

**Internal distribution code:**

- (A) [ ] Publication in OJ  
(B) [ ] To Chairmen and Members  
(C) [X] To Chairmen

**D E C I S I O N**  
**of 21 February 1995**

**Case Number:** T 0373/93 - 3.2.1.

**Application Number:** 87115998.4

**Publication Number:** 0265969

**IPC:** B60K 28/16, B60T 8/32

**Language of the proceedings:** EN

**Title of invention:**  
Wheel spin control apparatus for use in an automobile

**Patentee:**  
SUMITOMO ELECTRIC INDUSTRIES LIMITED

**Opponent:**  
Alfred Teves GmbH  
Robert Bosch GmbH

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56, 69, 84

**Keyword:**  
"Claims - interpretation"  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0373/93 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
21 February 1995

**Appellant:** Alfred Teves GmbH  
(Opponent 01) Guerickestrasse 7  
Postfach 90 01 20  
D-60441 Frankfurt (DE)

**Representative:** -

**Other party:** Robert Bosch GmbH  
(Opponent 02) Postfach 30 02 20  
D-70442 Stuttgart (DE)

**Representative:** -

**Respondent:** SUMITOMO ELECTRIC INDUSTRIES LIMITED  
(Proprietor of the patent) No. 15, Kitahama 5-chome  
Higashi-ku  
Osaka-shi  
Osaka 541 (JP)

**Representative:** Ritter und Edler von Fischern, Bernhard  
Dipl.-Ing.  
Hoffmann, Eitle & Partner  
Patentanwälte  
Postfach 81 04 20  
D-81904 München (DE)

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office dated 4 February 1993,  
posted on 22 February 1993 rejecting the  
opposition filed against European patent  
No. 0 265 969 pursuant to Article 102(2) EPC.

**Composition of the Board:**

**Chairman:** F. A. Gumbel  
**Members:** P. Alting van Geusau  
B. J. Schachemann

## Summary of Facts and Submissions

- I. European patent No. 0 265 969 was granted with effect from 2 May 1991 on the basis of European patent application No. 87 115 998.4 filed on 30 October 1987.

Claim 1 of the patent reads as follows:

"1. A wheel spin control apparatus including:  
detector means ( $S_R$ ,  $S_L$ ) for detecting the occurrence of an excessive wheel spin in at least one driven wheel;  
braking control means ( $BC_R$ ,  $BC_L$ ) for applying a braking force to at least one said driven wheel in response to the detection of said excessive wheel spin by said detecting means ( $S_R$ ,  $S_L$ ) to suppress said excessive wheel spin; and  
torque control means (EC; ECS, ECB) for controlling an output power of an engine employed to drive at least one said driven wheel, characterised in that after application of the braking force by the braking control means ( $BC_R$ ,  $BC_L$ ) the braking force is gradually reduced and the torque control means (EC; ECS, ECB) includes means (EC; ECB) which controls such that said engine output power is decreased in relation to the braking force, whereby the suppression of the excessive spin of said driven wheel effected by said braking control means is gradually taken over by said torque control means."

- II. Notice of Opposition was filed against this patent by the Appellant on 29 January 1992 (Opponent O1) and by the other party on 31 January 1992 (Opponent O2).

The oppositions were based on an alleged lack of inventive step of the subject-matter of Claim 1 having regard in particular to the prior art disclosed in

D1: EP-A-0 166 178 and  
D2: DE-A-3 021 116.

III. With decision announced at the oral proceedings held on 4 February 1993, with written reasons posted on 22 February 1993, the Opposition Division rejected the oppositions.

The Opposition Division was of the opinion that any combination of features disclosed in the prior art documents D1 and D2 would not result in the wheel spin control apparatus according to the independent Claim 1. In particular no information was given that could teach the skilled person to decrease the engine output power in relation to the braking force whereby the braking control would be gradually taken over by the torque control.

VI. The Appellant (Opponent O1) lodged an appeal against this decision on 22 April 1993 with payment of the appeal fee on the same day.

The Statement of Grounds of Appeal was filed on 22 June 1993.

VII. In a communication for preparation of oral proceedings requested by both the Appellant and Respondent, the Board drew attention to a discrepancy between the claimed subject-matter and the disclosure of the description. In view of this discrepancy an interpretation of the claimed subject-matter in accordance with Article 69 (1) EPC would appear to be necessary so as to be able to determine the exact nature of the subject-matter claimed in Claim 1.

In respect of the issue of inventive step, the Board noted that in D2 throttle control appeared to be carried out essentially by sensing whether both driven wheels are braked or not but without taking into account the braking force itself or any other parameter relating to the amount of braking force.

