(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 135 791**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84109866.8**

(22) Date of filing: **18.08.84**

(51) Int. Cl.⁴: **D 21 G 3/00**

(30) Priority: **31.08.83 SE 8304700**

(43) Date of publication of application: **03.04.85 Bulletin 85/14**

(84) Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

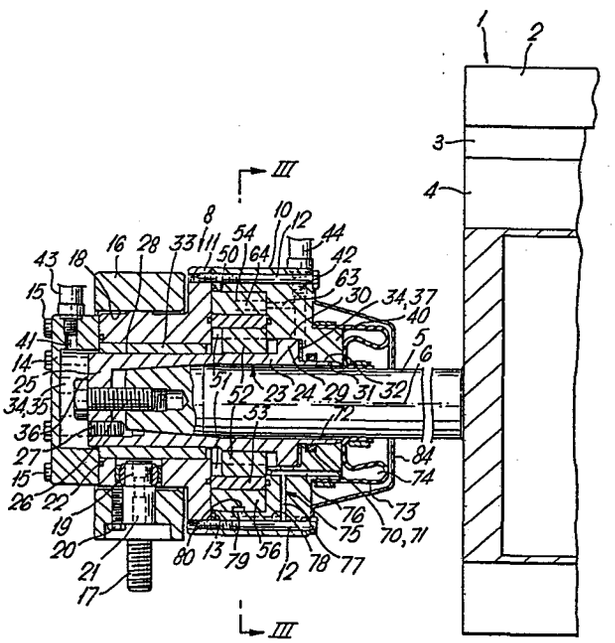
(71) Applicant: **Elofson, Bror Harry, Skattkärrsvägen 5, S-654 80 Karlstad (SE)**

(72) Inventor: **Elofson, Bror Harry, Skattkärrsvägen 5, S-654 80 Karlstad (SE)**

(74) Representative: **Hynell, Magnus, Hynell Patenttjänst AB Box 236, S-683 02 Hagfors (SE)**

(54) Bearing arrangement.

(57) The invention relates to a bearing arrangement for journalling a device, in particular a doctor blade carrier, which is designed to be able to move axially in an oscillating fashion as well as to be moved a certain angle about its axis from an OFF position, the rest position of the device, to an ON position, the working position of the device, and back. The invention is characterized by comprising a bearing housing (9) containing a hydraulic cylinder (34) having two pressure chambers to accomplish the axial oscillations, viz a first pressure chamber (35) axially outside the end of the journal (5) and a second, annular, pressure chamber (39) around the journal at a distance from its end, first and second connecting conduits (41, 42) to deliver and evacuate a pulsating flow of hydraulic fluid to alternately said first and second pressure chambers, respectively, to accomplish the axial oscillations, and a hydraulically powered turning device (50) inside the bearing housing with which to turn the journal in the hydraulic cylinders (34) to and from said on and off positions.



EP 0 135 791 A2

0135791
P613A

BEARING ARRANGEMENT

FIELD OF INVENTION

The invention relates to a bearing arrangement for journalling a device. More particularly the invention relates to an apparatus for journalling a doctor blade carrier, which is designed to be abel to move axially in an oscillating fashion as well as to be turned a certain angle about its axis from an OFF position, the rest position of the device, to an ON position, the working position of the device, and back, said apparatus comprising a bearing arrangement with a bearing housing for each of the two journal ends.

BACKGROUND ART

Oscillating doctor blades are employed in connection with paper making machines among other things in order to keep rolls and cylinders clean. Another area where oscillating doctor blades are put to use is in rotation printing. There are a multitude of solutions for the journalling and manoeuvring of these oscillating doctor blades. Bearing arrangements thus include roller bearings as well as slide bearings, and the oscillating function is realized by means of air, electricity and hydraulics, while the movement of the blade towards and away from the roll or cylinder generally is air-powered.

