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(71) Applicant: **Bo.Mec. Srl**
36034 Vicenza (IT)

(72) Inventors:
• **BORTOLOTTO, VALTER**
36034 VICENZA (IT)
• **BORTOLOTTO, DAVIDE**
36034 VICENZA (IT)

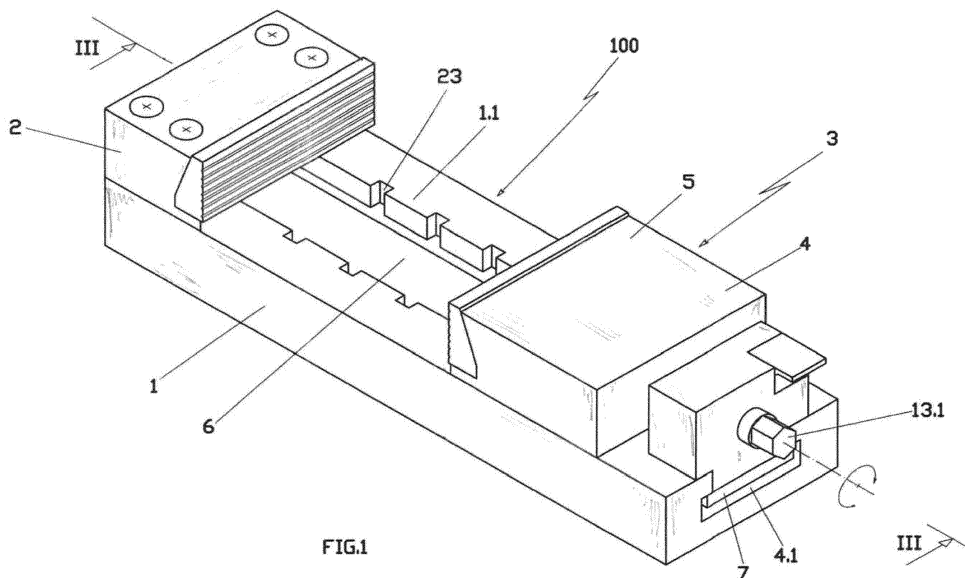
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(74) Representative: **Bettello, Pietro**
Via Col d'Echele, 25
36100 Vicenza (IT)

(54) **PRECISION VICE FOR INDUSTRIAL USES**

(57) The present invention relates to a precision vice for industrial uses of the type substantially consisting in a baseplate (1) on which two jaws are positioned, one jaw (2) of which being fixed, integral with the aforesaid baseplate (1), while the opposite jaw (3) being linearly slidable still on the aforesaid baseplate (1), in order to adapt to the different "openings" required by the sizes of the workpieces. Said movable jaw (3) is composed of two parts: a body (4) and a slider (5), mutually engaged by means of a threaded connection (10), where the body (4) has the function of blocking in proximity of the workpiece the entire mobile jaw (3) on the baseplate (1), by

a latch (20), while the final clamping of the workpiece is obtained by driving the aforesaid threaded connection (10), always totally contained inside the movable jaw (3), in any position and opening condition of said movable jaw (3). Said precision vice (100) is characterized in that even said latch (20) is always totally contained inside the movable jaw (3), in any position and opening condition of said movable jaw (3) and in that it can be related to a "guillotine" system, where a transverse rod (21) is susceptible to linearly slide for positioning inside the pairs of opposite notches (23).



Description

[0001] The present invention relates to a precision vice for industrial uses, according to the general part of claim 1.

[0002] In mechanical machining with tooling machines, ranging from milling machines to CNC machining centres, the workpiece is clamped and engaged by means of a mechanical equipment known as a "precision vice", consisting essentially of a baseplate on which two jaws are positioned, one jaw of which is fixed, integral with the aforesaid baseplate, while the opposite jaw is linearly slidable, to adapt to different "apertures" required by the sizes of the workpieces.

[0003] In the current state of the art, numerous types of precision vices are known; in particular, those having a movable jaw adjusted by means of a screw mechanism are widespread.

[0004] By way of an example, mention is made to patent document CN 108555788 A (see in particular figs. 1-3; claim 1), which is undoubtedly the most important document of the state of the art, as well as the patent document EP 0 526 432 A1 (see in particular figs 7-10; claim 8).

[0005] Other documents of the state of the art are: US 4431174 A, DE 127733 C, US 2430366 A, US 1765826 A, US 2868091 A and US3063707 A.

[0006] In practice, the precision vices currently on the market have drawbacks which limit the use thereof.

[0007] A first drawback is constituted by the fact that the present precision vices are constituted by a large number of elements and moreover, in order to balance the efforts necessary to ensure a regular closure of the jaws, they have considerable sizes; this significantly increases the purchase cost of the entire equipment.

[0008] Another drawback is of an operational type, since, with the current conformations of the precision vices, the machining waste, such as metal shavings, scraps, powders, oils and emulsions, are also deposited on the movable jaw, thus impregnating, in addition to the sliding guides, also the control members of the aforesaid jaw and in particular the screw mechanism that controls the longitudinal advancement thereof and the blocking mechanism on the baseplate, which involves the need for frequent maintenance and, consequently, an additional cost.

[0009] The main object of the present invention is to realize a precision vice for industrial uses which is free from the drawbacks manifested by similar products of known type. A further object of the present invention is to realize a precision vice for industrial uses, which ensures the maximum alignment precision, using a limited number of components.

[0010] Still, a further object of the present invention is to realize a precision vice for industrial uses, in which the control members of the movable jaw are protected from machining waste and therefore require minimal maintenance.

[0011] Still another object of the present invention is to realize a precision vice for industrial uses in which the assembly of the components is easy and simple.

5 **[0012]** Still, another object of the present invention is to realize a precision vice for industrial uses in which the components are rapidly interchangeable.

10 **[0013]** Not least object of the present invention is to realize a precision vice for industrial uses which, due to the simplicity of manufacturing the components, is of limited cost. These objects are achieved with a precision vice for industrial uses in which the control members of the movable jaw are always completely contained inside the body of the aforesaid jaw, with any aperture of the vice and, therefore, are always protected from machining waste of the engaged workpiece, with the realization of a particular mechanism that blocks the movable jaw on the baseplate.

15 **[0014]** In particular, the vice according to the invention is compliant with the characterizing part of claim 1; some particular embodiments thereof are described in the dependent claims.

