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D E C I S I O N
of 2 October 2001

Case Number: T 1052/99 - 3.2.1

Application Number: 88310388.9

Publication Number: 0315463

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Language of the proceedings: EN

Title of invention:
Tamper-resistant brake actuator

Patentee:
Indian Head Industries, Inc.

Opponent:
Knorr-Bremse Systems for Commercial Vehicles Limited

Headword:
-

Relevant legal provisions:
EPC Art. 56, 114(2) EPC

Keyword:
"New ground of opposition (not admitted)"
"Inventive step (yes)"

Decisions cited:
G 0010/91, T 0192/82, T 0227/88, T 0922/94

Catchword:
-



Case Number: T 1052/99 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 2 October 2001

Appellant 1: Knorr-Bremse Systems
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 28 September
1999 concerning maintenance of European patent
No. 0 315 463 in amended form.

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
G. Weiss

Summary of Facts and Submissions

I. European patent No. 0 315 463 was granted on 10 January 1996 on the basis on European patent application No. 88 310 388.9.

II. The granted patent was opposed by the present first appellants (henceforth "opponents") on the ground that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC) and that the invention was insufficiently disclosed (Article 100(b) EPC).

Of the prior art documents relied upon in the opposition proceedings only the following have played any significant role on appeal:

(D4) FR-A-2 220 161

(D5) US-A-3 478 519

(D6) Gb-A-2 000 225

(D7) US-A-3 101 133

(D13) DE-U-7 308 049 (German language equivalent of document D4)

(D14) Leaflet "Anchorlok Spring Brakes", 1978.

III. With its decision posted on 28 September 1999 the Opposition Division held that the patent could be maintained in amended form on the basis of a set of claims according to a first auxiliary request. The main request was rejected on the ground that its independent claim 2 infringed Article 123(3) EPC.

IV: Respective notices of appeal against this decision were filed by the opponents on 18 November 1999 (appeal fee paid one day later) and the proprietors of the patent on 3 December 1999 (fee paid on the same day). The statements of grounds of appeal were filed on 4 February 2000 and 31 January 2000, respectively.

V. In a communication pursuant to Article 11(2) RPBA posted on 23 January 2001 the Board indicated that it considered US-A- 565 120 (D18), a document mentioned in the description of the patent specifications to represent the closest state of the art.

VI: Oral proceedings before the Board were held on 2 October 2001.

The opponents requested that the decision under appeal be set aside and the patent revoked in its entirety.

The proprietors requested maintenance of the patent in amended form on the basis of claims 1 to 3, description and drawings as submitted at the oral proceedings.

Independent claims 1 and 2 read as follows:

"1. A tamper-resistant fluid-operated brake actuator (20) comprising
a flange case (28) having a pair of opposed chamber portions, defining portions of a spring chamber (29) and a service chamber (50) respectively, said flange case (28) having an annular flange (84) which extends generally radially outwardly from said portion defining part of said spring chamber (89),
a service chamber housing (52) defining said service chamber (50) with said flange case portion,

a diaphragm (60) received between said service chamber housing (52) and said flange case (28),

a spring (54) mounted between said service chamber housing (52) and said service chamber diaphragm (60) and biasing said service chamber diaphragm (60) towards said flange case (28),

a head (90) having an annular radially extending rim (118) secured to said annular flange (84) to define said spring chamber (89),

a spring chamber diaphragm (78) having an outer peripheral portion disposed between said annular flange (84) of said flange case (28) and said annular rim (118) of said head (90),

a power spring piston (86) mounted on said spring chamber diaphragm (78),

a power spring mounted (88) in contact with said power spring piston (86), and between said power spring piston (86) and said head (90),

a second spring (36) mounted between said spring chamber diaphragm (78) and said flange case (28),

a push rod (30) mounted in contact with said spring chamber diaphragm (78) and extending through said flange case (28), into said service chamber (50) and outwardly through said service chamber housing (52) and adapted to be connected to a yoke assembly (58), characterised in that

