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SNAP DEVICE

Filed May 20, 1960

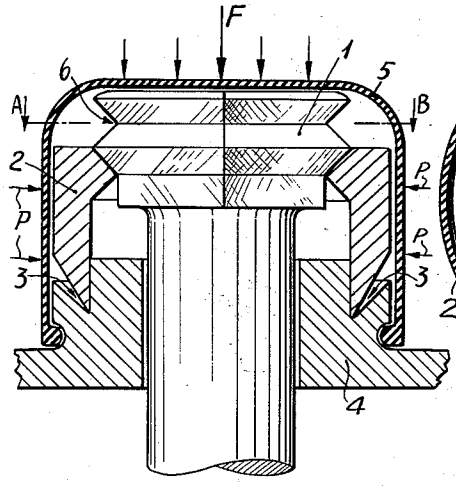


FIG. 1

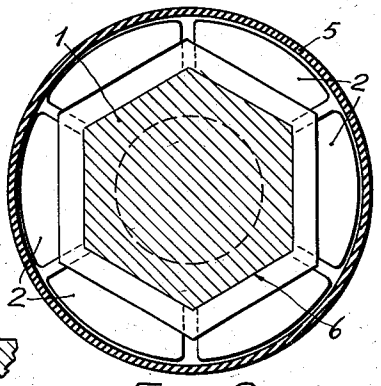


FIG. 2

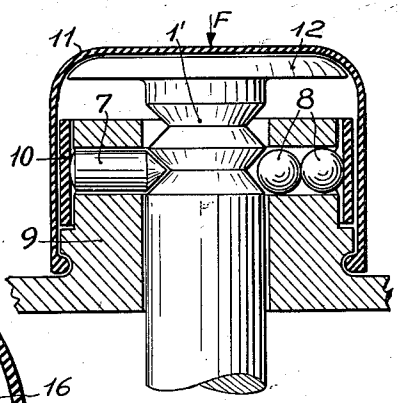


FIG. 3

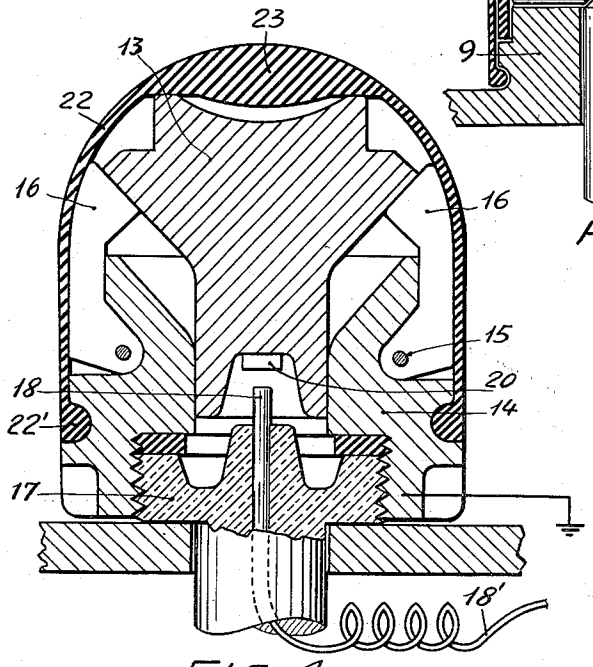


FIG. 4

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SNAP DEVICE

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The present invention relates to snap action devices, working when subjected to an outer force of a predetermined value, and adapted to perform immersed in liquid as well as gaseous fluid means, such as the atmosphere, and not to be influenced by the pressure changes of said fluid even though said changes arise suddenly and with a substantial value.

The device according to the present invention comprises essentially an element yielding resiliently when the outer force of a predetermined amount is acting thereon, said element surrounding a system made up of a rigid element surrounded by segmental means blocking said rigid element in a prefixed position, said segmental means being adapted to be displaced when subjected to said outer force, and because of the deformation of said resilient member, so as to allow the snap action movement of said mobile means when the force attains the predetermined value, this displacement of said mobile means bringing into operation other members or devices connected thereto.

The principle of the present invention and the range of its applications will be apparent in the following disclosure of some embodiments of the present invention which are described with reference to the accompanying drawings, and only as an example not to be limited thereto.

In the drawing:

drawing, and only as an examplt not to be limited thereto.

FIGS. 1 and 2 show in a diagrammatic form the main members of said snap action device according to the present invention and its embodiment, and more precisely:

FIG. 1 is an axial section of the device and

FIG. 2 is a plan sectional view on the line A—B of FIG. 1,

FIG. 3 is a sectional view like that of FIG. 1 concerning another embodiment of the snap action device, the right hand half showing a variation with respect to the left hand one.

FIG. 4 shows a sectional view through the axis of another form of realisation of the snap action device according to the present invention as applied to an electric contactor device.

The embodiment shown in FIG. 1 and FIG. 2 comprises, as main elements, a movable piston shaped means 1, which has its widened upper head formed with a plurality of sloping surfaces, as clearly shown on the drawing. One of these surfaces, sloping downwardly, is in engagement relationship with some surfaces, correspondingly shaped, of segmental elements shown with reference numeral 2, and which are six in number in the embodiment herein illustrated. They are shaped as clearly shown on the drawing, and terminate with a very thin portion, which bears on a groove 3 of a stationary crown 4. The upper portion of the movable element 1, segmental elements 2 and the top portion of crown 3 are all of them surrounded and enclosed in a cap 5 of resilient material.

The operation of the snap action device shown in FIGS. 1 and 2 is as follows: when on the snap action device top a force F of a predetermined value is applied, the elastic cap 5 allows an easy downward motion of the piston shaped mobile member 1, said displacement being allowed by segmental means 2 in that the pressure exerted by the

sloping surface of element 1, contacting segmental means 2, causes these segmental means 2 to move outwardly, while rotating about their lower end which is engaged in groove 3 and expanding resilient cap 5, which has such a size as to allow said displacement.

When the innermost tip of segmental means 2 goes beyond the sloping surface of element 1, the piston shaped element 1 will be free to move downwardly speedily and suddenly, the resilient actuation by cap 5, which will bias segmental means 2 to engage into the top recess 6 of the head of piston element 1, will improve the quick snap action movement of piston shaped element 1 while limiting in the meantime the displacement thereof.

On the other hand, when a sudden change of the pressure of the fluid in which said snap action device is immersed takes place, cap element 5 will be subjected to pressures such as those shown by arrows *p*. These pressures exerting their action simultaneously on the head as well as sides of cap 5, then there would be no displacement of the inner members of the snap action device, because the action of said pressures *p* would compensate each other thus preventing the snap action device from operating at that moment.

FIG. 3 shows a modification of the snap action device illustrated in the preceding figures, and, in this case, the segmental means are replaced either by cylinders with one tip shaped and directed towards the inside and shown at 7 on the drawing, or by balls 8, said elements being engaged in grooves or seats provided in a stationary crown 9, like the stationary crown 4 in FIG. 1, the tip of cylinders 7 or a portion of the surface of balls 8 projecting from said seats being engaged in a groove in the head of mobile piston shaped element 1 and operating in a manner wholly similar to that of segmental means 2. Another variation of said snap device is carried out by forming the resilient element which keeps in position cylinders 7 or balls 8 in the form of a resilient ring or cylinder 10, which surrounds the portion where said movable elements 7 or 8 are placed, whilst the device assembly is again enclosed in a resilient cap 11, which in this case may be much lighter as it has no more the purpose to bias cylinders 7 or balls 8 but has simply the task of forming a protection and a sealing action against the fluid surrounding it, and of gathering and transmitting the eventual external pressure changes. In this case the head of the mobile piston shaped element 1' is formed with an enlarged portion 12, and the force F will act thereon so as to cause the snap action of the device. Indeed, when a force F of a predetermined amount is applied on the top plate 12 of the mobile element 1', this latter will bias cylinders 7 or balls 8, which will be pushed away in a radial direction, deforming the resilient retaining member 10, and allowing, when said displacement has reached a sufficient value, the sudden downward movement of the mobile piston shaped element 1' bringing about the desired snap action.

In this case too, after the snap action has taken place elements 7 or 8 go back to their original position, but engage in the top groove of mobile piston shaped 1'.

In this case too the snap action device as illustrated is not sensitive to the pressure action exerted by the fluid said device is immersed in. In particular, when the top portion of the snap action device, covered with resilient cap 11 is immersed in air, a pressure wave, even though a substantial surge, which arises near the said device would not be able to make the device operate, which thence would not lose its charge and efficiency.

