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(54) **Bar system**

Schienensystem

Système de barres

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(56) References cited:
SE-C- 501 517

US-A- 5 052 156

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Description

Technical field

[0001] The present invention relates to a bar system designed to allow simple application and level adjustment of bars and comprising bars and level adjustment means, according to which system said level adjustment means includes rods which are attachable to the bars in such a manner that one end thereof projects past the bars, and the length by means of which said rods project may be varied by rotation thereof owing to the provision of threads on the rods. More specifically, said level adjustment means comprise rods which are hollow and which are provided on the end which upon the application of the rods against the support structure with holes allowing the rod to be attached to the support structure by means of fasteners, such as screws and nails, or the like.

Background

[0002] In many cases it is suitable to mount floors, interior walls or the like such that a spacing is formed between the mounted surface material and the original support structure. This is particularly advantageous, when ventilation is required, such as is the case when problems related to moisture, moulding, radon and the like exist or may be suspected to exist. This arrangement is also advantageous if insulation material, heating coils or the like are to be installed or in order to allow piping and conduits (water, heat, sanitation, telephone, electricity, and the like) to be positioned in such a manner as to be easily accessible, instead of positioning such piping and conduits directly in the very support structure, which may consist of concrete or the like. In such cases bars are usually used, which are placed so as to rest against the support structure, whereupon the new surface material may be attached to the bars.

[0003] In many cases it is not, however, possible to position the bars directly in abutment against the support structure. Many types of bars, for instance, are damaged when resting on a moist support structure and in addition, they obstruct the free circulation of air between the new and the original surface. Furthermore, the original surface is not as a rule completely even, or a certain inclination in the new surface may be desired (for instance in the case of bathroom floors).

[0004] For these reasons it is advantageous to provide the bars with support legs the height of which may be easily adjusted to raise the bars somewhat from the support structure and to orientate them in a simple manner according to wish. One example of such a level-adjustment legs is shown in US 4 040 222. This publication describes a level adjustment means comprising a rod and a sleeve which are interconnected by a thread engagement system. The rod is attached in the support structure by insertion thereof in a keyway, whereupon

this sleeve is thread-adjusted to the desired height above the support structure and the new structure is attached to the upper part of the sleeve by screw engagement. A disadvantage inherent in this type of level adjustment systems is, however, the clumsiness of the attachment operation. In order to attach the rod end to the original support structure the latter must be provided with keyways and in order to attach the new surface material to the upper part of the sleeve, nails or screws may be forced through the new surface material into the sleeve, which is impractical, for instance in the installation of flooring, since in this case the bars are comparatively thick. A further disadvantages inherent in this type of level adjustment systems is that the level adjustment operation cannot be made from the exterior face of the new surface material, which makes the work difficult and post-correction measures are very inconvenient to perform.

[0005] Another system having rods and sleeves is disclosed in US 5,052,156, in which the sleeves are attached directly to the panel in stead of to the bars. However, in order to be able to use the same type of panels as I places where this system is not needed, it is usually necessary to keep the bar system, since the panels otherwise would have to be reinforced to withstand similar load conditions.

[0006] A system by means of which these problems are partly eliminated is disclosed in the Swedish Patent SE 501 517, WO 95/01485 A. The bar system described in this publication comprises bars having threaded holes in the massive bar material into which screwed rods are formed with matching external threads. In this manner it becomes possible to easily adjust the length of projection of the rods beyond the bars. In addition, the rods are hollow and the ends projecting away from the bars are provided with holes adapted for reception therein of fasteners, such as screws, nails and the like. The arrangement allows the rods to be attached to the support structure in a convenient manner. By configuring the internal cavity of the rod in such a manner that at least the end thereof that is received inside the bar has a cross-sectional configuration adapted for engagement with a rotary tool, such as an Allen wrench, it becomes possible to perform the level adjustment of the bar as well as the attachment of the rod to the support structure from the side of the bar facing away from the original support structure. A disadvantage inherent in this type of bar systems is, however, that the side-to-side thickness of the bars must be such as to allow accommodation therein of the threads, which in principle excludes the commonly used conventional U-beams, and also that the bars must be provided with threaded holes which, when made during the mounting proper, is very time consuming and requires special equipment and, when performed in advance, requires knowledge as to the exact positions of the holes on the bar. These features also make the system inflexible.

[0007] These disadvantages are solved by a bar sys-

tem devised in accordance with the teachings of the invention.

Object of the Invention

[0008] The object of the present invention is to provide a bar system according to which the bars are supported on rods spaced from the original support structure, according to which it is possible to adjust the rods axially for level adjustment of the rods in a simple manner from the side of the bars that faces away from the original support structure, according to which the rods may be easily attached to the bars without the latter having to be specially manufactured or be configured in any particular way, and according to which the mounting proper may be performed in a simple and rapid manner.

[0009] These objects are achieved in a bar system defined in claim 1. Further advantageous modifications and configurations of this bar system are described in the dependent claims.

Summary of the Invention

[0010] A bar system in building constructions, comprising bar and level adjustment means, said bars (1, 20, 40) being formed with through holes (6, 22) extending transversely in relation to the lengthwise extension of the bars and, at least adjacent said holes, with engagement parts (10, 23, 42), said level adjustment means being adapted for attachment in the bars (1, 20, 40) so as to project in the shape of load-carrying legs from the bars (1, 20, 40) against the support structure and comprising hollow rods (4) the end face of which that in the attached position of the rods projects from the bar being provided with an opening (7) for attachment of said rod to the support structure by means of a fastener (5) and at the opposite end with external threads. In accordance with the invention the level adjustment means also comprise internally threaded sleeves (3, 21, 41) the threads of which match those of the rods (4), in that the sleeves (3, 21, 41) are manually applicable to the bars (1, 20, 40) by snap fastening attachment with the engagement parts (10, 23, 42) of the holes (9, 22) provided in the bars (1, 20, 40) and in that the rods (4) are attachable to the sleeves (3, 21, 41) by thread engagement as they are being screwed into the bar during which operation also the length by which the rods (4) project from the bar (1, 20, 40) is adjustable.

