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Application No.: 82 108 834.1

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Title of invention: High voltage apparatus with three-dimensional structure

Classification: H01L 25/10

D E C I S I O N
of 18 December 1991

Proprietor of the patent: KABUSHIKI KAISHA TOSHIBA

Opponent: Siemens Aktiengesellschaft

Headword: TOSHIBA

EPC Article 56

Keyword: Inventive step (no)

Headnote



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Boards of Appeal

Chambres de recours

Case Number : T 425/90 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 18 December 1991

Appellant :
(Proprietor of the patent)

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Decision under appeal :

Decision of the Opposition Division of the
European Patent Office dated 3 April 1990
revoking European patent No. 0 076 439 pursuant
to Article 102(1) EPC.

Composition of the Board :

Chairman : G.D. Paterson
Members : H.J. Reich
Y. van Henden

Summary of Facts and Submissions

- I. The Appellant is owner of European patent No. 0 076 439.
- II. This patent was revoked by a decision of the Opposition Division on opposition by the Respondent, on the ground that the subject-matter of granted Claim 1 was lacking an inventive step having regard to documents:

D1: DE-B-2 354 663, and

D2: J. Biermanns: "Hochspannung und Hochleistung",
Carl Hanser Verlag, München 1949, pp. 122-125.

The Opposition Division took the view, that by virtue of their similar construction, the insulating columns of document D1 having insulators with metallic spacers between them, would provide the same advantages as the claimed insulating columns and thus provide a suitable solution to the stated problems of the prior art described in Figures 1 to 3 of the patent under appeal. Moreover, it would be obvious to a technician of average abilities to provide a clearance between components in order to insulate them from each other and thus to use a pair of distant spacers between the insulators. Furthermore, the provision of flanges on insulators would be obvious in view of document D2.

- III. The Appellant (Patentee) lodged an appeal against this decision.
- IV. In a communication annexed to a summons to oral proceedings the parties were informed of a series of facts on which the Board based its provisional view that the opinion of the Opposition Division might possibly be followed. In response to this communication of the Board, the Appellant filed on 18 November 1991 a new set of amended claims:

Claim 1 reads as follows:

"1. A high voltage apparatus with a three-dimensional structure, which comprises:

a plurality of electric units (52) each having a first mounting arm (68a) and a second mounting arm (68b), the electric potential of said first mounting arm (68a) being the same as that of said second mounting arm (68b);

a frame (54) having at least a first insulating column (60) and a second insulating column (60) vertically orientated and horizontally spaced from each other,

said electric units (52) being mounted in a plurality of vertical stages between said first and second insulating columns (60),

each of said first and second insulating columns (60) including a plurality of insulators (62) of a synthetic resin in a substantially vertical linear arrangement at intervals each including an upper flat flange (82), a lower flat flange (84) placed substantially parallel to said upper flat flange, and a rib (62a) there-around in order to increase a creeping distance;

a plurality of pairs of channel-shaped metallic spacers (64a, 64b), each pair of said metallic spacers being arranged between said each of said plurality of insulators to couple each of said plurality of insulators (62) thereby to form each of said first and second insulating columns (60), and including a first metallic spacer (64b) and a second metallic spacer (64a) arranged at a distance from and thus insulated from said first metallic spacer (64b), each of said first and second metallic spacers (64b, 64a) including an upper wall (88), a lower wall (88) placed substantially parallel to said upper wall (88), and a side wall (90) coupling said upper and lower walls (88) at both ends thereof; and

bolts and nuts (94, 96) for connecting said upper and lower walls (88) to said lower and upper flat flanges (84, 82), respectively, and screws (98) for attaching said electric units (52) to said lower wall (88) of said first and second metallic spacers (64b, 64a);

wherein each of said electric units (62) is mounted substantially horizontally between said first and second insulating columns (60) such that said first mounting arm (68a) of each of said electric units (52) is mounted on each of said first metallic spacers (64b) of said first insulating column (60) and said second mounting arm (68b) of each of said electric units (62) is mounted on each of said second metallic spacers (64a) of said second insulating column (60)."

Claim 2 is dependent on Claim 1.

- V. Oral proceedings were held on 18 December 1991, at the end of which the Appellant (Patentee) requested that the decision under appeal be set aside and that the patent be maintained on the basis of Claims 1 and 2 filed on that day.

The Respondent (Opponent) requested that the appeal be dismissed.

- VI. In support of his request, the Appellant made essentially the following submissions:

- (a) The problem underlying the present invention cannot only be seen in creating between neighbouring insulators of document D1 spacers which allow to apply a different potential to adjacent electric units in the same vertical stage, but furthermore in providing a high voltage apparatus which is compact in size, is mechanically strong, has high insulating

performance and can be manufactured at low cost (see the patent under appeal, column 3, lines 22 to 27).

- (b) The desired mechanical strength should have such a degree that the columns of the apparatus resist to earthquakes (see the patent under appeal, column 3, lines 13 to 18). This strength is prima facie realised by providing flanges at insulators and spacers and connecting adjacent flanges with each other via nuts and bolts. An interposition of metallic spacers alone - as taught by document D1 - does not necessarily provide the desired mechanical strength. Moreover, document D1, column 4, lines 47-51, teaches to use threaded pocket holes in insulators. Their replacement by nuts clearly reduces manufacturing costs.

- (c) Due to the fact that document D1, column 3, lines 47 to 53, teaches to use spacers formed of metal only for current carrying nodes, a skilled person would interpret the non-current carrying spacers 8 in Figure 1c of document D1 as made of an insulating material. In view of this prior art a skilled person would rather use one non-metallic spacer in order to insulate adjacent electric units having a different potential than split a metallic spacer into two parts. The hint in document D1, column 6, lines 18 to 22, to vary the geometrical form of the known spacers, for instance from a cube into a hexagon, would not suggest such splitting. Hence, the provision of a pair of spacers between neighbouring insulators would only be obvious with hindsight.

- (d) In the apparatus of document D1 the commercially available insulators according to document D2 would

be of no use, because their tops cannot be screwed up.

- (e) The combination of all steps which, starting from the prior art disclosed in document D1, are necessary in order to progress to the subject-matter of Claim 1, would not be obvious, due to the fact that the features of all these steps contribute to solve a common problem.

VII. The above submissions were contested by the Respondent who argued essentially as follows:

- (a) The problem defined by the Patentee in paragraph VI-(a) is based on the prior art according to Figures 1 to 3 of the patent under appeal and solved by applying the modular construction principle of document D1, wherein the inclusion of metallic spacers increases the mechanical strength and the use of commercially available ribbed and flanged insulators of synthetic resin (D1, column 3, lines 44, 45 in combination with D2, Figures 104 and 105) shortens the column length and reduces the manufacturing costs.
- (b) Document D1, column 6, lines 19 to 22, hints at deviating from the cubical form of spacers and Figure 6 of document:

D3: DE-B-1 439 239

cited in the notice of opposition, would show the claimed geometrical form of spacers, i.e. a pair of two channel shaped spacers at a distance from each other and adjacent to insulators. Moreover, replacing one spacer by two separated ones in the event of an

intended potential difference in one particular node, would fall within a skilled person's normal abilities.

- (c) Connecting the modules of document D1 via outwardly extending flanges pressed together by nuts and bolts, means to make use of a generally known basic and simple mechanical connecting means with only foreseeable effects. Hence, the constructional changes which are necessary in order to progress from the prior art disclosed in document D1 to the subject-matter of Claim 1 would not imply an inventive step.

Reasons for the Decision

1. Inventive step

- 1.1 From the nearest prior art according to document D1 there is known in the wording of Claim 1:

"A high voltage apparatus (see D1, column 4, line 4) with a three-dimensional structure (D1, Figures 1a, 1b, 1c) which comprises: a plurality of electric units (4) each having a first mounting arm and a second mounting arm (5 in Figure 1c); a frame having at least a first insulating column (8) and a second insulating column (8a) vertically orientated and horizontally spaced from each other, said electric units being mounted in a plurality of vertical stages (1, 2, 3) between said first and second insulating columns; each of said first and second insulating columns including a plurality of insulators (10) of a synthetic resin (column 3, lines 44, 45) in a substantially vertical linear arrangement at intervals, a plurality of metallic

spacers (9, column 3, lines 45 to 50; contrary to the Appellant's view in paragraph VI-c, D1, column 3, lines 47, 48 reads "all or at least the current guiding nodes" and thus clearly discloses an embodiment with throughout metallic spacers) each being arranged between said each of said plurality of insulators to couple each of said plurality of insulators thereby to form each of said first and second insulating columns, each of said metallic spacers including an upper wall, a lower wall placed substantially parallel to said upper wall, and a side wall coupling said upper and lower walls at both ends thereof (see left insulating column 8a in Figure 1b), bolts (14 in Figure 1b and column 4, lines 47 to 51) for connecting said upper and lower walls to said lower and upper" insulator ends and means (see 5 in Figure 1a) "for attaching said electric units to said lower wall of said metallic spacers; wherein each of said electric units (4) is mounted substantially horizontally between said first and second insulating columns."

The further wording of Claim 1: "... such that said first mounting arm of each of said electric units is mounted on each of said first metallic spacers of said first insulating column and said second mounting arm of each of said electric units is mounted on each of said second metallic spacers of said second insulating column" is only the logical consequence of the preceding wording of Claim 1 and does not define any further technical means which specify the subject-matter of Claim 1.

1.2 Starting from the prior art disclosed in document D1 the objective technical problem underlying the patent under appeal is to provide a high voltage apparatus which:

- (a) is compact in size and allows high insulating performance,

- (b) is mechanically strong and can be manufactured more simply (i.e. at low cost); and
- (c) allows to apply different potentials to neighbouring electric units in the same vertical stage;

see also paragraph VI-(a) above.

The technical aims (a) to (c) arise out of practical needs. Thus, the formulation of the objective problem does not contribute to an inventive step underlying the subject-matter of Claim 1.

- 1.3 Part (a) of the objective problem is solved according to Claim 1 in that the insulators have "a rib there-around in order to increase a creeping distance". Such means and their effects are known for instance from document D2, Figures 104 and 105 with the corresponding description.
- 1.4 Part (b) of the objective problem is solved according to Claim 1 in that the insulators "each include an upper flat flange, a lower flat flange placed substantially parallel to said upper flat flange and nuts (cooperating with the known bolts) for connecting said upper and lower walls (of the spacers) to said lower and upper flat flanges respectively" and by "screws" (for attaching the electric units to the spacer walls).

An insulator with a lower flat flange (and a through hole for a bolt) is known from document D2, Figure 104. The Board is not able to follow the Appellant's view in paragraph VI-(d), that a skilled person would be unable to provide a flange also at the upper end of this known ribbed insulator when replacing the insulators 10 of

document D1 by the known more compact ones with ribs and maintaining synthetic resin as insulator material.

A skilled person, in the Board's view, is able to recognise that it is a more simple manufacturing process and thus advantageous to maintain the known through holes in the insulator flanges disclosed in Figure 104 of document D2, and to replace the threaded pocket holes in insulators 10 of document D1 by threads in the spacer walls of document D1 or still more simply by through holes in the spacer walls and nuts. The Appellant cannot be followed in his implicit view in paragraph VI-(b) above that such measures normally cannot be expected from a skilled person. External flanges, nuts and bolts are basic mechanical construction elements and thus basic knowledge of the competent skilled person. From the patent in suit, column 3, lines 11 to 14, can be derived that a better resistance to earthquakes is achieved by lowering the height of the column (see also paragraph 1.3).

Furthermore, neither the patent in suit nor documents D1 or D2 disclose any dimensions of walls and flanges. Thus, in the Board's view the means claimed in Claim 1 which improve the mechanical strength of the apparatus according to document D1 are only the nuts. However, the effect that a thread in metal (i.e. in a nut) resists higher mechanical forces than a thread in a synthetic resin is known and foreseeable to a skilled person.

- 1.5 Part (c) of the objective problem is solved according to Claim 1 in that "pairs" of channel-shaped metallic spacers are arranged between neighbouring insulators "including a first metallic spacer and a second metallic spacer arranged at a distance from and thus insulated from said first metallic spacer".

Contrary to the Appellant's view in paragraph VI-(c) above, in the Board's view, a skilled person will select the known alternative of document D1, column 3, lines 47, 48, using throughout metallic spacers with regard to the desired mechanical strength of the apparatus. In the Board's view, a skilled person is able to realise that the spacers inter alia are mounting means for the electric units. The fact, that electric units being on different voltages cannot have a common metallic mounting means in the same column as in document D1 is trivial. Providing, therefore, an individual mounting means for each electric unit - i.e. a pair of spacers - is held by the Board to be a logical consequence of the desired aim. Hence, the Board agrees with the Opposition Division that such a measure should be expected from the skilled person within the normal technical development.

- 1.6 It is not derivable from the patent in suit and not established by the Appellant that the claimed "channel shape" of the spacers and the claimed feature concerning "the electric potential of said first mounting arm being the same as that of said second mounting arm" contribute to solve the problem set in the description. Therefore, these features of Claim 1 need not be considered in assessing inventive step; see decision T 37/82, OJ EPO 1984, 71.

- 1.7 As shown in paragraphs 1.3 to 1.5 above, each of the constructional measures necessary to convert the apparatus disclosed in document D1 into the one claimed in Claim 1, contributes to the solution of the obvious objective problem defined in paragraph 1.2 above, only its own expected effects. For this reason the Appellant cannot be followed in his opinion according to paragraph VI-(e) above that the combination of such per se known or obvious constructional means in solving a common technical problem results in an inventive step.

- 1.8 For these reasons the Board considers that the subject-matter of Claim 1 is the result of an obvious use of known insulators and basic mechanical constructional elements for adapting the apparatus disclosed in document D1 to practical-needs. Therefore, in the Board's judgment, Claim 1 lacks an inventive step within the meaning of Article 56 EPC.
2. Claim 2 falls because of its dependency on Claim 1.

Order

For these reasons, it is decided that:

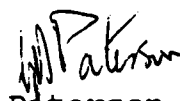
The appeal is dismissed.

The Registrar:



M. Beer

The Chairman:



G.D. Paterson

