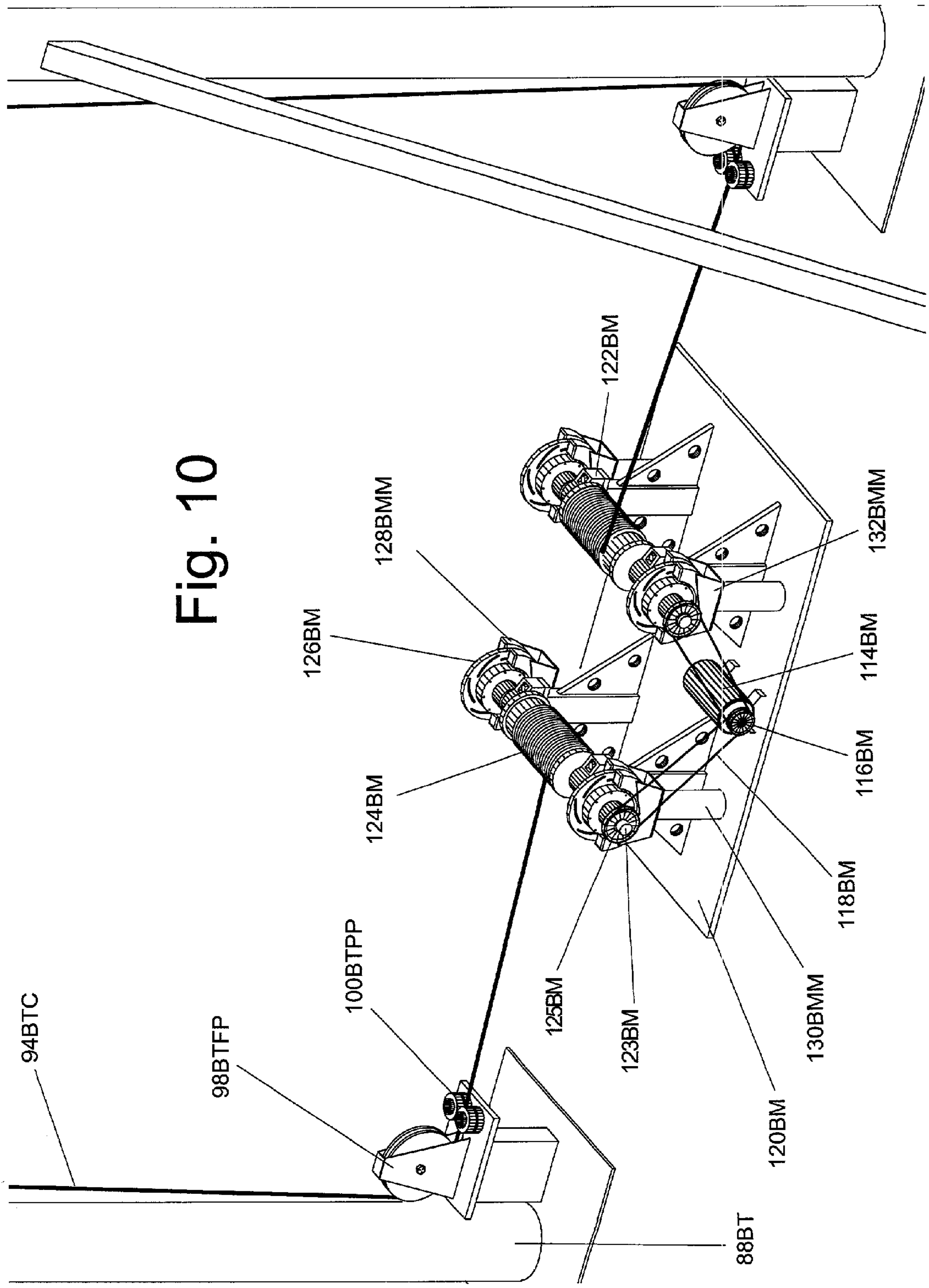
122BM
128BMM
132BMM
126BM
114BM
116BM
124BM
118BM
100BTPP
125BM
123BM
130BMM
94BTC
98BTFP
120BM
88BT

