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(54) **Title**: BULK WIRE ISOLATOR APPARATUS

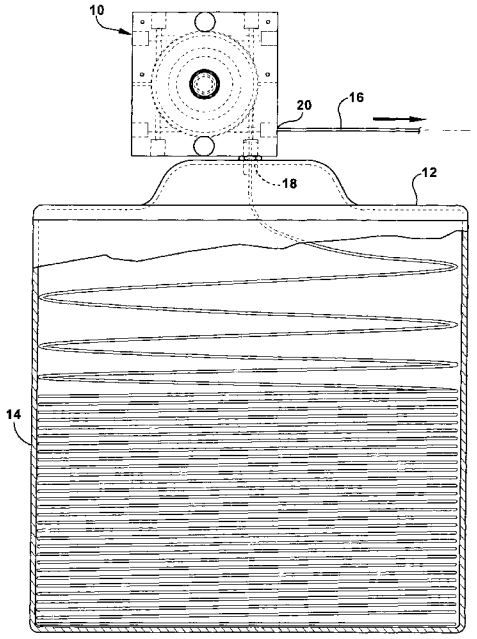

Fig. 1

(57) **Abstract**: An apparatus includes a bulk wire container (14) comprising coiled wire (16) and an isolator (10, 110). The isolator includes an attachment means to said bulk wire container, an inlet (22), an outlet (24), and a wire engaging means (31). The wire engaging means (31) translates longitudinal axial movement of the wire in the inlet into circumferential tangential movement about the wire engaging means.

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BULK WIRE ISOLATOR APPARATUS

Technical Field

[0001] The invention described herein relates generally to wire isolators for bulk welding wire containers and a method of using the same.

Background of the Disclosure

[0002] Welding applications which require large quantities of welding wire necessitate welding wire packages which contain large quantities of a continuous welding wire. As a result, large welding wire packages have been created for these applications which allow for a significant amount of welding run time before the operation must be shut down to swap the used package for a new package of welding wire. This is particularly important for automated or semi-automated welding operations.

[0003] Bulk packaging of welding wire is gaining popularity in both automated and semi-automated welding applications due to the reduced down time necessary to change and restring a new package of welding wire. Further, it is important to have reliable wire payout or dispensing from the welding wire package without wire tangling or wire flip/wander. Each tangle can potentially shut down an entire manufacturing line and reduces production yield. In this respect, in order to work in connection with the wire feeder of the welder, the welding wire must be dispensed in a non-twisted, non-distorted and non-canted condition which produces a more uniform weld without human attention.

[0004] Drum or box wire packages have been developed which protect the welding wire from the manufacturing environment and which can be disposed of at a lesser cost. The welding wire is coiled, looped, or spun into the drum or box package in a loosely wound wire stack or coil consisting of many convolutions of wire which are often not as structurally stable as the wire convolutions of other wire packages, a reeled wire for example. In addition, twisting that originates from the wire feeder can transmit to the bulk wire package and/or restrictions in the feed path prevent natural unwinding of the wire from the box, both may increase tangling. Therefore, it is important to control the wire within the package in addition to the payout of the wire from the package in order to reduce twisting, tangling or canting of the welding wire. This condition is worsened with larger welding wire packages which are preferred in automated or semi-automated welding operations. Furthermore, abuse during shipping and handling of the soft drum or box container often disrupts the

uniform spacing or stacking of each convolution in the wire stack, increasing tangling potential.

[0005] In view of the foregoing problems and shortcomings of removal or payout of welding wire from bulk welding wire containers, the present application describes bulk wire dampers to overcome these shortcomings.

Summary of the Disclosure

[0006] In accordance with the present invention, there is provided an apparatus that includes a bulk wire container comprising coiled wire and a wire isolator; the isolator as such is an independent part of the invention separable from the apparatus. The wire isolator includes an attachment means to said bulk wire container, an inlet, an outlet, and a wire engaging means. The wire engaging means translates longitudinal axial movement of the wire in the inlet into circumferential tangential movement about the wire engaging means, interposed between the inlet and the outlet.

[0007] Also within the scope of the invention is an assembly comprising a bulk wire container including coiled wire and at least one isolator; the isolator as such is an independent part of the invention separable from the apparatus. The at least one isolator includes an attachment means, a lower housing, an inlet, an outlet, and a wire engaging means. The wire engaging means circumferentially translates the wire from the inlet to the outlet and the wire engaging means connects to the lower housing

[0008] Also within the scope of the invention is another wire isolator for use with a container having bulk welding wire. The wire isolator includes an attachment means, a lower housing having a bottom surface, an inlet having a first central longitudinal axis, and outlet having a second central longitudinal axis, and a pulley which circumferentially translates the wire between the inlet and the outlet.

[0009] These and other objects and features of this invention will be evident when viewed in light of the drawings, detailed description and appended claims.

Brief Description of the Drawings

[0010] The invention may take physical form in certain parts and arrangements of parts, a preferred embodiment of which will be described in detail in the specification and illustrated in the accompanying drawings which form a part hereof, and wherein:

[0011] *Fig. 1* is a side elevational view in partial cross-section of a bulk wire container having an attached wire isolator;

[0012] *Fig. 2a* is a perspective view of one embodiment of a wire isolator;

[0013] *Fig. 2b* is a side view of the wire isolator illustrated in *Fig. 2a*;

[0014] *Fig. 2c* is a cross-sectional view of the wire isolator illustrated in *Figs. 2a-2b* taken along line 2c-2c shown in *Fig. 2b*;

[0015] *Fig. 3* is an exploded assembly view of the wire isolator illustrated in *Fig. 2a*;

[0016] *Figs. 4a-4f* are top plan views of wire isolators with covers removed having welding wire engaging at least a portion of a pulley in each wire isolator;

[0017] *Fig. 5* is an exploded assembly view of an alternative wire isolator;

[0018] *Fig. 6* is a top plan view of a wire isolator having a roller bearing assembly;

[0019] *Fig. 7* is a top plan view of a wire isolator having a fixed circular shaft;

[0020] *Fig. 8* is a perspective view of an alternative wire isolator; and

[0021] *Fig. 9* is a perspective view of another alternative wire isolator.

Detailed Description of the Drawings

[0022] The best mode for carrying out the invention will now be described for the purposes of illustrating the best mode known to the applicant at the time of the filing of this patent application. The examples and figures are illustrative only and not meant to limit the invention, which is measured by the scope and spirit of the claims.

[0023] Referring now to the drawings wherein the showings are for purposes of illustrating the preferred embodiment of the invention only and not for purposes of limiting the same, as illustrated in *Fig. 1*, wire isolator **10** attaches to a dome shaped cover **12** on a drum or

box bulk wire container **14** containing welding wire (the cover and the container are not drawn to scale). Welding wire **16** is shown exiting bulk wire container **14** through wire isolator **10**, feeding a wire pulling apparatus to supply a welding system (both not shown). The process of pulling welding wire out of a bulk wire container is known as payoff. In the illustrated embodiment, wire isolator **10** attaches to a top portion of cover **12** so that welding wire enters an inlet aperture side **18** and exits an outlet aperture side **20**. In this embodiment, wire isolator **10** attaches to the top of the bulk wire container or to another side of the bulk wire container. In another embodiment, more than one wire isolator attaches to the cover (inside or outside), the bulk wire container, or some other location in a welding wire system. In yet another embodiment, the wire isolator attaches to a welding wire feeder. In another embodiment, the wire isolator attaches to the cover or the bulk wire container and a wire straightening device is connected to the welding wire feeder. In yet another embodiment, the wire isolator is motorized and/or includes a control system that includes at least one of the following sensors: motion, torque, and rotational speed. In another embodiment, the wire isolator includes a camera system that connects to a computer system that can be monitored by an operator.

[0024] *Fig. 2a* illustrates an enlarged perspective view of wire isolator **10**, illustrated in *Fig. 1*, having welding wire **16** feeding through a fitting (discussed below) and into inlet **22** and exiting wire isolator **10** from outlet **24** (internal components shown in ghost lines). In the illustrated embodiment, wire isolator **10** includes square back plate **26**, front guide housing **28**, and cover **30**, and an appropriately-sized pulley **31**, e.g., a four inch diameter, where at least a portion of the pulley engages the welding wire (further discussed below). The pulley is sized by a consideration of several factors known in the art, at least one of which is the diameter of the welding wire. The wire isolator can be made by machining, molding, or other processes known by one skilled in the art. In the illustrated embodiment, back plate **26**, front guide housing **28**, cover **30**, and pulley **31** are preferably made from plastic materials so that wire isolator **10** may be an electrically nonconductive device. A non-limiting exemplary listing of plastic materials useful in the manufacture of these components includes thermoset resins, thermoplastic resins, and reinforced resins of either type. For example, back plate, front guide, cover, and pulley made from thermoplastics may be made from a non-exhaustive and non-limiting list that includes (meth)acrylics, celluloids, ethylene-vinyl acetate, flouroplastics, polyacrylates, polyamides, polybutylene, polycaprolactone, polycarbonate, polyethylene, polypropylene, and polyvinyl chloride. A non-exhaustive and exemplary list of thermosets includes vulcanized rubbers, melamine resin, polyimides,

and fiberglass-filled polyesters as well as crosslinked thermoplastics. In another embodiment (not shown), back plate, front guide housing, and/or optional cover are made into another shape to hold at least one pulley or at least one wire engaging device, including but not limited to circular, rectangular, and the like.

