



(22) Date de dépôt/Filing Date: 2003/04/17

(41) Mise à la disp. pub./Open to Public Insp.: 2003/10/29

(30) Priorité/Priority: 2002/04/29 (MI2002A 000910) IT

(51) Cl.Int.⁷/Int.Cl.⁷ F16L 5/02

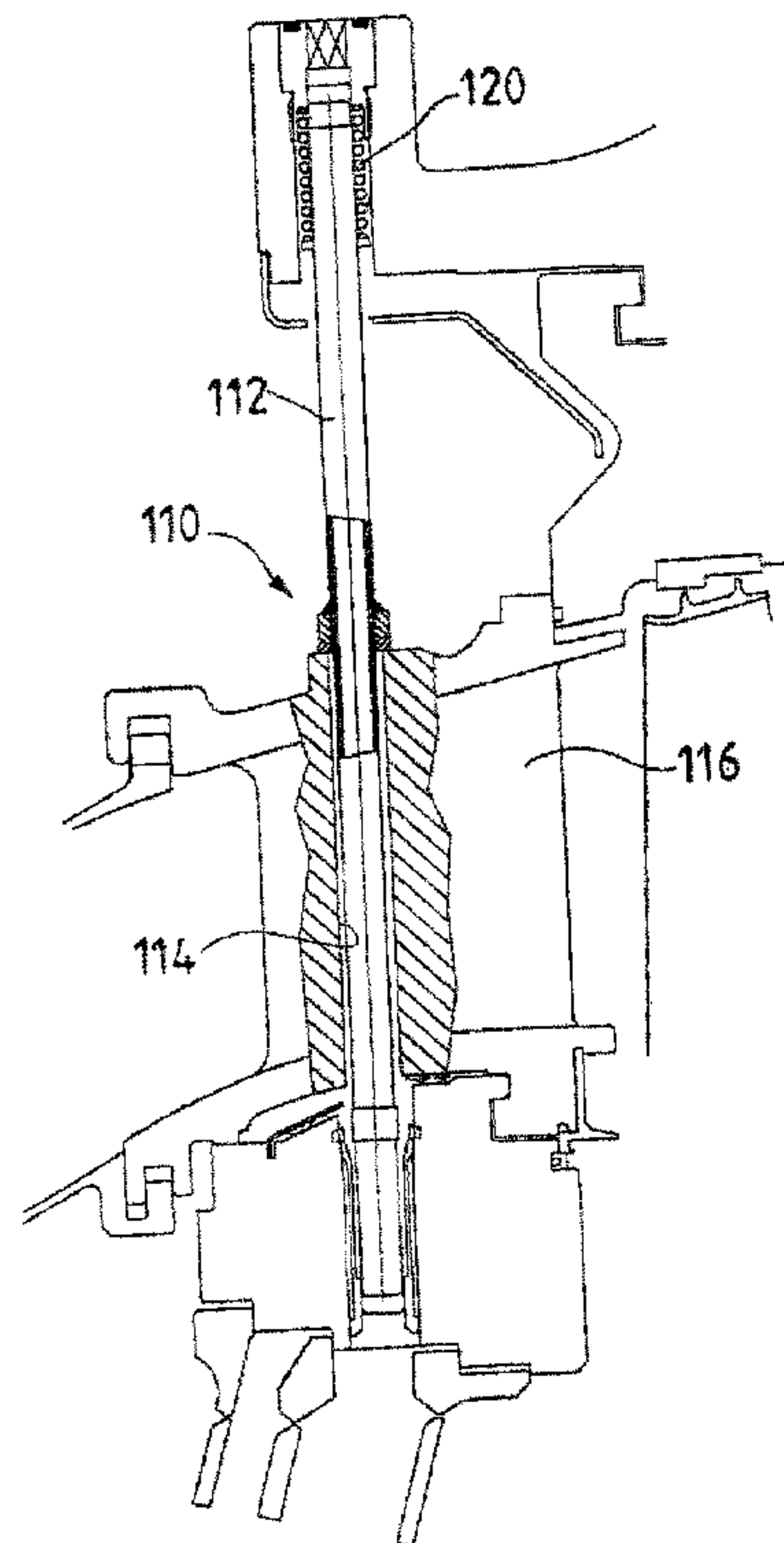
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(54) Titre : DISPOSITIF D'ETANCHEITE POUR LE RACCORDEMENT D'UN TUYAU DANS UN TROU

(54) Title: SEALING DEVICE FOR CONNECTION OF A PIPE IN A HOLE



(57) Abrégé/Abstract:

A sealing device (110) for connection of a pipe (112) in a hole (114), wherein the fitting is free, with play, of the type comprising pressure means (120) to thrust the pipe (112) in the direction of the hole (114), and a washer (118) with an annular shape, with a central hole into which the pipe (112) is inserted and secured; this washer (118) has a base which is shaped according to a spherical annular surface portion (119) and is disposed with this spherical base (119) facing the hole (114), the spherical base (119) being thrust against the hole (114) by these pressure means (120).



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SEALING DEVICE FOR CONNECTION OF A PIPE IN A HOLE

ABSTRACT

A sealing device (110) for connection of a pipe (112) in a hole (114), wherein the fitting is free, with play, of the type comprising pressure means (120) to thrust the pipe (112) in the direction of the hole (114), and a washer (118) with an annular shape, with a central hole into which the pipe (112) is inserted and secured; this washer (118) has a base which is shaped according to a spherical annular surface portion (119) and is disposed with this spherical base (119) facing the hole (114), the spherical base (119) being thrust against the hole (114) by these pressure means (120).

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SEALING DEVICE FOR CONNECTION OF A PIPE IN A HOLE

The present invention relates to a sealing device for connection of a pipe in a hole.

In the art there are frequent cases in which a pipe must pass through a baffle which divides two areas.

Often, the connection between the pipe, and a hole which is provided in the baffle, is rigid, and for example is produced by means of welding.

Sometimes, on the other hand, the connection between the pipe and the hole is free, with play.

This situation can be required for various reasons, for example in order to permit differential movements between the pipe and the baffle, or for reasons of thermal expansion to which the pipe is subjected.

In particular, in gas turbines, there exist pipes for internal cooling circuits, which connect an outer case of the turbine to an inner nozzle-holder ring, by passing through a divider baffle, which is also known as the nozzle sector.

In these cases, it is necessary to provide sealing devices in order to prevent passage of air in the space between the pipe and the hole.

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In the known art, in the field of gas turbines, pipes are used which are provided with washers which are welded onto the outside of the pipes.

The washer is thrust against a surface, which for example is precision cast, of the divider baffle, by a spring which ensures that an area above the baffle is sealed relative to an area on the opposite side of the baffle.

However, the level of sealing obtained is not optimal, since it is difficult to obtain perfect contact between the washer and the surface of the baffle, owing both to geometric processing tolerances and to differentiated movements which exist between the outer case to which the pipe is coupled, and the divider baffle, which is secured to the inner nozzle-holder ring.

The object of the present invention is thus to eliminate the disadvantage previously described, and in particular to provide a sealing device for connection of a pipe in a hole, which guarantees a high level of sealing, even in the presence of geometric differences of concentricity between the pipe and the hole.

Another object of the invention is to provide a sealing device for connection of a pipe in a hole, which is particularly reliable, simple and functional, and has relatively low costs.

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These objects and others according to the present invention are achieved by providing a sealing device for connection of a pipe in a hole, as described in claim 1.

Further characteristics are described in the subsequent claims.

Advantageously, the sealing device for connection of a pipe in a hole is used for a cooling pipe in a gas turbine, thus permitting a large saving in cooling air, but also in particular preventing blow-by which is undesirable and is difficult to assess.

