J. R. TANNER.

DIAPHRAGM.

APPLICATION FILED MAR. 3, 1910.

1,034,323.

Patented July 30, 1912.

FIG. 1

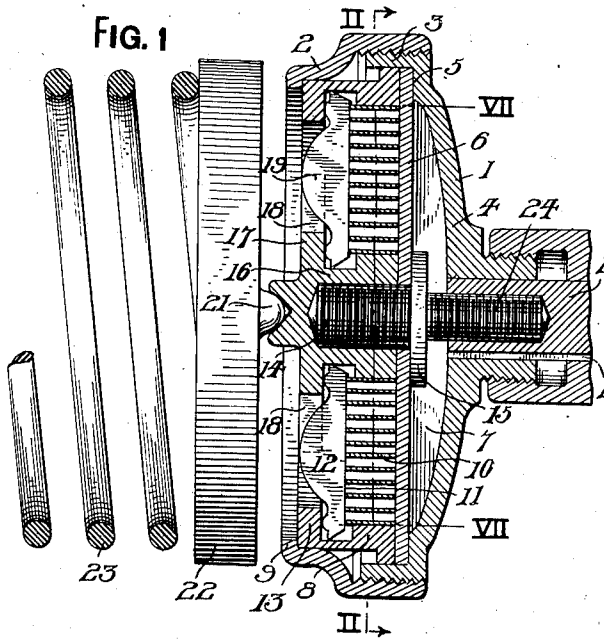


FIG. 3

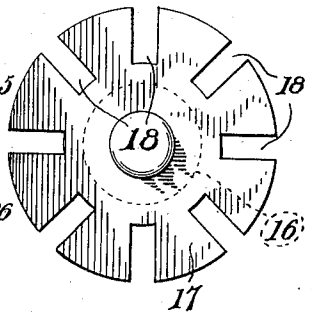


FIG. 4

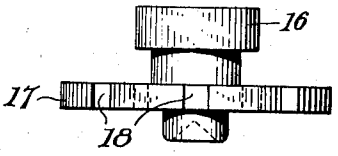


FIG. 2

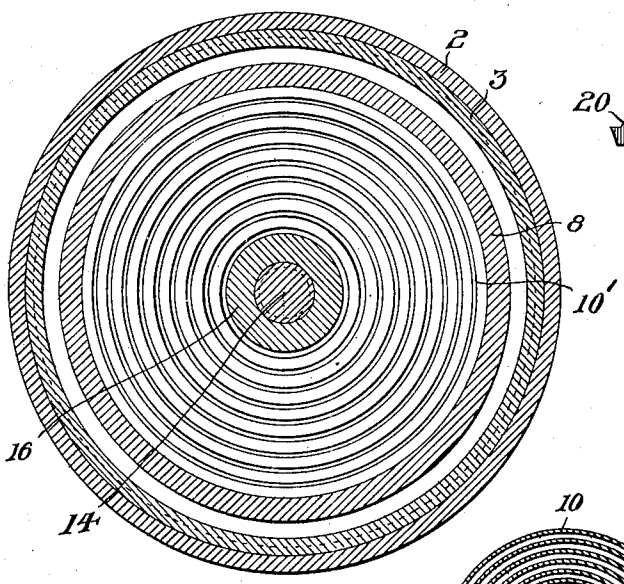


FIG. 5

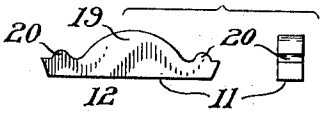


FIG. 6

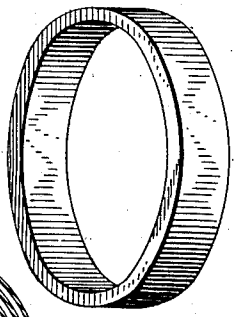
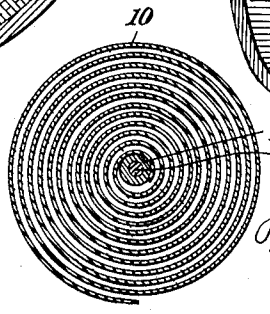


FIG. 7



WITNESSES

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UNITED STATES PATENT OFFICE.

JULIUS R. TANNER, OF PITTSBURGH, PENNSYLVANIA.

DIAPHRAGM.

1,034,323. Specification of Letters Patent. Patented July 30, 1912.

Application filed March 3, 1910. Serial No. 547,013.

To all whom it may concern:

Be it known that I, JULIUS R. TANNER, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in Diaphragms, of which the following is a specification.

My invention relates to diaphragms such as may be used for pressure regulators but it is not confined to such use.

The object of my invention is to protect the diaphragm by providing a yielding support therefor without appreciably affecting its sensitiveness or efficiency of operation.

Referring to the accompanying drawings, Figure 1 is a central longitudinal section of an embodiment of my invention, parts being shown in elevation; Fig. 2, a section on the line II—II, Fig. 1, but showing concentric rings instead of a coil spring; Fig. 3, a plan of the central portion, or spider; Fig. 4, a side elevation of Fig. 3; Fig. 5, a side and an end elevation of one of the radial supporting beams; Fig. 6, a perspective of one of the rings in Fig. 2; and Fig. 7, a section on the line VII—VII, Fig. 1.

I have not illustrated the common well-known valves or other devices which my diaphragm may control, as the application of my invention thereto will be readily understood by those skilled in the art to which it relates.

I provide a casing composed of the sections 1 and 2, the section 1 having the cylindrical externally-threaded wall 3, provided with the depressed, or concave end or bottom 4 having the internal annular seat or shoulder 5 near the wall 3 and at a right angle thereto. The circular diaphragm 6, composed of a sheet of suitable yielding material, as thin copper, rubber, and the like, is placed on the shoulder 5, leaving the pressure chamber 7 between the end 4 and the said diaphragm. The clamping ring 8 has one edge placed on the diaphragm 6 opposite the shoulder 5 and the other edge is engaged by the inturned flange 9 on the outer end of the annular section 2, whose opposite end is internally threaded and screwed on the threads of the section 1. By rotating the section 2 in the proper direction, the diaphragm may be tightly clamped on the section 1 between the shoulder 5 and the clamping ring 8. The coiled spring 10 made preferably of thin flat steel is seated within the clamping ring 8 with one end resting on the diaphragm 6, the other end of the spring being supported by the plane faces 11 of the radially arranged beams 12, which have their outer ends engaging the inner face of the inturned flange 13 on the clamping ring 8.

The screw 14 extends through the center of the diaphragm 6 and has fixed thereon the small support or disk 15 bearing against that side of the diaphragm which is toward the chamber 7. The hub or center 16 receives the screw 14 and is seated in the central opening of the spring 10 and upon the central portion of the diaphragm 6 opposite the support 15. The outer end of the hub or center 16 is provided with the flange 17 having the outer portion thereof provided with the radial slots 18 to receive the convex or centrally-widened portions 19 of the beams 12, whereby the latter are kept in their proper radial position and without any danger of their turning over laterally. The inner ends of the beams extend beneath the central or unslotted portion of the flange 17. The ends of the beams are provided with the rocking lugs or knife edges 20 which bear against the inner faces of the flanges 13 and 17. The outer end of the hub 16 is provided with a seat to receive the lug 21 on the support 22, on whose outer face the spring 23 or its equivalent presses and tends to maintain the diaphragm in the position shown. It is clear that other yielding means, as weights, etc., may be used to return the diaphragm to its normal position.

Opposite to the screw 14 and rigid therewith is the screw 24 which is threaded in an opening in the rod 25, reciprocable through the center of the end 4. The rod 25 is the rod which leads in the usual way to the valve or other device which regulates the flow of gas, steam, water, electricity, etc., in a well-known way. The passage 26 in the regulator rod 25 connects the chamber 7 to the source of pressure which is to be regulated, this being well known.

The pressure to be regulated having access by way of the passage 26 to the chamber 7, will, if the pressure be above a predetermined value, cause the diaphragm to be forced slightly out or made somewhat conical, the apex being toward the spring 23. The inward movement of the rod 25 acts in the usual way to reduce the supply of fluid having access to the passage 26. The spring

23 will return the diaphragm to its normal position as the pressure is reduced in the chamber 7. The operation just given is well known and will be readily understood by those having ordinary skill in the art of pressure regulators.

The novelty of my invention consists in the manner by which I support the diaphragm. It will be seen that, as the pressure in the chamber 7 lifts the center of the diaphragm, the hub 16 rises carrying with it the inner ends of the beams 12, which rock with but little friction on the lugs 20; and that the diaphragm is constantly supported all the way from the hub 16 to the ring 8 by the spring 10 which yields with practically no resistance and mainains the distance between the beams and the diaphragm substantially uniform, thereby preventing the latter from being unduly stretched and possibly broken. As the spring 23 is arranged to resist the outward pressure of the rod 25, it is not essential that the diaphragm shall, of itself, have any elasticity for returning it to its normal position. It should act merely to form a yielding wall for the chamber 7 so as to confine the pressure therein. By the use of the supporting spring 10 and the beams 12, I can make the diaphragms of much weaker material than that of which diaphragms have heretofore been made without any liability of the same being abnormally stretched or broken.

Modifications of my invention will readily occur as, for example, the concentric rings 10′ shown in Fig. 2 may be substituted for the spring 10. Diaphragm-supporting means are regarded as coming within the principle of my invention if they so support the same that, as the center reciprocates, the radii are caused to move simultaneously in equal degrees, the radii being supposed to have their fulcra at the ring 8. All parts of the diaphragm move parallel to each other and to the axis of the diaphragm prolonged. Other diaphragm supporting means, not concentric or spiral, may be devised without departing from the spirit of my invention as expressed in the appended claim.

I claim—

A casing-section having an internal annular seat, a yieldable diaphragm on the seat, there being a pressure chamber between the diaphragm and the bottom of the section, and there being a passage to the chamber for connection to a source of fluid pressure, a clamping ring engaging the diaphragm opposite the seat, the ring having an inturned flange, a second casing-section having an inturned flange engaging the outer end of the ring and means for drawing the casing-sections, one toward the other, in combination with a central stud carried by the diaphragm having an outwardly-extending flange on the same side of the diaphragm as the said ring, narrow radial beams having their ends supported on the said flanges, a telescopically flexible member having its ends supporting the diaphragm and resting on the beams, means tending to move the diaphragm toward the bottom of the first casing-section, and a rod reciprocable in the latter section and connected to the diaphragm.

Signed at Pittsburgh, Pa., this 28th day of February, A. D. 1910.

JULIUS R. TANNER.

Witnesses:
F. N. BARBER,
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