(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 515 040 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92303647.9**

(51) Int. Cl.^{5} : **H01R 33/08**

(22) Date of filing : **23.04.92**

(30) Priority : **23.04.91 JP 28137/91**
22.10.91 JP 273830/91

(43) Date of publication of application :
25.11.92 Bulletin 92/48

(84) Designated Contracting States :
DE FR GB IT

(71) Applicant : **Kabushiki Kaisha Denkosha**
17-1, 4-chome, Nishigahara Kita-ku
Tokyo (JP)

(72) Inventor : **Koda, Yoshiharu, c/o K. K. Denkosha**
17-1 Nishigahara 4-chome, Kita-ku
Tokyo (JP)

(74) Representative : **Rees, David Christopher et al**
Kilburn & Strode 30 John Street
London WC1N 2DD (GB)

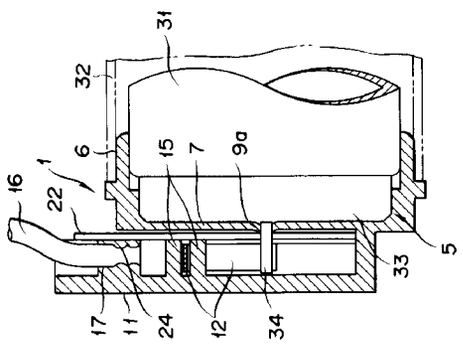
(54) Sockets for fluorescent discharge lamp.

(57) This invention is directed to sockets for a fluorescent discharge lamp ideal for use in an atmosphere of low temperature, particularly to such sockets for a fluorescent discharge lamp that the work of wire distribution during the attachment of the sockets is easy and the replacement of an exhausted fluorescent discharge lamp with a new supply is also easy.

By the insertion of base pins into insertion holes of a diameter equal to or smaller than the diameter of the base pins, the sockets proper are reduced to the state of being retained on the fluorescent discharge lamp. When an electrification adapter is inserted into an electrification adapter retaining part formed in the socket proper which has assumed this state, the base pins are connected to an esternal power source through the medium of a power supply electrode.

A capacitor is incorporated in the electrification adapter and this capacitor is laid to interconnect a resonant circuit line and a power supply electrode.

FIG. 13



EP 0 515 040 A1

This invention relates to sockets ideal for use with a fluorescent discharge lamp of the type which is energized in an atmosphere of low temperature, and particularly to such sockets for use with such a fluorescent discharge lamp that the work for wire distribution during the installation of the sockets is easy and the work for replacing the fluorescent discharge lamp, on exhaustion, with a new supply is also easy.

Discharge lamps, particularly fluorescent discharge lamps, have been finding extensive utility in conventional illuminating facilities because they are characterized by performing effectively with a small power consumption as compared with incandescent lamps and nevertheless producing a relatively large luminous energy.

In open showcases which are copiously used in supermarkets and convenience stores, for example, fluorescent discharge lamps are attached one each to the display shelves serving to partition their interiors. These fluorescent discharge lamps are adapted to be energized by an electronic multi-lamp simultaneous lighting device.

The open showcase of this kind is constructed as illustrated in Fig. I, for example. In a case proper 51, a commodity cabinet 52 opening into the front side of the case proper 51 is formed. This commodity cabinet 52 is divided by display shelves 53 into a plurality of empty spaces. Fluorescent discharge lamps 31 are attached one each to the lower sides of the display shelves 53 so as to illuminate commodities displayed below. These fluorescent discharge lamps 31 are retained in place by having base pins thereof held in fast contact with the electrodes of sockets formed one each at the opposite terminals of the fluorescent discharge lamps. To retain the fluorescent discharge lamps 31, the sockets are rendered laterally movable by virtue of the resilient force imparted thereto. The fluorescent lamps 31 are energized with the electric power which is supplied thereto via the electrodes from an electronic multi-lamp simultaneous lighting device 55 (hereinafter referred to briefly as "electronic lighting device") which is disposed in the lower part of the case 51. To the lower sides of the display shelves 53, capacitors 56 for aiding the electronic lighting device 55 in energizing the fluorescent lamps 31 are attached through the medium of sockets 57 of their own.

When these open showcases are used for displaying frozen or refrigerated foodstuffs or when the fluorescent discharge lamps 31 are used not only in the open showcases but also in commercial refrigeration plants, namely when the fluorescent discharge lamps are used in an atmosphere of low temperature, the fluorescent discharge lamps 31 fail to generate a desired luminous energy because of conditions different from those in a normal atmosphere. When the fluorescent discharge lamps are used in the harsh atmosphere, therefore, they are covered with pipes and consequently allowed to remain in a warmed state required for emission of a desired luminous energy. In other words, the fluorescent discharge lamps enclosed with the pipes are allowed to keep the interiors of the pipes warm with the heat of their own generation. When the fluorescent discharge lamps covered with the pipes as described above still use the conventional sockets, however, replacement of exahusted fluoresent discharge lamps with new supplies is extremely irksome. This is because the replacement necessitates simultaneous removal of pipes and fluorescent discharge lamps.

The pattern in which the electronic lighting device 55 is connected to the fluorescent discharge lamps 31 and the capacitors 56 is as illustrated in Fig. 2. To be specific, power supply lines 58a, 58b issue from the electronic lighting device 55 and these power supply lines 58a, 58b are connected to terminals 60a, 60b respectively of sockets 59a, 59b which serve to retain the Fluorescent lamp 31 to the display shelf 53. Terminals 56a, 56b of the capacitor 56 are respectively connected to terminals 61a, 61b of the sockets 59a, 59b through the medium of a socket 57 and resonant circuit lines 62a, 62b. The capacitors 56 are intended to resonate the high-frequency voltage applied thereto from the electronic lighting device 55 via the power supply lines 58a, 58b. Owing to the capacitors 56, the fluorescent discharge lamps 31 are enabled to retain their energized state.

When the wire distribution described above is carried out in an open showcase, since the capacitors 56 are generally disposed on the lower sides of the display shelves 53, the capacitors 56 necessitate a space for the work of their attachment and entail the possibility of sustaining a physical injury from the impact exerted by commodities being moved in and out of the commodity cabinet. Besides, the wire distribution from the electronic lighting device 55 entails the disadvantage of calling for time and labor. For the elimination of this disadvantage, there may be conceived an idea of disposing the capacitor 56 inside the electronic lighting device 55, leading the power supply lines 58a, 58b and the resotant circuit lines 62a, 62b out of the electronic lighting device 55, and connecting these lines to the terminals of thesockets 59a, 59b as illustrated in Fig. 3. Though this construction indeed obviates the necessity for externally attaching the capacitor 56, it entails the necessity for distributing four electric lines issuing from the electronic light device 55. Thus, the wire distribution in this construction gains more in complexity and demands more time and labor than that in the construction illustrated in Fig. 2.

This invention has been produced for the purpose of overcoming the problem of the prior art described above. The first object of this invention is to provide for a fluorescent discharge lamp such sockets as to facilitate the replacement of the fluoresent discharge lamp, on exhaustion, with a new supply. The second

object of this invention is to provide for a fluorescent discharge lamp such sockets as to facilitate the work of wire distribution owing to the incorporation of a capacitor in at least one of the sockets.

To accomplish the first object, the sockets of this invention for a fluorescent discharge lamp each comprise a base accommodating part shaped to accommodate therein the relevant base -of the fluorescent discharge lamp, a pipe fitting part formed on the outer periphery of the base accommodating part and adapted for insertion therein of a pipe serving to keep the fluorescent discharge lamp warm and protect it against shock, and base pin inserting parts formed in the flat surface wall of the base accommodating part and adapted to allow insertion therein of base pins projected from the base of the fluorescent discharge lamp and, at the same time, permit penetration of the base pins through the flat surface wall of the base accommodating part.