These known designs have a number of more or less serious drawbacks and limitations. A very serious drawback in the case of conventional mechanical doctor blade oscillators is that they have a number of lubrication points. This requires constant attention and maintenance, which is labour-consuming. The lubrication also creates a risk of oil spillage, which may be disastrous in the case of paper making machines. The known devices are generally also both complicated and large, hence requiring difficult installation procedures. Having separate systems for the oscillation and the on-off movement means further complications.

DISCLOSURE OF THE INVENTION

The purpose of the invention is to offer an improved bearing for an

oscillating doctor blade. In particular, a purpose of the invention is to offer a device which is entirely hydraulically powered, i e with hydraulics accomplishing the axial oscillation as well as the on-off movement.

Another purpose of the invention is to eliminate the need for lubrication, to make possible permanent pipe mounting for the bearing device, and to make possible an optional positioning of the bearing device in relation to the doctor blade.

Yet another purpose is to design the bearing device so that a number of bearing devices may be serviced with one pulsating oil flow from a central oil pump station.

These and other purposes may be achieved by a bearing device characterized in that in at least one at the two bearing houses there is provided at least one hydraulic cylinder and in the two bearing houses together at least two pressure chambers, with a first and a second pressure chamber to accomplish the axial oscillations, that first and second connecting conduits are provided to deliver and evacuate a pulsating flow of hydraulic fluid to alternately said first and second pressure chambers, respectively, and that a hydraulically powered turning device is provided inside at least one of the bearing housings to torn the journal in the hydraulic cylinder to and from said ON and OFF positions. Suitably the two pressure chambers are provided in one and the same bearing housing, wherein the first pressure chamber is positioned axially outside the end of the journal and the second pressure chamber, which is angular, is positioned around the journal at the distance from its end. The turning device preferably comprises a further pair of pressure chambers, viz a third pressure chamber with a third connecting conduit to deliver hydraulic fluid to said third pressure chamber as the turning device is to turn the shaft from the off position to the on position and to evacuate the fluid from the third chamber as the turning device is to turn the shaft to the off position, and a fourth pressure chamber with a fourth conduit for delivery and evacuation of hydraulic fluid

to and from said fourth pressure chamber respectively, as the device is turned off and is turned on.

Further characteristics and aspects of the invention as well as other advantages thereof will be apparent from the appending claims and from the following description of a preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following description of a preferred embodiment reference will be made to the attached drawings, of which

Fig. 1 is an end elevation of an oscillating doctor blade carrier equipped with a bearing device according to the invention,

Fig. 2 is a sectional view of the bearing device of Fig. 1 where the plane of section coincides with the bearing axis, corresponding to the markings II-II in Fig. 1, certain parts corresponding to a section along II'-II' indicated by ghost lines and

Fig. 3 is a sectional view along III-III in Fig. 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

A doctor blade carrier has generally been designated in the figures by the numeral 1. The carrier is only shown schematically and consists of a doctor blade 2, a blade holder 3, and a pair of end plates 4. Only one of the end plates 4 has been shown in the figures. A journal 5 extends sidewards from each of the end plates 4. As the carrier 1 is turned about the turning axis 6 of the journal 5 the doctor blade may be brought into contact with a roll 7 - the on position - or be brought back to a rest position, as indicated in the drawings, the off position.

The inventive concept resides in a bearing arrangement 8 for the journal 5. This arrangement comprises not only bearings for both

axial and twisting movements but also means for bringing about such movements, adapted to the special demands made in connection with doctor blades. The bearing arrangement 8 comprises a housing 9, consisting of two main parts, viz an inner housing 10 and an outer housing 11 (as viewed from the doctor blade carrier 1). The two housings 10 and 11 are joined by screws 12. Between the housings 10 and 11 is located a permanent packing ring 13. At the back end of the bearing arrangement there is a cover 14 which is secured to the outer housing 11 by means of screws 15. The bearing arrangement 8 may be attached to a fundament by means of a frame 16, which is attached to the fundament by means of screws 17. The frame 16 has a circular recess 18 for the outer housing 11 and is connected thereto by means of a ball coupling 19, which allows for bending the axis and the bearing of the bearing arrangement as well as for correction of disalignment as per se is well known in the art. A fastening screw is designated 20 in Fig. 2, while a conventionally positioned plunge is designated 21. A permanent packing ring between the cover 14 and the outer housing 11 is designated 22.

The external end of the journal 5 tapers. On it is placed a socket 23. This consists of a mantle 24 and a bottom 25. The socket 23 is connected to the journal 5 by means of a screw 26, which makes the journal 5 and the socket 23 an integrated whole. An espelling screw is designated 27. As viewed from the bottom 25 the mantle 24 consists firstly of a straight, outwardly cylindrical part 28, forming a first bearing surface, and then a flange 29, extending outwards, forming a second bearing surface and simultaneously being part of a turning device to be described more closely below. Finally, the mantle 24 comprises a part 31 with a third bearing surface 32. The first bearing surface 28 is somewhat longer than the axial extension of the outer housing 11. Between said first bearing surface 28 and the inside of the housing 11 there is a bushing 33 made of brass or some other suitable bearing alloy.

The cover 14 and the inner and outer housings 10 and 11 form a hydraulic cylinder 34. This hydraulic cylinder 34 has two pressure

chambers, viz. a cylindrical first pressure chamber 35 between the cover 14 and the bottom surface 36 of the bottom 25, and a second, annular pressure chamber 37 between on the one side the inside of the inner housing 10 in the area of said second bearing surface 30 and a flange 40, extending inwards from the inner housing wall, and on the other side the flange 29 and said third bearing surface 32. A first connecting conduit 41 for hydraulic fluid extends through the cover 14 to the first pressure chamber 35, and a second connecting conduit 42 for hydraulic fluid extends through the inner housing 10 to the second pressure chamber 39. These conduits are via hydraulic hoses 43 and 44 connected to a hydraulic pump, common to several bearing devices 8, which generates a pulsating fluid flow to bring about the axial oscillation of the journal 5.

In order to make possible hydraulic manoeuvring of the on - off function of the doctor blade carrier 1 there is a turning device 50 located between said first and second pressure chambers 35 and 39. More specifically, this turning device 50 is located in the area of the flange 29. To this end said flange is equipped with a pair of key grooves 51. Each of these grooves is fitted with keys 52, the axial extension of which is somewhat less than that of the grooves 51, thus allowing the socket 23 and hence the flange 29 to carry out a stroke of desired length during each cycle of the axial oscillation. The keys 52 are further arranged in grooves around a ring 53 in a way which is conventional per se. This ring 53 is firmly attached to a mobile ring section 54. This attachement of ring 53 to ring section 54 may be accomplished by a wedge lock as between the ring 53 and the flange 29, or by a number of screws 55. The mobile ring section 54 extends somewhat less than half a turn. Coplanar with it is a second ring section 56, which is firmly attached to the inner housing 10 and hence stationary. This section extends a half turn. Thus, there are formed two pressure chambers in the shape of annular spaces viz. a third pressure chamber 57 for the turning of the carrier from the off position to the on position and a fourth pressure chamber 58 for turning the carrier from the on to the off position. Hydraulic fluid conduits number three and four have been designated 59 and 60, re-

spectively. Hoses supplying hydraulic fluid to the on - off mechanism have been designated 61 and 62.

To prevent the carrier from oscillation while turned to the off position a connection is provided between said second conduit 42 and said third conduit 59. This connection is designed not to open until the turning device 50 has turned the carrier 1 to the off position. More specifically, the connection consists of the following parts, namely a recess forming a side channel 63 from said second conduit 42, a channel 64 in the mobile sector 54, said channel being coaxial with the channel 63 in the off position, see Fig. 3, and a channel 65 in the sector 54 extending from the channel 64 to said third pressure chamber 57. When the channels 63 and 64 are co-linear, which happens only in the off position, see Fig. 3, the hydraulic fluid thus flows directly from said second conduit 42 via channels 63, 64 and 65 to third pressure chamber 57 and from there out through the conduits 59 and 61 without causing a pressure to build up in the second pressure chamber 37.

