Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVID CHEUNG, JOE FENG,
JUDY H. HUANG and WAI-FAN YAU

Appeal No. 2000-1004
Application 08/743,628

ON BRIEF

Before WARREN, LIEBERMAN and TIMM, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner finally rejecting claims 1, 2, 9 through 11, 22, 24 and 25, and refusing to allow claims 15 and 23 as amended subsequent to the final rejection. Claims 3 through 8 and 12 through 14 are also of record and have been allowed by the examiner. Claims 1, 9 and 15 are illustrative of the claims on appeal:

1. A method for reducing footing in a photoresist layer deposited on a substrate, comprising the steps of:

depositing an antireflective layer comprising silicon, oxygen and nitrogen on the substrate; and

depositing a capping layer on said antireflective layer, said capping layer having a nitrogen content less than a nitrogen content of said antireflective layer.

9. A process for patterning a layer formed on a substrate, said process comprising the steps of:

depositing an antireflective layer on the layer;

depositing a capping layer on said antireflective layer to a thickness selected such that said capping layer does not increase a reflectivity of said antireflective layer by more than about 25%, said capping layer having a nitrogen content of less than about 5% , by weight;

depositing a photoresist layer on said capping layer;

removing a first portion of said photoresist layer, a first portion of said capping layer and a first portion of said antireflective layer according to a mask pattern in order to expose a first portion of the layer substantially similar in shape to said first portions of said photoresist layer, said capping layer and said antireflective layer; and

removing the first portion of the layer, leaving a remaining portion of the layer substantially similar in shape to said remaining portion of said photoresist layer, said capping layer and said antireflective layer.

15. The process of claim 10 wherein said photoresist layer is removed prior to removing the first portion of the layer.

The appealed claims, as represented by claims 1, 9 and 15, are drawn to a process for patterning a layer formed on a substrate which can use any material for an antireflective layer (claim 9), or the antireflective layer comprises silicon, oxygen and nitrogen on the substrate (claim 1), wherein the capping layer deposited on the antireflective layer either has a thickness selected such that said capping layer does not increase a reflectivity of said antireflective layer by more than about 25%, and has a nitrogen content of less than about 5% , by weight, when any material is used for the antireflective layer (claim 9) or when the antireflective layer comprises silicon, oxygen and nitrogen, the capping layer has a nitrogen content less than a nitrogen content of said antireflective layer (claim 1). Appealed claim 15, dependent on claim appealed 10 which depends on claim 9, specifies that the photoresist layer is removed prior to removing the first portion of the patterned layer formed on the substrate. According to appellants, the process involves the deposition of "a low nitrogen content [capping] layer to reduce footing experienced in a subsequently applied photoresist layer, without substantially adversely altering the optical qualities of an associated antireflective layer" (specification, page 6).

The references relied on by the examiner are:

Abernathey et al. (Abernathey)	5,219,788	Jun. 15, 1993
Tsukamoto et al. (Tsukamoto)	5,600,165	Feb. 4, 1997

(filed Jul. 26, 1995)

Cleeves 5,710,061 Jan. 20, 1998
(effective filing date Jan. 10, 1994)

The examiner has advanced the following grounds of rejection on appeal:

claims 9 through 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Abernathey;

claims 1, 2 and 22 through 25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Abernathey in view of Tsukamoto; and

claim 15 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Abernathey in view of Cleeves.

Appellants, on pages 4-5 of the brief, group the claims into eight grouping, and present argument with respect to each grouping of claims. However, the argument with respect to each of several groups merely refers to arguments made with respect to another group or otherwise merely point out features contained in the claim(s) of the grouping, which does not constitute an argument directed to the patentability of the claim(s) over the applied prior art with specificity. We further note that appellants have still further presented argument with respect to different groupings of claims in the reply brief. Thus, we decide this appeal based on appealed claims 1, 9 and 15 as respectively representative of the three grounds of rejection. 37 CFR § 1.192(c)(7) (1999).

We affirm the grounds of rejection based on Abernathey alone and in view of Cleeves and reverse the ground of rejection based on Abernathey in view of Tsukamoto.

Rather than reiterate the respective positions advanced by the examiner and appellants, we refer to the examiner's answer and to appellants' brief and reply brief for a complete exposition thereof.

Opinion

We have carefully reviewed the record on this appeal and based thereon find ourselves in agreement with the examiner that the claimed process for patterning a layer formed on a substrate encompassed by appealed claim 9 would have been obvious over the teachings of Abernathey to one of ordinary skill in this art at the time the claimed invention was made.

As pointed out by the examiner (answer, page 4), Abernathey discloses a process for patterning a layer that includes the deposition of a barrier or capping layer of silicon or silicon dioxide over an antireflective layer of titanium nitride (col. 2, line 36, to col. 3, line 6), from

which it would have been apparent to one of ordinary skill in this art that the capping layer comprised of either material would not contain nitrogen. The examiner submits that the barrier or capping layer of silicon or silicon dioxide would not interfere with the reflectivity of the titanium nitride antireflective layer, pointing to the teachings of the deposition of "approximately 250 A [sic, Å] of Si" as the capping layer in an embodiment of the reference (col. 3, lines 48-54). Indeed, we observe that one of ordinary skill in this art would have reasonably inferred that the barrier or capping layer would not so interfere from the objective of Abernathey "to provide a satisfactory barrier that avoids undesirable interactions while at the same time providing a technique that achieves *photolithographic low reflectivity*" (col. 2, lines 41-44; emphasis supplied).[1]

Accordingly, on this record, we find that the examiner has established that it reasonably appears that the claimed process is identical or substantially identical to the process of Abernathey, and thus the burden falls upon appellants to establish by effective argument or objective evidence that the claimed process patentably distinguishes over Abernathey, even though the rejection is based on § 103(a). *See, e.g., In re King*, 801 F.2d 1324, 1326-28, 231 USPQ 136, 138-39 (Fed. Cir. 1986) ("Here, appellants' burden before the board was to prove that Donley's structure does not perform the so-called method defined in the claims when placed in ambient light. . . . It did not suffice merely to assert that Donley does not inherently achieve enhanced color through interference effects, challenging the PTO to prove to the contrary by experiment or otherwise. The PTO is not equipped to perform such tasks."); *In re Best*, 562 F.2d 1252, 1255-56, 195 USPQ 430, 433-34 (CCPA 1977)("Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Ludtke*, [441 F.2d 660, 169 USPQ 563 (CCPA 1971)]. Whether the rejection is based on 'inherency' under 35 USC 102, on 'prima facie obviousness' under 35 USC 103, jointly or alternatively, the

[1] It is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, see *In re Fritch*, 972 F.2d 1260, 1264-65, 23 USPQ2d 1780, 1782-83 (Fed. Cir. 1992); *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968), presuming skill on the part of this person. *In re Sovish*, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985).

burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products. [Footnote and citation omitted.]"); *In re Skoner*, 517 F.2d 947, 950, 186 USPQ 80, 82 (CCPA 1975) ("Appellants have chosen to describe their invention in terms of certain physical characteristics . . . . Merely choosing to describe their invention in this manner does not render patentable their method which is clearly obvious in view of [the reference]. [Citation omitted.]").

Accordingly, since a *prima facie* case of obviousness has been established over Abernathey by the examiner, we have again evaluated all of the evidence of obviousness and nonobviousness based on the record as a whole, giving due consideration to the weight of appellants' arguments in the brief and reply brief. *See generally, In re Johnson*, 747 F.2d 1456, 1460, 223 USPQ 1260, 1263 (Fed. Cir. 1984); *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

We have carefully considered all of appellants' arguments and authority submitted in the brief (pages 8-9 and 10) and reply brief (pages 2 and 3). The controlling authority with respect to the issue of whether the process disclosed by Abernathey which includes the formation of the approximately 250 Å barrier or capping layer of Si fall within the appealed claims is the line of decisions by our reviewing Court and one of its predecessor courts beginning with *Ludtke*, *supra*. It is clear from these decisions that more is required to patentably distinguish the claimed process from that taught by Abernathey than the argument that the burden is on the examiner to establish that the inherent properties of the barrier or capping layer prepared in Abernathey where the examiner establishes that it reasonably appears from the references that this layer would satisfy the requirements of appealed claim 9. *King, supra; Best, supra; Skoner, supra*.

We find no effective argument or objective evidence in the record which carries appellants' burden.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in Abernathey with appellants' countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 9 through 11 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

We decide the ground of rejection of appealed claim 15 over the combined teachings of Abernathey and Cleeves on the same basis because the examiner has shown that the process encompassed by appealed claim 15, that is, with the additional step with respect to the process of appealed claim 9, would be a conventional modification of the process of Abernathey as shown by Cleeves (answer, page 6), and appellants' traverse, that Cleeves does not teach antireflective layers (brief, page 11), is rebutted by the examiner, finding that the claimed step involves the photoresist layer which is taught by Cleeves (answer, page 13).

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Abernathey and Cleeves with appellants' countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claim 15 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

Turning now to the ground of rejection of appealed claim 1 based on the combined teachings of Abernathey and Tsukamoto, we agree with appellants (brief, page 7; reply brief, pages 3-4) that one of ordinary skill in the art would not have combined the teachings of Abernathey and Tsukamoto.[2] We find that Abernathey teaches that the titanium nitride layer prevents "silicon transport form the barrier layer [of silicon or silicon dioxide] to the aluminum containing metal layer" (col. 2, line 68, to col. 3, line 2), and the examiner has not established that the silicon oxynitride (SiON) antireflective layer of Tsukamoto would perform the same function as the titanium nitride layer if the oxynitride layer was substituted therefor (see answer, pages 5 and 7-8).

We note that Tsukamoto does disclose a layer of "silicon oxide" as "offset oxidized film **11**" (col. 7, lines 14-15) in the FIGs. thereof , e.g., FIGs. **2** and **3**, but the examiner does

[2] The issue here is whether one of ordinary skill in the art would have combined the references, not whether Abernathey would have taught away from the use of SiON in place of TiN because the reference does not make any reference to the former material. *See In re Gurley*, 27 F.3d 551, 552-53, 31 USPQ2d 1130, 1131-32 (Fed. Cir. 1994) ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. [Citations omitted.]").

not establish the significance of this layer with respect to silicon transport and the SiON antireflective layer **10**.

Accordingly, we find that the examiner has not established that one of ordinary skill in this art would have combined the teachings of Abernathey and Tsukamoto with respect to the antireflective layer. It is well settled that the examiner must point to some teaching, suggestion or motivation in the prior art to support the combination of references, and thus we reverse this ground of rejection. *See In re Lee*, 277 F.3d 1338, 1343, 61 USPQ2d 1430, 1433-34 (Fed. Cir. 2002)*; Smith Industries medical Systems, Inc. v. Vital Signs, Inc.*, 183 F.3d 1347, 1356, 51 USPQ2d 1415, 1420-21 (Fed. Cir. 1999); *In re Mayne*, 104 F.3d 1339, 1342, 41 USPQ2d 1451, 1454 (Fed. Cir. 1997); *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984).

The examiner's decision is affirmed-in-part.

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

CHARLES F. WARREN Administrative Patent Judge	)	
PAUL LIEBERMAN Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
CATHERINE TIMM Administrative Patent Judge	)	

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