June 13, 1967 H. HORNSCHUCH 3,324,657

JET ENGINE MOUNTING

Filed Dec. 22, 1965 3 Sheets-Sheet 1

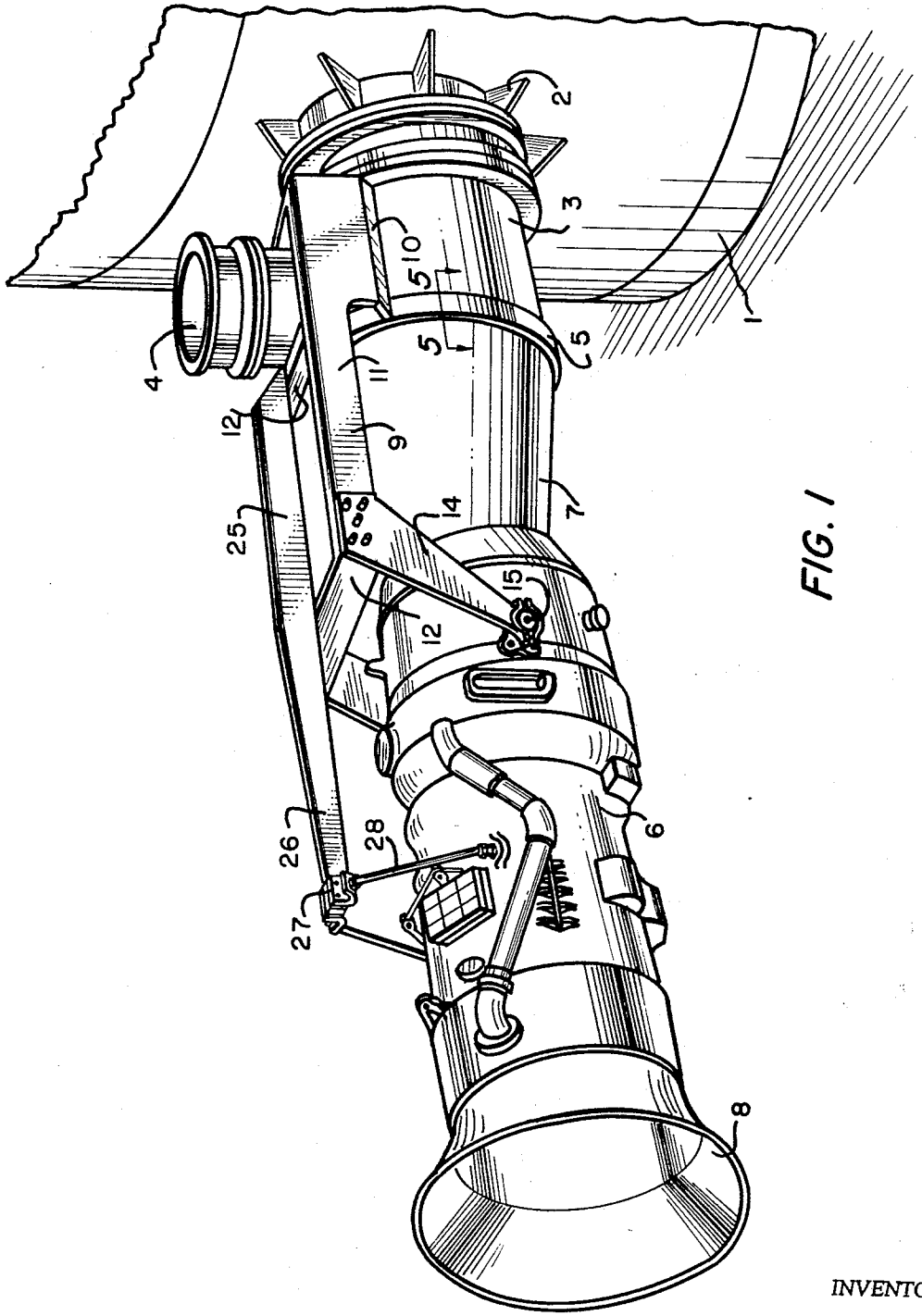


FIG. 1

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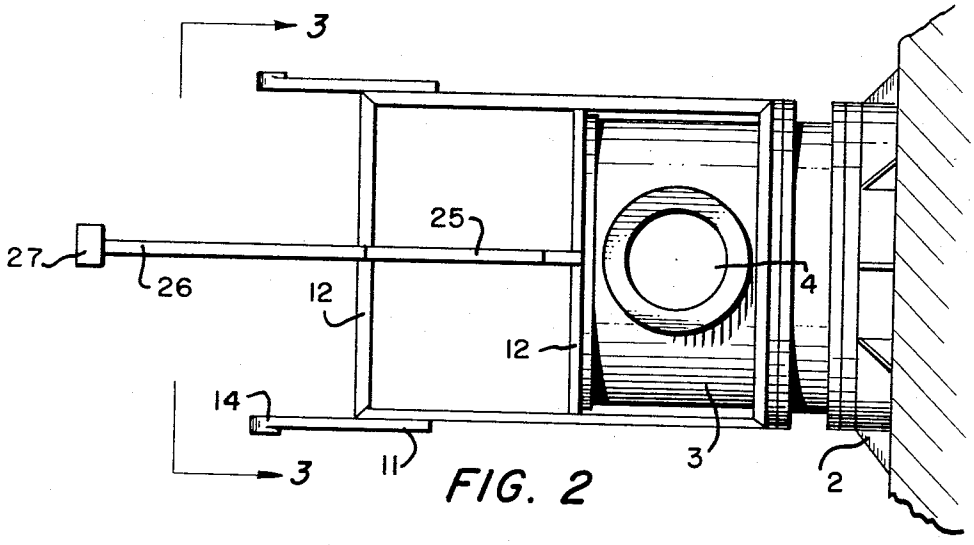


FIG. 2

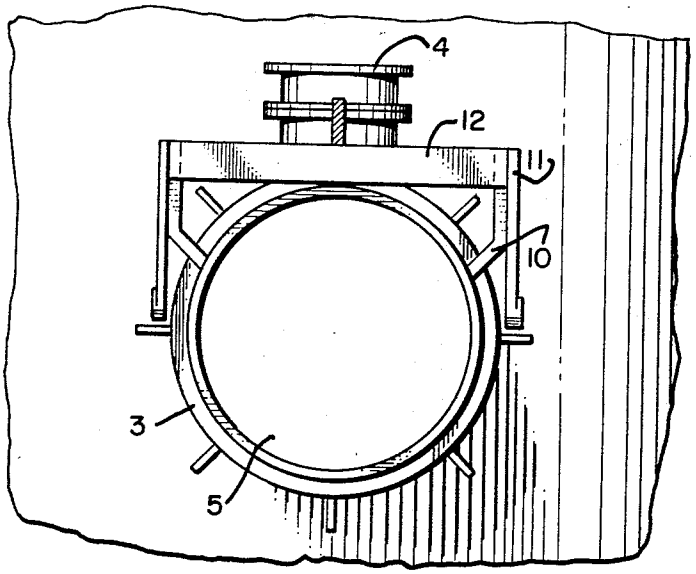


FIG. 3

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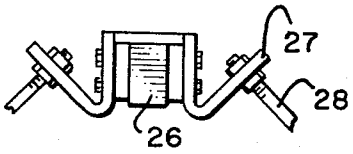


FIG. 4

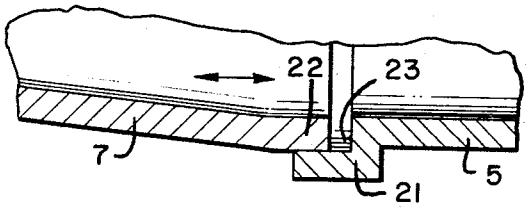


FIG. 5

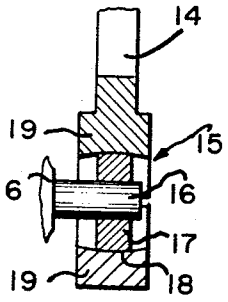


FIG. 7

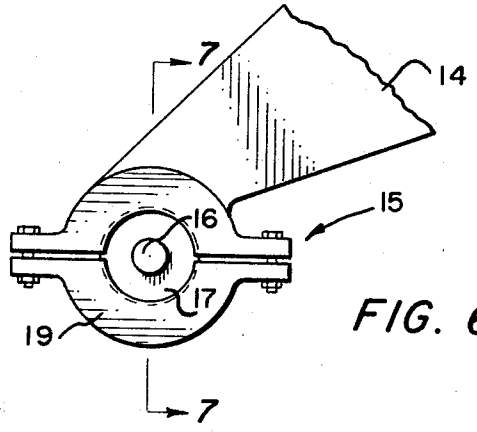


FIG. 6

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United States Patent Office 3,324,657 Patented June 13, 1967

3,324,657

JET ENGINE MOUNTING

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Filed Dec. 22, 1965, Ser. No. 515,560
5 Claims. (Cl. 60—39.32)

The present invention relates to a power plant using jet engines as gas generators and, more particularly, to a jet engine mounting.

It is known to mount one or more jet engines on the side or sides of a plenum chamber tank so as to discharge hot gas into the plenum chamber tank through the outlet of the jet engines. An arrangement of this type is disclosed in United States Patent No. 3,172,257 granted to H. Hornschuch on Mar. 9, 1965.

In mounting these jet engines difficulties have been encountered in placing them so that there are not undue stresses and strains applied to the base or walls of the jet engine and plenum chamber. Both the jet engines and plenum chamber tank undergo considerable changes of temperature between an operating condition and an idle or shut-down condition. These changes of temperature cause thermal expansion and contraction of parts of the jet engines and plenum chamber. Such thermal changes in size of the jet engines and tank may create undue stresses in both the jet engiens and plenum chamber tank if the jet engines are not supported by a mounting which can allow such thermal changes to occur without the creation of stresses. These stresses are undesirable because they are likely to cause early ageing and failure of parts of the jet engines and plenum chamber tank.

The principal object of this invention is to eliminate or substantially minimize the aforesaid problem.

Other important objects of this inevntion include: to provide a jet engine mounting which allows the jet engine and plenum chamber to remain in proper fitted relationship at all temperatures; to provide a mounting which avoids strains at the juncture of the plenum chamber and the jet engine; to provide a jet engine mounting which allows the jet engine to freely expand and contract without restraint; to provide a mounting to which a jet engine can be easily and quickly attached; and to provide an attaching means for a jet engine which is sufficiently flexible to handle the thermal growth in length of the jet engine between the front and rear supports of the jet engine mounting.

Briefly, the above objects are accomplished by mounting the jet engine by means of a double cantilever structure. One element of the cantilever structure supports the jet engine intermediate its length by two trunnions and a second element of the cantilever structure supports the forward end of the jet engine by a cantilever arm which has at its end remote from the plenum chamber two rods which extend between the end of the cantilever arm and the forward part of the jet engine. The rear end of the jet engine is connected to the manifold inlet by a slip joint allowing the jet engine to grow in length without applying stresses to either the engine or the manifold. The attachment of the rods to the cantilever arm and the forward part of the jet engine is sufficiently flexible to handle the growth in length of the jet engine due to thermal expansion between the front and rear supports of the jet engine.

The invention is illustrated in the accompanying drawings wherein:

FIG. 1 is a perspective view of a power plant utilizing the jet engine mounting means of this invention;

FIG. 2 is a top view of the jet engine mounting means;

FIG. 3 is an outboard end view of the jet engine mounting means taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary end view of the outboard end of the mounting means;

FIG. 5 is an enlarged fragmentary section taken on the line 5—5 in FIG. 1;

FIG. 6 is an enlarged fragmentary elevational view showing the trunnion interconnection between the engine and the mounting means; and

FIG. 7 is a section taken on the line 7—7 in FIG. 6.

The embodiment of the invention shown in FIG. 1 includes a plenum chamber **1** adapted to receive hot gases from a jet engine. The plenum chamber **1** includes a manifold flange **2** and an inlet manifold **3** projecting from the flange **2** in a substantially horizontal plane. The manifold **3** includes a by-pass outlet **4** and a jet engine inlet **5**. FIG. 1 illustrates a conventional jet engine **6** having an exhaust end **7** and an intake end **8** mounted on the manifold **3** in a substantially horizontal position with its exhaust end **7** connected to the manifold inlet **5**. The foregoing structure is conventional, as shown in my Patent No. 3,172,257.

The invention is in this application involves a novel mounting for supporting the jet engine **6** while allowing the jet engine **6** to vary its dimensional length due to thermal expansion or contraction under operating conditions without the creation of undue stresses in either the jet engine or the mounting for the jet engine. The mounting **9** includes a box-like frame having a seat **10** arranged at its inner end fixed to the top of the valve manifold **3**. The seat **10** can be fixed to the manifold **3** by welding or other rigid mounting means. The frame **9** further includes a pair of horizontally spaced and horizontally extending bars **11** projecting outwardly from the seat **10** and overlaying the jet engine **6**. The bars **11** are interconnected at their outer ends and intermediate their ends by a pair of cross braces **12** for adding strength and stability to the frame **9**.

A pair of substantially depending parallel arms **14** are fixed to the outer ends of the bars **11** and extend downwardly and outwardly at an angle to the vertical to straddle the jet engine **6** intermediate its ends. The lower ends of the arms **14** are fixed to the jet engine **6** by a trunnion means **15** shown in FIGS. 6 and 7, which allows the arms **14** to pivot on the jet engine **6** through a limited angle. The trunnion means **15** allows the jet engine to move relative to the arms **14** a limited amount without applying bending stresses to the jet engine body.

The trunnion means **15** is best shown in FIGS. 6 and 7 and includes a radially projecting pin **16** fixed to the jet engine **6** and an annular bushing **17** slidably mounted on the pin **16**. The bushing **17** includes a circumstance **18** which is arcuate in the axial direction and is encircled by a two-piece socket **19** formed on the end of each depending arm **14** and having an interior surface corresponding to the circumference **18** of the bushing **17**. The slidable mounting of the bushing **17** on the pin **16** allows the trunnion means **15** to move radially relative to the jet engine **6** while the axially arcuate circumference **18** of the bushing **17** allows the socket **19** to tilt or cant on the bushing **17**. Both types of relative movement may take place in the trunnion means **15** as the torque of the operating jet engine **6** attempts to turn it about its axis with the trunnion means **15** and associated mounting resisting such turning.

The exhaust end **7** of the jet engine **6** is free to move longitudinally between the trunnion means **15** and the manifold inlet **5** by the provision of a sliding or telescoping joint between the exhaust end **7** and inlet **5**. This joint is shown in FIG. 5 and includes an enlarged bell flange **21** on the manifold inlet **5** slidably and snugly receiving the end portion **22** of the exhaust end **7**. A gap **23** normally exists between the outer edge of the end portion **22** and the inner shoulder of the bell flange **21** to allow

the end portion **22** to slide axially in the bell flange **21** during expansion of the exhaust end **7** of the jet engine **6**.

A horizontal extension **25** is centrally mounted on top of the frame **9** and is fixed to both of the cross braces **12** of the frame **9**. The extension **25** has an outer portion **26** projecting in a cantilever fashion beyond the outer end of the frame and overlaying the outer portion of the jet engine **6**. The outer end of the extension projection **26** includes a W-shaped bracket **27** which is interconnected to the jet engine **6** by a pair of relatively yieldable or flexible rods **28** which act more or less as extension cables for suspending the weight of the outer portion of the jet engine **6** from the end of the extension **25**. The rods **28** are fixed by threaded joints at both ends through the bracket **27** (as shown in FIG. 4) and the jet engine **6** which allows further flexible movement of the rods **28** relative to both the jet engine **6** and the outer portion **26**. The rods **28** are of sufficient length so that they can flex sufficiently during thermal changes in length of the jet engine without the imposition of undue stresses or strains on the body of the jet engine **6** or on the extension **25**.

Although only one embodiment of the invention is specifically described, it will be noted that the invention may embrace various other embodiments which are obvious from an understanding of the described embodiment and are embraced within the claims of the invention.

Having described my invention, I claim:

1. A jet engine mounting comprising:

a manifold having an inlet;

a jet engine having an intake end and an exhaust end, said jet engine being located substantially in a horizontal position with its exhaust end connected to said inlet of said manifold;

a horizontal frame having one end fixed to said manifold and having a pair of horizontally spaced, substantially vertical arms at its other end, the free ends of said arms straddling said jet engine into intermediate its ends and being interconnected to said jet engine;

a horizontal extension fixed to said frame and projecting beyond said other end; and

yieldable means interconnecting the outer end of said extension to said jet engine intermediate its intake end and the free ends of said arms whereby said jet engine is relatively free to change its length due to thermal changes while being supported by said frame and said extension.

2. The jet engine mounting of claim **1** wherein:

said frame is located above said jet engine with said arms depending from its other end.

3. The jet engine mounting of claim **2** wherein:

said arms are pivoted to said jet engine.

4. The jet engine mounting of claim **3** wherein:

said yieldable means includes a relatively flexible elongated rod suspending the weight of a part of said jet engine from the outer end of said extension in a manner to allow limited movement of said jet engine relative to said extension.

5. The jet engine of claim **1** wherein:

the exhaust end of said jet engine is slidably mounted in the inlet of said manifold allowing relative axial movement between said exhaust end and said manifold inlet during operation of said engine.

References Cited

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3,188,808	6/1965	Crooks	60—39.32 X

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