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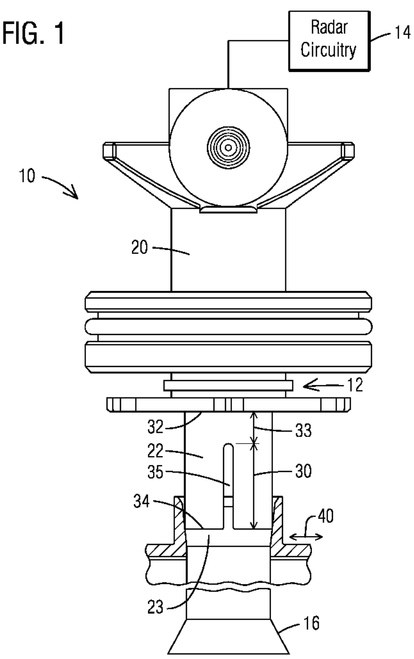
(54) Title: RADAR LEVEL GAUGE WITH A QUICK CONNECT/DISCONNECT WAVEGUIDE JOINT AND METHOD REGARDING SAME

FIG. 1



(57) Abstract: A radar level gauge with an improved quick connect/disconnect waveguide joint and method regarding same are provided. A cylindrical waveguide assembly (18) includes a quick connect/disconnect waveguide joint (22) between a radar circuitry (14) and an antenna (16) of the radar level gauge. The quick connect/disconnect waveguide joint may be include a discontinuous annular body (30) extending between a first axial end (32) and a second axial end (34) of the quick connect/disconnect waveguide joint and may be configured for connecting with a waveguide member (23) electrically coupled to the antenna to provide a compliant interference fit with the waveguide member. Disclosed embodiments are expected to allow service personnel to perform in a more user-friendly manner servicing operations. For example, without having to deal with the burdensome operations commonly involved for accessing and manipulating interconnected components in a coaxial waveguide arrangement, as may involve a coaxial connector and associated cabling.

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RADAR LEVEL GAUGE WITH A QUICK CONNECT/DISCONNECT WAVEGUIDE JOINT AND METHOD REGARDING SAME

FIELD OF THE INVENTION

Disclosed embodiments are generally related to a radar level gauge for measuring a level of a surface of a material in a container, and, more particularly, to a radar level gauge with a quick connect/disconnect waveguide joint and method regarding same.

BACKGROUND OF THE INVENTION

A radar circuitry of a radar level gauge may be connected by way of a coaxial waveguide arrangement, such as may involve a coaxial connector and associated coaxial cable, to convey the radio frequency (RF) output (e.g., at microwave frequencies) of the radar circuitry to an antenna. See for example US patent No. 7,453,393.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in the following description in view of the drawings that show:

FIG. 1 shows a non-limiting embodiment of a waveguide arrangement for connecting a radar circuitry to an antenna in a radar level gauge. This arrangement can benefit from disclosed embodiments of a quick connect/disconnect waveguide joint.

FIG. 2 shows a cut-away, fragmentary setup of a waveguide assembly in the radar level gauge including one non-limiting embodiment of a quick connect/disconnect waveguide joint, as may be assembled in the waveguide assembly for connecting with a waveguide member electrically coupled to the antenna.

FIG. 3 is a half-section isometric of a non-limiting model representation of one disclosed quick connect/disconnect waveguide joint and waveguide assembly.

FIG. 4 is a plot of respective non-limiting curves indicative of transmission loss, and return loss over one non-limiting frequency band based on the non-limiting model of the quick connect/disconnect waveguide joint shown in FIG. 3.

FIG. 5 is a plot indicative of a representative distribution of electrical field lines and magnetic field lines for a transverse electric dominant mode (e.g., mode TE_{11}) of a cylindrical waveguide assembly.

FIG. 6 is a non-limiting flowchart of steps that may be performed during servicing operations for a radar gauge including a disclosed quick connect/disconnect waveguide joint.

DETAILED DESCRIPTION OF THE INVENTION

The present inventors have recognized certain drawbacks in at least some known co-axial waveguide arrangements for a radar level gauge, as may involve a coaxial connector and associated coaxial cable, to convey the RF output of the radar circuitry to the antenna. Based on customary trends in the electrical/electronic industry for realizing cost-effective and reliable reduction in the size of electrical/electronic components, a module (e.g., a cup or suitable container) that contains the radar circuitry of the radar level gauge may be realized having a substantially reduced footprint or volume.

This reduced footprint of the radar electronics module can present various advantages to users/installers of radar level gauges; however, during servicing operations, for example, this reduced footprint of the radar electronics module can present certain challenges to servicing personnel. For example, the reduced footprint or volume of the radar electronics may limit such personnel from readily accessing and manipulating the coaxial connector and/or associated coaxial cable to disconnect the co-axial waveguide arrangement between the radar electronics and the antenna. In certain situations, to appropriately access and manipulate the coaxial connector and/or associated coaxial cable, the antenna may need to be dismounted from the top of the container where the radar level gauge is installed to disconnect the waveguide arrangement between the radar electronics and the antenna and this dismounting and re-mounting can add incremental costs and burdens to such servicing operations.

At least in view of the foregoing considerations, the present inventors propose in disclosed embodiments, an improved radar level gauge that benefits from an innovative quick connect/disconnect waveguide joint between the radar circuitry and the antenna of the radar level gauge. Disclosed embodiments of the proposed quick connect/disconnect waveguide joint are configured to provide a compliant interference fit with a waveguide member electrically coupled to the antenna. One non-limiting aspect is to provide a user-friendly quick connect/disconnect waveguide joint that provides reliable electromagnetic and mechanical coupling between the interconnected waveguide components resulting in low attenuation and excellent matching at microwave frequencies. Another non-limiting aspect in connection with this user-friendly quick connect/disconnect waveguide joint is allowing service personnel to, for example, perform servicing operations without having to deal with the burdensome operations generally involved for accessing and manipulating interconnected components in a coaxial waveguide arrangement, as may involve a coaxial connector and associated cabling.

In the following detailed description, various specific details are set forth in order to provide a thorough understanding of such embodiments. However, those skilled in the art will understand that embodiments of the present invention may be practiced without these specific details, that the present invention is not limited to the depicted embodiments, and that the present invention may be practiced in a variety of alternative embodiments. In other instances, methods, procedures, and components, which would be well-understood by one skilled in the art have not been described in detail to avoid unnecessary and burdensome explanation.

Furthermore, various operations may be described as multiple discrete steps performed in a manner that is helpful for understanding embodiments of the present invention. However, the order of description should not be construed as to imply that these operations need be performed in the order they are presented, nor that they are even order dependent, unless otherwise indicated. Moreover, repeated usage of the phrase "in one embodiment" does not necessarily refer to the same embodiment, although it may. It is noted that disclosed embodiments need not be construed as mutually exclusive embodiments, since aspects of such disclosed embodiments may be appropriately combined by one skilled in the art depending on the needs of a given application.

The terms "comprising", "including", "having", and the like, as used in the present application, are intended to be synonymous unless otherwise indicated. Lastly, as used herein, the phrases “configured to” or “arranged to” embrace the concept that the feature preceding the phrases “configured to” or “arranged to” is intentionally and specifically designed or made to act or function in a specific way and should not be construed to mean that the feature just has a capability or suitability to act or function in the specified way, unless so indicated.

FIG. 1 shows a simplified representation of a waveguide arrangement 10 in a radar level gauge that can benefit from disclosed embodiments of a quick connect/disconnect waveguide joint 22 between a radar circuitry 14 and an antenna 16 for the radar level gauge.

As may be appreciated in FIG. 2, the radar level gauge may comprise a waveguide assembly 18, such as without limitation, a cylindrical waveguide assembly, that includes a waveguide member 20 that may be electrically coupled to radar circuitry 14 (FIG. 1); and quick connect/disconnect waveguide joint 22 that may be electrically coupled to antenna 16 (FIG. 1) through a waveguide member 23. A dielectric barrier 12 may be arranged between waveguide member 20 and quick connect/disconnect waveguide joint 22 to provide galvanic isolation between waveguide member 20 and quick connect/disconnect waveguide joint 22; thus providing galvanic isolation between radar circuitry 14 and antenna 16.

In one non-limiting embodiment, a portion of quick connect/disconnect waveguide joint 22 may comprise a discontinuous annular body (schematically indicated by line 30 in FIG. 1) extending between a first axial end 32 and a second axial end 34 of quick connect/disconnect waveguide joint 22. That is, a discontinuous annular body in view of a slit 35 that circumferentially splits a portion of connect/disconnect waveguide joint 22. In one non-limiting embodiment, slit 35 may axially extend from a location disposed between first axial end 32 and second axial end 34 of quick connect/disconnect waveguide joint 22 to second axial end 34 of quick connect/disconnect waveguide joint 22.

In one non-limiting embodiment, another portion of quick connect/disconnect waveguide joint 22 may comprise a continuous annular body (schematically indicated by line 33 in FIG. 1). That is, an annular portion of connect/disconnect waveguide joint 22, which is free of slits and may be conceptualized as constituting an anchored side of discontinuous annular body 30, while second axial end 34 of quick connect/disconnect waveguide joint 22 may be conceptualized as constituting a free end of discontinuous annular body 30.

Discontinuous annular body 30 may be arranged for connecting at the second axial end (e.g., by way of the side proximate second axial end 34) with waveguide member 23. As elaborated in greater detail below, discontinuous annular body 30 of quick connect/disconnect waveguide 22 is configured to provide a compliant interference fit with waveguide member 23.

In one non-limiting embodiment, the compliant interference fit may be formed between an outer surface 38 of quick connect/disconnect waveguide joint 22 and an inner surface 36 of waveguide member 23. That is, in one non-limiting embodiment quick connect/disconnect waveguide joint 22 may structurally function as a male-connecting side, and waveguide member 23 may structurally function as a female-connecting side that receives the male-connecting side.

It will be appreciated by those skilled in the art, that the foregoing structural functionality may be appropriately modified (e.g., reversed) depending on the needs of a given application.

In one non-limiting embodiment, the compliant interference fit provided by the discontinuous annular body of quick connect/disconnect waveguide joint 22 is configured to accept axial displacement (e.g., along longitudinal axis 24 (FIG. 2), radial displacement (schematically represented by twin-headed arrow 40) or both, as such displacements may develop between quick connect/disconnect waveguide joint 22 and waveguide member 23.

In one non-limiting embodiment, inner surface 36 of waveguide member 23 may be configured to define a tapering profile 42. For example, a radial dimension of waveguide member 23 may decrease as quick connect/disconnect waveguide joint 22 is inserted into waveguide member 23. In one non-limiting embodiment, waveguide member 23 may be configured to include a radially-extending shoulder 26 (e.g., outwardly extending at an axial edge of waveguide member 23) that circumferentially abuts a corresponding surface in a notch in a module member 60 that may be part of a modular assembly that contains the radar electronics. This abutting engagement of waveguide member 23 and module member 60 is conducive to, for example, maintaining axial alignment of waveguide assembly 18.

As may be appreciated in FIG. 3, the discontinuous annular body of quick connect/disconnect waveguide joint 22 may further include a second slit 37. In one non-limiting embodiment, first slit 35 and second slit 37 may be disposed 180 degrees apart from one another. The respective locations of first slit 35 and second slit 37 in the discontinuous annular body may be arranged to correspond to regions of minimal current flow 44 (FIG. 5), as may be formed in a transverse electric dominant mode (e.g., propagation mode TE_{11}) of the cylindrical waveguide assembly. It will be appreciated that based on the needs of a given application, the slit location and number in quick connect/disconnect waveguide joint 22 may be configured to accommodate other waveguide propagation modes.

It should be now appreciated that first slit 35 and second slit 37 permit respective portions of the discontinuous annular body 30 to behave as a cantilever spring between the anchored end and the free end of the discontinuous annular body and thus effective to carry out the compliant interference fit with waveguide member 23.

In practical embodiments, quick connect/disconnect waveguide joint 22 may be made up of an electrically conductive metal or an electrically conductive metal alloy, and, in one non-limiting embodiment a thickness dimension of the wall of quick connect/disconnect waveguide joint 22 may be chosen to be sufficiently thin effective for the cantilever spring behavior (e.g., suitable to accept flexure loading) between the anchored end and the free end of the discontinuous annular body; and sufficiently thick to be greater (e.g., about five times greater) than a skin depth of the electrically conductive metal or the electrically conductive metal at microwave frequencies. It will be appreciated by those skilled in the art that the wall thickness of the quick connect/disconnect waveguide joint can vary depending on various considerations, such as type of material and/or metallurgical properties, length of slits, degree of compliance for a given application, magnitude of tolerances for a given application, etc.

FIG. 4 is a plot of respective non-limiting curves indicative of transmission loss 54, and return loss 56 over one non-limiting frequency band based on the non-limiting model of the quick connect/disconnect waveguide joint shown in FIG. 3.

FIG. 5 is a plot indicative of a representative distribution 43 of electrical field lines (indicated by solid lines 46) and magnetic field lines (indicated by dashed lines 48) a transverse electric dominant mode (e.g., TE_{11}) of a cylindrical waveguide assembly.

FIG. 6 is a non-limiting flowchart of steps that may be performed during servicing operations in a radar gauge including a disclosed quick connect/disconnect waveguide joint, having the structural features described above in the context of the preceding figures.

Subsequent to a start step 100, step 102 allows electrically joining a radar circuitry (e.g., radar circuitry 14, FIG. 1), and an antenna (e.g., antenna 16, FIG. 1) of the radar level gauge. This may be performed by way of a cylindrical waveguide assembly including a quick connect/disconnect waveguide joint 22 (FIG. 1) having a discontinuous annular body extending between a first axial end and a second axial end of the quick connect/disconnect waveguide joint, as described in the context of FIG .1.

Step 104 allows connecting the quick connect/disconnect waveguide joint to a waveguide member 23 (FIG 1). In one non-limiting embodiment, the connecting of the quick connect/disconnect waveguide joint to the waveguide member may comprise relative axial motion in a first direction between the waveguide member and the quick connect/disconnect waveguide joint to receive the waveguide member into the quick connect/disconnect waveguide joint. The discontinuous annular body may be configured to provide a compliant interference fit with the waveguide member, which is electrically coupled to the antenna.

When servicing the radar circuitry, step 106 allows disconnecting the waveguide member from the quick connect/disconnect waveguide joint. In one non-limiting embodiment, the disconnecting may comprise relative axial motion in a second direction between the waveguide member and the quick connect/disconnect waveguide to withdraw the quick connect/disconnect waveguide joint from the waveguide member, where the first direction and the second direction are in mutually opposite directions.

For example, the connecting of the waveguide member to the quick connect/disconnect waveguide joint may be performed by uncomplicated insertion of the quick connect/disconnect waveguide joint into the waveguide member. Similarly, the disconnecting of the quick connect/disconnect waveguide joint from the waveguide member may be performed by uncomplicated withdrawal of the quick connect/disconnect waveguide joint from the waveguide member. For example, as should be appreciated by those skilled in the art, the connecting/disconnecting between the quick connect/disconnect waveguide joint and the waveguide member can now be advantageously performed without having to perform the actions typically involved in prior art co-axial waveguide arrangements, such as between a coaxial connector and a coaxial cable, e.g., involving physical access to such components and further involving manipulation of such components for establishing a threaded connection, or for undoing such a threaded connection.

Prior to return step 110, step 108 allows removing a module that contains the radar circuitry to perform servicing of the radar circuitry without accessing the waveguide member electrically coupled to the antenna. For example, in some prior art co-axial waveguide arrangements dismounting of the antenna may be necessary in order to access the coaxial connector and/or the coaxial cable electrically coupled to such coaxial connector. In one non-limiting embodiment, the connecting/disconnecting of the waveguide member from the quick connect/disconnect waveguide joint may be performed without manipulating the waveguide member electrically coupled to the antenna.

In operation, disclosed embodiments are expected to provide in a cost-effective manner a user-friendly quick connect/disconnect waveguide joint effective for reliable electromagnetic and mechanical coupling between the interconnected waveguide components resulting in low attenuation and excellent matching at microwave frequencies. Additionally, disclosed embodiments are expected to allow service personnel to perform servicing operations without having to deal with the burdensome operations generally involved with manipulations of a coaxial connector and associated cabling. For example, disclosed embodiments are expected to provide a fast, make-or-break connection in the waveguide arrangement, conceptually analogous to push-to-connect, pull-to-disconnect fittings, in lieu of threaded or flanged connections, which may involve direct access for manipulation of the interconnected components, or could even involve utilization of wrenches.

While various embodiments of the present invention have been shown and described herein, it will be apparent that such embodiments are provided by way of example only. Numerous variations, changes and substitutions may be made without departing from the invention herein. Accordingly, it is intended that the invention be limited only by the scope of the appended claims.

What is claimed is:

1. A radar level gauge comprising:

a cylindrical waveguide assembly (18) comprising a quick connect/disconnect waveguide joint (22) between a radar circuitry (14) and an antenna (16) of the radar level gauge, the quick connect/disconnect waveguide joint comprising a discontinuous annular body (30) extending between a first axial end (32) and a second axial end (34) of the quick connect/disconnect waveguide joint, the discontinuous annular body configured for connecting at the second axial end with a waveguide member (23) electrically coupled to the antenna, the discontinuous annular body of the quick connect/disconnect waveguide configured to provide a compliant interference fit with the waveguide member.

2. The radar level gauge of claim 1, wherein the compliant interference fit is formed between an outer surface (38) of the quick connect/disconnect waveguide joint and an inner surface (36) of the waveguide member.

3. The radar level gauge of claim 2, wherein the inner surface of the waveguide member defines a tapering profile (42), wherein a radial dimension of the tapering profile increases as the waveguide member advances toward the first axial end of the quick connect/disconnect waveguide joint.

4. The radar level gauge of claim 2, wherein the compliant interference fit provided by the discontinuous annular body of the quick connect/disconnect waveguide joint is configured to accept axial and/or radial displacements between the quick connect/disconnect waveguide joint and the waveguide member.

5. The radar level gauge of claim 1, wherein the discontinuous annular body of the quick connect/disconnect waveguide joint comprises a first slit (35) and a second slit (37), the first slit and the second slit axially extending from a location disposed between the first axial end and the second axial end of the quick connect/disconnect waveguide joint to the second axial end of the quick connect/disconnect waveguide joint.

6. The radar level gauge of claim 5, wherein the quick connect/disconnect waveguide joint further comprises a continuous annular body (33) positioned to support an anchored end of the discontinuous annular body (30), wherein the second axial end of the quick connect/disconnect waveguide joint constitutes a free end of the discontinuous annular body.

7. The radar level gauge of claim 6, wherein the first slit and the second slit permit respective sections of the discontinuous annular body to behave as a cantilever spring between the anchored end and the free end of the discontinuous annular body effective to provide the compliant interference fit with the waveguide member.

8. The radar level gauge of claim 5, wherein the first slit and the second slit in the discontinuous annular body are disposed 180 degrees apart from one another.

9. The radar level gauge of claim 8, wherein the location of the first slit and the second slit in the discontinuous annular body are arranged to correspond to regions of minimal current flow (44) in a transverse electric dominant mode of the cylindrical waveguide assembly.

10. The radar level gauge of claim 7, wherein the quick connect/disconnect waveguide joint comprises an electrically conductive metal or an electrically conductive metal alloy, and wherein the quick connect/disconnect waveguide joint comprises a wall sufficiently thin effective for the cantilever spring behavior between the anchored end and the free end of the discontinuous annular body.

11. The radar level gauge of claim 10, wherein the wall of the quick connect/disconnect waveguide joint is sufficiently thick to be greater than a skin depth of the electrically conductive metal or the electrically conductive metal at microwave frequencies.

12. A method involving a radar level gauge, the method comprising:

electrically joining a radar circuitry (14) and an antenna (16) of the radar level gauge by way of a cylindrical waveguide assembly comprising a quick connect/disconnect waveguide joint (22) having a discontinuous annular body (30) extending between a first axial end and a second axial end of the quick connect/disconnect waveguide joint;

connecting quick connect/disconnect waveguide joint to a waveguide member (23), wherein the connecting comprises relative axial motion in a first direction between the waveguide member and the quick connect/disconnect waveguide joint to receive the waveguide member into the quick connect/disconnect waveguide joint, wherein the discontinuous annular body is configured to provide a compliant interference fit with the waveguide member, and wherein the waveguide member is electrically coupled to the antenna;

when servicing the radar circuitry, disconnecting the waveguide member from the quick connect/disconnect waveguide joint, wherein the disconnecting comprises relative axial motion in a second direction between the waveguide member and the quick connect/disconnect waveguide to withdraw the quick connect/disconnect waveguide joint from the waveguide member, wherein the first direction and the second direction are mutually opposite directions; and

removing a module that contains the radar circuitry to perform servicing of the radar circuitry without accessing the waveguide member electrically coupled to the antenna.

13. The method of claim 12, wherein the connecting of the waveguide member to the quick connect/disconnect waveguide joint is performed without manipulating the waveguide member electrically coupled to the antenna.

14. The method of claim 13, wherein the disconnecting of the waveguide member from the quick connect/disconnect waveguide joint is performed without manipulating the waveguide member electrically coupled to the antenna.

15. The method of claim 13, further comprising configuring the compliant interference fit provided by the discontinuous annular body to accept axial and radial displacements between the quick connect/disconnect waveguide joint and the waveguide member.

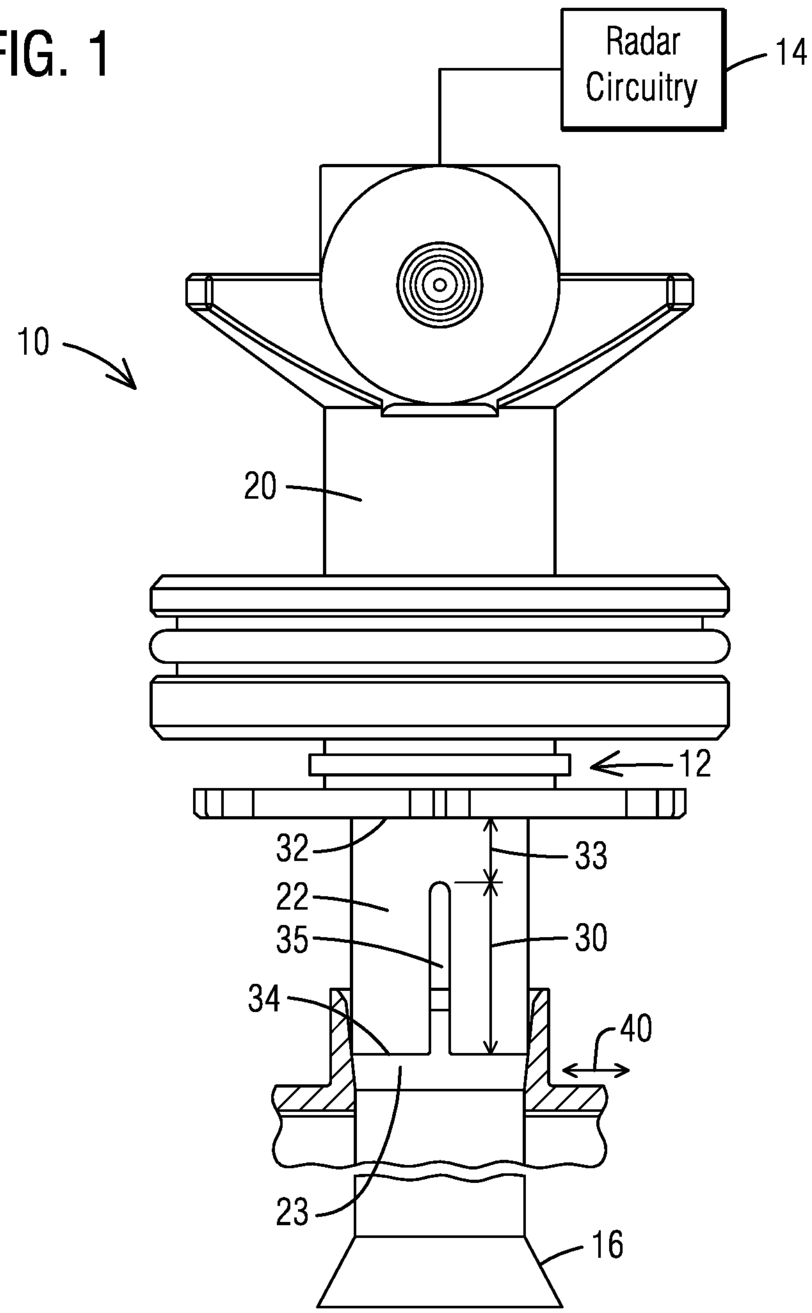
16. The method of claim 12, further comprising defining in the discontinuous annular body a first slit and a second slit, the first slit and the second slit axially extending from a location disposed between the first axial end and the second axial end of the quick connect/disconnect waveguide joint to the second axial end of the quick connect/disconnect waveguide joint.

17. The method of claim 16, further comprising arranging the first slit and the second slit in the discontinuous annular body 180 degrees apart from one another to correspond to regions of minimal current flow in a transverse electric dominant mode of the cylindrical waveguide assembly.

18. The method of claim 16, wherein the quick connect/disconnect waveguide joint comprises an electrically conductive metal or an electrically conductive metal alloy, and wherein the method further comprising configuring a wall of the discontinuous annular body of the quick connect/disconnect waveguide joint to be sufficiently thin to compliably accept axial and radial displacements between the quick connect/disconnect waveguide joint and the waveguide member.

19. The method of claim 18, further configuring the wall of the discontinuous annular body of the quick connect/disconnect waveguide joint to be sufficiently thick to be greater than a skin depth of the electrically conductive metal or the electrically conductive metal at microwave frequencies.

FIG. 1


Radar Circuitry
14
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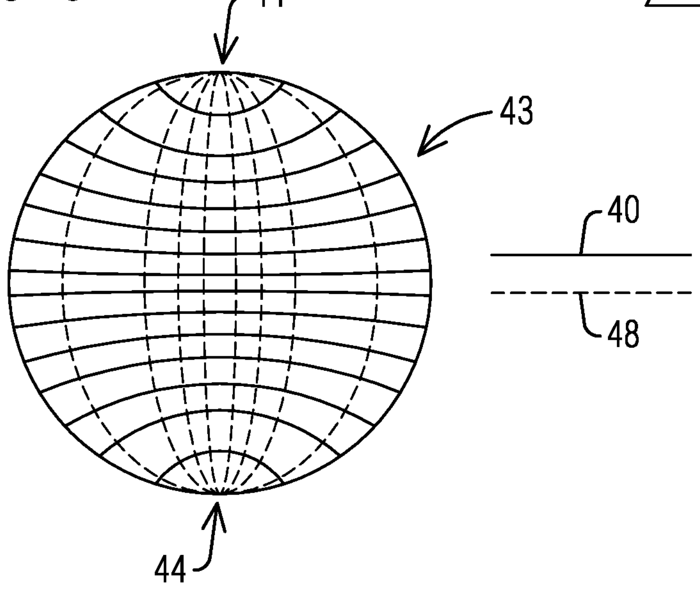
12
32
33
22
35
30
34
40
23
16

FIG. 5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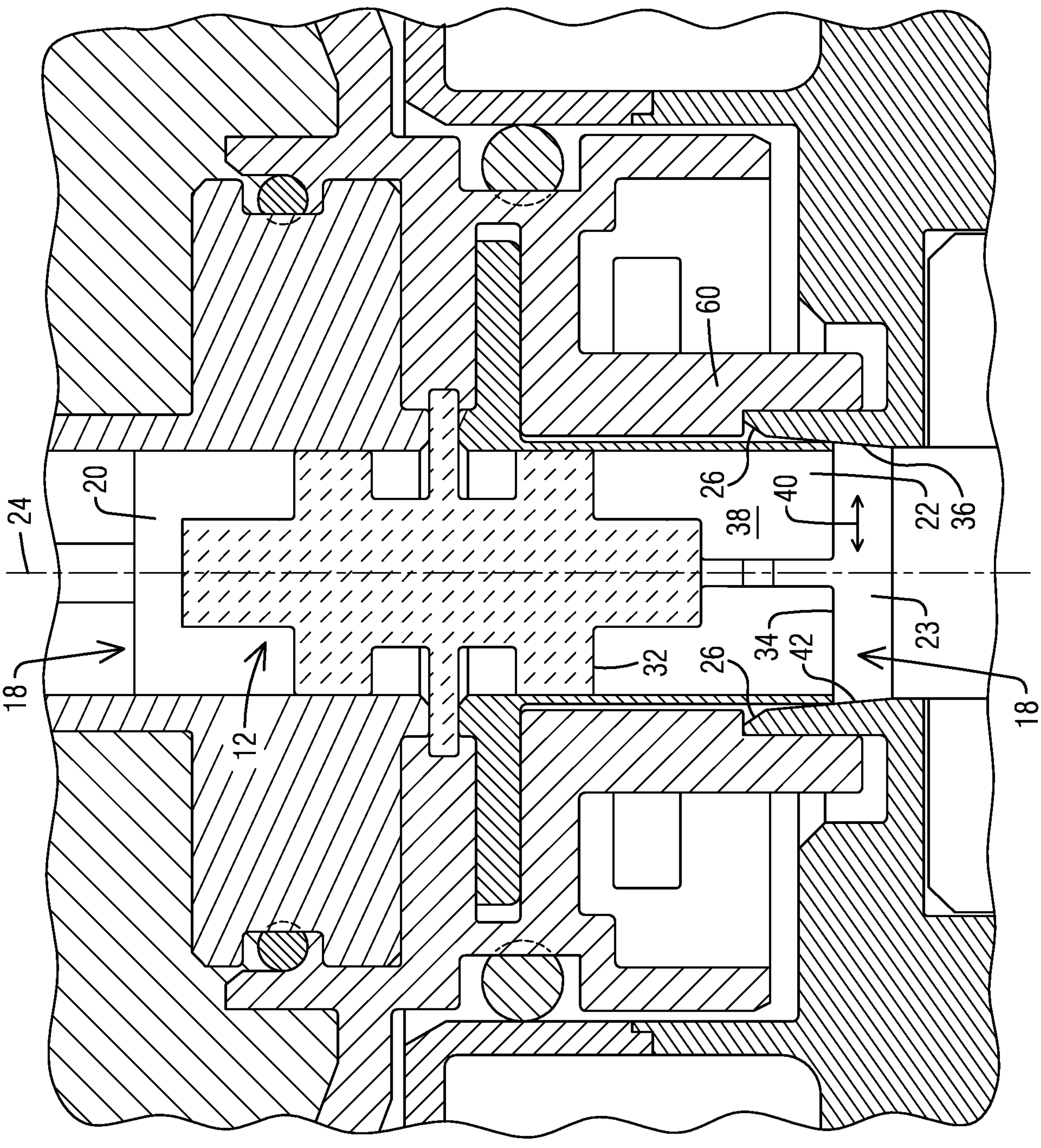


FIG. 2

FIG. 3

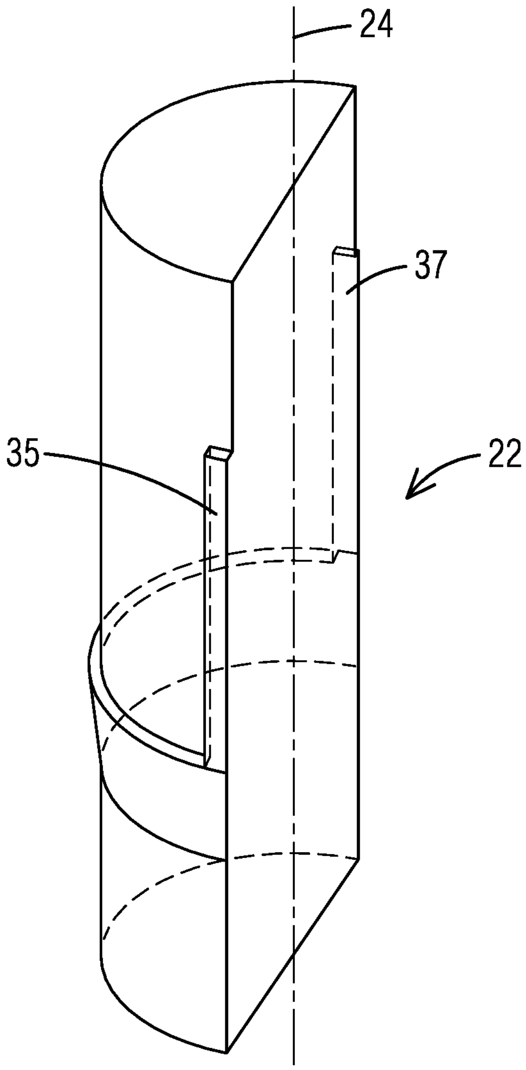
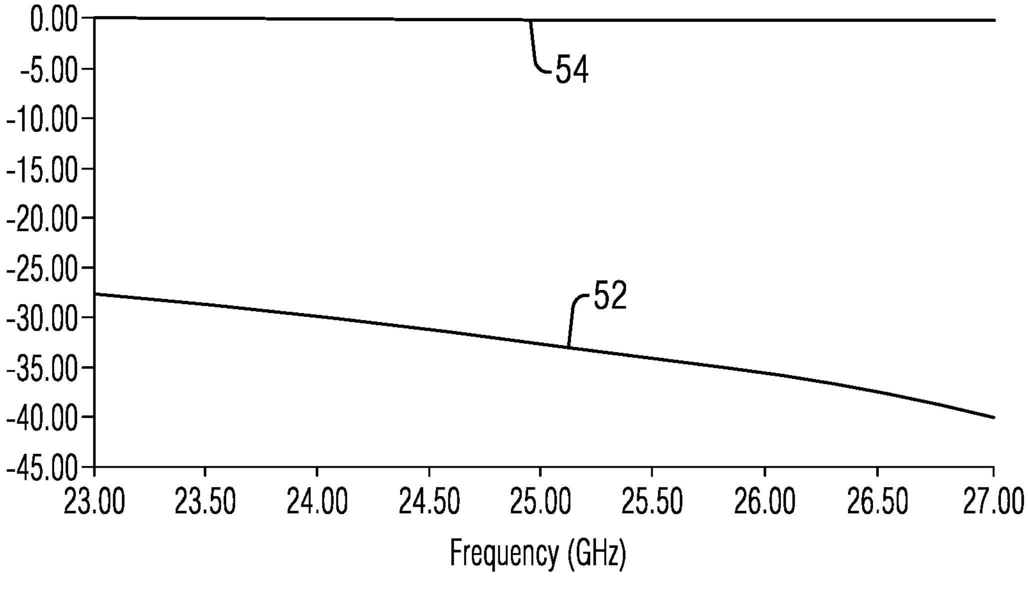

