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

(11) EP 0 882 855 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
09.12.1998 Bulletin 1998/50

(21) Application number: **97944153.2**

(22) Date of filing: **17.10.1997**

(51) Int. Cl.[6]: **E04F 13/14**

(86) International application number:
PCT/JP97/03749

(87) International publication number:
WO 98/24993 (11.06.1998 Gazette 1998/23)

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **03.12.1996 JP 337474/96**
06.01.1997 JP 11819/97
02.06.1997 JP 159243/97

(71) Applicant: **Iijima, Kazuo**
Makabe-gun, Ibaraki 300-44 (JP)

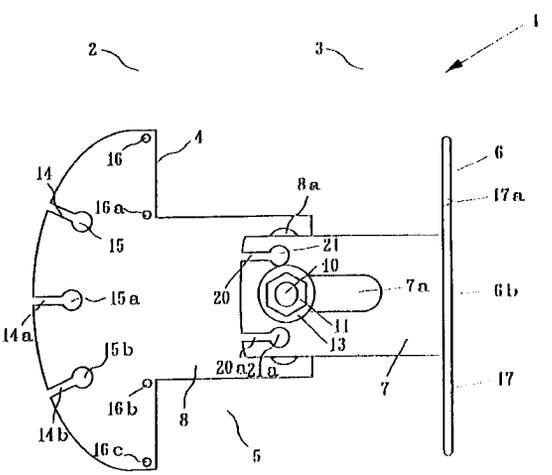
(72) Inventor: **Iijima, Kazuo**
Makabe-gun, Ibaraki 300-44 (JP)

(74) Representative:
W.P. Thompson & Co.
Coopers Building,
Church Street
Liverpool L1 3AB (GB)

(54) JOINER, ANCHOR BOLT, ROAD RIVET, LINE RIVET, AND POINT RIVET

(57) Improvements to a joiner used in mounting stone to stone, concrete, and asphalt and mounting panel or the like to stone, an anchor bolt for mounting and securing of a fixture and a box or the like to a wall surface, a road rivet, a line rivet, a point rivet and the like installed on road for prevention of traffic accident. A joiner comprising a left joint member including an insertion plate having a semi-circular shape, formed with a plurality of slits and provided with a protective frame, and a joint plate having a bolt and nut mounted in an insertion hole, and a right joint member comprising an elliptical-shaped insertion plate and a joint plate secured perpendicularly to the insertion plate; an anchor bolt formed at one end thereof with an integrally molded semi-circular insertion plate and having a nut releasably threaded onto the other end thereof; a joiner comprising a flat member, of which connection is provided continuous to an anchor formed to have a substantially T-shape, and a T-shaped member composed of a connection and an upright portion connected to the flat member; a road rivet provided with a semi-circular anchor portion, which is provided on an underside of a reflective portion attaching thereto a reflective plate and is formed to be semi-circular shaped; a road rivet, in which the reflective portion has a flattened trapezoidal shape; a road rivet comprising a cylindrical portion provided with a reflective portion and mounted to a base, and a cross-shaped anchor provided on an underside of the base; a metallic joiner comprising an insertion portion formed with upper and lower bend pieces and provided continuous to an end of an anchor portion having a semi-circular shape; a line rivet comprising an anchor portion formed with a plurality of through holes and provided on an underside of an elliptical-shaped exposed portion; and a point rivet provided with a plurality of through holes in a round-shaped exposed portion.

Fig. 2



EP 0 882 855 A1

Description

Technical Field

The present invention relates to improvements in a joining tool used for attaching a stone to another stone, a stone to concrete, a stone to asphalt, and a panel or the like to a stone, an anchor bolt for fixing an implement, a box or the like to a wall surface, and a road rivet, a line character rivet, a braille rivet or the like which is provided on a road for preventing traffic accidents.

Background Art

Conventionally, as a method used for joining a concrete body and stones, for instance, as shown in Fig. 24, a hole 23b is formed with a vibration drill in a concrete body 23 to be joined, an anchor 32 is set in the above hole 23b, and the anchor 32 is fixed with a driving bar. A hole 25b is formed in the upper end of a stone 25 to be joined to the above concrete body 23 and the stone 25 is fixed to a predetermined position. The interior of the above hole 25b is filled with an adhesive 26, a round pin 34 of a right joining member 31 is inserted in the said hole 25b, a left joining member 30 is set to the anchor 32 set in the above hole 25b, and a bolt 33 is temporarily fastened. The left joining member 30 and the right joining member 31 are fastened to each other by screwing a nut 11 onto the bolt 10. After the stone 25 is adjusted minutely and exactly at the predetermined position, the nut 11 is properly fastened onto the bolt 10 to be fixed. Next, after a hole 24b for allowing the pin 34 to enter is accurately formed in the lower end of a stone 24 and is filled with the adhesive 26 and then the stone 24 is put on the stone 25, strokes the same as the above are repeated to fix the stone 24. This is a conventional method.

However, in the conventional method for joining the concrete body and the stones or the like, because the formation of the hole with the vibration drill in the concrete body for driving in the anchor exerts a vibration on the wall surface of the concrete body, an influence is given to the periphery of the hole. Even if the formation is a failure, another hole can not be formed in the immediate neighborhood of the hole. Because the new hole must be distant by at least several centimeters, the hole already formed in the stone must also be moved. Besides, if the direction of the vibration drill sways right and left upon the formation of the hole in the stone with the drill, there is the case that cracks or through holes peculiar to brittle material are generated in the surface of the stone. In that case, the stone becomes impossible to use and a loss of material. Furthermore, because stone processing technique has progressed in recent years and the stone thickness has decreased to lower the cost, the progress of joining tools used for joining is slow and it is hard to obtain an economical effect.

For overcoming the above defects, the present invention aims to provide a joining tool in which processing is performed without exerting the vibration on the wall surface of the concrete body so that no influence is given to the periphery of a groove, the cracks or the through holes peculiar to brittle material are prevented from being generated in the surface of the stone, and the stone is not a loss of material, and which keeps up with the progress of stone processing technique in recent years and can be used even in the case of a thin stone thickness.

Conventionally, for fixing an electric apparatus, a storage shelf, a storage box or the like to a wall surface, an anchor bolt is driven in or an adhesive is applied to the wall surface to fix the apparatus, the box or the like.

However, in the conventional method, there are defects that, in the case of the wall surface made of hollow blocks or light concrete, even if fixing is attempted by using the conventional anchor bolt, the fixing ends in failure, and even if the electric apparatus, the storage shelf, the storage box or the like to the wall surfaces of which the adhesive is applied is fixed to the wall surface, the adhesive force of the adhesive deteriorates due to vibrations of an earthquake and so on so that the fixed electric apparatus, storage shelf, storage box or the like falls.

For overcoming the above defects, the present invention aims to provide an anchor bolt with which the electric apparatus, the storage shelf, the storage box or the like can extremely easily and simply be fixed to the wall surface of a hollow block or the wall surface of a light-concrete body, and even if there are vibrations of the earthquake and so on and the electric apparatus, the storage shelf, the storage box or the like fixed to the wall surface has been fixed to the wall surface for many years, the said electric apparatus, storage shelf, storage box or the like never falls.

Conventionally, a joining tool used for joining a stone to another stone, a stone to a concrete body or a stone to an asphalt body joins the stone to the stone, the stone to the concrete body, the stone to the asphalt body or the like by the manner that a hole is made in the stone, the concrete body, the asphalt body or the like and a bolt is embedded and fixed in the made embedding hole. However, in the case of joining a thin stone to another thin stone, if embedding holes for inserting embedded bolts are formed in both thin stones, cracks are generated in the thin stones and the thin stones break, and there is the defect that, because plural embedding holes must be made in the thin stones, too many working hours are required and the working efficiency is extremely bad and so it is not economical. Accordingly, the present invention aims to provide a joining tool for joining the thin stone to the thin stone with extreme ease.

In conventional road rivets, as shown in Fig. 47, a road rivet 53 is a rectangular parallelepiped and cylindrical fixing legs 55 for fixing on a road are attached to the lower surface of a reflection portion 53a to which a

reflecting plate 54 is attached. For attaching the road rivet 53 to the road, cylindrical holes allowing the fixing legs 55 and 55 to enter are formed in the road and the fixing legs 55 and 55 are inserted in the said holes and mortar is poured into the holes to set up the road rivet. On the other hand, an adhesive is applied to the bottom surface of a road rivet and a braille rivet and they are directly bonded and fixed to the surface of a road, a sidewalk or the like.

In the method for attaching the conventional road rivet and the conventional braille rivet to the road and the sidewalk, there are many cases that a car runs up onto the road and the road rivet and the braille rivet are easily broken due to the impact by the car. Formations of embedding holes in the road and the sidewalk are extremely troublesome and the working efficiency is extremely bad and so it is not economical.

Accordingly, the present invention aims to provide a road rivet, a line character rivet and a braille rivet which can extremely simply be attached and fixed to the road and the sidewalk in a short time, and never come off even if they receive impacts, and never break besides.

Disclosure of the Invention

The present invention is in a joining tool characterized by comprising a left joining member comprising a semicircular insertion portion provided with plural slits and provided with a protection frame, and a joining portion in which a bolt and a nut are attached to an insertion hole, and a right joining member comprising an elliptic insertion portion and a joining portion fixed at right angles to the above insertion portion, an anchor bolt characterized in that a semicircular insertion plate is integrally formed with one end of a bolt and a nut is screwed onto the other end in the manner of being detachable, a joining tool characterized by comprising a flat member in which a joining portion is formed connectedly with a nearly-T-shaped anchor and a T-shaped member comprising a joining portion connected with the above flat member and a standing portion, a road rivet characterized in that a semicircular anchor portion is provided on the lower surface of a reflection portion to which a reflecting plate is attached, a road rivet characterized in that the above reflection portion is a flat trapezoid, a road rivet characterized in that a cylindrical portion provided with a reflection portion is attached to a base and a cross-shaped anchor is provided on the lower surface of the above base, a joining tool characterized in that an insertion portion in which upward and downward bending tongues are formed is formed connectedly with an end portion of a semicircular anchor portion, a line character rivet characterized in that an anchor portion in which plural through holes are formed is provided on the lower surface of an elliptic exposure portion, and a braille rivet characterized in that an anchor portion in which plural through holes are formed is provided on the lower surface of a perfectly-circular exposure portion.

Brief Description of the Drawings

Fig. 1 is a front view of the first embodiment of a joining tool that is the present invention; Fig. 2 is a plan view of the first embodiment of a joining tool that is the present invention; Fig. 3 is a left side view of the first embodiment of a joining tool that is the present invention; Fig. 4 is a right side view of the first embodiment of a joining tool that is the present invention; Fig. 5 is a bottom view of the first embodiment of a joining tool that is the present invention; Fig. 6 is a cross-sectional view of the state that a concrete body and stones are joined by using the first embodiment of a joining tool that is the present invention; Fig. 7 is a partially and vertically cross-sectional view of the state that a left joining member of the first embodiment of a joining tool that is the present invention is joined to the concrete body; Fig. 8 is a front view of the left joining member of the first embodiment of a joining tool that is the present invention; Fig. 9 is a left side view of the left joining member of the first embodiment of a joining tool that is the present invention; Fig. 10 is a front view of a right joining member of the first embodiment of a joining tool that is the present invention; Fig. 11 is a left side view of the right joining member of the first embodiment of a joining tool that is the present invention; Fig. 12 is a front view of the left joining member of another embodiment of a joining tool that is the present invention; Fig. 13 is a left side view of the left joining member of another embodiment of a joining tool that is the present invention; Fig. 14 is a partially and vertically cross-sectional view of the state that a concrete body and stones are joined by using the second embodiment of a joining tool that is the present invention; Fig. 15 is a front view of a left joining member of the second embodiment of a joining tool that is the present invention; Fig. 16 is a left side view of the left joining member of the second embodiment of a joining tool that is the present invention; Fig. 17 is a front view of a right joining member of the second embodiment of a joining tool that is the present invention; Fig. 18 is a left side view of the right joining member of the second embodiment of a joining tool that is the present invention; Fig. 19 is a front view of a triangular wedge constituting a joining tool that is the present invention; Fig. 19a is a left side view of the triangular wedge constituting a joining tool that is the present invention; Fig. 20 is a partially and vertically cross-sectional view that a concrete body and stones are joined by the third embodiment of a joining tool that is the present invention; Fig. 21 is a partially and vertically cross-sectional view that a concrete body and stones are joined by the fourth embodiment of a joining tool that is the present invention; Fig. 22 is a partially and vertically cross-sectional view that a concrete body and a stone are joined by the fifth embodiment of a joining tool that is the present invention; Fig. 23 is a front view of an L-shaped

wedge constituting a joining tool that is the present invention; Fig. 23a is a front view of the L-shaped wedge constituting a joining tool that is the present invention; Fig. 24 is a partially and vertically cross-sectional view of the state that a concrete body and stones are joined by a conventional joining tool; Fig. 25 is a front view of an anchor bolt that is the present invention; Fig. 26 is a plan view of an anchor bolt that is the present invention; Fig. 28 is a left side view of an anchor bolt that is the present invention; Fig. 4 is a right side view of an anchor bolt that is the present invention; Fig. 29 is a front view of the state that a flat washer, a spring washer and a nut are removed from the bolt of an anchor bolt that is the present invention; Fig. 30 is a partially cross-sectional view of the state that an anchor bolt that is the present invention is attached to a wall surface; Fig. 31 is a perspective front view of a joining tool that is the present invention; Fig. 32 is a perspective rear view of a joining tool that is the present invention; Fig. 33 is a perspective view of the state that a plane member of a joining tool that is the present invention is attached to a stone or the like; Fig. 34 is a perspective view of a road rivet that is the present invention; Fig. 35 is a perspective view showing another embodiment of a road rivet that is the present invention; Fig. 36 is a perspective view showing another embodiment of a road rivet that is the present invention; Fig. 37 is a front view of another embodiment of a joining tool that is the present invention; Fig. 38 is a left side view of another embodiment of a joining tool that is the present invention; Fig. 9 is a cross-sectional view of the state that another embodiment of a joining tool that is the present invention is attached to a stone; Fig. 40 is an enlarged cross-sectional view of the state that another embodiment of a joining tool that is the present invention is attached to a stone; Fig. 41 is a plan view of a line character rivet that is the present invention; Fig. 42 is a front view of a line character rivet that is the present invention; Fig. 43 is a vertically cross-sectional view of the state that a line character rivet that is the present invention is attached to a sidewalk; Fig. 44 is a plan view of a braille rivet that is the present invention; Fig. 45 is a front view of a braille rivet that is the present invention; Fig. 46 is a vertically cross-sectional view of the state that a braille rivet that is the present invention is attached to a sidewalk; and Fig. 47 is a perspective view of a conventional road rivet.

Best Mode for Carrying out the Invention

[Embodiments]

Next, joining tools, anchor bolts, road rivets, a line character rivet and a braille rivet which are the present invention will be described in detail on the basis of drawings.

Fig. 1 is a front view of a joining tool that is the present invention, Fig. 2 is a plan view of the joining tool that is the present invention, Fig. 3 is a left side view of the joining tool that is the present invention, Fig. 4 is a right side view of the joining tool that is the present invention, and Fig. 5 is a bottom view of the joining tool that is the present invention.

The first embodiment of the present invention will be shown. As shown in Figs. 1 and 2, the joining tool 1 that is the present invention comprises a left joining member 2 and a right joining member 3. As shown in Figs. 1 and 2, the above left joining member 2 comprises a semicircular insertion portion 4, a nearly square joining portion 8, a protection frame 9 provided rightward of the rear surface of the above joining portion 8, and a bolt 10 and a nut 11 which are used for joining to the above right joining member 3.

As shown in Fig. 2, slits 14, 14a and 14b the tip portions of which is formed into circular holes 15, 15a and 15b are provided at constant intervals at three positions of the leftward portion of the semicircular insertion portion 4 of the above left joining portion 2. The above slits 14, 14a and 14b and circular holes 15, 15a and 15b are formed and made in order that an adhesive enters therein to be strongly joined to a concrete body. Small circular holes 16, 16a, 16b and 16c are made in a line rightward of the above insertion portion 4. Because the insertion portion 4 is formed into a semicircle, it is easy to be put in the concrete body or the like.

As shown in Figs. 2, 3 and 4, the right joining member 3 comprises a nearly elliptic insertion portion 6 and a joining portion 7 formed at right angles to the above insertion portion 6. In the left end portion of the above joining portion 7, slits 20 and 20a are formed at two positions so as to place an insertion hole 7a between them. Circular holes 21 and 21a are provided at the tips of the above slits 20 and 20a. In the middle of the joining portion 7, the elliptic insertion hole 7a is formed.

As shown in Figs. 3 and 4, in the elliptic insertion portion 6 of the above right joining member 3, slits 17 and 17a are formed at two positions in one curved-surface portion and slits 17b, 17c and 17d are formed at three positions in the other curved-surface portion. The tip portions of the above slits 17, 17a, 17b, 17c and 17d are formed into circular holes 18, 18a, 18b, 18c and 18d, respectively. A large-diameter hole 19 is provided between the above slits 17 and 17a.

The protection frame 9 shown in Figs. 1 and 3 is disposed at the right end of the joining portion 8 of the left joining member 2 in a vertically oblong manner. The interior 5 of the protection frame receives the head portion of the bolt 10.

Fig. 6 is a vertically cross-sectional view of the state that a concrete body and stones are joined by using the joining tool that is the present invention. As shown in Fig. 6, after a groove 23a provided in a concrete body 23 with a diamond cutter or the like is filled with an adhesive 26, the insertion portion 4 of the left joining member 2 of the joining tool 1 is inserted. If the above insertion portion 4 is in an unsteady condition and not strongly fixed, by the manner that a wedge 22 is driven

in as shown in Fig. 6, the insertion portion 4 is more strongly joined to the concrete body 23.

The upper portion 6a and the lower portion 6b of the insertion portion 6 of the right joining member 3 are fixed by the manner that, after grooves 24a and 25a formed in stones 24 and 25, respectively, are filled with the adhesive 26 and 26, the upper portion 6a and the lower portion 6b of the insertion portion 6 of the right joining member 3 of the joining tool 1 are inserted, respectively. After the insertion portions 4 and 6 inserted in the concrete body 23 and the stones 24 and 25, respectively, are fixed to each other, the joining portions 7 and 8 are piled up, the bolt 10 is passed through the insertion holes 7a and 8a formed in each of the above joining portions 7 and 8, and the nut 11 is screwed onto the above bolt 10 through a spring washer 12 and a flat washer 13 to fasten.

Fig. 7 is a cross-sectional view of the state that the left joining member of the joining tool that is the present invention is attached to the concrete body. As shown in Fig. 7, by removing the nut 11, the spring washer 12 and the flat washer 13, the right joining member 3 shown in Fig. 6 and so on can easily be removed from the left joining member 2. Fig. 8 is a front view of the left joining member of the joining tool that is the present invention and Fig. 9 is a left side view of the left joining member of the joining tool that is the present invention.

As shown in Figs. 8 and 9, the joining plate 8 of the left joining member 2 is nearly square and the elliptic insertion hole 8a is formed in the right end portion of the joining portion 8. The threaded portion of the bolt 10 is passed through the above insertion hold 8a and the protection frame 9 is provided in order that the above bolt 10 does not fall off the insertion hole 8a.

Fig. 10 is a front view of the right joining member of the joining tool that is the present invention and Fig. 11 is a left side view of the right joining member of the joining tool that is the present invention. As shown in Figs. 10 and 11, the large-diameter hole 19 is formed to the left of the central portion of the insertion portion 6 constituting the right joining member 3 and the slits 171 and 17a the tips of which are formed into the circular holes 18 and 18a are formed in the left side portion 6a. The slits 17b, 17c and 17d the tips of which are formed into the circular holes 18b, 18c and 18d are formed in the right side portion 6b.

The joining portion 7 is vertically fixed to the central portion of the above insertion portion 6. The above joining portion 7 is provided with the slits 20 and 20a the tips of which are formed into the circular holes 21 and 21a, and the elliptic insertion hole 7a.

Fig. 12 is a front view of a left joining member of the joining tool that is the present invention and Fig. 13 is a left side view of the left joining member of the joining tool that is the present invention. In the left joining member 2a of this example, although the insertion hole 8a and the protection frame 9 are provided in parallel with the insertion portion 4 in the left joining member 2 shown in Figs. 8 and 9, they are provided at right angles to the insertion portion 4 in the left joining member 2a of this example.

Fig. 14 shows the second embodiment of a joining tool that is the present invention and is a cross-sectional view of the state that a concrete body and stones are joined by using the joining tool of this example. The joining tool 1a of this example comprises a left joining member 2a, a right joining member 3 and a wedge 22. For connecting the left joining member 2a and the right joining member 3 to each other, a bolt 10 is inserted into insertion holes 7a and 8a formed in joining portions 7 and 8 and a nut 11 is screwed onto the bolt 10 through a spring washer 12 and a flat washer 13 to connect.

Fig. 15 is a front view of the left joining member of the joining tool that is the second embodiment that is the present invention and Fig. 16 is a left side view of the left joining member of the joining tool of the second embodiment that is the present invention. As shown in Figs. 15 and 16, the left joining member 2b of this example is provided with a rectangular fitting hole 27 in the central portion of the joining plate 8 at right angles to an insertion portion 4.

Fig. 17 is a front view of the right joining member of the joining tool that is the second embodiment of the present invention and Fig. 18 is a left side view of it. As shown in Figs. 17 and 18, in the right joining member 3a of this example, the joining portion 7 is provided with a rectangular fitting hole 27 in the central portion of the joining portion 7 at right angles to an insertion portion 6.

Fig. 19 is a front view of the wedge used in the joining tool of the second embodiment that is the present invention and Fig. 19a is a left side view of it. The triangular wedge 29 constituting the joining tool of this example is plate-like and nearly triangular. In this triangular wedge 29, the upper surface 29a and the lower surface 29b are parallel with each other but the widths are different from each other and there are a slanting surface 29c and a side surface 29d.

Fig. 20 is a vertically cross-sectional view of the state that a concrete body and stones are joined by using a joining tool of the third embodiment that is the present invention. The joining tool 1b of this example comprises a left joining member 2b, a right joining member 3a, an L-shaped wedge 22 and a triangular wedge 29. In this example, the left joining member 2b and the right joining member 3a are connected to each other with the triangular wedge 29. The L-shaped wedge 22 is driven in to make the join strong.

Fig. 21 is a cross-sectional view that a concrete body and stones are joined by using the fourth embodiment of a joining tool that is the present invention. In the joining tool of this example, the concrete body 23 and stones 24 and 25 are joined to each other with only a right joining member 3a. Fig. 22 is a cross-sectional view of the state that a concrete body and a stone are joined to each other by using the fifth embodiment of a joining tool that is the present invention. The joining tool

of this example comprises a right joining member 3a and an L-shaped wedge 22. As shown in Fig. 22, for more strongly joining the concrete body 23 and a joining portion 7, when the L-shaped wedge 22 is used, the head portion of the wedge 22 can be struck through a large-diameter hole 19 of an insertion plate 6 to drive in.

Fig. 23 is a front view of a triangular wedge constituting a joining tool that is the present invention and Fig. 23a is a plan view of it. The triangular wedge 22 has a gently slanting surface 22b and is formed so that it is easy to insert the tip 22a, and a standing plate 23c is formed at the left end and the wedge is constructed so that it is easy to drive in.

Fig. 25 is a front view of an anchor bolt that is the present invention, Fig. 26 is a plan view of the anchor bolt that is the present invention, Fig. 27 is a left side view of the anchor bolt that is the present invention, and Fig. 28 is a right side view of the anchor bolt that is the present invention. The anchor bolt 35 that is the present invention comprises a bolt 37 with one end of which an insertion plate 36 is integrally formed, a bolt 38, a spring washer 39 and a flat washer 40. The insertion plate 36 formed at the one end of the bolt 37 is semicircular and provided with plural slits 36a, 36b and 36c formed therein. Circular holes are connectedly formed at the tips of the above slits. Although the insertion plate 36 in Figs. 25, 26 and 27 is provided with the slits 36a, 36b and 36c to which the plural circular holes 36d, 36e and 36f are connectedly formed, it may not be provided with the slits 36a, 36b and 36c to which the circular holes 36d, 36e and 36f are connectedly formed.

On the other hand, each slit 36a, 36b or 36c may be a rectangular slit to which the circular hole 36d, 36e or 36f is not connectedly formed. To the other end of the bolt 37, the spring washer 36 and the flat washer 40 are inserted and the nut 38 is screwed. There may not be the spring washer 36 and the flat washer 40. There may be only a spring nut 38 and a washer 39. Furthermore, it may be the construction that only the nut 38 is screwed without the spring washer 39 and the flat washer 40.

Fig. 29 is a front view of the state that the flat washer, the spring washer and the nut are removed from the bolt of the anchor bolt that is the present invention. As this manner, the nut 38, the spring washer 39 and the flat washer 40 can be removed from the bolt 37. Fig. 30 is a partially cross-sectional view of the state that the anchor bolt that is the present invention is attached to a wall surface. For fixing the anchor bolt 35 that is the present invention to the wall surface or the like, at first, an insertion groove 41a allowing the insertion plate 36 to enter is formed in the wall surface 41 with a cutter.

Next, an adhesive 42 is poured into the above insertion groove 41a formed in the wall surface 41, the insertion plate 36 to which the bolt 37 is formed is inserted in the insertion groove 41a into which the adhesive was poured, and it is left till the insertion plate 41a is secured to the wall surface 41 by the adhesive 42. An electric apparatus, a storage shelf, a storage box or the like is attached to the bolt 37 of the insertion plate 36 secured to the wall surface 41 and the spring washer 39 and the flat washer 40 or the like are put on to the bolt 37 and then the nut 38 is screwed onto the bolt 37 to fasten.

Fig. 31 is a perspective front view of a joining tool that is the present invention and Fig. 32 is a perspective rear view of it. As shown in Figs. 31 and 32, the joining tool 43 that is the present invention comprises a flat member 44 and a T-shaped member 47. The flat member 44 is nearly T-shaped and comprises an anchor portion 45 and a joining portion 46. The above anchor portion 45 is semicircular and provided with plural through holes 45a, 45a, 45a, 45b, 45b, 45b and 45b made therein. The joining portion 46 formed connectedly to the anchor portion 45 is rectangular and provided with a nearly elliptic insertion hole 46a so that the T-shaped member 47 can be connected with a bolt and nut 50.

The shape of the T-shaped member 47 connected to the anchor portion 45 comprises a joining portion 48 and a standing portion 49 and an elliptic insertion hole 48a for connecting the flat member 44 is formed in the joining portion 48. Plural large and small through holes 49a, 49b and 49c are formed in the above standing portion 49. The above standing portion 49 is formed vertically to the joining portion 48. The insertion hole 46a formed in the joining portion 46 of the flat member 44 and the insertion hole 48a formed in the joining portion 48 of the T-shaped member 47 are both elliptic. But, each insertion hole 46a or 48a may be a hole that is circular, polygonal or the like. By the way, as for a method of manufacturing the T-shaped member 47, after the joining portion 48 and the standing portion 49 are formed in one flat plate, the standing portion 49 is bent at right angles to the joining portion 48 to stand up. By the construction of connectediy forming in one body as this manner, the manufacturing cost extremely decreases.

Fig. 33 is a perspective view of the state that the flat member 44 of the joining tool 43 that is the present invention is attached to and embedded in a stone, a concrete body or the like. After an adhesive is injected in an embedding groove 52a formed in a side surface of a stone 52 formed in a thin shape, the anchor portion 45 of the flat member 44 is inserted into the above embedding groove and the flat member 44 is fixed to the side surface of the board-like stone 52. For joining a stone to another stone, a stone to a concrete body or the like with the joining tool 43, as shown in Figs. 31 and 32, at first, the bolt and nut 50 screwed in the joining tool 43 is loosened to separate the flat member 44 and the T-shaped member 47 from each other.

Next, as shown in Fig. 33, the embedding groove 52a is formed in the side surface of the stone 52 with a diamond cutter or the like. After the adhesive is injected

into the embedding groove 52a, the anchor portion 45 of the flat member 44 is inserted therein and the adhesive is solidified to be fixed. Because the radius of the nearly semicircular arc of the anchor portion 45 is equal to the radius of the arc of the diamond cutter, a closely adherent insertion in the embedding groove 52a formed with the cutter is possible.

For joining the stone 52 to which the T-shaped member 47 is fixed to the stone 52 to which the flat member 44 is fixed, the joining portion 46 of the flat member 44 and the joining portion 48 of the T-shaped member 47 are piled up and the bolt of the bolt and nut 50 is passed through the insertion holes 46a and 48a and the nut is screwed onto the above bolt to fasten. The reference 51 denotes a washer.

Figs. 34, 35 and 36 show the invention in relation to road rivets. Fig. 34 is a perspective bottom view of a road rivet that is the present invention. As shown in Fig. 34, the shape of this road rivet 56 is a rectangular parallelepiped. Reflecting plates 57 and 57a for reflecting lights from cars are fixed to the front surface 56a and the rear surface 56b. Nearly-semicircular projecting plates 58 and 59 parallel to each other are attached vertically to the bottom surface 56c of the road rivet 56. Although the number of the projecting plates is two in this example, the number may be one. Besides, the projecting plates 58 and 59 may be attached so that they intersect.

Plural through holes 58a, 58a and 58a and 59a, 59a and 59a and plural slits 58b, 58b and 58b and 59b, 59b and 59b are formed in the above projecting plates 58 and 59. An adhesive enters in these through holes 58a, 58a, 58a, 59a, 59a and 59a and slits 58b, 58b, 58b, 59b, 59b and 59b and the through holes and the slits are for increasing the adhesive strength.

Fig. 35 is a perspective view of another embodiment of a road rivet that is the present invention. In the road rivet 60 of this example, as shown in Fig. 35, the shape of the reflection portion is a flat trapezoid and reflecting plates 61, 61a, 61b and 61b are attached to the whole surface.

Also in the road rivet 60 of this example, semicircular projecting plates 62 and 63 are attached to the lower surface of the reflection portion similarly to the road rivet 56 shown in Fig. 34. Plural through holes 62a and 63a and plural slits 62b and 63b are formed in the above projecting plates 62 and 63. The above projecting plates 62 and 63 are attached in parallel with each other and vertically to the bottom surface. Although the number of the projecting plates is two in this example, the number may be one. Besides, the projecting plates 58 and 59 may be attached so that they intersect.

Fig. 36 is a perspective view showing another embodiment of a road rivet that is the present invention. As shown in Fig. 36, the road rivet 64 of this example comprises a cylindrical portion 64a on which reflection portions 64b and 64c are formed, and a base 65 to which the above cylindrical portion 64a is fixed. Cross-shaped projecting plates 66 are attached to the lower surface of the base 65. A large number of through holes 66a, 66a, 66a, 66a, 66a, 66a and 66a is formed in the above projecting plates 66. Although the projecting plates 66 attached to the lower surface of the base 65 intersect crosswise in Fig. 6, they may be attached in parallel with each other. Besides, only the projecting plate of 43 may be attached to the lower surface of the base 65.

In a method for attaching the road rivet 56, 60 or 64 shown in Fig. 34, 35 or 36 to a road, an embedding groove allowing the projecting plates to enter is formed at a setting place of the road with a diamond cutter or the like. After an adhesive is injected into the said embedding groove, the projecting plates are inserted into the said embedding groove and it is attached by being left for a predetermined time for solidifying the adhesive.

Figs. 37 and 38 are drawings showing another embodiment of a joining tool. Fig. 37 is a front view of another embodiment of the joining tool that is the present invention and Fig. 38 is a left side view of another embodiment of the joining tool that is the present invention and a cross-sectional view of the state that another embodiment of the joining tool that is the present invention is attached to a stone. As shown in Figs. 37 and 38, the joining tool of this example comprises an anchor portion 67a and an insertion portion 67b integrally formed with the above anchor portion 67a. The above anchor portion 67a is nearly semicircular and the above insertion portion 67b is rectangular and they are plate-like as a whole. An upward bending tongue 67c and a downward bending tongue 67d bending right and left are provided in an end portion of the insertion portion 67b as shown in Fig. 8.

Fig. 39 is a cross-sectional view of the state that another embodiment of the joining tool that is the present invention is attached to a stone and Fig. 40 is an enlarged cross-sectional view of the state that another embodiment of the joining tool that is the present invention is attached to the stone. In a method for using and attaching the joining tool 67 of this example, a cut groove in which the anchor portion 67a of the joining tool 67 can be embedded is formed in the ornamental board-like stone 68 with a diamond cutter or the like. After an adhesive is injected into the said cut groove, the anchor portion 67a is inserted and embedded and this joining tool 67 can be fixed to the stone 68 by being left till the adhesive is solidified. A panel is attached to the insertion portion 67b of this fixed joining tool 67.

Figs. 41, 42 and 43 are drawings showing the shape of a line character rivet that is the present invention and a method of attaching it. Fig. 41 is a plan view of the line character rivet that is the present invention, Fig. 42 is a front view of the line character rivet that is the present invention and Fig. 44 is a vertically cross-sectional view of the state that the line character rivet that is the present invention is attached to a sidewalk.

This line character rivet 69 comprises an exposure portion 69a and an anchor portion 69a connectedly formed in one body with the above exposure portion 69a. Plural through holes 70a, 70a, 70a and 70a for an adhesive entering are formed in the anchor portion 70.

The above exposure portion 69a is formed into a laterally oblong ellipse and a slope is formed on the outer circumferential surface of the exposure portion 69a. The anchor portion 70 is hung down from and formed connectedly to the lower surface of the above exposure portion 69a to project downward, and plural through holes 70a are formed at constant intervals. Of course, the slope 69b may not be formed on the outer circumferential surface of the exposure portion 69a. The number of the through holes 70a, 70a, 70a and 70a may be increased or decreased as occasion demands. It is also possible not to form any through hole. If the slope 69b is formed, even when a visually handicapped person walks on the surface of the sidewalk 71, he never stumbles and it is safe.

Fig. 43 is a vertically cross-sectional view of the state that this line character rivet 69 is set to the sidewalk. As shown in the drawing, at first, a cut groove 71a in which the anchor portion 70 can be inserted and embedded is formed at a setting place of the sidewalk 71. After an adhesive 71b is injected into the said cut groove 71a, the anchor portion 70 is inserted into the cut groove 71b and it is left for a predetermined time to solidify the adhesive 71b and it can be set to the sidewalk 71. The exposure portion 69a projects from the level of the horizontal plane of the sidewalk 71.

Figs. 44, 45 and 46 are drawings showing a braille rivet that is the present invention. Fig. 44 is a plan view of the braille rivet that is the present invention, Fig. 45 is a front view of the braille rivet that is the present invention and Fig. 46 is a vertically cross-sectional view of the state that the braille rivet that is the present invention is attached to a sidewalk. This braille rivet 72 comprises exposure portions 72a, 72a, 72a, 72a and 72a and an anchor portion 73 connectedly formed in one body with the above exposure portions 72a. Plural through holes 73a, 73a, 73a and 73a for an adhesive 71b entering are formed in the anchor portion 73.

The above exposure portions 72a, 72a, 72a, 72a and 72a are provided on projecting portions 73c, 73c, 73c, 73c and 73c are projectively formed at the upper portion of the anchor portion 73. The above exposure portions 72a, 72a, 72a, 72a and 72a are perfectly circular. A slope 72b, 72b, 72b, 72b or 72b is formed on the outer circumferential surface of each exposure portion 72a, 72a, 72a, 72a or 72a. The anchor portion 70 is hung down from and formed connectedly to the lower surfaces of the above exposure portions 72a, 72a, 72a, 72a and 72a to project downward, and plural through holes 73a, 73a, 73a and 73a are formed at constant intervals.

Of course, the slopes 72b, 72b, 72b, 72b and 72b may not be formed on the outer circumferential surfaces of the exposure portions. The number of the through holes 73a, 73a, 73a and 73a formed in the anchor portion 73 may be increased or decreased as occasion demands. It is also possible not to form any through hole. If the slopes 72b, 72b, 72b, 72b and 72b are formed, even when a visually handicapped person walks on the surface of the sidewalk 71, he never stumbles and it is safe.

Fig. 43 is a vertically cross-sectional view of the state that this line character rivet 69 is set to the sidewalk. In a method for setting this braille rivet 72 to the sidewalk, as shown in the drawing, at first, a cut groove 71a in which the anchor portion 73 can be inserted and embedded is formed at a setting place of the sidewalk 71. After an adhesive 71b is injected into the said cut groove 71a, the anchor portion 73 is inserted into the cut groove 71b and it is left for a predetermined time to solidify the adhesive 71b and it can be set to the sidewalk 71. The exposure portions 72b project from the level of the road surface of the sidewalk 71.

Possibility of Industrial Utilization

Because the present invention is constructed as described above, the following effects can be obtained.

First, by cutting by using a diamond cutter, the work can be performed without giving a vibration to the concrete body side. Besides, because the depth of the groove is shallow, there is no case of touching an inside iron-reinforcing rod. In comparison with a conventional constructing method, because no anchor is driven in, it is possible to drive successively at no interval. Besides, although a pin adhered by the effect of point and line, because of the adhesion by surface, it is superior in adherence effect, and, even if there is generated a dimensional error or the like upon enforcing, it is possible easily to adjust by elongating the groove, and, because a hook can be engaged with the large-diameter hole of the insertion plate to be hung with a wire upon hanging a stone or the like, it is extremely effective for saving power. Furthermore, because the bolt is used at one place, properly fastening can be completed in one time, the slippage in setting decreases and a speedup of constructing becomes possible.

Second, an electric apparatus, a storage shelf, a storage box or the like can extremely easily and simply be fixed to the wall surface of a hollow block or the wall surface of a light-concrete body. Even if there are vibrations of the earthquake and so on and the electric apparatus, the storage shelf, the storage box or the like fixed to the wall surface has been fixed to the wall surface for many years, the said electric apparatus, storage shelf, storage box or the like never falls.

Third, in the joining tool, because the anchor portion is nearly-semicircular-plate-like, the cut groove in which the anchor portion, is inserted and embedded can easily be formed and there is no case of being easily removed from a stone or the like when being fixed to

the stone or the like. Besides, even in the case that the stone or the like is an extremely-thin board-like stone, fixing is possible and the thin stone or the like never be damaged. Furthermore, because the anchor portion of the road rivet, letter rivet, braille rivet or the like that is the present invention is nearly-semicircular-plate-like, the cut groove in which the anchor portion is inserted can easily be cut, the working efficiency is remarkably good, it is economical and there is no case of being easily removed from the road due to an impact.

Claims

1. A joining tool characterized by comprising a left joining member comprising a semicircular joining portion provided with plural slits and provided with a protection frame and in which a bolt and a nut are attached to an insertion hole, and a right joining member comprising an elliptic insertion portion and a joining portion fixed at right angles to said insertion portion.

2. A joining tool characterized by comprising a left joining member comprising a semicircular insertion portion provided with plural slits and a joining portion in which a fitting hole is formed, an elliptic insertion portion, a right joining member fixed at right angles to said insertion portion and in which a fitting hole is formed, and a triangular wedge.

3. A joining tool characterized in that a fitting hole and a slit are formed at right angles to the central portion of an elliptic insertion portion.

4. A joining tool characterized by comprising only a right joining member in which a fitting hole and a slit are formed at right angles to the central portion of an elliptic insertion portion.

5. A joining tool characterized by comprising a right joining member in which a fitting hole and a slit are formed at right angles to the central portion of an elliptic insertion portion, and an L-shaped wedge.

6. An anchor bolt characterized in that a semicircular insertion plate is integrally formed with one end of a bolt and a nut is screwed onto the other end in the manner of being detachable.

7. An anchor bolt described in claim 6, characterized in that plural slits are formed in the semicircular insertion plate.

8. An anchor bolt described in claim 6 or 7, characterized in that circular holes are connectedly formed at the tips of plural slits in the semicircular insertion plate.

9. A joining tool characterized by comprising a flat member 2 in which a joining portion is formed connectedly with a nearly-T-shaped anchor and a T-shaped member comprising a joining portion connected with said flat member and a standing portion.

10. A road rivet characterized in that a semicircular anchor portion is provided on the lower surface of a reflection portion to which a reflecting plate is attached.

11. A road rivet described in claim 2, characterized in that the reflection portion is a flat trapezoid.

12. A road rivet characterized in that a cylindrical portion provided with a reflection portion is attached to a base and a cross-shaped anchor is provided on the lower surface of said base.

13. A joining metal tool characterized in that an insertion portion in which upward and downward bending tongues are formed is formed connectedly with an end portion of a semicircular anchor portion.

14. A line character rivet characterized in that an anchor portion in which plural through holes are formed is provided on the lower surface of an elliptic exposure portion.

15. A braille rivet characterized in that an anchor portion in which plural through holes are formed is provided on the lower surface of a perfectly-circular exposure portion.

Fig. 1

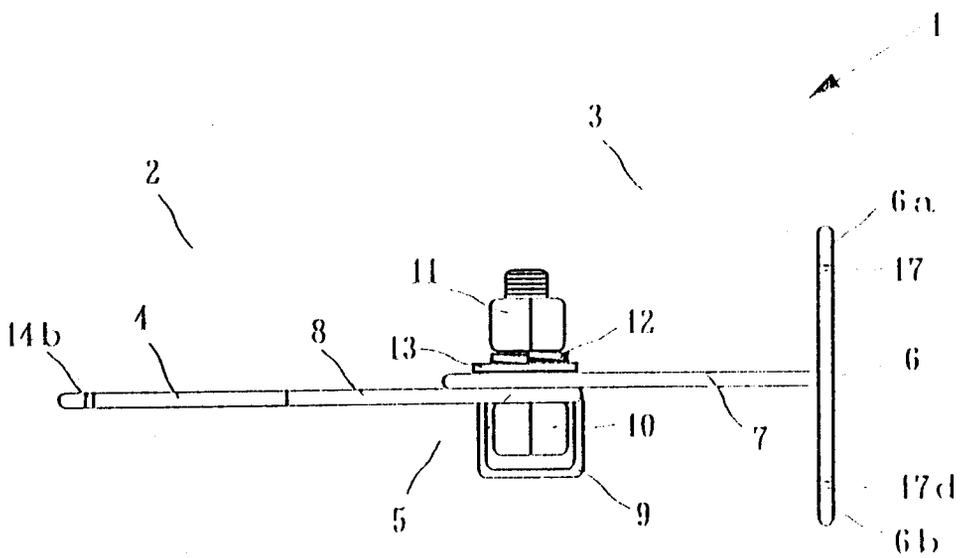


Fig. 2

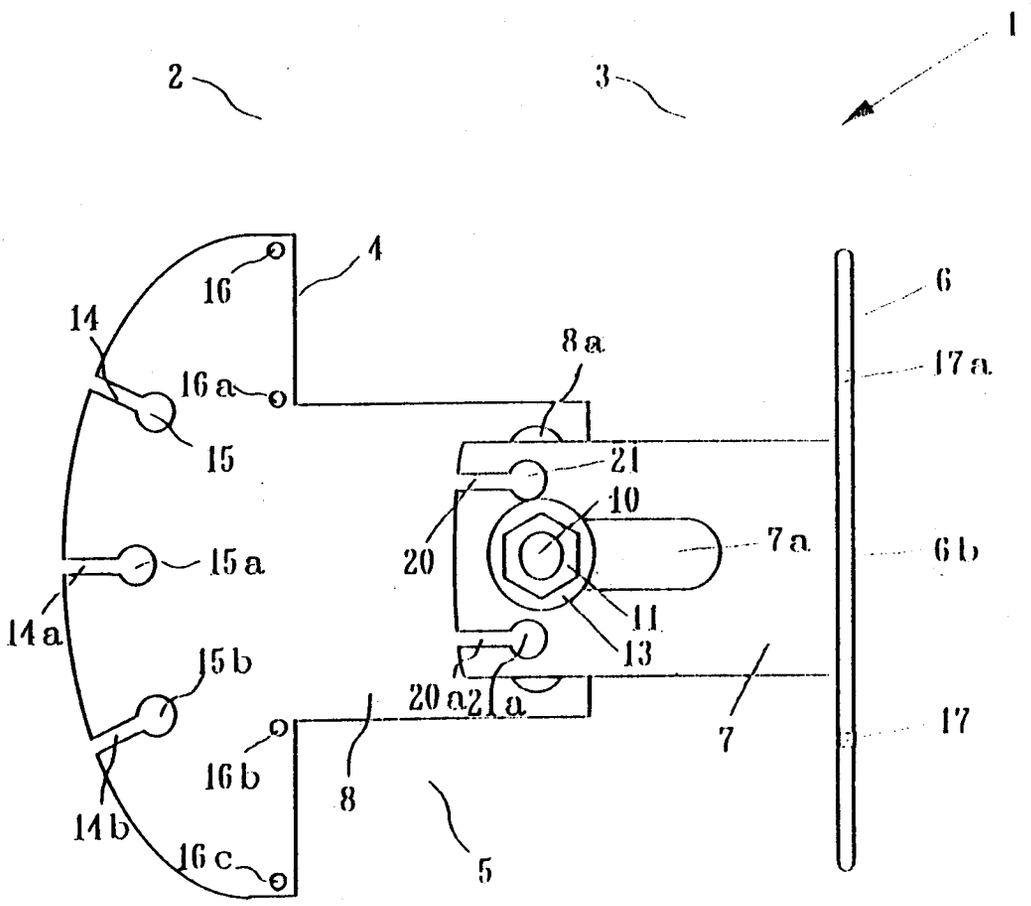

1
2
3
4
16
14
16a
15
15a
14a
15b
16b
14b
16c
8a
21
10
20
7a
11
13
20a
2a
8
5
7
6
17a
6b
17

Fig. 3

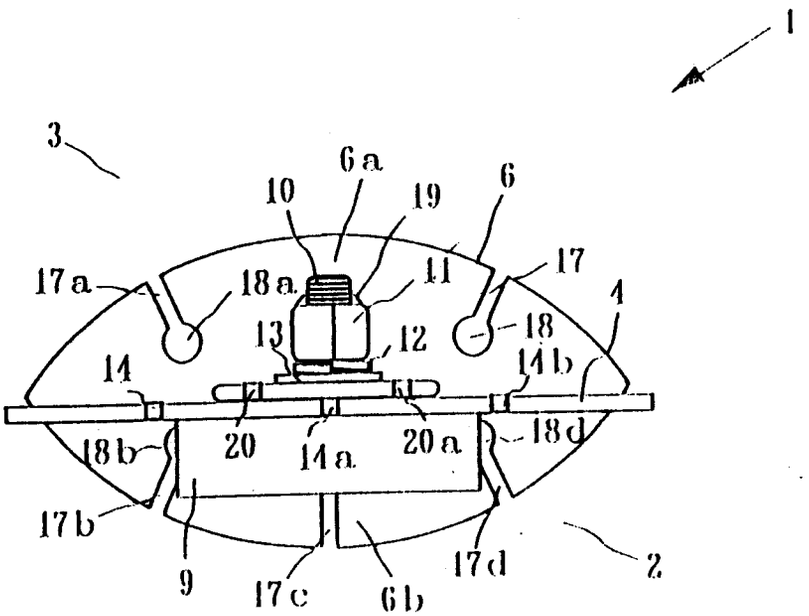

1
3
6a
10
19
6
17a
18a
11
17
4
13
12
18
14
14b
18b
20
14a
20a
18d
17b
9
17c
6b
17d
2

Fig. 4

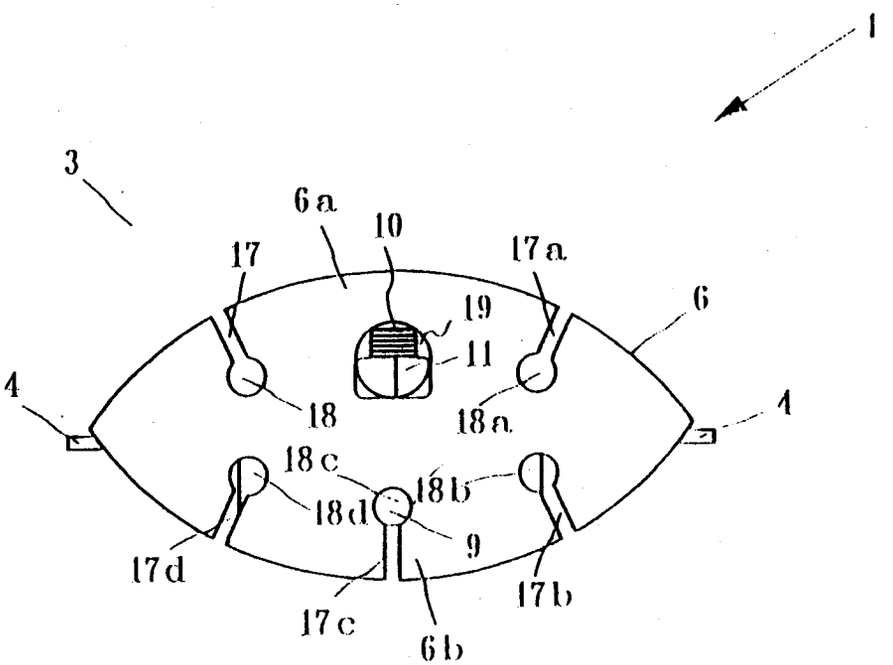


Fig. 5

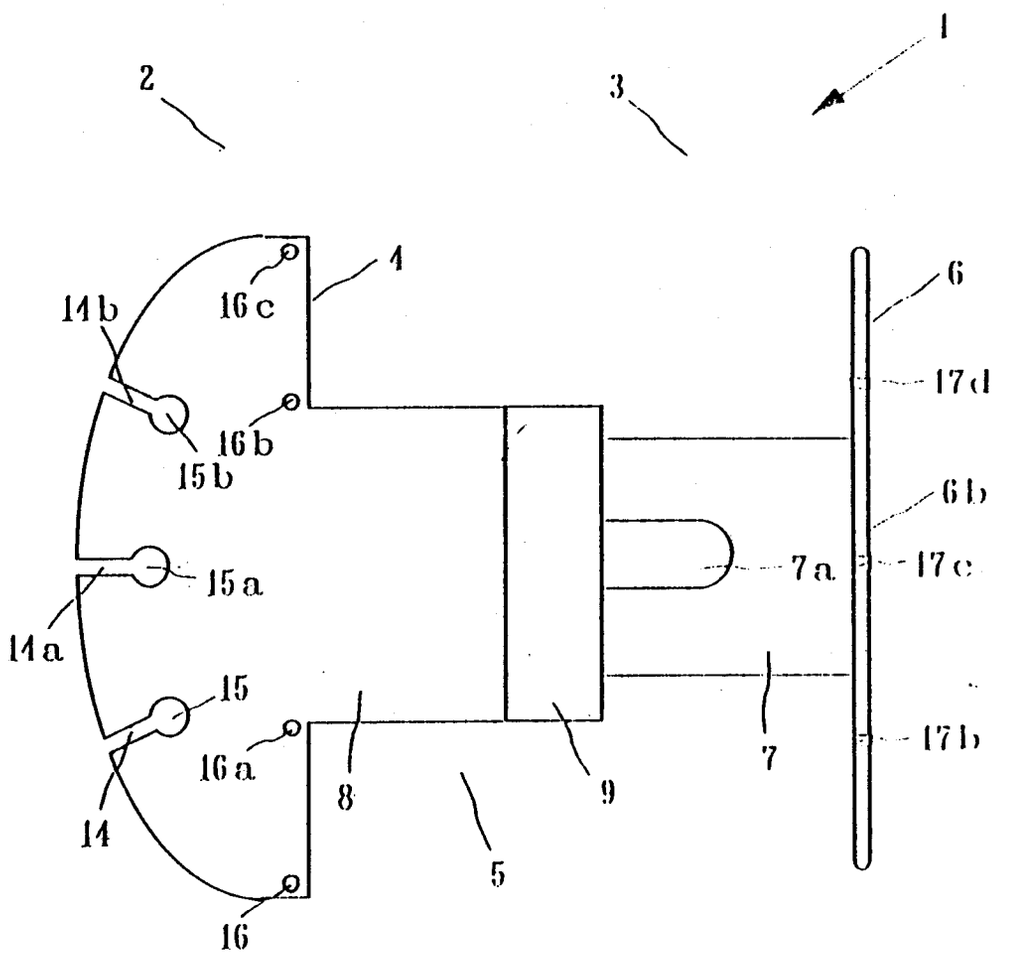


Fig. 6

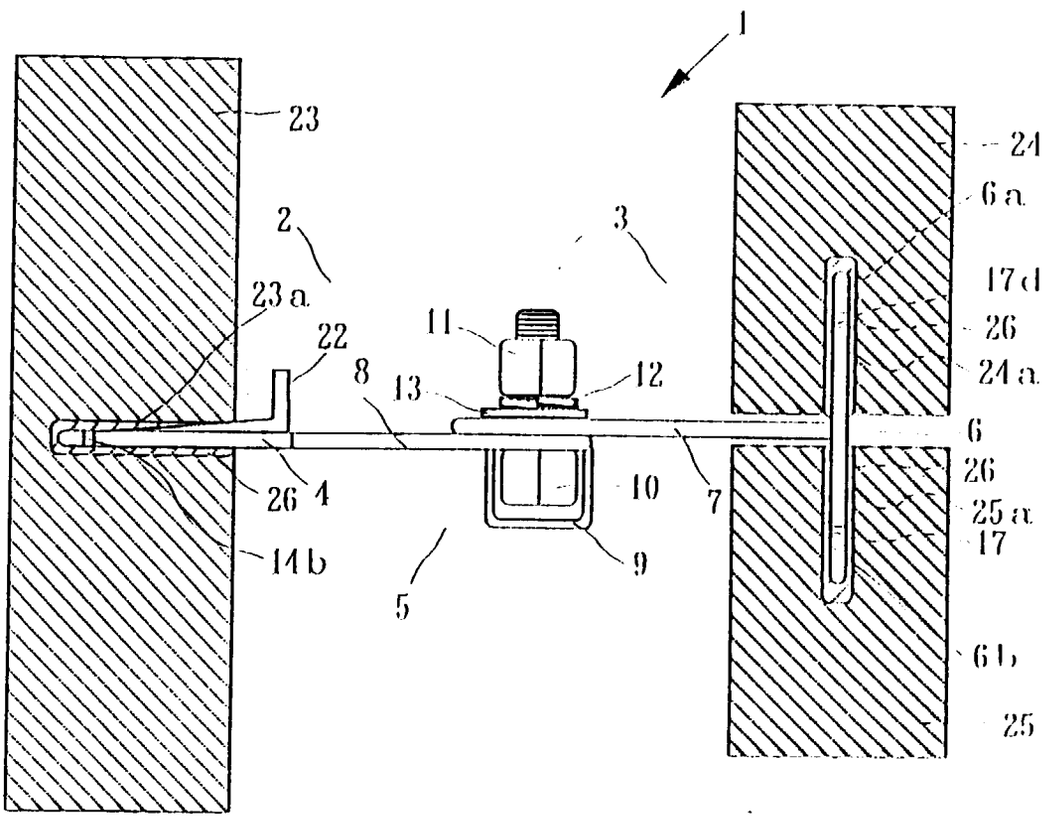

1
23
2
3
24
6a
23a
22
11
8
13
12
17d
26
24a
6
26
4
10
7
25a
17
14b
9
5
6b
25

Fig. 7

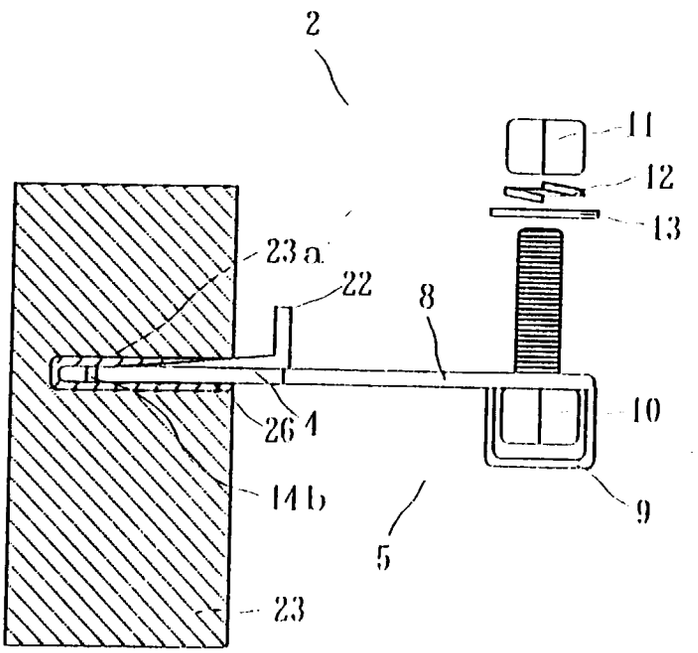


Fig. 8

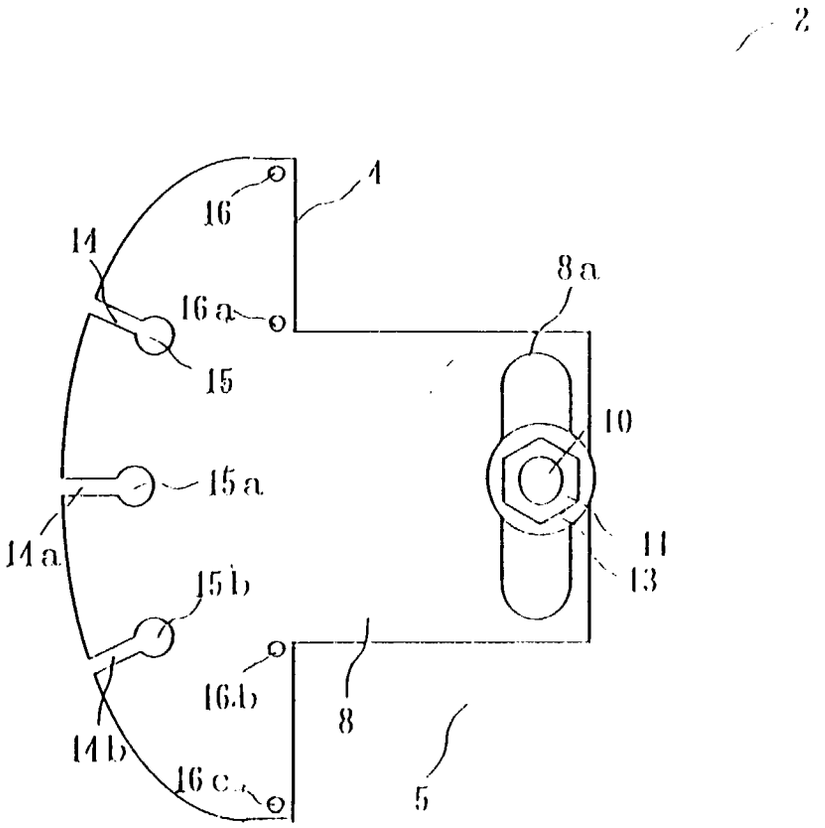


Fig. 9

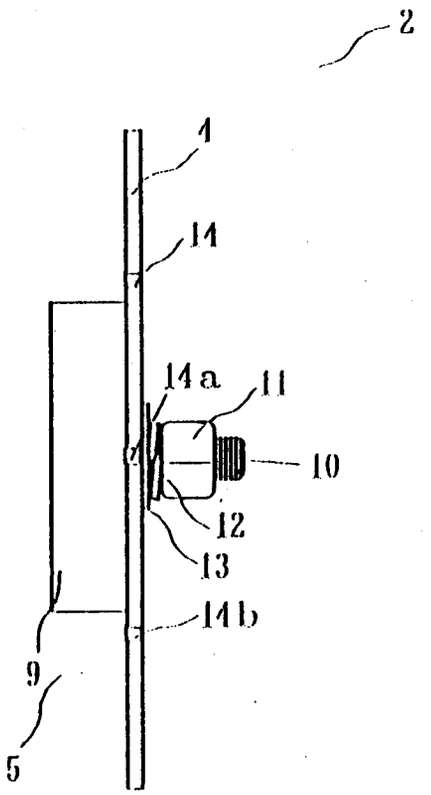


Fig. 10

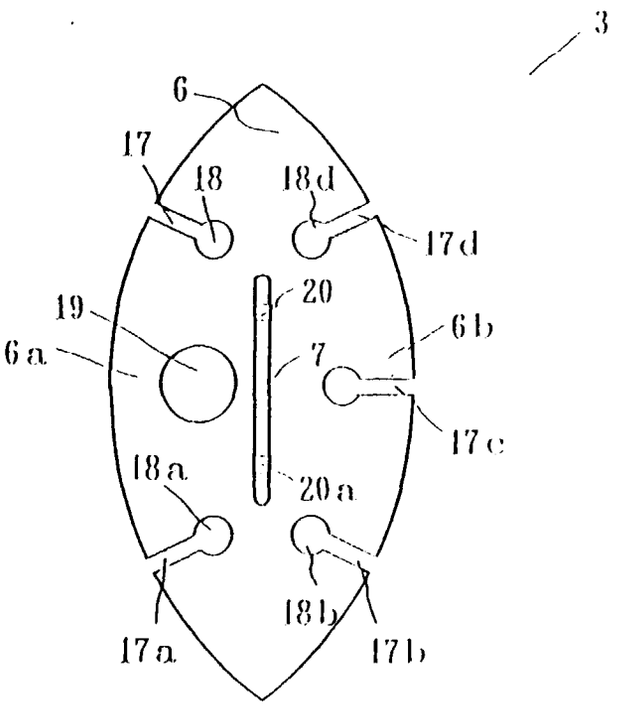


Fig. 11

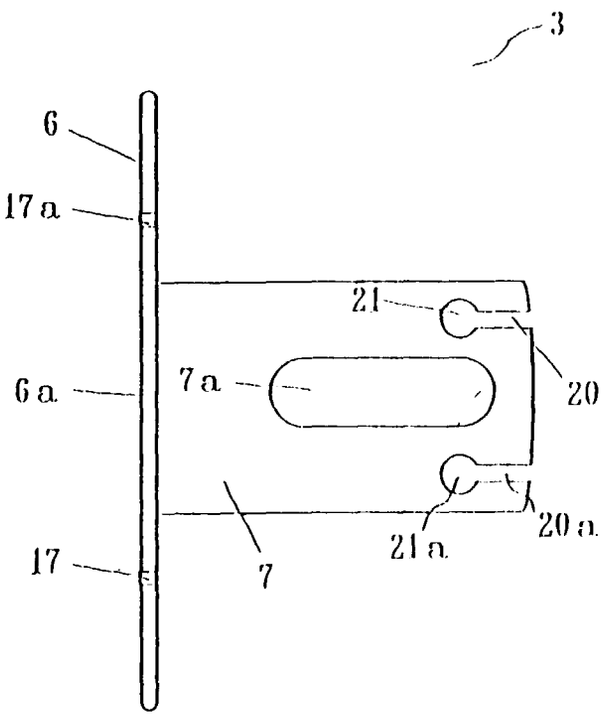


Fig. 12

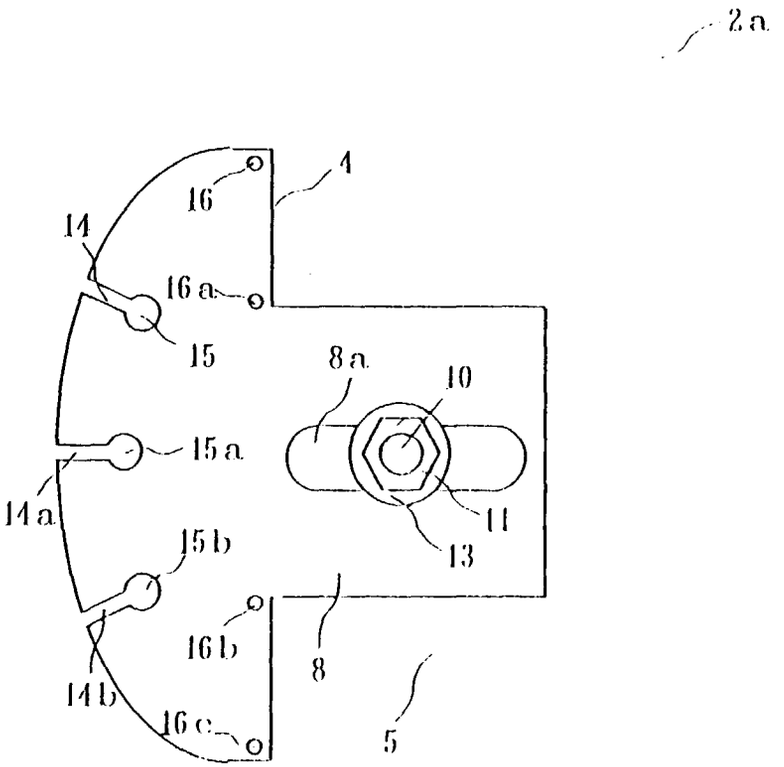


Fig. 13

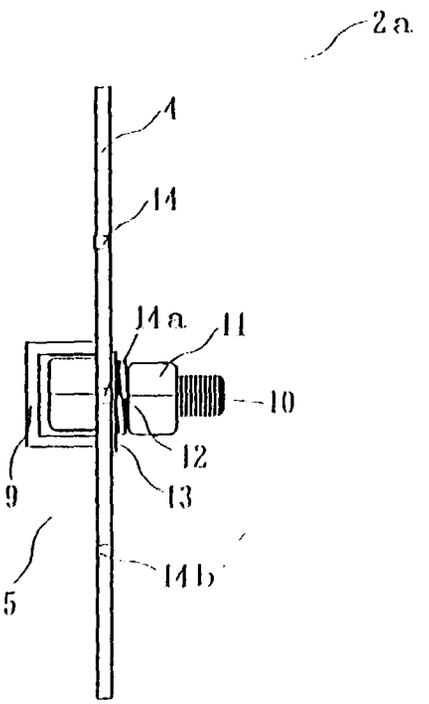


Fig. 14

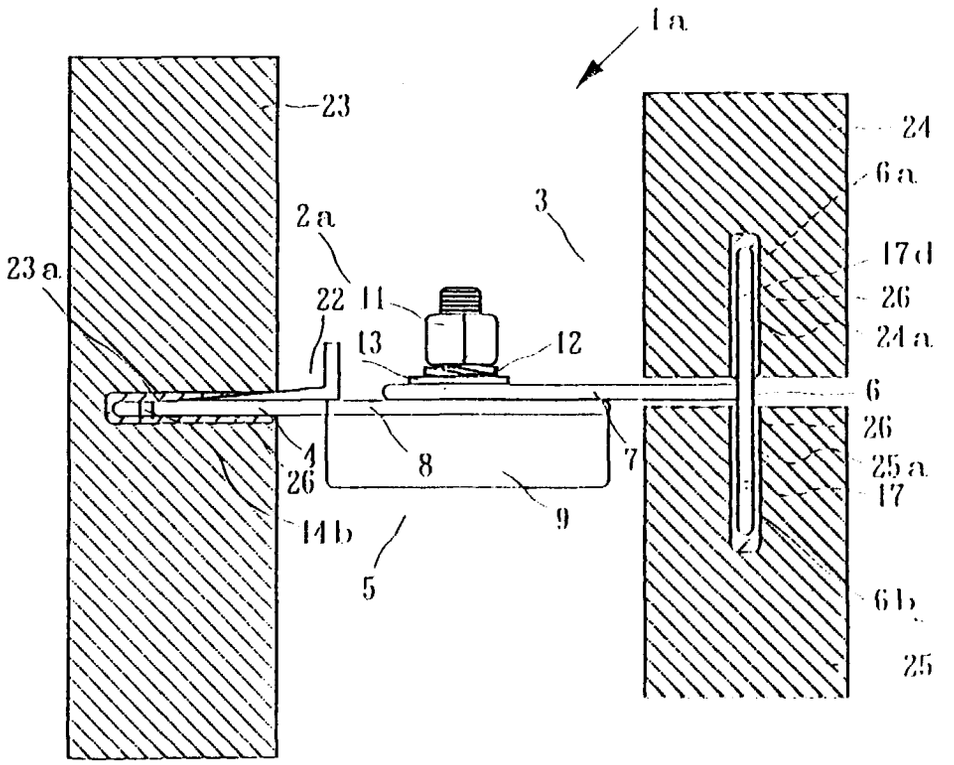

1a
23
24
6a
3
2a
17d
23a
22
11
26
24a
13
12
6
26
4
8
7
25a
26
17
14b
9
5
6b
25

Fig. 15

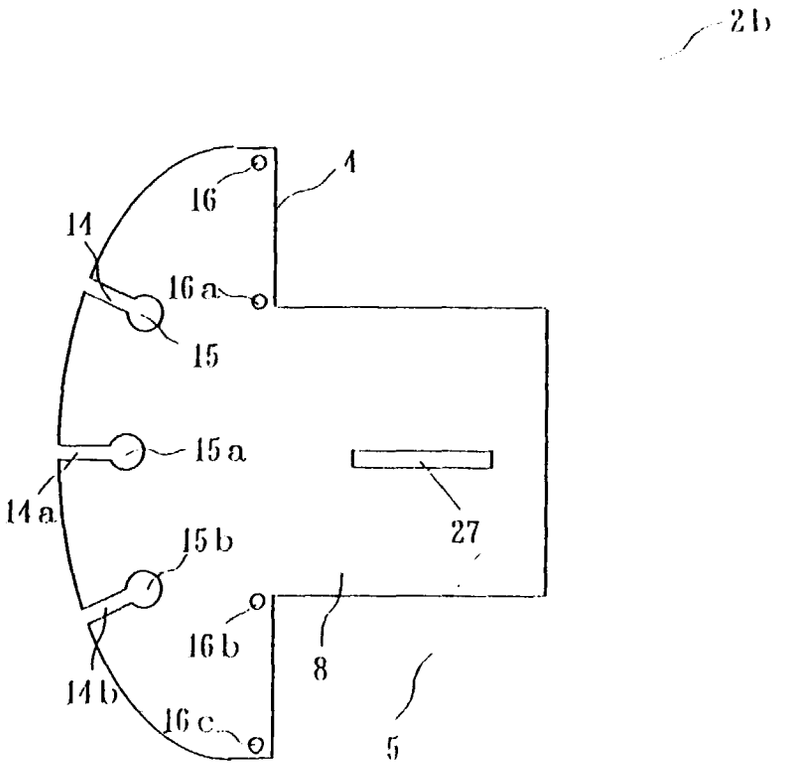


Fig. 16

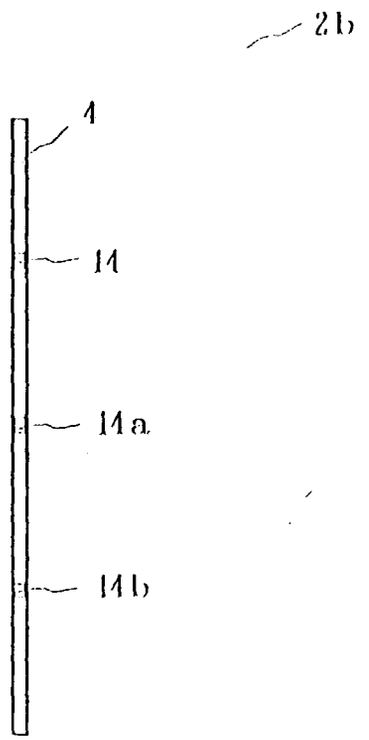


Fig. 17

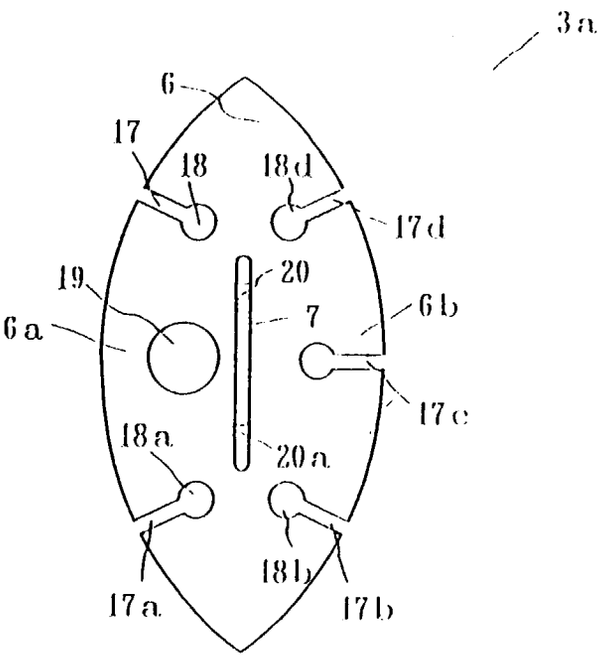


Fig. 18

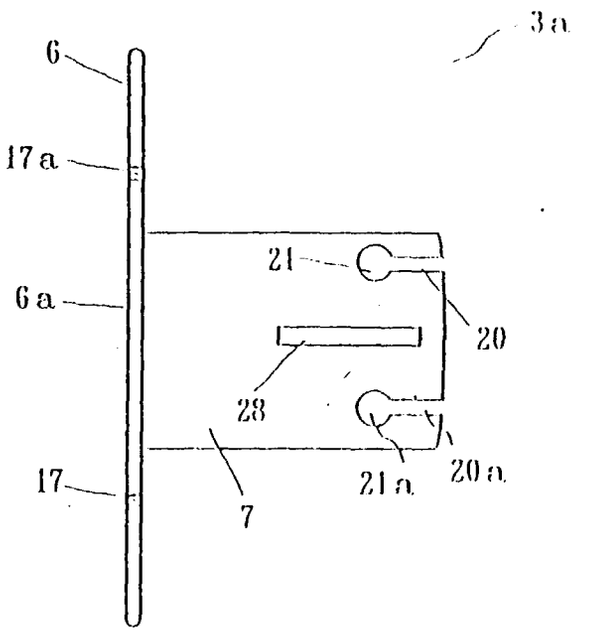


Fig. 19

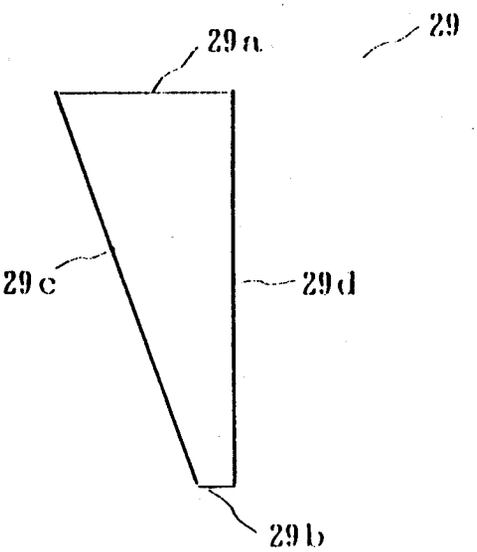


Fig. 19a

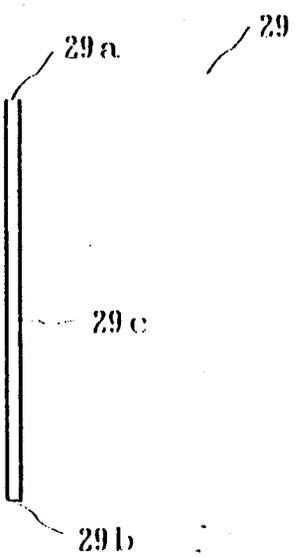


Fig. 20

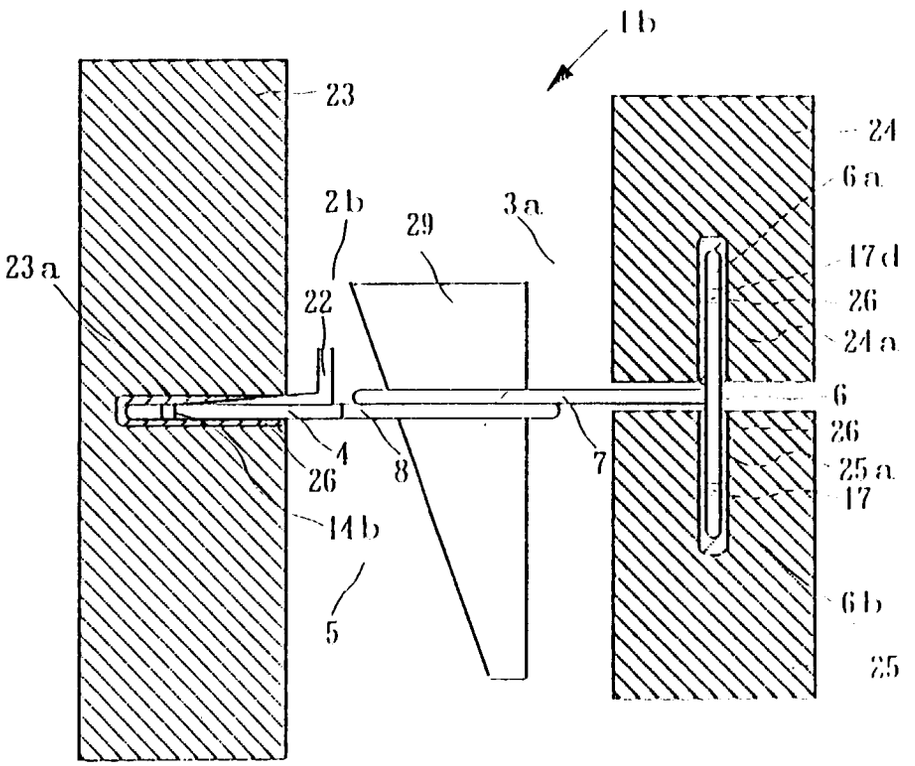


Fig. 21

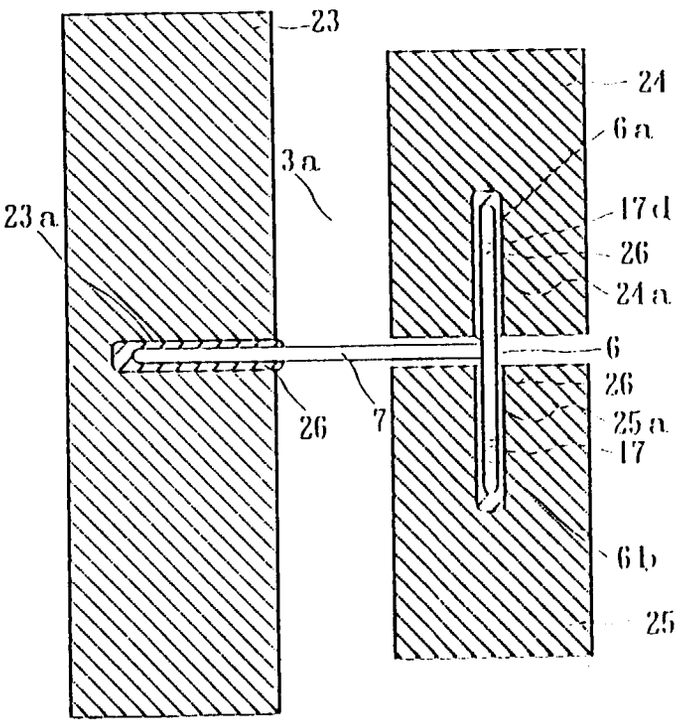


Fig. 22

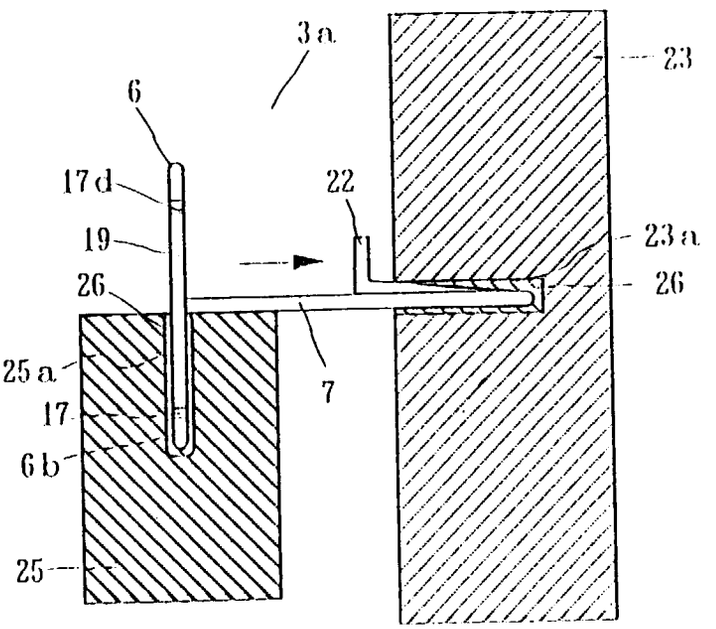


Fig. 23

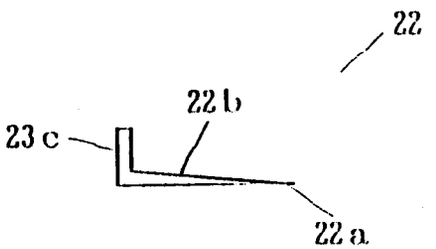


Fig. 23a

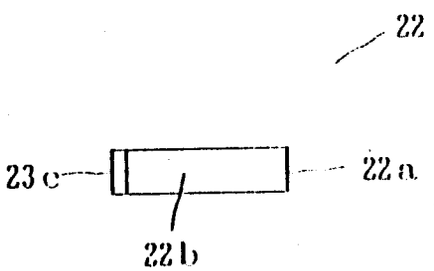


Fig. 24

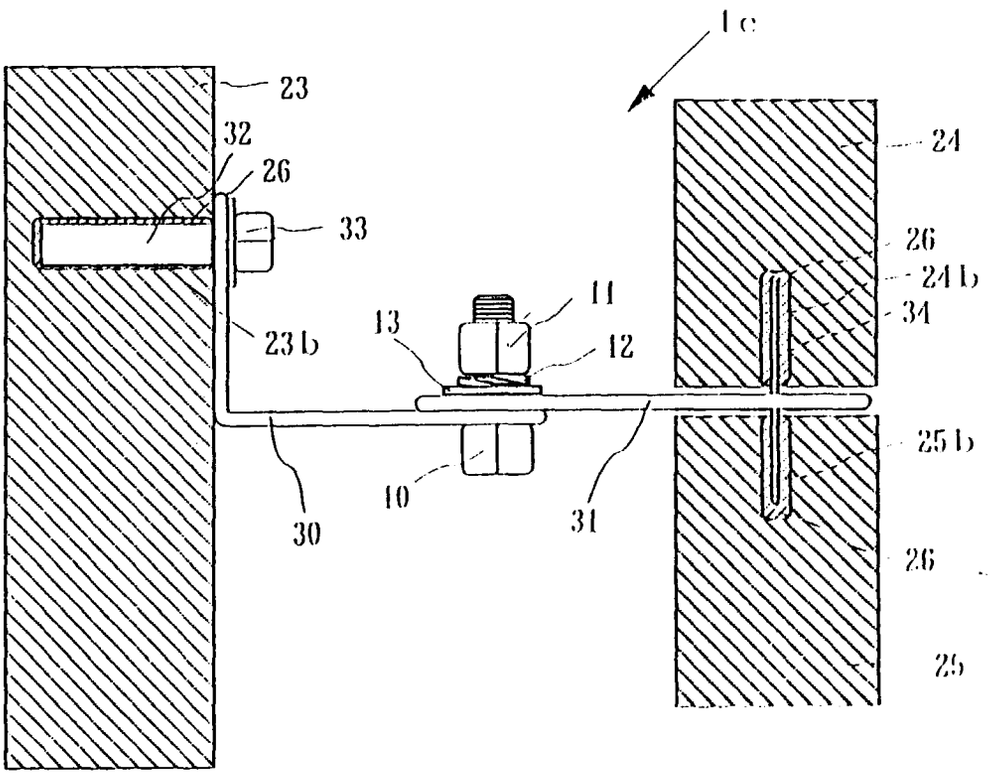


Fig. 25

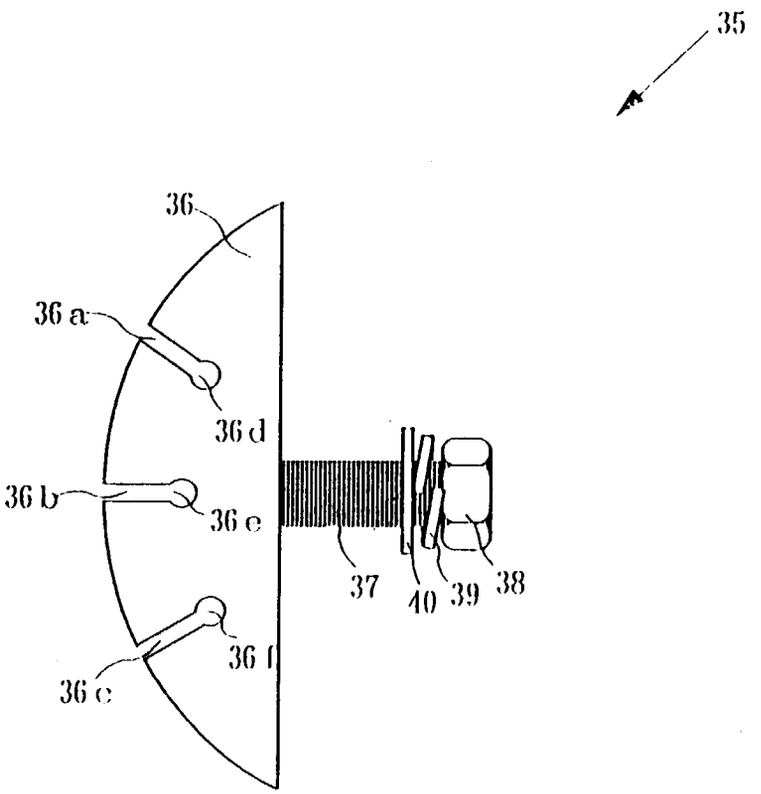


Fig. 26

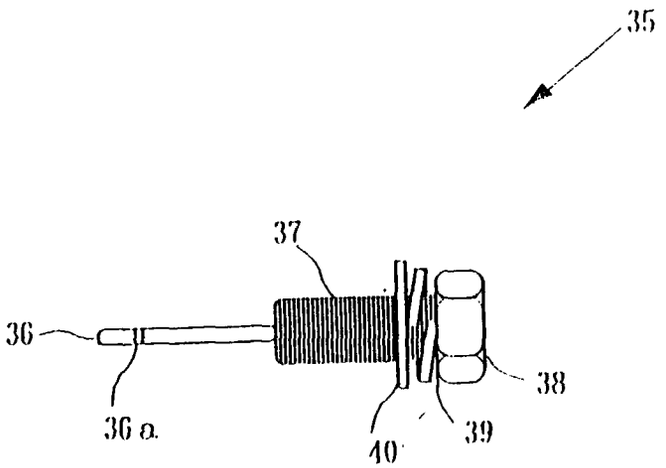


Fig. 27

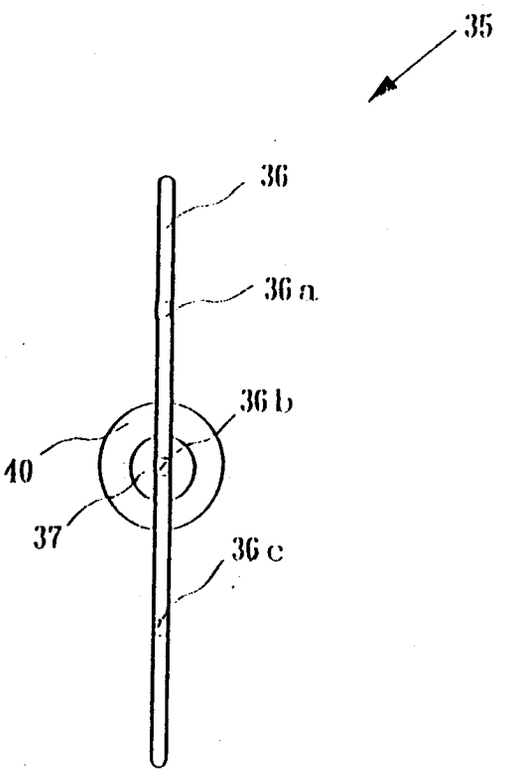


Fig. 28

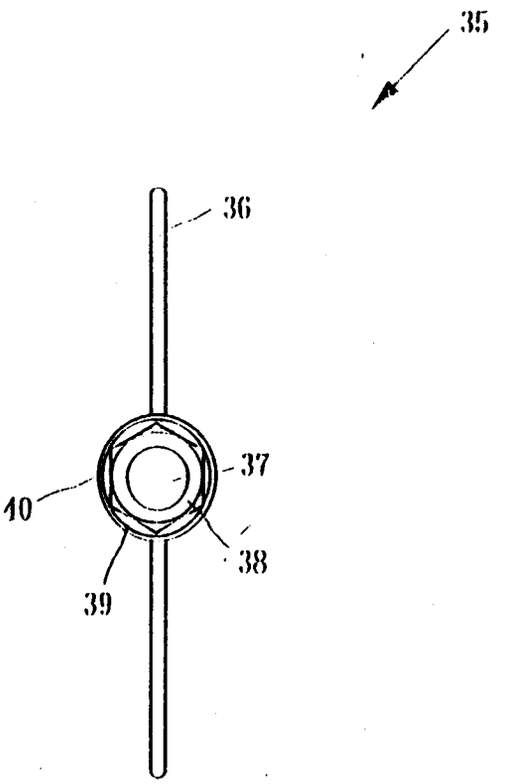


Fig. 29

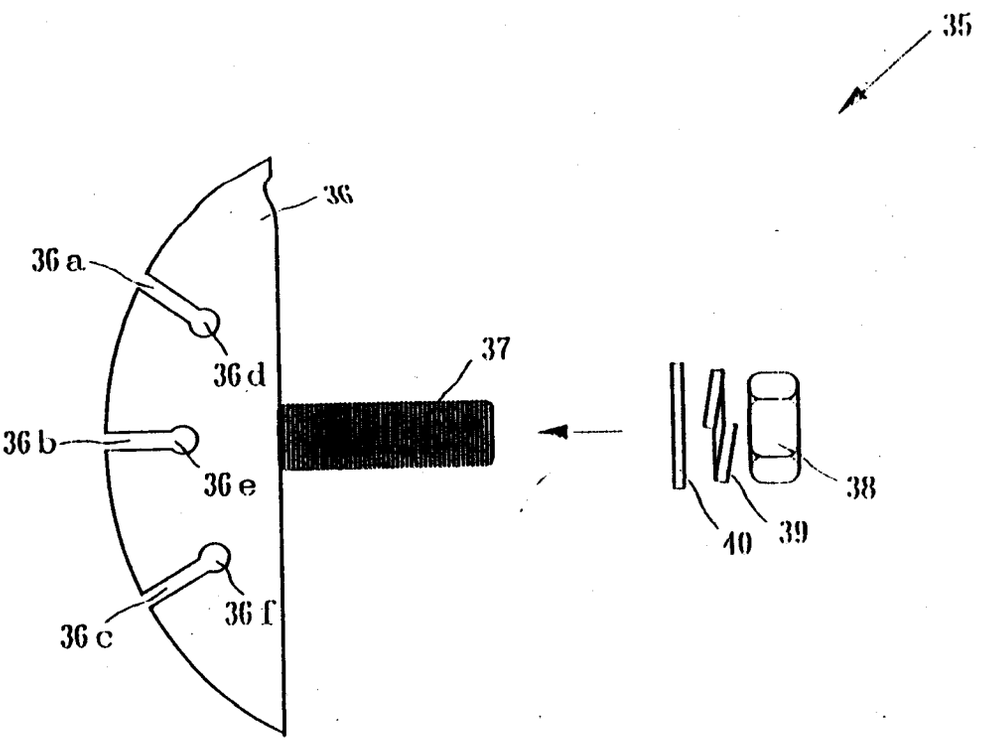


Fig. 30

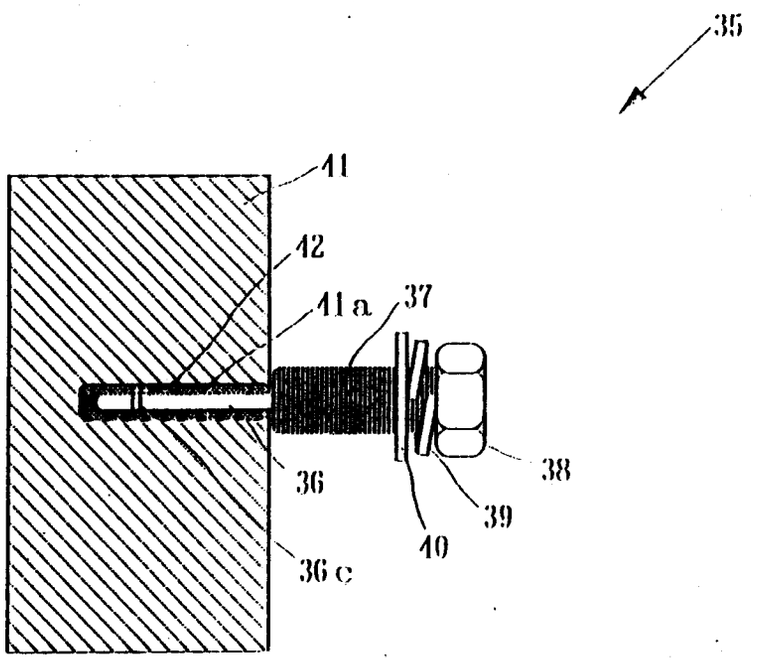


Fig. 31

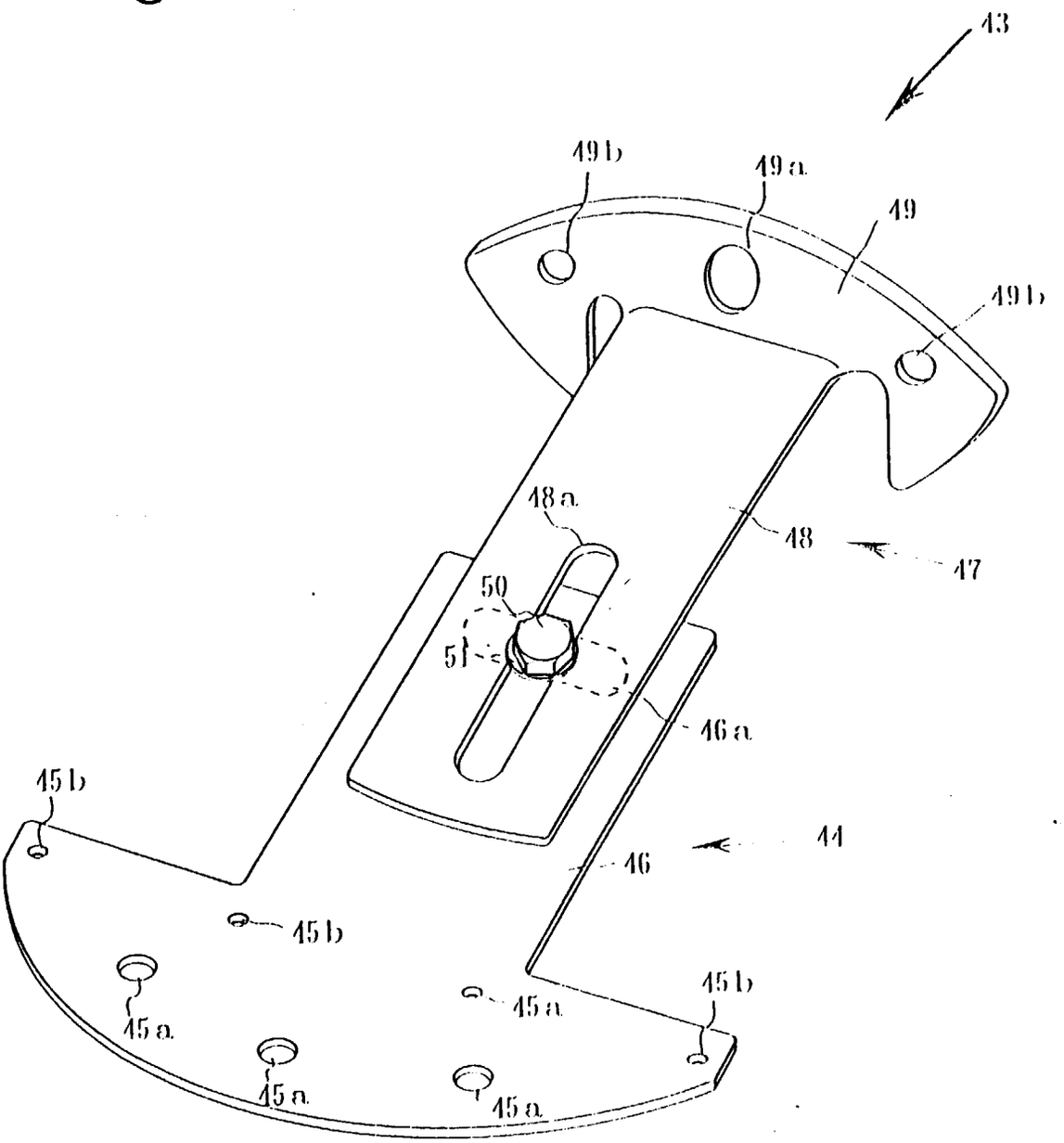

43
49b
49a
49
49b
48a
48
47
50
51
46a
45b
44
46
45b
45b
45a
45a
45a
45a

Fig. 32

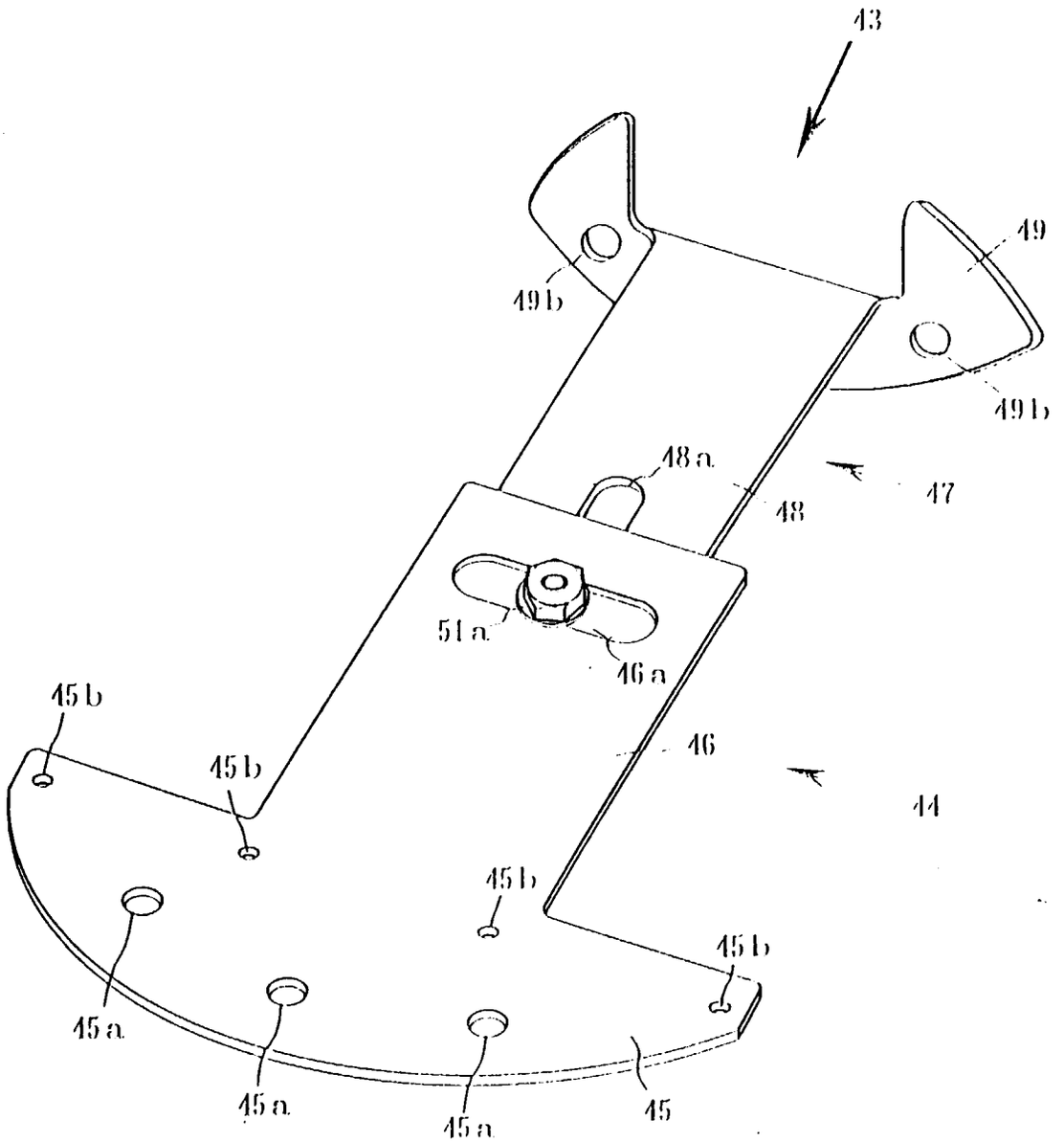

43
49
49b
49b
48a
48
47
51a
46a
45b
45b
46
44
45b
45b
45a
45a
45a
45

Fig. 33

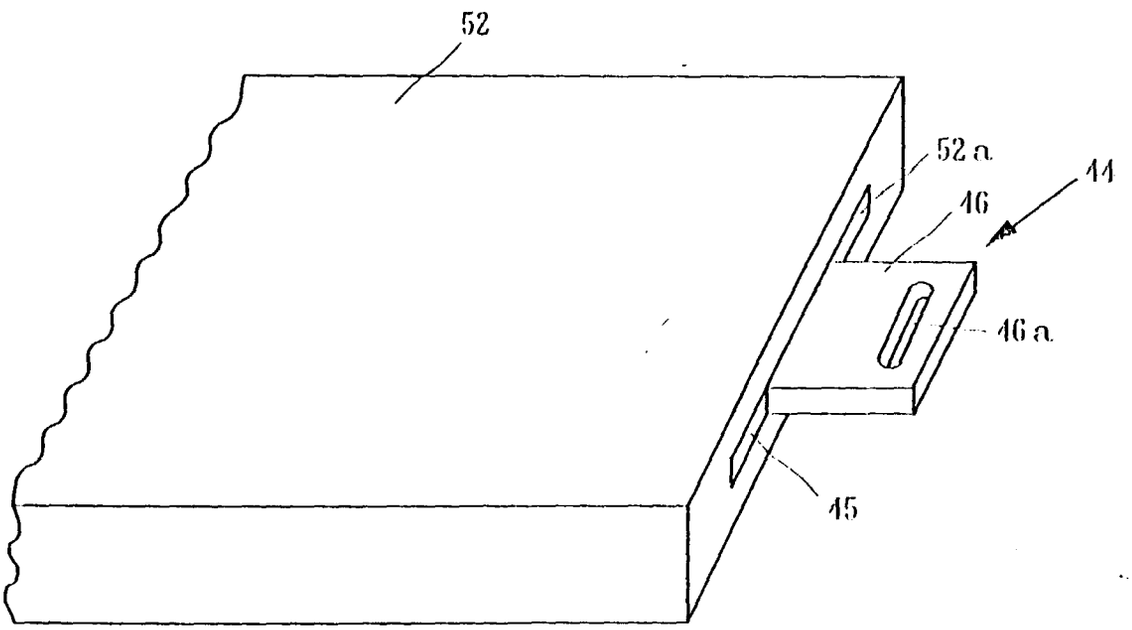


Fig. 34

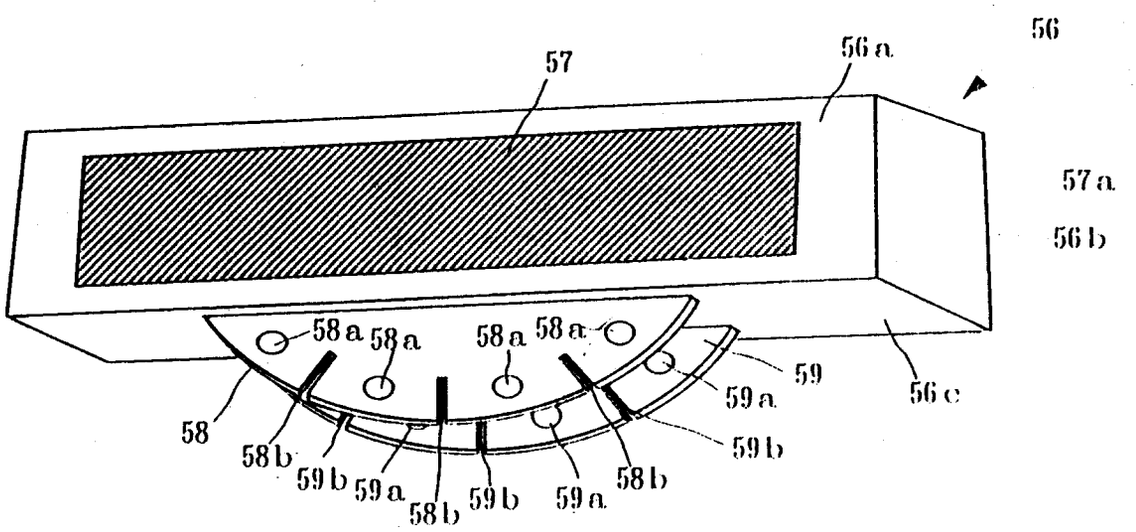

56
56a
57
57a
56b
58a
58a
58a
58a
59
59a
56c
58
58b
59b
59a
58b
59b
59a
58b
59b

Fig. 35

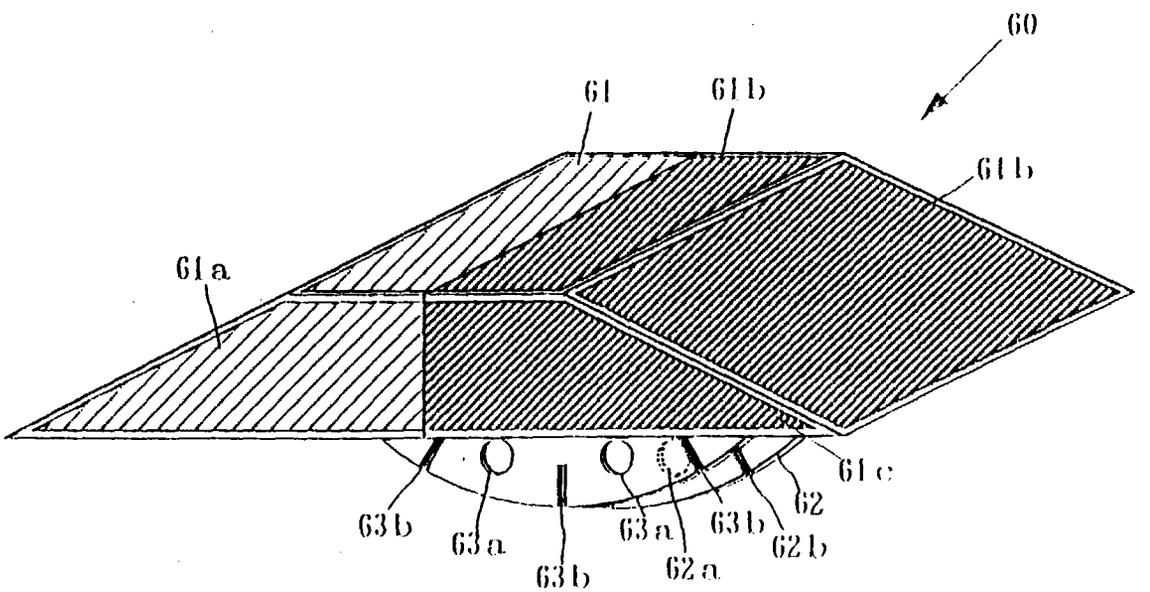


Fig. 36

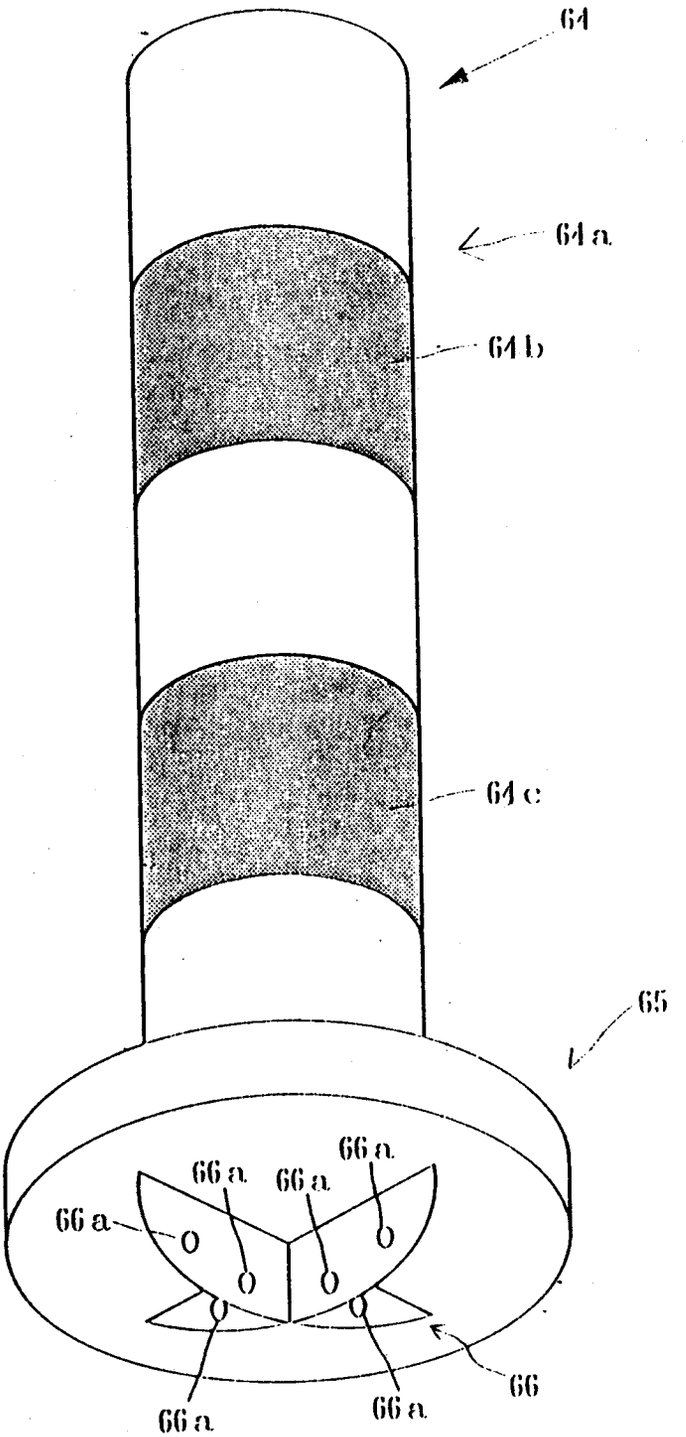


Fig. 37

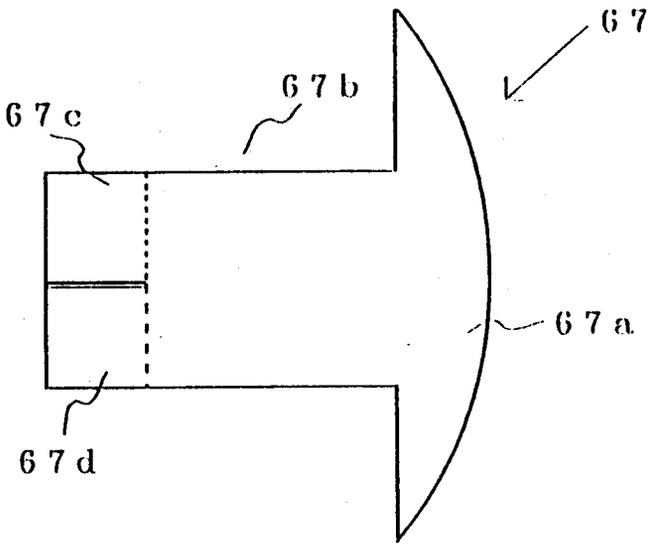


Fig. 38

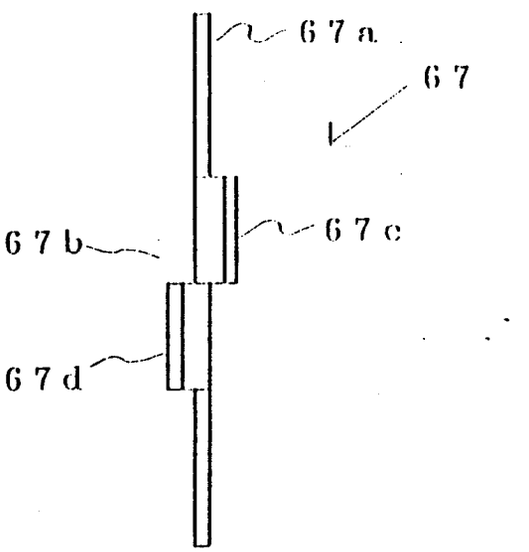


Fig. 39

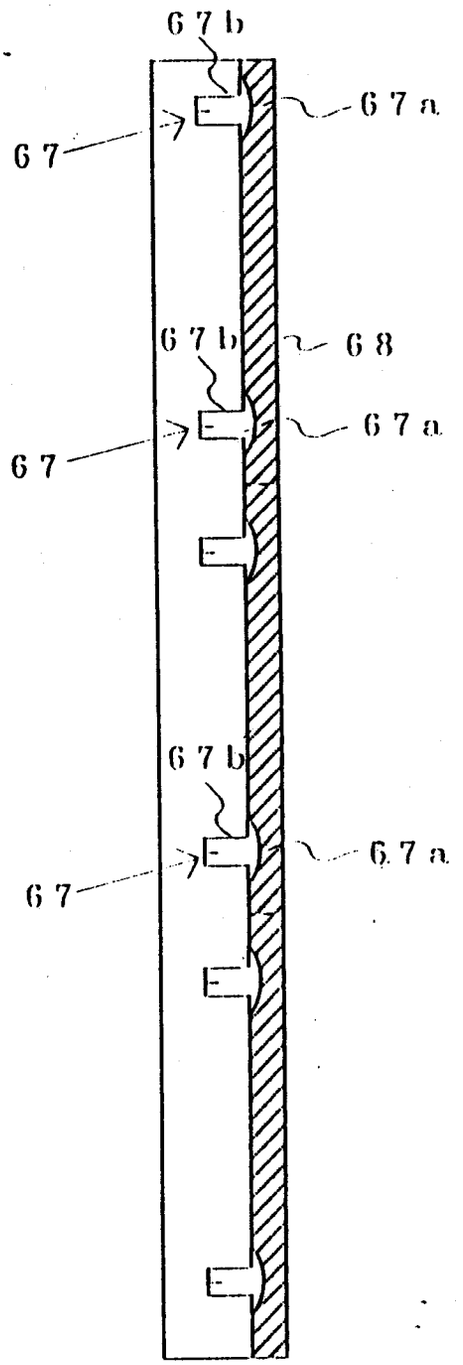


Fig. 40

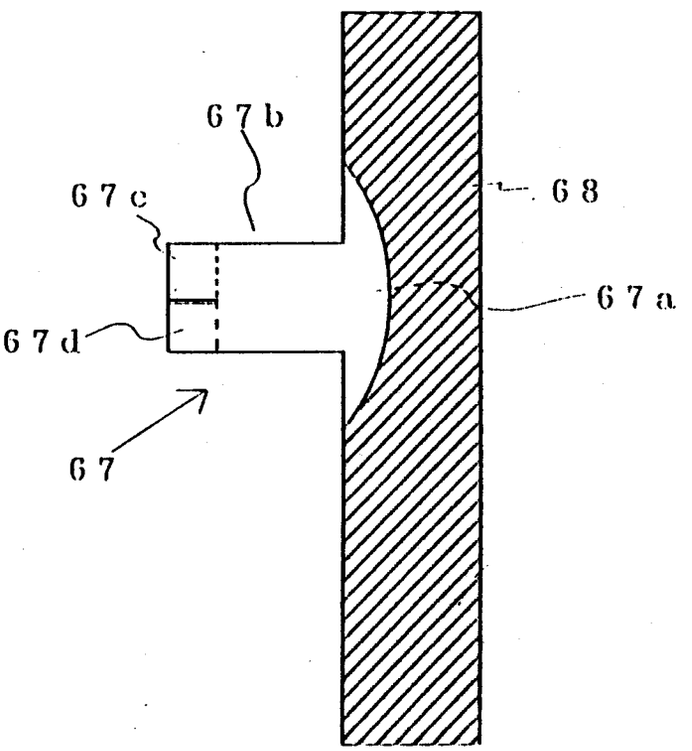


Fig. 41

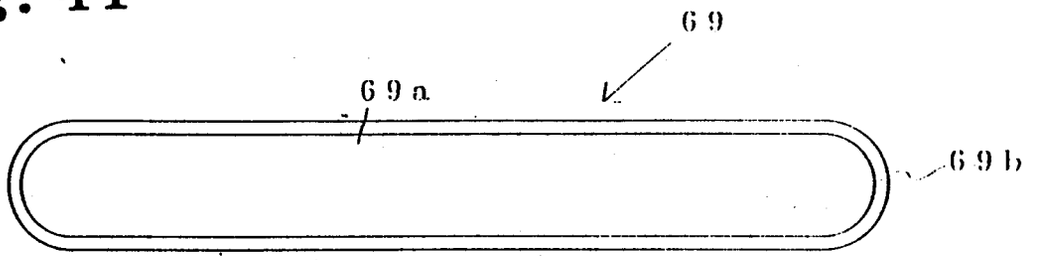


Fig. 42

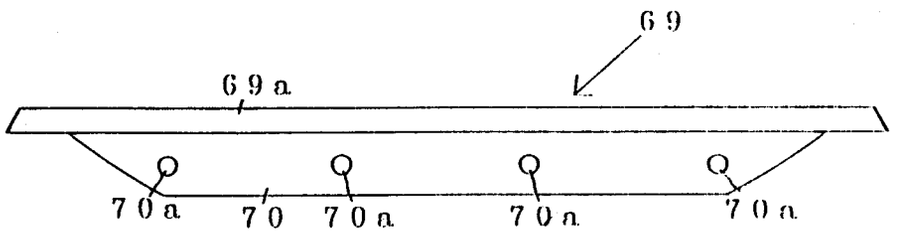


Fig. 43

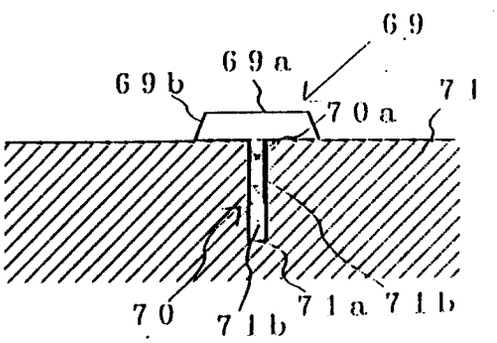


Fig. 44

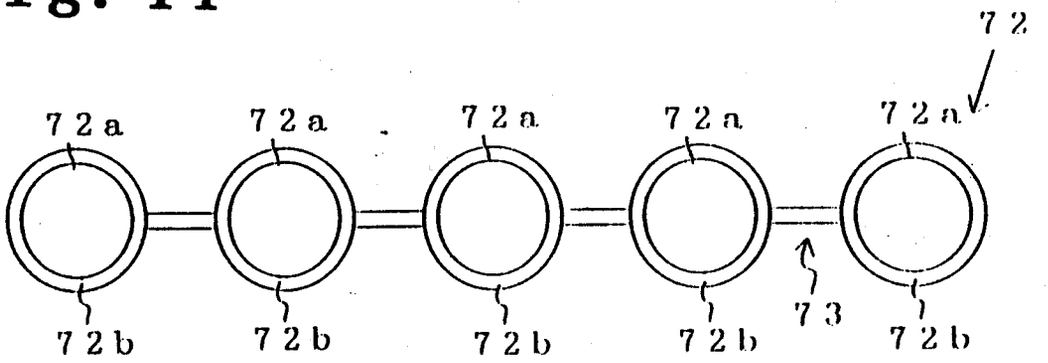


Fig. 45

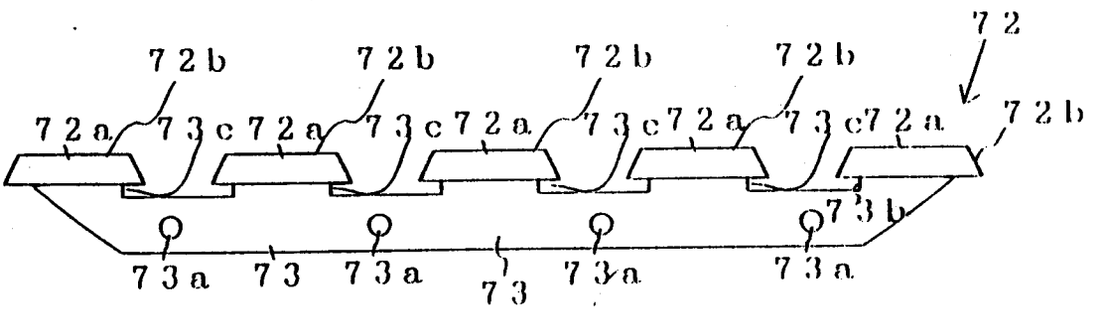


Fig. 46

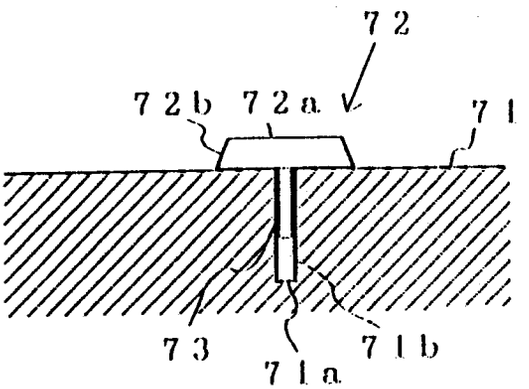
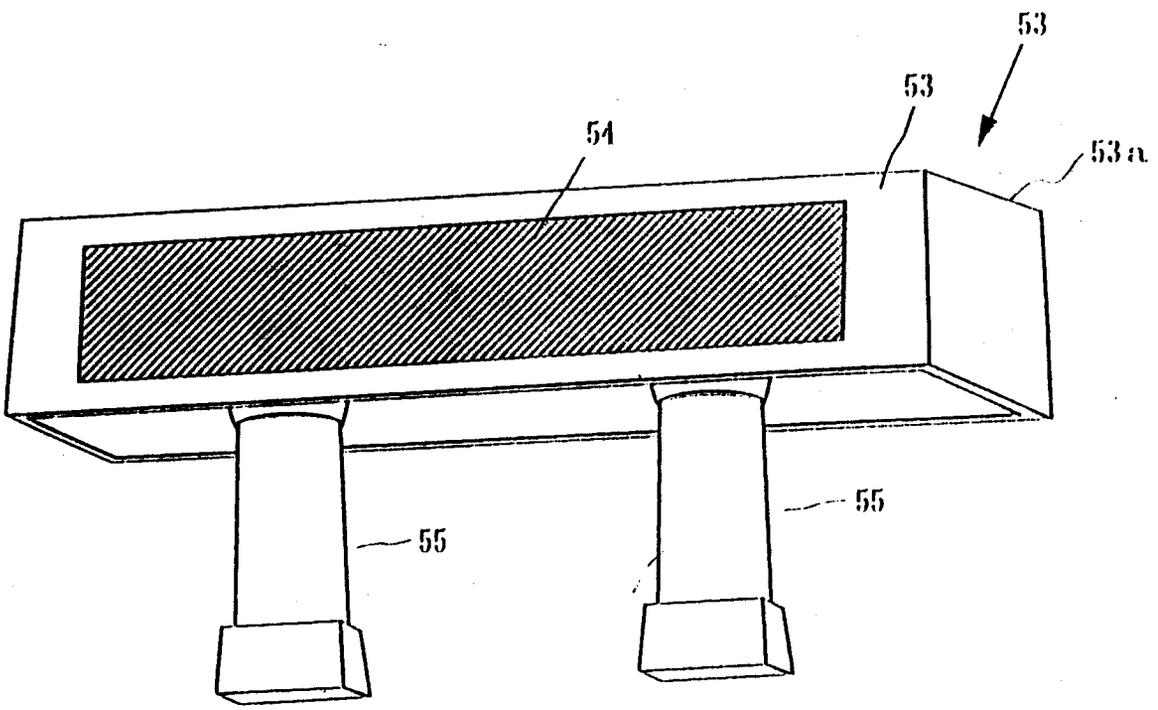


Fig. 47



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP97/03749

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl^6 E04F13/14

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl^6 E04F13/00, E04B1/41, E01F9/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926 - 1996 Jitsuyo Shinan Toroku Koho 1996 - 1997
Kokai Jitsuyo Shinan Koho 1971 - 1996
Toroku Jitsuyo Shinan Koho 1994 - 1997

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 6-248785, A (Yasuo Niki and two others), September 6, 1994 (06. 09. 94)(Family: none)	1 - 5
A	JP, 1-127758, A (Dai Hagiwara), May 19, 1989 (19. 05. 89)(Family: none)	9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same pateat family

Date of the actual completion of the international search	Date of mailing of the international search report
January 8, 1998 (08. 01. 98)	January 20, 1998 (20. 01. 98)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)