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(54) **MANDREL HOLDER HEAD WITH RELEASE DEVICE**

DORNHALTERKOPF MIT TRENNVORRICHTUNG

TÊTE DE MAINTIEN DE MANDRIN AVEC DISPOSITIF DE DÉVERROUILLAGE

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Description

Field of the invention

[0001] The present invention relates to a mandrel holder head with release device, in particular for weldless tube rolling mills.

Background art

[0002] Means for retaining the internal tool, hereinafter called mandrel, are present in retained mandrel longitudinal weldless tube rolling mills.

[0003] Weldless tube rolling mills generally comprise one or more motors controlling respective pinions which, in turn, engage a rack which moves forwards and backwards. Such rack is generally supported by wheels or other guiding systems, e.g. runners or the like. A mandrel holder head is rigidly connected to the rack in which the tail shank of the mandrel is accommodated.

[0004] Motors retain mandrel feed and allow feed at a speed, called retained speed, chosen according to technological needs.

[0005] During the normal rolling cycle, at each subsequent rolling run, the mandrel is replaced with a new mandrel by means of automatic systems, normally of the rotating arm type. Such systems lift the mandrel to be replaced once it has performed its function and the respective shank integral with it, from the mandrel holder head with motion essentially directed from the bottom upwards. Such automatic systems lower a new mandrel along with the shank replacing the first with a reversed motion directed from the top downwards into the mandrel holder head.

[0006] The retaining function of the shank in the mandrel holder head is achieved by means of an essentially "U"-shaped device which defines a groove in which an undercut is made in which the shank is arranged by clamping. This traditional equipment is generally called a "guillotine". The guillotine and the mandrel holder head are shaped so that the shank cannot be extracted with axial movement along the axis of the mandrel. A device of the prior art of this type is shown in figure 1 in section taken along an axial plane.

[0007] For accidental reasons, occasionally an unexpected interruption may occur and the rolling operation may not be completed due to causes of various type; consequently the rolling mill may stop with the machined tube still inside.

[0008] In such a situation, the mandrel which is still partially within the tube would in most cases be clenched by the tube itself and rigidly connected to the mandrel holder head. In such a case, resuming rolling mill operation would cause difficulties and delays, causing production downtime and hold-ups which have chain-effect repercussions on the rolling line.

[0009] An even more negative situation occurs in the case of severe jamming with the formation of unrolled

material in excess in the spaces between cages, because the radial shift of the mandrel shank (5) to release the mandrel holder head (1) is essentially impossible, as there is no space for radial movements in transversal direction of the mandrel axis between mandrel holder head and shank.

[0010] Document EP-A 0348596 discloses a mandrel holder head with a release device where an eave overlaps a tang and holds it radially within the cradle seat thereby locking it. This document corresponds to the preamble of claim 1.

[0011] Therefore a need is felt to make a mandrel holder head with release device which is very versatile in use and allows to overcome the aforesaid drawbacks.

Summary of the invention

[0012] It is the main objective of the present invention to make a mandrel holder head with release device, simple to make and which allows easy detachment between shank and mandrel holder head and which can be actuated also in particularly troublesome blockages of the rolling system.

[0013] The present invention therefore aims at reaching the objects illustrated above by means of a mandrel holder head with release/fastening device of a mandrel for rolling metallic tubes, comprising a first support member adapted to be moved by motor means and provided with an internal cavity with a first lateral opening, the internal cavity is adapted to accommodate a first end portion of the mandrel of transversal dimensions larger than those of second end part, characterised in that it comprises a second intermediate member adapted to cooperate with said first member, said internal cavity being adapted to accommodate the second member through said first opening and in that said second member defines an axis, has a second internal cavity with a second lateral opening oriented axially, is adapted to accommodate in said second end part of the mandrel, and is adapted to allow the extraction of said mandrel from said mandrel holder head in the axial direction. The cylindrical shape of the external surface of the second half collar member allows a coupling between a first mandrel holder member and a second member of the type allowing a rotation about the axis of the second member. This allows the insertion of the second member in the internal cavity of the first member with a lateral movement followed by a rotation about its axis. It results the advantage that it is possible to remove the second member from the cavity of the first member also if the mandrel is clamped within a tube in turn jammed in a rolling mill.