24
37
35
22

FIG. 4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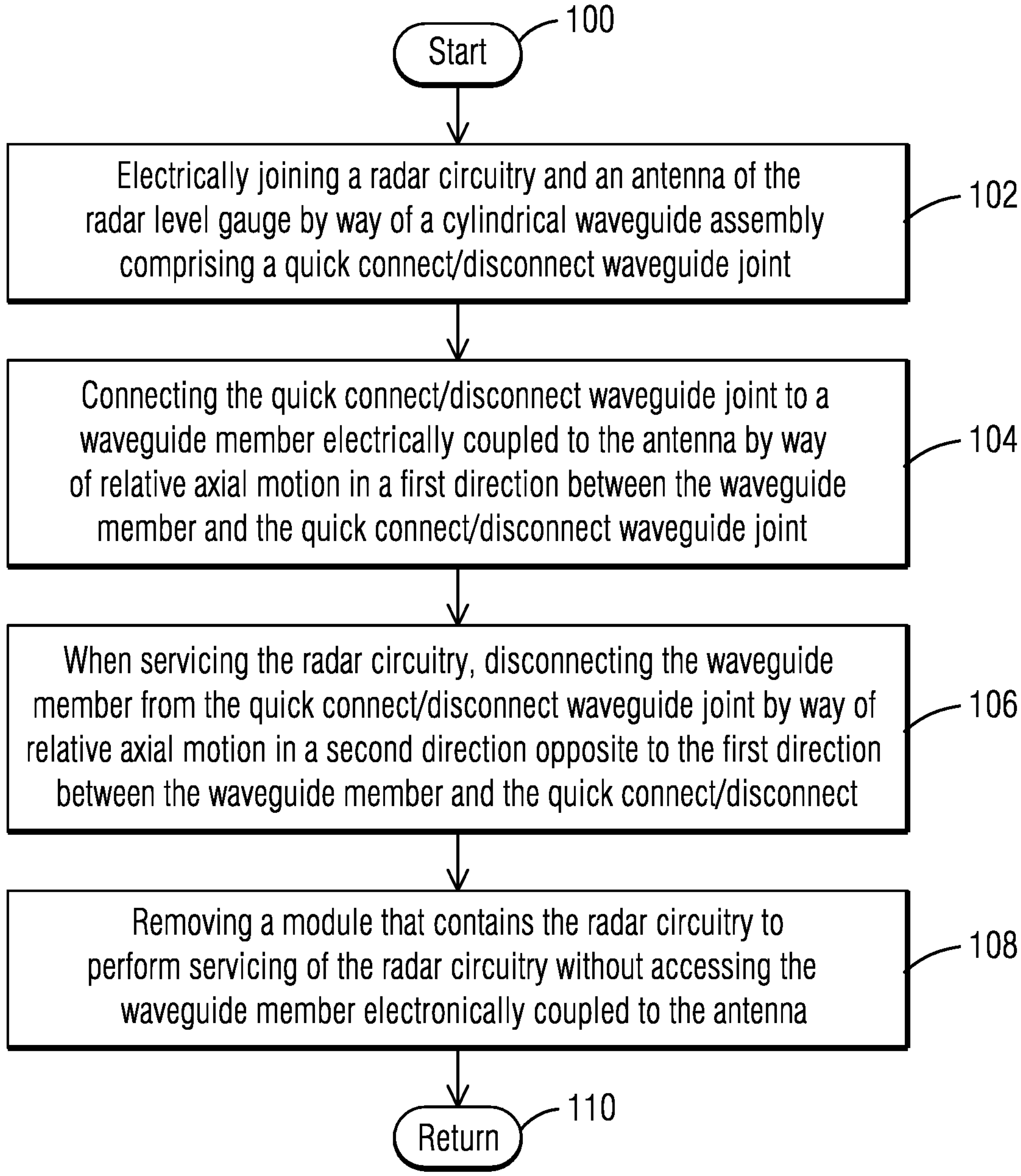
Frequency (GHz)

FIG. 6


Start
100
Electrically joining a radar circuitry and an antenna of the radar level gauge by way of a cylindrical waveguide assembly comprising a quick connect/disconnect waveguide joint
102
Connecting the quick connect/disconnect waveguide joint to a waveguide member electrically coupled to the antenna by way of relative axial motion in a first direction between the waveguide member and the quick connect/disconnect waveguide joint
104
When servicing the radar circuitry, disconnecting the waveguide member from the quick connect/disconnect waveguide joint by way of relative axial motion in a second direction opposite to the first direction between the waveguide member and the quick connect/disconnect
106
Removing a module that contains the radar circuitry to perform servicing of the radar circuitry without accessing the waveguide member electronically coupled to the antenna
108
Return
110

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/027531

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01F23/284
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)
G01F G01S H01P H01Q

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 2009/211808 A1 (FALK JOHANNES [DE] ET AL) 27 August 2009 (2009-08-27) paragraphs [0003] - [0006], [0013], [0038], [0065], [0078], [0164], [0174] - [0182], [0215], [0216], [0229] - [0232]; figures 1, 13, 14, 27 -----	1,5-19
X	US 2003/137372 A1 (FEHRENBACH JOSEF [DE] ET AL) 24 July 2003 (2003-07-24) paragraphs [0001] - [0002], [0008], [0009], [0014] - [0018], [0027] - [0036], [0044] - [0047]; figures 1, 2, 4a, 4b -----	1-4, 12-15
X	US 2015/288069 A1 (FALK JOHANNES [DE] ET AL) 8 October 2015 (2015-10-08) paragraphs [0003] - [0004], [0086] - [0100]; figures 5, 6, 7 ----- -/--	1-4, 12-15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
20 December 2017	05/01/2018

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	Myrillas, K

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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