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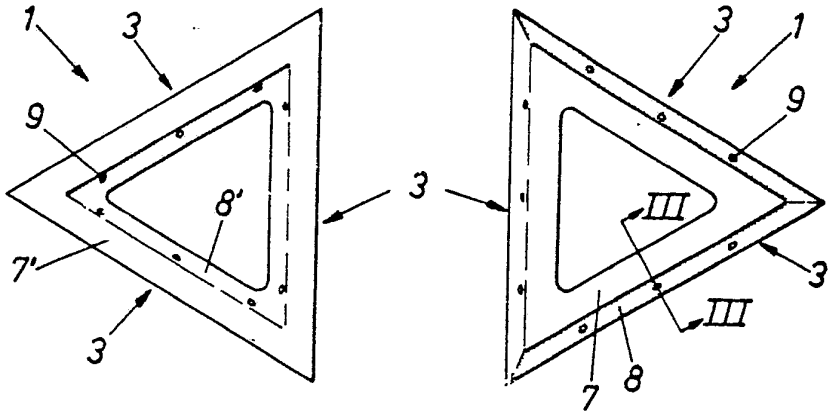
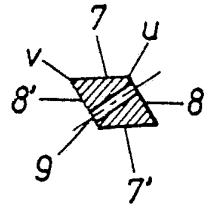
(54) Title: BUILDING UNIT, METHOD FOR THE MANUFACTURING THEREOF AND USE OF THE BUILDING UNIT





(57) Abstract

A building unit (1) in the form of a plane unit of acute-angled triangular shape comprises three connected crosspieces (3) each having two substantially plane sides (7, 7') being parallel and situated in parallel planes, and an outer edge face (8) being substantially plane and forming an angle (v, u) differing from 90° with the parallel planes. In the crosspieces (3) there may be provided a number of connecting means, for example through-bores (9), so that a number of building units may be connected and thereby form a spatial figure.

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BUILDING UNIT, METHOD FOR THE MANUFACTURING THEREOF AND USE OF THE BUILDING UNIT.

The invention relates to a building unit in the form of a plane unit of acute-angled triangular shape. Acute-angled means that the outer limits of the unit are sides in a triangle having acute angles, i.e. angles less than 90°.

There are known several different forms of triangular building units which can be connected to form one or more different articles for everyday use or for decoration by connecting a number of uniform units.

It is the object of the present invention to provide a building unit which may both be used separately, in pairs and which is suitable for being connected in a number so that it is thereby possible to form many different forms of articles for everyday use or for decoration particularly articles which may be used as household goods or in connection with household goods, as units in connection with house building, as toys etc.

This is achieved by designing the building unit according to the invention as disclosed in the characterising part of claim 1. There is thus obtained a very simple unit which due to its particular geometrical shape may be connected in innumerable ways and form many different figures for use for various purposes. The building unit may be designed so as to have little weight but nevertheless sufficient strength to any desired applications, and the building unit is moreover designed in such a manner

that it may be used separately or be connected with other corresponding building units without all the building units which are to be connected requiring exactly the same shape.

By designing the building unit according to the invention as disclosed in the characterising part of claim 2, there is obtained a unit having a harmonic appearance in that the opening in the unit gets the same shape as the unit itself. This design will moreover permit the application of many different generally known connecting methods and permit manufacturing of the unit in a rational manner so that manufacturing costs are reduced. The cross-sectional profile of the crosspieces thereby becomes rhomb-shaped, preferably as an equilateral rhomb.

Depending on whether the crosspieces are of the same or different lengths it is possible by connecting a number of building units to form a number of different figures or household articles. For example, two building units may be connected so that two outer edge faces of each of the units are in two planes at right angles to each other.

The building unit according to the invention is for example designed as disclosed in the characterising part of claim 3. It is possible to use other angles than those mentioned in the claim but with the stated angles there is obtained an equilateral building unit which is simple in use, for example in or at a corner, against or on a plane surface such as a wall, or which can form a complete spatial figure because of the equilateral form of the unit.

By designing the building unit according to the invention as disclosed in the characterising part of claim 4, there is obtained a very simple and discreet connecting method in that the connecting means are preferably provided on or in a normally rearwardly facing side.

If the building unit according to the invention is designed as disclosed in the characterising part of claim 5, the bores may be used for connecting the units to each other as well as for screw holes for for example fixing the units to a wall. Moreover, the visible edges of the bores form part of the decorative appearance of the building unit.

If the connecting means of the building unit according to the invention are designed as disclosed in the characterising part of claim 6, the need for visible connecting means on the normally outwardly facing side is avoided.

The building unit according to the invention may be manufactured as disclosed in the characterising part of claim 7 by starting with a sheet material which is machined. This will permit manufacturing of the building unit according to the invention by two process steps, viz. by a cutting of the outer profile and a subsequent machining of the internal profile. There is thus obtained a very fast and automated manufacturing process in that the entire manufacturing may proceed on programmed machine tools.

The building unit according to the invention may find

use for a great number of different household articles such as household articles as disclosed in claims 8, 9 and 10.

The invention will be further explained in the following with reference to the drawing wherein

Fig. 1 is a building unit according to a first embodiment viewed from one side,

Fig. 2 is the same building unit viewed from the other side,

Fig. 3 is a plane cross-section of a crosspiece in Fig. 2,

Fig. 4 is a plane section corresponding to Fig. 3 but in another embodiment of the building unit,

Fig. 5 is the other embodiment viewed from one side,

Fig. 6 is the same building unit as in Fig. 5 but viewed from the other side,

Fig. 7 is two building units as a shelf bracket,

Fig. 8 is two building units as a shelf support,

Fig. 9 is a number of building units forming a spatial figure,

Fig. 10 is two building units forming a basket or

the like, and

Fig. 11 is another embodiment of the unit shown in Fig. 2 and at a larger scale.

The building unit shown in Figs. 1-3 consists of three integral rods, beams or crosspieces 3 made of for example plastics, steel, concrete, wood or fibre material. Fig. 1 shows the unit viewed from what would generally be termed the front, and Fig. 2 is a rear view of the unit. In the centre of the unit there is a through-opening of triangular shape with rounded corners since the inwardly facing edge faces 8' are produced by milling. In the three crosspieces there are a number of bores 9, for example three bores in each crosspiece placed at intervals of a quarter of the length of the crosspiece. The building unit 1 is equilateral and the angles v and u in the cross-sectional profile shown in Fig. 3 will be 35,264° and 144,736° which by usual manufacturing tolerances may be reckoned as approx. 35,3° and 144,7° which angles are situated between the edge faces 7 and 8 where 8 is the outer edge face and 8' is the inner edge face and where the sides 7 are mutually parallel just as the sides 8 and 8' are mutually parallel.

The building unit 2 shown in Figs. 4-6 is designed in a manner similar to the building unit shown in Figs. 1-3 but the crosspieces 4, 5 and 6 are of unequal length. This produces the result that the cross-sectional profile becomes different in the three crosspieces. The bevelled angles u and v will therefore not have the same angle as by equilateral units

but by a suitable choice of the angles u and v dependent on the relative lengths of the crosspieces it is possible to still make the planes wherein the edge faces 8 of the unit are situated intersect each other at an angle of 90°.

The through-bores 9 are made at right angles to the edge faces 8 and 8' and arranged symmetrically thereby permitting connection of two units edge to edge as shown in Fig. 7, pins or screws 15 being mounted in the bores 9. The two building units 1 shown form a shelf bracket which may be fixed to a wall by means of screws mounted in the bores in the crosspieces resting against the wall (the plane of the paper) and a shelf 10 may likewise be secured by means of pins in the bores 9 which pins engage holes in the underside of the shelf 10.

The simplest application is to place a single unit in a corner as a bracket for a corner shelf.

The geometrical design of the crosspieces is such that the crosspieces supporting the shelf in Fig. 7 will have their outwardly facing edge face 8 situated in a common plane corresponding to the plane of the shelf 10.

The building unit may also be used as shown in Fig. 8 where the bores 9 facing each other are used for retaining a couple of bars 12 which may for example be used as supports for hangers and the like or have a decorative effect. Apart from the upper shelf 10 it is possible inside the structure to mount a further shelf 11.

Fig. 9 of the drawing shows a lamp suspended in a wire 14, said lamp being designed by a number of building units of somewhat different design in that the upper building units 1 are equilateral and of the kind shown in Figs. 1-3 whereas the building units 2 arranged thereunder are of the kind shown in Figs. 4-6 of the drawing. In the triangular openings there may be provided glass or similar translucent material.

If equilateral building units are used, eight units may form a regular octahedron. If isosceles building units are used, two different octahedrons may be formed by eight units, and if units where all sides are of different lengths are used, eight units may form three different octahedrons.

Fig. 10 shows a suspension basket composed by two building units of the type shown in Figs. 4-6 wherein the short sides are joined and the longer sides define the limit against a wall and define the upwardly directed opening of the basket, respectively. In the triangular openings there is provided sheet material 13.

Fig. 11 shows a further embodiment of the connecting means in that projections 16 with through-bores 17 in transverse direction may hold together the units by means of pins or screws in the bores. The projections are substantially parallel to the outer edge face 8 and form an integral part of the side 7. In this manner the connecting means will not be visible on the outer side. The connecting means 16 may for example

also be used for retaining various fillings in the central opening.

The building unit according to the invention is preferably manufactured by cutting in the usual manner a sheet material with the required thickness into triangular sheet-formed objects which are then machined by moulding or cutting so as to form the inwardly directed edge faces 8'. There is thus obtained rounded internal corners in that the rounding is determined by the diametre and shape of the cutting or moulding tool.

It is obvious that if the building unit according to the invention is to be manufactured of a plastic material, the most advantageous procedure would be to produce the unit by injection moulding but this will require a complete mould for each size and for each type of building unit. By production by means of a programmed moulding or cutting machine it is possible by simply using a program to determine the size and shape of the individual building unit thus simplifying the manufacturing process and permitting a quick change of production. Particularly the embodiment according to Fig. 11 is advantageous for injection moulding in plastics to form a unit.

The building unit according to the invention may be produced in small dimensions, e.g. for toys or toy systems, in larger dimensions, e.g. for household articles as mentioned in connection with Figs. 7-10 of the drawing, or in very large dimensions, e.g. as wood, concrete or iron/steel units for house building whether as supporting units as well as decorative

units such as facade panels, special rafter structures etc.

PATENT CLAIMS

1. Building unit (1,2) in the form of a plane unit of acute-angled triangular shape, characterised by comprising three connected crosspieces (3,4,5,6) surrounding a central opening and where the crosspieces each have two substantially plane sides (7,7') being parallel and situated in parallel planes, and an outer edge face (8) being substantially plane and forming an angle (v,u) differing from 90° with the parallel planes.

2. Building unit according to claim 1, characterised in that each crosspiece (3,4,5,6) has an inwardly facing edge face (8') being substantially plane and being parallel to the plane of the outer edge face (8) and where the planes of the outer edge faces (8) intersect at an angle of 90°.

3. Building unit according to claim 1 or 2, characterised in that the angle (v,u) differing from 90° is approx. 35,3° (v) or 144,7° (u).

4. Building unit according to any one of claims 1-3, characterised in that a number of connecting means (9,16) are provided in the crosspieces (3,4,5,6).

5. Building unit according to claim 4, characterised in that the connecting means are a number of bores (9) which may be through-bores and are provided perpendicularly to the outer edge faces (8) and symmetrically in the cross-sectional profile (Figs. 3,4) of the crosspieces.

6. Building unit according to claim 4, characterised in that the connecting means are a number of forwardly protruding projections (16) on one of the parallel sides (7) said projections each having a crossbore (17).

7. Method for manufacturing a building unit according to any one of claims 1-3, characterised in that it is manufactured by machining on a programmed machine tool, for example a moulding or cutting machine, from suitable sheet material such as wood, fibre material or plastics, said sheet material having a thickness corresponding to the distance between the substantially parallel and plane sides (7).

8. Use of at least one building unit according to any one of claims 1-6 as a shelf bracket.

9. Use of a number of building units according to any one of claims 1-6 as a shading unit, for example as a lamp shade.

10. Use of a building unit according to any one of claims 1-6 in that a number of units are connected so as to form a spatial figure.

Fig. 1

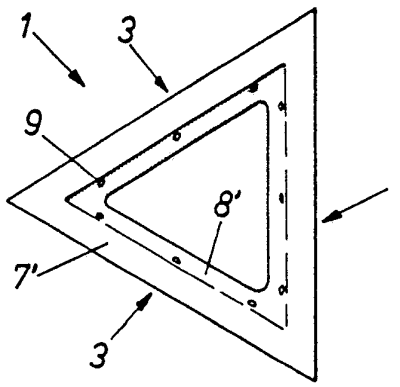


Fig. 2

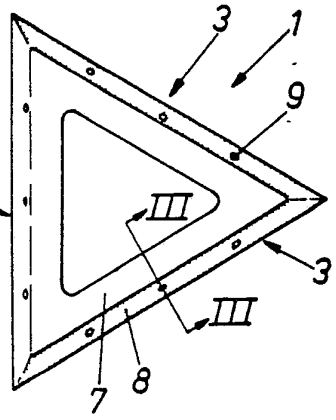


Fig. 3

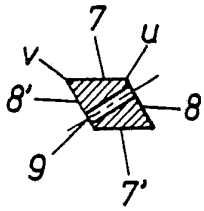


Fig. 4

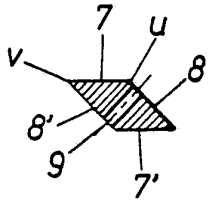


Fig. 5

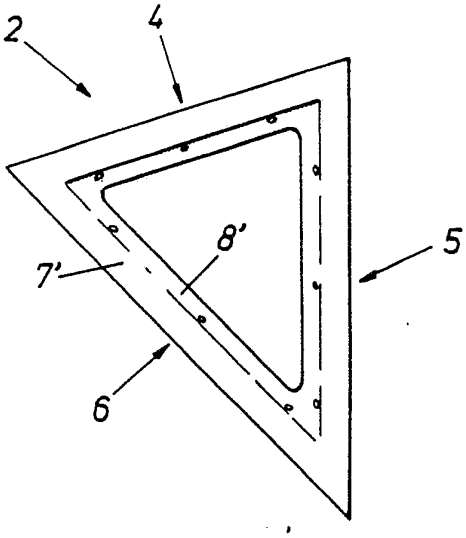
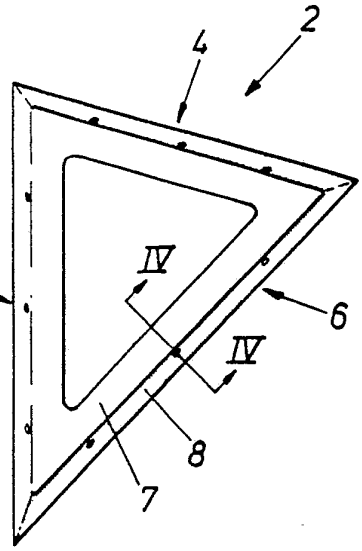


Fig. 6



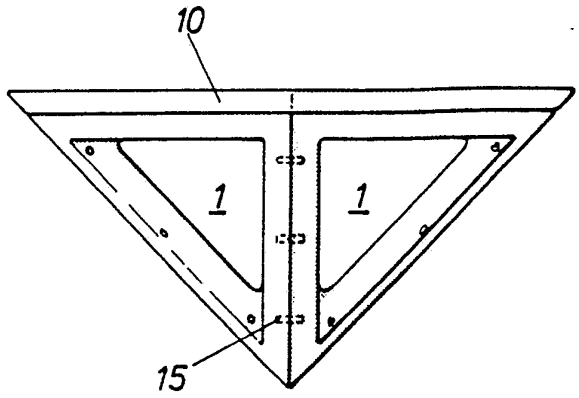


Fig. 7

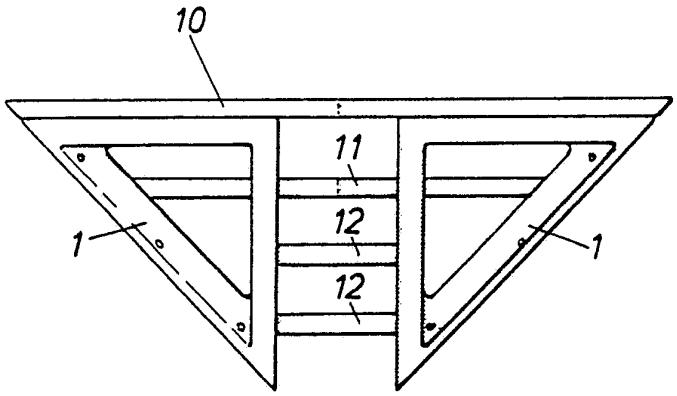


Fig. 8

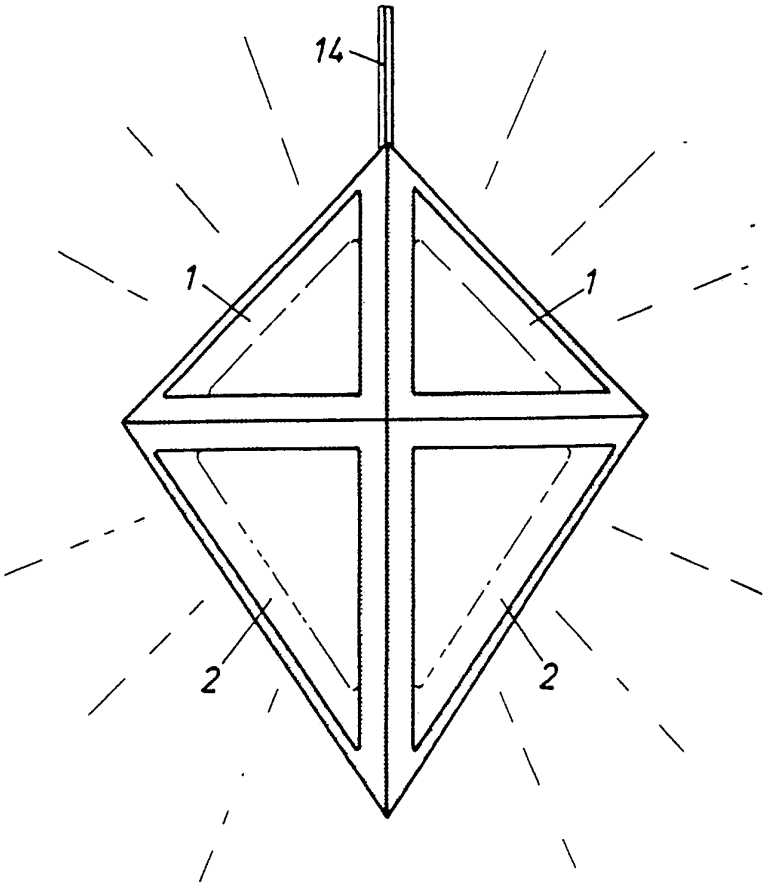


Fig. 9

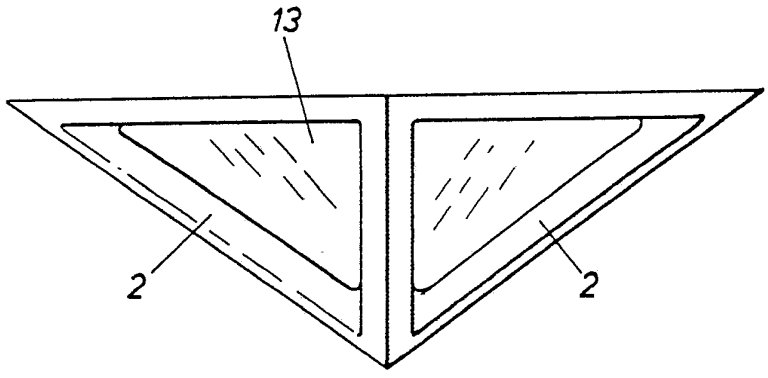
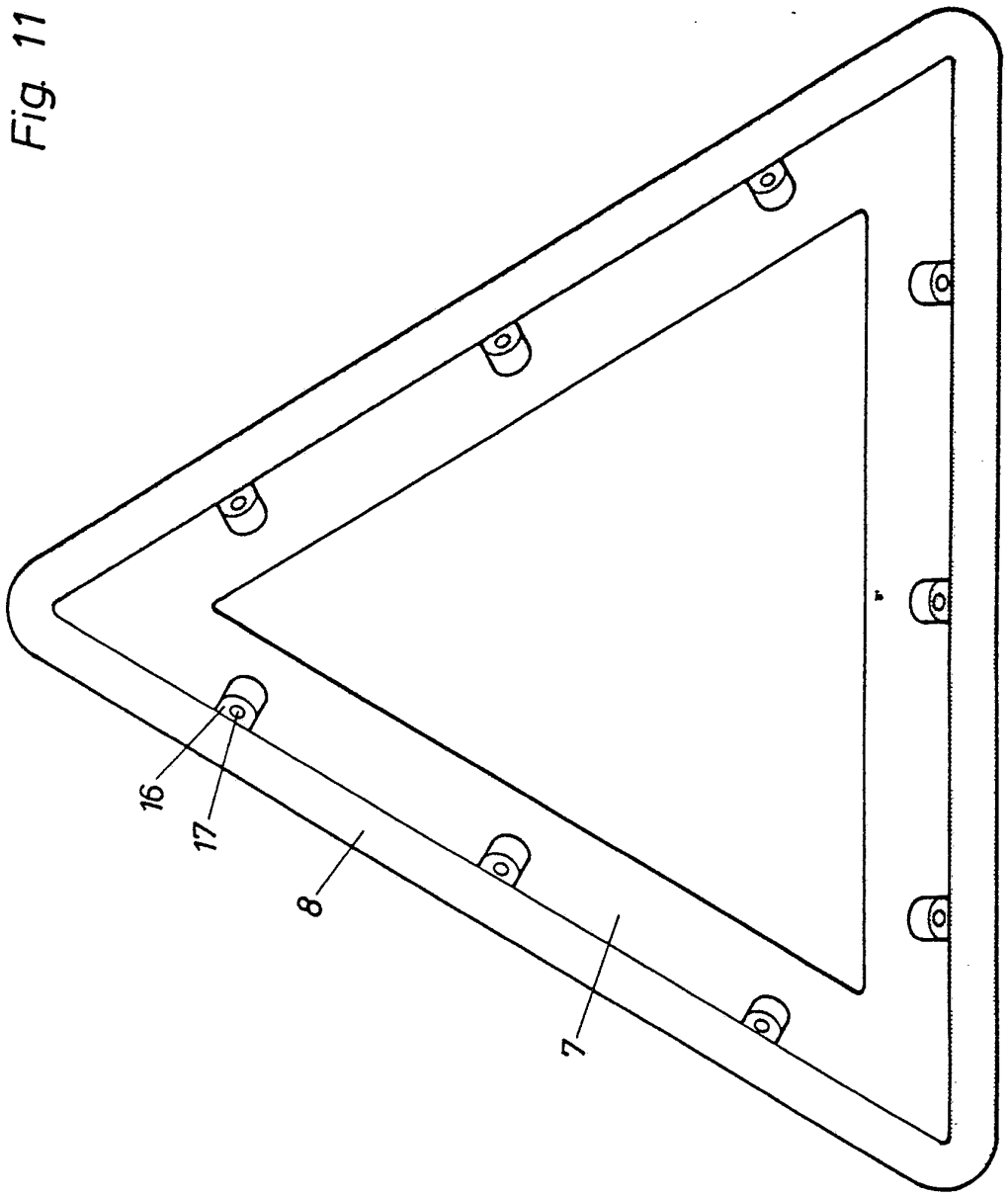


Fig. 10

Fig. 11



INTERNATIONAL SEARCH REPORT

International Application No PCT/DK87/00118

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 4

E 04 C 2/38, E 04 B 1/32 // A 47 B 47/04, A 63 H 33/10, F 21 V 1/02

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	A 47 B 47/04, 87/00; A 63 H 33/03-/20; E 04 C 2/38; E 04 B 1/32; B 27 C 5/00; F 16 S 1/00, /02, /08; F 21 V 1/00-/26, 3/00-/04 .../...

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

SE, NO, DK, FI classes as above

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]
X	SE, A, 176 506 (K G R SANDGREN) 12 September 1961	8
X	SE, B, 445 192 (CMC CONSTRUZIONI MECCANICHE R P CELASCHI & C SNC) 9 June 1986 & GB, 2020226 FR, 2424800 DE, 2917874	7
X	DE, A1, 2 365 704 (M MENGERINGHAUSEN) 5 February 1976	9.
X	US, A, 3 114 176 (A.E. MILLER) 17 December 1963	1-5, 10
X	US, A, 3 255 556 (R. D'AMATO et al) 14 June 1966	1, 2, 4-6, 10
X	US, A, 4 048 770 (A.J. McKENZIE) 20 September 1977	1-6, 10

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"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
1987-11-23	1987 -12- 04
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Vilho Juvonen

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Fields searched (cont)

Nat. Cl 34i: 15/05; 77f: 33/04-/10

US Cl 46: 16-31;
52: 80, 81, 90;
240: 100, 108;
312: 108;
362: 351-360

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.