Brief Description of the Drawings

[0011] In the accompanying drawings:

Fig. 1a is a view from above of a bar system in accordance with invention including a rectangular bar, such as a wooden bar;

Fig. 1 is a cross-sectional view of the bar system of Fig. 1a with the view taken along line b-b;

Fig. 1c is a cross-sectional view taken along line c-c of the bar system of Fig. 1a;

Fig. 2a is a view from above of a part of the bar of the bar system of Fig. 1;

Fig. 2b is a cross-sectional view taken along line b-b of the bar of Fig. 2a;

Fig. 2c is a cross-sectional view taken along line c-c of the bar of Fig. 2a;

Fig. 3a is a view from above of the sleeve of the bar system of Fig. 1;

Fig. 3b is a cross-sectional view through the sleeve of Fig. 3a with the view taken along line b-b;

Fig. 3c is a cross-sectional view of the sleeve of Fig. 3a with the view taken along line c-c;

Fig. 4a is a view from above of a bar system in accordance with the invention, comprising a U-shaped bar, for instance a steel beam;

Fig. 4b is a cross-sectional view of the bar system of Fig. 4a with the view taken along line b-b;

Fig. 4c is a cross-sectional view of the bar system of Fig. 4a with the view taken along line c-c;

Fig. 5a is a view from above of a part of the bar of the bar system of Fig. 4;

Fig. 5b is a cross-sectional view of the bar of Fig. 5a with the view taken along line b-b;

Fig. 5c is a cross-sectional view of the bar of Fig. 5c with the view taken along line c-c;

Fig. 6a is a view from below of the sleeve of the bar system of Fig. 4;

Fig. 6b is a cross-sectional view through the sleeve of Fig. 6a with the view taken along line b-b;

Fig. 6c is a view from above of the sleeve of Fig. 6a;

Fig. 6d is a plan projection of the sleeve of Fig. 6c as seen in the direction of arrow d;

Fig. 7 is an alternative embodiment of the rail system intended for a U-shaped bar; and

Fig. 8 illustrates the sleeve of the rail system of Fig. 7, part of the sleeve also being shown in an enlarged view.

Description of Preferred Embodiments

[0012] The invention will be described in closer detail for exemplifying purposes by means of one embodiment and with reference to the accompanying drawings.

[0013] In accordance with the first embodiment of a bar system in accordance with the invention, illustrated in Figs 1a-c, the system comprises bars 1 having a rectangular cross-sectional shape, such as wooden bars, and supporting level-adjustment means 2. The level-adjustment means comprise rods 4 and sleeves 3. The sleeves 3 are attached to the bars 1 in a manner to be described in closer detail in the following and the rods 4 are attached in the sleeves. Such attachment is effected by means of internal threads formed in the sleeve 3 and matching external threads formed on the rods 4, at least in the upper ends thereof facing the bar, which arrangement allows the rods to be screwed into the

sleeves. In this manner the rods are caused to engage with the sleeves and further, the lengths by which the rods project beyond the bar may be easily adjusted by turning the rod inside the sleeve. Furthermore, the rods 4 are hollow and at their ends turned away from the bar they are provided with holes 7 for reception therein of fasteners 5, such as screws or nails, by means of which they may be attached to the support structure. The cavity 6 in the rods preferably has a cross-sectional shape, at least at their upper end accommodated inside the bar, that is suitable for tool engagement. For example, the cavity may have an hexagonal cross-sectional shape allowing the rod to be turned by means of an Allen wrench. In this manner both the attachment of the rods by means of the fasteners 5 and the adjustment of the rods vertically may be effected from the upper side of the bar that is turned away from the support structure. On top of the bars is subsequently applied the external surface material 8 of the wall or the floor.

[0014] Figs 2a-c illustrate the bars 1 in more detail. The bars are provided with through holes 9, in which the sleeves 3 may be inserted, and with abutment shoulders 10 against which the sleeves 3 may be caused to engage. Advantageously, these abutment shoulders may be configured in such a manner that the upper part of the hole facing away from the support structure has a somewhat larger diameter size than the lower portion. The holes may be either drilled in the bars in advance or be drilled in connection with the mounting. When the holes are pre-drilled, they could either be drilled in predetermined suitable places or in a number of places, an arrangement which allows the most suitable holes in any particular case to be chosen during the mounting.

[0015] The sleeves 3 are shown in closer details in Figs 3a-c. The sleeves are internally threaded and at the upper portion, i.e. at the end intended to be turned away from the support structure they are provided with locking protrusions 11 intended to engage with the abutment shoulders 10 formed in the holes 9 of the bars. Further, the sleeves are provided at the very same ends with longitudinal slits 12 and they are made of a material which may be bent resiliently somewhat outwards. Owing to this arrangement the sleeve may be forced into a hole in a bar from the lower face thereof, whereby the locking protrusions 11 of the sleeve are forced somewhat towards one another, whereupon it is pushed upwards in the hole until its locking protrusions move past the abutment shoulder 10 and snap outwards to lockingly secure the sleeve. This fastening arrangement is advantageous since on the one hand it is rapid and simple and on the other it may be locked and if needed be detached completely manually without the use of tools or with the aid of simple tools only.

[0016] In addition, the sleeve ends are provided with projecting flanges 13 against which the bar 1 is supported. The flanges 13 may be prolonged by insulation carrier means 14 which, when the sleeve is secured in a bar, project beyond the bar 1 to carry insulation material

16 (for thermal or sound purposes) or the like, as illustrated in Fig. 1b. Between the flanges 13 and the insulating carriers 14 brake-off slits 15 preferably are provided to allow the insulating carriers to be removed in a simple manner without damaging the flanges, should they not be needed. Intermediate the flanges and the bars rubber seals 17 preferably are positioned in order to provide resiliency and/or sound reduction in the floor, or the like.

[0017] A second embodiment of the bar system in accordance with the invention is illustrated in Figs 4a-c. In accordance with this embodiment the system comprises bars 20 having a U-shaped cross-sectional configuration, such as steel beams. In addition, in accordance with the previous embodiment, it comprises rods 4 and sleeves 21, the first ones being of equal configuration to those of the previous embodiment but the latter being somewhat modified.

