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PIEZOELECTRIC PRESSURE INDICATOR

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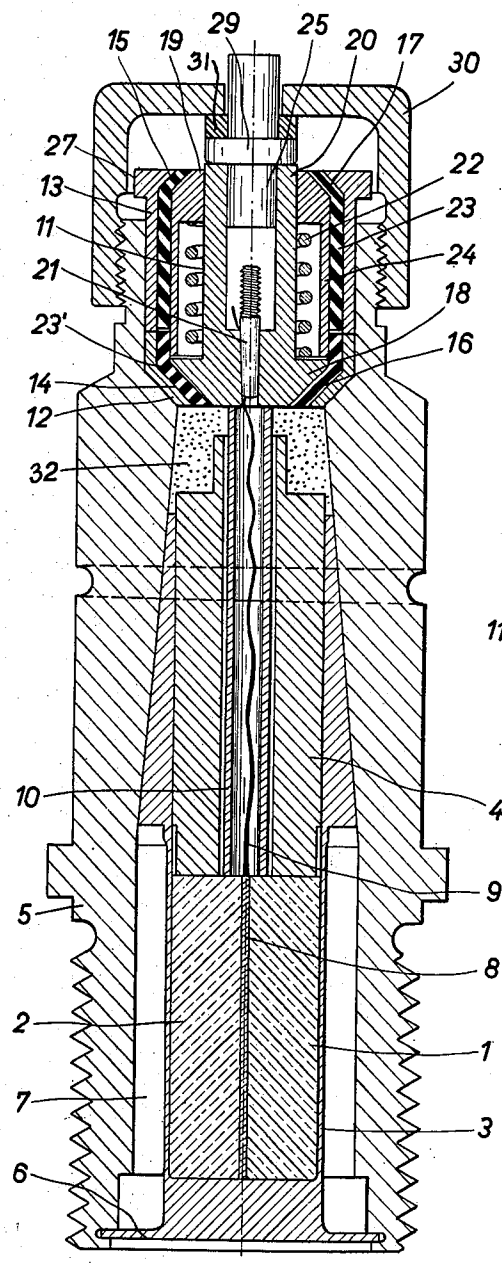


Fig.1

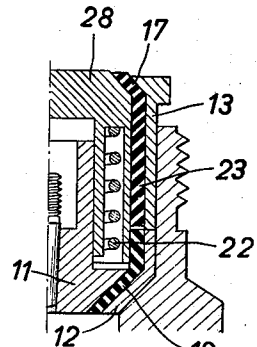


Fig.2

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PIEZOELECTRIC PRESSURE INDICATOR

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3 Claims. (Cl. 174—50.56)

This invention relates to piezoelectric pressure indicators, and more particularly to the sealing and the electrical insulation of the current delivery end of such indicators.

In a known piezoelectric pressure indicator the sealing and the insulation of the contact piece comprises an elastic ring, which is engaged by spring pressure between a shoulder of the indicator casing and a shoulder of the contact piece at the outer end of the instrument. This sealing ring is mounted so as to provide inner and outer radial clearance, whereby it may expand on all sides when the instrument heats up, and may regain its original shape upon cooling. However, due to the insufficiently rigid connection between indicator casing and contact piece, such sealing means does not withstand any violent shocks, as may occur e. g. when indicating internal combustion engines.

It is an object of the invention to provide sealing and insulating means for piezoelectric pressure indicators, which will be able to withstand even severe and constant vibrations, while permitting the possibility of free expansion for the sealing ring.

According to the invention the insulating and sealing ring is arranged at the end of an indicator chamber, situated at the current delivery side of the pressure indicator and extending concentrically to the axis of the indicator, while a second elastically resilient insulating and sealing ring is engaged between a shoulder of the other end of said chamber and a spring-loaded collar which is axially slidable on a contact piece.

In this manner, the contact piece is elastically connected to a casing extension, not only at a single point, but on two points spaced apart from each other, whereby stability will be considerably improved. The occurrence of shaking vibrations of the contact piece, particularly in transverse direction, and also the intensity of such vibrations will thereby be limited to a considerable extent. Further, the more compact and stable arrangement results in maintaining the load at all times uniformly distributed over the entire supporting surface of the insulating material, and consequently the occurrence of undue plastic deformations is prevented.

Two embodiments of the invention are illustrated in the accompanying drawing, showing in Fig. 1 a preferred form of the improved pressure indicator in longitudinal section, and in Fig. 2 a modification thereof.

The pressure indicator shown in Fig. 1 belongs to the type called sleeve indicator, wherein the crystal column formed of two semi-cylindrical quartz bars **1** and **2** is built into a steel sleeve **3** which is closed on the pressure side. These bars are placed under initial stress by a steel cylinder **4** pressed into the sleeve **3**. An annular diaphragm **6** is rolled into sealing contact with the casing **5** and prevents pressure gases from penetrating into the annular space **7** between sleeve **3** and casing **5**.

When the quartz column is stressed in longitudinal direction, a positive charge is produced on the outer surface of the quartz cylinder **1**, **2**, this charge being grounded by the steel sleeve **3** and the casing **5**. The countercharge formed at the separating plane of the semi-cylindrical bars is taken up by a thin copper sheet **8** placed between the two bars, and passes through a conductor **9**, which extends within an insulating quartz tube **10**, to a tubular metal contact piece **11** to which the conductor is clamped by means of a pin **21**. A counter-contact piece **29** is separated from a cup nut **30** by an insulating washer **31** and is provided for further transmission of the electric charge.

