April 27, 1965 R. E. HERMAN 3,180,576

MEANS FOR MOUNTING A THERMOSTATIC ELEMENT

Filed May 8, 1962 2 Sheets-Sheet 1

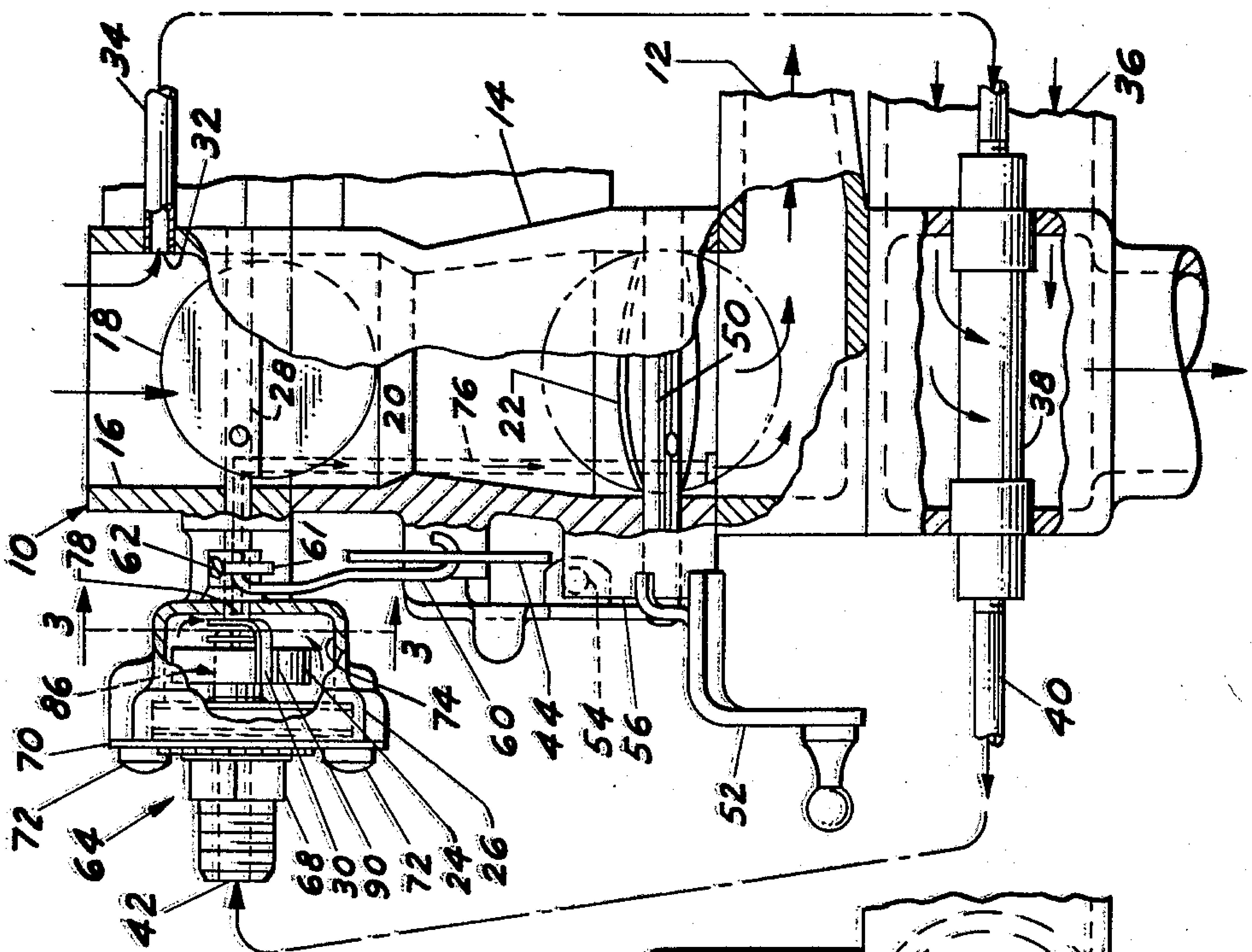

FIG. 1

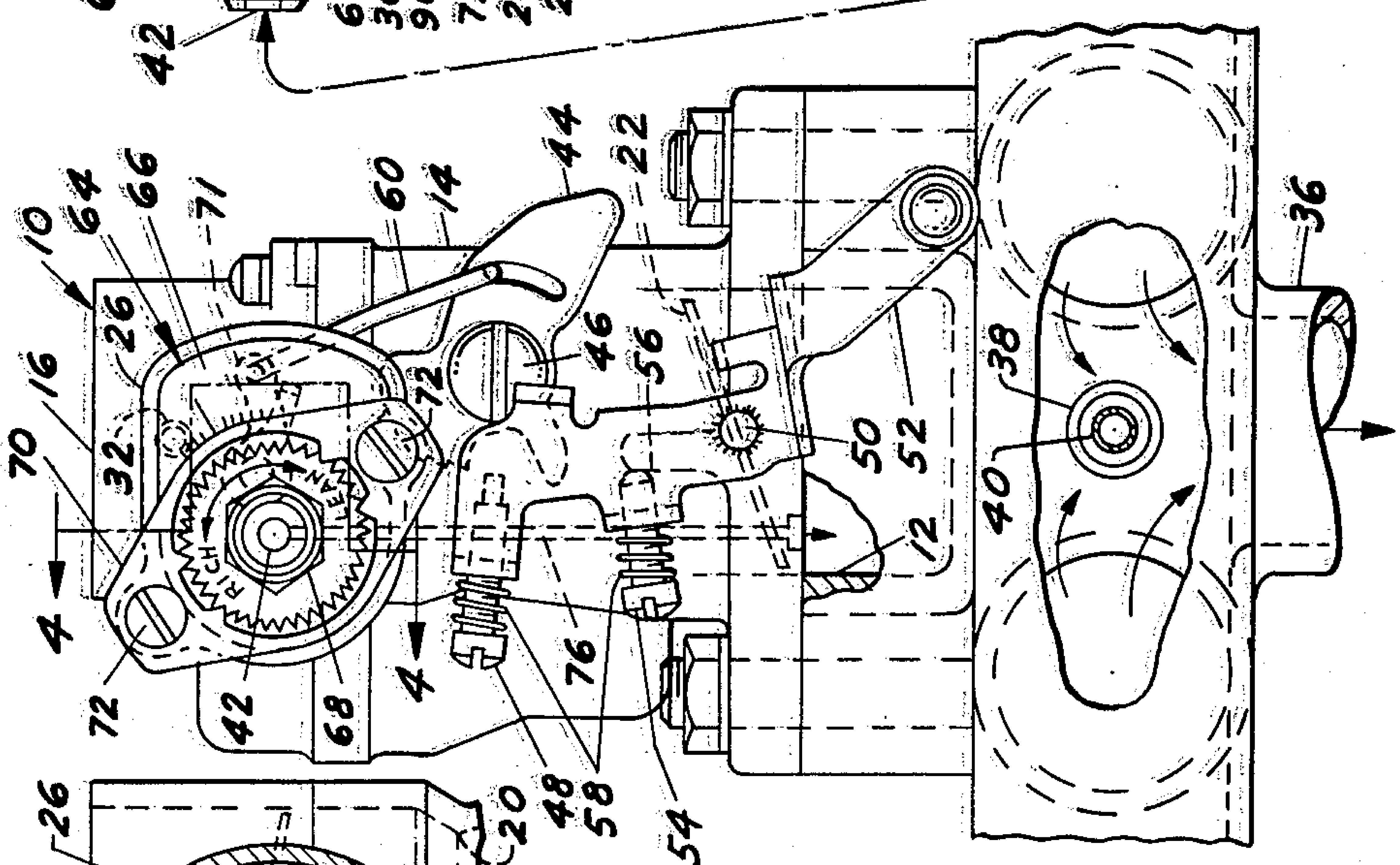

