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(54) **Roll-type rolling mill**

Walzen-Typ-Walzwerk

Laminoir du type cylindre

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EP 1 470 871 B1

Description

[0001] This invention relates to a roll-type rolling mill for use in rolling of wire rods or steel bars and more particularly to a structure of a rolling mill provided with rolling rolls.

[0002] Fig. 3 is a cross-sectional view showing the structure of a conventional three-roll rolling mill.

[0003] As shown in Fig. 3, the rolling mill 1 is provided with three rolls 2 to 4 which are disposed within a casing 5 so that they cross each other at an angle of 120 degrees. A groove for rolling is provided at the front end part of the peripheral surface of each of the rolls 2 to 4. A substantially circular gap 6 is formed by disposing the rolls 2 to 4 at respective predetermined positions (positions shown in Fig. 3). The rolls 2 to 4 are rotation-driven by a predetermined drive unit, and a wire rod or the like to be rolled is supplied into the gap 6 among the rolls 2 to 4, whereby the wire rod or the like is rolled into a designed outer diameter.

[0004] According to the structure of the conventional rolling mill, in order to shape the wire rod into a designed outer diameter with high accuracy, the dimension of the gap 6, that is, the position of the rolls 2 to 4, should be accurately set. This requirement is independent of the number of rolls and is true of two-roll, four-roll, or five-roll rolling mills. In such roll-type rolling mills, various means for improving the positioning accuracy of the rolls and for simplifying positioning work have hitherto been proposed (see, for example, JP-A-12-94016)..

[0005] The rolls 2 to 4 have hitherto been positioned by the following method. At the outset, the roll 3 and the roll 4 are rotatably supported by predetermined support shafts and are positioned at predetermined positions relative to a housing 5. The roll 2 is fitted into and fixed to a hub 7. In this case, for example, an oil injection method is adopted as means for fixing the roll 2. The roll 2 fixed to the hub 7 is housed in a roll housing part 8 in the housing 5. In this state, a rotating shaft 9 is inserted into the housing part 8. The rotating shaft 9 is a drive shaft. The rotating shaft 9 is inserted from the outside of the housing 5 into the roll housing part 8 and is extended through the hub 7. The rotating shaft 9 is fixed to the hub 7, for example, by an oil injection method.

[0006] A tie rod 10 is provided in the housing 5. Simultaneously with the insertion of the rotating shaft 9 into the housing 5, the tie rod 10 is inserted into the rotating shaft 9. In this state, the tie rod 10 is previously axially pulled by predetermined tensile force. As a result, the tie rod 10 is elongated by predetermined length. In such a state that the tie rod 10 has been pulled, a fixing nut 11 is attached onto the tie rod 10 by threaded engagement. The above tensile force is then released, whereby the rotating shaft 9 is fixed to the housing 5. As a result, the roll 2 is positioned and fixed to a predetermined position of the housing 5 to form the above gap 6.

[0007] Although the roll 2 is positioned by the above method, the position of the roll 2 relative to the housing 5 is not determined by direct operation of the roll 2. That is, the position of the roll 2 is determined as a result of the determination of the mounting position of the hub 7 relative to the rotating shaft 9 and the mounting position of the rotating shaft 9 relative to the housing 5.

[0008] The dimension of the gap 6 is much smaller than the dimension (size of outer shape) of the roll 2 and the rotating shaft 9. For this reason, in such a state that the roll 2 and the rotating shaft 9 have been incorporated in the housing 5, in some cases, the dimension of the gap 6 is not in exact agreement with the designed dimension. Further, as described above, the roll 2 is not positioned by directly operating the roll 2. This increases a tendency toward the occurrence of an error of the dimension of the gap 6, that is, the occurrence of disagreement of the dimension of the gap 6 with a designed dimension determined by the rotating shaft 9.

[0009] Further, when the rolling mill 1 is used for a long period of time, the position of the hub 7 relative to the rotating shaft 9 is sometimes varied due to abrasion of the hub 7 and the like. This also leads to an error between the dimension of the gap 6 and the designed dimension determined by the rotating shaft 9.

[0010] When the dimension of the gap 6 is not in exact agreement with the designed dimension, the wire rod or the like is not rolled into a designed outer diameter. Therefore, the once assembled rolling mill 1 should be dismantled and then reassembled. This work is very troublesome and further poses a problem of lowered productivity in a rolling line of the wire rod or the like.

[0011] US-A-3,861,187 discloses a rolling stand for rolling rod-like stock having at least three interchangeable driven work rolls disposed radially about the longitudinal axis of the stock to be rolled and all of the rolls together with their spindles being jointly adjustable relative to the stock axis by means of a single adjusting spindle.

[0012] "Iron & Engineer", vol. 55, no. 1, January, 1978, pages 55 to 67, and "Stahl u. Eisen", vol. 112, no. 7, July, 1997, pages 53 to 60 and 130 disclose a rolling mill block similar to that disclosed in US-A-3,861,187 above.