[0018] The bars, illustrated in more detail in Figs 5a-c, are also in this case provided with holes 22 on the main face 24 of the bar but in this case the abutment shoulders are provided by slits 23 formed on the legs 25 of the bar. Like in the previous embodiment these notches in the bar may either be formed during the very mounting or in advance. In this case it is, however, a definite advantage to provide the notches in advance and preferably in a number allowing the assembler to choose comparatively freely the number of level adjustment means to use and where to position them. Reference 44 designates a transverse recess formed in the legs 25, allowing the bar to be bent at point 45 on its main face 24 in order to allow adjustment to a desired change of inclination of the finished floor.

[0019] The sleeves, shown in more detail in Figs 6a-d also in this case comprise an internally threaded hole 26. In accordance with this embodiment the locking projections 27 are, however, formed on separate arms 28 which are arranged in parallel with the hole-delimiting walls. These locking projections 27 and arms 28 are positioned on the flange 29 projecting from the sleeve and are arranged in such a manner that when the sleeve is pushed from below into the U-shaped bar 20 they will be positioned externally of the legs 25 and thus, from the outside, snap into and lockingly engage with the slits 23. Also in this case the flanges 29 may be prolonged by brake-off insulation carrier means 30 and with rubber seals 31.

[0020] In all other respects the bar system in accordance with this embodiment functions in the manner described previously.

[0021] Another manner of causing the sleeves 40 and the U-shaped bar 41 to engage in a simple and removable manner is shown in Figs 7 and 8. In this case the legs of the bars have been bent inwards into the shape of flange edges 42, at least below the holes, and in a corresponding manner the sleeves have been provided with grooves 43. Upon application, the sleeves are inserted sideways into the bars from the lengthwise direc-

tion of the bars until they assume a position opposite a suitable hole. Otherwise, the bar system in accordance with this embodiment functions in a manner identical to that described with reference to the previous embodiments.

[0022] One advantage gained by the system in accordance with the present invention is its ability for adaptation to most types of bars normally used, such as rectangular wooden bars, U-shaped steel bars, and the like. A further advantage is that it may be mounted, adjusted, and dismantled simply and rapidly and that the main part of the work may be effected from the outer face, allowing the work to be performed quicker and without being as demanding as hitherto.

[0023] It should also be emphasised that the above described embodiments are to be regarded as examples only of the invention and not as limitations thereof. Modifications of the described embodiments, such as adaptations to other bar configurations, engagement with the aid of outwardly projecting flange edges instead of inwardly projecting ones and the like must be regarded as obvious and thus to fall within the scope of the invention as the latter is defined by the appended claims.

Claims

1. A bar system for building constructions, comprising bars and level adjustment means, said bars (1, 20, 40) being formed with through holes (9, 22) extending transversely in relation to the lengthwise extension of the bars and, at least adjacent said holes, with engagement parts (10, 23, 42), said level adjustment means being adapted for attachment in the bars (1, 20, 40) so as to project in the shape of load-carrying legs from the bars (1, 20, 40) against the support structure and comprising hollow rods (4), the end face of which that in the attached position of the rods projects from the bar being provided with an opening (7) for attachment of said rod to the support structure by means of a fastener (5) and at the opposite end with external threads, **characterised in that** said level adjustment means also comprise internally threaded sleeves (3, 21, 41) the threads of which match those of the rods (4), **in that** the sleeves (3, 21, 41) are manually applicable to the bars (1, 20, 40) by snap fastening attachment with the engagement parts (10, 23, 42) of the holes (9, 22) provided in the bars (1, 20, 40), and wherein the rods (4) are attachable to the sleeves (3, 21, 41) by thread engagement as they are being screwed into the bar, during which operation also the length by which the rods (4) project from the bar (1, 20, 40) is adjustable.
2. A bar system according to claim 1, **characterised in that** the engagement parts of the bar comprise

abutment shoulders (10, 23) and **in that** the sleeves are provided with matching resiliently flexible locking protrusions (11, 27) for snap fastening attachment of the sleeves to the bars.

3. A bar system as claimed in claim 1, **characterised in that** the engagement parts of the bars comprise inwardly or outwardly bent flange edges (42) extending in the longitudinal direction of the bars, and **in that** the sleeves are provided with matching grooves (43) for push-on attachment of sleeves onto the bars.
4. A bar system according to any one of the preceding claims, **characterised in that** dampening means (12, 31) are provided between abutment faces on the sleeves and the bars for resiliently yielding support of the bars on the support structure.
5. A bar system according to any one of the preceding claims, **characterised in that** for level adjustment purposes the bars (4) may be screwed into or out of the sleeves (3, 21, 41) through the holes in the bars, from the face of bars opposite the one facing the support structure.
6. A bar system according to any one of the preceding claims, **characterised in that** on the end facing the support structure the sleeves (3, 21, 41) are formed with projecting flanges (14, 30) said flanges, when the sleeves are attached to the bars, projecting exteriorly therefrom to support insulating material intermediate the bars or the like.
7. A bar system as claimed in claim 6, **characterised in that** projecting flanges are provided with brake-off slits (15) for easy breaking away of said flanges, should they not be desirable.

Patentansprüche

1. Stangensystem für Baukonstruktionen, umfassend Stangen und Höhenverstellmittel, wobei die Stangen (1, 20, 40) mit Durchgangslöchern (9, 22), die sich quer in Bezug auf die Längsausdehnung der Stangen erstrecken, und - wenigstens neben den Löchern - mit Verbindungsmitteln (10, 23, 42) versehen sind, wobei die Höhenverstellmittel so für das Anbringen in den Stangen (1, 20, 40) konfiguriert sind, dass sie sich in Form von lastaufnehmenden Trägern von den Stangen (1, 20, 40) gegen die Tragkonstruktion erstrecken und Hohlstäbe (4) umfassen, die an ihrer Stirnfläche, die in der befestigten Stellung der Stäbe von der Stange absteht, mit einer Öffnung (7) zum Anbringen des Stabs mittels eines Verbindungselements (5) an der Tragkonstruktion und an ihrer gegenüberliegenden Seite

mit Außengewinden versehen sind, **dadurch gekennzeichnet, dass** die Höhenverstellmittel des Weiteren Innengewindemuffen (3, 21, 41) umfassen, deren Gewinde zu denen der Stäbe (4) passen, dass die Muffen (3, 21, 41) von Hand an den Stangen (1, 20, 40) durch Einrasten in die Verbindungsmittel (10, 23, 42) der in den Stangen (1, 20, 40) angeordneten Löcher (9, 22) angebracht werden können, und wobei die Stäbe (4) durch Gewindeverbindung an den Muffen (3, 21, 41) befestigt werden können, wenn sie in die Stange geschraubt werden, wobei während dieses Vorgangs auch die Länge, um die die Stäbe (4) von der Stange (1, 20, 40) hervorstehen, eingestellt werden kann.

2. Stangensystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verbindungsmittel der Stange Auflageschultern (10, 23) umfassen, und dass die Muffen mit passenden federnd flexiblen Sicherungsvorsprüngen (11, 27) zum Einrastverbinden der Muffen mit den Stangen versehen sind.

3. Stangensystem nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verbindungsmittel der Stangen nach innen oder nach aussen gebogene Bördelränder (42) umfassen, die sich in der Längsrichtung der Stangen erstrecken, und dass die Muffen mit passenden Nuten (43) zum Aufsteckbefestigen der Muffen an den Stangen versehen sind.

4. Stangensystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zwischen Auflageflächen an den Muffen und den Stangen Dämpfungsmittel (12, 31) für eine elastisch nachgebende Stützung der Stangen an der Tragkonstruktion vorhanden sind.

5. Stangensystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Stäbe (4) zu Zwecken der Höhenverstellung durch die Löcher in den Stangen von der Seite der Stangen, die der zur Tragkonstruktion gerichteten Seite gegenüberliegt, in die Muffen (3, 21, 41) hineingeschraubt oder herausgeschraubt werden können.

6. Stangensystem nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Muffen (3, 21, 41) an der zur Tragkonstruktion gerichteten Seite mit vorstehenden Bündeln (14, 30) ausgebildet sind, wobei diese Bündel, wenn die Muffen an den Stangen befestigt sind, von dort nach aussen vorstehen, um Isoliermaterial zwischen den Stangen oder ähnliches zu halten.

7. Stangensystem nach Anspruch 6, **dadurch gekennzeichnet, dass** vorstehenden Bündel mit Abbruchschlitzen (15) zum einfachen Wegbrechen der Bündel, wenn diese nicht erwünscht sein sollten,

versehen sind.

Revendications

1. Système de barres pour constructions de bâtiments, comprenant des barres et des moyens d'ajustement, lesdites barres (1, 20, 40) étant réalisées avec des trous (9, 22) s'étendant transversalement par rapport à l'extension longitudinale des barres et au moins avec desdits trous adjacents avec des parties d'engagement (10, 23, 42), lesdits moyens d'ajustement de niveau étant adaptés pour une fixation dans les barres (1, 20, 40) de manière à faire saillie, sous la forme de jambes portant la charge, des barres (1, 20, 40) contre la structure de support et comprenant des tiges creuses (4), dont la face d'extrémité faisant saillie de la barre en position attachée des tiges est munie d'une ouverture (7) pour la fixation de ladite tige à la structure support au moyen d'une fixation (5) et, à l'extrémité opposée, avec des filets externes, **caractérisé en ce que** lesdits moyens d'ajustement de niveau comprennent aussi des manchons filetés à l'intérieur (3, 21, 41) dont les filets correspondent à ceux des tiges (4), **en ce que** les manchons (3, 21, 41) peuvent être appliqués manuellement sur les barres (1, 20, 40) par fixation par encliquetage avec les parties d'engagement (10, 23, 42) des trous (9, 22) pratiqués dans les barres (1, 20, 40) et dans lequel les tiges (4) peuvent être fixées aux manchons (3, 21, 41) par engagement fileté lorsqu'on les visse dans la barre, opération durant laquelle la longueur à raison de laquelle les tiges (4) font saillie de la barre (1, 20, 40) est aussi ajustable.

2. Système de barres selon la revendication 1, **caractérisé en ce que** les parties d'engagement de la barre comprennent des épaulements de butée (10, 23) et **en ce que** les manchons sont munis de protubérances de verrouillage flexibles, résilientes, correspondantes (11, 27) pour une fixation par encliquetage des manchons aux barres.

3. Système de barres selon la revendication 1, **caractérisé en ce que** les parties d'engagement de la barre comprennent des bords de bride fléchis vers l'intérieur et vers l'extérieur (42) s'étendant dans la direction longitudinale des barres et **en ce que** les manchons sont munis de rainures correspondantes (43) pour une fixation par poussée des manchons sur les barres.

4. Système de barres selon l'une des revendications précédentes, **caractérisé en ce que** des moyens d'amortissement (12, 31) se trouvent entre les faces de butée des manchons et les barres pour un support flexible et souple sur la structure de support.

5. Système de barres selon l'une des revendications précédentes, **caractérisé en ce que** dans un but d'ajustement du niveau, les barres (4) peuvent être vissées dans les manchons (3, 21, 41) ou en être dévissées par les trous dans les barres, depuis la face des barres opposées à celle faisant face à la structure de support. 5
6. Système de barres selon l'une des revendications précédentes, **caractérisé en ce que** sur l'extrémité faisant face à la structure de support, les manchons (3, 21, 41) sont formées avec des brides de projection (14, 30), lesdites brides quand les manchons sont attachées aux barres, faisant saillie vers l'extérieur pour supporter le matériau d'isolement entre les barres ou similaires. 10 15
7. Système de barres selon la revendication 6, **caractérisé en ce que** des brides saillantes sont munies de fentes de rupture (15) pour se débarrasser des dites brides, si elles n'étaient pas désirées. 20

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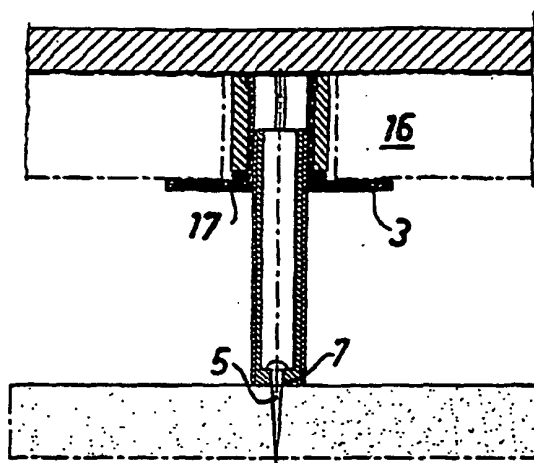


Fig. 1b

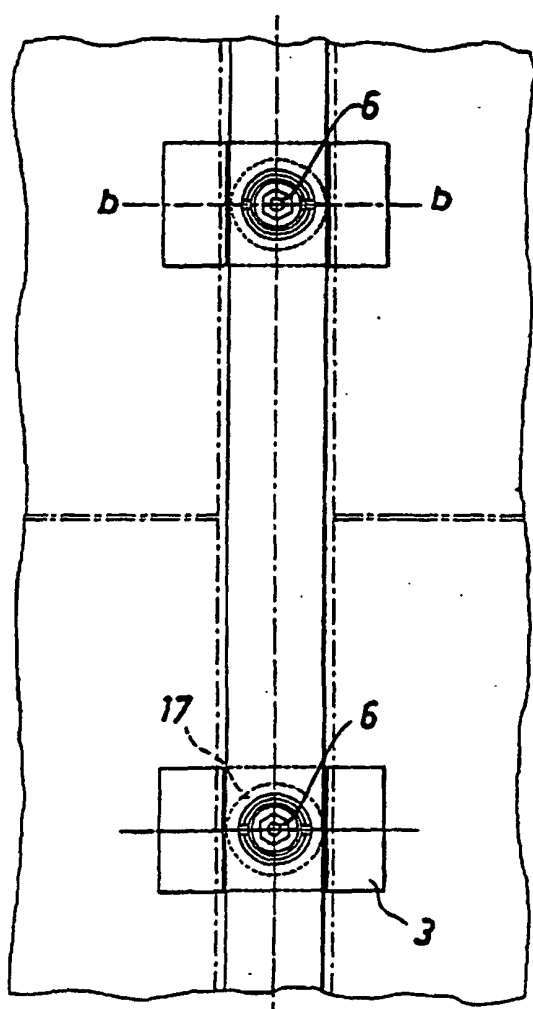


Fig. 1a

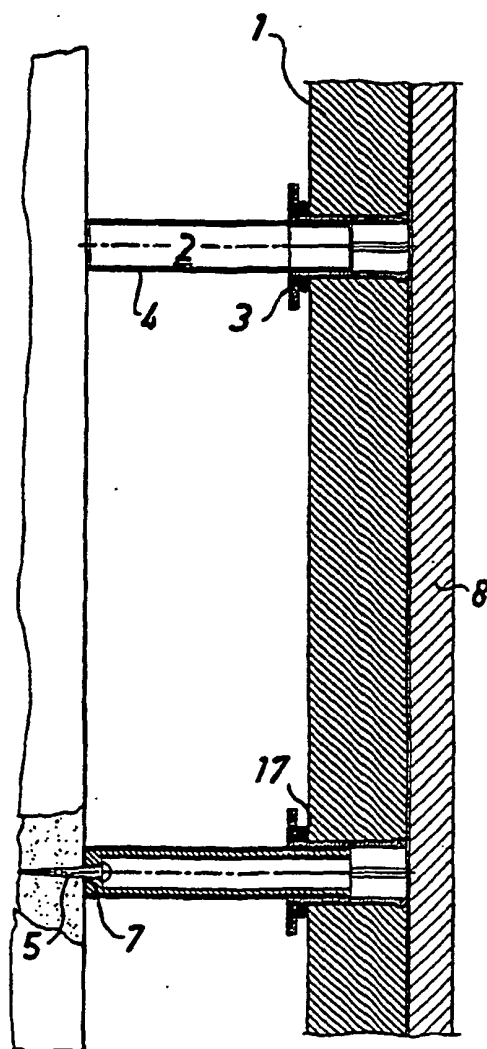


Fig. 1c

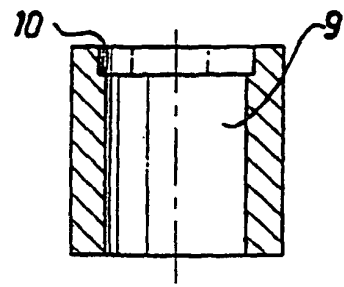


Fig. 2b

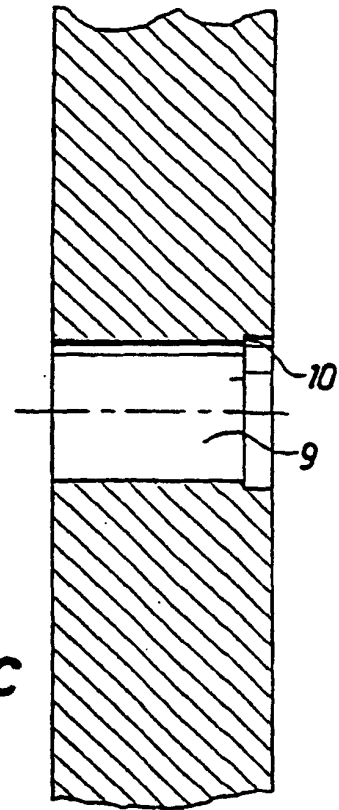


Fig. 2c

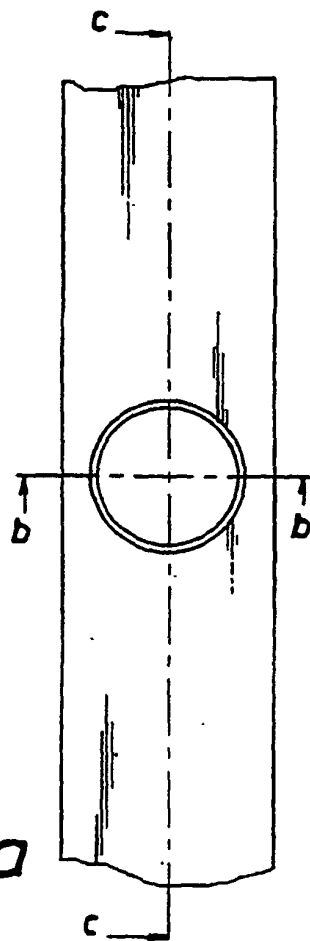
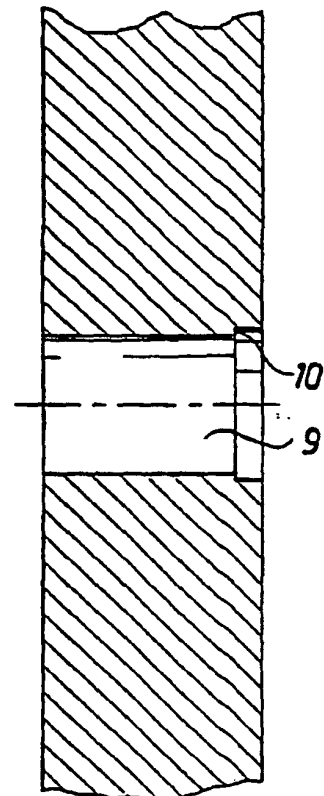


Fig. 2a



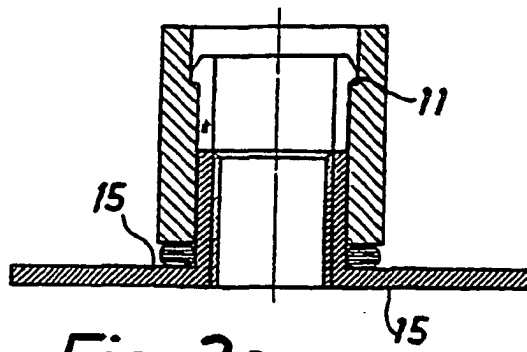


Fig. 3c

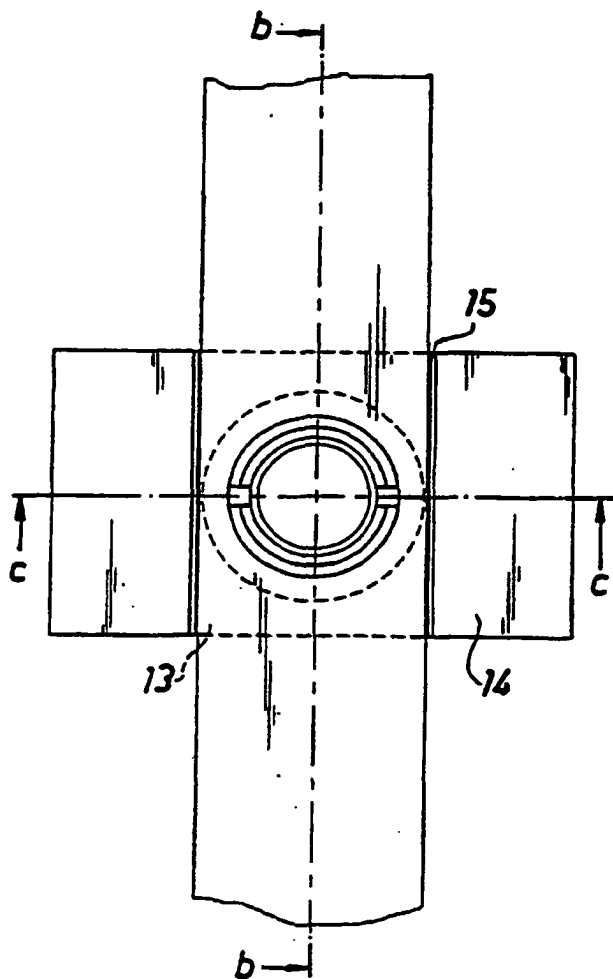


Fig. 3a

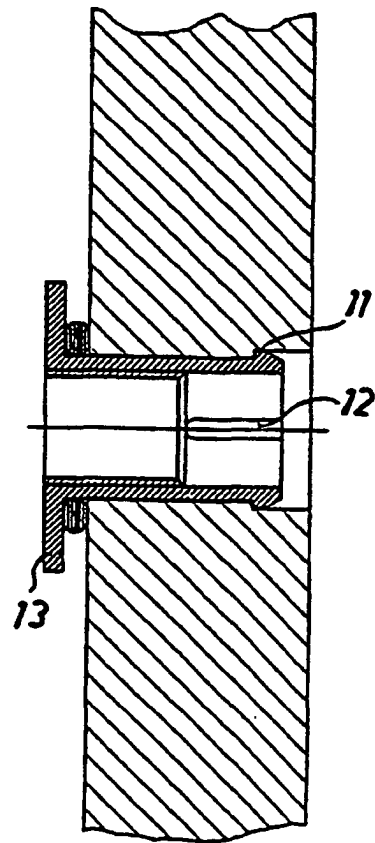


Fig. 3b

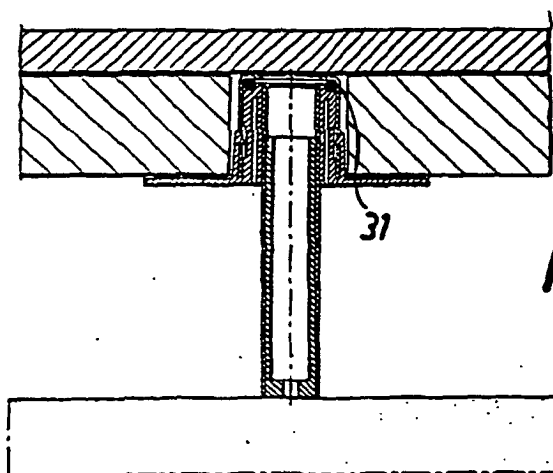


Fig. 4b

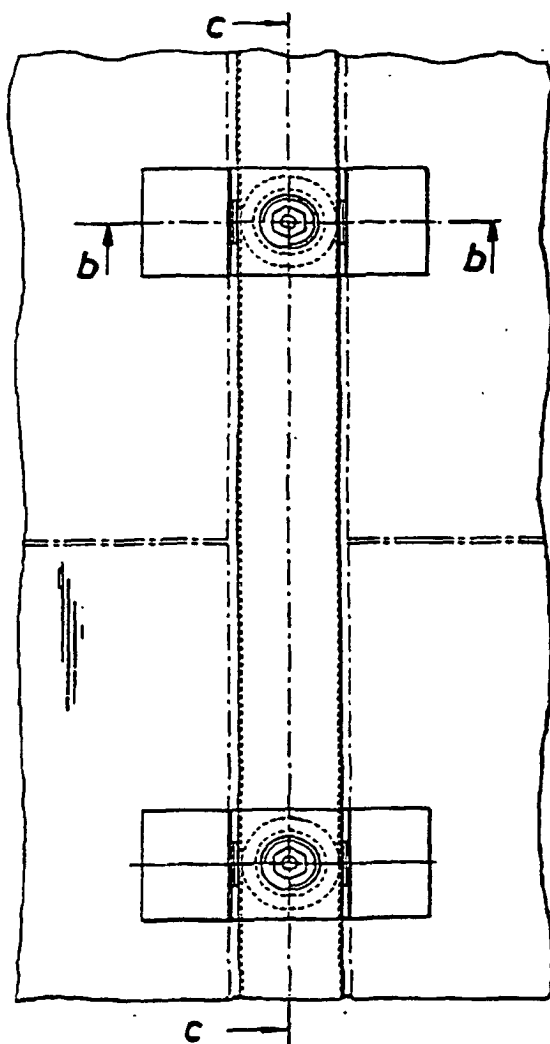


Fig. 4a

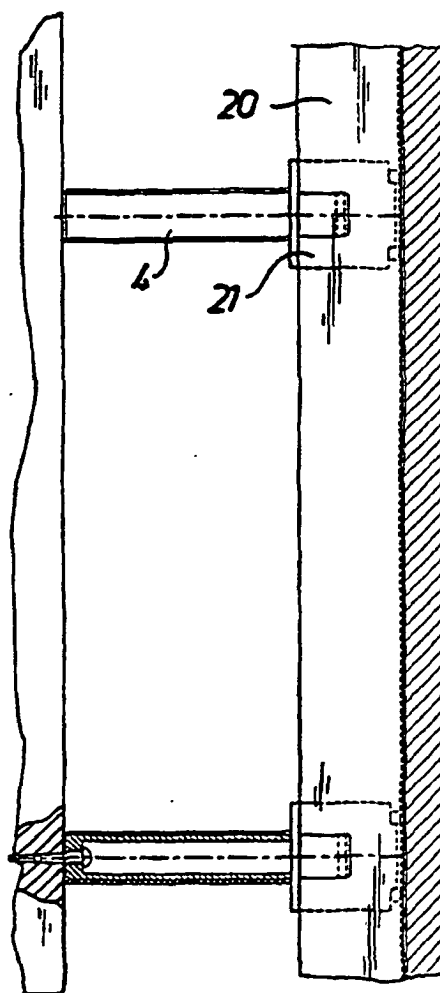
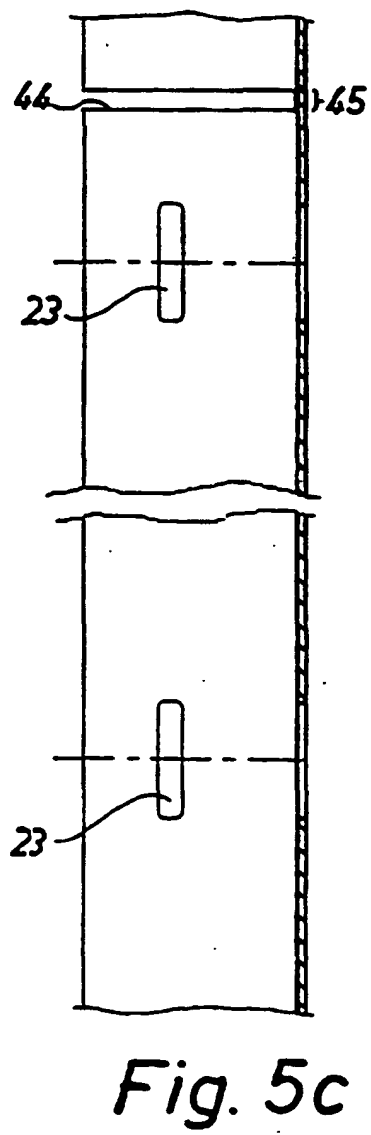
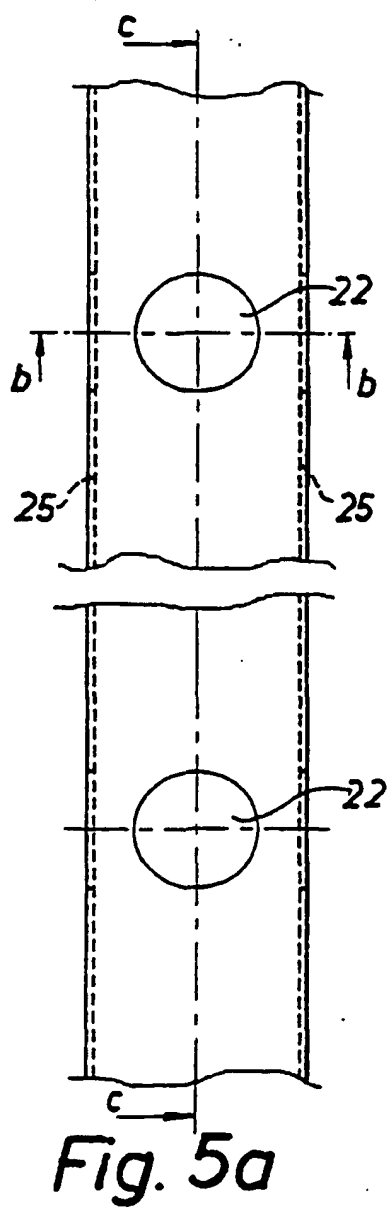
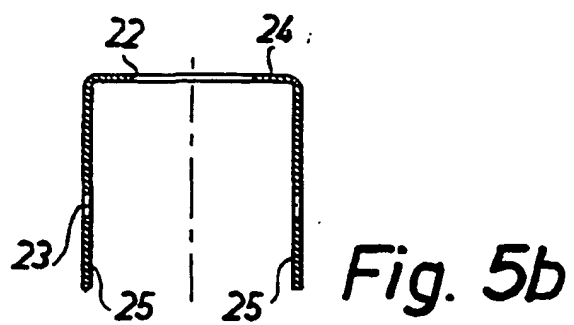


Fig. 4c



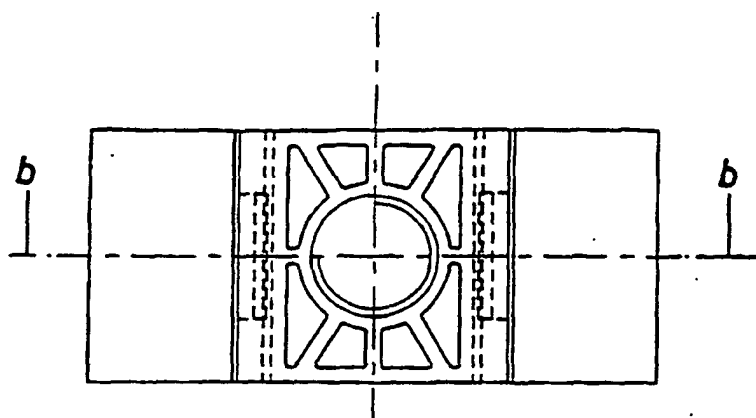


Fig. 6a

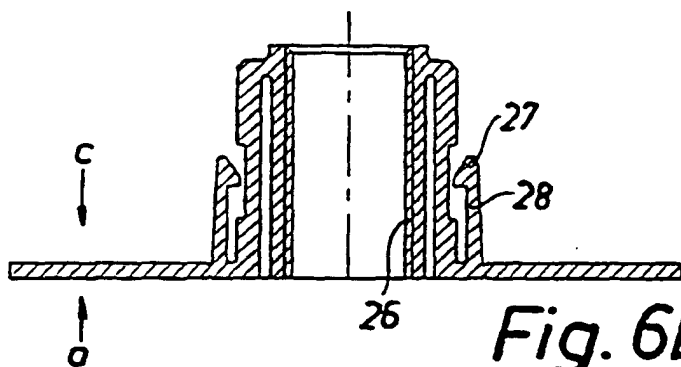


Fig. 6b

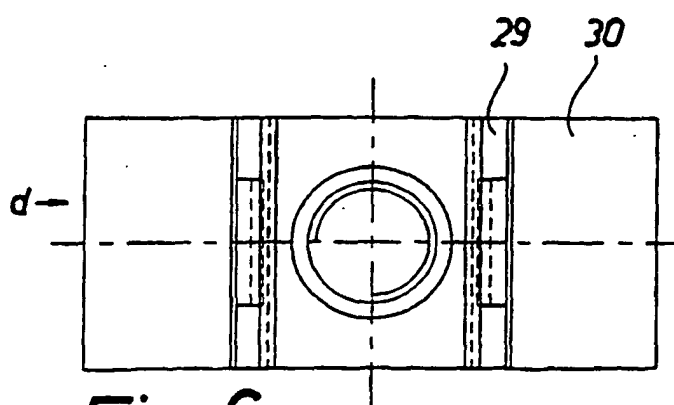


Fig. 6c

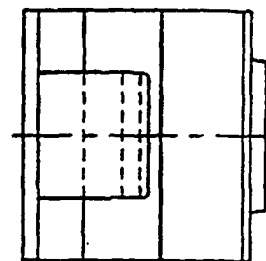


Fig. 6d

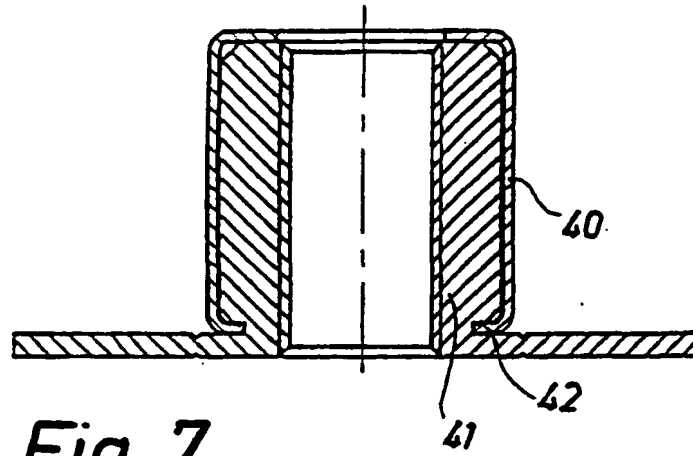


Fig. 7

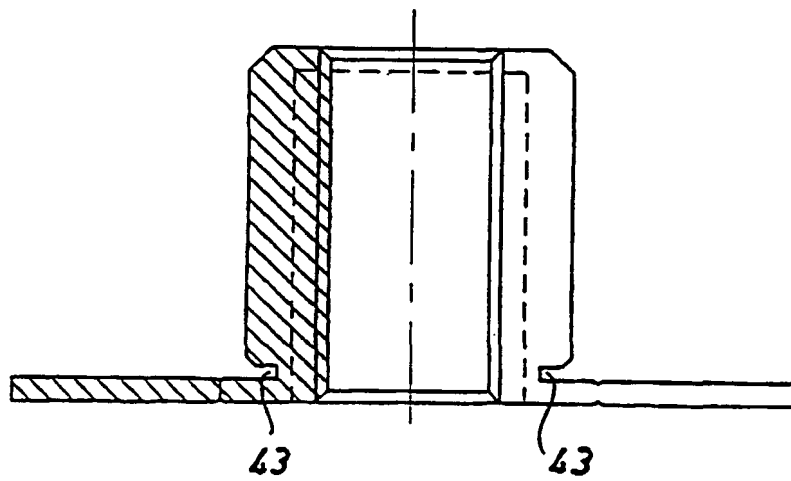


Fig. 8