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Remarks:
This application was filed on 22-05-2012 as a divisional application to the application mentioned under INID code 62.

(54) **Eccentric bush moment arm bearing assembly**

(57) The present invention relates to a bearing assembly for grinding cereals comprising a moving roll (13), a standing roll (5), an assembly bracket (6) whereby said moving roll (13) is assembled by means of a moving bearing (14), a piston (7) coupled to this bracket (6) by means of a moving hub (7.1), spring assembly (4), and adjustment spindle (15), a moment arm (1) provided with an eccentric bush (2) driven eccentrically in a moving hub (1.1) to allow said grinding rolls (13, 5) be engaged and disengaged quickly by means of said piston (7) in an accurate manner, and characterized by comprising a roll assembly lifting wheel apparatus (21) which is assembled externally when needed and allows said assembly bracket (6) be lifted upwards to some extent.

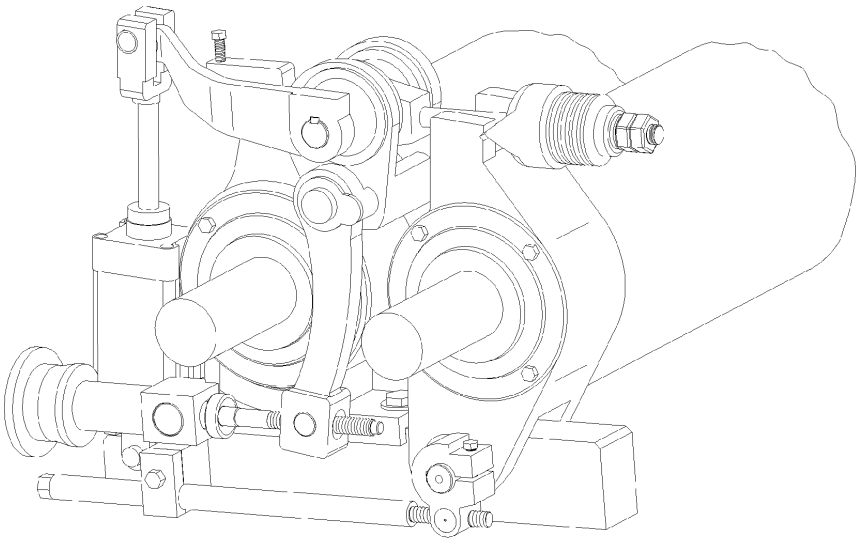

Figure 15

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Description

Technical Field

[0001] The present invention relates to bearing assemblies supporting the grinding rolls of milling machines employed in grinding cereals to produce flours, semolina etc.

[0002] The present invention more particularly relates to an eccentric bush moment arm which allows to quickly engage to and disengage from each other said grinding rolls by means of a piston and which at the same time allows such operations be conducted accurately.

Background of Invention

[0003] Grinding operations in milling machines are conducted by means of grinding the cereals between grinding rolls. Such grinding operations are conducted by feeding the cereals or grains into the gap between two rolls by means of transfer elements, and products such as flours, semolina, etc. are obtained by means of grinding cereals with the rolls rotating inversely.

[0004] There is a requirement that one of the grinding rolls is rotated more slowly as compared to the other roll. This requirement originates from the grinding technique.

[0005] The rolls must be maintained close to each other to a desired extent while cereals are ground, and if the cereal supply in between the rolls is interrupted for any reason, the rolls must be disengaged from each other. This is because if the distance between the rolls is too close, i.e. they are very close to each other, and the cereal feed is interrupted, the rolls may hit to each other -due to the clearances to occur within bearing elements in time- so as to deteriorate the roll surfaces and generate noise, etc. This problem does not occur as cereals are processed, because the cereals ground between the rolls provide elimination of this gap. This problem starts when the rolls are kept in the rotating mode with the cereal feed being interrupted. Therefore, the rolls are engaged to each other while cereals are processed, and they are disengaged from each other once the cereal feed is interrupted.

[0006] The patent applications DE2730166 and EP0336939B1 can be given as examples in relation to milling assemblies. The patent application DE2730166 discloses a milling assembly and method prepared to grinding cereals.

[0007] The patent application EP0336939B1, on the other hand, relates to grinding various cereals between two rolls and to further grinding them between two more rolls without any sieving effect, and to suitable processes for such purpose. Bearing assemblies are seen here as well.

[0008] The application TR 2005 03728 U filed at the Turkish Patent Office and titled "An Arrangement to angularly position Grinding Rolls relative to each other" can be given as another example. Here is disclosed an angular positioning approach, performed by means of an eccentric angular positioning arrangement of rolls. Here the operation of the angular positioning arrangement needs to be followed externally with a scale.

[0009] Another relevant application is the patent application EP1201 308 A1 of the firm OCRIM. This application discloses wheels provided to facilitate the maintenance and assembly of grinding rolls. Said wheels, however, are provided rigidly within the assembly bracket. The presence of wheels in each machine influences both the assembly process and costs substantially.

[0010] The application TR 2006 02167 U filed at the Turkish Patent Office relates to cereal grinding machines, in which are comprised a drive roll and a driven roll, pulleys are coupled to the end parts of said rolls, the drive taken from the drive roll is transmitted to the driven roll by means of a drive transmission element, and said drive transmission element is tensioned by means of an idle pulley, wherein is further disclosed an idle tensioner plate supporting said idle pulley, said idle tensioner plate being supported so as to rotate around an origin that corresponds to the center of a moving bearing.

Description of Invention

[0011] The objective of the present invention is to provide the feature of quick engaging said grinding rolls to each other or quick disengaging said rolls from each other by an accurate adjustment capability.

[0012] In order to realize the mentioned objective, there is a provided moment arm with an eccentric bush which is driven eccentrically in a drive hub that allows said grinding rolls to be engaged to and disengaged from each other quickly by means of said piston and allows such operations be made accurately.

[0013] In order to realize the mentioned objectives, said eccentric bush comprises an eccentric hub.

[0014] A further objective of the present invention is having an angular positioning arm to provide angular positioning of said grinding rolls upward and downward with eccentric structure and an indicator thereof, allowing such angularly positioning operations be made more easily and indicating the degree of such angular positioning.

