

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952

SPRISON, FERGUSON

614321

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made for a patent for an invention entitled:

Use of a Solid Phenol Formaldehyde Condensation Product as a Hardener in Epoxy Resin Mixtures and Process for making a Powder Paint from Said Mixtures

I/We, 1. Helmut Weber
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do solemnly and sincerely declare as follows:-

1. I am/We are authorised by Isovolta Österreichische Isolierstoffwerke Aktiengesellschaft, the applicant for the patent to make this declaration on its behalf.
2. The basic application as defined by Section 141 of the Act was made in Austria on 30 November 1987 by Isovolta Österreichische Isolierstoffwerke Aktiengesellschaft
3. Walter Eichberger and Josef H. Jilek, of Max-Margulesweg 14, A-2380 Perchtoldsdorf, Austria and Mariengasse 27, A-1170 Vienna, Austria [respectively], are the actual inventors of the invention and the facts upon which the applicant is entitled to make the application are as follows: Isovolta Österreichische Isolierstoffwerke Aktiengesellschaft is entitled by Contract of Employment between the inventors as employees and Isovolta Österreichische Isolierstoffwerke Aktiengesellschaft as employer, as a person who would be entitled to have the patent assigned to it if a patent were granted upon an application made by the inventors
4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Wr. Neudorf this 12th day of September 1989

Signature of Declarant

Helmut Weber Rolf Köhler

TO: THE COMMISSIONER OF PATENTS
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(12) PATENT ABRIDGMENT (11) Document No. AU-B-28058/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 614321

(54) Title
USE OF A SOLID PHENOL FORMALDEHYDE CONDENSATION PRODUCT AS A HARDENER IN EPOXY RESIN MIXTURES AND PROCESS FOR MAKING A POWDER PAINT FROM SAID MIXTURES

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(56) Prior Art Documents
DE 1138542
JP 62-135574
JP 59-226067

(57) Claim

1. Process for preparing an epoxy resin coating material comprising the steps of a) preparing a phenol-formaldehyde condensation product which has a Kofler melting point greater than 75°C, a glass transition temperature, determined by DSC, greater than 55°C, and a hydroxy equivalent in the range between 100 and 110, and of b) hot mixing said phenol-formaldehyde condensation product as a hardener with an epoxy resin having an epoxy equivalent in the range between 500 and 2,500, being for the most part a bifunctional epoxy resin, and of c) cooling said mixture and of d) converting said mixture into powdered form.

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PCT

W: AOJP DATE 27/07/89 PCT NUMBER PCT/AT88/00105

INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

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(21) Internationales Aktenzeichen: PCT/AT88/00105 (22) Internationales Anmeldedatum: 30. November 1988 (30.11.88) (31) Prioritätsaktenzeichen: A 3130/87 (32) Prioritätsdatum: 30. November 1987 (30.11.87) (33) Prioritätsland: AT (71) Anmelder (für alle Bestimmungsstaaten ausser US): ISO-VOLTA ÖSTERREICHISCHE ISOLIERSTOFFWERKE AKTIENGESELLSCHAFT [AT/AT]; Industriezentrum Nö-Süd, A-2355 Wiener Neudorf (AT). (72) Erfinder;und (75) Erfinder/Anmelder (nur für US): EICHBERGER, Walter [AT/AT]; Max-Margulesweg 14, A-2380 Perchtoldsdorf (AT). JILEK, Josef, H. [AT/AT]; Mariengasse 27, A-1170 Wien (AT).	(81) Bestimmungsstaaten: AT (europäisches Patent), AU, BE (europäisches Patent), CH (europäisches Patent), DE (europäisches Patent), FI, FR (europäisches Patent), GB (europäisches Patent), IT (europäisches Patent), JP, LU (europäisches Patent), NL (europäisches Patent), SE (europäisches Patent), US. Veröffentlicht Mit internationalem Recherchenbericht.	

(54) Title: USE OF A SOLID PHENOL FORMALDEHYDE CONDENSATION PRODUCT AS A HARDENER IN EPOXY RESIN MIXTURES AND PROCESS FOR MAKING A POWDER PAINT FROM SAID MIXTURES

(54) Bezeichnung: VERWENDUNG EINES FESTEN PHENOL-FORMALDEHYDKONDENSATIONSPRODUKTES ALS HÄRTER IN EPOXYDHARZGEMISCHEN, SOWIE VERFAHREN ZUR HERSTELLUNG EINES PULVERLACKES AUS SOLCHEN EPOXYDHARZGEMISCHEN

(57) Abstract

A phenol formaldehyde condensation product containing on average more than two aromatic hydroxyl groups per molecule, having a hydroxy equivalent in the range 100 - 110 and a Kofler melting point greater than 75°C and a glass transition point determined by differential scanning calorimetry (DSC) greater than 55°C, is used as a phenolic hardener in epoxy resin powder paints consisting mainly of a bifunctional epoxy resin with an epoxide equivalent between 500 and 2500. Paint coatings of these powder paints have the same good mechanical properties as similar known powder paints and greater chemical resistance.

(57) Zusammenfassung

Ein Phenol-Formaldehydkondensationsprodukt, das im Durchschnitt mehr als zwei aromatische Hydroxylgruppen pro Molekül enthält, das ein Hydroxyäquivalentgewicht im Bereich von 100-110 besitzt und das einen Koflerschmelzpunkt von höher als 75°C sowie einen mittels DSC bestimmten Glasumwandlungspunkt von höher als 55°C aufweist, wird als phenolischer Härter in Epoxydharz-Pulverlacken verwendet, die zumindest zum größten Teil aus einem bifunktionellen Epoxydharz mit einem Epoxydäquivalentgewicht zwischen 500 und 2500 bestehen. Lackbeschichtungen aus diesen Pulverlacken haben gegenüber bekannten ähnlichen Pulverlacken bei etwa gleich guten mechanischen Eigenschaften eine höhere Chemikalienbeständigkeit.

Use of a solid phenol-formaldehyde condensation product as hardener in epoxy resin mixtures, and process for the preparation of a powder coating from epoxy resin mixtures of this type

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Technical field

The invention relates to the use of a phenol-formaldehyde condensation product which is solid at room temperature and which contains, on average, more than two aromatic hydroxyl groups per molecule, as hardener in epoxy resin mixtures. It relates furthermore to a process for the preparation of a powder coating made from epoxy resin mixtures of this type.

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Prior art

The use of phenol-formaldehyde condensation products which are solid at room temperature, and which contain, on average, more than two aromatic hydroxyl groups per molecule and consequently comprise novolaks for the most part, has been disclosed in AT-PS 225,426, which describes moulding compositions which contain for example as resin components a phenol novolak polyglycidyl ether and a phenol novolak, the latter acting as hardener.

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Moreover, epoxy resin mixtures which contain epoxydized novolaks are known as the base for epoxy resin powder coatings. Powder coatings of this type are used for example for internal and external coatings on steel components as protection against corrosion and have high solvent resistance and chemical resistance. Here, however, such coatings are generally more brittle the greater their chemical resistance.

Description of the invention

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The object upon which the invention is based is initially to provide an advantageous use of the phenol-formaldehyde condensation product initially mentioned in the description, as hardener for epoxy resin mixtures, particularly for those which are used as a base for a powder coating, the chemical resistance in the end product, thus particularly in the powder coating being improved while maintaining approximately identical



mechanical properties as in similar known powder coatings.

