

FIG. 1

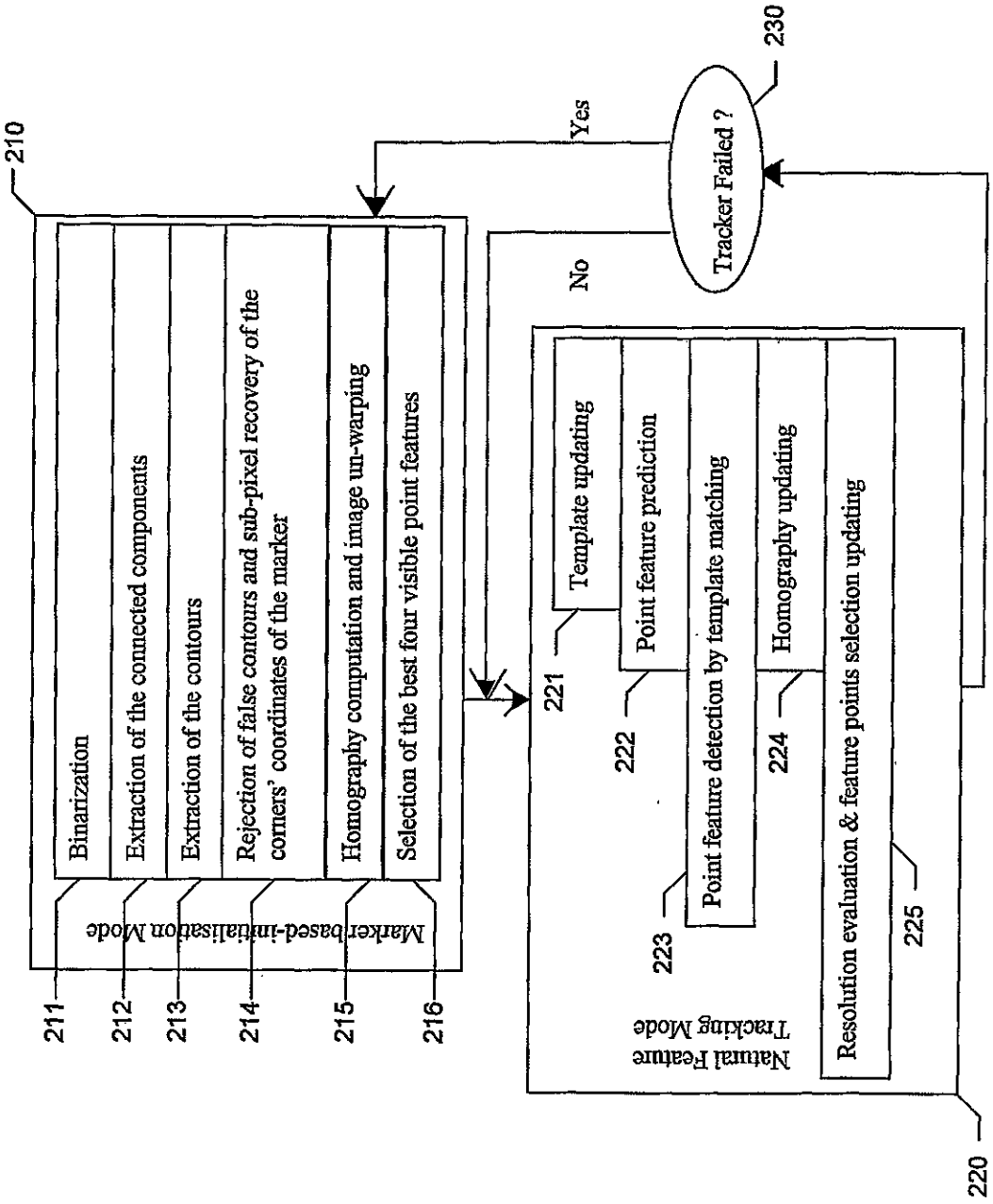
210
Marker based-initialisation Mode
Binarization
Extraction of the connected components
Extraction of the contours
Rejection of false contours and sub-pixel recovery of the corners' coordinates of the marker
Homography computation and image un-warping
Selection of the best four visible point features
211
212
213
214
215
216
Yes
No
Tracker Failed ?
230
Natural Feature Tracking Mode
Template updating
Point feature prediction
Point feature detection by template matching
Homography updating
Resolution evaluation & feature points selection updating
221
222
223
224
225
220

FIG. 2

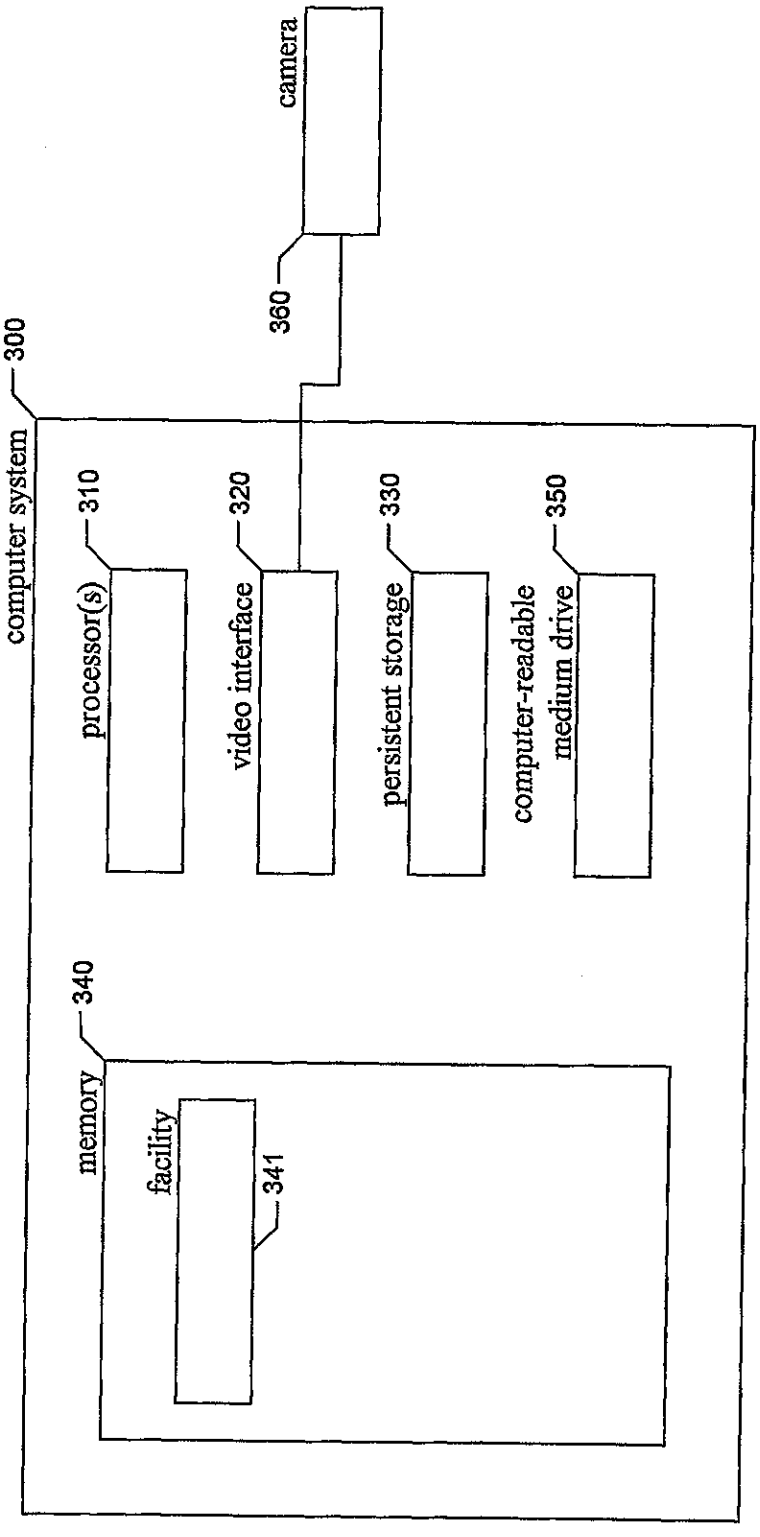
camera
360
300
computer system
processor(s)
310
video interface
320
persistent storage
330
computer-readable medium drive
350
memory
340
facility
341

FIG. 3

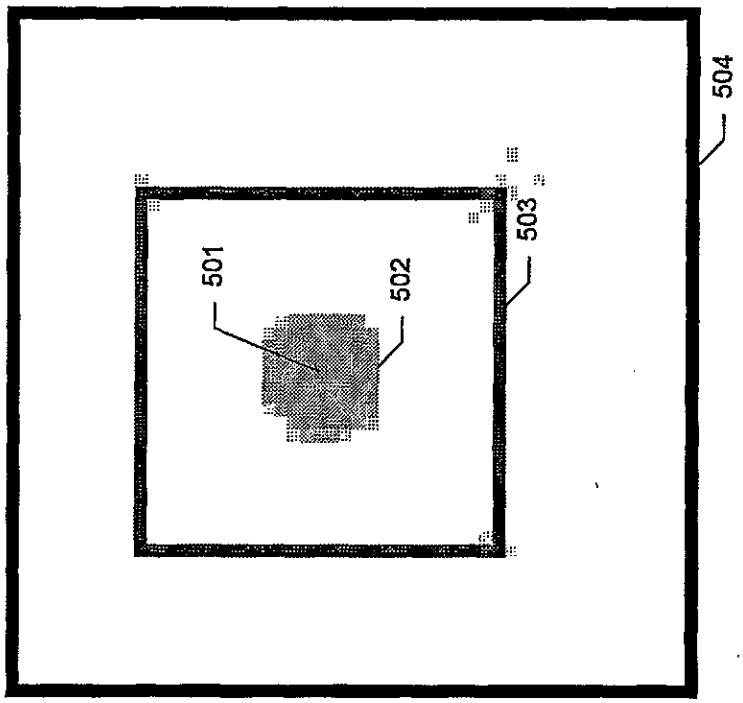
504
503
501
502

FIG. 5

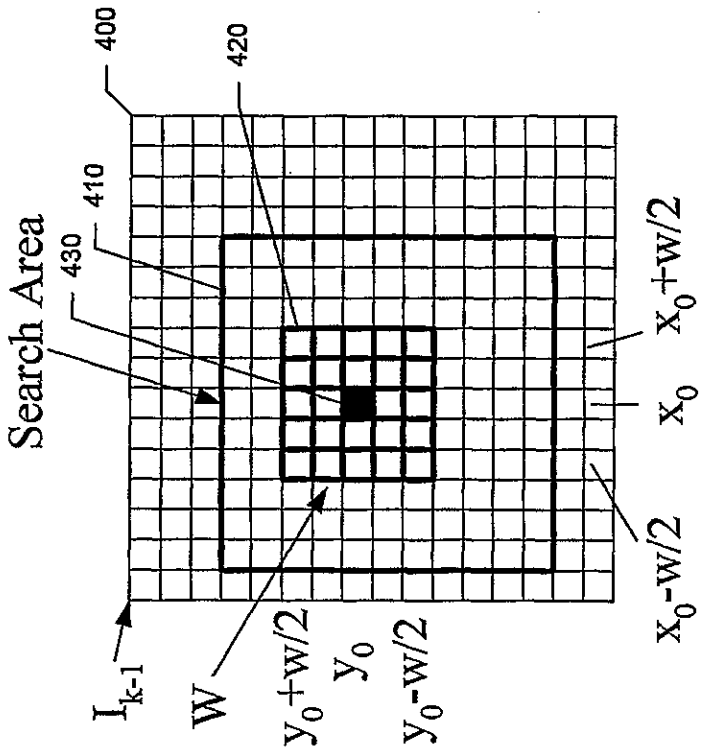
400
420
410
430
Search Area
I_{k-1}
W
$y_0+w/2$
y_0
$y_0-w/2$
$x_0-w/2$
x_0
$x_0+w/2$

FIG. 4

FIG. 6A



FIG. 6B





FIG. 7

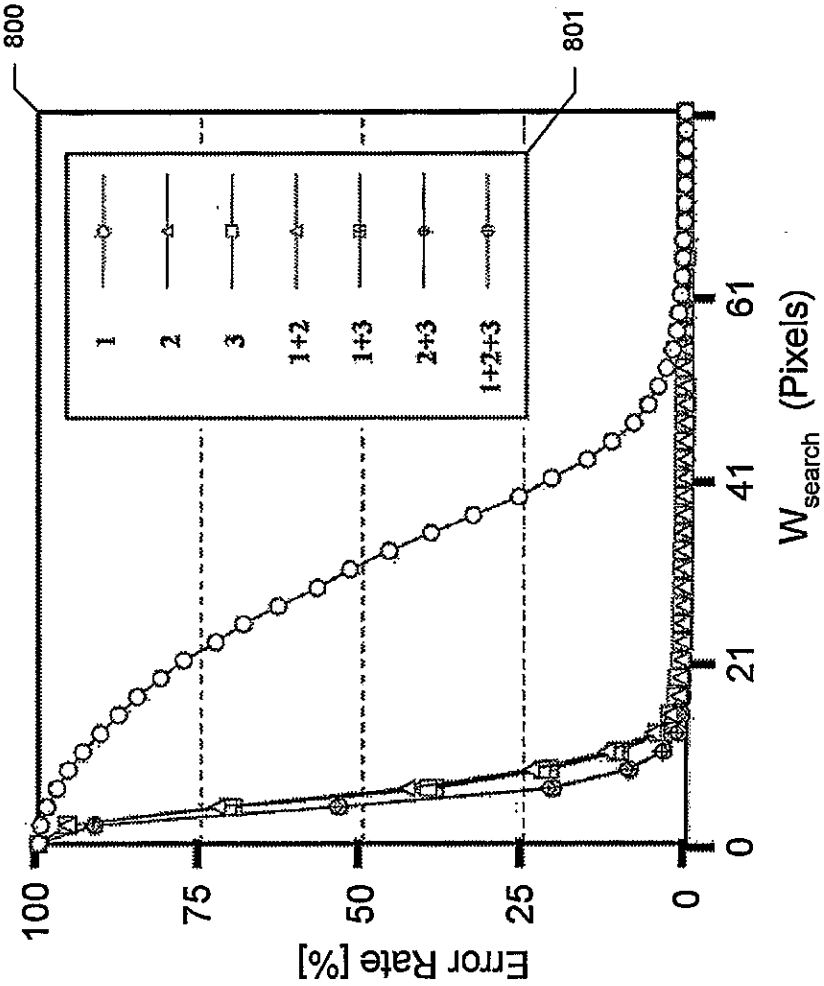
800
801
1
2
3
1+2
1+3
2+3
1+2+3
100
75
50
25
0
Error Rate [%]
0
21
41
61
W_{search} (Pixels)

FIG. 8

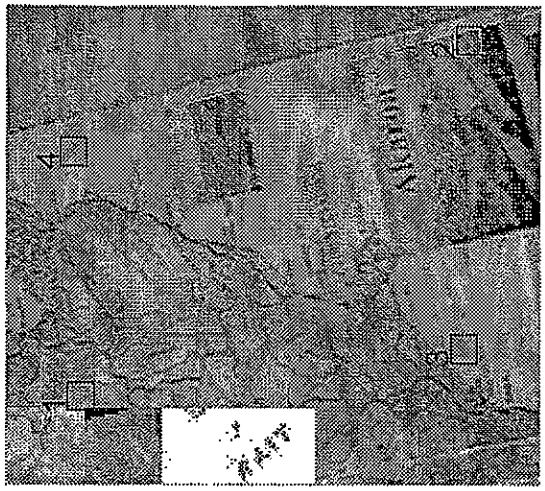

FIG. 9C

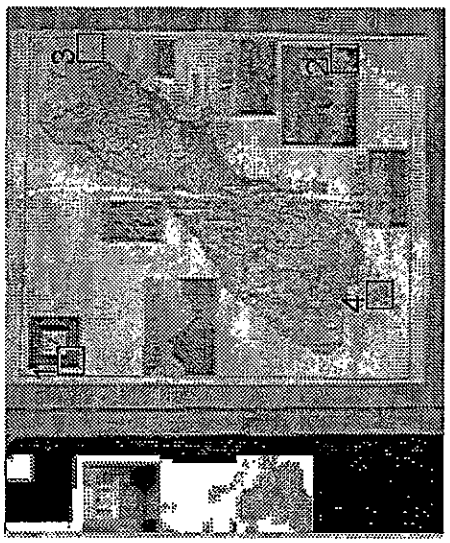

FIG. 9B

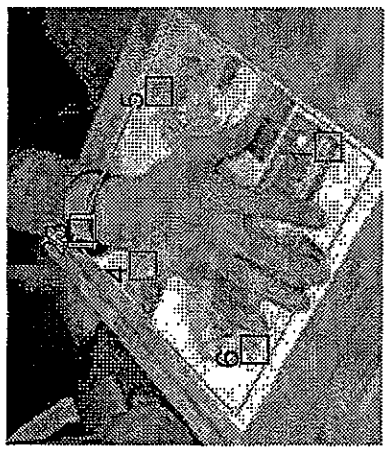

FIG. 10B

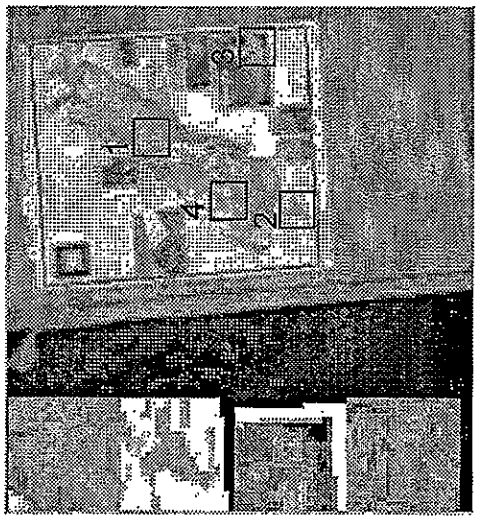

FIG. 9A

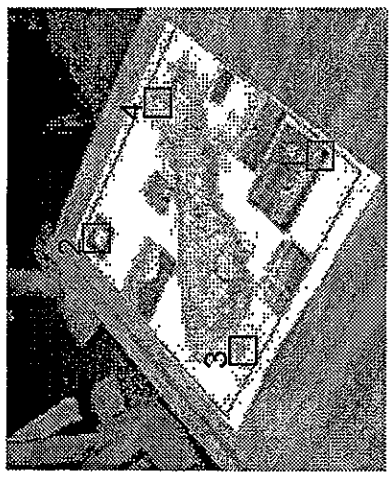

FIG. 10A

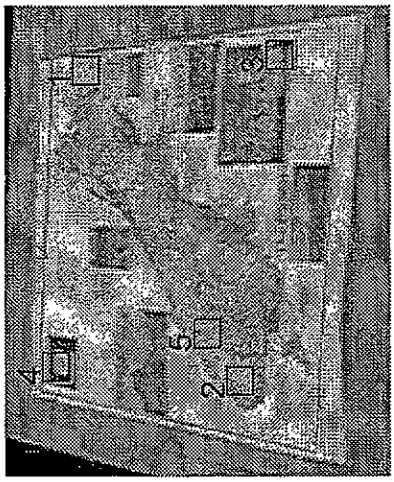

FIG. 11C



FIG. 11D

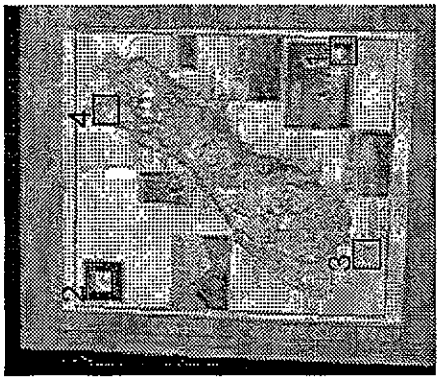

FIG. 11A

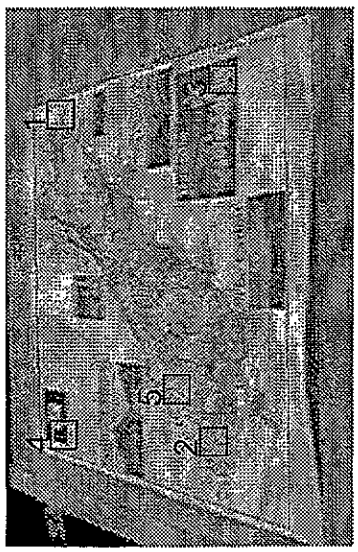

FIG. 11B

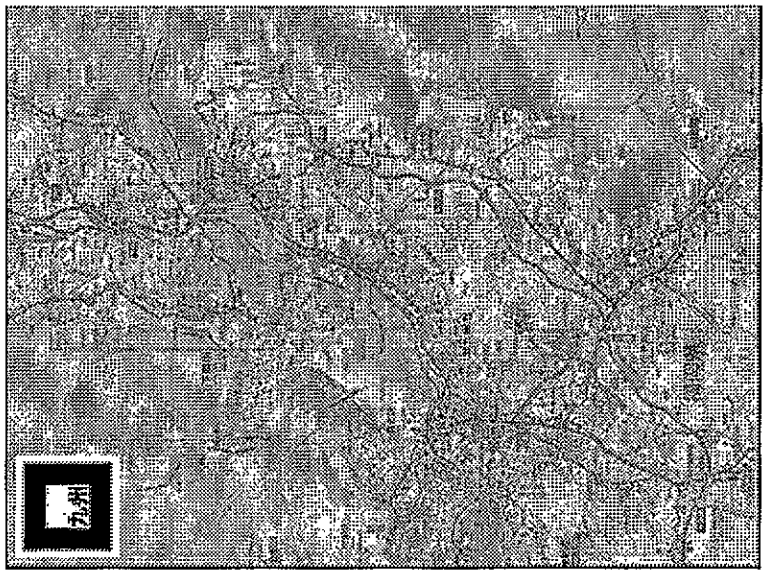

FIG. 12B

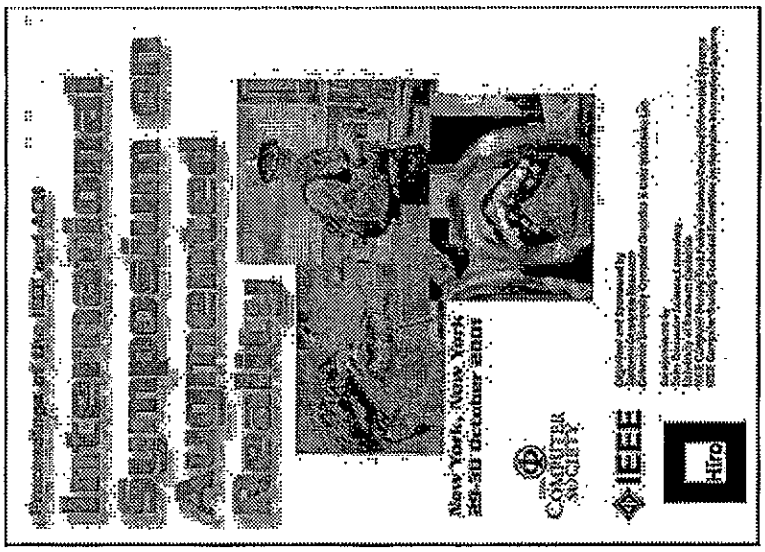

FIG. 12A

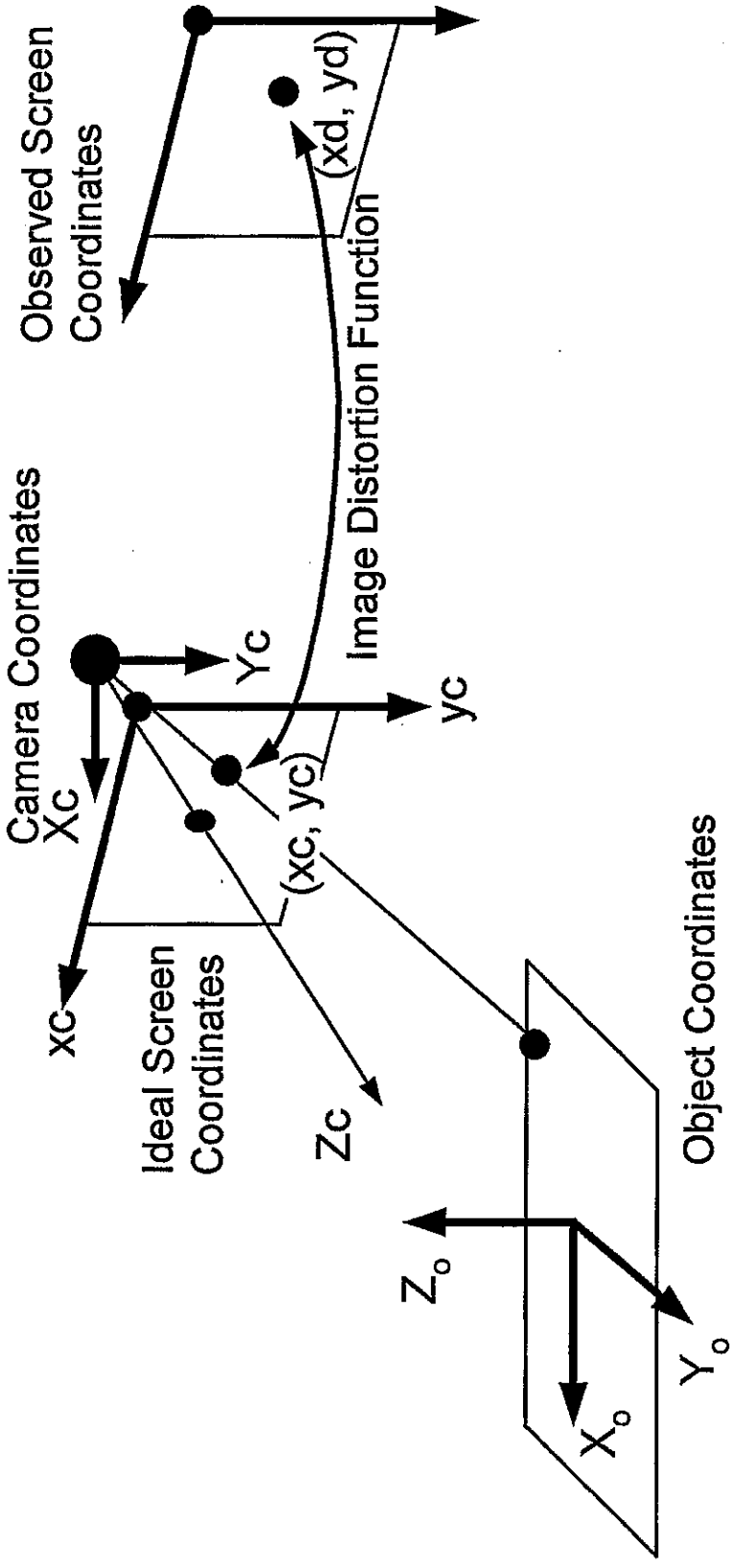
Observed Screen Coordinates
(xd, yd)
Image Distortion Function
Camera Coordinates
Xc
Yc
yc
(xc, yc)
xc
Ideal Screen Coordinates
Zc
Object Coordinates
Zo
Yo
Xo

FIG. 13

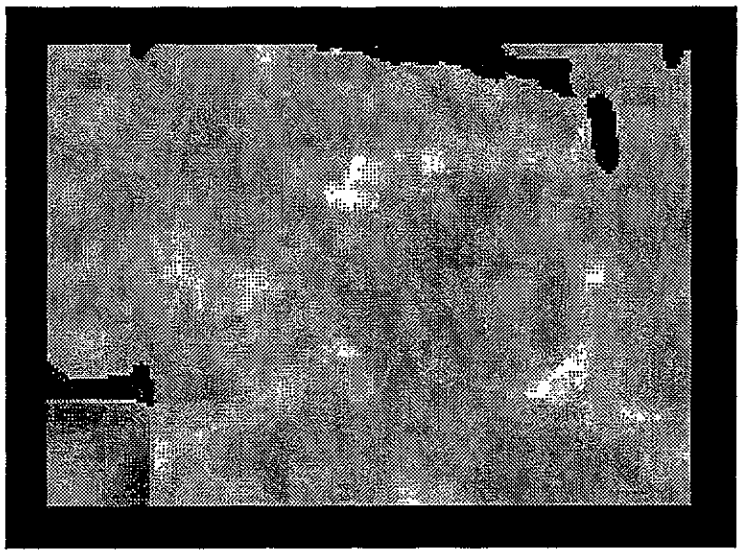

FIG. 14B

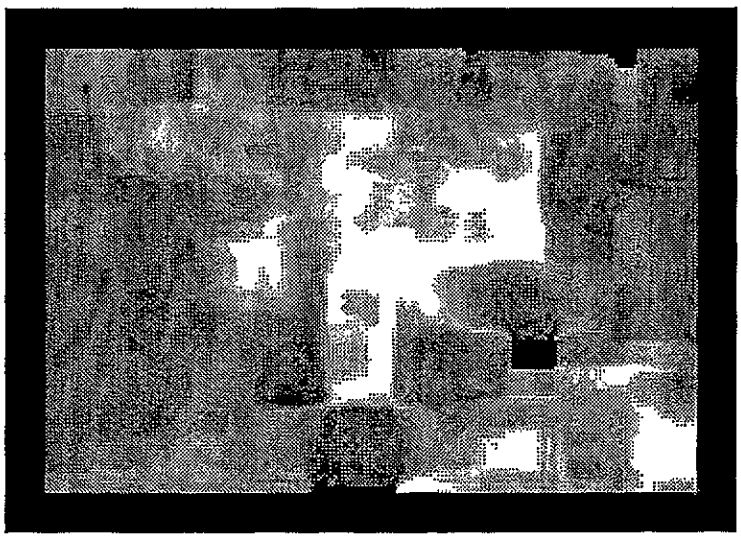

FIG. 14A

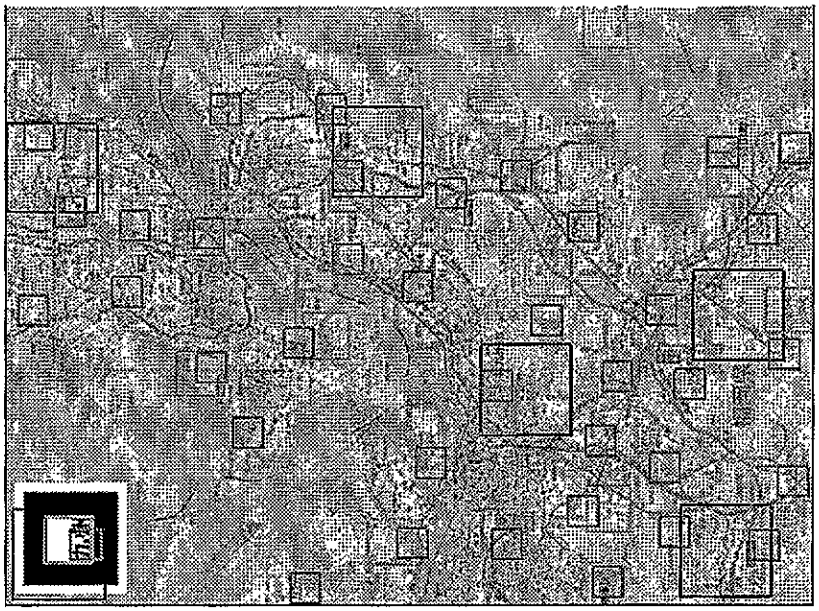

FIG. 15B

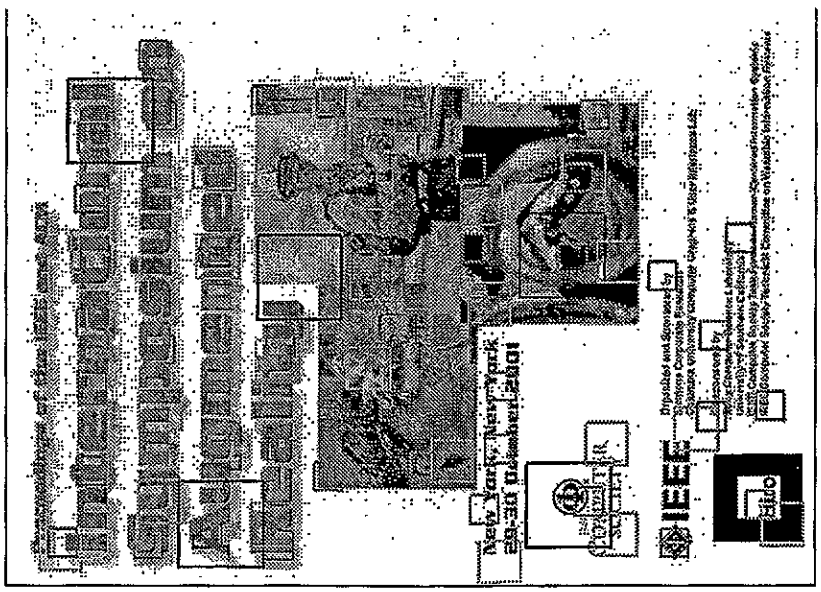

FIG. 15A



FIG. 16C

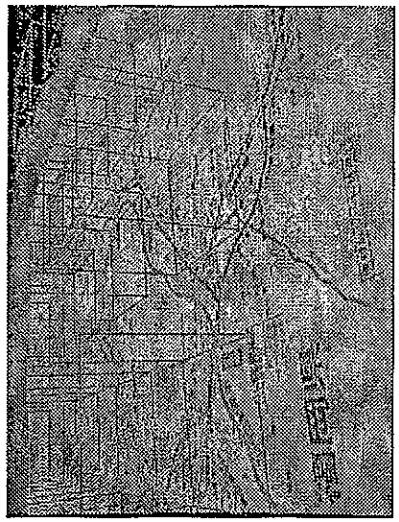

FIG. 16F

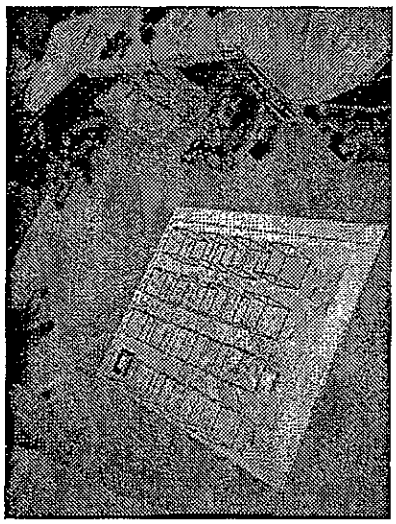

FIG. 16B

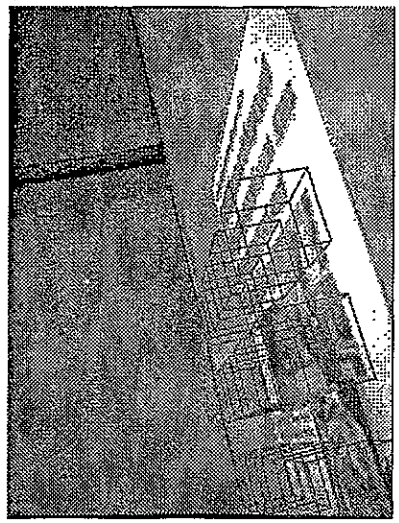

FIG. 16E

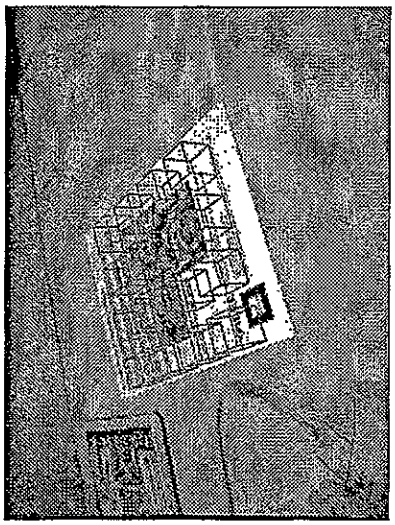

FIG. 16A



FIG. 16D

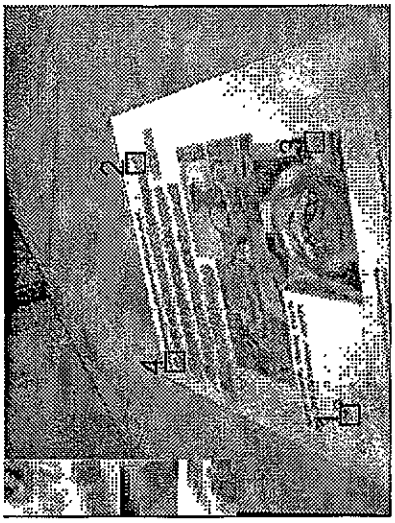

FIG. 17A

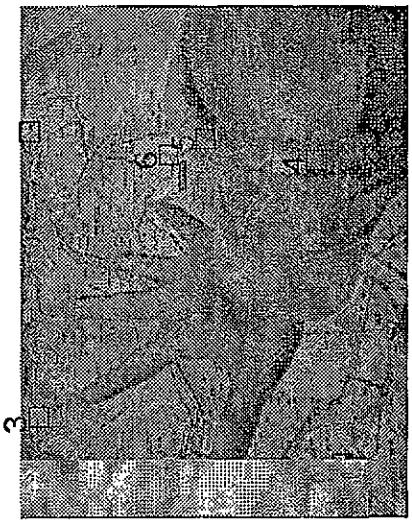

FIG. 17D



FIG. 16H

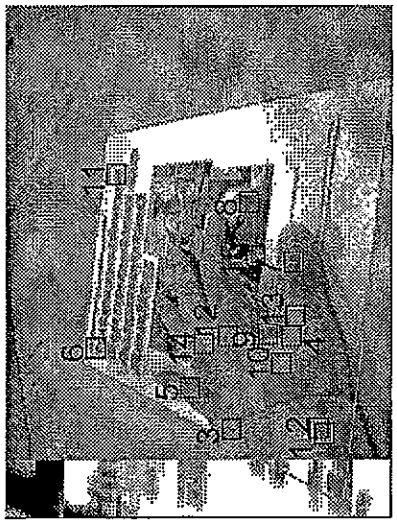

FIG. 17C

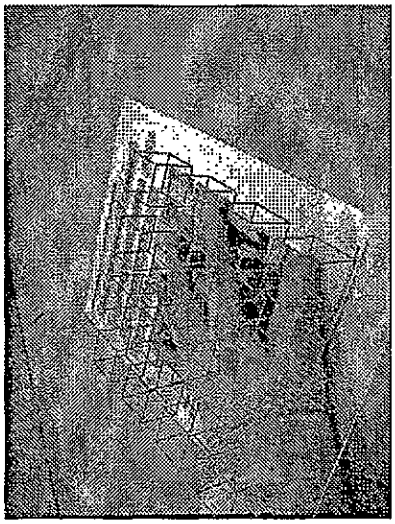

FIG. 16G



FIG. 17B