(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 December 2004 (16.12.2004)

PCT

(10) International Publication Number
WO 2004/109920 A1

(51) International Patent Classification[7]: H03K 17/945

(21) International Application Number: PCT/AU2004/000742

(22) International Filing Date: 4 June 2004 (04.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2003902783 4 June 2003 (04.06.2003) AU

(71) Applicant *(for all designated States except US)*: **LIGHT-CONTROL PTY LTD** [AU/AU]; 6 Mary Parade, Rydalmere, NSW 2116 (AU).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **MEYER, Allan, Dolph** [AU/AU]; 8 Hartree Place, Cherrybrook, NSW 2126 (AU). **SMAIR, Hayel** [AU/AU]; 17 Wiltshire Avenue, Carlingford, NSW 2118 (AU). **DOWMAN, Mathew, John** [AU/AU]; 71 Glanmire Road, Baulkham Hills, NSW 2153 (AU).

(74) Agent: **GRANT, Paul, Ainsworth**; P.O. Box 7460, Fisher, ACT 2611 (AU).

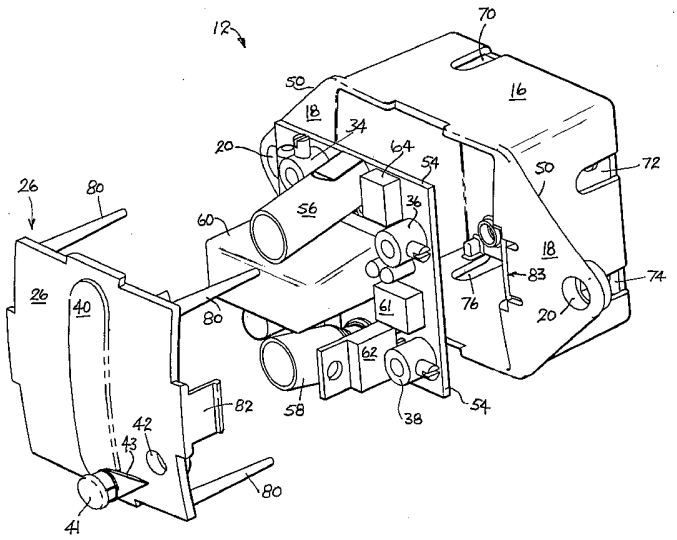
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: REMOTE-CONTROLLED SWITCH



(57) Abstract: A remote-controlled light switch assembly (10, Figure 2) is disclosed that is operable by hand-waves and can be simply substituted for standard mechanical wall-mounted light switches used in the domestic environment. The switch assembly has a housing assembly (12) and a faceplate, the housing assembly including a square-section box-like molding (16) housing a square removable circuit board (54) that has a transmitting IR transducer located in an upwardly angled collimating tube (58) and a receiving IR transducer located in a downwardly angled collimating tube (56). A window plate (26) is clipped onto the front of the box-like molding (16) to provide a larger IR window (40) and a smaller visible window (41). Receiving IR transducer is connected to a micro-controller (64) that energizes a relay (60) via an opto-coupler (61) to switch lights or other devices upon detection of coded pulses transmitted by the IR transmitting transducer.

WO 2004/109920 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TITLE: REMOTE-CONTROLLED SWITCH

TECHNICAL FIELD

This invention relates to remote-controlled electrical switches suitable for use in commercial and domestic buildings for controlling electric lights and other electrical apparatus when the proximity of an object, such as a human hand, is detected by the switch. Such switches are sometimes referred to as 'proximity switches'.

When used to control room lighting, the switches of the invention normally will be 'wall-mounted', that is supported in or on a vertical surface, such as a wall, doorframe, architrave or the like. However, they can also be mounted horizontally in ceilings, if desired, and can be incorporated in standard, bedside, reading or other free-standing light fittings.

In addition to the control of domestic lighting and appliances, the remote-controlled or proximity switches of the invention may be used to control many electrical devices in the professional and industrial environment.

BACKGROUND TO THE INVENTION

Many different forms of proximity switches are known where an electrical switch is operated by the proximity of an object. Such switches are adapted to sense the presence of an object in various ways; for example, by reflectivity with respect to electromagnetic radiation at a selected or a broad range of wavelengths, by capacitive effects, by sensing a thermal radiator or thermal sink, by sensing a magnetic field or the presence of a ferromagnetic object. As yet, few proximity switches have reached the domestic housing market for the control of lights, for example, where they could be implemented as non-contact 'hand-wave' switches. Such switches would offer great convenience and prevent walls, architraves and nearby fixtures from becoming dirty from repeated hand-contact and are conveniently operated by children. Most industrial proximity switches are far too expensive and operate over much too short detection distances. On the other hand, remotely operated switches used

in door openers and security lights have ranges that are too broad. They also tend to be too complex and expensive for domestic use. Furthermore, most of such proximity switches require special installation and wiring.

OUTLINE OF THE INVENTION

From one aspect, this invention comprises a remote-controlled electrical switch assembly of the proximity type suitable for use as a 'hand wave' operable switch in the domestic environment. In one form, the switch assembly is preferably suitable for direct substitution for a conventional mechanically-operated wall-mounted electrical switch for controlling lights or other electrical appliances. The switch may be operable by the presence of an object (including a person) closer than about 2000 mm, but preferably between about 100 and 600 mm). Substitutability may be effected or facilitated by the device having a housing or a faceplate (sometimes also called a 'cover-plate' in the industry) of substantially the same dimensions and/or mounting arrangements (eg, screw holes) as housings or faceplates of the common mechanically-operated wall switches found in the domestic environment.

The switch assembly thus may include housing means having a front plane that will be normally vertical and substantially flush with the wall, the housing means containing circuit means – such as a circuit board with electronic components thereon. The circuit means includes IR transmitter means adapted to form and direct an interrogating transmitted IR beam along a transmission axis that subtends a first acute angle to the horizontal (assuming a wall-mounted device), and, IR receiver means adapted to form and detect a reflected beam returned along a receiving axis that subtends a second acute angle to the horizontal (again assuming a wall-mounted device). In addition, the switch assembly includes switch means – normally a relay – connected to the receiver means and operable upon detection of a reflected beam to successively energize and de-energize the relay to turn the connected load – normally room lighting – on and off.

To reduce the likelihood of spurious operation, it is preferable that the interrogating transmitted beam is modulated and that the receiver is tuned or adjusted to respond selectively to IR radiation of the same modulation. Also for the same purpose, it is preferable to provide a separate collimator tube around the transmitter transducer and the receiver transducer so that a narrow limited detection zone in front of the switch assembly is created, the collimator tubes being located along with the transducers on the front of a circuit board of the circuit means. Furthermore, it is desirable for the axis of the receiver beam to be angled downwards so that the effect of sunlight is minimized. Thus, it is desirable that the circuit board be removable and repositionable in the housing to arrange for the receiver beam to be angled downward even though the disposition of the housing may be dictated by the orientation of the mounting plate of a standard wall switch that is being replaced.

To facilitate the desired orientation of the reflected beam in a wall-mounted switch assembly, the housing means may be box-like with a square section and the circuit board may also be square and dimensioned so that it will be slidingly accommodated by the housing in the different positions required. A window plate may then be clipped onto the front of the housing to hold the circuit board in place while, at the same time, providing a window or windows for the transmitted and reflected beams. The window plate can be combined with a faceplate or separate from it. If desired the window plate can be formed to provide a lenticular or focusing effect for the IR beams.

The switch assembly can be secured to a standard mounting plate by mounting means – such as lugs with mounting holes – formed on the housing sides or by removably clipping the housing to a faceplate that is, in turn, secured to the mounting plate.

Different colored LEDs, or similar emitters of visible radiation, may be included in the circuit means and arranged on the front of the circuit board to indicate the stat of the switch assembly. For example, red light may be emitted when the relay is energized and a blue light may be emitted when it is not energized.

Such light may be transmitted through a suitable window in the window plate and/or faceplate. Where separate window and faceplates are used, the faceplate preferably has one or more cutouts opposite the windows in the window plate and the window for the visible LED light can be of lenticular form. Where the window plate and faceplate are combined, the faceplate can be formed of plastic material that is transparent to IR radiation and translucent to visible radiate so that the LED light appears to make it glow in the appropriate color.

DESCRIPTION OF EXAMPLE

Having portrayed the nature of the present invention, an example will now be described with reference to the accompanying drawings. However, those skilled in the art will appreciate that many variations and modifications can be made to the example without departing from the scope of the invention as defined by the following claims.

Brief Description of the Drawings

Figure 1, is an external perspective of the switch assembly of the chosen example showing the housing assembly, faceplate and electrical leads in 'exploded' form.

Figure 2 is an exploded perspective view of the housing assembly of Figure 1, showing the main components thereof.

Figure 3 is a simplified sectional elevation of the switch assembly taken on plane 3 – 3 of Figure 1 with the faceplate fitted to the housing assembly, Figure 3 diagrammatically indicating the zone of detection and the relevant angles.

Figure 4A is an exploded perspective view of the switch assembly of Figure 1 indicating the manner in which it can be horizontally mounted in a dry wall in place of a standard toggle switch.

Figure 4B is an exploded perspective view of the switch assembly of Figure 1 indicating the manner in which it can be vertically mounted in a dry wall in place of a standard toggle switch.

Figure 5 is a block diagram of the circuit of the switch assembly of the chosen example.

Figure 6 is a flow chart indicating the basic logic sequence employed in the switch assembly of the chosen example.

Turning to Figure 1, the basic components of the remote-controlled switch assembly 10 of the chosen example will now be described. Switch assembly 10 basically comprises a housing assembly 12 and a faceplate 14. Housing assembly 12 includes a rectilinear box-like housing molding 16 having integral side lugs 18 with mounting holes 20 for mounting screws 22, housing molding 16 having an open front face 24 (see also Figure 2) that, together with lugs 18, define a front plane. The open front face of housing molding 16 is closed by a snap-fitting window plate 26. Electrical leads, comprising active and neutral power leads 28 and 30 and load lead 32 (respectively), are shown ready for insertion into respective terminals 34, 36 and 38 in housing assembly 12. Window plate 26 is molded from IR transparent plastic, which preferably appears 'smoky' or darkly translucent in normal light, and has an integral central elongate IR window protrusion 40 on its front face. A small, round and clear

visible-spectrum window-plug 41 is pushed into a hole 42 (see Figure 2) formed in window plate 26 so as to protrude a little from the front face thereof, the inner or rear end 43 of window-plug 41 being formed at an acute angle to the axis of the plug in order to more readily accept and transmit light generated from within housing molding 16. Thus, window protrusion 40 forms a first window in window plate 26 that is transparent to IR radiation and plug 41 forms a second window in window plate 26 that is transparent to visible light. Faceplate 14 has a central elongate cutout 44 for window 40 and a small circular cutout 46 for window-plug 41 that protrudes a little from the front face of window plate 26.

In the arrangement shown in Figure 1, faceplate 14 is removably attached to housing assembly 12 by four clips 48 (shown in broken lines) that engage the four edges 50 of lugs 18, clips 48 being integrally molded on the back face of faceplate 14. In the example illustrated, lugs 18 and their mounting holes 20 form the mounting means. Alternatively, however, lugs 18 can be dispensed with and the mounting means can be constituted by holes 52 (shown in broken lines in Figure 1) in faceplate 14 for mounting screws 22. In that case, however, it is desirable that a portion of each lug 18 be retained for engagement by clips 48, or that clips 48 be repositioned to engage other portions of housing molding 16. It is further envisaged that window-plate 26 and faceplate 14 can be integral with the combined plate being clipped onto housing molding 16 and being attached to a fixture by mounting screws 20 passing through mounting holes such as those indicated at 52.

Figure 2 is an exploded view of the housing assembly 12 from which it will be seen that terminals 34, 36 and 38, along with other electrical / electronic components of the assembly are mounted on a square printed circuit board 54. The components basically comprise upper and lower collimating tubes 56 and 58 for the IR sensor and transmitter transducers respectively (to be described below with reference to Figures 3, 4A and 4B), solid-state relay 60, an integrated circuit opto-coupler for operating relay in an electrically isolated manner, AC – DC converter (low voltage DC power supply) chip 62, micro-controller 64, and LEDs 66 and 68 of different colors – for example, red and

blue. LEDs 66 and 68 comprise the aforementioned multicolor LED means and may be integrated in a single physical entity, as is known in the art. All the electronic components indicated are readily available commercially and can be mounted on circuit board 54 to perform the functions indicated by those skilled in the art.

Molded box-like housing 16 has a square (vertical) section to slidingly accommodate circuit board 54 in any one of four possible orientations, though only two that at 90 degrees apart are necessary. In the arrangement shown in Figure 2, board 54 can be slid rearward into housing molding 16 in the orientation shown so that terminals 34 on the top lines up with access hole 70 in molding 16 and terminals 36 and 38 are on the right and line up with access holes 72 and 74 in molding 16. This is for a horizontally disposed molding 16; that is, where lugs 18 are horizontally arranged. Alternatively, where molding 16 is vertically disposed with lugs arranged vertically (say, by rotating molding 16 anticlockwise by 90- degrees) board 54 can still be slid rearwards into molding 16 in the orientation shown in Figure 2; that is, with collimating tubes 56 and 68 arranged vertically as shown. In that event, access hole 72 lines up with terminal 34 and an access hole 76 lines up with terminal 38. A second access hole in the same side of housing molding 16 as hole 76 (but not visible in Figures 1 and 2) lines up with terminal 36.

Window plate 26 is molded with an integral rearwardly extending leg 80 in each corner, legs 80 serving to locate circuit board 54 in the back of housing molding 16 when window plate 26 is in position. Window plate 26 has side clips 82 by which it is releasably clipped into slots 83 where lugs 18 join the box-like portion of molding 16. Clips 82 can be readily formed to fit into molding 16 so as to clip into slots or behind shallow protrusions, if desired.

As shown in the diagrammatic sectional elevation of Figure 3 and the exploded views of Figures 4A and 4B, an IR receiving LED transducer 84 is mounted near the upper edge of board 54 so as to be angled downwards and covered by collimating tube 56, which can be simply pushed onto LED 84 or its base.

SImillary, a transmitting LED transducer 86 is mounted near the bottom of board 54 so as to be angled upwards and is covered by collimating tube 58. [For the sake of clarity, other components on board 54 have been omitted in Figure 3.] In Figure 3, the upwardly angled collimated interrogating beam emitted by LED 86 is indicated at 90 and has an axis **x** that subtends a first acute angle **α** to the horizontal central axis **y.** The collimated field of view (or received beam) of receiving LED 84 is indicated at 92 and has an axis **z** that subtends a second acute angle **β** to the horizontal central axis **y.** The region of overlap in which an object can be detected is therefore that indicated by hatched area 94. In this example hatched area extends from about 200 mm to about 800 mm in front of window plate 26 but, as indicated above, longer or shorter detection fields are envisaged. As is known in the art, beam 90 transmitted by LED 86 is switched or modulated in a particular manner and the IR radiation received by LED 84 along field of view 92 is synchronously detected in a manner to be selective of reflections from beam 90. The signal for effecting the modulated of transmitting LED 86 and the synchronous detection of IR radiation received by receiving LED 84 are effected by microcontroller 64 and associated components in a manner known in the art.

It will be appreciated that switch assembly 10 of the first example does not need to be wall-mounted, though that will be most common. Assembly 10 can be mounted on a standard or reading lamp, or on any other electrical appliance, at any angle desired. It may even be ceiling or floor mounted. Thus axis **y** does not need to be horizontal and can generally be described as being orthogonal to and roughly central of the front of housing assembly 12, window plate 26 and/ or the open front plane of box-like molding 16. Similarly, the first and second acute angles mentioned above are measured with respect to axis **y** rather than to the horizontal plane.

Figures 4A and 4B are exploded views of the proximity switch assembly 10 of Figures 1- 3 respectively showing housing 16 mounted horizontally and vertically in hole 96 cut in a drywall 97 and fitted with a standard mounting plate 98, it being assumed that switch assembly 10 is replacing old horizontally and

vertically mounted conventional switches (not shown). The rotation of circuit board 54 in housing molding 16 being clearly seen by a comparison of Figures 4A and 4B.

Further comparison of Figures 4A and 4B will show that window-plate 26 of Figure 4A differs from window-plate 26a of Figure 4B in that side clips 82 are arranged orthogonally to IR window 40 in Figure 4A but clips 82a are in line with window 40 in Figure 4B. Similarly, elongate cutout 44 is orthogonal to the longer dimension of faceplate 14 of Figure 4A but cutout 44a is in-line in faceplate 14a of Figure 4B. Further, it will be noted that the location of visual indicator window 46a on faceplate 14a is different to window 46 on faceplate 14.

Thus, to allow for horizontal or vertical mounting it may be desirable to package both types of window-plate and faceplate with a switch assembly. To avoid the need for this, it is envisaged that housing molding 16 can be made with sockets for clips 82 (or slight modifications thereof) on all four sides. This would allow a window-plate to be rotated with respect to housing 16 like the circuit board 54 before being clipped into place. It is also envisaged that the need for two different faceplates 14 could be avoided by (i) making cutout 44 on faceplate 14 and IR window protrusion 40 on window-plate 26 of matching cruciform shape and (ii) by fitting two visible window plugs 41 into window-plate 26 and forming two corresponding cutouts 46 for them in the modified faceplate. Such a solution has the advantage that the window-plate then does not need to be rotated with respect to housing 16. Instead of the need for two cutouts 46 in faceplate 14, window-plug (or plugs) 41 in window-plate 26 can be flush with the outer face of the window-plate and faceplate 14 can be made of translucent plastic so that the entire faceplate glows with the colors transmitted through the visible window plug(s) indicator LEDs 66 or 68. For example, faceplate 14 may glow pink or blue depending upon the status of the switch.

The basic circuit diagram of switch assembly 10 is indicated in Figure 5, the circuit including an on-board AC to DC converter and power-supply 62 that supplies power to micro-controller 64. In operation, micro-controller 64 sends a

30 kHz pulsed signal 100 to transmitter LED 86 and receives an electronic output signal 102 from receiver LED 84. If the received signal is also pulsed at 30 k Hz, it is recognized by controller 64 as indicative of an object such as a hand in activation zone 94 and controller 64 then determines the appropriate states of multicolor indicator LEDs 66 and 68, and, the appropriate output to relay 60 (via opto-coupler 61, not shown in Figure 5). When energized, relay 60 connects active input line 28 to load line 32 to power room lighting 104.

Figure 6 is a flow chart illustrating one of the many logic programs that can be loaded into controller 62. While relay 60 is not energized (and light 104 is off), blue LED 68 is energized to make clear window 41 glow blue, red LED 66 not being energized. If a 30 k Hz signal [IR RX] is detected on output 102 of IR receiver LED 384 while light 68 is off, the received pulses of output 102 are matched twice in succession to ensure that they are the same as that of the transmitter. This discriminates over IR signals from other sources. If the correct pulse shape is detected, controller 64 interprets the signal as an instruction to turn light 104 on, whereupon red LED 66 is operated and blue LED 68 is turned off. This causes clear window 41 to glow red or pink. If, while light 68 is on, a further output from receiver 34 is detected, that output is again matched twice to ensure that it is pulsed appropriately. If so, controller 64 interprets the signal as an instruction to turn light 104 off. Red LED 66 is switched off and, after a 20 second time delay (to allow a person to get to bed or exit the room), relay 60 is de-energized to turn off light 104 and to re-energize blue LED 68.

Though one example with a number of variations has been described, it will be appreciated that many other examples and variations are possible within the scope of the invention as defined by the following claims.

CLAIMS

1. A remote-controlled electrical switch assembly operable by an object in proximity thereto to connect and disconnect electrical power to an electrical load, wherein:

the switch assembly includes housing means having a front plane and a notional axis extending forwards from said front plane,

circuit means is located in the housing means, said circuit means having a power terminal for connecting the circuit means to a source of electrical power and a load terminal for connecting the circuit means to the electrical load, the circuit means including:

IR transmitter means adapted to form and direct an interrogating transmitted beam of IR radiation forward along a transmission axis that subtends a first acute angle with respect to said notional axis,

IR receiver means adapted to form and detect a reflected beam of said IR radiation beam that is returned rearward along a receiving axis that subtends a second acute angle with respect to said notional axis, and said circuit means including

switch means connected between said supply terminal and said load terminal to electrically connect and disconnect said power terminal and said load terminal, said switch means being connected to said receiver means whereby said switch means is operable upon detection of said reflected beam to effect said connection and disconnection, and wherein

said transmitted beam and said reflected beam, when projected forward, define a detection zone wherein the presence of an IR-reflecting object can cause the generation and detection of said reflected beam and the operation of said switch means to effect connection or disconnection of said power terminal and said load terminal.

