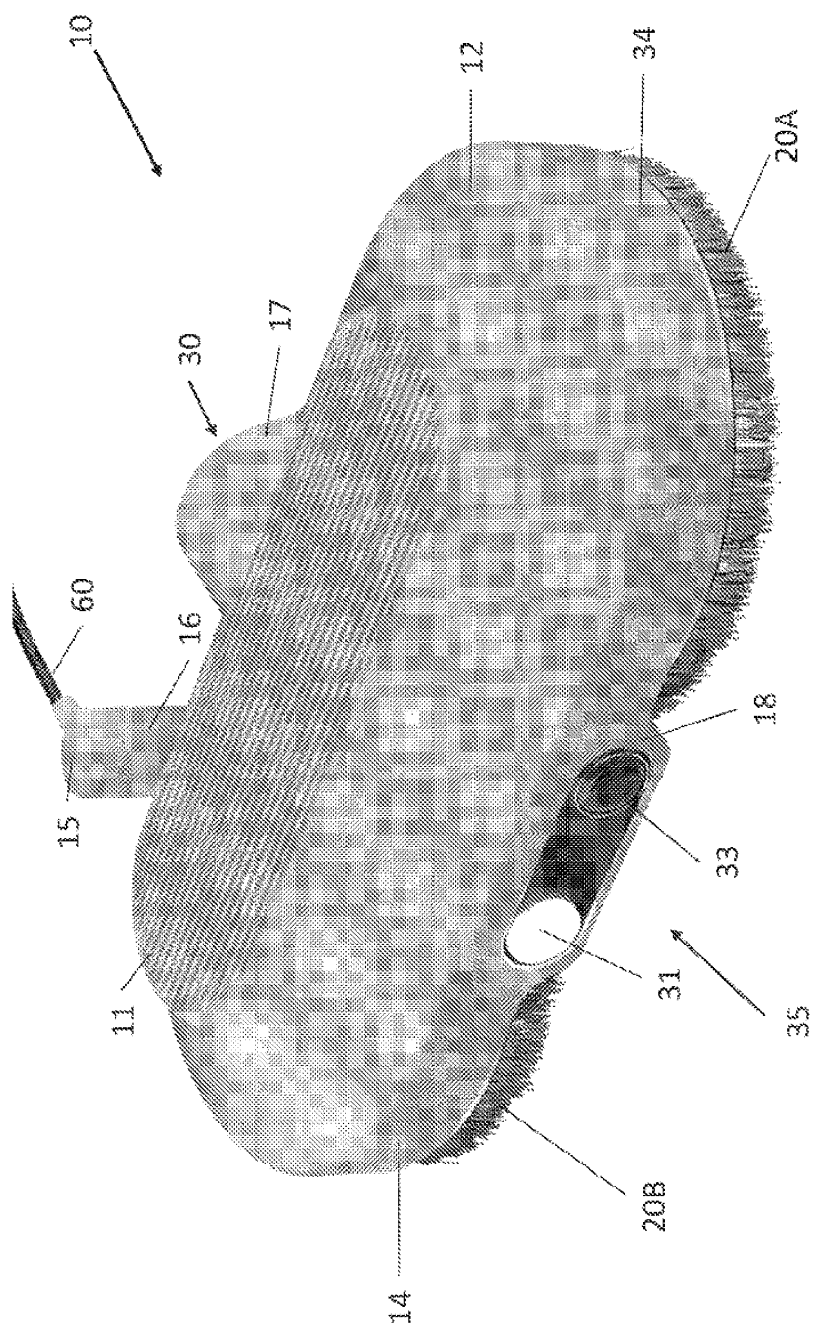








































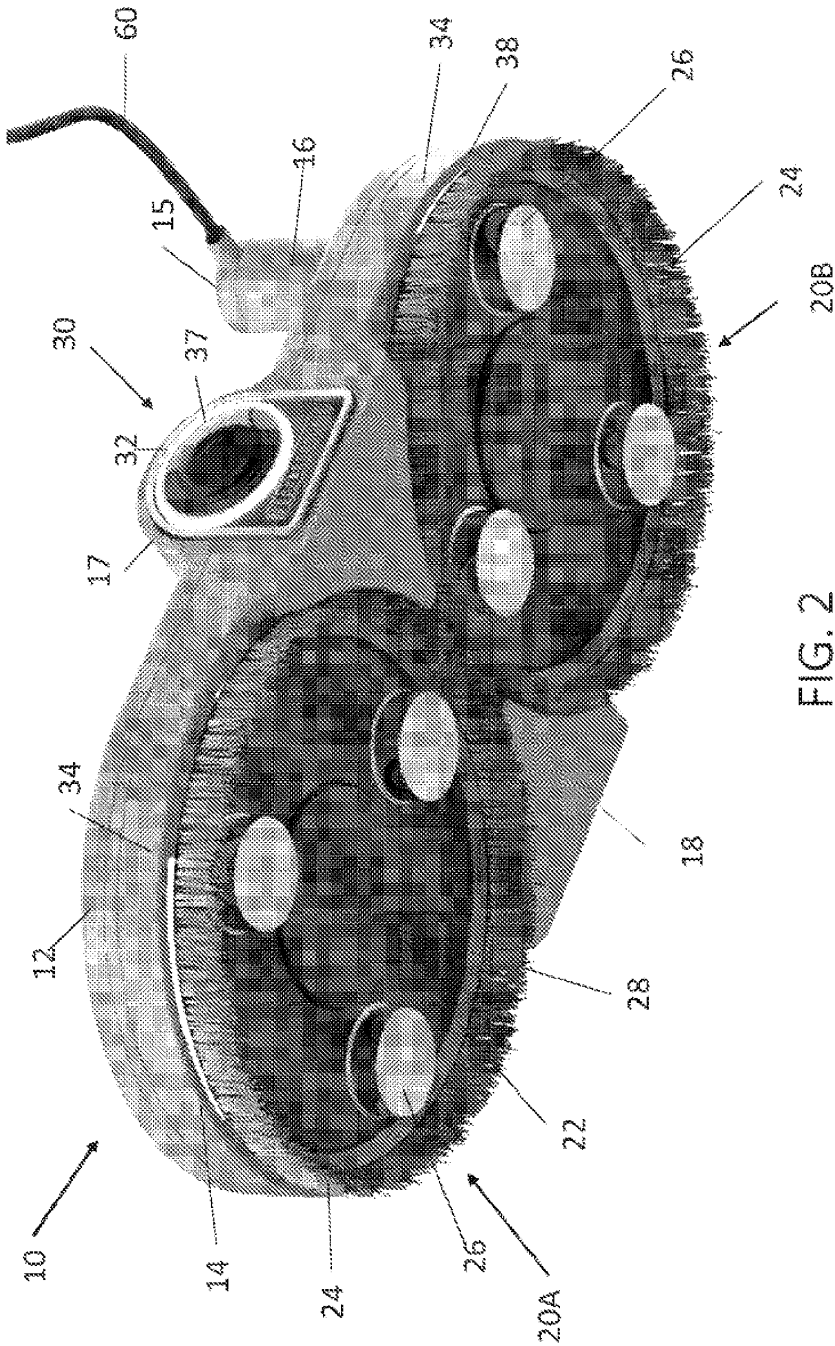












