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

(11) Publication number: **0 103 555**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 83850217.7

(22) Date of filing: 19.08.83

(51) Int. Cl.³: F 15 B 15/26

(30) Priority: 20.08.82 SE 8204775

(43) Date of publication of application: 21.03.84
Bulletin 84/12

(84) Designated Contracting States: CH DE FR GB IT LI

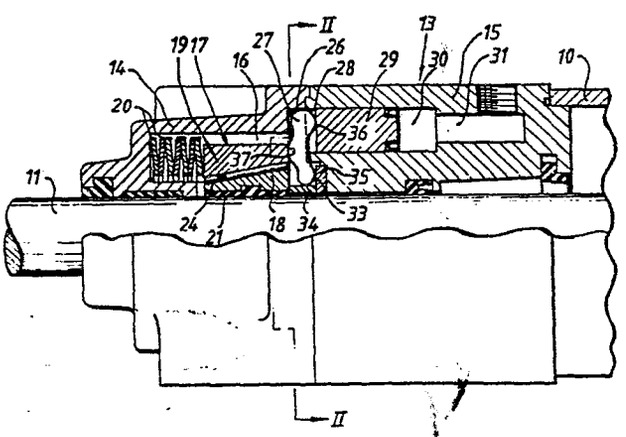
(71) Applicant: **Atlas Copco Aktiebolag, Nacka (SE)**

(72) Inventor: **Andersson, Per-Ulf, Lindetofta L 4, S-531 00 Lidköping (SE)**

(74) Representative: **Pantzar, Tord et al, c/o Atlas Copco Management Consulting AB Patent Department, S-105 23 Stockholm (SE)**

(54) **Piston locking device.**

(57) A pressure fluid actuated piston-cylinder device including a piston rod locking mechanism which comprises conical wedge means (18, 19) by which a friction grip is accomplished on the piston rod, and a spring (20) arranged to continuously develope an activation load upon the wedge means (18, 19). The locking mechanism also comprises a release piston (29) and a number of levers (27) connecting the release piston (29) to the wedge means (18, 19), thereby amplifying the force developed by the release piston (29). By the lever arrangement a relatively small piston is able to neutralize the force of a powerful activating spring.



EP 0 103 555 A1

0103555

Piston-cylinder device with piston locking means.

This invention relates to a pressure fluid actuated piston cylinder device in which a piston is sealingly guided in a cylinder and a piston rod united with the piston extends out of the cylinder through one of the cylinder end walls. A releaseable piston rod locking mechanism is disposed in the cylinder end wall and comprises first and second wedge means arranged to frictionally engage the piston rod, and a spring means continuously biassing the wedge means into locking engagement with piston rod.

Piston-cylinder devices of the above type find use in applications where safety demands are high as regards avoidance of uncontrolled piston movement at, for instance, hose breakage. By a piston cylinder device having a built-in piston locking mechanism it is also possible to stop and lock the piston and piston rod in predetermined positions. According to a previously known piston rod locking device shown and described in DE-OS 27 55 456 conical piston rod engaging friction ring is encircled by an annular activation member which is spring biassed in its friction ring engaging direction and selectively acted upon by pressure fluid in the opposite direction for releasing the piston rod. Accordingly, safety demands are satisfied in that the piston is always locked unless pressure fluid is supplied to release it.The force developed by the pressure fluid has to counteract and exceed the force generated by the spring for relaxing the friction ring. According to this known design consept it would not be possible to obtain an effective enough locking action between the friction element and the piston rod unless increasing the outer dimension of the cylinder or decreasing the cone angle of the friction ring or both. The last mentioned measure, however, would make the locking mechanism much more difficult to release and would also necessitate a longer release stroke. That too would have an undesirable effect upon the outer dimensions of the piston-cylinder device.

Accordingly, it would not be possible to employ a large enough pressurized piston area on the annular activation element without

increasing the outer dimension of the piston cylinder device. So,in order to obtain a more effective locking action on the piston rod a larger force has to be applied on the activation member by the spring, and for neutralizing that spring force and releasing the locking device the area of the pressure fluid activated means has to be larger. Then the size of the piston area would be too big not to influence upon the outer dimensions of the piston cylinder device.

