

PRESSURE FLUID CYLINDERDESCRIPTION

The invention relates to a pressure cylinder with a tubular casing, in which are arranged a plurality of parallel, cylindrical, inner chambers with in each case a longitudinally directed slot and a piston is
5 longitudinally guided in each inner chamber, each piston having a force removal extension projecting outwards through the associated slot and which is connected via a connecting device with the other force removal extensions, at least one inner chamber being frontally terminated
10 and provided with inlets and outlets, the piston guided in said inner chamber having a packing at either end and the elongated slot of said inner chamber being sealed from the inside by a sealing strip.

GB-A-470,088 discloses such a pressure cylinder
15 arrangement, in which a plurality of cylinders are juxtaposed and are reinforced by external reinforcing webs. This arrangement aims at preventing widening of the elongated slots. In the described construction, there are three such cylinders, whose force removal
20 extensions between them form in each case an angle of 120° . The force removal extensions are connected to a saddle, which has an approximately V-shaped cross-section. A slide with wheels running in guide rails is used for guiding the force removal extensions and the
25 saddle connected thereto.

In the case of rodless pressure cylinders with a single piston, it is known (DE-A-3,124,915) to arrange

two parallel guideways on either side of the elongated slot on the outside of the cylindrical tube and to provide the force transmission member with a bracket, which is supported against the guideways. However, this construction suffers from the disadvantage that the guideways are always open and can easily become dirty and that also during the movement of the piston in a widened area, considerable frictional forces occur, which must be overcome by applying additional pressure.

A similar arrangement is known from US-A-2,473,430, where the force removal extension is provided with a bracket, which engages in a roughly U-shaped manner over the exterior of the casing and is slidingly fixed by its two ends to in each case one rod guided parallel to the cylindrical casing. The same disadvantages occur as with the arrangement according to DE-A-3,124,915.

In the case of pressure cylinders with a piston rod, it is known to arrange parallel pistons. However, in this case, the arrangement of several parallel cylinders cannot then contribute to ensuring a guidance of the outer end of the piston rod.

The problem of the invention is to so construct a pressure cylinder of the aforementioned type that an exact lateral guidance of the force removal extension and the piston are ensured.

According to the invention, this problem is solved in that two inner chambers and two pistons are arranged in juxtaposed manner in a common casing and are separated from one another by a central partition

-3-

and the force removal extensions of the two pistons run parallel to one another and are screwed to a joint plate, the at least one sealed elongated slot being additionally sealed by an external sealing strip,
5 which extends through the force removal extension.

This arrangement ensures that the pistons and their force removal extensions are exactly guided on the non-deformable, central partition. Thus, it is still not possible for there to be a lateral movement of
10 the force removal extensions even if the elongated slots are slightly widened due to the action of pressure. Any widening of the elongated slots only acts on the side thereof which is remote from the partition. Due to the parallelism of the force removal extensions,
15 a precisely dosable guide clearance for fitting the cylinder unit is provided.

The arrangement of the per se known additional, outer sealing strip makes it possible for there to be no pressure loss, even on widening the elongated slot,
20 so that any widening of said slot which may occur has no influence on the operation of the pressure cylinder proposed by the invention.

The arrangement in a common casing leads to optimum casing rigidity, so that the possibility of
25 the casing bending is also reduced. The two inner chambers need not have the same cross-section and can, for example, have a different cross-sectional surface or a different shape. However, it is particularly appropriate for the inner chambers to have the same
30 shape and cross-section.

-4-

Whilst one piston has a packing at either end, so that it can be moved by the pressure medium, it is possible for the second piston to have no packing and to act as a guide piston. It can therefore
5 be sufficient for it to only partially fill the cross-section, it being obvious that in this case it must still engage with at least part of the inner wall. The measures proposed by the invention not only lead to an exact guidance of the piston, but also ensures
10 that the complete guidance means is located within the casing and is only accessible through the elongated slot, so that the risk of pollution or contamination is also eliminated in this construction. This more particularly applies if, as is further proposed by the
15 invention, the inner chamber for the guide piston is also closed at both end faces.

