



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 738 808 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.10.1996 Bulletin 1996/43

(51) Int. Cl.⁶: **E04G 17/04**

(21) Application number: **96105660.3**

(22) Date of filing: **10.04.1996**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IT LI LU NL PT SE

(30) Priority: **21.04.1995 JP 96998/95**

(71) Applicant: **Hayakawa, Yoshiyuki**
Sapporo-shi, Hokkaido (JP)

(72) Inventor: **Hayakawa, Yoshiyuki**
Sapporo-shi, Hokkaido (JP)

(74) Representative: **Prüfer, Lutz H., Dipl.-Phys. et al**
PRÜFER & PARTNER,
Patentanwälte,
Harthauser Strasse 25d
81545 München (DE)

(54) Concrete molding form member connector

(57) A concrete molding form member connector comprises a first holding portion (3) having a linearly extending first holding surface (3a) of a prescribed length, a cylindrical insertional shaft portion (2), having a central axis being perpendicular to the first holding surface (3a), which is provided in the vicinity of a first end of the first holding surface (3a), and a second holding portion (4), having a second holding surface (4a) being opposed to the first holding surface (3a) in a parallel manner at a prescribed space in a region close to a second end of the first holding surface (3a), which is continuous with the first holding portion (3) on the second end of the first holding surface (3a) so that its free end is positioned at a prescribed space with respect to the insertional shaft portion (2). The insertional shaft portion (2) is inserted in through holes which are provided in overlapping side plate portions of adjacent form members so that the connector is rotated about the same, whereby the side plate portions of the adjacent form members are held between the first holding surface (3a) and the second holding surface (4a). Consequently, a lightweight concrete molding form member connector having excellent workability, which can be provided at a relatively low cost, is provided.

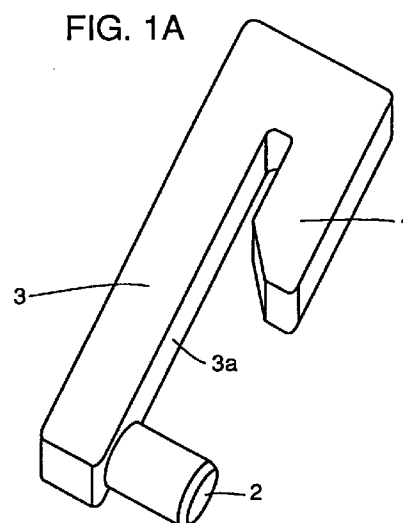


FIG. 1A

EP 0 738 808 A1

Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a concrete molding form member connector which is employed for molding concrete in civil engineering/construction work or manufacturing a concrete secondary product.

Description of the Background Art

In order to assemble a concrete molding form for civil engineering/construction work or for manufacturing a concrete secondary product by connecting form members with each other, connectors which are prepared by working metal round bars are employed in general.

A conventional concrete molding form member connector 10 is now described with reference to Figs. 8A to 8C and 9A to 9C. Referring to Figs. 8A to 8C, the conventional concrete molding form member connector 10 comprises a first holding portion 11, a second holding portion 12 which is opposed to the first holding portion 11 in a parallel manner at a prescribed space, a bent grip portion 16 which is continuous with first ends of the first and second holding portions 11 and 12 for integrally coupling the same with each other, and an insertional shaft portion 13 perpendicularly extending from a second end of the first holding portion 11. Such a concrete molding form member connector 10 is obtained by bending a round bar of a metal such as iron, for example.

In order to connect/fix side plate portions 5 and 6 of adjacent form members to each other by the concrete molding form member connector 10 having the aforementioned structure, the insertional shaft portion 13 is first inserted in a connector mounting hole 27 which is provided in each of the form member side plate portions 5 and 6, in a state shown in Fig. 9A. Then, the grip portion 16 is hit with a hammer or the like, to rotate the first and second holding portions 11 and 12 about the center of the insertional shaft portion 13, thereby holding the form member side plate portions 5 and 6 between the first and second holding portions 11 and 12 as shown in Figs. 9B and 9C.

Through an experiment on a typical conventional form member connector for wood concrete molding form members, the strength of a junction which is necessary for connecting such form member side plate portions 5 and 6 with each other is described as follows, with reference to Figs. 10A and 10B:

Referring to Fig. 10A, the form member side plate portions 5 and 6 are fixed to adjacent form members 17 and 18 for forming a wood concrete molding form respectively, and pressure P is applied to the form members 17 and 18 by concrete which is placed in concrete molding. Due to this pressure P, force F0 acts in direc-

tions for separating the form members 17 and 18 from each other against connection/fixation.

In order to obtain the strength of the junction which is necessary for connecting/fixing the form members 17 and 18 to each other, the following experiment was first carried out: The form member side plate portions 5 and 6 were set at lengths L1 and L2 of 30 mm and 50 mm respectively with lengths of 300 mm in the longitudinal direction (direction perpendicular to the plane of Fig. 10A), fastened to each other with four nails 19a, 19b, 19c and 19d of 65 mm in length and 3.5 mm in diameter as shown in Fig. 10A, and subjected to a tensile test in this state, as shown in Fig. 10B. Consequently, force F1 which was required for separating the form members 17 and 18 through breakage of the junction was about 150 kg. Thus, it is inferred that each nail can withstand force of about 40 kg at the maximum in fastening.

In an experiment placing concrete in practice, it was possible to sufficiently maintain strength for connecting/fixing the form member side plate portions 5 and 6 to each other by fastening the same with only two nails 19a and 19b shown in Fig. 10A. From the result of this experiment, therefore, it is understood that the form members 17 and 18 can be sufficiently connected/fixated to each other when resistance against tensile force of about 80 kg, which can be withstood by two nails each having tensile strength of 40 kg, is ensured. Thus, the tensile strength for fastening/fixing form members to each other may be at a relatively low level conceivably because force which is applied to the form members by the pressure of placed concrete mainly acts perpendicularly to planes of concrete placing surfaces of the form members without remarkably acting on the surface directions.

When the aforementioned conventional metal concrete molding form member connector 10 was employed to fasten/join metal form members 17 and 18 to each other as shown in Fig. 11A, on the other hand, a side plate portion 5 was deformed and broken as shown in Fig. 11B with tensile force (F2 in Fig. 11B) of 180 kg. Thus, it has been proved that the form member connector 10 can withstand tensile force of at least about 180 kg. It can be said that strength of at least twice is attained in this numerical value as compared with the tensile strength of 80 kg in the case of connecting/fixing the wood form members 17 and 18 to each other with the two nails 19a and 19b in form member side plate portions 25 and 26. Namely, the aforementioned conventional form member connector 10 has excessive strength, since the same is made of a metal such as iron.

