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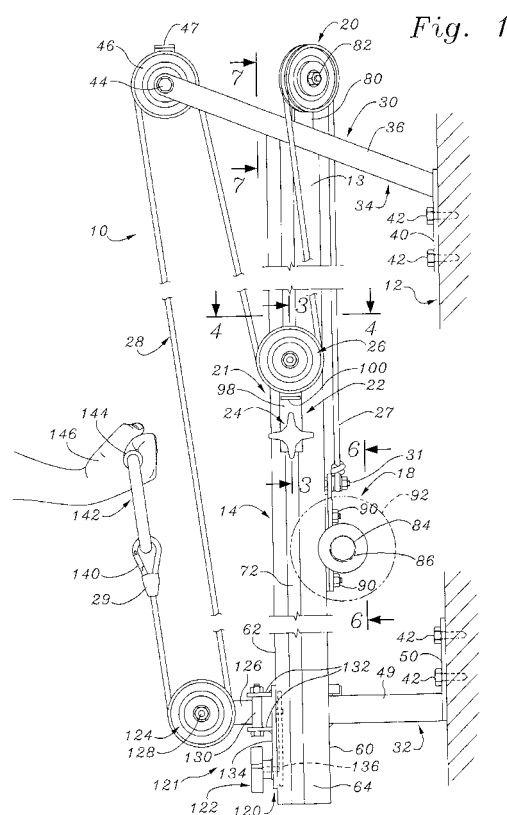
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(54) **Exercise machine**

(57) A physical development exercise machine is comprised of a longitudinally elongated, extruded metal column (14) rigidly preferably attached to a vertical support, such as a wall, in spaced separation therefrom. The column includes a plurality of longitudinal, parallel tracks (68,70,72). A weight carriage (18) is engaged for reciprocal movement in the vertical track located on the side of the column opposite the user. At least a first turning pulley slide (22), and preferably a second turning pulley slide (120) are engaged in other of the vertical tracks. An upper pulley (20) is mounted at the upper end of the column. Turning pulley slide locks are provided to releaseably immobilize the slides upon which the turning pulleys are mounted relative to the elongated column. A single weight-lifting cable is employed and is attached to the weight carriage and looped through the upper pulley and one or more of the turning pulleys.



EP 1 302 221 A1

Description

[0001] The present invention relates to a machine useful for muscle development by individuals, both for physical conditioning and for physical rehabilitation.

[0002] Various exercise machines have been devised for use in enabling individuals to develop their muscles. It is well known that exercise of a muscle enhances its development. Therefore, numerous devices exist that provide hand grips or limb-engaging attachments by means of which an individual overcomes a force in order to apply stress to a muscle. Repeated muscular stress performed in a regimen of periodic exercises results in an increase in muscle development and strength.

[0003] Many of the commercially available devices of this type for enhancing muscle development are inordinately complex and occupy a substantial amount of floor space when assembled. With living area floor space at a premium in most urban environments, many conventional exercise machines simply occupy more floor space than the user can spare.

[0004] Also, conventional exercise machines are frequently rather complex in their construction. They often require expertise in their assembly that is beyond the ability of many users. Moreover, complexity in construction typically significantly increases the cost of an exercise machine.

[0005] Another problem with conventional exercise machines is that they lack versatility in performing different exercises and in allowing users of different statures and physiques to engage in muscle development in the manner that is most effective for each individual user. Due to height differences, weight differences, differences in stances, and differences in personal preferences, the location of the handgrip or other limb-engaging device on an exercise machine for one user is often uncomfortable, and sometimes even painful, when employed by another user.

[0006] The present invention provides an improved muscle development machine that, to a very large extent, overcomes the deficiencies of prior art devices. The muscle development or exercise machine of the present invention is constructed so as to occupy a very minimal amount of floor space once assembled. Thus, a user is forced to devote only a very limited amount of living area, storage area, or exercise area to use of the exercise machine of the invention.

[0007] The muscle development machine of the invention is also extremely simple, yet effective in construction. The simplicity of its construction allows it to be assembled without difficulty by most users. Also, the simplicity of construction makes the exercise machine of the invention relatively inexpensive to fabricate. This reduces the cost of manufacture, thereby reducing the cost to the ultimate user.

[0008] The simplicity of construction also provides the exercise machine of the invention with smooth, aesthetically pleasing lines. This is important to many individu-

als since the device, once assembled, is typically within sight of the user and others in the user's dwelling a great deal of the time.

[0009] One of the biggest advantages of the exercise machine of the invention is its versatility. The muscle development machine of the invention employs a plurality of pulleys which may be positioned longitudinally along the length of an upright column in an infinitely adjustable manner. The feature of infinite adjustment of the position of many of the pulleys allows each individual user to utilize the machine in the most comfortable and effective manner possible, irrespective of the height, weight, physical stature, or stance of the user. The locations of the adjustable pulleys along the length of the column are quickly and easily adapted to the personal preferences of each user.

[0010] The ability to adjust the position of some of the pulleys is also advantageous in that the length of the cable extending from the pulley closest to the user may be adjusted to the maximum comfort of the user. By raising or lowering one of a plurality of the pulleys along the length of the column, the user can not only adjust the angle at which the cable extends from the final pulley toward the user, but also the length of that portion of the cable emanating from the final pulley.

[0011] In one broad aspect the present invention may be considered to be a physical development machine comprising: a longitudinally elongated column having upper and lower ends and including a plurality of elongated vertical tracks defined thereon, an upper pulley mounted at the upper end of the column, a weight carriage engaged in one of the vertical tracks, a first turning pulley slide engaged in another of the vertical tracks, a first turning pulley slide lock for releaseably immobilizing the first turning pulley slide relative to the elongated column, a first turning pulley mounted on the first turning pulley slide, and a cable having opposing ends. The upper pulley is mounted for rotation at the top of the column about a horizontally oriented axis. The weight carriage is engaged for reciprocal movement in one of the vertical tracks, while the first turning pulley slide is engaged for longitudinal movement to a selected vertical elevation in another of the vertical tracks. The first turning pulley is mounted on the first turning pulley slide for rotation about a horizontal axis of rotation. One end of the cable is attached to the weight carriage and the other end of the cable is accessible for the application of longitudinal tensile force. The cable is looped about both the upper pulley and the first turning pulley.

[0012] The column is preferably formed as an elongated, extruded metal tubular structure having different channeled sides in which the plurality of tracks are formed. The column preferably has a generally rectangular cross-sectional configuration and the tracks are preferably formed as T-shaped channels in some or all of the sides of the column. This construction provides the column with overhanging flanges along the sides of the channels to laterally confine movement of structural

elements of the machine that are longitudinally movable or positionable along the tracks.

[0013] The exercise machine of the invention preferably has a back side, an opposite front side, and opposing lateral sides oriented at right angles to both the back and front sides. The vertical track engaged by the weight carriage is preferably located on the back side of the elongated column. The vertical track in which the first turning pulley slide is engaged is preferably located on one of the lateral sides of the elongated column. Also, another of the vertical tracks is preferably defined in the front side of the elongated column and the exercise machine is further comprised of a second turning pulley slide engaged in the vertical track on the front side of the column. This second turning pulley slide is equipped with a second turning pulley and a second turning pulley slide lock for releaseably immobilizing the second turning pulley slide relative to the column. The second turning pulley is preferably mounted on a turning pulley swivel bracket coupled to the second turning pulley slide for rotation relative thereto about a vertical axis. The turning pulleys may be positioned at various locations along the length of the column, depending upon the preference of the user.

[0014] A cantilevered pulley is also preferably provided and is carried by a beam that projects toward the user at the upper end of the column. The cantilevered pulley is particularly advantageous for use in physical therapy for individuals in wheelchairs. The beam projects outwardly beyond the front side of the column a sufficient distance to allow a person in a wheelchair to position himself or herself directly beneath the cantilevered pulley and perform physical therapy exercises from that location.

[0015] The weight lifting cable is attached to the weight carriage and looped through one or more of the turning pulleys, as well as the upper pulley, and through the cantilevered pulley for some exercises. A variety of different grips or limb-engaging attachments may be releaseably secured to the accessible end of the weight cable line so that a variety of different muscle development exercises may be performed using the exercise machine of the invention.

[0016] In another broad aspect the invention may be considered to be a muscle development machine comprising an elongated column, upper and lower mounting brackets, an upper pulley, a weight carrier, at least one pulley carriage slide, at least one releaseable pulley carriage lock, at least one turning pulley, and a cable attached to the weight carrier. The upper and lower mounting brackets are respectively fastened to the upper and lower ends of the column to firmly hold the column in upright alignment. The mounting brackets hold the column at a spaced distance from an upright vertical support.

[0017] The elongated column is formed with at least first and second longitudinal tracks. The first track faces the upright, vertical support and the second track is dis-

posed to face a different direction from the first track. The upper pulley is mounted for rotation about a horizontally aligned axis and is located atop the upper end of the column. The weight carrier is mounted for longitudinal, reciprocal movement along the first track. The pulley carriage slide is mounted for longitudinal, reciprocal movement along the second track. The releaseable pulley carriage lock immobilizes the pulley carriage slide at a selected position along the second track. The turning pulley is mounted on the pulley carriage slide for rotation about a horizontal axis. The cable is looped over the upper pulley and is also looped over the turning pulley. The end of the cable opposite the end at which the weight carriage is attached is accessible to a person performing muscle development exercises.

[0018] In still another aspect the invention may be considered to be a muscle development machine comprising upper and lower mounting brackets, a longitudinally, elongated column, a weight carrier, an upper pulley located atop the column, a turning pulley carriage slide engaged in a track of the column, a releaseable carriage pulley lock for engaging the turning pulley carriage at a selected longitudinal location along the column, and a cable having a secured end attached to the weight carrier. The column has a plurality of channeled sides, each having an elongated track defined thereon. The column has upper and lower ends respectively secured to the upper and lower mounting brackets. The mounting brackets hold the elongated column in a vertical orientation spaced horizontally from the upright support.

[0019] The weight carrier is engaged in one of the tracks on one of the channeled sides of the column for longitudinal, reciprocal movement therealong. The upper pulley is mounted for rotation atop the column about a horizontal axis of rotation. The turning pulley carriage slide is engaged in a track of another of the channeled sides of the column for longitudinal, reciprocal movement therealong. The cable is looped about both the upper pulley and the turning pulley, and has an opposite free end accessible to a user.

[0020] The invention may be described with greater clarity and particularity by reference to the accompanying drawings.

[0021] Fig. 1 is a side elevational view, partially broken away, illustrating one preferred embodiment of the invention set up for performing one-handed curl exercises.

