Paper No. 12

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FURQAN ZAFAR SHAIKH, MARTIN ANDREW BROGLEY, CRAIG EDWARD BURCH, NEAL JAMES COREY, THOMAS JOHN HEATER and GARY ALLAN VRSEK

Appeal No. 2000-0093
Application No. 08/874,812

ON BRIEF

Before McCANDLISH, Senior Administrative Patent Judge, and McQUADE and NASE, Administrative Patent Judges.

McQUADE, Administrative Patent Judge.

DECISION ON APPEAL

Furqan Zafar Shaikh et al. originally took this appeal from the final rejection of claims 1 through 26, all of the claims pending in the application.[1] On page 2 in their appeal

[1] The record indicates that the instant application is a continuation-in-part of Application 08/158,879, filed November, 29, 1993, now abandoned, which itself was involved in an appeal to this Board (Appeal No. 97-0177). A decision in the prior appeal sustaining the examiner's rejections was rendered March 17, 1998.

brief (Paper No. 10), the appellants state that "Applicant [sic] hereby cancels Claims 2-7, 12, and 20-21, without prejudice." As amendments must be submitted in a paper separate from the brief (see MPEP § 1207), the proposed cancellation is informal and has not been clerically entered into the record. Nonetheless, we construe it as an indication that the appellants will formally cancel claims 2 through 7, 12, 20 and 21 in due course and no longer intend these claims to be subject to the appeal. Hence, the appeal as to claims 2 through 7, 12, 20 and 21 is hereby dismissed, leaving for review the standing rejections of claims 1, 8 through 11, 13 through 19 and 22 through 26.

THE INVENTION

The invention relates to the manufacture of consumable investment patterns used to make metal castings. Claim 1 is representative and reads as follows:

> 1. A method of making a casting having free-form, undercut or hidden interior surfaces, comprising:
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> (a) designing a three-dimensional computer graphic model of said casting;
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> (b) computer sectioning the graphic model into graphic members which are at least one of blocks and slabs having sides normal to the sectioning interval;
>
> (c) carving a physically solid member for each of the graphic members, the solid members being (i) constituted of an easily meltable, dissolvable or evaporative solid material, (ii) proportional to and enveloping its corresponding graphic member, and said carving being carried out by accessing and carving into and through two or more of said sides of each solid member that possesses at least portions of said interior surfaces and thereby essentially duplicate the corresponding graphic member;
>
> (d) securing the carved solid members together with matching

interior surfaces to replicate the graphic-model and form a unitary investment pattern;

(e) forming a mold around said pattern, and

(f) casting metal within said mold while removing the pattern from such mold either by evaporation during pouring of the molten metal thereinto or by melting or dissolution prior thereto.

THE PRIOR ART

The references relied on by the examiner as evidence of obviousness are:[2]

Tamura (Tamura '541)	JP 64-034,541	Feb. 06, 1989
Tamura (Tamura '340)	JP 01-178,340	Jul. 14, 1989

THE REJECTIONS

Claims 13 through 19 and 22 through 25 stand rejected under 35 U.S.C. § 112, second paragraph, as failing to particularly point out and distinctly claim the subject matter the appellants regard as the invention.

Claims 1, 8 through 11, 13 through 19 and 22 through 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over either Tamura '541 or Tamura '340.

Attention is directed to the appellants' brief (Paper No. 10) and to the examiner's final rejection and answer (Paper Nos. 7 and 11) for the respective positions of the appellants and the examiner with regard to the merits of these rejections.[3]

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[2] Copies of the English language translations of these references which were mailed to the appellants with the decision in the prior appeal (see n.1, supra) are appended hereto for convenience.

[3] In the final rejection and answer, the examiner mentions a number of references which are of record, but not included in the statement of the § 103(a) rejection, to support the conclusion of obviousness.

DISCUSSION

I. The 35 U.S.C. § 112, second paragraph, rejection

This rejection rests on the examiner's determination that claim 13, and claims 14 through 19 and 22 through 25 which depend therefrom, are indefinite because "[i]n claim 13, ninth line from the last, the meaning of 'said subdividing planes that interfere with interior surfaces' is not clear" (final rejection, page 2).

The appellants concede that the problematic word "interfere" (instead of the intended word "interface") appears in this limitation as the result of a typographical error, but nevertheless insist that the limitation is not indefinite since "[e]ach subdividing plane does interfere or intersect with interior surfaces" (brief, page 4).

The word "interfere," however, is not synonymous with "intersect" or "interface," and does not clearly or accurately set forth the disclosed relationship between the subdividing planes and the interior surfaces. We shall therefore sustain the standing 35 U.S.C. § 112, second paragraph, rejection of claims 13 through 19 and 22 through 25.

II. The 35 U.S.C. § 103(a) rejection

Both of the Tamura references pertain to the manufacture of consumable investment patterns.

Where a reference is relied on to support a rejection, however, whether or not in a minor capacity, there is no excuse for not positively including the reference in the statement of the rejection. In re Hoch, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970) and MPEP § 706.02(j). Accordingly, in reviewing the § 103(a) rejection, we have not considered any reference other than the Tamura references cited in the statement of the rejection.

Tamura ‘340 discloses

a method for manufacturing a metallic mold [i.e., a metallic casting] in which multiple slice panels are polymerized together to produce a metallic mold pattern [i.e., a unitary investment pattern], and the aforementioned metallic mold pattern is used to produce a metallic mold by means of full mold casting, a method for manufacturing a metallic mold characterized in that the thickness of the aforementioned multiple slice panels is varied in accordance with the curvature of the outline to be formed by the metallic mold pattern [translation, page 4].

Tamura ‘340 describes this method in more detail as follows:

Figure 1 is an application example of the present invention, and shows all of the steps in the method for manufacturing a metallic mold by means of full mold casting using a metallic mold pattern. As shown in Figure 1, when a metallic mold is manufactured, first, using a computer, multiple 2-dimensional figure data which represent parsed planar images and external planar images for the metallic mold to be manufactured are input, and 3-dimensional shape data which represent the overall image of the metallic mold are produced and recorded (S1) .

Next, with the computer that stores the aforementioned 3-dimensional shape data, outline data for each slice section are produced from the aforementioned 3-dimensional shape data by making slice sections of a specific pitch in the lengthwise direction of-the metallic mold (S2). With regard to this slicing, when, for example, the portion of the metallic mold that constitutes its surface has the horizontal outline a such as is shown by the broken line in Figure 2, the pitch is changed according to the curvature of that outline a; the pitch of the slicing is made small at the sections where the curvature is large, and the pitch of the slicing is made large at the sections where the curvature is small. As shown in Figure 3, when the slicing occurs, the thickness of each slice section i.e., pitch X_n, $X_n + 1$, X_n, + 2 is made such that the shift in the coordinates of contiguous slice sections, in the direction of slicing, is a constant value *.

Next, based on the pitch dimensions data and the outline data for each slice section obtained by the computer, straight foamed styrol material is cut to form multiple thin planar slice panels with a thickness equal to the pitch of the respective slice sections. At the same time, said slice panels are processed into shapes with an outline corresponding to each slice section (S3).

> Here, as for the processing of the shape of the outline of the aforementioned slice panels 4, for example, based on the outline data for each slice section which is obtained by a computer, the shape of the outline for each slice section is drawn on recording paper by a printing device which is the output unit for the computer. Then, a paper pattern for each slice section is produced from this recording paper, and using said paper pattern, the slice panels are cut out in an outline of a specific shape using a cutter. In addition to this method of processing, by means of an NC processing apparatus or the like, with the outline data for each slice section obtained by the computer, it is possible to directly cut out slice panels into outlines of a specific shapes without using a paper pattern.
>
> Then, as shown in Figure 2, when multiple slice panels 1, 1, ... that have been processed into a shape with a specific outline as described above are aligned with one another and polymerized by binding with a binding agent, metallic mold pattern 2 with an outline that is horizontal with respect to the outline A of metallic mold is formed (S4). Next, the aforementioned metallic mold pattern 2 is erased with sandpaper or the like, or small pieces of molded styrofoam are pasted on; thus the fairing process is performed to produce metallic mold pattern 2 completely in an outline with a specific shape (S5).
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> . . .
>
> After that, a metallic mold is cast by means of full mold casting using the aforementioned metallic mold pattern that has been processed by fairing. (S6). As is publicly known, full mold casting involves embedding a metallic mold pattern in casting sand, then injecting a molten mixture into the casting sand, with the heat of the molten mixture burning away the metallic mold pattern. Then by filling a molten mixture into the cavity formed by the external form of the metallic mold pattern in the casting sand, a metallic mold with a shape that corresponds to the
>
> metallic mold pattern is obtained. This completes the manufacture of the metallic mold [translation, pages 5 through 8].

