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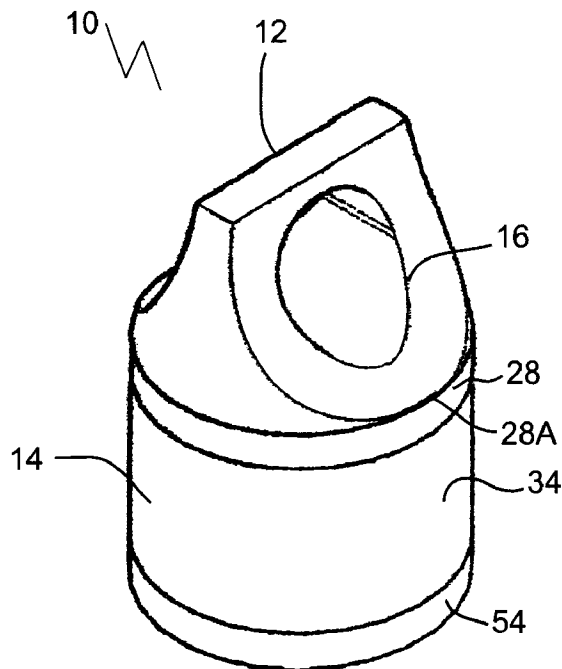
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(54) Title: STRAP CONNECTION SYSTEMS, QUICK CONNECTORS, AND RELATED SYSTEMS AND METHODS



(57) Abrégé/Abstract:

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(57) **Abrégé(suite)/Abstract(continued):**

downs, and others. An interchangeable strap connection system is described, having: a male connector; a strap connected to the male connector; a plurality of female sockets spaced from one another and anchored to a substrate, with each female socket structured to permit the male connector to interchangeably quick connect with and quick release from the female socket.

ABSTRACT OF THE DISCLOSURE

A male-female quick connect system is described, along with related methods and uses.

Example applications include using the strap as an exercise resistance trainer band, a boating mooring connector, a replacement or supplement to freight transport tie-downs, and others.

An interchangeable strap connection system is described, having: a male connector; a strap connected to the male connector; a plurality of female sockets spaced from one another and anchored to a substrate, with each female socket structured to permit the male connector to interchangeably quick connect with and quick release from the female socket.

STRAP CONNECTION SYSTEMS, QUICK CONNECTORS, AND RELATED SYSTEMS AND METHODS

TECHNICAL FIELD

[0001] This document relates to strap connection systems, quick connectors, and related systems and methods.

BACKGROUND

[0002] Quick connect and release connectors are known. A bayonet connector is one style of these connectors. Other styles include camlock, ball bearing, latch, and other types of connectors. Quick connect straps are known for securing electrical equipment and connecting to handbags, among other uses.

SUMMARY

[0003] A male-female quick connect system is disclosed, along with related methods and uses. Example applications include using the strap as an exercise resistance trainer band, a boating mooring connector, a replacement or supplement to freight transport tie-downs, and others.

[0004] An interchangeable strap connection system is disclosed comprising: a male connector; a strap connected to the male connector; a plurality of female sockets spaced from one another and anchored to a substrate, with each female socket structured to permit the male connector to interchangeably quick connect with and quick release from the female socket.

[0005] A method is disclosed of using an interchangeable strap connection system further comprising quick connecting the male connector into, or quick releasing the male connector out of, one of the plurality of female sockets.

[0006] A resistance strap exercise system is disclosed comprising: a first connector; an elastomeric strap connected to the first connector; and a plurality of second connectors spaced from one another and anchored to a substrate, with each second connector structured

to permit the first connector to interchangeably quick connect with and quick release from the second connector.

[0007] A resistance strap exercise system is disclosed comprising: an elastomeric strap; and a weight bar collar connected to the elastomeric strap.

[0008] A strap exercise system is disclosed comprising: a weight bar collar formed of a spool with a sleeve and opposed end flanges; a locking part that extends between the opposed end flanges and is spaced over an external cylindrical surface of the sleeve to secure in use a strap in between the locking part, the external surface, and the opposed end flanges.

[0009] A method is disclosed of operating a resistance strap exercise system comprising applying tension to elongate the elastomeric strap.

[0010] A boat mooring system is disclosed comprising: a male connector; a strap connected to the male connector; and a female socket anchored to one of a boat or a dock adjacent the boat, with the strap anchored to the other of the boat or dock, with the female socket structured to permit the male connector to quick connect with and quick release from the female socket.

[0011] A method is disclosed of operating a boat mooring system further comprising quick connecting the male connector into, or quick releasing the male connector out of, the female socket.

[0012] A cargo securing system is disclosed comprising: a male connector; a strap connected to the male connector; and a female socket anchored to a wheeled trailer flatbed, rail car, or transport container, with the strap anchored to the wheeled trailer flatbed, rail car, or transport container, with the female socket structured to permit the male connector to quick connect with and quick release from the female socket.

[0013] A method is disclosed of operating a boat mooring system further comprising quick connecting the male connector into, or quick releasing the male connector out of, the female socket.

[0014] In various embodiments, there may be included any one or more of the following features: The plurality of female sockets are embedded within the substrate. The substrate is one or more of a wall, a floor, or a ceiling, of a room. The plurality of female sockets are arranged in a matrix on the substrate. The male connector has a shaft with a

radial latch pin; each female socket of the plurality of female sockets defines a slot shaped to receive the shaft and radial latch pin, along a shaft axis of the shaft, when the shaft and radial latch pin are angularly aligned with the slot; and each female socket is structured to catch the radial latch pin after insertion and rotation to prevent removal of the shaft from the slot. The shaft has diametrically opposed radial latch pins. Each female socket comprises: a socket body that defines an axial bore, with the slot being defined axially through a plate that extends transversely across the axial bore; and in which an undersurface of the plate defines a stop for the radial latch pin to prevent the radial latch pin from aligning with the slot. The undersurface defines an arcuate channel whose radial ends define the stop. Each female socket comprises a biasing device that biases the radial latch pin into engagement with the undersurface. The biasing device comprises a spring. The male connector is structured to quick release upon axially depressing the male connector further into the slot against the biasing force of the biasing device, and rotating the shaft such that the radial latch pin aligns with the slot. A base of each female socket is defined by a base plate that is secured to the socket body. The base plate is secured to the socket body by a fastener. The base plate defines a fastener bore, with the fastener bore being defined axially through the base plate and through which passes a fastener that anchors the base plate to the substrate. The male connector receives the strap through a strap aperture through the male connector. The strap aperture is defined between a first part and a second part of the male connector, in which the first part and the second part are secured together in a closed position by fasteners, latches, or hinges. The strap is elastomeric. Forming a resistance strap exercise system. The plurality of female sockets are mounted at different locations on a boat and a dock adjacent the boat. The plurality of female sockets are mounted at different locations on a wheeled trailer flatbed, rail car, or transport container. A pair of male connectors, with the strap connected between the pair of male connectors, in which each female socket of the plurality of female sockets are structured to permit both of the pair of male connectors to interchangeably quick connect with and quick release from the female socket. Quick connecting the male connector into, or quick releasing the male connector out of, one of the plurality of female sockets. The plurality of female sockets are located on a vehicle. The plurality of female sockets are located on a military vehicle or on military equipment. A weight bar collar connected to the

strap. A first connector, with the elastomeric strap being connected to the first connector; and a plurality of second connectors spaced from one another and anchored to a substrate, with each second connector structured to permit the first connector to interchangeably quick connect with and quick release from the second connector. The strap, female socket, or male connector, is connected to a boat fender. The boat fender is suspended by a second strap from the male connector or female socket. The boat fender is connected to the boat.

[0015] These and other aspects of the device and method are set out in the claims, which are incorporated here by reference.

BRIEF DESCRIPTION OF THE FIGURES

[0016] Embodiments will now be described with reference to the figures, in which like reference characters denote like elements, by way of example, and in which:

[0017] Fig. 1 is a perspective view of a connector system in a locked position.

[0018] Fig. 2 is an exploded perspective view of the connector system of Fig. 1.

[0019] Fig. 3 is a side elevation view of the male quick connector of the connector system of Fig. 1.

[0020] Fig. 4 is a front elevation view of the male quick connector of the connector system of Fig. 1.

[0021] Fig. 5 is a top plan view of the female socket of the connector system of Fig. 1.

[0022] Fig. 6 is a section view taken along the 6-6 section lines from Fig. 5.

[0023] Fig. 7 is a top plan view of the female socket of another embodiment of a connector system.

[0024] Fig. 8 is a section view taken along the 8-8 section lines from Fig. 7.

[0025] Fig. 9 is a perspective view of another embodiment of a connector system in a locked position.

[0026] Fig. 10 is an exploded perspective view of the connector system of Fig. 9.

[0027] Fig. 11 is an exploded side elevation view of the male quick connector of the connector system of Fig. 9.

[0028] Fig. 12 is a top plan view of the upper portion of the male quick connector of the connector system of Fig. 9.

[0029] Fig. 13 is a top plan view of the lower portion of the male quick connector of the connector system of Fig. 9.

[0030] Fig. 14 is a perspective view of a person in a room using the connector system of Fig. 1 to connect two resistance bands to the floor to carry out a squat exercise.

[0031] Fig. 15 is a perspective view of a person in a room using the connector system of Fig. 1 to connect a resistance band to a side wall to carry out a row exercise.

[0032] Fig. 16 is a perspective view of a person in a room using the connector system of Fig. 1 to connect resistance bands to opposing side walls to carry out a fly exercise.

[0033] Fig. 17 is a perspective view of a person in a room using the connector system of Fig. 1 to connect a resistance band to a ceiling to carry out a variant of a row exercise or a pull-down exercise.

[0034] Fig. 17A is a side elevation view of a bar handle incorporated in the system of Fig. 17.

[0035] Fig. 17B is a side elevation view of a barbell weight bar and weight bar collar incorporated into the system of Fig. 17.

[0036] Fig. 18 is an exploded perspective view of the connector system of Fig. 9, illustrating the arcuate channel in the undersurface of the female socket.

[0037] Fig. 19 is a side section view of the connector system of Fig. 9 with a pair of male connectors located on either end of the strap, with each male connector aligned to mate with a respective female socket to secure the strap at two locations.

[0038] Fig. 20 is a cross-sectional view of another embodiment of a connector system in an inserted but unlocked position.

[0039] Fig. 21 is a cross-sectional view of the connector system of Fig. 20 in a locked position.

[0040] Fig. 22 is a top plan view of a boat mooring system, illustrating a boat with strap connection points at various locations on the boat and dock such that the boat may be connected by a tether extending between the boat and dock.

[0041] Fig. 23 is a top plan view of a flatbed of a truck illustrating strap connection points at various locations on the flatbed for securing a strap between plural connection points to secure a load.

[0042] Fig. 24 is an upper perspective view of the male quick connector of another embodiment of a connector system.

[0043] Fig. 25 is a base perspective view of the male quick connector of the connector system of Fig. 24.

[0044] Fig. 26 is a top plan view of the male quick connector of the connector system of Fig. 24.

[0045] Fig. 27 is a section view taken along the 27-27 section lines from Fig. 26.

[0046] Fig. 28 is a side elevation view of an embodiment of a weight bar collar that may be used with a strap to perform exercises.

[0047] Fig. 29 is a section view taken along the 29-29 lines from Fig. 28.

[0048] Fig. 30 is a section view taken along the 30-30 lines from Fig. 29

[0049] Fig. 31 is a perspective view of the weight bar collar of Fig. 28.

[0050] Fig. 32 is an upper perspective view of the male quick connector of another embodiment of a connector system.

[0051] Fig. 33 is a top plan view of the male quick connector of the connector system of Fig. 32.

[0052] Fig. 34 is a base perspective view of the male quick connector of the connector system of Fig. 32.

[0053] Fig. 35 is a side elevation view of the male quick connector of the connector system of Fig. 32.

[0054] Fig. 36 is another side elevation view of the male quick connector of the connector system of Fig. 32.

[0055] Fig. 37 is a section view taken along the 37-37 section lines from Fig. 36.

[0056] Fig. 38 is a bottom plan view of the male quick connector of the connector system of Fig. 32.

[0057] Fig. 39 is a perspective view of the female socket of another embodiment of a connector system.

[0058] Fig. 40 is a perspective view of the female socket of the connector system of Fig. 39.

[0059] Fig. 41 is a side elevation view of the female socket of the connector system of Fig. 39.

[0060] Fig. 42 is a section view taken along the 42-42 section lines from Fig. 41.

[0061] Fig. 43 is a bottom plan view of the female socket of the connector system of Fig. 39.

[0062] Fig. 44 is a section view taken along the 44-44 section lines from Fig. 43.

[0063] Fig. 45 is a perspective view of a military vehicle, namely a Humvee, with a connector system secured to a side wall in order to tether a strap between the Humvee and an object (not shown).

[0064] Fig. 46 is a perspective view of a connector system in a locked position to tether a boat to a dock, with a boat fender attached to the male quick connector.

[0065] Fig. 47 is a perspective view of the connector system of Fig. 46 with the male connector detached from the female socket and the boat fender partially disassembled.

DETAILED DESCRIPTION

[0066] Immaterial modifications may be made to the embodiments described here without departing from what is covered by the claims.

[0067] A fastener is a hardware device that mechanically joins or affixes two or more objects together. In general, fasteners are used to create non-permanent joints, that is, joints that can be removed or dismantled without damaging the joining components. Welding is an example of a method of creating permanent joints. Several other alternative methods of joining materials include: crimping, welding, soldering, brazing, taping, gluing, cement, or the use of other adhesives. Non-permanent joints may be created using forces, such as with magnets, vacuum (suction cups), or even friction (such as sticky pads or interference fits). Some types of woodworking joints make use of separate internal reinforcements, such as dowels or biscuits, which in a sense can be considered fasteners within the scope of the joint system, although on their own they are not general purpose fasteners.

[0068] Quick connectors may be used in fluid line couplings. An example of a quick connector is a quick connect fitting, also called a quick disconnect or quick release coupling. These are couplings used to provide a fast, make-or-break connection of fluid transfer lines. Operated by hand, quick connect fittings replace threaded or flanged connections, which require wrenches. When equipped with self-sealing valves, quick connect fittings will, upon disconnection, automatically contain any fluid in the line. A cam and groove coupling, also called a camlock fitting, is a form of hose coupling. This kind of coupling is popular because it is a simple and reliable means of connecting and disconnecting hoses quickly and without tools.

[0069] Other types of quick connectors are used in industry, such as magnetic connectors, hook and loop connectors, buckles, over-the-center latches and other latches, snap fasteners, and others.

[0070] A bayonet mount or bayonet connector is a fastening mechanism consisting of a cylindrical male side with one or more radial pins, and a female receptor with corresponding L-shaped slot(s) (or another suitable shape such as a ramp) with spring(s) to keep the two parts locked together. The slots may be shaped like a capital letter L with a serif (a short upward segment at the end of the horizontal arm). In use the pin slides into the vertical arm of the L, rotates across the horizontal arm, then is pushed slightly upwards into the short vertical "serif" by the spring. Once in the serif the connector is no longer free to rotate unless pushed down against the spring until the pin is out of the "serif".

[0071] Referring to Figs. 1-6, a connection system 10 is illustrated. Connection system 10 comprises a male connector 12, and a female socket 14. The male quick connector 12 may include a shaft 32 with a radial latch pin 30, for example diametrically opposed radial latch pins 30. In this document, reference characters referred to in the description may appear in the respective drawings with Roman numeral superscripts to delineate between multiple instances of the same part shown in the drawing. Referring to Fig. 14, in some embodiments, the system 10 has a plurality of female sockets 14, and forms an interchangeable connection system where the male quick connector can be interchangeably connected to any of the female sockets 14. The plurality of female sockets 14 spaced from one another and each structured to quick connect with and quick release from the male quick

connector 12. The plurality of female sockets 14 may be anchored at different locations on a substrate 21, for example a fixed substrate such as a floor of a building as shown.

[0072] Referring to Figs. 1-4 and 14, a strap 18 may be connected to the male connector 12. In some cases a handle grip 20 may be provided on the strap 18 for a user to grasp to apply tension to the strap 18 after connecting the connector 12 and socket 14. A strap, sometimes also called a strop, may be an elongated flap, rope, or ribbon, made of a suitable material such as fabric, leather, or elastomeric polymer or rubber. Thin straps are used as part of clothing or baggage, or bedding such as in a sleeping bag, while thicker straps may be used in similar applications, for example in the case of a belt. A webbing may be a particular type of strap that is a strong fabric woven as a flat strip or tube that is also often used in place of rope. Modern webbing is typically made from exceptionally high-strength material, and is used in automobile seat belts, furniture manufacturing, transportation, towing, military apparel, cargo fasteners, and many other fields.

[0073] Referring to Figs. 2-8, 10-13, 18, and 20-21, the male quick connector 12 of the connection system 10 may have a suitable structure. The connector 12 may include a shaft 32. The shaft 32 may further include a radial latch pin 30, for example two or more pins 30 (two are shown in the figures). Referring to Figs. 2-6, the pins 30 may be considered radial because they extend in radial directions relative to an axis 10A of the shaft 32. The female socket 14 of the plurality of female sockets 14 may include a slot 36. The slot 36 may be shaped to permit the shaft 32 and radial latch pin 30 to be inserted along shaft axis 10A into the slot 36. In order to angularly align the shaft and slot, an axis 10B of the slot 36 may align with shaft axis 10A. Referring to Figs. 5 and 6, the slot 36 may have a suitable shape, such as a bore 37 with cutouts 38 shaped to receive each pin 30.

[0074] Referring to Figs. 5-8 and 18, the female socket 14 may have a shape suitable to catch the shaft 32. The female socket 14 may be structured to catch the radial latch pin 30 to prevent removal from the slot 36, after the shaft 32 is rotated about the shaft axis 10A out of alignment with the slot 36. The socket 14 may comprise a socket body 34 that defines an axial bore 44. The slot 36 may be defined axially through a plate 39 or other suitable structure that extends transversely across the bore 44. The plate 39 may define an upper surface 34A of the socket body 34, which faces the male quick connector 12 when the

connector system 10 is engaged. The shaft 32 and pins 30 may be sized and structured relative to the plate 39 such that the male connector 12 has an inserted position where the shaft 32 and pins 30 extend past an undersurface 39A of the plate 39. Thus, upon rotation of the shaft 32 after insertion, the pins 30 move out of alignment with pin channels or cutouts 38. If the user then attempts to pull the connector 12 out, the pins 30 will contact undersurface 39A and removal will be prevented.

[0075] Referring to Figs. 5-8 and 18, the female socket 14 may have a shape suitable to stop the shaft 32 from exiting the socket 14 via the slot 36. A stop may function in a variety of ways. For example, in a bayonet mount system, the pins ride up a radial ramp into a serif, which the pin may be biased into to prevent accidental exiting of the pin from the serif (not shown). In the example shown, the undersurface 39A of the plate 39 may define a stop 42 for the radial latch pin 30. For example, the undersurface 39A may define an arcuate channel 40 whose radial ends define the stop 42. The stop 42 may restrict movement of the pin in the direction of the stop 42. Thus, once the pins are inserted through the cutouts 38 into bore 44, the shaft 32 rotated, and the shaft retracted partially to bring the pins 30 into contact with the channel 40, further rotation of the shaft 32 will prohibit pins 30 from aligning with cutouts 38 due to the location of stops 42. As addressed below, a biasing device may be used to bias the pins 30 into the channel 40.

[0076] Referring to Figs. 2, 18, and 20-21, the female socket 14 may comprise a biasing device 52 that biases the radial latch pin 30 into engagement with the stop 42 or undersurface 39A. For example, the biasing device 52, such as a spring as shown, may apply a force, for example directly or indirectly through a washer 46, against the pins 30 towards the undersurface of the plate 39, such that the radial latch pin 30 abuts the undersurface of the plate 39 unless a sufficient opposing force is applied by the user 50 to depress the biasing device 52. Thus, the male quick connector 12 may be structured to quick release upon depressing the male quick connector 12 further into the slot 36 against the biasing force of the biasing device 52, and rotating the shaft 32 such that the radial latch pin 30 aligns with the slot 36. The undersurface of the plate 39 may define a washer or spring seat 48 on which the washer 46 or biasing device 52 rests when the connection system 10 is in a locked

position. Referring to Figs. 42 and 44, other suitable biasing devices 52 may be used such as a wave disc spring.

[0077] Referring to Figs. 2, 18, and 20-21, the socket 14 may be mounted to the substrate 21 via a suitable fashion and mechanism. The socket 14 may have a suitable mechanism for securing to the substrate 21. A base of each female socket 14 may be defined by a base plate 54 that is secured to the socket body 34. Referring to Fig. 21, the base plate 54 may be secured to the socket body 34 by a fastener, such as a lag bolt 60. The base plate 54 may define a fastener bore 58. The fastener bore 58 may be defined axially through the base plate 54, for example coaxial with axis 10A, and through which passes a fastener such as bolt 60 that anchors the base plate 54 to the substrate 21. Referring to Figs. 2 and 21, the base plate 54 may be secured to the socket body 34 by a suitable mechanism, such as by passing fasteners 62 through aligned apertures 66 and 64 in the plate 54 and socket body 34, respectively. A top surface 54A of the plate 54 may abut an undersurface 34B of the body 34. The top surface 54A may define a spring seat 56 upon which the spring 46 sits.

[0078] Referring to Fig. 21, the socket 14 may be anchored to the substrate via a suitable mechanism. In the example shown, the socket 14 is embedded within the substrate 21', which may be a drywall board if the substrate is a wall, or may be a tile or carpet or rubber surface if the substrate is a floor, as examples only. In some cases the socket 14 is mounted directly to a stud 21'' or other structural frame member of a building. In other cases the socket 14 is mounted on the substrate 21, or partially but not fully embedded in the substrate 21. In the example shown, outer surface of the socket 14 and substrate 21 are flush with one another.

[0079] Referring to Figs. 1-4, the male quick connector 12 may have a suitable structure. The shaft 32 may depend from a knob 28. A base flange 28A of the knob 28 may be shaped to abut socket body 34, and in some cases may be shaped such that when in abutting relationship the cylindrical sidewalls of flange 28A and body 34 are flush with one another.

[0080] Referring to Figs. 1-4, 9-10, and 20-21, the male quick connector 12 may receive the strap 18 via a suitable fashion. One example is to use a strap aperture 16. Referring to Figs. 1 and 2, the aperture 16 may be defined through the knob 28 in a suitable

fashion. Referring to Figs. 9 and 10, a different embodiment of connector 12 is illustrated, and that incorporates, among other things, a two part strap connector system. The strap aperture 16 may be defined between a first part 12A and a second part 12B. The first part 12A and the second part 12B may be secured together in a closed position by a suitable mechanism, such as using fasteners (shown), latches, or hinges. Referring to Fig. 20, for example, the first part 12A and second part 12B may be secured by fasteners 94 passed through aligned apertures 90 and 92 in the second part 12B and first part 12A, respectively. The fastener 94 may engage by press fitting, snap fitting, or may be formed as an integral fastener, threaded fastener, or rivet. Other mechanisms may be used, such as latches, to secure the parts. Referring to Figs. 9-13, in the example shown the second part 12B includes a plate 88 from which shaft 32 depends. Plate 88 forms a substrate upon which columns 91 rest to support a base 80 of a knob 28 spaced over but not contacting plate 88, to define a slot for the strap (not shown) to pass through. Knob 28 may include an upstanding handle portion 86 with a top flange 84, or other suitable structure as may be functionally or ergonomically used.

[0081] Resistance training (also called strength training or weight training) is the use of resistance to muscular contraction to improve the strength, anaerobic endurance, tone, length, flexibility, proper function, and size of skeletal muscles. During a resistance training workout, a person may move their body or limbs against resistance provided by their body weight, gravity, bands, weighted bars or dumbbells. In some cases, a person may use a machine specifically designed to provide resistance training to target a particular muscle or group of muscles. The benefits of resistance training are considered to be significant. People who participate in this form of training typically have an easier time moving through activities of daily living because their muscles move more efficiently. Furthermore, resistance training has been shown to strengthen bones, improve cardiac health, raise metabolic rate, and increase lean muscle mass.

[0082] Resistance band training is a popular form of resistance training. Resistance bands are made of an elastomeric material. In some cases such a material is a strong, thin rubber. The band or strap may include a handle at an end, and may come in a variety of resistances and dimensions. Unlike weights, resistance bands do not rely on gravity to

provide resistance and therefore may place less pressure on the user's joints than do gravity resistance training methods. Resistance bands may also be particularly advantageous for injury rehabilitation, enabling a user to improve flexibility by increasing range of motion by repetitive motions of moving the band away or towards the body. Resistance bands are also lightweight and portable and are typically available at significantly lower costs than other forms of resistance training equipment and apparatuses.

[0083] Many resistance band training exercises require at least one part of the band (for example a non-handle end) to be mounted to a fixed structure. For example, a resistance band may be required to be anchored to a doorway or incorporated into an exercise machine. Track systems may be mounted on a support such as a wall to fix part of a resistance band to a slidable hook, or to a series of hooks.

[0084] Referring to Figs. 14-17, the connection system 10 may be used as a resistance strap exercise system. The strap 18 of the interchangeable connection system 10 may be elastic for such a purpose, although inelastic straps may be used for some exercises, such as if the male connector 12 were mounted to a socket 14 on the ceiling and the strap 18 were to be used to climb to the ceiling. With an elastic strap 18, a tensile force applied to the band / strap 18 by a user will elongate the strap 18 from its unstretched, neutral length, and similarly, the strap 18 may return to the unstretched length when the tensile force is released. Elasticity differs from flexibility, which refers to the ability of the strap 18 to bend under non-tensile loads. A user 50 may mount an elastic strap 18 to substrate 21 by connecting the male quick connector 12 to a fixed female socket 14. The elastic strap 18 may have a suitable shape, such as tubing-shaped (more suitable for the embodiment of Fig. 1), or planar-or-ribbon-shaped, for example a latex band (more suitable for the embodiment of Fig. 9).

[0085] Referring to Figs. 14-17, the strap 18 may connect to a handle or foot grip 20. In some cases, the grip 20 is selected from a plurality of interchangeable grips, such as clevis shackle-shaped handles (Figs. 14-16), and dual-hand bar handles (Figs. 17 and 17A), to name a few options. From a position where the strap 18 is taut but unstretched, a user 50 may engage in resistance training by applying a force on the handle grip 20 such that the strap 18 is lengthened into a stretched position. The user 50 may then gradually release the force applied to the handle grip 20 until the strap 18 returns to an unstretched length. An

interchangeable connection system 10 may also include a plurality of male quick connectors 12 with corresponding straps 18. A male quick connector 12 may secure to more than one strap 18 such that more than one user 50 may use a connection system 10 at the same time. Male connectors 12 and handles 20 may secure to opposing axial ends of the strap 18, or at intermediate locations along the length of strap 18.

[0086] Referring to Figs. 17B, and 28-31, a strap connection system 10 may comprise a weight bar collar 100, which could also be referred to as a weight bar ring. As shown in Fig. 17B, weight bar collar 100 may be connected to the elastomeric strap 18 of a resistance exercise strap system. In other cases, the collar 100 may be connected to a non-elastomeric strap. Referring to Figs. 28-31 bar collar 100 may comprise a spool 104 configured to permit a strap 18 (Fig. 17B) to be wound around bar collar 100, for example at least partially wound around the collar 100, and in some cases wrapped around collar 100 one or more times. Spool 104 may include a sleeve 105 and opposed end flanges 108. Flanges 108 may extend radially outward from the spool 104 at the ends of the spool 104. In some cases flanges 108 are not provided or one is provided.

[0087] Referring to Figs. 28-31, a locking part may be provided to secure the strap 18 to the collar 100. The locking part, such as one or more bars or plates 102, may extend between the opposed end flanges 108. The locking part may be spaced over an external cylindrical surface 109 of the sleeve to secure in use a strap 18 in between the locking part, the external surface, and the opposed end flanges 108. Plates 102 may be secured to the flanges 108 or another part of collar 100, for example via fasteners 111, to form a bridge or cantilever that spans the spool 104 and retains the strap 18 against the spool 104. In some cases the locking part may be releaseable, for example via a latch, magnet, or other quick-release connector, to permit the strap 18 to be conveniently secured and released to the collar 100 as desired. Referring to Fig. 17B, strap 18 may be wound under the plates 102 to secure the strap 18 to the bar collar 100.