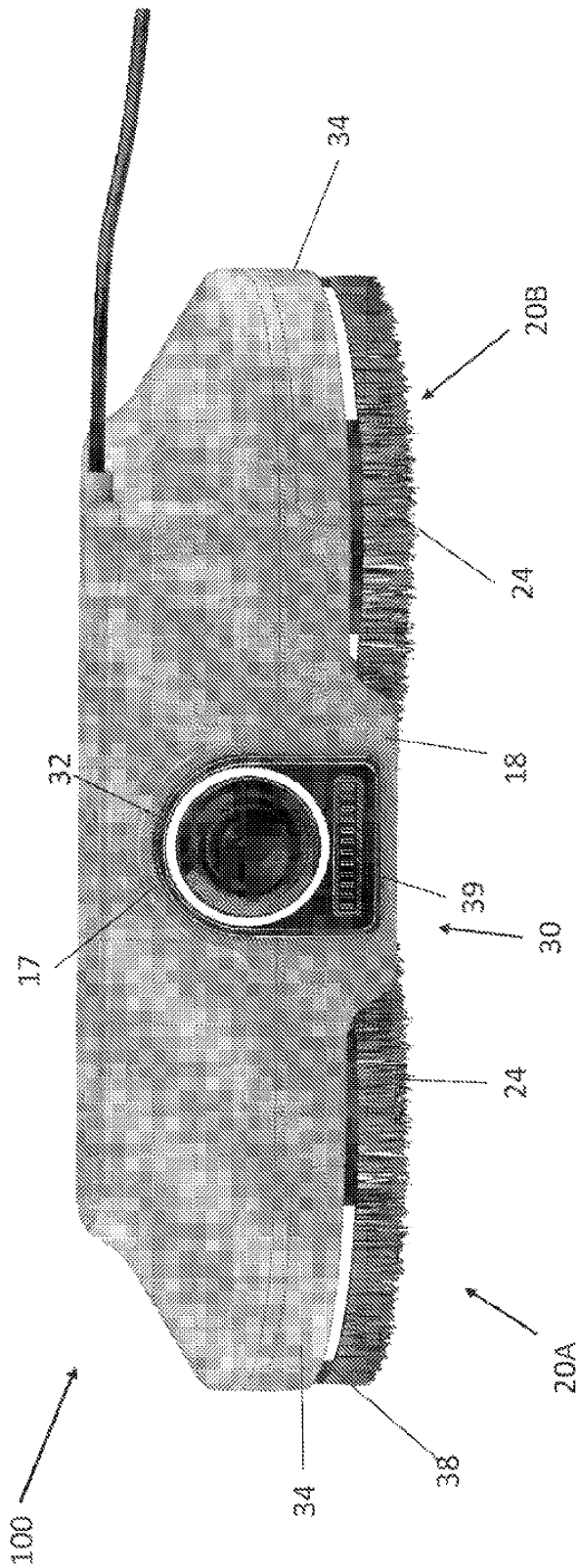


FIG. 3A

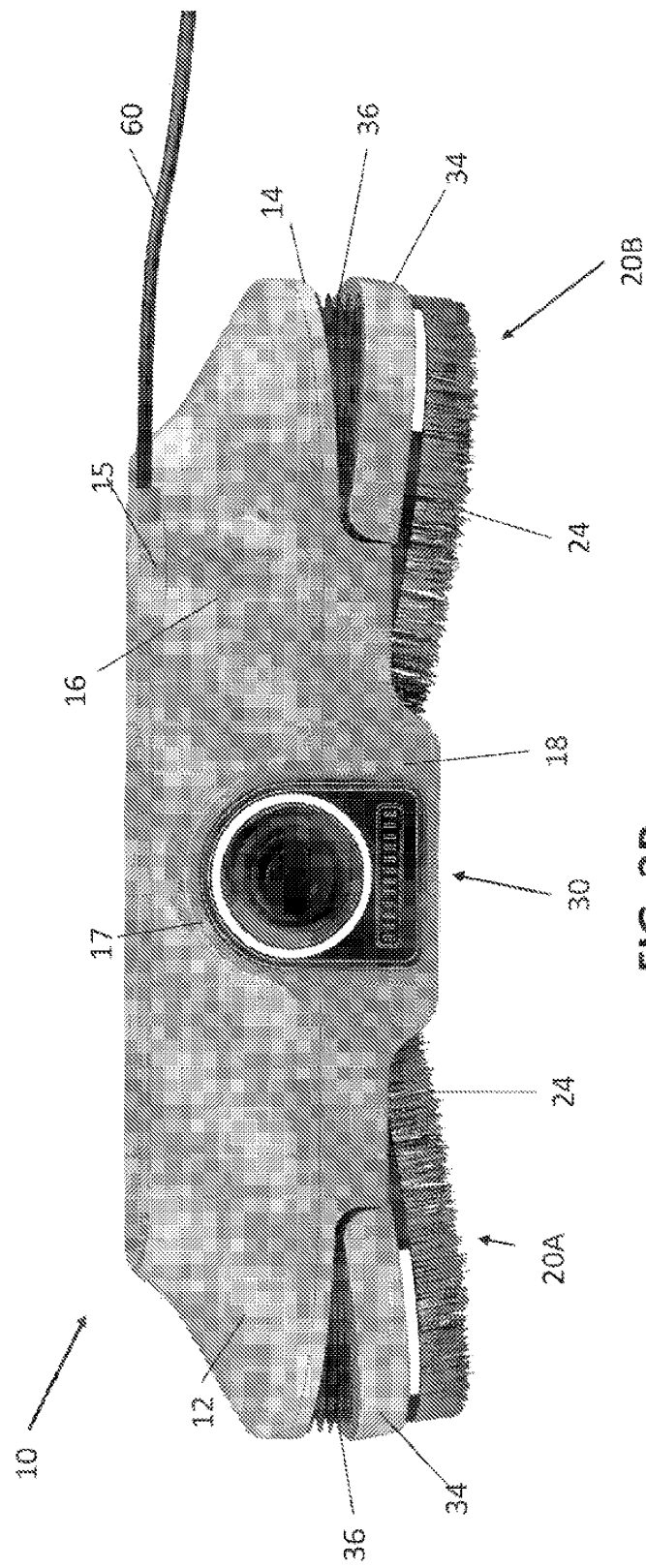


FIG. 3B

