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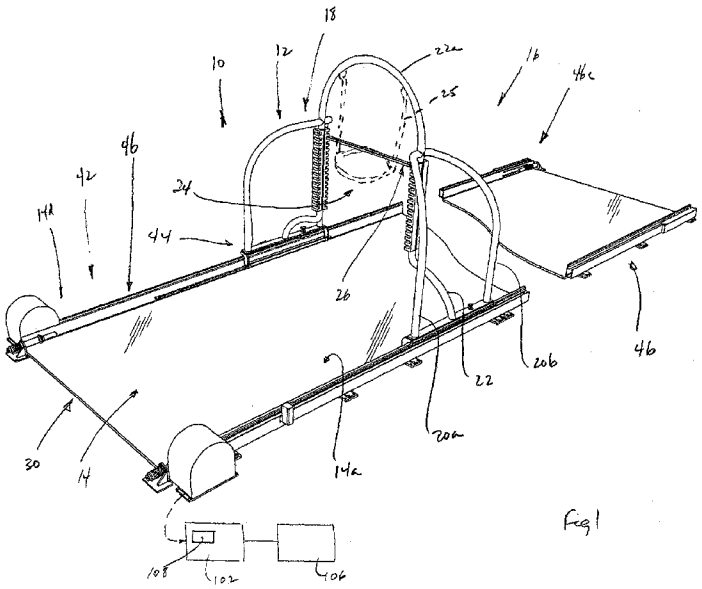
(54) **Title:** RESISTANCE TRAINING



(57) **Abstract:** Disclosed is a training device comprising a support structure mounted for travel along a game surface, the support structure having a pair of opposed upright portions and a transverse member, the transverse member extending between and being positionable at one of a plurality of operative elevations relative to the opposed upright portions, a selected operative elevation corresponding to an elevation for a trainee to grip the transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface.

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RESISTANCE TRAINING

FIELD OF THE INVENTION

[0001] The present invention relates to athletic training.

DESCRIPTION OF THE RELATED ART

[0002] A variety of methods have been developed to strengthen and tone muscles for both health and athletic activity. Conventional exercise emphasizes, and often requires, slow steady movement, with loads generated by weights, springs, or friction. The difficulty lies in trying to create resistance in the exercise equipment which simulates actual resistance encountered in a sport activity.

[0003] Limitations of existing exercise equipment make an actual practice session, such as hockey practice on a rink, or other sports practice in its corresponding game-playing area, the most effective method of preparing athletes for competition. However, live game simulation or practice may endanger player health as the excitement and uncontrollable nature of athletic activities can result in players getting injured. Even when professional players are well matched, drills such as blocking and checking can aggravate old injuries and cause new ones.

[0004] Further, due to the limited range of exercise machines, muscles such as outer thigh muscles, upper body muscles and/or inner thigh muscles are generally not sufficiently worked to gain benefits similar to 'those gained from performing actual sports.

[0005] It would be desirable to provide a novel approach to athletic training that attempts to address at least one of these issues.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Several preferred embodiments of the present invention will be provided, by way of examples only, with reference to the appended drawings, wherein,

[0007] Figure 1 is a fragmentary perspective view of a training device;

[0008] Figure 2 is a fragmentary side view of the device of figure 1;

[0009] Figures 3 through 11 are fragmentary perspective views of various portions of the device of figure 1;

[0010] Figures 12 through 14 are fragmentary plan views of the device of figure 1 in different operative positions;

[0011] Figure 15 is a fragmentary part-schematic side view of a portion of an alternative training device;

[0012] Figure 16 is a fragmentary perspective view of another training device;

[0013] Figure 17 is a side view of the device of figure 1 in a mode of operation;

[00010] Figure 18 is a perspective view of a further training device;

[0010] Figure 19 is a perspective view of a portion of the device of figure 18;

[0011] Figure 20 is a top plan view of the device of figure 18;

[0012] Figure 21 is an end view of a portion of the device of figure 18, showing the track arrangement;

[0013] Figures 22A through 22B are fragmentary perspective views of the resistance control arrangement of the device of figure 18;

[0014] Figure 23 is a perspective view of the brake arrangement of the device of figure 18; and

[0015] Figure 24 is a perspective view of the brake arrangement of the device of figure 18, in a compressed configuration.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] It should be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless limited otherwise, the terms "connected," "coupled," and "mounted," and variations thereof herein are used broadly and encompass direct and indirect connections, couplings, and mountings. In addition, the terms "connected" and "coupled" and variations thereof are not restricted to physical or mechanical connections or couplings. Furthermore, and as described in subsequent paragraphs, the specific mechanical configurations illustrated in the drawings are intended to exemplify embodiments of the invention. However, other alternative mechanical configurations are possible which are considered to be within the teachings of the instant disclosure. Furthermore, unless otherwise indicated, the term "or" is to be considered inclusive.

[0017] As will be elaborated on below, there is provided a training device comprising a support structure mounted for travel along a game surface. The support structure has

a pair of opposed upright portions and a transverse member. The transverse member extends between and is positionable at one of a plurality of operative elevations relative to the opposed upright portions. A selected operative elevation corresponds to an elevation for a trainee to grip the transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface.

[0018] In some embodiments, each one of the opposed upright portions includes a first side region facing a first direction and a second side region facing a second direction, the transverse member being positionable against the corresponding first or second side regions of the opposed upright portions to enable the device to be operated in either the first direction or the second direction support structure.

[0019] In some embodiments, each upright portion includes a pair of lateral portions, each including a first post portion, the first post portions converging on an offset second post portion. The offset second post portion may be integrally formed with an overarching hoop portion or be associated in other configurations.

[0020] In some embodiments, each side region may include a plurality of clamp formations, where the transverse member are engageable with a corresponding one of said clamp formations. Each clamp formulation may include a recess bordered by a pair of locking flanges for snap-fitting the transverse member therein.

[0021] Some embodiments may further comprise a track arrangement and at least one carriage portion for travel along the track arrangement, the support structure being positioned on the carriage. At least one carriage portion may include a pair of carriage portions, the support structure having a pair of lateral portions, one of said carriage portions being joined to a corresponding lateral portion, the track arrangement including a pair of track portions, each positioned on an opposite side of the game surface, each carriage portion being engaged with a corresponding track portion.

[0022] In some embodiments, each track portion is fixed in position adjacent the game surface, the track portion having a predetermined first profile, each carriage portion including a bearing member having a second profile to be complementary with the first profile. The first profile may include a first outer profile, while the second profile may include a second inner profile.

[0023] In some embodiments, the bearing member including a V-shaped slide assembly and each carriage portion includes a base member with a pair of slide assemblies mounted near opposite ends thereof.

[0024] In some embodiments, at least one of said carriage portion including a brake arrangement mounted on the base member. The brake arrangement includes a brake pad and a drive unit for displacing the brake pad relative to a corresponding brake surface portion on the track portion. The drive unit may include a threaded fastener, operating between the base member and a brake plate portion, the brake pad being biased outwardly from the brake plate portion.

[0025] In some embodiments, each track portion has a pair of outer limit portions for limiting travel of the carriages to between the limiting portions. At least one carriage portion may include a dampening portion for cushioning impact with outer limit portions. The dampening portion may include at least one shock absorber including a piston operatively mounted in a shock absorber housing, the shock absorber being arranged to displace the piston relative to the housing upon impact occurring at outer limit portion.

[0026] In some embodiments, the outer limit portion includes a bumper portion. The bumper portion may include a bumper rod spring loaded in a bumper body. The dampening portion may include a dual acting shock absorbing unit having a housing with opposed end regions, a piston rod mounted in the housing, the piston rod having a pair of opposed end regions, each extending outwardly from a corresponding end region, a first of the end regions being arranged to engage one of said outer limit portions and a second of said end regions being arranged to engage another of said

outer limit portions. A pair of first brace members may be mounted on opposed ends of the base member and extending outwardly therefrom to support the housing therebetween.

[0027] In some embodiments, the brake arrangement includes a cable anchored to the base member, at least one first follower pulley mounted at one end of the track portion and at least one second follower pulley mounted at an oppose end of the track portion, at least one braking pulley adjacent the at least one second follower pulley and a brake unit associated with the braking pulley, the cable being entrained on the first follower pulley, the at least one second follower pulley and the braking pulley.

[0028] In another embodiment, there is also provided method of conducting athletic training, comprising:

i. providing a support structure which is mounted for travel along a game surface,

ii. providing the support with a upright portions positioned on opposite sides of the game surface;

iii. providing a transverse member which extends between the upright portions and positionable at one oaf plurality of operative elevations relative to the opposed upright portions;

iv. selecting an operative elevation corresponding to an elevation for a trainee to grip the transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface;

v. positioning the support structure at a designated home position above the game surface;

vi. the trainee stepping onto the game surface, gripping the transverse member and advancing the support structure along the game surface.

[0029] In a still further embodiment, there is provided a method of conducting athletic training, comprising:

i. providing a support structure which is mounted for travel along a game surface,

ii. providing the support with a upright portions positioned on opposite sides of the game surface;

iii. providing two or more transverse members which extend between the upright portions and positionable at one oaf plurality of operative elevations relative to the opposed upright portions;

iv. arranging a first of the transverse members to engage the upright portions on a first side of the support structure;

v. selecting an operative elevation corresponding to an elevation for a first trainee to grip the first transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface;

vi. positioning the support structure at a designated first position above the game surface;

vii. the first trainee stepping onto the game surface, gripping the first transverse member and advancing the support structure along the game surface from the first position to a second position;

viii. arranging a second of the transverse members to engage the upright portions on a second side of the support structure;

ix. selecting an operative elevation corresponding to an elevation for a second trainee to grip the second transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface; and

x. the second trainee stepping onto the game surface, gripping the second transverse member and advancing the support structure along the game surface from the second position to the first position;

[0030] In yet another embodiment, there is provided a training device comprising a support structure mounted for travel along a game surface, a track arrangement and at least one carriage portion for travel along the track arrangement, the support structure being positioned on the carriage portion, the support structure having a pair of opposed upright portions, the support structure arranged for a trainee to exert lateral forces thereon, the support structure providing at least one handle formation positionable at a plurality of operative elevations relative to the opposed upright portions, a selected operative elevation corresponding to an elevation for a trainee to grip the handle formation and exert sufficient lateral force thereto to advance the support structure along the game surface.

[0031] In some embodiments, the at least one carriage portion includes a pair of carriage portions, the support structure having a pair of lateral portions, one of said carriage portions being joined to a corresponding lateral portion, the track arrangement

including a pair of track portions, each positioned on an opposite side of the game surface, each carriage portion being engaged with a corresponding track portion.

[0032] In some embodiments, each track portion is fixed in position adjacent the game surface, the track portion having a predetermined first profile, each carriage portion including a bearing member having a second profile to be complementary with the first profile.

[0033] In some embodiments, the first profile includes a first outer profile, the second profile including a second inner profile.

[0034] In some embodiments, the bearing member includes a U-shaped slide assembly.

[0035] In some embodiments, each carriage portion includes a base member with a pair of slide assemblies mounted near opposite ends thereof.

[0036] In some embodiments, at least one of said carriage portion includes a brake arrangement mounted on the base member.

[0037] In some embodiments, the brake arrangement includes a brake pad and a drive unit for displacing the brake pad relative to a corresponding brake surface portion on the track portion.

[0038] Some embodiments further comprise a control unit configured to dynamically control said brake arrangement.

[0039] Some embodiments further comprise a sensor to measure a position of said carriage along said track portion, said control unit configured communicate with said sensor.

[0040] In some embodiments, the control unit is configured to dynamically control said brake arrangement as a function of position and/or time.

[0041] In some embodiments, the control unit is configured to collect data for analysis and display,

[0042] In some embodiments, the control unit is configured to calculate speed and/or acceleration as a function of time and/or brake control.

[0043] In yet another embodiment, there is provided a method of measuring performance improvement of a trainee, said method comprising steps of: providing a training device as defined in claim 38; executing a series of predefined training exercises; measuring position, time and brake control information; storing said measured information; displaying performance data compiled from said stored information as a function of time.

[0044] Referring now to the figures, there is provided a training device 10 having a support structure 12 mounted for travel along a game surface 14. The support structure 12 has a pair of opposed upright sections shown generally at 16, 18. When viewing the device 10 in figure 2, it can be seen that each upright section 16, 18 includes a pair of lateral portions, in the form of symmetrically arranged first post portions 20a, 20b which converge on an offset second post portion 22. As can be seen in figure 1, each second post portion 22 is offset from a corresponding peripheral region 14a of the game surface 14 to define a trainee access zone therebetween. The offset second post portions 22 are integrally formed with an overarching hoop portion 22a. A transverse member 26 extends between and is positionable at one of a plurality of operative elevations relative to the offset second post portions 22. Referring to figure 2, a selected operative elevation corresponds to an elevation for a trainee 28 to grip the transverse member 26 and exert sufficient lateral force thereto to advance the support structure 12 along the game surface 14.

[0045] Referring to figure 1, the game surface 14 in this example is an artificial skating surface provided by a substrate in the form of a modular panel assembly 30 that is made from moldable synthetic resin, which may include anyone or more of high density polyethylene, polypropylene, and fluorinated polyethylene, which provide(s) a suitable operative hockey playing surface Suitable substrates of this type are available under the trade name of EZ GLIDE. Further information is available from www.coldproducts.com. Other examples of the suitable materials may be wood, carpet, and/or rubber that may be in a single sheet or a plurality of slabs panels of uniform size or non-uniform size with confronting edges or edges of interlocking relationship, for use with other athletic activities.

[0046] Referring to figure 3, for the opposed upright section 16, each of the opposed upright sections 16, 18 provide a pair of opposed side regions 22b, 22c which are found, in this case, on the offset second post portions 22. The transverse member 26 is positionable against a corresponding side region 22b, 22c to enable the device 10 to be operated from both sides of the support structure 12.

[0047] In this example, each of the side regions 22b, 22c includes a plurality of clamp formations 32 to receive the transverse member 26. The transverse member 26 itself is provided with a cross sectional area and profile equivalent to a shaft of standard hockey stick and engageable with a corresponding one of the clamp formations 32. The transverse member 26 may be formed with other cross sections, and may include additional handle or other support formations or harnesses as need be. Other alternative cross section areas and/or profiles may be used for securing the frame member in position, such as a sliding clamp that is adjustable along the opposed second frame portions and/or attached to the transverse member 26 itself.

[0048] In this example, the clamp formations 32 are provided on a pair of clamp bodies 34 fastened together by fasteners 35. Each clamp body 34 has a back wall 34a having a circular shape to engage the second post portion 22. The clamp body 34 has a front face 34b with a number of clamp recesses 36. Each recess 36 is bordered by a

pair of locking flanges 38 for snap-fitting the transverse member 26 therein. Each clamp formation 32 includes a pair of opposed grooves 36a. The transverse member 26 has end regions 26a fitted with spring-loaded pin or ball formations 26b, each to engage a corresponding groove 36a. The number of clamp formations 32 may be selected according to the desired number of incremental adjustments.

[0049] Referring to figure 1, the device 10 includes a track arrangement 42 with at least one, in this case two, carriage portions 44 for travel along the track arrangement 42 with the support structure 12 being positioned on the carriage portions 44. In this case, each group of first and second frame portions 20, 22 is secured to a common carriage portion 44. The track arrangement 42 includes a pair of track portions 46, each positioned on an opposite side of the game surface 14. Each carriage portion 44 is engaged with a corresponding track portion 46.

[0050] Referring to figures 4 and 6, each track portion 46 has a predetermined first profile 46a. Each carriage portion 44 includes one or more bearing members 48, each with a second profile 48a to be complementary with the first profile 46a. In this example the first profile 46a includes a first outer profile and the second profile 48a includes a second inner profile, though the profiles may be reversed or be a combination of inner and outer profiles as desired. In this case, the bearing members 48 are inverted U-shaped in cross section and are secured (figure 2) on opposite end regions 50a of a base member 50.

[0051] Referring to figure 4, at least one (in this case both) of the carriage portions 44 includes a brake arrangement 54 mounted on the base member 50. In this example, one brake arrangement is provided on each carriage portion 44. Referring to figure 4, each brake arrangement 54 includes brake pad 54a and a drive unit 56 for displacing the brake pad 54a relative to a corresponding brake surface portion 46b on the track portion 46. In this case, the drive unit 56 includes a threaded fastener 56a, which operates between the base member 50 and a brake plate portion 54b. The brake pad 54a is biased outwardly from the brake plate portion 54b by way of pair of spring

elements shown in phantom at 54c. Other mechanical and/or electrical braking arrangements may be employed, such as a powered solenoid or the like.

[0052] Referring to figures 1, 6 and 7, each of the track portions 46 has a pair of outer limit portions 46c, 46d for limiting the travel of the carriage portions 44 between the limiting portions. Each carriage portion 44 includes a dampening portion 58 for cushioning impact with the outer limit portions. In this example, the dampening portion 58 includes dual acting shock absorbing unit 60, having a housing 62 with opposed end regions 62a and a piston rod 64 mounted in the housing 62. A pair of first brace members 66 is mounted on opposed ends of the base member 50 and extend outwardly therefrom to support the housing 62 therebetween. The piston rod M has a pair of opposed end regions 64a, 64b, each extending outwardly from a corresponding housing end region 62a, 62b. In this case, the piston rod 64 may, if desired, be spring biased toward a central position, relative to the housing 62. A first of the end regions 64a of the piston rod 64 is arranged to engage one of the outer limit portions 46c at one end of the game surface 14, while a second of the end regions 64b is arranged to engage another of the outer limit portions 46d at the opposite end of the game surface 14.

[0053] Referring to figures 7 to 10, each of the outer limit portions 46c, 46d includes a bumper portion 70 with a bumper rod 72 spring loaded in a bumper body shown at 74, by way of a two stage spring assembly 76. The spring assembly 76 includes an inner sleeve member 78 with a central passage 78a therein which receives the bumper rod 72. The inner sleeve member 78 has a flange 78b on one end. The bumper rod 72 has an end portion 72a which extends into an inner passage in an end member 72b and a first spring member 80 acts between the end member 72b and the flange 78b. The bumper body 74 provides an inner passage 74a to receive the inner sleeve member 78 as well as an annular cavity 74b between the bumper body 74 and the inner sleeve member 78 to receive a second spring member 82. The latter thus acts between the flange 78b and an opposite boundary wall of the annular cavity 74b. A pair of bellows elements 84a, 84b are joined to the bumper body to the end member 72b in one case

and an opposite end member 72c in the other case to prevent contact with the working elements of the bumper portion 70.

[0054] Referring to figure 4, it can thus be seen that the brake arrangement 54 is useful to set a particular resistance level by adjusting the threaded fastener 56a, the tighter the setting, the more resistance provided. If desired, the threaded fastener 56a may be motorized to provide a controlled remote adjustment thereof according to a predetermined routine.

[0055] Referring to figures 7 and 8, the device 10 also provided with a resistance control arrangement 90 as shown which provides greater control in both braking and resistance. It will be understood that the device 10 may be operated with either the brake arrangement 54 or the resistance control arrangement 90 or both as presented in the illustrated example.

[0056] The resistance control arrangement 90 includes a cable 92 anchored to the base member 50 by way of block 92a with a first follower pulley shown schematically in figure 7 at 94a mounted at one end of the track portion 46 and one or more (in this case two) second follower pulleys 94b mounted at an opposite end of the track portion 46. A braking pulley 96 is positioned adjacent the second follower pulleys 94b and a brake unit 98 is associated with the braking pulley 96 and mounted on a frame structure shown at 100. One example of the brake unit and braking pulley is commercially available from WARNER ELECTRIC (Static Torque 1251b. ft.) part number 5383-170-004 EB825 24 volt and is operable to deliver a braking force to the cable 92 against a strut 98a anchored between the frame 100 and the braking unit 98. The cable, in this case, is entrained on the first follower pulley, the second follower pulleys and the braking pulley.

[0057] The resistance control arrangement 90 is also provided with a control unit shown schematically at 102 in figure 1, which is capable of providing commands to or adjustments to the braking force being delivered to the cable 92 by the brake unit 98 via

the braking pulley 96. The control unit 102 receives signals from one or more sensors, such as a rotation sensor shown schematically at 104 located adjacent the brake unit 98 to determine the rotational position of the pulley and thereby to determine the position of the support structure 12 along the track arrangement 42, the rate of travel of the support structure 12, the level of braking force exerted by the braking unit 98 and the like. Another type of sensor is a proximity sensor 200. One or more proximity sensors can be positioned along the length of the track (such as at position "P" shown on Figure 18) to detect the local presence of carriage portion 44 and/or support structure 12, and thereby certain calculations can be inferred such as the rate of travel, and so on. The control unit 102 provides a graphical user interface 106 to present various data in a suitably informative manner to illustrate the operating parameters. The control unit 102 has a memory unit 108 to store data in order to provide a log of activities for one or more trainees.

[0058] In another embodiment of the invention, shown at Figures 21-22, a resistance control arrangement 209 is provided.

[0059] Referring to Figure 22C, there is shown an assembly 210, comprising a handle 211, threaded rod 212 and magnet 213. The magnet 213 is a high-strength rare-earth magnet. The threaded rod 212 can be threaded into the magnet 213 and also through a threaded hole in the handle 211. The threaded rod 212 is attached by way of a nut to the handle 211 and to the magnet 213. The handle 211 and threaded rod 212 are fabricated from aluminium.

[0060] Figure 22D shows a top assembly 214, shoe 215 and friction pad 216. Assembly 210 is inserted through the hollow cylinder in the top assembly 214, such that the magnet 213 rests on the shoe 215. There is magnetic attraction between the magnet 213 and the track portion 46 (which is made of steel), causing the magnet to pull the handle 211 in the direction of the friction pad 216. The handle 211 is mechanically connected to the shoe 215 which pushes upon the friction pad 216 and which also exerts force upon the track portion 46.

[0061] By varying the distance between the magnet 213 and the track portion 46, the magnetic force can be varied. Because of the strength of the magnet 213, a small variance can result in a large change in force - for example a 0.5 mm change in magnet displacement can vary the force applied by 5 lbs.

[0062] In a preferred embodiment, prior to use, the force is calibrated using a pull gauge. In a further preferred embodiment, a series of assemblies 210 are employed, each calibrated to exert a different force. In use, a different force can be exerted merely by removing one assembly and replacing with a different one.

[0063] Figure 22D also shows a retaining pin 217 and spring catch 218. The retaining pin 217 has a groove, engagable by the spring catch 218. When engaged, the friction pad 216 is held away from the track portion 46, exerting no force thereupon.

[0064] An advantage of the use of a magnet to generate force, is that compared to spring-based systems, a magnet based system is not as susceptible to fatigue and a consequent variability and lack of accuracy or reliability in training.

[0065] The control unit and its associated components are, in this case, computer implemented and may be provided in a number of forms. They may be embodied in a software program configured to run on one or more general purpose computers, such as a personal computer, or on a single custom built computer, such as programmed logic controller (PLC) which is dedicated to the function of the system alone. The system may, alternatively, be executed on a more substantial computer mainframe. The general purpose computer may work within a network involving several general purpose computers, for example those sold under the trade names APPLE or IBM, or clones thereof, which are programmed with operating systems known by the trade names WINDOWS, LINUX or other well known or lesser known equivalents of these. The system may involve pre-programmed software using a number of possible languages or a custom designed version of a programming software sold under the trade name ACCESS or other programming software. The computer network may be a wired local

area network, or a wide area network such as the Internet, or a combination of the two, with or without added security, authentication protocols, or under "peer-to-peer" or "client-server" or other networking architectures. The network may also be a wireless network or a combination of wired and wireless networks. The wireless network may operate under frequencies such as those dubbed 'radio frequency' or "RF" using protocols such as the 802.11, TCP/IP, BLUE TOOTH and the like, or other well known Internet, wireless, satellite or cell packet protocols.

[0066] The control unit may provide the ability to dynamically vary the resistance as a function of time or a function of position along the track portion (sometimes referred to as a rail) or alternatively in response to a signal from a coach. Thus, the resistance may automatically increase as a training routine progresses, or as a training program progresses from day to day or week to week. Also, various training scenarios may be simulated such as checking an opposing player or being checked. Other scenarios may include interval training where the force is increased and decreased at regular intervals to help build muscle or endurance or reaction time. Additional sensors may be provided to measure load on braking unit 90 or force exerted on transverse member 26. Data from these sensors may be combined to calculate force exerted, skating speed, physical work being performed, acceleration, response time to a decrease in resistance. These data may be recorded and logged for later retrieval, analysis and display in tabular or graphical form. This may be useful for measuring improvement of performance of a player over a training period or season; or from season to season; or for comparing skating strength between different players.

[0067] The device 10 may be used in a number of different arrangements.

[0068] For the arrangement using only the manual braking arrangement, the support structure 12 is located at a home position at a designated end of the game surface 14. The transverse member 26 is adjusted to elevation suitable for a particular trainee. For instance, a child trainee will like1y have the transverse member 26 at a position lower than an adult trainee. The resistance applied by the manual braking arrangement may

then be adjusted according to the type of exercise being carried out on the unit, from no force for a coasting exercise, to a minimal force to a maximum force and force levels therebetween by an appropriate adjustment of the threaded fastener. The dampening arrangement is then configured to be sure that the end region of the piston rod extends outwardly from the housing in the direction of travel.

[0069] The trainee may then climb onto the game surface 14, grip the transverse member 26 and displace the support structure 12 along the track arrangement to the other end of the game surface 14. As the support structure 12 nears that location, the end region of the piston rod contacts the end member 72b of the bumper portion 70. The end member 72b thus displaces the bumper rod 72 against the biasing action of the first spring member 80 until the end member 72b contacts the flange 78b. At this stage, the flange 78b acts against the biasing action of the second spring member 82 while the flange is displaced toward the adjacent end of the bumper body 74. The dampening arrangement then provides for a controlled deceleration and halting of the support structure 12 without requiring the trainee to exert forces on the transverse member 26 for the support structure 12 to step. The support structure 12 may then be used in the reverse direction since the transverse member 26 is accessible from both sides thereof. However, in this case, to use the support structure 12 in the reverse direction, the transverse member 26 is removed from its current position on one side of the offset second post portion and placed on the opposite side thereof and reinstalled in position in a corresponding pair of recesses. Alternatively, the support structure may be returned to its designed home position. Thus, the device may be used with two players, each with its own transverse member, and stationed at opposite ends of the track.

[0070] For the arrangement using the resistance control arrangement 90, the control unit is activated and an exercise program may be selected. The control unit 102 may provide a number of windows to identify/characterize a trainee and to identify/characterize the type of training. The control unit then issues signals to the brake unit to adjust the braking force being exerted on the braking pulley. The signals may be intermittent and/or follow a prescribed schedule according to distance and/or

speed along the game surface 14 as the control unit tracks the position and/or acceleration of the support structure 12.

[0071] If desired, a drive unit may also be integrated into the brake arrangement as shown, for example, in dashed lines at 110 in figure 15. In this case, a third group of two or more follower pulleys 112 may be employed to direct the cable around a drive pulley 114 which in turn may be equipped to a suitable drive unit, such as, for instance, a stepping motor, not shown. In this case, then, the resistance control arrangement may also be configured to return the support structure 12 to a home position. In this case, the drive pulley may be provided with an interrupt circuit, akin to an automatic door closer control functions used in passenger vans, such as the van commercially available under the model ODYSSEY, by HONDA MOTOR COMPANY, in the model year 2005, to suspend travel of the support structure 12 when detecting an obstacle.

[0072] A portion of another device 120 is shown in figure 16. In this case, the device 120 makes use of a bumper portion 122 to replaced the bumper portion 74 as illustrated above. In this case, the bumper portion 122 has a stationary rod 124 which is anchored at one end region 124a to a base portion 126, itself fastened in a location adjacent the game surface. The stationary rod 124 has a remote end region 124b which includes a block member 128 anchored thereto. Positioned in a mid-region of the rod 124 is a floating member 130 which is slidable along the rod 124. Positioned between and fastened to both the floating member 130 and the base portion 126 is a first spring element 132 of a first spring rate R1. Positioned on an opposite side of the floating member 130 is a second spring element 134 of a second spring rate R2. The second spring element 134 has an opposite end region 134a. Located between the opposite end region 134a and the block member 128 is flange portion 136 which slidable along the rod 124. The flange portion 136 is coupled to a bumper carriage portion 138 to travel along the track portion 146. The bumper carriage portion 138 is thus located along the track portion 140 at a location to engage a corresponding carriage portion shown schematically at 44 (with the associated support structure not shown). On engagement with the carriage portion 44, the bumper carriage portion 138 causes the

flange portion 136 to displace in a manner to compress the combination of the first and second spring elements 132, 134. Of course, the extent of the compressions of each depends on the spring rate between them. For instance, it may be desirable to have the first spring rate R1 larger than the second spring rate R2. The spring rates R1, R2 may be chosen, for instance, so that the second spring rate R2 is chosen to provide a suitable braking function for a relatively lighter user, such as a child hockey player, while the first spring rate R1 is chosen to provide a suitable braking function for a relatively heavier user, such as a child hockey player.

