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PRESSURE INDICATOR

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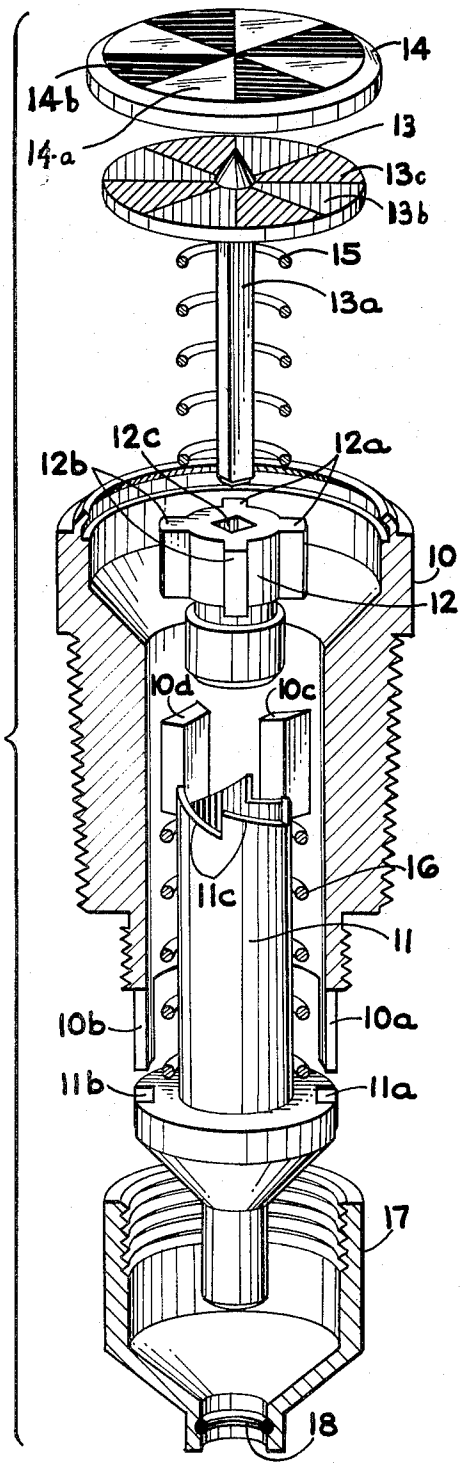


FIG. 1

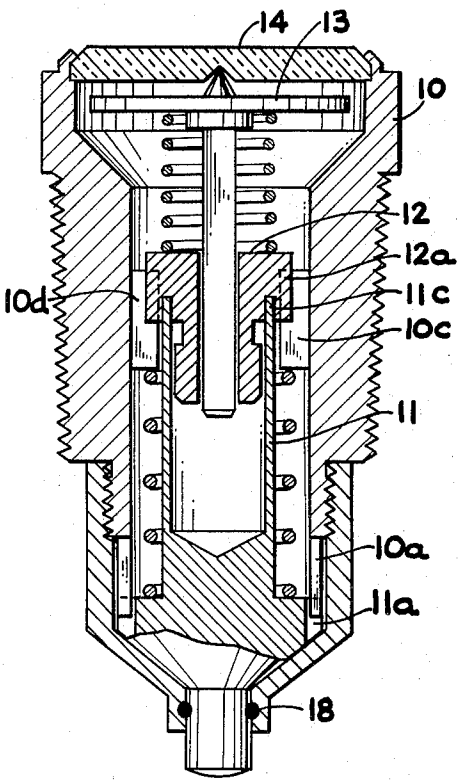


FIG. 2

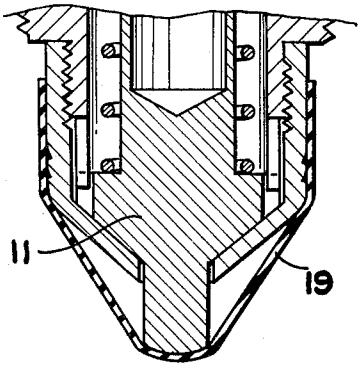


FIG. 3

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PRESSURE INDICATOR

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This invention relates generally to pressure indicators and more particularly to a novel pressure indicator preferably for use with fire extinguisher tanks.

There are many types of pressure indicators presently on the market for indicating the pressure in a fire extinguisher tank. These indicators usually operate over a range from zero to perhaps 175 p.s.i. A fire extinguisher tank is properly charged if the pressure resides within an upper range of, for example, from 120 p.s.i. to 175 p.s.i. Below 120 p.s.i., the tank is underpressurized and is of no use.