[0014] The dependent claims describe preferred embodiments of the mandrel holder head according to the invention.

Brief description of the drawings

[0015] Further features and advantages of the present

invention will become apparent in the light of the detailed description of a preferred non-exclusive, embodiment, of a mandrel holder head with release device illustrated by means of a non-limiting example, with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view according to an axial plane of a mandrel holder head with release device according to the prior art;

Fig. 2 shows an axonometric view of a mandrel holder head with release device according to the present invention,

Fig. 3 is a lateral view of the mandrel holder head in Fig. 2,

Fig. 4 is a sectional view taken on an axial plane A-A of the mandrel holder head in Fig. 2,

Fig. 5 is a view seen from the mandrel axis of the mandrel holder head in Fig. 2,

Fig. 6 is a lateral view of the mandrel holder head only;

Fig. 7 is an axonometric view of a component of the mandrel holder head in Fig. 2 isolated from the mandrel holder head.

Figures 8a, 8b, 8c, 8d show assembly and disassembly steps of the mandrel shank in the mandrel holder head.

[0016] The same numerals and reference letters in the figures refer to the same elements.

Detailed description of a preferred embodiment of the invention

[0017] Figures from 2 to 7 show a mandrel holder head 1 in locked position of the shank 10 and the respective mandrel integral with the latter.

[0018] The mandrel holder head 1 accommodates within the half collar 2 held in position by two stops 30 and 31 removably fastened to the head 1 by means of screws 41, 42, 43, 44 which are four by the way of example. This number may however be higher or lower than four.

[0019] As shown in Figures 2 and 3, the mandrel shank 10 is divided into three parts. Two parts 50 and 52 have a larger diameter and are separated by a third part 51 of smaller diameter. As shown in Fig. 7, the half collar 2 is divided into three zones along its axis. The half collar 2 is shaped so as to turn on an axis of rotation essentially coinciding with the X axis of the mandrel shank 10 (Figures 3, 4 and 6). The first cylindrical shape zone 21 is the one with the larger diameter and is the part which is interposed between the neck of the shank 51 and a complementarily shaped annular cavity of the mandrel holder head 1. The second cylindrical shape zone 22 has a smaller diameter than that of zone 21 and is arranged in axial direction after the first zone 21. This zone engages a corresponding seat, of complementary shape, arranged in the mandrel holder head 1. The third cylindrical

shape zone 23 arranged by the side of zone 22 along the axis of the half collar is provided with flattened surfaces 6', 6'', adapted to appropriately shaped tools so as to allow the rotation of the half collar 2 about its axis in case of need. Such flattened surfaces 6', 6'' are made by way of example and may be replaced by other devices, such as holes or other without departing from the teaching of the invention.

[0020] The external diameter of the second zone 22 of the half collar 2 is advantageously larger than the diameter of the end portion 52 of shank 10. Thanks to such difference of diameter, after extracting the half collar 2 from the mandrel holder head 1 it is possible to axially release the shank 10 along the X axis.

[0021] The seat of the mandrel holder head 1, in which the half collar 2 is inserted, comprises "U" shaped sections along the X axis whose internal walls are shaped, at least on the part opposite the open side of the "U", with shapes complementary to the external shapes of the two zones 21, 22 into which the half collar 2 is divided.

[0022] The cylindrical shape of the external surface of the half collar 2 allows the rotation about the X axis, with associated circumferential sliding within the mandrel holder 1 during the fastening or release operation of the shank 10 of the mandrel holder 1.

[0023] As shown in Fig. 3, when the half collar 2 is in locked position of the shank 10, cavities 70, 71 remain in the part near the side of the half collar 2 corresponding to the opening of the "U" between the external surface of the cylindrical shape half collar 2 and the internal surface of the seat arranged in the flat shaped mandrel holder 1.

[0024] Two stops 30, 31 are provided to complete locking of the shank in the mandrel holder. These stops 30, 31 have various functions: to prevent lifting and rotation of the half collar 2, to limit infiltration and accumulation of dust, calamine, graphite or other in the cavities 70, 71.

[0025] Being the mechanical parts of the mandrel holder head heavily stressed, appropriate exhausts and unions, which do not modify the operation of the invention, are present.

[0026] In a variant of the invention, shank 10 may be either separate or integral with the mandrel.

[0027] Advantageously, on the lower part of the half collar 2 a threaded hole 8 (figure 8c) may be made to apply an eyebolt for lifting.

[0028] If the mandrel is jammed in the tube on the rolling mill and cannot be extracted, the mandrel holder head is released from the shank 10 using the following sequence of operations, with reference to Figures 2 and 8a ... 8d. The stops 30, 31, are firstly released by removing the screws 40, 41, 42, 43 (Figures 2 and 8a) and in this way the half collar 2 is free to turn about its axis. By means of a tool with forces on the gripping surfaces 6', 6'', the half collar is angularly turned sufficiently to place the opening of the "U" cavity towards the mandrel holder (Figures 8b and 8c). In such way, it is possible to extract the half collar 2 (Figure 8d), also if the shank is still in-

serted in the mandrel holder head, making the half collar shift in transversal direction to the axis. Finally, the mandrel holder 1 may be removed with a movement related to the shank directed parallelly to the X axis of the mandrel shank 10.

Claims

1. Mandrel holder head with release/fastening device of a mandrel for rolling metallic tubes, comprising a first support member (1) adapted to be moved by motor means and provided with a first internal cavity with a first lateral opening, the first internal cavity being adapted to accommodate a first end portion (52) of the mandrel of transversal dimensions larger than those of a second end portion (51), a second intermediate member (2) adapted to cooperate with said first member (1), **characterised in that** said first internal cavity is adapted to accommodate the second member (2) through said first lateral opening, **in that** said second member (2) defines an axis (X), has a second internal cavity with a second lateral opening oriented axially, is adapted to accommodate said second end portion (51) of the mandrel, has an external cylindrical shape, is divided along its axial direction into first and second portions (21, 22) in which the external diameter of the first portion (21) is larger than the external diameter of the second portion (22) and is provided with a third member (30, 31) for locking said second member (2) within the first internal cavity of the first member, said third member being adapted to be fastened with removable fastening means (41, 42, 43, 44) so as to prevent a release of the second member (2) through the first lateral opening in first predetermined operating conditions and so as to allow the release in second predetermined operative conditions, **in that** the shape of the first internal cavity is complementary to the external surface of said second member (2) so as to create a shape coupling between the first and second members and so as to allow an axial rotation of the second member with respect to the first member to allow release/fastening operations, and **in that** the first and second end portions (51, 52) of the mandrel are cylindrical and the external diameter of the second portion (22) of the second member (2) is larger than the diameter of the first end portion (52) of the mandrel whereby, after extracting the second member (2) from the first member (1), it is possible to axially release the mandrel in axial direction (X).
2. A mandrel holder head according to claim 1, **characterised in that** said first and second cavities have a "U" shape on section planes transversal to said axis.

3. A mandrel holder head according to one of the preceding claims, **characterised in that** the second member (2) comprises a third portion (23) adapted to couple with a tool for applying a moment about the axis of the second member.
4. A mandrel holder head according to one of the preceding claims, **characterised in that** a threaded hole 8 is provided to apply a lifting device.
5. A mandrel holder head according to one of the preceding claims, **characterised in that** the third locking member of said second member (2) comprises two separate parts (30, 31).

