

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 5 May 2017**

Case Number: T 2095/14 - 3.3.03

Application Number: 08727715.8

Publication Number: 2115012

IPC: C08C19/22, C08F8/30

Language of the proceedings: EN

Title of invention:

METHOD OF BONDING PERFLUOROELASTOMERIC MATERIALS TO A SURFACE

Applicant:

GREENE, TWEED OF DELAWARE, INC.

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - all requests (no)



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 2095/14 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 5 May 2017

Appellant: GREENE, TWEED OF DELAWARE, INC.
(Applicant) 1105 North Market Street,
Suite 1300
Wilmington, DE 19801 (US)

Representative: Petraz, Gilberto Luigi
GLP S.r.l.
Viale Europa Unita, 171
33100 Udine (IT)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted on 20 February
2014 refusing European patent application No.
08727715.8 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
C. Brandt

Summary of Facts and Submissions

- I. The appeal by the applicant lies against the decision of the Examining Division posted on 20 February 2014 refusing European patent application No. 08727715.8.
- II. The decision of the examining division was based on a main request filed on 25 October 2013. It was held therein that the main request lacked an inventive step in view of the closest prior art D12 (US 5 008 340) in view of D10 (US 5 252 401).

Claim 1 of that request read as follows:

"1. A method of bonding a perfluoroelastomer material to first surface (13a, 13b; 22a, 22b), comprising:
(a) contacting a first surface with a bonding agent comprising a curable perfluoropolymer and a curing agent, wherein the bonding agent is a solution prepared by dissolving the curable perfluoroelastomer and the curing agent in a solvent; and
(b) curing the bonding agent to form a perfluoroelastomer material that is bonded to the first surface;
characterized in that the first surface is a surface of a perfluoroelastomer member and the perfluoroelastomer formed is a perfluoroelastomer weld and in that step (a) further comprises placing the bonding agent also in contact with a second surface and step (b) further comprises curing the bonding agent to form a perfluoroelastomer weld between the first surface and the second surface, wherein upon curing the perfluoroelastomer weld comprises essentially the same perfluoroelastomer as the perfluoroelastomer member."

The decision of the examining division, as far as

relevant to the present decision, can be summarised as follows:

Starting from D12, the subject-matter of claim 1 of the main request differed from the known method of D12 in that the bonding agent was provided as a solution prepared by dissolving the curable perfluoroelastomer and the curing agent in a solvent. No example was provided that showed an effect of this difference so that the problem to be solved was seen as to provide an alternative to the method of bonding a perfluoroelastomer material of D12. D10 disclosed a process for bonding cured perfluoroelastomer to itself using a perfluoropolymer bonding agent in a solvent. The perfluorinated thermoplastic bonding agents used in this process were uncured copolymers of the same general chemical composition as the cured perfluoroelastomer to be joined. Using a solvent to prepare a bonding agent used in a method for bonding a perfluoroelastomer belonged to the normal practice of the skilled person. The claimed subject matter therefore lacked an inventive step.

- III. Documents D10 and D12, which were relied upon in the decision, were also relied upon in appeal.

- IV. The applicant (appellant) lodged an appeal against the decision of the examining division and submitted with the statement of grounds of appeal a main request (corresponding to the request filed with letter of 25 October 2013) as well as an auxiliary request. Claim 1 of the auxiliary request read as follows (additions as compared to claim 1 of the main request in bold):

"1. A method of bonding a perfluoroelastomer material to first surface (13a, 13b; 22a, 22b), comprising:

(a) contacting a first surface with a bonding agent comprising a curable perfluoropolymer and a curing agent, wherein the bonding agent is a solution prepared by dissolving the curable perfluoroelastomer and the curing agent in a solvent; and

(b) curing the bonding agent to form a perfluoroelastomer material that is bonded to the first surface;

characterized in that the first surface is a surface of a **cured** perfluoroelastomer member and the perfluoroelastomer **material** formed is a perfluoroelastomer weld and in that step (a) further comprises placing the bonding agent also in contact with a second surface and step (b) further comprises curing the bonding agent to form a perfluoroelastomer weld between the first surface and the second surface, wherein upon curing the perfluoroelastomer weld comprises essentially the same perfluoroelastomer as the **cured** perfluoroelastomer member."

- V. In a communication sent in preparation of oral proceedings, the Board summarised the points to be dealt with and provided a preliminary view on the disputed issues.
- VI. With letter of 28 April 2017, the appellant informed the Board that he would not be attending the oral proceedings scheduled on 5 May 2017. Accordingly, oral proceedings were held on 5 May 2017 in the absence of the appellant.
- VII. The arguments provided by the appellant in writing, as far as relevant to the present decision, can be summarised as follows:

The disclosure of D12 related to heat-recoverable articles and had nothing to do with the claimed subject matter, that aimed at providing a method of bonding a cured perfluoroelastomer to itself in order to produce seals from rod stock by bonding the two rod stock ends together to form the required size seal. The claimed subject matter differed from D12 in that the bonding agent was dissolve in a solvent and in that it was cured to form a perfluoroelastomer weld between the first surface and the second surface and that upon curing the perfluoroelastomer weld comprised essentially the same perfluoroelastomer as the perfluoroelastomer member.

The technical effect provided by the above differences was that no weak points were obtained when bonding the perfluoroelastomeric material to a surface, since the bonding agent solution could be distributed uniformly on the surfaces to be bonded, filling voids and any irregularities in the surfaces - without melting and resulting in an undesired intermediate fusing layer which represents a weak point - and essentially the same material as the perfluoroelastomeric material was used to obtain the weld bonding the perfluoroelastomeric material surfaces.

Thus, the objective technical problem underlying the claimed subject matter was to provide an improved method of bonding and/or welding perfluoroelastomers and parts formed from them that was simple and economical and provided for a homogeneous finished part that substantially retained the strength of a solid finished piece.

D10 described a thermoplastic perfluoropolymer bonding agent that lead to a layer of fused perfluoropolymer

resulting in a "weak" point. The skilled person would not have combined the teachings of D12 and D10 since these documents related to different bonding methods. The claimed subject matter was therefore inventive.

No separate arguments were filed for the auxiliary request.

VIII. The appellant requested in writing, that the decision under appeal be set aside and that a patent be granted on the basis of the main request or on the basis of the auxiliary request, both requests filed with the statement setting out the grounds of appeal.

Reasons for the Decision

Main request

1. Inventive step

1.1 The application in suit aims at a method of bonding perfluoroelastomeric materials to a surface by which a bonding agent comprising a solution of a curable perfluoropolymer and a curing agent is contacted with a first surface of a perfluoroelastomer member and then to a second surface (paragraph 12). The bonding agent is cured to form a perfluoroelastomer weld between the first surface and the second surface, wherein upon curing the perfluoroelastomer weld comprises essentially the same perfluoroelastomer as the perfluoroelastomer member (paragraph 13). According to the application, the claimed method addresses the need for a simple method for bonding and/or welding perfluoroelastomers with a standard cure system that can be cured without complex process steps (paragraph 11) and that results in a homogenous finished part that

substantially retains the strength of a solid finished piece (paragraph 5).

1.2 D12 was chosen as the closest prior art in the decision of the examining division. The appellant provided arguments on inventive step starting *inter alia* from D12 as the closest prior art. The Board sees no reason to take a different approach.

1.3 D12 relates to curable adhesives (column 1, lines 28-43) and to a method of bonding a surface to another surface using said adhesive (column 2, lines 1-3). The adhesive composition of D12 can therefore be seen as a bonding agent in the sense of the present application. The adhesive composition of D12 is also a perfluoroelastomer material since it comprises, among others, a thermoplastic fluoropolymer, an elastomeric fluoropolymer, a thermoplastic ethylene copolymer and a crosslinking agent component (column 1, lines 26-43; column 2, lines 6-20, claim 1). The adhesive of D12 is said to be particularly useful for bonding to a wide variety of surfaces, among which fluoropolymers (column 1, lines 10-17). Like the present application, D12 therefore concerns a bonding method of a surface comprising a perfluoropolymer to another surface by means of a curable adhesive.

1.4 In D12, the method of bonding two surfaces with one another comprises (i) applying to one of the surfaces to be bonded the adhesive composition, (ii) bringing the surfaces to be bonded together with said adhesive positioned between them; and (iii) applying heat to cause the curable adhesive to melt and flow and to cure the adhesive (column 2, lines 4-24). Thus, as in the present application, the method according to D12 is characterized in that the bonding agent is placed in

contact with a second surface before it is cured by applying heat.

1.5 The adhesive compositions of D12 are said to be particularly advantageous for sealing and/or bonding to a surface having a low surface energy, examples of which are surfaces from ethylene tetrafluoroethylene copolymer, polytetrafluoroethylene, and the like and wherein the polymer may be crosslinked or uncrosslinked (column 5, lines 14-20 or column 1, lines 44-47). That passage constitutes in itself an unambiguous disclosure of the method of bonding according to D12 applied to crosslinked perfluoropolymers, i.e. perfluoroelastomers. The bond obtained by curing the adhesive composition of D12 can be seen as a weld in the sense of the present application since paragraph 63 defines a "weld" as broadly encompassing "any joining together of two surfaces through use of a bonding agent therebetween, whether in liquid or solid "plug" form, physically and preferably using curable chemical crosslinking and/or bonding between each of the two opposing surfaces to be welded and the bonding agent [...]". Thus, D12 also discloses a weld in the broad meaning of the present application.

1.6 Claim 1 of the main request requires that upon curing, the perfluoroelastomer weld comprises essentially the same perfluoroelastomer as the perfluoroelastomer member forming the first surface. The present application does however not define in the claim itself, nor in the description, what is meant by "essentially the same" in that context. The first surface mentioned in claim 1 of the main request is broadly defined as a surface of a perfluoroelastomer member in the present application (paragraphs 12 and 13). No further information is provided as to the

composition of the perfluoroelastomer member forming that first surface. As to the bonding agent forming the perfluoroelastomer material weld once cured, it is defined to comprise perfluoropolymers (paragraphs 29-32) alongside many other optional additives that can include a wide range of organic and inorganic compounds and polymers (paragraph 44). It is nowhere disclosed in the present application if those additive components can also be part of the first surface or if they are only used in the bonding agent. On the basis of the information contained in the present application and in view of the wording of claim 1, it cannot be determined in how far the compositions of the bonding agent and of the first surface may differ from one another. As a result, the present application does not teach the skilled reader what is meant by the wording "essentially the same perfluoroelastomer" as used in claim 1. That wording is hereafter given its most general meaning within the scope of the present application and is seen as referring to a composition comprising at least a crosslinked perfluoropolymer. Since the adhesive composition and the first surface of the disclosure of column 5, lines 14-20 of D12 both comprise crosslinked perfluoropolymers, it is concluded that the perfluoroelastomer weld of D12 comprises essentially the same perfluoroelastomer as the perfluoroelastomer member of the first surface.

- 1.7 The adhesive compositions of D12 are not said to contain a solvent. D12 defines the adhesive composition as a composition comprising (a) a thermoplastic vinylidene fluoride homopolymer or copolymer, (b) an elastomeric vinylidene fluoride, (c) a thermoplastic ethylene copolymer, (d) a crosslinking agent component and (e) a tackifier (claim 1). The adhesive composition of D12 is also not said to be applied to the first

surface in solution in a solvent. In the method according to D12 (column 2, lines 1-25), the surfaces to be bonded are brought together with the adhesive positioned between them and heat is applied to cause the curable adhesive to melt and flow and to cure the adhesive. The claimed subject matter therefore differs from that disclosed in D12 in that the bonding agent is a solution prepared by dissolving the curable perfluoroelastomer and the curing agent in a solvent.

- 1.8 The solvent is defined in paragraph 46 of the present application as being generally "any solvent which is known or to be developed, that is capable of dissolving the compounded curable perfluoropolymer, and preferably the curative and/or the primary components in the compounded perfluoroelastomer formulation (i.e., the perfluoropolymer and the curative aside from any additives)". Although fluorinated solvents are said to be preferred in that passage, neither the description nor claim 1 limits the solvent beyond the requirement that it must dissolve the compounded curable perfluoropolymer. According to paragraph 8 of the present application, the lack of the ability to cure high molecular weight curable perfluoropolymers in solution restricted the use of perfluoroelastomer coatings to non-critical applications where "flow" of the uncured material was acceptable. Dissolution of the bonding agent in a solvent would allow for an easy-to-form surface coating. Beyond that, the present application does not teach which effect would arise from the use of a bonding agent dissolved in a solvent that could not already be obtained in the absence of a solvent. The present application provides two examples for which in both cases the bonding agents were dissolved in a solvent (Fluorinert® FC-77 in example 1 and Fluorinert® FC-43 in example 2) but it does not

contain a comparative example corresponding to the bonding method of D12 wherein no solvent is used in the adhesive composition.

The applicant submitted that weak points could be avoided in the weld between the two surfaces as a result of the use of a dissolved bonding agent. There is however no evidence of that effect in the present application. It can therefore not be concluded that the technical problem underlying the claimed subject matter was to provide an improved method of bonding. Starting from D12 as the closest prior art, the only problem that can be formulated on the basis of the evidence provided in the application is the provision of a further method of bonding surfaces.

- 1.9 The aim of D12 is to provide a method for bonding a wide variety of surfaces including polymeric surfaces having a low surface energy like surfaces including fluoropolymers as well as to provide greater bond strength and/or sealing performance towards those surfaces (column 1, lines 10-25). After applying the adhesive composition to one of the surfaces to be bonded, the surfaces of D12 are brought to one another with the adhesive positioned between them and heat is applied to cause the curable adhesive to melt and flow and the adhesive is cured (column 2, lines 1-25). Thus, heat is applied to the surface in order first to cause the adhesive to melt and flow to fill any irregularities in the surface before it cures the adhesive composition, leading to excellent sealing between the surfaces and in the case of ethylene-tetrafluoroethylene copolymer surfaces, even if uncrosslinked, excellent bonding to the surface (column 5, lines 23-29). That was also observed in the more specific case of the heat recoverable articles of D12

as melting and flowing of the adhesive fills any voids between the article and the substrate before curing. D12 teaches that that provides exceptional bond strength, even in the case of surfaces with low surface energy (column 6, lines 55-60). Critical to the bonding method of D12 is therefore to achieve an optimum distribution of the adhesive composition on the surface to be bonded before curing.

- 1.10 The skilled person would have considered D10 when looking for a further method starting from the one of D12, because that document relates to a process for bonding cured perfluoroelastomer to another surface by means of a bonding agent based on a perfluoropolymer (claim 1) as in D12 and the present application. D10 already taught that a bonding agent could be conveniently applied to one or both surfaces to be bonded as a solution in a solvent before bonding through the application of heat (column 3, lines 12-15). Even though bonding in D10 occurs by cooling the bonding agent and not by curing, D10 is nonetheless relevant to D12 since it concerns foremost the application of the bonding agent to the surface to be bonded before the final stage of the bonding process during which heat is applied. D10 teaches a way of effectively applying a bonding agent to a surface and provides a solution to the broad problem of providing a further method of bonding surfaces. The claimed subject matter lacks therefore inventive step in view of D12 and D10. Thus, the main request does not comply with the requirements of Article 56 EPC.

Auxiliary request

2. Inventive step

2.1 Claim 1 of the auxiliary request was amended in that it recites that the first surface is a surface of a cured perfluoroelastomer member and specifies that the perfluoroelastomer weld formed is a perfluoroelastomer material. The amendments provided in claim 1 do not add further differences with respect to D12. The same reasoning as that provided for the main request applies therefore *mutatis mutandis* to the claims of the auxiliary request.

2.2 Since the teaching of D12 applies to both cured and uncured surfaces (column 5, lines 19-20), the claimed subject matter cannot be seen as inventive over D12. The auxiliary request does not comply with the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated