System for maintaining an atmosphere at a desired pressure in a shell containing a motor, the shell being subjected to conditions such that leakage of atmosphere and reduction in pressure may occur.
ATMOSPHERE SUPPLY SYSTEM FOR MOTORS

BACKGROUND OF THE INVENTION

It has been found that motors used in outer space equipment operate more efficiently when they are provided with an environment which is close to the atmospheric conditions existing on the earth's surface. Such motors are usually sealed to retain air therearound even after the device in which they are used is sent aloft or placed in orbit.

Under even normal conditions, some slight leakage of atmospheric occurs. Therefore, it has been found that merely sealing a motor unit is not satisfactory.

THE INVENTION

A system has been devised which is provided with a source of the atmosphere under a pressure above that in the shell or container housing the motor. The atmosphere source is connected to the shell with appropriate valves, to control the passage of the atmosphere from the source to the shell.

The system includes a spring-biased pressure differential valve having an element exposed to the pressure in the motor shell and to the atmosphere pressure in the source. In the event that the pressure differential is below that desired, the valve moves from one position blocking the connection between the shell and the source to a position permitting flow from the source to the shell. A second normally closed valve in the connection conduit is solenoid operated to an open position upon energization of the motor. Thus, when the solenoid valve is open, atmosphere can flow between the source of the motor. This double requirement assures that air in the source is utilized only when needed, that is, when the air is low in the shell and when the motor is running and needs air. Otherwise, no air in the source is utilized during periods when the motor is not operating or when there is adequate air in the shell.

When the pressure differential valve is balanced, it moves to block further flow from the source to the shell.

THE DRAWINGS

The single FIGURE of the drawing is a diagrammatic illustration of the system of this invention.

THE PREFERRED EMBODIMENT

The drawing shows a shell 10 which contains a motor 12 connected to a suitable power source (not shown). The shell 10 is of a suitable metal and constructed of plural parts for ease of fabrication, the parts being joined by flanges or the like 14 and perhaps welded or otherwise suitably joined together.

Inasmuch as the motor is to be used for space systems, an atmosphere which may be air or other mixtures of gases is provided. A fill valve 16 is provided for filling the shell.

Even though precautions are taken to seal the atmosphere in the shell 10, leakage may occur. Because the motor 12 operates most efficiently in the encased atmosphere, an arrangement is provided to supply atmosphere to the shell 10. This arrangement includes a suitable source 18 of pressurized atmosphere filled through a fill valve 20 and connected to the shell by a conduit 22. Disposed in the conduit 22 is a solenoid-operated valve 24 which is normally closed, blocking the conduit 22 and which is connected with the motor 12 for operation therewith.

Also in the connecting conduit 22 is a pressure differential controlled valve 26 which is normally closed, blocking the conduit 22. The valve 26 includes a check valve part 28 engaging a seat 30 in its closed position which is connected to a control piston 32 movable in a cylinder 34. The piston 32 is biased by a spring 36, as illustrated, and includes pressure areas 38 and 40, the area 38 being smaller than the area 40. The area 38 is subjected to the pressure in the source 18 by means of a conduit 42 and the area 40 is subjected to the pressure in the shell 10 by means of a conduit 44 and also the pressure exerted by the biasing spring 36.

When the pressure in the shell drops below a desired value, the piston 32 moves to a piston wherein the valve part 28 moves from its seat to unblock the conduit 22. Atmosphere from the source can then flow in to the conduit 22 to the valve 26.

Upon energization of the motor 12, the solenoid valve 24 is energized and moves from its normally closed position to an open position permitting flow through the conduit 22 from the source to the shell. When the desired pressure balance is reestablished, as determined by the pressure differential valve, the valve part 28 seats with the seat 30 and blocks the conduit 22. Stopping of the motor deenergizes the solenoid valve 24, blocking the conduit 22.

What is claimed is:

1. The combination comprising a motor; means to actuate said motor;
a shell enclosing said motor and containing an atmosphere at a first pressure which is to be maintained at a desired level; said shell being subjected to conditions wherein undesirable leakage of atmosphere therefrom and reduction in pressure from the desired level can occur;
a source of said atmosphere at a second and higher pressure;
means including a conduit for connecting said source to said shell to effect the passage of atmosphere from said source to said shell;
a valve in said connecting means movable substantially simultaneously with motor activation from a normally closed position, in which said conduit is blocked, to an open position in which said conduit is open to permit atmospheric flow from said source to said shell; and
a differential pressure valve in said connecting means exposed to the first and second pressures and movable from a position blocking said conduit, when the first pressure is established at the desired level, to a position opening said conduit when the first pressure is below the desired level and thus causing the pressure differential between said shell and said source to be smaller than that desired, whereby upon actuation of said first-named valve higher pressure atmosphere flows from said source through said connecting means to said shell until the first pressure is increased back to the desired level and the desired pressure differential is reestablished,
atmosphere from said source thereby being supplied to said shell only when said motor is running and then only when the pressure within said shell is less than that desired.

2. The combination of claim 1 in which said first-named valve is solenoid operated.

3. The combination of claim 1 in which said pressure differential valve is biassed toward its position blocking said conduit.

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