According to a first embodiment of the present invention there is provided a process for preparing an epoxy resin coating material comprising the steps of a) preparing a phenol-formaldehyde condensation product which has a Kofler melting point greater than 75°C, a glass transition temperature, determined by DSC, greater than 55°C, and a hydroxy equivalent in the range between 100 and 110, and of b) hot mixing said phenol-formaldehyde condensation product as a hardener with an epoxy resin having an epoxy equivalent in the range between 500 and 2,500, being for the most part a bifunctional epoxy resin, and of c) cooling said mixture and of d) converting said mixture into powdered form.

This object upon which the invention is based is achieved in the use according to the invention, in that the solid phenol-formaldehyde condensation product used has a Kofler melting point greater than 75°C, but preferably greater than 80°C, and a glass transition temperature, determined by DSC, greater than 55°C, but preferably greater than 60°C, and has a hydroxy equivalent in the range 100-110 and in that it is used as hardener for an epoxy resin having an epoxy equivalent in the range between 500 and 2,500, and comprising for the most part a bifunctional epoxy resin. In this case, the hardener according to the invention may advantageously be substantially free from phenol (monohydroxybenzene).

In an advantageous embodiment of the invention the phenol-formaldehyde condensation product used as hardener is one whose preparation is carried out in two steps, in which in the first step phenol and formaldehyde are mixed in aqueous solution in the molar ratio phenol:formaldehyde in the range of about 1:0.3 to 1:0.7, adjustment to an acid medium is made by adding a volatile acid, and the whole is kept at an elevated temperature until the condensation reaction is complete, that then - in a second step - formaldehyde is added to the reaction product of the first step, which comprises phenol to a small extent and otherwise predominantly dihydroxydiphenylmethane, the amount of formaldehyde being such that the molar ratio of phenol used in the first step:total amount of formaldehyde used in both steps is in the range of about 1:0.6 to 1:0.95, and the condensation reaction is continued at elevated temperature and completed, and that the condensation product is separated from the water and is allowed to solidify outside the reaction vessel and is comminuted. Here, it may be advantageous after completion of the condensation reaction and removal of the water, to remove the remaining phenol (monohydroxybenzene) at least for the most part by steam distillation.

According to a further advantageous embodiment of the invention the phenol-formaldehyde condensation product is used as hardener in an epoxy resin powder coating.

5 Finally, the invention relates to a process for the preparation of an epoxy resin powder coating with hardener-use according to the invention, which is characterized in that the solid phenol-formaldehyde condensation product used as hardener is extruded with the epoxy
10 resin and optionally with the other components of the powdered resin formulation in the form of a melt, the extrudate is cooled and converted into the powder coating by grinding.

The applicant has now found that coatings which
15 comprise the powder coating prepared according to the invention have a greater chemical resistance than the known coatings made from a powder coating based on an epoxydized novolak, while having approximately identically high toughness (brittleness). It has moreover been
20 shown that the melting points of the powder coatings prepared according to the invention may be not insignificantly higher than in the case of the known powder coatings with epoxydized novolaks which have been mentioned. This has the advantage that during storage and/or
25 transport of a powder coating of this type, the danger of caking of the powder coating is less than in the case of the known powder coatings which have been mentioned.

Moreover, when the hardener used therein is substantially free from phenol (monohydroxybenzene) the
30 powder coating is particularly suitable for the preparation of coatings which come into contact with foodstuffs or products such as tea, coffee, tobacco etc.

Exemplary embodiment of the invention

In order to prepare the phenol-formaldehyde
35 condensation product, 10 mol of phenol (monohydroxybenzene), 5 mol of 37% strength aqueous formaldehyde solution and 0.01 mol of conc. hydrochloric acid are mixed together at 20-30°C. The mixture is then heated to the reflux temperature (100-102°C), which is to be



maintained for 60 minutes. The mixture which has initially become clear, becomes cloudy after about 20 minutes, the mixture separating into an aqueous layer and a resin layer. After the condensation, the water is distilled off sufficiently until the temperature increases to 120°C. The product which has been dehydrated in this way is cooled to 70°C.

