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Datasheet for the decision of 2 October 2020

Case Number: T 1752/18 - 3.2.01

Application Number: 12184115.9

Publication Number: 2708429

IPC: B60T17/02, F04B35/04, F04B49/02

Language of the proceedings: EN

Title of invention:
Compressed air system for a motor vehicle

Patent Proprietor:
KNORR-BREMSE Systeme für Nutzfahrzeuge GmbH

Opponent:
Scania CV AB

Headword:

Relevant legal provisions:
EPC Art. 123(2), 123(3), 56

Keyword:
Amendments - broadening of claim (yes) - main and auxiliary requests 1, 1A
Inventive step - ex post facto analysis - auxiliary request 2

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 1752/18 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 2 October 2020

Appellant: (Opponent)	Scania CV AB P.O. Box Granparksvägen 10, by 117 kv 151 87 Södertälje (SE)
Representative:	Thum, Bernhard Wuesthoff & Wuesthoff Patentanwälte PartG mbB Schweigerstraße 2 81541 München (DE)
Respondent: (Patent Proprietor)	KNORR-BREMSE Systeme für Nutzfahrzeuge GmbH Moosacher Strasse 80 80809 München (DE)
Representative:	LifeTech IP Spies & Behrndt Patentanwälte PartG mbB Elsenheimerstraße 47a 80687 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 7 May 2018 concerning maintenance of the European Patent No. 2708429 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	M. Geisenhofer
	P. Guntz

Summary of Facts and Submissions

I. The appeal was filed by the opponent against the interlocutory decision of the opposition division finding that, on the basis of the auxiliary request 1 (then on file), the patent in suit met the requirements of the EPC.

In particular, the opposition division decided that
- the subject-matter of this request was novel and involved an inventive step (Article 100(a) EPC),
- the patent, on the basis of this request, disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC), and
- the subject-matter of the claims of this request did not extend beyond the content of the application as filed and the patent was not amended in such a way as to extend the protection it confers (Article 100(c) EPC).

II. Oral proceedings were held before the Board.

III. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent in suit be revoked.

IV. The respondent (patent proprietor) requested that the appeal be dismissed and the patent be maintained as allowed by the opposition division (main request) or, in the alternative, that the patent be maintained in amended form on the basis of the auxiliary request as submitted during oral proceedings (auxiliary request 1a) or with at least one of the independent claims of the main request (auxiliary request 1b), or on the basis of one of the auxiliary requests 2 or 3 filed with the reply to the

statement of grounds of appeal, or with at least one of the independent claims of auxiliary request 3 (auxiliary request 4).

V. The **unique independent claim** of the patent **as granted** reads as follows:

"*A compressed air system (100) for a motor vehicle with an air supply system (200), comprising:*
- an electric drive motor (8), which can be controlled for variable speed,
- an air compressor (9) coupled to be driven by the electric drive motor(8),
- an electric power supply (6) for supplying electric power to the electric drive motor (8),
- at least one air reservoir (11) connected with said air compressor (9) to receive air from the air compressor (9),
- an air utilization system (300) connected to said at least one air reservoir (11) to receive air from said at least one air reservoir (11),
- a controller (7) to control the speed of the electric drive motor (8),characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon at least one signal out of the following signals:
- A signal representing the activation status of an accelerator pedal (21) of the vehicle,
- a signal representing the speed of the vehicle,
- a signal representing the temperature of the power supply (6),
- a signal representing the temperature of the electric drive motor (8),
- a signal representing the wetness level of the air compressed by the air compressor (9),
- a signal representing the load of the air compressor (9),

- a signal representing the running time of the air compressor (9),
- a signal representing the status of the electric power supply (6)."

VI. **Main request**

The main request in the appeal proceedings comprises six independent claims directed to a compressed air system which all comprise the following features in common:

"*A compressed air system (100) for a motor vehicle with an air supply system (200), comprising:*
- an electric drive motor (8), which can be controlled for variable speed,
- an air compressor (9) coupled to be driven by the electric drive motor (8),
- an electric power supply (6) for supplying electric power to the electric drive motor (8),
- at least one air reservoir (11) connected with said air compressor (9)to receive air from the air compressor (9),
- an air utilization system (300) connected to said at least one air reservoir (11) to receive air from said at least one air reservoir (11),
- a controller (7) to control the speed of the electric drive motor (8)"

In addition thereto, the independent claims of the main request further comprise the following features, respectively:

Claim 1:
"wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon a signal representing the load of the air

compressor (9) and depending upon a signal representing the status of the electric power supply (6),
characterized in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the compressor (9) is switched offload and the actual speed of the electric drive motor (8) of the compressor (9) is higher than zero, the electric drive motor (8) is operated in a generator mode to charge the electric power supply (6) until a set or predetermined charge level of the electric power supply (6) is reached."