Patentansprüche

1. Dornhalterkopf mit einer Freigabe/Befestigungsvorrichtung eines Dorns zum Walzen von Metallrohren, umfassend:

ein erstes Trägerelement (1), das zur Bewegung durch ein Motormittel angepasst und mit einem ersten Innenhohlraum mit einer ersten Seitenöffnung versehen ist, wobei der erste Innenhohlraum derart angepasst ist, einen ersten Endabschnitt (52) des Dorns mit Querabmessungen, die größer als diejenigen eines zweiten Endabschnitts (51) sind, aufzunehmen,
ein zweites Zwischenelement (2), das zum Zusammenwirken mit dem ersten Element (1) angepasst ist,
dadurch gekennzeichnet, dass der erste Innenhohlraum zur Aufnahme des zweiten Elements (2) durch die erste Seitenöffnung angepasst ist,
dass das zweite Element (2) eine Achse (X) definiert, einen zweiten Innenhohlraum mit einer zweiten Seitenöffnung, die axial orientiert ist, aufweist, zur Aufnahme des zweiten Endabschnitts (51) des Dorns angepasst ist, eine äußere zylindrische Form besitzt, entlang seiner axialen Richtung in einen ersten und zweiten Abschnitt (21, 22) unterteilt ist, wobei der Außendurchmesser des ersten Abschnitts (21) größer als der Außendurchmesser des zweiten Abschnitts (22) ist, und mit einem dritten Element (30, 31) zum Verriegeln des zweiten Elements (2) in dem ersten Innenhohlraum des ersten Elements versehen ist, wobei das dritte Element zum Befestigen mit einem entfernbaren Befestigungsmittel (41, 42, 43, 44) angepasst ist, um ein Freigeben des zweiten Elements (2) durch die erste Seitenöffnung in ersten vorbestimmten Betriebsbedingungen zu verhindern und um so die Freisetzung in zweiten vorbestimmten Betriebsbedingungen zu ermöglichen.

chen,

dass die Form des ersten Innenhohlraums komplementär zu der Außenfläche des zweiten Elements (2) ist, um so eine Formkopplung zwischen dem ersten und zweiten Element zu erzeugen und um so eine axiale Drehung des zweiten Elements in Bezug auf das erste Element zuzulassen, um Freigabe/Befestigungsarbeitsgänge zu ermöglichen, und **dass** der erste und zweite Endabschnitt (51, 52) des Dorns zylindrisch sind und der Außendurchmesser des zweiten Abschnitts (22) des zweiten Elements (2) größer als der Durchmesser des ersten Endabschnitts (52) des Dorns ist, wodurch nach Entnahme des zweiten Elements (2) von dem ersten Element (1) es möglich wird, den Dorn axial in der axialen Richtung (X) freizugeben.

2. Dornhalterkopf nach Anspruch 1, **dadurch gekennzeichnet, dass** der erste und zweite Hohlraum eine "U"-Form an Schnittebenen quer zu der Achse besitzen.
3. Dornhalterkopf nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das zweite Element (2) einen dritten Abschnitt (23) umfasst, der derart angepasst ist, mit einem Werkzeug zum Aufbringen eines Moments um die Achse des zweiten Elements gekoppelt zu werden.
4. Dornhalterkopf nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Gewindeloch (8) vorgesehen ist, um eine Hubvorrichtung aufzubringen.
5. Dornhalterkopf nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das dritte Verriegelungselement des zweiten Elements (2) zwei separate Teile (30, 31) umfasst.

Revendications

1. Tête de support de mandrin avec un dispositif de libération/fixation d'un mandrin pour laminier des tubes métalliques, comprenant un premier élément de support (1) adapté pour être déplacé par des moyens de moteur et prévu avec une première cavité interne avec une première ouverture latérale, la première cavité interne étant adaptée pour loger une première partie d'extrémité (52) du mandrin de dimensions transversales supérieures à celles d'une seconde partie d'extrémité (51),

un deuxième élément intermédiaire (2) adapté pour coopérer avec ledit premier élément (1),

caractérisée en ce que ladite première cavité interne est adaptée pour loger le deuxième élément (2) à travers ladite première ouverture latérale,