The main object of the invention is to accomplish a piston cylinder device in which the locking means will generate a powerful enough locking action and in which the locking means does not cause increased outer dimensions of the piston cylinder device.

Other objects and advantages of the invention will appear from the following description and claims.

On the drawings

Fig 1 shows, partly in section, the front end of a piston-cylinder device having a piston locking mechanism according to the invention.

Fig 2 shows a cross section taken along line 2-2 in Fig 1.

The piston-cylinder device shown in the drawing figures comprises a cylinder 10, a piston (not shown) sealingly guided in the cylinder and a piston rod 11 which extends out of the cylinder 10 through the end wall 13 of the cylinder 10. The cylinder end wall 13 comprises an outer section 14 and an inner section 15. In the outer section 14 there is a cylindrical chamber 16 in which there is located a piston rod clamping unit 17. The clamping unit 17 comprises three conical piston rod 11 engaging friction segments 18, an axially displaceable wedge ring 19 surrounding the friction segments 18, and a spring means 20. The latter, which consists of a number of Belleville-type spring washers, acts between the outer cylinder end wall section 14 and the wedge ring 19, thereby biassing the latter in the friction segment engaging direction. Each of the friction segments are

provided with a lining 21 for improved frictional engagement with the piston rod 11. Between the segments 18 there are radial clearances 22 for making sure that the radial grip on the piston rod 11 is not jeopardized by contact between the friction segments themselves.

The wedge ring 19 is locked against rotation by means of two axially extending keys 23 mounted diametrically opposite each other in the end wall section 14. Wire inserts 24 are located in axial grooves in the cooperating conical surfaces of the friction segments 18 and the wedge ring 19 in order to prevent the segments to rotate and also to prevent the piston rod 11 from being rotated when locked.

Between the cylinder end wall sections 14, 15 there is an annular space 26 in which three equally spaced levers 27 are supported. Each of these levers 27 is guided in a radial recess 28 in the inner cylinder wall section 15. A ring piston 29 is sealingly guided in an annular chamber 30 in the inner end wall section 15. The annular chamber 30 is selectively supplied with pressure fluid through a passage 31. The piston 29 is intended to counteract and neutralize the force developed by the Belleville springs 20 and to move the annular wedge ring 19 off the segments 18, thereby relaxing the clamping unit 17 and permitting movement of the piston rod 11. Each of the levers 27 has a first contact surface 33 engaging two immovable fulcrum forming rings 34, 35, a second contact surface 36 facing the same direction as the first contact surface 33 for engaging the ring piston 29, and a third contact surface 37 located right in between the first and second contact surfaces 33, 36 and facing the opposite direction. The third contact surface 37 abuts against the wedge ring 19. Due to the lever arrangement, the movement of piston 29 is transferred to the wedge ring 19 at half the speed but twice the power. This means that a fairly small release piston may be used to neutralize a strong activation spring 20.

In Fig 1, the locking mechanism is shown in its released position. Pressure fluid is supplied to chamber 30 via passage 31, and the

piston 29 has moved to its left hand position. The piston movement has been transferred to the annular wedge ring 19 by the levers 27. The force developed by the piston 29 is amplified by 100% by the levers 27.

When the pressure fluid supply to chamber 30 is discontinued the power of Belleville springs 20 immediately returns the levers 27 and piston 29 to their rest positions while the wedge ring 19 reengages and activates the friction segments 18 to lock the piston rod 11.