Claim 2:
"*- a current sensor (29) and/or a voltage sensor (30) for generating a signal representing the status of the electric power supply (6) which signal is received by the controller (7),*
wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon a signal representing the activation status of an accelerator pedal (21) of the vehicle and depending upon the signals of the current sensor (29) and/or the voltage sensor (30), characterized in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if an accelerator pedal (21) of the drive engine (2, 4) of the vehicle is kicked down and the charge status of the electric power supply (6) exceeds a set charge limit and the consumption of electric power is above a set consumption limit, than the electric drive motor (8) of the compressor (9) is controlled to operate with a calculated speed lower than its maximum speed until the pressure in the air system reservoir (11) reaches a set cut off pressure level."

Claim 3:
"*characterized in that a temperature sensor (25) for generating a signal representing the temperature of the*

power supply (6) is provided which signal is received by the controller (7), and in that a temperature sensor (26) for generating a signal representing the temperature of the electric drive motor (8) is provided which signal is received by the controller (7), and in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the temperature of the electric drive motor (8) and the signal representing the temperature of the power supply (6), wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the temperature of the electric drive motor (8) is above a set temperature limit, a reduced first speed (n_{calc1}) of the drive motor 8 of the compressor (9) is calculated, reducing the load of the electric drive motor (8). which then is controlled to operate with this first calculated speed (n_{calc1}), and if, additionally, the temperature of the electric power supply (6) is above a set temperature limit, then, the first calculated speed (n_{calc1}) of the electric drive motor (8) is recalculated to a second calculated speed (n_{calc2}) which is lower than first calculated speed (n_{calc1}) and the electric drive motor (8) is controlled to operate with the second calculated speed (n_{calc2}), until the pressure in air system reservoir (11) reaches a set cut off pressure level."

Claim 4:

"*wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon a signal representing the load of the air compressor (9) and a signal representing the running time of the air compressor (9), characterized in that the controller (7) of the electric drive motor (8) of the air compressor (9) has an internal clock, such that signals representing the running time of the air compressor (9) are generated and evaluated and in that the electric drive motor (8) is*

controlled by the controller (7) in a way, that, if the electric drive motor (8) is in an offload mode for a time period longer than a set or predefined time period, the electric drive motor (8) is started and controlled to operate with a set or calculated speed until the pressure in the air system reservoir (11) reaches a cut off pressure level."

Claim 5 :

"*characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon a signal representing the wetness level of the air compressed by the air compressor (9), wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the wetness level in the air system reservoir (11) is above a predefined or set wetness level limit, the electric drive motor (8) of the compressor (9) is stopped.*"

Claim 6:

"*characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon a signal representing the running time of the air compressor (9), wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the ambient temperature is below a set or predefined temperature and if the electric drive motor (8) is stopped during a predefined or set time period, the electric drive motor (8) is controlled to start and run at a set or calculated speed until the pressure level in air system reservoir (11) has reached a cut off pressure level.”*

VII. **Auxiliary request 1A**

The auxiliary request 1A comprises six independent claims directed to a compressed air system which all comprise the same features in common as mentioned above for the main request.

The independent claims of auxiliary request 1A further comprise the following additional features, respectively :

Claim 1:

"wherein
- the controller (7) receiving signals from several sensors, among which is
- a current sensor (28) for generating a signal representing the current present in the electric power network (19) and therefore also representing the load of the compressor (9),
- a current sensor (29) and/or a voltage sensor (30) or generating a signal representing the status of the electric power supply (6),
- a pressure sensor (31) for generating a signal representing the pressure in the air system reservoir (11),
- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8, wherein
wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the load of the air compressor (9) and depending upon the signal representing the status of the electric power supply (6),
characterized in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the compressor (9) is switched offload and the actual speed of the electric drive motor (8) of the compressor (9) is higher than zero, the electric drive motor (8) is operated in a generator mode to charge the electric power supply (6) until

a set or predetermined charge level of the electric power supply (6) is reached."

Claim 2:

"wherein

- the controller (7) receiving signals from several sensors, among which is

- a sensor (20) for generating a signal representing an activation status of an accelerator pedal (21) of an engine (2, 4) of the vehicle,

- a pressure sensor (31) for generating a signal representing the pressure in the air system reservoir (11),

- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8,

- a current sensor (29) and/or a voltage sensor (30) for generating a signal representing the status of the electric power supply (6), which signals are received by the controller (7),

wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the activation status of the accelerator pedal (21) of the vehicle and depending upon the signals of the current sensor (29) and/or the voltage sensor (30), characterized in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the accelerator pedal (21) of the drive engine (2, 4) of the vehicle is kicked down and the charge status of the electric power supply (6) exceeds a set charge limit and the consumption of electric power is above a set consumption limit, than the electric drive motor (8) of the compressor (9) is controlled to operate with a calculated speed lower than its maximum speed until the pressure in the air system reservoir (11) reaches a set cut off pressure level."

Claim 3:

"wherein

- the controller (7) receiving signals from several sensors, among which is

- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8, wherein characterized in that a temperature sensor (25) for generating a signal representing the temperature of the power supply (6) is provided which signal is received by the controller (7). and in that a temperature sensor (26) for generating a signal representing the temperature of the electric drive motor (8) is provided which signal is received by the controller (7), and in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the temperature of the electric drive motor (8) and the signal representing the temperature of the power supply (6), wherein the electric drive motor (8) is controlled by the controller (7) in a way. that, if the temperature of the electric drive motor (8) is above a set temperature limit, a reduced first speed (n_{calc1}) of the drive motor 8 of the compressor (9) is calculated, reducing the load of the electric drive motor (8), which then is controlled to operate with this first calculated speed (n_{calc1}), and if. additionally, the temperature of the electric power supply (6) is above a set temperature limit, then, the first calculated speed (n_{calc1}) of the electric drive motor (8) is recalculated to a second calculated speed (n_{calc2}) which is lower than first calculated speed (n_{calc1}) and the electric drive motor (8) is controlled to operate with the second calculated speed (n_{calc2}), until the pressure in air system reservoir (11) reaches a set cut off pressure level."

Claim 4:

"wherein

- the controller (7) receiving signals from several sensors, among which is

- a wetness sensor (27) for generating a signal representing the wetness of the air compressed by the compressor and delivered to an air processing unit (10) including an air dryer for air regeneration which is connected with the air reservoir (11),

- a current sensor (28) for generating a signal representing the current present in the electric power network (19) and therefore also representing the load of the compressor (9),

- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8, wherein wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the load of the air compressor (9) and a signal representing the running time of the air compressor (9), characterized in that the controller (7) of the electric drive motor (8) of the air compressor (9) has an internal clock, such that signals representing the running time of the air compressor (9) are generated and evaluated and in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the electric drive motor (8) is in an offload mode for a time period longer than a set or predefined time period, the electric drive motor (8) is started and controlled to operate with a set or calculated speed until the pressure in the air system reservoir (11) reaches a cut off pressure level."

Claim 5:

"wherein

- the controller (7) receiving signals from several sensors, among which is

- a wetness sensor (27) for generating a signal representing the wetness of the air compressed by the compressor and delivered to an air processing unit (10) including an air dryer for air regeneration which is connected with the air reservoir (11),
- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8, wherein characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the wetness level of the air compressed by the air compressor (9), wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the wetness level in the air system reservoir (11) is above a predefined or set wetness level limit, the electric drive motor (8) of the compressor (9) is stopped."

Claim 6:
"wherein
- the controller (7) receiving signals from several sensors, among which is
- a pressure sensor (31) for generating a signal representing the pressure in the air system reservoir (11),
- an ambient temperature sensor (32) for generating a signal representing the temperature of the ambient,
- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8, and wherein
- the controller (7) of the electric drive motor (8) of the air compressor (9) has an internal clock, such that signals representing the running time of the air compressor (9) are generated and evaluated, wherein
characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the running time of the air compressor (9).

wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the ambient temperature is below a set or predefined temperature and if the electric drive motor (8) is stopped during a predefined or set time period, the electric drive motor (8) is controlled to start and run at a set or calculated speed until the pressure level in air system reservoir (11) has reached a cut off pressure level."

