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Insulating metal frame elements and method of making such elements.

(57)

Window frames or door frames incorporate thermal barriers to prevent conduction of heat from one side to the other of the frame.

An element is made from a metal frame member (21) comprising side walls (23,24) and walls (25,26) interconnecting the side walls to provide a closed hollow interior (22a) which is provided with thermally insulating foam plastics material (31) so as to interconnect the side walls (23,24). Parts (38a,39a) of the walls (25,26) are then cut away to provide thermal breaks. In a modification, part of the hollow interior of the member may be occupied by a plastics housing and the remainder filled with foam plastics material. Additional thermally insulating plastics material may be provided to bridge the breaks in the walls (25,26).

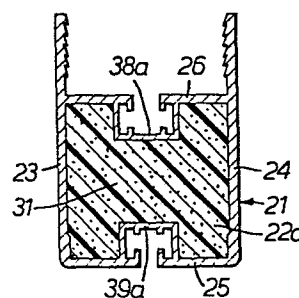


FIG. 9.

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TITLE MODIFIED
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IMPROVEMENTS IN AND RELATING TO METAL
FRAME ELEMENTS

5 The present invention relates to improvements in metal frame elements for framing openings, for example for windows or doors, which incorporate thermal barriers to prevent conduction of heat from one side of the frame to the other.

Such elements generally comprise a frame member, e.g. extruded of aluminium, with the or each wall connecting the two sides of the frame element provided with a break which is bridged with a suitable thermally insulating
10 plastics material to create the thermal barrier. Where a single wall connects the two sides of the frame element, the wall is generally provided with a channel open along one face. The channel is filled with the thermally insulating plastics material in liquid form, and after
15 the plastics material has set, a part of the wall of the channel is removed to create the break. For this, access is required both to the open face of the channel and to another face, to fill the channel and then to remove a part of the wall of the channel respectively.

20 With frame elements made from hollow section frame members, the situation is more complex because there are then two walls connecting the two sides of the frame, both of which have to be provided with thermal barriers. For convenience the channels in the region of

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the thermal barriers are provided within the interior of the hollow of the member so that it is impossible to provide direct access to two faces of each channel. It has been proposed to provide a channel which is open on one face in one wall and a channel which is open on two opposite faces in the other wall and through which openings access can be obtained to another face of the first channel. Such an arrangement is shown in Figure 1 of the accompanying drawings in which an extruded aluminium frame member 1 is shown in section. The member 1 comprises two side walls 2,3 extended by flanges 4,5 for mounting purposes, and walls 6,7 interconnecting side walls 2,3. A thermal barrier is required to be provided in both walls 6 and 7 and, to this end, a channel 9 is provided having an opening 10 in wall 6 and channel 11 is provided having an opening 12 in wall 7 and an aligned opening 13 for providing access to the opposed face of channel 9. In this arrangement, the frame element of Figure 1 is inverted and channel 9 is filled with a suitable thermally insulating plastics material 14, as shown in Figure 2, through opening 10. When the material 14 has set, a part of the wall of channel 9 is removed to create break 15, as shown in Figure 3, access being obtained through the openings 12,13 of channel 11. The member is then inverted and the opening 13 in channel 11 is closed using for example a strip 16 of thermally insulating material, as shown in Figure 4, or a plug 17 of thermally insulating material as shown in Figure 5. Finally channel 11 is filled with a suitable thermally insulating material 18 as shown in Figure 6. It will be appreciated that this method of producing the thermal breaks in both walls 6 and 7 is not only expensive because it is time consuming but it is also difficult to achieve a finished product having good dimensional stability because the member 1 has an open hollow section,

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the two sides of the member 1 being only connected by the part of the wall of channel 9 which is subsequently removed to create break 15.

According to the present invention there is
5 provided a method of making an elongate frame element comprising providing an elongate metal frame member having a closed hollow interior in part bounded by walls interconnecting the sides of the member, providing thermally insulating plastics material in the hollow
10 interior arranged so as to interconnect the sides of the member and removing portions of the interconnecting walls along the length of the member so as to provide discontinuities therein forming thermal breaks.

The member may be provided with channels in each
15 of the said walls, each channel having a single opening in the respective said wall and wherein after the interior space of the member has been filled with thermally insulating plastics material, a part of the wall of each channel is removed to create the break or
20 discontinuity and the channels are then filled with thermally insulating plastics material. Advantageously the plastics material used to fill the interior of the section has a lesser strength than the plastics material used to fill the channels.

25 According to another aspect of the present invention there is provided a frame element made according to the method set out above.

The present invention will be more fully understood from the following description of embodiments
30 thereof, given by way of example only, with reference to the accompanying drawings, in which:

Figure 7 is a section through an embodiment of an elongate frame element according to the present invention;

35 Figure 8 is a section through an elongate metal

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member for use in making the frame element shown in Figure 7;

Figures 9 and 10 are sections similar to that of Figure 8 showing the element of Figure 7 in course
5 of manufacture;

Figure 11 is a section through another embodiment of an elongate frame element according to the present invention; and

Figure 12 is a section through an elongate
10 metal member for use in making the frame element shown in Figure 11.

The completed frame element shown in Figure 7 comprises an extruded aluminium member 21 having a hollow interior 22 defined by side walls 23, 24 and
15 walls 25, 26 perpendicular to and interconnecting the side walls. Side walls 23, 24 are extended by flanges 27, 28 for mounting purposes. As shown, the walls 25, 26 each have longitudinal breaks 29, 30 providing thermal barriers and the hollow interior 22 is filled
20 with a thermally insulating plastics material 31, for example a rigid closed cell plastics foam, such as polyurethane, which has a relatively low structural strength, and, in the area of the breaks 29, 30, the portions of walls 25, 26 are interconnected by thermally
25 insulating plastics material 32, 33 which has a high structural strength, for example non-foamed polyurethane.

The above described frame element is made starting from an elongate extruded aluminium member 21,
30 as shown in Figure 8, which has a closed hollow interior 22a defined by the walls 23 to 26 and channels 34, 35 which are provided in walls 25, 26 within the confines of the rectangle defined by walls 23 to 26. The channels 34, 35 each have a single opening 36, 37 in
35 the respective walls 25, 26 and the walls of the channels

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interconnect the portions of the walls 25, 26 to either side of the openings 29, 30 and thereby close the interior of the member.

To make the frame element shown in Figure 7, members 21 of a suitable length, for example 5 metres are used. One end of the interior 22a of the member 21 is plugged, the plug being provided as required with air vents, and the whole of the space in the interior 22a is filled, as shown in Figure 9, with the thermally insulating foam plastics material 31. This may be effected using a lance which is fully inserted into the interior of the member and progressively withdrawn, or by providing a nozzle at the open end of the interior and which projects the foam plastics material at high speed from that end to the other closed end. After the plastics material 31 has solidified, portions 38a, 39a of the walls of the channels opposite the openings 36, 37 are removed, as shown in Figure 10. This then completely breaks the two parts of the walls 25, 26 at 38, 39 to provide the thermal break between the two sides of the frame element. However, the two halves of the member 21 are retained in their original relative position by the foam plastic material 31 which completes the walls of the channels in place of the wall portions 38a, 39a which have been removed.

The portions 38a, 39a of the walls of the channels can simply be removed using, for example, a circular saw which passes through the openings 36, 37 respectively. Thereafter first one channel and then the other is filled with a structurally strong thermally insulating plastics material 32, 33, as shown in Figure 7. This can be effected for example by providing the element on a conveyor which is moved progressively past a nozzle or pouring head for the liquid plastics material, the two ends of each channel being closed by

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an appropriate plug. The frame element is then complete.

As will have been appreciated, the aluminium member is extruded with a closed hollow interior so that it can be made with a high degree of accuracy and the walls of the member are not broken until the interior space is filled with the plastics material 31 which is selected to have sufficient rigidity to hold the two parts together in their correct orientation while the channels 34, 35 are being filled. It will be appreciated that the arrangement of the channels 34, 35 extending into the rectangle bounded by walls 23 to 26 gives the foam material 31 a generally H-shape so that it is keyed in the member. For the same reason, the channels 34, 35 are provided with inwardly projecting walls to key the plastics material 32, 33.

Another embodiment of frame element is shown in Figure 11. In this embodiment, in which the same reference numerals are used for similar parts, the channels 34, 35 are arranged in adjacent corners of the rectangle defined by walls 23 to 26. As in the preceding embodiment the channels 34, 35 are filled with thermally insulating plastics material 32, 33 which structurally interconnects the two sides of the element and a space within the interior of the element is provided with thermally insulating plastics material 31. However, in this embodiment, a steel rod (not shown), forming part of a locking mechanism, extends in use from end to end of the element. To ensure that it does not bridge the thermal break, an elongate thermally insulating plastics housing 40 is provided in the interior of the frame element in which the steel rod is received. To facilitate construction, the plastics housing 40 is positively located in the element by lugs 41.

The member, an aluminium extrusion, from which

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the above described element is made is shown in Figure 12. Manufacture proceeds exactly as described in relation to the embodiment of Figure 7 but the initial step of providing the closed hollow interior space with foam plastics material is preceded by insertion of the plastics housing 40, the remainder of the interior space not occupied by the housing being then filled with foam plastics material. By virtue of the arrangement of the housing 40 around the channel 34, part of the housing 40 closes the opening in the channel produced by removal of wall portion 39a, the opening in the other channel being closed, as in the previous embodiment, by the material 31.

It will be appreciated that the plastics material 31 must be compatible with the plastics material 32, 33 because the two are in contact and that the same plastics material could be used to fill the interior 22 as is used to fill the channels 34, 35. However since a structurally strong plastics material is required for filling the channels 34, 35 this will create a more expensive element. If the structurally strong plastics material is used to fill the interior of the hollow section, while inwardly projecting walls may still be provided for keying the plastics material in the member, the channels 34, 35 may be omitted, the member 21 being formed with continuous walls 25, 26, portions of which are then cut away to provide the thermal breaks when the interior has been filled with the plastics material.

In the foregoing two specific types of plastics materials have been described for filling the hollow interior of the element and for bridging the walls of the element at the breaks. It will be appreciated that other materials may be used. The basic requirements for the plastics materials are that, for filling the hollow interior of the element, the material should provide a

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degree of thermal insulation which is preferably better than that of the air which it displaces and should have sufficient strength merely to hold the two parts of the element together in their correct relative orientation

5 after the breaks 38, 39 have been made, while channels 34, 35 are being filled and while the filling sets. In the foregoing embodiments, the material filling the hollow interior of the element is mechanically keyed by the channels in the embodiment of Figure 7 or to a

10 lesser extent in the embodiment of Figure 11 by lugs. A mechanical key may not be necessary where the material adheres sufficiently to the walls of the element. For the plastics material filling the channels 34, 35, its thermal transmission rate must be substantially lower

15 than that of the material of which the element is made, for example aluminium, and it must have sufficient structural strength to fulfil the requirements of a particular design and for the full range of temperatures for which the design is intended.

20

CLAIMS:

1. A method of making an elongate frame element comprising providing an elongate metal frame member (21) having a hollow interior (22) in part bounded by walls (25,26) interconnecting the sides (23,24) of the member, the walls being provided with breaks (38,39) along the length thereof, the breaks being bridged with plastics material; characterised in that the hollow interior (22) of the member is closed, thermally insulating plastics material (31;31,10) is provided in the hollow interior so as to interconnect the sides (23,24) of the member, and portions (38_a,39_a) of the interconnecting walls are removed along the length of the member so as to provide discontinuities (38,39) therein forming the thermal breaks.

2. A method as claimed in claim 1, characterised in that the plastics material (31; 31,10) provided in the interior of the member structurally interconnects the sides (23,24) of the frame element.

3. A method as claimed in claim 1, characterised in that the member is provided with channels (34,35) in each said wall, each channel having a single opening (36,37) opposite the portion of the said wall to be removed, the portion of the said wall being removed after the hollow interior has been provided with the thermally insulating plastics material to create the thermal break in that wall, and the channels are then filled with thermally insulating plastics material (32,33).

4. A method as claimed in claim 3, characterised in that plastics material provided in the hollow interior of the member closes the openings in the channels formed by removal of the portions of the said walls.

5. A method as claimed in either claim 3 or claim 4, characterised in that the thermally insulating plastics material (32,33) filling the channels (34,35) has a high structural strength and structurally interconnects the sides of the frame element.

6. A method as claimed in claim 5, characterised in that thermally insulating plastics material provided in the hollow interior (31) has a lesser structural strength than that filling the channels, but sufficient to hold the sides of the member in their original orientation during filling of the channels with plastics material.

7. A method as claimed in any one of claims 3 to 5, characterised in that the channels (34,35) are shaped to key the plastics material therein.

8. A method as claimed in any one of claims 3 to 7, characterised in that the frame member comprises a pair of generally parallel first side walls (23,24), and a pair of generally parallel second walls (25,26) perpendicular to and interconnecting the first walls, a said channel (34,35) being provided in each second wall, the channels being arranged within the rectangle bounded by the first and second walls and having their openings (36,37) in the second walls.

9. A method as claimed in claim 8, characterised in that the hollow interior (22) of the member is defined by the first walls (23,24), the second walls (25,26) and the channels (34,35) and is completely filled with thermally insulating foam plastics material (31).

10. A method as claimed in claim 8, characterised in that an elongate casing (10) of thermally insulating plastics material is provided within the interior (22) of the frame member and the remainder of the interior is completely filled with thermally insulating foam plastics material (31).

11. A frame element made by a method according to any one of claims 1 to 9.

12. A frame element comprising an elongate metal frame member (21) having a hollow interior (22) in part bounded by walls (25,26) interconnecting the sides (23,24) of the member, the walls being provided with breaks (38,39) along the length thereof, the breaks being bridged with plastics material (31; 31,10), characterised in that the hollow interior (22) of the member is provided with thermally insulating plastics material interconnecting the sides of the member.

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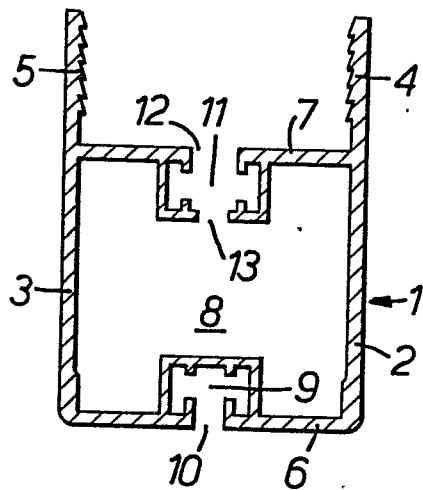


FIG. 1.

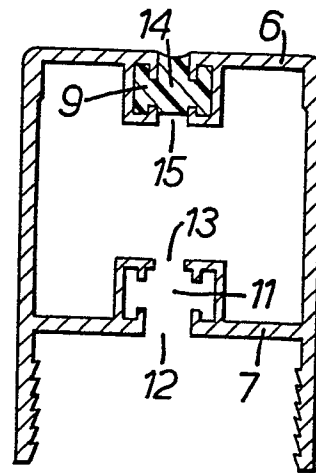


FIG. 3.

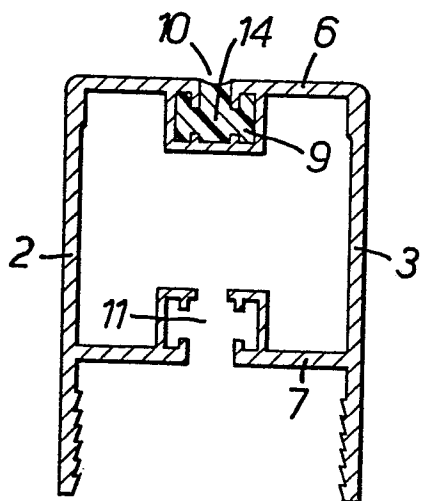


FIG. 2.

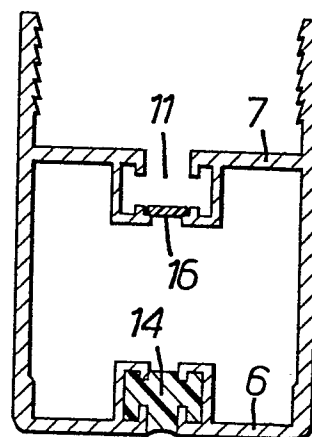


FIG. 4.

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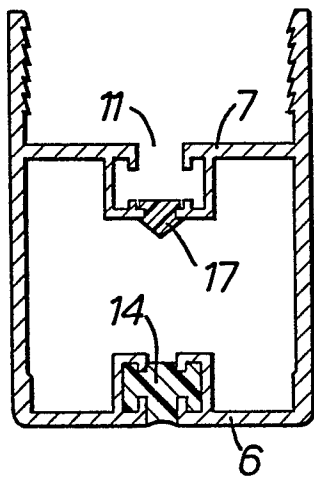


FIG. 5.

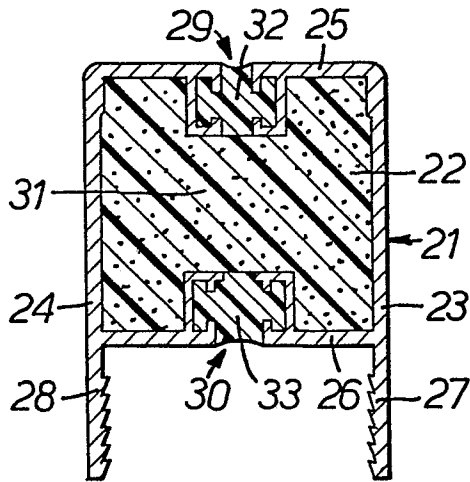


FIG. 7.

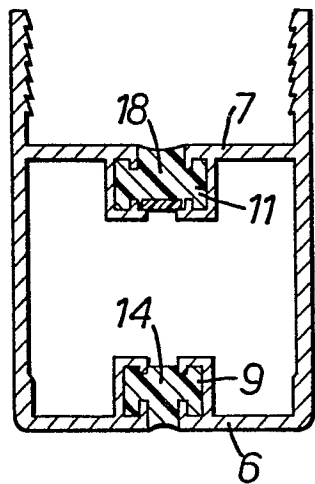


FIG. 6.

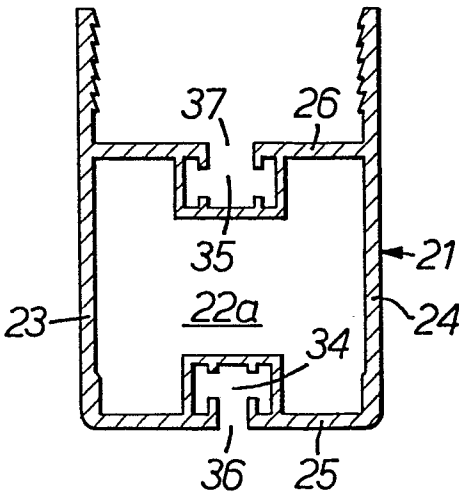


FIG. 8.

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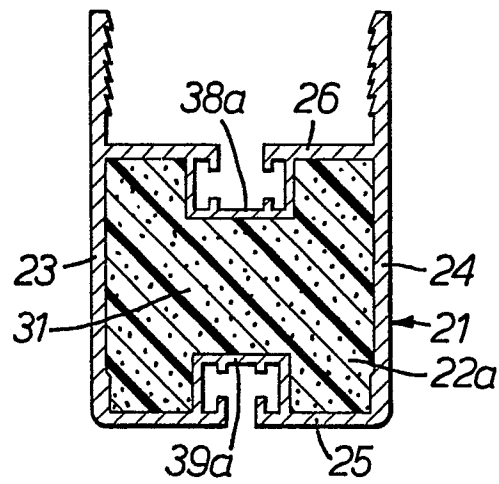


FIG. 9.

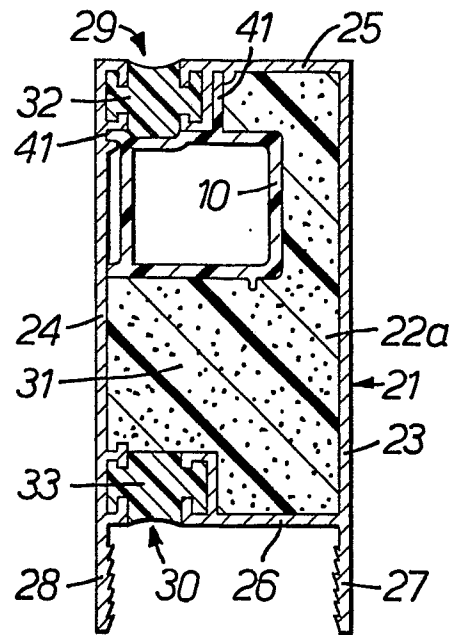


FIG. 11.

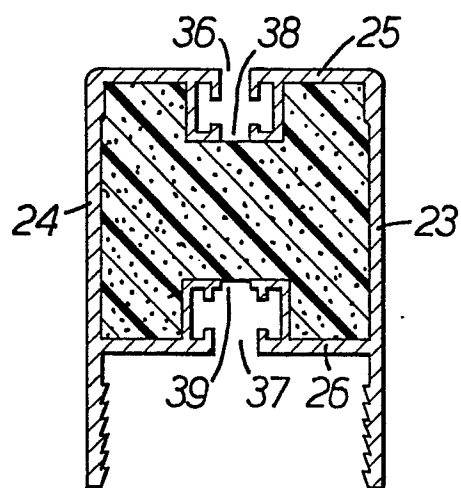


FIG. 10.

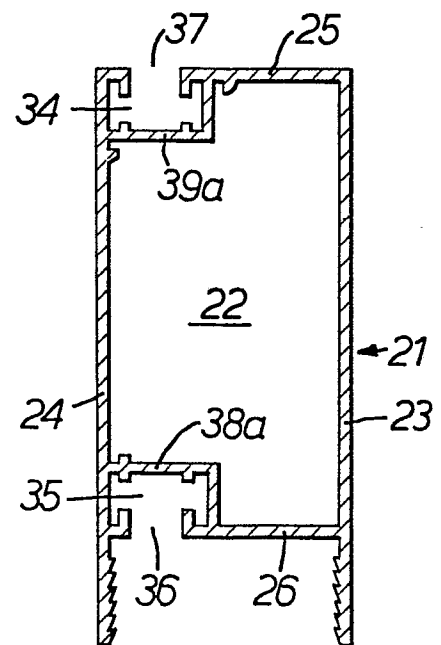


FIG. 12.



European Patent
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EUROPEAN SEARCH REPORT

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Application number

EP 82 30 0756.2

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	DE - C - 1 174 483 (J. & A. ERBSLÖH) * fig. 1 to 3 *	1,5,7, 12	E 06 B 3/26 F 16 S 3/02
A	DE - B1 - 2 904 192 (E. HUECK) * claims; fig. *	1,5,7 8,12	
A	DE - A1 - 2 531 221 (WIELAND-WERKE AG.) * claim 1; fig. *	1,2,7	
A	DE - A1 - 2 917 578 (M. MÜHLE) * claim 1; fig. 2, 3 *	1,2, 5,7	TECHNICAL FIELDS SEARCHED (Int.Cl.3) E 06 B 3/26 F 16 S 3/00
A	DE - B2 - 2 536 666 (H. NAHR)		
A	DE - A1 - 2 543 969 (WIELAND-WERKE AG.)		
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☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search Berlin		Date of completion of the search 04-05-1982	Examiner WUNDERLICH