Claims

1. A pressure fluid actuated piston cylinder device, comprising a cylinder (10), a piston rod (11) united with the piston and extending out of the cylinder (10) through one of the cylinder end walls (13), and a releasable locking mechanism disposed in said cylinder end wall (13) and including a first wedge means (18) frictionally engageable with the piston rod (11), a second wedge means (19) axially movable and engageable with said first wedge means (18), and a spring means (20) continuously biassing said second wedge means (19) into engagement with said first wedge means (18) thereby accomplishing a piston rod locking action, c h a r a c t e r i z e d i n that a fluid actuated release means (29, 27) is arranged to move said second wedge means (19) in a direction opposite to the direction of the biassing force of said spring means (20) so as to neutralize said biassing force and discontinue said piston rod locking action, said release means (29, 27) comprises one or more piston element(s) (29) each sealingly guided in a cylinder chamber (30) selectively supplied with pressure fluid, and a force amplifying means (27) interconnecting said piston element(s) (29) and said second wedge means (19).

2. Piston-cylinder device according to claim 1, wherein said one or more piston element(s) (29) comprises a single annular piston disposed concentrically with the piston rod (11) and sealingly guided in an annular cylinder chamber (30) located in the end wall (13) of the cylinder (10).

3. Piston-cylinder device according to claim 1 or 2, wherein said force amplifying means (27) comprises a number of levers each having at one end a first contact surface (33) arranged to engage a fulcrum support means (34, 35) fixed in the cylinder end wall (13), a second contact surface (36) located at the opposite end of the lever (27) and arranged to be engaged by said piston element or elements (29), and a third contact surface (37) located between said

first contact surface (33) and said second contact surface (36) and arranged to engage said second wedge means (19).

4. Piston-cylinder device according to claim 3, wherein said levers (27) are three in number and extend radially relative to the geometric axis of the piston rod (11).

5. Piston-cylinder device according to claim 3 or 4, wherein said third contact surface (37) is situated at substantially equal distances from said first and second contact surfaces (33, 36).

6. Piston-cylinder device according to any one of claims 1 to 5, wherein said first wedge means (18) comprises a number of friction segments, whereas said second wedge means (19) comprises a conical ring element encircling said segments (18).