[0088] Referring to Figs. 28-31, the collar 100 may have other suitable characteristics. Collar 100 may include an internal bushing sleeve 106 that may be secured to the interior of the spool 104. An interior cylindrical wall 107 of the bushing sleeve 106 (or another part of the collar 100), may be structured to receive a weight bar (shown in Fig. 17B

as bar 110). A weight bar is a rigid bar or frame structured to mount one or more weights, such as weight plates, by inserting the bar through a central aperture in the plate, and sliding the plate into position on the bar. The weight bar may be made of a suitable material such as steel or another metal. The weight bar may form cylindrical rod, which may have an outer diameter of suitable dimensions, such as between 25 and 50 millimeters, although larger or smaller diameters may be used. The inner dimensions of the sleeve 106 or collar 100 may be sized to fit the bar, for example by having a corresponding internal diameter slightly larger than the outer diameter of the bar. The collar 100 may be structured to secure or retain the bar within the collar 100. For example, the collar 100 may be made of a suitable material, such as rubber or textured material, that creates friction with the bar 110 to retain the bar within the collar 100 against removal under normal forces when the bar 110 is being used for exercise. The bar collar 100 may comprise a locking mechanism such as a clamp, spring, friction lock, or latching system, to secure the bar within the bar collar 100 during use. As shown in Fig. 17B, bar 110 may be inserted into bar collar 100 to form a handle grip 20 to permit the user to perform a variety of exercises with the bar, with or without additional weight plates mounted on the bar and secured by collar 100. Referring to Figs. 17 and 17B, the strap 18 may be connected to a first connector such as a male quick connector 12 (for example at the opposite end of the strap 18 as collar 100), to permit the strap 18 to be connected to any of a plurality of second connectors, such as female sockets 14, anchored to a substrate.

[0089] Referring to Figs. 14-17 different exercises are shown. In Fig. 14, a squat exercise is simulated using a pair of connectors and straps 18 secured to the floor 22. In Fig. 15, a row exercise is simulated by mounting a singled connector 12 to the wall 24. In Fig. 16 a fly exercise is simulated by mounting two straps 18 and connectors 12 to opposing walls 24. Referring to Fig. 17 a pull-down exercise is simulated by mounting the strap 18 and connector 12 to a ceiling 26. In other cases, exercises with an inelastic strap may be used (not shown). For example, two inelastic straps 18 may be mounted to a ceiling 26 such that a user 50 may suspend themselves from the ceiling 26, for example to engage in suspended core exercises or to perform a pull-up. Ring handles (not shown) may be used to connect to straps 18 for such a purpose.

[0090] Referring to Figs. 14-17, different exercises may be achieved by varying the location of the male-female connection, the number of straps, and the type of handles. The substrate 21 where the sockets 14 are located may be one or more of a floor 22 (Fig. 14), wall 24, or a ceiling 26 of a room, or two or all of these types. The plurality of female sockets 14 may comprise female sockets 14 on the wall 24 and floor 22, or may comprise female sockets 14 on the wall 24, floor 22, and ceiling 26 of a room. The female sockets 14 may be distributed in a suitable pattern or arrangement on the substrate 21, for example arranged in series in a matrix as shown to create a particular application of the interchangeable connection system. A matrix may consist of a series of regularly spaced columns and rows. A matrix pattern may allow a user 50 to readily change the position of a connection system 10 or several connection systems 10 to suit the band requirements of a particular exercise. The plurality of female sockets 14 may also be distributed such that more than one user 50 may be able to use the interchangeable connection system 10 at the same time or engage in partner exercises.

[0091] Referring to Fig. 19 each strap 18 may connect to two or more male quick connectors 12. A strap 18 may extend between the pair of male connectors 12. For example, a strap 18 may not have a user 50 end but rather be fixed to a connector system 10 at both ends of the strap 18. A plurality of female sockets 14 may be provided to quick connect and quick release from each male quick connector 12 in the pair. The interchangeable connection system 10 may thus comprise a plurality of male quick connectors 12 and straps 18. A strap 18 may diverge into several straps 18, each of which may have a male connector 12, such as with a v-shaped diverging strap 18.

[0092] Mooring may refer to any permanent structure to which a water vessel may be secured. Examples include quays, wharfs, jetties, piers, anchor buoys, and mooring buoys. A ship may be secured to a mooring to forestall free movement of the ship on the water. An anchor mooring fixes a vessel's position relative to a point on the bottom of a waterway without connecting the vessel to shore. As a verb, mooring refers to the act of attaching a vessel to a mooring. The most common way to secure a water vessel to a mooring is to use a rope that is looped around and knotted to a mooring.

[0093] Referring to Fig. 22, the connection system 10 disclosed here may be used to anchor a boat to a substrate 21, such as a dock 70. The plurality of female sockets 14 may be mounted at different locations on one or more of a boat 72 and dock 70 adjacent the boat 72. For example, sockets 14 may be mounted at one or more of a front 72A, rear 72B, and sides 72C and 72D of the boat 72. If sockets 14 are provided on boat and dock, then a dual connector 12 strap 18 may be used such as shown in Fig. 19. A user wishing to dock a boat may secure the boat to the dock using the quick connector 12, and upon desiring to leave the dock, the user may either release one or both of the connectors 12 to break the anchor connection.

[0094] Referring to Figs. 46-47, a boat fender 112 may be attached to the connection system 10. Such an arrangement may allow the fender 112 to be easily connected and removed from the side of a boat 72 or dock 70 during docking. In boating, a fender is a bumper used to absorb the kinetic energy of a boat or vessel berthing against a jetty, quay wall, dock, or adjacent vessel. Fenders, are used on all types of vessels, from cargo ships to cruise ships, ferries and personal yachts, to prevent damage to vessels and berthing structures. As shown in Fig. 46, the strap 18 may comprise a rope that may be connected to a male quick connector 12 at one end and another connector, such as a hooking mechanism 116 or quick-release connector at another end. Hooking mechanism 116 may comprise a carabiner, which may allow a user to connect the rope 18 to another connector, such as a hook 114, for example, on a dock 70. In the example shown, the fender 112 is suspended from the male connector 12 via a strap 120, which may be a separate strap as 18 or may be part of strap 18. In other cases the fender 112 is suspended by the female socket 14. The system 10 may allow the fender 112 to be connected to the boat, for example prior to mooring.

[0095] Load securing, also known as cargo securing, is the securing of cargo for transportation. It has been estimated that up to 25% of accidents involving trucks can be attributable to inadequate cargo securing. Cargo that is improperly secured can cause severe accidents and lead to the loss of cargo, the loss of lives, the loss of vehicles, unintentional disclosure of a concealment, or cause environmental hazards. The most common method used to secure cargo is to use tie down straps. These straps (also called ratchet straps, lashing

straps or tie downs) are fasteners used to hold down cargo or equipment during transport. Tie down straps are essentially webbing that is outfitted with tie down hardware. This hardware allows the tie down strap to attach to the area surrounding the cargo or equipment, loop over the cargo or equipment, and/or attach to the cargo or equipment. It usually also includes a method of tensioning the strap, such as a ratchet.

[0096] Referring to Fig. 23 the connection system 10 disclosed here may be used to secure a cargo to a substrate 21, such as a plywood or other flatbed 81, or container, such as an intermodal container, as a rail-car, or any other type of freight transport system requiring load securement. The plurality of female sockets 14 may be mounted at different locations on the transport flatbed 81. For example, sockets 14 may be mounted at one or more of a front 81A, rear 81B, and sides 81C and 81D of the flatbed 81. Sockets 14 may also be mounted at a cargo zone 83 of the flatbed 81. Dual connector straps 18 may be used as shown for example when securing between two sockets 14 to secure cargo 85. Ratchets or other tightening devices may be provided on each strap 18 to tighten the strap 18 against the load in question.

[0097] In some cases the male connector 12 has no moving parts. In some cases the strap 18 connects to a greater structure, such as a tarp, fabric sheet, or other item. In some cases a strap 18 is clamped into the male connector 12. The plurality of female sockets 14 may be mounted on a panel to support temporary installation of the female sockets 14 on a substrate 21.

[0098] Referring to Figs. 24-27 and 32-38, the male quick connector 12 may be formed in any of a variety of shapes and may include a variety of attachments to suit a particular function or strap. The aperture 16 may be structured to define an aperture width 16A that is sized for a particular strap. For example, the embodiment of male quick connector 12 illustrated in Figs. 24-27, has an elongated shape suitable for securing a flat strap 18. Referring to Figs. 32-38, the male connector 12 may be shaped to receive a strap that has a circular or elliptical cross-section, such as a rope or cable.

[0099] Referring to Figs. 39-55, the female quick connector (socket 14) may be formed in any of a variety of shapes and may include a variety of attachments to suit a particular function or male quick connectors. In some cases the socket 14 may mount to a

strap 18, with the male connector mounted to a substrate to receive the socket 14 and strap 18.

[00100] Referring to Fig. 45, the connection system 10 may be mounted to a vehicle 118, such as a military vehicle or a Humvee as shown. A plurality of female sockets 14 may be located on the vehicle 118 such that connection system 10 may be connected to any part of the vehicle or other equipment. Thus, a user may connect a strap 18 to vehicle 118, for example the Humvee in a military embodiment, and thereafter use the strap 18 for a variety of training purposes, such as resistance band training exercises. For example, sockets 14 may be located at various locations around the vehicle, such as on the sides, front or rear of the vehicle 118. The above example provides a remote and convenient exercise system for use by military or others in remote locations without conventional workout facilities. The sockets 14 may be mounted on other suitable equipment, for example military equipment such as crates, boxes, fences, or walls, that would provide sufficient structural strength to permit such exercises to be performed. The connection system 10 may also be used as part of a winch or towing system to connect a tow cable to another vehicle or item to be towed by the vehicle 118 or to permit the vehicle 118 itself to be towed. When not in use the strap 18 and connector 12 (and other equipment such as handle 20 or bar 110) may be stored in the vehicle 118, for example in a pelican case.

[00101] One or more buckles (not shown), such as D-rings, may be used for adjusting strap length.

[00102] In the claims, the word “comprising” is used in its inclusive sense and does not exclude other elements being present. The indefinite articles “a” and “an” before a claim feature do not exclude more than one of the feature being present. Each one of the individual features described here may be used in one or more embodiments and is not, by virtue only of being described here, to be construed as essential to all embodiments as defined by the claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An interchangeable strap connection system comprising:
 - a male connector;
 - a strap connected to the male connector;
 - a plurality of female sockets spaced from one another and anchored to a substrate, with each female socket structured to permit the male connector to interchangeably quick connect with and quick release from the female socket.
2. The interchangeable strap connection system of claim 1 in which the plurality of female sockets are embedded within the substrate.
3. The interchangeable strap connection system of any one of claim 1 - 2 in which the substrate is one or more of a wall, a floor, or a ceiling, of a room.
4. The interchangeable strap connection system of any one of claim 1 - 3 in which the plurality of female sockets are arranged in a matrix on the substrate.
5. The interchangeable strap connection system of any one of claim 1 - 4 in which:
 - the male connector has a shaft with a radial latch pin;
 - each female socket of the plurality of female sockets defines a slot shaped to receive the shaft and radial latch pin, along a shaft axis of the shaft, when the shaft and radial latch pin are angularly aligned with the slot; and
 - each female socket is structured to catch the radial latch pin after insertion and rotation to prevent removal of the shaft from the slot.
6. The interchangeable strap connection system of claim 5 in which the shaft has diametrically opposed radial latch pins.

7. The interchangeable strap connection system of any one of claim 5 - 6 in which each female socket comprises:

a socket body that defines an axial bore, with the slot being defined axially through a plate that extends transversely across the axial bore; and

in which an undersurface of the plate defines a stop for the radial latch pin to prevent the radial latch pin from aligning with the slot.

8. The interchangeable strap connection system of claim 7 in which the undersurface defines an arcuate channel whose radial ends define the stop.

9. The interchangeable strap connection system of any one of claim 7 - 8 in which each female socket comprises a biasing device that biases the radial latch pin into engagement with the undersurface.

10. The interchangeable strap connection system of claim 9 in which the biasing device comprises a spring.

11. The interchangeable strap connection system of any one of claim 9 - 10 in which the male connector is structured to quick release upon axially depressing the male connector further into the slot against the biasing force of the biasing device, and rotating the shaft such that the radial latch pin aligns with the slot.

12. The interchangeable strap connection system of any one of claim 7 - 11 in which a base of each female socket is defined by a base plate that is secured to the socket body.

13. The interchangeable strap connection system of claim 12 in which the base plate is secured to the socket body by a fastener.

14. The interchangeable strap connection system of claim 13 in which the base plate defines a fastener bore, with the fastener bore being defined axially through the base plate and through which passes a fastener that anchors the base plate to the substrate.
15. The interchangeable strap connection system of any one of claim 1 - 14 in which the male connector receives the strap through a strap aperture through the male connector.
16. The interchangeable strap connection system of claim 15 in which the strap aperture is defined between a first part and a second part of the male connector, in which the first part and the second part are secured together in a closed position by fasteners, latches, or hinges.
17. The interchangeable strap connection system of any one of claim 1 - 16 in which the strap is elastomeric.
18. The interchangeable strap connection system of claim 17 forming a resistance strap exercise system.
19. The interchangeable strap connection system of any one of claim 1 - 17 in which the plurality of female sockets are mounted at different locations on a boat and a dock adjacent the boat.
20. The interchangeable strap connection system of any one of claim 1 - 17 in which the plurality of female sockets are mounted at different locations on a wheeled trailer flatbed, rail car, or transport container.
21. The interchangeable strap connection system of any one of claim 19 - 20, further comprising a pair of male connectors, with the strap connected between the pair of male connectors, in which each female socket of the plurality of female sockets are structured to permit both of the pair of male connectors to interchangeably quick connect with and quick release from the female socket.

22. The interchangeable strap connection system of any one of claim 1 - 21 in which the plurality of female sockets are located on a vehicle.
23. The interchangeable strap connection system of any one of claim 1 - 21 in which the plurality of female sockets are located on a military vehicle or on military equipment.
24. The interchangeable strap connection system of any one of claim 1 - 23 further comprising a weight bar collar connected to the strap.
25. A method of using the interchangeable strap connection system of any one of claim 1 - 24 further comprising quick connecting the male connector into, or quick releasing the male connector out of, one of the plurality of female sockets.
26. A resistance strap exercise system comprising:
a first connector;
an elastomeric strap connected to the first connector; and
a plurality of second connectors spaced from one another and anchored to a substrate, with each second connector structured to permit the first connector to interchangeably quick connect with and quick release from the second connector.
27. A resistance strap exercise system comprising:
an elastomeric strap; and
a weight bar collar connected to the elastomeric strap.
28. The resistance strap exercise system of claim 27 further comprising:
a first connector, with the elastomeric strap being connected to the first connector;
and

a plurality of second connectors spaced from one another and anchored to a substrate, with each second connector structured to permit the first connector to interchangeably quick connect with and quick release from the second connector.

29. A strap exercise system comprising:
a weight bar collar formed of a spool with a sleeve and opposed end flanges;
a locking part that extends between the opposed end flanges and is spaced over an external cylindrical surface of the sleeve to secure in use a strap in between the locking part, the external surface, and the opposed end flanges.
30. A method of operating the resistance strap exercise system of any one of claim 26 - 29 comprising apply tension to elongate the elastomeric strap.
31. A boat mooring system comprising:
a male connector;
a strap connected to the male connector; and
a female socket anchored to one of a boat or a dock adjacent the boat, with the strap anchored to the other of the boat or dock, with the female socket structured to permit the male connector to quick connect with and quick release from the female socket.
32. The boat mooring system of claim 31 in which the strap, female socket, or male connector, is connected to a boat fender.
33. The boat mooring system of claim 32 in which the boat fender is suspended by a second strap from the male connector or female socket.
34. The boat mooring system of any one of claim 32 - 33 in which the boat fender is connected to the boat.

35. A method of operating the boat mooring system of any one of claim 31- 34 further comprising quick connecting the male connector into, or quick releasing the male connector out of, the female socket.

36. A cargo securing system comprising:
a male connector;
a strap connected to the male connector; and
a female socket anchored to a wheeled trailer flatbed, rail car, or transport container, with the strap anchored to the wheeled trailer flatbed, rail car, or transport container, with the female socket structured to permit the male connector to quick connect with and quick release from the female socket.

37. A method of operating the cargo securing system of claim 36 further comprising quick connecting the male connector into, or quick releasing the male connector out of, the female socket.

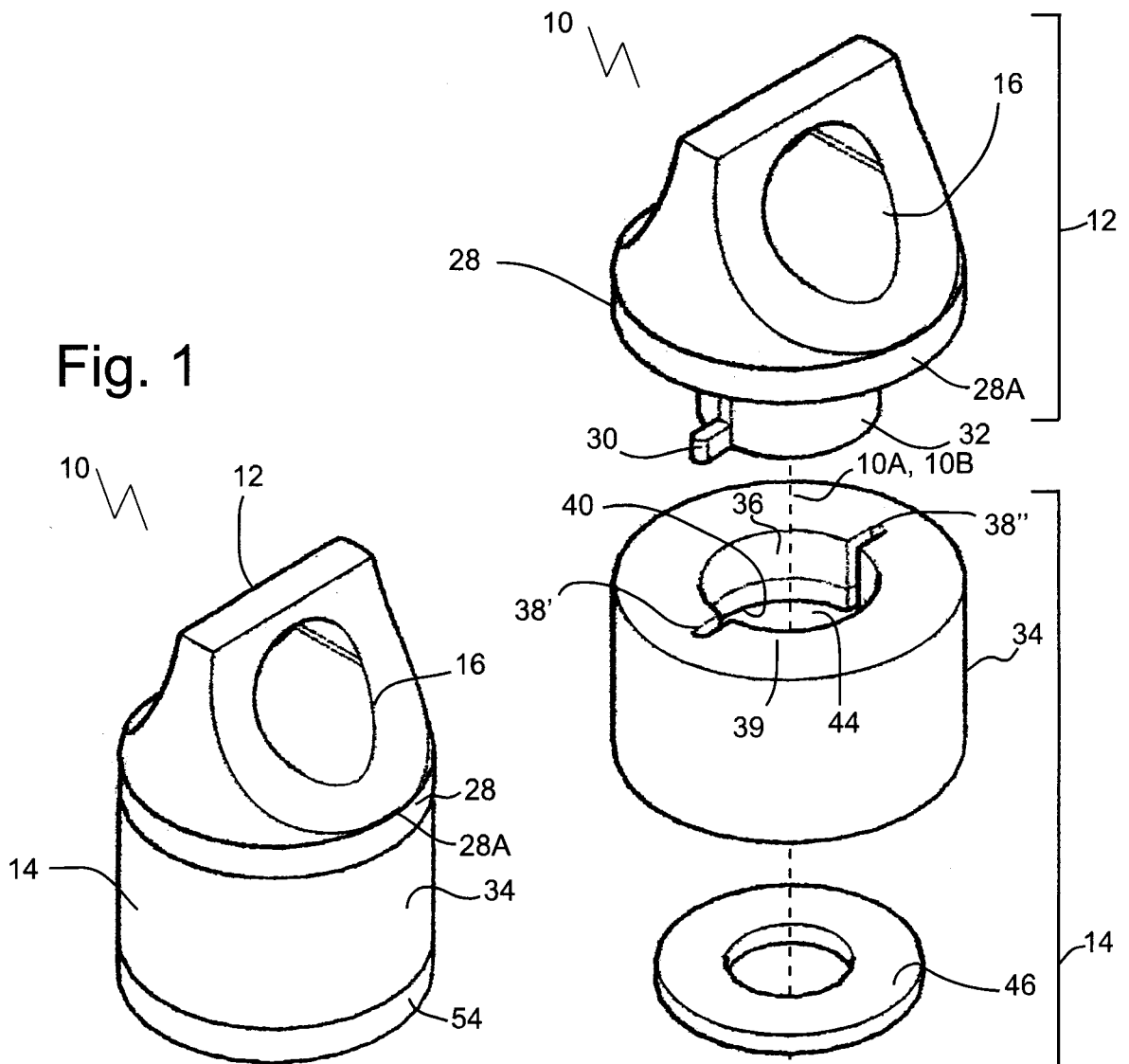
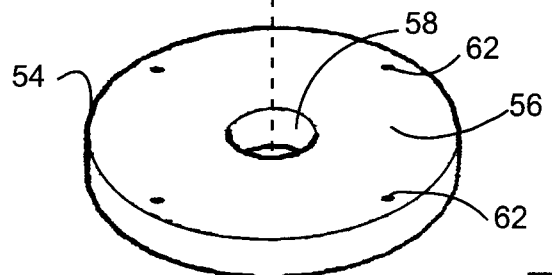


