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## (54) Multi-purpose prefabricated centering

(57) This multi-purpose prefabricated centering consists of a main upright (1) exemplified by a tubular section, the upper end of which is threaded (3') and on which is screwed a threaded body (3) or slider, a secondary upright (4) fitted in the main upright (1) and provided with holes (5) for the coarse height adjustment of the upright (1, 4) by inserting a pin (5') in the external hole of the threaded body (3), whereas precision adjustment is achieved by acting on the slider (3), a head (6, 7) provided with a vertical semicircular plate with transverse holes (8, 9) located on an internal and an external spider, primary arms (10) provided with a hole (13) at their lower end (11) in which to fit a hinge pin (12) inserted in one of the holes (8) of the internal spider and featuring a slot (15) to block the arm by fitting the pin (14) in the hole (9) drilled in the external spider, while the primary arm 10) features at its outer end a threaded body or slider (17) provided with secondary arms (18) sliding in each primary arm (10), bearing a rod (19) at its outer end and provided with a series of holes (20) for coarse adjustment of the total length of the arms (10-18) by means of the pin (20') fitted in the hole (20) of the arm (18) on the outside of the threaded body (17), whereas precision adjustment is achieved by acting on the slider (17), including a plate (21) in flexible deformable material, the inner surface of which features a set of seats (22) in which to lodge the rods (19) of the secondary arms (18), so that all components of the centering can be used for all kinds of vaults and even for multiple-centered vaults and arches and these components may be recovered and re-used in other constructions.

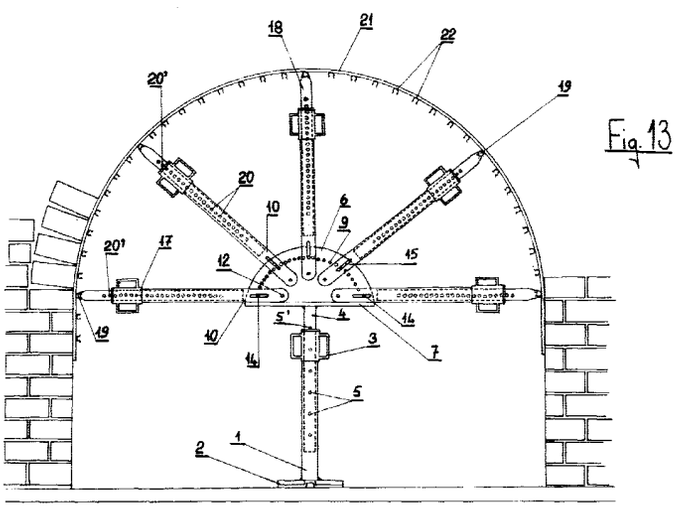


Fig. 13

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## Description

**[0001]** This invention covers a multi-purpose prefabricated centering which can be used to build vaults and arches of any type and with any appropriate material, with different curvatures which may even be dissymmetrical.

**[0002]** The centering is known to be a temporary, usually wooden or iron scaffolding, to shape and support arches and vaults during their construction. The centering normally consists of a junction of scaffold members following the curvilinear pattern of the intrados of the vault or arch, supported by braces, crosspieces and stulls resting on uprights or standards acting as supports of the assembly. The centerings nowadays used are dismantled and thrown away after use.

**[0003]** In addition, they cause some problems during the building phase as well as after erection and always require expensive and difficult operations on the building yard.

**[0004]** A first problem concerns the deformability of the wooden material and the changes that may occur in the configuration of the structure during junction of its members and these factors shall duly be taken into account during the fabrication of the centering.

**[0005]** A second problem crops up when the arch is multiple-centered, i.e. if it has a variable curvature with several centres. In such case, the fabrication of the centering, in any material, is complex and takes much time; it will be even more difficult if the ground on which the uprights are resting, is not level or has a variable gradient.

**[0006]** This invention has the aim to obviate these drawbacks by proposing a prefabricated centering consisting of components ready for assembly on the building site and which may be used for arches having different curvatures and gradient. They can therefore meet all needs on the building site, for buildings in reinforced concrete, as well as for brickwork or stone structures or even in mixed material.

