



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 405 957 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.04.2004 Bulletin 2004/15

(51) Int Cl.7: **E04B 1/21**

(21) Application number: **02079104.2**

(22) Date of filing: **03.10.2002**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**
Designated Extension States:
AL LT LV MK RO SI

• **Mäkinen, Esko**
04320 Riihikallio (FI)

(74) Representative:
Järveläinen, Pertti Tauno Juhani et al
Heinänen Oy
Annankatu 31-33 C
00100 Helsinki (FI)

(71) Applicant: **TARTUNTAMARKKINOINTI OY**
15540 Villähde (FI)

(72) Inventors:
• **Viljakainen, Kari**
15150 Lahti (FI)

(54) **Concealed console joint**

(57) A concealed console joint, which is used in the joints between vertical and horizontal framework elements of a building, especially in the joints of a prefabricated concrete framework of a building, where a prefabricated concrete beam, is joined and fastened to prefabricated concrete column, via a load transmitting joint, said joint comprising a first and a second joining element, of which the first joining element is fitted in a prefabricated column, while the second joining element is fitted in a prefabricated beam, said console joint comprising a joint adapter (21), by means of which a joint can be formed by connecting the first and the second joining elements via the aforesaid adapter especially without any parts protruding from the horizontal framework element, said second joining element comprising a slot which is open at its lower end and through which a bracket-like part of the joint adapter can be fitted into the second joining element.

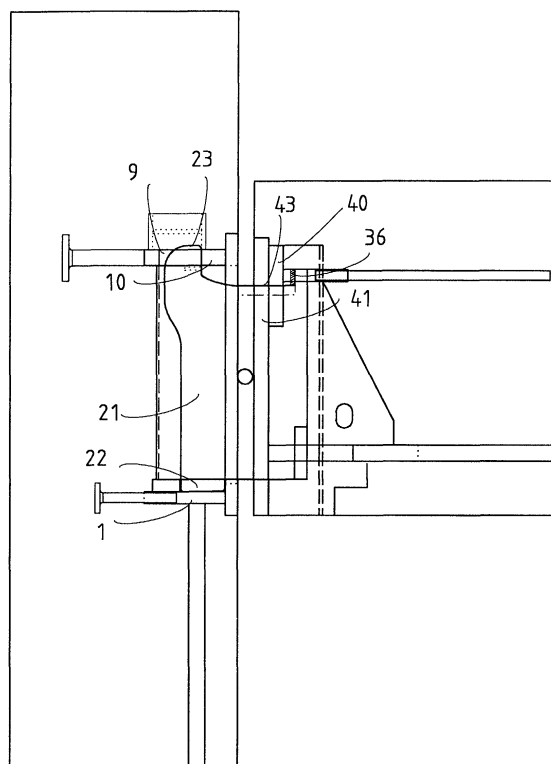


FIG. 9

Description

[0001] The present invention relates to a concealed console joint, which is used in the joints between vertical and horizontal framework elements of a building, especially in the joints of a prefabricated concrete framework of a building, where a horizontal framework element, such as a prefabricated concrete beam, is joined and fastened to a vertical framework element, such as a prefabricated concrete column, via a load transmitting joint. The concealed console joint can also be used on the same principles in the beam-column joints of e.g. a reinforced-concrete composite-construction framework.

[0002] In the load-bearing framework of houses constructed from concrete elements, prefabricated beams and columns are used. The beams are generally concrete elements of a length corresponding to only one bay between columns. The columns are in most cases prefabricated concrete elements of a height corresponding to several floors. These framework elements are joined together on the building site during installation by first erecting the prefabricated columns and then mounting a prefabricated beam between the columns. The prefabricated beams are connected to the prefabricated columns via cast concrete brackets, which are formed in the columns already at casting time. The beam is mounted and fastened onto this bracket provided in the column. This method is expensive and difficult as it requires complex mould equipment for the prefabrication of the column. In addition, in most cases the bracket under the beam remains exposed, unless a lowered ceiling is built under a concrete slab. This bracket of the column requires a large space, typically 300 - 600 mm, which has to be taken into account when selecting the floor height of the building. Therefore, this is often an architectural question. Moreover, in construction element prefabrication technology, parts protruding from the mould involve fairly high costs.

[0003] Known in prior art is also a concealed console structure that can be used instead of the above-described solution and that requires no consoles or similar brackets cast in mould, instead permitting the entire joint to be placed inside the beam so that no protruding parts of the joint remain exposed. This makes it possible to reduce the manufacturing costs and to achieve an architecturally improved solution. One concealed console solution is disclosed in FI-specification 83358, in which the prefabricated column comprises a metallic console element and the prefabricated beam has a corresponding attaching part. The attaching part consists of a metallic fastening slot provided at the end of the beam, the bottom and lateral surfaces of the slot being fitted against and supported by the console element in the column to receive the moment produced by the weight of the beam and an eccentric load. The console element is fastened with screws to a plate embedded in the cast column. WO 02/33185 also discloses a concealed console solution wherein a console element is fastened with

screws to a plate embedded in the column.