The base pin inserting parts are insertion holes which form parts of a diameter smaller than or equal to the diameter of the base pins projected from the base of the fluorescent discharge lamp. More specifically, the base pin inserting parts are each composed of an insertion hole forming a part of a diameter smaller than or equal to the diameter of the relevant base pin projected from the base of the fluorescent discharge lamp and hole diameter enlarging notches extended radially from the insertion hole and adapted to facilitate the enlargement of the insertion hole during the insertion of the base pin therethrough.

In addition to the base accommodating part formed for the purpose of serving to accommodate the relevant base of the fluoresent discharge lamp, the pipe filling part formed on the outer periphery of the base accommodating part for the purpose of allowing insertion therein of a pipe intended to keep the fluorescent discharge lamp warm and protect it against impact, and the base pin inserting parts formed in the flat surface wall of the base accommodating part for the purpose of permitting insertion therein of the base pins projected from the base of the fluorescent discharge lamp and enabling them to penetrate through the flat surface wall, the sockets each comprise a socket proper having an electrificiation adapter retaining part formed outside the flat surface wall for the purpose of retaining an electrification adapter for supplying the electric power from an external pour source to the fluorescent discharge lamp via the base pins projected outwardly from the flat surface wall. The electrification adapter is provided with a power supply electrode for electrically connecting the external power source to the base pins when this electrification adapter is set in place on the electrification adapter retaining part of the socket proper. The electrification adapter retaining part is provided with an electrode pressing member serving to press the power supply electrode against the base pins while the electrification adapter is retained by the electricification adapter retaining part.

Since the base pin inserting parts for permitting insertion therein of the base pins projected from the base of the fluorescent discharge lamp when the fluorescent discharge lamp is accommodated in the base accommodating part are formed in the flat surface wall of the base accommodating part of the socket proper, the insertion of the base pins into the base pin inserting parts causes the socket proper to be retained by the fluorescent discharge lamp. When the electrification adapter is inserted into the electrification adapter retaining part of the socket proper in the ensuant state, the power supply electrode provided for the electrification adapter is pressed against the base pins by the electrode pressing member provided in the electrification adapter retaining part of the socket proper. As a result, the supply of the electric power from the external power source to the fluorescent discharge lamp is effected.

To accomplish the second object of this invention in the illumination apparatus for energizing a fluorescent discharge lamp by the use of an electronic lighting device, a capacitor for connection to the input terminal of the fluorescent discharge lamp is incorporated in a socket fulfilling the role of transferring to the fluorescent discharge lamp the electric power supplied from the electronic lighting device. Owing to this construction, the time and labor required for wire distribution can be minimized because the least possible number of electric lines suffices to effect necessary wire distribution during the installation of the illumination apparatus and the necesity for disposing an external capacitor is obviated.

Fig. 1 is a diagram schematically illustrating an open showcase. Fig. 2 is a diagram illustrating the pattern of wire distribution for an illumination apparatus in which a socket for exclusive use for a capacitor is disposed outside en electronic lighting device and the capacitor is attached to the socket. Fig 3 is a diagram illustrating the pattern of wire distribution for an illumination apparatus in which an electronic lighting device incorporates a capacitor therein and a conventional socket is used for a fluorescent discharge lamp. Fig. 4 is a diagram illustrating a socket proper of a socket of this invention for a fluorescent discharge lamp; Fig. 4 (A) representing a front view thereof, Fig. 4 (B) a cross section taken through Fig. 4 (A) along the line A-A, Fig. 4 (C) a rear side view thereof, and Fig. 4 (D) a top view thereof. Fig. 5 is a perspective view of the socket proper shown in Fig. 4. Fig. 6 is a diagram illustrating an electrification adapter proper of this invention for the socket of the fluorescent discharge lamp; Fig. 6 (A) representing a top view thereof, Fig. 6 (B) a front view thereof, Fig. 6 (C) a plan view thereof, Fig. 6 (D) a cross section taken through Fig. 6 (B) along the line B-B, and Fig. 6 (E) a rear view thereof. Fig. 7 is a diagram illustrating a power supply

electrode to be incorporated in the electrification adapter proper of Fig. 6; Fig. 7 (A) representing a side view thereof and Fig. 7 (B) a front view thereof. Fig. 8 is a perspective view illustrating the state in which the power supply electrode shown in Fig. 7 is incorporated in the electrification adapter proper shown in Fig. 6. Fig. 9 is a diagram illustrating an electrification adapter lid for the socket of this invention for a fluorescent discharge lamp; Fig. 9 (A) representing a top view thereof, Fig. 9 (B) a front view thereof, Fig. 9 (C) a plan view thereof, Fig. 9 (D) a side view thereof, and Fig. 9 (E) a rear view thereof. Fig. 10 is a perspective view of the electrification adapter lid shown in Fig. 9. Fig. 11 is a perspective view of an electrification adapter for the socket of this invention for a fluorescent discharge lamp. Fig. 12 is a perspective view of the socket of this invention for a fluorescent discharge lamp. Fig. 13 is a cross section illustrating the socket for a fluorescent discharge lamp which is retained in the state shown in Fig. 12. Fig. 14 is a diagram illustrating one example of an illumination apparatus using a capacitor-incorporating socket for a fluorescent discharge lamp.

Now, one working example of this invention will be described below with reference to the accompanying drawings. Figs. 4 (A) - (D) are respectively a front view, a cross section, a rear view, and a top view of the socket proper and Fig. 5 is a perspective view of the socket proper.

As illustrated in these diagrams, a socket proper 1 is provided on the front surface side thereof with an electrification adapter retaining part 2 having attached thereto an electrification adapter which will be described specifically hereinbelow. In the electrification adapter retaining part 2, anchoring projections 3a, 3b adapted to engage anchoring depressions possessed by the electrification adapter and prevent them from slippage and electrode pressing members 4a, 4b adapted to force open power supply electrodes disposed in the electrification adapter in consequence of the attachment of the electrification adapter are formed. On the rear surface side of the socket proper 1, a base accommodating part 5 for admitting the base of a fluorescent discharge lamp and a pipe inserting part 6 for allowing insertion therein of a pipe serving to keep the fluorescent discharge lamp in a warmed state and protect it against impacts are formed. On a flat surface wall 7, base pin inserting parts 8a, 8b adapted to allow insertion therein of base pins protruding from the base of the fluorescent discharge lamp when the base is admitted in the base accommodating part 5 are formed. The base pin inserting parts 8a, 8b respectively comprise insertion holes 9a, 9b having a diameter smaller than or equal to the diameter of the base pins so as to allow insertion therein of the base pins without production of any idle space and sets of hole diameter enlarging notches 1O, 1O, and 1O adapted to facilitate this insertion without entailing any distortion of the flat surface wall 7 and laid radially around the insertion holes 9a, 9b as circumferentially spaced at a substantially uniform angular interval.

In the socket proper 1 which is constructed as described above, when the base part of the fluorescent discharge lamp (not shown) is admitted in the base accommodating part 5 in such a manner as to accompany insertion of the base pins into the base pin inserting parts 8a, 8b, the base pins force open the insertion holes 9a, 9b until the diameters of the insertion holes 9a, 9b are equalized with the diameter of the base pins while faintly moving in the direction of insertion the elastic wall intervening between the diameter enlarging notches 1O, 1O, and 1O. Thereafter, the base pins are driven home in the insertion holes 9a, 9b. Thus, the insertion of the base pins is accomplished. As a result, the base pins have part thereof nipped by the insertion holes 9a, 9b and the rest thereof thrust past the flat surface wall 7 and lodged fast on the front surface side of the socket proper 1, namely on the side on which the electrification adapter retaining part 2 is formed. The socket proper 1, therefore, is finally retained in the base part of the fluorescent discharge lamp so fast that it will not be dislocate in spite of appreciable force.

Figs. 6 (A) to (E) are diagrams illustrating an electrification adapter and Figs. 7(A) and (B) are diagrams illustrating a power supply electrode to be incorporated in the electrification adapter proper. Fig. 8 is a perspective view of the electrification adapter proper in the state incorporating therein the power supply electrode. Figs. 9 (A) to 9 (E) are diagrams illustrating the electrification adapter lid, Fig. 10 is a perspective view thereof, and Fig. 11 is a perspective view of an electrification adaptor formed by attaching the electrification adapter lid to the electrification adapter proper.