In the area of the inner flange 40 of the inner housing 10 there is a groove 70 for an O-ring and a packing ring 72 which adjoins said third bearing surface 32. Since the bearing arrangement is to be used in connection with paper making machines it is however of utmost importance that no oil spillage occur. This embodiment therefore includes further particulars to prevent such spillage. Inside the flange 40 of the inner housing 10 there is consequently a rubber bellows which is fastened to the outside of the flange 40 and to the journal 5. A closed space 74 is thus formed inside the bellows 73. This space is connected to a slot 80 in the stationary annular sector 56 via internal conduit 75 comprising channels 76, 77, 78 and 79, and therefrom to said third pressure chamber 57 via a channel 81A. For reasons of manufacture the stationary annular sector 56 is symmetrical and equipped with a channel 81B leading to the fourth pressure chamber as well, making it possible to use the same component in a turning device mounted at the opposite end of the bearing arrangement. Between the channel 81A and the pressure chamber 57 is fitted a

check valve 82A to prevent back flow from the pressure chamber 57 and correspondingly a check valve 82B between the channel 81B and the fourth pressure chamber 58. The space 74 inside the bellows 73 acts as a pump house. If oil should leak into the space 74 past packing rings 71 and 72 the oscillation, which causes the alternating compression and expansion of the space 74, will force the oil to exit via conduit 75 to that one of the pressure chambers 57 and 58 which is relieved of pressure, in the case illustrated consequently to chamber 57. The rubber belows 73 is protected by a cap 84.

Although the working mode of the turning device should be apparent from the above description of the components, said mode will be presented briefly below. The initial position is assumed to be that of the drawings. Further it is assumed that the hydraulic hoses are atteched to a pump which provides a pulsating pressure and flow in the connections. It is suitable to let this pump be common to several bearing arrangements. In spite of the pulsating flow the carrier will not oscillate in this position, since the doctor blade 2 is in its off position, the by-pass 63-64-65 being open and "short-circuiting" pressure chambers 37 and 57, preventing pressure for oscillation from building up in chamber 37. The moment pressure is raised in conduit 61 concurrently with a pressure relief in conduit 62 the turning device 50 will turn the journal 5, causing the doctor blade 2 to press against the roll 7, while the connection between conduits 42 and 59 and consequently between chambers 37 and 57 is simultaneously broken. The journal immediately starts oscillating as the first and second chambers 35 and 37 are alternately put under pressure and evacuated by the pulsating flow of hydraulic fluid. At the same time the bellows 73 functions as a displacement pump, returning any leaking hydraulic fluid to said third pressure chamber 57 via conduit 75.

It is possible to mount a bearing arrangement of similar design to the one just described on the other journal of the doctor blade carrier. This second bearing arrangement need not, however, be equipped with a turning device for the on - off movement, nor with apparatus for oscillation, which will reduce the amount of pipe in-

stallations necessary. It is also possible to provide a bearing arrangement on each journal and provide one of them with the first pressure chamber and the other one with the second pressure chamber. In this case the second pressure chamber need not be annular but may be located outside the end of the journal in the same mode as the first pressure chamber in the disclosed embodiment. By this arrangement the design is simplyfied, but on the other hand there is required more pipe installations than with the disclosed embodiment.

CLAIMS

1. Apparatus for journalling a doctor blade carrier which is designed to be able to move axially in an oscillating fashion as well as to be moved a certain angle about its axis from an OFF position, the rest position of the device, to an ON position, the working position of the device, and back, said apparatus comprising a bearing arrangement (8) with a bearing housing (9) for each of the two jornal ends, c h a r a c t e r i z e d in that in at least one at the two bearing houses there is provided at least one hydraulic cylinder (34) and in the two bearing houses together at least two pressure chambers, with a first (35) and a second (39) pressure chamber to accomplish the axial oscillations, that first and second connecting conduits (41, 42) are provided to deliver and evacuate a pulsating flow of hydraulic fluid to alternately said first and second pressure chambers, respectively, and that a hydraulically powered turning device (50) is provided inside at least one of the bearing housings to turn the journal in the hydraulic cylinder (34) to and from said ON and OFF positions.

2. Apparatus according to claim 1, c h a r a c t e r i z e d in that the two pressure chambers are provided in one and the same bearing housing, and that the first pressure chamber (35) is positioned axially outside the end of the journal (5) and the second pressure chamber, which is annular, is positioned around the journal at the distance from its end.

3. Bearing arrangement according to claim 1, c h a r a c t e r i z e d in that it comprises a first internal conduit (63, 64, 65) inside the bearing housing connecting one of said first and second connecting conduits to said third connecting conduit, said internal conduit being designed to be opened as the turning device turns the journal to the off position, whereby that hydraulic fluid which is delivered by the pulsating flow via said first or second connecting conduits is evacuated through said third connecting conduit via said first internal conduit without creating any pressure in said first or second pressure chamber, as a result of which the axial oscillations are stopped.

4. Bearing arrangement according to claim 2, c h a r a c t e r i z e d in that the turning device is located between said first and second pressure chambers.

5. Bearing arrangement according to any of claims 1-4, c h a r a c t e r i z e d in that the turning device comprises one ring section (56), which is stationary in the bearing housing and another ring section (54), which is mobile with respect to the bearing housing; that said third and fourth pressure chambers are annular spaces between the stationary and the mobile ring sections; and that the mobile ring section is attached to the journal, so that the turning movements of the mobile ring section are transferred to the journal.

6. Bearing device according to any of claims 1-5, c h a r a c t e r i z e d in that there is a space (74) inside the bearing housing as viewed in axial direction towards the device to be journalled, said space being bounded by a part of the inside wall of the bearing housing, a part of the mantle covering the journal, and the inside of a bellows (73), which is fastened to the bearing housing and to the mantle of the journal, and having a volume which varies as the journal oscillates axially, said space therefore functioning as a pump house, being connected to one of said pressure chambers or said connecting conduits via a second internal conduit (75) in order to evacuate from said space any leaking hydraulic fluid to said pressure chamber or connecting conduit when said chamber or conduit is not under pressure.

7. Bearing arrangement according to any of claims 1-6, c h a r a c t e r i z e d in that the journal is surrounded by a socket (23), designed as a hydraulic piston in a double-acting hydraulic cylinder, said socket consisting of a bottom (25) and a mantle (24), said bottom forming a first piston surface in said first pressure chamber and the mantle forming a second piston surface in the second pressure chamber.

8. Bearing arrangement according to claim 7, c h a r a c t e r i - z e d in that said second piston surface is an annular surface of a flange (29) of the mantle.

9. Bearing arrangement according to any of claims 1-8, c h a r a c - t e r i z e d in that the turning device is located in the area of said flange (29).

Fig.1.

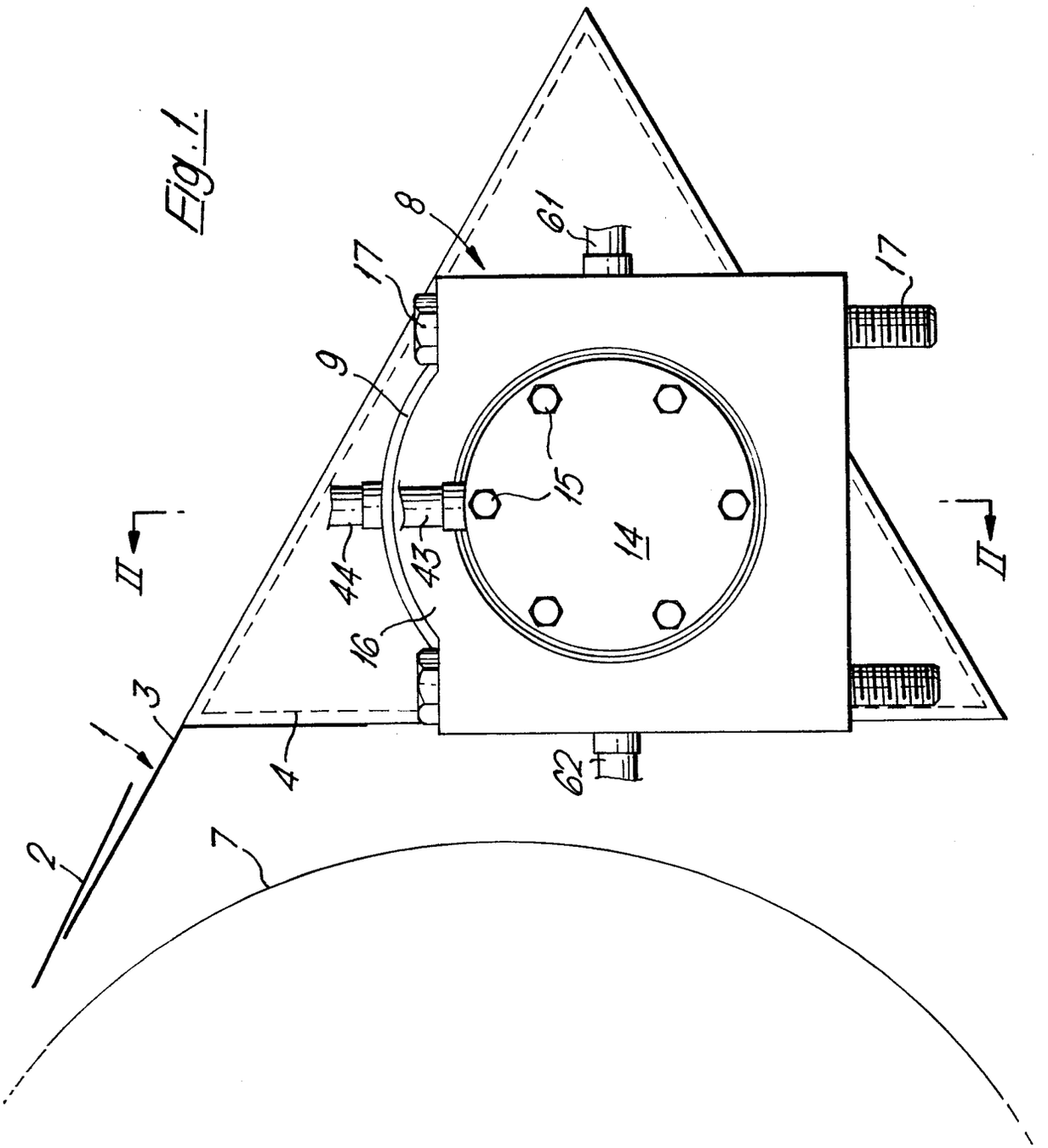


Fig. 2.

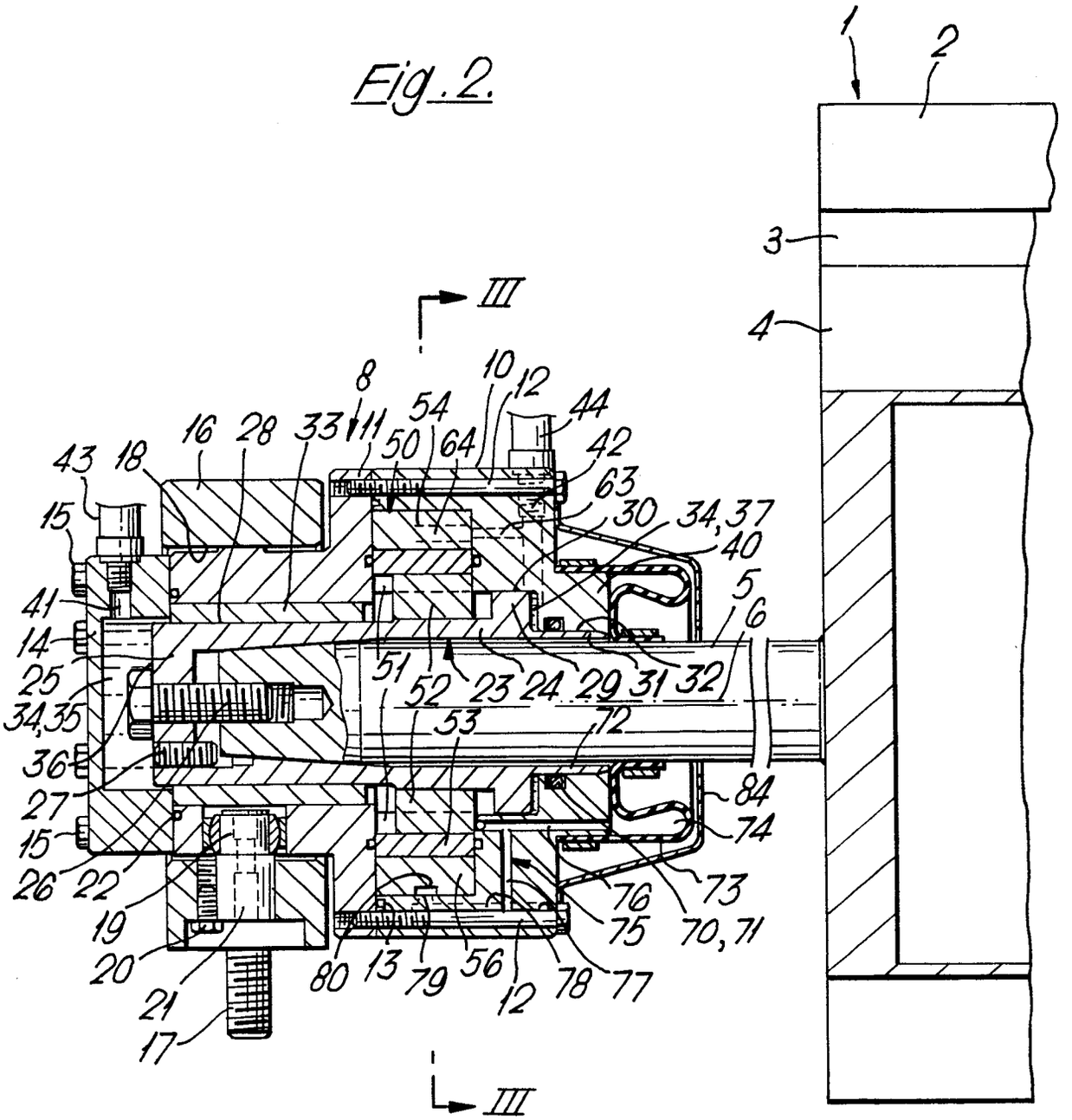
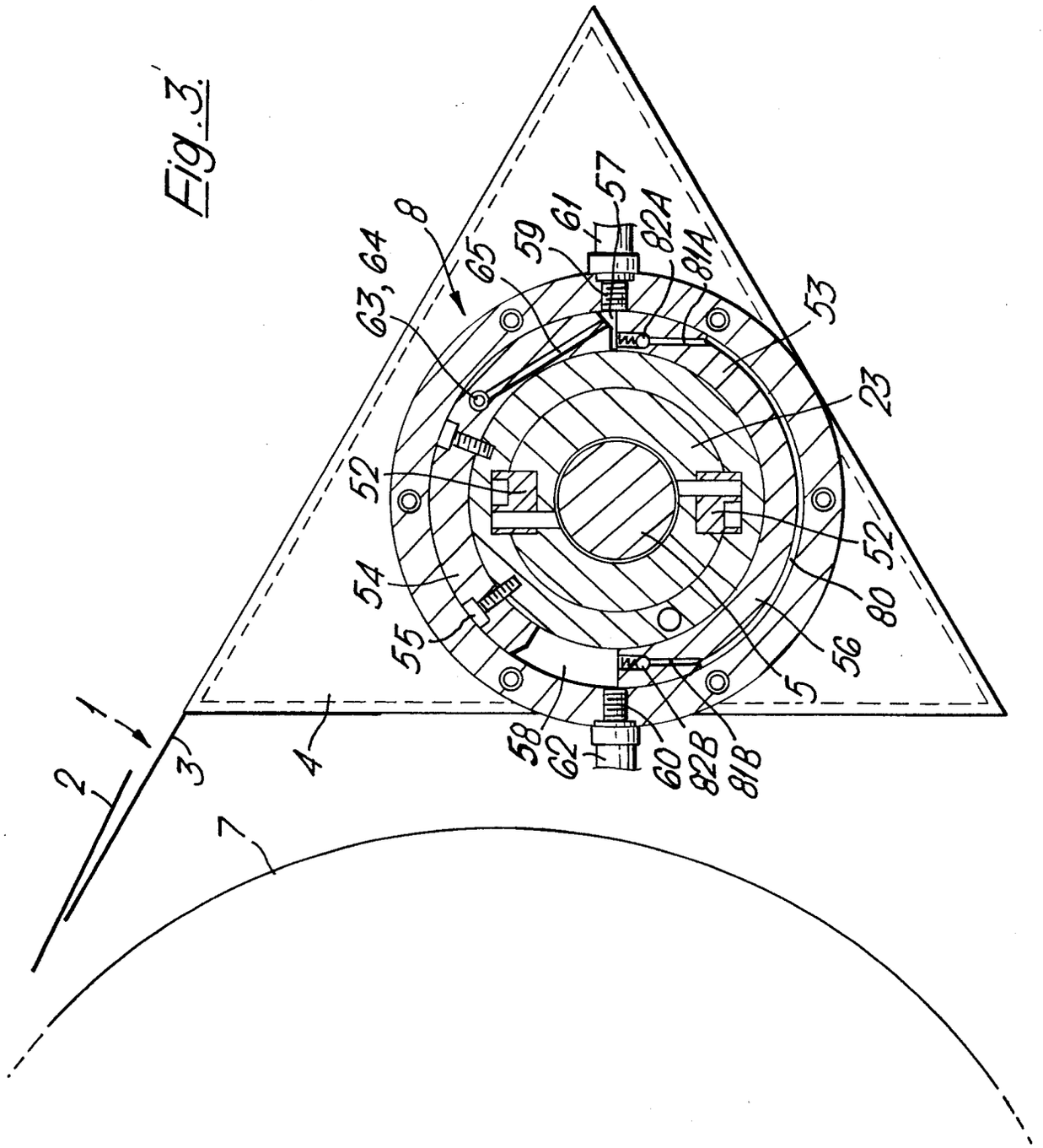

1
2
3
4
III
III
8
10
12
44
42
63
30
34,37
40
5
6
16
28
33
11
54
50
64
43
18
15
41
14
25
34,35
36
27
15
26
22
19
20
21
17
51
52
23
24
29
31
32
53
72
84
74
73
76
75
70,71
80
13
79
56
12
78
77

Fig.3.


8
63, 64
65
59
61
57
82A
81A
53
23
52
52
54
55
80
56
5
58
62
60
82B
81B
1
2
3
4
7