

Publication in the Official Journal ~~Yes~~ / No

File Number: T 113/88 - 3.2.1  
Application No.: 83 201 159.7  
Publication No.: 0 101 129  
Title of invention: Fluid lost motion cylinder

Classification: F15B 15/14, F16J 10/02, B62D 33/06

D E C I S I O N  
of 12 December 1991

Applicant: Applied Power Inc.

Headword:

EPC Article 56

Keyword: "Inventive step after amendment (yes)"

Headnote



Case Number : T 113/88 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 12 December 1991

**Appellant :** Applied Power Inc.  
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**Representative :** Boelsma, Gerben Harm, Ir et al  
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**Decision under appeal :** Decision of Examining Division dated 20 May 1986  
refusing European patent application  
No. 83 201 159.7 pursuant to Article 97(1) EPC.

**Composition of the Board :**

**Chairman :** P. Delbecque  
**Members :** M. Ceyte  
W. Moser

## Summary of Facts and Submissions

- I. European patent application No. 83 201 159.7 (Publication No. 0 101 129) was refused by a decision of the Examining Division dated 20 May 1986.
- II. The reason for the refusal was that the subject-matter of Claim 1 filed on 17 January 1986 did not involve an inventive step in view of:
- D1: US-A-3 853 368  
D2: DE-A-2 030 450  
D3: GB-A-2 009 883
- III. An Appeal was lodged against this decision on 15 July 1986 and the prescribed fee paid at the same time. Statement of Grounds of Appeal was filed on 16 September 1986.
- IV. In a communication pursuant to Article 110(2) EPC dispatched on 12 July 1990, the Board informed the Applicant of its provisional opinion according to which the subject-matter of Claim 1 filed with the reasoned statement did not appear to involve an inventive step. The content of the communication in that respect can be summarised as follows:

document D2 appears to represent the nearest prior art.

The piston-cylinder device according to document D2 is provided with a by-pass groove which is apparently machined into the cylinder wall. This requires a cylinder of substantial thickness since the material removal reduces the wall strength. This construction has the drawback to reducing the cylinder strength, so that it must be made from thicker walled tube material in order to have a sufficient strength in the area of the groove.

Thus, the problem to be solved in respect of prior art document D2 is to form a groove on a cylinder wall while overcoming the drawback mentioned above.

The solution of this problem appears to be based on the idea of forming the groove without any metal removal by outwardly deforming the corresponding wall portion, for example by press swaging.

Such an idea, however, appears to have already been suggested to the person skilled in the art in document D3 which describes grooves formed by press-swaging in a cylinder wall thus without any material removal.

- V. The Appellant filed on 23 October 1990 an amended single claim. He submitted that, in order to solve the technical problem with which the patent application-in-suit is concerned, it is necessary not only to press-swage the bypass grooves at the bottom end portion of the cylinder wall, but also to provide the claimed piston cylinder device with a welded bottom end closure and a reinforced outer ring surrounding the O-ring.
- VI. In response to a further communication pursuant to Article 110(2) EPC despatched on 8 July 1991, the Appellant filed on 26 July 1991 an amended description brought into conformity with the amended single claim.
- VII. The Appellant requests that the decision under appeal be set aside and a patent be granted on the basis of the following documents:
- The single Claim as filed on 23 October 1990.
  - Description: pages 1-4, filed on 26 July 1991 with the amendment at page 2 made by the Board and

approved by the Appellant during the telephone call of 10 December 1991.

- Drawings of the published patent application EP-A-0 101 129.

VIII. The single Claim reads as follows:

"Hydraulic piston cylinder device adapted to be mounted between a vehicle chassis and a vehicle cab and suitable for tilting and supporting said cab relative to said chassis, said device comprising a cylinder (10) having inner and outer wall surfaces and a piston rod (26) carrying at one end a piston (12) which is mounted to slidably move within said cylinder (10) between an extended and a retracted position, said cylinder (10) having a bottom end which is closed by an end piece provided with a mounting eye (24), while the piston rod (26) extends outwardly through the opposite cylinder end, at least one groove (32) being provided in the bottom end area of the inner wall surface of the cylinder and extending from said end piece longitudinally through a distance which is larger than the axial size of said piston, said piston (12) having a circumferential groove accommodating a two-part sealing ring (36,38) for slidably contacting said inner wall surface, which comprises an inner O-ring (38) of rubber and a ring (36) of a harder material surrounding said inner ring (38), characterised in that the cylinder (10) wall has a uniform thickness, said at least one groove (32) being formed by deforming the bottom end portion of said cylinder wall radially outwardly, whereas said end piece is fastened to the bottom end of the cylinder by welding and the outer ring of said two-part ring is formed of a reinforced resinous material."

## Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC; it is admissible.
2. The patent application as originally filed related to fluid cylinders in general. Subject-matter of the single Claim is a "hydraulic piston cylinder device adapted to be mounted between a vehicle chassis and a vehicle cab and suitable for tilting and supporting said cab relative to said chassis".

The above quoted passage is disclosed on page 1, lines 5-10 of the description as filed. The added feature that the end piece is welded to the bottom end of the cylinder, is clearly shown by Figures 1 and 2 as originally filed.

The addition that the outer ring is made of a reinforced resinous material finds support on page 3, line 33 of the description as originally filed. It is not indicated that the glass fibres of the glass filled resinous material disclosed in the aforementioned passage have the purpose of reinforcing the sealing ring. However, such an effect can be deduced without any difficulty by any person skilled in the art from the application as filed, so that its mention in the present claim does not contravene Article 123(2) EPC.

The further amendments of the single Claim are adequately supported by the illustrated embodiment of the description as filed.

Therefore, the subject-matter of this claim does not extend beyond the content of the application as filed (Article 123(2) EPC).

3. In the prior art portion of the single Claim, the Appellant has stated all those features of the claimed subject-matter which are, in combination, disclosed in document D2. The device according to this citation represents the nearest prior art, since none of the devices disclosed in the other publications comes closer to the subject-matter of the claim. The single Claim thus likewise meets in this respect the formal requirements of Rule 29(1) EPC.

The piston-cylinder device according to document D2 has a by-pass groove provided in the inner wall of the cylinder, which permits flow of the working fluid back and forth between opposite sides of the piston. The by-pass groove is machined into the cylinder wall, that is to say shaped by metal removal. This requires a cylinder of substantial thickness since the metal removal has the drawback to reducing the cylinder strength. The cylinder must be thus made from a thicker walled tube material which renders the mechanism heavier and more expensive.

Moreover, as mentioned in document D2, in order to avoid the sealing ring mounted on the piston to penetrate into the by-pass groove and consequently to obstruct it, so that the by-pass function cannot be properly fulfilled, the outer part of the sealing ring is made, for example, of a resin or metal, i.e. a material which is harder than the rubber sealing ring which forms the inner part of the sealing ring. Such a two-part reinforced sealing ring will have a better resistance to peripheral deformation.

4. In the light of the foregoing, the technical problem underlying the patent application-in-suit may be seen in providing an improved device of the type disclosed in document D2, which is inexpensive to manufacture and which overcomes the above-mentioned drawbacks.

5. According to the patent application in suit, this technical problem is solved by the features stated in the characterising portion of the single Claim, i.e. by
- (a) forming the by-pass groove without material removal, by outwardly deforming the corresponding wall portion of the cylinder, so that the cylinder has a uniform wall thickness
  - (b) welding together the cylinder and the end piece which closes its bottom end and
  - (c) making the outer part of the two-part sealing ring of a reinforced resin.

The partial problem which is solved by the above-mentioned characterising feature (a) is to form a groove without weakening the cylinder wall. This object is achieved by outwardly deforming the cylinder wall so as to shape the by-pass groove without metal removal.

As submitted by the Appellant during the appeal proceedings, this solution gives rise to two kinds of difficulties which are inherent in the claimed forming method: Due to the outwardly deformation of the cylinder wall, the end portion of the cylinder is not any more of annular cross section, so that it is not possible to obtain a leak-proof closure of the bottom end of the cylinder by screwing. Furthermore, the claimed deformation of the cylinder wall for forming the by-pass groove leads to groove edges which are not sharp but rounded so that the tendency of the sealing ring to obstruct the by-pass groove is accentuated. These two difficulties are overcome by the characterising features (b) and (c). A combinatorial effect is thus indeed present.



6. It is evident from the statement in section 5) above that the device according to the claim differs from that of the closest prior art document D2 by the above characterising features (a), (b) and (c).

None of the other available prior art documents discloses a device having all the characterising features (a), (b) and (c).

The subject-matter of the single Claim is therefore novel (Article 54 EPC).

7. It still remains to be examined whether the requirement of inventive step is met by the claimed subject-matter.

- 7.1 The alleged lack of inventive step in the decision under appeal was based on the teaching of document D3.

The vehicle suspension unit disclosed therein comprises an outer cylinder and an inner cylinder in which a damping piston is axially slidable. As illustrated in Fig. 3, longitudinal grooves are press-swaged into the outer cylinder, i.e. the outer cylinder wall is radially outwardly deformed so as to define with the inner cylinder wall flow paths for the purpose of "heat dissipation" (cf. page 1, line 57). These grooves thus do not fulfill a by-pass function as in the claimed device.

Document D3 teaches that a cylinder for an axially slidable piston is to be received in an outer cylinder provided with grooves obtained by cold forming of its wall. Thus, there is no disclosure or suggestion of forming by-pass grooves directly on the piston-guiding wall of the inner cylinder.

7.3 In view of the teaching of document D3, it is however not excluded that the skilled person could have provided the known cylinder according to document D2 with grooves formed without any material removal. However, the proper question to ask is not whether the skilled person could have done so, but whether he would have done so (cf. T 2/83, OJ EPO 1984, 265). In seeking an answer to this question, it should be examined whether or not the skilled person confronted with the problem to be solved or the object to be achieved would have considered the teaching of document D3:

In the closest prior art represented by document D2, in relation to which the problem to be solved was determined, the by-pass grooves are formed into the bottom end portion of the cylinder and extend longitudinally from the bottom end closure of the cylinder.

Turning now to document D3, reference is made to the passage of page 1, lines 65-70 where it is stated that the grooves "do not extend into the end portions of the outer cylinder, the end portions being of circular cross-section to permit the leak-proof attachment of an end closure (not shown) at one end and a piston rod guide (not shown) at the other end".

Consequently, document D3 teaches that the grooves should not be provided at the end portion of the cylinder, and that the cylinder ends should be maintained circular because of the problem which would otherwise be created with respect to the leak-proof closure of the cylinder end. Thus, the skilled person would be at least reluctant to provide the bottom end portion of the known cylinder according to document D2 with by-pass grooves obtained by cold forming without metal removal.

Because of this inherent incompatibility of these disclosures, the Board considers that the skilled person confronted with the problem underlying the patent application-in-suit would not have considered the teaching of document D3 and thus would not have provided the bottom end portion of the cylinder according to document D2 with by-pass grooves shaped without removal of metal.

Moreover, document D3 is wholly silent with respect to the characterising features (b) and (c) which are necessary to solve the technical problem underlying the patent application-in-suit. Therefore, without an ex post facto analysis, a skilled person by applying the teaching given there to the known device according to document D2 would not arrive at the claimed teaching.

- 7.4 Document D1 relates to a hydraulic piston cylinder device of the type specified on the prior art part of the single Claim, in which the by-pass grooves are machined, that is to say shaped by metal removal. Moreover, there is no disclosure or suggestion in this citation of the claimed two-part reinforced sealing ring (feature c).
- 7.5 The Board has also considered the further documents cited in the Search Report and found them not prejudicial to the subject-matter of the single Claim, neither alone nor in combination with the documents cited above.
- 7.6 Therefore, in the Board's judgement, the subject-matter of the single Claim involves an inventive step (Article 56 EPC). The single Claim is thus allowable in accordance with Article 52(1) EPC.
- 7.7 The description and the drawings also meet the requirements of the Convention.

**Order**

For these reasons, it is decided that:

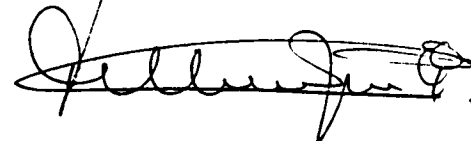
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a European patent on the basis of the documents indicated in section VII above.

The Registrar

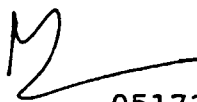


S. Fabiani

The Chairman



P. Delbecque

  
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