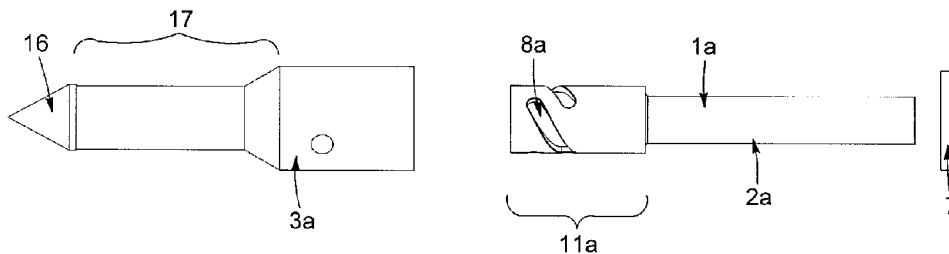




(86) Date de dépôt PCT/PCT Filing Date: 2016/03/21
(87) Date publication PCT/PCT Publication Date: 2016/09/29
(45) Date de délivrance/Issue Date: 2021/03/02
(85) Entrée phase nationale/National Entry: 2017/09/20
(86) N° demande PCT/PCT Application No.: CA 2016/050324
(87) N° publication PCT/PCT Publication No.: 2016/149814
(30) Priorité/Priority: 2015/03/20 (US62/136,103)

(51) Cl.Int./Int.Cl. *F16D 13/22* (2006.01),
F16D 13/24 (2006.01), *F16D 13/58* (2006.01)
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(54) Titre : EMBRAYAGE A FRICTION A DEPLACEMENT LINEAIRE
(54) Title: LINEAR TRAVEL FRICTION CLUTCH



(57) **Abrégé/Abstract:**

A linear travel friction clutch assembly for use with a corresponding complementary motor assembly (ex. a turbine) requiring power torque transmission. The linear travel friction clutch assembly includes a shaft being pivotably mountable about a given support, the shaft being linearly displaceable with respect to said support and being operable between drawn-in and drawn-out configurations, the shaft having a driver portion configured for connection to a driver apparatus in order to selectively drive said shaft in rotation. The linear travel friction clutch assembly also includes an adapter portion connectable to the shaft so as to rotate therewith, the adapter being provided with at least one guiding slot. The linear travel friction clutch assembly also includes a friction head mountable onto the adapter portion and being displaceable and operable between disengaged and engaged configurations with respect to a corresponding receiving component of the complementary motor assembly in order to selectively transmit torque from the driver apparatus to the complementary assembly via the linear travel friction clutch assembly.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(10) International Publication Number
WO 2016/149814 A1

(43) International Publication Date
29 September 2016 (29.09.2016)

(51) International Patent Classification:

F16D 13/22 (2006.01) *F16D 13/58* (2006.01)
F16D 13/24 (2006.01)

(21) International Application Number:

PCT/CA2016/050324

(22) International Filing Date:

21 March 2016 (21.03.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/136,103 20 March 2015 (20.03.2015) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: LINEAR TRAVEL FRICTION CLUTCH

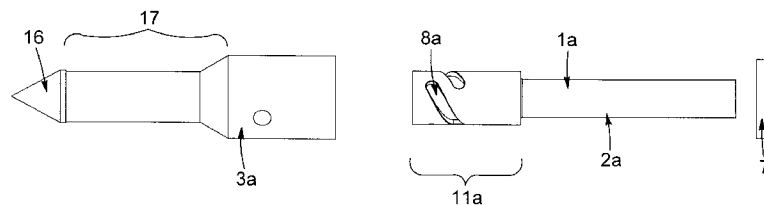


FIG. 17

(57) Abstract: A linear travel friction clutch assembly for use with a corresponding complementary motor assembly (ex. a turbine) requiring power torque transmission. The linear travel friction clutch assembly includes a shaft being pivotably mountable about a given support, the shaft being linearly displaceable with respect to said support and being operable between drawn-in and drawn-out configurations, the shaft having a driver portion configured for connection to a driver apparatus in order to selectively drive said shaft in rotation. The linear travel friction clutch assembly also includes an adapter portion connectable to the shaft so as to rotate therewith, the adapter being provided with at least one guiding slot. The linear travel friction clutch assembly also includes a friction head mountable onto the adapter portion and being displaceable and operable between disengaged and engaged configurations with respect to a corresponding receiving component of the complementary motor assembly in order to selectively transmit torque from the driver apparatus to the complementary assembly via the linear travel friction clutch assembly.

LINEAR TRAVEL FRICTION CLUTCH

Field of the invention:

The present invention relates to the field of torque power transmission devices, such as clutches used to transfer torque from one equipment to another, as in the case with motors, engines, gearboxes and the like, for example. More particularly, the present invention relates to a linear travel friction clutch, to a kit for assembling the same, to an assembly provided with such a linear travel friction clutch, and to corresponding methods of assembling and operating associated thereto.

Background of the invention:

It is well known in the art that for long, clutches have been around and used mostly to transfer torque from one device (ex. electric motors, gas turbine engines, starter devices, etc.) to another equipment (ex. another motor, engine, gearbox, shaft, etc.). Clutches are most often used with electrical motors, but are not limited to, and can be used as starter, and also with other motor types where the clutches are used for intermittent torque transmitters between a motor of any given kind, to a gearbox, shaft and/or any other device needing rotational torque power, and more particularly, intermittent torque power.

One best example is an electrical starter motor when used to start a automobile's engine, where when the electrical starter is activated, the bendix clutch engages between the starter motor and the automobile's engine to provide rotational torque so the automobile's engine can be started. Once the starting sequence is completed, the starter motor is deactivated and the bendix clutch disengaged so the automobile's

2

engine can operate freely. The main characteristic of clutches is that they are designed to engage and disengage in a manner that both the driver motor and that which it drives (e.g. slave motor, gearbox, shaft, etc.) are temporarily mechanically connected to each other.

But it is also known that clutches are usually assembled with a great number of complex parts and components, such as springs, friction discs subjected to wear, cams or cylinders and friction plates or engaging teeth that makes clutches complex and sensitive devices easily subjected to failures, and often of large size and considerably heavy.

Also, most of actual clutches available today and offering linear motion capabilities, accomplish this motion with the use of a secondary electrical or mechanical system such as solenoid, used to move the clutch engaging component forward or backward. This represents additional parts that complicate the clutch, while making the clutch more subject to failures and dependent to a secondary system and power source to accomplish its operation.

Therefore, in view of the above, there is a need to continue innovating and finding better and/or different ways of torque power transmission, in a quicker, easier, simpler, faster, more efficient, more reliable, more versatile and/or more durable manner, than what is possible with known conventional systems. Indeed, it would be particularly useful to provide a new torque power transmission device with additional simplicity and/or reliability, along with reduced and size and/or weight.

Summary of the invention:

3

An object of the present invention is to provide a transmission device (ex. clutch, etc.) which, by virtue of its design and components, is an improvement over other related transmission devices, systems, assemblies and/or methods known in the prior art.

The present disclosure concerns a transmission device (ex. clutch, etc.) and/or corresponding transmission method such as the one briefly described herein and such as the one exemplified in the accompanying drawings.

More particularly, according to one aspect of the present invention, there is provided a linear travel friction clutch assembly for use with a corresponding complementary motor assembly requiring power torque transmission, the linear travel friction clutch assembly:

- a shaft being pivotably mountable about a given support, the shaft being linearly displaceable with respect to said support and being operable between drawn-in and drawn-out configurations, the shaft having a driver portion configured for connection to a driver apparatus in order to selectively drive said shaft in rotation;

- an adapter portion connectable to the shaft so as to rotate therewith, the adapter being provided with at least one guiding slot; and

- a friction head mountable onto the adapter portion and being displaceable and operable between disengaged and engaged configurations with respect to a corresponding receiving component of the complementary motor assembly in order to selectively transmit torque from the driver apparatus to the complementary assembly via the linear travel friction clutch assembly.

According to another aspect of the present invention, there is also provided an assembly (ex. a motor, an engine, a gearbox, etc.) provided with the above-mentioned transmission device.

According to another aspect of the present invention, there is also provided a system (ex. a motor, an engine, a gearbox, etc.) for carrying out the above-mentioned transmission method.

According to another aspect of the present invention, there is also provided a method of installing (i.e. assembling, etc.) the above-mentioned transmission device, system and/or components thereof.

According to another aspect of the present invention, there is also provided a method of operating the above-mentioned transmission device, assembly, system and/or components thereof.

According to another aspect of the present invention, there is also provided a kit with corresponding components for assembling the above-mentioned transmission device, assembly, system and/or components thereof.

According to yet another aspect of the present invention, there is also provided a set of components for interchanging with components of the above-mentioned kit.

According to yet another aspect of the present invention, there is also provided a method of assembling components of the above-mentioned kit and/or set.

According to yet another aspect of the present invention, there is also provided a method of doing business with the above-mentioned method(s), kit, set, device, assembly, system and/or components thereof.

The objects, advantages and other features of the present invention will become more apparent upon reading of the following non-restrictive description of preferred embodiments thereof, given for the purpose of exemplification only, with reference to the accompanying drawings.

Brief description of the drawings:

Figure 1 is a perspective view of an example of a linear travel friction clutch shown in a possible context of use (ex. on a large turbine) according to a possible embodiment of the present invention.

Figure 2 is an enlarged view of a portion of what is shown in Figure 1.

Figure 3 is a perspective view of a component shown in Figure 2 intended to receive the linear travel friction clutch according to a possible embodiment of the present invention.

Figure 4 is a perspective view of the linear travel friction clutch shown in Figure 1.

Figure 5 is a cross-sectional view taken along cross-section lines 5-5 of Figure 4.

Figure 6 is an enlarged view of a portion of what is shown in Figure 6.

Figure 7 is a cross-sectional view of some of the components shown in Figure 4 shown in an exploded manner.

Figure 8 is a top view of some of the components shown in Figure 4 shown in an exploded manner.

Figure 9 is a perspective view of another example of a linear travel friction clutch shown in a possible context of use (ex. on a smaller turbine) according to a possible embodiment of the present invention.

Figure 10 is an enlarged view of a portion of what is shown in Figure 9.

Figure 11 is a cross-sectional view of a portion of what is shown in Figure 9.

Figure 12 is an enlarged view of some of the components shown in Figure 11, including the linear travel friction clutch.

Figure 13 is an enlarged view of a portion of what is shown in Figure 12.

Figure 14 is a perspective view of the linear travel friction clutch shown in Figure 10.

Figure 15 is a perspective view of a component shown in Figure 2 intended to receive the linear travel friction clutch according to a possible embodiment of the present invention.

Figure 16 is a cross-sectional view of some of the components shown in Figure 14 shown in an exploded manner.

Figure 17 is a side view of some of the components shown in Figure 14 shown in an exploded manner.

Detailed description of preferred embodiments of the invention:

In the following description, the same numerical references refer to similar elements. Furthermore, for sake of simplicity and clarity, namely so as to not unduly burden the figures with several reference numbers, only some figures have been provided with reference numbers, and components and features of the present invention illustrated in other figures can be easily inferred therefrom. The embodiments, geometrical configurations, materials mentioned and/or dimensions (expressed in inches, for example) shown in the figures are preferred, for exemplification purposes only.

Moreover, although the present invention was primarily designed for torque power transmission devices, and more particularly for clutches used to transfer torque from one equipment to another such as motor, engines or gearboxes, it may be used with other types of objects, and in other fields, as apparent to a person skilled in the art. For this reason, expressions such as "torque", "power", "transmission", "clutch", "motor", "engine", "gearbox", etc., used herein should not be taken as to limit the scope of the present invention and includes all other kinds of objects or fields with which the present invention could be used and may be useful, as apparent to a person skilled in the art.

Moreover, in the context of the present invention, the expressions "device", "clutch", "system", "machine", "method", "kit", and "assembly", as well as any other equivalent expressions and/or compounds word thereof known in the art will be used interchangeably, as apparent to a person skilled in the art.

Furthermore, in the context of the present description, it will be considered that all elongated objects will have an implicit "longitudinal axis" or "centerline", such as the longitudinal axis of a shaft, or the centerline of a hole, for example (and as a result, there is a "transversal axis" being substantially "perpendicular" for each longitudinal axis, etc.), and that expressions such as "connected" and "connectable", or "mounted" and "mountable", may be interchangeable, in that the present invention also relates to a kit with corresponding components for assembling a resulting fully assembled and operational transmission device (and/or a resulting system, assembly, etc., including such a transmission device).

Moreover, components of the machine(s) and/or steps of the method(s) described herein could be modified, simplified, altered, omitted and/or interchanged, without departing from the scope of the present invention, depending on the particular applications which the present invention is intended for, and the desired end results, as briefly exemplified herein and as also apparent to a person skilled in the art.

In addition, although the preferred embodiment of the present invention as illustrated in the accompanying drawings may comprise various components, and although the preferred embodiments of the transmission method and corresponding transmission device may consist of certain preferred steps and components as explained herein, not all of these steps and components are essential to the invention and thus should not be taken in their restrictive sense, i.e. should not be taken as to limit the scope of the present invention. It is to be understood, as also apparent to a person skilled in the art, that other suitable steps, components and cooperation thereinbetween, may be used for the present transmission method and corresponding device (as well as corresponding components) according to the present invention, as will be briefly explained hereinafter and as can be easily inferred herefrom by a person skilled in the art, without departing from the scope of the invention.

Broadly described, the present invention, as illustrated in the accompanying drawings, relates to an invention used to intermittently transfer rotational force and torque from one driver device to a driven device, such as for starting or mechanical rotation driving purposes and more particularly related to clutches used to transfer intermittent torque power from one rotating device to another.

Referring to the drawing, and more particularly to Fig. 1, is one example of the linear travel friction clutch assembly 1 in a context of an example use, to start a turbine.

Fig. 4 through 8 show the linear travel friction clutch assembly 1 in greater detail. The linear travel friction clutch assembly 1 has a shaft 2, which, in this example, has a cylindrical shape (which can be machined of steel for instance) having a driver portion 10 configured for connection to a driver apparatus of any suitable type (e.g. such as the one schematized in Fig. 1). In this embodiment, the driver portion is in the form of a rod of a length sufficient to connect to the desired driver device and of enough diameter to provide strength to resist to the driver device's applied torque force. Also present on this shaft 2 is an adapter portion 11 having a larger diameter than the rod portion, and having angled guide slots 8 shown in Fig. 8. A friction head 3 has a socket in the form of a bored cylindrical cavity which receives the adapter portion 11 therein with sufficient play to allow free relative rotation and axial sliding.

For illustrative purposes, in the specific example of the linear travel friction clutch 1 illustrated herein, the rod portion 10 of the shaft 2 has $\frac{1}{4}$ inch diameter and 3 inches of length, the adapter portion has $\frac{1}{2}$ inch diameter and an axial length of $\frac{1}{2}$ inch, and the guide slots 8 have $\frac{1}{8}$ of an inch wide by $\frac{1}{8}$ of an inch deep with an approximate length of $\frac{3}{16}$ of an inch angled at 83 degrees clockwise in reference to the a central axis coinciding with the length of the shaft 2.

In this specific example, the friction head 3, which can be made of machined steel for instance, generally has a solid of revolution shape with a generally cylindrical portion having the socket 12, and a truncated conical portion extending therefrom, away from the shaft 2. A cylindrical bored cavity 13 extends through the truncated conical portion and communicated with the socket 12. A number of apertures 14 are provided which lead radially into the socket 12, the number of which correspond to the number of guide slots 8 of the given embodiment. The apertures 14 can be drilled and tapped holes 14, for instance. A numbers of grooves 9 are also provided in the outer surface truncated conical portion . The friction head 3 conical surface can be of any suitable angle allowing it to be adapted to the angle of a corresponding conical inner cavity of a receiving surface of a component (e.g. 15 see Fig. 3) present on the device which is to be driven. In this particular embodiment, experimentations demonstrated that a 60 degrees total angle with a friction head 3 having a 1 inch diameter performed satisfactorily well, and better than other angles.

The diameter of the internal cavity 12 of the friction head 3 is slightly larger than the diameter of the adapter portion, which allows the friction head 3 to fit and freely slide over the adapter portion 11, and also includes the cavity 13 having a still smaller diameter and which can be drilled through the friction head 3 along the central axis. Also present on the friction head 3 is a number of grooves 9, embodied here in the form of two grooves having different diameters, which are used herein to position and hold toric rings 5 and 6 which purposes will be detailed further below. The apertures 14 receive aft dog set screws 4 which, in this case, are screwingly secured therein and protrude into the guide slots 8 whence the friction head 3 is assembled to the shaft 2. Henceforth, although the friction head is free to move to a certain degree, relative to the shaft 2, this movement is limited to a somewhat spiraling movement over a given length, as it is guided by the engagement between the aft dog set screws 4 and the guide slots 3.

A biasing member is used, provided here in the form of a magnet 7 which in this embodiment is provided of cylindrical geometry and pressure fitted onto the shaft 2 at the shown location, i.e. adjacent the friction head 3, the purpose of which will be detailed below.

It will be understood that in alternate embodiments, the rod portion 10 can be modified freely in order to adapt the linear travel friction clutch to any suitable driver device, be it electric, pneumatic or thermal engines to name a few examples. For instance, a larger driver motor driving or starting a larger driven device such as a gas turbine, will typically require using components having larger dimensions in the linear travel friction clutch, whereas a smaller driver or driven device will typically require the linear travel friction clutch to be adapted to smaller size.

For proper functioning, it can be required to properly lubricate the portion between the friction head 3 larger cavity 12 and the adapter portion 11 so that the relative movement can occur smoothly.

The use of the toric rings 5 and 6 ('O' Rings) can favour the torque transfer. They can be of a natural or synthetic rubber material for instance, and the exact number and configuration thereof can be varied depending on the embodiment. The grooves 9 can be adapted as a function of the toric rings they are engineered to receive, for instance.

The outer face of the truncated conical portion of the friction head, including the toric rings 5 and 6, can be referred to an engagement face of the clutch. The receiving component 15 on the turbine which receives the engagement face of the clutch can be said to also have an engagement face. In this embodiment, the engagement face of the receiving component 15 is matingly shaped with a conically inverted surface having an

equal total angle so a perfect contact can occur between the friction head 3 and the inverted conical surface of the driven device, and that the rotational torque transmitted across that interface can adequately be transferred without slipping. Experimentations were carried out with success using an approximate 60 degrees total angle.

It is also to be understood that the guiding member which is engaged in the guide slots 8, and which, in the illustrated example, are embodied by the aft dog set screws 4, have a significant function as they are responsible here both for the transfer of rotational torque and for the conversion of rotational torque into linear motion of the friction head 3 relative the adapter portion 11 in a manner that the friction head 3 moves forward or backward as the shaft 2 is rotated or stops rotating, via the guiding within the guide slots 8. They should therefore be embodied in a manner providing them sufficient mechanical resistance for both functions.

It will be understood that in the illustrated embodiment, two aft dog set screws 4 are used. In alternate embodiments, a greater quantity of aft dog set screws can be used. In any case, they should be equally spaced around the friction head 3 not to compromise the dynamic balancing.

It is also to be understood that the slots 8 can be angled or oriented in either directions and in accordance with the desired application clockwise or counter clockwise rotation direction. In the embodiment illustrated, they are shown adapted to rotation in the counter clockwise direction.

The linear travel friction clutch can be used for high speed rotation applications and for which proper dynamic balancing is required in order to maintain mechanical integrity and vibrations within reasonable limits.

It is also to be understood that alternate embodiments can depart from the geometry described above and illustrated. For instance, the engagement face of the clutch can be provided in the form of a cavity with a female, inwardly protruding conical inner surface, and the engagement face of the receiving component can be provided with the male truncated conical outer surface, for instance. Internal grooves 9 and toric rings 5 and 6 can be positioned internally in such a female embodiment. Similarly, the mating male-female aspect of the friction head and the adapter portion 11, and/or the mating male-female aspect of the guiding members and the guide slots can be inverted.

When the shaft 2 is subjected to counter clockwise rotation, the slots 8 transfer rotational torque to the aft dog set screws 4 since the lower portion of the aft dog set screws 4 are engaged in the shaft 2 slots, which in turns, transfer rotational torque to the friction head 3 and the friction head 3 rotates.

As the slots 8 are also angled to an angle lower than 90 degrees compared to the shaft 2 central axis, the shaft 2 counter clockwise rotation applies forward pressure to the aft dog set screws 4 which in turn transfers this forward pressure to the friction head 3 and forward linear motion of the friction head 3 is accomplished.

When the shaft's 2 rotation is stopped, the rotation dynamics momentum affects the friction head 3 and the aft dog set screws 4 tend to maintain rotation, generating backward pressure between the slots 8 to be applied to the aft dog set screws 4 engaging members which cause at first the friction head 3 to reverse backward and secondly to stop rotating at the end of the slots 8.

In other words, when the shaft 2 is subjected to a counter clockwise rotation, there are two combined rotational and linear forces that move the friction head 3 forward in an approximate slots 8 length and in rotation by the combined interaction of

14

the slots 8 and the aft dog set screws 4. In opposite and when the shaft 2 is stopped in its rotation, the rotational inertia dynamics momentum of the friction head 3 moves backward to its initial position by means of two opposite combined rotational and linear forces interacting between the slots 8 and the aft dog set screws 4 and in a slots 8 length.

The friction head 3 linear forward motion creates a contact between the toric rings 5 and 6 with the driven devices 15 contact surface and where this assembly 1 rotational torque is then transmitted to the driven device and where the driven device rotation is initiated. It was experimentally found that greater the driven device's rotational resistance is, greater the applied linear motion and friction forces applied by this assembly 1 is also and to the point where the linear motion and friction forces applied by this assembly 1 is linearly proportional to the driven device's rotational resistance.

As the present system's 1 rotation is stopped, this assembly 1 disengages from the driven device by means of the linear friction head 3 moving backward to its initial position and process is complete.

This assembly 1 also incorporates a magnet 7 used to maintain the friction head 3 to its initial backward position after the process is complete and for it was experimentally discovered that occasionally, the friction head 3 can move forward by means of vibrations often created by specific applications and where the friction head 3 can involuntary become in contact with the driven device contact surface after the process is complete, which can damage both the assembly 1 and the driven device, especially in high speed rotation applications and for which the magnet 7 was used to maintain the friction head 3 to its initial backward position.

This magnet 7 is to be of sufficient magnetism force to maintain the friction head 3 in position while not too powerful to inhibit the friction head's 3 forward motion when required. In conducted experimentations which yielded satisfactory results, the magnet 7 was of an equal external diameter to the external diameter of the friction head 3, with an internal diameter best to allow a press fit on the shaft 2 smaller diameter section 10 and was with a thickness of 1/8 of an inch.

In the tests and for the above description, the driver device was an air motor used as a starter unit and the driven device was a gas turbine used to be started with the invention use. In alternate embodiments, the driven devices can be other gas turbines, an internal combustion engine, a shaft, a gearbox or any other suitable device.

The present transmission device, system including the same and/or corresponding method may also come in the form of various different embodiment(s) including one and/or several of the following possible components and features (and/or different combination(s) thereof):

1. A linear clutch assembly comprising:

- a friction head having a body having a conical engagement face adapted for engagement with a corresponding face of a driven device, and a receiving end opposite the engagement face, the conical engagement face having a central axis;
- a shaft having a driver portion centered along the central axis and engageable with a driver device, and an adapter portion opposite the driver portion, the adapter portion being slidably engageable with the receiving end of the friction head in a cylindrical male-female engagement allowing both linear relative motion along the central axis and relative rotation between the shaft and the friction head around the central axis; and

a plurality of circumferentially interspaced guiding members provided on one of the adapter portion and the receiving end, and a plurality of circumferentially interspaced slots provided on the other one of the adapter portion and the receiving end, the slots having a length extending both circumferentially and axially, the guiding members being slidably engaged with the slots and guiding the relative linear motion and rotation along a path corresponding to the length of the slots.

2. The linear clutch assembly according to any one of the preceding combination(s), wherein the friction head is formed with a plurality of annular channels each receiving an associated toric ring.

3. The linear clutch assembly according to any one of the preceding combination(s), further comprising means to bias the guiding members to one end of the slots.

4. A linear travel friction clutch mechanical assembly used to transfer rotational motion and torque from one driver device to another driven device, the linear travel friction clutch comprising:

a shaft comprising one smaller diameter section, one larger diameter section and a number of angled slots circumferentially interspaced and defined in the larger diameter section, the shaft being all in one machined part;

a friction head as illustrated and comprising one cylindrical section at its back end, a conical surface at its front end, a larger cylindrical internal cavity, a smaller cylindrical cavity, a number of apertures, all in one machined part;

a number of guiding members protruding from the apertures and engaged in corresponding ones of the angled slots.

5. A sequence of operations and forces dynamics to transfer rotational motion and torque from one driver device to another driven device where :

at first the aft dog set screws are firmly fastened into the friction head by their threaded section with their unthreaded section freely inserted into the shaft's angled slots for free travel motion and invention assembly,

according to any one of the preceding combination(s), rotation and torque are transmitted from one driver device to this assembly's shaft will cause this shaft, and thus, its angled slots to rotate,

an invention comprising a friction head part that moves forward in a linear motion when the shaft rotates in one direction and moves backward in an opposite linear motion when the shaft rotation is stopped.

the static mass of the friction head, thus, also the aft dog set screws firmly fastened into, poses a natural static mass resistance to any motion and rotation.,

the rotation induced in the shaft and angled slots, combined with the inherent friction head's static mass resistance, will cause the aft dog set screws unthreaded section to make contact with the shaft's angled slots one of both sides and according to the shaft's rotation direction,

when the shaft and angled slots are in rotation, the contact between the aft dog set screws unthreaded section and the shaft's angled slots will cause the friction head to rotate in the same shaft rotation direction,

when the shaft and angled slots are in rotation, the contact between the aft dog set screws unthreaded section and the shaft's angled slots, opposed to the friction head inherent static mass, will cause the friction head to move forward in a linear motion and according to the shaft rotation direction,

when the shaft and angled slots rotation is stopped, the contact between the aft dog set screws unthreaded section and the shaft's angled slots will cause the friction head to stop rotating,

a dynamic rotation inertia force is created by the friction head and aft dog set screw mass when in rotation,

when the shaft and angled slots rotation is stopped, the friction head is pulled backward into initial position when a contact between the aft dog set screws unthreaded section and the rotating shaft and angled slots, is caused by the friction head dynamic rotation inertia force,

a friction head part comprises an external conical surface of preferred angle to match a driven device internal conical surface of preferred equal angle to maximize applied pressure between both the friction head external conical surface and the driven device internal conical surface and reduce slipping,

a number of toric rings are present on the friction head conical surface to concentrate the friction head's applied pressure to concentrated areas on the driven device internal conical surface and avoid slipping,

the number of toric rings are present on the friction head to eliminate wear and damages between the friction head external conical surface and the driven device's internal conical surface,

a magnet and magnetic force is used on this invention to retain the friction head to its backward position.

A linear travel friction clutch to transfer rotational motion and torque from one driver device to another driven device, the linear travel friction clutch comprising:

a shaft where one smaller diameter section of longer length will be machined to ideal size and heat treated for enough resistance to receive the selected application's torque and forces and to best suit the clutch's purpose.

A steel shaft according to any one of the preceding combination(s), where a larger diameter section of shorter length will be machined and heat treated for best resistance according to the selected application and to best suit clutch's purpose.

A steel shaft according to any one of the preceding combination(s), where a number of slots will be machined into and at a preferred angle and orientation to best suit this assembly's scope and according to the specific application's rotation direction.

A friction head part manufactured using steel material, on which one preferred angled external conical surface and one cylindrical section will be machined to best suit this assembly's scope.

A friction head according to any one of the preceding combination(s), where a number of grooves will be machined to sizes and diameters prescribed by toric rings selection and to best suit this assembly's scope.

A friction head according to any one of the preceding combination(s), where one large internal cylindrical cavity is machined to dimensions suitable for assembly with this assembly's shaft larger diameter section and to best suit this assembly's scope.

A friction head according to any one of the preceding combination(s), where one smaller internal cylindrical hole is drilled through to small dimensions and to best suit this assembly's scope.

A friction head according to any one of the preceding combination(s), where a number of drilled and tap holes of dimensions suited for a number of selected aft dog set screws selected but not limited too, and positioned for best assembly purposes with this invention shaft's slots positions and to best suit this assembly's scope.

A number of aft dog set screws and not limited too, and selected to best suit the assembly's torque and forces requirements and scope.

A number of rubber toric rings also referred to as "O" rings, selected of best dimensions and diameters to best suit the prescribed application's torque, pressure and friction requirements and to best suit this assembly's scope.

A magnet of sufficient size and magnetic strength capable of retaining this assembly's friction head when static, but without preventing a forward linear travel of the

friction head when this assembly's shaft is subjected to rotation and to best suit this assembly's scope.

As may now be appreciated, the present invention is a substantial improvement over other conventional transmission devices in that, by virtue of its design and components, as briefly explained herein, the linear travel friction clutch according to the present invention, enables to overcome several of prior art drawbacks, providing for a quicker, easier, simpler, faster, more efficient, more reliable, more versatile and/or more durable system.

The present system is advantageous in that: a) it provides a device in the form of a proposed clutch capable of torque power transfer by means of rotation and simple contact friction; b) it provides a device in the form of the proposed clutch capable of linear motion without use of secondary systems, such as simply by using rotational torque from the driver motor; c) it provides a device having a small amount of components or parts; d) it provides a clutch having a small size and weight, while maintaining satisfactory reliability, and/or improving reliability; e) it provides simple and practical method for torque transfer; f) it enables to alleviate some of the needs concerning clutches and intermittent torque power transfer from one device to another; g) etc.

The present system and corresponding parts are preferably made of substantially rigid materials, such as metallic materials, hardened polymers, composite materials, polymeric materials, and/or the like, so as to ensure a proper operation thereof depending on the particular applications for which the covering system is intended and the different parameters (forces, moments, torques, etc.) in cause, as apparent to a person skilled in the art.

Of course, and as can be easily understood by a person skilled in the art, the scope of the claims should not be limited by the possible embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole.

Furthermore, although preferred embodiments of the present invention have been briefly described herein and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to these embodiments and that various changes and modifications could be made without departing from the scope and spirit of the present invention, as defined in the appended claims.

CLAIMS:

1. A linear travel friction clutch assembly for use with a corresponding complementary motor assembly requiring power torque transmission, the linear travel
5 friction clutch assembly:

a shaft being pivotably mountable about a given support, the shaft being linearly displaceable with respect to said support and being operable between drawn-in and drawn-out configurations, the shaft having a driver portion configured for connection to a driver apparatus in order to selectively drive said shaft in rotation;

10 an adapter portion connectable to the shaft so as to rotate therewith, the adapter being provided with at least one guiding slot; and

a friction head mountable onto the adapter portion and being displaceable and operable between disengaged and engaged configurations with respect to a corresponding receiving component of the complementary motor assembly in order to
15 selectively transmit torque from the driver apparatus to the complementary assembly via the linear travel friction clutch assembly.

2. A linear travel friction clutch assembly according to claim 1, wherein the adapter portion has a cross-sectional body being greater than that of the driver portion.

20

3. A linear travel friction clutch assembly according to claim 1 or 2, wherein the driver and adapter portions have a cylindrical shape, and wherein a diameter of the adapter portion is greater than a diameter of the driver portion of the shaft.

25 4. A linear travel friction clutch assembly according to any one of claims 1-3, wherein the friction head includes a socket for receiving the adapter portion therein.

5. A linear travel friction clutch assembly according to claim 4, wherein the socket is positioned, shaped and sized for allowing free relative rotation and axial sliding
30 of the adapter portion within the socket.

6. A linear travel friction clutch assembly according to claim 4 or 5, wherein a peripheral outer surface of the friction head includes at least one aperture extending radially into the socket.

5

7. A linear travel friction clutch assembly according to any one of claims 4-6, wherein a peripheral outer surface of the friction head includes at least one aperture extending radially into the socket for each of the at least one guiding slot provided about a peripheral outer surface of the adapter portion.

10

8. A linear travel friction clutch assembly according to any claim 6 or 7, wherein the friction head is confined to move with respect to the adapter portion via at least one interconnecting fastener insertable into the at least one aperture of the friction head and engageable with the at least one guiding slot of the adapter portion.

15

9. A linear travel friction clutch assembly according to claim 8, wherein the at least one interconnecting fastener includes at least one aft dog setscrew.

10. A linear travel friction clutch assembly according to claim 8 or 9, wherein the at least one interconnecting fastener includes a pair of at least one aft dog setscrews.

20

11. A linear travel friction clutch assembly according to any one of claims 1-10, wherein the at least one guiding slot includes at least one spiral-shaped guiding slot so that the friction head is moveable with respect to the adapter portion in a corresponding spiral-shaped manner along a span of the at least one guiding slot.

25

12. A linear travel friction clutch assembly according to any one of claims 1-11, wherein the friction head has a conical portion.

30

13. A linear travel friction clutch assembly according to claim 12, wherein the conical portion includes an angled portion.

14. A linear travel friction clutch assembly according to claim 13, wherein the angled portion defines an angle range of about 60 degrees.

15. A linear travel friction clutch assembly according to any one of claims 1-14,
5 wherein the friction head has a truncated distal end.

16. A linear travel friction clutch assembly according to any one of claims 1-15,
wherein the friction head has a longitudinal bore extending from a distal end to a proximate end.

10 17. A linear travel friction clutch assembly according to any one of claims 1-16,
wherein the friction head comprises at least one peripheral groove for receiving a corresponding elastomeric ring therein.

15 18. A linear travel friction clutch assembly according to any one of claims 1-17,
wherein the friction head comprises a pair of circumferential grooves for receiving therein a corresponding pair of O-rings.

19. A linear travel friction clutch assembly according to any one of claims 1-18,
20 wherein the friction head includes a distal tip.

20. A linear travel friction clutch assembly according to claim 19, wherein the distal tip is removably insertable into a corresponding distal end of a corresponding longitudinal bore of the friction head.

25 21. A linear travel friction clutch assembly according to any one of claims 4-20,
wherein a longitudinal bore of the friction head communicates with a socket of the friction head.

30 22. A linear travel friction clutch assembly according to any one of claims 1-21,
wherein the linear travel friction clutch assembly comprises a biasing component for biasing the friction head into an initial backward position.

23. A linear travel friction clutch assembly according to claim 22, wherein the biasing component includes a magnet being mountable about the shaft, and being positionable adjacent to the adapter portion, and proximate to the friction head, for urging said friction head towards the magnet.

5

24. A linear travel friction clutch assembly according to claim 23, wherein the magnet is an O-ring-shaped magnet being pressed fitted about the shaft.

25. A kit with components for assembling a linear travel friction clutch assembly according to any one of claims 1-24.

10

26. A complementary motor assembly being provided with a linear travel friction clutch assembly according to any one of claims 1-24.

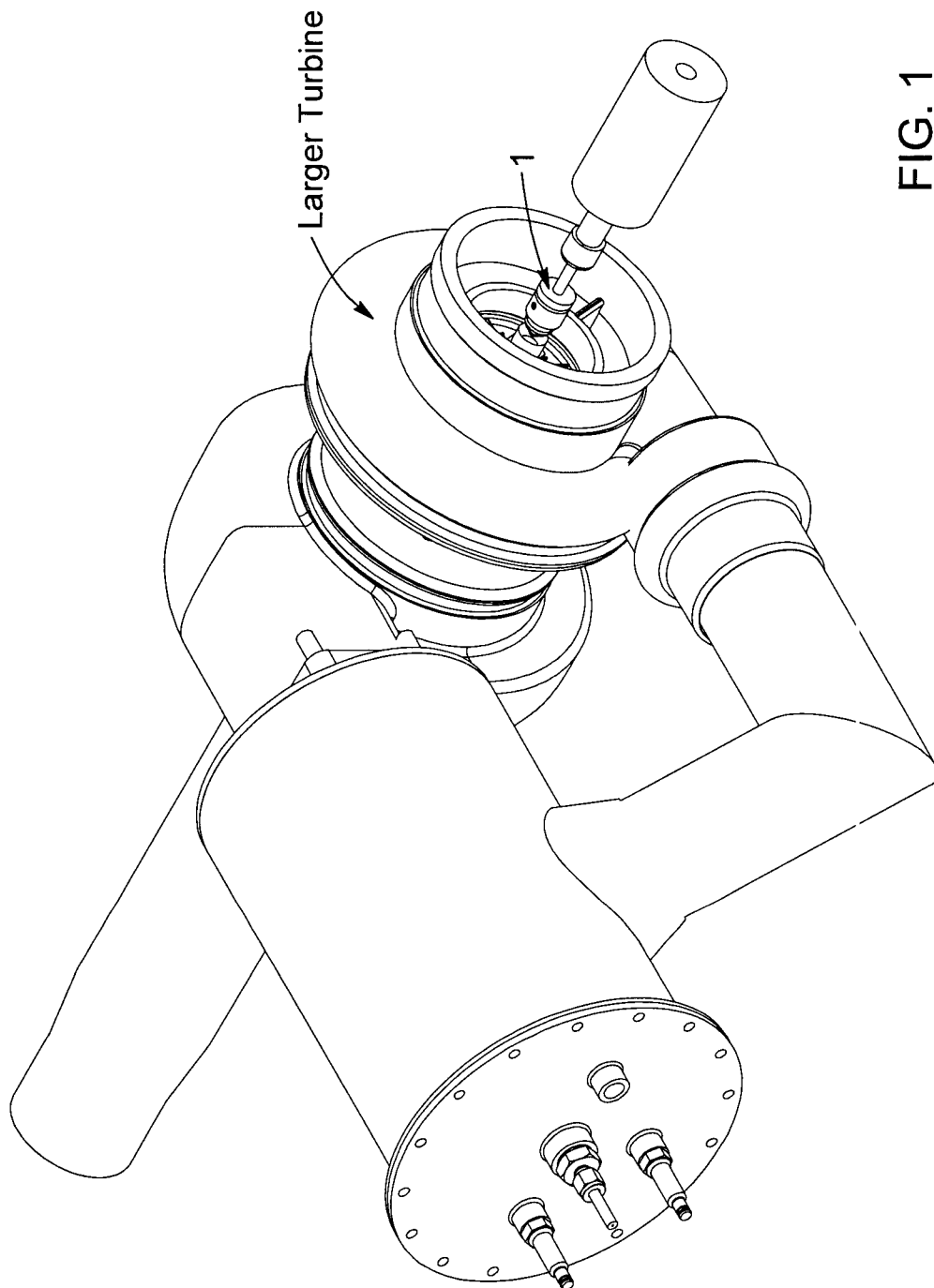
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27. A complementary motor assembly according to claim 26, wherein the complementary motor assembly includes a receiving component for selectively receiving the friction head of the linear travel friction clutch assembly.

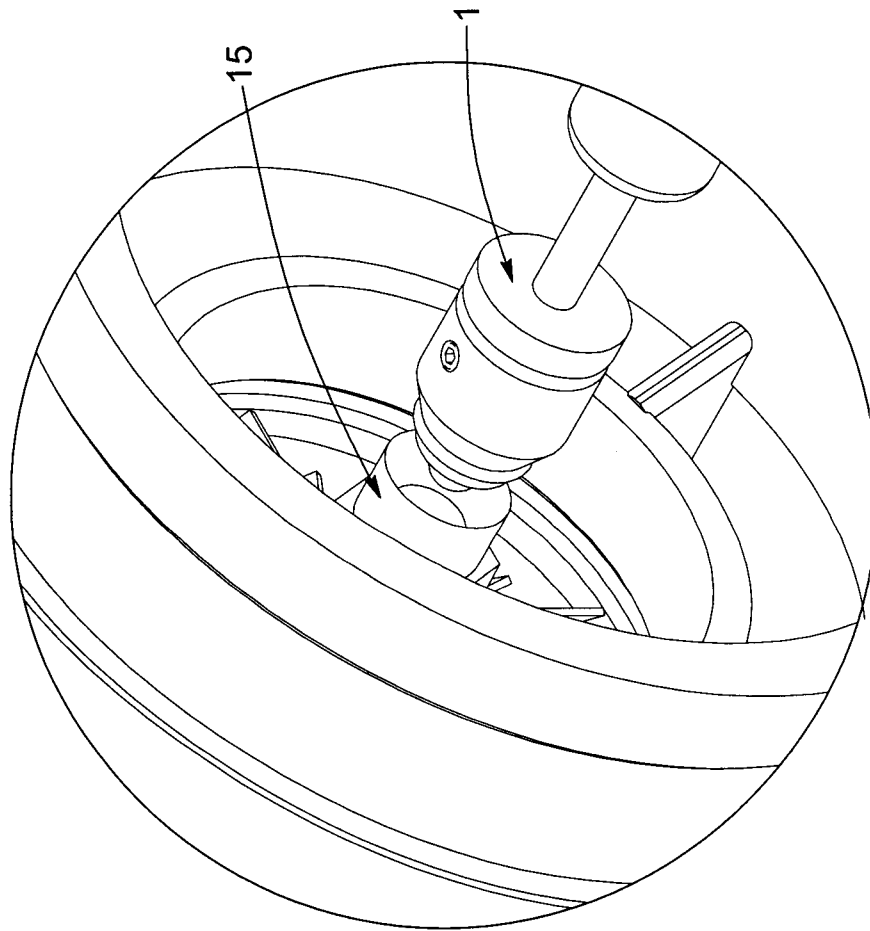
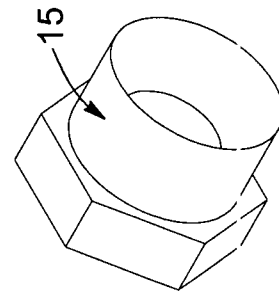
28. A complementary assembly according to claim 27, wherein the complementary motor assembly is a turbine.

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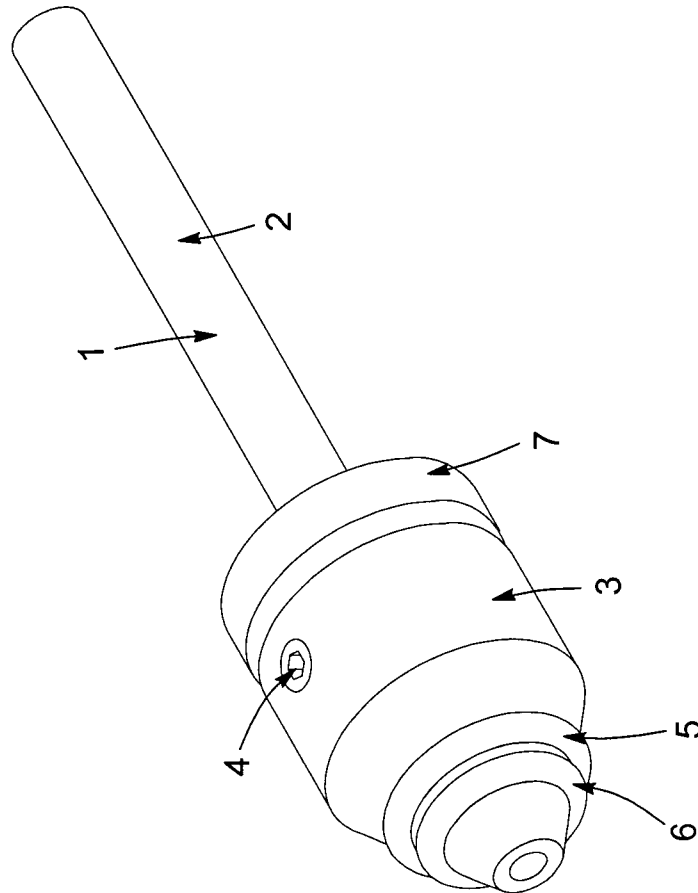
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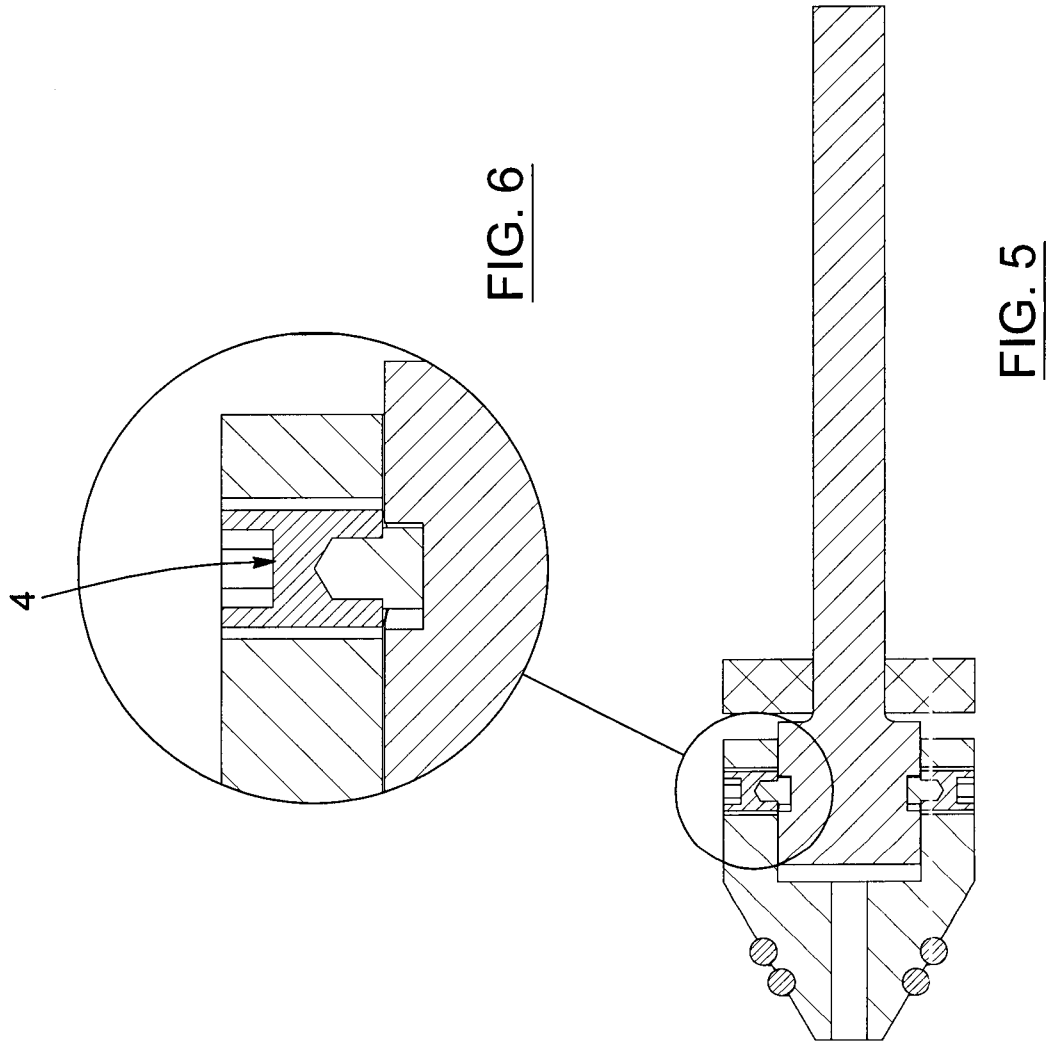
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FIG. 2FIG. 3

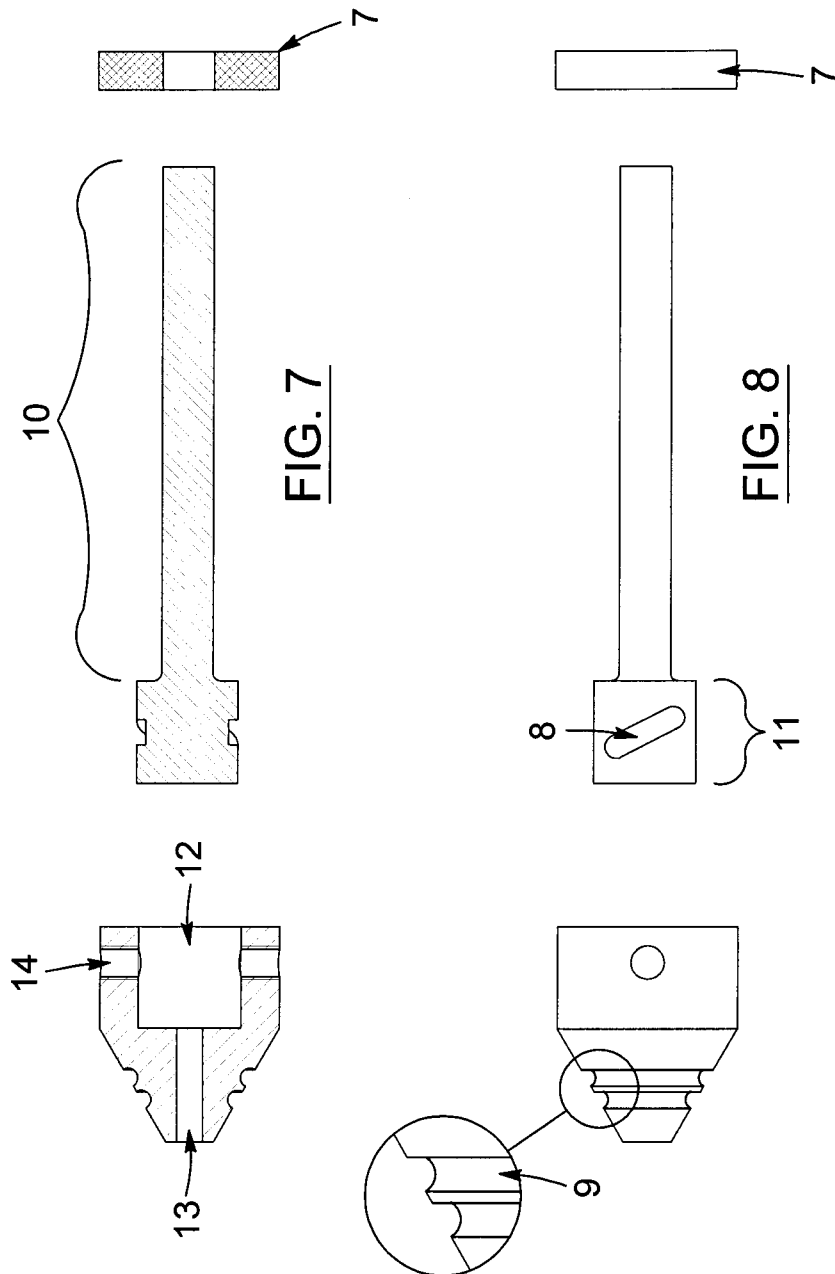
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FIG. 4

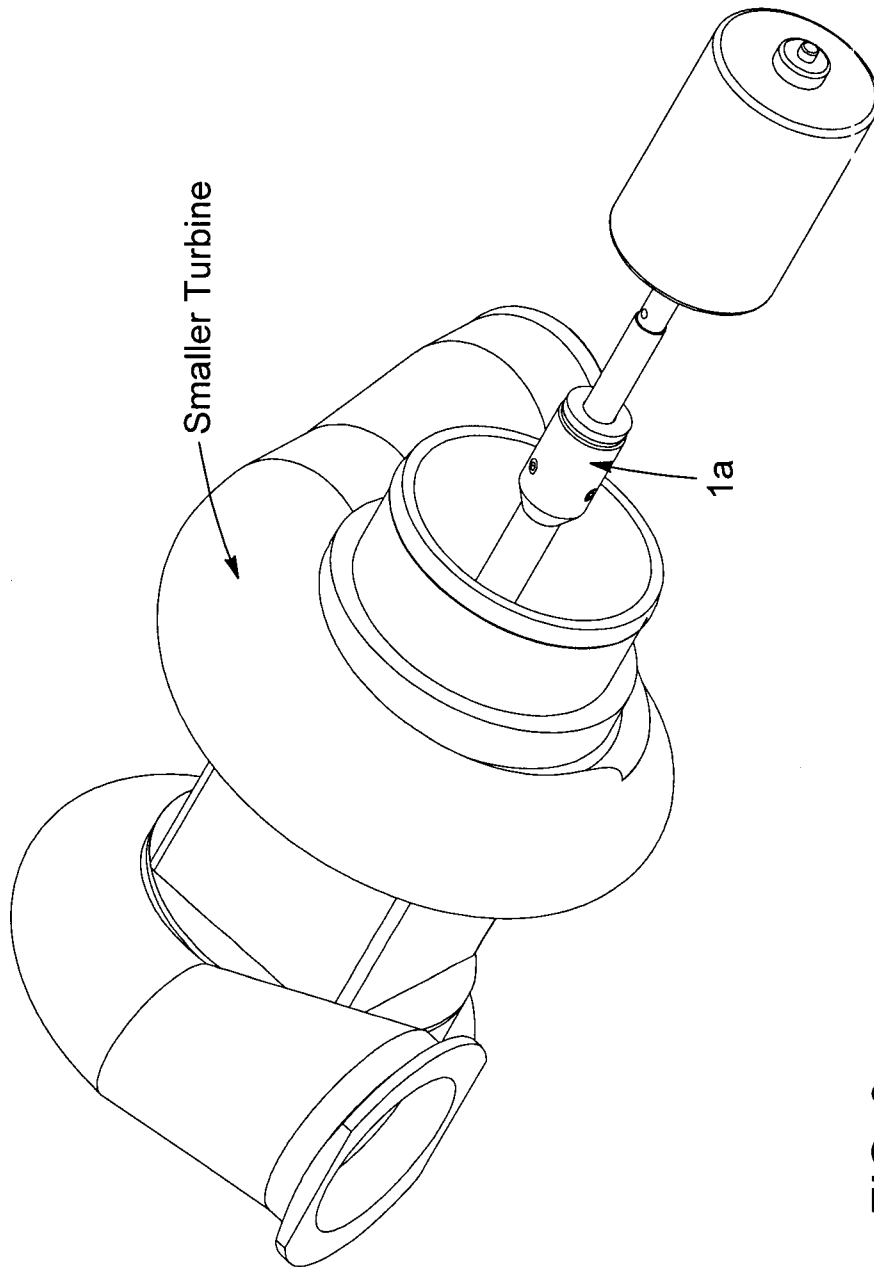
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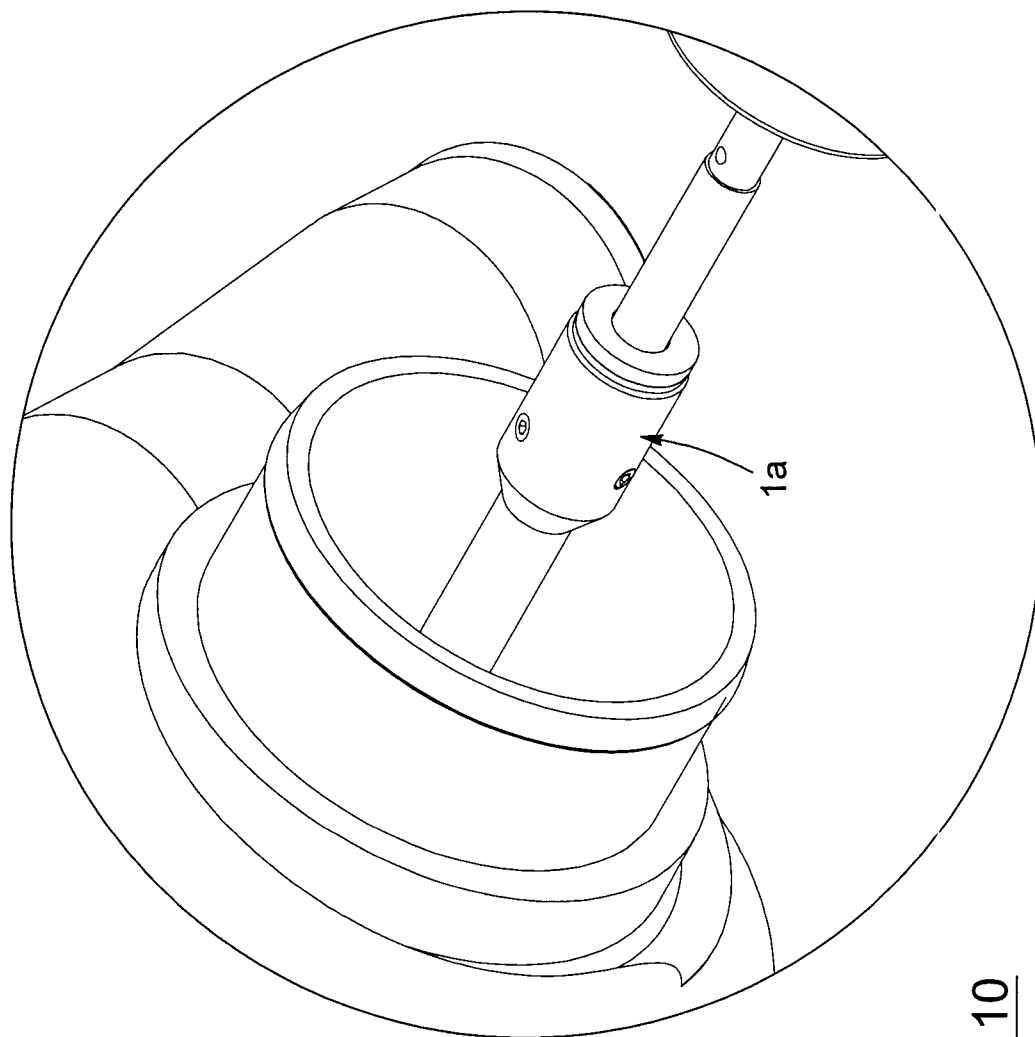
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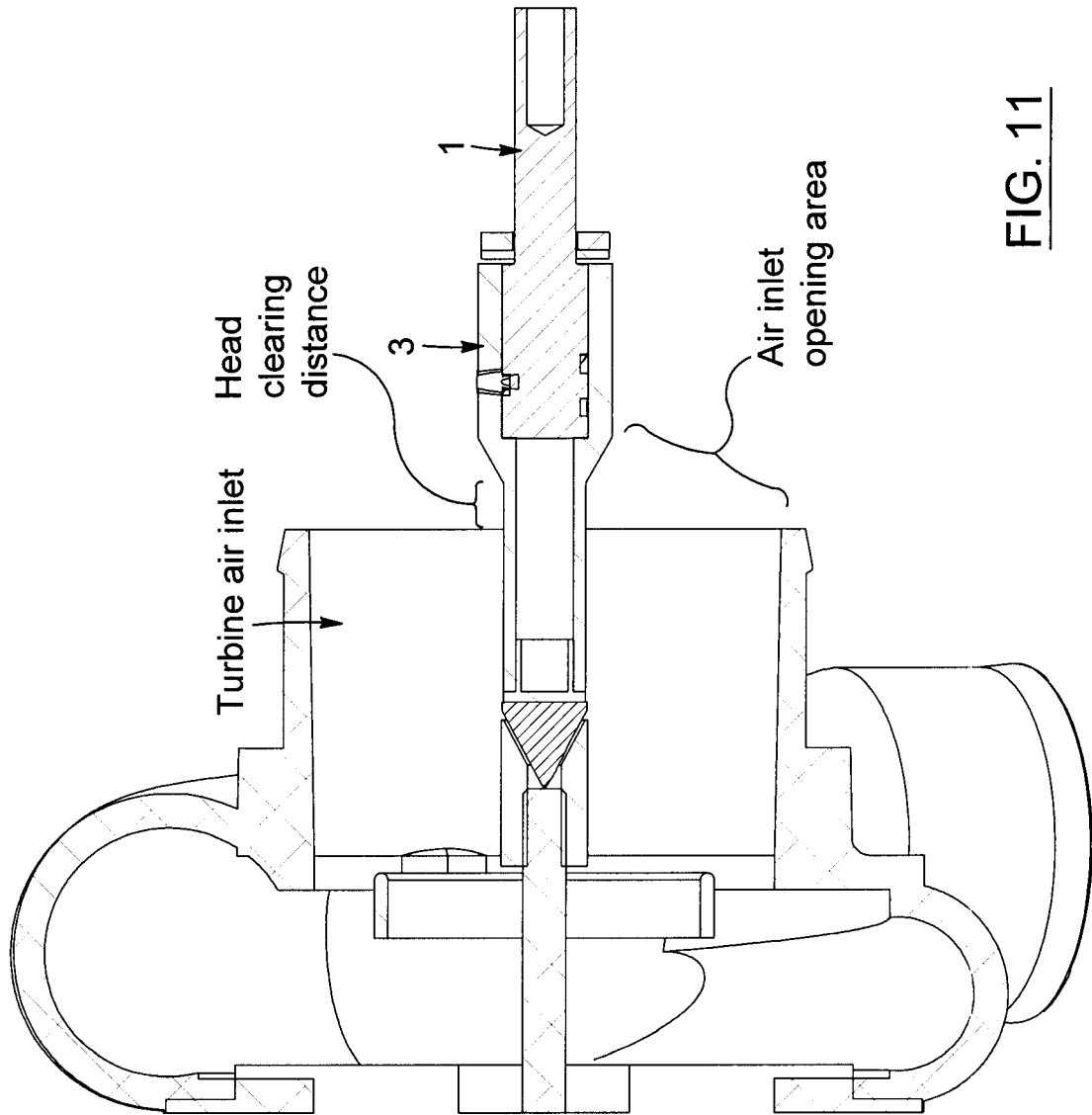
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FIG. 9

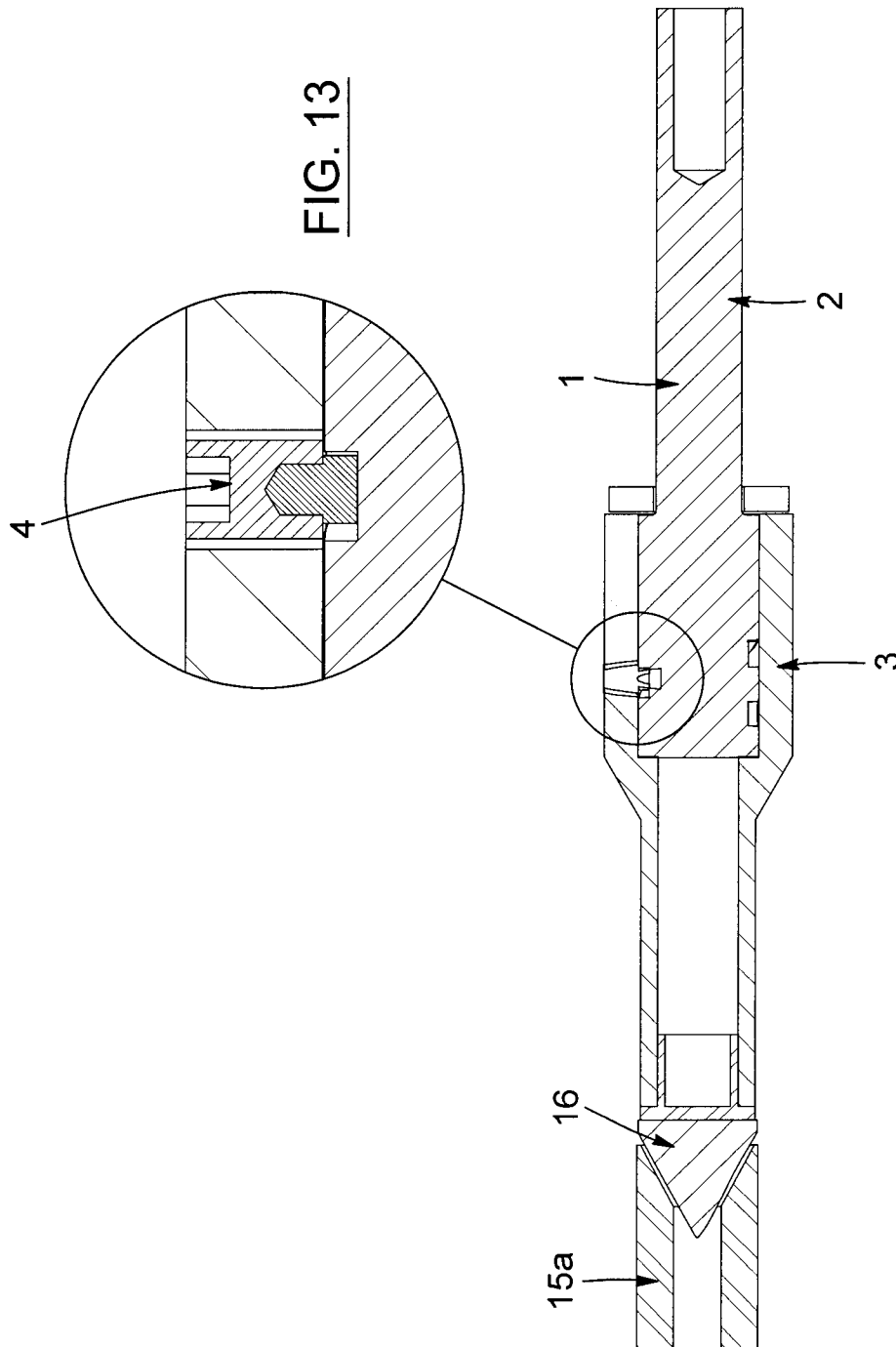
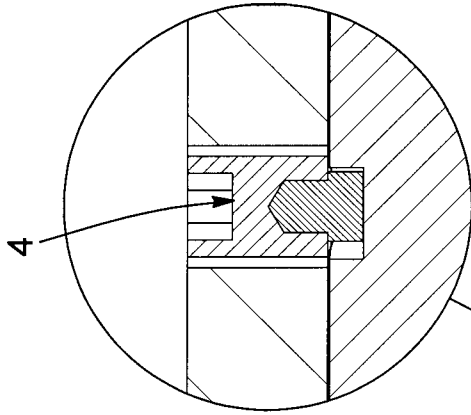
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FIG. 10

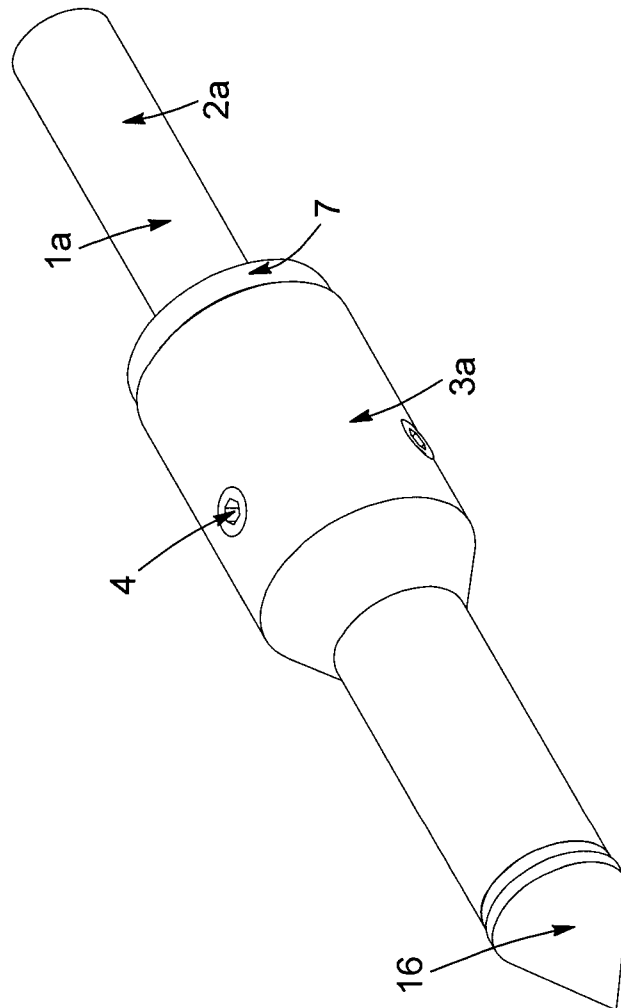
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FIG. 11

9/13

FIG. 13

10/13

FIG. 14

11/13

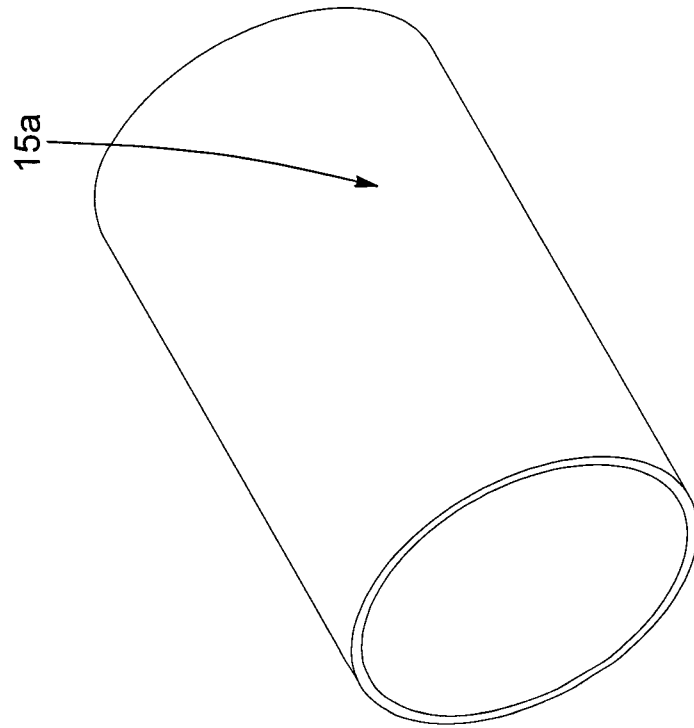
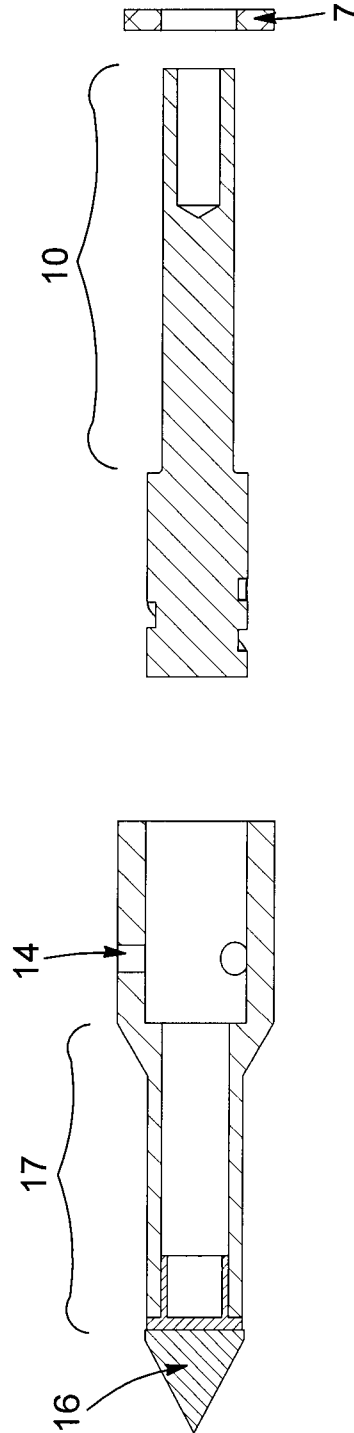


FIG. 15

12/13

FIG. 16

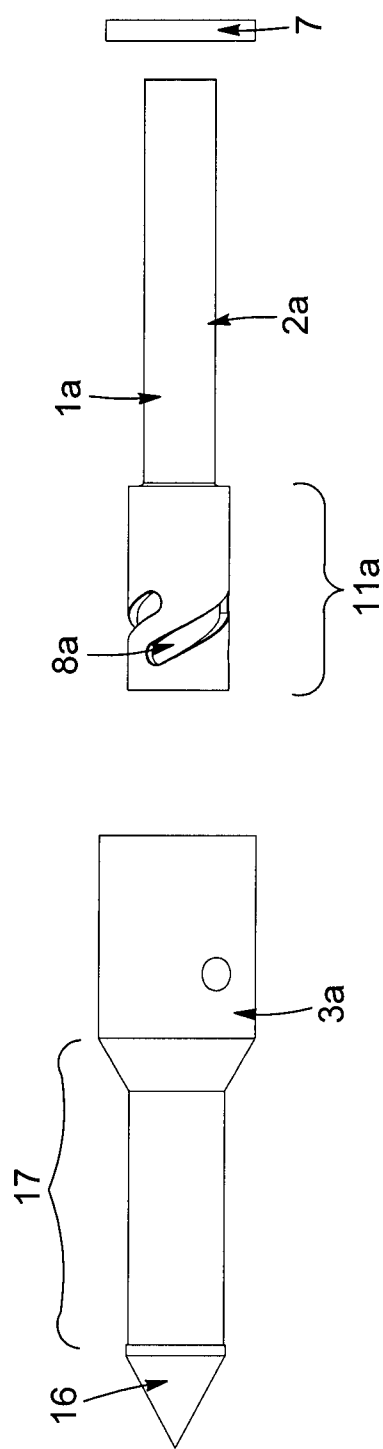


FIG. 17

