

12

EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

21 Application number: **86904401.6**

51 Int. Cl.³: **G 08 B 17/10**

22 Date of filing: **22.07.86**

Data of the international application taken as a basis:

86 International application number:
PCT/JP86/00388

87 International publication number:
WO87/00667 (29.01.87 87/03)

30 Priority: **22.07.85 JP 111991/85**

43 Date of publication of application:
26.08.87 Bulletin 87/35

84 Designated Contracting States:
CH DE FR GB LI

71 Applicant: **Nohmi Bosai Kogyo Kabushiki Kaisha**
No. 7-3, Kudan Minami 4-chome
Chiyoda-ku Tokyo 102(JP)

72 Inventor: **OHWASI, Etsuichi Nohmi Bosai Kogyo**
Kabushiki Kaisha
7-3, Kudan Minami 4-chome
Chiyoda-ku Tokyo 102(JP)

74 Representative: **Jochem, Bernd,**
Dipl.-Wirtsch.-Ing. et al,
Patentanwälte Beyer & Jochem Postfach 17 01 45
D-6000 Frankfurt/Main(DE)

54 **FRAME ASSEMBLY OF A PHOTOELECTRIC SMOKE SENSOR.**

57 A frame assembly wherein a frame (11) is large enough to cover the whole shield plate (10), and the frame (11) is engaged with and supported by a base plate (2) via the shield plate (10), to make it possible to simply and quickly assemble a photoelectric smoke sensor in which the frame (11) having a light-emitting unit (14) and a light-receiving unit (15) is secured to the base plate (2) via the shield plate (10).

FRAME ASSEMBLY FOR A PHOTOCELL-TYPE SMOKE DETECTOR

Technical Field

The present invention relates to a light-scattering or light-reducing type photocell-type smoke detector, and more particularly to a frame assembly for a photocell-type smoke detector.

Background Art

As a photocell-type smoke detector there are two types, i.e. a light-scattering-type in which smoke entering a dark box scatters a light beam from a luminescent part so that light reaches the light receiving part, and the other is a light-reducing type in which smoke entering the dark box shields the light beam from the luminescent part so that the light beam cannot reach the light receiving part. In both types there are provided a frame having a luminescent part and a light receiving part, and a shield plate to shield from outside noise, the frame being screwed to the base of the detector with the shield plate which forms the upper surface of the dark box intervening therebetween.

Thus, since in the conventional photocell-type smoke detector the frame and the shield plate are secured to the base by means of screws assembly is troublesome and it takes a long time, reducing productivity. Further, the

shield plate used as an upper surface of the dark box is made of a metallic plate taking account of its function, and since it is formed so as to have a larger dimension than the frame there exists a portion that is not covered by the frame, this portion reflecting the light beam. Therefore, in order to prevent such reflection a dark paint for absorbing light must be applied to the shield plate, so time for the assembly process is further increased.

Description of the Invention

In view of the above circumstances it is a principal object of the present invention to provide a frame assembly for a photocell-type smoke detector which allows a simple and rapid assembly to reduce the optical processes so as to improve productivity.

In order to attain this object, in accordance with the present invention, in a photocell-type smoke detector in which a frame having a luminescent part and a light receiving part is secured to the base of the detector with a shield plate being intervened therebetween a frame assembly is provided in which the frame is dimensioned to cover the whole of the surface of the shield plate, and the engaging holes are formed therein in order for elastic engaging members previously formed on the base to pass therethrough, hook portions formed on the elastic engaging

members being adapted to engage the stepped portions formed at the peripheries of the engaging holes in the frame so that the frame can be firmly secured to the base with the shield plate intervening between the base and the frame.

Since the frame assembly for a photocell-type smoke detector in accordance with the present invention has such a constitution as stated above, on assembly, after the shield plate is put on the base, when the frame is put on the shield plate the engaging members of the base pass through the holes for the engaging members formed in the frame, the hook portions formed on the engaging members engage the stepped portions formed around the peripheries of the holes so that the frame is securely fixed to the base with the shield plate intervening therebetween, and at the same time the whole of the shield plate is covered by the frame.

Brief Description of the Drawings

Fig. 1 is a vertical sectional view of one embodiment of the present invention;

Fig. 2 is a plan view of the base shown in Fig. 1;

Fig. 3 is a plan view of the shield plate shown in Fig. 1; and

Fig. 4 is a plan view of the frame shown in Fig. 1.

Best Mode for Carrying Out the Invention

Now the present invention will be explained in reference to the attached drawings wherein is indicated one embodiment of the present invention.

Referring now to Fig. 1 of the drawings wherein the reference numeral 1 indicates a photocell-type smoke detector embodying the present invention, the detector illustrated being a light-scattering type. Numeral 2 is a base of the detector which has an integral shield case 3 and printed circuit board 4. The base 2 is, as shown in Figs. 1 and 2, provided with receiving portions 5 for receiving the terminals of a luminescent element and a light receiving element, a pair of engaging holes 7 for elastically engaging and holding the hook portions of a dark box 6, the holes 7 being oppositely disposed radially, and a pair of elastic engaging members 8 similarly oppositely disposed radially. These engaging members 8 are elastically deformable and have hook portions 9 formed at their end portions, respectively, each projecting radially inwards. A frame 11 is secured to the base 2 with a shield plate 10 intervening therebetween. The shield plate 10 is, as shown in Fig. 3, made of a circular metallic plate having a diameter d , and this shield plate 10 is, as shown in Figs. 1 and 3, formed with a pair of holes 12 for introducing the engaging members 8 formed on the base 2, and receiving holes

13 for inserting the projecting portions of a luminescent part 14 and a light receiving part 15 provided on the frame 11, respectively. The frame 11 is, as shown in Figs. 1 and 4, of a circular disk configuration having the same diameter d as that of the shield plate 10 so as to wholly cover the shield plate 10, and is provided at its under surface with the luminescent part 14 and the light receiving part 15, a pair of holes 16 for receiving the engaging members 8 formed on the base 2 being formed so as to pass them therethrough.

The optical axes of the luminescent part 14 and the light receiving part 15 are inclined so as to intersect at a predetermined angle. On the radially inward edges of the holes 16 for the engaging members 8 are formed stepped portions 17, respectively, to engage the hook portions 9 of the engaging portions 8, respectively. The black box 6 comprises, as shown in Fig. 1, a protect cover 18, an insect screen 19, and a labyrinth 20, and it is in communication with the atmosphere. Further, in Fig. 1 the reference numeral 21 indicates a monitoring space, 22 a lens mounted in front of the luminescent element, and 23 a ceiling to which the smoke detector 1 is mounted.

Next the operation of the present invention having such a constitution as stated above will be explained.

First the shield plate 10 is put on the base 2 and the engaging members 8 of the base 2 are introduced into the holes 12 formed in the shield plate 10. Thereafter the frame 11 is placed on the shield plate 10 by passing the engaging members 8 formed in the base 2 through the holes 16 formed in the frame 11 respectively. The hook portions 9 of the engaging members 8 of the base 2 are therefore elastically radially urged outwards by the inner peripheries of the holes 16 for the engaging members 8, respectively, and upon passing through the holes 16, the hook portions 9 project over the surface of the frame 11, and the hook portions 9 abut the stepped portions 17 owing to their elastic, thus firmly pressing and securing the frame 11 to the base 2 by the engagement of the engaging members 8 with the stepped portions 17 of the frame 11. At the same time the shield plate 10 is interposed between the frame 11 and the base 2, and the whole surface of the shield plate 10 is covered by the frame 11.

It will be appreciated that the present invention is not limited to the embodiment described above and illustrated. For example, the elastically deformable hook portions 9 of the base 2 and the stepped portions 17 formed around the holes 16 of the frame 11 to be engaged by them may instead be provided on the frame 11 and on the base 2, respectively.

Since the present invention has such a constitution and operation the frame can be secured to the base with the shield plate intervening therebetween by merely putting the shield plate on the frame and urging them against the base. Therefore, since in accordance with the present invention no screwing is required for assembly contrary to the conventional smoke detector of this kind the assembly can be done simply and rapidly, remarkably improving the productivity. Further, since the frame entirely covers the surface of the shield plate the plate need not be darkly coloured to absorb light contrary to the conventional smoke detectors of this kind, such painting operation being eliminated to thereby increases productivity.

CLAIMS

1. A frame assembly for a photocell-type smoke detector wherein a frame (11) provided with a luminescent part (14) and a light-receiving part (15) is secured to a base (2) through a shield plate (10), characterized in that said frame (11) has a dimension (d) to wholly cover the shield plate (10), and that means is provided which serves to fasten said frame (11) to said base (2) with said shield plate (10) intervening therebetween.