20 **[0015]** The invention will be better defined through the description of a possible embodiment thereof, given solely by way of non-limiting example, with the aid of the attached drawings, wherein:

- fig. 1 represents a perspective view of the vice according to the invention;
- fig. 2 represents a perspective view of the vice according to the invention, with the movable jaw exploded;
- fig. 3 represents a longitudinal section view of the vice according to the invention, taken along the line III-III of fig. 1;
- 30 - fig. 4 represents a cross-sectional view of the vice according to the invention, taken along the line IV-IV of fig. 3;
- fig. 5 represents a cross-sectional view of the vice according to the invention, taken along the line IV-IV of fig. 3;
- 35 - fig. 6 represents a longitudinal section view of the vice according to the invention, taken along the line VI-VI of fig. 2;
- figs. 7, 8 represent cross-sectional views of the movable jaw taken along the line VIII-VIII of fig. 6, in the conditions, respectively, of locking and unlocking of the movable jaw on the baseplate;
- figs. 9, 10 represent two longitudinal section views of the vice in two different aperture conditions, respectively "XI" and "X2";
- 40 - figs. 11, 12 represent two exploded and assembly views, respectively, of the baseplate/fixed jaw assembly;
- fig. 13 represents a longitudinal view of the vice according to the invention, taken along the line XIII-XIII of fig. 12;
- 45 - figs. 14, 15 represent two exploded and assembly views, respectively of the stop block of the movable

jaw;

- fig. 16, 17 represent two exploded and assembly views, respectively of the slider of the movable jaw.

[0016] As can be seen in Figs. 1 and 3, the precision vice according to the invention, indicated as a whole with the reference 100, comprises a baseplate 1, on which the jaws 2 and 3 are positioned, where the jaw 2 is integral with said baseplate 1, while the jaw 3 always longitudinally slides on said baseplate 1, in order to be approached to the workpiece to be clamped.

[0017] As can be seen in figs. 2, 3 and 6, the movable jaw 3 is composed of two parts: a body 4 and a slider 5, mutually engaged by means of a threaded connection, indicated as a whole with reference 10.

[0018] The body 4 and the slider 5 are kept in guide by sliding their lower narrow base, respectively 4.1 and 5.1, along the channel 6 of the baseplate 1; they are prevented from vertically exiting by means of two plates, 7 and 8 respectively, which constitute the undercuts of the two opposite protruding edges 1.1, which provide the aforesaid channel 6 with a "T" configuration (see fig. 4).

[0019] The body 4 has the function of blocking in proximity of the workpiece the entire mobile jaw 3 on the baseplate 1 by a latch, indicated as a whole with reference 20 (see fig. 7), while the final clamping of the workpiece is realized by the precision advancement of the slider 5, obtained by driving the threaded connection 10 (see figs. 9, 10).

[0020] The threaded connection 10 between the body 4 and the slider 5 is of the "nut screw" type, where the nut 11 is positioned inside the body 4, while the screw 12 is positioned inside the slider 5.

[0021] The first novelty feature of the invention is constituted by the fact that the nut 11 is obtained on a threaded holed cylindrical hub 13 that is assembled in disengaged position on the body 4 which is only allowed to rotate axially, by acting on its tang 13.1, protruding from the back of said body 4, in order to be handled by the operator; furthermore, the screw 12 consists in an integrally-assembled threaded pin 14, which is not allowed to rotate inside the aforesaid slider 5.

[0022] In this way a threaded connection is realized with an "inverted nut screw", where the nut, kept allocated in the body 4, when axially rotated, engages the screw 12 to slide longitudinally, causing the longitudinal displacement of the slider 5 (gripper aperture/closure).

[0023] Furthermore, the body 4 and the slider 5 are always each other compenetrated, by the front narrow portion 4.2 of the body 4 which always stays fitted in the cavity 9 of the slider 5; thereby, as can be seen from the observation of figs. 9 and 10, in any position of the slider 5 (apertures X1-X2) the threaded pin 14 always results totally contained inside the jaw and, therefore, protected from external pollutants.

[0024] A further novelty feature of the invention is constituted by the conformation of the latch 20 which can be related to a "guillotine" system, where a transverse rod

21, contained in disengaged position inside a seat 22 obtained in the body 4, is susceptible to linearly slide for positioning inside the pairs of opposite notches 23 that are obtained on the two opposite protruding edges 1.1 of the channel 6 and resting on the base plate 5.1.

[0025] Operatively (see fig. 7), when the transverse rod 21 is lifted, the body 4 and, consequently, the entire jaw 3, are free to slide longitudinally in the channel 6; by contrast, when the transverse rod 21 (see fig. 8) is totally lowered, the rod interlocks into opposite notches 23, such that the body 4 remains locked on the baseplate 1; this enabling, by only rotating the nut 11, the cursor 2 to slide longitudinally to perform locking and unlocking of the workpiece.

[0026] The movement of the transverse rod 21 is controlled by two pins 24 and 25 sliding inside channels 26, obtained on the body 4, at least one 25 of which is provided with a protruding fin 27, that enables the operator to manually handle said rod.

[0027] From the above it is clear that the pre-set objects have been fully achieved: the movable jaw 3 is formed by a limited number of components and the movement thereof (the blocked positioning on the baseplate and the closure action of the slider) requires from the operator the simple operation of moving the guide pin 26, by acting on the fin 27, to lower the rod 21; then, by acting on the protruding tang 13.1, he makes the nut 11 rotate, to make the slider 25 advance until the workpiece is completely blocked.

[0028] Obviously, the technical design details and the components used, known in the state of the art and in evolution, can be the most varied, provided that all fall within the inventive concept defined by the following claims.

Claims

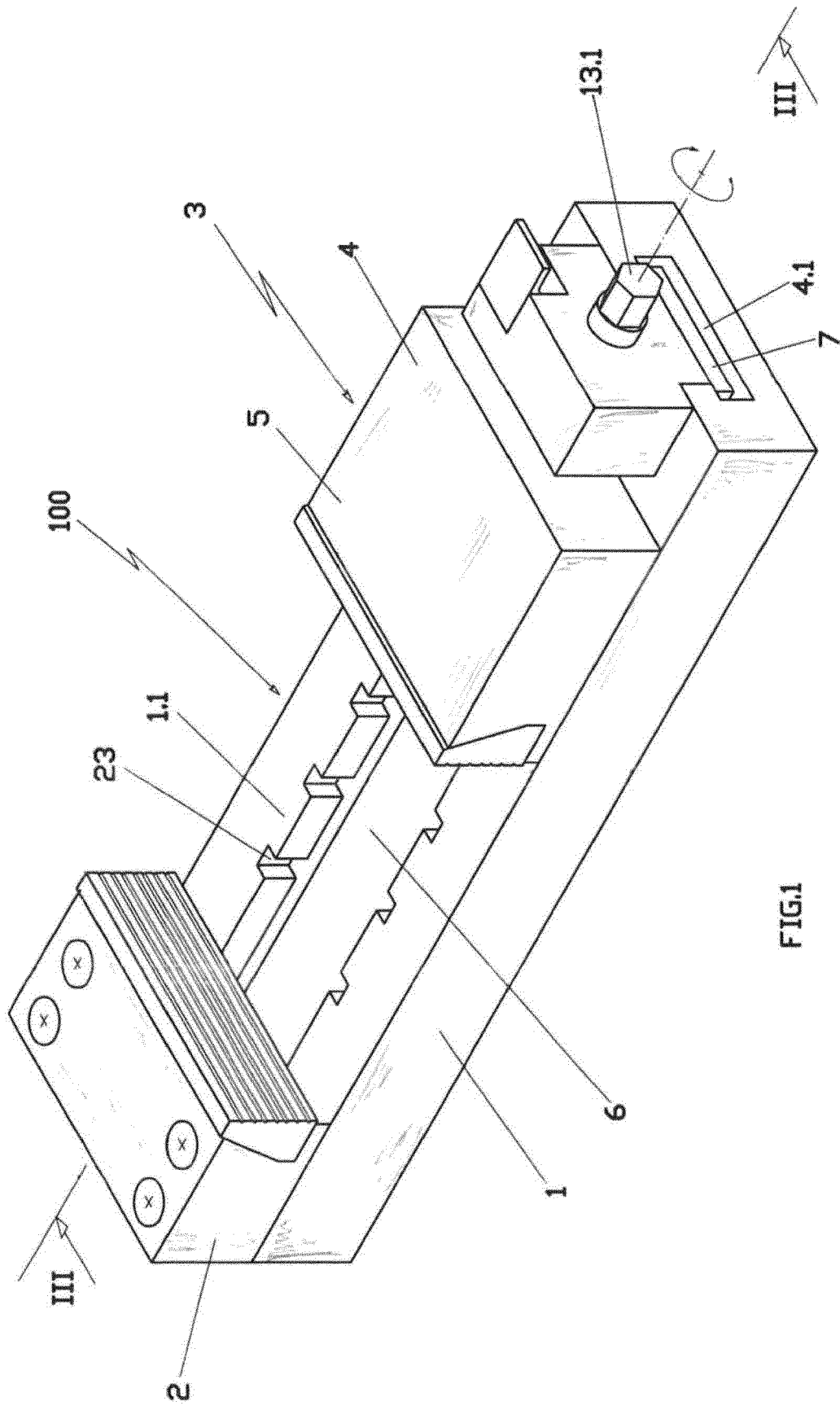
1. PRECISION VICE FOR INDUSTRIAL USES, to be used in mechanical processing with tooling machines, from milling machines to CNC processing centres, of the type substantially consisting in a baseplate (1) on which two jaws are positioned, one jaw (2) of which being fixed, integral with the aforesaid baseplate (1), while the opposite jaw (3) being linearly slidable still on the aforesaid baseplate (1), in order to adapt to the different "openings" required by the sizes of the workpieces, the movable jaw (3) being composed of two parts: a body (4) and a slider (5), mutually engaged by means of a threaded connection (10), where the body (4) has the function of blocking in proximity of the workpiece the entire mobile jaw (3) on the baseplate (1), by a latch (20), while the final clamping of the workpiece is achieved by the precision advancement of a slider (5), obtained by driving the aforesaid threaded connection (10), said threaded connection (10) being always totally contained inside the movable jaw (3), in any position

and opening condition of said movable jaw (3) **said precision vice (100) being characterized in that** even said latch (20) is always totally contained inside the movable jaw (3), in any position and opening condition of said movable jaw (3) and **in that** the latch (20) can be related to a "guillotine" system, where a transverse rod (21), contained in neutral inside a seat (22), obtained in the body (4), is susceptible to linearly slide for positioning inside the pairs of opposite notches (23) obtained on the two opposite protruding edges (1.1) of the channel (6) and resting on the base plate (5.1).

2. PRECISION VICE, according to claim 1, **characterized in that** the threaded connection (10) comprises a ball screw (11) positioned inside the body (4) and a screw (12) positioned inside the slider (5), where the ball screw (11) is obtained on a threaded holed cylindrical hub (13) assembled in neutral on the body (4) to which only the axial rotation is allowed and where the screw (12) consists in an integrally assembled threaded pin (14), to which the rotation inside the aforesaid slider (5) is not allowed.
3. PRECISION VICE, according to claim 2, **characterized in that** the operation of the threaded connection (10) is realized with an "inverted nut", where the ball screw (11), kept allocated in the body (4), when axially rotated, by acting on the tang (13.1) of the cylindrical hub (13) and protruding from the back of said body (4), engages the screw (12) to slide longitudinally, causing the longitudinal displacement of the slider (5) (gripper opening/closure).
4. PRECISION VICE, according to one or more of the preceding claims, **characterized in that** the body (4) and the slider (5) are always mutually compenetrated, by the front narrow portion (4.2) of the body (4) which always stays fitted in the cavity (9) of the slider (5), thereby, in any position of the slider (5) (openings X_1 - X_2), the threaded pin (14) always resulting totally contained inside the jaw (3).
5. PRECISION VICE, according to one or more of the preceding claims, **characterized in that** the body (4) and the slider (5) are kept in guide by sliding their lower narrow base (4.1, 5.1) along the channel (6) of the baseplate (1) and are prevented from vertically exiting by means of two plates (7, 8), which constitute the undercuts of two opposite protruding edges (1.1), which provide the aforesaid channel (6) with a "T" configuration.
6. PRECISION VICE, according to one or more of the preceding claims, **characterized in that**, when the transverse rod (21) is lifted, the body (4), and consequently, the entire jaw (3) are free to slide longitudinally in the channel (6) and by contrast, when

the transverse rod (21) is totally lowered, said rod interlocks into opposite notches (23) such that the body (4) remains locked on the baseplate (1), this enabling, by only rotating the ball screw (11), the cursor (2) to slide longitudinally to perform locking and unlocking of the workpiece.

7. PRECISION VICE, according to claim 6, **characterized in that** the movement of the transverse rod (21) is controlled by two pins (24, 25) sliding inside channels (26), obtained on the body (4), at least one (25) of which is provided with a protruding fin (27), that enables the operator to manually handle said rod (21).