**[0007]** The prefabricated centering, subject matter of this invention consists of a main upright having preferably a tubular section, resting on a floor base, the upright is usually placed in a central position with respect to the arch or vault. The upper end of this upright is threaded on which a body acting as slider is screwed to permit precision adjustment of the height of this main upright, as will be explained hereinafter.

**[0008]** A secondary upright is axially sliding inside the main upright. The secondary upright, which shall also preferably have a tubular section, features a series of holes drilled at prefixed intervals as will be described below. A pin fitted in the hole of the secondary upright, on the outside of this body acting as a slider, provides for coarse adjustment when drawing out the secondary upright and for adjustment of the total length of the uprights.

**[0009]** A head is mounted on the top of the secondary upright; it consists of two welded plates, one of which is horizontal and rectangular shaped, while the other is vertical and semicircular shaped, its horizontal axis being parallel to the axis of curvature of the vault or arch to be built and featuring two series of radially located holes.

**[0010]** A certain number of primary arms, having preferably a tubular section, are radially mounted on this head and fastened to the vertical semicircular plate; the lower end of these primary arms features a trunnion type articulated joint, the trunnion being fitted in a hole in the arm and passing through one of the holes of the inside spider of the semicircular plate, to ensure the best orientation in the development plane of the arch or vault and this orientation is blocked by a locking pin passing through a slot in the primary arm and through the matching hole of the outer spider of the semicircular plate. The upper end of these primary arms has a thread on which a body acting as a slider is screwed for precision adjustment of the length of the arms as will be explained hereinafter. A secondary arm is axially sliding inside each primary arm; this secondary arm preferably features at its outer end a properly tapered cross bearer, usually consisting of a suitably sized rod, perpendicular fastened to the arm, i.e. according to the horizontal axis of the vault or arch.

**[0011]** The secondary upright and secondary arms are each featuring a series of holes drilled at a prefixed spacing to permit an initial coarse adjustment of their extension and length by means of a pin inserted in the first hole on the outside of the screwed body or slider. Precision adjustment of the extension and length of the upright and arms is possible, as explained above, by axially moving the screwed bodies or slider against which the pins, preferably provided with washers, are resting.

**[0012]** The prefabricated centering, subject matter of this invention, is completed by a plate in flexible and deformable material, for example. PVC, its width and length being variable according to need. The inner surface of this plate features a series of seats lodging and blocking the rods of the secondary arms. This lodging and blocking seats preferably consist of clamps partially encircling the rod by their elastic action.

**[0013]** The invention in question is illustrated for exemplification purposes on the attached drawings, in which:

The **Fig. 1, 2 and 3** respectively show two side views and a top view of the main upright with its base and slider shaped body,

The **Fig. 4, 5 and 6** respectively show two side views and one top view of the secondary upright and its head,

**Fig. 7 and 8** show side views of the primary arms fitted with a slider,

**Fig. 9 and 10** show side views of the secondary arms provided at one end with a rod placed at right angles to the arm,

**Fig. 11** shows a view from bellow of the flexible plate supporting the vault or arch, equipped with anchor clamps blocking the rods of the secondary arms,

**Fig. 12** shows a side view of the plate illustrated in Fig. 11,

**Fig. 13** shows the prefabricated centering mounted and ready for building the vault or arch.

**[0014]** With reference to these Figures, 1 refers to the main or primary upright having for example a tubular section, having at its lower end a base 2, resting on the ground and at its upper end a thread 3' onto which the matching threaded body 3 is screwed which may be provided with a regulator handle for precision adjustment of the height of the central upright, as will be explained below.

**[0015]** A secondary sliding upright 4, which also has a tubular section, is located inside the main upright 1 and is provided with holes 5 for coarse adjustment of the upright by inserting a transverse pin 5' in one of these holes in the upper portion of the threaded body 3.

