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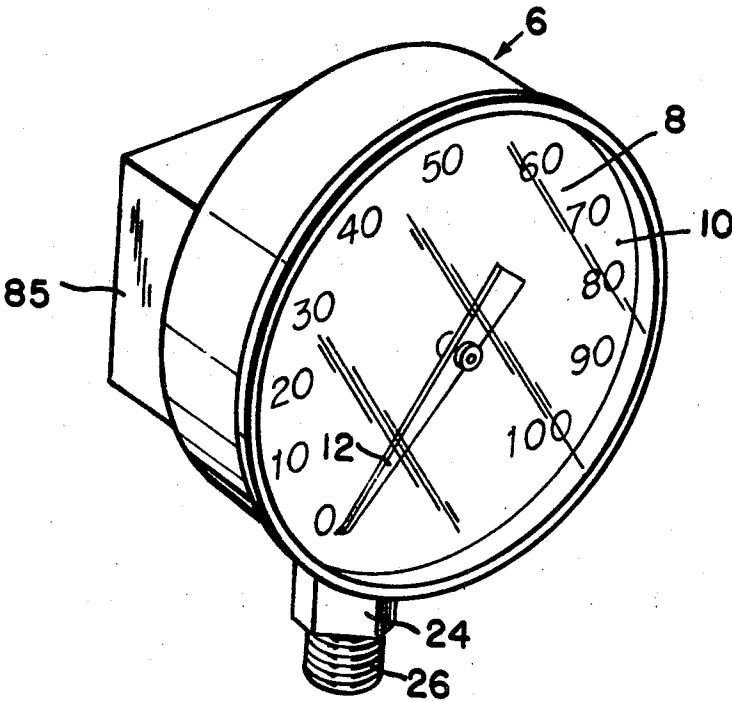
References Cited			
UNITED STATES PATENTS			
1,322,463	11/1919	Nelson	73/411
1,662,122	3/1928	McCabe	200/81.8
2,251,129	7/1941	Hammond	200/81.8 X
2,300,895	11/1942	Hopkins	200/81.8

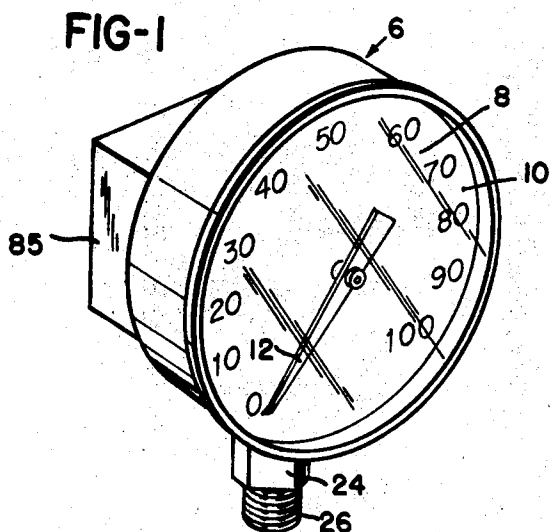
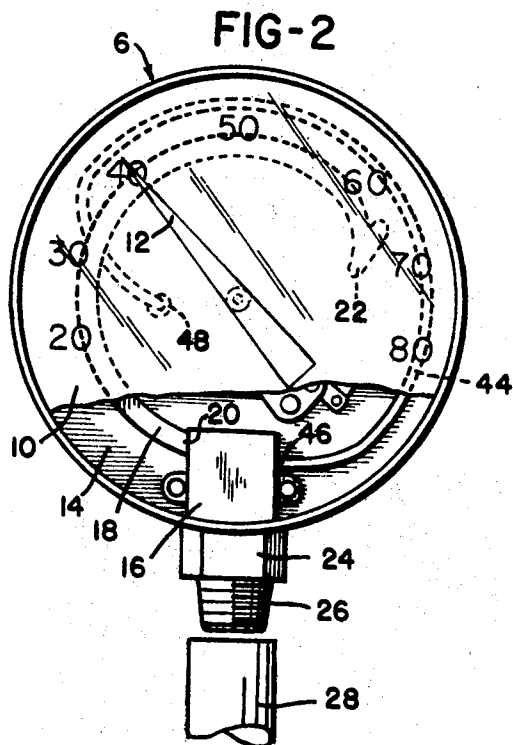
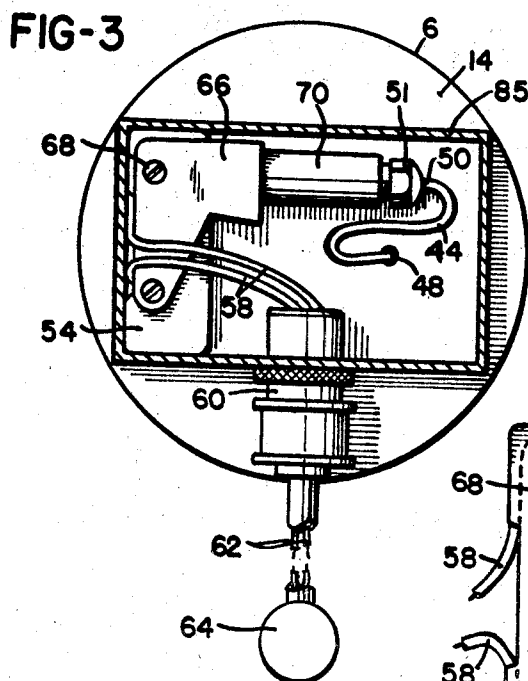
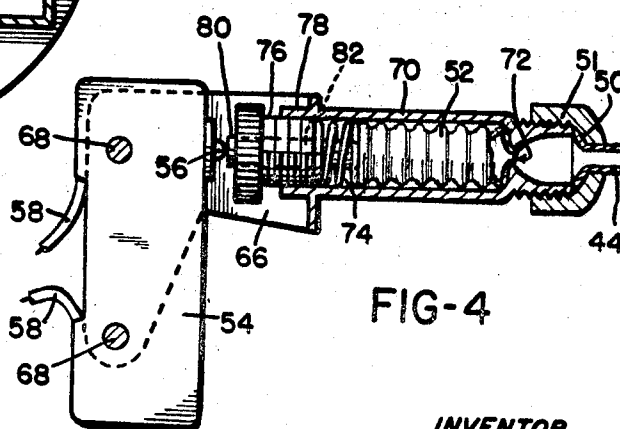
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[54] **COMBINATION PRESSURE-RESPONSIVE INDICATING AND ACTUATING DEVICE**
13 Claims, 4 Drawing Figs.

