Oct. 29, 1957 T. B. LEGEZA 2,811,313

THERMOSTATICALLY OPERATED VALVE

Filed Aug. 6, 1954

Fig. 1

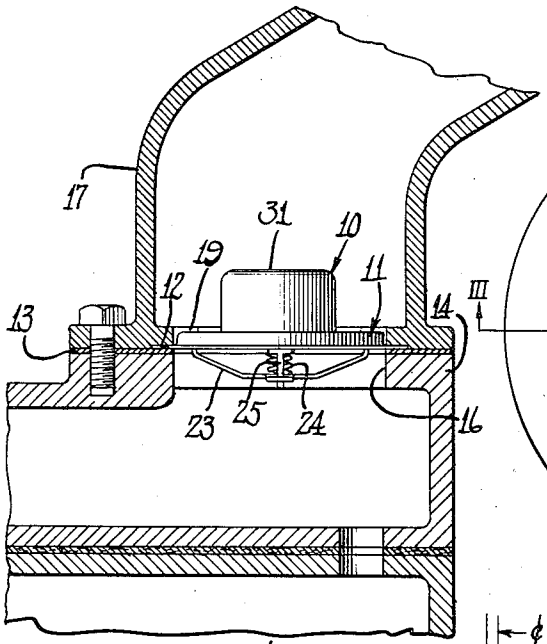


Fig. 2

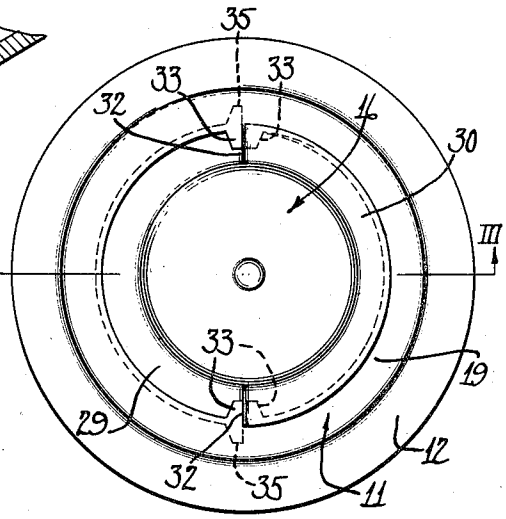
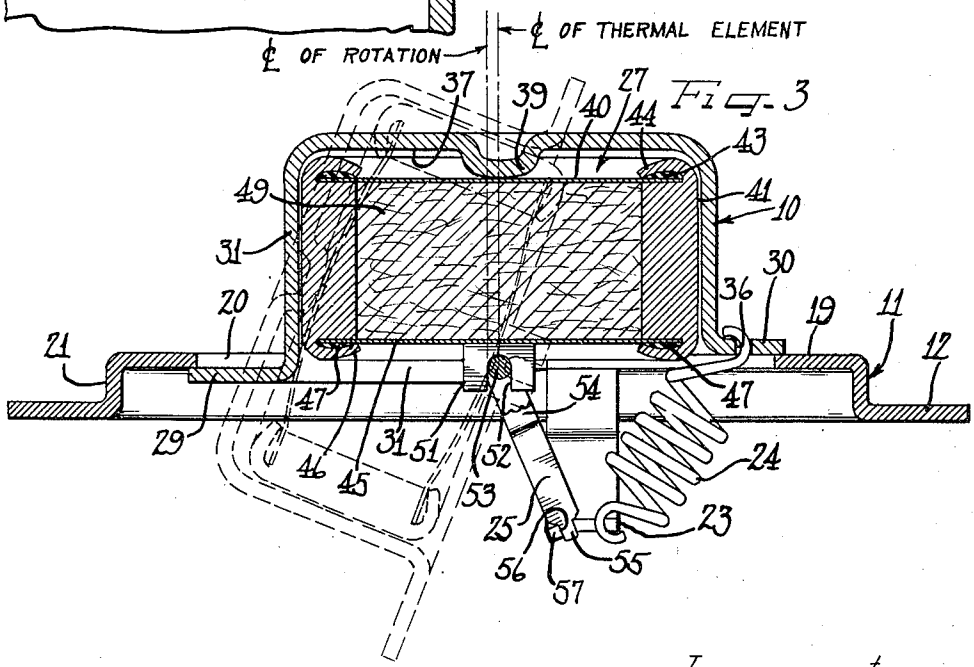


Fig. 3



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United States Patent Office

2,811,313

Patented Oct. 29, 1957

2,811,313

THERMOSTATICALLY OPERATED VALVE

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Application August 6, 1954, Serial No. 448,290

2 Claims. (Cl. 236—34)

This invention relates to improvements in thermostatically operated valves particularly adapted for use in the cooling systems for internal combustion engines.

A principal object of my invention is to provide an improved thermostatically operated valve arranged with a view toward utmost simplicity in construction and efficiency in operation.

Another object of my invention is to provide a thermostatically operated butterfly valve in which the number of parts of the valve is reduced by carrying the thermostatic element in the valve.

Still another object of my invention is to provide a shaftless butterfly valve type of thermostatic valve in which the thermostatic element is loosely carried within the valve and reacts against the valve upon a predetermined temperature rise, to open the same against a biasing spring.

Still another object of my invention is to provide a thermostaticaly operated butterfly valve particularly adapted for use in cooling systems of internal combustion engines wherein a disk-type thermostat is contained in the valve and has oppositely acting expansible disks extended by the thermally expansible material of the thermostat upon predetermined temperature rises, to pivot the valve to an open position and maintain the valve in such a position within a predetermined temperature range.

A still further and important object of my invention is to provide a thermostatically operated valve for the cooling system of an internal combustion engine in which the valve pivots to control the flow of cooling fluid through a port opening in the valve casing and has a cup-like recess therein, relatively loosely containing a disk-type of thermostatic element having parallel spaced oppositely acting disks, one of which reacts against the valve and the other reacts against the valve casing to open the valve against its spring bias upon predetermined temperature rises.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to accompanying drawing wherein:

Figure 1 is a fragmentary vertical sectional view taken through the cylinder head and cooling conduit of an internal combustion engine, and showing a thermostatically operated valve constructed in accordance with my invention associated therewith for controlling the passage of cooling fluid through the cooling conduit;

Figure 2 is a top plan view of the valve shown in Figure 1; and

Figure 3 is a sectional view taken substantially along line III—III of Figure 2.

In the embodiment of my invention illustrated in the drawing, I have shown in Figure 1 a thermostatically operated valve **10** having a flanged valve casing **11**. A flange **12** of the valve casing **11** abuts a gasket **13** on a cylinder head **14** of an internal combustion engine. The valve **10** is held in position within an outlet duct **16** in the water jacket of the cylinder head **14**, to control the passage of cooling fluid through an outlet duct or conduit **17**, secured to the cylinder head in engagement with the gasket **13** and also engaging the top surface of the flange **12**, to maintain the valve casing **11** in engagement therewith.

The casing **11** may be made from a metallic stamping, stamped from a sheet or plate of any suitable material and lending itself to large scale economical production. Said casing is shown in Figures 2 and 3 as having a flat annular upper portion **19**, the inner margin of which defines a valve or port opening **20**. The valve casing **11** also has an outer annular wall **21** connecting the annular portion **19** with the flange **12**, and has a yoke or bridge **23** extending thereacross in vertically spaced relation with respect to the flat annular portion **19** of the valve casing. The bridge **23** forms a connecting member for a tension spring **24**, biasing the valve **10** into a closed position, and also forms a mounting for a reaction link **25** having bearing engagement with a thermostatic element **27**, effective to open the valve by the reaction against said reaction link upon predetermined temperature rises of the cooling fluid, as will hereinafter more clearly appear as this specification proceeds.

The valve **10** may likewise be made from a metallic stamping of a type which may be economically manufactured in suitable press equipment and comprises two laterally offset semi-circular wing portions **29** and **30** having a central inverted generally cup-like receptacle **31** formed therein to receive the thermostatic element **27**. The wing portions **29** and **30** are shown as being joined together by intermediate sections **32, 32** extending generally at right angles to the wing portions **29** and **30**, and of a height determined by the thickness of the annular portion **19** of the valve casing **11** so that the wing portion **29** will be disposed on the underside of the annular flat portion **19** of the valve casing **11** and the wing portion **30** is disposed on the top side of the annular flat portion **19** when the valve is closed.

Two ears **33, 33** are herein shown as extending inwardly of the margin of the port opening **20** in the casing **11** and as forming diametrically opposed slots therebetween, to receive the right angled wall portions **32, 32** of the valve **10** and form a pivot for the valve.

The valve **10** is also shown as having two ears **35, 35** extending oppositely from the wing portion **29** laterally beyond the margin of the port opening **20** and abutting the bottom of the flat annular portion **19** of the valve casing, to come into engagement therewith upon complete opening of the valve, to retain the valve in position.

The spring **24** is shown as being hooked through an apertured portion **36** of the semi-annular wing portion **30** of the valve, to bias the valve into a closed position.

The receptacle **31** for the thermostatic element **27** is shown as having a wall **37** which in the present instance forms a top wall of the receptacle. The wall **37** is shown as having a central indented portion **39** extending within the receptacle and facing the open end thereof and forming a rocking bearing area for a disk or diaphragm **40** of the thermostatic element **27**, and accommodating limited rocking movement of said thermostatic element with respect to the receptacle **31**.

The thermostatic element **27** may be of a form similar to that shown and described in application Serial No. 399,947, filed by Samuel G. Eskin on December 23, 1953, and entitled "Thermal Responsive Unit." This thermostatic element, as shown, has a generally cylindrical casing **41**, one end of which is closed by the diaphragm or metallic disk **40** sealed to a shouldered end thereof by a gasket **43**, retained to said disk by a wall portion **44** of the casing **41** of reduced cross-sectional area from the cross-sectional area of the wall of the casing **41**, and spun over said gasket. The opposite end of the casing **41** is closed by a diaphragm or metallic disk **45** abutting

an opposite shouldered portion of the casing **41** and retained thereto by a reduced cross-sectional area wall portion **46** spun over a gasket **47** engaging an outer side of the metallic disk **45**.

The diaphragms or disks **40** and **45** retain a thermally expansible material **49** within the casing **41** which may, by way of example, be of metallic wool, such as a copper or aluminum wool having a fusible material filling the spaces therebetween and expansible on fushion, and being fusible in the operating range of the device. One form of fusible material may be any of the various forms of micro-crystalline waxes.

Other thermally expansible materials which may be used are crystalline materials having a plastic or elastic binding material in solution and having finely divided particles of a solid heat conducting material dispersed through and coated with the solution, so that the finely divided solid heat conducting particles are bound together by the binder into a solid body. A material of this type is described in United States Letters Patent No. 2,259,846, so need not herein be described further.

The metallic disks or diaphragms **40** and **45** may be made of a thin stainless steel or of a spring steel, or from a Phosphor bronze or any other suitable material, and flex outwardly as the thermally expansible material **49** reaches its fusion temperature, and return to their distended positions shown in Figure 3 by the resiliency of the disks.

The disk **45** is shown as having a yoke **51** welded or otherwise secured to the center thereof and depending therefrom and having a downwardly opening slot **52** therein, receiving opposite ends of a pivot pin **53** on the inner end of the reaction link **25**.

The reaction link **25** is shown as having a yoke **54** formed integrally with its upper end and extending along opposite sides of the yoke **51**. The pivot pin **53** is mounted at its ends in said yoke. The lower end of the reaction link **25** has a reduced diameter nib **55** extending therefrom and fitting within an apertured portion **56** of an inclined portion **57** of the bridge **23**. The inclined portion **57** of the bridge **23** is inclined perpendicularly to the longitudinal axis of the link **25** to support the link **25** in the general position shown in Figure 3, but to accommodate limited rocking movement of said link with respect to the bridge **23** during valve opening movement.

In assembling the valve the thermostatic element **27** is merely placed within the receptacle **31** with the diaphragm **40** thereof in engagement with the bearing nib or projection **39**. The reduced cross-section nib **55** of the reaction link **25** may be placed through the apertured portion **56** of the inclined face **57** of the bridge **23**, and the pivot pin **53** may be placed within the downwardly opening slot **52** of the yoke **51** to connect the reaction link to the thermostatic element and take the reaction thereof on the bridge **23**, and effect pivotal movement of the valve **10** upon extension of the disks **40** and **45** with respect to the casing **41** as the thermostatic material **49** reaches its fusion temperature.

When the reaction link **25** is in place, the spring **24** may then be hooked to the bridge **23** at one end and through the apertured portion **36** of the annular wing portion **30** at its opposite end, as shown in Figure 3.

It may be seen from the foregoing that as the thermally expansible material **49** is subjected to heat such as the cooling fluid of an internal combustion engine and the heat of the cooling fluid approaches the operating range of the thermostatic member **27**, which may be the fusion range of the fusible material, that the fusible material will expand and extend the diaphragms **40** or **45** with respect to the casing **41** as indicated by broken lines in Figure 3. This will exert a thrust reaction on the pin **53** of the reaction link **25** at a point offset from the pivot of the valve, and pivot the valve to the open position shown in Figure 3. Upon reductions in temperature the diaphragms **40** and **45** will tend to contract the thermally

expansible material within the casing **41** of their own resiliency and accommodate the spring **24** to pivot the valve to its biased closed position.

It should be understood, however, that the spring **24** biasing the valve **10** into a closed position, exerts forces on the diaphragms through the valve, tending to return the diaphragms to the unstressed or retracted positions shown in Figure 3.

It may further be seen that I have provided a simplified form of thermostatically operated valve particularly adapted for the cooling system of an internal combustion engine in which the thermostatic element is loosely carried by the valve and is held within the valve by the return spring for the valve and the reaction link, against which the thermostatic element reacts to move the valve to its open position, and that the valve may very simply be assembled or dismantled without the use of tools and that the thermostatic element may readily be replaced where it is desired to change the operating temperature at which the valve opens.

It will be understood that modifications and variations of the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In a thermostatic valve, a valve casing having a flat annular portion, the inner margin of which defines a port opening, a shaftless butterfly valve pivotally carried on said casing and engaging half of one side of said flat annular portion and half of the other side of said flat annular portion for closing said port opening, said valve having a receptacle formed integrally therewith having a generally cylindrical wall and opening in a downstream direction and closed on the upstream side of said valve, a spring connected between said casing and valve and biasing said valve into a closed position, a thermostatic element slidably carried in said receptacle and comprising a casing having a cylindrical wall slidably engageable with the wall of said receptacle and containing a fusible thermally expansible material and having spaced inner and outer expansible disks retaining the thermally expansible material within said casing, the inner of said disks reacting against the closed end of said receptacle and moving said thermostatic element outwardly with respect to said receptacle upon increases in temperature, a bridge extending from said casing across the open end portion of said receptacle in spaced relation with respect to the other of said expansible disks, and a reaction link having pivotal connection with the other of said expansible disks at one end and having pivotal engagement with said bridge at its opposite end, to effect opening of said valve against said spring upon fusion of the thermally expansible material contained within said casing and expansible movement of said disks and slidable movement of said thermal element along said receptacle toward the open end portion thereof.

2. In a thermostatic valve, a valve casing having a port opening leading therethrough, a butterfly valve pivotally supported by said casing for controlling the flow of fluid through said port opening, a bridge extending across said casing and spaced in a downstream direction with respect to said port opening, a spring connected between said bridge and valve and biasing said valve into a closed position, said valve having a receptacle therein having a cylindrical inner wall, a closed end wall spaced downstream of said port opening and opening in an upstream direction, a bearing projection extending inwardly from said closed end wall within said receptacle, a thermostatic element movably mounted within said receptacle and having a casing having a cylindrical wall slidably engageable with the cylindrical wall of said receptable and containing a fusible thermally expansible material, spaced flexible metallic diaphragms closing opposite ends of said casing, one of said diaphragms having engagement with said projection, and a reaction link pivotally connected between said bridge and the other of said diaphragms

and reacting against said bridge and diaphragm to move said valve in a valve opening direction upon increases in temperature sufficient to fuse the thermally expansible material contained within said casing and effect expansible movement of said disks with respect to said casing.

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