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(54) **HOOKING DEVICE WITH UNDERCUT COUPLING**

(57) The invention relates to a hooking device with undercut coupling. The device in question comprises a cylindrical body for undercut coupling (10,20,30,40), which is coupled to a body to be hooked, the upper part of which is connected to a connection system (4) that allows the connection of the device to another system such as for example a transport system; the cylindrical body comprises a coupling part (10a,20a,30a,40a) that has a surface provided with undercuts, is securely connected to the connection system (4), and has a lateral surface that extends over an angle with an amplitude less than 180°; the cylindrical body further comprises a centring part (10b,20b,30b,40b) that has a smooth lateral surface and has a diameter equal to the diameter of the cylindrical body without its undercuts; the two parts of the body (10,20,30,40) are mutually separable by means of a translation that brings them from a working position, in which the two parts are joined together to form the body (10,20,30,40), to a position for insertion into the body to be hooked, in which the centring part is always external to the body to be hooked.

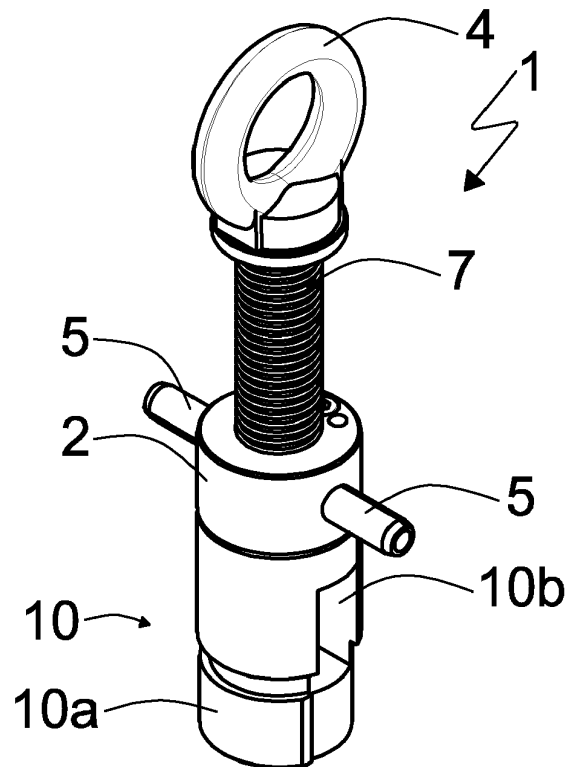


FIG.1

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Description

[0001] The present invention relates to a hooking device with undercut coupling. This refers in particular to devices used for hooking bodies, generally made from metal, and provided with a hole portion and/or a pin portion and/or a threaded portion that must be transported by transport systems that make these bodies slide along processing lines; for example, these devices are used to hook metal casings to painting lines, but can be hooked to metal elements that can be transported inside any production process or storage step of the metal element.

[0002] Bolts are currently used that bear, on the head, systems for the connection to the transport system which can be for example eyelets, hooks, snap-hooks, or any other known system for connection to a handling/piece processing line; a criterion for the choice of the type of connection system provided on the bolt depends on the corresponding connection system provided on the piece handling/transport line. These bolts are screwed into threaded holes present in the body to be transported so as to be integral with the body itself; the bolt itself connects with the connection system provided on the head of the bolt, therefore the body integral therewith, to the transport line; the body and the bolt are thus suspended on the transport line. Similar devices provide an internally threaded hole that is screwed onto a bolt in the body to be transported.

[0003] Generally the bodies to hang and transport are mechanical pieces of considerable weight and size and thus the connection between the hooking device and the body must therefore be particularly solid and secure; for this purpose the threaded part of the device which couples with the body to be transported is equipped with numerous pitches of screws that assure a firm connection between the hooking device and the body to be hooked.

[0004] The screwing of the hooking device to the threaded hole of the body to be hooked is carried out manually; the operator assigned to this task must therefore make several turns of the device to ensure that the expected number of pitches of the threads of the device couples with the threads present in the body to be hooked. Normally an annular abutment surface is provided which alerts the operator of the completion of the screwing of the device on the body to be hooked.

[0005] This manual screwing task requires a rather long amount of time and is repeated many times during a work shift; this involves the use of a high percentage of the time of a work shift with a tedious and repetitive task. Furthermore it may occur, although fortunately not frequently, that due to the operator's distraction or fatigue the device is not completely screwed onto the piece to be hooked and therefore the connection between the device and the body to be hooked is not as solid as it should be; this can lead to the detachment of the body from the hooking device with obvious serious consequences.

[0006] The object of the present invention is to eliminate the drawbacks of the known devices by providing a

hooking device that allows an easy and quick fixing to and removal from the body to be supported.

[0007] Another object of the present invention is to always ensure a correct and secure connection between the hooking device and the body to be hooked.

[0008] Another object of the present invention is that of providing a device that is easy and cheap to construct.

[0009] An advantage of the present invention is that of being able to be used in replacement of current devices of known type.

[0010] These objects and advantages and others still are all achieved by the invention in question, as characterised by the claims.