a securing member (104) extends around approximately 360° of the actuator and secures said annular rim (118) to said annular flange (84), and is an extension of the annular rim (118) and is integrally formed with the head (90),

said securing member (104) having a radially extending portion radially aligned with said annular flange (84) and said spring chamber diaphragm and on a

side of said chamber diaphragm (78) spaced towards said power spring (88) and said head (90),

said securing member (104) being deformed beyond its elastic limit around said annular flange (84) onto the side distant from the power spring (88) and the head (90)(a) to entrap and compress between said annular flange and said annular rim, said outer peripheral portion of said spring chamber diaphragm (78) which is radially aligned with the flange (84) and the radially extending portion of the securing member (104) and thereby to form an airtight seal and (b) to retain said head (90) to said flange case (28) such that said head (90) is rigidly secured to said flange case (28) by said securing member (104), whereby to remove said head (90,) from said flange case (28), said securing member (104) must be deformed beyond its elastic limit."

"2. A tamper resistant fluid operated brake actuator 20 comprising

a brake actuator head (90) of deformable metal,
a flange case (28) of relatively rigid cast material having a first portion extending radially outwardly from the remainder of the flange case,

a flexible diaphragm (78) disposed between the head (90) and the flange case (28),

a power spring (88) disposed between the head (90) and the diaphragm (78),

the diaphragm (78) having an outer peripheral portion overlying a portion of said first portion of said flange case (28),

and a push rod (30) disposed between the diaphragm (78) and the flange case (28), the push rod (30) adapted for movement with the diaphragm (78), and extending through an opening in the flange case

(28), characterised by

the head (90) including an integral annular rim (118) having a radially extending portion extending radially outwardly from the remainder of the head and overlying and contacting the outer peripheral portion of the diaphragm (78),

the annular rim (118) further comprising a securing portion (104) integrally formed with the head including axially extending portion for securing the annular rim to the first portion of the flange case (28),

the radially extending portion being radially aligned with the outer peripheral portion of the diaphragm (78) and on a side of the diaphragm towards the power spring (88) and the head (90),

the securing portion (104) then extending axially beyond the diaphragm (78) and the first portion of the flange casing (28) and inelastically deformed radially inwardly behind the first portion of the flange casing (28) onto the side distant from the power spring (88) and the head (90), into a generally U-shaped configuration (a) to entrap and compress between the radially extending portion of the rim (118) and the radially extending first portion of the flange case, said outer peripheral portion of said diaphragm (78) which is radially aligned with the flange (84) and the radially extending portion of the securing member (104), and thereby to form an airtight seal and (b) to retain the head (90) to the flange casing (28) such that the head is rigidly secured to the flange casing (28) by the securing member (104)

whereby to remove the head (90) from the flange casing (28) the securing member (104) must be deformed beyond its elastic limit."

VII. The arguments of the opponents in support of their request were substantially as follows:

Both of the independent claims 1 and 2 consisted of a combination of features derived from the two distinct embodiments originally disclosed with reference to Figures 1 to 3 and 4 to 7 respectively. The consequence of this was that the claims defined structures for which there was no basis in the application as originally filed. This could particularly be seen in the requirement that the head comprises both an annular radially extending rim and an integrally formed annular securing member. The former was disclosed only in the embodiment of Figures 4 to 7, the latter in the embodiment of Figures 1 to 3.

Claim 1 also included a further addition of subject-matter since a push rod as defined in the claim had not been originally disclosed.

Although addition of subject-matter had not been an original ground of opposition the Opposition Division had introduced this objection of its own motion so that it was not a "fresh ground" subject to the restrictions imposed by G 10/91 (OJ EPO 1993, 420). The Board was therefore obliged to consider all objections to the amended claims, irrespective of whether the patentees consented to this, see T 922/94 of 30 October 1997 (not published in OJ EPO).

Document D18 disclosed a brake actuator of the type to which the claimed invention related which was equipped with means to restrain the head from being separated from the flange case if the mechanic had not compressed the power spring by means of the take-up bolt

beforehand. If the mechanical restraint approach advocated in document D18 proved in practice to be insufficient as a means of preventing accidents on disassembly of the actuator then the next logical step, already suggested in document D6, was to join the head to the flange case in a manner which effectively prevented any such disassembly in the field. The customer would then lose the ability to service the actuator himself, but this could easily be compensated for by increasing the length of the guarantee period. The commercial success achieved by the proprietors with the patented brake actuators was based on such economic considerations and had no basis in the technical measures involved.

In particular, the crimping of the rim of the head to the flange case in such a manner as to secure the periphery of the diaphragm was commonplace in the relevant art, as could be seen from documents D4, D5, and D7. Document D4, especially, taught the advantage of a permanent crimped joint over one involving a clamp and the forces the joint was exposed to in the brake actuator of document D4 were generally comparable to those found in the claimed actuators. It would therefore in any case be obvious to apply the teaching of document D4 to the actuator of document D18 and arrive at the claimed subject-matter, the concomitant reduction of the risk of injury to unskilled mechanics then following as a mere "bonus effect".

VIII. The reply of the proprietors of the patent was essentially the following:

The new objection raised by the opponents were not occasioned by the amendments made to the claims and

were no longer admissible. It was in any case wholly inappropriate that they be introduced by the opponents for the first time at the oral proceedings before the Board.

For brake actuators of the type to which the patent related the inventive proposal to crimp the head to the flange case, so as to dissuade any attempts to separate them in the field, represented a distinct departure from the direction taken in the prior art with respect to the danger associated with the accidental explosive release of the power spring. The opponents had failed to demonstrate that it was known practice in the art to make a crimped joint enclosing the periphery of the diaphragm in circumstances which were comparable to those found in the actuator under consideration.

The invention had proved a great commercial success and actuators made according to the teaching of the patent had virtually completely displaced the prior art actuators with separable heads. Merely to argue as the opponents that for economic reasons the time had been ripe for the change introduced by the invention was nothing more than hindsight.

Reasons for the Decision

1. The appeals of both the opponents and the proprietors of the patent meet the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. They are therefore admissible.

2. With respect to the appeal of the proprietors it should be noted that they no longer seek reversal of the

contested decision with respect to claim 2 of their then main request. Indeed, they have now made extensive limitations to the patent of which they request maintenance, so that their status as appellants is more of a formal nature and effectively they are now respondents to the appeal of the opponents. In comparison with the amended form of the patent agreed by the Opposition Division the embodiment illustrated in Figures 4 to 7 and the claims directed to it (independent claim 2 and dependent claim 3) have been deleted. With the exception of the deletion of reference numerals present independent claims 1 and 2 correspond to independent claims 1 and 4 as maintained by the Opposition Division.

It is evident from the above that the amendments made in the course of the appeal proceedings give no cause for concern under Articles 123(2) and (3) EPC. As for the amendments made before the Opposition Division these are also in conformity with the requirements of these Articles. In particular, present claim 1 now comprises the limitation found in granted dependent claim 2 to the effect that the securing member is an extension of the annular rim and integrally formed with the head, this being the configuration employed in the embodiment of Figures 1 to 3. Present claim 2 corresponds, with the exception of the addition and deletion of various reference numerals, to granted claim 6.

Although conformity with Articles 123(2) and (3) EPC of the amendments made to a granted patent in the course of opposition proceedings may be reviewed by the Board of Appeal, irrespective of whether any objection was made to them before the Opposition Division, see

G 10/91 (supra), point 19, and T 227/88 (OJ EPO 1990, 292), the situation with regard to objections of added subject-matter against aspects of the claims which were already present in their granted versions is different since in effect it constitutes the reliance on a new ground of opposition (Article 100(c) EPC). The introduction of new grounds of opposition is governed by G 10/91 (supra), see in particular points 16 and 18. An Opposition Division has the discretion to allow the belated introduction of a new ground of opposition in dependence on its *prima facie* relevance, or may introduce such a new ground of its own motion. A Board of Appeal on the other hand may only allow the introduction of a new ground of opposition with the consent of the proprietors of the patent.

In the present case the opponents submitted for the first time at the oral proceedings before the Board arguments relating to various aspects of present claims 1 and 2, all of which were present in equivalent granted claims 1 and 6, which in their view constituted an addition of subject-matter over the original disclosure. In particular, they contended that the claims consisted of an inadmissible combination of features derived from different embodiments. The claims were now evidently restricted to the embodiment of Figure 1 to 3, but it was only the head disclosed in the now deleted embodiment of Figures 4 to 7 which comprises an annular radially extending rim as required by the claims. They also argued that the definition in claim 1 of the form and deposition of the push rod constituted an addition of subject-matter as it was inconsistent with what was actually disclosed. (In this context it should be noted that this aspect of granted claim 1 featured in the notice of opposition where it

was dealt with solely within the framework of an objection to insufficiency of disclosure under Article 100(b) EPC).

Relying on G 10/91 (supra), the proprietors protested about the belated introduction of what was effectively a new ground of opposition. For their part the opponents argued that it was not a new ground at all within the meaning of G 10/91 since the Opposition Division itself had introduced this ground into the proceedings of its own motion.

Although not clearly stated it would indeed appear from a consideration of paragraph (7) of the minutes of the oral proceedings before the Opposition Division in conjunction with points 3.3 and 3.5 of the reasons of the contested decision, that the Opposition Division raised an objection of added subject-matter against an aspect of an amended claim under examination which derived directly from the wording of granted independent claim 3. The objection was eventually overcome to the satisfaction of the Opposition Division, in the course of the appeal proceedings the claim in question, and the embodiment to which it related, have been deleted.

The Board sees it as an unduly formalistic interpretation of G 10/91, having regards to the fundamental principles underlying its reasoning, especially that of procedural certainty for the proprietors of a patent, that the introduction by the Opposition Division of a specific objection of added subject-matter to one independent claim can provide an adequate basis for the subsequent introduction, at any stage of the appeal proceedings, of wholly unrelated

objections of added subject-matter with respect to the terms of different independent claims.

The opponents sought to rely on T 922/94 (*supra*) as providing backing for their contention that their objection could not be disregarded pursuant to Article 114(2) EPC. In the opinion of the Board, however, that decision does no more than confirm the principles of **amendments** made to the granted patent being open to review at any stage in the proceedings, as discussed previously. On the above understanding of G 10/91 the Board cannot see that it has any discretion to allow the belated objections of the opponents into the proceedings without the consent of the proprietors, but even if it did it would not, in the circumstances, exercise it in favour of the opponents. The reason for that are to be seen in both the extreme belatedness with which the relevant submissions were made as well as their *prima facie* lack of relevance to the outcome of the appeal. In the latter context reference should be had to analysis made below of how the terms of the independent claims should be understood in the light of the description.

3. Claim 1 is directed to a well-known type of combined spring and service brake actuator commonly used on heavy commercial vehicles. A brake actuator of this type comprises a powerful coil spring which acts via a piston and a push rod in a direction to apply the brakes. The power spring is located in a spring chamber defined between a head and a flange case, the head being secured to an annular flange of the flange case with the outer peripheral portion of a spring chamber diaphragm located therebetween. By the application of fluid pressure to the side of the diaphragm remote from

the power spring, the spring is compressed to release the spring brake. This pressure is maintained during normal service of the vehicle, the spring brake thus being applied only when the vehicle is parked or in the event of an emergency. A service chamber including a second diaphragm is also defined between the flange case and a housing. Service brake pressure is applied to this second diaphragm for normal braking of the vehicle, the diaphragm acting via a corresponding push rod connected to a yoke assembly. In this conventional assembly there are thus two push rods which are axially aligned, the push rod of the spring brake acting to apply the brake via the push rod of the service brake. When the spring brake is released by the application of pressure to the spring chamber diaphragm the movement of the push rod of the service brake is controlled solely by the service brake diaphragm.

This physical independence of the two push rods is a technical necessity for the operation of the type of brake actuator involved and it is in the light of this that the reference in claim 1 to "a" push rod mounted in contact with the spring chamber diaphragm, extending through the flange case, into the service chamber and outwardly through the service chamber housing to be connected to a yoke assembly must be understood

Taken literally that statement would appear to require a single push rod, an arrangement which the person skilled in the art would recognise immediately as not only being totally at odds with the description of the preferred embodiment but also completely unworkable. He would therefore interpret the claim in the sense of a two-part piston rod assembly as explained above. As a consequence of this the reference to the form and

disposition of the push rod in claim 1 cannot be considered as constituting an addition of subject-matter over the original disclosure. Nor can this aspect of the claim lead to a finding of insufficiency of disclosure, the ground of opposition under which it was originally addressed but has not been pursued on appeal.

In the conventional type of brake actuator described above the head was secured to the flange case by means of a removable ring clamp. Before the clamp is removed it is necessary to take special measures to ensure that the energy of the power spring is not released quasi explosively, with potentially disastrous consequences. Thus the air pressure which retains the power spring in its compressed state must be dissipated and the power spring must be "caged" within the head. Instructions to this effect were typically included on an embossed plate attached to the head.

Nevertheless, accidents still occurred and accordingly various devices were proposed for addressing the improvident detachment of the head from the flange case. One such arrangement is found in document D18, which is a development of the commercialised brake actuator featuring in the document D14. The brake actuator is provided with notched ears depending from the head, the ears also having holes through which the clamping bolts of the ring clamp extend. The lower edge of the notch in the ear is positioned under the flange of the flange case and will be drawn up to engage the flange by the power spring if the clamp is removed without the power spring having been caged. If on the other hand the power spring has been properly caged then the width of the notch is sufficient to enable

normal disassembly of the head from the flange case. However according to the proprietors of the patent even this system does not guarantee sufficient safety since the sudden release of the power spring can generate forces high enough to cause failure of the ears.

In the light of the above the technical problem to solved is to be seen in the development of a brake actuator of the type referred to above in which the risk of injury caused by explosive release of the power spring is further reduced.

In general terms this problem is solved by dispensing with the clamp and joining the head directly to the flange of the flange case in a manner which effectively prevents any attempt to separate these two components in the field. More specifically, as defined in present claim 1, the head has an integral securing member which comprises an extension of its annular rim (the radially extending part of the head overlying the flange of the flange case). The securing member is deformed beyond its elastic limit around the flange of the flange case, entrapping and compressing the outer peripheral portion of the spring chamber diaphragm to form an airtight seal and retain the head on the flange case. To remove the head it is thus necessary to deform the securing member beyond its elastic limit. In this context the Board has no difficulty in relating the wording of the claim directly to the embodiment shown in Figure 1 to 3 and the argument of the opponents, see point 2 above, that the claim inadmissibly combines elements of the two district original embodiments is without any proper foundation.

At the oral proceedings before the Board the main

citation relied upon by the opponent with respect to this form of attachment of the head to the flange case was document D4 (and its German language equivalent D13). This state of art comprises a service brake actuator comprising a chamber equipped with a flexible diaphragm for receiving service brake pressure to actuate the brake via a push rod. A spring is arranged between the base of the chamber and the membrane to return this to its rest position. The chamber is defined by two sheet metal elements, a body and a head, which are secured together by crimping a radially extending edge portion of the head around an annular flange at the open end of the body, with the peripheral portion of the diaphragm being entrapped therebetween. The purpose of the arrangement is ensure uniform pressure on the diaphragm and to avoid the cost and space requirements of a separate clamp, as used conventionally.

