



US00D616805S

(12) **United States Design Patent**  
**Zha**

(10) **Patent No.:** **US D616,805 S**  
(45) **Date of Patent:** **\*\* Jun. 1, 2010**

(54) **CO-FLOW JET AIRCRAFT**

(75) Inventor: **Gecheng Zha**, Miami, FL (US)

(73) Assignee: **University of Miami**, Miami, FL (US)

(\*\*) Term: **14 Years**

(21) Appl. No.: **29/320,424**

(22) Filed: **Jun. 26, 2008**

**Related U.S. Application Data**

(63) Continuation of application No. 12/119,193, filed on May 12, 2008, which is a continuation-in-part of application No. PCT/US07/10122, filed on Apr. 24, 2007, application No. 29/320,424, which is a continuation-in-part of application No. 11/064,053, filed on Feb. 23, 2005, now abandoned.

(51) **LOC (9) Cl.** ..... **12-07**

(52) **U.S. Cl.** ..... **D12/343**

(58) **Field of Classification Search** ..... D12/319,  
D12/330-333, 342, 343, 345; 244/13, 15,  
244/35 A, 45 A, 45 R, 52, 53 B, 55, 120,  
244/91, 198, 211, 215, 218

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

2,041,795 A	5/1936	Stalker	
2,075,817 A	4/1937	Loerke	
2,078,854 A	4/1937	Jones	
2,514,513 A	7/1950	Price	
D177,547 S *	4/1956	Lian-Tong	D12/332
2,809,793 A	10/1957	Warner	
3,261,576 A	7/1966	Valyi	
D227,606 S *	7/1973	Rellis	D12/333
D229,494 S *	12/1973	Sather	D12/333
D230,474 S *	2/1974	Rellis	D12/340
D372,218 S *	7/1996	Herzberg et al.	D12/333
5,687,934 A	11/1997	Owens	
D417,184 S *	11/1999	Hartmann et al.	D12/333
D467,217 S *	12/2002	Andreyko	D12/319

D488,426 S *	4/2004	Hall	D12/319
D508,013 S *	8/2005	Rihn et al.	D12/319
D532,742 S *	11/2006	Pan	D12/319

**OTHER PUBLICATIONS**

International Search Report dated Oct. 3, 2009 for International Application No. PCT/US07/10122.

Anders, S., et al., "Active Flow Control Activities at NASA Langley", *AIAA* 2004-2623, Jun. 2004.

Tilman, C.P., et al., "Flow Control Research and Applications at the AFRL's Air Vehicles Directorate", *AIAA* 2004-2622, Jun. 2004.

Miller, D., et al., "Aerodynamic Flowfield Control Technologies for Highly Integrated Airframe Propulsion Flowpaths", *AIAA* 2004-2625, Jun. 2004.

(Continued)

*Primary Examiner*—Cathron C. Brooks

*Assistant Examiner*—Maurice Stevens

(74) *Attorney, Agent, or Firm*—Christopher & Weisberg, P.A.

(57) **CLAIM**

The ornamental design for a co-flow jet aircraft, as shown and described.

**DESCRIPTION**

FIG. 1 is a front perspective view of a co-flow jet aircraft, showing my new design;

FIG. 2 is a top view thereof;

FIG. 3 is a bottom view thereof;

FIG. 4 is a first side view thereof;