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[51] Int. Cl. G011 19/12
[50] Field of Search..... 73/411,
389, 343; 116/129; 200/81.8, 56

ABSTRACT: The gauge involves the use of two separate pressure-measuring members both of which are responsive to a single source of actuating pressure. One of said members actuates the pointer of an indicator whereas the other member simultaneously actuates a control member which in turn controls remotely located alarm, signal or other mechanisms. No change is required in conventional mounting of the gauge, using a single connection to a pressure source.





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COMBINATION PRESSURE-RESPONSIVE INDICATING AND ACTUATING DEVICE

This invention relates to a dual-purpose device which comprises a pressure-responsive indicator having operatively associated therewith control means and a pressure-responsive actuator for said control means.

The device provides simple, efficient and compact means for automatically and continuously indicating pressure or temperature conditions while simultaneously actuating electric or pneumatic control means for alarm, switching or other purposes whenever temperature or pressure conditions reach a predetermined set point or value which may be easily changed to accommodate the range of the indicator.

The device utilizes two independently operable pressure-measuring members which individually perform the indicating and control functions, and wherein the total force developed by the actuating or pressure source is directed to each of said members from a common socket member. The relationship of the two pressure-measuring members is such as to obtain the inherent accuracy of each of said members while confining the actuating source to a single connection, and to provide sufficient power to directly control electric switches handling currents up to 15 amperes at 115 volts AC.

Heretofore, indicating switches have been used which utilize a single source of actuation for operating a single pressure-responsive measuring element which is used for both indicating and switching purposes. Such prior art devices have the inherent disadvantage of being inaccurate and incapable of developing the power required to satisfactorily operate any but the lightest of weight electrical contact elements. The negligible power available for actuating switching means necessitates the use of extremely lightweight mechanically unstable contacts whose current-carrying capacity is limited to one-half ampere at 115 volts AC. Such devices require the use of expensive electronic or electrical relays to amplify the weak signal controlled by the aforesaid lightweight contacts.

The actuating medium for the device of the subject invention is a fluid under pressure. The present instrument provides a visual or other indication of pressure, and for making available a substantial force to perform work whenever the pressure indicated reaches a predetermined or selected value. The force so made available is sufficient to perform a substantial amount of work, such as actuating the heavier capacity electric switches, or perhaps actuating a valve or other control element, all without overburdening the indicating mechanism, or causing it to exhibit a false reading.

An object of the present invention is to provide an improved gauge and control instrument operative by changes of fluid pressure, which at a selected or predetermined pressure, will act to perform a substantial amount of work not heretofore realized in the operation of similar instruments.

Another object of the invention is to provide an improved gauge and control instrument of the character stated, which operates with a high degree of accuracy and exhibits true reading at all times.

Another object is to attain the foregoing advantages and objectives with the use of simple, reliable, and inexpensive structural means which require a minimum of servicing or maintenance attention.

A further object of the invention is to simplify and expedite installation of a gauge and control instrument for the purposes stated, on any fluid system requiring such equipment, thereby to reduce installation cost and the expenditure of costly labor.

The foregoing and other objects are attained by the means described herein and illustrated upon the accompanying drawings, in which:

FIG. 1 is a perspective view of an instrument embodying the teachings of the present invention.

FIG. 2 is a front elevational view of the same, shown partly in cross section for clarity of detail.

FIG. 3 is a cross-sectional view showing the rear of the FIG. 1 device, partly broken away.

FIG. 4 is an enlarged side elevation partly in cross section, showing the control means or unit of FIG. 3 which in this example includes a bellows and an electric switch.

The pressure gauge illustrated herein is largely conventional, in that it includes a housing 6 supporting a transparent member 8 through which may be seen a calibrated dial plate 10 swept by a pointer 12. Housing 6 may be closed at the rear by a wall 14.

Within housing 6 is fixed a hollow socket member or block 16, which is adapted to support a conventional bourdon tube 18, or equivalent pressure-responsive element. The tube of course is hollow, and at 20 it is in fluid communication with the interior of a chamber within the socket member or block 16. The free end 22 of tube 18 is closed to move or shift in a well-known manner in response to increases or decreases of the fluid pressure within the chamber of socket 16. By means of any well-known geared mechanism, not illustrated, movements of the bourdon tube end 22 are translated to the pointer 12, which sweeps the dial plate 10 to indicate the amount of pressure acting within the bourdon tube.

The socket member 16 is provided with a hollow fitting 24 having at its terminal end a mounting screw thread 26. Pressure of fluid introduced into the terminal end of fitting 24 from a pressure source 28, will tend to straighten the arched bourdon tube 18, which at end 22 will act upon pointer 12 to sweep the dial 10 for the purpose of pressure indication. It may be noted that the bourdon tube and its pointer 12, constitute a primary measuring means or measuring device for indicating pressure. Said primary measuring device may employ means other than the bourdon tube for activating the gauge, such as, by way of example, a bellows-type gauge as will be apparent to persons skilled in the art.

The means for connecting the gauge fitting 24 to pressure source or conduit 28 is subject to such modification as may be considered necessary or desirable under differing installation requirements.

In accordance with the invention, a tube 44 additional to the bourdon tube 18, has an end 46 secured to socket member 16 in fluid communication with the fluid chamber thereof. This second tube 44 leaves housing 6 through an opening 48 in rear wall 14, and has an outer end 50 secured, such as by means of a coupling nut 51 to the threaded end of tubular housing 70 for placing end 50 in fluid communication with an end of a bellows member 52 (FIG. 4) said member being more broadly considered an expansible member projectable by pressure of fluid in tube 44 and socket member 16. As such, member 52 may properly be considered a second pressure-measuring means of the overall gauge assembly. Said second pressure-measuring member or means is utilized as the actuator for a control unit, as will be explained.

From the foregoing, it will be understood that any change in fluid pressure within the chamber of block or socket 16, will simultaneously actuate the pressure-measuring unit element 18 and the pressure-measuring member 52 independently of one another, so that the accuracy of the reading of pointer 12 will be unaffected by movements of the element 52.

The reference numeral 54 indicates a control unit or member which is adapted to be actuated by the second pressure-measuring member 52.

The control unit 54 may be of one kind or another, depending upon the nature of the service to be performed thereby. Accordingly, it may be a fluid control valve or as in the example illustrated, the control unit may be an electric switch or contactor having an operating member or button 56 to be depressed for either opening or closing the contacts of the switch or contactor. Preferably, though not of necessity, the switch or contactor may be a conventional snap switch or microswitch. It may be used to control any form of signal, machine or mechanism indicated diagrammatically at 64 external to the gauge, through the conductors 58.

As suggested by FIG. 3, the conductor 58 may be directed to a junction unit 60, from which extensions 62 of the conductors 58 lead to a machine, alarm, or other mechanism, 64, to be controlled.

The control unit 54 is suitably mounted relative to the pressure-measuring member by means of a yoke 66 to which it is securely though releasably fastened as by means of screws 68. Yoke 66 is permanently secured to the housing or elongate sleeve 70 which houses and supports the measuring element or bellows 52. One end of element 52 is provided with an inlet 72, while the opposite end thereof abuts a compression spring 74 within the sleeve.

The force of spring 74 may be varied selectively by means of an adjuster which may be in the form of a screw 76 threadedly supported by the inner end 78 of sleeve 70. A pintle 80 slidably mounted in an axial bore 82 of the adjusting screw, has opposite ends disposed closely adjacent to operator 56 and the inner end of bellows 52, so that longitudinal expansion of the bellows will cause pintle 80 to depress operator 56 and actuate the switch contacts.

By rotating the adjuster 76, the bellows may be set to effect an actuation of switch 54 at any desired pressure of the source of actuation, 28. Since neither the pointer nor its driving mechanism provides any of the power needed to actuate the switch, the accuracy of the pointer reading is in no manner impaired by the switch actuation.

From the foregoing, it will be appreciated that the construction involves the use of two separate and independent measuring units, which individually perform the indicating and switching functions, notwithstanding the fact that both units are powered from a common pressure source and utilize a single gauge connection with such pressure source. This ensures that the total force of the pressure or actuating medium is available to both the indicating unit and the switching unit within the gauge, so that operation of one unit will not impair the operation of the other. As the result, sufficient power is available at the switching unit, to properly and reliably actuate heavy-duty electric switches or contactors or other controllable equipment without impairing the accuracy of the indicating unit.

As was previously mentioned, switch 54 in practice may be replaced by other forms of controllable mechanisms, such as valves, fluid controls, and the like; also, the apparatus disclosed, with slight modification; may be rendered responsive to negative pressure change situations, or to changes of temperature or other media. Switch 54 may be of any desired type which is applicable, and the contacts thereof may be normally closed or normally open circuited. As to the measuring unit 52, this is subject to considerable modification, as desired. Thus, other forms of pressure-responsive elements may be substituted for the bellows 52, to achieve a desired actuation of the switch 54 or other controllable mechanism.

In the preferred construction illustrated, the rear face 14 of the gauge housing may carry a box or cassette 85 normally fixed thereon, providing protective cover for the elements 54, 58, 60, 70 and 50, FIG. 3. The box or cassette may be made removable, if desired, with little if any modification required in the standard gauge housing 6 or its components.

It should be understood that if desired, a second, manually adjustable "set hand," not illustrated, may be associated with face 10 of the gauge to visually indicate the pressure at which the control unit 54 will be actuated by the second pressure-measuring member 52.

It should likewise be understood that in those instances in which the control unit comprises a pneumatic means such as a spool or poppet valve, such a control unit may be substituted for the electrical unit 54 by merely removing screws 68 and associating the other control unit relative to yoke 66. In the

event the control unit comprises a pneumatic valve the numerals 58 of FIGS. 3 and 4 would indicate conductors for fluid medium.

What I claim is:

1. A combination pressure-responsive indicating and actuating device comprising a housing, a hollow socket member in said housing and including a single inlet fitting extending through a wall of said housing for attaching said device to a source of fluid pressure media, a first pressure-measuring member connected directly to said socket member in direct fluid communication therewith and including means for indicating the pressure being measured, a control member, a second pressure-measuring member in fluid communication with said socket member, said second pressure-measuring member comprising an axially expansible bellows member in fluid communication at one end with said socket member, actuating means in cooperative association with the other end of said bellows member and movable by said bellows member for actuating said control member, said socket member distributing fluid pressure media to both said members independently and simultaneously.
2. The gauge as defined by claim 1, wherein said actuating means comprises a pintle engaged in axial alignment with said other end of said bellows.
3. A device as called for in claim 1, wherein the control member comprises an electric switch.
4. A device as called for in claim 1, wherein the control member comprises a valving member for fluid media.
5. A device as called for in claim 1, wherein means are included for selectively adjusting the pressure at which the control member is actuated by the second pressure-measuring member.
6. A device as called for in claim 1, wherein the first pressure-measuring member comprises a bourdon tube gauge.
7. The gauge as defined by claim 6, wherein the control unit includes an electric switch having contact means shiftable between open and closed circuit positions incident to the presence of predetermined pressure in said bellows member.
8. The gauge as defined by claim 7, wherein the combination includes means for indexing the operation of the control unit to readings of the indicator.
9. The combination as defined by claim 8, wherein is included a calibrated dial in position to be swept by the indicator, and protective cover means on the gauge enclosing the pressure-measuring member and control unit and the indexing means aforesaid.
10. The combination as defined by claim 9, wherein the hollow socket member inlet serves to supply fluid media to both the bourdon tube and the measuring member through the chamber of the socket member aforesaid.
11. A device as called for in claim 1, wherein the first pressure-measuring member comprises a conventional bourdon tube indicator gauge including a housing and a socket having a single inlet connection, and wherein the second pressure-measuring member and control member are mounted to but externally of the gauge housing.
12. A device as called for in claim 11, wherein the second pressure-measuring member and control member are enclosed within a housing secured to and carried by the gauge housing.
13. The gauge as defined by claim 1, wherein a tube is connected between said hollow socket member and said bellows member for conveying fluid media directly between said bellows member and the chamber of said hollow socket member.