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(54) **Cantilever-mounted sliding expanding shaft**

Fliegend gelagerte gleitende aufspreizbare Welle

Arbre expansible coulissant en porte-à-faux

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Description

[0001] The present invention relates to a cantilever-mounted expanding shaft. In particular it relates to a sliding expanding shaft.

[0002] Expanding shafts are used in a wide range of applications where a reel or a bobbin with a hollow core must be rotatably supported. In particular applications, for example in the field of winding/unwinding machines for printing or for the manufacture of rolls of kitchen film, when the reels are of limited length and the weights involved are not greater than a some tens of kilos, the expanding shafts may be mounted rotatably in cantilever fashion on a support structure, instead of being supported at both ends as is required for more demanding applications.

[0003] In these applications it is desirable to be able to displace longitudinally the reel locked on the shaft, so as to align it perfectly with the other components of the plant in which it is used. This requirement is of vital importance in plants for winding/unwinding thin films (for example aluminium foil for alimentary use) or in printing plants, where even a small misalignment between the reel and the winding/unwinding components may result rapidly in breakage of the film itself.

[0004] Moreover, the cantilever structure involves undeniable advantages from the point of view of the rapidity and ease of assembly and disassembly of the reel on the shaft, without taking into account the smaller dimensions and lower cost of the structure supporting the shaft itself. However, a person skilled in the art is obviously also aware how the limitations of structural strength, in a cantilever configuration, result in a very restrictive design specification; all the more so if, as in this sector, there are also problems of a dynamic nature (for example, phenomena associated with fatigue, excessive bending, centrifugal loads resulting from eccentricity, etc.) and it is necessary to ensure a high rigidity so that high winding/unwinding speeds of the reel may be tolerated (of the order of even 250 m/sec.).

[0005] Sliding expanding shafts have thus been developed, being composed essentially of a supporting shaft on which there is mounted in a sliding manner, but locked in rotation, a cylinder provided with extractable gripping splines or keys which are able to grip the internal core of the reel. After the reel has been loaded and locked on the expanding shaft, having checked a rough alignment of the reel with the corresponding components of the plant, the expanding shaft is made to slide longitudinally by the amount needed to be able to perform those small adjustments which allow perfect alignment of the reel to be obtained.

[0006] An illustrative sliding expanding shaft is shown in the enclosed Fig. 1 which is a partial longitudinal section of a sliding expanding shaft according to the known art.

[0007] As can be seen in Fig. 1, a hollow cylinder 1, from which suitable elements (not shown) for gripping the reel may be radially extracted, is slidably mounted on a supporting shaft 2 by means of bushes or bearings 3. A duct 4, for a fluid under pressure, passes through the supporting shaft 2 and leads to an interstice 4a - bounded by seals 5, by the internal surface of the hollow cylinder 1 and by the external surface of the supporting shaft 2 - which distributes the fluid under pressure to a system for extracting/retracting the gripping elements.

[0008] Moreover, a root end 2a of the supporting shaft 2 is rotatably mounted, by means of a bearing (not shown), on the winding/unwinding machine, while the other cantilever end 2b terminates in a knob 6 which can be rotated with respect to the hollow cylinder 1 and the shaft 2, but is locked in the longitudinal direction. This knob 6 acts, by means of a screw/female thread connection, on a head-piece or nose-piece 7 fixed to the hollow cylinder 1 and hence also slidable longitudinally on the supporting shaft 2 but locked in rotation, with respect to the latter, by means of a key 8.

[0009] With this construction, the hollow cylinder 1 is made to rotate by the supporting shaft 2. When the knob 6 is made to rotate with respect to the shaft 2, as a result of the screw connection the relative sliding between the supporting shaft 2 and the head-piece/hollow cylinder assembly is obtained, thus making it possible to perform the desired longitudinal adjustment in the alignment of the expanding shaft.

[0010] This construction, however, although it is widely accepted by the market, has various drawbacks.

[0011] A first drawback arises during the longitudinal adjustment of the expanding cylinder on the supporting shaft, which may be performed only when the reel is at a standstill or running at a very slow speed. In fact, the adjusting knob, acting on the supporting shaft and on the head-piece of the hollow cylinder, is made to rotate together with the expanding shaft during operation of the winding/unwinding machine and therefore it is not possible to operate it externally. However, in many situations, it is desirable to be able to perform adjustment while the reel is rotating and this may be done only by a skilful operator who is able to intervene very rapidly at the right moment at very slow speeds of rotation.

[0012] Another drawback is represented by the difficulties of conveying into the rotating shaft the fluid under pressure used for operation of the mechanism for retracting/extracting the gripping elements. The duct for the fluid under pressure, in fact, passes through the most part of the supporting shaft so as to communicate the extraction/retraction system with an external pressure source. Inevitably, it is necessary to provide, at some point in the apparatus, a rotating joint which distributes the fluid under pressure to the rotatable shaft, in some cases also during rotation of this latter. It is therefore necessary to provide this equipment as well which, in particular, is costly and delicate and therefore increases the cost of purchase and maintenance of the entire machine.

[0013] Finally, some employing limitations occurs due

to the particular geometry of the shaft according to the known art. In fact, in order to be able to fit a reel onto it, the hollow cylinder has an external diameter which is smaller than the internal diameter of the core of the reel which normally, for standardisation purposes, is either 74 mm or 69 mm. In turn, the supporting shaft, which has a constant cross-section so as to be able to slide inside the hollow cylinder, has a maximum diameter which is necessarily limited by the internal diameter of the hollow cylinder. Moreover, this latter diameter is defined by the nominal thickness of the cylinder itself which, in order to be able to house the mechanism actuating the extractable gripping elements, on account of the material from which it is made may not in any case be less than about one centimetre. Over and above structural considerations, it must nevertheless be considered also that the reduction in the thickness of the hollow cylinder, resulting in a smaller depth of the seat for the gripping elements, allows a smaller extraction stroke to be obtained for the gripping elements: this outcome is certainly disadvantageous since it results in less flexible use of the expanding shaft.

[0014] Ultimately, therefore, the maximum diameter of the supporting shaft - taking as a reference the more restrictive standard situation - is normally less than 25 mm: this results in a resistant section which is able to bear a maximum working length of 500 mm and a maximum load of 37 kg.

[0015] These constitute undoubtedly limitations with regard to use of the sliding expanding shafts of the known art.

[0016] US 3.908.926 discloses an expanding shaft where a main spindle is mounted fixed on a frame structure and an expanding sleeve is rotatably and slideably mounted thereon. An adjusting knob is provided at the distal end of said spindle and it is able to act against said slidable and rotatable expanding sleeve.

[0017] The object of the present invention is to overcome fully the disadvantages of the known art illustrated hitherto. In particular, the aim is to provide an improved sliding expanding shaft which may be adjusted with regard to its longitudinal position also during rotation at operating speed and, according to other advantageous aspects, does not impose particular restrictions on the dimensions of the resisting section, and no longer requires the installation of a rotating joint for distribution of the fluid under pressure.

[0018] These objects are achieved, by providing an axially sliding expanding shaft according to the appended claims.

[0019] Further characteristic features and advantages of the device according to the invention will emerge, however, more clearly from the detailed description which follows, of some preferred embodiments thereof, provided by way of example and illustrated in the accompanying drawings, in which:

Fig. 1, as already mentioned, is an interrupted longitudinal section of a shaft according to the known art; and

Fig. 2 is an interrupted longitudinal section of a preferred embodiment of the invention.

[0020] As shown both in Fig. 1 and in Fig. 2, a sliding expanding shaft is comprised of an expanding cylinder 11, provided with a system for moving radially extractable gripping elements (not shown), a main shaft 12 and an adjusting head-piece 17 in which an adjusting knob 16 is engaged.

[0021] According to the invention, a tie-rod 21 is inserted longitudinally inside the main shaft 12 and the expanding cylinder 10, emerging axially from the head-piece 17 and from the free end of the main shaft.

[0022] A fastening end 21a (the right-hand end in Fig. 2) of the tie-rod 21 is connected to the adjusting head-piece 17 by means of the knob 16 so that the mutual positional relationship between the head-piece 17 and the tie-rod 21 may be set by operating the knob 16. For example, as shown in Fig. 2, the knob 16 is fitted, being fixed in translation and free in rotation, onto the fastening end 21a and, at the same time, is engaged in a seat 17a of the head-piece 17 by means of a screw/female thread connection.

[0023] According to a preferred embodiment, the tie-rod 21, in turn, is connected to a locking system (not shown) - provided, for example, on the winding/unwinding machine support structure - which hold the tie-rod 21 standstill both in rotation and in translation with respect to the shaft 12 and the cylinder 11. Therefore, the main function of the tie-rod 21 is that of providing a connection between the locking system and the adjusting head-piece 17, through the knob 16, such that rotation of the knob itself, inside the threaded seat 17a of the head-piece 17, is translated into a translatory movement of the head-piece 17, and hence of the entire expanding cylinder 11, thus resulting in the desired longitudinal sliding which allows the adjustment in the alignment of the reel, mounted on the expanding shaft, with respect to the locking system, i.e. to the support structure of the winding/unwinding machine.

[0024] It should be pointed out that the tie-rod 21, since it does not have any substantial structural function, may have any small diameter as required, provided that it can withstand to the axial force applied to it by the adjusting knob 16. Therefore, the hole for passage of the rod 21 inside the main shaft 12 and inside the expanding cylinder 11 affects only marginally the resisting section of the expanding shaft, all more so if compared with the hole present in the hollow cylinder of the known art.

[0025] According to the preferred embodiment of the invention, the adjusting head-piece 17 is free in rotation from the cylinder 11 and is locked in rotation on the tie-rod 21 by means of a key 24 which allows only the longitudinal translation thereof. In particular the head-piece 17 has a hub 17b on which a radial bearing 23 is mount-

ed, the outer raceway of which being housed in a corresponding seat of the expanding cylinder 11. The bearing 23 is suitably mounted, so as to be able to transfer the longitudinal movement imparted by the knob 16 to the head-piece 17, also to the expanding cylinder.

[0026] Consequently, the tie-rod 21, the adjusting head-piece 17 and the knob 16 remain static even during rotation of the reel. This allows the main object of the invention to be achieved. In particular, the fact that the adjusting knob remains static also during rotation of the expanding shaft advantageously allows adjustment of the alignment to be performed also during rotation of the reel.

[0027] The tie-rod 21 may contain a duct 27 for the distribution of a fluid under pressure to the system for actuating the gripping elements. Accordingly, sliding seals 50 would be provided between the tie-rod 21 and the internal surface of the shaft 12.

[0028] Therefore, it is no longer necessary to use an additional rotating joint for distribution of the fluid under pressure to the internal duct 27 of the tie-rod 21, since the tie-rod itself is fixed with respect to the external support structure and therefore may be supplied using an ordinary static joint. This leads to the achievement of another object of the invention.

[0029] By way of alternative or in addition, in the cases where it is not indispensable to distribute continuously the fluid under pressure also during rotation of the expanding shaft, the system for moving the gripping elements may be supplied by means of a charging valve 28 arranged radially in a suitable seat formed in the thickness of the expanding cylinder. With this arrangement, obviously, the fluid under pressure may be inlet or allowed to flow out through the valve 28 only under static conditions, i.e. when the reel is at a standstill.

[0030] According to another preferred embodiment of the invention (shown in Fig. 2), the main shaft 12, on the one hand, is fixed to the expanding cylinder 11 - by means of any fixing means, for example by means of a forced connection or a screw/female thread connection 12a - and, on the other hand, is inserted inside a bell piece 20. The bell piece 20 is rotatably mounted, by means of bearings (not shown), on a support structure represented, for example, by the winding/unwinding machine.

[0031] Sliding bearings 13 are arranged between the bell piece 20 and the main shaft 12: the latter is therefore free to slide inside the bell piece 20, but the relative rotation between these two elements is prevented by the presence of a key 18 which is fixed to the main shaft 12 and slidable in a suitable seat 18a formed in the thickness of the bell piece 20.

[0032] In other words, the expanding shaft is manufactured according to a completely new and innovative configuration compared to the known art: the sliding function is performed by the shaft 12 and a special mechanical member, the bell piece 20, which is completely free from constructional limitations of the expanding cylinder. In this way another object of the invention is achieved. The main shaft may in fact have not only an external diameter which is as large as required, but also an internal hole of very small dimensions: therefore the resisting section of the main shaft 12, also at the point where it is subjected to the maximum bending stress, i. e. in the region of the junction fillet with the expanding cylinder 11, may be of wide dimensions, to the benefit of the maximum load which can be supported by the expanding shaft.

[0033] By way of example, it has been found that a sliding expanding shaft, manufactured according to this last preferred embodiment, with a working length of 500 mm, main shaft with a diameter of 40 mm and through-hole for the tie-rod 21 with a diameter of 16 mm, may easily support a load of up to 200 kg.

[0034] In this case, the tie-rod 21, can be mounted on a radial bearing 25 which is mounted on a base plate 26 integral with the bell piece 20, so that this latter can rotate independently of the rod 21. Sliding in longitudinal direction of the tie-rod 21 can be prevented by the bearing 25 itself.

[0035] It is understood, however, that the invention is not limited to the particular configurations which are illustrated above and which represent only non-limiting examples of the scope of the invention, but that numerous variations are possible, all within the grasp of a person skilled in the art, without thereby departing from the scope of the invention itself.

[0036] For example, although in the description reference has been made to embodiment in which the main shaft 12 is formed as part separate from the expanding cylinder 11, being assembled only subsequently - a choice this which results in a simpler machining process and hence undoubted advantages from a cost point of view - the same objects could be achieved with other techniques, for example by forming integrally the main shaft and the expanding cylinder.

[0037] Furthermore, the radial bearings may be replaced, on the basis also of the specific technological solution adopted, by sliding bearings, by combined thrust bearings or the like.

[0038] Finally, the adjusting knob can be provided on the opposite end 21b (the left-hand end in Fig. 2) of the tie-rod 21 projecting externally from the winding/unwinding machine. In this case, a drawing end 21a of the tie-rod 21 would be fixed in translation and free in rotation with respect to a drawn portion - for example the same head-piece 17 - of the cylinder/shaft assembly. Pushing or pulling the tie-rod 21 by means of the knob 16 mounted on the adjusting end 21b (which knob can engage with a threaded portion present on the support structure) provides for the sliding movement of the cylinder 11.

Claims

1. Axially sliding expanding shaft, of the type rotatably

mounted in cantilever fashion on a support structure of a winding/unwinding machine, comprising a main shaft (12) coupled with an expanding cylinder (11) provided with extractable gripping elements apt to retain the core of a reel mounted on the expanding shaft, **characterized in that** said main shaft (12) is rotatable and **in that** it further comprises a rod means (21), without a substantial structural function in radial direction and arranged longitudinally inside the main shaft (12) and the expanding cylinder (11), said rod being mounted free in rotation with respect to these latters and stationary in rotation/axial translation and cooperating with an adjusting portion (17) of the expanding cylinder/main shaft assembly and with an adjusting element (16), operation of said adjusting element (16) causing the sliding, of the expanding cylinder.

2. Expanding shaft as claimed in Claim 1, in which said adjusting element (16) is a knob acting, on one hand, on a fastening end (21a) of said rod means (21) and, on the other hand, on the adjusting portion (17) of the expanding cylinder/main shaft assembly.

3. Expanding shaft as claimed in Claim 2, in which said adjusting portion (17) includes an adjusting head-piece, free in rotation with respect to said expanding cylinder but locked in rotation with respect to said rod means (21).

4. Expanding shaft as claimed in Claim 3, in which said adjusting head-piece (17) has a threaded seat (17a) which is engaged with a threaded portion of said knob (16), the knob being fixed in translation and free in rotation with respect to said fastening end (21a) of the rod means (21).

5. Expanding shaft as claimed in Claim 4, in which radial bearings (23) are provided between said adjusting head (17) and said expanding cylinder (11).

6. Expanding shaft as claimed in any one of the preceding claims, in which said rod means (21) is statically held by locking means provided on said support structure of the winding/unwinding machine.

7. Expanding shaft as claimed in Claim 1, in which said rod means (21) has a drawing end (21a), connected free in rotation but fixed in translation to a drawn portion (17) of the expanding cylinder/main shaft assembly, and an opposite adjusting end (21b) cooperating with the adjusting element (16) apt to cause sliding of the rod means.

8. Expanding shaft as claimed in Claim 7, in which said adjusting element (16) is a threaded knob, mounted on the support structure free in rotation but locked in translation, apt to engage with a threaded portion of said adjusting end (21b) of the rod means, rotation of the knob (16) being apt to cause translation of said rod means (21).

9. Expanding shaft as claimed in Claims 7 or 8, in which a bearing is provided between said drawing end (21a) and said drawn portion (17) of the expanding cylinder.

10. Expanding shaft as claimed in any one of the preceding Claims, in which said rod means (21) houses ducts (27) for distribution of a fluid under pressure apt to actuate said gripping elements.

11. Expanding shaft as in any one of the preceding Claims, chracterized in that said main shaft (12), on the one hand, is locked in rotation and in translation with said expanding cylinder (11) and, on the other hand, is slidable inside a bearing member (20) mounted rotatably on said support structure.

12. Expanding shaft as claimed in Claim 11, in which said bearing member (20) is a cylindrical bell piece.

13. Expanding shaft as claimed in Claim 12, in which sliding bearings (13) are provided between said main shaft (12) and said bell piece (20) and a longitudinal seat (18a), provided on said bell piece (20) or on said main shaft (12), is apt to house a guide key (18) fixed to said main shaft (12) or to said bell piece (20), respectively.

Patentansprüche

1. Axial verschiebliche Spreizwelle, in der Bauart, die drehbar in fliegend gelagerter Weise auf einer Tragstruktur einer Auf- und Abwickelvorrichtung gehalten ist, mit einer Hauptwelle (12), die mit einem Spreizzylinder (11) gekoppelt ist, der mit ausziehbaren Greifelementen versehen ist, die dazu bestimmt sind, den Kern einer auf der Spreizwelle gehaltenen Spule festzuhalten, **dadurch gekennzeichnet, daß** die Hauptwelle (12) drehbar ist und daß sie ferner ein Stangenmittel (21) aufweist, ohne eine wesentliche strukturelle Funktion in radialer Richtung und in Längsrichtung innerhalb der Hauptwelle (12) und des Spreizzylinders (11) angeordnet, wobei die Stange frei in Bezug auf eine Drehung gegenüber diesen beiden letztgenannten Teilen ist und ortsfest hinsichtlich Drehung bzw. axialer Verlagerung ist und mit einem Einstellabschnitt (17) der Baugruppe aus Spreizzylinder und Hauptwelle ist und mit einem Einstellelement (16) versehen ist, wobei eine Betätigung des Einstellelements (16) eine Verschiebung des Spreizzylinders zur Folge hat.

2. Spreizwelle nach Anspruch 1, **dadurch gekenn-**

zeichnet, daß das Einstellelement (16) ein Knopf ist, der auf der einen Seite auf ein Befestigungsende (21a) des Stangenmittels (21) und auf der anderen Seite auf den Einstellabschnitt (17) der Baugruppe aus Spreizzylinder und Hauptwelle einwirkt.

3. Spreizwelle nach Anspruch 2, **dadurch gekennzeichnet, daß** der Einstellabschnitt (17) ein der Einstellung dienendes Kopfteil aufweist, das in Bezug auf den Spreizzylinder zur Drehung frei ist, aber in Bezug auf das Stangenmittel (21) drehungsmäßig verriegelt ist.

