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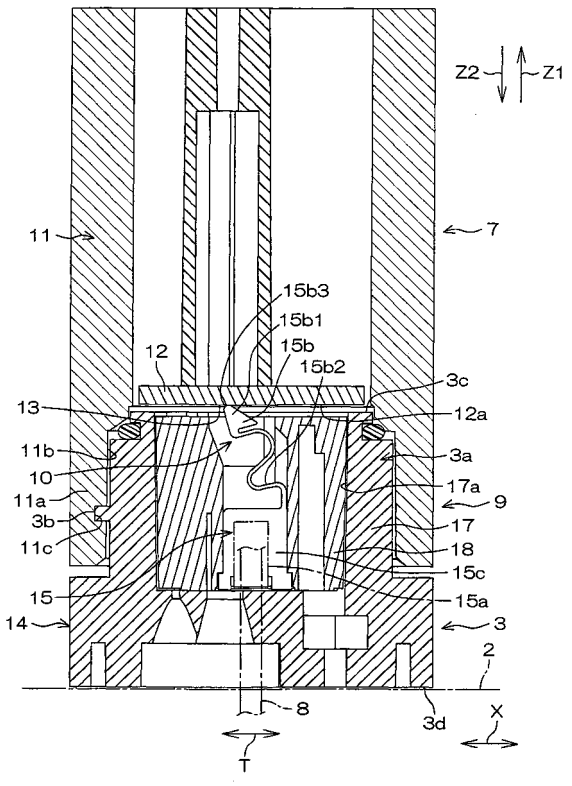
(54) Signaling indicator pillar structure and signaling indicator having the structure

(57) A signaling indicator pillar structure (10) is employed for a signaling indicator (1) including a terminal unit (3) and an upper unit (7) fitted on the terminal unit (3). A plurality of terminal fittings (15) are arranged in predetermined spaced relation in an outer peripheral portion (18c) of an insulator housing (18) of the terminal unit (3). Electrical cords (8) are inserted into the terminal unit (3) through a through-hole (18a) provided in a center portion of the terminal unit (3), and core wires (8a) exposed in distal portions (8c) of the electrical cords (8) are respectively electrically connected to first connection portions (15a) of the terminal fittings (15). Second connection portions (15b) of the terminal fittings (15) respectively contact planar electrodes (13) on the upper unit (7). The first connection portions (15a) are each located at a lower (Z2) position, and the second connection portions (15b) are each located at an upper (Z1) position. A portion of each of the terminal fittings (15) except the first connection portion (15a) and the second connection portion (15b) is enclosed in the insulator housing (18) of the terminal unit (3).

FIG. 2



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a signaling indicator to be attached to a mechanical machine or the like for giving a variety of information by lighting or blinking and, particularly, to a pillar structure required for attaching the signaling indicator to the mechanical machine.

2. Description of Related Art

[0002] A signaling indicator typically includes a multiplicity of indication elements (light emitting elements) such as lamps or LEDs provided therein, and a multiplicity of electrical cords for supplying electrical signals to the respective indication elements. The signaling indicator is attached to a mechanical machine for use. Therefore, when the signaling indicator is attached to the mechanical machine, the electrical cords accommodated in the signaling indicator are respectively electrically connected to electrical cords of the mechanical machine.

[0003] The signaling indicator attached to the mechanical machine generally projects from the mechanical machine. When the mechanical machine is transported into a plant or the like with the signaling indicator attached thereto, the signaling indicator projecting from the mechanical machine hinders the transportation of the mechanical machine. Therefore, the signaling indicator is generally dividable into a terminal unit which is fixed to the mechanical machine, and an upper unit (signaling indicator main unit) which is detachable from the terminal unit.

[0004] In the signaling indicator thus dividable into the terminal unit and the upper unit, a connection structure should be provided in engagement portions of the terminal unit and the upper unit so as to reliably establish electrical connection between the terminal unit and the upper unit for reliably supplying the electrical signals to the respective indication elements in the upper unit when the terminal unit is engaged with the upper unit.

[0005] On the other hand, the structures of the engagement portions of the terminal unit and the upper unit should also satisfy a requirement for size reduction.

[0006] An example of the prior-art structure satisfying the aforesaid both requirements is disclosed in United States Patent No. 5,952,915.

[0007] A signal pillar structure disclosed in United States Patent No. 5, 952, 915 includes L-shaped legs (31) and U-shaped connecting bridges (27), and the electrical connection between the terminal unit and the upper unit is established by the L-shaped legs (31) and the U-shaped connecting bridge (27).

SUMMARY OF THE INVENTION

[0008] In the prior-art connection structure (signal pillar structure) for the connection between the terminal unit and the upper unit, connection electrodes are brought into contact with each other in a direction parallel to axes of the units. Therefore, if a force acts on the units perpendicularly to the axes of the units, an excessive stress is liable to occur in the contacts of the connection electrodes. This may warp or damage the electrodes.

[0009] Further, if an attempt is made to arrange the electrical components in predetermined spaced relation for electrical safety when reducing the size of the pillar structure, the size reduction is limited. Thus, there is a limitation of the size reduction.

[0010] In view of the foregoing, it is a principal object of the present invention to provide a pillar structure which ensures a smaller size for a signaling indicator and a higher reliability of the electrical connection between the terminal unit and the upper unit.

[0011] It is another object of the present invention to provide a smaller size pillar structure which prevents damage to electrical cords connected to a terminal unit, and ensures reliable electrical connection between the terminal unit and an upper unit.

[0012] The present invention provides a pillar structure for a signaling indicator, which includes a terminal unit and an upper unit fitted on the terminal unit. The terminal unit is made of an insulator, and includes a plurality of terminal fittings arranged in predetermined spaced relation in an outer peripheral portion thereof. The terminal fittings each include a first connection portion to be electrically connected to a core wire exposed in a distal portion of an electrical cord inserted from a center portion of the terminal unit, and a second connection portion to be brought into contact with a connection electrode of the upper unit. The first connection portion is located at a lower position, and the second connection portion is located at an upper position. A portion of each of the terminal fittings except the first connection portion and the second connection portion is enclosed with the insulator of the terminal unit. The second connection portion projects from an upper surface of the terminal unit in a vertically displaceable manner. The upper unit includes a base plate extending at least along an outer periphery thereof, and a plurality of planar electrodes provided on a lower surface of the base plate to be each brought into press contact with the second connection portion from an upper side when the upper unit is fitted on the terminal unit.

[0013] According to the present invention, the second connection portions of the terminal fittings provided in the terminal unit are respectively brought into press contact with the planar electrodes provided on the upper unit when the upper unit and the terminal unit are engaged with each other. Therefore, the terminal unit and the upper unit are reliably electrically connected to each other. Further, the planar electrodes themselves have a re-

duced vertical size. The planar electrodes are respectively aligned with the second connection portions axially of the units when being connected to the second connection portions. Therefore, the units each have a reduced size as measured perpendicularly to the axes of the units.

[0014] The planar electrodes are respectively opposed to the second connection portions axially of the units to contact the second connection portions. Therefore, the second connection portions are prevented from suffering from an excessive stress when an external force is applied perpendicularly to the unit axial direction, for example, when the units are pried apart to be disengaged from each other. As a result, it is possible to prevent the terminal fittings (connection structure) from being damaged, thereby ensuring higher reliability. Further, the first connection portions of the terminal fittings for the connection to the electrical cords are each located at the lower position, and the second connection portions for the connection to the planar electrodes are each located at the upper position. Thus, interference of the electrical cords with the terminal fittings is suppressed when the terminal unit and the upper unit are connected to each other. As a result, it is possible to prevent the electrical cords from being damaged due to the interference, thereby ensuring higher reliability.

[0015] In the present invention, the terminal unit has a through-hole extending vertically through the center portion thereof. The electrical cords are inserted upward into the terminal unit from the bottom of the terminal unit through the through-hole, and bent 180 degrees downward in the terminal unit. Then, the core wires are directed downward to be respectively connected to the first connection portions. The first connection portions may be resiliently horizontally displaceable to respectively receive the core wires of the electrical cords. In this case, the first connection portions spontaneously retain the respective core wires by their resilience and, therefore, are reliably electrically connected to the core wires. With the electrical cords inserted through the through-hole, it is easy to connect the downwardly extending electrical cords to the first connection portions from the upper side. This facilitates a connection operation for connecting the electrical cords to the first connection portions.

[0016] In the present invention, the first connection portion and the second connection portion of each of the terminal fittings may be provided as a unitary member formed by stamping a single metal plate into a predetermined shape and bending the stamped metal plate. In this case, the terminal fittings each have a simplified structure, thereby permitting the size reduction.

[0017] In the present invention, a slider of an insulative material may be provided adjacent the first connection portion in a vertically displaceable manner. The slider may include a guide recess portion for guiding the core wire of the electrical cord, and legs extending downward on opposite sides of the guide recess portion for resiliently horizontally displacing the first connection portion to expand a gap defined on a lateral side of the first connection portion for receiving the core wire when the slider is displaced downward. In this case, the core wire receiving gap is expanded with the slider displaced downward. The core wire of the electrical cord guided by the guide recess portion is smoothly introduced into the gap, whereby the electrical cord can be easily connected to the first connection portion.

[0018] In the present invention, a prevention step for preventing intrusion of a sheath of the distal portion of the electrical cord may be provided above the core wire receiving gap. In this case, the intrusion of the sheath into the gap is prevented, so that the contact between the first connection portion and the sheath of the electrical cord can be prevented. As a result, it is possible to ensure reliable contact between the first connection portion and the core wire of the electrical cord.

[0019] In the present invention, the slider may be engaged with the insulator of the terminal unit, and a restriction portion may be provided for restricting the vertical displacement of the slider within a predetermined range. In this case, it is possible to prevent disengagement of the slider and to prevent the slider from being excessively displaced downward to ensure the resilient contact between the first connection portion and the electrical cord. This makes it easy to operate the slider and to connect the electrical cord to the first connection portion without paying careful attention to the displacement range of the slider.

[0020] In the present invention, the second connection portion may include an electrode plate portion having a contact portion on its distal end, and a curved support portion connected to a lower end of the electrode plate portion for supporting the electrode plate portion in such a manner that the electrode plate portion is resiliently displaceable vertically and along a surface of the electrode plate portion to locate the contact portion of the electrode plate portion at the uppermost position. In this case, the electrode plate portion is resiliently supported by the curved support portion and, therefore, prevented from suffering from an excessive stress. This prevents the damage to the connection structure.

[0021] In the present invention, the electrode plate portion may include a triangular plate portion having a rounded corner, and the curved support portion may include an S-shaped thin portion. In this case, the triangular electrode plate portion having the rounded corner is smoothly displaced relative to the planar electrode without being caught even if a prying force is applied to the units with the electrode plate portion in contact with the planar electrode. As a result, it is possible to prevent the electrode plate portion from suffering from an unwanted stress, thereby preventing the damage to the connection structure. Even if the triangular plate portion is displaced when the prying force acts on the units, a stress occurring in the S-shaped thin portion is reduced as compared with a case in which the support portion includes a linear thin portion. This prevents the damage to the connection

structure.

[0022] In the present invention, the upper unit may include a terminal unit receiving recess provided in a lower portion thereof to be fitted around the upper portion of the terminal unit, and the planar electrodes may be disposed in the recess as facing downward. In this case, the planar electrodes are less liable to be contaminated when the upper unit is detached. As a result, when the upper unit is attached again to the terminal unit, the units are reliably electrically connected to each other.

[0023] In the present invention, the terminal unit may include a first housing to be engaged with the upper unit, and a second housing of an insulator accommodated in the first housing and retaining the terminal fittings. In this case, a greater size signaling indicator and a smaller size signaling indicator, for example, share the second housing while employing different first housings.

[0024] Further, a signaling indicator according to the present invention has a pillar structure according to any of the aforementioned inventive aspects. According to the present invention, the signaling indicator enjoys the aforementioned effects provided by the inventive pillar structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Fig. 1 is a front view of a signaling indicator according to one embodiment of the present invention.

Fig. 2 is a sectional view of the embodiment, illustrating a section S1-S1 in Fig. 1.

Fig. 3 is an exploded perspective view of the embodiment.

Fig. 4 is a bottom view of an upper unit.

Fig. 5 is a plan view of a terminal unit.

Fig. 6 is a sectional view illustrating a section S6-S6 in Fig. 5.

Fig. 7 is an exploded perspective view of the terminal unit.

Fig. 8 is a plan view of a second housing.

Fig. 9 is a sectional view illustrating a section S9-S9 in Fig. 8.

Fig. 10 is a partly sectional perspective view illustrating a section S10-S10 in Fig. 8.

Figs. 11A, 11B and 11C are a perspective view, a front view and a side view, respectively, of a terminal fitting shown in Fig. 2.

Fig. 12 is a sectional view illustrating the terminal unit with sliders each located at the uppermost position.

Fig. 13 is a sectional view illustrating the terminal unit with the sliders each located at the lowermost position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0026] Embodiments of the present invention will hereinafter be described in detail with reference to the attached drawings.

[0027] Referring to Fig. 1, the signaling indicator 1 has a pillar shape elongated in one direction, and is disposed on an object, for example, on a top surface of a main body 2 of an automatic machine, with its longitudinal axis extending in a vertical direction Z1, Z2. It is noted that the signaling indicator 1 may be disposed with its longitudinal axis extending in a direction other than the vertical direction. This embodiment is directed to the case in which the signaling indicator 1 is disposed with its longitudinal axis extending in the vertical direction Z1, Z2.

[0028] The signaling indicator 1 includes a terminal unit 3 to be attached to the main body 2 of the automatic machine, and a signaling indicator body 4 connected to the unit 3.

[0029] The signaling indicator body 4 includes a cover 5 provided in a top portion thereof, a plurality of indication units 6 (e.g., three indication units 6) which emit light signals, and a base unit 7 (hereinafter also referred to as "upper unit 7") provided in a bottom portion thereof for supplying electric power to the indication units 6. In the signaling indicator 1, the cover 5, the plurality of indication units 6 and the base unit 7 are connected to one another longitudinally of the signaling indicator 1 in stacked relation. Further, the terminal unit 3 is connected to a lower end of the base unit 7.

[0030] The cover 5, the indication units 6 and the base unit 7 each have, for example, a hollow cylindrical shape. With these members axially stacked one on another, axes SO of these cylindrical members are aligned with each other as extending along the longitudinal axis of the signaling indicator 1. The longitudinal axis corresponds to a stacking direction in which the cover 5, the indication units 6 and the base unit 7 are stacked. In the following, a direction in which the axes SO extend is also referred to as a unit axial direction Z0. Further, the circumferential direction and the radial direction of each of the cylindrical units will also be referred to simply as "circumferential direction" and "radial direction," respectively.

[0031] The terminal unit 3 is fixed to the main body 2, and interposed between the main body 2 and the signaling indicator body 4. The signaling indicator body 4 is connected to the terminal unit 3 in an optionally detachable manner.

[0032] Electrical cords 8 extending from the main body 2 are electrically connected to the terminal unit 3. Here, the electrical cords 8 may be electrical cords for signal transmission, and/or electrical cords for power supply. The main body 2 is electrically connected to the signaling indicator body 4 via the terminal unit 3, whereby signals and electric power are applied to the signaling indicator body 4 from the main body 2.

[0033] Referring to Figs. 2 and 3, the signaling indica-

tor 1 has a mechanical connection structure 9 for mechanical connection between the terminal unit 3 and the upper unit 7 of the signaling indicator body 4. The connection structure 9 is a part of a pillar structure. The connection structure 9 is capable of mechanically connecting the terminal unit 3 and the upper unit 7 and mechanically disconnecting the units 3 and 7 from each other, as required.

[0034] The signaling indicator 1 further has an electrical connection structure 10 for electrical connection between the terminal unit 3 and the upper unit 7. The electrical connection structure 10 is also included in the pillar structure. When the connection structure 9 establishes the mechanical connection, the electrical connection structure 10 establishes the electrical connection between the terminal unit 3 and the upper unit 7. On the other hand, when the connection structure 9 mechanically disconnects the units 3 and 7 from each other, the electrical connection structure 10 electrically disconnects the units 3 and 7 from each other. The electrical connection or disconnection is achieved simply by performing a mechanically connecting or disconnecting operation.

[0035] Referring to Figs. 2, 3 and 4, the upper unit 7 includes a housing 11, a base plate 12 held by the housing 11, and a plurality of planar electrodes (connection electrodes) 13 provided on the base plate 12.

[0036] The housing 11 has a tubular shape. The housing 11 has a terminal unit receiving recess 11b defined in a lower portion 11a thereof. The recess 11b opens in a downward direction Z2, and receives an upper portion (projection) 3a of the terminal unit 3. The recess 11b has an inner peripheral surface. An outer peripheral surface of the upper portion 3a of the terminal unit 3 is engaged with the inner peripheral surface of the recess 11b. More specifically, projections 3b on the outer peripheral surface of the terminal unit 3 are brought into engagement with recesses 11c in the inner peripheral surface of the upper unit 7 by rotating the terminal unit 3 and the upper unit 7 relative to each other in a circumferential direction T after engaging the terminal unit 3 and the upper unit 7 with each other in the axial direction Z0. Thus, the units 3 and 7 are locked with each other.

[0037] The base plate 12 is horizontally disposed and fixed within the recess 11b in the lower portion 11a of the housing 11 by screws. The base plate 12 has a disk shape. The shape of the base plate 12 is not limited to the disk shape, but may be, for example, a partial disk shape. The base plate 12 may be of a donut shape extending at least along an outer periphery 11d of the housing 11. With the upper unit 7 and the terminal unit 3 disconnected from each other, a lower surface 12a of the base plate 12 is exposed in the downward direction Z2.

[0038] The planar electrodes 13 are each formed by gold plating a copper foil pattern formed by printing on the lower surface 12a of the base plate 12. This eliminates the need for providing an additional structure for ensuring electrical reliability in a certain use environment, thereby simplifying the structure of the electrodes. It is noted that the planar electrodes 13 may be formed by preparing metal plates (not shown) separately from the base plate 12 and fixing the metal plates onto the base plate 12.

[0039] Referring back to Figs. 2 and 3, the terminal unit 3 has a single housing 14 and a plurality of terminal fittings 15 (e.g., seven terminal fittings 15). The terminal unit 3 further has a plurality of sliders 16.

[0040] The sliders 16 are provided in association with the respective terminal fittings 15 for guiding the electrical cords 8 when the electrical cords 8 are to be connected to the respective terminal fittings 15.

[0041] The housing 14 includes a first housing 17 and a second housing 18. At least the second housing 18 is made of a synthetic resin material (insulator), but the first housing 17 may be made of a synthetic resin material (insulator) or a metal.

[0042] The first housing 17 is fixed to the main body 2, and supports the upper unit 7. Further, the second housing 18 is nested in the first housing 17. An upper portion of the first housing 17 which is of an annular shape defines the upper portion 3a of the terminal unit 3, and has an outer peripheral surface and an end face serving as a connection portion for connection to the upper unit 7.

[0043] The first housing 17 has a recess portion 17a which opens in the upward direction Z1. The recess portion 17a has an inner peripheral surface and a bottom wall. The second housing 18 is received in the recess portion 17a, and positioned in a predetermined position with respect to the axial direction Z0 and the circumferential direction T by the recess portion 17a. In this state, the first housing 17 and the second housing 18 are fixed to each other by screws. Further, the first housing 17 is fixed to the main body 2.

[0044] Reffering to Figs 5, 6, and 7, the second housing 18 holds the terminal fittings 15 in a surrounded state, thereby protecting and isolating the terminal fittings 15 from each other. Further, the second housing 18 surrounds the electrical cords 8 to protect the electrical cords 8. The second housing 18 has an annular shape, and includes a through-hole 18a (first inner portion) extending through a center portion thereof in the vertical direction Z1, Z2, and an accommodation chamber 18b (second inner portion) defined on an upper (Z1) side of the through-hole 18a. The accommodation chamber 18b communicates with the through-hole 18a, and has a greater diameter than the through-hole 18a for accommodating the electrical cords 8.

[0045] Referring to Figs. 2, 3 and 6, the electrical cords 8 extend upward from the main body 2 through a through-hole (not shown) formed in the bottom of the first housing 17 and the through-hole 18a of the second housing 18 into the accommodation chamber 18b, and are bent 180 degrees downward. Distal portions of the electrical cords 8 are directed downward.

[0046] The connection structure 9 includes the inner peripheral surface (engagement portion) of the recess 11b of the lower portion 11a of the upper unit 7, and the

outer peripheral surface (engagement portion) of the first housing 17 (the upper portion (projection) 3a of the terminal unit 3). With these engagement portions engaged with each other, the upper unit 7 is received on an upper end face of the terminal unit 3. Thus, the relative positions of the units 3, 7 with respect to the axial direction Z0 and the circumferential direction T are restricted, and electrical connection portions (corresponding to the planar electrodes 13 and the terminal fittings 15) are paired in opposed relation to be connected to each other.

[0047] That is, the planar electrodes 13 are opposed to second connection portions 15b (described later) of the corresponding terminal fittings 15 in the vertical direction Z1, Z2 to press-contact the second connection portions 15b when the upper unit 7 is fitted on the terminal unit 3, thereby also achieving the electrical connection with the second connection portions 15b.

[0048] Further, the connection structure 9 includes the projections 3b and the recesses 11c defined as engagement portions which also serve as fixing portions for fixing the units 3, 7 to each other. Thus, the axial relative movement of the units 3, 7 is restricted, so that the units 3, 7 are prevented from being inadvertently disconnected.

[0049] Referring to Figs. 5, 8 and 10, the second housing 18 has a plurality of fitting retention holes (retention portions) 19 for retaining the terminal fittings 15, a plurality of holder portions 20 for holding the sliders 16, and a fixing insertion hole 21.

[0050] The insertion hole 21 extends in the vertical direction Z1, Z2 through the second housing 18. A bolt (not shown) is inserted into the insertion hole 21, and fixes the first and second housings 17, 18 together to the main body 2.

[0051] The fitting retention holes 19 are respectively provided in association with the terminal fittings 15, and extend through the second housing 2 in the vertical direction Z1, Z2. The fitting retention holes 19 are provided in an outer peripheral portion 18c of the second housing 18 independently of each other at predetermined intervals in the circumferential direction T. The fitting retention holes 19 each have a first chamber 19a provided at a lower (Z2) position and having a greater width as measured radially, and a second chamber 19b provided at a higher (Z1) position and having a slit shape.

[0052] The first chamber 19a opens in the upward direction Z1. The first chamber 19a and the second chamber 19b communicate with each other.

[0053] The second chamber 19b opens in the downward direction Z2, but is closed by the first housing 17. The first chamber 19a communicates with the accommodation chamber 18b through a communication hole 22. The communication hole 22 is provided in a bottom wall of the accommodation chamber 18b as extending in the vertical direction Z1, Z2. A vertically middle portion of the communication hole 22 is divided into small holes 22a, 22b, 22c which are independent of one another.

[0054] The holder portions 20 each have a pair of guide grooves 20a provided in an inner periphery of the accommodation chamber 18b and opposed to each other, and the communication hole 22. The pair of guide grooves 20a are opposed to each other. The holder portions 20 respectively guide the movement of the sliders 16 in the vertical directions Z1, Z2. The holder portions 20 respectively hold the sliders 16 movably in the vertical directions Z1, Z2, while restricting movement of the sliders 16 in the other directions.

[0055] Referring to Figs. 5, 6 and 7, the terminal fittings 15 each include a first connection portion 15a, a second connection portion 15b, and a body portion 15c supporting and connecting the first and second connection portions 15a, 15b to each other. The second connection portion 15b is brought into contact with the planar electrode (connection electrode) 13 of the upper unit 7. The first connection portion 15a is electrically connected to a core wire 8a of the electrical cord 8.

[0056] The electrical cords 8 extend from the center through-hole 18a into the accommodation chamber 18b in the terminal unit 3. The electrical cords 8 each include the core wire 8a, and a sheath 8b sheathing the core wire 8a. The core wire 8a is partly exposed in a distal portion 8c of the electrical cord 8 with a part of the sheath 8b removed by a predetermined length from the distal end thereof. The exposed portion of the core wire 8a is directed downward to be connected to the first connection portion 15a. A side portion of the core wire 8a contacts an end (contact portion) of the first connection portion 15a. Thus, the first connection portion 15a achieves the electrical connection functions as a retainer for preventing the core wire 8a from being withdrawn upward. Alternatively, the distal end of the core wire 8a may contact a side surface (contact portion) of the first connection portion 15a.

[0057] Referring to Figs. 11A, 11B and 11C, the first connection portion 15a, the second connection portion 15b and the body portion 15c of the terminal fitting 15 are provided as a unitary member formed by stamping a single metal plate (conductor) into a predetermined shape and bending the stamped metal plate. For example, the first connection portion 15a, the second connection portion 15b and the body portion 15c are provided as a unitary metal plate member (unitary member).

[0058] The first connection portion 15a is horizontally resiliently displaceable to receive the core wire 8a of the electrical cord 8. That is, the first connection portion 15a includes an electrode plate portion 15a1, and a curved support portion 15a2. The curved support portion 15a2 is an S-shaped curved plate portion. One end of the curved plate portion is connected to the body portion 15c, and the other end of the curved plate portion is connected to the electrode plate portion 15a1. The curved support portion 15a2 is continuously curved from an upper edge of the electrode plate portion 15a1 to cantilever the electrode plate portion 15a1. Further, the curved support portion 15a2 is resiliently deformable, so that the electrode plate portion 15a1 is bent about the upper edge thereof to be radially resiliently displaceable. The curved support

portion 15a2 brings the electrode plate portion 15a1 into press contact with the core wire 8a located radially inward, by a resilient repulsive force generated by the resilient deformation.

