

A REMOTE-READER MODULE FOR FASTENING TO THE CAP OF A FLUID METER

The invention relates to a remote-reader module for fastening on the cap of a fluid meter, in particular a water meter.

A remote-reader module serves to read consumption remotely and it is installed on meters that might already themselves be installed. For this purpose, it is applied to the top face of the cap of the meter's register so as to ensure that the reader arrangement of the module is positioned accurately relative to an arrangement internal to the register and thus enable consumption to be detected, e.g. by detecting an indicator disk. This detection may be performed optically, capacitively, inductively, etc., e.g. by observing the movement of the indicator disk.

As described in patent document EP 1 586 869, it is known to fasten a remote-reader module on the cap of a fluid meter by means of a threaded male element of the screw type passing through the module and co-operating with a tapped female insert embedded in the molding of the cap of the meter and serving to receive the male element by screw fastening.

In such an arrangement, a visual-effect seal device said tamper seal device may be inserted by force into a cavity formed in the cap of the module and surrounding the head of the screw. The seal device is for example a part of substantially oblong shape that is made of flexible plastics material, which part is received tightly in the cavity, thereby covering the head and not being removable from the cavity without being destroyed at least in part, e.g. by using a screwdriver, thereby making it possible to detect visually that the module has been removed or that fraud has been perpetuated.

That arrangement enables fraud to be visually detected only by an inspector going to the site and observing the meter together with its module. It does

not enable the removal of a remote-reader module to be detected remotely.

Patent document EP 1 590 633 describes a remote-reader module for monitoring consumption by optically
5 detecting an indicator disk, and for this purpose it proposes equipping the module with a light emitter that forms a trace on the indicator disk, which trace is centered on its axis of symmetry and faces a reflecting surface. The absence of the reflected beam indicates
10 that the module is not in position on the meter.

That presence detection performs two functions. Firstly, it makes it possible to detect automatically that the module has been installed on the meter and thus to begin reading consumption automatically. Secondly, it
15 enables fraudulent removal of the module to be detected and to actuate an alarm that is transmitted remotely.

More generally, it is thus known to place a presence-detecting sensor in the remote-reader module together with a corresponding target or the equivalent in
20 the register close to the cap thereof.

Nevertheless, such a detection arrangement requires the meter and the module to be of a special design to accomplish, so they are therefore relatively expensive.

Furthermore, the meter needs to include said target
25 and must therefore be specially designed as a function of the associated module. It is thus not possible to fit such a module on already-existing meters that are not fitted with said target, and that might already be installed.

30 The invention solves these technical problems, and for this purpose is provided remote-reader module for fastening on the cap of a fluid meter and including a fastener element for fastening the module on the meter together with an associated visual-effect seal device,
35 the module being characterized in that said seal device includes a detection arrangement enabling its position on

said module and its removal from said module to be detected remotely.

By means of the invention, the positioning of the module is detected via the seal device associated with the fastener element of the module. As a result, no adaptation of the meter itself is required. It is therefore possible to fit such a module on meters that already exist and that might possibly already be installed.

In addition to enabling removal of the module and thus fraud to be detected remotely, the invention also ensures that the installer does not forget to install the visual-effect seal device on the module. This can be done merely by ensuring that the module operates only if the remote detection arrangement confirms that the device is in place, otherwise a corresponding alarm is actuated or unit remains in non-operating mode.

In a preferred embodiment, said detection arrangement comprises a sensor disposed in the module and an associated target disposed in said visual-effect seal device.

The sensor is thus protected inside the remote-reader module, with the target being detected through plastics material cap of the module. Since the target has no electrical connection, it can be placed in the fastener element, without any requirement for leak-proofing.

Said detection is preferably based on the electromagnetic effect.

In a first embodiment, said sensor is a Hall effect sensor and said target is a magnet.

Other ways of performing this detection include a reed switch as sensor and a magnet as target, an electromagnetic coil as sensor and a metal plate as target, and a capacitive sensor and a metal plate as target.

In a second embodiment, said sensor is a reed switch and said target is a first magnet.

Preferably, a second magnet is disposed in the module facing said first magnet, said second magnet
5 presenting a magnetic field opposite to the field from the first magnet and of absolute value equal to that of the magnetic field of the first magnet.

In these two embodiments, it is also possible to detect the presence of an external magnet that might be
10 used by a dishonest person to mask removal of the remote-reader module or to tamper meter register, many registers use magnets to drive the counter in the meter register.

Preferably, said visual-effect seal device is a piece of plastics material and said target is embedded in
15 said piece.

Said fastener element may be secured to said visual-effect seal device forming part of said detection arrangement.

By way of example, the fastener element may be
20 constituted by a snap-fastener rod and may include a head of specific shape constituting said visual-seal device.

The target may thus be included directly in the fastener element including the seal device.

In a specific embodiment, said fastener element is a
25 screw passing through the module and screwed into a tapped female insert embedded in the cap of the meter, the head of said screw being placed on the outside face of said module.

Under such circumstances, and preferably, the
30 visual-effect seal device is inserted by force into a cavity surrounding the head of said screw.

The invention is described below in greater detail with the help of figures that merely show preferred embodiments of the invention.

35 Figure 1 is an exploded perspective view showing a remote-reader module in accordance with the invention together with a meter.

Figure 2 is a section view showing a remote-reader module in accordance with a first embodiment of the invention and mounted on a meter.

Figures 3 and 4 are section views showing a remote-reader module in accordance with a second embodiment of the invention, and mounted on a meter.

Figure 1 shows a fluid meter 1, more precisely a water meter, comprising a casing referred to as a vessel 2 that is provided with a water inlet pipe 2A and a water outlet pipe 2B and that is surmounted by a register 3 containing a mechanism for transmitting and gearing down rotation of the shaft of a measuring element, such as a spinner or a volume-measuring chamber, that is contained in the vessel 2, which transmission is applied to a device 3A for displaying consumption and a rotary indicator disk 3B.

A remote-reader detector module 5 is placed on the top wall of the meter 1 in order to enable water consumption and also water flow direction to be detected remotely. For fastening purposes, the module 5 includes a through orifice 6 having a screw 7 inserted therein with the end of the screw being screwed into a tapped metal insert 8 that is embedded in the molding of the cap of the register 3.

The fastener element constituted by the screw 7 is associated with a visible-effect seal device 9 constituted by a piece of flexible plastics material inserted by force into a cavity 10 arranged in the cover of the module 5 and surrounding the head 7A of the screw 7.

In accordance with the invention, this arrangement for fastening a remote-reader module 5 on the cover of a fluid meter 1 thus includes a fastener element associated with the module and comprising a screw 7, together with a visual-effect seal device 9, the seal device including an arrangement enabling its position and its removal to be detected remotely.

In a first embodiment, shown in Figure 2, this detection relies on an electromagnetic effect and a Hall effect sensor 12 is placed in the module 5 on its electronics card 13, while the associated target constituted by a magnet 11 is embedded in the visual-effect seal element 9.

The visual-effect seal device 9 is substantially oblong in shape, corresponding to the shape of the cavity 10, thereby ensuring that the visual seal device is positioned in a unique relative position.

The voltage from the Hall effect sensor 12 is measured by the microcontroller already present in the remote-reader module 5 and a voltage threshold is defined in order to detect the presence of the magnet 11 in the seal device 9.

When the module 5 is installed on the meter 3, the module is fastened by screwing the screw 7 into the tapped insert 8 of the meter, and then the visual-effect seal device 9 is inserted by force into the corresponding cavity 10, thereby placing the magnet 11 close to the Hall effect sensor 12 and actuating a signal indicating that the module has been put into place and causing the remote reader to be put into operation.

In a fraudulent attempt to disassemble the module, the visual-effect seal device 9 needs to be removed in order to be able to unscrew the screw 7, and as a result the magnet 11 is moved away from the Hall effect sensor 12, thereby causing an alarm signal to be activated that indicates the attempted fraud.

During fraudulent manipulation in which an external magnet is used in an attempt to mask the fact that the remote-reader module has been removed, the Hall effect sensor 12 detects variation in the level of the electromagnetic field, its reference value being the value for the magnet 11. An alarm is then actuated electronically and the fraud is detected remotely.

In a second embodiment, shown in Figures 3 and 4, detection is by the electromagnetic effect, and a reed switch 22 is placed in the module 5 on its electronics card 13, and an associated target constituted by a first magnet 21, referred to as an opening magnet, is embedded in the visual-effect seal element 9.

The visual seal device 9 is likewise of substantially oblong shape corresponding to the shape of the cavity 10, thereby ensuring that the visual seal device is positioned in a unique relative position.

A second magnet 23, referred to as a closing magnet, is placed in the module 5 facing the opening magnet 21, under the electronics card 13. This closing magnet 23 delivers a magnetic field opposite to that of the opening magnet 21, and of the same absolute value.

When the module 5 is installed on the meter 3, the module is fastened by screwing the screw 7 into the tapped insert 8 of the meter, and then the visual-effect seal device 9 is inserted by force into the corresponding cavity 10, thereby placing the opening magnet 21 close to the reed switch 22, and the reed switch, while it is subjected to a zero magnetic field opens and initiates the operation of the remote reader module.

During a fraudulent attempt at removing the module, visual-effect seal device 9 needs to be removed in order to unscrew the screw 7, and as a result the opening magnet 21 is moved away from the reed switch 22, which is then subjected to the magnetic field of the closing magnet 23, thereby actuating an alarm signal indicating the attempt at fraud.

During fraudulent manipulation with an external magnet being put into place for the purpose of attempting to mask the removal of the remote-reader module, the reed switch 22 is subjected to the magnetic field of the external magnet adding to or subtracting from the magnetic field of the closing magnet 23, thereby closing

the reed switch and actuating an alarm and causing the fraud to be detected remotely.

CLAIMS

1. A remote-reader module (5) for fastening on the cap of a fluid meter (1) and including a fastener element for fastening the module (5) on the meter (1) together with an associated visual-effect seal device (9), the module being characterized in that said seal device (9) includes a detection arrangement enabling its position on said module and its removal from said module to be detected remotely.
2. A module according to the preceding claim, characterized in that said detection arrangement comprises a sensor disposed in the module (5) and an associated target disposed in said visual-effect seal device.
3. A module according to either preceding claim, characterized in that said detection uses the electromagnetic effect.
4. A module according to claims 2 and 3, characterized in that said sensor is a Hall effect sensor (12) and said target is a magnet (11).
5. A module according to claims 2 and 3, characterized in that said sensor is a reed switch (22) and said target is a first magnet (21).
6. A module according to the preceding claim, characterized in that a second magnet (23) is disposed in the module (5) facing said first magnet, said second magnet presenting a magnetic field opposite to the field from the first magnet and of absolute value equal to that of the magnetic field of the first magnet.
7. A module according to any one of claims 2 to 6, characterized in that said visual-effect seal device (9)

is a piece of plastics material and said target (11) is embedded in said piece.

8. A module according to any preceding claim,
5 characterized in that said fastener element is secured to said visual-effect seal device (9) forming part of said detection arrangement.

9. A module according to any preceding claim,
10 characterized in that said fastener element is a screw (7) passing through the module (5) and screwed into a tapped female insert (8) embedded in the cap of the meter (1), the head (7A) of said screw being placed on the outside face of said module.

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10. A module according to the preceding claim,
characterized in that the visual-effect seal device (9) is inserted by force into a cavity (10) surrounding the head (7A) of said screw.

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