FIG. 4 represents diagrammatically an application of the snap action device, forming the object of the present invention, which has been carried out in a manner like that shown in the figures previously described, to an electric contact control which may be used in many appli-

cations. As may be seen in FIG. 4, said control device comprises a mobile and rigid member **12**, the cylindrically shaped lower end thereof being inserted and slidably disposed within a corresponding socket provided in a circular crown shaped element **14**, on which segmental elements **16** are pivotally mounted at **15** and these elements **16** terminate at their top end wtih bosses having upper conical surfaces, the conicity thereof wholly corresponding to the conicity of the top portion of the mobile member **13**. The mobile element **13** is provided at its inner end with an electric contact **20**. The other electric contact **18** is fixed on a stationary member **17** of insulating material and mounted on the fixed crown element **14**. Said contact **18** is connected to an electric conductor **18'**, while the metallic element **14** is grounded. The whole assembly is surrounded and enclosed within a resilient cap **22** of rubber or another similar resilient material, the lower edge thereof being anchored and fixed as shown at **22'**, to the stationary crown **14**, while at the top it is formed with a thickening **23** which forms the pressure plate for the application of the force which is to actuate the snap action device of the present invention.

The performance of the embodiment of the snap action device illustrated in FIG. 4 is the following: when a pressing force is exerted on the top portion **23** of cap **22**, after the control device is placed at the required point, the downward stroke of said mobile piece **13** is prevented by the segmental elements **16** till the applied load reaches a predetermined value for which the resilient element holding the segmental elements **16** has been set. Then said segmental elements **16** turn around their relative pivots **15**, moving away in a radial direction, since they overcome the elastic holding bias exerted by resilient element **22**, and allow the free downward travel of mobile element **13**. When, however, the wider portion of said mobile element **13** has gone beyond the tips of segmental elements **16**, then these latter tend to close with a snapping action under the elastic force exerted on them by resilient element **22**, this effect still more accelerating the downward travel of mobile element **13**, and the electric contact **20** reaches suddenly the stationary contact **18**, closing the electric circuit controlled by them.

The resilient member, which holds the segmental elements **16** in the position shown on the drawing, may be made up of a suitable resilient ring, as provided in the embodiment shown in FIG. 3. In this case the outer cap would work only as a protection means with regard to the inside of the snap action device, and for the task described for cap **11** of FIG. 3.

The elements such as **2** and **16** in FIGS. 1 and 4 respectively, and the band **10** with the pin **7** or balls **8** of FIG. 3, constitute holding means surrounded by the side wall of the cup.

Of course, it will be apparent to those skilled in the art, that the applications of the snap action devices according to the present invention are not to be considered as being limited to that shown in FIG. 4. Therefore, the constructional details of the snap action device as resulting its many applications as well as of the applications

may be changed according to need without however departing from the scope of the present invention.

What I claim is:

1. A snap action device for operation in a fluid comprising a member movable between two positions and having a part on which a force can be exerted in a first direction to produce such movement from inoperative to operative position, holding means including; at least one element normally engaging with said member for holding it in inoperative position and movable in a second direction transverse to said first direction to permit movement of the member, a base within which the member and element are movably mounted, and a cuplike cover of flexible material having its rim secured to the base and having its bottom overlying said part and its side wall surrounding said holding means and lying close enough to the holding means so as, when an increase in pressure in the fluid in which the device is enclosed occurs, to prevent sufficient movement of the element to allow movement of the member to operative position.

2. A device as claimed in claim 1 in which the cover is of resilient material and the side wall engages the element for normally holding the member in inoperative position.

3. A device as claimed in claim 1, in which the element is fulcrummed on the base.

4. A device as claimed in claim 1, in which an elastic ring within the cover engages the element for normally holding the member in inoperative position.

5. A device as claimed in claim 1, in which the element and the member each have two slanting surfaces meeting in an edge, the upper surface on the element engaging the lower surface on the member when the member is in inoperative position and the lower surface on the element engaging the upper surface on the member after the edges have passed each other to push the member towards operative position.

6. A device as claimed in claim 5, in which the cover is of resilient material and the side wall engages the element for normally holding the member in inoperative position.

7. A device as claimed in claim 6, in which the element is fulcrummed on the base.

8. A device as claimed in claim 1, in which the member and base carry electrical contacts engageable by movement of the member to operative position.

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