



Europäisches Patentamt  
 European Patent Office  
 Office européen des brevets



(11) **EP 1 054 313 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**22.11.2000 Bulletin 2000/47**

(51) Int. Cl.<sup>7</sup>: **G05D 23/24, B60H 1/22**

(21) Application number: **00108752.7**

(22) Date of filing: **25.04.2000**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
 MC NL PT SE**  
 Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventor: **Riehl, Horst**  
**96476 Rodach (DE)**

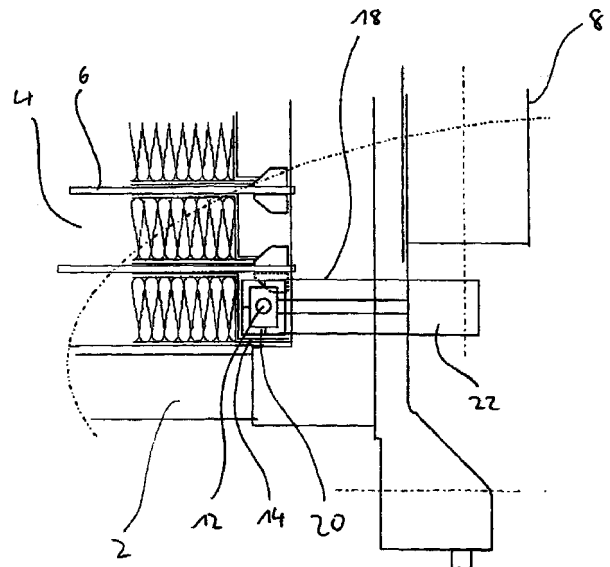
(30) Priority: **26.04.1999 DE 19918906**

(74) Representative: **Lemaire, Marc**  
**Valeo Management Services,**  
**Propriété Industrielle,**  
**2, rue André Boule,**  
**B.P. 150**  
**94017 Créteil (FR)**

(71) Applicant:  
**Valeo Klimasysteme GmbH**  
**96476 Rodach (DE)**

(54) **Temperature sensor**

(57) What is provided is a PTC heating register with a frame, at least one radiator element arranged in the frame, at least one PTC element and at least one temperature sensor for detecting the air entry temperature at the PTC heating register or the air exit temperature at the heat exchanger, the temperature sensor being arranged in a gap between the end of the at least one radiator element and the frame of the PTC heating register.



**FIG. 4**

**EP 1 054 313 A1**

## Description

**[0001]** The present invention relates to a PTC heating register, as described in the preamble of Claim 1.

**[0002]** It is known to use a technique for detecting the air exit temperature of a heat exchanger or the air entry temperature of a PTC heating register with at least one temperature sensor, which is arranged in the space between the heat exchanger and the PTC heating register.

**[0003]** The intervening space between the heat exchanger and the PTC heating register should be kept as small as possible, in order to achieve the smallest possible overall structural dimensions for the arrangement. This requirement for a small intervening space carries a disadvantage in that, in these circumstances, the temperature sensor has to be positioned very close to the PTC heating elements or strips. In the light of the fact that the temperature of the PTC heating register can reach as much as 160°C, it is therefore unavoidable that the radiant heat also influences the temperature sensor, such that the air temperature measurement from the sensor can be distorted to an undesirable extent. What is more, it has to be seen as a disadvantage that, with the known arrangement, additional openings and fastening devices have to be provided for the sensor in a housing of the heating/air conditioning installation, which represents a not inconsiderable additional manufacturing outlay.

**[0004]** The object of the present invention is therefore to provide a PTC heating register, which makes it possible, without distortion, to detect the air exit temperature from a heat exchanger or the air entry temperature of a PTC heating register with at least one temperature sensor, and which can be produced and used in a simple and economical way.

**[0005]** This object is achieved via the characterising features of the independent Claim 1, expedient embodiments being described via the features of the dependent claims.

**[0006]** A PTC heating register is provided with at least one strip as well as a frame, in which, according to the provisions of the invention, at least one temperature sensor which detects the air entry temperature at the PTC heating register or the air exit temperature at the heat exchanger, is integrated into the PTC heating register in a gap between the strip and the frame. The connector for the temperature sensor in this case is arranged at the same level as the connector of the PTC heating register, such that integration is made possible.

**[0007]** The striking advantage of the arrangement according to the provisions of the present invention can be seen in that distortion of the measurement value detected with the help of the temperature sensor due to radiant heat from the PTC heating register can be avoided, in that the temperature sensor takes up a specific position in the air stream, in that no undesirable piercings and/or fastenings are required on the heat-

ing/air conditioning installation, because the sensor, together with its housing, is fastened to the frame of the PTC heating register, and in that in the case of two or more temperature sensors, by appropriate arrangement of said sensors, the leads required can be laid in the frame of the PTC heating register, which markedly reduces the manufacturing cost as compared with traditional arrangements.

**[0008]** With the PTC heating register according to the provisions of the present invention, combined connectors for supplying the PTC heating register as well as for the signal from the temperature sensors 12 can be provided, in which case screening can be provided between the connector region for the temperature sensors and that for the supply in order to avoid electromagnetic interference effects.

**[0009]** What is more, electronic control of the PTC heating register can be provided integrated into the register, this preferably being provided in the area of the electrical connections.

**[0010]** Finally, a combined connector for the low-power control currents and the power electronics for driving the radiator elements can be provided, the electronic control installation for the radiator elements preferably containing low-power electronics and/or a microcontroller. The fact that the low currents are in the same connector as the power electronics poses no problem as regards electromagnetic compatibility. In fact, the wiring harness can be routed jointly over a certain distance. The microcontroller locally processes information from the temperature sensors. The processing may serve for preparation for transmission on a network, correcting of information or even more complicated tasks, such as the correcting of the electrical control of the register. As regards its environment, the register module behaves as an autonomous element, which is self-regulating, so as to deliver a particular thermal power.

**[0011]** Further properties, features and advantages of the present invention emerge from the following description of a preferred embodiment, in connection with the attached drawings, in which:

Fig. 1 shows the top view of an embodiment of a PTC heating register;

Fig. 2 shows the side view of the embodiment according to Fig. 1;

Fig. 3 shows an enlarged view of the integrated temperature sensor of the embodiment according to Fig. 1;

Fig. 4 shows an enlarged partial top view of the embodiment according to Fig. 1; and

Fig. 5 shows an enlarged partial side view of the embodiment according to Fig. 1.

**[0012]** An embodiment of a PTC heating register with an integrated air temperature sensor is depicted in Fig. 1. A frame 2 can be recognised, in which radiator

elements, here in the shape of metal strips 4, are accommodated between which PTC elements 6 are arranged, which extend parallel to the radiator elements 4. On the right-hand side of the frame 2 can be seen the connector housing 8, which is configured and arranged in such a way that a lower region on the frame is left free, that is to say not covered by the connector housing 8. In this free region the frame 2 exhibits an opening 10, through which a temperature sensor 12, which detects the air temperature and is built into a sensor housing 18, can be inserted and arranged in a gap 14 between the end of the strips 4 and the frame 2. Besides the embodiment shown in Fig. 1, a number of temperature sensors can be provided in the gaps between the ends of the strips 4 and the frame 2; in the embodiment depicted, for example, in the region 16 opposite the temperature sensor 12. For a heating/air-conditioning installation with water-side temperature adjustment right and left, the temperature detection is advantageously by a second temperature sensor in the part of the frame located opposite; the lead is advantageously led in the long side of the frame 2 to the first temperature sensor 12 onto a combined connector 22.

**[0013]** Fig. 2 shows a side view of the embodiment according to Fig. 1, similar elements being designated with the same reference number. The opening 10 in the frame 2 should particularly be noted; through it the temperature sensor 12 can be inserted into the gap 14 between the end of the strips 4 and the frame 2.

**[0014]** Finally, the temperature sensor 12, together with the housing 18 surrounding it, is depicted in an enlarged view in Fig. 3. The temperature sensor 12 is surrounded by a single- or multi-layer radiant heat and convection shielding 20, which serves the purpose of reducing or even completely eliminating even the slightest remaining heating. The temperature sensor 12 is in this case provided with a preferably annular or rectangular radiant heat and convection shielding 20. On the side of the sensor housing 18 lying opposite the sensor 12 itself a connector 22 is provided on the housing, with which the temperature sensor 12 can be connected to a corresponding measurement device (not depicted) or control electronics. The sensor is fixed in the frame 2, on the connector side of the PTC heating register, preferably by means of a plug connection in such a way that, for servicing, it can easily be fitted and removed. Furthermore it is advantageous for the temperature sensor 12, as depicted, to be placed as close as possible to the air inlet.

**[0015]** Fig. 4 shows a partial top view of the embodiment of the PTC heating register according to Fig. 1. The regions of the frame 2, of the strips 4 as well as of the PTC elements 6 are depicted in which the temperature sensor 12 together with its housing 18, the radiant heat and convection shielding 20 as well as the connector 22 is arranged. In Fig. 4 can clearly be seen, in particular, the gap 14 formed between the end of the strips 4 and the frame 2, which makes use of the arrangement

according to the provisions of the present invention, so as to arrange the temperature sensor 12 in a suitable position requiring a particularly small space.

**[0016]** Finally, Fig. 5 shows the region depicted in Fig. 4 in a side view, with the frame 2, the connector housing 8 as well as the opening 10 for accommodating the temperature sensor housing 18.

### Claims

1. PTC heating register with a frame (2), at least one radiator element (4) arranged in the frame, at least one PTC element (6) and at least one temperature sensor (12) for detecting the air entry temperature at the PTC heating register or the air exit temperature at the heat exchanger, characterised in that the temperature sensor (12) is arranged in a gap (14) between the end of the at least one radiator element (4) and the frame (2) of the PTC heating register.
2. PTC heating register according to Claim 1, characterised in that the temperature sensor (12) is accommodated in a housing (18) with a connector (22) directed outwards beyond the frame (2).
3. PTC heating register according to Claim 2, characterised in that the connector (22) is arranged at the same level as the connectors (8) of the PTC heating register.
4. PTC heating register according to Claim 2 or 3, characterised in that the housing (18) is constructed so as to be releasable from the frame (2).
5. PTC heating register according to one of the preceding claims, characterised in that the leads required for several temperature sensors (12) are laid in the frame (2) of the PTC heating register.
6. PTC heating register according to one of the preceding claims, characterised in that the radiator elements are constructed in the form of metal strips (4).
7. PTC heating register according to one of the preceding claims, characterised in that the PTC-elements (6) are arranged between the radiator elements (4).
8. PTC heating register according to one of the preceding claims, characterised in that the frame (2) has an opening (10), through which the temperature sensor (12) is inserted and arranged.
9. PTC heating register according to one of the preceding claims, characterised in that the temperature sensor (12) is surrounded by radiant heat and

convection shielding (20).

10. PTC heating register according to Claim 9, characterised in that the radiant heat and convection shielding (20) is a single layer. 5
11. PTC heating register according to Claim 9, characterised in that the radiant heat and convection shielding (20) is in several layers. 10
12. PTC heating register according to one of Claims 9 to 11, characterised in that the radiant heat and convection shielding (20) is annular.
13. PTC heating register according to one of Claims 9 to 11, characterised in that the radiant heat and convection shielding (20) is rectangular. 15
14. PTC heating register according to one of the preceding claims, characterised in that combined connectors are provided for supplying the PTC heating register as well as for the signal from the temperature sensors (12). 20
15. PTC heating register according to Claim 14, characterised in that screening is provided between the connector region for the temperature sensors and that for the power supply, in order to avoid electromagnetic interference effects. 25
16. PTC heating register according to one of the preceding claims, characterised in that integrated electronic control of the PTC heating register is provided. 30
17. PTC heating register according to Claim 16, characterised in that the electronic control is provided in the region of the electrical connections. 35
18. PTC heating register according to one of Claims 16 and 17, characterised in that a combined connector is provided for the low-power control currents and the power electronics for controlling the radiator elements. 40
19. PTC heating register according to Claim 18, characterised in that the electronic control unit for the radiator elements contains low-power electronics and/or a microcontroller. 45

50

55

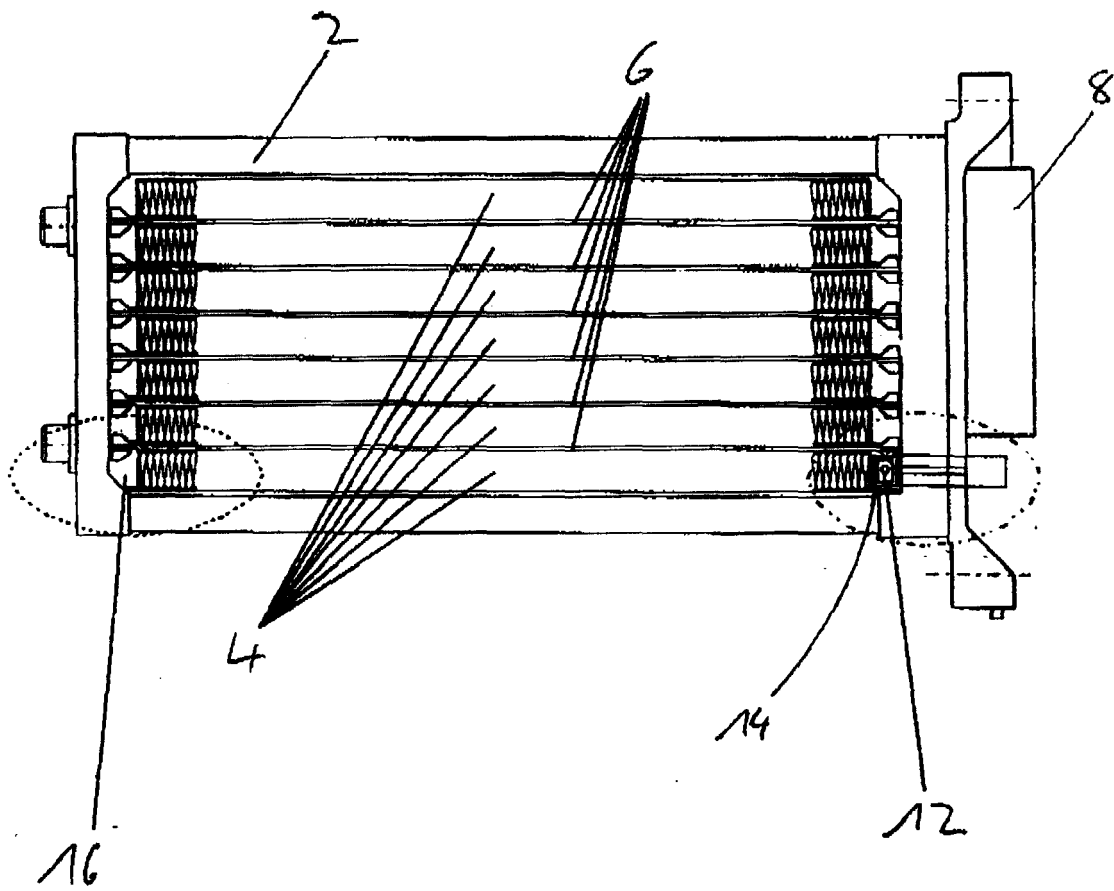


FIG. 1

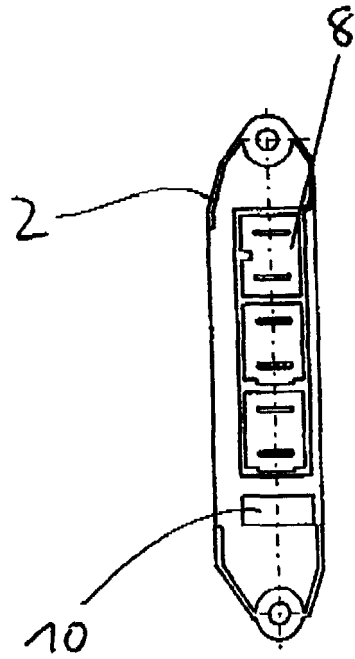


FIG. 2

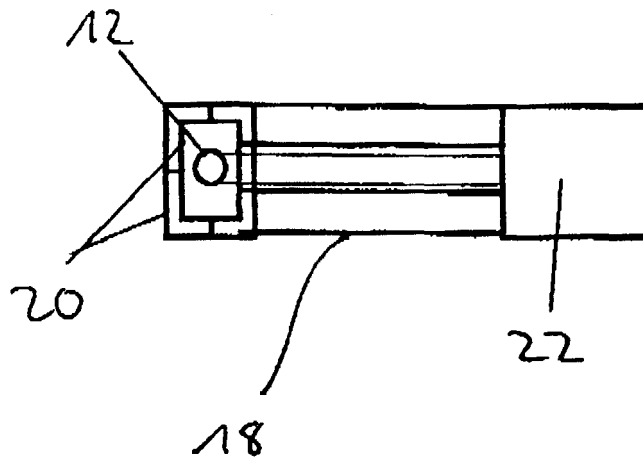


FIG. 3

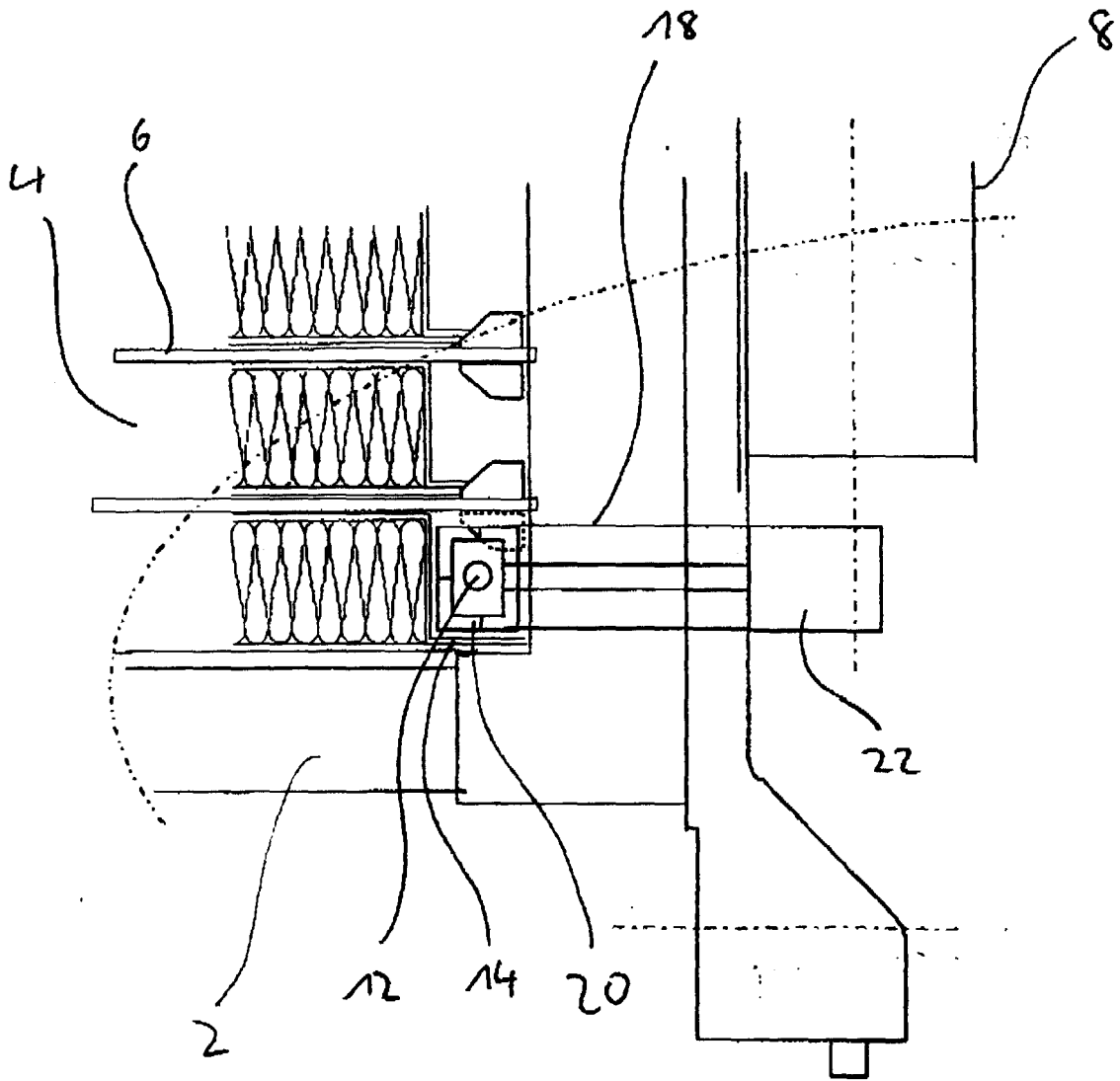


FIG. 4

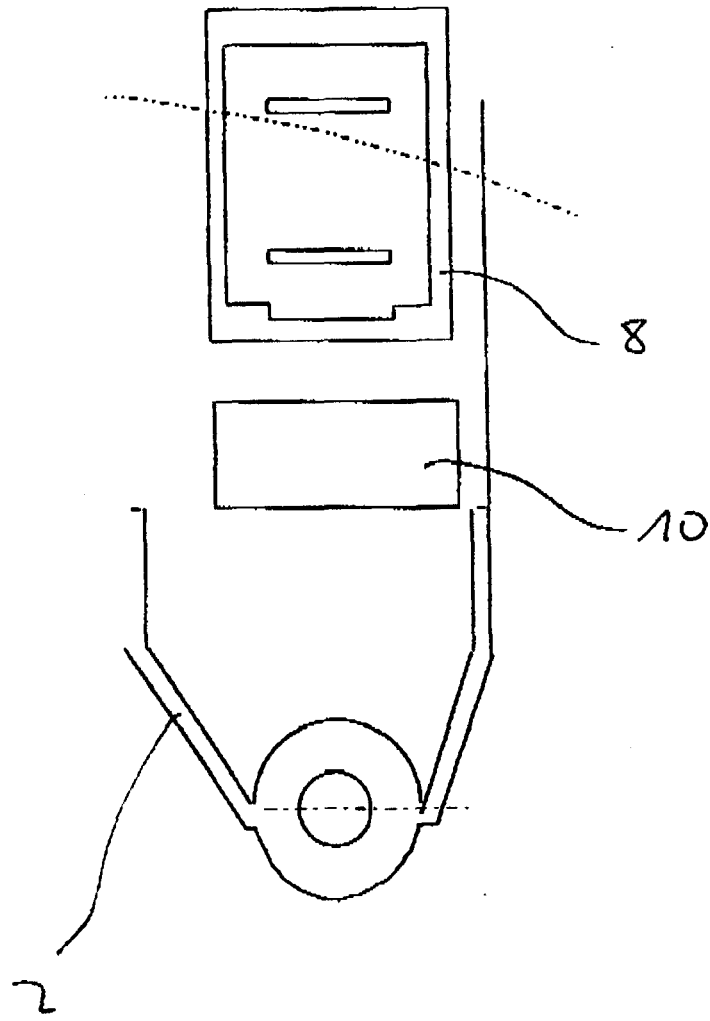


FIG. 5





European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number  
EP 00 10 8752

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 963 716 A (VAN DEN ELST FREDRIK M N ET AL) 16 October 1990 (1990-10-16) * abstract * * column 2, line 60 - column 4, line 49; figures 1,3,4 *	1	G05D23/24 B60H1/22
A	DE 44 04 345 A (VALEO THERMIQUE HABITACLE) 25 August 1994 (1994-08-25) * abstract * * column 3, line 40 - column 5, line 26; figures 1-3 *	1	
A	FR 2 742 384 A (VALEO CLIMATISATION) 20 June 1997 (1997-06-20) * abstract * * page 5, line 20 - line 22; figures 1-3 *	1	
A	EP 0 243 077 A (FORD WERKE AG ; FORD FRANCE (FR); FORD MOTOR CO (GB); FORD MOTOR CO) 28 October 1987 (1987-10-28) * abstract; figure 1 *	1	
A	DE 197 12 178 A (BEHR GMBH & CO) 24 September 1998 (1998-09-24) * abstract; figure 2 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G05D B60H
The present search report has been drawn up for all claims			
Place of search <b>MUNICH</b>		Date of completion of the search <b>2 August 2000</b>	Examiner <b>Helot, H</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 10 8752

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02-08-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4963716 A	16-10-1990	JP 1009017 A	12-01-1989
DE 4404345 A	25-08-1994	FR 2701757 A	26-08-1994
FR 2742384 A	20-06-1997	NONE	
EP 0243077 A	28-10-1987	JP 62295381 A	22-12-1987
DE 19712178 A	24-09-1998	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82