2. A remote-controlled electrical switch assembly according to claim 1 wherein:

said IR transmitter means is adapted to modulate said transmitted beam in a predetermined pattern,

said receiver means is adapted to selectively detect reflected IR radiation modulated in said predetermined pattern.

3. A remote-controlled electrical switch assembly according to claim 1 or 2 wherein said detection zone is located within 2000 mm from said circuit means along said notional axis.

4. A remote-controlled electrical switch assembly according to any preceding claim wherein said detection zone is located between 100 mm and 600 mm from said circuit means.

5. A remote-controlled electrical switch assembly according to any preceding claim, wherein:

said circuit means includes a circuit board having a front face,

said transmitter means includes a solid-state IR transmitting transducer mounted on the front face of the circuit board and a first collimating tube fitted over said transmitting transducer to form said transmitted beam,

said receiver means includes a solid-state IR receiving transducer mounted on the front face of said circuit board and a second collimating tube fitted over said receiving transducer to form said reflected beam.

6. A remote-controlled electrical switch assembly according to claim 5 wherein,

said housing comprises a box-like molding of substantially square section that has two opposing sides, and

said circuit board is of substantially square section and is adapted to fit slidingly and removably within the housing with its front face forwards, either in a first position with said first and second collimating tubes located in a plane aligned with said sides, or in a second position with said first and second collimating tubes aligned orthogonally to said sides, so that the housing can be mounted in a wall with the sides aligned horizontally or vertically with the circuit board positioned within the housing so that, in

either case, the first and second collimating tubes can be aligned vertically with said receiving axis directed downward at said second acute angle.

7. A remote-controlled electrical switch assembly according to claim 6 wherein,

said mounting means comprises a mounting lug on each of said opposing sides of the housing means,

each mounting lug has a mounting hole therein adapted to take a mounting screw or the like,

said mounting holes are spaced apart by a distance corresponding to the spacing of mounting nuts in standard toggle-operated wall-switch mounting plates.

8. A remote-controlled electrical switch assembly according to any preceding claim adapted for substitution for a conventional mechanically operated wall mounted electrical switch for controlling lights or other electrical apparatus, the switch assembly also being adapted for operation by means of a hand-wave executed within the detection zone by a person.

9. A remote-controlled electrical switch assembly according to any one of claims 5 - 7, wherein:

said switch means comprises a relay mounted on the front of the circuit board and connected to the receiver means for energization thereby, and

multicolor LED indicator means is mounted on the front of said circuit board and connected to said receiver means or to said relay so as to emit visible radiation of one color when the relay is energized and a different color when the relay is not energized and the switch assembly is connected to electrical power.

10. A remote-controlled electrical switch assembly according to any one of claims 6 – 8 wherein,

said box-like housing molding has an open front through which said circuit board can be inserted into and removed from the housing, and

a window plate removably fits into or over said open front to thereby locate the circuit board against movement within the housing molding, said window plate including a first window that is transparent to IR radiation and that thereby permits transmission of said transmitted and reflected beams to and from the housing molding with the window plate in place.

11. A remote-controlled electrical switch assembly according to claim 9 when read through claim 6, wherein:

said window plate is adapted to be clipped over said open front of the housing in a first orientation wherein said first window is opposite said collimating tubes, whether the circuit board is located within the housing in said first position or in said second position.

12. A remote-controlled electrical switch assembly according to claim 9 or 10 when read through claim 8 wherein, said window plate includes a second window that is transparent to visible radiation so that light emitted by said LED indicator means is visible through the window plate by humans with normal sight.

13. A remote-controlled electrical switch assembly according to any one of claims 9 – 12 wherein:

said window plate has the shape of a standard faceplate of a standard wall-mounted toggle-operated light-switch

the window plate has mounting holes adapted to take standard mounting screws and spaced apart appropriately for securing the faceplate to a standard wall-mounting plate,

attachment means are provided between said housing and said window plate adapted to releasably attach the housing means to the window plate in a plurality of orientations.

14. A remote-controlled electrical switch assembly according to any one of claims 9 – 12 including,

a faceplate adapted to fit over said window plate,

means for detachably securing said faceplate to said housing means so as to locate said window plate therebetween, and

corresponding aperture or apertures in said faceplate aligned with said window or windows in the window plate.

15. A remote-controlled electrical switch assembly according to claim 14 wherein said first IR window is of cruciform shape and the corresponding aperture in the faceplate is also of cruciform shape, thereby enabling said housing means and associated IR transmitting means and receiving means to be mounted in two orthogonal positions relative to the faceplate and window plate of the assembly.

16. A remote-controlled electrical switch assembly substantially as herein before described with reference to the accompanying drawings.

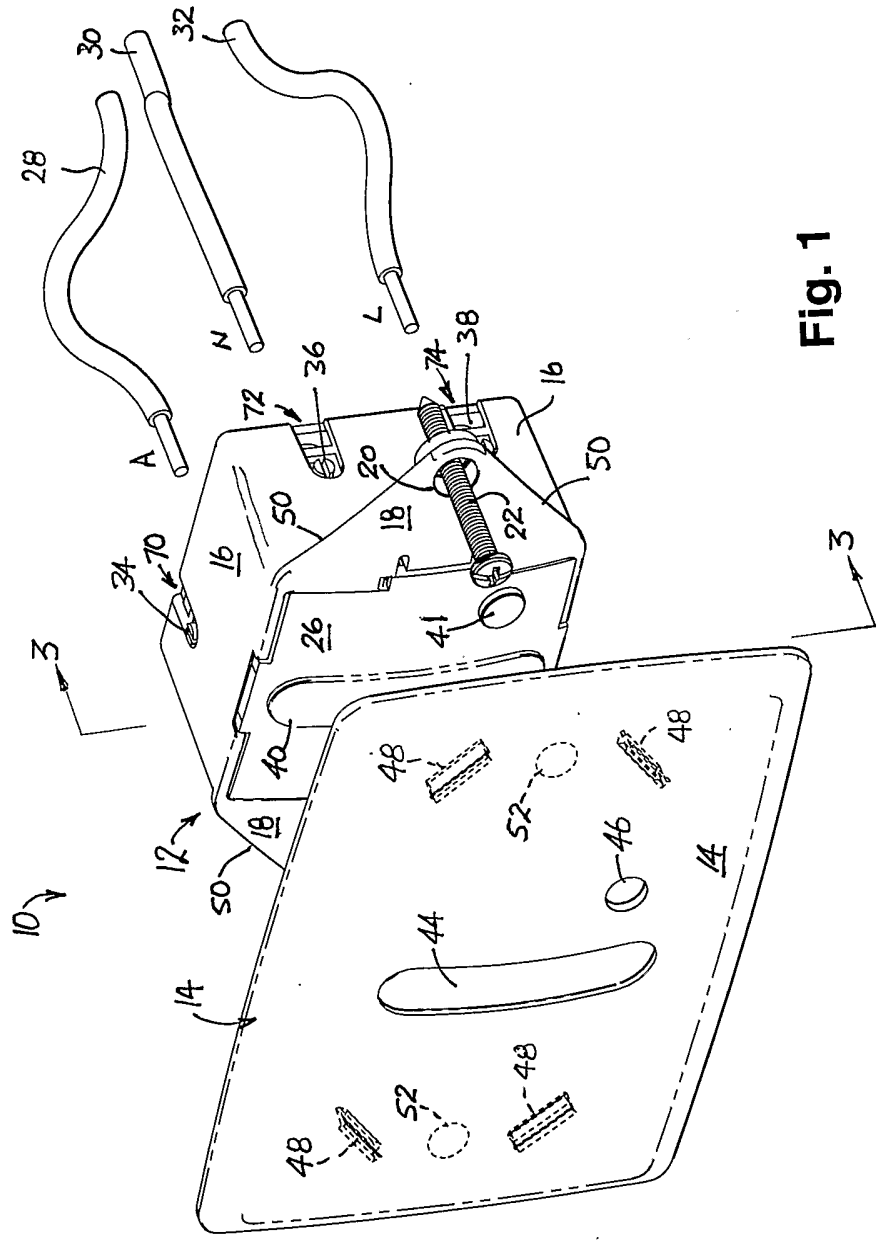

30
32
28
N
L
A
36
72
74
38
16
20
50
18
22
34
70
26
41
3
3
40
48
52
46
14
12
10
44
48
52
48

Fig. 1

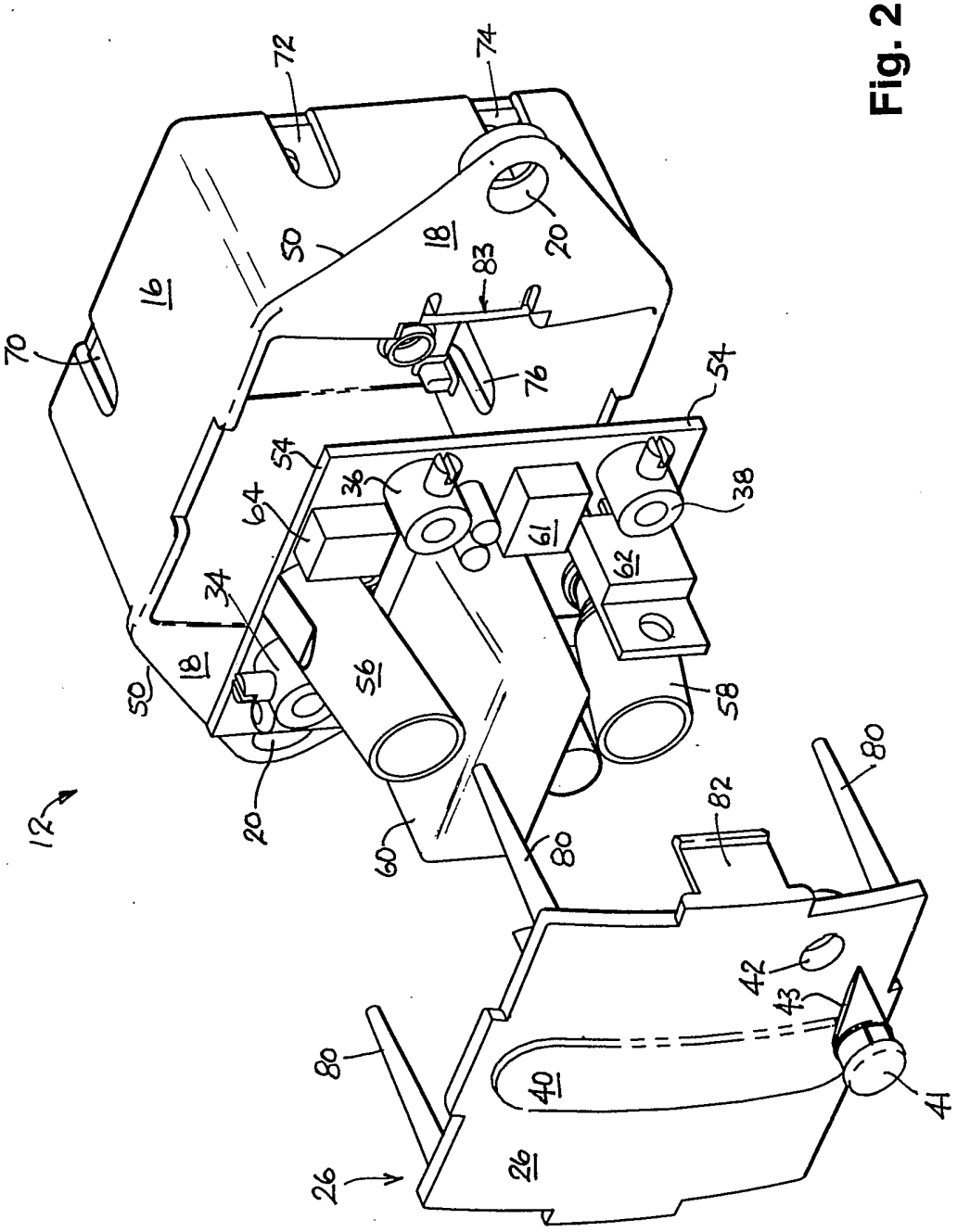

72
74
50
18
20
83
16
70
76
54
54
36
38
64
61
62
34
18
50
56
58
12
20
60
80
82
80
42
43
80
40
41
26
26

Fig. 2

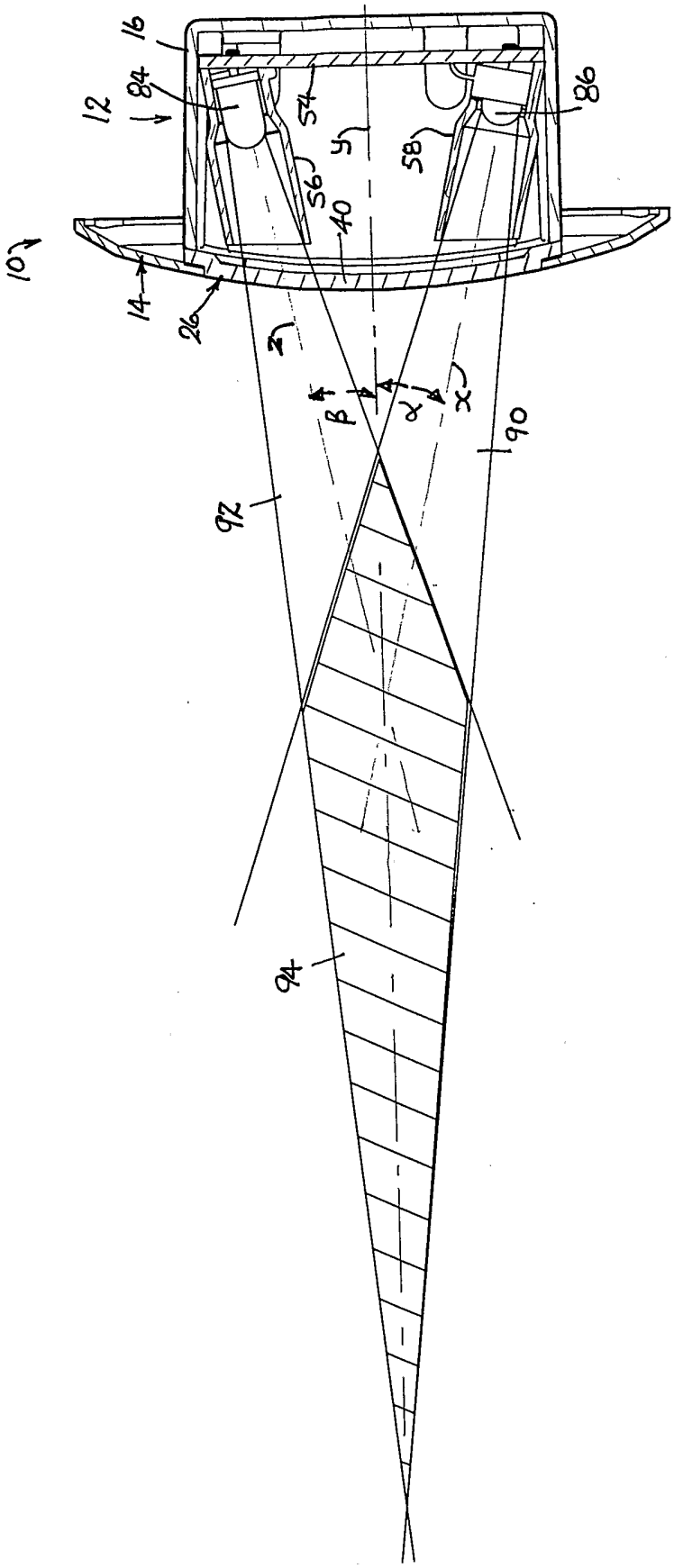


Fig. 3

Fig. 4A

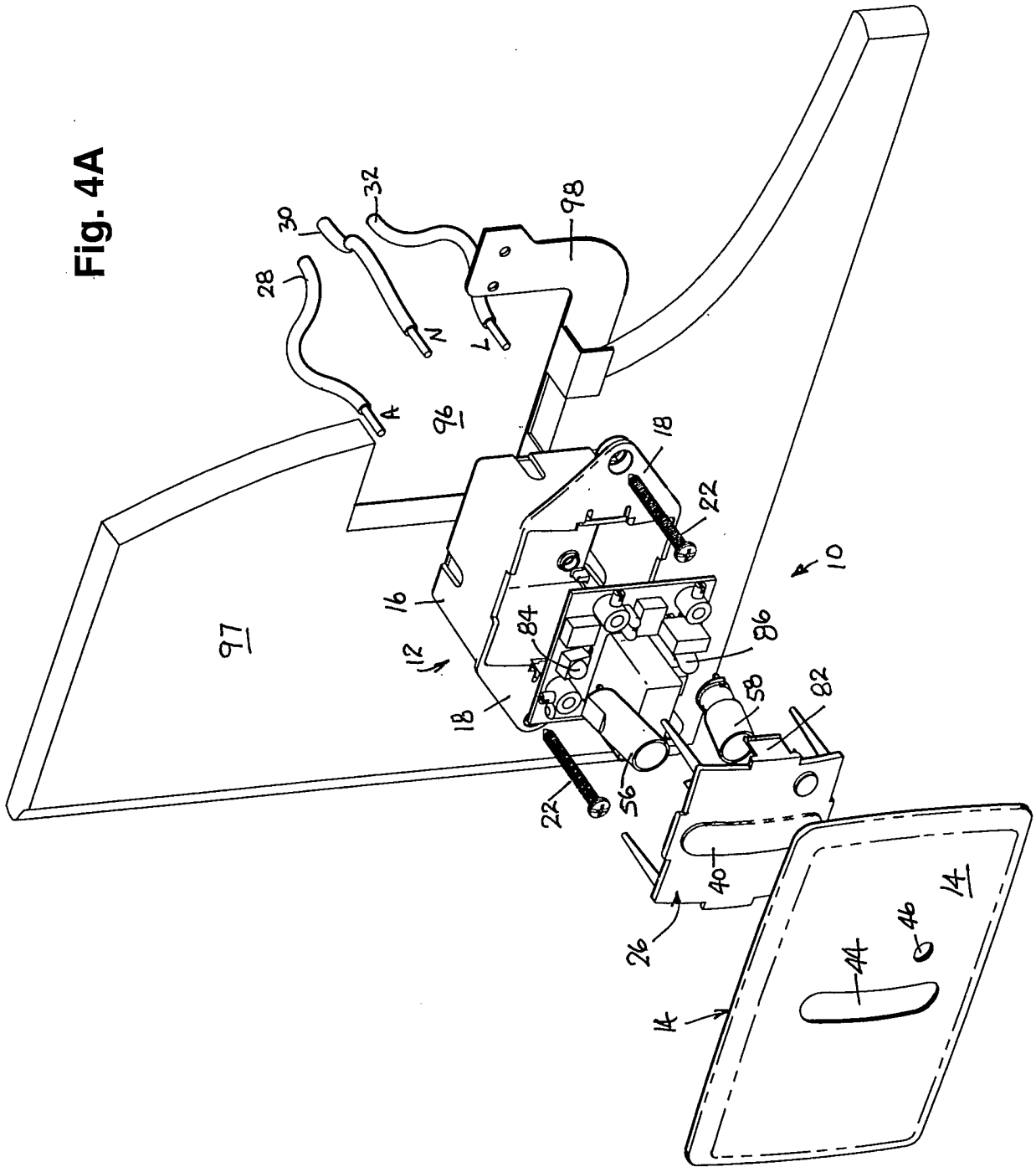

30
32
98
28
N
L
A
96
18
22
10