Fig. 1

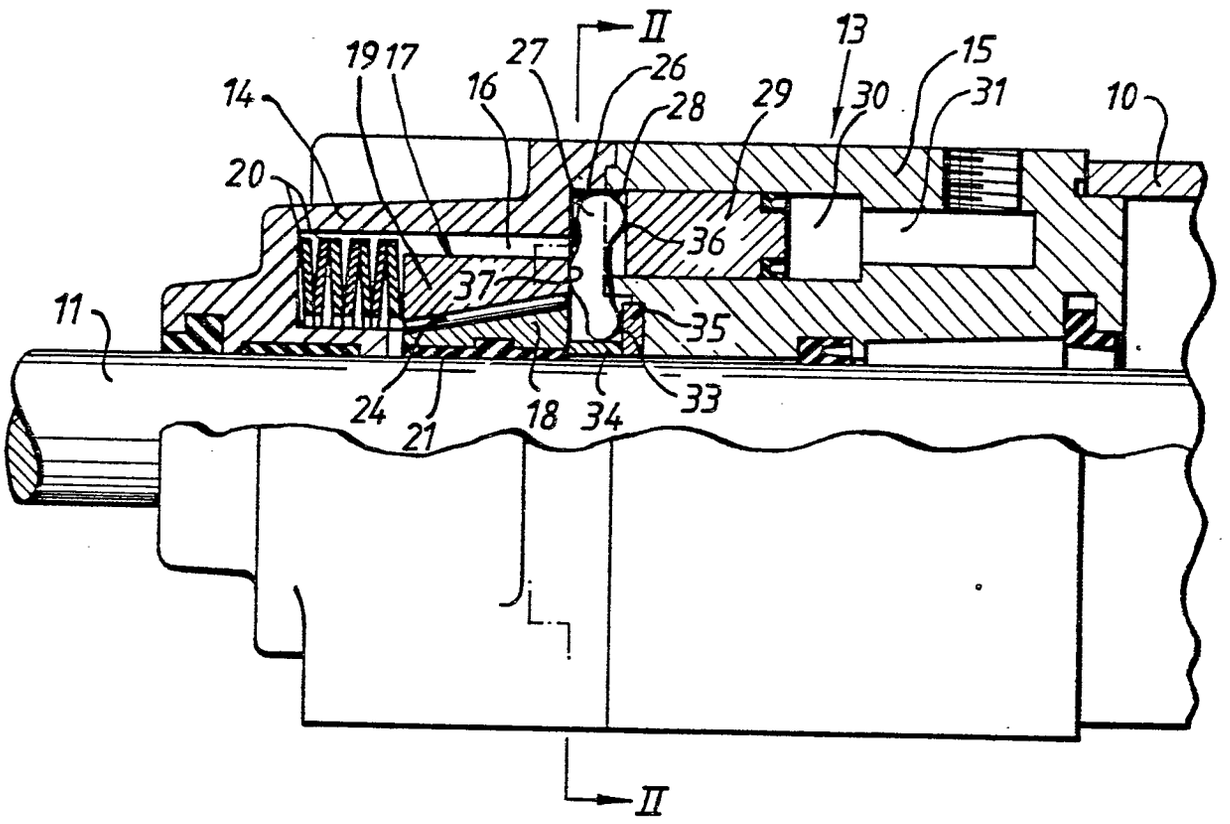
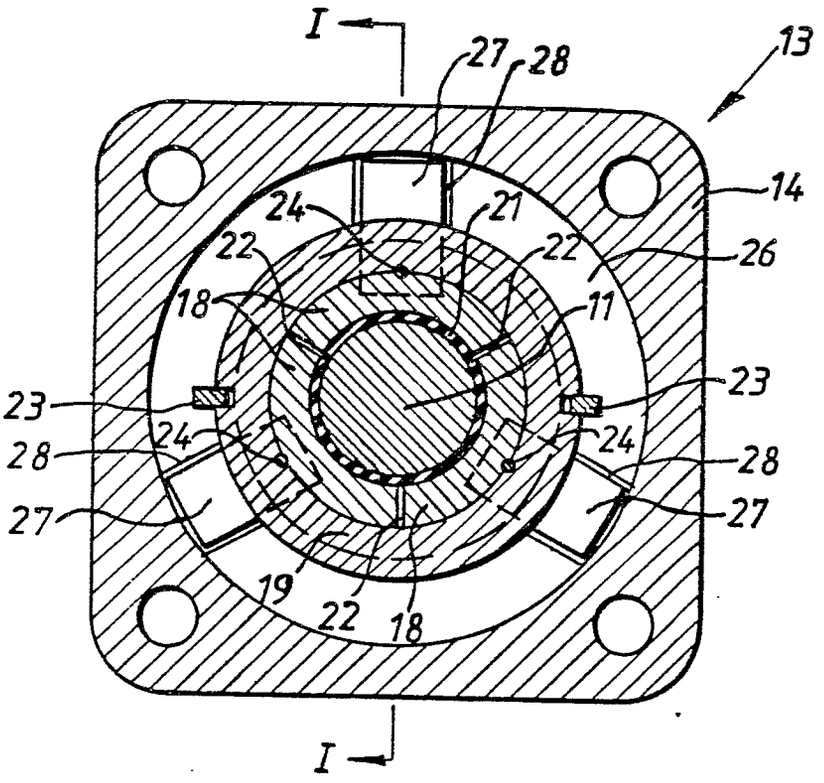

II
19
17
27
26
13
15
14
16
28
29
30
31
10
20
36
37
11
35
24
21
18
34
33
II

Fig. 2


I
27
28
13
14
24
21
22
22
26
18
11
23
23
24
24
28
28
27
27
19
22
18
I

0103555

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 83 85 0217

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	GB-A-2 006 340 (A. STRATIENKO) * Complete document *	1,2	F 15 B 15/26
A	DE-U-7 931 576 (P-H-MATIC) * Page 5, line 17 - page 6, line 12; figures 3, 4 *	1,2,6	
A	FR-A- 761 703 (M.N. NICKTS)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

F 15 B 15/00
B 66 F 7/00
B 66 F 3/00
G 05 G 5/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	15-11-1983	LEMBLE Y.A.F.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document