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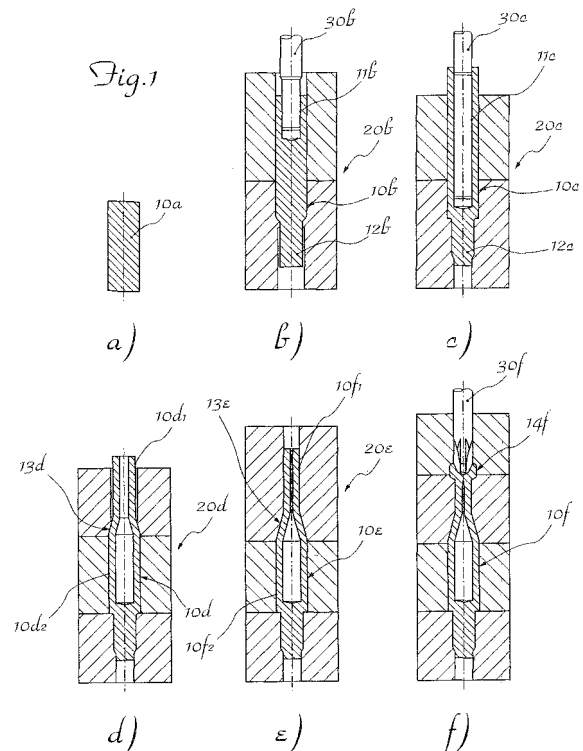
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(54) **Method for producing a pin/tie-bolt**

(57) Method for producing a pin/tie-bolt (110;210) extending in the longitudinal direction (X-X), comprising the steps of:

- a) providing a solid workpiece (10a) made of suitable material and having a suitable length in the longitudinal direction and width/diameter in the transverse direction; wherein the length in the longitudinal direction of the initial workpiece is less than the length in the longitudinal direction of the finished pin/tie-bolt;
- c) compressing the solid workpiece (10b) inside a second mould (20c) associated with a second punch (30c) with formation of a workpiece (10c) having a length in the longitudinal direction elongated to the final desired size and with an internal longitudinal cavity (11c) having a suitable final depth;
- e) compressing in the transverse direction the workpiece (10d) inside a fourth mould (20e) with a longitudinally directed stretching and partial closing of the longitudinal internal cavity with formation of a workpiece (10e) which has a cylindrical top part (10f₁) closed to the final desired diameter, a hollow conical connecting collar (13e) with the final size and a hollow cylindrical middle part (10f₂) of larger diameter than the cylindrical top part (10f₁) and with the final size.



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Description

[0001] The present invention relates to a method for producing shaped pins/tie-bolts, particularly, but not exclusively, to be associated with devices for joining two parts arranged at 90° relative to each other.

[0002] It is known, for example in the furnishing goods sector, that there exists the need to assemble furniture such as cupboards, sets of drawers and the like, using flat parts such as side pieces, cross pieces and the like which must be fastened together in a relative right-angled position in order to ensure a final square arrangement of the assembled furniture.

[0003] It is also known that, in order to achieve stable fastening between the various parts, screw/female thread means are widely used, these essentially consisting of a cylindrical tie-bolt, to be concealingly inserted inside a corresponding seat/bushes of one of the two parts and designed to form the part reacting against a grub screw which engages in the transverse direction with said cylindrical member, being screwed onto the female thread of a bush integral with the other part to be joined and thus causing pulling together of the two parts which bear against each other, remaining fastened together.

[0004] Although performing their function, these joining devices have the drawback, however, consisting in the difficulty of producing said pins/tie-bolts which, since they must ensure, in the form of a single body, numerous configurational variations in order to allow correct positioning and mating with the other parts of the joining device, require complicated machining operations and the need for subsequent machine-tool finishing of the semi-finished part.

[0005] DE-GM-93 19 728 also discloses a method for forming a solid workpiece which envisages insertion of the said workpiece inside moulds where it is shortened and shaped to the final size of the finished workpiece.

[0006] Although fulfilling its function, this method envisages however the need to start with a workpiece having an initial size larger than its final size, thereby producing a large amount of machining swarf and wasted material.

[0007] The technical problem which is posed, therefore, is to develop a method for the simple and low-cost production of shaped pins/tie-bolts, particularly, but not exclusively suitable for association with a device for joining together two parts, for example the component parts of a piece of furniture or the like.

[0008] In connection with this problem it is also required that this method should allow the production of pins/tie-bolts which are in any case shaped, but sufficiently strong, with a substantial saving in material, and, if necessary, provided with means for operation using normal standardized tools by any user, even without specialized skills.

[0009] These results are achieved according to the present invention by a method according to the charac-

teristic features of Claim 1.

[0010] Further details may be obtained from the following description of a non-limiting example of embodiment of the subject of the present invention provided with reference to the accompanying drawings in which:

Figs. 1a-1f show the various steps for production of a pin/tie-bolt according to the present invention;

10 Figs. 2a,2b show a side view and partially sectioned view, respectively, of a first embodiment of a pin/tie-bolt according to the present invention; and

15 Figs. 3a,3b show a side view and partially sectioned view, respectively, of a second embodiment of a pin/tie-bolt according to the present invention.

[0011] As shown in Fig. 1 and assuming solely for the sake of simplification of the description and without any limitation of meaning a pair of reference axes having, respectively, a longitudinal direction coinciding with the axis of rotation of the tie-bolt and a transverse direction Y-Y, the method for producing a pin/tie-bolt according to the present invention comprises essentially the following steps:

30 **a)** providing a solid workpiece 10a made of suitable material and having a suitable length in the longitudinal direction smaller than the length in the longitudinal direction of the finished pin/tie-bolt and width/diameter in the transverse direction greater than or the same as the width/diameter in the transverse direction of the finished pin/tie-bolt;

35 **b)** closing the solid workpiece 10a inside a first mould 20b with compression of the solid workpiece and simultaneous insertion in the longitudinal direction X-X of a punch 30b; during this step the workpiece 10a stretches in the longitudinal direction owing to compression of the mould 20b and, encountering the punch 30b, produces a workpiece 10b which is elongated and has an internal cavity 11b extending in the longitudinal direction and of suitable length; during this step the bottom part 12b of the pin/tie-bolt is also compressed and pre-shaped so as to prepare the same for the next processing step;

40 **c)** further compressing the workpiece 10b inside a second mould 20c associated with a second punch 30c; during this step the compression produces a workpiece 10c, the top part of which according to the orientational layout in the figures is still cylindrical, and further elongated to the final desired size and with an internal axial cavity 11c having a suitable final depth; during this step shaping of the bottom part 12c of the workpiece 10c is also completed;

45 **d)** compressing the workpiece 10c inside a third mould 20d; during this step the compression produces a workpiece 10d, the top part of which according

to the orientational layout in the figures is deformed so as to reduce partly the diameter of the cylindrical top part with formation of a conical collar 13d connecting together the cylindrical top part 10d₁ of smaller diameter and the cylindrical middle part 10d₂ of larger diameter;

e) further compressing the workpiece 10d inside a fourth mould 20e; during this finishing and sizing step the compression produces a workpiece 10e, the top part of which is further elongated and which has a cylindrical top part 10f₁ closed to the final desired diameter, conical connecting collar with the final size and cylindrical middle part 10f₂ of larger diameter than the cylindrical top part 10f₁ and with the final size;

f) final shaping pressing by means of a punch 30f so as to obtain a workpiece 10f with a head 14f having an inset, for example cross-like, seat for operation by means of a tool;

g) although not shown a further final step involving rolling of the pin/tie-bolt so as to form a bottom shank 112 which is self-tapping (Fig. 2a, 2b) or provided with a thread 212 (Figs. 3a, 3b) suitable for mating with a corresponding female thread (not shown).

