The opinion in support of the decision being entered today was not written
for publication and is not binding precedent of the Board.

Paper No. 25

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte KEVIN R. ANDERSON and CHRISTOPHER J. MISORSKI

Appeal No. 2003-1332
Application No. 09/797,143

HEARD: November 19, 2003

Before COHEN, NASE, and BAHR, Administrative Patent Judges.
NASE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection (Paper No. 11, mailed April 9, 2002) of claims 1 to 5 and 7 to 20, which are all of the claims pending in this application. In the brief (Paper No. 18, filed September 9, 2002), the appellants withdrew claims 1 to 5 and 7 to 14 from appeal. Accordingly, the appeal with respect to claims 1 to 5 and 7 to 14 is dismissed. Claims 15 to 20 remain on appeal.

We REVERSE.

BACKGROUND

The appellants' invention relates to a fuel injector made with a poppet that is formed of a material that increasingly conforms in shape to an associated valve seat in response to continued wear of the poppet through repeated contact with the valve seat (specification, p. 1). The appellants' invention provides the beneficial result of improved salt water corrosion resistance and by using a softer metal to make the poppet, the improved sealing characteristic improves fuel efficiency of the engine and reduces emissions of undesirable compounds. A copy of the claims under appeal is set forth in the appendix to the appellants' brief.

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

Danis	3,319,321	May 16, 1967
Kloske et al. (Kloske)	3,770,426	Nov. 6, 1973
Gu	5,119,792	June 9, 1992

Claims 15 to 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Gu in view of Danis.

Claims 15 to 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Gu in view of Kloske.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the answer (Paper No. 19, mailed December 17, 2002) for the examiner's complete reasoning in support of the rejections, and to the brief for the appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the examiner. Upon evaluation of all the evidence before us, it is our conclusion that the evidence adduced by the examiner is insufficient to establish a prima facie case of obviousness with respect to the claims under appeal. Accordingly, we will not sustain the examiner's rejection of claims 15 to 20 under 35 U.S.C. § 103. Our reasoning for this determination follows.

In rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. See In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). A prima facie case of obviousness is

established by presenting evidence that would have led one of ordinary skill in the art to combine the relevant teachings of the references to arrive at the claimed invention. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988) and In re Lintner, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972).

Claim 15, the only independent claim on appeal, reads as follows:

> A fuel injector comprising:
> an actuator portion;
> a nozzle portion having a fluid conduit extending therethrough and a valve seat formed in association with said fluid conduit;
> a poppet having a valve head shaped to be received by said valve seat in sealing relation, said poppet being movable relative to said nozzle portion between a closed position in which said fluid conduit is blocked and an open position in which said fluid conduit is at least partially unblocked, said valve head being made increasingly conformable to said valve seat by wear of said valve head through repeated contacts with said valve seat, said repeated contacts causing a contact surface of said valve head to achieve an increasingly smoother surface finish as a result of said wear.

Gu's invention relates to an electromagnetic fuel injector for a two-stroke engine, particularly to an electromagnetic fuel injector with compressed air and fuel injection through a cylinder head of a two-stroke engine with improved spray injection effect and shortened time of fuel injection. As shown in Figure 2, Gu's fuel injector has an actuator portion (solenoid assembly 20); a nozzle portion having a fluid conduit extending therethrough (injection head 29) and a valve seat formed in association with the fluid conduit (the bevel 298 of injection head 29); and a poppet (mushroom valve

27) having a valve head (valve face 273) shaped to be received by the valve seat in sealing relation wherein the poppet is movable relative to the nozzle portion between a closed position in which the fluid conduit is blocked and an open position in which the fluid conduit is at least partially unblocked.

Danis' invention relates to an improved method of making an engine valve and more particularly to an improved process for forming poppet-type valves of the type used in internal combustion engines employing a ductile low-carbon steel which facilitates the formation by cold forging and/or extrusion relatively intricate valve configurations followed by a subsequent preliminary machining and case hardening treatment and thereafter a final machining operation resulting in a valve having excellent performance characteristics and which is substantially simpler and more economical to manufacture. Danis teaches (column 1, lines 20-24) that "[p]oppet-type valves for use in internal combustion engines, and particularly intake poppet valves of the type employed in automobile engines have heretofore been made employing medium and high-carbon alloy steels by either cold or hot forging techniques." One object of Danis' invention was to provide an improved process for forming poppet-type engine valves employing a low-carbon steel which enables the use of simpler tooling and further reduces wear on the tools providing greater die life with corresponding

reductions in production down time and improved manufacturing efficiency. Danis teaches (column 2, line 33 to column 3, line 1) that:

> The steel raw material used for forming the valve body may comprise any cold formable grade of low-carbon or 35 low-alloy steel which is susceptible to case hardening such as by carbonitriding or carburizing including steel having a carbon content ranging from about 0.03% to about 0.6%. Carbon contents in a range of from about 0.08% to about 0.25% are prepared for maximum workability of the material as may be required in the most complex forming operations. In addition to the carbon constituents in the steel, the steel may further contain in addition to conventional quantities of impurities, up to about 5% of intentional alloying elements employed in standard SAE steel grades including alloying constituents such as nickel, manganese, chromium, molybdenum, boron, silicon, vanadium, etc.
>
> The specific composition of the steel or low-alloy steel can be varied within the aforementioned definition to provide a resultant steel having a degree of ductility sufficient to enable cold-formation of the steel blanks into a valve of the desired configuration. . . .
>
> A steel which has been found eminently as satisfactory in accordance with the practice of the present invention comprises a fully annealed SAE 1018 steel which has a sufficient degree of ductility to enable cold deformation of the blank into poppet-type valve configurations of the most complex configuration presently employed in commercial automobile engines. The composition of an SAE 1018 steel typically includes 0.15-0.20% carbon, 0.60-0.90% manganese, 0.4% maximum phosphorous, 0.5% maximum sulfur, and the balance iron.

Danis teaches that the valve made from a low carbon steel is subjected to a case-hardening treatment to provide a hard surface layer on the surfaces thereof to increase its wear resistance. Danis provides (column 4, lines 53-72) that:

> The type of case hardening and the degree of case hardening achieved will also vary consistent with the intended end use of the valves. In many cases it is necessary that only the valve tip indicated at 16 in FIG. 4 be fully hardened

> to a martensitic structure while unhardened pearlitic structures may be suitable to provide suitable stem and seat abrasion resistance in conventional automobile internal combustion engine use. For most engine applications, a valve made in accordance with the present process having a Rockwell hardness on the C-scale (Rc) on the valve tip of about 50 or more and on the other surfaces of valve of about 20 Rc or more provides for satisfactory operation and high resistance to wear. Since a full martensitic structure has a hardness in the range of about 50 to about 60 Rc units, a hardness in the valve tip of at least about 50 Rc can be achieved either during the primary case hardening operation or during a secondary localized case hardening of the tip itself such as for example by subjecting it to a flame-hardening treatment step as schematically illustrated in FIG. 1.

Kloske's invention pertains to steels especially adapted for use in exhaust poppet valves for internal combustion engines, and provides a steel of novel composition and improved properties therefor, which is further characterized over steels which are presently commercially acceptable for such applications, in being cold-formable, as by upsetting and extruding, into valve configuration. The steel of Kloske's invention is essentially a substantially austenitic, medium carbon, high nitrogen, chromium-nickel-manganese steel with 19-23% Chromium; 4.0-6.5% Nickel; 6.5-8.0% Manganese; 0-1.0% Silicon; 0.15-0.30% Carbon; 0.15-0.30% Nitrogen; 0-0.2% Columbium; 0-0.1% Phosphorous; 0-0.1% Sulphur; and the balance substantially Iron. Kloske teaches (column 2, lines 42-49) that his steel differs fundamentally from low carbon austenitic steels of, for example, 0.05% maximum carbon, which are strengthened exclusively by nitrogen additions, and which require a

minimum of about 14% nickel plus manganese for imparting a fully austenitic structure, and also a minimum of about 8% manganese for preventing ingot porosity.

After the scope and content of the prior art are determined, the differences between the prior art and the claims at issue are to be ascertained. Graham v. John Deere Co., 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966).

Based on the examiner's analysis and review of Gu and claim 15, the examiner ascertained (answer, pp. 3-4) that "Gu does not disclose the material used to make the poppet valve [i.e., the limitation of claim 15 that the valve head is made increasingly conformable to the valve seat by wear of the valve head through repeated contacts with the valve seat, the repeated contacts causing a contact surface of the valve head to achieve an increasingly smoother surface finish as a result of the wear]." With regard to this difference, the examiner then determined that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the poppet valve of Gu from the materials suggested and taught by either Danis or Kloske.

The appellants argue that the applied prior art does not suggest the claimed subject matter. We agree.

In our view, the teachings of the applied prior art contain no suggestion, teaching or motivation for a person of ordinary skill in the art at the time the invention was made to have made the poppet valve of Gu's fuel injector from the materials suggested and taught by either Danis or Kloske. The poppet valves taught by both Danis and Kloske are for use as either an inlet valve or an outlet valve of an internal combustion engine. As such, there is no teaching or suggestion therein to apply the materials taught by Danis and Kloske to be used in the poppet valve of a fuel injector. Without some teaching in the applied prior art that the same material would be useful in both a poppet valve of a fuel injector and the inlet valve or an outlet valve of an internal combustion engine, we must conclude that the only suggestion for modifying Gu to arrive at the claimed invention as set forth in the rejections under appeal stems from hindsight knowledge derived from the appellants' own disclosure. The use of such hindsight knowledge to support an obviousness rejection under 35 U.S.C. § 103 is, of course, impermissible. See, for example, W. L. Gore and Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

Additionally, it is our opinion that even if it would have been obvious at the time the invention was made to a person of ordinary skill in the art to have made the poppet valve of Gu from the materials suggested and taught by either Danis or Kloske that

such a modification of Gu would not necessarily arrive at the claimed invention. In that regard, the examiner has not established[1] that the poppet valve heads made from the steel materials as suggested and taught by Danis or Kloske would inherently be **increasingly conformable** to the valve seat by wear of the valve head through repeated contacts with the valve seat, the repeated contacts causing a contact surface of the valve head to achieve an **increasingly smoother surface finish** as a result of the wear. In our view, the mere fact that both Danis and Kloske disclose steels starting with a carbon content of 0.5% or less and a Rockwell Hardness of about 50 or less does not naturally result in the claimed functions (i.e., increasingly conformable and increasingly smoother surface finish).

For the reasons set forth above, the decision of the examiner to reject claims 15 to 20 under 35 U.S.C. § 103 is reversed.

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[1] As stated in In re Oelrich, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981) (quoting Hansgirg v. Kemmer, 102 F.2d 212, 214, 40 USPQ 665, 667 (CCPA 1939)) (internal citations omitted):

> Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. If, however, the disclosure is sufficient to show that the natural result flowing from the operation as taught would result in the performance of the questioned function, it seems to be well settled that the disclosure should be regarded as sufficient.

CONCLUSION

To summarize, the appeal with respect to claims 1 to 5 and 7 to 14 is dismissed and the decision of the examiner to reject claims 15 to 20 under 35 U.S.C. § 103 is reversed.

REVERSED

IRWIN CHARLES COHEN Administrative Patent Judge	)
JEFFREY V. NASE Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
JENNIFER D. BAHR Administrative Patent Judge	)

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