March 2, 1937. M. GAUL 2,072,500

THERMOSTAT

Filed Nov. 19, 1934

Fig. 1.

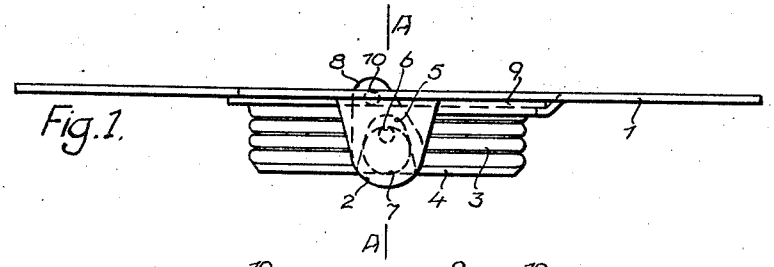


Fig. 2

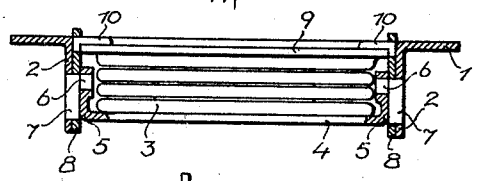


Fig. 3

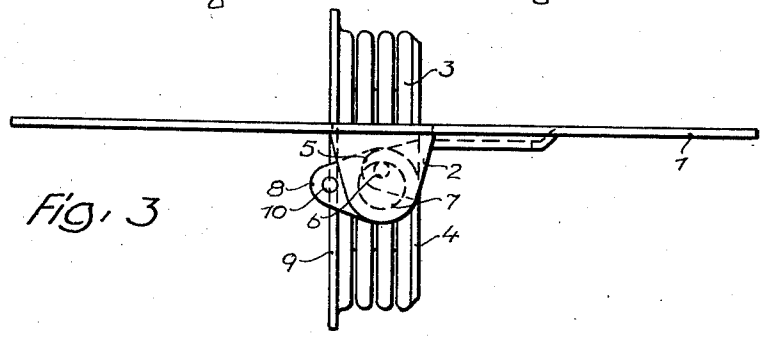
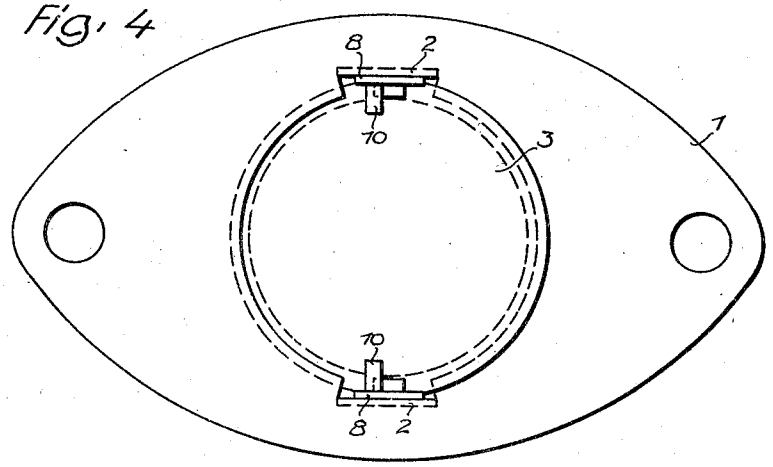


Fig. 4



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2,072,500

UNITED STATES PATENT OFFICE

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THERMOSTAT

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Application November 19, 1934, Serial No. 753,718
In Germany September 19, 1933

2 Claims. (Cl. 236—34)

This invention relates to thermostats in which a bellows-like container usually made of copper is used, which is expanded and contracted owing to temperature variations of the liquid therein. It is known to make use of this phenomenon for operating a throttle flap or the like in pipes filled with a liquid, steam or gas with the object of keeping the temperature at a definite height or within definite limits. One disadvantage of this arrangement is, that the thermostatic element fills the greater part of the cross-section of the pipe and consequently has a disturbing effect on the flow, if, having regard to the available space, for instance in the case of motor vehicles, the pipe cannot be made of any desired cross-section. Furthermore the effect of the flowing liquid on the thermostatic element is, owing to the fixed position of the latter, not always entirely favourable. According to the present invention the thermostatic element is itself used as the valve or throttling flap, thus combining a very simple constructional form of the whole device with the best possible effect of the flowing or stationary liquid and the like on the element in any position.

A constructional example of the invention is illustrated in the accompanying drawing, in which

Fig. 1 is a side elevation; Fig. 2 a part section on line A—A of Fig. 1; Fig. 3 a side elevation as in Fig. 1, with the thermostatic element in another position, and Fig. 4 a plan view.

The flange 1 of thick metal sheet is designed for mounting the thermostat, for instance in the cooling water pipe of motor vehicles. At two oppositely located places of the aperture in the flange 1 for the passage of the cooling water two lugs 2 are bent out at right angles from the metal sheet, which serve as bearing supports for the thermostatic element 3 consisting of a copper bellows body of a known kind, which is closed on all sides and is filled with the liquid. For this purpose its base plate 4 is provided with two oppositely located upwardly bent lugs 5, with the bores in which the element 3 can turn about the fixed axial pins 6. These pins form eccentrically projecting parts of discs 7 which are fixed in the bearing supports 2 by soldering or riveting. There are further mounted on the discs 7 so as to be capable of turning on them crank members 8 which are controlled by pins 10 fixed on the cover plate 9 of the thermostatic element 3. The cover plate 9 acts as the valve plate and is consequently made somewhat larger than the passage aperture provided in the flange 1. As the plate 9 by turning about the pins 6 lifts from the flange 1 (Fig. 3), the latter engages with the edge of the aperture on one side (in Figs. 1, 3, 4 on the left) over the plate 9 and on the opposite side under it.

The thermostat which is inserted for instance in the cooling water pipe of a motor vehicle operates as follows: When the cooling water is below a certain temperature the aperture in the flange 1 leading to the radiator is closed by the cover plate 9 of the thermostatic element 3. As the temperature rises the cooling water circulates in the by-pass pipe and in front of the closed aperture, sweeping over the folds of the element 3 in a very effective manner. This continues until the cooling water has reached a temperature at which the liquid in the element vaporizes and thereby causes the bellows body 3 to expand. This expansion which develops a great force necessarily causes the two positively connected points of revolution 6 and 10 on the thermostatic element to move apart out of their initial position by the amount of the gradual expansion of the bellows body 3. The element can thus gradually swing from the initial position shown in Fig. 1 into the extreme position shown in Fig. 3. The greatest possible expansion of the bellows body 3 and the eccentricity of the two pivotal points 6 and 10 are thus in a fixed ratio to the right angle enclosed by the extreme positions of the thermostatic element so that a rotation beyond the right angle is impossible. Regarded as a valve plate, the thermostatic element provides in its position according to Fig. 3 the greatest passage of flow for the cooling water and the latter will again sweep over the folds of the bellows body 3, that is to say the cooling surface, in a very effective manner, so that the most rapid transmission of heat from the cooling water to the liquid in the element (from that which is to be regulated to that which regulates) is ensured and consequently the thermostat acts with as little inertia as possible.

The invention, that is the employment of the thermostatic element as an integral part of the valve and at the same time as a driving means for the valve, is not limited to the constructional form here described which can be modified in many ways. More particularly the mechanical motion imparting members for the element are capable of various modifications.

What I claim is:

1. The combination of a valve mounting with a thermostat element adapted to expand and contract lengthwise under variations in tempera-

ture, a flat valve disc secured to one end of the thermostat element so as to leave the remainder of the thermostat element fully exposed, pivotal supporting means on the valve mounting for one end of the thermostat element, further pivotal supporting means on the valve mounting for the other end of the thermostat element located eccentrically with respect to the first mentioned pivotal supporting means, said pivotal supporting means for the ends of the thermostat element being located intermediately of the ends of the thermostat so that on the thermostat element expanding it is forced to turn bodily around the pivotal supporting means for the ends of the thermostat.

2. The combination of a valve mounting with a thermostat element adapted to expand and contract lengthwise under variations in temperature, a flat valve disc secured to one end of the thermostat element so as to leave the remainder of the thermostat element fully exposed, pivots fixed on said valve mounting, levers mounted on said pivots and having pins thereon fixed to the valve disc for rotatably supporting one end of the thermostat element on the valve mounting, and eccentric axial pins on said pivots for rotatably supporting the other end of the thermostat element on the valve mounting, said pivots being located intermediately of the ends of the thermostat element so that on the thermostat element expanding it is forced to turn bodily around the said pivots and axial pins.

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