VIII. Oral proceedings were held on 21 February 1995 in the presence of the Appellant and Respondent. The other party had given notice with letter dated 11 August 1994 that it would not attend the oral proceedings.

The Appellant requested that the decision under appeal be set aside and that the European Patent be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained.

During the discussion about the correct interpretation of the claimed subject-matter the Respondent relied on the disclosures in the first part of column 11 of the description of the patent in an attempt to substantiate the sequence of control steps defined in the characterising part of Claim 1, in particular in respect of the feature that after application of the braking force by the braking control means the braking force is gradually reduced in an active way by the control means itself.

However, in this respect the Board drew attention to the fact that the disclosure as a whole, and in particular the statements of invention in columns 3 and 4 of the patent, indicated that, since the wheel spin is the single input variable disclosed for activation of the braking controller, the reduction of the braking force would appear to be the result of the reduction of wheel spin brought about by the combined influence of the

braking and reduction of engine torque rather than an independent function of the braking controller itself. In the present case interpretation of Claim 1 in accordance with Article 69 EPC would appear to be necessary and should be based on the disclosure of the patent as a whole.

IX. In support of his request the Appellant relied essentially on the following arguments:

In accordance with the present patent excessive wheel spin is reduced by the braking control while the torque control progressively supersedes the braking control for gradually switching over from braking control to torque control in dependence of the braking force. The braking force is in direct relation to the calculated wheel spin, less wheel spin resulting in a smaller braking force, and by the control loop a gradual taking over of the braking control by the engine torque control is provided. Claim 1 should be interpreted to define such control steps.

In principle such control is known from D2. In case excessive wheel spin occurs torque control is effected so as to limit the engine power delivered to the wheels. The limitation of engine power influences the wheel spin and through the control loop including the wheel spin measuring means and braking controller also reduces the necessary braking pressure for suppressing the excessive wheel spin. It thus follows that also in D2 the torque control supersedes the braking control to gradually take over the braking control.

The main difference between the known control and the control defined in Claim 1 of the patent in suit is the provision of electronic instead of hydro-mechanical control means.

However in this respect D1, which is a later publication, already shows that the development of wheel spin controllers went into the direction of using more and more electronic means for carrying out the previous hydraulic or electric control steps known from the prior art. Against the background of such normal development the subject-matter of Claim 1 did not involve any inventive step.

Moreover, it is already indicated in Figure 2 of D1 that the taking over of the braking control by the torque control may vary in dependence of the vehicle speed and from the graph characteristics shown the skilled person would be led to adapt the control known from D2 to include a shock-free taking over of the brake control by the torque control at any vehicle speed.

- X. The Respondent contested the Appellant's view and submitted the following counterarguments:

No interpretation of Claim 1 of the patent in suit is necessary because the wording of Claim 1 is clear. Anyhow the sequence of control steps defined in Claim 1 is fully supported by the description. In the description of the preferred embodiment disclosed in Figure 5 (see column 11) it is indicated that immediately after application of the braking force by the braking control means, short pulses are generated to effect a moderate reduction of the fluid pressure which is in fact a ramp function for gradually reducing the braking force as stated in Claim 1.

In the control disclosed in D2, application of braking force and closing of the throttle are simultaneous events if excessive wheel spin occurs and so is the brake release and opening of the throttle if the wheel spin falls below a predetermined threshold value.

From this document it is neither known nor is there any hint given that a gradual reduction of the braking force during the presence of excessive wheel spin is accompanied by a gradual reduction of engine torque in relation to the reduction of the braking force, in order to achieve the effect that engine torque control takes over the wheel spin control from the brake control.

In contrast thereto, Claim 1 in accordance with the patent in suit teaches an immediate dependency of the torque control on the amount of brake pressure. The resulting gradual control avoids the occurrence of shocks while at the same time traction can be maximised. Such gradual control is not possible with the system disclosed in D2 because the amount of braking pressure is not taken into account for the control.

The further document D1 cited by the Appellant does not disclose any of the characterising features of Claim 1 or the underlying principle and cannot therefore give the skilled person an incentive to modify the system disclosed in D2 with a view of achieving the functions provided by the features of Claim 1 of the patent in suit.

XI. The other party did not file any requests or comments.

## 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. *Interpretation of Claim 1*

2.1 In the Board's opinion, the subject-matter of Claim 1 lacks clarity, in particular in respect of the cause and result of the claimed wheel spin control sequence.

Lack of clarity is not a ground of opposition in itself but in order to be able to examine the exact nature of the claimed subject-matter such deficiency calls for interpretation with the help of the description and drawings in accordance with Article 69(1) EPC.

