BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 235/90 - 3.2.1

Application No.: 82 304 448.2

Publication No.: 0 074 734

Title of invention: Actuator for brakes or the like

Classification: F16D 59/02, F16D 65/54, F16D 65/32, B60T 17/08

D E C I S I O N
of 19 September 1991

Proprietor of the patent: Bendix Limited

Opponent: WABCO Westinghouse

Headword:

EPC Articles 56 and 84

Keyword: "Inventive step (confirmed)"

Headnote

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 235/90 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 19 September 1991

Appellant : (Proprietor of the patent)
WABCO Westinghouse Fahrzeugbremsen GmbH
Am Lindener Hafen 21
Postfach 91 12 80
W - 3000 Hannover 91 (DE)

Representative :
Schrödter, Manfred
WABCO Westinghouse Fahrzeugbremsen GmbH
Am Lindener Hafen 21
Postfach 91 12 80
W - 3000 Hannover 91 (DE)

Respondent : (Opponent)
Bendix Limited
Douglas Road
Kingswood
Bristol BS15 2NL (GB)

Representative :
Turner, Alan Reginald
Bendix Limited
Douglas Road
Kingswood
Bristol BS15 2NL (GB)

Decision under appeal :
Interlocutory decision of the Opposition Division of the European Patent Office dated 15 November 1989, and posted on 24 January 1990, concerning maintenance of European patent No. 0 074 734 in amended form.

Composition of the Board :

Chairman : F. Gumbel
Members : S. Crane
F. Benussi

Summary of Facts and Submissions

I. European patent No. 0 074 734 was granted with effect from 10 December 1986 on the basis of European patent application No. 82 304 448.2 filed on 24 August 1982, priority being claimed from United Kingdom application No. 8 127 307 dated 9 September 1981.

II. The patent was opposed by the Appellants' on the grounds of lack of novelty and/or inventive step (Article 100(a) EPC) and of insufficient disclosure (Article 100(b) EPC).

The following documents were referred to by the Appellants as relevant state of the art:

(D1) US-A-3 908 804
(D2) US-A-3 759 147
(D3) FR-A-2 370 194.

III. By its decision taken at oral proceedings on 15 November 1989 and issued in writing on 24 January 1990 the Opposition Division found that the patent was to be maintained in amended form.

IV. The Appellants filed an appeal against this decision on 21 March 1990 and paid the appeal fee on the same day. They requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

The Statement of Grounds of Appeal was filed on 26 May 1990.

V. Oral proceedings were held on 19 September 1991.

VI. At the oral proceedings the Respondents (Patentees) submitted a new set of documents on the basis of which they requested the maintenance of the patent in amended form. These documents comprise independent Claim 1 and nine claims dependent thereupon, four pages of description and four sheets of drawings with Figures 1 to 5.

Independent Claim 1 reads as follows:

"An actuator for brakes or the like including a housing (1) having a cylindrical bore, a first pressure signal input port (2), a second pressure signal input port (18; 46), a fluid pressure responsive first piston (7,10,11; 37,47) operable in said bore in response to a fluid pressure signal at said first signal input port (2), to execute a forward stroke and to apply an output force to a brake element (14) or the like, an automatic adjusting means (4,5; 4,35) operable in relation to the first piston for locking thereof relative to the housing (1) against more than a predetermined return stroke and a spring applied and a fluid pressure released parking brake means (12,15; 36,41) or the like having a spring (15; 41) under compression between the first piston and a second piston (12; 36) responsive to a fluid control pressure at said second signal input port (18; 46) and acting via a piston rod (13; 48) between the first piston (7,10,11; 31,47) and the said brake element (14) to apply the brake or the like characterised by the first piston being provided with a tubular output member (6; 34) of lesser diameter than the first piston and having means for effecting said locking relative to the housing, the piston rod (13; 48) being axially movable through the tubular output member (6; 34) and by the first piston (7,10,11; 31,47) having at least two seals (20,21,22; 45,50) which seal the control fluid pressure at the second port (18; 46) of the housing in communication with a space (16; 42) defined between a part (11; 47) of the first piston and

the second piston (12; 36) to act in a forward direction on said part of the first piston and to act in the return direction upon the second piston (12; 36) to compress the spring whereby the net action of the pressure at the second port does not oppose the action of the pressure at the first port (2) on the first piston."

VII. The arguments of the Appellants in support of their request for revocation of the patent, insofar as these are still relevant to the documents submitted at the oral proceedings, can be summarised as follows:

Claim 1 was unclear in numerous respects. Thus it was not clear what purpose the tubular output member mentioned in the characterising clause of the claim served and whether the means for effecting locking thereof relative to the housing were the same as, or additional to, the automatic adjustment means mentioned in the preamble. Furthermore, it could not be seen how two seals on the first piston could seal the control fluid pressure at the second port in communication with a space, or even what this last term was supposed to mean at all. Lastly, the mere reference to "a part" of the first piston was undefined.

Claim 1 covered arrangements which would not work. To support this contention the Appellants produced sketches of actuators which allegedly showed all the features of Claim 1 but in which a force on the first piston in the forward direction was generated by the control pressure at the second port, thereby preventing the actuator from being released.

The statement of object of the invention could not be derived from the original disclosure in which there was no mention of the automatic adjustment means being more simple than in the prior art. In any case it was not

apparent how this aspect of the object was actually solved by the features specified in the claim.

Starting from document D1 as the closest prior art, the essential distinguishing features of Claim 1 could all be found in document D3 which since it related to a brake actuator was clearly in the same technical field. It would be obvious for the skilled man to apply the teachings of document D3 to an actuator as disclosed in document D1 in order to avoid the need for a service piston of large area. The features of the characterising clause of Claim 1 not present in document D3 were either constructional details of no significance and/or had nothing to do with the solution of the technical problem involved and could therefore be disregarded. It would also be possible to arrive at the subject-matter of Claim 1 by taking document D3 as the starting point and incorporating features from document D1.

VIII. In reply, the Respondents put forward essentially the following arguments:

On any reasonable interpretation of Claim 1 it was apparent that the tubular output member applied the output force on a brake element or the like and that the means for effecting locking constituted part of the automatic adjustment means. As best shown in the embodiment of Figure 2, for example, two seals on the first piston acted to confine the pressure applied at the second port within a space defined between a part of the first piston and the second piston, this being what was meant by the pressure being sealed in communication with the space. The statement in the claim that the pressure in this space acted in the forward direction on a part of the first piston adequately defined the position of this part.

The arrangements shown in the sketches produced by the Appellants did not conform to the requirements of Claim 1 since the spring was not under compression between the first and second pistons.

The use of a tubular output member had been the first step in the realisation of the invention since it enabled the first piston to act directly on the brake element and not via the second piston. Furthermore, by having the adjustment means act on the tubular output member rather than the first piston itself, as was the case in document D1, the adjustment means could be simplified. Thus, the tubular output member contributed to the solution of the technical problem as this was now stated.

The actuator of document D3 was so different in its basic structure to that of document D1 that the skilled man would not conceive of combining features of one with the other. Furthermore, a reduction in the area of the service brake piston was nowhere mentioned as being an objective of the arrangement shown in document D3. Instead the only purpose stated was a reduction in the axial length of the actuator. The actuator of document D3 had neither a tubular output member associated with the first piston, nor automatic adjustment means.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC; it is, therefore, admissible.

2. Formal allowability of the amendments; clarity and interpretation of Claim 1

2.1 Present Claim 1 includes all the features of granted Claim 1 together with the features of granted dependent Claim 3 and further restrictions relating to the diameter of the tubular output member, the location of the locking means, and how the control fluid pressure at the second port acts. These latter features do not figure in the granted claims but are directly derivable from the original description and drawings. The Appellants argued in the opposition proceedings that since granted Claim 3 was only appended via Claim 2 to Claim 1 then the features of Claim 2 should also be incorporated into Claim 1. The Board cannot support this view as there was no close functional or structural relationship between the features of granted Claims 2 and 3.

The amendments made to Claim 1 are therefore in conformity with Articles 123(2) and (3) EPC.

2.2 The statement of object in the description has been amended to take proper account of what was already known from document D1 and the role of the tubular output member in the claimed actuator. It belongs to the well-established practice of the Boards of Appeal that the technical problem to be solved has to be reformulated in the light of the closest prior art which often, as is the case here, was not known to the draftsman of the original application documents. The Board is satisfied that the reformulation of the problem undertaken by the Respondents does not contravene Article 123(2) EPC. The other amendments to the description were necessary to bring this into line with present Claim 1.

2.3 The Board is convinced that present Claim 1, particularly when read in the light of the description, gives a clear teaching to the man skilled in the art.

It is stated in the preamble of the claim that the first piston is operable to apply an output force to a brake element or the like. When then, in the characterising clause of the claim, reference is made to the first piston being provided with a tubular output member it is immediately apparent that this member must have the function of applying the output force mentioned previously in the claim.

Similarly, it is stated in the preamble of the claim that an automatic adjustment means is operable for locking the first piston relative to the housing. The subsequent mention in the characterising clause of the claim of means for effecting "said locking relative to the housing" can therefore only refer back to the operation of the automatic adjustment means. In other words the locking means mentioned in the characterising clause constitute the automatic adjustment means of the preamble.

Claim 1 requires that the pressure applied to the second port communicates with a space defined between a part of the first piston and the second piston and also that this pressure acts in a forward direction on said part of the first piston. This provides an adequate definition of the disposition of the part of the first piston that is being referred to. Furthermore, as shown in Figure 2 the first piston is provided with two seals acting respectively between the first piston and the bore of the housing, and between the first piston and the second piston to seal the space involved. The contention of the Appellants that a minimum of three seals on the first piston is necessary in this respect is therefore not correct.

