

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CARL ZEISS SMT GMBH
Petitioner

v.

NIKON CORPORATION
Patent Owner

Case IPR2013-00362
Patent 7,348,575 B2

Before HOWARD B. BLANKENSHIP, SALLY C. MEDLEY, and
MATTHEW R. CLEMENTS, *Administrative Patent Judges*.

CLEMENTS, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Carl Zeiss SMT GmbH (“Carl Zeiss”) filed a petition requesting *inter partes* review of claims 1–3, 8–12, 16–20, 23–26, and 29–33 of U.S. Patent No. 7,348,575 B2 (Ex. 1001, “the ’575 patent”). Paper 3 (“Pet.”). The patent owner, Nikon Corporation (“Nikon”), did not file a preliminary response. We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides as follows:

THRESHOLD.—The Director may not authorize an *inter partes* review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

Upon consideration of the petition, we determine that the information presented by Carl Zeiss establishes that there is a reasonable likelihood that Carl Zeiss would prevail in showing unpatentability of claims 1–3, 8–12, 16–20, 23–26, and 29–33 of the ’575 patent. Accordingly, pursuant to 35 U.S.C. § 314, we institute an *inter partes* review for claims 1–3, 8–12, 16–20, 23–26, and 29–33 of the ’575 patent.

A. Related Proceedings

Seven applications claim benefit under 35 U.S.C. § 120 to the application that issued as the ’575 patent: 11/513,160 (pending); 11/583,934 (issued as U.S. Patent No. 7,309,870); 11/583,916 (issued as U.S. Patent No. 7,312,463); 11/882,208 (abandoned); 12/379,415 (pending); 12/884,332 (abandoned); and

13/275,760 (pending). Pet. 1-2. United States Patent No. 7,309,870 has been the subject of four interference proceedings. *Id.* Carl Zeiss also has filed another petition for *inter partes* review of claims 55–67 of the '575 patent: IPR2013-00363. In addition to these identified related proceedings, Nikon indicates that U.S. Patent Application No. 13/889,780 may affect, or may be affected by, a decision in this *inter partes* review. Paper 8.

B. The '575 Patent

The subject matter of the '575 patent relates to a catadioptric projection optical system, exposure apparatus, and exposure method and, more particularly, to a high-resolution catadioptric projection optical system suitable for use in production of semiconductor devices and liquid-crystal display devices by photolithography. Ex. 1001, col. 1, ll. 18-23. In the production of semiconductor devices, photolithography uses a projection exposure apparatus to project “an image of a mask (or reticle) through a projection optical system onto a wafer (or a glass plate or the like) coated with a photoresist or the like.” Ex. 1001, col. 1, ll. 27–32. As the dimensions of semiconductor devices shrink, the projection optical system of the projection exposure apparatus requires greater resolving power (resolution). Ex. 1001, col. 1, ll. 32–36. In order to satisfy the requirements for the resolving power of the projection optical system, it is necessary to shorten the wavelength of illumination light (exposure light) and to increase the image-side numerical aperture of the projection optical system. Ex. 1001, col. 1, ll. 37–41. It was known to increase the numerical aperture by putting a medium with a high refractive index, like a liquid, in the optical path between the projection optical

system and the image plane. Ex. 1001, col. 1, ll. 55–58. However, there were known disadvantages to this approach. Ex. 1001, col. 1, ll. 59–67.

The '575 patent discloses systems and methods to provide a relatively compact projection optical system that is “corrected for various aberrations, such as chromatic aberration and curvature of field, and is capable of securing a large effective image-side numerical aperture while suppressing the reflection loss on optical surfaces.” Ex. 1001, col. 2, ll. 3–9. A medium having a refractive index larger than 1.1, such as deionized water, is interposed in the optical path between the boundary lens and the image plane, thereby increasing the image-side numerical aperture. Ex. 1001, col. 5, ll. 9–21. The projection optical system is catadioptric, comprising at least two reflecting mirrors, in which every transmitting member and every reflecting member with a refracting power are arranged along a single optical axis and in which the projection optical system has an effective imaging area that does not include the optical axis. Ex. 1001, col. 5, ll. 39–45. By arranging the transmitting members and the reflecting members along a single axis, the system is easier to produce than a system wherein the optical members are arranged along multiple optical axes. Ex. 1001, col. 5, ll. 52–59.

C. Exemplary Claim

Claim 1 is representative and is reproduced below:

1. A catadiopt[ri]c projection optical system, which forms a reduced image of a first surface on a second surface, comprising:
 - at least two reflecting mirrors; and
 - a boundary lens whose surface on the first surface side has a positive refractive power,

wherein where a refractive index of an atmosphere in an optical path of the projection optical system is 1, an optical path between the boundary lens and the second surface is filled with a medium having a refractive index la[r]ger than 1.1,

wherein every transmitting member and every reflecting member with a refractive power constituting the projection optical system are arranged along a single optical axis; and

the projection optical system having an effective imaging area of a predetermined shape not including said optical axis.

D. Prior Art Relied Upon

Carl Zeiss relies on the following prior art references, as well as the declaration of Richard C. Juergens (Ex. 1016):

Suwa	US 5,825,043	Oct. 20, 1998	Ex. 1009
Terasawa	US 2002/0024741 A1	Feb. 28, 2002	Ex. 1008
Fukami ¹	WO 99/49504	Sept. 30, 1999	Ex. 1012
Takahashi ²	WO 02/035273	May 2, 2002	Ex. 1007
Suenaga	EP 1 069 448 B1	Mar. 19, 2003	Ex. 1027

¹ Fukami is a Japanese language document. Ex. 1012. Unless indicated otherwise, all subsequent references to Fukami in this decision will refer to its certified English language translation. Ex. 1015.

² Takahashi is a Japanese language document. Ex. 1007. Unless indicated otherwise, all subsequent references to Takahashi in this decision will refer to its publication in English by the European Patent Office as EP 1 336 887 A1. Ex. 1014. Patent Owner admitted that EP 1 336 887 A1 is the English publication of WO 02/035273. Ex. 1026 at 35-36 (material facts 130 and 131, Admitted).

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