

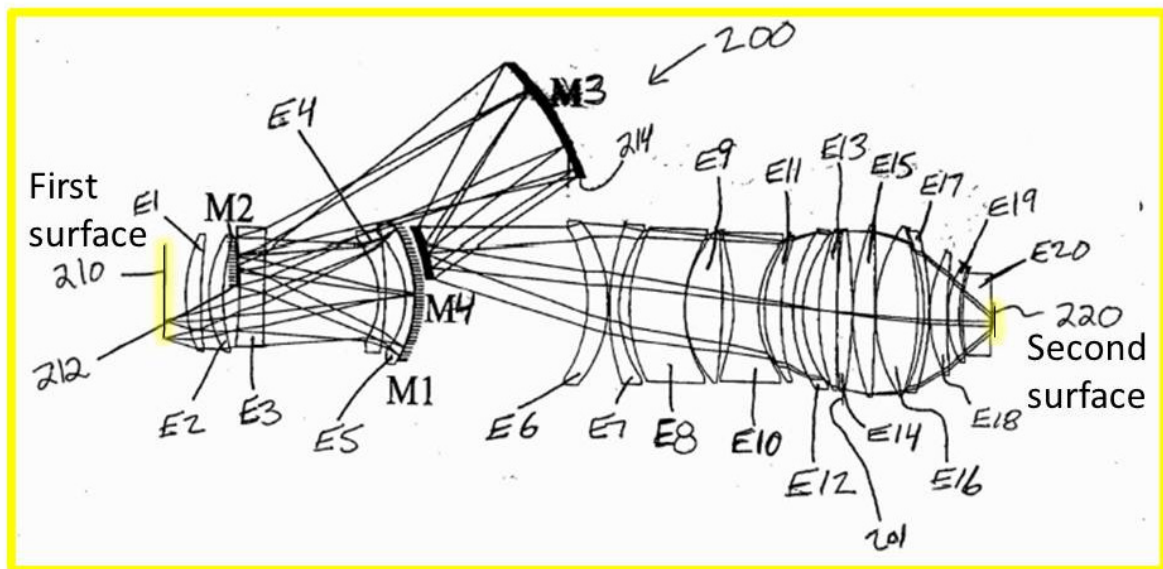
Ex. 1110, Fig. 2

55. A catadioptric projection optical system, which forms an image of a first surface on a second surface, comprising:

- a first unit disposed in an optical path between the first surface and the second surface and having a positive refractive power;
- a second unit disposed in an optical path between the first unit and the second surface and comprising at least four mirrors;
- a third unit disposed in an optical path between the second unit and the second surface, comprising at least two negative lenses, and having a negative refractive power; and
- a fourth unit disposed in an optical path between the third unit and the second surface, comprising at least three positive lenses, and having a positive refractive power,

wherein an intermediate image is formed in the second unit and wherein an aperture stop is provided in the fourth unit.

Ex. 1101, 64:44-59



Ex. 1110, Fig. 2

55. A **catadioptric projection optical system**, which forms **image of a first surface** on a **second surface**, comprising:  
 a first unit disposed in an optical path between the first surface and the second surface and having a positive refractive power;  
 a second unit disposed in an optical path between the first unit and the second surface and comprising at least four mirrors;  
 a third unit disposed in an optical path between the second unit and the second surface, comprising at least two negative lenses, and having a negative refractive power; and  
 a fourth unit disposed in an optical path between the third unit and the second surface, comprising at least three positive lenses, and having a positive refractive power, wherein an intermediate image is formed in the second unit and wherein an aperture stop is provided in the fourth unit.

Ex. 1101, 64:44-59

[0041] Now referring to FIG. 2 in which a **catadioptric multi-mirror projection reduction objective 200** according to a second embodiment is illustrated. FIG. 2 is a schematic optical diagram of the system 200 illustrating the system 200 in a manner to generally show the arrangement of the elements. The system 200 includes a plurality of mirrors and

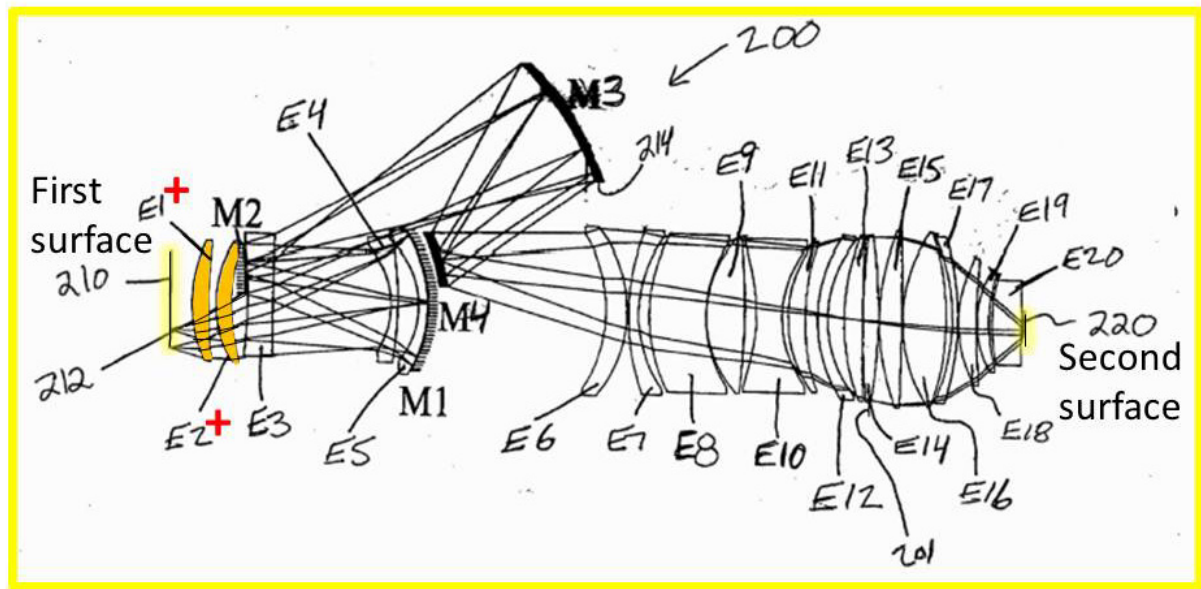
Ex. 1110, [0041]

reticle 210 as is commonly known. Beginning from the least image forward element and ending with the most image forward element along the optical path of the system 200, the system 200 includes a first lens element E1 and a second lens element E2 that are disposed between the reticle 210 and a mirror M2. The **first and second lens elements E1 and E2 are positive lenses** through which the light rays pass from one or more points of the reticle 210 toward the mirror M2.

Ex. 1110, [0043]

See, also, Ex. 1116, ¶¶ 93-95

per No. 3, at 19-20



Ex. 1110, Fig. 2

55. A catadioptric projection optical system, which forms an image of a first surface on a second surface, comprising:
- a first unit disposed in an optical path between the first surface and the second surface and having a positive refractive power;
  - a second unit disposed in an optical path between the first unit and the second surface and comprising at least four mirrors;
  - a third unit disposed in an optical path between the second unit and the second surface, comprising at least two negative lenses, and having a negative refractive power; and
  - a fourth unit disposed in an optical path between the third unit and the second surface, comprising at least three positive lenses, and having a positive refractive power, wherein an intermediate image is formed in the second unit and wherein an aperture stop is provided in the fourth unit.

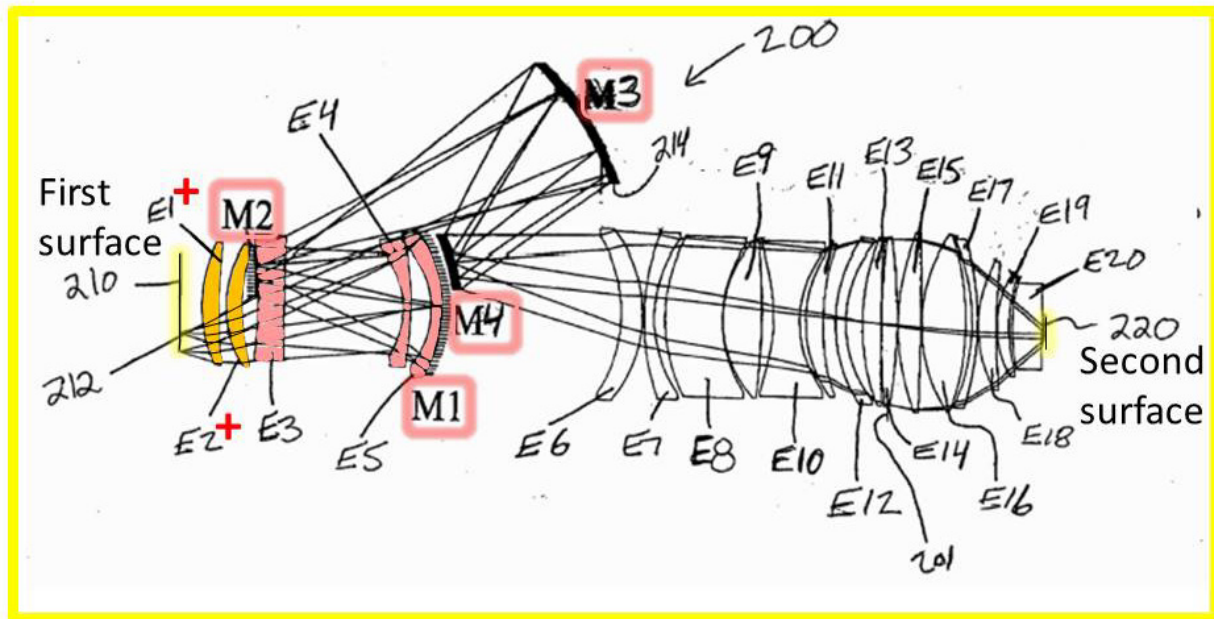
Ex. 1101, 64:44-59

reticle 210 as is commonly known. Beginning from the least image forward element and ending with the most image forward element along the optical path of the system 200, the system 200 includes a first lens element E1 and a second lens element E2 that are disposed between the reticle 210 and a mirror M2. The first and second lens elements E1 and E2 are positive lenses through which the light rays pass from one or more points of the reticle 210 toward the mirror M2.

Ex. 1110, [0043]

See, also, Ex. 1116, ¶ 96 and Ex. 1136, 53:14-55:14





Ex. 1110, Fig. 2

55. A catadioptric projection optical system, which forms an image of a first surface on a second surface, comprising: a first unit disposed in an optical path between the first surface and the second surface and having a positive refractive power; a second unit disposed in an optical path between the first unit and the second surface and comprising at least four mirrors; a third unit disposed in an optical path between the second unit and the second surface, comprising at least two negative lenses, and having a negative refractive power; and a fourth unit disposed in an optical path between the third unit and the second surface, comprising at least three positive lenses, and having a positive refractive power, wherein an intermediate image is formed in the second unit and wherein an aperture stop is provided in the fourth unit.

Ex. 1101, 64:44-59

per No. 3, at 21

[0044] The system 200 includes a third lens element E3 that is disposed physically (spatially) and optically behind the mirror M2. The light rays traveling through openings

Ex. 1110, [0044]

[0045] The system 200 includes fourth and fifth lens elements E4 and E5 that are spatially and optically behind the lens element E3. In the illustrated embodiment, the lens elements E4 and E5 are negative lenses. The lens elements E4 and E5 are disposed spatially proximate to the mirror M1

Ex. 1110, [0045]

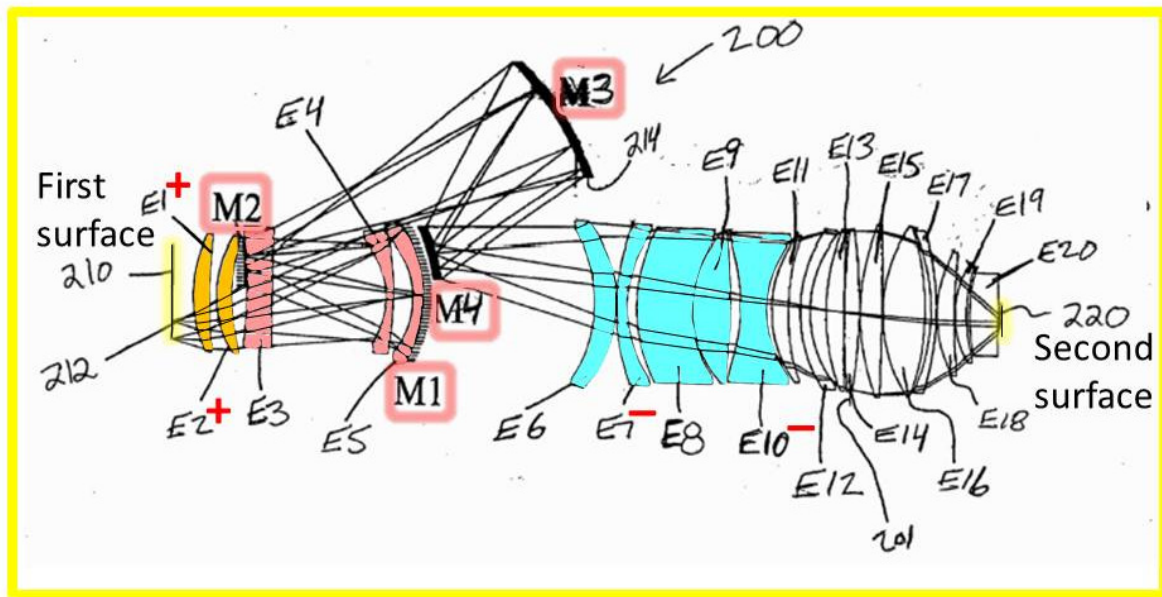
[0046] After the light rays pass through the lens element E3 for a third time, the light rays are directed to a mirror M3.

Ex. 1110, [0046]

[0047] The system 200 includes a mirror M4 that is spatially in front of but optically behind the mirror M3. As

Ex. 1110, [0047]

See, also, Ex. 1116, ¶ 97



Ex. 1110, Fig. 2

55. A catadioptric projection optical system, which forms an image of a first surface on a second surface, comprising: a first unit disposed in an optical path between the first surface and the second surface and having a positive refractive power; a second unit disposed in an optical path between the first unit and the second surface and comprising at least four mirrors; a third unit disposed in an optical path between the second unit and the second surface, comprising at least two negative lenses, and having a negative refractive power; and a fourth unit disposed in an optical path between the third unit and the second surface, comprising at least three positive lenses, and having a positive refractive power, wherein an intermediate image is formed in the second unit and wherein an aperture stop is provided in the fourth unit.

Ex. 1101, 64:44-59

[0048] According to one aspect of the present invention and similar to the above described first embodiment, a lens element, namely a sixth lens element E6, is disposed between the mirror M3 and mirror M4 such that the lens element E6 is physically in front of mirror M3 but optically behind both mirrors M3 and M4. The lens element E6 is a

Ex. 1110, [0048]

element E6 and optically and physically in front of the wafer 120. Lens element E7 is a negative lens, lens elements E8 and E9 are positive lenses, lens element E10 is a negative lens, lens element E11 is a positive lens, lens element E12 is a negative lens, lens elements E13-E16 are positive lenses, lens element E17 is a negative lens, lens elements E18-E20 are positive lenses.

Ex. 1110, [0050]

per No. 3, at 21-22 and Paper No. 26, at 12

See, also, Ex. 1116, ¶ 98 and Ex. 1136, 53:14-55:14

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