Tamura '541 discloses a method for manufacturing a metallic mold which is essentially similar to that disclosed by Tamura '340. Of particular interest is that

> a processor produces 3-D data that describes the whole image of the mold to be built based upon the 2-D graphic data of the mold, and, based upon this 3-D data, cross-sectional-shape data is obtained for each shape of a plurality of parallel cross-sections obtained in the whole image of the mold at every given interval. Subsequently, based upon the cross- sectional-shape data obtained in this manner, from a material for full-mold-casting models, such as styrofoam board, etc., multiple board pieces are prepared which have the external shapes corresponding to the shapes of the parallel cross-sections that are described by the cross-sectional-shape data [translation, page 6].

Tamura '541 also discloses that the multiple board pieces are shaped by an automatic cutting device under control of the processor (see, for example, page 17 in the translation).

The preambles of claims 1, 8, 13 and 26, the four independent claims on appeal, define the methods respectively recited therein as being for "making a casting having free-form, undercut or hidden interior surfaces" (claim 1), "making a casting having complex free-form, undercut or substantially hidden interior surfaces" (claim 8), "making a functional casting from molten castable material, said casting having interior surfaces which are shaped with two or more characteristic[s] of free-form, undercut or hidden" (claim 13) and "making a fugitive investment pattern having free-form, undercut or hidden interior surfaces" (claim 26). Each of these claims also sets forth a "carving" step relating to the formation of such interior surfaces. In applying the Tamura references against the appealed claims, the examiner takes the position that

> each of prior art references substantially shows the invention as claimed except that they do not disclose [how] to make a casting having free-from undercut or hidden interior surfaces.[4] However, it is [sic, was] known that the multiple axises [sic] cutting machine is [sic, was] commercial[ly] available. It would have been obvious to use the multiple axises [sic] cutting machine in the apparatus of [the] cited prior art references for making a pattern of complex shape if that particular complex shape of casting is designated [final rejection, page 3].

Rejections based on 35 U.S.C. § 103(a) must rest on a factual basis. In re Warner, 379 F.2d 1011, 1017, 154 USPQ 173, 177-78 (CCPA 1967). In making such a rejection, the examiner has the initial duty of supplying the requisite factual basis and may not, because of doubts that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in the factual basis. Id.

In the present case, the examiner has failed to advance any factual support for the rationale employed to cure the acknowledged deficiencies of the Tamura references with respect to the subject matter recited in independent claims 1, 8, 13 and 26. While multiple-axis milling machines may have been known in the art at the time of the appellants' invention, there is nothing in either Tamura reference which would have suggested modifying the methods respectively disclosed therein by using such a machine to carve interior surfaces of the sort required by these claims. This lack of suggestion belies the examiner's conclusion that the differences between the subject matter recited in

[4] In the answer, the examiner makes the contradictory statement that "[t]he interior surfaces of both Mazda [Tamura] references are considered as free-form cavity since they do not have surface generated as a result of revolving about an axis" (page 4). According to Webster's Third New International Dictionary (G. & C. Merriam Co. 1971), the term "free form" means "an asymmetrical biomorphic and usu. non-rectilinear shape". Neither Tamura reference discloses an interior surface having such a shape.

the independent claims and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art.

Accordingly, we shall not sustain the standing 35 U.S.C. § 103(a) rejection of independent claims 1, 8, 13 and 26, and dependent claims 9 through 11, 14 through 19 and 22 through 25, as being unpatentable over either Tamura ‘541 or Tamura ‘340.

SUMMARY

The decision of the examiner:

a) to reject claims 13 through 19 and 22 through 25 under 35 U.S.C. § 112, second paragraph, is affirmed; and

b) to reject claims 1, 8 through 11, 13 through 19 and 22 through 26 under 35 U.S.C. § 103(a) as being unpatentable over either Tamura ‘541 or Tamura ‘340 is reversed.

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

AFFIRMED-IN-PART

HARRISON E. McCANDLISH Senior Administrative Patent Judge	)))))) BOARD OF PATENT
JOHN P. McQUADE Administrative Patent Judge	) APPEALS) AND) INTERFERENCES
JEFFREY V. NASE Administrative Patent Judge	))))

jpm/vsh

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