As illustrated in these diagrams, an electrode nipping part 13 serving to nip a power supply electrode 12 shown in Fig. 7 and retain it in a prescribed posture is formed on the front side of an electrification adapter proper 11. This elecrrode nipping part 13 comprises a nipping base part 14 allowing collision thereagainst the power supply electrode 12 and two pairs of nipping columns 15, 15 allowing contact therewith the opposite surfaces thereof in the direction of thickness. The nipping base part 14 incorporates a capacitor therein. This capacitor, during the formation of the electrification adapter proper 11, is located so as to assume the position thereof in the nipping base part 14 and then molded therein. One of the terminals of the molded capacitor is adapted to protrude from the surface of the nipping base part 14 and come into contact with the power supply electrode 12 to be described specifically herein below. The other terminal is joined as by soldering to an electric line. On the upper side of the electrode nipping part 13, electric line retaining parts 17 for allowing passage therethrough of

an electric line 58 connecting the power supply electrode 12 to the external power source and, at the same time, nipping fast the electric line when the electrification adapter lid to be described specifically hereinbelow is attached to the electrification adapter proper 11. The line retaining parts 17 are formed in a base stand 18 which is provided for the electrification adapter proper 11 and the hole diameter of the line retaining parts 17 is substantially equal to or slightly smaller than the diameter of the electric line 58. Since the nipping base part 14, the nipping columns 15, and the base stand 18 are generally desired to be formed integrally on the electrification adapter proper 11 in consideration of the simplification of assembly and the maintenance of strength, the present embodiment has all these components integrally formed. The power supply electrode 12 is formed in a shape as illustrated in Fig. 7. Electric line connecting parts 19 are formed one each at one terminal of each of the two electric line supply electrodes attached to the electrification adapter proper 11. As a result, one surface of the power supply electrode 12 collides against the lateral wall of the nipping base part 14 and, at the same time, comes into contact with one of the terminals of the capacitor. To the other terminal of the capacitor, a conductor line of the electric line 58 is electrically connected as by soldering. One surface of the power supply electrode 12 collides against the lateral wall of the nipping base part 14. To the other surface thereof, the conductor of the electric line 58 is electrically joined as by soldering. A sliding part 20 is formed in the other terminal part. When the electrification adapter proper 11 is attached to an electrification adapte retaining part 2 of a socket proper 1 shown in Fig. 8, this sliding part 20 slides on the outer surfaces of electrode pressing members 4a, 4b and expands the electric line supply electrode 12 with the advance of insertion thereof. As a result, the central part of the power supply electrode 12 is pressed against the lateral surface of the base pins of the fluorescent discharge lamp omitted from illustration. On the lateral surface of the electrification adapter proper 11, engaging depressions 21a, 21b for engagement with anchoring projections 3a, 3b formed on the electrifification adapter retaining part 2 are formed. By these engaging depressions 21a, 21b, the sensation of attachment of the electrification adapter to the socket proper 1 is enhanced and the possible slippage of the electrification adapter from the socket proper 1 can be infallibly prevented.

The front surface side of the electrification adapter proper 11 is covered with an electrification adapter lid proper 22 constructed as illustrated in Fig. 9. On the rear surface side of this electrification adapter lid member 22 is formed a base stand 23 adapted to be opposed to the base stand 18 of the electrification adapter proper 11. In the base stand 23 are formed electric cable retaining parts 24 which are adapted similarly to be opposed to the electric cable retaining parts 17. When the electrification adapter proper 11 is covered with the electrification adapter lid member 22, therefore, the electric cable retaining parts 17 and 24 are joined to form openings for passing electric cables and eventually nipping the passed electric cables fast in place. Below the electric cable retaining parts 24 are disposed electrode bending protuberances 25. These electrode bending protuberances 25 are so formed that the fulcrums on which the power supply electrodes 12 are extended when the electrification adapter proper 11 is attached to the electrification adapter retaining part 2 will be altered from the nipping columns 15 on the upper side as illustrated in Fig. 5 to these electrode bending protuberances 25. They serve the purpose of increasing the pressure of the power supply electrodes 12 against the base pins and consequently realizing a safe state of electric connection. Below these electrode bending protuberances 25 are formed guiding notches 26 adapted to guide the base pins protruding from the flat surface wall 7 toward the power supply electrodes 12 in consequence of the insertion of the electrification adapter proper 11 into the electrification adapter retaining part 2. in the lateral surfaces of the electrification adapter lid member 22, engaging depressions 27 are formed one each in the same manner as described above. The electrification adapter lid member 22 is attached fast to the electrification adapter proper 11 in such a manner as to cover the open side thereof after the power supply electrodes 12 have been set in place in the electrification adapter proper 11 and the electric cables 16 have been soldered to the electric cable connecting parts 19. As a result, the electrification adapter proper 11 and the electrification adapter lid member 22 are integrated to complete an electrification adapter 30 as illustrated in Fig. 11.

The electrification adapter 30 constructed as described above is attached to the electrification adapter retaining part 2 of the socket proper 1 as illustrated in Fig. 12. In the course of this attachment, the electrification adapter lid member 22 is inserted in a gap part which is formed between the electrification adapter retaining part 2 and the flat surface wall 7 as illustrated in Fig. 4. As a result, a slip preventing wall 28 which is necessarily formed between the guiding notched 26 for guiding the base pins to the power supply electrodes 12 as illustrated in Fig. 9 forces its way between the electrode pressing members 4a, 4b and the flat surface wall 7 as illustrated in Fig. 4. Thus, the electrification adapter 30 is prevented from slipping off in the direction of the front surface of the socket proper 1. The prevention of the slippage thereof on the side opposite the direction of insertion is attained by virtue of the engaging projections 3a, 3b.

When the fluorescent discharge lamp and the pipe have been attached to the socket proper 1 and the electrification adapter 30 have been attached to

the socket proper 1, the resultant assembly assumes a cross section as illustrated in Fig. 13. A pipe 32 for retaining a fluorescent discharge lamp 31 in a warmed state and protecting it against impacts is joined by insertion to the pipe inserting part 6 of the socket proper 1. The base accommodating part 5 of the socket 1 admits a base 33 of the fluorescent discharge lamp 31. Base pins 34 protruding from the base 33 are passed through the insertion holes 9a, 9b formed in the flat surface wall 7. The power supply electrodes 12 are pressed against the lateral surfaces of the base pins 34. The supply of electric power to the fluorescent discharge lamp, therefore, is accomplished via a path which extends from the electric cables 16 through the power supply electrodes 12 to the base pins 34.

In the socket for a fluorescent lamp constructed as described above, when the fluorescent discharge lamp needs replacement with a new supply, it suffices first to pull an electrification adapter 30 from the electrification adapter retaining part 2 and then extract the socket proper 1 from base pins 34 with a pipe 32 held firmly in a hand. As a result, the fluorescent discharge lamp 31 is ready to be removed. The attachment of the newly supplied fluorescent discharge lamp 31 is accomplished by fitting the socket proper 1 to the fluorescent discharge lamp 31 while inserting the base pins 34 into insertion holes 9a, 9b meanwhile. Consequently, one of the base pins of the fluorescent discharge lamp 31 is connected to the electric line 58 via the electrode 12 and the other base pin is connected to the electric line 58 via the electrode 12 and the capacitor. Then, the fluorescent discharge lamp 31 is inserted into the pipe 32 and the terminal part of the pipe 32 is fit into a pipe inserting part 6 of the socket proper 1. Subsequently, the electrification adapter 30 is set in place in the electrification adapter retaining part 2. The attachment and detachment of the fluorescent discharge lamp 31 can be very easily effected as described above.

The sockets constructed as described above are used for wire distribution to the fluorescent discharge lamp, the pattern of wire distribution is as illustrated in Fig. 14. In the construction illustrated in Fig. 4, the electrification adapter 30 incorporating the capacitor is used exclusively for the socket proper 1.