With the presently available pressure indicators, the indication varies linearly with the pressure over the entire range. Usually the degree of movement of the indicating element is relatively small between the fully charged condition and uncharged condition. As a consequence, there is relatively smaller movement between 120 p.s.i. and 175 p.s.i. and it is very difficult to determine whether the extinguisher is fit for use or has lost its charging pressure when the actual pressure reading is in the neighborhood of 120 p.s.i.

With the foregoing in mind, it is accordingly a primary object of this invention to provide a novel pressure indicator in which the indicator will show a properly charged condition of a fire extinguisher tank as, for example, when the pressure is between 120 p.s.i. and 175 p.s.i. and immediately upon any pressure drop below a given threshold pressure such as 120 p.s.i., show an abrupt change. Accordingly, the user is never in any doubt about the suitability of the extinguisher for use.

Other important objects are to provide a pressure indicating device meeting the foregoing object which is relatively economical to manufacture, is compact in size, and which is reliable in operation.

Briefly, these and other objects and advantages of this invention are attained by providing an indicating means adapted to indicate at least two different pressure conditions. Cooperating with this indicating means is a pressure responsive means for actuating the indicating means only when a given pressure threshold within a given pressure range is crossed. With the foregoing arrangement, a first condition is continuously indicated by the pressure indicator in response to all pressures in a given pressure range below a given pressure and a second condition is continuously indicated in response to all pressures in the given pressure range above said given pressure. Accordingly, a person may determine at a glance the condition of the fire extinguisher.

A better understanding of the invention will be had by now referring to a preferred embodiment thereof as illustrated in the accompanying drawings, in which:

FIGURE 1 is an exploded perspective view partly in cross-section illustrating the basic component parts making up the pressure indicator;

FIGURE 2 is a partial cross-section of the various parts in assembled relationship; and,

FIGURE 3 shows in fragmentary view a modification of the pressure indicator.

Referring to both FIGURES 1 and 2, the pressure indicator comprises an externally threaded body **10** for securement in the wall or cover of a pressurized vessel. The body **10** terminates at its lower end in key means **10***a* and **10***b* and also includes radially inwardly directed projection means **10***c* and **10***d* terminating at their upper ends in sloping cam surfaces. The entire body **10** as

described may constitute a single integrally molded member.

Cooperating with the body **10** is a plunger **11** including at its lower ends lateral keyways **11***a* and **11***b* adapted to receive the key means **10***a* and **10***b* of the body **10** so that the plunger **11** is keyed against rotation with respect to the body **10** and yet may move longitudinally with respect thereto.

The upper end of the plunger **11** terminates in sloping cam surfaces **11***c* forming a circumferential ratchet configuration. The plunger **11** is responsive to pressure acting on its lower end to move longitudinally within the body **10**.

A coupling means in the form of a floating detent element **12** is shown disposed above the plunger **11**. The element **12** includes lateral projections **12***a* and **12***b* as shown. This element also includes a square cross-section central opening **12***c*. The lateral projections **12***a* and **12***b* are adapted to seat on the cam surfaces **11***c* of the upper end of the plunger **11** when the device is assembled as shown in FIGURE 2.

An indicating means in the form of a disc **13** having a square shaft **13***a* receivable within the square openings **12***c* is coupled through the medium of the detent element **12** to the plunger **11**. This indicating means includes on its upper face alternate sectors **13***b* of a specific color such as red, the remaining sectors **13***c* being of a different color such as green. A cover member **14** in turn has a surface divided into transparent alternate sectors **14***a* and opaque remaining sectors **14***b*. The arrangement is such that the transparent sectors **14***a* will register with the red colored sectors **13***b* of the disc **13** when the disc **13** is in a first rotative position whereas when the disc **13** is rotated through one-eighth of a complete rotation, the green colored sectors **13***c* will be visible through the transparent portions **14***a*.

An upper spring **15** is positioned between the underside of the disc **13** and the top surface of the floating detent element **12** to bias this element downwardly so that the lateral projections **12***a* and **12***b* are pressed into engagement with the cam surfaces **11***c*. With respect to the foregoing and as will be clear from FIGURE 2, when the detent element **12** is positioned so that its lateral projections engage the cam surfaces **11***c*, the lateral projections will be disposed between the inwardly directed projecting means **10***c* on the body **10** so that the detent element **12** will be keyed against rotation.

A lower spring **16** is disposed beneath the projections **10***c* and **10***d* and the plunger **11** to oppose pressure acting to move the plunger longitudinally upwardly.

The assembly is completed by a suitable lower cover arranged to be fitted to the lower end of the body and retain the plunger in position. The lower end of this cover member terminates in a smooth bore including sealing O-ring **18** receiving a lower piston portion **11***d* of the plunger. This sealing ring insures a gas-tight connection with respect to the lower piston portion **11***d* so that longitudinal movement of the plunger may take place and yet a gas-tight seal can be maintained between the interior and exterior of the body.

The assembled structure as shown in FIGURE 2 illustrates the pressure indicating disc **13** in a first position to indicate a first pressure condition. In this condition, pressure acting on the plunger **11** at its lower end is below a given threshold pressure such as 120 p.s.i. In such condition, the red sectors **13***b* are visible through the cover **14**.

In operation, assume that pressure exerted on the exterior of the lower piston portion **11***d* increases, thereby urging the plunger **11** upwardly against the force of the lower biasing spring **16**. As this pressure increases, upward movement of the plunger **11** will cause the upper

cam surfaces **11***c* to bear against the lateral projections **12***a* and **12***b* of the detent element **12** thereby urging the same upwardly. The plunger is keyed at **11***a* and **11***b* such that the cam surfaces **11***c* are engaged at mid positions. The spring pressure downwardly on the detent **12** tends to rotate the detent because of its engagement with the sloping cam surfaces **11***c*. The detent element cannot rotate, however, because of the keying of the projections **12***a* with respect to the radially inward projections **10***c* and **10***d* on the body member **10**.

As the upward movement of the plunger continues with increasing pressure, the detent element **12** will reach a level at which it is free of the inwardly directed projections **10***c* and **10***d* on the body member. When this condition exists, the spring **15** exerting a downward pressure on the detent element will result in rotation of the detent element through approximately one-eighth of a turn until the projections **12***a* and **12***b* engage the vertical edges at the ends of the cam surfaces on the plunger **11**. This rotation is a result of the detent riding down on the cam surfaces. As long as the plunger **11** is held in its upward position, the detent member will remain in its rotated position so that the green sectors are now visible through the transparent portions of the cover **14**.

If the pressure should now drop so that the plunger **11** moves downwardly under force of the spring **16**, the projections **12***a* and **12***b* of the detent member **12** will engage the sloping cam surfaces on the inwardly directed projections **10***c* and **10***d* of the body **10**. As soon as the plunger has moved downwardly sufficiently so that the vertical ends of the cam surfaces **11***c* leave the sides of the projections **12***a*, the detent will then rotate through another one-eighth turn to engage those upper cam surfaces of the plunger **11** space one-quarter of a turn from the first engaged cam surfaces. This further rotation through one-eighth of a turn is effected by the sloping cam surfaces on the projections **10***c* and **10***d* and results again in the red sectors being visible through the top cover and thus indicates that the pressure is now below a given threshold pressure.

It will be evident accordingly, that the pressure indicator will assume two pressure conditions and will remain continuously in a first one of these conditions as long as the pressure is below a given threshold pressure, and in a second one of these conditions as long as the pressure is above the given threshold pressure.

FIGURE 3 illustrates an alternative sealing arrangement to that illustrated in FIGURES 1 and 2. Thus, rather than an O-ring seal, a diaphragm **19** may be secured to the exterior lower portion of the cover **17** on the body **10** to cover the lower end of the plunger **11**. Pressure acting on this diaphragm will then be transmitted to the plunger to move the same as described heretofore.

From the foregoing description, it will thus be evident that the present invention has provided a greatly improved pressure indicator. The entire structure consists of only nine basic parts, each of which may be easily manufactured. Moreover, the cooperating components may be made relatively small so that a compact configuration results.

While the invention has been described in conjunction with use for fire extinguishers, it should be understood that the indicator may be used in other environments in which it is desired to indicate whether or not a given pressure has dropped below a desired threshold value.

