



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 911 158 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.04.1999 Bulletin 1999/17

(51) Int. Cl.⁶: **B41F 13/20**

(21) Application number: **98119939.1**

(22) Date of filing: **21.10.1998**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

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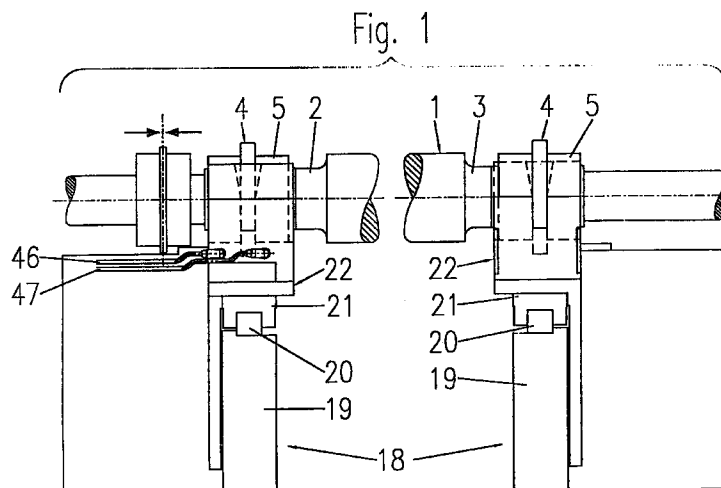
(30) Priority: **21.10.1997 IT VR970097**

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(54) **Apparatus for controllably and removably retaining a printing cylinder mounted for rotation on supports**

(57) A working cylinder having two holds (2, 3) which axially extend from both sides of the cylinder (1) and is characterized in that it comprises a peripherally

flanged member (4) mounted for rotation on each hold (2, 3).



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Description

Background of the invention

[0001] The present invention relates to an apparatus for controllably and removably retaining a work cylinder and in particular a cylinder in a printing unit of flexographic or off-set printing machines.

[0002] When running a printing machine, more particularly a multi-colour printing machine, upon changing the subject matter to be printed or the colours or upon occurrence of breakdowns the work cylinders must be replaced. The cylinder changing operation is conventionally carried out manually, i.e. one or more operators move a hoist near to the printing unit whose cylinder is to be replaced, manually release the cylinder to be replaced from its supports, e.g. two arched caps are manually unlocked and raised open (one on each hold of the cylinder and having one end thereof hinged to a fixed support and the other end thereof that can be locked to the same support but on the opposite side with respect to the hold to be secured), before lifting and moving the cylinder away from its printing unit. A similar operation is to be carried out, although in reverse sequence, for mounting a printing cylinder in its working position.

[0003] In recent years, it has been suggested to open and close in an automatic manner such arched caps or other similar locking devices arranged to removably engage the holds of printing cylinders by providing oleodynamic or pneumatic actuation means, which has considerably simplified printing cylinder replacement and mounting operations. Despite all the benefits brought about by automation, the use of cap devices requires wide spaces for both opening the caps and housing and operating the drive means, spaces that are increasingly difficult to provide in the last generation of printing machines.

Summary of the invention

[0004] The main object of the present invention is to solve this problem by providing both a new working cylinder and a new retaining device for removably holding it free to rotate in its working position.

[0005] Another object of the present invention is to provide a removable retaining device that can be generally used on any type of printing machine, while ensuring high accuracy, reliability and short operating time.

[0006] According to a first aspect of the present invention there is provided a working cylinder, more particularly a printing cylinder, having two holds which axially extend from both sides of the cylinder and is characterized in that it comprises a peripherally flanged member mounted for rotation on each end tail.

[0007] Advantageously, the said peripherally flanged member comprises a flange, an undercut annular seat formed in the flange as well as a sleeve which is integral

with the said flange and is mounted for rotation on its respective hold with interposition of rolling means for reducing friction.

