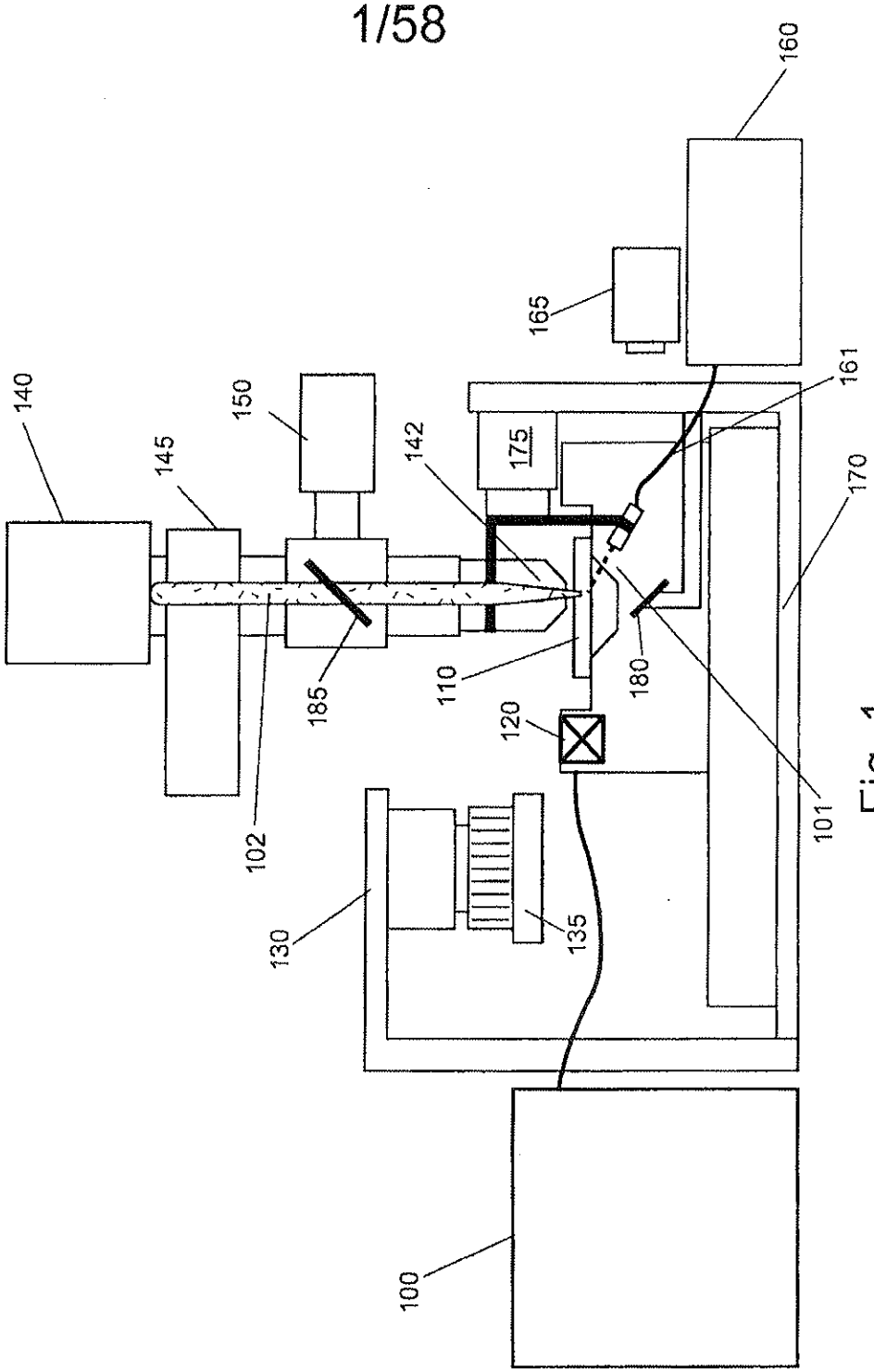

160
165
161
140
150
145
142
175
170
185
110
180
120
102
101
130
135
100

Fig. 1

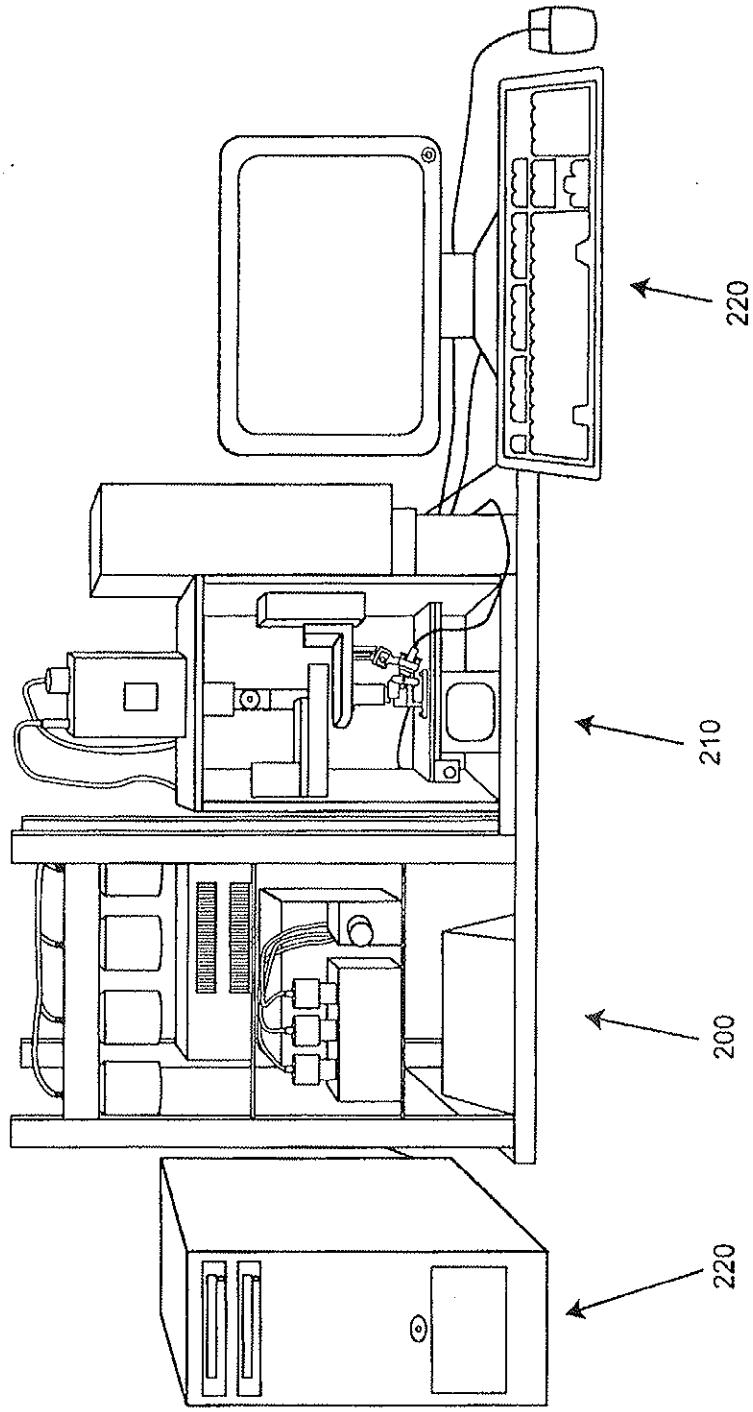


Fig. 2

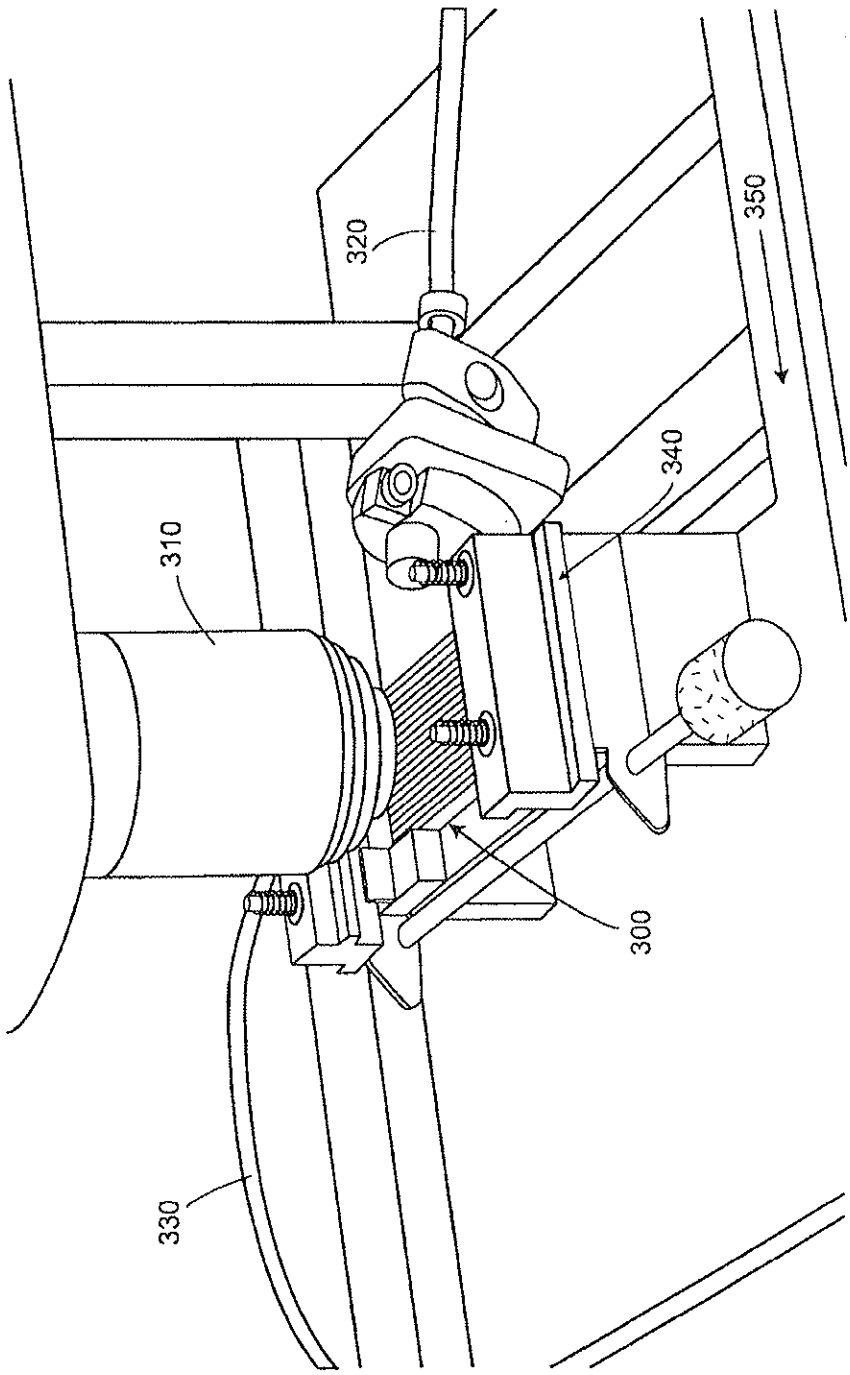


Fig. 3

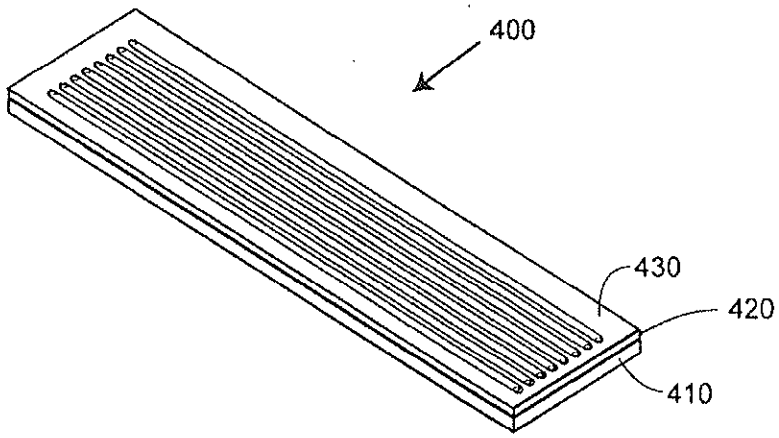


Fig. 4A

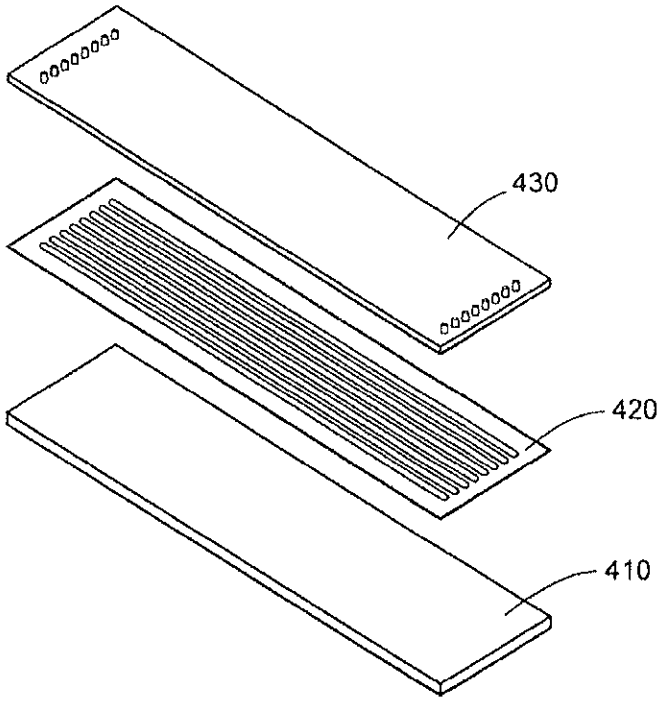


Fig. 4B

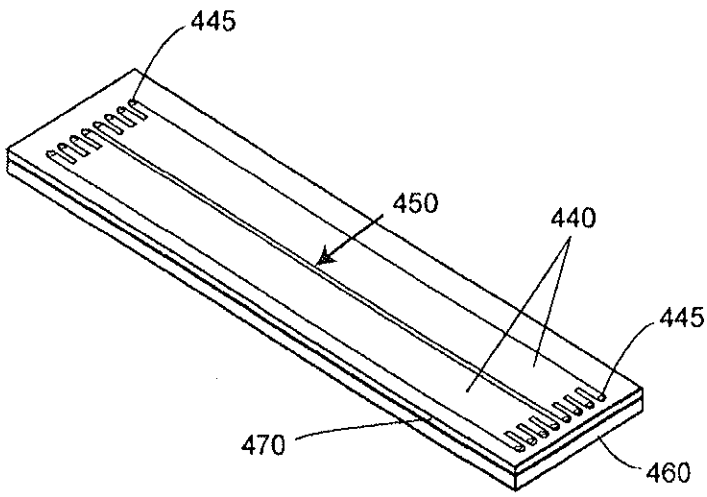


Fig. 4C

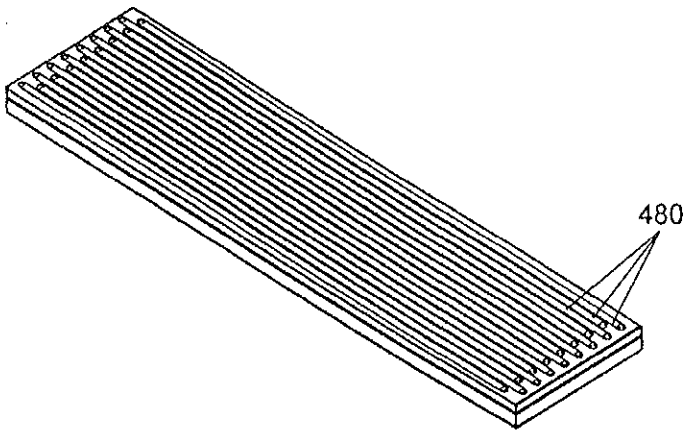


Fig. 4D

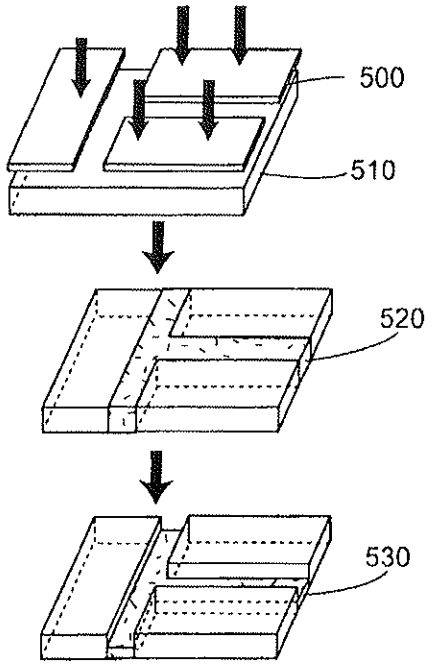

500
510
520
530

Fig. 5A

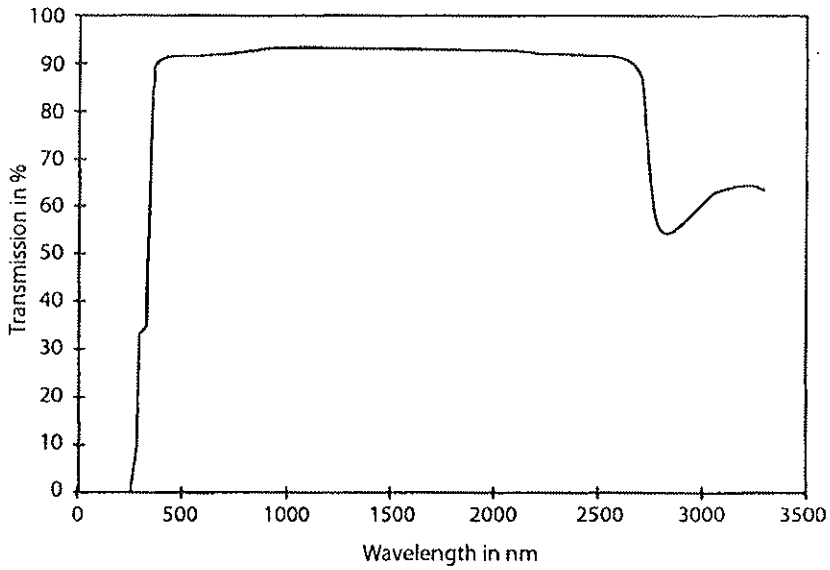

100
90
80
70
60
50
40
30
20
10
0
Transmission in %
0
500
1000
1500
2000
2500
3000
3500
Wavelength in nm

Fig. 5B

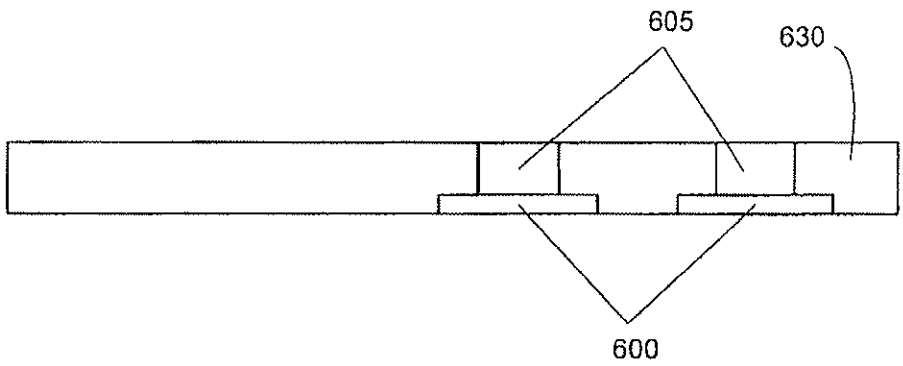


Fig. 6A

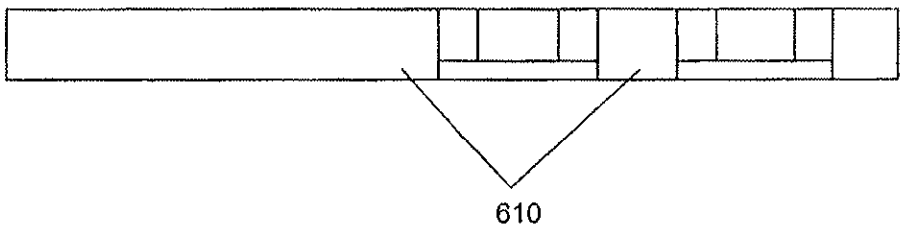


Fig. 6B

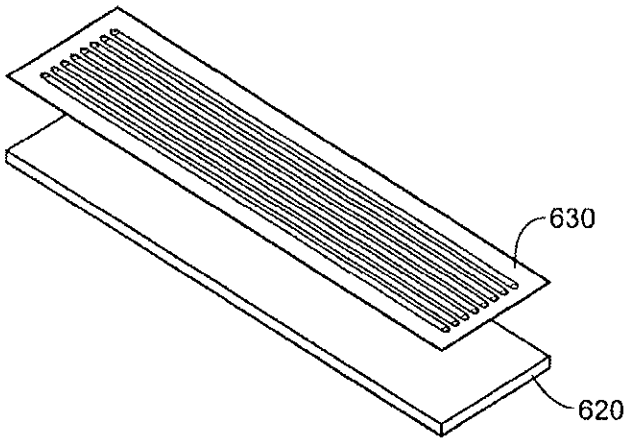


Fig. 6C

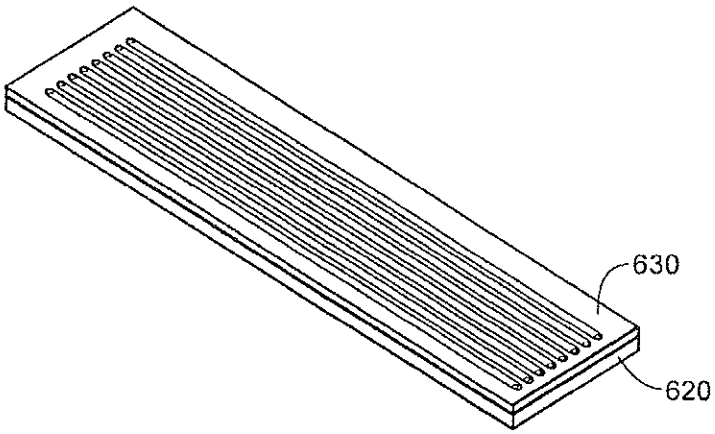


Fig. 6D

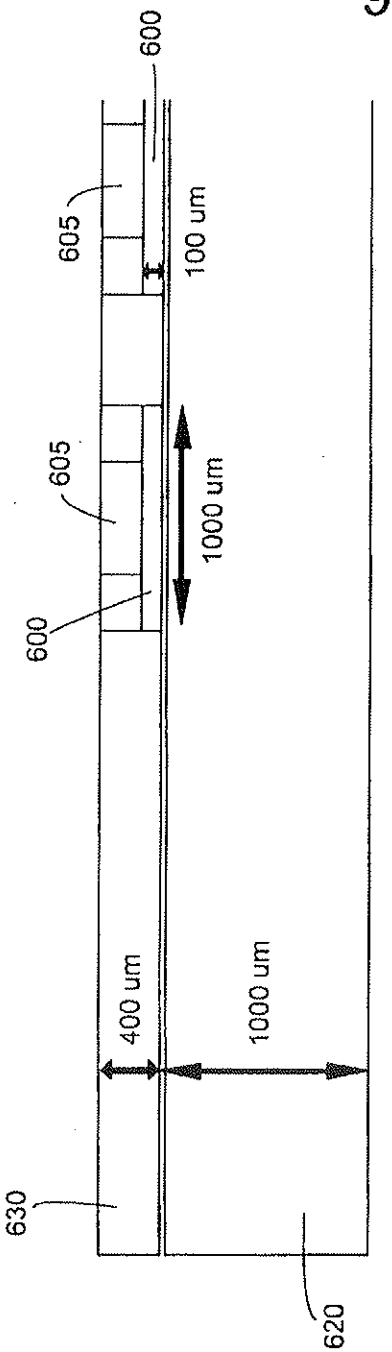

600
605
100 um
605
1000 um
600
400 um
1000 um
630
620

Fig. 6E

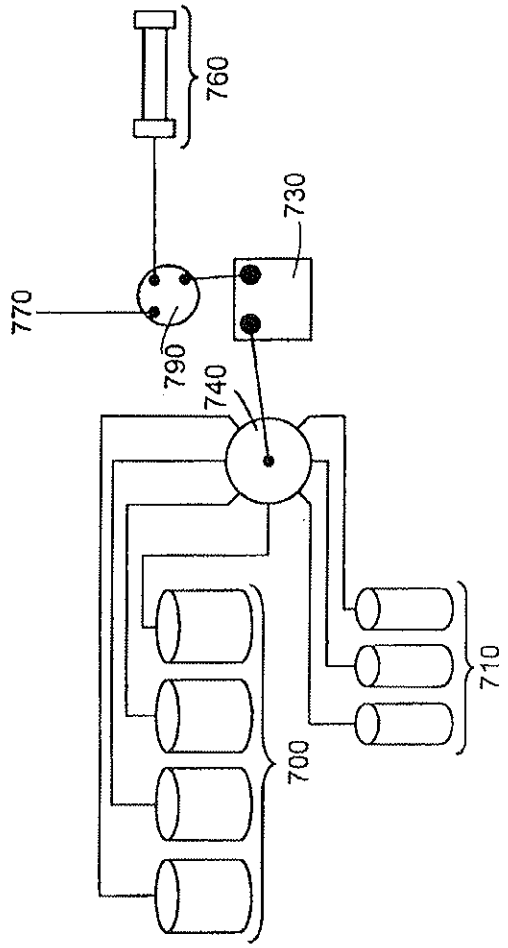

760
730
770
790
740
710
700

Fig. 7A

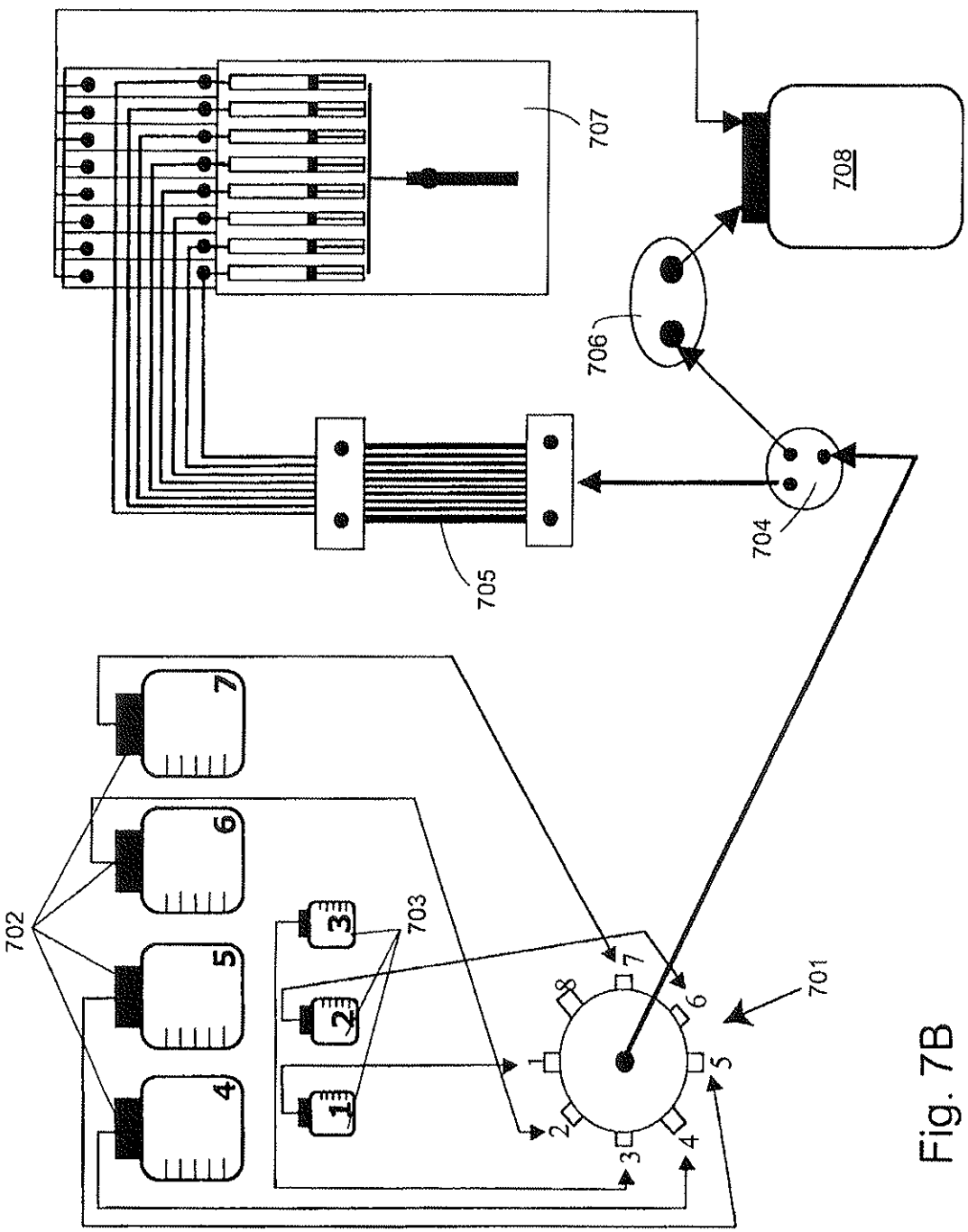


Fig. 7B

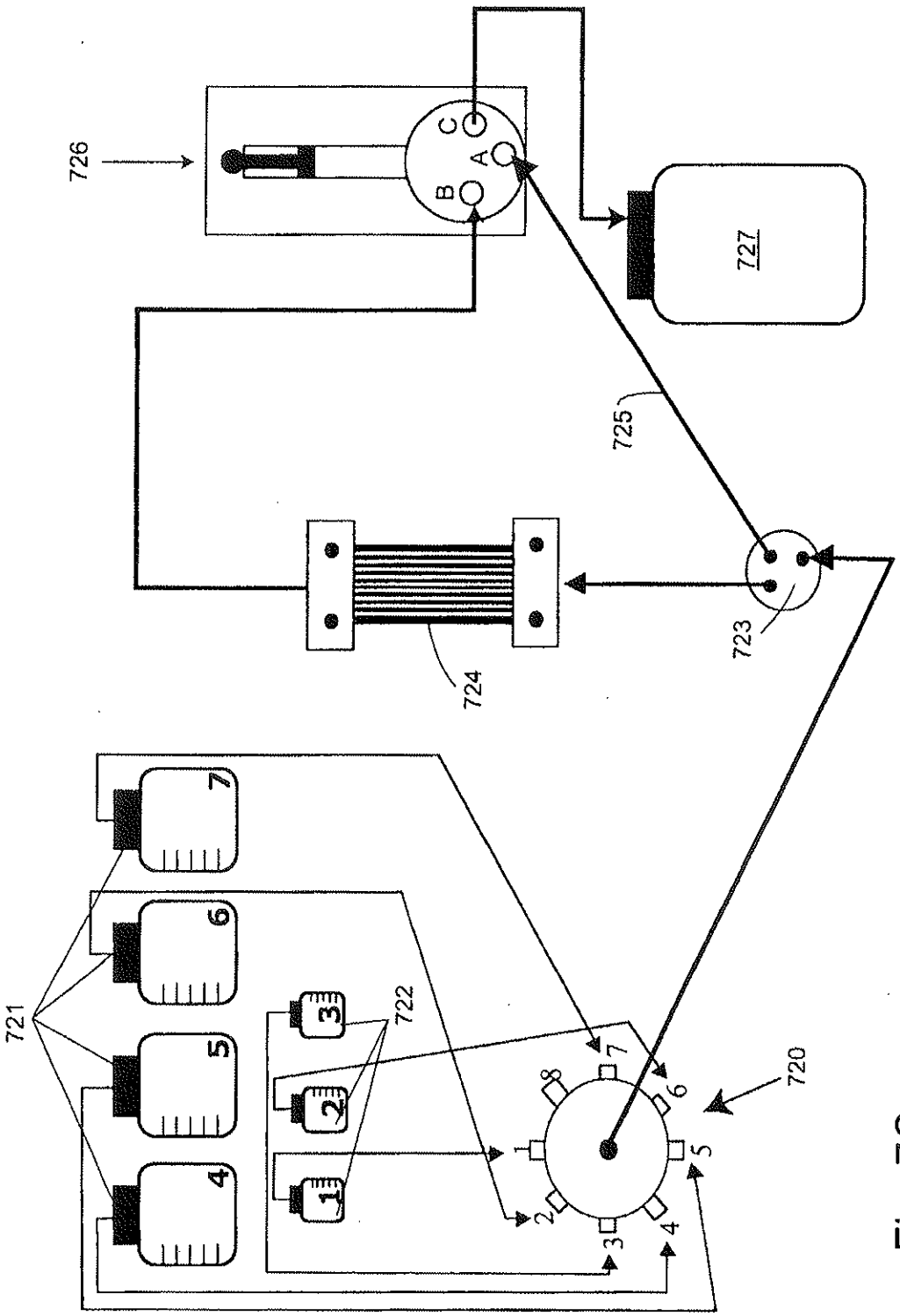


Fig. 7C

Fig. 8

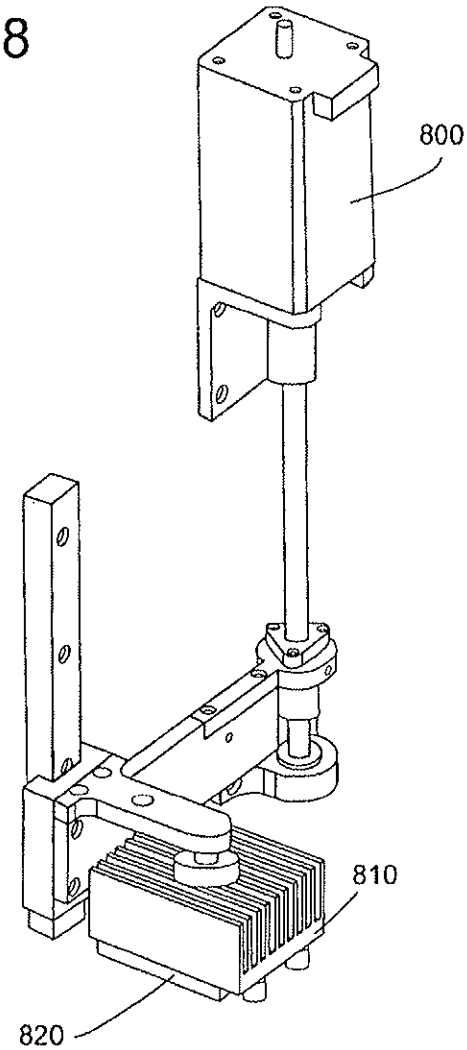
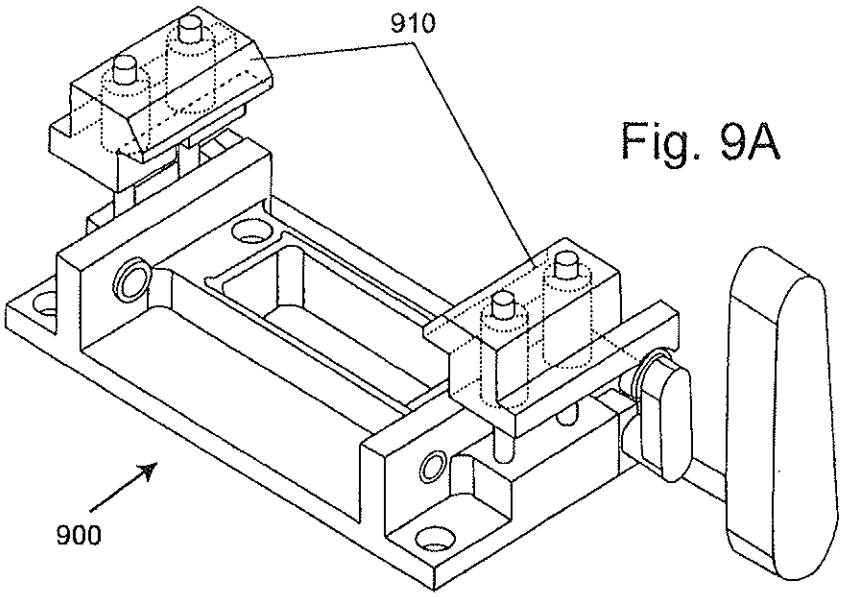


Fig. 9A



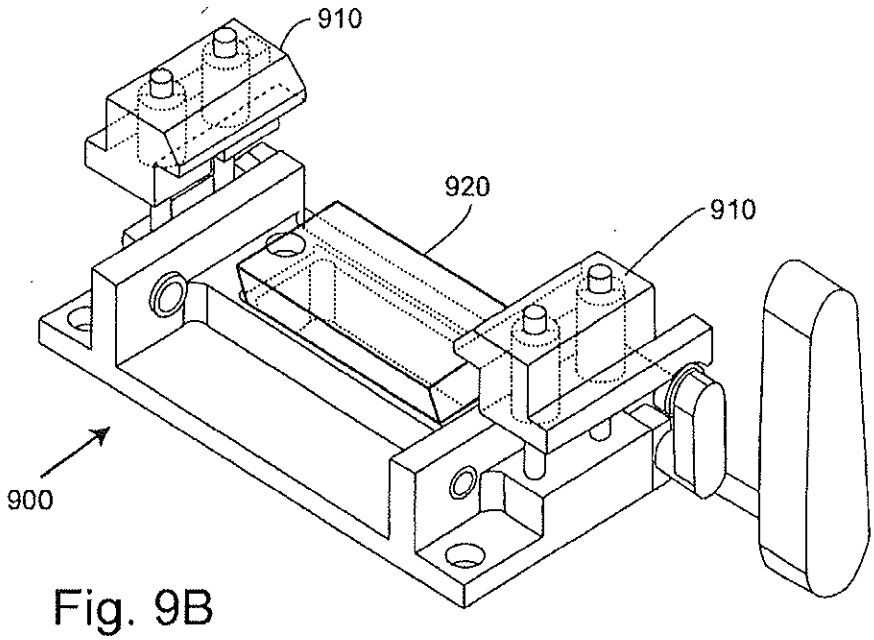


Fig. 9B

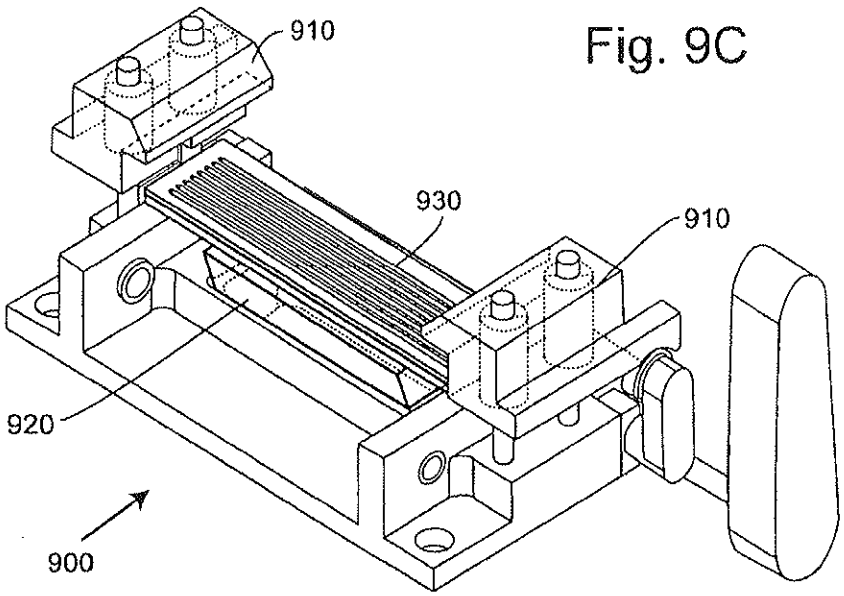


Fig. 9C

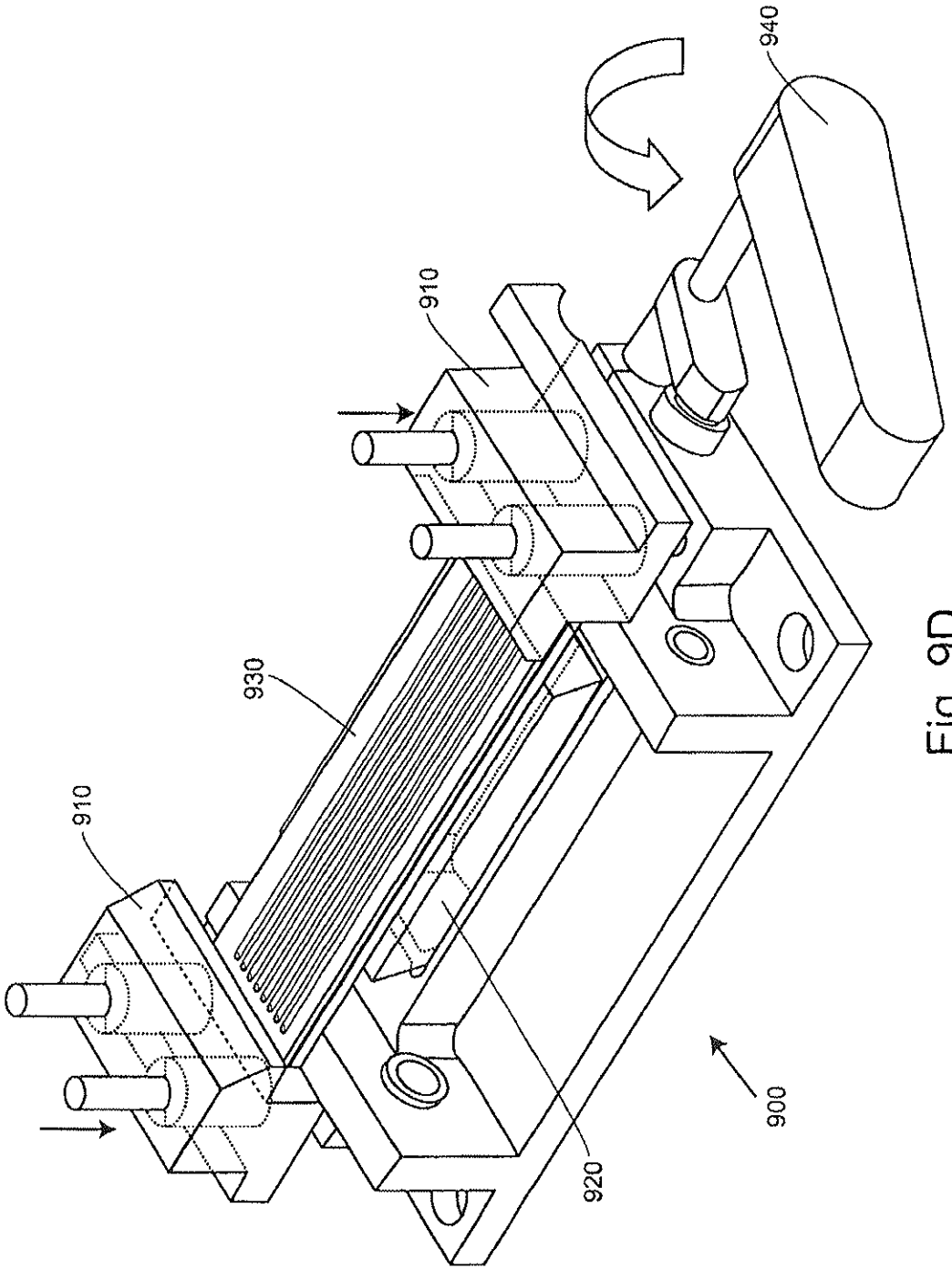


Fig. 9D

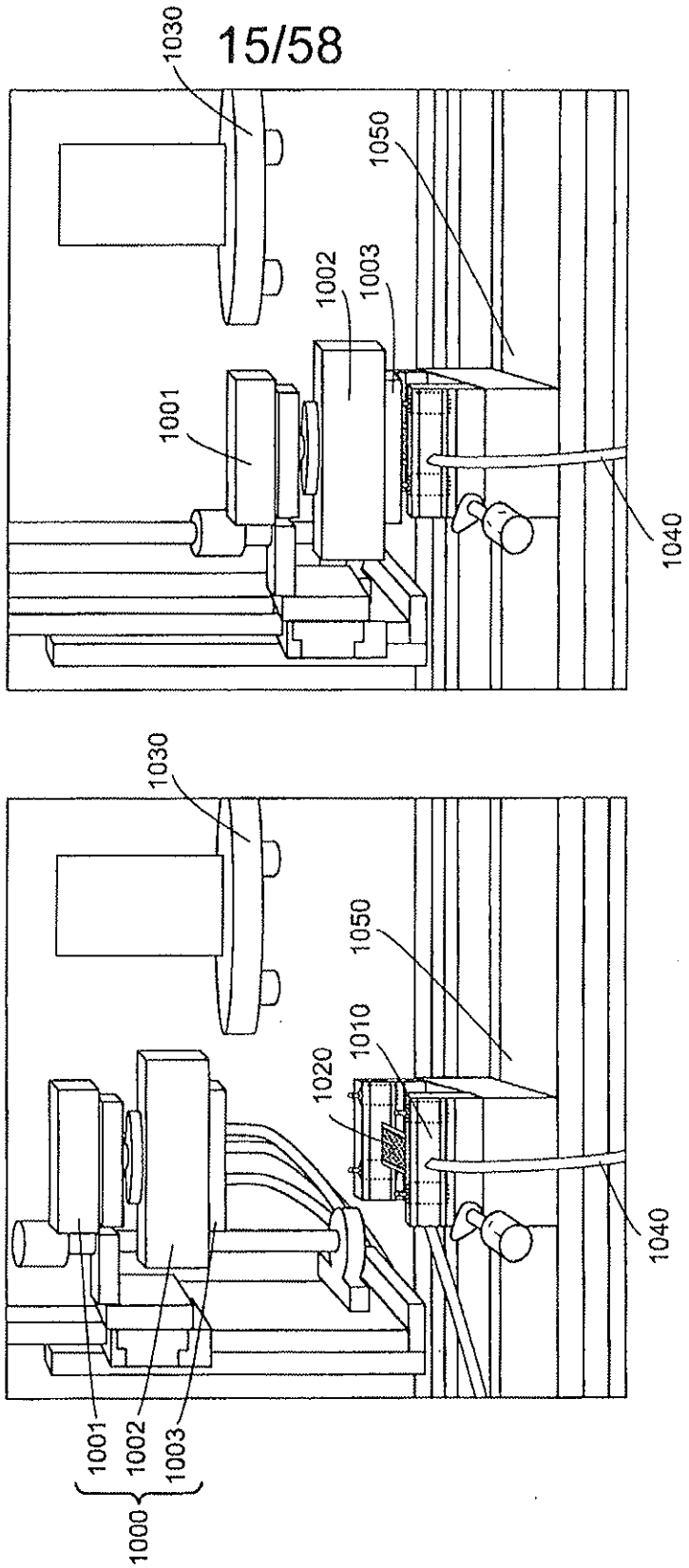

1030
1050
1002
1003
1001
1040
1030
1050
1010
1020
1040
1001
1002
1003
1000

Fig. 10A

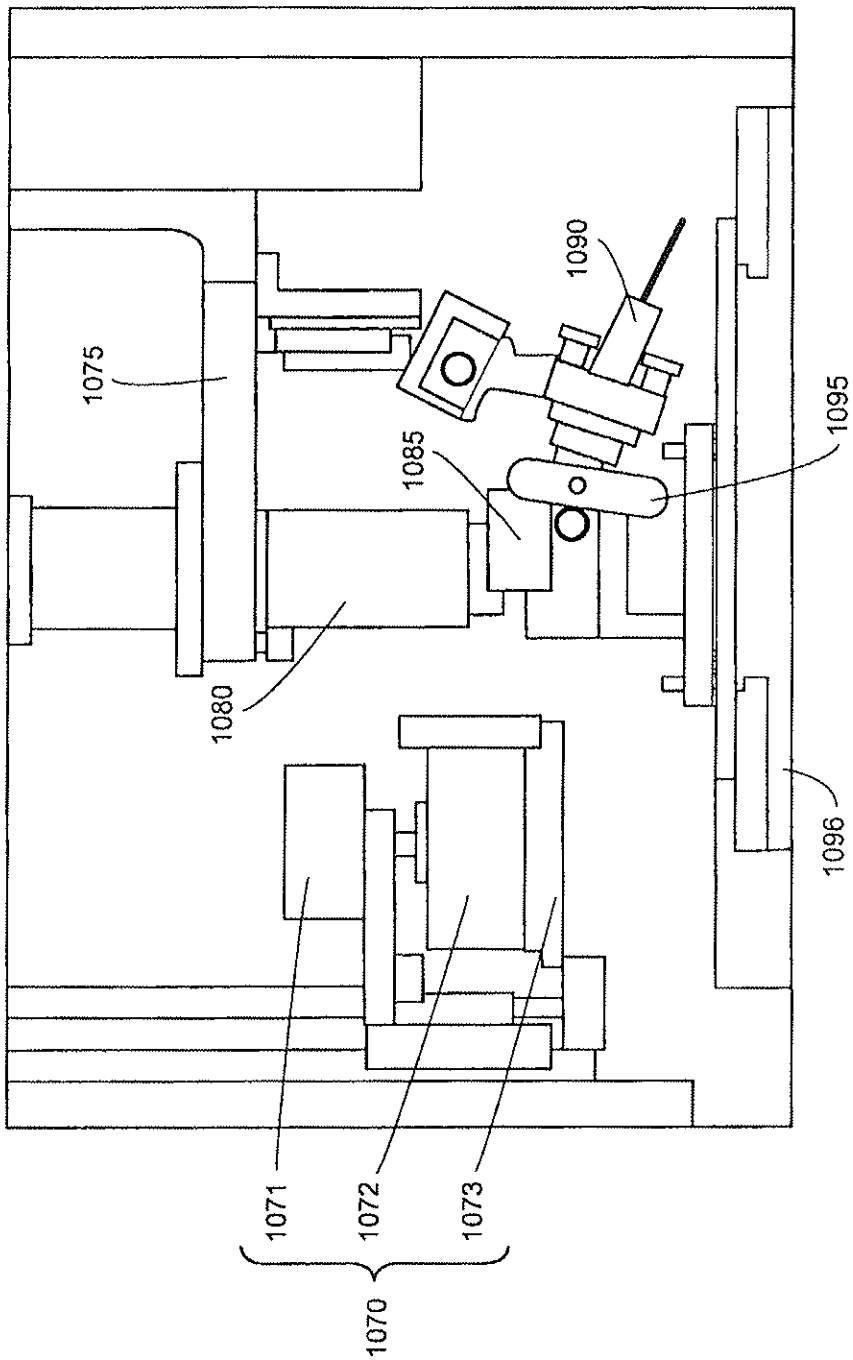


Fig. 10B

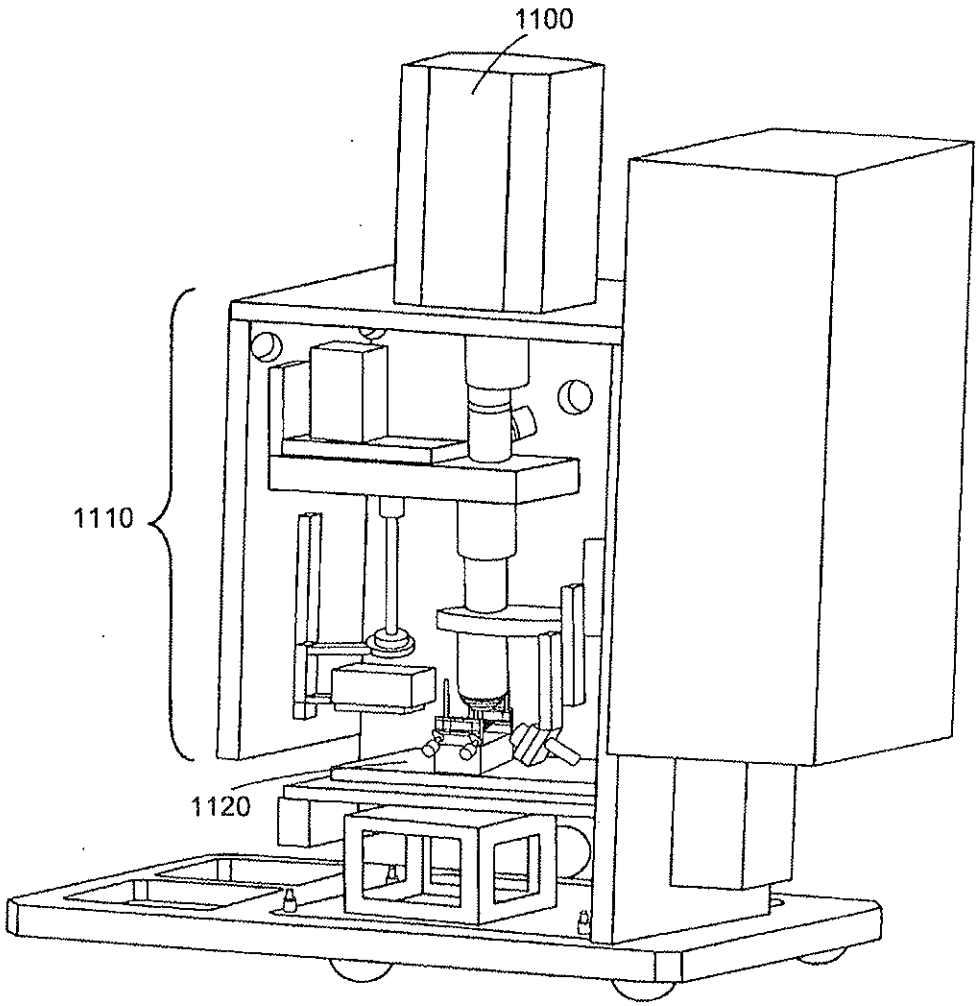


Fig. 11A

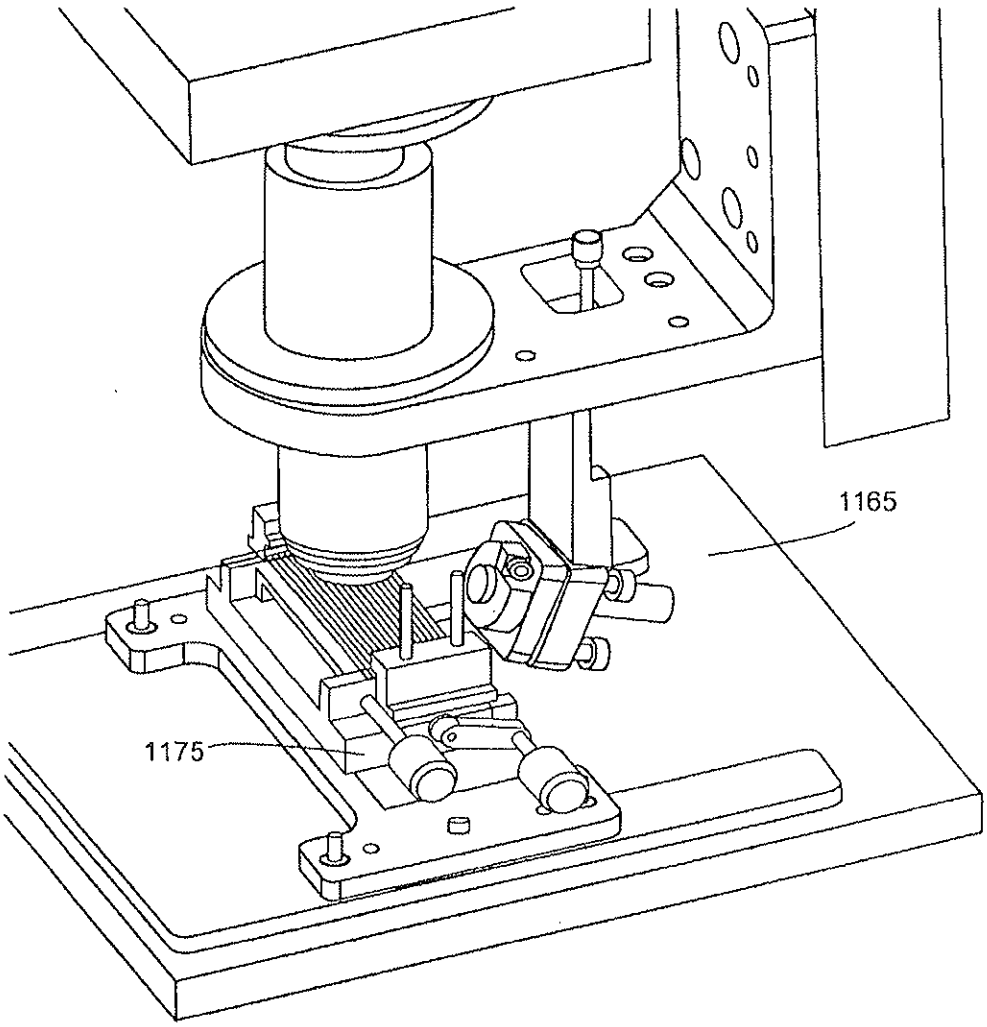


Fig. 11B

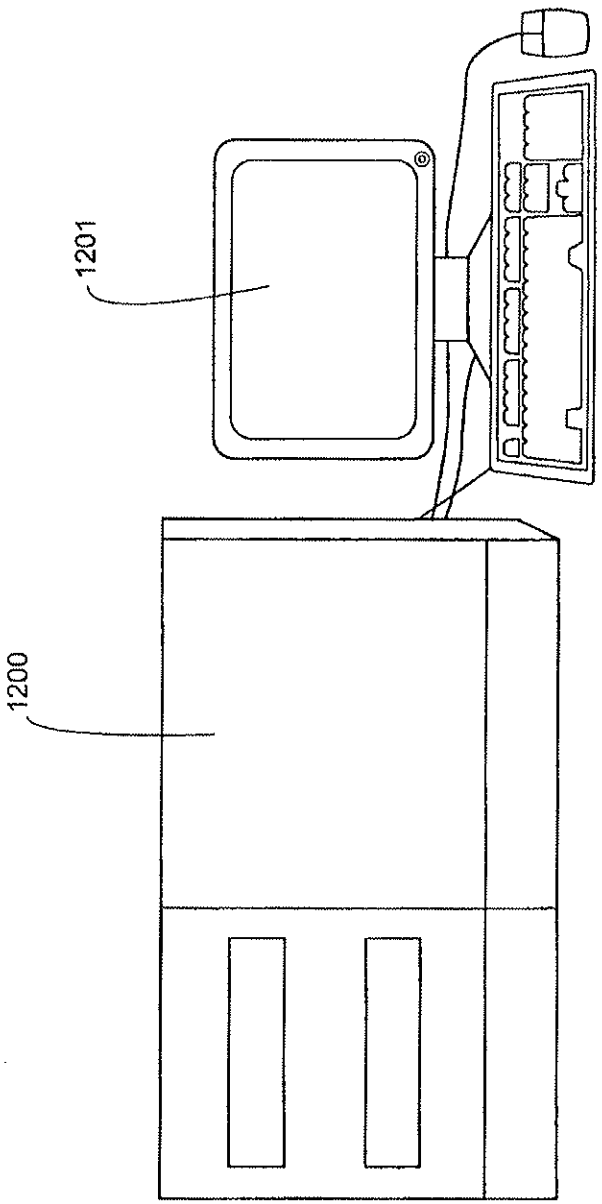


Fig. 12

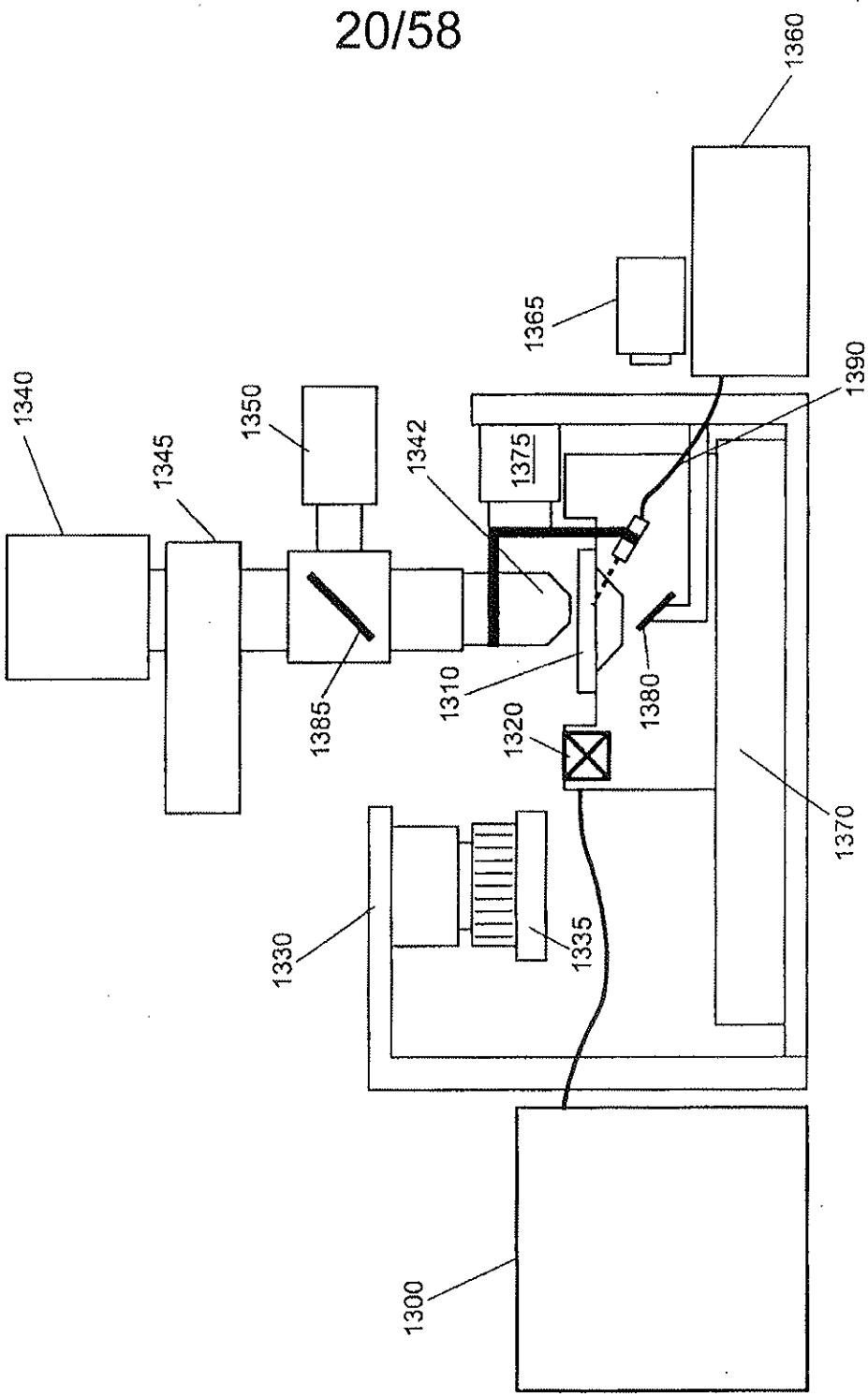

1360
1365
1390
1340
1345
1350
1342
1375
1310
1385
1380
1320
1370
1330
1335
1300

Fig. 13

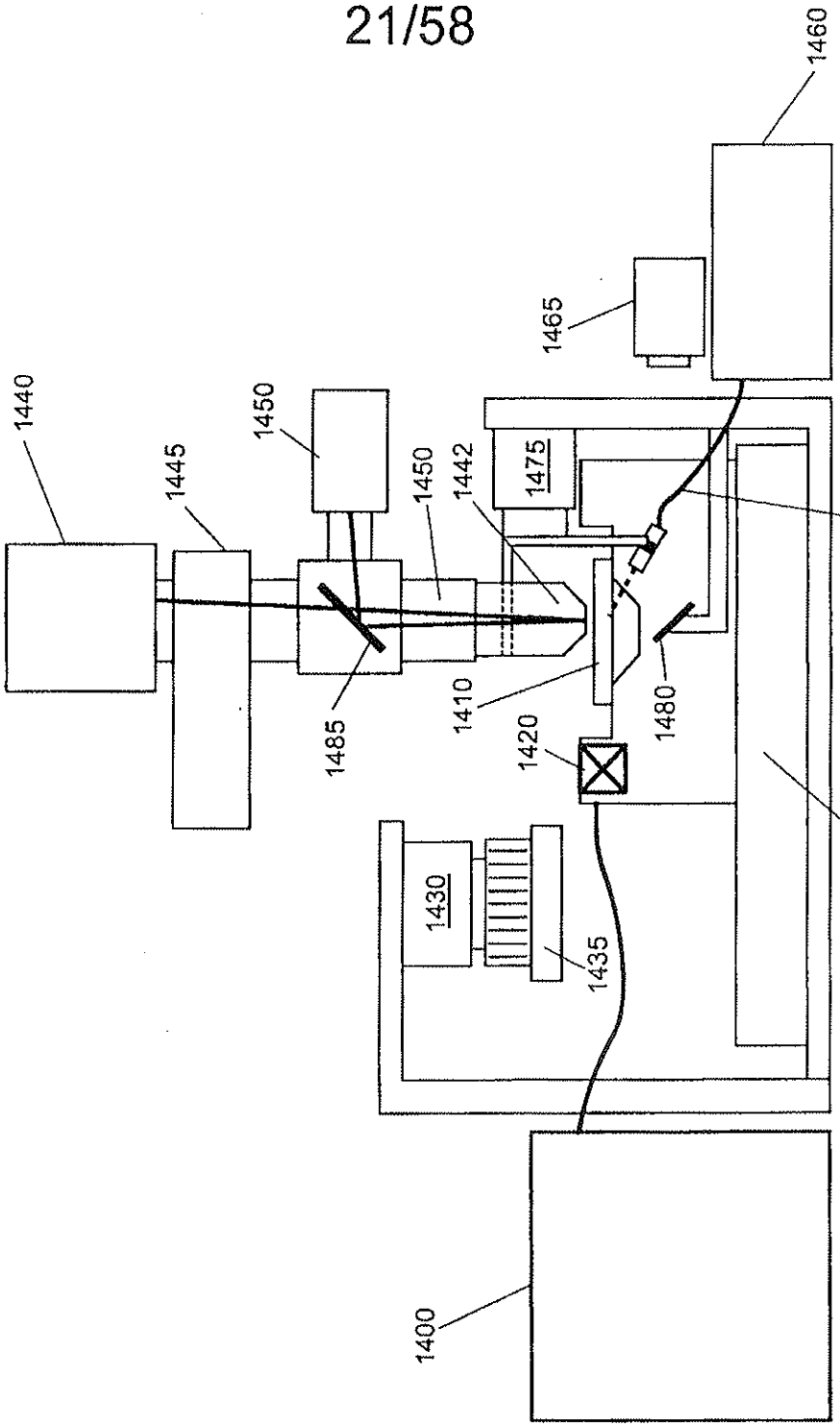

1460
1465
1440
1445
1450
1450
1442
1475
1490
1485
1410
1480
1420
1470
1430
1435
1400

Fig. 14

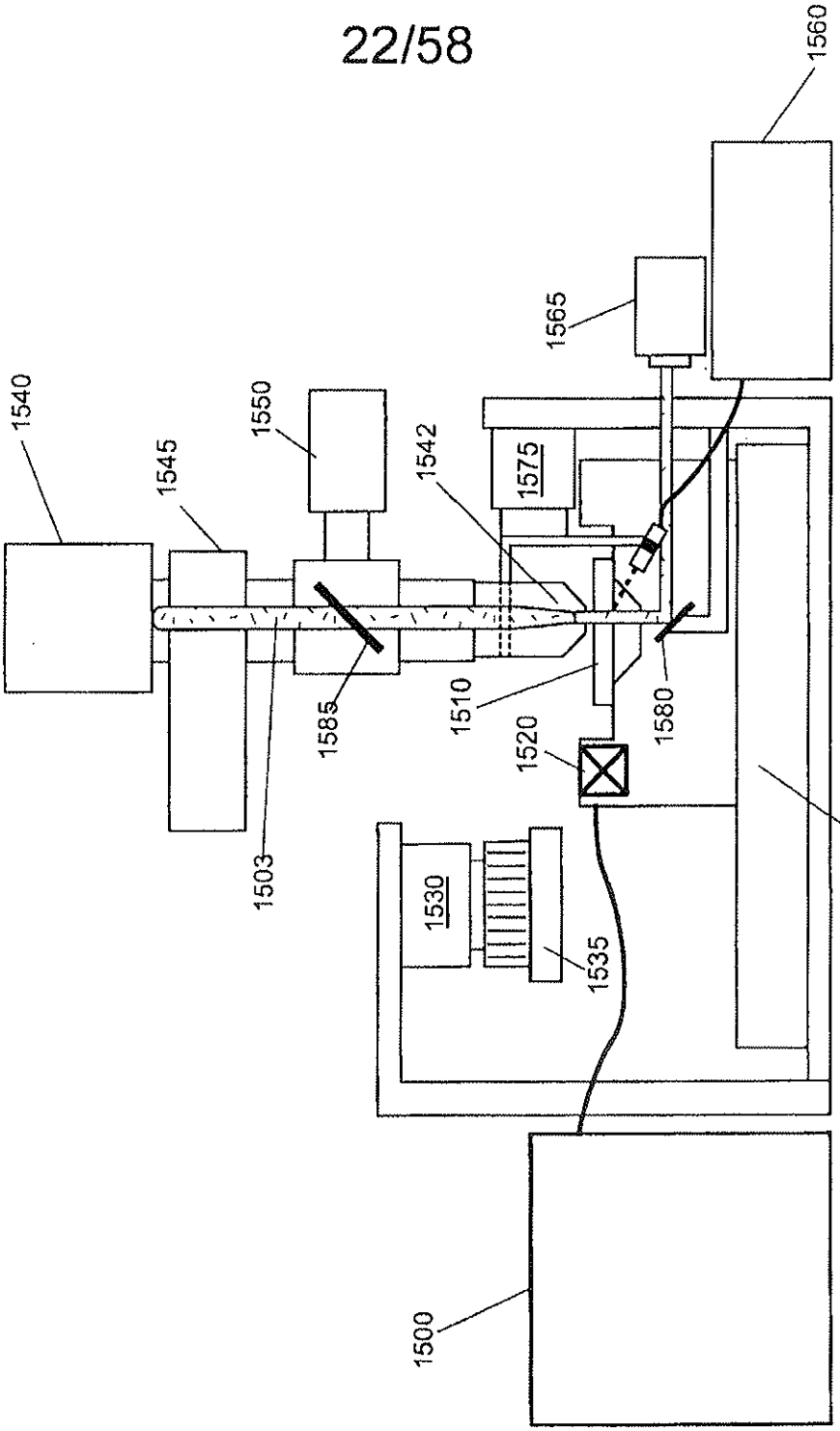

1560
1565
1540
1550
1545
1542
1575
1585
1510
1580
1520
1503
1530
1535
1570
1500

Fig. 15

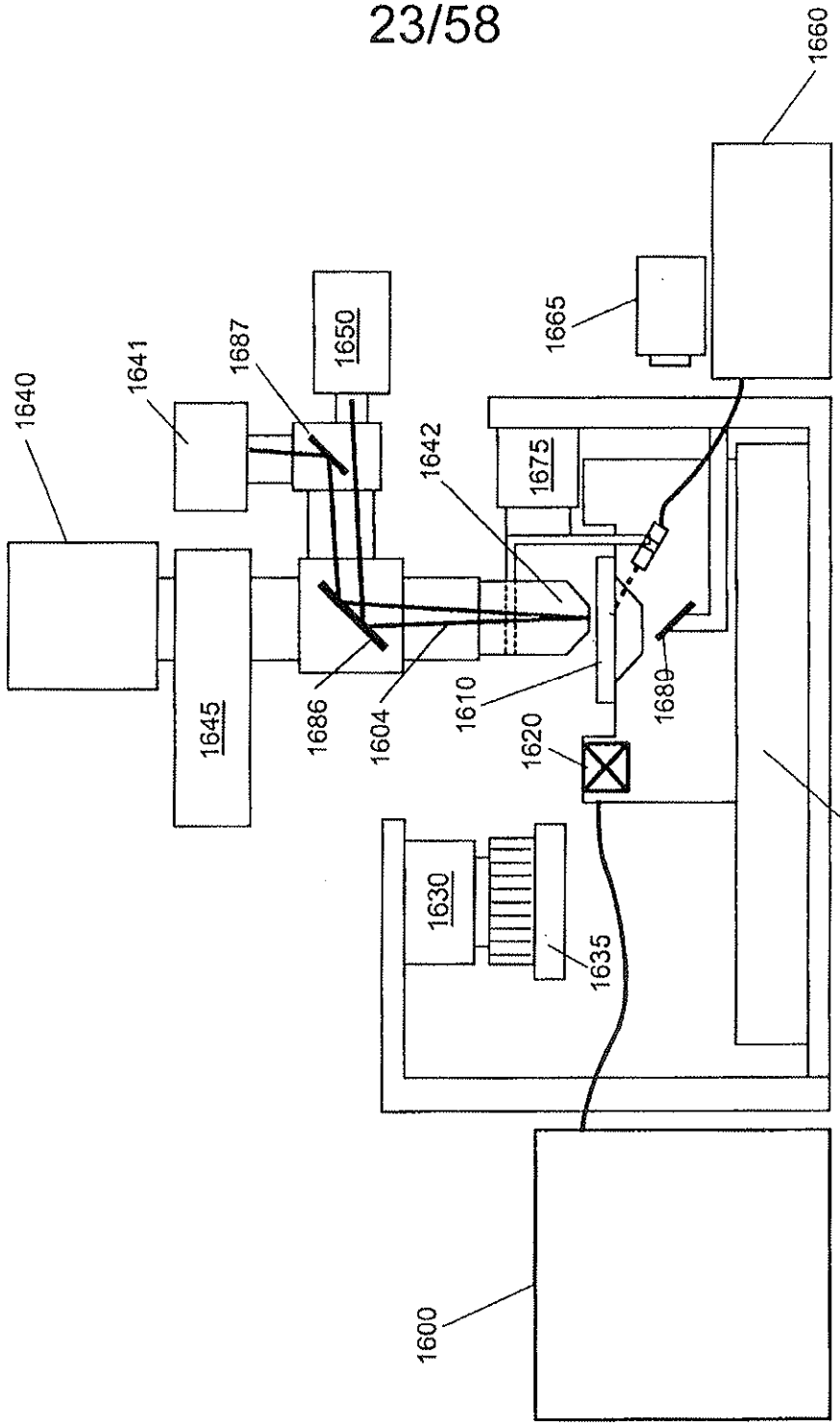
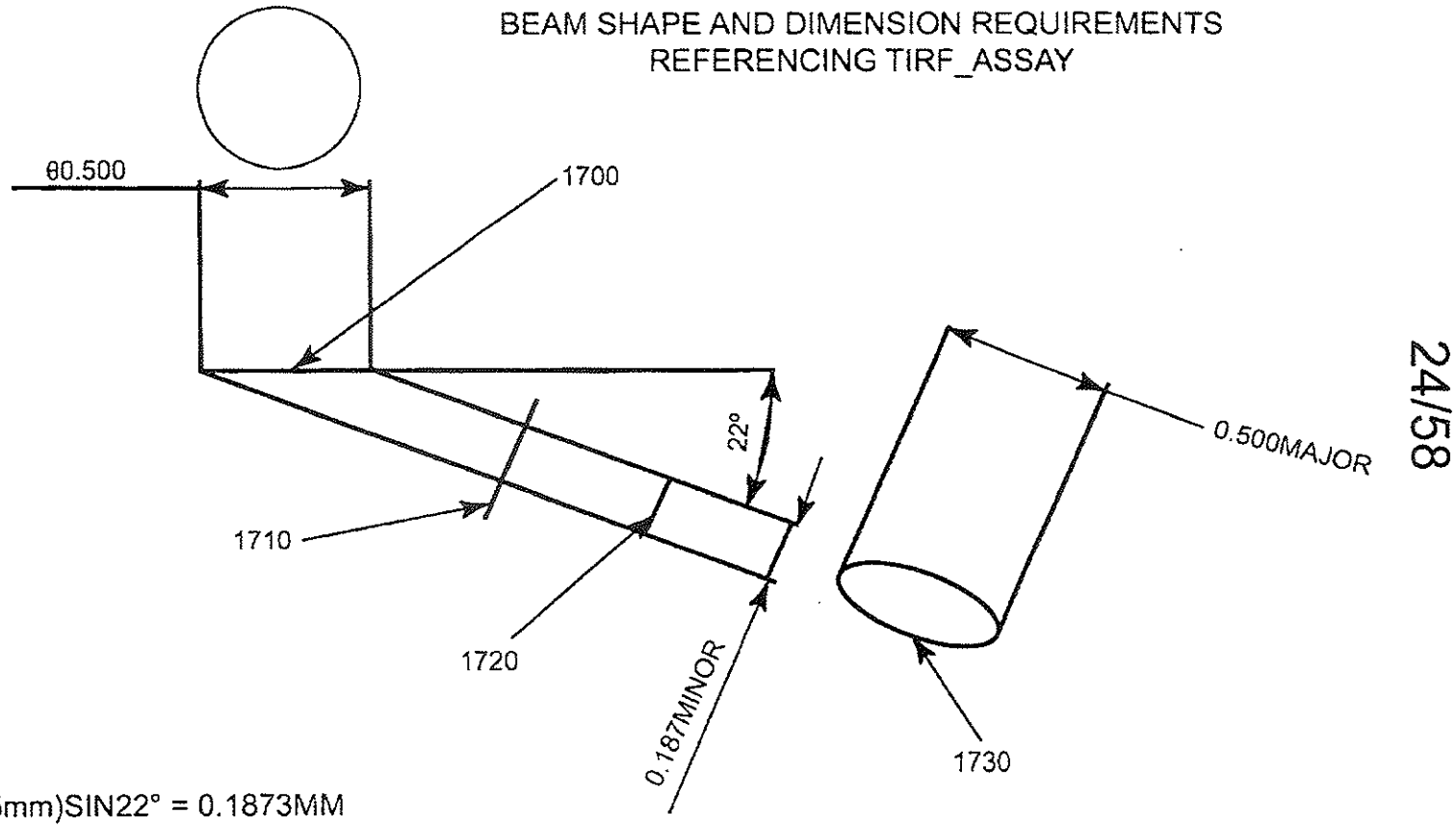

1660
1665
1650
1687
1641
1640
1642
1675
1645
1686
1604
1610
1689
1620
1630
1635
1670
1600

Fig. 16



(0.5mm)SIN22° = 0.1873MM
ASPECT RATIO=0.5mm/0.187mm=2.67
or 1/2.68=.375 (if preferred)

Fig. 17

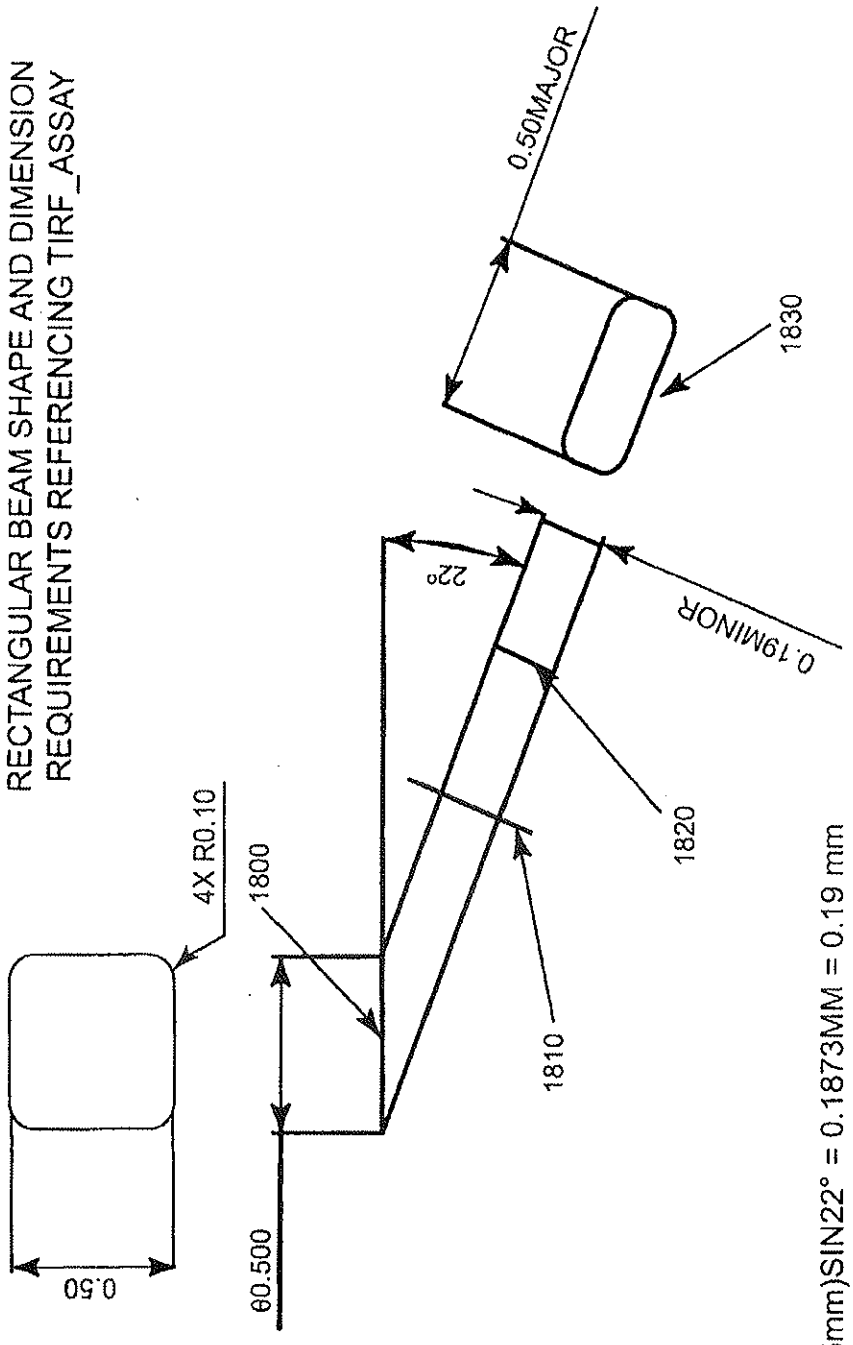

RECTANGULAR BEAM SHAPE AND DIMENSION
REQUIREMENTS REFERENCING TIRF_ASSAY
0.50
4X R0.10
1800
Θ0.500
22°
1810
1820
0.19MINOR
0.50MAJOR
1830
(0.5mm)SIN22° = 0.1873MM = 0.19 mm
ASPECT RATIO=0.5mm/0.19mm=2.63
or 1/2.63=.38 (if preferred)

Fig. 18

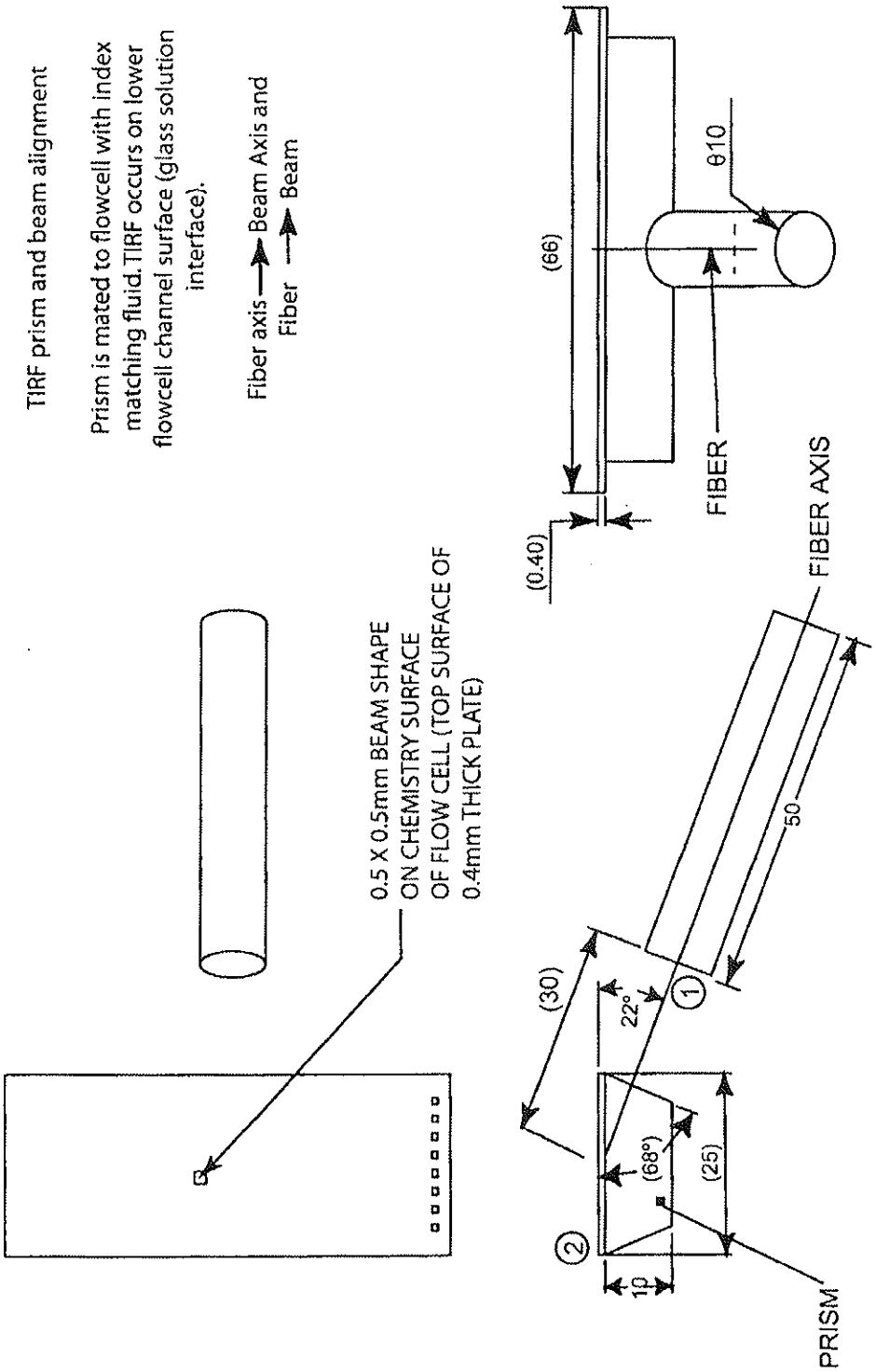

TIRF prism and beam alignment
Prism is mated to flowcell with index matching fluid. TIRF occurs on lower flowcell channel surface (glass solution interface).
Fiber axis → Beam Axis and Fiber → Beam
0.5 X 0.5mm BEAM SHAPE ON CHEMISTRY SURFACE OF FLOW CELL (TOP SURFACE OF 0.4mm THICK PLATE)
(66)
(0.40)
θ10
FIBER
FIBER AXIS
50
(30)
22°
(68°)
(25)
1ρ
PRISM

Fig. 19

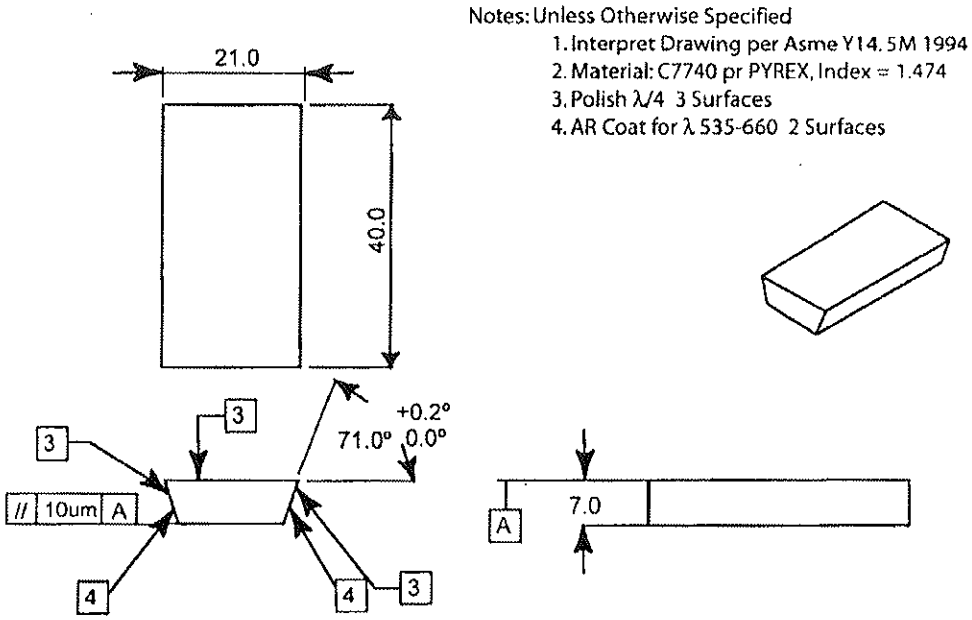

Notes: Unless Otherwise Specified
1. Interpret Drawing per Asme Y14.5M 1994
2. Material: C7740 pr PYREX, Index = 1.474
3. Polish λ/4 3 Surfaces
4. AR Coat for λ 535-660 2 Surfaces
21.0
40.0
3
3
+0.2°
71.0° 0.0°
// 10um A
4
4
3
A
7.0

Fig. 20

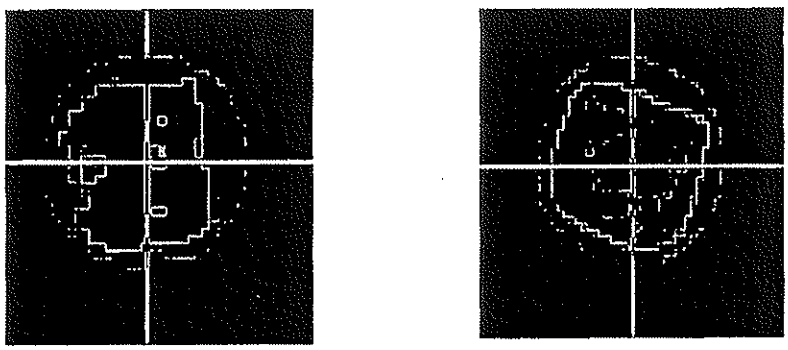


Fig. 21

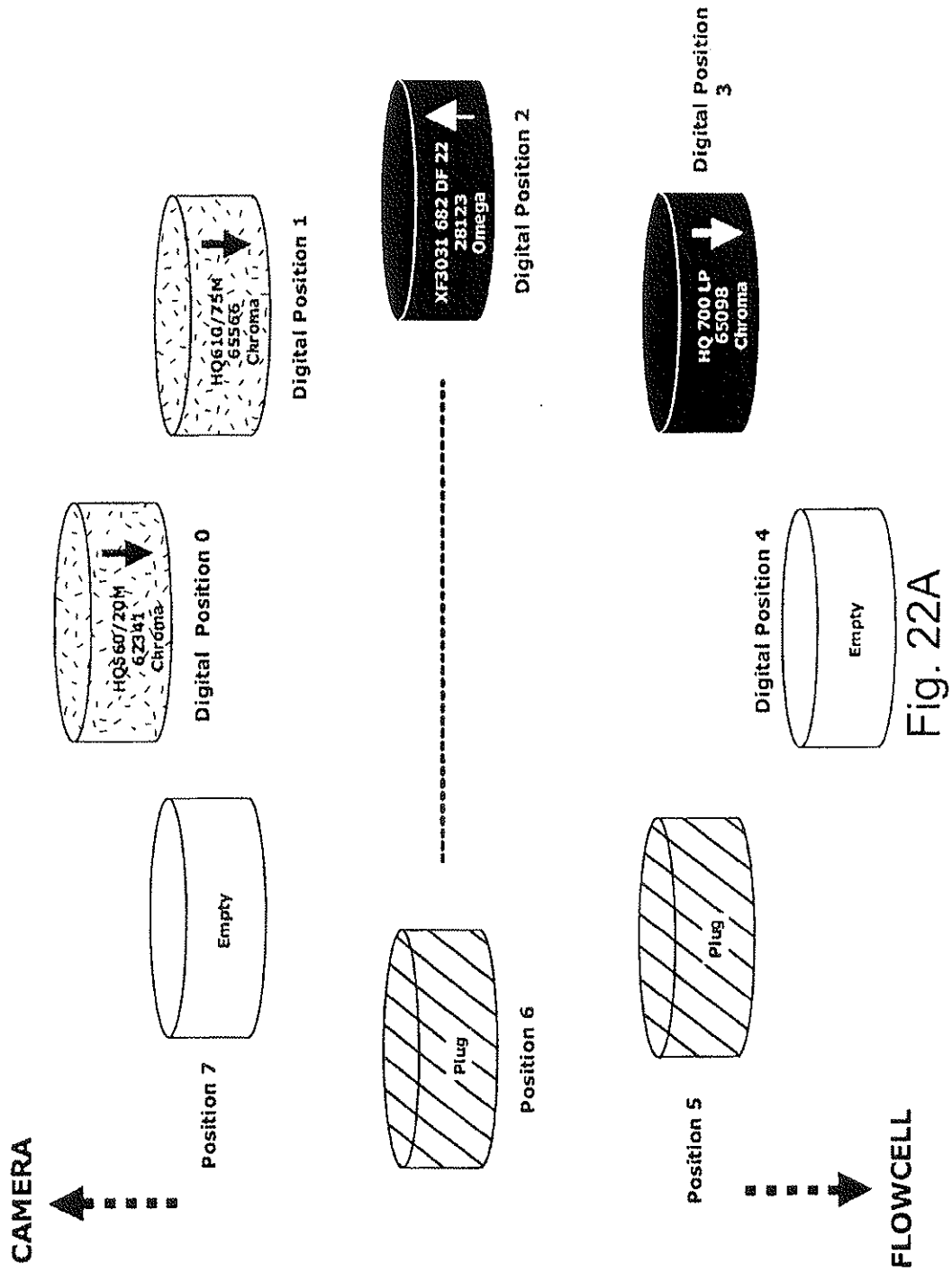

CAMERA
Position 7
Empty
Digital Position 0
HQ560/20M
62341
Chroma
Digital Position 1
HQ610/75M
65565
Chroma
Position 6
Plug
Digital Position 2
XF3031 682 DF 22
28123
Omega
Position 5
Plug
Digital Position 4
Empty
Digital Position 3
HQ 700 LP
65098
Chroma
FLOWCELL

Fig. 22A

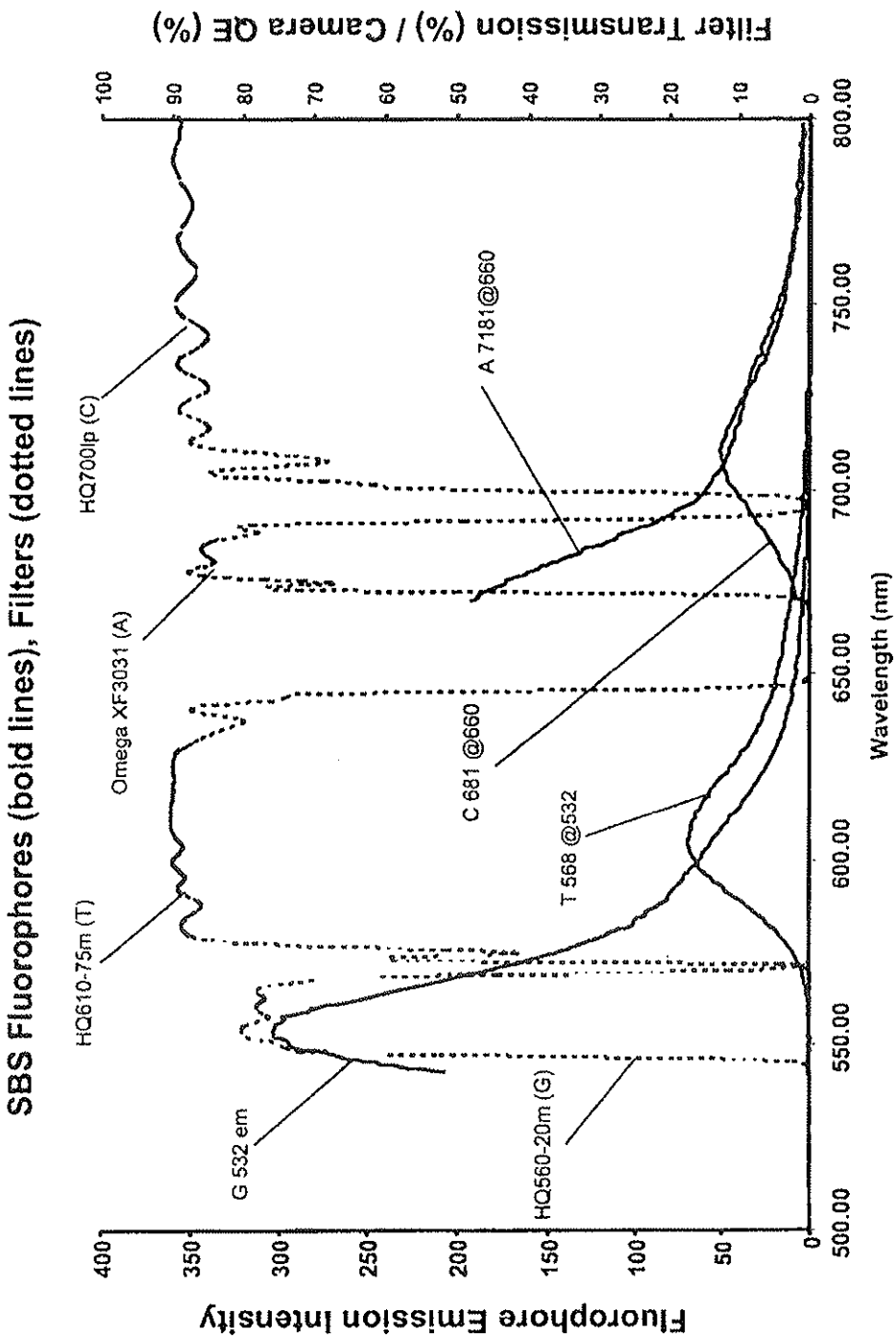

SBS Fluorophores (bold lines), Filters (dotted lines)
Fluorophore Emission Intensity
Filter Transmission (%) / Camera QE (%)
Wavelength (nm)
500.00
550.00
600.00
650.00
700.00
750.00
800.00
0
50
100
150
200
250
300
350
400
10
20
30
40
50
60
70
80
90
100
HQ610-75m (T)
Omega XF3031 (A)
HQ700lp (C)
G 532 em
HQ560-20m (G)
T 568 @532
C 681 @660
A 7181@660

Fig. 22B

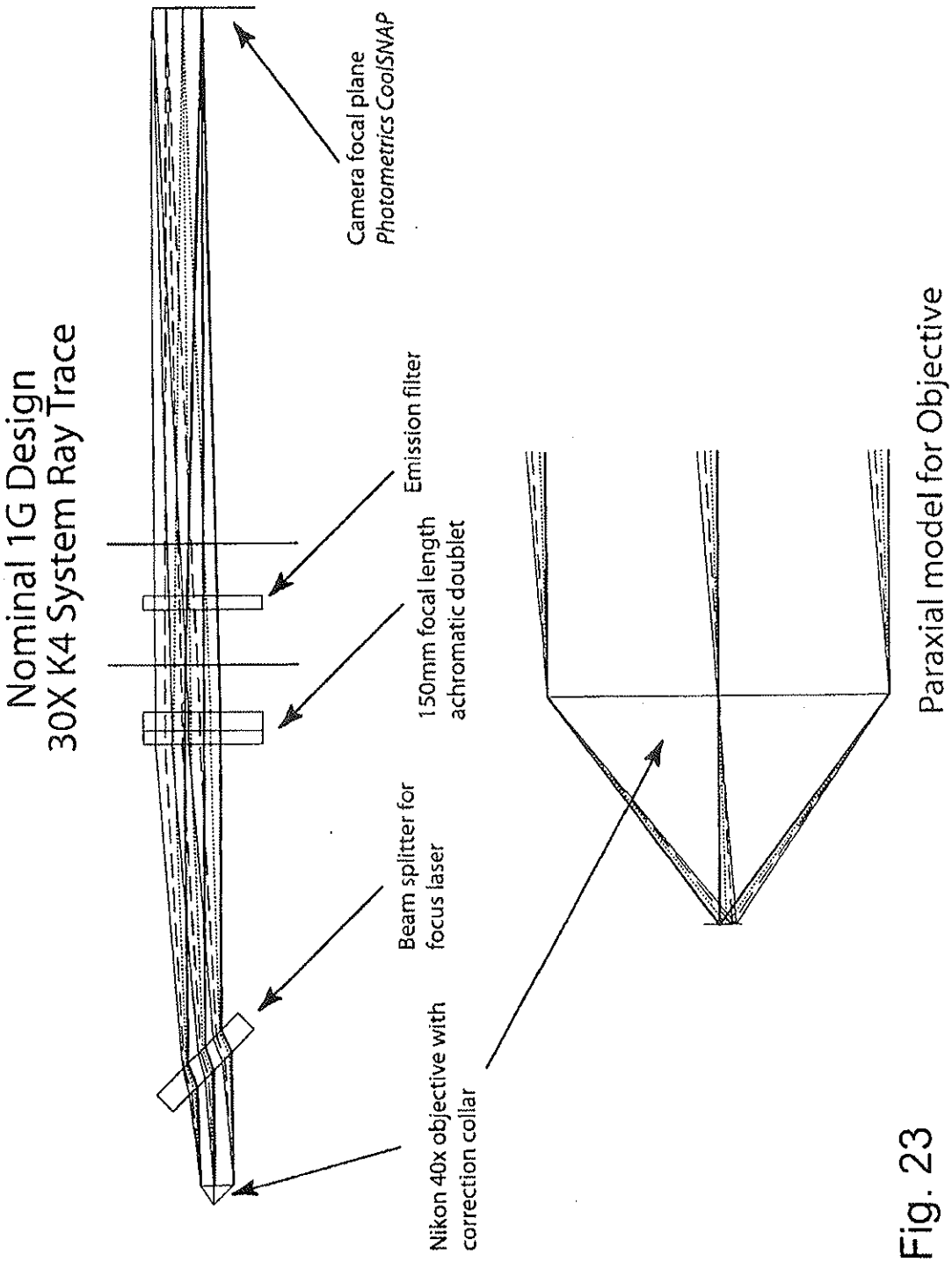

Nominal 1G Design
30X K4 System Ray Trace
Camera focal plane
Photometrics CoolSNAP
Emission filter
150mm focal length
achromatic doublet
Beam splitter for
focus laser
Nikon 40x objective with
correction collar
Paraxial model for Objective

Fig. 23

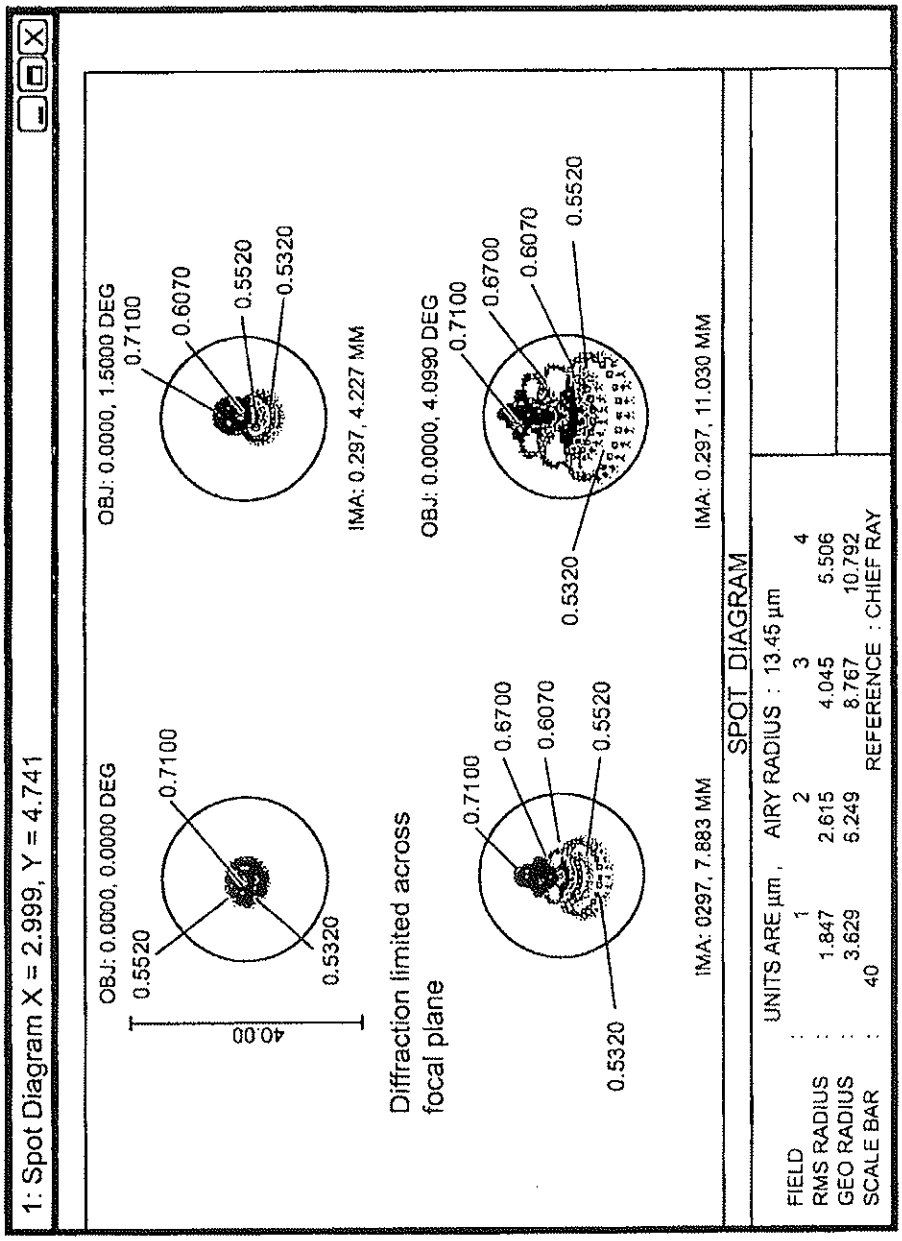

1: Spot Diagram X = 2.999, Y = 4.741
OBJ: 0.0000, 0.0000 DEG
0.7100
0.5520
0.5320
40.00
OBJ: 0.0000, 1.5000 DEG
0.7100
0.6070
0.5520
0.5320
IMA: 0.297, 4.227 MM
Diffraction limited across
focal plane
OBJ: 0.0000, 4.0990 DEG
0.7100
0.6700
0.6070
0.5520
0.5320
0.7100
0.6700
0.6070
0.5520
0.5320
IMA: 0297, 7.883 MM
IMA: 0.297, 11.030 MM
SPOT DIAGRAM
UNITS ARE µm , AIRY RADIUS : 13.45 µm
FIELD : 1 2 3 4
RMS RADIUS : 1.847 2.615 4.045 5.506
GEO RADIUS : 3.629 6.249 8.767 10.792
SCALE BAR : 40
REFERENCE : CHIEF RAY

Fig. 24

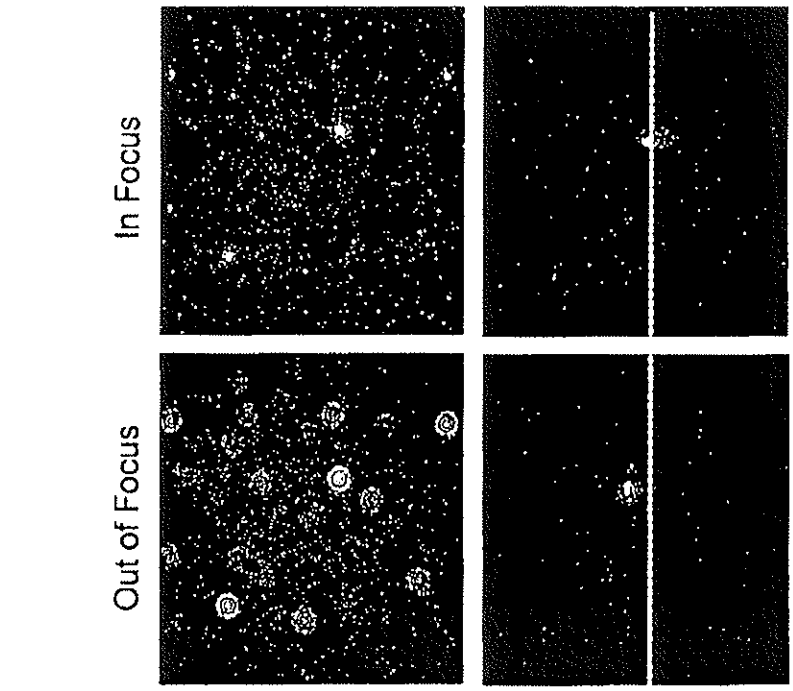

In Focus
Out of Focus

Fig. 26

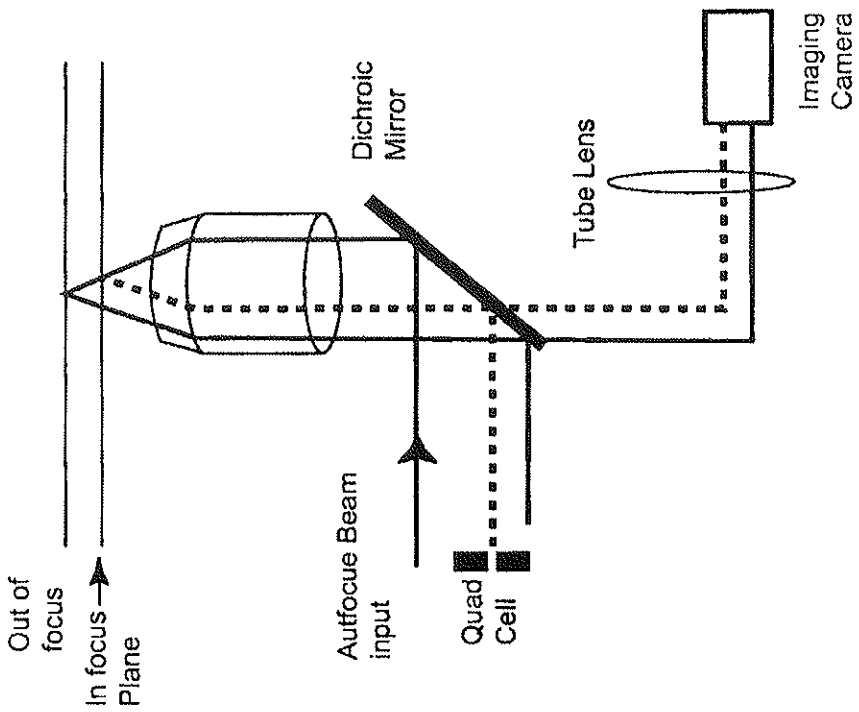

Out of focus
In focus Plane
Autfocue Beam input
Quad Cell
Dichroic Mirror
Tube Lens
Imaging Camera

Fig. 25

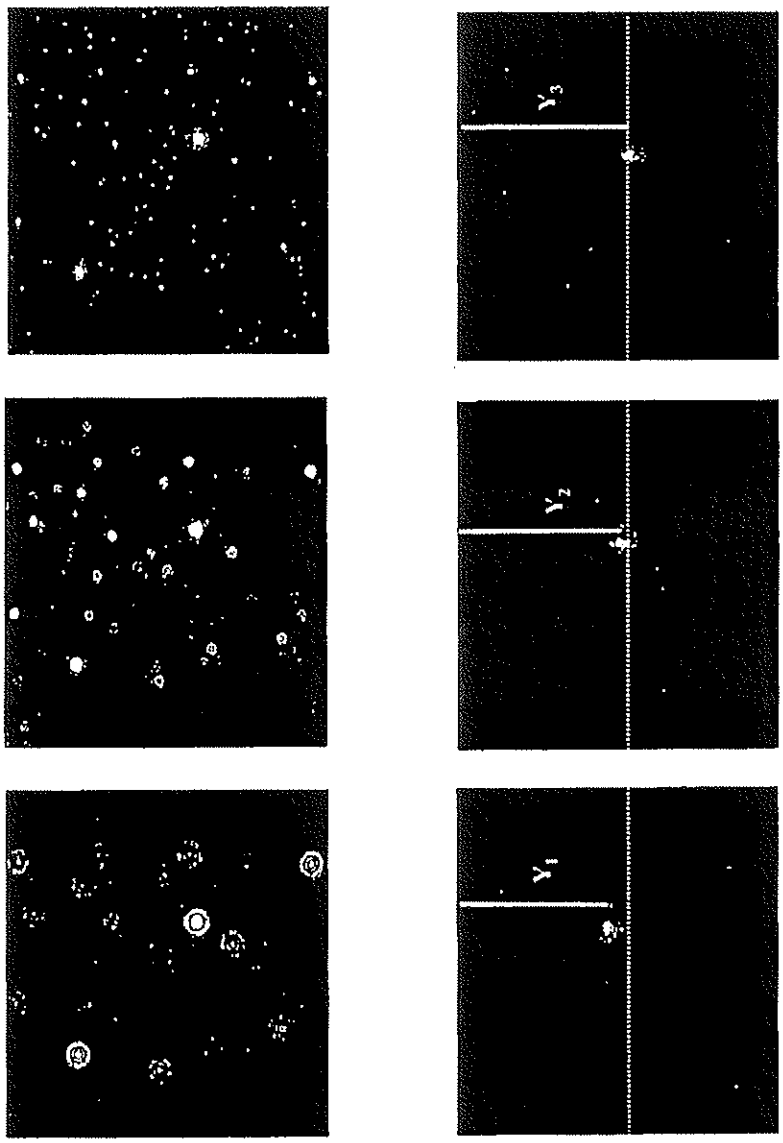


Fig. 27

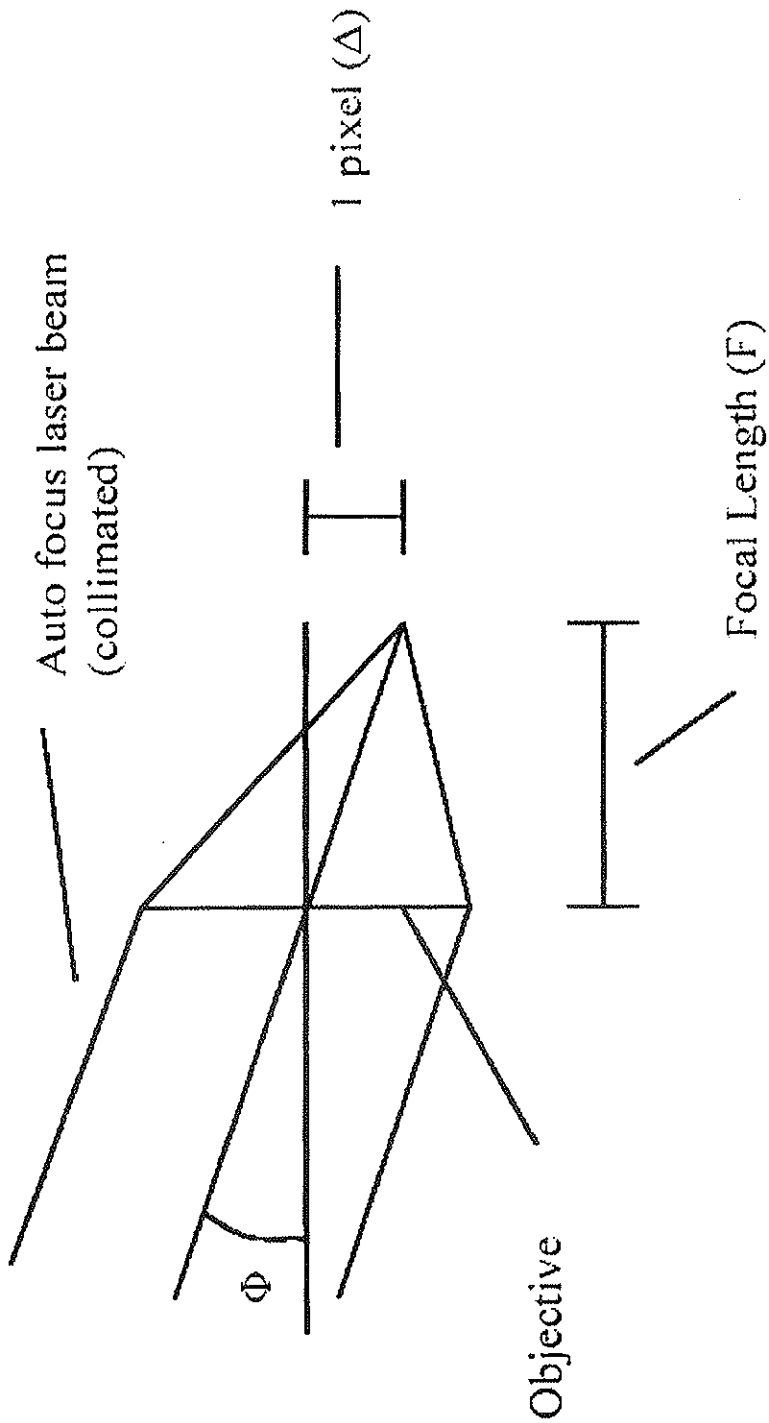

Auto focus laser beam
(collimated)
1 pixel (Δ)
Focal Length (F)
Φ
Objective

Fig. 28

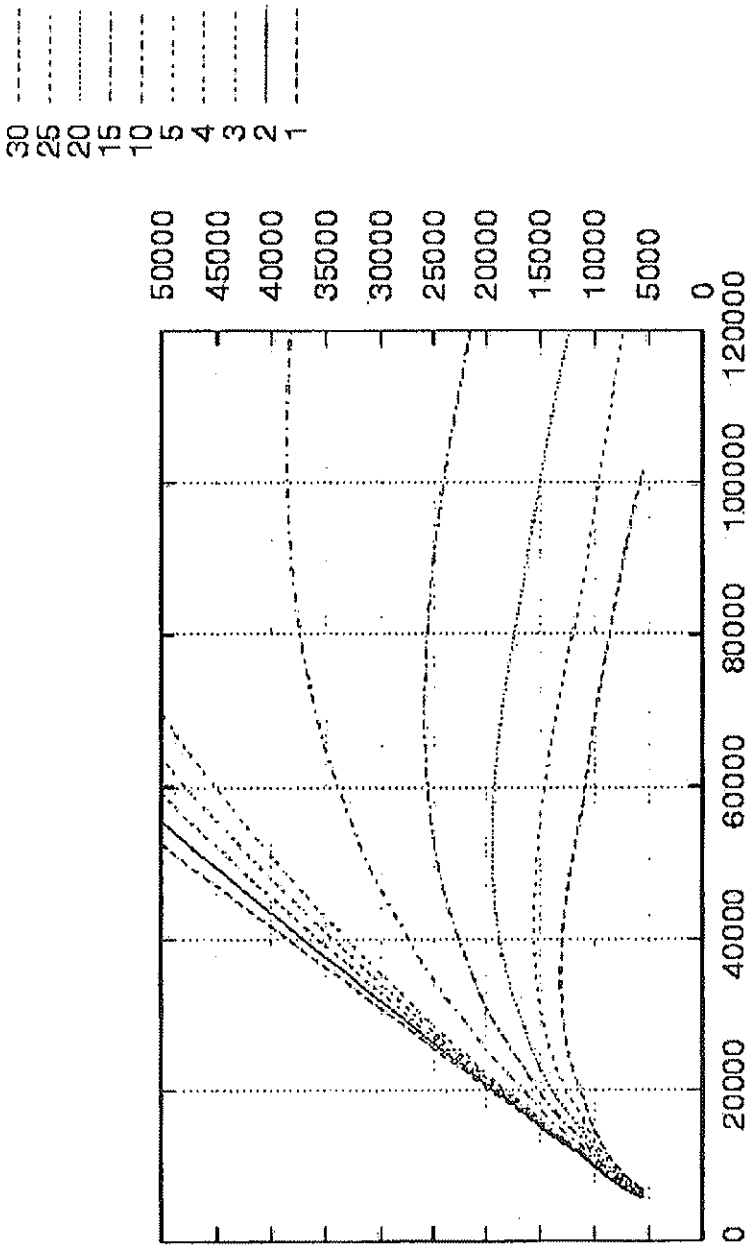

30
25
20
15
10
5
4
3
2
1
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
20000
40000
60000
80000
100000
120000
Total number of clusters per image

Fig. 29

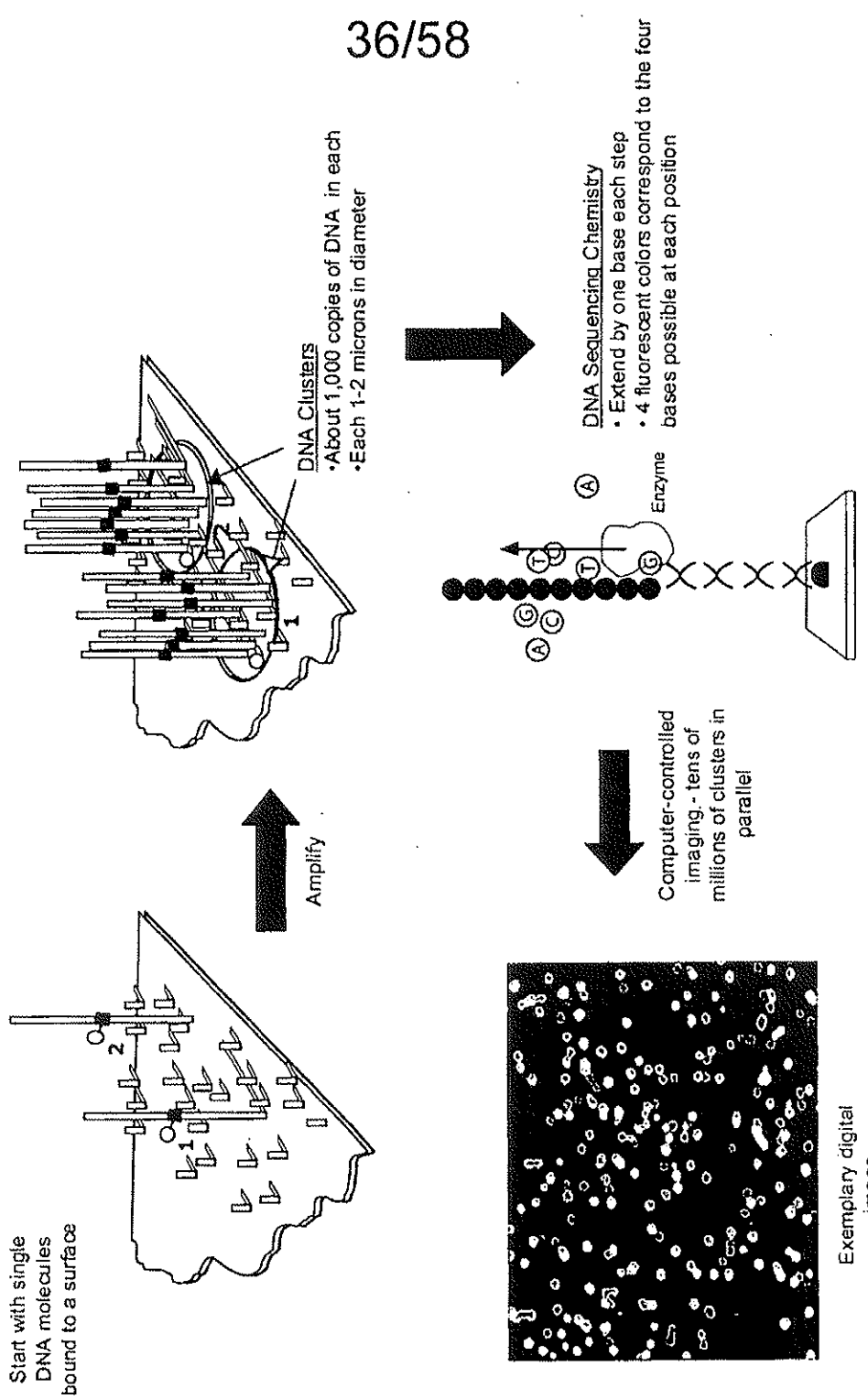
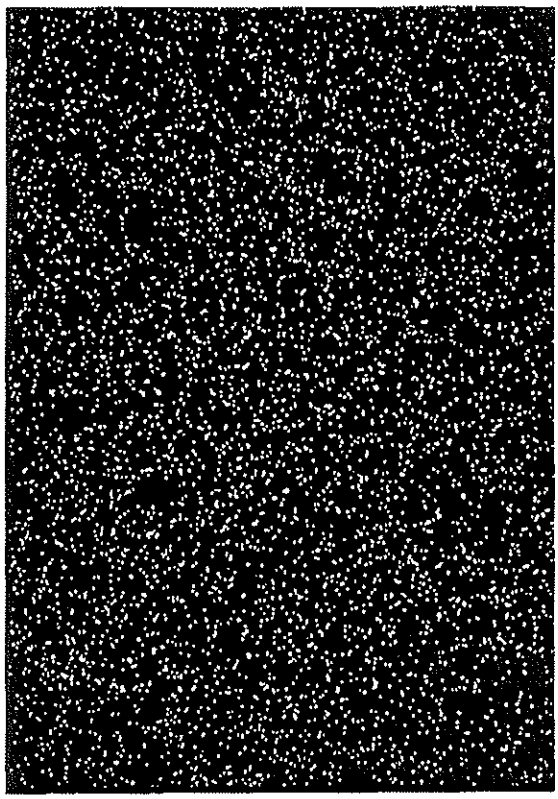
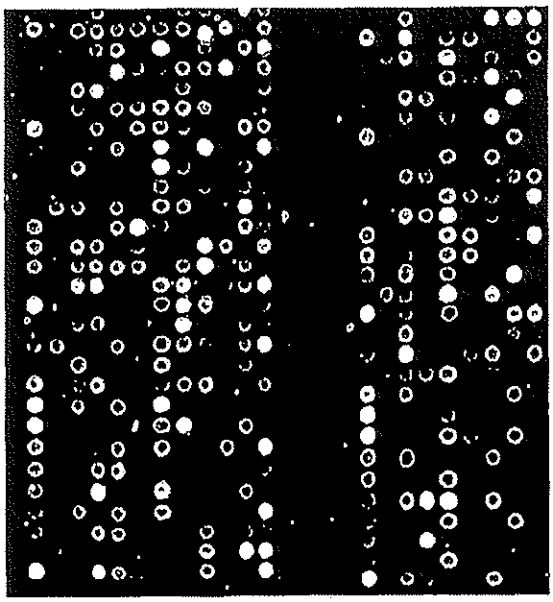

Start with single DNA molecules bound to a surface
Amplify
DNA Clusters
•About 1,000 copies of DNA in each
•Each 1-2 microns in diameter
DNA Sequencing Chemistry
• Extend by one base each step
• 4 fluorescent colors correspond to the four bases possible at each position
Enzyme
Computer-controlled imaging,- tens of millions of clusters in parallel
Exemplary digital image

Fig. 30



10^7-10^8/cm^2



10^4-10^5/cm^2

Fig. 31

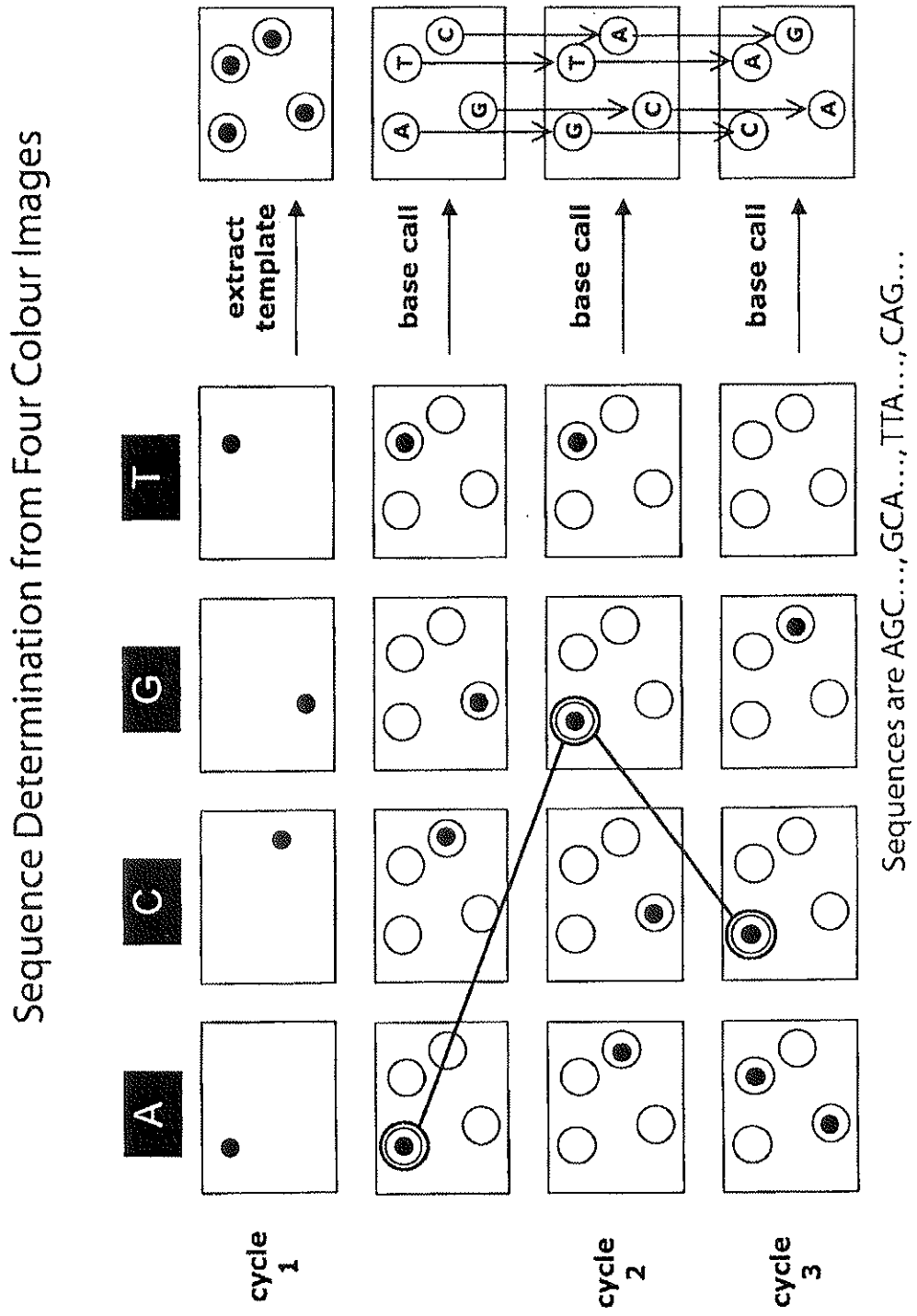

Sequence Determination from Four Colour Images
A
C
G
T
cycle 1
cycle 2
cycle 3
extract template
base call
base call
base call
Sequences are AGC...,GCA...,TTA...,CAG...

Fig. 32

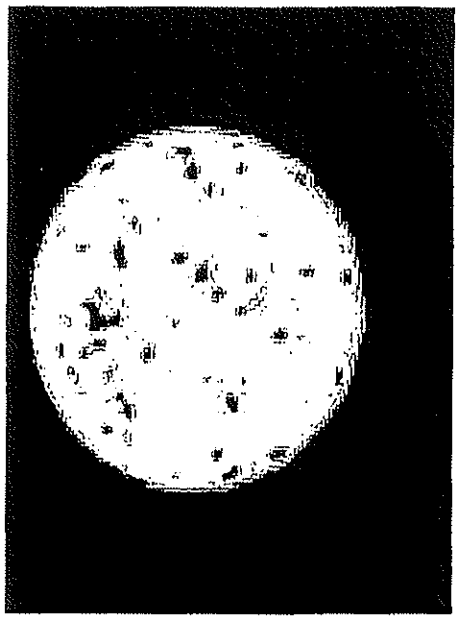


Fig. 33B

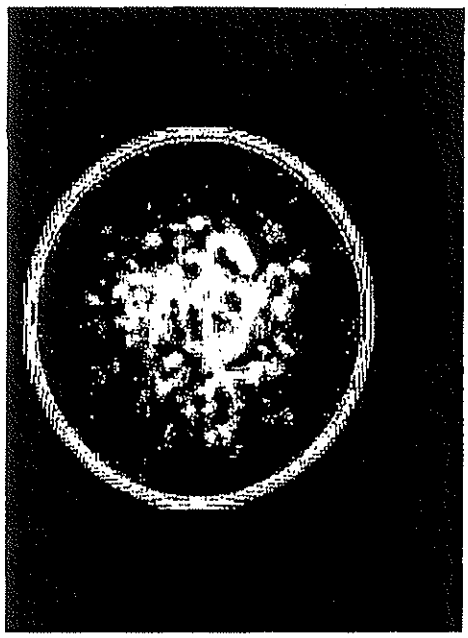


Fig. 33D

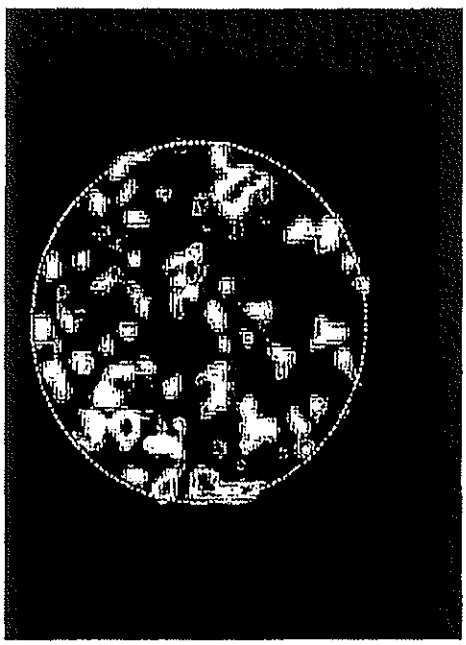


Fig. 33A

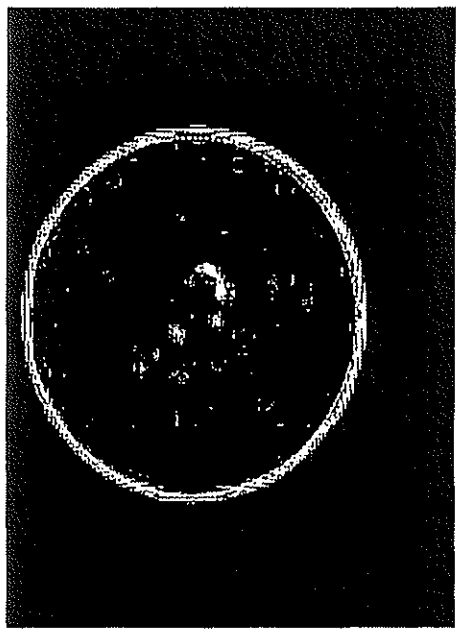


Fig. 33C

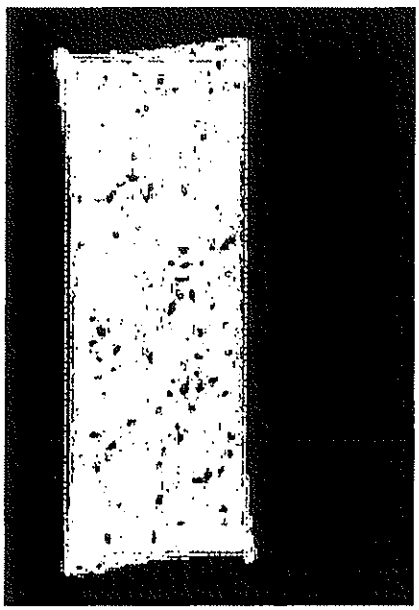


Fig. 34B

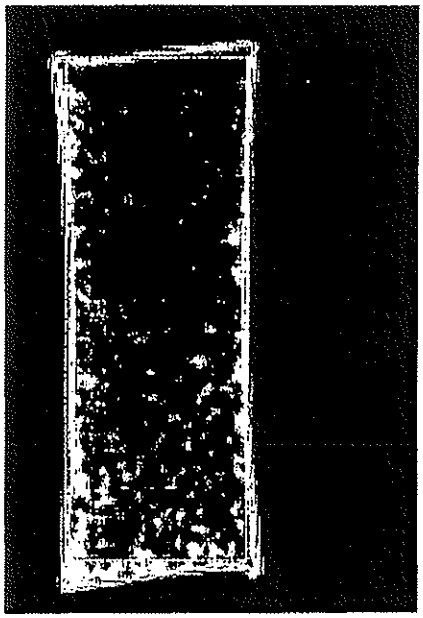


Fig. 34D

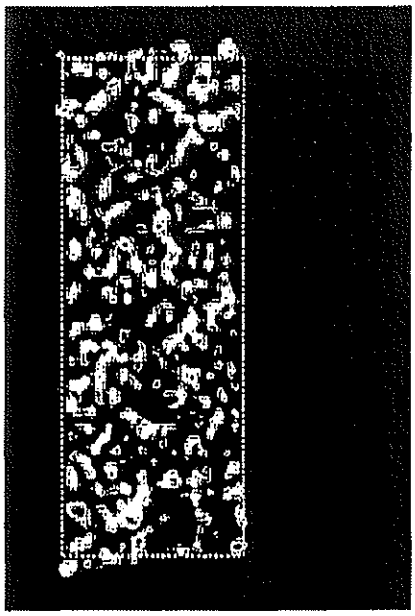


Fig. 34A

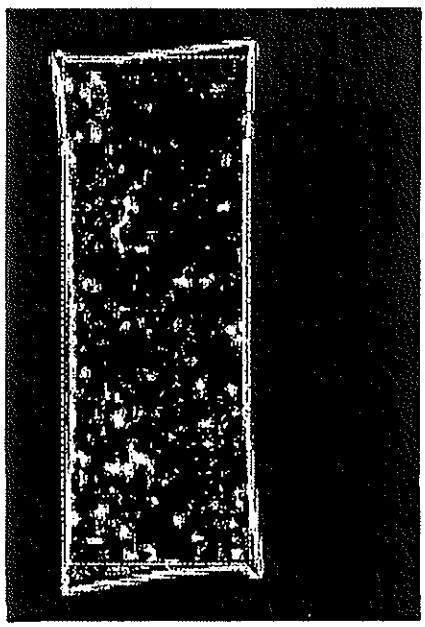


Fig. 34C

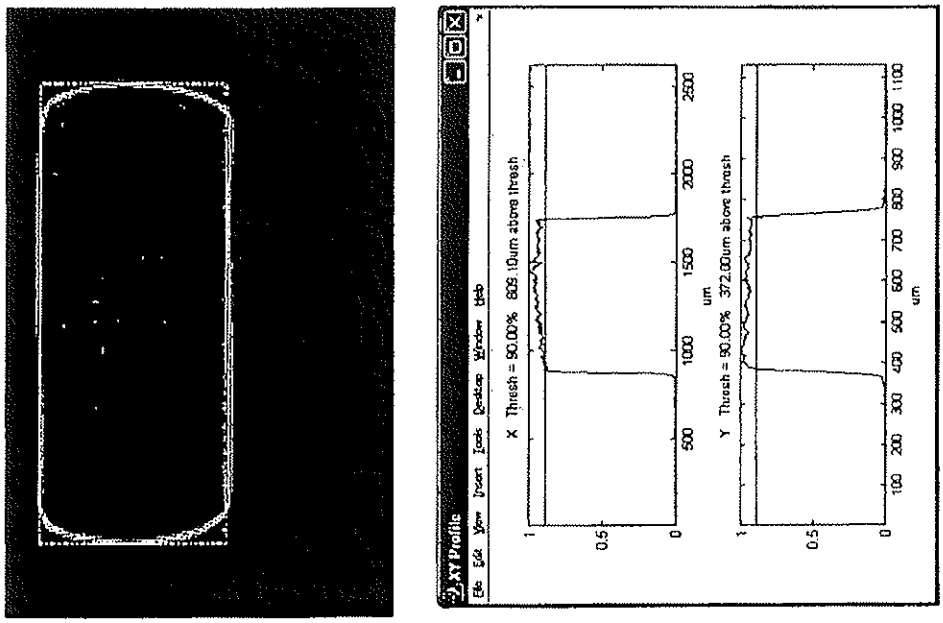


Fig. 35B

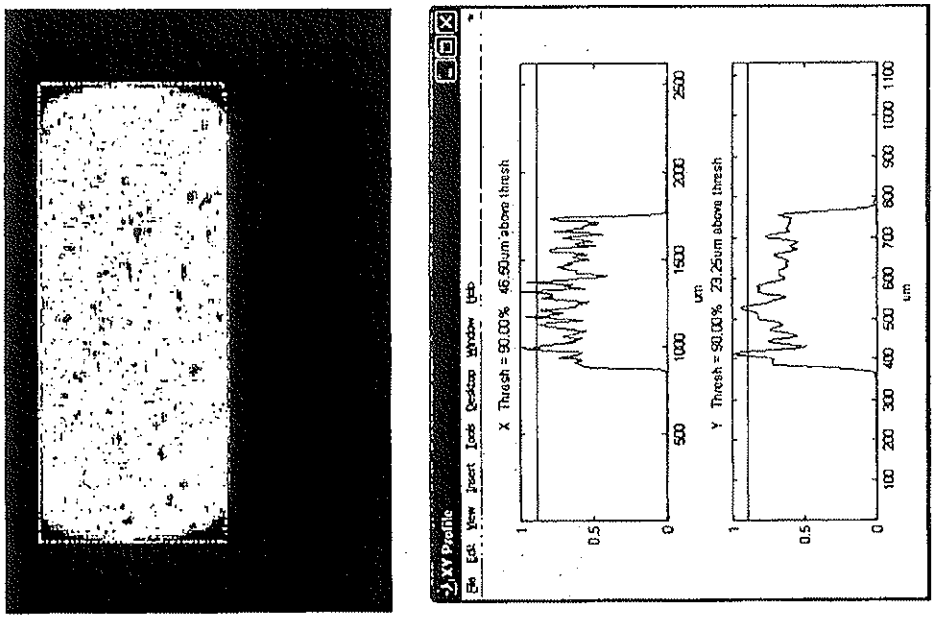
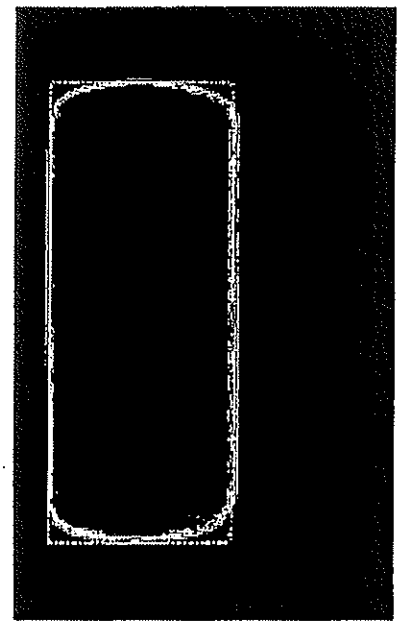


Fig. 35A



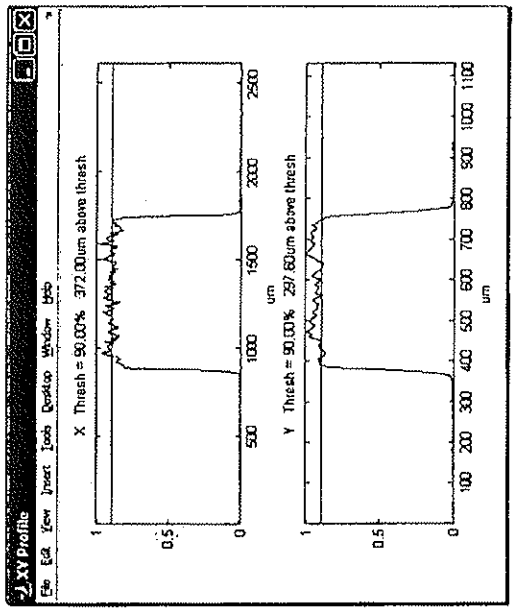
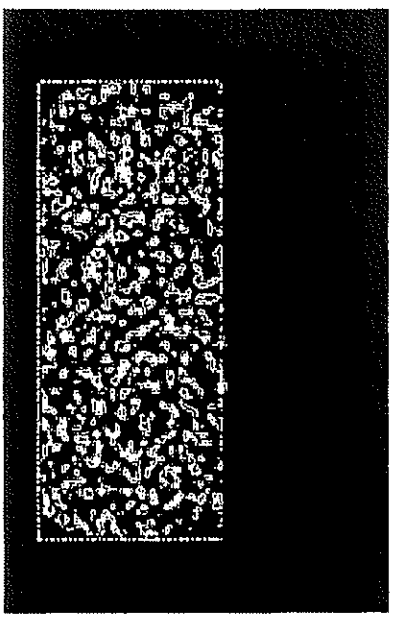


Fig. 35D



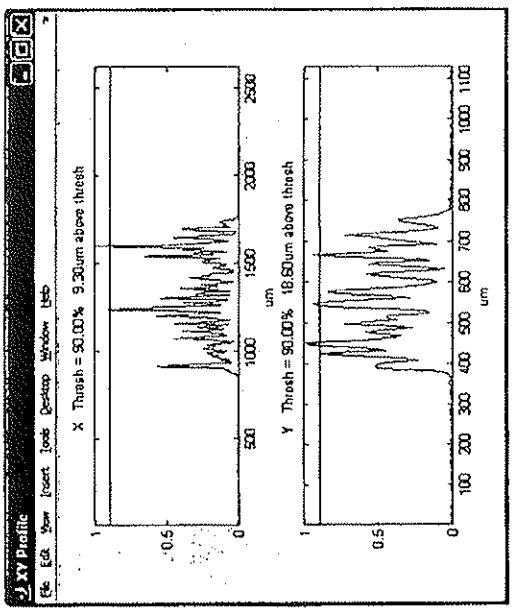


Fig. 35C

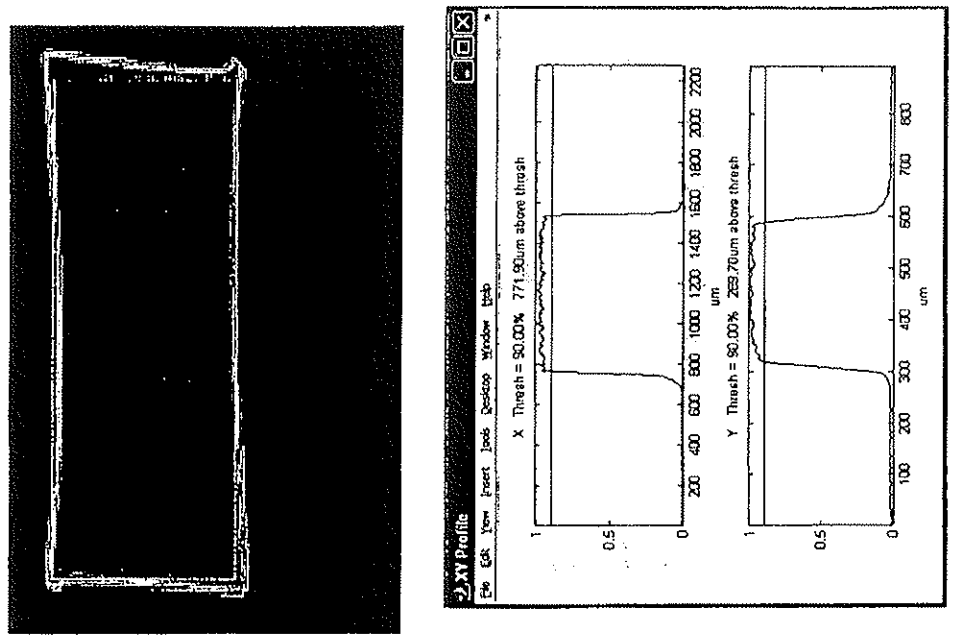


Fig. 35F

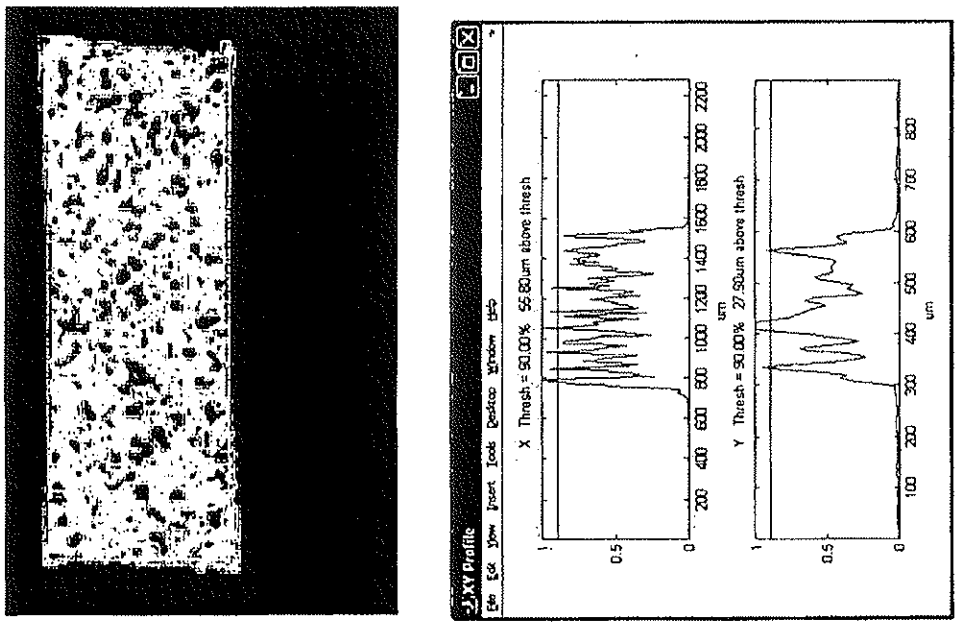
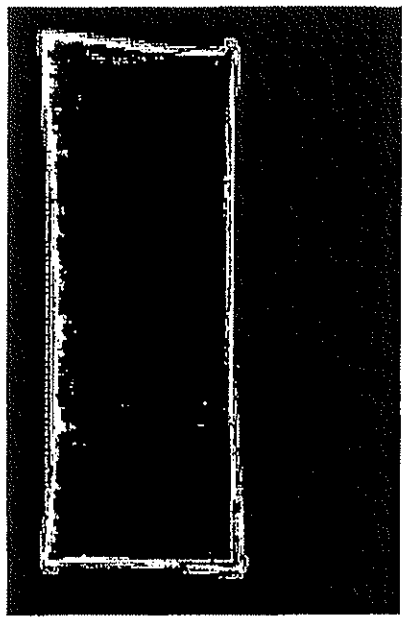


Fig. 35E



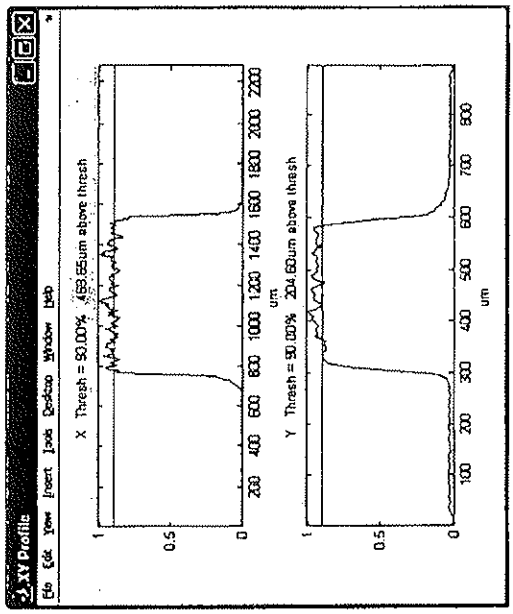
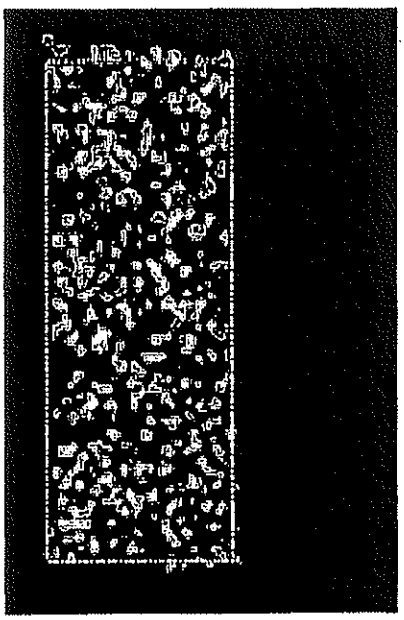


Fig. 35H



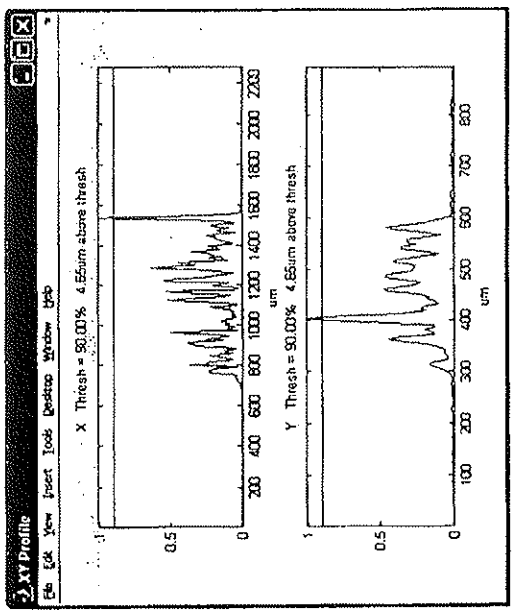


Fig. 35G

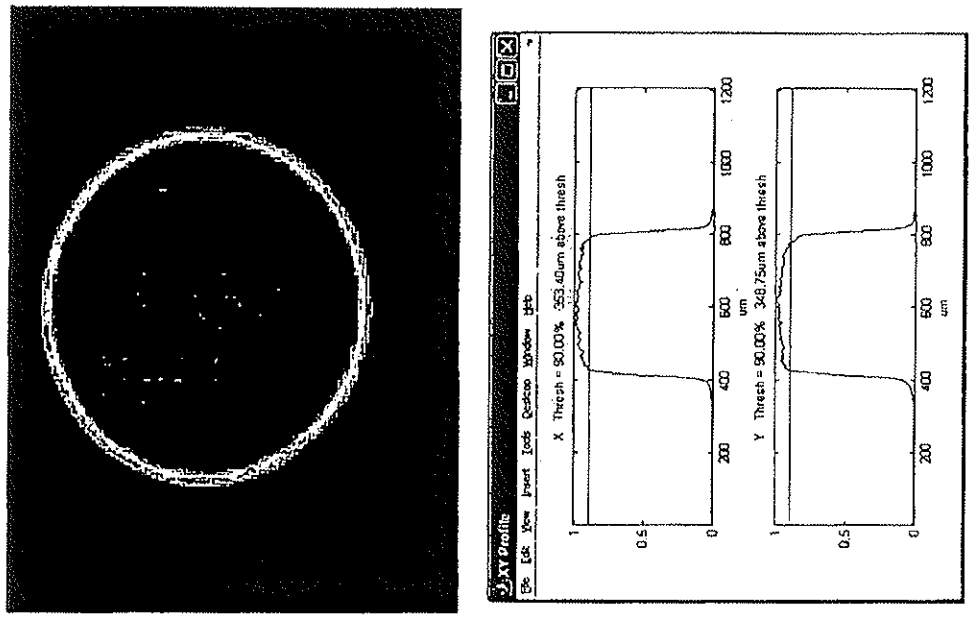


Fig. 35J

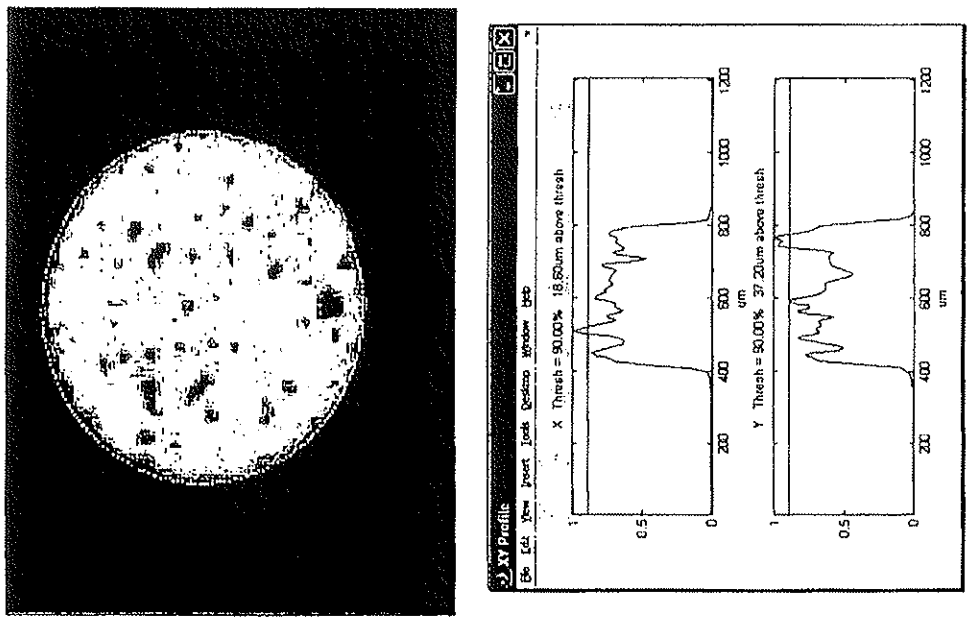


Fig. 35I

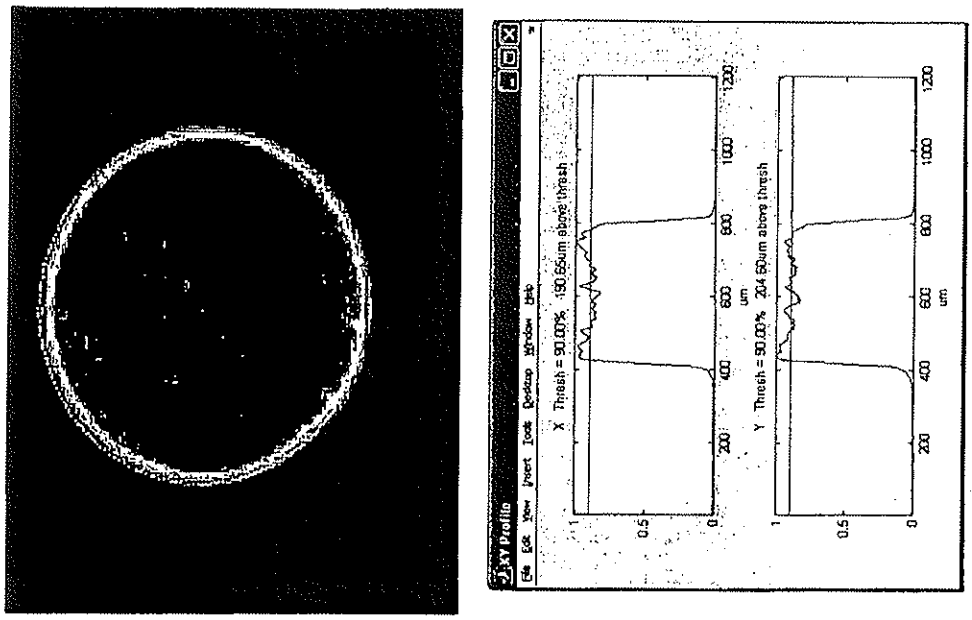


Fig. 35L

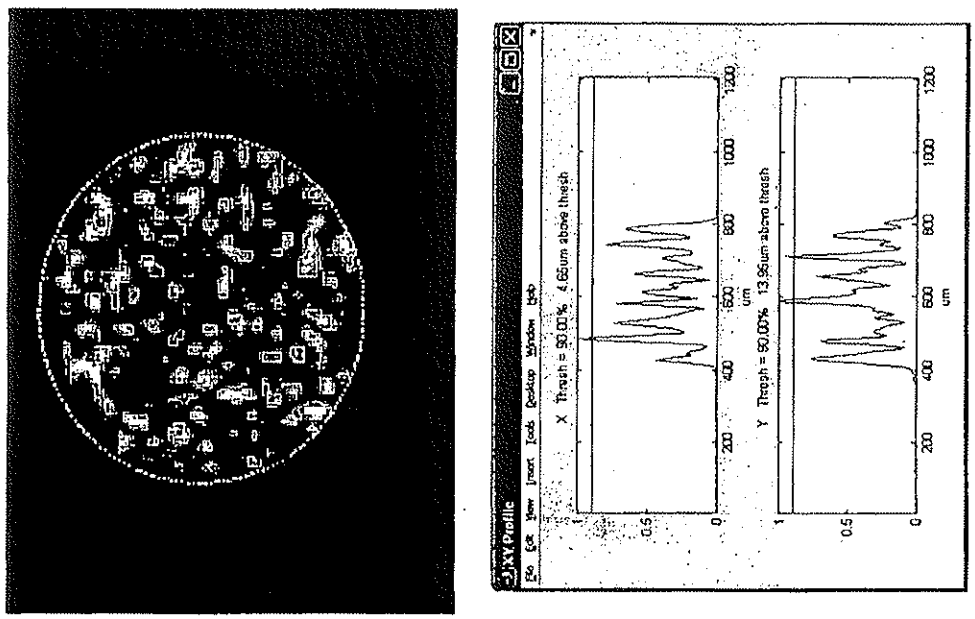


Fig. 35K

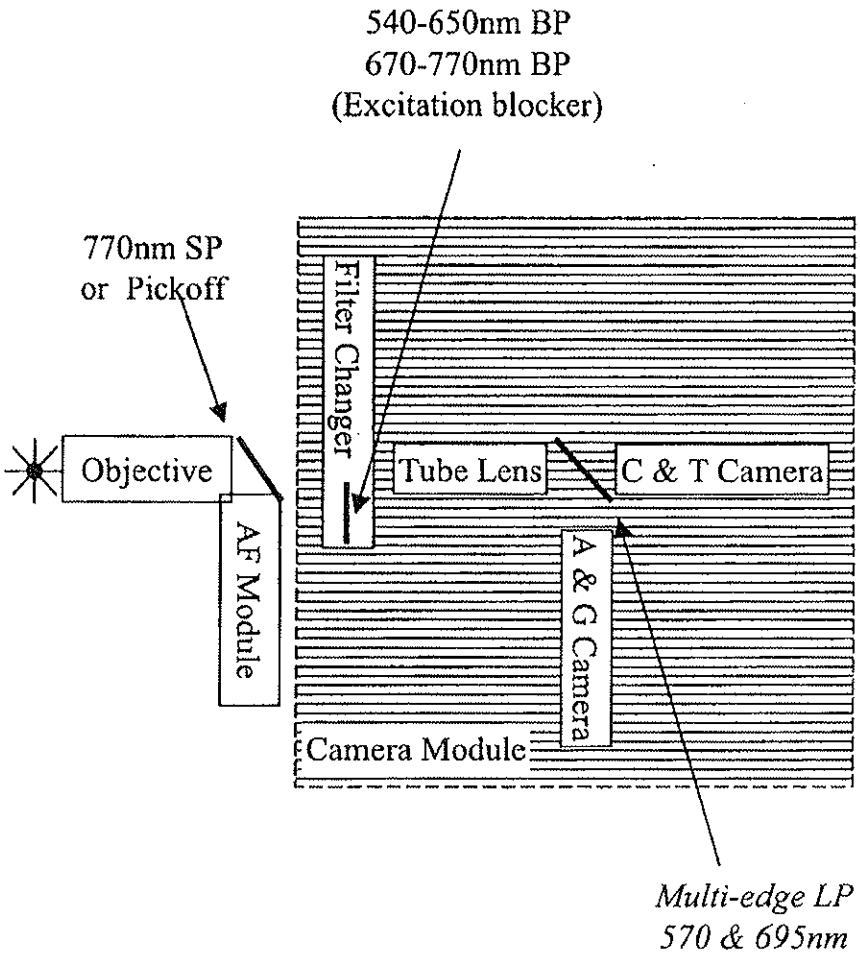

540-650nm BP
670-770nm BP
(Excitation blocker)
770nm SP
or Pickoff
Filter Changer
Objective
AF Module
Tube Lens
C & T Camera
A & G Camera
Camera Module
Multi-edge LP
570 & 695nm

Fig. 36

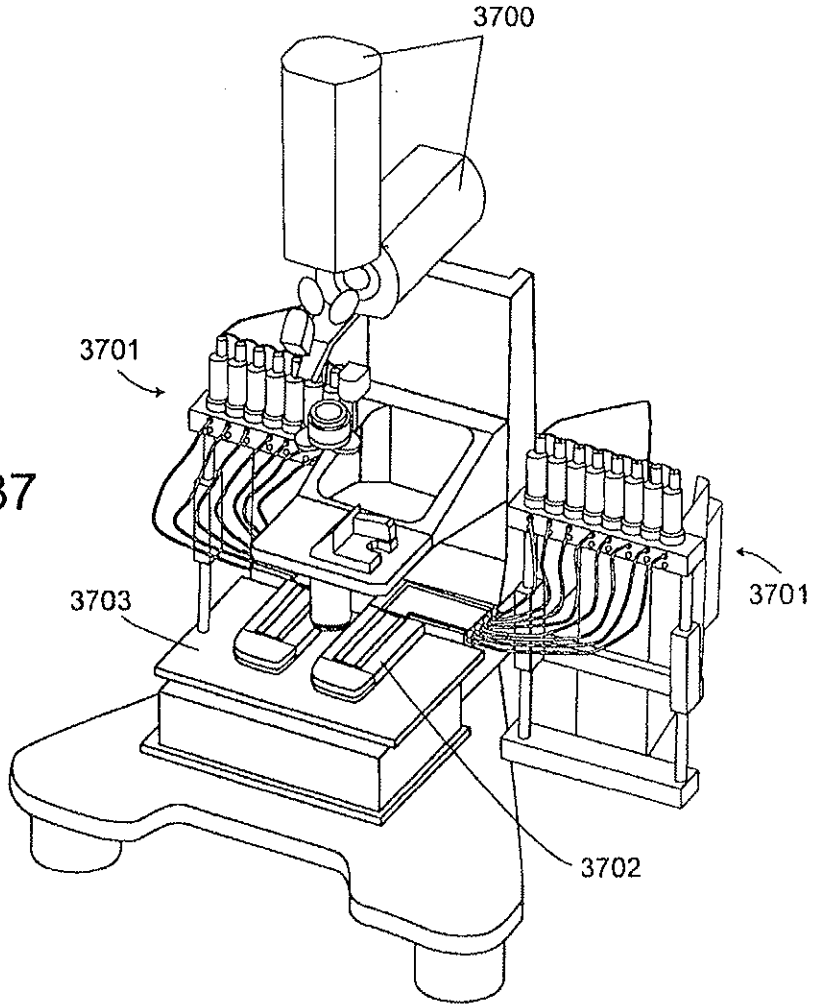


Fig. 37

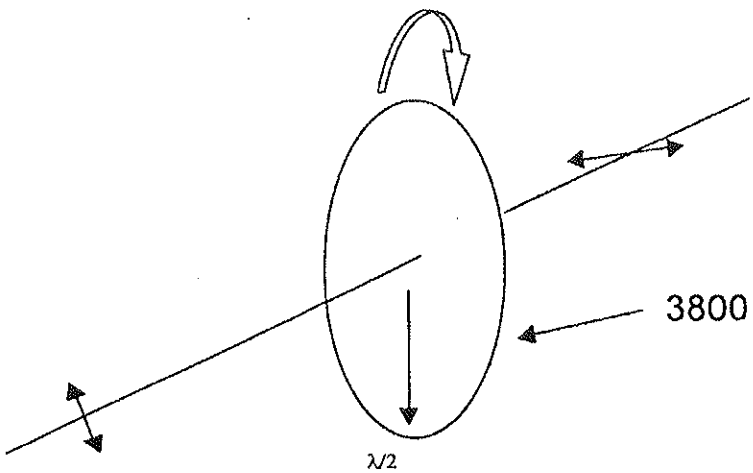


Fig. 38

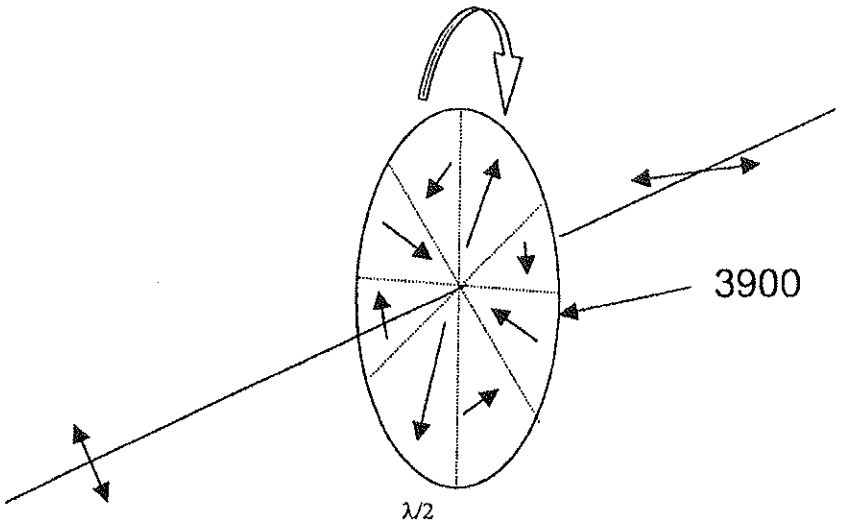


Fig. 39

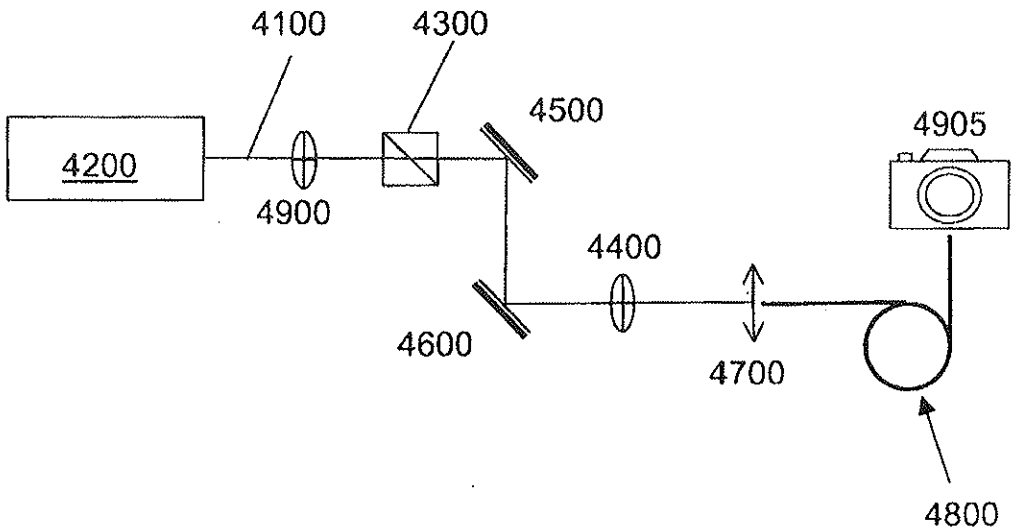


Fig. 40

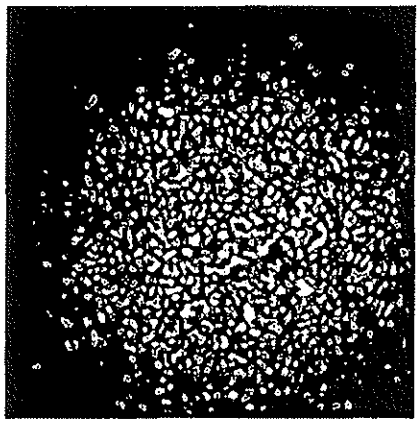


Fig. 41A

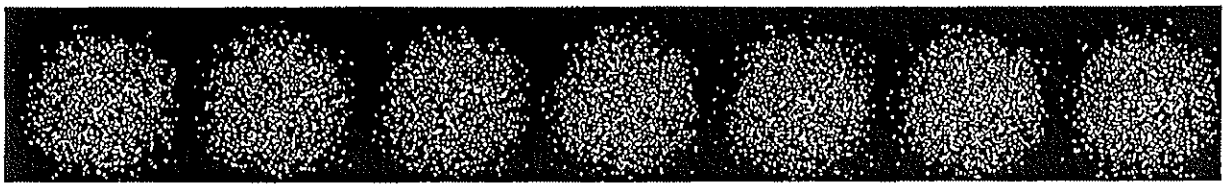


Fig. 41B

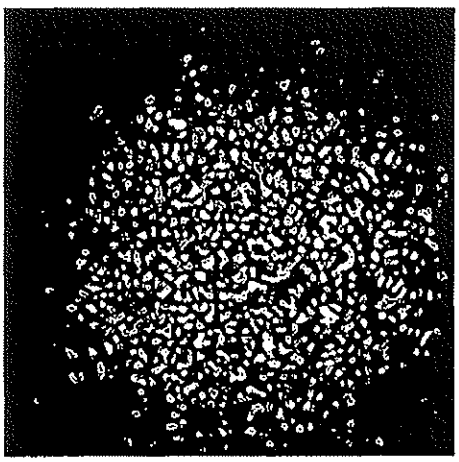


Fig. 41C

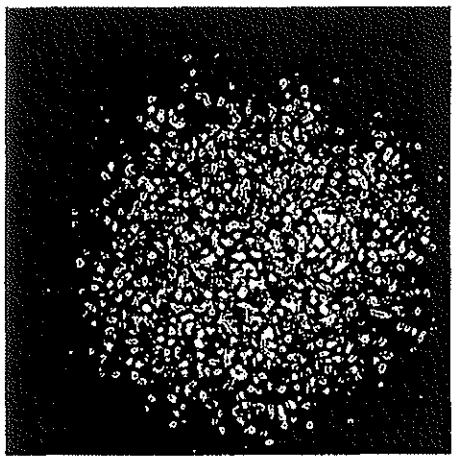


Fig. 41D

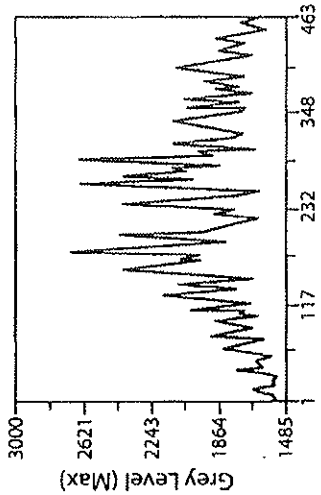


Fig. 42A

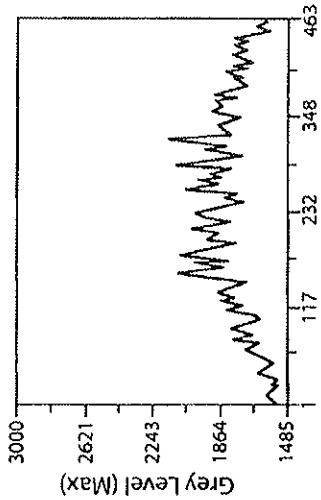


Fig. 42B

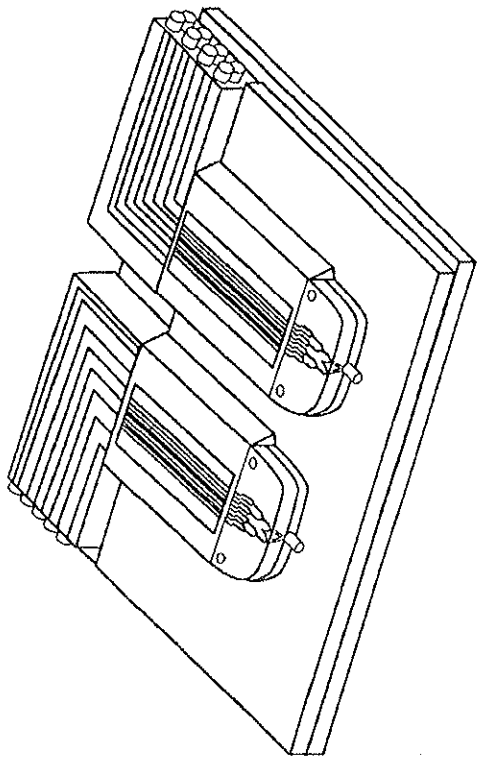


Fig. 43

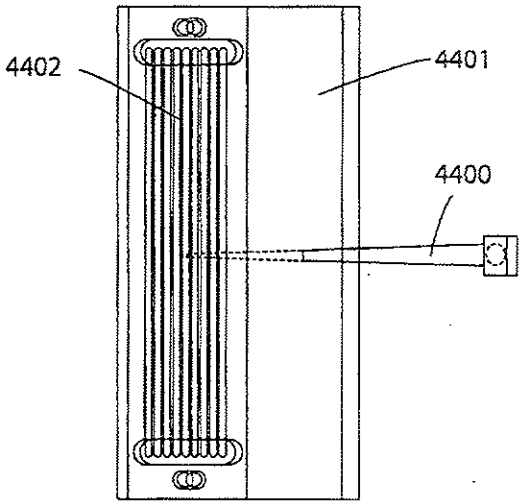


Fig. 44A

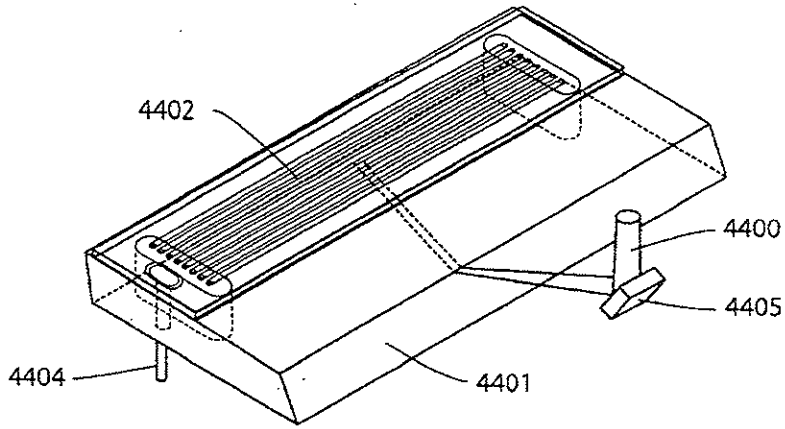


Fig. 44B

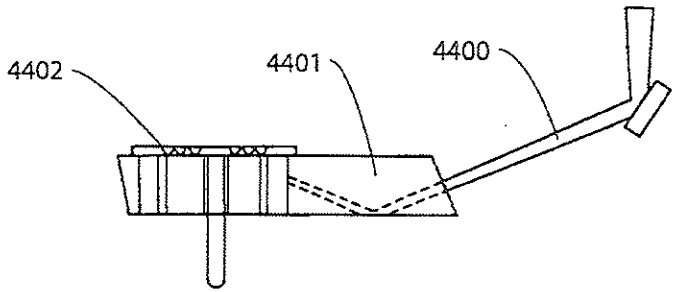


Fig. 44C

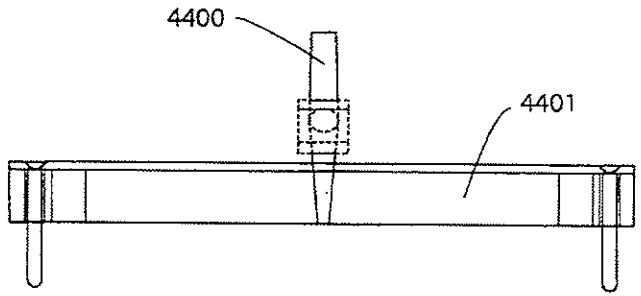


Fig. 44D

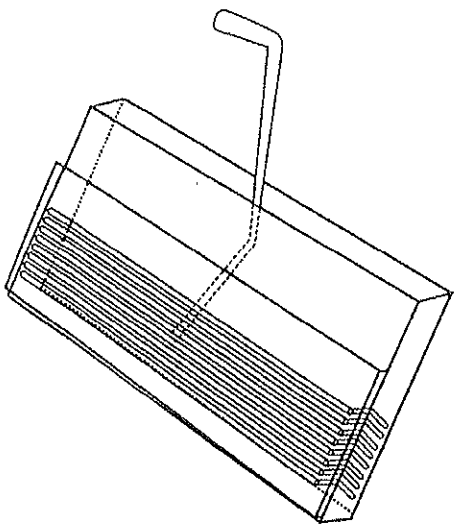


Fig. 44E

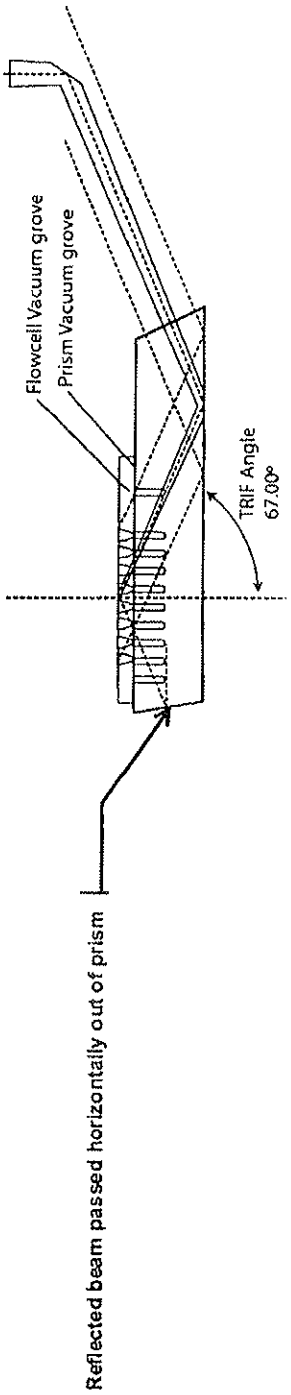


Fig. 44F

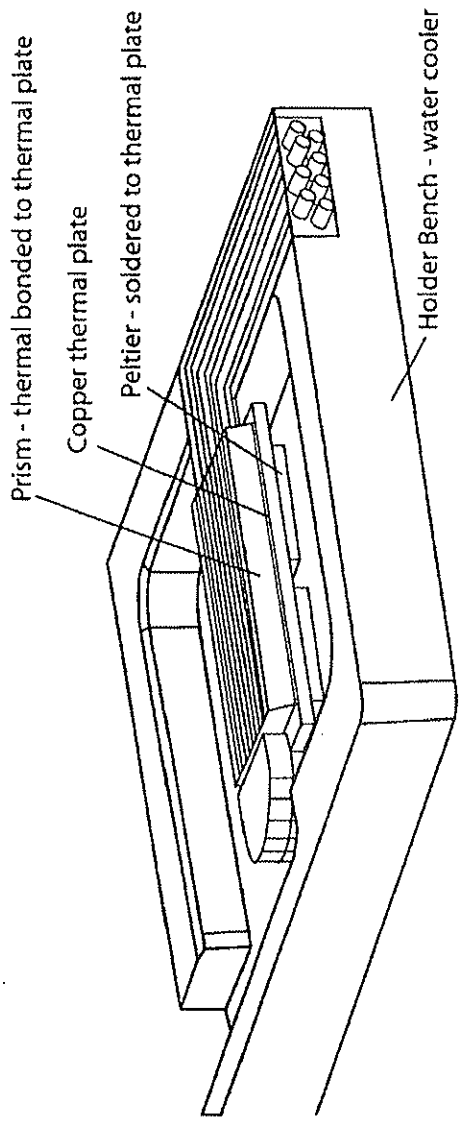

Prism - thermal bonded to thermal plate
Copper thermal plate
Peltier - soldered to thermal plate
Holder Bench - water cooler

Fig. 45

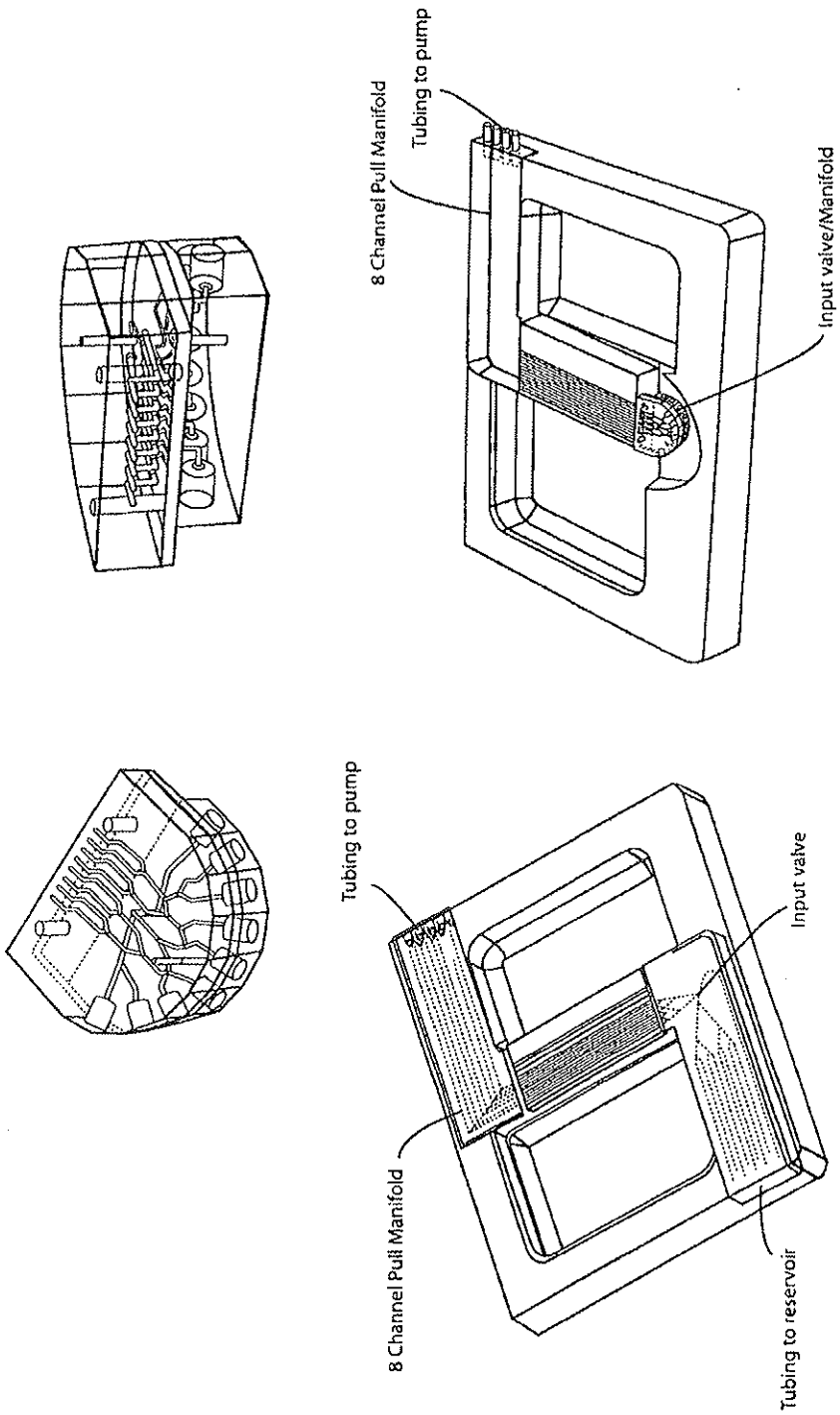

8 Channel Pull Manifold
Tubing to pump
Input valve/Manifold
Tubing to pump
Input valve
8 Channel Pull Manifold
Tubing to reservoir

Fig. 46

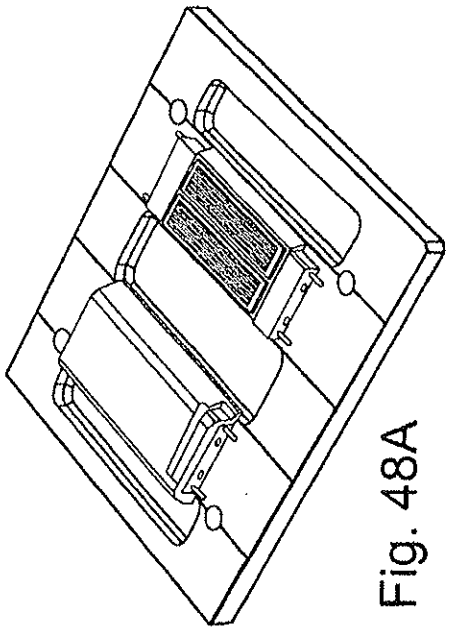


Fig. 48A

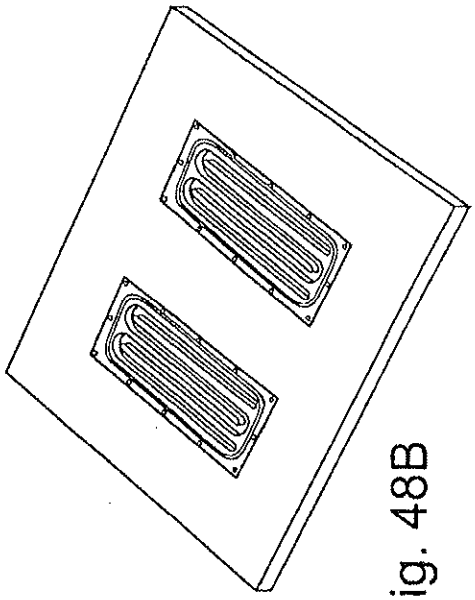


Fig. 48B

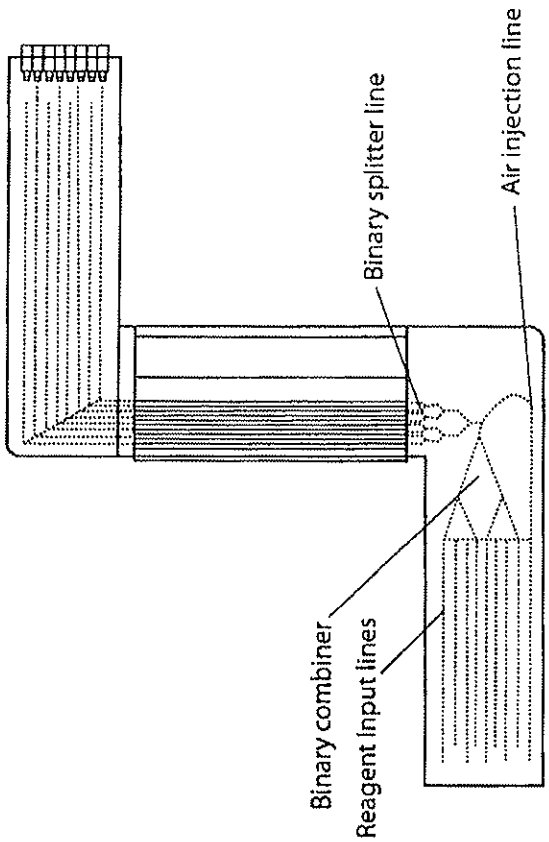


Fig. 47

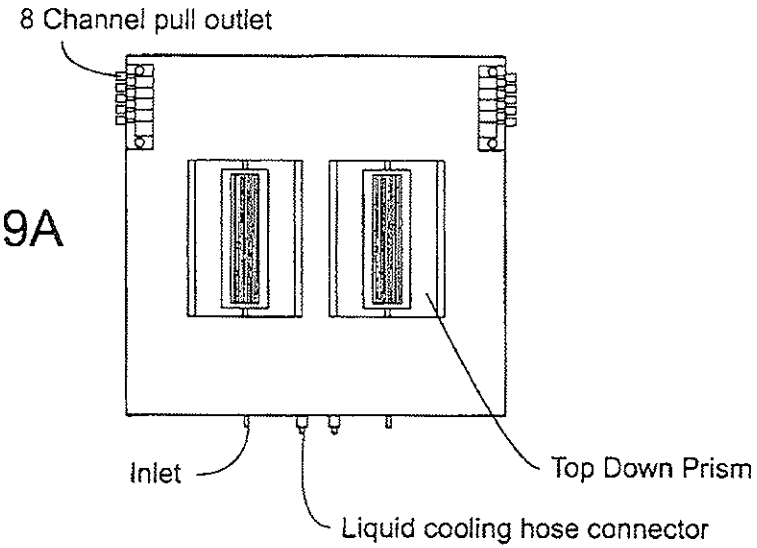


Fig. 49A

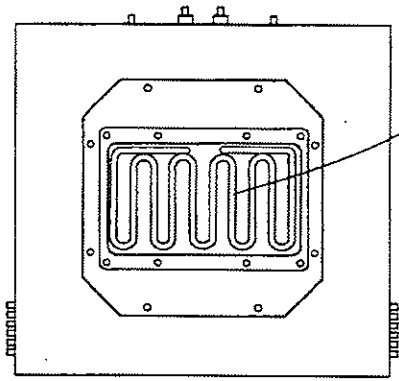


Fig. 49B

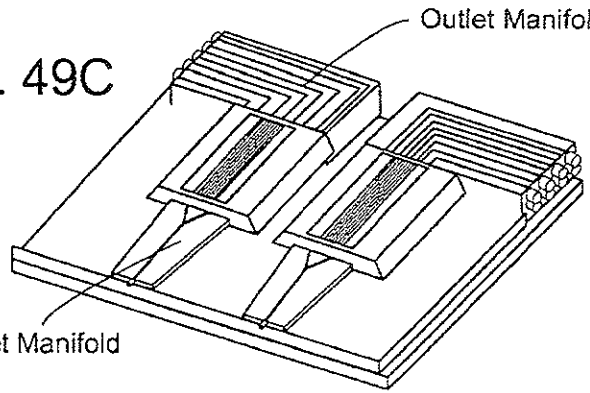


Fig. 49C

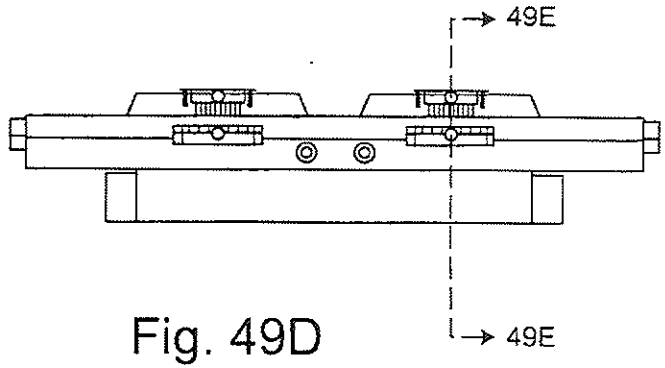


Fig. 49D

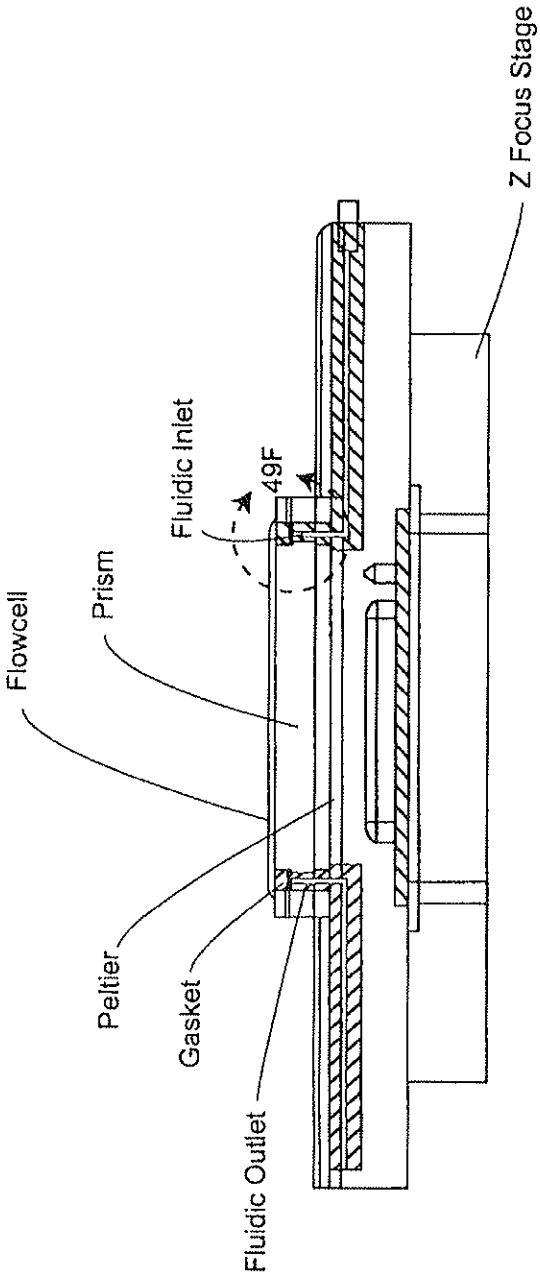


Fig. 49E

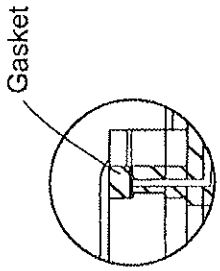


Fig. 49F