[0004] The object of the present invention is to achieve a new type of concealed console joint. The concealed console joint of the invention consists of three prefabricated steel parts, by means of which a joint between a prefabricated beam and a prefabricated column can be formed after the casting of the prefabricated concrete elements. A steel part is mounted in the mould for the prefabricated column and embedded in the column in connection with the casting of the latter. This steel joint element embedded in the column does not protrude at all from the surface of the column. The joint element of the column is provided with an opening, in which a joint adapter is mounted. The end of the prefabricated beam is provided with another joint element of a corresponding type, which is mounted in the mould of the prefabricated beam and embedded in the beam in connection with the casting of the beam. This joint element again has no parts protruding from the beam. The joint element of the beam also has an opening into which the joint adapter connecting the beam and the column becomes fastened.

[0005] The actual joint between the prefabricated beam and the prefabricated column is formed on the construction site at installation time by using a third part, a joint adapter connecting the joints. This joint adapter is a discrete part and it is so shaped that it fits into the openings in the joint elements of the beam and the column. The joint adapter connecting the joints is mounted in the joint element of the prefabricated column before the prefabricated beam is mounted, and it is locked in place without any screws or similar fastening elements. The beam is so mounted that it remains supported by the adapter connecting the joints, whereupon the joint is ready to carry a load.

[0006] The features of the joining unit of the invention are presented in detail in the claims below.

[0007] Because of the tolerances required in the manufacture and installation of a concrete element framework, the concealed console joint of the invention must also be adjustable so as to allow the variation in dimensions occurring in the manufacture and installation of the prefabricated elements to be eliminated when the console joint is being made. Adjustability of the joint is a basic requirement that has to be fulfilled to allow the installation of a large prefabricated-element framework to be accomplished without difficulties and accurately observing the designed dimensions. Variations in dimensions in the building framework appear at the end of the beam as displacements in the directions of the three principal coordinate axes and as a twisting of the column and the beam relative to their longitudinal axes. It is necessary to have a possibility of adjusting the concealed console joint at installation time in the directions of these three deviations in dimensions and relative to three twisting directions. The console joint is adjusted by using the following solutions: A displacement in the direction of the longitudinal axis of the beam is adjusted by

utilizing the clearance provided between the beam part and the adapter part. A horizontal displacement of the beam end is adjusted by means of shims of different thicknesses placed inside the joint element and used to move the beam sideways in a horizontal direction. A twist about the longitudinal axis of the beam is adjusted by means of wedging parts, which are used to lock the joint finally in place. A vertical displacement of the beam end is adjusted by means of the joint elements, which are mounted over the joint adapter. Once the adjustment of the joint has been accomplished, the interior joint area inside the beam is cast full of concrete, so this concrete ensures that the parts used for adjustment will remain in position, and it also functions as a fire protection of the joint.

[0008] Although the joint is required to be adjustable, the joint must also be capable of transmitting forces in all three directions of adjustment. This is achieved by locking all degrees of freedom of displacements and twists of the joint after the adjustment. However, since the console joint in the ultimate application situation functions as an elbow joint for vertical loads imposed on the beam, the beam end must be allowed to turn in the vertical direction even after the joint has been cast with concrete.

[0009] In the following, the invention will be described in detail by the aid of an example with reference to the attached drawings, wherein

Fig. 1 presents a side view of a part of a console according to the invention, designed to be placed in a prefabricated concrete column and having a square or rectangular cross-section,

Fig. 2 presents a part of a console according to the invention, designed to be placed in a prefabricated concrete column and having a square or rectangular cross-section, as seen from the front side of the a joint surface,

Fig. 3 presents a console according to the invention placed in a prefabricated column as seen from above, Fig. 3A showing the same in partial longitudinal section as seen from above,

Fig. 4 presents a side view of a part of a console according to the invention, designed to be placed at the end of a prefabricated concrete beam,

Fig. 5 presents a top view of a part of a console according to the invention, designed to be placed at the end of a prefabricated concrete beam,

Fig. 6 presents a part of a console according to the invention, designed to be placed at the end of a prefabricated concrete beam, in partial longitudinal section as seen from the back side of the joint surface,

Fig. 7 presents a side view of a joint element connecting the parts of the console,

Fig. 8 presents a front view of a joint element connecting the parts of the console,

Fig. 9 shows how the console parts of a prefabricat-

ed concrete column and a prefabricated concrete beam are fitted together to form a functional concealed console, and

Fig. 10 presents the adjusting elements needed in installation-time adjustment of the concealed console before the console joint is mounted in place.

[0010] Figures 1, 2, 3 and 3A illustrate a joint element of the concealed console joint of the invention, which is placed in the column mould and embedded in the column at casting time. The joint element consists of the following components: Component 1 is the base plate of the column joint element and it consists of two plates joined together in a substantially square shape, the upper one of said plates being provided with a rectangular opening 1 a, the lug 22 of the beam joint element (Fig. 7) being fitted into this opening 1 a. Components 2 are straight corrugated steel bars used as anchorages for transmitting forces to the column. Typically, 1 - 3 bars are used. Component 2 meets component 1. Component 3 is a protective casing protecting the joint. It is made of bent steel sheet and attached to components 1, 4 and 5 so that components 1, 3, 4 and 5 form a box-like space 3a. Component 4 consists of a rectangular steel plate, which is attached to components 1, 3 and 5 and which has a rectangular opening 6 cleft in its middle part, joint element 21 (Fig. 7) being fitted into this opening. Component 7, which is made of concrete steel and has an expanded conical head 8 at one end, forms a part anchoring the joint to the column. Component 5 forms the top of the encasement space 3a. It is a rectangular plate with a rectangular opening 9 and a collar 10, which engage the shoulder 23 (Fig. 7) of the joint adapter connecting the joints is supported.

[0011] Figures 4 - 6 present a joint element designed to be mounted in the mould of a prefabricated beam for a concealed console joint according to the invention and embedded in the prefabricated beam at casting time, said joint element consisting of the following components: Component 41 is a rectangular form-cut joint end plate, which is placed level with the end of the prefabricated beam. In the central part of component 41 there is a rectangular, downwardly open slot 42, the upper edge of the slot being provided with a stop element 43, which is supported on the upper surface 24 of the joint adapter (Fig. 7). Component 40 is a support plate at the upper edge of component 41. Component 44 is a plate-like encasement forming a downwardly open space 44a. Components 45 and 46 are straight corrugated bars, which are anchored to joint elements 47 and 48. Component 47 is a lower support plate of the joint, surrounding the open space 44a. Component 48 is an upper support plate of the joint and it is provided with an open rectangular aperture 49. The encasement 44 has stop faces 20, on which the support blocks 26 (Fig. 8) of the joint adapter are supported.

[0012] Figures 7 and 8 present a joint adapter connecting the column and beam parts of the concealed

console joint of the invention. The adapter body 21 is a shaped plate-like part that is adapted to fit into the opening 6 and slot 42 of the two counterparts. The adapter body 21 comprises a bracket-like part 22 which engages stop element 1 a of the column and a bracket-like part 23 that engages stop element 10 of the column. The adapter body 21 has an elbow 24 on which component 43 rests. The adapter body comprises a shaped plate-like support block 26, which rests on the stop faces 20 of the beam part. The adapter body 21 comprises a rectangular part 32 which is fastened via components 33 to the adapter body 21. The adapter body 21 comprises a clutch element 31 having rounded edges on both sides. The clutch element 31 engages plate 40 of the beam. The front surface of the clutch element 31 is provided with a surfacing 36 made of a soft and compressible material, designed to permit a twist of the joint in the final application situation. The surfaces 25 of the adapter body are coated with a material preventing adhesion of concrete on the surfaces.

[0013] Fig. 9 illustrates a situation where a console joint is being installed. The joint adapter is mounted inside the column part so that stop face 22 of the joint adapter engages stop faces 1 and 1 a of the column part, and the shoulder 23 of the adapter is fitted into the opening 9 of component 5 and shoulder 23 engages collar 10. The prefabricated beam is mounted by lowering it from above directly down so that the adapter body 21 enters into the slot 42 of component 41.

[0014] Installation-time adjustment of the console joint is performed using adjusting elements as presented in Fig. 10. The plate-like elements 27 are placed against stop faces 20 inside the encasement 44 of the beam part. The thickness and position of the plates 27 can be varied depending on the required lateral adjustment of the joint. The wedge-shaped parts 28 are placed inside the encasement 44 of the beam part, and they engage the adjusting elements 27 and the support plate 25 and 31 of the joint adapter. Horizontal displacement of the joint and longitudinal displacement of the beam are adjusted by means of joint elements 27 and 28.

[0015] Vertical adjustment of the joint is accomplished by the aid of joint element 32 of the joint adapter 21. By adjusting the height of this element, it is possible to adjust the vertical position of the whole joint.

[0016] Fire protection of the joint is implemented by mounting, by the aid of joint element 35, a shaped element 34 made of fire-resistant material into the downwardly open encasement 42 of the beam part. Fire protection can also be achieved by casting the encasement 42 of the beam part full of concrete. To ensure that the beam part can function as an articulated joint after the casting, surfaces 25 of the joint adapter 21 are treated with a material preventing the adhesion of concrete, and the front surface of the clutch 31 is provided with a surfacing 36 made of elastic material. The coating 25 and the material 36 permit a twist of the joint relative to the vertical axis.

[0017] The invention is not restricted to the embodiment described above; instead, it can be varied within the scope of the claims presented below. Thus, the column may also have a circular cross-section, in which case the corresponding parts of the concealed console joint are adapted to the shape of the column and the shape of the various parts of the console are therefore not restricted to the shapes described above.

Claims

1. Concealed console joint, which is used in the joints between vertical and horizontal framework elements of a building, especially in the joints of a prefabricated concrete framework of a building, where a horizontal framework element, such as a prefabricated concrete beam, is joined and fastened to a vertical framework element, such as a prefabricated concrete column, via a load transmitting joint,

said joint comprising a first and a second joint element, of which the first joint element is fitted in the vertical framework element, such as a prefabricated column, while the second joint element is fitted in the horizontal framework element, such as a prefabricated beam,

said console joint comprising a joint adapter (21), by means of which a joint can be formed by connecting the first and the second joint elements via the aforesaid adapter especially without any parts protruding from the horizontal framework element,

said second joint element comprising a downwardly open slot (42), through which a bracket-like part (31) of the joint adapter can be fitted into the second joint element,

which joint adapter (21) connecting the joint is provided with a stop face (24) or stop faces while the second joint element comprises a stop element (43) or elements, against which the joint adapter stop face (24) can be fitted,

characterized in that

the joint adapter (21) connecting the joint at the end of the first joint element, too, has a substantially bracket-like structure and the first joint element is provided with an opening (6) through which the end of the joint adapter can be fitted into the first joint element, said adapter being designed to be fitted into the first joint element without any special fastening elements.

2. Concealed console joint according to claim 1, **characterized in that**

the joint adapter comprises a first and a second bracket-like stop element (22, 23) for the first joint element and the first joint element has corresponding first and second stop element (1a, 9) in the form of an opening or cavity, so that the first stop

element (22) of the joint adapter (21) can be fitted into the first stop element (1a) of the first joint element (21) and the second stop element (23) of the joint adapter (21) can be fitted into the second stop element (9) of the first joint element, and that 5

the second bracket-like part (23) of the joint adapter (21) engages a stop face (10) comprised in conjunction with stop element (9) of the first joint element while the first bracket-like part (22) of the joint adapter (21) simultaneously engages a stop face (1) comprised in conjunction with stop element (1a) of the first joint element. 10

3. Concealed console joint according to claim 1, **characterized in that** the joint adapter (21) comprises a bracket-like part (31) having a rectangular shape and rounded edges on two sides, and the front surface of the bracket-like part placed against the second joint element (40) is provided with a filling (36) made of elastic or soft material. 15 20

4. Concealed console joint according to claim 1, **characterized in that** it contains adjusting elements (27, 28) of a rectangular or wedge-like shape and of different thicknesses, which elements are used to adjust the lateral play and which can be placed between the stop faces (20, 25). 25

5. Concealed console joint according to claim 1, **characterized in that** it comprises an adjustable riser block (32), by means of which the vertical play of the joint can be adjusted by varying the height of the surface (24) of the joint adapter. 30

6. Concealed console joint according to claim 1, **characterized in that** a stop block (26) of the joint adapter (21) is tightly pressed against the stop faces (20) of the second joint element. 35

7. Concealed console joint according to claim 1, **characterized in that** the bracket-like part (22) of the joint adapter (21) rests on a plate (1) of the first joint element and on a bar (2) placed under it. 40

8. Concealed console joint according to claim 1, **characterized in that** the joint components (41, 44) of the second joint element form a downwardly open space (44a) to allow the joint to be assembled. 45

9. Concealed console joint according to claim 1 or 8, **characterized in that** the downwardly open encasement (44a) comprised in the second joint element is cast substantially full of concrete, and that the materials of the front surface (36) and lateral surfaces (25) of bracket-like part (31) of the joint adapter (21) permit twisting of the joint relative to the vertical axis after the casting. 50 55

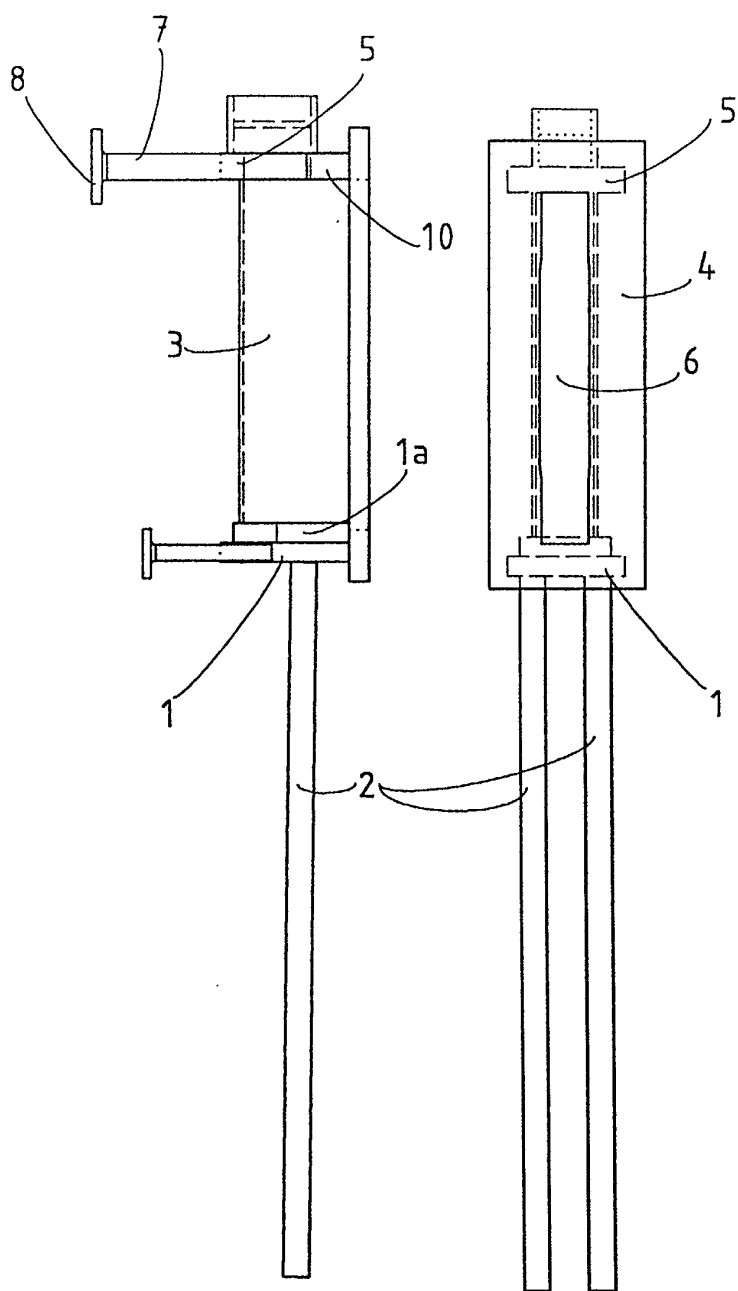


FIG. 1

FIG. 2

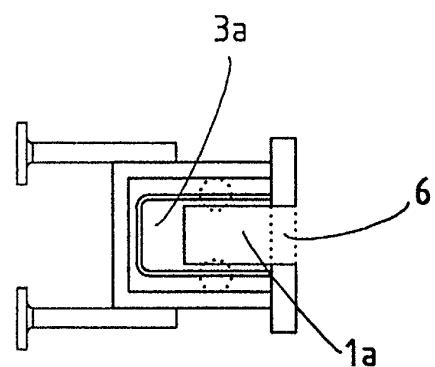


FIG. 3A

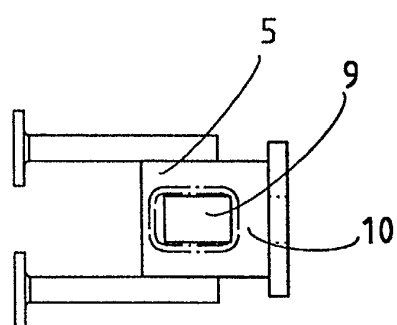


FIG. 3

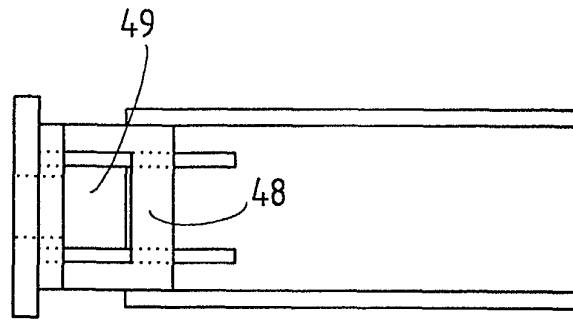


FIG. 5

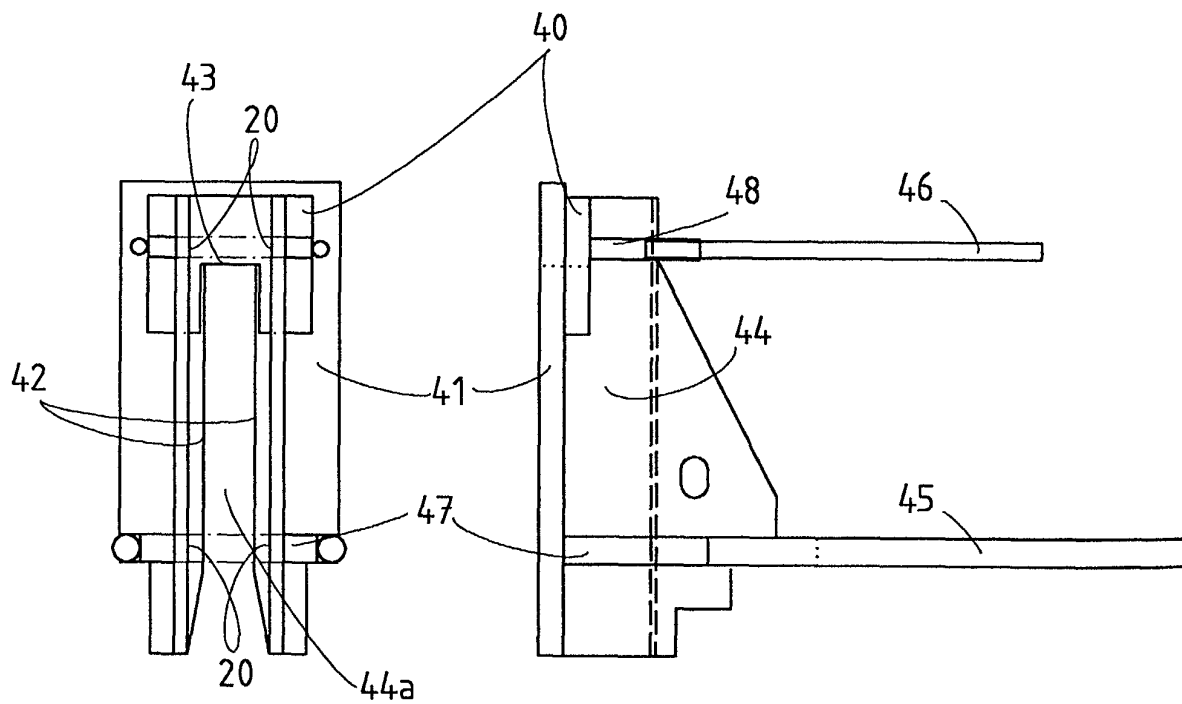


FIG. 6

FIG. 4

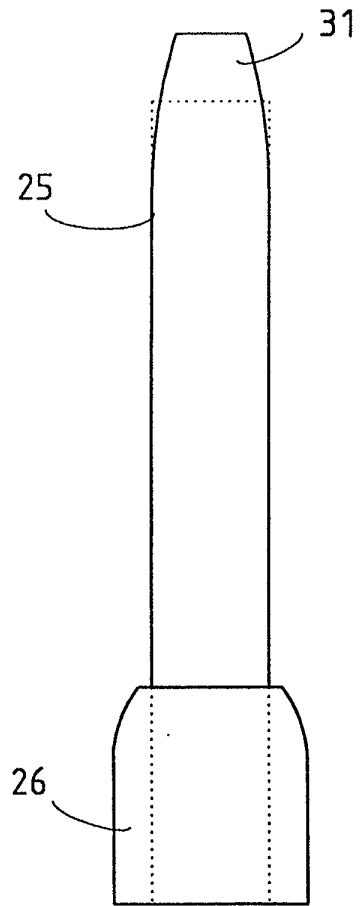


FIG. 8

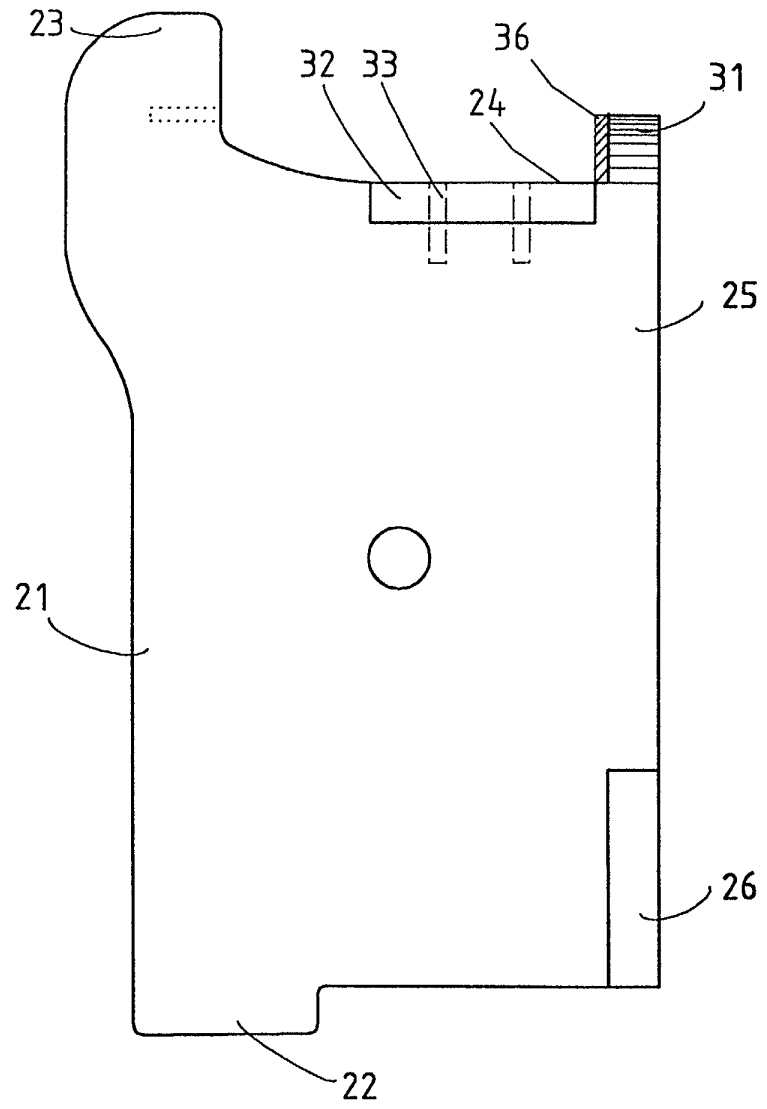


FIG. 7

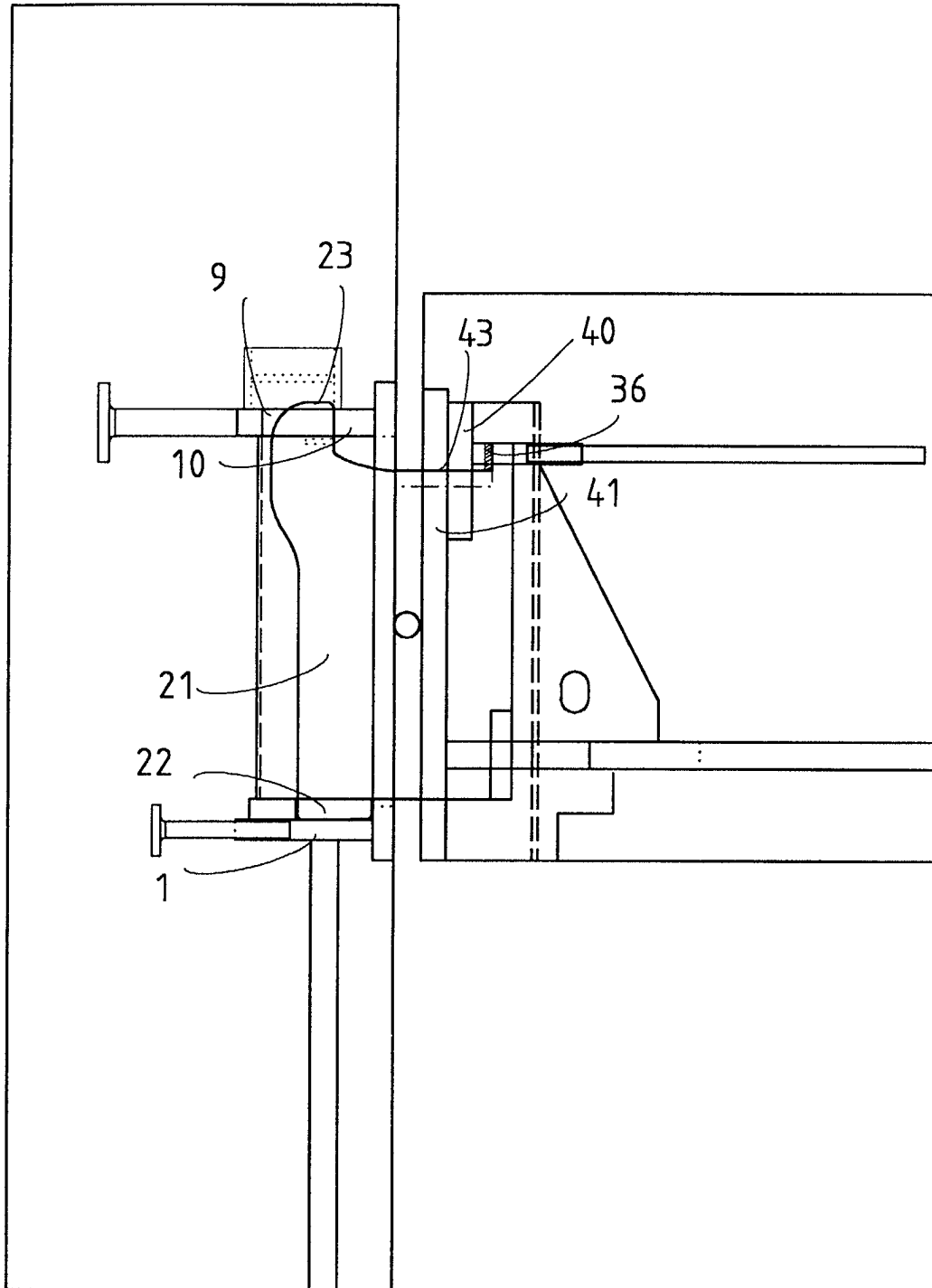


FIG. 9

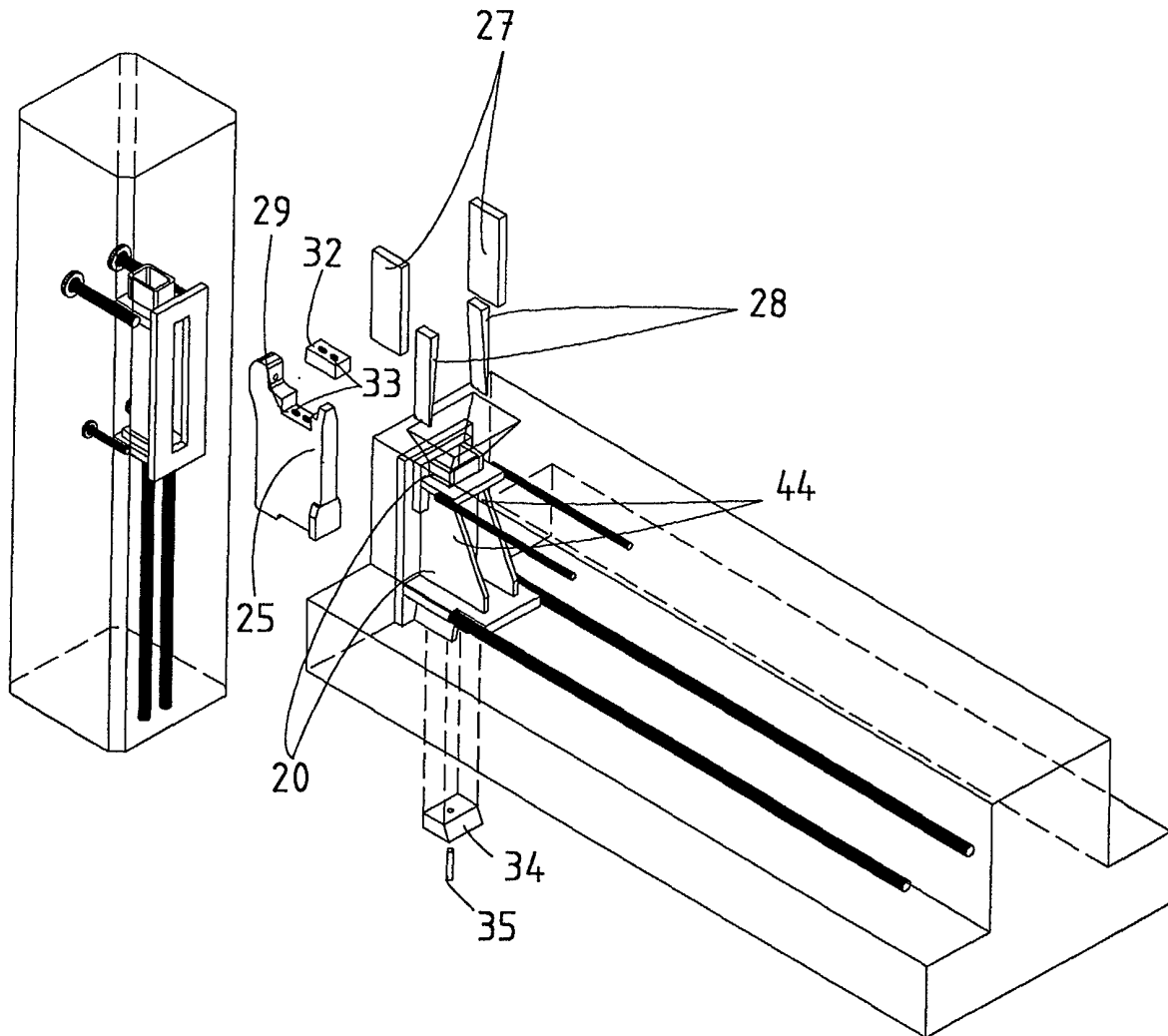


FIG. 10



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 07 9104

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.7)
X	WO 88 08061 A (STRAENGBETONG AB) 20 October 1988 (1988-10-20) * page 8, line 27 - page 9, line 21; figures 1-14 *	1, 4, 6, 8, 9	E04B1/21
A	US 4 951 438 A (THORESEN BJORN O) 28 August 1990 (1990-08-28) * column 5, line 44 - line 48; figure 13 *	1, 4	
A	GB 2 179 115 A (PARTEK AB) 25 February 1987 (1987-02-25)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E04B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		25 February 2003	Zuurveld, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 07 9104

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-02-2003

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 8808061	A	20-10-1988	SE	457221 B	05-12-1988
			EP	0356451 A1	07-03-1990
			NO	885507 A ,B,	12-12-1988
			SE	8701492 A	11-10-1988
			WO	8808061 A1	20-10-1988
US 4951438	A	28-08-1990	NO	871451 A	10-10-1988
			NO	880703 A	18-08-1989
			AT	71419 T	15-01-1992
			AU	601274 B2	06-09-1990
			AU	1493088 A	04-11-1988
			CA	1303379 A1	16-06-1992
			DE	3867590 D1	20-02-1992
			DK	679388 A	31-01-1989
			EP	0311653 A1	19-04-1989
			FI	885604 A ,B,	01-12-1988
			JP	1503317 T	09-11-1989
			JP	2706499 B2	28-01-1998
			WO	8808059 A1	20-10-1988
			ES	2012858 A6	16-04-1990
GB 2179115	A	25-02-1987	FI	72369 B	30-01-1987
			SE	464363 B	15-04-1991
			SE	8603353 A	13-02-1987