[0008] Moreover, according to the invention there is provided a retaining device for a working cylinder as specified above, which device comprises a receiving cradle for each end tail of said working cylinder at the said peripherally flanged member, removable engaging means arranged in each cradle designed to engage and lock in position the flange of its respective hold, and control and drive means for the said engaging means.

Brief description of the drawings

[0009] Further aspects and advantages of the present invention will better appear from the following description of a presently preferred embodiment thereof, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic side view of a working cylinder according to the present invention, which is mounted on the side frames of a printing machine and provided with a retaining device for holding it in position;

Figure 2 shows a diagrammatic side view of Fig. 1; Figures 3 and 4 are each a diametral cross-section view along a vertical plane of a retaining device of Fig. 1, and illustrate engaging means in unlocking and locking position, respectively;

Figures 5 and 6 are perspective views with portions in cross-section, which illustrate a receiving cradle for a flange of a working cylinder in an unlocked and a locked position, respectively; and

Figure 7 shows a perspective view with portions in cross-section of a receiving cradle provided with engagement means.

Detailed description of a preferred embodiment

[0010] With reference to the above listed Figures, it will be noted that a printing cylinder 1 according to the present invention has two axial holds 2 and 3 which extend in opposite directions from the cylinder and are each provided with a peripherally flanged member 4 mounted for rotation on its respective hold. More particularly, each peripherally flanged member 4 comprises a sleeve 5 (Figs. 3 and 4) having an outer flange constituted by a radial web 6 and an end longitudinal section 7, which has an outer cylindrical surface and an inner flared surface 8 acting as an inclined plane, which delimits an undercut annular seat 9 together with the outer surface of the sleeve 5.

[0011] The sleeve 5 is mounted on the hold 3 through a pair of roller bearings 10 and 11 which are arranged between a pair of oil seals 12 and 13 that are held in position by two end seeger rings 14 and 15. The roller bearings 10 and 11 are in turn mounted either on the hold 3 or preferably on a bush 16 inserted onto the hold

3 against an abutting shoulder.

[0012] A machine, e.g. a flexographic printing machine, generally indicated at 18 has fixed side shoulders 19 which support respective slide guides 20 on which one or more slides 21 are slidably mounted, each slide being designed to support one or a sequence of cradles generally indicated at 22 arranged to receive one hold 2 or 3 of a printing cylinder 1 at the flange 4 thereof.

[0013] Each cradle comprises, e.g. a base 25, a pair of spaced apart sides 26 and 27 supported by the base 25 and delimiting at the top thereof a substantially semicylindrical receiving seat 28 for supporting and receiving a sleeve 16 having an intermediate semicylindrical coaxial recess 29 for loosely receiving a flange 4. Between the receiving seat 28 and the base 25 the two sides 26 and 27 delimit a space in which removably engaging means designed to engage and lock in position the flange 4 of a hold 2 or 3 is located.

[0014] In the embodiment shown, such engaging means comprises a pair of linear actuators, generally indicated at 30 and 31 (only one of which 31 is illustrated in detail in cross-section), that are arranged to control a locking-unlocking member or rim 32 for a flange 4. More particularly, each actuator comprises a cylindrical space 33 which is closed at its ends by two sealing elements 34 and 35, the seal being provided by gaskets 36. The cylindrical space has an intermediate through opening 37 at its upper part through which a portion (segment) of the flange 4 can pass and in which two sliding pistons are located on opposite sides with respect to the through opening 37, i.e. one piston 38 that supports the locking-unlocking member or rim 32 and is arranged on the same side as the sealing element 34, and the other 39 arranged on the same side as the sealing element 35 and whose piston rod 40 is axially secured, e.g. by means of a bolt 41, to the piston 38, whereby the pistons 38 and 39 form a single actuator displaceable within the space 33.

[0015] The pistons 38 and 39 are provided with peripheral seals 42 and 43, respectively and can be moved together between an opening or unlocking position, in which the piston 38 rests against the sealing element 34, while the piston 39 is in a position far away from the sealing element 35 and the locking-unlocking member 32 leaves the opening 37 free, and a closing or locking position (Figs. 4 and 6), in which the pistons 38 and 39 has been moved to the opposite side and the locking-unlocking member 32 is urged into engagement with the wing portion 7 of the flange.

[0016] Preferably, the locking-unlocking member 32 has an inclined-plane surface 44 which has the same inclination as the wing portion 7 of the flange 4 and thus an inclined-plane locking action is produced between element 32 and the flange.

[0017] Actuation of the pistons 38 and 39 is provided by a five-way electrovalve 45 which is in communication with a pressurised fluid source. The electrovalve 45

supplies pressurised fluid via two ducts 46 and 47 sequentially into the gap between piston 38 and adjacent sealing element 34 by feeding it along the duct 46 and draining it from the gap between the piston 39 and sealing element 35 via the duct 47, and then by draining it via the duct 46 and feeding it via the duct 47.

[0018] The operation of a retaining device according to the present invention is quite simple.

[0019] When such device is in its rest or unlocking position, as illustrated in Figs 3 and 5, the cylinder 1 can be loaded onto, or removed from the cradles 28, e.g. by lifting or lowering it by means of a hoist or a robot. Should the cylinder be loaded or mounted, once the same has been laid on the cradles 28 at both its holds 2 and 3, a control signal is forwarded to the valves 45 which will cause the retaining device to switch from its rest position to its engaging position as illustrated in Figs. 4 and 6, i.e. pressurised fluid will be fed to the duct 46 which would result in the locking members 32 engaging with the wings 7 of the flange 4, whereby the latter will be firmly locked in position while holding the cylinder 1 rightly seated with no clearance in its respective receiving cradles 28, while being free to rotate at low friction owing to the presence of the bearings 10 and 11.

[0020] The invention as described above can undergo numerous modifications and variations within the scope of the claims.

[0021] Thus, for example, the flange 4 can comprise only its radial portion 6 and the engaging means can comprise an hydraulic caliper group arranged to lock and unlock the flange 4, e.g. likewise the shoes of a disc brake.

[0022] Moreover, the cradles 28 are delimited at their ends by a respective inserted block 48, which can be secured, e.g. by bolts, to a respective shoulder 26 or 27 and formed with an intermediate V-shaped groove which is a continuation of its respective groove 29 and constituted a guiding element for easier and quick seating of the flanges 4 in the receiving seats.

[0023] The used materials and dimensions can vary according to requirements.

Claims

1. A working cylinder having two holds (2, 3) which axially extend from both sides of the cylinder (1) and is characterized in that it comprises a peripherally flanged member (4) mounted for rotation on each hold (2, 3).
2. A working cylinder as claimed in claim 1, characterized in that the said peripherally flanged member (4) comprises a flange, an undercut annular seat (9) formed in the flange as well as a sleeve (5) which is integral with the said flange and is mounted for rotation on its respective hold (2, 3) with interposition of rolling means (10, 11) for reducing friction.

3. A working cylinder as claimed in claim 2, characterized in that the said flange comprises a radial web portion (6) and an outer cylindrical end wing portion (7) which has an inner inclined-plane flared surface (8) and delimits said annular engaging seat (9) together with the web portion (6) and the outer surface of the sleeve (5). 5
4. A working cylinder as claimed in claim 2 or 3, characterized in that the said sleeve (5) is mounted on its respective hold (2, 3) with interposition of at least one rolling bearing (10, 11). 10
5. A working cylinder as claimed in claim 4, characterized in that it comprises a bush (16) between the or each rolling bearing (10, 11) and the hold (2,3). 15
6. A retaining device for a working cylinder according to anyone preceding claim, which device comprises at least one receiving cradle (22) for each hold (2, 3) of a working cylinder (1) at the said peripherally flanged member (4), removable engaging means (32) arranged in each cradle designed to engage and lock in position the flange of its respective hold (2, 3), and control and drive means (38, 39) for the said engaging means (32). 20
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7. A retaining device as claimed in claim 6, characterized in that each cradle (22) comprises a base (25), a pair of spaced apart sides (26, 27) supported by the said base (25) and delimiting a substantially semicylindrical receiving seat (28) for receiving and supporting the said peripherally flanged member (4) of a respective hold (2, 3) of a working cylinder (1) and having an intermediate semicylindrical coaxial recess (29) for loosely receiving the flange of the said flanged member (4) and engaging means (32) arranged to engage and lock in position the said flange upon control. 30
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8. A retaining device as claimed in claim 7, characterized in that the said intermediate recess (29) has end expansions for easier and quick seating of the said flange. 45
9. A retaining device as claimed in claim 7 or 8, characterized in that the said engaging means (32) comprises at least one linear actuator (30, 31) arranged to control the said engaging means (32) for locking-unlocking the said flange. 50
10. A retaining device as claimed in claim 9, characterized in that each linear actuator (30, 31) comprises a cylindrical space (33) closed at its ends and having an intermediate through opening (37) for receiving a portion of said flange (4) and locating two sliding pistons (38, 39) arranged on opposite sides with respect to the said through opening (37), and in that the said engaging means (32) comprises a projecting rim supported by one (38) of the said pistons, whereby it is slidable between a working position in which it partly closes the said through opening (37) in order to engage and lock the said flange (4) and a rest position in which it is away from the said transverse through opening (37). 55
11. A retaining device as claimed in claim 10, characterized in that the said projecting rim (32) has an inclined plane surface (44) for engagement with a respective inclined surface (8) of the said flange (4).
12. A retaining device as claimed in claim 10 or 11, characterized in that at the said transverse through opening (37) it comprises a longitudinal groove formed in the side wall of the said space (33) and a rim (32) rigid in movement with a piston rod (38) of one of the said pistons and in sliding engagement with the said groove.
13. A retaining device as claimed in anyone of the claims 6 to 10, characterized in that the said engagement means comprises a caliper group arranged to lock upon control a portion of the said flange (4).
14. A retaining device as claimed in anyone of the claims 6 to 10, characterized in that the said driving and control means comprises at least one fluid-operated cylinder and piston linear actuator (38, 39), pressurised fluid source, at least one slide electrovalve (45) for distributing pressurised fluid coming from the said source and supplied to or discharged from each linear distributor and an electronic control unit for each electrovalve.
15. A printing machine when including a cylinder as claimed in anyone claim 1 to 5.
16. A printing machine when including a working cylinder retaining device as claimed in anyone of the claims 6 to 14.

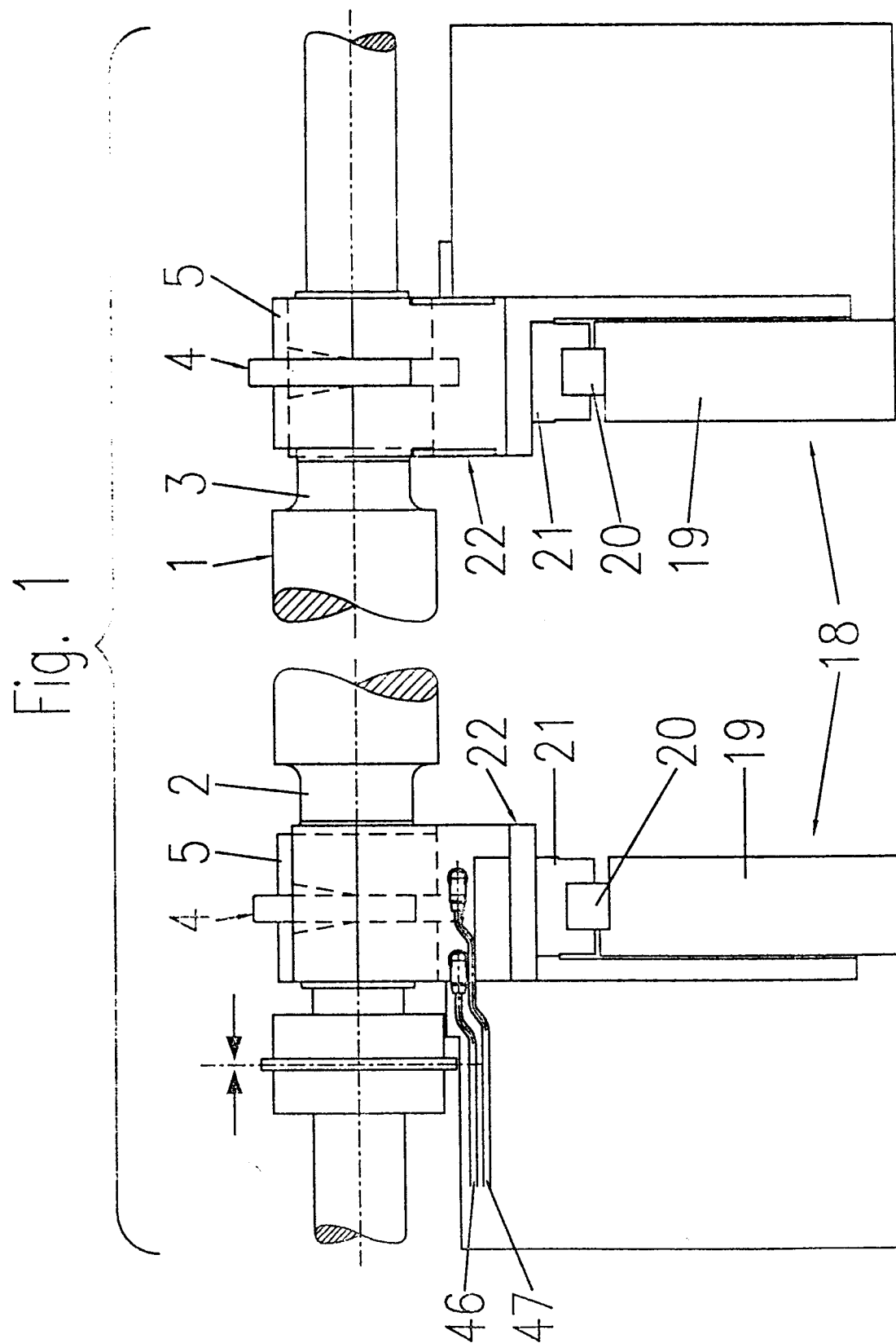


Fig. 7

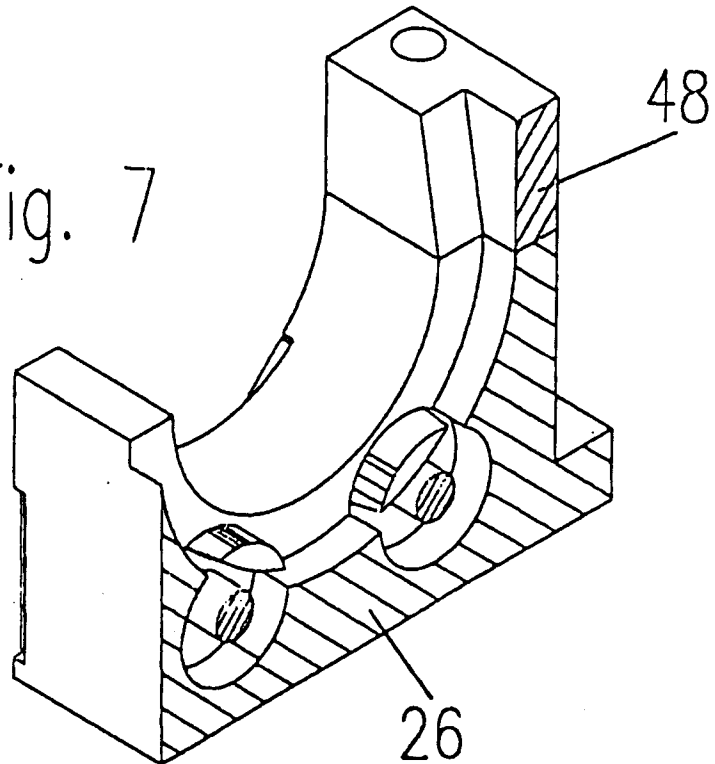