2.2 In fact, as was also submitted by the Appellant (see the last paragraph on page 3 of the Statement of Grounds of Appeal) in accordance with the embodiments disclosed in the description and drawings it is both the braking and the reduction of the engine power output that results in a drop of the wheel spin. The signal indicative for the amount of wheel spin is the only input signal for the braking controller which therefore acts in accordance with the calculated amount of wheel spin. As a direct consequence thereof the brake force decreases if the wheel spin decreases (see in particular column 5, lines 9 to 20).

Such a control sequence also follows from the statement of invention in column 3, lines 45 to 52 and column 4, lines 10 to 18.

2.3 The Respondent considered that the subject-matter of Claim 1 should be interpreted in accordance with the disclosures in column 11, lines 7 to 17, in which a moderate reduction of the brake fluid pressure is said to be accomplished by the control itself.

However, as can be derived from the explanation in relation with Figure 5 of the patent, the moderate reduction of the fluid pressure generated by short negative pulses from the braking controller takes place during the hold command of the fluid pressure. This control step is sequentially later than the application of brake pressure and thus also later than the initiation of the torque control resulting from the presence of brake pressure. This part of the disclosure does not therefore change the interpretation of Claim 1 referred to above.

In the Board's opinion the part of the control discussed in relation to Figures 5 (a) to (d) of the patent obviously concerns measures taken to enable the fluid pressure to be controlled in accordance with the amount of wheel spin shown in the wheel spin curve of Figure 5 (a) also for those parts of the curve where no threshold signals are generated for activating the brake fluid pressure control valve(s).

The generation of an alleged negative "ramp" function of the braking controller, as was submitted by the Respondent at the oral proceedings, is not disclosed as such and cannot be supported by the above function either.

2.4 Therefore, also considering the part of the disclosure of the patent relied upon by the Respondent, the Board comes to the conclusion that the subject-matter of Claim 1 when considered in the light of the disclosure

of the patent as a whole can only be interpreted to mean that after application of the braking force the reduction of the braking force in accordance with Claim 1 is the result of the reduction of wheel spin brought about by both the braking and the subsequent reduction of engine torque, rather than that the reduction of the braking force is an active control parameter of the control apparatus.

- 2.5 Claim 1 further stipulates that the "engine output is decreased in relation to the braking force".

In the context of the claimed subject-matter, having in particular regard to the gradual reduction of the braking force and the specific disclosures of the description in relation thereto this feature can only be interpreted to mean that the engine output is decreased in relation to the **amount** of braking force.

3. *Prior art*

- 3.1 D1 concerns a wheel spin control system for road vehicles according to which, in case excessive wheel spin is observed on both driven wheels, in addition to a wheel brake function the engine torque is reduced so as to keep the wheel spin within predetermined limits. The engine torque reduction is dependent both upon the velocity of the vehicle and threshold values of wheel spin in order to optimise traction of the vehicle.
- 3.2 D2, considered to be particularly relevant by the Appellant, discloses in relation to the embodiments shown in Figures 5 and 6 a wheel spin control which, in addition to a wheel brake function, also controls the engine torque.

However, the torque control comprising a control valve in a hydraulic circuit for actuation of a hydraulic throttle valve motor is either electrically activated (embodiment of Figure 5) if excessive slip is detected on both driven wheels or (embodiment of Figure 6) the presence of brake fluid pressure on both driven wheels is used for activation of an AND-gate in the hydraulic circuit for the hydraulic throttle valve motor.

- 3.4 JP-A-58-16948 (D3), cited in column 1, line 52 of the description of the patent obviously concerns the prior art to which the pre-characterising part of the granted Claim 1 is related. This document is considered to be less relevant than D1 and D2 since it deals with problems encountered during cornering of the vehicle and suggests an independent application of the braking control mode and the torque control mode, thus it does not address the issue of taking over of the reduction of excessive wheel spin effected by the braking control means by the torque control means.
- 3.5 DE-A-3 420 411 (D4), discussed in column 2, lines 45 to 53 of the patent in suit, discloses a wheel spin control system with both braking and engine torque control in which engine torque control is carried out in dependence of a predetermined function if excessive wheel spin is sensed or the engine torque is kept constant if the brake pressure is decreased.
- 3.6 No arguments have been based on any of the other documents cited in the preceding proceedings and since these documents are clearly less relevant than the material discussed above there is no need to consider them in detail.

4. *Novelty*

Novelty of the subject-matter of Claim 1 of the patent in suit follows from the fact that none of the cited documents discloses a wheel spin control apparatus in which the engine output power is decreased in relation to the amount of braking force so that the braking control means is gradually taken over by the torque control means.

Since novelty was not contested it is not considered necessary to elucidate this matter further.

4. *Inventive step*

4.1 Considering the subject-matter of Claim 1 interpreted in the manner as explained above, either one of documents D1 to D4 can be considered to describe the closest prior art relating to a wheel spin control apparatus including the combination of pre-characterising features of Claim 1.

4.2 When compared to these prior art systems, the system in accordance with Claim 1 allows, in addition to quick suppression of excessive wheel spin by the application of a braking force, a gradual take over of the braking control by the torque control means so as to maximise traction while any possible loss of energy, extra wear or undesirable shock that would be brought about by unnecessary braking can be avoided (see column 9, lines 30 to 58 and column 13, lines 50 to 57 of the patent in suit). Therefore, the object underlying the features of Claim 1 can be seen in the provision of a wheel spin control apparatus optimised to avoid the above drawbacks.

4.3 This object is achieved essentially in that the wheel spin braking control is gradually taken over by the wheel spin torque control in dependence upon the actual amount of brake force applied.

The control loop comprising the engine (positive torque applied to the wheels), wheel spin detectors, brake controller and brakes (negative torque applied to the wheels) uses the brake force, either directly by measuring the brake fluid pressure (embodiment of Fig. 1) or indirectly based on the brake control signals (embodiment of Fig. 3) as input signals to decrease the engine output power to a level such that unnecessary braking is reduced while the maximum available traction between road and wheel can be explored.

4.4 In the system disclosed in D2 the engine power is reduced merely as a fixed function of the inertia of the engine control means itself.

In contrast to the control apparatus in accordance with Claim 1, in which the engine output power is decreased in relation to the amount of brake force which at any moment during the control can be used as a measure of the necessary amount of torque reduction, such known control cannot differentiate between high and low braking forces for decreasing the engine output power in relation to the braking forces **actually** involved and thus no real gradual take over of the braking control by the torque control means or the avoidance of unnecessary braking with less engine power loss is possible, such as it is described in column 2, lines 31 to 37 of the patent.

In the wheel spin control apparatus known from D1 and D4 the engine power is reduced in accordance with other, not further described functions but not in relation to the amount of braking force such as defined in Claim 1 of the patent in suit.

4.5 The Appellant submitted that in the embodiment disclosed in relation to Figure 6 of D2 the valve arrangement (38 and 39) would, at least to some extent, have some proportional characteristic when opening the valves for the pressurised fluid to enter the hydraulic throttle actuator 30 and consequently the skilled person would be led to relate the torque control to the amount of brake pressure. However, in accordance with the disclosure of D2 the valves (38 and 39) are arranged to form a hydraulic AND-gate which clearly implies to the skilled person a switching function rather than a proportional function. Therefore the Appellant's interpretation of the functioning of the control shown in Figure 6 of D2 is considered to be based on hindsight and cannot be taken into account as an implicit disclosure or hint in the direction of effecting torque control in relation to the amount of brake pressure.

4.6 The Appellant further relied upon D1 for substantiating the view that the skilled person is well aware of the relation between brake control and torque control and the necessity of adapting their dependency in accordance with the prevailing circumstances, for example the vehicle speed. The combined teachings of D1 and D2 would lead the skilled person to the subject-matter of Claim 1 of the patent.

Indeed D1 discloses control means that take into account the interdependence of the brake and torque control. However, the control disclosed in D1 is merely based on threshold values which are variable in accordance with

the vehicle speed and does not address the aspect of gradual take over of the brake control by the torque control or hint to considerations of using the amount of braking force as a variable in such take over phase. Therefore, even the combination of features of D1 and D2 would not result in a control in accordance with Claim 1.

5. Summarising, in the Board's judgment, the proposed solution defined in independent Claim 1 to the technical problem underlying the patent in suit is inventive over the available prior art and therefore this Claim as well as its dependent Claims 2 to 14 relating to particular embodiments of the invention in accordance with Rule 29(3) EPC, are allowable.

The grounds of opposition relied upon by the Appellant do therefore not prejudice the maintenance of the patent as granted.

**Order**

**For these reasons it is decided that:**

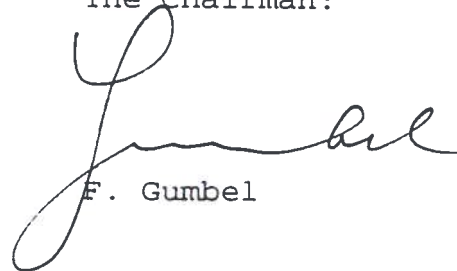
The appeal is dismissed.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel