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D E C I S I O N
of 17 January 1994

Case Number: T 0520/92 - 3.5.2

Application Number: 85630069.4

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Language of the proceedings: EN

Title of invention:
Automatic door control system

Patentee:
The Stanley Works

Opponent:
Besam AB

Headword:
-

Relevant legal norms:
EPC Art. 54, 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

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Case Number: T 0520/92 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 17 January 1994

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 6 April 1992 rejecting the opposition filed against European patent No. 0 162 799 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: R.E. Persson
Members: M.R.J. Villemin
W.J.L. Wheeler

Summary of Facts and Submissions

I. The Appellant contests the decision of the Opposition Division to reject the opposition against the European patent No. 0 162 799.

II. The independent Claims 1, 10, 19, 24 read as follows:

"1. An automatic sliding door system of a type wherein at least one door is moved along a linear path between closed and opened positions by means of the rotary drive of an electric motor, said system comprising:

sliding door means (16, 18) moveable between closed and opened positions;

motor means (12) to produce bidirectional multispeed rotary drive for drivably moving said sliding door means; and

motor control means (38) to control the direction and speed of said motor means, characterized by

position means (30, 32) responsive to the rotary drive of the motor means to translate the rotary drive into a linear position scale and determine the direction of movement of the rotary drive and to produce position signals indicative thereof;

sensor means (40) to detect an activating event and produce an operate signal indicative thereof; and motion control means (36) responsive to said position signals and operate signal to sequentially control and pace the operation of the motor means (12), said motion control means (36) transmitting direction and speed signals to said motor control means (38) and producing dynamic braking therein.

10. An automatic sliding door system of a type wherein at least one door is moved along a linear path between closed and opened positions by means of the rotary drive

of an electric motor, said sliding door system comprising:

sliding door means (16, 18) moveable between closed and opened positions;

motor means (12) to produce bidirectional multispeed rotary drive for driving the sliding door means (16, 18) in opening and closing directions including a drive shaft; and

motor control means (38) to control the direction and speed of said motor means; characterized by

an encoder means (30) mounted on said drive shaft to generate a train of signals upon rotary motion of the drive shaft; and

sensor means (40) to detect an activating event and produce an OP signal indicative thereof;

position means (30, 32) responsive to said train of signals to generate a OCK signal indicative that the door means (16, 18) is opening in an opening check zone, a CCK signal indicative that the door means is closing in a closing check zone, a CP signal indicative that the door means is in a closed position, and a RATE signal indicative of the speed of the drive shaft;

motion control means (36) responsive to said OP, OCK, CCK, CP and RATE signals to sequentially control and pace the operation of the motor control means (38), said motion control means (36) selectively transmitting direction and speed signals to said motor control means (38) and producing dynamic braking therein.

19. An automatic sliding door system of a type wherein at least one door is moved along a linear path between closed and opened positions by means of the rotary drive of an electric motor, said system comprising:

sliding door means (16, 18) linearly moveable between opened and closed position;

motor means (12) to produce bidirectional multispeed rotary drive for driving said sliding door means; and

motor control means (38) to control the direction and speed of motor means; characterized by

encoder means (30) to generate a pair of signal trains in accordance with the rotary drive of the motor means (12);

decoder means to produce position signals, direction signals and a speed signal indicative of the operation of the sliding door means by decoding said signal trains;

motion control means (36) to provide speed control and direction control signals to the motor control means (38) in response to said position, direction and speed signals so that said sliding door means (16, 18) is driven by said motor means (12) in a closing direction at a selective speed in accordance with the linear position of the sliding door means and is driven in the opening direction at a selective speed in accordance with the linear position of the sliding door means.

24. A method for automatically controlling the operation of a sliding door system of a type wherein at least one door (16, 18) is moved along a linear path between closed and opened positions by means of the rotary drive of an electric motor (12) comprising:

(a) driving a sliding door system (16, 18) by means of the rotary drive of a multispeed bidirectional motor (12);

characterized by the steps of

(b) generating position pulses in accordance with the rotary drive of the motor (12);

(c) decoding the position pulses to produce operational position signals (OCK, ROS, CCK, CP, RATE) indicative of the position and direction of movement of said sliding door system;

(d) processing said operational position signals to produce corresponding motor speed and motor direction signals;

(e) controlling the speed and direction of said motor (12) in accordance with the motor speed and motor direction signals."

III. In the Statement of Grounds of appeal the Appellant referred to a prior art document already considered in the decision of the Opposition Division:

D1: US-A-4 449 078

and to two not previously cited documents:

D2: US-A-4 312 033
D3: US-A-4 353 019.

IV. The Appellant argued essentially as follows:

All the features of Claim 1 and Claim 24 were disclosed in D1, therefore their subject-matter was not novel within the meaning of Article 54 EPC.

Since the motor control means according to D1 effected dynamic braking of the motor M by generating braking pulses for reverse rotation of the motor, the only feature of Claim 10 which was not known from D1 related to encoder means (30) mounted on the drive shaft to generate a train of signals upon rotary motion of the drive shaft. However, it would have been obvious to the person skilled in the art to replace the tacho generator in the system according to D1 with encoder means known, for instance, from D2 or D3. Therefore, Claim 10 did not involve an inventive step. The subject-matter of Claim 19 differed from the sliding door system known from D1 essentially in that it comprised encoder means

to generate a pair of signal trains and decoder means to decode said signal trains and produce signals indicative of the position and operation of the sliding door means. However, similar encoder and corresponding decoder means were known from D2. To the skilled person it would have been obvious to arrive at the subject-matter of Claim 19 by combining the teaching of D1 and D2. Therefore, this claim was also not allowable.

V. The Respondent's arguments can be summarised as follows:

Though D2 and D3 were referred to in D1, they did not form part of the latter document and therefore should be disregarded as being submitted too late. As already made clear in the decision of the Opposition Division, the features of Claim 1 and the steps of the method according to Claim 24 were not all known from D1. Thus, these claims defined novel subject-matter. Even if documents D2 and D3 were admitted into the proceedings, it would not have been obvious to the skilled person to arrive at the subject-matter of Claims 10 and 19 by applying their teaching to the automatic sliding door system according to D1. Therefore, Claims 10 and 19 involved an inventive step within the meaning of Article 56 EPC.

VI. The Appellant requests that the decision of the Opposition Division be set aside.

The Respondent requests that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. (HEADING OR INTRODUCTORY PARAGRAPH REQ'D PLEASE)

2.1 Having assessed the teaching of D2 and D3, which are essentially concerned with the precise control of the position of an element driven by a lead screw to avoid errors due to backlash, the Board has come to the conclusion that these documents are not of sufficient relevance to an automatic sliding door system according to the patent in suit to justify their admission into the proceedings at such a late stage. Therefore, pursuant to Article 114(2) EPC, D2 and D3 will be disregarded.

2.2 D1 discloses an automatic sliding door system of a type wherein at least one door is moved along a linear path between closed and opened positions by means of the rotary drive of an electric motor M, said system comprising:

sliding door means 5 moveable between closed and opened positions;

motor means M to produce bidirectional multispeed rotary drive for drivably moving said sliding door means;

motor control means 9 to control the direction and speed of said motor means, position means 7, 10, 23 including a tacho generator 7 producing pulses P1 responsive to the rotary drive of the motor means to translate the rotary drive into a linear position scale and to produce position signals indicative of the position of the rotary drive;

sensor means 12 to detect an activating event and produce an operate signal R1 indicative thereof; and

motion control means 11 responsive to said position signals and operate signal to sequentially control and pace the operation of the motor means, said motion control means 11 transmitting direction signals R2, R3 and speed signals V_1, L, H to said motor control means 9.

2.3 In the opinion of the Board, D1 has to be regarded as the closest prior art document.

3. *Novelty*

3.1 Claim 1

According to the Appellant D1 discloses, *inter alia*, the following features of the characterising part of Claim 1:

(a) "position means (30, 32) responsive to the rotary drive of the motor means to translate the rotary drive into a linear position scale and determine the direction of movement of the rotary drive and to produce signals indicative thereof"

(b) "(motion control means) ... producing dynamic braking therein".

The Board agrees with the Appellant that the automatic sliding door system according to D1 also comprises position means responsive to the rotary drive of the motor means to translate the rotary drive into a linear position scale. However, the tacho generator 7 mechanically coupled to the motor M and the pulse shaper 10 deliver pulse signals to the counter 23 which are not dependent on the direction of rotation of the motor. Thus, the position means disclosed in D1 are not

suitable for producing signals indicative of the direction of movement of the sliding doors.

Furthermore, for reasons explained in section 4.1(c) of the present decision, the Board is of the opinion that dynamic braking is not produced in the system according to D1.

The Board concludes, contrary to the view expressed by the Appellant, that D1 does not disclose the above-mentioned features (a) and (b). Therefore, the subject-matter of Claim 1 is novel over D1.

3.2 Claims 10 and 19

The Appellant has not contested the novelty of the subject-matter of these claims.

3.3 Claim 24

For reasons similar to those given with regard to Claim 1 in section 3.1 above, the subject-matter of Claim 24 differs from the method for automatically controlling the operation of a sliding door system according to D1 in that it comprises the step of processing ("decoding") position pulses for producing position signals indicative of the direction of movement of the sliding door. Contrary to the view expressed by the Appellant, step (c) of the method according to Claim 24 is not known from D1. Thus, the subject-matter of Claim 24 is novel over D1.

4. *Inventive step*

In the Statement of Grounds of appeal, the Appellant argued that the subject-matter of independent Claims 1 and 24 lacked novelty and that of independent Claims 10

and 19 did not involve an inventive step. Even though the Appellant has not presented any observations to the Board with regard to the question of whether an inventive step is involved in Claims 1 and 24, the Board is of the opinion that it should satisfy itself that the subject-matter of these claims involves an inventive step before taking a decision resulting in the maintenance of the patent as granted.

In the closest prior art according to D1, the signals indicating direction of movement of the door are derived in a rather indirect manner by a state sequencer. Starting from D1, the problem addressed in the contested patent can be considered to be to provide an automatic sliding door system in which the signals indicative of the direction of movement of the door are derived more directly in response to the movement of the door.

4.1 Claim 1

(a) The above-mentioned problem is solved according to Claim 1 in that position means (30, 32) responsive to the rotary drive of the motor means produce signals indicating both the position and the direction of movement of the door.

(b) According to the description, the position means (encoder 30) mounted on the drive shaft generates position pulses X and Y whose phase difference is indicative of the direction of rotation. Signals $\overline{CU}$ and $\overline{CD}$ derived from the position signals X, Y are directly connected to respective up and down inputs of the up/down counter 54, whose output is a function of the position of the sliding doors. In the system according to D1, however, a tacho generator 7 coupled with the motor M generates an AC voltage which is independent of the direction of

rotation of the drive motor. Thus, in the system according to D1 the counter requires additional signals (R_2, R_3) produced by the sequencer 24 and indicative of the direction of movement of the doors.

(c) As acknowledged by the Appellant, in the system according to D1 the motor M is slowed down by means of braking pulses which cause a triac to connect the AC-supply to the motor for reverse rotation. However, this does not constitute dynamic braking. According to the contested patent (and to the meaning generally attached to this expression) dynamic braking is a system of electric braking in which the motor is disconnected from the supply system and connected as a generator, the energy being dissipated in the winding and, if necessary, in a separate resistor, (cf. IEEE Standard Dictionary of Electrical and Electronics Terms cited by the Appellant; see also description of the contested patent, column 2, lines 17 to 21). The Board is therefore of the opinion that D1 neither mentions nor remotely implies the use of dynamic braking in the system disclosed there.

(d) Summarising, the Board concludes that features (a) and (b) summarised in paragraph 3.1 above are not rendered obvious by the prior art disclosed in D1. Therefore the subject-matter of Claim 1 involves an inventive step within the meaning of Article 56 EPC.

4.2 Claim 10

(a) The Board agrees with the Appellant that the subject-matter of Claim 10 differs from the automatic sliding door system known from D1 in that it comprises, *inter*

alia, encoder means 30 mounted on the drive shaft to generate a train of signals upon rotary motion of the drive shaft.

The Board also agrees with the Appellant that means to encode the rotary movement of a motor shaft are generally known *per se*. However, the Board observes that the encoder means recited in Claim 10 generate signals from which the position means (30, 32) can derive the OCK, CCK, CP and RATE signals. This implies that information about the rate and direction of movement of the rotary drive must be already present in the signals generated by the encoder means 30. The prior art does not show any encoder means used in the context of the claimed invention, and the encoder means recited in Claim 10 cannot be regarded as a mere technical equivalent of the tacho generator according to D1. The replacement of the tacho generator in the system known from D1, with encoder means as defined in the contested patent, would entail considerable modifications of the system and its operation which, in the opinion of the Board, cannot be regarded as obvious to the person skilled in the art. The Board cannot share the Appellant's view that the signals L, R_2; L, R_3 in D1 correspond to the signals OCK and CCK mentioned in Claim 10, because the former signals are not derived from a train of signals generated by encoder means mounted on the drive shaft.

(b) For reasons similar to those defined in paragraph 4.1(c) above, in relation to Claim 1 the use of dynamic braking in the system according to Claim 10 is regarded as not obvious in the light of the teaching of D1.

(c) It follows from the above that the Board considers that the subject-matter of Claim 10 involves an

inventive step within the meaning of Article 56 EPC.

4.3 Claim 19

(a) The system according to Claim 19 essentially differs from the system disclosed in D1 in that it comprises:

- encoder means 30 to generate a pair of signal trains in accordance with the rotary drive of the motor means 12,

- decoder means to produce position signals, direction signals and a speed signal indicative of the operation of the sliding door means by decoding said signal trains.

Claim 19 shares a feature indicated in Claim 10 but not disclosed in D1 and consisting in "encoder means" to generate signals which are a function of the rotation of the drive motor. Reference is made to paragraph 4.2(a) above concerning Claim 10.

(b) The Board further notes that D1 does not disclose the generation of a pair of signal trains in response to the rotary drive of the motor means, or decoder means able to produce direction signals as well as position signals by decoding a pair of signal trains.

(c) It follows from the above that the Board considers that the subject-matter of Claim 19 is not rendered obvious by the teaching of D1 and therefore involves an inventive step within the meaning of Article 56 EPC.

4.4 Claim 24

The method according to Claim 24 essentially differs from that according to D1 in that it comprises the step (c) of decoding position pulses indicative of the direction of movement of the sliding door. This step (c) involves making use of decoder means of the kind indicated in Claim 19 (see section 4.3 above). It is, moreover, unambiguously derivable from steps (c) and (b) in Claim 24 that the position pulses to be decoded are signals also indicative of the direction of movement of the sliding door. It has been shown in sections 4.3(a), (b) and 4.1(a), (b) of the present decision that there are no indications in D1 which could prompt a person skilled in the art to envisage the use of decoder means or the use of position signals which are also indicative of the direction of movement of the sliding door.

In the Board's opinion, the method of Claim 24 cannot be deduced from D1 without taking an inventive step within the meaning of Article 56 EPC.

5. Summarising, in the Board's judgment, the proposed solutions to the technical problem underlying the patent in suit defined in the independent Claims 1, 10, 19, 24 involve an inventive step within the meaning of Article 56 EPC and these claims are acceptable. Dependent Claims 2 to 9, 11 to 18, 20 to 23 and 25 to 27, relating to particular embodiments of the invention, are likewise acceptable. The patent can be maintained with these claims.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl E. Persson