



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.08.2018 Bulletin 2018/31

(51) Int Cl.:
B25B 27/00 (2006.01) B25B 27/02 (2006.01)

(21) Application number: **17461505.4**

(22) Date of filing: **25.01.2017**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(54) **PLIABLE JOINT INSTALLATION TOOL**

(57) This disclosure provides tools for installing a pliable joint in the joint space between rigid bodies. A reaction bar (110) with lateral ends engages flanges on the rigid bodies. A pusher interface (130,230,330) engages the pliable joint member to push it into place when a force is applied to a lever handle (170,270,370). A lever body (150,250,350) perpendicular to the reaction bar (110) holds fixed lever relationships between the reaction bar (110), pusher interface (130,230,330), and lever handle (170,270,370) with a first lever distance between the reaction bar and the pusher interface and a second lever distance between the lever handle and the pusher interface.

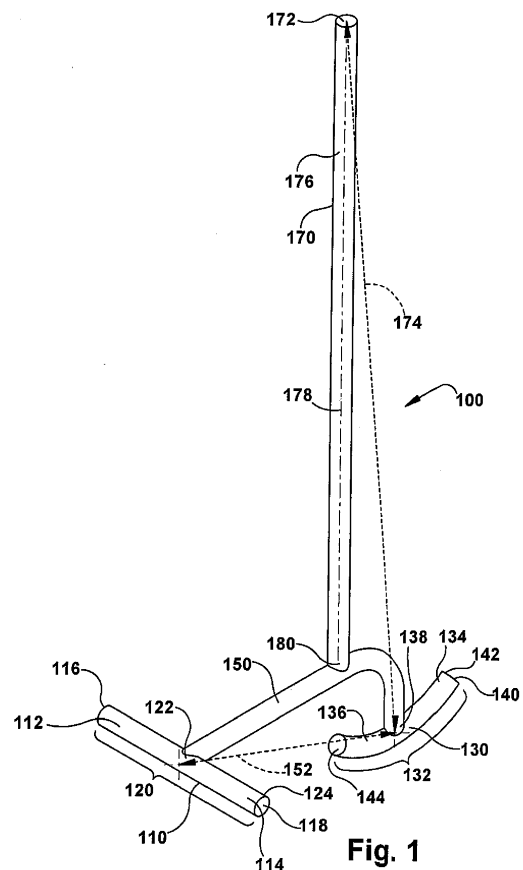


Fig. 1

Description

BACKGROUND

[0001] The disclosure relates generally to tools for installing a pliable joint between two rigid bodies, and more particularly, to tools for installing expansion joints and similar pliable seals in turbomachines, auxiliary systems, and other machines.

[0002] A variety of heavy machinery includes pliable joint seals between adjacent rigid bodies, such as expansion joints. For example, adjacent metal components define a space or seam into which a rubber seal is inserted. It is not always possible to place such seals before the metal components are positioned and the seals are often designed to be held in place by an interference fit or compression of the pliable member. In this context, "pliable" may still require a great deal of force to get the seal into position and the spaces these seals are installed into are not always easy to access and maneuver around.

[0003] For example, some turbomachines, such as gas turbines, and auxiliary systems, such as air ducts, include one or more expansion joints between various components. One example is the expansion joint between the inlet plenum and inlet casing (or cone) of a gas turbine. During installation, service, or repair, it may be necessary to remove and replace the rubber expansion joint, such as for an inlet replacement. A service crew may perform the repair and have to manually install or reinstall the rubber expansion joint. Applying the necessary force along the expansion joint to push it into place may be challenging.

SUMMARY

[0004] A first aspect of this disclosure provides a pliable joint installation tool. The tool includes a reaction bar, a pusher interface, a lever body, and a lever handle. The reaction bar has a first lateral end and a second lateral end. The pusher interface is perpendicular to the reaction bar and defines a first lever distance from the reaction bar. The lever body connects the reaction bar to the pusher interface and maintains the first lever distance between the reaction bar and the pusher interface. The lever handle extends from the lever body. The lever handle has a distal end and defines a second lever distance from the distal end of the lever handle to the pusher interface.

[0005] A second aspect of the disclosure provides a tool for installing a pliable joint member between a first rigid body having a first flange and a second rigid body having a second flange. The first rigid body and the second rigid body define a joint space there between. The tool includes a reaction bar, a pusher interface, a lever body, and a lever handle. The reaction bar has a first lateral end and a second lateral end. The first lateral end provides contact pressure with the first flange and the second lateral end provides contact pressure with the second flange. The pusher interface is perpendicular to

the reaction bar and defines a first lever distance from the reaction bar. The pusher interface engages the pliable joint member to force the pliable joint member into the joint space. The lever body connects the reaction bar to the pusher interface and maintains the first lever distance between the reaction bar and the pusher interface. The reaction bar being in contact with the first flange and the second flange provides a fulcrum. The lever handle extends from the lever body. The lever handle has a distal end and defines a second lever distance from the distal end of the lever handle to the pusher interface. The pusher interface being in contact with the pliable joint member provides a load for translating force applied to the lever handle to through the fulcrum to the load.

[0006] A third aspect of the disclosure provides a tool for pliable joint installation. The tool includes a reaction bar, a pusher interface, a lever body, and a lever handle. The reaction bar has at least one lateral end. The pusher interface defines a first lever distance from the reaction bar. The lever body is perpendicular to the reaction bar and connects the reaction bar to the pusher interface. The lever handle is in fixed relationship to the reaction bar, the pusher interface, and the lever body. The lever handle has a distal end and defines a second lever distance from the distal end of the lever handle to the pusher interface. The second lever distance is greater than the first lever distance. The pusher interface applies a downward force and the reaction bar applies an upward force in response to a force applied to the lever handle.

[0007] The illustrative aspects of the present disclosure are arranged to solve the problems herein described and/or other problems not discussed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other features of this disclosure will be more readily understood from the following detailed description of the various aspects of the disclosure taken in conjunction with the accompanying drawings that depict various embodiments of the disclosure, in which:

FIG. 1 shows a side perspective view of an example pliable joint installation tool.

FIG. 2 shows a side perspective view of another example pliable joint installation tool.

FIG. 3 shows a side perspective view of another example pliable joint installation tool.

FIG. 4 shows a perspective view of the example pliable joint installation tool in use.

[0009] It is noted that the drawings of the disclosure are not necessarily to scale. The drawings are intended to depict only typical aspects of the disclosure, and therefore should not be considered as limiting the scope of the disclosure. In the drawings, like numbering represents like elements between the drawings.

DETAILED DESCRIPTION

[0010] In some embodiments, aspects of the disclosure may be implemented through a single piece tool comprised of tool-grade medium-carbon steel, titanium or a similar metal. In some embodiments, different components may be made of different materials. In some embodiments, it may be forged, cast, machined, or some combination as a continuous piece. In other embodiments it may be forged, cast, machined or some combination as components and welded or otherwise permanently joined into a single piece. In some embodiments, one or more components may be removably attached to other components with bolts (or other fasteners), mating threads, interference fit, spring pegs, or other mechanical attachments. More specifically, some components may be made in varying dimensions or other interchangeable features to enable the tool to be customized to a specific application, such as machines of varying sizes and the dimensions of the pliable seals, flanges on the rigid bodies, and access. Various members in the tool may be comprised of bars of varying cross-sections, including pipes, other hollow cross-sections, rectangles, other polygons, flat plates (straight or curved), L, T, I, or more complex cross-sections. These members may be formed as a single piece (cast, extruded, and/or machined) and/or welded or otherwise bonded from multiple pieces. Any given tool embodiment, may include members of varying materials and cross-sections.

[0011] Figure 1 depicts an example pliable seal installation tool 100 as a single body made of four components. In some embodiments, these components are welded or otherwise permanently joined to form a one piece tool. In the embodiment shown, the tool is composed of a reaction bar 110, a pusher bar 130, a lever body 150, and a lever handle 170. Reaction bar 110 may be designed to be positioned under opposed flanges from adjacent components with rigid bodies that define a joint space between them. The opposed flanges have a gap between them through which reaction bar 110 can be inserted, generally by orienting the reaction bar so that it is more parallel to the gap to fit through it. Once reaction bar 110 is through the gap and into the wider space on the opposite side of the flanges, tool 100 may be rotated such that reaction bar 110 is oriented perpendicular to the gap and the lateral ends 112, 114 are under the flanges. The contact force between the distal end portions of reaction bar 110 will provide resistance or create a fulcrum or load point when lever handle 170 is rotated by a user in the general direction of pusher bar 130. Pusher bar 130 is designed to apply pressure to a pliable joint member positioned between the adjacent components and below the flanges and tool 100. Pusher bar 130 has a curved surface 132 that acts as a pusher interface with the pliable joint member and engages the pliable joint member to force the pliable joint member into the joint space. Pusher bar 130 is connected to reaction bar 110 by lever body 150 and maintains a lever distance 152 between them.

Lever handle 170 connects to lever body 150 and defines another lever distance 174 from the distal end 172 to the pusher interface of pusher bar 130. The pusher interface becomes another fulcrum or load point where it contacts the pliable joint member for translating force applied to lever handle 170. The environment and use of tool 100 will be further described below with regard to FIG. 4.

[0012] In some embodiments, reaction bar 110 is a reaction member formed of a cylindrical bar. In some embodiments, other reaction member configurations are possible, including reaction bars of different cross-sections (square, hexagonal, etc.) or shapes (straight, curved, V shaped, etc.), reaction plates, or more complex shapes to provide contact pressure with the flanges for leverage. In the embodiment shown in FIG. 1, lateral ends 112, 114 protrude in opposite directions from the central connection 122 with lever body 150. The portion of lateral ends 112, 114 located below the flanges when tool 100 is in use may vary. The portion of lateral ends 112, 114 in contact with the flanges may be referred to as contact surfaces and generally correspond to the flange facing surfaces of lateral ends 112, 114. Lateral ends 112, 114 may engage with the flanges to maintain a fixed position while force applied to lever handle 170 is translated into force through pusher bar 130 and then lateral ends 112, 114 can be moved in a direction parallel to the flanges to find a new position for pushing the next portion of the pliable joint member into place. In some embodiments and applications, the lateral ends 112, 114, each end in a distal surface 116, 118 and define a reaction bar width 120 between distal surfaces 116, 118. Reaction bar width 120 may be less than the total width of the depth of the respective recesses below the flanges on each side plus the flange gap distance between the adjacent, generally parallel, edge surfaces of the flanges. Reaction bar width 120 may be greater than the width of the flange gap such that reaction bar 110 can engage both flanges simultaneously. Reaction bar diameter 124 may be less than the flange gap distance such that reaction bar 110 can be inserted through the flange gap while it is oriented substantially parallel to the edge surfaces of the flanges and then be rotated approximately 90 degrees such that lateral ends 112, 114 are approximately perpendicular to the flange gap and positioned to provide contact force on the underside of the flanges. In some embodiments, reaction bar 110 may include a width adjustment for accommodating different recess widths and different flange gap distances. In some embodiments, reaction bar 110 may only include one lateral end extending perpendicular from the connection with lever body 150 and intended to engage with a flange on one of the adjacent rigid bodies. An example would include if only one of the rigid bodies has a flange capable of receiving the contact force necessary for pushing the pliable joint member into place.

[0013] In some embodiments, pusher bar 130 is a pusher member formed of a curved cylindrical bar. In some embodiments, other pusher member configurations are possible, including pusher bars of different

cross-section (square, hexagonal, etc.) or shape (straight, curved, S shaped, etc.), pusher plates, pusher balls, or more complex shapes to provide contact pressure with the pliable joint member for pushing it into (or out of) place. In some embodiments (not shown), pusher bar 130 may be formed continuously with lever body 150. For example, lever body 150 may end in a curved portion to act as pusher bar 130. Pusher bar 130 may include curved surface 132 to act as a pusher interface with the pliable joint member and incrementally push the pliable joint member into the joint space in a direction parallel to lever body 150 in response to the force applied to lever handle 170. A curved pusher interface may incrementally engage the pliable joint member that is not yet seated in the joint space without damaging the surface of the pliable joint member. In some embodiments, other pusher (and/or pliable joint member) shapes may define flat, patterned, complementary or more complex pusher interfaces. Pusher bar 130 may include extensions 134, 136 extending from a body connection 138 in a direction parallel to the anticipated orientation of the pliable joint member. In some embodiments and applications, extensions 134, 136, each end in a distal surface 142, 144 and define a pusher bar length 140 between distal surfaces 142, 144 along curved surface 132.

[0014] In some embodiments, lever body 150 is a lever member formed of a curved cylindrical bar. In some embodiments, other lever member configurations are possible, including lever bars of different cross-section (square, hexagonal, etc.) or shape (straight, curved, V shaped, etc.), body blocks, body frames, or more complex shapes to provide a rigid connection and defined lever distances among reaction bar 110, pusher bar 130, and lever handle 170. Lever body 150 may interconnect the other components to define a lever relationship among a force applied by the user to lever handle 170, the contact surfaces between reaction bar 110 and the flanges, and the contact point between the pliable joint member and the pusher interface of pusher bar 130. The relative positions of lever body 150, reaction bar 110, pusher bar 130, and lever handle 170 may define lever distance 152 between the contact points of reaction bar 110 and pusher bar 130 and lever distance 174 between the contact point of pusher bar 130 and wherever the user applies force to lever handle 170, with a maximum lever distance 174 based on force applied proximate the distal end 172 of lever handle 170. Lever distance 174 is generally greater than lever distance 152 and lever distance 174 may preferably be at least twice lever distance 152 in some embodiments. The application of force to lever handle 170 in a direction generally parallel to the joint space and in the direction of the portion of the pliable joint member being pushed may create load and fulcrum relationships with the contact points of reaction bar 110 and pusher bar 130, with reaction bar 110 generally acting as the fixed (fulcrum) position and pusher bar 130 generally acting as the movable (load) position to move the pliable joint member into position. The application of

force to lever handle 170 in the opposite (but still parallel to the joint space) may move reaction bar 110 (now acting as load) from engagement with the flanges while pusher bar 130 is temporarily fixed (and acting as fulcrum). Once disengaged, lever handle 170 may be used to move both pusher bar 130 and reaction bar 110 along the joint space and to a new position for engaging the flanges and pliable joint member to push the next portion of the pliable joint member into the joint space. In some embodiments and application, one or both of pusher bar 130 and reaction bar 110 may or may not remain in contact with the pliable joint member and flanges respectively as they are moved. In some embodiments, one or both of pusher bar 130 and reaction bar 110 may include surface configurations, materials, and/or mechanical features (e.g. wheels) for facilitating movement between applications of force for pushing the pliable joint member into the joint space. In some embodiments, lever body 150 may include length adjustments for changing lever distance 152. For example, lever body 150 may include telescoping members held in position with bolts (or other fasteners), mating threads, spring pegs, or other mechanical attachments but moveable among a plurality of positions to adjust length.

[0015] In some embodiments, lever handle 170 is a handle member formed of a straight cylindrical bar. In some embodiments, other handle member configurations are possible, including lever handles of different cross-section (square, hexagonal, etc.) or shape (straight, curved, angled, etc.), contoured/ergonomic, or more complex shapes to provide effective application of manual force at a distance for mechanical leverage. Lever handle 170 may include an exterior surface 176 for being gripped by a user. In some embodiments, lever handle 170 may incorporate specific gripping features in the handle member and/or accommodate additional gripping components, such as a rubberized grip sleeve over a portion of lever handle 170. Lever handle 170 may define a handle length 178 from a connection point 180 with lever body 150 and distal end 172. In some embodiments, handle length 178 is adjustable based on incorporating one or more length adjustments. For example, lever handle 170 may be comprised of telescoping members held in position with bolts (or other fasteners), mating threads, spring pegs, or other mechanical attachments but moveable among a plurality of positions to adjust length.

[0016] FIG. 2 depicts another example pliable joint installation tool 200. In some embodiments, tool 200 may operate similarly to tool 100 in FIG. 1 and is described primarily in terms of differences from tool 100. Joint installation tool 200 includes a reaction bar 210, a pusher plate 230, a lever body 250, and lever handle 270. It also includes a cross member 290 extending from lever body 250 to lever handle 270. Cross member 290 provides additional structural support for maintaining the fixed relationships between reaction bar 210, pusher plate 230, and lever handle 270.

[0017] In the embodiment shown, reaction bar 210 in-

cludes lateral ends 212, 214 protruding in opposite directions from the central connection 222 with lever body 250. Lateral ends 212, 214 end in adjustable end caps 216, 218. End caps 216, 218 are width adjustments capable of independently adjusting the reaction bar width. In the embodiment shown, end caps 216, 218 may comprise cylindrical caps with interior threads that mate with complementary threads 224, 226 formed in the body of reaction bar 210. Screwing and unscrewing end caps 216, 218 the reaction bar width may be adjusted. Reaction bar 210 has a reaction bar diameter 220 and end caps 216, 218 have an end cap diameter 228. In some embodiments, end cap diameter 228 may be greater than reaction bar diameter 220 and the exterior surfaces of end caps 216, 218 may protrude from the exterior surfaces of the body of reaction bar 210. The exterior surfaces of end caps 216, 218 may provide the contact surfaces for engaging the flanges, rather than the body of reaction bar 210. In some embodiments, end caps 216, 218 may be comprised of different materials than the body of reaction bar 210. For example, end caps 216, 218 may be comprised of a durable polymer with desirable durability and surface characteristics for providing fixed surface contact with the flanges when tool 200 is applying pressure to the joint member but moving easily along the under surface of the flanges when pressure is released. In another embodiment, end caps 216, 218 are a multi piece end cap that enables the threaded width adjustment portion to stay in place, while allowing the exterior shell of the end cap to rotate around the threaded width adjustment portion to act as freely rotating wheels for moving reaction bar 210 from one position to the next.

[0018] In the embodiment shown, pusher plate 230 is a pusher member formed of a metal plate formed into a curve for engaging the pliable joint member. Pusher plate 230 may have a central attachment point 232 to lever body 250 and extend outward from attachment point 232 in a curved plane. The outer surface 234 may provide a curved interface surface for engaging the pliable joint member having a surface width 236 and a surface length 238. In some embodiments, surface width 236 may be wider than the width of the member or members comprising lever body 250 and narrower than a width of the pliable joint member and/or the joint space.

[0019] In the embodiment shown, lever body 250 forms a 90 degree angle connection with lever handle 270 and is strengthened by cross member 290. Cross member 290 has end connection points 292, 294 with lever body 250 and lever handle 270. The number, variety, and configuration of cross members may include any number of options for strengthening the rigidity and durability of lever body 250 and its connection points with some or all of lever handle 270, reaction bar, 210, and/or pusher plate 230.

[0020] In the embodiment shown, lever handle 270 incorporates a length adjustment. More specifically, lever handle 270 has a fixed portion 272 and a telescoping portion 274. Fixed portion 272 and telescoping portion

274 incorporate a plurality of through holes 276 and one or more fasteners 278 for adjusting and fixing the length of lever handle 270.

[0021] FIG. 3 depicts another example pliable joint installation tool 300. In some embodiments, tool 300 may operate similarly to tool 100 in FIG. 1 and/or tool 200 in FIG. 2 and is described primarily in terms of differences from tools 100, 200. Joint installation tool 300 includes a reaction bar 310, a pusher wheel assembly 330, a lever body 350, and lever handle 370.

[0022] In the embodiment shown, pusher wheel assembly 330 includes wheel 332, wheel supports 334, 336, and axle 338. A variety of wheel assemblies, including variations in mounting structures, axles and hubs, subcomponents, and wheel configurations, may be used for providing pusher wheel assembly 330. In some embodiments, the components of pusher wheel assembly 330 may include a variety of different materials that are dissimilar from the material or materials used for reaction bar 310, lever body 350, and lever handle 370. Wheel 332 includes a curved surface 340 that provides a rotatable pusher interface for engaging the pliable joint member. In some embodiments, wheel 332 and/or curved surface 340 may be comprised of materials and surface characteristics to prevent damage to pliable joint member and allow easy movement to a next position along the pliable joint member.

[0023] FIG. 4 shows tool 100 from FIG. 1 in the context of example use in a machine 400, such as a turbomachine, for installing a pliable joint member 410 between adjacent rigid bodies 420, 430 defining a seam space 440 and flanges 422, 432. Reaction bar 110 is inserted under flanges 422, 432 and spanning seam space 440. Pusher bar 130 is engaged with pliable joint member 410 to push pliable joint member 410 into seam space 440 when force 450 is applied to lever handle 170 and lever body 150 maintains the connections and relative positions among the other components of tool 100. Rigid body 420 defines flange 422 with a flange edge 424 and a recess under flange 422 with a recess depth. Rigid body 430 defines a flange 432 with a flange edge 434 and a recess under flange 432 with a recess depth. Rigid body 420 and rigid body 430 are spaced from one another by seam space 440 and flange edge 424 is spaced from flange edge 434 by a flange gap 442. Reaction member 110 has lateral ends that extend under flange edges 424, 434 and into their respective recesses to engage the under sides of flanges 422, 432. Pusher bar 130 has a curved surface to act as a pusher interface with pliable joint member 410 and engage pliable joint member 410 to force pliable joint member 410 into joint space 440. The curved surface of pusher bar 130 incrementally pushes pliable joint member 410 into joint space 440 in a direction parallel to lever body 150 and perpendicular to reaction bar 110 in response to force 450 applied to lever handle 170 while reaction bar 110 maintains a fixed position in contact with flanges 422, 432. Lever body 150 connects reaction bar 110 to pusher bar 130 providing

the pusher interface with pliable joint member 410. Lever body 150 maintains a lever distance between reaction bar 110 and the pusher interface. Reaction bar 110 in contact with flanges 422, 432 provides a fulcrum 452 when force 450 is applied to lever handle 170. Lever handle 170 extends from lever body 150 and has a distal end. Force 450 may be applied proximate the distal end to define another lever distance from the distal end of lever handle 170 (or wherever along lever handle 170 force 450 is applied) to the pusher interface. The point of contact between the pusher interface and pliable joint member 410 at any given time provides a load 454 for translating force 450 applied to lever handle 170 through [0024] fulcrum 452 to load 454. Once pliable joint member 410 is pushed into joint space 440, additional retention features may be aligned and engaged. In machine 400, pliable joint member 420 includes regularly spaced through holes for accommodating fasteners 412 that align with similarly spaced holes in the adjacent rigid bodies 420, 430.

[0025] Machine 400 is shown by way of example only. Tools 100, 200, 300 and similar embodiments may be used in a variety of machine and installation environments involving pliable joints that require substantial force to install or dislodge, including but not limited to turbomachines, such as gas turbines, including one or more expansion joints between various components. One example is the expansion joint between the inlet plenum and inlet casing or cone of a gas turbine. In FIG. 400, rigid body 420 could be a portion of the inlet plenum and rigid body 430 could be a portion of the inlet casing.

[0026] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0027] The corresponding structures, materials, acts, and equivalents of all means or step plus function elements in the claims below are intended to include any structure, material, or act for performing the function in combination with other claimed elements as specifically claimed. The description of the present disclosure has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the disclosure in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the disclosure. The embodiment was chosen and described in order to best explain the principles of the disclosure and the practical application, and to enable others of ordinary skill in the art to understand the disclosure for various

embodiments with various modifications as are suited to the particular use contemplated.

5 Claims

1. A tool comprising:

a reaction bar having a first lateral end and a second lateral end;
a pusher interface perpendicular to the reaction bar and defining a first lever distance from the reaction bar;
a lever body connecting the reaction bar to the pusher interface and maintaining the first lever distance between the reaction bar and the pusher interface; and
a lever handle extending from the lever body, the lever handle having a distal end and defining a second lever distance from the distal end of the lever handle to the pusher interface.

2. The tool of claim 1, wherein the second lever distance is greater than the first lever distance.

3. The tool of claim 1, wherein the second lever distance is at least twice the first lever distance.

4. The tool of claim 1, wherein a distance between the first lateral end to the second lateral end of the reaction bar defines a reaction bar width and the reaction bar includes a width adjustment.

5. The tool of claim 4, wherein the width adjustment includes the first lateral end and the second lateral end of the reaction bar each comprising a threaded adjustment cap.

6. The tool of claim 1, wherein the pusher interface is a curved surface selected from a portion of a curved pusher bar attached to the lever body, a portion of a curved pusher plate attached to the lever body, and a portion of a wheel rotatably mounted to the lever body.

7. The tool of claim 1, wherein the lever body is selected from a straight member and a curved member.

8. The tool of claim 1, wherein the lever body is perpendicular to the lever handle and the tool further comprises a cross member extending from the lever body to the lever handle.

9. The tool of claim 1, wherein the lever handle has a handle length from the lever body to the distal end of the lever handle and the lever handle includes a handle length adjustment.

- 10.** A tool for installing a pliable joint member between a first rigid body having a first flange and a second rigid body having a second flange, wherein the first rigid body and the second rigid body define a joint space therebetween, the tool comprising:

a reaction bar having a first lateral end and a second lateral end, wherein the first lateral end provides contact pressure with the first flange and the second lateral end provides contact pressure with the second flange;

a pusher interface perpendicular to the reaction bar and defining a first lever distance from the reaction bar, wherein the pusher interface engages the pliable joint member to force the pliable joint member into the joint space;

a lever body connecting the reaction bar to the pusher interface and maintaining the first lever distance between the reaction bar and the pusher interface, wherein the reaction bar in contact with the first flange and the second flange provides a fulcrum; and

a lever handle extending from the lever body, the lever handle having a distal end and defining a second lever distance from the distal end of the lever handle to the pusher interface, wherein the pusher interface in contact with the pliable joint member provides a load for translating force applied to the lever handle through the fulcrum to the load.

- 11.** The tool of claim 10, wherein the second lever distance is at least twice the first lever distance.

- 12.** The tool of claim 10, wherein the first flange defines a first recess depth in the first rigid body and the second flange defines a second recess depth in the second rigid body and wherein the first lateral end to the second lateral end of the reaction bar defines a reaction bar width and the reaction bar width is less than a recess width from the first recess depth to the second recess depth and greater than a flange gap distance from the first flange to the second flange.

- 13.** The tool of claim 12, wherein the reaction bar includes a width adjustment for accommodating different recess widths and different flange gap distances.

- 14.** The tool of claim 10, wherein the pusher interface is a curved surface of a pusher member selected from a pusher bar or a pusher plate and attached to the lever body, the curved surface incrementally pushing the pliable joint member into the joint space in a direction parallel to the lever body in response to the force applied to the lever handle while the reaction bar maintains a fixed position.

- 15.** The tool of claim 10, wherein the pusher interface is

a curved surface of a wheel rotatably mounted to the lever body, the curved surface incrementally pushing the pliable joint member into the joint space in a direction parallel to the lever body in response to the force applied to the lever handle while the reaction bar maintains a fixed position and the wheel moving along the pliable joint member in a direction parallel to the lever body when the reaction bar moves along the first flange and the second flange.

- 16.** The tool of claim 10, wherein the lever body is selected from a straight member and a curved member,

- 17.** The tool of claim 10, wherein the lever body is perpendicular to the lever handle and the tool further comprises a cross member extending from the lever body to the lever handle.

- 18.** The tool of claim 10, wherein the lever handle has a handle length from the rigid body to the distal end of the lever handle and the lever handle includes a handle length adjustment.

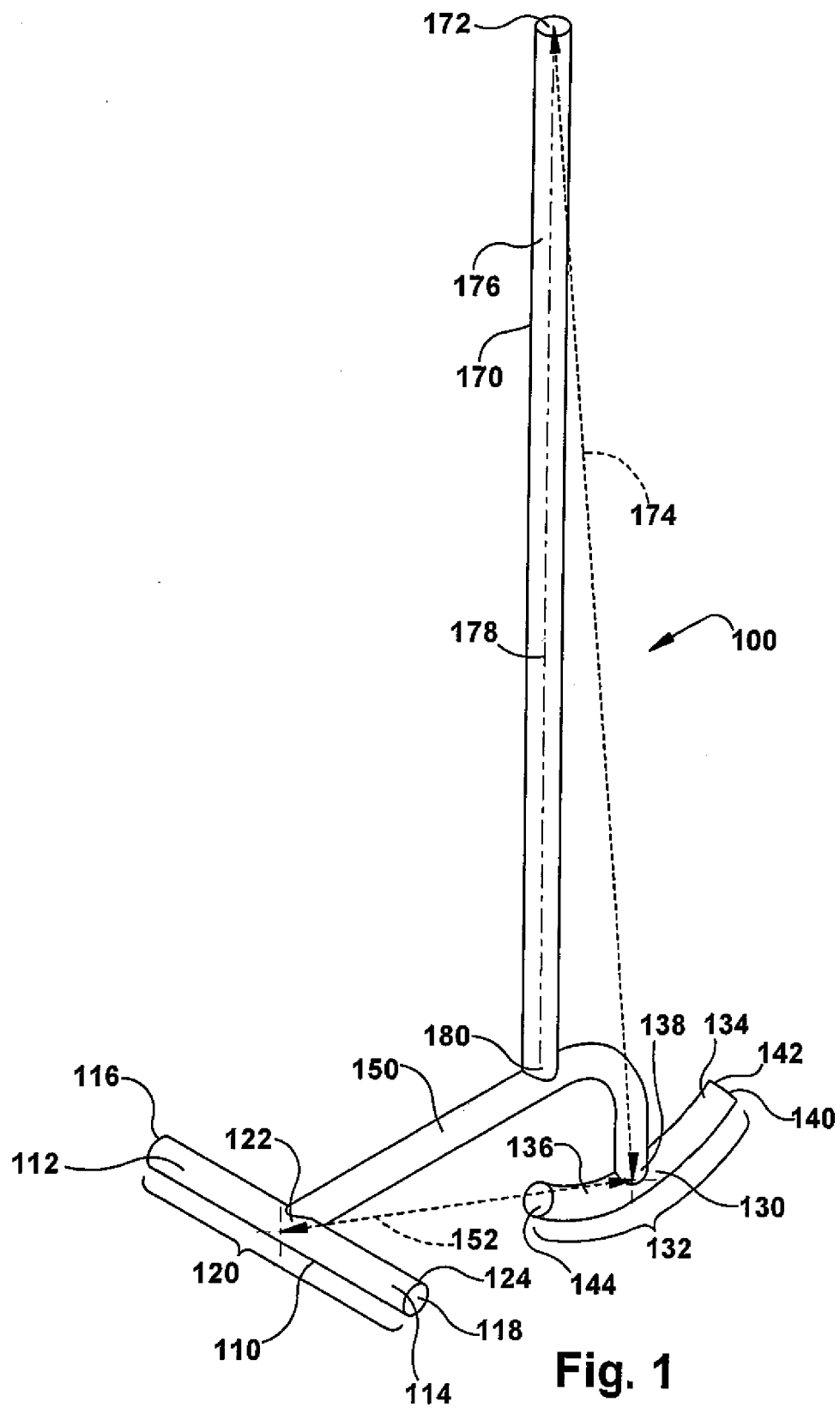
- 19.** A tool comprising:

a reaction bar having at least one lateral end;
a pusher interface defining a first lever distance from the reaction bar;

a lever body perpendicular to the reaction bar and connecting the reaction bar to the pusher interface; and

a lever handle in fixed relationship to the reaction bar, the pusher interface, and the lever body, the lever handle having a distal end and defining a second lever distance from the distal end of the lever handle to the pusher interface, wherein the second lever distance is greater than the first lever distance and the pusher interface applies a downward force and the reaction bar applies an upward force in response to a force applied to the lever handle.

- 20.** The tool of claim 19, wherein the reaction bar engages a flange of a rigid body and the pusher interface engages a pliable seam member to position the pliable seam member relative to the rigid body for installation.



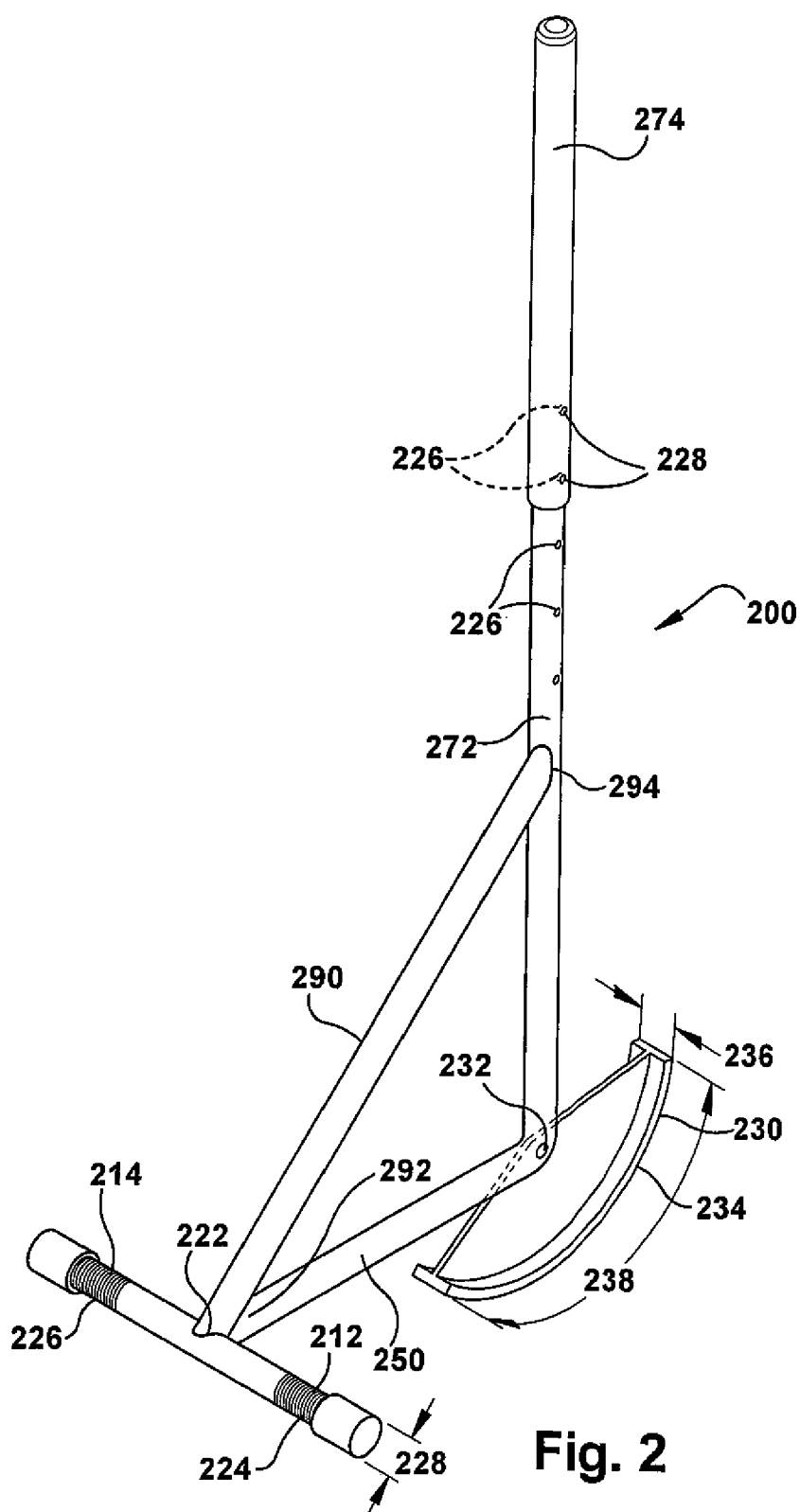


Fig. 2

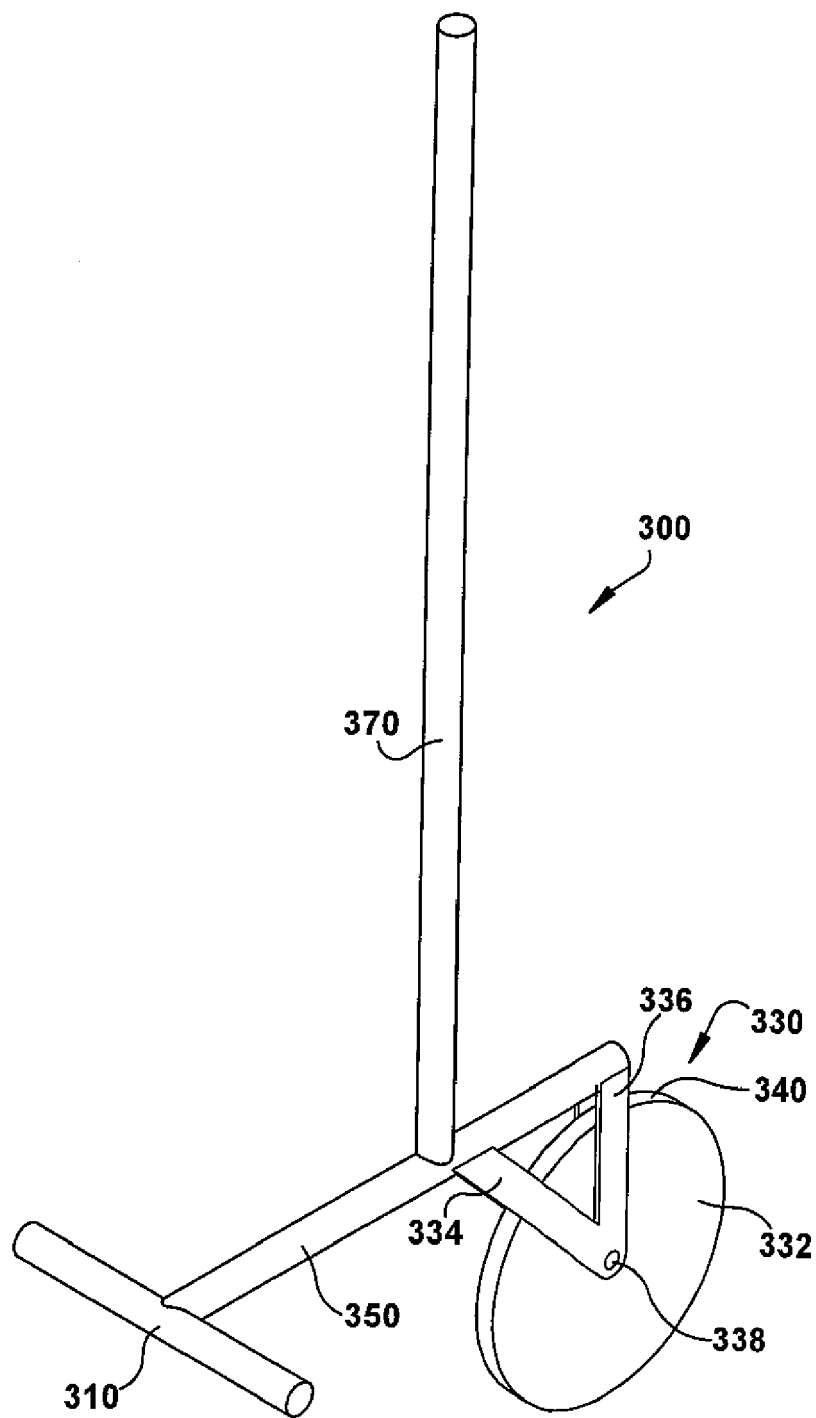
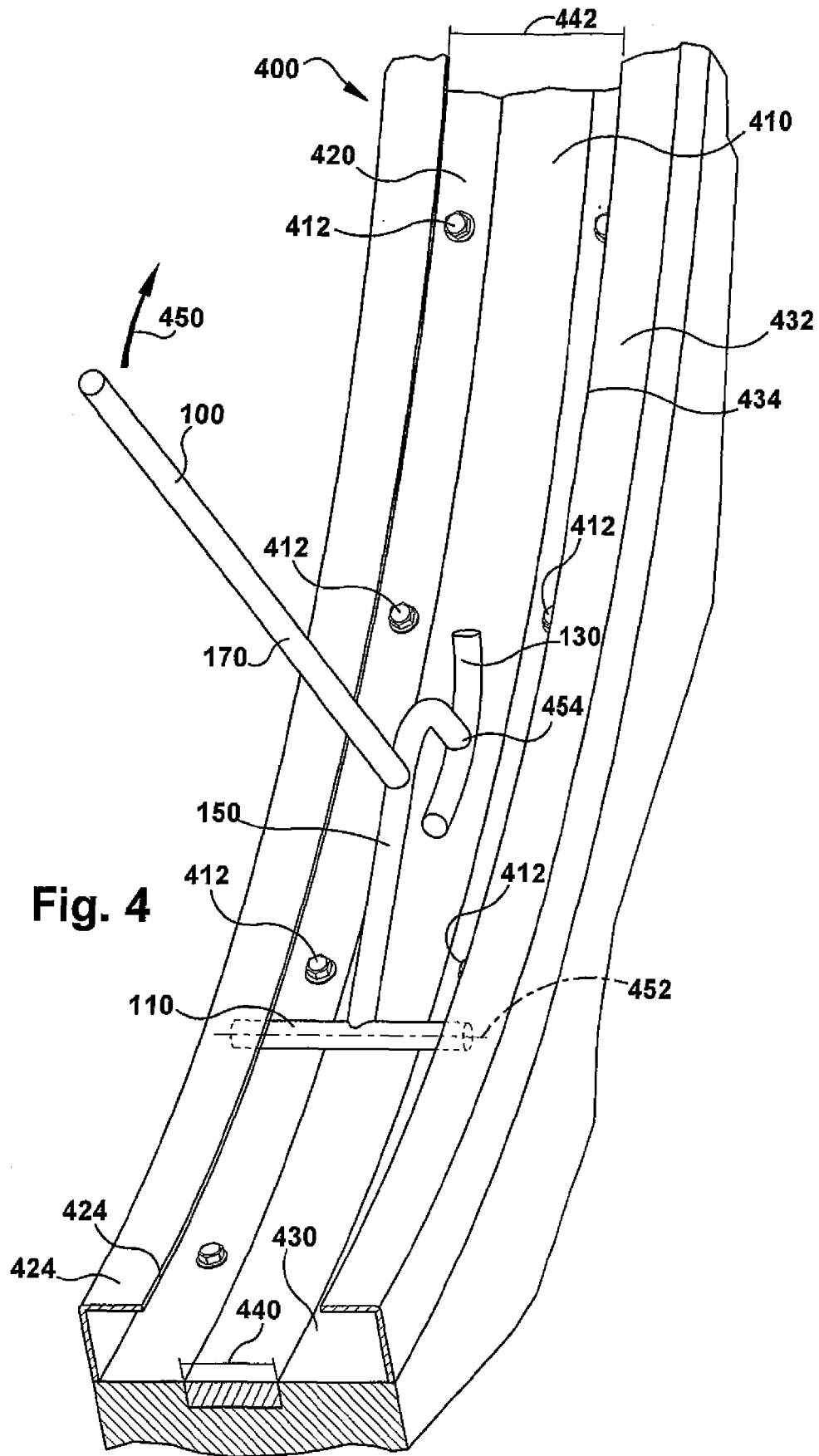


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 17 46 1505

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 232 395 A (LA BARGE ROBERT L) 1 February 1966 (1966-02-01) * column 1, line 51 - column 2, line 40; figures 1,8 * * column 4, line 4 - column 4, line 24 * -----	1-20	INV. B25B27/00 B25B27/02
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