[0013] Accordingly, an object of the present invention is to provide a roll-type rolling mill which can accurately position rolls at respective predetermined positions.

[0014] This object can be achieved by the features defined in the claims. Particularly, the above object can be attained by a roll-type rolling mill comprising: a casing; a plurality of rolling rolls disposed within the casing so that the outer peripheral surfaces of the rolling mills are located to face each other; a drive shaft which is disposed within the casing and on which one of the plurality of rolling rolls, a first rolling roll, is mounted; a driven shaft which is disposed within the casing and on which the other rolling roll is mounted; a driven mechanism driven by the first rolling roll to drive the other rolling roll; a tie rod which is provided in the casing and is axially passed through the drive shaft and the driven shaft to position the drive shaft and the driven shaft relative to the casing;

and a position adjustment member for varying the position of the drive shaft and the driven shaft relative to the tie rod along the axial direction of the tie rod.

[0015] According to this construction, one of the plurality of rolling rolls, a first rolling roll, is mounted on the drive shaft and is disposed within the casing. On the other hand, the other rolling roll is mounted on the driven shaft and is disposed within the casing. When a plurality of the other rolling rolls are provided, the other rolling rolls are mounted on respective separate driven shafts. Since the first rolling roll and the other rolling roll(s) is (are) disposed so that the outer peripheral surfaces of them face each other, the outer peripheral surfaces of the rolling rolls define a rolling center part at which the wire rod or the steel bar is rolled. The first rolling roll is driven by driving the drive shaft, and the other rolling roll(s) is (are) driven by the driven mechanism upon the drive of the first rolling roll. This permits the wire rod or the like to be rolled while being supplied to the rolling center part.

[0016] The drive shaft is fixed by a tie rod. Specifically, when the drive shaft is inserted into the casing, the tie rod is axially passed through the drive shaft. The tie rod is previously pulled in the axial direction. In this state, a lock nut or the like is attached onto the tie rod by threaded engagement, and the tensile force is then released. As a result, the drive shaft tightened by the tie rod is fixed to the casing. The driven shaft can be fixed in the same manner as in the fixation of the drive shaft.

[0017] When the drive shaft is fixed onto the casing, the position of the first rolling roll relative to the casing is also determined. In this case, it is also considered that the position of the first rolling roll deviates from the designed predetermined position (the center of the rolling roll deviates from the rolling center part). In this case, the position of the drive shaft relative to the tie rod is varied by the position adjustment member to accurately position the first rolling roll at the designed predetermined position.

[0018] Regarding the rolling roll mounted on the driven shaft as well, the position of the driven shaft relative to the tie rod can be varied by the position adjustment member. Therefore, the rolling roll mounted on the driven shaft can be positioned at a designed predetermined position with high accuracy.

[0019] The position adjustment member according to the present invention comprises a cylindrical screw shaft which is attached by threaded engagement to the end face of each of the drive shaft and the driven shaft and is movable from each end face forward into the drive shaft and the driven shaft and backward from within the drive shaft and the driven shaft. According to this construction, since the cylindrical screw shaft is attached by threaded engagement to the drive shaft or the driven shaft, the position of the drive shaft and the driven shaft relative to the tie rod can be very easily and reliably varied by rotating the cylindrical screw shaft around the axial direction.

[0020] Further, the above object can be attained by a three-roll rolling mill comprising: a casing; three rolling rolls radially disposed within the casing so that the outer peripheral surfaces of the rolling mills are located to face each other; a drive shaft which is disposed within the casing and on which one of the rolling rolls, a first rolling roll, is mounted; two driven shafts which are disposed within the casing and on which the other rolling rolls are respectively mounted; a driven mechanism driven by the first rolling roll to drive the other rolling rolls; three tie rods which are provided in the casing and are axially passed through the drive shaft and each of the driven shafts to position the drive shaft and each of the driven shafts relative to the casing; and three position adjustment members for varying the position of the drive shaft and each of the driven shafts relative to each of the tie rod along the axial direction of each of the tie rods.

[0021] According to this construction, one of the three rolling rolls, a first rolling roll, is mounted on the drive shaft and is disposed within the casing. On the other hand, the two other rolling rolls are mounted on the respective driven shafts and are disposed within the casing. Since these three rolling rolls are disposed radially so that the outer peripheral surfaces of them face each other, the outer peripheral surfaces of the rolling rolls define a rolling center part at which the wire rod or the steel bar is rolled. The first rolling roll is driven by driving the drive shaft, and the other rolling rolls are driven by the driven mechanism upon the drive of the first rolling roll. This permits the wire rod or the like to be rolled while being supplied to the rolling center part.

[0022] The drive shaft is fixed by a tie rod. Specifically, when the drive shaft is inserted into the casing, the tie rod is axially passed through the drive shaft. The tie rod is previously pulled in the axial direction. In this state, a lock nut or the like is attached onto the tie rod by threaded engagement, and the tensile force is then released. As a result, the drive shaft tightened by the tie rod is fixed to the casing. The driven shaft can be fixed in the same manner as in the fixation of the drive shaft.

[0023] When the drive shaft is fixed onto the casing, the position of the first rolling roll relative to the casing is also determined. In this case, it is also considered that the position of the first rolling roll deviates from the designed predetermined position (the center of the rolling roll deviates from the rolling center part). In this case, the position of the drive shaft relative to the tie rod is varied by the position adjustment member to accurately position the first rolling roll at the designed predetermined position.

[0024] Regarding the rolling rolls mounted on the respective driven shafts as well, the position of each of the driven shafts relative to the tie rod is varied by the position adjustment member, and the two other rolling rolls can be positioned at designed predetermined positions with high accuracy.

[0025] The position adjustment members each comprise a cylindrical screw shaft which is attached by threaded engagement to the end face of each of the drive shaft and the driven shafts and is movable from each end face forward into the drive shaft and the driven shafts and backward from within the drive shaft and the driven shafts. According to this construction, since the cylindrical screw shaft is attached by threaded engagement to the drive shaft or the driven shafts, the position of the drive shaft and the driven shafts relative to the tie rod can be very easily and reliably varied by rotating the cylindrical screw shaft around the axial direction.

[0026] As described above, according to the present invention, even when the position of the rolling rolls has deviated from the predetermined position due to the so-called assembling error, annual change or the like, the position of each of the rolling roll can be regulated by a position adjustment member. Therefore, the individual rolling rolls can be always disposed at respective predetermined positions. Further, unlike the prior art technique, in the registration of the rolling rolls, there is no need to dismantle the whole rolling mill, and rolling roll position adjustment work can be easily and rapidly carried out.

[0027] Preferred embodiments of the present invention will be described in detail, if necessary, with reference to the accompanying drawings, in which

Fig. 1 is a cross-sectional view showing a three-roll rolling mill in one embodiment of the present invention;
Fig. 2 is an enlarged cross-sectional view of the principal part of a drive shaft of the three-roll rolling mill in one embodiment of the present invention; and
Fig. 3 is a cross-sectional view showing the structure of a conventional three-roll rolling mill.

[0028] Fig. 1 is a cross-sectional view of a three-roll rolling mill (hereinafter referred to simply as "rolling mill") in one embodiment of the present invention.

[0029] This rolling mill 20 includes a casing 21, three rolling rolls 22 to 24 disposed in a positioned state within the casing 21, a drive shaft 25 for supporting and rotation-driving the rolling roll 22, driven shafts 26, 27 for supporting the rolling rolls 23, 24, respectively, a driven mechanism 28 for rotating the driven shafts 26, 27 upon the rotation of the drive shaft 25, a tie rod 29 for positioning the drive shaft 25 and each of the driven shafts 26, 27 relative to the casing 21 (tie rods for respective driven shafts 26, 27 not shown), and a screw shaft (a position adjustment member) 30 for varying the position of the drive shaft 25 and each of the driven shafts 26, 27 relative to the tie rod 29.

[0030] The casing 21 is formed of, for example, a cast steel, and roll holding parts 31 to 33 are provided within the casing 21. The roll holding parts 31 to 33 house therein the rolling rolls 22 to 24, and, as shown in Fig. 1, are disposed radially in three directions within the casing 21. That is, the individual roll holding parts 31 to 33 are disposed so as to cross each other at an angle of 120 degrees.

[0031] The rolling roll 22 is in a disk form and comprises a roll body 34 and a hub 35.

[0032] The hub 35 is formed of, for example, SCM 440, and, as described below, the drive shaft 25 extends through the center part of the hub 35. The roll body 34 is formed of, for example, a ductile and is in a ring form.

[0033] This roll body 34 is fitted into the outer peripheral surface of the hub 35. The roll body 34 is firmly fixed to the hub 35, for example, by an oil injection method. To this end, an oil introduction path 36 is provided in the hub 35.

[0034] As shown in Fig. 1, the outer peripheral surface part of the roll body 34 is formed triangularly so as to be protruded outward in a radial direction, and a groove 37 is provided on the top of the roll body 34. The internal wall surface of the groove 37 is circular.

[0035] The rolling roll 23 and the rolling roll 24 have the same construction as the rolling roll 22, and, thus, the explanation thereof will be omitted.

[0036] As shown in Fig. 1, the drive shaft 25 is provided in a stepped rod form and is constructed to be rotation-driven by a necessary drive unit (not shown). The drive shaft 25 is disposed within the casing 21. Specifically, in Fig. 1, the drive shaft 25 is inserted, from the left side of the casing, into the casing 21 and is supported rotatably by a drive shaft support part 38 and a drive shaft support part 39 provided in the casing 21.