VIII. **Auxiliary request 2**

The auxiliary request 2 comprises six independent claims directed to a compressed air system which all comprise the following features in common:

"*A compressed air system (100) for a motor vehicle with an air supply system (200), comprising:*
- an electric drive motor (8), which can be controlled for variable speed,
- an air compressor (9) coupled to be driven by the electric drive motor(8),
- an electric power supply (6) for supplying electric power to the electric drive motor (8),
- at least one air reservoir (11) connected with said air compressor (9) to receive air from the air compressor (9),
- an air utilization system (300) connected to said at least one air reservoir (11) to receive air from said at least one air reservoir (11),
- a controller (7) to control the speed of the electric drive motor (8), wherein
- the electric power supply (6), the controller (7) and the electric drive motor (8) are connected by an electric power supply network (19), wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon a signal

representing the status of the electric power supply network (19), and wherein
- the signal representing the status of the electric network (19) is the the conducted current, and wherein
- the controller (7) receiving signals from several sensors, among which is
- a sensor (20) for generating a signal representing an activation status of an accelerator pedal (21) of an engine (2, 4) of the vehicle,
- a sensor (22) for generating a signal representing an activation status of a brake pedal (23) of an air brake system (12) of the vehicle,
- a speed sensor (24) for generating a signal representing the speed of the vehicle,
- a temperature sensor (25) for generating a signal representing the temperature of the electric power supply (6),
- a temperature sensor (26) for generating a signal representing the temperature of the electric drive motor (8),
- a wetness sensor (27) for generating a signal representing the wetness of the air compressed by the compressor and delivered to an air processing unit (10) including an air dryer for air regeneration which is connected with the air reservoir (11),
- a current sensor (28) for generating a signal representing the current present in the electric power network (19) and therefore also representing the load of the compressor (9),
- a current sensor (29) and/or a voltage sensor (30) or generating a signal representing the status of the electric power supply (6),
- a pressure sensor (31) for generating a signal representing the pressure in the air system reservoir (11),
- an ambient temperature sensor (32) for generating a signal representing the temperature of the ambient,

- a speed sensor (33) for generating a signal representing the rotational speed of the electric drive motor 8, wherein the aforementioned sensors are connected by electric signal lines with the controller (7), to feed controller (7) with respective signals"

The independent claims of auxiliary request 2 further comprise the following additional features, respectively:

Claim 1:
"wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the load of the air compressor (9) and depending upon the signal representing the status of the electric power supply (6), characterized in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the compressor (9) is switched offload and the actual speed of the electric drive motor (8) of the compressor (9) is higher than zero, the electric drive motor (8) is operated in a generator mode to charge the electric power supply (6) until a set or predetermined charge level of the electric power supply (6) is reached."

Claim 2:
"wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the activation status of the accelerator pedal (21) of the vehicle and depending upon the signals of the current sensor (29) and/or the voltage sensor (30), characterized in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the accelerator pedal (21) of the drive engine (2, 4) of the vehicle is kicked down and the charge status of the electric power supply (6) exceeds a set charge limit and the consumption of electric power is above a set

consumption limit, than the electric drive motor (8) of the compressor (9) is controlled to operate with a calculated speed lower than its maximum speed until the pressure in the air system reservoir (11) reaches a set cut off pressure level."

Claim 3:

"wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the temperature of the electric drive motor (8) and the signal representing the temperature of the power supply (6), wherein the electric drive motor (8) is controlled by the controller (7) in a way. that, if the temperature of the electric drive motor (8) is above a set temperature limit, a reduced first speed (n_{calc1}) of the drive motor 8 of the compressor (9) is calculated, reducing the load of the electric drive motor (8), which then is controlled to operate with this first calculated speed (n_{calc1}), and if. additionally, the temperature of the electric power supply (6) is above a set temperature limit, then, the first calculated speed (n_{calc1}) of the electric drive motor (8) is recalculated to a second calculated speed (n_{calc2}) which is lower than first calculated speed (n_{calc1}) and the electric drive motor (8) is controlled to operate with the second calculated speed (n_{calc2}), until the pressure in air system reservoir (11) reaches a set cut off pressure level."

Claim 4:

"wherein the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the load of the air compressor (9) and a signal representing the running time of the air compressor (9), characterized in that the controller (7) of the electric drive motor (8) of the air compressor (9) has an internal clock, such that signals

representing the running time of the air compressor (9) are generated and evaluated and in that the electric drive motor (8) is controlled by the controller (7) in a way, that, if the electric drive motor (8) is in an offload mode for a time period longer than a set or predefined time period, the electric drive motor (8) is started and controlled to operate with a set or calculated speed until the pressure in the air system reservoir (11) reaches a cut off pressure level."

