THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PETER ROMANN

Appeal No. 97-3717
Application No. 08/397,163[1]

ON BRIEF

Before FRANKFORT, McQUADE, and NASE, Administrative Patent Judges.

NASE, Administrative Patent Judge.

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[1] Application for patent filed March 6, 1995. According to the appellant, the application is the national stage application of PCT/DE93/00760, filed August 20, 1993.

Appeal No. 97-3717
Application No. 08/397,163

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 9, 10 and 12 through 16. Claim 11 has been allowed. Claims 1 through 8 have been canceled.

We AFFIRM.

BACKGROUND

The appellant's invention relates to an electromagnetically actuated valve. An understanding of the invention can be derived from a reading of exemplary claim 9, which appears in the appendix to the appellant's brief.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Longsworth	4,152,903	May 8, 1979
Kamiya et al. (Kamiya)	4,483,485	Nov. 20, 1984
Mesenich	4,798,329	Jan. 17, 1989
Morini et al. (Morini)	4,923,122	May 8, 1990
Hunt	4,946,107	Aug. 7, 1990
Terakado et al. (Terakado)	5,156,341	Oct. 20, 1992

Reference made of record by this panel of the Board is:

Newcomb	4,284,263	Aug. 18, 1981

Claim 9 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Hunt.[2]

Claims 9, 10 and 13[3] stand rejected under 35 U.S.C. § 103 as being unpatentable over Terakado in view of Kamiya.

Claims 12 and 16 stand rejected under 35 U.S.C. § 103 as being unpatentable over Terakado in view of Kamiya and Morini.

Claim 14 stands rejected under 35 U.S.C. § 103 as being unpatentable over Terakado in view of Kamiya and Mesenich.

Claim 15 stands rejected under 35 U.S.C. § 103 as being unpatentable over Terakado in view of Kamiya and Longsworth.

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[2] The rejection of claim 12 under 35 U.S.C. § 102(b) made in the final rejection was apparently withdrawn by the examiner since the answer does not include claim 12 in this rejection.

[3] We note that claim 13 depends from claim 12. Claim 12 was not included in this § 103 rejection, but was included in another § 103 rejection. Since the appellant has not argued these claims separately from their independent claim 9, we need not resolve this discrepancy.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellant regarding the above-noted rejections, we make reference to the final rejection (Paper No. 8, mailed December 20, 1996) and the examiner's answer (Paper No. 12, mailed May 15, 1997) for the examiner's complete reasoning in support of the rejections, and to the appellant's brief (Paper No. 11, filed March 24, 1997) for the appellant's arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellant's specification and claims, to the applied prior art references, and to the respective positions articulated by the appellant and the examiner. As a consequence of our review, we make the determinations which follow.

The anticipation issue

We will not sustain the rejection of claim 9 under 35 U.S.C. § 102(b) as being anticipated by Hunt.

To support a rejection of a claim under 35 U.S.C. § 102(b), it must be shown that each element of the claim is disclosed, either expressly described or under principles of inherency, in a single prior art reference. See Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026 (1984).

Claim 9 recites an electromagnetically actuated valve comprising, inter alia, a core, a coil, a valve seat, an armature, a valve closing element, a valve needle and a valve seat carrier wherein the material of the valve seat carrier has a larger coefficient of thermal expansion than the material of the valve needle.

Hunt discloses an electromagnetic fuel injection valve. As shown in Figure 1, the electromagnetic fuel injection valve includes a core 10, a coil 4, a nozzle seat 22, an armature valve 26, a sleeve member 20 and ball valve 35. Hunt teaches (column 2, lines 50-52) that the sleeve member 20 is formed of a non-magnetic material such as plastics, ceramics, stainless steel and the like. Hunt also teaches (column 2, line 58)

that the armature valve 26 is magnetic. Hunt does not disclose any particular material to be used for the armature valve 26.

In view of these teachings of Hunt, we agree with the examiner that the sleeve member 20 and the armature valve 26 are made of different materials. However, since Hunt provides no indication of the specific magnetic material used for the armature valve 26, we also agree with the appellant's argument (brief, pp. 6-7) that there is no disclosure, either expressly or inherently, that the material of the sleeve member 20 (i.e., the valve seat carrier) has a larger coefficient of thermal expansion than the material of the armature valve 26 (i.e., the valve needle). Accordingly, the decision of the examiner to reject claim 9 under 35 U.S.C. § 102(b) is reversed.

The obviousness issues

Claim 9

We will sustain the rejection of claim 9 under 35 U.S.C. § 103.

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. See In re Young, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991) and In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).

Terakado discloses an electromagnetic type fuel injection valve. According to one aspect of his invention (column 2, lines 25-28), the armature, the rod, and the valve body at the end of the rod are integrally formed from the same material. As shown in Figure 1, the electromagnetic type fuel injection valve 10 comprises a stator iron core 1, an electromagnetic coil 2 surrounding this stator iron core, a plastic insulating member 3
molded around this electromagnetic coil and surrounding the stator iron core, a casing 4 made of a magnetic material, a valve guide 5 supported at the bottom of this casing, a moving body 6 whose armature 6a faces the lower end of the stator iron core, a stopper 7 in the form of a split washer and retained between a step section of the casing and the valve guide, a nozzle 8 supported at the bottom of the valve guide,

a coil spring 9 arranged to bias the moving body 6, and an adjusting screw 11 threaded into the threaded upper section of the central hole 1a of the stator iron core and adapted to enable the spring load to be adjusted from the exterior. Referring to Figure 2, the moving body 6 comprises an armature 6a, a rod 6b, a guide portion 6c having a disc-like configuration, and a spherical valve body 6d designed to be seated on the valve seat 5a of the valve guide 5. The armature 6a faces in the casing 4 the lower end of the stator iron core 1, the guide portion 6c being in slidable contact with the inner peripheral surface of the center hole 5b of the valve guide 5. The moving body 6 is constantly biased downwards by a coil spring 9, thereby seating the valve body 6d

on the valve seat 5a of the valve guide 5. Only when the electromagnetic coil 2 is excited to cause the moving body 6 to be attracted by the stator iron core 1 will the valve body 6d be able to separate from the valve seat 5a of the valve guide 5, thereby causing fuel supplied through a fuel passage 13 to be ejected outwardly through the nozzle 8. Terakado further discloses that the moving body 6 is made of a material

A selected from among those meeting JIS standard SUS420J2 (the type containing 0.26 to 0.40% C and 12.00 to 14.00% Cr) taking into consideration the magnetic properties, the induction heating suitability, and the corrosion resistance. The armature 6a, the guide portion 6c and rod 6b are integrally formed from this material.

Kamiya discloses an electromagnetic fuel injector. As shown in Figure 3, the electromagnetic fuel injector 21 includes a valve housing 22 provided with a fuel injection nozzle 23 at its front end and a guide hole 24 extending along its axis for guiding a plunger-like valve body 31. A valve body 31 is slidably inserted into the guide hole 24. An armature 34 is fixed to the rear end of the valve body 31. A fuel chamber 24a is defined between the fuel injection nozzle 23 and the front portion of the guide hole 24. Kamiya teaches that the arrangements of electromagnetic housing 27, fixed magnet core
28, exciting coil 29, terminal 30, O-ring seals 35, 36 and 37, and fuel filter 38 are substantially identical with those in a conventional electromagnetic fuel injector. The fixed magnet

core 28 is provided with an axial through-hole as a fuel passage 25. A compression spring 26 is inserted into the front portion of the axial through-hole so as to normally bias against the rear end of the valve body 31 and hold the valve body 31 in a closed position. The compression spring 26 abuts against the front end of a sleeve 25a which is carried in the axial through-hole of the fixed magnet core 28. As shown in Figure 4, the valve body 31 is constituted of a valve member 32 having a spherical surface 32a, hollow cylindrical slide member 33 and an armature 34 fixed on the rear end of the slide member 33. The interior of the slide member 33 serves as a fuel passage 33a and fuel outlets 33b are provided at the front side wall of the slide member 33. With this arrangement, liquid fuel flowing through an opening 34a of the armature 34 is supplied through the fuel passage 33a and the fuel outputs 33b to the fuel chamber 24a. In order to reduce the weight of the valve body 31, the valve member 32 and/or the slide member 33 are preferably formed of titanium or titanium alloy having specific gravity of about 4.5 as well as stainless steel SUS 440C having specific gravity of about 8.0

or more preferably formed of ceramic having specific gravity of about 2 to 4. Kamiya teaches (column 4, lines 57-64) that

> [s]ince the slide member 33 is of a hollow cylindrical shape and the valve member 32 and the slide member 33 are formed of a light material such as titanium, the valve body 31 is reduced in weight, thereby increasing the response characteristic to the on-off operation of the exciting coil and reducing the time required for the valve body to be stabilized when the valve is opened or closed.

In applying the above-noted test for obviousness, the examiner determined (final rejection, p. 3) that

> [i]t is deemed to have been obvious to one of ordinary skill in the art to construct the valve stem [of Terakado] from titanium as taught by Kamiya to reduce the valve stem weight and increase [sic, decrease] the response time of the valve in Terakado.

Implicit in this rejection is the examiner's view that the above noted modification of Terakado would result in an apparatus which corresponds to the apparatus recited in claim 9 in all respects.

Initially, we note that the appellant has not argued that the material of the valve seat carrier does not have a larger coefficient of thermal expansion than the material of the

valve needle. The arguments raised by the appellant (brief, pp. 7-11) are unpersuasive for the following reasons.

First, on pages 9-10 of the brief, the appellant argues that Terakado teaches away from using titanium in the manner set forth by the examiner. We do not agree. While Terakado does disclose that his moving body 6 is made of a material A selected from among those meeting JIS standard SUS420J2 (the type containing 0.26 to 0.40% C and 12.00 to 14.00% Cr) taking into consideration the magnetic properties, the induction heating suitability, and the corrosion resistance, this teaching of a preferred embodiment does not constitute a teaching away. This is especially true since according to one aspect of Terakado's invention (column 2, lines 25-28), the armature, the rod, and the valve body (i.e., the moving body) are integrally formed from the same material. Thus, it is our view that Terakado's disclosure, taken as a whole, is not limited to materials meeting JIS standard SUS420J2. See In re Susi, 440 F.2d 442, 169 USPQ 423 (CCPA 1971) and In re Dunn, 349 F.2d 433, 146 USPQ 479 (CCPA 1965).

Second, on pages 10-11 of the brief, the appellant argues that if one skilled in the art modified the structure of the Terakado patent in view of the Kamiya patent, one would have substituted titanium not only for the valve stem of the Terakado patent, but also for all the components of the valve body (including the casing) so that the valve body weight is further reduced and the valve is made stronger. We do not agree. We have reviewed the Kamiya patent and fail to find any suggestion, teaching or motivation to make the changes proposed by the appellant. However, it is our opinion that of the Kamiya patent does provide the suggestion, teaching and motivation to make the change proposed by the examiner. In that regard, Kamiya specifically teaches to form the valve body 31 of a light material, such as titanium, to reduced its weight, thereby increasing its response characteristic to the on-off operation of the exciting coil and reducing the time required for the valve body to be stabilized when the valve is opened or closed. In our view, this is sufficient suggestion, teaching and motivation to
construct the valve stem (i.e., the moving body 6) of Terakado from titanium.

For the reasons set forth above, the decision of the examiner to reject claim 9 under 35 U.S.C. § 103 is affirmed.

Claims 10 and 12 through 16

Dependent claims 10 and 12 through 16 have not been separately argued by the appellant. Accordingly, these claims will be treated as falling with parent claim 9. See In re Young, 927 F.2d 588, 590, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991); In re Nielson, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987); and In re Wood, 582 F.2d 638, 642, 199 USPQ 137, 140 (CCPA 1978). Thus, it follows that the decision of the examiner to reject claims 10 and 12 through 16 under 35 U.S.C. § 103 is also affirmed.

CITATION OF PRIOR ART

We cite the patent to Newcomb for consideration by both the appellant and the examiner in any further proceedings on the merits of the appealed subject matter.

Newcomb discloses a control valve such as a servovalve or fuel injection valve for controlling flow of a medium. As

shown in Figure 2, the control valve includes a valve body 21 and a piezoelectric actuating element 2. The valve body 21 includes an inlet duct (not identified in Figure 2, but identified at 4 in Figure 1) and an outlet duct (not identified in Figure 2, but identified at 5 in Figure 1). Between the two ducts, a valve seat is provided against which a disc-shaped movable body 6 rests. The movable body 6 is accommodated in a valve head
7 which is attached to the valve body 21 by bolts (not shown). A disc spring 8 acts to press the movable body 6 against the seat so that the valve is held in a normally closed condition. The lower end of the actuating element 2 carries a metal pad 2a which
rests against the movable body 6. Elongation of the actuating element 2, by means of the application of a suitable electrical signal to the element 2, will cause the movable body 6 to be moved downwards against the force of spring 8 so that fluid under pressure can flow from inlet duct, along the movable body 6, and out of the outlet duct. The piezoelectric actuating element 2 is encapsulated in a body 16 of a suitable material to form a cylinder shape and which provides a smooth

sealing surface for contact with a sealing member 12. The actuating element 2 has an upper end piece or spacer 22b. Newcomb teaches (column 3, lines 38-47) that (1) the valve body 21 and the lower end piece 2a of the actuating member 2 were made from steel having a thermal expansion coefficient of 12 Fm K^{-1}; (2) the piezoceramic material forming the actuating member 2 has a thermal expansion coefficient of 4 Fm K^{-1}; and (3) the upper end piece or spacer 22b of the actuating member was made from aluminum having a thermal expansion coefficient of 23 Fm K^{-1}.

Newcomb discloses (column 3, lines 52-68) that

> [t]he length of the aluminum end piece 22b is determined as follows. In operation of the valve any thermal expansion of the steel valve body 21 and end plate 14 would result in the distance between the side with the plate 14 and the open side of the valve housing becoming larger. The same temperature change would cause the aluminum end piece or spacer 22b, the element 2 and the lower end piece 2a to expand in a direction away from the end plate 14. The axial lengths of the parts 22b, 2 and 2a can be calculated so that the thermal expansion coefficient of these parts together corresponds to that of the body 21 and end plate 14.
>
> In this way, the lower surface of the lower end piece 2a where it makes contact with the movable body 6 can be maintained in a substantially fixed position with respect to the seat end of valve housing 21 even though changes in the temperature of the valve may take place.

In any further proceedings on the merits of the appealed subject matter, the examiner should determine on the record whether or not Newcomb, newly cited by this panel of the Board, combined with any of the other prior art would render any claim obvious under 35 U.S.C. § 103.

CONCLUSION

To summarize, the decision of the examiner to reject claim 9 under 35 U.S.C. § 102(b) is reversed and the decision of the examiner to reject claims 9, 10 and 12 through 16 under 35 U.S.C. § 103 is affirmed.

Since at least one rejection of each of the appealed claims has been affirmed, the decision of the examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

CHARLES E. FRANKFORT Administrative Patent Judge	)	
JOHN P. McQUADE Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
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APPEAL NO. 97-3717 - JUDGE NASE
APPLICATION NO. 08/397,163

APJ NASE

APJ McQUADE

APJ FRANKFORT

DECISION: **AFFIRMED**

Prepared By: Delores A. Lowe

DRAFT TYPED: 23 Jun 98

FINAL TYPED: