July 6, 1954 G. WÜNSCH 2,683,245

WHEATSTONE-BRIDGE BALANCING SYSTEM

Filed Oct. 17, 1950

FIG. 1

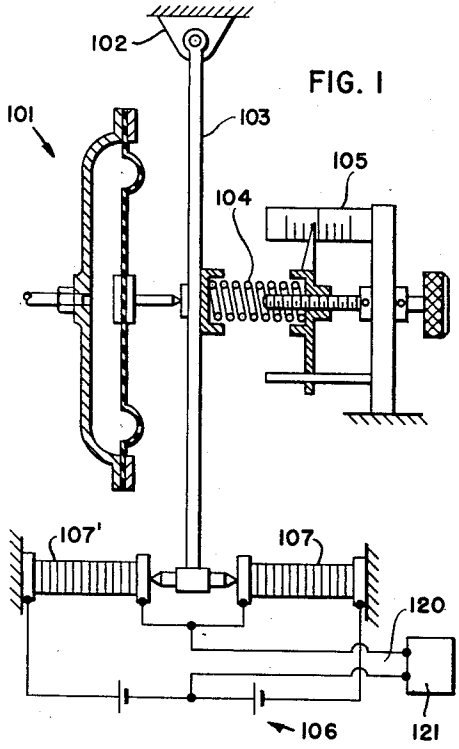
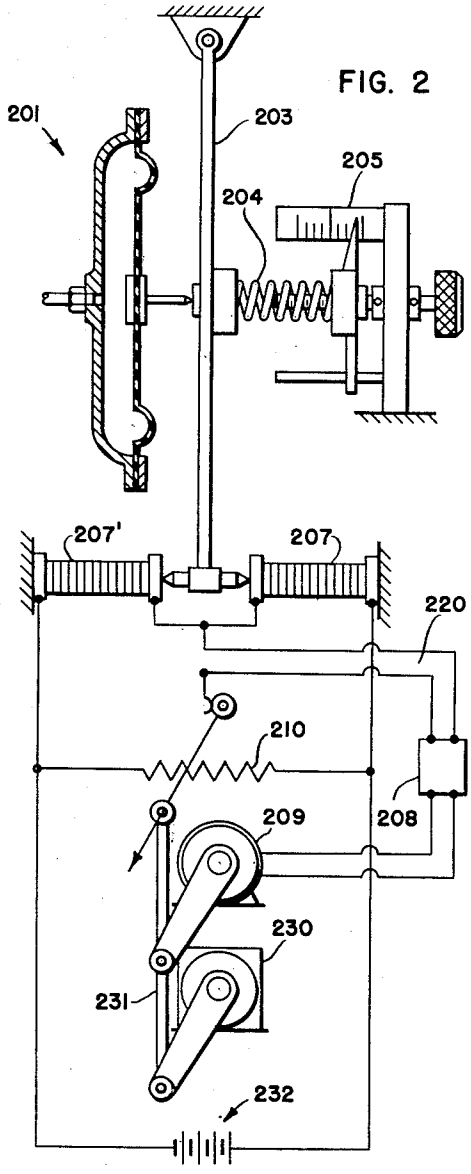


FIG. 2



INVENTOR:
Guido Wuensch
BY
F. D. Prager
Atty.

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WHEATSTONE-BRIDGE BALANCING SYSTEM

Guido Wünsch, Berlin, Germany, assignor to Askania-Werke A.-G., a corporation of Germany

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2 Claims. (Cl. 318—29)

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This invention relates to adjustable relays transforming feeble fluid pressure impulses into powerful electric currents for fluid control purposes and the like.

A pair of compression carbon rheostats, a lever actuating the same and an adjustably balanced actuator system for the lever are used as vital parts of the novel relay. It is extremely simple but is believed to be quite new to transform pressure impulses into currents by the present combination of actuators, levers and rheostats and thereby to facilitate adjustments of the relay action.

The invention will be understood more exactly upon consideration of two embodiments thereof, hereinafter described and schematically illustrated in the drawing, wherein:

Figure 1 shows a simple relay transforming fluid pressure impulses into electric currents.

Figure 2 shows a similar relay in conjunction with a control arrangement of the stop-and-go type.

Referring first to Figure 1: A pressure responsive device, such as a diaphragm chamber 101, receives a pressure impulse to be measured from a source (not shown). At the fulcrum 102 a lever 103 is pivoted, which is actuated by the device 101, subject to a counter-acting pressure applied to the lever by a control compression spring 104, the force of which can be adjusted, and indicated on a scale 105.

Number 106 designates a source of electric current, connected with two compression carbon rheostats or carbon piles 107, 107', which form an electric bridge, and mechanically center the free end of the lever. Both rheostats are slightly compressed or preloaded when the lever is in equilibrium.

In operation a pressure to be measured with electric response is received in the diaphragm chamber 101 and is counteracted by the mechanical pressure of the compression spring 104. If and when the fluid pressure reaches and exceeds a certain magnitude, adjustable on scale 105, it begins to counteract the resistance of spring 104 sufficiently to compress carbon rheostat 107, shown at right, while reducing pressure on the left carbon rheostat 107'. This change in pressure reduces the electric resistance in the right compression rheostat 107 and increases the electric resistance in the left compression rheostat 107'; thereby electrically unbalancing the bridge and producing a current in the diagonal 120 of the bridge. The existence or magnitude of such current can serve to actuate an electric receiver

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device 121, which is included in the circuit formed by the diagonal 120.

The simple system of Figure 1 may be sufficient if the receiver 121 is an electric motor which is expected to run continuously so long as a current of sufficient magnitude flows in circuit 120; that is, so long as a certain pressure exists in the diaphragm chamber. It is possible with a suitable type of motor to increase or decrease the running speed in response to an increase or decrease of pressure in the diaphragm chamber 101.

It is often desired that the motor should run in response to a change in fluid pressure, but come to rest when a control action has taken place. This is another object in the field of fluid controls which can be achieved with means of surprising simplicity and efficiency when using compression rheostats. The spring characteristics of this type of rheostat can be utilized, eliminating the need for mechanical connections required and used in other control systems of this type. This can be explained by reference to Figure 2.

In this embodiment the mechanical construction and operation of the diaphragm chamber 201, lever 203, spring 204 and compression rheostats 207, 207' can be the same as shown and described for the respective parts 101, 103, 104, 107, 107', in Figure 1. The electric receiver in this case is a motor reducer 209 which serves to position a fluid control device 230 by linkage 231. This motor is energized, directly or through a booster 208, by the current flowing in the diagonal 220 of a Wheatstone bridge. The bridge is energized by a source of current 232, has the compression rheostats 207, 207' as resistor arms, and uses a potentiometer 210 as proportioning means; this potentiometer being mechanically actuated by the motor linkage 231.

The potentiometer shifts the zero or balance point of the Wheatstone bridge, simultaneously with the motor operation, thereby furnishing an infinite number of zero points—one for each pressure in the diaphragm chamber. In order to stop the motor at any such zero point a small partial return stroke of the lever 203 is required, since the operation of a motor 209 and motor-operated potentiometer 210 is generally concurrent with but inherently lags a few moments behind the operation of the lever 203. It is usual in generally similar fluid control systems of the static type, to provide for the return stroke of the lever 203 by yielding and resilient linkage between the lever and a control motor like 209,

which linkage produces the same effect as if the compression of the adjusting spring 204 had been increased. In the present system the yielding and resilient character of the compression rheostat, operating with a slight lead ahead of the responding motor and potentiometer, has the same effect; it produces a slight, partial return stroke of the lever 203, sufficient to reestablish equilibrium in the bridge and thereby to stop the motor 209, regulator 230 and potentiometer 210 in their new positions.

Further modifications of the relays described will no doubt occur to persons skilled in the art.

I claim:

1. An adjustable control relay, comprising a lever; a pair of compression rheostats, compressively preloaded by the lever to resiliently load the lever toward a null position; a fluid pressure responsive device to shift the lever in one direction, to an extent corresponding to a fluid pressure; a Wheatstone bridge comprising said rheostats as resistor arms; a control motor controlled by the diagonal of the bridge; and a combined pressure balancing and control adjusting device substantially consisting in the combination of a spring to shift the lever in a direction opposite to the first-mentioned direction and means to adjust the moment of the spring upon the lever.

2. A relay according to claim 1, wherein the control motor is of the stop-and-go type and the bridge comprises a potentiometer to form a second pair of resistor arms; the control motor being adapted to shift the potentiometer and thereby to shift the balance point of the bridge.

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