Claim 5:

"characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the wetness level of the air compressed by the air compressor (9), wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the wetness level in the air system reservoir (11) is above a predefined or set wetness level limit, the electric drive motor (8) of the compressor (9) is stopped."

Claim 6:

"wherein

- the controller (7) of the electric drive motor (8) of the air compressor (9) has an internal clock, such that signals representing the running time of the air compressor (9) are generated and evaluated,

characterized in that the controller (7) controls the electric drive motor (8) to determine the speed of the electric drive motor (8) depending upon the signal representing the running time of the air compressor (9). wherein the electric drive motor (8) is controlled by the controller (7) in a way, that, if the ambient temperature is below a set or predefined temperature and if the electric drive motor (8) is stopped during a predefined or set time period, the electric drive motor (8) is controlled to start

and run at a set or calculated speed until the pressure level in air system reservoir (11) has reached a cut off pressure level."

IX. In the present decision, reference is made to the following documents which were referred to by the parties in the opposition procedure:

D1 DE 10 2008 006 860 A1
D3 US 2009/0254246 A1
D4 US 2007/0131408 A1
D5 US 2009/0087319 A1
D6 US 2009/0090118 A1
D10 EP 1183172 B1
D12 WO 2006/071170 A1
D13 DE 10 2005 013 027 A1
D14 JP2005-233164 A
D15 EP 2 073 029 A1
D17 US 2009/0056354 A1
D18 DE 10 2010 025 890 A1
D21 DE 3724149 A1

The following documents were filed with the statement of grounds of appeal:

D22 US 5 114 315 A
D23 DE 103 23 142 A1
D24 DE 10 2010 016 131 A1
D25 EP 2 123 343 A1
D26 EP 0 943 468 A2

X. The **appellant's arguments** can be summarised as follows:

(a) The main request does not comply with Article 123(3) EPC since the unique independent claim as granted refers to a multi-functional controller receiving signals from a plurality of sensors, whereas the controllers of any of claims 1 – 6 respectively

receive only a part of these signals, the scope of protection thus being enlarged compared to the granted independent claim.

(b) The same applies to each of the independent claims 1 – 6 of the auxiliary requests 1A and 1B which therefore do not comply with Article 123(3) EPC either.

(c) All independent claims 1 - 6 of the auxiliary request 2 lack inventive step, contrary to Article 56 EPC.

(d) The further alleged deficiencies of auxiliary request 2 identified in the written procedure before the oral procedure in appeal proceedings were withdrawn.

XI. The **respondent's arguments** can be summarised as follows:

(a) The granted independent claim discloses any mathematically possible combination of signals mentioned in the enumeration in the claim, including those combinations as explicitly defined in independent claims 1 – 6 of the main request. Removing all other mathematically possible combinations is a restriction and not an enlargement of the scope of protection conferred by the respective independent claim as compared to the granted independent claim.

(b) In independent claims 1 – 6 of the auxiliary request 1A, only those sensors were added that provide the respective signal used by the controller. The scope of protection thus was further restricted.

(c) Since all independent claims 1 – 6 of the main request comply with Article 123(3) EPC, auxiliary request 1B comprises at least one independent claim that is allowable.

(d) Auxiliary request 2 complies with the requirements of Article 54 and 56 EPC since none of the prior art documents cited in the procedure discloses or renders obvious a controller using input from the plurality of sensors as defined in all independent claims. Furthermore, the respective way of control defined in the respective independent claim is not rendered obvious by the state of the art mentioned in the proceedings either.

(e) The appeal is inadmissible since the arguments presented by the appellant in the statement of grounds of appeal merely do not refer to the auxiliary request in opposition which was maintained by the opposition division, but to the patent as granted (that was not defended during opposition proceedings) or to the main request in opposition (that was deemed non-compliant with the requirements of Article 123(2) EPC by the opposition division). Hence both requests are not open to appeal by the opponent being now the appellant.

Reasons for the Decision

Admissibility of the appeal

1. The only disputed issue in the context of the question whether the appeal is admissible is whether the statement of appeal sufficiently substantiates the reasons for the appeal and the facts and evidence on which the appeal is based.

1.1 The appellant indeed refers in the statement of grounds of appeal merely to the main request in opposition and to the

patent as granted. The main request in opposition was refused by the opposition division and thus is not open to an appeal by the opponent, now being the sole appellant. The patent as granted was not defended by the patent proprietor during opposition proceedings such that the appeal cannot be based on the patent as granted either.

1.2 However, the appellant also refers in its statement of grounds of appeal in section F on pages 69 and 70 to possible unallowable amendments of claims 2, 3 and 4 of the auxiliary request which was upheld by the opposition division. The appellant alleges that dependent claims 2, 3 and 4 are based on an unallowable intermediate generalisation and therefore do not comply with Article 123(2) EPC. The appellant refers in his line of argument to paragraph [0038] of the description forming basis for the amendments and explains why, in his opinion, it is not sufficient to add only part of the sensors disclosed in paragraph [0038].

1.3 The statement of grounds of appeal hence comprises at least one line of argument dealing with the request considered allowable by the opposition division, which line of argument is sufficiently substantiated, such that the statement of grounds complies with Article 108 EPC and Rule 99(2) EPC.

1.4 The appeal is therefore admissible (Rule 101(1) EPC).

Main request – Article 123(3) EPC

2. The main request does not fulfill the requirements of Article 123(3) EPC.

2.1 Claim 1 as granted defines a compressed air system comprising inter alia a controller to control the speed of an electric drive motor whereby "*the controller controls the electric drive motor to determine the speed of the electric drive motor depending upon at least one signal out of the following signals:*

- *a signal representing the activation status of an accelerator pedal (21) of the vehicle,*
- *a signal representing the speed of the vehicle,*
- *a signal representing the temperature of the power supply (6),*
- *a signal representing the temperature of the electric drive motor (8),*
- *a signal representing the wetness level of the air compressed by the air compressor (9),*
- *a signal representing the load of the air compressor (9),*
- *a signal representing the running time of the air compressor (9),*
- *a signal representing the status of the electric power supply (6).*"

2.2 Contrary to the respondent's view, according to whom the claim must be read as defining several alternative controllers (i.e. a controller that only receives a signal from one of the sensors from the list, or a controller that receives signals from more of the sensors, or from all of them), the Board agrees with the appellant's view that the claim may be read as defining that the controller receives all the signals from the list but, depending on circumstances, performs the control based on only one or more ("at least one") of the signals that it receives. This interpretation is based on the wording of claim 1 that defines that the controller controls depending upon at least one signal out of the list, i.e. that the

controller must be suitable for controlling depending on any of the signals from the list.

2.3 Taking the description and the figures into consideration (Article 69 EPC), the Board comes to the conclusion that the scope of protection attached to claim 1 as granted can only be determined on the basis of the latter interpretation.

2.4 Paragraph [0011] in particular, referring to the wording of claim 1, which is recited in the preceding paragraph [0010], discloses that determination of the speed of the electric drive motor depends "*upon signals representing the vehicle status …, accelerator pedal signals, brake pedal signals, vehicle speed signals, temperature signals of the electric power supply or power stage, temperature signals of the electric motor, upon signals describing the status of the compressed air system, upon signals representing the status of the electric power supply and the status of the electric power network*".

This paragraph mentions a plurality of signals (upon signals) and thus confirms that the controller should receive more than one signal out of the list.

2.5 The description furthermore discloses only one single embodiment with a controller receiving all signals mentioned in the list of the granted independent claim. This is obvious from the description of the drawings where paragraph [0028] refers to "an illustrative embodiment" and figures 3 – 14 show different modes of operation of this single embodiment. These modes are further described in paragraphs [0042] – [0069] whereby the various references to "the electric drive motor", "the compressor" and "the reservoir" stress that the passages describe one single embodiment with a controller receiving all of the

signals mentioned in paragraphs [0010] and [0011] at the same time.

2.6 The respondent argued that the various modes described in paragraphs [0042] – [0069] need not be implemented in one and the same controller but these modes refer to distinct controllers each carrying out one mode only.

This view is nevertheless not supported by the wording of these paragraphs: all of the 13 different modes refer to one and the same compressed air system and hence also to one single controller forming part of this compressed air system. This is in particular obvious from the consistent use of the definite article "the" when referring to the various parts of the system ("*the electric drive motor*" etc.).

2.7 It is therefore clear that the scope of protection of claim 1 as granted extends to a controller that receives all the signals from the list but might use just one or more thereof depending on the mode of operation.

3. The independent claims according to the main request are directed to a controller that receives only some of the signals of the list recited in claim 1 as granted.