[0037] A through-hole 55 is axially provided in the center of the drive shaft 25. As described later, a tie rod 29 is inserted into the through-hole 55. A concave 57 is provided on the drive shaft 25 in its left end face 56. This concave 57 constitutes a seat of a fastening nut 58 which will be described in detail later.

[0038] The drive shaft support part 38 is provided with a bearing 40, and the left part of the drive shaft 25 is supported by this bearing 40. Further, the drive shaft support part 39 includes the tie rod 29 and an end plate 42. The tie rod 29 is a rod-shaped member. The tie rod 29 in its right end part 43 is in a flat plate form, and a male screw is provided on the left end part 59. The above fastening nut 58 is attached by threaded engagement to the left end part 59. The right end part 43 of the tie rod 29 is fixed to the casing 21, and the tie rod 29 extends toward the left side as shown in Fig. 1.

[0039] The end plate 42 is substantially cylindrical and is inserted into the tie rod 29. As described in detail later, the end plate 42 specifies the position of the right end face of the drive shaft 25. The end plate 42 is rotatably supported by the bearing 41.

[0040] Fig. 2 is an enlarged cross-sectional view of the principal part of the drive shaft 25 and shows the detailed structure of the drive shaft 25 and the drive shaft support part 39.

[0041] The screw shaft 30 is mounted on the right end face of the drive shaft 25. The screw shaft 30 is formed of, for example, S45C and is cylindrical. A male screw 44 is provided on the outer peripheral surface of the screw shaft 30, and a screw hole 46 with a female screw formed therein is provided on the right end face 45 of the drive shaft 25. The screw shaft 30 is mounted on the drive shaft 25 by attaching the screw shaft 30 by threaded engagement to the screw hole 46. Therefore, the rotation of the screw shaft 30 permits the screw shaft 30 to be moved forward or backward relative to the right end face 45 of the drive shaft 25. In Fig. 2, the screw shaft 30 is protruded from the right end face 45 of the drive shaft 25 by a distance d.

[0042] The rolling rolls 23, 24 have the same construction as the rolling roll 21, and, thus, the explanation thereof will be omitted. The rolling rolls 23, 24 are supported by the driven shaft 26 and the driven shaft 27, respectively, and are housed in the roll holding parts 32, 33. These driven shafts 26, 27 are supported on the casing 21 by a bearing (not shown), whereby the rolling rolls 22, 23 are rotatable about the driven shafts 26, 27.

[0043] The driven shafts 26, 27 are driven by the driven mechanism 28. The driven mechanism 28 comprises two pairs of bevel gears 47 to 50. The bevel gears 47, 49 are supported on the roll holding part 31 of the casing 21 through bearings 51, 52 and are fixed to the drive shaft 25. The bevel gears 48, 50 are supported on the roll holding parts 32, 33, respectively, through bearings. The bevel gear 48 is fixed to the driven shaft 26, and the bevel gear 50 is fixed to the driven shaft 27.

[0044] The bevel gear 47 meshes with the bevel gear 48, and the bevel gear 49 meshes with the bevel gear 50. Therefore, upon the rotation of the driven shaft 25, the bevel gears 47, 49 are rotated, and, at the same time, the bevel gears 48, 50 are rotated, whereby, upon the rotation of the drive shaft 25, the driven shafts 26, 27 are rotated to rotate the rolling rolls 22 to 24.

[0045] As described above, the groove 37 is provided in the rolling rolls 22 to 24. Therefore, in such a state that, as shown in Fig. 1, the rolling rolls 22 to 24 are placed to face each other, the grooves 37 of the rolling rolls 22 to 24 face each other radially from three directions. The grooves 37 provided to face each other constitute a rolling center 53. The internal wall surface of the grooves 37 is circular, and, thus, a substantially circular rolling center 53 is provided.

[0046] A material such as a wire rod is supplied to the rolling center and is rolled into a bar material having a predetermined outer diameter by rotating the rolling rolls 22 to 24.

[0047] Next, how to assemble the rolling rolls 22 to 24 on the casing 21 will be described.

[0048] The roll body 34 of the rolling roll 22 is previously mounted on the hub 35 by the above method. The rolling roll 22 is inserted into the roll housing part 31, and, in this state, the drive shaft 25 is inserted into the casing 21, whereby the drive shaft 25 is extended through the rolling roll 22. The rolling roll 22 is fixed to the drive shaft 25, for example, by an oil injection method. To this end, an oil introduction path 54 is provided in the hub 35.

[0049] Since the tie rod 29 is provided in the casing 21, upon the insertion of the drive shaft 25 into the casing 21 as described above, the tie rod 29 is inserted into and extended through the through-hole 55 of the drive shaft 25. This allows the right end of the tie rod 29 to be abutted against the end plate 42, and the left end part 59 of the tie rod 29 is protruded from the left end face 56 of the drive shaft 25. At that time, since the screw shaft 44 is protruded from the right end face 45 of the tie rod 29 by a distance d, the screw shaft 44 is abutted against the end plate 42.

[0050] Further, the tie rod 29 is pulled by necessary tensile force toward the left side in the drawing and consequently is elongated by a predetermine level. A conventional apparatus such as a hydraulic power unit is adopted for pulling the tie rod 29. In this state, the fastening nut 58 is attached onto the tie rod 29 by threaded engagement, and the fastening nut 58 is tightened within the concave 57. Upon the tightening of the fastening nut 58 by a predetermined tightening torque, the tensile force is released. This causes an axial contraction in the tie rod 29. As a result, the drive shaft 25 is firmly positioned and fixed onto the casing 21. The rolling rolls 23, 24 are also positioned and fixed within the casing 21 in the same manner as in the rolling roll 22.

[0051] When the rolling rolls 22 to 24 have been positioned by the above method, in some cases, the rolling rolls 22 to 24 are not disposed at respective designed positions. Specifically, when the rolling rolls 22 to 24 are positioned and the grooves 37 of the rolling rolls 22 to 24 are disposed to face each other, in some cases, the rolling center 53 does not have an accurate circular shape. This makes it impossible to form a designed bar material by rolling with high accuracy.

[0052] In this embodiment, as shown in Fig. 2, since a screw shaft 30 is provided on the drive shaft 25 and the driven shafts 26, 27, the position of the end face (that is, the right end face of the screw shaft 30) of the drive shaft 25 and the driven shafts 26, 27 may be varied by rotating the screw shaft 30. Therefore, even when the position of the rolling rolls 22 to 24 deviates from the designed position, the position of the drive shaft 25 and the driven shafts 26, 27 can be varied by properly rotating the screw shaft 30 to accurately dispose the rolling rolls 22 to 24 at the respective designed positions. Specifically, the position of the rolling rolls 22 to 24 can be easily varied by once loosening the fastening nut 58 and rotating the screw shaft 30.

[0053] Thus, in this embodiment, by virtue of the provision of the screw shaft 30, the position of the drive shaft 25 and the driven shafts 26, 27 relative to the tie rod 29 can be varied, and, consequently, the rolling rolls 22 to 24 can be accurately disposed at the designed positions. Therefore, according to this embodiment, unlike the prior art technique, for registration of the rolling rolls 22 to 24, there is no need to once dismantle the drive shaft 25, the driven shaft 26, and the rolling rolls 22 to 24, and simple and rapid work can be realized.

[0054] In particular, in this embodiment, the screw shaft 30 is adopted for regulating the position of the drive shaft 25 and the driven shafts 26, 27, and the member for regulating the position of the drive shaft 25 and the like has a very simple structure. Therefore, this embodiment is advantageous in that the production cost of the whole rolling mill 20 is not significantly increased.

[0055] The member for regulating the position of the drive shaft 25 and the like, however, is not limited to the screw shaft 30, and other various spacers and mechanisms for directly elongating/contracting the drive shaft 25 and the like may be adopted.

[0056] In this embodiment, the present invention is applied to a three-roll rolling mill provided with rolling rolls 22 to 24. The application of the present invention, however, is not limited to the three-roll rolling mill, and it is a matter of course that the present invention can also be applied to two-roll rolling mills and, in addition, four-roll rolling mills and other multi-roll rolling mills.

[0057] Also in this case, as with the rolling rolls 22 to 24 in this embodiment, the individual rolling rolls are disposed within the casing, one of the plurality of rolling rolls is supported by the drive shaft while the other rolling roll (s) is (are) supported by the driven shafts. The driven shaft(s) is (are) driven by the same mechanism as the driven mechanism 28, and the position of the drive shaft and the driven shaft(s) can be regulated by the screw shaft 30.

Claims

1. A roll-type rolling mill comprising:

a casing (21);
a plurality of rolling rolls (22, 23, 24) disposed within the casing so that the outer peripheral surfaces of the rolling mills are located to face each other;
a drive shaft (25) which is disposed within the casing and on which one of the plurality of rolling rolls, a first rolling roll, is mounted;
a driven shaft (26, 27) which is disposed within the casing and on which the other rolling roll(s) is (are) mounted;
a driven mechanism (28) driven by the first rolling roll to drive the other rolling roll;
a tie rod (29) which is provided in the casing and is axially passed through the drive shaft and the driven shaft to position the drive shaft and the driven shaft relative to the casing; and
a position adjustment member (30) for varying the position of the drive shaft and the driven shaft relative to the tie rod along the axial direction of the tie rod, **characterized in that** said position adjustment member comprises a cylindrical screw shaft (30) which is attached by threaded engagement to the end face of each of the drive shaft and the driven shaft and is movable from each end face forward into the drive shaft and the driven shaft and backward from within the drive shaft and the driven shaft.

2. A three-roll rolling mill according to claim 1, wherein the roll-type rolling mill comprises:

three rolling rolls (22, 23, 24) radially disposed within the casing so that the outer peripheral surfaces of the rolling mills are located to face each other;
the drive shaft (25) on which one of the three rolling rolls (22, 23, 24), a first rolling roll, is mounted;
two driven shafts (26, 27) which are disposed within the casing and on which the other rolling rolls are respectively mounted;
three tie rods (29) which are provided in the casing and are axially passed through the drive shaft and each of the driven shafts to position the drive shaft and each of the driven shafts relative to the casing; and
three position adjustment members (30) for varying the position of the drive shaft and each of the driven shafts relative to each of the tie rod along the axial direction of each of the tie rods.

Patentansprüche

1. Walzgerüst mit:

einem Gehäuse (21);
mehreren Walzen (22, 23, 24), die im Gehäuse so angeordnet sind, daß die Außenumfangsflächen der Walzen zueinanderweisend liegen;
einer Antriebswelle (25), die im Gehäuse angeordnet ist und auf der eine der mehreren Walzen, eine erste Walze, angeordnet ist;
einer Abtriebswelle (26, 27), die im Gehäuse angeordnet ist und auf der die andere(n) Walze(n) angeordnet ist (sind);
einem Abtriebsmechanismus (28), der durch die erste Walze angetrieben wird, um die andere Walze anzutreiben;
einer Verbindungsstange (29), die im Gehäuse vorgesehen ist und durch die Antriebswelle und die Abtriebswelle axial durchgeführt ist, um die Antriebswelle und die Abtriebswelle relativ zum Gehäuse zu positionieren; und
einem Positionseinstellteil (30) zum Variieren der Position der Antriebswelle und der Abtriebswelle relativ zur Verbindungsstange in Axialrichtung der Verbindungsstange,
dadurch gekennzeichnet, daß das Positionseinstellteil aufweist:

eine zylindrische Schneckenwelle (30), die durch Gewindeeingriff jeweils an der Endfläche der Antriebswelle und der Abtriebswelle angebracht ist und von jeder Endfläche vorwärts in die Antriebswelle und die Abtriebswelle und rückwärts aus dem Inneren der Antriebswelle und der Abtriebswelle bewegbar ist.

2. Dreiwalzengerüst nach Anspruch 1, wobei das Walzgerüst aufweist:

drei Walzen (22, 23, 24), die im Gehäuse so radial angeordnet sind, daß die Außenumfangsflächen der Walzen zueinanderweisend liegen;
die Antriebswelle (25), auf der eine der drei Walzen (22, 23, 24), eine erste Walze, angeordnet ist;
zwei Abtriebswellen (26, 27), die im Gehäuse angeordnet sind und auf denen die anderen Walzen jeweils angeordnet sind;
drei Verbindungsstangen (29), die im Gehäuse vorgesehen sind und durch die Antriebswelle und jede der Abtriebswellen axial durchgeführt sind, um die Antriebswelle und jede der Abtriebswellen relativ zum Gehäuse zu positionieren; und
drei Positionseinstellteile (30) zum Variieren der Position der Antriebswelle und jeder der Abtriebswellen relativ zu jeder der Verbindungsstangen in Axialrichtung jeder der Verbindungsstangen.

Revendications

1. Laminoir à cylindre comprenant :

■ un corps (21) ;
■ une pluralité de cylindres de laminage (22, 23, 24) disposés à l'intérieur du corps de sorte que les surfaces périphériques extérieures des laminoirs sont positionnées pour se faire face ;
■ un arbre d'entraînement (25) qui est disposé à l'intérieur du corps et sur lequel un parmi la pluralité de cylindres de laminage, un premier cylindre de laminage, est monté ;
■ un arbre entraîné (26, 27) qui est disposé à l'intérieur du corps et sur lequel l'autre (les autres) cylindre(s) de laminage est (sont) monté (s) ;
■ un mécanisme entraîné (28) entraîné par le premier cylindre de laminage pour entraîner l'autre cylindre de laminage ;
■ un tirant (29) qui est prévu dans le corps et passe de façon axiale à travers l'arbre d'entraînement et l'arbre entraîné pour positionner l'arbre d'entraînement et l'arbre entraîné par rapport au corps ; et
■ un élément de réglage de position (30) destiné à varier la position de l'arbre d'entraînement et l'arbre entraîné par rapport au tirant le long de la direction axiale du tirant, **caractérisé en ce que** ledit élément de réglage de position comprend :

■ un arbre à vis cylindrique (30) qui est fixé par engagement fileté à la face d'extrémité de chacun de l'arbre d'entraînement et l'arbre entraîné et est mobile à partir de chaque face d'extrémité vers l'avant dans l'arbre d'entraînement et l'arbre entraîné et vers l'arrière à partir de l'intérieur de l'arbre d'entraînement et l'arbre entraîné.

2. Laminoir à trois cylindres selon la revendication 1, dans lequel le laminoir à cylindre comprend :

■ trois cylindres de laminage (22, 23, 24) disposés de façon radiale à l'intérieur du corps de sorte que les surfaces périphériques extérieures des laminoirs soient positionnées pour se faire face ;
■ l'arbre d'entraînement (25) sur lequel un des trois cylindres de laminage (22, 23, 24), un premier cylindre de laminage, est monté ;
■ deux arbres entraînés (26, 27) qui sont disposés à l'intérieur du corps et sur lequel les autres cylindres de laminage sont respectivement montés ;
■ trois tirants (29) qui sont prévus dans le corps et passent de façon axiale à travers l'arbre d'entraînement et chacun des arbres entraînés pour positionner l'arbre d'entraînement et chacun des arbres entraînés par rapport au corps ; et
■ trois éléments de réglage de position (30) destinés à varier la position de l'arbre d'entraînement et chacun des arbres entraînés par rapport à chacun des tirants le long de la direction axiale de chacun des tirants.

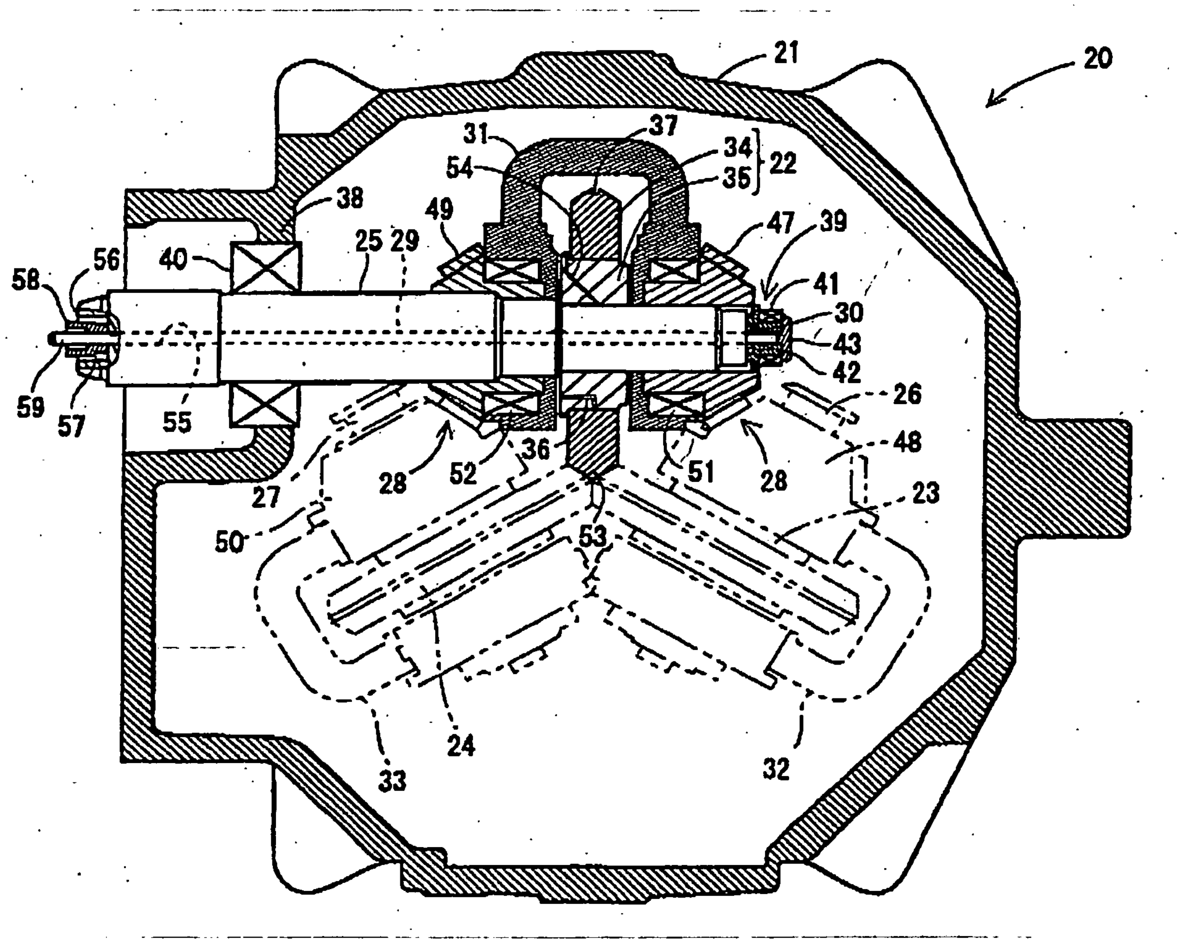
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FIG. 1

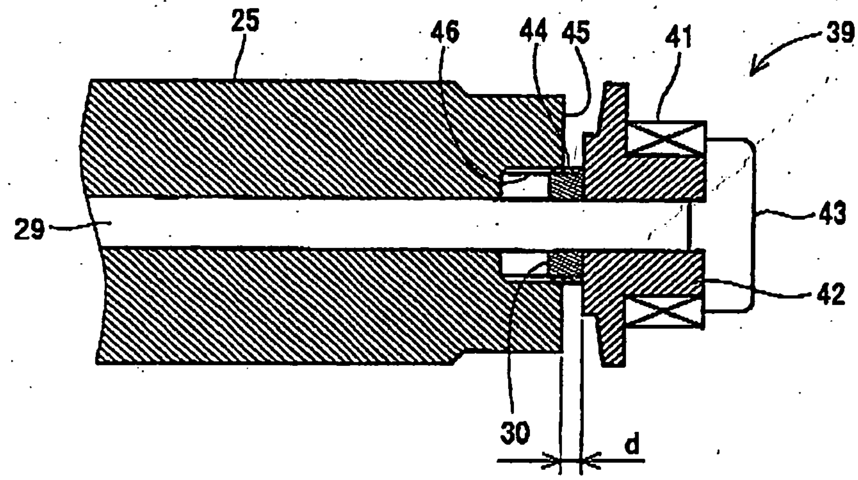

FIG. 2

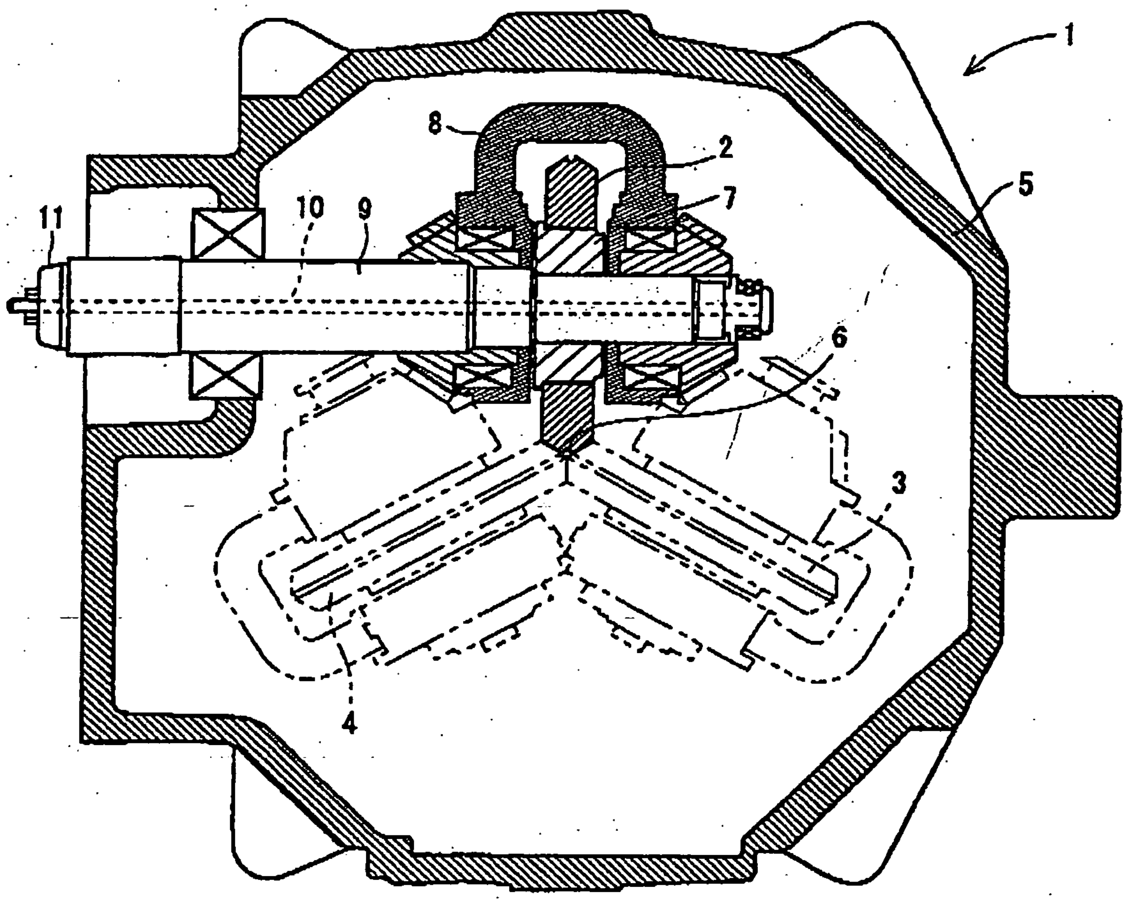

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- *Stahl u. Eisen,* July 1997, vol. 112 (7), 53-60130 **[0012]**