Such a conventional metal form member connector 10 is formed by bending a round rod, and hence opposite contact parts 14 and 15 of the first and second holding portions 11 and 12 holding the form member side plate portions 5 and 6 in practice are substantially in a state of line contact as shown in Fig. 12A, or close to a state of point contact in an extreme case. Fig. 12B shows a portion around the holding portions holding the

form member side plate portions 5 and 6 of form members 7 and 8 between the first and second holding portions 11 and 12 along a section taken along the line A - A in Fig. 12A in a typically enlarged manner. As shown in Fig. 12B in a hatched manner, parts of the first and second holding portions 11 and 12 which are in contact with the form member side plate portions 5 and 6 are at a contact angle θ of about 15° in the full circumference of 360° about the central axis of the round bar forming the form member connector 10. Assuming that the parts of the first and second holding portions 11 and 12 which are in contact with the form member side plate portions 5 and 6 along the direction perpendicular to the plane of Fig. 12B are 20 mm in length and the round bar forming the form member connector 10 is 13 mm in diameter, each of the contact parts 14 and 15 has the following area:

$$20 \text{ mm} \times \pi \times 13 \times 15^\circ / 360^\circ = 34 \text{ mm}$$

Since the contact areas are thus reduced in the holding portions, the surfaces of the contact parts of the form member connector are exposed to large stress when tensile force acts on the form member connector, and hence high strength is required.

The conventional concrete molding form member connector heavy and inferior in workability since the same is formed by a round bar of iron or the like as hereinabove described. Further, employment of a hammer or the like is inevitably necessary for attaching or detaching the concrete molding form member connector 10 to or from the form member side plate portions 5 and 6 due to high rigidity of the form member connector 10. Thus, the concrete molding form member connector 10 may be displaced from the connector mounting holes 27 provided in the form member side plate portions 5 and 6, deformed, or may endanger the operator. In addition, the conventional concrete molding form member connector 10 has such disadvantages that the same is rusted by rain or the like and corroded, inconvenient to carry and inferior in workability due to a relatively heavy weight, and at a relatively high cost.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a concrete molding form member connector which can be readily and safely attached to or detached from form member side plate portions, improves working efficiency with its light weightness, prevents corrosion by rust or the like, causes no deformation, and withstands long-term use at a relatively low cost.

In order to attain the aforementioned object, the concrete molding form member connector according to the present invention comprises a first holding portion having a linearly extending first holding surface of a prescribed length, a cylindrical insertional shaft portion, having a central axis perpendicular to the first holding surface, which is provided in the vicinity of a first end of

the first holding surface, and a second holding portion, having a second holding surface which is opposed to the first holding surface in a parallel manner at a prescribed space in a region close to a second end of the first holding surface, which is continuous with the first holding portion on the second end of the first holding surface so that its free end is positioned at a prescribed space with respect to the insertional shaft portion.

In employment of the inventive concrete molding form member connector, the insertional shaft portion is inserted in holes which are provided to pass through side plate portions, being in contact with each other, of adjacent concrete molding form members and the connector is rotated about the insertional shaft portion, so that the first and second holding surfaces hold the side plate portions of the adjacent form members thereby connecting/fixing the adjacent form members to each other.

Consequently, necessary holding power is ensured with relatively small holding pressure, whereby a stable holding operation can be attained.

Since the necessary holding power can be ensured with relatively small holding pressure, no large frictional force acts in case of holding the side plate portions of the form members by the first and second holding surfaces and the connector can be manually rotated without hitting the same with a hammer or the like, whereby workability for assembling the form members with each other is improved.

In a preferred embodiment of the inventive concrete molding form member connector, the first and second holding portions consist of a resin compact in the aforementioned structure.

This concrete molding form member connector is manufactured by forming at least the first and second holding portions by integral molding of resin, and properly joining/fixing the remaining portion which is prepared from another material thereto.

This is because the principal portion of the connector can be formed by a resin compact since necessary holding power can be ensured with relatively small holding pressure due to holding by surface contact. Consequently, the connector can be manufactured by forming the principal portion by integral molding of resin and properly joining/fixing the remaining portion which is made of another material thereto by adhesion or the like, whereby a concrete molding form member connector which is lightweight, excellent in workability and suitable for mass production can be provided at a relatively low cost.

In another preferred embodiment of the inventive concrete molding form member connector, the insertional shaft portion is provided with a male screw part on its free end.

In this concrete molding form connector, the male screw part is so provided on the free end of the insertional shaft portion that a nut is fitted with this male screw part in application to connection of form members, and side surfaces of overlapping side plate por-

tions of adjacent form members are held by the first holding surface and a bolt around connector mounting holes of the side plate portions receiving the insertional shaft portion, to be fastened/fixed to each other. Consequently, stronger connection/fixation of the form members is implemented.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A, 1B and 1C are a perspective view, a front elevational view and a side elevational view of a concrete form member connector according to a first embodiment of the present invention;

Fig. 2A is a side elevational view showing the form member connector, appearing in Figs. 1A to 1C, which is attached to mounting holes provided in form member side plate portions, Fig. 2B is a side elevational view showing the form member connector holding the form member side plate portions, and Fig. 2C is a perspective view thereof;

Fig. 3 is a perspective for illustrating parts of first and second holding portions of the form member connector appearing in Figs. 1A to 1C which are in contact with the form member side plate portions;

Fig. 4A is a perspective view of a concrete molding form member connector according to a second embodiment of the present invention, and Fig. 4B is a perspective view showing the form member connector holding form member side plate portions;

Fig. 5A is a sectional view showing the form member connector according to the first embodiment of the present invention holding side plate portions of form members, and Fig. 5B is a sectional view showing the form member connector which is broken by tensile force F3 acting on the form members;

Fig. 6A illustrates cross-sectional shapes of the first and second holding portions of the form member connector according to the first embodiment of the present invention, and Figs. 6B to 6D illustrate modifications of the cross-sectional shapes;

Fig. 7A is a perspective view showing a modification of the form member connector according to the second embodiment having an insertional shaft portion which is reinforced by a metal cover, and Fig. 7B is a perspective view showing another modification having a male screw part which is provided on a base end of an insertional shaft portion to be fitted with a first holding portion;

Figs. 8A, 8B and 8C are a perspective view, a front elevational view and a side elevational view of a conventional concrete molding form member connector;

Fig. 9A is a side elevational view showing the conventional form member connector, appearing in

Figs. 8A to 8C, which is attached to mounting holes provided in form member side plate portions, Fig. 9B is a side elevational view of the form member connector which is rotated to hold the form member side plate portions, and Fig. 9C is a perspective view thereof;

Fig. 10A is a sectional view showing side plate portions of conventional wood form members which are fastened with nails for connecting the form members with each other, and Fig. 10B is a sectional view showing the fastened portions which are broken by tensile force acting on the form members;

Fig. 11A is a sectional view showing the conventional metal concrete molding form member connector, appearing in Figs. 8A to 8C, holding side plate portions of form members, Fig. 11B is a sectional view showing the form members which are deformed by tensile force F2 acting thereon;

Fig. 12A is a perspective view for illustrating regions of the conventional concrete molding form member connector which are in contact with form member side plate portions, and Fig. 12B is a sectional view taken along the line A - A in Fig. 12A with the form side plate portions which are held by the concrete molding form connector in an enlarged manner; and

Fig. 13A is a perspective view showing a large box culvert serving as a concrete secondary product which can assemble a form with application of concrete form member connectors according to respective embodiments of the present invention, and Fig. 13B is a perspective view showing an upright stop L-shaped product serving as a concrete secondary product.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention are now described with reference to the drawings. First, a concrete molding form member connector 1 according to a first embodiment of the present invention is described with reference to Figs. 1A to 3 as follows: Referring to Figs. 1A to 1C, the form member connector 1 according to the present invention is provided with a first holding portion 3 having a linearly extending first holding surface 3a of a prescribed length, and a cylindrical insertional shaft portion 5, having a central axis which is perpendicular to the first holding surface 3a, provided in the vicinity of a first end of the first holding surface 3a. A second holding portion 4 having a free end whose second holding surface 4a is opposed to the first holding surface 3a in a parallel manner at a prescribed space is provided in the vicinity of a second end of the first holding portion 3. The overall form member connector 1 according to this embodiment is formed by integral molding of resin.