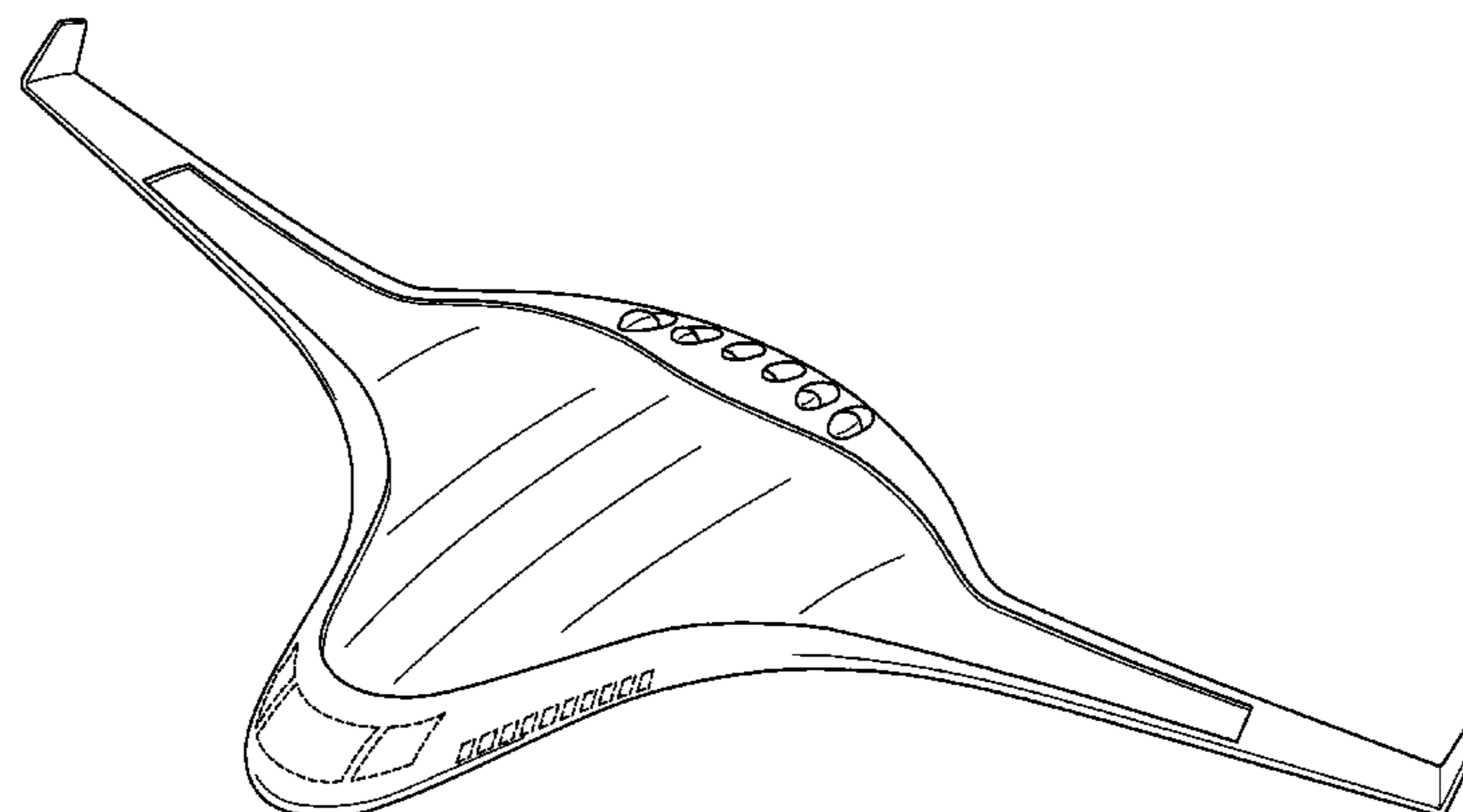
FIG. 5 is a second side view thereof;

FIG. 6 is a front view thereof; and,

FIG. 7 is a rear view thereof.

The broken lines show the unclaimed portions of the jet that form no part of the claimed design.

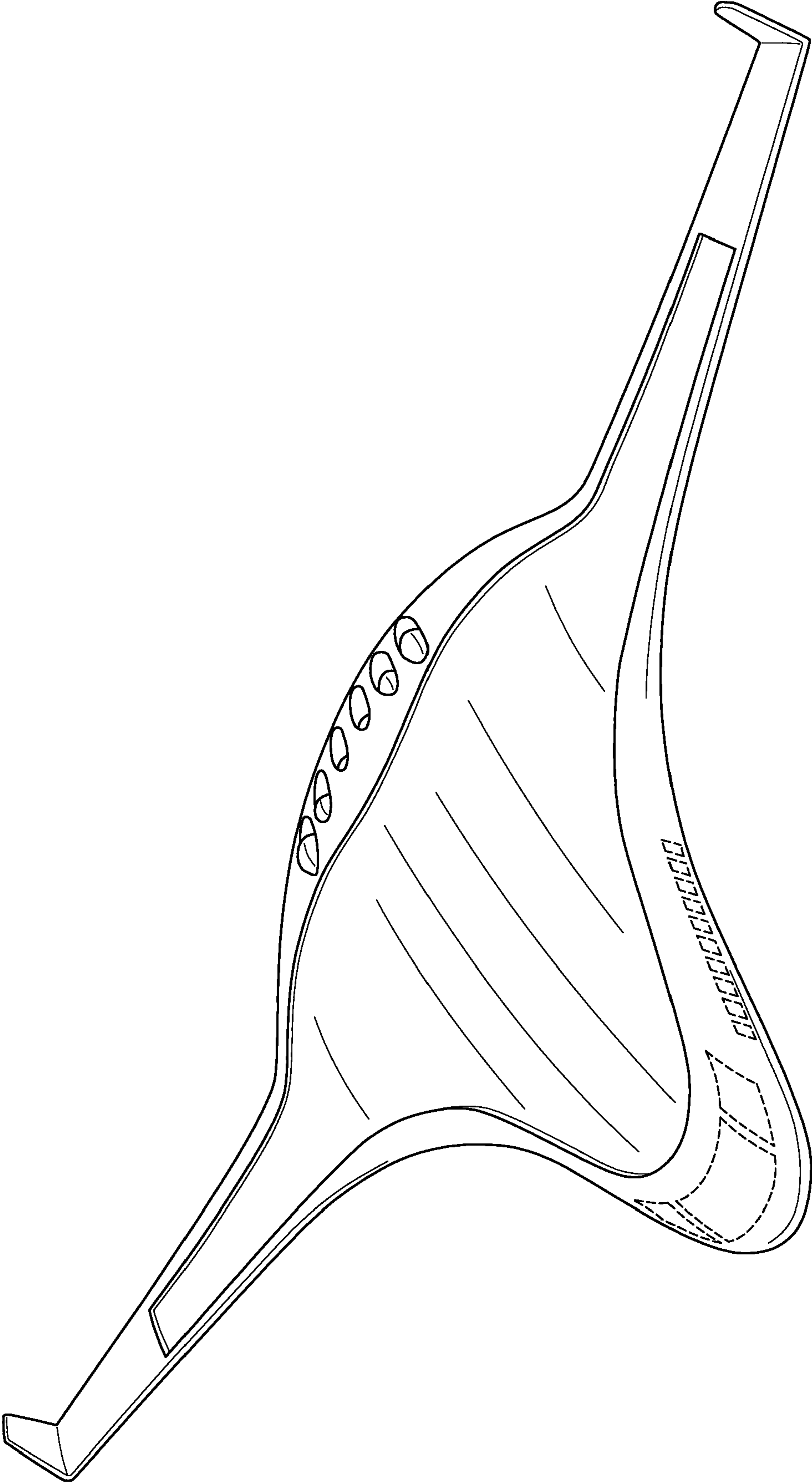
**1 Claim, 5 Drawing Sheets**



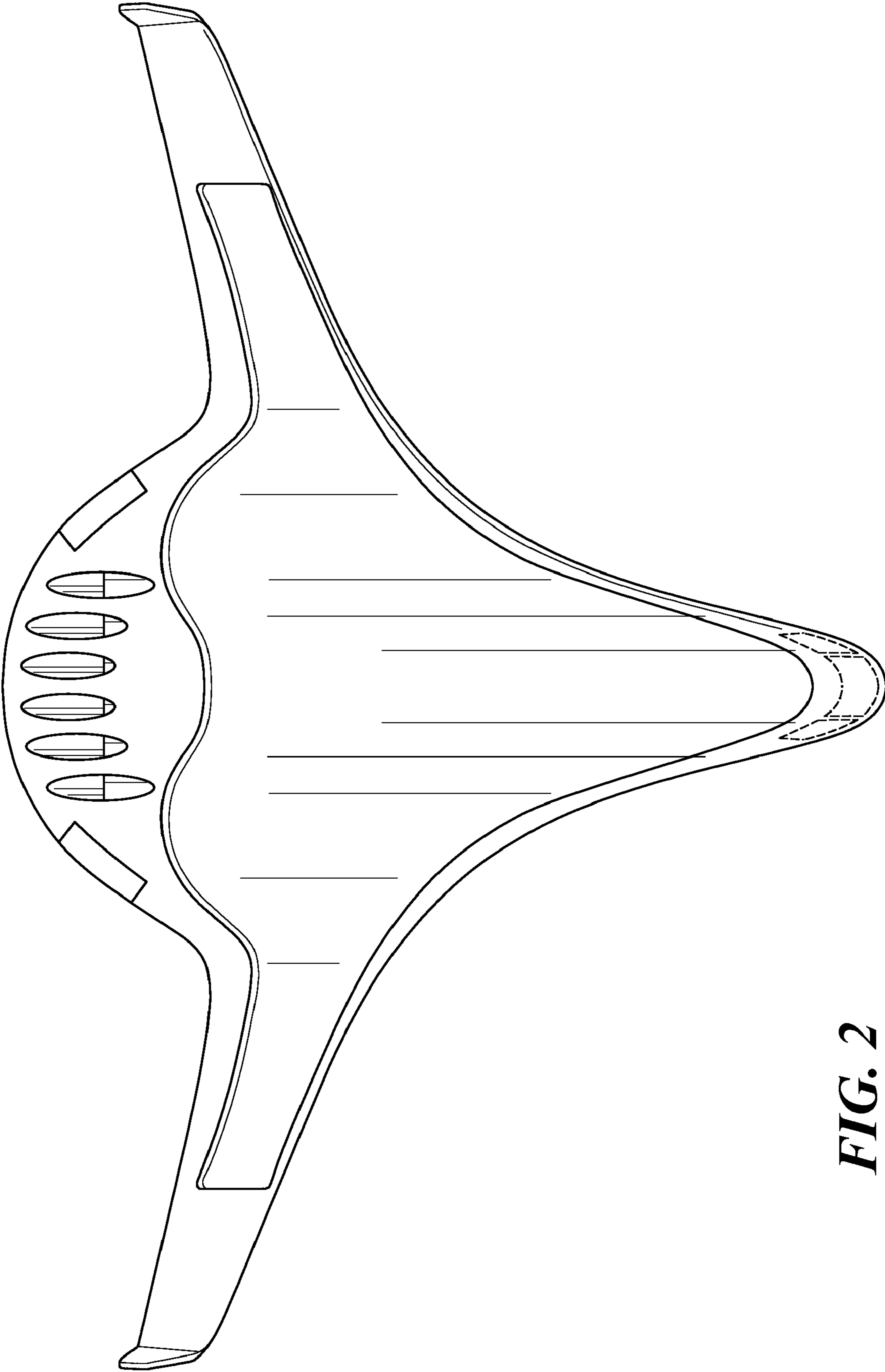
## OTHER PUBLICATIONS

- Kibens, V., et al., "An Overview of Active Flow control Applications at the Boeing Company", *AIAA* 2004-2624, Jun. 2004.
- Englar, R.J., "Circulation Control Pneumatic Aerodynamics: Blown Force and Moment Augmentation and Modifications; Past, Present and Future", *AIAA* 2000-2541, Jun. 2000.
- Bradley, L.C., "An Experimental Investigation of a Sting-Mounted Finite Circulation Control Wing", M.S. Thesis, Air Force Institute of Technology, Dec. 1995.
- Wood, N., et al., "Control of Asymmetric Vortical Flows over Delta Wings at High Angle of Attack", *Journal of Aircraft*, vol. 27, No. 5, pp. 429-435, May 1990.
- Wood, N., et al., "Control of Vortical Lift on Delta Wings by Tangential Leading-Edge Blowing", *Journal of Aircraft*, vol. 25, No. 3, pp. 236-243, Mar. 1988.
- Wood, N., et al., "Circulation Control Airfoils Past, Present, Future", *AIAA* 85/0204, 1985.
