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D E C I S I O N
of 14 January 1994

Case Number: T 1005/92 - 3.5.2

Application Number: 87302152.1

Publication Number: 0237355

IPC: H01H 71/34

Language of the proceedings: EN

Title of invention:

Circuit breaker with trip delay magnetic circuit

Applicant:

Westinghouse Electric Corporation

Opponent:

-

Headword:

Relevant legal norms:

EPC Art. 56

Keyword:

"Inventive step - yes"

Decisions cited:

-

Headnote:

-



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Boards of Appeal

Chambres de recours

Case Number: T 1005/92 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 14 January 1994

Appellant: Westinghouse Electric Corporation
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Representative: van Berlyn, Ronald Gilbert
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Decision under appeal: Decision of the Examining Division 051 of the
European Patent Office dated 11 June 1992 refusing
European patent application No. 87 302 152.1
pursuant to Article 97(1) EPC.

Composition of the Board:

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

Summary of Facts and Submissions

I. The present appeal contests the decision of the Examining Division refusing Appellant's European patent application No. 87 302 152.1. The reason for the refusal was that the claimed subject-matter did not involve an inventive step having regard to the prior art known from:

D1: US-A-4 129 843.

The following prior art documents were also cited in the proceedings before the Examining Division:

D2: US-A-3 206 578

D3: US-A-3 193 736

D4: DE-A-2 115 030.

II. During the appeal proceedings, the Appellant filed an amended Claim 1 and cancelled all the other claims. The Appellant also filed amended pages 1 and 2 of the description. Claim 1 is now worded as follows:

"1. A circuit breaker comprising a pair of separable contacts (34, 32) including a movable contact, a movable contact arm (38) carrying the movable contact and movable between open and closed positions of the contacts, an operating mechanism (18) for actuating the contact arm and comprising a pivotally supported releasable member (60), latching means (26) for latching the releasable member and including a latch lever movable between latched and unlatched positions of the releasable member, trip means including a trip bar (24) for releasably holding the latch lever in the latched position, trip delay means (22) for avoiding premature unlatching of the trip bar, a time-delayed mechanical

motion established by a dual magnetic field gap change provided by first electromagnetic means including a first armature (78) and second electromagnetic means (90, 72) including a second armature (90), a solenoid coil (72) and magnetic frame having two spaced frame members (76, 77) disposed at opposite ends of the coil (72), the second armature (90) being movable to initiate operation of the first armature (78) in response to an overcurrent below a predetermined overcurrent condition, with the first armature (78) being biased in a position corresponding to the latched position, whereby the trip delay means is adapted to override high transient conditions, but the time delay means is so arranged as to allow tripping to take place on short circuit current on an instantaneous fault, characterised in that the second armature (90) pivotally mounted on one frame member (76) and movable into and out of contact with the other frame member (77) in response to a magnetic force, so as to enhance the electromagnetic force acting on the first armature (78)."

III. The Appellant argued essentially that the claimed circuit breaker overrode transients, such as inrush currents when an electric motor was started, but tripped immediately on the occurrence of a short circuit. The arrangement of the second armature was different from that in the prior art.

IV. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the following application documents:

Claim 1 and description pages 1 and 2, as filed with the letter dated 5 November 1993 (received 9 November 1993);

Description pages 3 to 7 and drawings sheets 1/2 and 2/2, as originally filed.

Reasons for the Decision

1. The appeal is admissible.
2. Claim 1 as filed with the letter dated 5 November 1993 contains an obvious clerical error in the characterising part, namely the verb "is" should be inserted after "the second armature (90)". The Board orders that this error, and the corresponding one on page 2, line 21, be corrected.
3. The present Claim 1 specifies more details of the magnetic frame and the first and second armatures than did Claim 1 refused by the Examining Division. The functional feature that "the trip delay means is adapted to override high transient conditions, but the time delay means is so arranged as to allow tripping to take place on short circuit current on an instantaneous fault" has also been inserted. All these features were disclosed in the description and drawings as originally filed. Pages 1 and 2 of the description have been adapted to the present claim and a reference to US-A-3 193 736 (D3) has been inserted. In the opinion of the Board, the amendments comply with Article 123(2) EPC.
4. The Examining Division found that the subject-matter of Claim 1 then on file did not involve an inventive step having regard to the prior art known from US-A-4 129 843 (D1).
 - 4.1 D1 discloses a circuit breaker having many features in common with the circuit breaker according to the present Claim 1. The prior art circuit breaker known from D1 comprises a pair of separable contacts (29, 30, Fig. 2) including a movable contact (30), a movable contact arm

(31) carrying the movable contact and movable between open and closed positions of the contacts, and an operating mechanism (70, Fig. 3) for actuating the contact arm (31). As described in D1, column 3, line 40 ff, the operating mechanism comprises a pivotally supported releasable member (80), latching means (81) for latching the releasable member and including a latch lever (78) movable between latched and unlatched positions of the releasable member (80), and trip means including a trip bar (75) for releasably holding the latch lever (78) in the latched position. Trip delay means (50, Fig. 2) avoid premature unlatching of the trip bar (75). A time-delayed mechanical motion is established by a dual magnetic field gap change provided by first electromagnetic means including a first armature (52) biased in a position corresponding to the latched position, and second electromagnetic means including a second armature (105), a solenoid coil (35) and a magnetic frame (48) whose ends are disposed at opposite ends of the coil (35). As described in column 4, lines 45 to 64, of D1, the second armature (105) is movable to initiate operation of the first armature (52) in response to a low overcurrent condition and the trip delay means is adapted to override low overcurrent transient conditions but to allow tripping to take place on short circuit current on an instantaneous fault.

- 4.2 In this known circuit breaker, the first armature (52) is pivotally mounted at one end of the frame member (48) and the second armature is a magnetic core (105) slidable within a capsule (102) filled with a viscous liquid. It is noted that if the pivotally mounted armature (52) were to be regarded as the second armature (cf. paragraph 4 of the decision under appeal), the requirement that the second armature is movable to initiate operation of the first armature in response to

an overcurrent below a predetermined overcurrent condition would not be met. There is no suggestion that the second ("initiating") armature could be pivotally mounted on the frame member.

- 4.3 D3 discloses a circuit breaker in accordance with the preamble of the present Claim 1. The prior art circuit breaker known from D3 comprises a pair of separable contacts (12, 14) including a movable contact (14), a movable contact arm (15) carrying the movable contact and movable between open and closed positions of the contacts, and an operating mechanism for actuating the contact arm. As described in D3, column 2, line 58 ff, the operating mechanism comprises a pivotally supported releasable member (55), latching means for latching the releasable member and including a latch lever (60) movable between latched and unlatched positions of the releasable member (55), and trip means including a trip bar (48') for releasably holding the latch lever (60) in the latched position. Trip delay means avoid premature unlatching of the trip bar (48'). A time-delayed mechanical motion is established by a dual magnetic field gap change provided by first electromagnetic means including a first armature (46) biased in a position corresponding to the latched position, and second electromagnetic means including a second armature (91), a solenoid coil (22) and a magnetic frame having two spaced frame members (95, 96) disposed at opposite ends of the coil (22), the second armature (91) being movable to initiate operation of the first armature (46) in response to an overcurrent below a predetermined overcurrent condition, with the first armature (46) being biased in a position corresponding to the latched position. As described in D3, column 6, line 46 ff., the second armature (91) is movable to initiate operation of the first armature (46) in response to a low overcurrent condition and the trip delay means is adapted to

override low overcurrent transient conditions but to allow tripping to take place on short circuit current on an instantaneous fault.

4.4 In this known circuit breaker, the first armature (46) is pivotally mounted on a pintle (87) so as to bridge the gap between the frame members (95, 96) when operated. The second armature is a magnetic core (91) slidable within a tube (93) filled with a viscous liquid. There is also a pivotally mounted shunting armature (45), but it cannot be regarded as the second armature, since it has more of a restraining function than an initiating one (see D3, column 6, line 59 to 65). There is no suggestion that either the core (91) or the shunting armature (45) could be replaced by an armature pivotally mounted on one of the frame members (95 or 96) and movable into and out of contact with the other frame member in response to a magnetic force.

4.5 Furthermore, D2 discloses a circuit breaker having many features in common with the circuit breaker according to the present Claim 1. But, as in the case of the circuit breakers disclosed in D1 and D3, the second ("initiating") armature is a magnetic core (85) slidable within a tube (73) and there is no suggestion that it could be replaced by an armature pivotally mounted on the magnetic frame of the solenoid coil.

4.6 Summarising, while each of the prior art circuit breakers known from D1, D2 and D3 has many features in common with the circuit breaker according to the present Claim 1, none of them has its "second" armature pivotally mounted on a part of the magnetic frame of the solenoid coil and movable into contact with another part of the magnetic frame of the solenoid coil in response

to an overcurrent below a predetermined overcurrent condition, so as to enhance the electromagnetic force acting on the "first" armature.

4.7 D4 discloses circuit breakers having a mechanical motion established by a dual magnetic field gap change provided by a first armature in the form of a magnetic core (4, Fig. 1; 19, Fig. 2) slidable within a solenoid coil (1, Fig. 1; 21, Fig. 2) and a second armature (8, Fig. 1; 26, Fig. 2) pivotally mounted on a magnetic frame portion (2; 22) at one end of the coil (1; 21). The second armature (8; 26), and, in the case of the circuit breaker shown in Fig. 2, a third armature (23), is/are movable into contact with another magnetic frame portion at the opposite end of the solenoid coil in response to a magnetic force, so as to enhance the electromagnetic force acting on the first armature (4; 19). The second armature (8; 26) is arranged to release a latch (28, Fig. 2) to allow operation of the first armature (4; 19), the arrangement being such that the first armature (4; 19) cannot move before the second armature (8; 26) has released the latch.

4.8 The mechanical details of the second armatures (8; 26) disclosed in D4 are such that they could not be readily incorporated in any of the circuit breakers known from D1, D2 and D3 instead of, or in addition to, their slidable magnetic cores. If, for the sake of argument, the second armature (8) or (26) disclosed in D4 was simply mounted between the ends of the solenoid coil of any of the circuit breakers known from D1, D2 and D3, the second armature would shunt the first armature and therefore would not enhance the electromagnetic force acting thereon.

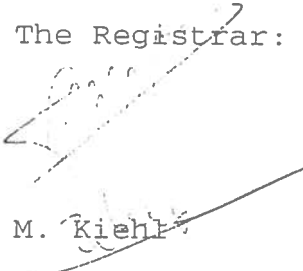
- 4.9 Alternatively, if, again for the sake of argument, the whole arrangement of the solenoid and first and second armatures disclosed in D4 was incorporated in one of the circuit breakers known from D1, D2 and D3, several further modifications would be necessary to arrive at a circuit breaker according to the present Claim 1. For example, the latch (28) of D4 would have to be replaced by means to bias the first armature in a position corresponding to the latched position, and the movable contacts (6; 20) of D4, which are mounted directly on the plunger (5; 18) of the first armature (4; 19) would have to be replaced by a trip bar designed to cooperate with the latch lever of the circuit breaker known from D1, D2 or D3.
- 4.10 Such modifications would be inconsistent with the teaching of D4, where it is recited in Claim 1 that the plunger exerts a force on the movable contacts and the pivoted armature unlatches the switching mechanism. The Board can see no obvious reason why a person skilled in the art, who was unaware of the present invention, would try combining different features taken from D4 with features taken from D1, D2 or D3.
5. The Board therefore concludes that the subject-matter of the present Claim 1 is not obvious having regard to the prior art cited by the Examining Division and therefore must be considered as involving an inventive step within the meaning of Article 56 EPC.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent as requested by the Appellant (see paragraph IV above), subject to correction of the obvious clerical error in Claim 1 and on page 2 (see paragraph 2 above).

The Registrar:


M. Kiehl

The Chairman:


E. Persson