The intermediate which has been prepared in this manner is mixed with another 3 mol of a 37% strength aqueous formaldehyde solution and 0.01 mol of conc. hydrochloric acid and condensed under reflux for a further 1 1/2 hours. After the condensation, the water is distilled off in vacuo, until the product is substantially free from water and the resin melt has reached a temperature of 150°C. The product which has been dehydrated in this way is poured into a tin plate tub, left to solidify and finally comminuted.

This product which is to be used as hardener for epoxy resins has a Kofler melting point of 85°C and a glass transition temperature (measured by DSC) of 62°C and a hydroxy equivalent of 105.

The preparation of two different powder coating formulations is given below, a phenol-formaldehyde condensation product prepared as described above being used as hardener in these formulations. In these formulations, three different commercially available epoxy resins are used, each of which is a bisphenol A-epichlorohydrin epoxy resin, namely

Resin type	Producer	Epoxy equivalent	Additive
XV 302	Ciba-Geigy	610 - 680	Flow control agent added
XB 2874	Ciba-Geigy	750 - 850	More flow control agent added
DER 664U	Dow Chemical	880 - 970	No flow control agent added



The two powder coatings now comprise the formulations I and II having the following components:

Components	I	II
	parts by weight	parts by weight
XV 302	--	1204
DER 664U	1048	--
XB 2874	184	--
Hardener	168	250
Barium sulphate as pigment	300	300
Red iron oxide as pigment	287	287
Aerosil R 972 from Degussa	10	10
as thixotropic agent		
2-Methylimidazole as accelerator	3	3

In order to prepare the powder coatings, the components of the formulations are extruded in the form of melts, the extrudate is cooled and converted into powder coatings by grinding.

For test purposes, the powder coatings are now applied electrostatically to cold rolled sheet steel and cured for 10 min at 200°C. These test finishes now had the following properties.

	I	II
Erichsen flexibility	6.7 mm	6.1 mm
Impact strength (reverse side)	20 inch- pounds	20 inch- pounds
Action of methyl ethyl ketone for 1 min		
effect	no effect	none
Action of N-methyl- pyrrolidone for 5 min		
effect	slightly matt	none
Tg (DSC)	112.6°C	113.0°C

Below, a comparative formulation is now given, in which are used, inter alia,



- 5 - an epoxy resin based on bisphenol A modified with
 epoxidized novolak, type DER 642U from Dow Chemical
 having an epoxy equivalent of 500 to 570 and a
 phenolic hardener, type DEH 81 from Dow Chemical
 having a hydroxy equivalent of 250 and a Kofler
 melting point of 67°C, namely

Parts by weight

DER 642U	818
XB 2874	142
10 DEH 81 (hardener)	438
Barium sulphate	300
Red iron oxide	290
Aerosil R 972	10

15 Test finishes using a powder coating prepared
 from this formulation had the following properties:

Erichsen flexibility	6.7 mm
Impact strength (reverse side)	20 inchpounds
Action of methyl ethyl ketone for 1 min	slightly matt
Action of N-methylpyrrolidone for 5 min	destroyed
20 Tg (DSC)	104.0°C

25 It is thus seen that at approximately identical
 mechanical properties in the finish, these properties
 being characterized by the values for the Erichsen
 flexibility and the impact strength (reverse side), a
 chemical resistance in the conventional powder coating
 according to the comparative formulation is obtained
 which is not insignificantly less than in the case of the
 two formulations I and II of the powder coating prepared
 with the hardener-use according to the invention. More-
30 over, with the formulations I and II, the values of the
 glass transition temperature Tg (DSC) are lower than with
 the comparative formulation.

 Finally, attention is drawn once again to the
 fact that the Kofler melting point is considerably higher
 with the hardener used according to the invention than



with the relevant known phenolic hardeners, which has the advantage, since the hardener is a commercial product, that it has a lesser tendency to cake during transport and storage.

5 In a variant of the preparation of the hardener, after completion of the condensation reaction and the vacuum distillation in the second process step, the hot resin melt is subjected to steam distillation during which the phenol still remaining in the resin melt is
10 substantially removed.

Industrial utility

 Epoxy resin powder coatings which while having equally good mechanical properties as with known powder coatings, have a greater chemical resistance than these,
15 can be prepared from epoxy resin mixtures which have been prepared with the hardener-use according to the invention. These novel powder coatings are used for example for internal and external coatings on steel components such as on fittings or pipes, as a protection against
20 corrosion.



The claims defining the invention are as follows:

1. Process for preparing an epoxy resin coating material comprising the steps of a) preparing a phenol-formaldehyde condensation product which has a Kofler melting point greater than 75°C, a glass transition temperature, determined by DSC, greater than 55°C, and a hydroxy equivalent in the range between 100 and 110, and of b) hot mixing said phenol-formaldehyde condensation product as a hardener with an epoxy resin having an epoxy equivalent in the range between 500 and 2,500, being for the most part a bifunctional epoxy resin, and of c) cooling said mixture and of d) converting said mixture into powdered form.

2. Process according to claim 1, wherein step a) consists of two steps, in which in the first step phenol and formaldehyde are mixed in aqueous solution in the molar ratio in the range from 1:0.3 to 1:0.7, adjustment to an acid medium is made by adding volatile acid, and the whole is kept at an elevated temperature until the condensation reaction is complete, that then - in a second step formaldehyde is added to the reaction product of the first step, which comprises phenol to a small extent and otherwise predominantly dihydroxydiphenylmethane, the amount of formaldehyde being such that the molar ratio of phenol used in the first step to the total amount of formaldehyde used in both steps is in the range of about 1:0.6 to 1:0.95, and the condensation reaction is continued at elevated temperature and completed, and that the condensation product is separated from the water and is allowed to solidify outside the reaction vessel and is comminuted.

3. Process according to claim 2, wherein after completion of the condensation reaction and removal of the water, the remaining phenol (monohydroxybenzene) is removed at least for the most part from the resin melt by steam distillation.

4. Process according to claim 1, wherein the phenol-formaldehyde condensation product prepared according to step a) has a Kofler melting point greater than 80°C and a glass transition temperature determined by DSC greater than 60°C.

5. Process according to claim 1, wherein the phenol-formaldehyde condensation resin prepared according to step a) is substantially free from phenol (monohydroxybenzene).



6. Process according to claim 1, wherein according to step b) the phenol-formaldehyde condensation product is extruded with the epoxy resin and optionally with the other ^{additives} ~~components of the powdered resin formulation~~ in the form of a melt, the extrudate is cooled according to step c) and converted into the powder coating by grinding according to step d).

7. Heat curable resin powder coating processed according to claim 1, wherein said resin powder contains a bifunctional epoxy resin having an epoxy equivalent in the range between 500 and 2500 and a phenol-formaldehyde condensation product having a hydroxy equivalent in the range of 100 - 110 which is solid at room temperature and contains, on average, more than two aromatic hydroxyl groups per molecule, and which has a Kofler melting point greater than 75°C, and a glass transition temperature, determined by DSC, greater than 55°C as a hardening agent.

8. A process for the preparation of an epoxy resin coating material, substantially as hereinbefore described with reference to the Example but excluding the Comparative Formulation.

9. A phenol-formaldehyde condensation product substantially as hereinbefore described with reference to the Example but excluding the Comparative Formulation.