[0011] Further characteristics and advantages of the invention will become more apparent from the detailed description given hereinafter with reference to the accompanying drawings provided by way of non-limiting example, of various embodiments of the hooking device in question in which:

- figure 1 is an axonometric view of a first embodiment of the hooking device in question;
- figure 2 is a longitudinal sectional view of the hooking device of figure 1 in an operative hooking configuration;
- figure 3 is a longitudinal sectional view of the hooking device of figure 1 in an operative hooking configuration, preliminary to the configuration of figure 2;
- figure 4 shows an enlarged scale of a detail of figure 2 with the parts in working position inserted in a threaded hole of a body to be hooked;
- figure 5 is an axonometric view of a variant of the hooking device of figure 1;
- figure 6 is an axonometric view of a second embodiment of the hooking device in question;
- figure 7 shows a longitudinal section of the device of figure 6 in an operative configuration of centring the body to be hooked;
- figure 8 shows a longitudinal section of the device of figure 6 in an operative configuration of hooking the body to be hooked;
- figure 9 is an axonometric view of a third variant embodiment of the hooking device;
- figure 10 shows a longitudinal section of the device of figure 9 in a hooking configuration;
- figure 11 shows a longitudinal section of the device of figure 9 in a centring configuration preliminary to the hooking configuration of figure 10;
- figure 12 is an axonometric view of a fourth variant embodiment of the hooking device;
- figure 13 shows a longitudinal section of the hooking device of figure 12 in an operative hooking configuration;
- figure 14 shows a longitudinal section of the hooking device of figure 12 in an operative centring configuration preliminary to the hooking configuration of figure 13;

[0012] In the attached figures the reference number 1 generally indicates a hooking device in accordance with the present invention, realised in different variants.

[0013] The device 1 is normally used for hooking a body, generally made of metal, provided with a portion with a hole (threaded or provided with an undercut) or a pin portion (threaded or cylindrical with a narrowing section forming an undercut).

[0014] The aforesaid body is, by means of the device 1, transported by a handling system that moves it along processing and/or storage lines.

[0015] This type of hooking can however be used for any application that requires hooking bodies provided with threaded holes or pins.

[0016] The device 1 comprises a cylindrical body for undercut coupling 10,20,30,40, which couples on a body to be hooked C1,C2,C3,C4. A connection system 4 is connected at the top of the device that allows the connection of the device to a transport system also not shown in the figures; this connection system, which depends on the corresponding connection system provided on the transport system, can be an eyelet, as shown in the figures, or a hook, a snap-hook, a threaded pin, a pin with a blind threaded hole, or any other known system for connection to a transport system or in any case a system intended to support bodies to be hooked.

[0017] The cylindrical body comprises a coupling part 10a,20a,30a,40a, which is securely connected to the connection system 4 and has a surface provided with undercuts, which will be described in more detail herein below illustrating the various embodiments of the device; in all the embodiments illustrated the lateral surface of the coupling part extends over an arc of amplitude less than 180°.

[0018] The cylindrical body further comprises a centring part 10b,20b,30b,40b which has a smooth lateral surface and a diameter equal to the diameter of the cylindrical body without its undercuts.

[0019] In particular, each undercut can be defined by one or more reliefs, preferably defined by a cylindrical surface of the coupling part 10a,20a,30a,40a and by one or more cavities made in the cylindrical surface, or radial ridges, preferably comprising one or more threads, with a greater diameter than the diameter of the base of the coupling part.

[0020] The two parts of the cylindrical body are mutually separable by means of a translation that brings them from a working position, in which the two parts are joined together to form the cylindrical body 10,20,30,40, to a position for insertion into the body to be hooked, in which the centring part is always external to the body to be hooked. The working position also corresponds to a resting position assumed by the device when it is not used.

[0021] The device comprises a central element 3 on the upper part of which the connection system 4 is securely connected and on the lower part of which the coupling part 10a,20a,30a,40a of the cylindrical body is formed. The device further comprises a bushing 2 that

is provided with the ability to slide in the axial direction on the central element 3; the centring part 10b,20b,30b,40b of the cylindrical body is securely connected to the lower part of the bushing. A pair of pins 5 is provided on the bushing which are arranged coaxially to each other and are projecting in a radial direction from opposite parts of the bushing 2 so as to be able to be easily gripped with the fingers of one hand.

[0022] A recess 8 is provided in the central element 3 which is shaped and arranged so as to house the centring part 10b,20b,30b,40b of the body 1 when the device is in the insertion position; the upper surface of the recess also defines the end of stroke of the insertion position.

[0023] The device comprises means for mutually translating the two parts of the cylindrical body so as to bring them from the working position to the insertion position, and vice versa. The translation takes place by sliding in the axial direction of two flat surfaces that are placed in contact with each other, are respectively arranged on each of the parts of the cylindrical body and define the surface of separation and contact between the parts of the cylindrical body. This translation is performed by sliding the bushing 2 on the central element 3.

[0024] Elastic means 7 is also provided, shown in the figures in the preferred form of a helical spring, which has the function of keeping the two parts of the cylindrical body in working position and preventing the insertion position from being reached; in other words, the elastic means 7 is compressed by the bushing 2 when the device is moved from the working position (or resting position) to the insertion position, and brings back the device from the insertion position to the working position.

[0025] The device also comprises a radial abutment surface 6 that is formed on the top of the cylindrical body 10 and defines an end of stroke of the insertion of the cylindrical element in the body to be hooked.

[0026] In a first embodiment illustrated in figures 1-4, the device 1 is adapted to couple with a body C1 to be hooked equipped with a threaded hole, the coupling part 10a has a threaded outer lateral surface; the centring part 10b is a cylindrical portion that has a smooth outer lateral surface and has a diameter equal to the core diameter of the threaded coupling part. In other words, the centring part does not provide undercuts which are instead represented by the ridges of the threading present in the coupling part.

[0027] In this embodiment, shown in figures 1 to 4, the centring part 10b extends with an arc which is complementary to that of the coupling part, i.e. completes a 360° angle with the latter.

[0028] In a possible variant of the first embodiment of the device shown in figure 5, the centring part 10b is a cylindrical portion, delimited by two planes parallel to the axis of the cylindrical body, whose lateral surface extends over an arc of amplitude less than 180°; in other words, in this embodiment the centring part does not complete the cylindrical body but defines only a part thereof in any case sufficient, as will be better described hereinafter, to

carry out the centring of the cylindrical body, even if incomplete, inside the threaded hole provided on the body to be hooked.

[0029] In a second embodiment of the device illustrated in figures 6-8, adapted to couple with a body C2 to be hooked provided with a threaded pin, the coupling part 20a has an internal recess 8 with a threaded inner lateral surface that couples with the threaded pin of the body C2 to be hooked. In this second embodiment the centring part 20b has an internal recess 8 with a smooth inner lateral surface having a diameter equal to the nominal diameter of the threaded coupling part. Also in this case, the centring part does not provide undercuts which are instead represented by the ridges of the threading present in the coupling part.

[0030] In a third embodiment of the device shown in figures 9 to 11, the coupling part 30a and the centring part 30b have a diameter equal to the diameter of a hole provided on the body C3 to be hooked. A radial projection 30c is provided on the lower end of the coupling wall 30a. Said radial projection 30c extends outwards from the coupling portion 30a.

[0031] The hole provided on the body C3 to be hooked must be a through-hole or must provide an inner annular recess in which the radial projection 30c can be inserted following the coupling of the device. Naturally the length of the cylindrical body of the device must be such as to allow it to cross the hole or to insert the radial projection 30c in the annular recess of the hole of the body to be hooked. Also in this embodiment the centring part 30b can be complete, as in the first embodiment, or a cylindrical portion delimited by two planes parallel to the axis of the cylindrical body, as in the third embodiment previously described; this possible embodiment of the device with the centring part 30b shaped like that of the second embodiment is not illustrated in the figures, as it is perfectly intuitive.

[0032] In a fourth embodiment of the device in question, illustrated in figures 12 to 14, the coupling part 40a and the centring part 40b share an internal hole with a diameter equal to the diameter of a pin provided on the body C4 to be hooked; the lower end of the coupling part 40a is provided with a radial projection 40c.

[0033] Said projection 40c extends, with a radial trend, from the coupling part 40a towards the centring part 40b.

[0034] The pin provided on the body C4 to be hooked must provide a narrowing section on the inner diameter so as to form an inner annular recess in which the radial projection 40c can be inserted following the coupling with the device. Naturally the length of the cylindrical body 40 of the device must be such as to allow it to cross the entirely cylindrical portion of the pin such that the radial projection 40c can couple in the annular recess of the pin of the body C4 to be hooked. Also in this embodiment the centring part 40b can be complete, as in the first embodiment, or a cylindrical portion delimited by two planes parallel to the axis of the cylindrical body, as in the third embodiment previously described; this possible embod-

iment of the device with the centring part 40b shaped like that of the third embodiment is not illustrated in the figures, as it is perfectly intuitive.

[0035] The operation of the device in question, equal (mutatis mutandis) for all the embodiments, will be described below.

[0036] The device is normally in the resting position, which as mentioned above corresponds to the working position.

[0037] To hook a body the pins 5 are grasped and the bushing 2 is pulled upwards, which is integral with the centring part that then disengages from the cylindrical part of the device; the lifting terminates when the centring part abuts on the upper surface of the recess 8 and the device 1 is located in the insertion position.

[0038] In this position the coupling part is coupled to the body to be hooked; given that the coupling part of the device extends over an arc with an amplitude less than 180° it is possible to couple it to the body to be hooked without its undercuts interfering with the elements of the body itself. In some embodiments of the device 1 the coupling portion is inserted slightly offset towards the inside of the holes provided on the body to be coupled; in this way the threads of the parts 10a and 20a do not interfere with the threads of the threaded hole present in the body to be hooked and can thus be freely inserted; likewise the annular projection 30c or 40c does not interfere with the inner surface of the hole present in the body to be hooked (or narrowing section of the pin) and can thus be freely inserted until it exits the hole or arrives at its annular groove. In the second embodiment the coupling part is inserted slightly offset towards the outside of the pin provided on the body to be coupled; in this way the threads of the part 20a do not interfere with the threads of the threaded pin present in the body to be hooked and the part 20a can therefore be freely fitted on the pin.

[0039] Once the coupling part is inserted, the pins 5 and the bushing 2 are released so that the centring part, pushed by the spring 7, returns to the working position being inserted into the body to be coupled; the insertion of the centring part is free and possible because this part has no undercuts which could hinder the descent.

[0040] The descent of the centring part 10b,20b,30b,40b returns the cylindrical body 10,20,30,40 in axis so that the undercuts present in the coupling part 10a,20a,30a,40a are coupled with the corresponding elements present in the body to be hooked and, interacting with them, thus ensure the secure connection between the hooking device and the body to be hooked.

[0041] Once coupled with the body to be hooked, the cylindrical body 10,20,30,40 is perfectly coupled and coaxial with the corresponding element present on the body to be hooked without creating clearances (obviously except for those envisaged in the processing phase) that can cause oscillations or unwanted movements of the coupling.

[0042] As it is intuitive to understand, the unhooking of the device from the body to be hooked is carried out with movements similar to those previously described for the hooking operation.

[0043] By acting on the pins 5, the bushing 2 is pulled upwards which causes the raising of the centring part and its disengagement from the body to be hooked; causing a slight misalignment of the coupling part then disengages this part of the body to be hooked. By releasing the pins 5 and the bushing 2, the spring 7 brings back the device, all the parts of which are completely released from the body to be hooked, to its resting position (working), thus arranging the device for a new use.

Claims

1. A hooking device with undercut coupling, of the type that comprises a cylindrical body for undercut coupling (10,20,30,40), which is coupled to a body (C1,C2,C3,C4) to be hooked, the upper part of which is connected to a connection system (4) that allows the connection of the device to another system, **characterised in that** the cylindrical body (10,20,30,40) comprises a coupling part (10a,20a,30a,40a), securely connected to the connection system (4), having a surface equipped with undercuts, and a centring part (10b,20b,30b,40b) having a lateral surface without undercuts; the lateral surface of the coupling part extends over an angle of amplitude less than 180°; the centring part has a diameter that is equal to the diameter of the cylindrical body without its undercuts; the two parts of the body (1) are mutually separable by means of a translation parallel to the axis of the cylindrical body (10,20,30,40) that brings them from a working position, in which the two parts are joined together to form the cylindrical body (10,20,30,40), to a position for insertion into the body to be hooked, in which the centring part is always external to the body to be hooked.
2. The device according to claim 1, **characterised in that** it comprises means for mutually translating the two parts of the cylindrical body (10,20,30,40) by means of sliding in the axial direction of two flat surfaces that are placed in contact with each other, are respectively arranged on each of the parts of the cylindrical body, and define the surface of separation and contact between the parts of the cylindrical body.
3. The device according to one or more of the preceding claims, **characterised in that** the undercut is defined by one or more radial reliefs or ridges having a diameter greater than the base diameter of the coupling part (10a, 20a, 30a, 40a).
4. The device according to claim 3, **characterised in that** said one or more ridges comprises one or more threads.
5. The device according to one or more of the preceding claims, **characterised in that** the coupling part (10a) has a threaded outer lateral surface that couples with a threaded hole provided on the body to be hooked (C1).
6. The device according to claim 3, **characterised in that** said one or more reliefs is defined by a cylindrical surface of said coupling part (10a, 20a, 30a, 40a) and by one or more cavities made in said cylindrical surface.
7. The device according to one or more of the preceding claims, **characterised in that** it comprises a central element (3), on the upper part of which the connection system (4) is securely connected and on the lower part of which the coupling part (10a,20a,30a,40a) of the cylindrical body is formed; a bushing (2), provided with the ability to slide in the axial direction on the central element (3), at the lower part of which the centring part (10b,20b,30b,40b) of the cylindrical body is securely connected; a recess (8), formed in the central element (3), shaped and arranged so as to house the centring part (10b,20b,30b,40b) of the cylindrical body (10,20,30,40) when the device is in the insertion position, and to define the end of stroke of this position; elastic means (7) for keeping the two parts of the cylindrical body in working position and to prevent the insertion position from being reached.
8. The device according to claim 7, **characterised in that** it comprises a radial abutment surface (6), formed on the top of the cylindrical body (10,20,30,40), which defines an end of stroke of the insertion of the cylindrical element in the body to be hooked.
9. The device according to claim 7 or 8, **characterised in that** it comprises a pair of pins (5) arranged coaxially and projecting in a radial direction from opposite parts of the bushing (2).
10. The device according to one or more of the claims from 7 to 9, **characterised in that** the coupling part (20a) has an internal recess with a threaded lateral surface that couples with a threaded pin provided on the body (C2) to be hooked; the centring part (20b) has an internal recess with a smooth lateral surface having a diameter that is equal to the nominal diameter of the threaded coupling part.
11. The device according to one or more of the claims from 7 to 9, **characterised in that** the centring part (10b) is a cylindrical portion, delimited by two planes

parallel to the axis of the cylindrical body, the lateral surface of which extends over an arc with an amplitude less than 180°.

12. The device according to one or more of the claims from 7 to 9 when dependent on claim 3 or 6, **characterised in that** the coupling part (30a) and the centring part (30b) have a diameter that is substantially equal to the diameter of a hole provided on the body (C3) to be hooked; said one or more reliefs comprising a radial projection (30c) arranged on the lower end of the coupling portion (30a) and extending outwards and away from the coupling portion from the coupling portion (30a).
13. The device according to one or more of the claims from 7 to 9 when dependent on claim 3 or 6, **characterised in that** the coupling part (40a) and the centring part (40b) have an inner hole with a diameter that is equal to the diameter of a pin provided on the body (C4) to be hooked; said one or more reliefs comprising a radial projection (40c) arranged on the lower end of the coupling part and extending outwards from the coupling portion (40a) towards the centring portion (40b).

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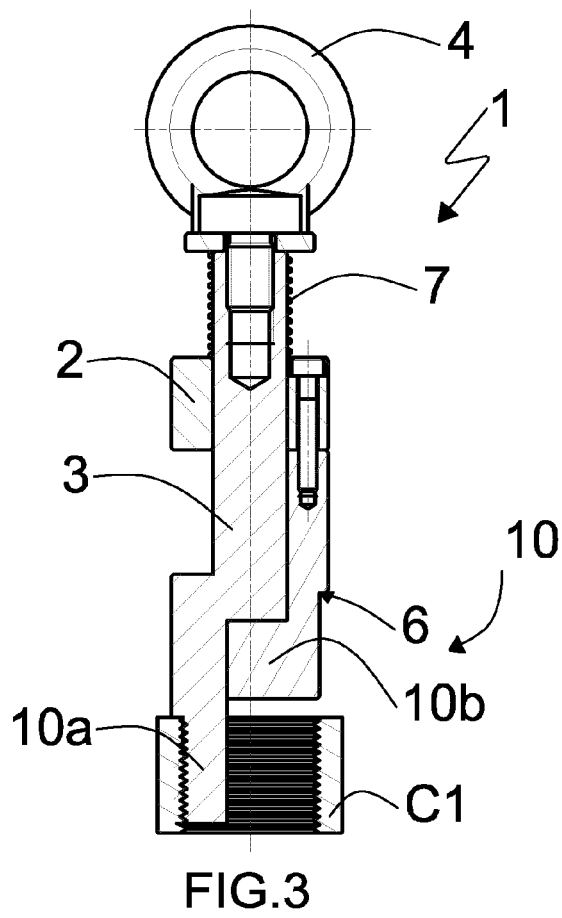
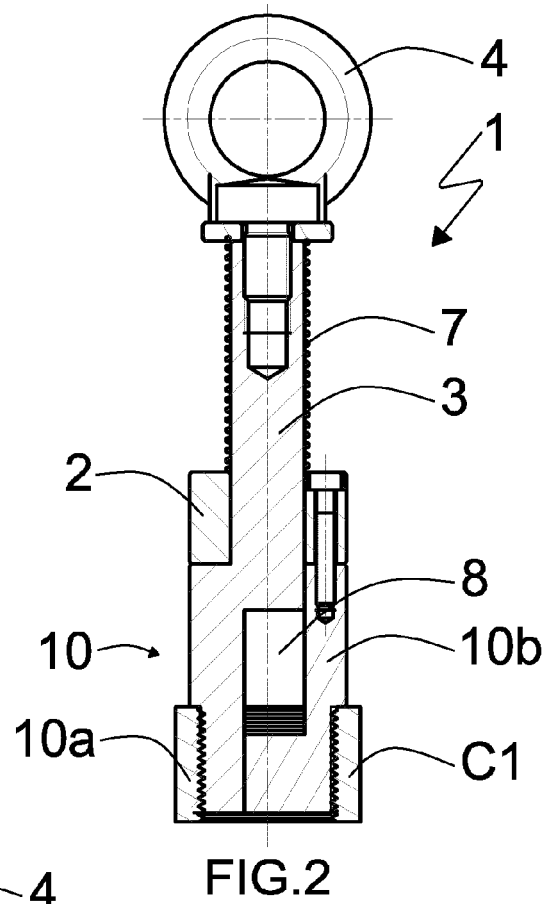
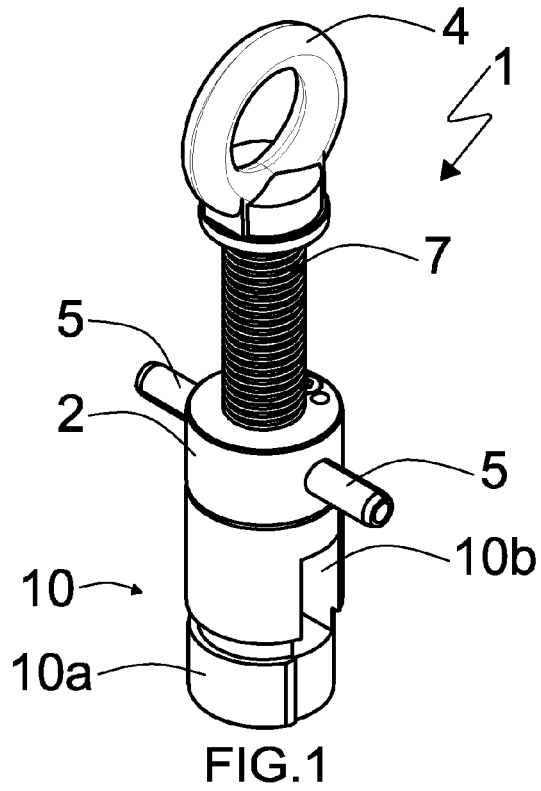
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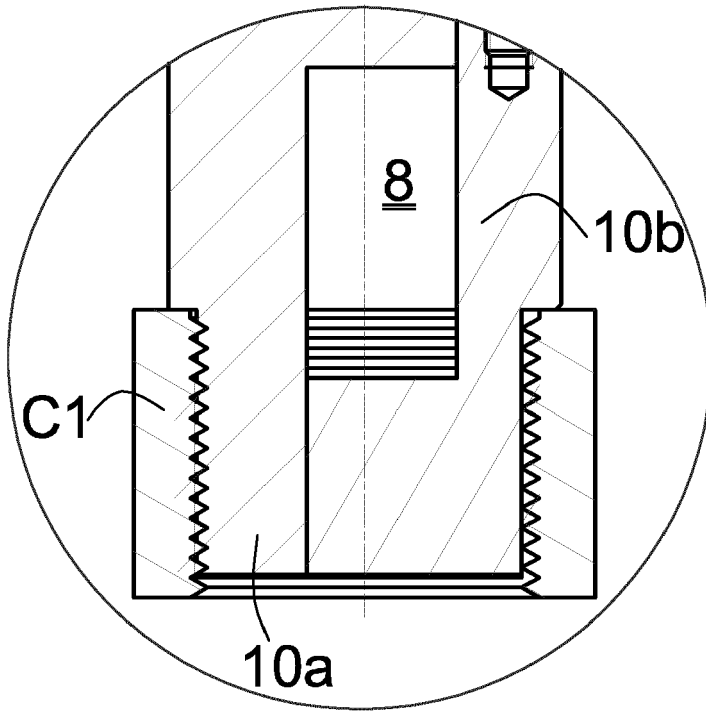


FIG. 4

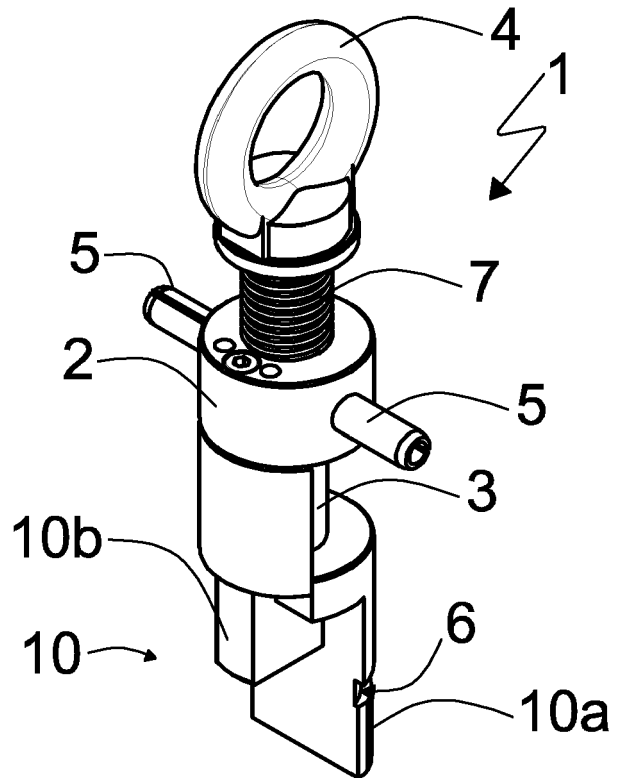


FIG. 5

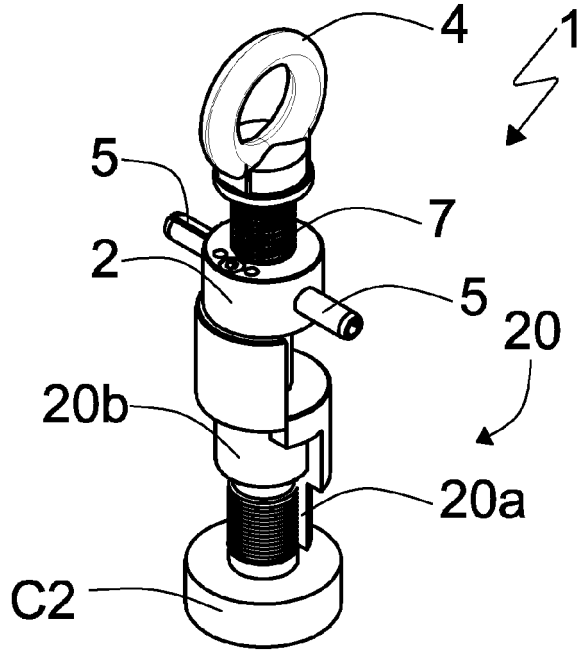


FIG. 6

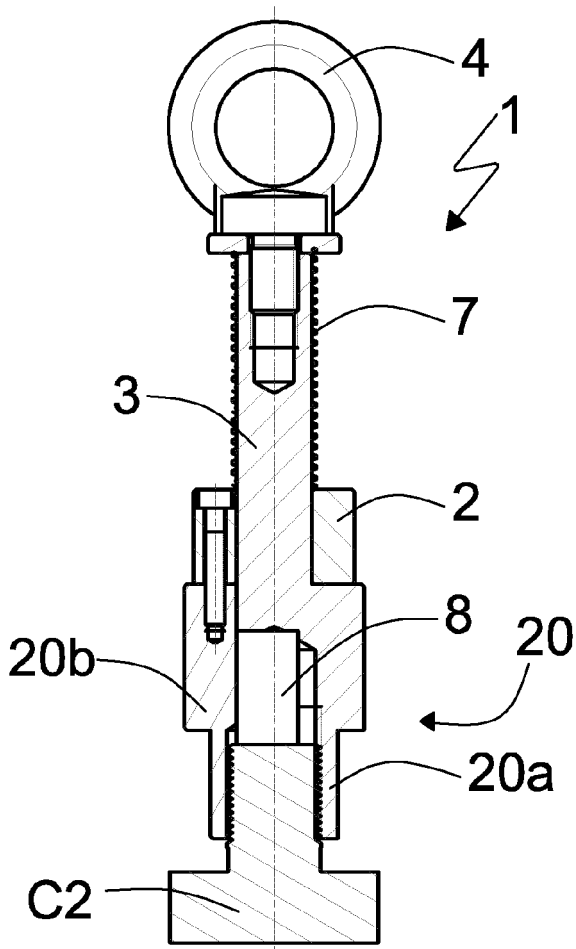


FIG. 7

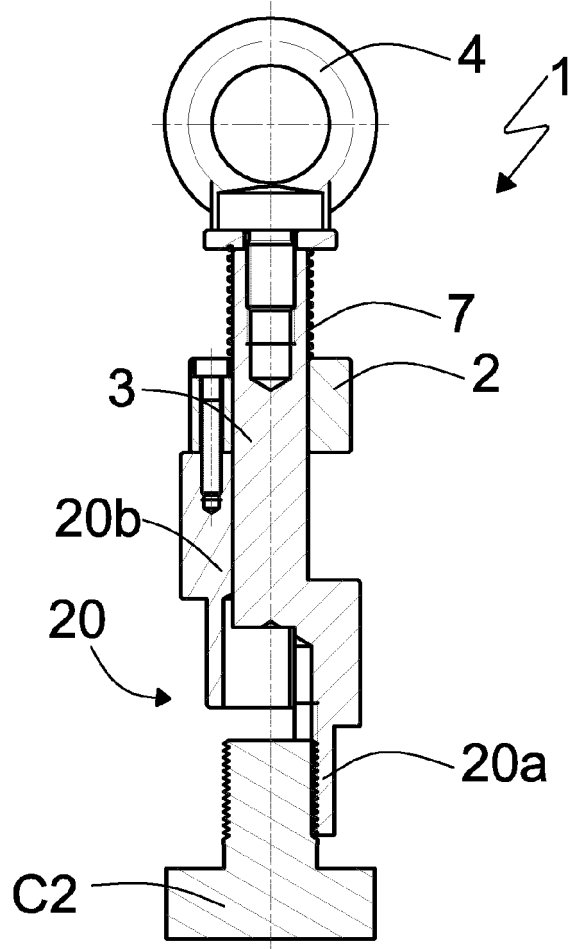
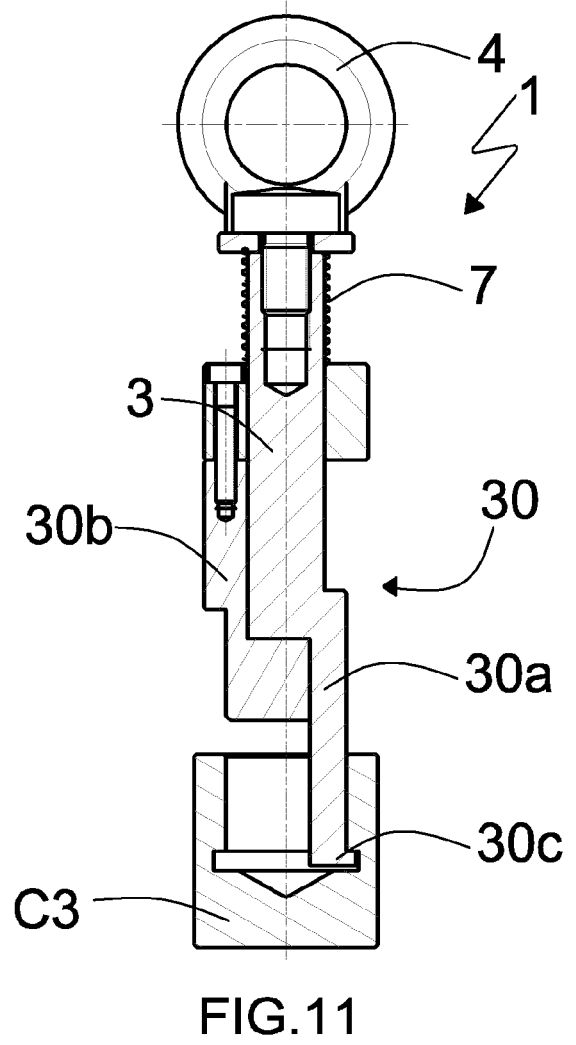
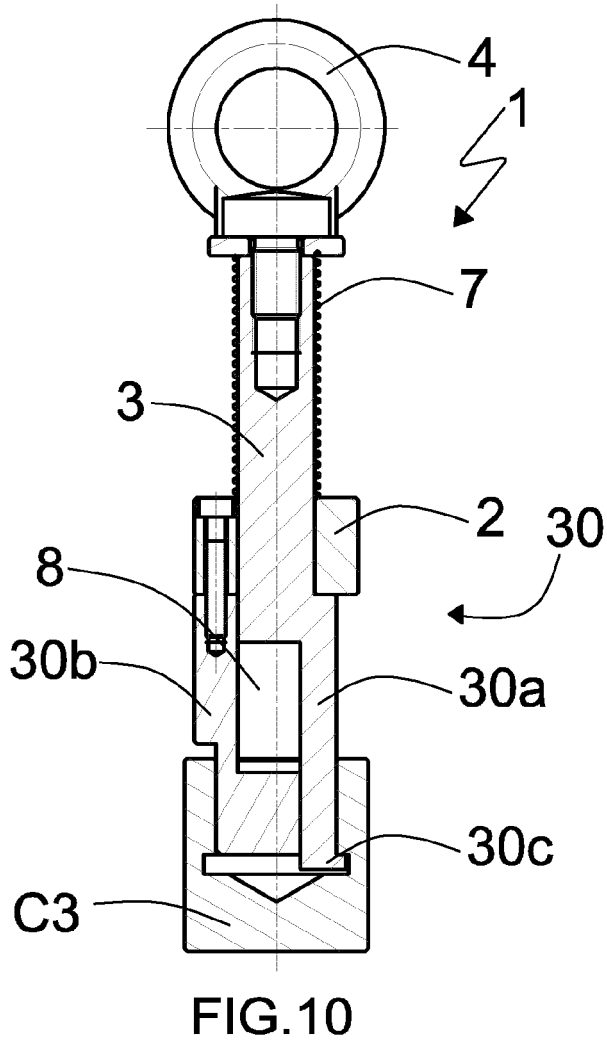
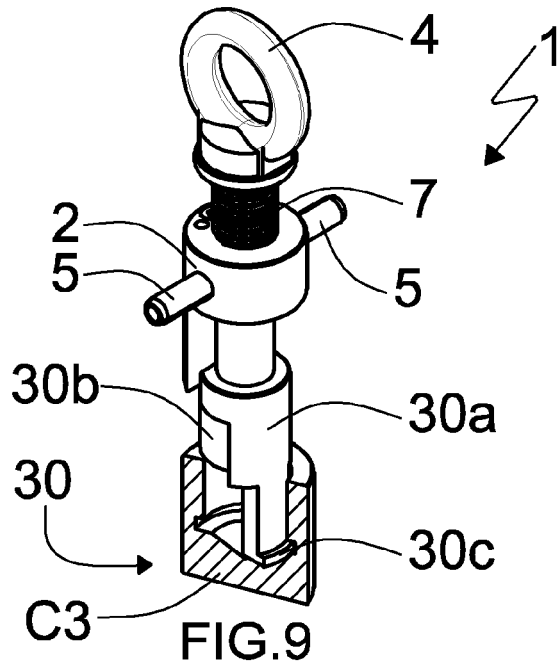
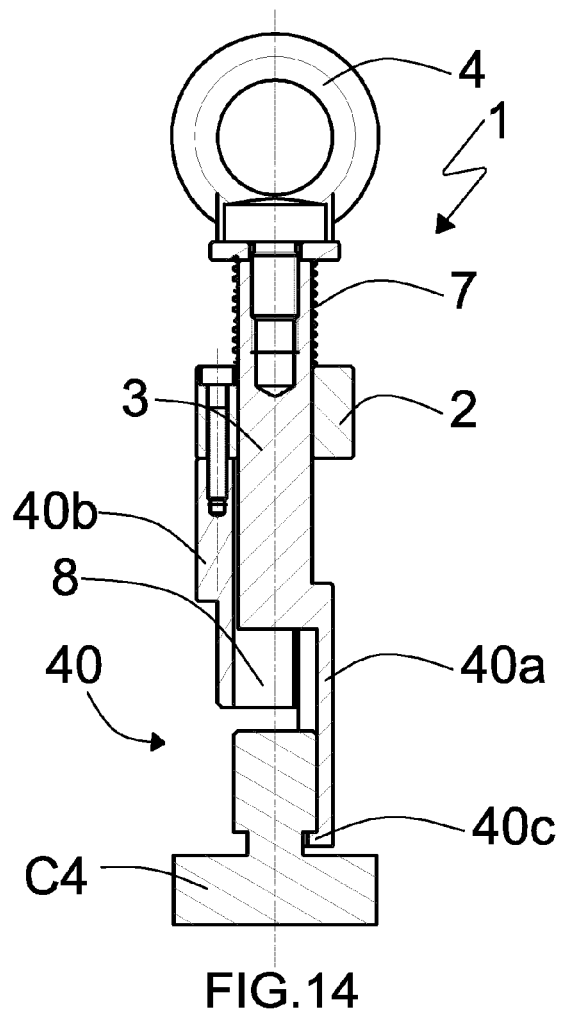
