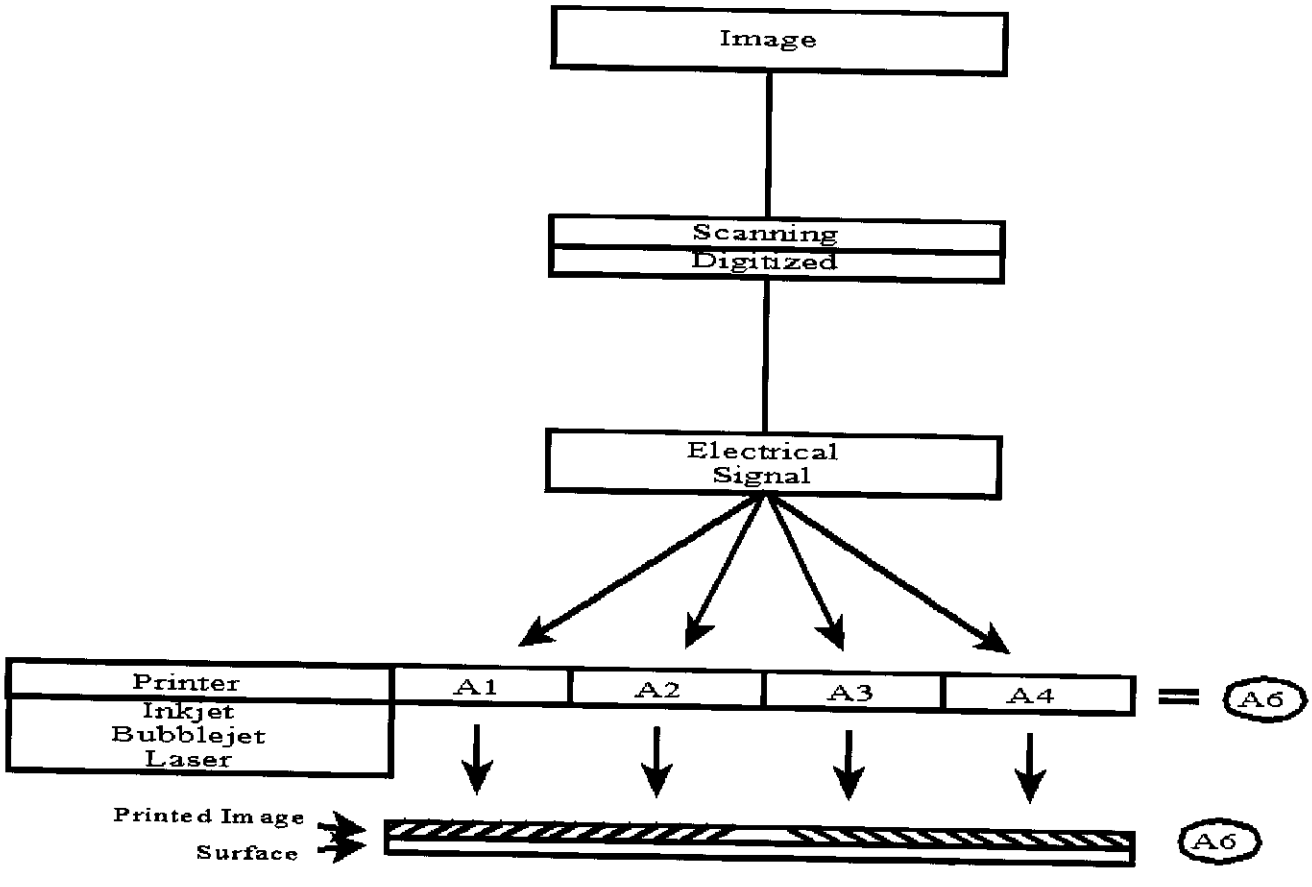

Image
Scanning
Digitized
Electrical
Signal
Printer
Inkjet
Bubblejet
Laser
A1
A2
A3
A4
A6
Printed Image
Surface
A6

FIG. 1

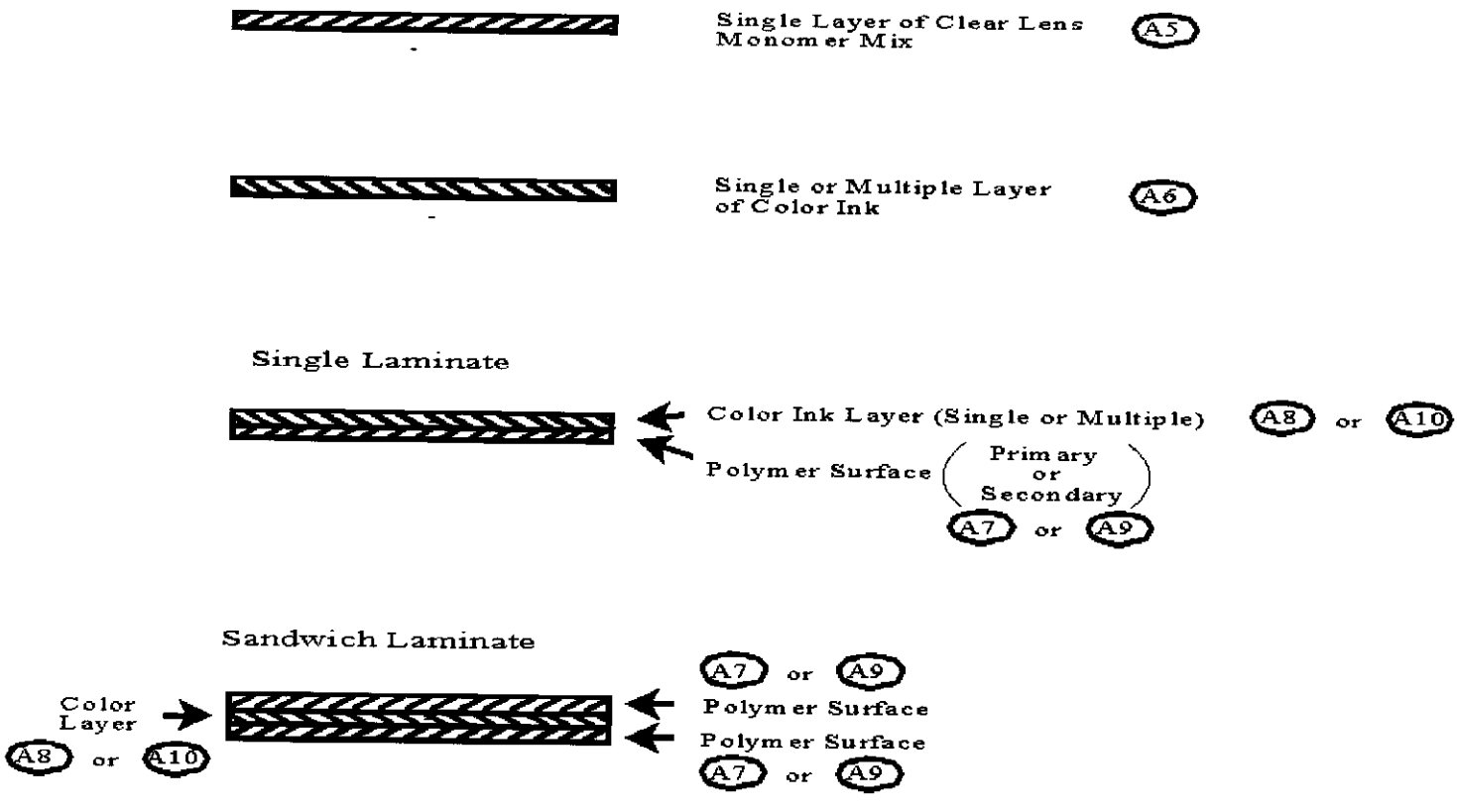

Single Layer of Clear Lens Monomer Mix
A5
Single or Multiple Layer of Color Ink
A6
Single Laminate
Color Ink Layer (Single or Multiple)
A8 or A10
Polymer Surface
Primary or Secondary
A7 or A9
Sandwich Laminate
Color Layer
A8 or A10
A7 or A9
Polymer Surface
Polymer Surface
A7 or A9

FIG. 2

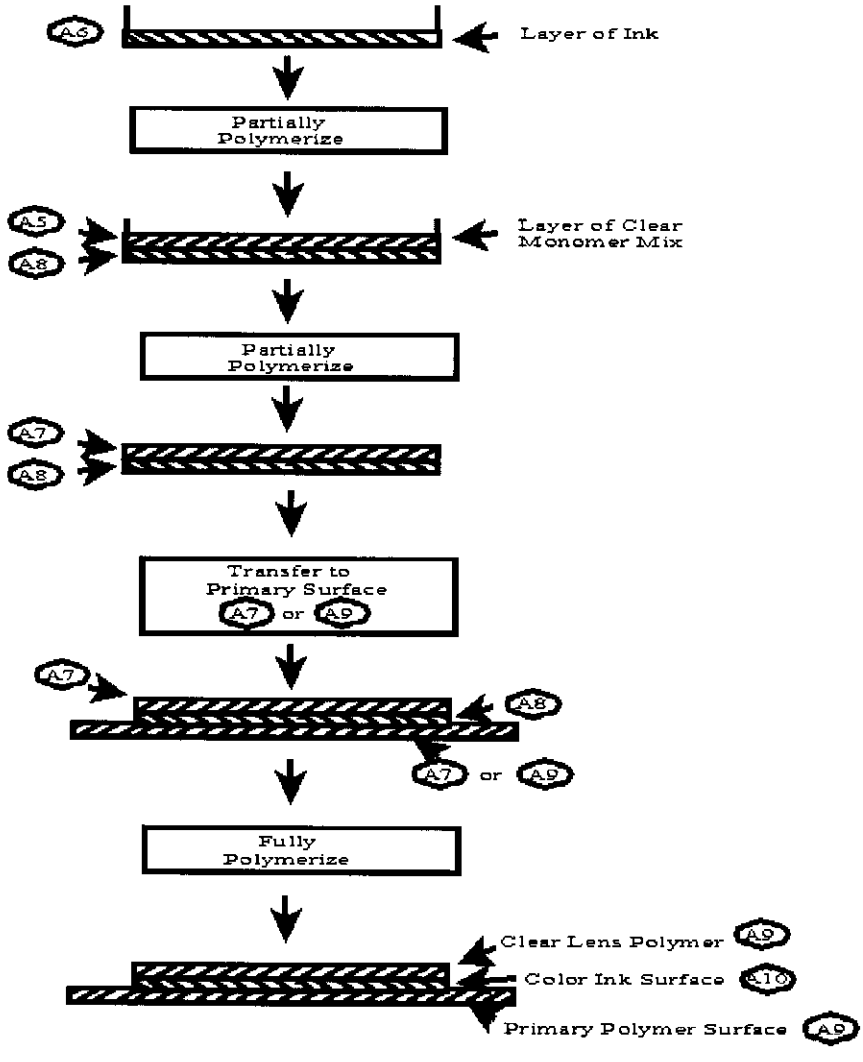

A6
Layer of Ink
Partially Polymerize
A5
A8
Layer of Clear Monomer Mix
Partially Polymerize
A7
A8
Transfer to Primary Surface
A7 or A9
A7
A8
A7 or A9
Fully Polymerize
Clear Lens Polymer A9
Color Ink Surface A10
Primary Polymer Surface A9

FIG. 3A

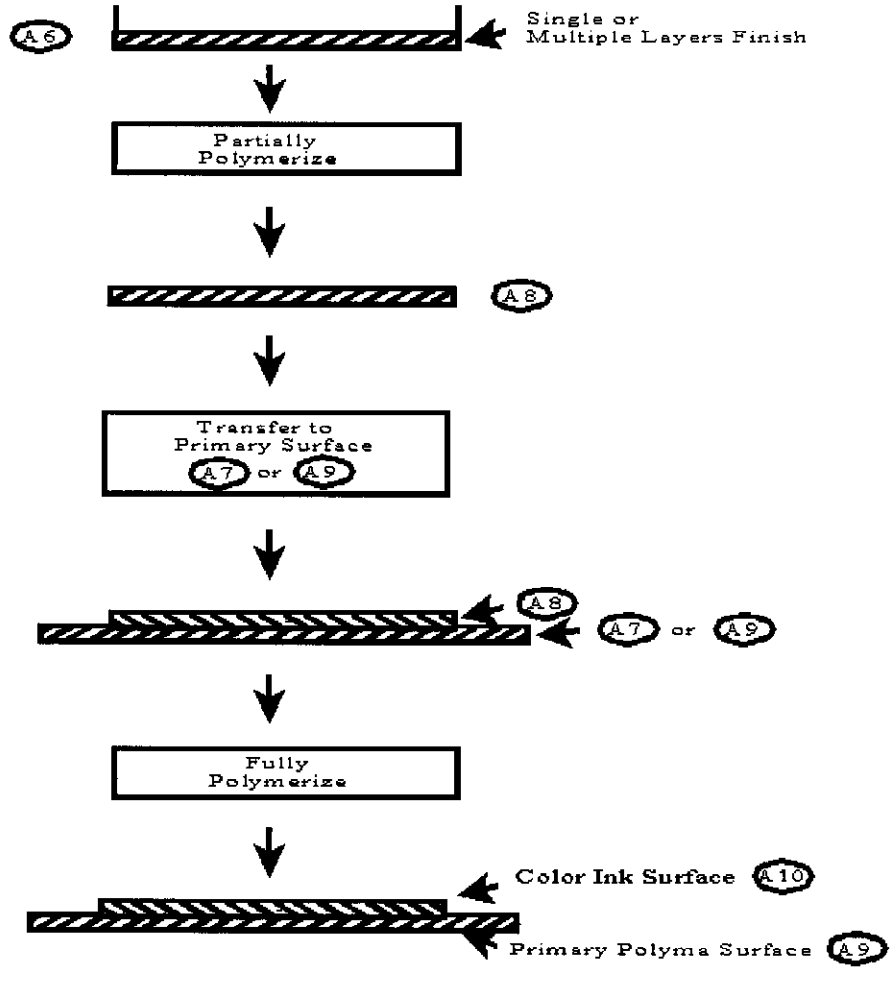

A6
Single or
Multiple Layers Finish
Partially
Polymerize
A8
Transfer to
Primary Surface
A7 or A9
A8
A7 or A9
Fully
Polymerize
Color Ink Surface A10
Primary Polyma Surface A9

FIG. 3B

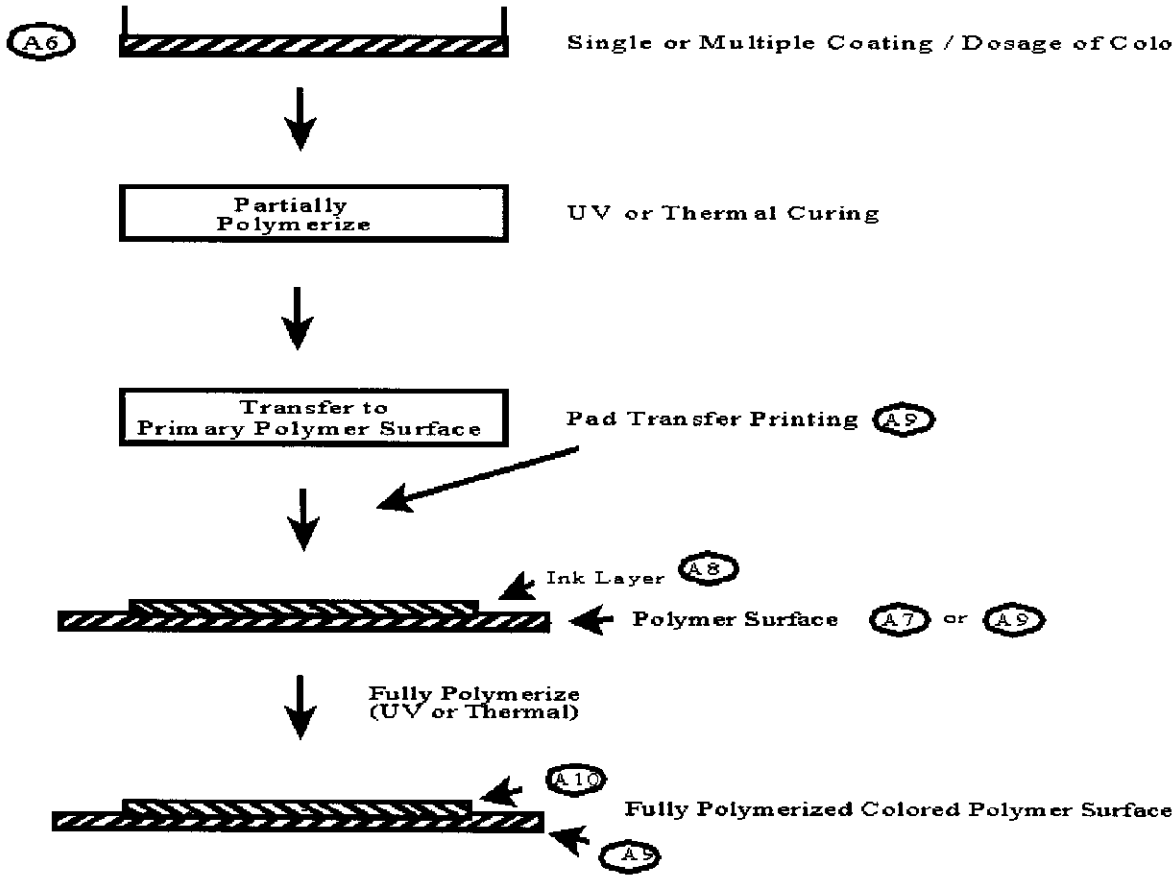
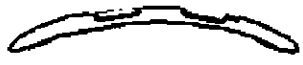

A6
Single or Multiple Coating / Dosage of Color Ink
Partially Polymerize
UV or Thermal Curing
Transfer to Primary Polymer Surface
Pad Transfer Printing
A9
Ink Layer
A8
Polymer Surface
A7
or
A9
Fully Polymerize (UV or Thermal)
A10
Fully Polymerized Colored Polymer Surface
A5

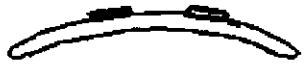
FIG. 4

Lathe/Fabrication

1  A contact lens (partially or fully polymerized polymer) with completed front curve and back curve.

2A  Removal of lens portion, to be printed with digital ink, by cutting, laser removal, grinding.

or

2B  The digital image is formed on top of lens surface 1.

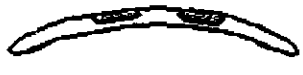
3A  Digitally print in the area of "removed" lens portion and filled to the top.

or

3B  Digitally print in the area of "removed" lens portion but filled only partially.

4A Fully polymerize 3A or 2B.

4B or partially polymerize 3B.

5B  Provide a clean monomer layer on the top of the partially filled and partially polymerized digital image area to get laminated image.

6B Fully polymerize 5B.

7. Take 4A or 6B and carry out process steps like polishing, hydration as required to produce soft or hard lens.

NOTE: Step 2 can be carried out on front surface or back surface. When back surface is removed the process that provided sandwich 'laminated' structure is preferred, for comfort purpose.

FIG. 5

Cast Molded Lens

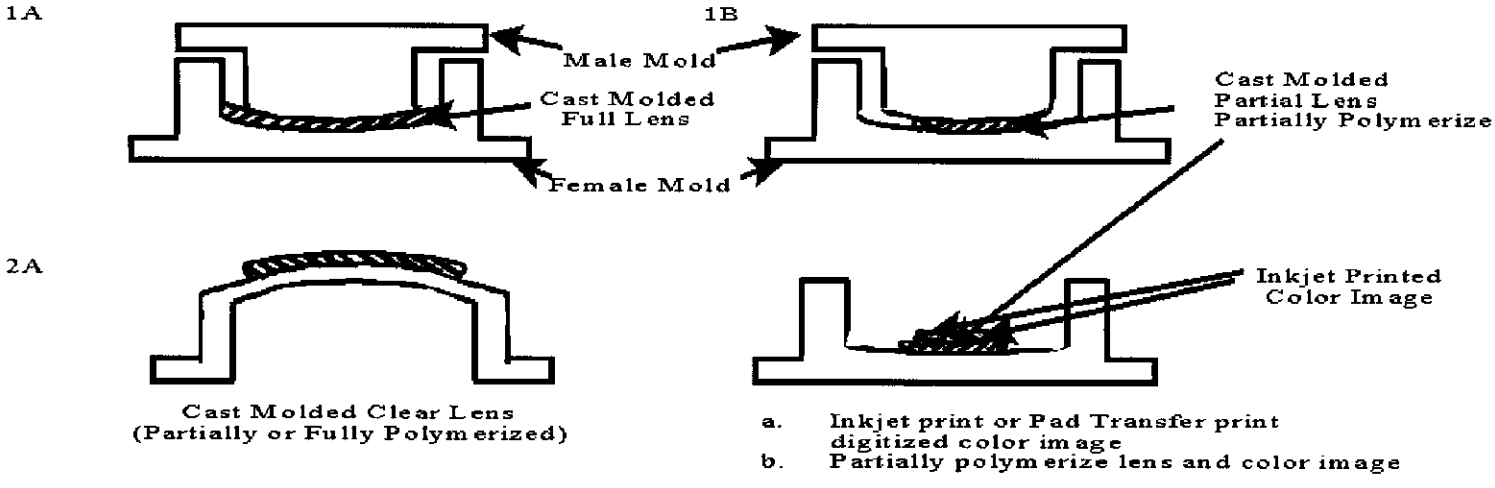
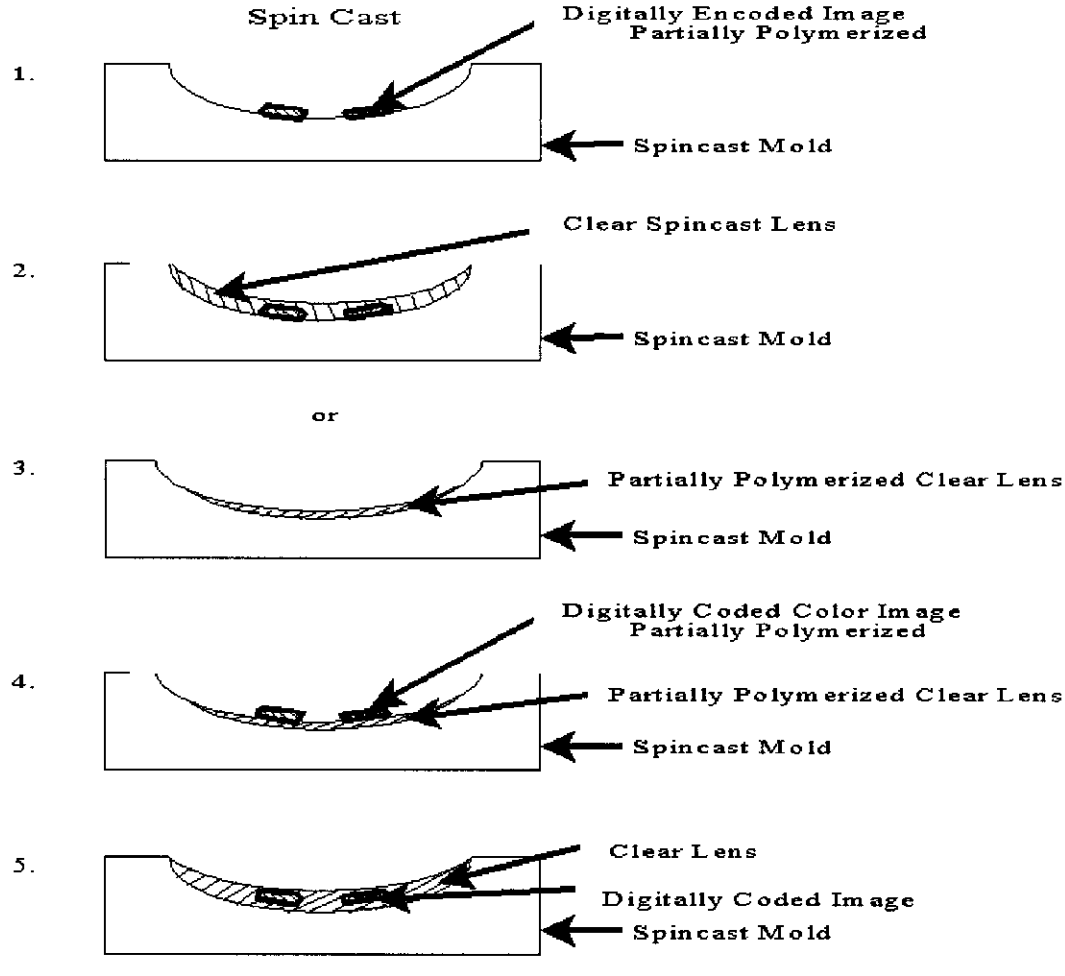


FIG. 6



6. Follow conventional lens finishing process.

FIG. 7A

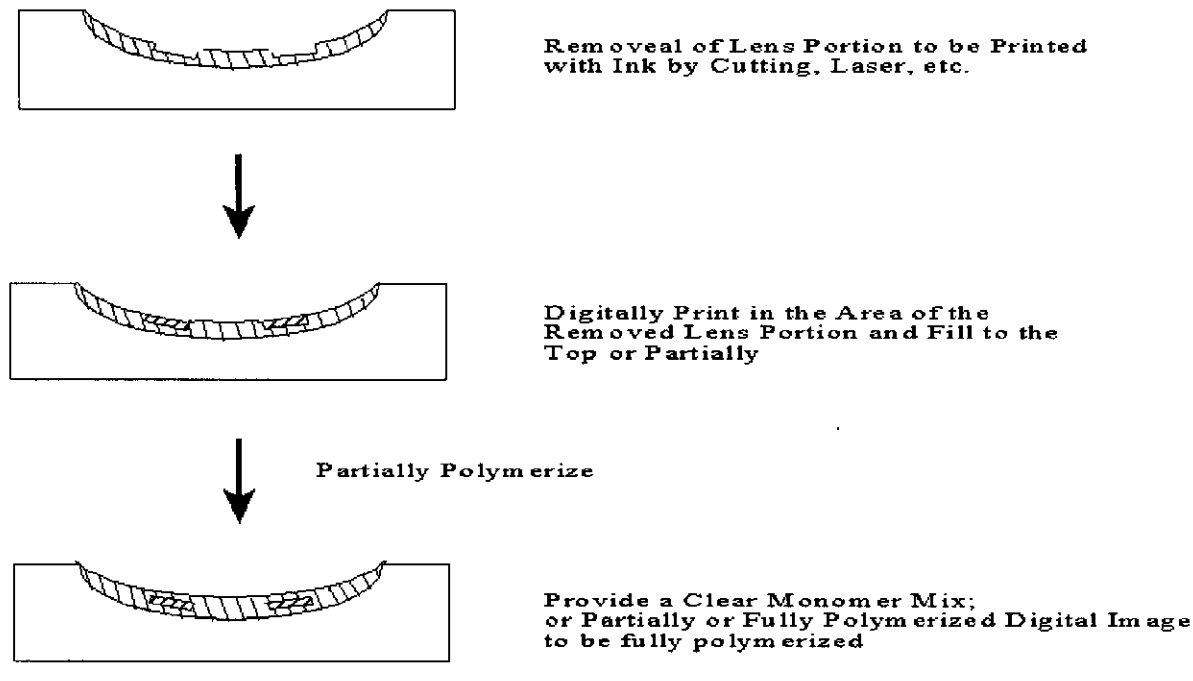

Removeal of Lens Portion to be Printed with Ink by Cutting, Laser, etc.
Digitally Print in the Area of the Removed Lens Portion and Fill to the Top or Partially
Partially Polymerize
Provide a Clear Monomer Mix; or Partially or Fully Polymerized Digital Image; to be fully polymerized

FIG. 7B

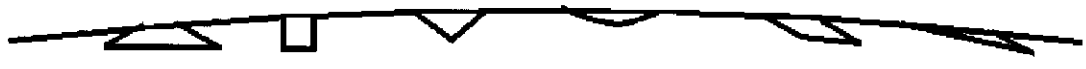


FIG. 8A

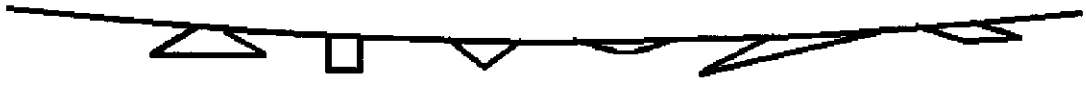


FIG. 8B

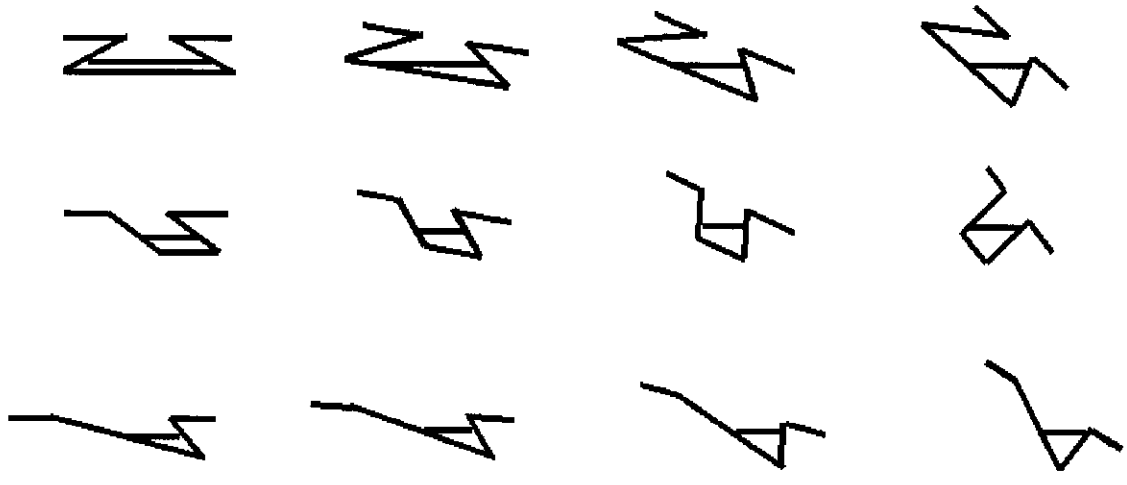


FIG. 9

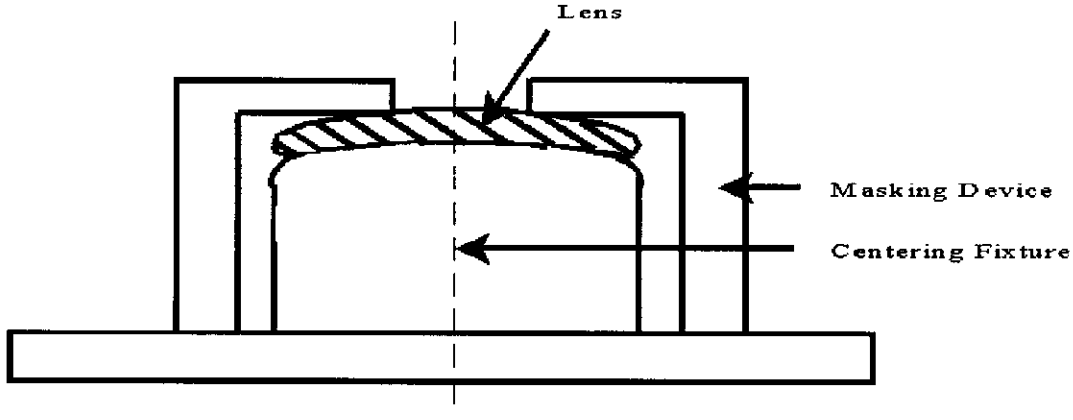


FIG. 10

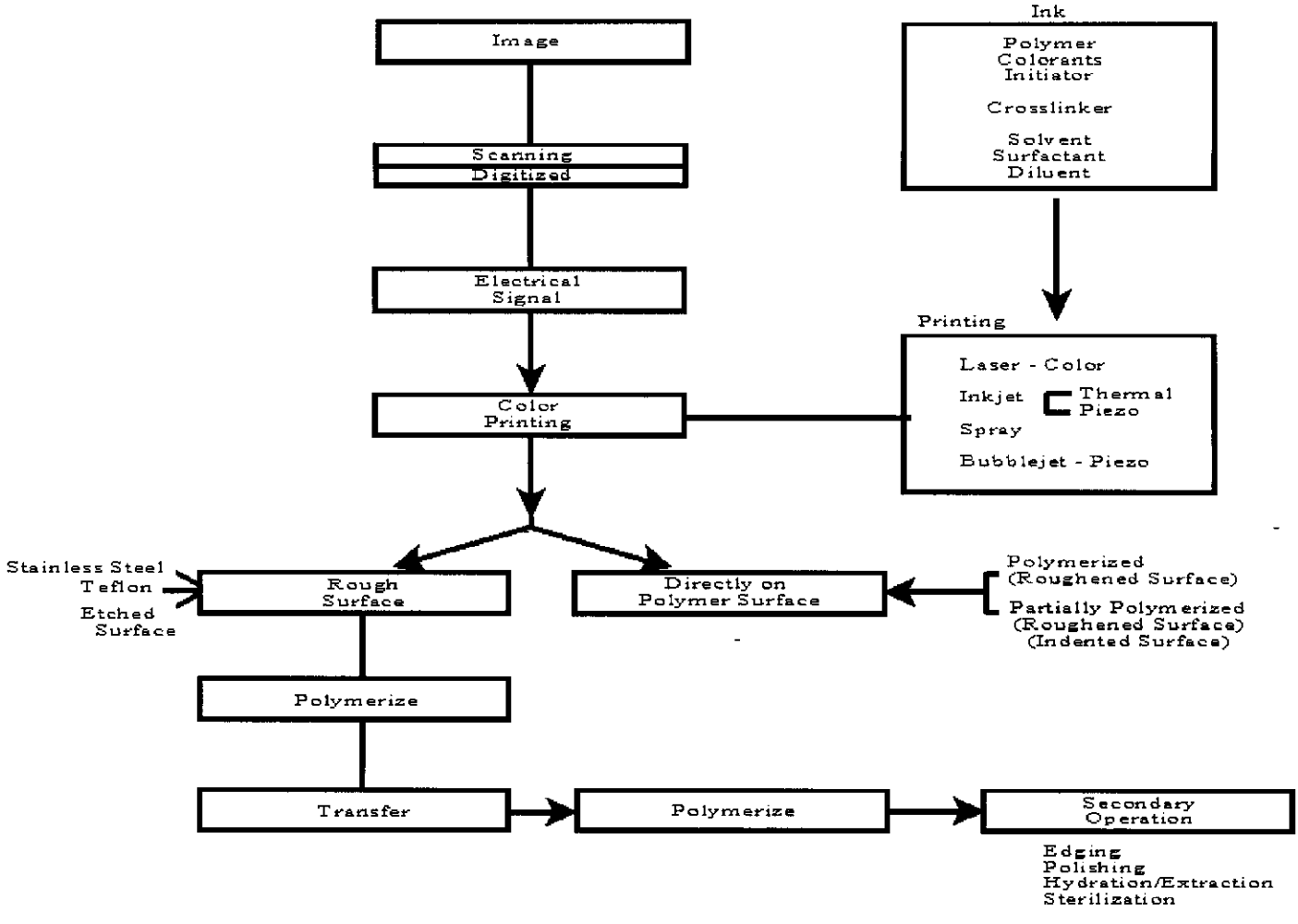

Image
Scanning
Digitized
Electrical
Signal
Color
Printing
Ink
Polymer
Colorants
Initiator
Crosslinker
Solvent
Surfactant
Diluent
Printing
Laser - Color
Inkjet
Thermal
Piezo
Spray
Bubblejet - Piezo
Stainless Steel
Teflon
Etched
Surface
Rough
Surface
Directly on
Polymer Surface
Polymerized
(Roughened Surface)
Partially Polymerized
(Roughened Surface)
(Indented Surface)
Polymerize
Transfer
Polymerize
Secondary
Operation
Edging
Polishing
Hydration/Extraction
Sterilization

FIG. 11

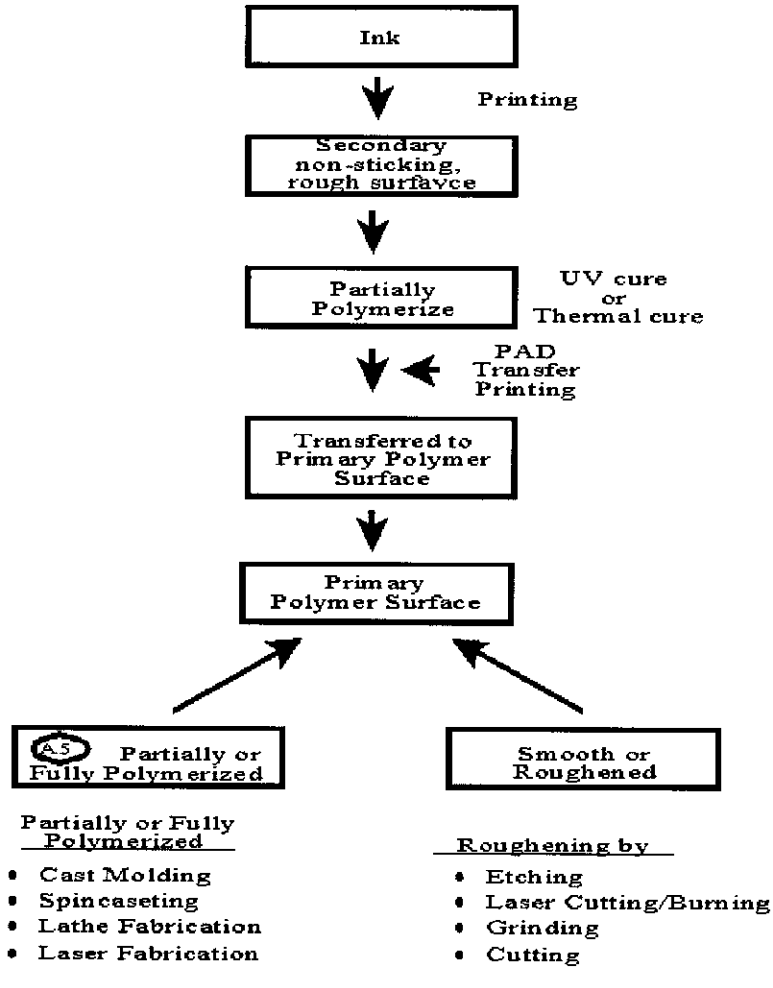

Ink
Printing
Secondary non-sticking, rough surfavce
Partially Polymerize
UV cure or Thermal cure
PAD Transfer Printing
Transferred to Primary Polymer Surface
Primary Polymer Surface
A5
Partially or Fully Polymerized
Smooth or Roughened
Partially or Fully Polymerized
Cast Molding
Spincaseting
Lathe Fabrication
Laser Fabrication
Roughening by
Etching
Laser Cutting/Burning
Grinding
Cutting

FIG. 12

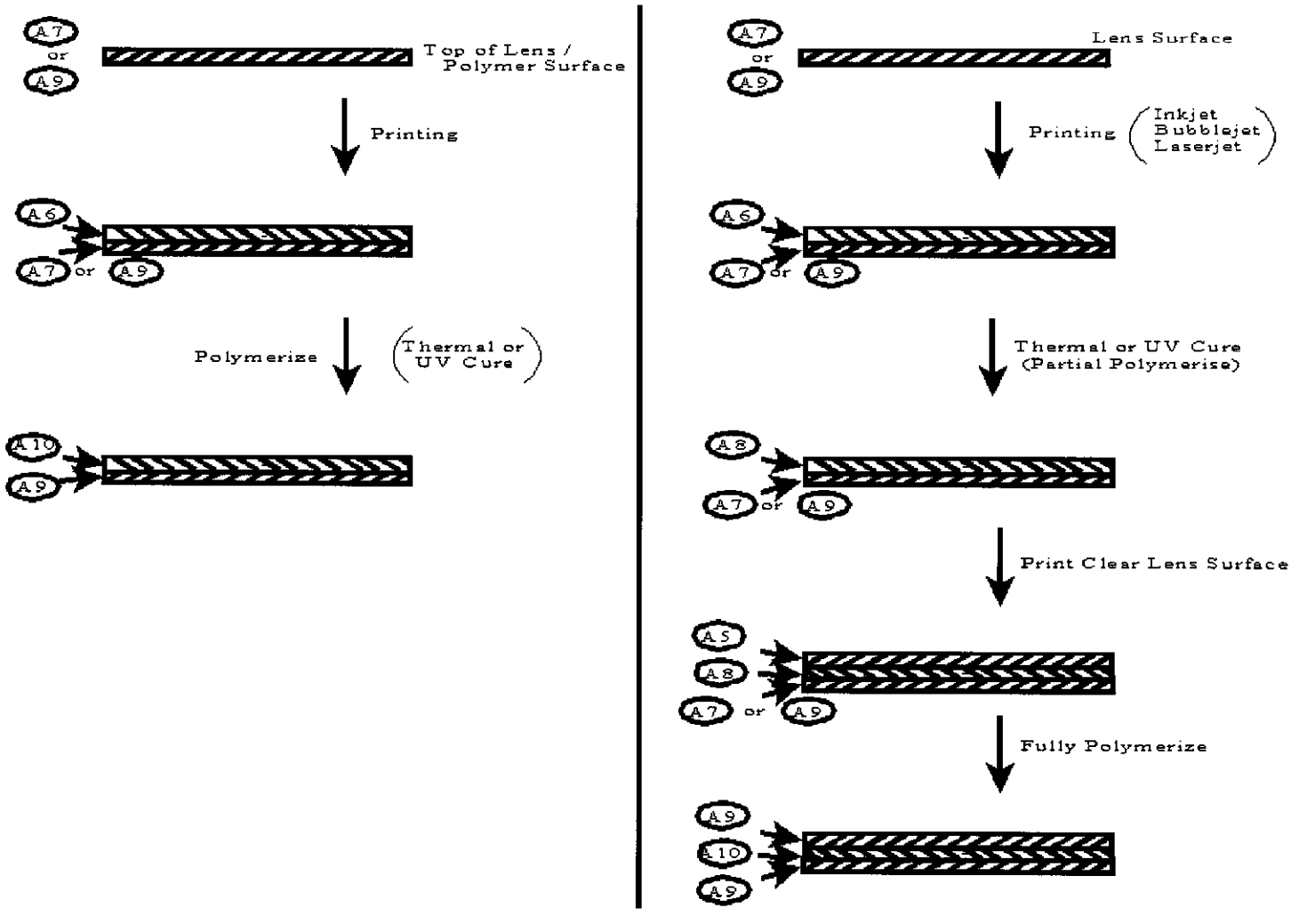

A7
or
A9
Top of Lens / Polymer Surface
Printing
A6
A7 or A9
Polymerize
Thermal or UV Cure
A10
A9
A7
or
A9
Lens Surface
Printing
Inkjet
Bubblejet
Laserjet
A6
A7 or A9
Thermal or UV Cure
(Partial Polymerise)
A8
A7 or A9
Print Clear Lens Surface
A5
A8
A7 or A9
Fully Polymerize
A9
A10
A9

FIG. 13

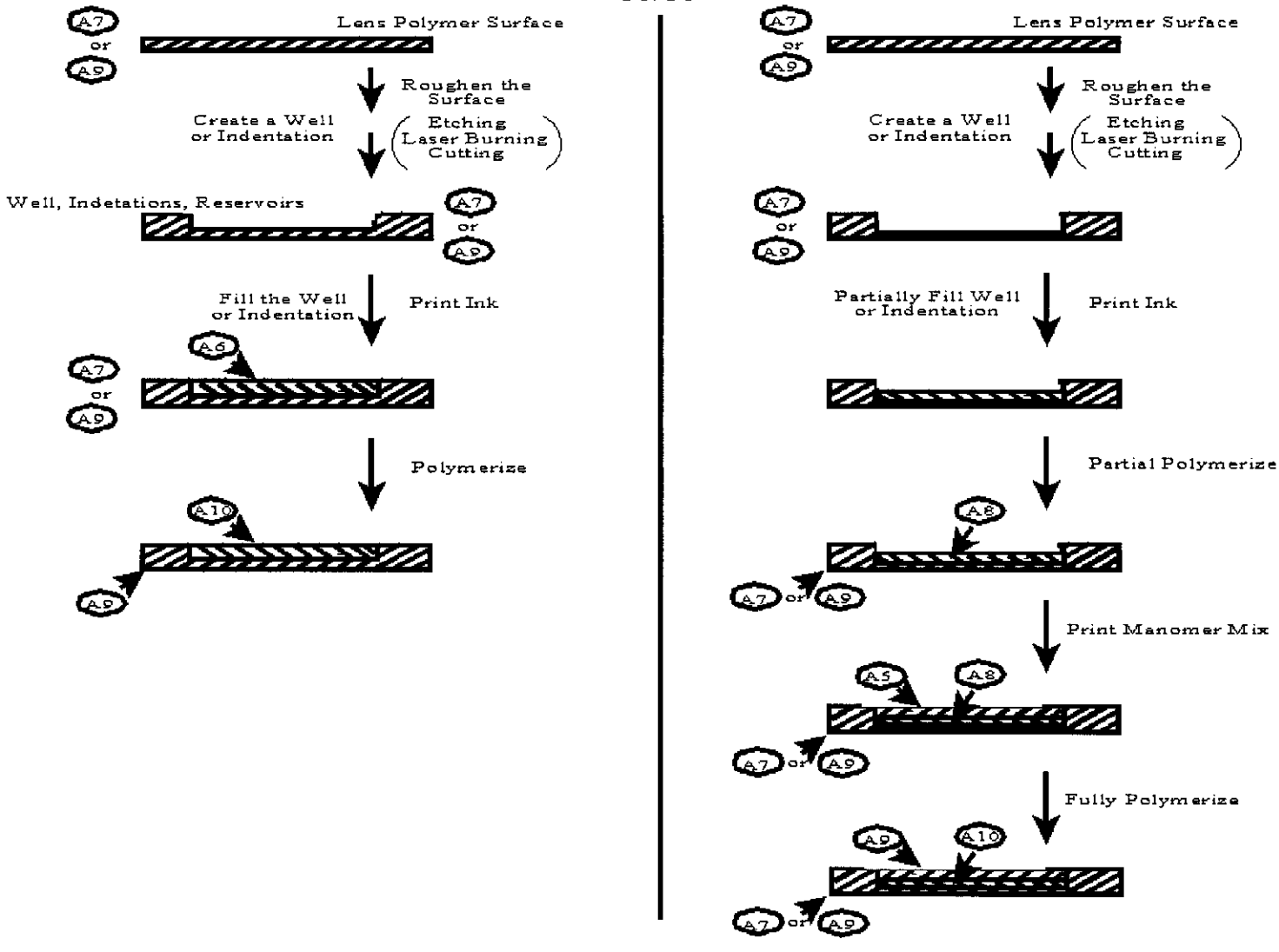

A7
or
A9
Lens Polymer Surface
Roughen the Surface
Create a Well or Indentation
Etching
Laser Burning
Cutting
Well, Indetations, Reservoirs
Fill the Well or Indentation
Print Ink
A6
Polymerize
A10
Partially Fill Well or Indentation
Partial Polymerize
A8
Print Manomer Mix
A5
Fully Polymerize

FIG. 14