16
84
86
12
97
58
82
18
56
22
40
14
26
46
44
14

Fig. 4B

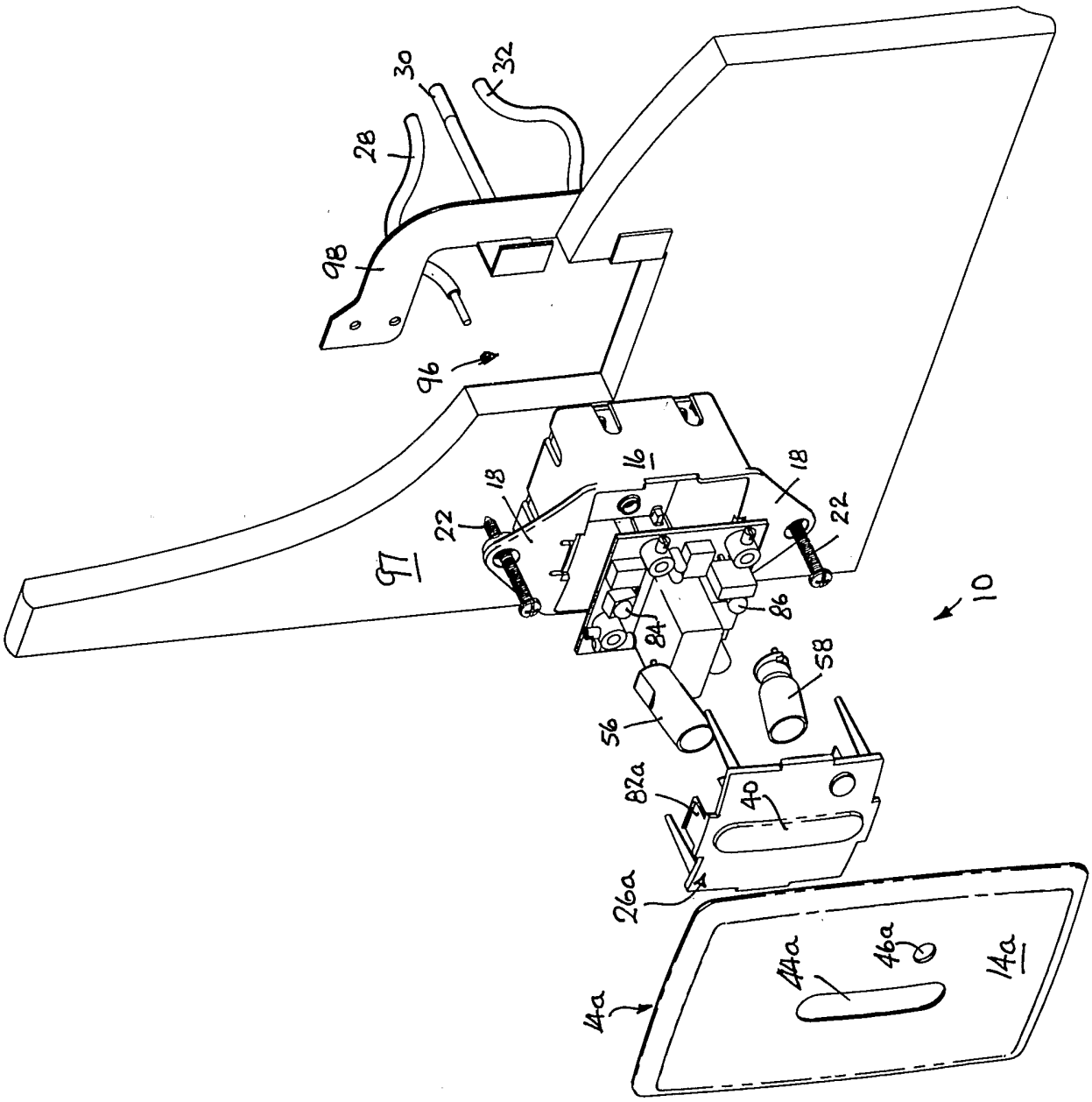
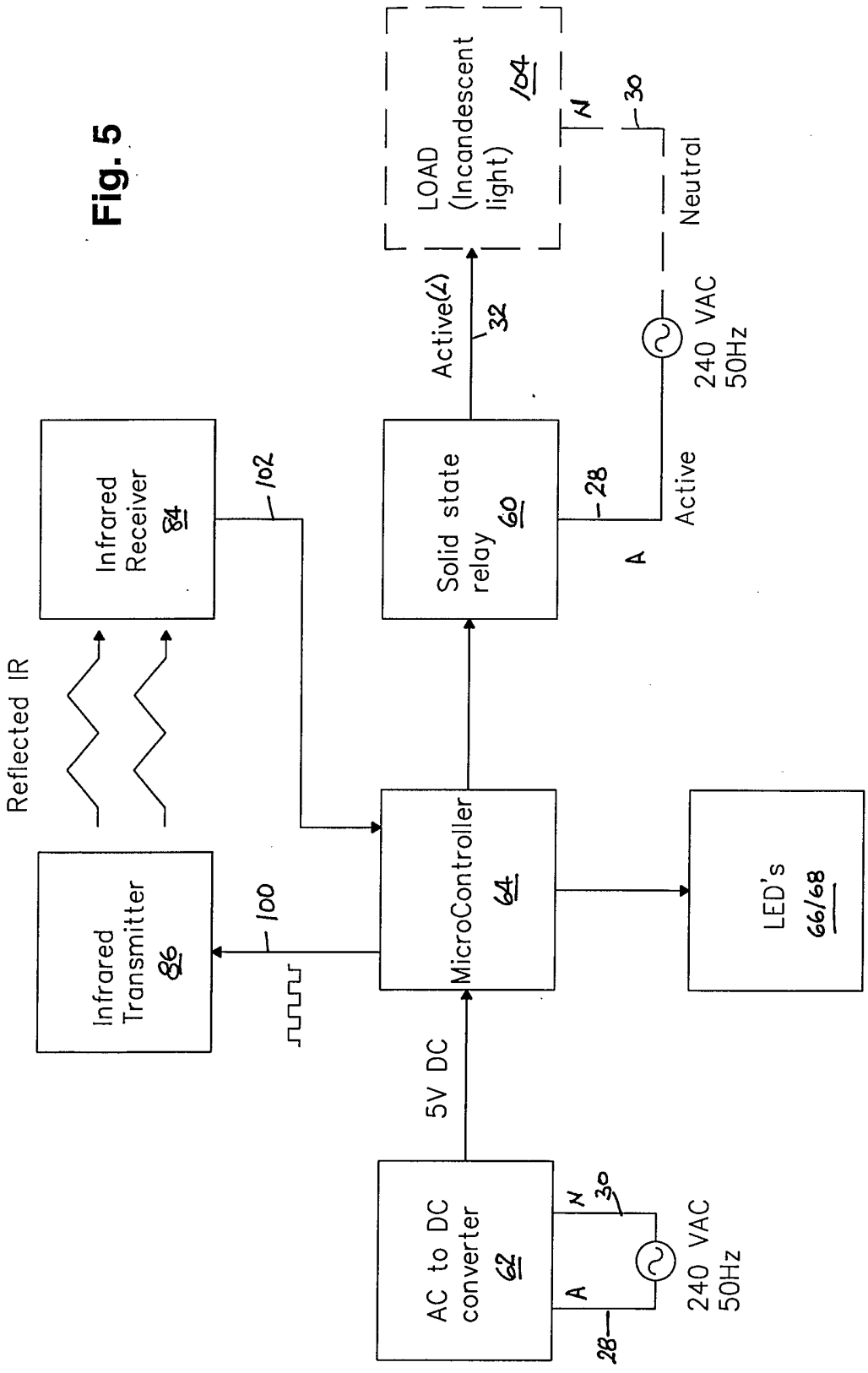

