PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number:
F16B 12/30, 7/18	A1	WO 86/ 03265
		(43) International Publication Date: 5 June 1986 (05.06.86)

(21) International Application Number: PCT/EP85/00603

(22) International Filing Date: 11 November 1985 (11.11.85)

(31) Priority Application Numbers: 23728 A/84
24246 B/84

(32) Priority Dates: 23 November 1984 (23.11.84)
21 December 1984 (21.12.84)

(33) Priority Country: IT

(71) Applicant *(for all designated States except US)*: ITALTEL TECNOMECCANICA S.P.A. [IT/IT]; Strada Maratta Bassa Km. 3,695, I-05100 Terni (IT).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : ROMANELLO, Giampaolo [IT/IT]; Via Solari, 23, I-Milano (IT). SALVATORE, Daniele [IT/IT]; Viale dei Fiori, 59, I-Cusano Milanino (Milano) (IT). CECCHELLERO, Sergio [IT/IT]; Via Gozzoli, 4, I-Milano (IT). MARTELLI, Enzo [IT/IT]; Vocabolo Campo Maggiore di Cesi, 21/G, I-Milano (IT).

(74) Agent: COGGI, Giorgio; Italtel Società Italiana Telecomunicazioni s.p.a. , P.O. Box 10, I-20019 Settimo Milanese (Milano) (IT).

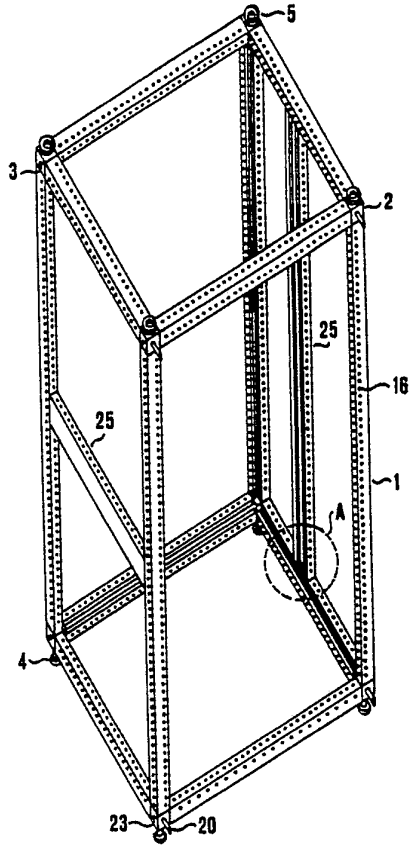
(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent), SU, US.

Published
With international search report.

(54) Title: SECTIONAL STRUCTURE FOR CARPENTRY, PARTICULARLY ADAPTED TO REALIZE RACKS

(57) Abstract

The structure is of the type comprising a plurality of bars (1) and a plurality of joints (2). These latter mainly consist of a cubic body whose center area presents a cavity communicating with each of the six faces by way of a respective clearance hole. Three of such clearance holes are so structured as to receive the head of the relative screw, whose shank is screwed into anchorage elements joined to the bars (1). At least one of the remaining clearance holes is of threaded type. Coupling elements (20) and elastic plates are further described. The coupling element enables the joining two by two of sectional structures of the type described above; the elastic plates allow the locking of cross-bars (25) among pairs of bars (1). These latter and the joints (2) are the main elements of the frame which is the base of the sectional structure according to our invention.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GA**	Gabon	**MR**	Mauritania
AU	Australia	**GB**	United Kingdom	**MW**	Malawi
BB	Barbados	**HU**	Hungary	**NL**	Netherlands
BE	Belgium	**IT**	Italy	**NO**	Norway
BG	Bulgaria	**JP**	Japan	**RO**	Romania
BR	Brazil	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SN**	Senegal
CH	Switzerland	**LI**	Liechtenstein	**SU**	Soviet Union
CM	Cameroon	**LK**	Sri Lanka	**TD**	Chad
DE	Germany, Federal Republic of	**LU**	Luxembourg	**TG**	Togo
DK	Denmark	**MC**	Monaco	**US**	United States of America
FI	Finland	**MG**	Madagascar		
FR	France	**ML**	Mali		

"SECTIONAL STRUCTURE FOR CARPENTRY, PARTICULARLY ADAPTED TO REALIZE RACKS"

The present invention relates to a sectional structure particularly for use in the realizazion of carpentry works, e.g. of the type adapted to support electrical or electronic devices.

The circuits and devices needed for implementation of electrical or electronic systems are usually located inside racks that perform the double function of support and protection. The racks in question must provide a good and strong mechanical structure as, due to safety reasons, they are usually required to be able to stand relevant stresses, including bursts or explosions which might occur in electric energy distribution systems caused by possible short-circuit events.

To comply with the mechanical robustness, such racks are usually realised with a metal structure covered by panels anchored to the structure itself.

Considering that such racks may present a wide range of sizes, the metal structure is usually obtained by assembling a plurality of elementary pieces which are obtained by the subdivision of a bar which in turn is obtained by shearing and then folding iron sheets.

Purpose of the present invention is the realisation of a modular structure for carpentry works so structured as to allow an easy assembly and an higher number of modular composition possibilities.

Object of the present invention is therefore a sectional structure for metal carpentry works, particularly fit for the realisation of industrial racks of the type comprising a plurality of bars and joints that may be linked to the bar through screws.

The joints mainly consist of a body, whose base shape is substantially cubic, three faces locating a trihedron angle providing a shank whose transversal section is complementary to the inner profile of the bars. In the center area of such a cubic body is provided a cavity which communicates with each of the six faces through a respective clearance hole.

The clearance holes communicating with the faces of the cubic body equipped with said shanks are fit to accomodate the screws, whose head can be received in a place communicating with such a cavity and whose shanks can be screwed into threaded holes provided by anchorage elements which are placed inside the bars. At least one of the clearance holes communicating with the faces of the cubic body not equipped with said shanks must be threaded.

Further characteristics of the structure can be taken from the following description which refers to a non-limiting example shown in the following drawings, whereas:

- Figure 1 shows a perspective view of the structure using the solutions which are the base of the invention;

- Figure 2 shows a detailed view of one of joints 2 under Figure 1;

- Figure 3 shows a section of one of joints 2 of Figure 1;

- Figure 4 shows a detailed view of one of the coupling elements under Figure 1;

- Figure 5 shows a coupling element 20 together with two joints;

- Figure 6 shows a frame realized by element 20 of Figure 4 together with four joints 2 corresponding to four different structures;

- Figure 7 shows section A of Figure 1 with the explosion of the single elements;

- Figure 8 shows a view of the elastic plate 27 under Figure 7;

- Figure 9 shows the side view of bar 25 of Figure 7 which supports said elastic plate 27.

The structure of Figure 1 is realized by way of a plurality of bars 1 and a plurality of joints 2. These latter mainly consist of a cubic body whose side size corresponds to the outer size of the transversal section of bars 1.
Three faces of the cubic body locating a trihedron angle result to be coupled to as many bars 1 via joints illustrated in detail in Figures 2 and 3. The remaining three faces of the cubic body present a threaded hole 3 (better shown in Figure 3) fit to receive a plurality of elements such as the shank of feet 4, or the shank of devices 5 adapted to allow the hoisting of the structure or the coupling element 20 better shown in Figure 4.
Figure 2 shows in detail one of such joints 2 together with two bar portions 1. As evident this figure illustrates the faces of the joint destined to be joined to bars 1 and to this aim said faces provide a shank 6, whose profile coincides with the inner profile of bars 1. The axis of each of these three faces coincides with the axis of a hole 7 which is arranged to receive the shank of a screw 8, whose head results allocated in a cavity inside the cubic

body as better indicated in the following description of Figure 3.

Screw 8 provides such a length that a good portion thereof comes out from the free end of the shanks and its shifting according to the axis is reduced by the head on the one side and by an elastic ring 9 on the other side; the ring is coupled to the screw when a structure composition occurs. This ring avoids in fact that the screw comes out of its place before or during said composition operation.

The structure further provides the presence of anchorage elements consisting for example of a plate 10 whose shape coincides with the inner profile of the bars 1. Such plates 10 are inserted inside the bars and joined thereto, for example through soldering, at a distance from the ends not inferior to the height of shanks 6 of the cubic body. Plates 10 provide a threaded hole 11 fit to receive the shank of said screws 8, whose center coincides with the axis of bars 1.

According to a second embodiment of the solution, plates 10 result to be coupled to bars 1 at least through a pair of stirrups 12, illustrated as an example in the vertical bar of Figure 2. These stirrups 12 may be obtained by way of as many drawings effected on at least two opposite angles of the bars, so structured as to provide a flat surface in coincidence with the area of contact with plate 10.

According to a further embodiment, this flat surface of drawings 12 provides a hole 13 adapted to receive a respective tooth 14 of plate 10. The use of said stirrups involves a change in the profile of shanks 6 which will have to provide chamfered angles (not illustrated) fit to receive the drawings of said bars.

The figure also shows cavities 15 on shanks 6 to receive the shank of screws which are to be screwed into threaded holes 16 provided on bar 1 (see Figure 1). Such screws have the task of performing the tightening of panels if the structure is provided for the implementation of racks.

Another realisation provides shanks 6 shaped as illustrated in Figure 5 and does not require therefore the presence of cavities 15.

Figure 3 illustrates the section of joint 1 as well as a view of the second joint.

From said section it is possible to see that the center of the cubic body 2 coincides with the center of a cavity 17 which communicates with each face of the cubic body through holes 7.

In particular the holes which communicates with the faces equipped with said shanks 6 provide such a diameter as to receive the shank of screws 8, and in coincidence with the end facing the cavity 17, such a diameter is so enlarged as to create a place 18 adapted to receive the head of the screw.

The holes (3) communicating with the remaining three faces provide instead a diameter not inferior to the diameter of the screw heads and however such as they can be crossed by the shank of a tool fit to allow the screwing of the shank as mentioned above. At least one of these three latter holes is threaded to allow the screwing of the shank of one of the elements mentioned above (4, 5 or 20).

The faces of joint 2 not presenting said shanks 6 provide the presence of a further threaded hole 19 that results aligned, in an assembled structure, with holes 16 obtained on bars 1 in order to allow, for instance, the anchorage of said panels to both bars 1 and joints 2.

Figure 4 shows a coupling element 20 adapted to allow the joining of two or more modular structures of the type mentioned above. Such an element is composed by a body element 20, stretched shaped, mainly constituted by a cylinder having a diameter d inferior to the diameter D of said threaded holes 3 of joints 2. On each end of element 20 there is a seat 21 whose width corresponds to d and whose depth corresponds to d/2, having the task to allow the realisation of a frame similar to that one illustrated in Figure 6.

A hole 22 faces said seat 21, and the axis of the hole is perpendicular to the cylinder 20 axis and the hole 22 is truncated cone - shaped.

The coupling element provides the presence of a pair of screws 23 which have a threaded head and the shank shaped to the said hole 22 size.

Figure 5 shows a pair of joints 2 that are part of two structures, as illustrated in Figure 1, and are adapted to be coupled by way of the element shown in Figura 4.

The said coupling is realized by inserting the cylinder 20, up to the half of its greatest size, in one of the holes 3 of the first joint 2 and inserting the remaining half in the opposite hole 3 of a second joint 2. The insertion is correct when the axis of each hole 22 corresponds with the relative axis of holes 3, perpendicular to holes 3' where the cylinder 20 is inserted, and when such a portion, truncated cone-shaped, faces the corresponding hole 3'. Once reached such a condition it is then possible to start the blocking operation to be performed through screws 23, whose shanks have to be placed inside holes 22 provided on element 20.

The truncated cone-shaped portion of screws 23 has the task to allow the screwing when the alignment above mentioned is not reached.

Such a portion in fact is engaged against the truncated cone-shaped portion of holes 22 and causes therefore a side shifting of element 20 till to reach the coincidence of the axis as above. In such a condition it is possible to complete the coupling operation by producing the placing of the cylindric portion of the shank of screw 23 into the cylindric portion of hole 22.

Figure 6 shows a frame that is composed by four coupling elements similar to those ones illustrated in Figure 4. Such a frame is adapted to block four sectional structures whose joints are shown with a dotted line. The frame is of modular type due to the presence of said seats 21 which allow the placing at right angle of two contiguous elements as well as the placing of end 24 of an element 20 in seat 21 of the contiguous element 20.

As said seats 21 has a depth equal to d/2, where an overlap of the ends of two continguous elements 20 takes place, the frame presents a d size and is therefore adapted to be placed inside said holes 3' of joints 2. The joining of each pair of elements 20 to the corresponding joint 2 is realised through a single screw 23 once reached the alignment of hole 22 on an element 20 to the same hole of the contiguous element 20 as well as to the relative hole 3'.

Remaining always in the same solution, it is possible to realize such elements 20 without seats 21. In this way it is obtained an element able to accept a pair of structures, but unable to form frames for the joining of other sectional structures as illustrated in Figure 6.

Making again reference to Figure 1 it is possible to note that in some embodiments the structure described above is completed with cross-bars 25, horizontally or vertically placed, that have their ends joined between two vertical or two horizontal bars 1 through means at this end provided.

Figure 7 shows the particular A of Figure 1 in order to better evidence the structure of said cross-bars 25 as well as the anchorage elements as stated above. In particular it is possible to note that the horizontal section of said cross-bars is rectangular-shaped where one of the longer sides provides a hole 26 through which a plate 27, fit for the assembly operation, is inserted. The anchorage elements are composed of a base element 28, provided at each end of cross-bars 25, which is mainly obtained by folding a section of the aluminium or iron sheet which composes the cross-bars 25.

The outer part of element 28 is linked to the side of a vertical bar 1 and has to be tightly coupled to the same through two screws 29, supported by an elastic plate realized according to the invention.

It will be more evident in the continuation of the description and with reference to Figure 8 that said screws 29 have their axes coincident with the axes of the holes provided in the base element 28 making therefore easier the coupling operation, that could be realized by introducing a screwdriver in the hole 26 of the cross-bars 25 and performing the screwing operation without having to support the screws.

From Figure 8 it results evident that the elastic plate 27 is composed by a base body 30, adapted to be placed inside the cross-bars 25 and which results to be equipped with a pair of holes 31 with a diameter superior to the shank diameter of screws 29. Holes 31 are provided with apexes 32 which, due to the elastic

composition, lose their proper shape and, engaging against the threaded screws 29, prevent the same from coming out of the holes.

The elastic plate further provide a pair of arms 33 that according to a preferential embodiment are disposed at right angle in comparison with the base body 30. One of the arms end is in fact joined to one end of the base body 30, while the other end is so shaped as to be complementary with one of the edges of said cross-bars 25 which delimitates the hole 26 mentioned above. This latter end of arms 33 has the task to perform the elastic anchorage of the plate to said edges.

Figure 9 shows a side view of bar 25 under Figure 7 in order to evidence the function performed by the apexes 32. In addition to the locking of screws 29, the apexes provide the electric connection of the elastic plate to the horizontal bars by scratching, during the locking operation of screws 29, the paint deposited in the base element 28. The said electric connection is required for instance when the industrial racks are assigned to the allocation of electronic devices.

According to a preferential embodiment the said plate is equipped with two holes 31, whose axis are 20 mm away and therefore the holes provided on the side of the vertical bars 1 as well as the holes on the sides of cross-bars 25 have the same 20 mm step. It has been noticed that a step shaped as described above is considered the optimum when the said structure has to be realised using flexible automatic lines which make easier the working of the the processor that controls the production line.

According to the invention the structure fulfills the requirements cited, is of modular type and easily composable.

This latter feature comes from the structure which uses a single screw 8 for the joining of one bar 1 to a joint 2 and uses said elastic plate 27 which facilitates the joining operation of cross-bars 25 to bars 1, enabling the preassembling of the screws with the cross-bars ends.

CLAIMS

1. A sectional structure for carpentry works, particularly adapted to realize racks of the type comprising a plurality of bars joined through screws to a plurality of joints, these latter consisting of a cubic body, wherein the three faces locating a trihedron angle provide a shank of shape complementary to the inner profile of the bars; said cubic body providing in its center area a cavity which communicates with any of the six faces through the respective clearance hole, the clearance holes communicating with the faces of the cubic body providing said shanks being adapted to accomodate said screws whose head is placed in a section communicating with such a cavity and whose shank is screwed into threaded holes which are obtained on anchorage elements joined to the bars, characterized in that at least one of said holes (3) communicating with the faces of said cubic body (2) not equipped with said shanks (6) is of threaded type.

2. A structure as claimed under claim 1, characterized in that joints (2) provide the presence of recesses (15) obtained on the shanks (6) in an area coinciding with the prolongation of the connection line of the axis of a plurality of holes (16) provided on the sides of bars (1) and provide further the presence of threaded holes (19), obtained in the faces of the cubic body (2) not equipped with said shanks (6) in an area coinciding

with the cross point of the prolongation of the connection line of said holes (16) provided on horizontal bars (1) and of the prolongation of the connection line of said holes (16) provided on vertical bars (1).

3. A structure as claimed under claim 1,characterized in that an elastic ring (9) is located on the shank of said screws (8) that comes out from shanks (6).

4. A structure as claimed under claim 1,characterized in that the said anchorage elements rest on a pair of stirrups (12) provided inside bars (1) at a distance from an end not inferior to the height of shanks (6) of the cubic body (2), in that said stirrups are realized through a drawing in coincidence with at least two opposite angles of bars (1), so shaped as to provide a flat surface perpendicular to the axis of the bars and in that said stirrups (12) provide a hole (13) adapted to receive a respective tooth (14) of the anchorage elements.

5. A sectional structure for carpentry works, of the type described in at least one of the claims above and comprising coupling means with at least a similar sectional structure, characterized in that said coupling means are composed by a coupling element 20 stretched shaped, and by a pair of screws (23); in that the portion of said element 20, perpendicular to its main axis, presents a dimension d inferior to diameter D of the clearance holes (3) provided on said joints (2); in that said

element (20) presents near each end a hole 22, a section of which if truncated cone - shaped, and in that said screws (23) have a threaded head and the shank has a truncated cone- and a cylindric-shaped section.

6. A sectional structure as claimed under claim 5, where said element (20) on each end presents a place (21) with a width not inferior to such dimension d and a depth not inferior to d/2.

7. A sectional structure as claimed under claim 5 and 6 characterized in that said element (20) presents a transversal section round shaped, whose diameter is equal to d.

8. A sectional structure as claimed in at least one of the claims above and comprising a plurality of cross-bars with a transversal section, polygonal shaped, and joined perpendicular to the bars through elastic plates, characterized in that each elastic plate (27) is composed by a base element (30) and at least two arms (33), in that the base element has at least a hole (31) adapted to receive the screws shank (29) which performs the assembly of bars (25) to cross-bars (1) and in that one end of the arms (33) is joined to the base element (30) while the other end is so shaped as to be complementary to the edges of hole (26) of said cross-bars (25).

9. A plate as claimed under claim 1, characterized in that said arms (33) at the sides are located at right angle in comparison with base element (30) and in that said hole (31) is equipped with elastic apexes (32).

10. A structure as claimed under claim 2 and 9 characterized in that said elastic plate (27) provides two holes (31) whose axis are 20 mm away, that is the maximum distance between the axis of a contiguous pair of said holes (16) provided on the sides of bars (1).

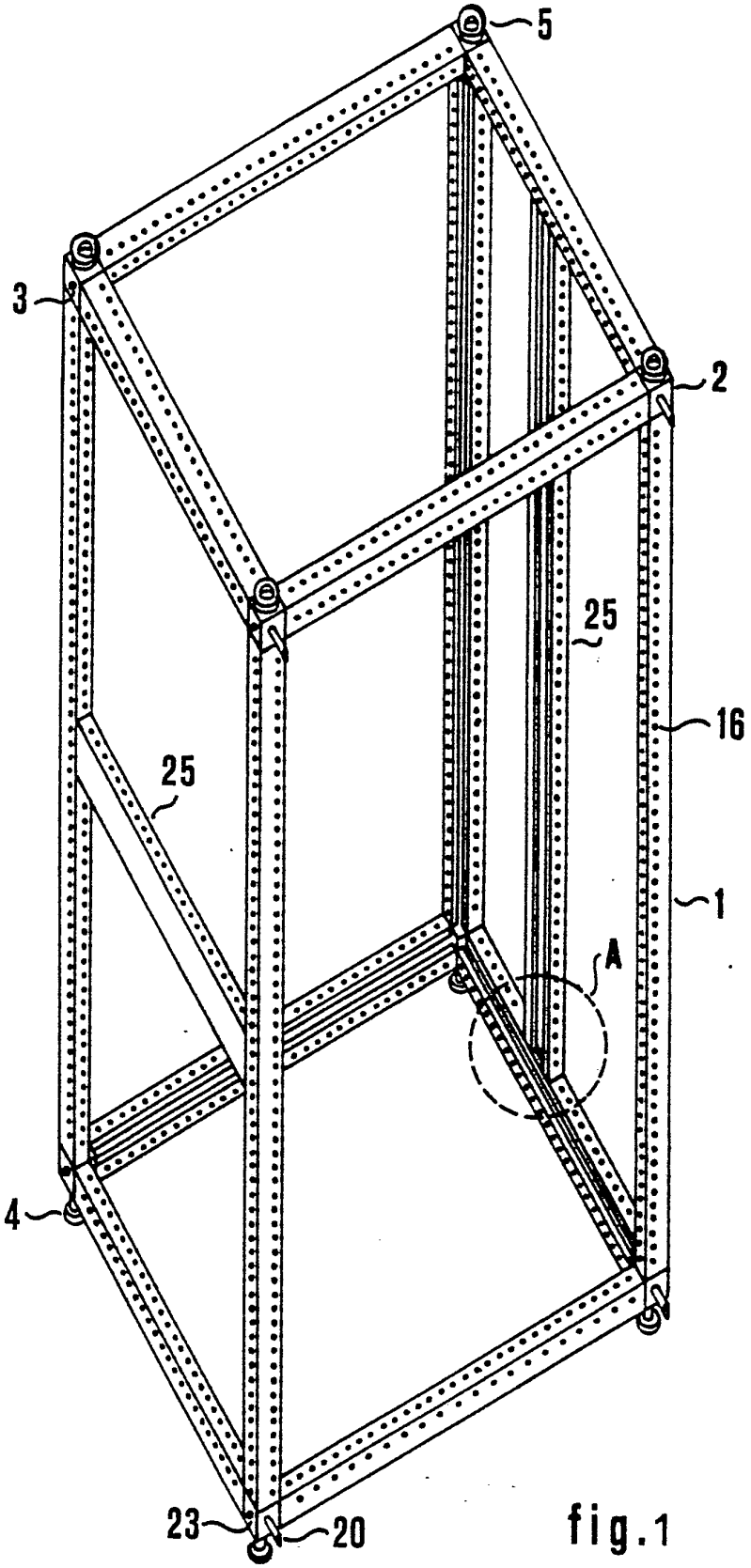


fig.1

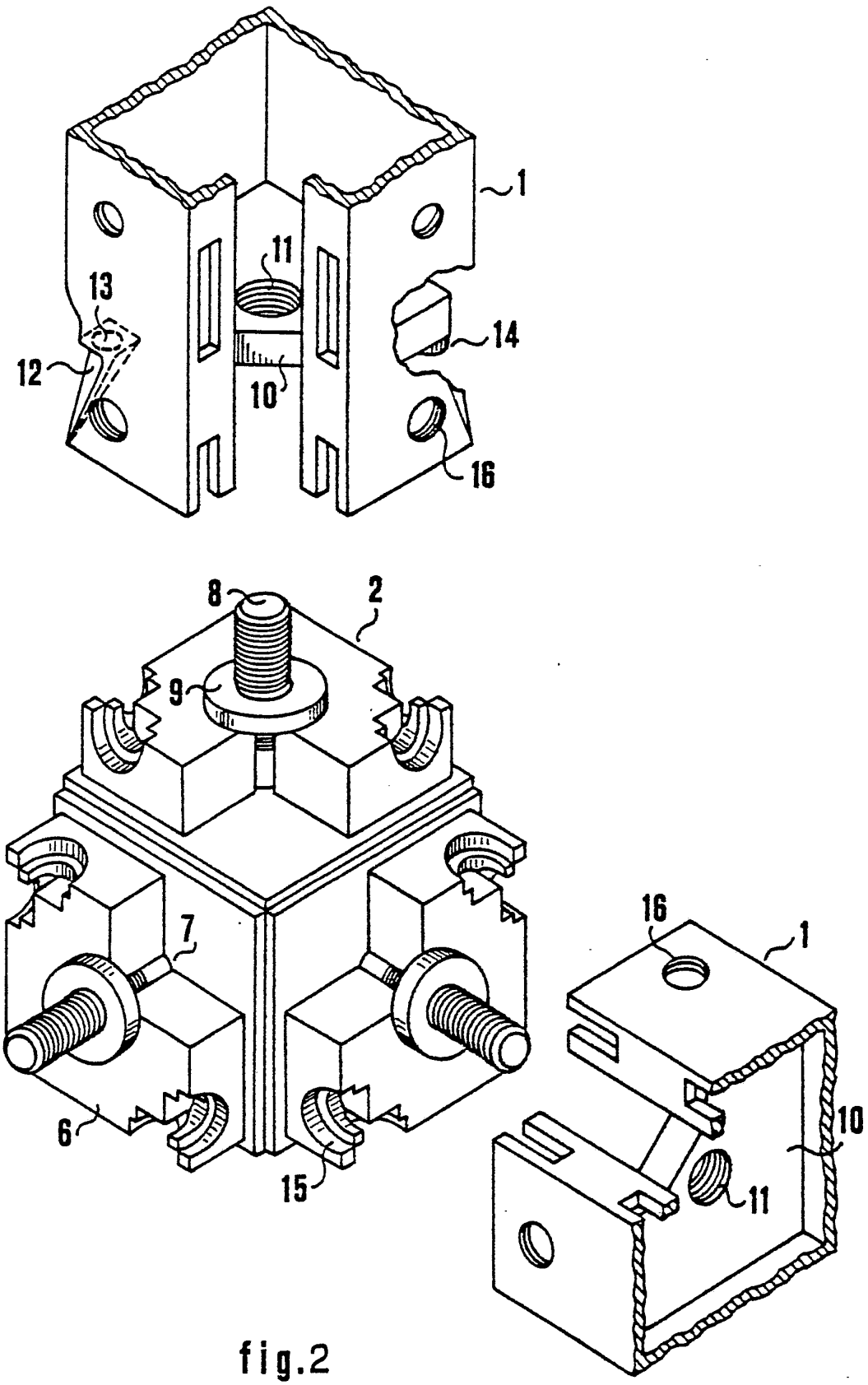


fig.2

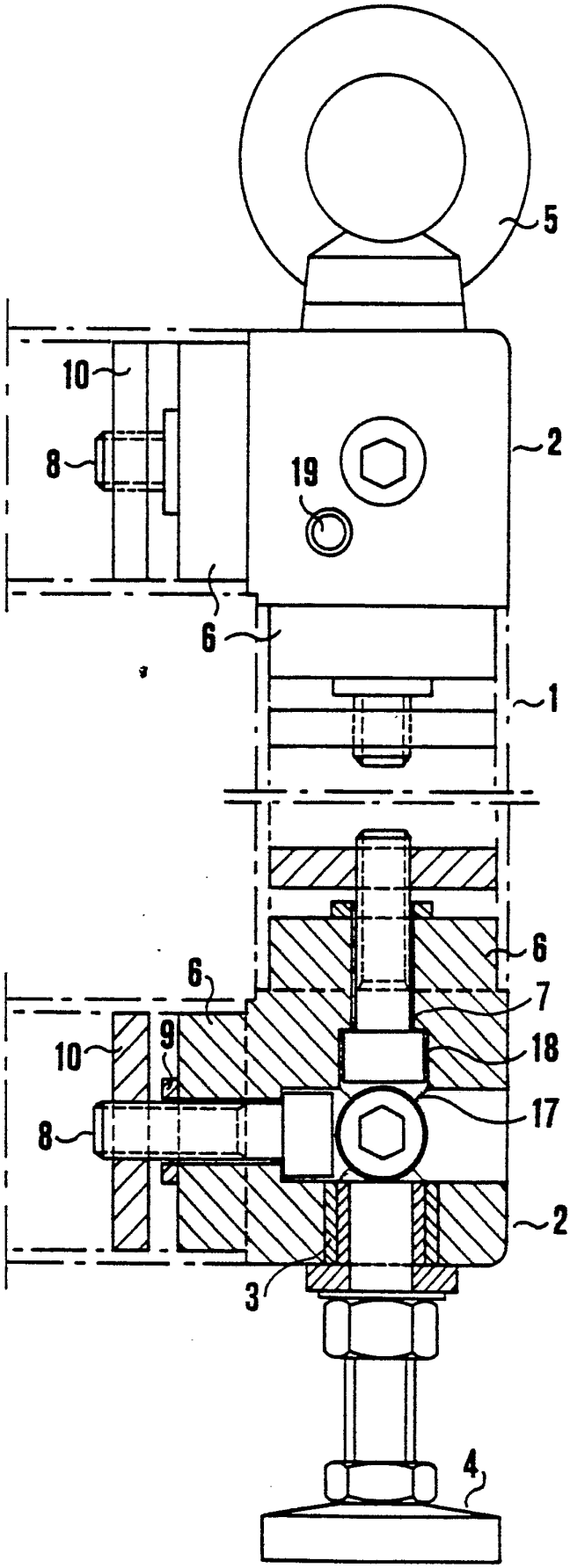


fig.3

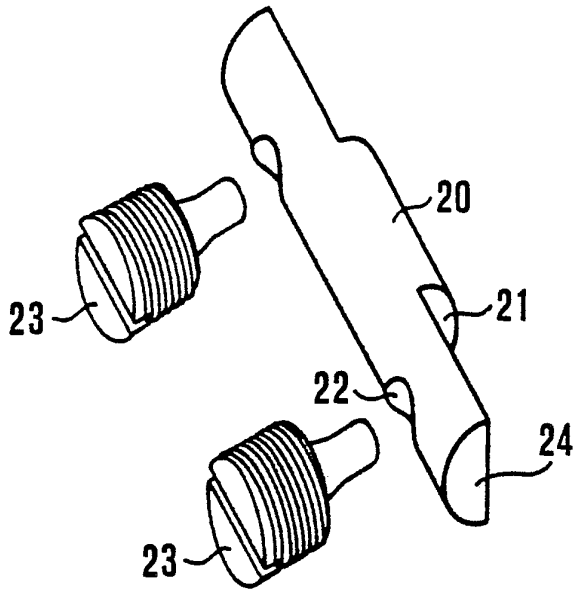


fig.4

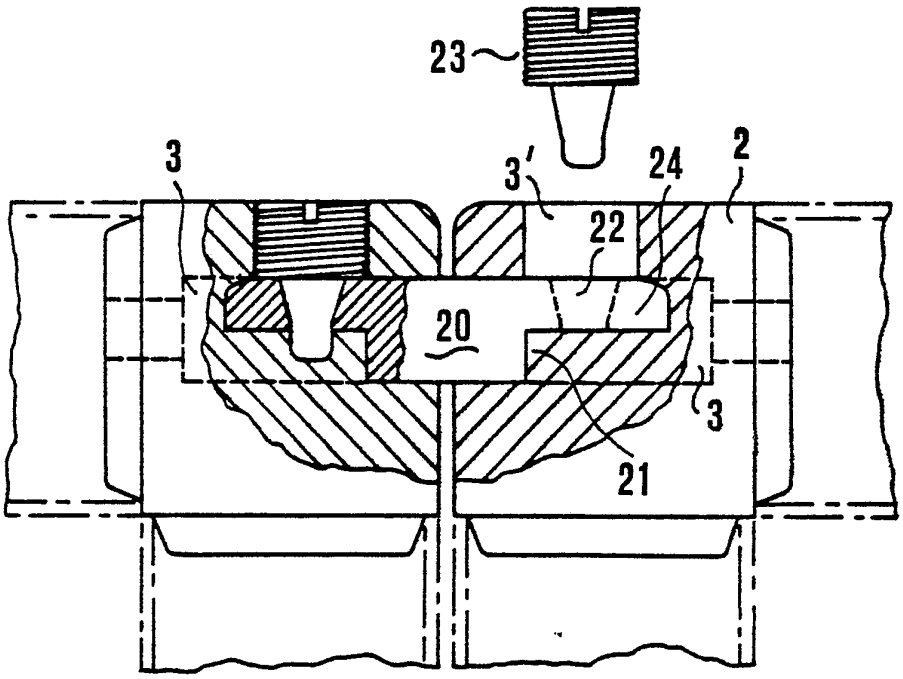


fig.5

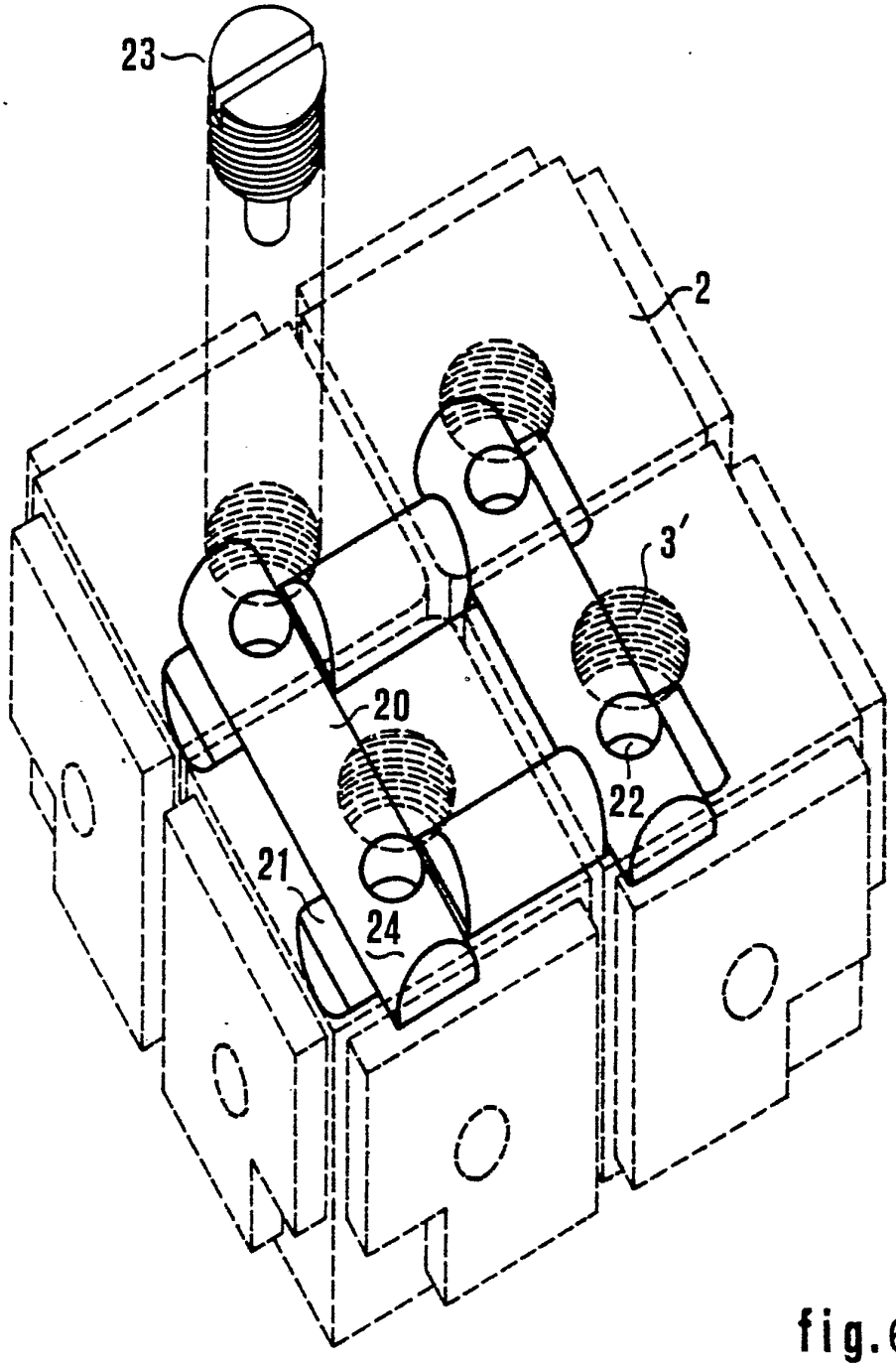


fig.6

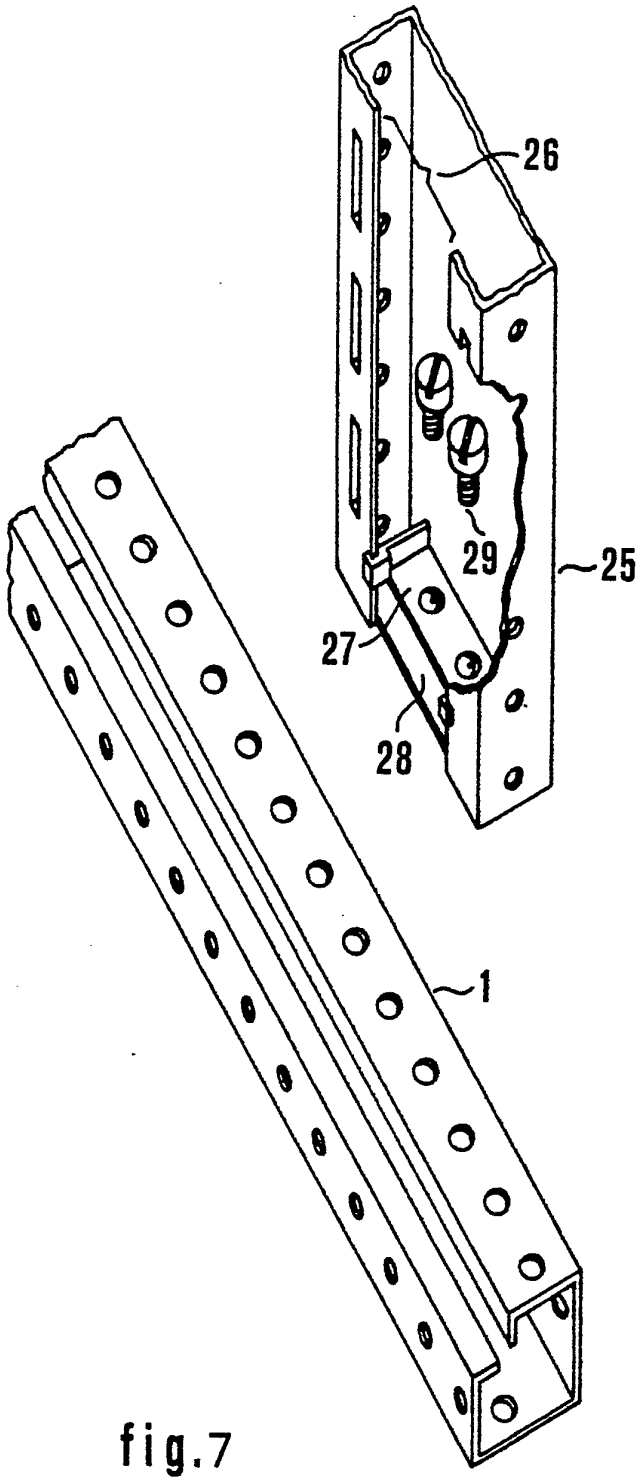


fig.7

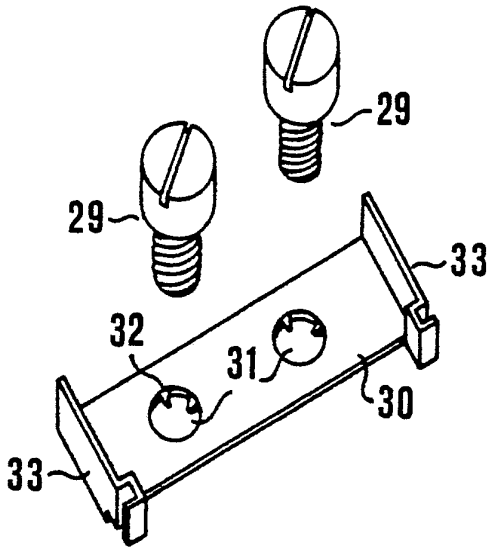


fig.8

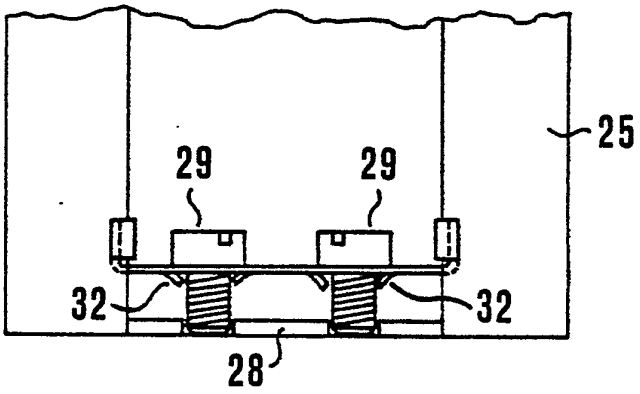


fig.9

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 85/00603

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: F 16 B 12/30; F 16 B 7/18

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	A 47 B; F 16 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	DE, A, 1654759 (ZENTRONIK) 2 September 1971 see the entire document	1
Y	US, A, 4012153 (PIDGEON) 15 March 1977 see column 1, lines 5-17; column 2, lines 8-48; figures 1-3	1
A	US, A, 3292323 (HAGAN) 20 December 1966 see column 5, lines 22-27; figures 4,5,7	1,2,3
P,A	DE, A1, 3324675 (BAACK) 17 January 1985 see claims 1,2; figure 1	1,4
A	GB, A, 1285411 (TAYLOR) 16 August 1972 see page 1, line 91 - page 2, line 51; figures 1,2	5,6,7
A	BE, A, 687929 (SCHULTZE-BONATZ) 16 March 1967 see page 5; figure 15	5

./.

* Special categories of cited documents: [10]

"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

"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 patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
28th February 1986	21 MARS 1986
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	DE, A1, 2627260 (LOEGSTRUP) 13 January 1977 see figures E,F; pages 14,15	8,9,10

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/EP 85/00603 (SA 11307)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 17/03/86

The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A- 1654759	02/09/71	None		
US-A- 4012153	15/03/77	None		
US-A- 3292323		None		
DE-A- 3324675	17/01/85	None		
GB-A- 1285411	16/08/72	None		
BE-A- 687929	16/03/67	NL-A-	6613820	10/04/67
		GB-A-	1117737	
DE-A- 2627260	13/01/77	NL-A-	7606607	22/12/76
		GB-A-	1512899	01/06/78
		SE-B-	421578	04/01/82
		SE-A-	7607058	21/12/76