According to a further development of the invention, both pistons can have packings for a pressure medium. This makes it possible to also exert
20 pressure on the inner chamber of the cylinder in which the second piston is arranged, so that the same pressure prevails in both parallel inner chambers. Thus, the central partition, is freed from any one-sided, lateral force action, so that no deformation or
25 lateral movement can occur on this partition. This leads to completely pressure-independent guidance characteristics of the pressure cylinder according to the invention. This also ensures that no one-sided thrust moment can act and also that an accurately
30 dosable guide clearance for fitting the cylinder unit

-5-

is provided. Thus, the pressure cylinder according to the invention is much more advantageous than the known pressure cylinders, in which the guides are laterally supported on the outer or inner walls of the pressure cylinder. Particular preference is given to this construction in uses, where particularly precise guidance is important.

The two inner chambers can be constructed for the action of the same pressure medium. For example, this could be achieved in that the components frontally terminating the inner chambers have a single connection for the pressure medium, which is connected with both inner chambers.

However, it is particularly advantageous if both inner chambers have separate feed lines, so that either the same pressure medium under different conditions, or different media can act in the two inner chambers. In this case, both pressure chambers can be designed independently of one another and the characteristics of different pressure media can be utilized. For example, one piston can be operated by air pressure and the other by oil pressure.

According to a further development, both pistons have approximately the same length and the joint plate extends roughly over the entire length of both pistons. As the two pistons are juxtaposed, this ensures that the total length of the two pistons is utilized for ensuring guidance, so that for geometrical reasons alone, guidance is particularly good, without it being necessary for the pressure cylinder

-6-

arrangement to have a greater overall length.

In order to seal the guidance system even more effectively against contamination, according to the invention the elongated slot of the inner chamber for the guide piston can be sealed from the outside by a sealing strip, which is passed through the outer part of the auxiliary piston extension. This sealing strip ensures a perfect sealing of the elongated slot outside the area in which the actual extension is located. In the vicinity of the elongated slot, the casing can be provided with a device cooperating with the sealing strip for the positive fixing thereof. This can relate to the cooperation of magnetic strips on either side of the elongated slot or individual permanent magnets inserted in the vicinity of the elongated slot and which attract the optionally steel sealing strip. It is naturally also possible to provide lip-like projections on the outside of the casing and behind which can be pressed the e.g. elastic plastic outer sealing strip. The pressing in behind these lips can be carried out by means of a slide or zip fastener-like device fitted to the extension.

Advantageously, both pistons have an identical construction and optionally the elongated slots of both pistons are in each case sealed from the outside and the inside by a sealing strip. The outer sealing strips are passed through the outer parts of the force removal extensions and the inner sealing strips through the pistons.

Further features, details and advantages of the invention can be gathered from the following description of preferred embodiments and the attached drawings, wherein show:

- 5 Fig. 1 a broken-away longitudinal view of a pressure cylinder arrangement, partly sectioned along line I-I of fig. 2.
- Fig. 2 a section roughly along line II-II of fig. 1.
- Fig. 3 a section corresponding to fig. 2 through a
- 10 modified embodiment with an only partly represented auxiliary piston.
- Fig. 4 a view corresponding to fig. 1 of another embodiment.
- Fig. 5 one end of the cylinder in diagrammatic form.
- Fig. 6 a section through the embodiment of fig. 4 roughly
- 15 along line VI-VI thereof.

 Fig. 1 shows a view 11 of a pressure cylinder arrangement. Casing 11 contains two longitudinally directed, cylindrical inner chambers 12, 13. In the represented embodiment, the inner chambers have a

20 circular cross-section, but other shapes can also be used. A piston 14 having a packing 15 at either end is placed in inner chamber 12. At its two ends not shown in fig. 1, casing 11 is closed and provided with an inlet and/or outlet, through which a pressure

25 medium, e.g. compressed air, can be introduced into the inner chamber 12 on in each case one side of piston 14. By introducing pressure into inner chamber 12 on one side of piston 14, it is displaced in the opposite direction and as a result of this displacement

-8-

of piston 14, a device connected thereto can be moved.

Parallel to the inner chamber 12 for piston 14 is provided the second inner chamber 13, which has the same diameter and cross-sectional shape. Inner chamber 5 13 contains an auxiliary piston 16, which is widened at both ends and in this widened area 17 can be provided e.g. with an adhesion-reducing coating. Auxiliary piston 16 has roughly the same length as piston 14.