3.1 As a matter of fact, among the signals of the list:
- the system of claim 1 only needs to receive a signal representing the load of the air compressor;
- the system of claim 2 only needs to receive a signal representing the activation status of an accelerator pedal and a signal representing the charge status of the electric power supply;
- the system of claim 3 only needs to receive a signal representing the temperature of the power supply and a signal representing the temperature of the electric drive

motor;
- the system of claim 4 only needs to receive a signal representing the load of the air compressor and a signal representing the running time of the air compressor;
- the system of claim 5 only needs to receive a signal representing the wetness level of the air compressed by the air compressor;
- the system of claim 6 only needs to receive a signal representing the running time of the air compressor and a signal representing the temperature of the ambient.

4. Since the controller according to any of the independent claims 1 to 6 of the main request may receive only some of the signals of the list recited in claim 1 as granted, each of these claims defines objects that were not covered by claim 1 as granted. Accordingly, none of the independent claims 1 – 6 complies with the requirements of Article 123(3) EPC.

Auxiliary request 1A – Article 123(3) EPC

5. Claims 1 to 6 of auxiliary request 1A differ from claims 1 to 6 of the main request in that each independent claim specifies the sensor(s) used to provide the respective signal(s) mentioned in the independent claim. However,the independent claims undisputedly do not define any additional signals in addition to those specified in the corresponding independent claim of the main request.

Therefore, auxiliary request 1A does not comply with Article 123(3) EPC for the same reasons provided with respect to the main request.

Auxiliary request 1B – Article 123(3) EPC

6. The respondent requests as auxiliary request 1B to maintain the patent with at least one of the independent claims of the main request that during appeal proceedings proves to comply with the requirements of the EPC.

Since none of the independent claims of the main request complies with Article 123(3) EPC, auxiliary request 1B is not allowable either.

Auxiliary request 2

7. The appellant argued in his letter dated 14 June 2019 with respect to auxiliary request 2, alleging that the request does not comply with Articles 83, 84, 123(2) and 56 EPC and Rule 80 EPC.

7.1 During oral proceedings the appellant withdrew these lines of attack but maintained those in connection with the prior art and referred to his submissions in the written procedure.

7.2 Accordingly, the appellant only objected under Article 56 EPC (lack of inventive step) in respect of auxiliary request 2.

8. It is worth to note that auxiliary request 2 meets the requirements of Articles 83, 84, 123(2) and (3) EPC and of Rule 80 EPC, although no detailed discussion is needed here, since no objections were raised or maintained by the appellant in this respect. It suffices to say that the requirements of Article 123(3) EPC are met as each independent claim specifies that the controller receives

all the signals recited in claim 1 as granted.

9. All independent claims of auxiliary request 2 involve an inventive step in the sense of Article 56 EPC.

9.1 The appellant considers document D1 to represent the closest prior art.

9.2 D1 discloses a compressed air system for a motor vehicle with an air supply system (cf. paragraph [0001]), comprising:

- an electric drive motor (21), which can be controlled for variable speed (cf. last 6 lines of paragraph [0054]),
- an air compressor (13) coupled to be driven by the electric drive motor (21),
- an electric power supply (17) for supplying electric power to the electric drive motor (21),
- at least one air reservoir (cf. paragraph [0058]: "*Die Verbraucherkreise 30 bis 32 können hierbei die vielfältig beschriebenen pneumatischen Komponenten beinhalten wie jeweils einen Druckluftbehälter,...*") connected with said air compressor (13) to receive air from the air compressor (13),
- an air utilization system (30 – 32) connected to said at least one air reservoir to receive air from said at least one air reservoir,
- a controller (4) to control the speed of the electric drive motor (21).

The electric power supply (17), the controller (4) and the electric drive motor (21) are connected by an electric power supply network (19, 20, 22), wherein the controller (4) controls the electric drive motor (21) to determine the speed of the electric drive motor (21) depending upon a signal (cf. paragraph [0045]) representing the status of

the electric power supply network (17). The signal representing the status of the electric network (17) is the conducted current.

The controller (4) of D1 receives signals from several sensors, among which are

(a) a current sensor and/or a voltage sensor (18) generating a signal representing the status of the electric power supply (cf. paragraph [0054]),

(b) a pressure sensor (cf. paragraph [0057]) for generating a signal representing the pressure in the air system reservoir,

(c) an ambient temperature sensor (cf. paragraph [0059]) for generating a signal representing the temperature of the ambient,

(d) a speed sensor for generating a signal representing the rotational speed of the electric drive motor (implicit since otherwise the speed of the motor cannot be controlled as disclosed at the end of paragraph [0054]),

(e) a sensor for generating a signal representing an activation status of an accelerator pedal of an engine of the vehicle (cf. paragraph [0059]), and

(f) a sensor for generating a signal representing an activation status of a brake pedal of an air brake system of the vehicle (cf. paragraph [0059]).

The aforementioned sensors are connected by electric signal lines (dashed lines in the figures) with the controller (4), to feed controller (4) with respective signals.

The controller (4) of D1 controls the electric drive motor (21) to determine the speed of the electric drive motor (21) depending upon the signal representing the load of

the air compressor and depending upon the signal representing the status of the electric power supply.

9.3 The subject-matter of all independent claims of auxiliary request 2 differs from the compressed air system known from D1 at least in that the controller is able to receive signals also from the following additional sensors:

(g) a speed sensor for generating a signal representing the speed of the vehicle,

(h) a temperature sensor for generating a signal representing the temperature of the electric power supply,

(i) a temperature sensor for generating a signal representing the temperature of the electric drive motor,

(j) a wetness sensor for generating a signal representing the wetness of the air compressed by the compressor and delivered to an air processing unit including an air dryer for air regeneration which is connected with the air reservoir (n. b. D1 only discloses measuring the humidity of a drying agent but not the wetness of the compressed air), and

(k) a current sensor for generating a signal representing the current present in the electric power network and therefore also representing the load of the compressor (n. b. D1 does neither mention the load of the compressor nor a sensor measuring a current in the power network).

These sensors provide further information on the state of the compressed air system but also on the state of the vehicle on which the system is used. This additional information can be used for additional control algorithms allowing to further optimize the working of the compressed air system.

9.4 The appellant argued that it is obvious to modify the controller of D1 such that it can also use signals from a plurality of sensors including the additional sensors enumerated above as potential input for the controller to carry out the respective control algorithm defined in any of independent claims 1 - 6.

The appellant refers in this context to various documents each proposing use of one of the additional sensors identified above:

Sensor (g) is obvious from D1, D3, D12, D13, D24 or D26.
Sensor (h) is obvious from D14 or D15.
Sensor (i) is obvious from D5 or D6.
Sensor (j) is obvious from D10, D18, D21 or D25.
Sensor (k) is obvious from D4, D5, D6 or D17.

9.5 The respondent argued during oral proceedings that there is no teaching available in the prior art that would guide the skilled person to a controller using exactly the combination of sensors (a) - (k) as defined in all independent claims. The appellant's argument is based on hindsight in knowledge of the patent in suit.

9.6 The Board shares the respondent's view. Only a combination of a plurality of documents would allow the skilled person to arrive at a compressed air system with a controller that uses input signals from all of the sensors (a) – (k) mentioned in each of the independent claims. There is no hint available in D1 that would point the skilled person to the incorporation of additional sensors and even if the skilled person would consider to add further sensors, there is no document available that would suggest adding all of the sensors (g) - (k). The skilled person thus needs to combine the teaching of a plurality of documents to arrive at the specific combination of sensors mentioned

in the independent claims of the auxiliary request 2 such that the appellant's arguments are based on an unallowable *ex post facto* analysis. Without knowing the claimed controller according to the invention, the skilled person has no teaching at hand that the specific combination of sensors (a) – (k) has a particular advantage. The skilled person would thus not consider to amend the controller of D1 to use input from the plurality of sensors (a) – (k) mentioned in the independent claims.

9.7 With letter dated 14 June 2019, the appellant essentially argued that the distinguishing features did not contribute to a common technical effect and thus could be considered independently of each other using the "partial problems" approach. However, as stated above, these distinguishing features cannot be considered independently of each other as they contribute to the solution of a single problem, relating to an optimized functioning of the compressor.

9.8 The subject-matter of each of claims 1 - 6 of the auxiliary request 2 therefore is not rendered obvious by the prior art cited in the appeal procedure.

10. As a consequence thereof, it can be left open whether documents D22 – D26, that were filed with the statement of grounds of appeal and considered to be late-filed by the respondent, are admitted into the procedure (Article 12(4) RPBA).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of the claims according to auxiliary request 2 as submitted with the reply to the statement of grounds of appeal and a description to be adapted where necessary.

The Registrar: The Chairman:

D. Magliano G. Pricolo

Decision electronically authenticated