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3,266,791

ATMOSPHERIC METERING THROTTLE RETURN CHECK ASSEMBLY

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2 Sheets-Sheet 1

Fig. 1

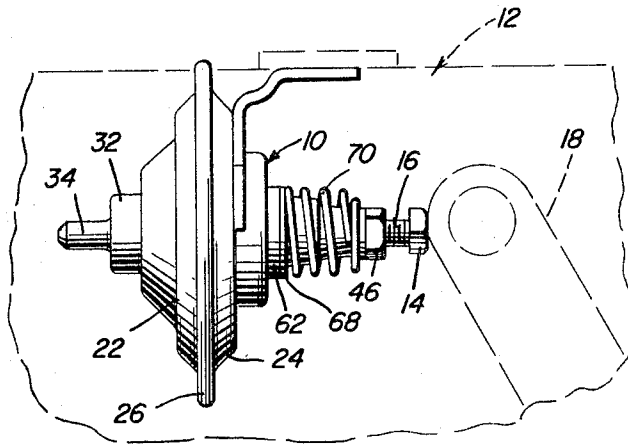


Fig. 5

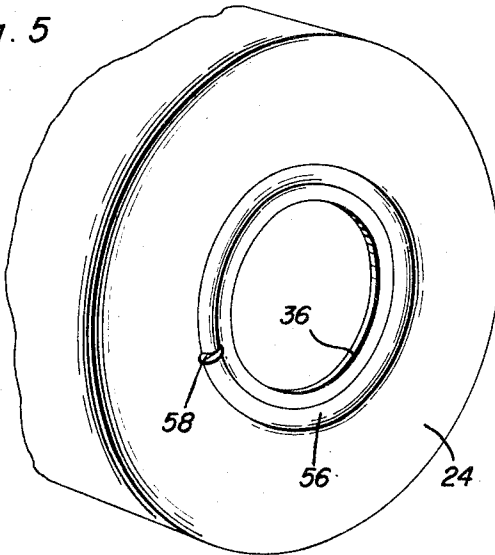


Fig. 6

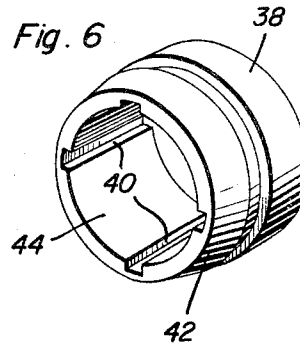
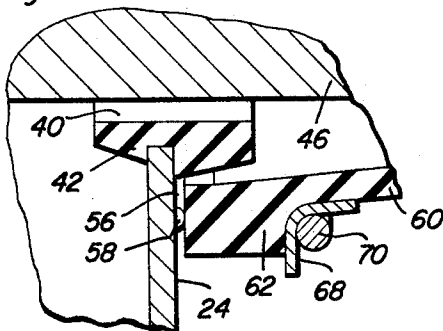


Fig. 7



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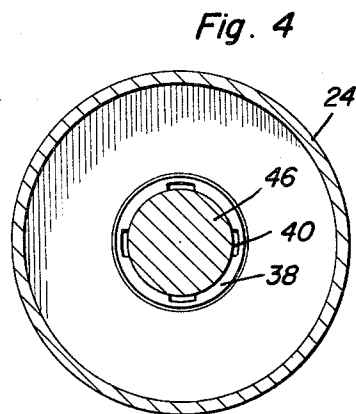
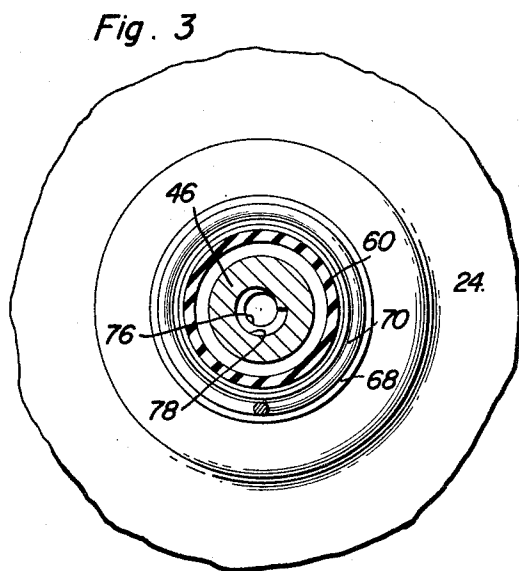
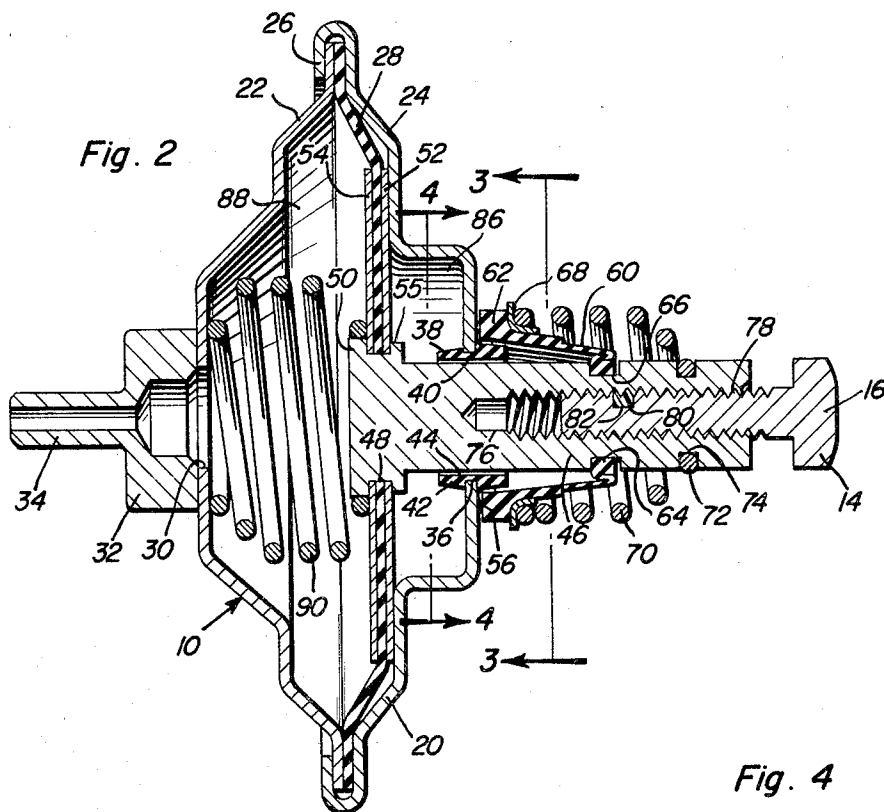
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ATMOSPHERIC METERING THROTTLE RETURN CHECK ASSEMBLY

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2 Sheets-Sheet 2



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ATMOSPHERIC METERING THROTTLE RETURN CHECK ASSEMBLY

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8 Claims. (Cl. 267—1)

This invention relates to a novel and useful atmospheric metering throttle return check assembly and more specifically to an anti-stall device used in conjunction with automatic automotive transmissions.

The engine of a conventional form of motor vehicle provided with an automatic transmission is subject to stalling if the throttle control of the engine is suddenly released allowing the carburetor linkage to return to the full idle position. In order to overcome the sudden return of the throttle linkage of a motor vehicle engine to its full idle position, dashpots such as those disclosed in U.S. Patents Nos. 2,862,702 and 2,894,740 dated December 2, 1958, and July 14, 1959, respectively, have in the past been provided to ensure a slow return of the throttle linkage to the full idle position.

Conventional types of manifold vacuum actuated dashpots are substantially the same as the compression type dashpots with the exception that the diaphragm therein is spring-urged to one limit position and the conventional metered vent opening of the compression type of dashpot is replaced by passage means adapted for communication with a source of manifold vacuum and including check valve means for metering the passage of air from one side of the diaphragm out of the dashpot thereby enabling the pressure of the ambient atmosphere to force the diaphragm toward the other limit position against the thrust effected by means yieldably urging the diaphragm to the first limit position.

However, since the advent of crankcase breathers which pipe crankcase vapors to the intake manifold to minimize air pollution, considerable sludge and gum is introduced into the intake manifold which in some installations find their way into the check valve assembly of the presently used manifold vacuum actuated dashpots rendering these check valves inoperative.

Accordingly, it is the main object of this invention to provide a manifold vacuum actuated throttle return check assembly for an internal combustion engine constructed in a manner whereby there will be no check valve means in communication with the passage means of the return check assembly by which the latter is communicated with a source of manifold vacuum.

Another object of this invention is to provide an atmospheric metering throttle check valve assembly in accordance with the preceding object constructed in a manner whereby it may be readily utilized as a replacement for existing manifold vacuum actuated dashpots provided with the aforementioned check valves without requiring any modifications to existing applications of the previously known types of manifold vacuum actuated dashpot installations other than the mere replacement of the check valved dashpot by the return check assembly of the instant invention and the subsequent proper adjustment of the abutment screw thereof.

Yet another object of this invention is to provide a manifold vacuum actuated dashpot type throttle return check assembly including means for progressively reducing the effective thrust applied to the abutment stem of the throttle return check assembly in response to movement of the abutment stem effected by communication of the throttle return check assembly with increased manifold vacuum.

A final object of this invention to be specifically enumerated herein is to provide an atmospheric metering throt-

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tle return check valve assembly in accordance with the preceding objects which will conform to conventional forms of manufacture, be of simple construction and easy to install so as to provide a device that will be economically feasible, long lasting and relatively trouble-free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view of the atmospheric metering throttle return check assembly of the instant invention shown operatively associated with a portion of the throttle linkage of an internal combustion engine which is shown in phantom lines;

FIGURE 2 is an enlarged vertical sectional view taken substantially upon a plane passing through the longitudinal center-line of the return check assembly;

FIGURE 3 is a fragmentary transverse vertical sectional view taken substantially upon the plane indicated by the section line 3—3 of FIGURE 2;

FIGURE 4 is a transverse vertical sectional view taken substantially upon the plane indicated by the section line 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary enlarged perspective view of the flange cover of the throttle return check assembly showing the coined ridge formed thereon which has a metering notch formed therein;

FIGURE 6 is an enlarged perspective view of the abutment stem sleeve bearing; and

FIGURE 7 is a fragmentary enlarged sectional view taken substantially upon a plane passing along a radius of the coined ridge formed on the flange cover passing through the metering notch formed in the coined ridge.

With attention now directed more specifically to the drawings the numeral 10 generally designates the atmospheric metering throttle return check assembly of the instant invention which is illustrated in FIGURE 1 of the drawings as being supported from any convenient portion of an internal combustion engine generally referred to by the reference numeral 12 and with the free headed end 14 of its abutment screw 16 disposed in engagement with a portion 18 of the throttle linkage of the internal combustion engine 12.

With attention now directed more specifically to FIGURE 2 of the drawings it may be seen that the atmospheric metering throttle return check assembly 10 includes a housing 20 having a first dished circular cover 22 and a second dished circular cover 24. The cover 24 includes a flange portion 26 which is initially generally cylindrical but which is bent over the outer peripheral portion of the cover 22 after it is abutted against the outer peripheral portions of the flexible diaphragm 28 disposed within the cover 24.

The center of the dished cover 22 is apertured as at 30 and has a fitting 32 secured thereto about the aperture 30 including a reduced neck portion 34 which is adapted to be communicated with one end of suitable conduit means whose other end is communicated with the interior of the intake manifold (not shown) of the internal combustion engine 12.

The flanged cover 24 is also centrally apertured as at 36 and has a bearing sleeve or bushing 38 secured within the aperture 36. The sleeve or bushing 38 is preferably constructed of nylon or a similar substance and has a circumferential groove 40 formed therein in which the portions of the flanged cover 24 defining the aperture 36 are seated. The outer surfaces 42 of the end of the bushing 38 disposed within the flanged cover 24 are cone-shaped so as to facilitate the insertion of the bushing 38

within the aperture 36 from the exterior of the cover 24.

From FIGURES 2 and 4 of the drawings it may be seen that the sleeve or bushing 38 is provided with a plurality of inner circumferentially spaced and longitudinally extending grooves or passages 44 and that the bushing or sleeve 38 slidably receives an elongated and generally cylindrical stem 46 whose inner end is enlarged as at 48 and provided with a circumferential flange 50. The inner peripheral portions of the annular diaphragm 28 and a pair of annular abutment disks 52 and 54 between which the diaphragm is sandwiched are first disposed on the enlargement 48. Thereafter, the inner end of the enlargement is further enlarged as at 55 to secure the diaphragm 28 and the disks 52 and 54 on the stem 46.

The outer surface of the flanged cover 24 is provided with a coined ridge 56 having a generally radial metering slot 58 therein. A boot or dirt seal 60 is provided and is generally truncated cone-shaped. The base end of the boot 60 includes a radially outwardly projecting abutment flange 62 while the minor diameter end of the boot 60 includes an annular radially inwardly projecting seating flange 64 which is seated within a circumferential groove 66 formed in the stem 46 outwardly of the abutment flange 62. An abutment washer 68 is abutted against the outer end of the abutment flange 62 and has the inner end of a compression spring 70 bearing thereagainst, the outer end of the compression spring 70 being reduced in diameter as at 72 and seated within a second circumferential groove 74 formed in the stem 46 outwardly of the circumferential groove 66.

The outer end of the stem 46 has an axially extending blind bore 76 formed therein which includes a threaded counterbore 78. The shank portion of the abutment screw 16 is threaded and is provided with a nylon slug 80 which is pressed into a radially outwardly opening recess 82 formed in the shank of the abutment screw 16.

In operation, with the throttle return check assembly 10 secured to the internal combustion engine 12 as illustrated in FIGURE 1 of the drawings and the abutment screw 16 disposed for engagement by the portion 18 of the throttle linkage of the internal combustion engine 12, the fitting 32 may be communicated with the interior of the intake manifold (not shown) of the internal combustion engine 12 whereby the formation of a vacuum within the intake manifold of a predetermined minimum magnitude will be sufficient to enable the pressure of the ambient atmosphere with which the chamber 86 defined within the housing 20 between the cover 24 and the diaphragm 28 is communicated by means of the grooves 40 and the metering notch 58 to move the diaphragm 28 from the position illustrated in FIGURE 2 of the drawings to a position with the disk 54 abutting the cover 22. In this position, the stem 46 is retracted and the portion 18 of the throttle linkage may move further to the left as viewed in FIGURE 1 of the drawings to the full idle position. However, the notch 58 restricts the flow of air into the chamber 86 to the extent that a movement of the diaphragm 28 to the applied position with the disk 54 abutting the cover 22 will take a predetermined length of time, possibly one and a half to six seconds, with full idle vacuum being communicated with the chamber 88 defined between the diaphragm 28 and the cover 22. As soon as the manifold vacuum is appreciably reduced which may be caused by the throttle linkage of the internal combustion engine 12 being suddenly moved to the full open position, the compression spring 90 disposed between the cover 22 and the disk 54 will quickly urge the diaphragm 28 to the position illustrated in FIGURE 2 of the drawings. It is to be understood that the spring 90 is considerably stronger than the spring 70 and therefore that movement of the diaphragm 28 to the right as viewed in FIGURE 2 of the drawings may be readily accomplished by the spring 90 upon a reduction of vacuum in the chamber 88. As the diaphragm 28 moves to the right,

air pressure within the chamber 86 is suddenly increased and air is forced through the grooves 40 formed in the sleeve 28 and into the boot 60 which causes the abutment flange 62 to "pop" off the coined ridge 56. The sudden discharge of air from between the abutment flange 62 and the coined ridge 56 will of course have a tendency to clear the adjacent portions of the assembly 10 from any foreign material that may be drawn into the boot 60 upon movement of the diaphragm 28 to the left as viewed in FIGURE 2 of the drawings.

It will be noted that when the diaphragm 28 moves to the left, a vacuum is formed in the chamber 86. The vacuum in the chamber 86 increases and thus increasingly opposes the manifold vacuum as the latter causes the diaphragm to move to the left as viewed in FIGURE 2. Accordingly, the rate of movement of the diaphragm progressively decreases as a greater vacuum is formed in the chamber 86.

It is also to be noted that the assembly 10 does not include any check valve assemblies which are in communication with the manifold vacuum and therefore that the gumming up of such check valve assemblies as are now in use by crankcase vapors as hereinbefore set forth is eliminated.

The boot 60, the compression spring 70, the coined ridge 56 and the notch 58 formed in the ridge 56 coact together to form valve means for metering the flow of air into the chamber 86 and allowing free movement of air out of the chamber 86 after a certain air pressure therein has been formed.

The abutment screw 16 may be of course adjusted as desired to provide the proper gapping between it and the portion 18 of the throttle linkage of the internal combustion engine 12 and is retained in adjusted position by means of the slug 80 and its frictional engagement with the threaded counterbore 78.

Besides having the advantage of not requiring a ball check valve, the check assembly 10 has a characteristic pattern of inward movement of its stem 46 when compared with the pattern of movement of conventional valve assemblies utilizing ball check valves. This different characteristic of inward movement allows the clearance between the adjusting or abutment screw 16 and the portion 18 of the associated throttle linkage to be reduced. With this reduced clearance, as the stem 46 moves outward slightly with loss of manifold vacuum at idle due to a drop in the pressure of the ambient atmosphere caused by high altitude, compensation is made for altitude changes.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. An atmospheric metering throttle return check assembly comprising a housing, diaphragm means in said housing defining an airtight partition therein, including portions thereof mounted for reciprocation between first and second limit positions, and defining first and second chambers in said housing on opposite sides of said diaphragm means, said housing including first passage means communicated with the interior of said first chamber and adapted to be communicated with a source of manifold vacuum and second passage means venting said second chamber to the ambient atmosphere, means yieldingly urging said movable portions of said diaphragm means toward said second position to increase the volume of said first chamber, movable movement transmitting means operatively connected to said movable portion and including a portion disposed exteriorly of said housing adapted for engagement with a throttle control for govern-

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ing movement of said throttle control in response to movement of said movable portion of said diaphragm means, and throttle valve means associated with said second passage means and operable to throttle the passage of air through said second passage means into and out of said second chamber and allow relatively free passage of air out of said second chamber through said second passage means only in response to a rise in pressure in said second chamber to a predetermined minimum above the pressure of the ambient atmosphere.

2. An atmospheric metering throttle return check assembly comprising a housing, diaphragm means in said housing defining an airtight partition therein, including portions thereof mounted for reciprocation between first and second positions, and defining first and second chambers in said housing on opposite sides of said diaphragm means, said housing including first passage means communicated with the interior of said first chamber and adapted to be communicated with a source of manifold vacuum and second passage means venting said second chamber to the ambient atmosphere, means yieldingly urging said movable portions of said diaphragm means toward said second position to increase the volume of said first chamber, movable movement transmitting means operatively connected to said movable portion and including a portion disposed exteriorly of said housing adapted for engagement with a throttle control for governing movement of said throttle control in response to movement of said movable portion of said diaphragm means, and throttle valve means operatively associated with said second passage means for throttling the passage of air through said second passage means into said second chamber, a sleeve member extending through one wall of said housing, said movement transmitting means comprising a shank member slidably received through said sleeve member having its inner end connected to said diaphragm means, the surfaces of at least one of said members disposed in sliding engagement with each other having at least one groove formed therein opening toward the other of said surfaces defining said second passage means.

3. The combination of claim 2 wherein said throttle valve means defines a generally cylindrical and flexible boot disposed about the outer end of said shank member having its outer end sealingly secured to said shank member and means yieldingly urging the inner end of said boot into seated engagement with the portions of said housing surrounding the outer end of said sleeve member.

4. The combination of claim 3 wherein said portions of the outer surfaces of said housing define a raised ridge extending circumferentially about said sleeve upon which the inner end of said boot is seated.

5. The combination of claim 4 wherein said ridge has a transverse groove formed therein at one point about its circumference.

6. The combination of claim 5 wherein said means yieldingly urging said inner end of said boot into seated engagement with said ridge comprises a compression

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spring disposed about said shank member and said boot interconnected between the outer end of said shank member and the inner end of said boot.

7. An atmospheric metering throttle return check assembly comprising a housing, diaphragm means in said housing defining an airtight partition therein, including portions thereof mounted for reciprocation between first and second positions, and defining first and second chambers in said housing on opposite sides of said diaphragm means, said housing including first passage means communicated with the interior of said first chamber and adapted to be communicated with a source of manifold vacuum and second passage means venting said second chamber to the ambient atmosphere, means yieldingly urging said movable portions of said diaphragm means toward said second position to increase the volume of said first chamber, movable movement transmitting means operatively connected to said movable portion and including a portion disposed exteriorly of said housing adapted for engagement with a throttle control for governing movement of said throttle control in response to movement of said movable portion of said diaphragm means, and throttle valve means operatively associated with said second passage means for throttling the passage of air through said second passage means into said second chamber, a sleeve member extending through one wall of said housing, said movement transmitting means comprising a shank member slidably received through said sleeve member having its inner end connected to said diaphragm means, the surfaces of at least one of said members disposed in sliding engagement with each other having at least one groove formed therein opening toward the other of said surfaces defining said second passage means, the outer end of said shank member including an axially extendable portion including means for maintaining said extendable portion in predetermined extended positions.

8. The combination of claim 1 wherein said throttle valve means includes means operative to increase and decrease said predetermined minimum pressure above atmospheric pressure in response to movement of said motion transmitting means with said movable portion of said partition toward said first and second limit positions, respectively.

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