[0015] In order to realize the mentioned objectives, there is provided at least one angular positioning arm ensuring the upward and downward displacement of moving roll.

[0016] In order to realize the mentioned objectives, there is provided an angular positioning eccentric bush where said angular positioning arm is fixed and an angular positioning eccentric hub formed on said bush.

[0017] In order to realize the mentioned objectives, said angular positioning arm comprises at least one angular positioning arm scale.

[0018] A further objective of the present invention is having wheels with modular structure, which allow the assembly and maintenance of grinding rolls be made easily. Thus, said wheels are used only during assembly and maintenance.

[0019] Another objective of the present invention is to avoid the need of using extra wheels for each machine since such wheels have modular structures, such that the costs and assembly periods are minimized.

[0020] In order to realize the mentioned objectives, there is provided a wheel with a modular structure to lift the assembly bracket upward to some extent and a roll assembly lifting wheel apparatus having an eccentric wheel axle.

[0021] In order to realize the mentioned objectives, there is provided a tensioning spacer piece having a coupling center, a fixation channel and an eccentric tension spindle ensuring the tension of the timing belt.

[0022] In order to achieve the mentioned objectives, there are provided coupling bolts, which ensure the fixation of said tensioning spacer on the bracket, and channel coupling bolts.

[0023] In order to realize the mentioned objectives, said eccentric tension spindle comprises at least one fixation bolt.

[0024] In order to achieve the mentioned objectives, there are provided a locking latch having an eccentric spindle locking and idling the adjustment spindle, and a locking compressing piece coupled to said latch and moved up- and downward.

[0025] In order to realize the mentioned objectives, there are provided fixation teeth formed on the adjustment spindle ensuring the locking and supporting of said locking compressing piece.

[0026] In order to achieve the mentioned objectives, a compressing spring is provided that compresses the locking piece.

[0027] In order to achieve the mentioned objectives, there is a compressing spindle bushing provided whereby the compressing spring and locking piece are kept inside and a cover for said bushing.

Figures Illustrating the Invention

[0028]

Figure 1 illustrates a milling position wherein the eccentric bush moment arm keeps the rolls close to each other.

Figure 2 illustrates the position wherein the piston rotates the eccentric bush in the moment arm so that the rolls are disengaged.

Figure 3 illustrates an exemplar grinding implementation wherein the eccentric bush moment arm keeps the rolls close to each other.

Figure 4 illustrates an exemplar embodiment wherein the piston rotates the eccentric bush in the moment arm so that the rolls are disengaged.

Figure 5 illustrates the position wherein the adjustment spindle is rotated to change the position of the moment arm so that the rolls are disengaged in an accurate way, while the rolls were in the grinding position.

Figure 6 illustrates an exemplar embodiment wherein the adjustment spindle is rotated to change the position of the moment arm so that the rolls are disengaged in an accurate way, while the rolls were in the grinding position.

Figure 7 illustrates the case wherein the position of moving roll as it is angularly positioned downward is followed by means of the scale.

Figure 8 illustrates the case wherein the position of moving roll as it is angularly positioned upward is followed by means of the scale.

Figure 9 gives an exemplary embodiment wherein the position of moving roll as it is angularly positioned downward is followed by means of the scale.

Figure 10 gives an exemplary embodiment wherein the position of moving roll as it is angularly positioned upward is followed by means of the scale.

Figure 11 illustrates an exemplary embodiment wherein the wheels are mounted to disassemble the roll assembly.

Figure 12 illustrates an exemplary embodiment wherein the roll assembly is lifted upwards.

Figure 13 illustrates an exemplary embodiment wherein the uplifted roll assembly is slid outwards.

Figure 14 is a perspective view of the eccentric bush moment arm.

Figure 15 is a perspective view of the bearing assembly in an assembled form.

Figure 16 is an exemplary embodiment wherein the tensioning spacer piece and the timing belt are pre-positioned.

Figure 17 is a cross-sectional top illustration of the pre-positioned tensioning spacer piece and timing belt.

Figure 18 is an exemplary embodiment and detailed illustration of the adjustment spindle locking mechanism.

Reference Numbers of Parts

[0029]

1. Moment arm
1.1. Moment arm drive hub
2. Moment arm eccentric bush
2.1. Eccentric hub
3. Bearing assembly
4. Spring assembly
5. Standing roll
5.1. Standing roll moving hub
5.2. Standing bearing
6. Assembly bracket
7. Piston
7.1. Piston moving hub
7.2. Piston rod
7.3. Piston coupling point
8. Piston coupling arm
8.1. Coupling arm support protrusion
8.2. Stopper
9. Tension arm
10. Tension bracket
11. Tension spring
12. Tension adjustment nut
13. Moving roll
13.1. Moving roll moving hub
14. Moving bearing
14.1. Moving bearing moving hub
15. Adjustment spindle
15.1. Adjustment hand wheel
15.2. Adjustment spindle coupling point
15.3. Adjustment spindle nut coupled to the moment arm
16. Angular positioning adjustment spindle
16.1. Adjustment spindle rotating edge
16.2. Adjustment spindle bracket
16.3. Bracket coupling point
17. Angular positioning arm
17.1. Angular positioning arm scale
17.2. Scale arrow
18. Angular positioning eccentric bush
18.1. Angular positioning eccentric hub
19. Distance between axes (X)
20. Distance between axes (Y)
21. Roll assembly lifting wheel apparatus
21.1. Eccentric wheel axle
21.2. Wheel
22. Wheel apparatus fixation ring
23. Tensioning spacer piece
23.1. Tensioning spacer piece positioning channel
23.2. Tensioning spacer piece coupling hub
23.3. Tensioning spacer piece coupling bolts
23.4. Tensioning spacer piece fixation bolt
23.5. Positioning scale
24. Eccentric tension spindle
24.1. Eccentric tension spindle fixation bolt
25. Tension pulley
25.1. Tension pulley bearings
26. Driven pulley
27. Drive pulley
28. Drive belt
29. Adjustment spindle locking mechanism

30. Locking compressing piece

30.1. Adjustment spindle fixation teeth

31. Locking eccentric spindle

32. Locking latch

33. Compressing spring

34. Compressing spindle bushing

34.1. Bushing cover

Detailed Description of Invention

[0030] The present invention provides a moment arm (1) with at least one eccentric bush (2) which is driven eccentrically in a moving hub (1.1) that allows said grinding rolls (13, 5) to be engaged and disengaged by means of said piston (7) and allows such operations be made accurately.

[0031] The moment arm (1) both ensures an accurate adjustment of said rolls (13, 5) by means of the adjustment spindle (15), and makes said rolls (13, 5) engage and disengage from the eccentric bush (2) in the eccentric bush slot by means of the piston (7) in a quick and stable manner.

[0032] The standing roll (5) illustrated in figures 1, 2, 3 and 4 is assembled to the standing bearing (5.2) on the assembly bracket (6) and is immovable. Said standing roll comprises also a moving hub (5.1). The eccentric bush moment arm (1) is assembled from the moment arm moving hub (1.1) to the standing bearing (5.2) by means of a pin. The moving roll (13) is assembled from the moving bearing moving hub (14.1) to the moving bearing (14) and assembly bracket (6) by means of a pin.

[0033] The tension arm (9) is coupled to the tension bracket (10) so as to exert load onto the moving bearing (14) in the direction the rolls (13, 5) are engaged. The other end of the tension arm (9) is coupled to the eccentric bush (2) by means of a pin from the eccentric hub (2.1).

[0034] As shown in figures 2 and 4, the eccentric bush (2) is connected with the piston rod (7.2) by means of the piston coupling arm (8) with a pin. The piston (7) assembled with a pin from the piston moving hub (7.1) to the assembly bracket (6) pulls the drive arm (8) assembled to the eccentric bush (2) so as to rotate the eccentric bush (2) and moving the tension arm (9) backward. The moving roll (13) is moved away from the standing roll (5) by means of the moving bearing (14) coupled to the tension arm (9).

[0035] As illustrated in figures 1 and 3, the piston (7) pushes the drive arm (8) and brings the rolls (13, 5) close to each other so as to switch to the grinding mode. The piston coupling arm (8) leaning on the stopper (8.2) located on the support protrusion (8.1) provides the system's stability in the grinding mode.

[0036] As illustrated in figures 5 and 6, the adjustment spindle (15) is assembled from the adjustment spindle coupling point (15.2) in a rotatable manner and positions the moment arm (1) with the adjustment spindle nut (15.3) accurately.

[0037] As illustrated in figures 7, 8, 9 and 10, the angular positioning adjustment spindle (16) moves the moving roll (13), which is coupled to the moving bearing (14) from the angular positioning hub (18.1) coupled to the eccentric bush (18) down- or upward by means of the angular positioning arm (17) so as to angularly position the rolls (13, 5) relative to each other. In Figure 9 the bracket coupling point (16.3) is illustrated as well.

[0038] Figure 7 illustrates the case where the moving roll (13) is lowered down, a distance X(19) occurs.

[0039] Figure 8 illustrates the case where the moving roll (13) is raised up, a distance Y (20) occurs.

[0040] The scale arrow (17.2) indicates the angular positioning arm's (17) position on the scale (17.1) so as to be followed. Thanks to this scale arrangement (17.1, 17.2); the angular positioning extent of rolls can be predetermined and implemented accordingly.

[0041] As illustrated in figures 11, 12 and 13, the rolls (13, 5) with the bearing assemblies (3) are removed from the system by means of the wheel axle (21.1) and wheel (21.2) of the roll assembly wheel apparatus (21). The wheel apparatus (21) provided with wheel (21.2) and eccentric wheel axle (21.1) is engaged to the slots on the assembly bracket (6). The eccentric wheel axels (21.1) are rotated so that the assembly bracket (6) is lifted upwards to some extent. The wheel apparatus (21) is fixed by means of a fixation ring (22). The wheel apparatuses (21) are attached to four slots on two mutual assembly brackets (6) and the eccentric wheel axels (21.1) are rotated, such that two assembly brackets (6) lifted upwards on four wheels (21.2), and accordingly the bearing assemblies (3) and rolls (13, 5) are slid over the machine and conveniently taken out.

[0042] The patent EP1201 308 A1 of Ocrim discloses a similar arrangement. The wheels in this arrangement are provided rigidly within the assembly bracket. In the present arrangement, however, the wheel apparatus (21) is an external component and is attached if needed to perform the disassembly operation. When the wheel apparatus (21) is used it is taken out from the assembly bracket (6) and is stored until used in another machine. And the emptied slots on the assembly bracket (6) are closed with plugs.

[0043] The tension arrangements made by means of an eccentric tension spindle (24) only (without the tensioning spacer piece (23)) fail in providing the positioning whereby the drive belt (28) embraces the driven pulley (26) in a maximal manner. In this case the drive belt (28) shall not be able to transmit adequate power to the driven pulley (26) and cause problems such as skidding, loosening, etc, leading to an inefficient grinding operation.

[0044] Based on this consideration, an eccentric tensioning spacer piece (23) is developed capable of pro-

viding a second eccentricity to carry out pre-positioning. A slot is provided on this piece, whereto a tensioning eccentric spindle (24) is connected. This piece is assembled to the slot on the assembly bracket (6) more eccentrically. The tensioning spacer piece (23) is fixed from the positioning channel (23.1) to the assembly bracket (6) at a desired eccentric position by means of a bolt so as to provide the pre-positioning. The drive belt (28) is tensioned to a desired extent by means of the eccentric tension spindle (24).

[0045] A scale (23.5) is provided on the positioning channel (23.1) whereby the eccentricity can be followed.

[0046] As illustrated in Figure 17, a cross-sectional top view is given of the tensioning of the tensioning spacer piece (23) and drive belt (28). Here are shown the tension pulley (25), tension pulley bearings (25.1), driven pulley (26), drive pulley (27) and drive belt (28).

[0047] Figure 18 illustrates the fixation teeth (30.1) formed on the adjustment spindle (15) to lock the adjustment spindle (15). By rotating the locking latch (32) connected to the eccentric spindle (31), the locking compressing piece (30) is linearly displaced downward and locks the adjustment spindle (15) with the fixation teeth (30.1) by means of the compressing spring (33). The compressing piece (30) operates in a compressing spindle bushing (34) and a cover (34.1) thereof.

Claims

1. A milling mechanism to grind cereals comprising a moving roll (13), a standing roll (5), an assembly bracket (6) whereby said moving roll (13) is assembled by means of a moving bearing (14), a piston (7) coupled to this bracket (6) by means of a moving hub (7.1), spring assembly (4) and adjustment spindle (15), a moment arm (1) provided with an eccentric bush (2), which is driven eccentrically in a moving hub (1.1) and allows said grinding rolls (13, 5) to be quickly engaged and disengaged by means of said piston (7) and adjusts the grinding rolls (13, 5) accurately, said milling mechanism being **characterized by** comprising a roll assembly lifting wheel apparatus (21) which is assembled externally when needed and allows said assembly bracket (6) be lifted upwards to some extent.

2. A mechanism according to Claim 1, **characterized by** a fixation ring (22) providing the fixation of said wheel apparatus (21).

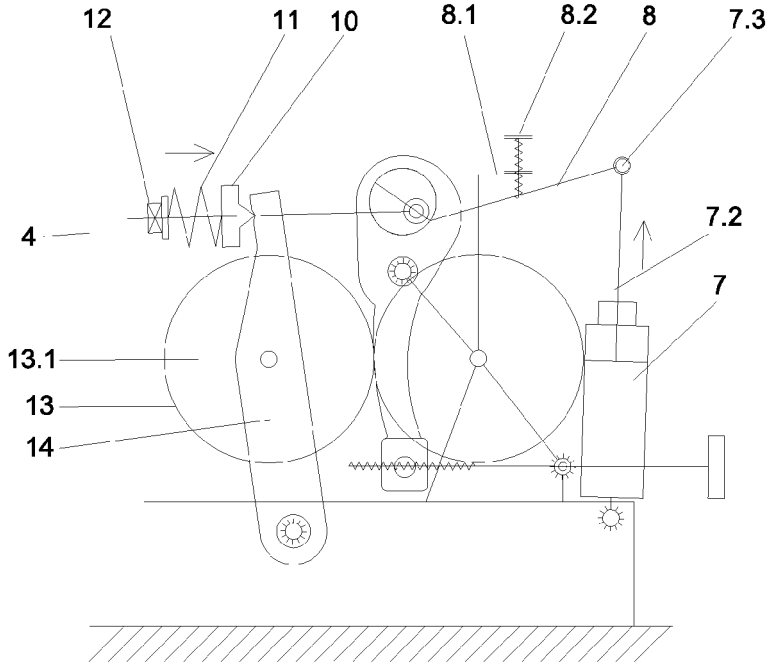

Figure 1

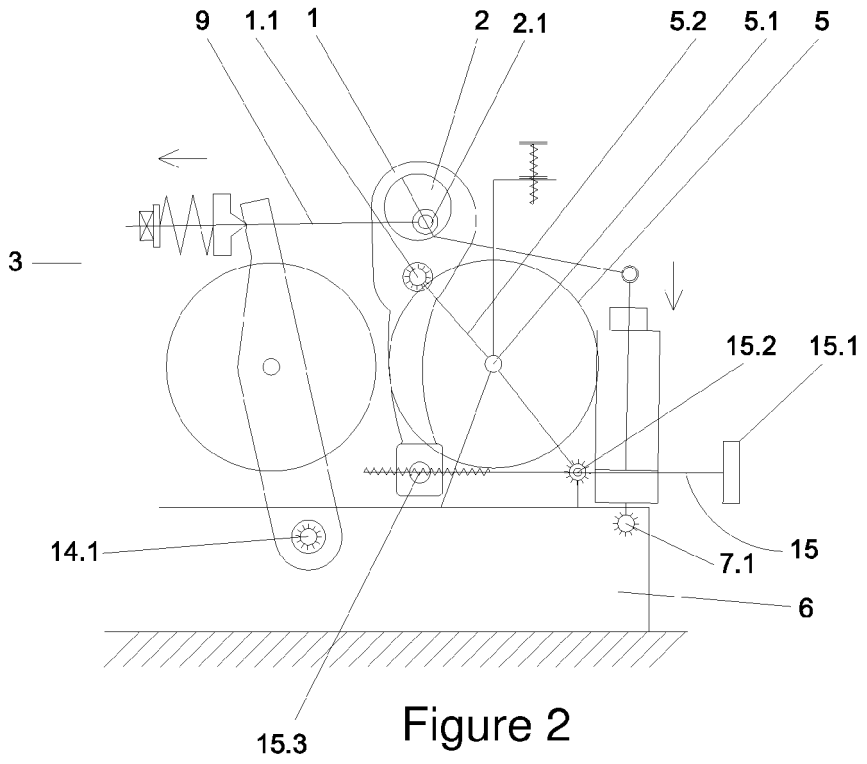

Figure 2

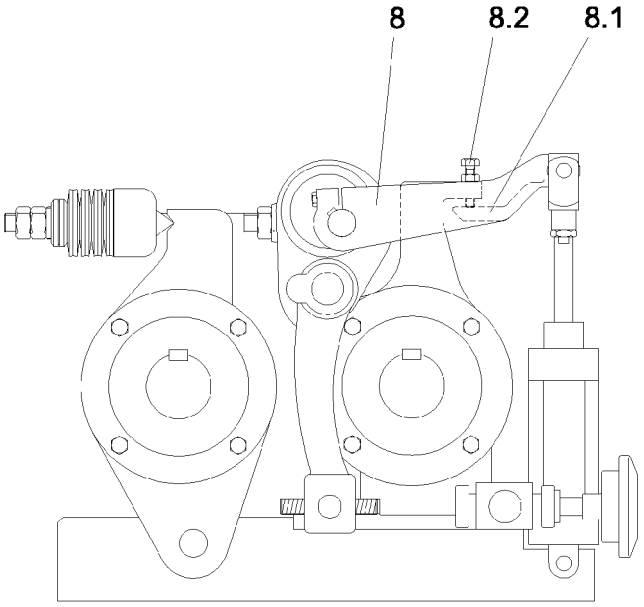

Figure 3

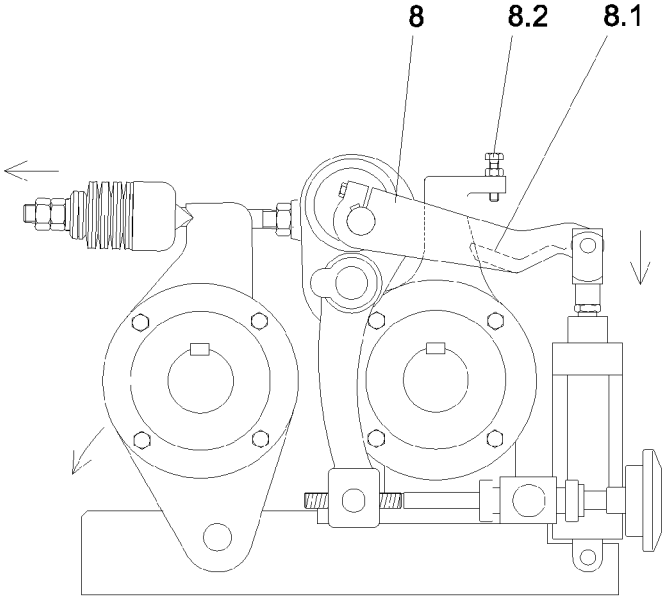

Figure 4

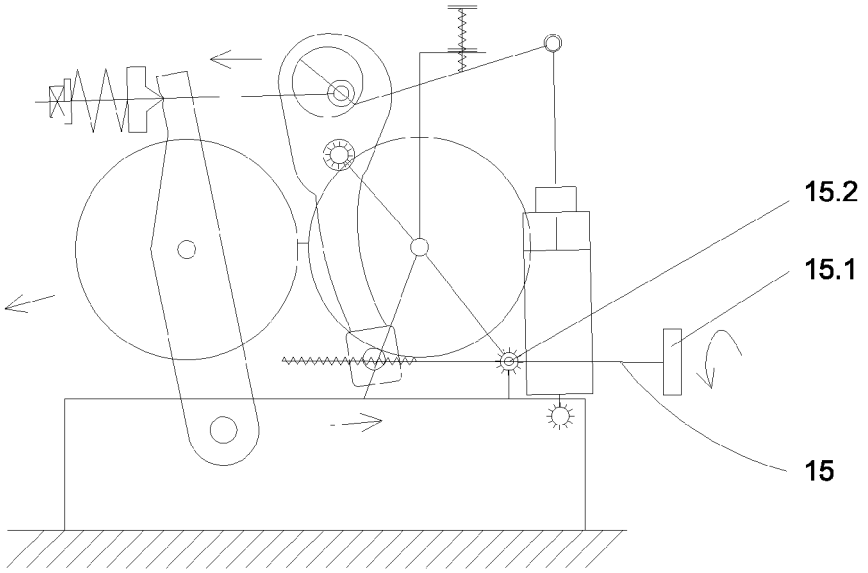

Figure 5

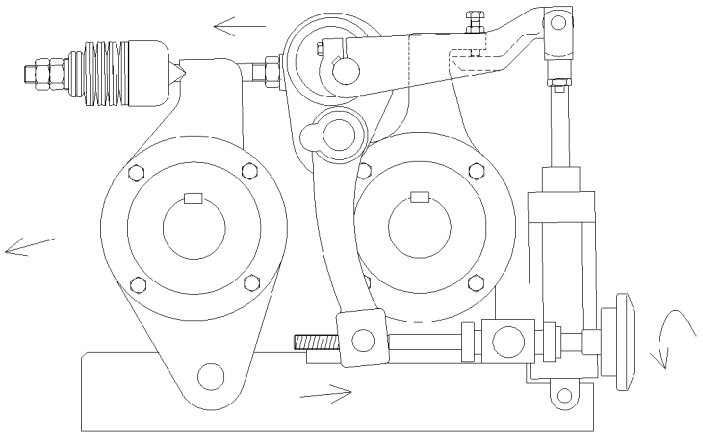

Figure 6