The opponents argued that the level of forces encountered in the brake actuator of D4 were generally equivalent to those found in the spring brake section of a combined spring and service brake. The only distinction was that in the latter the forces were permanently applied (either by the power spring or by the release pressure) and in the former they varied with the amount of braking force required. The person skilled in art would therefore see no technical reason why the solution proposed in D4 should not be used in the type of brake actuator to which the claimed invention related in order to achieve the same benefits associated with dispensing with a separate clamp. That the resulting construction would also be safer than the prior art was a mere "bonus effect".

The proprietor of the patent contended however that in document D4 the degree of overlap of the crimped edge of the head and the flange of the body is so small that in fact the head was intended to be removably secured to the body in the manner of a clip, so that the arrangement did not correspond with that claimed. In the circumstances that does not seem to be a convincingly realistic appraisal of the teachings of the document. However, the arguments of the proprietors concerning the differences of the circumstances of use and the corresponding forces to be withstood between a service brake actuator as disclosed in document D4 and a brake actuator comprising a power spring as claimed carry more weight. In particular, they pointed to the fact that in addition to the high permanent load given by the force power spring, the joint between the head and the flange case was also subjected to high dynamic vibrational loads caused by the location of the heavy spring in the free end of the head. There was nothing in document D4 which could lead the person skilled in the art to the conclusion that the type of joint portrayed there would be suitable in these different circumstances.

On balance, the Board finds the arguments of the proprietors more convincing. In order for the "bonus effect" approach of the opponents to succeed it would be necessary to demonstrate that the person skilled in art was effectively on a "one-way street" which would have inevitably led him to adopt a crimped type joint instead of a separate clamp in the type of brake actuator under consideration (see T 192/82, OJ EPO 1984, 415). For the reasons advanced by the proprietors, this the opponents have failed to do. Also from a more conventional problem and solution approach

to the evaluation of inventive step there is nothing in document D4 which can in any way be related to the safety problems associated with power spring brakes and the Board can see no reason why the person skilled in the art when addressing these problems should have any reference to the teachings of that document.

Similar considerations apply to documents D5 and D7, also referred to in order to show crimped joints between components of chambers of brake actuators, the joints serving to secure the peripheral portion of a flexible diaphragm. In both cases however the actuators do not correspond with the type presently under consideration.

For completeness the Board also notes that in document D6, which relates to a combined spring and service brake actuator, but of a type comprising a piston rather than a flexible diaphragm for releasing the spring brake, it is suggested to make the joint between the head and the body of the actuator in such a way that it can only readily be released in the factory to reduce the risk of injury to unskilled personnel. In the embodiment of Figure 2 this is achieved by rolling the open end of the head over an enlarge peripheral portion of the body. Although in general terms document D6 could thus be said to be an antecedent for what the present invention sets out to do to increase safety, it must be stressed that the contested patent does not attempt to claim the broad concept involved as such but is instead restricted to a particular manner of achieving the required result, a manner which, as discussed above, is not derivable in an obvious way from the state of the art.

Accordingly, the Board comes to the conclusion that the subject-matter of claim involves an inventive step (Article 56 EPC). It is reinforced in this view by the presence of a number of so-called secondary indicia, in particular the satisfaction of a long-felt want by means of a relative simple solution and the undisputed commercial success enjoyed by the claimed invention (see section I. D. 7.4 to 7.6 of the compendium "Case Law of the Boards of Appeal of the EPO").

4. In essence, independent claim 2 differs from claim 1 only to the extent that the preamble of the claim is restricted to the spring brake section of the actuator, the reason for this being that the spring brake section and the service brake section are commercially available as separate units. It is apparent from the above that the arguments developed in the support of the inventive step of the subject-matter of claim 1 apply with equal force of the subject-matter of claim 2.

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 on the basis of the following documents:

Claims 1 to 3, description and drawings as presented at the oral proceedings on 20 October 2001

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel