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(54) Tool quick coupler

(57) A connecting device for tools is provided with a first member (2) and a second member (3) fit to be fixed to a tool (100) and to a support (101) that, in an operational condition, they transmit to each other strength mainly oriented in a strength direction (S).

The device (1) includes at least a arrest mean (7) associated to one of the members (2, 3) and sliding in comparison to this latter in a sliding direction (D) tilted in comparison to the average strength direction (S), to detachably engage, in a linking condition (C), at least a respective housing mean (9) of the remaining member (3, 2). Said arrest mean (7) being provided with at least a wedge surface (10) tilted in comparison with its sliding direction (D) and fit, in the linking condition (C), to match at least a corresponding second flat surface (11) of the housing mean (9).

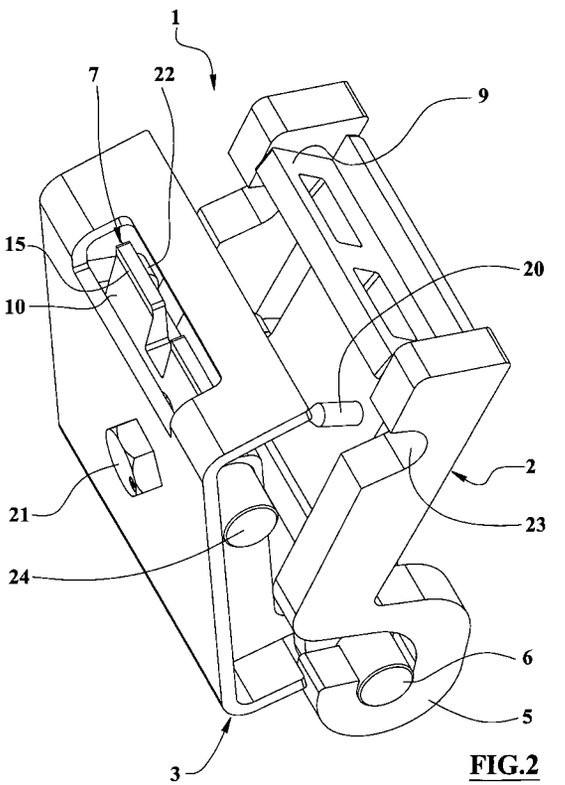

FIG.2

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Description

[0001] The present invention refers to the field of mechanical links and refers to a connecting device for tools fit for linking said tool to driving means such as articulated arm means of ground moving or demolition vehicles, for agricultural or for shearing devices and the like and generally to mechanically connect, in removable way, mechanical elements of different kind.

[0002] There are known hook device for tools, such as buckets and pneumatic hammer for demolition, provided with a first member fixed to such tools and of a second member fixed to a support such as the end of an articulated arm.

[0003] Generally, such known devices are provided with pivots or prismatic elements fit to be inserted in slots of the elements for their mutual hooking and detachable fixing. Said devices sometimes are also equipped with safety locks to block the pivots or the prismatic elements.

[0004] A drawback of said known devices consists in that the pivots or prismatic elements, matching the slots with the necessary slack for their engagement and for the disconnection, under the effect of the vibrations, of the impulsive strength and of the hits, they violently crash against the edges of the slots of the members having the tendency to get disconnected, to be damaged up to break the safety locks causing unfavorable and dangerous openings.

[0005] Other drawback of such known device consists in that they are difficult and complicate to be hooked and to be unhooked causing losses of time and risks for the safety of the operators.

[0006] An object of the present invention is to propose a connecting device for tools to reduce the connecting slacks, to minimize the mutual movements of the elements of the device caused by vibrations, hits and impulsive strengths, and therefore very strong, reliable and safe.

[0007] Other purpose is to propose a device to avoid the risk of unfavorable releasing also in case of fault or of breakage.

[0008] Further object is to propose a simple device fast to hook and to unhook.

[0009] The above mentioned objects are reached according to the contents of the claims.

[0010] The features of the invention are underlined in the following, with particular reference to the attached drawings, in which:

- figure 1 shows a side view of the connecting device for tools whose first member is fixed to a tool and whose second member is fixed to an articulated arm support;
- figure 2 shows an axonometric view of the device of figure 1 in a stand alone and partially connected condition;
- figure 3 shows a section view of the device of figure 2;
- figure 4 shows a top view of the device of figure 2;
- figures 5 and 6 show plan and axonometric views of an arrest mean of the device of figure 1;
- the figures 7 and 8 show section and axonometric views of the first member of the device of figure 1;
- the figures 9 and 10 show section and axonometric views of the second member of the device of figure 1;
- the figures 11 and 12 show partial plant views of the device of figure 1 in extreme conditions of block of the arrest mean respectively toward the inside and the outside.

[0011] With reference to the figures from 1 to 12, numeral 1 indicates the device object of the present invention, provided with a first member 2 and of a second member 3 respectively fit to be fixed, for instance by means of a welding, to a tool 100, such as a pneumatic hammer or a bucket, and to a support 101, such as an articulated hydraulic arm of a vehicle.

[0012] The members first 2 and second 3 can be mutually hinged by means of respective hook means first 5 and second 6, substantially consisting of pivots for respective hooks insertable one in the others and detachable in correspondence of a predetermined mutual orientation of the members 2, 3 in which the pivots can enter in the hooks.

[0013] The device is provided with an arrest mean 7, approximately flattened parallelepiped shaped, associated to the second member 3 and fit for detachably engaging a respective housing mean 9 of the remaining member 3 in a linking condition C in which also the hook means first 5 and second 6 are mutually constrained.

[0014] The arrest mean 7 is constrained to slide, in a sliding direction D, by sliding means 22, of plain or guide kind, of the second member 3.

[0015] In alternative the sliding means 22 can consist of a pivot for the sliding rotation of the arrest mean 7.

[0016] In the linking condition C and in correspondence of the operation, the tool 100 and the support 101 transmit to each other, through the device 1, vibrations, hits and impulsive strengths mainly directed in an average strength direction S, for instance approximately coincident with the axis of a pneumatic hammer tool 100.

[0017] In the linking condition C, the sliding direction D of the arrest mean 7 is nearly orthogonally tilted in comparison to the strength direction S.

[0018] The arrest mean 7 is bifurcated and is provided with two wedge surfaces 10, flat and tilted in comparison to the sliding direction D and, in the linking condition C, fit for matching correspondent second flat surfaces 11 carried out in two openings separated by a stiffening leg of the housing mean 9.

[0019] In alternative, the invention provides that the arrest mean is not bifurcated being provided with a single wedge surface 10 for a flat surface 11 carried out in a single opening of the housing mean 9.

[0020] The wedge surfaces 10 and the housing mean 9 are on sides of the members 2, 3 nearly opposite to the hook means first 5 and second 6.

[0021] Members 2, 3 are provided with respective means of positioning first 23 and second 24 comprising pivots and respective open slots mutually matching in the linking condition C for the consolidation of the link of the device 1.

[0022] The second member is equipped with two elastic means 16, of compressed helical spring type, to elastically push the arrest mean 7 in the sliding direction D toward the housing mean 9.

[0023] In the linking condition C the two elastic means 16, pushing the wedge surfaces 10 against the second flat surfaces 11 of the housing mean 9, cause the mutual approach of the members 2, 3 up to the complete mutual matching of the positioning means first 23 and second 24.

[0024] The arrest mean 7 has two safety surfaces 15, nearly perpendicular to the strength direction S, each of them being outside and adjacent to the respective wedge surface 10 with which it forms an angle different from zero, in the linking condition C.

[0025] The arrest mean 7 has a first main face 13 nearly flat and approximately perpendicular to the strength direction S; the opposite second main face 14, parallel to the first 13, has, close to its edge transversal to the sliding direction D, the wedge surfaces 10 tilt toward the first face 13 and linking the second face 14 the same, with the respective safety surfaces 15 also approximately perpendicular to the strength direction S and therefore parallel to the main faces 13, 14.

[0026] Optionally, the invention provides that each safety surface 15 is slightly tilted in opposite direction to the respective wedge surface 10 in comparison to the main faces 13, 14, or that its geometric plan contains the rotation axis of the hook means first 5 and second 6.

[0027] The arrest mean 7 is provided with a shaped hollow 17 for a block mean 18 hinged to the second member 3 and rotating between two extreme conditions of block of the arrest mean 7 to the inside N and toward the outside E in comparison to the second member 3.

[0028] The block mean 18 is hook shaped to prevent the arrest mean 7 to slide toward the inside of the device 1, in other word, toward a condition inside N, matching a shaped protrusion 19 of the hollow 17.

[0029] The block mean 18 is rotationally hinged to the second member 3 and is rotationally operated by driving means 21 consisting of a rotation pivot fixed to the block mean 18 and provided with an external hexagonal head for the driving by means of a nuts spanner.

[0030] The first member 2 is provided with a stop mean 20 consisting of a pivot with a beveled head for matching the block mean 18 fit for, in correspondence of the link of the members 2, 3 of the device 1, partially hocking the hollow 17 matching the block mean 18 causing its rotation from the inside N block condition toward the outside E block condition.

[0031] The operation of device 1 provides that the members fixed to the tool and to the support are set, through the driving of the latter, in predetermines and mutual orientation for the insertion of the pivots in the hooks of the hook means first 5 and second 6 of the device.

[0032] Subsequently to such insertion and to the rotation of the driving means 21 for the positioning of the block mean 18 in the extreme condition inside N of block of the arrest mean 7, a rotation of the second member 3 around the axes of the hook means carried out by means of the support 101 up to the mutual matching of the positioning means first 23 and second 24 causes the positioning of the portion of the arrest mean 7, having the wedge surfaces 10, in front of the housing mean 9.

[0033] The rotation of the driving means 21 for the positioning of the block mean 18 in the extreme outside E condition of block of the arrest mean 7 releases the arrest mean 7 that, under the pushing of the elastic means 16, engages the housing mean 9 positioning the wedge surface 10 against the second flat surface 11 causing the reduction of the linkage slacks of the device. An eventual force having a bigger intensity than that of the elastic means and acting on the arrest mean 7 toward the inside N condition it is stopped by the matching of the shaped protrusion 19 of the hollow 17 with the hook of the block mean 18 preventing the exit of the arrest mean 7 from the housing mean 9.

[0034] Due to the inclined plane realized by the wedge surfaces 10 and second flat surfaces 11, the vibrations and impulsive strengths oriented along the strength direction S, transmit to the arrest mean 7 strengths toward the inside N condition and therefore pushing the arrest mean 7 outside the housing mean 9, but this is prevented from the safety surface 15. In case of a movement of exit of the arrest mean 7 caused by strengths direct according to the strength direction S, the matching between such arrest mean 7 and the housing mean 9 it would happen in correspondence of the safety surface 15 whose orientation in comparison to the strength direction S can annul, or reverse, the effect of said strengths avoiding the risk of exit.

[0035] An advantage of the present invention is to provide a reliable and sure connecting device for tools to reduce the linking slacks to minimize the mutual movements of the elements of the device caused by vibrations, hits and impulsive strengths and therefore very strong, reliable and safe.

[0036] Other advantage is to provide a device to avoid the risk of unfavorable releasing also in case of a fault or of breakage.

[0037] Further advantage is to furnish a simple and fast device to hook and to unhook.

[0038] Other advantage is to furnish a device for mechanical detachable linking for almost all kind and type of elements requiring a stable, precise and strong linkage.

Claims

1. Connecting device for tools provided with a first member (2) and a second member (3) fit to be fixed to a tool (100) and to a support (101) that, in an operational condition, they transmit to each other strength mainly oriented in a strength direction (S); said device (1) being **characterized in that** includes at least a arrest mean (7) associated to one of the members (2, 3) and sliding in comparison to this last in a sliding direction (D) tilted in comparison to the average strength direction (S), to detachably engage, in a linking condition (C), at least a respective housing mean (9) of the remaining member (3, 2); such arrest mean (7) being provided with at least a wedge surface (10) tilted in comparison with its sliding direction (D) and fit, in the linking condition (C), to match at least a corresponding second flat surface (11) of the housing mean (9).