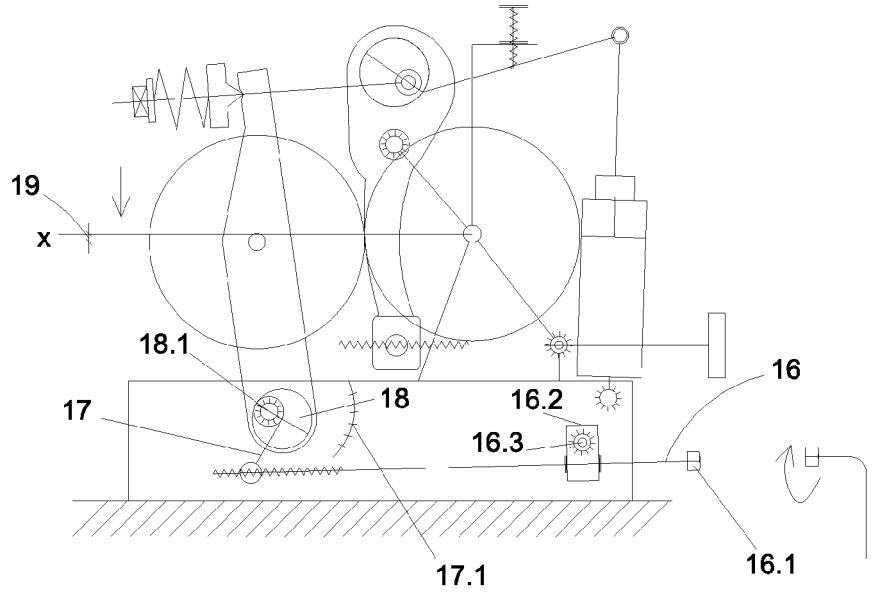

Figure 7

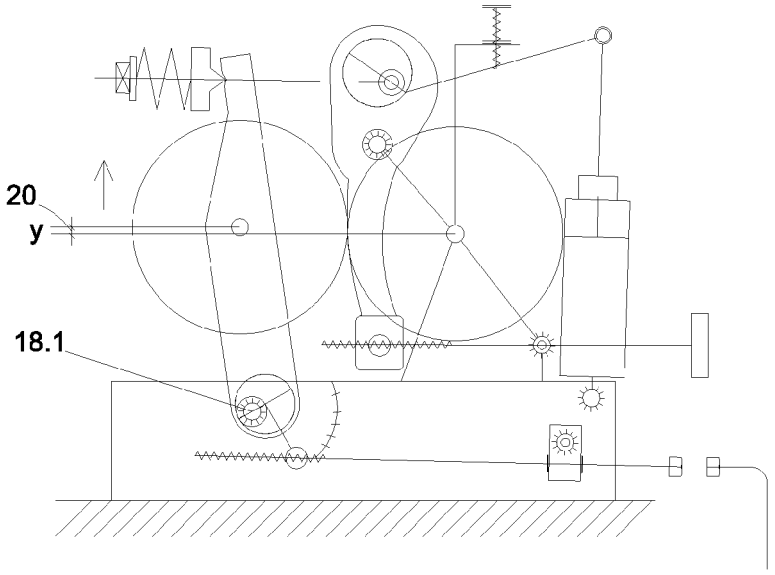

Figure 8

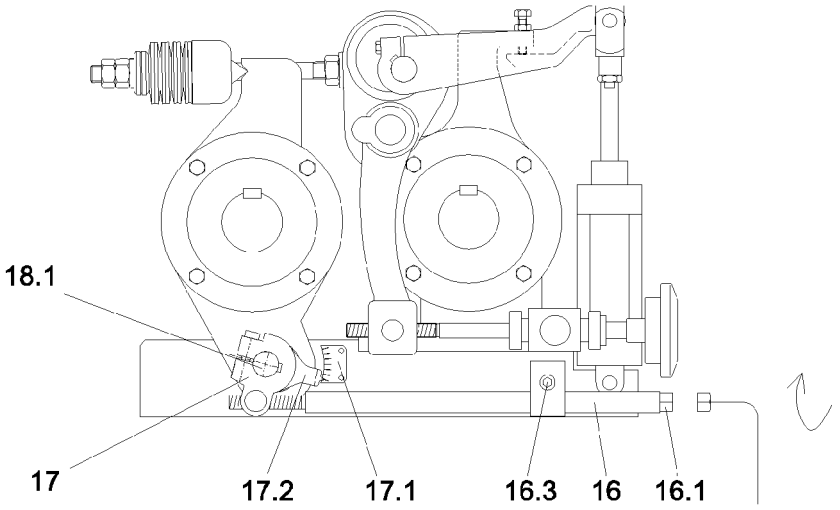

Figure 9

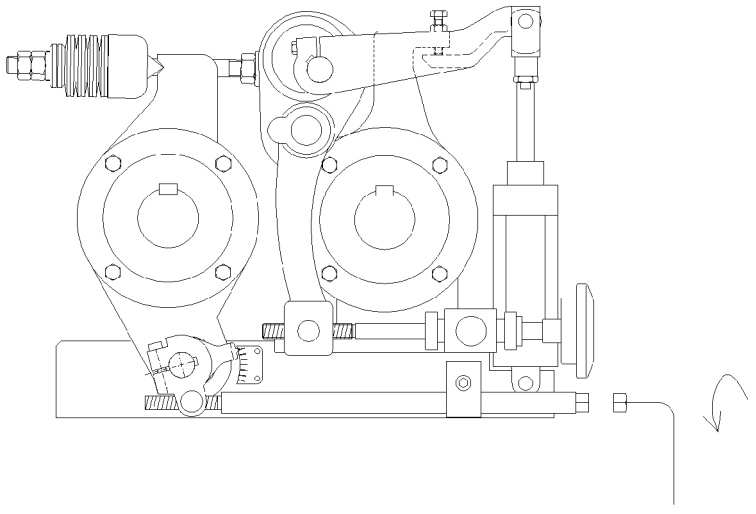

Figure 10

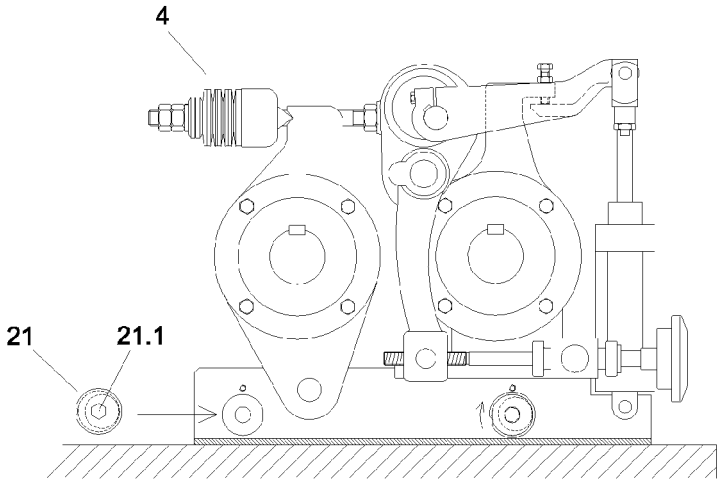

Figure 11

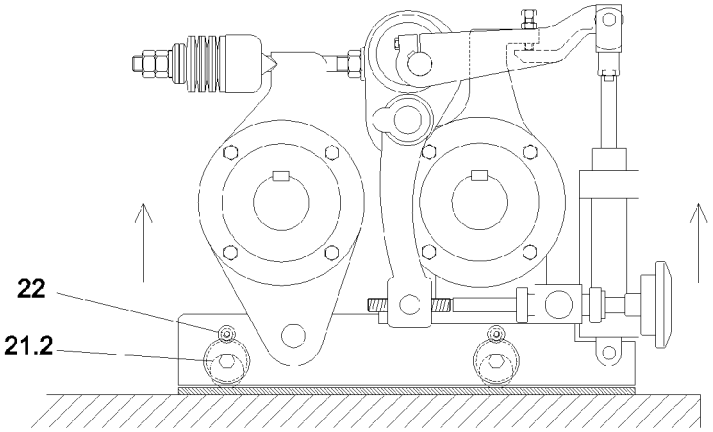

Figure 12

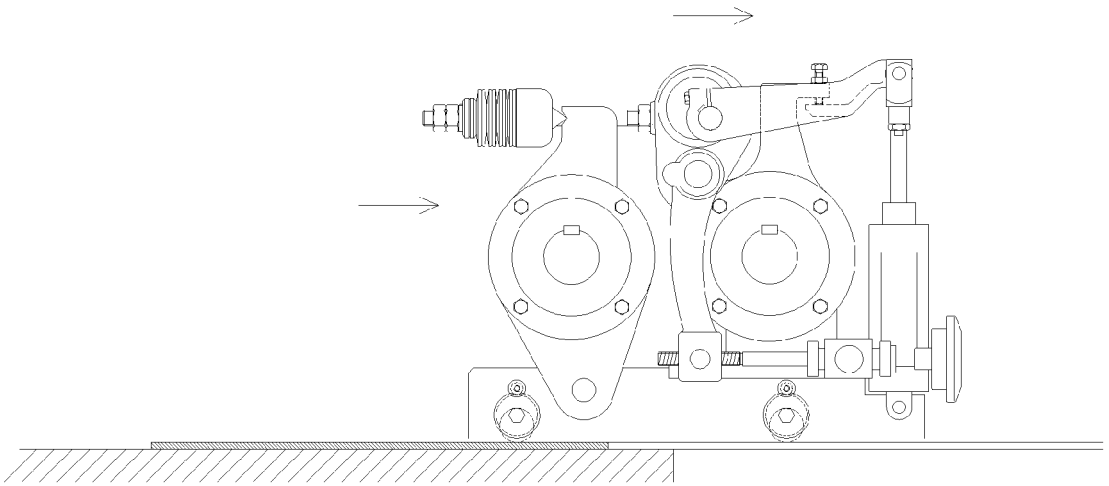

Figure 13

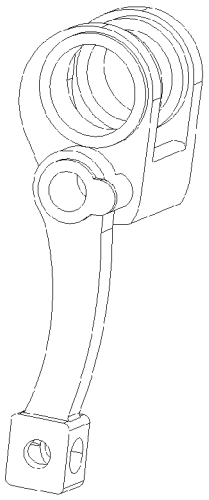

