through a nozzle **18** so as to provide forward propulsive thrust. The core engine **16** is enclosed within a casing **20** in a conventional manner including an inlet **27** in serial flow relationship with a compressor, a combustor, a first turbine means for driving the compressor, and a second turbine means for driving the fan **22**, all of which are conventional and therefore not labelled in the drawing.

The fan **22** is concentric with the core engine **16** and includes a plurality of circumferentially spaced apart variable pitch fan blades **23** extending radially outward from an inner hub **25** to an outer cowling **24.** Cowling **24** is larger in diameter than the core engine **16** and spaced apart therefrom to form a bypass duct **26** which provides for additional thrust by movement of relatively large masses of low velocity air in a well known manner. The fan **22** may be of a high bypass ratio type whereby the mass of air passing through the fan may be as high as **8** or greater times the amount of airflow through the core engine **16.** The fan **22** is thus used to propel air through the duct **26** as well as to supercharge the engine **16.**

As previously discussed, the variable pitch fan **22** provides for increased performance efficiency by adjusting the fan speed to meet different engine operating requirements as dictated by the flight mission. Thus, the variable pitch fan blades **23** permit the fan speed to be varied without changing the rotational speed of the core engine **16.** Such blading may even be varied to reverse pitch or negative pitch for complete thrust reversal after landing whereby the direction of the flow of air in the duct **26** is reversed. Due to the high bypass ratio of the fan flow, it may be necessary only to reverse the direction of the fan flow for satisfactory braking, whereupon the core engine exhaust can then be ignored.

When the variable pitch fan blades **23** of the fan **22** are in reverse pitch for braking, the airflow which is drawn into the bypass duct **26** through the annular rear entry, as generally defined between the cowling **24** and the core engine casing **20,** may suffer some degree of distortion due to the turning of the airflow into the core engine compressor which still requires an inlet airflow for continued operation of the core engine. This distortion is due to the fact that the reverse pitch airflow passing forwardly along the bypass duct **26** must turn through **180°** in order to enter the core engine inlet **27.** As a direct consequence of such distorted flow occurring when the air passes forwardly along the bypass duct **26,** there is an aerodynamic restricting or nozzle effect produced in the airflow before it reaches the variable pitch fan blades **23.** Since the entry to the fan is so restricted, the reverse thrust produced by the variable pitch fan is less than it would otherwise be if this aerodynamic restriction could be eliminated or reduced.

Referring now to FIG. **2,** in conjunction with FIG. **1,** the cowling **24** can be seen to include a forward fixed portion **28** and an aft variable portion **30** comprising a plurality of circumferentially spaced apart hinged nozzle flaps **32** which may be opened to accommodate a maximum airflow through the bypass duct **26** during takeoff and climb to altitude after which the nozzle flaps **32** may be rotated into the closed position to accommodate the reduced airflow through the bypass duct during the cruise portion of the flight. Airflow sealing between the nozzle flaps **32** may be accomplished by a plurality of interleaved seal elements **39** as shown in FIG. **3.**

Nozzle flaps **32** are connected to an axially translatable unison ring **33** by means of a plurality of circumferentially spaced apart hinges or pins **36.** The unison ring **33** may include an inner annular wall member **34** spaced apart from an outer annular wall member **35** interconnected by an integral forward end wall member **38,** the generally concave face of which sealingly engages the generally convex aft end **40** of the forward fixed portion **28** of the cowling. Intermediate the inner and outer wall members **34, 35,** there is provided an inflatable bladder **42** of generally circular cross-section, in abutting relation with the generally concave side of still another annular wall member **44** which extends radially between the inner and outer wall members **34** and **35.** An actuating ring section **46** is slidably disposed for axial translation between the inner and outer wall members **34, 35** and includes a generally concave surface **48** for engaging the aft side of the inflatable bladder **42.** Extending rearwardly from the actuating ring section **46** is a circumferential flange **50** terminating in a circumferential abutment face **52,** the purpose of which will become obvious from the following discussion.

An annular ring section **54** is maintained in spaced relation intermediate the inner and outer wall members **34, 35** by a plurality of circumferentially spaced apart radial flange members **37,** which integrally connect to the inner wall member **34** and coincidentally retain the pins **36** for rotation relative to the unison ring **33.** The annular ring section **54** includes a forward annular abutment face **58** which operates as a stop for minimum nozzle area position and an aft annular abutment face **60** which operates as a stop for maximum nozzle area position as will be fully described in the following discussion.

The unison ring **33** may be retained for axial translation relative to the fixed portion **28** of the cowling **24** by a plurality of circumferentially spaced apart longitudinal guide and support struts **62.** The struts **62** may be of I beam cross-section, as shown in FIG. **2A,** so as to be axially translated by a linear actuator **64** along rollers **63, 63'** which are rotatably pinned to the fixed portion **28** of the cowling. The linear actuator **64** interconnects the guiding support struts **62** through an actuator piston drive rod **65** and may be of the well known hydraulic type wherein hydraulic fluid is supplied to the actuator from a control source of hydraulic fluid, not shown. Alternatively, the linear actuator could be of the screw jack type driven by a rotating motion from a hydraulic, pneumatic, or electric motor (not shown). The control for either hydraulic or screw jack actuators would be similar to that used to control the variable area of a jet exhaust nozzle and thus would be well known to persons of ordinary skill in the art.

Referring now to FIG. **4,** there is shown an air inlet at **66** for the inflatable bladder **42** wherein the air inlet is circumferentially offset from the guide and support struts **62** and may be axially retracted from the downstream end of an air hose or air conduit **68.** The air hose **68** receives a flow of pressurized air from a source (not shown) whereby the flow of pressurized air to the inflatable bladder **42** may be selectively controlled by an air valve **70.**

During normal engine operation at takeoff and climb to altitude, the airflow through the bypass duct **26** is at a maximum whereupon the hinged nozzle flaps **32** must