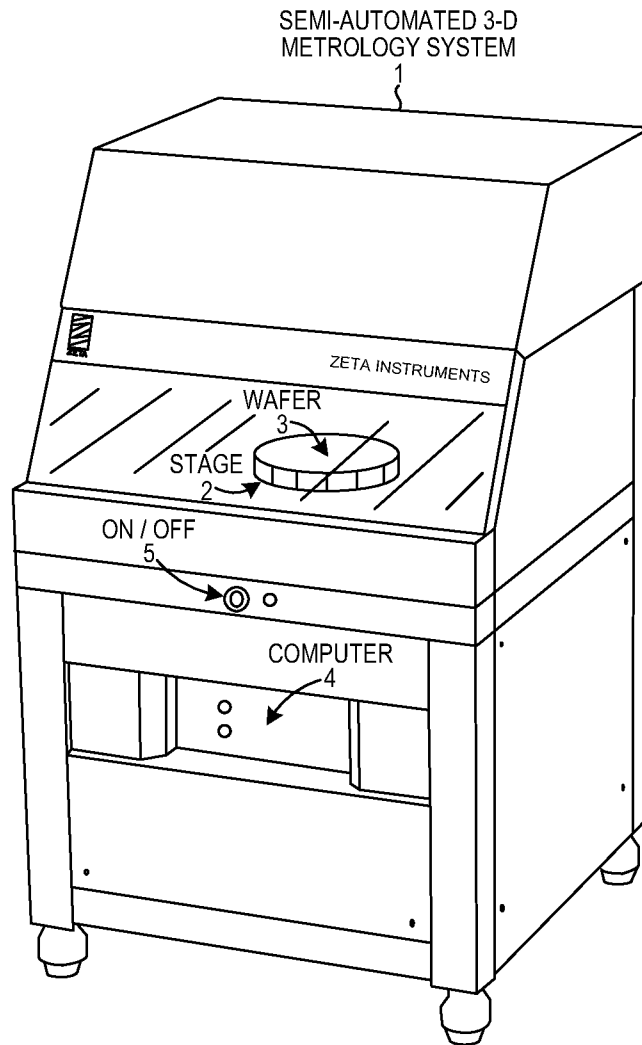


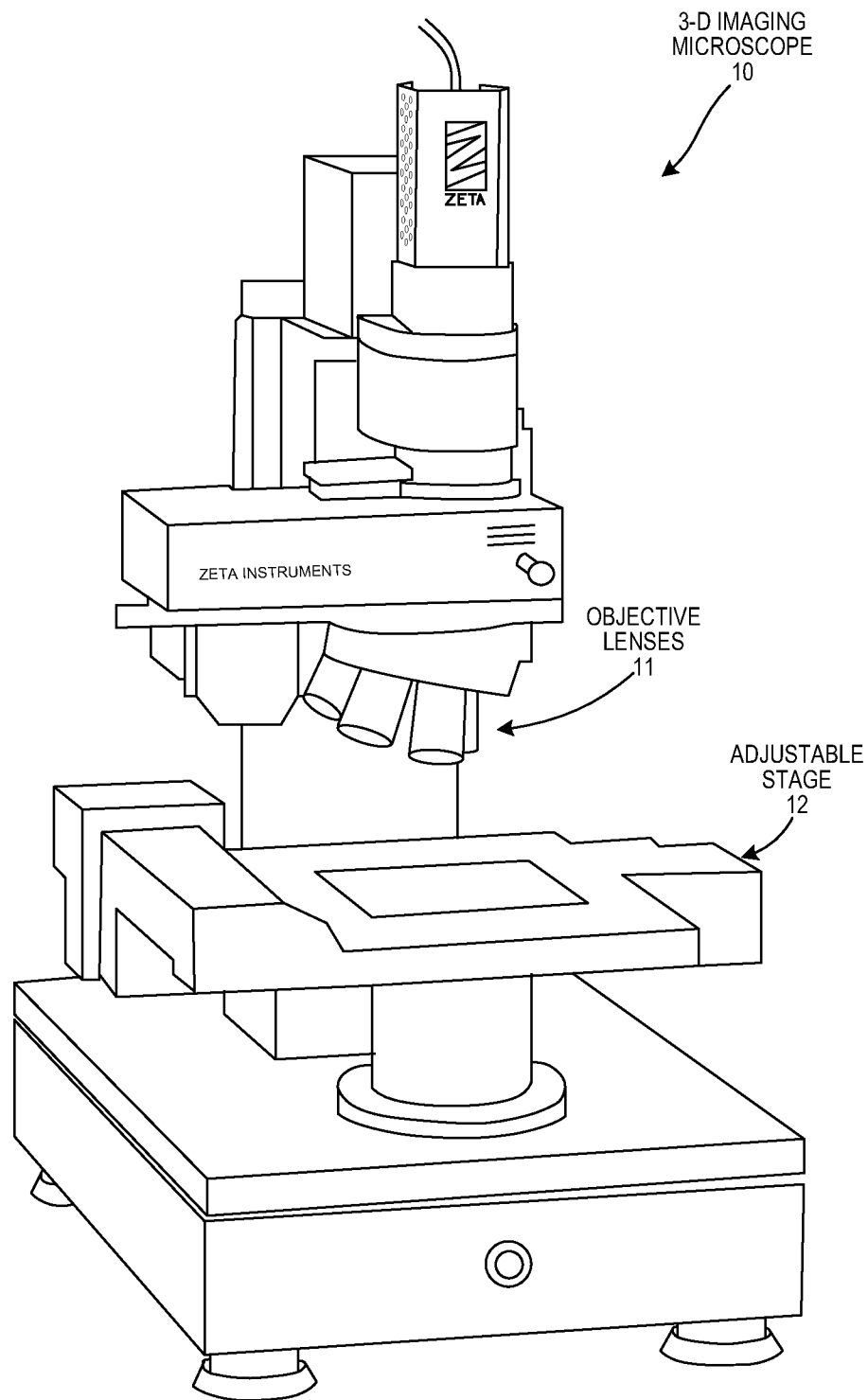
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SEMI-AUTOMATED 3-D METROLOGY SYSTEM

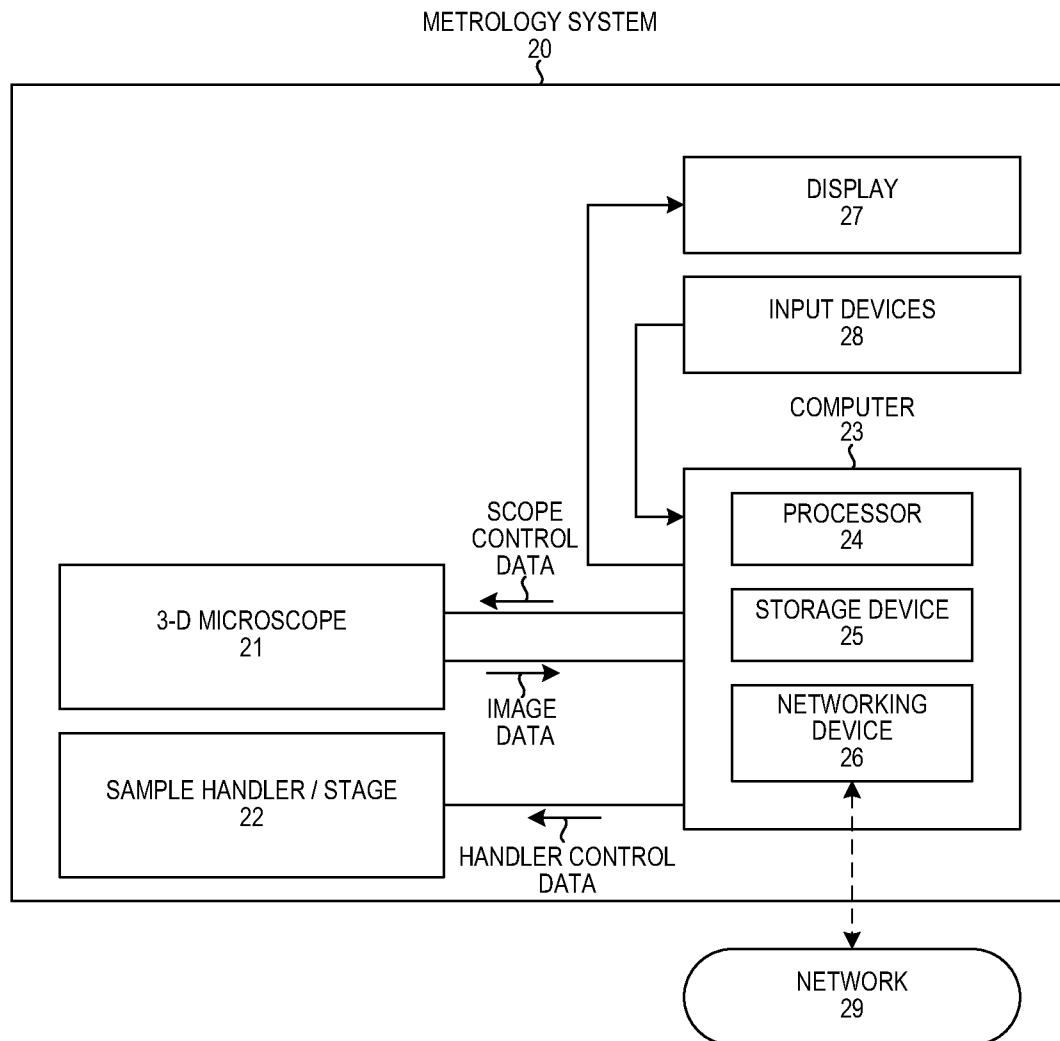
FIG. 1

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3-D IMAGING MICROSCOPE
FIG. 2

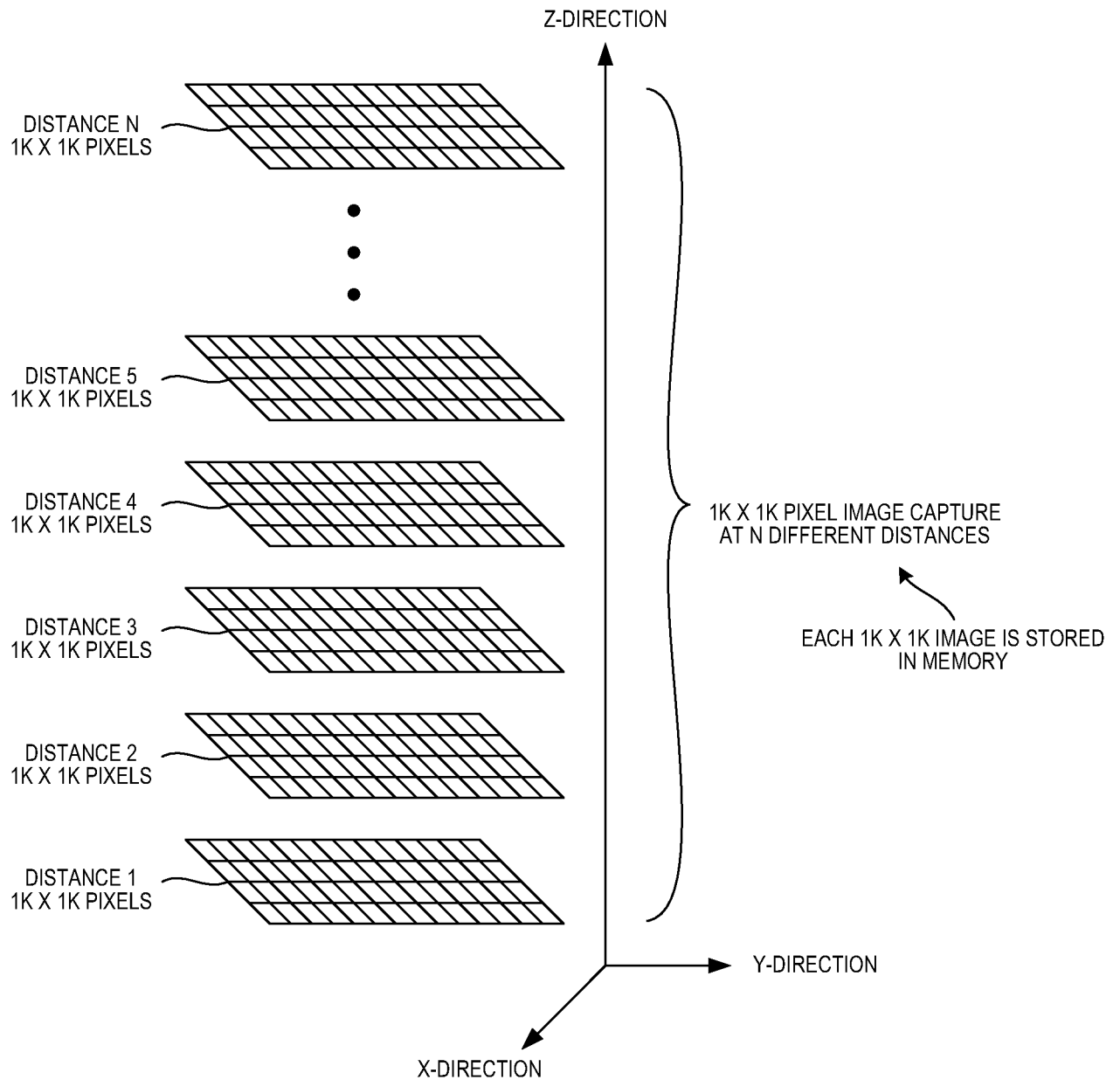
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METROLOGY SYSTEM

FIG. 3

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MULTIPLE IMAGES CAPTURED AT DIFFERENT DISTANCES

FIG. 4

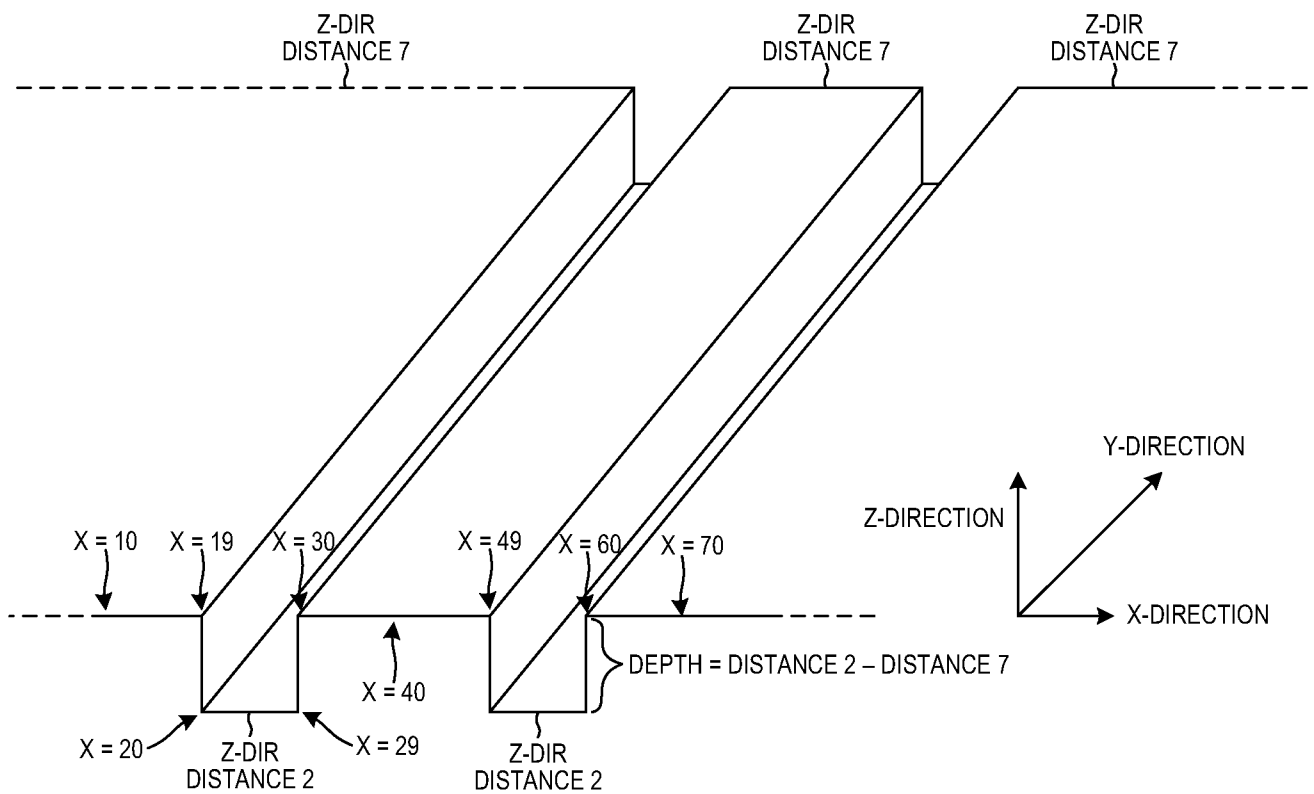
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	Y-DIRECTION						
Y = 12	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 11	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 10	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 9	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 8	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 6	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 5	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 4	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 3	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
Y = 1	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7	Z-DIR DISTANCE 2	Z-DIR DISTANCE 7	Z-DIR DISTANCE 7
	X = 1 ~ 19	X = 20 ~ 29	X = 30 ~ 39	X = 40 ~ 49	X = 50 ~ 59	X = 60 ~ 69	X-DIRECTION

MAXIMUM CHARACTERISTIC VALUES FOR EACH PIXEL
LOCATION ACROSS ALL CAPTURED IMAGES

FIG. 5

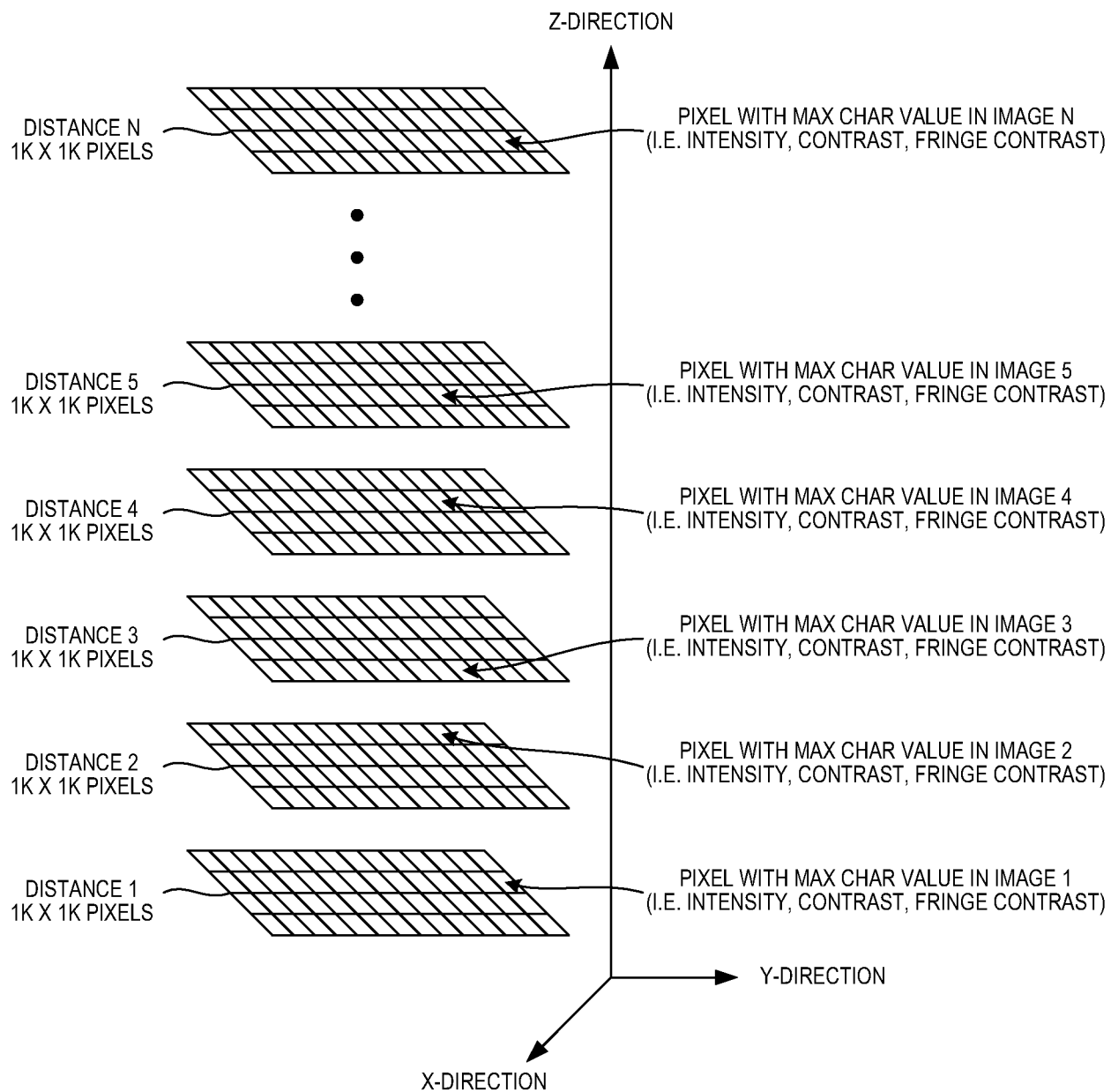
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3-D IMAGE RESULTING FROM SELECTING MAXIMUM VALUES FOR EACH X-Y PIXEL LOCATION ACROSS ALL Z-DIRECTION DISTANCES

FIG. 6

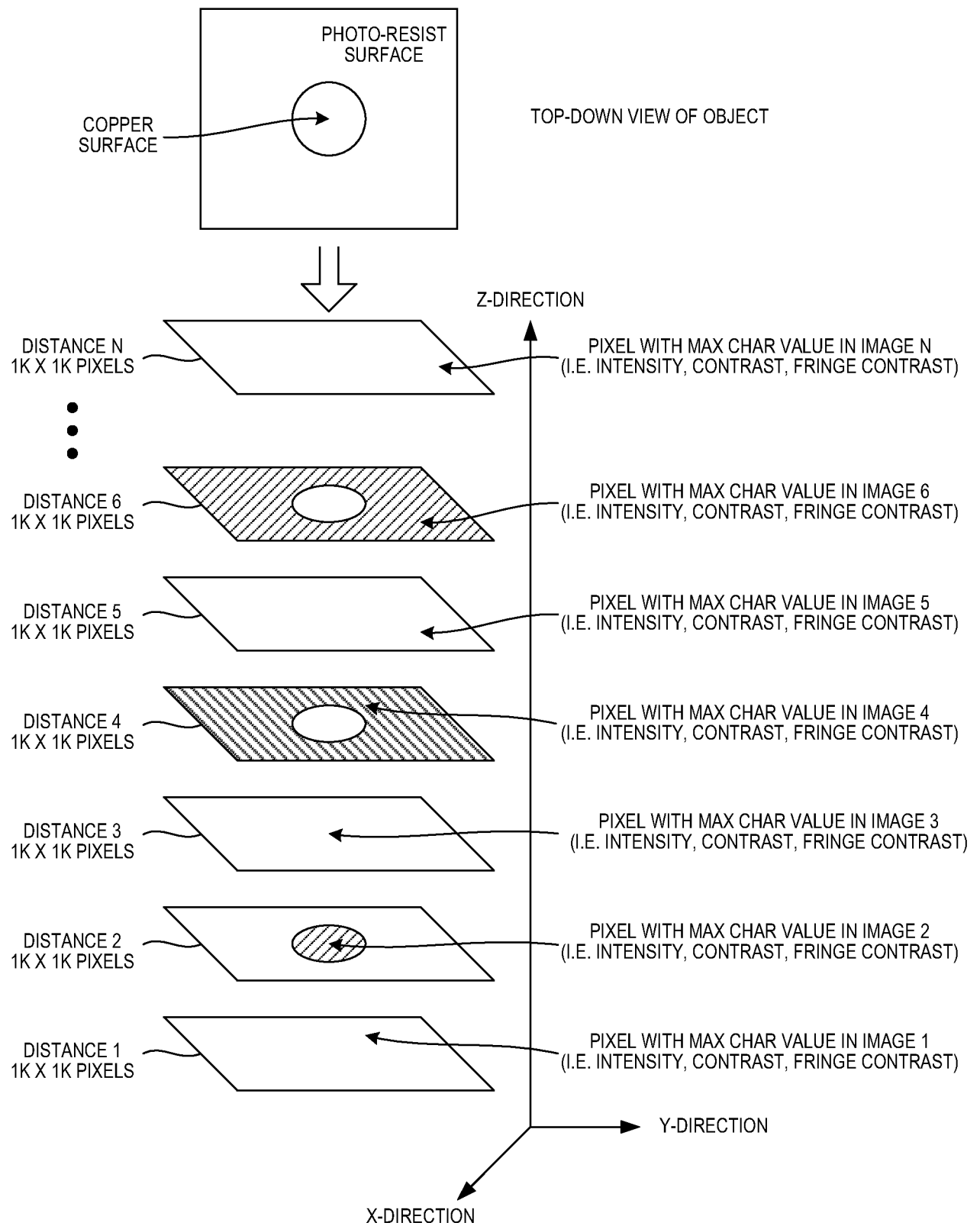
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PEAK MODE OPERATION
(SELECT MAXIMUM CHARACTERISTIC VALUE FOR
EACH CAPTURED IMAGE)

FIG. 7

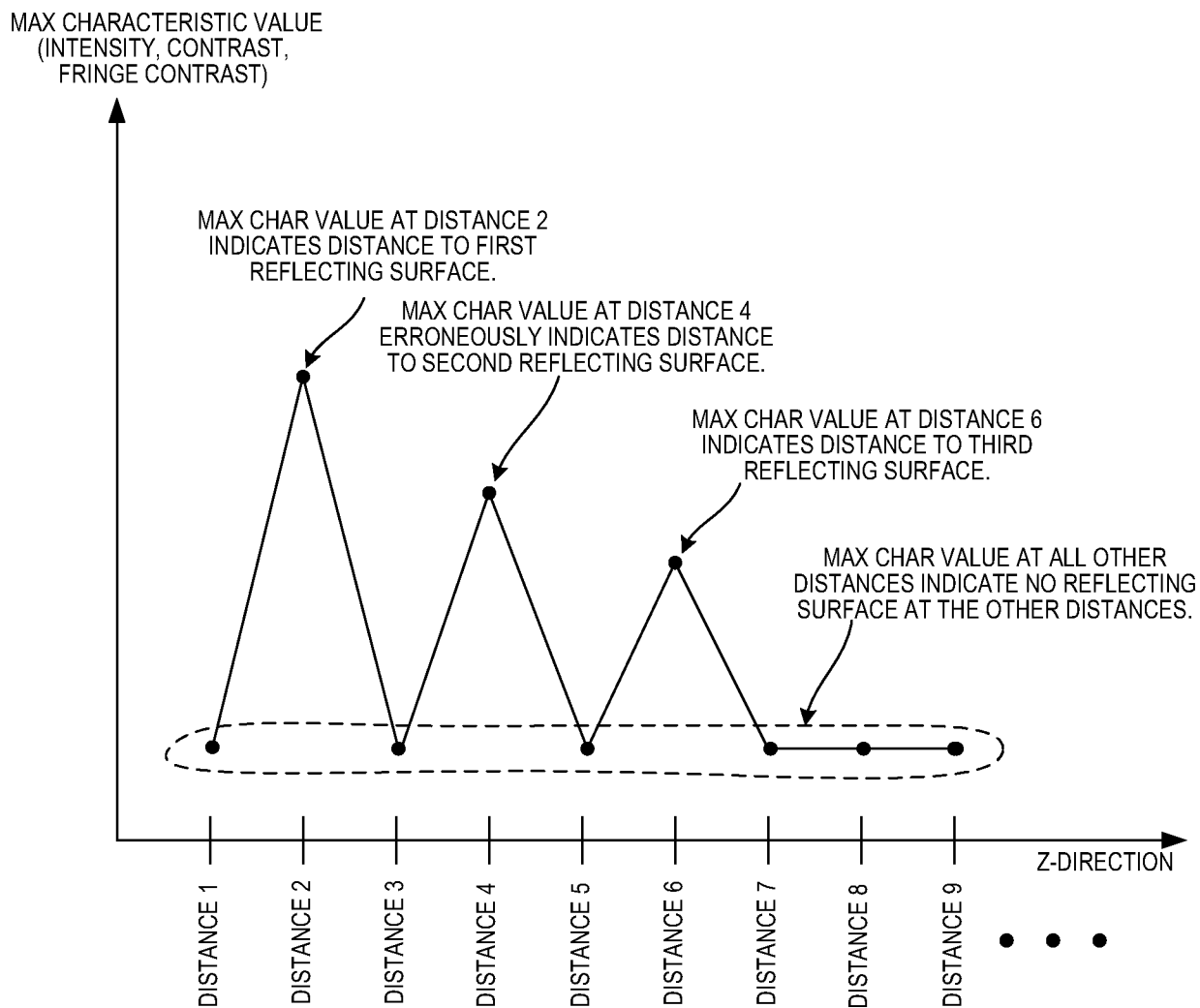
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PEAK MODE OPERATION
(MAXIMUM CHARACTERISTIC VALUE FOR EACH CAPTURED IMAGE)

FIG. 8

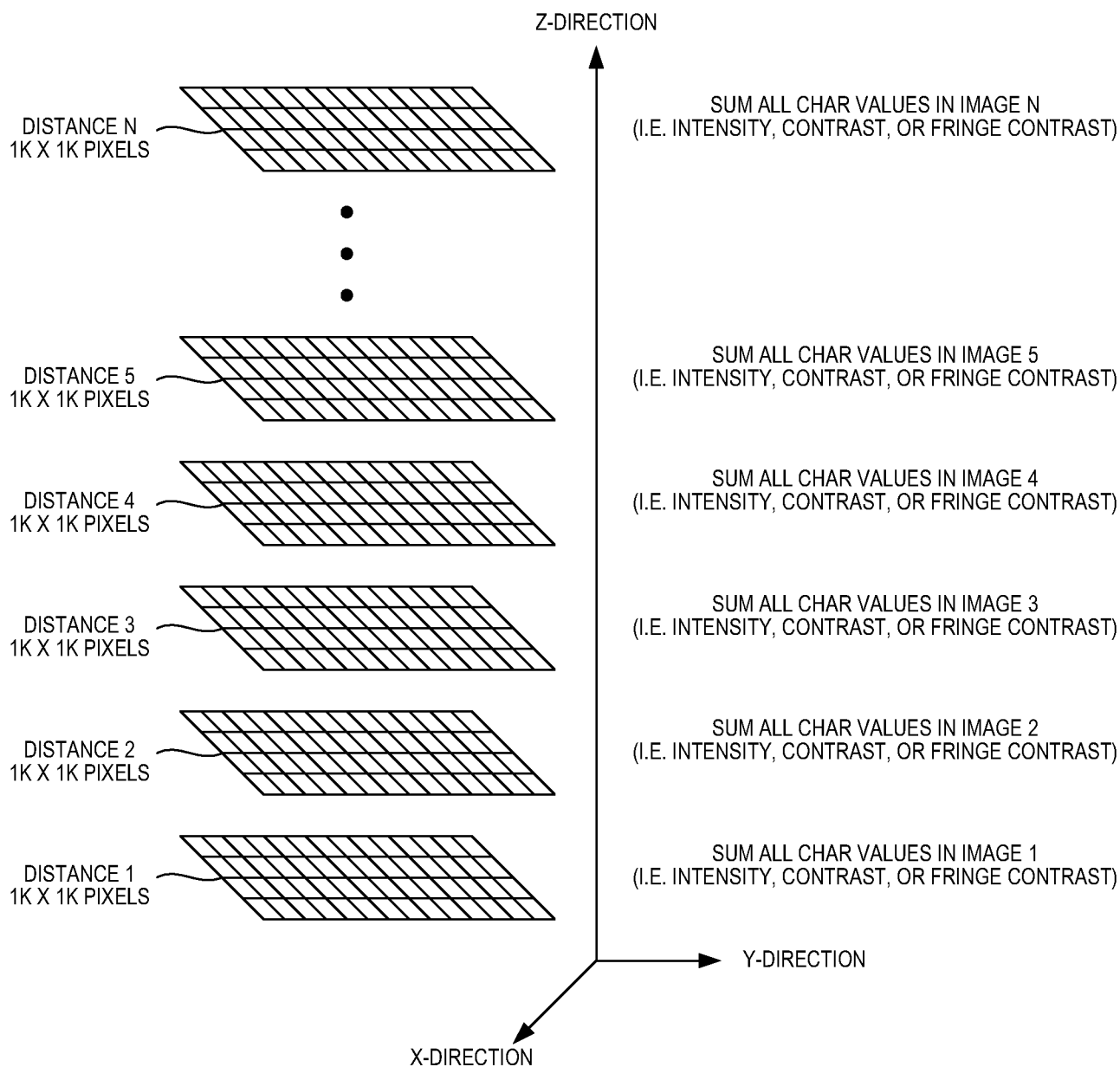
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MAXIMUM CHARACTERISTIC VALUE
ACROSS ALL CAPTURED IMAGES

FIG. 9

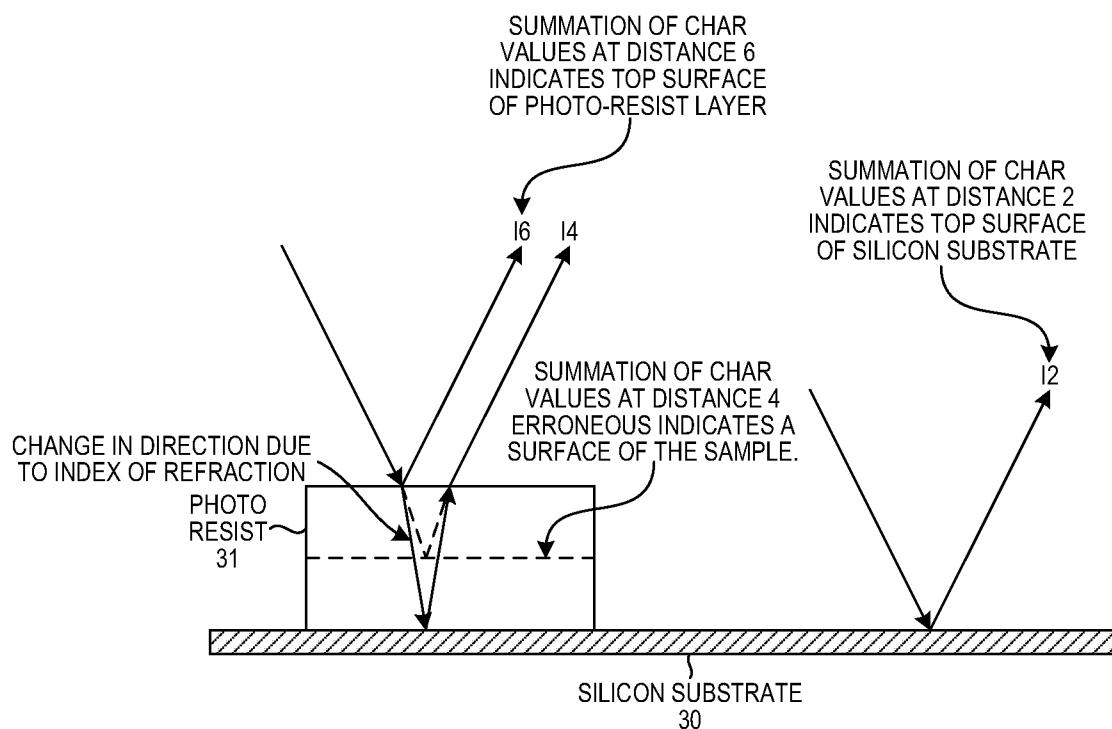
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SUMMATION MODE OPERATION
(SUM ALL CHARACTERISTIC VALUES FOR EACH CAPTURED IMAGE)

FIG. 10

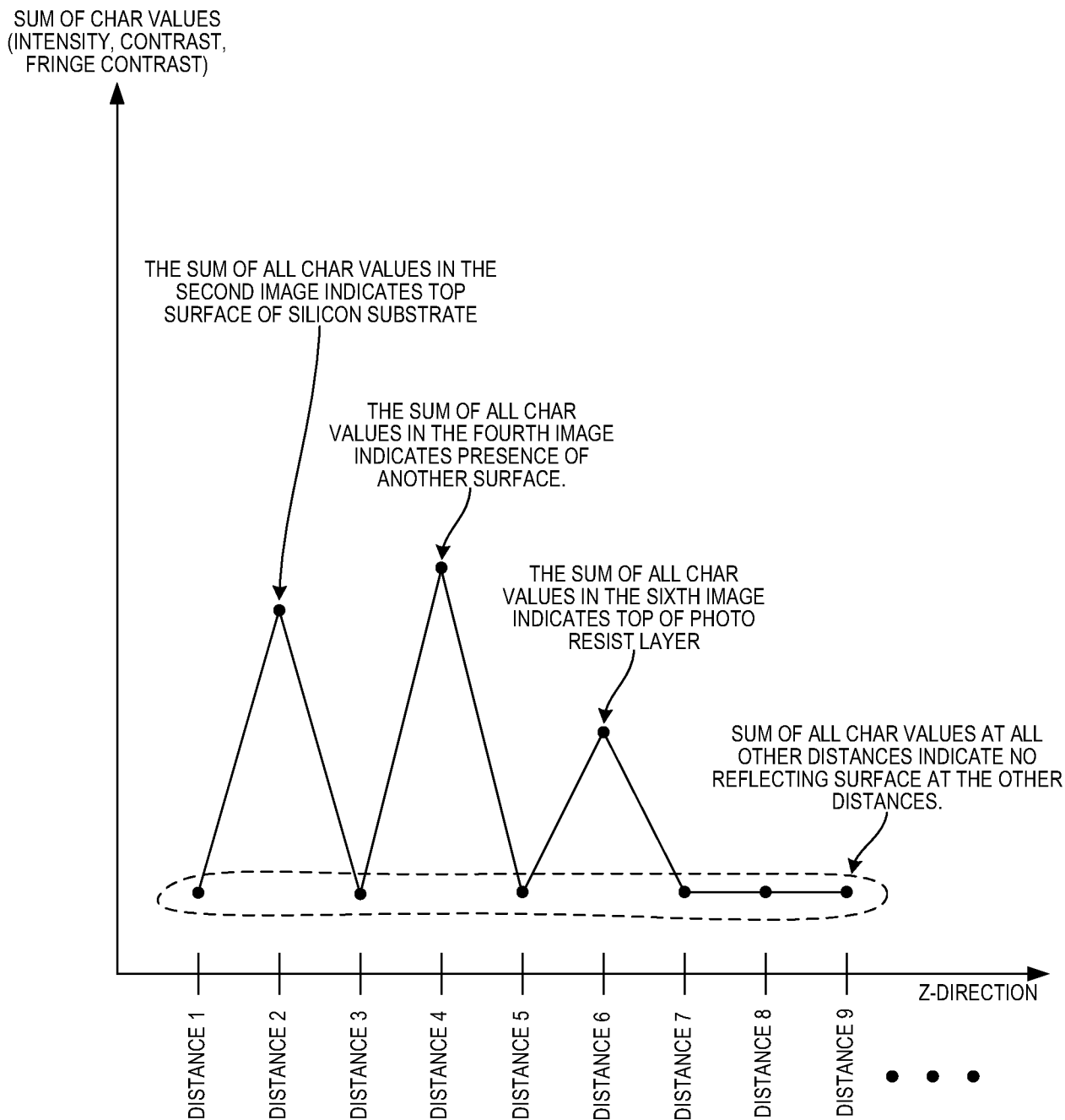
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ERRONEOUS SURFACE DETECTION
DUE TO TRANSPARENT MATERIALS

FIG. 11

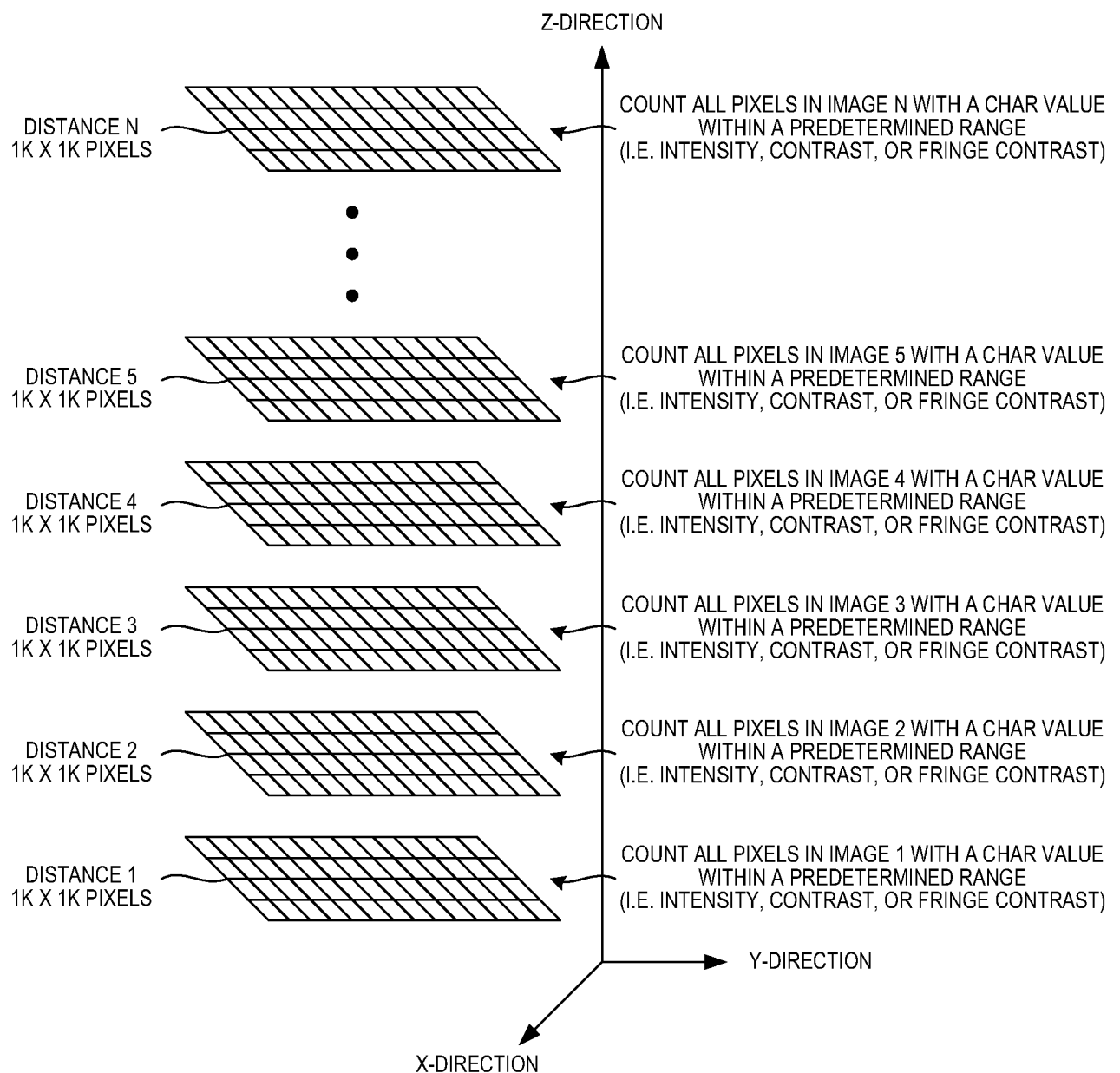
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SUMMATION OF ALL CHARACTERISTIC VALUES
FOR EACH IMAGE

FIG. 12

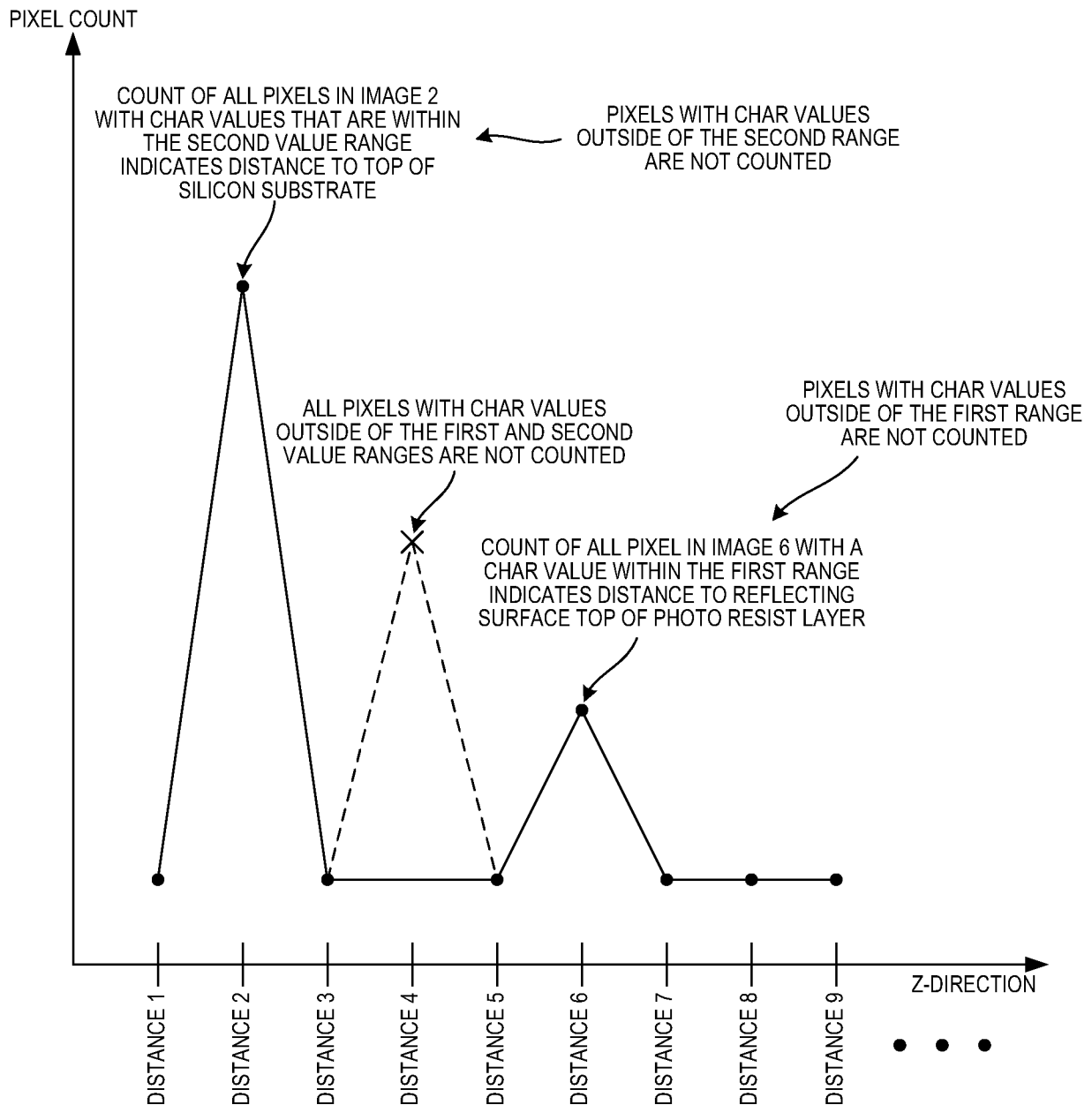
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RANGE MODE OPERATION
(COUNT ALL PIXELS WITH A CHARACTERISTIC VALUE
WITHIN A RANGE)

FIG. 13

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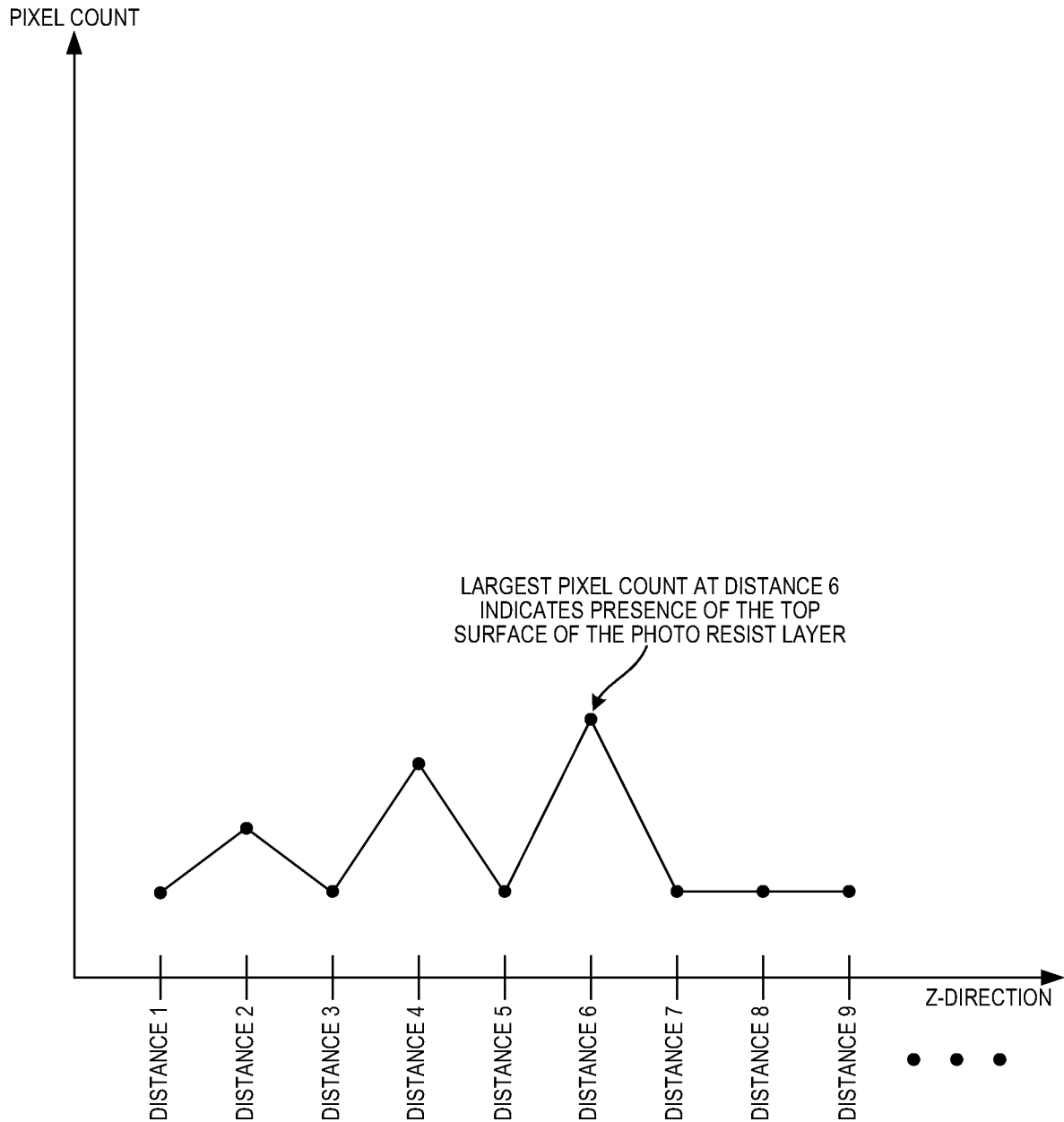


ALL PIXELS WITH A VALUE OUTSIDE THE FIRST AND SECOND RANGES ARE FILTERED OUT, THEREBY REMOVING THE ERRONEOUS INDICATION OF A THIRD SURFACE THAT DOESN'T EXIST AT DISTANCE 4.

COUNT OF ALL PIXELS WITH CHARACTERISTIC VALUES
WITHIN A SPECIFIC RANGE

FIG. 14

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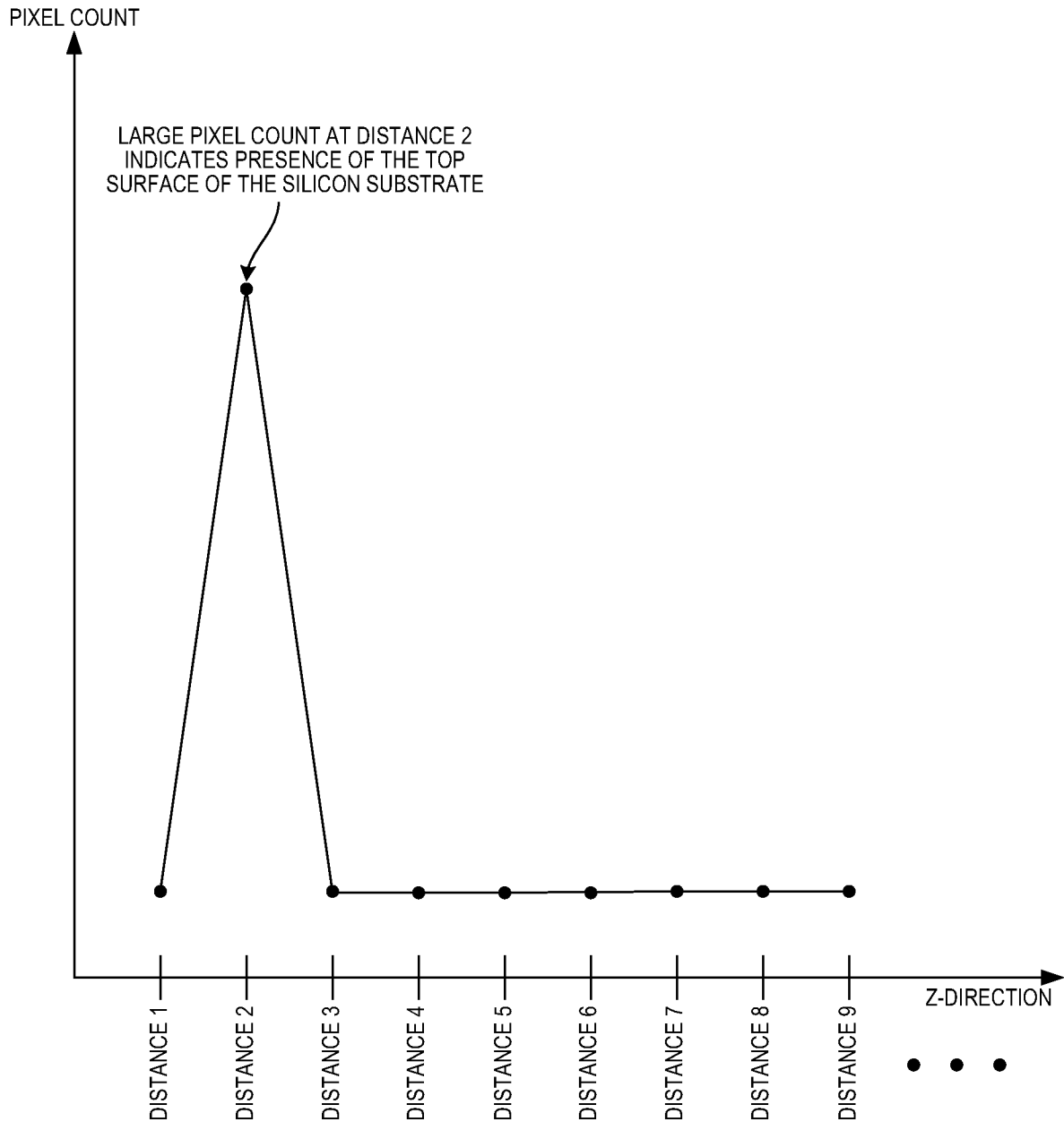


ALL PIXELS WITH A VALUE OUTSIDE THE FIRST RANGE ARE FILTERED OUT, THEREBY ONLY INDICATING A COUNT OF PIXELS THAT INDICATE THE PRESENCE OF THE TOP SURFACE OF THE PHOTO-RESIST LAYER.

COUNT OF ALL PIXELS WITH CHARACTERISTIC VALUES
WITHIN A FIRST RANGE

FIG. 15

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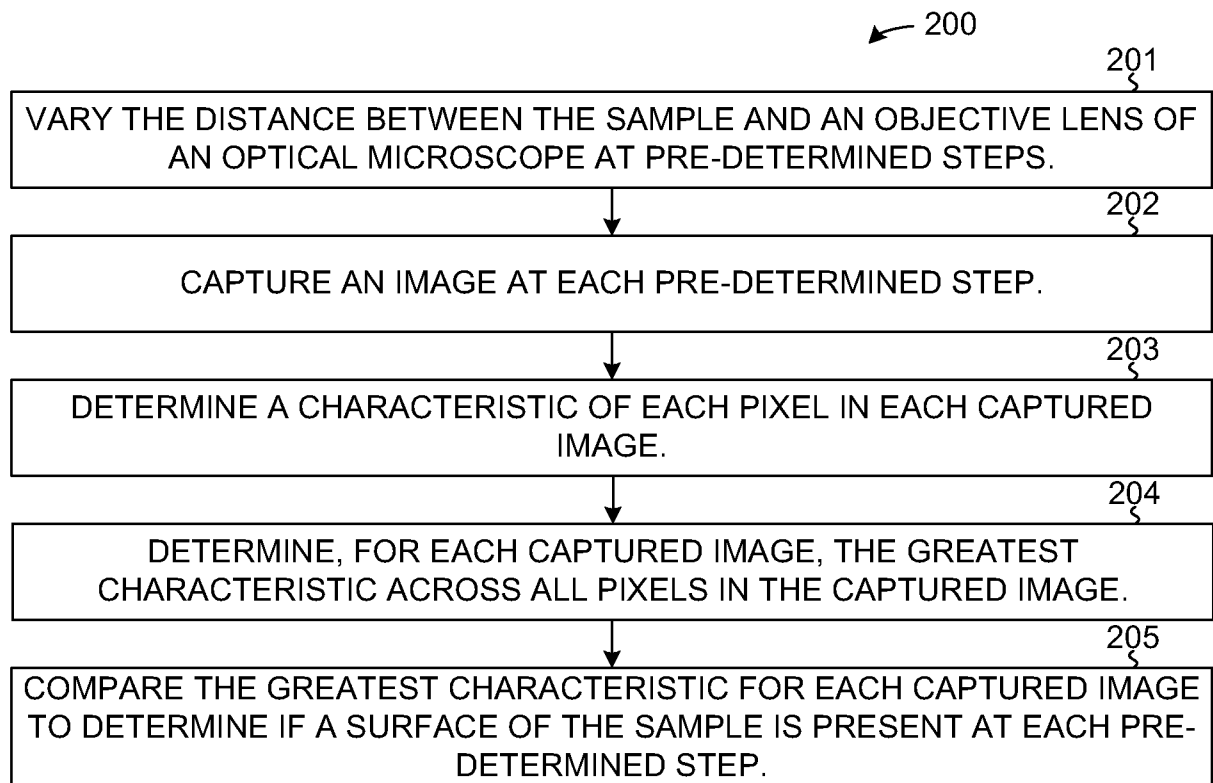


ALL PIXELS WITH A VALUE OUTSIDE THE SECOND RANGE ARE FILTERED OUT, THEREBY ONLY INDICATING A COUNT OF PIXELS THAT INDICATE THE PRESENCE OF THE TOP SURFACE OF THE SILICON LAYER.

COUNT OF ALL PIXELS WITH CHARACTERISTIC VALUES
WITHIN A SECOND RANGE

FIG. 16

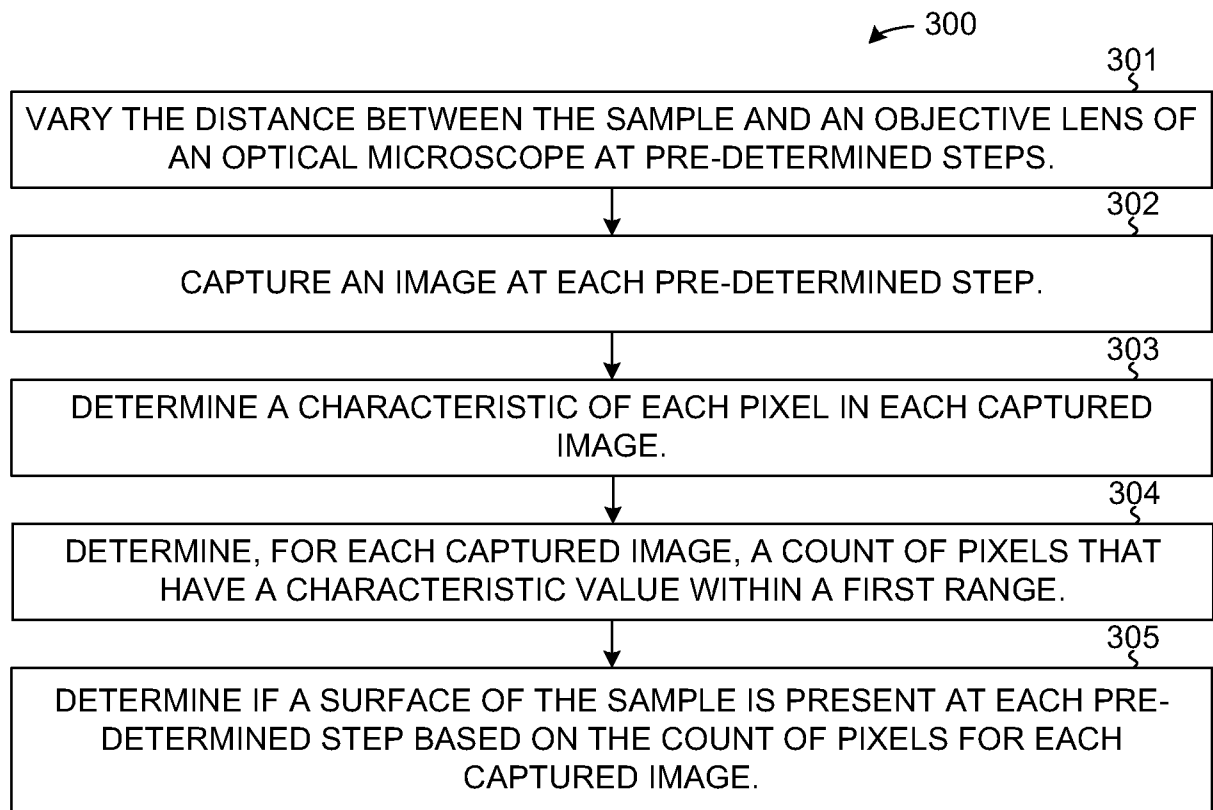
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PEAK MODE FLOWCHART

FIG. 17

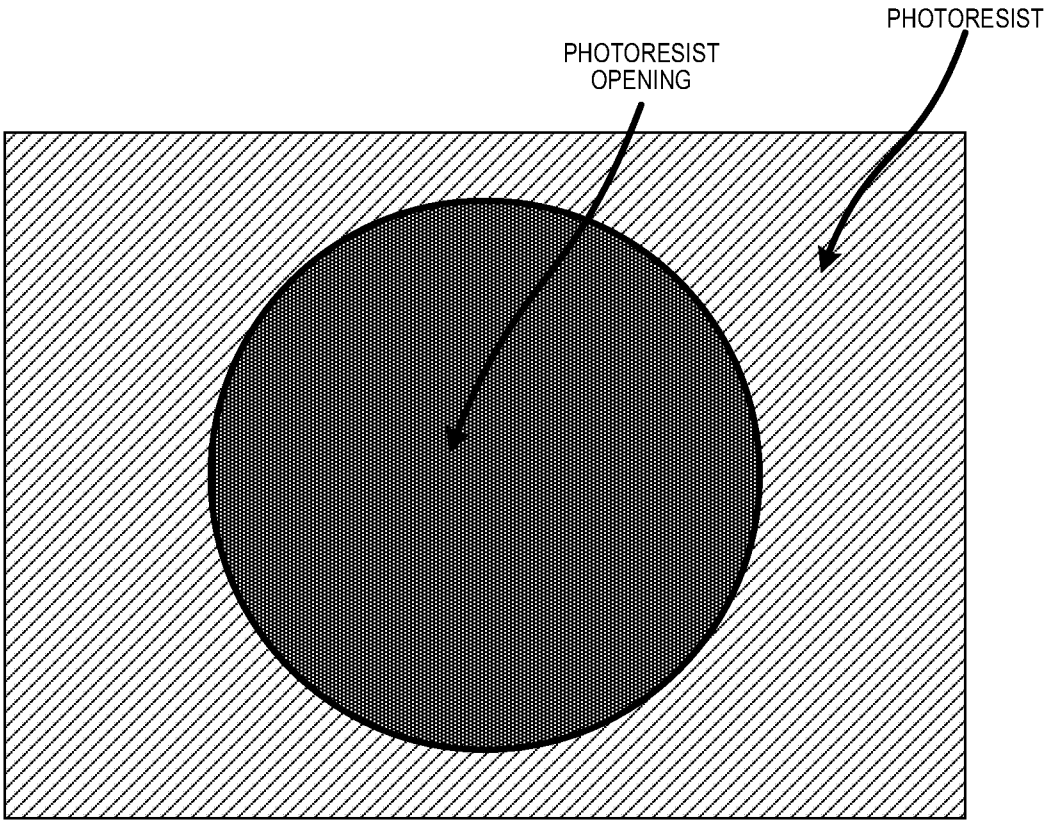
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RANGE MODE FLOWCHART

FIG. 18

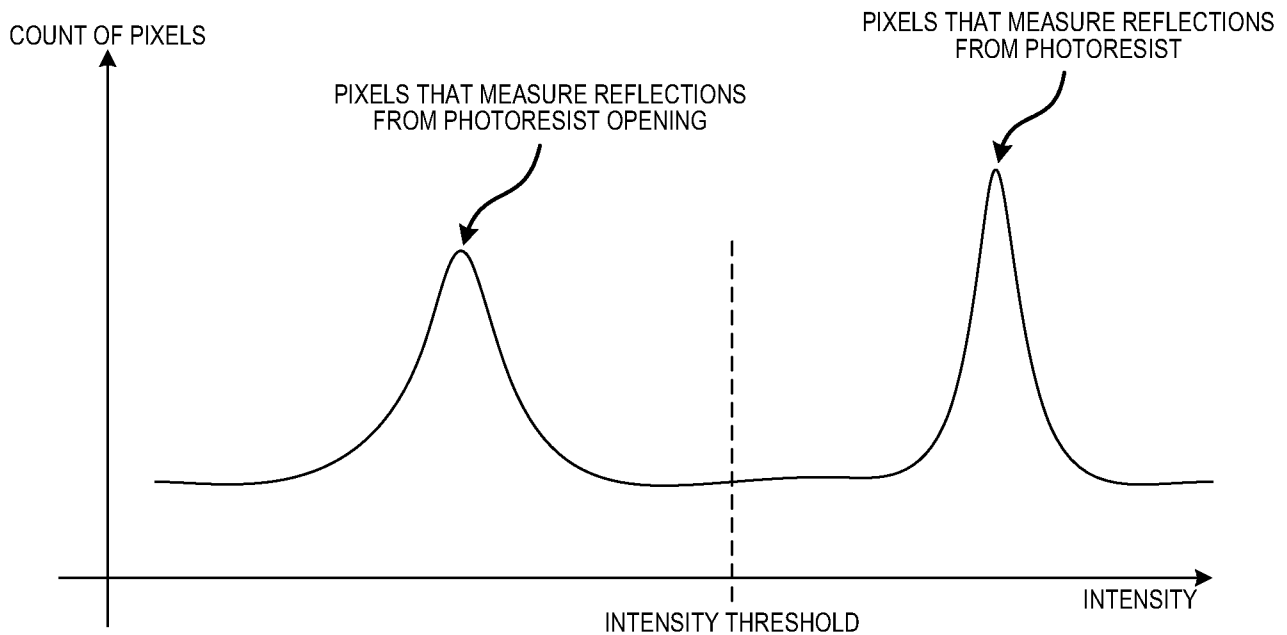
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CAPTURED IMAGE

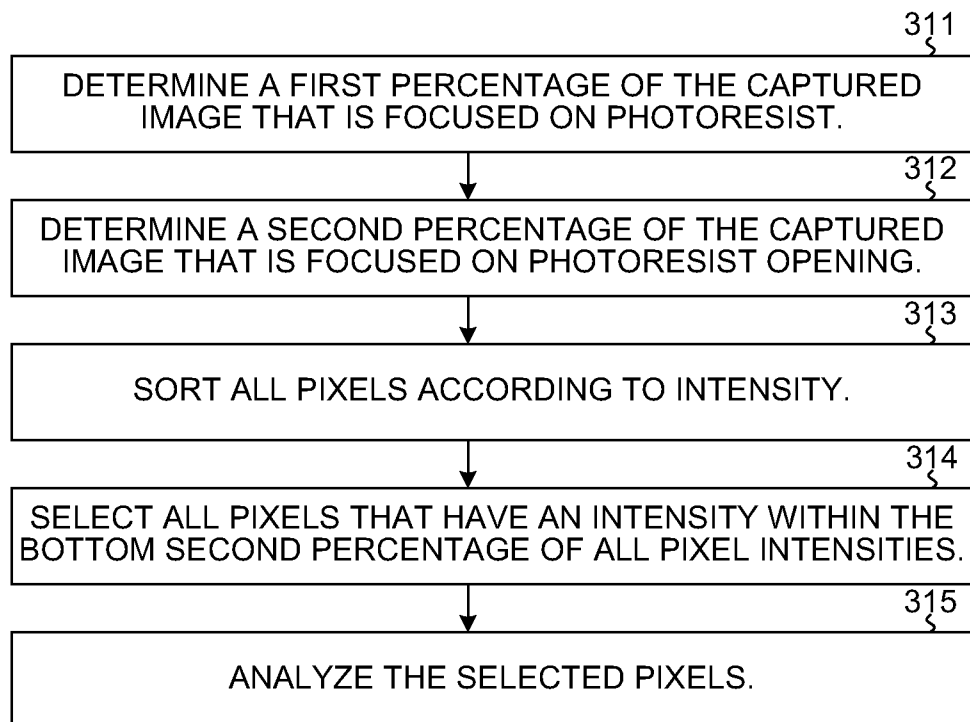
FIG. 19

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FIRST METHOD OF GENERATING INTENSITY THRESHOLD

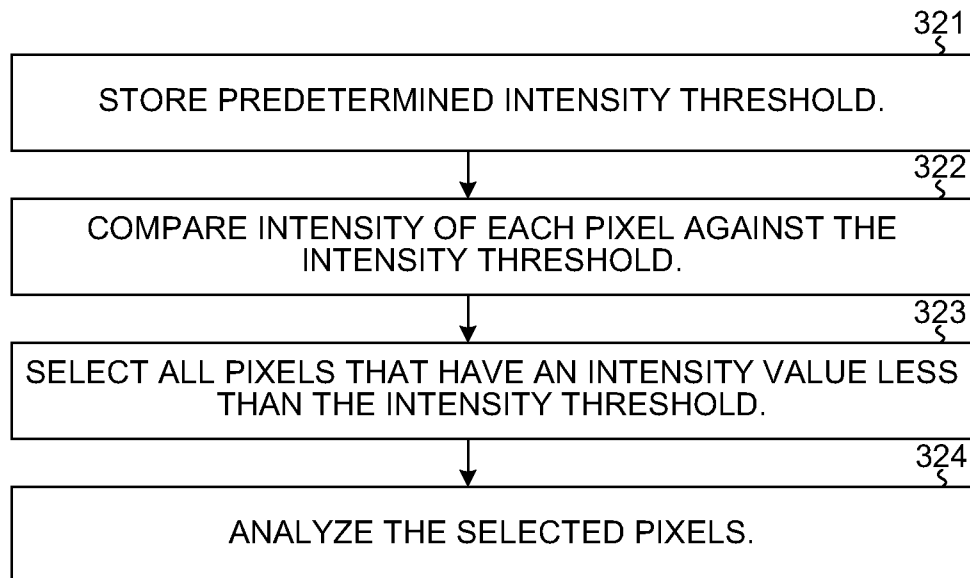
FIG. 20



SECOND METHOD OF GENERATING INTENSITY THRESHOLD

FIG. 21

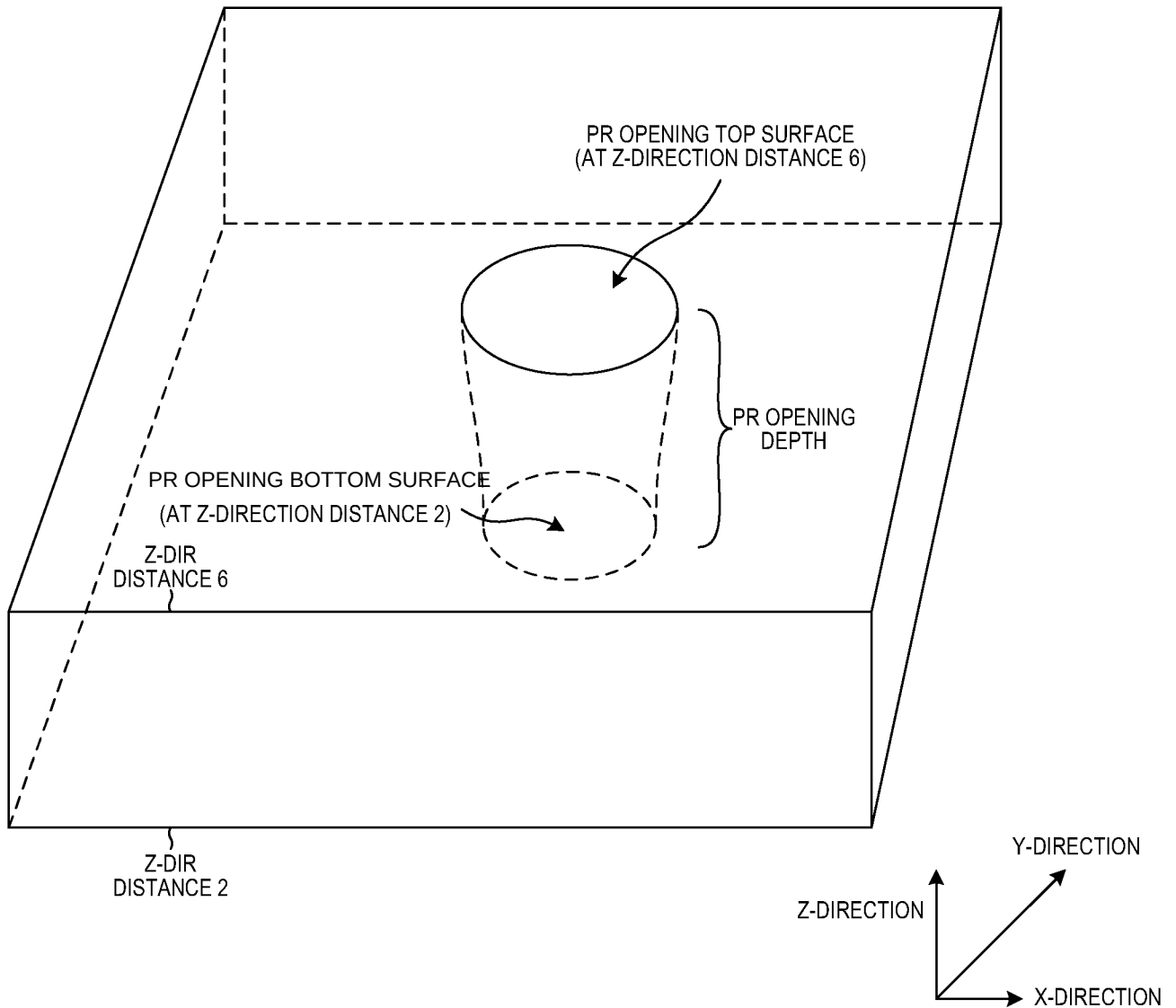
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THIRD METHOD OF GENERATING INTENSITY THRESHOLD

FIG. 22

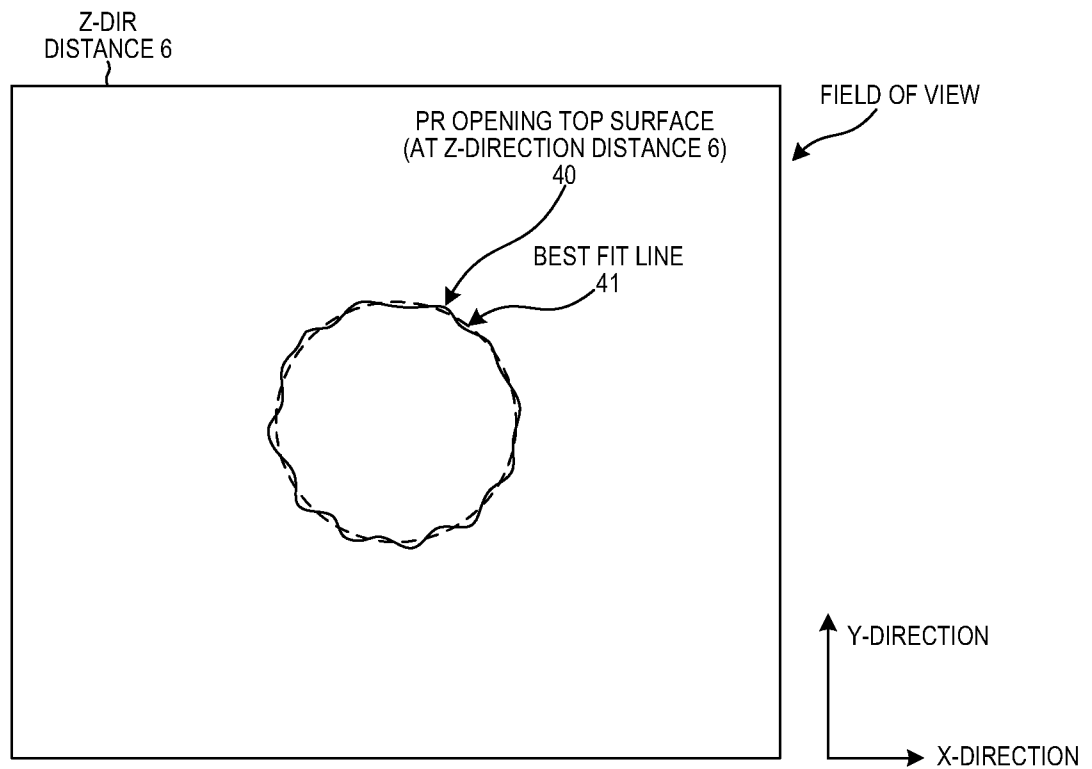
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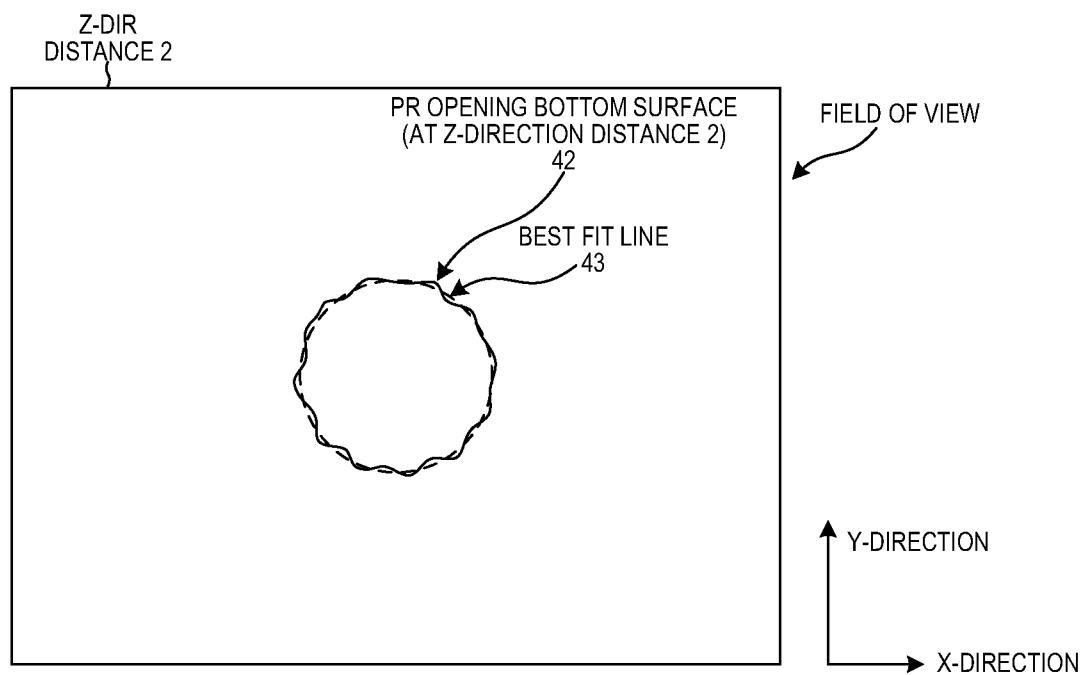
3-D VIEW OF PR OPENING

FIG. 23

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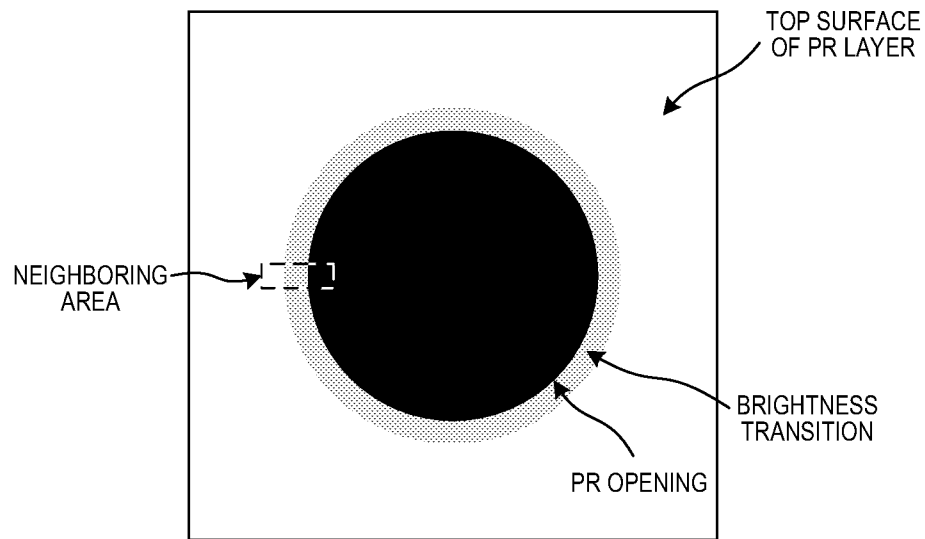


2-D VIEW OF PR OPENING TOP SURFACE
FIG. 24



2-D VIEW OF PR OPENING BOTTOM SURFACE
FIG. 25

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CAPTURED IMAGE FOCUSED ON TOP SURFACE OF PR LAYER

FIG. 26

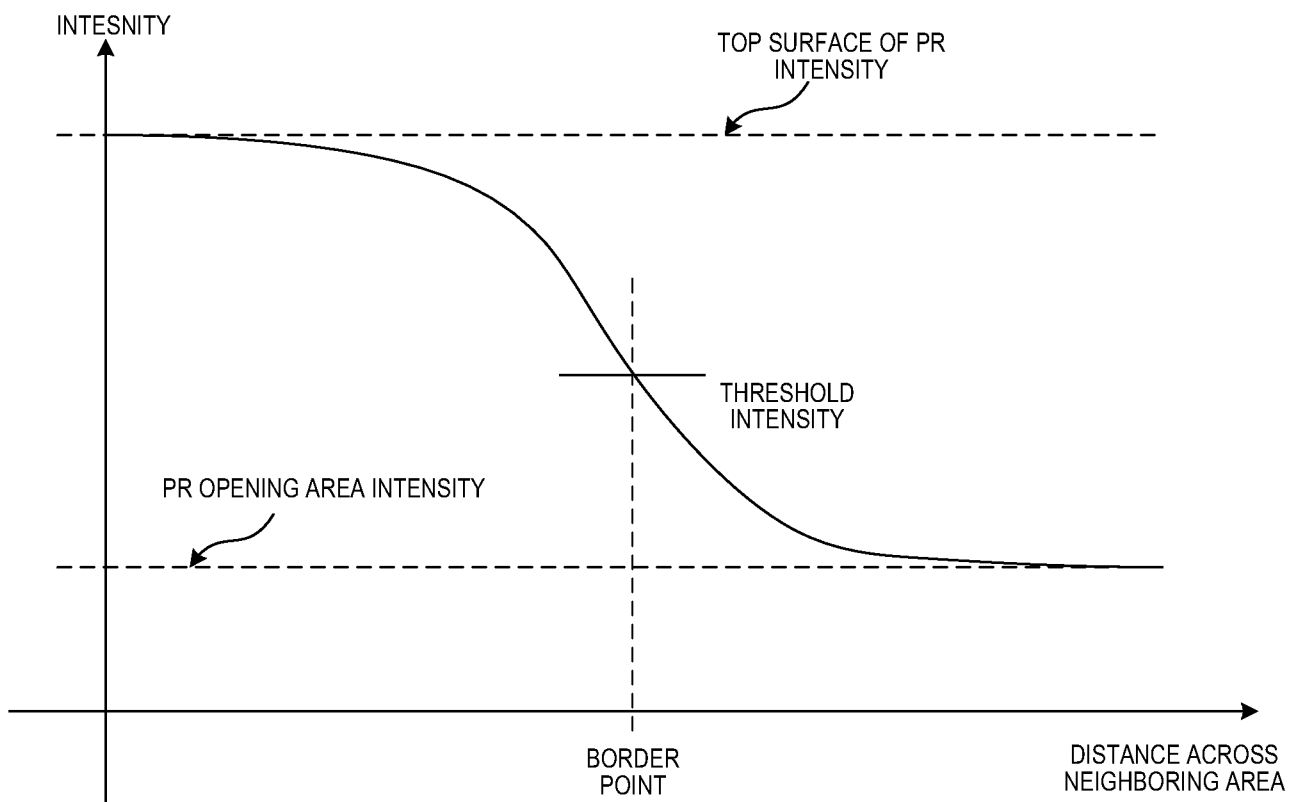
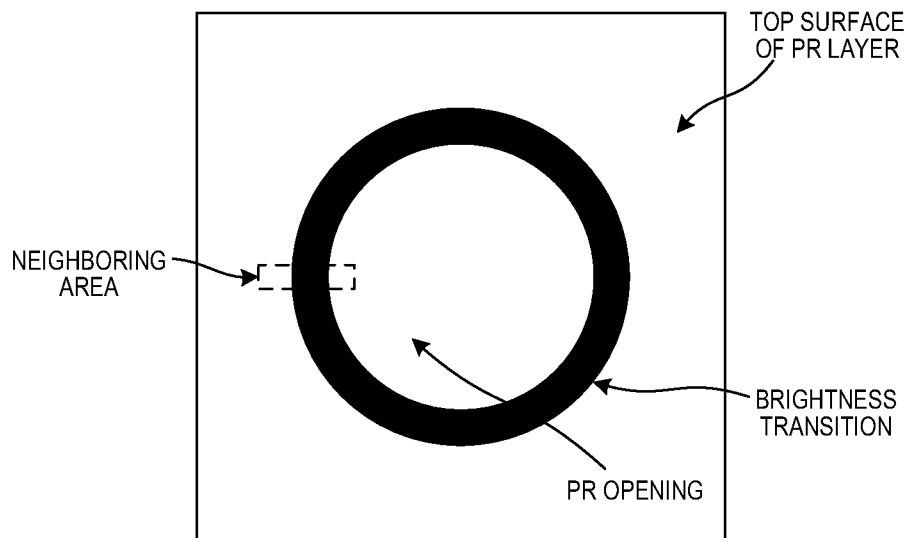


FIG. 27

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CAPTURED IMAGE FOCUSED ON BOTTOM SURFACE OF PR LAYER

FIG. 28

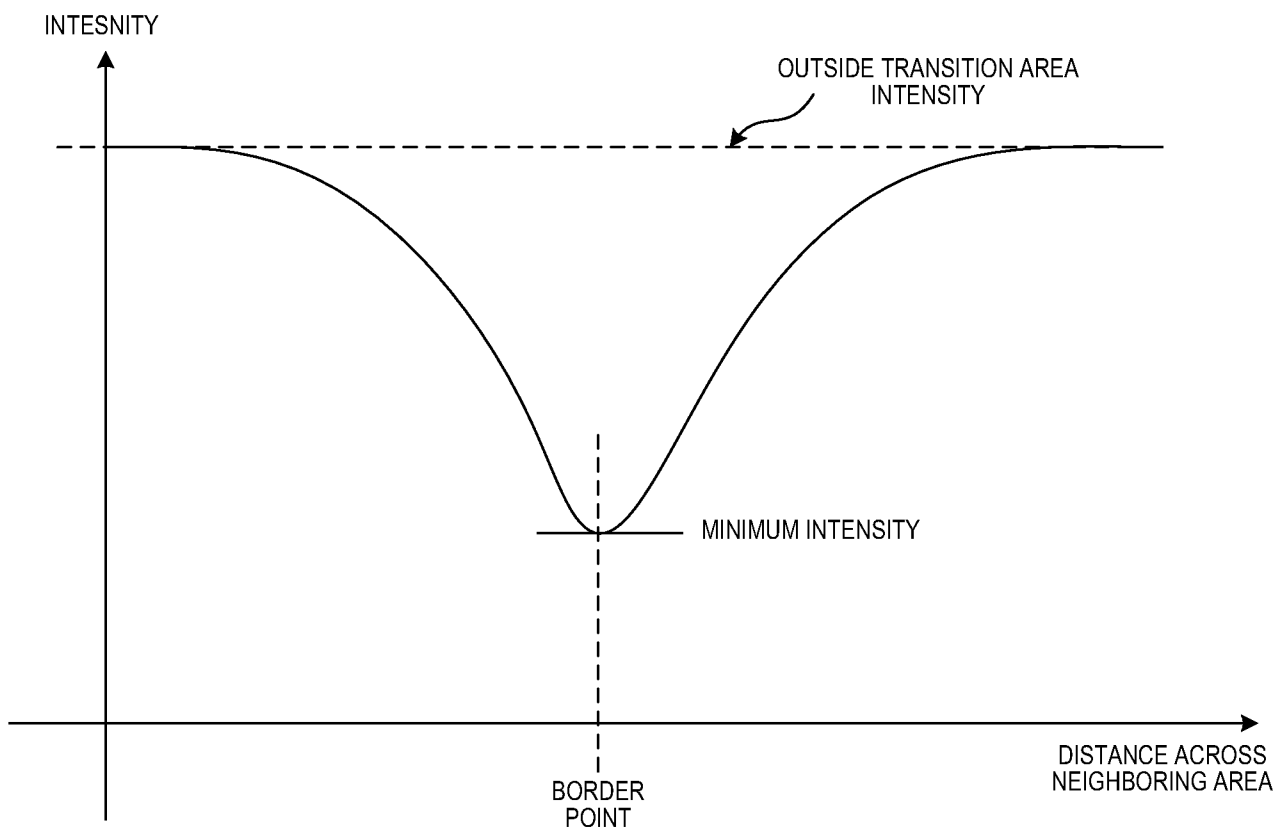
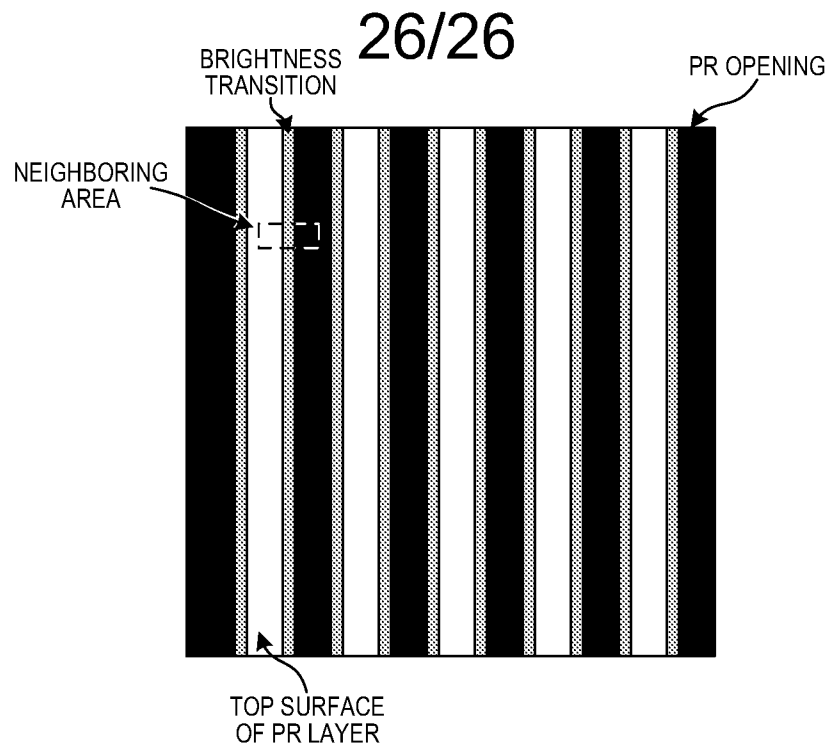


FIG. 29



CAPTURED IMAGE FOCUSED ON TOP SURFACE OF PHOTORESIST TRENCH

FIG. 30

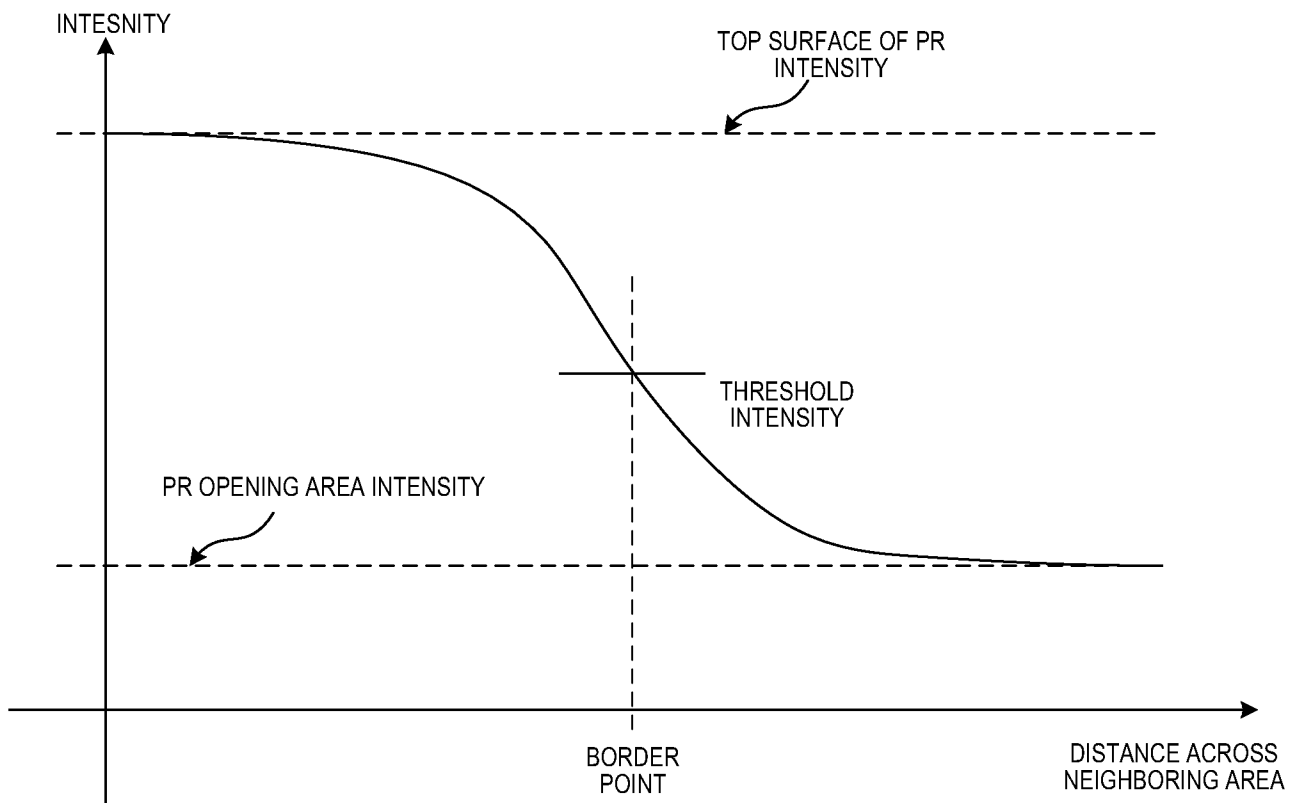


FIG. 31