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D E C I S I O N
of 13 December 1996

Case Number: T 0075/95 - 3.2.4

Application Number: 90301421.5

Publication Number: 0383500

IPC: FO2M 65/00

Language of the proceedings: EN

Title of invention:

Method of cleaning an electronically controllable injector

Patentee:

HIGH TECH AUTO TOOLS PTY LTD

Opponent:

Celtn Pty Ltd
Tecnotest S.r.l.

Headword:

-

Relevant legal provisions:

EPC Art. 54(2) EPC

Keyword:

"Novelty (yes) - public prior use (no) - insufficient evidence"

Decisions cited:

T 0173/89; T 0109/91; T 0327/91

Catchword:

-



Case Number: T 0075/95 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 13 December 1996

Appellant: Celtin Pty Ltd
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Representative: Kraus, Jürgen Helmut, Dipl. -Phys. Dr.
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Respondent: HIGH TECH AUTO TOOLS PTY LTD
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Representative: Brown, John David
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Other party: Tecnotest S.r.l.
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 21 November 1994
rejecting the oppositions filed against European
patent No. 0 383 500 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: H. A. Berger
M. Lewenton

Summary of Facts and Submissions

I. Two oppositions against the European patent No. 0 383 500 as a whole and based on Article 100 (a) EPC (Opponent I) and Articles 100 (a) and (b) EPC (Opponent II) were rejected by the Opposition Division in its decision dispatched on 21 November 1994. Opponent I lodged an appeal against this decision. The appeal and the appeal fee were received on 23 January 1995. The statement setting out the grounds of appeal was received on 22 March 1995.

II. Claim 1 of the patent as granted reads as follows:

"A method of cleaning an electronically controllable injector, which method comprises the steps of supporting an electronically controllable injector in an ultrasonic bath of cleaning fluid such that at least the outlet tip is immersed and pulsing the injector, characterised in that the frequency of the ultrasonics and the frequency of the pulses are such that the cleaning fluid flows in the reverse direction through the injector as a result of the interaction of the ultrasonics and the pulsing of the injector."

III. The following prior art documents among those cited during the opposition proceedings have been taken into account as relevant documents during the appeal proceedings:

D1: US-A-4 082 565

D2: AU-B-57678/86

D3: US-A-2 974 070

D4: EP-A-0 209 967

D5: EP-A-0 205 355

The Appellant (Opponent I) asserted public prior use and cited the following documents in order to give evidence:

- E2: Statutory declaration signed by Mr. F. Dietsche (4 May 1993), [Exhibit 2];
- E3: Statutory declaration signed by Mr. M. Payne (4 May 1993), [Exhibit 3];
- E4: Statutory declaration signed by Mr. K.A. Greenfield (4 May 1993), [Exhibit 4];
- E5: Statutory declaration signed by Mr. R.H. O'Donnell (7 May 1993), [Exhibit 5];
- E6: Statutory declaration signed by Mr. P.L. Ginley (14 May 1993), [Exhibit 6];
- E7: US-A-4 845 979, [Exhibit 7], (not prepublished).

For the support of his own arguments the Respondent (Patentee) presented the following documents:

- P1: Statutory declaration signed by Mr. T. Tansley (8 April 1994), accompanied by Annexes A to D
- P2: Statutory declaration signed by Mr. R.B. Tilley (6 April 1994), accompanied by Annexes A to U, wherein as well as a number of subpoenas to produce documents the following invoices were presented:
 - annex M: Invoice No. 1024, dated 14 March 1989, Col Crawfords, concerning Sonic Bath-120 HT;

- annex N: Invoice No. 770248, dated 16 November 1988, Col Crawford Pty. Limited, concerning E.F.I.2001 Fuel Injector System;
- annex O: Invoice No. 005144, dated 21 September 1988, Col Crawford Pty. LTD, concerning Fuel Pressure Gauge, Ram Chector, Pressurized Injector Cleaner, Penray Cleaner and Tank additive;
- annex Q: Invoice No. 005225, dated 11 October 1988, Kevin Greenfield Sales, concerning Soniclean Unit, Electronic Engine MGMT Manual and Chemical for EFI850;
- annex R: Invoice, dated 23 May 1991, Kevin Greenfield Sales, concerning Ultrasonic Bath. The number of the invoice is not clearly readable, it might be No. N11134.

IV. With regard to the asserted prior use the Appellant filed in the appeal proceedings the following documents for the first time:

- E8: Statutory declaration signed by Mr. F. Dietsche (13 March 1995), [Exhibit 8];
- E9: Statutory declaration signed by Mr. K.A. Greenfield (13 March 1995), [Exhibit 9];
- E10: Statutory declaration signed by Mr. M. Payne (13 March 1995), [Exhibit 10];
- E11: Statutory declaration signed by Mr. P.L. Ginley (14 March 1995), [Exhibit 11].

In response to the communication of the Board, dated 10 September 1996, in which the Board informed the parties about the necessity for further documents to prove the asserted prior use, the Appellant maintained that there is no need to provide additional support of the evidence.

V. Oral proceedings were held on 13 December 1996. Neither the Appellant (Opponent I) nor the other party as of right (Opponent II), although duly summoned, appeared. The oral proceedings were continued without them (Rule 71 (2) EPC).

VI. In his written statement the Appellant argued that the evidence submitted (E2 to E11) clearly shows that the method of prior use fully anticipates the teaching of Claim 1.

The Appellant is of the opinion that it follows beyond any doubt from the statements of Mr. Dietsche (E2 and E8) that the energisation of the ultrasonic bath combined with the pulsing of the injectors resulted in the occurrence of the reverse flow. According to the clear wording of the sections 5 to 7 of E2 and sections 12 and 13 of E8 the fuel injectors were held above an ultrasonic bath (as purchased from Petro-Ject Equipment) with at least the outlet tips of the injectors immersed in the cleaning fluid of the bath. From section 6 of E2 and sections 12 and 13 of E8 it is clear that the ultrasonic bath having the outlet tips of the injectors immersed therein was energized **and** the injectors were **also** operated at a pulse rate within the normal operating range by using the New Age EFI 2001 device. According to the statutory declaration of Exhibit 6 (E6) the New Age EFI 2001 device is described in US-A-4 845 979 (E7).

Sections 12 and 13 of E8 again confirm that the method of prior use by Mr. Dietsche did not only objectively make use of reverse flow generated as a result of interaction of the ultrasonics and the pulsing of the injectors, but that Mr. Dietsche was moreover conscious of such effect. Further, it follows, from section 13 that Mr. Dietsche communicated his positive knowledge about such interaction effect to customers and members of the trade.

According to section 4 of Exhibit 2 (E2) Mr. Dietsche had started using the method about September or October 1988, i.e. well before the priority date of the opposed patent. There have existed from the very beginning strong reasons for Mr. Dietsche to actually explain all details of his knowledge to his customers (see E2 and E8).

It is further submitted as an utmost measure of precaution that the decision under appeal has also misinterpreted the factual situation evidenced through the statutory declarations of the other witnesses as submitted in the notice of opposition as Exhibits 3 to 6 (E3 to E6). When talking of injectors energised with pulses at a rate within the normal operating range nothing else than electronically controllable injectors were meant.

The attention of the Board was furthermore drawn to the statements E9 to E11.

According to the Appellant the decision under appeal is also highly defective in its assessment concerning inventive step. Since Mr. Dietsche's method undoubtedly relies on combined ultrasonic energisation and injector pulsing, the explanation concerning the interaction therebetween is straightforwardly obvious.

With regard to the prior art other than the prior use evidence the Appellant is of the opinion that the conclusion of the Opposition Division is also not convincing taking into account documents D1, D2 and D3. Since document D1 discloses cleaning of injectors in an ultrasonic bath by pulsing the injectors and document D2 emphasises the utility of having the cleaning liquid flow in a reverse direction, a person of average skill having information from document D3 of the feasibility of reverse flow through thin passages as a result of ultrasonic bath energisation, has sufficient indication in the written state of the art to combine injector pulsing with bath energisation so as to implement the method of the opposed patent without any need for non-obvious considerations.

The Appellant further stated that the fact that the statutory declaration P2 criticizes the absence of an invoice for the purchase of an ultrasonic bath having an earlier date than the priority date of the opposed patent while there exists an invoice dated 14 March 1989 for a sonic bath - 120HT (see document P2, Annex "M") - cannot shed doubt on the probatory value of the referenced evidence, since document P2, Annex "U" under paragraph 2 is evidence of the purchase of the Petro Ject Equipment ultrasonic bath in October 1988 in full compliance with the statements made in the statutory declarations E2 and E8.

VII. The Respondent contested the arguments of the Appellant and argued that the Statutory Declarations presented in support of the allegation of prior use (E2 to E11) do not prove that the method of Claim 1 formed part of the state of the art before the priority date of the opposed patent and that the alleged facts provided so far cannot be substantiated in any way. They should therefore be completely disregarded.

He pointed out that the inquiries made by Mr. T. Tansley according to the statutory declaration P1 and by the solicitor of the Patentee, Mr. R.B. Tilley, according to the statutory declaration P2, do not confirm the content of the statutory declarations E2 to E11 but are partly in contradiction to them. The statements P1 and P2 can be considered as an official act not only with regard to the result of the inspections made on the different locations where the alleged prior use had allegedly taken place, but also with regard to the result of the subpoenas to produce documents issued to the firms involved in the alleged prior use. There are no objections against the assertion that an ultrasonic bath for cleaning injector nozzles has been used long before the priority date of the impugned patent, and that the cleaning device New Age 2001 according to E7 has been sold since about 1986, but it is pointed out that there is no proof that both devices have been used in a manner as claimed in the granted patent. The device New Age 2001 is not constructed for such an operation and the cables are not long enough. If the device New Age 2001 is switched on then also the pump is actuated. Without modification the device New Age 2001 therefore is incompatible with an ultrasonic bath. According to P1 and P2 it could even not be proved by invoices (subpoenas) or by demonstrating devices during these inspections that an ultrasonic bath and a cleaning device New Age 2001 were both available in every one of the firms cited in the statutory declarations E2 to E11 before the priority date of the patent.

The Respondent concluded that the method of Claim 1 is novel since the alleged prior use cannot be accepted and the further cited prior art documents D1 to D3 do not disclose a method with all the features of Claim 1. With regard to the document D2 he pointed out that it was published only on 19 October 1989 and therefore is

not state of the art according to Article 54 (2) EPC. A prepublished document of the same patent family is document D4 however.

With regard to the inventive step he argued that the use of pulsing and ultrasonic techniques in Claim 1 is not merely a juxtaposition of features but is a new, inventive functional relationship between these features resulting in a new technical effect. The closest prior art is known from document D1. However neither this prior art alone nor a combination of the teaching of documents D1, D4 and D3 can lead to the method of Claim 1.

VIII. The other party to the appeal proceedings as of right according to Article 107 EPC (Opponent II) did not bring forward any arguments during the appeal proceedings.

IX. **Requests**

The Appellant requested that the decision under appeal be set aside and the patent revoked.

The Respondent requested that the appeal be dismissed and the patent be maintained as granted.

Reasons for the Decision

1. The appeal is admissible.
2. *Prior use*
 - 2.1 The Appellant has filed statutory declarations E2 to E11 to prove the alleged prior use.

- 2.2 The basic content of the statutory declarations E2 to E5, all using mainly the same wording, is the following:

A cleaning liquid was placed in an ultrasonic bath and injectors were held above the bath with at least the outlet tips of the injectors immersed in the cleaning fluid. The ultrasonic bath was energised and the injectors were also operated with pulses at a rate within their normal operating range. It was observed that the cleaning liquid in the bath flowed out of the inlets of the injectors, thereby flowing in the reverse direction to the normal flow of fuel through the injectors. It was the habit from the very beginning to explain the above cleaning technique to the customers (see declarations E2, sections 5 to 8; E3 sections 5 to 8; E4 sections 5 to 8) or to trainees (see declaration E5 sections 5 to 7).

- 2.3 In the statutory declarations E6 and E11, Mr. P.L. Ginley declares (document E6, section 2) that the New Age EFI 2001 device is described in US-A-4 845 979 (E7) and that the device was first sold in Australia about 1986. He stated (see E6, section 4) that in the course of his activities as a sales representative he visited motor vehicle service centres. He also makes a reference to the alleged prior user Mr. F. Dietsche.

However, according to the statutory declaration of R.B. Tilley, P2, sections 3, 5 (Air Automotive Pty Ltd) and 12, a subpoena was issued (in relation to the Australian litigation) on the 2 August 1993 to Air Automotive Pty Ltd, in which firm Mr. P.L. Ginley is director now, and no documents in relation to that alleged prior use have been produced in answer to that subpoena.

2.4 Document E7, which describes, according to E6, the cleaning device "New Age EFI 2001", discloses an electronic fuel injector service device comprising a pump which delivers pressurised liquid to the injectors not only when they are fixed in the testing part of the device (Figure 2) but also when they are fixed in the cleaning part of the device (Figure 3) (see column 4, lines 3 to 16). There is a control unit delivering electric pulses to the injectors and causing actuation of the valve mechanisms (see E7 column 2, lines 35 to 43). In testing operation with the normal flow direction the injectors spray into a cylinder (19) and the outlet tips of the nozzles are not immersed in a fluid (see Figures 1, 2 and 4 of E7). Means are provided for back washing of the injectors (Figure 3: cleaning operation), whereby the pressurised cleaning liquid flows from the nozzle outlet to the injector inlet, i.e. in the reverse flow direction.

This known device is constructed to work independently of an ultrasonic bath. If the device is put into operation then the pump apparently is simultaneously actuated (see Claim 1, column 4, lines 4 to 16). Nothing is disclosed in E7 about either an ultrasonic bath or a disconnection of the pump. The device does not have any means either with which it would be possible to connect the injectors in such a way that firstly they could be immersed in the liquid of an ultrasonic bath and secondly that a reverse flow of the fluid could be realized.

Even if an injector were pulsed and dipped with at least its outlet tip in an ultrasonically reaction bath of cleaning fluid, this would - as can be seen from document D1 (see section 6.1 below) - not necessarily lead to a reverse flow of cleaning fluid through the injector as a result of possible interactions between the frequency of the ultrasonic bath and the pulsing of

the injector. Therefore, the step which allegedly has led different persons to use a combination of the cleaning device New Age EFI 2001 with the possibility of pulsing the injectors, with an ultrasonic bath in order to attain a reverse flow through the injectors, is already not clear in this respect.

2.5 Furthermore, none of the statutory declarations E2 to E11 gives details about structural features of the combined devices, in particular the electric connection of the electronic pulsing equipment with an injector positioned above the ultrasonic bath having the outlet tip immersed in the liquid. Moreover, no single remark was made concerning the disconnection of the pump present in the New Age EFI 2001 device.

2.6 In response to the communication of the Board, dated 10 September 1996, in which it was stated that the statutory declarations E2 to E11 do not seem to be clearly supported by additional documents of evidence, the Appellant argued in his letter of 21 November 1996, that these statutory declarations constitute sworn statements in writing in accordance with Article 117 (1) (g) EPC thereby forming admissible means of giving evidence. The Appellant sees no need to provide additional support of this evidence by invoices, technical drawings, etc., since the evidence appearing from the statutory declarations is already clear and complete. It was pointed out that the latter is in particular true for the combined statutory declarations E2 and E8 by Mr. F. Dietsche and the attention of the Board was drawn to document P2, Annex U, section 2.

2.6.1 It is correct that any kind of document, regardless of its nature (be it a sworn statement or a simple opinion), is admissible during proceedings before the European Patent Office. The probative value of any such document, however, depends on the particular

circumstances of the particular case in application of the principle of free evaluation of evidence (see decision T 327/91, section 2.2.1).

The Boards of appeal generally apply as a standard of proof the "balance of probabilities". Absolute certainty is not required but a degree of probability which in human experience verges on certainty (decisions T 109/91, section 2.10; T 173/89, section 2).

- 2.7. According to the statutory declarations E2 and E8 and the affidavits "T" and "U" (P2), Mr. F. Dietsche, of New Era Automotive (1995), being employed from September 1988 to June 1989 by Col Crawford Pty Ltd alleged having used ultrasonic cleaning techniques since about September or October 1988. Mr. F. Dietsche indicated that two devices were used as claimed, firstly an ultrasonic bath purchased from Petro Ject Equipment (document P2, annex U section 2: October 1988), and secondly a New Age EFI 2001 device purchased from Air Automotive Pty Ltd (annex T section 2: October 1988).

Mr. F. Dietsche declared on oath in the affidavit for the Federal Court of Australia (see document P2, annexes T and U) that "In October 1988 I purchased from Air Automotive Pty Limited an EFI-2001 machine on behalf of Col Crawford Pty Limited - Nissan and BMW dealer in Brookvale. I believe Col Crawford Pty Limited has the receipt of payment for the machine" and "In October 1988, on behalf of Col Crawford Pty Limited - Nissan and BMW dealer in Brookvale, I purchased from Petro Ject Equipment, Annandale, an ultrasonic bath. I believe Col Crawford Pty Limited has the receipt of payment for the ultrasonic bath. I purchased the ultrasonic bath for use with the EFI 2001 machine".

2.7.1 However, no further document supporting these declarations was presented. In this respect attention is drawn to the statement of the Respondent in his letter of 9 October 1995, section 29, page 11, pointing out that before December 1992 the Australian law required that business records be kept for seven years. This law was changed in December 1992 to the effect that all business records must be kept for a period of five years. This statement of the Respondent was not contradicted by the Appellant. Therefore, when subpoenas to produce documents concerning the alleged prior uses were sent to New Era Motors Pty Limited, on 27 August 1993 (see document P2, annex L) as well as to Col Crawford Motors Pty Ltd, invoices from October 1988 should have still been available.

According to the statutory declaration P2, section 10, no documents have been produced in answer to the subpoena served upon New Era Motors Pty Limited (the company of Mr. F. Dietsche). Col Crawford Motors Pty Ltd however presented documents (see document P2, annexes N, M, and O) namely documents proving that an EFI 2001 device was sold to Col Crawford Pty Ltd on 16 November 1988 (not September or October), that a sonic bath 120 HT was sold to Col Crawfords on 14 March 1989, i.e. after the priority date of the present patent, and that a pressurized injector cleaner was sold to Col Crawford Pty Ltd on 21 September 1988.

2.7.2 It must therefore be stated, that on the basis of the presented facts and statements, there is no proof as to - at least - the existence of the two devices, namely an EFI 2001 device and an ultrasonic bath, before the priority date at the place where the alleged prior use by Mr. F. Dietsche should have taken place, let alone a single indication as to how these devices were adapted to each other to make them work together, in an appropriate manner (see above sections 2.4 and 2.5).

2.8 In the statutory declarations E3 and E10, Mr. M. Payne, of Northside Carburettor & Fuel Injection Service, declared that from at least 1988 he had used the New Age EFI 2001 Injector Cleaning device (see E3, section 3) and that since about June 1988 he cleaned fuel injectors utilising ultrasonic cleaning techniques (see E3, section 4).

According to the statutory declaration of Mr. T. Tansley (see P1, sections 17 to 21), an integrated circuit package was shown to him during an inspection on Monday 6 September 1993 at the premises of Northside Carburettor & Fuel Injection Service. Mr. T. Tansley's conclusion of this inspection was that the circuit board shown to him could not have been used for the designated purpose before September 1990. Furthermore, a subpoena to produce documents addressed to Mr. Payne was not answered (see statutory declaration P2, page 5, section 9 and annex L).

Since supporting proof of the declarations firstly could not be found on the premises where the alleged prior use should have taken place, and secondly nothing in the form of documents has been brought forward by the alleged prior user, the Board on the basis of these facts, cannot come to the conclusion that a prior use has taken place.

2.9 In the statutory declarations E4 and E9 Mr. K.A. Greenfield, of Ultra Tune Systems Pty Ltd, declared that he cleaned fuel injectors utilising ultrasonic cleaning techniques since about 1984 (see E4, section 4). He was in charge of the technical department of Ultra Tune at 56 Silverwater Road, Silverwater, Sydney, New South Wales, from approximately 1977 to 1989. Since 1989 he has been working for Ultra Tune, 13 Carter Road, Brookvale, Sydney.

In the letter of 10 August 1993 (see document P2, annex P), Mr. K.A. Greenfield declared "We are unable to locate the invoice for the purchase of a NEW AGE AUTO SENSE INJECTOR PULSE therefore I am detailing dates and cheque numbers for payment of this unit. ... We have no designs of any device incorporating Pulse/Bath System and do not have a EFI 2000 Machine". An invoice (see document P, annex Q) dated 11 October 1988 of a Soniclean Unit, Electronic Engine MGMT Manual, and Chemical for EFI850 was presented. Another invoice about an ultrasonic bath was dated 23 May 1991 (see document P2, annex R).

However, Mr. T. Tansley attended the workshop of Ultra Tune on 6 September 1993 (see P1, sections 15 and 16) and stated in his statutory declaration (P1) that it did not appear possible to mount the ultrasonic bath (which was present) in such a way that injectors could routinely be pulsed and ultrasonically cleaned simultaneously. He saw no evidence of any such activity having taken place before August 1989.

The Appellant knowing these facts presented by the Respondent, preferred not to supply additional documents of evidence in this respect. Therefore, it is not possible for the Board to state that the alleged prior use has been proven sufficiently.

- 2.10 Mr. R.H. O'Donnell, who is shareholder and director of H.R. & R.H. Enterprises Pty Limited, which company trades as Petroject Victoria, declared in the statutory declaration E5, that he cleaned fuel injectors utilising ultrasonic cleaning techniques since about 1988.

According to the statutory declaration of Mr. R.B. Tilley, P2, section 11, a subpoena was served upon HR & RH Enterprises Pty Limited on the 2 August

1993 and no documents have been produced in answer to that subpoena.

Furthermore, no detailed specific machine has been described during the present procedure, so that the Board has no convincing proof for the pretended prior use.

- 2.11 In his letter of 9 October 1995, the Respondent argued that the description of the methods allegedly used by the Declarants in E2 to E6 merely mimics the wording of Claim 1 of the patent in suit without attempting to give any specific details of the actual methods used (see section 15) and that the statutory declarations filed appear to have been fabricated such that they do not reflect the true statements of the Declarants (see section 31).

Indeed, the wording of the statutory declarations E2 (sections 5 to 8), E3 (sections 5 to 8), E4 (sections 5 to 8) and E5 (sections 5 to 7) are highly similar. The risk of errors may increase when the Declarants are lead by a given wording. The argument of the Respondent in this respect was not abrogated by additional documents of evidence supporting the content of the statutory declarations, which could improve the probative value of these statements.

- 2.12 The alleged prior use in the present case only can be accepted as state of the art according to Article 54 (2) EPC if there is no major doubt as to the apparatus used and as to the circumstances of the prior use (see section 2.6.1 above). In the present case several points of the statutory declarations (E2 to E11) presented by the Appellant are not in conformance with and are even in contradiction to (see section 2.8 above) the statutory declarations (P1 and P2) presented by the Respondent. No clear support by invoices could

be provided to prove that an ultrasonic bath and a device for pulsing the injectors were both available at the place and at the time declared in the statutory declarations E2 to E6. Moreover no detailed features of construction of the combination of the injector pulsing system and the ultrasonic bath have been forwarded. Clarification only could be effected by the support of the party which maintained the prior use, i.e. in the present case the Appellant, which however is of the opinion that no further documents of evidence are necessary.

- 2.13 The Board therefore comes to the conclusion that the arguments, statements and documents presented by the Appellant are not sufficient to prove the alleged prior use and that the alleged prior use therefore cannot be considered as state of the art according to Article 54 (2) EPC.

3. *Novelty*

None of the patent documents D1 to D5 cited in the appeal proceeding discloses a method with all the features of Claim 1. The method of Claim 1 therefore is new in the meaning of Article 54 EPC.

4. *Closest state of the art*

Document D1 discloses all the features of the preamble of Claim 1. Document D1 is more relevant than the device "New Age EFI 2001" according to document E7, acknowledged as state of the art by the Respondent, since it discloses the use of an ultrasonic bath in combination with the pulsing of an injector. Therefore, document D1 is taken as the closest state of the art in assessing inventive step.

5. *Problem and Solution*

5.1 Problem

The method known from document D1 suffers from the disadvantage in that it does not allow impurity particles trapped in the filter basket of the injector to be readily removed during cleaning and also requires a separate reservoir of cleaning fluid and connections to the inlets of the injectors to flow fluid therethrough. The invention seeks to ameliorate the disadvantage.

5.2 Solution

By providing a method for cleaning injectors which allows readily flushing out of the filter basket of the injector the impurity particles in the filter are removed. Furthermore, according to the Respondent, the deposits are removed from all the surfaces throughout the flow path of the injector in such a manner that they can flow through the filter basket, and thereby can be brought outside the injector device. Since the reverse flow is attained by the frequency of the ultrasonics and the frequency of the pulses of the injector, a pump and separate reservoir for the cleaning fluid is not necessary.

6. *Inventive step*

6.1 In the device of document D1 an electric circuit with a transformer (19,20) supplies from 25 to 100 pulses per second and preferably 50 half-wave pulses per second to each of the pair of conductors (13a, 13b) and, consequently, to each of the solenoid windings connected to the conductors (13a, 13b) to actuate the injectors (see column 2, lines 20 to 28 and 55 to 60). The secondary windings (19, 20) of the transformer also

serve to supply an oscillator (51) generating an ultrasonic frequency (approx. 50 kHz). The output voltage of said oscillator is supplied to a piezoelectric ultrasonic transmitter mechanically attached to the underside of the bottom of the receptacle of the cleaning bath (column 3, lines 17 to 24). The rear orifices of the injector valves are connected by flexible conduits (54) to a suitable source of detergent causing a slow stream of detergent to flow from that source (container 44) through the valves (column 3, lines 35 to 43; column 4, lines 20 to 26). The circuits are thereby rendered active to cause the injector needles to reciprocate with a frequency of 50 double strokes per second and to cause the transmitter (50) to vibrate with an ultrasonic frequency.

No hint is given in document D1 towards a reverse flow of the cleaning fluid through the injector. On the contrary, the teaching clearly and unequivocally indicates a flow through the injectors in the normal direction. Furthermore even if such a reverse flow were to take place, it is not obvious that the user of this device would have noted a backflow of the detergent, since the injector outlets are connected to pipes which apparently are not transparent flexible conduits (55, see column 3, lines 35 to 38 and Figure 3).

6.2 From document D4 (D2) the advantages of a reverse flow for cleaning injectors is known. However, in this known cleaning device, the cleaning fluid is pressurised by a pump and a control device is provided to switch from one flow direction to the other flow direction through the injector. An ultrasonic bath is not mentioned in document D4. The combination with an ultrasonic bath, would involve a considerable change of the construction of document D4, since the injectors according to document D4 are connected at both ends to adapting

members. No hint is given for such a modification. Since document D1 does not disclose the possibility of a reverse flow and document D4 discloses the use of a pump for both flow directions, including the reverse flow, the skilled person would not consider to create solely a back flow in the device of document D1 without a pump.

6.3 Document D3 discloses the possibility that in an ultrasonic bath liquid can flow through small orifices in plates or articles having a substantially flat face. In this cleaning device the flat article is preferably positioned a small distance above the surface of the cleaning liquid (see column 2, lines 50 to 53). The article to be cleaned should not be submerged in the liquid to such an extent as to prevent the formation of fountains as cleaning liquid is forced through the orifices, since these fountains are of fundamental significance insofar as concerns determination of complete cleaning. On the basis of this known device it could not be derived that the fluid moved by the ultrasonic bath can be pumped through a passage of considerable length, like in an injector. A hint for the specific combination of the pulsing of the injector and the frequency of the ultrasonic bath cannot be derived from this document D3, since the orifices of these articles to be cleaned are always open.

6.4 Document D5 is less relevant than the documents D1, D3 and D4 and also cannot lead to the method of Claim 1.

6.5 The method of Claim 1 therefore involves an inventive step in the meaning of Article 56 EPC.

7. The patent can therefore be maintained as granted.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:



N. Maslin



The Chairman:

C. Andries

