Sept. 19, 1933. F. F. KISHLINE 1,927,550

SUSPENSION MEANS FOR HEAT CONTROL VALVES

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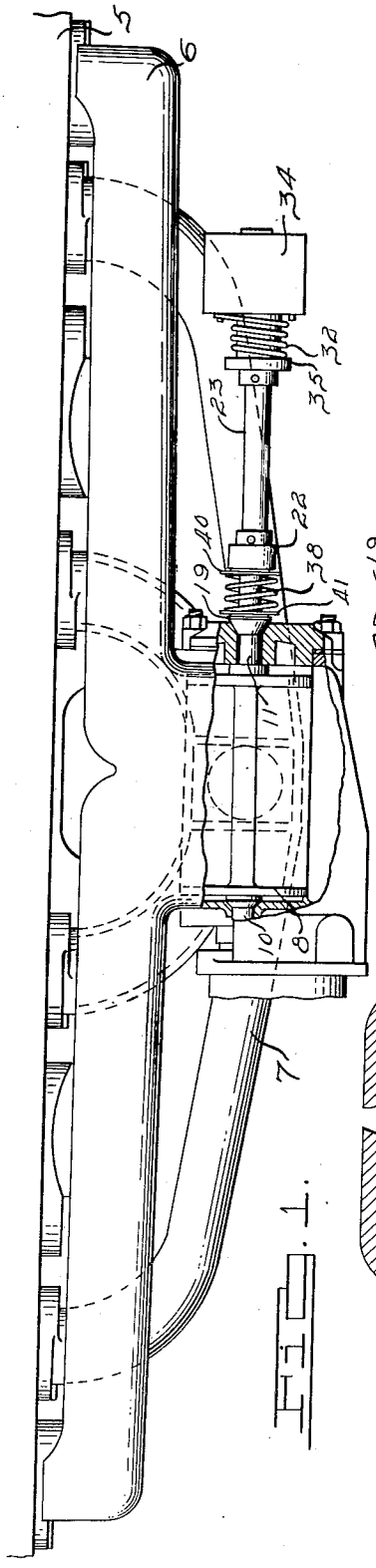


Fig. 1.

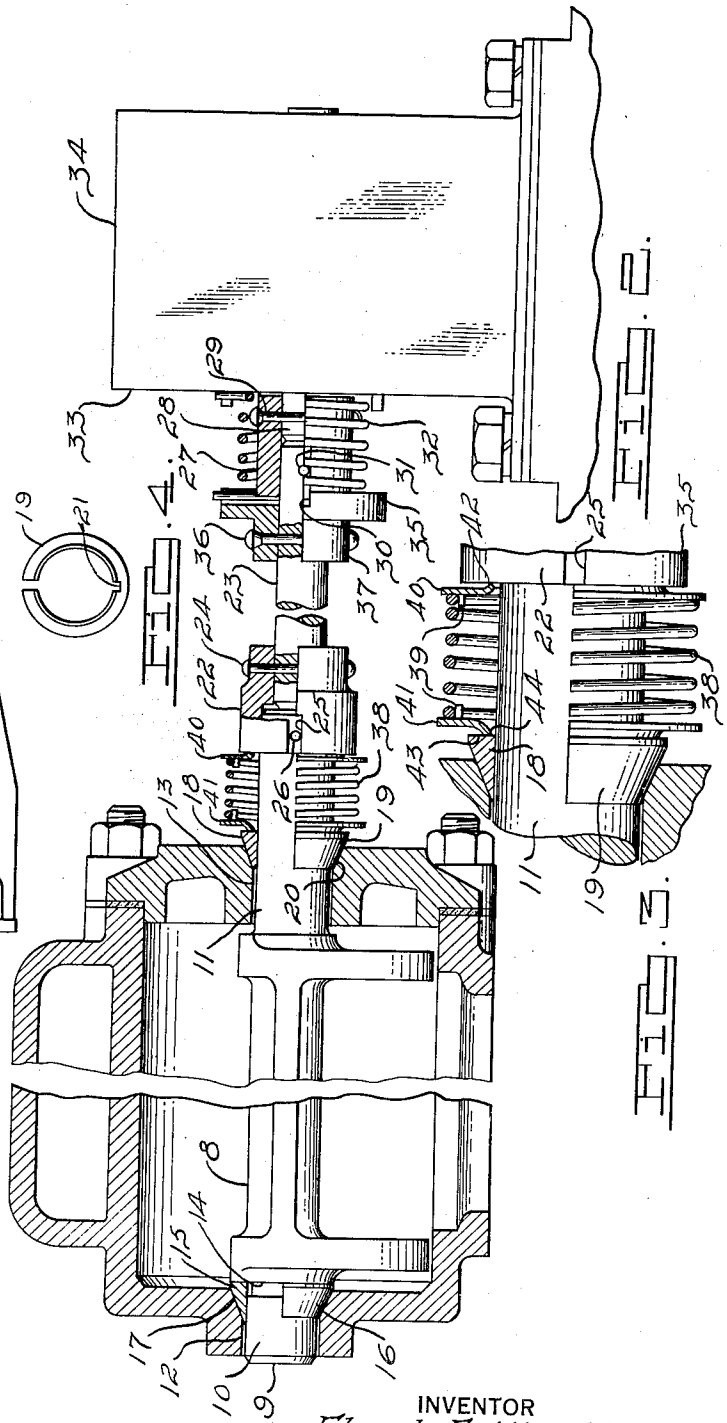


Fig. 2.

Fig. 4.

Fig. 3.

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SUSPENSION MEANS FOR HEAT CONTROL VALVES

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Application August 7, 1930. Serial No. 473,706

9 Claims. (Cl. 251—112)

This invention relates to means for mounting or journaling an exhaust control valve.

The main objects of this invention are to provide improved means for journaling a manifold heat control valve; to provide means for journaling such a valve which will permit its operation under widely differing conditions of temperature; to provide an improved mounting for the trunnions of an exhaust gas directing valve in which yielding means automatically preserve a snug fit at all times so as to prevent leakage and at the same time permit free rotation of the valve relative to its journal bearings.

An illustrative embodiment of this invention is shown in the accompanying drawing, in which

Fig. 1 is a top plan view of an exhaust manifold of an internal combustion motor embodying my improved invention.

Fig. 2 is an enlarged vertical medial sectional view showing the exhaust gas directing valve and drive shaft for rotating the same, the motive unit being shown in elevation.

Fig. 3 is an enlarged fragmentary detail view showing the mounting of one of the compression springs.

Fig. 4 is an enlarged view in face elevation of a split bushing upon which each end of the valve is mounted.

In the construction shown in the drawing, an internal combustion motor 5 is shown provided with an exhaust manifold 6 and an intake manifold 7 which are joined together at their medial points as more fully shown and described in my co-pending application, Serial Number 473,705, filed Aug 7, 1930.

As disclosed in the above mentioned co-pending application, means are provided for directing the exhaust gases into contact with the intake manifold for the purpose of raising its temperature. This means comprises a valve 8 integrally formed on a shaft 9 so as to provide oppositely extending co-axial trunnions 10 and 11 which project through and are journaled in bearings 12 and 13 formed in the end walls of the chamber which surrounds the valve 8. Any suitable means may be provided for rotating the shaft 9 and valve 8, such as, for example, manual means as provided in my copending application or a thermo unit operating means such as illustrated in the drawing enclosed in the housing 34.

At the point where the trunnion 10 joins the valve 8 a radially extending annular shoulder 14 is provided against which abuts a bushing 15 which has a tapered face 16. The bearing 12 is provided with a complementary tapered face 17 against which the bushing seats.

The trunnion 11 is also provided with a split bushing 18 axially slidable thereon which is provided with a tapered face 19 for seating against a complementary tapered face 20 of the bearing 13. The bushings 15 and 18 are of identical construction and as shown in Fig. 4 of the drawing are provided with a saw cut therethrough and at the diametrically opposite point with a notch 21, so that the bushings will decrease in diameter or contact around their trunnions when urged against the tapered faces of their respective bearings. The taper on the face of these bushings is at an angle of 22½ degrees from the axis, as it has been found that with this angle the bushings will contract around their trunnions so as to snugly embrace them and at the same time will not wedge or jam in the tapered faces of their respective bearings.

The trunnion 11 extends beyond the bearing 13 and the outer end thereof is surrounded by one end of a sleeve 22 which is rigidly secured to a shaft 23 by a pin 24 which extends through said sleeve and shaft. The end of the sleeve 22 which surrounds the end of the trunnion 11 is provided with an axially extending slot 25 for receiving a pin 26 mounted in the end of the trunnion 11 so as to prevent relative rotation between the trunnion 11 and drive shaft 23 while permitting relative axial movement therebetween.

The opposite end of the drive shaft 23 is embraced by one end of a sleeve 27, the other end of which surrounds and is rigidly secured to a shaft 28 by a pin 29. The shaft 28 and its function and coaction with the other elements are more fully set forth in the above mentioned co-pending application.

The end of the sleeve 27 which surrounds the drive shaft 23 is provided with a slot 30 which receives a pin 31 rigidly mounted transversely through the end of the drive shaft 23 so that relative rotation between the sleeve 27 and shaft 23 is prevented while permitting relative axial movement therebetween.

Means are provided for yieldingly urging the drive shaft 23 axially toward the valve 8 for seating the bushing 15 against its tapered bearing face 17 and comprises a helical compression spring 32 which surrounds the sleeve 27. One end of the compression spring bears against a fixed abutment such as the end wall 33 of a thermo-unit housing 34 and the other end of which bears against the face of a flange 35 which is rigidly

secured to the shaft 23 by a pin 36 which passes through the hub 37 of the flange and transversely through the shaft.

This spring 32 also serves as a torsion spring for rotating the shaft 23 and valve 8 as more fully set forth in my above-mentioned co-pending application.

Means are provided for yieldingly urging the bushing 18 against its tapered bearing face 20 and comprises a compression spring 38 which surrounds the protruding end of the trunnion 11 in spaced relation thereto. The spring 38 is mounted on a series of axially extending lugs 39 which are struck from spring steel washers 40 and 41. The washers 40 and 41 surround the trunnion 11 and the marginal edge of the openings therethrough are curved in an axial direction, so as to provide edge line contacts at the points 42 and 43 which bear against the end of the collar 22 and the outer face 44 of the bushing 18 respectively.

In the operation of this device the apparatus is assmbled as shown in the drawing with the spring 32 urging the shaft 23, valve 8 and trunnions 10 and 11, to the left as viewed in Fig. 2 of the drawing. The shoulder 14, against which the bushing 15 abuts, urges the tapered face of the bushing 15 against the complementary tapered face 17 of the bearing 12. The angle of the taper and the strength of the tension of the spring 32 are so proportioned and arranged that the bushing will be squeezed snugly around the trunnion 10 and make a snug fit with both the trunnion and the tapered face 17 at all times.

The bushing 18 is urged against its tapered face 20 by the spring 38 which is preferably of one-half the strength of the spring 32, thus equally distributing the tension of the spring 32 between the two bushings 15 and 18.

By reason of the pin 31 being embraced in the slot 30, the shaft 23 is free to be moved axially with respect to the shaft 28 by the spring 32 while at the same time preventing relative rotation therebetween.

The spring 38 is prevented from being injured by the high temperature to which the valve 8 and trunnion 11 are raised, by mounting the spring in spaced relation to the trunnion 11 on the washers 40 and 41. By flanging in the marginal edge of these washers as shown most clearly in Fig. 3 of the drawing, only line contact at the points 42 and 43 is made between the washers and the members against which they abut, thus a minimum amount of heat is transferred through the washers and to the spring 38.

By having the bushings 15 and 18 split as shown in Fig. 4 of the drawing and provided with the interior notch 21, these bushings will decrease in diameter when urged against their respective tapered faces and thereby snugly grip the trunnions upon which they are mounted.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. In combination, a valve, spaced trunnions on said valve, bearings for said trunnions, said bearings having tapered faces inclined in the same direction, complementary tapered portions on said trunnions for seating against said tapered faces, and yielding means for urging said tapered portions against said tapered faces, said means operable in any position.

2. In combination, a valve, spaced trunnions on said valve the axis of said trunnions being substantially horizontal, bearings for said trunnions, said bearings having tapered faces inclined in the same direction, complementary tapered portions on said trunnions for seating against said tapered faces, said tapered portions being independently movable relative to each other, and yielding means for urging said tapered portions against said tapered faces.

3. In combination, a valve, spaced trunnions on said valve, bearings for said trunnions, said bearings having tapered faces, complementary tapered portions on said trunnions for seating against said tapered faces, said tapered portions being independently movable relative to each other, a spring urging said valve and one of said tapered portions against its bearing face, and a second spring acting between said first mentioned spring and the other of said tapered portions for urging said other tapered portions against its bearing face.

4. In combination, a valve, co-axial oppositely extending spaced trunnions on said valve the axis of said trunnions being substantially horizontal, bearings having tapered faces for said trunnions, one of said trunnions having a tapered portion for seating against one of said bearing faces, a spring urging said valve and trunnions axially to hold said tapered portion snugly against its bearing face, a tapered bushing axially slidable on the other of said trunnions, and a spring for urging said bushing against the other of said tapered bearing faces.

5. In combination, a valve, co-axial oppositely extending spaced trunnions on said valve, bearings having tapered faces for said trunnions, one of said trunnions having a tapered portion for seating against one of said bearing faces, a spring urging said valve and trunnions axially to hold said tapered portion snugly against its bearing face, a tapered bushing axially slidable on the other of said trunnions, and a second spring acting between said first mentioned spring and said bushing for urging said bushing axially against its bearing face.

6. In combination, a valve, co-axial oppositely extending spaced trunnions on said valve, bearings having tapered faces for said trunnions, one of said trunnions having a tapered portion for seating against one of said bearing faces, a spring urging said valve and trunnions axially to hold said tapered portion snugly against its bearing face, a tapered bushing axially slidable on the other of said trunnions, and a second spring acting between said first mentioned spring and said bushing for urging said bushing axially against its bearing face,—said second spring being of substantially half the strength of said first mentioned spring.

7. In combination, a valve, trunnions on said valve, bearings for said trunnions, said bearings having tapered faces, complementary tapered bushings on said trunnions for seating against said tapered faces, said bushings being split so as to decrease in diameter when urged against said tapered faces and springs for urging said bushings against said tapered faces.

8. In combination, a valve, trunnions on said valve, bearings for said trunnions, said bearings having tapered faces, complementary tapered bushings on said trunnions for seating against said tapered faces, said bushings being independ-

ently movable relative to each other and being split so as to decrease in diameter when urged against said tapered faces, a spring urging said valve and one of said bushings against its bearing face and a second spring acting between said first mentioned spring and the other of said bushings for urging said other bushing against its bearing face.

9. In combination, a shaft, a bearing for said shaft, said bearing having a tapered face, a complementary tapered portion on said shaft for seating against said tapered bearing face, a helical spring surrounding said shaft in spaced relation thereto, a washer engaged by one end of said spring and bearing against said shaft, the marginal edge of the opening in said washer being curved so as to have line contact with said shaft for transmitting a minimum of heat from said shaft to said spring.

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