[0022] Fig. 2 is a front elevational view of the exercise machine shown in Fig. 1, also partially broken away.

[0023] Fig. 3 is a sectional elevational detail taken along the lines 3-3 of Fig. 1.

[0024] Fig. 4 is a transverse sectional view taken along the lines 4-4 of Fig. 1.

[0025] Fig. 5 is a sectional elevational detail taken along the lines 5-5 in Fig. 2.

[0026] Fig. 6 is a rear elevational detail taken along the lines 6-6 in Fig. 1.

[0027] Fig. 7 is a front sectional elevational detail taken along the lines 7-7 in Fig. 1.

[0028] Fig. 8 is a side elevational view illustrating the exercise machine of Fig. 1, set up for use with a lat bar.

[0029] Fig. 9 is a side elevational view of the exercise machine of Fig. 1, set up for use with an ankle strap for performing leg lifts.

[0030] Fig. 10 is a side elevational view of the exercise machine of Fig. 1 set up for use with an ankle strap for performing standing leg pulls.

[0031] Fig. 11 is a side elevational detail illustrating an alternative embodiment of the cantilevered pulley illustrated in Fig. 1.

[0032] Fig. 12 is a top plan detail view taken along the lines 12-12 of Fig. 11.

[0033] Fig. 13 is a side elevational view of the upper portion of an alternative embodiment of the invention employing a purchase-enhancing pulley.

[0034] Fig. 14 is a side elevational view of the upper portion of still another alternative embodiment of the invention employing a plurality of purchase-enhancing pulleys.

[0035] Fig. 15 is a sectional elevational detail of an alternative embodiment of a turning pulley assembly to that illustrated in Fig. 3.

[0036] Fig. 1 illustrates an exercise machine or muscle development machine indicated generally at 10 assembled and installed for use near a vertical surface 12, such as the wall of a dwelling or garage, or attached to a stand. The physical development or exercise machine 10 is comprised of a longitudinally elongated, channeled column 14 supported in a vertical orientation, a weight carriage 18, an upper pulley 20, a first turning pulley assembly 21 a second turning pulley assembly 121, a cantilevered pulley 46, and a single cable 28 formed of polyester rope.

[0037] The longitudinally elongated column 14 has upper and lower ends 13 and 15, respectively. The column 14 is about seven feet in length and is supported in a vertical orientation by an upper mounting bracket 30 and a lower mounting bracket 32. The upper and lower mounting brackets 30 and 32 are made from a combination of rectangular steel tubing and flat steel welded together. The upper bracket 30 is formed with a top mounting beam 34 secured atop the elongated column 14 and fabricated from a pair of side rails 36 about sixteen inches long and one and one-eighth inches wide spaced laterally apart from each other a distance of about one and one-quarter inches. A pair of narrow, front and back vertical column connection track-engaging flanges 38 are welded between the side rails 36 and hold the side rails 36 a spaced distance apart. The vertical column connection track-engaging flanges 38 project downwardly between the side plates 36. The front vertical column connection track-engaging flange 38 projecting downwardly from between the side rails 36 is visible in Fig. 2.

[0038] At the rear end of the bracket 30 the side rails

36 are welded to the edges of an upper flat, steel wall fastening plate 40 that is oriented in a vertical disposition. The upper wall fastening plate 40 resides in face-to-face contact with the wall 12. The upper wall fastening plate 40 is secured to the wall 12 by means of lag bolts 42. It is important for the lag bolts 42 to be attached to a very secure spot on the wall 12, such as to a stud through an interior drywall surface within a room, or an exposed stud in a garage. The lag bolts 42 are long enough to pass through the drywall and penetrate into a stud within the wall 12.

[0039] At the outboard, front end of the upper mounting bracket 30 a cantilevered pulley axle 44 extends between and is fastened to the side rails 36. The pulley 46 is a cantilevered pulley and is mounted on the outboard end of the top mounting beam 34 of the upper bracket 30. The cantilevered pulley 46 is mounted for rotation about the horizontal axis of the axle rod 44 at the cantilevered forward extremity of the top mounting beam 34. A finger-shape retaining guide 47 is mounted at one side of the beam 34 and projects alongside and over the top of the cantilevered pulley 46. The retaining guide 47 aids in preventing the cable 28 from inadvertently coming off of the cantilevered pulley 46.

[0040] The lower mounting bracket 32 is secured to the lower end 15 of the upright column 14. It is formed of a length of rectangular tubing 49 that is welded to and projects outwardly at right angles from a flat, steel lower wall fastening plate 50. The lower wall fastening plate 50 is also secured to the wall 12 by means of lag bolts 42.

[0041] The column 14 is formed as an extruded aluminum member having a uniform cross-sectional shape along its entire length, as is evident in Fig. 4. The elongated, vertical column 14 is formed in a generally rectangular configuration in which a plurality of longitudinal channels are formed. The upright column 14 has a back side 60 that faces the wall 12 and is parallel to and spaced therefrom a distance of about five and three-quarters inches by the mounting brackets 30 and 32. The front side 62 of the column 14 faces forward and in the opposite direction from the back side 60. The column 14 has opposing lateral sides 64 and 66, which are parallel to each other, as illustrated in Fig. 2, and which are perpendicular to the back side 60 and front side 62, as shown in Fig. 4.

[0042] As illustrated in Fig. 4, the column 14 is formed with a first track 68 on its back side 60, a second track 72 on its lateral side 64, and a third track 70 on its front side 62. Each of the tracks 68, 70, and 72 has a T-shaped cross section and is formed as an elongated channel with overhanging flanges 74 that form the faces of the column sides 60, 62, and 64. The elongated, vertical tracks 68, 70, and 72 extend the entire length of the vertically oriented, extruded column 14, which has a uniform cross-sectional configuration throughout its length.

[0043] The side rails 36 of the top mounting beam 34 project forward from the elongated column 14 in parallel

alignment with and just outside of the lateral sides 64 and 66 of the column 14. The rear and front column connection track-engaging flanges 38 between the side rails 36 of the beam 34 project downwardly and respectively fit into the track 68 in the back side 60 and into the track 70 in the front side 62 of the column 14. The overhanging flanges 74 of the tracks 68 and 70 at the upper end 13 of the column 14, laterally entrap the column connection track-engaging flanges 38 within the upper ends of the tracks 68 and 70. The upper mounting bracket 30 is secured to the upper end 13 of the column 14 by a machine bolt 76 that extends through apertures in the column connection track-engaging flanges 38 and through the structure of the column 14 from the back side 60 to the front side 62 thereof.

[0044] The upper pulley 20 is mounted at the upper end 13 of the column 14 for rotation about a horizontally oriented axis by an upright upper pulley mounting plate 80. The upper pulley mounting plate 80 projects upwardly from and is welded to the inside of one of the top beam side rails 36 and to the inside of the rear column connection track-engaging flange 38. The upper pulley mounting plate 80 thereby resides at an acute angle relative to the alignment of the top mounting beam 34.

[0045] At its upper extremity the mounting plate 80 carries an axle 82 upon which the upper pulley 20 is mounted for rotation. As best illustrated in Figs. 2 and 7, the upper pulley 20 is offset by an acute angle from parallel alignment with the lateral sides 64 and 66 of the elongated column 14 due to the orientation of the upper pulley mounting plate 80. Preferably, the upper pulley 20 is offset by an angle of about eighteen degrees from alignment with the lateral column sides 64 and 66 and the top mounting beam 34 of the mounting bracket 30.

[0046] As shown in Figs. 4 and 6, the weight carriage 18 is formed from a flat, narrow, exposed steel plate 82 to which a transverse, tubular weight-bearing bar 84 with disc-shaped weight stops 85 thereon is welded. As illustrated in Fig. 4, a plastic track-follower glide 86 having an 1-shaped cross section is inserted into the track 68. Longitudinal grooves 87 are defined along the sides of the track-follower glide 86 to receive the flanges 74 of the track 68. The plastic glide 86 is preferably formed of HDPE (high density polyethylene) and is secured beneath the steel plate 82 by bolts 88 and lock nuts 90. The glide 86 is laterally confined by the overhanging flanges 74 but moves freely longitudinally along the track 68.

[0047] The track-follower glide 86 moves vertically in longitudinal reciprocation within the lateral confines of the track 68. The weight carriage 18 is thereby engaged for reciprocal, longitudinal movement in the first vertical track 68 located on the back side 60 of the column 14. As indicated in phantom in Fig. 1, the user will place a selected number of weights 92 of a selected mass on each of the laterally projecting ends of the weight-bearing bar 84. The ends of the weight-bearing bar 84 are inclined upwardly and outwardly relative to the center of

the bar so that the weight bar ends are at a slightly higher elevation than the center of the weight-bearing bar 84. The weights 92 will thereby not fall off of the ends of the weight-bearing bar 84, but rather will gravitate toward the weight stops 86.

[0048] The first turning pulley assembly 21 includes a first turning pulley slide 22. As shown in Figs. 1 and 2, and in detail in Fig. 3, the first turning pulley slide 22 is engaged in another of the vertical tracks of the column 14. Specifically, the first turning pulley slide 22 is engaged in the second vertical track 72 formed in the lateral side 64 of the column 14.

[0049] The first turning pulley slide 22 has a thin, narrow, flat, outboard plate 98, preferably about five inches in length. The flat plate 98 is provided with a rearwardly projecting cable guide tab 100 located just below the first turning pulley 26. The first turning pulley 26 is mounted for rotation about a horizontal axis of rotation to the outboard plate 98 by means of a first turning pulley axle pin 102. A spacing sleeve 104 located about the shank of the threaded axle pin 102 allows the first turning pulley 26 to rotate freely. A clamping nut 106 secures the first turning pulley 26 to the first turning slide 22 for rotation about an axis of rotation that is oriented perpendicular to the lateral side 64 of the column 14.

[0050] The outboard plate 98 of the first turning pulley slide 22 includes an inwardly directed stud 108 that projects into a positioning bore 110 defined within an inboard clamping plate 112. The inboard clamping plate 112 is thin, flat, and narrow enough to fit within the track 72, but wider than the gap between the flanges 74 overhanging the track 72. The clamping plate 112 is slightly shorter than the outboard plate 98. At its lower extremity the inboard clamping plate 112 is equipped with a threaded stud 114 that projects outwardly through a corresponding opening in the outboard plate 98 and through the gap defined between the flanges 74 that overhang the channel 72.

[0051] The first turning pulley slide assembly 21 is further provided with a first turning pulley slide lock in the form of a star-shaped tightening knob 116 having an internally threaded bore 117 defined therewithin. The tightening knob 116 may be turned in a clockwise direction, as viewed in Fig. 1, to pull the clamping plate 112 toward it to clamp the outboard plate 98 and the clamping plate 112 against the flanges 74 of the channel 72. By tightening the first turning pulley slide lock knob 116 in this manner, the clamping effect of the outboard plate 98 and inboard plate 112 against the flanges 74 of the channel 72 immobilizes the first turning pulley slide 22 in the track 72 and relative to the elongated column 14.

[0052] The vertical track 68 which is engaged by the weight carriage 18, is located on the back side 60 of the elongated column 14. The vertical track 72 in which the first turning pulley slide 22 is engaged is located on one of the lateral sides of the elongated column 14, specifically the lateral side 64 thereof. Still another of the vertical tracks, specifically the track 70, is defined in the

front side 62 of the elongated column 14. A second turning pulley assembly 121 is located on the front side 62 of the column 14 and is engaged in the track 70.

[0053] The second turning pulley assembly 121 is illustrated in Figs. 1, 2, and 5. The second turning pulley assembly 121 includes a second turning pulley carriage slide 120 that is engaged in the vertical track 70 in the front side 62 of the column 14 for longitudinal movement to a selected position therealong. A second turning pulley slide lock in the form of a star-shaped clamping knob 122 is provided for releaseably immobilizing the second turning pulley slide 120 relative to the elongated column 14. A second turning pulley 124 is mounted on the second turning pulley slide 120 for rotation about a horizontal axis of rotation.

[0054] In the embodiment shown, the second turning pulley 124 is mounted to the second turning pulley slide 120 by means of a pulley swivel bracket 126 that carries the second turning pulley 124 for rotation about a horizontal axle 128. The swivel bracket 126 is coupled to the second, additional turning pulley slide 120 for rotation relative thereto about a vertical axis coaxial with the vertically oriented coupling sleeve 130 on the end of the pulley swivel bracket 126 remote from the second turning pulley 124. The coupling sleeve 130 fits between a pair of forwardly projecting mounting brackets 132. An axle bolt 127 passes through the coupling sleeve 130 and is secured to the brackets 132 by a locking nut 129. The a vertical axis of rotation of the turning pulley swivel bracket 126 is defined by the axle bolt 127. The mounting brackets 132 project forwardly and extend horizontally from an outboard plate 134 on the second turning pulley slide 120.

[0055] The second turning pulley slide 120 also includes a clamping plate 136. The clamping plate 136 is located within the track 70 and is movable longitudinally therein, laterally confined by the flanges 74 overhanging the channel 70. The clamping plate 136 has a forwardly directed threaded stud 138 welded thereto and which projects outwardly through a corresponding opening in the outboard plate 134. The clamping knob 122 may be tightened by rotating it in a clockwise direction, as viewed in Fig. 2, to clamp the plates 134 and 136 of the second turning pulley slide 120 against the flanges 74 overhanging the channel 70. Tightening of the locking knob 122 in this manner immobilizes the second turning pulley slide 120 relative to the elongated column 14. The locking knob 122 may be rotated slightly counterclockwise, as viewed in Fig. 2, to loosen the clamping plate 136. Once the locking knob 122 is loosened, the user may adjust the position of the second turning pulley slide 120 along the length of the column 14 to a desired elevation. The clamping knob 122 is then retightened.

[0056] The second turning pulley slide 120 is engaged in the vertical track 70 on the front side 62 of the elongated column 14. By tightening and loosening the second turning pulley locking knob 122, the second turning pulley slide 120 may be moved longitudinally in infinitely

adjustable fashion to a selected position along the length of the track 70. Tightening of the knob 122 clamps the flanges 74 between the plates 134 and 136 of the second turning pulley slide 120, thereby releaseably immobilizing the second turning pulley slide 120 relative to the elongated column 14.

[0057] As illustrated in Fig. 1, the cable 28 has opposing ends 27 and 29. One of the opposing ends, the end 27, is attached to the weight carriage 18 by a knot about a coupling bolt 31. The other free end 29 of the cable 28 is accessible for the application of longitudinal tensile force and is looped about both the upper pulley 20 and the first turning pulley 26. When employed in the manner illustrated in Fig. 1, the cable 28 is also looped about the cantilevered pulley 46 and also about the second turning pulley 124. As shown in that drawing figure, a releaseable clip 140 is located at the free, accessible end 29 of the cable 28.

[0058] Various grips and limb-engaging articles may be attached to the accessible end 29 of the cable 28. In Fig. 1, the releaseable clip 140 is attached to a stirrup-shaped grip 142 having a cylindrical, tubular handle 144 which the user grasps with one hand, indicated at 146. The user may then perform one-handed curls. With the application of tensile force, the weights 92 mounted on the weight carriage may be raised by stressing the user's arm muscles and lowered when those muscles are relaxed. Because the second turning pulley 124 is mounted on a swivel bracket 126, the user need not necessarily pull on the cable 28 in a direction normal to the plane of the wall 12 when the exercise machine 10 is operated as illustrated in Fig. 1. To the contrary, the user may pull on the cable 28 at an angle in either lateral direction. The swivel bracket 126 will rotate about the axle bolt 127 so that the cable 28 will not come off of the pulley 124.

[0059] It should be appreciated that when the exercise machine 10 is utilized in the manner illustrated in Fig. 1, the length of the cable 28 may be adjusted to the comfort of the user. Specifically, the first and second slide locking knobs 24 and 122 may be loosened and retightened to allow repositioning of the first and second turning pulley slides 22 and 120, respectively. The user is thereby able to infinitely adjust the length of the cable 28, and also to adjust the direction of force application by adjusting the position of the second turning pulley slide 120 along the length of the column 14.

[0060] On the other hand, the stirrup-shaped grip 142 may be detached from the clip 140. In its place an elongated bar 148 may be secured, as illustrated in Fig. 8. The bar 148 is utilized to exercise the *latissimus dorsi* muscles, and is termed a "lat bar" in the parlance of physical conditioning. The user employs both hands 146 at the opposing ends of the lat bar 148 to exert tensile force on the cable 28.

[0061] When the lat bar 148 is employed in the manner illustrated in Fig. 8, the cable 28 is looped about the upper pulley 20 and the first turning pulley 26 and then

through the cantilevered pulley 46. However, since the preferred application of force using a lat bar 148 is in a downward direction, the second turning pulley 124 is not utilized for this exercise.

[0062] Figs. 9 and 10 illustrate the connection of the releaseable clip 140 at the accessible end 29 of the cable 28 to another limb-engaging accessory. Specifically, Figs. 9 and 10 illustrate the operation of the exercise machine 10 using an ankle strap 147. The ankle strap 147 is secured to the cable 28 by means of the releaseable clip 140. If the user desires to perform leg lifts while lying on the floor 11, as shown in Fig. 9, the first turning pulley slide 22 is normally moved to a position near the upper end 13 of the column 14, and clamped utilizing the first turning pulley slide lock knob 24. The user then lies on the floor 11 and exercises the muscles of a leg 148 by exerting tensile force in an upward direction on the cable 28. By raising and lowering the user's leg 148, the weight 92 is sequentially lifted and lowered by reciprocal movement of the weight carrier 18 up and down the track 68 on the back side 60 of the column 14.

[0063] Alternatively, the user may wish to perform leg exercises from a standing position, as shown in Fig. 10. The user exerts force through the leg 148 to pull on the cable 28 and lift the weights 92. The weights 92 descend when the leg 148 is relaxed and moved back toward the column 14.

[0064] It should be noted that the end 27 of the cable 28 that is secured to the weight carrier 18 extends vertically upward and is generally parallel to and is located directly outboard from the rear track 68 of the back side 60 of the column 14. By orienting the upper pulley 20 at an acute angle relative to the lateral sides 64 and 66 of the column 14, the cable 28 may be easily and smoothly directed off toward the lateral side 64 of the column 14, so that it may be smoothly engaged with the first turning pulley 26. The cable 28 is then routed back upwardly to the cantilevered pulley 46, and then back down to the second turning pulley 124 mounted on the swivel bracket 126.

[0065] To provide a smooth travel for the routing of the cable 28 it may be advisable to mount the cantilevered pulley 46 on a swivel bracket 150, as illustrated in Figs. 11 and 12. This mounting structure and arrangement is very similar to the manner in which the second turning pulley 124 is mounted to the second turning pulley slide 120.

Specifically, and as illustrated in Fig. 11, the cantilevered pulley swivel bracket 150 carries the cantilevered pulley 46 at the forward, cantilevered end of the beam 34. However, instead of employing an axle bolt 44 through the end of the side rails 36, a transverse bracket plate 152 is welded across the ends of the side rails 36. The bracket plate 152 carries a pair of upper and lower bracket flanges 154 that project longitudinally from the cantilevered beam 34. The swivel bracket 150 has a coupling sleeve 156 that is disposed in between the bracket flanges 154. A coupling bolt 158 passes through aper-

tures formed in the mounting bracket flanges 154 so that the swivel bracket 150 rotates about an upright axis of rotation that departs from vertical only to the extent of inclination of the mounting bracket flanges 154 relative to horizontal.

[0066] The top mounting beam 34 projects in a direction away from the vertical support 12. The cantilevered pulley 46 is secured to the top mounting beam 34 remote from the upright supporting wall 12. The cantilevered pulley 46 is mounted for rotation about a horizontal axis defined by the axle bolt 160. The cantilevered pulley swivel bracket 150 carries the cantilevered pulley 46 and is coupled to the top mounting beam 34 for rotation relative thereto about an upright axis of rotation defined by the coupling bolt 158.

[0067] The turning pulley slide lock assemblies illustrated in the embodiment of Fig. 1 depend upon the clamping effect provided by tightening the knobs 24 and 122 in order to immobilize the turning pulley slides 22 and 120, respectively. It is possible that the frictional force could be overcome if the locking knobs 24 and 122 are not tightened sufficiently. In such a situation, the frictional force of the clamping and outboard plates against the flanges 74 of the tracks 70 and 72 might be insufficient to resist a very strong tensile force on the cable 28. As a result, either the turning pulley slide 22 or the turning pulley slide 120, or both, might suddenly slip along the tracks 72 or 70, respectively.

[0068] To guard against such an occurrence, a silicon carbide grit can be applied to the flanges 74 overhanging the tracks 70 and 72 by a plasma application process to increase the traction. Alternatively, a different type of locking mechanism altogether may be employed to immobilize the turning pulley slides. For example, Fig. 15 illustrates an alternative arrangement in which the tracks 70 and 72 in which the turning pulley slides are located are perforated with a series of spaced apertures 162. The turning pulley slide 222 illustrated in Fig. 15 does not employ an outboard plate 98 and a clamping plate 112 that may be tightened or loosened relative to the channel flanges 74, as illustrated in Fig. 3. Rather, the turning pulley slide 222 illustrated in Fig. 15 is formed with a single traveling block 226 having a relatively narrow neck and outboard wings 228 and inboard wings 230. The outboard wings 228 overlie the flanges 74, while the inboard wings 230 project beneath the flanges 74, but are narrow enough to allow the turning pulley slide 222 to travel freely along the track 72 on the lateral side 64 of the column 14.