Fig. 2



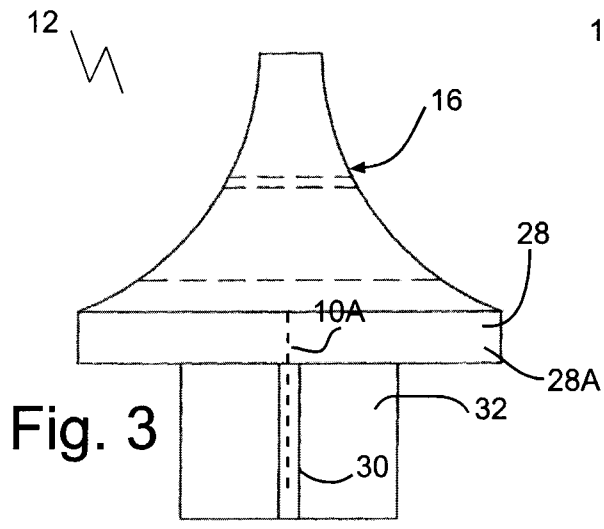


Fig. 3

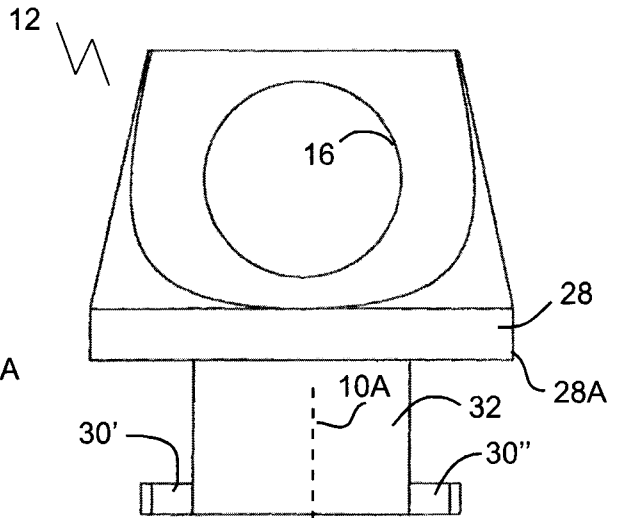


Fig. 4

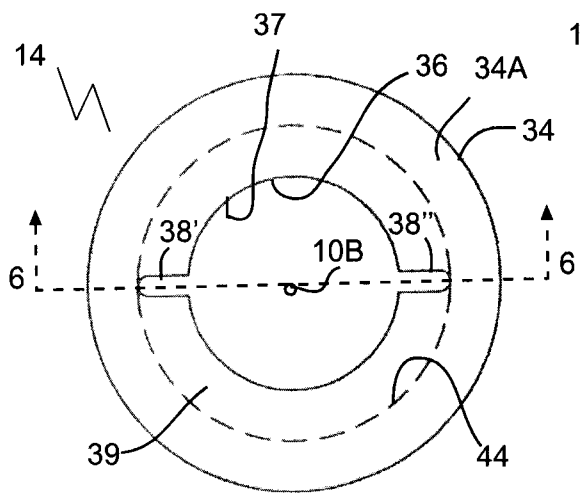


Fig. 5

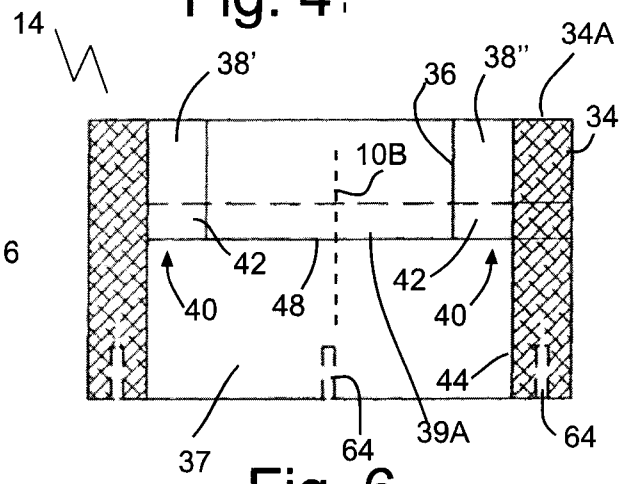


Fig. 6

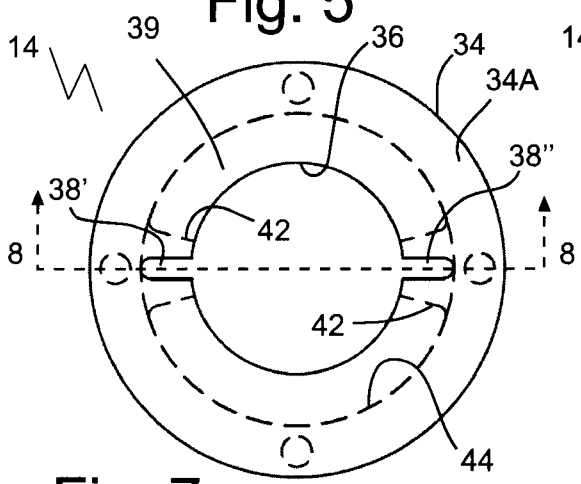


Fig. 7

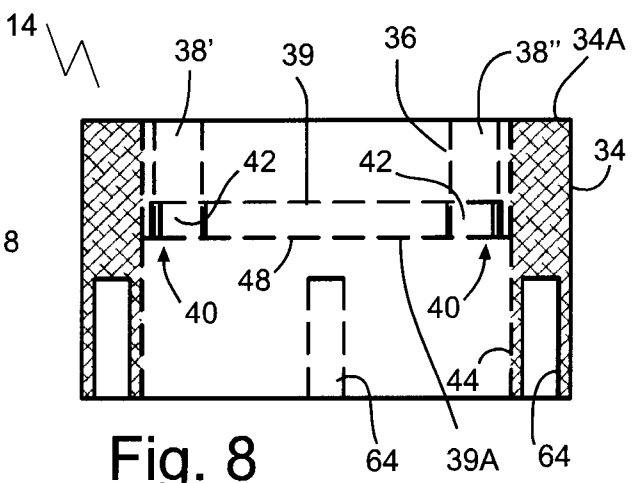


Fig. 8

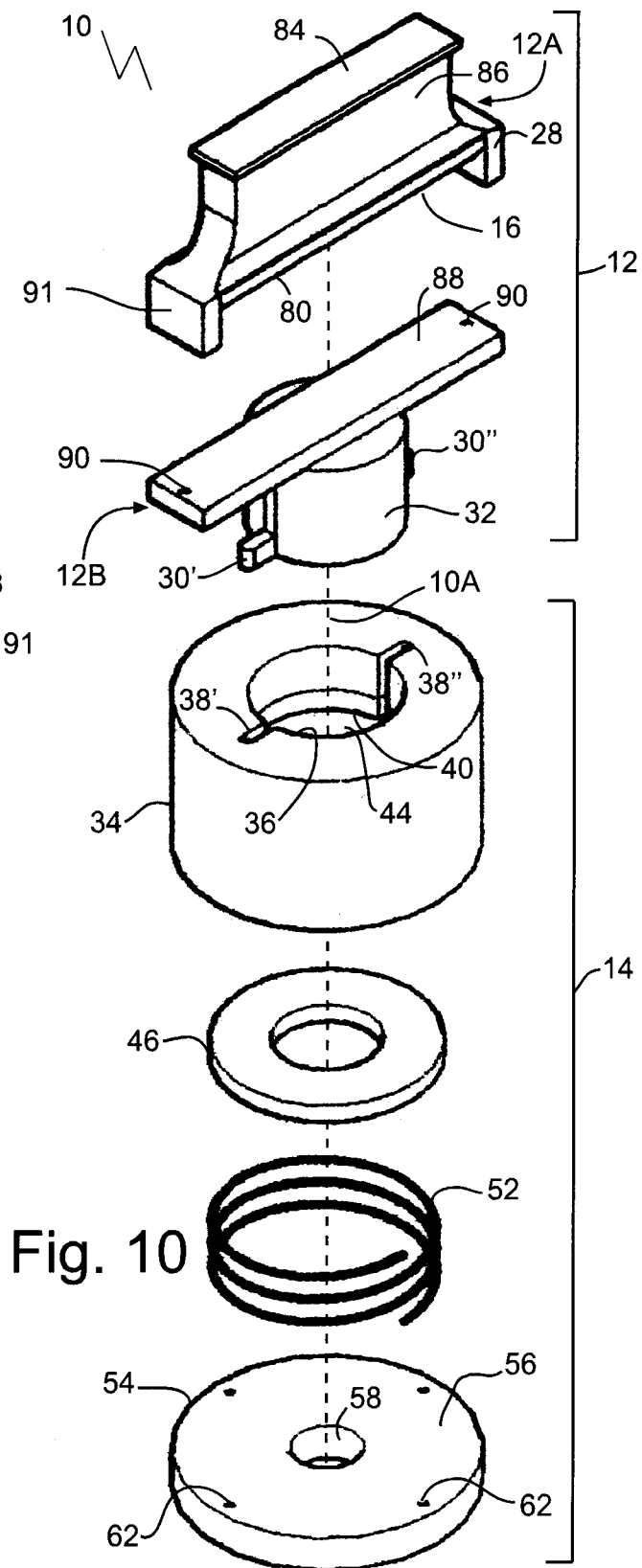
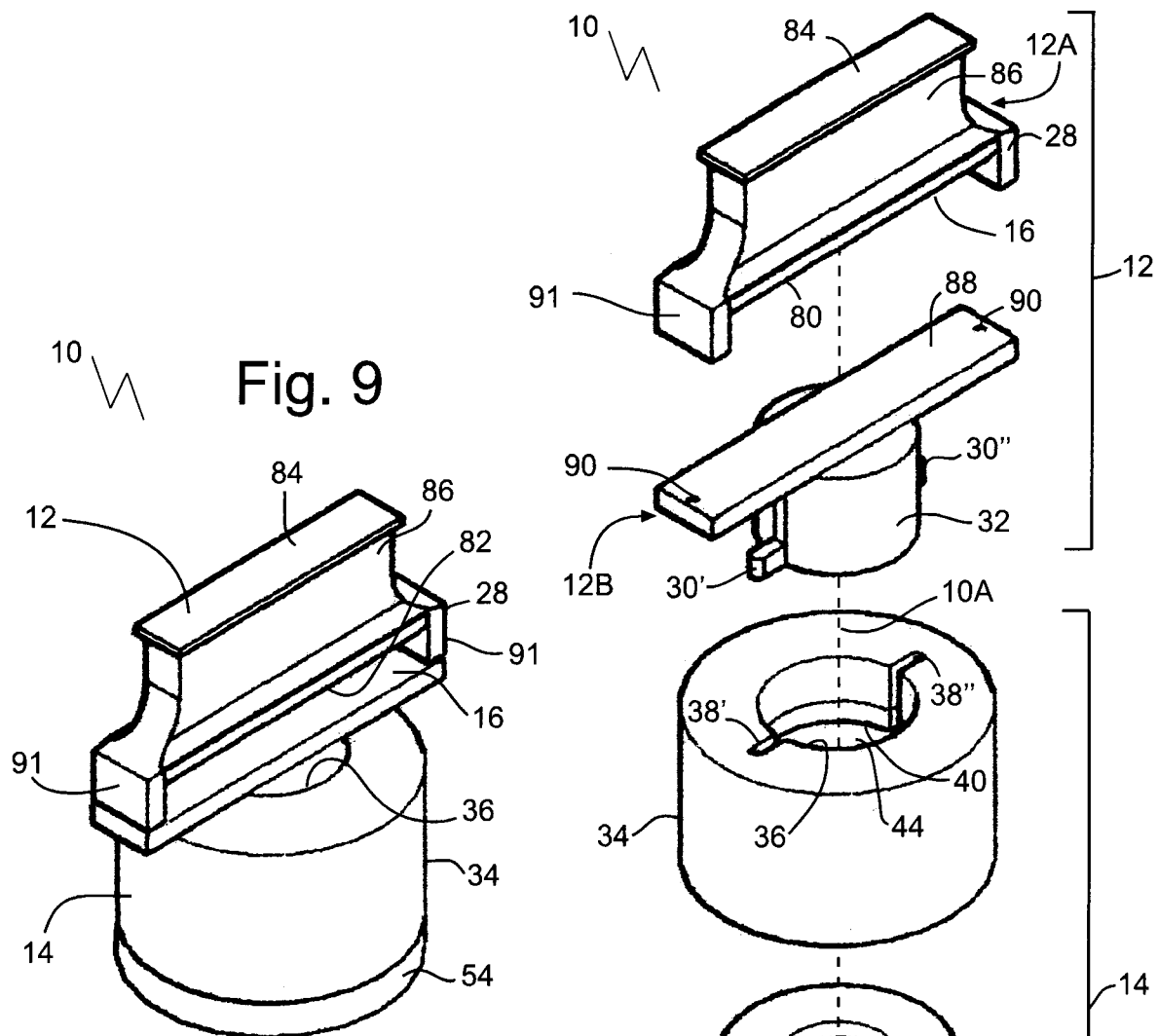


Fig. 11

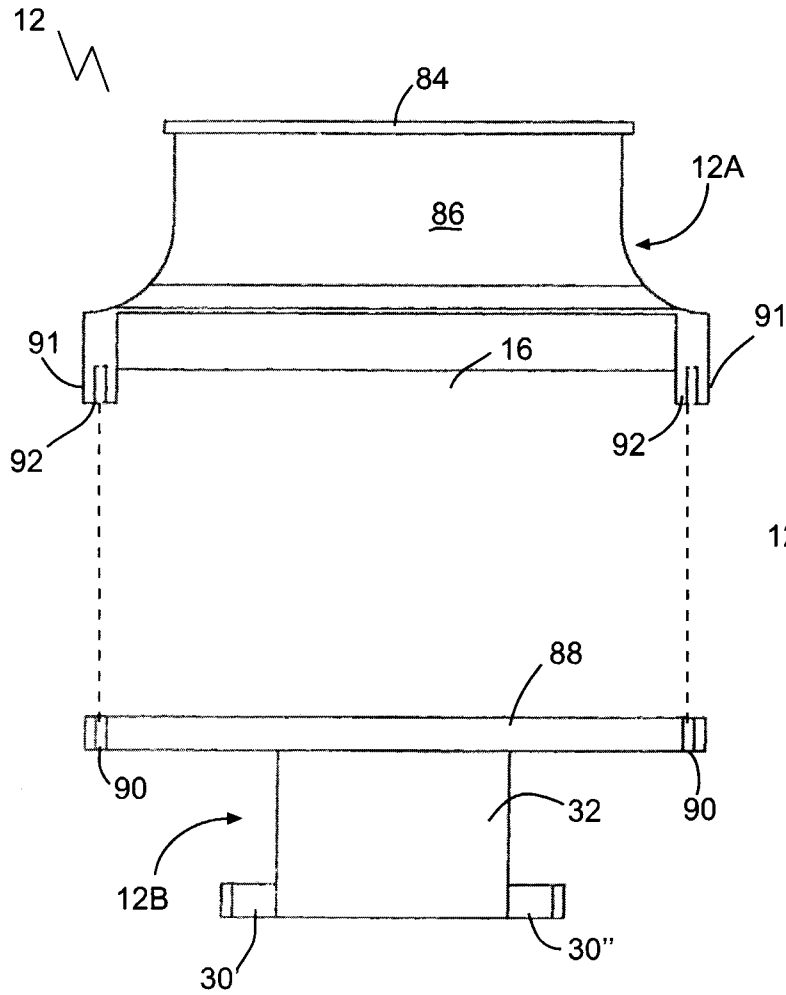


Fig. 12

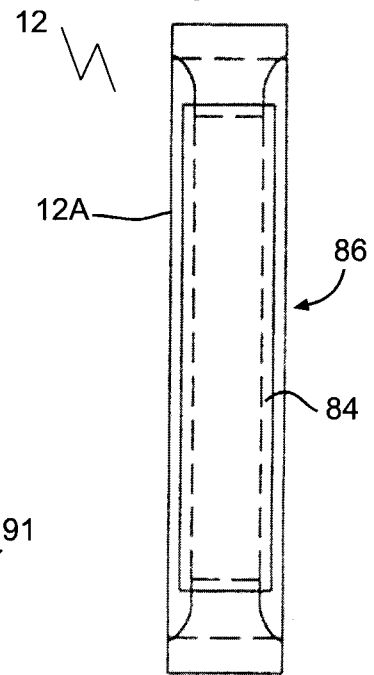
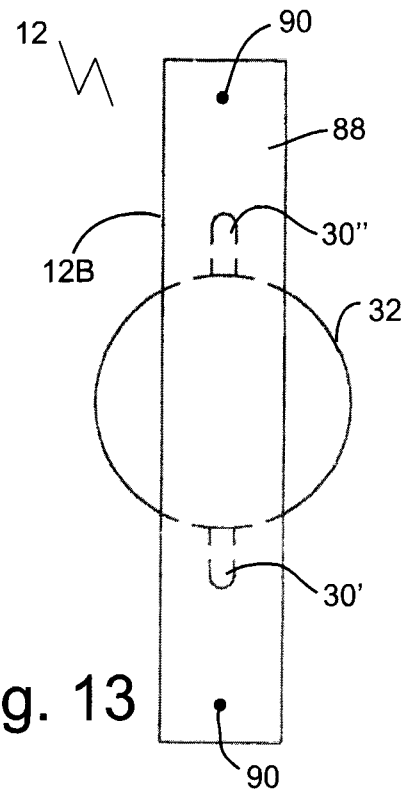


Fig. 13



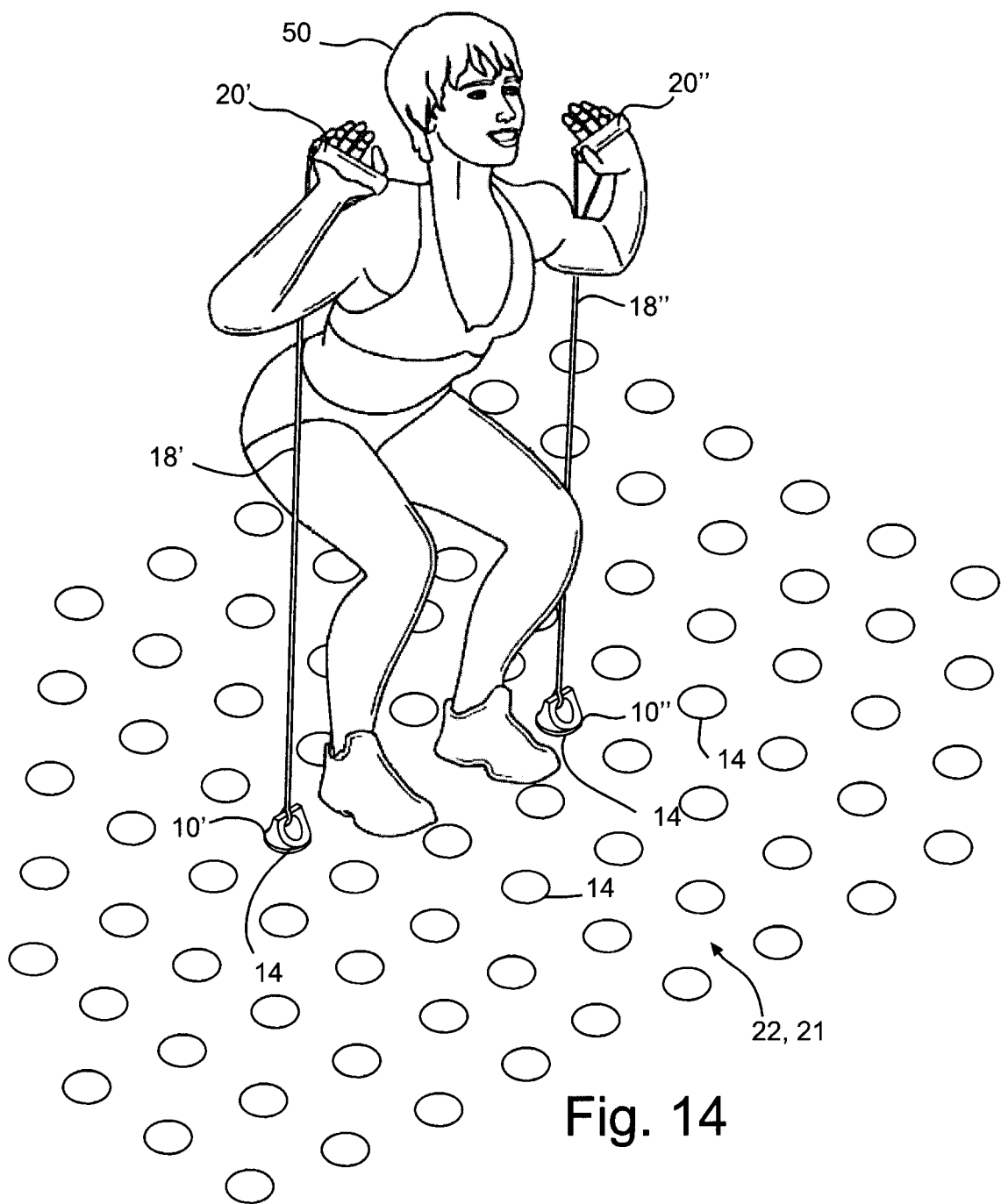


Fig. 14

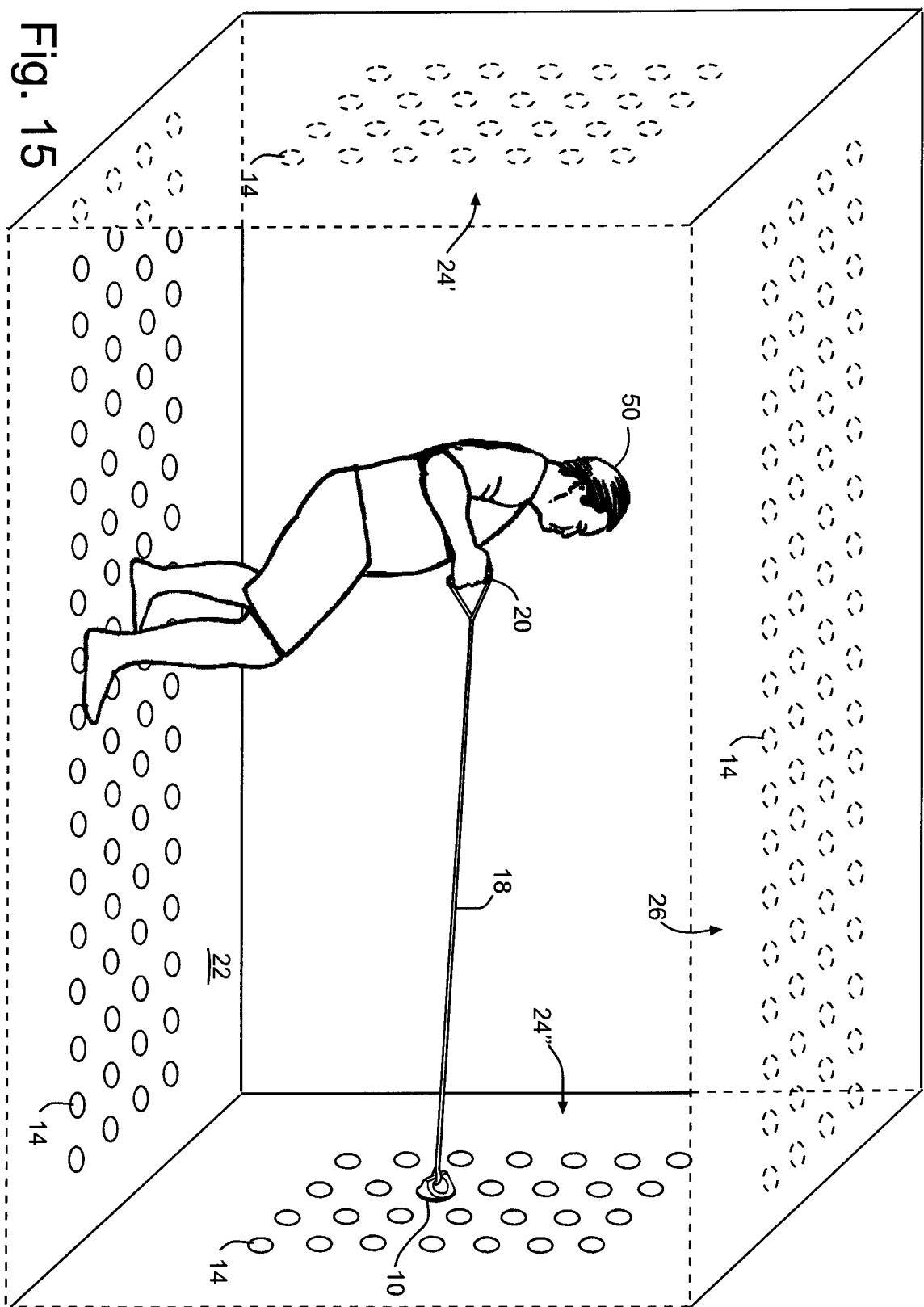


Fig. 15

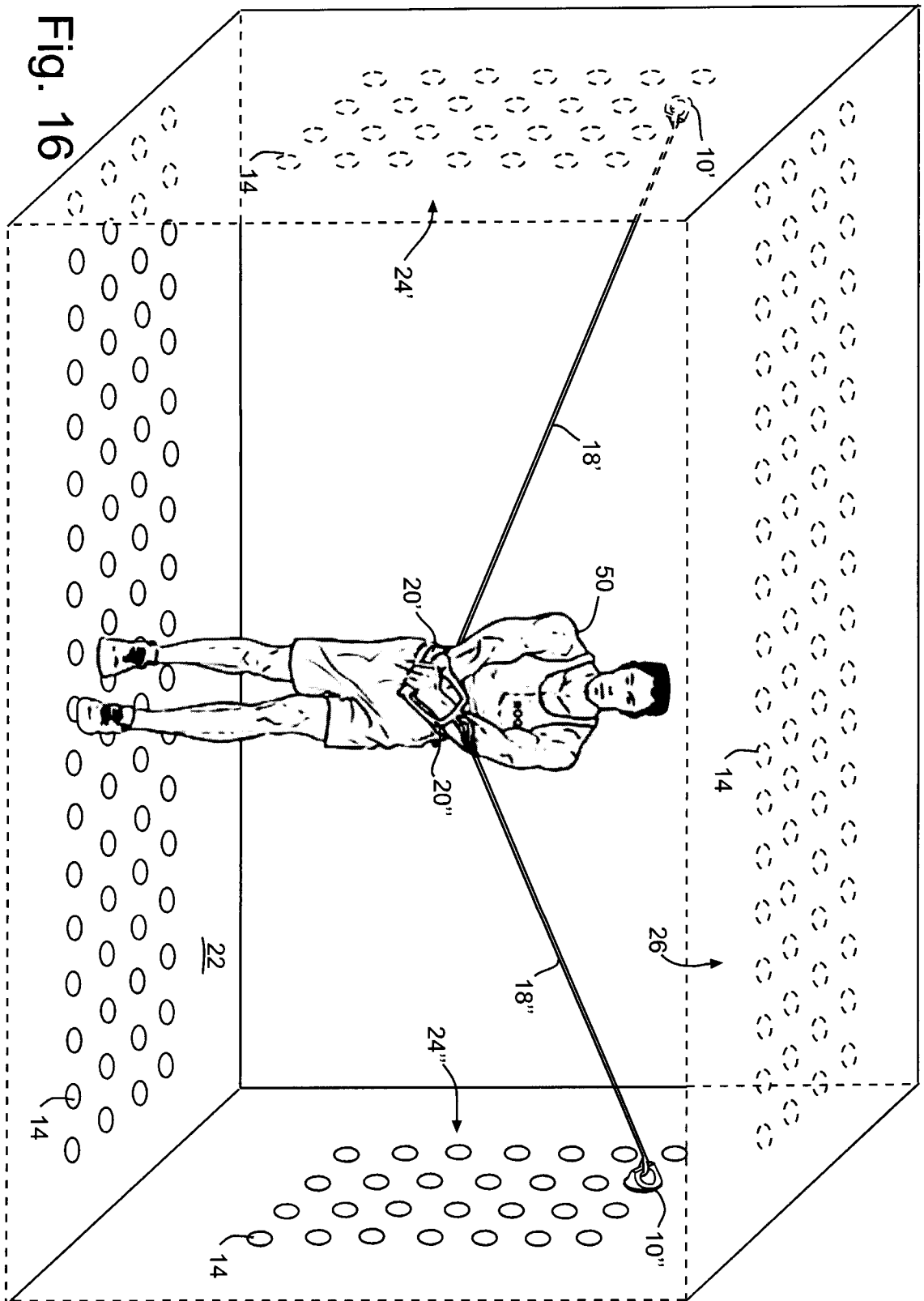


Fig. 16

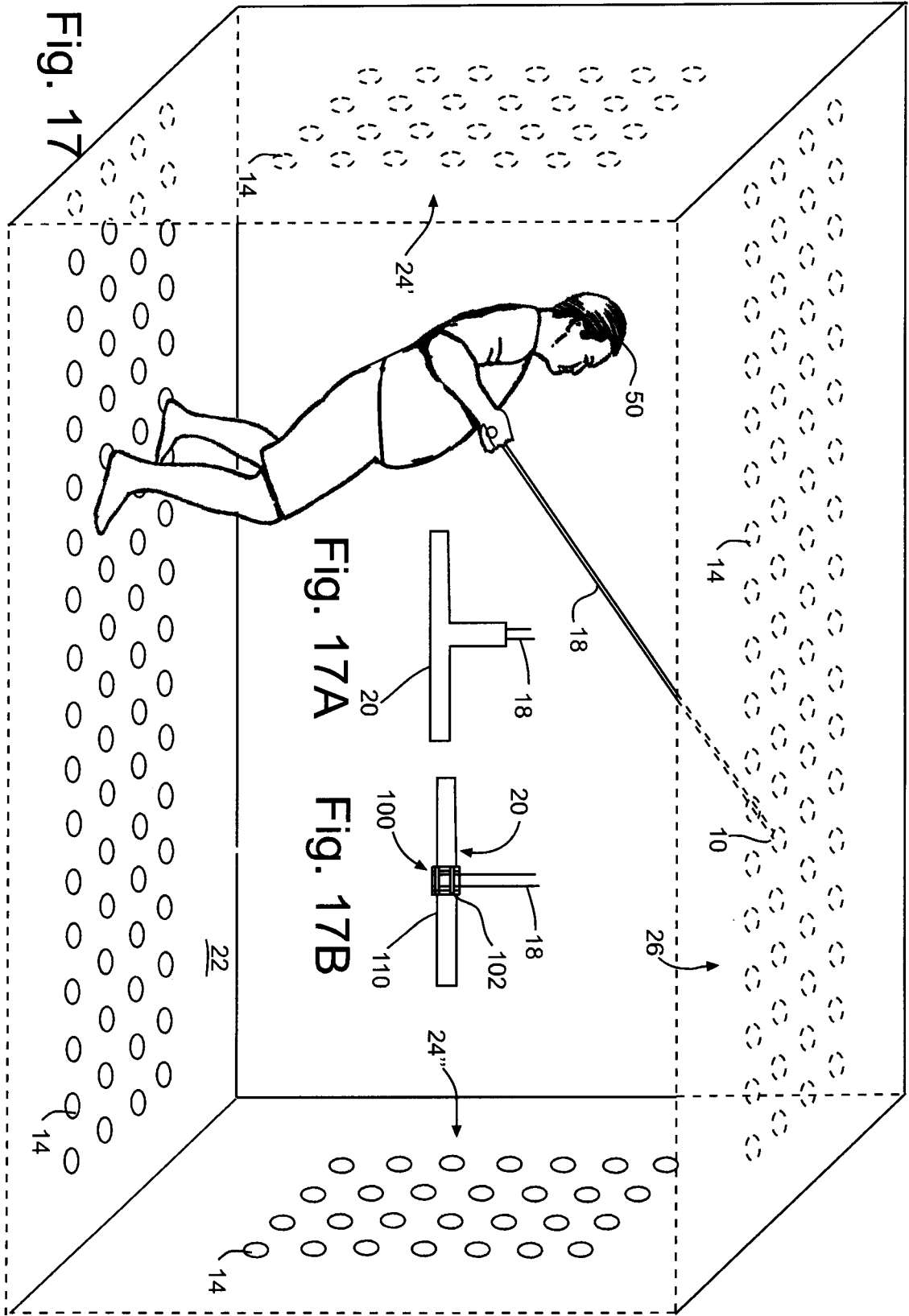
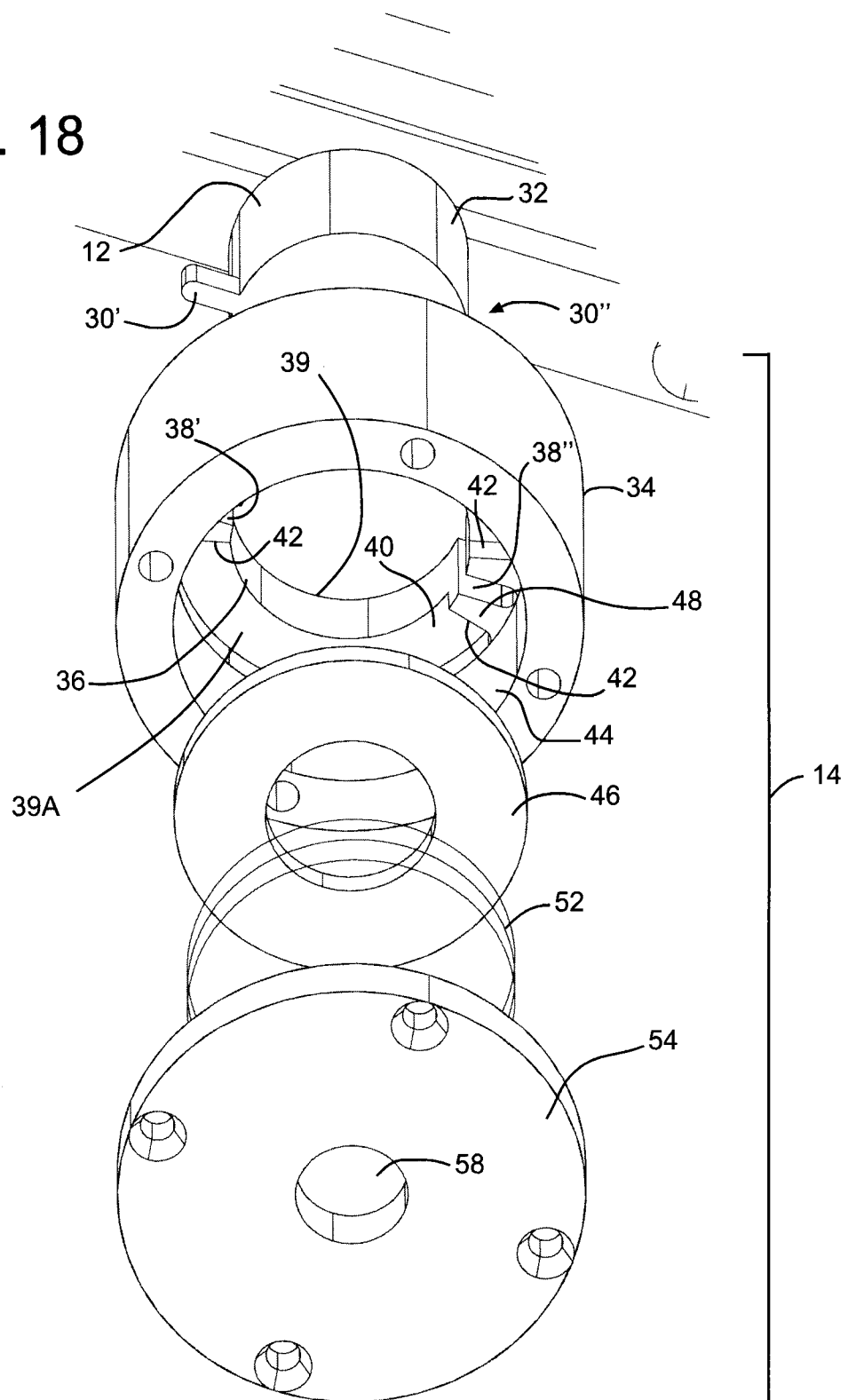
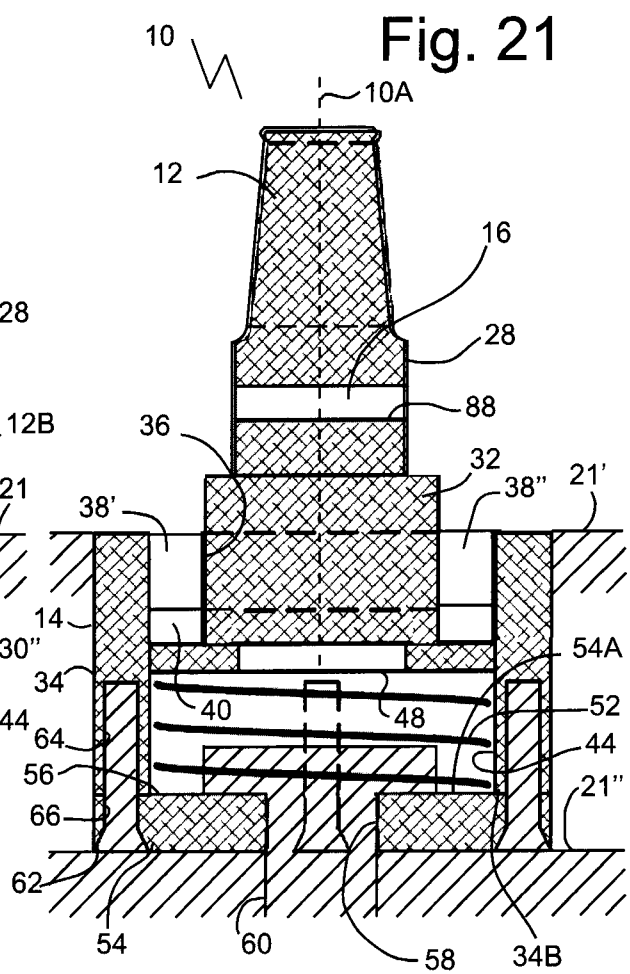
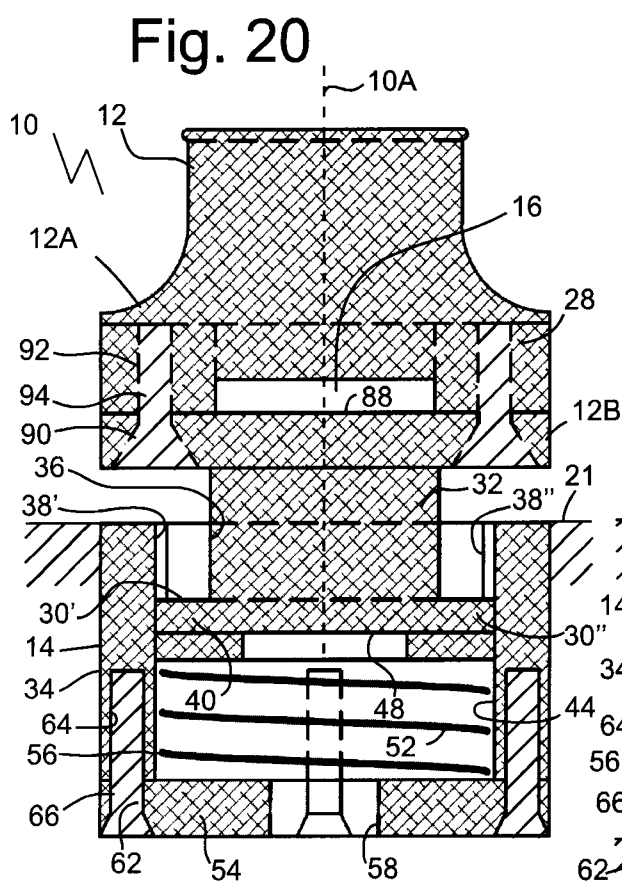
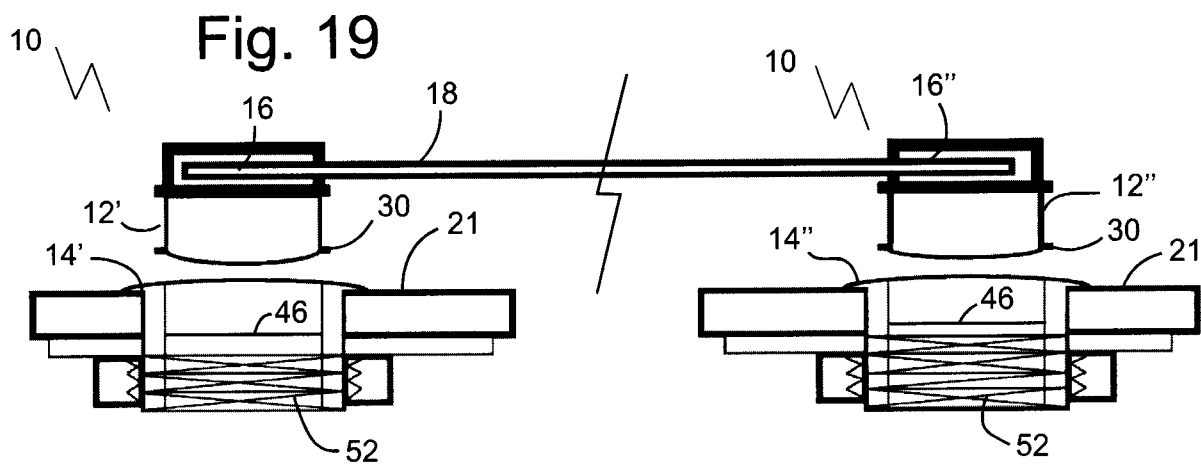


Fig. 17

Fig. 18





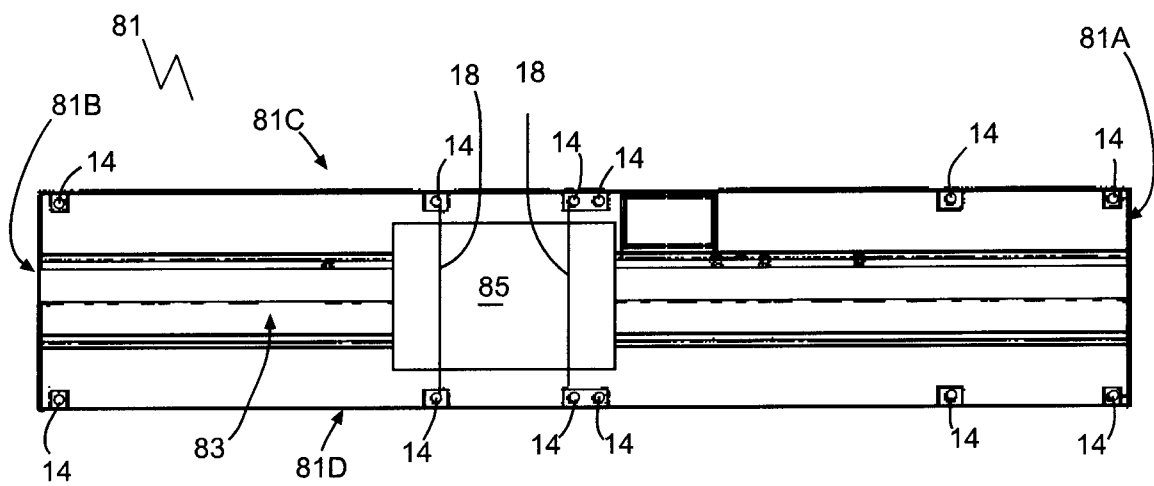
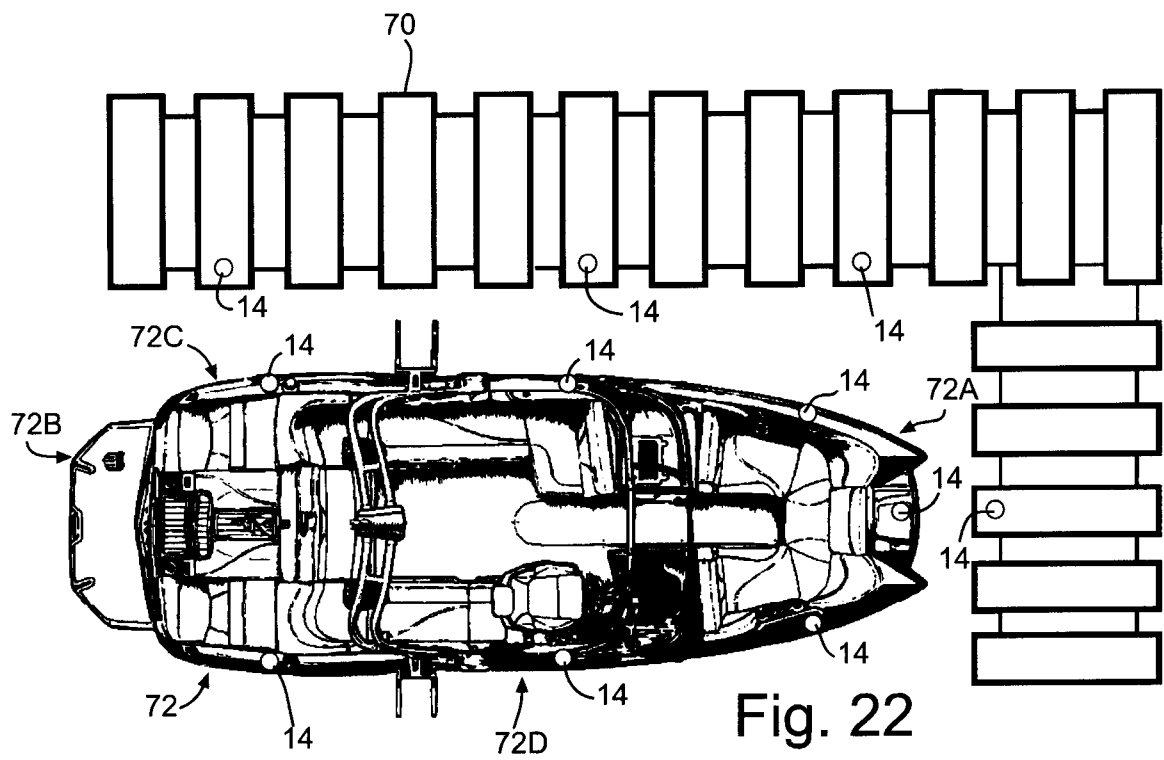


Fig.24

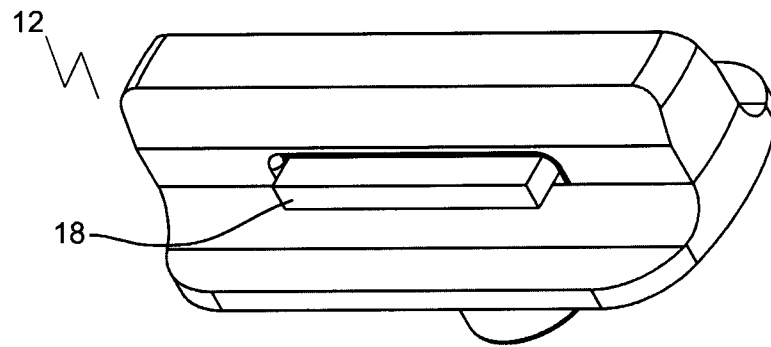


Fig.25

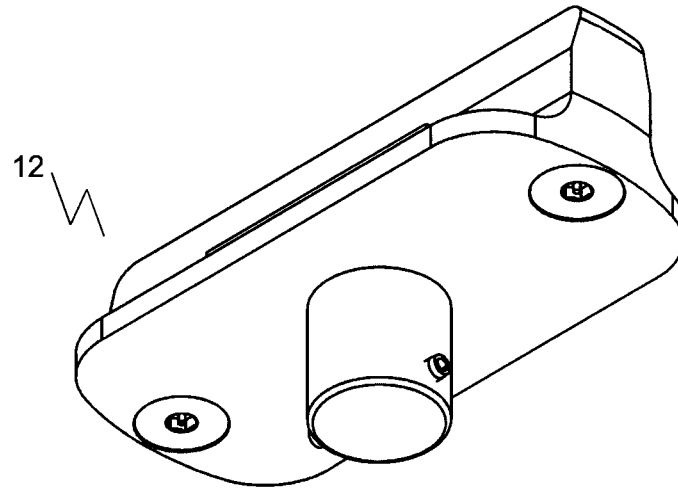


Fig.26

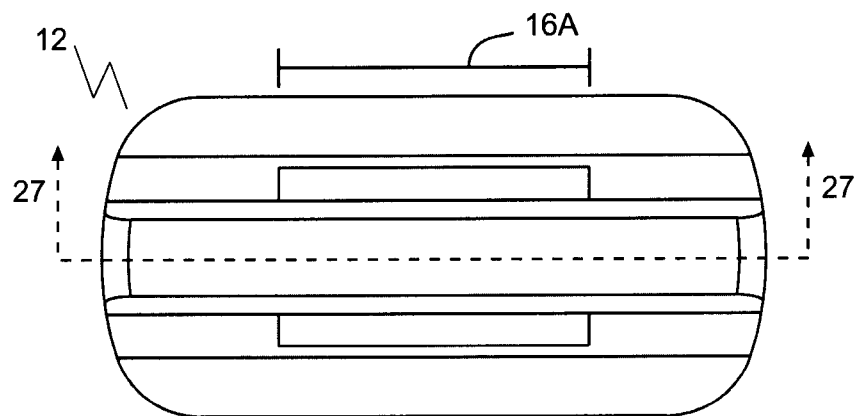
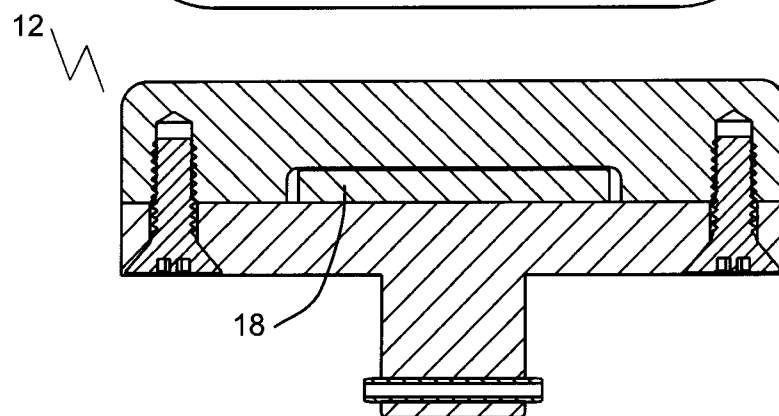


Fig.27



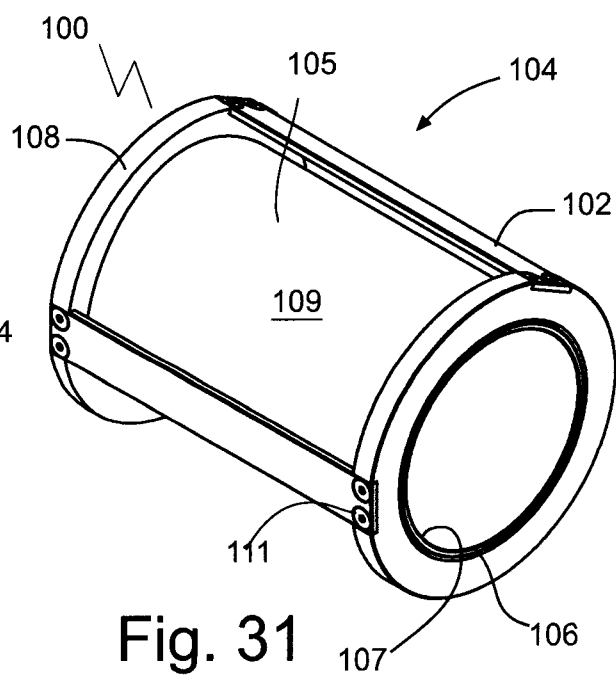
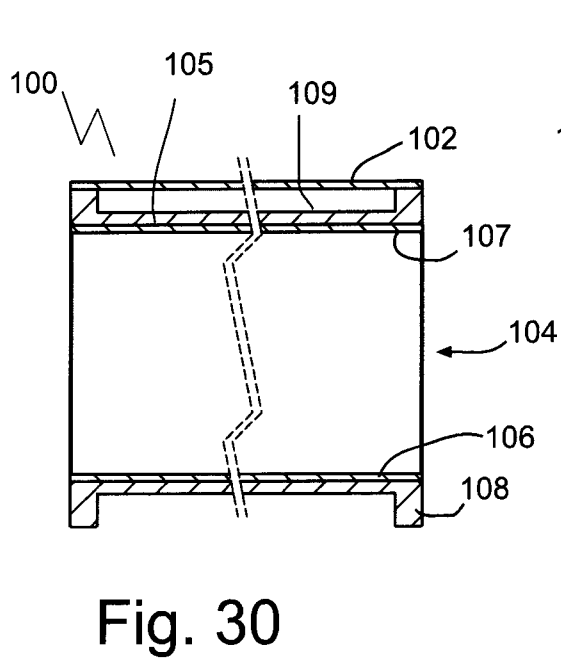
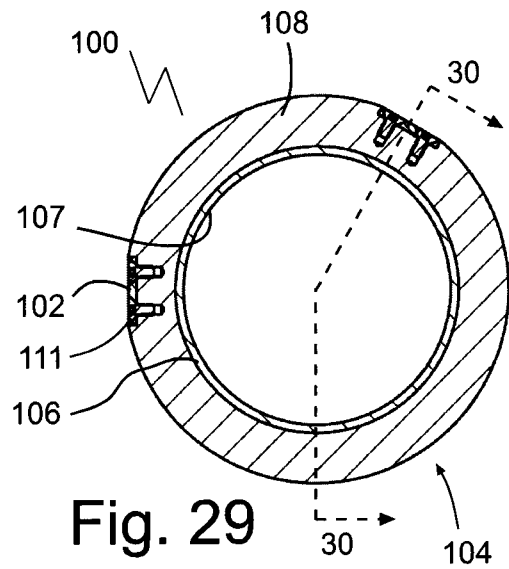
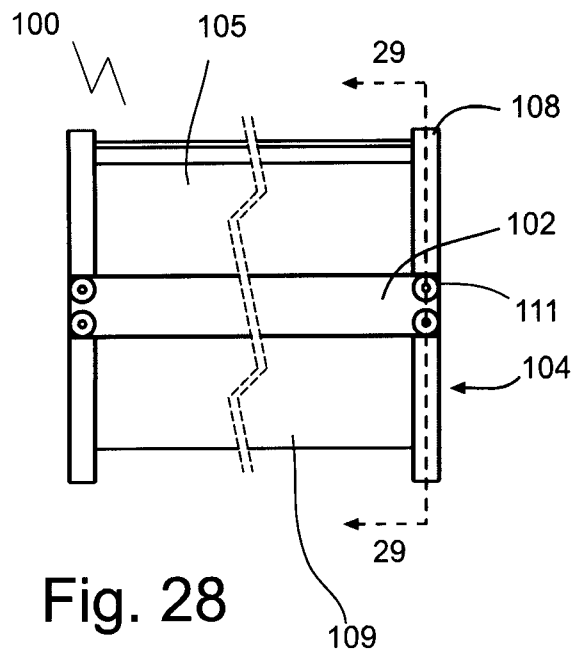


Fig. 32

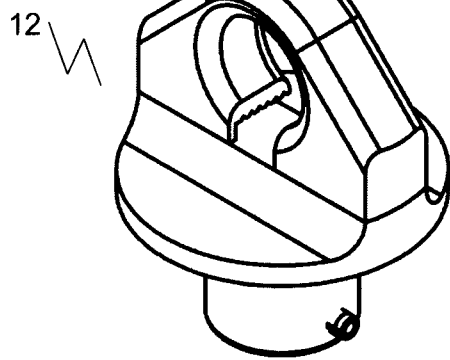


Fig. 33

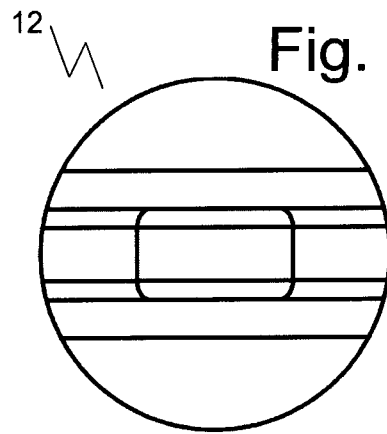


Fig. 34

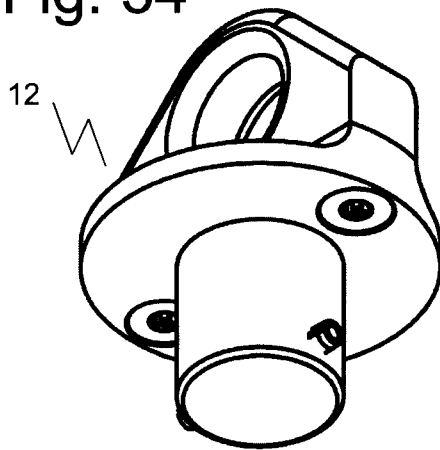


Fig. 35

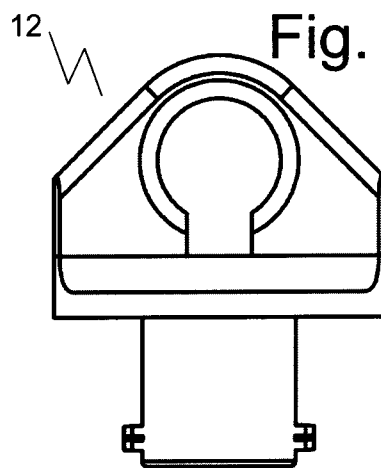


Fig. 36

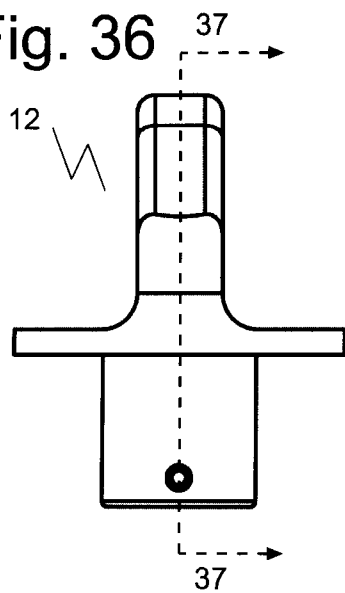


Fig. 37

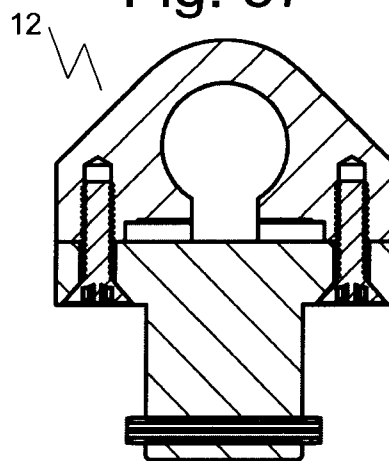
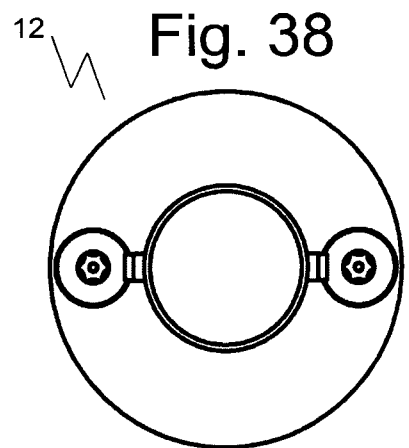


Fig. 38



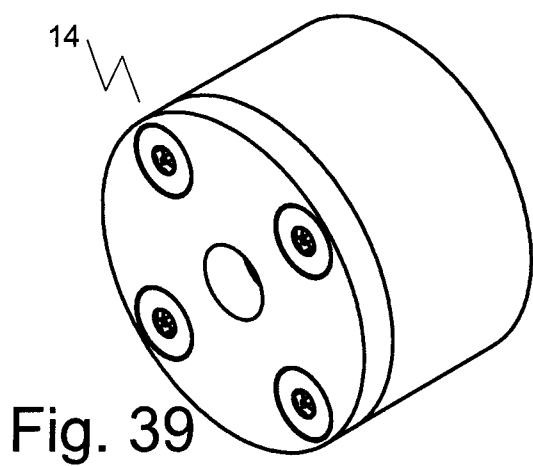


Fig. 39

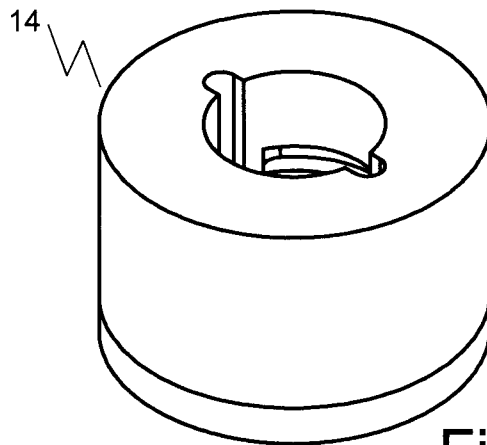


Fig. 40

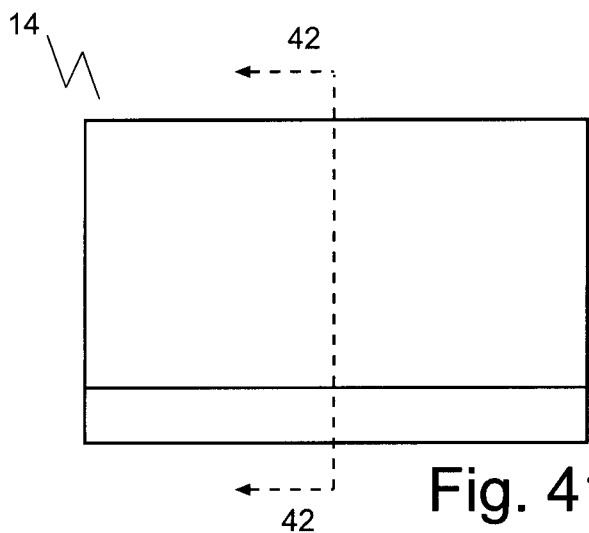


Fig. 41

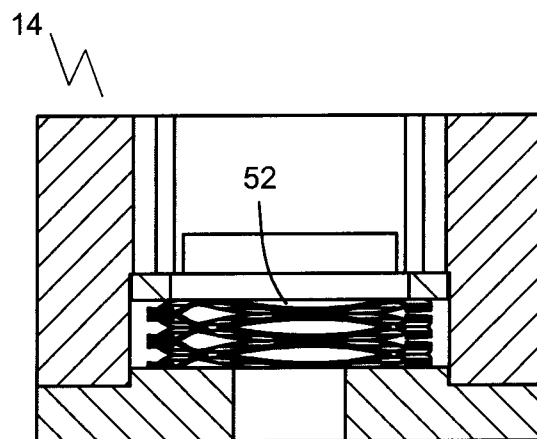


Fig. 42

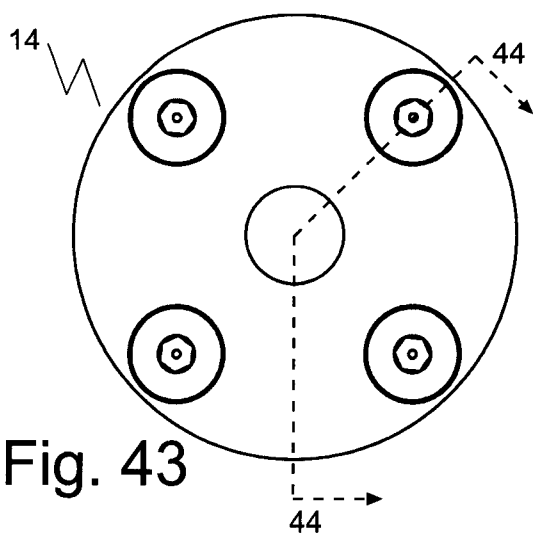


Fig. 43

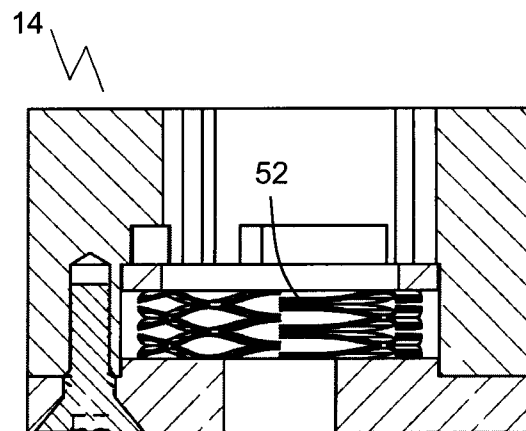


Fig. 44

Fig. 45

