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. 27

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHANNES EDLINGER and HELMUT RUDIGIER

Appeal No. 2000-0038
Application 08/751,369

ON BRIEF

Before PAK, OWENS and KRATZ, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the examiner's final rejection of claims 10-12, 17, 18, 20, 21, 23-34, 36-41, 43 and 44, which are all of the claims remaining in the application.

THE INVENTION

The appellants' claimed invention is directed toward a process for making an optical waveguide. Claim 10 is illustrative:

10. A process for the production of an optical waveguide, comprising the steps of:

(a) shaping a substrate consisting essentially of organic material only;

(b) applying at least one intermediate layer by a vacuum coating process, onto the substrate; and

(c) applying a waveguide layer by means of a reactive physical vapor deposition (PVD) process, onto the intermediate layer, the reactive physical vapor deposition process being reactive DC sputtering.

THE REFERENCE

Heming et al. (Heming)	5,369,722	Nov. 29, 1994 (filed Sep. 18, 1992)

THE REJECTION

Claims 10-12, 17, 18, 20, 21, 23-34, 36-41, 43 and 44 stand rejected under 35 U.S.C. § 103 as being unpatentable over Heming.

OPINION

We affirm the rejection of claims 10-12, 17, 18, 20, 21, 23-34, 37, 38, 40, 41, 43 and 44, and reverse the rejection of claims 36 and 39.

The appellants state that the claims stand or fall in the following groups: A) claims 10, 11, 17, 18, 20, 25, 26 and 40; B) claim 12; C) claims 21, 31 and 32; D) claims 23 and 24; E) claim 27; F) claim 28; G) claims 29 and 30; H) claims 33 and 34; (I) claim 36; J) claims 37 and 38; K) claim 39; L) claim 41; and M) claims 43 and 44 (brief, pages 8-9). The appellants, however, do not provide a substantive argument for the separate patentability of claim 12. This claim, therefore, stands or falls with claim 10 from which it depends. Thus, we limit our discussion to one claim in each group except group B, i.e., respectively, claims 10, 31, 23, 27, 28, 29, 33, 36, 37, 39, 41 and 43. *See In re Ochiai*, 71 F.3d 1565, 1566 n.2, 37 USPQ2d 1127, 1129 n.2 (Fed. Cir. 1995); *In re Burckel*, 592 F.2d 1175, 1178-9, 201 USPQ 67, 70 (CCPA 1979); *In re Herbert*, 461 F.2d 1390, 1391, 174 USPQ 259, 260 (CCPA 1972); 37 CFR § 1.192(c)(7)(1997).

Claim 10

Heming discloses a process for producing an optical waveguide (col. 1, lines 9-11). The waveguide substrate can be a synthetic resin or a material having a “high organic proportion”, i.e., more than 0.1 hydrocarbon group per metallic atom of an oxide (col. 3, lines 24-26 and 36-43). The substrate preferably is a synthetic resin film (col. 4, lines 58-59). In one preferred embodiment at least one intermediate layer is applied to the substrate (col. 7, lines 3-6). The intermediate layer can be applied by any method which is suitable for yielding a compact layer devoid of column structures, and preferably is applied by a vacuum coating process (col. 8, lines 44-47; col. 12, lines 51-59). A waveguide layer is applied to the intermediate layer by known coating methods, the exemplified methods including ion-enhanced PVD (col. 6, lines 12-22). It is undisputed that ion-enhanced PVD methods include reactive DC sputtering.

The appellants argue that Heming does not specifically disclose forming the waveguide layer by reactive sputtering and would not clearly have taught one of ordinary skill in the art which method to use to deposit a waveguide layer onto an organic substrate material (brief, pages 9-10; reply brief, pages 2-3). Although Heming does not specifically disclose reactive sputtering, the disclosed ion-enhanced PVD includes ion-enhanced sputtering, and the appellants state that ion sputtering is a form of reactive sputtering (brief, page 11). Moreover, the appellants acknowledge that reactive DC sputtering was a well known deposition process at the time of the appellants' invention (brief, page 15).[1] Heming, therefore, would have fairly suggested, to one of ordinary skill in the art, forming the waveguide layer by reactive DC sputtering. Because Heming does not limit the disclosed waveguide layer formation methods to any particular disclosed substrate material, the reference would have fairly suggested, to one of ordinary skill in the art, using any of the disclosed waveguide layer formation methods in combination with any of the disclosed substrate materials. For this reason and because ion-enhanced PVD is one of only three exemplified types of deposition methods (col. 6, lines 16-18), and synthetic resins are one of only two disclosed types of substrate materials (col. 3, lines 24-25), Heming would have fairly suggested, to one of ordinary skill in the art, using a synthetic resin substrate in combination with waveguide layer formation by ion-enhanced PVD.

The appellants argue that Heming prefers to deposit the waveguide layer by PCVD, especially PICVD (col. 12, lines 61-63), and that in Heming's examples, only microwave PICVD is used

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[1] It is axiomatic that our consideration of the prior art must, of necessity, include consideration of the admitted prior art. *See In re Hedges*, 783 F.2d 1038, 1039-40, 228 USPQ 685, 686 (Fed. Cir. 1986); *In re Davis*, 305 F.2d 501, 503, 134 USPQ 256, 258 (CCPA 1962).

(col. 13, lines 45-48) (brief, pages 14-16; reply brief, page 3). Heming's disclosure, however, is not limited to the preferred embodiment or to the examples. *See In re Fracalossi*, 681 F.2d 792, 794 n.1, 215 USPQ 569, 570 n.1 (CCPA 1982); *In re Kohler*, 475 F.2d 651, 653, 177 USPQ 399, 400 (CCPA 1973); *In re Mills*, 470 F.2d 649, 651, 176 USPQ 196, 198 (CCPA 1972); *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969). Instead, all disclosures in the reference must be evaluated for what they would have fairly suggested to one of ordinary skill in the art. *See In re Boe*, 355 F.2d 961, 965, 148 USPQ 507, 510 (CCPA 1966). The disclosures by Heming discussed above would have fairly suggested, to one of ordinary skill in the art, using reactive DC sputtering to form a waveguide layer on a synthetic resin substrate.

The appellants argue that Heming's preference for PCVD and PICVD indicates that ion sputtering is not a valuable method for depositing the waveguide layer (brief, page 15). This argument is incorrect because Heming teaches that ion-enhanced PVD processes are effective for forming the waveguide layer (col. 6, lines 12-18).

The appellants argue that it is not clear why, in view of the fact that ion sputtering such as reactive DC sputtering was known to have the advantages of controllability, high rate of deposition and rather low cost, Heming would not have disclosed ion sputtering as a method for forming the waveguide layer (brief, pages 15-17). The appellants provide no evidence that ion sputtering has these advantages. The appellants provide only argument of counsel, and such argument cannot take the place of evidence. *See In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984); *In re Payne*, 606 F.2d 303, 315, 203 USPQ 245, 256 (CCPA 1979); *In re Greenfield*, 571 F.2d 1185, 1189, 197 USPQ 227, 230 (CCPA 1978); *In re Pearson*, 494 F.2d 1399, 1405, 181 USPQ 641, 646 (CCPA 1974). Regardless of any benefits of reactive DC sputtering, Heming's teaching that ion-enhanced PVD, which includes reactive DC sputtering, is an effective method for forming the waveguide layer (col. 6, lines 12-18) would have been sufficient to have fairly suggested, to one of ordinary skill in the art, forming the waveguide layer by reactive DC sputtering.

The appellants argue that because their specification teaches that their process produces a sufficiently critical waveguide layer despite the fact that an essentially organic substrate is used, and Heming teaches that such a substrate introduces its own set of difficulties in achieving a serviceable waveguide layer, the appellants' specification provides evidence of unexpected results (reply brief, page 3). This argument is not well taken because the appellants have not provided a side-by-side comparison, commensurate in scope with the claims, of their claimed invention with the closest prior art, and have not explained why the results would have been unexpected by one of ordinary skill in the art. *See In re Baxter Travenol Labs.*, 952 F.2d 388, 392, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991); *De Blauwe*, 736 F.2d at 705, 222 USPQ at 196; *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 778 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035, 206 USPQ 289, 296 (CCPA 1980); *In re Freeman*, 474 F.2d 1318, 1324, 177 USPQ 139, 143 (CCPA 1973); *In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972).

The preponderance of the evidence, therefore, indicates that the process recited in the appellants' claim 10 would have been obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103.

Claim 31

Heming discloses that the intermediate layer can be, and in one embodiment preferably is, SiO_2 (col. 8, lines 48-50 and 57-58). Since the claim recites "at least one of SiO_2 and a mixture of SiO_2 and TiO_2 and of Si_3N_4", the appellants' argument (brief, page 17) that Heming does not disclose the recited materials other than SiO_2 is irrelevant.

Claim 23

The appellants argue that Heming does not disclose depositing the waveguide layer at low temperature using reactive sputtering (brief, pages 17-18). Heming's teachings that the synthetic resin substrate is to be heated to a temperature which is lower than its glass transition temperature (col. 3, lines 26-27), and that some of the synthetic resins have long term usage temperatures below 100°C (col. 4, lines 25-26 and 51-54), would have fairly suggested, to one of ordinary skill in the art, carrying out any of the disclosed waveguide layer formation processes, including ion-enhanced PVD (col. 6, line 18), at a sufficiently low temperature, such as a temperature below 100°C, to avoid thermally damaging the synthetic resin substrate.

Claim 27

The appellants argue that Heming does not relate the disclosure of low absorbance of the intermediate layer (col. 8, lines 37-38) to the substrate characteristics (brief, page 18). The appellants do not specify in their specification how much lower the propagation attenuation of the intermediate layer must be relative to that of the substrate to be "substantially lower" as recited in claim 27. Thus, we consider “substantially lower” to be lower by any considerable amount or degree.[2] It reasonably appears, considering that Heming’s glassy SiO_2 intermediate layer material is among the intermediate layer materials used by the appellants (specification, page 8, line 12), and that Heming’s polycarbonate, polymethylmethacrylate, PVC and polyester substrate materials (col. 4, lines 5-7 and 52) are substrate materials exemplified by the appellants (specification, page 8, lines 3-5),[3] that Heming’s SiO_2 intermediate layer, like that of the appellants, has a propagation attenuation which is lower to a considerable degree than that of the synthetic resin substrate materials.

Claim 28

Heming discloses that the waveguide layer preferably can be made of TiO_2, TiO_2-SiO_2, ZnO_2, Nb_2O_5, Si_3N_4 or HfO_2 (col. 6, lines 12-14), all of which are recited in the appellants’ claim 28. The fact that the appellants’ claim 28 recites

[2] *See* Webster’s II New Riverside University Dictionary 1155 (Riverside 1984).

[3] The appellants exemplify a particular polyester, i.e., polyethylene terephthalate (PET) (specification, page 8, lines 3-5).

additional materials, as argued by the appellants (brief, page 18), is irrelevant.

Claim 29

The appellants argue that Heming does not disclose or suggest selecting a waveguide layer from group (a) in the appellants' claim 28 for guiding light having a 400-1000 nm wavelength (brief, page 18). As discussed above regarding claim 28, Heming discloses waveguide layer materials which are among those in group (a) of the appellants' claim 28. Heming's materials and those of the appellants which have the same composition necessarily are capable of passing light of the same wavelengths. Thus, the capability of the waveguide layer material required by claim 29 does not serve to distinguish over Heming the claimed process for making the waveguide.

Claim 33

The appellants acknowledge that Heming's intermediate layer thickness of 10-5,000 nm falls within the scope of at least 5 nm recited in the appellants' claim 33, but argue that this thickness is not disclosed in combination with a waveguide layer deposited by reactive sputtering (page 19). Heming's disclosed intermediate layer thickness, however, is not limited to an intermediate layer in combination with a waveguide layer formed by any particular process (col. 5, line 64 - col. 6, line 2). Hence, Heming would have fairly suggested, to one of ordinary skill in the art, using an intermediate layer having the disclosed thickness in combination with a waveguide layer formed by any of the disclosed processes including ion-enhanced PVD.

Claim 36

Claim 36 requires sputtering with a DC plasma discharge supplied by a DC generator, and cyclically separating the generator from the plasma discharge and simultaneously short circuiting the plasma discharge. The examiner argues that this is analogous to the pulsing microwave treatment disclosed by Heming (col. 13, lines 47-48 and 68). The examiner, however, provides no support for this argument. The mere speculation provided by the examiner is not sufficient for establishing a *prima facie* case of obviousness. *See In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968); *In re Sporck*, 301 F.2d 686, 690, 133 USPQ 360, 364 (CCPA 1962). Moreover, the examiner has not explained why, even if these processes are analogous, Heming’s disclosure of pulsed microwave PICVD treatment would have led one of ordinary skill in the art to the particular process recited in the appellants’ claim 36.

Claim 37

The appellants argue that Heming does not disclose varying the index of refraction of the intermediate layer to produce different refraction profiles (brief, page 20). The predetermined course of index of refraction along the thickness of the intermediate layer required by the appellants' claim 37, however, can be any predetermined course including one which does not vary. Heming reasonably appears to disclose a predetermined course of index of refraction which does not vary (col. 8, line 20 - col. 9, line 2).

Claim 39

The appellants' claim 39 requires that the at least one intermediate layer is applied such that only a negligible part of light energy reaches an interface between the intermediate layer and the substrate. The examiner argues (answer, page 4): "One of ordinary skill in the art would desire to limit signal loss, and hence limit the amount of light energy leaving the waveguide layer. Concerning light reaching the interface of the intermediate layer and the substrate, see column 8, lines 21-28.” The portion of Heming relied upon by the examiner states:

> With an increasing thickness of the intermediate layer, the substrate surface will be increasingly removed from the region of the transversely damped field of the wave. Due to the fact that the guided wave, with adequate thickness of the intermediate layer, will interact with the substrate surface now merely in its marginal zone, scattering and absorption losses are minimized.

Heming teaches that the light absorption of the intermediate layer is low (col. 8, lines 37-38), and the above excerpt indicates that light interacts with the substrate surface in its marginal zone. The examiner has not explained how these teachings indicate that only a negligible part of light energy reaches an interface between the intermediate layer and the substrate. Hence, the examiner has not carried the burden of establishing a *prima facie* case of obviousness of the process recited in the appellants’ claim 39.

Claim 41

The appellants argue that the interaction of the intermediate layer with the waveguide to reduce the propagation losses in the waveguide is not clearly disclosed by Heming (brief, page 20). To the contrary, Heming teaches that commercially available thermoplastic synthetic resin plates or films have too high a surface roughness, and that the intermediate layer reduces the surface roughness, thereby reducing propagation losses in the waveguide (col. 7, lines 3-23).

Claim 43

The appellants argue that Heming does not disclose applying both the intermediate layer and the waveguide layer by reactive DC sputtering (brief, page 21). Heming, however, teaches applying the intermediate layer by ion sputtering (col. 12, lines 51-55). The appellants do not dispute that this teaching would have fairly suggested, to one of ordinary skill in the art, applying the intermediate layer by reactive DC sputtering. Forming the waveguide layer by reactive DC sputtering would have been fairly suggested to one of ordinary skill in the art by Heming as discussed above regarding the rejection of claim 10.

Conclusion

For the above reasons we conclude that the processes recited in the appellants' claims 10, 23, 27, 28, 29, 31, 33, 37, 41 and 43 would have been obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103, and that the examiner has not established a *prima facie* case of obviousness of the processes recited in the appellants' claims 36 and 39.

DECISION

The rejection of claims 10-12, 17, 18, 20, 21, 23-34, 37, 38, 40, 41, 43 and 44 under 35 U.S.C. § 103 over Heming is affirmed, and the rejection of claims 36 and 39 under 35 U.S.C. § 103 over Heming 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

CHUNG K. PAK Administrative Patent Judge	
TERRY J. OWENS Administrative Patent Judge	BOARD OF PATENT APPEALS AND INTERFERENCES
PETER F. KRATZ Administrative Patent Judge	

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