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PRESSURE INDICATING DEVICE

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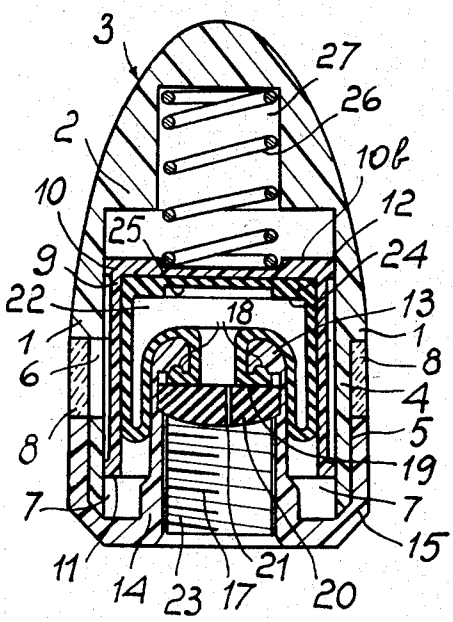

Fig. 1

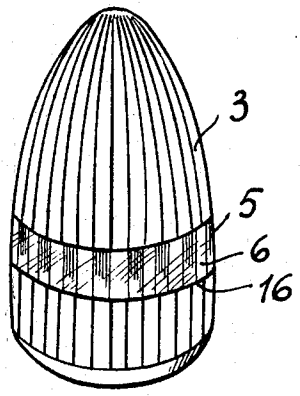

Fig. 2

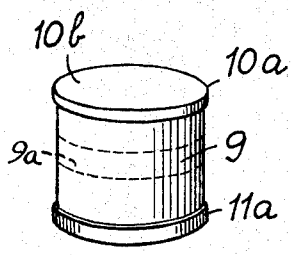

Fig. 3

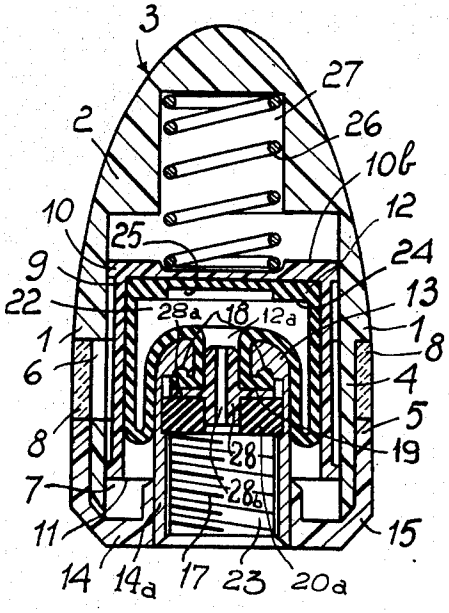

Fig. 4

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PRESSURE INDICATING DEVICE

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The present invention relates to a pressure indicating device, which is particularly adapted to be attached directly to tire valves of vehicles in general, and serve also as a closing cap of such valves.

An object of the present invention is to provide a pressure indicating device of the described kind, which will be reliable in operation, of simple but durable construction and of low cost.

Further objects and advantages of the invention will be more evident from the description which follows of two preferred but not exclusive embodiments of the invention illustrated in the accompanying drawing in which:

FIG. 1 is a sectional view according to the longitudinal axis of the first embodiment of the pressure indicator.

FIG. 2 is a perspective view of the pressure indicator shown in FIG. 1.

FIG. 3 is a perspective view of a bell shaped indicating member, and

FIG. 4 is a sectional view similar to that of FIG. 1 of a second embodiment of the pressure indicator.

Referring to the figures, in which like reference numerals designate like or corresponding parts, it will be seen that the pressure indicator is formed of an outer hollow body **1**, the upper substantially ovoidal portion **2** of which has externally a knurling **3**, while the lower cylindrical portion **4** is provided along a length of its outer surface **5** with spaced substantially rectangular windows **6** providing a communication between the cavity of said hollow body **1** and the outside. The annular portion provided with the windows **6** is covered by a ring **8** of transparent material, e.g. of plastic material commercially known under the name of "Plexiglas," so that through said windows **6** a substantially bell shaped hollow cylindrical element **9** may be completely seen, said element being slidably mounted in the cavity **7** of body **1** and in contact with the inner surface of said cavity through its ends **10** and **11** provided for the purpose with edges **10***a* and **11***a*.

An elastic diaphragm or bellows member **12**, mounted inside said cylindrical element **9**, may be deformed by the pressure to be measured and this deformation defines the movement of said bell shaped cylindrical element **9**. The elastic diaphragm **12**, of flexible and deformable material is oversized so that it assumes the form of a bag the neck of which is fixed on the inner flange-like upper portion **13** of a sleeve member or cylindrical wall **14**, the lower portion of which is outwardly bent to form an annular boss **15** integral therewith and slipped in an air tight manner over and fixed on the lower portion **4** of body **1**. The boss part **15** extends up to the lower end **16** of the annular zone provided with the windows **6**. Internally the sleeve member is provided with a screw thread **17** adapted to be screwed on the tire valve (not shown in the drawing). In order to fix securely the elastic diaphragm **12** said inner flange-like upper portion **13** of the sleeve member **14** is bent inwardly to form an inner flange portion provided on the lower surface thereof, with an annular groove **18** in which there is pressed the deformable material of said

elastic diaphragm **12** wound around the inner flange portion **13**. Owing to the inner flange-like upper portion **13** the end portion of the diaphragm **12** forms an abutment **19** onto which the disc **20** is pressed, such disc being provided with a small hole **21** adapted to allow communication between the chamber **22**, defined by the elastic diaphragm **12**, and the interior **23** of the sleeve member **14**. The plate-like top wall **24** of the chamber **22** of the elastic diaphragm **12** has a central recess **25** facilitating an air tight closure of the upper end **13** of the sleeve member **14**, when wall **24** is lowered. The movement of the cylindrical element **9**, caused by the deformation in the expansion direction of said elastic diaphragm **12**, is counteracted by the spring **26** located in the recess **27** provided in the portion **2** coaxial with the cavity **7** of the body **1** and acting against the upper external surface **10***b* of said cylindrical element **9**. The cylindrical element **9** has on its lateral external surface between the ends **10***b* and **11***a* markings or scales **9***a* for indicating the internal pressure of the tire.

The cavity **7** and recess **27** will communicate with the atmosphere through e.g. one or more little holes (not shown) provided in the body **1**. For this purpose the cylinder member **9** may have longitudinal grooves on the outer surface thereof or a clearance may be provided between the walls of cavity **7** and cylinder **9**.

The operation is as follows: screwing the thread **17** of the sleeve member **13** of the pressure indicating device on a tire valve stem, disc **20** is brought into contact with the core of said valve, which is consequently lowered thereby opening the tire valve. The air from the tire thus passes through the hole **21**, and enters the cavity **22** of the elastic diaphragm **12**, which is consequently expanded. Such expansion, counteracted by the calibrated spring **26**, causes the raising of the cylindrical element **9**. In a given position the counteraction of the spring will balance the pressure action and such position will indicate the internal pressure of the tire. For this purpose, as mentioned, the outer surface of cylinder **9**, visible through the windows **6**, is provided with pressure condition indicating markings. Preferably the lower portion of cylinder **9** will bear on its outer surface a marking indicating the optimum value of pressure, while the upper portion will bear a marking indicating the wrong pressure. Such markings will preferably have, respectively, a suitable distinguishing colouring e.g. the marking for normal pressure will have the same colouring of the external shell and that for the wrong pressure will have a red colour.

In case of leakages due, for instance, to damages of the elastic diaphragm **12**, the pressure will drop to a pre-determined minimum value, without having a complete deflating of the tire as generally happens with known devices of this type. In fact, in the case of leakage due to bursting, when the air pressure within the tire has reached a value which is lower than that exerted by the spring, such spring will press the top wall **24** of the chamber **22**, defined by the elastic diaphragm **12**, against the end **13** of the sleeve member closing the corresponding opening and preventing further escape of air. In this case the sealing is determined by the central recess **25** provided in the top wall **24**.

In fact such recess **25** is provided in order to increase the surface exposed to the pressure of the tire and consequently the lifting force acting on the top wall **24** when the latter is in contact with the end **13** of the sleeve member in opposition to the elastic action of the spring **26**.

In the embodiment according to FIG. 4 the sleeve portion **14** is adapted to receive in a stable and fluid tight manner a metallic bush **14***a* having an inner thread **17** to be screwed on the tire valve. Furthermore, against the

annular abutment **19** defined by the end of the diaphragm **12** and the inner flange **13** of the bush **14***a*, a flange **28***a* of a bush member **28** forced in an air tight manner into the aperture **12***a* of the flexible diaphragm **12** is pressed, said bush member **28** being provided with an axial hole **28***b* providing communication **22** between chamber **22** and the inside **23** of the bush **14***a*. Between the inner surface of said bush **14***a* and the outer surface of the bush member **28** an annular gasket element **20***a* is arranged to accomplish a sealing contact between the tire valve stem and the bush member **28**, the lower surface of said annular gasket **20***a* lying in a plane which is parallel and axially downwardly projecting with respect to the lower end surface of said bush member **28**.

The communication between cavities **7** and **27** and the outside atmosphere may be provided in a similar manner as described with reference to the embodiment of FIGS. 1–3.

The operation of this second embodiment of the pressure gauge is substantially as above disclosed with reference to the first embodiment. The only difference consists in the fact that by screwing the outer hollow body **1** through the thread **17** of the bush **14** on a tire valve terminal, firstly the annular gasket element **20***a* contacts the annular end edge of the tire valve stem so that a fluid tight contact is achieved and subsequently by further screwing the bush member **28***a* compresses the gasket **20***a* and presses down the core of the tire valve causing escape of compressed air from the tire within the chamber **22** of the flexible diaphragm **12**.

Other features of this embodiment correspond to those previously described.

It will be understood that the foregoing description of the invention and the embodiments shown are merely illustrative of the principles thereof; and, accordingly, that the appended claims are to be construed as defining the invention within the full spirit and scope thereof.

We claim:

1. A pressure indicating device, comprising a hollow body having a closed top part and a bottom part, an opening in said bottom part, a substantially cylindrical wall on said bottom part and surrounding said opening, said cylindrical wall having a diameter smaller than the diameter of the cavity of said hollow body, said cylindrical wall projecting from said bottom within the cavity of said hollow body, at a distance from the top part thereof, a bag-like bellows member of flexible material and having a neck portion of reduced diameter projecting from the body portion of said bellows member having a diameter substantially greater than the diameter of said neck portion, said neck portion fitting within the interior of the top portion of said cylindrical wall, means for fixing said neck portion to the inside of the top portion of said cylindrical wall, a bell member above said cylindrical wall and riding on said bellows member, said bell member being movable within the interior of said hollow body, spring means biasing said bell member towards said cylindrical wall, indication markings on the outer surface of said bell member and window means on the outer wall of said hollow body for allowing vision of said indication markings.

2. A pressure indicating device, comprising a hollow body having a closed top part and a bottom part, means defining an opening in said bottom part, a substantially cylindrical wall on said bottom part and surrounding said opening, said cylindrical wall having a diameter smaller than the diameter of the cavity of said hollow body, said cylindrical wall projecting from said bottom within the cavity of said hollow body at a distance from the top part thereof, a bag-like bellows member of flexible material and having a neck portion of reduced diameter projecting from the body portion of said bellows member having a diameter substantially greater than the diameter of said neck portion, said neck portion fitting within the interior of the top portion of said cylindrical wall, means for fixing said neck portion to the inside of the top portion of said cylindrical wall, a bell member above said cylindrical wall and riding on said bellows member, said bell member being movable within the interior of said hollow body, a portion of said bag-like bellows member near the neck portion thereof riding on the top portion of said cylindrical wall and extending therefrom towards the inner surface of said bell member, said bellows member having a plate-like top part opposite to said neck portion thereof and a recess in said plate-like top part facing said neck portion, the diameter of said recess being greater than the inner diameter of said cylindrical wall and smaller than the outside diameter of said cylindrical wall plus twice the thickness of the bellows member portion riding on the top portion of said cylindrical wall, spring means biasing said bell member towards said cylindrical wall, indication markings on the outer surface of said bell member, and window means on the outer wall of said hollow body for allowing vision of said indication markings.

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