

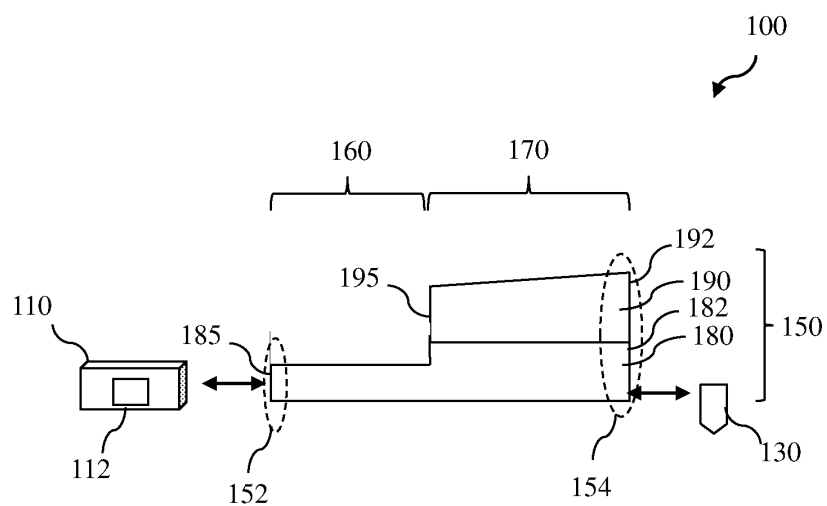


FIG. 1

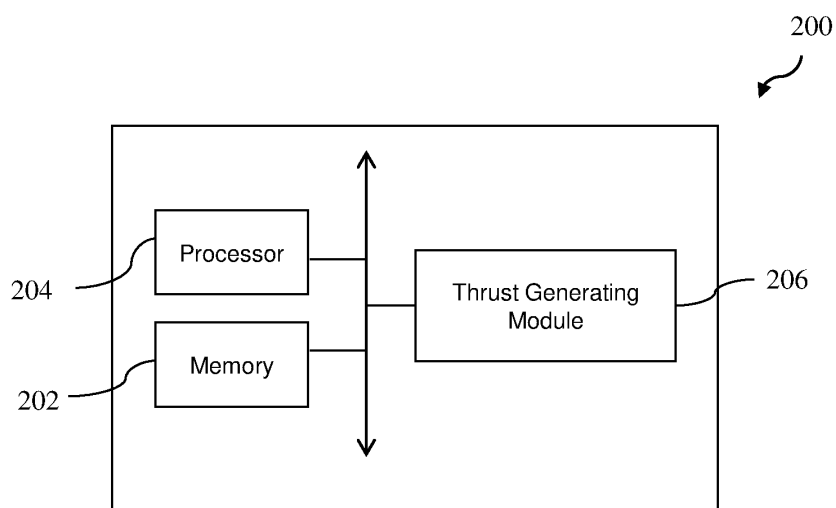


FIG. 2

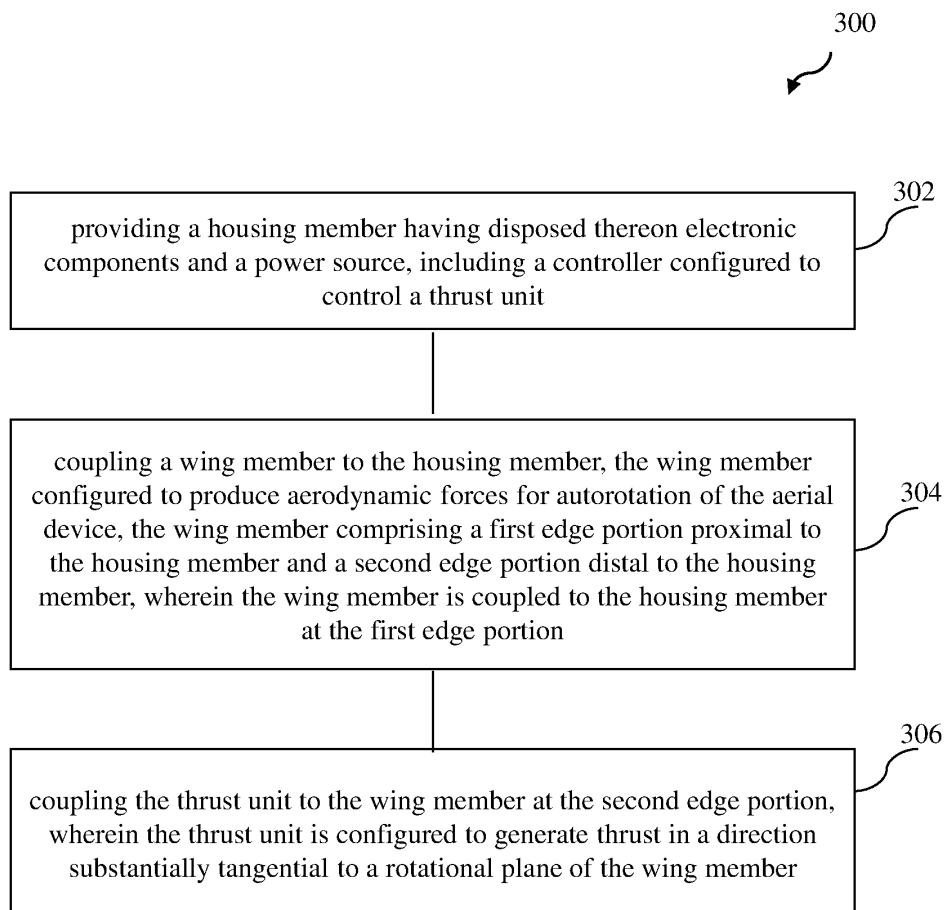


FIG. 3

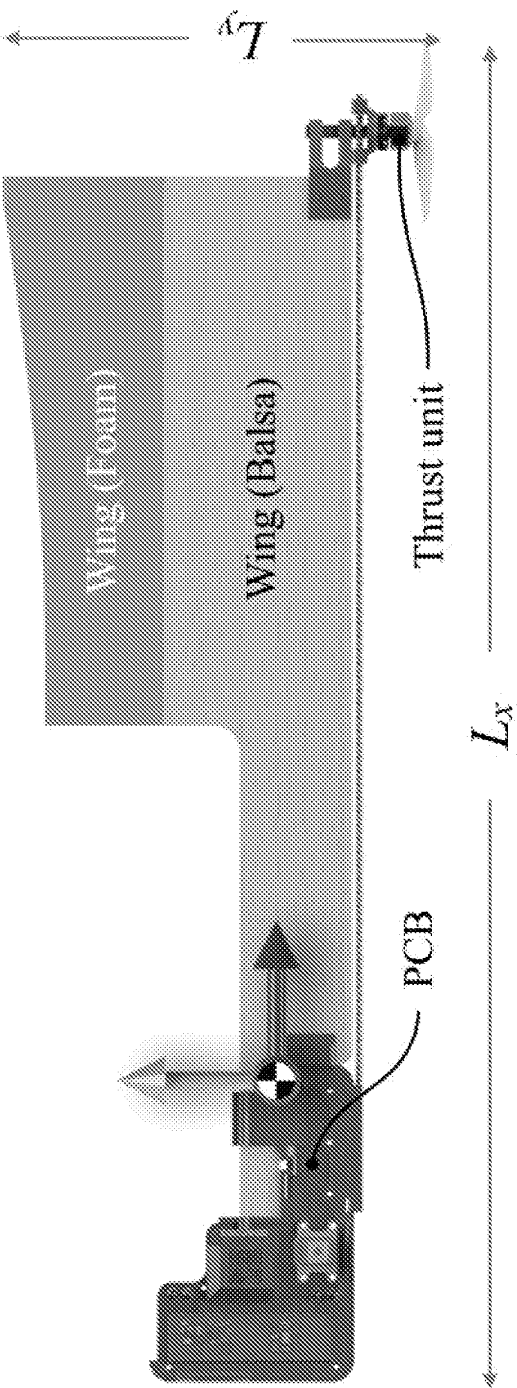


FIG. 4A