The power supply lines 58a, 58b for supplying electric power to the fluorescent discharge lamp 31 are connected to the electronic lighting device 55 and the power supply line 58a is connected to the power supply electrode 12a of the socket 59a and the power supply line 58b to the power supply electrode 12b of the socket 59b. The capacitor 56 is disposed inside the socket 59a and one of the terminals of the socket is connected to the electric line connecting parts 19a of the power supply electrode 12 incorporated in the electrification adapter proper 11 and the other terminal of the capacitor is connected to a resonant circuit line 65a. A resonant circuit line 65b is connected to the power supply electrode 19b of the socket 59b and the resonant circuit line 65a and the resonant circuit line 65b are interconnected through the medium of a connector 66. Owing to this wire distribution, the high-frequency voltage applied from the electronic lighting device 55 to the fluorescent discharge lamp 31 resonates with the capacitor 56 and keeps the fluorescent discharge lamp 31 in an activated state. This connector 66 is not required to be particularly provided herein where no use is found therefor. Where the connector 66 is omitted, the electrodes 19a, 19b are directly interconnected with one resonant circuit line via the capacitor 56.

The attachment of the fluorescent discharge lamp to the open showcase is attained by first disposing the sockets 59a, 59b on the display shelf 53, laying the two power supply lines 58a, 58b to the electronic lighting device 55, then setting the four base pins 34a to 34d of the fluorescent discharge lamp 31 in place in such a manner as to contact respectively the terminals 12a, 12b, 19a, and 19b of the sockets 59a, 59b, and finally fitting the connector 66 in place.

The electrification adapter retaining part 2 is so formed as to permit attachment thereto of a varying electrification adapter other than the one described in the present embodiment.

Since the illumination apparatus of this invention, unlike the conventional countertype, obviates the necessity for attaching a socket exclusively for a capacitor or securing a space for the attachment of the socket, it has no use for the work of installing a capacitor in the electronic lighting device and distributing four power lines to the sockets and, therefore, enjoys improved workability and promotes reduction of space requirement. Though the embodiment cited above has been described as having one capacitor incorporated in only one of the opposite sockets, two capacitors may be incorporated one each in the opposite sockets. Naturally, the capacity of each of the two capacitors incorporated in the opposite sockets is different from that of the sole capacitor incorporated in only one of the opposite sockets.

The sockets of this invention for a fluorescent lamp are such that a capacitor is incorporated in at least one of the opposite sockets. The illumination apparatus using these sockets, therefore, enjoys enhanced efficiency of wire distribution and economized use of space for attachment of the sockets and smoothened movement of commodities into and out of an open showcase.

Claims

1. A socket for a fluorescent discharge lamp (31), characterised in that it comprises: a base accommodating part (5) arranged to accommodate the base (33) of a fluorescent discharge lamp (31); a

pipe insertion part (5) arranged to permit the insertion of a pipe (32) used to keep the lamp in a warm state and to protect the lamp (31) against shock; and base pin insertion parts (8a,8b) formed in the flat surface wall (7) of the base pins (34) projecting from the base (33) of the lamp (31) and to allow part of the base pins (34) to penetrate through the flat surface wall (7) of the base accommodating part (5).

2. A socket as claimed in Claim 1, characterised in that the base pin insertion parts (8a,8b) are insertion holes (9a,9b) having diameters smaller than or equal to the diameter of the base pins (34) projecting from the base (33) of the lamp (31).

3. A socket as claimed in Claim 2, characterised by hole diameter enlarging notches (10), preferably extending radially from each insertion hole (9a,9b) as a centre, adapted to facilitate enlargement of the hole diameter during the insertion of a base pin (34).

4. A socket as claimed in any preceding Claim, characterised in that the base accommodating part (5) and the pipe insertion part (6) form part of a socket proper (1), the socket further comprising: an electrification adapter retaining part (2) formed outside the flat surface wall (7) for retaining an electrification adapter (30) serving to supply power from an external power source to the lamp (31) via the base pins (34) projecting outwards from the flat surface wall (7), the electrification adapter (30) being provided with a power supply electrode (12) arranged to connect electrically the external power source to the base pins (34) when the electrification adapter (30) is retained by the electrification adapter retaining part (2) of the socket proper (1), the electrification adapter retaining part (2) being provided with an electrode pressing member (4a,4b) arranged to press the power supply electrode (12) against the base pins (34) when the electrification adapter (30) is retained by the electrification adapter retaining part (2).

5. A socket for a fluorescent discharge lamp (31) in an illumination apparatus adapted to energise the fluorescent discharge lamp (31) by the use of an electronic lighting device (55), characterised in that the socket includes a capacitor (56) for connection to the electronic lighting device (55) and to the input terminal of the fluorescent discharge lamp (31) incorporated in the socket and serving to transfer to the fluorescent discharge lamp (31) the electric power supplied from the electronic lighting device (55).

6. A pair of sockets as claimed in Claim 5, one to be joined independently to each of the input terminals provided at the opposite ends of the lamp (31) characterised in that a capacitor (56) for connection to the electronic lighting device (55) and to the input terminal of the lamp (31) is incorporated in one or other of the two sockets or two such capacitors (56) are incorporated one in each of the two sockets.

7. A pair of sockets as claimed in Claim 6, characterised in that the two sockets are each provided with engaging terminals (12) severally for engagement with the two base pins (34) provided at each end of the lamp (31) and where one capacitor (56) is incorporated in one or other of the sockets, it has one of its opposite terminals connected to one of the opposite engaging terminals (12) of the capacitor incorporating socket and its other terminal connected to one of the opposite terminals (12) of the other socket via a resonant circuit line (65a,65b).

8. A pair of sockets as claimed in Claim 6, characterised in that the sockets are each provided with engaging terminals (12) severally for engagement with the two base pins (34) provided at each end of the lamp (31) and where two capacitors are incorporated one in each of the two sockets, each has one of its opposite terminals connected to one of the opposite engaging terminals of the relevant capacitor (56) and its other terminal connected mutually via a resonant circuit line (65a,65b) to one of the opposite terminals of the capacitor (56) incorporated in the other socket.

9. A pair of sockets as claimed in Claim 7 or Claim 8, characterised in that, of the engaging terminals (12) provided for the two sockets, those on the outer sides are severally connected to the output terminal of the electronic lighting device (55) via a power supply line or lines (58a,58b).

10. A pair of sockets as claimed in any of Claims 7 to 9, characterised in that the resonant circuit line comprises an electric line (65a,65b) connected to each of the engaging terminals (12) of each of the two sockets and a connector (66) capable of detachably connecting the electric line.

11. A pair of sockets as claimed in any of Claims 7 to 10, characterised in that the resonant circuit line is an electric line (58a,58b) for directly connecting the two engaging terminals (12) severally of the two sockets.

FIG. 1

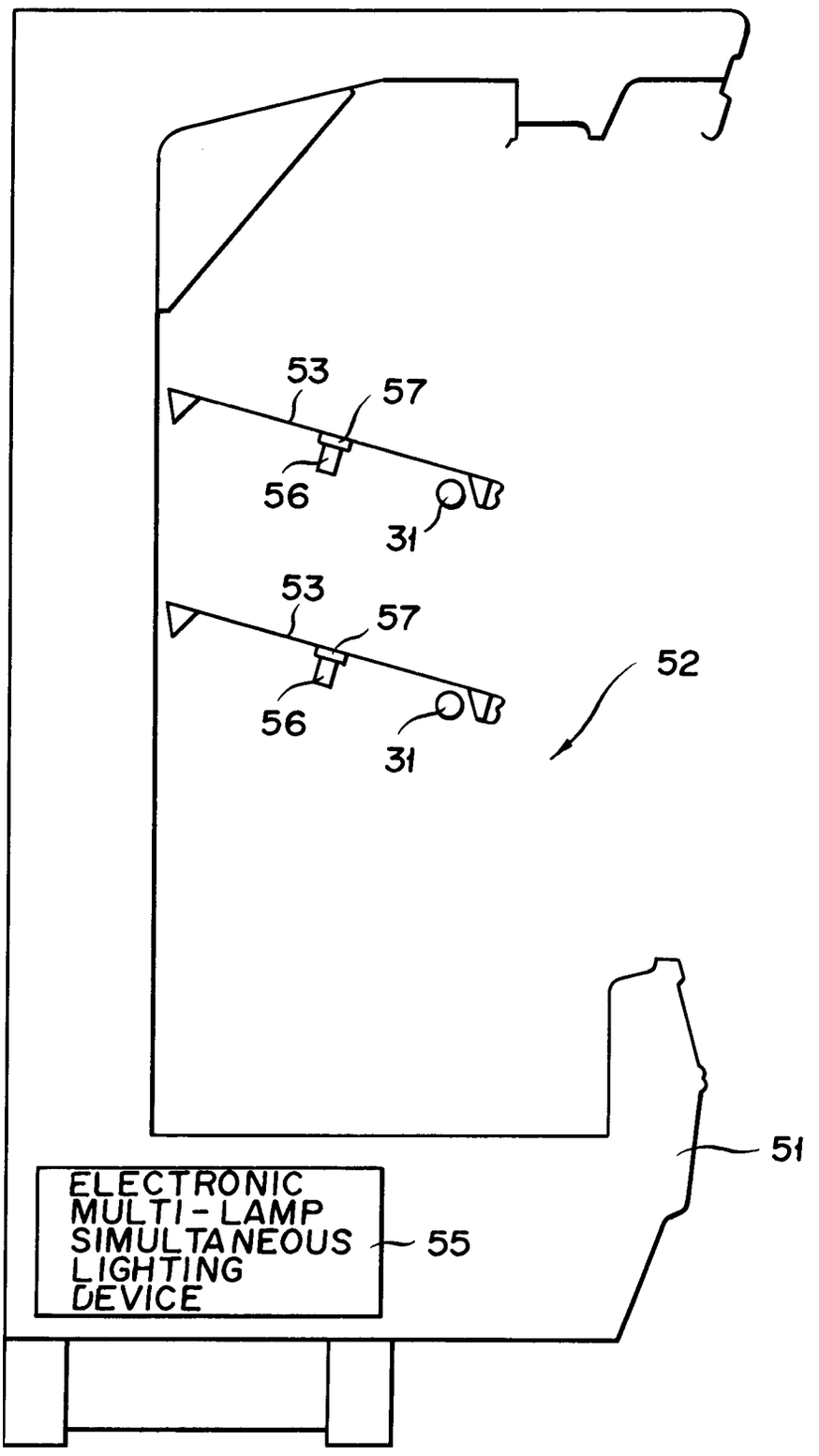

53
57
56
31
53
57
56
31
52
51
ELECTRONIC
MULTI-LAMP
SIMULTANEOUS
LIGHTING
DEVICE
55

FIG.2

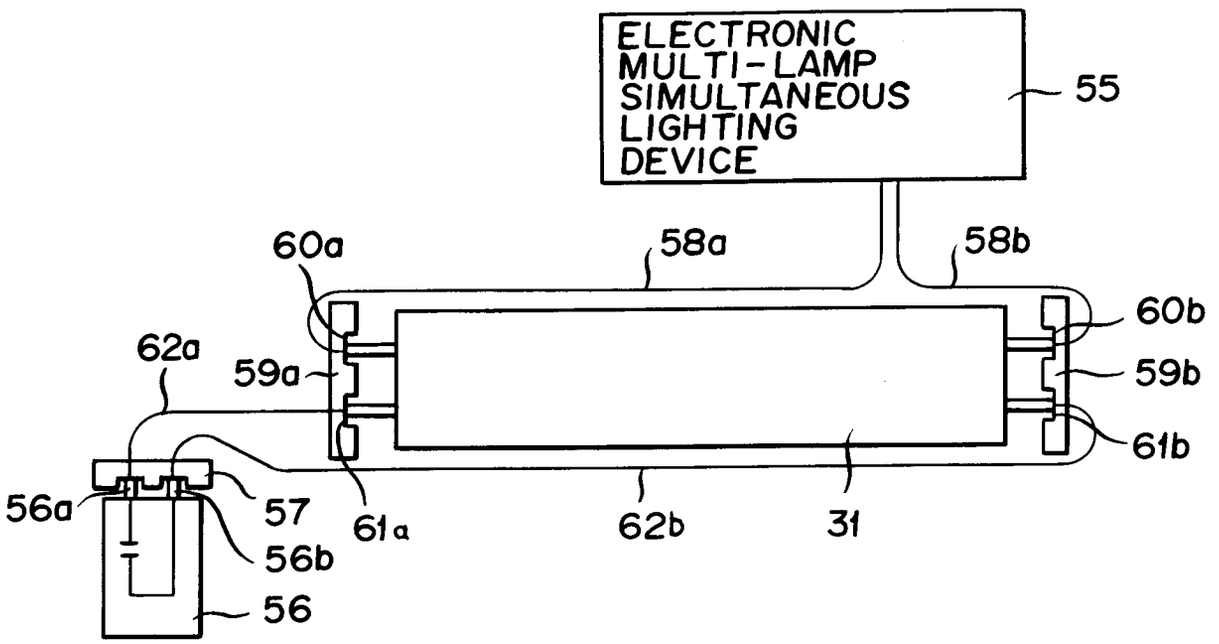
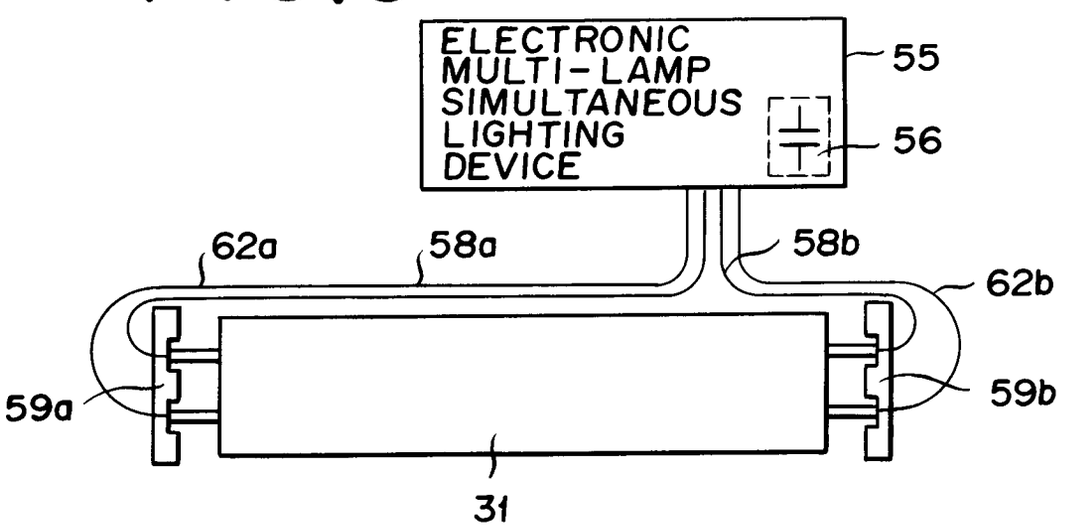

ELECTRONIC
MULTI-LAMP
SIMULTANEOUS
LIGHTING
DEVICE
55
60a
58a
58b
60b
62a
59a
59b
61b
56a
57
61a
62b
31
56b
56

FIG.3


ELECTRONIC
MULTI-LAMP
SIMULTANEOUS
LIGHTING
DEVICE
55
56
62a
58a
58b
62b
59a
59b
31

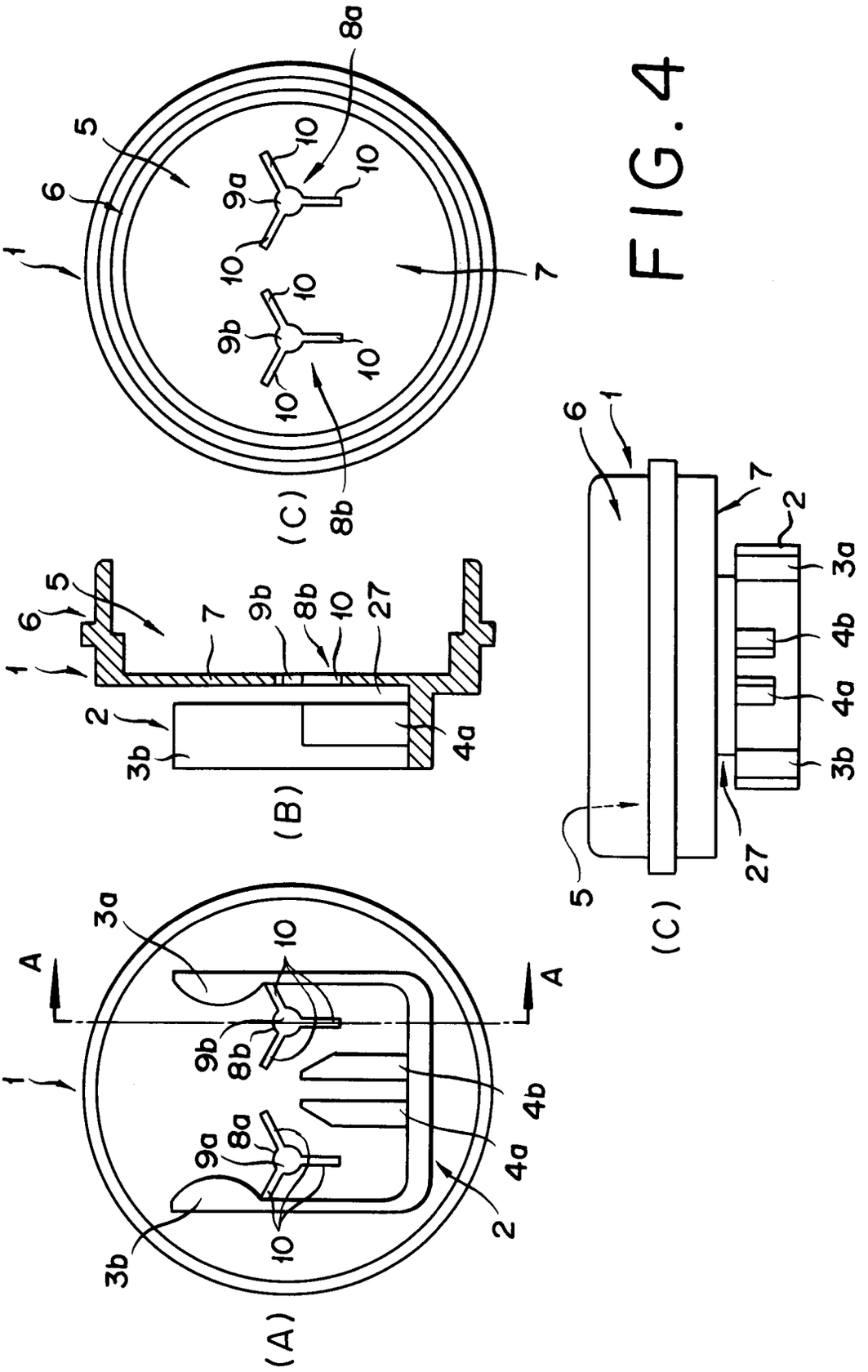


FIG. 4

FIG.8

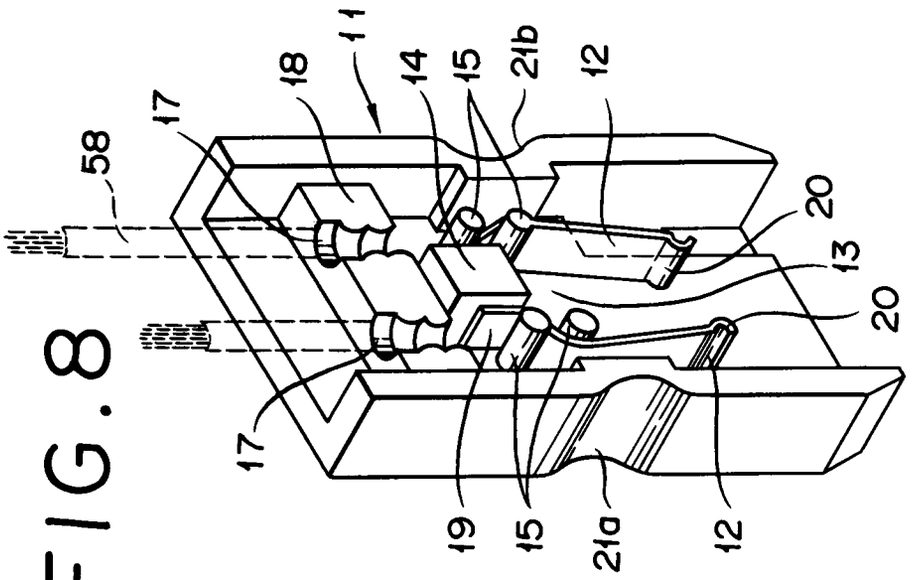

58
17
18
11
14
15
21b
12
20
13
20
17
19
15
21a
12

FIG.5

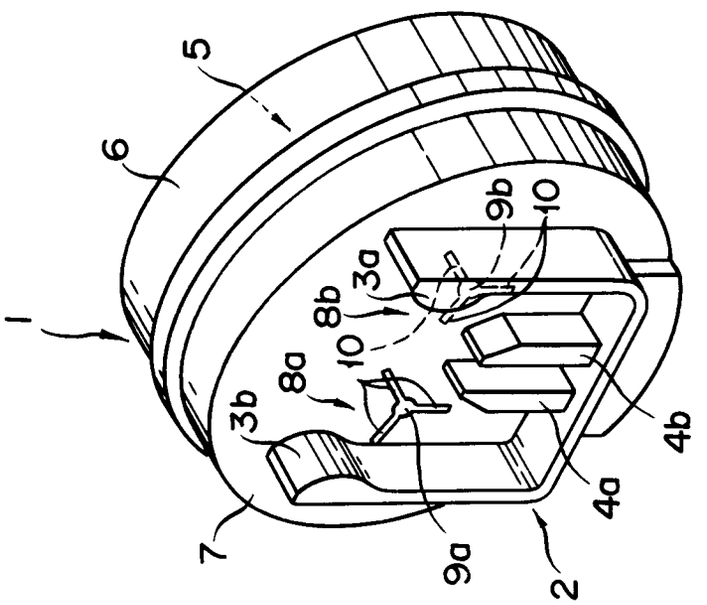

1
5
6
9b
10
3a
8b
10
8a
3b
4b
4a
7
9a
2

FIG.6

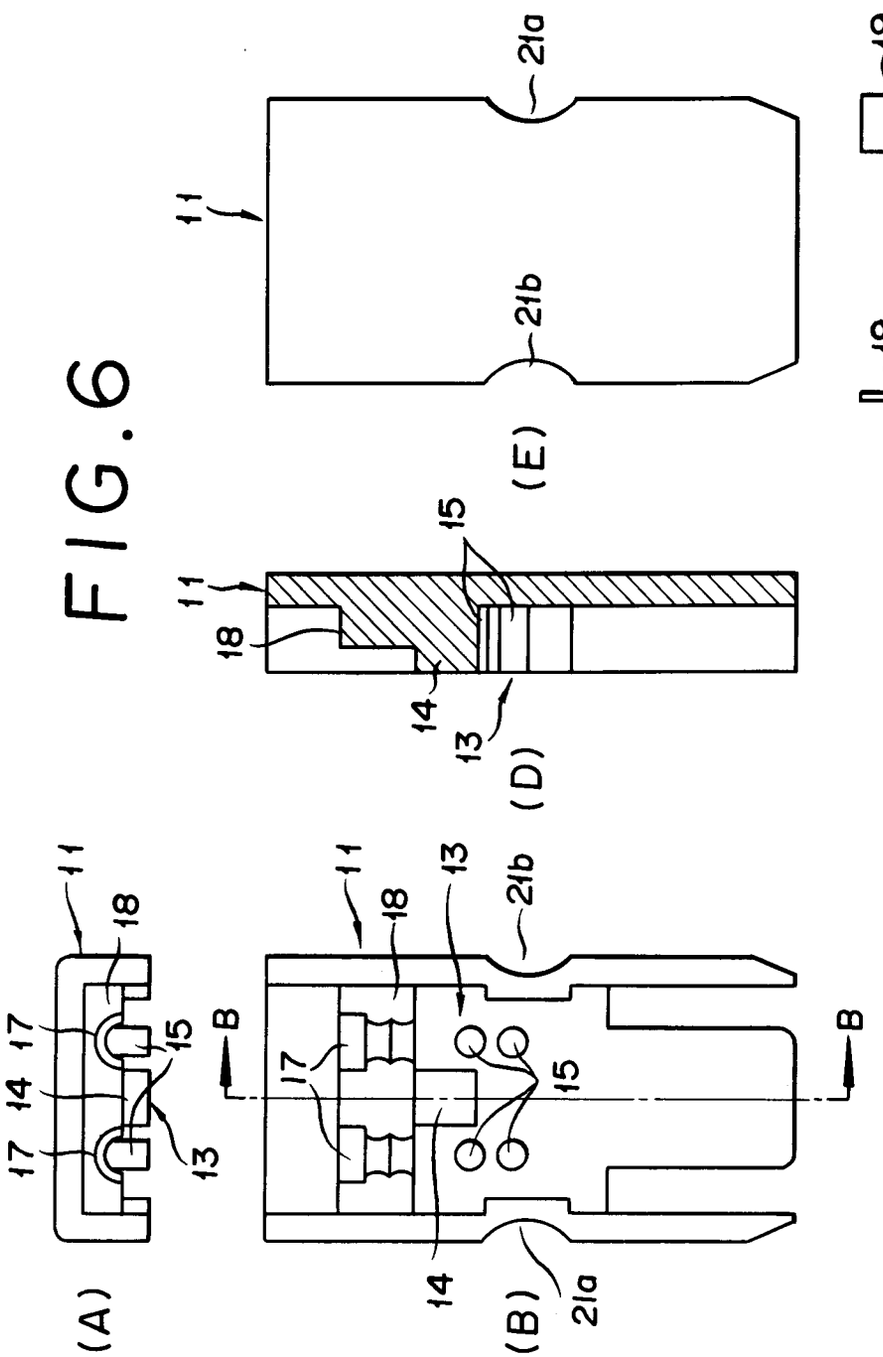

11
21a
21b
(E)
15
11
18
14
13
(D)
11
18
13
21b
B
B
17
15
17
14
17
13
14
21a
(B)
(A)
11
18
17
15
14
17
13
(C)

FIG.7

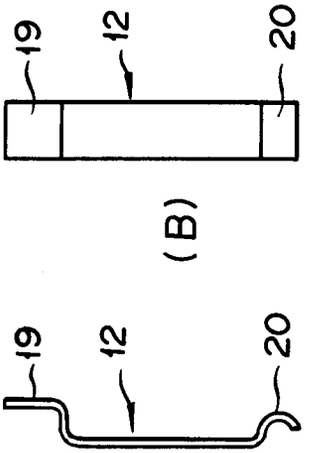

19
12
20
(B)
19
12
20
(A)

FIG. 9

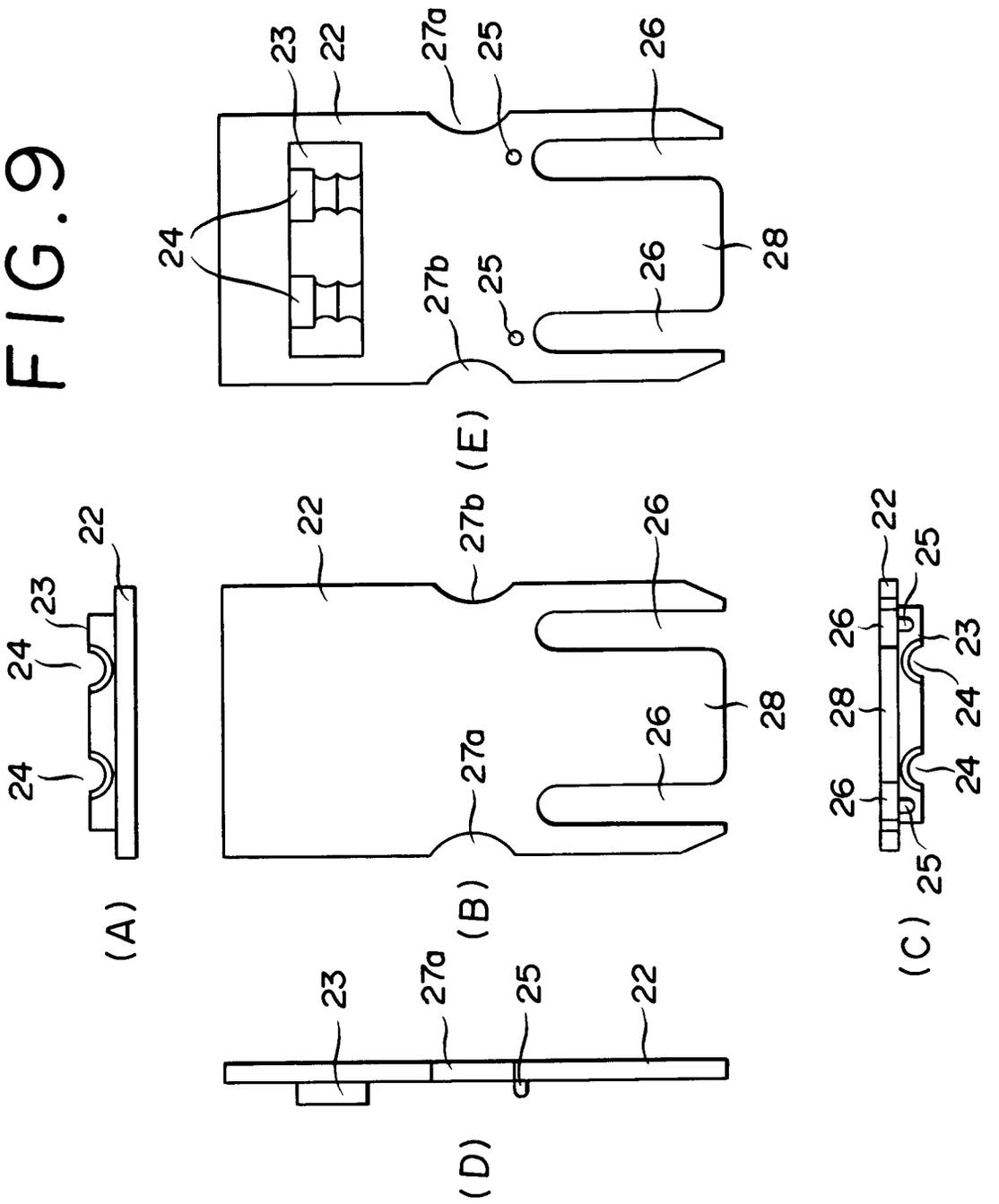

(A)
22
23
24
24
(B)
22
27b
26
28
26
27a
(C)
22
25
26
23
28
24
24
26
25
(D)
23
27a
25
22
(E)
23
22
27a
25
26
24
27b
25
26
28

