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 26/91 - 3.2.1

Application No.: 84 308 183.7

Publication No.: 0 146 283

Title of invention: Improvements in or relating to prefilled hydraulic control apparatus

Classification: F15B 7/00, F16D 25/14, F16L 37/08, F16L 37/28

D E C I S I O N
of 29 September 1992

Proprietor of the patent: Automotive Products PLC

Opponent: 01) BMW AG
02) Federal Mogul

Headword:

EPC Article 56

Keyword: "Technical prejudice (no)"
"Inventive step (no)"

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 26/91 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 29 September 1992

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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 19 September 1990 with written reasons posted on 5 November 1990 maintaining the European patent No. 0 146 283 as amended pursuant to Article 102(3) EPC.

Composition of the Board :

Chairman : F. Gumbel
Members : P. Alting van Geusau
J. de Preter

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 146 283 based on European patent application No. 84 308 183.7, which was filed on 26 November 1984 and claiming priorities of 30 April 1984 (US 607020) and 28 November 1983 (US 555667), was published on 11 January 1989.

II. In notices of opposition filed on 7 October 1989 and 11 October 1989, respectively, the other party (Opponent 01) and the Appellant (Opponent 02) requested revocation of the patent for reasons of non-compliance with the provision of Article 100(a) EPC.

In respect of an alleged lack of novelty and inventive step the oppositions were supported inter alia by the following documents:

D2: US-A-2 511 765
D3: GB-A-1 539 879
D4: US-A-2 536 628
D5: FR-A-2 048 419
D16: GB-A-1 132 443.

III. By a decision given at oral proceedings held on 19 September 1990, with written reasons posted on 5 November 1990, the Opposition Division maintained the patent in amended form on the basis of Claims 1 to 26 filed with letter of 13 August 1990 including additional amendments to the independent Claims 1, 2 and 12 made at the oral proceedings in the opposition procedure.

The Opposition Division held that starting from the closest prior art as disclosed in D3, several steps were necessary to arrive at the subject-matter of the independent Claims 1, 2 and 12. A skilled person could not

be expected to follow these steps in an obvious manner even if he were aware of the prior art cited in the opposition procedure.

IV. An appeal was lodged against this decision on 4 January 1991 with payment of the appeal fee on the same day.

The Statement of Grounds of Appeal was filed on 15 March 1991.

V. In a communication of 10 December 1991 the Board expressed its provisional opinion according to which the skilled person faced with the problem of adapting the prefilled clutch actuating arrangement of D3 to the needs encountered when using an annular slave cylinder for actuating the clutch and following the teachings given in D16 together with his general knowledge in regard of hydraulic line couplings, would appear to arrive in an obvious manner at the subject-matter of the independent claims of the patent in suit as amended.

VI. During correspondence of the Appellant and Respondent, reference was made in particular to the following additional documents:

D17: pages 72 and 73 of ATE Bremsen Handbuch 1960
D18: Lockheed Brochure 1949, page 7, Figure 3
D19: EP-A-0 092 823
D20: EP-A-0 095 841 (not pre-published)
D21: US-A-3 694 890
D22: Lockheed Servo System Catalogue, page 12, "The Lockheed Servo Brake" (publication date unknown).

With summons of 25 March 1992 the parties were invited to oral proceedings as had been auxiliarily requested by the Respondent on 18 February 1992.

VII. At the oral proceedings held on 29 September 1992 the Respondent further amended the claims underlying the Opposition Division's decision in that the words "and testing" and "pretested" were inserted before "prior" and "modular", respectively, in Claims 1 and 2 and the words "and pretested" were inserted after the word "fluid" in line 1 of Claim 12.