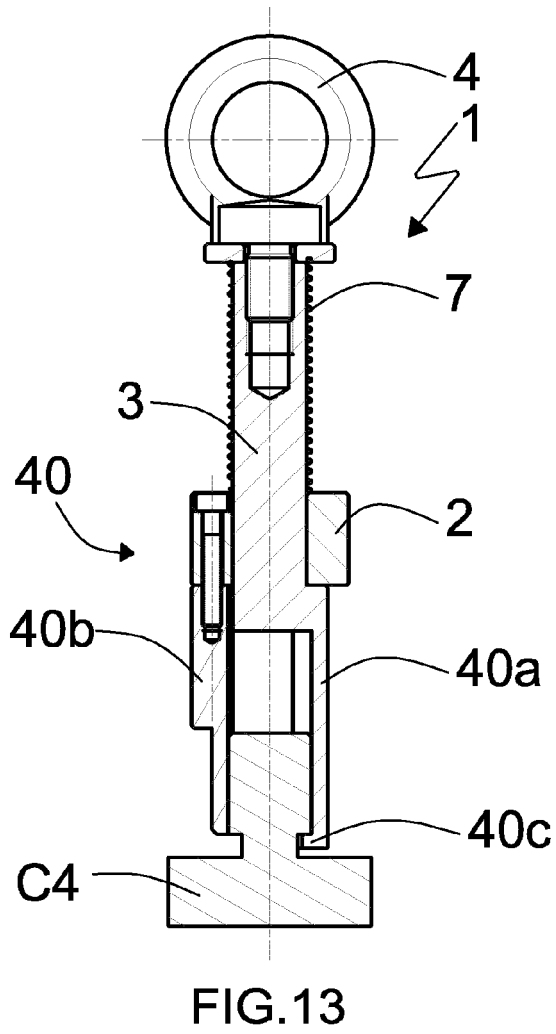
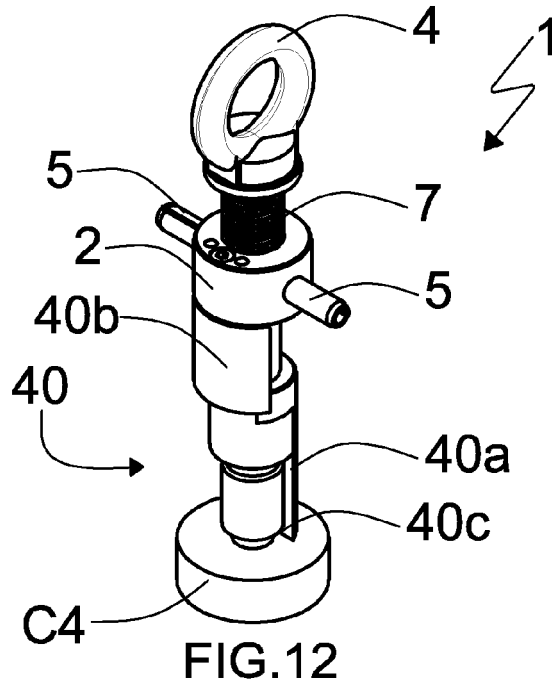


FIG. 8







EUROPEAN SEARCH REPORT

Application Number
EP 19 19 6351

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 139 278 A (CHARCON TUNNELS LTD) 7 November 1984 (1984-11-07)	1-4,6-8	INV. B66C1/66
Y	* page 1, lines 116-126 * * abstract * * figures *	5,9-13	
Y	----- JP H05 306091 A (KUROSAKI REFRACTORIES CO) 19 November 1993 (1993-11-19)	5,9,10, 12,13	
A	* Google Translation * * abstract * * figures *	1	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
The Hague		15 January 2020	Colletti, Roberta
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.02 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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