2. Device according to claim 1 **characterized in that** each arrest mean (7) has at least a safety surface (15) external and adjacent to the at least one wedge surface (10) with which forms an angle different from zero.

3. Device according to the claim 2 **characterized in that** each safety surface (15) is nearly perpendicular to the strength direction (S).

4. Device according to the claim 2 **characterized in that** the arrest mean (7) has approximately a flattened parallelepiped form with a first main face (13) nearly flat and the opposite second main face (14) having, close to one its edges transversal to the sliding direction (D), the wedge surface (10) tilted toward the first face (13) and linking the second face (14) with at least one safety surface (15) parallel to the main faces (13, 14).

5. Device according to the claim 4 **characterized in that** the main faces (13, 14) are approximately perpendicular to the strength direction (S).

6. Device according to the claim 5 **characterized in that** each safety surface (15), in comparison to the main faces (13, 14), is slightly tilted in opposite direction of the wedge surface (10).

7. Device according to the claim 1 **characterized in that** includes a set of elastic means (16) for pushing the arrest mean (7) in the sliding direction (D) toward the housing mean (9).

8. Device according to the claim 1 **characterized in that** the arrest mean (7) is associated to the second member (3) and it is constrained to slide by sliding means (22) of the arrest mean (7).

9. Device according to the claim 8 **characterized in that** the arrest mean (7) is provided with a shaped hollow (17) for a block mean (18) hinged to the second member (3) and rotating between two extreme conditions of block of the arrest mean (7) toward the inside (N) and the outside (E) in comparison with the second member (3).

10. Device according to the claim 9 **characterized in that** the block mean (18) is hook shaped to prevent the arrest mean (7) to slide toward the inside of the device (1) matching a shaped protrusion (19) of the hollow (17).

11. Device according to the claim 9 **characterized in that** comprises driving means (21) of the block mean (18) to operate and to hinge this last to the second member (3).

12. Device according to the claim 9 **characterized in that** the first member (2) in equipped with a stop mean (20) fit, in correspondence of the linking of the members (2, 3) of the device (1), for partially engaging the hollow (17) matching the block mean (18) causing its rotation from the condition of block in the inside (N) toward the condition of block to the outside (E).

13. Device according to the claim 9 **characterized in that** the stop mean (20) substantially consists of a pivot having a beveled head for matching the block mean (18).

14. Device according to the claim 1 **characterized in that** the members (2, 3) are provided with hook means first (5) and second (6) for the rotating and detachable connection of said members (2, 3).

15. Device according to the claim 14 **characterized in that** the hook means first (5) and second (6) are positioned on sides of the members (2, 3) nearly opposite to the wedge surface (10) and to the housing mean (9).

16. Device according to the claim 14 **characterized in that** the hook means first (5) and second (6) comprise pivots fit for inserting in and engaging respective hooks.

17. Device according to the claim 1 **characterized in that** the members (2, 3) are provided with positioning means first (23) and second (24) for the stiffening of the device in the linking condition (C).

18. Device according to the claim 17 **characterized in that** the positioning means first (23) and second (24) comprises pivots and open slots.

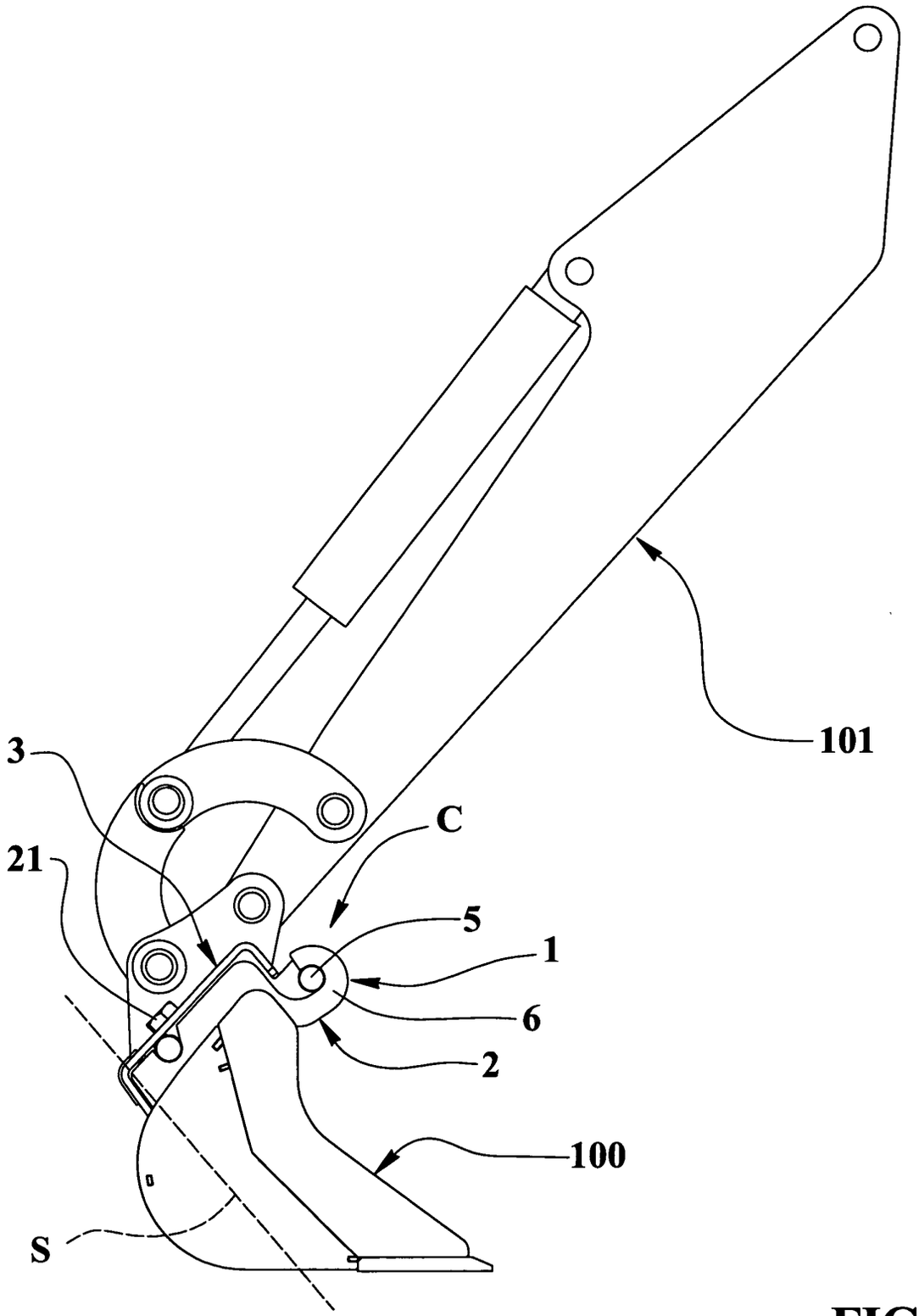


FIG.1

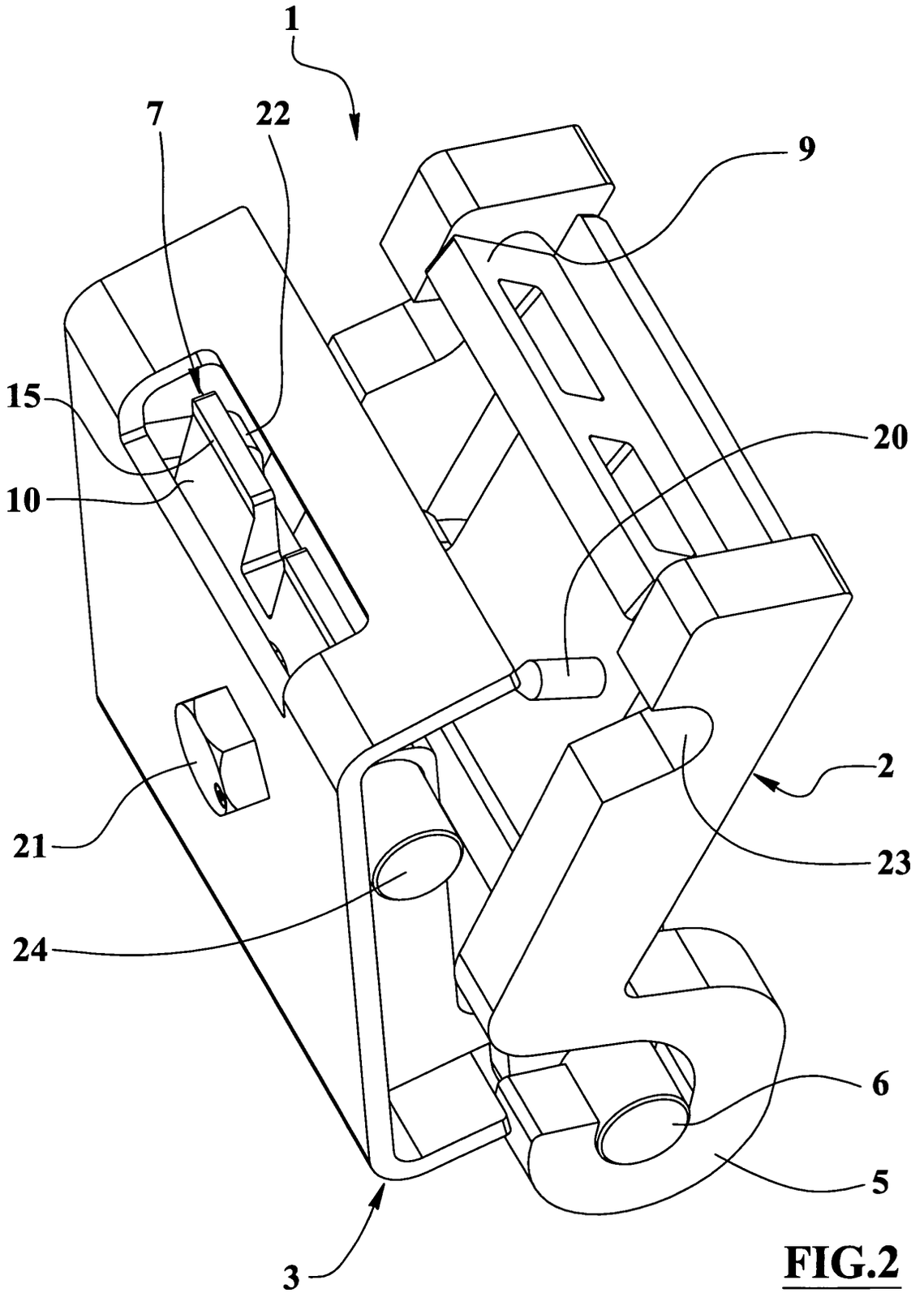
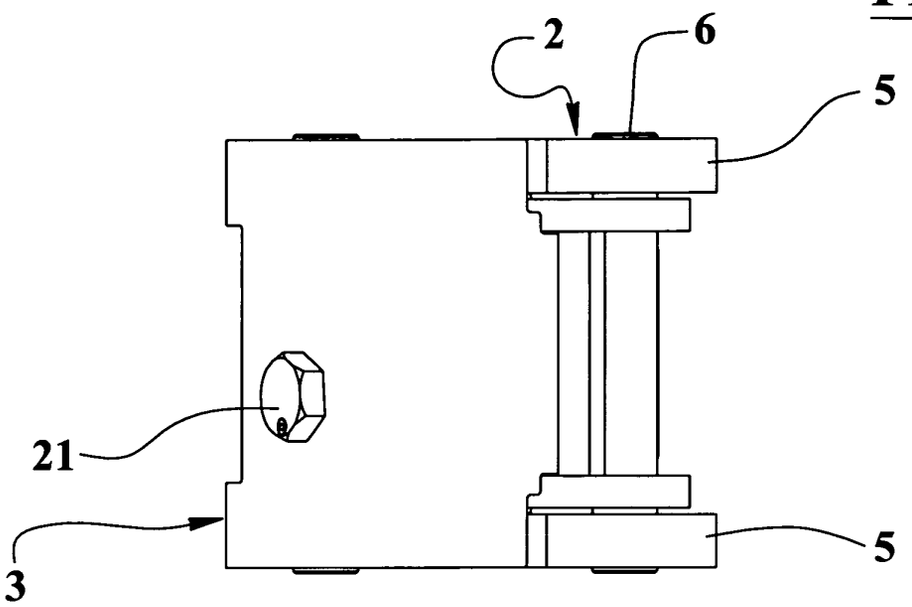


FIG.2

FIG.4



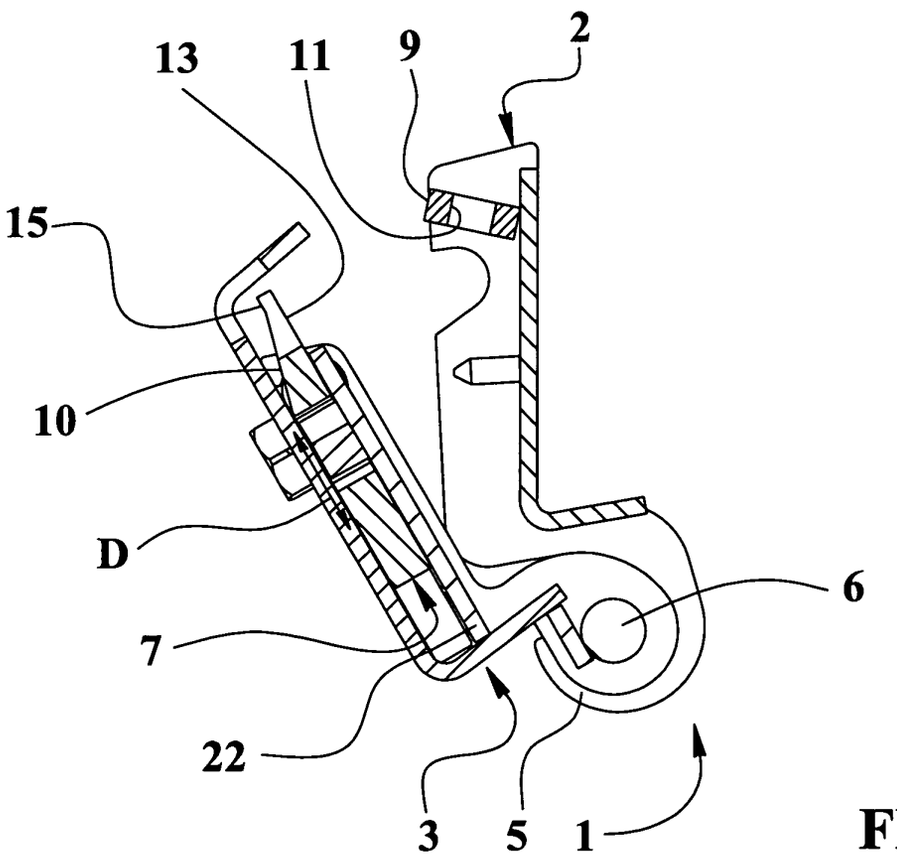
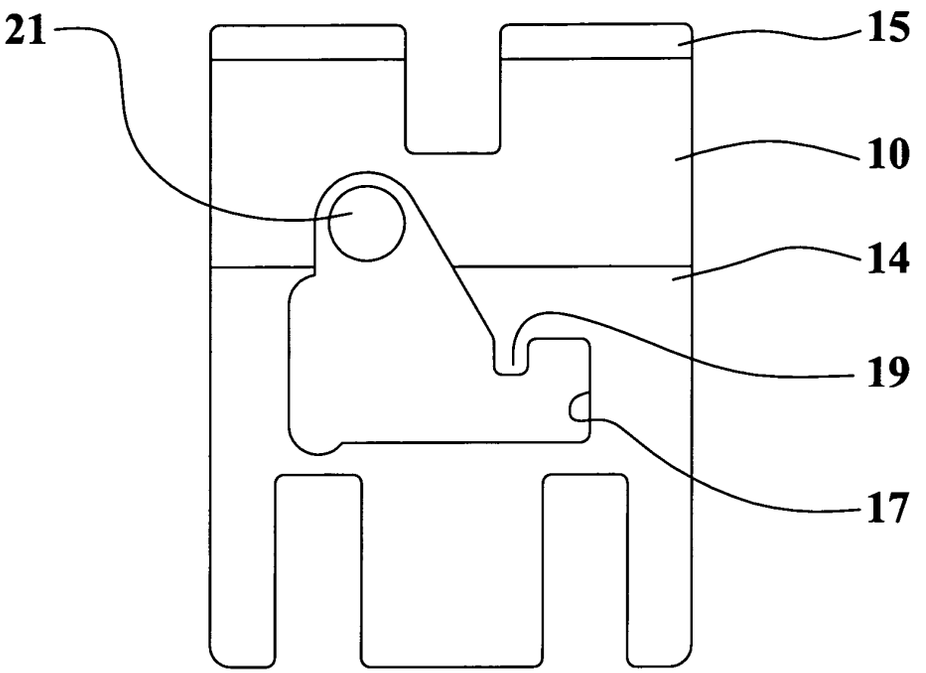