2.4 The non-functioning arrangements shown in the sketches submitted by the Appellants at the oral proceedings do not conform with the requirement of the preamble of Claim 1 that the spring is "under compression between the first piston and a second piston". This term is clearly to be understood as meaning that the spring is in direct operative contact with both pistons and not, as the Appellants contended, that the spring is firstly under compression and secondly located somewhere between the two pistons. That this is the case is further reinforced by a comparison with document D1, on which the preamble of the claim is based.

3. State of the art

3.1 The most relevant state of the art is the combined service and parking brake actuator shown in document D1. This comprises first and second pistons located within the cylindrical bore of a housing. The second piston has a piston rod extending out of the housing for acting on a brake element and a rearwardly directed extension which is contacted by the first piston on forward movement thereof as the result of application of service brake pressure to a first input port. The pistons are normally held apart by a strong compression spring which operates therebetween and which is compressed by the application of a parking brake release pressure to a second input port. The first piston is provided at its circumference with a spring ring which cooperates with a series of grooves in the bore of the housing and provides for automatic adjustment of the rest position of the first piston.

With this arrangement the parking brake spring force stays substantially constant as the brake friction surfaces wear. However, the parking brake release pressure opposes

the action of the service brake pressure, thus necessitating pistons of large area.

3.2 Document D3 relates to a combined service and parking brake actuator for a brake of the dual disc type. The actuator is annular in form, located axially between the discs, and comprises a housing, a first piston on which the service brake pressure acts and a second piston located within the first piston. A spring is disposed between the first and second pistons for applying the parking brake via an annular ring which extends through an end wall of the first piston and is compressed by the application of a parking brake release pressure to a port in the first piston. The arrangement of the second piston within the first piston is stated to decrease the axial length of the actuator.

3.3 Document D2, which has not been referred to in the appeal proceedings, is less relevant than documents D1 and D3 and need not be considered further.

4. Novelty

The actuator according to present Claim 1 is distinguished from the closest state of the art according to document D1 by the features of the characterising clause of the claim. Since the novelty of the claimed actuator has not been disputed in the appeal proceedings further detailed explanations on this point would be superfluous.

5. Inventive step

5.1 The technical problem to be solved in relation to the closest state of the art according to document D1 is to be seen in the provision of an actuator for brakes or the like in which it is possible to minimise in a simple

manner the stroke of the spring-operated portion without the necessity of having a first (service brake) piston of large effective area.

In essence this is achieved by the actuator according to Claim 1 firstly in that the first piston is arranged so that it is also subjected to the (parking brake release) pressure at the second input port whereby the net action of this pressure does not oppose the action of the (service brake) pressure at the first input port, and secondly in that the force on the first piston is applied to the brake or the like via a tubular output member and not via the second piston. The automatic adjustment means act on this tubular output member rather than the first piston itself which enables these means to be simplified.

5.2 Since document D3 relates to a brake actuator, and in particular a combined service and parking brake actuator, it must be considered as lying in the same technical field as document D1 and belonging to the specialist knowledge available to the skilled man addressed by the above technical problem. It is questionable, however, given the very particular annular construction of the actuator according to document D3 and the fact that this document makes no mention whatsoever of any advantages in the direction of reduction of service brake piston area, that the skilled man would pay it more than passing attention when considering a solution to this technical problem. This question can, however, be left in abeyance since even if the skilled man were to apply the teachings of document D3 to an actuator according to document D1 it would still not lead to the actuator specified in present Claim 1 as neither of these documents provides any suggestion to equip the first piston with a tubular output member through which the piston rod of the second piston passes and to arrange the locking means such that they act

between this member and the housing. Furthermore, there can be no suggestion that these features lie within the common general knowledge of the skilled man or are trivial measures with no bearing on the operation of the actuator.

5.3 It is clear from the description of the actuator of document D3 given in point 3.2 above that this would be a wholly unsuitable starting point for judging the inventive step of the actuator claimed. This alternative approach advanced by the Appellants at the oral proceeding must therefore also fail.

5.4 The Board therefore comes to the conclusion that the subject-matter of Claim 1 cannot be derived in an obvious manner from the state of the art and accordingly involves an inventive step as required by Articles 52(1) and 56.

This claim, together with its dependent Claims 2 to 10 relating to preferred embodiments of the actuator, and the revised description and drawings can therefore form the basis for maintenance of the patent in amended form.

6. Sufficiency of disclosure (Article 100(b) EPC)

The attack on the patent under this ground was based essentially on an alleged inconsistency between the terms of the statement of object and Claim 1 of the granted patent. Since both of these have since been amended and in the opinion of the Board are now fully consistent with each other this objection need not be considered further. There has been no suggestion in the appeal proceedings that the disclosure in the patent specification is not such as to enable the skilled man to perform the invention.

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 maintain the patent with the claims, description and drawings submitted at the oral proceedings.

The Registrar: The Chairman:

S. Fabiani F. Gumbel