TEMPERATURE RESPONSIVE SWITCH

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ABSTRACT

This invention relates to a temperature switch and more particularly to a temperature responsive switch used in a catalytic converter that fits into an internal combustion engine exhaust system. The temperature switch is an independent self-contained unit that is connected directly to the converter and has a sensing element that fits within the converter to activate the switch to provide a signal and therefore an indication that the catalyst within the converter is ineffective due to deterioration of the catalyst.

4 Claims, 1 Drawing Figure
TEMPERATURE RESPONSIVE SWITCH

This invention relates to a temperature switch having a sensing element inserted into a catalytic converter to provide an indication that the catalyst in the converter is not functioning properly because of deterioration. Problems of air pollution from internal combustion engines and the use of catalytic converters in the exhaust system of such engines to minimize air pollution has led to the requirement for a simple and inexpensively manufactured temperature sensing device to be used within the converter to detect failure of the catalyst in the converter. Most of the similar devices available are delicately constructed as well as expensive to manufacture and therefore impractical for use as temperature switches in the automobile application. The temperature devices available apparently do not perform properly in the rigorous environment and the rigorous use that they are put to when installed in automobile converters and further any sensors practical for use are very costly and complex to produce by mass production techniques.

Accordingly, it is an object of the present invention to provide a simple, reliable and inexpensive temperature switch having means for sensing the failure of a catalyst in a catalytic converter. A further object is to provide a temperature device that is directly connected to the converter and has a sensing element on a probe within the converter that is constructed of the same catalyst material found in the converter.

Another object is to provide a temperature switch having interchangeable sensing means.

Another object of the invention is to provide a temperature switch that can be produced and assembled by mass production techniques.

A further object is to provide a temperature switch that is compact and self-contained and therefore can be manufactured and adapted for use as an assembly for easy insertion into a converter.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

The FIGURE shows a cutaway sectional view of the preferred embodiment of the invention.

Referring to the drawing, there is shown a switch housing 10 generally constructed of a one-piece body member 12 that may be made of stainless steel or the like, having attachment means 14 in the form of a threaded neck portion 16 at one end thereof.

Assembled within the body 12 is a tube assembly 18 that has a flared out attaching portion 20 at one end thereof that rests on a shoulder 22 in body 12 and makes electrical contact with the body. Tube assembly 18 extends through the neck portion 16 and is of sufficient length to extend into the catalyst bed of the converter, when the housing is attached to the converter. Tube assembly 18 and the flared attaching portion 20 are made of Inconel or similar type metals in order to withstand the heat within the converter. Electrically connected to tube assembly 18 are a set of contacts 24 that may be formed directly on the flared portion 20 of the tube or may be independently formed and attached thereto by some means such as welding, brazing or the like. A second set of contacts 26 are located opposite contacts 24 and are attached to a generally movable yoke shaped member 28. Spring 30 that rests on the yoke member 28 electrically connects the two sets of contacts, when they are closed, to a terminal 32 having a connector 34 that extends through the body 12 at the end opposite from the threaded neck portion 16.

Contacts 26, spring 30 and the terminal 32 are electrically insulated from the body 12 by insulating means 36, 38. Insulator means 36 can be a ceramic insulator, and insulator 38 can be made of mica, for example. The components assembled within the body 12 are held in place by a spacer 40 and rolled-over portions 42 formed on the body 12 adjacent the connector 34.

Within the tube assembly is an actuator rod 44 that fits into an indented portion 46 on the yoke 28 within body 12. The actuator rod may be made of stainless steel or Inconel and generally extends the full length of the tube assembly and engages a second rod 48 that is formed of a catalyst material which is inserted in a second tube or can member 50. The catalyst material that makes up the second rod 48 is the same as the catalyst material formed in the converter. It is understood that metal or other means having a melt point or deterioration point the same as the catalyst could be used. The length of the tubular forming catalyst 48 is such that it forces actuator rod 44 upwardly into the body member 12 to push the spring toward terminal 32 to open the contacts 24, 26. Actuator rod 44 is therefore spring biased in a downward direction and the contacts are normally open. Can member 50 is connected to tubular member 18 by a bayonet type connection 52. Bayonet connector 52 is generally formed of a pair of ear members 54 on tubular member 18 and mating pin members 56 on the can 50 with such connectors being well known in the art.

In operation the housing 10 is screwed into a catalytic converter forming a path to ground through neck 16. The tubular member 18 having the axial rod 44 therein and can 50 attached thereto extend into the catalyst bed in the converter. The length of the catalyst rod 50 determines the distance that the contacts are apart and therefore determines the length of time the catalyst within the converter can be exposed to high temperature without damage. If the catalyst is exposed to high temperature beyond this period, the catalyst in the converter will begin to deteriorate. However, the catalyst rod 48 being of a smaller volume than the catalytic bed and due to deterioration will shrink causing actuator rod 44, urged by spring 30, to move downwardly. When the catalyst rod 48 has deteriorated to the set point where the converter could be damaged, contacts 24, 26 close to provide a signal through connector 34 and ground, to a telltale or the like that the catalyst within the converter has deteriorated to an unacceptable point. Upon the converter being serviced, which would generally be at time that replacement of the catalyst is required, the can member 50 is disconnected from the tubular assembly 18 and catalyst rod 48 within can 50 is replaced or a new can member containing the catalyst rod could be replaced as a unit.

It is readily apparent that the temperature switch is an easily constructed simple device that is easily assembled and has a replaceable sensor at one end that can be readily serviced at minimal cost.

While the embodiments of the invention as herein disclosed constitute a preferred form, it is to be understood that other forms could be adopted.
I claim:

1. A temperature responsive electrical switch comprising: a body having attachment means thereon; a tubular member having one end in said body in electrical contact therewith, and the other end extending therefrom; first contact means on the one end of said tubular member; second contact means opposite said first contact means; a spring electrically connecting said second contact means to a terminal on said body; insulator means electrically insulating said second set of contacts, spring, and terminal from said body; and an actuator rod, having an expendable sensing means at one end and having the other end in contact with said second contact means to normally hold said first and second contacts open.

2. A temperature responsive electrical switch adapted to be used in a catalytic converter to detect catalyst failure comprising: a body having attachment means at one end thereof for attachment to the converter; a tubular member having one end in said body in contact therewith, and the other end extending therefrom through said attachment means wherein said other end of the tubular member is adapted to extend into the converter; a first set of contacts on said one end of the tubular member; a second set of contacts opposite said first set of contacts; spring means electrically connecting said second set of contacts to a terminal on said body at the end opposite said attachment means; insulator means within said body electrically insulating said second set of contacts, spring means, and terminal from said body; an actuator rod within said tubular member in contact with an expendable rod formed of a substantially similar catalyst as used in the converter; said expendable rod being held in a container attached to said tubular member by removable connector means and being of sufficient length to force said actuator rod into the indented portion on said yoke, to maintain said first and second contacts in a normally open position.

3. A temperature responsive electrical switch adapted to be used on a catalytic converter to detect catalyst failure within the converter comprising: a body having attachment means at one end thereof adapted for attachment to the converter; a tubular member having one end thereof in electrical contact with said body, and the other end extending therefrom and being of sufficient length to extend through said attachment means and into the converter; a first set of contacts on said one end of the tubular member; a yoke member having an indentation substantially at the center; a second set of contacts on said yoke member at each end thereof opposite said first set of contacts; spring means attached to said yoke member to electrically connect said second set of contacts to a terminal on said body at the end opposite to said attachment means; insulator means within said body electrically insulating said second set of contacts, spring means, and terminal from said body; an actuator rod within said tubular member in contact with an expendable rod formed of a substantially similar catalyst as used in the converter; said expendable rod being held in a container attached to said tubular member by removable connector means and being of sufficient length to force said actuator rod into the indented portion on said yoke, to maintain said first and second contacts in a normally open position.

4. A temperature responsive switch as set forth in claim 2, wherein the expendable sensing means is a catalytic rod comprising substantially the same catalyst as in the converter; said catalytic rod being attached to said tubular member by a removable container whereby upon catalyst failure in the converter said catalytic rod shrinks to allow the actuator rod to move away from said second set of contacts to permit the contacts to close and thereby provide a signal of catalyst failure.