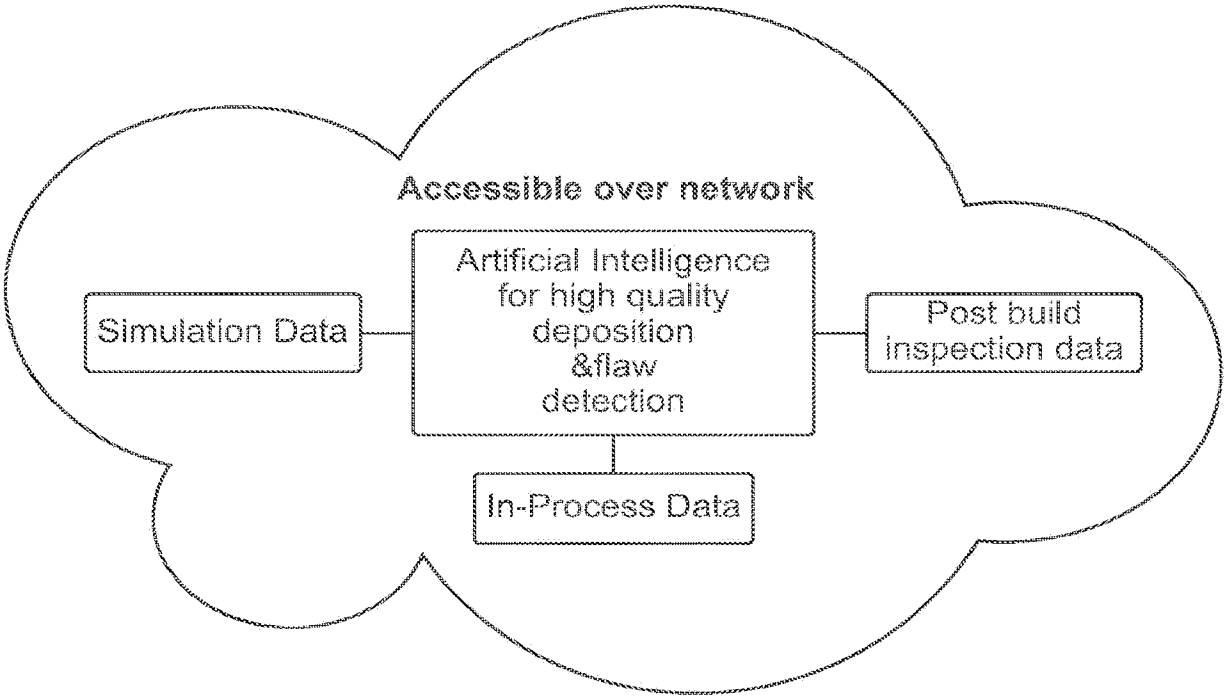

Accessible over network
Artificial Intelligence for high quality deposition &flaw detection
Simulation Data
Post build inspection data
In-Process Data