[0059] The second connection portion 15b includes an electrode plate portion 15b1 and a curved support portion 15b2.

[0060] The electrode plate portion 15b1 is a triangular plate portion having a rounded corner 15b3. The electrode portion 15b1 has a contact portion on an edge of the rounded corner 15b3.

[0061] The curved support portion 15b2 is an S-shaped thin portion. One end of the thin portion is connected to the body portion 15c, and the other end of the thin portion is connected to the electrode plate portion 15b1. The curved support portion 15b2 is continuous to a lower (Z2) portion of the electrode plate portion 15b1 to cantilever the electrode plate portion 15b1 so that the contact portion of the electrode plate portion 15b1 is located at the uppermost position. Further, the curved support portion 15b2 is resiliently deformable, thereby supporting the electrode plate portion 15b1 in such a manner that the electrode plate portion 15b1 is resiliently displaceable in the vertical directions Z1, Z2 and along a surface of the electrode plate portion. Further, the curved support portion 15b2 brings the electrode plate portion 15b1 into press contact with the planar electrode 13 by a resilient repulsive force generated by the resilient deformation. A direction along the surface of the electrode plate portion herein corresponds to the circumferential direction T when the terminal fittings 15 are mounted in the housing 11.

[0062] The body portion 15c is fixed in the fitting retention hole 19. Thus, the first connection portion 15a is resiliently supported in a radially displaceable manner, and the second connection portion 15b is resiliently supported so that the distal corner 15b3 thereof is displaceable in the vertical directions Z1, Z2.

[0063] Referring to Figs. 2 and 6, where the terminal unit 3 is not connected to the upper unit 7, an upper portion and other adjacent portion of the electrode plate portion 15b1 project from an upper surface 3c of the terminal unit 3 to a greater extent. With the terminal unit 3 and the upper unit 7 connected to each other, the distal corner 15b3 projects from the upper surface 3c of the terminal unit 3 to a smaller extent and contacts the planar electrode 13 of the upper unit 7.

[0064] The first connection portion 15a is located at a lower (Z2) position, and the second connection portion 15b is located at a higher (Z1) position. The first connection portion 15a and the second connection portion 15b are partly exposed from the second housing 18. On the other hand, a portion of the terminal fitting 15 except the first connection portion 15a and the second connection portion 15b, e.g., the body portion 15c, is enclosed in the second housing 18. Further, the second housing 18 encloses the curved support portion 15b2 of the second connection portion 15b.

[0065] Referring to Figs. 7, 12 and 13, the sliders 16 are located adjacent the first connection portions 15a, and respectively retained in the holder portions 20 in a vertically (Z1, Z2) displaceable manner. The sliders 16 can be manually depressed in the downward direction Z2. When no depressing force is applied to the sliders 16, the sliders 16 are biased in the upward direction Z1 by resilient repulsive forces of the first connection portions 15a of the respective terminal fittings 15.

[0066] The sliders 16 each have a guide recess portion 16a, and a pair of legs 16b. The guide recess portion 16a and the pair of legs 16b are provided as a unitary member formed of a synthetic resin (insulative material). The sliders 16 are respectively retained in the holder portions 20 of the second housing 18.

[0067] The guide recess portion 16a guides the core wire 8a exposed in the distal portion 8c of the electrical cord 8 when the electrical cord 8 is connected to the first connection potion 15a. The guide recess portion 16a has a chute-like inwardly curved surface, and opens radially inward and in the vertical directions Z1, Z2, so that the core wire 8a can be guided along the inwardly curved surface from the upper (Z1) side to the lower (Z2) side.

[0068] Linear projections 16c (engagement portions) to be respectively engaged with the guide grooves 20a are provided behind the guide recess portion 16a. With the linear projections 16c in engagement with the guide grooves 20a, the holder portion 20 permits the movement of the slider 16 in the vertical directions Z1, Z2, and restricts the movement of the slider 16 in the radial direction and in the circumferential direction T.

[0069] An upper surface of the slider 16 has a linear recess 16d (operation portion) . The linear recess 16d is provided for engagement with a tool 23. When the slider 16 is to be depressed in the downward direction Z2 in the assembling, a tip of the tool 23 (e.g., screw driver) is fitted in the linear recess 16d. Thus, the slider 16 can be depressed stably and reliably.

[0070] Referring to Figs. 7, 8, 12 and 13, the legs 16b extend in the downward direction Z2 on opposite sides of the guide recess portion 16a. The legs 16b are inserted into the insertion hole 22. More specifically, the legs 16b are respectively inserted into outer ones 22a, 22c of the three small holes 22a, 22b, 22c. Distal ends of the legs 16b are located in the first chamber 19a. When the slider 16 is displaced in the upward direction Z1 to the uppermost position, the lower ends of the legs 16b are located on an upper (Z1) side of the electrode plate portion 15a1. At this time, a relatively small gap 24 (or no gap) is defined between the electrode plate portion 15a1 of the first connection portion 15a and an opposed inner wall portion 19c of the first chamber 19a on a lateral side of the electrode plate portion 15a1. When the slider 16 is displaced in the lower direction Z2 to the lowermost position, the distal ends of the legs 16b are bought into abutment with the electrode plate portion 15a1 of the first connection portion 15a, which is in turn pressed radially outward. Thus, the electrode plate portion 15a1 of the first con-

nection portion 15a is horizontally resiliently displaced, whereby the gap 24 defined on the lateral side of the first connection portion 15a is expanded for receiving the core wire 8a.

[0071] Referring to Figs. 7, 9, 12 and 13, the displacement of the slider 16 in the vertical directions Z1, Z2 is restricted within a predetermined range. The second housing 18 has a first restriction portion 25 and a second restriction portion 26. The slider 16 has a first restriction portion 27 and a second restriction portion 28.

[0072] The first restriction portion 25 and the second restriction portion 26 of the second housing 18 are integral with the second housing 18. The first restriction portion 25 is provided as steps on side walls of the insertion hole 22. The second restriction portion 26 is provided as the bottom wall of the accommodation chamber 18b.

[0073] The first restriction portion 27 is provided as projections 16e on side surfaces of the legs 16b. The projections 16e each have an inclined lower surface. When the legs 16b are inserted into the communication hole 22 from the upper (Z1) side, the inclined surfaces of the projections 16e are fitted on edges of the communication hole 22, whereby the legs 16b are resiliently deformed and the projections 16e override the edges of the communication hole 22. After the projections 16e override the edges of the communication hole 22, the legs 16b are restored into their original states by their resilient restoration power. Thus, upper faces of the projections 16e are engaged with the steps provided on the side walls of the communication hole 22 on a lower (Z2) side of the edges, i.e., the first restriction portion 25. The second restriction portion 28 is provided as a lower surface of the guide recess portion 16a.

[0074] The first restriction portion 25 of the second housing 18 and the first restriction portion 27 of the slider 16 are brought into abutment engagement to restrict the movement of the slider 16 in the upward direction Z1, thereby functioning as a retainer for preventing the slider 16 from being withdrawn in the upward direction Z1. The second restriction portion 26 of the second housing 18 and the second restriction portion 28 of the slider 16 are brought into engagement to restrict the movement of the slider 16 in the downward direction Z2. The range of the displacement of the slider 16 in the vertical directions Z1, Z2 is thus defined, thereby restricting the displacement of the slider 16.

[0075] Referring to Figs. 6, 8 and 9, the second housing 18 has prevention steps 29 for preventing intrusion of the sheaths 8b of the distal portions 8c of the electrical cords 8. The prevention steps 29 are each disposed on an upper (Z1) side of the core wire insertion gap 24, and defined by a peripheral edge of the middle one 22b of the three small holes 22a, 22b, 22c of the communication hole 22. The small hole 22b has a tapered inner periphery, which has a greater diameter at its upper portion and a smaller diameter at its lower portion. The inner diameter (minimum diameter) of the small hole 22b is greater than the outer diameter (maximum diameter) of the core wire 8a, and is smaller than the outer diameter (minimum diameter) of the sheath 8b. Thus, the prevention step 29 permits the insertion of the core wire 8a while preventing the insertion of the sheath 8b.

[0076] Referring to Figs. 6, 12 and 13, when the core wire 8a is to be connected to the electrode plate portion 15a1 of the first connection portion 15a, the core wire 8a is inserted from the upper (Z1) side through the guide recess portion 16a of the slider 16 and displaced in the downward direction Z2 into the communication hole 22, and then inserted into the middle small hole 22b of the communication hole 22. As the electrical cord 8 is moved in the downward direction Z2, the slider 16 is displaced in the downward direction Z2. When the slider 16 is displaced in the downward direction Z2, the gap 24 is expanded as described above. Therefore, the core wire 8a can be smoothly displaced in the downward direction Z2. When the electrical cord 8 is further moved in the downward direction Z2, the displacement of the sheath 8b of the electrical cord 8 in the downward direction Z2 is finally prevented by the prevention step 29. Thus, the displacement of the electrical cord 8 is also prevented. At this time, the core wire 8a is located on the lateral side of the first connection portion 15a. When the movement of the electrical cord 8 is stopped, the slider 16 is moved back in the upward direction Z1 by the resilient restoration power of the first connection portion 15a. Then, the core wire 8a is resiliently held between the electrode plate portion 15a1 and the opposed inner wall portion 19c as shown in Fig. 6.

[0077] Other than the above, the slider 16 may be manually depressed in the downward direction Z2 to insert the core wire 8a into the expanded portion of the gap 24. When the force applied to depress the slider 16 is released in this state, the core wire 8a is elastically sandwiched between the electrode plate portion 15a1 and the opposed inner wall portion 19c.

[0078] As described above, the pillar structure for the signaling indicator 1 according to this embodiment includes the terminal unit 3 and the upper unit 7 fitted on the terminal unit 3. The terminal unit 3 is made of the insulator, and includes the plurality of terminal fittings 15 arranged in predetermined spaced relation in the outer peripheral portion 18c. The terminal fittings 15 each include the first connection portion 15a to be electrically connected to the core wire 8a exposed in the distal portion 8c of the electrical cord 8 inserted from the center portion of the terminal unit 3, and the second connection portion 15b to be brought into contact with the connection electrode (planar electrode 13) of the upper unit 7. The first connection portion 15a is located at the lower (Z2) position, and the second connection portion 15b is located at the upper (Z1) position. The portion of each of the terminal fittings 15 except the first connection portion 15a and the second connection portion 15b is enclosed in the second housing 18 (insulator) of the terminal unit 3. The second connection portion 15b projects from the upper surface 3c of the terminal unit 3 in a vertically (Z1, Z2)

displaceable manner. The upper unit 7 includes the base plate 12 extending at least along the outer periphery 11d thereof, and the plurality of planar electrodes 13 (connection electrodes) provided on the lower surface 12a of the base plate 12 to be each brought into press contact with the second connection portion 15b from the upper (Z1) side when the upper unit 7 is fitted on the terminal unit 3.

[0079] Thus, the second connection portions 15b of the terminal fittings 15 provided in the terminal unit 3 are respectively brought into press contact with the planar electrodes 13 provided on the upper unit 3 when the upper unit 7 and the terminal unit 3 are engaged with each other. Therefore, the terminal unit 3 and the upper unit 7 are reliably electrically connected to each other.

[0080] Further, the planar electrodes 13 are respectively opposed to the second connection portions 15b in the unit axial direction Z0 to contact the second connection portions 15b. Therefore, the second connection portions 15b are each prevented from suffering from an excessive stress when an external force is applied perpendicularly to the unit axial direction Z0, for example, when the units 3, 7 are pried apart to be disengaged from each other. As a result, it is possible to prevent the terminal fittings 15 (connection structure) from being damaged, thereby ensuring higher reliability.

[0081] Further, interference of the electrical cords 8 with the terminal fittings 15 is suppressed when the terminal unit 3 and the upper unit 7 are connected to each other. As a result, it is possible to prevent the electrical cords 8 from being damaged due to the interference, thereby ensuring higher reliability.

[0082] Since the terminal fittings 15 are enclosed in the second housing 18 made of insulator, the interference between the electrical cords 8 and the terminal fittings 15 is further suppressed. There is no possibility that the electrical cords 8 are damaged by the planar electrodes 13 of the upper unit 7. As a result, the damage to the electrical cords 8 can be prevented.

[0083] In addition, the planar electrodes 13 each have a smaller size as measured in the vertical direction Z1, Z2. Since the planar electrodes 13 are respectively aligned with the second connection portions 15b in the unit axial direction Z0, the units 3, 7 each have a smaller size as measured perpendicularly to the unit axial direction Z0.

[0084] In other words, an easy-to-handle and greater-size component may be employed as an electrical connection component. This ensures easy connection and disconnection of the units 3 and 7. Further, this facilitates a cord routing and connecting operation to be performed in the units 3, 7.

[0085] In this embodiment, the terminal unit 3 has the through-hole 18a extending through the center portion thereof in the vertical direction Z1, Z2. The electrical cords 8 are inserted upward into the terminal unit 3 from the bottom 3d of the terminal unit 3 through the through-hole 18a, and bent 180 degrees downward in the terminal unit 3. Then, the core wires 8a exposed in the distal portion 8c of the electrical cords 8 are directed downward to be respectively connected to the first connection portions 15a. The first connection portions 15a are resiliently displaceable in the horizontal direction X to respectively receive the core wires 8a exposed in the distal portions 8c of the electrical cords 8.

[0086] In this case, the first connection portions 15a spontaneously retain the respective core wires 8a by their resilience and, therefore, are reliably electrically connected to the core wires 8a. With the electrical cords 8 inserted through the through-hole 18a, it is easy to connect the downwardly directed electrical cords 8 to the first connection portions 15a from the upper (Z1) side. This facilitates a connection operation for connecting the electrical cords 8 to the first connection portions 15a.

[0087] Further, the electrical cords 8 can be partly pushed back into the through-hole 18a after the connection, for example. This also prevents the damage to the electrical cords 8, because the upward (Z1) projection of the electrical cords 8 in the terminal unit 3 is suppressed.

[0088] In this embodiment, the first connection portion 15a and the second connection portion 15b of each of the terminal fittings 15 are provided as the unitary member formed by stamping the single metal plate into the predetermined shape and bending the stamped metal plate. This simplifies the structure of the terminal fitting 15, thereby permitting the size reduction.

[0089] Further, the first connection portion 15a is formed by bending a metal plate. Therefore, the resilient force of the first connection portion 15a for retaining the core wire 8a can be provided by a simple structure utilizing the resilience of the metal plate. This permits the size reduction.

[0090] In this embodiment, the sliders 16 of the insulative material are respectively provided adjacent the first connection portions 15a in a vertically (Z1, Z2) displaceable manner. The sliders 16 each include the guide recess portion 16a for guiding the core wire 8a exposed in the distal portion 8c of the electrical cord 8, and the legs 16b extending in the downward direction Z2 on the opposite sides of the guide recess portion 16a for resiliently displacing the first connection portion 15a in the horizontal direction X to expand the gap 24 defined on the lateral side of the first connection portion 15a for receiving the core wire 8a when the slider is displaced in the downward direction Z2. Thus, the gap 24 for receiving the core wire 8a is expanded with the slider 16 displaced in the downward direction Z2. The core wire 8a of the electrical cord 8 guided by the guide recess portion 16a is smoothly introduced into the gap 24, whereby the electrical cord 8 can be easily connected to the first connection portion 15a. That is, the slider 16 is moved back in the upward direction Z1 to connect the electrical cord 8 to the first connection portion 15a when the first connection portion 15a is displaced in the horizontal direction X by the resilience of the first connection portion 15a with the electrical cord 8 located in the gap 24.

[0091] In this embodiment, the second housing 18 has the prevention steps 29 respectively provided above the core wire receiving gaps 24 for preventing the intrusion of the sheaths 8b of the distal portions 8c of the electrical cords 8. Thus, the intrusion of the sheaths 8b into the gaps 24 is prevented, thereby preventing the sheaths 8b of the electrical cords 8 from contacting the first connection portions 15a. As a result, the core wires 8a of the electrical cords 8 are assuredly brought into contact with the first connection portions 15a.

[0092] In this embodiment, the sliders 16 are engaged with the second housing 18 (insulator) of the terminal unit 3. The restriction portions 25, 26, 27, 28 are provided for restricting the vertical displacement within the predetermined range. This prevents the disengagement of the sliders 16, and prevents the sliders 16 from being excessively displaced in the downward direction Z2 (that is, plastic deformation) to ensure the resilient contact between the first connection portions 15a and the electrical cords 8. This makes it easy to operate the sliders 16 and to connect the electrical cords 8 to the first connection portions 15a without paying careful attention to the displacement range of the sliders 16.

[0093] In this embodiment, the second connection portion 15b includes the electrode plate portion 15b1 having the contact portion (corner portion 15b3) on its distal end, and the curved support portion 15b2 connected to the lower (Z2) end of the electrode plate portion 15b1 for supporting the electrode plate 15b1 in such a manner that the electrode plate portion 15b1 is resiliently displaceable in the vertical directions Z1, Z2 and along the surface of the electrode plate to locate the contact portion of the electrode plate portion 15b1 at the uppermost position. Thus, the electrode plate portion 15b1 is resiliently supported by the curved support portion 15b2 and, therefore, prevented from suffering from an excessive stress. This prevents the damage to the terminal fittings 15 (connection structure).

[0094] In this embodiment, the electrode plate portion 15b1 includes the triangular plate portion having the rounded corner 15b3, and the curved support portion 15b2 includes the S-shaped thin portion. Thus, the triangular electrode plate portion 15b1 having the rounded corner 15b3 is smoothly displaced relative to the planar electrode 13 even if a prying force is applied to the units 3, 7 with the electrode plate portion 15b1 in contact with the planar electrode 13. As a result, it is possible to prevent the electrode plate portion 15b1 from suffering from an unwanted stress, thereby preventing the damage to the connection structure. Even if the triangular plate portion is displaced when the prying force acts on the units, a stress occurring in the S-shaped thin portion is reduced as compared with a case in which the support portion includes a linear thin portion. This prevents the damage to the connection structure.

[0095] In this embodiment, the upper unit 7 includes the terminal unit receiving recess 11b provided in its lower portion 11a to be fitted around the upper portion 3a of the terminal unit 3, and the planar electrodes 13 are disposed in the recess 11b as facing downward. Thus, the planar electrodes 13 are less liable to be contaminated when the upper unit 7 is detached. As a result, when the upper unit 7 is attached again to the terminal unit 3, the units 3, 7 are reliably electrically connected to each other.

[0096] In this embodiment, the terminal unit 3 includes the first housing 17 to be engaged with the upper unit 7, and the second housing 18 of the insulator accommodated in the first housing 17 and retaining the terminal fittings 15. Thus, a smaller size signaling indicator having a smaller diameter and a greater size signaling indicator having a greater diameter, for example, share the second housing 18, while employing different first housings 17.

[0097] Further, the fitting retention holes 19 of the second housing 18 are closed from the lower side by the bottom of the recess portion 17a of the first housing 17. Thus, the terminal fittings 15 and the core wires 8a of the electrical cords 8 are assuredly prevented from being inadvertently brought into contact with the main body 2. As a result, it is easy to improve the electrical reliability.

[0098] The signaling indicator 1 according to this embodiment has the pillar structure 10 of the embodiment described above and, therefore, enjoys the aforementioned effects provided by the pillar structure 10.

[0099] The following variations are conceivable for the embodiment described above. In the following, differences from the embodiment described above will be mainly described, and like components will be denoted by like reference characters and will not be explained.

[0100] Any other unit may be employed as the upper unit 7 as long as the unit is provided as a base of the signaling indicator body 4. The construction of the signaling indicator body 4 (upper unit 7) is not limited to that described above. For example, a different number of indication units 6 may be provided, and a unit having any other function, e.g., a unit (not shown) which gives an alarm by an audio signal, may be employed in combination. It is also conceivable to eliminate some of the aforesaid units 5, 6, 7, or to combine some of the units 5, 6, 7 into a unitary unit.

[0101] The first connection portions 15a are circularly arranged in the circumferential direction T, but may be linearly arranged parallel to the horizontal direction X in the center portion of the second housing 18. It is also conceivable to provide the first and second housings 17, 18 as a unitary housing.

[0102] In the embodiment described above, the pillar structure 10 and the connection structure 9 are employed for connection between the terminal unit 3 and the upper unit 7, but this is not limitative. For example, a portion of the pillar structure 10 similar to that provided in the terminal unit 3 may be provided in an underlying unit provided on the object side, and a portion of the pillar structure 10 similar to that provided in the upper unit 7 may be provided on an overlying unit to be fitted on the underlying unit.

[0103] It is also conceivable to invert a relationship be-

tween the projection and the recess of the connection structure 9. For example, the upper portion 3a of the terminal unit 3 may have an engagement recess, and the lower portion 11a of the upper unit 7 may have an engagement projection. Then, the units 3, 7 may be connected to each other by fitting the engagement projection in the engagement recess. The main body 2 of the automatic machine is employed as the object on which the terminal unit 3 is fixed, but other examples of the object include a variety of mechanical machines and parts of facilities and buildings. Further, various design modifications may be made within the scope of the present invention defined by the appended claims.

DESCRIPTION OF REFERENCE CHARACTERS

[0104]

1:	Signaling indicator
3:	Terminal unit
3a:	Upper portion of terminal unit
3c:	Upper surface of terminal unit
3d:	Bottom of terminal unit
7:	Base unit (upper unit)
8:	Electrical cord
8a:	Core wire
8b:	Sheath
8c:	Distal portion of electrical cord
10:	Electrical connection structure
11a:	Lower portion of upper unit
11b:	Recess (terminal unit receiving recess)
11d:	Outer periphery of upper unit
12:	Base plate
12a:	Lower surface of base plate
13:	Planar electrode (connection electrode)
15:	Terminal fitting
15a:	First connection portion
15b:	Second connection portion
15b1:	Electrode plate portion (triangular plate portion) of second connection portion
15b2:	Curved support portion (thin portion)
15b3:	Corner of triangular plate portion (upper portion, edge, contact portion of electrode plate portion)
16:	Slider
16a:	Guide recess portion
16b:	Leg
17:	First housing
18:	Second housing (insulator)
18a:	Through-hole (center portion of terminal unit)
18c:	Outer peripheral portion of terminal unit
24:	Gap
25, 26, 27, 28:	Restriction portions
29:	Prevention step
T:	Circumferential direction (along surface of electrode plate portion)
X:	Horizontal direction
Z1:	Upward direction (vertical direction)
Z2:	Downward direction (vertical direction)

Claims

1. A pillar structure for a signaling indicator (1), comprising:

a terminal unit (3) ; and
an upper unit (7) fitted on the terminal unit (3);
wherein the terminal unit (3) is made of an insulator, and includes a plurality of terminal fittings (15) arranged in predetermined spaced relation in an outer peripheral portion thereof;
wherein the terminal fittings (15) each include a first connection portion (15a) to be electrically connected to a core wire (8a) exposed in a distal portion of an electrical cord (8) inserted from a center portion of the terminal unit (3), and a second connection portion (15b) to be brought into contact with a connection electrode (13) of the upper unit (7);
wherein the first connection portion (15a) is located at a lower position, and the second connection portion (15b) is located at an upper position;
wherein a portion of each of the terminal fittings (15) except the first connection portion (15a) and the second connection portion (15b) is enclosed with the insulator of the terminal unit (3);
wherein the second connection portion (15b) projects from an upper surface of the terminal unit (3) in a vertically displaceable manner;
wherein the upper unit (7) includes a base plate (12) extending at least along an outer periphery thereof, and a plurality of planar electrodes (13) provided on a lower surface of the base plate (12) to be each brought into press contact with the second connection portion (15b) from an upper side when the upper unit (7) is fitted on the terminal unit (3).

2. A signaling indicator pillar structure as set forth in claim 1,
wherein the terminal unit (3) has a through-hole (21) extending vertically through the center portion thereof,
wherein the electrical cord (8) is inserted upward into the terminal unit from a bottom of the terminal unit through the through-hole (21) and bent 180 degrees downward in the terminal unit (3), and the core wire (8a) of the electrical cord (8) is directed downward

to be connected to the first connection portion (15a), wherein the first connection portion (15a) is resiliently horizontally displaceable to receive the core wire (8a) of the electrical cord.

3. A signaling indicator pillar structure as set forth in claim 1 or 2, wherein the first connection portion (15a) and the second connection portion (15b) of each of the terminal fittings (15) are provided as a unitary member formed by stamping a single metal plate into a predetermined shape and bending the stamped metal plate.

4. A signaling indicator pillar structure as set forth in claim 2 or 3,
wherein a slider (16) of an insulative material is provided adjacent the first connection portion (15a) in a vertically displaceable manner,
wherein the slider (16) includes a guide recess portion (16a) for guiding the core wire (8a) of the electrical cord (8), and legs (16b) extending downward on opposite sides of the guide recess portion (16a) for resiliently horizontally displacing the first connection portion (15a) to expand a gap (24) defined on a lateral side of the first connection portion (15a) for receiving the core wire (8a) when the slider (16) is displaced downward.

5. A signaling indicator pillar structure as set forth in claim 4, wherein a prevention step (29) is provided above the core wire receiving gap (24) for preventing intrusion of a sheath (8b) of the distal portion of the electrical cord (8).

6. A signaling indicator pillar structure as set forth in claim 4 or 5, wherein the slider (16) is engaged with the insulator of the terminal unit (3), and a restriction portion is provided for restricting a vertical displacement of the slider (16) within a predetermined range.