en ce que ledit deuxième élément (2) défini un axe (X), a une seconde cavité interne avec une seconde ouverture latérale orientée de manière axiale, est adapté pour loger ladite seconde partie d'extrémité (51) du mandrin, a une forme cylindrique externe, est divisé le long de sa direction axiale en première et seconde parties (21, 22) dans lesquelles le diamètre externe de la première partie (21) est supérieur au diamètre externe de la seconde partie (22), et est prévu avec un troisième élément (30, 31) pour bloquer ledit deuxième élément (2) à l'intérieur de la première cavité interne du premier élément, ledit troisième élément étant adapté pour être fixé avec des moyens de fixation amovibles (41, 42, 43, 44) afin d'empêcher une libération du deuxième élément (2) par la première ouverture latérale dans des premières conditions de fonctionnement prédéterminées et pour permettre la libération dans des secondes conditions de fonctionnement prédéterminées,

en ce que la forme de la première cavité interne est complémentaire à la surface externe dudit deuxième élément (2) afin de créer un couplage de forme entre les premier et deuxième éléments et afin de permettre une rotation axiale du deuxième élément par rapport au premier élément pour permettre des opérations de libération/fixation,

et **en ce que** les première et seconde parties d'extrémité (51, 52) du mandrin sont cylindriques et le diamètre externe de la seconde partie (22) du deuxième élément (2) est supérieur au diamètre de la première partie d'extrémité (52) du mandrin, moyennant quoi, après l'extraction du deuxième élément (2) du premier élément (1), il est possible de débloquer axialement le mandrin dans la direction axiale (X).

2. Tête de support de mandrin selon la revendication 1, **caractérisée en ce que** lesdites première et seconde cavités ont une forme de « U » sur des plans en coupe transversaux par rapport audit axe.
3. Tête de support de mandrin selon l'une des revendications précédentes, **caractérisée en ce que** le deuxième élément (2) comprend une troisième partie (23) adaptée pour se coupler avec un outil pour appliquer un mouvement autour de l'axe du deuxième élément.
4. Tête de support de mandrin selon l'une des revendications précédentes, **caractérisée en ce qu'un** trou fileté (8) est prévu pour appliquer un dispositif de levage.

5. Tête de support de mandrin selon l'une des revendications précédentes, **caractérisée en ce que** le troisième élément de blocage dudit deuxième élément (2) comprend deux pièces séparées (30, 31).

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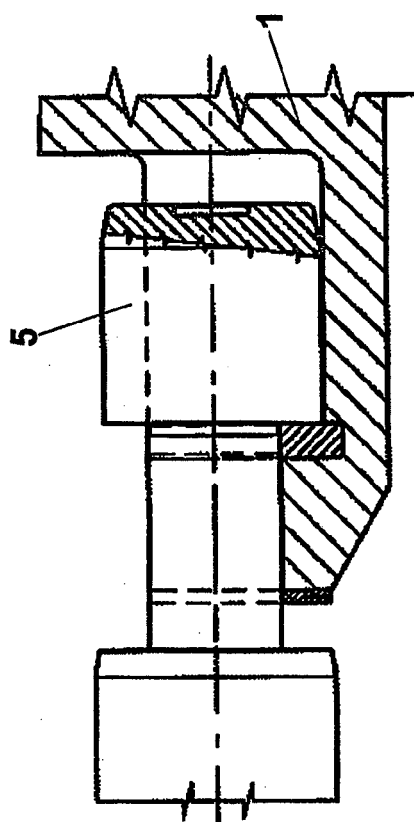


