Appeal decision

Appeal No. 2017-15667

Appellant NITTAN VALVE CO., LTD.

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2014-544493, "engine valve", [international publication on May 8, 2014, WO2014/069397], has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

The present application was originally filed on Oct. 28, 2013 (Heisei 25) as an International Patent Application (Priority Claim on Oct. 30, 2012 (Heisei 24), Japan), and the procedures thereafter are shown as follows.

May 11, 2017 (date of dispatch) : A Written Notice of Reasons for Refusal

Jul. 5, 2017 : Submission of a Written Opinion and a Written Amendment

Jul. 24, 2017 (date of dispatch) : Decision of Refusal

Oct. 23, 2017 : Submission of a Written Demand for Appeal and a Written Amendment

Oct. 24, 2017 : Submission of a Supplemental Statement of Proceedings

Jul. 31, 2018 : Interview

Aug. 8, 2018 (date of dispatch) : A Written Notice of Reasons for Refusal (hereinafter, referred to as "Reason for Refusal by the Body 1")

Oct. 5, 2018 : Submission of a Written Opinion and a Written Amendment

Dec. 12, 2018 (date of dispatch) : A Written Notice of Reasons for Refusal (hereinafter, referred to as "Reason for Refusal by the Body 2")

Feb. 7, 2019 : Submission of a Written Opinion and a

Written Amendment

Feb. 8, 2019 : Submission of a Supplemental Statement of Proceedings

No. 2 The Invention

The invention according to Claim 1 of the present application (hereinafter, referred to as "the Invention") is specified by the matters described in Claim 1 of the Scope of Claims amended by the amendment of Feb. 7, 2019, and is as follows.

"An engine valve including a valve base for use in the engine valve, the valve base having a stem portion, and a head portion connected to one end of the stem portion, the engine valve comprising

a ring-shaped built-up portion forming a face of the head portion, wherein

the built-up portion is formed of Co-based abrasion-resistant alloy including iron and Cr, and the face formed by the built-up portion includes a machined surface on which the iron is scattered, and a surface hardening layer formed on the machined surface, and wherein

the surface hardening layer is an oxide film involving an interspersed nitrided layer formed by applying salt bath soft-nitriding to the iron scattered on the machined surface corresponding to a distribution of the iron."

No. 3 Reasons for Refusal by the body

1 Reason for Refusal by the body 2

Reason 1 and Reason 2 of Reason for Refusal by the Body 2 are as follows.

Reason 1 (Enablement requirement) In the present application, the statement of the detailed description of the invention does not meet the requirement stipulated in Article 36(4)(i) of the Patent Act in the following points.

Reason 2 (Requirement for support) In the present application, the statement of the Scope of Claims does not meet the requirement stipulated in Article 36(6)(i) of the Patent Act in the following points.

In addition, there is the following statement in Reason for Refusal by the Body 2. "At the moment, it is not apparent whether or not the Reasons for Refusal concerning B of Reason 3 (clarity) and Reason 4 (inventive step) of the Reasons for Refusal (Note by

the body: "Reason for Refusal by the Body 1") notified as of Aug. 1, 2018 (date of dispatch: Aug. 8, 2018) have been resolved. Examination will be made based on the Appellant's allegation against these Reasons for Refusal."

2 Reason for Refusal by the Body 1

Reason 1 and Reason 4 of Reason for Refusal by the Body 1 are as follows.

Reason 1 (Enablement requirement) In the present application, the statement of the detailed description of the invention does not meet the requirement stipulated in Article 36(4)(i) of the Patent Act in the following points.

Reason 4 (Inventive step) The following invention according to Claim 1 of the present application could have been invented with ease by a person having ordinary knowledge in the technical field to which the invention belongs before the priority date thereof based on the inventions described in the following publications distributed in Japan or abroad in advance of the priority date thereof, and, therefore, Appellant should not be granted a patent for that in accordance with the provisions of Article 29(2) of the Patent Act.

1. Japanese Unexamined Patent Application Publication No. 2000-1704
2. Japanese Unexamined Patent Application Publication No. H7-133706

No. 4 Regarding Article 36(4)(i) of the Patent Act (Enablement requirement)

Regarding the Reason for Refusal concerning Article 36(4)(i) of the Patent Act, the Reason for Refusal by the Body 1 states to the effect that "it is understood that the Invention is of an engine valve in which, after finish processing of the face surface F of the built-up metal 13 made of cobalt-based alloy has been performed to make the face surface F be a machined surface on which iron is scattered, salt bath soft-nitriding processing is performed on the overall valve to form an oxide film involving a scattering nitrided layer corresponding to the distribution of the scattered iron on the surface of the face. However, in light of common general technical knowledge that finish processing of the face surface of a built-up metal is performed in order to remove an oxide film, which is formed when forming the built-up metal onto a valve material, so as to facilitate subsequent nitriding treatment and other processing, it is understood as an oxide film does not exist on the face surface after the finish processing. Furthermore, it can be also understood that finish processing to form a machined

surface on which iron is scattered is processing to form a surface on which an oxide film and the like do not exist. Then, even if the Detailed Description of the Invention of the present application is examined in light of common general technical knowledge, it cannot be understood what kind of salt bath soft-nitriding processing should be performed on such machined surface so as to enable to form an oxide film. Although it can be understood that a nitrided layer is formed by performing salt bath soft-nitriding processing on the machined surface, it cannot be understood that an oxide film is formed".

Against Reason for Refusal by the Body 1, Appellant submitted the Written Opinion on Oct. 5, 2018, and alleged, in Reference Material 1 attached to the Written Opinion, that, since it is clearly described that an oxide is formed on the surface in salt bath soft-nitriding processing, it is considered common general technical knowledge for a person skilled in the art that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface. In addition, Appellant alleged in the written opinion that "Generally, in Co-based alloy, a lot of Cr having heat resistance and corrosion resistance is included, and, also in 'abrasion-resistant alloy including iron and a Co base' according to Claim 1 after amendment, Cr of about 25-28% is included (refer to [Table 1] in paragraph [0017] of the description of the present application, and see, as Reference Material 2, the attached Japan Soc. of Heat Treatment, Heat Treatment, vol. 48, issue 1, 'Basis of Heat-resistance Material', page 4, Feb., 2008). In locations other than portions where iron scattered on a machined surface is concentrated, chromium (Cr) having a property to be extremely easy to bond with oxygen oxidizes instantaneously to form a precise chromium oxide film (indicated as CrO in the reference sectional view B) called a passive state film on the surface of the machined surface. A chromium oxide film that is formed by bonding between chromium and oxygen has a precise structure, and will function as a robust corrosion resistance film, and, therefore, it is common general technical knowledge for a person skilled in the art that, in salt bath soft-nitriding processing in which nitriding and oxidation occur at the same time, nitrogen cannot pass through a chromium oxide film, and thus nitriding does not proceed beneath the chromium oxide film (refer to the reference sectional view B). On the other hand, with respect to iron scattered on a machined surface, although iron and oxygen bond with each other to form an iron oxide (indicated as FeO in the reference sectional view B), so-called rust, an iron oxide film is different from the above-mentioned passive state film in the sense that it is of a porous structure, and enables nitrogen to pass through it as shown in the reference sectional view B, and thus it is also common general technical knowledge for a person skilled in the art that

nitriding of iron progresses under the iron oxide film to form a nitrided layer (indicated as FeN in the reference sectional view B) (refer to paragraph [0006] of the description of Japanese Unexamined Patent Application Publication No. 2004-131795)".

Against this, Reason for Refusal by the Body 2 stated the Reason for Refusal to the effect that, on the ground that "it cannot be said that 'the matter that if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface' is 'common general technical knowledge' immediately from 'Reference Material 1,' and that it can be even understood as it is common general technical knowledge for a person skilled in the art to form an oxide film by soft-nitriding processing and oxidation processing, it cannot be said, from the Appellant's allegation in the written opinion, that 'the matter that if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface' is 'common general technical knowledge'".

Appellant alleges in written opinion of Feb. 7, 2019, against Reason for Refusal by the Body 2, that

"Although the Examiner has indicated, in the present Notice of Reasons for Refusal, that 'it is not common general technical knowledge that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface', it is considered that it is common general technical knowledge that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface, due to the following reasons. .... In Reference Material 1, a film for which an oxide was not able to be confirmed is an ion nitriding sample, and there is no description that an oxide cannot be confirmed in a salt bath soft-nitriding sample. Furthermore, when 'OKα' in Fig. 3(a) indicating salt bath soft-nitriding sample No. 1 and 'OKα' in Fig. 3(c) indicating ion nitriding sample No. 3 are compared, it can be confirmed that oxygen is concentrated obviously deeply in salt bath soft-nitriding sample No. 1, and, therefore, it is obvious that concentration of oxygen is remarkable in salt bath soft-nitriding processing as compared with ion nitriding treatment.

For the reasons mentioned above, it is considered that there is an error in the view of the Administrative Judge that it cannot be said that there is an oxide even in a salt bath soft-nitriding sample, on the ground of the result of the ion nitriding sample.

Therefore, when conducting salt bath soft-nitriding processing, it is considered that it is common general technical knowledge for a person skilled in the art that, even if finish processing is performed to the face surface of the built-up portion of an engine valve to remove an oxide film, an oxide film is formed on the surface in salt bath soft-nitriding processing that is performed after that".

Furthermore, Appellant also alleged, by Reference Material 3 submitted by the

Supplemental Statement of Proceedings on Feb. 8, 2019, that
"A mapping analysis result of a surface hardening layer formed on a machined surface of a 'built-up portion' according to Claim 1 after amendment will be considered (this is submitted by a Supplemental Statement of Proceedings as Reference Material 3). Reference Material 3 indicates a cross section of a surface hardening layer formed on the machined surface of a 'built-up portion' according to Claim 1 after amendment, and distribution positions and distribution quantities of each element can be confirmed. Specifically, it is possible to confirm that the distribution of portions shown in the blue color is not concentrated, and, on the other hand, the distribution of portions shown in the red color is concentrated. From this mapping analysis result, it is obvious that portions in which Fe and Co is concentrated and portions in which Cr is concentrated are different. In view of these, it can be confirmed that, in portions where Fe is concentrated, also a lot of Co exists, and, on the other hand, Cr does not exist so much. Then, in portions where Fe and Co are concentrated, from the point of view of standard free energy of formation ΔG, oxides of Fe will be formed on a priority basis. That is, oxide films formed on portions where Fe is concentrated are iron oxide films mainly. On the other hand, in portions where Fe is not concentrated, there exists a lot of Cr, and, since Cr is capable of more easily forming an oxide than Fe and Co, it is also well known that an oxide of Cr is formed on a priority basis. In other words, oxide films formed on portions where Fe is not concentrated are mainly chromium oxide films. Therefore, it is clear that oxide films to be formed on a 'machined surface' are formed as chromium oxide films or iron oxide films according to whether or not it is a portion where Fe is concentrated".

Therefore, the Appellant's allegation in the Written Opinion of Feb. 7, 2019 will be examined.

The Reason for Refusal notified in Reason for Refusal by the Body 2 is roughly one that: considering that O is concentrated in a porous layer in the neighborhood of the surface layer in either of salt bath soft-nitriding sample No. 1 in which there are, in the proximity of its surface, minute amounts of: ε phase which is hexagonal system nitride; spinel type oxide M_3O_4; and γ' phase which is cubic system nitride, and ion nitriding sample No. 3 for which existence of an oxide was not be able to be confirmed, there is no direct relation necessarily between an O-concentrated portion formed by nitriding treatment and the matter that an oxide can be formed on that portion; and, in addition, it is understood that, on the surface of salt bath soft-nitriding sample No. 1 to which salt bath soft-nitriding processing was performed, a film in which M_3O_4 which is an oxide and γ' phase are mixed to ε phase which is a hexagonal system nitride as a main

constituent; that is, a film that is not an oxide film, is formed. Although Appellant alleges that, "when 'OKα' in Fig. 3(a) which indicates salt bath soft-nitriding sample No. 1 and 'OKα' in Fig. 3(c) which indicates ion nitriding sample No. 3 are compared, it can be confirmed that oxygen is concentrated obviously deeply in salt bath soft-nitriding sample No. 1, and, therefore, it is obvious that concentration of oxygen is remarkable in salt bath soft-nitriding processing as compared with ion nitriding treatment.", the allegation does not indicates that there is relation between concentration of oxygen and the matter that an oxide can be formed. Then, so long as there is no direct relation between concentration of oxygen and the matter that an oxide can be formed, it can be said that there is no relation between "oxygen is concentrated obviously deeply in salt bath soft-nitriding sample No. 1" and "in the neighborhood of the surface of salt bath soft-nitriding sample No. 1, there are minute amounts of: ε phase which is hexagonal system nitride; spinel type oxide M_3O_4; and γ' phase which is cubic system nitride". Then, on the surface of salt bath soft-nitriding sample No. 1 to which salt bath soft-nitriding processing was performed, a film in which M_3O_4 which is an oxide and γ' phase are mixed to ε phase which is hexagonal system nitride as a main constituent; that is, a film that is not an oxide film, is formed, and, furthermore, M_3O_4 in the neighborhood of the surface is of a negligible quantity and is not included in calculation of a volume ratio. Therefore, it is reasonable to understand that a film that is formed on the surface of salt bath soft-nitriding sample No. 1 to which salt bath soft-nitriding processing was performed is a film in which negligible quantities of M_3O_4 which is an oxide and γ' phase which is cubic system nitride are mixed to ε phase which is hexagonal system nitride as a main constituent, and thus it is not an oxide film.

In addition, when Reference Material 3 is reviewed based on the allegation in the Written Opinion that "Specifically, it is possible to confirm that the distribution of portions shown in the blue color is not concentrated, and, on the other hand, the distribution of portions shown in the red color is concentrated.", supposing that "machined surface" in Reference Material 3 is the boundary between the white portion indicated to the effect that it is a "cobalt-based built-up metal" in the upper right figure of the Reference Material 3 and the portion in the right lower side of the white portion (the black portion to which the description as a backscattered electron image is given), portions in which a lot of Cr is distributed are portions inside the machined surface of the cobalt-based built-up metal and a part of the machined surface, portions in which a lot of Fe is distributed are a small fraction of the machined surface, and thus it can be said that, in the machined surface, there are Cr- and Fe-rich portions as well as Co rich portions. Then, elements which have portions of large distribution quantities locating

along the machined surface include Cr, Fe, and Co as well as carbon (C), nitrogen (N), and oxygen (O), and it can be seen that carbon-rich portions are in all areas of the machined surface, a lot of nitrogen-rich portions exist after the carbon-rich portions, whereas oxygen-rich portions are fewer compared with the carbon- and nitrogen-rich portions. From the above, it can be said that the machined surface is covered mainly by carbide of Cr, Fe, and Co; and, next, it is widely covered by nitride of Cr, Co, and Fe; and, thus, portions covered by oxide of Cr and Fe are fewer than portions covered by carbide and nitride. In this understanding, it can be said that the surface hardening layer indicated in Reference Material 3 is a layer to be covered by carbide or nitride, and is not an oxide film involving an interspersed nitrided layer formed by nitriding corresponding to the distribution of iron interspersed on the machined surface. (Rather, it can be said to be a nitride film involving an interspersed oxide layer formed by oxidation corresponding to the distribution of iron interspersed on the machined surface. When it is understood in this way, this also conforms to the neighborhood of the surface in salt bath soft-nitriding sample No. 1 of Reference Material 1.)

Therefore, even if taking Reference Material 1 and Reference Material 3 into consideration, it cannot be said to the extent that the matter "that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface" is "common general technical knowledge".

Meanwhile, Appellant also alleges that, from the matters disclosed in Evidence A No. 11 submitted in Supplemental Statement of Proceedings of Oct. 24, 2017 and Japanese Unexamined Patent Application Publication No. 2006-129625 cited in the Written Opinion on Feb. 7, 2019, it is "common general technical knowledge" "that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface". Therefore, when confirmation is made also regarding the disclosure matters of Evidence A No. 11 and Japanese Unexamined Patent Application Publication No. 2006-129625, it is described in Evidence A No. 11 (Japanese Unexamined Patent Application Publication No. H9-195729) to the effect that, when salt bath soft-nitriding processing is performed to a poppet valve made of titanium alloy as oxidation processing, an oxidation layer, not a nitrided layer, is formed on the surface of the base material (refer to paragraphs [0012] to [0017]).

However, the disclosure matter is a matter in which salt bath soft-nitriding processing is performed on titanium alloy that includes titanium as the major component and contains aluminum, and the oxidation layer is composed of TiO_2 and Al_2O_3. On the other hand, the Invention is one in which salt bath soft-nitriding processing is performed on Co-based abrasion-resistant alloy including iron and Cr, not

including aluminum and not even being titanium alloy. That is, it cannot be said, from the disclosure matters of Evidence A No. 11, that it is common general technical knowledge to perform salt bath soft-nitriding processing as oxidation processing to Co-based abrasion-resistant alloy including iron and Cr which is made up of materials different from those of Evidence A No. 11. In addition, in Japanese Unexamined Patent Application Publication No. 2006-129625, it is described, as a curing method of the surface of the drive friction member 3 made of metal, that: nitriding treatment is utilized; after nitriding treatment is applied to a SUS304 hollow pipe to increase surface hardness, the oxidation layer on the surface is removed; and, as the nitriding treatment, salt bath soft-nitriding is cited (refer to paragraph [0049]). However, the relevant description discloses that an oxidation layer is formed by salt bath soft-nitriding processing, and there is no description that an oxide film is formed by the processing. Then, it can be understood, from Reference Material 1 and Reference Material 3, that an oxide is formed by salt bath soft-nitriding processing. Here, considering that, even if taking Reference Material 1 and Reference Material 3 into consideration, it cannot be said that it is "common general technical knowledge" "that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface" as described above, it cannot be said, from the disclosure matters in Japanese Unexamined Patent Application Publication No. 2006-129625, that it is "common general technical knowledge" "that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface".

Accordingly, Appellant's allegation in the written opinion of Feb. 7, 2019 is improper.

Therefore, the Detailed Description of the Invention of the present application is not clearly and sufficiently described to the extent that a person skilled in the art can carry out the invention according to Claim 1.

No. 5 Regarding Article 36(6)(i) of the Patent Act (Requirements for support)

Regarding Article 36(6)(i) of the Patent Act, in Reason for Refusal by the Body 2, there was notified a Reason for Refusal that "As viewed from the description of 'abrasion-resistant alloy including iron and a Co base' of Claim 1, it can be understood that there is no limitation regarding to what degree is iron included in the abrasion-resistant alloy of the invention according to Claim 1. However, both of the cobalt-based alloys A and B described in [Table 1] in paragraph [0017] of the description of the present application include 1% Fe. In addition, regarding cobalt-based alloy including less than 1% Fe and cobalt-based alloy including more than 1% Fe, there is no statement or suggestion in the Description of the present application. Then, there is no

limitation regarding to what degree is iron included, and the statement of 'abrasion-resistant alloy including iron and a Co base' of Claim 1 that can be understood as including an amount of iron different from 1% exceeds the matters described or suggested in the Detailed Description of the Invention. Meanwhile, the same applies to the components other than Co in the cobalt-based alloys A and B described in [Table 1] in paragraph [0017] of the Description of the present application.".

In response to this, Appellant alleged, in the written opinion on Feb. 7, 2019, that "In addition, the Examiner has pointed out that 'regarding cobalt-based alloy including less than 1% Fe and cobalt-based alloy including more than 1% Fe, there is no statement or suggestion in the description of the present application'.

In paragraph [0008] of the description originally attached to the application, there is a statement that '... general cobalt-based build-up material was used ...', and, in paragraph [0010], there is a statement that 'regarding the built-up metal 13 according to cobalt-based alloy, general cobalt-based abrasion-resistant alloy was used ...', and, therefore, it is clear that the invention according to Claim 1 after amendment includes general cobalt-based built-up material and cobalt-based abrasion-resistant alloy, and thus it is obvious that only ones of Fe content of 1% are not targets.

Accordingly, Claim 1 after amendment satisfies the requirements stipulated in Article 36(6)(i) of the Patent Act; that is, the requirements for support.".

Therefore, this Appellant's allegation will be examined.

There is a description as "general cobalt-based built-up material" in paragraph [0008] of the Detailed Description of the Invention of the present application. Also, in paragraph [0010], there is description that "Regarding the built-up metal 13 by the cobalt-based alloy of the second example (b) according to the present invention, general cobalt-based abrasion resistance alloy was used". Therefore, it can be said that use of "general cobalt-based build-up materials" and "general cobalt-based abrasion resistance alloy" is described. However, it is not clearly described in the Detailed Description of the Invention of the present application that "general cobalt-based build-up material" and "general cobalt-based abrasion resistance alloy" specifically indicate what kind of cobalt-based alloy. As viewed from the statement of the above-mentioned paragraph [0010], although it can be understood that general cobalt-based abrasion resistance alloy in the Invention is a cobalt-based alloy of the second example (b), there is no statement related to the cobalt-based alloy concerning the second example (b) in the Detailed Description of the Invention of the present application, and thus it is unclear what kind of composition the cobalt-based alloy has. In addition, in paragraph [0016], there is a statement as "in the case of built-up metal being cobalt-based alloy (the second

example)", and thus it can be understood that, from the statement, built-up metal of cobalt-based alloy is the second example. However, in the Detailed Description of the Invention of the present application, there is no description concerning cobalt-based alloy (the second example), and it is unclear what kind of composition the cobalt-based alloy has. Furthermore, even if understanding that "general cobalt-based built-up material" is conventionally known built-up material using cobalt alloy, and looking at Table 4 describing a conventional Co-Cr-W-C system alloy (Stellite (registered trademark)) described as Comparative Example 2 in paragraph [0043] of the present application, Comparative Examples A and B that can be said to be corresponding to that alloy have 0% Fe, that is, do not include Fe, and thus these do not conform to Co-based abrasion-resistant alloy stated in Claim 1. Accordingly, it cannot be understood that cobalt-based alloy including what degree of Fe is indicated by "general cobalt-based build-up material" described in paragraph [0008] of the Detailed Description of the Invention of the present application and "general cobalt-based abrasion resistance alloy" described in paragraph [0010] even based on common general technical knowledge, and thus it cannot be understood that "only ones of Fe content of 1% are not the target" based on these statements. In view of the above, "general cobalt-based build-up material" and "general cobalt-based abrasion resistance alloy" substantially described in the Detailed Description of the Invention of the present application are "the cobalt-based built-up metal A" and "the cobalt-based built-up metal B" described in paragraph [0017] and [Table 1], and it is possible to understood that cobalt-based alloy other than "the cobalt-based built-up metal A" and "the cobalt-based built-up metal B" is neither described nor suggested. Both of "the cobalt-based built-up metal A" and "the cobalt-based built-up metal B" are ones that include 1% Fe.

Then, there is no limitation regarding what degree of iron is included, and the statement of "Co-based abrasion-resistant alloy which includes iron and Cr" of Claim 1 that can be understood as including iron of an amount different from 1% exceeds the matters described or suggested in the Detailed Description of the Invention.

Accordingly, the Appellant's allegation is improper.

Therefore, the invention according to Claim 1 is not described in the Detailed Description of the Invention of the present application.

No. 6 Article 29(2) of the Patent Act (Inventive step)

Assuming that the present application meets the requirements stipulated in Article 36(4)(i) of the Patent Act and Article 36(6)(i) of the Patent Act, examination regarding whether or not the Invention meets the requirement stipulated in Article 29(2)

of the Patent Act will be performed. Here, Co-based abrasion-resistant alloy of the Invention is not limited to ones of Fe content of 1%, and, in addition, it is common general technical knowledge that, if salt bath soft-nitriding processing is performed, an oxide film is formed on the surface.

1 Described matters in Cited Documents

(1) Cited Document 1

In Cited Document 1 (Japanese Unexamined Patent Application Publication No. 2000-1704) cited in Reason for Refusal by the Body 1, and distributed before the priority date of the present application, there are described the following matters together with drawings (refer to FIG. 1, in particular) relating to "built-up welded valve and manufacture thereof", (Underlines were given by the body for the purpose of helping understanding, and the same applies hereafter).

A "[0001]

[Field of the Invention] The present invention relates to a built-up welded valve that is excellent when used as an air intake valve and an air release valve of an internal-combustion engine, and to a manufacturing method thereof."

B "[0013]

[Embodiments of the invention] FIG. 1 indicates a valve head part of a built-up welded valve of one embodiment of the present invention, and this valve 21 is made to be of a constitution in which a built-up portion 23 made of sintered alloy is formed along the entire perimeter of the outer edge part of a valve body 22 thereof, and the ratio of the density of the built-up portion 23 to the true density is made to be in a range of 0.95-1.00.

[0014] The valve body 22 is constituted by heat-resistant steel such as SUH11, for example.

[0015] On the other hand, as the material of the built-up portion 23, Co system alloy made of 26-33wt% Cr, 3-14wt% W, 0.9-3wt% C, 3wt% or less Ni, 3wt% or less Fe, and the remainder composed of Co and inevitable impurities, for example, such as No. 1, No. 6 and No. 12 of Mitsubishi Stellite (registered trademark of Mitsubishi Materials Corporation) is used preferably. Also, for use under special corrosive environments, Mitsubishi Stellite No. 32 is also preferred, for example, as a Co system alloy having a high Ni content."

C "[0017] Next, a build-up method of the valve 21 mentioned above will be described based on FIG. 2. When a mold 31 for use in this build-up is described, first, the mold 31 includes, within a die 32, a lower punch 33 that supports the valve body 22 from the lower side; a first upper punch 34 for pressing the periphery of a stem part 22b of the valve body 22 mounted on the lower punch 33 from the upper side with the exception of a notched part 22a; and a second upper punch 36 that is arranged in a coaxial manner relative to the first upper punch 34 and forms a cavity 35 for build-up between the notched part 22a of the valve body 22 and itself. In addition, at least the lower punch 33 and the second upper punch 36 are constituted of metal, carbon, and the like having conductivity, and these are connected to a power source 37.

[0018] Then, the valve body 22 is arranged in the mold 31 and held between the lower punch 33 and the first upper punch 34; and, in conjunction with this, lubricant such as boron nitride (BN) is applied on the facing surfaces of the notched part 22a of the valve body 22 and the second upper punch 36 in advance, and, in a state where the second upper punch 36 is made to rise, metal powder 23a for build-up is filled into the notched part 22a of the valve body 22. Next, while pressing the metal powder 23a between the second upper punch 36 and the lower punch 33, a voltage of a level of 10 v, for example, is applied between these both punches 33 and 36 to induce flow of a pulse current of a few hundred amperes or more, and, by this, the mold is made to generate heat to heat the metal powder 23a and discharge is generated between the mold and the metal powder particles to burn the alloy powder 23a mentioned above. Such a series of operations is conducted in a state making the inside of the mold 31 be any atmosphere such as the air atmosphere just as it is, or an endoergic transformation atmosphere, a reducing atmosphere, an inert atmosphere, or vacuum.

[0019] By the above method, and by performing machining processing if necessary such as leveling and finish grinding, the sintered built-up welded valve 21 as shown in FIG. 1 can be obtained. In this connection, when the inside of the mold 31 is made to be any of the atmospheres of an endoergic transformation atmosphere, a reducing atmosphere, an inert atmosphere, and vacuum other than the air atmosphere, the entire mold 31 is stored in a chamber (illustration abbreviated)."

D As viewed from the described matters of the above B and the illustrated content in FIG. 1, it can be said that the valve body 22 is formed of the stem part 22b and a head portion connected to one end of the stem part 22b, and the built-up portion 23 has a constitution in which it is formed along the entire perimeter of the outer edge part of the head portion.

From the above, it is recognized that, in the above-mentioned Cited Document 1, the following invention (hereinafter, referred to as "Cited Invention") is described.

"A sintered built-up welded valve 21 comprising a valve body 22 for use in the sintered built-up welded valve 21 formed of a stem part 22b and a head portion connected to one end of the stem part 22b,

the sintered built-up welded valve 21 having a built-up portion 23 formed along the outer peripheral surface of the head portion, wherein

the built-up portion 23 is formed of a Co system alloy including Fe and Cr, and, to the built-up portion 23, finish grinding is performed."

(2) Cited Document 2

In Cited Document 2 (Japanese Unexamined Patent Application Publication No. H7-133706) that was cited in Reason for Refusal by the Body 1, and distributed before the priority date of the present application, there are described the following matters along with drawings (refer to FIG. 1 and FIG. 2, in particular).

A "[0003] For the reason that, when the engine is in operation, the stem portion (02) repeats sliding movement at a high speed at all times in a manner being guided by a valve guide (04), and, furthermore, by a lip seal (06) fixed to the upper end of the valve guide (04), a leak of lubricating oil into the side of a head portion (01) beyond necessity is being suppressed, the stem portion (02) is under a harsh friction environment.
[0004] Therefore, in the conventional valve body (03), the abrasion resistance of the stem portion (02) is enhanced by, for example, applying, on the surface of the stem portion (02) which has been made to be of predetermined surface roughness by a grinding step and the like, a hardening layer according to soft-nitriding processing (Tufftride), or surface treatment such as chrome plating or nickel plating and the like."

B "[0011]
[Examples] Hereinafter, one example of the present invention will be described based on drawings. FIGS. 1 (A) and (B) indicate the present invention in the order of steps, and, after having applied grinding (preprocessing) to the whole surface, with the exception of the head top (10d), of the heat-resistant steel valve body (10) to which finishing into predetermined sizes has been applied to the stem portion (10a), the head portion (10b) and the cotter groove (10c) by various kinds of machining processing

steps, first, so as to make these be of predetermined surface roughness (for example, Rz 1.0-10.0 μm) by a grinding wheel of a grinding machine and the like (this preprocessing step is not shown), salt bath soft-nitriding processing (Tufftride) is applied to the whole surface except for the head top (10d) to form the hardening layer (11) as shown in FIG. 1 (A).

[0012] This hardening layer (11) is formed by, for example, heating a treatment bath containing potassium cyanide, potassium cyanate, sodium ferrocyanide, or the like as a main component up to around 600 degrees Celsius, and dipping the to-be-treated portion of the valve body (10) therein for a predetermined time. In this connection, it is preferred that the thickness of the hardening layer (11) be 10-20 μm."

From the above, it is recognized that the following matter is described in Cited Document 2 mentioned above.

"That, after grinding the whole surface of the valve body (10) made of heat-resistant steel with the exception of the head top (10d), salt bath soft-nitriding processing is applied to form a hardening layer."

2 Comparison

When the Invention and Cited Invention are compared, "the sintered built-up welded valve 21" of the latter corresponds to "engine valve" of the former as viewed from its function, constitution, and technical significance, and, in a similar fashion, "valve body 22" corresponds to "valve base", "stem part 22b" to "stem portion", "Fe" to "iron", and "Co system alloy" to "Co-based abrasion-resistant alloy".

In addition, "built-up portion 23" corresponds to "built-up portion" of the former. In view of the above, it can be said that "a built-up portion 23 formed along the outer peripheral surface of the head portion" of the latter is one that has a matter corresponding to "a ring-shaped built-up portion forming a face of the head portion" of the former. Then, since the latter is one to which "finish grinding is performed", it can be said that it is "the face formed by the built-up portion includes a machined surface" of the former. Then, the latter, of which it can be said that "a face formed by a built-up portion includes a machined surface", and the former, of which "the face formed by the built-up portion includes a machined surface on which the iron is scattered, and a surface hardening layer formed on the machined surface" are identical to the extent that "a face formed by a built-up portion includes a machined surface".

Therefore, the two are identical in the point of

"An engine valve including a valve base for use in the engine valve, the valve base having a stem portion and a head portion connected to one end of the stem portion, the engine valve comprising

a ring-shaped built-up portion forming a face of the head portion, wherein

the built-up portion is formed of Co-based abrasion-resistant alloy including iron and Cr, and the face formed by the built-up portion includes a machined surface", and differ in the following point.

[Different Feature]

A point that the built-up portion of the former includes a machined surface "on which the iron is scattered" and "a surface hardening layer formed on the machined surface" that is "an oxide film involving an interspersed nitrided layer formed by applying salt bath soft-nitriding to the iron scattered on the machined surface corresponding to a distribution of the iron", whereas, it is unclear whether or not, in the built-up portion of the latter, "iron is scattered" on the machined surface, and, in addition, "surface hardening layer" is not included.

3 Judgment

The above-mentioned Different Feature is examined.

As viewed from the statement of paragraph [0015] of the above-mentioned "1", "(1)", "B", Co system alloy of Cited Invention contains Fe component. Then, it could have been easily conceived of by a person skilled in the art with ease that, when finish grinding is performed on the built-up portion 23 of such Co system alloy, scattered iron exists on the machined surface.