[0069] The turning pulley slide lock 229 shown in Fig. 15 includes a latch knob 232 having a locking pin 234 projecting therefrom in an inboard direction through an aperture defined in the traveling block 226. A compressed coil spring 236 is disposed about the locking pin 234 and is located within the track 72. The spring is compressed between a C-shaped clip 238 set into an annular groove a spaced distance from the distal tip of the locking pin 234 and a smooth washer 237 that slides

along the undersides of the overhanging flanges 74. The compressed coil spring 236 tends to urge the distal tip of the locking pin 234 in an inboard direction, latching it in an aperture 162 in the channel floor with which it is aligned. As illustrated in Fig. 15, when the spring 236 is free to act, the distal tip of the locking pin 234 is engaged in an aligned aperture 162 in the column 14 so that the turning pulley slide 222 is immobilized relative to the column 14.

[0070] If the user desires to reposition the turning pulley slide 222 along the length of the channel 72, the user merely pulls the latch knob 232 in a outboard direction away from the side 64 of the column 14, thereby overcoming the force of the spring 236 and pulling the distal tip of the latching pin 234 out of registration with the plane of the channel floor in which the apertures 162 are defined. Holding the spring 236 fully compressed and the latch knob 232 pulled in an outboard direction, the user slides the turning pulley slide 222 to a new selected longitudinal position relative to the ends 13 and 15 of the column 14. When the latching knob 232 is released, the force of the spring 236 pushes the distal tip of the locking pin 234 into the latching aperture 162 with which the distal tip of the locking pin 234 is most closely aligned. The turning pulley slide 222 is thereupon immobilized again relative to the column 14 until and unless the turning pulley slide lock mechanism 229 is released.

[0071] While the locking mechanism 229 is illustrated in Fig. 15 only with respect to the first turning pulley slide 222 in the channel 72 on the lateral side 64 of the column 14, it is to be understood that this same latching mechanism can be utilized to lock the second turning pulley slide on the front of the column 14, as well.

[0072] Different exercises may be performed at different speeds in muscle development and physical rehabilitation. In some exercises the cable 28 is pulled at a higher speed than in other exercises. In such situations it is therefore desirable to provide, in addition to the turning pulley or pulleys, one or more purchase-enhancing pulleys to provide an enhanced mechanical advantage. The use of such purchase-enhancing pulleys increases the weight that a given tensile force on the cable 28 will lift, but reduces the distance, and therefore the speed, at which the weight is lifted.

[0073] Fig. 13 illustrates an alternative embodiment of a physical training (PT) exercise machine 300 according to the invention which employs a purchase-enhancing pulley 302 mounted at the upper extremity of the weight carriage 18. The purchase-enhancing pulley 302 may be mounted about the bolt 31 of the weight carriage 18. An alternative embodiment of a beam 334 is employed to terminate the secured end 27 of the cable 28.

[0074] In the exercise machine 300, the beam 334 is formed from a length of rectangular tubing and has a pair of upper pulleys 320 and 321. The upper pulleys 320 and 321 are mounted for rotation about horizontal axes, but are located on one side of the beam 334. The

upper pulleys 320 and 321 respectively rotate about axle pins 322 and 324. The exercise machine 300 also includes a cantilevered pulley 46 located at the outboard end of the beam 334, remote from the upper attachment plate 40.

[0075] In place of the front and rear depending track-engaging flanges 38 employed in the exercise machine 10, the exercise machine 300 has a single depending track-engaging flange 338 that projects downwardly from the side of the beam 334. The track-engaging flange 338 fits easily, but snugly, within the lateral confines of the track 72 on the lateral side 64 of the column 14 and is secured to the upper end 15 of the column 14 by means of a bolt 339.

[0076] The beam 334 also has a transversely projecting cable-terminating tab 341 through which a pair of apertures are defined. The cable-terminating tab 341 is located vertically above the purchase-enhancing pulley 302. The secured end 27 of the cable 28 is directed up through one of the apertures in the cable-terminating tab 341 and is knotted at its extremity. The knot 343 is large enough so that it cannot pass through the aperture in the cable-termination tab 341. The knot 343 resides atop the cable-terminating tab 341 so that the secured end 27 of the cable 28 projects downwardly through one of the apertures in the tab 341. The cable 28 is then looped about the purchase-enhancing pulley 302 and directed back upwardly through the first of the two upper pulleys 320. From the pulley 320 the cable 28 is directed downwardly and looped about the first turning pulley 26. The cable 28 is directed from the first turning pulley 26 back up and over the second upper pulley 321, and then downwardly again. The free, or accessible, end 29 of the cable 28 terminates in the releaseable clip 140.

[0077] The purchase-enhancing pulley 302 provides the exercise machine 300 with a mechanical advantage at a ratio of two to one. That is, using the exercise machine 300, a given tensile force applied to the cable 28 at the releaseable clip 140 over a specific distance of travel will lift weights 92 that are twice as heavy as can be lifted utilizing the exercise machine 10. However, the weights 92 will be lifted only half the distance of travel of the releaseable clip 140, due to the action of the purchase-enhancing pulley 302, which moves longitudinally along the track 68 with the weight carriage 18.

[0078] By utilizing the purchase-enhancing pulley 302, the exercise machine 300 increases the smoothness of travel and cuts down on the momentum factor of a force exerted on the cable 28. This reduces the jarring or shock effect to the user's muscles applying a tensile force of the cable 28 that would otherwise result from a sudden yank or tug on the cable 28.

[0079] The momentum factor may be reduced even further and the mechanical advantage increased by employing a plurality of purchase-enhancing pulleys. Fig. 14 illustrates a speed training (ST) exercise machine 400 that employs the same beam 334 and the same upper pulley arrangement as the exercise machine 300

shown in Fig. 13. However, the exercise machine 400 has a pair of purchase-enhancing pulleys 402 and 403, both mounted about the axle bolt 31, but rotatable independently of each other. In addition, the beam 334 of the exercise machine 400 is provided with a depending mounting flange 406 that projects downwardly from the underside of the beam 334 directly above the purchase-enhancing pulleys 402 and 403. The depending mounting flange 406 is oriented at an angle of eighteen degrees from perpendicular alignment relative to the beam 334, and carries a third turning pulley 408. The third turning pulley 408 is rotatable about a horizontal axis of rotation that resides at an angle of eighteen degrees relative to the plane of the back side 60 of the column 14.

[0080] The secured end 27 of the cable 28 is directed through the other aperture in the cable-terminating tab 341 and passes downwardly to the outboard purchase-enhancing pulley 402. From there, the cable 28 is directed upwardly and passes about the inclined third turning pulley 408 and back down again, around the other purchase-enhancing pulley 403. From the purchase-enhancing pulley 403 the cable 28 is directed upwardly and looped about the first upper pulley 320 and then back down to the first turning pulley 26. From the first turning pulley 26 the cable is directed upwardly to the second upper pulley 321 and then back down to the releaseable clip 140.

[0081] The use of a second purchase-enhancing pulley 403 provides the exercise machine 400 with a mechanical advantage of four to one. That is, using the exercise machine 400, a given tensile force exerted on the cable 28 at the releaseable clip 140 will lift weights 92 having a mass four times as great as in the exercise machine 10, but the weight carriage 18 will move only one-quarter the distance of travel of the releaseable clip 140 at the accessible end 29 of the cable 28. This system significantly reduces the momentum factor of travel of the weights 92, and also increases the stability of the weight carriage 18.

[0082] Undoubtedly, numerous variations and modifications of the invention are possible. For example, other slide and locking mechanism may be substituted for those depicted in Figs. 3 and 15. Also, the upright, vertical column is not necessarily attached to a wall, but can be mounted as a free-standing post, or attached between a floor and ceiling of a room. Accordingly, the scope of the invention is not limited to the specific embodiments depicted and described, but rather is defined in the claims appended hereto.

Claims

1. A physical development machine comprising:

a longitudinally elongated column having upper and lower ends supported in a vertical orientation and including a plurality of elongated verti-

cal tracks defined thereon,
an upper pulley mounted at said upper end of said column for rotation about a horizontally oriented axis,
a weight carriage engaged for reciprocal movement in one of said vertical tracks,
a first turning pulley slide engaged in at least one other of said vertical tracks for longitudinal movement to a selected vertical elevation,
a first turning pulley slide lock for releaseably immobilizing said first turning pulley slide relative to said elongated column,
a first turning pulley mounted on said first turning pulley slide for rotation about a horizontal axis of rotation, and
a cable having opposing ends, one of which is attached to said weight carriage and the other of which is accessible for the application of longitudinal, tensile force, and said cable is looped about both said upper and first turning pulleys.

2. A physical development machine according to Claim 1 wherein said elongated column has a back side, an opposite front side, and opposing lateral sides oriented at right angles to both said back and front sides and said vertical track engaged by said weight carriage is located on said back side of said elongated column.
3. A physical development machine according to Claim 2 wherein said vertical track in which said first turning pulley slide is engaged is located on one of said lateral sides of said elongated column.
4. A physical development machine according to Claim 2 wherein said upper pulley is offset by an acute angle from parallel alignment with said lateral sides of said elongated column.
5. A physical development machine according to Claim 4 wherein still another of said vertical tracks is defined in said front side of said elongated column and further comprising a second turning pulley slide engaged in said vertical track in said front side of said column for longitudinal movement to a selected position therealong, a second turning pulley slide lock for releaseably immobilizing said second turning pulley slide relative to said elongated column, and a second turning pulley mounted on said second turning pulley slide for rotation about a horizontal axis of rotation.
6. A physical development machine according to Claim 5 further comprising a turning pulley swivel bracket carrying said second turning pulley and coupled to said second turning pulley slide for rotation relative thereto about a vertical axis.

7. A physical development machine according to Claim 4 further comprising a top mounting beam projecting forward from said elongated column in parallel alignment with said lateral sides of said column, and said top mounting beam has at least one track-engaging flange that is engaged in at least one of said elongated vertical tracks defined on said column.
8. A physical development machine according to Claim 7 further comprising a cantilevered pulley mounted for rotation about a horizontal axis from said top mounting beam and a cantilevered pulley swivel bracket carrying said cantilevered pulley and coupled to said top mounting beam for rotation relative thereto about an upright axis.
9. A physical development machine according to Claim 1 further comprising at least one purchase-enhancing pulley between said weight carrier and said upper pulley and about which said cable is looped to increase the mechanical advantage of tensile force exerted on said free end of said cable.
10. A physical development machine according to Claim 1 wherein said elongated column is an extruded metal member having a uniform cross-sectional shape along its length.
11. A muscle development machine comprising:
- an elongated column having upper and lower ends and formed with at least first and second longitudinal tracks thereon,
 - upper and lower mounting brackets that are respectively fastened to said upper and lower ends of said column to firmly hold said column in upright alignment a horizontally spaced distance from an upright vertical support, whereby said first track faces said upright vertical support and said second track is disposed to face in a different direction from said first track,
 - an upper pulley mounted for rotation about a horizontally aligned axis atop said upper end of said column,
 - a weight carrier mounted for longitudinal reciprocal movement along said first track,
 - at least one pulley carriage slide mounted for longitudinal reciprocal movement along said second track,
 - at least one releaseable pulley carriage lock for immobilizing said pulley carriage slide at a selected position along said second track,
 - at least one turning pulley mounted on said pulley carriage slide for rotation about a horizontal axis, and
 - a cable attached to said weight carrier, looped over said upper pulley, and looped over said turning pulley.
12. A physical development machine according to Claim 11 wherein said elongated column is formed with a third longitudinal track thereon, an additional pulley carriage slide mounted for longitudinal reciprocal movement along said third longitudinal track, an additional releaseable pulley carriage lock for immobilizing said additional pulley carriage slide at a selected position along said third track, and an additional turning pulley mounted on said additional pulley carriage slide for rotation about a horizontal axis.
13. A physical development machine according to Claim 12 wherein said upper mounting bracket includes a top mounting beam projecting in a direction away from said vertical support and a cantilevered pulley secured to said top mounting beam remote from said upright support for rotation about a horizontal axis.
14. A physical development machine according to Claim 13 further comprising a cantilevered pulley swivel bracket carrying said cantilevered pulley and coupled to said top mounting beam for rotation relative thereto about an upright axis.
15. A physical development machine according to Claim 12 further comprising a turning pulley swivel bracket carrying said additional turning pulley and coupled to said additional pulley carriage slide for rotation relative thereto about a vertical axis.
16. A physical development machine according to Claim 12 wherein said column has a back side facing said upright support, an opposite front side, and a pair of mutually parallel lateral sides oriented perpendicular to said front and back sides, and said first track is located on said back side of said column, said second track is located on one of said lateral sides of said column, and said third track is located on said front side of said column.
17. A physical development machine according to Claim 11 wherein said elongated column is an extruded metal member having a uniform cross-sectional shape throughout its length.
18. A muscle development machine comprising:
- upper and lower mounting brackets for attachment to an upright support,
 - a longitudinally elongated column having a plurality of channeled sides, each having an elongated track defined thereon, said column having upper and lower ends respectively secured to said upper and lower mounting brackets,

whereby said mounting brackets hold said elongated column in a vertical orientation spaced horizontally from said upright support, a weight carrier engaged in one of said tracks on one of said channeled sides of said column for longitudinal reciprocal movement therealong, 5
an upper pulley located atop said column for rotation about a horizontal axis of rotation, a turning pulley carriage slide engaged in one of said tracks of another of said channeled sides of said column for longitudinal reciprocal movement therealong, 10
a releaseable carriage pulley lock for engaging said turning pulley carriage at a selected longitudinal location along said column, and 15
a cable having a secured end attached to said weight carrier and looped about both said upper pulley and said turning pulley and having an opposite, free end accessible to a user. 20

19. A physical development machine according to Claim 18 further comprising a releaseable clip at said other end of said cable for attachment to different limb-engaging accessories. 25

20. A physical development machine according to Claim 18 further comprising at least one purchase-enhancing pulley interposed between said weight carrier and said upper pulley and about which said cable is looped to increase the mechanical advantage of tensile force exerted on said free end of said cable. 30

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Fig. 1

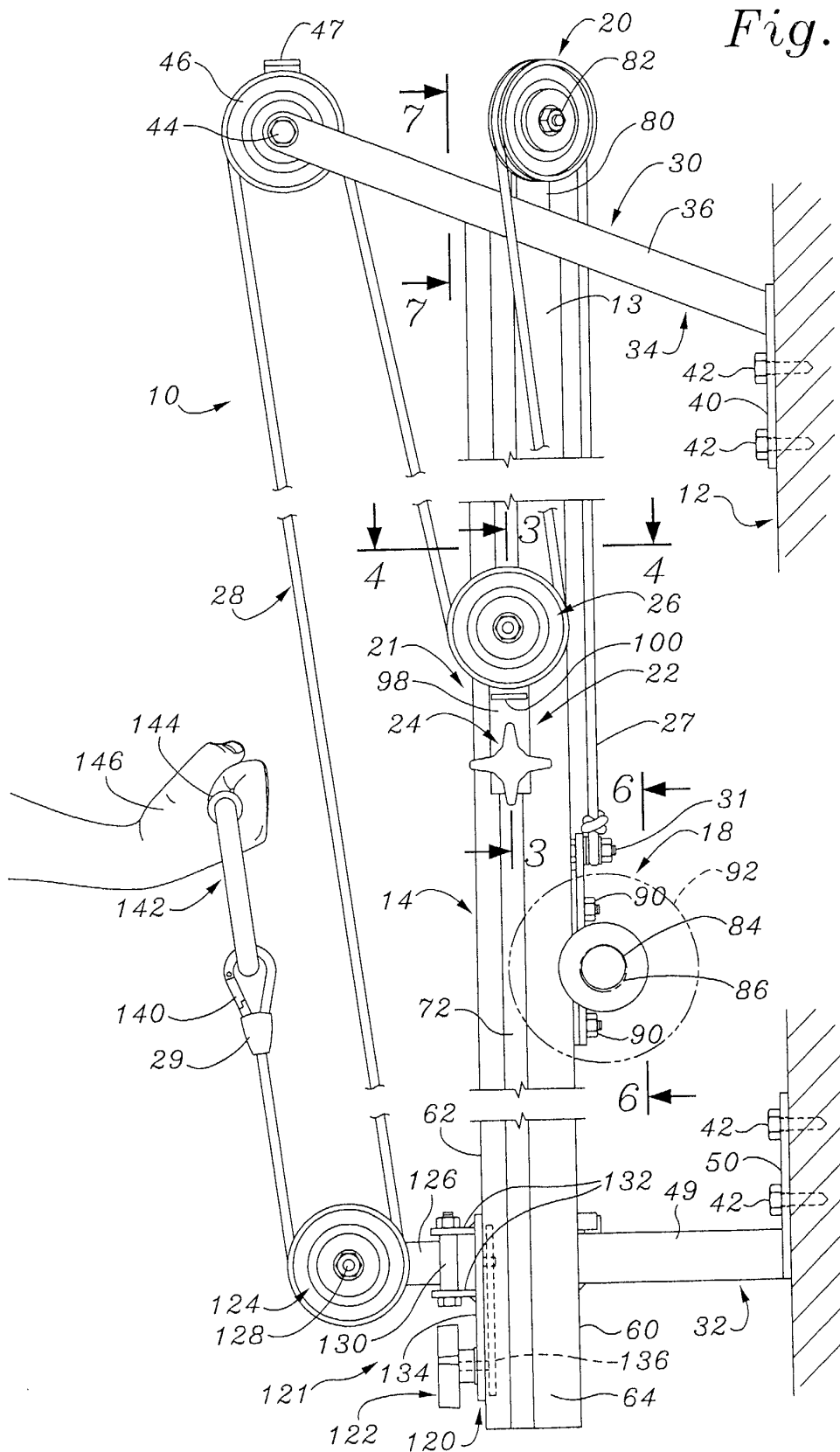


Fig. 2

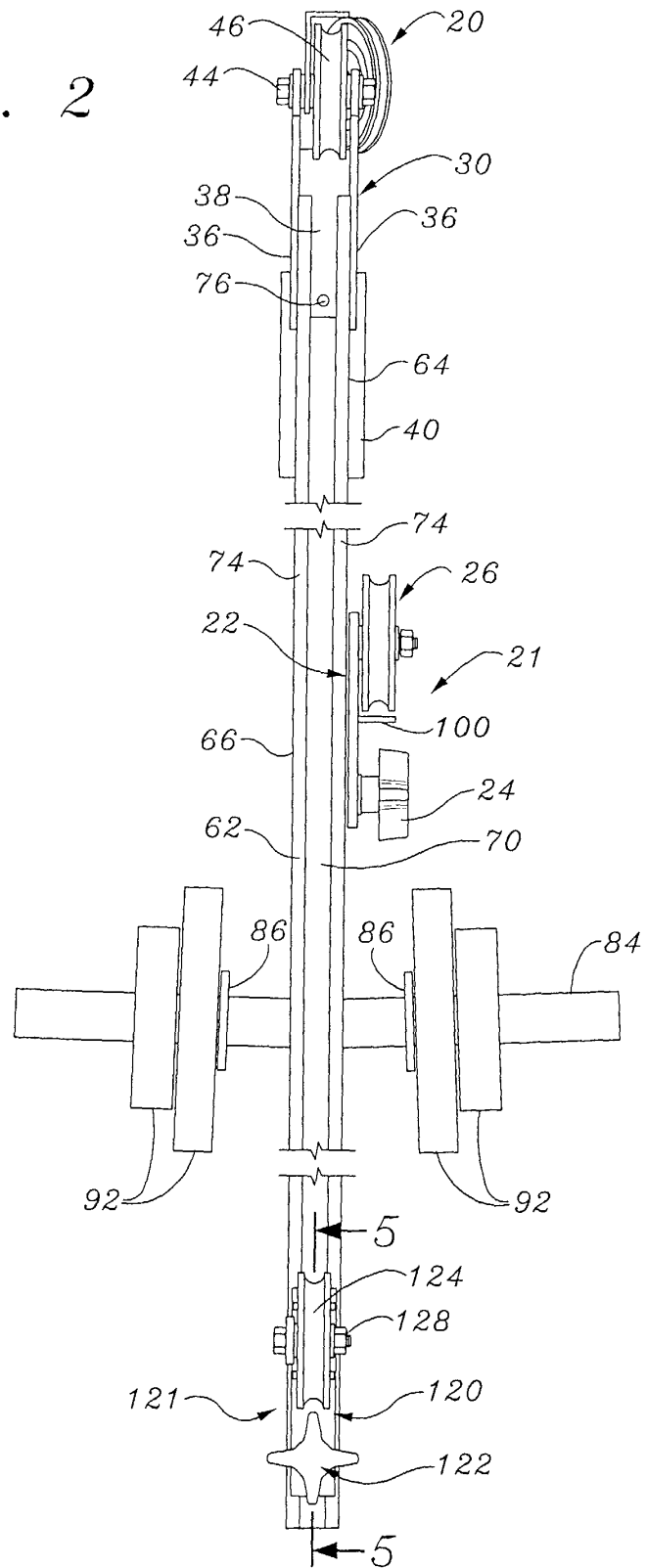


Fig. 3

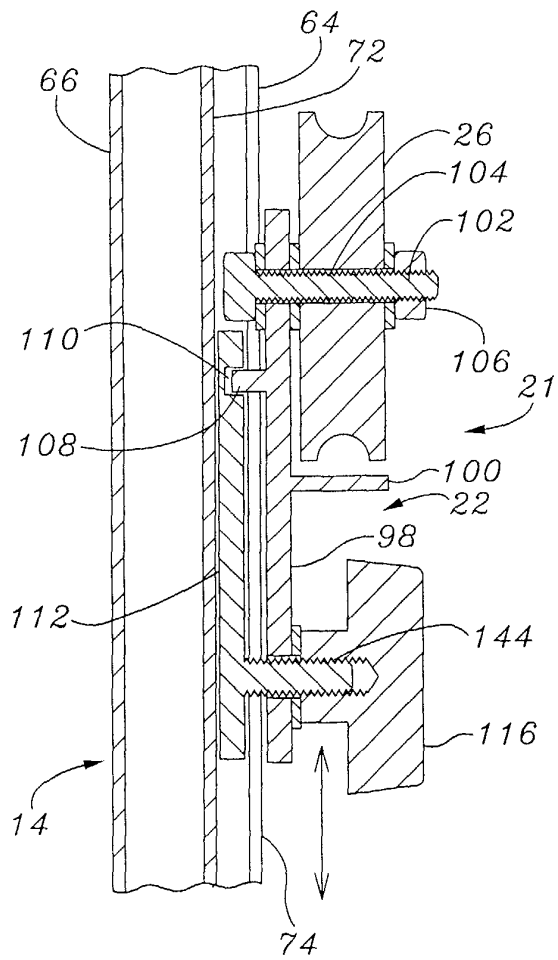


Fig. 15

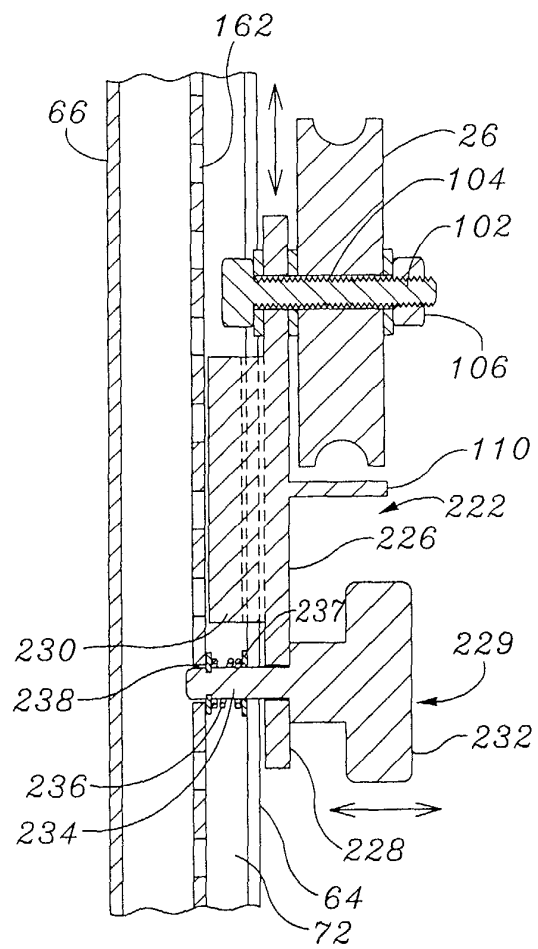


Fig. 6

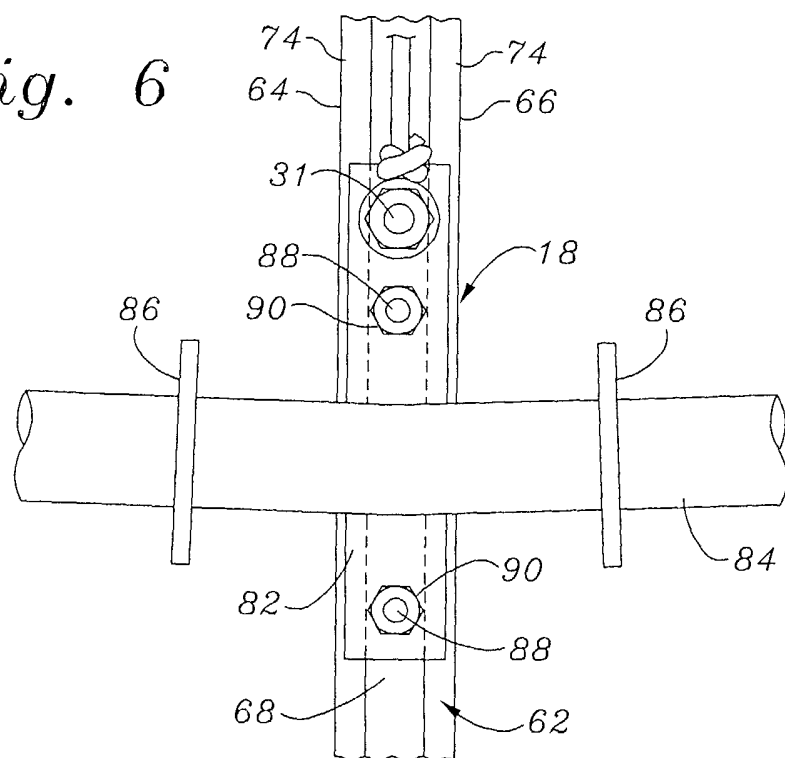
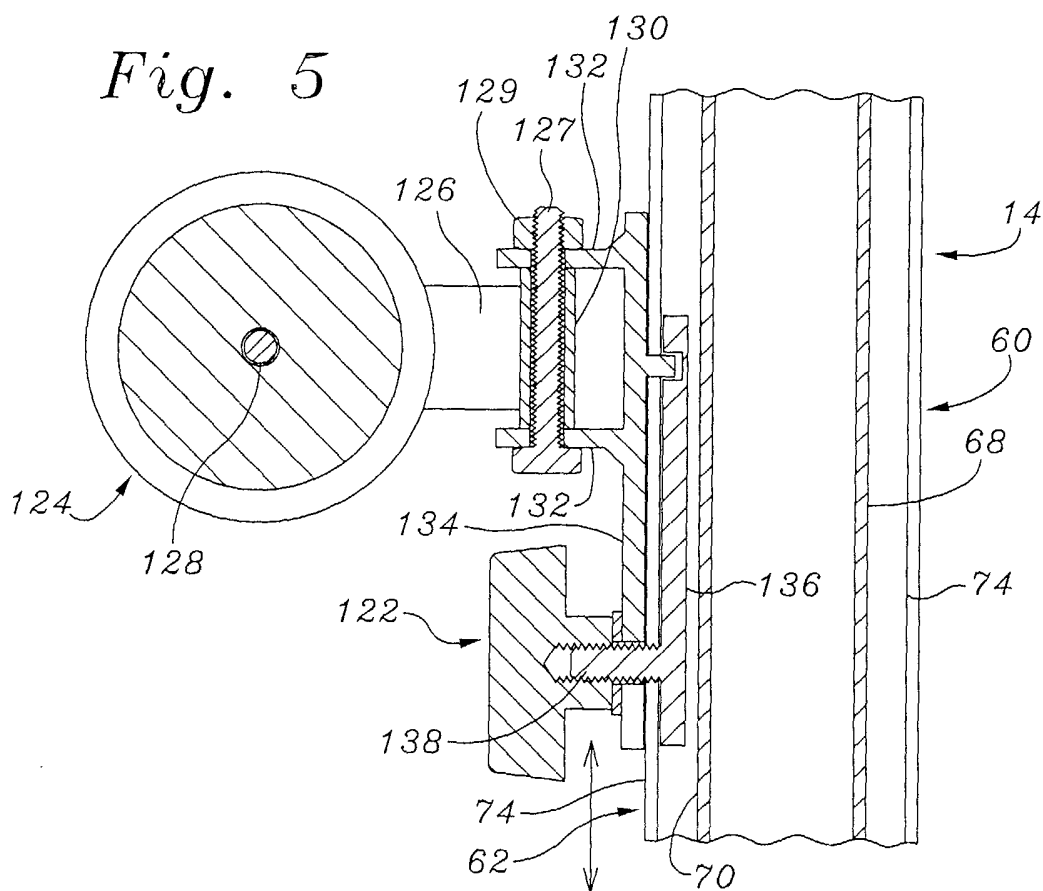
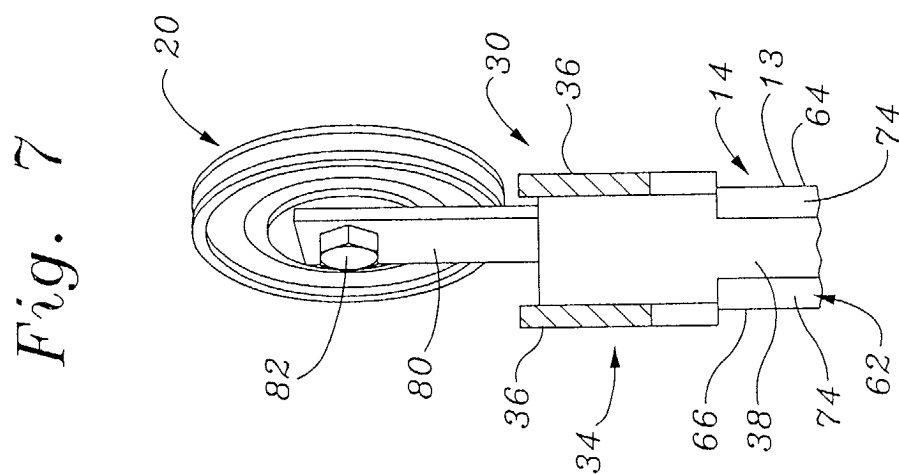
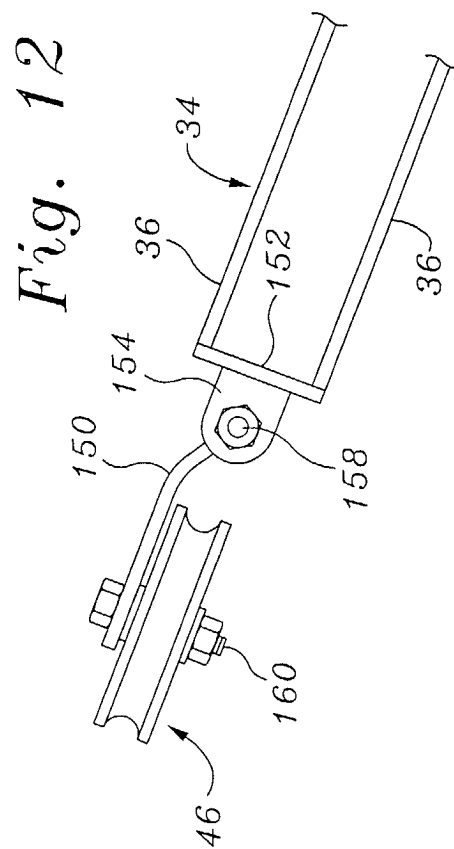
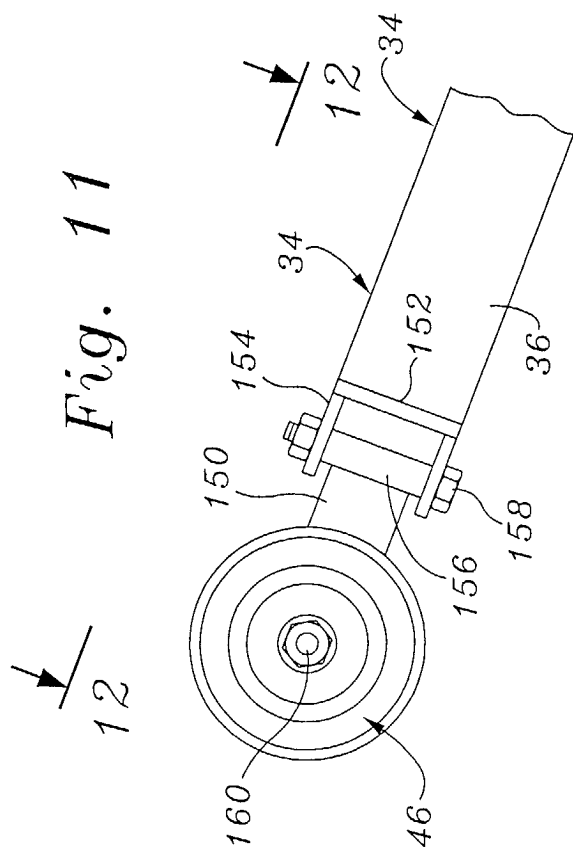
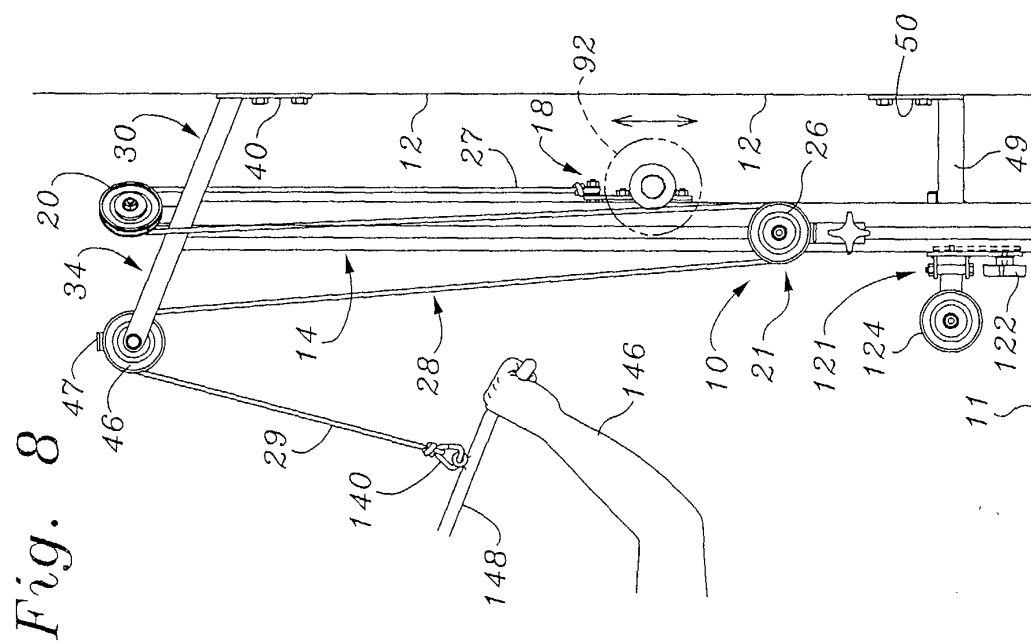
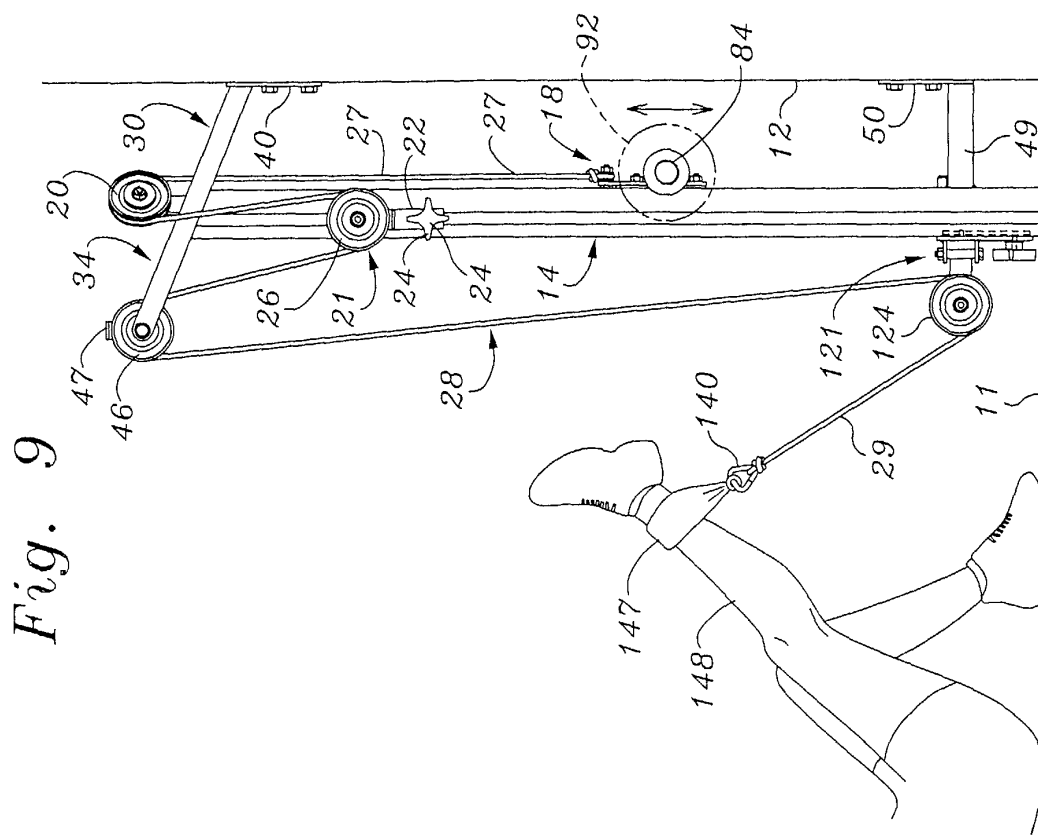


Fig. 5







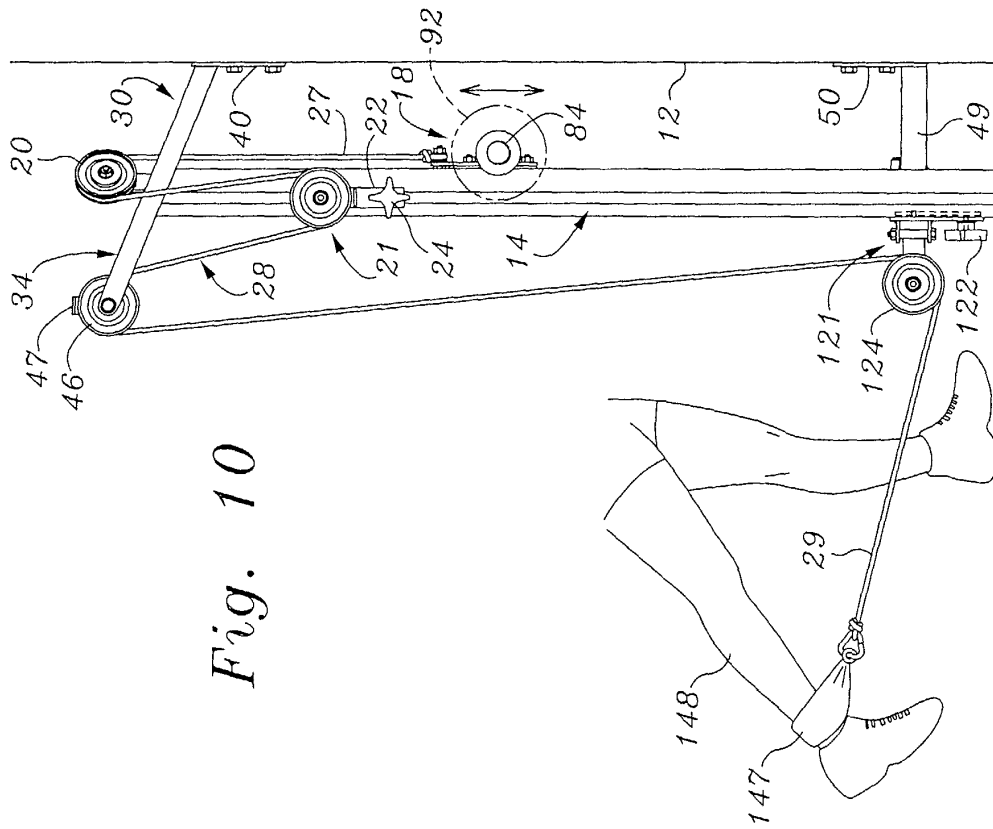
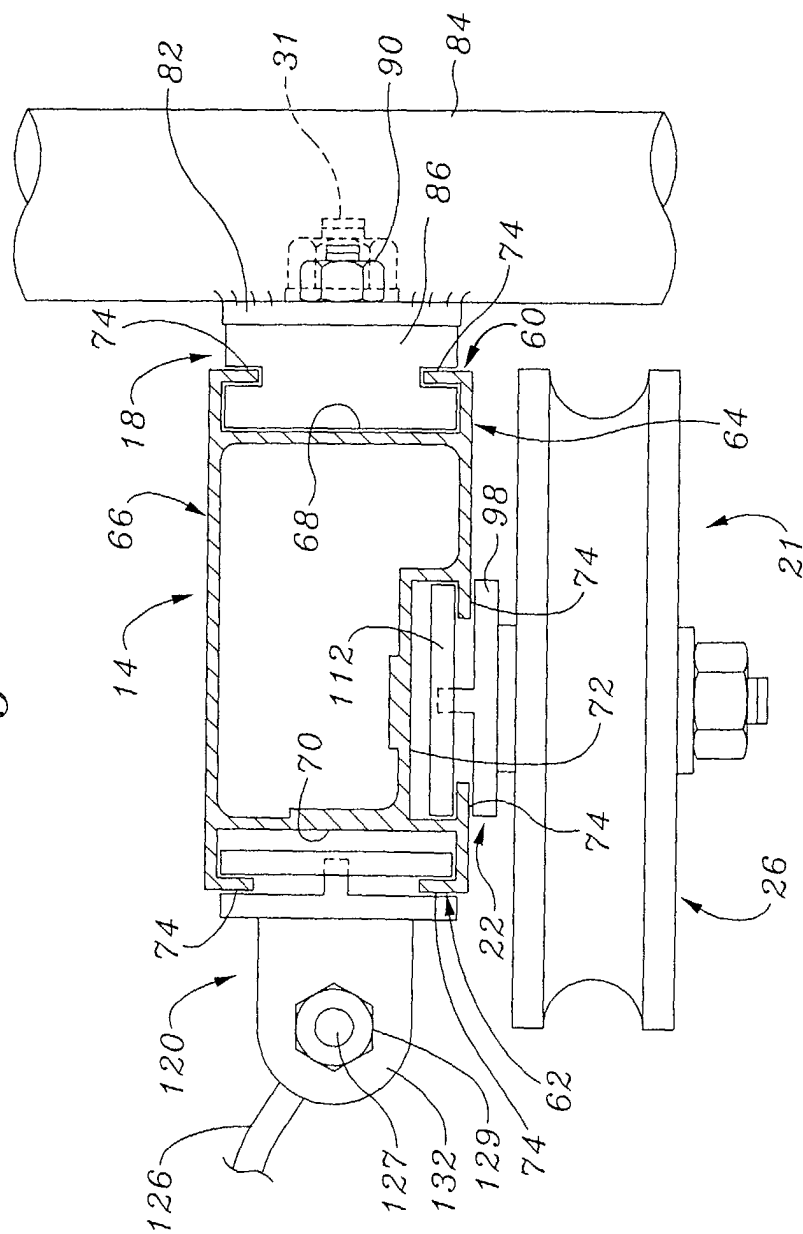
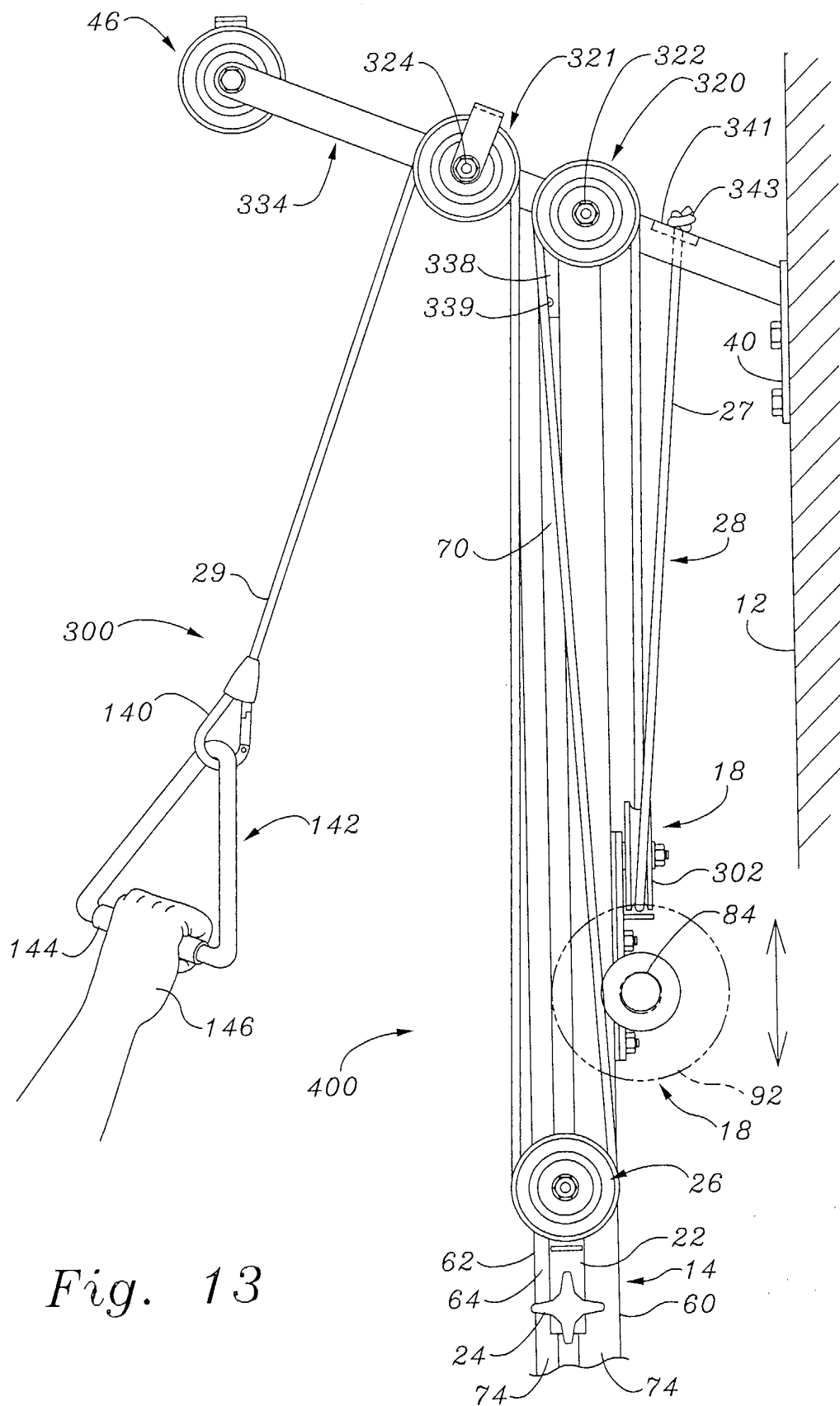


Fig. 10

Fig. 4





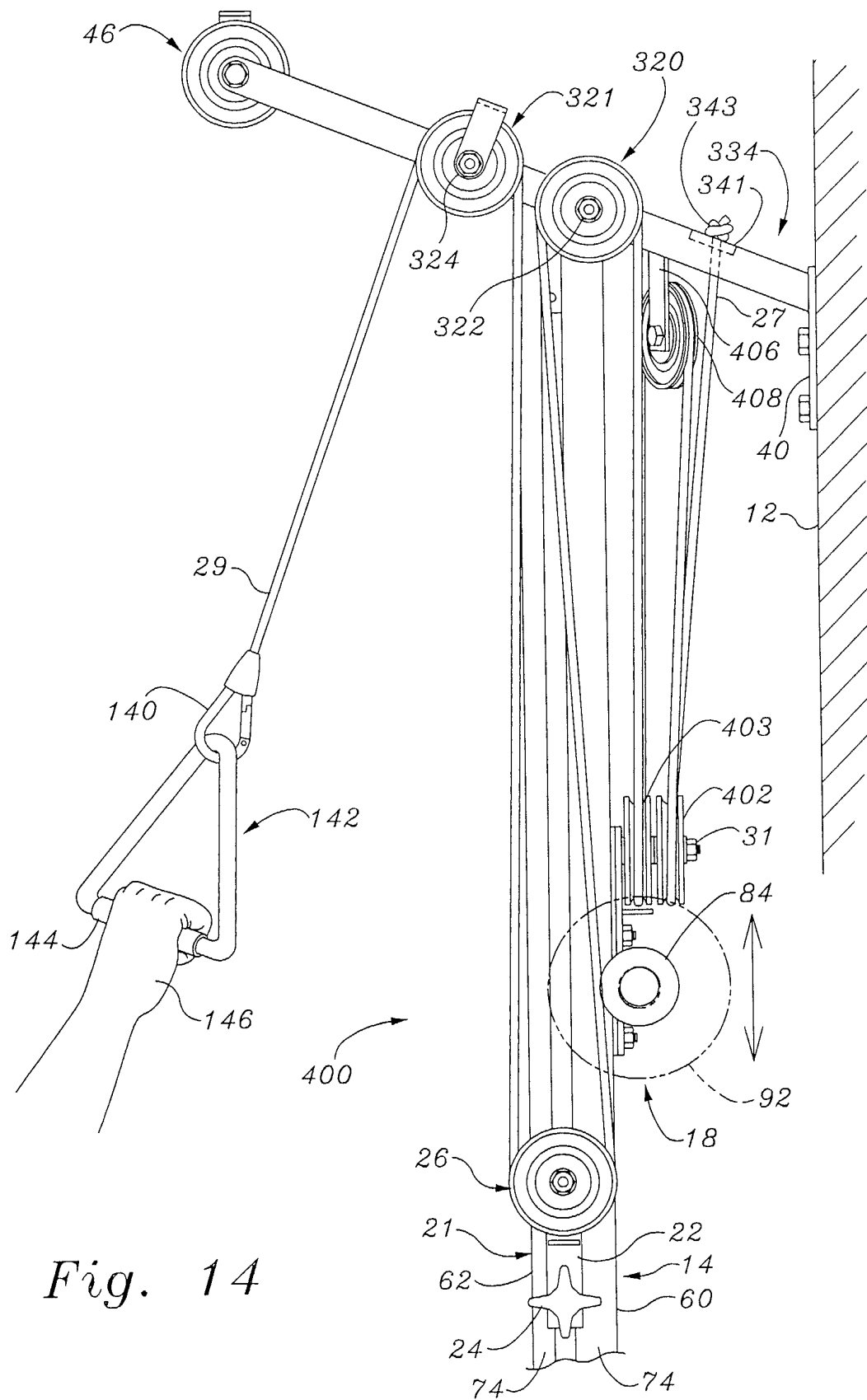


Fig. 14



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 7008

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 807 728 A (CHILLIER M) 30 April 1974 (1974-04-30)	1,2	A63B21/062
A	* column 3, line 26 - column 4, line 31; figure 5 *	10	

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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 8 January 2003	Examiner Squeri, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 25 7008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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