FIG. 2

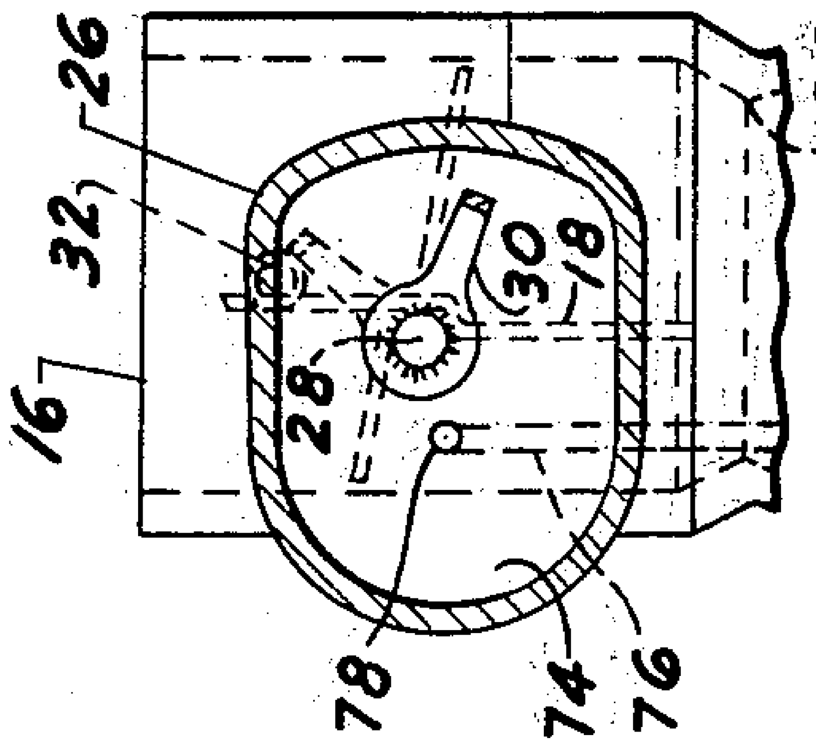

FIG. 3

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FIG. 4

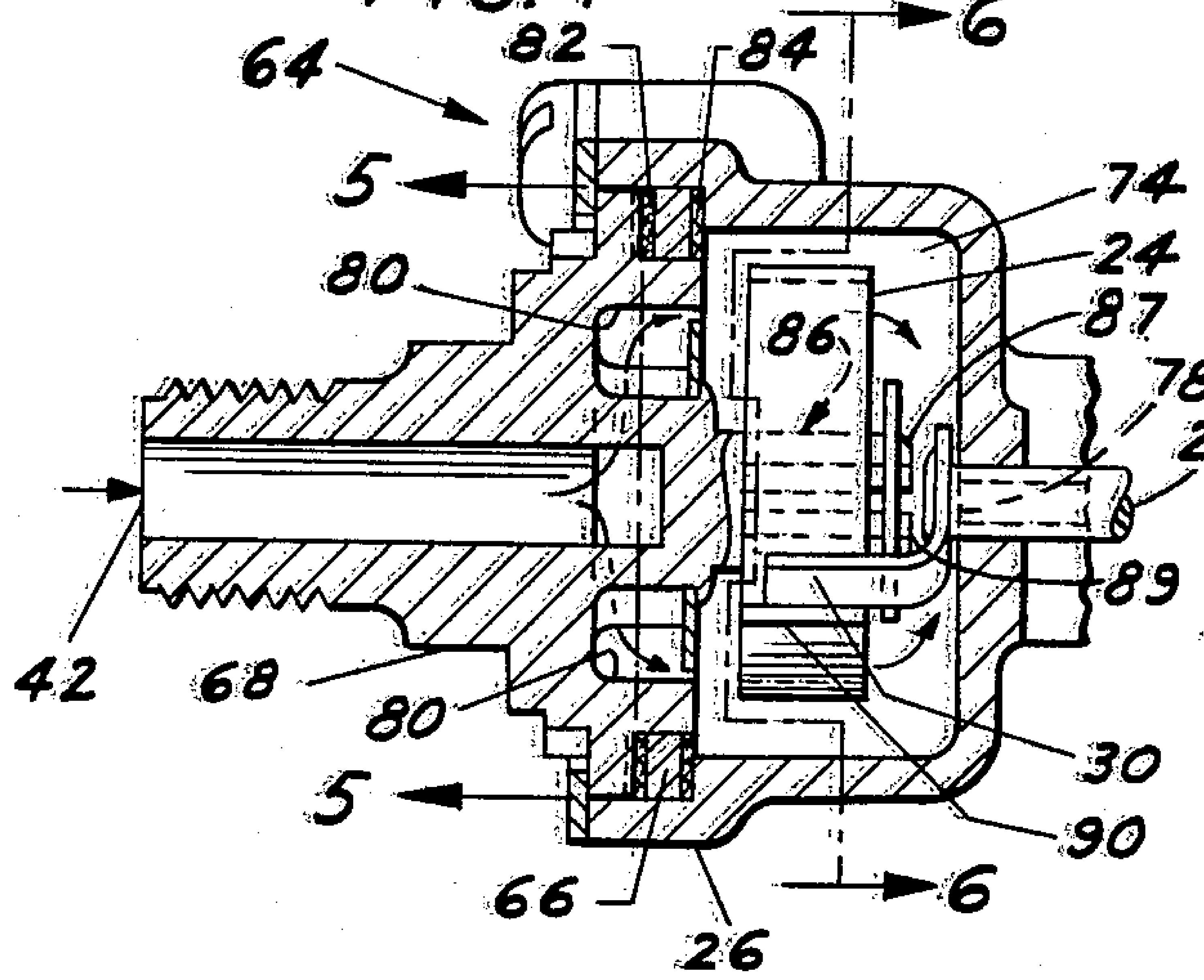
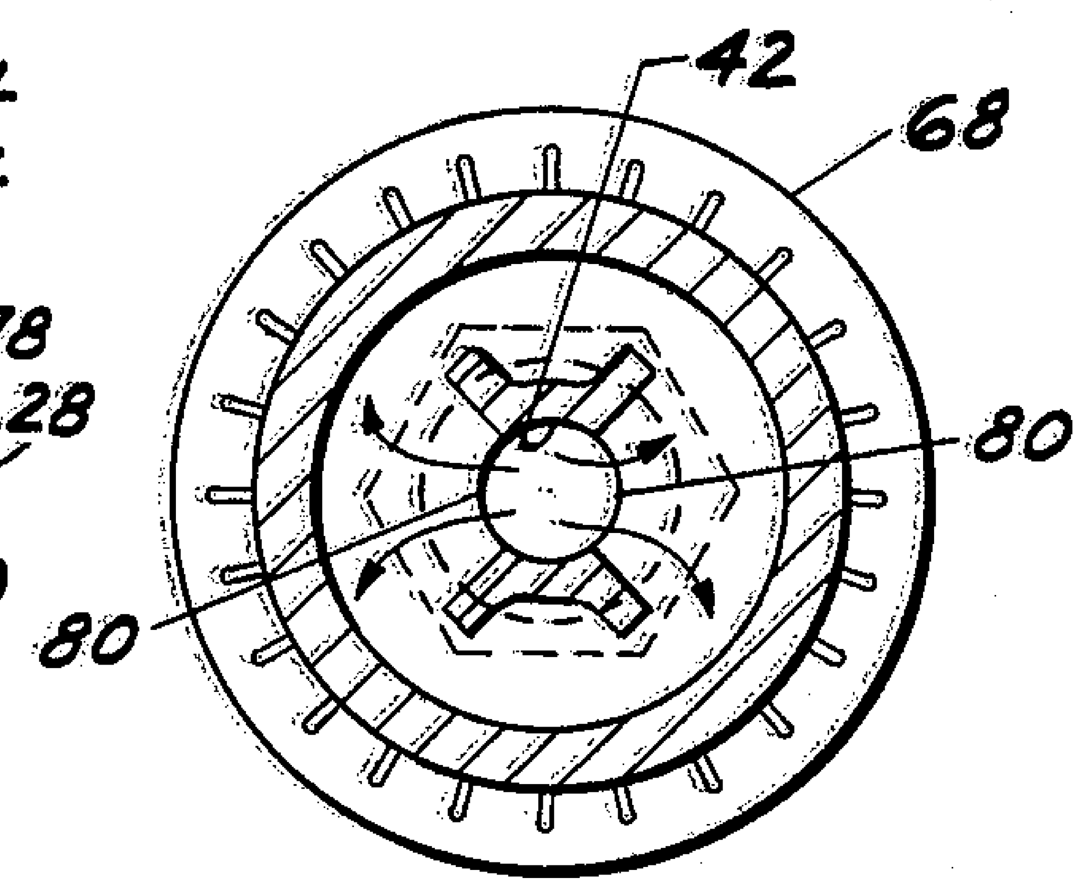


FIG. 5



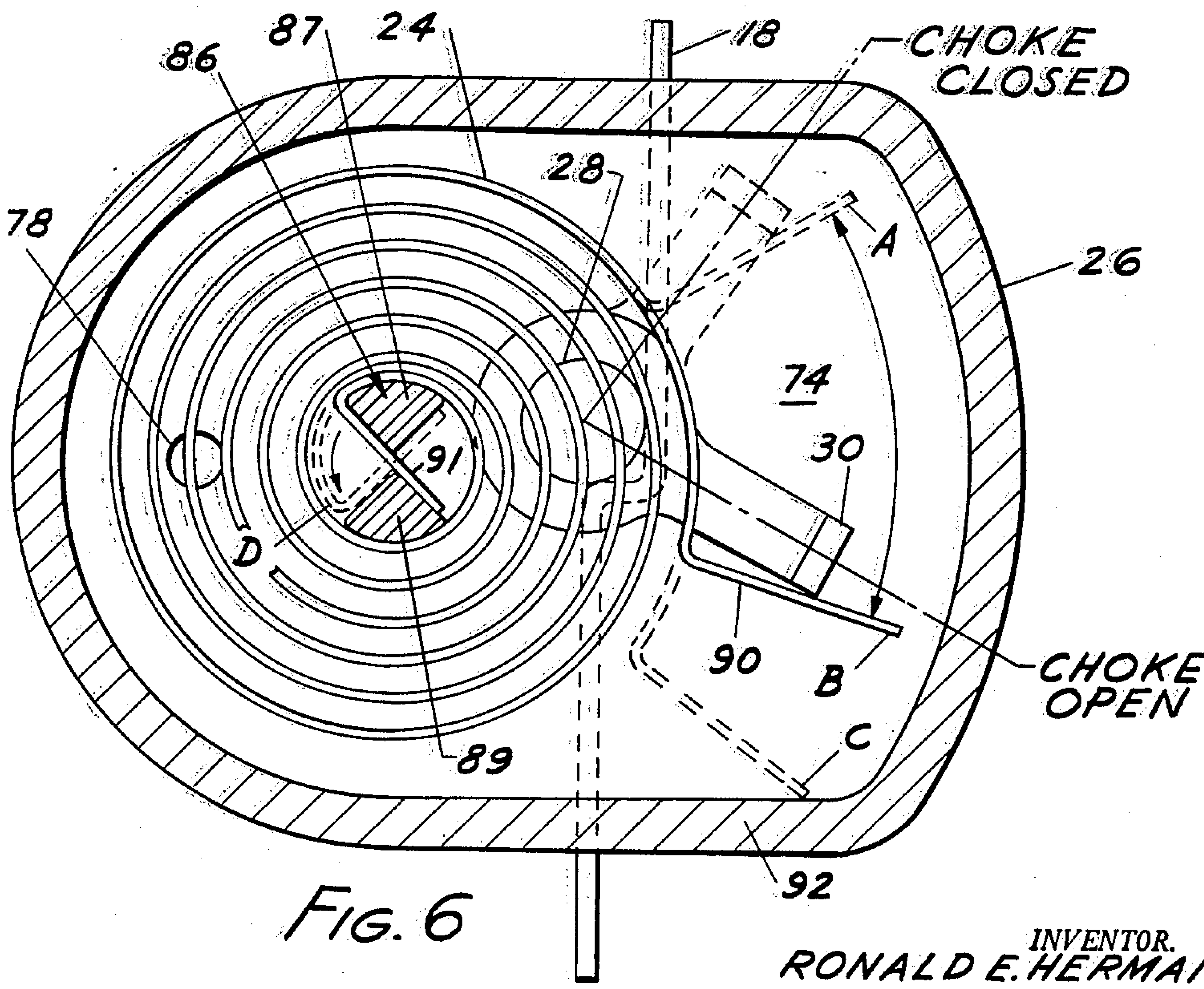


FIG. 6

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MEANS FOR MOUNTING A THERMOSTATIC ELEMENT

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5 Claims. (Cl. 236—101)

This invention relates generally to internal combustion engine carburetors having thermostatically controlled automatic choke systems, and more particularly to novel means for relieving stress that may otherwise build up in the thermostatic element at higher engine temperatures when the choke is open.

Most carburetor automatic choke systems comprise a choke plate mounted on a shaft in such a way that the flow of air to the engine tends to open the choke plate, and the opening of the choke valve is resisted when the engine is cold by the free end of a thermostatic coil spring having its inner end anchored to the choke housing. In the usual case, the coil is unwound when cold and winds up when heated; thus, the resistance of the thermostatic coil spring to choke opening decreases as the engine temperature increases.

The above described arrangement is generally acceptable. However, in some carburetor designs, it is essential that the choke housing comprise a compact shape, which in some instances is other than circular. In such a housing, it is conceivable that the tang or free end of the thermostatic bimetal spring, after a certain amount of travel, would abut against a side of the choke housing, and thus not be free to further wind about its center as the temperature in the housing continued to rise.

Accordingly, a general object of the invention is to provide a means for stress relieving the thermostatic bimetal spring after it comes into contact with the choke housing wall.

A more specific object of the invention is to provide a movable anchor which would permit the inner end of the bimetallic coil spring to rotate about its axis in a direction opposite to the rotation of the external tang, and thus relieve the stress that would otherwise be present in the bimetallic spring.

A further object of the invention is to provide for smaller choke housings, or for housings which depart from a circular shape, thus permitting a more compact configuration of the carburetor and air-cleaner combination.

Still another object of the invention is to relieve the stress in bimetallic springs in those instances where a circular choke housing is employed, but where the free end of the thermostatic element is looped about the choke lever projection so that the element is similarly restricted from further winding-up when the choke is already open and temperature increases.

Other more specific objects and advantages of the invention will become apparent when reference is made to the following description and the accompanying illustrations wherein:

FIGURE 1 is a front elevational view, with portions thereof cut away and in cross section, illustrating generally a carburetor embodying the invention, the carburetor being mounted on the intake manifold of an engine;

FIGURE 2 is a side elevational fragmentary view of the carburetor shown by FIGURE 1;

FIGURE 3 is a cross-sectional view, taken on the plane of line 3—3 of FIGURE 1 and looking in the directions of the arrows;

FIGURE 4 is an enlarged, cross-sectional view of the automatic choke assembly, taken on the plane of line 4—4 of FIGURE 2 and looking in the direction of the arrows;

FIGURE 5 is a cross-sectional view, taken on the plane of line 5—5 of FIGURE 4 and looking in the direction of the arrows;

FIGURE 6 is an enlarged cross-sectional view, taken on the plane of line 6—6 of FIGURE 4 and looking in the direction of the arrows;

Referring to the drawings in greater detail, FIGURE 1 illustrates generally a carburetor assembly **10** mounted on the engine intake manifold **12**. The carburetor **10** includes the usual carburetor body **14** with an air inlet passage **16** therethrough. The air inlet passage **16** includes the usual choke valve **18**, venturi **20** and throttle valve **22**. The choke valve **18** is operatively connected to a bimetallic thermostat spring **24**, positioned in the automatic choke housing **26**, by means of the choke shaft **28** and the choke lever **30**. The choke housing **26** is warmed by air which enters the system through the air inlet passage **16** and then passes through a cold air intake **32** and cold air tube **34** to the exhaust manifold **36** to become heated by a stove **38** located therein; the heated air then passes through the hot air tube **40** and into the choke housing inlet **42**.

FIGURE 2 illustrates the fast idle cam **44** pivotally fastened to the carburetor body **14** by a fast idle cam screw **46**. The fast idle cam **44** is at times in contact with the usual fast idle screw **48**, the latter being connected to a throttle lever **52** which is responsive in the well-known manner through appropriate linkage to manual movement of the foot pedal (not shown). A throttle shaft **50** is fixedly attached to the throttle lever **52** for rotation therewith in order to actuate the throttle valve **22**.

Maximum movement of the throttle lever **52** is controlled by the usual throttle stop screw **54** which abuts against a lug cast on the side of the carburetor body **14**. Manual adjustment of the fast idle screw **48** and the throttle stop screw **54** are maintained by the compressed springs **58**. The cam **44** is operatively connected to the choke shaft **28** by means of a fast idle link **60**, a linking element **61** and a set screw **62**.

FIGURE 2 further illustrates the choke housing cover assembly **64** which comprises a choke housing plate **66**, a thermostat cap and baffle assembly **68**, a thermostat cap clamp **70** and a thermostat cap clamp screw **72**.

FIGURE 3 illustrates the inner chamber **74** of the choke housing **26**, with the choke housing cover assembly **64** removed. The choke lever **30** is shown rigidly attached to the choke shaft **28** so that it can control the opening and closing of the choke plate **18**. The choke housing chamber **74** is subjected to vacuum from the intake manifold **12** through a vacuum passage **76** and an inlet **78**.

FIGURE 4 is an enlarged view of the complete automatic choke assembly demonstrating the passageway **80** into the choke housing chamber **74** for the hot air which enters the choke housing **26** through the thermostat cap inlet **42**. The choke housing plate **66** can be seen to include a gasket **82** that may be cemented to its outer face and to be backed up by a second independent gasket **84**. This figure also shows the bimetallic thermostat spring **24** mounted on a support extension **86** of the thermostat cap and baffle assembly **68**. It will be realized, of course, that many carburetor designs utilize a single cover instead of the housing plate **66** and the thermostat cap and baffle assembly **68**; in that event, the support extension **86** for the thermostat spring would be on the back cover.

FIGURE 5 shows the routing of the hot air through the thermostat cap inlet **42** and thence through the passageways **80** which in this case, are cast into the thermostat cap and baffle assembly **68**. In other designs the passageways **80** could be drilled holes.

FIGURE 6 is illustrative of the manner in which the bimetallic thermostat spring **24** is attached to the support extension 86. This view also demonstrates the cooperation of the thermostat spring tang 90 with the choke lever 30, and the subsequent contact by the tang 90 with the choke housing wall 92.

With respect to the support extension 86, it can be seen that it amounts to a cylindrical stem being first formed with a pair of diametric, right angle slots, the slots being as wide as the thickness of the spring 24 and at least as long the the spring 24 is wide so as to provide four 90° sections and then having a pair of oppositely disposed sections removed. The two remaining sections 87 and 89 adequately retain the inner end 91 of the coil spring 24, but permit a 90° rotation thereof between the sections 87 and 89 from the solid line to the dotted line portion D.

Operation

The operation of the invention can best be described by reference to FIGURE 6, which shows the outer free end or tang 90 of the bimetallic thermostatic spring 24 having progressed from its starting or "cold" position, shown at A. This assumes that the vehicle operator has begun his starting operation by having initially depressed the foot pedal (not shown), as is customary in the usual internal combustion engine starting process. This would have pivoted the fast idle screw 48 (FIGURE 2) away from whichever step of the fast idle cam 44 it was contacting from the previous operating of the vehicle. The cold bimetallic thermostat spring 24 in the chamber 74, thus freed, would have immediately loosened or unwound itself with respect to the support extension 86 so as to rotate the choke lever 30 in a counterclockwise direction to position A. The fast idle cam 44 would have been rotated by the fast idle link 60 leading from the choke shaft 28, which was also turned by the cold bimetallic thermostat spring 24. Release of the initial foot pedal depression would then have allowed the fast idle screw 48 to return against the now rotated high step of the fast idle cam 44.

Referring again to FIGURE 6, as the warm air from the exhaust manifold 36 enters the chamber 74 through the inlet 42 and the passageway 80 shown in FIGURES 4 and 5, the bimetallic thermostat spring 24 becomes warmed and begins to tighten about the support extension 86, rotating in a clockwise direction, thus offering less and less resistance to the opening of the unbalanced or offset choke plate 18 by the fresh air entering through the air inlet passage 16 (FIGURE 1). The choke plate 18 is thus progressively opened as engine temperature increases until the choke lever 30 forces the thermostat spring tang 90 to position B, at which time the choke valve 18 would be fully open.

Once the choke plate 18 is fully opened, the movement of the choke lever 30, of course, will be stopped. Thereafter, however, depending upon the thermal activity rate of the bimetallic thermostat spring 24 involved, the spring 24 may continue to wind up. In fact, a typical high rate spring 24 would continue to wind about the center support 86 until its tang 90 abuted against the choke housing wall 92, as shown at C. In the usual automatic choke construction where the inner end 91 of the coil is rigidly anchored, the above restraint of tang 90 of wall 92 would cause undue stress within the thermostatic spring 24 as long as the higher temperatures exist.

It will be seen from FIGURE 6 that the invention eliminates the above objections to present choke constructions, particularly in the smaller carburetor designs for the so-called compact vehicles. That is, the structure of the support 86 for mounting the coil spring 24 is such that the inner end 91 of the spring is free to rotate 90° in a counterclockwise direction to the dotted-line position when tang 90 is restrained by wall 92. Actually, the inner end 91 may begin to rotate in the counterclockwise direction once the tang 90 leaves contact with the choke lever 30 at point B. Thus, any stress of the spring during the higher temperatures is effectively reduced or eliminated.

As stated previously, some prior choke designs have the tang 90 actually looped about the lever 30. Here, again, the spring 24 would be stressed at temperatures above the choke open temperature because the lever 30 is prevented from further clockwise rotation due to an abutment which is necessary to prevent the choke plate from opening beyond the fully opened position.

Relieving stress in the thermostatic coil spring as described above is important because the stress may exceed the elastic limit of the spring material so that a permanent set or deformation of a spring occurs. This set is in the direction such that it increases the resistance of the spring to choke opening when the engine is cold. Thus, the next cold start would be either impossible or excessively rich. In other words, the permanently deformed coil spring would thereafter keep the choke on too long and adversely effect cold starting and operation.

Thus, it can be seen that the invention enables the use of compact and irregularly shaped choke housings or the use of looped connections between the thermostatic coil spring and the choke lever, at the same time relieving or eliminating harmful stresses that may otherwise exist on account of such constructions.

Although but one embodiment of the invention has been shown and described, it is conceivable that various modifications are possible, and no limitation not recited in the appended claims is intended.

What I claim as my invention is:

1. In an internal combustion engine carburetor including an air inlet passage, a choke valve in said air inlet passage and means for automatically controlling the position of said choke valve, said means including a spiral type thermostatic element having a free outer end operatively connected to said choke valve and an inner end, said outer end being restrained from further movement when a predetermined temperature has been attained, means for mounting said inner end so as to provide a limited degree of stress relieving motion thereof and when said outer end is restrained, said latter means comprising a pin having oppositely disposed wedge portions between which said inner end is mounted and the opposite aligned surfaces of which provide two limits of movement of said inner end.

2. In an automatic choke mechanism, a thermostatic element having a free outer end and a pivotable inner end formed thereon, means for heating said thermostatic element, a pair of oppositely disposed wedge-shaped supports, means for pivotably connecting said inner end to said wedge-shaped supports, and means for at times restraining movement of said free outer end in one direction, one side of each of said wedge-shaped supports serving to restrain movement of said inner end in said one direction while said free outer end is moving in the same direction, the other two sides of each of said wedge-shaped supports serving to restrain further movement of said inner end in the other direction after said inner end has moved a predetermined distance.

3. In an automatic choke mechanism including a choke shaft and a choke lever secured thereto, a spiral thermostatic element having a free radially-extending outer end and a diametrically-extending inner end formed thereon, said outer end at times being in contact with said choke lever, means for heating said thermostatic element, a pair of oppositely disposed wedge-shaped supports, said inner end being positioned between said wedge-shaped supports, means for restraining movement of said outer end in one direction after said outer end has left contact with said choke lever, said inner end being free to rotate from a position adjacent one side of each of said wedge-shaped supports toward the other side of each of said wedge-shaped supports once said outer end leaves contact with said choke lever.

4. In an automatic choke mechanism including a choke shaft and a choke lever secured thereto, a spiral thermostatic element having a radially-extending outer end and

a diametrically-extending inner end formed thereon, said outer end being in contact with said choke lever, means for heating said thermostatic element, a pair of oppositely disposed wedge-shaped supports, said inner end being positioned between said wedge-shaped supports, means for restraining movement of said outer end in one direction, said inner end being free to rotate from a position adjacent one side of each of said wedge-shaped supports toward the other side of each of said wedge-shaped supports with increased temperature.

5. A temperature-controlled mechanism, comprising a membert to be positioned in accordance with temperature, a thermostatic spiral coil element having the outer free end thereof operatively connected to said member and an inner end, means restraining the further movement of said outer end as temperature increases, and rigid abutment means for mounting said inner end in a manner to allow said inner end to assume any position between two limits, said rigid abutment means including a mounting pin formed to provide a pair of oppositely disposed wedge sections, the inner coil of said spiral coil element surrounding said pin and said inner end being positioned between said wedge sections.

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