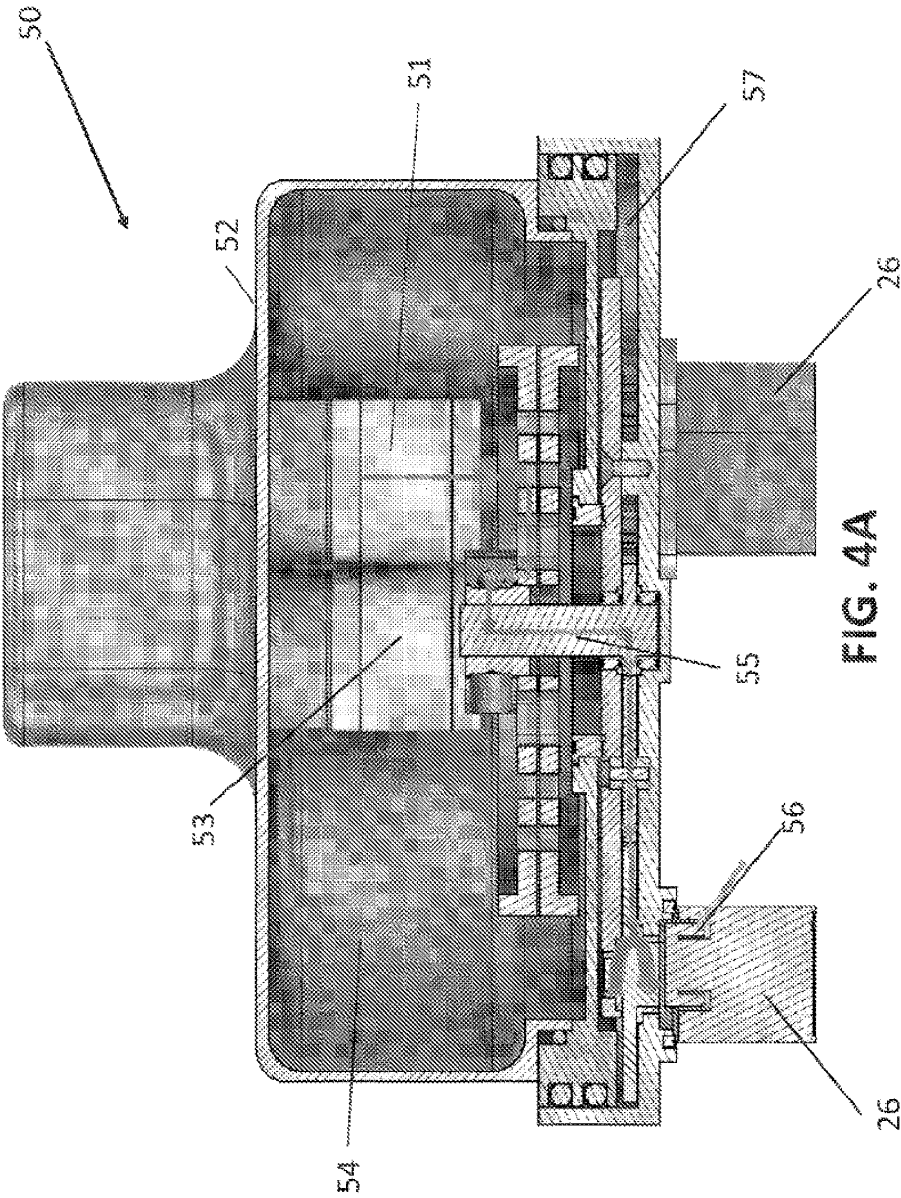


FIG. 4A

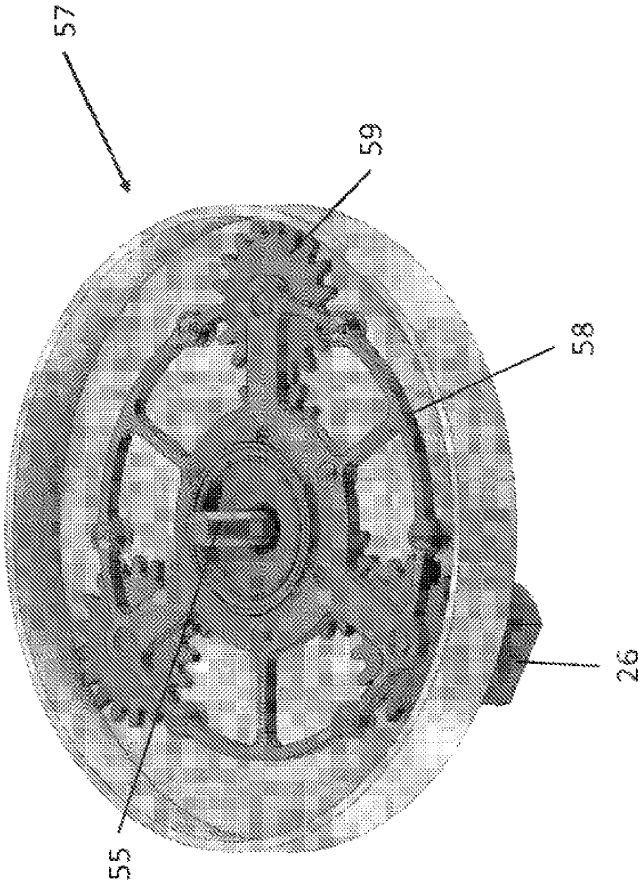


FIG. 4B