Fig. 10

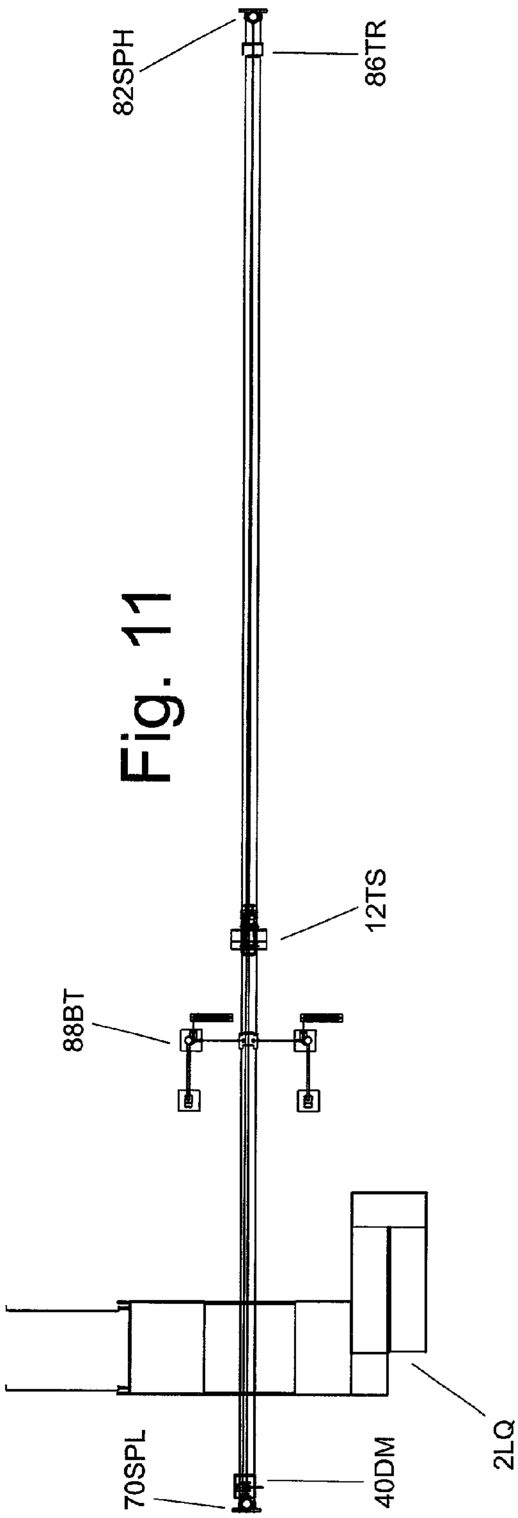

Fig. 11

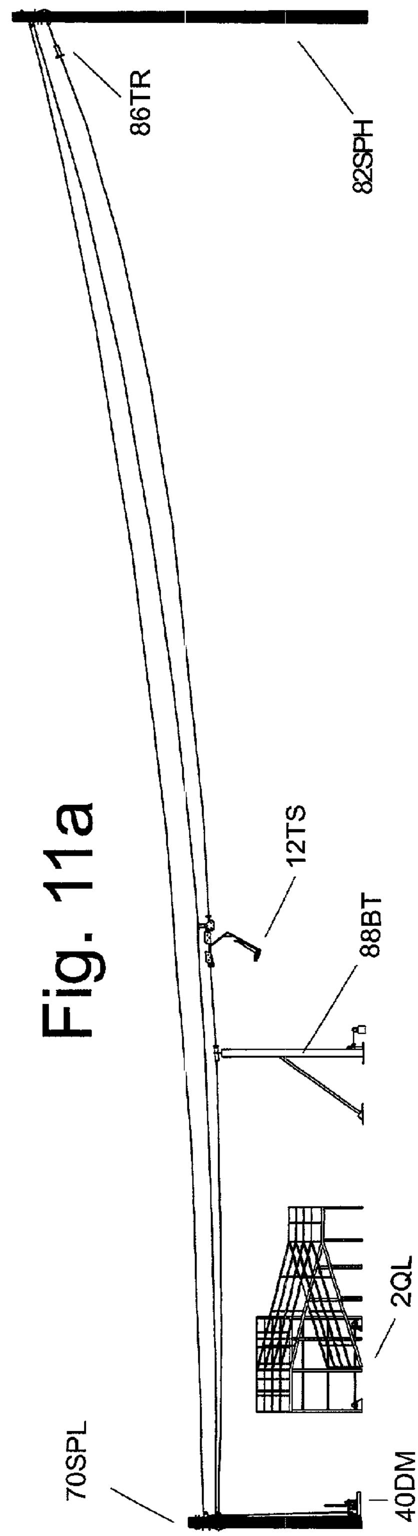

Fig. 11a

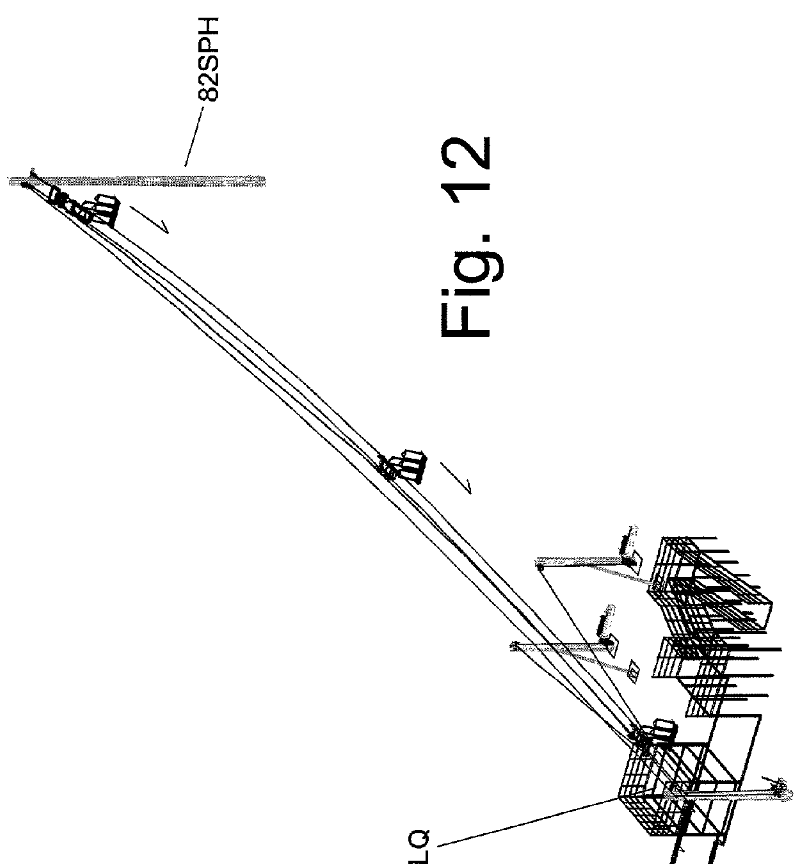

Fig. 12

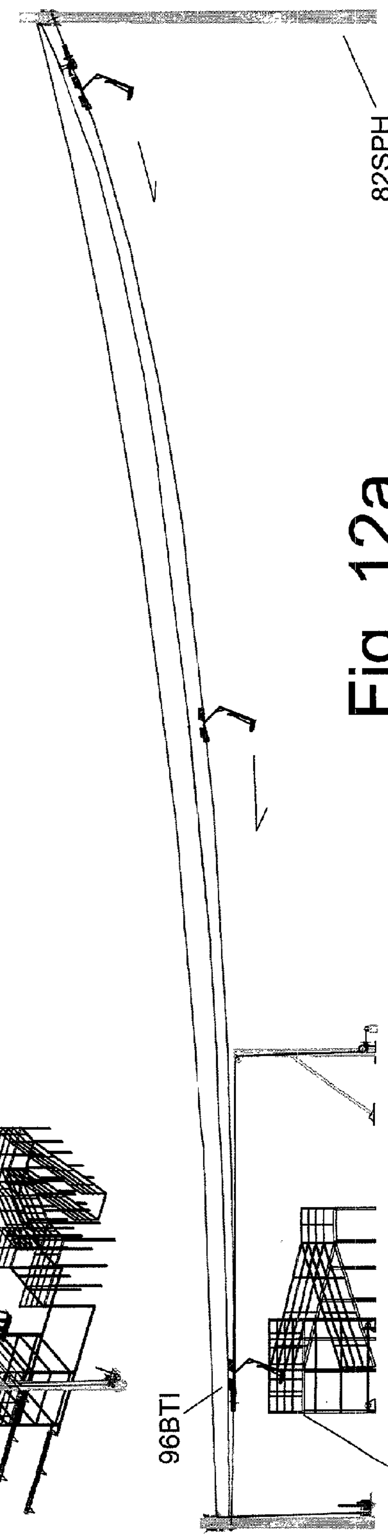

Fig. 12a

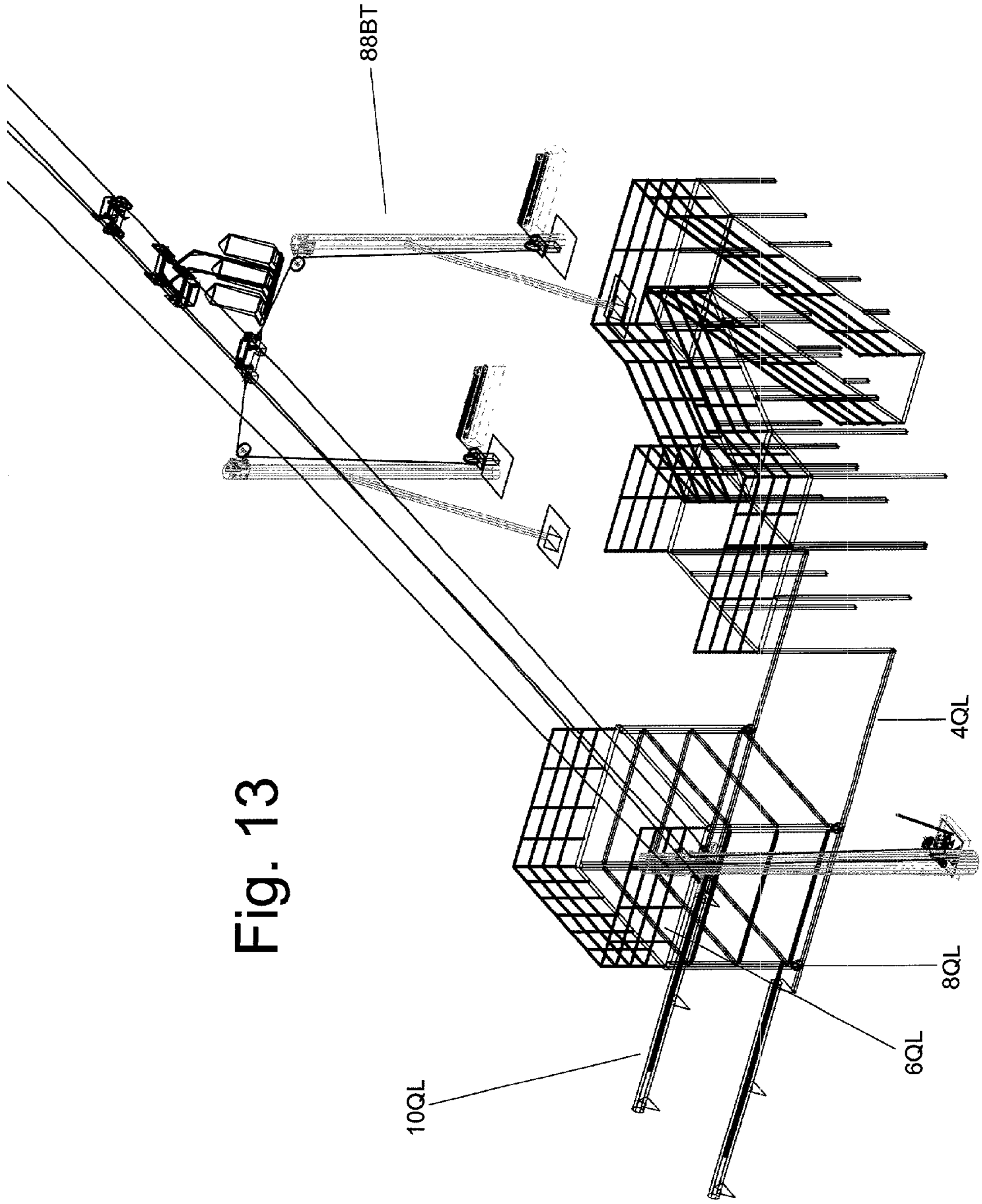

Fig. 13

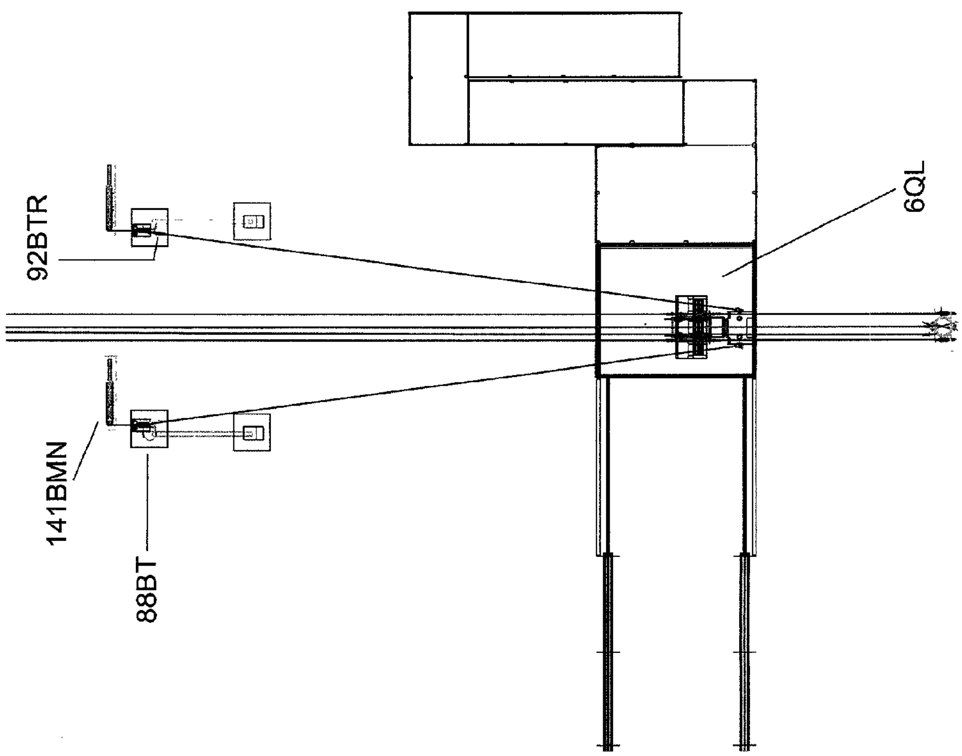

Fig. 14a

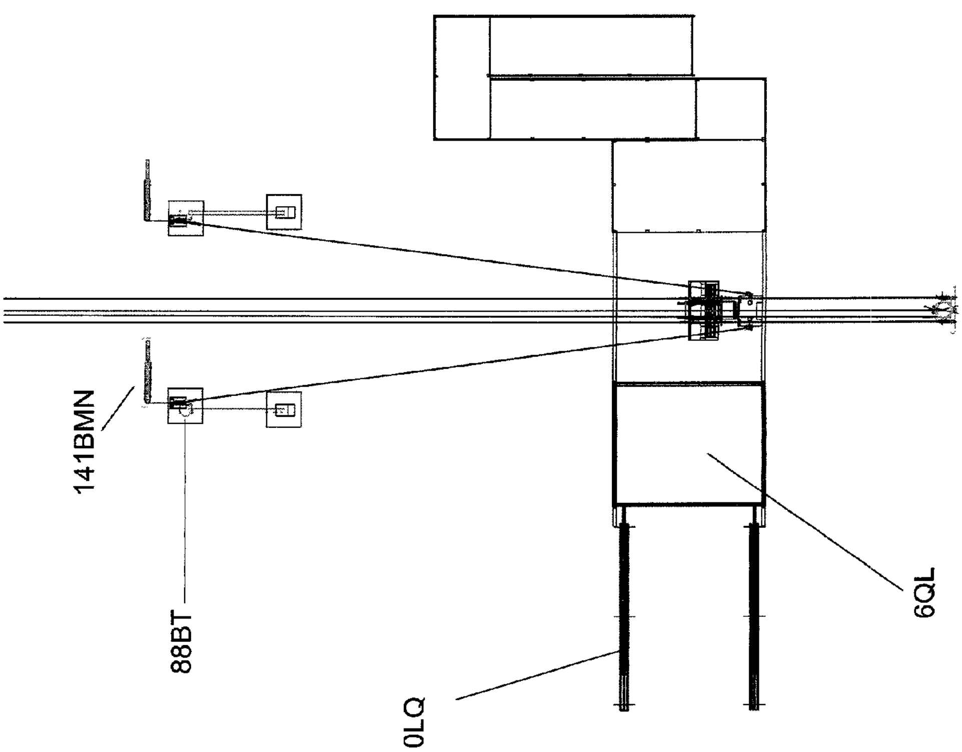

Fig. 14

DUAL CABLE ZIPLINE HAVING MECHANICAL ASCENSION AND BRAKING SYSTEMS

BACKGROUND—DESCRIPTION OF PRIOR ART

[0001] For over a century zip lines have been used in a variety of venues, from military physical training to therapeutic, scholastic and recreational settings. Within the last 30 years, the prevelance and use of ziplines has greatly proliferated due, in large extend, to the growth and popularity of challenge/ropes courses in which a zipline is often a key element.

[0002] The first known reference to a "zip line" occurs in the 1850s. (*Origins of th e Challenge Course,* Project Adventure, 2002, web reference.) George Herbert, a captain in the French military, developed the first documented obstacle course as a part of the physical training of recruits. A zip line was part of this obstacle course. It consisted of a rope suspended between two points of differing elevation whereby the participant descended by means of a steel ring sliding over said rope. The participant was stopped by means of a knot at the end of the rope, at which point the participant let go of the steel ring.

[0003] Since this time, ziplines in a variety of configurations have been a mainstay in military physical training programs worldwide. More recently, around 1968, the concept and use of the zip line moved from the strictly military venue to the public arenas of therapeutic, recreational, and scholastic usages.

[0004] Specifically, Karl Rohnke in 1968 installed a zip line for the North Carolina Outward Bound Program/School, as a part of their commercial recreation program. (See enclosed prior art, #1)

[0005] From this point onward there has been a proliferation of the installation and utilization of the zip line in a variety of recreational venues. Notably, in 1972, Adrian Kissler and the company Project Adventure built a recreational facility with a zip line in Rota, Spain. (See prior art #2.) Thereafter, ziplines have been a mainstay of challenge/ropes courses and their attendant programs worldwide.

[0006] Since 1968, ziplines utilized in challenge/ropes course facilities have typicallly consisted of a steel cable, of at least ⅜" diameter, rigged between two points of differing elevation with a single-wheel pulley attached to the cable. Initially, for ascend and descend, the participant hung by a lanyard attached to the pulley. Later, this method of attachment, was replaced by the participant being secured in some type of harness being suspended from the pulley. In both cases the particpant climbed to a disembarkation point, and, after "zipping" down the cable, was manually removed at the terminus of the system.

[0007] In the earliest years of zipline development the most common used system for the braking and stopping of the participant was the tire "impact" style system. In this system, upon termination of the descend the pulley would impact into four or five tires rigged into the terminus of the cable. (See prior art #3).

[0008] Later, braking was accomplished by a group of people who would utilize either a cargo net or a rope to "catch" the descending participant as he/she ran into either the net or the rope.

[0009] Later still, an "impact brake block" braking system was developed and is still in use today. This consists of a "brake block" (made from two pieces of 2×4 wood or other material) bolted around the cable so that it slides freely along said cable. Attached to the brake block are one or two ½" bungee cords that in turn are attached to a terminus point. At the end of the descent the pulley impacts the block engaging the bungee cord(s), which stretch and slow down and eventually stop the participant. (See prior art #4).

[0010] Along with the development of the impact brake block braking system, the "gravity brake system" was devised and also is still in use today. In this system, " . . . using gravity as the impetus, the rider zips to the bottom of the cables arch (the belly), and then begins the slowing process as he/she continues rolling up the sloping cable until gravity and friction exert enough drag to slow the rider to a stop." (Rohnke, Karl *Cow's Tails and Cobras II,* p. 121, 1989, Kendall/Hunt Publishing Co. see prior art #5)

[0011] One further braking device has also been used, although rarely. The braking in this system is accomplished by means of friction applied directly to the zip cable by the participant via a hand brake device. The hand brake may consist of anything from the use of heavy-duty gloves worn by the participant, to the putting of a stick or wood shims into the pulley itself, or by the use of a compression plate.

[0012] In 1984 the Association of Challenge Course Technologies (ACCT) became the sanctioning body for the challenge/ropes course industry, and as such it has standardized the construction, design and installation of challenge/ropes course elements, one of which, is the zipline, with either the gravity brake or impact brake block system. Since this standardization of zipline design and installation by the ACCT, very little modification or improvement of the basic design or construction has occurred with the exception that there has been a growing preference for the use of the gravity brake system over the impact brake block system. This is mainly due to the simplicity, ease of construction/installation, and use of the gravity brake system. (See further enclosed prior art not previously directly referenced.

[0013] With respect to the previously mentioned braking systems utilized on ziplines other than those proposed for this invention, there are many liabilities and disadvantages associated with them.

[0014] Starting with the tire impact braking method, it has been found that it is impractical and dangerous due to the abrupt and unpredictable nature of the force of impact necessary to effect stopping. This drawback therefore severely restricts its use for high-speed, long distance ziplines.

[0015] The method whereby groups of people stop the descending participant by the use of rope or cargo net is, needless to say, unreliable, dangerous and restricted in use.

[0016] The impact brake block system utilizing bungee cords has two main disadvantage as presently utilized. First, the bungee cords attached to the brake block inevitably wear quickly due to stress, UV damage, and fatigue at the knots. This wear makes it necessary to frequently replace the bungee(s). Second, the impact of the pulley into the impact block eventually causes damage and wear to both, and consequently, necessitates their eventual replacement. Both these disadvantages render the impact block braking system difficult to maintain and operate.

[0017] The gravity brake system, although easy to use has the major disadvantage of excessive cable wear which in turn affects maintenance, and safety. This cable wear is created by the very nature of the drape in the cable system. At the top of the descent there is a shock load on the cable caused by the participant, thereby creating an undesirable angle at the point where the pulley contacts the cable. This process is reversed as the participant is slowed and eventually stopped at the terminus of the descent. These undesirable angles created in the cable at the contact point of the pulley are 90 degrees or more. At these angles, according to state and federal elevator and rigging safety codes that hereto pertain, a pulley diameter theoretically should be thirty-six times or more the diameter of the cable being used. This would by extension necessitate the use of pulleys a minimum of 13½" for ⅜" cable. This in itself is extremely impractical due to cost and other problems created by the excessively large mass of the pulley. Hence the uses of conventional two to three inch zip pulleys. But, according to ACCT standards, the use of these smaller size pulleys in these applications only allows for a maximum of 5,000 cycles of use, during which time the cable must be constantly inspected and after any visiable damage must be replaced. This is not only an inconvenient process but expensive as well.

[0018] Last, the braking system utilizing direct pressure on the cable by the participant, as described above, has proved to be an ineffective, dangerous, and costly method of braking. This is due to the fact that the actual pressure applied by the participant to the cable by any means is unpredictable, inconsistent, and unreliable. Consequently: (1) the actual contact on the cable that creates the pressure to brake in turn actuallly causes cable deformation and damage which therefore necessitates frequent inspection and replacement, and (2) the unpredictable, inconsistent, and unreliable nature of the applied pressure can lead to partial or complete failure in the braking itself.

[0019] (It should be noted that in all preexisting zipline systems the participant physicallly initiates his/her descent themselves.)

OBJECTS AND ADVANTAGES

[0020] Accordingly, besides the objects and advantages of the freefall simulator with a braking system described in this patent, several objects and advantages of the present invention are:

[0021] (a) to provide a zipline that loads the participants from the base (low point)of the system and raises them to the top of the system via an integrated mechanical motor drive:

[0022] (b) to provide a zipline that uses a dual cable system to increase safety, minimize load and increase cable lifespan;

[0023] (c) to provide a zipline that provides a smooth reliable and redundant mechanical decelerating/ braking system;

[0024] (d) to provide a zipline whose braking system is automatic and not reliant on participant interaction or gravity;

[0025] (e) to provide a zipline braking system whos component parts are designed for long term, low maintenance use;

[0026] (f) provide a zipline that accommodates the various weights of multiple participants on a single installation;

[0027] (g) to provide a zipline that uses mechanical and gravitational means to descend the cable;

[0028] (h) to provide a zipline whose tram is connected to the tram cables via four, dual-wheeled tram pulleys;

[0029] (i) to provide a zipline that automatically starts the tram on it's descent down the cables via an automatic release system;

[0030] (j) to provide a zipline whose operation can be controlled by a single operator;

[0031] (k) to provide a zipline that can be installed in both permanent and mobile applications;

[0032] (l) to provide the flexibility to vary the length of a zipline to suit the particular need of the location.

[0033] Further object and advantaged of my invention will become apparent from a consideration of the drawings and ensuing description.

SUMMARY

[0034] In accordance with the present invention, a high speed, dual cable zipline ride is provided whereby participant(s) ascend dual tram cables by a mechanical motor drive and descend the tram cables using a combination of mechanical and gravitational forces. Prior to assent and descent, the participant(s) are secured in either a harnessed or a seated tram configuration from a sliding raised platform. Once secured in the tram the raised platform is lowered, swung, or slid out of the way. The control of the deceleration and stopping of the ride will be performed by one of four mechanical configurations depending on the dimension of the ride (i.e. length and height of the ride). These different configurations may be: an air shock system, a nitrogen shock system, a hydraulic disc braking system, or a magnetic disc braking system.

DRAWINGS

[0035] Drawing Figures

[0036] The foregoing and other objects and features of the present invention will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only typical embodiments of the invention and are, therefore, not to be considered limiting of its scope, the invention will be described with additional specificity and detail through use of the accompanying drawings.

[0037] (Note, in the drawings, closely related figures have the same number but different alphabetic suffixes.)

[0038] **FIG. 1** shows a perspective of a dual tram cable zipline with a braking system apparatus in accordance with the invention

[0039] **FIG. 2** shows a close up perspective of a participant seat, tram housing and drive interface.

[0040] FIGS. **3** to **3***a* shows a side view of the tram when it is connected to the drive interface and releasing from the drive interface.

[0041] **FIG. 4** shows a close up perspective of a motor drive system, axel bull-wheel assembly, and maintenance brake.

[0042] **FIG. 5** shows a perspective of a termination of tram cables, drive cables and release block on a taller pole.

[0043] **FIG. 6** shows a perspective of a termination of tram cables, drive cables on a shorter pole.

[0044] **FIG. 7** shows a close up perspective of a braking tower system with a nitrogen/air based braking system.

[0045] FIGS. **8** to **8***a* shows a close up perspective of the nitrogen system at rest and under load.

[0046] **FIG. 9** shows a close up perspective of a hydraulic disk brake system at rest and under load.

[0047] **FIG. 10**. shows a close up perspective of a magnetic disk brake system at rest and under load.

[0048] FIGS. **11** to **11***a* shows top and side views of one embodiment of an entire zipline system.

[0049] FIGS. **12** to **12***a* shows a perspective and side view of a path of travel for the participant(s) and the braking system at full extension.

[0050] **FIG. 13** shows a close up perspective of a loading/unloading system and the braking towers.

[0051] FIGS. **14** to **14***a* shows a top view of a sliding platform moving into position after the participants have been stopped.

Reference Numerals In Drawings	
2LQ	loading ramp
4LQ4	tracks for sliding platform
6LQ6	sliding platform
8LQ8	wheels for the sliding platform
10LQ	pneumatic cylinders that move the sliding platform
12TS	participant seats
14TS	structural members for the seats
16TT	bolted connection of the seats and a tram housing
18TT	capture bar
20TR	3-wheeled pulley configuration for the release system
22TR	2-wheeled pulley assembly for the tram (1 of 4)
23TT	tram housing
24TT	through-bolt that connects TT22 to the housing (TT23)
26TT	breaking pad
28SCT	tram cable (1 of 2) (Structural cable, tram)
30SCD	drive cable (Structural cable, drive)
32TR	drive interface
34TR	release pad
36TR	springs that reset TR34
38TR	cable and pulley system that translated the horizontal movement of TR34 to vertical movement
38TR	interface Hook
40DM	drive motor
42DM	spring loaded magnetic release brake for the motor (DM40)
44DM	dual pulley on the motor
46DM	two V-belts that drive the Bull Wheel (DM50)
48DW	larger Cog that is driven directly by the motor via DM46
50DW	bull wheel that drives the drive cable via 1.5 half-wraps of cable

-continued

Reference Numerals In Drawings	
52DA	drive axel that transfers power from DW48 to DM50
54DA	pillow blocks that support the axel (1 of 3)
56DA	disc brake rotor
58DB	dual-cylinder calipers
60DB	hydraulic line
62DB	hydraulic piston
64DB	hand lever that actuates DB62
66DA	structural supports for the pillow blocks, drive axel, and bull wheel
68DM	footing for the drive motor
70SPL	low termination pole
74ST	strand vise
76ST	horizontal cross member to which the tram cables are connected and supported
78SPLP	upper pulley from where the drive cable travels all the way to the high pole pulley (SPHP84)
80SPLP	lower pulley to which the drive cable runs directly to the release mechanism
82SPH	high termination pole
84SPHP	high pulley for the drive cable
86TR	release block that releases the tram upon impact
88BT	main braking system tower
90BT	45-degree supports for BT88
92BTR	rotating pulleys
94BTC	braking tower cables which connect Impact brake block (BT196) to the deceleration unit
96BTI	impact brake block
98BTFP	fixed pulleys at the base of the main brake towers (BT88)
100BTT	pressure pulleys which prevents slack from developing in the system
102BMH	dual cylinder caliper, racing-style hydraulic brake
104BMH	brake line
106BMH	nitrogen-charged hydraulic pack
108BMH	disc rotor
110BMH	support for the nitrogen charged pack (BMH 106)
112BMH	support for the caliper (BMH 102)
114BM	positioning motor
116BM	dual cog
118BM	v-belts
120BM	footing
122BM	pillow block
123BM	axel
124BM	grooved cable drum
126BM	Copper disk rotor
128BMM	crescent shaped magnets (NdFeB) Neodymium Iron Boron
130BMM	base support for the magnets
132BMM	structural housing for the magnets with a preset gap
134BMN	footing for the nitrogen brake
136BMN	main structural member for the sliding mechanism
138BMN	delrine rail that is used to track the pulleys in a straight line
140BMN	pulley housing, which moves upon loading of the cable
142BMN	dual nitrogen-based or air-bag-based automotive shocks
144BMN	intermediate connection between sets of shocks (BMN142), it too slides and tracks along the delrine rail (BMN138)
146BMN	cable termination where the cable is connected to the brake housing (BMN150)
150BMN	non-sliding pulley housing form which the cable travel out to the pressure pulleys and the fixed pulley

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0052] It should be readily understood that the components of the present invention, as generally described and illustrated in the figures herein, could be arranged and designed in a wide variety of different configurations. Thus, the following more detailed description of the embodiment of the system and method of the present invention, as represented in **FIGS. 1 through 13**, is not intended to limit the scope of the invention. The scope of the invention is as broad as claimed herein. The illustrations are merely representative of certain, presently preferred embodiments of the invention and will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout.

[**0053**] Those of ordinary skill in the art will, of course, appreciate that various modifications to the details of the Figures may easily be made without departing from the essential characteristics of the invention. Thus, the following descriptions of the figures is intended only as examples, and simply illustrate certain presently preferred embodiments consistent with the invention as claimed.

[**0054**] Referring to **FIG. 1**, FIGS. **11** to **11***a,* thes are mulitiple views of the entire zipline system. A single cable system, or a dual cable system, or a tram cable **28**SCT maybe used to support a participant in a seat, or a tram seat **12**TS. The cables **28**SCT are to be at least ⅜" inch in diameter and may be both anti rotation and pre-construction stretched. The cables **28**SCT may be supported by any suitable means such as existing structures, trees, towers or low pole **70**SPL and high pole **82**SPH. In one presently preferred embodiment the low pole **70**SPL must be shorter than the high pole **82**SPH such that the tram cables are traveling down hill towards the low pole. Due to forces of nature as well as practical safety concerns, cable sag will be evident in the tram cables. The sag is to be no less than 5% of the total length of the cable. For optimum performance, the sag should be no more than 12% the total length of the cable. This provides a constant down ward motion for the tram seat **12**TS.

[**0055**] Participants gain access to the zipline via the loading platform, cue or ramp **2**QL. In one presently preferred embodiment the ramp **2**QL may be designed such that it is in compliance with the federal disabilities act. Due to the fact the tram seats **12**TS move with speed over the loading dock, swing platform, or sliding platform **6**LQ, the sliding platform **6**LQ slides along rails **4**LQ to move out of the way. Using wheels **8**LQ and pneumatic cylinders **10**LQ the platform can move out of the way of the tram seats **12**TS leaving ample room for clearance.

[**0056**] Referring to **FIGS. 2 through 3***a,* a perspective of the tram seat **12**TS, tram housing **23**TT, and release pad **34**TR, drive interface **32**TR may be used to connect the tram release apparatus to the drive cable **30**SCD. The tram release apparatus is connected to a tram housing **23**TT via a hook **39**TR. Said hook **39**TR may be made out of any material that will be long lasting and not damaging to the capture bar **18**TT. The hook **39**TR is activated by the release pad **34**TR and a connection cable and pulley **38**TR. When the release pad **34**TR makes contact with a release block **86**TR (**FIG. 1** and **FIG. 3***a*), the force generated by drive cable **30**SCD compresses the release pad **34** TR which pulls the connection cable **38**TR which lifts the release hook **39**TR off the capture bar **18**TT as shown in **FIG. 3***a.* As the drive cable **30**SCD returns the tram release apparatus to the loading area, a spring **36**TR returns the release pad to the extended position that prepares the hook to interface with the tram housing **23**TT.

[**0057**] In one presently preferred embodiment the participants are seated in seats **12**TS secured by any current ordinary restraint system available, such as a 5 point racing harness or an over the shoulder, roller coaster-style restraint. The seats **12**TS are supported by structural member **14**TS. Structural member **14**TS has two independent points to connect to the tram housing **18**TT via bolts **16**TT. To provide further safety, additional fail safe connection points could be added as long as the seat **12**TS is able to swing freely on the bolts **16**TT to adjust to the changing angles of the cable as the ride is in motion. To further compensate for these changing angles a dual wheel pulley assembly, or pulley **22**TT, is connected to the tram housing **23**TT via a through bolt **24**TT which allows the pulleys **22**TT to rotate independently of one another.

[**0058**] Referring now to the motor drive system in **FIG. 4**, in one presently preferred embodiment a 3 phase electric motor **40**DM may be used to power the drive cable **30**SCD. The motor **40**DM may use a magnetic disk brake **42**DM that turns on when the power is off. The motor **40**DM is controlled by an inverter dive (common and not shown) that allows the user to start/stop forward/reverse the motor via a control box (common and not shown). In other presently preferred embodiments it may be prudent to add computers, PLCs, limit switches or other control devices to automate the zipline and increase safety. Power from the motor **40**DM is transferred to the drive cable **30**SCD via dual v-belts **46**DM attached by a small cog **44**Dm on the motor and a large cog **48**DM on the axel **52**DA. The axel **52**DA is connected to both the large cog **48**DM and a Bull Wheel **50**DW. The axel **52**DA is supported by pillow blocks **54**DA which sit on top of steel supports **66**DA. The steel supports are connected into the ground via a foundation **68**DM. For inspection purposes, a maintenance brake apparatus comprising of a disk rotor **56**DA, dual cylinder caliper **58**DA, hydraulic line **50**DB and manual hydraulic piston **62**DB with a handle DB**64**. The handle DB**64** applies the pressure to the calipers to activate the brake.

[**0059**] The drive cable **30**SCD may use 1.5 half wraps around the bull wheel **50**DW to create the friction needed to move the seats **12**TS up the tram cable **28**SCT. The drive cable **30**SCD first travels up and away from the left side bull wheel **50**DW to a directional pulley **80**SPLP (**FIG. 6**). From there the drive cable **30**SCD travels and terminates at the dive cable interface **32**TR (**FIG. 3**). The drive cable **30**SCD continues up to the high pole **82**SPH (**FIG. 5**) where it travels up through and around a directional pulley **84**SPHP. Now pointing back towards the low pole **70**SPL the drive cable **30**SCD connects all the way to a directional pulley **78**SPLP (**FIG. 6**) where it then travels down to the bull wheel **50**DW on right side of the wheel.

[**0060**] The tram cable **28**SCT may be terminated via strand vice **74**ST. The strand vice **74**ST is to be of series **5202**. A structural support **75**ST may be used to spread the tram cables **28**SCT to the proper distance.

[**0061**] Referring to **FIG. 7**. a breaking tower **88**BT may be used to slow the seat **12**TS. The braking tower **88**Bt is supported by down angles **90**BT to counter act the forces generated by the braking cable **94**BTC. The braking cable **94**BTC may be attached to a braking block **96**BTI. The braking cable **94**BTC may be attached in such a way as to create a fail safe in the event of main termination failure. Said braking block **96**BTI may be made out of delrine or other composite material to limit wear on the cable. The braking block **96**BTI makes use of a shock-absorbing pad, located centrally, which makes contact with the tram housing **23**TT. The tram housing **23**TT has a braking pad **25**TT that is used to interface with the brake block **96**BTI. As the two units collide the braking cable **94**BTC is pulled through first a rotating pulley **92**BRT at the top of the braking tower **88**BT. This pulley **92**BRT must rotate side to side in order to stay in alignment as the tram **23**TT passes by. Then going down the braking cable **94**BTC goes to a fixed directional pulley **98**BTFP. Said pulley **98**BTFP changes the direction of the braking cable **94**BTC 90 degrees so that is may then pass horizontally through a pressure pulley **100**BTPP which keeps slack from being generated. The braking cable **94**BTC may then go to one of three mechanical braking systems: a nitrogen/air automotive shock **(FIG. 8 & FIG. 8*a*)**, a hydraulic disk brake **(FIG. 9)**, or a magnetic disk brake **(FIG. 10)**.

[**0062**] The reason for there being different braking systems is that each has benefits for different variations of the zipline in terms of height, and length as well as environmental factors. All the systems have the common ground that they are acting as a shock absorber, controlling the degree to which the braking cable is paid out.

[**0063**] Referring to **FIG. 8** and **FIG. 8*a*,** a nitrogen/air automotive shock system may be used. The braking cable is routed to the static pulley housing **150**BMN and from there is passes back an forth from the static pulley housing **150**BMN to the sliding pulley housing **140**BMN until it is terminated to the bottom of the static pulley housing at **146**BMN. Automotive nitrogen or air shocks **142**BMN are placed in tandem between the two pulley housing **150**BMN and **140**BMN. The braking cable **94**BTC is pulled through the block and tackle system the shocks **142**BMN are compressed **(FIG. 8*a*)**. Through the dampening effects of the shocks **142** BMN the cable is paid out in a controlled fashion slowing down the tram **12**TS in a smooth motion. To accommodate the moving connection point **144**BMN where the sets of shocks **142**BMN connect to one another, both the moving connection point **144**BMN and the sliding pulley housing **140**BMN slide in a delrine track **138**BMN attached to the main structural member **136**BMN which keeps the system in line and limits wear on the cable **94**BTC and pulley housings **150**BMN and **140**BMN. The nitrogen/air system is totally non-powered in that when the tram **12**TS is moved backwards, the charge of gas in the shock **142**BMN forces the shock to extend, pulling the braking cable **94**BTC thus automatically resetting the brake back to the at rest position.

[**0064**] Referring now to **FIG. 9, a** hydraulic disc brake system may be used. Differing from the afore mentioned system, the brake cable **94**BTC is wrapped around a grooved drum **124**BM in a winch style configuration. The drum **124**BM is connected to an axel **123**BM, which goes through pillow blocks **122**BM. On either side of the axel are hydraulic disc brakes using a disk rotor **108**BMH and a dual cylinder caliper **102**BMH. The calipers **102**BMH are always putting pressure on the disk rotor **108**BMH via a charged hydraulic pack **106**BMH connected to the caliper via a hydraulic line **104**BMH. The pack **106**BMH is charged with nitrogen to ensure that pressure is always there and is supported off the ground via a pedestal **110**BMH. As the braking cable **94**BTC is pulled, the drum **124**BM spins against the resistance generated by the disk brakes. To reset the system, the motor **114**BM reverses the drums via v-belt **118**BM and cogs **116**BM and **125**BM. In one presently preferred embodiment it may be that computer controls are added to customize the braking power to the load being stopped.

[**0065**] Referring to **FIG. 10**, it demonstrates that magnets can be used to achieve the same result. This system works in the same general fashion as the disk system with the difference that the braking power is provided by dual crescent shaped magnets (NdFeB) Neodymium Iron Boron **128**BMM. A copper disk **124**BM passing at close proximity between two attracting magnets **128**BMM creates the braking power. The magnets are positioned using a frame **132**BMM, which are supported by large pedestals **130**BMM. As the magnets **128**BMM sit statically eddy currents are generated between the two magnets. As the disk **124**BM passes through the currents, force is generated in proportion to the force being applied progressively slowing the disk **124**BM down until an equilibrium is reached. It makes this system very suited for larger faster loads as it can adapt. However due to the fact that the magnets cannot dead stop the load, the motor **114**BM is used more extensively for positioning purposes.

[**0066**] Referring to **FIG. 12** and **FIG. 12*a*** a path of travel is noted from the top to the bottom of the zipline. As mentioned above the tram release apparatus lets the tram **12**TS go to roll down the tram cables **28**SCT. The tram **12**TS travels down the tram cable **28**SCT until it interfaces with the brake block **96**BTI extending the cable and activating the braking system. During this action the sliding platform **6**LQ is out of the way as shown in **FIG. 14**. After the tram **12**TS comes to a complete stop, the sliding platform **6**LQ is moved into place via the pneumatic cylinders **10**LQ.

[**0067**] Alternative Embodiments

[**0068**] It is easy to imagine all the various modifications and alternate uses for this invention. For instance, it could be possible to change the tram seat **12**TS to offer other positions for riding. Standing, laying down, flipping over, spinning, upside down, or simple harness could all be used with the current brake block **96**BTI **FIG. 7** system. Although the preferred embodiment is shown to take participants from the bottom to the top and back down again, the opposite is also possible in so much as the participants load at the top (off a building or such) ride down and are brought back to the top to unload. This method also provides a better opportunity to use the drive cable **30**SCD as a means to launch the participant down.

[**0069**] Due to the nature of the braking system, slowing down to a constant rate or dead stop, the angle of decent could approach 90 degrees. It is very difficult to achieve this due to issues with the tram cables **28**SCT. However it is noted that the braking system could be used to lower a tram from height at a constant rate it that were the goal. Since it is apparent that these systems can decelerate people to a constant rate or a dead stop, it is reasonable to set up an extra braking system on the large pole **82**SPH to help protect maintenance workers as they climb and lower the pole. Protection for the workers may be achieved by routing the braking cable **94**BTC **FIG. 7** to a pulley at the top, allowing the end to come down to the ground while loading the brake (**93**BRT **FIG. 7**). By preloading the brake, cable take up is achieved as the worker climbs by the nitrogen/air pistons expanding. In order to make the magnetic version of the break serve the same purpose, a spring could be added to the drum providing the cable take up much in the same way a tape measurer pulls in the tape.

[0070] Advantages

[0071] From the description of the invention above, a number of advantages become evident as relates to the use in the dual cable zipline of mechanical asension and braking systems.

[0072] (a) By using dual cables the potential load is spread over two cables, not just one, which in turn increases longevity and lowers wear on the tram cables **28**SCT.

[0073] (b) Having spread 4 pulley wheels across each tram cable **28**SCT, the load is spread over a larger area, again increasing longevity and lessoning wear on the tram cables **28**SCT. Also, the spread of the four pulleys eliminates the occurance of small angles in the cable.

[0074] (c) By allowing the tram pulleys **22**TT to rotate independently, the cableis kept from being damaged due to the creation of small angles, which also promotes the longevity of and lessens wear on the tram cables **28**SCT.

[0075] (d) Providing a loading position at the low point of the system allows for any person to partake in the attraction.

[0076] (e) Using seats with restraints allows for quick and safe entry and exit from the ride which is much more effiecient than any harnessed system.

[0077] (f) Locating the motor drive at the low point of the system allows for all the power and control to be at one location which saves time in maintenance and provides a more user friendly product.

[0078] (g) Having a maintenance brake included on the motor dive axel allows for quick inspection of all critical parts, such as the tram cables.

[0079] (h) Having a motor drive intergrated with the system allows for quick throughput of participants and an increase in safety as well as a lessening of costs.

[0080] (i) The impact braking system has several advantages, namely:

[0081] 1) A fail safe design. It is impossible for the tram to become disengaged from the braking system.

[0082] 2) Having a shock absorber connected to the cables at all time centers the cables and keeps vibration to a minimum, which allows for operation in foul or windy weather.

[0083] 3) The brakings systems are mechanical and thererfor do not need elctrical power to function.

[0084] 4) The nitrogen/air system is nort electrically powered in that when the tram is moved back the charge of gas in the tube forces the piston to extend thus automatically resetting the brake.

[0085] 5) The braking action in any one system does not rely on any one person or any other braking system.

[0086] 6) Due to nature of the braking system and the abilty of all the methods to automatically adjust to the load, no computers are necessary to calculate the braking power needed for each cycle.

[0087] 7) By using automotive shocks, replacement is fast and easy. There is also an added advantage; the history of the use of automotive shocks on vehicles has proven them to be far more reliable and durable than would be necessary for the use on ziplines.

[0088] 8) With a braking system such as these the zipline can be bigger, faster and can have steeper angle of descent than ever before.

[0089] Operation - **FIGS. 3, 3***a,* **4, 7, 12, 12***a,* **14, 14***a*

[0090] To use the ride/invention the participant walks up the ramp **2**LQ to the loading platform. At the lower end of the ride the operater straps in the participant to the tram seat **12**TS via the provided safety belts or shoulder bar. Once the participant(s) is strapped in, the operator turns on the motor drive **40**DM (**FIG. 4**) and brings the tram release **32**TR to the loading platform. Once down, the tram release **32**TR is brought close to the tram such that the hook **39**TR can be lift up to connect to the capture bar **18**TT. Once this interface is complete, the sliding platform **6**LQ is moved out of the way. This leaves the participant(s)' feet hanging above ground such that there is ample clearance for their feet. At this point several actions can commence. With the sliding platform **6**LQ out of the way the operator can now move the participant(s) towards the braking area for a short pause to verify that the braking system has been reset. When using the disk or magnetic systems this is done by the electric positioning motor **114**BM. Once the brake block is in the proper position, the participant(s) is then ready to be ascended up the tram cable by the main drive cable. In the nitrogen version, the brake is reset automatically, thus the participant(s) at this point is ready for ascension via the drive cable; the controller is able to continue this ascend provide the brake block **96**BTI has moved back with the tram seat **12**TS.

[0091] The tram is moved by the drive cable **30**SCD due to the friction cause by the 1.5 half wraps around the bull wheel **50**DA. With the gear ratio of the small cog **44**DM to the large cog **48**DW the motor drive can get the participants up the height in short order. Once the tram seat **12**TS reaches the top, the release block **34**TR is compressed, the hook **39**TR goes up and the participants are free to roll down the tram cables **28**SCT. A skilled operator may also accelerate the participants down with a short to long burst of speed from the motor drive. For those not so skilled, a computer or PLC could be added to automate the system.

[0092] As the tram seat **12**ST moves down the tram cables **28**SCT, the tram picks up speed and the participant(s) hears a high pitch from the wheels that gets higher as the speed increases. At this point the operator may start lowering the tram release to prepare for the next cycle. Shortly, the tram speeds along towards the brake block **96**BTI (**FIG. 7**.) and collides with it. The riders feel little to no jolt as the system starts to engage. The cable is let out as described above via the braking system in use. The tram seat **12**TS slows to a stop over the loading zone as shown in **FIG. 14**. In the event that the tram is not heavy enough to make it back to the sliding platform **6**QL the operator simply moves the tram seat **12**TS forward until it is position. Once over the platform area, the operator moves the sliding platform into position so that the participants may exit quickly, comfortably and safely.

[**0093**] Conclusion, Ramification, and Scope

[**0094**] Accordingly, the reader will see that the dual cable zipline having a mechanical means of ascension and braking can be used easily, safely and quickly. One of the main problems with ziplines in the past was that there was not a good method to stop the participant at the end that did not harm the cable. Another issue was the slow cycle speed and staff intensiveness. With the motor drive the unit can be run quickly with out the added danger or hassle of connecting other pulleys and trams in-between participants. Designed with safety, high volume and quick operation in mind the present invention is fills a void that has been vacant since the beginning. Furthermore, the invention has the additional advantages in that:

[**0095**] it increases longevity and lowers wear on the tram cables **28**SCT;

[**0096**] it provides a loading position at the low point allowing for all persons to partake in the attraction;

[**0097**] it uses seats with restraints allows for quick and safe entry and exit from the ride that is much more efficient than any harnessed system;

[**0098**] it saves time in maintenance and provides a user-friendlier product by locating critical systems in easy to reach locations;

[**0099**] it uses a motor drive to allows for quick throughput of participants and increases safety as well as lowering costs;

[**0100**] it uses an impact braking system, which has several advantages namely:

[**0101**] Fail safe design. It is impossible for the tram to disengage from the braking system;

[**0102**] The braking action in no way relies on any one person or system;

[**0103**] Due to nature of the braking systems they have the ability to automatically adjust to the load, no computers are necessary to calculate the braking power needed for each cycle;

[**0104**] With a braking system such as these the zipline can be bigger, faster and have steeper angle of attack than ever before.

[**0105**] Although the description above contains much specificity, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. For example the zipline could use several different style of chairs, be very short or long, be fast or slow, load from the bottom or the top. Thus the scope of the invention should be determined by the appended claim and their legal equivalents, rather than by the examples given.

I claim:

1. A dual tram cable zipline ride having a mechanical means of ascension and braking comprising of:

an upper and lower cable termination, where by said lower cable termination is lower than said upper cable termination;

two cables rigged side by side between the said upper and lower cable terminations such that the lowest point in the unloaded cables is higher than the said lower cable termination but lower than the said upper cable termination;

multiple wheeled pulley mounted on said cable for movement there along;

passenger tram that supports at least one person connected to said Multiple wheeled pulley such that said tram can rotate freely on a fixed point;

access means located near said lower cable termination for permitting entry of said at least one passenger for commencement of said ride;

ascension of said tram via a motor driven cable to said upper cable termination;

disembarking means located at said access means

2. A dual tram cable zipline ride having a mechanical means of ascension and braking comprising of:

an upper and lower cable termination, where by said lower cable termination is lower than said upper cable termination;

two cables rigged side by side between the said upper and lower cable terminations such that the lowest point in the unloaded cables is higher than the said lover cable termination but lower than the said upper cable termination;

multiple wheeled pulley mounted on said cable for movement there along;

passenger tram that supports at least one person connected to said Multiple wheeled pulley such that said tram can rotate freely on a fixed point;

access means located near said upper cable termination for permitting entry of said at least one passenger for commencement of said ride;

ascension of said tram via a motor driven cable to said upper cable termination;

disembarking means located at said access means

3. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the braking system uses a nitrogen/air automotive shock to provide the braking power.

4. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the braking system uses automotive nitrogen charged disk brake to provide the braking power.

5. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the braking system uses a magnetic disk brake to provide the braking power.

6. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the braking system uses an impact brake block to interface with the said passenger tram to slow it down

7. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the braking system can be used to provide fall protection for maintenance workers.

8. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein a motor drive may be computer controlled to launch the participants down the said tram cables.

9. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the said dual tram cables are at least ⅜" in diameter.

10. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein both said cable terminations are portable.

11. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein both said cable terminations are connected to existing structures. The dual tram cable zipline ride having a mechanical means of ascension and braking of claim 1 wherein the passenger tram means includes a securing harness means.

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