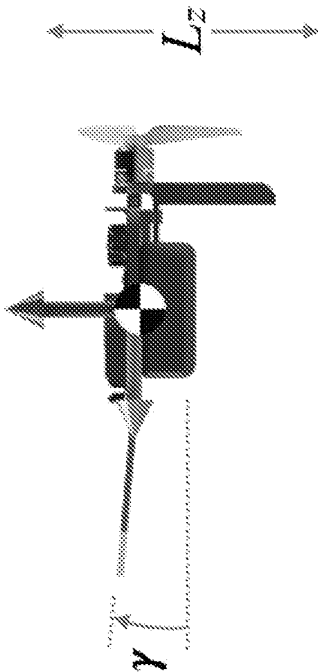


FIG. 4B

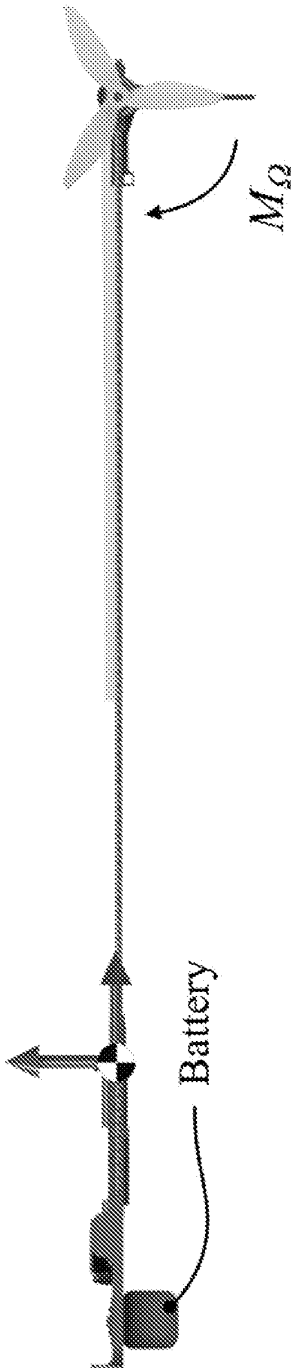


FIG. 4C

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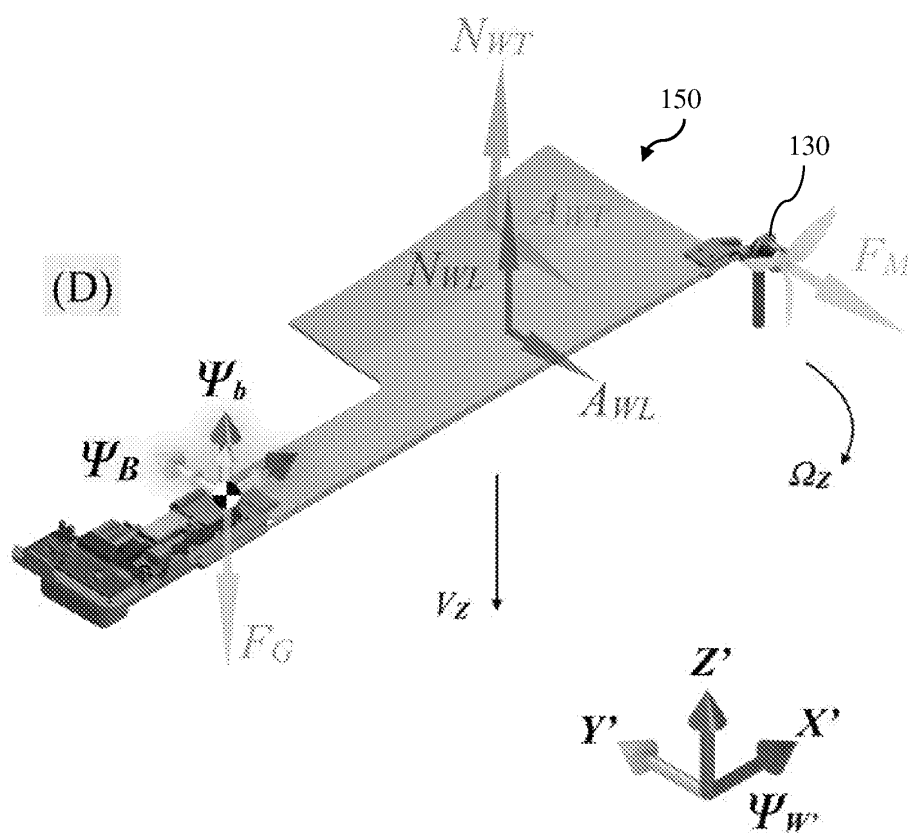
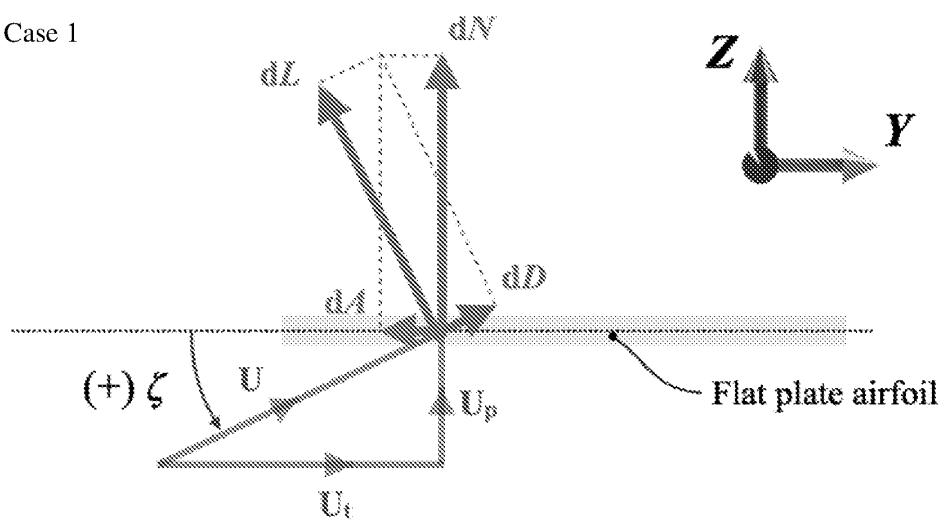