FIG.3

FIG.5



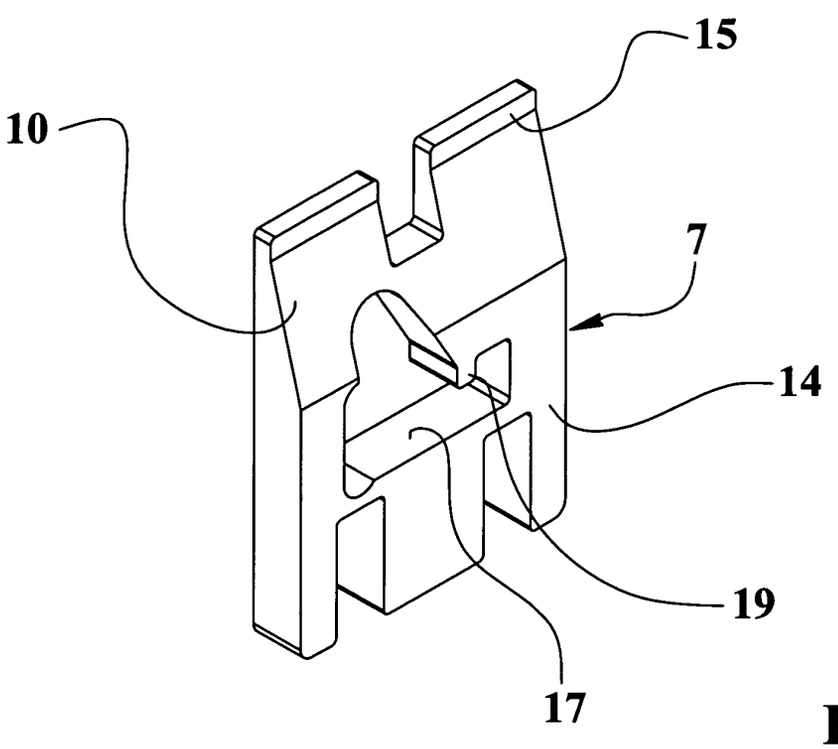
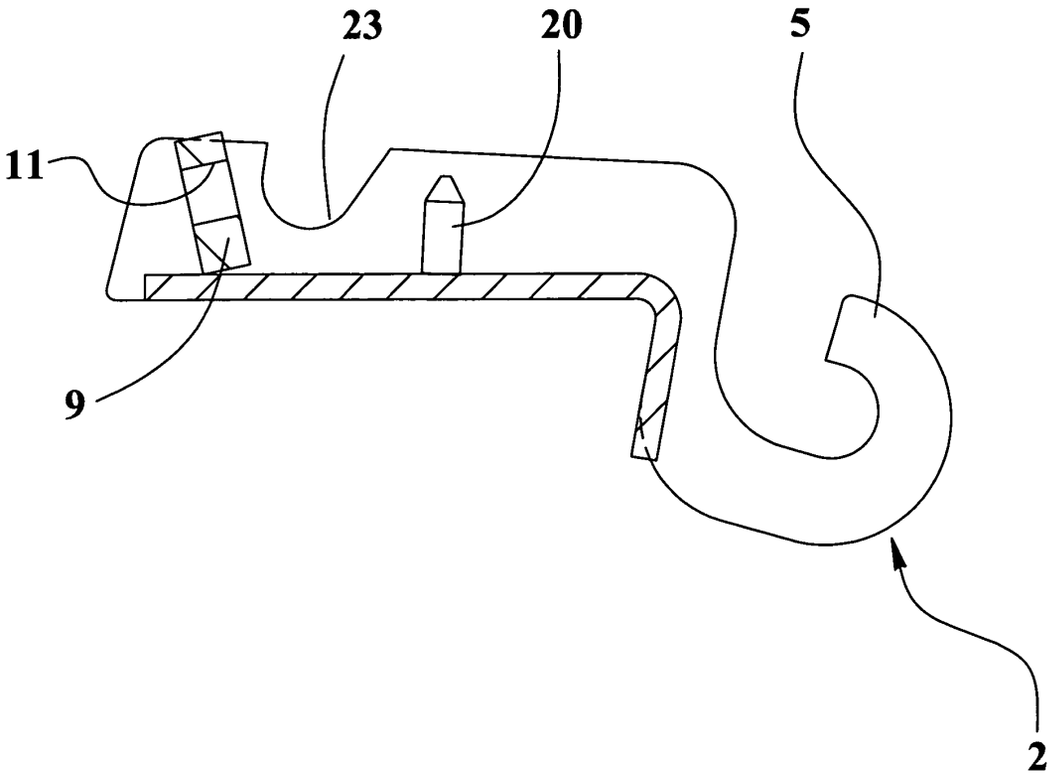


FIG.6

FIG.7



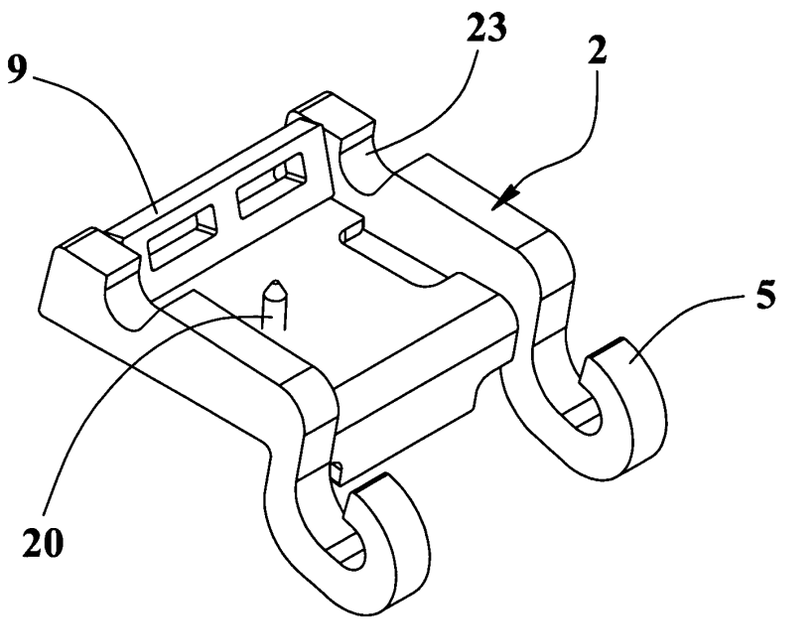
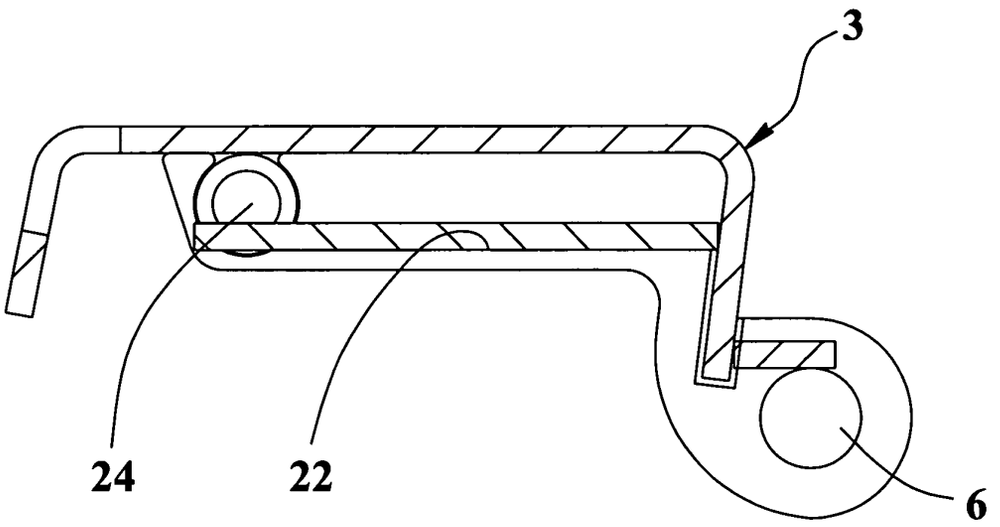


FIG.8

FIG.9



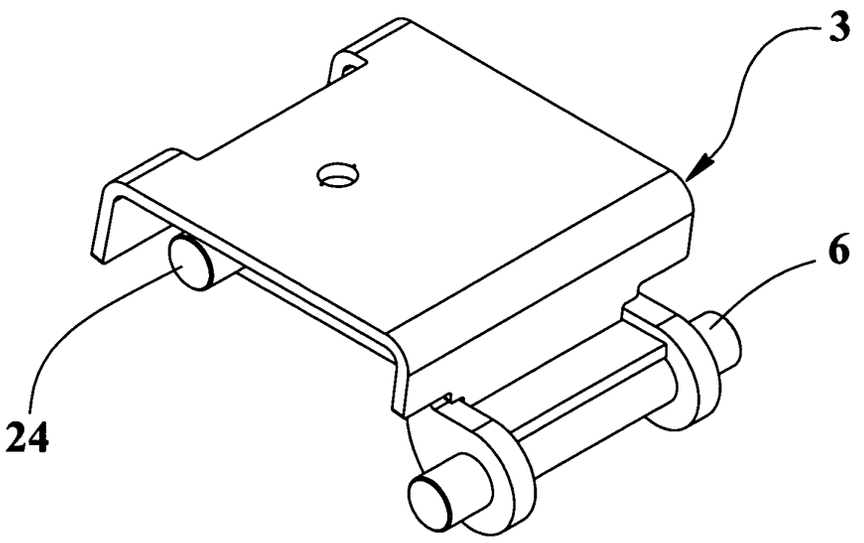


FIG.10

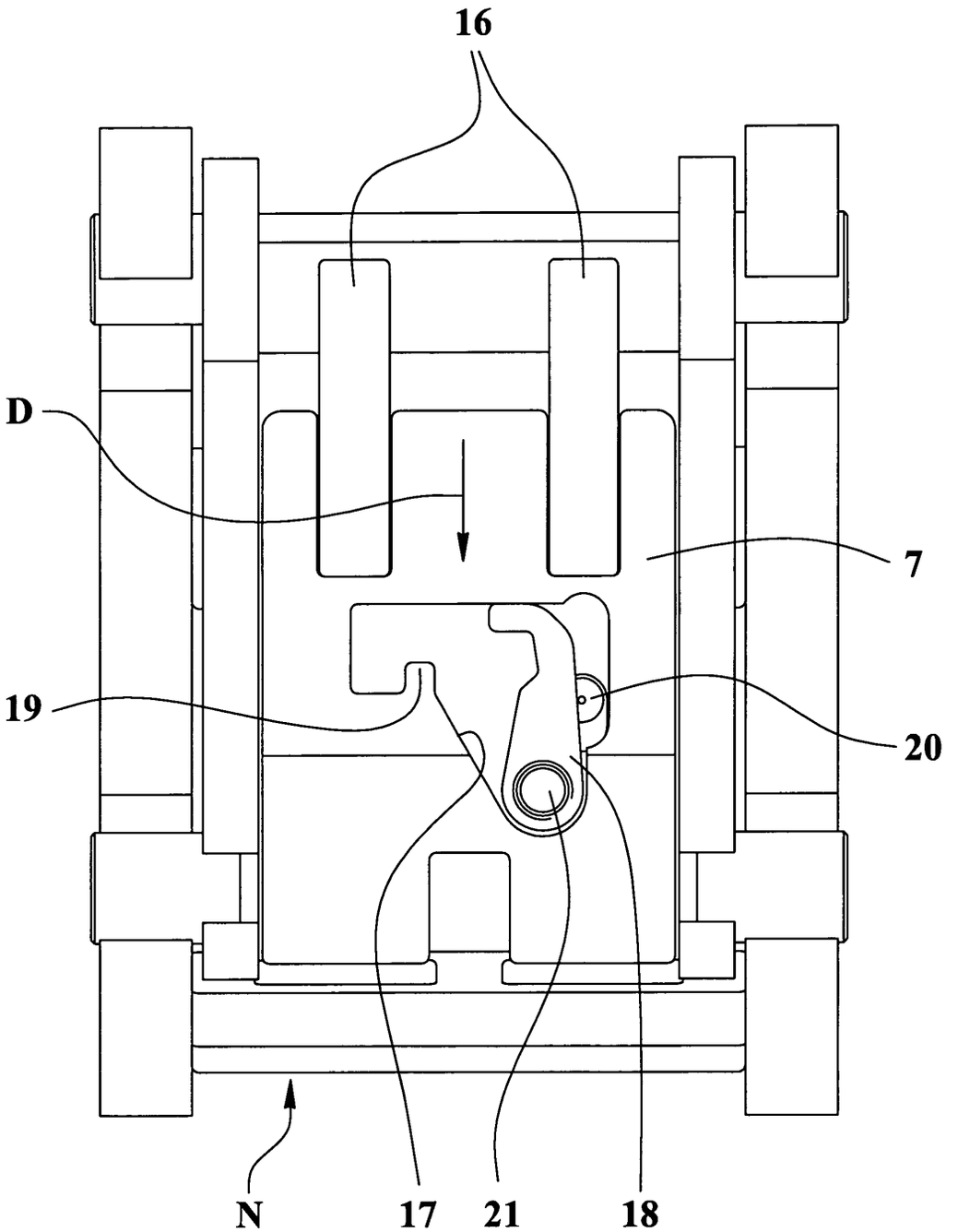


FIG.11

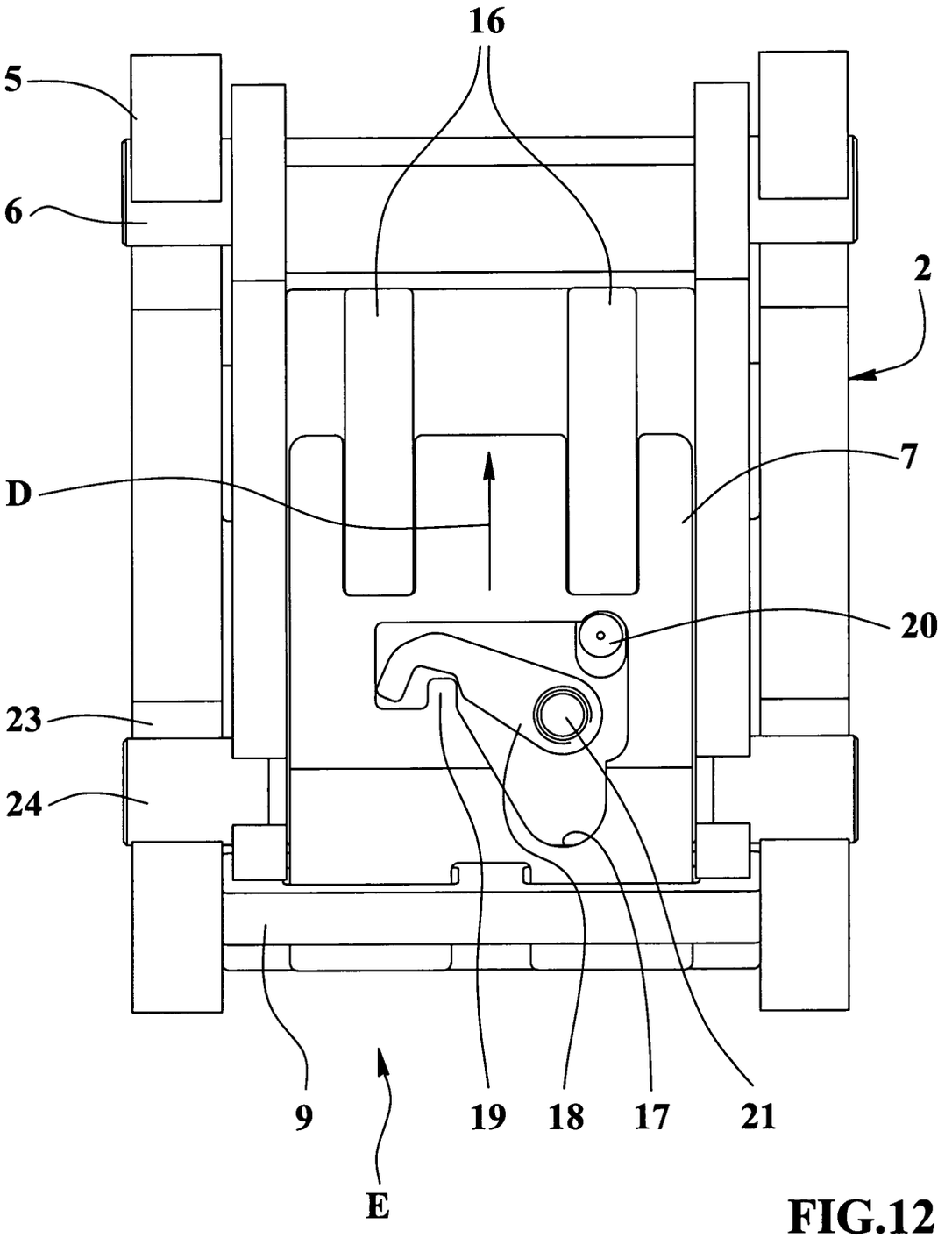


FIG.12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 00 2724

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	14 May 2004	Laurer, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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

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EPO FORM 1503 03.82 (P04C01)

European Patent Office

Application Number
EP 04 00 2724

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 04 00 2724

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1+2-6

   directed to a tool quick coupler comprising a latch mechanism comprising a wedge having a stepped safety surface;

2. Claim : 1+7

   directed to a tool quick coupler comprising elastic means for pushing the latching means to its latching position;

3. Claims: 1+8-13

   directed to a tool quick coupler comprising latching means mountable on inversely onto the tool;

4. Claims: 1+14-16

   directed to a tool quick coupler comprising hook means for engagement with respective coupling parts;

5. Claims: 1+17-18

   directed to a tool quick coupler comprising means for stiffening the coupler in its latched position;

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 00 2724

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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