[0073] Thus, in one example, the device 10 may be considered a resistance trainer which provides a structure in the form of a carriage that sits on rails. The carriage may thus be pushed or pulled as the case may be. The rails may be equipped with carriage rail brake pads or magnetic resistance means to adjust to increase or decreasing resistance during the transfer of the carriage along the rails. A computer program may also be provided to add or reduce resistance at any time or at any location as desired, according to a predetermined athletic exercise routine, along the length of the game surface 14 which may, for instance, extend from about 10 feet to about 100 feet, or for instance about 72 feet or any other length for the intended athletic activity. In one specific example, the carriage may be built on ½ inch synthetic ice that is 72ft long. Further braking and safety features may be added as desired to prevent or at least minimize sudden stops.

[0074] This resistance trainer may thus provide a training regime for power skating athletes so that they may become stronger and more technically sound skaters.

[0075] The resistance trainer may desirably set the athlete in a proper skating posture by a simplified adjustable height mechanism to allow the adults and children alike to use the device 10 comfortably. The device 10 is capable of being operated in two opposite directions, so that one training sequence to occur in one direction to the end of travel and then another training sequence to occur in an opposite direction, again to the end of travel. A supervising coach may then provide an adjustable resistance by

adjusting the fastener or by a more automated version with the touch of a dial or by way of an executed command sequence in an accompanying computerized program, whose operating functions may be set uniquely for each user or group of users, as the case may be. This enables the device 10 to provide resistance to train, in one orientation, the skating muscles when pushing or pulling by having the hands on the bar posture is maintained and where the workload is focused on the legs with skates on or off. The device 10 may be adjusted so that minimal leverage or momentum is generated from the arms. This has the benefit of magnifying the work load and providing maximum strength training.

[0076] Thus, as shown in figure 17, the device 10 allows for a method of training for two or more trainees, by providing two or more transverse members which extend between the upright portions and positionable at one of a plurality of operative elevations relative to the opposed upright portions. For the first trainee 144, a first of the transverse members 146 may be provided to engage the upright portions on a first side of the support structure. An operative elevation may be selected which is appropriate for the first trainee to grip the first transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface. The support structure may then be positioned at a designated first position above the game surface. The first trainee 144 may then step onto the game surface, grip the first transverse member 146 and advance the support structure along the game surface from the first position to a second position shown at 148, remove the first transverse member 146 and step off the game surface. Then, a second of the transverse members 150 to engage the upright portions on a second side of the support structure and suitable elevation for the second transverse member may be selected for a second trainee 152, waiting at the second position, to grip the second transverse member 150 and exert sufficient lateral force thereto to advance the support structure along the game surface. The second trainee 152 may then step onto the game surface, grip the second transverse member 150 and advance the support structure along the game surface from the second position to the first position. This can result in a substantial reduction in preparation time and allow for two trainees to be using the device during a single operating period if desired.

Moreover, more than two trainees may be able to take advantage of a single operating period by each having his own transverse member. For instance, a third trainee might need additional support accessories on a designated third transverse member. In other words the transverse members may then be tailored, if desired, to the needs of each trainee.

[0077] The carriage structure may thus be pulled, pushed or used sideways for skating "crossovers" may be used with resistance or for speed training without resistance, or perhaps a portion of both intermittently along the length of the track.

[0078] The device 10 may, in one aspect, be fabricated from industrial grade materials to provide reasonably long life, a reasonably smooth and quiet operation and, in some cases, allow for a game-like simulation to take place, though other operative modes may provide other useful non-game-like simulations as desired. The device 10 may provide adjustments in both the level of resistance and the timing or position adjustment for the resistance. In other words, the level of resistance may be adjusted so that it may be turned at a varied intensity at any location along the length of the track, depending on the level of control provided by the brake arrangement and its associated components. The device 10 may also provide an adjustable height bar (for stance, posture and maximum work load). The device 10 may be used young children or adults. The device 10 may also be used for other sports such as football, soccer, running and the like. In this case, the bar maybe interchangeable from a hockey stick shaft to blocker or shoulder pads. The dimensions of specific examples of the device 10 may thus be chosen depending on the intended athletic activity. The computerized controller may also be provided with network functionality if desired to permit remote access as need be, for example by medical professionals and the like. The device 10 may also be used for rehabilitation in sports therapy, for example by the use of a harness shown schematically at 25 in figure 1 which is coupled to the hoop portion 22a. The harness may be configured to hold more than 500 pound athletes or other individuals coming off a knee injury or back injury even for the hospitals for people learning to walk after major surgery on hips feet back etc.

[0079] The resistance trainer may thus allow coaches greater control in the athletic training of athletes. In one example, a length of 72 feet of synthetic ice may enable the athlete to skate while the device 10 controls resistance level at a level to simulate certain aspects of the sport. The device 10, when computer controlled, provides a variable braking system which generates the level of resistance, with the ability to track the operation of the device 10 by the athlete, such as duration of a session, with speed, resistance and athletic response. The device 10 enables a subroutine to simulate contact with other hockey players. For instance, the device 10 may simulate the athlete to hit another hockey player, say at the 50 foot mark along the track, which may present the sensation that the hit hockey player is stationary, or skating, depending on the resistance operating profile of the computer based controller. The controller may also measure heart rate, blood pressure and the like during a session and adjust the resistance profile should the athlete present unusual characteristics. The device 10 may also provide enhanced rehabilitation to assist people to walk following a period of inactivity, by accident, disease or the like.

[0080] Thus, the device 10 is provided with primary and secondary dampening systems to assist in decelerating the device 10 smoothly and safely.

[0081] If desired, the device 10 may also be operated on an adjustable incline.

[0082] While device 10 is used with a pair of tracks portions secured on a substrate on opposite sides of a playing surface, the track portions may be portable and installed on a permanent game surface 14, such as in a hockey arena in the case of a game surface for hockey, in a basketball arena for a game surface for basketball, on a football field for use with a game surface of football.

[0083] The device may require the breaking and/or dampening functions in all examples depending on the training regimes being implemented.

[0084] The track arrangement may be permanently mounted adjacent the game surface or be positioned thereon and portable for transport between temporary or otherwise non-permanent installation sites. The transverse member 26 may, if desired, be replaced by other handle or body engaging formations, as desired, depending on the training regime and sport being implemented. The track arrangement may involve a single track member and corresponding carriage portion. The track arrangement may be located below, beside or above the game surface, such as on a floor, wall or ceiling. In this case, the transverse member may be held on the single carriage, such as in a cantilever fashion, if desired.

[0085] While the device is provided with a transverse member 26 for use in hockey simulations, other transverse members 26 may be used with other shapes and orientations to complement the sport in question. Moreover, the support structure 12 may provide a harness or the like in place of, or in conjunction, with the transverse member 26 as an interface between a user and the device.

[0086] Other track arrangements may be utilized, for example such as a single track arrangement which may be located adjacent to or above the game surface of a plurality of track arrangements located above the game surface.

[0087] While the present invention has been described for what are presently considered the preferred embodiments, the invention is not so limited. To the contrary, the invention is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

CLAIMS:

1. A training device comprising a support structure mounted for travel along a game surface, the support structure having a pair of opposed upright portions and a transverse member, the transverse member extending between and being positionable at one of a plurality of operative elevations relative to the opposed upright portions, a selected operative elevation corresponding to an elevation for a trainee to grip the transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface.

2. A device as defined in claim 1, each one of the opposed upright portions including a first side region facing a first direction and a second side region facing a second direction, the transverse member being positionable against the corresponding first or second side regions of the opposed upright portions to enable the device to be operated in either the first direction or the second direction support structure.

3. A device as defined in claim 2, each upright portion including a pair of lateral portions.

4. A device as defined in claim 3, each lateral portion including a first post portion, the first post portions converging on an offset second post portion.

5. A device as defined in claim 4, the offset second post portion being integrally formed with an overarching hoop portion.

6. A device as defined in claim 2, each side region including a plurality of clamp formations, the transverse member being engageable with a corresponding one of said clamp formations.

7. A device as defined in claim 6, each clamp formation including a recess bordered by a pair of locking flanges for snap-fitting the transverse member therein.

8. A device as defined in claim 1, further comprising a track arrangement and at least one carriage portion for travel along the track arrangement, the support structure being positioned on the carriage.

9. device as defined in claim 8, said at least one carriage portion including a pair of carriage p0l1ions, the support structure having a pair of lateral portions, one of said carriage portions being joined to a corresponding lateral portion, the track arrangement including a pair of track portions, each positioned on an opposite side of the game surface, each carriage portion being engaged with a corresponding track portion.

10. A device as defined in claim 9, each track portion being fixed in position adjacent the game surface, the track portion having a predetermined first profile, each carriage portion including a bearing member having a second profile to be complementary with the first profile.

11. A device as defined in claim 10, the first profile including a first outer profile, the second profile including a second inner profile.

12. A device as defined in claim 11, the bearing member including a U-shaped slide assembly.

13. A device as defined in claim 9, each carriage portion including a base member with a pair of slide assemblies mounted near opposite ends thereof.

14. A device as defined in claim 13, at least one of said carriage portions including a brake arrangement mounted on the base member.

15. A device as defined in claim 14, the brake arrangement including a brake pad and a drive unit for displacing the brake pad relative to a corresponding brake surface portion on the track portion.

16. A device as defined in claim 15, the drive unit including a threaded fastener.

17. A device as defined in claim 16, the threaded fastener operating between the base member and a brake plate portion, the brake pad being biased outwardly from the brake plate portion.

18. A device as defined in claim 8, each track portion having a pair of outer limit portions for limiting travel of the carriages to between the limiting portions, at least one carriage portion including a dampening portion for cushioning impact with outer limit portions.

19. A device as defined in claim 18, the dampening portion including at least one shock absorber including a piston operatively mounted in a shock absorber housing, the shock absorber being arranged to displace the piston relative to the housing upon impact occurring at outer limit portion.

20. A device as defined in claim 19, the outer limit portion including a bumper portion.

21. A device as defined in claim 20, the bumper portion including a bumper rod spring loaded in a bumper body.

22. A device as defined in claim 21, the dampening portion including dual acting shock absorbing unit having a housing with opposed end regions, a piston rod mounted in the housing, the piston rod having a pair of opposed end regions, each extending outwardly from a corresponding end region, a first of the end regions

being arranged to engage one of said outer limit portions and a second of said end regions being arranged to engage another of said outer limit portions.

23. A device as defined in claim 22, further comprising a pair of first brace members mounted on opposed ends of the base member and extending outwardly therefrom to support the housing therebetween.

24. A device as defined in claim 10, the brake arrangement including a cable anchored to the base member, at least one first follower pulley mounted at one end of the track portion and at least one second follower pulley mounted at an oppose end of the track portion, at least one braking pulley adjacent the at least one second follower pulley and a brake unit associated with the braking pulley, the cable being entrained on the first follower pulley, the at least one second follower pulley and the braking pulley.

25. A method of conducting athletic training, comprising:

- providing a support structure which is mounted for travel along a game surface,

- providing the support with a upright portions positioned on opposite sides of the game surface;

- providing a transverse member which extends between the upright portions and positionable at one of a plurality of operative elevations relative to the opposed upright portions;

- selecting an operative elevation corresponding to an elevation for a trainee to grip the transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface;

- positioning the support structure at a designated home position above the game surface;

- the trainee stepping onto the game surface, gripping the transverse member and advancing the support structure along the game surface.

26. A method of conducting athletic training, comprising:

- providing a support structure which is mounted for travel along a game surface,

- providing the support with a upright portions positioned on opposite sides of the game surface;

- providing two or more transverse members which extend between the upright portions and positionable at one of a plurality of operative elevations relative to the opposed upright portions;

- arranging a first of the transverse members to engage the upright portions on a first side of the support structure;

- selecting an operative elevation corresponding to an elevation for a first trainee to grip the first transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface;

- positioning the support structure at a designated first position above the game surface;

- the first trainee stepping onto the game surface, gripping the first transverse member and advancing the support structure along the game surface from the first position to a second position;

- arranging a second of the transverse members to engage the upright portions on a second side of the support structure;

- selecting an operative elevation corresponding to an elevation for a second trainee to grip the second transverse member and exert sufficient lateral force thereto to advance the support structure along the game surface; and

- the second trainee stepping onto the game surface, gripping the second transverse member and advancing the support structure along the game surface from the second position to the first position.

27. A training device comprising a support structure mounted for travel along a game surface, a track arrangement and at least one carriage portion for travel along the track arrangement, the support structure being positioned on the carriage portion, the support structure having one pair of opposed upright portions, the support structure arranged for a trainee to exert lateral forces thereon, the support structure providing at least one handle formation positionable at a plurality of operative elevations relative to the opposed upright portions, a selected operative elevation corresponding to an elevation for a trainee to grip the handle formation and exert sufficient lateral force thereto to advance the support structure along the game surface.

28. A device as defined in claim 27, the at least one carriage portion including a pair of carriage portions, the support structure having a pair of lateral portions, one of said carriage portions being joined to a corresponding lateral portion, the track arrangement including a pair of track portions, each positioned on an opposite side

of the game surface, each carriage portion being engaged with a corresponding track portion.

29. A device as defined in claim 28, each track portion being fixed in position adjacent the game surface, the track portion having a predetermined first profile, each carriage portion including a bearing member having a second profile to be complementary with the first profile.

30. A device as defined in claim 29, the first profile including a first outer profile, the second profile including a second inner profile.

31. A device as defined in claim 30, the bearing member including a U-shaped slide assembly.

32. A device as defined in claim 30, each carriage portion including a base member with a pair of slide assemblies mounted near opposite ends thereof.

33. A device as defined in claim 32, at least one of said carriage portion including a brake arrangement mounted on the base member.

34. A device as defined in claim 33, the brake arrangement including a brake pad and a drive unit for displacing the brake pad relative to a corresponding brake surface portion on the track portion.

35. A device as defined in claim 34, further comprising a control unit configured to dynamically control said brake arrangement.

36. A device as defined in claim 35, further comprising a sensor to measure a position of said carriage along said track portion, said control unit configured communicate with said sensor.

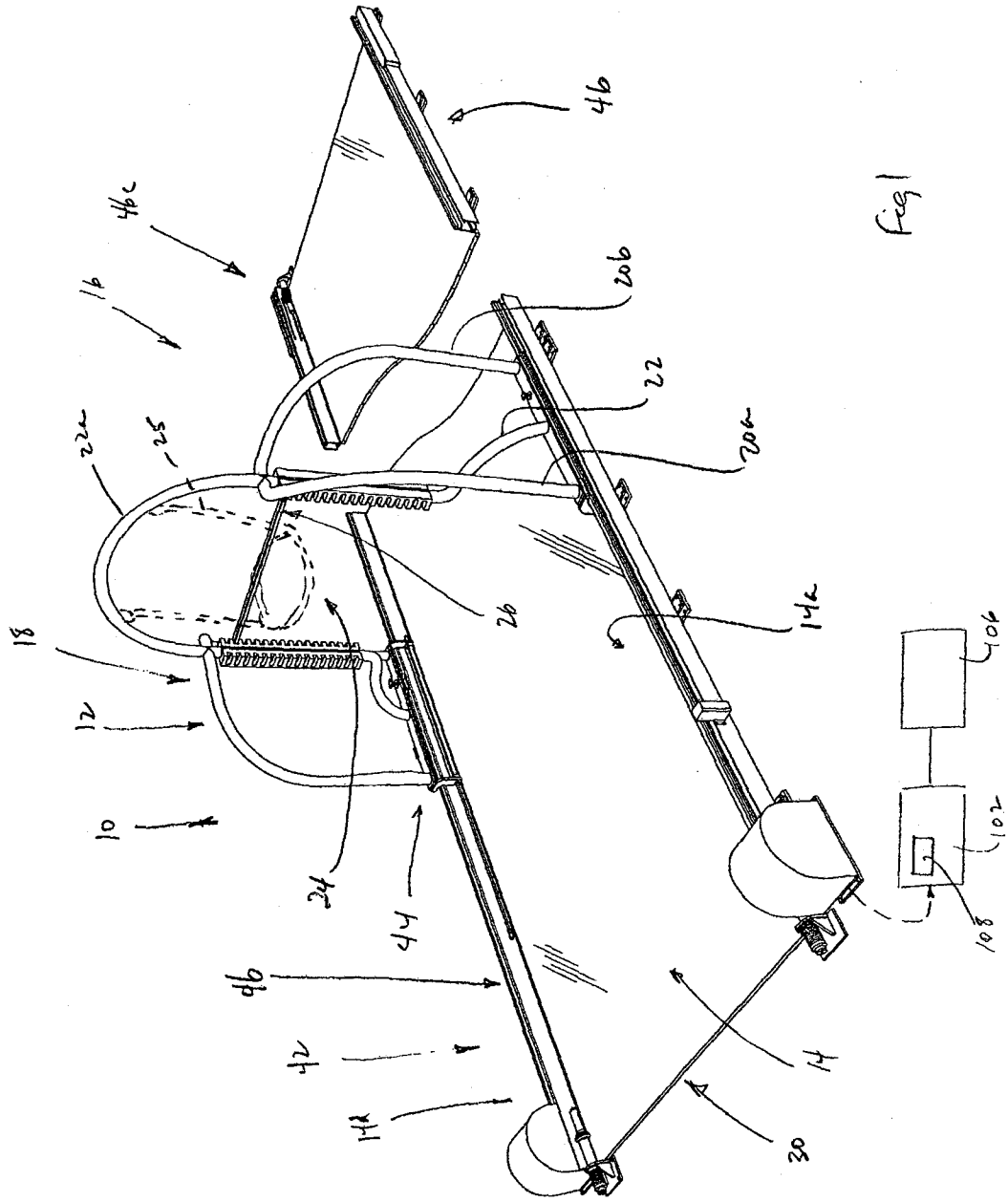
37. A device as defined in claim 36, wherein said control unit is configured to dynamically control said brake arrangement as a function of position and/or time.

38. A device as defined in claim 37, wherein said control unit is configured to collect data for analysis and display,

39. A device as defined in claim 38, wherein said control unit is configured to calculate speed and/or acceleration as a function of time and/or brake control.

40. A method of measuring performance improvement of a trainee, said method comprising steps of: providing a training device as defined in claim 38; executing a series of predefined training exercises; measuring position, time and brake control information; storing said measured information; and displaying performance data compiled from said stored information as a function of time.

41. A device as defined in claim 14 and 33, the brake arrangement including an assembly including a magnet for exerting a variable and controllable force on a corresponding brake surface portion on the track portion.


46
46c
16
206
22
22a
52
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142a
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12
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44
40b
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106
102
108

Fig 1

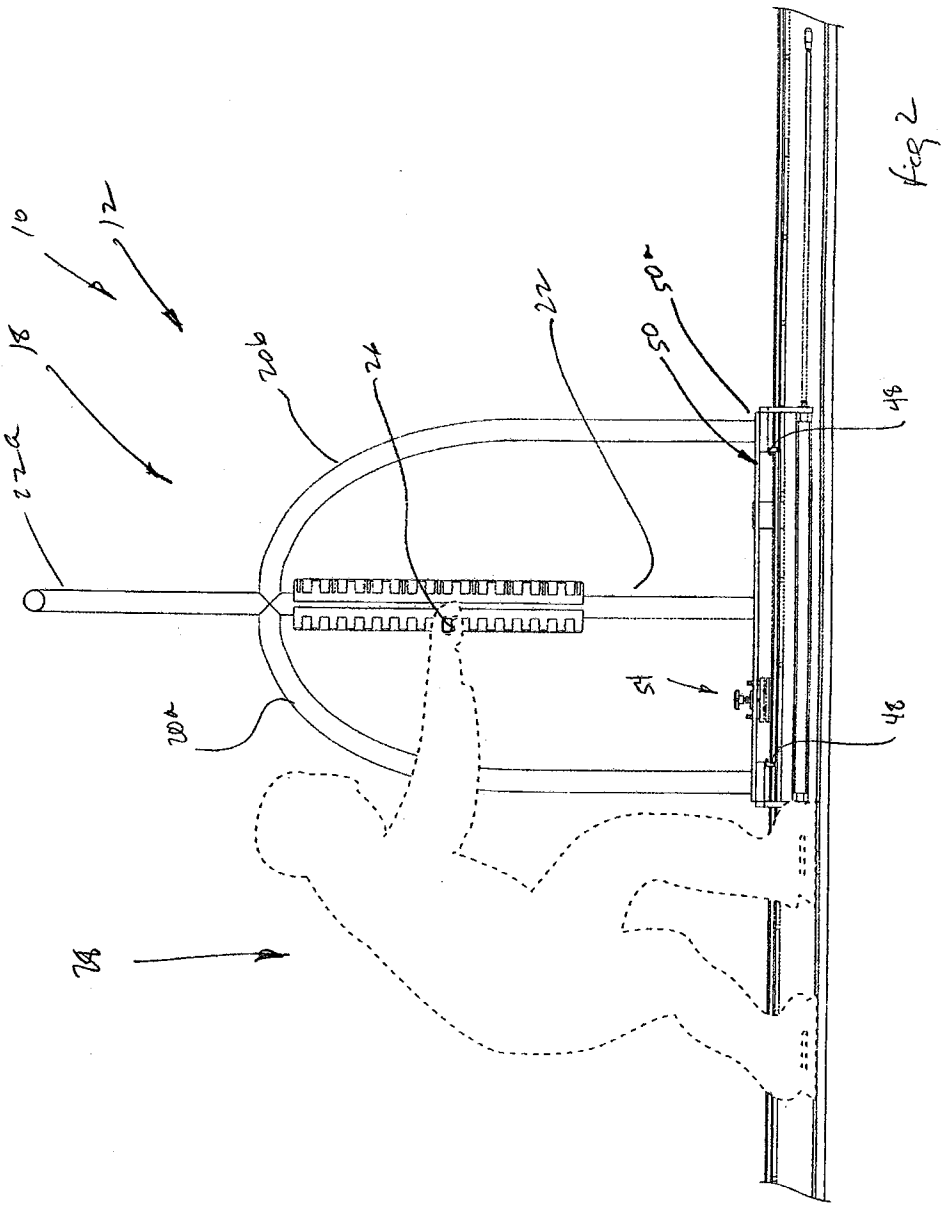

Fig 2

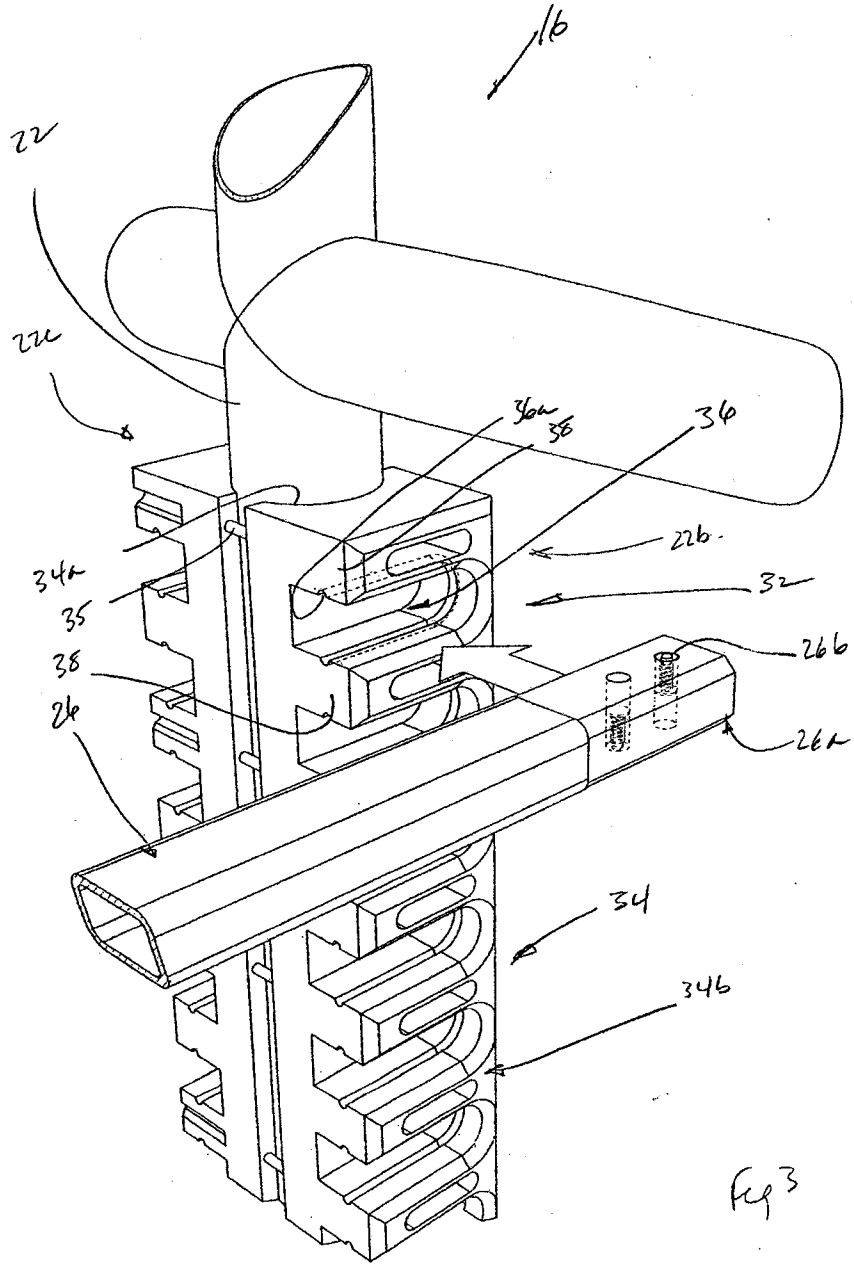

Fig 3

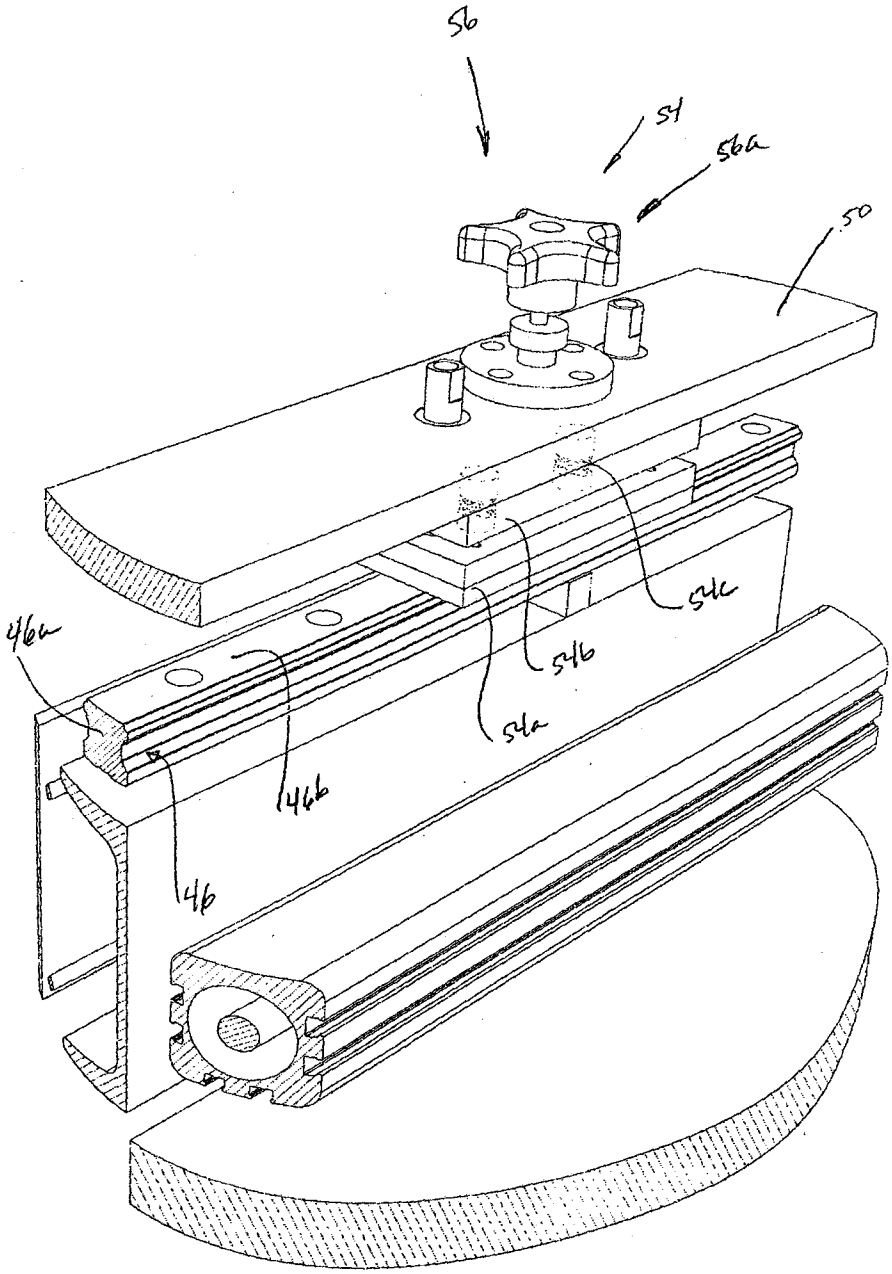

Fig 4

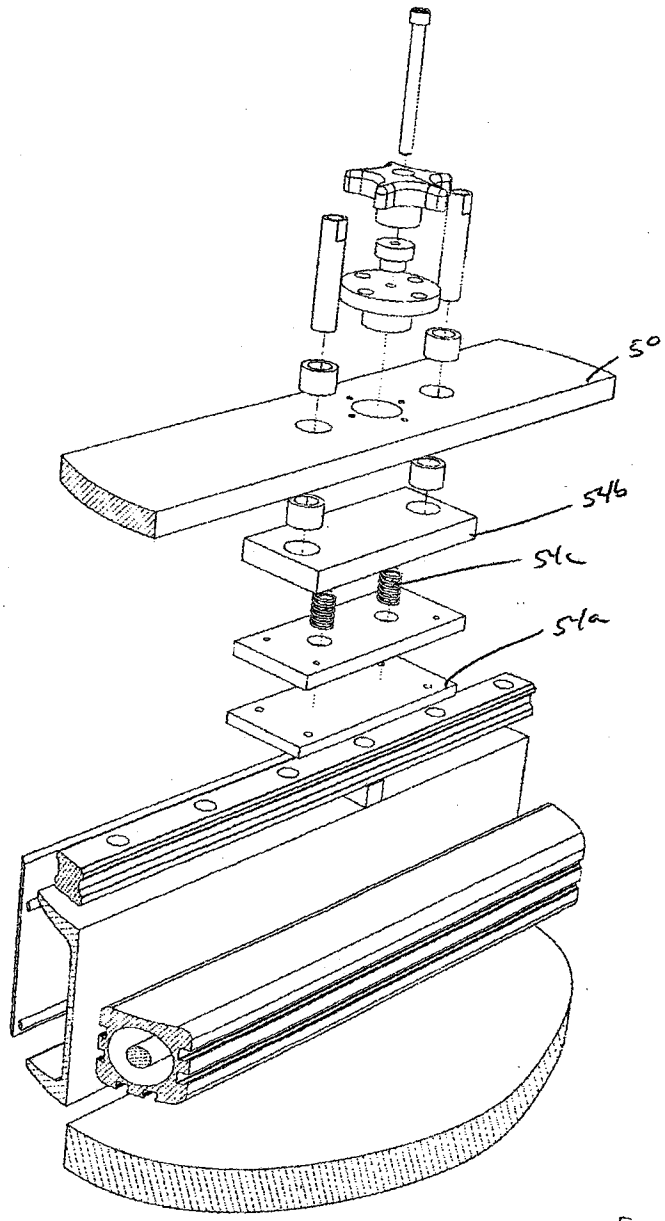

Fig 5

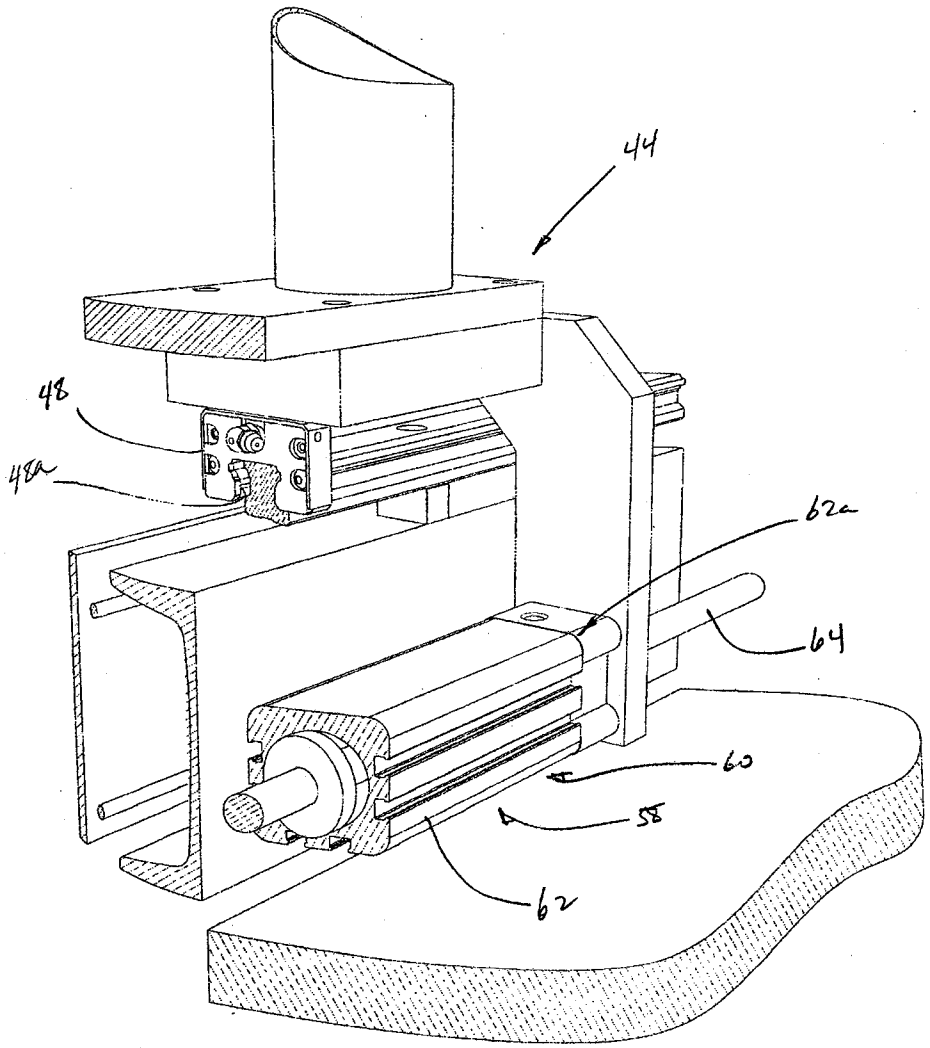

Fig 6

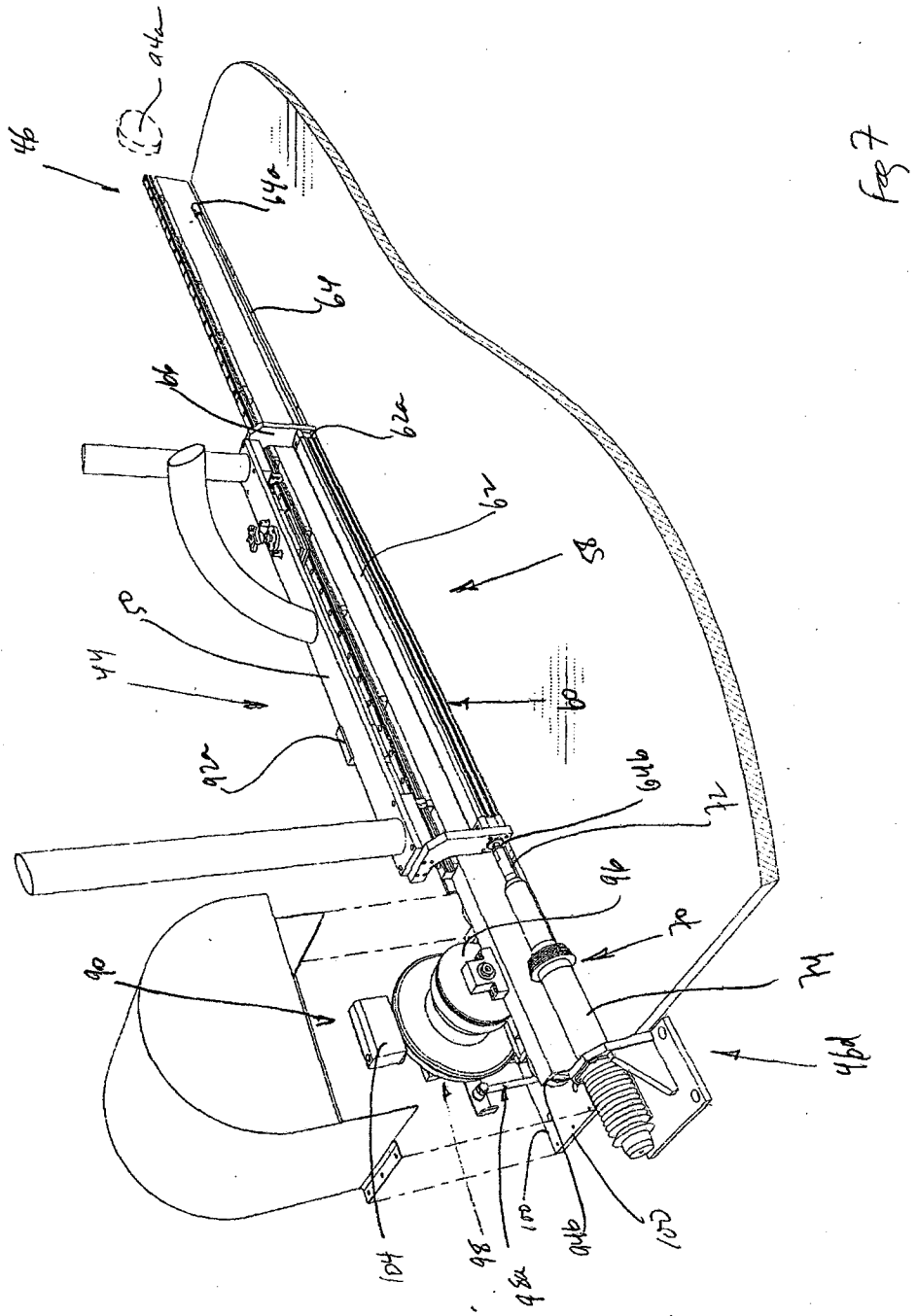

Fig 7

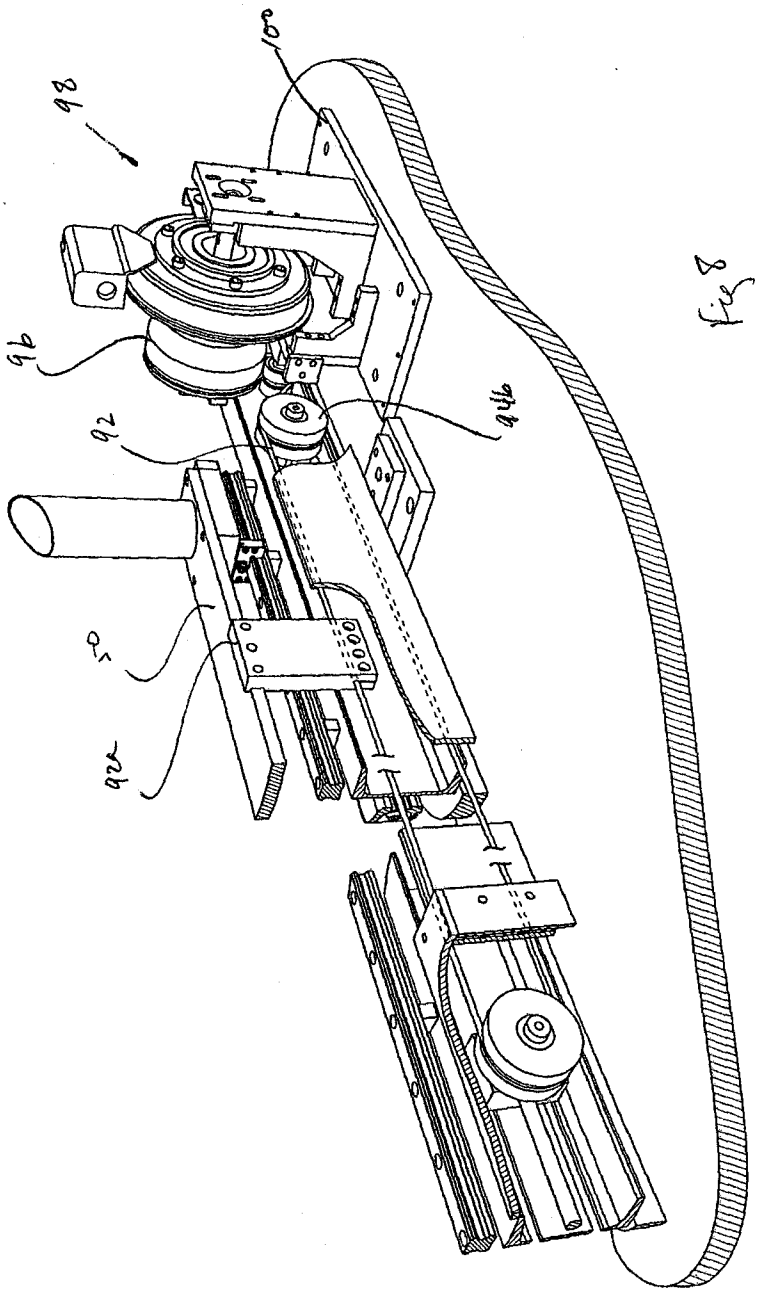

Fig 8

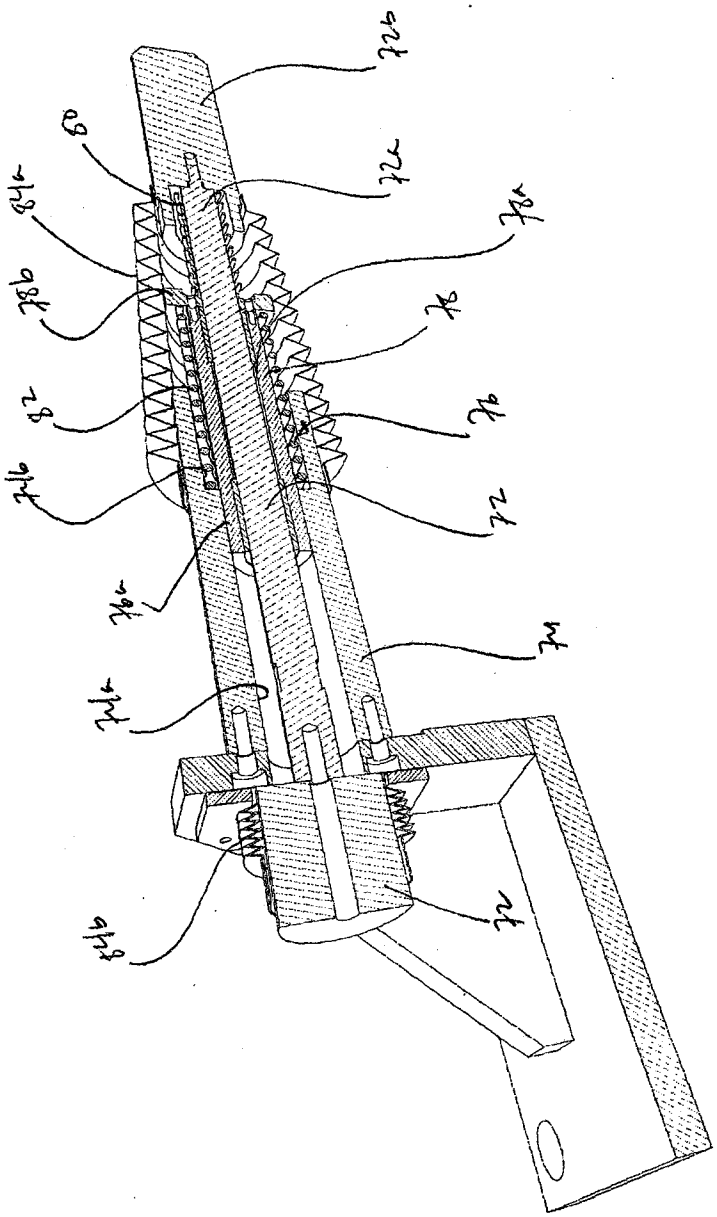

Fig 9

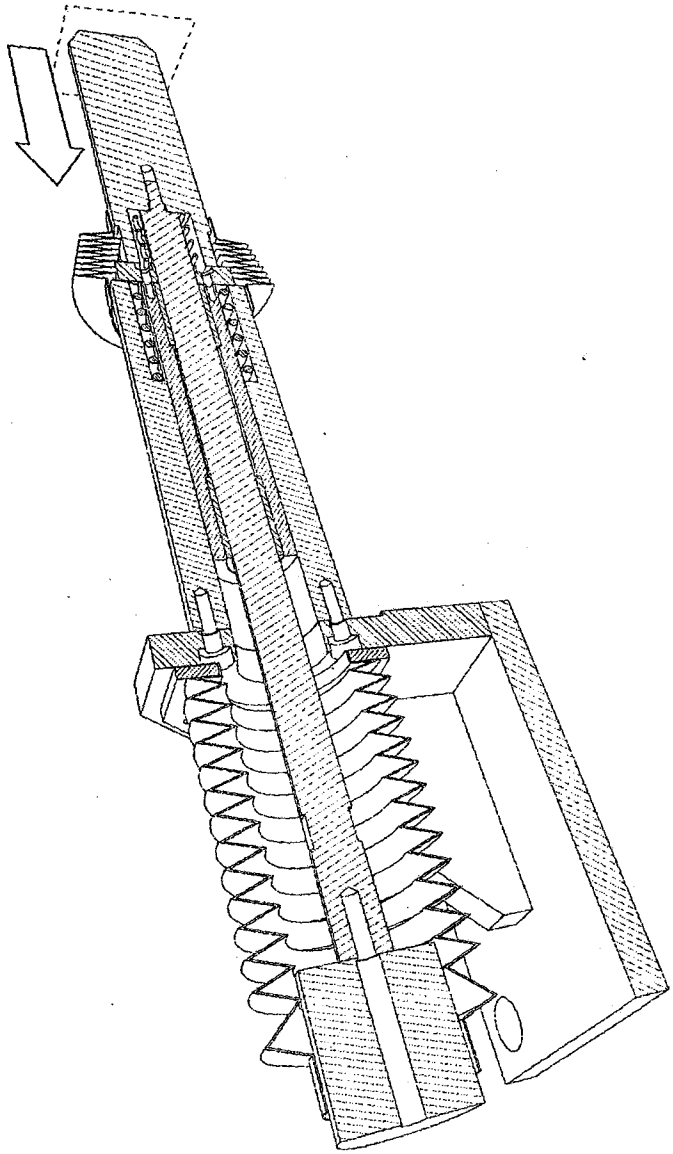

Fig 10

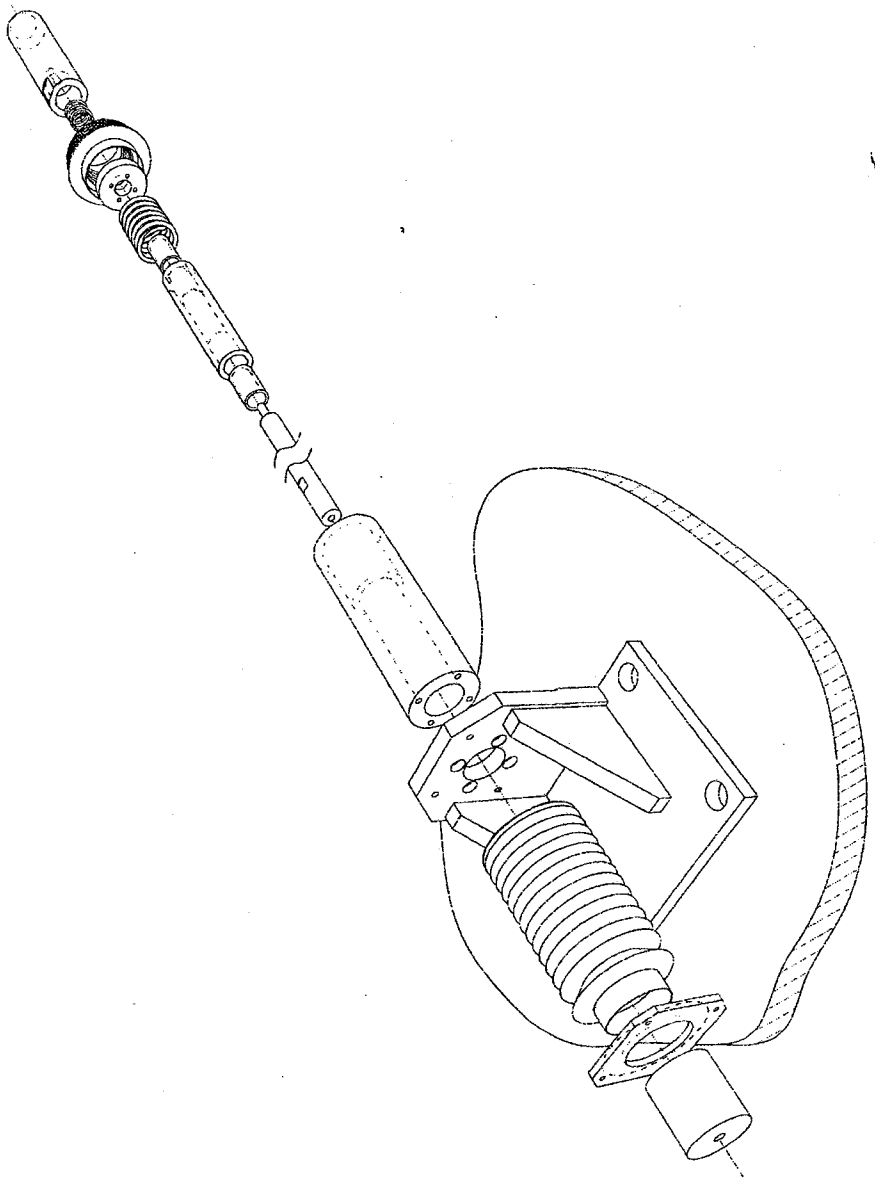

Fig 1

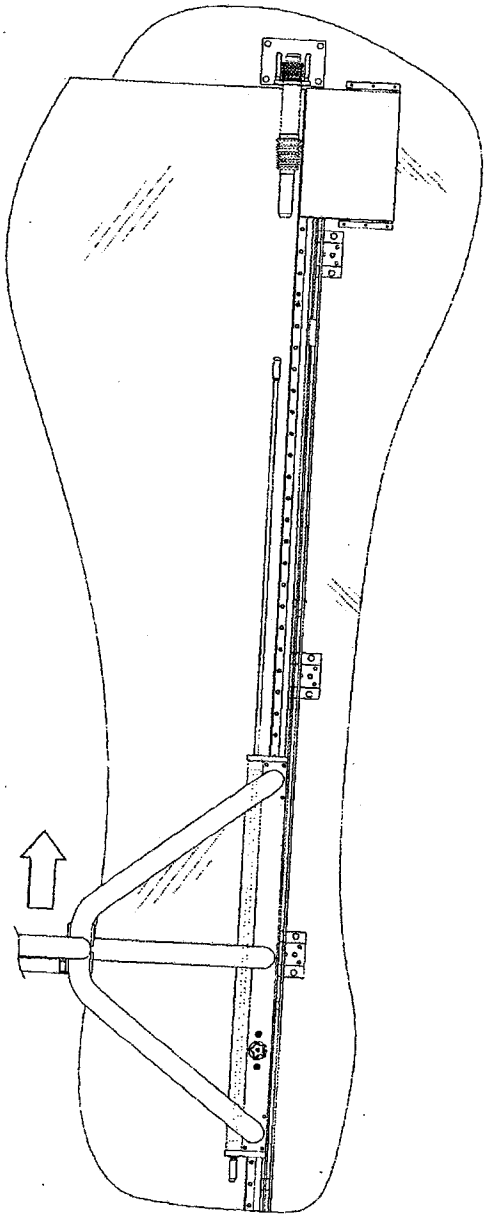

Fig 12

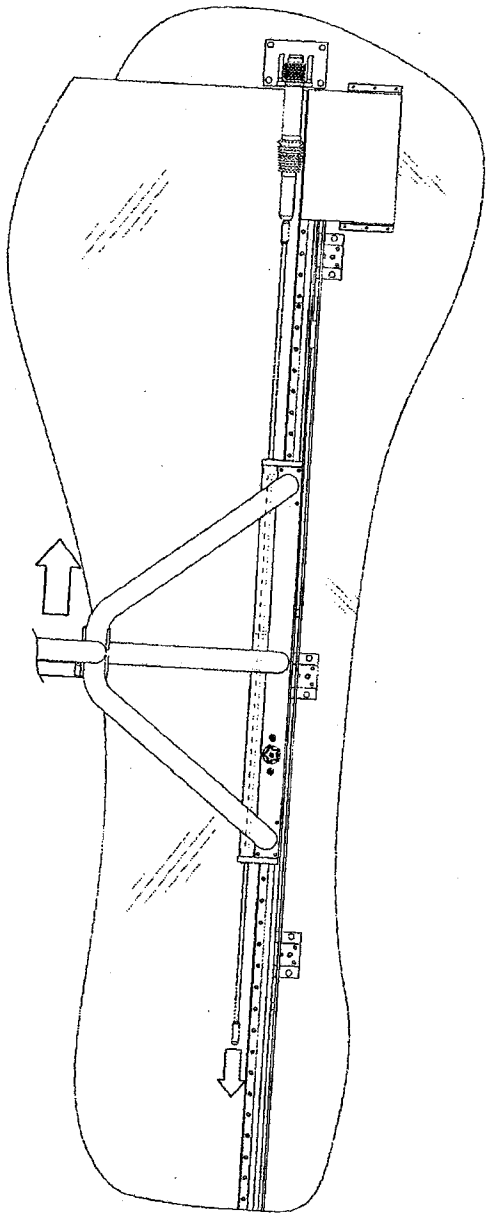

Fig 13

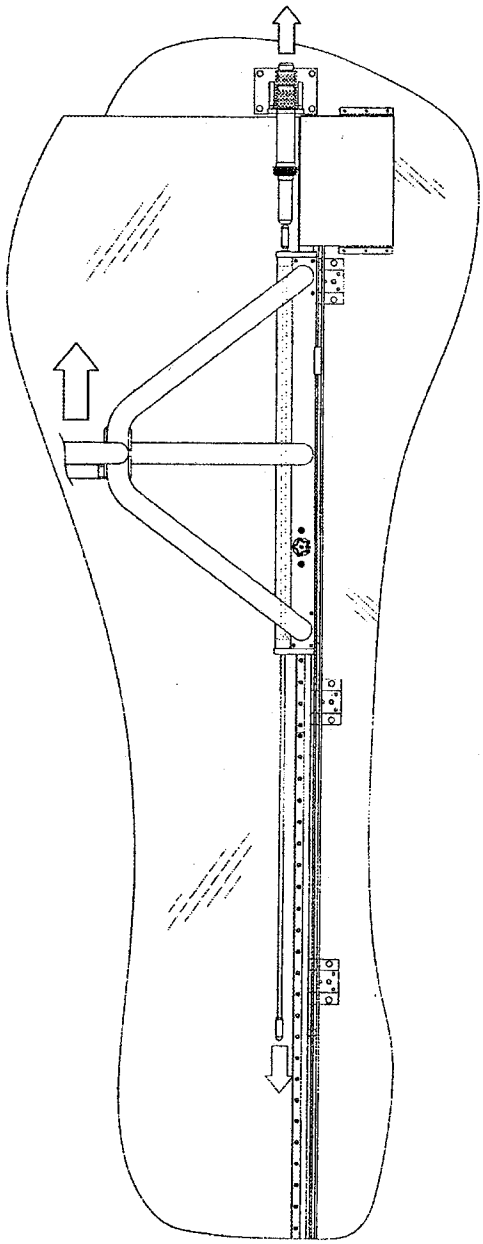

Fig 14

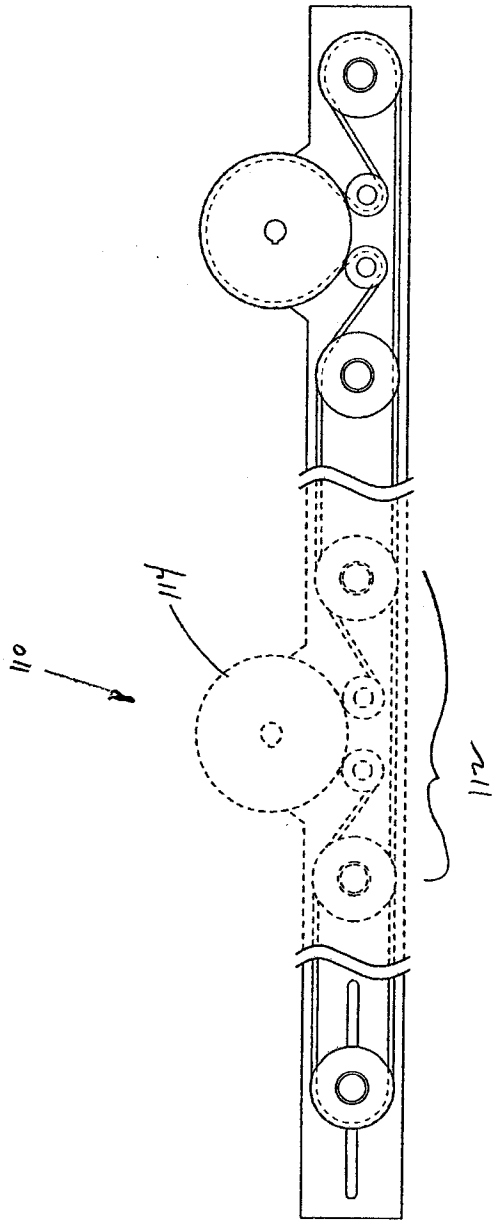

Fig 15

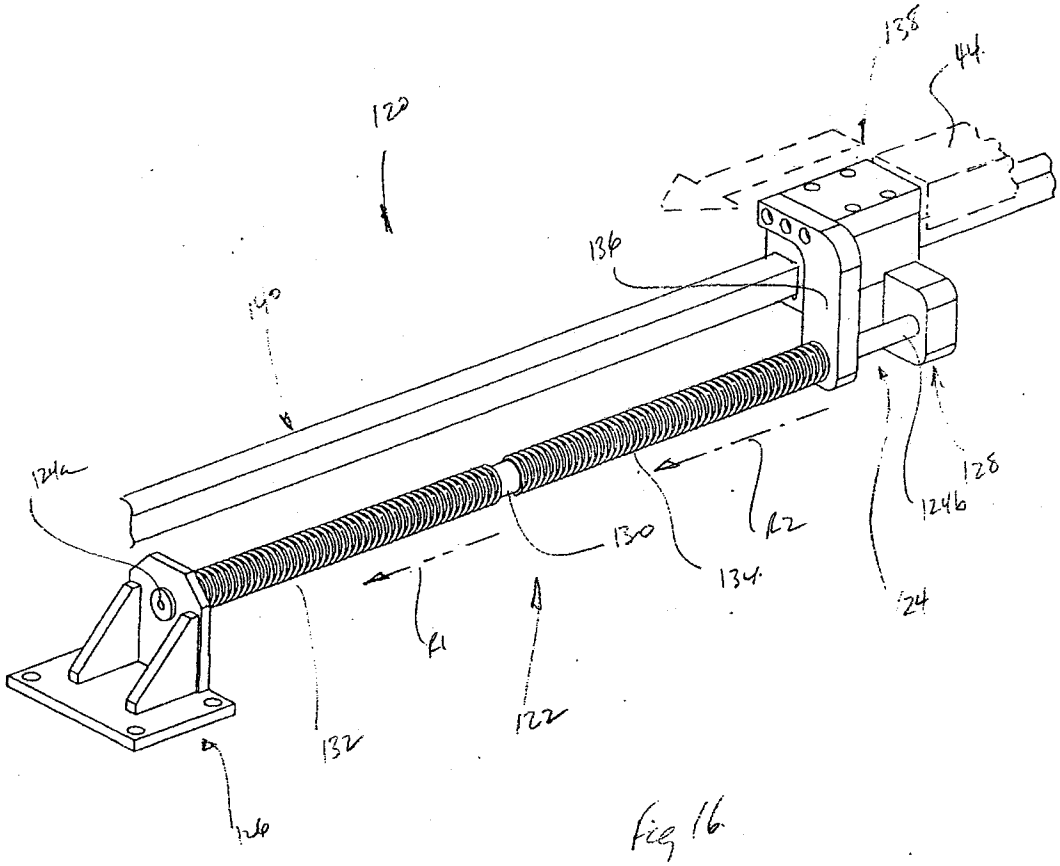

Fig 16

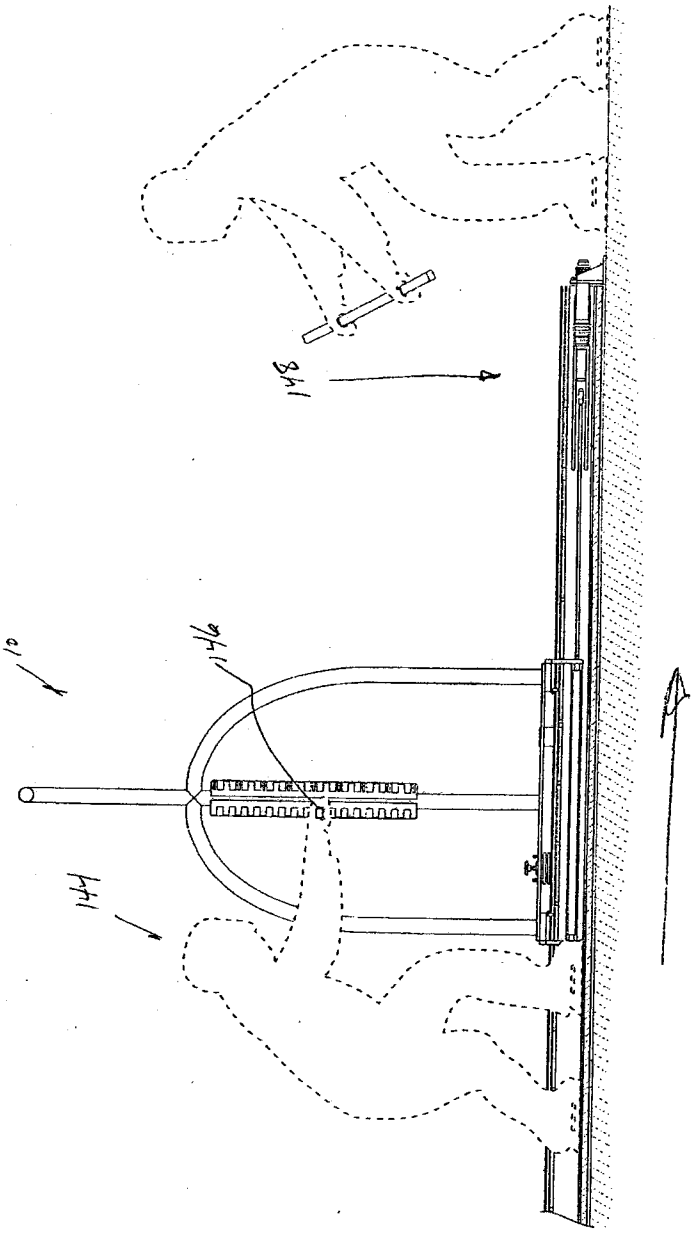

Fig 17

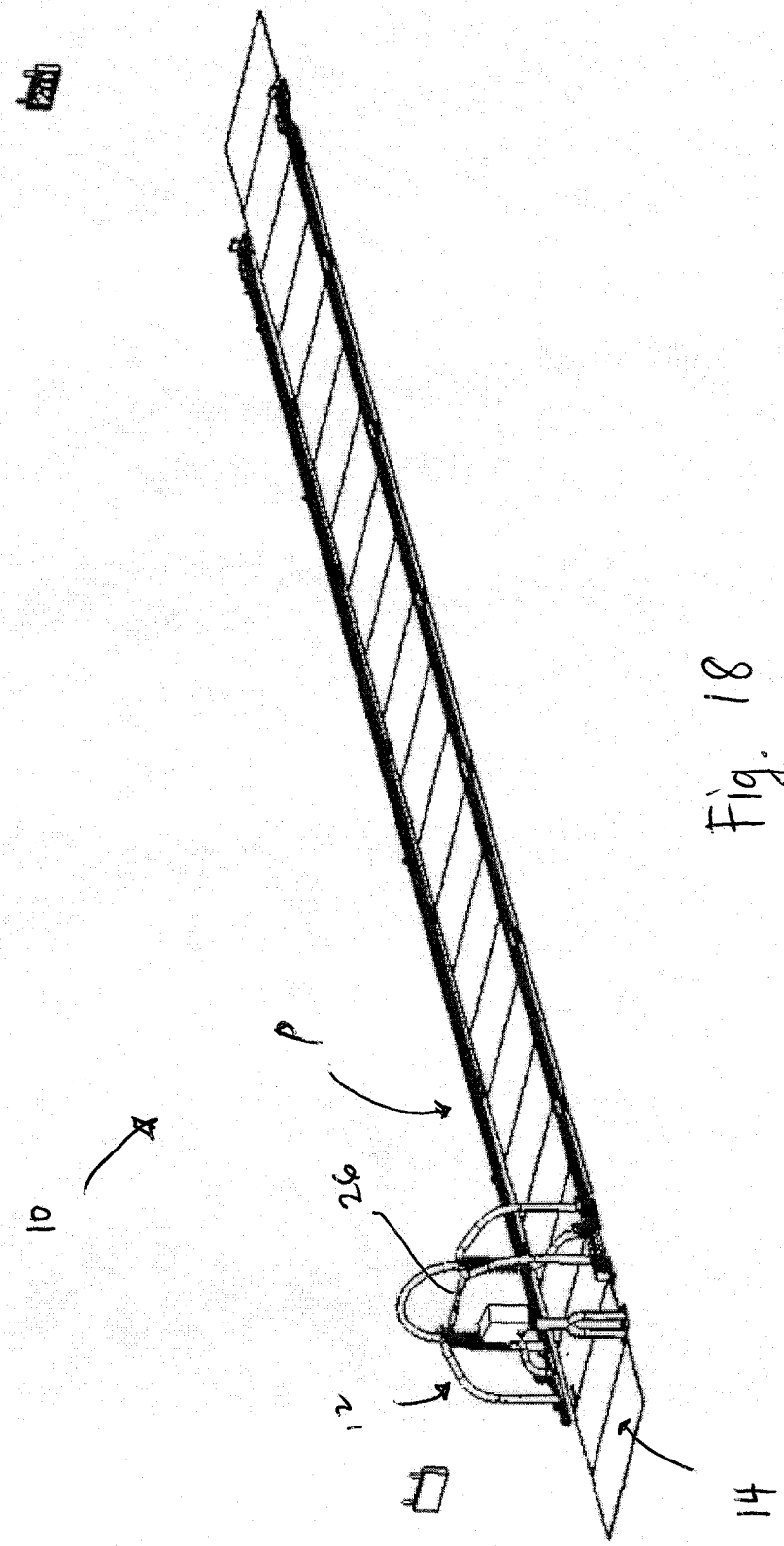

Fig. 18

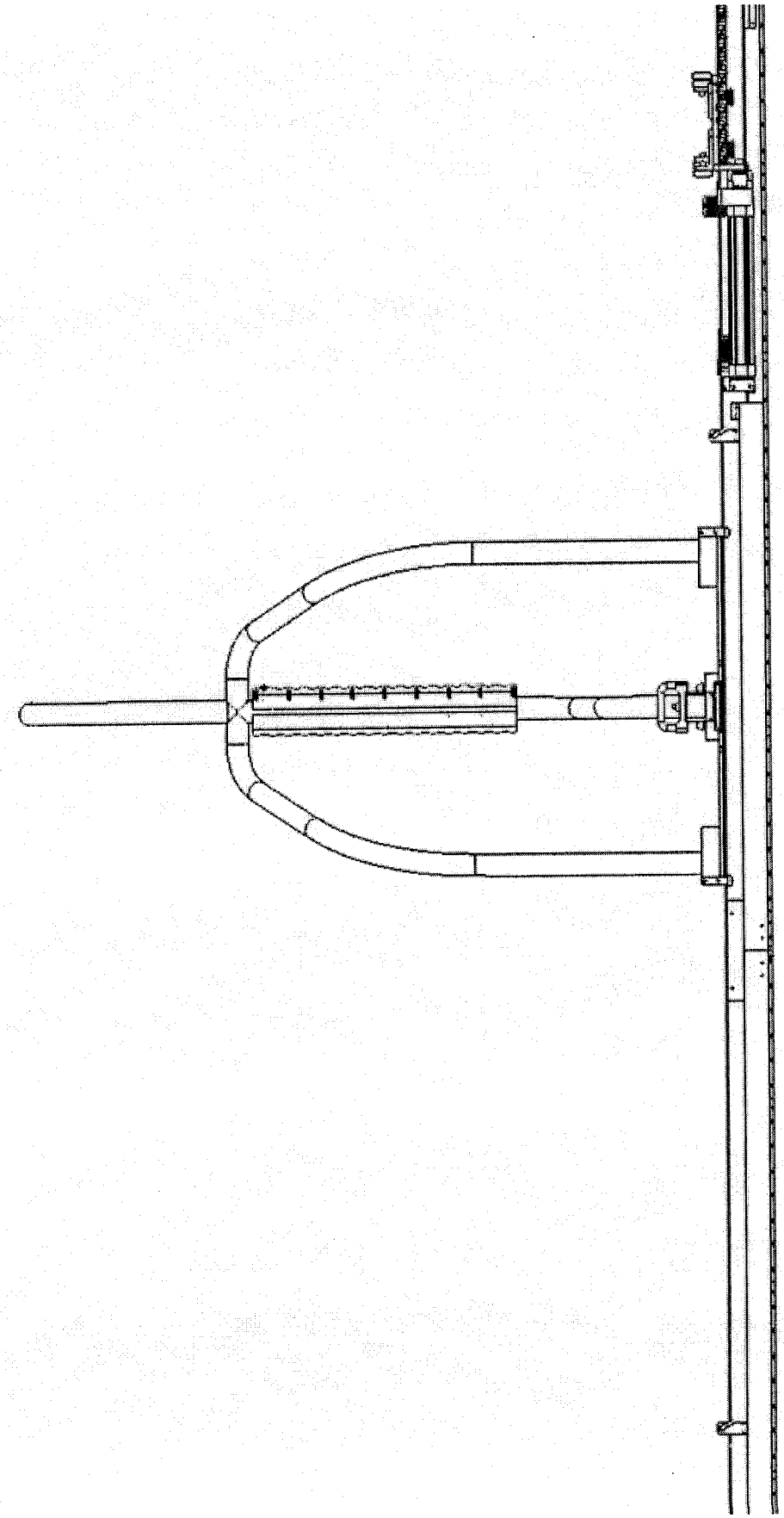

Fig. 19

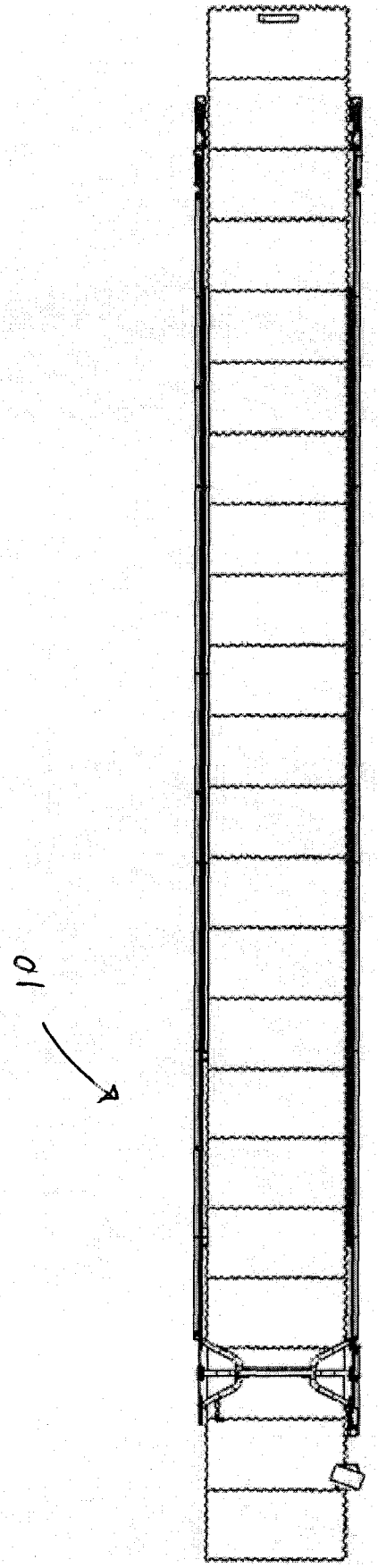

Fig. 2D

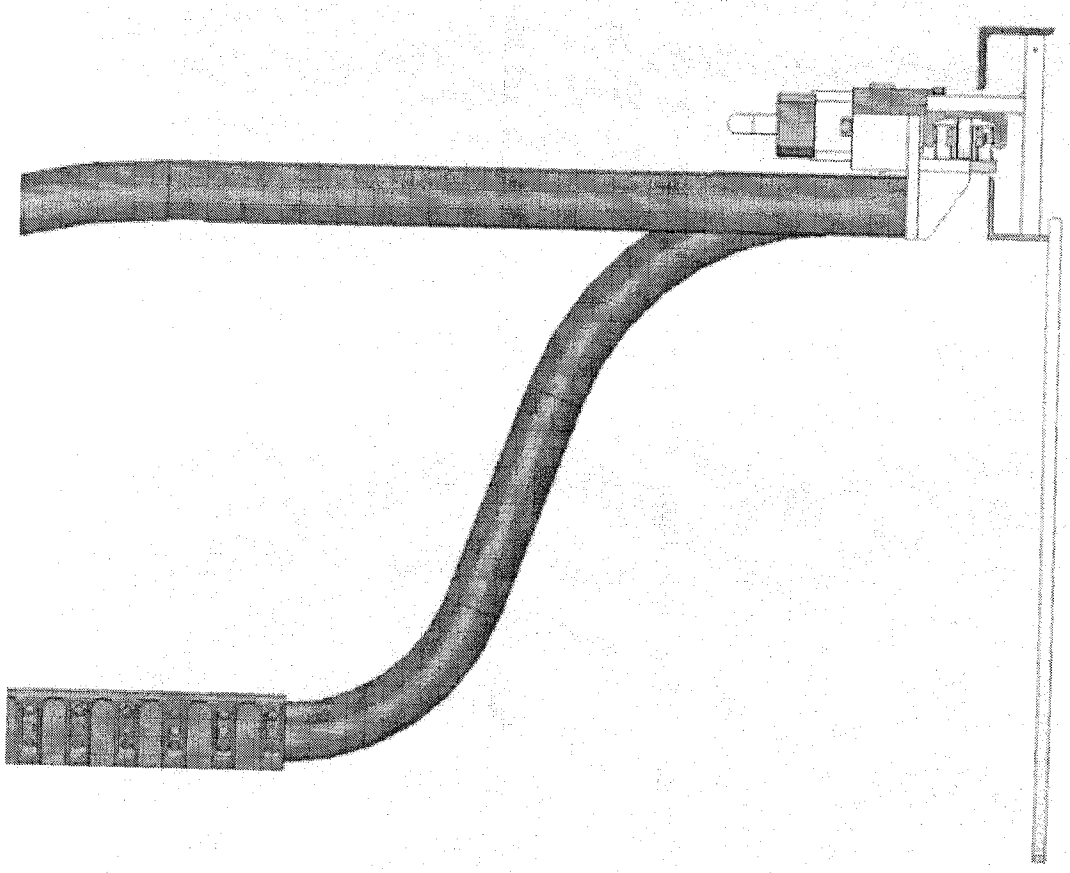

Fig. 21

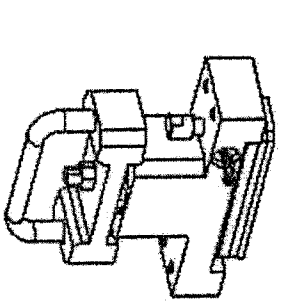

Fig. 22E

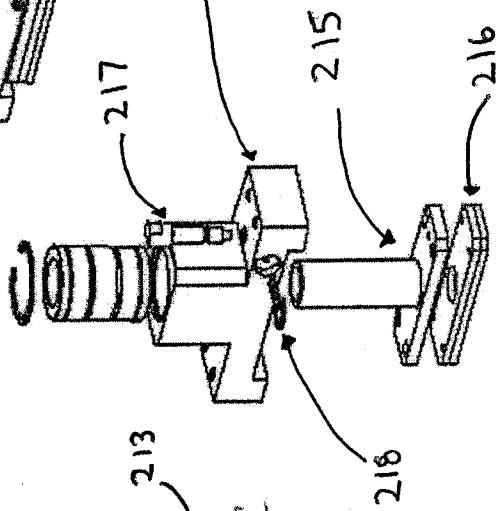

Fig. 22D

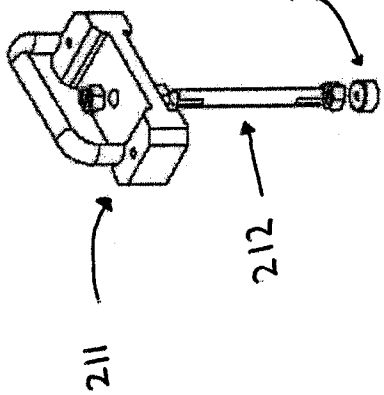

Fig. 22C

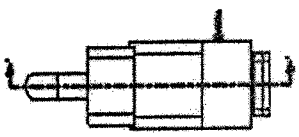

Fig. 22B

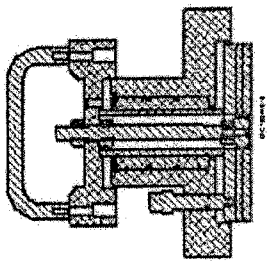

Fig. 22A

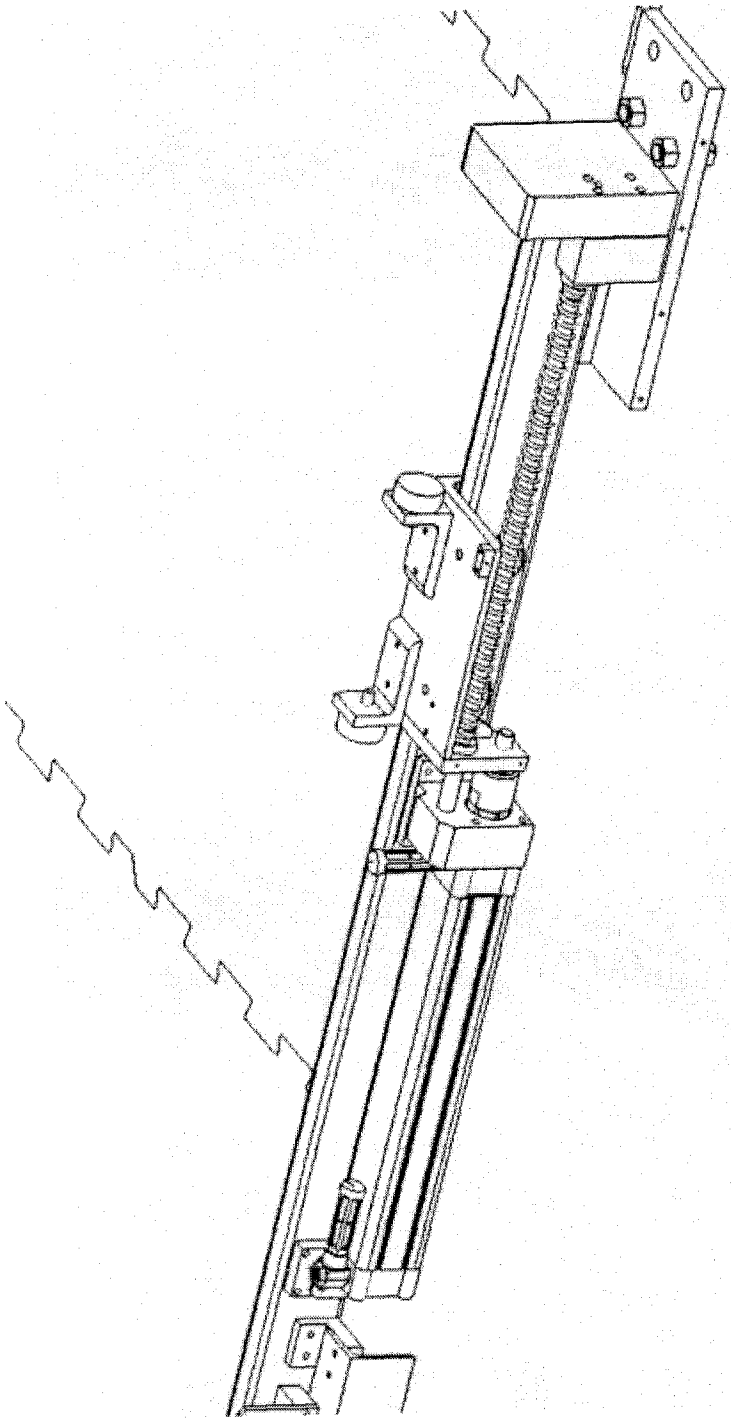

Fig. 23

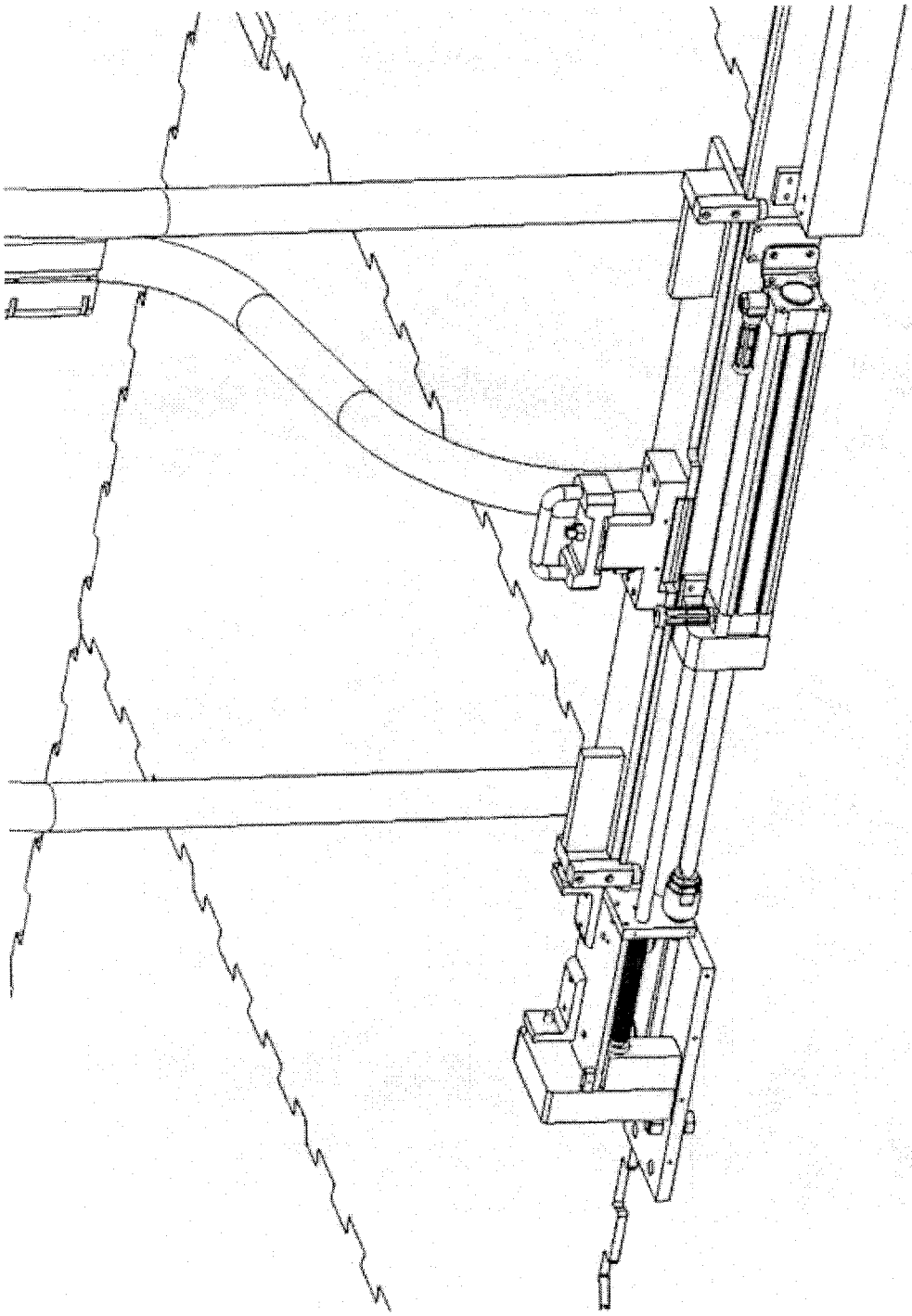

Fig. 24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2008/001719

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***A63B 21/00*** (2006.01) , ***A63B 22/20*** (2006.01) , ***A63B 69/00*** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: ***A63B 21/00*** (2006.01) , ***A63B 22/20*** (2006.01) , ***A63B 69/00*** (2006.01)

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patent Database; Delphion; USPTO; WEST; Google Patents
Keywords used in combination: resistance; training; pushing; force; support structure; treadmill; ice skating; aid; football; sleds; inventor's names

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4779862 A; (KEPPLER); October 25, 1988 (25.10.1988) Figures 1 &2; Column 2, lines 18 to 36	Claims 1 and 25 to 27
Y	US 5971891 A; (HUMPHREY); October 26, 1999 (26.10.1999) Figure 1	Claims 1 and 25 to 27
Y	US 6090015 A; (MEYERS); July 18, 2000 (18.07.2000) Figures 1 & 4 to 6; Column 3, line 38 to column 4 line 52	Claims 1 to 3 and 25 to 27
Y	US 5810697 A; (JOINER); September 22, 1998 (22.09.1998) Figures 1 to 3	Claims 1, 25 and 27
Y	US 6824504 B2; (OTT); November 30, 2004 (30.12..2004) Figures 1 and 3	Claims 1, 25 and 27
A	US 5385520 A; (LEPINE et al.); January 31, 1995 (31.01.1995) Figure 1; Column 2, line 4 to column 3, line 10	Claims 1 to 41

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

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
December 8, 2008 (08.12.2008)	16 January 2009 (16-01-2009)

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819- 994-5348

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2008/001719

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US 4779862A	25-10-1988	US RE34320E	20-07-1993
US 5971891A	26-10-1999	None	
US 6090015A	18-07-2000	CA 2184150A1	01-03-1997
US 5810697A	22-09-1998	None	
US 6824504B2	30-11-2004	US 2002077226A1	20-06-2002
US 5385520A	31-01-1995	None	