**[0016]** Precision adjustment of the extension of the secondary upright 4 and of the total length of the uptight 1-4 is achieved by screwing or unscrewing the threaded body 3 or by moving the slider which causes, by means of an interposed washer, shifting of the pin 5' and hence displacement of the secondary upright 4.

**[0017]** The secondary upright 4 features at its upper end a head consisting of two plates welded together at right angles, the lower horizontal plate 7 being directly welded on the upper end of the secondary upright 4, whereas the upper plate 6 is semicircular shaped and is vertically welded on the horizontal plate 7, extending in the development plane of the arch or vault to be built.

**[0018]** The vertical semicircular plate 6 features, radially located, internal holes 8 and external holes 9 on which to fasten a suitable number of primary arms 10 articulated in the development plane of the arch or vault. These arms 10, usually having a tubular section, have their lower end 11 shaped as an inverted "U" in which to receive the plate 6 and to be blocked to this plate 6 by the pins 12 transverse fitted into a lower hole 13 in the arm and into the hole 8 of the internal spider. Each primary arm 10 is therefore articulated on its own trunnion 12 and its orientation is fixed by a pin 14 inserted in a slot 15 in the arm and passing through the hole 9 of the external spider of the vertical plate 6. These arms 10 feature at their upper end a thread 16 on which the matching threaded body or slider 17 is screwed, which slider may be provided with a handle for precision adjustment of the arm length, as will be explained hereinafter. A secondary arm 18, usually having a tubular section, is axially sliding inside the primary arm 10; this secondary arm 18 features at its outer end, chamfered at the tip, a rod 19, of suitable diameter and length in perpendicular position with respect to the secondary arm, i.e. having its axis parallel to the axis of curvature of the arch or vault. Like the secondary upright 4, the secondary arm 18 too features a series of holes 20 for coarse adjustment of the total length of the arm 10-18, by means of the pin 20', fitted in the external hole of the threaded body 17 or slider. Precision adjustment of the arm length is achieved by screwing or unscrewing the threaded body or by moving the slider as already explained for precision adjustment of the height of the upright.

**[0019]** For indicatory purposes, marks may be made, even with added paint, as a reference for screwing and unscrewing purposes or for moving the threaded body or slider 17 so that an equal length of all radial arms 10-18 can be easily obtained.

**[0020]** The arch or vault is supported by a plate 21 in flexible and deformable material like PVC, having a variable length and width based upon the requirements, its inner surface being provided with seats 22 on which to receive and block by removable fixing the rods 19 of the secondary arms 18. These seats 22 lodging and blocking the rods 19 may be clamps, the ends of which are partially encircling the rod by their elastic action.

**[0021]** By this description of the centering, subject matter of this invention, its assembly on the building yard for the construction of arches and vaults is quite clear. Assembly starts with the central positioning of the main or primary upright 1,2,3 with respect to the arch or vault to be built. The secondary upright 4 equipped with the semicircular plate 6, is then inserted in the primary upright and the height of the centering supporting pier is adjusted to the springing line of the vault or arch, by means of a pin 5' inserted in the hole 5 of the secondary upright resting, preferably by interposition of a washer, on the threaded body 3 acting as a slider of the main upright 1. The pin 5' fitted in the hole 5 will thus provide for coarse height adjustment of the upright 1-4, whereas precision adjustment is obtained by screwing or unscrewing the threaded body 3 acting as a slider which will push the pin 5' upwards or downwards. Usually, the height of the central pier will be such as to ensure that the horizontal plate 7 will be positioned at springing line level of the arch or vault.

**[0022]** The required number of primary arms 10 will now be mounted, by placing their inverted U-shaped lower end 11 astride of the vertical plate 6 and fitting a trunnion 12 in a hole 8 of the internal spider of the vertical plate 6 and through the holes 13 of the legs 11 of the inverted "U" shape. In this way, the arm is articulated mounted and is fixed in the required direction by the pin 14, inserted in the hole 9 of the external spider of the vertical plate 6 and in the slot 15 of the arm.

**[0023]** The secondary arms 18 are then mounted in the primary arms 10 and the extension of these secondary arms is adjusted by a pin 20' fitted in the hole 20 on the outside of the screwed body 17 or slider on which it is resting, preferably by interposition of a washer.

**[0024]** Then follows assembly of the properly bent plate 21 with its inner clamp shaped seatings 22 in which

to receive the rods 19 of the secondary arms 18. The length of the arms 10-18 will then be precision adjusted by screwing or unscrewing the various bodies 17 or sliders. The prefabricated centering, subject matter of this invention is now ready to support the arch or vault to be built.

**[0025]** The prefabricated centering as implemented according to this invention, is easy to fabricate and has no drawbacks caused by the deformability of wooden material, since the bearing structure is usually in metal or plastic or mixed material.

**[0026]** Furthermore, the presence of the holes 5 and 20 respectively in the secondary upright 4 and in the secondary arm 18 and the presence of the threaded bodies 3 and 17 respectively on the main upright 1 and on the primary arm 10, permit an exact adjustment of the height and development of the prefabricated centering, of its bending radius or radii, if the arch is multiple-centered and also allows to disassemble the centering after construction of the arch or vault and to use it again for completely different arches or vaults.

**[0027]** The system described, forming the multi-purpose prefabricated centering, may be conveniently used to build simple vaulting arches but may also be used for multiple arches or tunnels which may require the utilisation of a multiple number of prefabricated centerings.

**[0028]** The upright 1-4 and the various arms 10-18 have normally a tubular section as explained above, but they may also be fabricated with box-type or any other section type (square, rectangular, etc.) and in such case, the bodies screwed together or slides for precision adjustment of the length, are replaced by other sliders provided with an adequate adjustment and blocking system of their axial translation.

## Claims

1. Multi-purpose prefabricated centering, ***characterized* in that** it consists of:

   - a main upright (1) exemplified by a tubular section, the lower end of which is resting on a floor base (2), whereas its upper end features a threading (3') on which a threaded body (3) or slider is screwed which may be provided with regulator handles;
   - a secondary upright (4), inserted in the main upright (1) also having a tubular section matching the section of the main upright, this secondary upright (4) has holes (5) for coarse height adjustment of the upright assembly (1,4) by fitting a pin (5'), resting on the threaded body (3), preferably by interposition of washers, whereas precision adjustment is achieved by screwing or unscrewing the threaded body (3) or slider;
   - a head mounted on the upper end of the secondary upright (4), consisting of two welded plates, of which the lower one (7) is horizontal and rectangular shaped and is directly welded on top of the secondary upright (4), while the upper plate (6) is semicircular shaped and is vertically welded on the above mentioned horizontal plate (7) in the centre of the development plane of the vault or arch and is featuring on it surface series of transverse holes (8, 9) located on two inner and outer spiders;
   - articulated primary arms (10) usually having a tubular section, their lower end (11) having the shape of an inverted "U" in which to receive the vertical plate (6) to which it is secured by a trunnion (12) passing through a lower hole (13) in the lower U-shaped end (11) and through one of the holes (8) of the internal spider of the plate (6) and by a pin (14) fitted in a slot (15) appropriately located on the end (11) of the primary arm (10) and passing through one of the holes (9) of the external spider of the vertical plate (6) so as to adjust the direction of this arm based upon the curvature and configuration of the vault or arch, while each primary arm (10) features a thread (16) at its upper end on which the threaded body (17) or slider, possibly provided with a regulator handle, is screwed;
   - secondary arms (18) sliding inside each primary arm (10), also having a tubular section matching the section of the primary arms (10), these secondary arms (18) are featuring, at their properly tapered outer end, a rod (19) of suitable diameter and length, placed perpendicularly with respect to the secondary arms and oriented according to the horizontal curvature axis of the vault or arch while these secondary arms (18) feature a series of holes (20) for coarse adjustment of the total length of the arm (10-18) by means of the pin (20') fitted in the external hole (20) of the threaded body (17) or slider and resting on the latter, preferably by interposition of washers, while precision adjustment of the total arm length is achieved by screwing or unscrewing the threaded body (17) or slider;
   - a plate (21) in flexible and deformable material of variable length and width, provided on its inner surface with a series of seats (22) on which to receive and block the rods (19) of the secondary arms (18),

   so that it will be possible to utilize the components of the centering in other building yards thanks to their easy assembly and adjustment to any and all vault and arch types, even if multiple-centered.

2. Centering as described in claim 1, ***characterised* in that** it may be conveniently used for the construction of simple arches and vaults but also for multiple

arches and tunnels which may require the utilisation of a multiple number of prefabricated centerings.

3. Centering as described in claim 1. ***characterised in that*** the upright (1-4) and the various arms (10-18) may have a rectangular or square box type section etc. and will be provided with matching mobile bodies (3, 17) or sliders for precision adjustment, these mobile bodies or sliders being provided with an adequate moving and blocking system after adjustment.

4. Centering as described in claim 1, ***characterised in that*** reference marks are provided for moving the threaded body or slider (17) to facilitate a uniform length adjustment of the radially extending arms (10-18).

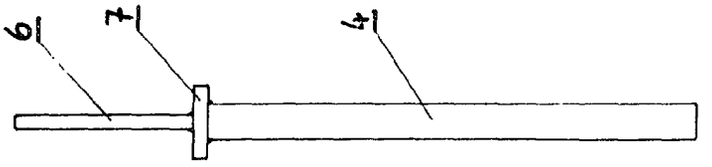



Fig. 5

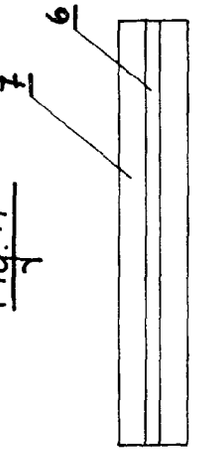



Fig. 6

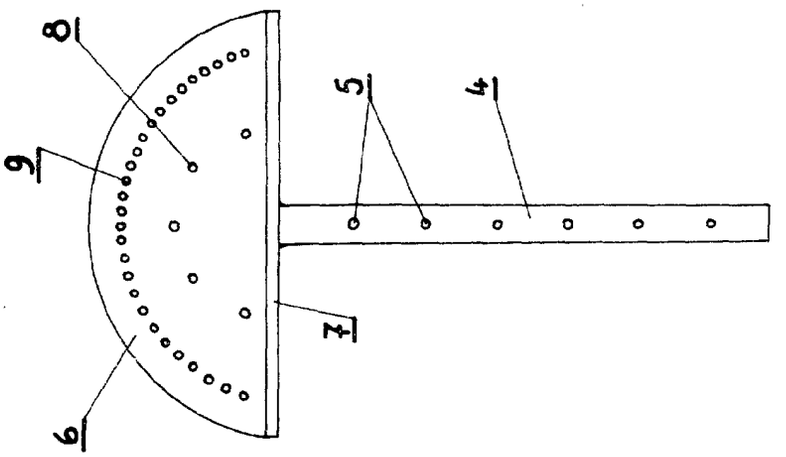



Fig. 4

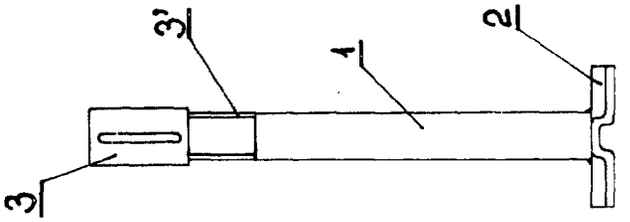



Fig. 2

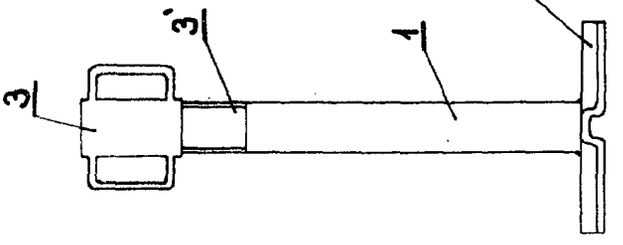



Fig. 1

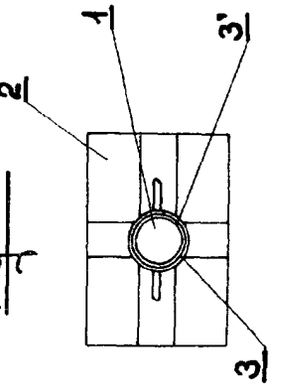



Fig. 3

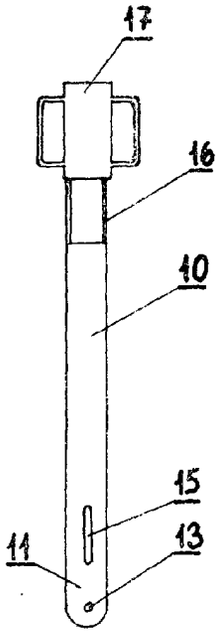



Fig. 7

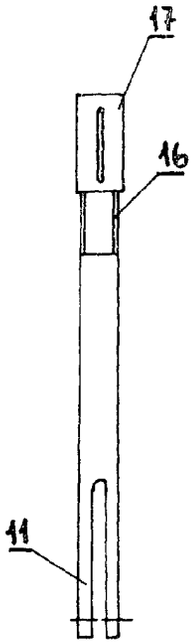



Fig. 8

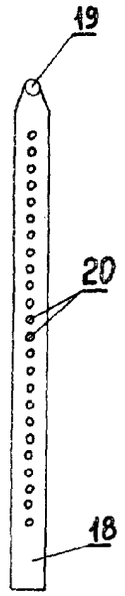



Fig. 9

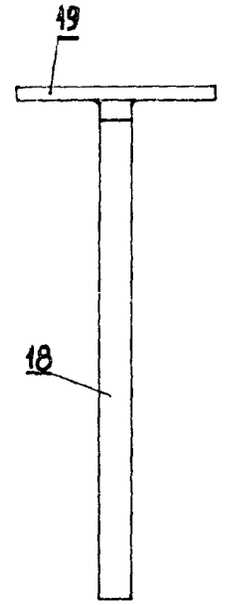



Fig. 10

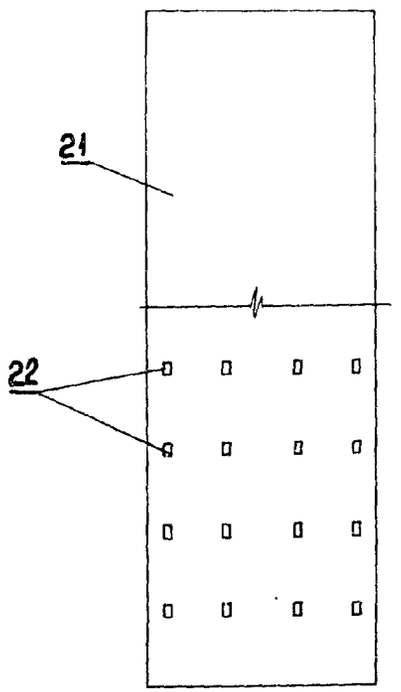



Fig. 11

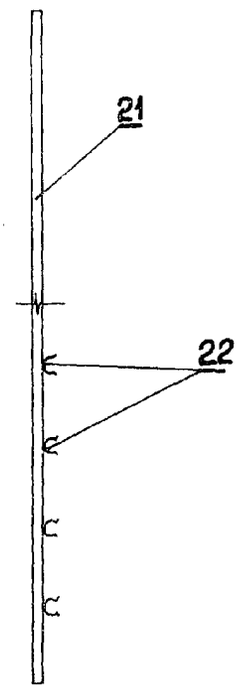
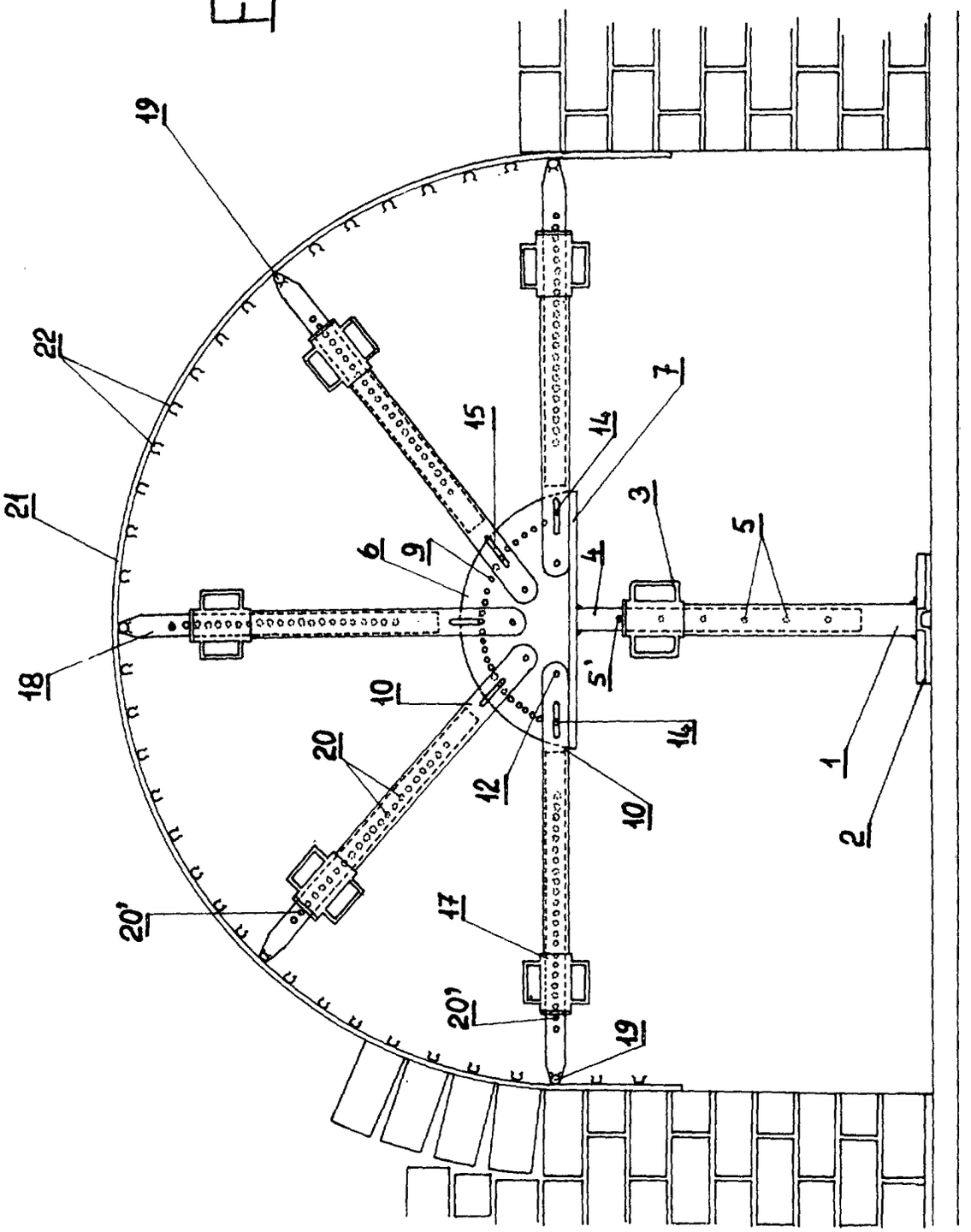



Fig. 12

Fig. 13



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# EUROPEAN SEARCH REPORT

Application Number
EP 01 11 7320

## 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) |
|---|---|---|---|
| A | US 5 584 159 A (PRESLEY JAMES R)<br>17 December 1996 (1996-12-17)<br>* column 3, line 52 - column 4, line 59 *<br>* figures * | 1 | E04G21/18<br>E04G11/36 |
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E04G

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 15 November 2001 | Andlauer, D |

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15-11-2001

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