April 4, 1950 G. E. COXON 2,502,559

ELECTRIC PRESSURE RESPONSIVE DEVICE

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Fig. 1.

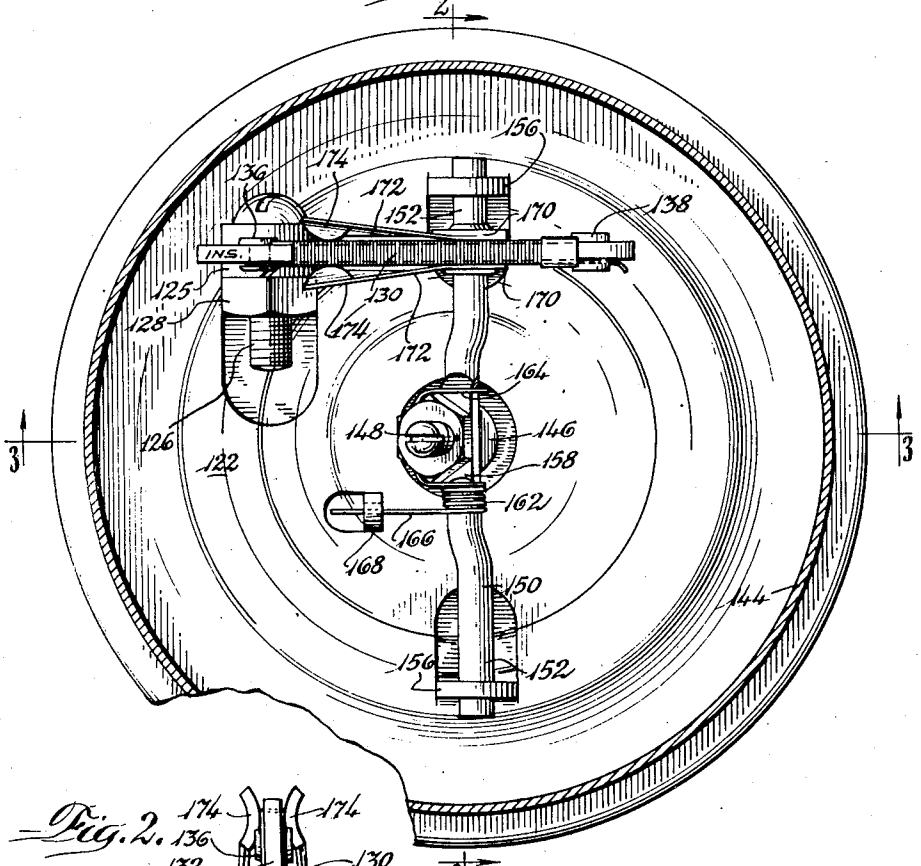
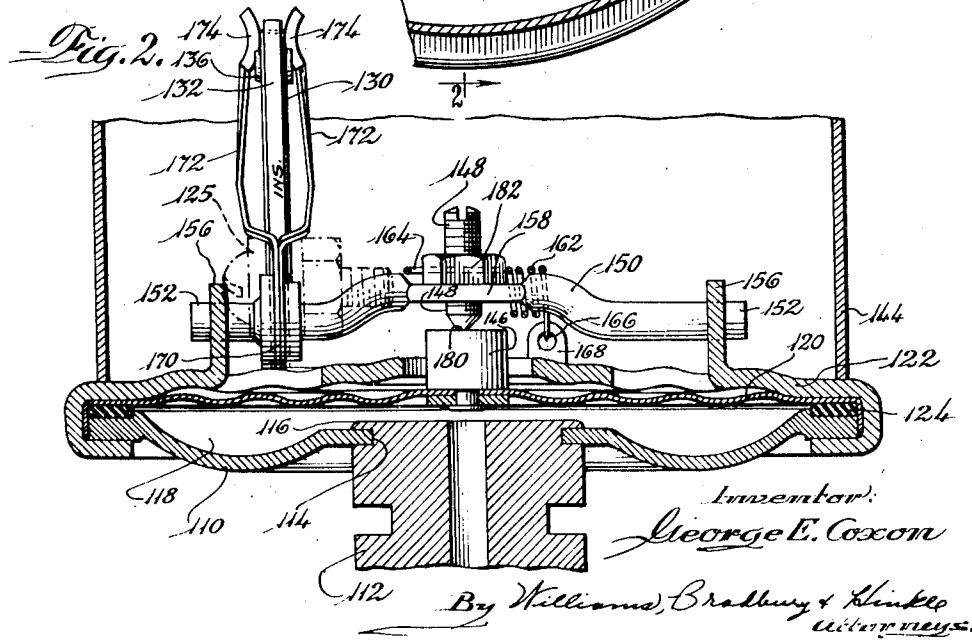


Fig. 2.



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Fig. 3.

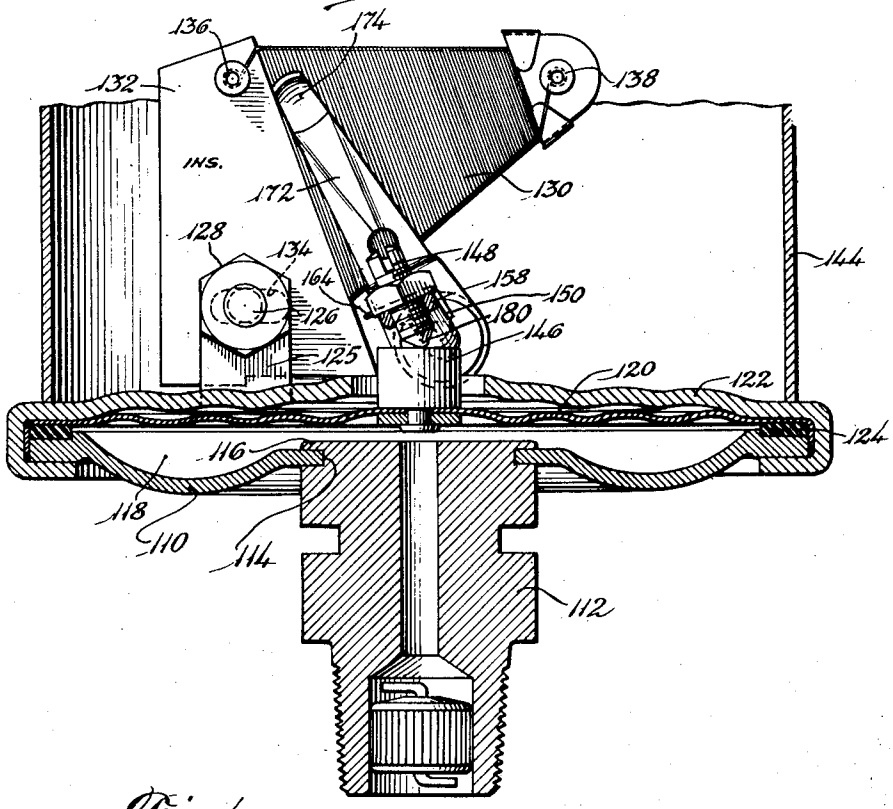


Fig. 4.

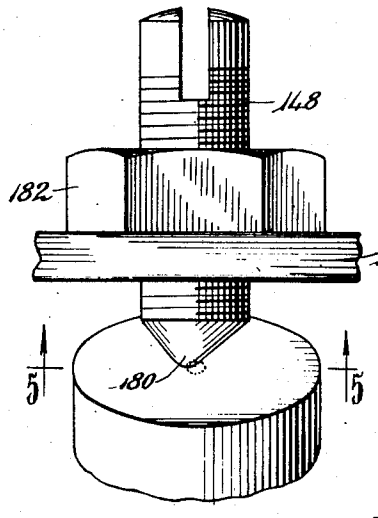
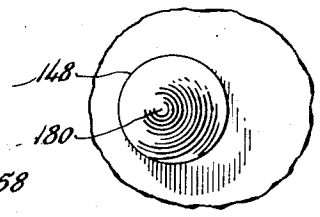


Fig. 5.



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UNITED STATES PATENT OFFICE

2,502,559

ELECTRIC PRESSURE RESPONSIVE DEVICE

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2 Claims. (Cl. 201—48)

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This invention relates to a pressure responsive device, and it is particularly concerned with a mechanism arranged to be actuated by variations of fluid pressure and to transmit indications of such variations to an indicating device located at some distance from the pressure responsive means.

One object of the invention is to provide a new and improved pressure responsive means arranged to vary the resistance of an electrical circuit for producing indications of pressure by means of an electrically actuated instrument located at a distance from the pressure responsive means and connected in a circuit.

Another object of the invention is to provide in combination with the pressure responsive device an electrical resistance element wound in flat form and designed for connection in circuit with the indicator responsive to changes in the current strength, together with a contact member actuated by changes in pressure in the pressure responsive device and held yieldingly in engagement with the flat resistance element to be shifted along it for varying the strength of the current in the indicating circuit.

It is also an object of the invention to provide a new and improved pressure responsive device including a diaphragm movable by changes in fluid pressure applied thereto and having a centrally disposed contact button together with a rocker shaft mounted adjacent the diaphragm with the adjustable and pointed contact screw carried by the rocker shaft and obliquely engaging the button, the point of the screw being eccentrically located to afford a limited range of adjustment by the rotation of the screw in calibrating the device.

A further object of the invention is to provide a new and improved pressure responsive device in which a pressure actuated member traverses an electrical resistance coil for varying the resistance of a circuit operating an indicating instrument, the coil having turns of different length and graduated in relation to each other to adapt the device to cooperate with an instrument graduated in a particular manner.

Other objects and advantages of the invention will appear from the following description taken in connection with the drawings, in which:

Fig. 1 is a plan view of a pressure responsive device embodying the invention, being taken as a horizontal section through the outer casing but showing the interior structure in plan;

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Fig. 2 is a vertical sectional view taken as indicated at line 2—2 on Fig. 1;

Fig. 3 is a vertical section taken as indicated at line 3—3 on Fig. 1;

Fig. 4 is an enlarged detail elevational view of the adjustable contact screw;

Fig. 5 is a detail section taken as indicated at line 5—5 on Fig. 4.

In the operation of machinery it is often desirable to observe pressure conditions in remote or inaccessible parts of the mechanism. For this purpose a pressure responsive device may be installed adjacent the portion of the machine at which the pressure in question originates or is effective, and this device includes means for operating an indicating instrument located at a considerable distance where it can be conveniently mounted for observation by the engineer or operator in charge. The mechanism illustrated herein is designed to respond to variations in fluid pressure, as for example, the pressure of the lubricating oil in an aircraft engine, and it includes means by which the variations of oil pressure actuate a rheostat or variable resistance device in an electrical circuit which in turn operates an electrical instrument in the nature of a galvanometer or voltmeter but graduated in terms of oil pressure and located in the pilot's cabin or in the engineer's compartment of the aircraft.

The drawings do not include the electrically actuated instrument or the simple circuit in which it would be connected since these are conventional features well understood by those skilled in the art. The pressure responsive device shown in the drawings and embodying this invention includes a base or bottom wall 110 with a mounting fitting 112 reduced at 114 and peened over at 116 for rigid securement of the bottom wall. To form a pressure chamber 118, a diaphragm 120 is secured between the top wall 122 and the bottom wall 110 with its marginal portion gripped between marginal portions of the two walls and with a sealing washer 124 interposed therebetween. The electrical resistance element is supported from the top wall 122 by a lug 126 upstanding therefrom and provided with

a clamp screw 126, and a clamping nut 128 for gripping between them a flat core 132 of insulating material on which the coil 130 is wound. The coil 130 is of generally triangular shape so that its successive turns are graduated in length; and the base or core 132 is formed with a slot 134 embracing the clamp screw 126 to permit adjustment of the coil 130 in the direction of its length when the device is initially calibrated. One end of the coil 130 is engaged with an eyelet 136 set through the insulating material of the core 132, and the other end is engaged with the eyelet 138 set in the core 132 near the apex of its triangular form, and a lead wire (not shown) may extend from either of these eyelets to place the pressure responsive device in the electrical circuit leading to the indicating instrument, not shown, it being understood of course that such indicating instrument will be correspondingly calibrated, depending on whether the circuit is connected to one end or to the other end of the triangular coil 130. The electrical conductor leading from the coil 130 will extend through the outer case 144 in insulated relation thereto.

The diaphragm 120 carries a contact button 146 engaging the end of a screw 148 which is set in a crank shaft 150 having its end portions 152, 152 journalled in standards 156 which are bent up from the top wall 122 as seen in Fig. 2. The middle portion of the crank shaft 150 is flattened and offset at 158 and is threaded to receive the screw 148. A spring 162 is coiled around the shaft 150 with one end portion 164 of the spring bearing against the shaft and with the other end 166 anchored under a clip 168 which is attached to the top wall 122. This spring serves to maintain contact of the screw 148 with the button 146 to insure that the rocker or crankshaft 150 will follow movements of the diaphragm 120 in response to variations of pressure acting against it in the chamber 118.

The shaft 150 has rigidly secured to it the inner end portions 170 of a pair of contact arms 172, 172 which embrace the flat resistance coil 130 with their spherically formed outer end portions 174, 174 engaging the coil at opposite sides. Since the wire of the coil is disposed in planes, these contacting end portions 174, 174 of the contact arms 172 are formed as spherical bosses to provide approximately single point contacts with the wire so that the circuit shall have a definite resistance for any given position of the contact arms 172. The fact that the coil 130 is wound in flat form on a support of susbtantially uniform thickness permits the same end portions 174, 174 of the contact arms 172 to perform the contacting function throughout the range of rocking movement of the rocker assembly, which includes the crank shaft 150 and the contact arms; this means that the same spring pressure is applied by the arms 172 against the conductor of the coil 130 throughout the range of adjustment. This uniformity of pressure insures that any change in the reading of the indicating instrument will be due to a change in position of the contacting ends 174 along the coil, which, in turn, will be due to a change in position of the diaphragm 120 produced by a change in the pressure applied against it.

The core 132 will not necessarily be of tapered or triangular shape; if the indicating instrument to be used with the device responds at a uniform rate to changes of resistance in the circuit, the core 132 may be made with parallel sides, assuming also that the diaphragm 120 acts uniformly in response to increments of pressure. Usually, however, the indicating instrument will not be designed for strictly "straight-line" performance and in such cases the triangular shape which provides the graduated turns of the coil 130 will be planned so as to compensate for the instrument and permit an equal part scale to be employed therein.

In the initial calibration of the device the coil 130 may be shifted bodily to the extent permitted by the slot 134 in its core 132 and may then be clamped by the nut 128 at adjusted position. This serves as a zero adjustment. The axial movement of the screw 148 when adjusted in its threaded mounting in the crank portion of the rocker 150 may also be employed as a zero adjustment. In addition, the screw 148 is formed with a substantially conical point 180 which is offset or eccentric to the axis of the screw as clearly shown in Figs. 4 and 5. Since the axis of the screw is oblique to the surface of the button 146 engaged by the conical end of the screw, a partial turn of the screw in the threaded crank portion 158 of the crank or rocker shaft 150 will change the effective crank arm of the screw considered as a part of the rocker, and will thus change the leverage of the rocker in its operation of the contact arms 172. Thus the rate of travel of the contact arms may be changed by increasing or decreasing the distance from the axis or center line of the rocker shaft 150 to the point of contact of the conical point of the screw 148 with the diaphragm button 146. When correctly adjusted, the screw 148 will be secured by the lock nut 182 which engages the flattened portion 158 of the rocker shaft.

It will be understood that various changes may be made in the construction and arrangement of the parts without departing from the real spirit and purpose of the invention, and it is the intention to cover hereby any modified forms of structure or use of mechanical equivalents which may be reasonably included within the scope of the claims.

I claim:

1. A pressure responsive device comprising means forming a pressure chamber with a movable wall, a rocker fulcrumed adjacent said wall with a part extending from said rocker into engagement with the wall for moving the rocker in response to movement of the wall, a fixedly mounted resistor and a movable contact arm both adapted to be connected in an electric circuit with an indicating instrument responsive to changes in the resistance of the circuit, said contact arm engaging the resistor and being connected to said rocker to be shifted along the resistor thereby for including more or less of the resistor in said circuit, said movable wall having a contact button with a flat surface, and said part extending from the rocker being a screw adjustably threaded in said rocker, the axis of said screw being inclined to the flat surface of the contact button whereby rotative adjustment of the screw alters the effective crank arm of the rocker and the rate at which it moves said contact arm along the resistor and said screw having a conical point slightly eccentric to the axis of the screw, whereby a partial rotation of the screw effects a minute rocking adjustment of the rocker and a slight shifting of the contact arm along the resistor.

2. A pressure responsive device comprising means forming a pressure chamber with a mov-

able wall, a rocker fulcrumed adjacent said wall with a part extending from said rocker into engagement with the wall for moving the rocker in response to movement of the wall, and an indicating system responsive to movements of the rocker, said movable wall having a contact button with a flat surface, and said part extending from the rocker being a screw adjustably threaded in said rocker, the axis of said screw being inclined to the flat surface of the contact button at one limit of movement of the rocker and said screw having a conical point slightly eccentric to the axis of the screw whereby a partial rotation of the screw effects a minute rocking adjustment of the rocker with a corresponding shifting of the position of said contact arm along the resistor.

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