The characteristics and advantages of a sealing device for connection of a pipe in a hole, according to the present invention, will become clearer and more apparent from the following description, provided by way of non-limiting example, with reference to the attached schematic drawings, in which:

figure 1 is a view in lateral elevation, partially in cross-section, of a sealing device according to the known art, for connection of a cooling pipe in a hole in a divider baffle in a gas turbine;

figure 2 shows an enlarged view in lateral elevation of the sealing device in figure 1;

figure 3 is a view in lateral elevation, partially in cross-section, of a sealing device according to the

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present invention, for connection of a cooling pipe in a hole in a divider baffle in a gas turbine; and

figure 4 shows an enlarged view in lateral elevation of the sealing device in figure 3.

Figures 1 and 2 show a sealing device which is according to the known art, and is indicated as 10 as a whole, for connection of a cooling pipe 12 in a hole 14 in a divider baffle 16 in a gas turbine.

In the example illustrated, the device 10 comprises a washer 18 with an annular shape, with two flat bases and with a central hole with a diameter which is the same as the outer diameter of the pipe 12.

The washer 18 is threaded onto the outside of the pipe 12, and is joined to the latter, for example by being welded.

The washer 18 of the pipe 12 is thrust towards a flat surface of the baffle 16 in which the hole 14 is provided, by pressure means 20 such as a spring.

The spring 20 can be fitted on one end of the pipe 12 which faces the hole 14 in the baffle 16, and pre-loaded against a wall.

The functioning of the sealing device 10 according to the invention is clear from the foregoing description

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provided with reference to figure 1, i.e. it is implemented by means of the thrust action of the pressure means 20 which brings part of a base of the washer 18 into contact with the flat surface of the baffle 16 which is disposed around the hole 14.

Figure 2 shows a situation of imperfect sealing, with consequent passage of air between the pipe 12 and the hole 14, caused for example by imperfect co-planarity between the washer 18 and the flat surface around the hole 14.

Another cause of imperfect sealing can be inaccurate squareness between the axis of the washer 18 and the flat surface of the hole 14.

On the other hand, figures 3 and 4 illustrate a sealing device 110 according to the present invention, in which components which are the same as and/or equivalent to those illustrated in figures 1 and 2 have the same reference numbers increased by 100.

The sealing device 110 is used in the connection of a cooling pipe 112 in a hole 114 in a divider baffle 116 in a gas turbine.

In the example illustrated, the device 110 comprises a spherical washer 118 with an annular shape, with a

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central hole with a diameter which is the same as the outer diameter of the pipe 112.

The washer 118 has a flat base 117, and a base which is shaped according to an annular portion of spherical surface 119, with convexity towards the exterior of the washer 118 itself. In practice, this shape can be obtained by extending a base of a washer of a known type 18 which does not yet have a central hole, such as to obtain a spherical cap: at this point the central hole will be provided.

The spherical washer 118 is threaded onto the outside of the pipe 112, with the flat base 117 disposed on the side opposite the hole 114. The washer 118 is joined to the pipe 112, for example by being welded, using the flat base 117.

On a flat surface of the baffle 116, which is disposed around the hole 114, there is provided a conical washer 122 with an annular shape, with a central hole which has a diameter slightly larger than the outer diameter of the pipe 112, such that the pipe 112 can be inserted into it. The washer 122 has a flat base and a base which is shaped according to a frusto-conical surface 123, with the smaller base disposed on the flat base side.

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The flat base of the conical washer 122 is supported on the flat surface which surrounds the hole 114, such as to make the axis of the washer 122 parallel with that of the hole 114.

The spherical washer 118 of the pipe 112 is thrust towards the conical washer 122, which is applied to the baffle 116, by pressure means 120, such as a spring.

The spring 120 can be fitted on one end of the pipe 112 which faces the hole 114 in the baffle 116, thus pre-loading the spring against one wall.

The functioning of the sealing device 110 according to the invention is clear from the foregoing description provided with reference to figures 3 and 4, and briefly is as follows.

The thrust action of the pressure means 120 brings the annular portion of spherical surface 119 of the spherical washer 118 into contact with the frusto-conical surface 123 of the conical washer 122. More particularly, as known from the geometry, the contact takes place around a circumference.

This therefore prevents the problems of imperfect sealing caused by imprecise concentricity between the axis of the washer 118 and the axis of the hole 114.

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Thus, even in the presence of axial movements between the pipe 112, which for example is secured to an outer case of the gas turbine, and the divider baffle 116, or in the presence of rotations of the pipe 112, the sealing is guaranteed.

In addition, the spherical washer 118, which is thrust by the spring 120, tends to centre itself in the conical washer 122, thus also centring the pipe 112.

It should be noted that the figures represent pipes with a circular cross-section, and it is apparent that it would not alter anything in the sealing device according to the invention if pipes with a different cross-section were used.

It is also apparent that the figures illustrate pipes which pass through the divider baffle, but it is clear that it would not alter anything in the sealing device according to the invention if use were made of pipes which do not pass through the divider baffle, but simply extend as far as the start of the hole in the divider baffle itself.

The description provided makes apparent the characteristics of the sealing device according to the present invention, for connection of a pipe in a hole,

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and also makes apparent the corresponding advantages, which, it will be remembered, include:

- optimal sealing with consequent saving of cooling air;
- elimination of blow-by of air, which is undesirable and is difficult to assess;
- simple and reliable use; and
- low costs, compared with the known art.

Finally, it is apparent that the sealing device thus designed, for connection of a pipe in a hole, can be subjected to numerous modifications and variants, all of which come within the scope of the invention; in addition, all the details can be replaced by technically equivalent elements. In practice, any materials, shapes and dimensions can be used, according to the technical requirements.

The scope of protection of the invention is thus delimited by the attached claims.

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CLAIMS

1. Sealing device (110) for connection of a pipe (112) in a hole (114), wherein the fitting is free, with play, of the type comprising pressure means (120) to thrust the said pipe (112) in the direction of the said hole (114), and a washer (118, 118) with an annular shape, with a central hole into which the said pipe (112) is inserted and secured, characterised in that the said washer (118) has a base which is shaped according to a spherical annular surface portion (119) and is disposed with the said spherical base (119) facing the said hole (114), the said spherical base (119) being thrust against the said hole (114) by the said pressure means (120).

2. Sealing device (110) according to claim 1, characterised in that on a flat surface which is disposed around the said hole (114), there is provided a conical washer (122), with an annular shape, with a central hole which has a diameter slightly larger than the outer diameter of the pipe (112), the said conical washer (122) having a flat base, which is supported on the said flat surface around the hole (114), such as to render the axis of the washer (122) parallel with that of the hole (114), and a base which is shaped according to a frusto-conical

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surface (123), with the smaller base disposed on the flat base side.

3. Sealing device (110) according to claim 1, characterised in that the said pressure means (120) comprise a spring (120) fitted at one end of the pipe (112) which faces the hole (114), and is pre-loaded against a wall.

4. Sealing device (110) according to claim 1, characterised in that the said washer (118) has a flat base (117) which is used for the securing to the said pipe (112) by means of welding.

5. Sealing device (110) according to claim 1, characterised in that the spherical base (119) of the said washer (118) has convexity towards the exterior of the washer (118) itself.

6. Sealing device (110) according to claim 1, characterised in that the said pipe (112) is a cooling pipe in a gas turbine, which connects an outer case of the turbine with an inner nozzle-holder ring, by passing through a divider baffle (116).

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7. Sealing device (110) for connection of a pipe (112) in a hole (114), substantially as described and illustrated, and for the purposes specified.

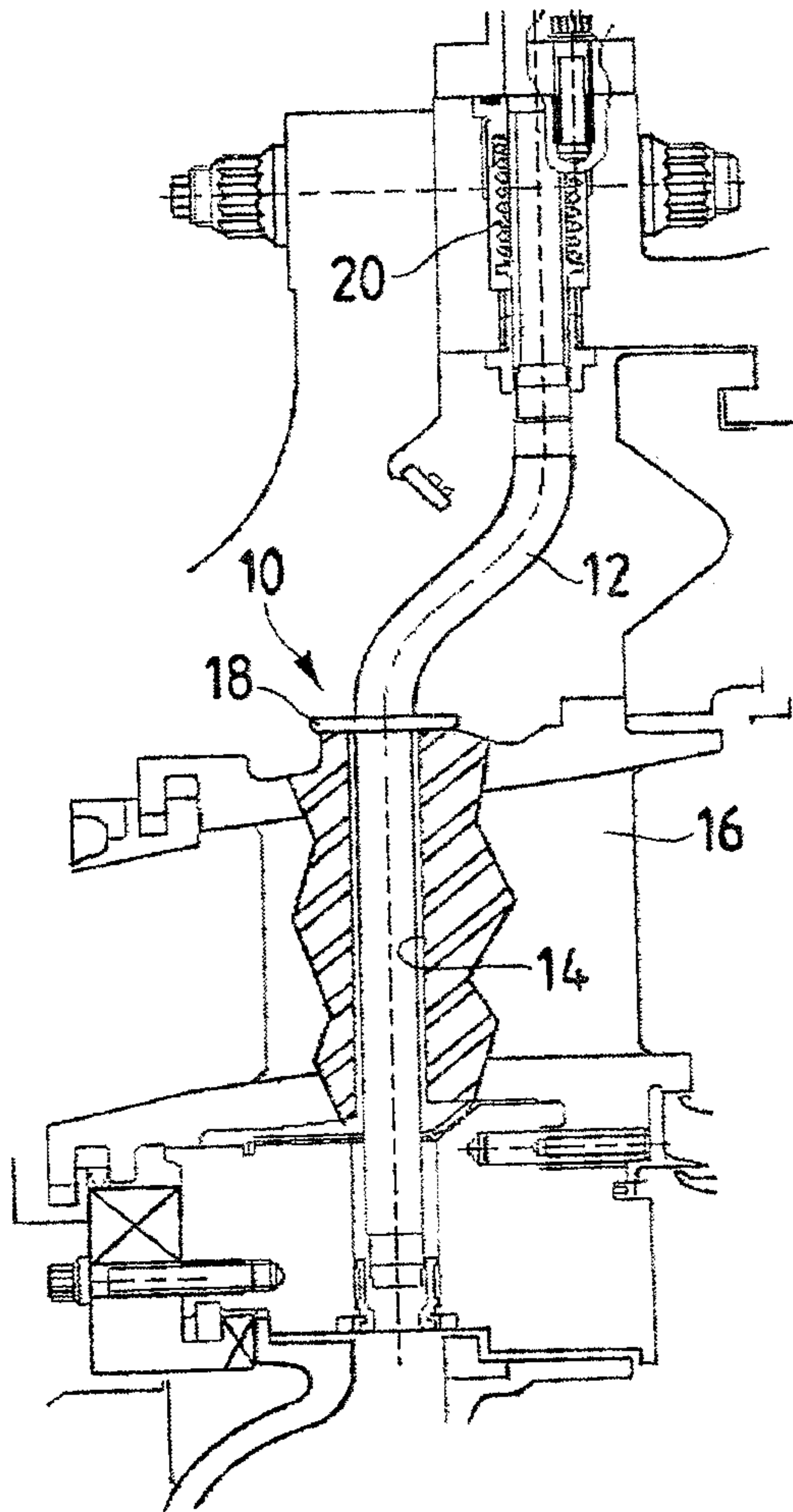


Fig.1

PRIOR ART

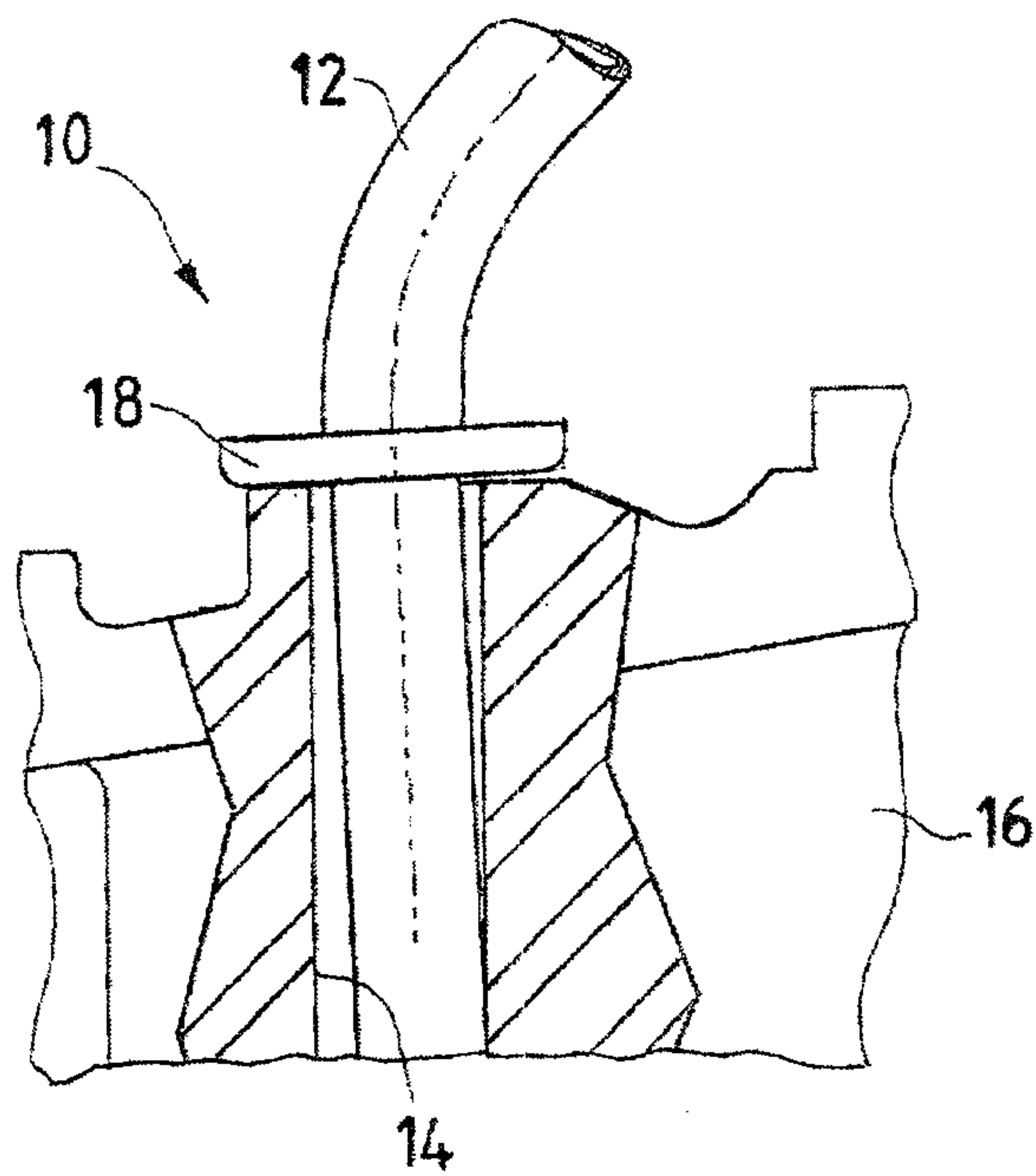


Fig.2

PRIOR ART

Fig.3

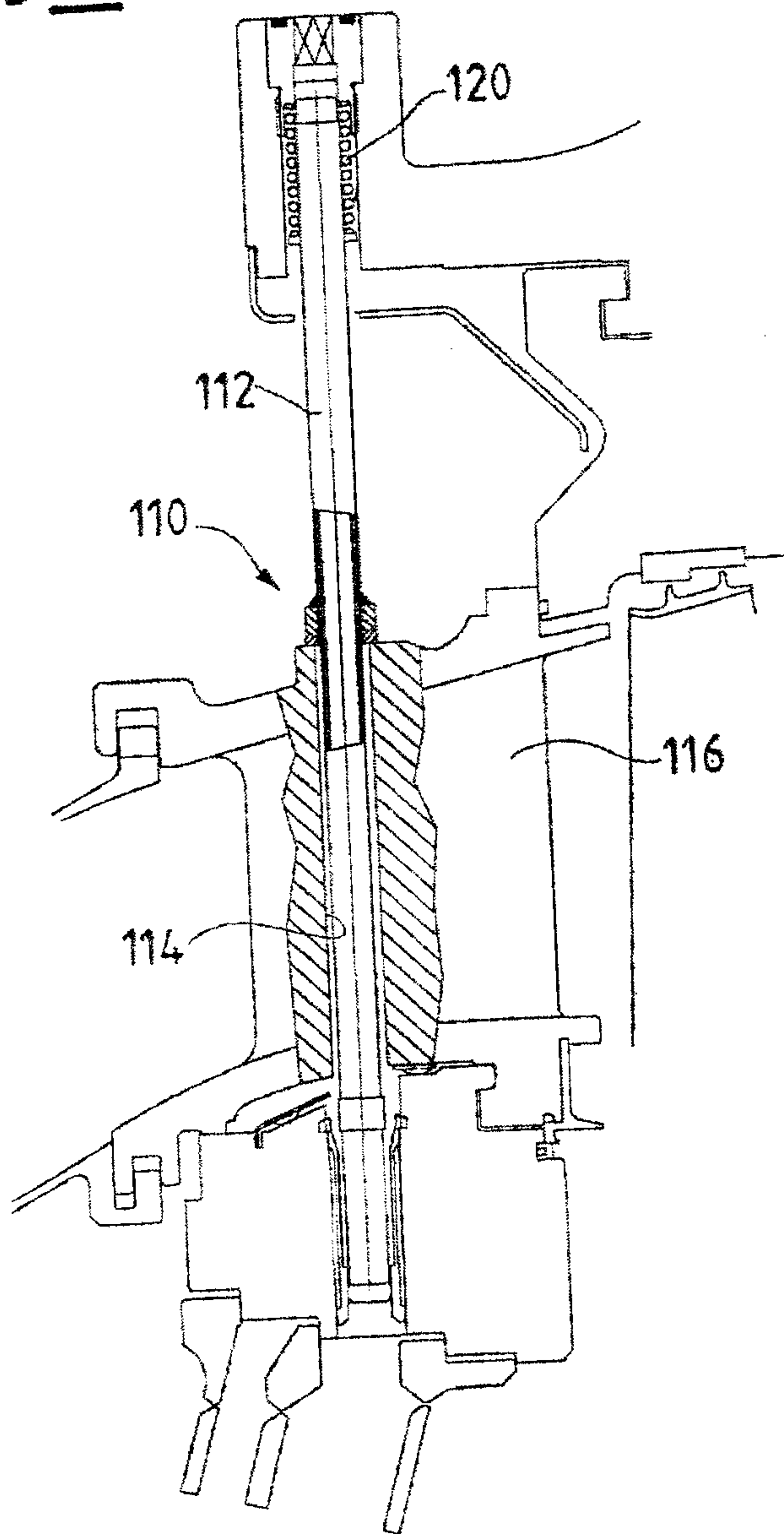


Fig.4