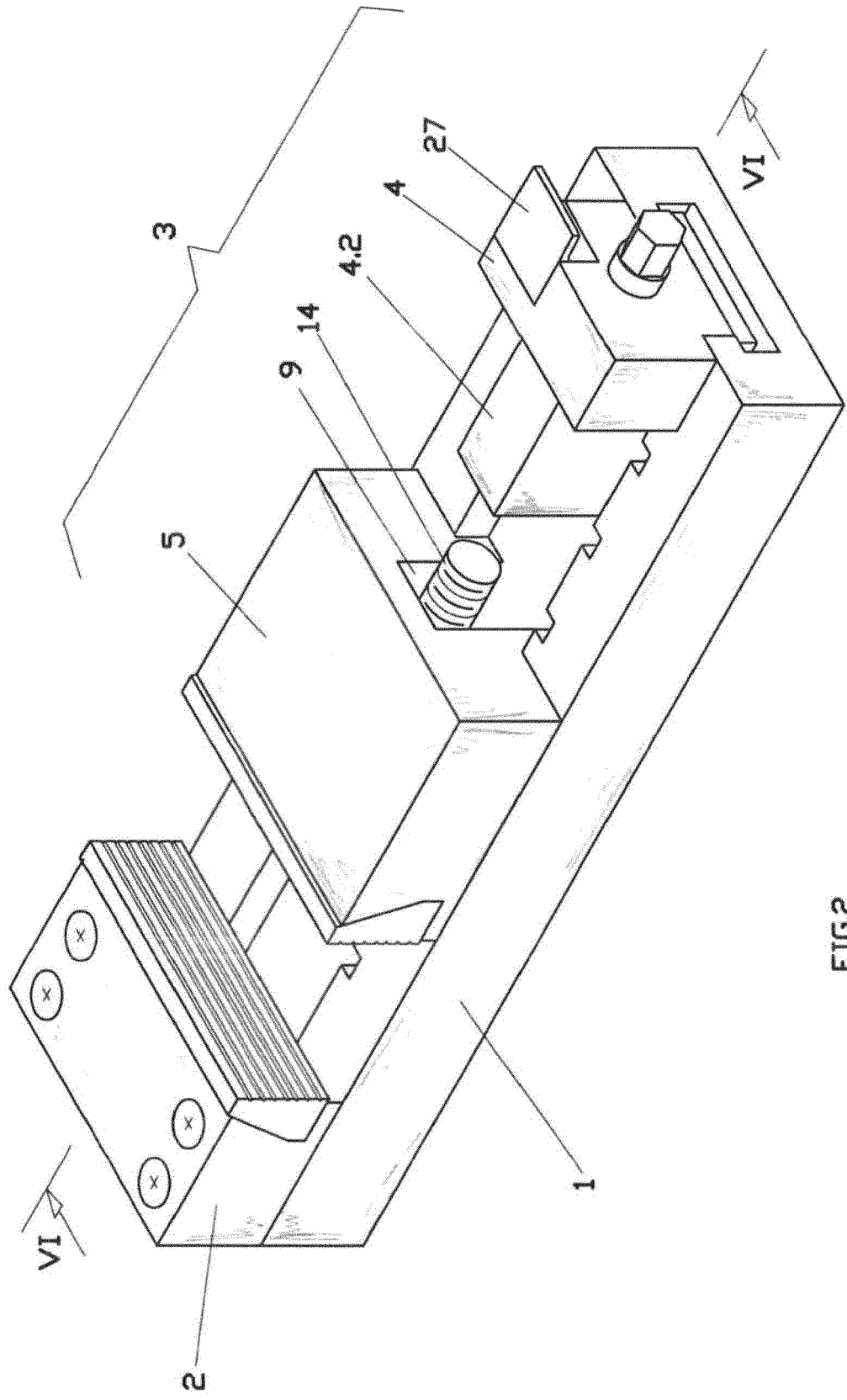
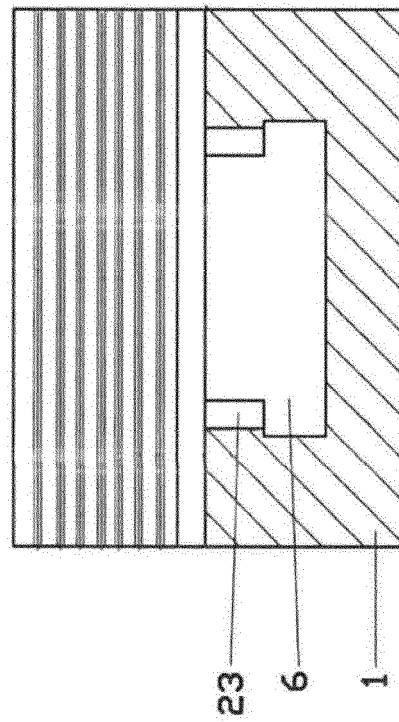
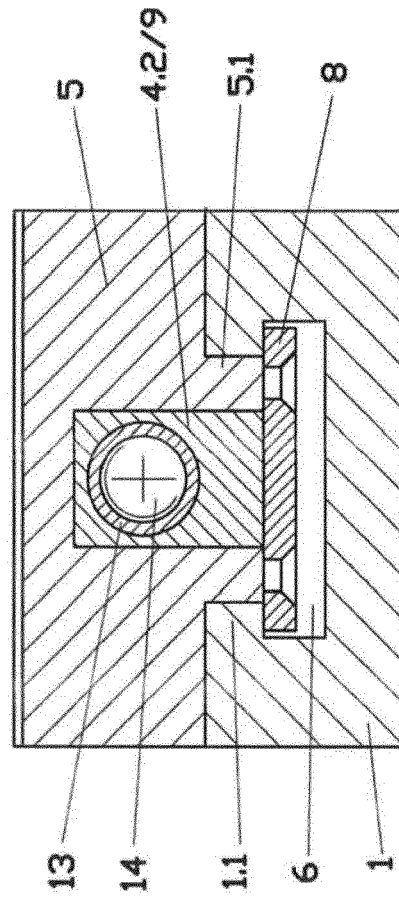
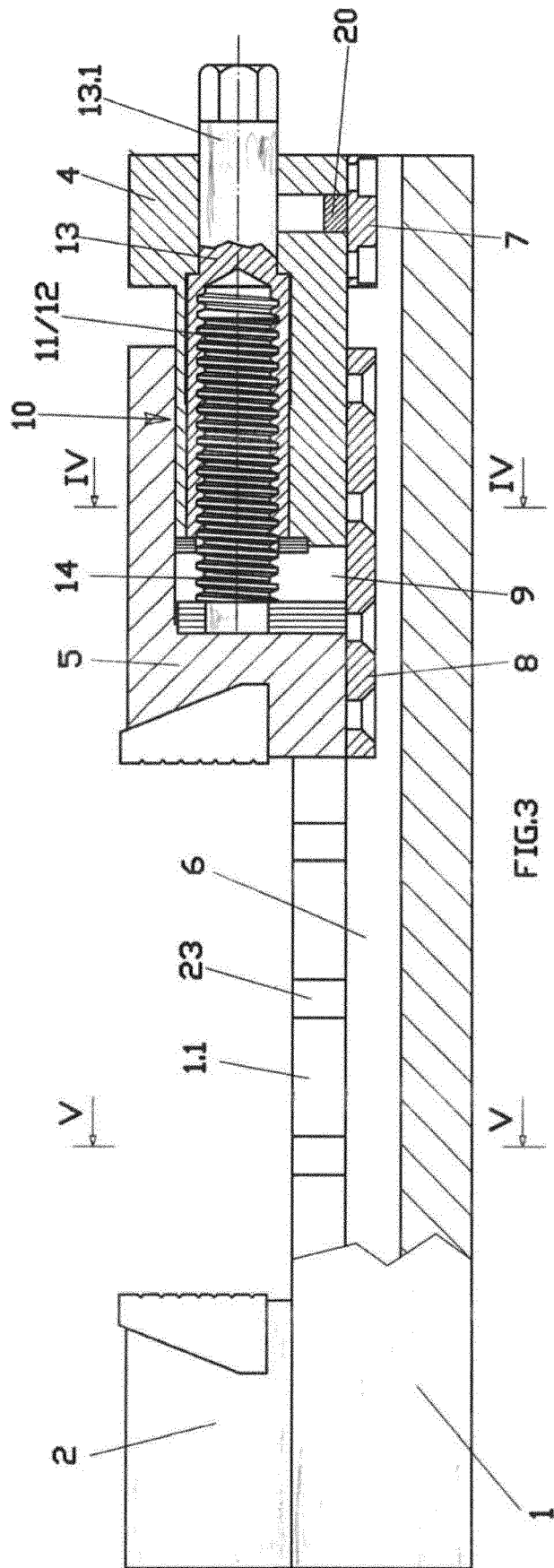
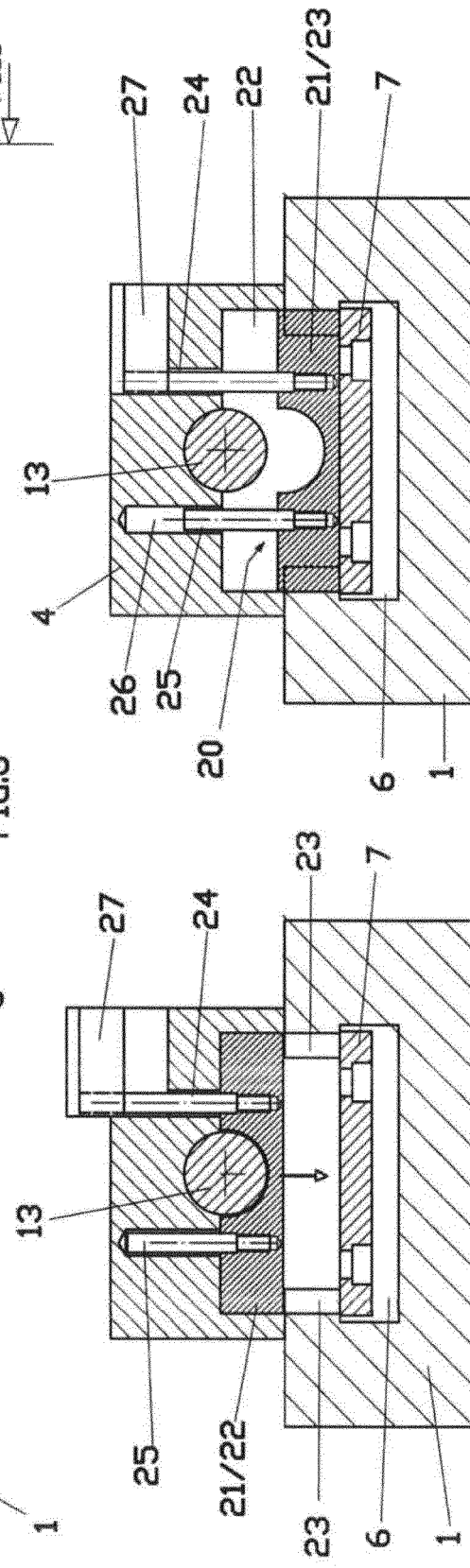
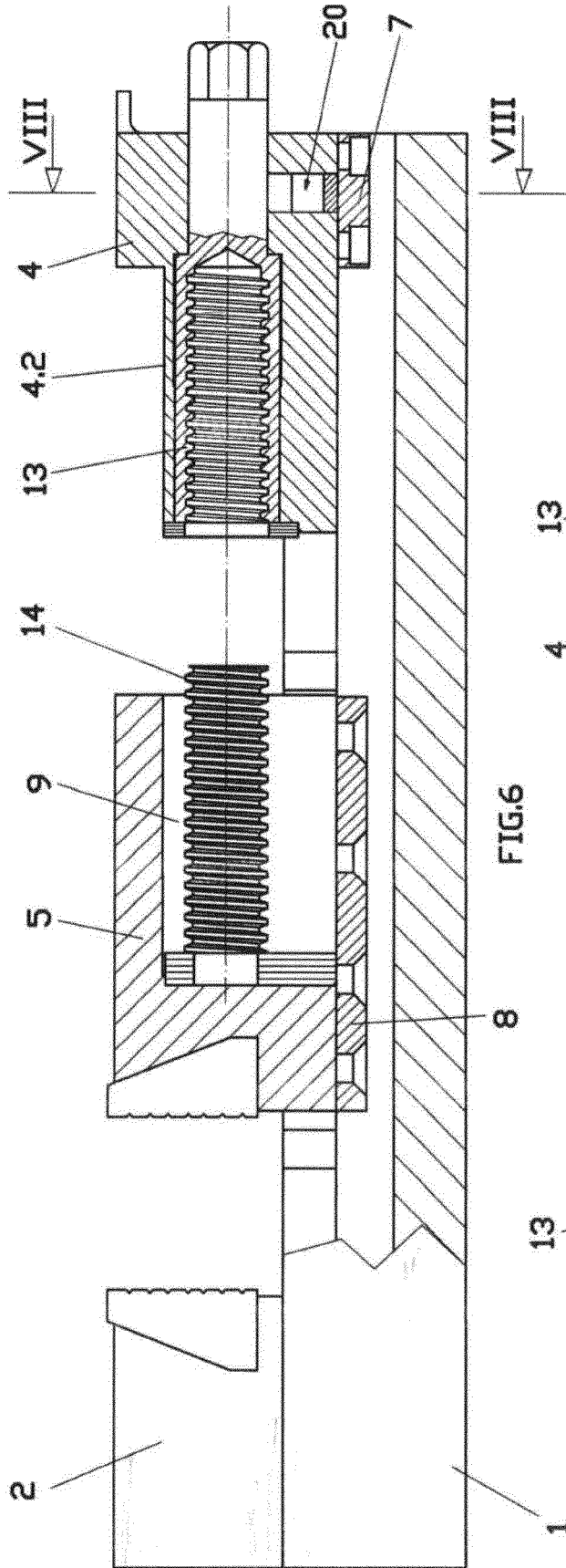


FIG.2





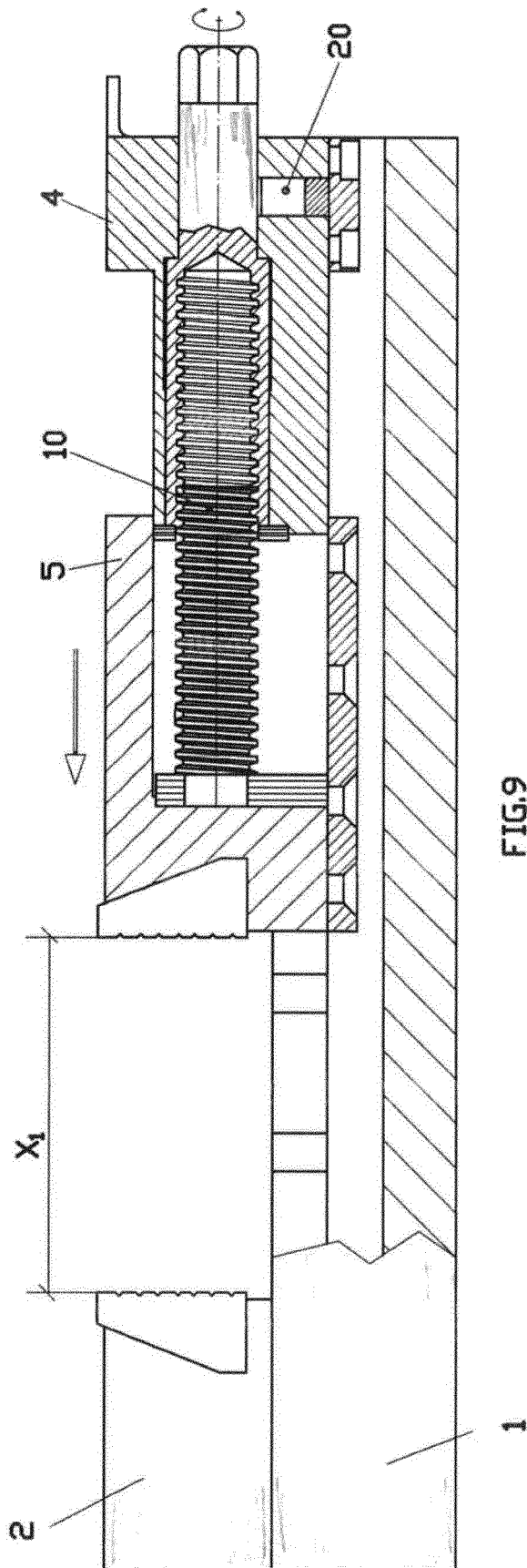


FIG. 9

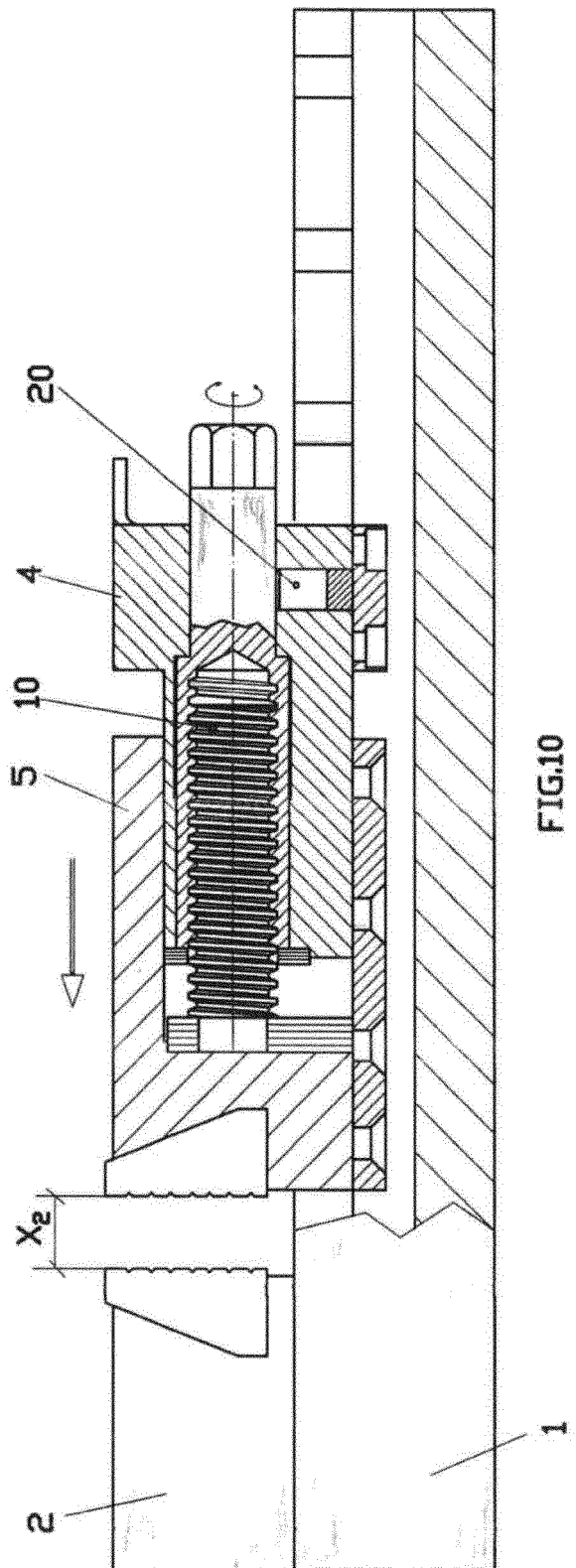
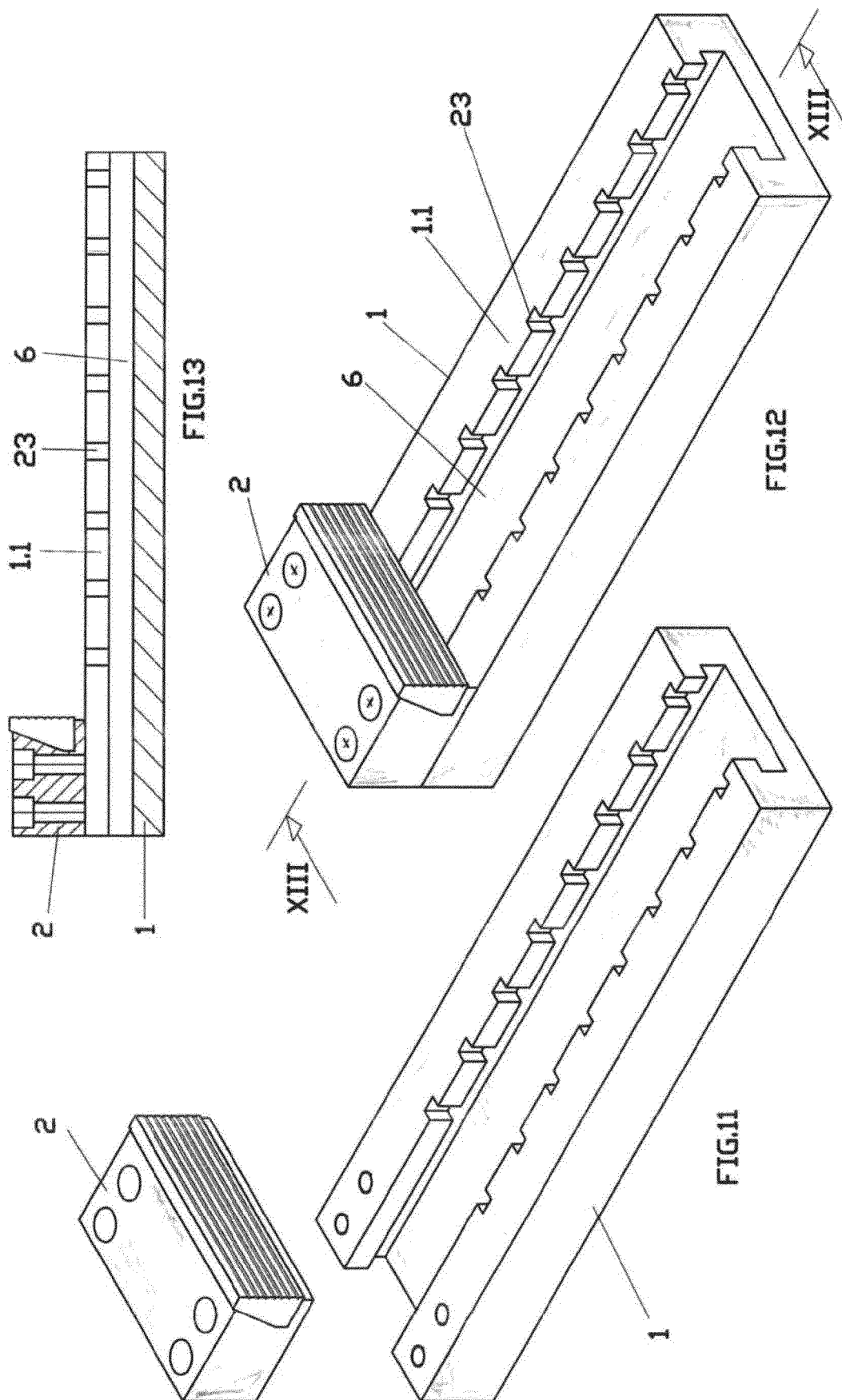
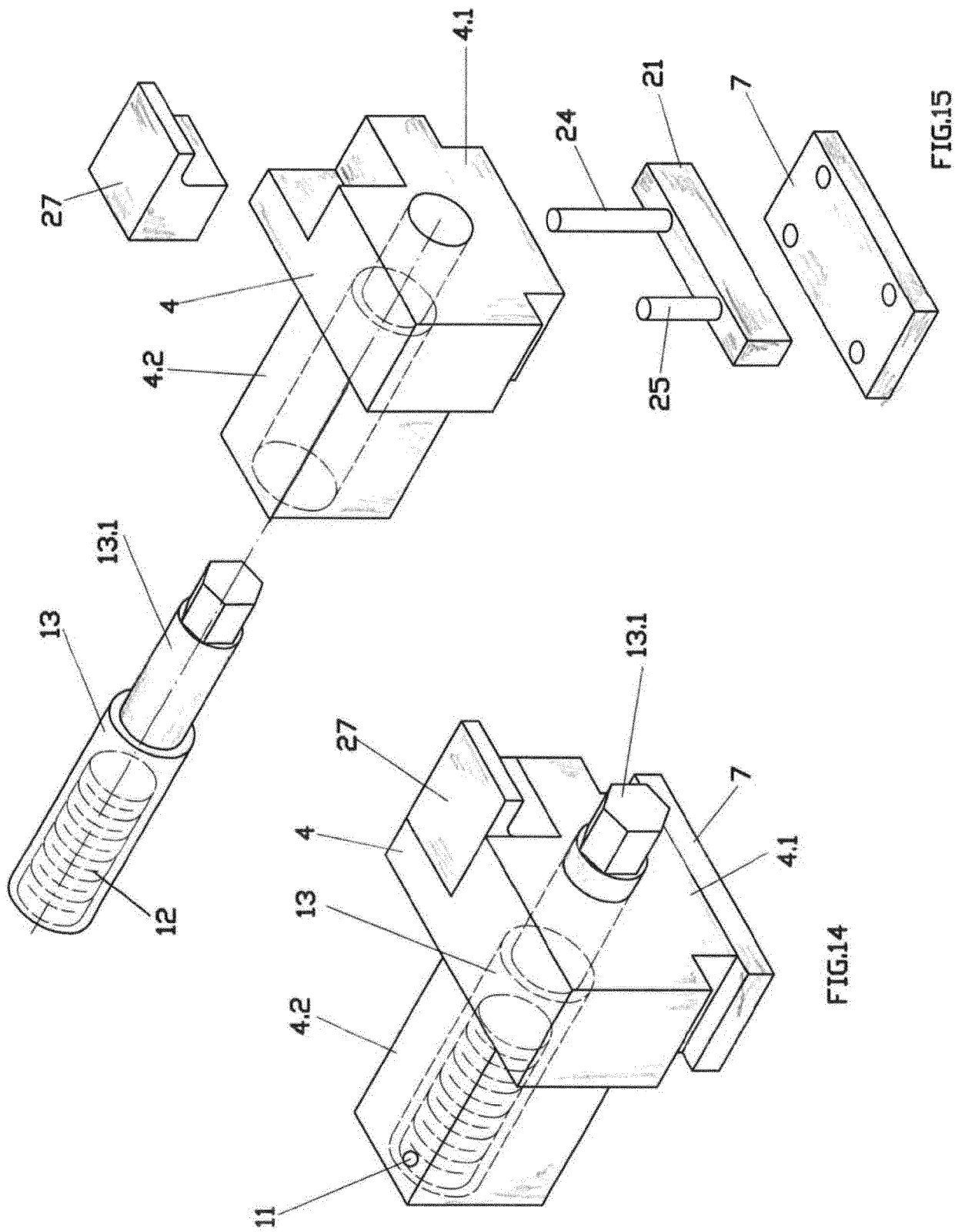


FIG. 10





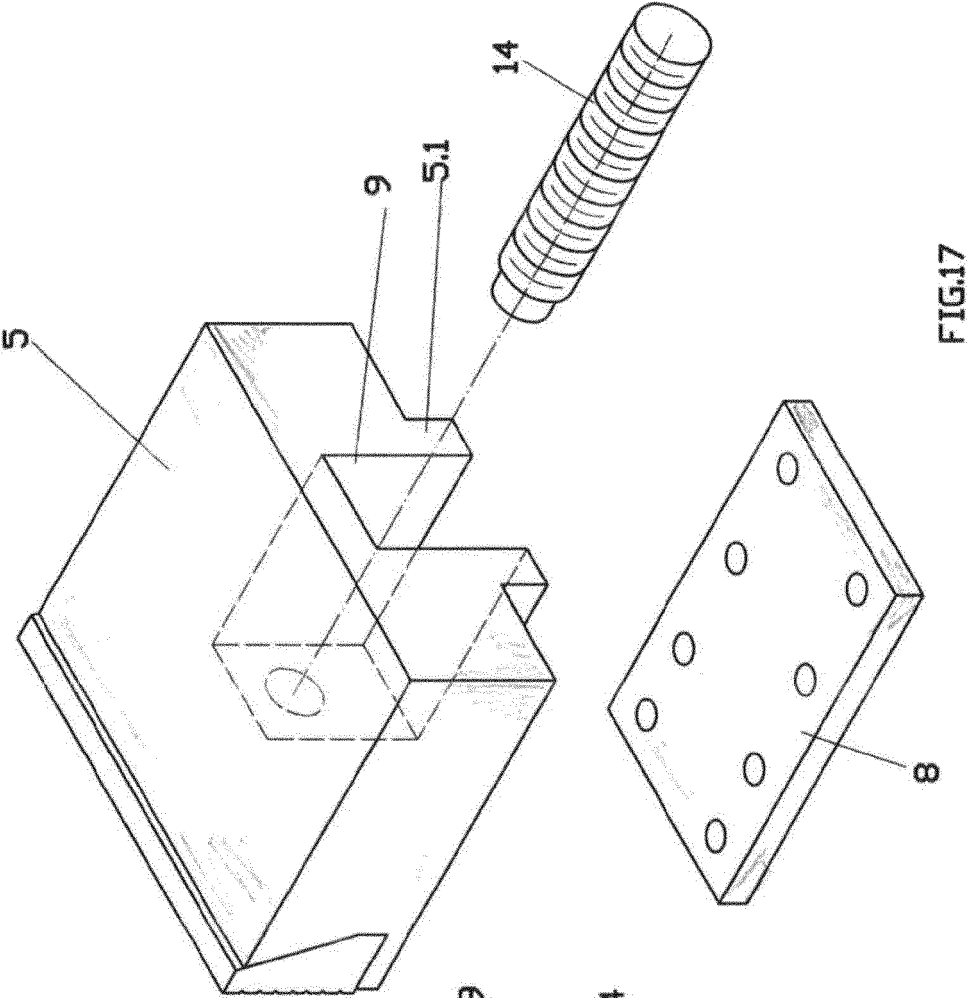


FIG.17

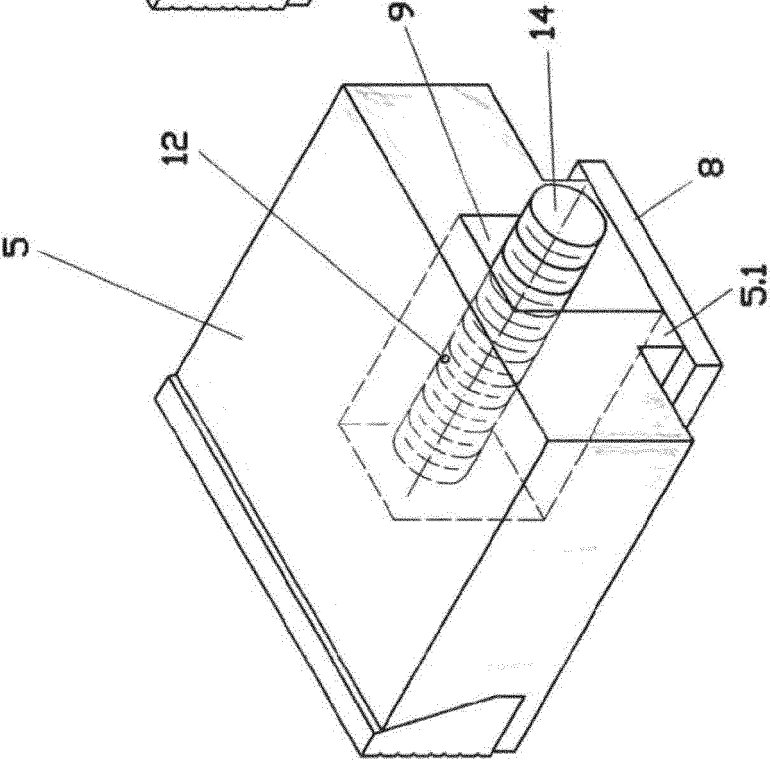


FIG.16



EUROPEAN SEARCH REPORT

 Application Number
EP 20 21 5162

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 2 430 366 A (PORTERFIELD A T) 4 November 1947 (1947-11-04) * column 1, line 50 - column 3, line 13; figures 1-3 *	1-7	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 May 2021	Examiner Pastramas, Nikolaos
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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ON EUROPEAN PATENT APPLICATION NO.**

EP 20 21 5162

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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25-05-2021

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EP 0526432	A1	03-02-1993	NONE
US 4431174	A	14-02-1984	NONE
CN 108555788	A	21-09-2018	NONE
DE 127733	C	30-01-1901	NONE
US 2430366	A	04-11-1947	NONE
US 1765826	A	24-06-1930	NONE
US 2868091	A	13-01-1959	NONE
US 3063707	A	13-11-1962	NONE

REFERENCES CITED IN THE DESCRIPTION

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