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(54) MOUNTING KIT FOR COUPLING A WAVEGUIDE GASKET TO A WAVEGUIDE

(57) A mounting kit (1) is described for coupling a waveguide gasket (2) to a first waveguide (3), the first waveguide (3) comprising a first interconnection portion (5) including first interconnection elements (6) for connecting the first waveguide (3) to a second waveguide (7), the mounting kit (1) comprising:
- a positioning member (11) comprising a holding element (12) configured to removably hold the waveguide gasket (2) ;
- first guide elements (14) configured to be removably coupled to said first interconnection elements (6);
wherein the positioning member (11) comprises second conjugated guide elements (16) configured to cooperate with the first guide elements (14) so as to slidably couple the positioning member (11) and the first guide elements (14).

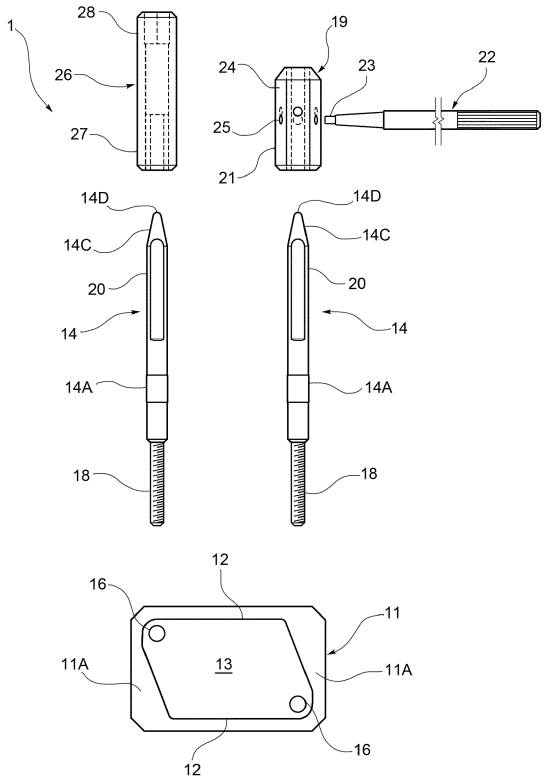

FIG. 1

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Description

[0001] This description relates to the technical field of waveguides for the transmission of electromagnetic waves, such as electromagnetic waves in radio frequency (RF). More particularly, this description relates to a mounting kit for coupling a gasket for a waveguide to a waveguide.

[0002] With reference, by way of non-limiting example, to the military sector, particular types of missiles are known that are normally equipped with a radar guidance system for detecting and tracking a target to hit. The radar guidance system normally includes a radar antenna suitable to capture a signal emitted or reflected from the target to hit. Typically the above-mentioned radar guidance system further comprises a transmitter connected to the radar antenna through a waveguide path. The transmitter is suitable to receive a signal from the antenna and, on the basis of this signal, transmits control signals to the various control devices of the missile in such a way as to enable the missile to track the target to hit or, in any case, to correct the related trajectory to the target.

[0003] The path in the waveguide interposed between the antenna and the transmitter, normally comprises a waveguide connected to the transmitter (transmitter-side waveguide) and a waveguide connected to the antenna (antenna-side waveguide). The transmitter-side waveguide has a respective interconnection portion (transmitter-side interconnection portion). Similarly, the antenna-side waveguide has a respective interconnection portion (antenna-side interconnection portion). These interconnection portions allow interconnecting the antenna-side waveguide and the transmitter-side wave guide with each other. In particular, typically the transmitter-side interconnection portion comprises a pair of threaded holes and the antenna-side interconnection portion comprises a pair of through-holes. The antenna-side and transmitter-side waveguides are fixed together by means of a pair of locking screws that pass through the through-holes of the antenna-side interconnection portion and are screwed into the threaded holes of the transmitter-side interconnection portion. Between the transmitter-side and antenna-side interconnection portions, it is known to provide a waveguide gasket having the purpose of limiting, or substantially eliminating, power losses of the electromagnetic signal which passes through the waveguide path under the operating conditions of the missile. This gasket is normally a plate-shaped gasket that has an adhesive face and an opposite non-adhesive face. Usually, before coupling the transmitter-side waveguide and the antenna-side waveguide to each other, the gasket is manually fixed by an operator to the transmitter-side interconnection portion. More particularly, the operator, holding the gasket, for example between two fingers of one hand, couples the adhesive face of the gasket to the transmitter-side interconnection in such a way as to glue to the gasket to the transmitter-side waveguide. Once the gasket is glued to the transmitter-side waveguide, the antenna-side interconnection portion is fixed by means of said locking screws to the transmitter-side interconnection portion in such a way that the waveguide gasket is interposed between said interconnection portions.

[0004] However, the method of coupling of the waveguide gasket to the transmitter-side waveguide and the method of interconnection between the transmitter-side waveguide and the antenna-side waveguide described above have certain drawbacks. For example, the method of coupling the waveguide gasket described above, determines an imprecise positioning of the waveguide gasket. Such imprecise positioning of the gasket can cause a burning of the gasket or, in any case, a burning inside the waveguide path under the operating conditions of the missile. Moreover, note that once the gasket has been positioned and glued inaccurately, it can no longer be repositioned or reused. Therefore, if during the step of coupling the gasket, the operator realises that the gasket was positioned inaccurately, he is forced to replace the previously glued gasket with a new gasket.

[0005] As regards the methods of interconnection between the transmitter-side waveguide and the antenna-side waveguide described above, one drawback is due to the fact that that alignment between these waveguides is made directly by means of locking screws. In such a case, it may happen that, during the step of the alignment of the transmitter-side and antenna-side waveguides, the locking screws inserted into the through-holes of the antenna-side interconnection portion (which are not yet perfectly aligned with the threaded holes of the transmitter-side interconnection portion) accidentally come into contact with the gasket glued to the transmitter-side interconnection portion. This can cause damage or a partial separation or displacement of the gasket.

[0006] A general purpose of this description is to make available a mounting kit for coupling a waveguide gasket to a waveguide that is able to solve or eliminate, at least partly, the drawbacks described above with reference to the known art.

[0007] This and other purposes are achieved through a mounting kit as defined in claim 1 in its most general form, and in the dependent claims in several particular embodiments.

[0008] This invention also covers a method as defined in claim 10 in its most general form, and in the dependent claims in several particular embodiments.

[0009] The invention will be better understood from the following detailed description of its embodiments, provided by way of example and therefore in no way limiting, in relation to the accompanying drawings, wherein:

- Fig. 1 is a plan view of a mounting kit for coupling a waveguide gasket to a waveguide according to a currently preferred embodiment;
- Fig. 2 and Fig. 3, are respectively a side plan view and a front plan view of the front of one of the com-

ponents of the mounting kit of Fig. 1;

- Figs. 4, 5 and 6 are respectively a front plan view, a side plan view and a rear plan view of one of the components of the mounting kit of Fig. 1;
- Fig. 7 is a side plan view, partially in section, of one of the components of the mounting kit of Fig. 1;
- Figs. 8, 9 and 10 are respectively a side plan view, a front plan view and a rear plan view of one of the components of the mounting kit of Fig. 1;
- Fig. 11 is a partial perspective view of a first device to which is associated a first waveguide, this waveguide being shown coupled to two components of the mounting kit of Fig. 1;
- Fig. 12 is a perspective view of a component of the mounting kit of Fig. 1, to which is partially coupled a waveguide gasket;
- Fig. 13 is a partial perspective showing several components of the mounting kit of Fig. 1 in a coupling configuration of the waveguide gasket of Fig. 12 to the first waveguide of Fig. 11;
- Fig. 14 is a partial perspective view of the components of the mounting kit shown in Fig. 13, where such components are shown in a different configuration with respect to that of Fig. 13, where one of the components is held by two fingers and where the waveguide gasket is shown coupled to the first waveguide;
- Fig. 15 is a partial perspective view of a support base of a second apparatus and a second waveguide coupled to the components of the mounting kit shown in Fig. 11;
- Fig. 16 is a partial perspective view showing the support base and the second waveguide of Fig. 15 and showing two components of the mounting kit of Fig. 1 that are not shown in Fig. 15;
- Fig. 17 is a partial perspective view showing the support base and the second waveguide of Fig. 15, where the second waveguide is shown connected to a second apparatus and showing a component of the mounting kit of Fig. 1 that is not shown in either Fig. 15 or Fig. 16 and a tool suitable to cooperate with this component.

[0010] In the accompanying figures, equal or similar elements will be indicated by the same reference numbers.

[0011] Fig. 1 shows a mounting kit according to a currently preferred embodiment, which is globally indicated by the reference number 1. With reference to Figs. 11 and 12, according to a preferred embodiment, the mounting kit 1 allows coupling a waveguide gasket 2 to a first waveguide 3. The gasket 2 is suitable to be arranged along a waveguide path and has the purpose of limiting, or substantially eliminating, the power losses of an electromagnetic signal that passes through the waveguide path. The gasket 2 is a plate-shaped gasket that has an adhesive face 2A and an opposite non-adhesive face 2B (the non-adhesive face 2B is shown, for example, in Fig. 14). The adhesive face 2A is preferably covered by a film (not shown) intended to be removed before coupling the gasket 2 to the waveguide 3. As can be seen in Fig. 12, the gasket 2 is provided with gasket through-openings 2C, preferably a pair of gasket through-openings 2C, more preferably two gasket holes 2C. The first waveguide 3 is associated with a first apparatus 4. Preferably the apparatus 4 is a transmitter 4 and, more preferably, it is a transmitter of a missile. The first waveguide 3 comprises an interconnecting portion 5 that is provided with first interconnection elements 6. The first interconnection elements 6 preferably comprise a first and a second threaded hole 6. The interconnecting elements 6 are provided for connecting the first waveguide 3 to a second waveguide 7 (Fig. 17). With reference to Fig. 17, the second waveguide 7 is associated to a second apparatus 8. Preferably the apparatus 8 is an antenna 8 and, more preferably, it is an antenna of a missile. The second waveguide 7 comprises a second interconnection portion 9 for connecting the second waveguide 7 to the first waveguide 3. The second interconnection portion 9 is provided with second interconnection elements 10. Preferably, the second interconnection elements 10 comprise a first and a second interconnection through-opening 10 and, more preferably, a first and a second interconnection hole 10 is not threaded.

[0012] Henceforth, for greater clarity of description, and without thereby introducing any limitation, the first waveguide 3 and the second waveguide 7 will be referred to respectively as "transmitter waveguide" and "antenna waveguide".

[0013] Returning to Fig. 1, the mounting kit 1 comprises a positioning member 11, preferably a positioning plate 11, including a holding element 12 that is configured to removably retain the gasket 2. According to a preferred embodiment, the holding element 12 comprises a holding portion 12 or retention edge 12 defining a housing recess 13 configured to receive the waveguide gasket 2. More particularly, retention edge 12 is counter-shaped with respect to the gasket 2.

[0014] The mounting kit 1 further comprises first guide elements 14 that are configured to be removably coupled to the interconnection elements 6 of the transmitter waveguide. The positioning member 11 comprises second conjugated guide elements 16 that are configured to cooperate with the first guide elements 14 so as to slidably couple the positioning member 11 and the first guide elements 14. In particular, the second conjugated guide elements 16 are configured to cooperate with the first guide elements 14 so as to slidably couple the positioning member 11 and the first guide elements 14 along a sliding direction. Preferably, the positioning member 11 comprises a front face 11A in which is provided the holding element 12 and the sliding direction is orthogonal to a sliding direction with respect to said front face 11A. According to a preferred embodiment, first guide elements 14 comprise a first and a second guide pin 14 and the second conjugated guide elements 16 comprise a

first and a second guide through-opening 16 through which said first and second guide pin 14, respectively, can be removably inserted. When the first and the second guide pin 14 are inserted through the first and second guide through-opening 16, the first and the second guide pin 14 allow slidingly guiding the positioning member 11 along the said sliding direction, i.e., along the first and second guide pin 14. Preferably, as in the example, the first and second guide pin 14 are equal to each other. Preferably, each pin 14 has a length generally between 40 mm and 50mm, extremes included, and more preferably has a length of about 40 mm. According to a preferred embodiment, the first and second guide pin 14 respectively comprise a first and a second threaded end portion 18 provided for coupling each pin 14 with a respective threaded hole 6 of the interconnection portion of the transmitter waveguide.

[0015] According to a preferred embodiment, the housing recess 13 of the positioning member 11 has a generally quadrangular conformation and the guide through-openings 16 are located at two angles of the housing recess which are aligned or substantially aligned along a diagonal of the housing recess. In the example, the housing recess 13 has a generally parallelogram shape, and the guide through-openings 16 are substantially aligned along a diagonal of that parallelogram. In Fig. 12, the plate 11 and the gasket 2 are shown in a configuration of almost complete coupling. In reality, when the gasket 2 is completely received in the recess 13, the adhesive face 2A of the gasket is flush or substantially flush with the front face 11A of the plate 11. In other words, preferably the depth of the housing recess 13 substantially corresponds to the thickness of the gasket 2.

[0016] Again with reference to Fig. 1, according to a preferred embodiment, the mounting kit 1 comprises a first extraction bush 19 couplable to the first guide pin 14. In particular, the first guide pin 14 comprises a first coupling portion 20 and the first bush 19 comprises a first conjugated coupling portion 21. The first conjugated coupling portion 21 is a hollow portion configured to receive, at least partially and removably, the coupling portion 20 of the first guide pin. The conjugated coupling portion 21 of the bush 19 is counter-shaped with respect to the coupling portion 20 of the first guide pin 14 in such a way as to make the bush 19 and the guide pin 14 integral in rotation with each other when the bush 19 and the guide pin 14 are coupled together. Preferably, the bush 19 is a hexagonal profile bush. Figs. 2 and 3 show respectively a side view and a front view of one of the pins 14 according to a preferred embodiment. As can be seen in Fig. 3, according to a preferred embodiment, the coupling portion 20 has a circular segment profile formed by an arc of circumference 20A and by a chord 20B. In other words, the coupling portion 20 preferably comprises a cylindrical part and a flat part jointed to the cylindrical part. With reference to Fig. 2, each guide pin 14 preferably has a calibrated portion 14A having a larger cross-section than the coupling portion 20. The calibrated portion 14A is counter-shaped with respect to the holes 6 of the interconnection portion 5 and preferably has a tolerance of two hundredths of a millimetre with respect to the holes 6. The calibrated portion 14A, is preferably interposed between the portions 18 and 20. According to a preferred embodiment, each pin 14 has a tapered tip 14C having a rounded-tip end 14D. Preferably, the tapered tip 14C has a generally conical shape.

[0017] Returning to Fig. 1, according to a preferred embodiment, the mounting kit 1 comprises a first tool 22 having an actuation tip 23. As shown in Figs. 4, 5 and 6, in this case the first extraction bush 19 is provided, on a respective side wall 24, with at least one conjugated actuation opening 25 that is configured to cooperate with the actuation tip 23. The actuation tip 23 is removably couplable to the above-mentioned at least one conjugated actuation opening 25. Preferably, the bush 19 is provided with a plurality of openings 25, for example six openings 25. With reference to Fig. 7, which shows the tool 22 partially in section, one can see that the tip 23, is preferably a cylindrically-shaped tip 23. This cylindrical tip 23 is preferably coupled by means of a forced coupling, such as a cold-forced coupling, to a hollow end portion 23A of a main body 22A of the tool 22. Preferably, the main body 22A is made of stainless steel while the tip 23 is made of hardened steel.

[0018] Returning to Fig. 1, according to a preferred embodiment, the mounting kit 1 comprises a second extraction bush 26 couplable to the second guide pin 14. Preferably, the bush 26 is a knurled bush. The second guide pin 14 comprises a second coupling portion 20 and the extraction bush 26 comprises a second conjugated coupling portion 27. In the example, in which the guide pins 14 are equal to each other, the coupling portion 20 of the second guide pin and the coupling portion 20 of the first guide pin are equal to each other. The second conjugated coupling portion 27 of the bush 26 is a hollow portion configured to receive at least partially and in a removable manner the coupling portion 20 of the second guide pin. In particular, the conjugated coupling portion 27 is counter-shaped with respect to the coupling portion 20 of the second guide pin 14 in such a way as to make the extraction bush 26 and such guide pin 14 integral in rotation with each other when the extraction bush 26 and the guide pin 14 are coupled together. The extraction bush 26 also comprises a third coupling portion 28, opposite to the second conjugated coupling portion 27, which is configured to be coupled to a second tool T (Fig. 17). With reference to Figs. 8, 9 and 10, according to a preferred embodiment, the conjugated coupling portion 27 has a circular-segment inner profile 27A, while the third coupling portion 28 has a polygonal inner profile 28A, such as, for example, a hexagonal inner profile 28A. The tool T is a tool of a different type with respect to the tool 22. Preferably, the tool T is a tool having a polygonal-profile head H (Fig. 17), for example with a hexagonal profile.

[0019] Having described the structure of the mounting

kit 1, we now describe an exemplifying and non-limiting method of use of mounting kit with reference to the embodiment illustrated in the accompanying figures.

[0020] To couple the gasket 2 to the transmitter waveguide, the gasket 2 is initially inserted in the housing recess 13 of the plate 11 with the respective non-adhesive face 2B facing the plate 11. When the gasket 2 is completely coupled to the plate 11, the holes 2C of the gasket are aligned with the guide holes 16 of the positioning plate 11. Before or after having coupled the gasket 2 to the plate 11, the pins 14 are fixed to the interconnection portion 5 of the transmitter waveguide by screwing the threaded portions 18 in the threaded holes 6, as shown for example in Fig. 11. To screw the guide pins 14 in the holes 6, one can use, for example, the extraction bush 26 and the related tool T. The plate 11, with the gasket 2 coupled to it, is then coupled to the pins 14 through the guide holes 16. In particular, when the plate 11 with the gasket 2 is coupled to the pins 14, these guide pins also pass through the holes 2C of the gasket 2. Once the plate 11 with the gasket 2 is coupled to the pins 14, the plate 11 is made to slide, preferably by holding the plate 11 between two fingers of one hand, towards the transmitter waveguide 3 to bring the adhesive face 2A of the gasket 2 (after removing the film, if present) in contact with the interconnection portion 5 so as to glue the gasket 2 to the interconnection portion 5. Fig. 13 shows this latter configuration, in which the adhesive face 2A of the gasket 2 is in contact with the interconnection portion 5. In this configuration, to allow a correct gluing of the gasket 2, it is preferable to apply a slight pressure on the plate 11. Once the gasket 2 is coupled to the interconnection portion 5, the plate 11 is uncoupled from the guide pins 14 by sliding the plate 11 so as to move it away from the interconnecting portion 5. Fig. 14 shows the plate 11, preferably held between two fingers D1, D2, during this step of removal from the interconnecting portion 5. Fig. 14 shows the gasket 2 glued to the interconnection portion 5.

[0021] Once the plate 11 is uncoupled from the pins 14, it is possible to couple the transmitter waveguide 3 and the antenna waveguide 7 together. To this end, with reference to Fig. 15, the transmitter waveguide, with the guide pins 14 still fixed to it, is placed against an interconnection opening O1 provided on an interconnection wall W1. In the example, the wall W1 is a wall of a support base B1 of the antenna 8. Note that, in Fig. 15, the transmitter waveguide and the respective interconnection portion 5 are not visible as they are located on the opposite side of the wall W1 with respect to the side of said wall W1 shown in Fig. 15. In particular, the interconnection portion 5 is disposed in such a way that the guide pins 14 protrude from a face 30 of the wall W1. At this point, the interconnection portion 9 of the antenna waveguide can be coupled to the transmitter waveguide 3 by passing the pins 14 through the holes 10. In particular, the interconnection portion 9 is made to slide along the pins 14 until a projecting annular edge 31 or flange 31 of the interconnection portion 9 abuts against the wall W1. Note that, in this configuration, a projecting central portion (not shown in the figures) of the interconnection portion 9 is facing and preferably passes through the opening O1 so as to contact the second gasket 2 coupled to the interconnection portion 5. The projecting central portion of the interconnection portion 9 is preferably a portion substantially equal to the interconnection portion 5 of the transmitter waveguide. The non-threaded-holes 10 extend through the projecting portion of the interconnection portion 9. As can be seen in Fig. 15, when the interconnection portion 9 is in abutment with the wall W1, a portion of the pins 14 projects from the interconnection portion 9 from the side of the face 30. At this point, the guide pins 14 may be uncoupled from the interconnection portion 5 and replaced by respective locking screws (not shown). More particularly, as shown in Fig. 16, to uncouple the pins 14 from the threaded holes 6, the first extraction bush 19 is, for example, initially coupled to the portion 20 of one of the pins 14. In particular in the example, the bush 19 is coupled to the pin 14 that is closer to a peripheral edge 32 of the wall W1. The bush 19 is then rotated so as to unscrew the pin 14 coupled to it from the respective hole 6. More particularly, the bush 19 is preferably rotated by means of the tool 22 by inserting the tip 23 of such tool into the holes 25 provided on the bush 19. Once unscrewed, the pin 14 is then extracted and replaced by a locking screw (not shown), which is inserted through a hole 10 of the interconnection portion 9, a hole 2C of the gasket 2 and finally screwed into a hole 6 of the interconnection portion 5. Conveniently, thanks to the bush 19 and the tool 22, it is possible to unscrew the pin 14 coupled to the bush 19 in the case in which the working space in a direction orthogonal to the wall W1 is particularly limited, for example due to the presence of an obstacle, such as, for example a portion of the antenna waveguide 7. Moreover, note that the bush 19 may, in general, also be driven by a spanner. However, by using the tool 22, it is advantageously possible to avoid or reduce possible impacts of the tool with the antenna waveguide that could partially damage said waveguide.

[0022] After removing one of the pins 14, the other pin 14 is removed preferably by coupling the extraction bush 26 in such a guide pin, as shown for example in Fig. 17. More particularly, the bush 26 is rotated with the tool T in order to unscrew the pin 14. It should be noted that, in reality, Fig. 17 shows an extraction step of the pins 14 in which the pin 14 coupled to the bush 26 is the first of the pins 14 to be removed instead of being the second pin 14 to be removed. For this reason, Fig. 17 also shows the pin 14 that is not coupled to the bush 26. In other words, based on what is described above, Fig. 17 should show a locking screw in place of the pin 14 shown in this figure.

[0023] Once the pin 14 is unscrewed using the extraction bush 26, this pin is then extracted and replaced by a locking screw (not shown) that, in a manner similar to

the pin 14 that was previously removed, is inserted through a hole 10 of the interconnection portion 9, a hole 2C of the gasket 2 and finally screwed in the respective hole 6 of the interconnection portion 5. Note that, conveniently, thanks to the bush 26 and the tool T, it is possible to unscrew the pin 14 coupled to the bush 26 in the case in which the working space in a direction parallel to the wall W1 is particularly limited, for example due to the presence of an obstacle. At this point, once the locking screws are screwed in the holes 6, the coupling between the transmitter waveguide and the antenna waveguide is complete.

Generalising what is described above, in practice we have also described a method for mutually coupling a first and a second waveguides 3,7, where the first waveguide 3 comprises a first interconnection portion 5, including first interconnection elements 6 for connecting the first waveguide to the second waveguide 7. This coupling method includes:

- a step of providing first guide elements 14;
- a step of removably coupling the first guide elements 14 to first interconnection elements 6;
- a step of providing a positioning member 11;
- a step of providing a waveguide gasket 2, the waveguide gasket comprising an adhesive face 2A and an opposite non-adhesive face 2B;
- a step of removably coupling the waveguide gasket 2 to the positioning member 11 with the non-adhesive face 2B facing the positioning member 11;
- a step of coupling the positioning member 11 with said gasket 2 to the first guide elements 14 and of sliding the positioning member 11 toward the first waveguide 3 until bringing the adhesive face 2A of the waveguide gasket 2 in contact with the first interconnection portion 5 so as to glue the waveguide gasket 2 to the first interconnection portion 5;
- a step of uncoupling the positioning member 11 from the first guide elements 14 by making the positioning member 11 to slide so as to move it away from the first interconnection portion 5.

[0024] According to a preferred embodiment, the above coupling method also comprises:

- a step of providing the second waveguide 7, where the second waveguide comprises a second interconnection portion 9 including second interconnection elements 10 for connecting the second waveguide 7 to the first waveguide 3;
- a step of coupling the second interconnection elements 10 to the first guide elements 14 coupled to the first waveguide 3;
- a step of making the second waveguide 7 to slide until bringing the second interconnection portion 9 in contact with the waveguide gasket 2 secured to the first interconnection portion 5 of the first waveguide 3.

[0025] According to a preferred embodiment, the above coupling process further comprises a step of fixing the second waveguide 7 to the first waveguide 3, where the fixing step includes:

- an operation of uncoupling the first guide elements 14 from the first interconnection elements 6;
- an operation of providing locking elements (not shown);
- an operation of replacing the first guide elements 14 with the aforesaid locking elements, where the locking elements are configured to cooperate with the first and the second interconnection elements 6,10 to mutually secure the first and second waveguides 3,7.

[0026] According to a preferred embodiment, the first guide elements 14 comprise a first and a second guide pin 14, the first interconnection elements 6 comprise a first and a second threaded hole 6, the second interconnection elements comprise a first and a second interconnection through-opening 10, and the locking elements comprise a first and a second locking screw suitable to be screwed into said first and second threaded hole 6, respectively.

[0027] According to a preferred embodiment of the above coupling method, the operation of uncoupling the guide pins 14 comprises:

- an operation of coupling a first bush 19 to the first guide pin 14;
- an operation of coupling a first tool 22 to the first bush 19 to unscrew the first guide pin 14 from the first threaded hole 6.

[0028] According to a preferred embodiment, the operation of uncoupling the guide pins 14 comprises:

- an operation of coupling a second bush 26, of a different type with respect to the first bush 19, to the second guide pin 14;
- an operation of coupling a second tool T, of a different type with respect to the first tool 22, to the second bush 26 to unscrew the second guide pin 14 from the second threaded hole 6.

[0029] Based on the above, it is therefore possible to understand how a mounting kit according to this description allows achieving the purposes mentioned above with reference to the state of the prior art.

Thanks to the fact of providing a positioning member configured to removably hold the waveguide gasket and the guide elements to which can be slidingly coupled the positioning member, where these guide elements are configured to be removably coupled to interconnection elements provided on an interconnection portion of a first waveguide, it is, in fact, possible to accurately glue a waveguide gasket in the predetermined position avoiding

the positioning errors of the gasket discussed above with reference to prior art. This advantageously allows both to avoiding, or at least significantly reducing the probability, that the gasket may be burned due to incorrect positioning and, in general, improving the transmission performance of the waveguide path. Moreover, by preventing an incorrect positioning of the gasket, a mounting kit according to this description advantageously allows substantially eliminating the costs of the known art related to the need to discard gaskets that were not glued in the correct position and that cannot be reused. According to an aspect of the invention, a mounting kit according to this description also allows precisely aligning a pair of waveguides avoiding that, during the coupling procedure of the waveguides, the locking screws damage or cause a disconnection or displacement of the waveguide gasket once it has been glued to the respective waveguide.

[0030] Without prejudice to the principle of the invention, the forms of embodiment and details of construction may be varied widely with respect to what has been described and illustrated purely by way of non-limiting example, without thereby departing from the invention as defined in the appended claims.

Claims

1. A mounting kit (1) for coupling a waveguide gasket (2) to a first waveguide (3), the first waveguide (3) comprising a first interconnection portion (5) including first interconnection elements (6) for connecting the first waveguide (3) to a second waveguide (7), the mounting kit (1) comprising:

- a positioning member (11) comprising a holding element (12) configured to removably hold the waveguide gasket (2) ;
- first guide elements (14) configured to be removably coupled to said first interconnection elements (6);

wherein the positioning member (11) comprises second conjugated guide elements (16) configured to cooperate with the first guide elements (14) so as to slidably couple the positioning member (11) and the first guide elements (14).

2. The mounting kit (1) according to claim 1, wherein said holding element (12) comprises a holding portion (12) of the positioning member (11) defining a housing recess (13) configured to receive the waveguide gasket (2).

3. The mounting kit (1) according to claim 1 or 2, wherein the first guide elements (14) comprise a first and a second guide pin (14) and wherein the second conjugated guide elements (16) comprise a first and a second guide through-openings (16) through which said first and second guide pin (14), respectively, can be removably inserted.

4. The mounting kit (1) according to claim 3, as dependent from claim 2, wherein the housing recess (13) has a generally quadrangular conformation, and wherein said guide through-openings (16) are located at two angles of the housing recess (13) which are aligned or substantially aligned along a diagonal of the housing recess (13).

5. The mounting kit (1) according to claim 3 or 4, wherein said guide pins (14) have a length greater than or equal to 40 mm and less than or equal to 50 mm.

6. The mounting kit (1) according to any of the claims 3 to 5, wherein said first interconnection elements (6) comprise a first and a second threaded hole (6), and wherein the first and the second guide pin (14) comprise a first and a second threaded end portion (18), respectively, for coupling the guide pins (14) to said threaded hole (6).

7. The mounting kit (1) according to any of the claims 3 to 6, comprising a first extraction bush (19) couplable to the first guide pin (14), wherein the first guide pin (14) comprises a first coupling portion (20) and said first bush (19) comprises a first conjugated coupling portion (21), the first conjugated coupling portion (21) being a hollow portion configured to at least partially and removably receive said coupling portion (20) of the first guide pin (14), the first conjugated coupling portion (21) of the first extraction bush (19) being counter-shaped with respect to the first coupling portion (20) of the first guide pin (20) so as to make the first extraction bush (19) and the first guide pin (14) mutually integral in rotation when the first extraction bush (19) and the first guide pin (14) are mutually coupled.

8. The mounting kit (1) according to claim 7, comprising a first tool (22) having an actuation tip (23), the first extraction bush (19) comprising a side wall provided with at least one conjugated actuation opening (25) configured to cooperate with said actuation tip (23), the actuation tip (23) being removably couplable to said at least one actuation opening (25).

9. The mounting kit (1) according to claim 7 or 8, further comprising a second extraction bush (26) couplable to the second guide pin (14), wherein the second guide pin (14) comprises a second coupling portion (20) and the second extraction bush (26) comprises a second conjugated coupling portion (27), the second conjugated coupling portion (27) being a hollow portion configured to at least partially and removably receive said coupling portion (20) of the second guide pin (14), the second conjugated coupling por-

tion (27) of the second extraction bush (26) being counter-shaped with respect to the second coupling portion (20) of the second guide pin (14) so as to make the second extraction bush (26) and the second guide pin (14) mutually integral in rotation when the second extraction bush (26) and the second guide pin (14) are mutually coupled, the second extraction bush (26) further comprising a third coupling portion (28), opposite the second conjugated coupling portion (27), which is configured to be coupled to a second tool (T).

10. A method for mutually coupling a first and a second waveguides (3, 7), the first waveguide (3) comprising a first interconnection portion (5) including first interconnection elements (6) for connecting the first waveguide (3) to the second waveguide (7), and said method comprising:

- a step of providing first guide elements (14);
- a step of removably coupling the first guide elements (14) to said first interconnection elements (6);
- a step of providing a positioning member (11);
- a step of providing a waveguide gasket (2), the waveguide gasket (2) comprising an adhesive face (2A) and an opposite non-adhesive face (2B);
- a step of removably coupling the waveguide gasket (2) to the positioning member (11) with the non-adhesive face (2B) facing the positioning member (11);
- a step of coupling the positioning member (11) with said gasket (2) to the first guide elements (14) and of sliding the positioning member (11) toward the first waveguide (3) until bringing the adhesive face (2A) of the waveguide gasket (2) in contact with the first interconnection portion (5) so as to glue the waveguide gasket (2) to the first interconnection portion (5);
- a step of uncoupling the positioning member (11) from the first guide elements (14) by making the positioning member (11) to slide so as to move it away from the first interconnection portion (5).

11. The method according to claim 10, further comprising:

- a step of providing said second waveguide (7), the second waveguide comprising a second interconnection portion (9) including second interconnection elements (10) for connecting the second waveguide (7) to the first waveguide (3);
- a step of coupling the second interconnection elements (10) to the first guide elements (14) coupled to the first waveguide (3);
- a step of making the second waveguide (7) to slide until bringing the second interconnection portion (9) in contact with the waveguide gasket (2) secured to the first interconnection portion (5) of the first waveguide (3).

12. The method according to claim 11, further comprising a step of securing the second waveguide (7) to the first waveguide (3), said securing step comprising:

- an operation of uncoupling the first guide elements (14) from the first interconnection elements (6); and
- an operation of providing locking elements;
- an operation of replacing the first guide elements (14) with said locking elements, said locking elements being configured to cooperate with the first and the second interconnection elements (6, 10) to mutually secure the first and second waveguides (3, 7).

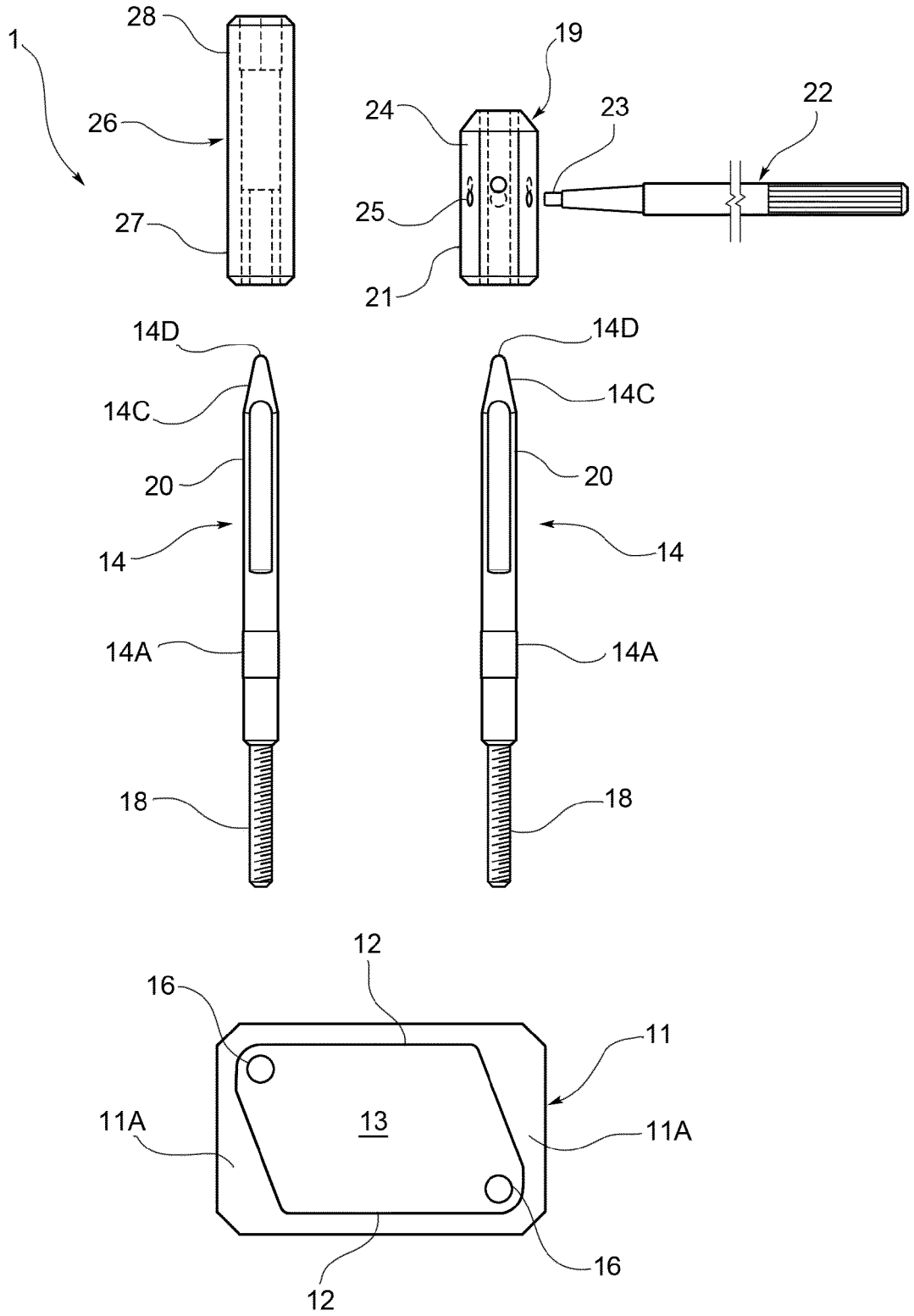
13. The method according to claim 12, wherein the first guide elements (14) comprise a first and a second guide pin (14), the first interconnection elements comprise a first and a second threaded hole (6), the second interconnection elements comprise a first and a second interconnection through-openings (10), and wherein said locking elements comprise a first and a second locking screw suitable to be screwed into said first and second threaded hole (6), respectively.

14. The coupling method according to claim 13, wherein the uncoupling operation of said guide pins (14) comprises:

- an operation of coupling a first extraction bush (19) to the first guide pin (14);
- an operation of coupling a first tool (22) to the first extraction bush (19) to unscrew the first guide pin (14) from the first threaded hole (6).

15. The coupling method according to claim 14, wherein the uncoupling operation of the guide pins comprises:

- an operation of coupling a second extraction bush (26), of a different type with respect to the first bush (19), to the second guide pin (14);
- an operation of coupling a second tool (T), of a different type with respect to the first tool (22), to the second extraction bush (26) to unscrew the second guide pin (14) from the second threaded hole (6).


1
28
26
27
19
24
23
22
25
21
14D
14C
20
14
14A
18
14D
14C
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12
16
11
11A
13
11A
16
12

FIG. 1

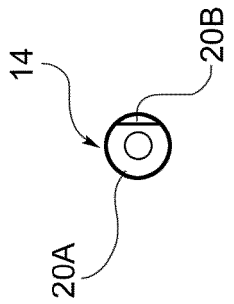

FIG. 3

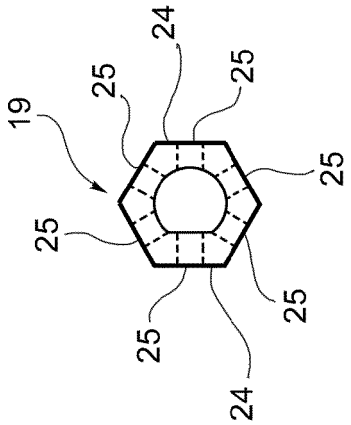

FIG. 6

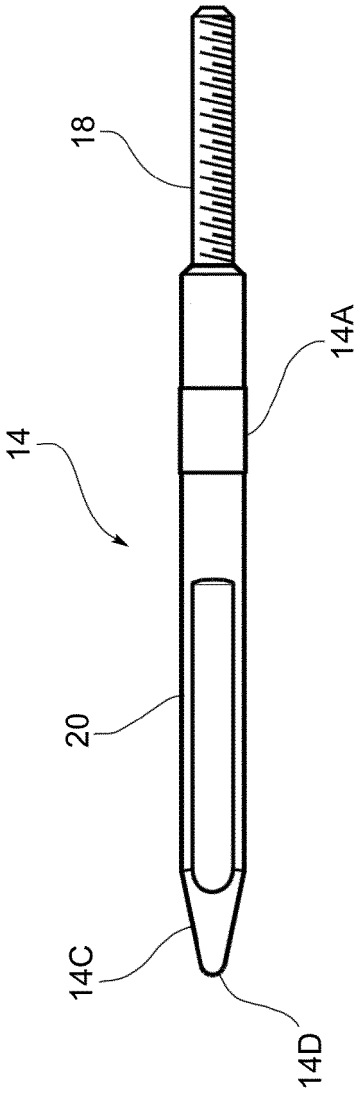

FIG. 2

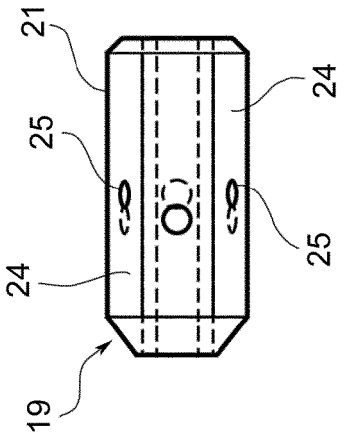

FIG. 5

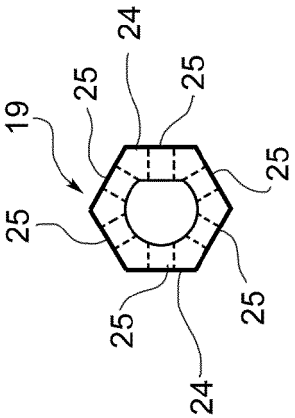

FIG. 4

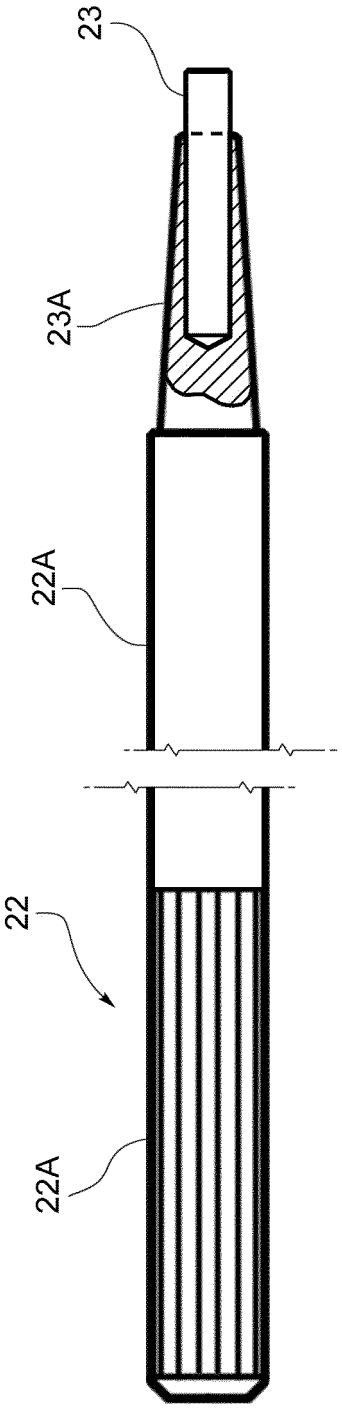

FIG. 7

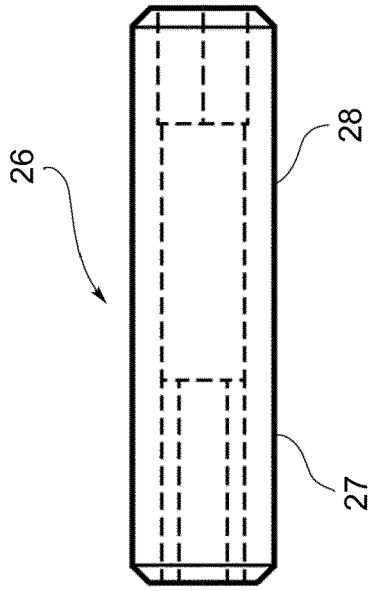

FIG. 8

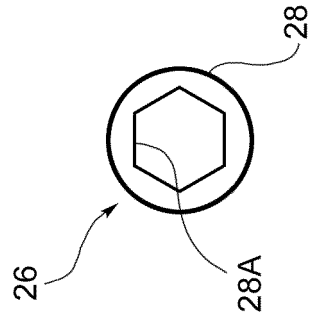

FIG. 10

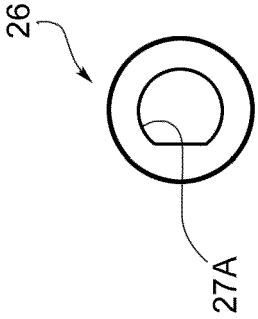

FIG. 9

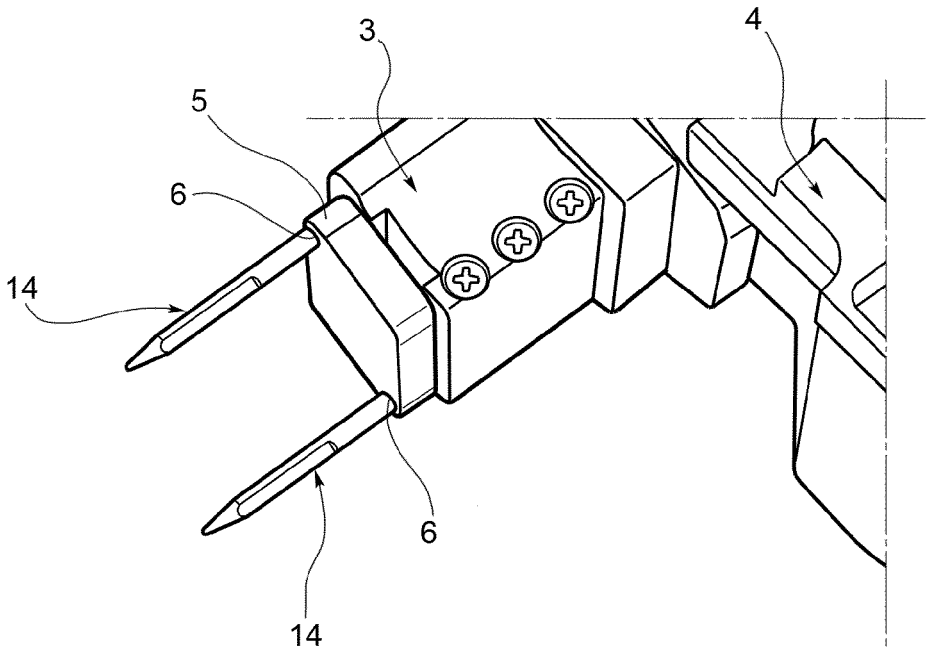

FIG. 11

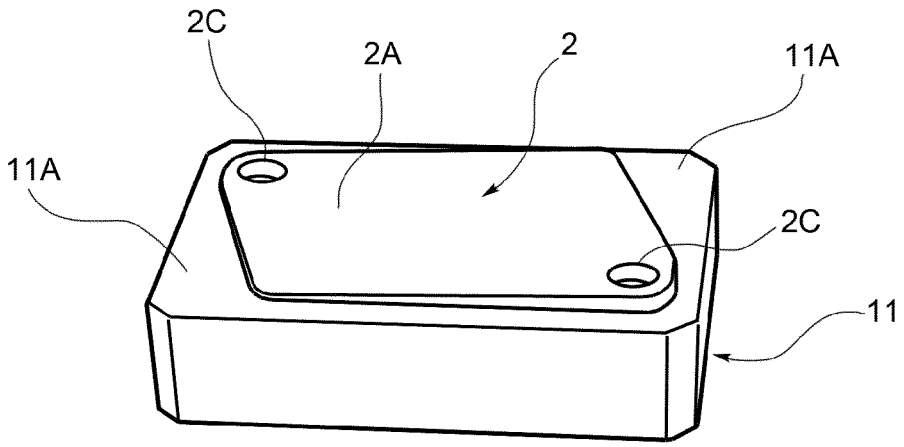

FIG. 12

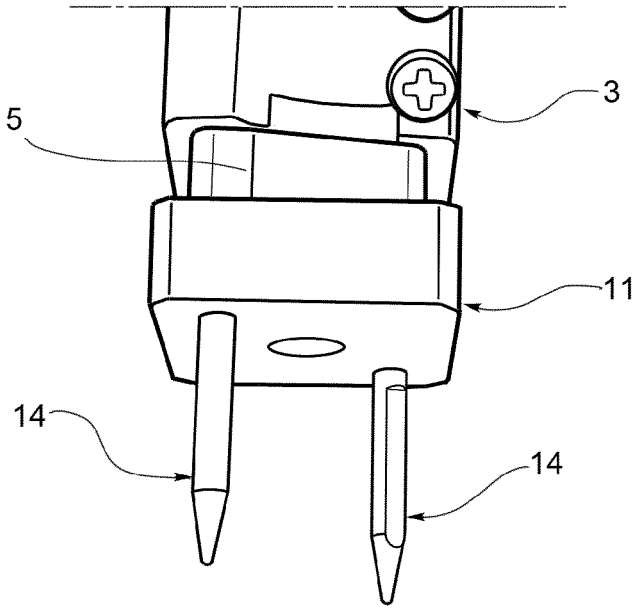

FIG. 13

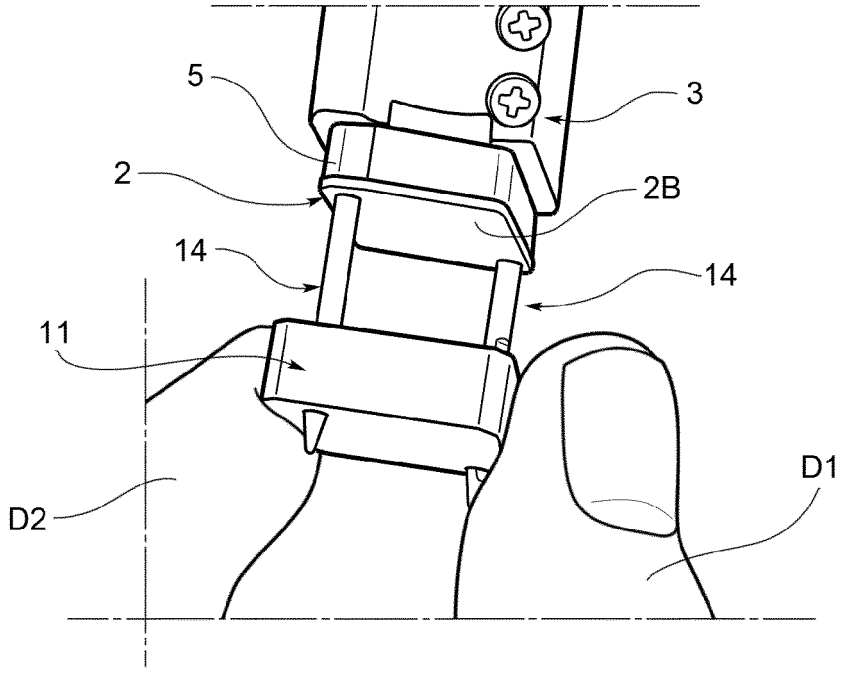

FIG. 14

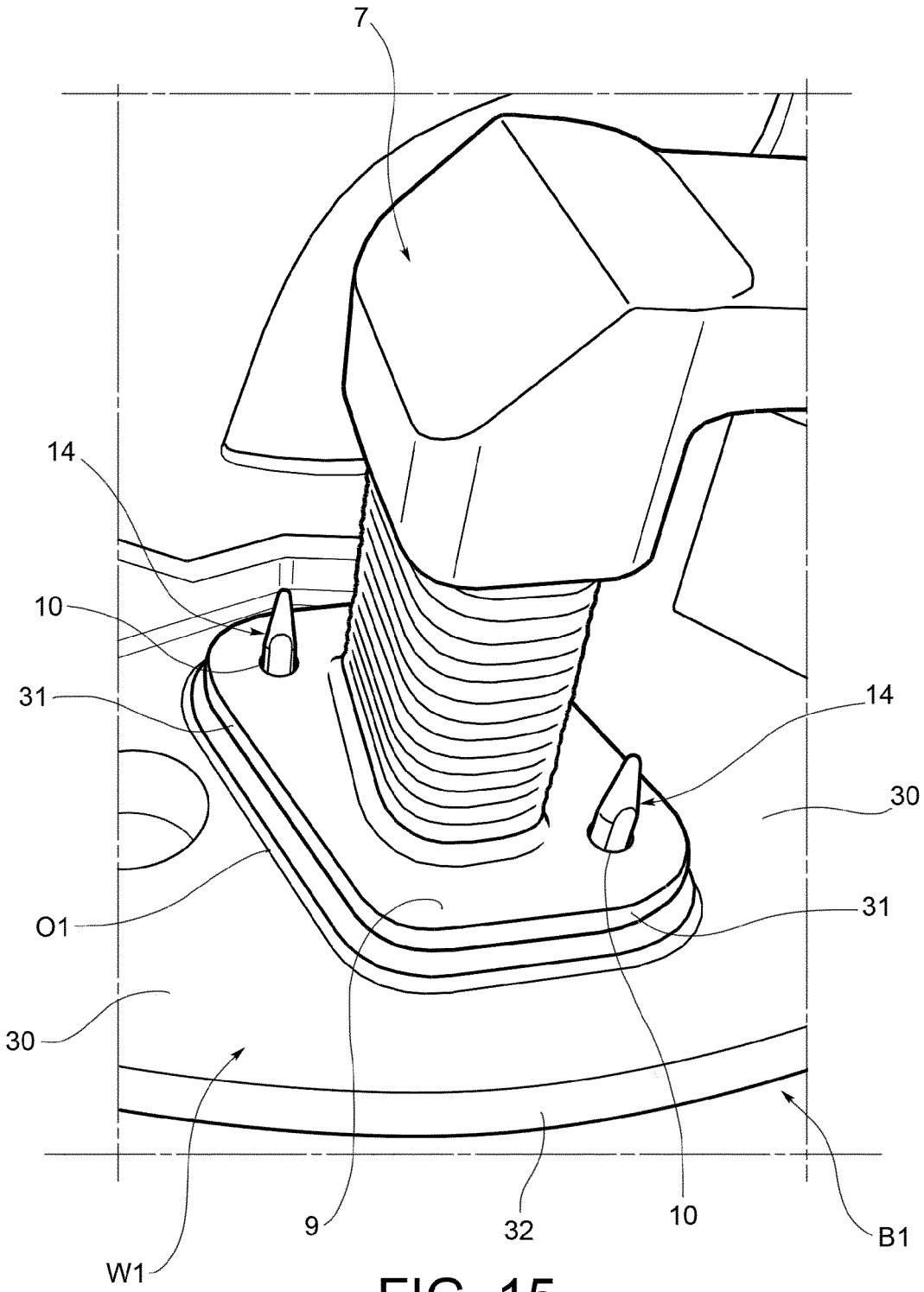

FIG. 15

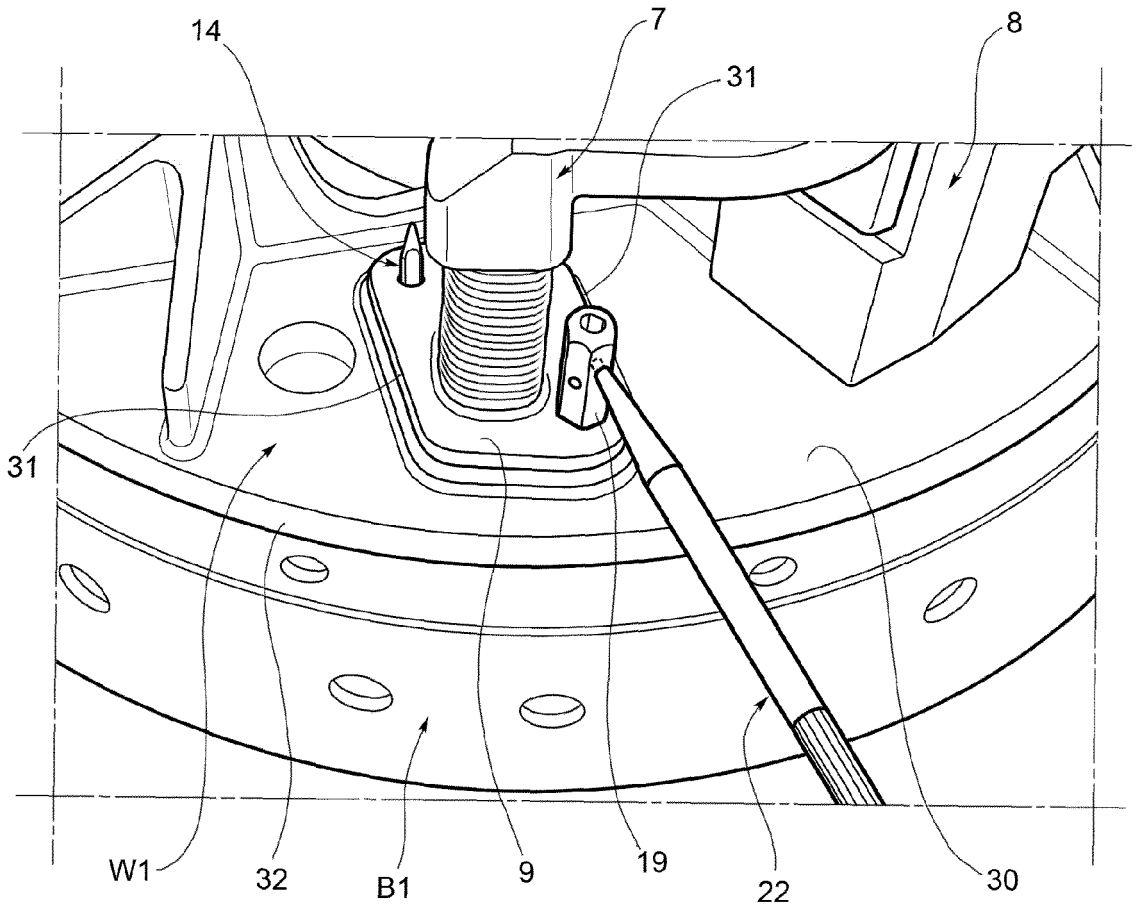

FIG. 16

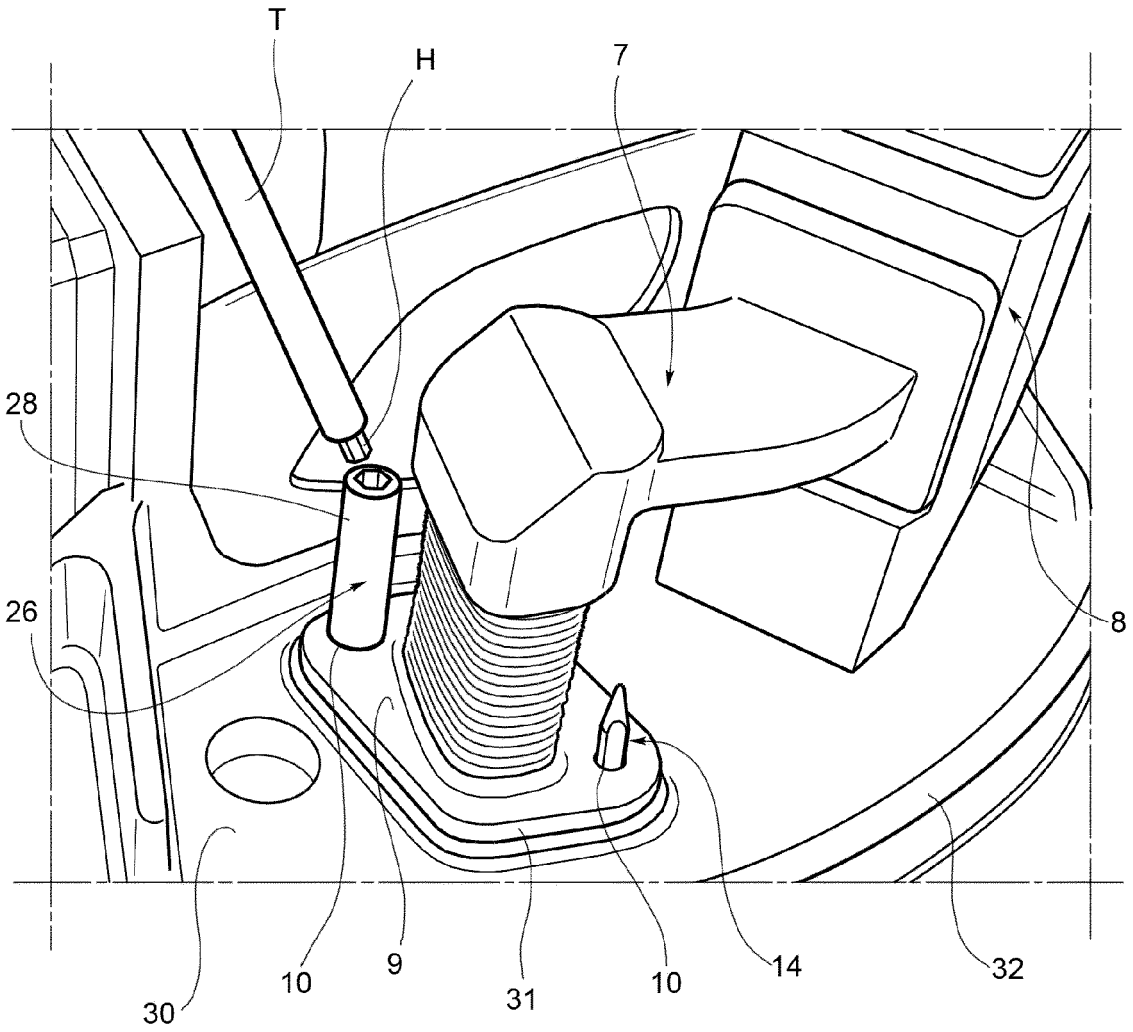

FIG. 17

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 7854

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/285702 A1 (GRACZYK FRANK J [US] ET AL) 29 December 2005 (2005-12-29) * paragraph [0021] - paragraph [0023]; figures 1-3B *	1-15	INV. H01P1/04 F16L23/00
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A	US 4 052 045 A (SHADDIX BILLY JOE) 4 October 1977 (1977-10-04) * column 2, line 62 - column 4, line 15; figures 1,2 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC) H01P F16L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 December 2015	Pastor Jiménez, J

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14-12-2015

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