Fig. 2

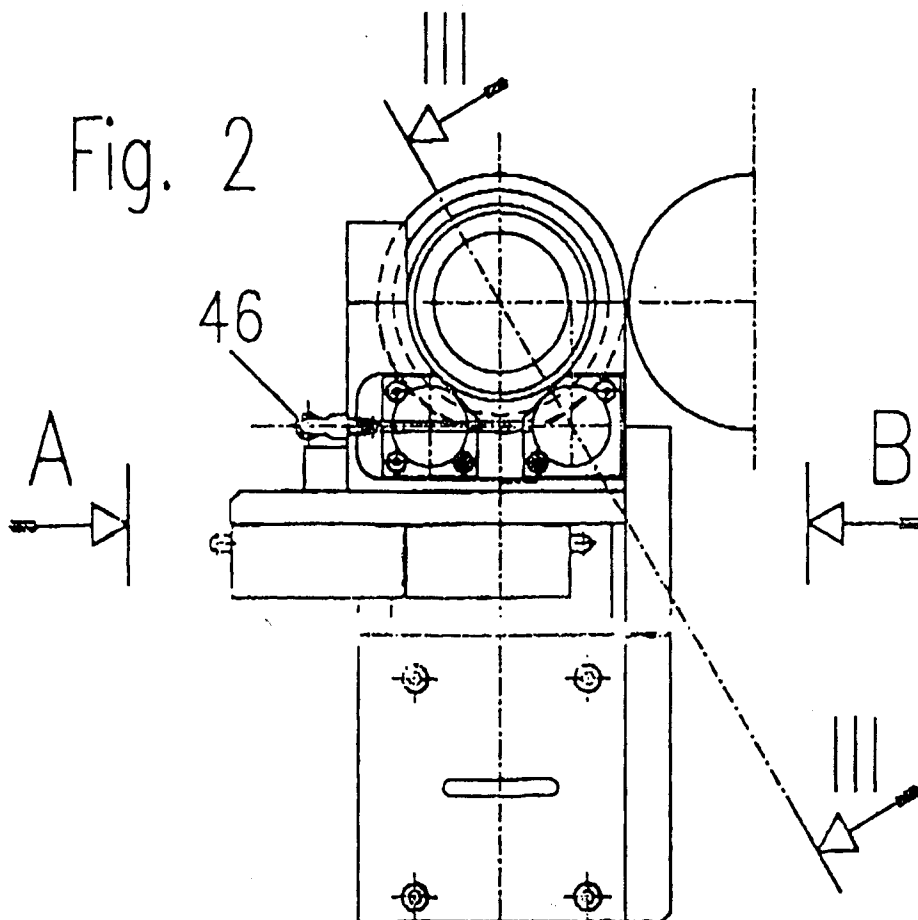


Fig. 3

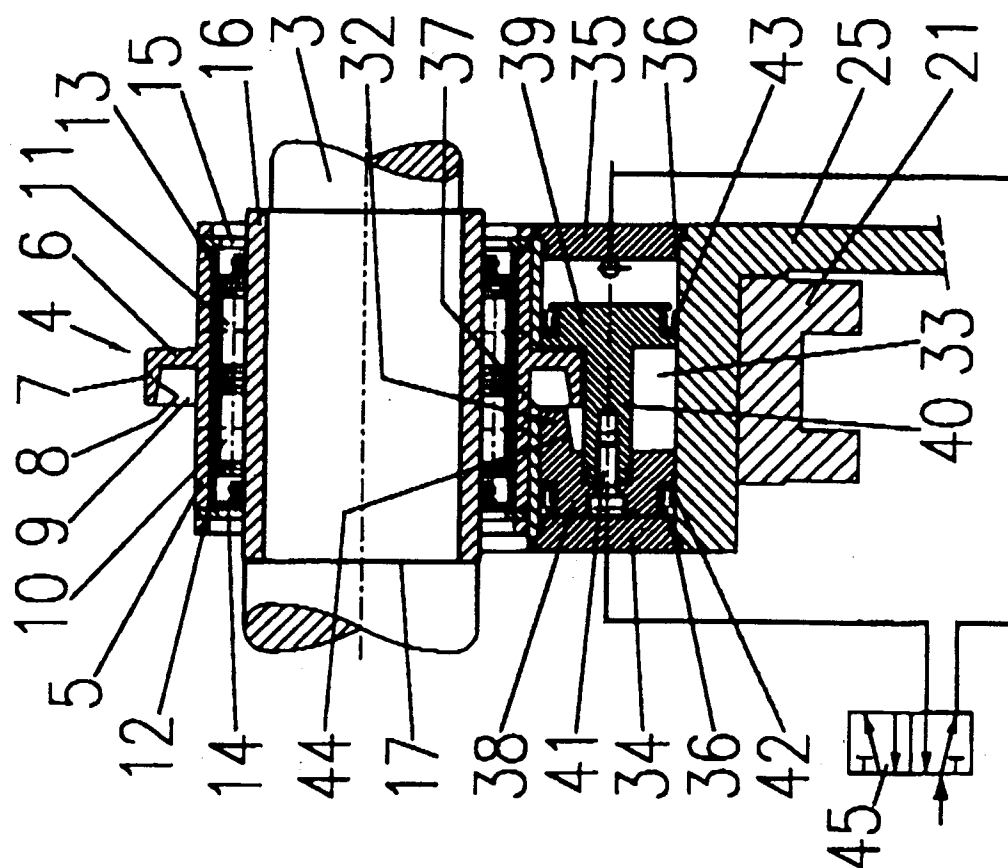


Fig. 4

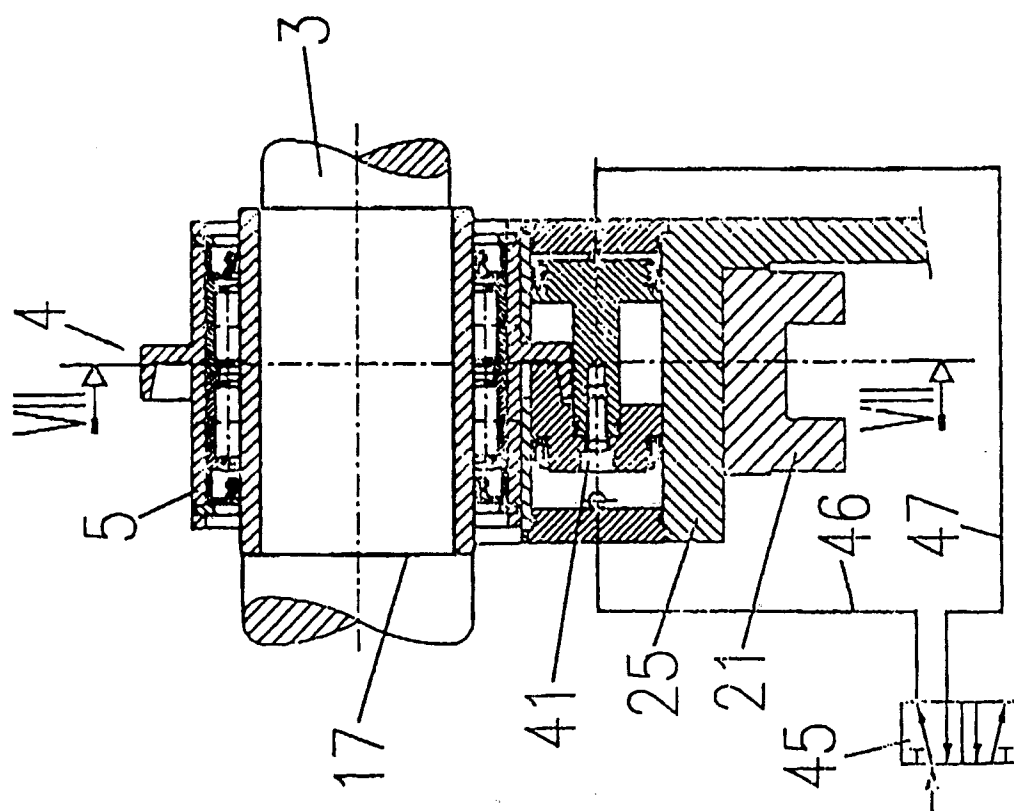


Fig. 5

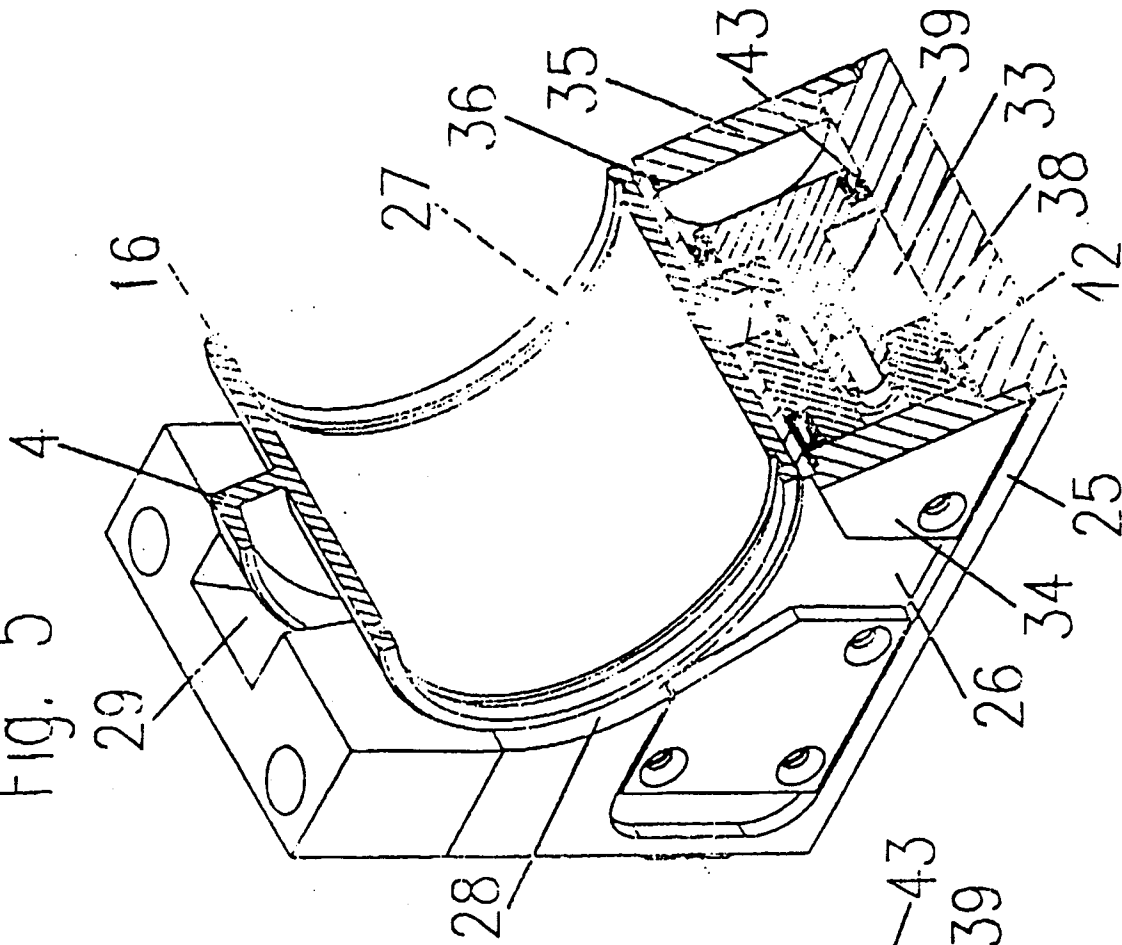


Fig. 6