The valid independent claims read as follows:

"1. A method of prefilling a vehicle clutch hydraulic control apparatus with hydraulic fluid prior to installation of said apparatus on a vehicle, said apparatus when installed comprising a hydraulic master cylinder (28), a remote hydraulic slave cylinder (18) and a conduit (26) connecting the master cylinder to the slave cylinder, characterised by providing a connector (32) at a position in the fluid flow path between master cylinder (28) and slave cylinder (18) through which connector (32) hydraulic fluid can pass, the connector being of a leakproof quick-connect type and comprising a pair of half-connector members (44, 46; 404, 402; 500, 502) each including valve arrangements (92, 94 and 134, 138; 438, 448 and 416, 424; 532, 536 and 556, 568) which valve arrangements are both closed when the half-connector members are uncoupled and are both open when the half-connector members are coupled to permit hydraulic fluid to flow through the connector and thereby enable the cylinders (18, 26) to be interconnected through the conduit (26), and filling the cylinders and conduit with said hydraulic fluid and testing prior to installation on the vehicle to provide separate pretested modular units prefilled with said hydraulic fluid with the half-connector members uncoupled whereby the modular units when installed on the vehicle can subsequently be

interconnected by coupling together the half-connector members of the connector (32) to form the vehicle clutch hydraulic control apparatus.

2. A method of installing a vehicle clutch hydraulic control apparatus being prefilled with hydraulic fluid on a vehicle, said apparatus, when installed comprising a hydraulic master cylinder (28), a remote hydraulic slave cylinder (18), and a conduit (26) connecting the master cylinder to the slave cylinder, characterised by providing a connector (32) at a position in the fluid flow path between master cylinder (28) and slave cylinder (18) through which connector (32) hydraulic fluid can pass, the connector being of a leakproof quick-connect type and comprising a pair of half-connector members (44, 46; 404, 402; 500, 502) each including valve arrangements (92, 94 and 134, 138; 438, 448 and 416, 424, 532, 536 and 556, 568) which valve arrangements are both closed when the half-connector members are uncoupled and are both open when the half-connector members are coupled to permit hydraulic fluid to flow through the connector and thereby enable the cylinders (18, 26) to be interconnected through the conduit (26), and filling the cylinders and conduit with said hydraulic fluid and testing prior to installation on the vehicle, providing separate and pretested modular units with the half-connector members uncoupled and prefilled with said hydraulic fluid, installing the separate modular units on the vehicle and interconnecting the installed modular units by coupling together the half-connector members of the connector (32) to form the vehicle clutch hydraulic control apparatus.

12. Vehicle clutch hydraulic control apparatus being prefilled with hydraulic fluid and pretested by a method according to Claim 1 or any of Claims 3 to 11 when appendant to Claim 1 for installation in a vehicle, said

apparatus when installed comprising a hydraulic master cylinder (28), a remote hydraulic slave cylinder (18) and a conduit (26) connecting the master cylinder to the slave cylinder, characterised in that a connector (32) is provided at a position in the fluid flow path between master cylinder (28) and slave cylinder (18) through which connector (32) hydraulic fluid can pass, the connector being of a leakproof quick-connect type and comprising a pair of half-connector members (44, 46; 404, 402; 500, 502) each including valve arrangements (92, 94 and 134, 138; 438, 448 and 416, 424; 532, 536 and 556, 568) which valve arrangements are both closed when the half-connector members are uncoupled and are both open when the half-connector members are coupled to permit hydraulic fluid to flow through the connector and thereby enable the cylinders (18, 26) to be interconnected through the conduit (26)."

VIII. The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 146 283 be revoked.

In support of his request he essentially submitted the following arguments.

Considering the most relevant prior art documents D2, D3, D16 and D21, there are several ways for showing that the subject-matter of the independent claims does not involve an inventive step. The most obvious way is considered to be derivable from the combination of the teachings of D3 and D21. When starting from D3 as the closest prior art the skilled person would obviously recognise the problems encountered when using this known prefilled hydraulic clutch actuating mechanism with motor vehicles utilising annular slave cylinders for the clutch actuation as referred to in the patent in column 1. Since the problem

is essentially a manufacturing problem, when assembling a motor car the skilled person would look for a solution in this area and would certainly be confronted with D21.

D21 relates to the manufacture of a motor vehicle with prefilled hydraulic systems prior to installation in the motor car. This prior art discloses a modular concept of installation of a hydraulic brake system in which the master cylinder and rear brakes are connected by means of self-sealing couplings. Since obviously these self-sealing couplings must seal quickly enough to avoid ingress of air they must be part of a quick acting connector such as defined in the independent claims of the patent in suit.

In this respect reference can also be made to D22 which discloses that the known trailer coupling is termed a "self sealing coupling" and because almost certainly this coupling is of the type as shown in D2 it is also of the quick-connect type.

No real distinction between hydraulic brake and hydraulic clutch actuating can be made and also no real difference exists between "hydrostatic" and "hydrodynamic" systems when trapped air is concerned as was alleged by the Respondents; the skilled person knows that air must be excluded from the hydraulic system at any cost.

As regards an alleged prejudice against splitting up a hydrostatic hydraulic system, the documents on file and in particular D2 and D21 show that there was no such prejudice. It is clear that by using a quick-connect coupling in a system of D3 many advantages may be achieved but the complication of using two extra coupling parts must be accepted. Therefore it is merely a balancing of the advantages and disadvantages to be expected when deciding which system is preferable for a particular job.

This has however nothing to do with a prejudice but depends on the proper evaluation of known facts in each particular case.

It is further a matter of course that when the system of D3 is split up into two parts, both parts may be prefilled and tested before installation in the motor car. In D21 it is not said that the subassemblies are tested but this is considered self-evident in view of the fact that the hydraulic system is prefilled and thus ready for use.

IX. The Respondent requested that the appeal be dismissed and that the patent be maintained with the document underlying the decision under appeal comprising the amendments in Claims 1, 2 and 12 filed at the oral proceedings (see point VII above).

In support of his request the Respondent submitted essentially the following arguments.

It is agreed that D3 represents the closest prior art. This prefilled hydraulic clutch actuating arrangement has the advantage that it may be manufactured as a sealed unit which avoids cumbersome filling and bleeding operations after assembly in a motor car.

However, it is well known to the skilled person that when a hydrostatic hydraulic system is filled and bled it should not be touched anymore so as to prevent air from entering the system. In so far the skilled person would be very reluctant to change this known system because this would give a risk of air entering the system.

The hydraulic coupling disclosed in D2 is almost certainly concerned with a hydrodynamic system such as is used in

D18 which is less vulnerable to ingress of air for its proper functioning.

However, as can be seen from D17, when a car has a hydrostatic braking system the trailer has its own independent hydraulic braking system and the coupling of the two systems relies on a connection which transmits motion rather than that fluid flows from the tractor to the trailer.

In the contested decision the Opposition Division held that the skilled person could be expected to split up the vehicle clutch hydraulic control apparatus according to D3 in view of the documents D4 and D5. However, D4 and D5 do not relate to hydraulic clutch control and history shows that to use a quick-connect self-sealing connector in a prefilled clutch system was a significant departure from the teaching in this art.

D21 further considered to be pertinent by the Appellant shows nothing more than a subassembly which is built up in the traditional manner and although the hydraulic circuit assembly may be prefilled it is too big to be pretested. There is also no disclosure of a quick-acting coupling. Moreover, D21 and also the hydraulic brake arrangement of D18 and D2 are "dead-end" developments which have not been produced at all or only in insignificant numbers and would therefore not be considered by the skilled person for solving the underlying problem of the invention which essentially relates to independent mounting of master and slave cylinders.

Numerous advantages followed the introduction of the quick connect coupling into a hydrostatic clutch system. Examples of such advantages are:-

1. By using a quick-connect coupling, there is great flexibility as to the best moment of connection. At a convenient time, at virtually any point in the production line, the two prefilled modular units can be snapped together.

2. The system is easier to fit since one is not left with a filled modular unit dangling from the part which is being fitted to the vehicle.

3. If during servicing it is necessary to change a cylinder, the quick-connect system allows an easy change without subsequent filling and bleeding.

4. If a vehicle body is built up in one place and the engine and transmission is built in another place, the respective prefilled modular unit can be fitted by each manufacturer and then when the parts are shipped to the main production line, the assembled prefilled modular units can be snapped together.

The system provides all these advantages without any sacrifices of quality and the advantages compensate for the higher component cost over the basic prefilled system.

The adoption of the quick-connect prefilled system in a vehicle clutch hydraulic system was clearly a move in the direction away from an established technical prejudice and it gives rise to many benefits to the user when compared with prior systems.