30
32
28
98
96
16
18
18
22
22
97
10
86
84
58
56
82a
40
26a
44a
46a
14a
14a

Fig. 5


LOAD
(Incandescent
light)
104
N
30
Neutral
Active(L)
32
240 VAC
50Hz
Infrared
Receiver
84
102
Solid state
relay
60
28
A
Active
Reflected IR
Infrared
Transmitter
86
100
MicroController
64
LED's
66/68
5V DC
AC to DC
converter
62
N
30
A
28
240 VAC
50Hz

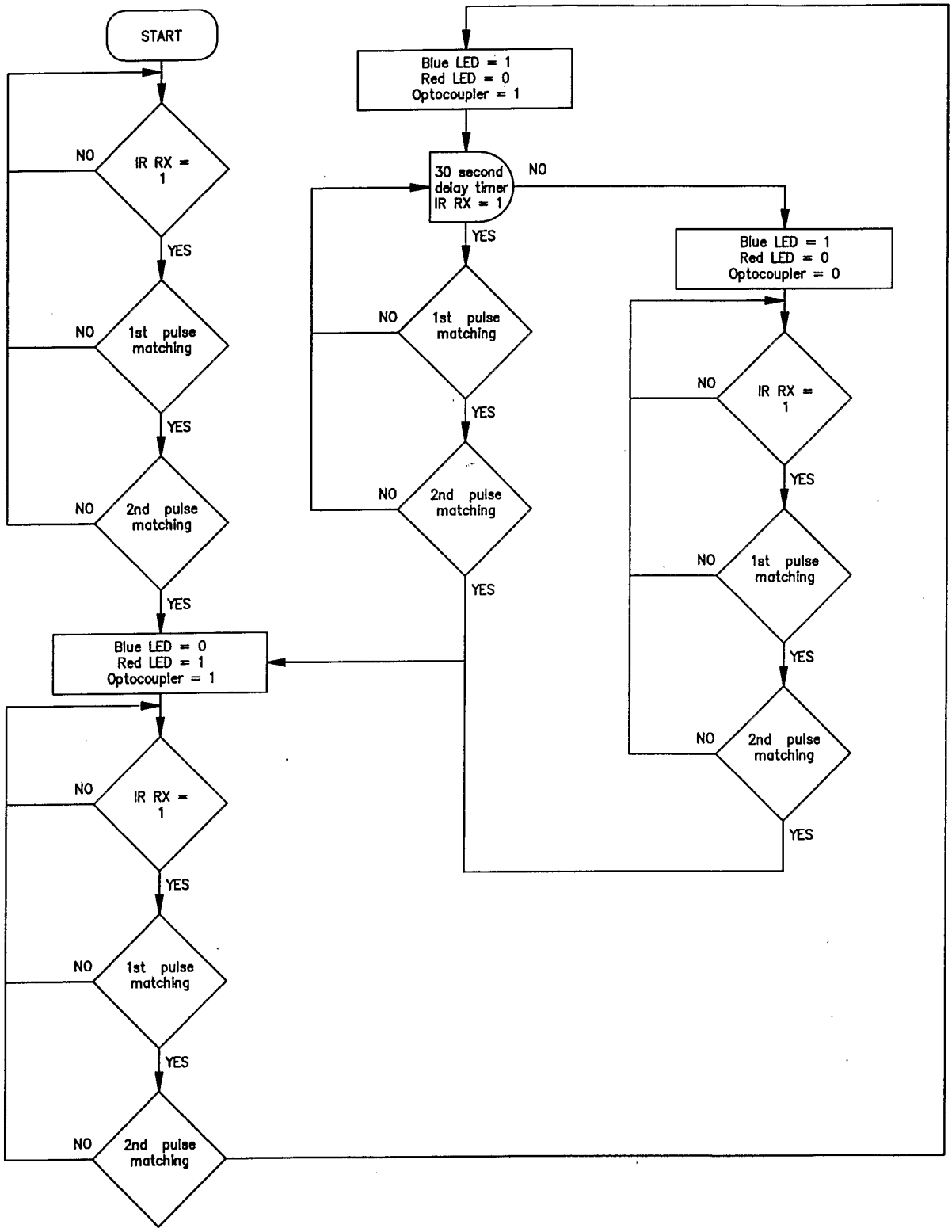

START
IR RX = 1
NO
YES
1st pulse matching
NO
YES
2nd pulse matching
NO
YES
Blue LED = 0
Red LED = 1
Optocoupler = 1
IR RX = 1
NO
YES
1st pulse matching
NO
YES
2nd pulse matching
NO
YES
Blue LED = 1
Red LED = 1
Optocoupler = 1
30 second delay timer IR RX = 1
NO
YES
1st pulse matching
NO
YES
2nd pulse matching
NO
YES
Blue LED = 1
Red LED = 0
Optocoupler = 0
IR RX = 1
NO
YES
1st pulse matching
NO
YES
2nd pulse matching
NO
YES

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000742

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: H03K 17/945

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT, ESP@CE, USPTO, INTERNET and Keywords (IR, proximity, switch) and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4305006 A (WALTHALL et al.) 8 December 1981 See whole document, in particular columns 1, 2, 7 and 9 and figures 1, 2, 3 and 5.	1 - 5, 8 - 10, 12, 14
A	US 6275163 B1 (BOGORAD et al.) 14 August 2001 See whole document.	1 - 16
A	US 6181095 B1 (TELMET) 30 January 2001 See whole document.	1 - 16
A	WO 1998/037631 A1 (NEWTRONICS PTY. LTD.) 27 August 1998 See figure 7, abstract and pages 2 - 4.	1 - 16

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* 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 application or patent 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 when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 June 2004	23 JUN 2004
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **R.W.J. FINZI** Telephone No : (02) 6283 2213

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000742

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5786644 A (ZARETSKY) 28 July 1998 See whole document.	1 - 16
A	EP 0813075 B1 (INTER COMPANY COMPUTER) 17 December 1997 See pages 2 and 5.	1 - 16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2004/000742

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	4305006				
US	6275163	CA	2280660		
US	6181095	US	6020703		
WO	9837631	AU	59755/98		
US	5786644	CA	2180041	US	5623172
EP	0813075	US	5963135		

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX