

[54] **AUTOMATIC CHOKE FOR A CARBURETOR**

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[51] Int. Cl.²..... **F02M 1/10**

[58] Field of Search... **261/39 B; 236/101 C, 101 D; 123/119 F**

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[57]

ABSTRACT

A bimetallic coil for an automatic choke for a carburetor on a vehicular engine, which is provided with means for holding the bimetallic coil against vibration. The means for holding the bimetallic coil against vibration comprises, for example, a plurality of pins or an elongate wall type structure positioned in proximity to the coil so as to be contacted by or contact the loops formed on the coil upon thermal deformation of the coil or the coil and the means to thereby prevent or at least reduce the vibration of the coil during the operation of the engine.

7 Claims, 10 Drawing Figures

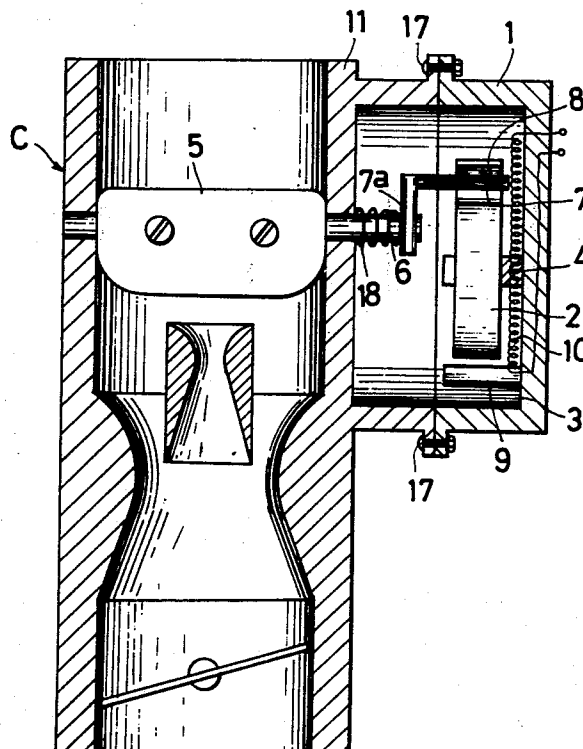


FIG. 4

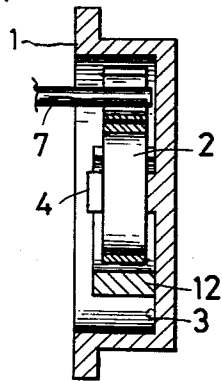


FIG. 3

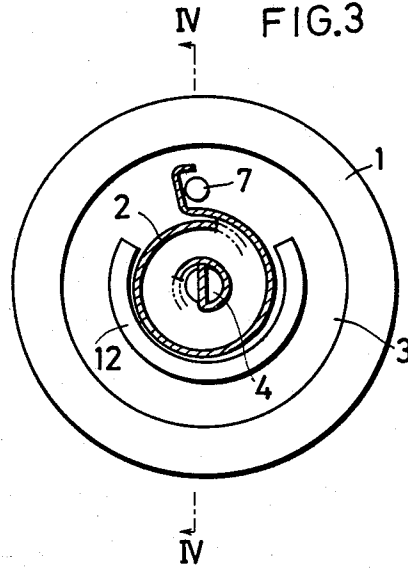


FIG. 5

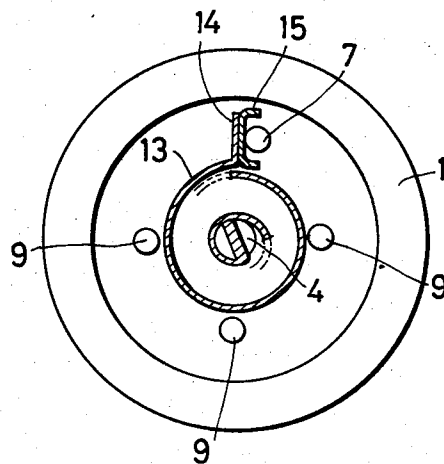


FIG. 6

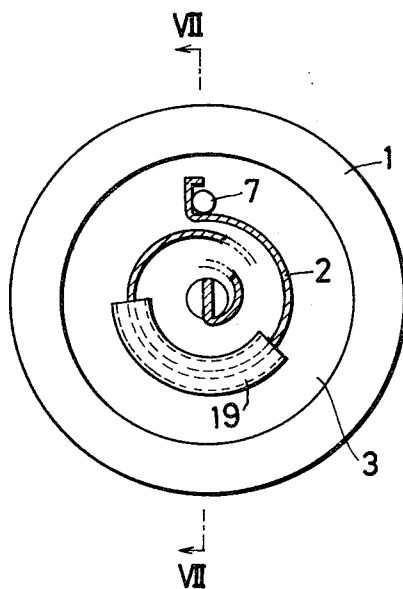


FIG. 7

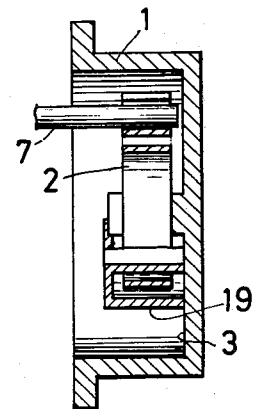


FIG. 8

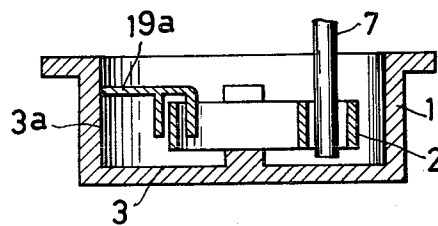


FIG.9

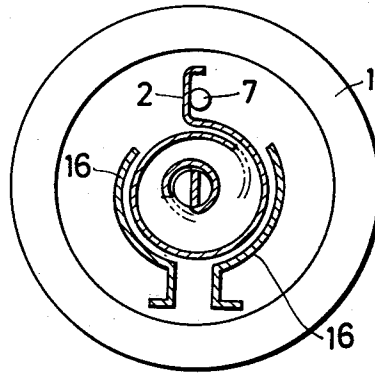
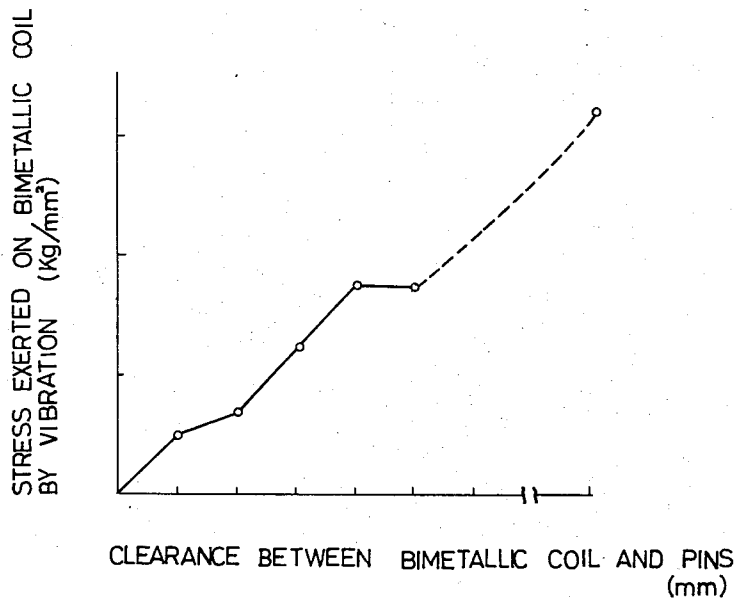


FIG.10



AUTOMATIC CHOKE FOR A CARBURETOR

This invention relates to a bimetallic strip in coiled form for an automatic choke in a carburetor on a motor vehicle, and more particularly to such a bimetallic strip provided with anti-vibratory means.

The bimetallic strip in coiled form known in the art for use in a carburetor choke on a motor vehicle is often found to vibrate with the vibration of an engine during a certain period of the engine operation when the strip has become hot and deformed with its outer end disengaged from a choke lever on a choke valve and hanging freely. The stress exerted on the strip by its vibration often exceeds the maximum allowable stress for the strip, resulting in breakage of the strip and failure of the choke. The vibration of the strip tends to occur even when it is maintained in engagement with the choke lever, though less often than when its outer end is hanging freely.

It is, therefore, an object of this invention to provide an improved bimetallic strip in coiled form for an automatic choke in a carburetor on a motor vehicle which has none of the drawbacks inherent in the known device as pointed out above.

It is another object of this invention to provide simple and effective means for minimizing or preventing the vibration of a bimetallic strip in coiled form for an automatic choke in a carburetor on a motor vehicle during the operation of an engine.

In an automatic choke for a carburetor on a motor vehicle comprising a valve member positioned within a carburetor housing, a valve shaft secured to the valve member and rotatably supported on the carburetor housing at both ends, one of which ends has an extension projecting outwardly from the carburetor housing, a crank connected to the extension of the valve shaft and forming a lever and a bimetallic coil positioned within a housing joined to the carburetor housing and having an inner end secured to the housing and an outer end normally engaged with the lever to urge it in a direction which keeps the valve member closed, this invention provides an improvement in the bimetallic coil which is provided with means for preventing the coil from vibrating during the operation of an engine. The means for preventing the vibration of the bimetallic coil comprises a plurality of pins standing from the floor of the coil housing and adapted to be contacted by the outer edge of the coil when the coil tends to vibrate. The means may alternatively comprise a curved wall structure standing from the floor of the coil housing in proximity to the coil periphery and extending along a portion of the coil periphery to be contacted by the coil when the coil tends to vibrate. A modified form of the wall type means comprises a channel-shaped double wall structure standing from the floor of the coil housing and enclosing a portion of the outermost turn of the coil. The inner and outer walls of this wall type means are adapted to be contacted by the coil when the coil tends to vibrate. A further alternative may comprise a pair of oppositely disposed curved walls surrounding the coil and be formed from a bimetallic strip. Upon elevation of the surrounding temperature, these bimetallic walls may be deformed to contact the coil to prevent it from vibrating. Instead of being secured to the floor of the coil housing, the wall type means may be secured to the inner side wall of the coil housing. The means of the foregoing construction can prevent

or at least decrease the vibration of the bimetallic coil during a certain period of engine operation, whether the outer end of the coil is engaged with the choke lever or not. Thus, the stress which would otherwise be exerted on the bimetallic coil during the engine operation can be maintained below the maximum allowable limit, so that breakage of the bimetallic coil due to vibration can be completely prevented. Accordingly, this invention contributes to prolonging the life of an automatic choke for a vehicular carburetor to a remarkable extent since failure of the choke due to a broken bimetallic coil can be completely prevented.

Other objects and advantages of this invention will become apparent from the following description, and the accompanying drawings, in which:

FIG. 1 is a front elevational view in vertical section of an automatic choke for a vehicular carburetor incorporating the principles of this invention;

FIG. 2 is a top plan view showing a preferred embodiment of this invention;

FIG. 3 is a top plan view showing another preferred embodiment of this invention;

FIG. 4 is a cross-sectional view taken along line IV—IV of FIG. 3;

FIG. 5 is a top plan view showing still another preferred embodiment of this invention;

FIG. 6 is a top plan view showing a further preferred embodiment of this invention;

FIG. 7 is a cross-sectional view taken along line VII—VII of FIG. 6;

FIG. 8 is a cross-sectional view showing a modified form of the embodiment shown in FIG. 7;

FIG. 9 is a top plan view showing a still further preferred embodiment of this invention; and

FIG. 10 is a graph illustrating the effect of this invention.

Referring to FIG. 1 of the drawings, a housing 1 is joined by bolts 17 to a housing 11 for a carburetor C, and a bimetallic coil 2 is positioned within the housing 1. The bimetallic coil 2 is formed from two metals, and the inner metal has a smaller coefficient of linear expansion than the outer metal. As shown in FIG. 2, the bimetallic coil 2 has an inner end 2a secured to a shaft 4 standing from the floor 3 of the housing 1, and is a left-hand coil. A valve member 5 is positioned within the housing 11 for the carburetor C and secured to a rotatable shaft 6 rotatably supported by the housing 11. The shaft 6 has an outward extension at one end and a crank 7a is secured to the extension of the shaft 6. The free end of the crank 7a forms a lever 7 extending into the housing 1 for the bimetallic coil 2. A coil spring 18 is positioned between the wall of the carburetor housing 11 and the crank 7a and encircles the extension of the shaft 6 to urge the valve member 5 to open. The bimetallic coil 2 has a bend 8 at its outer end as shown in FIG. 2, and the bend 8 is adapted to normally engage the lever 7 to urge it in a direction (to the right in FIG. 2) which can keep the valve member 5 closed against the action of the coil spring 18 to allow a rich fuel-air mixture to be supplied through the carburetor C to start an engine. A plurality of pins 9 stands from the floor 3 of the housing 1 and cooperate to surround the bimetallic coil 2 in proximity thereto as illustrated in FIG. 2. The pins 9 are spaced from one another and each pin 9 is preferably positioned so as to be contacted by one of the loops or antinodes formed on the bimetallic coil 2 when it vibrates during the operation

of the engine. A heating element 10 is provided between the bimetallic coil 2 and the floor 3 of the housing 1 and adapted to be actuated in response to elevation of the temperature in the vicinity of the engine to deform the bimetallic coil 2 to open the valve member 5 at a predetermined time after the engine is started.

As the bimetallic coil 2 is heated by the heating element 10, its outer end or bend 8 moves counterclockwise or to the left in FIG. 2 reducing its diameter. The lever 7 is gradually released from the force applied thereto by the bimetallic coil 2, and the action of the coil spring 18 becomes predominant to open the valve member 5 gradually. As the heating element 10 continues to heat the bimetallic coil 2, the bend 8 of the bimetallic coil 2 finally disengages itself from the lever 7, whereupon the valve member 5 becomes fully open and remains in that position as long as the bimetallic coil 2 remains hot. When the bimetallic coil 2 has its outer end hanging freely after it has been disengaged from the lever 7, it has a tendency to vibrate with the vibration of the engine during a certain period of the engine operation. According to this invention, this tendency can be considerably reduced or prevented when the bimetallic coil 2 contacts the pins 9. Accordingly, the stress exerted on the bimetallic coil 2 by its vibration can be maintained below its fatigue limit, so that the bimetallic coil 2 will never be broken by vibration.

FIG. 10 illustrates the relation between the clearance between the bimetallic coil 2 and the pins 9 and the stress exerted on the bimetallic coil 2 by its vibration during a certain period of the engine operation. It will be noted from this graph that proper selection of the positions of the pins 9 can effectively reduce the stress exerted on the bimetallic coil 2 by its vibration and can accordingly prevent breakage of the bimetallic coil 2 due to vibration.

In the embodiment shown in FIGS. 3 and 4, the means for preventing vibration of the bimetallic coil 2 comprises a curved wall 12 standing from the floor 3 of the housing 1 and surrounding the bimetallic coil 2 in proximity thereto. The wall 12 can obviously provide a much larger surface of contact with the bimetallic coil 2 than the pins 9 as hereinbefore described can, so that the wall 12 can produce a so much greater effect in the prevention of the vibration of the bimetallic coil 2 than the pins 9. The wall 12 also provides the bimetallic coil 2 with an excellent wear resistance and an excellent fatigue strength. The wall 12 is preferably so provided as to surround that portion of the bimetallic coil 2 in which loops are formed when the coil 2 vibrates.

Referring to FIG. 5, a modified form of bimetallic coil 13 comprises a right-hand coil in which the inner metal has a larger coefficient of linear expansion than the outer metal. The inner end of the bimetallic coil 13 is fastened to the shaft 4. A bend 14 is formed at the outer end of the coil 13 and a channel-shaped strip 15 is attached to the bend 14. Before the bimetallic coil 13 is heated, the channel-shaped strip 15 is engaged with the lever 7 to urge it in a direction (to the right in FIG. 5) which keeps the valve member 5 closed. When the bimetallic coil 13 is heated by the heating element 10, the coil 13 expands and somewhat increases its diameter. The coil 13 contacts the pins 9 and the channel-shaped strip 15 at the outer end of the coil 13 disengages itself from the lever 7. The coil 13 hangs freely at its outer end, while it is secured at its inner end, but

any tendency of the coil 13 to vibrate due to engine vibration can immediately be prevented or at least considerably reduced by its contact with the pins 9.

In the embodiment shown in FIGS. 6 and 7, the means for preventing vibration of the bimetallic coil 2 comprises a channel-shaped curved double wall structure 19 standing from the floor 3 of the housing 1. As best shown in FIG. 7, the double wall structure 19 encloses the outermost turn of the bimetallic coil 2 with its inner and outer walls and top wall spaced from the coil 2. The double wall structure 19 is preferably so positioned as to cover that portion of the bimetallic coil 2 in which loops may be formed when the coil 2 vibrates.

FIG. 8 shows a modified form of curved channel-shaped double wall structure 19a adapted to be contacted by the coil 2 when the latter starts vibrating. The double wall structure 19a is similar to the double wall structure shown in FIG. 7 both in construction and in function except that it is supported on the side wall 3a of the housing 1 instead of standing from the floor 3.

All of the various forms of means for preventing vibration of a bimetallic coil as hereinabove described with reference to FIGS. 2 through 8 are stationary themselves, and are adapted to prevent the vibration of the bimetallic coil when contacted by the coil which has been thermally deformed. But such means may alternatively be formed from a thermally deformable material and one example of a modified structure is shown in FIG. 9. The modified structure shown in FIG. 9 comprises a pair of substantially arcuate bimetallic strips 16 supported on the floor 3 of the housing 1 at one end. Each of the arcuate strips 16 consists of two metals having different coefficients of expansion, and the outer metal of each strip 16 has a greater coefficient of expansion than the inner metal thereof. The other ends of the arcuate strips 16 are hanging freely and extend along the outer periphery of the bimetallic coil 2 in proximity thereto. The outer metal constituting the bimetallic coil 2 has a greater coefficient of expansion than the inner metal thereof as stated before. Because of their construction as described above, the arcuate strips 16 decrease their radii, when heated, to contact or approach the bimetallic coil 2 to prevent or reduce the vibration of the bimetallic coil 2 when the latter is disengaged from the lever 7 to allow the valve member 5 to fully open. It will be noted that the arcuate strips 16 may alternatively be supported on the side wall 3a of the housing 1.

As an alternative to the structure shown in FIG. 9 and described above, the means for preventing the vibration of the bimetallic coil may comprise a bar or strip of metal having a large coefficient of thermal expansion supported on the side wall 3a of the housing 1 perpendicularly thereto and having its free end located in a position where it may be contacted by each loop formed on the bimetallic coil when the latter vibrates. When heated, the bar or strip expands and its free end contacts the bimetallic coil to prevent the latter from vibrating.

Although in all of the foregoing description reference has been made to the situation in which the free end of a bimetallic coil hangs freely, it is to be understood that the present invention may equally be applied with equal effect to the situation in which the free end of the bimetallic coil remains engaged with the lever connected to a choke or air valve.

While the invention has been described in several preferred forms, it should be understood that further modifications or variations may be made by those skilled in the art without departing from the scope of the invention which is defined by the appended claims.

What is claimed is:

1. In combination with an automatic choke system for an internal combustion engine carburetor having a bimetallic coil in a housing for restraining the opening of a throttle valve in said carburetor, the improvement comprising: a curved double wall structure channel-shaped in cross-section surrounding at least a portion of the outermost turn of said bimetallic coil, said structure being secured to said housing in spaced relation to said bimetallic coil and adapted to be contacted by said bimetallic coil to prevent vibration thereof.

2. In combination with an automatic choke system for an internal combustion engine carburetor having a bimetallic coil in a housing for restraining the opening of a throttle valve in said carburetor, the improvement comprising: at least one pin secured at one end to said housing in proximity to said bimetallic coil, said bimetallic coil, upon heating thereof, being movable into contact with said pin to prevent vibration of said bimetallic coil.

3. The combination defined in claim 2 wherein said pin is positioned in proximity to the outer peripheral

surface of said bimetallic coil.

4. The combination defined in claim 2 wherein said pin is positioned in proximity to that portion of said bimetallic coil in which a loop of vibration may be formed when said bimetallic coil tends to vibrate.

5. In combination with an automatic choke system for an internal combustion engine carburetor having a bimetallic coil in a housing for restraining the opening of a throttle valve in said carburetor, the improvement comprising: at least one elongated curved wall formed from a bimetallic strip and extending around said bimetallic coil in proximity thereto, one end of said wall being secured to said housing and the opposite end of said wall being free and adapted to contact said bimetallic coil to prevent vibration thereof.

6. The combination defined in claim 5 wherein said wall has an inner surface complementary to the outer peripheral surface of said bimetallic coil in spaced relation thereto.

7. The combination defined in claim 5 wherein said wall is made of a bimetallic strip having a larger coefficient of thermal expansion than the material of which said bimetallic coil is made, said opposite end of said wall being adapted to bend toward said bimetallic coil and contact the outer peripheral surface thereof when said wall is brought to an elevated temperature.

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