[0025] Materials used to fabricate wire isolator **10** are made from materials designed to withstand forces transmitted to the wire isolator from the welding wire and may optionally be made from metal and wood materials. A non-exhaustive, exemplary list of metals includes carbon steel, stainless steel, aluminum, and copper; while a similar non-limiting exemplary list of wood materials includes hardwoods and softwoods, e.g., oak, pine, ash, cedar, buckeye, cherry, hickory, and maple.

[0026] In the illustrated embodiment, front guide housing **28** includes first guide portion **32** and second guide portion **34** and at least two apertures, including at least one inlet **22** and at least one outlet **24**. First guide portion **32** and second guide portion **34** each include half circle cutouts (not shown) that form a substantially full circle cutout **36** when the two guide portions attach to the back plate. The full circle cutout **36** forms an opening where pulley **31** is pivotally and securedly fastened to back plate **26**. Back plate **26** may be securedly fastened to first guide portion **32** and/or second guide portion **34**. Cover **30** may be securedly fastened to back plate **26** and/or at least one portion of front guide housing **28**. In another embodiment (not shown), front guide housing may include more or less inlets and/or outlets than what is illustrated in *Fig. 2*. In the illustrated embodiment, wire isolator **10** prevents twisting from external welding wire from transmitting into the welding wire stored in the bulk wire container. As discussed above, twisting welding wire may lead to tangling and other undesirable conditions during welding wire payoff from the bulk container.

[0027] *Fig. 2b* illustrates a side view of wire isolator **10**, illustrated in *Fig. 2a*, with interior portions and components illustrated in hidden lines. Inlet **22** includes outward facing surface **38**, circular bore **40** (optionally threaded) having centerline **CL1** offset from bottom of back plate **26** by first distance **D1**, laterally extending circular bore **42**, and inward facing aperture **44**, preferably a beveled elliptical aperture. Surface **38** and circular bore **40** are configured to receive a fitting (preferably with mating threads). Laterally extending circular bore **42** and inward facing aperture **44** are configured to guide welding wire to a pulley (shown in hidden lines). Outlet **24** includes outward facing surface **46**, threaded circular bore **48** having centerline **CL2** offset from bottom of back plate **26** by second distance **D2**,

laterally extending circular bore **50**, and inward facing aperture **52**, preferably a beveled elliptical aperture. Inward facing aperture **52** and laterally extending circular bore **50** guide welding wire from the pulley to threaded circular bore **48** and outward facing surface **46**, which is illustrated as having an optional threaded fitting. In the illustrated embodiment, first distance **D1** and second distance **D2** are not equal, therefore, the inlets and the outlets are on different parallel planes or the inlet has a first central longitudinal axis and the outlet has a second central longitudinal axis that is offset from the first axis, e.g., vertically and/or horizontally offset. In other words, the welding wire moves from a first plane to a second plane as the welding wire moves in wire isolator **10** from inlet **22** to outlet **24**. In another embodiment (not shown), the inlets and the outlets are on the same or substantially the same plane, therefore, the welding wire travels less than three-hundred and sixty degrees or the pulley may include a groove having a spiral flight. In yet another embodiment (not shown), circular bores are curved and/or are at an angle relative to the centerlines of the inlet and/or the outlet. In another embodiment (not shown), the inlets and outlets are at least one of the following: non-threaded and non-circular. In yet another embodiment (not shown), inlets and/or outlets may include a fitting.

[0028] *Fig. 2c* illustrates a cross-sectional view of wire isolator illustrated in *Figs. 2a-2b* taken along line 2c-2c shown in *Fig. 2b*. Wire isolator **10** is illustrated as having a fitting **75** securedly attached to inlet **22**. Welding wire **16** enters wire isolator **10** through inlet **22**, engages pulley **31**, also known as a wire engaging member, along at least a portion of a radially outer surface of the pulley, and exits wire isolator **10** through outlet **24**. In other words, pulley **31** engages welding wire **16** and translates longitudinal axial movement of welding wire **16** moving through inlet **22** into circumferential tangential movement about pulley **31**. The circumferential tangential movement translates back into longitudinal axial movement as welding wire **16** moving through outlet **24**. As discussed further below, wire isolator **10** may be configured so welding wire **16** can engage another portion of pulley **31** and/or can enter and exit through other inlets and outlets.

[0029] *Fig. 3* illustrates an exploded assembly view of wire isolator **10** illustrated in *Figs. 2a-2c*. Square back plate **26** includes first threaded hole **54**, first thru-hole **56**, second thru-hole **58**, and a plurality of perimeter thru-holes **60**. First threaded hole **54** includes threads configured to receive a fastener (discussed below) that securedly attaches pulley **31** to back plate **26**. In another embodiment (not shown), back plate does not include first threaded hole and back plate includes an upward extending post configured to securedly mount and attach the pulley or a welding wire engaging member to the back plate. In the

illustrated embodiment, first thru-hole **56** and second thru-hole **58** receive internally threaded inserts **59** that press into thru-holes **56** and **58**. Internally threaded inserts **59** include a plurality of external fins **62** that securedly attach each insert **59** in each thru-hole **56** and **58** when insert **59** receives a fastener. For example, the internal threads of each insert **59** are configured to securedly receive and fasten the thumb screws (discussed below) to the wire isolator. In another embodiment, the thru-holes and inserts are threaded. In yet another embodiment, thru-holes may be threaded and the thumb screws may fasten directly to the back plate. In another embodiment, thru-holes may not be perimeter thru-holes, but may be in another location of the back plate. In the illustrated embodiment, plurality of perimeter thru-holes **60** are configured to receive pins **66** or fasteners that securedly attach back plate **26** to at least one portion of front guide housing **28**. Pins **66** may include at least one of the following: tapered pins, spring pins, roll pins, and the like. In another embodiment (not shown), perimeter thru-holes can be threaded and the back plate and at least one portion of front guide housing can be securedly attached by a threaded fastener. In yet another embodiment (not shown), the back plate does not include thru holes, but may include at least two upward extending posts that securedly engage thru holes in at least one portion of the front guide housing. In another embodiment, at least a portion of the front guide housing is an extension of the back plate (discussed below in *Fig. 5*), so pins or fasteners are not needed. In yet another embodiment, the wire isolator is assembled with bolts, washers, and nuts.

[0030] In the illustrated embodiment, front guide housings **28** are shown having two separate portions, first guide portion **32** and second guide portion **34**, each having a rectangular shape with a half circle cutout **36** on an inward facing side. First guide portion **32** and second guide portion **34** of front guide housing **28** form circular cutouts that receive and surround pulley **31**. In yet another embodiment (as shown in *Fig. 5*), front guide housing includes an integrally formed cover or shield. In another embodiment, front guide housing and back plate are integrally formed in one piece. In another embodiment (not shown), front guide housing is a single contiguous portion or has more than two portions.

[0031] In the illustrated embodiment, front guide housing **28** includes a plurality of perimeter thru-holes **68**. At least one of the plurality of thru-holes **68** in first guide portion **32** aligns with at least one of the plurality of perimeter thru-holes **60** in back plate **26** and each further receive pin **66** that securedly attaches back plate **26** to first guide portion **32**. At least one of the plurality of thru-holes **68** in second guide portion **34** aligns with at least one of the plurality of perimeter thru-holes **70** in cover **30** and each further receive pin **72** that se-

curedly attaches first guide portion **34** to cover **30**. Pins **72** may include at least one of the following: tapered pins, spring pins, roll pins, and the like. Further in the illustrated embodiment, front guide housing **28** includes first thru-hole **56** and second thru-hole **58** that aligns with first thru-hole **56** and second thru-hole **58**, respectively, in back plate **26**. In another embodiment, the front guide housing and the back plate do not include pins and are glued together. In yet another embodiment, at least the front guide housing and the back plate are molded as at least one piece, e.g., plastic injection molding.

[0032] In the illustrated embodiment, pipe fitting **75** may thread into inlet **22** and/or outlet **24** on one end and may thread into a quick connect (not shown) or some other style of connection that may connect to the cover of a bulk welding wire container (discussed above) or that may connect to a welding wire conduit that supplies welding wire to a welding system (both not shown). In another embodiment (not shown), wire isolator can include alternative fitting types, including but not limited to nipples, couplings, compression fittings, and the like. In yet another embodiment (not shown), wire isolator can include fittings that include male and/or female threads and/or threads only on one end. In another embodiment (not shown), the wire isolator can include more than one fitting.

[0033] Further illustrated in *Fig. 3* is pulley assembly **74** that includes pulley **31**, two washers **76**, sleeve bearing **78**, and cap screw **80**. Pulley **31**, washers **76**, and sleeve bearing **78** each have centrally located apertures **79** or holes that are configured to receive cap screw **80**. Pulley assembly **74** may be assembled by sliding the following components onto cap screw **80**: washer **76**, pulley **31**, washer **76**, and sleeve bearing **78**, wherein sleeve bearing **78** slides through apertures **79** in washers **76** and pulley **31**. Cap screw **80** securedly attaches to back plate **26**, and pulley **31** fits within the full circle cutout **36** formed by first guide portion **32** and second guide portion **34**. In the illustrated embodiment, pulley **31** includes at least one circumferential groove **82** having a u-shaped cross section that is configured to slideably engage at least one diameter of welding wire. Welding wire (not shown) sits and/or slides in at least one groove **82** as welding wire (not shown) engages pulley **31** and moves through the wire isolator **10**. In another embodiment (not shown), the groove has at least one of the following cross sections: v-shape, u-shaped wherein all sides are of equal or unequal length, semi-circular, and the like. In yet another embodiment (not shown), wire isolator includes more than one pulley. In another embodiment (not shown), wire isolator includes more than one pulley assembly. As discussed below, the pulley assembly may be replaced with another structure or assembly that the welding wire engages as it moves through the wire isolator.

[0034] In the illustrated embodiment, pulley **31**, washers **76**, sleeve bearing **78**, and cap screw **80** are made from plastic materials identified previously. In another embodiment (not shown), the pulley may be made from wood or metal materials, including the non-exhaustive and non-limiting list of wood and metal materials discussed above. In yet another embodiment (not shown), washers, sleeve bearing, and cap screw may be made from metal materials identified previously.

[0035] In the illustrated embodiment, cover **30** includes first thru-hole **56** and second thru-hole **58** that are longitudinally aligned with thru-holes in front guide housing **28** and back plate **26**. Thumb screws **84** pass through first thru-holes **56** and second thru-holes **58** in cover **30** and top guide **28** to securedly engage with internal threads of insert **59**, which securedly assembles back plate **26**, top guide **28**, and cover **30**. In another embodiment (not shown), back plate, top guide, and cover are assembled using other fasteners that are known to one skilled in the mechanical arts. In yet another embodiment (not shown), back plate, top guide, and cover are formed using other processes, e.g., plastic injection molding. In the illustrated embodiment, cover **30** includes a plurality of perimeter thru-holes **70** configured to securedly attach cover **30** to front guide housing **28** (as discussed above). Further, cover **30** includes a centrally located hole **86** configured to provide access to cap screw **80** of pulley assembly **74**.

[0036] *Figs. 4a-4f* are top plan views of wire isolators with covers removed having welding wire **16** engaging at least a portion of pulley **31** in wire isolator **10**. As discussed above, wire isolator **10** may include at least one inlet and at least one outlet. In the illustrated embodiments, the welding wire engages from 35 degrees to 1080 degrees of the pulley between a contact point and a takeoff point, more preferred from 90 degrees to 720 degrees, and most preferred from 180 degrees to 360 degrees. One skilled in the art would recognize that the listed ranges of welding wire engagement may vary plus or minus 25 degrees. Locations **88-102** represent a non-exhaustive and exemplary number of possible locations for at least one inlet and at least one outlet where welding wire **16** may enter and exit wire isolator **10**. As discussed above, welding wire **16** engagement of at least a portion of pulley **31** may prevent or minimize the level of twisting that transmits into the bulk welding wire from incoming welding wire. In other words, the wire isolator creates a standing loop in the wire that prevents rotational energy from transferring from the feed path to the wire stored in the bulk wire container. In another embodiment, the wire isolator creates a partial standing loop in the wire that prevents at least a portion of the rotational energy from transferring from the feed path to the wire stored in the bulk wire container.

[0037] In *Fig. 4a*, welding wire **16** enters wire isolator at inlet location **88**, engages a substantial portion of an outer radial groove of pulley **31**, and exits wire isolator **10** at outlet location **90**. In *Fig. 4b*, welding wire **16** enters wire isolator at inlet location **88**, engages a portion of an outer radial groove of pulley **31**, and exits wire isolator **10** at outlet location **94**. In *Fig. 4c*, welding wire **16** enters wire isolator at inlet location **88**, engages the entire outer radial groove of pulley **31**, and exits wire isolator **10** at outlet location **94**. In *Fig. 4d*, welding wire **16** enters wire isolator at inlet location **88**, engages at least ninety degrees of an outer radial groove of pulley **31**, and exits wire isolator **10** at outlet location **98**. In *Fig. 4e*, welding wire **16** enters wire isolator at inlet location **88**, engages about one-hundred and eighty degrees of an outer radial groove of pulley **31**, and exits wire isolator **10** at outlet location **102**. In *Fig. 4f*, welding wire **16** enters wire isolator at inlet location **102**, engages an outer radial groove of pulley **31**, and exits wire isolator **10** at outlet location **100**. *Figs. 4a-4f* should not be construed to limit the number, arrangement, orientation, or location of inlets and outlets in the wire isolator or the degree or amount of engagement between the pulley and the welding wire. In *Figs. 4a, 4c, and 4f*, for example, the inlet and outlet apertures may need to be offset, e.g., vertically offset, when the incoming and exiting welding wire cross paths (when viewed from above) so the incoming and exiting portions of the welding wire do not make contact. In another embodiment, the inlet and/or the outlet aperture may include an offset tubing that prevents the incoming and exiting welding wire from making contact.

[0038] *Fig. 5* illustrates an exploded assembly view of an alternative wire isolator **110** that is similar to wire isolator **10** discussed above, including materials and wire isolator function, except wire isolator **110** is made from a different number of parts than wire isolator **10** illustrated in *Fig. 3*. Wire isolator **110** includes lower housing portion **112** and upper housing portion **114**. Lower housing portion **112** includes back plate **116** having an upward extending threaded post **118**, first guide portion **120** having half circle cutout **122**, at least one threaded inlet **124**, at least one threaded outlet **126**, at least two upward extending alignment posts **128**, and threaded holes **130** and **132**. In another embodiment, inlet, outlet, and/or holes may not be threaded, but may be configured to have another fastening configuration.

[0039] In the illustrated embodiment, wire isolator **110** further includes pulley assembly **134**, including washers **136**, pulley **138** having a circumferential groove **139**, and sleeve bearing **140**. Pulley assembly **134** slideably engages upward extending post **118** and threaded nut **142** securedly attaches pulley assembly **134** to threaded post **118**. In another

embodiment (discussed below), upward extending post does not include threads, but includes a laterally extending hole at an upper end configured to receive a fastener, e.g., a cotter pin, that securedly attaches pulley assembly or a welding wire engaging member to the post. In another embodiment (not shown), upward extending post includes a self-locking feature that securedly attaches the pulley to the post without the need for a fastener. In the illustrated embodiment, upper housing portion **114** includes cover portion **143** and second guide portion **144** having half circle cutout **122** that aligns with first guide portion **120** to form a complete circle cutout. Upper housing portion **114** further includes upward extending cylindrical cavities **146** configured to receive upward extending alignment posts **128** from lower housing portion **112**. Further, upper housing portion **114** include holes **148** and **150** that receive thumb screws **152** that insert into and securedly engage threaded holes **130** and **132** in lower housing portion **112**. In another embodiment (not shown), the upper portion may only include a cover portion and the lower portion may include an entire guide portion having a complete circular cutout or a substantial portion thereof. In another embodiment (not shown), the upper portion includes a downward extending post configured to securedly engage a pulley assembly or a welding wire engaging member.

[0040] *Fig. 6* illustrates a top plan view of a wire isolator having a roller bearing assembly **154** that may be installed in the wire isolator to replace the pulley assembly discussed above. In the illustrated embodiment, roller bearing assembly **154** includes at least one roller bearing **156**, wherein the at least one roller bearing forms a circular configuration and welding wire **158** engages at least one roller bearing **158**. In the illustrated embodiment, the roller bearings **156** are ball bearings and are securedly attached to the back plate. In another embodiment (not shown), the roller bearings can include needle bearings, tapered roller bearings, spherical roller bearings, thrust bearings, and the like.

[0041] *Fig. 7* illustrates a top plan view of a wire isolator having a fixed circular shaft **160** that upwardly extends from the back plate of the wire isolator to replace the pulley assembly discussed above. In the illustrated embodiment, fixed circular shaft **160** is made from a wear resistant material that allows movement of welding wire **158**. In another embodiment (not shown), fixed circular shaft includes a circumferential groove that guides the welding wire. In yet another embodiment (not shown), fixed circular shaft includes a replaceable circumferential groove. In another embodiment (not shown), fixed circular shaft is securedly attached to the back plate. In yet another embodiment (not shown), more than one fixed shaft upwardly extends from the back plate of the wire isolator to form a circular configuration that allows movement of welding wire.

[0042] *Fig. 8* is a perspective view of an alternative wire isolator **162**. Wire isolator **162** includes square base plate **164** having at least one upward extending square post **166** and an upward extending circular shaft **168**. Upward extending square post **166** includes threaded inlet **170** and threaded outlet **172** that are configured to feed welding wire **174** into and out, respectively, of wire isolator **162**. In another embodiment (not shown), wire isolator may include more than one upward extending post or the post may have another cross-section or configuration, including but not limited to an oval cross-section or an angle-shaped configuration. In the illustrated embodiment, wire isolator **162** includes pulley **176** that is securedly attached to upward extending circular shaft **168** by cotter pin **178** that securedly attaches to upward extending circular shaft **168** through laterally extending hole **180**. In another embodiment (not shown), upward extending circular shaft includes laterally extending threads and a threaded fastener securedly attaches pulley to the post. In the illustrated embodiment, wire isolator **162** includes a clear cover **182** that removeably attaches to the upward extending post **166** or another portion of the wire isolator in at least one location.

[0043] In the illustrated embodiment, square base plate **164**, pulley **176**, and cover **182** are made from plastic materials identified previously. In another embodiment (not shown), wire isolator, pulley, and/or cover may be made from wood or metal materials, including the non-exhaustive and non-limiting list of wood and metal materials discussed above.

[0044] *Fig. 9* is a perspective view of an alternative wire isolator **184** attached to a dome shaped cover **185** on a drum or box bulk wire container (not shown). Wire isolator **184** includes at least one part, including square base plate **186**, upward extending first angle bracket **188** having threaded inlet **190**, circular tubing **191**, and upward extending second angle bracket **192** having threaded outlet **194**. Threaded inlet **190** and threaded outlet **194** are configured to feed welding wire **195** in and out, respectively, of wire isolator **184**. Circular tubing **191** is offset and guards outgoing welding wire from incoming welding wire. As discussed above, the axes of threaded inlet **190** and threaded outlet **194** may be offset. In another embodiment (not shown), upward extending first angle bracket having threaded inlet and upward extending second angle bracket having threaded outlet may be positioned at another location of square base plate. In the illustrated embodiment, wire isolator **184** includes pulley **196** that is securedly attached to upward extending circular shaft **198** by cotter pin **200** that securedly attaches to upward extending circular shaft **198** through laterally extending hole **202**. In another embodiment (not shown), upward extending circular shaft includes laterally extending threads and a threaded fastener that securedly attaches

pulley to the post. In yet another embodiment (not shown), the pulley is fastened with a cap screw that is securedly attached to the base plate. In another embodiment, wire isolator includes a clear cover that removeably attaches to the upward extending first and second angle brackets or another portion of the wire isolator in at least one location. In the illustrated embodiment, square base plate **186**, pulley **196**, and brackets **188** and **192** are made from plastic, metal, or wood materials identified previously.

[0045] While the invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from its scope. Therefore, it is intended that the invention not be limited to the particular embodiments disclosed, but that the invention will include all embodiments falling within the scope of the appended claims.

Reference numbers:

10	wire isolator	46	surface
12	cover	48	bore
14	bulk wire container	50	bore
16	welding wire	52	aperture
18	inlet aperture side	54	hole
20	outlet aperture side	56	thru-hole
22	inlet	58	thru-hole
24	outlet	59	inserts
26	back plate	60	thru-holes
28	housing	62	fin
30	cover	66	pin
31	pulley	68	thru-hole
32	first guide portion	70	thru-hole
34	second guide portion	72	pin
36	cutout	74	pulley assembly
38	surface	75	fitting
40	bore	76	washers
42	bore	78	bearing
44	aperture	79	aperture

80 screw
82 groove
84 screw
86 hole
88-102 locations
110 wire isolator
112 lower housing portion
114 upper housing portion
116 back plate
118 post
120 first guide portion
122 half circle cutout
124 inlet
126 outlet
128 post
130 hole
132 hole
134 pulley assembly
136 washers
138 pulley
139 groove
140 sleeve bearing
142 nut
143 cover portion
144 second guide portion
146 cylindrical cavities
148 hole
150 hole
152 thumb screws
154 roller bearing assembly
156 roller bearing
158 welding wire
160 shaft
162 wire isolator
164 base plate
166 post
168 shaft
170 inlet
172 outlet
174 welding wire

	176	pulley	D1	first distance
	178	cotter pin	D2	second distance
	180	hole		
	182	cover		
	184	wire isolator		
	185	cover		
	186	plate		
	188	bracket		
	190	inlet		
	191	tubing		
	192	bracket		
	194	outlet		
	195	welding wire		
	196	pulley		
	198	shaft		
	200	cotter pin		
	202	hole		
	CL1	centerline		
	CL2	centerline		

CLAIMS

1. An apparatus comprising:

a bulk wire container (14) comprising coiled wire (16);

a wire isolator (110) comprising:

an attachment means to said bulk wire container (16);

an inlet (22) for said wire isolator (110);

an outlet (24) for said wire isolator (110); and

a wire engaging means which translates longitudinal axial movement of said wire (16) in said inlet (22) into circumferential tangential movement about said wire engaging means, interposed between said inlet (22) and said outlet (24).

2. The apparatus of claim 1, wherein said wire engaging means is selected from the group consisting of a pulley assembly (74, 134) that includes at least one pulley (31, 138), a roller bearing assembly that includes at least one roller bearing, and at least one shaft.

3. The apparatus of claim 1 or 2, wherein said wire engaging means securedly attaches to a post (166) that is integrally formed with said wire isolator (110).

4. The apparatus of one of the claims 1 to 3, wherein said wire engaging means is securedly attached to said wire isolator with a fastening means.

5. The apparatus of one of the claims 1 to 4, wherein said wire (16) circumferentially translates about said wire engaging means between a contact point and a takeoff point from 35 degrees and 1080 degrees.

6. The apparatus of one of the claims 1 to 4, wherein said wire (16) circumferentially translates about said wire engaging means between a contact point and a takeoff point from 180 degrees and 360 degrees.

7. The apparatus of one of the claims 1 to 6 further comprising a cover (30) to enclose said wire engaging means.

8. The apparatus of one of the claims 1 to 7, wherein said inlet (22) has a first central longitudinal axis and said outlet (24) has a second central longitudinal axis that is parallel to said first central longitudinal axis.

9. The apparatus of claim 8, wherein said wire isolator further includes a back plate (26, 116) having a bottom surface, and wherein said first central longitudinal axis and said second central longitudinal axis are offset relative to said bottom surface.

10. The apparatus of one of the claims 1 to 9, wherein said attachment means to said bulk wire container (16) includes a fitting (75) that attaches to said bulk wire container (16) and said inlet (22).

11. An assembly comprising:

a bulk wire container (14) comprising coiled wire (16);

at least one isolator (110) comprising:

an attachment means to said bulk wire container (16);

a lower housing (112);

an inlet (22) for said at least one isolator (110);

an outlet (24) for said at least one isolator (110); and

a wire engaging means which circumferentially translates said wire (16) from said inlet (22) to said outlet (24), wherein said wire engaging means connects to said lower housing (112).

12. The assembly of claim 11, wherein said wire engaging means is selected from the group consisting of at least one pulley (31, 138), at least one roller bearing, and at least one shaft.

13. The assembly of claim 12, wherein the at least one pulley includes a circumferential groove, and wherein said wire is engaged in at least one location of the circumferential groove (82).

14. The assembly of one of the claims 11 to 13 further comprising at least one upper housing (114) that securedly connects to said lower housing (112).

15. The assembly of claim 14, wherein said inlet (22) and said outlet (24) laterally extend through at least one of the following: said lower housing (112) and said at least one upper housing (114).

16. The assembly of claim 14 or 15 further comprising a cover (30) that securedly attaches to said at least one upper housing (114).

17. The assembly of one of the claims 11 to 16, wherein said wire (16) circumferentially translates about said wire engaging means between a contact point and a takeoff point from 35 degrees and 1080 degrees.

18. The assembly of one of the claims 11 to 16, wherein said wire (16) circumferentially translates about said wire engaging means between a contact point and a takeoff point from 180 degrees and 360 degrees.

19. The assembly of one of the claims 11 to 18 further comprising an upward extending post (28), and wherein said inlet (22) and said outlet (24) laterally extend through said upward extending post (28).

20. The assembly of one of the claims 11 to 19 further comprising a first bracket and a second bracket that are each attached to said lower housing (112), and wherein said inlet (22) extends through said first bracket and said outlet (24) extends through said second bracket.

21. A wire isolator (110) for use with a container (14) having bulk welding wire (16) comprising:

an attachment means;

a lower housing (112) having a bottom surface;

an inlet (22) for said wire isolator (110), wherein said inlet (22) has a first central longitudinal axis;

an outlet (24) for said wire isolator (110), wherein said outlet (24) has a second central longitudinal axis; and

a pulley (31) which circumferentially translates said wire (16) between said inlet (22) and said outlet (24).

22. The wire isolator of claim 21, wherein said first central longitudinal axis and said second central longitudinal axis are offset.

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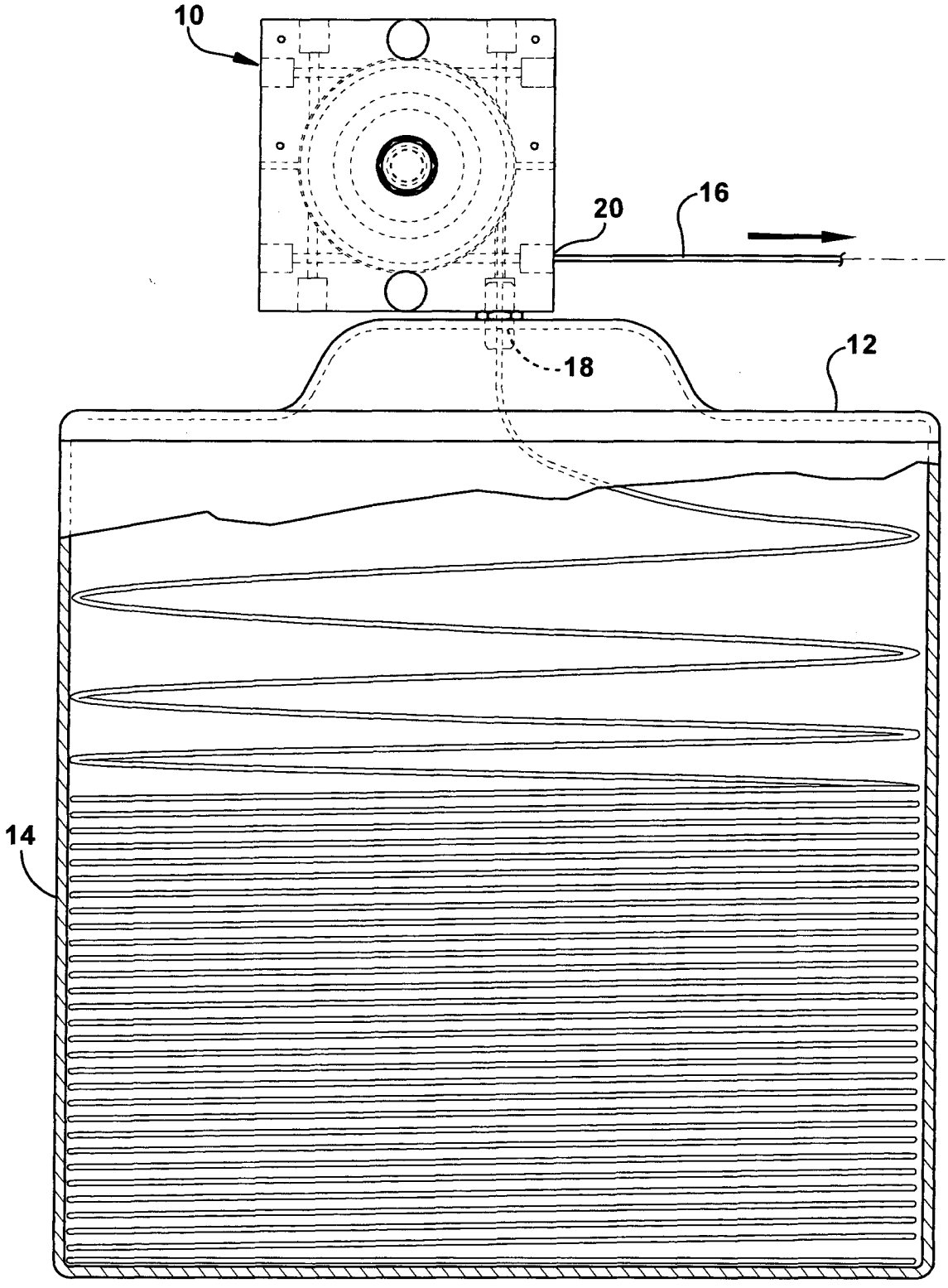

Fig. 1

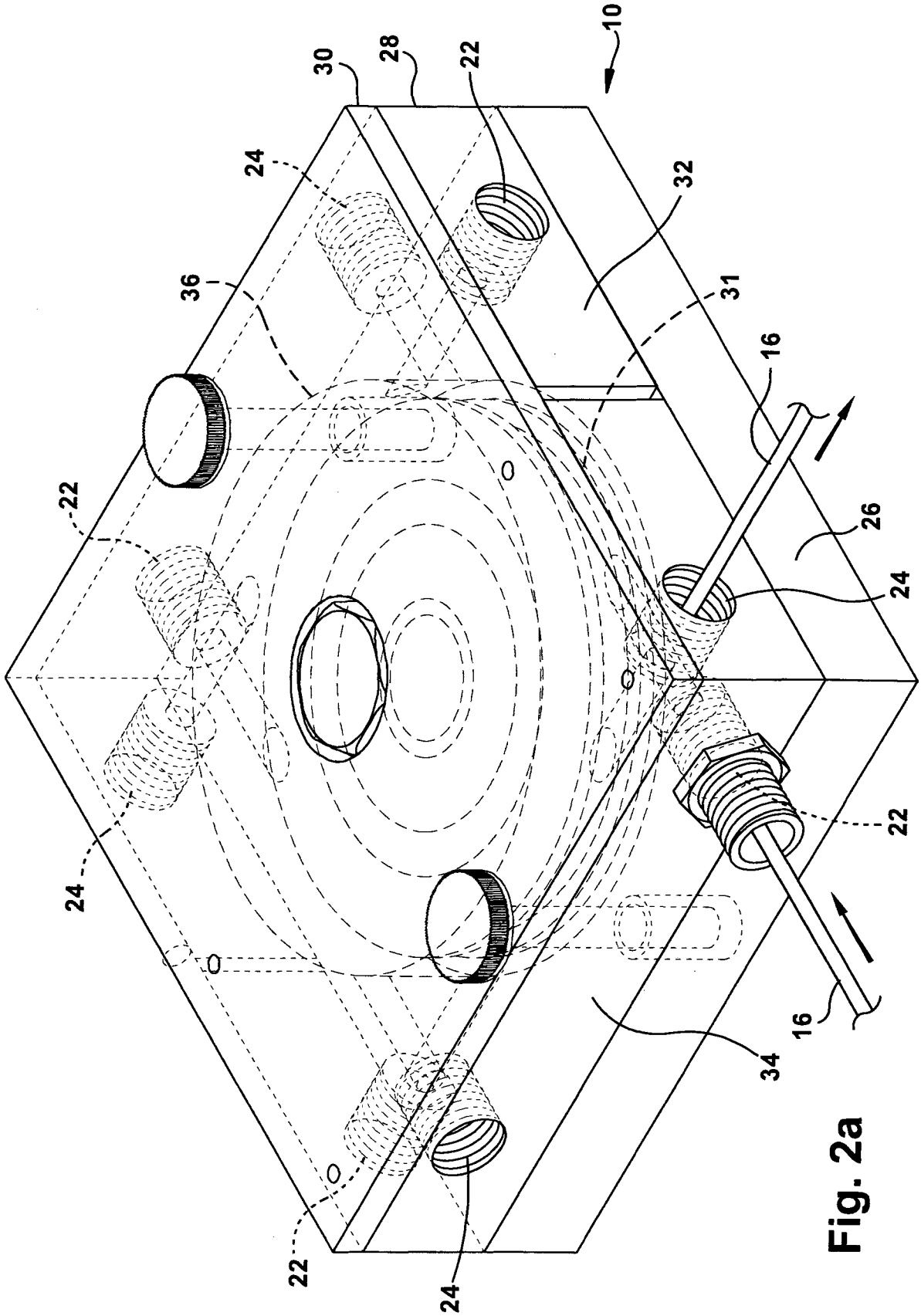

Fig. 2a

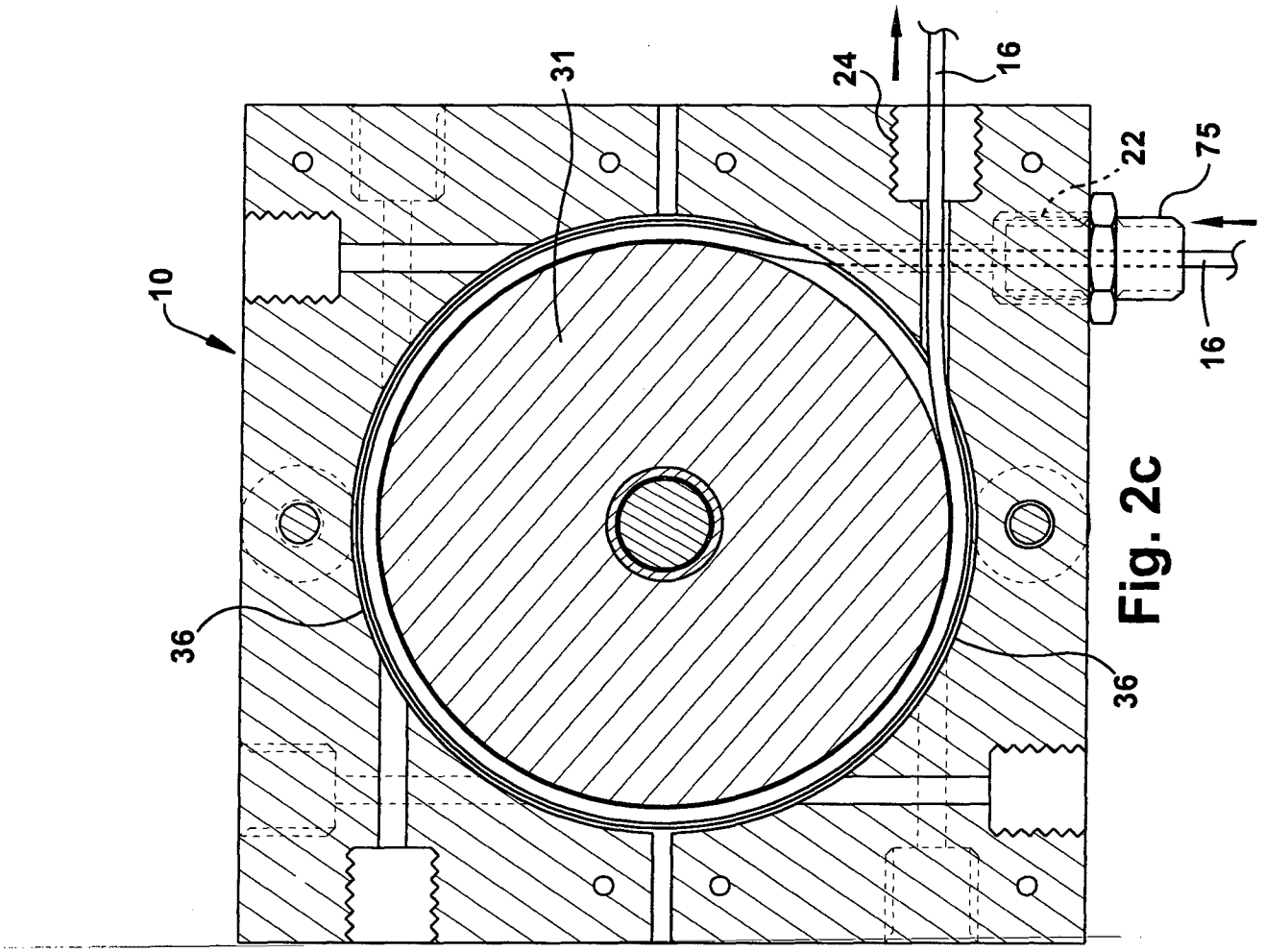
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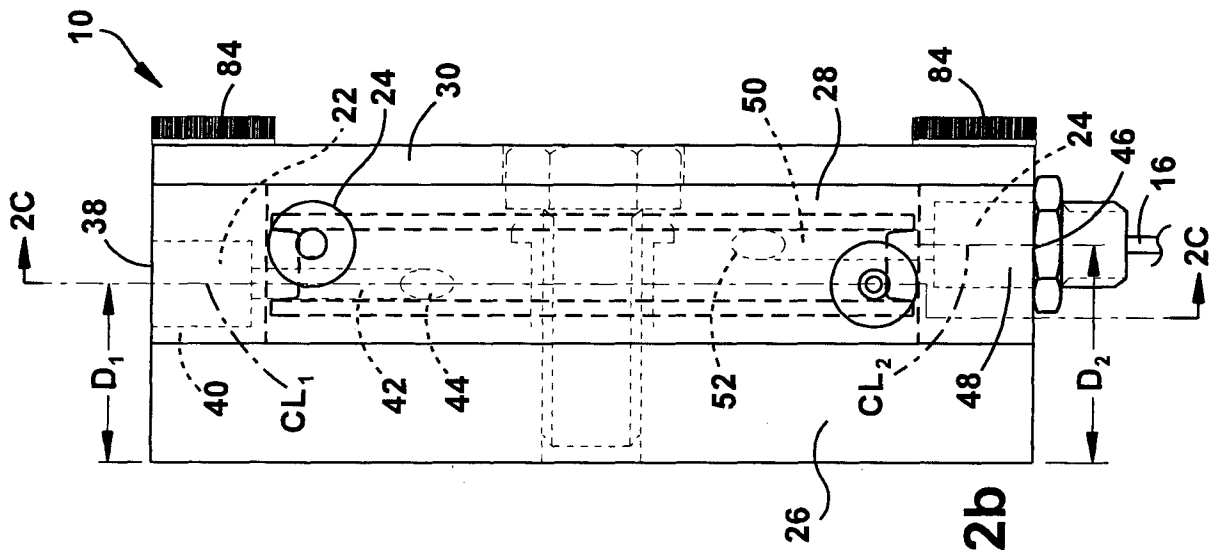
Fig. 2c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CL_2
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D_2
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Fig. 2b

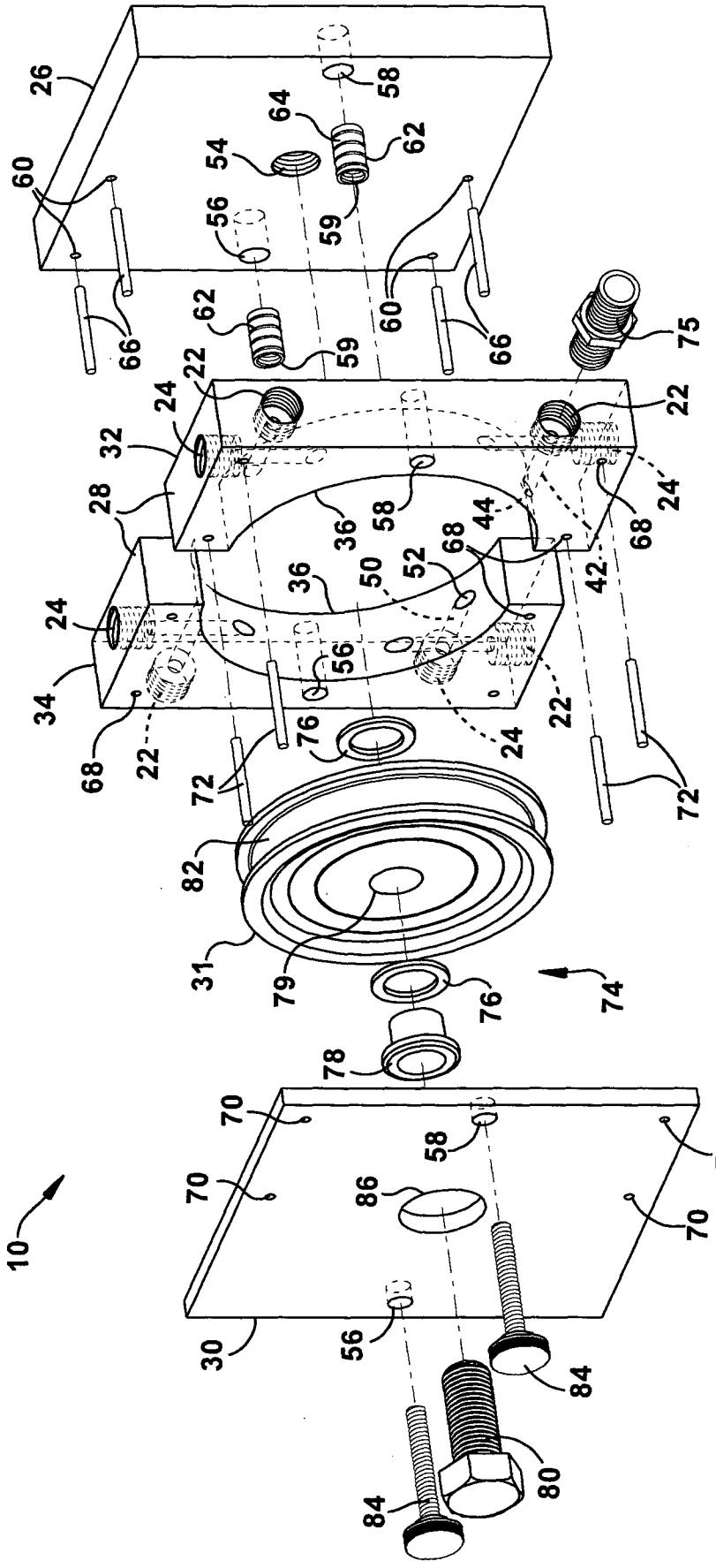
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Fig. 3

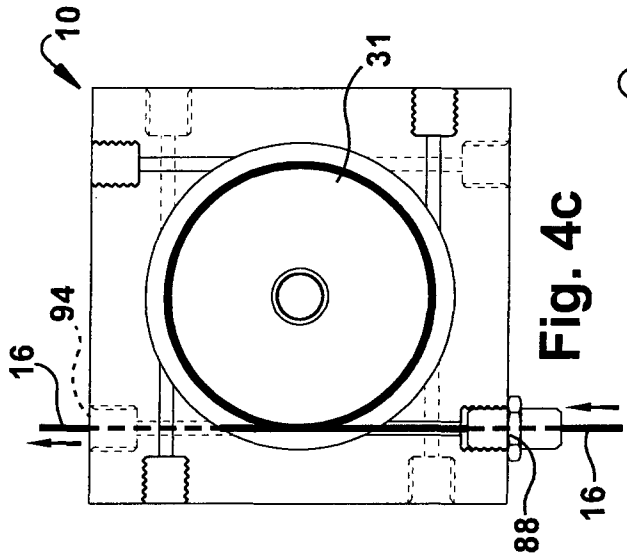

Fig. 4c

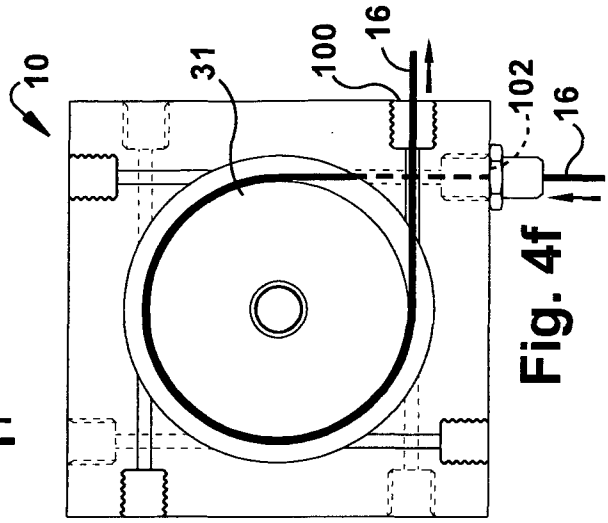

Fig. 4f

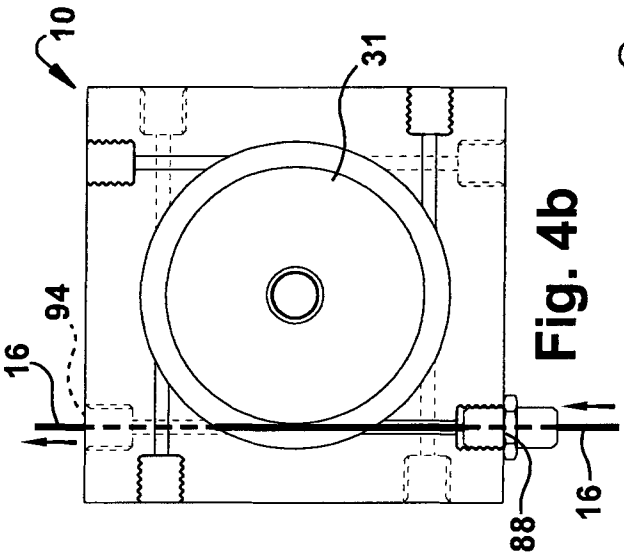

Fig. 4b

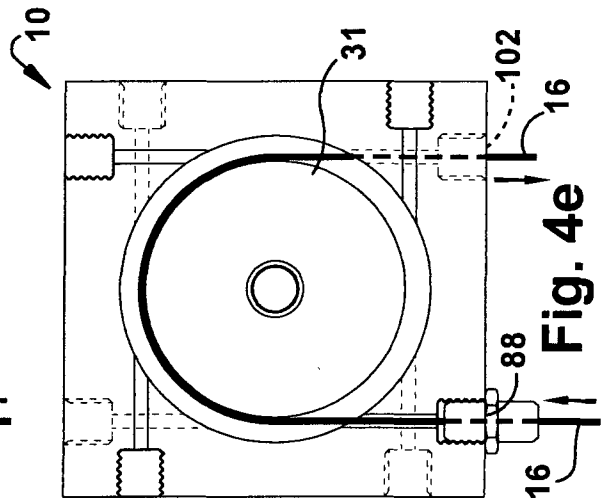

Fig. 4e

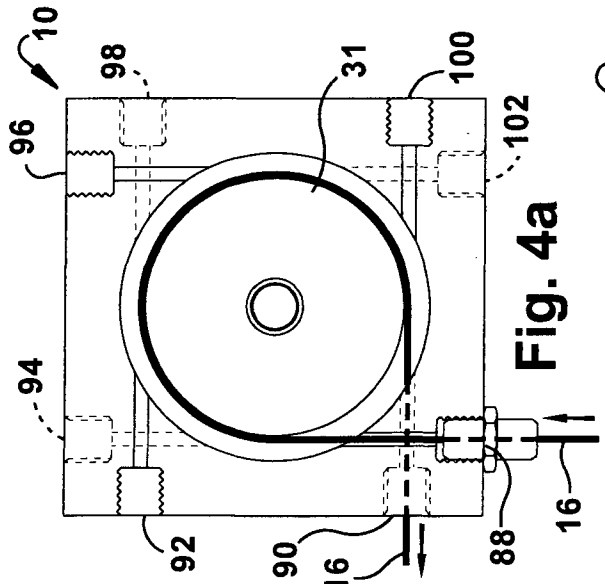

Fig. 4a

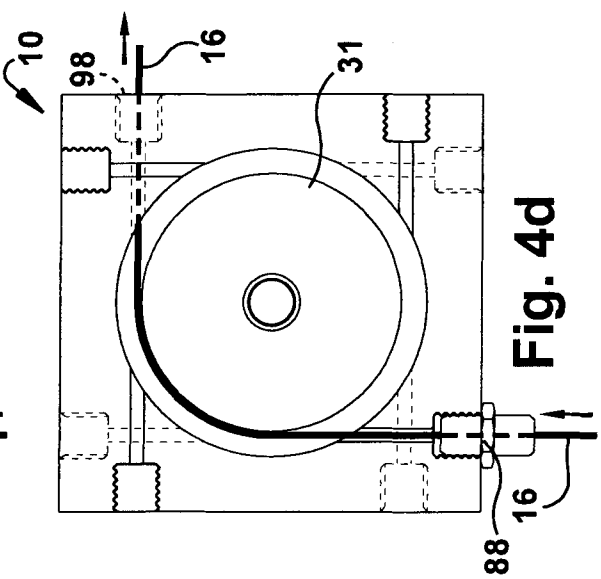

Fig. 4d

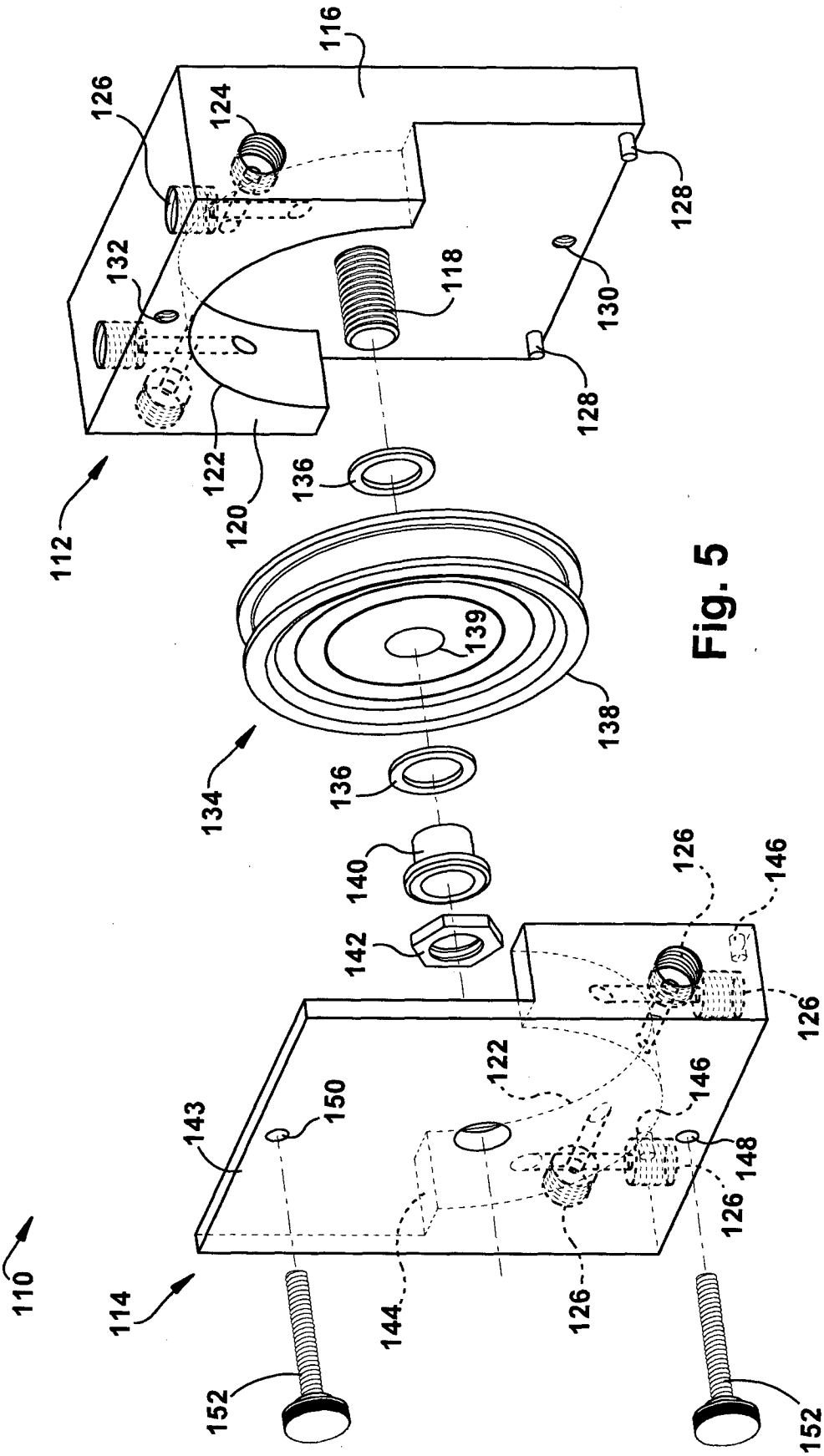
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Fig. 5

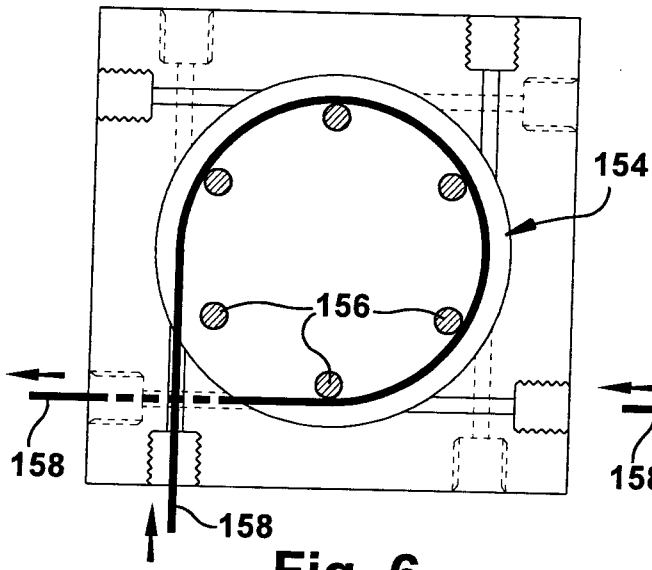

Fig. 6

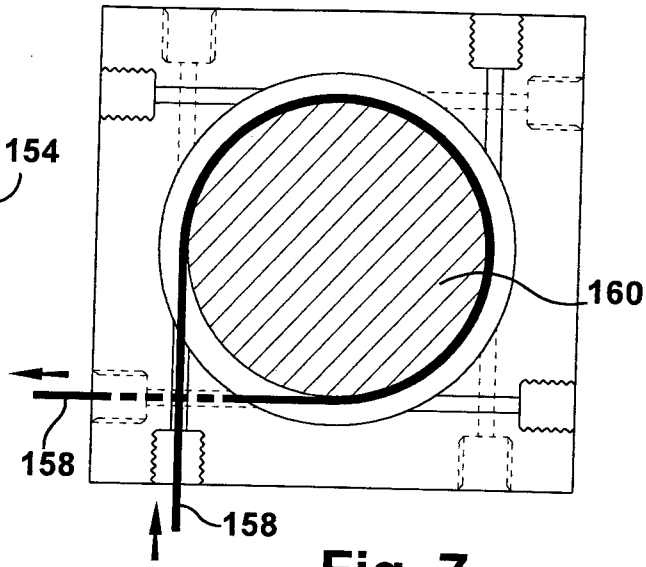

Fig. 7

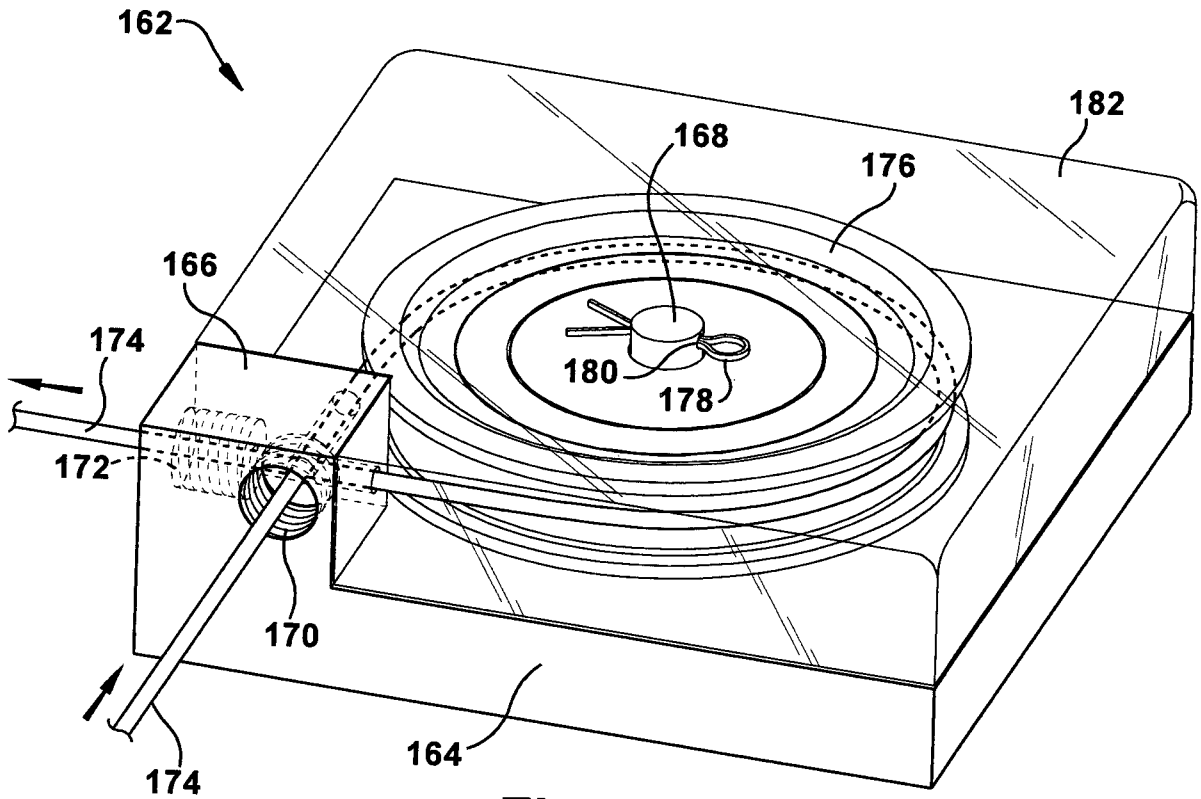

Fig. 8

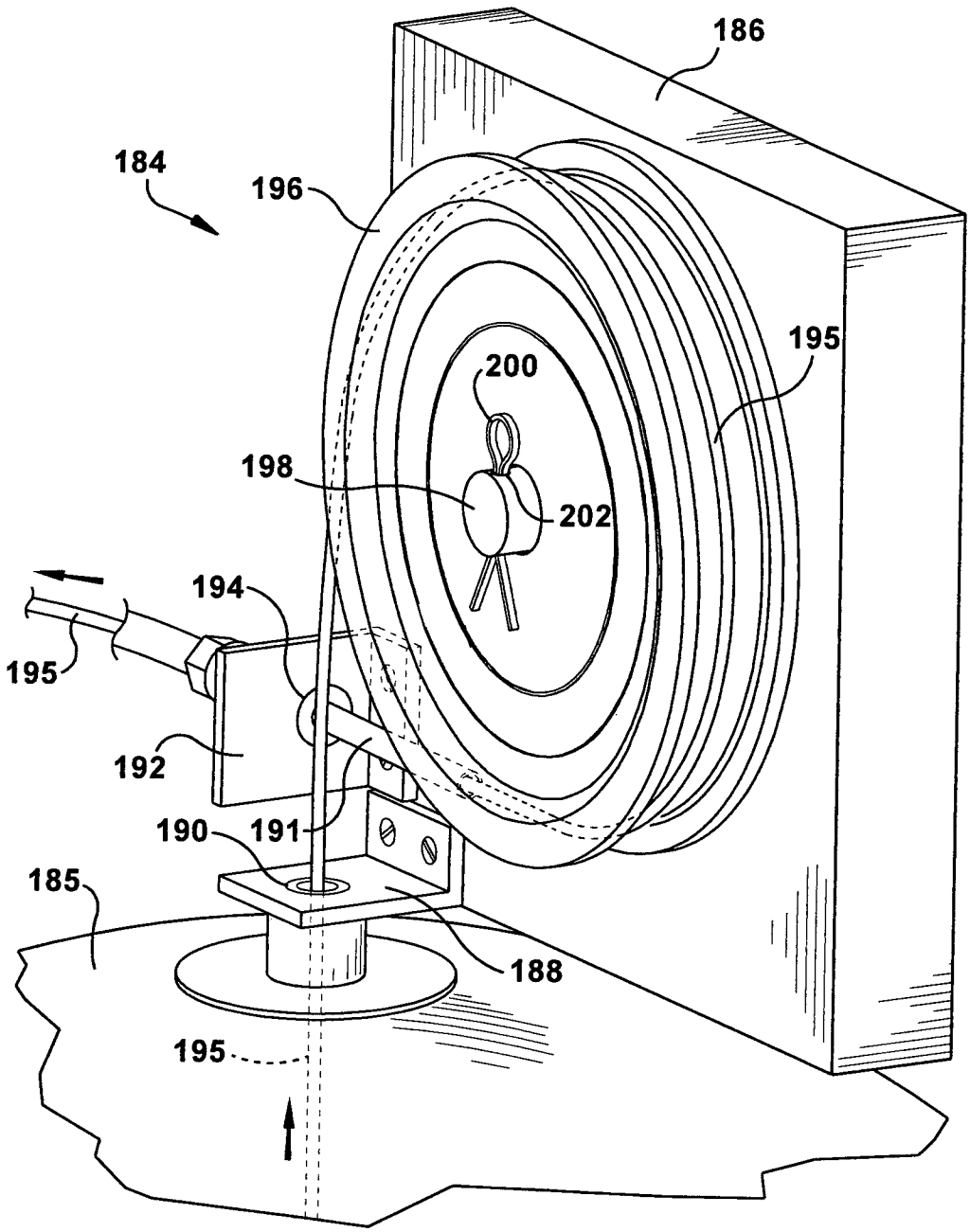

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/001297

A. CLASSIFICATION OF SUBJECT MATTER
INV. B23K9/133 B65H57/18
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B23K B65H

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 179 056 A (SCHMERLING DONALD W [US]) 18 December 1979 (1979-12-18) figures 1,4	1-22
X	US 4 160 151 A (TONITA PETER) 3 July 1979 (1979-07-03) figures	21,22
A	BE 560 317 A (UNION CARBIDE CORPORATION) 14 August 1957 (1957-08-14) figures	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2012	25/10/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Caubet, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2012/001297

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4179056 A	18-12-1979	NONE	
US 4160151 A	03-07-1979	NONE	
BE 560317 A	14-08-1957	NONE	