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Biegemaschine

Machine à cintrer

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(56) References cited:
CH-A- 318 252
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Description

[0001] The present invention relates to an arrangement for bending bar-shaped or tubular material, comprising a central bending head and a clamping device, divisible into a first clamping part and a second clamping part, for accepting and clamping the material to be bent, in a bending process in which the clamping device is rotated together with the bending head.

[0002] Many variants are known in the prior art of arrangements of this kind, in which two types can be distinguished. The first type has a central bending head constructed in one piece. The material in this case is clamped against the central bending head with a separate clamp, the actual bending action being effected by a subsequent rotation of the central bending head, together with the separate clamp, about the shaft of the central bending head. The second type has a central bending head divided, in axial sense, into two halves, each half being provided with a half clamp such that, when the two halves are pressed together, the material is secured. The actual bending action is again effected by a subsequent rotation of the central bending head. Both prior art types of arrangement have the disadvantage that the material, usually tubing, is only clamped on two sides. For a bending action in the horizontal plane, for example, the arrangement of the first type will only clamp the tube on the sides, whereas the arrangement of the second type will only clamp the top and the bottom.

[0003] The drawback of only two-sided clamping becomes especially apparent if material is to be processed that is easily damaged, such as thin-walled tubing or tubing having a specific surface structure, such as stainless steel tubing.

[0004] The result in those cases is often that the bending action fails, which specifically gives rise to loss of material, or that, with the aid of cleaning and polishing techniques, the damage is eliminated, which gives rise to loss of time and leads to a sub-optimal result. The invention described here obviates this drawback to a significant degree, and is characterized in that the clamping device is provided with at least one additional clamping part, arranged for contacting the material at a joint face between the first clamping part and the second clamping part. This is particulary advantageous as this is the place where the material in the prior art arrangements is hardly clamped at all.

[0005] According to the invention the arrangement is then provided in a further advantageous embodiment with means for positioning the at least one additional clamping part in a cavity formed in the first clamping part and the second clamping part, substantially simultaneously with or after the clamping of the material by the first clamping part and the second clamping part.

[0006] From GB-A-2166986 (nearest state of the art) a bending arrangement is known in which one clamping part is provided with a cavity and a jaw, or two jaws, for resiliently clamping the material. The advantage of the known arrangement is that a workpiece is easily removable from the clamping part after bending.

[0007] A particularly advantageous embodiment of the invention utilizes the great force which can be exerted with a wedge to achieve the additional grip, and is characterized in that the at least one additional clamping part is provided with at least one bevel and that the cavity is provided with a mating bevel, so that, when the additional clamping part is positioned in the cavity, this part is clamped by the mating bevels on the material to be processed.

[0008] A special embodiment of the invention is characterized in that the central bending head comprises a first head section and a second head section, with the first clamping part forming a whole with the first head section and the second clamping part forming a whole with the second head section, the central bending head thus formed being rotatably fitted with means being provided for the displacement in axial sense of the second head section relative to the first head section for the securing or releasing of the material. The cavity for accepting the at least one additional clamping part may then be made in the joint face of the first clamping part and the second clamping part, comprising in that case a first subcavity in the first clamping part and a second subcavity in the second clamping part, such that the additional part contacts the material to be processed exactly at the joint face, filling at least substantially the combined first subcavity and second subcavity.

[0009] Since the second, displaceable part of the bending head is normally of a less heavy construction than the first part, a further advantageous embodiment is characterized in that the second subcavity is smaller than the first subcavity, the first and the second subcavities in that case both preferably being provided with a bevel. In this case there is then exactly one additional part, in the operating condition filling at least substantially the combined first and second subcavities, the additional part provided on one side with a profile for partwise enclosing the material to be bent, and provided on an opposite side with bevels mating with the bevels of the subcavities.

[0010] A problem that may arise when bending thick-walled tubes is that, owing to the extremely great forces exerted during bending on the first and the second clamping part, these parts may be forced apart, leading to a sub-optimal result. A further very advantageous embodiment of the arrangement is characterized in that the additional clamping part is provided with locking means, for interlocking, when the additional clamping part is positioned in the cavity, the first clamping part and the second clamping part.

[0011] The locking means may be made to contact internally, by providing a suitable profile on the bevels of the additional clamping part and of the cavity. In an alternative form the locking means may be constructed as a U-shaped profile fastened to the additional clamping

part which, when the additional clamping part is positioned, embrace the first and the second clamping parts, to achieve an external lock.

[0012] The invention will now be further explained with reference to the following figures, where:

Fig. 1A represents, in side view, a prior art bending arrangement of the first type;
Fig. 1B represents, in top view, the prior art bending arrangement of the first type;
Fig. 2A represents, in side view, a prior art bending arrangement of the second type;
Fig. 2B represents, in top view, the prior art bending arrangement of the second type;
Fig. 3 represents, in side view, an embodiment of the bending arrangement of the first type according to the invention;
Fig. 4 represents, in side view, an embodiment of the bending arrangement of the second type according to the invention;
Fig. 5 represents, in top view, an implementation with an automatically actuated wedge;
Fig. 6 represents, in top view, an example of a wedge;
Fig. 7A represents a bending arrangement with internal locking;
Fig. 7B represents, in top view, the bending arrangement with internal locking;
Fig. 8A represents, in side view, a bending arrangement with external locking;
Fig. 8B represents, in top view, the bending arrangement with external locking.

[0013] Fig. 1A shows, in side view, a prior art bending arrangement of the first type, where a tube 1 can be secured between a central bending head 2 and a clamp 3, and bending head 2 and clamp 3 together with a base 4 can subsequently be rotated around a shaft 5 through a desired angle, thus to achieve a desired bending of tube 1. It is immediately apparent that a grip on tube 1 can only be effected at the sides of the tube, and that consequently the top and bottom are not completely immobilized. A result of this is that tube 1, in spite of the presence of clamp 3, tends to slip to a certain degree during bending. This slippage may adversely affect the accuracy of the product, and moreover cause damage to the tube surface. To avoid this, an additional clamping device is often slid on the tube, which then lies against the central bending head. This provision may in fact reduce the slippage, but on the other hand makes the operation more time-consuming. Fig. 1B shows for clarity the same bending arrangement of the first type in top view, the top view indicating again tube 1, central bending head 2, clamp 3, base 4 and axis of rotation 5. It may be noted that only bends smaller than 180 degrees can be realized with this bending arrangement of the first type.

[0014] Fig. 2A shows a prior art bending arrangement of the second type in side view, where a tube 1 can be secured between a first head section 6 and a second head section 7 of a divided central bending head, and where the head sections together with base 4 can again be rotated around an axis of rotation 5. As can also be seen from the Fig. 2B top view of this type of bending arrangement, the central bending head has a substantially radial symmetry, whereas the first head section 6 is provided with a first clamping part 8 and the second head section 7 with a second clamping part 9, with clamping parts 8,9 in the operating condition securing tube 1, after which the central bending head can again be rotated about shaft 5, thus to achieve the desired bending of tube 1. A feature of this bending arrangement of the second type is that the tube is clamped at the top and the bottom, and that the sides are not completely immobilized. Therefore also bending arrangements of this type will exhibit slippage. An advantage of this second type of bending arrangement is that angles significantly larger than 180 degrees can be realized, provided that second head section 7 has been constructed such that it can be bodily removed.

[0015] Fig. 3 shows, in side view, an embodiment of the invention, applied to a bending arrangement of the first type, where in accordance with the invention at the joint face of central bending head 2 and clamp 3 part of the material has been removed, such that two cavities 10,11 are created, into which two wedges 12,13 can be inserted. Wedges 12,13 are provided, on the side facing tube 1, with a profile for part-wise embracing the tube, and on the side facing away from tube 1 with a bevel, preferably mating with bevels of cavities 10,11 such that, when the wedges are inserted into the cavities, the wedges immobilize tube 1. Tube 1 is thus additionally secured, reducing the possibility of slippage. The grip, moreover, is now effected with a more radial symmetry, which significantly reduces the risk of damage to the tube. An additional clamping device is no longer necessary, and it is immediately clear to a person skilled in the art that the insertion of the wedges can easily be automated using, for example, a hydraulic or pneumatic cylinder fitted to base 4. The advantages of the invention are essentially retained if only one cavity and one wedge are employed, with the wall parts lying opposite providing the counterpressure, and contributing to the firmness of the grip. As a grip in that case is still exerted in two mutually perpendicular directions, slippage of the tube is still practically ruled out.

[0016] Fig. 4 shows, in side view, an embodiment of the invention applied to a bending arrangement of the second type, where in the manner described with reference to Fig. 3 a cavity is made in the joint face of first clamping part 8 and second clamping part 9, into which again a wedge 15 can be inserted to obtain a grip of more radial symmetry.

[0017] Fig. 5 shows the same embodiment in top view, where for clarity second head section 7 together with the second clamping section 9, with which it forms a

whole, is left out. It is furthermore indicated how wedge 15 is inserted into the cavity, via an arm 16, which is rotatably fitted to base 4, the arm 16 in turn being actuated by a hydraulic or pneumatic cylinder 17, which is likewise fitted to base 4. By activating cylinder 17 at least substantially simultaneously with a hydraulic or pneumatic cylinder (not shown, but as such known in the art) effecting the clamping of second head section 7, an instantaneous grip is obtained in two mutually perpendicular directions, which practically removes the risk of the tube that is to be bent sustaining slippage or damage.

[0018] With a bending arrangement of the second type the second head section 7 is generally of as light a construction as possible, because this part must move during each clamping action, but also because it must be easily removable by hand. It may then be advantageous to make the cavity 14 shown in Fig. 4 such that the subcavity in the lightly constructed second clamping part 9 is smaller than the subcavity in first clamping part 8. Fig. 6 shows an example of a wedge, which consists of two subwedges 19,20 joined together, filling as such the cavity consisting of two different subcavities. In this manner it is still possible to achieve an even additional grip of the tube to be processed at the joint face of first clamping part 8 and second clamping part 9, with first clamping part 8 absorbing the greatest forces.

[0019] Fig. 7A shows, in side view, a bending arrangement which is likewise provided with a wedge to achieve an additional grip, but with wedge 15 moreover being profiled in the shape of a U-shaped profile 21. The advantage of a profile thus effected is that first clamping part 8 and second clamping part 9 are interlocked as soon as wedge 15 is applied. This totally prevents first clamping part 8 and second clamping part 9 from being forced apart during the actual bending action.

[0020] Fig. 7B shows the same bending arrangement in top view, where wedge 15 is provided with a profile 21, and where wedge 15 has not yet been inserted into cavity 14. At inserting, profile 21 will first effect a lock of the clamping parts 8,9, and next clamp tube 1 owing to the operation of wedge 15.

[0021] Fig. 8A shows, in side view, a bending arrangement provided with a lock 22, which is mounted on wedge 15 and which, after wedge 15 has been inserted, externally embraces first clamping part 8 and second clamping part 9, rendering it again impossible for the two clamping parts to be forced apart during the actual bending action. Fig. 8B shows the same bending arrangement in top view, with cavity 14, wedge 15 and lock 22, the lock, with wedge 15 being pressed home, sliding over both clamping parts 8,9.

Claims

1. Arrangement for bending bar-shaped or tubular material (1), comprising a central bending head (2) and a clamping device (3), divisible into a first clamping part (8) and a second clamping part (9), for accepting and clamping the material (1) to be bent, in a bending process in which the clamping device (3) is rotated together with the bending head (2), characterized in that the clamping device (3) is provided with at least one additional clamping part (15), arranged for contacting the material (1) at a joint face between the first clamping part (8) and the second clamping part (9).

2. Arrangement as claimed in claim 1, characterized in that the first clamping part (8) is provided with a first subcavity and the second clamping part (9) is provided with a second subcavity, the combined subcavities forming a cavity (14) for accepting the at least one additional clamping part (15).

3. Arrangement as claimed in claim 2, characterized in that means (16,17) are provided for positioning the at least one additional clamping part (15) in the cavity (14), substantially simultaneously with or after the clamping of the material (1) by the first clamping part (80 and the second clamping part (9).

4. Arrangement as claimed in claim 3, characterized in that the at least one additional clamping part (15) is provided with at least one bevel and that the cavity (14) is provided with a mating bevel, so that, when the additional clamping part (15) is positioned in the cavity (14), this part is clamped by the mating bevels on the material (1) to be processed.

5. Arrangement as claimed in claim 4, characterized in that the bending head (2) comprises a first head section (6) and a second head section (7), the head sections together forming the central bending head (2), with the first clamping part (8) forming a whole with the first head section (6) and the second clamping part (9) forming a whole with the second head section (7), the central bending head (2) thus formed being rotatably fitted with means being provided for the displacement in axial sense of the second head section (7) relative to the first head section (6) for the securing or releasing of the material (1).

6. Arrangement as claimed in claim 5, characterized in that the second subcavity is smaller than the first subcavity.

7. Arrangement as claimed in claim 6, characterized in that the subcavities are both provided with a bevel.

8. Arrangement as claimed in claim 7, characterized in that exactly one additional part (15) is provided, in the operating condition filling at least substantially the cavity (14), the additional part (15) being provided on one side with a profile for part-wise enclos-

ing the material (1) to be bent, and provided on an opposite side with bevels mating with the bevels of the subcavities.

9. Arrangement as claimed in claim 3, characterized in that the additional clamping part (15) is provided with locking means (21,22), for interlocking, when the additional clamping part (15) is positioned in the cavity (14), the first clamping part (8) and the second clamping part (9).

10. Arrangement as claimed in claim 9, characterized in that the locking means (21) comprise a profile of the bevel of the additional clamping part (15) and a mating profile of the bevel of the cavity (14), for obtaining an internal locking of the clamping parts (8,9).

11. Arrangement as claimed in claim 10, characterized in that the additional clamping part is provided with a U-shaped profile.

12. Arrangement as claimed in claim 9, characterized in that the locking means (22) comprise a U-shaped profile fastened to the additional clamping part (15), the arms of which, when the additional clamping part (15) is positioned, embrace the first clamping part (8) and the second clamping part (9), for obtaining an external lock.

Patentansprüche

1. Vorrichtung für das Biegen von stab- oder röhrenförmigem Material (1), welche Vorrichtung einen zentralen Biegekopf (2) und eine Spannvorrichtung (3) umfasst, unterteilt in ein erstes Spannteil (8) und ein zweites Spannteil (9), für die Aufnahme und das Spannen des zu biegenden Materials (1), in einem Biegeverfahren, wobei die Spannvorrichtung (3) zusammen mit dem Biegekopf (2) rotiert, dadurch gekennzeichnet, dass die Spannvorrichtung mit zumindest einem zusätzlichen Spannteil (15) versehen ist, eingerichtet, um das Material (1) mit einer Verbindungsfläche zwischen dem ersten Spannteil (8) und dem zweiten Spannteil (9) in Angriff zu bringen.

2. Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, dass das erste Spannteil (8) mit einem Teilhohlraum und das zweite Spannteil (9) mit einem zweiten Teilhohlraum versehen ist, wobei die beiden Teilhohlräume gemeinsam einen Hohlraum (14) für die Aufnahme von zumindest einem zusätzlichen Spannteil (15) bilden.

3. Vorrichtung gemäß Anspruch 2, dadurch gekennzeichnet, dass Mittel (16,17) für das Positionieren von zumindest dem einen zusätzlichen Spannteil (15) in dem Hohlraum (14) vorgesehen sind, und zwar im wesentlichen gleichzeitig mit oder nach dem Spannen des Materials (1) in dem ersten Spannteil (8) und dem zweiten Spannteil (9).

4. Vorrichtung gemäß Anspruch 3, dadurch gekennzeichnet, dass zumindest ein Spannteil (15) mit zumindest einer Abschrägung, und dass der Hohlraum (14) mit einer darauf anschließenden Abschrägung versehen ist, so dass, wenn das zusätzliche Spannteil (15) in dem Hohlraum (14) positioniert wird, dieses Teil von den zusammenarbeitenden Abschrägungen auf das zu bearbeitende Material (1) gespannt wird.

5. Vorrichtung gemäß Anspruch 4, dadurch gekennzeichnet, dass der Biegekopf (2) einen ersten Kopfabschnitt (6) und einen zweiten Kopfabschnitt (7) umfasst, welche Kopfabschnitte gemeinsam den zentralen Biegekopf (2) bilden, wobei das erste Spannteil (8) ein Ganzes mit dem ersten Kopfabschnitt (6) und das zweite Spannteil (9) ein Ganzes mit dem zweiten Kopfabschnitt (7) bildet, wobei der so geformte zentrale Biegekopf (2) rotierbar befestigt ist, und wobei Mittel für die Verschiebung des zweiten Kopfabschnittes (7) gegenüber dem ersten Kopfabschnitt (6) in axialer Richtung für das Spannen beziehungsweise Lösen des Materials (1) vorgesehen sind.

6. Vorrichtung gemäß Anspruch 5, dadurch gekennzeichnet, dass der zweite Teilhohlraum kleiner als der erste Teilhohlraum ist.

7. Vorrichtung gemäß Anspruch 6, dadurch gekennzeichnet, dass die Teilhohlräume beide mit einer Abschrägung versehen sind.

8. Vorrichtung gemäß Anspruch 7, dadurch gekennzeichnet, dass genau ein zusätzliches Teil (15) vorgesehen ist, welches Teil in Gebrauchszustand zumindest im wesentlichen den Hohlraum (14) füllt, wobei das zusätzliche Teil (15) an einer Seite mit einem Profil für das partielle Spannen des zu biegenden Materials (1) und an einer gegenüberliegenden Seite mit Abschrägungen versehen ist, welche an die Abschrägungen der Teilhohlräume anschließen.

9. Vorrichtung gemäß Anspruch 3, dadurch gekennzeichnet, dass das zusätzliche Spannteil (15) mit Verriegelungsmitteln (21,22) versehen ist, und zwar für die gegenseitige Verriegelung des ersten Spannteiles (8) und des zweiten Spannteiles (9), wenn das zusätzliche Spannteil (15) in dem Hohlraum (14) positioniert wird.

10. Vorrichtung gemäß Anspruch 9, dadurch gekennzeichnet, dass die Verriegelungsmittel (21) ein Profil der Abschrägung des zusätzlichen Spannteiles (15) und ein darauf anschließendes Profil der Abschrägung des Hohlraumes (14) umfassen, um eine innere Verriegelung der Spannteile (8,9) zu erhalten.

11. Vorrichtung gemäß Anspruch 10, dadurch gekennzeichnet, dass das zusätzliche Spannteil mit einem U-förmigen Profil versehen ist.

12. Vorrichtung gemäß Anspruch 9, dadurch gekennzeichnet, dass die Verriegelungsmittel (22) ein an dem zusätzlichen Spannteil (15) befestigtes, U-förmiges Profil umfassen, dessen Arme beim Positionieren des zusätzlichen Spannteiles das erste Spannteil (8) und das zweite Spannteil umklammern, um eine externe Verriegung zu erhalten.

Revendications

1. Dispositif pour plier du matériel (1) tubulaire ou en forme de barreau, comprenant une tête de pliage (2) centrale et une dispositif de serrage (3), divisible d'une première part de serrage (8) et une deuxième part de serrage (9), pour accepter et serrer le matériel (1) qui aurai plié, dans un procès de pliage dans lequel la dispositif de serrage est tournée simultanément avec la tête de pliage (2), caractérisée en ce que la dispositif de serrage (3) est prévue de du moins une part de serrage (15) additionnelle, arrangée pour contacter le matériel (1) jusqu'au plan de contact entre la première part de serrage (8) et la deuxième part de serrage (9).

2. Dispositif selon la revendication 1, caractérisée en ce que la première part de serrage (8) est prévue d'une première sous-cavité et la deuxième part de serrage (9) est prévue d'une deuxième sous-cavité, et que les sous-cavités combinées forment une cavité (14) pour accepter la aux moins une part de serrage (15) additionnelle.

3. Dispositif selon la revendication 2, caractérisée en ce que des moyens (16,17) sont prévues pour positionner la du moins une part de serrage (15) additionnelle dans la cavité (14), du moins essentiellement simultanément ou après le serrage du matériel (1) par la première part de serrage (8) et la deuxième part de serrage (9).

4. Dispositif selon la revendication 3, caractérisée en ce que la du moins une part de serrage (15) additionnelle est prévue d'une clavette et que la cavité (14) est prévue d'une clavette complémentaire, tellement que, si la part de serrage (15) additionnelle a été placée dans la cavité, ce part est serrée sur le matériel (1) par les clavettes en combinaison.

5. Dispositif selon la revendication 4, caractérisée en ce que la tête de pliage (2) comprends une première sous-tête (6) et une deuxième sous-tête (7), les deux sous-têtes ensemble formant la tête de pliage (2), la première part de serrage (8) formant un ensemble avec la première sous-tête (6) et la deuxième part de serrage (9)formant un ensemble avec la deuxième sous-tête (6), la tête de pliage (2) centrale formée comme ça étant montée tournante et prévue de moyens pour déplacer la première sous-tête (6) à l'égard de la seconde sous-tête (7) dans une direction axiale, pour serrer ou desserrer le matériel (1).

6. Dispositif selon la revendication 5, caractérisée en ce que la deuxième sous-cavité est plus petite que la première sous-cavité.

7. Dispositif selon la revendication 6, caractérisée en ce que tous les deux sous-cavités sont prévues d'une clavette.

8. Dispositif selon la revendication 7, caractérisée en ce qu'exactement une part de serrage (15) additionnelle est prévue qui en utilisation au moins principalement remplit la cavité (14), la part de serrage (15) additionnelle étant prévue d'une côté prévue d'un profil pour serrer part du matériel (1) qui auront pliés et d'une côté opposée prévue de clavettes qui peuvent coopérer avec les clavettes des sous-cavités.

9. Dispositif selon la revendication 3, caractérisée en ce que la part de serrage (15) additionnelle est prévue de dispositifs de verrouillage (21,22), pour verrouiller la première part de serrage (8) et la deuxième part de serrage (9) si la part de serrage (15) additionnelle a été placée dans la cavité (14).

10. Dispositif selon la revendication 9, caractérisée en ce que le dispositif de verrouillage (21) comprends une coté profilée à la clavette de la part de serrage (15) additionnelle et une coté profilée à la clavette complémentaire de la cavité (14), pour obtenir une verrouillage interne des parts de serrage.

11. Dispositif selon la revendication 10, caractérisée en ce que la part de serrage additionnelle est prévue d'un profilé en U.

12. Dispositif selon la revendication 9, caractérisée en ce que le dispositif de verrouillage (22) comprends un profil en U, attaché à la part de serrage (15) additionnelle, les bras de laquelle embrassent la première part de serrage (8) et la deuxième part de ser-

rage (9) si la part de serrage (15) additionnelle a été placée, pour réaliser une serrure externe.

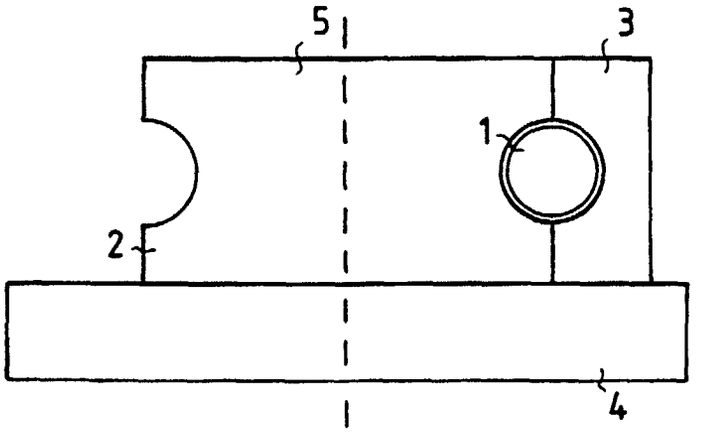

FIG. 1A

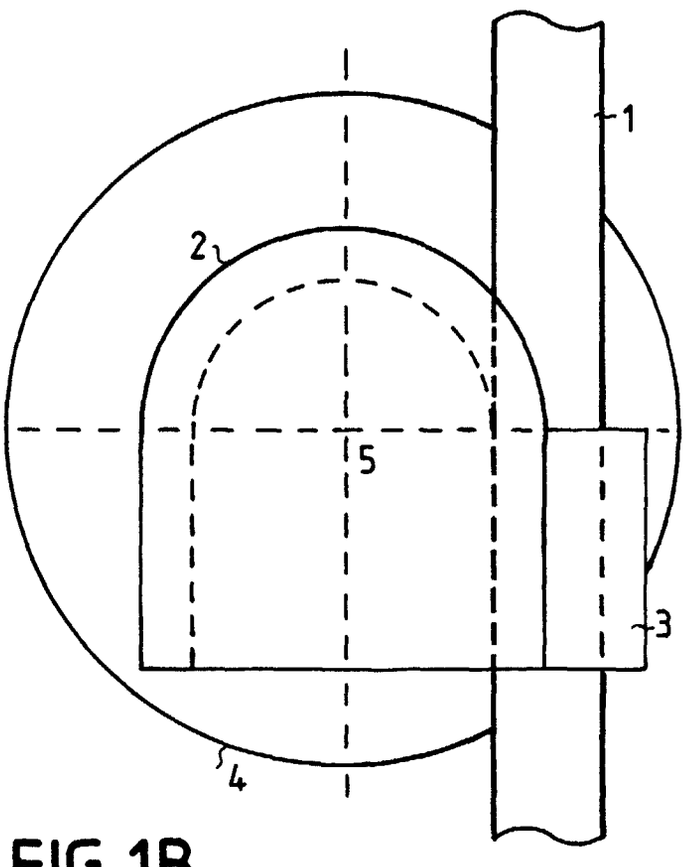

FIG. 1B

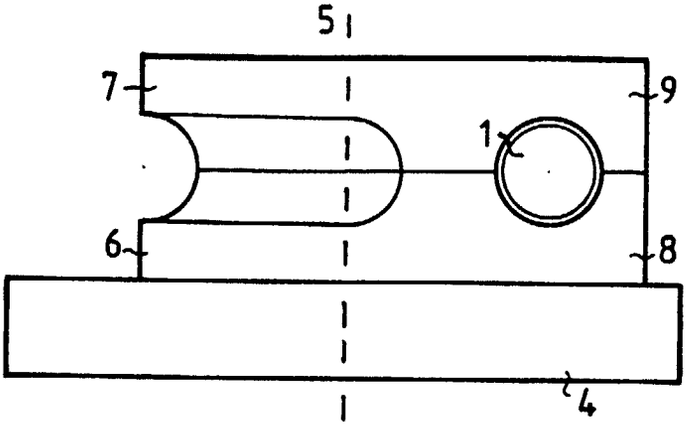

FIG. 2A

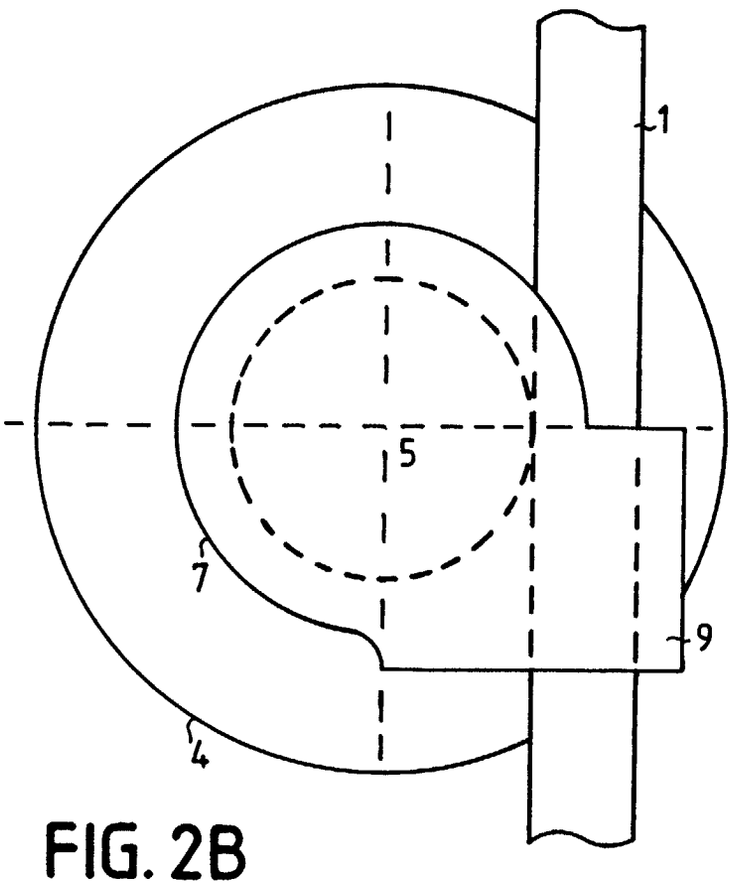

FIG. 2B

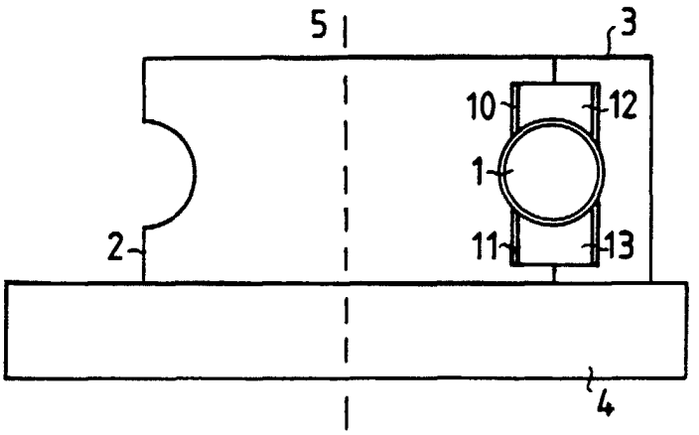

FIG. 3

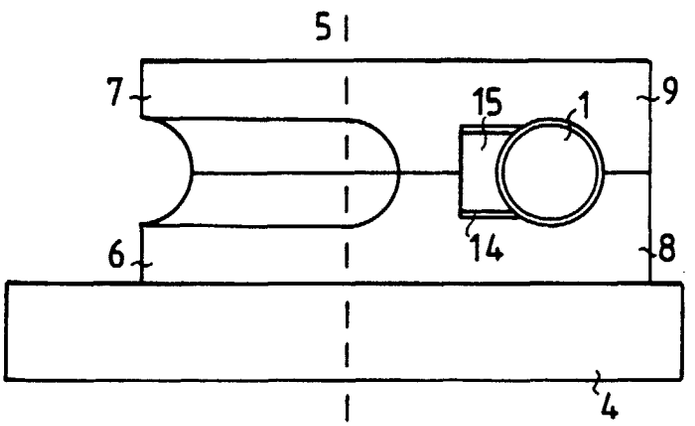

FIG. 4

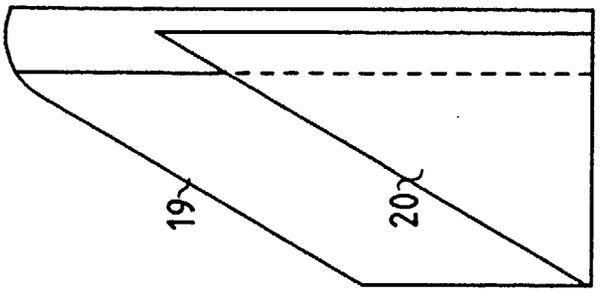

FIG. 6

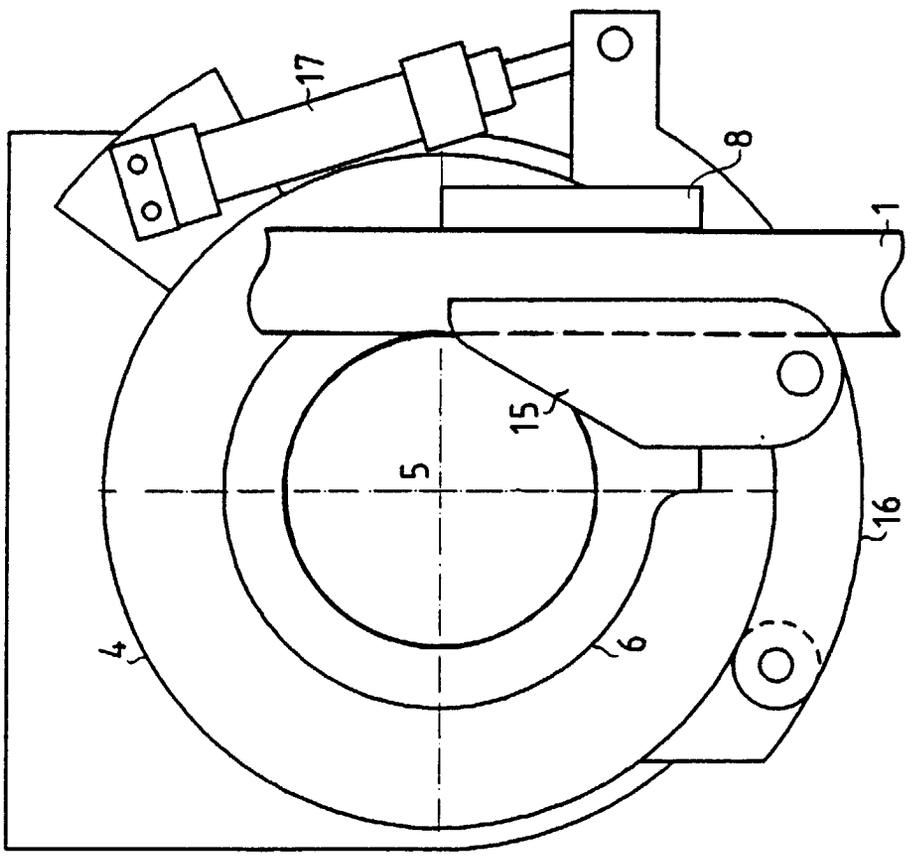

FIG. 5

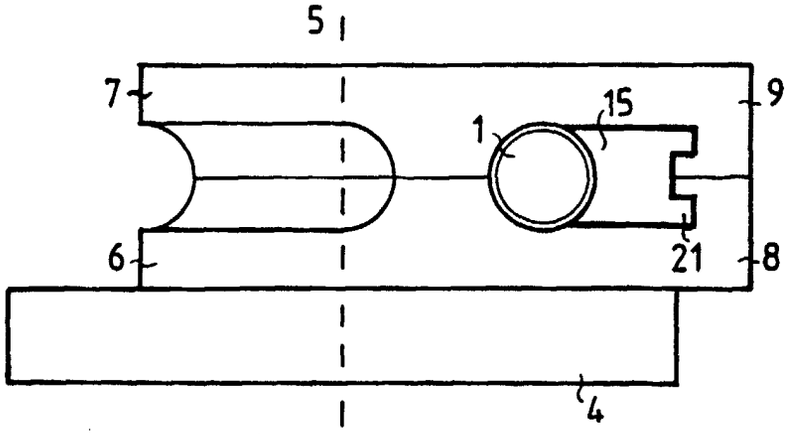

FIG. 7A

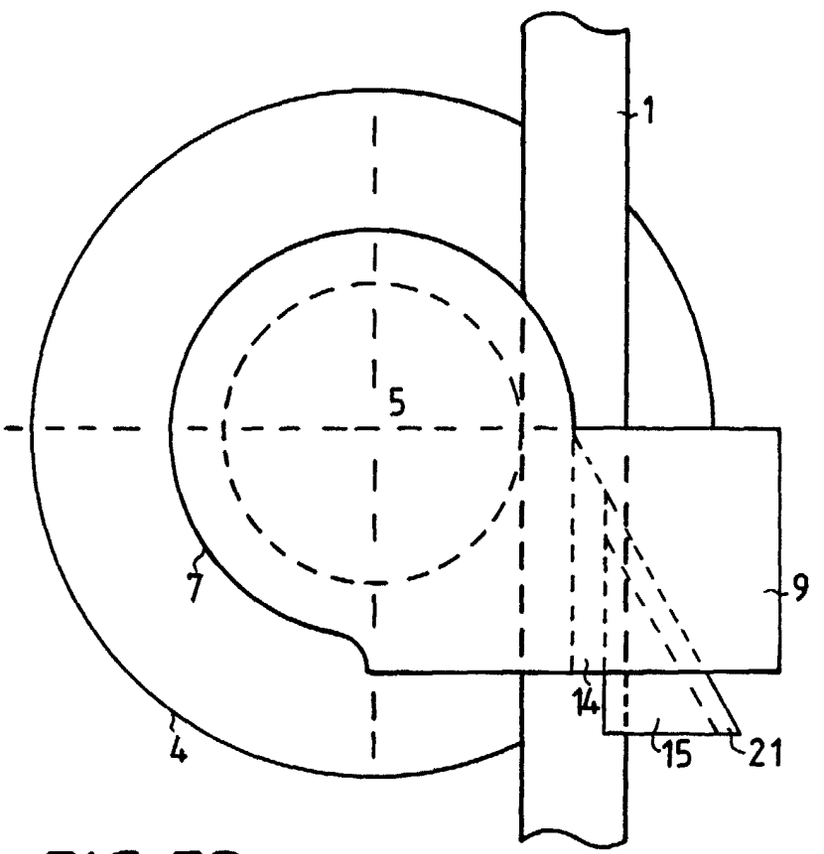

FIG. 7B

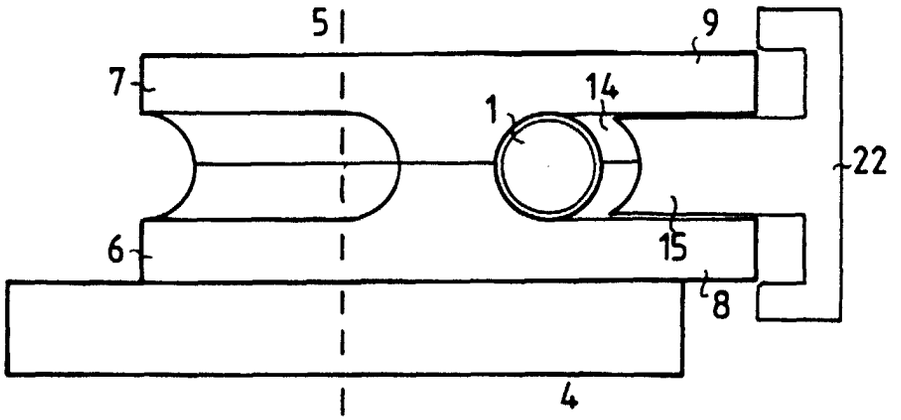

FIG. 8A

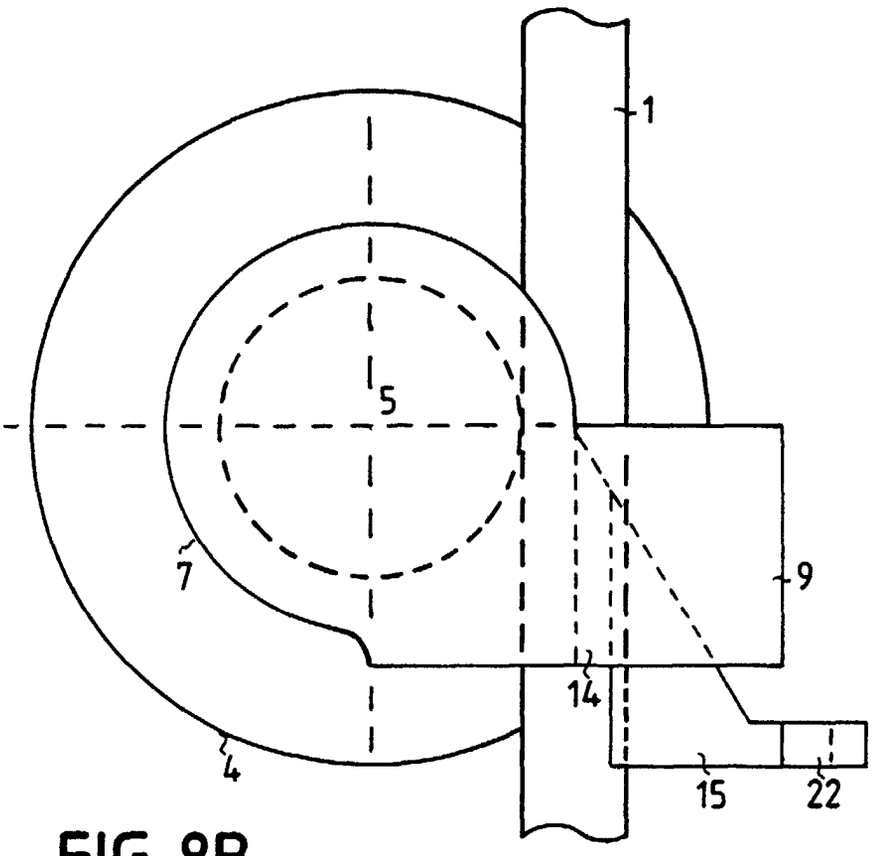

FIG. 8B