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D E C I S I O N
of 20 May 2003

Case Number: T 0481/02 - 3.2.1

Application Number: 97943393.5

Publication Number: 0935581

IPC: B66B 25/00

Language of the proceedings: EN

Title of invention:
Control system for a passenger conveyor

Applicant:
OTIS ELEVATOR COMPANY

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0481/02 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 20 May 2003

Appellant: OTIS ELEVATOR COMPANY
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Representative: Hirsch, Peter, Dipl.-Ing.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 18 December 2001 refusing European patent application No. 97 943 393.5 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: S. Crane
Members: M. Ceyte
M. Aúz Castro

Summary of Facts and Submissions

I. European patent No. 97 943 393.5 based on the international application WO 98/18711 was refused by a decision of the Examining Division posted 18 December 2001.

The reason for the refusal was that the subject-matter of claim 1 according to the main or auxiliary request did not involve an inventive step in view of the prior art disclosed in

D1: US-A-4 748 394.

In the course of the appeal proceedings, the following further document was considered:

D2: AU-A-5 861 480 (cited in the search report)

II. On 15 February 2002 the appellant (applicant) lodged an appeal against this decision and paid the prescribed appeal fee.

The statement of grounds of appeal was filed on 16 April 2002.

III. Oral proceedings before the Board were held on 20 May 2003.

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 3 filed on 16 April 2002 or by way of auxiliary request on the basis of claims 1 to 3 filed on 17 April 2003.

Claim 1 according to the main request reads as follows:

"1. A method to operate a passenger conveyor (10), the passenger conveyor (10) having a platform (18) moveable between a pair of landings (12, 14), a passenger sensor (32), a drive (26) for providing actuation of the moving platform (18), a source of power (36) for the drive (26), and a frequency converter (56), the frequency converter (56) disposed between the power source (36) and the drive (26), the method including the steps of:

- sensing a passenger entering the passenger conveyor (10);
- transitioning the speed of the platform (18) to a nominal speed by increasing the frequency generated by the frequency converter (56);
- switching the drive (26) to be directly powered by the power source (36) after the platform speed reaches the nominal speed,
- switching the drive (26) to the frequency control if it is determined that no passengers remain on the passenger conveyor (10); and
- transitioning the platform speed to a stand-by speed by decreasing the frequency generated by the frequency converter (56), the stand-by speed being less than the nominal speed;

characterized by

transitioning the passenger conveyor (10) from the stand-by speed to a ready-to-operate condition if a predetermined amount of time elapses without a passenger entering the passenger conveyor (10), wherein in the ready-to-operate condition the platform (18) is stopped."

Claim 1 according to the auxiliary request reads as follows:

"1. A method to operate a passenger conveyor (10), the passenger conveyor(10) having a platform (18) moveable between a pair of landings (12, 14), a passenger sensor (32), a drive (26) for providing actuation of the moving platform (18), a source of power (36) for the drive (26), and a frequency converter (56), the frequency converter (56) disposed between the power source (36) and the drive (26), the method including control of the switched-on passenger conveyor(10) to be in one of the following three possible operation modes:

a. nominal speed;

b. stand-by-speed which is less than the nominal speed; and

c. ready-to-operate condition in which the platform (18) is stopped; and the method including the steps of:

a.1 sensing a passenger entering the passenger conveyor (10);

a.2 transitioning the speed of the platform (18) to the nominal speed by increasing the frequency generated by the frequency converter (56);

a.3 switching the drive (26) to be directly powered by the power source(36) after the platform speed reaches the nominal speed;

b.1 switching the drive (26) to the frequency control if it is determined that no passengers remain on the passenger conveyor (10);

b.2 transitioning the platform speed to the stand-by speed by decreasing the frequency generated by the frequency converter (56); and

c.1 transitioning the passenger conveyor (10) from the stand-by speed to the ready-to-operate condition

if a predetermined amount of time elapses without a passenger entering the passenger conveyor (10)."

IV. In support of its requests the appellant submitted i.a. the following:

(i) D1 which represents the closest prior art teaches operating the passenger conveyor either at a nominal speed or at a stand-by speed. If the technical problem underlying the present invention was to minimize wear and save energy, the best way to solve this problem would be to operate the passenger conveyor either at nominal speed or at zero speed at which wear is non-existent and the consumption of energy is substantially non-existent as well. This would, however, lead to the shortcomings of that conventional control apparatus which the author of D1 intended to overcome, namely a drop-off in use of the conveyor by potential passengers who have the tendency not to use an escalator when it is held stopped (column 1, lines 12 to 17 of D1).

Thus in the light of the disclosure of D1, the technical problem to be solved by the present invention is to provide a method to operate a variable speed passenger conveyor in such way that wear is minimized and energy is saved, while counteracting the tendency of potential passengers not to use a stopped conveyor. Prior art passenger conveyors can be classified into two categories, those which are operated either at nominal speed or at zero speed (which minimizes wear and energy consumption but causes the drop-off in use of the passenger conveyor) and those which are operated

either at nominal speed or at a stand-by speed (avoiding the drop-off in use of the passenger conveyor but still causing a relatively high wear and power consumption).

The above problem is solved in accordance with the present invention by operating the passenger conveyor not only in two operation modes (either nominal speed and zero speed or nominal speed and stand-by speed) as in the prior art but in three operation modes (nominal speed, stand-by speed and zero speed (ready-to-operate condition).

In the prior art citations D1 and D2 there is no suggestion to solve the technical problem above by the three operation modes defined in claim 1.

(ii) The wording of claim 1 according to the auxiliary request makes clear that controlling the conveyor into the ready-to-operate mode or zero speed takes place in its switched-on condition.

Reasons for the Decision

1. The appeal is admissible.

2. *Inventive step (main request)*

2.1 It is not disputed that the method to operate a passenger conveyor disclosed in D1 represents the closest prior art.

This citation relates to the variable-speed control of an escalator. In its description of background part, D1 refers to a conventional control apparatus for escalators which uses a system wherein the escalator is usually held at a stop and is started when the presence of a passenger is detected by a photoelectric device or the like. It is said that the reasons why the escalator is usually held stopped are to save energy and to extend the escalator's life time. In stores, however, there is the tendency that when the escalator is held stopped the number of users thereof decreases to reduce the numbers of shoppers in the upper floors.

In the invention disclosed in D1 a passenger conveyor such as an escalator is operated at two speeds, a nominal speed and a stand-by speed which is less than the nominal speed. The motor of the escalator is controlled by a frequency converter to operate at the stand-by speed until a passenger is detected; then the frequency converter increases the speed back to the nominal speed. Thus the stand-by speed is used in the absence of passengers on or at the escalator and a higher nominal speed is used in the presence of passengers on the escalator.

According to the European patent application, a method of this kind suffers from the problem that the escalator is in the absence of passengers operated at reduced speed, so that "wear of the escalator components still occurs and energy is wasted during no-load conditions"

Therefore the technical problem to be solved by the present invention is to provide a method to operate a variable speed passenger conveyor of the type stated in

the pre-characterising part of claim 1, which overcomes this disadvantage, i.e. which minimizes wear and power consumption, while retaining its low speed or stand-by speed mode, in order to counteract the tendency of potential passengers not to use the conveyor when it is held stopped.

This problem is in essence solved by the step stated in the characterising part of claim 1 requiring the transitioning of the stand-by speed to a ready-to-operate condition (zero speed) if a predetermined amount of time elapses without any passenger being detected.

2.2 The speed profile of a conventional passenger conveyor or escalator is illustrated by Figure 2(ii) of D2. Upon detection of a passenger, the conveyor is switched on and accelerated from zero to full speed. After the passenger exits, the conveyor is decelerated from full speed to zero and stopped. Such a typical passenger conveyor is acknowledged in the introductory part of the European patent application (page 1, lines 15 to 23). It is said that this kind of passenger conveyor saves energy by not running continuously during no-load conditions. Reference is also made to document D1 which gives the reasons why such conventional passenger conveyor is held stopped: reduction of the power consumption and increase of the escalator's lifetime i.e. reduction of wear.

Thus it is basic knowledge for a skilled person that the ready-to-operate mode (zero speed) allows reduction of wear and power consumption.

For these obvious reasons of minimizing wear and power consumption the skilled person would have been encouraged to switch the passenger conveyor of D1 from its stand-by speed into its ready-to-operate (zero speed) condition, if a predetermined amount of time elapses without any passenger being detected. In other words, for the skilled person faced with the problem of reducing wear and energy consumption while maintaining the stand-by-speed (low speed) mode of the conveyor of D1 so as to counteract the tendency of potential passengers not to use the conveyor when it is held stopped, it would be readily apparent to switch the stand-by-speed to the ready-to operate condition or zero speed, after a predetermined duration of time without a passenger entering the conveyor.

It is true that the available prior art does not disclose a conveyor which is operated into the claimed three operation modes, that is nominal speed, stand-by speed and zero speed. However, in the Board's view, once the above drawbacks of indefinitely operating the conveyor of D1 in the stand-by speed in the absence of passengers have been recognised, it is only logical that the skilled person seeking to overcome these drawbacks, would envisage an interruption of this permanent stand-by speed mode by switching it to the ready-to-operate mode (zero speed) after a predetermined duration of time elapses without any passenger being detected.

For the foregoing reasons the subject-matter of claim 1 lacks an inventive step as required by Article 56 EPC.

3. *Inventive step (auxiliary request)*

In comparison to claim 1 of the main request, claim 1 of the auxiliary request explicitly states that the claimed three operation modes occur when the passenger conveyor is in its switched-on condition. In the reasoning above it was assumed that in the ready-to-operate condition (zero speed) the passenger conveyor was switched on.

Therefore the aspects referred to with respect to the lack of inventive step of the subject-matter of claim 1 according to the main request apply in turn also to the subject-matter of alternative claim 1.

For these reasons the auxiliary request must also fail.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani S. Crane