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for publication and is not binding precedent of the Board.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. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte JYOTI MAZUMDER

Appeal No. 2004-1495
Application No. 09/526,631

ON BRIEF

Before FRANKFORT, BAHR and SAADAT, Administrative Patent Judges.

BAHR, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1-14, which are all of the claims pending in this application.

We AFFIRM-IN-PART and REMAND.

BACKGROUND

The appellant’s invention relates to smart dies and molds having integrated sensors for controlling temperature, distortion and/or stress and the process of making

such smart dies and molds by a direct-metal deposition process (specification, page 1). A copy of the claims under appeal is set forth in the appendix to the appellant's brief.

The examiner relied upon the following prior art references in rejecting the appealed claims:

Moore et al. (Moore)	4,493,362	Jan. 15, 1985
Arai	5,062,786	Nov. 5, 1991
Prinz et al. (Prinz)	5,278,442	Jan. 11, 1994
Spillman Jr. (Spillman)	5,440,300	Aug. 8, 1995
Amaya et al. (Amaya)	5,976,457	Nov. 2, 1999

The following rejections are before us for review.

(1) Claims 1-3, 5 and 6[1] stand rejected under 35 U.S.C. § 103 as being unpatentable over Arai in view of Prinz.

(2) Claims 4 and 10 stand rejected under 35 U.S.C. § 103 as being unpatentable over Arai in view of Prinz and Moore.

(3) Claims 7-9 stand rejected under 35 U.S.C. § 103 as being unpatentable over Arai in view of Prinz and Spillman.

(4) Claim 11 stands rejected under 35 U.S.C. § 103 as being unpatentable over Arai in view of Prinz, Moore and Spillman.

(5) Claims 12 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Moore in view of Amaya.

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[1] As explained by the examiner on pages 2-3 of the answer, the inclusion of claims 7-9 in this rejection in the final rejection (Paper No. 9) was in error.

(6) Claim 14 stands rejected under 35 U.S.C. § 103 as being unpatentable over Moore in view of Amaya and Spillman.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellant regarding the above-noted rejections, we make reference to the answer (Paper No. 12) for the examiner's complete reasoning in support of the rejections and to the brief (Paper No. 11) 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.

Rejection (1)

Arai discloses a molding device for molding optical elements, in particular Fresnel lenses, comprising a molding machine including a high frequency induction heating means 18 and a moving side mold 2B and a fixed side mold 2A, each having a temperature sensor 20A, 20B embedded therein and cooling channels connected by pipe 14A to a temperature controller 14. The signals from the temperature sensors are transmitted to a temperature controller 22 which compares the detected temperatures to a predetermined peak temperature to see if the predetermined peak temperature has been reached or exceeded. Upon mold initiation, the moving side mold 2B is moved

toward the fixed side mold 2A and the temperature controller 14 is actuated to heat the cooling medium in a reservoir and actuate a pump to circulate cooling medium through the cooling channels within the molds. The temperature controller 14 maintains the cooling medium in the reservoir at a predetermined constant temperature (column 7, lines 67-68). When the fixed side mold stops moving, high frequency oscillations are transmitted to the heating coil 18B to heat the molds 2A, 2B. When the temperatures detected by the temperature sensors reach or exceed the peak temperature, the oscillation to the heating coil 18B is stopped, the heating means 18 is retracted, the mold is closed, the molding operation is completed and the molded article is removed.

As disclosed in column 9, lines 3-30, the mold components 2A, 2B are fabricated

> by laminating an electroformed copper layer, and thereafter laminating a chromium plating layer or a titanium compound layer on the worked face.
>
> More specifically, by use of an iron type metal material as the substrate for mold, heating can be done efficiently by high frequency heating, and the copper layer which is formed by electroforming is substantially free from effect such as pinhold, etc. and excellent in cutting workability, whereby high degree of mirror finishing is rendered possible. Further, by providing a nickel layer between the substrate of an iron type metal material and the copper layer according to the electroforming method, adhesive force between the iron type metal an [sic: and] the copper layer is enhanced to completely prevent peeling, etc. during mechanical working, hot impact.
>
> Also, since the copper layer is susceptible to flaws caused by deforming on account of low surface hardness and elasticity, by lamination of a chromium plating layer or a titanium compound layer such as of titanium nitride, etc., it becomes possible to obtain a mold surface strongly resistant

> to flaw or deformation, while maintaining fine uneven portion or mirror surface characteristic.

The examiner determined that Arai lacked a body constructed using a direct metal deposition process and a surrounding portion[2] as called for in claim 1. The examiner's position appears to be that it would have been obvious to fabricate the mold components 2A, 2B of Arai using the thermal spray deposition method of Prinz to facilitate production of articles having undercuts and irregular shapes.

To the extent that the lamination using electroforming process of Arai may not be considered to be "a direct metal deposition process" as used in claim 1, we agree with the examiner that Prinz provides ample motivation to form the nickel, copper and chromium or titanium layers of Arai's mold using a thermal deposition spray process wherein material is incrementally built up in thin layers to overcome the disadvantages of known lamination techniques cited by Prinz in column 2, lines 17-23.

Appellant's argument on page 5 of the brief that Arai is not directed to articles having undercuts and irregular shapes is not well taken. As illustrated in Figure 6, the molds 2A, 2B are shaped so as to mold a Fresnel lens having an irregular shape.

We are also unpersuaded by appellant's argument on page 5 of the brief to the effect that Prinz lacks any teaching that the thermal spray deposition process is used for anything more than a few layers. We find no requirement in claim 1 that the entirety of

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[2] We, on the contrary, consider the material of Arai's moving side mold 2B surrounding the cavity thereof to be a surrounding portion as called for in claim 1.

the body be constructed using direct metal deposition. In other words, the claim language is sufficiently broad to encompass the modified Arai mold with the nickel, copper and chromium or titanium layers being added by a thermal deposition spray process to an iron substrate in view of Prinz as discussed above.

For the reasons discussed above, we do not find appellant's arguments persuasive as to the patentability of claim 1 over Arai in view of Prinz and thus shall sustain the rejection of claim 1, as well as claims 2, 3, 5 and 6 which appellant has grouped therewith (brief, page 4).

Rejection (2)

Claim 4 depends from claim 1 and further recites that the product shaping or forming portion is a die. As eventually recognized by the examiner on page 16 of the answer, Arai discloses either a mold or a die in column 5, line 31. Thus, we regard the reliance on the additional teachings of Moore as mere surplusage. For the reasons discussed above with regard to claim 1, it follows that we shall also sustain the rejection of claim 4 as being unpatentable over Arai in view of Prinz and Moore.

We shall not, however, sustain the rejection of claim 10 as being unpatentable over Arai in view of Prinz and Moore. We appreciate that Moore discloses a die-casting machine in which temperature feedback is used to control the flow of coolant through servo-controlled coolant valves. Arai's molding device, on the other hand, uses temperature feedback to control the induction heating and not the coolant flow. As

explained above, Arai's temperature controller 14 maintains the cooling medium in the reservoir at a predetermined constant temperature (column 7, lines 67-68) and simply actuates a pump to circulate the cooling medium through the cooling passages in the mold. While Arai's molding device could be modified to provide an electronic flow meter which adjusts inlet coolant flow based on signals from a feedback controller, the controller operating to adjust the temperature of the coolant by sending signal input to the flow meter, we find no suggestion in either Arai or Moore to do so. The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification. See In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992); In re Mills, 916 F.2d 680, 682, 16 USPQ2d 1430, 1432 (Fed. Cir. 1990); In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984).

Rejection (3)

Claims 7-9 depend from claim 1 and further require a plurality of integrated sensors, each outputting an electrical signal which is a function of strain. Arai does not disclose strain sensors in the molding device. In fact, one of ordinary skill in the art would have inferred from the disclosure in the second full paragraph of column 2 that the use of strain sensors was not necessary, inasmuch as the use of high frequency induction heating in combination with mold temperature control is expected to prevent sinking or strain on the optical part.

Spillman evidences that it was known in the art at the time of appellant's invention to embed strain sensors in smart structures. As pointed out by appellant (brief, page 6), however, Spillman's teachings are directed to wireless systems with capability to sense, process and receive data from embedded structures without direct physical connection between the structures and a data collection and powering interface and are not specifically directed to tools, molds or dies.

For the above reasons, we conclude that the teachings of Arai, Prinz and Spillman are insufficient to have suggested the inclusion of strain sensors in Arai's molding device. It follows that we shall not sustain the rejection of claims 7-9 as being unpatentable over Arai in view of Prinz and Spillman.

Rejection (4)

Claim 11, like claims 7-9, requires a plurality of integrated sensors each outputting an electrical signal which is a function of strain. For the reasons discussed above with regard to claims 7-9, we find no suggestion in the applied references to include strain sensors in Arai's molding device. We thus shall not sustain the rejection of claim 11 as being unpatentable over Arai in view of Prinz, Moore and Spillman.

Rejection (5)

Moore discloses a method of fabricating a product using a die casting machine comprising thermocouples 112, 114 outputting an electrical signal indicative of temperature. Moore does not disclose providing a computer database describing the

mold and fabricating the mold using a laser-aided, computer-controlled direct metal deposition process in accordance with the computer database description.

Amaya discloses a method of fabricating molds using a CAD type computer database describing the mold in conjunction with existing technologies, such as stereolithography (SLA), to form the core and cavity patterns of the mold. In the SLA process, a fully-automated machine uses the CAD data to guide an ultraviolet laser over a vat of photosensitive polymer to cure or solidify portions struck by the laser so as to incrementally build up a solid object to achieve the dimensions specified in the CAD files. The core and cavity patterns so formed are then fitted into die pockets to powder injection mold the actual mold parts. Amaya does not appear to disclose a laser-aided computer-controlled direct metal deposition process as asserted by the examiner on page 13 of the answer. We thus find ourselves in agreement with appellant that the combined teachings of Moore and Amaya fail to suggest fabricating a product including one or more integrated sensors using a laser-aided computer-controlled direct metal deposition process. We thus shall not sustain the rejection of claims 12 and 13.

Rejection (6)

Claim 14, which depends from claim 12 and further recites one or more sensors for monitoring temperature, stress and strain, is rejected as being unpatentable over Moore in view of Amaya and Spillman. We have reviewed the teachings of Spillman and find nothing therein to overcome the above-noted deficiencies of the combination of

Moore and Amaya. Moreover, we find no suggestion, in Spillman's broad disclosure of the use of embedded strain sensors in smart structures, to provide strain sensors in the mold of Moore. Accordingly, we shall not sustain the rejection of claim 14.

REMAND TO THE EXAMINER

Pursuant to our authority under 37 CFR § 41.50(a)(1), we remand this application to the examiner to review the scope of claim 12 and consider conducting an additional search in view of such scope. It is not apparent from the record and from the references cited and applied by the examiner that the examiner has appreciated that claim 12 is directed to a method of fabricating a product broadly and is not limited to fabrication of a mold or die. Claim 12 would be met by a method of using a CAD database and laser-aided computer-controlled direct metal deposition process to fabricate any product including an integrated sensor. We also note that claim 12 does not expressly recite that the sensor is fabricated using the direct metal deposition process.

CONCLUSION

To summarize, the rejections of claims 1-6 are sustained and the rejections of claims 7-14 are reversed. The application is remanded to the examiner for the reasons discussed above.

In addition to affirming the examiner's rejection of one or more claims, this decision contains a remand. 37 CFR § 41.50(e) (effective September 13, 2004, 69 Fed. Reg. 49960 (August 12, 2004), 1286 Off. Gaz. Pat. Office 21 (September 7, 2004)) provides that

> [w]henever a decision of the Board includes a remand, that decision shall not be considered final for judicial review. When appropriate, upon conclusion of proceedings on remand before the examiner, the Board may enter an order otherwise making its decision final for judicial review.

Regarding any affirmed rejection, 37 CFR § 41.52(a)(1) provides "[a]ppellant may file a single request for rehearing within two months from the date of the original decision of the Board."

The effective date of the affirmance is deferred until conclusion of the proceedings before the examiner unless, as a mere incident to the limited proceedings, the affirmed rejection is overcome. If the proceedings before the examiner do not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Board of Patent Appeals and Interferences for final action on the affirmed rejections, including any timely request for rehearing thereof.

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 and REMANDED

CHARLES E. FRANKFORT Administrative Patent Judge	)	
JENNIFER D. BAHR Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
MAHSHID D. SAADAT Administrative Patent Judge	)	

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