[0012] The same figures 2a,2b and 3a, 3b show two pins/tie-bolts 110,210, respectively, which, in addition to the different threading, also have different lengths of the two top and bottom cylindrical sections and of the middle collar.

[0013] It is therefore clear how, with the method according to the invention, it is possible to obtain tie-bolts and/or pins generally in a simple, low cost and versatile manner, by means of machining steps which are all cold-machining steps, without the need for subsequent intermediate machine-tool operations, with obvious advantages in terms of reduction of the tooling, production downtime and therefore final costs of the workpiece.

[0014] It also pointed out how with the method according to the invention it is possible to achieve further economies of scale due to the small initial dimensions of the initial workpiece 10a which, since the final dimensions are achieved by means of elongation, allows a reduction in the amount of material needed while achieving the same technical, i.e. mechanical strength, characteristics.

[0015] It is also envisaged that, if permitted by the corresponding dimensional values, the top cylindrical part (Fig. 1c) with associated inset seat may be obtained in a single pass, omitting step 1b, and in the same way closing of the cylindrical top part (Fig. 1e) may be obtained in a single pass 1e, omitting step 1d.

[0016] Although described in connection with certain constructional forms and certain preferred examples of embodiment of the invention, it is understood that the scope of protection of the present patent is defined solely by the following claims.

Claims

1. Method for producing a pin/tie-bolt (110;210) extending in the longitudinal direction (X-X), comprising the steps of:

a) providing a solid workpiece (10a) made of suitable material and having a suitable length in the longitudinal direction and width/diameter in the transverse direction;

e) compressing in the transverse direction the workpiece (10d) inside a fourth mould (20e) with a longitudinally directed stretching and partial closing of the longitudinal internal cavity with formation of a workpiece (10e) which has a cylindrical top part (10f₁) closed to the final desired diameter, a conical connecting collar (13e) with the final size and a cylindrical middle part (10f₂) of larger diameter than the cylindrical top part (10f₁) and with the final size;

characterized in that

the length in the longitudinal direction of the initial solid workpiece (10a) is less than the length in the longitudinal direction of the finished pin/tie-bolt and **in that** it comprises a preliminary step of **c)** compressing the solid workpiece (10b) inside a second mould (20c) associated with a second punch (30c) with formation of a workpiece (10c) having a length in the longitudinal direction elongated to the final desired size and with an internal longitudinal cavity (11c) having a suitable final depth.

2. Method according to Claim 1, **characterized in that** the step c) is preceded by a pre-forming step which envisages:

b) closing the solid workpiece (10a) inside a first mould (20b) with compression of the solid workpiece and simultaneous insertion in the longitudinal direction (X-X) of a first punch (30b) of suitable length in the axial direction and simultaneous compression and shaping of the bottom part (12b) of the pin/tie-bolt so as to prepare the same for following step c).

3. Method according to Claim 1, **characterized in that** the step e) is preceded by a pre-forming step which envisages:

d) compressing the hollow part of the workpiece (10c) leaving the second mould (20c) inside a third mould (20d) so as to form a workpiece (10d), the top part of which has a smaller diameter, a conical collar (13d) connecting together the cylindrical top part (10d₁) of smaller diameter and a cylindrical middle part (10d₂) of larger diameter;

4. Method according to Claim 1, **characterized in that** it comprises a further step involving:

g) rolling the pin/tie-bolt so as to produce a threaded bottom shank (112;212). 5

5. Method according to Claim 1, **characterized in that** it comprises a further step involving:

f) punching the top end in a coaxial direction in order to form a head (14f) with an inset seat suitable for operation by means of a tool; 10

6. Method according to Claim 1, **characterized in that** the forming steps are cold-forming steps. 15

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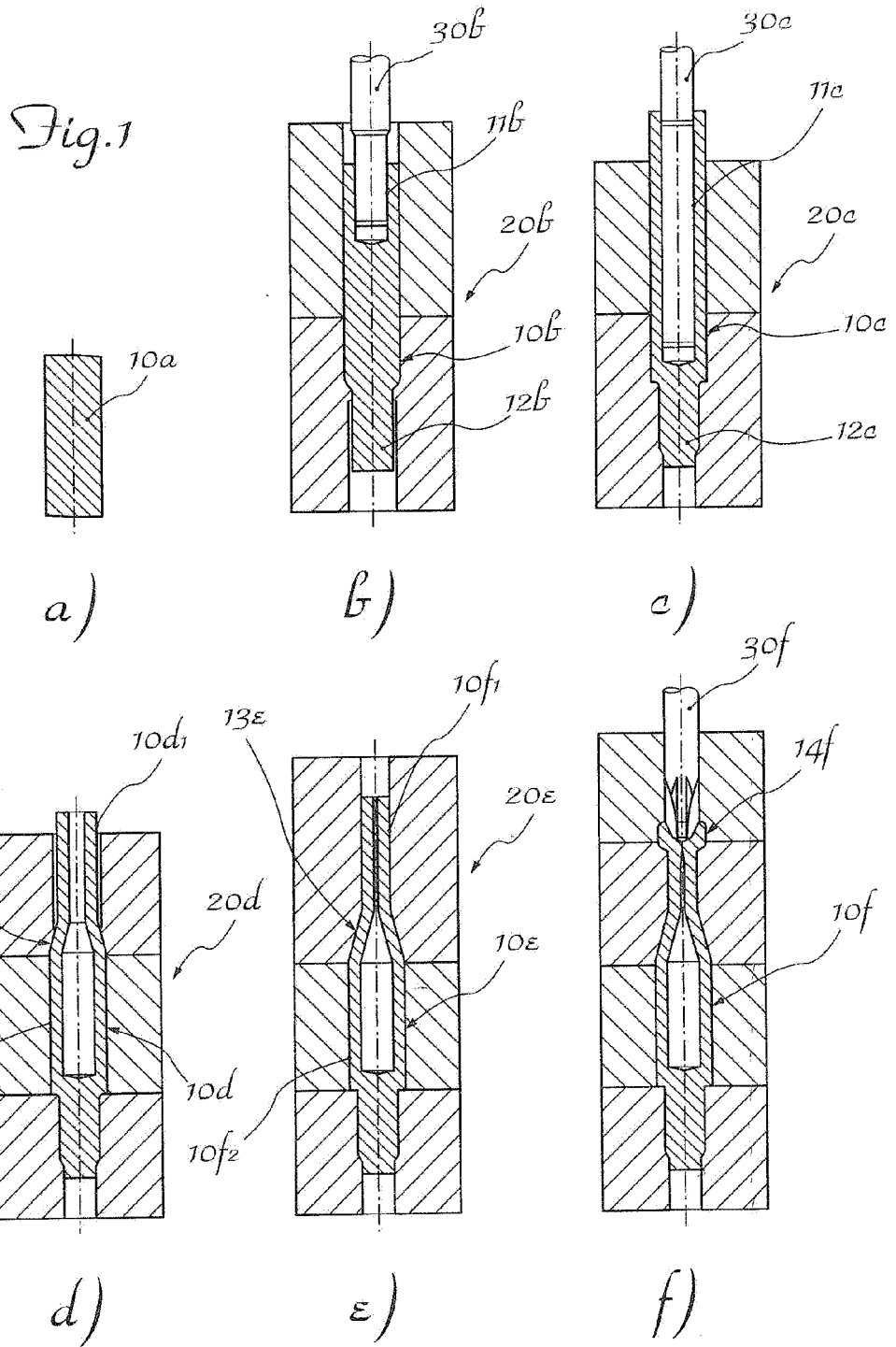
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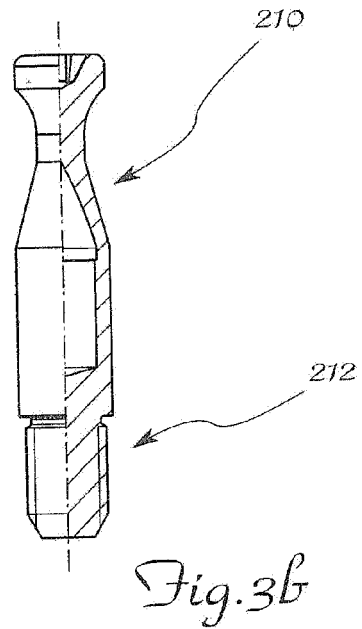
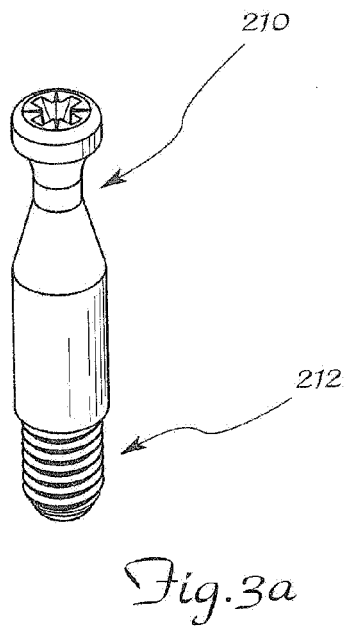
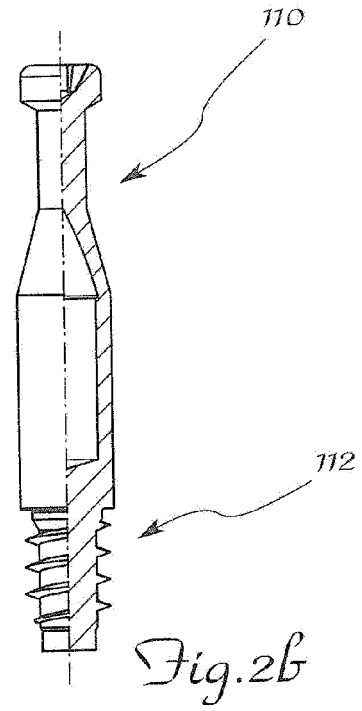
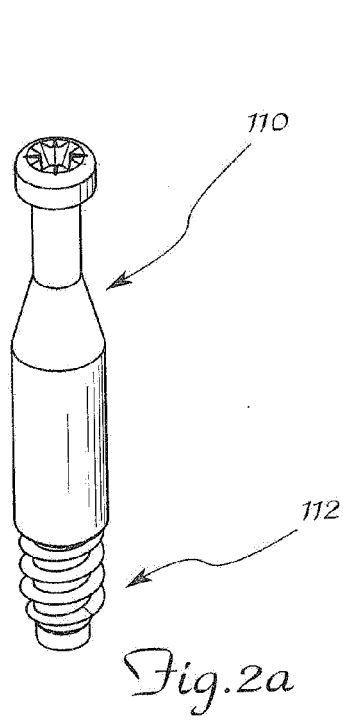
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EUROPEAN SEARCH REPORT

Application Number
EP 10 17 4806

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 93 19 728 U1 (MOEHLING GMBH & CO [DE]) 16 June 1994 (1994-06-16) * the whole document * -----	1-6	INV. B21H3/02 B21K1/46 B21K1/56 B21K21/08
A	JP 1 202333 A (SAKAMURA MACHINE) 15 August 1989 (1989-08-15) * abstract; figures 1,2 * -----	1-6	
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A	DE 199 18 196 A1 (HEINRICH HOFSAES GMBH & CO [DE]) 26 October 2000 (2000-10-26) * column 3, line 59 - line 66; figure 3 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B21H B21K
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 November 2010	Examiner Ritter, Florian
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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