FIG.11

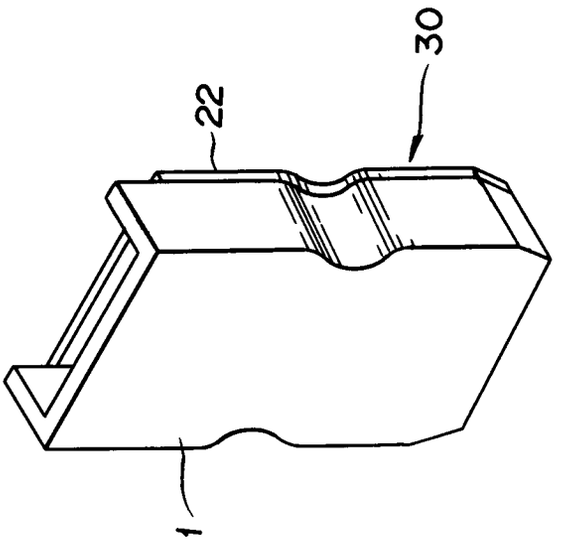


FIG.10

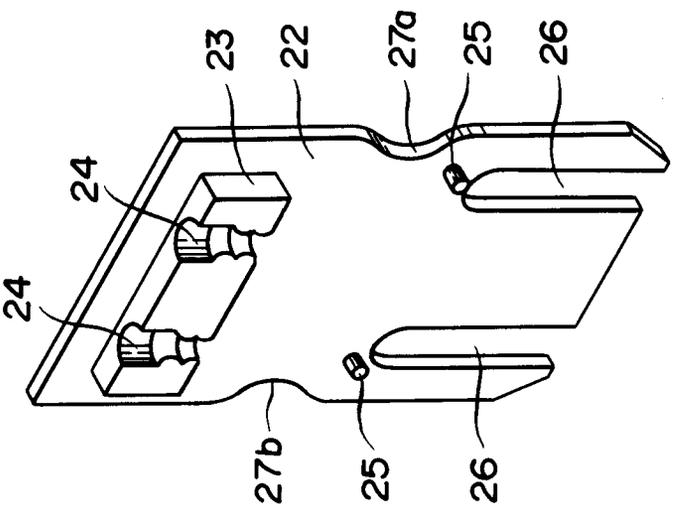


FIG.13

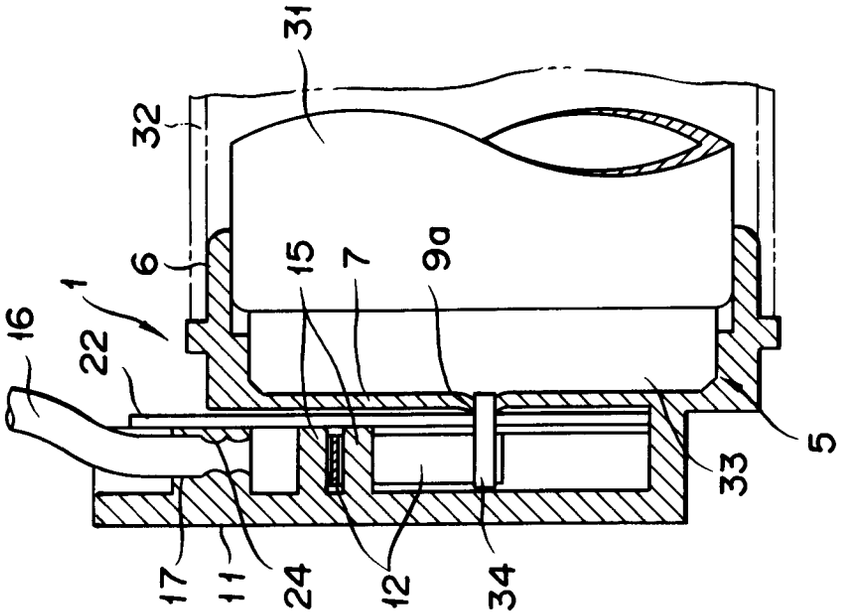


FIG.12

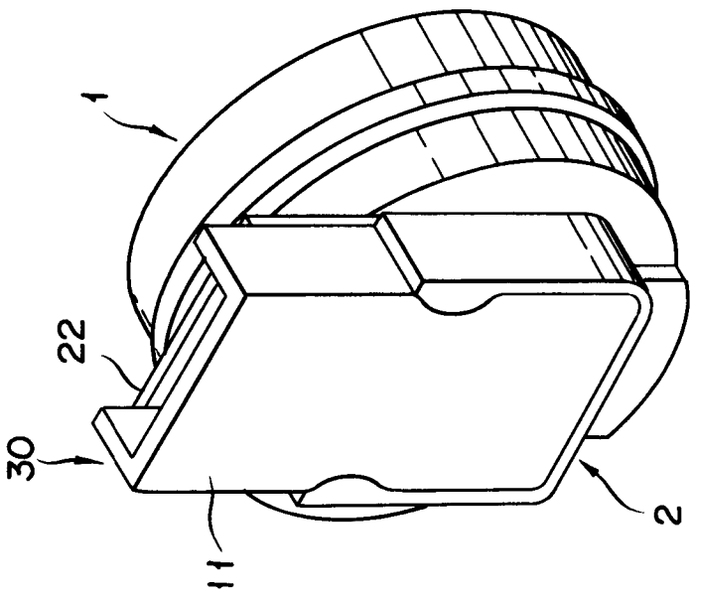
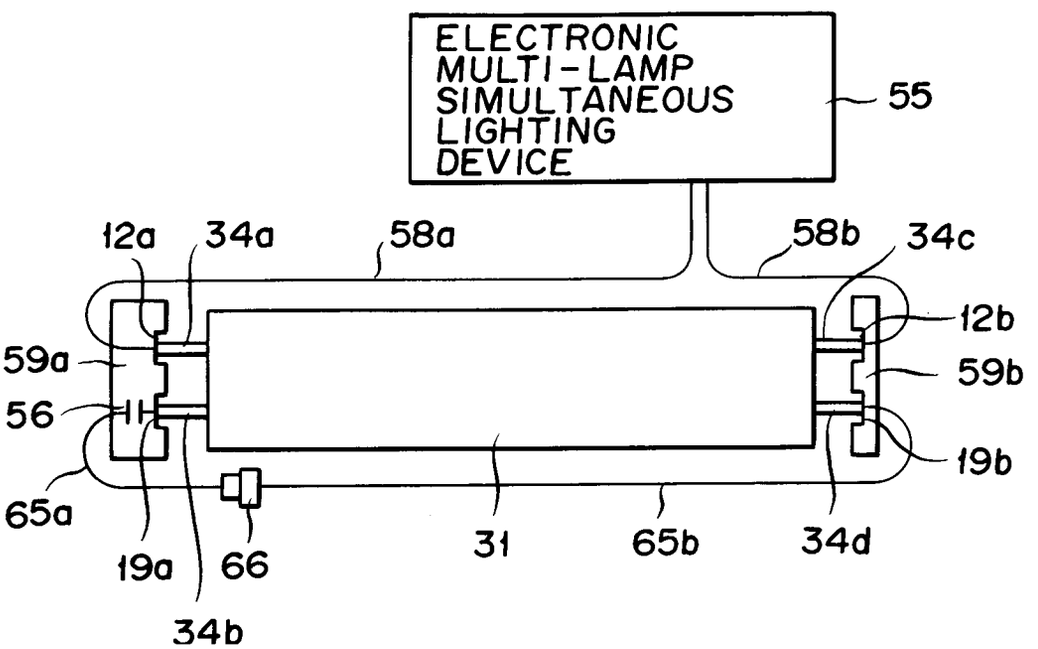


FIG.14


ELECTRONIC
MULTI-LAMP
SIMULTANEOUS
LIGHTING
DEVICE
55
12a
34a
58a
58b
34c
12b
59a
59b
56
19b
65a
19a
66
31
65b
34d
34b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 3647

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-3 740 701 (TRILUX-LENZE GMBH & CO KG) * abstract; figure 3 * ---	1	H01R33/08
A	FR-A-1 358 459 (BOURLON DE SARTY) * page 1, line 31 - line 46; figure 1 * ---	1	
A	DE-C-948 797 (SIEMENS-SCHUCKERTWERKE GMBH.) * claims 1,2; figure 3 * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 AUGUST 1992	HORAK A. L.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)