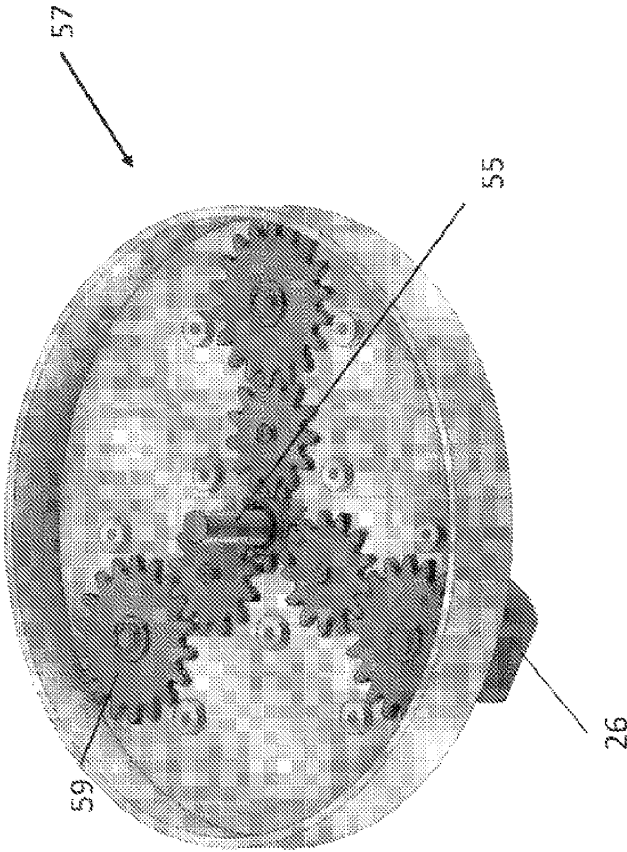


FIG. 4C

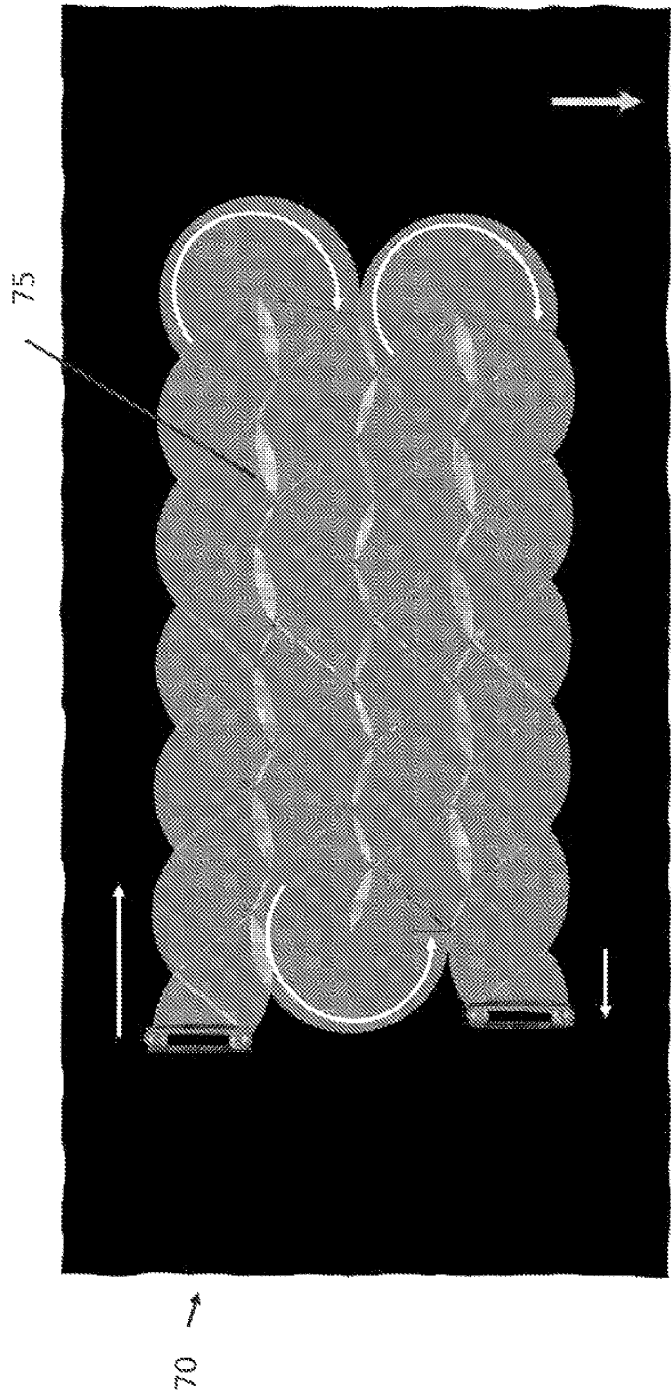
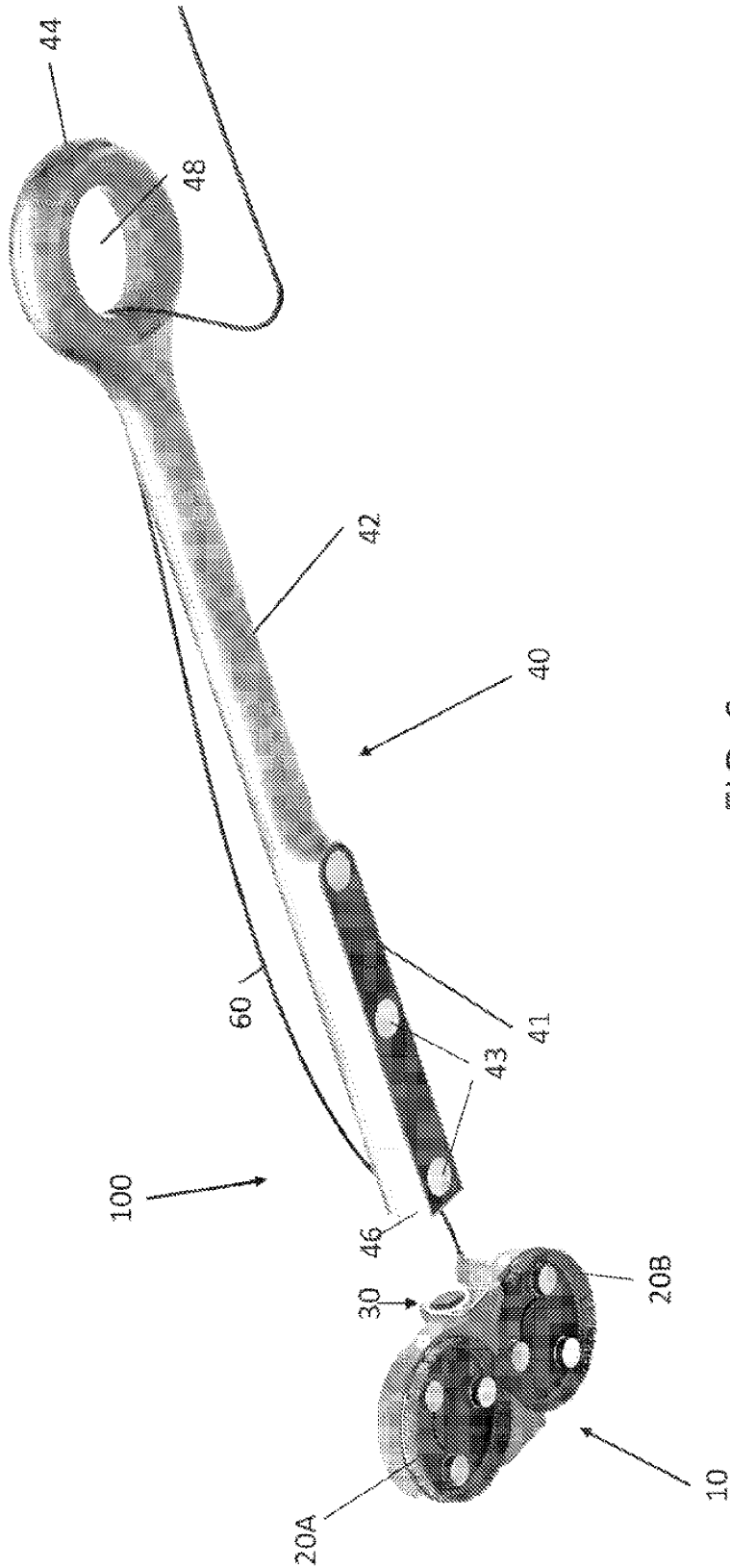


FIG. 5



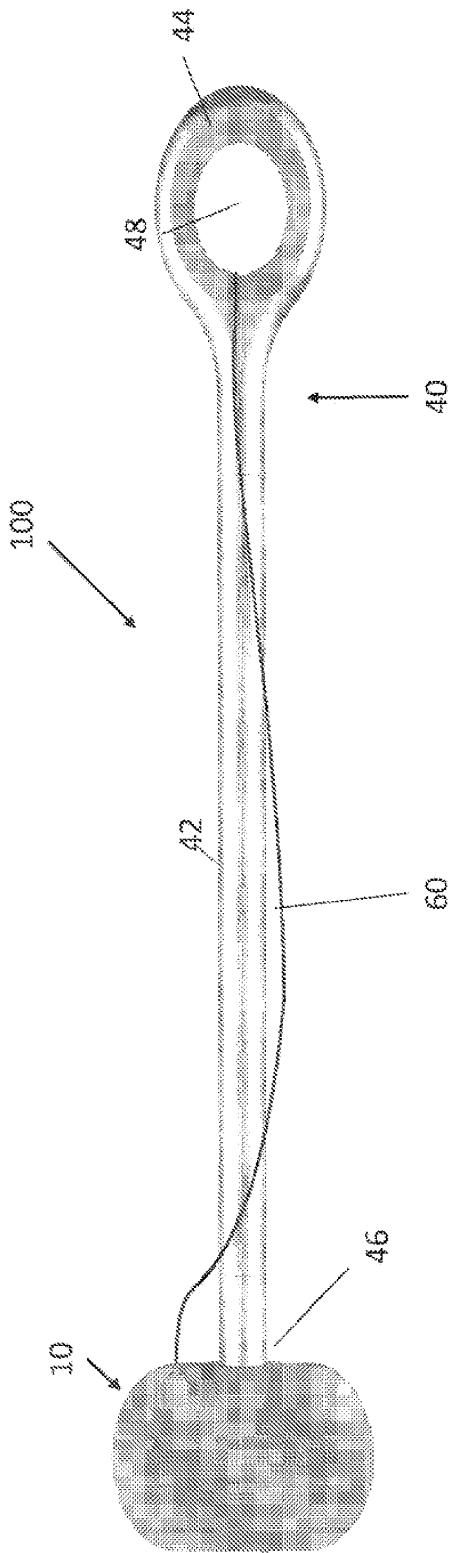


FIG. 7A

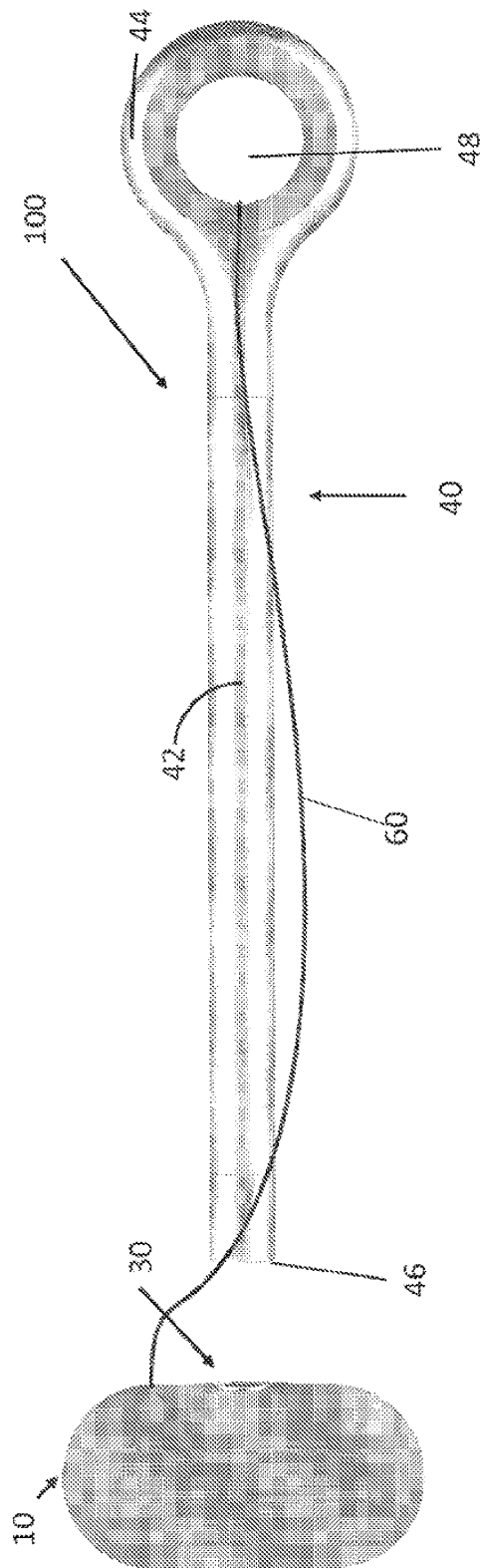


FIG. 7B

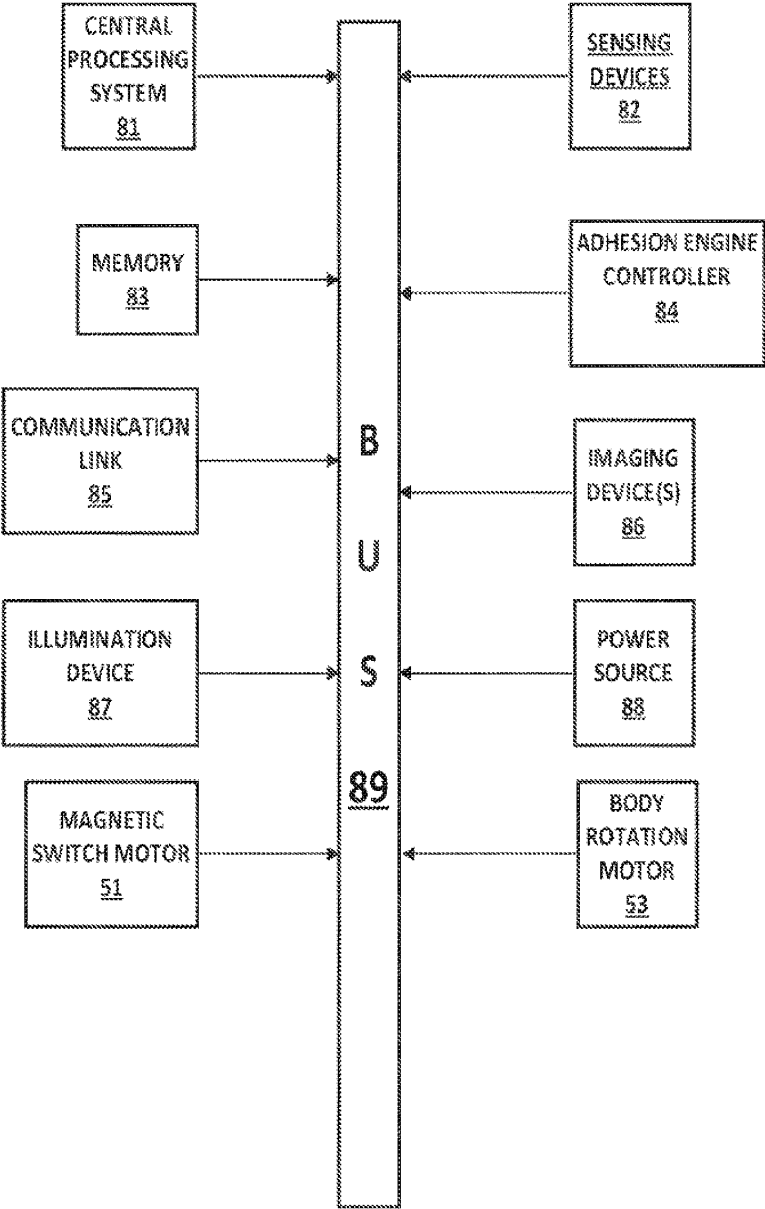


FIG. 8

Sensor	Robot Movements	Adhesion Verification	Localization	Obstacle Detection	Simplistic Navigation	Advanced Navigation	Inspection & Mapping
Motor Encoders	X		X	X	X	X	X
Motor Current Sensing		X		X			X
Adhesion engine angle sensors		X		X	X	X	X
Magnetometer		X		X			
IMU			X	X	X	X	
Depth Sensor			X		X	X	
Distance Sensor					X	X	X
Ultrasound / Eddy current			X			X	X
Vision System (Camera)			X			X	X
Optical Flow Sensor			X			X	
Paint thickness							X

FIG. 9

State		Fixed Adhesion Engine (current sensing)		Moving Adhesion Engine (current sensing)		Test case to differentiate
Water Velocity	Surface Roughness	Mag SW Motor	Body Motor	Mag SW Motor	Body Motor	
Low	Low	-	Nominal	-	Nominal	-
Low	High	-	Above Nominal	-	Above Nominal	If a 360 deg. rotation of the moving adhesion engine around the fixed adhesion engine has similar current values throughout the rotation, then it's measuring surface roughness.
High	Low	-	Above Nominal	-	Nominal	-
High	High	-	Above Nominal	-	Above Nominal	If a 360 deg. rotation of the moving adhesion engine around the fixed adhesion engine has varying current values, then likely it's from water velocity as that will have roughly constant vector pushing against the robot.

FIG. 10

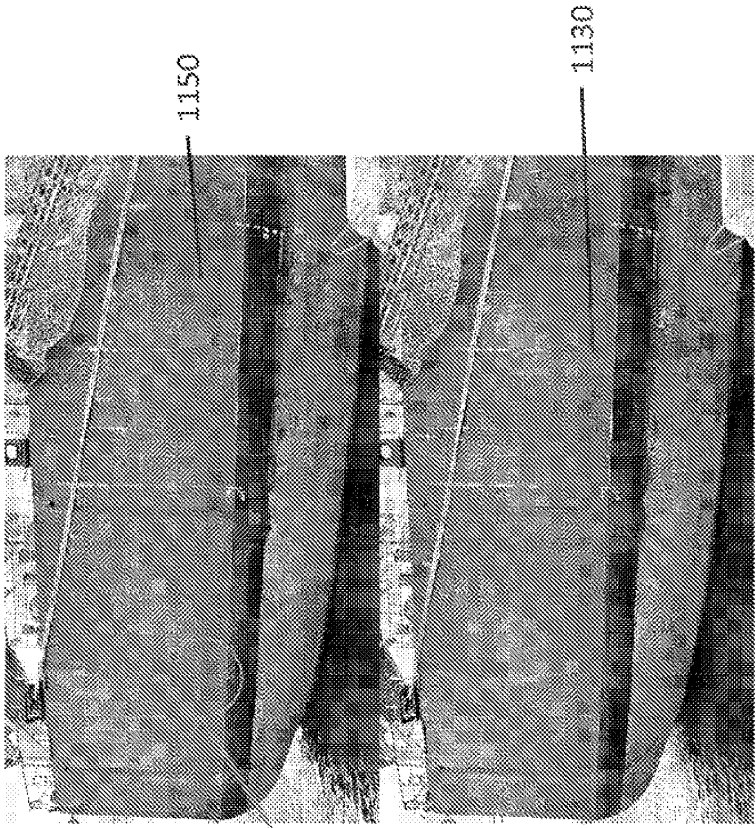


FIG. 11

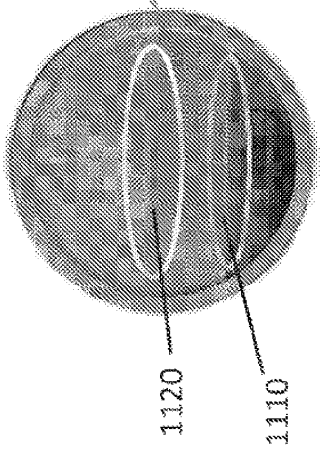
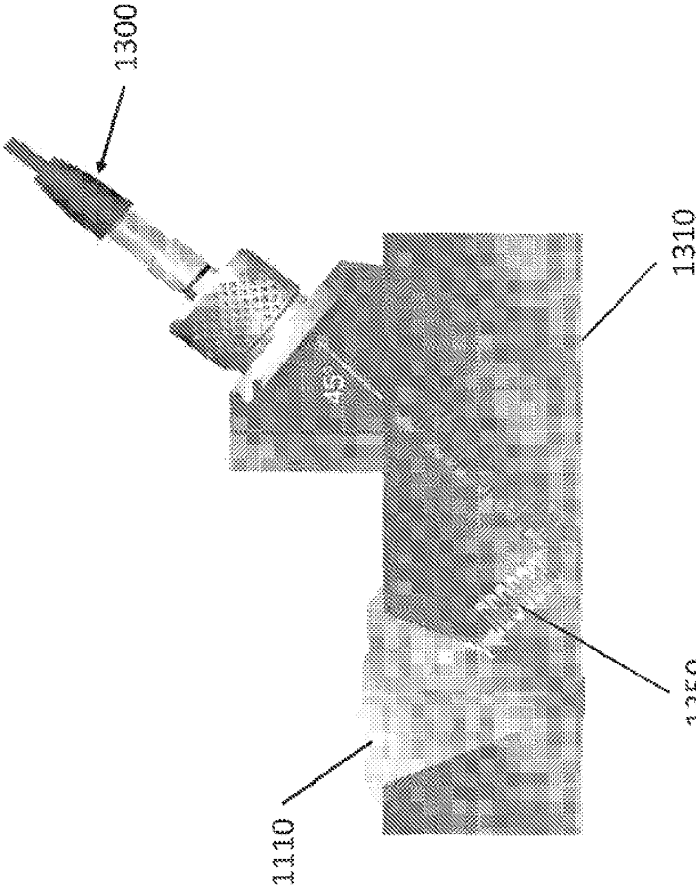


FIG. 12



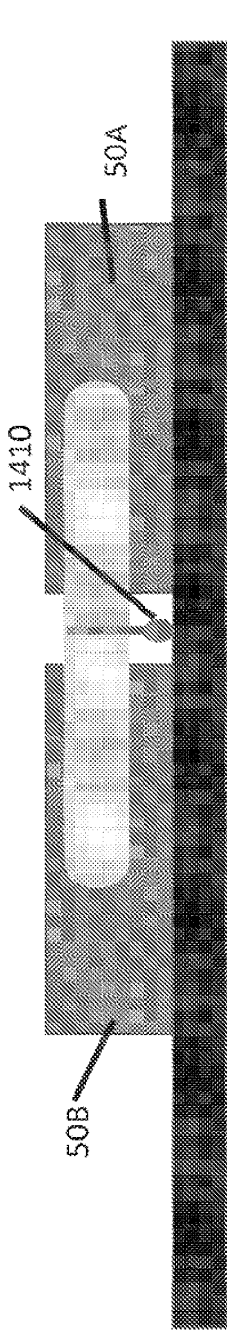


FIG. 14A

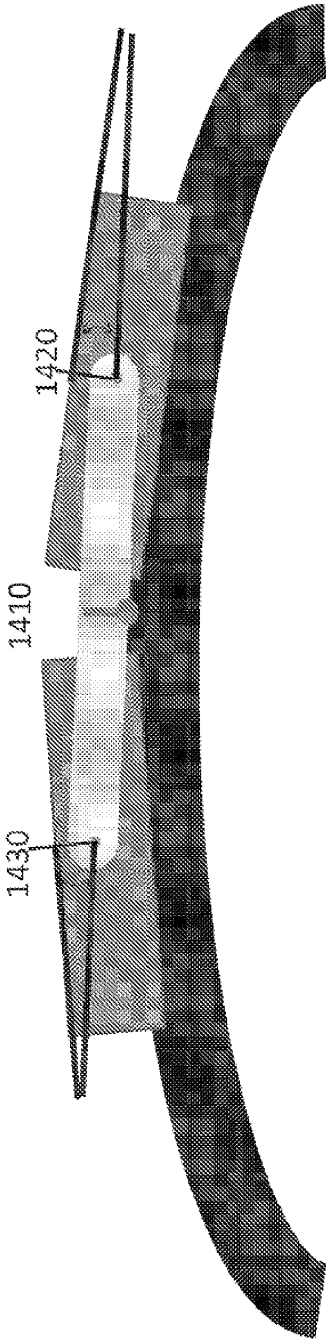


FIG. 14B

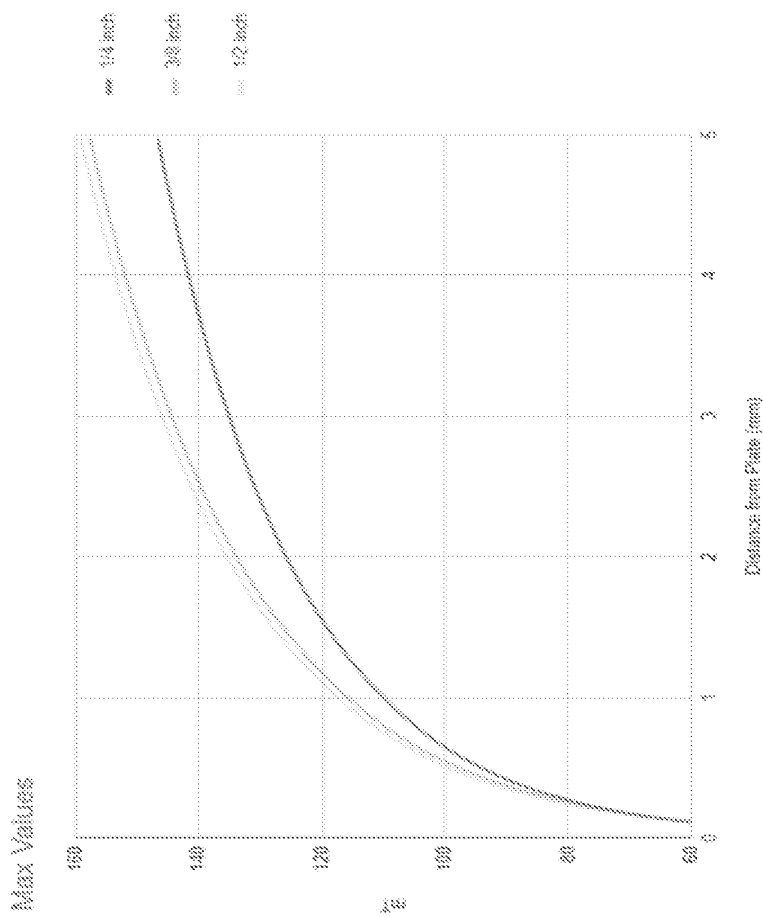


FIG. 15

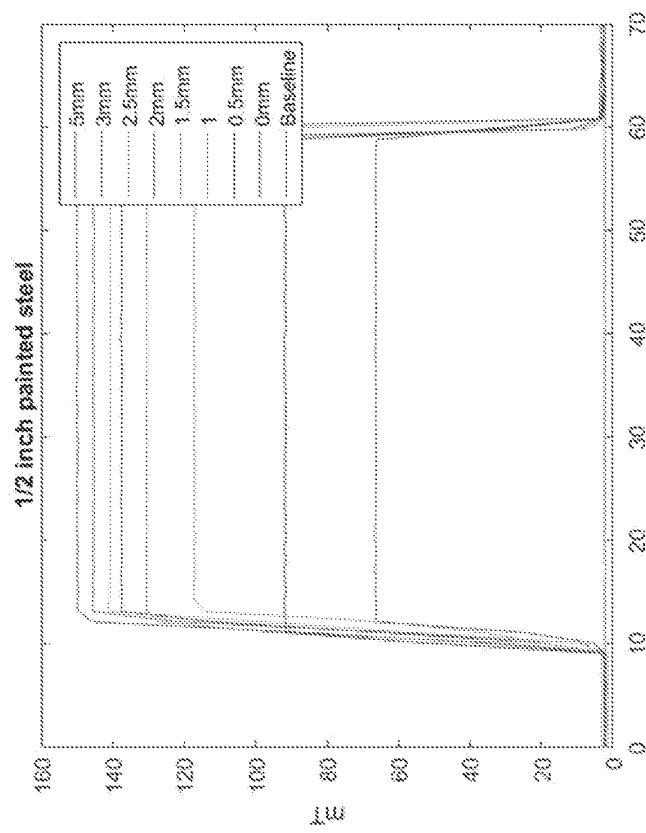


FIG. 16

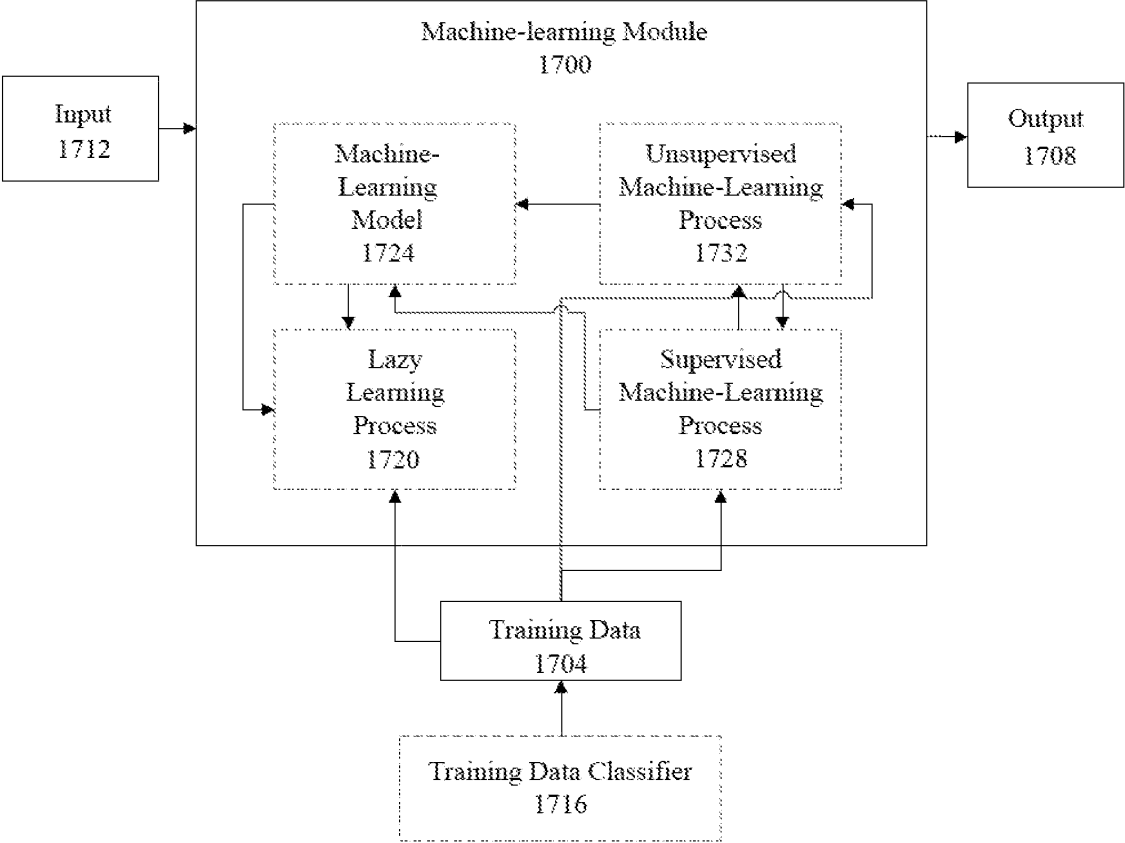


FIG. 17