Board of Patent Appeals and Interferences

Informative

Opinion

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT PETER SCHOLL, RAINER HILBIG,
ACHIM KOERBER, JOHANNES BAIER,
THOMAS JUESTEL, and CORNELIS REINDER RONDA

Appeal 2007-3653
Application 10/480,355
Technology Center 2800

Decided: March 13, 2008

Before ROBERT E. NAPPI, JOHN A. JEFFERY, and MARC S. HOFF, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's rejection of claims 1 and 3-10. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

Appellants invented a low-pressure gas discharge lamp with a mercury-free gas filling. The filling comprises an indium compound and a buffer gas. The lamp comprises a phosphor layer that contains red, green, and blue phosphors. The phosphors' emissions, together with the emission from the gas discharge, produce white light.[1] Claim 1 is illustrative.

1. A low-pressure gas discharge lamp comprising a gas discharge vessel containing a mercury-free gas filling with an indium compound and a buffer gas, and comprising a phosphor layer containing at least one phosphor emitting in the visible range of the spectrum, and comprising electrodes and means for generating and maintaining a low-pressure gas discharge, characterized in that the emission from the phosphor layer together with the emission from the gas discharge forms white light.

The Examiner relies on the following prior art references to show unpatentability:

Watanabe	US 4,208,611	Jun. 17, 1980
Roberts	US 4,983,889	Jan. 8, 1991
Rothwell	US 5,043,634	Aug. 27, 1991
Shanks	US 5,188,451	Feb. 23, 1993
Lee	US 6,366,012 B1	Apr. 2, 2002
Comanzo	US 6,409,938 B1	Jun. 25, 2002 (filed Mar. 27, 2000)
Srivastava	US 6,621,211 B1	Sep. 16, 2003 (filed May 15, 2000)
Muto	US 6,724,145 B1	Apr. 20, 2004 (filed Jun. 23, 2000)

[1] *See generally* Spec. 2:1-3:26.

1. Claims 1, 3, and 4 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, and Comanzo.
2. Claims 1, 5, and 7[2] stand rejected under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, and Srivastava.
3. Claims 6 and 8 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, Srivastava, Watanabe, and Lee.
4. Claim 10 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, Srivastava, and Rothwell.
5. Claim 9 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, Srivastava, Rothwell, and Shanks.

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Briefs and the Answer for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments which Appellants could have made but did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

OPINION

Claims 1, 3, and 4

[2] Although the Examiner's statement of this rejection omits claim 1, the Examiner nevertheless includes claim 1 in the text of the rejection (Ans. 4). Furthermore, Appellants include claim 1 in their arguments pertaining to this rejection (App. Br. 10; Reply Br. 5). Based on the record before us, we therefore presume the Examiner intended to include claim 1 in this rejection.

We first consider the Examiner's rejection of claims 1, 3, and 4 under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, and Comanzo. In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966).

Discussing the question of obviousness of a patent that claims a combination of known elements, the Court in *KSR Int'l v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007) explains:

> When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *Sakraida* [*v. AG Pro, Inc.,* 425 U.S. 273 (1976)] and *Anderson's-Black Rock*[*, Inc. v. Pavement Salvage Co*., 396 U.S. 57 (1969)] are illustrative—a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.

KSR, 127 S. Ct. at 1740. If the claimed subject matter cannot be fairly characterized as involving the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement, a holding of obviousness can be based on a showing that "there was an apparent reason to combine the known elements in the fashion claimed." *Id.*, 127 S. Ct., at 1740-41. Such a showing requires "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. . . . [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *Id.*, 127 S. Ct. at 1741 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

If the Examiner's burden is met, the burden then shifts to the Appellants to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. *See In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992).

Regarding representative independent claim 1,[3] the Examiner's rejection essentially finds that Roberts discloses a low-pressure gas discharge lamp that includes, among other things, a gas filling with an indium compound and a buffer gas, as claimed. The Examiner notes that Roberts teaches using an inert gas such as xenon or krypton instead of mercury. Additionally, the Examiner cites Muto as teaching the importance of eliminating mercury from lamp fillings (Ans. 3).

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[3] Appellants argue claims 1, 3, and 4 together as a group *See* App. Br. 6-10. Accordingly, we select claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner acknowledges that Roberts and Muto do not disclose a phosphor layer as claimed, but cites Comanzo for such a teaching. The Examiner then concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to coat Roberts' discharge vessel with a suitable phosphor to produce white light (Ans. 3-4).

Appellants acknowledge Roberts' teaching that an inert gas, such as xenon or krypton, may comprise a suitable buffer. Appellants, however, emphasize that Roberts *prefers* mercury vapor for such a buffer (App. Br. 6; Reply Br. 2-3). Appellants add that not only does Muto fail to teach or suggest a phosphor layer, the reference actually teaches away from adding such a layer. Although Appellants acknowledge that Muto teaches a mercury-free lamp, the reference nonetheless teaches that an ideal spectral distribution of white light is obtained without such a layer (App. Br. 6-8; Reply Br. 4).

Regarding Comanzo, Appellants contend that there is no disclosure regarding the fill of the lamp, or the spectral characteristics of either the lamp or its phosphor coating. As such, Appellants argue, nothing would suggest to the skilled artisan that it would be advantageous to add Comanzo's phosphor to either Roberts' or Muto's lamp. Appellants further argue that even if there were a suggestion to apply a phosphor to Roberts' lamp, the combination would fail to teach or suggest a lamp with a mercury-free fill containing an indium compound (App. Br. 7-8).

The issues before us, then, are (1) whether Appellants have shown error in the Examiner's combination of the respective teachings of the cited references to arrive at the claimed invention, and (2) whether all limitations of representative claim 1 are taught or suggested by such a combination, namely a lamp with a mercury-free gas filling containing an indium compound and a buffer gas where the lamp further comprises a phosphor layer as claimed. For the reasons that follow, we find ample reason on this record to combine the references to arrive at the claimed invention. We further find that all limitations of representative claim 1 are taught or suggested by the cited references.

Roberts discloses a discharge lamp with an arc tube 10. The gaseous discharge medium or "fill" within the tube comprises one or more halides and a buffer. Suitable halides include, among other things, indium iodide. An inert gas, such as xenon or krypton, may comprise a suitable buffer. However, mercury vapor is preferably used as the buffer because mercury results in an increased arc voltage drop, thus decreasing electrode losses (Roberts, col. 4, ll. 12-24).

Muto discloses a metal halide discharge lamp that contains no mercury in the arc tube (Muto, Abstract). Although Muto indicates that mercury has been widely used in metal halide lamps, mercury is toxic and will leak if the arc tube is damaged. Moreover, upon disposal, the arc tubes must be broken up to recover the mercury which increases costs. Therefore, arc tubes lacking toxic materials, such as mercury, have become preferred (Muto, col. 1, l. 59 - col. 2, l. 3).

Comanzo teaches a white light illumination system that includes, among other things, disposing a phosphor coating 5 on a lamp cover 3

(Comanzo, col. 4, ll. 17-24; Fig. 1). The phosphor is a trivalent cerium doped yttrium aluminum garnet ($YAG:Ce^{3+}$) composition (Comanzo, col. 1, ll. 18-20; col. 2, ll. 19-23).

Based on these collective teachings, we agree with the Examiner that the skilled artisan would have ample reason to combine the respective teachings of the cited references to arrive at the claimed invention. At the outset, we note that Roberts discloses every feature of representative claim 1 except for the phosphor layer.

Regarding the recited indium compound, we disagree with Appellants' contention (Reply Br. 4) that Roberts does not allegedly teach or suggest that indium iodide is employed to the exclusion of other iodides. On the contrary, Roberts states that the fill comprises *one* or more metal halides and a buffer, where one of the metal halides is indium iodide (Roberts, col. 4, ll. 12-19; col. 5, ll. 37-40 (text of claim 1); emphasis added). Since Roberts indicates that the fill need only have one metal halide, Roberts therefore teaches that indium iodide can be used exclusively as the metal halide along with the buffer. This exclusive use of indium iodide in Roberts fully meets the indium compound recited in claim 1.

While Roberts may prefer mercury vapor for the buffer to reduce electrode losses (Roberts, col. 4, ll. 21-24), the reference by no means discounts or discredits mercury-free gas fillings tantamount to teaching away from such approaches. First, Roberts expressly states that inert gases, such as xenon or krypton, can be "suitable" buffers (Roberts, col. 4, ll. 21-22). Second, the language of Roberts' claims 1 and 11 unequivocally lists xenon, krypton, and mercury vapor as equally-viable alternatives for the buffer gas so long as the quantity of the gas limits chemical transport of energy from the arc discharge to the walls of the arc tube.[4] Significantly, Roberts' preference for mercury vapor is reflected only in dependent claims 3, 4, 13, and 14 -- claims which further limit the three recited buffer gas alternatives to mercury vapor.

The clear import of this discussion is that xenon, krypton, and mercury vapor are equally-viable alternatives for buffer gases in terms of their ability to limit chemical transport of energy from the arc discharge to the walls of the arc tube. Indeed, claim differentiation principles alone suggest this conclusion.[5] While mercury vapor may have the additional advantage of reducing electrode losses, skilled artisans would readily glean from Roberts that the mercury-free alternatives, xenon and krypton, are nonetheless amply capable of functioning as buffer gases.

Furthermore, given Muto's discussion regarding the increasing preference for mercury-free metal halide lamps due to mercury's toxicity, potential environmental impact, and concomitant disposal costs (Muto, col.

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[4] *See* Roberts, col. 5, ll. 45-50 (claim 1); col. 6, ll. 43-48 (claim 11) (reciting that the buffer gas is "selected from the group consisting of xenon, krypton, and mercury vapor").

[5] "The doctrine of claim differentiation creates a presumption that each claim in a patent has a different scope…The difference in meaning and scope between claims is presumed to be significant to the extent that the absence of such difference in meaning and scope would make a claim superfluous." *Free Motion Fitness, Inc. v. Cybex Int'l, Inc.*, 423 F.3d 1343, 1351 (Fed. Cir. 2005) (internal quotation marks and citations omitted).

1, l. 59 - col. 1, l. 3), skilled artisans would have ample reason to select a mercury-free alternative for the gas filling in Roberts. While such an alternative may increase electrode losses over mercury vapor, such a consequence would be offset by the reduced disposal costs and potential environmental impact associated with a mercury-free gas filling.

In short, selecting a mercury-free gas filling over one with mercury amounts to an engineering tradeoff that accounts for the relative advantages and disadvantages of using either type of filling. Such an engineering decision, in our view, is well within the level of ordinarily skilled artisans. Moreover, Muto -- a patent that issued more than a decade after Roberts -- evidences a clear trend in the industry away from mercury-based metal halide lamps in view of mercury's toxicity.[6] Such a trend, in our view, further reinforces our conclusion that selecting a mercury-free alternative in Roberts would have been a predictable variation prompted by design incentives and other market forces -- an obvious improvement.[7] Additionally, in view of this trend, selecting a mercury-free alternative from the buffer gas alternatives in Roberts (xenon, krypton, and mercury vapor)

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[6] *See* Muto, at col. 2, ll. 1-3; *see also id.*, at col. 13, ll. 16-19 (noting that a high-efficiency discharge lamp is provided that does not employ toxic mercury, thus "respond[ing] to *ever-more-pressing requirements* to prevent the spread of toxic materials") (emphasis added).

[7] *See KSR*, 127 S. Ct. at 1740 ("When a work is available in one field of endeavor, *design incentives and other market forces can prompt variations of it*, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.") (emphasis added).

would have been obvious as there are a finite number of predictable solutions and the skilled artisan has ample reason to pursue the known mercury-free options.[8]

We also agree with the Examiner that skilled artisans would have ample reason on this record to provide a phosphor layer on Roberts' lamp. First, it is well known that indium emits blue light -- a fact readily admitted by Appellants.[9] Second, as we indicated previously, Roberts' lamp can utilize indium iodide exclusively as the metal halide along with the buffer. Skilled artisans would therefore recognize that Roberts' exclusive use of an indium compound would produce at least some blue light from the lamp. Providing a phosphor layer in Roberts's lamp that was excited by this light to ultimately produce white light as suggested by Comanzo (Comanzo, col. 1, ll. 10-26) would have been well within the level of ordinarily skilled artisans.

Appellants' arguments regarding Muto's lamp producing an ideal spectral distribution of white light, and therefore teaching away from adding a phosphor layer to obtain a white light source (App. Br. 6-7; Reply Br. 4-5),

[8] *See id.*, at 1742 ("When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103.").

[9] *See* Reply Br., at 4 ("[I]t is true that Muto teaches that indium emits blue light.").

are unavailing and, in any event, are not germane to the reason why the Examiner cited the reference. Muto was cited merely to show why skilled artisans would select mercury-free alternatives in lieu of mercury and as evidence that indium emits blue light (Ans. 8-9). As we noted above, we find ample reason on this record to provide a phosphor layer in conjunction with Roberts' lamp to ultimately produce desired wavelengths of light including white light.

For the foregoing reasons, we will sustain the Examiner's rejection of representative claim 1 and claims 3 and 4 which fall with claim 1.

Claims 1, 5, and 7

We now consider the Examiner's rejection of claims 1, 5, and 7 under 35 U.S.C. § 103(a) as unpatentable over Roberts, Muto, and Srivastava. In this rejection, the Examiner repeats the findings of Roberts and Muto, but cites Srivastava for teaching providing a phosphor layer with the recited red, green, and blue phosphors in conjunction with Roberts' lamp to produce white light (Ans. 4-5).

Appellants argue that Srivastava teaches using the disclosed phosphors with mercury-containing lamps -- not mercury-free lamps -- and therefore the spectral characteristics are different. Appellants further argue that Srivastava does not teach or suggest the particular wavelength ranges claimed for the red, green, and blue phosphors since Srivastava's wavelength ranges were designed for LEDs, not mercury-free indium-containing gas radiation sources (App. Br. 10-11; Reply Br. 5).

Our previous discussion pertaining to Roberts and Muto applies equally here, and we incorporate that discussion by reference. The issues before us, then, are (1) whether Appellants have shown that the Examiner erred in combining the teachings of Srivastava with Roberts and Muto, and (2) whether the combination teaches or suggests all limitations recited in claims 1, 5, and 7. For the reasons that follow, we find no error in the Examiner's combination of references, and that the combination reasonably suggests all recited limitations.

Srivastava discloses a white light illumination system that, in one embodiment, utilizes a phosphor coating 35 on a fluorescent lamp 31 containing a gas which may contain mercury (Srivastava, col. 12, ll. 43-54; col. 5, ll. 55-63; Fig. 6). To this end, Srivastava utilizes multiple phosphors with different peak emission wavelengths such that their combined emissions in conjunction with the radiation source are perceived as white light (Srivastava, col. 5, ll. 8-19).

For clarity, Srivastava's phosphors and their associated wavelength ranges are summarized below along with a summary of the phosphors and associated wavelengths recited in claims 5 and 7:

Srivastava's Phosphors	**Phosphors Recited in Claims 5 and 7**
575-620 nm (orange)	590-630 nm (red)
495-550 nm (blue-green)	510-560 nm (green)

420-480 nm (blue)	420-460 nm (blue)

Table 1: Summary of Spectral Properties of Phosphors in Srivastava Compared with the Phosphors Recited in Claims 5 and 7.

As shown above, there is substantial overlap between the respective wavelength ranges of Srivastava's orange, blue-green, and blue phosphors and the red, green, and blue phosphors recited in claims 5 and 7. Based on this substantial overlap, we find the Examiner has established a prima facie case of obviousness which has not been persuasively rebutted.[10] Appellants' argument that Srivastava's wavelength ranges are designed for LEDs (App. Br. 11) is unavailing, as Srivastava expressly states that the radiation source can be any radiation source capable of causing emission from the phosphors, including a lamp (Srivastava, col. 5, ll. 55-62). Although the specific colors for the corresponding wavelength ranges do not exactly match (i.e., orange vs. red; blue-green vs. green), skilled artisans would recognize that both orange and blue-green emissions nonetheless contain red and green components respectively.

Similar to our reasoning above with respect to combining the teachings of Comanzo with Roberts, we see no reason why skilled artisans could not likewise apply the teachings of Srivastava to Roberts' lamp, namely utilizing the disclosed phosphors in conjunction with the lamp to

[10] *See In re Harris*, 409 F.3d 1339, 1341 (Fed. Cir. 2005) (noting that a prima facie case of obviousness can arise even if the claimed range and the prior art range do not completely overlap).

obtain white light. We therefore find no error in the Examiner's combination of references and further find that all limitations are suggested by the combination.

For the foregoing reasons, we will sustain the Examiner's rejection of claims 1, 5, and 7.

Claims 6 and 8

Regarding claims 6 and 8, the Examiner adds the teachings of Watanabe and Lee to the previous combination of references for teaching specific compositions of red, green, and blue phosphors that are said to be among those claimed (Ans. 6-7). Appellants argue that there is no guidance in Srivastava, Watanabe, or Lee that would motivate the skilled artisan to pick one or more compositions at random from each reference and combine them in the manner urged by the Examiner. In any event, Appellants argue, such random selections do not teach or suggest the particular groups of phosphors claimed (App. Br. 12-13; Reply Br. 6).

Watanabe discloses a fluorescent lamp that includes red, green, and blue ray-emitting phosphors (col. 11, ll. 20-42). In particular, the red phosphors include (1) europium-activated yttrium vanadate (YVO_4:Eu), and (2) europium-activated yttrium phosphovanadate ($Y(P,V)O_4$:Eu) (Watanabe, col. 11, ll. 24-27). Although Appellants do not dispute the Examiner's finding that the first red phosphor noted above in Watanabe (YVO_4:Eu) corresponds to one of the claimed red phosphors (Ans. 6), we note that the second red phosphor ($Y(P,V)O_4$:Eu) corresponds to one of the recited red phosphors.

Appellants, however, do dispute the Examiner's findings with respect to the blue phosphors. Specifically, the Examiner relies upon Srivastava for teaching $Sr_5(PO_4)_3Cl$:Eu[11] as corresponding to one of the recited blue phosphors (Ans. 6). This blue phosphor also is used in Watanabe (Watanabe, col. 11, ll. 31-33). But Appellants contend that while this phosphor may be similar to the recited $(Ba,Sr)_5(PO_4)_3(F,Cl)$:Eu phosphor, the prior art phosphor does not contain Ba or F (App. Br. 13; Reply Br. 6).[12]

Lee discloses a cathode ray tube with a light absorbing filter layer with predetermined absorption characteristics. Lee notes that common phosphor materials in the art include (1) ZnS:Ag for blue phosphors; (2) ZnS:Au,Cu,Al for green phosphors; and (3) Y_2O_2S:Eu for red phosphors (Lee, col. 1, ll. 31-35).

Although the Examiner relies on Lee solely for the green phosphor composition noted above (Ans. 7), Appellants admit that each of the red, blue, and green phosphors in Lee corresponds to one of the red, blue, and green phosphors recited in claims 6 and 8 (App. Br. 13). Therefore, while the specific blue phosphor composition in Srivastava and Watanabe does not

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[11] This composition is derived from the formula $D_5(PO_4)_3Cl:Eu^{2+}$ given by Srivastava in connection with the blue phosphor (Srivastava, col. 8, ll. 64-66).

[12] In this regard, Appellants contend that, contrary to the Examiner's assertion (Ans. 12), an expression reciting two elements separated by commas within parentheses (e.g., (A,B)) means that both elements are present in the phosphor (Reply Br. 6).

exactly correspond with the claimed composition, Lee's blue phosphor composition nevertheless does correspond to one of the claimed blue phosphors (as does the red and green phosphor compositions).

Based on the record before us, we see no reason why the skilled artisan could not utilize such phosphor compositions in the Roberts/Muto/Srivastava white light illumination system, particularly since Srivastava expressly states that the first (orange), second (blue-green), and third (blue) phosphors can be *any* phosphor that emits visible light within the stated wavelengths (Srivastava, col. 6, ll. 35-38; col. 7, ll. 6-10; col. 8, ll. 40-43).

For the foregoing reasons, we will sustain the Examiner's rejection of claims 6 and 8 based on the collective teachings of the cited prior art references.

Claims 9 and 10

Regarding claim 10, the Examiner adds the teachings of Rothwell for teaching an outer bulb 22 surrounding the discharge vessel 12 to protect the vessel (Ans. 7). Similarly, the Examiner cites Shanks with respect to claim 9 for teaching enclosing a fluorescent lamp with an outer bulb (Ans. 7-8).

Appellants argue that both Rothwell and Shanks disclose mercury-containing lamps which conflict with Muto's teaching of a mercury-free lamp. As such, Appellants contend, skilled artisans would not be led to use the recited features in a mercury-free lamp (App. Br. 14-15; Reply Br. 6-7).

We will sustain the Examiner's rejections of claims 9 and 10. As shown in Figure 1, Rothwell positions a transparent sleeve 22 around lamp tube 12. The sleeve has a phosphor coating 24 thereon (Rothwell, col. 3, ll. 25-41; Fig. 1).

Similarly, Shanks surrounds a discharge envelope tube 12 with a glass radiation-transmitting sleeve 14. The interior surface of the envelope tube 12 is coated with a light-emitting phosphor (Shanks, col. 4, ll. 13-35; Fig. 1).

We agree with the Examiner (Ans. 13) that these teachings are reasonably combinable with the cited prior art references to, among other things, shield and protect the discharge vessel with an outer surrounding structure. That the lamps of Rothwell and Shanks may contain mercury as Appellants argue (App. Br.14-15; Reply Br. 7) does not detract from the references' fundamental teachings relied upon by the Examiner, namely surrounding a lamp with an outer structure for shielding and protection. Such shielding and protection benefits, in our view, would be obtained by with the surrounding structure would be readily applicable to many different types of lamps, both with and without mercury.

Furthermore, Appellants argue that neither Rothwell nor Shanks surrounds a gas discharge vessel with an outer bulb and note that Shanks' tube and sleeve are tubular -- not bulbous (Reply Br. 7). We note at the outset that this specific argument was first raised in the Reply Brief -- not the Appeal Brief -- and is therefore waived.[13] Nevertheless, we note that

[13] *See Optivus Tech., Inc. v. Ion Beam Applications S.A.*, 469 F.3d 978, 989 (Fed. Cir. 2006) ("[A]n issue not raised by an appellant in its opening brief

Appellants' own Specification indicates that the specific shape of the outer bulb is not critical as it notes that "any shape known from incandescent lamps can be selected" (Spec. 7:8-9). Therefore, selecting the specific shape of the outer surrounding structure (e.g., a bulbous shape), in our view, would have been well within the level of one of ordinary skill in the art.

For the foregoing reasons, we will sustain the Examiner's rejections of claims 9 and 10.

DECISION

We have sustained the Examiner's rejections with respect to all claims on appeal. Therefore, the Examiner's decision rejecting claims 1 and 3-10 is affirmed.

... is waived.") (citations and quotation marks omitted).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

Tdl/gw

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