FIG. 1

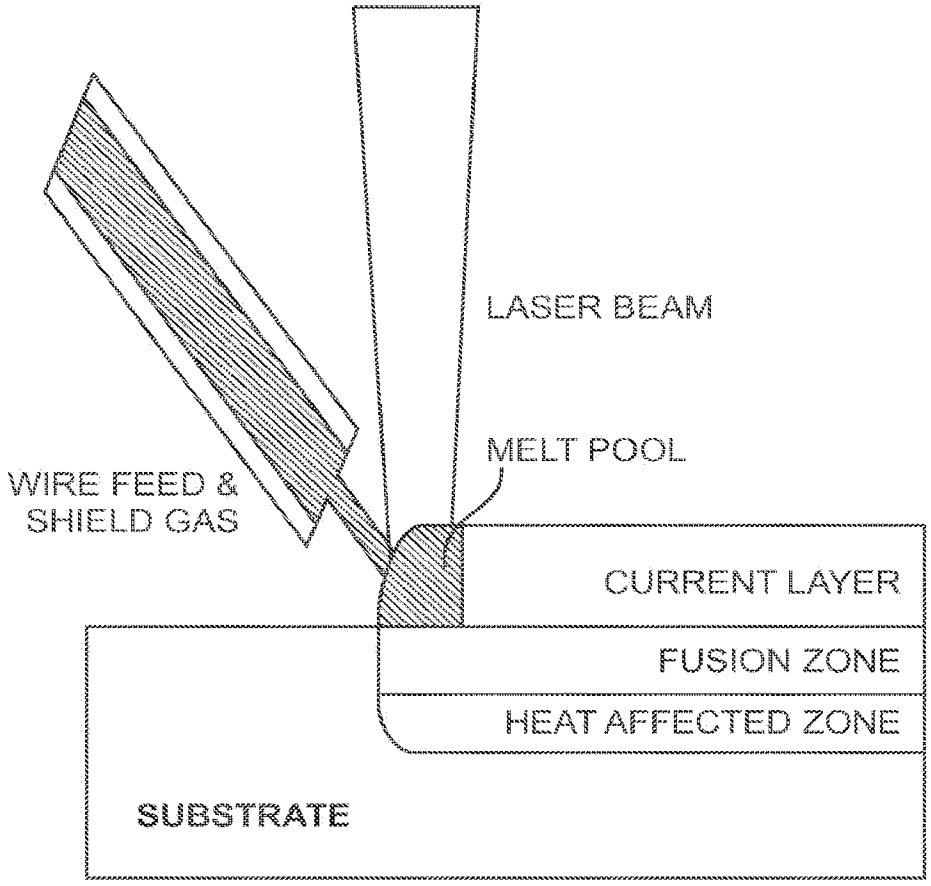

LASER BEAM
MELT POOL
WIRE FEED &
SHIELD GAS
CURRENT LAYER
FUSION ZONE
HEAT AFFECTED ZONE
SUBSTRATE

FIG. 2

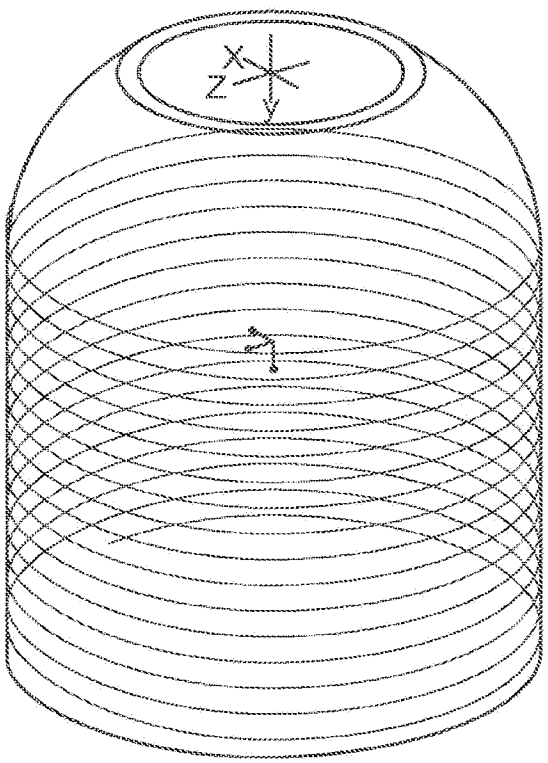


FIG. 3A

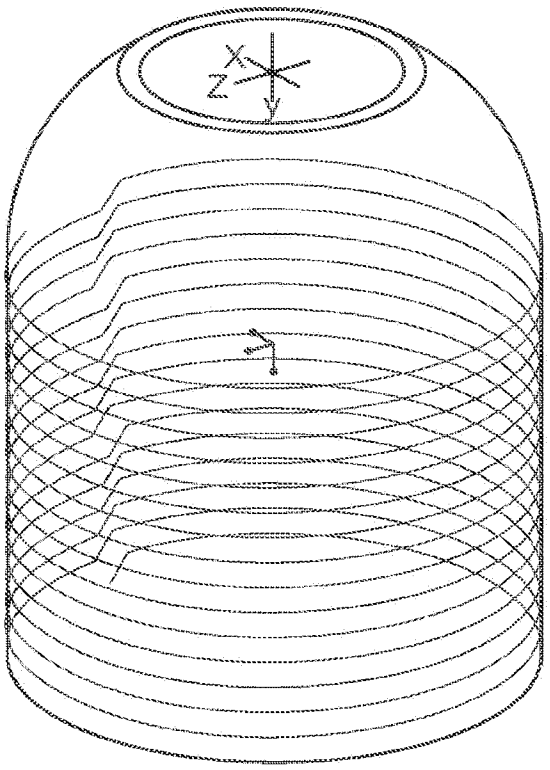


FIG. 3B

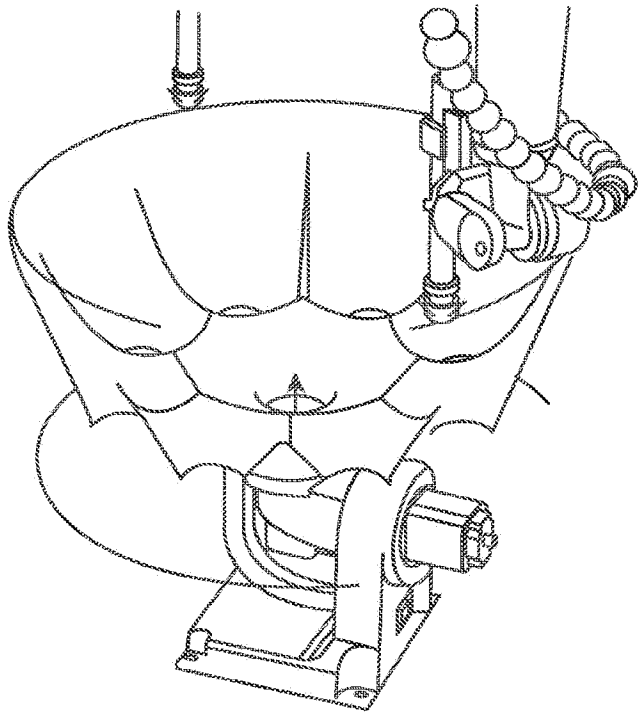


FIG. 3C


1.00e+00
9.50e-01
9.00e-01
8.50e-01
8.00e-01
7.50e-01
7.00e-01
6.50e-01
6.00e-01
5.50e-01
5.00e-01
4.50e-01
4.00e-01
3.50e-01
3.00e-01
2.50e-01
2.00e-01
1.50e-01
1.00e-01
5.00e-02
0.00e+00

FIG. 4B

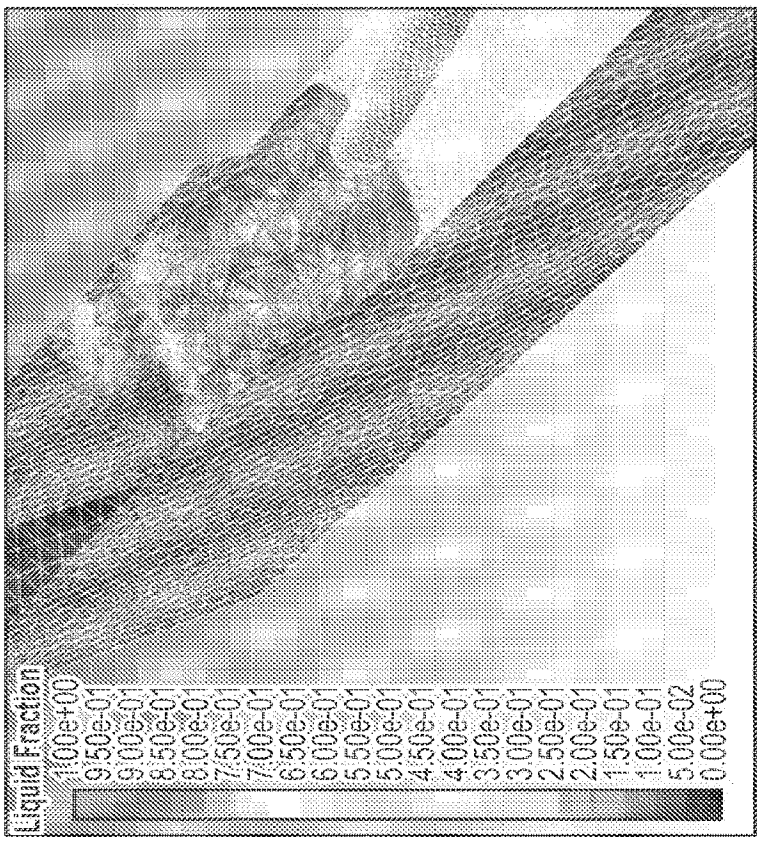

Liquid Fraction
1.00e+00
9.50e-01
9.00e-01
8.50e-01
8.00e-01
7.50e-01
7.00e-01
6.50e-01
6.00e-01
5.50e-01
5.00e-01
4.50e-01
4.00e-01
3.50e-01
3.00e-01
2.50e-01
2.00e-01
1.50e-01
1.00e-01
5.00e-02
0.00e+00

FIG. 4A

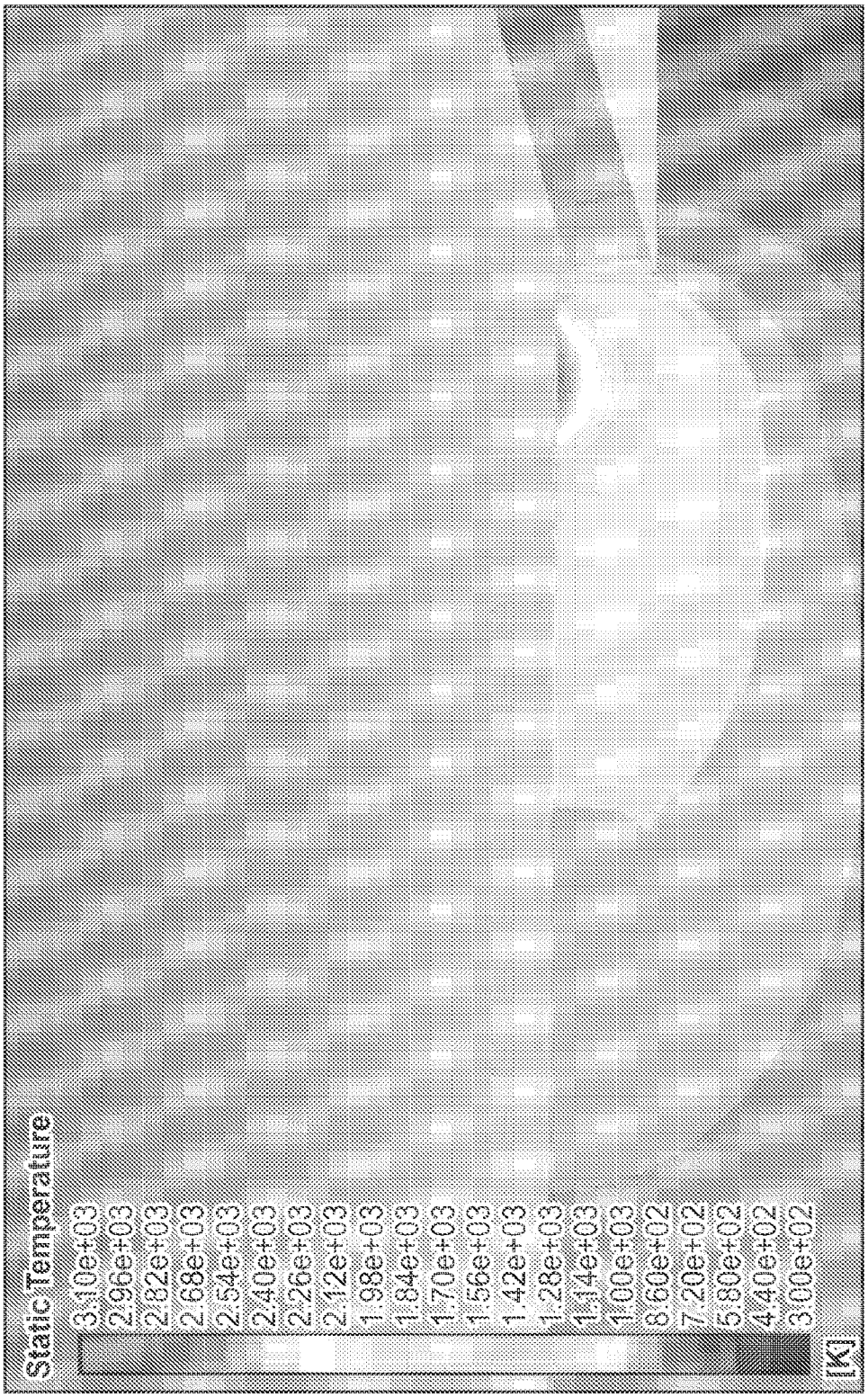

Static Temperature
3.10e+03
2.96e+03
2.82e+03
2.68e+03
2.54e+03
2.40e+03
2.26e+03
2.12e+03
1.98e+03
1.84e+03
1.70e+03
1.56e+03
1.42e+03
1.28e+03
1.14e+03
1.00e+03
8.60e+02
7.20e+02
5.80e+02
4.40e+02
3.00e+02
[K]

FIG. 4C

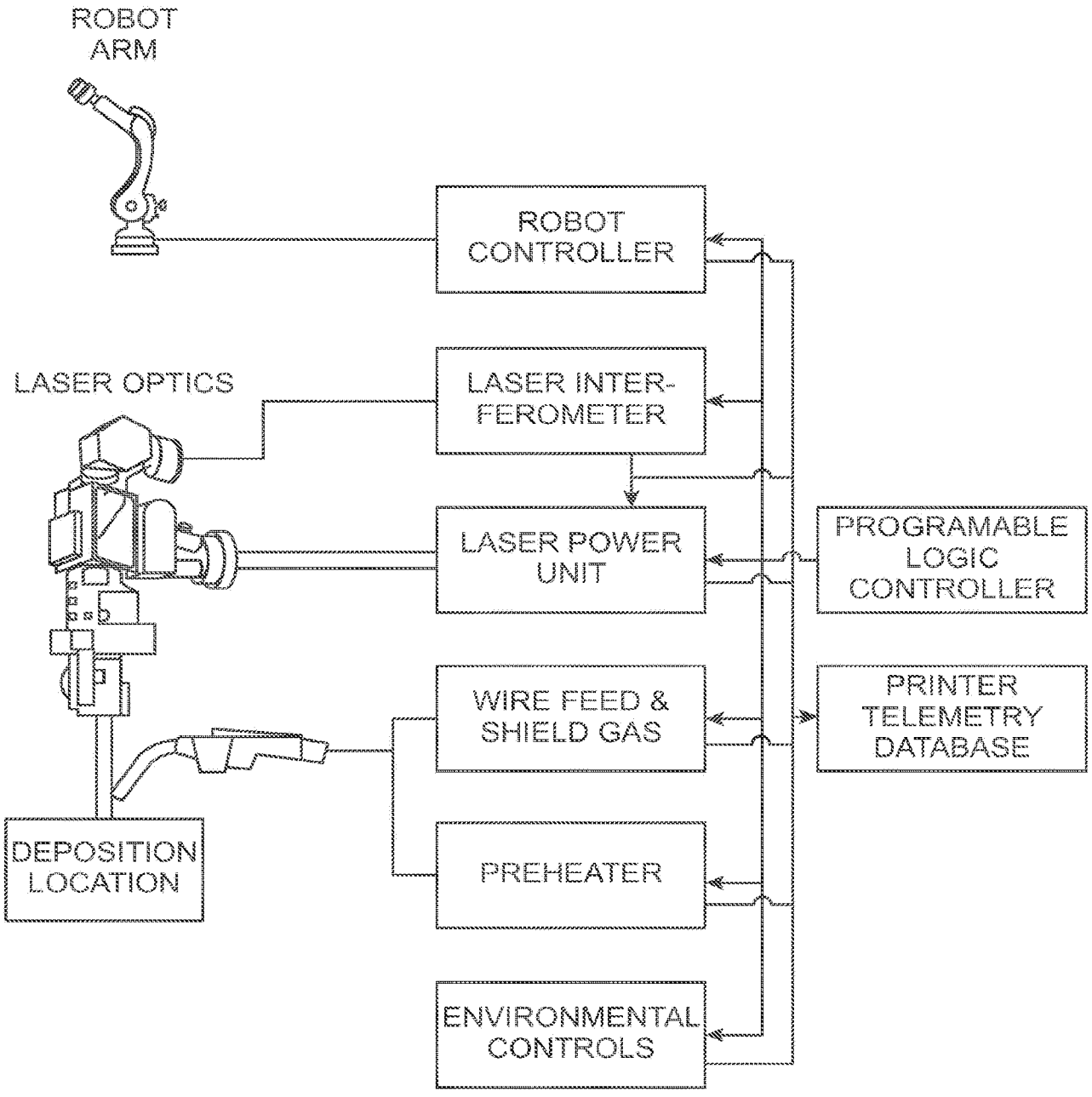

ROBOT ARM
ROBOT CONTROLLER
LASER OPTICS
LASER INTER-FEROMETER
LASER POWER UNIT
PROGRAMABLE LOGIC CONTROLLER
WIRE FEED & SHIELD GAS
PRINTER TELEMETRY DATABASE
DEPOSITION LOCATION
PREHEATER
ENVIRONMENTAL CONTROLS

FIG. 5

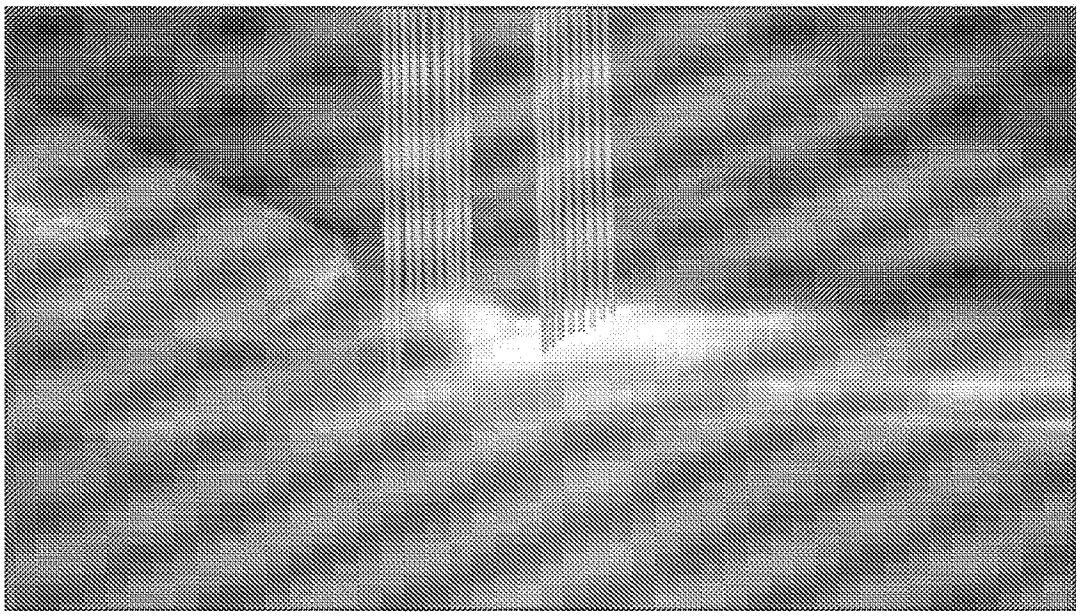


FIG. 6A

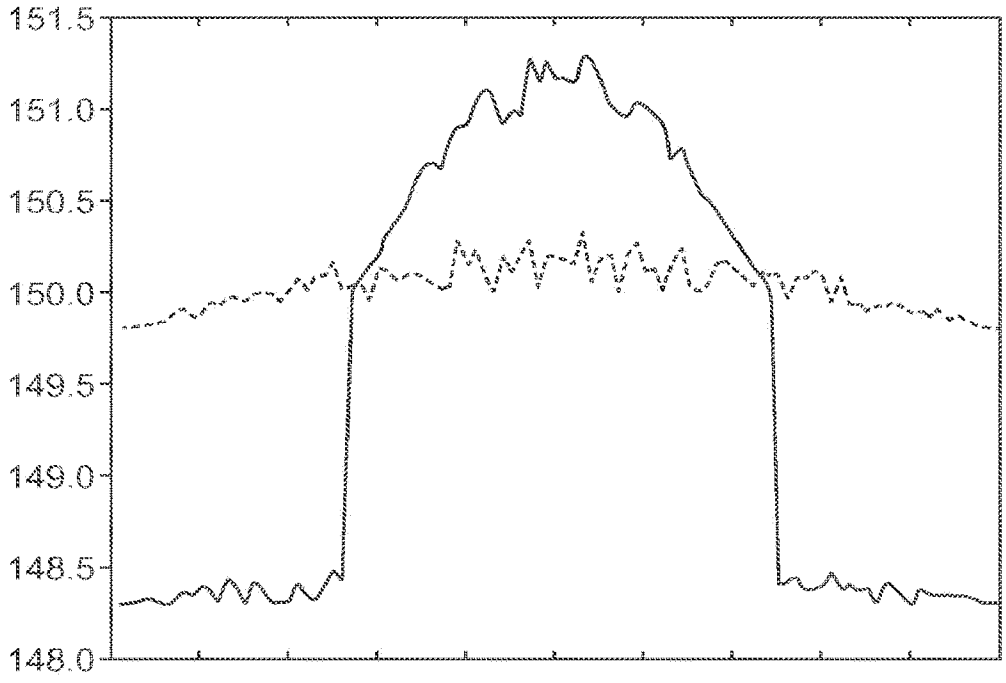


FIG. 6B

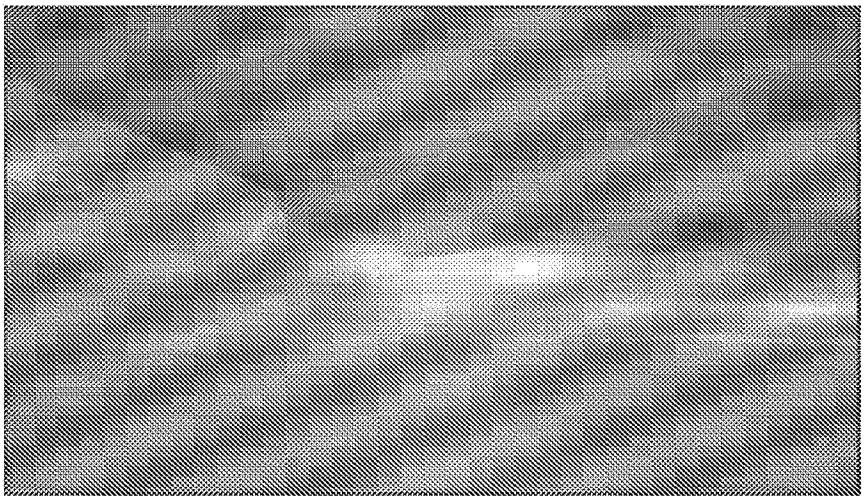


FIG. 7A

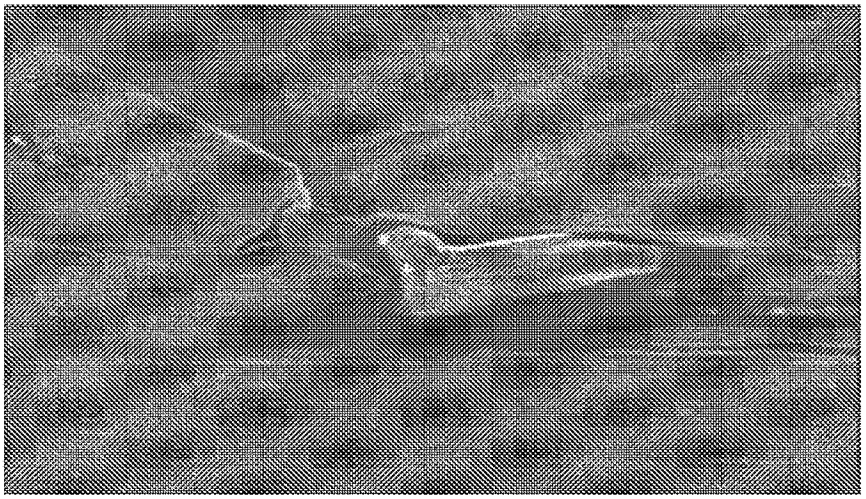


FIG. 7B

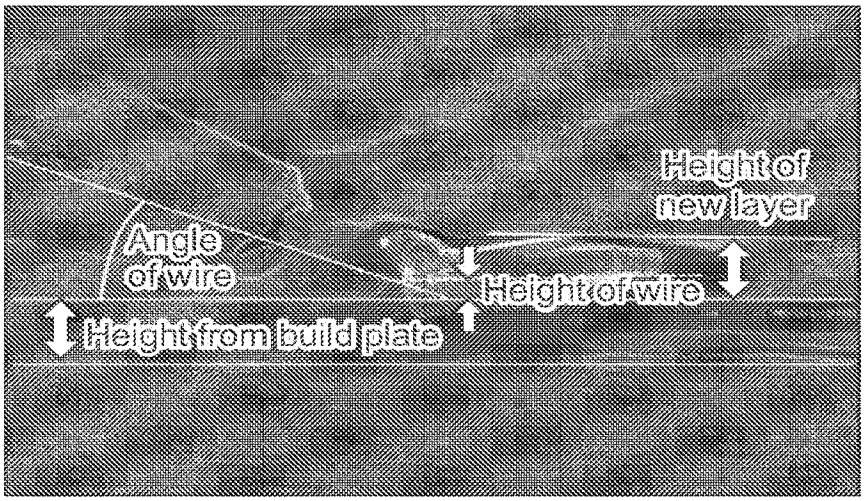


FIG. 7C

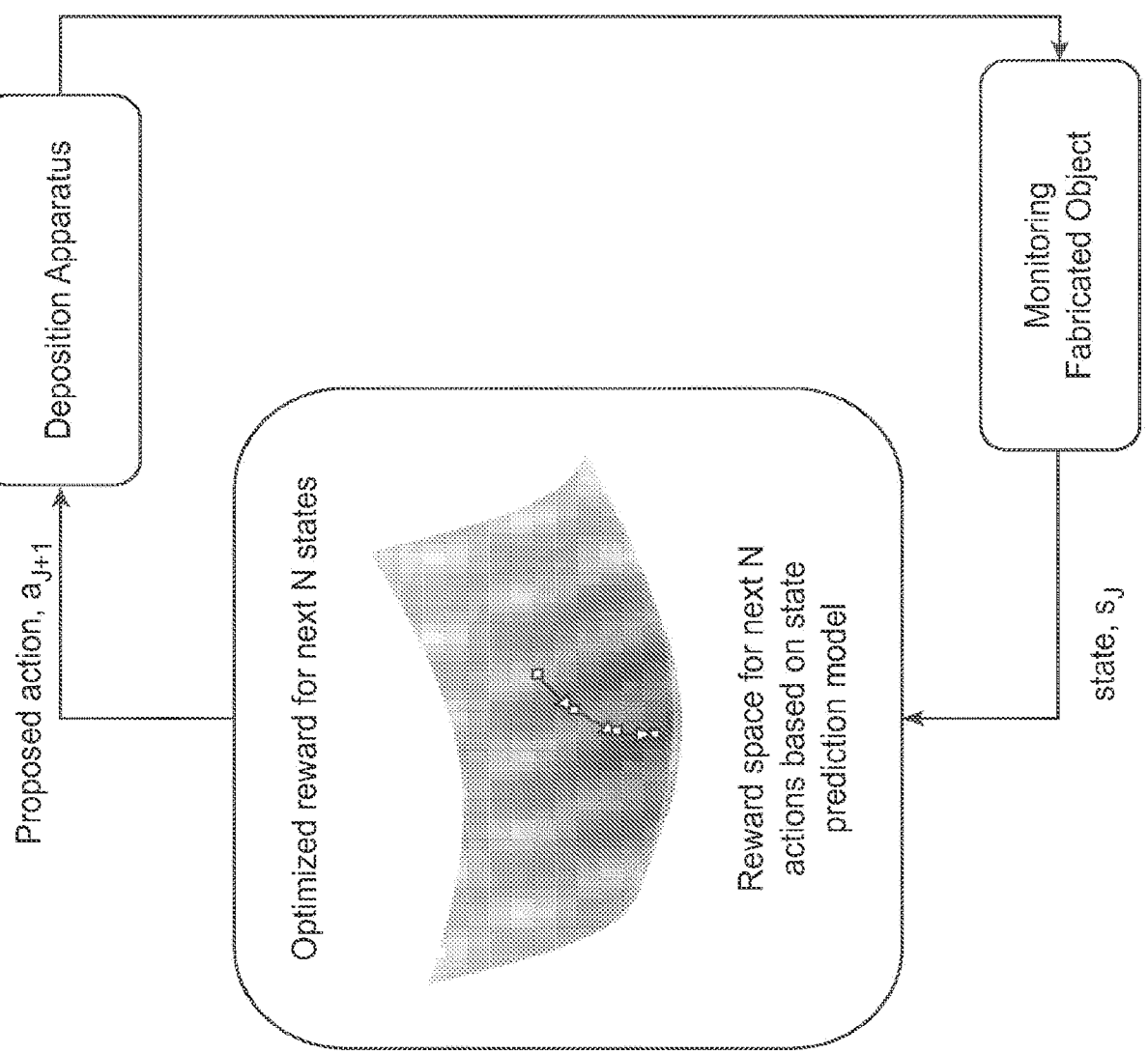

Action, a_J
Deposition Apparatus
Monitoring Fabricated Object
Proposed action, a_{J+1}
Optimized reward for next N states
Reward space for next N actions based on state prediction model
state, s_J

FIG. 8

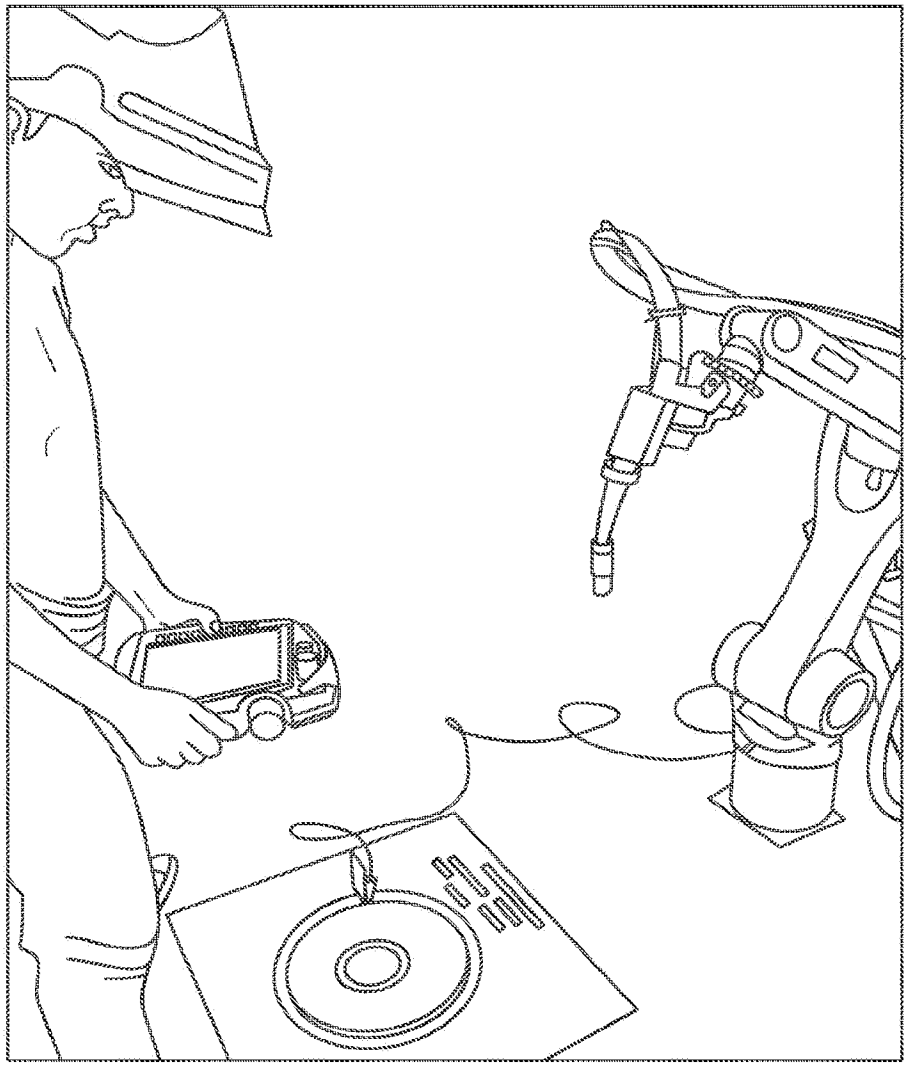


FIG. 9

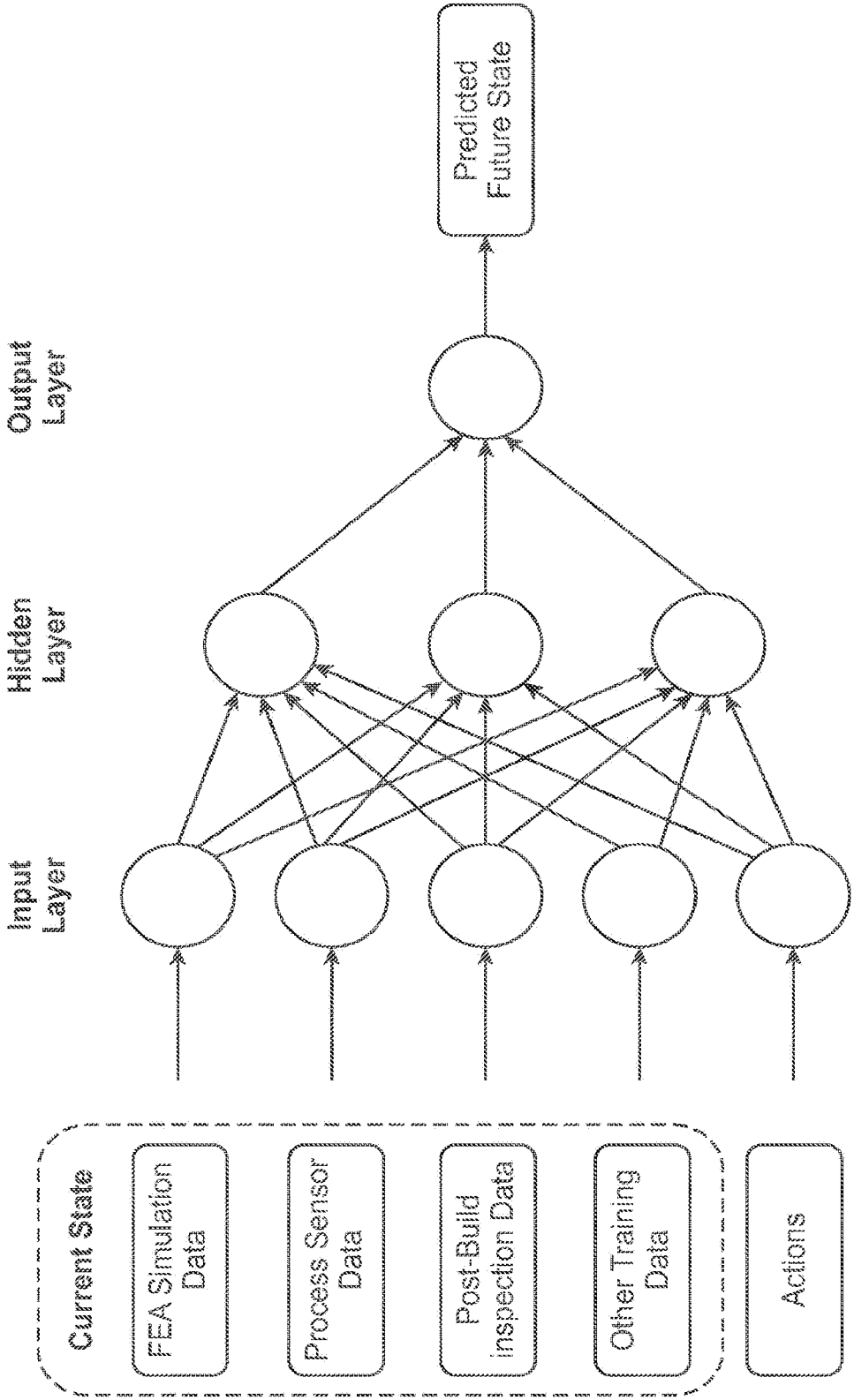

Predicted Future State
Output Layer
Hidden Layer
Input Layer
Current State
FEA Simulation Data
Process Sensor Data
Post-Build Inspection Data
Other Training Data
Actions

FIG. 10

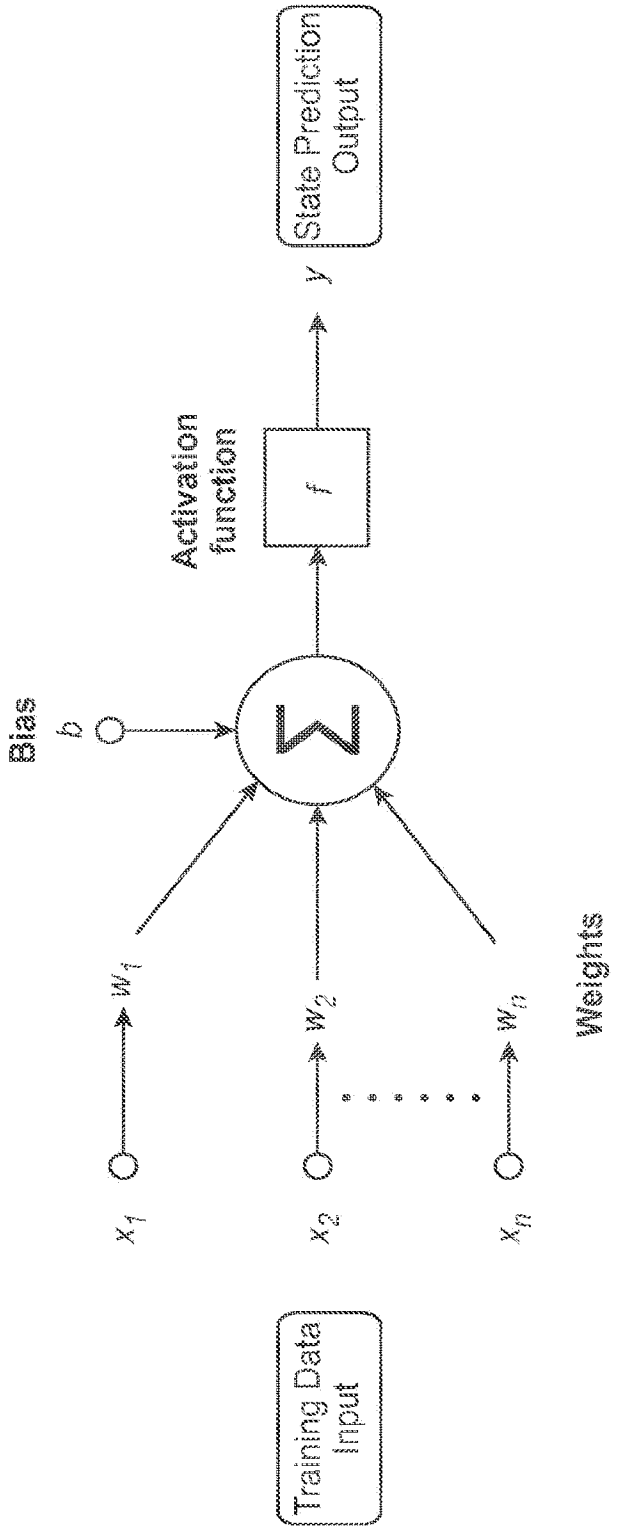

Training Data Input
State Prediction Output
Activation function
Bias
Weights
x_1
x_2
x_n
w_1
w_2
w_n
b
f
y

FIG. 11

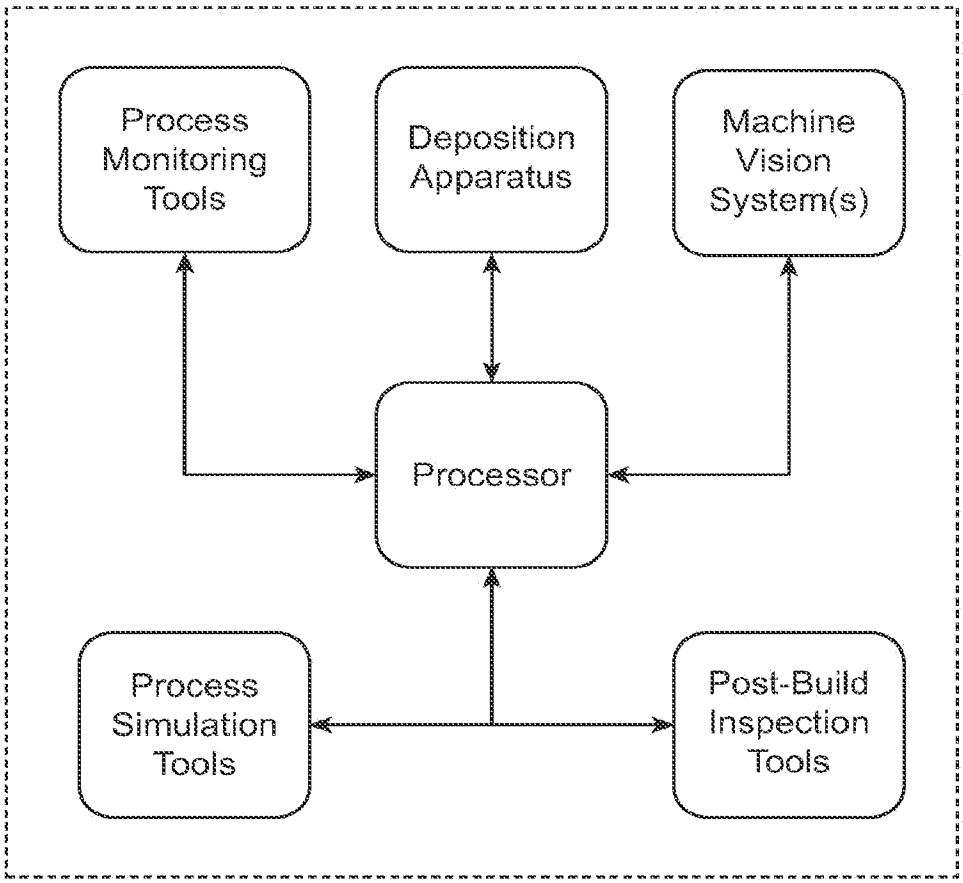

Process Monitoring Tools
Deposition Apparatus
Machine Vision System(s)
Processor
Process Simulation Tools
Post-Build Inspection Tools

FIG. 12

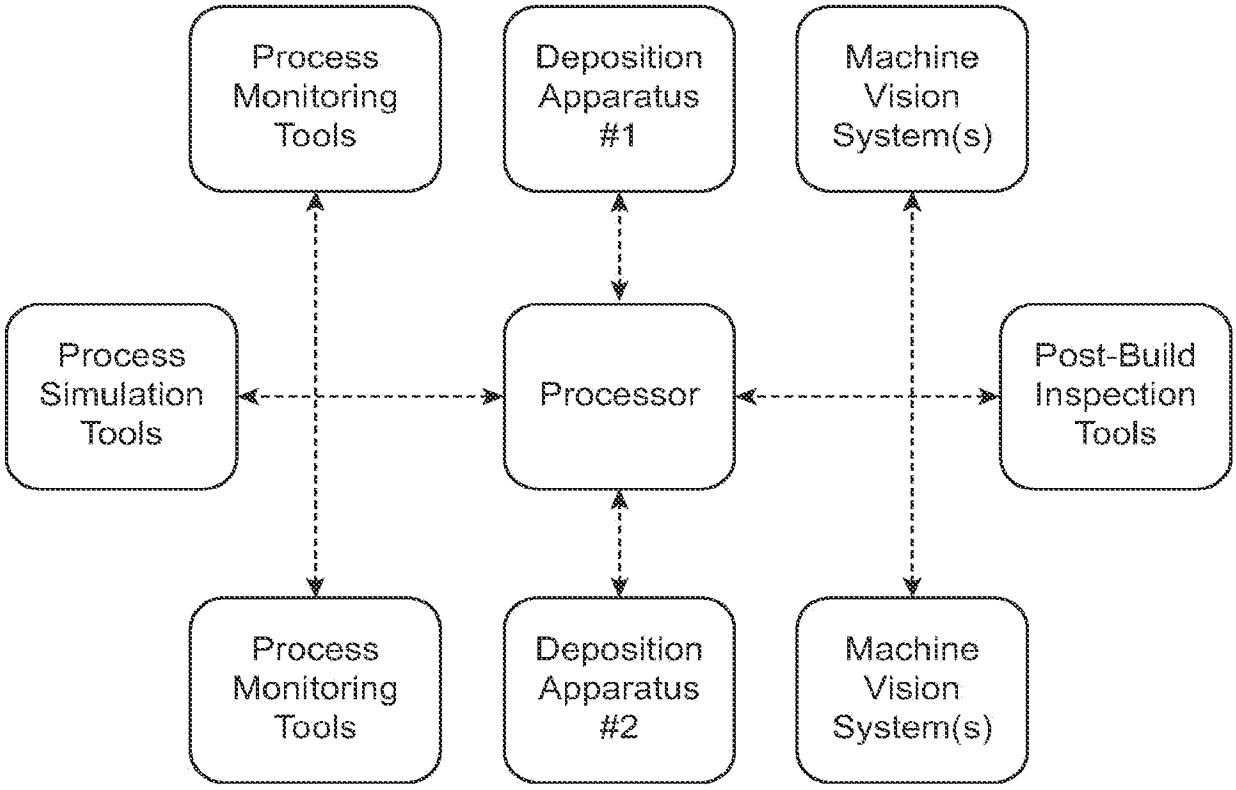

Process Monitoring Tools
Deposition Apparatus #1
Machine Vision System(s)
Process Simulation Tools
Processor
Post-Build Inspection Tools
Process Monitoring Tools
Deposition Apparatus #2
Machine Vision System(s)

FIG. 13

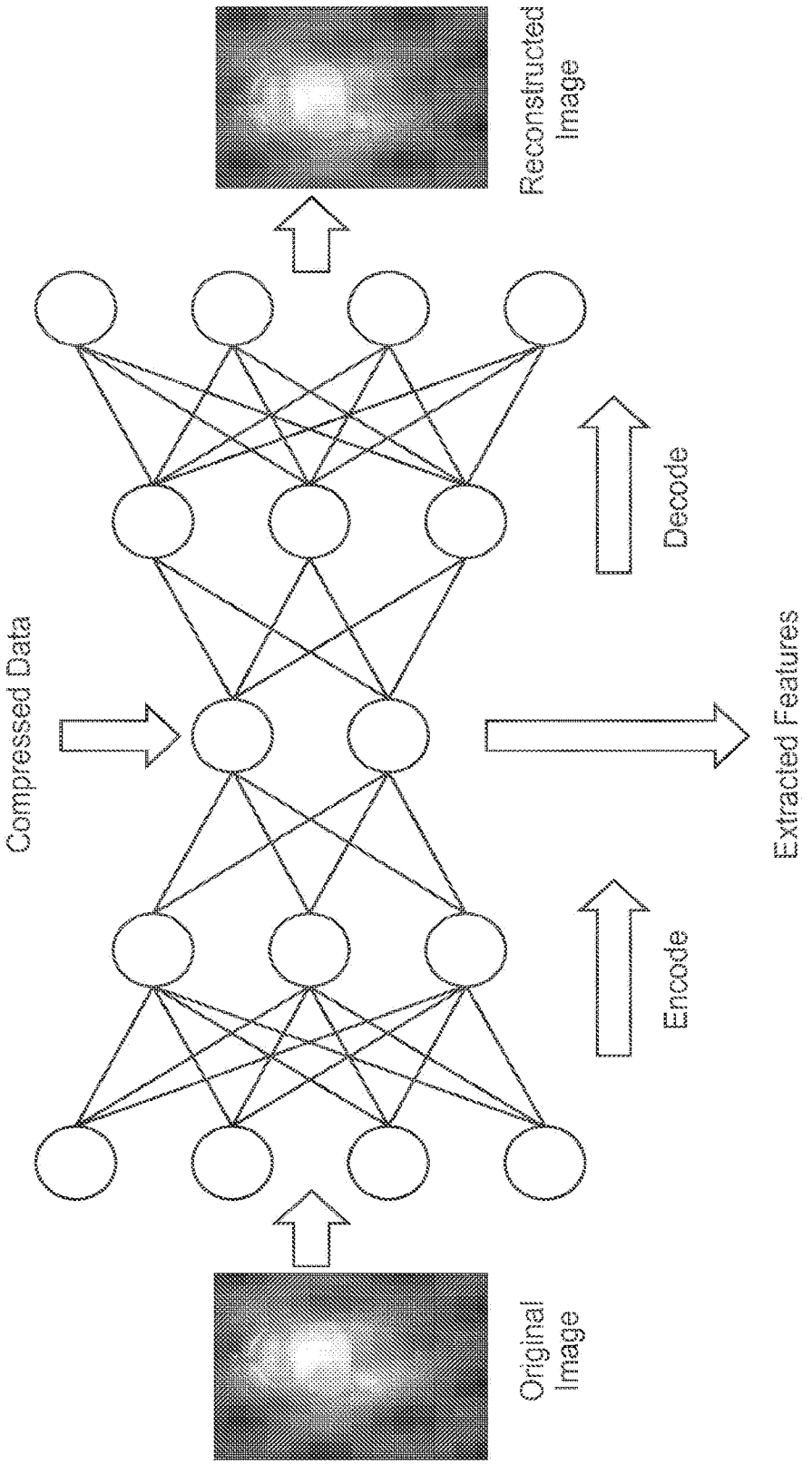

Reconstructed Image
Decode
Compressed Data
Extracted Features
Encode
Original Image

FIG. 14

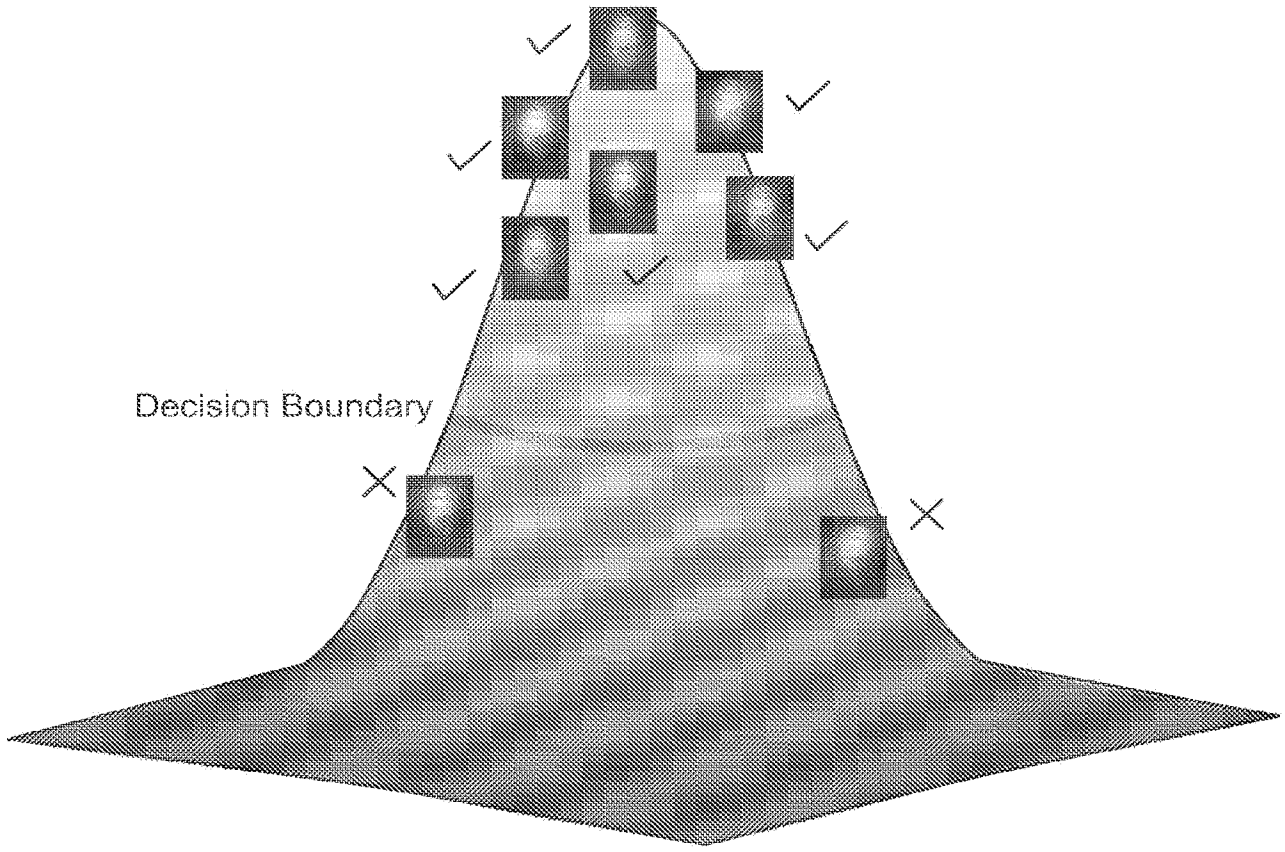


FIG. 15

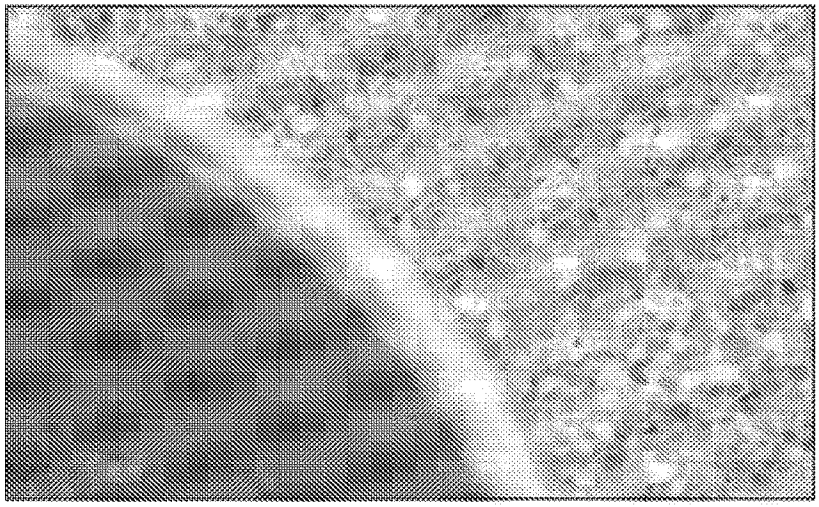


FIG. 16A

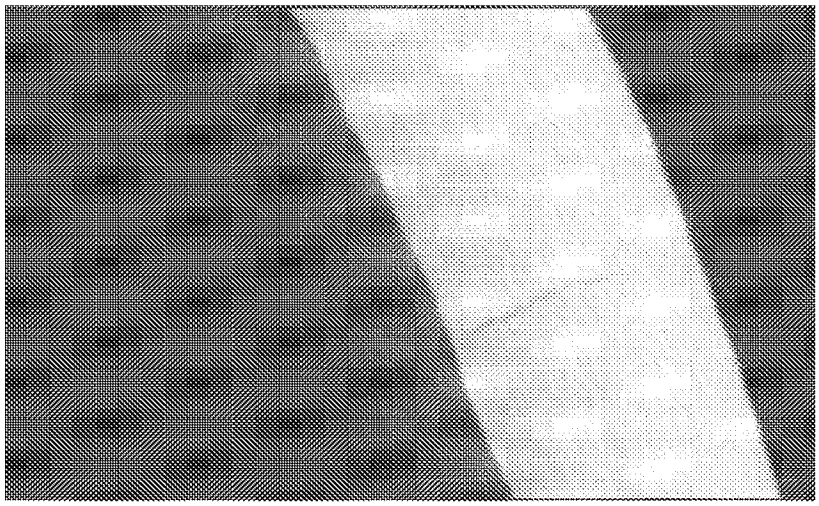


FIG. 16B

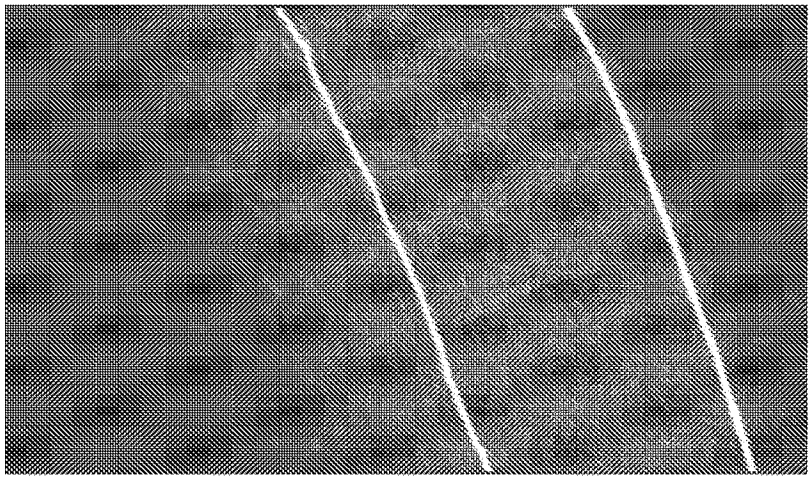


FIG. 16C