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(54) **Lighting apparatus**

(57) A lighting apparatus comprises a number of open square frame modules 10 releasably connected to each other in a row by sprung rivots 14. The modules have a pair of apertures 11 in each side to enable the modules to be connected in a chosen composite array (e.g. rows, columns, or combinations thereof) initially or

changed from time to time. A light fitting 15, only one is shown in the Figure, is pivotably supported in each module by opposing sprung stub axle clips. This allows the light fitting 15 to be easily removed for bulb replacement. The apparatus is provided with support arrangements that include anchor brackets 17 and wall brackets 21.

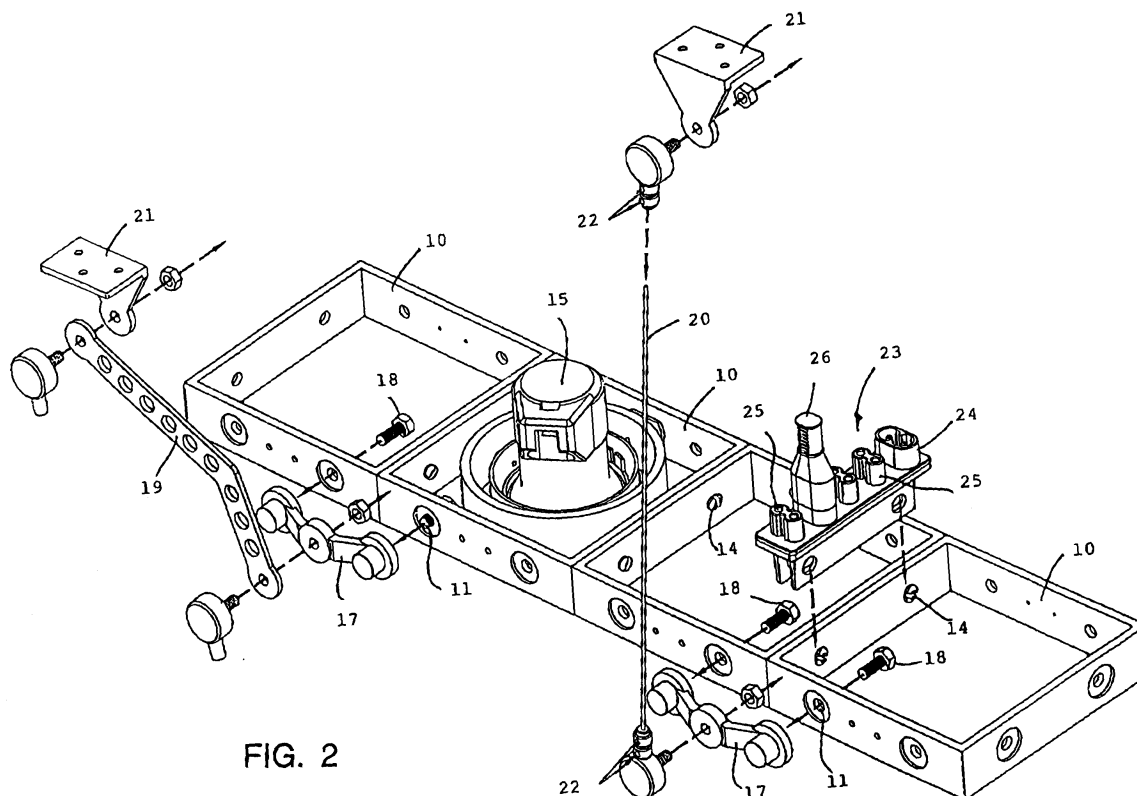


FIG. 2

Description

[0001] The invention relates to lighting apparatus.

[0002] For homes, offices, shops and other lighting it is known to provide lighting consisting of a number of separate electric light fittings mounted in modules and supported by brackets or tracks. The modules may be movable and the fittings may be swivable within the modules. At present such modules, when provided in a composite structure for multiple use, are normally permanently joined together in a predetermined fixed array. For maintenance, and in particular for changing bulbs as usually required from time to time, multiple modules may require partial disassembly or are at least physically awkward for carrying such operations. This is accentuated in practice as the lighting apparatus itself is often difficult to reach being usually mounted adjacent a ceiling or at an elevated point well above the ground.

[0003] It is an object of the invention to overcome or at least reduce one or both of these problems.

[0004] According to the invention there is provided a lighting apparatus comprising a plurality of individual light fitting support modules joined together to provide a composite array for mounting lights in a position of need, in which each module comprises a rectangular frame arranged to be releasably joined and held firmly together at least partially along one of its sides to another of the modules.

[0005] Each module preferably comprises a square frame.

[0006] The one of its sides may be integrally formed with a lip to receive a clip that holds the frame to the array.

[0007] At least the one of the sides may be formed with apertures to receive module joining means.

[0008] Each module includes a light fitting supporting bracket that is preferably releasably mounted to the module. The supporting bracket may pivotably hold the light fitting to the module.

[0009] The lighting apparatus may include flexible power cables for supplying each light that are held by clips mounted to the array.

[0010] The frames are preferably made of stainless steel.

[0011] Lighting apparatuses according to the invention will now be described by way of example with reference to the accompanying drawings in which :

Figure 1 is a top isometric view of three modules joined together;

Figure 2 is a top isometric view of four modules joined together;

Figure 3 is a top isometric view of one module;

Figure 4 is a bottom isometric view of one module with a light fitting separated from the module;

Figure 5 is a top exploded view of five modules;

Figure 6 is a top isometric view of three modules;

Figure 7 is a top isometric view of two modules;

Figure 8 is a bottom isometric view of a different module; and

Figure 9 is a top isometric view of two of the different modules.

[0012] Embodiments of the invention are lighting apparatuses made up of a plurality of various like support modules. Each module supports an individual light fitting which is itself includes a reflector support bracket, a bulb, which may be incorporated with the reflector, and electrical connections. The modules each comprise a rectangular (preferably square) frame that is joined in use along one side of the frame to along a side of another adjacent frame (or in some cases to or by a spacer, as in Figures 6 and 7 for example). Provision is made to connect to enable all sides of the frames to receive connecting means so that different chosen arrays of using same modules can be made up and releasably joined together according to a user's requirements.

[0013] Referring to the drawings, in Figure 1 each support module 10 consists of an open square stainless steel frame having two apertures 11 formed in each side. Each aperture 11 is formed with a cavity 12 to receive and surround a shoulder 13 of a sprung rivot 14 (see Figure 5) so that the sides of the frames can be releasably held firmly together against one another along their lengths.

[0014] Each module supports a light fitting 15 (only one is shown in Figure 1), in a manner explained more fully below with reference to Figures 3 and 4. Electrical cable clips 16 are mounted to the modules as indicated in the drawing and are shaped to hold respective modules together when in position for use. The cable clips are held in position by the rivots 14 and can be removed from the modules when the rivots 14 have been withdrawn.

[0015] In Figure 2, the same modules 10 are joined together in an array of four modules in a row. Figure 2 shows two kinds of mounting arrangements for the lighting apparatus. Each mounting arrangement includes an anchor bracket 17 that is held to a pair of adjacent modules by bolts 18 that pass through respective of the apertures 11. This means that the anchor brackets 17 can also serve to hold the modules 10 together. It will be noted that no special fixings are required as the apertures 11 are already provided at the correct positions in the modules 10 to receive the anchor brackets 17 and the bolts 18. The mounting arrangements either have two arms 19 or two stiff wire connectors 20 (or may have one of each as shown in the Figure) extending between the anchor brackets 17 and wall mounting brackets 21.

It will be appreciated that the described mounting arrangements permit a considerable degree of flexibility in the separation and orientation of the lighting apparatus relative to any wall or other like structure to which the brackets 21 are fixed in use. In this respect, it is relatively easy to cut a suitable length for the wire connector 20 (or shorten the wire when required), as the ends of the wire connector 21 are fixed in position by grub screws 22.

[0016] Figure 2 also shows a power distribution panel 23 that includes a socket 24, for receiving external power, and four outlets 25 for the light fittings, one of the outlets is shown with a plug 26 in position. Flexible cables not shown extend from the plugs 26 to each respective light fitting in use and are held in position by suitable cable push-in clips 16 shown in Figure 1. It will be noted that the panel 23 fits over the sides of one pair of modules 10 and will be held in position by the spring clips 14.

[0017] In Figures 3 and 4, it can be seen how each light fitting 15 is mounted to its module 10. Inwardly protruding stub axle spring clips 27 are held by fixed rivots to opposite sides of the module 10 to receive axles 28 mounted to an outer ring 29. An inner ring 30 is pivotably connected to the outer ring to allow swivelling actions indicated by dotted arrows in Figure 3. (Thus, the two rings 29 and 30 provide in effect a "universal coupling" between each of the light fittings 25 and the modules 10.)

[0018] Importantly, as shown in Figure 4, the light fittings can be readily removed. If the power supply cable (not shown) is unclipped and is provided with enough slack, the light fitting can be partially removed. If the power cable is unplugged, the light fitting can be completely removed. In any event, the light fitting 15 can be easily released and removed (using only one hand, say) for maintenance, and more usually and conveniently for replacing a faulty light bulb. When the maintenance has been carried out or a new bulb has been fitted, the light fitting 15 is pressed into and clipped back in position in the module 10.

[0019] It will be appreciated that in many commercial applications and/or when there are many lights in use, it is often a matter of routine maintenance to replace all bulbs, whether they are faulty or not, after a certain life span somewhat shorter than their predicated normal lives. The described light fitting removable mountings significantly reduces the time and the effort required to change the bulbs.

[0020] Also shown in Figure 4 are a number of "dummy" sprung rivots 31. The rivots 21 are provided principally for aesthetic reasons. The rivots 31 are normally made of suitable plastics material (as indeed the rivots 14 might be) and coloured the same as the colour of the material of the modules 10. The rivots 31 therefore visually obscure the cavities 12 of unused apertures 11. When preferred of course, the rivots 14 may be made of a contrasting colour material to provide a colour pattern effect for the exposed sides of the modules 10.

[0021] Figure 5 shows five modules 10 in a cross shaped array. Only one light fitting 25 is shown in the Figure. The modules 10 are releasably fixed together as before, using the sprung rivots 14. Power cable clips and a distribution panel (not shown) will normally be provided, as explained with reference to earlier Figures.

[0022] Figure 6 shows a somewhat different array of modules 10, again only one light fitting 15 is shown. An open triangular spacer 32 is placed between two modules. The spacer has suitably positioned apertures 33 to receive the sprung rivots 14. Likewise, Figure 7 shows another different form of array using a narrow triangular spacer 34 that is connected to the modules 10 by the sprung rivots 14.

[0023] Any number of the modules 10 can be releasably connected together to form chosen arrays as explained, and using if required spacers such as the triangular spacers 32 and 34. In each case, the same like modules can be manufactured and provided to allow the user to form his own chosen arrays. The user may also change the array from time to time if he wishes, because the modules 10 can be readily disconnected. This is also the case if the modules 10 are fixed together in practice by nuts and bolts, or other releasable connecting means. The described sprung rivots (or poppets) 14 however have the advantage that they enable the modules to snap together and be pulled apart without the use of hand tools.

[0024] It will be noted that one module, say, in an array may be used to support a transformer instead of a light fitting. A transformer is often be required because many lighting bulbs require a low voltage direct current power supply. In that case, a transformer and distribution panel are mounted in the one module and suitable power supply cables connect to the light fittings from the distribution panel. The module used for supporting the transformer normally has an otherwise "standard" frame 10 (or could be in the form of a spacer, such as spacer 32) so that the "transformer" module can be releasably connected anywhere in the array to the other frames 10 in the manner described above.

[0025] In Figures 8 and 9, the support modules comprise square plate-like frames 35 which can be joined together to each other to form various arrays. Each light fitting 36 (which could be the same as light fitting 15) is pivotably supported by a U-shaped bracket 37 that swivably fits to an aperture 38 in the centre of the frame 35. The bracket 37 is connected to the frame by a flexible hollow plastic plug 39 that is held in the aperture 38. The bracket 37 can be pushed upwards so that an aperture (not shown) in the base of the U slides over the plug 39 and into a peripheral groove formed on the plug. To remove the bracket 39, a lower end of the plug is squeezed closed and the bracket slipped out of the peripheral groove to allow the bracket to slide downwards and off the plug 39. This action can normally be achieved by using only one hand if necessary.

[0026] Figure 9 shows how two modules 35 are held

together by a clip 40 that fits under integrally formed lips 41 of the modules 35. The lips 41 extend along each side of the modules 35 so that the modules can be connected together, along any and each of its sides to another module, to make up different shaped arrays when required.

[0027] A power supply distribution panel 42 (generally similar to the panel 23 in Figure 2) is mounted in use to a platform 43 that is held to an upper tongue 44 of the clip 40 by screws 41. The lower edge of the platform 43 bears down against top surfaces of the modules 35 to hold the top surfaces in a common plane. When the platform is removed the top surfaces can be tilted to release the clip 40 from the lips 41 and separate the modules from one another.

[0028] The modules 35 can be releasably fitted together as described and made up into various arrays. Suitable triangular or other shaped spacers may be used if required. As before, lighting apparatuses using the modules 35 and the brackets 37 enable the user to make up and change the arrays as desired. The light fittings 36 being easily removed, with the bracket 37, enable servicing and bulb replacement to be carried out without difficulty.

[0029] It will be understood that the frames 10 are preferably square but other rectangular forms may be used. Such non-square forms still enable the sides of modules to be connected against and along at least parts of their lengths to form aesthetically pleasing and robust composite structures. Rectangular (including square) frames may be connected in "stepped" arrays such that a common side of the array is stepped in one direction or the other, for example. The frames may be made wholly or partly of suitable plastics material or of metals other than stainless steel.

5. A lighting apparatus according to any of claims 1 to 4, in which each module includes a light fitting supporting bracket that is releasably mounted to the module.

6. A lighting apparatus according to claim 5, in which the supporting bracket pivotably holds the light fitting to the module.

7. A lighting apparatus according to any of claims 1 to 6, including flexible power cables for supplying each light that are held by clips mounted to the array.

8. A lighting apparatus according to any of claims 1 to 7, in which the frames are made of stainless steel.

Claims

1. A lighting apparatus comprising a plurality of individual light fitting support modules joined together to provide a composite array for mounting lights in a position of need, in which each module comprises a rectangular frame arranged to be releasably joined and held firmly together at least partially along one of its sides to another of the modules.
2. A lighting apparatus according to claim 1, in which each module comprises a square frame.
3. A lighting apparatus according to claim 1 or 2, in which one of its sides is integrally formed with a lip to receive a clip that holds the frame to the array.
4. A lighting apparatus according to claim 1 or 2, in which at least the one of the sides is formed with apertures to receive module joining means.

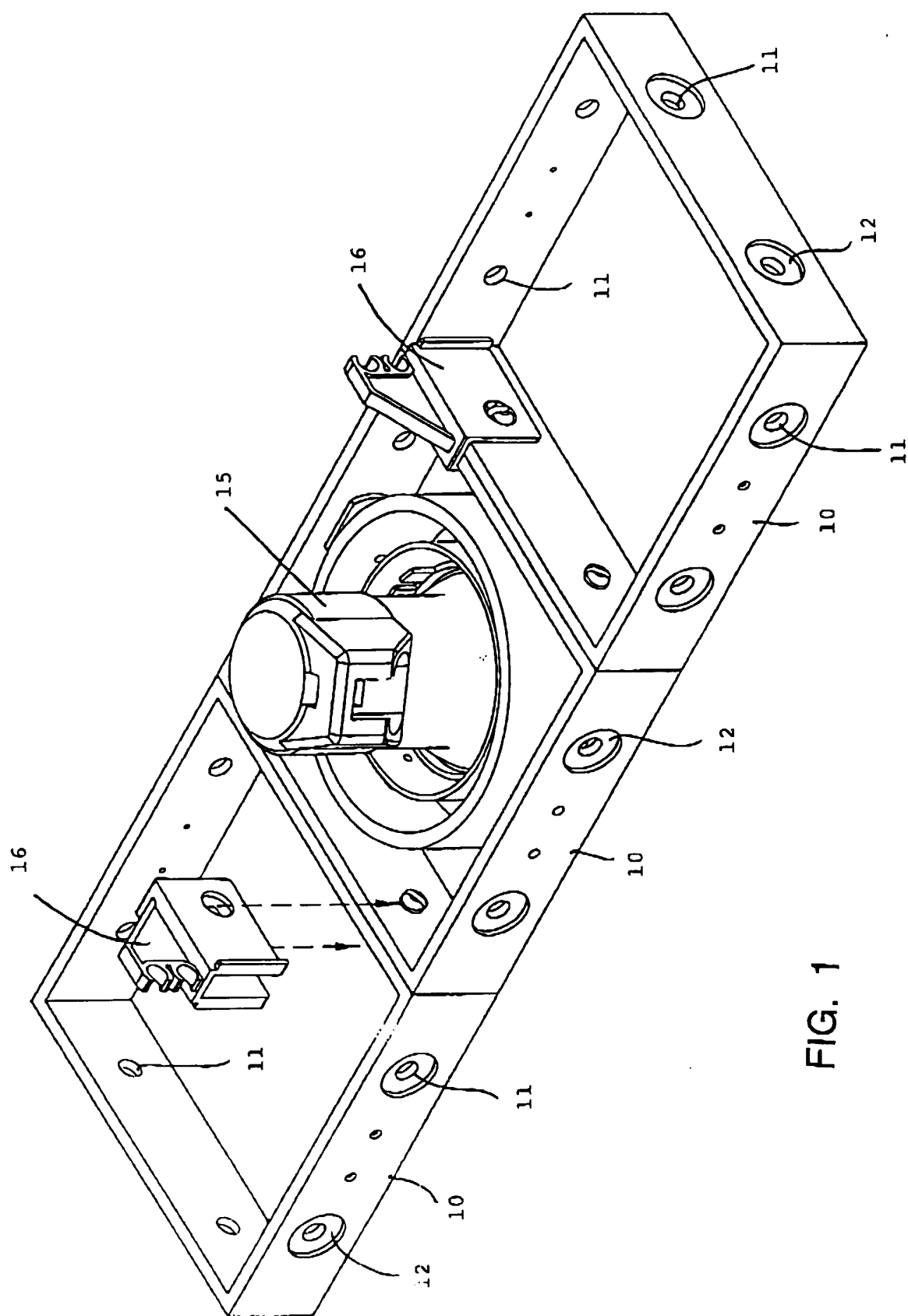


FIG. 1

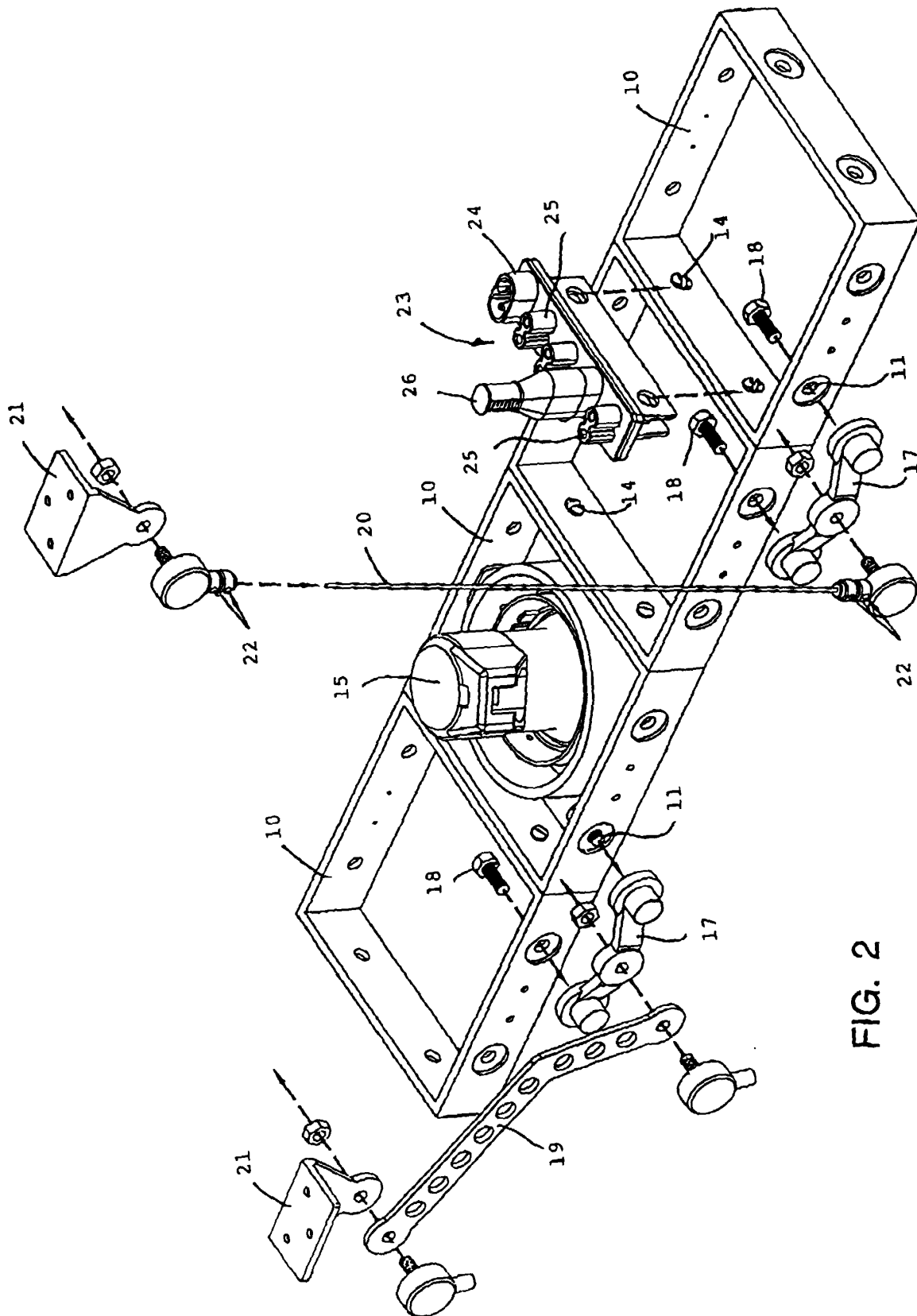
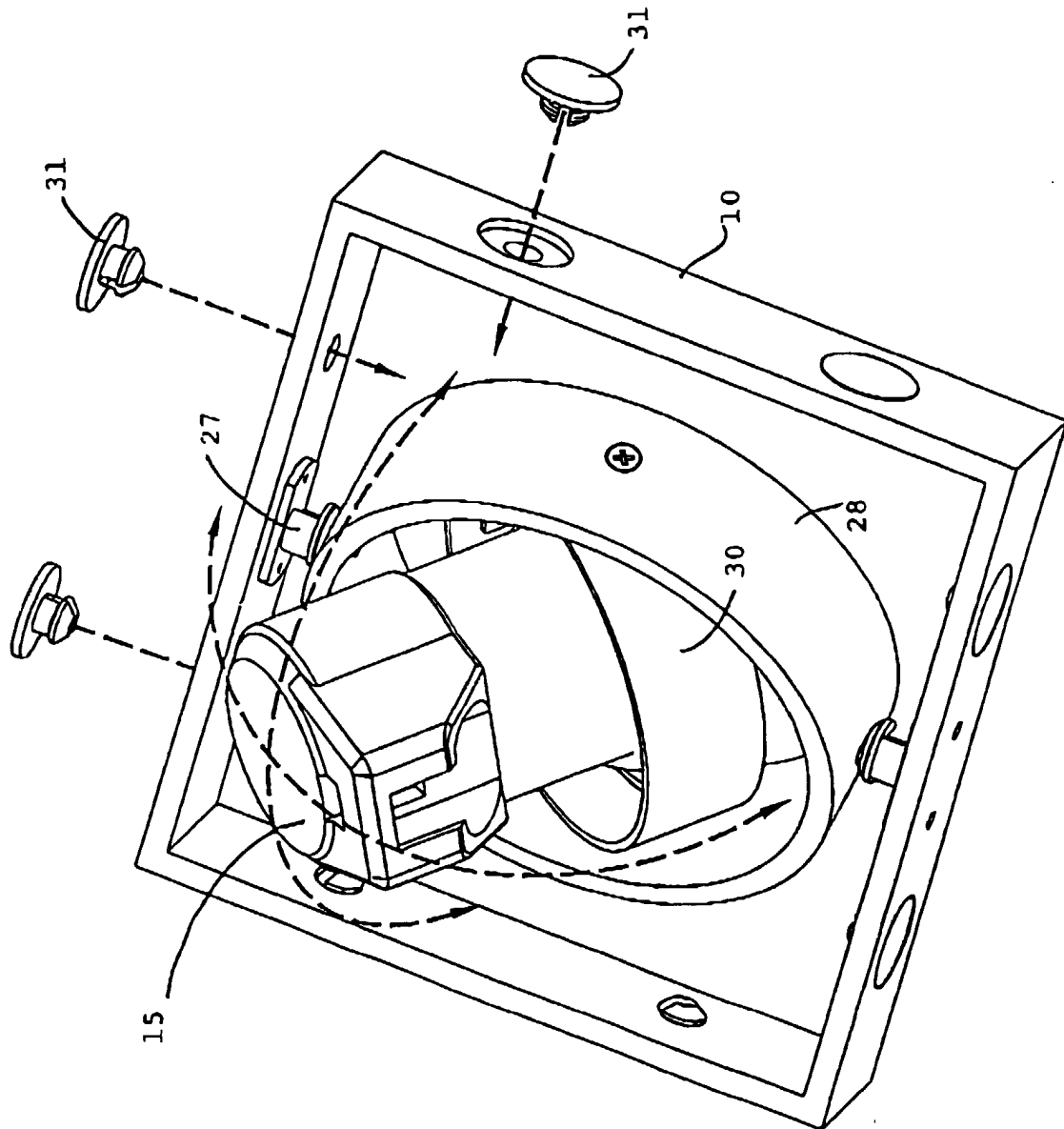


FIG. 2

FIG. 3



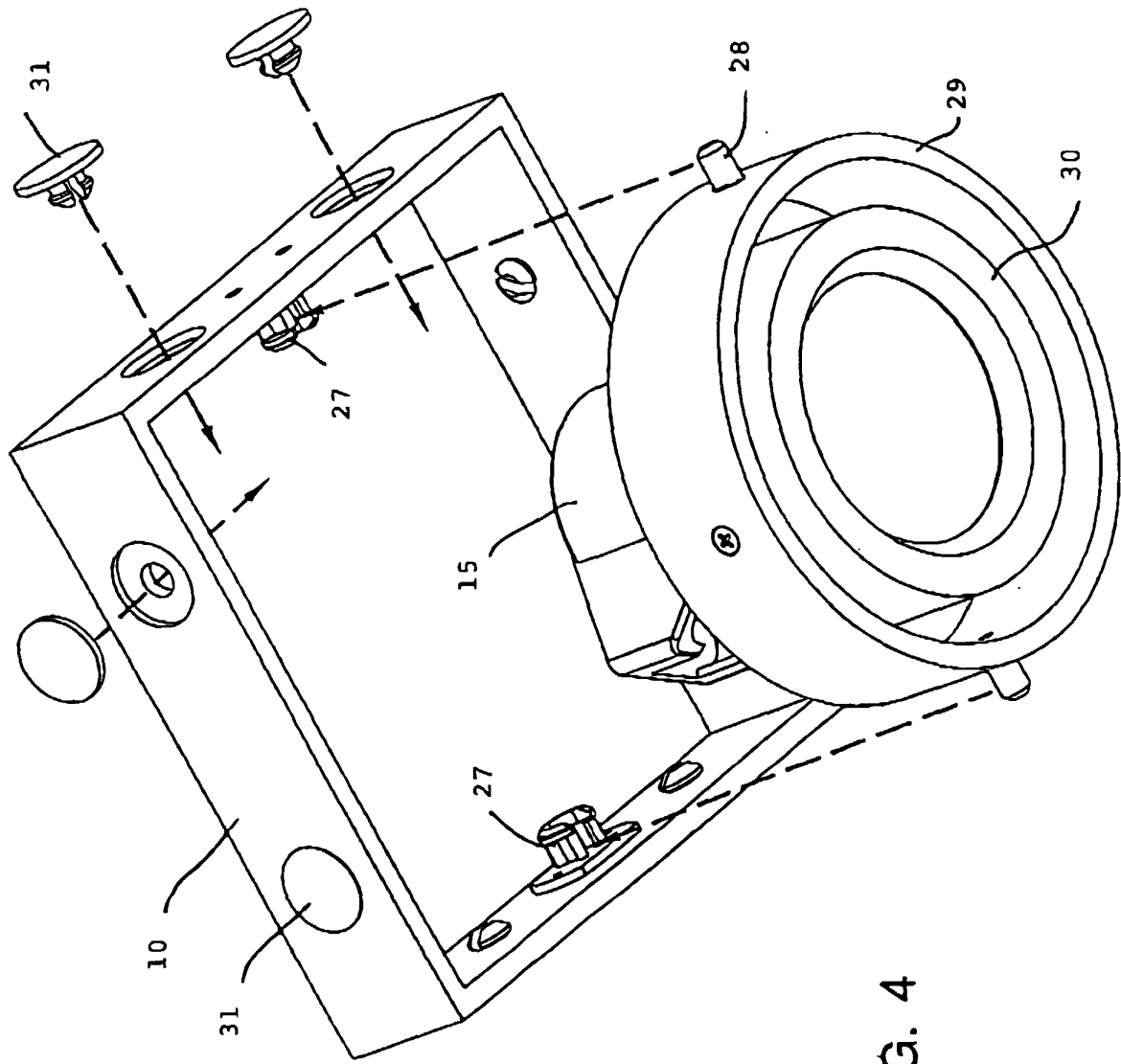


FIG. 4

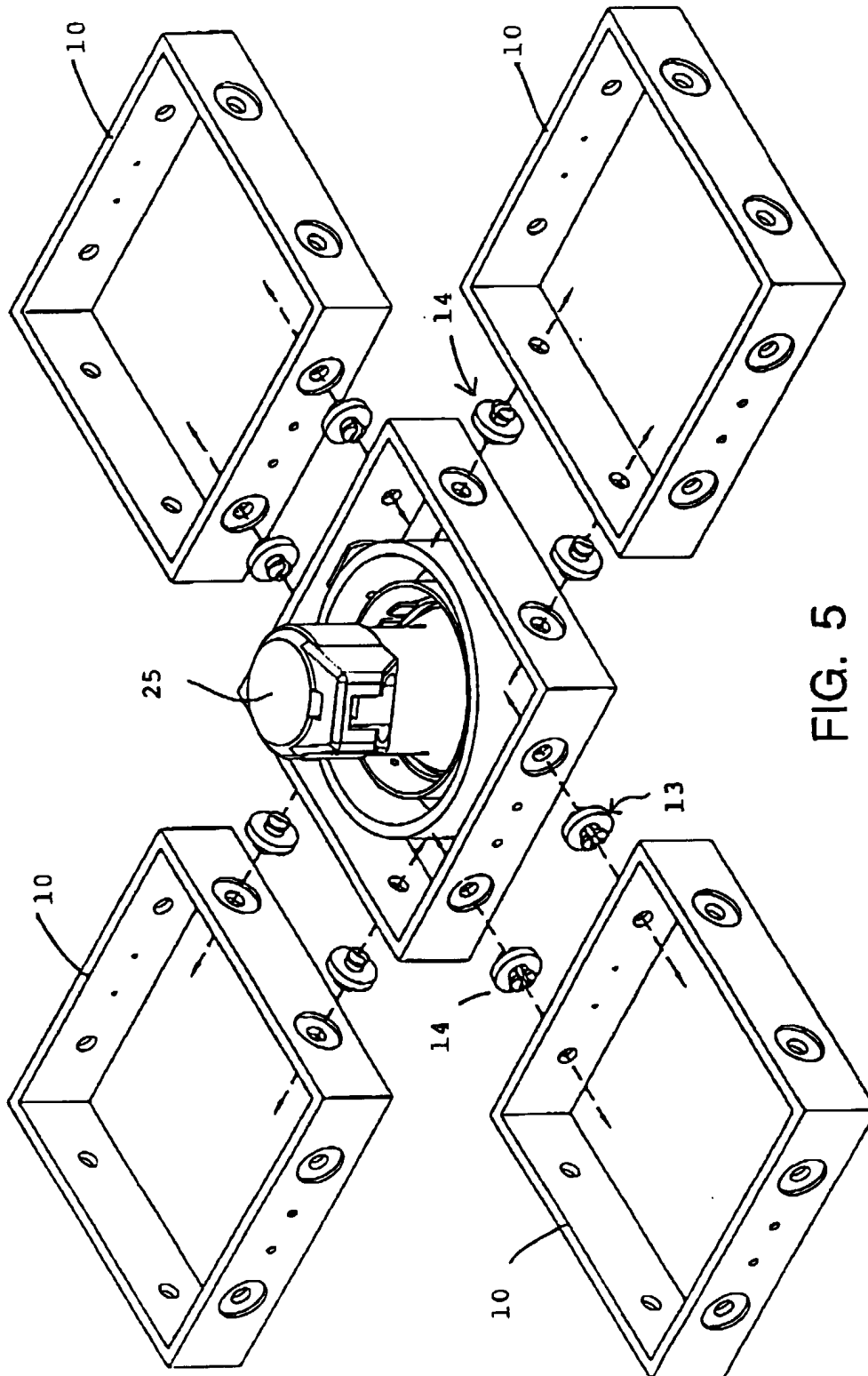


FIG. 5

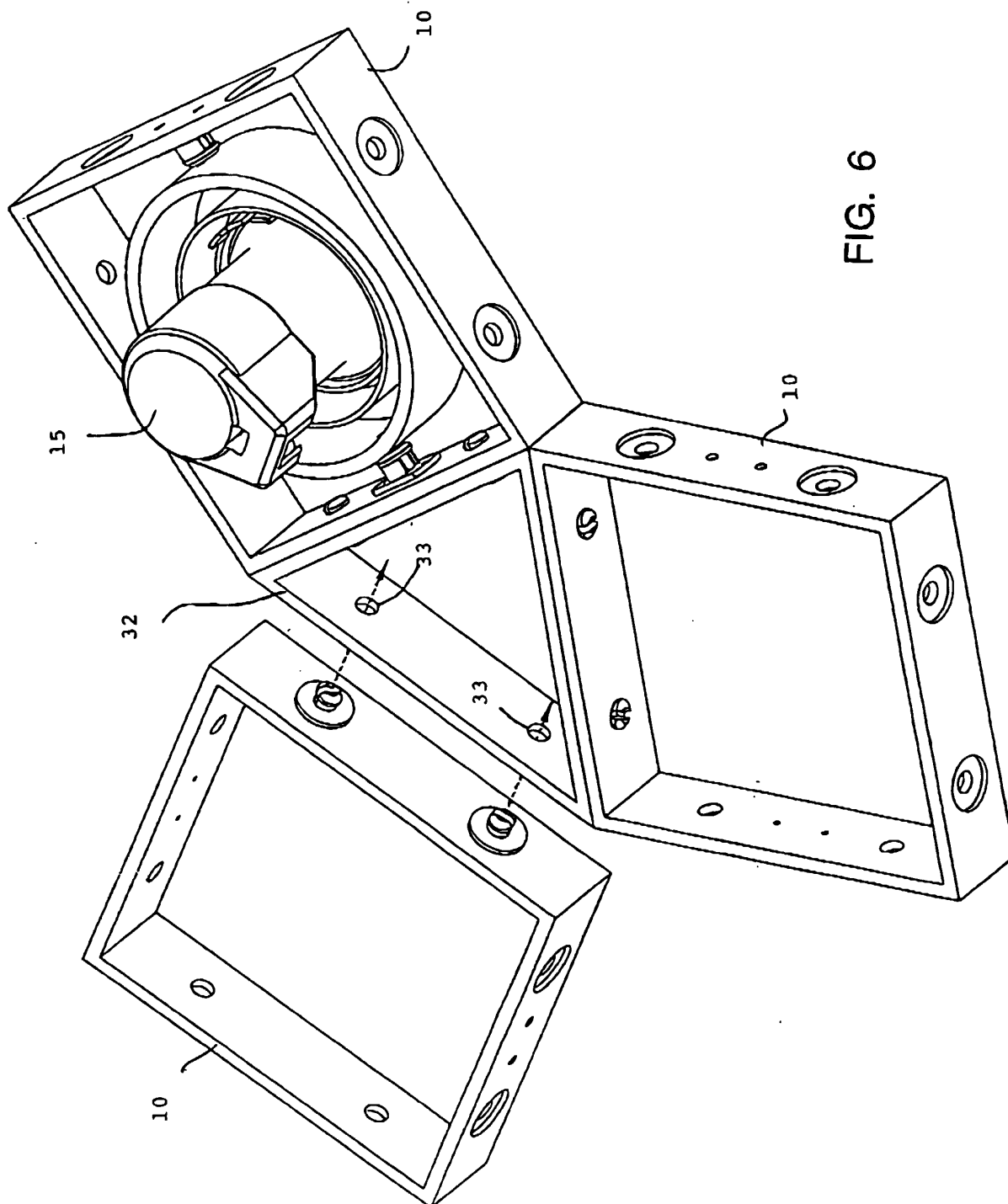
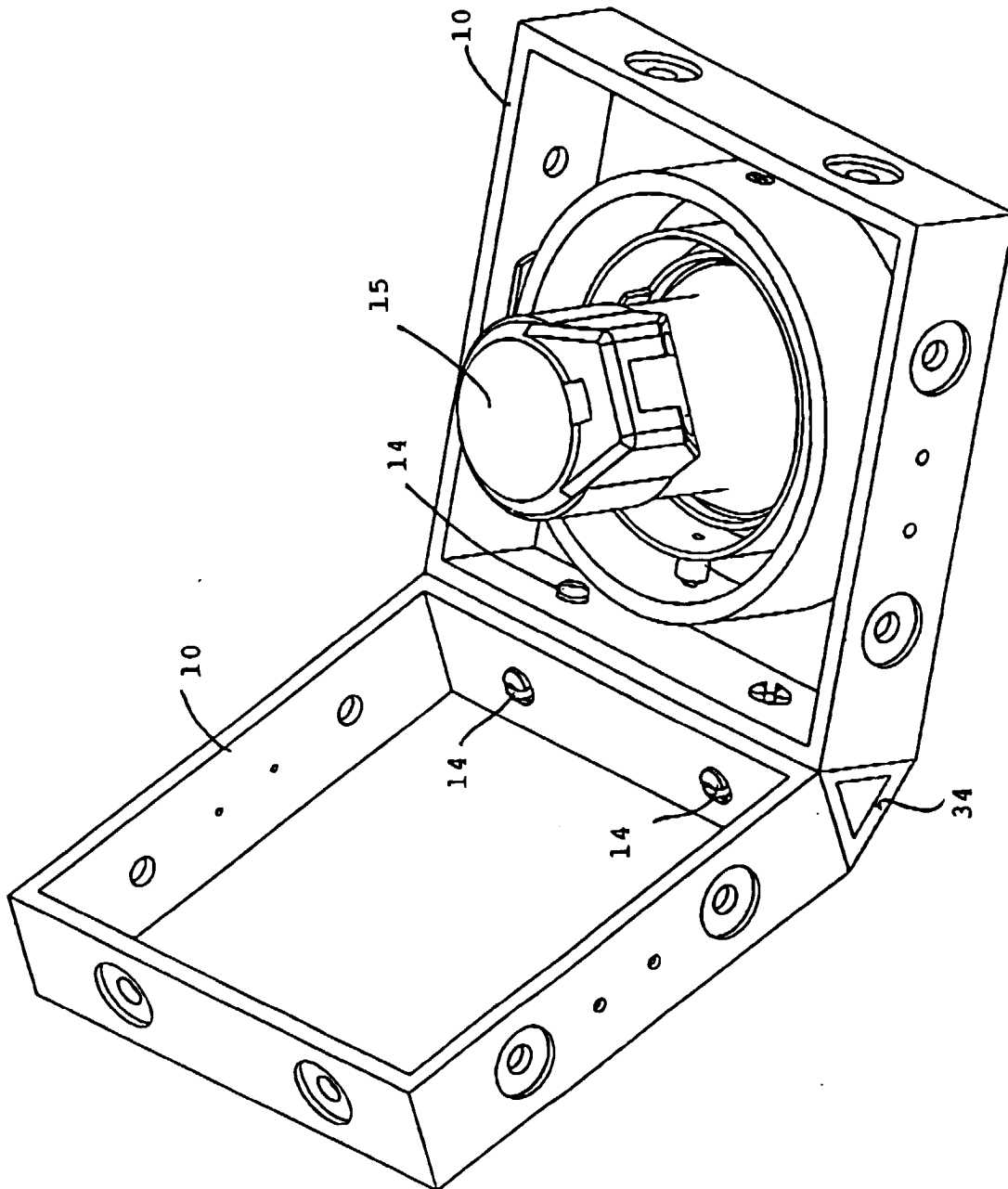


FIG. 6

FIG. 7



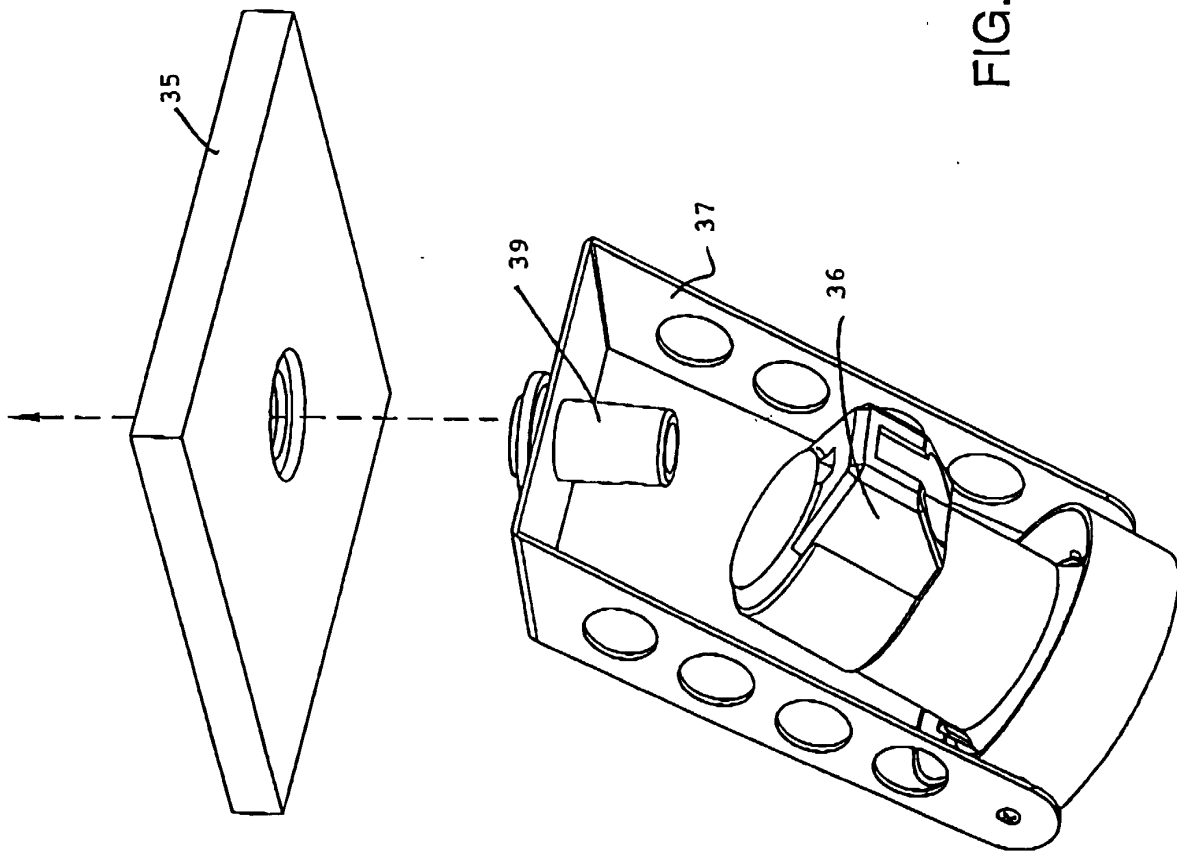


FIG. 8

FIG. 9