Figure 14

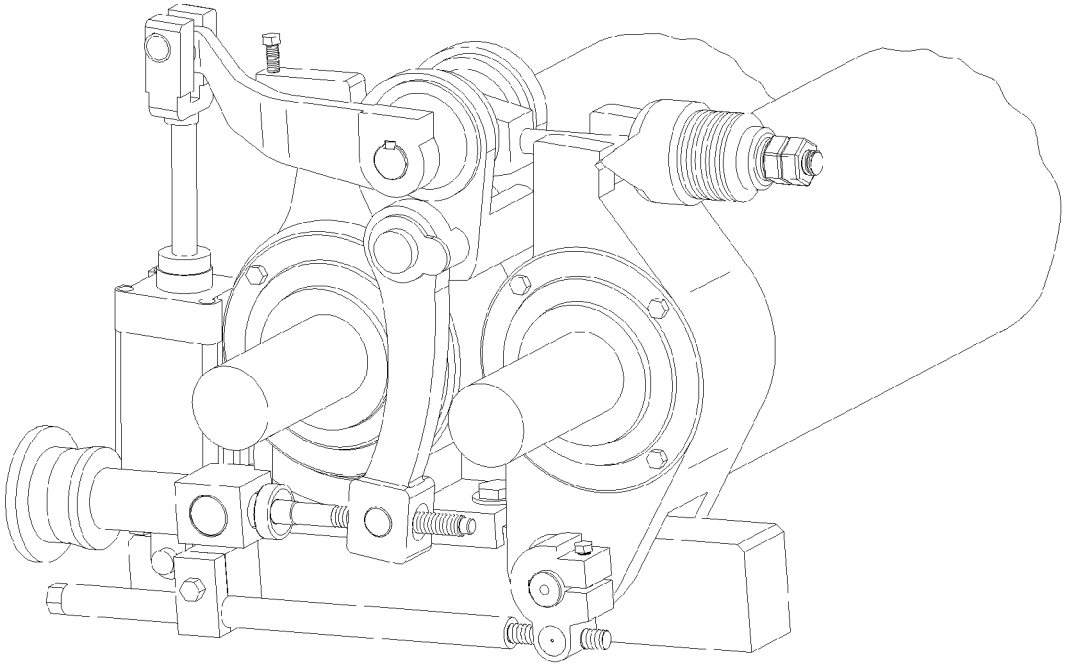

Figure 15

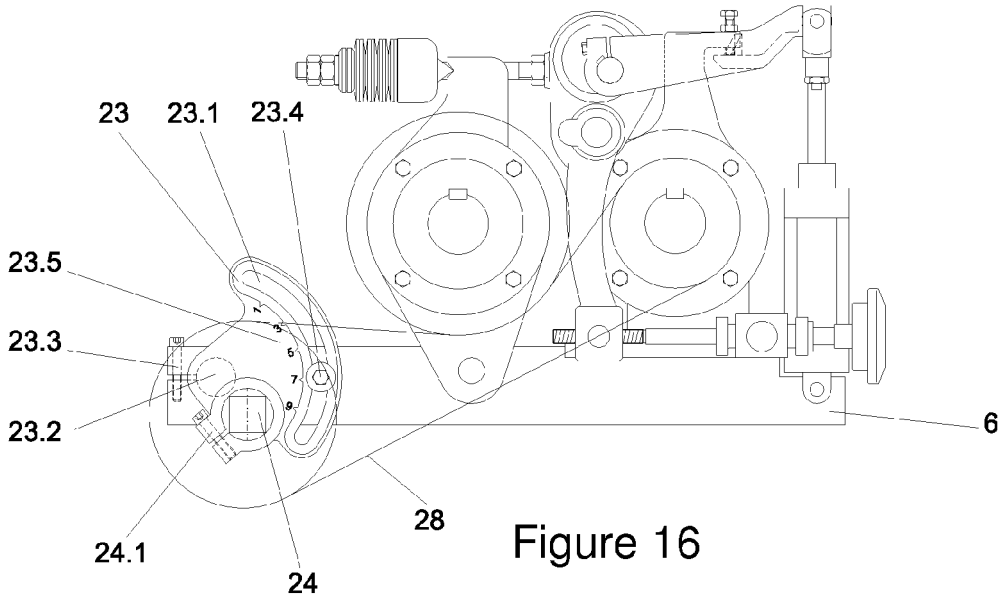

Figure 16

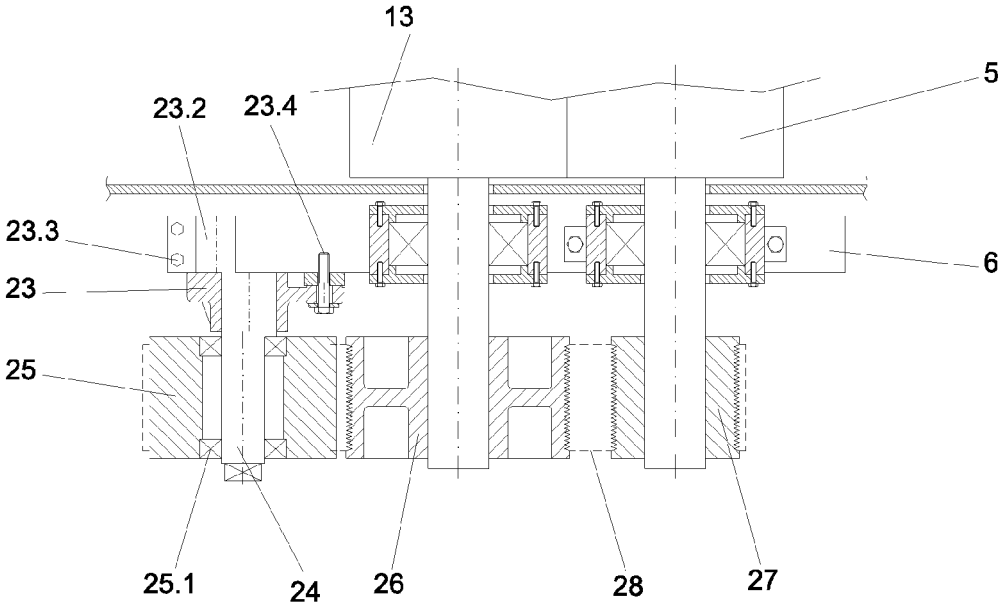

Figure 17

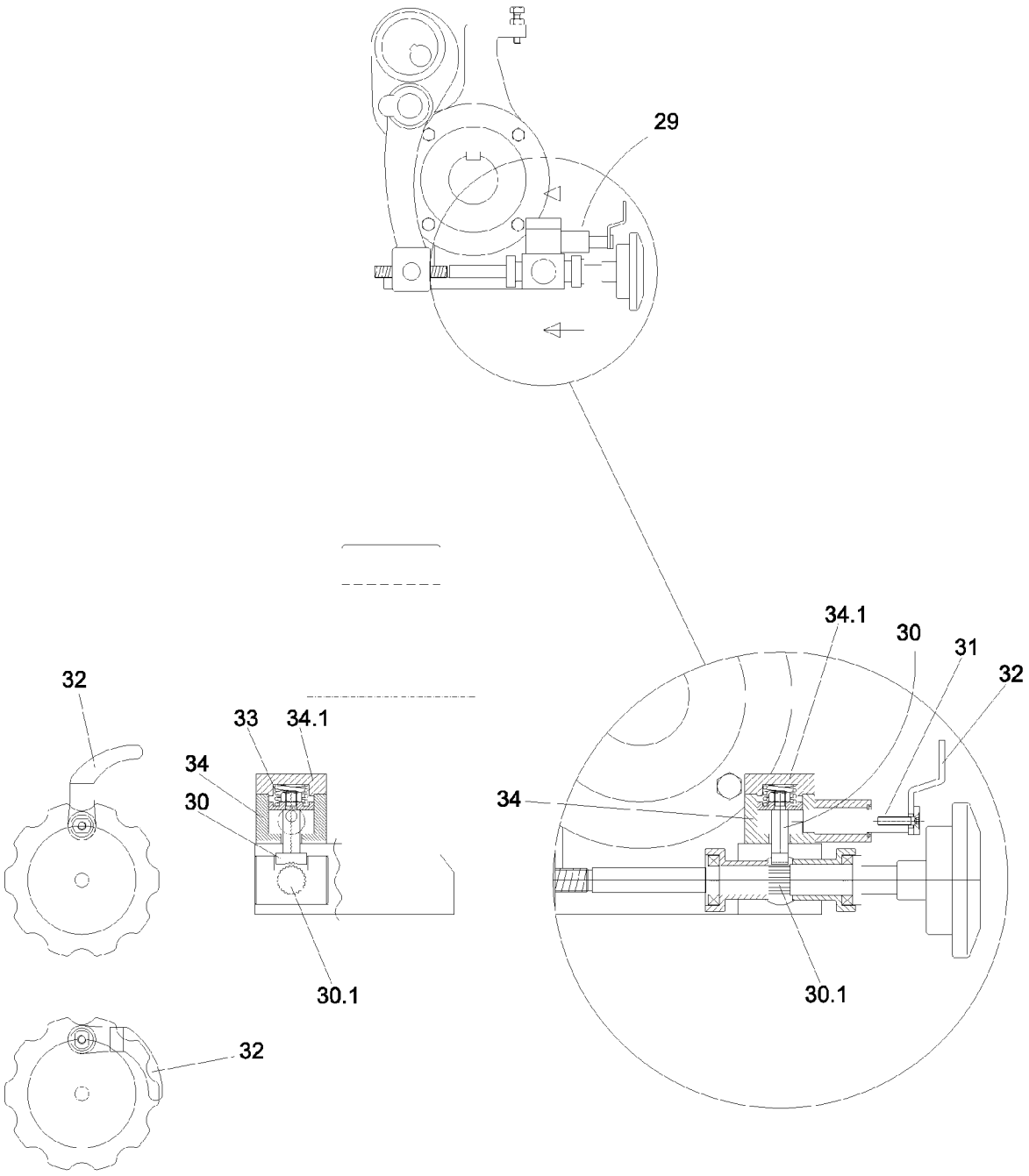

Figure 18

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 2730166 **[0006]**
- EP 0336939 B1 **[0006] [0007]**
- TR 200503728 U **[0008]**
- EP 1201308 A1 **[0009] [0042]**
- TR 200602167 U **[0010]**