

Automatic fire alarm

The present invention relates to an automatic fire alarm which has an alarm-holder having a connecting block, and also an alarm cover and an alarm insert which can be inserted in the alarm-holder and has a printed circuit board with evaluating electronics, a sensor system and a plug which is associated with the connecting block.

In a fire alarm of this kind described in DE-U-92 10 858.3, the alarm-holder, which consists for example of a simple injection moulded part, contains a multi-polar connecting block with the necessary plug sockets, and the alarm insert has a contact pin strip with the corresponding contact pins which are, perforce, associated with the connecting block when the alarm (alarm insert plus alarm cover) is inserted. The alarm insert is rotatably disposed in the circumferential alarm cover and can be locked in its final position. For this purpose, the alarm insert has a circumferential side wall which functions as a centring ring. The alarm cover can be mechanically interlocked on the alarm-holder, an interlocking cam formed on the alarm cover being guided, when the alarm is inserted, in an obliquely extending gate guide in an interlocking gate. The latter is disposed on the alarm cover in such a way that, when the alarm is inserted and

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twisted in, vertical lifting is achieved for contact-making purposes.

Apart from a certain risk of damage to the interlocking mechanism in the event of inexpert handling, both the interlocking mechanism with the interlocking gate and interlocking cam, and also the making of contact between the connecting block and contact pins by means of a vertical lifting movement lead to an increase in manufacturing costs, which is undoubtedly a disadvantage in the case of a mass-production product such as a fire alarm.

In particular, the making of contact by means of a vertical lifting movement increases the manufacturing costs. For on the one hand, a not insignificant constructional outlay is necessary in order to bring the contact pin strip, initially by a rotational movement of the alarm, into the correct position in which, although it is in alignment with the connecting block, it is nevertheless at a distance from the latter, and then to produce electrical contact in a gentle and yet reliable manner when the vertical lifting movement occurs. And on the other hand, this type of contact-making needs contact pins which are directed upwards from the printed circuit board in the vertical direction, a fact which makes it necessary to mount a separate component on the said printed circuit board. This, once again, requires an additional working step.

Through the invention, then, the alarm initially mentioned is to be improved in such a way that it is possible to attain a

noticeable reduction in the manufacturing costs, without the robustness or ease of handling of the alarm being impaired.

This object is achieved, according to the invention, through the fact that the printed circuit board is constructed as a plug-in card and has a contact strip, and that the insertion of the alarm insert in the alarm-holder takes place by means of a vertical movement and a subsequent horizontal displacement, an electrically conductive connection being produced between the connecting block and the contact strip when the horizontal displacement occurs.

The construction of the printed circuit board as a plug-in card has the advantage that no separate plug has to be mounted on the said printed circuit board, as a result of which the costs of the plug and the mounting thereof are saved. The insertion operation by means of a vertical lifting movement and a subsequent horizontal displacement means that the alarm is no longer twisted in but pushed in, which on the one hand facilitates the handling of the alarm and, on the other hand, necessitates less complicated gate guides. And as a result, the robustness of the alarm is increased vis-à-vis possible faults in the mounting thereof.

A first preferred form of embodiment of the fire alarm according to the invention is characterised in that the alarm-holder and the alarm insert have means which are associated with one another for guiding the alarm insert when it is pushed vertically into the alarm-holder. In a second preferred form of embodiment, the alarm insert is guided by

the aforesaid guide means both during the vertical movement and also during the horizontal displacement.

A third preferred form of embodiment of the fire alarm according to the invention is characterised in that the alarm insert has a defined contour on its side which carries the printed circuit board, and that the alarm-holder contains holding means which are adapted to this contour and into which the alarm insert can be pushed when the vertical movement occurs. A fourth preferred form of embodiment is characterised in that the alarm insert is provided with nose-like projections on the aforesaid contour, and that the holding means have guide gates for these projections.