A casing chamber, which extends concentrically to the main axis of the indicator and contains built-in sealing members, is provided on the current delivery end of the instrument, in order to seal the active parts of the piezoelectric pressure indicator and also to insulate the contact piece **11**. Said chamber is formed by two bushings **12**, **13** which are pressed into the casing **5** and provided with frustro-conical supporting surfaces **14** and **15**, respectively. The main sealing member comprises a ring **16** made of elastically resilient and highly insulating material, such as Teflon, and the supplementary sealing member consists of a ring **17** made of the same material. The two insulating and sealing rings have the shape of truncated cones with their theoretical tips pointing in opposite directions. The contact piece **11** is provided with a shoulder **18** which on one side is formed conically and bears against the conical portion of the sealing ring **16**. A collar **19** is axially slidable along, but snugly fitting on, the shaft **20** of the contact piece **11** and abuts with its outer conical seating surface against the conical portion of the supplementary sealing and insulating ring **17**. Due to the effect of the preloaded coil spring **22**, the shoulder **18** and collar **19** are urged apart from each other in axial direction and transmit the tension of the spring to the sealing rings **16**, **17**. The compressed sealing material is able to elastically yield somewhat towards the respective ends of the chamber. Longitudinal and size deformations of the insulating material, caused by temperature changes, are also compensated by this arrangement. The complementary sealing and insulating ring **17** extends in direction towards the interior of the chamber in the form of an elongate sleeve **23**, while the main sealing ring **16** has a shorter sleeve-like extension **23'**. These sleeves, on one hand, bear against the chamber bushings **12** and **13**, respectively and on the other hand engage the sleeve-shaped extension **24** of the top ring **19**.

The hollow space within the casing **5**, between the contact piece **11** and the steel cylinder **4**, is filled with a drying agent **32** for the purpose of fixing even the smallest traces of moisture which may penetrate through fine fissures after assembling the indicator.

The described mode of sealing and insulating offers considerable advantages. Of prime importance is particularly the compact assembly of the entire instrument, wherein the contact member **11** is maintained with both ends within the casing **5** by means of the sealing rings **16**, **17** in a quite firm but nevertheless resilient manner. As a result, the contact member will withstand violent shocks without becoming subjected to shaking vibrations and without causing damages to the comparatively soft sealing material or to the conducting wire. Also, the extension members **23**, **23'** of the sealing rings **16**, **17** are well retained, owing to the guiding influence of the elongated top ring **19**, and are protected against breaking out. All members of the sealing assembly are nevertheless able to easily follow the expansions due to heat, such as they occur e. g. when indicating an internal combustion engine.

For purposes of mantenance the entire sealing assembly can easily be disassembled and reassembled by

first removing the closure plug **25** and the contact pin **21** and subsequently engaging the shoulder **27** of the chamber bushing **13** and pulling the latter out of the upper extension of the casing **5**.

Instead of extending the contact member **11** itself to the outside of the casing, said member could also be shortened, as shown in Fig. 2, the top ring could be formed as a plate **28**, the latter effecting the transmission of the electric current to the counter-contact **29**. This construction provides the additional advantage of completely sealing the interior of the chamber. In this case, the counter-contact **29** is resiliently pressed against the plate **28**, so that this contact may not be lifted from the sealing ring **17** when the cap nut **30** is tightened.

We claim:

1. A piezoelectric pressure indicator comprising a casing having a chamber formed therein at the current delivery end of the indicator and concentric with the axis of the casing, said casing having shoulders at both ends of said chamber, a contact member within said chamber, a movable collar axially movable within the casing, a spring member between said contact member and said collar urging said collar towards one end of the casing, an elastically yielding insulating and sealing ring within said casing, said ring being maintained between the shoulder at one end of the casing and said contact member and said contact member being pressed against said ring by the action of said spring, and a second elastically yielding insulating and sealing ring within said casing, said second ring being maintained between the shoulder at the other end of the casing and said spring loaded collar.

2. A piezoelectric pressure indicator comprising a casing having a chamber formed therein at the current delivery end of said casing and extending concentric with the axis of the casing, said casing having abutment shoulders at both ends of said chamber, a contact member extending axially within said chamber, an axially movable collar guided along said contact member, a spring member within said casing between said contact member and said collar axially urging said contact member and collar towards opposite ends of the casing, an elastically yielding insulating and sealing ring within said casing and having a portion thereof maintained between the shoulder at one end of the casing and one end of said spring loaded contact member, and a second elastically yielding insulating and sealing ring within the casing and having a portion thereof maintained between the shoulder at the other end of the casing and said spring loaded collar, whereby at least a component of the spring force is directed at right angles to the abutting surface of the sealing ring.

3. A piezoelectric pressure indicator as claimed in claim 2, wherein said spring loaded movable collar coacting with the sealing ring at one end of said chamber comprises a plate-shaped top and is axially guided within the chamber along said contact member in current conducting relation therewith to transmit the electric charge to the outside of the indicator casing.

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