In order to connect/fix form member side plate portions 5 and 6 to each other by the concrete molding form member connector 1 of this embodiment having the aforementioned structure for assembling a concrete molding form for civil engineering work, for example, the insertional shaft portion 2 is inserted in a connector mounting hole 27 which is provided in each of the form member side plate portions 5 and 6, as shown in Fig. 2A. Then, the connector 1 is manually rotated about the insertional shaft portion 2 as shown in Fig. 2B, for holding the overlapping form member side plate portions 5 and 6 between the first and second holding portions 3 and 4, i.e., between the first and second holding surfaces 3a and 4a which are opposed to each other.

In order to obtain strength of the form member connector 1 according to this embodiment against tensile force which is applied to the form members 7 and 8, a tensile test was carried out. Consequently, tensile force F3 of about 100 kg was required for breaking the form member connector 1 along the junction between the first and second holding portions 3 and 4 as shown in Fig. 5B, from a state shown in Fig. 5A. Namely, the form member connector 1 according to this embodiment is not broken until the tensile force F3 which is applied to the form members 7 and 8 is about 100 kg. Considering that strength against tensile force which is required in application to assembling of a concrete molding form is about 80 kg as described above, it is understood that the inventive form member connector has sufficient strength.

Consideration is now made on contact pressure which is applied from the form member side plate portions 5 and 6 to the first and second holding surfaces 3a and 4a in employment of the form member connector 1 according to this embodiment. The form member connector 1 comes into contact with the form member side plate portions 5 and 6 in a region of the first holding surface 3a shown in a hatched manner in Fig. 3, and a region of the second holding surface 4a which is opposed thereto. The area of each such region is about 200 mm², assuming that the region is 20 mm in length and 10 mm in width. This means that a contact area of about six times that of the aforementioned conventional form member connector 10 having a contact area of about 34 mm² is ensured.

The tensile force acting on the form members in the state of employment of the form member connector 1 is about 100 kg at the maximum, and hence surface stress which is caused on contact surfaces between the form member connector 1 and the form member side plate portions 5 and 6 is about 0.5 kg/mm². An ordinary resin compact can sufficiently withstand such surface stress.

Thus, the form member connector 1 according to this embodiment is formed by integral molding of a resin material, whereby the same is easy to manufacture, lightweight, and excellent in workability in carrying or attachment. Further, the form member connector 1 according to this embodiment which is made of a resin material is not excessive in rigidity as compared with the

conventional form member connector 10 which is made of a metal material, whereby the same can be sufficiently rotated by hand for holding the form member side plate portions with no necessity of hitting with a hammer or the like, whereby workability in attachment and detachment is further improved.

While the resin material for the form member connector 1 according to this embodiment is prepared from a mixed material of ABS resin having relatively high mechanical strength and thermoplastic nylon resin, a mixture of ABS resin and thermoplastic engineering plastic other than nylon resin can alternatively be employed. While a thermoplastic resin material is optimum as the material to be mixed with ABS resin, thermosetting polyester/epoxy resin or the like can alternatively be employed as the mixed material.

While both of the first and second holding portions 3 and 4 of the form member connector 1 according to the first embodiment have rectangular cross sections as shown in Fig. 6A, the cross sections may be so shaped that the first and second holding surfaces 3a and 4a can form planes. For example, sectional shapes shown in Figs. 6B to 6D are also employable, so far as required mechanical strength is satisfied. In particular, the cross-sectional shapes shown in Fig. 6B or 6D provide rib structures so that the connector can be further reduced in weight while maintaining its mechanical strength, and can hold the form member side plate portions 5 and 6 on the basis of a principle which is similar to that of the connector shown in Fig. 6A.

A concrete molding form member connector 30 according to a second embodiment of the present invention is now described with reference to Figs. 4A, 4B, 7A and 7B. In the form member connector 30 according to this embodiment, an insertional shaft portion 2 is formed by previously working a metal, so that its base end is joined to a portion of a first holding surface 3a of a first holding portion 3 which is close to its free end and integrally molded in a shape shown in Fig. 7A when the first holding portion 3 and a second holding portion 4 are integrally molded by resin. A male screw part 2a is formed on a free end of the insertional shaft portion 2 of the form member connector 30 according to this embodiment as shown in Fig. 4A, so that a nut 2b is fitted with this male screw part 2a in case of holding form member side plate portions 5 and 6, as shown in Fig. 4B. Thus, the form member side plate portions 5 and 6 are strongly held between the portion of the first holding surface 3a which is close to the male screw part 2a and a pressing surface of the nut 2b which is opposed thereto. Consequently, the form member side plate portions 5 and 6 are held between the first and second holding portions 3 and 4 as well as between the first holding portion 3 and the nut 2b. Thus, stronger connection/fixation of form members is implemented.

The insertional shaft portion 2 of the form member connector 30 according to this embodiment can be reinforced by press-fitting/joining a sleeve-like metal cover 22, for example, with its base end, as shown in Fig. 7A.

Further, a female screw 3b may be formed in the vicinity of the free end of the first holding portion 3 as shown in Fig. 7B after the first and second holding portions 3 and 4 are integrally molded, so that the male screw part 2b which is provided on the metal insertional shaft portion 2 is fitted therewith for joining/fixation, in place of embedding/molding the insertional shaft portion 2 simultaneously with integral molding of the first and second holding portions 3 and 4. In addition, a cylindrical hole may be formed in the vicinity of the free end of the first holding portion 3 in place of the female screw 3b for press-fitting the base end of the insertional shaft portion 2 therewith for attaining joining/fixation.

Also in the form member connector 30 according to the second embodiment, a resin material which is similar to that in the first embodiment can be employed for the first and second holding portions 3 and 4.

The aforementioned concrete molding form member connectors 1 and 30 according to the first and second embodiments of the present invention are effectively utilized for forming concrete secondary products such as a large box culvert of concrete shown in Fig. 13A and an upright stop L-shaped product shown in Fig. 13B, for example.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims.

Claims

1. A concrete molding form member connector comprising:
 - a first holding portion (3) having a linearly extending first holding surface (3a) of a prescribed length;
 - a cylindrical insertional shaft portion (2) being provided in the vicinity of a first end of said first holding surface (3a) and having a central axis being perpendicular to said first holding surface (3a); and
 - a second holding portion (4) having a second holding surface (4a) being opposed to said first holding surface (3a) in a parallel manner at a prescribed space in a region close to a second end of said first holding surface and being continuous with said first holding portion (3) on said second end of said first holding surface (3a) with its free end being positioned at a prescribed space with respect to said insertional shaft portion (2).
2. The concrete molding form member connector in accordance with claim 1, wherein at least said first holding portion (3) and said second holding portion (4) consist of a resin compact.
3. The concrete molding form member connector in accordance with claim 1 or 2, wherein said insertional shaft portion (2) includes a male screw part (2a) on its free end.
4. The concrete molding form member connector in accordance with claim 2 or 3, wherein said resin compact consists of a mixed material of ABS resin and thermoplastic resin.
5. The concrete molding form member connector in accordance with claim 4, wherein said thermoplastic resin is nylon resin.
6. The concrete molding form member connector in accordance with one of claims 1 to 5, wherein a sleeve-like metal cover (22) is attached to said insertional shaft portion (2) by press-fitting/joining.
7. The concrete molding form member connector in accordance with one of claims 1 to 6, wherein
 - said insertional shaft portion (2) consists of a metal member with a male screw part (2b) provided in the base and thereof; and
 - said insertional shaft portion (2) is fixed to said first holding portion (3) by means of fitting said male screw portion (2b) with said female screw (3b).
8. The concrete molding form member connector in accordance with one of claims 1 to 6, wherein
 - a cylindrical hole is formed in the vicinity of the free end of said first holding portion (3); and
 - said insertional shaft portion (2) is fixed to said first holding portion (3) by means of press fitting the base end of said insertional shaft portion (2) with said cylindrical hole.

FIG. 1A

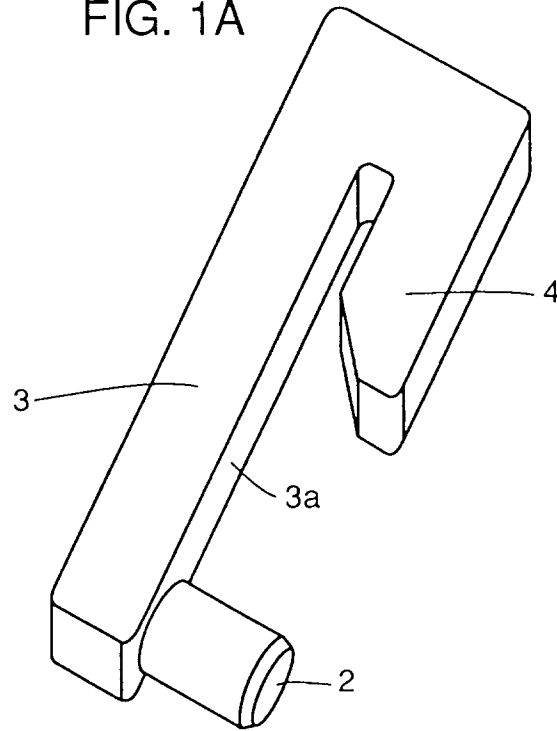


FIG. 1B

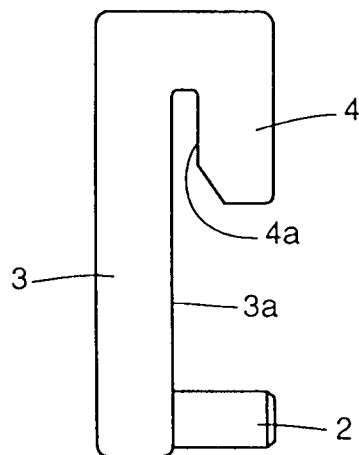


FIG. 1C

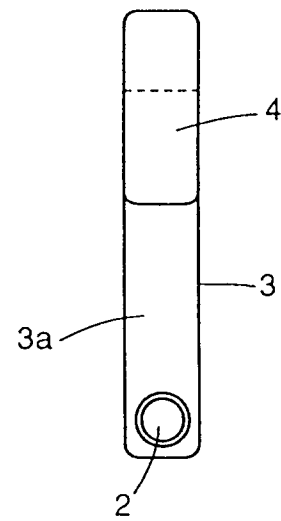


FIG. 2A

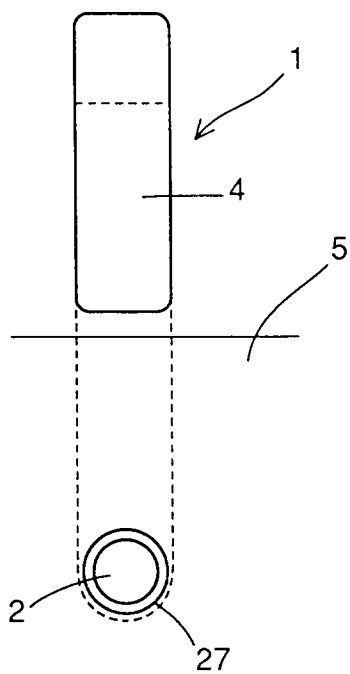


FIG. 2B

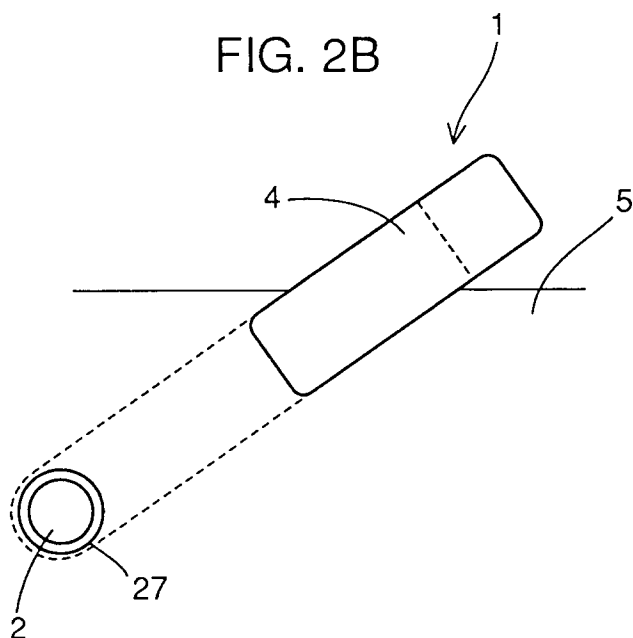


FIG. 2C

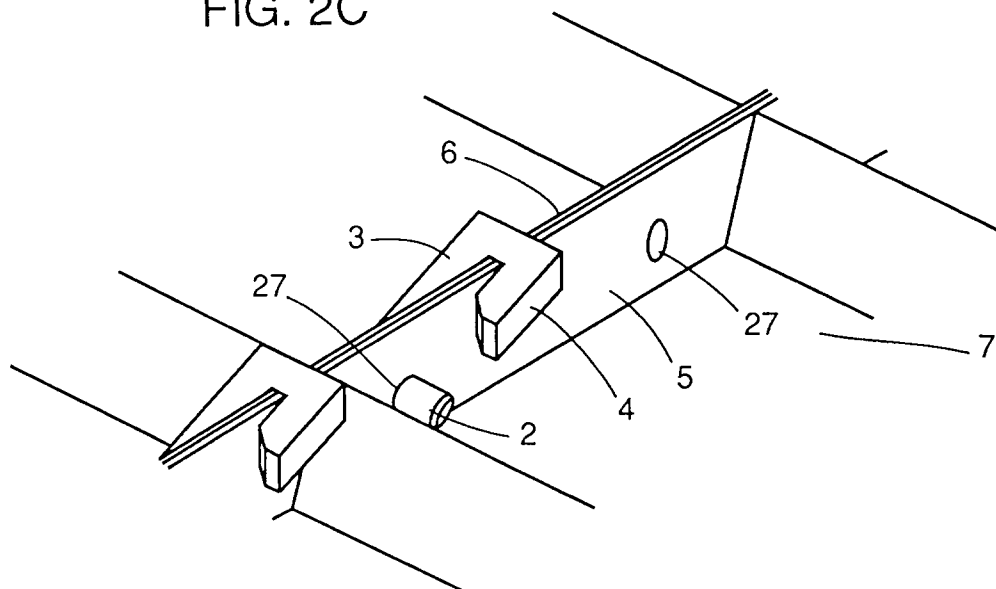


FIG. 3

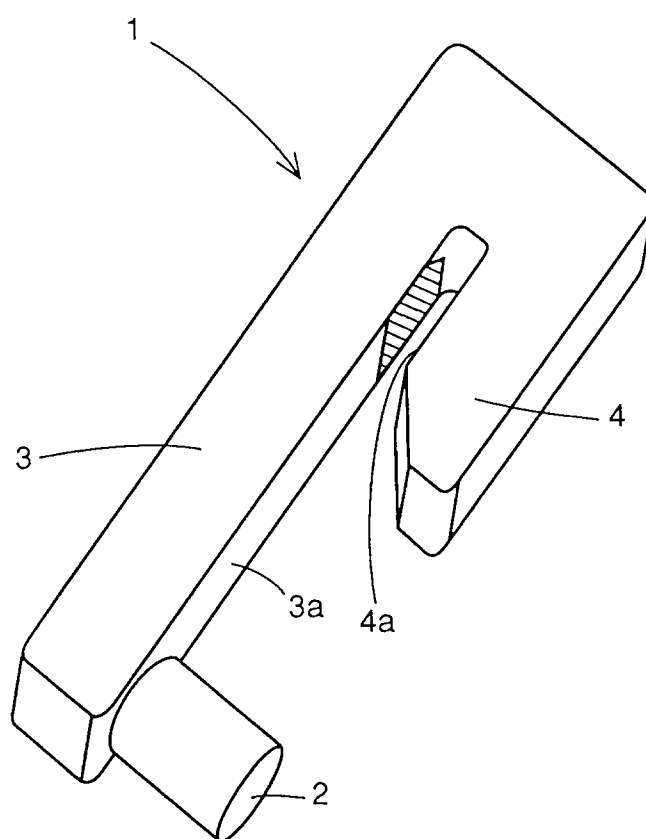


FIG. 4A

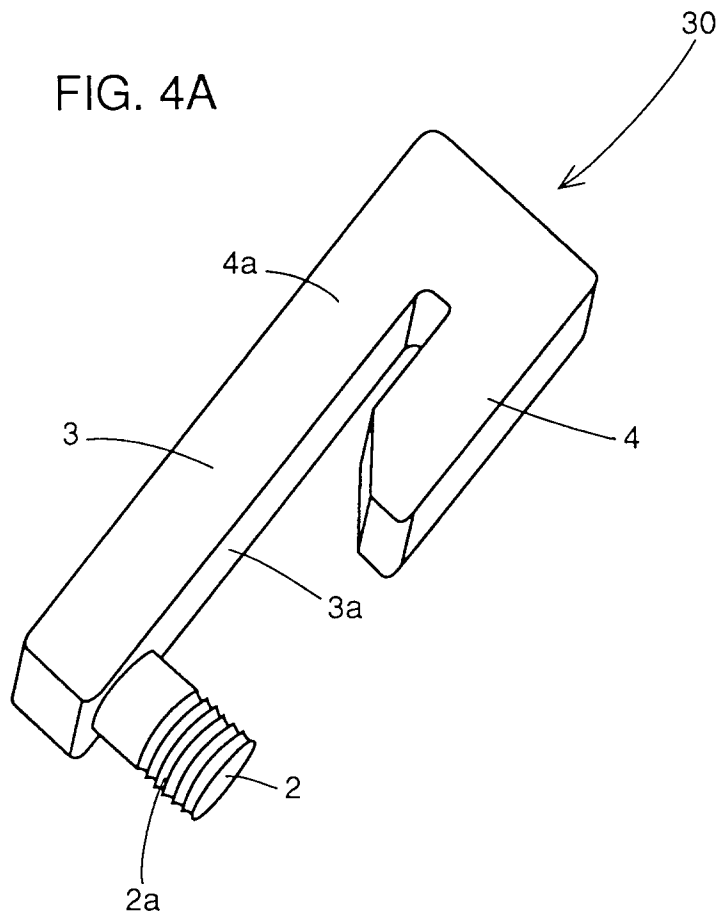


FIG. 4B

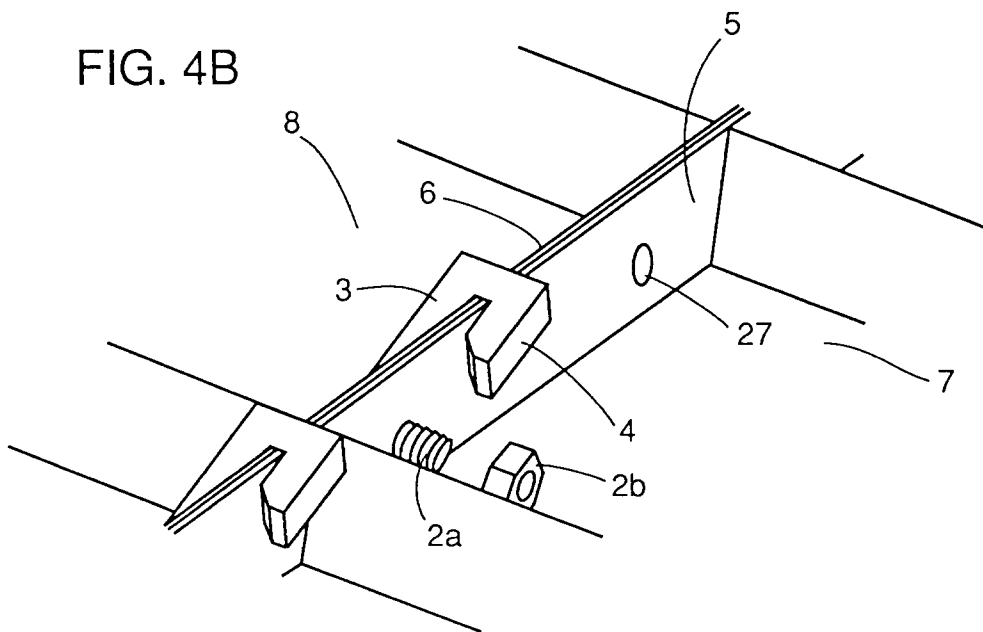


FIG. 5A

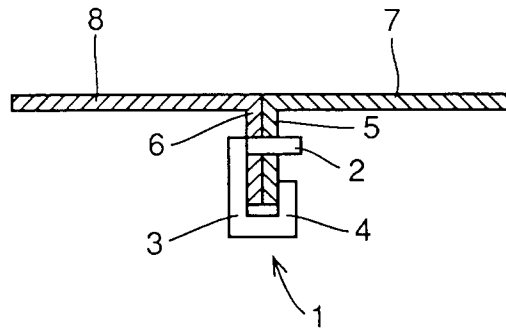


FIG. 5B

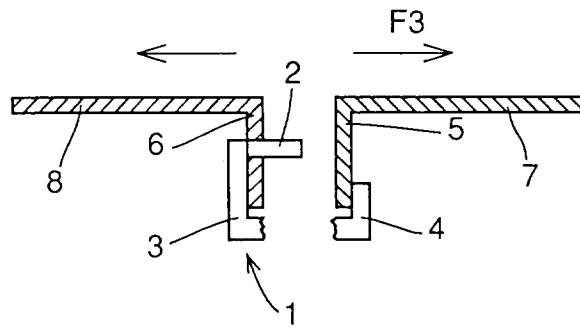


FIG. 6A

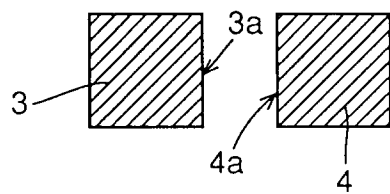


FIG. 6B

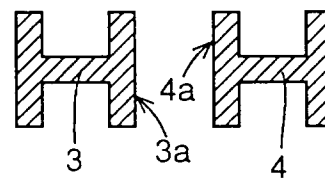


FIG. 6C

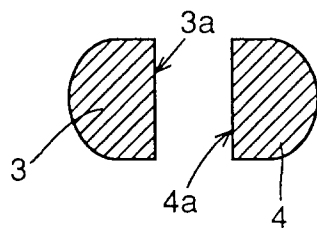
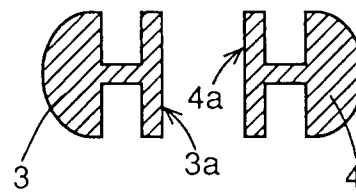


FIG. 6D



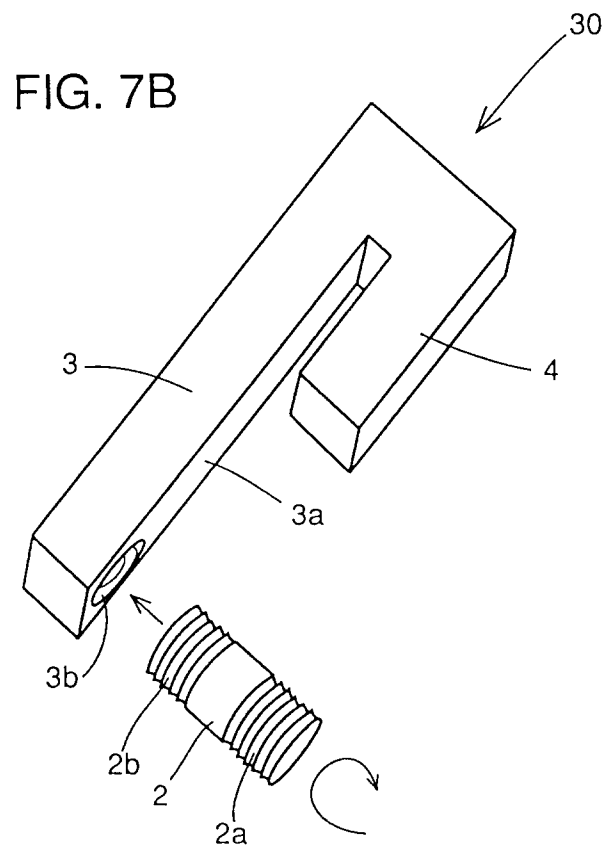
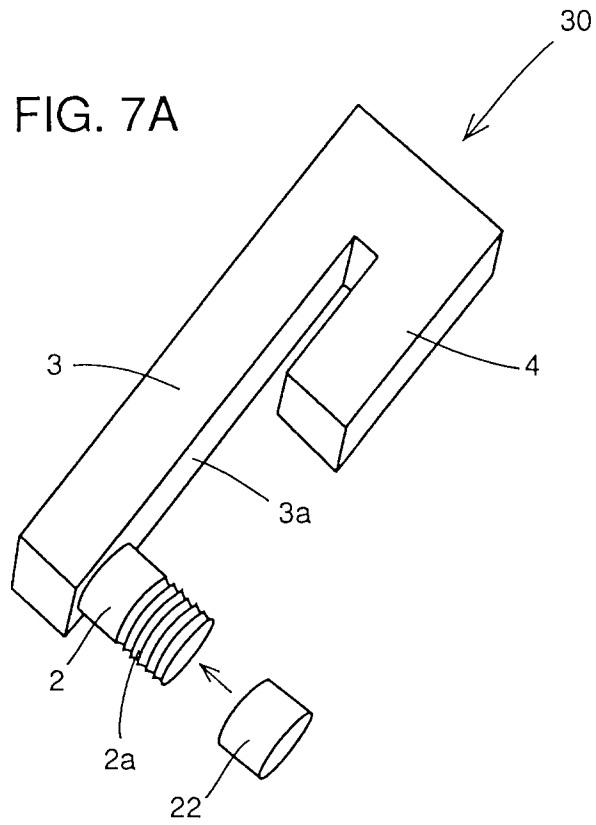


FIG. 8A

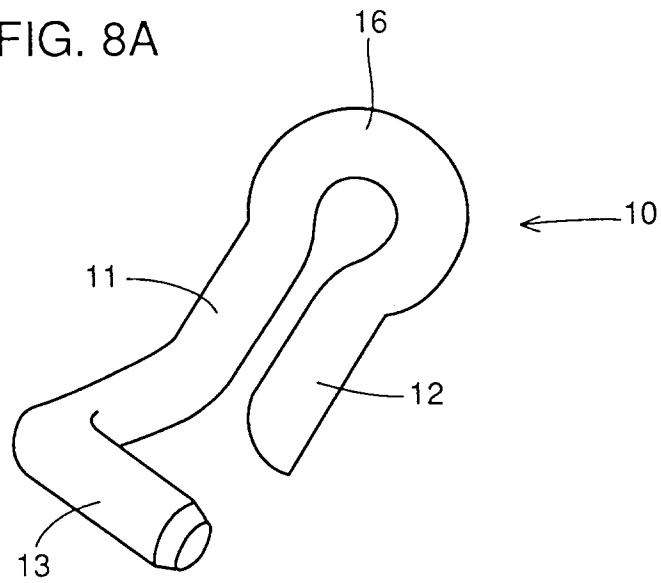


FIG. 8B

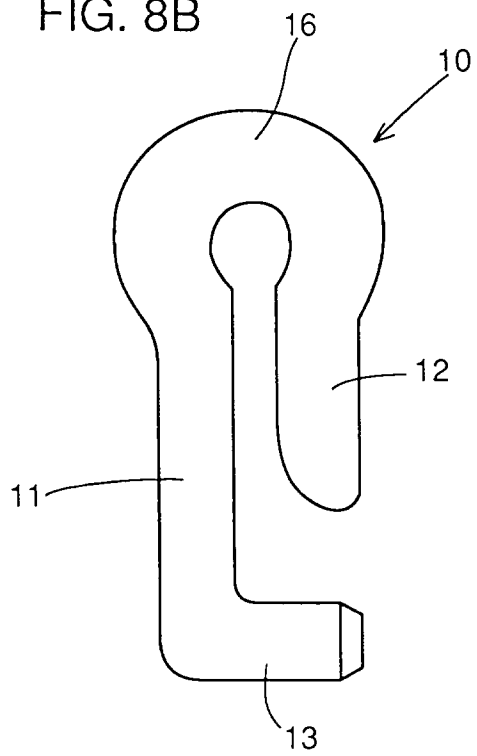


FIG. 8C

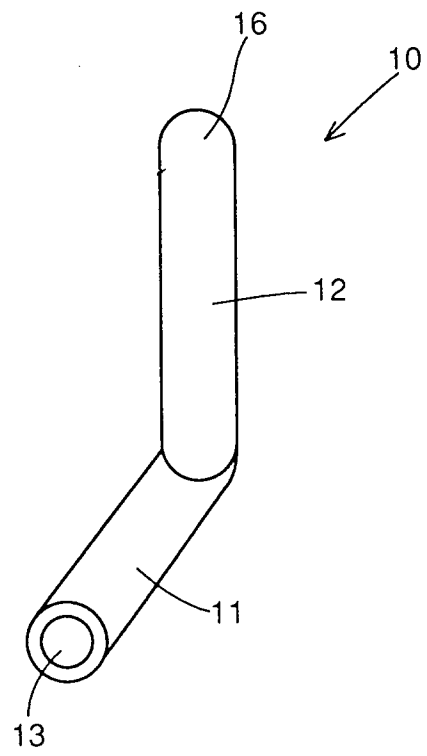


FIG. 9A

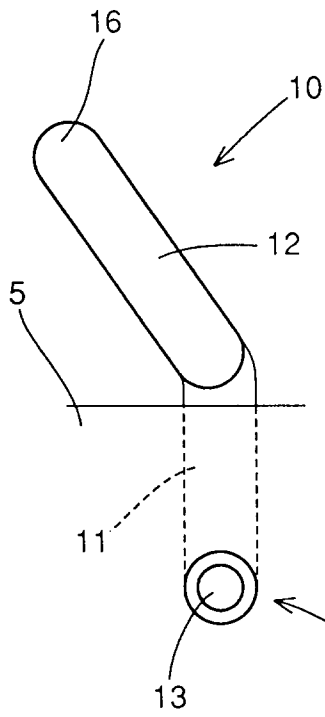


FIG. 9B

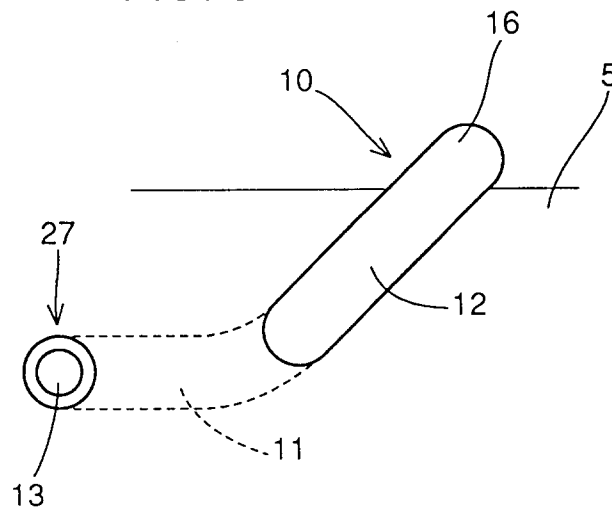


FIG. 9C

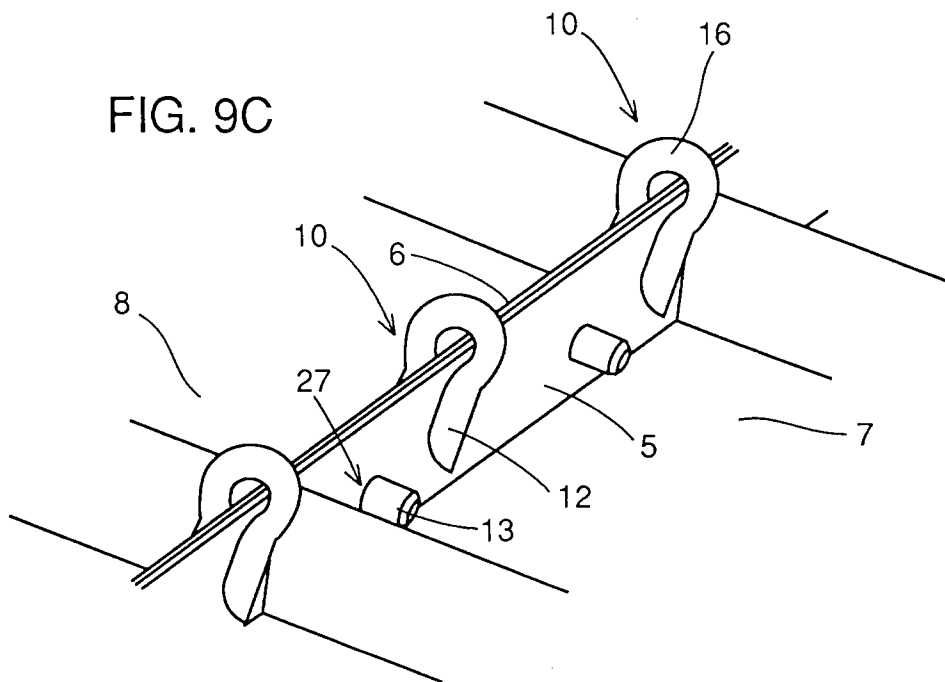


FIG. 10A

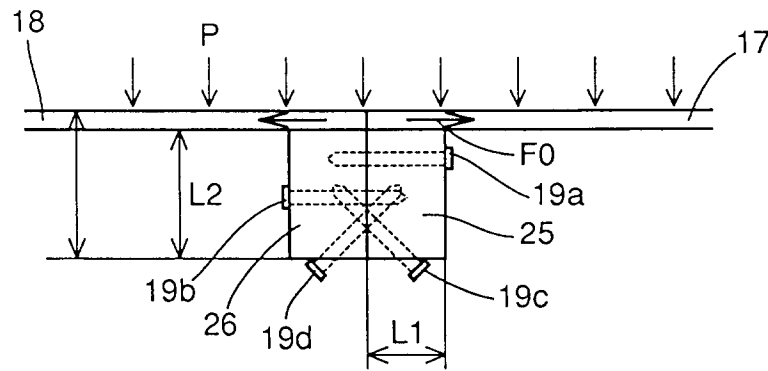


FIG. 10B

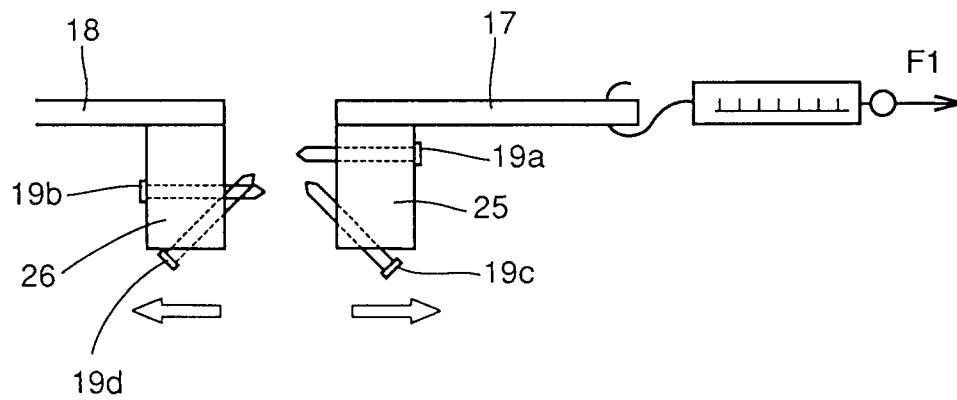


FIG. 11A

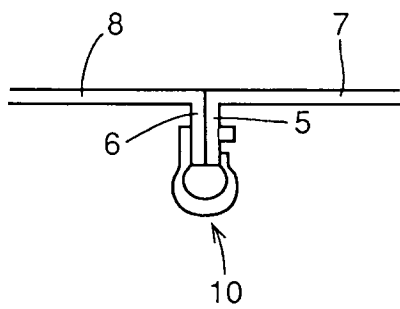


FIG. 11B

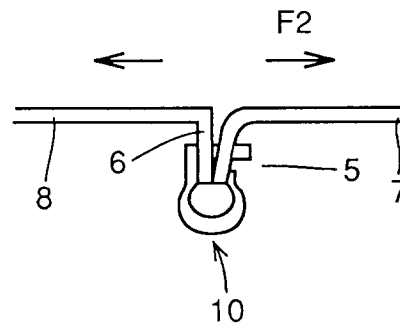


FIG. 12A

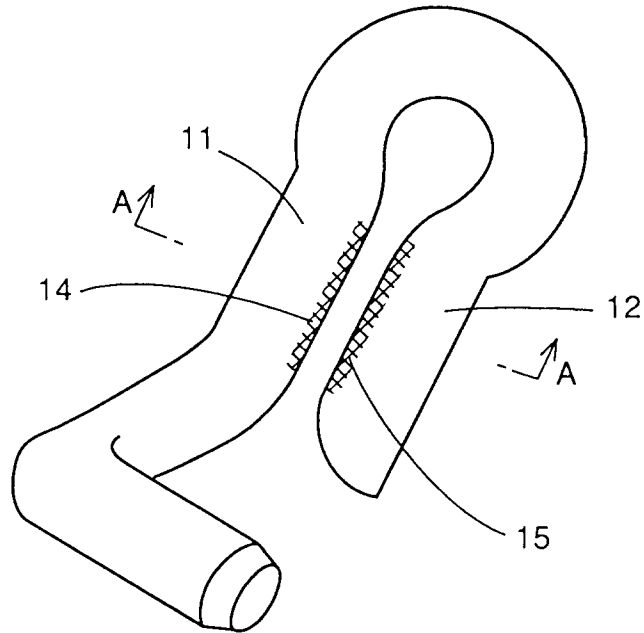


FIG. 12B

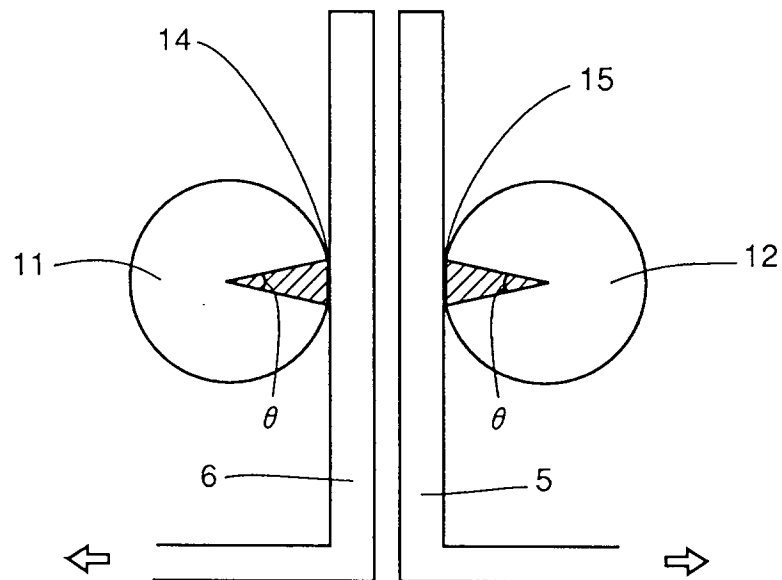


FIG. 13A

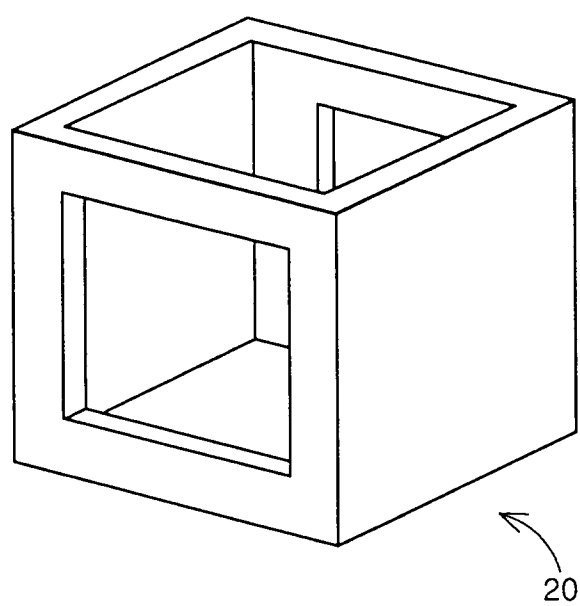
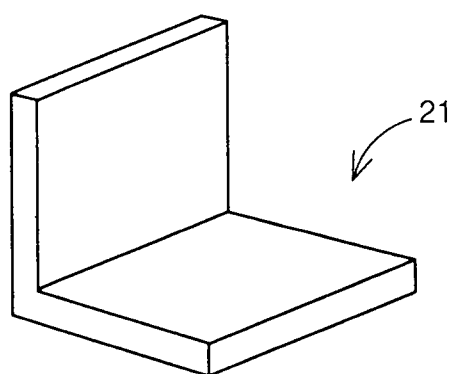


FIG. 13B





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 10 5660

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	GB-A-600 606 (JENNINGS) * page 3, line 25 - line 127; figures *	1	E04G17/04
X	US-A-5 080 321 (CARLSON) * column 2, paragraph 3; figures *	1	
X	NL-A-7 603 908 (MATAB) * page 3, line 22 - page 5, line 3; figures *	1	
A	GB-A-1 520 259 (MAQUINARIA Y UTILES PARA LA CONSTRUCTION)		
A	US-A-5 039 059 (MILLER)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E04G
Place of search		Date of completion of the search	Examiner
THE HAGUE		9 July 1996	Vijverman, W
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.92 (P04C01)