10 As can be gathered from Fig 2, both piston 14 and auxiliary piston 16 is in each case provided with an extension 18, 19, both of which project to the outside through in each case one elongated slot 20, 21 in casing 11. As is also shown in Fig 1, 15 both the side of elongated slot 20 facing inner chamber 12 and the side of elongated slot 20 facing the outside of casing 11 is in each case sealed by a sealing strip 22, 23. With respect to the upper piston 14, these sealing strips ensure a pressure-tight sealing of inner chamber 12. The outside of 20 elongated slot 21 for auxiliary piston 16 is also sealed by a sealing strip 24, which is intended to prevent dirt penetrating the guidance system. The two extensions 18, 19 run parallel to one another 25 and at right angles to one outer face 25 of casing 11. The two extensions 18, 19 are rigidly interconnected by a joint plate 26, the latter being screwed by means of screws 28 to spacers 27 fitted to the extensions.

On either side of the elongated slots 20, 21 30 outer face 25 has flat grooves, in which are laterally

-9-

guided the sealing strips 23, 24, so that no lateral displacement of said strips is possible. This ensures a relatively smooth surface of outer face 25.

5 As can then more particularly be gathered from the simplified Fig 2, auxiliary piston 16 acts against any attempt on the part of the arrangement to widen in the vicinity of the inner chamber 12 for piston 14. In addition, any lateral forces which can
10 act on extension 18 are absorbed by the rigid arrangement of the two pistons and the joint plates 26, so that the lateral forces do not have to be absorbed by the longitudinal edges of elongated slots 20, 21.

Fig 3 shows a modified embodiment of the
15 auxiliary piston 39, which contains two cross-sectionally circular segmental portions 30, which cross-sectionally extend over somewhat less than half the circle and which are interconnected by a cylindrical central portion 31. Piston 39 fulfils the same functions as
20 auxiliary piston 16 of Fig 2, because it permits a guidance of the auxiliary piston on the inner wall of inner chamber 13. This piston has the further advantage that no air cushion can build up on either side thereof in the longitudinal direction. Obviously,
25 the formation of the air cushion can be prevented by one or more bores or openings extending in the longitudinal direction of piston 16 in Fig 2.

In the case of the embodiment of Fig 4,
the auxiliary piston 36 is once again constructed as
30 a sealed piston, so that it has a packing 15 at either

-10-

end. In this case, auxiliary piston 36 is also sealed from the inside of the casing by a sealing strip 22, which extends through the said piston. The construction of auxiliary piston 36 is the same
5 as that of the force transmission piston 14 of Fig 1. Otherwise, the embodiment according to Fig 4 corresponds to that of Fig 1, so that there is no need to describe it again. Due to the identical dimensions of the two casings, even in the case of an already
10 existing cylinder, the auxiliary piston arrangement according to Fig 1 can be replaced by an auxiliary piston arrangement according to Fig 4.

Fig 5 purely diagrammatically shows the end of a cylinder arrangement, as proposed by the
15 invention. Casing 11 is frontally terminated by a component 40, which seals from the outside the two inner chambers 12, 13. Component 40 also contains the ends of the sealing strips. As can be gathered from Fig 5, component 40 contains two connections for
20 in each case one pressure line 42. Both pressure lines can be controlled separately of one another. This makes it possible for different pressure media to act on the two inner chambers and it must naturally also be possible to control them differently. It is
25 obviously also possible to allow the same pressure medium to act in both inner chambers 12, 13 and this can once again be differently controlled.

It is naturally also possible for the same pressure medium to act under the same conditions in
30 both pressure chambers.

-11-

The cross-section through casing 11 shown in Fig 6 once again reveals the two parallel inner chambers, each of which contains a piston 14, 36.

Both inner chambers, whose cross-section is filled
5 by the piston and/or their packings 15, are displaced in the direction of the outside 25 relative to a median longitudinal plane of casing 11, so that the latter is asymmetrical with respect to said plane, which is indicated by the broken line 44 in Fig 6. The force
10 removal extensions 18, 19 of both pistons 14, 36 extend from the pistons in the direction of the outside 25 having a limited spacing with respect to the inner chambers.

Both inner chambers are separated from one
15 another by a rigid partition 45, which extends transversely through casing 11. Outside 25, which bounds partition 45 towards the top, is constructed in a linear manner in the cross-section of Fig 6, so that the two edges 46, 47 of the two elongated slots 20, 21 are
20 located on either side of a strong web.

If pressure is e.g. introduced into the right-hand inner chamber of Fig 6, due to the elasticity of the material of casing 11, there is a slight enlargement of the inner chamber. Due to the fact that the inner
25 chamber is positioned closer to the outer face 25 of casing 11 at which issue the force removal extensions 18, 19 and due to the rigid partition 45, the widening of the right-hand inner chamber only takes place on the right-hand edge region 48 of casing 11. The left-
30 hand half of the right-hand inner chamber 13 remains

-12-

circular without any deformation, whilst the right-hand half of inner chamber 13 is enlarged towards the outside. Piston 36, which in the embodiment of Fig 6 is identical to piston 14, is consequently guided
5 in the same way on the left-hand half of inner chamber 13 as if the latter was not deformed. However, it is not possible for there to be any displacement of piston 36 to the right into the slightly widened part of inner chamber 13, because as a result of the rigid
10 connection of piston 36 via extension 19, connecting bridge 26 and extension 18 with piston 14, the latter would have to be simultaneously moved to the right, which is prevented by partition 45. Thus, piston 36 as well as piston 14, remains in its normal position
15 in the case of widening of the two inner chambers, which leads to the desired precise guidance.

The same naturally occurs when starting with the left-hand piston 14, on considering the arrangement according to Fig 6. Thus, piston 36 is constructed in
20 exactly the same way as piston 14 and also has an inner sealing strip 49 corresponding to the inner sealing strip 22 of piston 14. The outer sealing strips 23, 24 are also identical in the case of both pistons.

Both force removal extensions 18, 19 run parallel
25 to one another and pass out on the same outer face 25 of casing 11. The distance between the inner wall of the two inner chambers 12, 13 and the outer face 25 at which the force removal extensions 18, 19 issue, is much smaller than the corresponding distance on
30 the opposite outside 50 of casing 11.



-1-

CLAIMS

1. Pressure fluid cylinder with a tubular casing 11, in which are arranged several parallel, cylindrical inner zones (12, 13) with in each case one longitudinally directed slot (20, 21) and in each inner zone (12, 13) is longitudinally displaceably guided a piston (14, 16, 36, 39), whereof each has a power take-off lug (18, 19) projecting outwards through the associated slot (20, 21) and which is connected via a connecting device to the other power take-off lugs (18, 19), at least one inner zone (12, 13) being frontally closed and provided with inlet and outlet ports, the piston (14, 36) in said inner zone (12, 13) is provided at both ends with a seal (15) and the longitudinal slot (20) of said inner zone (12) is sealed from the inside by a sealing strip (22), characterized in that two inner zones (12, 13) and two pistons (14, 16, 36, 39) are arranged in juxtaposed manner in the common casing (11) and are separated from one another by a central partition (45) and the power take-off lugs (18, 19) of the two pistons (14, 16, 36, 39) are parallel to one another and screwed with a connecting plate (26), the sealed longitudinal slot (20) of the at least one inner zone (12, 13) being additionally sealed by an outer sealing strip (23), which extends through the power take-off lug (18).
2. Pressure fluid cylinder according to claim 1, characterized in that one piston (16, 39) has no seal and serves as a guide piston.
3. Pressure fluid cylinder according to claim 1, characterized in that both pistons (14, 36) have seals (15).
4. Pressure fluid cylinder according to one of the preceding claims, characterized in that the inner zones (12, 13) are constructed for the action of the same pressure fluid.
5. Pressure fluid cylinder according to one of the claims 1 to 3, characterized in that the inner zones (12, 13) are constructed for the action of different pressure fluids.



-2-

6. Pressure fluid cylinder according to one of the preceding claims, characterized in that both pistons (14, 16, 36, 39) have roughly the same length and the connecting plate (26) extends over roughly the entire length of the piston (14, 16, 36, 39).

7. Pressure fluid cylinder according to one of the claims 1 and 3 to 6, characterized in that both pistons (14, 36) have an identical construction.

8. Pressure fluid cylinder according to one of the claims 2 to 7, characterized in that the longitudinal slot (21) of the inner zone (13) is sealed from the outside for the guide piston (16, 39) by a sealing strip (24), which is passed through the outer portion of the power take-off lug (19) of guide piston (16, 39).

9. Pressure fluid cylinder according to one of the preceding claims characterized in that the longitudinal slots (20, 21) of both pistons (14, 16, 36, 39) are sealed from the outside and from the inside by in each case one sealing strip (22, 23, 24), whereof the outer sealing strips (23, 24) are passed through the outer portions of the power take-off lugs (18, 19) and the inner sealing strips (22) through the pistons (14, 36).

10. Pressure fluid cylinder according to one of the preceding claims, characterized in that in the vicinity of the longitudinal slots (20, 21), casing (11) is provided with a device cooperating with the sealing strip (23, 24) for the positive fixing thereof.