2. A frame assembly for a photocell-type smoke detector as claimed in claim 1 wherein said means to fasten said frame (11) to said base (2) comprises a pair of elastically deformable engaging members (8) formed on said base (2), each member having a hook portion (9) formed at its end portion, holes (16) being formed in said frame (11) for passage of said engaging members (8) so as to enable said hook portions (9) to pass therethrough, and stepped portions (17) formed on the peripheries of said holes (16) so as to engage said hook portions (9).

3. A frame assembly for a photocell-type smoke detector as claimed in claim 1 wherein said means to fasten said frame (11) to said base (2) comprises a pair of elastically deformable engaging members formed on said frame (11), each member having a hook portion formed at its end portion,

holes being formed in said base (2) for passage of said engaging members so as to enable said hook portions to pass through them, and stepped portions formed in said base (2) on the peripheries of said holes so as to engage said hook portions.

4. A frame assembly for a photocell-type smoke detector as claimed in claim 1 wherein said shield plate (10) is formed with holes (12) for passage of said engaging members (8) which serve to enable said hook portions (9) of said engaging members (9) formed on said base (2) to pass there-through.

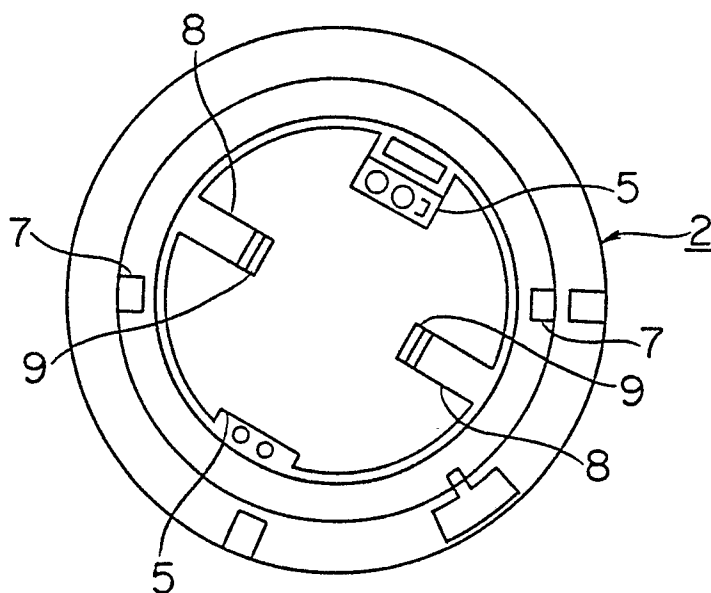
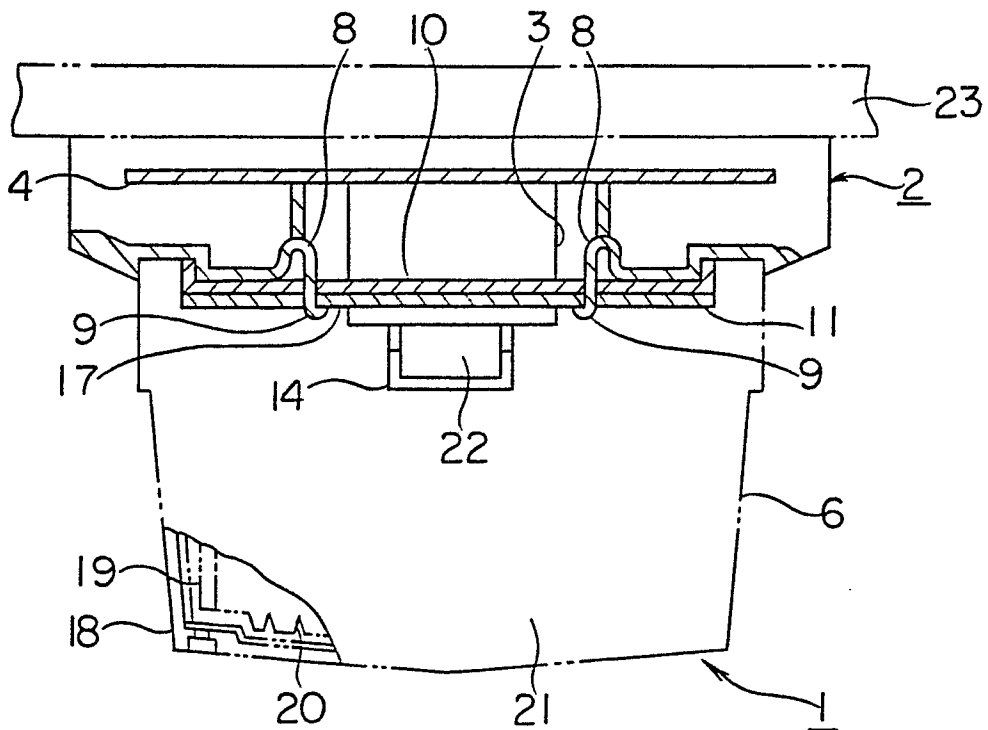


FIG. 3

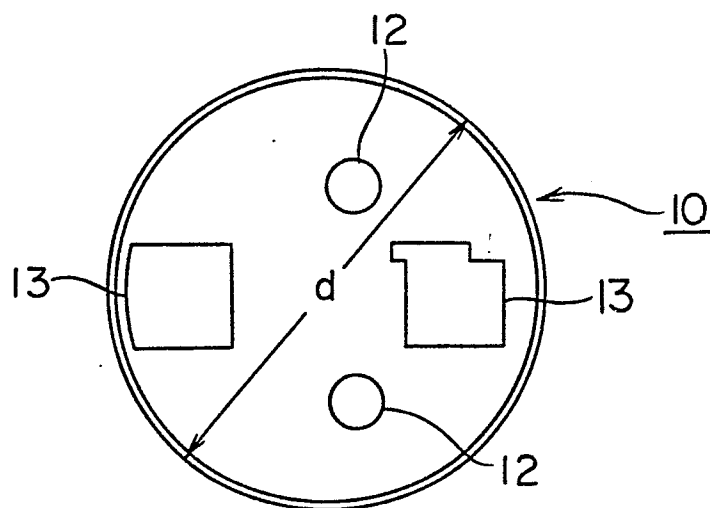
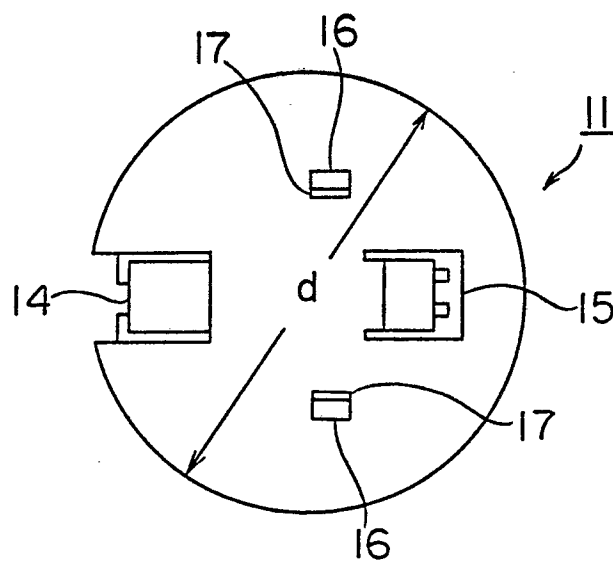


FIG. 4



INTERNATIONAL SEARCH REPORT

International Application No.

PCT/JP86/00388

0233294

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. ⁴ G08B17/10		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
IPC	G08B17/10	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁴		
Jitsuyo Shinan Koho		1933 - 1986
Kokai Jitsuyo Shinan Koho		1971 - 1986
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴		
Category ¹	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁴
Y	JP, U, 54-136981 (Matsushita Electric Works, Ltd.) 22 September 1979 (22. 09. 79) (Family: none)	1 - 4
Y	JP, Y2, 58-12316 (Cybernet Kogyo Kabushiki Kaisha) 9 March 1983 (09. 03. 83) (Family: none)	1 - 4
Y	JP, Y2, 57-21119 (Matsushita Electric Works, Ltd.) 7 May 1982 (07. 05. 82) (Family: none)	1 - 4
¹⁸ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "Z" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ²		Date of Mailing of this International Search Report ²
October 3, 1986 (03. 10. 86)		October 20, 1986 (20. 10. 86)
International Searching Authority ¹		Signature of Authorized Officer ¹⁹
Japanese Patent Office		