10. An epoxy resin coated material whenever prepared by the process according to any one of claims 1 to 6 or 8.

DATED this TWENTY-THIRD day of APRIL 1991

Isovolta Österreichische Isolierstoffwerke Aktiengesellschaft

Patent Attorneys for the Applicant
SPRUSON & FERGUSON



INTERNATIONAL SEARCH REPORT

International Application No PCT/AT 88/00105

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all:*)

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl⁴ C 09 D 3/58; C 09 D 3/56

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System *

Classification Symbols

Int.Cl⁴ C 08 G; C 08 L

Documentation Searched other than Minimum Documentation
to the extent that such Documents are included in the Fields Searched *

III. DOCUMENTS CONSIDERED TO BE RELEVANT*

Category * Citation of Document, ** with indication, where appropriate, of the relevant passages ** Relevant to Claim No. **

- | | | |
|---|--|--|
| X | Patent Abstracts of Japan, volume 11, No. 365, 1-7
(C-460) (2812), 27 November 1987
& JP, A, 62135574 (NITTO ELECTRIC IND.
CO. LTD) 18 June 1987,
see the whole abstract
-- | |
| X | Patent Abstracts of Japan, volume 9, No. 96, 1-7
(C-278) (1819), 25 April 1985
& JP, A, 59226067 (SUMITOMO DUREZ K.K.)
19 December 1984, see the whole abstract
-- | |
| X | DE, B, 1138542 (REICHHOLD) 25 October 1962, 1-7
see claims; column 2, lines 20-50
----- | |

* Special categories of cited documents: 10

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

23 February 1989 (23.02.89)

Date of Mailing of this International Search Report

23 March 1989 (23.03.89)

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

AT 8800105
SA 25541

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

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen PCT/AT 88/00105

I. KLASSIFIKATION DES ANMELDUNGSGEGENSTANDS (bei mehreren Klassifikationssymbolen sind alle anzugeben) ⁵		
Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC		
Int. Cl. ⁴ C 09 D 3/58; C 09 D 3/56		
II. RECHERCHIERTE SACHGEBIETE		
Recherchierter Mindestprüfstoff ⁷		
Klassifikationssystem	Klassifikationssymbole	
Int. Cl. ⁴	C 08 G; C 08 L	
Recherchierte nicht zum Mindestprüfstoff gehorende Veröffentlichungen, soweit diese unter die recherchierten Sachgebiete fallen ⁸		
III. EINSCHLÄGIGE VERÖFFENTLICHUNGEN⁹		
Art*	Kennzeichnung der Veröffentlichung ¹¹ , soweit erforderlich unter Angabe der maßgeblichen Teile ¹²	Betr. Anspruch Nr. ¹³
X	Patent Abstracts of Japan, Band 11, Nr. 365, (C-460)(2812), 27. November 1987 & JP, A, 62135574 (NITTO ELECTRIC IND. CO. LTD) 18. Juni 1987, siehe die ganze Zusammenfassung	1-7
X	Patent Abstracts of Japan, Band 9, Nr. 96, (C-278)(1819), 25. April 1985 & JP, A, 59226067 (SUMITOMO DUREZ K.K.) 19. Dezember 1984, siehe die ganze Zusammenfassung	1-7
X	DE, B, 1138542 (REICHHOLD) 25. Oktober 1962, siehe Patentansprüche; Spalte 2, Zeilen 20-50	1-7

* Besondere Kategorien von angegebenen Veröffentlichungen¹⁰: "A" Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist "E" älteres Dokument, das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist "L" Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt) "O" Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht "P" Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist "T" Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist "X" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden "Y" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann naheliegend ist "&" Veröffentlichung, die Mitglied derselben Patentfamilie ist		
IV. BESCHEINIGUNG		
Datum des Abschlusses der internationalen Recherche	Absendedatum des internationalen Recherchenberichts	
23. Februar 1989	26.03.89	
Internationale Recherchenbehörde	Unterschrift des Bevollmächtigten Bediensteten	
Europäisches Patentamt	 P.C.G. VAN DER PUTTEN	

ANHANG ZUM INTERNATIONALEN RECHERCHENBERICHT ÜBER DIE INTERNATIONALE PATENTANMELDUNG NR.

AT 8800105
SA 25541

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben.

Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am 10/03/89.
Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
DE-B- 1138542		Keine	