4. Spreizwelle nach Anspruch 3, **dadurch gekennzeichnet, daß** das der Einstellung dienende Kopfteil (17) einen mit Gewinde versehenen Sitz (17a) aufweist, der mit einem mit Gewinde versehenen Abschnitt des Knopfs (16) in Eingriff steht, wobei der Knopf hinsichtlich einer Translation fixiert ist und zur Drehung in Bezug auf das Befestigungsende (21 a) des Stangenmittels (21) frei ist.

5. Spreizwelle nach Anspruch 4, **dadurch gekennzeichnet, daß** Radiallager (23) zwischen dem Einstellkopf (17) und dem Spreizzylinder (11) vorgesehen sind.

6. Spreizwelle nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** das Stangenmittel (21) durch Verriegelungsmittel statisch gehalten wird, die auf der Tragstruktur der Auf- und Abwickelvorrichtung angeordnet sind.

7. Spreizwelle nach Anspruch 1, **dadurch gekennzeichnet, daß** das Stangenmittel (21) ein Zugende (21a) aufweist, das zur Drehung frei, aber hinsichtlich einer Translation fixiert mit einem gezogenen Abschnitt (17) der Baugruppe aus Spreizzylinder und Hauptwelle verbunden ist, und ein gegenüberliegendes Einstellende (21b), das mit dem Einstellelement (16) zusammenwirkt, welches dazu bestimmt ist, eine Verschiebung des Stangenmittels zu veranlassen.

8. Spreizwelle nach Anspruch 7, **dadurch gekennzeichnet, daß** das Einstellelement (16) ein mit Gewinde versehener Knopf ist, der auf der Tragstruktur frei zur Drehung, aber hinsichtlich einer Translation verriegelt gehalten ist, und dazu bestimmt ist, mit einem mit Gewinde versehenen Abschnitt des Einstellendes (21b) des Stangenmittels zusammenzuwirken, wobei eine Drehung des Knopfs (16) dazu bestimmt ist, eine Translation des Stangenmittels (21) zu veranlassen.

9. Spreizwelle nach einem der Ansprüche 7 oder 8, **dadurch gekennzeichnet, daß** ein Lager zwischen dem Zugende (21a) und dem gezogenen Abschnitt (17) des Spreizzylinders vorgesehen ist.

10. Spreizwelle nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** das Stangenmittel (21) Kanäle (17) aufnimmt, um ein unter Druck stehendes Fluid zuzuführen bzw. zu verteilen, welches dazu bestimmt ist, die Greifelemente zu betätigen.

11. Spreizwelle nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** die Hauptwelle (12) auf der einen Seite hinsichtlich einer Drehung und einer Translation mit dem Spreizzylinder (11) verriegelt ist und auf der anderen Seite innerhalb eines Lagerungselements (20) verschieblich ist, welches drehbar auf der Tragstruktur gehalten ist.

12. Spreizwelle nach Anspruch 11, **dadurch gekennzeichnet, daß** das Lagerungselement (20) ein zylindrisches Muffenteil ist.

13. Spreizwelle nach Anspruch 12, **dadurch gekennzeichnet, daß** Gleitlager (13) zwischen der Hauptwelle (12) und dem Muffenteil (20) vorgesehen sind, wobei ein in Längsrichtung verlaufender Sitz (18a), der auf dem Muffenteil (20) oder auf der Hauptwelle (12) vorgesehen ist, dazu bestimmt ist, einen Führungskeil (18) aufzunehmen, der auf der Hauptwelle (12) oder auf dem Muffenteil (20) fixiert ist.

Revendications

1. Arbre extensible à coulissement axial, du type monté mobile en rotation, de façon en porte-à-faux, sur une structure de support d'une machine de bobinage / débobinage, comprenant un arbre principal (12) couplé avec un cylindre extensible (11) pourvu d'éléments de serrage pouvant se déployer aptes à maintenir le coeur d'une bobine monté sur l'arbre extensible, **caractérisé en ce que** ledit arbre principal (12) est mobile en rotation et **en ce qu'**il comprend en outre un moyen (21) formant tige n'assurant pas de fonction structurelle substantielle dans une direction radiale et agencé longitudinalement à l'intérieur dudit arbre principal (12) et du cylindre extensible (11), ladite tige étant montée libre en rotation par rapport à ces derniers, et stationnaire en rotation / translation axiale et coopérant avec une partie (17) de réglage de l'ensemble cylindre extensible / arbre principal et avec un élément (16) de réglage, la mise en oeuvre dudit élément (16) de réglage provoquant le coulissement du cylindre extensible.

2. Arbre extensible selon la revendication 1, dans lequel ledit élément (16) de réglage est un bouton

agissant, d'une part, sur une extrémité (21a) de fixation dudit moyen (21) formant tige et, d'autre part, sur la partie (17) de réglage de l'ensemble cylindre extensible / arbre principal.

3. Arbre extensible selon la revendication 2, dans lequel ladite partie (17) de réglage inclut une pièce de tête de réglage, libre en rotation par rapport audit cylindre extensible mais verrouillée en rotation par rapport audit moyen (21) formant tige.

4. Arbre extensible selon la revendication 3, dans lequel ladite pièce de tête (17) de réglage comporte un siège taraudé (17a) qui engage une partie filetée dudit bouton (16), le bouton étant fixe en translation et libre en rotation par rapport à ladite extrémité (21a) de fixation du moyen (21) formant tige.

5. Arbre extensible selon la revendication 4, dans lequel des paliers radiaux (23) sont prévus entre ladite tête (17) de réglage et ledit cylindre extensible (11).

6. Arbre extensible selon l'une quelconque des revendications précédentes, dans lequel ledit moyen (21) formant tige est maintenu de manière statique par un moyen de verrouillage prévu sur ladite structure de support de la machine de bobinage / débobinage.

7. Arbre extensible selon la revendication 1, dans lequel ledit moyen (21) formant tige comporte une extrémité (21a) d'entraînement, reliée libre en rotation mais fixe en translation à une partie conique (17) de l'ensemble cylindre extensible / arbre principal, et une extrémité (21b) de réglage opposée coopérant avec l'élément (16) de réglage apte à provoquer un coulissement dudit moyen formant tige.

8. Arbre extensible selon la revendication 7, dans lequel ledit élément (16) de réglage est un bouton fileté, monté libre en rotation mais verrouillé en translation sur la structure de support, apte à engager une partie taraudée de ladite extrémité (21b) de réglage du moyen formant tige, la rotation du bouton (16) étant apte à provoquer une translation dudit moyen (21) formant tige.

9. Arbre extensible selon la revendication 7 ou 8, dans lequel un palier est prévu entre ladite extrémité (21a) d'entraînement et ladite partie entraînée (17) du cylindre extensible.

10. Arbre extensible selon l'une quelconque des revendications précédentes, dans lequel ledit moyen (21) formant tige loge des conduits (27) destinés à une distribution d'un fluide sous pression apte à mettre en oeuvre lesdits éléments de serrage.

11. Arbre extensible selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit arbre principal (12), d'une part, est verrouillé en rotation et en translation avec ledit cylindre extensible (11) et, d'autre part, peut coulisser à l'intérieur d'un élément (20) de portée monté mobile en rotation sur ladite structure de support.

12. Arbre extensible selon la revendication 11, dans lequel ledit élément (20) de portée est une pièce formant cloche cylindrique.

13. Arbre extensible selon la revendication 12, dans lequel des paliers (13) de coulissement sont prévus entre ledit arbre principal (12) et ladite pièce (20) formant cloche, et un siège longitudinal (18a), réalisé sur ladite pièce (20) formant cloche, ou sur ledit arbre principal (12), est apte à loger une clavette (18) de guidage fixée, respectivement, audit arbre principal (12) ou à ladite pièce (20) formant cloche.