Moreover, considering the relevant prior art documents, none of them suggests or hints to the underlying problem of the invention which relates to the independent

installation of master and slave cylinders which are prefilled and pretested.

X. The other party did not submit arguments or evidence nor did they attend the oral proceedings.

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 admissible.

2. Amendments

2.1 If compared with the granted claims only the independent Claims 1, 2 and 12 have been amended by limiting the subject-matter of these claims to a vehicle clutch hydraulic control apparatus, by introducing some clarifications concerning the position of the connector in the fluid flow path, and by the feature that the separate modular units of the vehicle clutch hydraulic control apparatus are pretested.

These amendments are supported by the originally filed application documents in regard of the preferred embodiments disclosed which all relate to hydraulic clutch actuating means and show the claimed position of the connector in the fluid flow path between a master and slave cylinder as well as that the modular units comprising the master and slave cylinder are pretested (see for example page 12, line 11 and page 13, line 15).

These amendments do not give rise to objections under Article 123(2) and (3) EPC.

3. Prior art

Of all the documents cited in the proceedings the following publications are considered to represent the most relevant prior art for assessing novelty and inventive step of the subject-matter of the independent claims of the patent in suit.

3.1 The closest prior art, as agreed to by the Appellant and Respondent, is disclosed in D3.

The hydraulic clutch release apparatus described in this document comprises a master cylinder, a slave cylinder and a flexible connecting pipe. The apparatus is prefilled and bled and may be stored, transported and installed as a unit in a motor vehicle after which it is immediately ready for use.

Although it is not explicitly stated in D3 that the unit is pretested, this follows, in the Board's opinion, immediately from the fact that after assembly of the unit in the motor car it is ready for use.

This prior art represents in combination the precharacterising features of the independent Claims 1, 2 and 12, respectively.

3.2 D2 relates to a hydraulic connector of the leakproof quick-connect type and comprises two coupling elements mounted to the flexible hydraulic pipe line in the braking system of a tractor vehicle and the pipe line of its trailer vehicle, respectively.

A pair of valve members are provided within the body of each coupling element to seal off the pipes when the coupling elements are disconnected.

3.3 D16 discloses a connecting device for two hydraulic units permitting them to be assembled in a filled condition without allowing air to penetrate into the hydraulic circuit. Reference is further made to the advantages achieved when assembling parts of a hydraulic circuit which are already filled with a hydraulic fluid. The connecting device provided in D16 comprises two connecting end pieces, each of which is sealed by a diaphragm, an assembling device for bringing the two end pieces together and an independent diaphragm puncturing device for puncturing the diaphragm and establishing fluid communication between the two circuit sections.

3.4 D17 discloses a car having a hydraulic braking system and a trailer having its own independent hydraulic braking system. The two systems are interconnected through a coupling which enables fluid displacement in the car braking system to displace a piston in the connector transferring its motion mechanically to a piston in trailer circuit. However, no fluid flow through the coupling takes place and the hydraulic systems remain fully separated.

3.5 D18 concerns a page (7) of a Lockheed brochure showing a hydraulic servo brake system. The system comprises a hydraulic servo pump delivering hydraulic fluid to a pedal operated control valve. The front brakes are operated directly from the control valve whereas the rear brakes are operated through a separate master cylinder actuated by the combined action of foot pedal and fluid pressure provided by the control valve to the front brakes.

3.6 D19 discloses a so-called annular slave cylinder for actuating a motor car clutch. The slave cylinder is connected to the master cylinder by means of a fluid line

comprising pipe couplings and is filled and bled in the traditional manner.

3.7 D21 discloses a manufacturing method of a motor vehicle including manufacturing of subassemblies which provides a unit that facilitates the use of a modular concept in the manufacture of a motor vehicle (see column 5, "operation").

A subassembly comprises a complete front suspension arrangement with a hydraulic brake booster system of the vehicle brake system being integrated. It may be charged with hydraulic fluid before the subassembly is completed. The brake master cylinder, brake lines and calipers may also be filled with fluid (column 5, lines 49 to 54).

The rear brake system can also be manufactured as a subassembly having the rear wheel cylinder and brake lines precharged with brake fluid. With a construction of that type self-sealing couplings may be used to join the rear brake system to the master cylinder once the subassembly is installed in the vehicle (column 5, lines 55 to 65).

4. Novelty

4.1 As follows from the above analysis of the most relevant prior art, none of the available documents discloses the full combination of features of any of the independent claims of the patent in suit.

In particular none of the documents discloses a prefilled and pretested vehicle clutch hydraulic control apparatus in which subunits comprising the master, respectively, slave cylinders may be coupled by means of a connector of the quick-connect type.

As novelty of the claimed subject-matter was no longer in dispute in the appeal proceedings further substantiations on this point are considered unnecessary.

5. Inventive step

5.1 Whether the slave cylinder or the master cylinder is installed first on the vehicle, and the other cylinder installed at some other subsequent station on the assembly line does normally not present much inconvenience in a system disclosed in D3. The last installed component may be simply left dangling on the end of the flexible conduit, or may be attached to some portion of the motor vehicle frame or body, until definitely mounted in its operative position. However, with the present trend towards utilising annular slave cylinders (see D19) disposed concentric to the driveshaft, it is difficult to provide a fully assembled, fully tested prefilled apparatus without some accompanying inconveniences. Such inconveniences relate to the inherent requirement that the annular slave cylinder be installed first in the clutch bell housing, or on the transmission casing face, and the master cylinder on the end of the flexible line or conduit interconnecting the master and slave cylinders be provisionally attached, in some manner by strings, wires or straps to the motor vehicle frame, and subsequently installed in its proper position through the passenger compartment floorboard or bulkhead. Therefore, there are probably only a few places along the production line where the components can be assembled; if these are missed it can be difficult to assemble later.

5.2 The features of the characterising portion of the independent Claims 1, 2 and 12 of the patent in suit as amended avoid these drawbacks in that there is greater flexibility by splitting up the system in two units. By

using a quick-connect coupling in the connecting fluid line from the master to the slave cylinder, the cylinder can be mounted separately and at virtually any point in the production line the two prefilled modular units can be snapped together during end-assembly of the vehicle.

5.3 Starting from the known arrangement disclosed in D3, the problem to be solved by the patent in suit can therefore be seen in the provision of a hydraulic clutch control assembly system allowing greater flexibility when mounting the assembly while maintaining the advantages of the fully pre-assembled hydraulic clutch actuating system.

5.4 The Respondent submitted that the problem to be solved should be considered to relate to the independent installation of the master and slave cylinders which are prefilled and pretested and that such a problem since not derivable from the prior art, should be regarded as inventive in itself.

In this respect the Board considers that the problem should be objectively assessed in relation to the closest prior art, such that it does not already contain essential features of the solution proposed or hints thereto.

5.5 The objective problem outlined in point 5.3 above will be immediately encountered by the practitioner when using an annular slave cylinder in the arrangement of D3 and therefore no inventive activity was necessary for the recognition of this problem.

Looking for a solution to this problem the skilled person would, in the Board's opinion, consider in particular assembling methods of hydraulic circuits comprising master and slave cylinders in a motor car and would in doing so certainly become aware of D21.

D21 teaches the use of modular units in order to facilitate the manufacture of a motor vehicle. The known modular units comprise fully finished front and rear axle subassemblies with prefilled hydraulic brake circuits which may be interconnected by using self-sealing couplings during assembly in the motor vehicle.

Clearly, in the Board's view, the skilled person would recognise the greater flexibility provided by such modular units and the general idea of splitting up the hydraulic brake circuit in prefilled units. Also, he would see no difficulties in applying the teachings of D21 to the prefilled system of D3 because the essential parts of the hydraulic circuits of a brake and clutch actuating system are identical.

As regards the use of a coupling of the quick-connect type, the Board is of the opinion that although it is not explicitly stated in D21 that the self-sealing couplings are quick-connect couplings the selection of such a coupling is obvious in view of their known application in brake connection lines for tractors and trailers (see D2). The Board further considers the Appellant's view convincing that in the context of motor vehicle assembly the skilled person would select a known coupling most suited for the job and therefore clearly would use quick-connect couplings which are readily available couplings of the self-sealing type and which are particularly easy to handle.

Therefore, no inventive merit can be seen in the use of a quick-connect coupling of the type disclosed in D2 for connecting the master and slave cylinders in a prefilled system disclosed in D3.

Further, although D21 is silent as to whether the prefilled subassemblies are pretested, it is considered to be self-evident that completed subassemblies undergo some sort of test for proper functioning in order to avoid cumbersome dismantling of the subassemblies after they are installed on the vehicle and prove defective. Such a test procedure for proper functioning of a separate part is considered nothing more than the usual procedure when mounting a vehicle from preassembled parts and hence cannot be considered to be of inventive significance.

Therefore, in the Board's judgment, a combination of the teachings of D3 and D21 when taking account of the knowledge of the skilled person concerning quick-couplings for hydraulic lines as shown in D2 would immediately lead to the method of prefilling a vehicle clutch hydraulic control apparatus defined in Claim 1 and the method of installing such a vehicle clutch apparatus onto a vehicle in accordance with Claim 2 or to a vehicle clutch hydraulic control apparatus as specified in Claim 12 of the patent in suit.

5.6 The Respondent argued that the skilled person would by no means split a prefilled and bled hydraulic hydrostatic circuit because there was a technical prejudice of splitting hydrostatic hydraulic systems.

In this respect the Respondent relied upon the differences between so-called "hydrodynamic" and "hydrostatic" hydraulic systems and submitted that tractor trailer couplings of the type used in D2 were applied only in hydrodynamic systems. Reference was made to D18 to show that tractor trailers use hydrodynamic brake systems.

Considering this line of argument the Board sees no proof that the coupling disclosed in D2 is intended for use with hydrodynamic systems only.

Although the system disclosed in D18 may be considered to comprise a hydrodynamic hydraulic brake circuit for the front brakes the rear brake circuit which obviously comprises the coupling to the trailer, is actuated by means of an separate master cylinder actuated by the brake pedal and fluid from the control valve. This master cylinder and the rear brake cylinders are thus part of a hydrostatic circuit in exactly the same manner as the circuit of D3.

Moreover also D16, which relates to hydraulic circuits in general, stresses the advantage of assembling parts of a hydraulic circuit when these parts are already filled with a hydraulic fluid and provide a coupling between the system parts which prevents penetration by air so that a so-called bleeding operation can be avoided.

Also here no reference is derivable to the alleged restriction that such a system is suitable for hydrodynamic hydraulic systems only.

The Respondent further pointed out that the disclosures of D17 and D21 were so-called "dead-end" developments and that therefore the skilled person would certainly not adopt their teachings. In this respect the Board considers that whether a solution is commercially successful does not only depend on its technical merits. Clearly in D21, as well as in the patent under discussion, the connector represents an extra part of considerable complexity and cost and comes into consideration only when its advantages at least outweigh the disadvantages.

The Board also takes the Appellant's view that even when the coupling of D2 would allow some small ingress of air during the coupling sequence the skilled person would recognise that this is insignificant for the use of such a coupling in a hydraulic clutch actuating apparatus because, contrary to a trailer, a coupling sequence is normally carried out only once in the life of the vehicle.

The Respondent further referred to the fact that the subassemblies of D21 do not represent modular units in the sense of the independent claims of the patent in suit but are merely assembled in the traditional manner to a rather massive unit and are thereafter filled with hydraulic fluid.

However, in the Board's opinion, the size of the modules do not prevent the skilled person from recognising the basic principle of using modular units disclosed in D21 and its relevance with respect to prefilled hydraulic circuits connectable in the course of assembling the motor vehicle.

6. For the above reasons the Board comes to the conclusion that the subject-matter of the independent Claims 1, 2 and 12 does not involve an inventive step within the meaning of Article 56 EPC and that therefore the grounds for opposition prejudice maintenance of the patent in the requested form. As the Board is bound by the single request of the Respondent it is not necessary to consider the merits of the subject-matter of the dependent Claims 3 to 11 and 13 to 26.

Order

For these reasons, it is decided that:

1. The decision of the Opposition Division is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

S. Fabiani F. Gumbel