

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JUN-CHENG LAI

Appeal 2008-3545
Application 10/250,228
Technology Center 1700

Decided: July 29, 2008

Before EDWARD C. KIMLIN, TERRY J. OWENS, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

The Appellant appeals from a rejection of claims 8-16, which are all of the pending claims.

THE INVENTION

The Appellant claims a method for patterning a material layer using a photomask. Claim 8 is illustrative:

8. A method of using a half-tone phase shift mask to form a strip pattern having two thicker ends and a narrower mid section, comprising the steps of:

- providing a substrate;
- forming a material layer over the substrate;
- forming a photoresist layer on the material layer;
- patterning the photoresist layer using the half-tone phase shift mask, wherein the half-tone phase shift mask comprises:
 - a mask substrate;
 - two sheltering layer formed as first strips on the mask substrate with a space therebetween;
 - a half-tone phase shift layer formed as a second strip and disposed at least in the space between the first strips, wherein the second strip is thinner than the first strips; and
- patterning the material layer using the patterned photoresist layer as an etching masks to form the strip.^[1]

¹ The Appellant's Specification states:

In this invention, the half-tone phase shift layer and the sheltering layer together form the non-exposed pattern area of the half-tone phase shift mask and there is a 180° phase angle difference between the half-tone phase shift layer and the sheltering layer. Hence, any diffraction along the edge of the sheltering layer is canceled out and the sheltering area is more solidly covered so that a higher photolithographic resolution and contrast is obtained through the mask [¶ 0035].

* * *

In addition, the half-tone phase shift layer and the sheltering layer are formed on the surface of the same mask (a binary pattern layer) in this invention. Without using a double exposure operation using two

THE REFERENCES

Tanaka (Tanaka ‘692)	US 2002/0039692 A1	Apr. 4, 2002
Tanaka (Tanaka ‘050)	US 2002/0177050 A1	Nov. 28, 2002

THE REJECTIONS

Claims 8-16 stand rejected under 35 U.S.C. § 103 over Tanaka ‘692 or Tanaka ‘050.

OPINION

We reverse the Examiner’s rejections. We need to address only the sole independent claim, i.e., claim 8. That claim requires “two sheltering layers formed as first strips on the mask substrate with a space therebetween”, and “a half-tone phase shift layer formed as a second strip and disposed at least in the space between the first strips, wherein the second strip is thinner than the first strips”.

Tanaka ‘692 discloses a photomask having a half-tone strip (12) between two hole regions (11a, 11b) and, surrounding the half-tone strip and the hole regions, a light blocking film (103) (¶ 0055; figs. 2(A), 2(B)).

Tanaka ‘050 discloses a phase shift mask (40) having two translucent regions (41a, 41b), a light shield region (44) surrounding each translucent region, a half-tone strip (42) between the light shield regions, an auxiliary pattern (43) surrounding the light shield regions and the half-tone strip, and a light shield region (44) surrounding the auxiliary pattern (¶¶ 0152, 0163; figs. 9A, 9B, 10A, 10B).

separate masks, the errors due to a mask misalignment is prevented and the cost for producing the mask is reduced [¶ 0040].

The Examiner argues that “Tanaka ‘692 Figs. 1 and 2A show this geometric pattern arrangement of a strip pattern having two thicker ends and a narrower mid section” (Ans. 7).

The Examiner has not pointed out where Tanaka ‘692 discloses a sheltering layer in the form of a strip. In the Tanaka ‘692 figures 1 and 2A, at each end of the half-tone strip there is a hole pattern (1a, 1b, 11a, 11b), and in figure 2A the half-tone strip and the hole pattern are surrounded by a light blocking film (103). There is no light blocking film in the form of a strip, which is “a long narrow piece of material”.²

The Examiner argues that “Tanaka ‘692 Fig. 2A, and Tanaka ‘050, Figs. 9 and 10, show the same profile and pattern arrangement as applicant’s Figs. 3 and 4” (Ans. 7).

The Appellant’s figure 3 shows a sheltering layer (306) in the form of a strip, and such a strip is not shown in the Tanaka figures relied upon by the Examiner.³

The Examiner argues that “it would have been obvious to one having ordinary skill in the art to take the teachings of the cited prior art and adjust the pattern to give the desired optical transmission in order to make the claimed invention because it is typical when using a mask comprising halftone regions, to adjust the amount of transmission adjacent the halftone regions in order to give the necessary destructive interference to produce the desired pattern” (Ans. 5).

² *Webster’s New Collegiate Dictionary* 1153 (G. & C. Merriam 1973).

³ The Appellant’s figure 4A shows a patterned photoresist (404), and figure 4B shows a patterned material layer (402a) (Spec. ¶ 0034).

Even if the Examiner is correct that it was known in the art to adjust the transmission adjacent a halftone region to provide the necessary destructive interference, the Examiner has not established that one of ordinary skill in the art would have been led by the applied prior art to do so by using sheltering layers in the form of strips. Thus, the record indicates that the reason relied upon by the Examiner for modifying the Tanaka photomasks to use sheltering layers in the form of strips comes from the Appellant's disclosure rather than coming from the applied prior art. The record, therefore, indicates that the Examiner used impermissible hindsight in rejecting the Appellant's claims. *See W.L. Gore & Associates v. Garlock, Inc.*, 721 F.2d 1540, 1553 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984); *In re Rothermel*, 276 F.2d 393, 396 (CCPA 1960).

For the above reasons we conclude that the Examiner has not established a prima facie case of obviousness of the Appellant's claimed invention over Tanaka '692 or Tanaka '050.

DECISION

The rejections of claims 8-16 under 35 U.S.C. § 103 over Tanaka '692 and over Tanaka '050 are reversed.

REVERSED

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PL initials:
sld

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