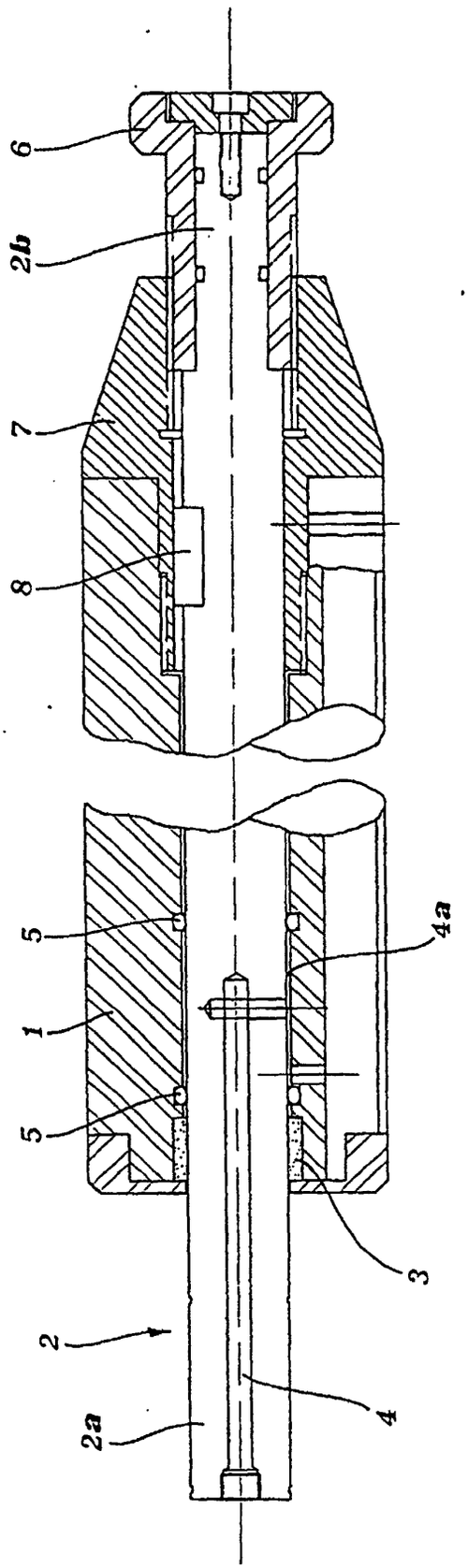

FIG. 1
PRIOR ART

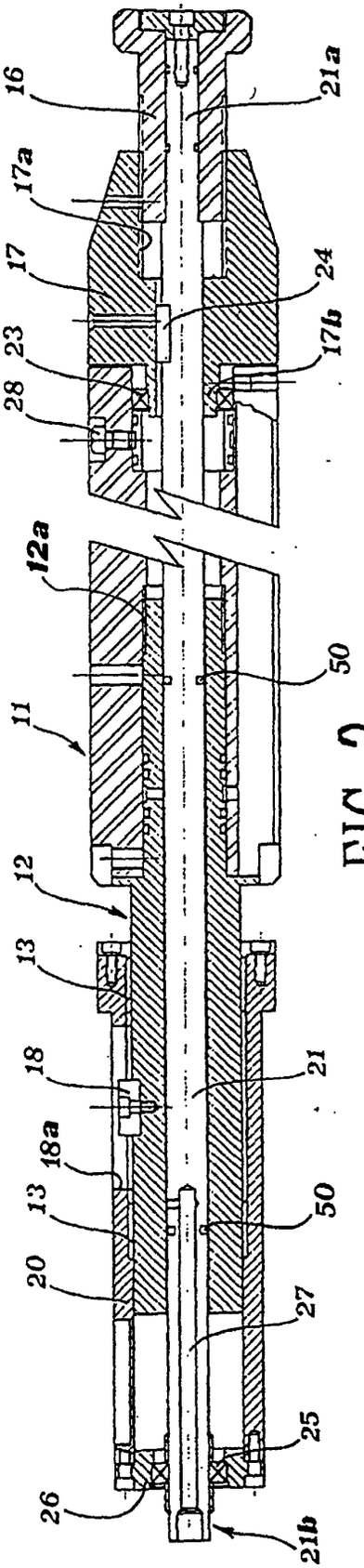

FIG. 2