- Englar, R.J., et al., "STOL Potential of the Circulation Control Wing for High-Performance Aircraft," *Journal of Aircraft*, vol. 14, No. 3, pp. 175-181, Mar. 1978.
- Englar, R.J., "Circulation Control for High Lift and Drag Generation on STOL Aircraft", *Journal of Aircraft*, vol. 12, No. 5, pp. 457-463, May 1975.
- Brown, G., et al., "On Density Effects and Large Scale Structure in Turbulent Mixing Layers", *Journal of Fluid Mechanics*, vol. 64, Part 4, pp. 775-816, 1974.
- Strykowski, P., et al., "The Effect of Counterflow on the Development of Compressible Shear Layers", *Journal of Fluid Mechanics*, vol. 308, pp. 63-69, 1996.
- Englar, R., et al., "Test Techniques for High Lift, Two-Dimensional Airfoils with Boundary Layer and Circulation Control for Application to Rotary Wing Aircraft", *Canadian Aeronautics and Space Journal*, vol. 19, No. 3, pp. 93-108, Mar. 1973.
- Liu, Y, et al., "Computational Evaluation of the Steady and Pulsed Jet Effects on the Performance of a Circulation Control Wing Section", *AIAA* 2004-56, 2004.
- Englar, R.J., et al., "Application of Circulation Control to Advanced Subsonic Transport Aircraft, Part I: Airfoil Development", *Journal of Aircraft*, vol. 31, No. 5, pp. 1160-1168, Oct. 1994.
- Englar, R.J., et al., "Application of Circulation Control to Advanced Subsonic Transport Aircraft, Part II: Transport Application", *Journal of Aircraft*, vol. 31, No. 5, pp. 1169-1177, Oct. 1994.
- Wynanski, I., "The Variables Affecting the Control Separation by Periodic Excitation", *AIAA* 2004-2505, Jun. 2004.
- McManus, K., et al., "Airfoil Performance Enhancement Using Pulsed Jet Separation Control", *AIAA* 97-1971, 1997.
- McManus, K., et al., "Separation Control in Incompressible and Compressible Flows Using Pulsed Jets", *AIAA* 96-1948, 1996.
- Johari, H., et al., "Visualization of Pulsed Vortex Generator Jets for Active Control of Boundary Layer Separation", *AIAA* 97-2021, 1997.

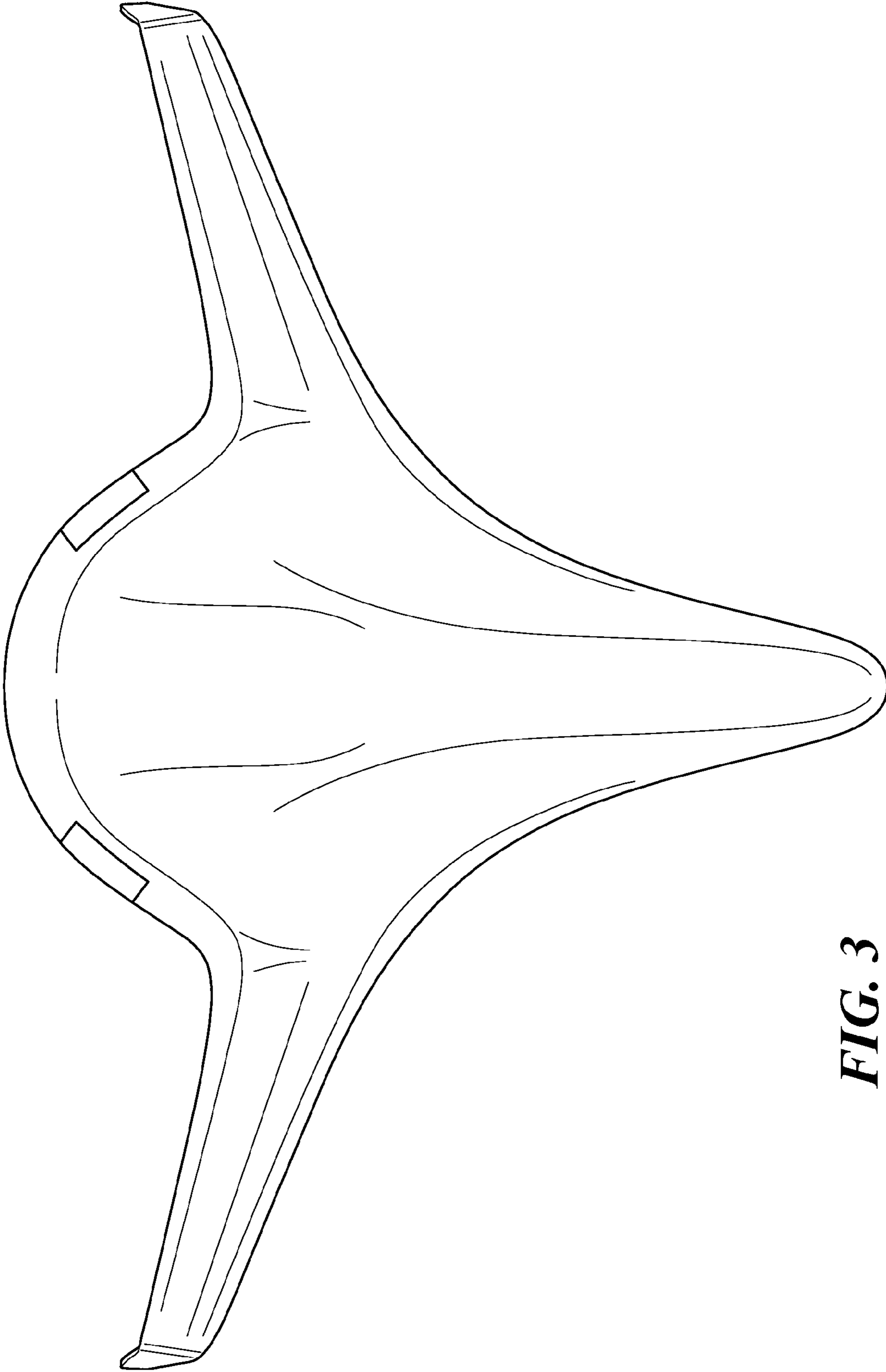
\* cited by examiner



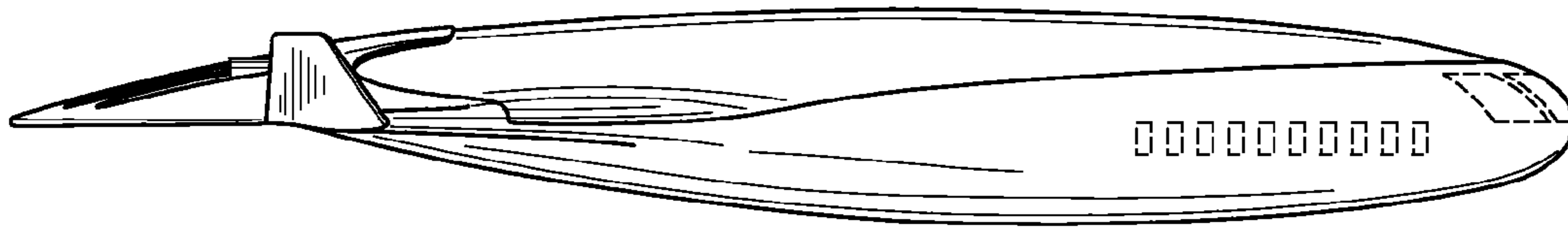
**FIG. 1**



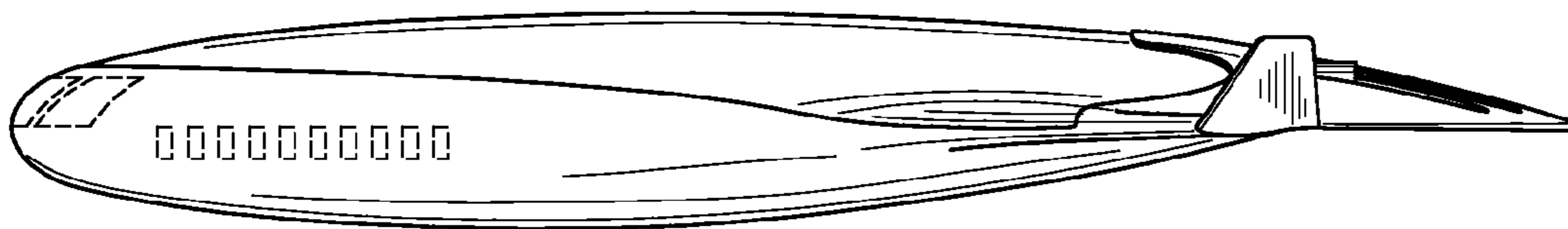
**FIG. 2**



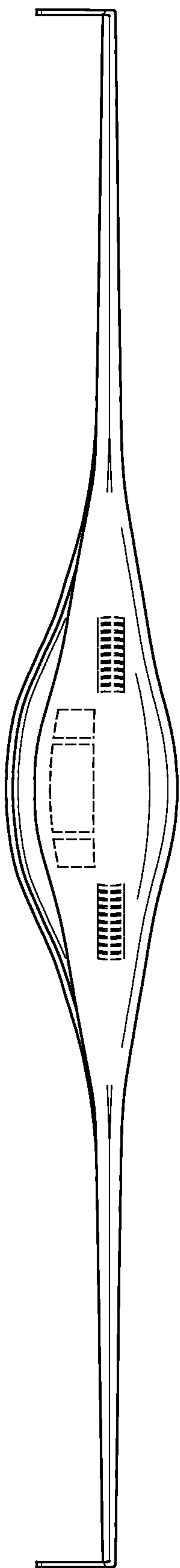
**FIG. 3**



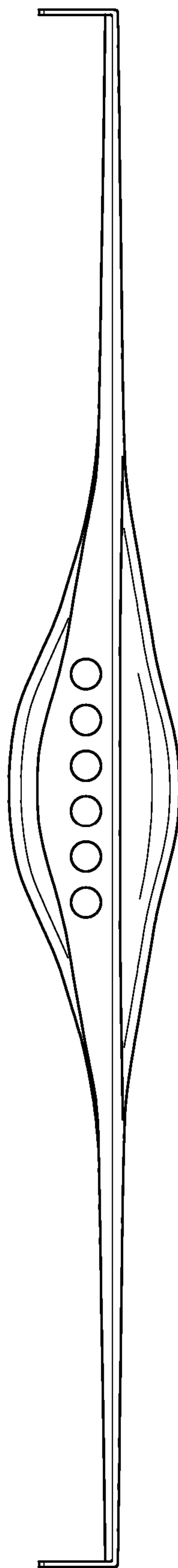
**FIG. 4**



**FIG. 5**



**FIG. 6**



**FIG. 7**