7. A signaling indicator pillar structure as set forth in any of claims 1 to 6, wherein the second connection portion (15b) includes an electrode plate portion (15b1) having a contact portion on a distal end thereof, and a curved support portion (15b2) connected to a lower end of the electrode plate portion for supporting the electrode plate portion in such a manner that the electrode plate portion (15b1) is resiliently displaceable vertically and along a surface of the electrode plate portion to locate the contact portion of the electrode plate portion at an uppermost position.

8. A signaling indicator pillar structure as set forth in claim 7, wherein the electrode plate portion (15b1) includes a triangular plate portion having a rounded corner, and the curved support portion includes an S-shaped thin portion.

9. A signaling indicator pillar structure as set forth in any of claims 1 to 8,
wherein the upper unit (7) includes a terminal unit receiving recess (11b) provided in a lower portion thereof to be fitted around an upper portion of the terminal unit (3),
wherein the planar electrodes (13) are disposed in the recess as facing downward.

10. A signaling indicator pillar structure as set forth in any one of claims 1 to 9, wherein the terminal unit (3) includes a first housing (17) to be engaged with the upper unit (7), and a second housing (18) of an insulator accommodated in the first housing (17) and retaining the terminal fittings (15).

11. A signaling indicator (1) comprising a pillar structure as set forth in any one of claims 1 to 10.

FIG. 1

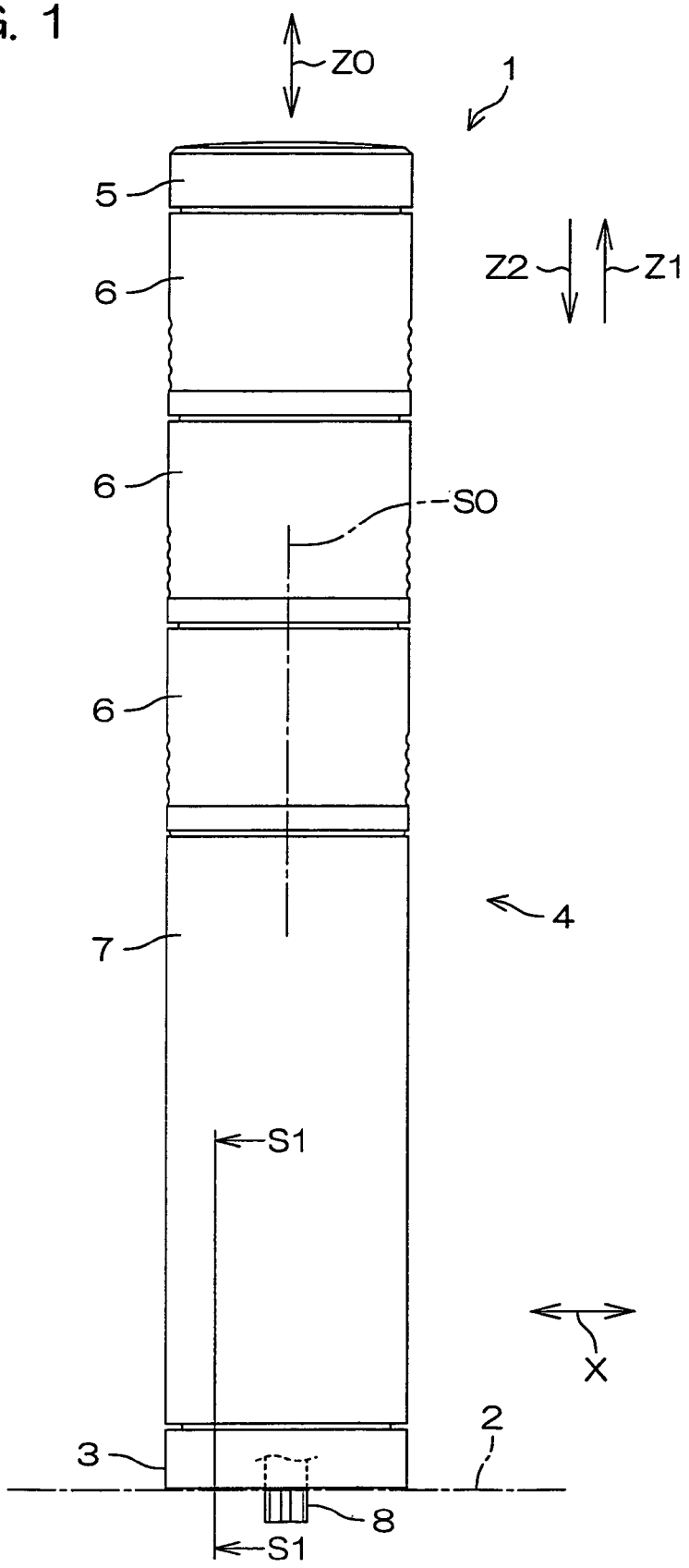


FIG. 2

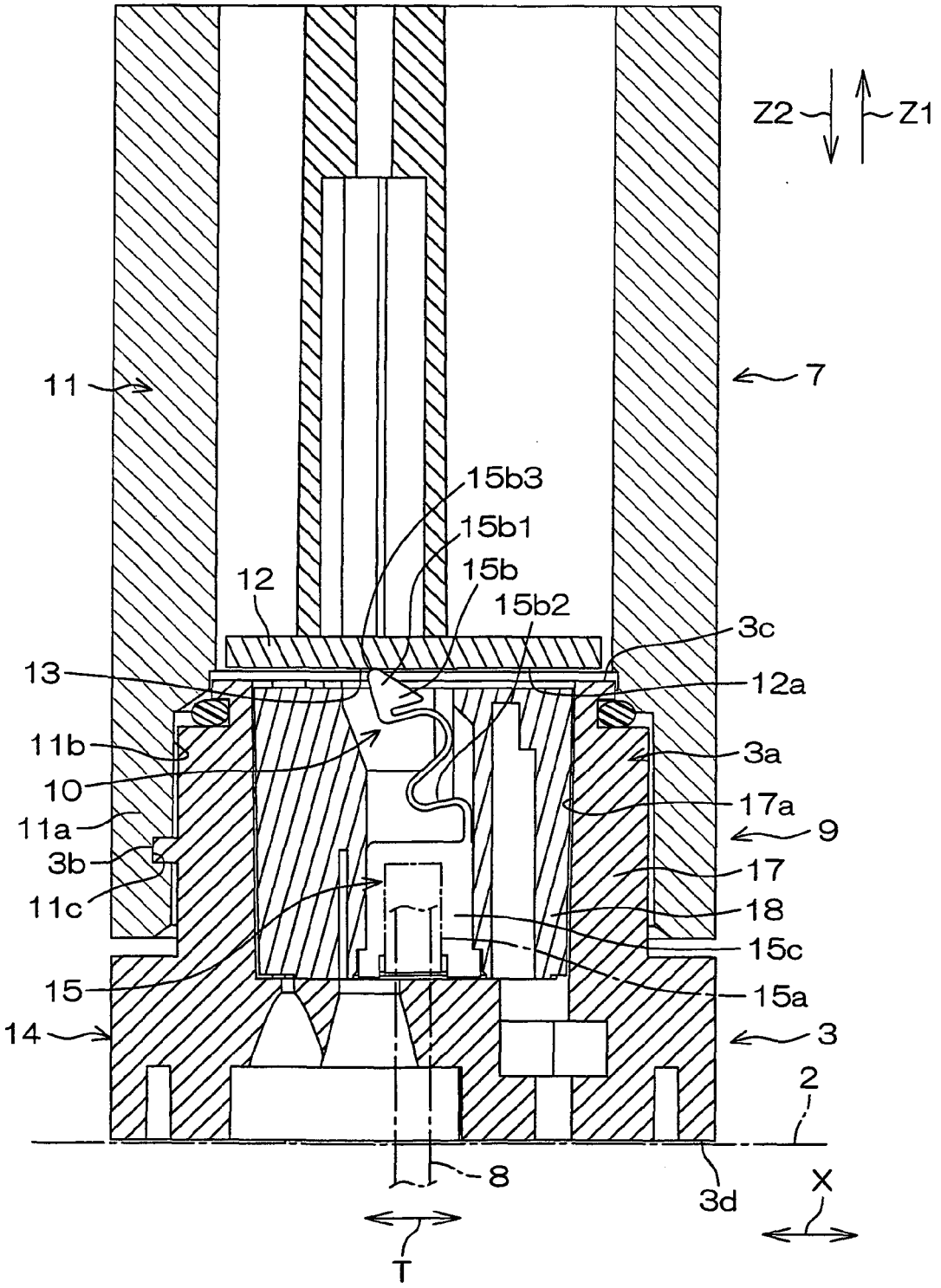

Z2
Z1
11
7
15b3
15b1
15b
12
15b2
3c
13
12a
11b
3a
10
17a
11a
9
3b
17
11c
18
15c
15
15a
14
3
2
8
3d
X
T

FIG. 3

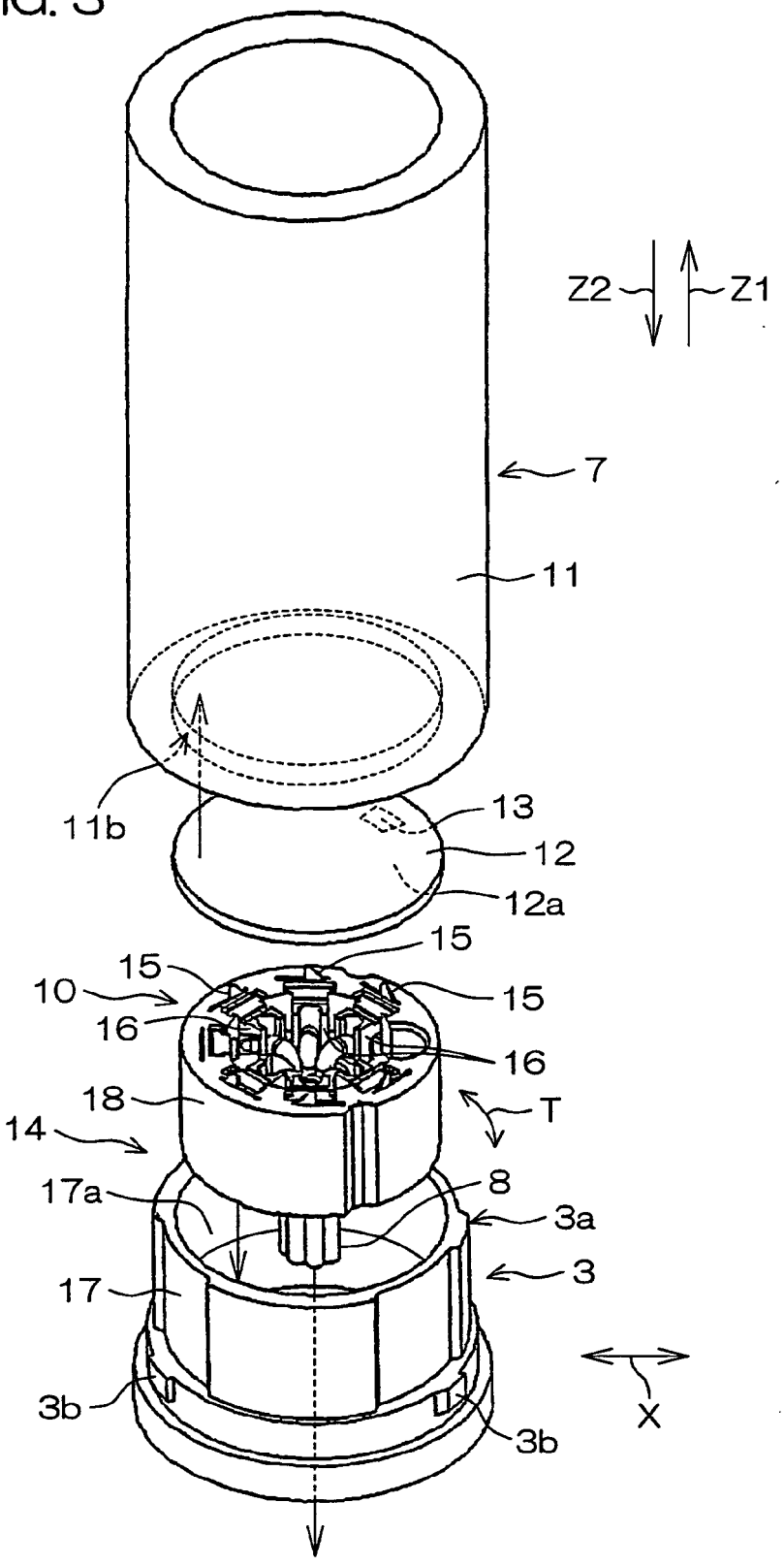


FIG. 4

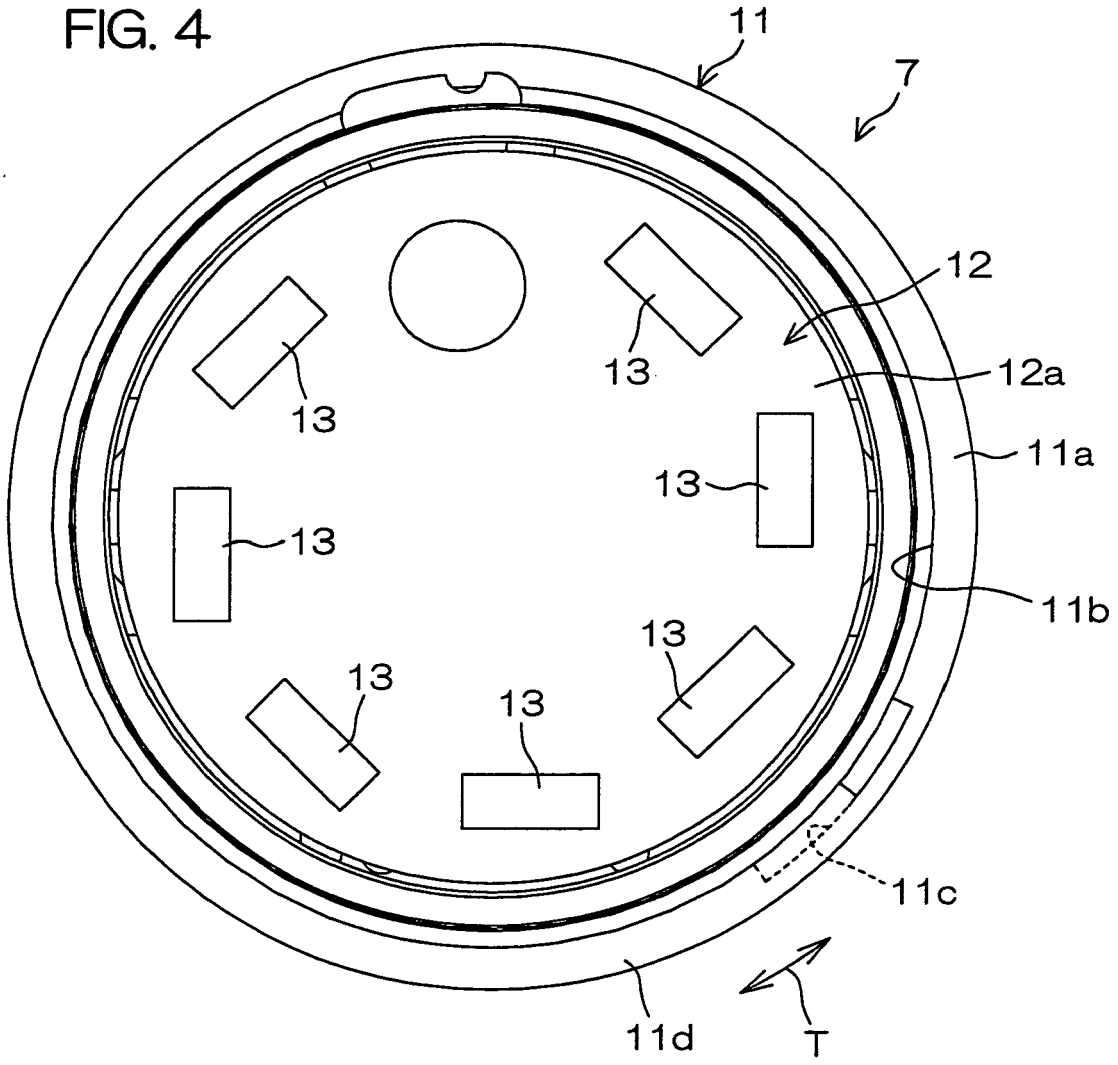
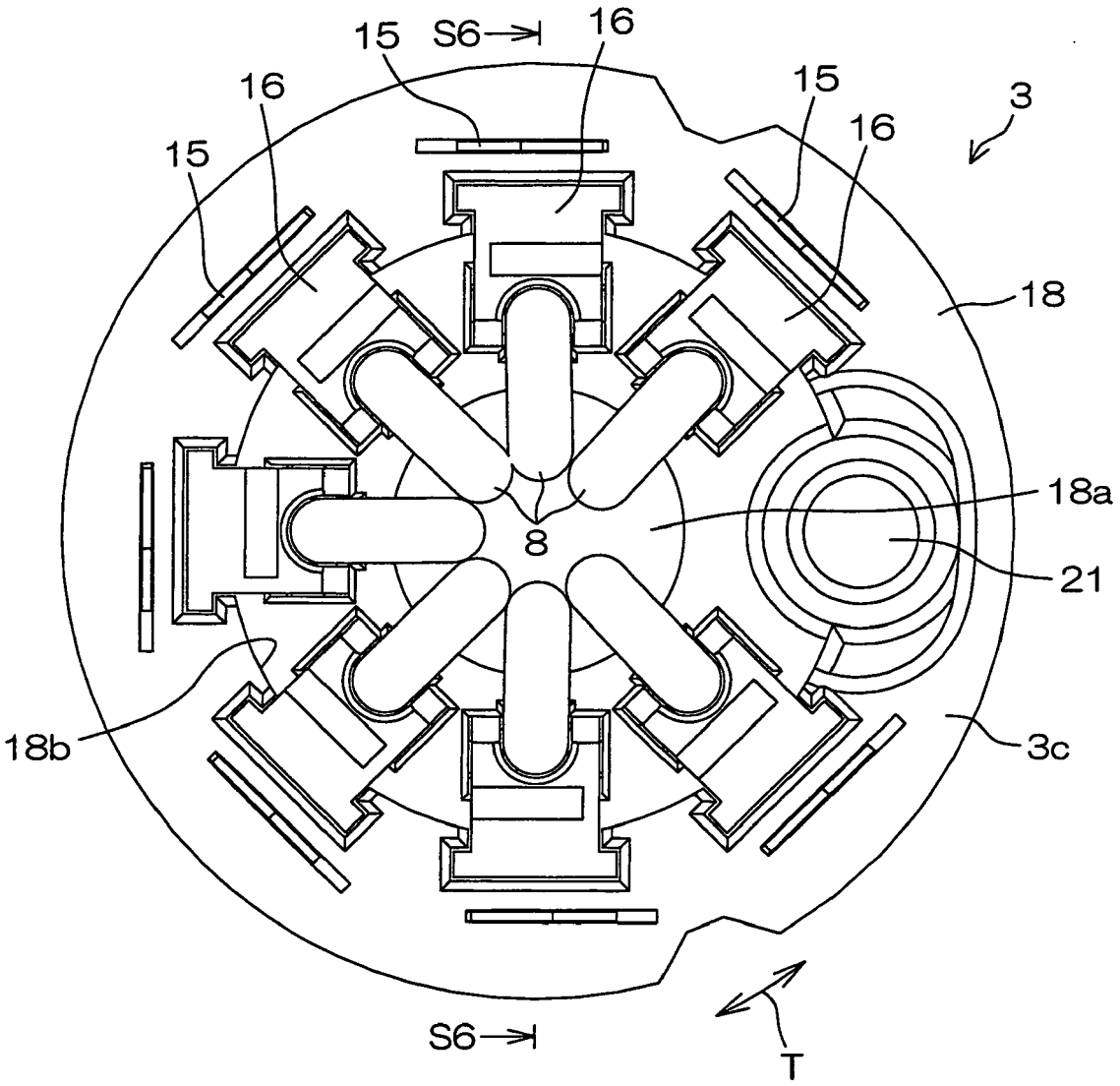
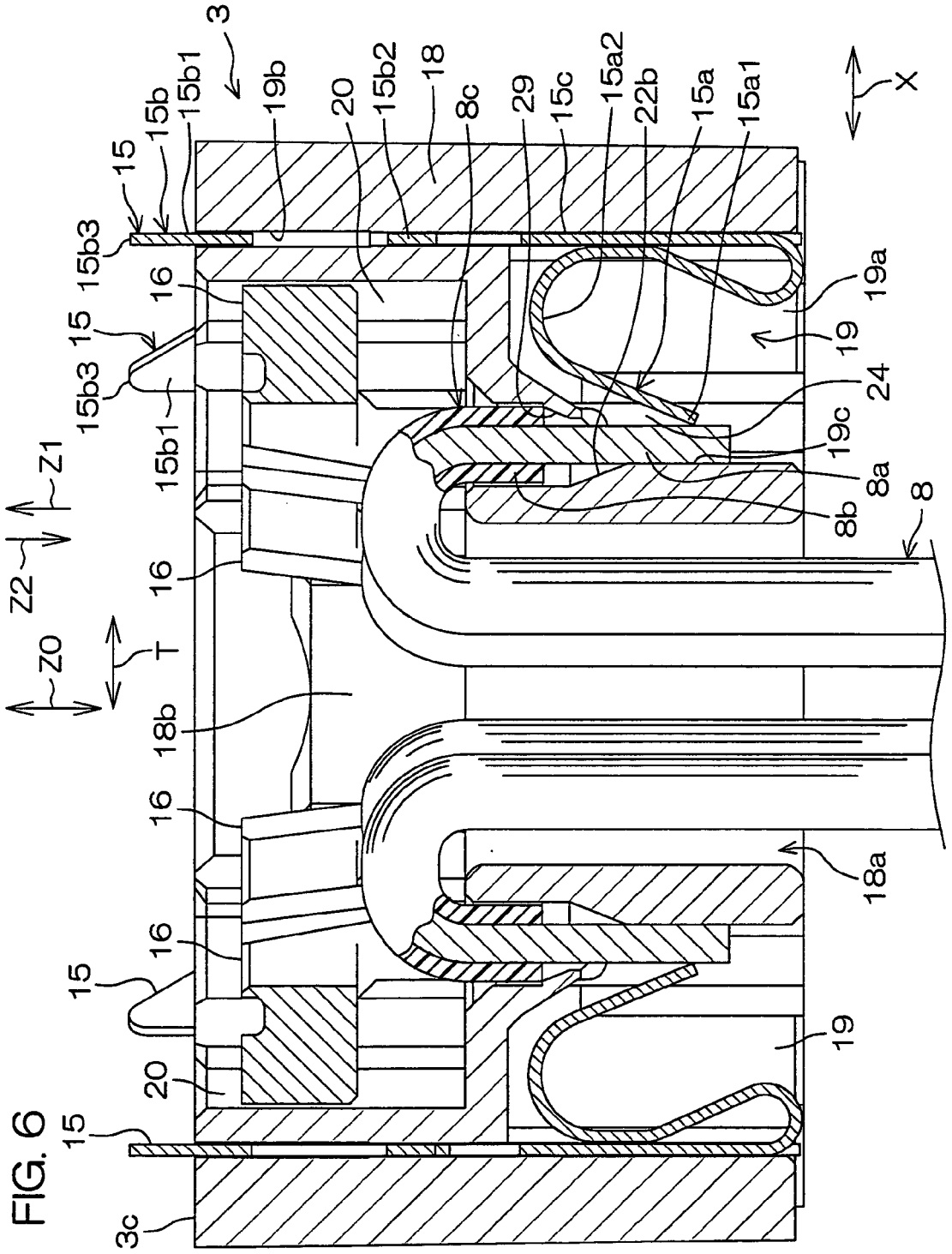


FIG. 5




3
15b
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19b
20
15b2
18
8c
29
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22b
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15a1
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16
15
15b3
15b1
Z1
Z2
Z0
T
16
18b
16
16
15
20
15
3c
19a
19
24
19c
8a
8b
8
18a
19

