Feb. 1, 1944. E. C. RANEY 2,340,685

CONTROL APPARATUS

Original Filed Dec. 19, 1940

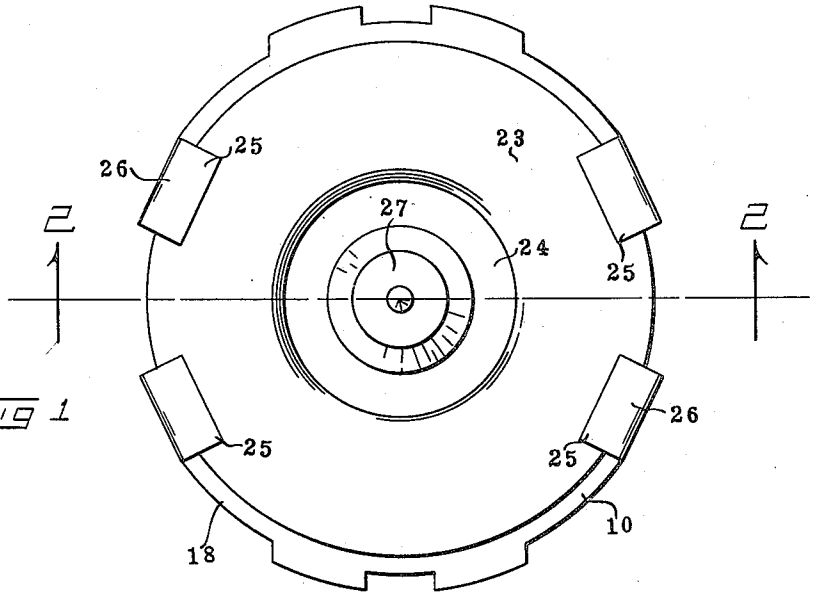


Fig 1

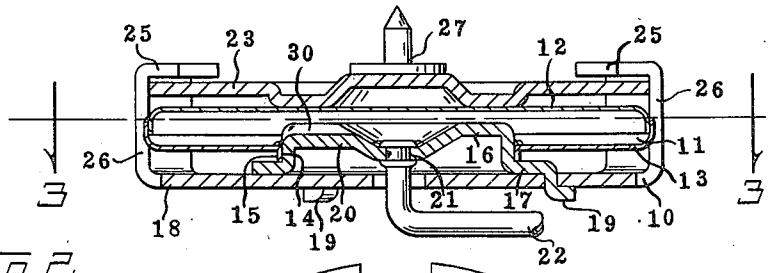


Fig 2

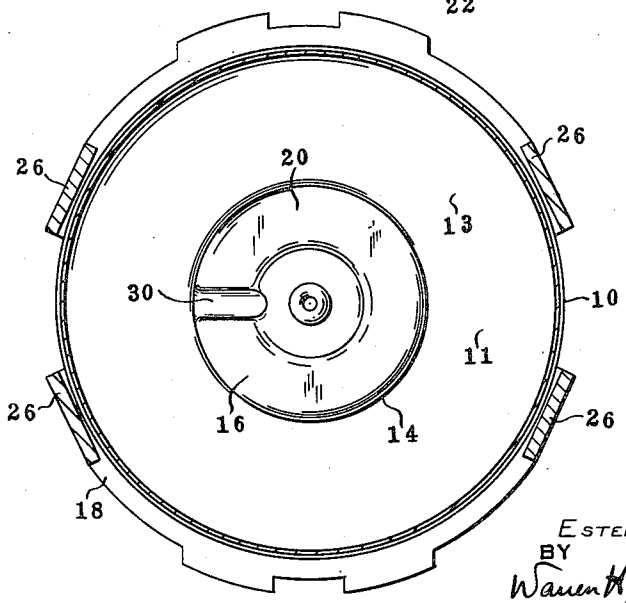


Fig 3

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Original application December 19, 1940, Serial No. 370,906. Divided and this application October 20, 1941, Serial No. 415,736

5 Claims. (Cl. 137—156.5)

The present invention relates to a thermal responsive device and more particularly to a wafer type diaphragm. This application is a division of my co-pending application Serial Number 370,906, filed December 19, 1940.

An object of the invention is to provide a pressure responsive unit comprising a diaphragm formed by a flexible wall connected hermetically with a second wall, the flexible wall carrying a relatively rigid plate, and the diaphragm being mounted on a rigid plate having portions thereon for forming stops that cooperate with the first mentioned plate for limiting expansion of the diaphragm.

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

Fig. 1 is a top view of a thermostatic device embodying the invention;

Fig. 2 is a view in section of the thermostatic device, the view being taken on line 2—2 of Fig. 1; and,

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

For the purpose of illustrating a preferred form of embodiment of my invention I have shown, referring to the drawing, a thermostatic mechanism 10. This thermostatic mechanism comprises a wafer type diaphragm 11 formed by two confronting, disc-like flexible walls 12 and 13, the peripheral edges of which are turned inwardly and telescoped with one another. The telescoped portions are suitably joined together, as by soldering. The wall 13 is provided with an opening 14 having an endless lip 15 formed thereabout. The lip 15 surrounds a cup shaped member 16 and is suitably sealed to the sides of the cup member as by soldering.

The cup member 16 is provided with a peripherial flange 17, which flange is attached to a circular rigid plate 18 by ears 19 extending through openings in the plate 18 and turned against the underside of the plate. A conical depression is formed in the wall 20 of the cupped member 16, and an opening 21 is formed in the wall 20 at the apex of the depression. An opening is formed in the plate 18 in alignment with the opening 21, and a tube 22 is extended through these openings. One end of the tube is sealingly attached to the wall 20 about the opening 21 by solder. The tube may be connected to a source of pressure, for example, the tube may be connected with a bulb containing a temperature responsive fluid. The wall 20 of the member 16 forms an internal stop for limiting the inward deflection of the diaphragm wall 12. A channel 30 is formed in the wall 20 for forming a passage from the tube 22 to the interior of the diaphragm when the wall 12 is abutting the wall 20.

A circular rigid plate 23, having an annular base portion 24 that abuts the wall 12 of the diaphragm 11, is interposed between the wall 12 and inwardly extending fingers 25 formed by extended portions 26 of the plate 18. The fingers 25 form stops that are engaged by the plate 23 for limiting expansion of the diaphragm. The plate 23 carries a pointed stud 27 for connecting the diaphragm with a suitable control, or indicating mechanism, for example, which mechanism is not shown.

By the arrangements of elements comprising the device 10, a relatively simple pressure responsive mechanism is produced having internal and external stops for limiting expansion of the flexible walls of the diaphragm, and which lends itself to quantity production.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

I claim:

1. A pressure responsive device comprising in combination, a plate; a diaphragm carried by the plate, said diaphragm having an outer movable flexible wall; and a plate carried by the movable wall, the first mentioned plate having portions on opposite edges thereof extending alongside the periphery of the diaphragm and beyond the second mentioned plate, said portions having turned sections forming abutments facing the second mentioned plate for limiting movement of the second mentioned plate relative to the first mentioned plate, the second mentioned plate extending substantially across said outer wall and being confined between said portions of the first mentioned plate and in alignment with said outer wall.

2. A pressure responsive device comprising a plate, a member projecting from one surface of said plate, a diaphragm carried by said plate, said diaphragm having spaced flexible walls joined at their edges to provide a fluid receiving chamber, said member projecting into said chamber and forming a stop to limit contraction of said diaphragm, a second plate disposed on the opposite side of said diaphragm from said first plate and means for retaining said second plate in as-

sembled relation with said diaphragm and limiting the expansion of the latter, said means including extensions projecting from circumferentially spaced points on said first mentioned plate and around said diaphragm and said second plate, the ends of said extensions being directed over said second plate to form stops.

3. A pressure responsive device comprising a plate provided with raised stop means adjacent to the center thereof, a diaphragm carried by said plate, said diaphragm having spaced flexible walls joined at their edges to provide a fluid receiving chamber, said stop means being disposed within said chamber to limit the contraction of said diaphragm, a second plate disposed on the opposite side of said diaphragm from the first plate, oppositely disposed expansion limiting members extending from said first plate and terminating beyond said second plate in inwardly directed stop fingers.

4. A pressure responsive device comprising a plate having oppositely disposed sets of spaced fingers extending therefrom substantially at right angles, a diaphragm carried by said plate between said sets of fingers, said diaphragm having a pair of confronting flexible walls joined at their peripheries to provide a fluid receiving chamber, and a second plate disposed on the opposite side of said diaphragm from the first plate, the extremities of said fingers being bent over said second plate to limit the expansion of said diaphragm.

5. A pressure responsive device comprising a plate, a diaphragm carried by said plate, said diaphragm consisting of a pair of flexible walls with telescoping flanges at their peripheries, a second plate having a reduced centrally arranged portion in contact with said diaphragm, and combined guide and stop means formed integrally with said first plate and extending alongside said diaphragm and second plate, the extremities of said stop means projecting over said second plate to limit movement thereof upon expansion of said diaphragm.

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