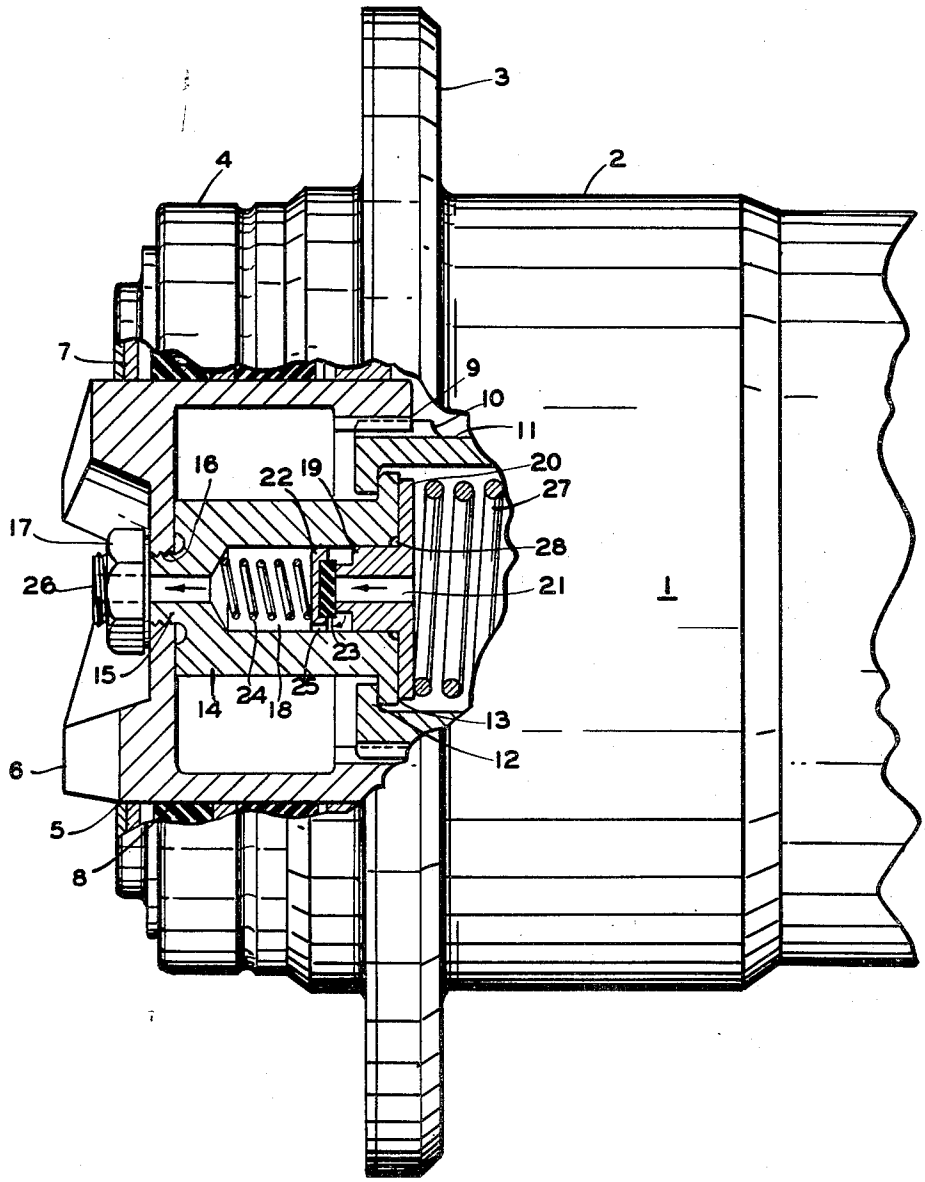
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PRESSURE BALANCING VALVE FOR AIRCRAFT STARTERS

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PRESSURE BALANCING VALVE FOR AIRCRAFT STARTERS

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The present invention relates to engine starters and more particularly to a pressure balancing valve for use in engine starters.

In engine starters, it is desirable to maintain the starter jaw out of mesh with the engine jaw when the engine is running, otherwise the jaws ratchet. Ratcheting of the jaws with the engine running at a high speed causes considerable wear and consequent failure of the jaw members. One of the causes of jaw meshing when the engine is running is pressure in the starter housing. The starter jaw is confined in an efficient oil seal and is essentially a piston that may be actuated by pressure. Thus, when the pressure within the starter housing is greater than that of the engine jaw compartment, the pressure acts upon the starter jaw to urge it towards an engaged position to ratchet on the engine jaw.

The jaw compartment is substantially a closed chamber. Upon changes in altitude, the pressure in the jaw compartment lags the change in atmospheric pressure. Upon an aircraft descending from a high altitude, the atmospheric pressure increases rapidly and due to the time lag in the response to pressure changes in the jaw compartment, the pressure in the starter housing will be greater than that in the jaw compartment. This differential in pressure is in a direction to tend to urge the jaws into engagement.

In the present invention, a one-way valve is provided in the starter mesh rod to relieve the pressure within the starter housing.

An object of the present invention is to provide an improved starter.

An object of the invention is to provide novel means for preventing jaw wear in starters.

Another object of the invention is to provide novel venting means for a starter.

Another object of the invention is to provide pressure relief means for an engine starter.

The above and other objects and features of the invention will appear more fully hereinafter from a consideration of the following description taken in connection with the accompanying drawings wherein one embodiment of the invention is illustrated by way of example.

In the drawing:

The single figure of the drawing is a partial cutaway view of an engine starter containing one embodiment of the invention.

Referring now to the single figure of the drawing, a starter **1** is provided with a housing **2**. Only a fragmentary portion of the starter **1** is illustrated, it is understood, however, that it will comprise driving means, reduction gearing and jaw advancing mechanism as is well known in the art. A mounting flange **3** is provided for securing the starter **1** to an engine housing (not shown).

A baffle plate **4** is secured to the housing **2** in any conventional manner and has an opening **5** therein adapted to receive a starter jaw **6**. A friction ring **7** surrounds and is in frictional engagement with the jaw **6**. The ring **7** is held in position by the baffle plate **4**. Also secured to the baffle plate **4** is an oil seal ring **8**. The starter jaw **6** has splines **9** adapted to mate with splines **10** of screw shaft **11**. The screw shaft **11** may be splined for rotation with and axial movement relative to a spline nut (not shown) in a conventional manner. The screw shaft

11 has a flanged portion **12** adapted to coact with a flange **13** on mesh rod **14**. The mesh rod **14** has a threaded portion **15** adapted to extend through an opening **16** in jaw **6**. A nut **17** secures the jaw **6** to the mesh rod **14**.

The mesh rod **14** has a counterbore portion **18** adapted to receive a valve seat member **19**. The member **19** has a circumferential flange **20** and a passageway **21** extending axially through the member **19**. A valve body **22** is positioned in the counterbore portion **18** and has a soft seal member **23** of soft rubber or the like secured thereto. A spring **24** biases the valve body **22** against the valve seat member **19** to seal the passageway **21**. The valve body **22** has a plurality of openings **25** around the circumference thereof to permit the passage of air. An opening **26** is provided in the mesh rod **14** to connect with the counterbore portion **18**. The valve seat member **19** is held in the counterbore **18** by meshing or ratcheting spring **27** coacting with the flange **20**. It is understood, however, that other means may be utilized to hold the valve seat member **19** in the counterbore **18**. An O-ring seal **28** may be used between the valve seat member **19** and the counterbore **18**.

In operation, upon the air pressure in the starter exceeding the pressure in the engine jaw compartment, the air pressure is applied to the valve body **22** through the passageway **21**. The spring **24** exerts a pressure somewhat less than the pressure of the engine jaw compartment and the bias thereof is overcome. The valve body **22** is forced away from the passageway **21** thus permitting the air to escape from the starter. The openings **25** and **26** permit the air to pass out into the engine jaw compartment. If the pressure in the engine jaw compartment is greater than that in the starter, the bias of the spring **24** is augmented thereby increasing the seal. The aforenoted arrangement prevents excess pressure from being built up in the starter that would tend to urge the jaws into mesh, yet provides an effective seal in the reverse direction to prevent oil from the engine entering the starter.

Although only one embodiment of the invention has been illustrated and described, various changes in the form and relative arrangement of the parts may be made to suit requirements.

What is claimed is:

1. In an engine starter, the combination comprising a starter housing, a jaw compartment, a jaw member extending from said starter housing into said jaw compartment, oil seal means positioned between said starter housing and said jaw member, a mesh rod member extending through and operatively connected to said jaw member, said mesh rod member having a passageway extending axially thereof, a one way valve member in said passageway and adapted to permit flow from said starter housing to said jaw compartment and prevent flow from said jaw compartment to said starter housing.

2. In an engine starter having a jaw member adapted for extension from a starter housing into a jaw compartment, the combination comprising a mesh rod member extending through and operatively connected to said jaw member, said mesh rod member having a passageway extending axially thereof, a valve seat member positioned in said passageway, a valve body having a soft seal portion adapted to form a seal with said valve seat member, said valve body being responsive to the differential in pressure between said starter housing and said jaw compartment to open said seal upon the pressure in said starter housing exceeding the pressure in said jaw compartment and to close said seal upon the pressure in said jaw compartment exceeding the pressure in said starter housing.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
511,706	Lamplugh	Dec. 26, 1893
1,656,670	Greenhouse	Jan. 17, 1928
2,254,209	Buttner	Sept. 2, 1941