In addition, the described matter of Cited Document 2 is

"That, after grinding the whole surface of the valve body (10) made of heat-resistant steel with the exception of the head top (10d) (this corresponds to 'machined surface is formed' of the Invention 1, and the same applies hereafter), salt bath soft-nitriding processing is applied to form a hardening layer.".

Cited Invention and the described matters of Cited Document 2 are common in a point of being technologies related to an engine valve, and are also common in the problems to be solved of improvement of abrasion resistance, and, therefore, it could have been conceived of by a person skilled in the art with ease to realize the matter of the Invention concerning the different feature by applying the described matter of Cited Document 2 to Cited Invention.

Then, since it is a common general technical knowledge that an oxide film is

formed on a surface when salt bath soft-nitriding processing is applied to the surface, it could have been conceived of with ease by a person skilled in the art that a film that is made by applying the described matter of Cited Document 2 to Cited Invention is "an oxide film involving an interspersed nitrided layer formed by applying salt bath soft-nitriding to iron scattered on the machined surface corresponding to a distribution of the iron" or something to that effect.

In addition, even examined as a whole, the Invention does not have a special effect that is unpredictable from Cited Invention and the described matter of Cited Document 2.

Therefore, the Invention could have been invented by a person skilled in the art with ease based on Cited Invention and the described matter of Cited Document 2.

4 Regarding Appellant's opinion

In the written opinion as of Feb. 7, 2019, Appellant alleges that "Since there is a statement, in paragraph [0009] of the description of Cited Document 1, that 'Since a metal oxide film existing on a surface of metal powder is destroyed by discharge to activate the surface, it becomes possible to realize precise sintering at relatively low temperature.', performing salt bath soft-nitriding processing by which an oxide film is formed on the surface corresponds to inhibiting the effect of the invention described in Cited Document 1, and, therefore, it can be said that there is technical disincentive in combining a hardening layer disclosed in Cited Document 2 with the invention described in Cited Document 1.

On the other hand, even if nitriding treatment is performed on the invention described in Cited Document 1, it is well-known that there exists ion nitriding treatment that is nitriding treatment that does not form an oxide film, and, therefore, a person skilled in the art would consider that it is natural to select ion nitriding treatment, and does not select salt bath soft-nitriding processing.".

However, looking into the above-mentioned "1", "(1)", "C", discharge is caused to be generated between a mold and metal powder particles, in Cited Invention, at the time when the metal powder 23a for build-up is filled into the notched part 22a of the valve body 22 and is burned. Then, the sintered built-up welded valve 21 is obtained by performing finish grinding after burning. On the other hand, the salt bath soft-nitriding processing of the described matter of Cited Document 2 is performed after performing grinding processing to an engine valve, and, therefore, a valve made by

applying the described matter of Cited Document 2 to Cited Invention is one in which salt bath soft-nitriding processing is performed after filling the metal powder 23a for build-up into the notched part 22a of the valve body 22, performing burning, and, further, applying finish grinding. That is, so long as discharge in Cited Invention and salt bath soft-nitriding processing that is the described matter of Cited Document 2 are not performed at the same time, and finish grinding is performed on the built-up portion 23 after performing the discharge and, further, performing salt bath soft-nitriding processing, destruction of a metal oxide film caused by the discharge is not one that gives influence to a degree to make it impossible to apply salt bath soft-nitriding processing to a surface after finish grinding; that is, a machined surface. Therefore, the relevant discharge will not technically inhibit application of the described matter of Cited Document 2 to Cited Invention. Then, both ion nitriding treatment and salt bath soft-nitriding processing alleged by Appellant are commonly used means in nitriding treatment, and, regarding any of the nitriding treatments, so long as there is no technical situation to make it impossible to apply these to Cited Invention, which processing is selected is a matter that could have been determined accordingly within a range of a usual creation ability of a person skilled in the art.

Accordingly, the above-mentioned allegation by Appellant in the written opinion as of Feb. 7, 2019 is improper.

No. 7 Closing

As above, since the present application does not meet the requirement stipulated in Article 36(4)(i) of the Patent Act, and does not meet the requirement stipulated in Article 36(6)(i) of the Patent Act, the present application should be rejected.

Even if, the present application meets the requirements stipulated in Article 36(4)(i) of the Patent Act and Article 36(6)(i) of the Patent Act, Appellant should not be granted a patent for the Invention in accordance with the provisions of Article 29(2) of the Patent Act, and, thus, the present application should be rejected.

Therefore, the appeal decision shall be made as described in the conclusion.

Jun. 4, 2019

Chief administrative judge: KANAZAWA, Toshio
Administrative judge: MIZUNO, Haruhiko
Administrative judge: SAITO, Koshiro