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(54) **SIMPLIFIED ENGRAVING MACHINE WITH A RECTILINEAR GUIDING BAR**

(57) It is disclosed an engraving machine for planar slabs, comprising a rectilinear bar (1) and a carriage (2) mounted freely sliding along said guiding bar (1) and carrying an engraving tool (U), wherein
said rectilinear guiding bar (1) has a lower surface provided with yielding support means made of high-friction material (3), and
said engraving tool (U) is integral with a pressure plate (23) movably mounted relative to a frame (21) of said carriage (2), having at least a displacement component perpendicular to said lower surface, in opposition to elastic means (24).

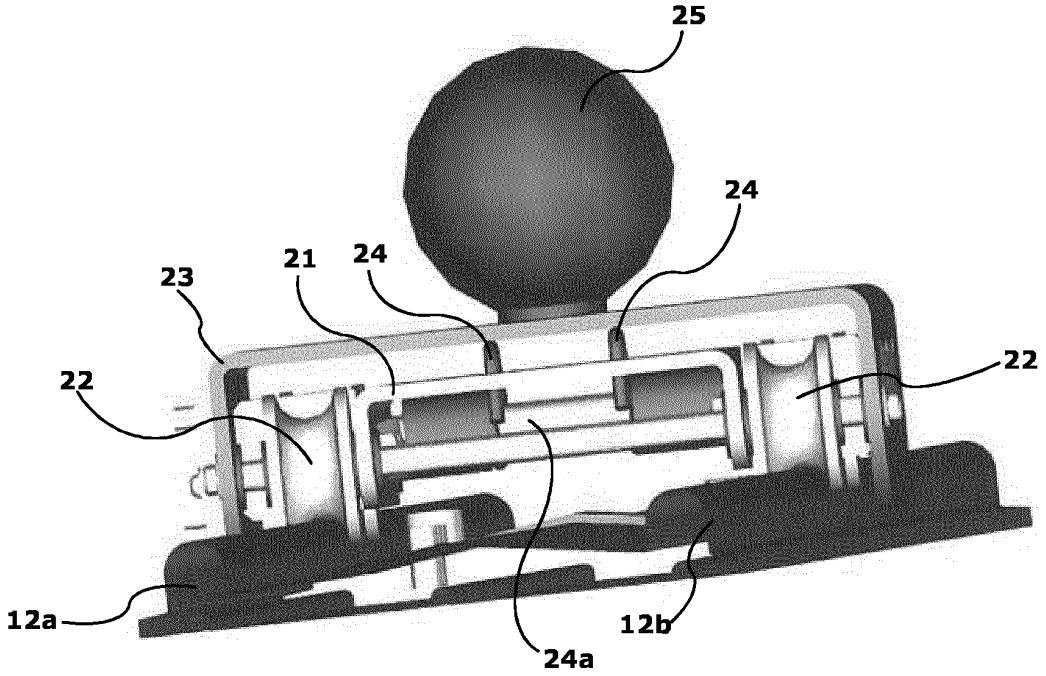

Fig. 4

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Description

Field of Invention

[0001] The present invention relates to a system for either cutting or engraving flat slabs (mainly tiles, but also slabs of glass or other flat surface materials), in particular a manually activated engraving machine for engraving/cutting large slabs.

Background art

[0002] For a long time, manual tile engravers represent a specialised sector, where few manufacturers have the required competences to build sophisticated engraving systems that would meet market requirements.

[0003] The traditional manual tile engravers available on the market consist of a base, including a tile support area, with two end poles supporting a guiding bar for the engraving tool holder. The latter is configured to slide freely along the bar and generally has a handle and an engraving tool below (usually consisting of a wheel made of a very hard material) that makes contact with the tile.

[0004] The engraving takes place through the operator's action, who applies a downward pressure on the tool, and at the same time pushes the tool to scroll along the slab, from a proximal to a distal position (or vice versa), in order to engrave the tile. The tile remains blocked between the engraving tool and the underlying base: the higher the pressure exercised on the tool, the higher the reaction of the underlying base; therefore, blocking of the tile is very efficient and the tile does not move from the desired position.

[0005] Over time, manual tile engravers underwent substantial evolution, especially to adapt them to new requirements of operating on large tiles. Presently, tiles in excess of 2000 mm in size are being worked on; the technique evolution has now resulted in tiles up to 4000 long and more than 1500 mm wide. Moreover, these tiles are more than 5 or 6 mm thick - obviously for mechanical resistance reasons, even simply in the handling phase - which require a very high engraving force to obtain efficient engraving.

[0006] It becomes more and more difficult to process tiles or slabs of these dimensions using a traditional tile engraver. Therefore, the approach has changed and some systems were proposed that may be less convenient to use, but are suitable for use with large slabs. In fact, these systems use light, lean structures, so they can be of a large size without being too heavy and therefore can be lifted and placed on top of the tiles (unlike in the traditional systems, where the tile is lifted and placed in the machine).

[0007] Therefore, some engraving systems similar to those that have existed for a long time in the glass sheets engraving sector appeared in the tile market. In these systems, the machine consists of a rectilinear bar, along which a sliding tool holder with the corresponding engraving tool is mounted, equipped with at least one pair of fixing systems. This way the machine is affixed directly to the slab to be engraved or to the work plane supporting the slab in order to perform the engraving. The splitting of the slab, or separation of the two parts along the engraving line, is then made using other manual tools (such as pressure pliers).

[0008] A system of this type is described for example in the utility model IT278539 in the name of the same Applicant, in which the fixing system is in form of multiple suction cup elements attached directly to the slab to be engraved.

[0009] US2013/0126574, US2835037, EP240802, DE3716057, DE29711778U disclose other guiding bar systems involving devices for attaching to the work table.

[0010] The systems proposed so far have shown to be fairly efficient, while a margin for improvement remains.

[0011] In particular, it must be noted that, regardless of the form of the engraving tool, the guiding bar must always be attached to the slab or to the support table by means of any fixing system, such as suction cups and/or clamps. The need for this is partially dictated by a prejudice existing in the sector, suggesting that the guiding bar must always be blocked to ensure engraving precision, and by the tool holder carriage mounting arrangement.

[0012] In fact, since the guiding bar rests directly on the flat slab, the engraving tool cannot be placed on the movement axis, but is typically mounted sideways laterally on a carriage sliding along the guiding bar. This inevitably leads to high overturning momentums - because the engraving pressure is exercised by the operator on the bar axis, while the reaction acts on the tool in an offset position - which tend to lift the guiding bar from the slab plane: therefore, the presence of fixing devices prevents undesired relative shifting between the guiding bar and the slab to be engraved.

[0013] However, the fixing devices result in additional cost and weight of the device and complicate its use.

[0014] Because of the presence of fixing clamps, the guiding bar is typically pressed strongly against the slab, with the risk of breaking or at least scratching it (an aluminium bar can easily scratch the tile surface). In order to partially resolve even this problem, it has already been proposed to set up an anti-scratch or soft material layer on the lower side of the guiding bar, but this does not change the fact that the construction complications related to the fixing system remain.

Summary of the Invention

[0015] Therefore, the purpose of this invention is to propose an engraving system for large slabs, constituting a considerable improvement compared to the known technique; in particular, it is intended to provide an apparatus configured in such a way as to eliminate the use of traditional suction cups or clamping fixing systems.

[0016] This is achieved by means of the features men-

tioned in claim 1. The subordinate claims describe preferential features of the invention.

[0017] In particular, according to a first aspect of the invention, it is provided an engraving/cutting machine for planar slabs, comprising a rectilinear bar and a carriage mounted freely sliding along said guiding bar and carrying an engraving/cutting tool, wherein

said rectilinear guiding bar has a lower surface provided with yielding support means made of high-friction material, and

said engraving tool is integral with a pressure plate movably mounted relative to a frame of said carriage, having at least a displacement component perpendicular to said lower surface, in opposition to elastic means.

[0018] Preferably, said supports are in the shape of inserts or small cylinders made of high-friction material inserted in corresponding seats made in the lower surface of said bar. Said supports project from said lower surface of the bar by at least 1 mm.

[0019] According to another aspect, the pressure plate is mounted pivoting on the carriage frame in opposition to elastic springs, preferably in the shape of torsional springs.

[0020] According to a further aspect, the engraving tool is mounted on a support head attached to the lateral side of a pressure plate in the shape of a cover surrounding the carriage frame.

[0021] In the following text, the term "large slabs" indicates tiles with dimensions of the order 3000 x 1000 mm, with a thickness of up to 6 mm or more, even though it is not ruled out that the machine described here can also be conveniently used to engrave tiles of traditional sizes, for example of the order of 300x300 mm, but also made of flat materials such as glass, panels of plastic material or rubber, glass panels etc.

Brief description of the drawings

[0022] Further features and benefits of the invention are better shown by the following detailed description, given purely as an example and not limitative, and illustrated by the attached drawings, where:

Fig. 1 is an overall perspective view, partially cross-section, of an engraving device according to the invention;

Fig. 2 is a perspective view, partially in section, of the invention's guiding bar;

Fig. 3 is a perspective view from below the engraving device of Fig. 1, from which a part of the guiding bar has been removed;

Fig. 4 is a perspective frontal view, partially in section, of the engraving device of Fig. 1;

Fig. 5 is a perspective view of the carriage only, from which only the pressure cover was removed;

Fig. 6 is a view similar to the one in Fig. 5, taken from the opposite side; and

Fig. 7 is a view similar to the one in Fig. 5 from a different perspective, of the carriage only supported on the guiding bar.

Detailed description of preferred embodiments

[0023] Fig. 1 shows an overall view of the engraving DEVICE according to the invention.

[0024] The device consists of a guiding bar 1, supporting a sliding carriage 2 with a tool holder.

[0025] The guiding bar 1 consists of an essentially flat lower section 11, on which a pair of rails 12a and 12b is provided. Preferably, bar 1 is obtained integrally from an extruded metal material, such as aluminium alloy.

[0026] According to an essential aspect of the invention, in the lower part of bar 1, i.e. in the surface facing the slab that is to be engraved, there are provided yielding supports made of high-friction material. In particular, these supports are made of rubber of a sufficient thickness to be able to be compressed sufficiently using the technique illustrated below, and therefore exercise a high friction resistance against movement of bar 1 on support plane.

[0027] The yielding supports are not simply thin layers of scratchproof or coating material, but the thickness and yielding of these materials must be adequate to offer an appropriate yielding stroke inducing an elastic reaction (according to the known formula F=xK, where x is the support yielding stroke) giving rise to a high pressure (the force exercised by the user on the tool holder through the carriage 2 and therefore on the bar 1 against the support plane).

[0028] According to the embodiment illustrated in Fig. 2, the supports have the shape of elongated rubber inserts, consisting of rubber strings, partially inserted in recesses or longitudinal grooves of bar 1 and protruding from the lower surface by at least 1 mm, preferably at least 2 mm. Typically, there could be three parallel inserts (one central and two along the peripheral edges of bar 1), constituted by rubber strings with a diameter of 4-5 mm, protruding from the lower surface by approximately 2 mm. Advantageously, the rubber material is clear in colour so any residue caused by friction does not stain the tile or slab placed underneath.

[0029] Other alternative support means (not illustrated) can be small cylinders, inserted perpendicularly and distributed uniformly on the lower surface of bar 1, or a anti-skid cover or mesh (made of rubber or polyester/PVC material) of sufficient thickness, for example at least 1 mm, covering a large part of the lower surface of bar 1.

[0030] In order to have a sufficiently long guiding bar and therefore to be able to engrave large tiles, preferably bar 1 is divided longitudinally in several parts, which can be held together by appropriate joints. For that purpose, the figures show a joining plate 5, attached to the lower section 11 of two continuous parts of the bar. Other joining means considered appropriate may also be used.

[0031] The tool holder carriage 2 is constituted by a

sliding frame 21, on which two sliding axes are mounted, to which two pairs of sliding rotating wheels 22 are attached. The wheels 22 are arranged so as to rest and rotate on the rails 12a and 12b. It is important for the proper functioning of the device that the wheels 22 be distributed at the four corners of the carriage so that the force exercised on the carriage (in the way described further) be applied on the centre line of the guiding bar, which reduces any overturning momentums as much as possible.

[0032] Preferably the wheels 22 have a central groove in order to be suitably guided laterally on the rails 12a and 12b and avoid transversal play in the longitudinal movement axis.

[0033] A pivoting pressure cover 23 is mounted on the tool holding carriage. It is mounted pivoting on the carriage in opposition to elastic means, as described below in more detail.

[0034] Preferably, the cover 23 pivots around an axis mounted at its front on back end. Therefore, the pivoting axis of the cover 23 is parallel to the sliding axes of wheels 22, and transversal to the carriage longitudinal sliding direction. Preferably, the pressure cover 23 rotates around a pivoting axis 23a coinciding with one of the axes of the wheels 22.

[0035] According to the illustrated embodiment, a tool holder head T is installed on the pressure cover 23, in proximity of the end opposite to that of the pivoting axis 23a (or in any case far from the pivoting axis). The head T carries on engraving tool U on its lower surface (which is the lower side of bar 1). Tool U is typically a wheel of hard metal, preferably small in diameter, or a diameter below 10 mm, preferably 8 mm.

[0036] Tool U is installed in a way to engrave the underlying slab while the carriage 2 scrolls over the bar 1.

[0037] Advantageously, tool U is mounted laterally to the pressure cover 23, at a pre-determined distance - facilitating the calculation of engraving measurements for the user. For example, the engraving tool U is arranged 1 cm from the external longitudinal edge of bar 1.

[0038] Moreover, according to the invention, between the pressure cover or plate 23 - on which tool U is mounted - and the frame 21 of the carriage - sliding on bar 1 - there are elastic means, pushing the plate 23 away from the frame 21, making it turn towards the outside around the pivoting axis 23a. In the illustrated embodiment, the elastic means are in the shape of a pair of torsion springs 24, mounted on a shaft 24a, transversal and integral with the frame 21. The two torsion springs 24 have a curved distal end, protruding through two slits 24b of the frame 21, which supports the pressure plate 23 from below.

[0039] Finally, above the pressure plate 23 there is an handling knob 25, for example a pull with a diameter of 6 cm. The pull 25 is placed essentially on the longitudinal axis of the carriage, so that the force applied is distributed uniformly on the wheels 22.

[0040] By means of the knob 25 the user can exercise, in addition to a longitudinal pushing action on the carriage 2, also a pressure perpendicular to the guiding bar 1, which pushes the pressure plate 23 towards the frame 21 of the carriage, overcoming the elastic reaction of the springs 24, until it brings the engraving tool U in contact with the slab to be engraved. The abutment of the tool U on the slab determines the end stop of the rotation of the pressure cover 23 on the frame 21. The rotation angle permitted for the pressure cover 23, is sufficient to cover a certain distance (for example 1 cm) by the tool U, useful to load the torsion spring 24, which applies its elastic reaction on the frame 21, and therefore, through the wheels 22, on the guiding bar 1.

[0041] Essentially, by placing elastic means between the pressure plate 23 (integral with tool U) and the frame 21 of the carriage, it is produced a significant pressure on the supports - inserted between the bar 1 and the support plane of the slab to be engraved - which yield partially and ensure a high level of friction with the underlying slab, on which the invention's device rests. Therefore, the pressure exercised with the knob - for example of a magnitude of 15 kg - before the tool U abuts on the slab to be engraved, loads the supports adequately, resulting in high friction between the bar 1 and the slab to be engraved, eliminating any possibility of relative movement between the two.

[0042] Therefore, this construction permits the elimination of the fixing equipment of the prior art and the certainty of restraint between the device and the slab to be engraved by an efficient friction surface.

[0043] Since it is the force applied against the spring 24 that causes the necessary restraining friction, it is also possible to consider a different intervention, for example loading the pressure cover with a temporary load. This permits an engraving efficiency and prevents movement between the bar 1 and the slab, without even having to intervene manually on the carriage. This is particularly convenient when the slab is very large and the users cannot reach all of its areas by hand to act on the knob: instead, they can load the carriage with a weight and then push or pull it with control cables or rods.

[0044] According to another embodiment, not illustrated, at one end of the bar there could be provided a rotating square. The edge of the square can be placed against the edge of the tile to be engraved to perform precisely a series of cuts with the desired angles.

[0045] As can be understood from the description given above, the invention's system can obtain the desired results. In fact, the combination of high-friction yielding supports with the possibility of loading the tool holder carriage elastically create a synergy for obtaining a very efficient, but at the same time light and economic, engraver.

[0046] In any case it is understood that the invention is not limited to the particular configurations illustrated above, which constitute only non-limitative examples of the scope of the invention, but that numerous variants are possible, all of them available to skilled man in the field, without departing from the scope of the invention

as defined in the attached claims.

[0047] For example, both the nature and shape of the knob and springs may vary widely depending on the user's preferences. Similarly, the arrangement of the relative displacement between the pressure plate 23 and the carriage frame 21 may be designed differently, as long as it involves the elastic reaction of the elastic means determining the load on the underlying support means.

[0048] Finally, as indicated above, the engraving tool may be adapted based on the requirements of the material to be engraved. For example, instead of the small wheel made of hard material, it is possible to use a cutting blade or a mounting system for an electric tool with a rotating cutting blade.

Claims

1. Engraving machine for planar slabs, comprising a rectilinear bar (1) and a carriage (2) mounted freely sliding along said guiding bar (1) and carrying an engraving tool (U), **characterised in that**
said rectilinear guiding bar (1) has a lower surface provided with yielding support means made of high-friction material (3), and that
said engraving tool (U) is integral with a pressure plate (23) movably mounted relative to a frame (21) of said carriage (2), having at least a displacement component perpendicular to said lower surface, in opposition to elastic means (24).

2. Machine as claimed in 1, wherein said supports are in the shape of inserts or dowels made of high-friction material (3) inserted in corresponding seats made in the lower surface of said bar (1).

3. Machine as claimed in 2, wherein said supports project from said lower surface of the bar (1) by at least 1 mm.

4. Machine as claimed in any one of the preceding claims, wherein said pressure plate (23) is mounted pivoting on said frame (21) in opposition to elastic springs (24).

5. Machine as claimed in any one of the preceding claims, wherein said engraving tool (U) is mounted on a support head (T) laterally integral with said pressure plate (23) in the shape of a cover surrounding said carriage frame (21).

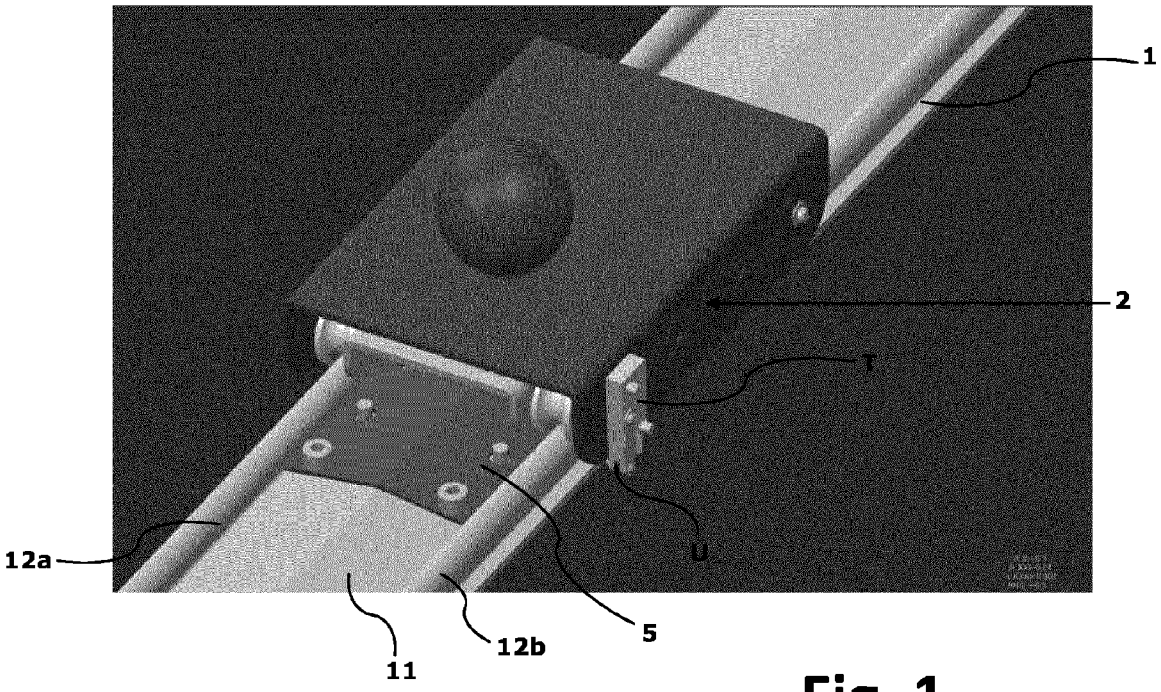

Fig. 1

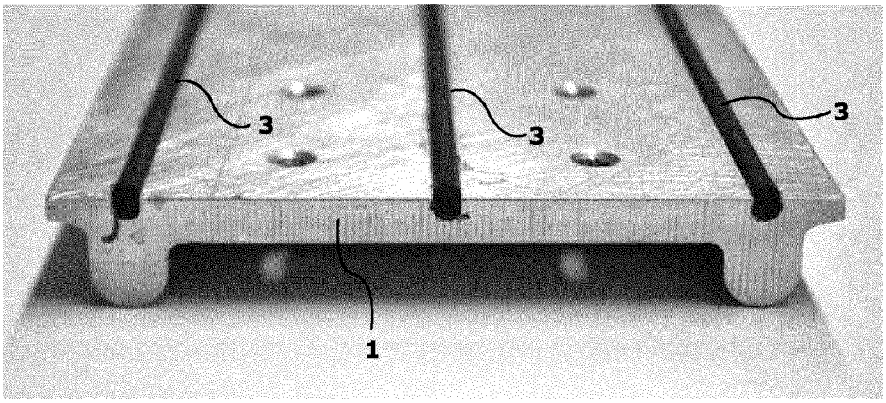

Fig. 2

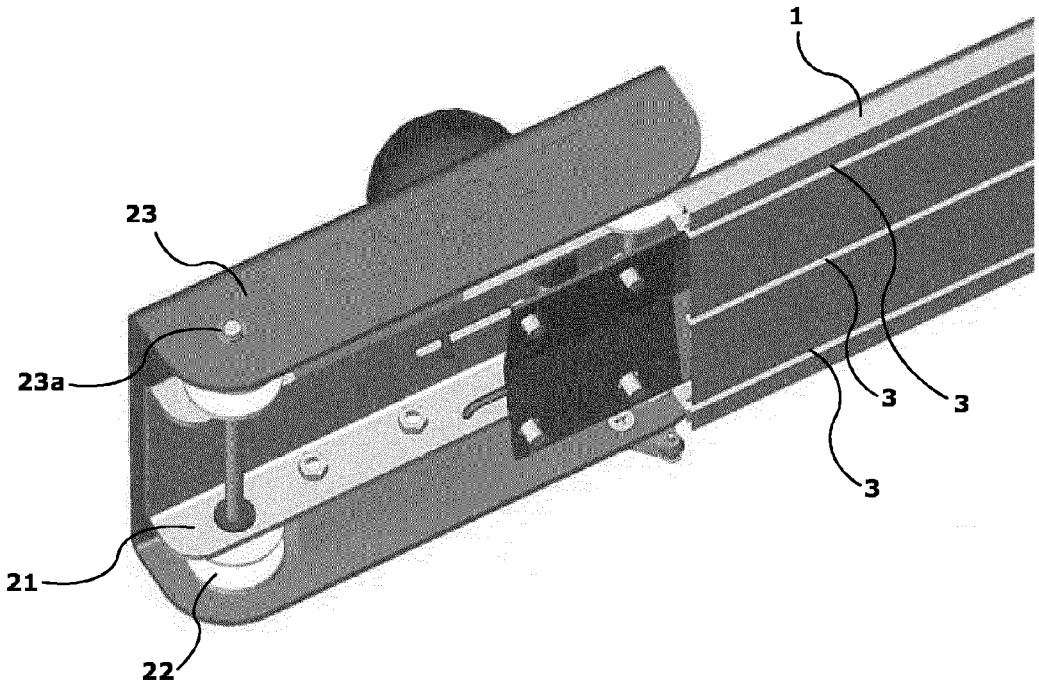

Fig. 3

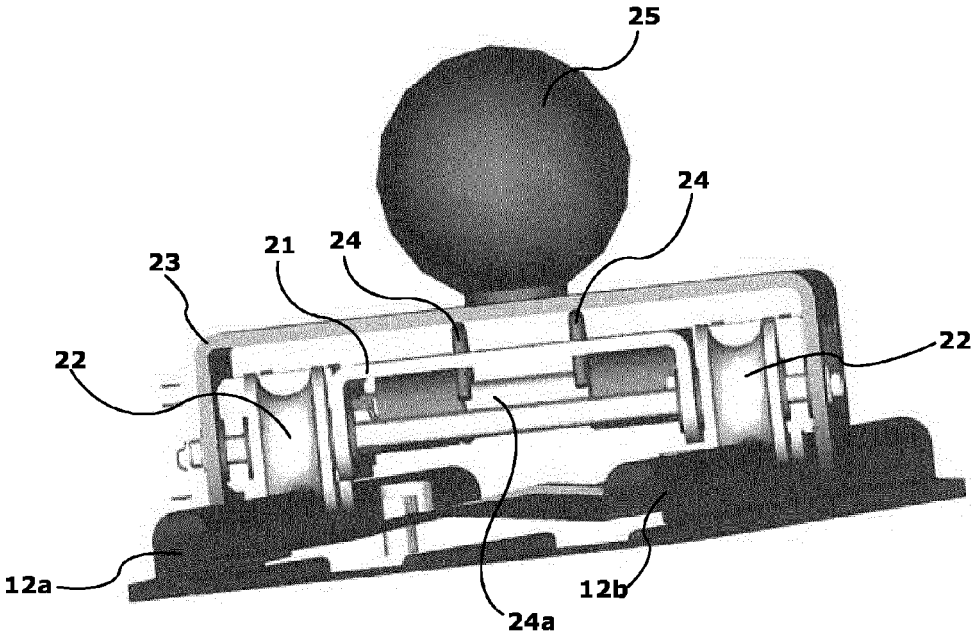

Fig. 4

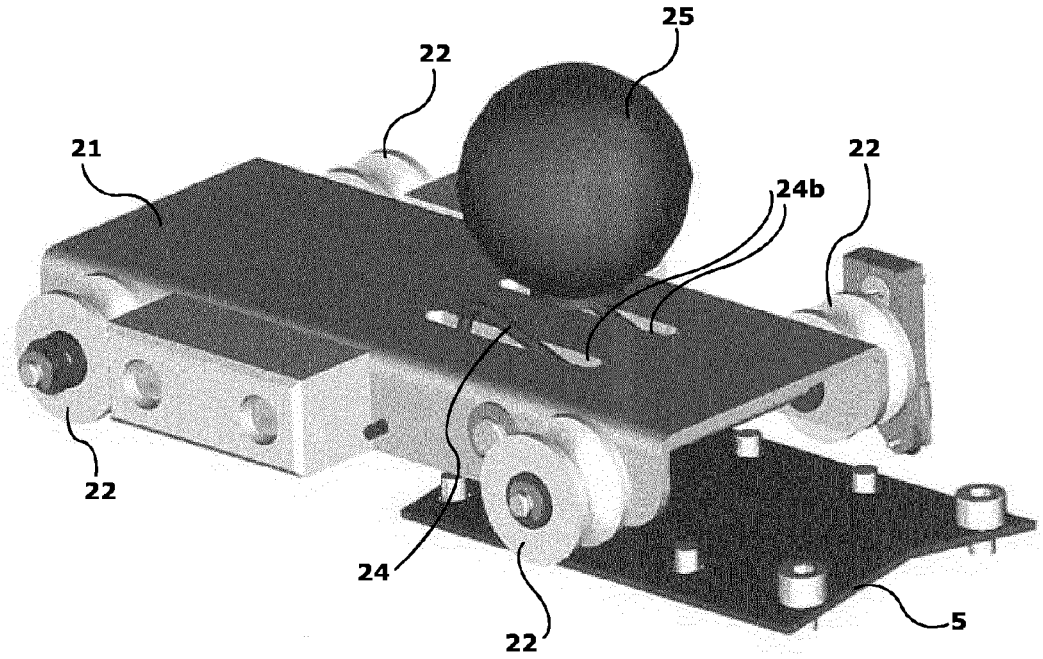

Fig. 5

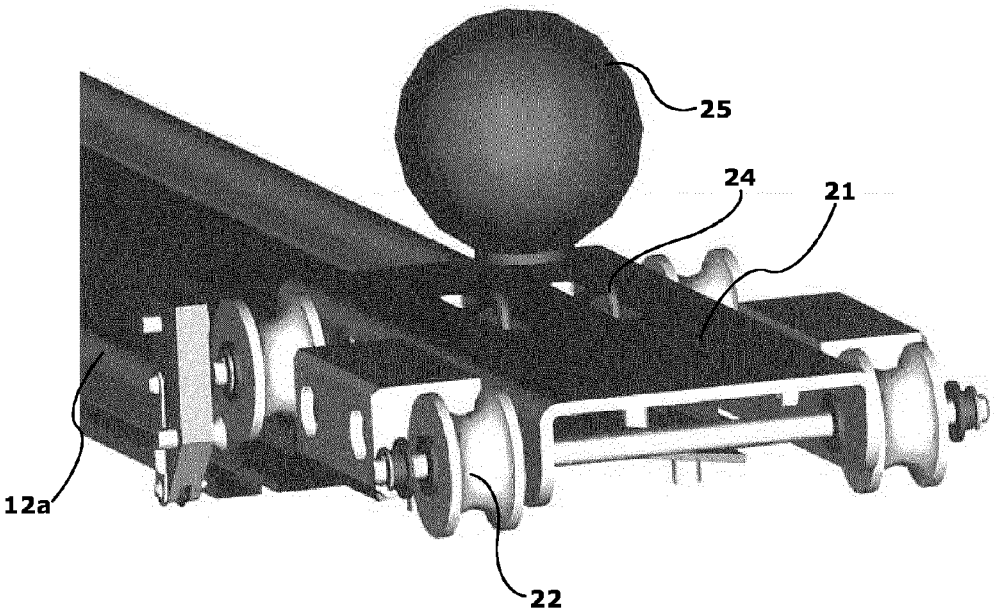

Fig. 6

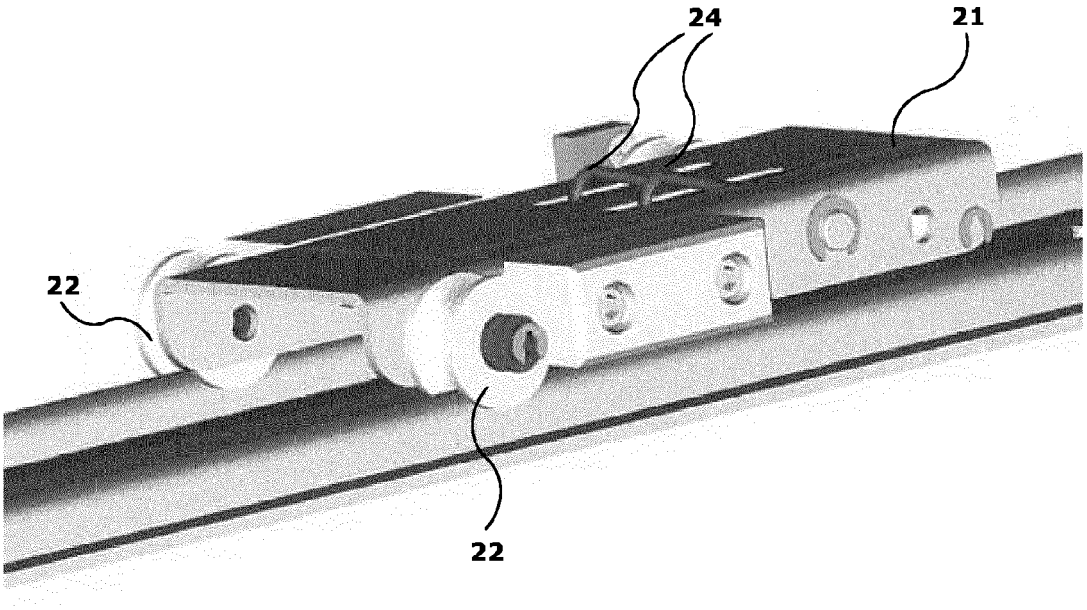

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 5728

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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
The Hague	14 December 2015	Popma, Ronald

CATEGORY OF CITED DOCUMENTS

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