What I claim is:

1. A pressure indicator comprising, in combination: a body; an indicating means adapted to indicate at least two different pressure conditions; a pressure responsive means in said body adapted to move over a given distance in response to a variation in pressure over a given range; and coupling means for coupling said pressure responsive means to said indicating means to change said indicating means abruptly from a first one of said pressure conditions to a second one of said pressure conditions when a given pressure in said given range is exceeded, whereby a first condition is continuously indicated in response to all pressures in said given range below said given pressure and a second condition is continuously indicated in response to all pressures in said given range above said given pressure, said pressure responsive means comprising a plunger longitudinally movable in said body in response to pressure acting thereon; means keying said plunger to said body against rotational movement relative to said body, the upper end of said plunger terminating in a first sloping cam surface; and a lower spring biasing said plunger in a direction opposed to said pressure, said coupling means comprising a detent element having at least one lateral projection the lower end of which engages said sloping cam surface, said body having radially inwardly directed projection means of given length in a longitudinal direction and terminating in an upper second sloping cam surface receiving said lateral projection to prevent rotation of said detent element which in a first longitudinal position, said indicating means being coupled for rotational movement with said detent element; and an upper spring biasing said detent element against said first sloping cam surface, whereby longitudinal movement of said plunger in response to increasing pressure urges said detent element upwardly in a longitudinal direction until its lateral projection is free of said inwardly directed projection means on said body at which time said element is free to rotate by movement along said sloping cam surface to thereby change said indicating means from said first condition to said second condition, downward movement of said plunger resulting in said lateral projection engaging said second cam surface on the upper end of said inwardly directed projection means to thereby result in a further rotation of said element to indicate said first condition.

2. A pressure indicator according to claim **1**, in which said indicating means includes a rotatable disc having a face divided into sectors, alternate sectors being of a first color and the remaining sectors being of a second color, said disc having a square cross-section shaft coupled to said detent element for rotation therewith but permitting free longitudinal movement of said detent element relative thereto; and a cover member having a face divided into cover sectors, alternate cover sectors being transparent to expose said alternate sectors of said disc when said disc is in said first pressure indicating condition, the remaining cover sectors being opaque to eclipse said remaining sectors on said disc when said disc is in said first pressure indicating condition, rotation of said detent means rotating said disc to expose said remaining sector portions and eclipse said first mentioned alternate sector portions thereby indicating said second pressure condition.

3. A pressure indicator according to claim **2**, in which the lower end of said plunger terminates in a piston portion, the lower end of said body terminating in a smooth bore through which said piston portion passes; and an O-ring in said bore to provide a substantially gas tight seal between the interior and exterior of said body.

4. A pressure indicator according to claim **2**, in which the lower end of said plunger terminates in a pressure responsive surface protruding from the lower end of said body; and a diaphragm covering the lower end of said plunger and secured to the exterior of said body whereby a substantially gas tight seal between the interior and exterior of said body is provided.

5. A pressure indicator comprising, in combination: rotative indicating means adapted to indicate at least two different pressure conditions, said indicating means including a rectilinear shaft; pressure responsive means designed for longitudinal movement in a direction co-axial with said shaft; coupling means interconnecting said pressure responsive means to said indicating means, said cou-

pling means converting said longitudinal movement of said pressure responsive means into rotative movement of said indicating means; and, spring means biasing said pressure responsive means to a first position corresponding to one of said pressure conditions, the force of said spring means being overcome in response to the other of said given pressure conditions to effect longitudinal movement of said pressure responsive means to effect corresponding rotative movement of said indicating means, said coupling means including locking means preventing any movement of said indicating means until said other predetermined pressure condition is reached.

6. A pressure indicator, according to claim 5, in which said coupling means includes inclined cam surfaces for effecting conversion of said longitudinal movement of said pressure responsive means into rotative movement of said indicating means.

7. A pressure indicator, according to claim 5, in which said indicating means includes a rotatable disc having a face divided into sectors, alternate sectors being of a first color and the remaining sectors being of a second color; and a covering member having a face divided into cover sectors, alternate cover sectors being transparent to expose said first color on said alternate sectors of said disc when said disc is in a first rotative position, the remaining cover sectors being opaque to eclipse said second color on said remaining sectors on said disc, rotational movement of said disc taking place upon actuation thereof by said pressure responsive means to expose said second color and eclipse said first color.

8. A pressure indicator comprising, in combination: a body; a rotative indicating means adapted to indicate

at least two different pressure conditions, said indicating means including a rectilinear shaft; a pressure responsive means designed for longitudinal movement in a direction co-axial with said shaft; a coupling means interconnecting said pressure responsive means to said indicating means, said coupling means converting said longitudinal movement of said pressure responsive means into rotative movement of said indicating means, said pressure responsive means being designed for movement within said body; and, spring means urging said pressure responsive means to a first position corresponding to one of said pressure conditions, said spring means being overcome by a change in pressure to the other of said given pressure conditions whereby longitudinal movement of said pressure responsive means is effected to in turn cause rotative movement of said indicating means, said coupling means including locking means preventing any movement of said indicating means until said other predetermined pressure condition is reached.

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