FIG. 6

FIG. 7

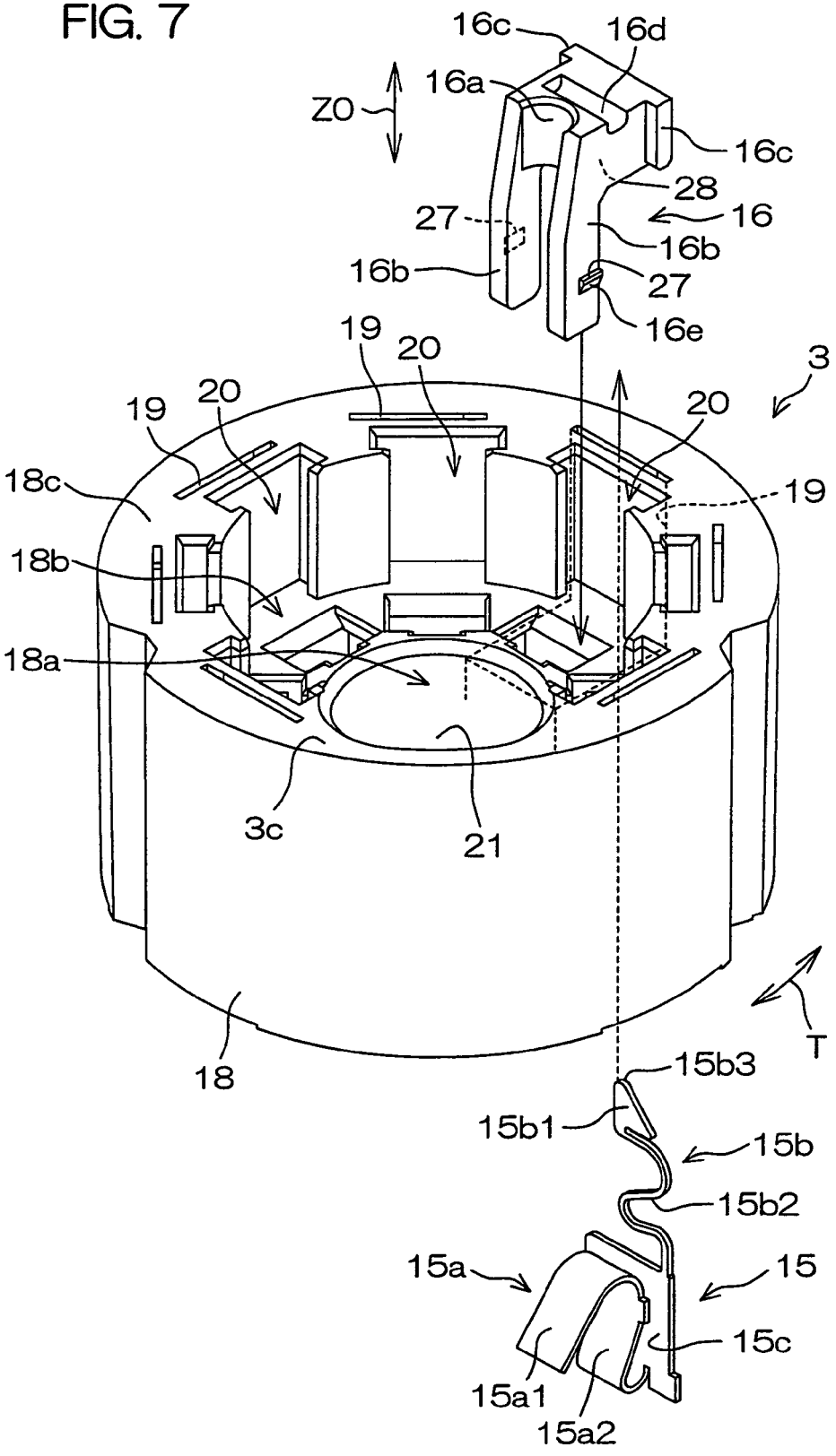
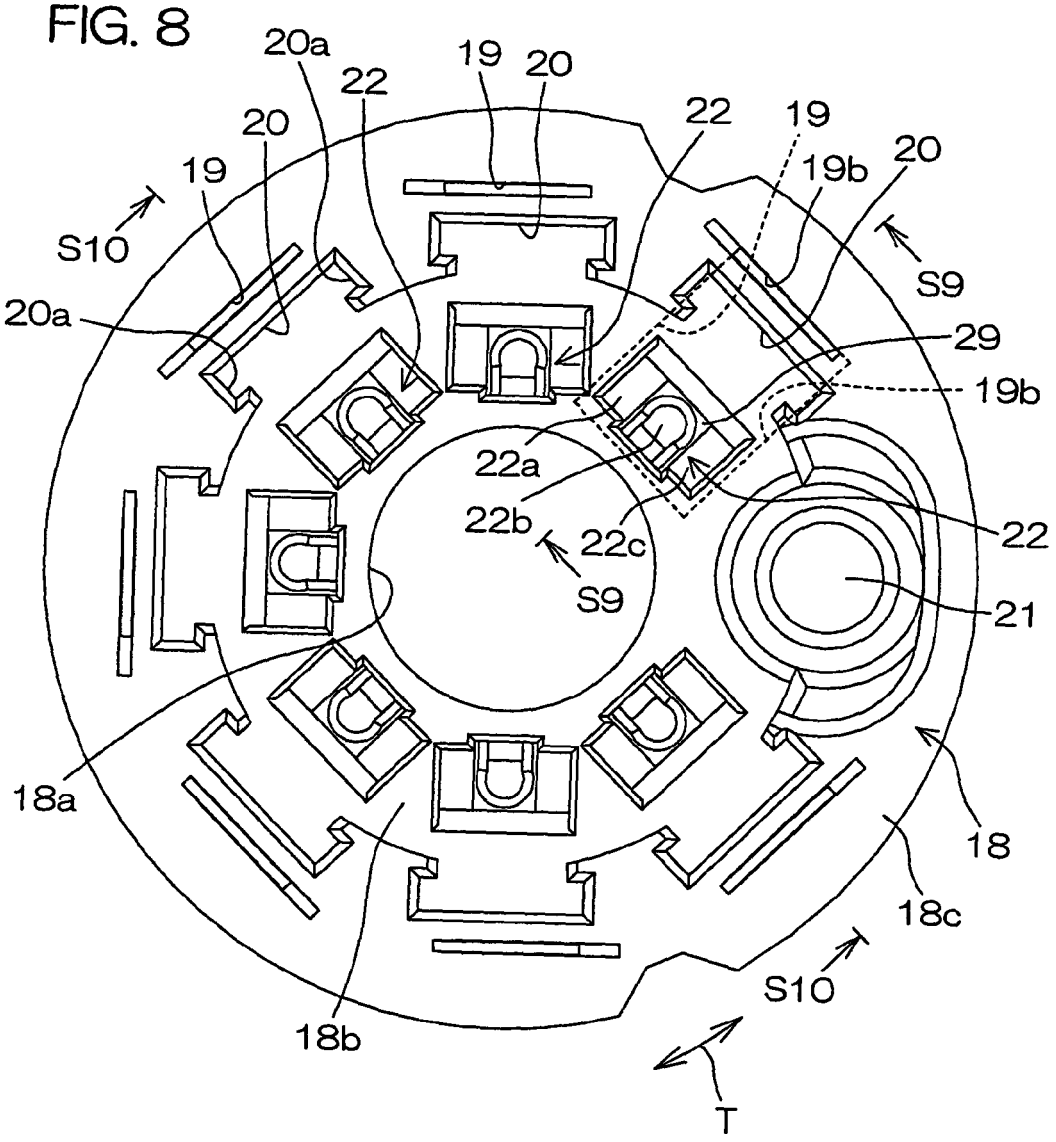

16c
16d
16a
Z0
16c
28
27
16
16b
16b
27
16e
19
20
3
19
20
20
19
18c
18b
18a
3c
21
T
18
15b3
15b1
15b
15b2
15a
15
15c
15a1
15a2

FIG. 8


20a
22
19
20
22
19
19b
20
19
S10
S9
20a
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19b
22a
22b
22c
22
S9
21
18a
18
18c
S10
18b
T

FIG. 9

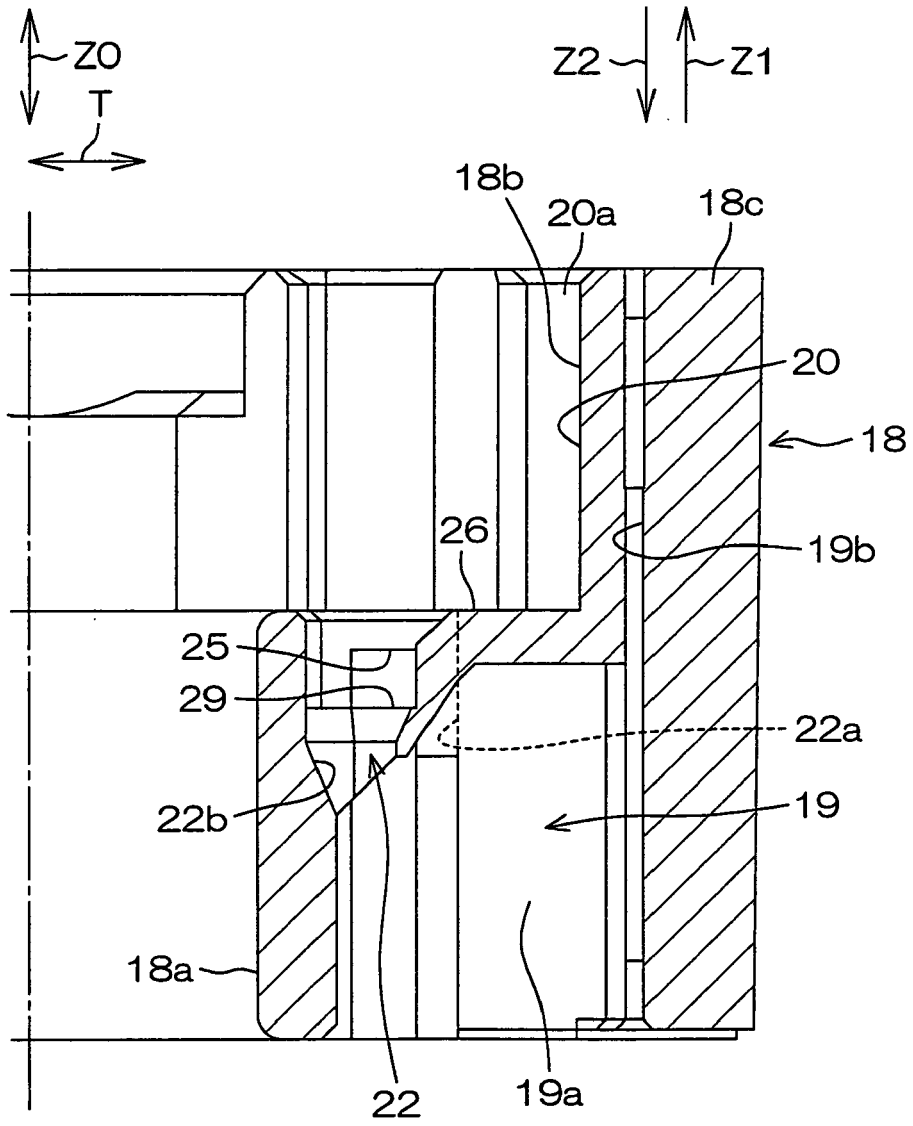


FIG. 10

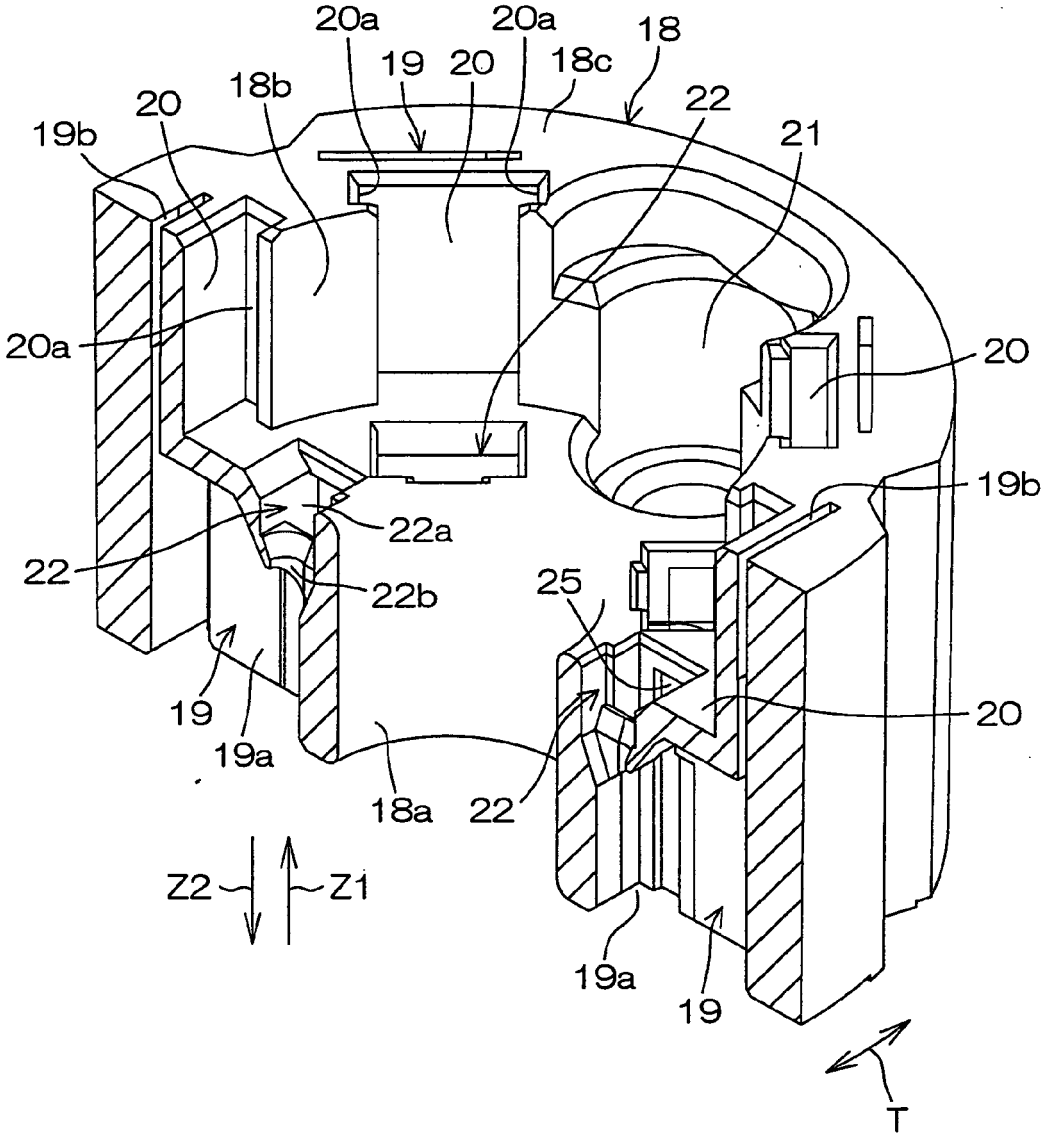

20a
20a
18
19
20
18c
18b
20
22
19b
21
20a
20
19b
22a
22
22b
25
19
19a
20
18a
22
Z2
Z1
19a
19
T

FIG. 11A

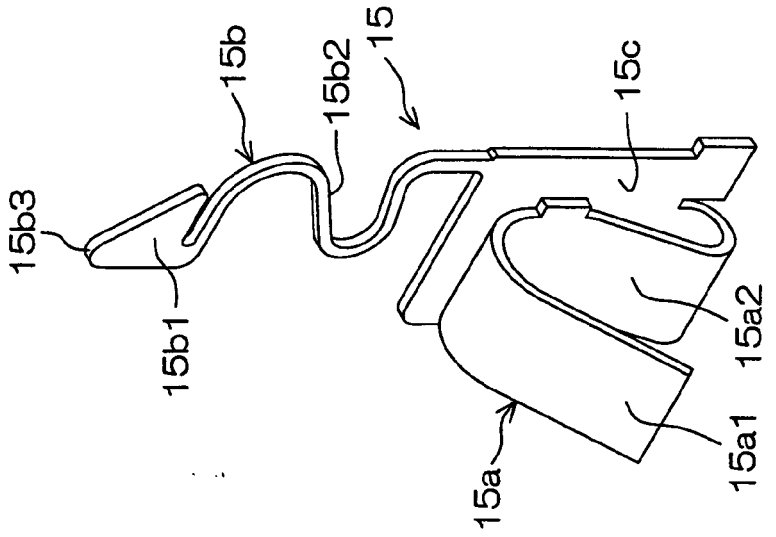


FIG. 11B

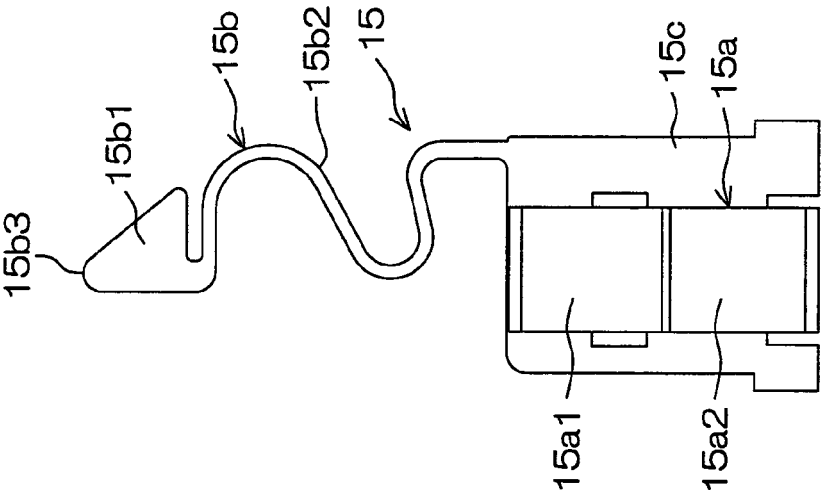
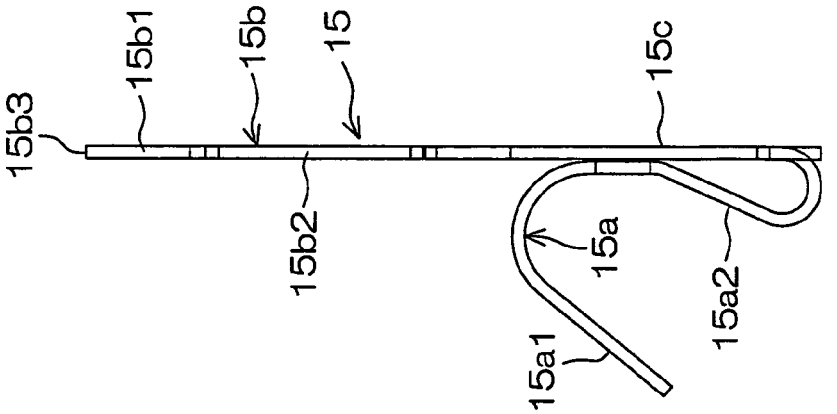
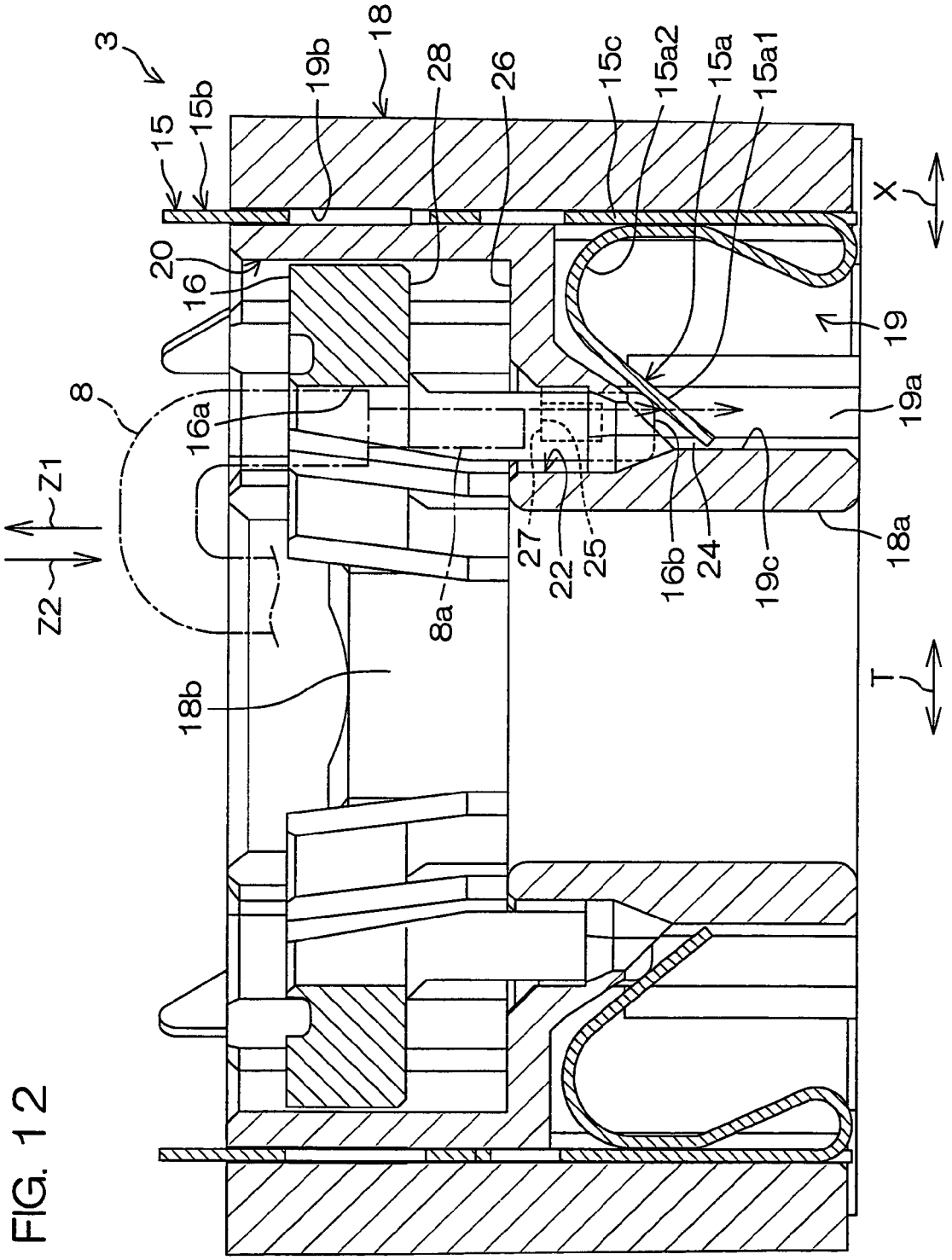


FIG. 11C

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15b
19b
18
28
26
15c
15a2
15a
15a1
X
20
16
19
8
16a
19a
Z1
Z2
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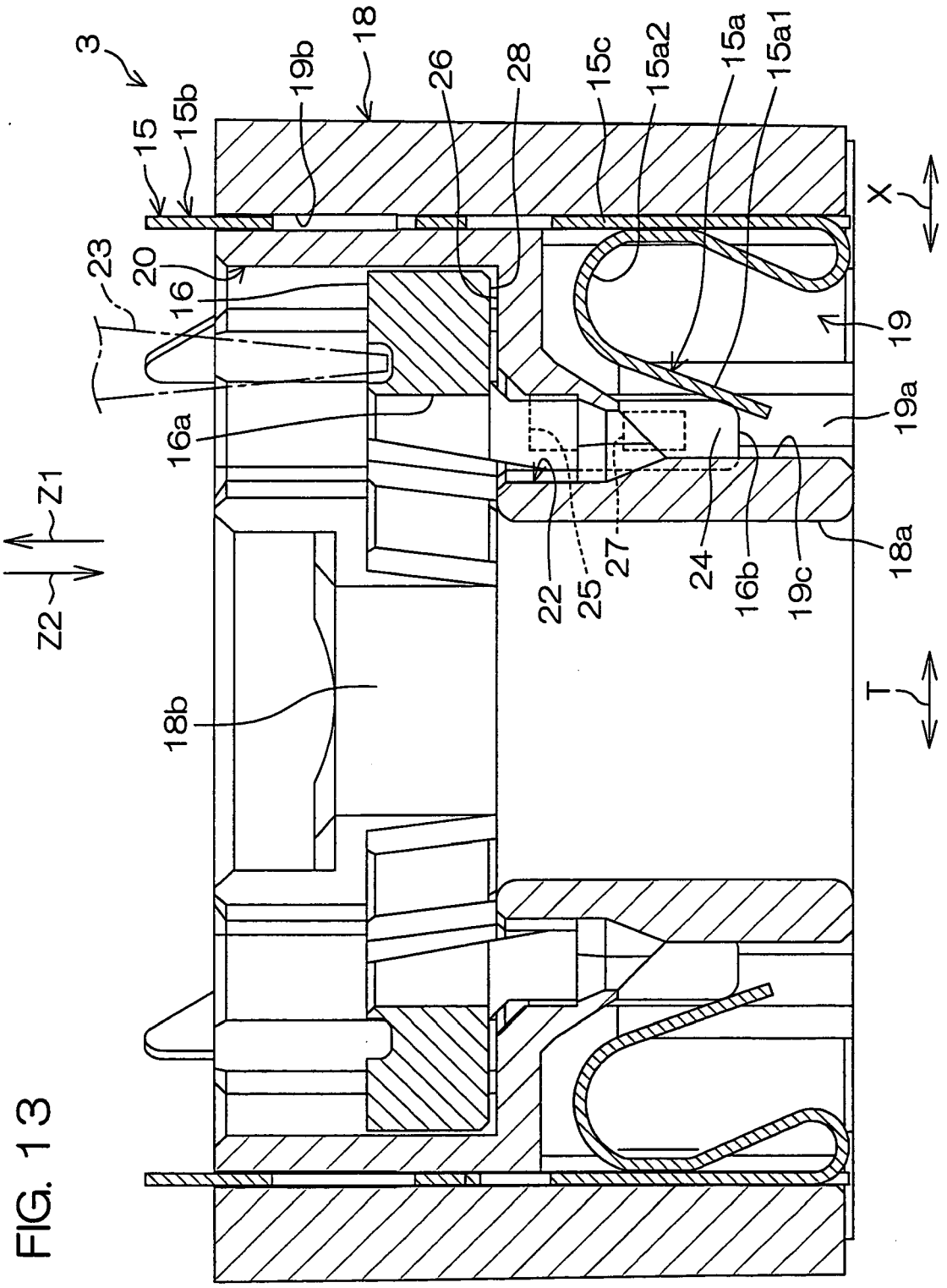
22
25
16b
24
19c
18a
8a
18b
T

FIG. 12

FIG. 13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Z1
Z2
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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 7691

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F21S
F21V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 October 2007	Arboreanu, Antoniu

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