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3 LEAK TEST FIXTURE

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and used
7 by or for the Government of the United States of America for
8 governmental purposes without the payment of royalties thereon or
9 therefor.

10
11 BACKGROUND OF THE INVENTION

12 (1) Field of the Invention

13 The present invention relates to a fixture to be used in
14 leak tests. The fixture may be utilized to perform
15 pressure/vacuum testing of devices, such as missile tube
16 penetrators, having an open end and a closed end.

17 (2) Description of the Prior Art

18 A variety of devices are known in the art to be used during
19 pressure/leak testing. For example, U.S. Patent No. 3,045,475 to
20 Pfundt illustrates a pressure test clamp developed for the
21 pressurizing/testing of round cable assemblies. The clamping
22 pressure and effectiveness in sealing of the Pfundt clamp are
23 contingent upon the action of a spring located in the handle.

24 U.S. Patent No. 3,390,569 to McMeekin illustrates a finish
25 inspection apparatus for glass containers. This apparatus does
26 not physically fasten to the vessel to be tested. Rather, it
27 relies upon a constant vacuum source to remain mated.

1 U.S. Patent No. 4,809,751 to McKenzie illustrates a pressure
2 test cap. The cap uses an expandable collet to facilitate
3 tightening/sealing against interior and exterior walls of a
4 shaped duct. This feature renders the McKenzie cap ineffective
5 in testing a collar having external threads.

6 U.S. Patent No. 5,548,992 to Hallet et al. illustrates a
7 device intended for use in leak detection where a trace gas is
8 installed into the container to be tested, a part of which is
9 then removed to allow use of a mass spectrometer. The actual
10 leak testing is accomplished by use of the mass spectrometer.

11 U.S. Patent No. 5,576,479 to Emmitte, Jr. shows a device
12 designed for the testing of a pressure chamber where both ends of
13 the chamber are open and accessible.

14 U.S. Patent No. 5,777,209 to Tien relates to a leakage
15 detection apparatus. The Tien apparatus includes a pressure
16 chamber specifically sized to fit semiconductor components. The
17 apparatus is made to be used in conjunction with a trace gas and
18 leak detector.

19 These devices are not well suited to perform pressure/vacuum
20 testing and/or to verify that there are no defects or damage on
21 the face of the device being tested which can prevent proper
22 sealing during the normal use of the device being tested.

23

24

SUMMARY OF THE INVENTION

25 Accordingly, it is an object of the present invention
26 to provide an improved fixture for conducting pressure/leak
27 testing.

1 It is a further object of the present invention to provide a
2 fixture as above which can detect defects or damage on the face
3 of the device being tested.

4 The foregoing objects are attained by the fixture of the
5 present invention.

6 In accordance with the present invention, a fixture for
7 conducting pressure/leak testing of a device comprises a shell
8 having a main body and a coupling ring surrounding the main body.

9 The coupling ring is provided with threads for engaging an
10 external thread connection on the device being tested and thereby
11 secure the fixture to the device. The threaded coupling ring has
12 the advantage of permitting easy installation and removal of the
13 fixture.

14 The fixture further comprises a back plate welded to the
15 main body and an adapter to be connected to a pressure or vacuum
16 source. The fixture further comprises an optional insulator,
17 which insulator has at least one through hole for allowing
18 pressurized air or for a vacuum to be applied to the device being
19 tested.

20 Other details of the fixture of the present invention, as
21 well as other objects and advantages attendant thereto, are set
22 forth in the following detailed description and the accompanying
23 drawings wherein like reference numerals depict like elements.

24
25 BRIEF DESCRIPTION OF THE DRAWINGS

26 FIG. 1 is a sectional view of a fixture in accordance with
27 the present invention;

1 FIG. 2 is a sectional view of the fixture of FIG. 1 joined
2 to a device to be tested; and

3 FIG. 3 is a bottom view of an optional insulator used in the
4 fixture of FIG. 1.

5
6 DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

7 In accordance with the present invention, a fixture 10 to be
8 used in pressure/vacuum/leak testing is described. Referring now
9 to FIG. 1, the fixture 10 has a main body 12 which is generally
10 cylindrical in shape. The main body includes an integrally
11 formed ring or shoulder 14. As can be seen from FIG. 1, a first
12 end 16 of the main body has a plurality of threads or grooves to
13 provide a user with a better gripping surface for disengaging the
14 test fixture from a device being tested such as a missile tube
15 penetrator. A second end 18 of the main body is provided with a
16 beveled edge 19, whose purpose will be described hereinafter.

17 The body 12 and the integrally formed ring 14 may be formed
18 from any suitable metal or non-metallic material known in the
19 art. The fixture 10 has one or more keyways and an index pin to
20 facilitate alignment with the alignment pins on the missile tube
21 penetrator during installation of the test fixture.

22 The fixture 10 further includes a coupling ring 20. When in
23 position, the coupling ring 20 is seated on the ring or shoulder
24 14. As can be seen from FIG. 1, the coupling ring is provided
25 with a plurality of threads 22 on an interior surface. The
26 threads 22 permit the coupling ring 20 to be joined to the device
27 24 to be tested (see FIG. 2) and thereby secure the fixture 10 to

1 the device 24. The threaded coupling ring 20 facilitates
2 installation and removal of the fixture 10 from the device 24.
3 The exterior surface 26 of the ring 20 may have a plurality of
4 slots 27 machined therein to assist in tightening and loosening
5 the threaded portion 22 of the ring 20. Alternatively, the ring
6 20 may have a polygonally shaped outer surface 26 to allow a tool
7 such as wrench to be used to install and remove the fixture 10 by
8 tightening or loosening the threaded portion 22 of the coupling
9 ring 20.

10 The fixture 10 further includes a back plate 30 welded to
11 the first end 16. The back plate 30 is provided to form a
12 pressure tight chamber 31 in the body 12 when the fixture 10 is
13 mated to the device 24 to be tested. The back plate 30 may be
14 formed from any suitable metallic or non-metallic material known
15 in the art. The back plate 30 is provided with an aperture 32
16 for receiving one end of a pneumatic adapter 34 which is
17 connected to either a source of pressure (not shown) or a vacuum
18 source (not shown). The pneumatic adapter 34 may comprise any
19 suitable pneumatic adapter known in the art.

20 An optional insulator 40 may be installed in the shell 12
21 adjacent the second end 18. The insulator 40 has at least one
22 through hole 42 and at least one contact 44. As shown in FIG. 3,
23 the insulator 40 may have a plurality of through holes 42 and a
24 plurality of contacts 44. The contacts 44 are arranged to mate
25 with the pins on the mating part or part under test. The
26 insulator 40 may be formed from any suitable material known in
27 the art and may have a one-piece or multi-piece construction.

1 The through hole(s) 42 are provided to allow either (i)
2 pressurized fluid, such as pressurized air, to flow into the
3 device 24 being tested, or (ii) a vacuum to be applied to the
4 device 24 being tested. The contact(s) 44 are provided to engage
5 the pins of the missile tube penetrator during test and to
6 simulate the mechanical resistance of contacts during
7 installation. The contact(s) 44 preferably comprise a plurality
8 of pins 46 placed in through holes in the insulator 44 and held
9 in place by clips (not shown) or molded in place.

10 As can be seen from FIG. 1, the insulator 40 has a beveled
11 edge 48 which mates with and is seated on the beveled edge 19.
12 When used, the insulator 40 may be joined to the main body 12
13 using any suitable technique known in the art such as welding,
14 brazing, riveting or an internal retaining ring.

15 In use, the fixture 10 is placed over the device 24 to be
16 tested so that a shoulder 38 on the main body 12 is in contact
17 with an upper end 37 of the device 24 being tested. The fixture
18 10 is secured in position by engaging the threads 22 on the
19 coupling ring 20 with the threads 62 on the device. An o-ring
20 38a which is installed against the shoulder 38 is compressed to
21 fill the void between the upper end 37 and the shoulder 38, thus
22 providing an airtight seal between the device being tested and
23 the body 12. After the fixture 10 is installed on the device 24,
24 a source of pressurized fluid, such as pressurized air, or a
25 vacuum source is attached to the pneumatic adapter 34 and either
26 pressure or a vacuum is applied to the device 24. The sealing
27 integrity of the device 24 is verified if the pressure (or

1 vacuum) drop does not exceed predetermined limits during a
2 specified period.

3 The fixture 10 of the present invention provides a number of
4 advantages. First, it verifies that there are no defects or
5 damage on the face of the device being tested, such as a missile
6 tube penetrator which seals against an O-ring or other sealing
7 device in a mating connector, which would prevent proper sealing.
8 Second, the fixture 10 of the present invention has particular
9 utility in testing missile tube penetrators. The fixture 10
10 simulates a mating Capsule Launching System (CLS) umbilical cable
11 connector and can be attached using the same procedure. This
12 adds confidence that the sealing integrity of the missile tube
13 penetrator is adequate.

14 It is apparent that there has been provided in accordance
15 with the present invention a leak test fixture which fully meets
16 the objects, advantages, and means set forth hereinbefore. While
17 the present invention has been described in the context of
18 specific embodiments thereof, other alternatives, modifications,
19 and variations will become apparent to those skilled in the art
20 having read the foregoing description. Therefore, it is intended
21 to embrace all such alternatives, modifications, and variations.

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1 Attorney Docket No. 79500

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3 LEAK TEST FIXTURE

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5 ABSTRACT OF THE DISCLOSURE

6 The present invention relates to a fixture to be used during
7 pressure/vacuum testing. The fixture includes a shell having a
8 main body and a coupling ring surrounding the main body. The
9 coupling ring has threads for engaging an external thread
10 connection on the device to be tested and for facilitating
11 installation and removal of the fixture. The fixture further
12 includes a back plate welded to one end of the main body and a
13 pressure adapter for connecting the fixture to a pressure source
14 or a vacuum source. The fixture still further includes an
15 optional insulator to be placed in contact with the device being
16 tested.

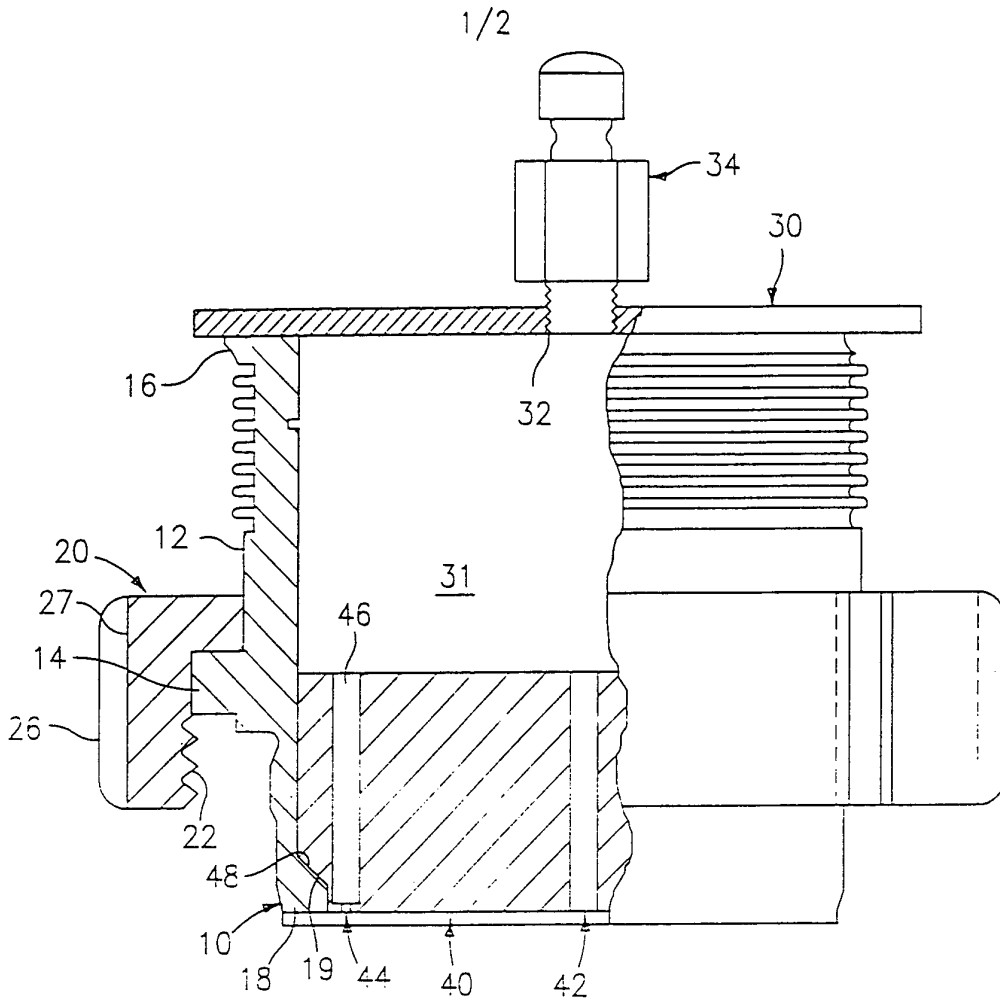


FIG. 1

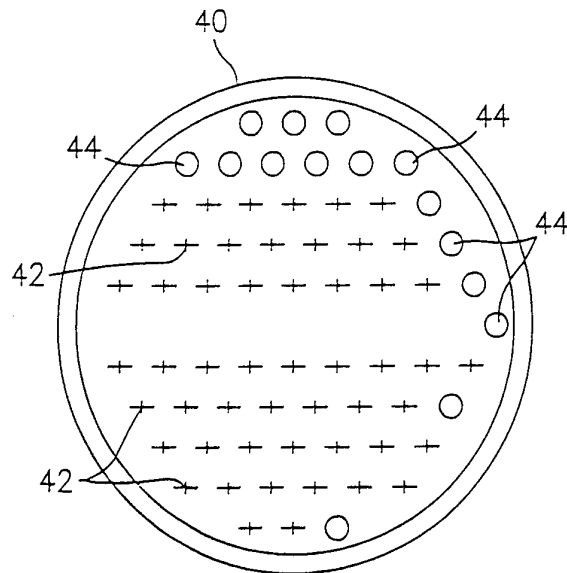


FIG. 3

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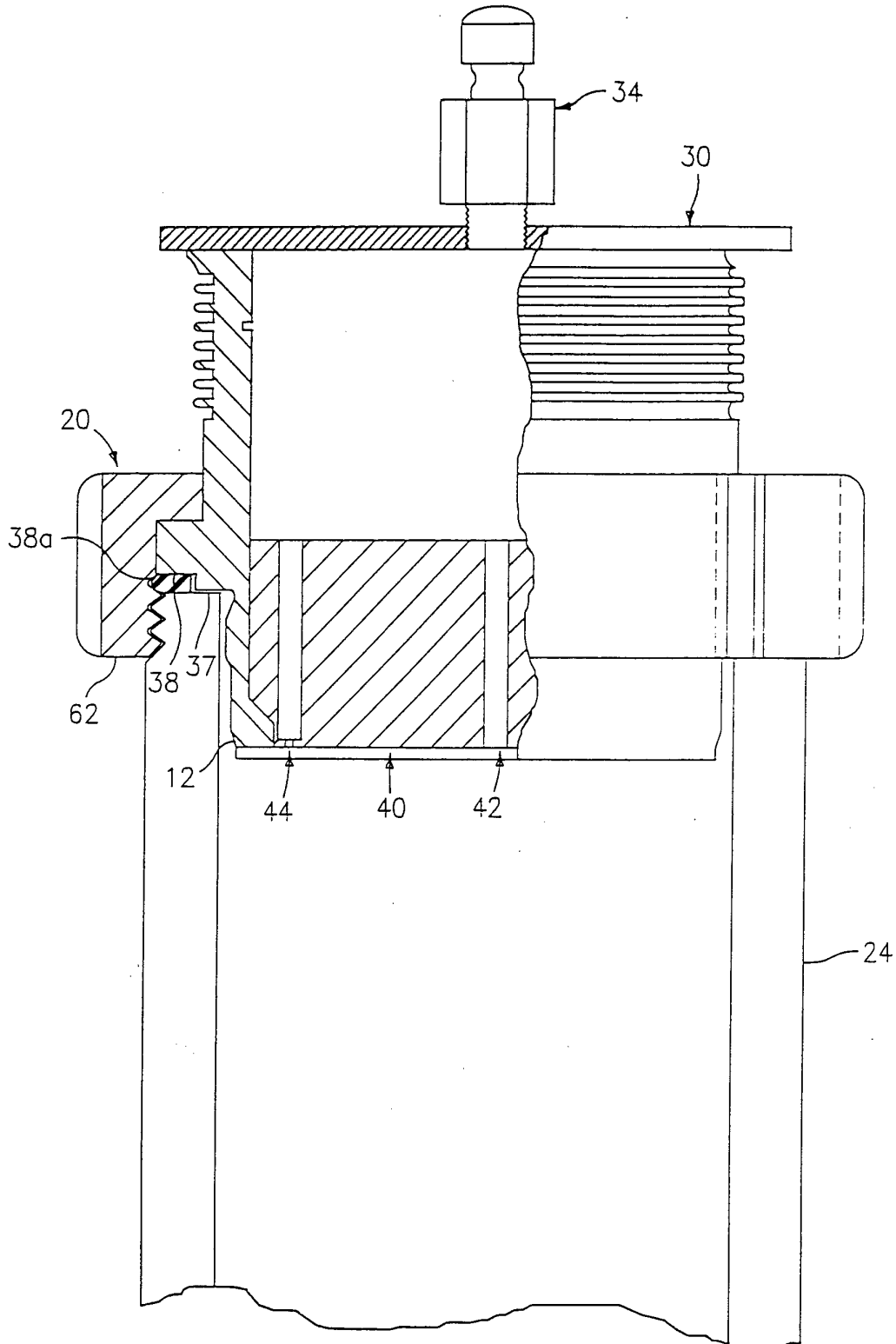


FIG. 2