FIG. 4D

Case 1



Case 2

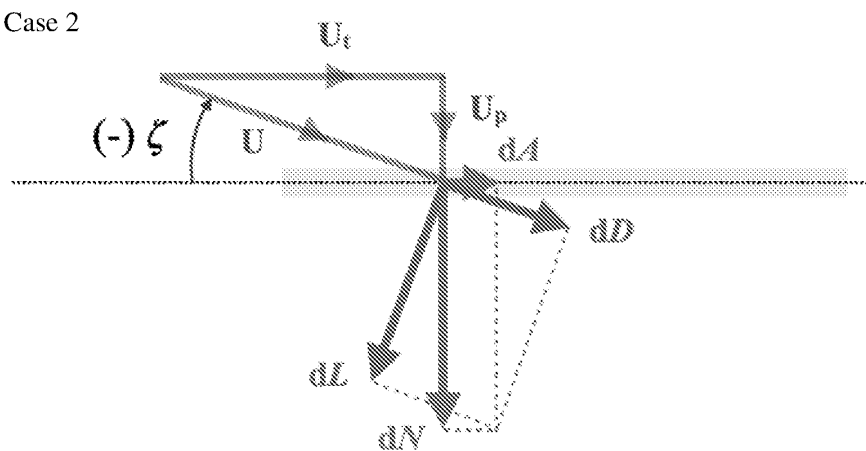


FIG. 5

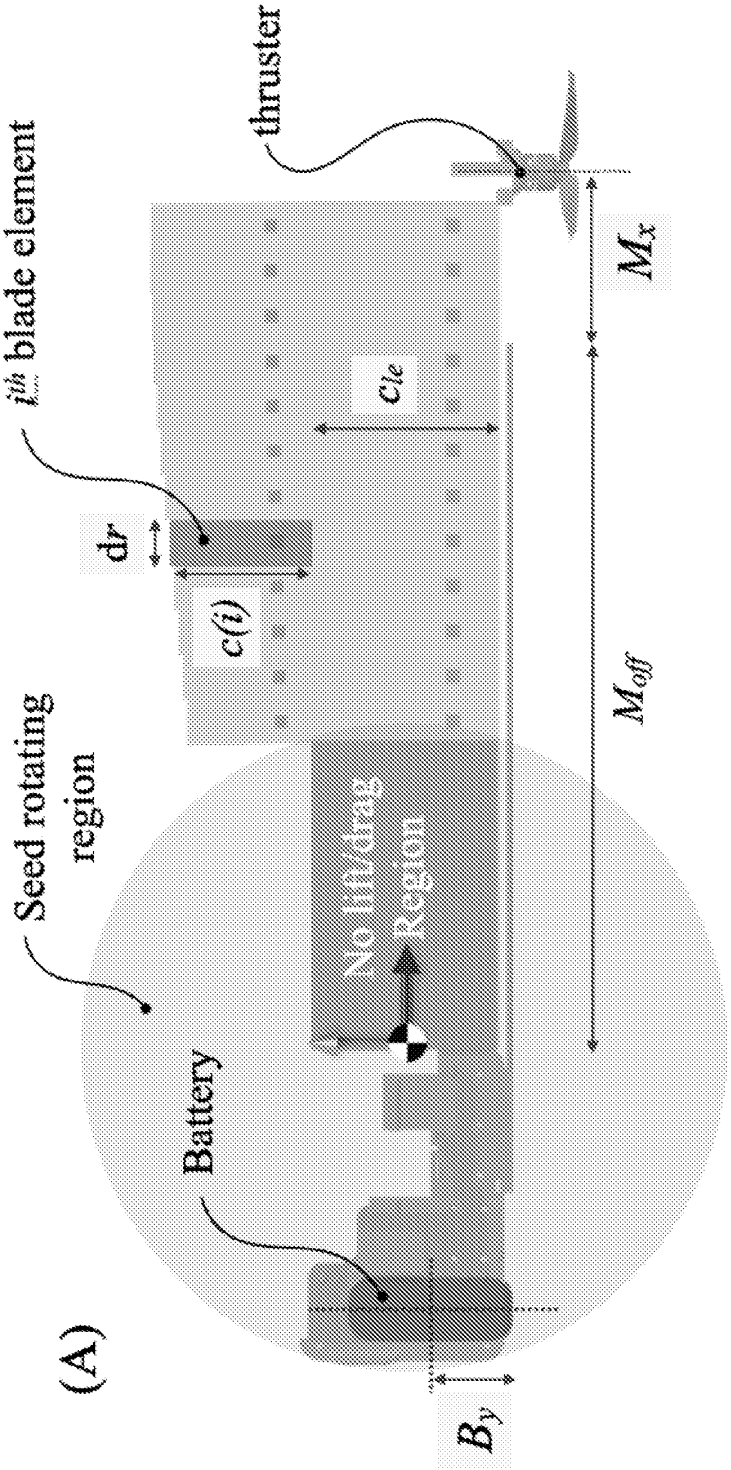


FIG. 6A

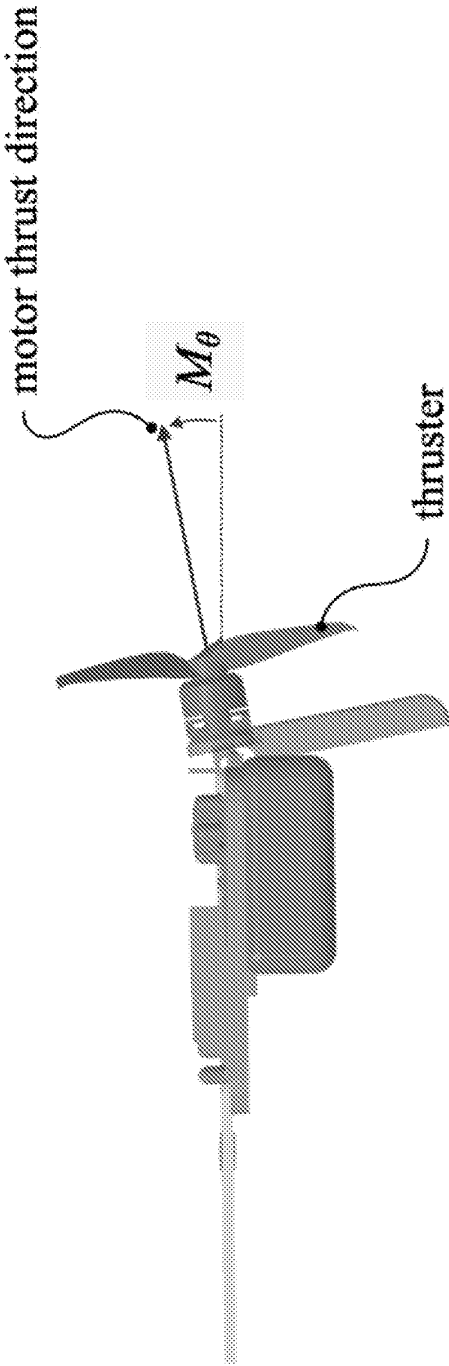


FIG. 6B

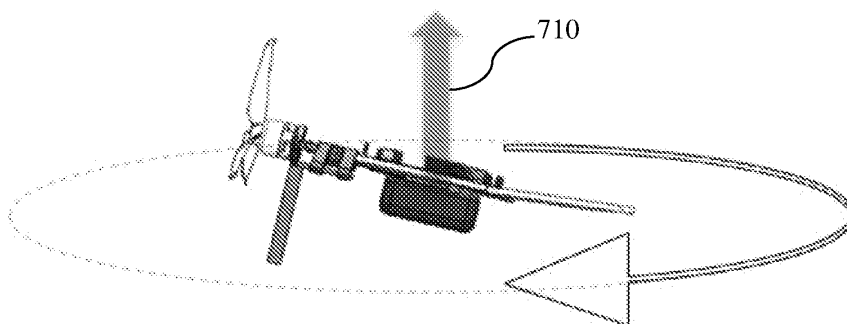


FIG. 7A

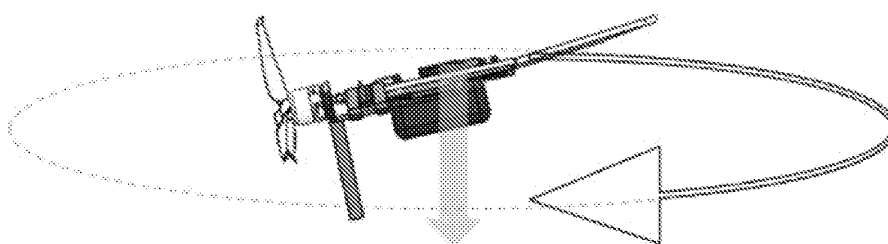


FIG. 7B

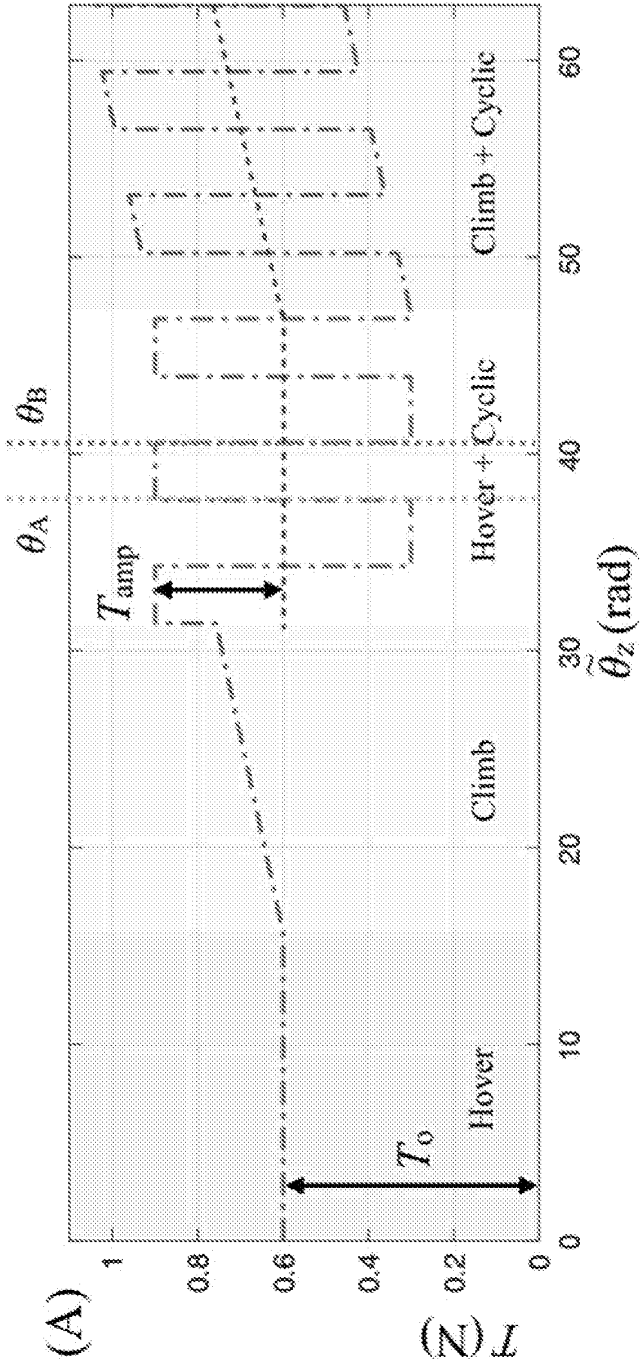


FIG. 8A

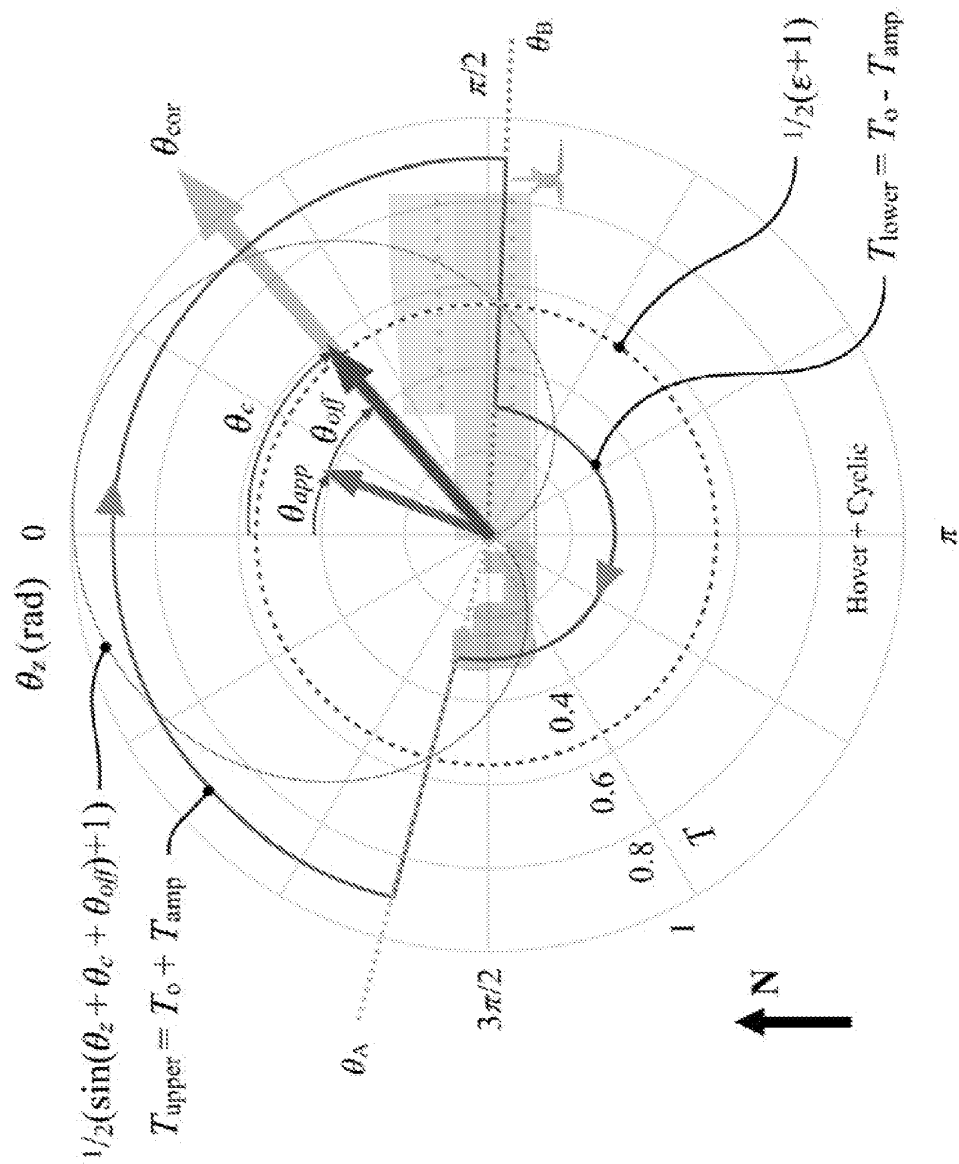


FIG. 8B

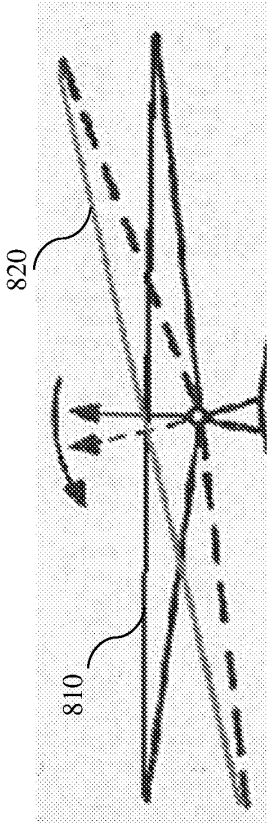


FIG. 8D

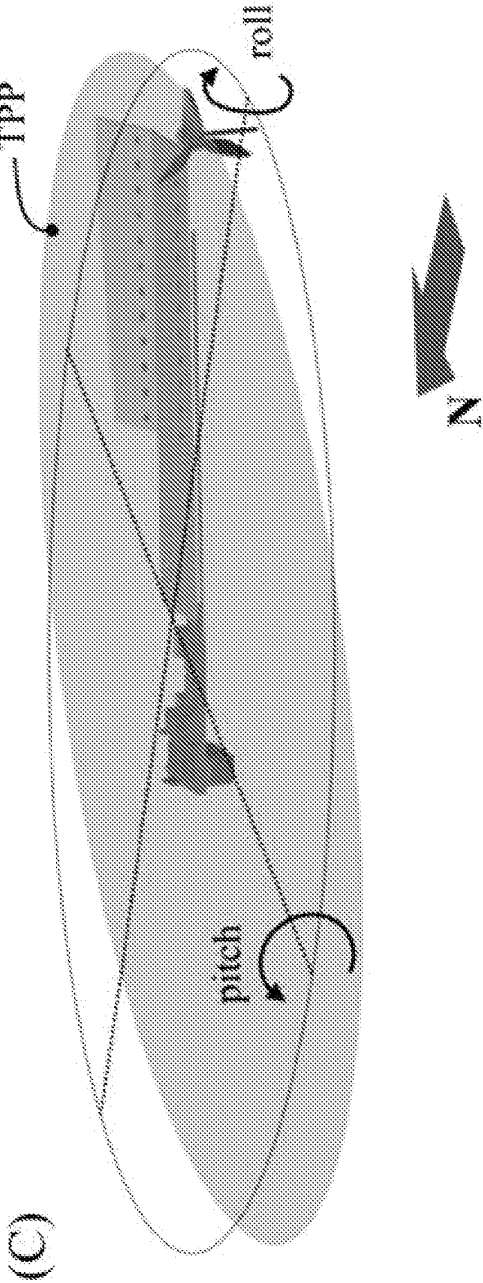


FIG. 8C

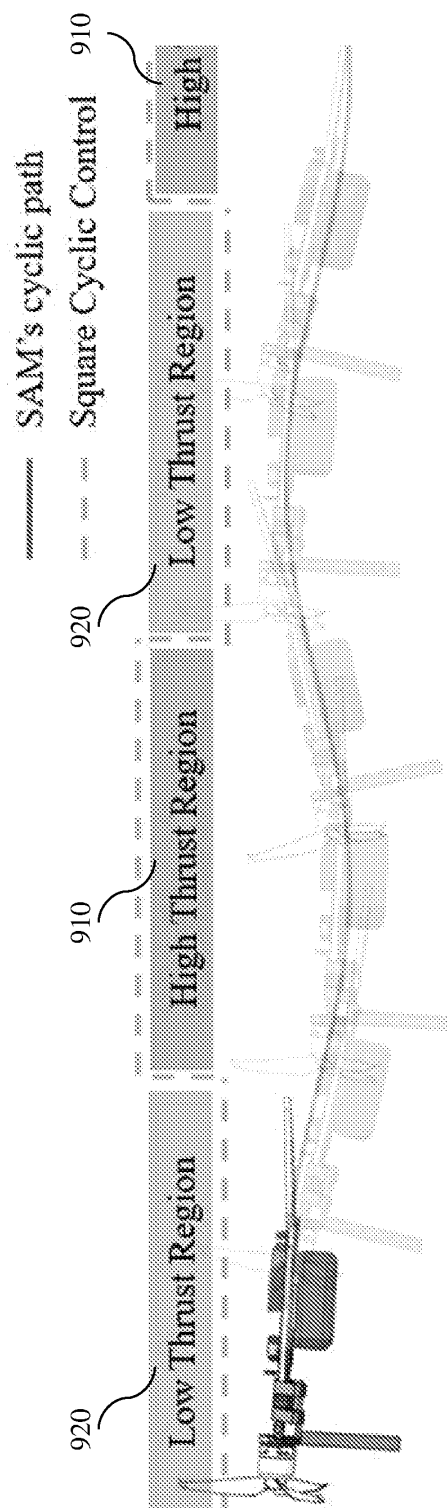


FIG. 9A

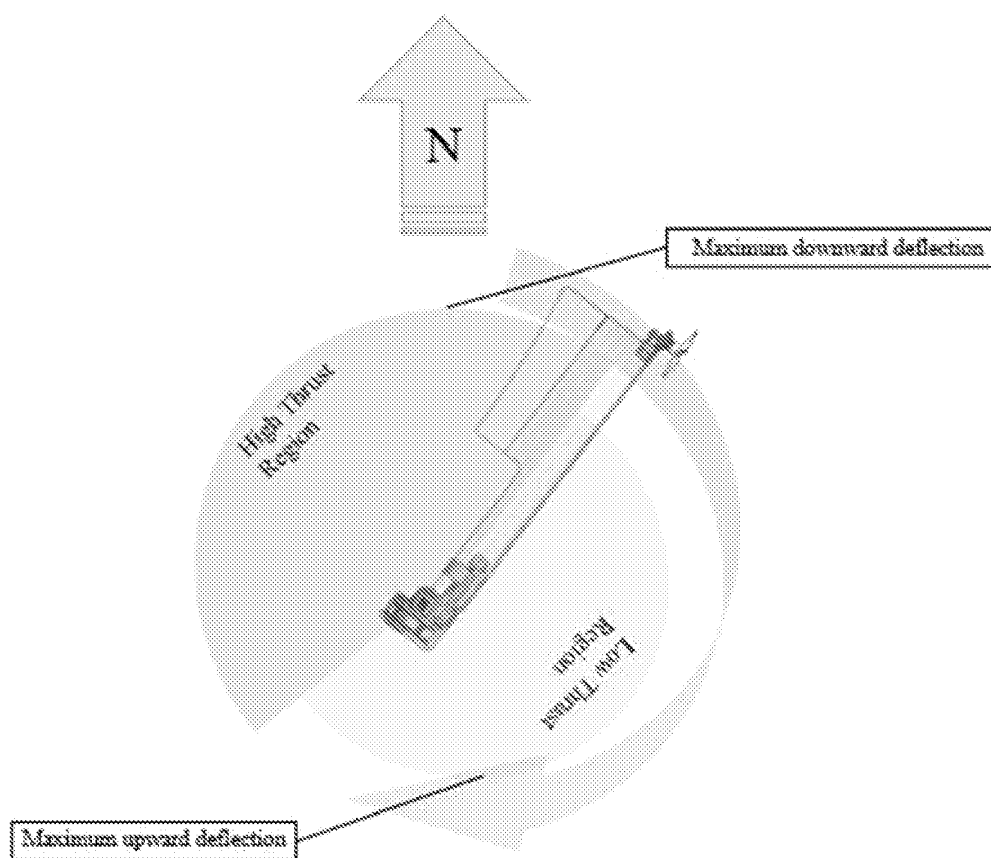


FIG. 9B

TABLE I
TABLE OF OPTIMIZATION VARIABLES

	Parameter	Lower Bound	Upper Bound
Γ_1	C_1	-1	1
	C_2	-2	2
	C_3	-3	3
	C_4	1	100
	$c_{l\epsilon}(\text{mm})$	30	70
	$dr(\text{mm})$	15	22
	$M_x(\text{mm})$	0	70
	$M_\theta(\text{deg})$	-5	30
	$B_y(\text{mm})$	0	30
Γ_2	$T_{amp}(\text{N})$	0.1	0.3
	ϵ	-0.99	0.99

FIG. 10

TABLE II
TABLE OF SIMULATION PARAMETERS

PARAMETERS	
Environment	$\rho = 1.225\text{kg/m}^3, g = -9.81\text{m/s}$
Initial conditions	$V_Z = 0\text{m/s}, \Omega_Z = -37.7\text{rad/s}$
Objective fn coeffs	$\kappa_1 = 1000, \kappa_2 = 1, \kappa_3 = 0.1,$ $\kappa_4 = 2, \beta_1 = 20, \beta_2 = 0.01$ $\beta_3 = 50$
Others	$n_1 = 4000, n_2 = 9999,$ $n_3 = 10000, n_4 = 20000$ $t_s = 10\text{s}, t_f = 20\text{s}$ $n_{be} = 12, M_{off} = 265\text{mm}, \mu = 2$
OPTIMIZED DESIGN VARIABLES	
Polynomial coeffs	$C_1 = -0.0096, C_2 = 0.1116, C_3 = 1.3272,$ $C_4 = 44.5336$
Mechanical params	$c_{le} = 70\text{mm}, dr = 17\text{mm}, M_x = 65\text{mm},$ $M_\theta = -1^\circ, B_y = 0\text{mm}$
Control params	$T_{amp} = 0.1491\text{N}, \epsilon = 0.0676$
Others	$\gamma = 0.087\text{rad}, m = 101\text{g}$ $L_x = 503\text{mm}, L_y = 160\text{mm}, L_z = 82\text{mm}$

FIG. 11

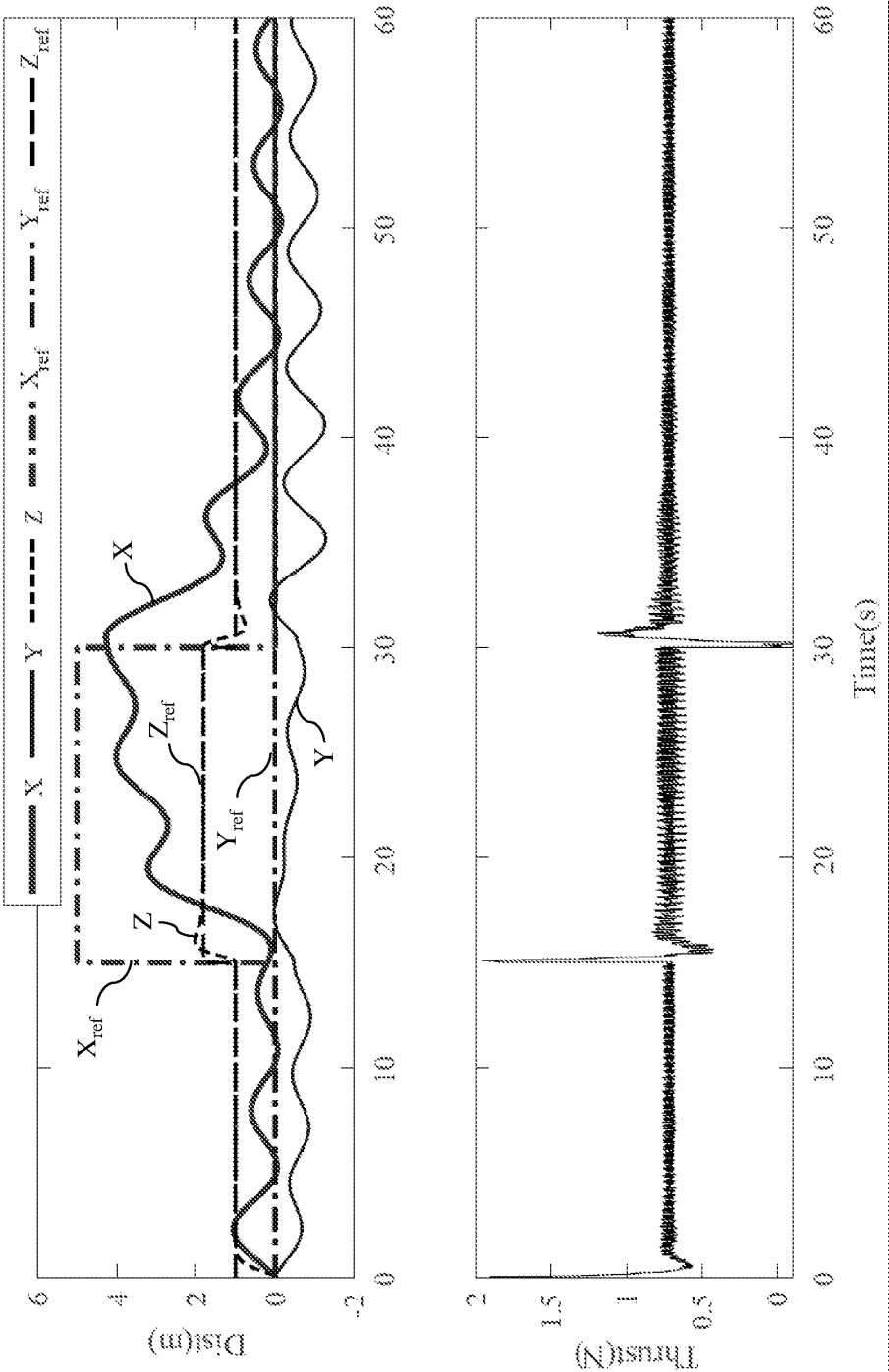


FIG. 12

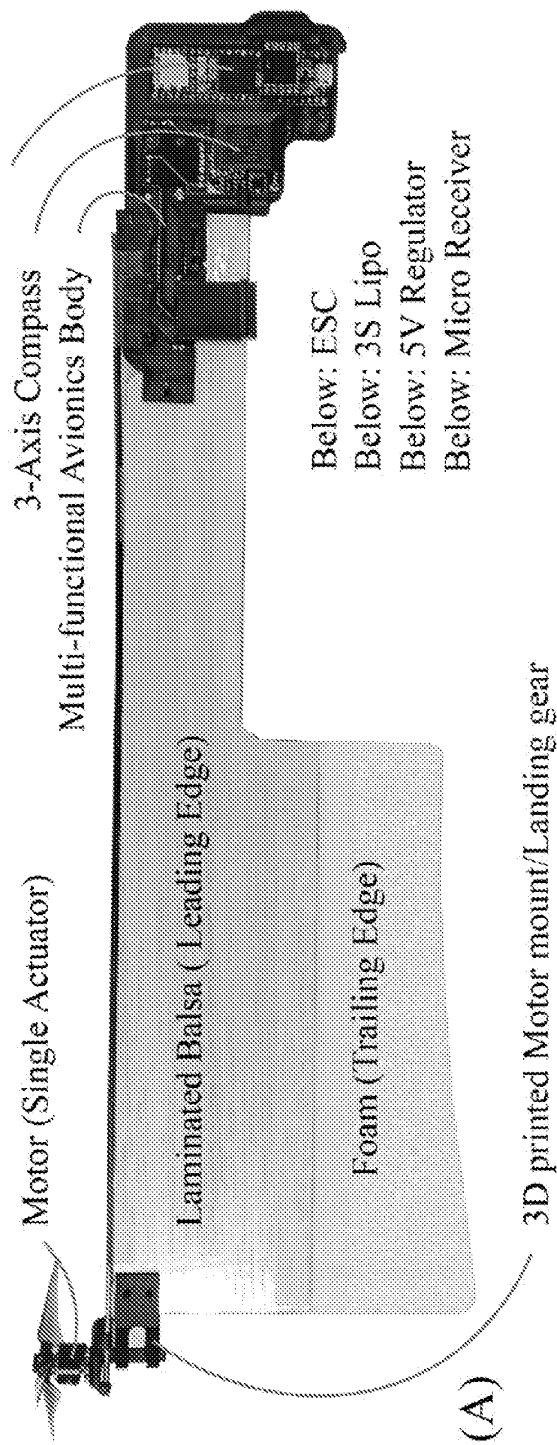


FIG. 13A

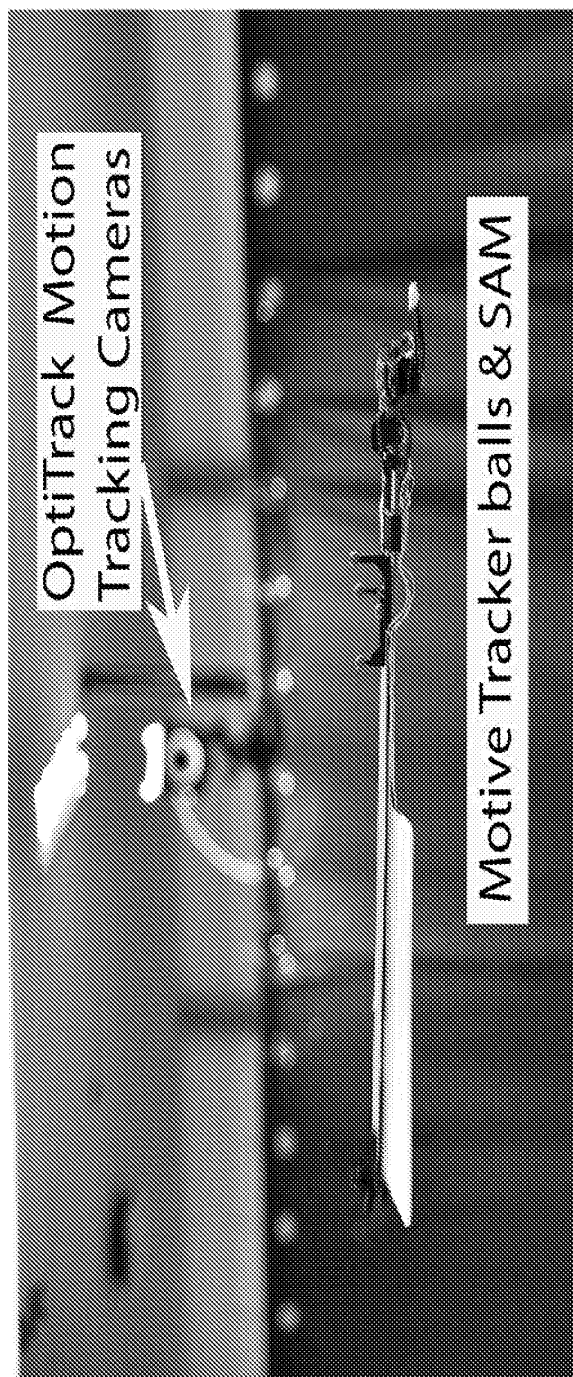


FIG. 13B

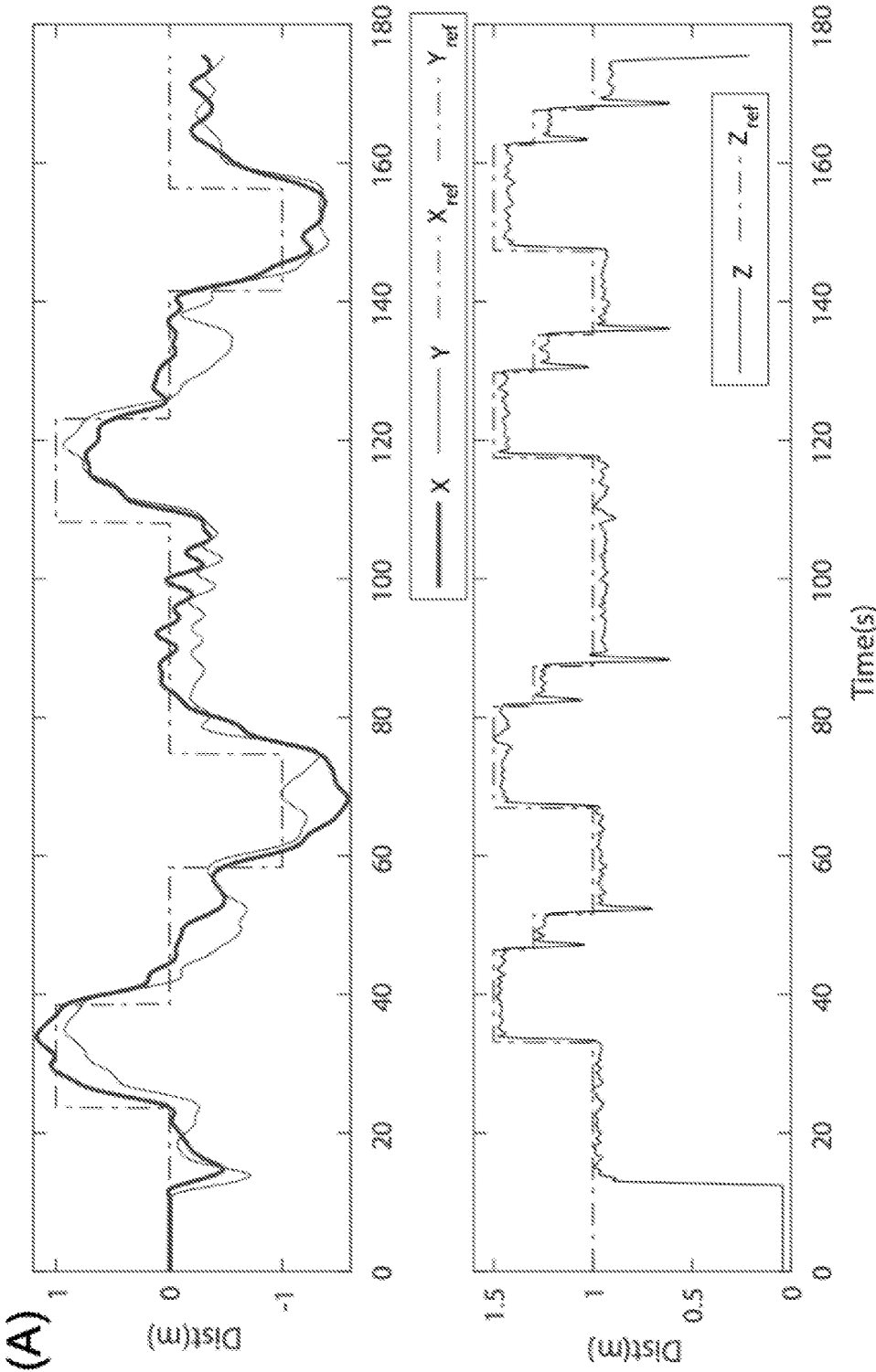


FIG. 14A

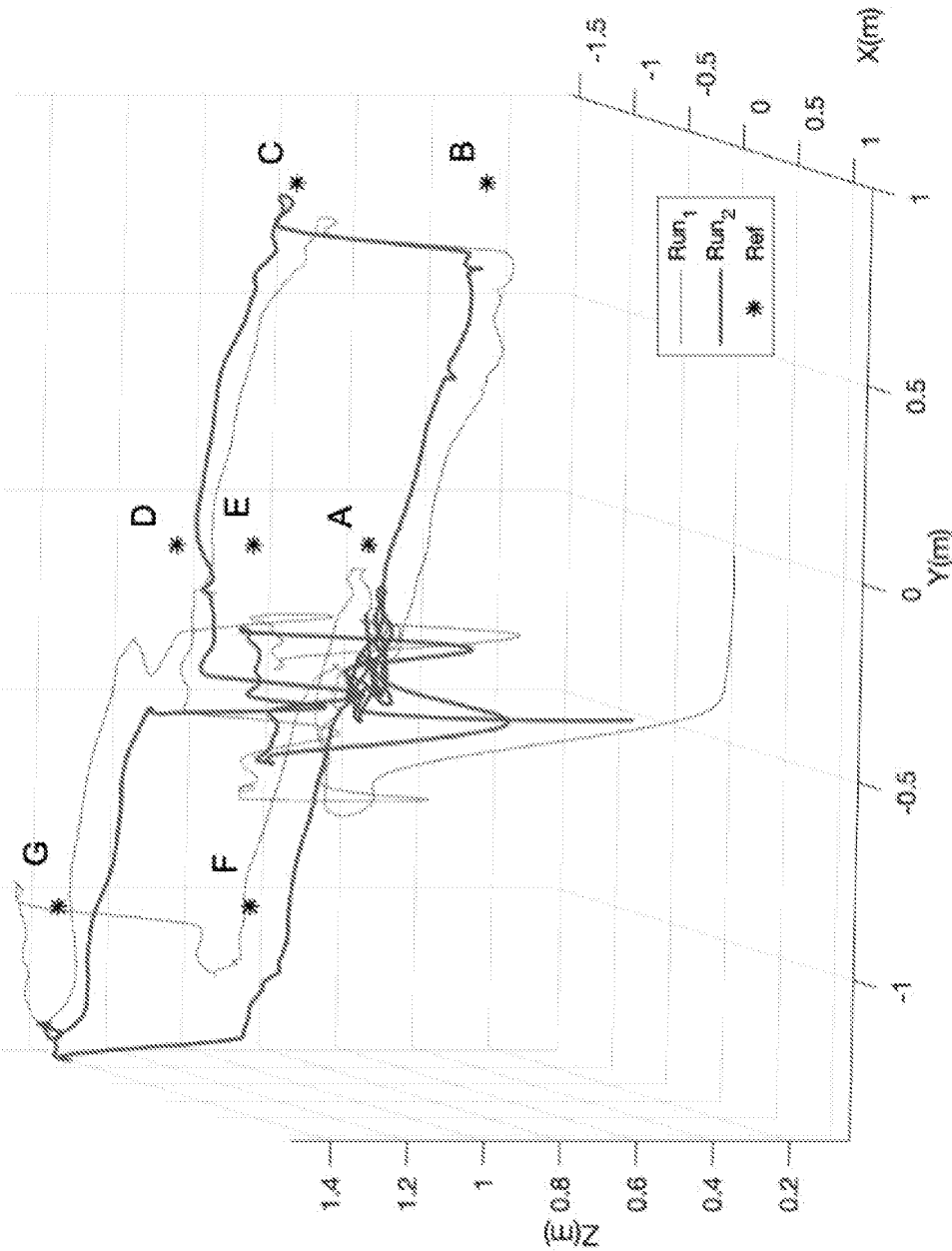


FIG. 14B