FIG. 1

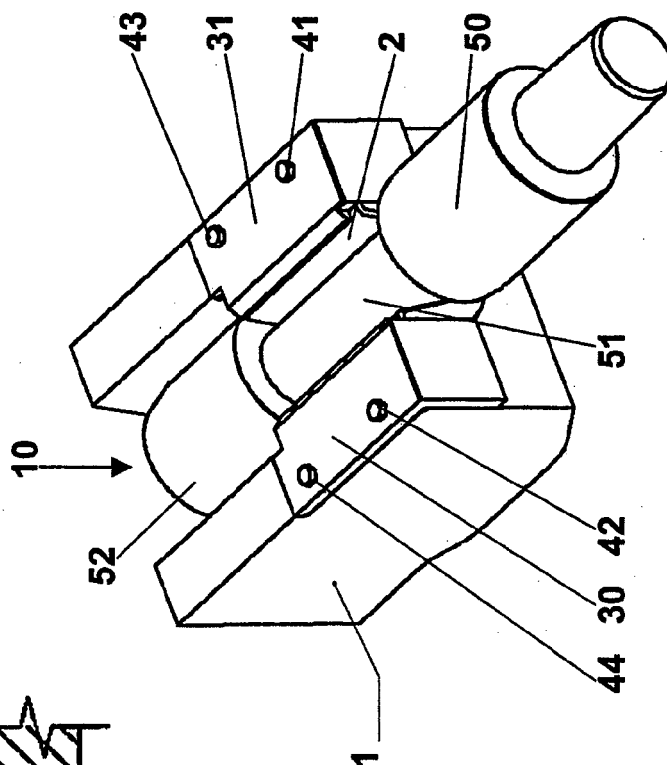


FIG. 2

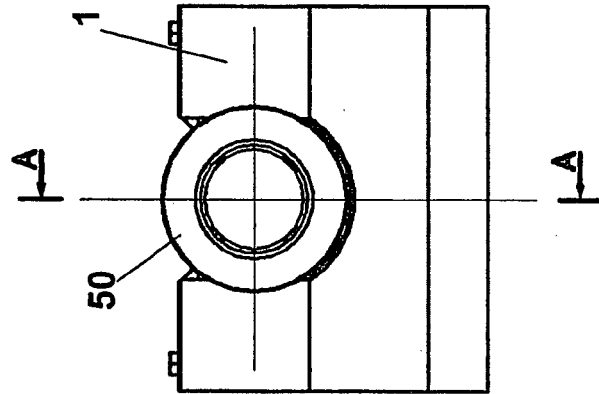


FIG. 5

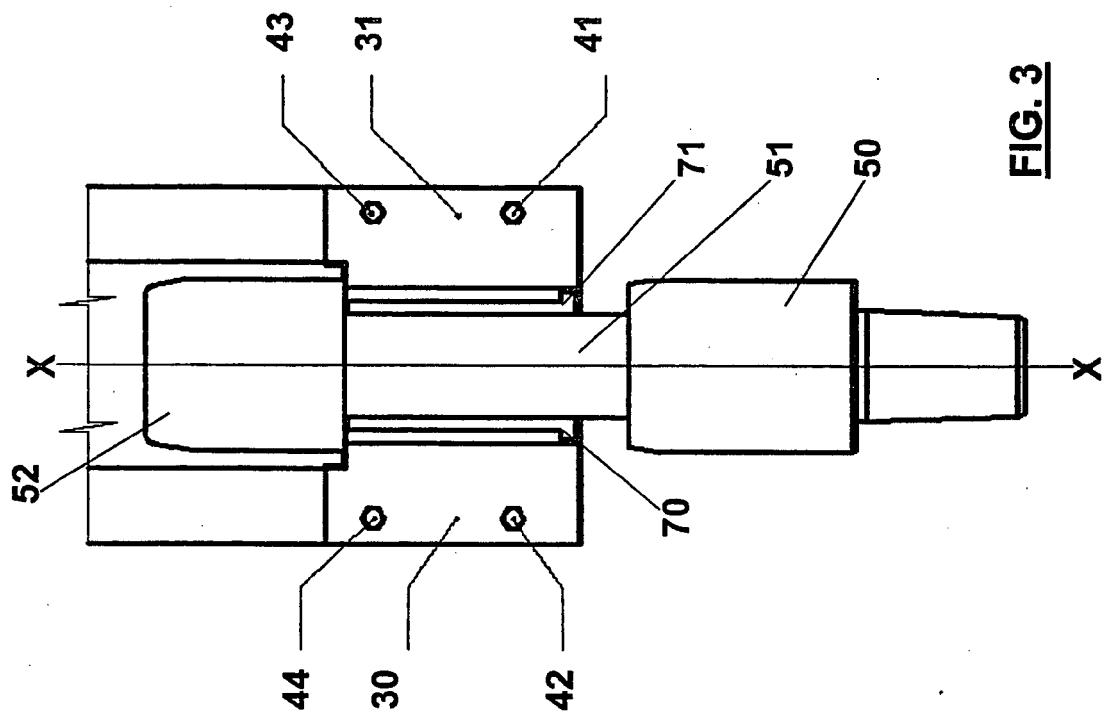
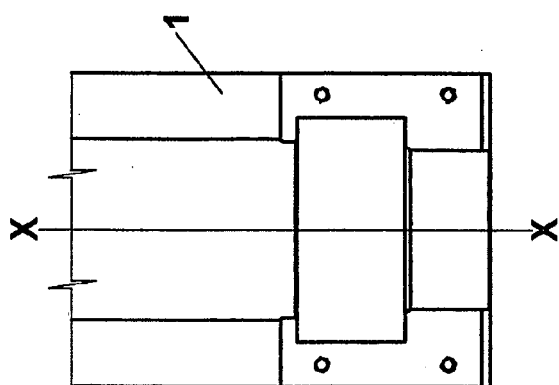
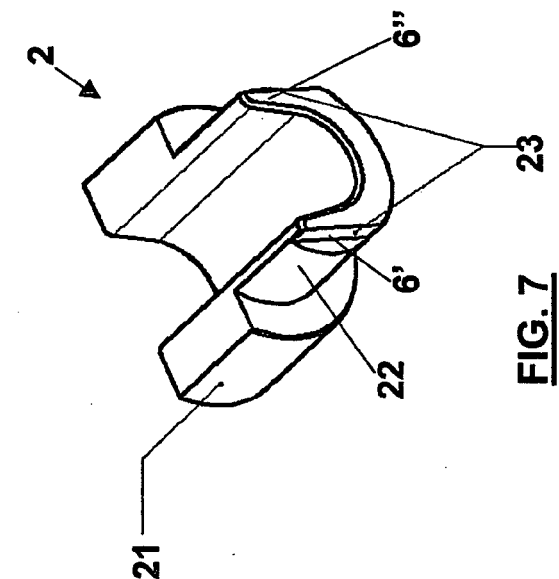
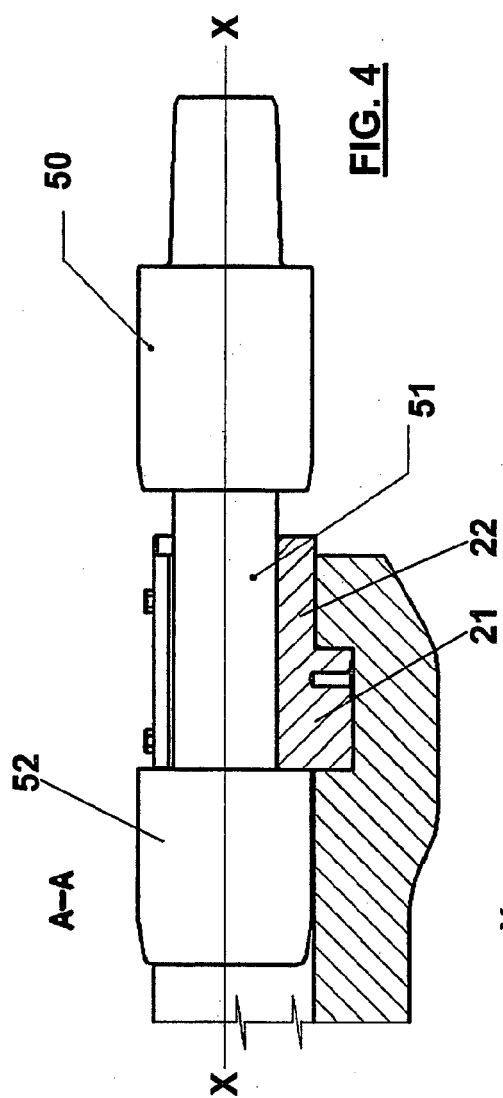
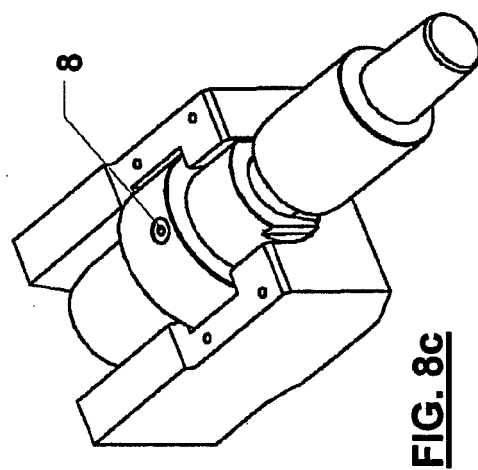
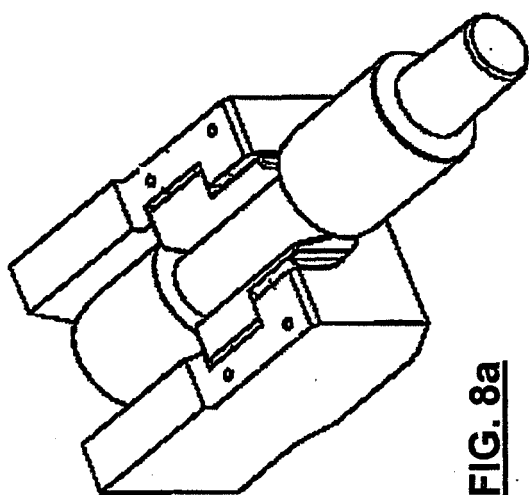
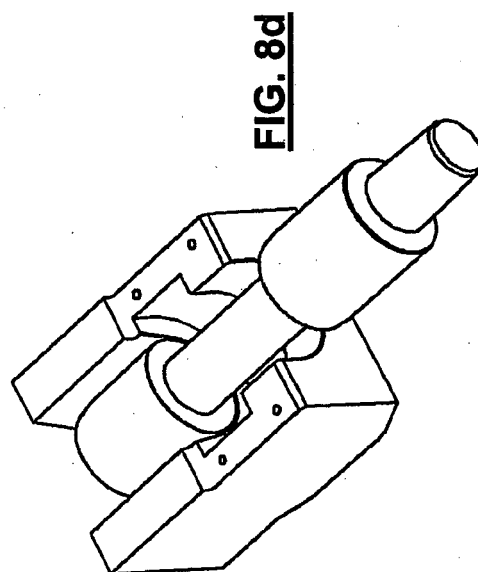
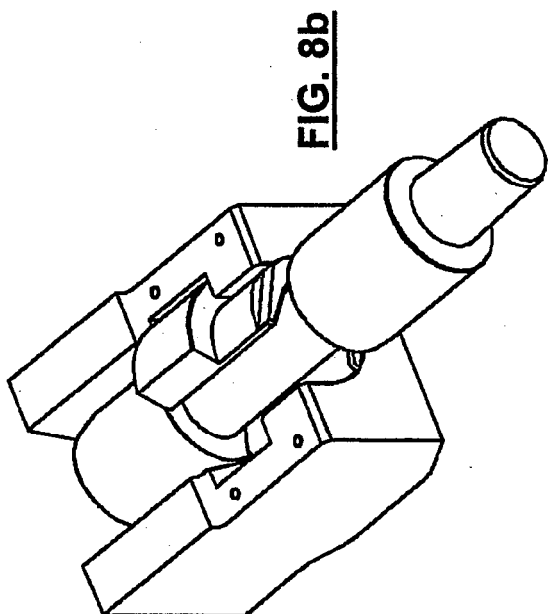


FIG. 3





REFERENCES CITED IN THE DESCRIPTION

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