A fifth preferred form of embodiment of the fire alarm according to the invention is characterised in that there is provided on the aforesaid contour of the alarm insert, preferably in the region of the plug associated with the connecting block, a coding which is specific to the particular type of alarm and which ensures that it is possible to fit into the particular alarm-holder only an alarm insert which is intended for it.

Another preferred form of embodiment of the fire alarm according to the invention is characterised in that the putting-on of the alarm cover takes place after the producing of the electrical connection between the connecting block and the contact strip and therefore after the insertion of the alarm insert. The alarm cover is preferably constructed as a means for locking the alarm insert in the alarm-holder and

engages, with its case, around the alarm insert in such a way that the latter is secured against horizontal displacement.

In the form of embodiment last mentioned, the alarm insert is pushed, without the alarm cover, into the alarm-holder as far as a stop and is then moved transversely to the alarm-holder. Since the printed circuit board is plugged into the connecting block when this movement occurs, the direction of movement is clearly visible to the operator. In addition, because the alarm cover has not yet been put on, a good overall view of the entire operation can be obtained and it can be constantly monitored. The alarm cover is not put on until the end.

The invention will be explained in greater detail below with the aid of an exemplified embodiment and the drawings, in which:

Figure 1 shows an exploded drawing, in perspective, of an alarm-holder and of an alarm insert in a fire alarm according to the invention, before the insertion of the insert in the holder;

Figure 2 shows a representation, in perspective, of an alarm-holder with an alarm insert pushed into the latter, the said alarm insert assuming an intermediate position; and

Figure 3 shows a representation, in perspective, of a complete fire alarm with the alarm-holder, the alarm insert in the final position, and the alarm cover.

Figure 1 shows, in the upper half, an alarm-holder 1 which is mounted on a ceiling, either directly onto a concealed box or else on the surface in conjunction with a suitable holder adjunct. The alarm-holder 1 consists of a base in the form of a round plate 2 which is provided, on its upper side which faces towards the ceiling, with fastening rails 3 and an edge covering 4, and has on its lower side, which is intended for receiving the alarm insert 5 represented in the lower half of figure 1, essentially a guide for the plugging-in of the alarm insert 5, and a connecting block 6. The guide consists of two mutually opposed guide blocks 7, each in two parts, which each have a guide gate 8 on their inner wall, and of a clip 9 for facilitating the pushing-in of the insert 5 into the holder 1.

The connecting block 6, which is disposed perpendicularly to the guide blocks 7 and opposite the clip 9, has a plug strip 10 which is intended for the pushing-in of a contact strip 11 on the alarm insert 5, which contact strip is orientated parallel to the plane of the disc 2. The guide blocks 7, the clip 9 and the connecting block 6 delimit the four sides of a rectangular plug socket, into which the alarm insert 5 can be plugged in the direction of the arrow A. Under these circumstances, the distance between the plug strip 10 and the clip 9 is greater than the corresponding dimension of the alarm insert 5.

Before the alarm insert is now described, it should be pointed out that the type of fire detection, which may for example be optical or thermal, is not essential to the

invention. The following description of an optical smoke alarm may therefore not be understood as constituting limitation to this type of alarm.

The alarm insert 5 represented essentially comprises a rectangular base body 12, which is provided, on its side which faces away from the alarm-holder 1, with a sensor system and, on its side which faces towards the said alarm-holder, with a printed circuit board with the evaluating electronics. The printed circuit card is disposed parallel to the plane of the base body 12. It is constructed as a plug-in card and contains contact lamellae which are integrated into the printed circuit and take over the function of the contact strip 11. The sensor system, which is disposed in an opto-electronic measuring chamber 13, contains a first casing 14 with a light source, a second casing 15 with a light-receiver, a diaphragm 16 and a so-called "labyrinth" 17. The diaphragm 16 and labyrinth 17 prevent light rays from being able to pass from the light source to the light-receiver in a direct way. The measuring chamber 13 is covered, at the bottom, by a lid which is not drawn in. The alarm insert 5 is provided, on its base body 12, preferably in the region of the contact strip 11, with a coding which is specific to the particular type of alarm. This coding is formed, for example, by mechanical elements such as ribs or grooves and ensures that it is possible to fit into the particular alarm-holder 1 only an alarm insert 5 which is intended for it.

That side of the base body 12 which contains the printed circuit board is preferably of box-like construction and has at least three side walls which enclose the printed circuit board on three sides and serve as mechanical protection and electrical screening for the said board. On the fourth side wall, which is at least partially open, the aforesaid contact strip 11 projects out of the base body 12. On two mutually opposed side walls of the base body 12, there are disposed, on the outside, two guide noses 18 in each case which are intended for engagement in the guide gates 8 of the guide blocks 7 on the alarm-holder 1. The chain-dotted lines between the guide noses 18 and the guide gates 8 indicate the mutual position of these elements when the alarm insert 5 is pushed into the alarm-holder 1. The reference symbol 19 designates a marking, which merely serves to facilitate understanding, on the base body 12.

The guide gates 8 are of essentially L-shaped construction and have a vertical and a horizontal leg. When the alarm insert 5 is plugged into the alarm-holder 1 in the direction of the arrow A, the guide noses 18 are pushed into the vertical leg of the guide gates 8 as far as the stop and are then displaced in the horizontal leg of the guide gates 8. Unerring pushing-in into the vertical leg is aided by the clip 9, in that the alarm insert 5 is applied, with one edge of the base body 12, against that leg of the clip 9 which is joined onto the plate 2, as a result of which positive guidance of the guide noses 18 into the gates 8 takes place.

Figure 2 represents that position which the alarm insert 5 assumes in the alarm-holder 1 after completion of the lifting movement in the direction of the arrow A (figure 1).

Attention should be paid to the position of the marking 19 on the associated guide block 7: the marking 19 lies exactly in front of an arrow located on the guide block 7. Attention should also be paid to the fact that the alarm insert 5 rests against the clip 9. Although, in the position represented, the alarm insert 5 is pushed fully into the alarm-holder 1 in the vertical direction (arrow A), there is nevertheless still no electrical contact between the plug strip 10 of the connecting block 6 and the contact strip 11, because the latter is not yet plugged into the plug strip 10.

Following the vertical movement in the direction of the arrow A, there now takes place a transverse movement of the alarm insert 5 in the direction of the arrow B, as a result of which the contact strip 11 of the printed circuit board is pushed into the plug strip 10 of the connecting block 6, and the alarm insert 5 passes into the position represented in figure 3. In this position, the alarm insert 5 is secured against falling out of the alarm-holder 1 by the guide noses 18 which are held in the horizontal leg of the guide gates 8. Attention should be paid, in the figure, to the distance between the marking 19 and the arrow on the guide block 7, and between the clip 9 and the adjacent side wall of the alarm insert 5.

Since the alarm insert 5 is inserted in the alarm-holder 1 without the alarm cover, the insertion operation can be

monitored visually. Since it is possible to clearly see both the connecting block 6 of the alarm-holder 1 and also the contact strip with the contact lamellae, which projects laterally out of the alarm insert 5, the correct position of the alarm insert for insertion in the alarm-holder 1 is clearly indicated to the operator. After the insertion of the alarm insert 5, the alarm cover, which is drawn in in broken lines in figure 3 and is designated by the reference symbol 20, is additionally put on and fixed. This latter operation preferably takes place by engaging or snapping the cover 20 into corresponding fixing organs on the alarm-holder 1.

For this purpose, the alarm-holder 1 has, in the region of the connecting block 6 and in fact preferably at the level of the fastening rails 3 (figure 1), projections (not represented) which protrude radially from the plate 2 and are intended to engage in corresponding recesses in the alarm cover 20. In addition, the clip 9 is of elastic construction and has, on its outer leg, projections 21 which are likewise intended to engage in corresponding recesses in the alarm cover 20. The putting-on of the alarm cover 20 now takes place through the fact that the said alarm cover is first of all hooked into the projections protruding radially from the plate 2 and is then engaged in the projections 21 in a pivoting movement. In order to remove the alarm cover 20, the latter is released by pressure on the projections 21.

The alarm cover is constructed as a means of locking the alarm insert 5 in the alarm-holder 1, so that the electrical

connection between the plug strip 10 and the contact strip 11 cannot be interrupted unintentionally, for example as a result of vibrations. For this purpose, the case of the alarm cover 20 is shaped in such a way that the said cover engages around the alarm insert 5 relatively tightly at a suitable point. This point is, according to the representation, the edge of the lower face of the base body 12, which face carries the sensor system.

Patent claims

1. Automatic fire alarm which has an alarm-holder (1) having a connecting block (6), and also an alarm cover (20) and an alarm insert (5) which can be inserted in the alarm-holder (1) and has a printed circuit board with evaluating electronics, a sensor system (13) and a plug which is associated with the connecting block (6), characterised in that the printed circuit board is constructed as a plug-in card and has a contact strip (11), and that the insertion of the alarm insert (5) in the alarm-holder (1) takes place by means of a vertical movement (A) and a subsequent horizontal displacement (B) of the alarm insert (5), an electrically conductive connection being produced between the connecting block (6) and the contact strip (11) when the horizontal displacement occurs.
2. Fire alarm according to claim 1, characterised in that the alarm-holder (1) and the alarm insert (5) have means which are associated with one another for guiding the alarm insert (5) when it is pushed vertically into the alarm-holder (1).
3. Fire alarm according to claim 2, characterised in that the alarm insert (5) is guided by the aforesaid guide means both during the vertical movement and also during the horizontal displacement.
4. Fire alarm according to claim 3, characterised in that the alarm insert (5) has a defined contour on its side which



carries the printed circuit board, and that the alarm-holder (1) contains holding means (7) which are adapted to this contour and into which the alarm insert (5) can be pushed when the vertical movement occurs.

5. Fire alarm according to claim 4, characterised in that the alarm insert (5) is provided with nose-like projections (18) on the aforesaid contour, and that the holding means (7) have guide gates (8) for these projections.

6. Fire alarm according to claim 4 or 5, characterised in that there is provided on the aforesaid contour of the alarm insert (5), preferably in the region of the plug associated with the connecting block (6), a coding which is specific to the particular type of alarm and which ensures that it is possible to fit into the particular alarm-holder (1) only an alarm insert (5) which is intended for it.

7. Fire alarm according to claim 6, characterised in that the coding is formed by mechanical elements, such as ribs and/or grooves.

8. Fire alarm according to claim 5, characterised in that the alarm insert (5) has a rectangular contour on the aforesaid side, and that the holding means on the alarm-holder (1) are formed by guide blocks (7) disposed on two opposite sides of the alarm insert (5).

9. Fire alarm according to claim 8, characterised in that there are disposed on the alarm-holder (1), on the other



sides of the alarm insert (5), on the one hand the connecting block (6) and, on the other hand, a guide clip (9) for positioning the alarm insert (5) in the longitudinal direction of the guide blocks (7).

10. Fire alarm according to one of claims 1 to 9, characterised in that the putting-on of the alarm cover (20) takes place after the producing of the electrical connection between the connecting block (6) and the contact strip (11) and therefore after the insertion of the alarm insert (5).

11. Fire alarm according to claim 10, characterised in that the alarm cover (20) is constructed as a means for locking the alarm insert (5) in the alarm-holder (1) and engages, with its case, around the alarm insert (5) in such a way that the latter is secured against horizontal displacement.

12. Fire alarm according to claims 9 and 10, characterised in that the alarm cover (20), when put on, is engaged or snapped in on the alarm-holder (1), the guide clip (9) for positioning the alarm insert (5) forming part of the fastening system for the alarm cover (20).

