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(54) **Mortise lock with operating mechanism for the closing laths of a window, door, or the like**

(57) A mortise lock (1) with operating mechanism for the closing laths of a window, a door and such, where the mechanism contains a housing (2) and an operating lath (20) that can be moved in an axial direction and a gearwheel transmission to drive the operating lath (20) and the closing laths, whereby the aforementioned gearwheel transmission contains a rotatable drive gearwheel (7), and contains a movable carriage (10), where the carriage (10) contains a rack (11) that engages with the drive gearwheel (7) to move the carriage (10) and a pinion (17) that can be rotated on an axle (13) that is firmly connected to the carriage (10), and this pinion (17) meshes with a rack (19) of the operating lath (20) and a rack (21) of the housing (2), and the drive gearwheel (7) and the pinion (17) are located in different planes.

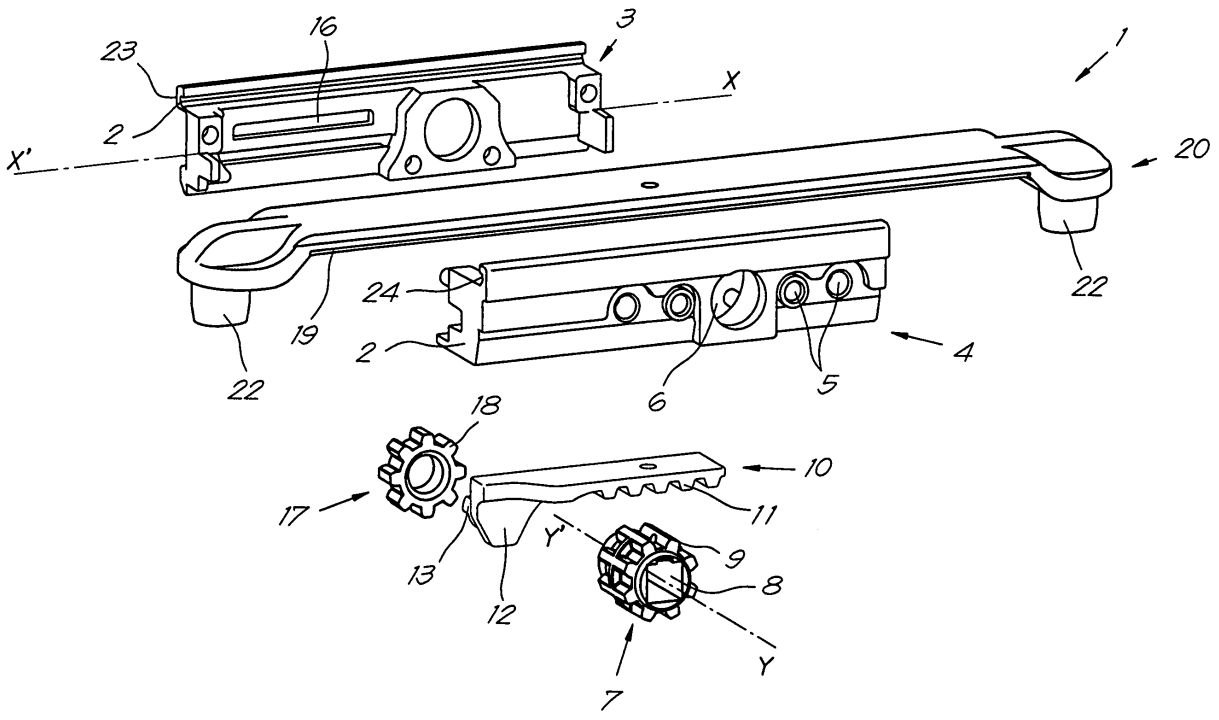

Fig. 1

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Description

[0001] The present invention relates to a mortise lock with operating mechanism for the closing laths of a window, door and such.

[0002] Such a mortise lock is generally built into the space between the fixed frame and the movable leaf of the window, door, and such in order to convert the rotating movement of the window or door handle into a rectilinear movement of the closers, in particular the closing laths that can be moved along the perimeter of the leaf.

[0003] In the simplest embodiment the operating mechanism of the mortise lock can consist of a gearwheel and a mating rack, in which the operation of the handle causes the gearwheel to rotate, so that the rotation of the gearwheel brings about a displacement of the rack, which in turn causes the closers to move.

[0004] However, it is known that the aforementioned space between the fixed frame and the movable leaf, in which the mortise lock must be built, is rather limited.

[0005] It is further known that a sufficiently large movement of the closing laths is difficult to realise with a simple rack and pinion transmission within this limited space. Improved gearwheel transmissions are also known that consist of a drive gearwheel engaging with a movable rack whereby the movement of the rack in turn makes a pinion rotate.

[0006] The pinion thereby meshes with a rack of a movable lath that is coupled or can be coupled to the closers, such that the aforementioned lath undergoes a displacement due to the rotation of the pinion that is twice as large as the displacement of the first-mentioned rack.

[0007] This principle of displacement doubling is already known, for example in DE 1.254.611, and can be applied to mortise locks such that a quarter turn or half turn of the handle brings about a sufficiently large displacement of the closing laths.

[0008] A disadvantage of the known mortise locks is, however, that they have quite a large built-in length and contain a reasonably large amount of components.

[0009] On the housings of known mortise locks there are a number of screw holes to secure the handgrip or handle. Generally these handgrips or handles have a standardised screwing distance and relatively long screws, and the mortise lock must be equipped to work with such standardised handgrips or handles without the risk of malfunction.

[0010] The presence of the screws, that can be long enough to penetrate through the wall of the housing into the inside of the housing by a significant distance, in these screw holes means that the pinions have to be placed a certain distance from the drive gearwheel, which explains among other things the relatively large built-in length.

[0011] Another disadvantage is that the forces on the racks and gearwheels are not distributed optimally such that these components are subject to premature wear.

[0012] In order to limit this wear, these components can be made from stronger materials, which then has the disadvantage that the mortise lock is much more expensive.

[0013] In order to limit or avoid early wear of the teeth, it can also be chosen to make the teeth of the drive gearwheel sufficiently large, but in view of the limited space between the frame and the profile this is not feasible in practice.

[0014] Moreover a limited number of larger teeth would result in a less fluid movement.

[0015] It follows from the foregoing that it is difficult to find a good balance between cost, strength and the dimensions of the mechanism.

[0016] In addition, the choice of material of the gearwheel will somewhat affect the choice of size of the teeth of the gearwheels, which further hampers a good compromise between price, size and strength of the mortise lock.

[0017] The purpose of the present invention is to provide a solution to one or more of the aforementioned and/or other disadvantages, by providing a mortise lock with operating mechanism for the closing laths of a window, a door and such, whereby the mechanism contains a housing and an operating lath that can be moved in an axial direction with respect to the housing, and a gearwheel transmission to drive the operating lath and the closing laths connected to it, whereby the aforementioned gearwheel transmission contains a drive gearwheel that can be rotated by a handle or other drive around its geometric axis Y-Y', contains a carriage that is movable with respect to the housing, whereby the carriage contains a rack that engages with the drive gearwheel to move the carriage in the housing, and a pinion that can be rotated on an axle that is firmly connected to the carriage (10), and this pinion meshes with a rack of the operating lath and a rack of the housing, and the drive gearwheel and the pinion are located in a different plane.

[0018] An advantage is that the mortise lock has smaller dimensions such that the built-in length of the mortise lock is substantially reduced and the mortise lock can easily be built into the limited space between the frame and the profile.

[0019] In a further preferred embodiment the drive gearwheel and pinion are placed very close to one another such that the built-in length is smaller.

[0020] An additional advantage is that the drive gearwheel and the pinion can at least partially overlap one another. Preferably the axle of the pinion forms part of the carriage and the axle of the pinion and the rack of the carriage form a whole.

[0021] An advantage is that the mortise lock contains a smaller number of components and can thus be assembled more easily.

[0022] Preferably the mechanism is constructed as a symmetrical mechanism with a carriage that presents a rack in the middle and on either side of it an axle on which there is a pinion.

[0023] An advantage is that the forces on the carriage, the pinions and the operating lath are better distributed

such that the components are subject to lower loads, which in turn has the advantage of reducing the wear and thus increasing the lifetime of the mortise lock.

[0024] On the other hand, the lower load also makes it possible to use cheaper materials such as zamak, for example.

[0025] Preferably the teeth of the pinion are shorter than the axle of the pinion, and the end of the aforementioned axle has a flat side that can be placed in a guide of the housing and can be moved.

[0026] An advantage is that the forces on the rack are better distributed.

[0027] An advantage attached to this is that the teeth can be of smaller dimensions, such that the built-in length is further reduced.

[0028] Another advantage of the better force distribution is that the gearwheels and racks can be made from cheaper materials.

[0029] In a practical embodiment of the invention the drive gearwheel can be constructed as a double gearwheel, in which the pitch of both toothings is the same and where the teeth of the two toothings are displaced with respect to one another.

[0030] An advantage is that the number of tooth transitions is doubled such that a smoother movement can be realised, even with a lower number of teeth on the drive gearwheel.

[0031] An advantage attached to this is that the teeth of the drive gearwheel have a larger tooth base and are thus stronger.

[0032] In a preferred embodiment of the invention, the axle of the pinion and the axle of the drive gearwheel can be at right angles to one another.

[0033] An advantage is that by orienting the pinion perpendicular to the drive gearwheel, the pinion can be of a greater diameter and with smaller teeth without losing strength, such that the built-in length of the lock can be further reduced.

[0034] It is hereby possible to make the pinions from zamak for example, such that the mortise lock is strong and cheap.

[0035] In a preferred embodiment the housing of the mortise lock is smaller in its longitudinal direction than the sum of the travel of the carriage and the length of the carriage, and the housing is open to enable a movement of the carriage outside the housing.

[0036] As a result the operating lath can be largely outside the housing and/or largely surround the carriage.

[0037] As a result of this construction method, the mortise lock can be shorter.

[0038] To better demonstrate the characteristics of the invention, a preferred embodiment is described below, as an example without any limiting nature, of a mortise lock according to the invention, with reference to the accompanying drawings, in which:

Figure 1 schematically shows in perspective an exploded view of the mortise lock with operating mechanism according to the invention.

Figure 2 schematically shows in perspective the assembled operating mechanism, with the omission of part of the housing.

Figure 3 shows a cross-section according to the line III-III of figure 2 on a larger scale.

Figure 4 shows the cross-section of figure 3 for an alternative embodiment.

Figure 5 shows an exploded view of an alternative embodiment of the invention.

Figure 6 shows the carriage and drive gearwheel of figure 5 in the mounted state on a larger scale.

Figures 7 and 8 each show an exploded view of other alternative embodiments of the invention.

Figure 9 shows a cross-section of the embodiment of figure 8, in a furthermost position as specified in figure 8 with IX-IX.

[0039] Figure 1 schematically shows a first embodiment of a mortise lock with operating mechanism according to the invention.

[0040] The mortise lock 1 contains a housing 2 with a pronounced longitudinal direction X-X', whereby the housing 2 in the embodiments shown is always in two parts, with on the one hand a base part 3 and on the other a cover 4. The housing is intended to be built into the space between the frame and the leaf of a window or door, whereby the longitudinal direction X-X' of the housing 2 is parallel to the outer perimeter of the frame or leaf.

[0041] In the cover 4 shown there are a number of screw holes 5 for fastening a rotatable handle, not shown in the drawings.

[0042] In the aforementioned cover 4 there is a cylindrical recess 6 in which the drive gearwheel 7 is held rotatably around a geometric axis Y-Y'.

[0043] In a practical embodiment of the invention the drive gearwheel 7 has a somewhat square or rectangular recess 8 that mates with the pin of a handle of the window or door, not shown in the drawings.

[0044] In the embodiments shown the drive gearwheel 7 has eight teeth 9 each time and the aforementioned teeth 9 can engage with a carriage 10 that is affixed movably with respect to the housing 2.

[0045] In the embodiment of figures 1 and 2, the aforementioned carriage 10 is constructed as an elongated element that contains a rack 11 at one end that engages with the drive gearwheel 7.

[0046] On the other end of the carriage 10 in this case there is a flat triangular part 12 that contains an axle.

[0047] The aforementioned axle 13 is thereby oriented perpendicularly on the triangular part 12 and extends in a direction parallel to the Y-Y' direction of the geometric axis of the drive gearwheel 7.

[0048] In the embodiment of the invention shown, the aforementioned axle 13 forms a whole with the carriage 10, which in practice can be realised by means of injection moulding, for example.

[0049] Preferably the aforementioned axle 13 has an end 14 with a flat side 15, and this side 15 is secured movably in a guide 16 of the base part 3 of the housing, all such that a better distribution of forces is realised in the mortise lock 1.

[0050] It is clear from the drawings that the aforementioned guide 16 preferably extends along the longitudinal direction X-X' of the housing 2.

[0051] On the aforementioned axle 13 there is a freely rotatable pinion 17 and the length of the teeth is chosen such that the end of the aforementioned axle 13 protrudes axially.

[0052] Although in the figures 1 and 2 shown, the pinion 17 and the drive gearwheel 7 both present the same number of teeth, this is not a strict requirement of the invention.

[0053] The teeth 18 of the pinion 17 mesh, on the one hand, with the teeth of a rack 19 that forms part of the operating lath 20 of the closers, and the teeth of a rack 21 that is secured in the housing 2 or forms part of it, as shown in figure 2.

[0054] The aforementioned operating lath 20 can thereby have a plug 22 at both ends, to which a closing lath can be fitted that is not shown in the drawings.

[0055] In the embodiment shown, the operating lath 20 is located in the upper half of the housing 2 and is movably mounted in a guide 23 of the base part 3 and a guide 24 of the cover 4, while the rack 21 is at the bottom of the housing on the diametrically opposite side of the pinion 17.

[0056] Although not strictly necessary for the invention, it is clear from figure 3 that the length of the teeth 18 of the pinion 17 is smaller than the length of the teeth 9 of the drive gearwheel 7.

[0057] Furthermore it is clear that the geometric axis Y-Y' of the drive gearwheel 7 and the axle 13 of the pinion 17 are parallel to one another.

[0058] In the embodiment shown, the planes of the pinion 17 and the drive gearwheel 7 are different to one another, all such that the pitch circles of these gearwheels 7, 17 can partially overlap one another, or in other words the gearwheels are mounted in a slanting configuration, which leads to a further reduction of the built-in length.

[0059] More specifically in figure 1 the plane of the drive gearwheel is located closer to the cover than the plane of the pinion, but this does not necessarily need to be the case.

[0060] In practical embodiments of the invention a partial or complete overlap in the longitudinal direction X-X' between the screw holes 5 and the pitch circles of the pinions 17 is possible, such that a certain reduction of the built-in length is realised, while the user can continue using the standard handgrips and handles, with their standard screw bolts, although in such a case they can protrude into the interior of the housing. This increases the flexibility of the user.

[0061] A further reduction of the mortise lock can be realised by making the pitch circles of the pinions 17 and the drive gearwheel 7 overlap in the longitudinal direction X-X' of the mortise lock.

[0062] The functioning of a mortise lock according to the invention is very simple and as follows.

[0063] When the pinion 17 is turned, for example by a handle, then the carriage 10 is moved over a length L in the housing 2 in the longitudinal direction X-X' of the housing 2. The axle 13 of the pinion 17 will be moved over the same distance, such that the pinion 17, by the interaction with the rack 21 of the housing 2, turns around the axle 13.

[0064] This turn of the pinion 17 will move the operating lath 20 in an axial direction by engaging with the rack 19 of the operating lath 20.

[0065] The movement of the operating lath 20 is twice as large as the movement L of the carriage 10. Through a relatively small movement of the carriage 10, a relatively large movement of the operating lath 20 can thus be realised, and this to a sufficient extent to operate the closing mechanism.

[0066] It is also possible according to the invention to affix the drive gearwheel 7 and pinion 17 at a smaller distance from one another, as illustrated in the embodiment of figure 4, such that the built-in length of the mortise lock can be further reduced.

[0067] In this embodiment the length A,B of the teeth of the drive gearwheel 7 and pinion 17 respectively, and the thickness C of the triangular part 12 of the carriage 10, is chosen such that the gearwheels 7 and 17 can be behind one another, at least viewed in the direction of the geometric axis Y-Y' of the drive gearwheel 7 and thus at least partially overlap in the longitudinal direction X-X' of the housing 2. In other words this means that the projection of the drive gearwheel 7 and the pinion 17 on a plane perpendicular to the axle 13 can at least partially overlap one another, such that the distance in the longitudinal direction X-X' of the housing 2 between the geometric axis of the axle 13 and geometric axis Y-Y' of the pinion 17 is smaller than the sum of the diameters of the outer circumference of the drive gearwheel 7 and the pinion 17.

[0068] This provides the advantage that the housing 2 can be made shorter in its longitudinal direction X-X' than in conventional mechanisms where the gearwheels 7 and 17 cannot overlap one another, as they are situated in the same plane and have their axes on a line that extends along the longitudinal direction of the housing 2.

[0069] Figures 5 and 6 show an alternative embodiment that is different to the foregoing embodiments in that the operating lath 20 is on the underside of the housing 2, while the rack 21 is at the top, all such that a more advantageous distribution of the load of the carriage 10 and the operating lath 20 is obtained, and the intruder security of the lock is also improved.

[0070] Another point of difference between this and the foregoing embodiments is that the drive gearwheel 7 is constructed as a double gearwheel 7.

[0071] As shown in greater detail in figure 6, the drive

gearwheel 7 contains two series of teeth 25-26 in which both series 25-26 present the same number of teeth and the one series of teeth 25 is turned somewhat by a certain angle with respect to the other 26, all such that the teeth of both series 25-26 are not in line with one another.

[0072] The teeth of the two series 25-26 thereby preferably have the same dimensions.

[0073] In the embodiment shown, the carriage 10 has two racks 27-28 that slide according to the longitudinal direction of the carriage 10 with respect to one another and mesh with each series of teeth 25-26 of the drive gearwheel 7 on one of the aforementioned racks 27-28, whereby at least one tooth 25 and one tooth 26 mesh at the same time in the rack 27 and 28 respectively.

[0074] The two series of teeth 25-26 can thereby be separated from one another by a rib 29 on the drive gearwheel 7, and this rib can be moved in a groove provided to this end between the racks.

[0075] Of course it is also possible to provide a rib between the racks, and to provide the drive gearwheel 7 with a groove.

[0076] In the example shown where the drive gearwheel 7 contains two series of seven teeth, fourteen teeth transitions can thus be realised, all such that a smoother movement of the carriage 10 is realised.

[0077] Of course, for a given number of teeth transitions, the number of teeth per series can be limited, such that the teeth can be of a larger and stronger construction and yet a smooth movement remains possible.

[0078] It goes without saying that three or more series of teeth can also be provided in the drive gearwheel 7, which in this case can mesh with the respective racks on the carriage 10.

[0079] The embodiment shown in figures 5 and 6 further differs from those of figures 1 to 4 inclusive due to the presence of a second pinion 17 on the carriage 10, and consequently a second rack 19 on the operating lath 20, as well as a second rack 21 on the housing 2.

[0080] The aforementioned pinions 17 are thereby placed symmetrically with respect to the rack 11 on the carriage 10, all such that a symmetrical mortise lock is realised. Thus due to the symmetrical configuration of the two pinions 17, a better distribution of the forces on the carriage 10, the operating lath 20 and pinions 17 is realised, which ensures more favourable loading.

[0081] As a result it is possible to manufacture all the aforementioned components from cheaper materials.

[0082] Figure 7 shows a further embodiment of the invention that differs from the embodiments of figures 5 and 6 in that the pinions 17 and the drive gearwheel 7 are oriented at right angles with respect to one another.

[0083] In this embodiment the drive gearwheel 7 and pinions 17 are located in intersecting planes.

[0084] Due to the perpendicular configuration in the embodiment shown, the pinions 17 can be of a larger diameter and the teeth on the pinion 17 can be of a smaller tooth length.

[0085] Due to the smaller tooth length of the pinions 17, the pinions can be put in the space between the cover 4 and the securing screws, all such that the length of the screws does not need to be unnecessarily limited.

[0086] In this embodiment, thanks to the configuration of the pinions 17 it is also possible to make the pinions 17 of a larger diameter and possibly also with larger teeth, which of course fosters the strength.

[0087] Also in this case the drive gearwheel 7 and the pinions 17 can overlap one another in the longitudinal direction X-X' of the housing 2.

[0088] Figures 8 and 9 show a further embodiment of the invention.

[0089] Just as in the embodiment of figure 7, here the axles of the pinions 17 and the drive gearwheel 7 are at right angles to one another.

[0090] Furthermore, in this embodiment the housing 2 is constructed such that the carriage 10 and the pinions 17 are not enclosed by the housing 2. Here the housing 2 is shorter in the X-X' direction than the sum of the length of the carriage 10 and its travel, i.e. the distance over which it can move. The carriage 10, and thereby the pinions 17, thus protrude to their furthest positions outside the housing 2, as shown in figure 9.

[0091] The housing is thus actually open on one side, i.e. the side where the carriage is located.

[0092] The operating lath 20 is divided into two, such that the parts 31, 32 are placed together by small bolts 33. The operating lath 20, in contrast to figure 7, is not in the housing but largely surrounds the housing 2 and the carriage 20 with pinions 17.

[0093] The use of small bolts 33 is not essential for the good operation of the mortise lock, the parts 31 and 32 can also be connected in other known ways for connecting two parts to one another.

[0094] This means that the operating lath 20 covers the aforementioned open side such that the interior mechanism is protected against undesired contact.

[0095] The operating lath 20 has a guide groove 34 and a guide edge 35. The housing 36 has a complementary guide edge 37 and guide groove 38.

[0096] There are recesses 39 in the housing that can receive the plugs 22 when the operating lath 20 is in its furthermost position.

[0097] The housing 2 is not placed around the complete path of the carriage 10 and is thus smaller than in other embodiments. As a certain travel of the carriage 10, the gearwheel 7 and the pinions 17, are preconditions for the design of a mortise lock 1, the size of these components is fixed. The same applies to the travel of the operating lath 20, as that too is a precondition.

[0098] Because a limiting factor for reducing the size of the mortise lock is the consideration that the operating lath 20 may not be so small that it can be blocked during its movement through the housing, this last embodiment, due to the housing 2 being smaller than in other embodiments, can be made smaller as a whole, which naturally has obvious advantages.

[0099] Although in the figures shown, a square recess

in the drive wheel 7 is shown to secure a handle, it is also possible to have the drive gearwheel 7 rotate around its axle by a different drive.

[0100] The present invention is not in any way limited to the embodiments described as an example and shown in the drawings, but a mortise lock according to the invention can be realised in all kinds of forms and dimensions, without acting outside the scope of the invention.

Claims

1. A mortise lock (1) with operating mechanism for the closing laths of a window, a door and such, **characterised in that** the mechanism contains a housing (2) and an operating lath (20) that can be moved in an axial direction with respect to the housing (2) and a gearwheel transmission to drive the operating lath (20) and the closing laths connected to it, whereby the aforementioned gearwheel transmission contains a drive gearwheel (7) that can be rotated by a handle or other drive around its geometric axis (Y-Y'), and contains a carriage (10) that is movable with respect to the housing (2), where the carriage (10) contains a rack (11) that engages with the drive gearwheel (7) to move the carriage (10) in the housing (2) and a pinion (17) that can be rotated on an axle (13) that is firmly connected to the carriage (10), and this pinion (17) meshes with a rack (19) of the operating lath (20) and a rack (21) of the housing (2), and the drive gearwheel (7) and the pinion (17) are located in a different plane.

2. A mortise lock (1) according to claim 1, **characterised in that** the housing (2) has screw holes (5) and the pinion (17) and the aforementioned screw holes (5) at least partially overlap one another in the longitudinal direction (X-X') of the housing (2), in at least some of the positions that the pinion (17) can occupy with respect to the screw holes (5).

3. A mortise lock (1) according to claim 1 or 2, **characterised in that** the drive gearwheel (7) and the pinion (17) at least partially overlap one another in the longitudinal direction (X-X') of the housing (2), in at least some of the positions that the pinion (17) and the drive gearwheel (7) can occupy with respect to one another.

4. A mortise lock (1) according to one of the foregoing claims, **characterised in that** the drive gearwheel (7) is constructed as a double gearwheel, and that the pitch of the two toothings (25-26) is the same and the teeth of both toothings (25-26) are displaced with respect to one another.

5. A mortise lock (1) according to claim 4, **characterised in that** the two rows of teeth of the drive gearwheel (7) and/or the rack (11) on the carriage (10) are separated by a rib or recess.

6. A mortise lock (1) according to one of the foregoing claims, **characterised in that** the axle (13) of the pinion (17) protrudes out of the pinion (17) by a certain axial length, and that this protruding end presents a flat side (15), and that this flat side (15) is placed in a guide (16) of the housing (2) and can be moved.

7. A mortise lock (1) according to one of the foregoing claims, **characterised in that** the carriage (10) has two axles (13) on which two rotatable pinions (17) are mounted.

8. A mortise lock (1) according to claim 7, **characterised in that** the axles (13) of both pinions (17) are positioned symmetrically with respect to the rack (11) on the carriage (10).

9. A mortise lock (1) according to claim 7 or 8, **characterised in that** both pinions (17) are practically identical and that the teeth of both pinions (17) mesh with two racks (19) of the operating lath (20) and two racks (21) of the housing (2).

10. A mortise lock (1) according to one of the foregoing claims, **characterised in that** the axle (13) of the pinion (17) and the axle of the drive gearwheel (7) are parallel.

11. A mortise lock (1) according to one of the foregoing claims, **characterised in that** the sum of the lengths of the teeth of the pinion (17) and the drive gearwheel (7) is less than the internal width of the housing (2).

12. A mortise lock (1) according to one of the claims 1 to 9, **characterised in that** the axle (13) of the pinion (17) and the axle of the drive gearwheel (7) are at right angles to one another.

13. A mortise lock according to one of the foregoing claims, **characterised in that** the housing (2) is smaller in its longitudinal direction (X-X') than the sum of the travel of the carriage (10), and that the housing (2) is open to enable a movement of the carriage (10) outside the housing (2).

14. A mortise lock according to claim 13, **characterised in that** the operating lath largely surrounds the carriage (10).

15. A mortise lock according to claim 13 or 14, **characterised in that** the operating lath (20) is largely outside the housing (2).

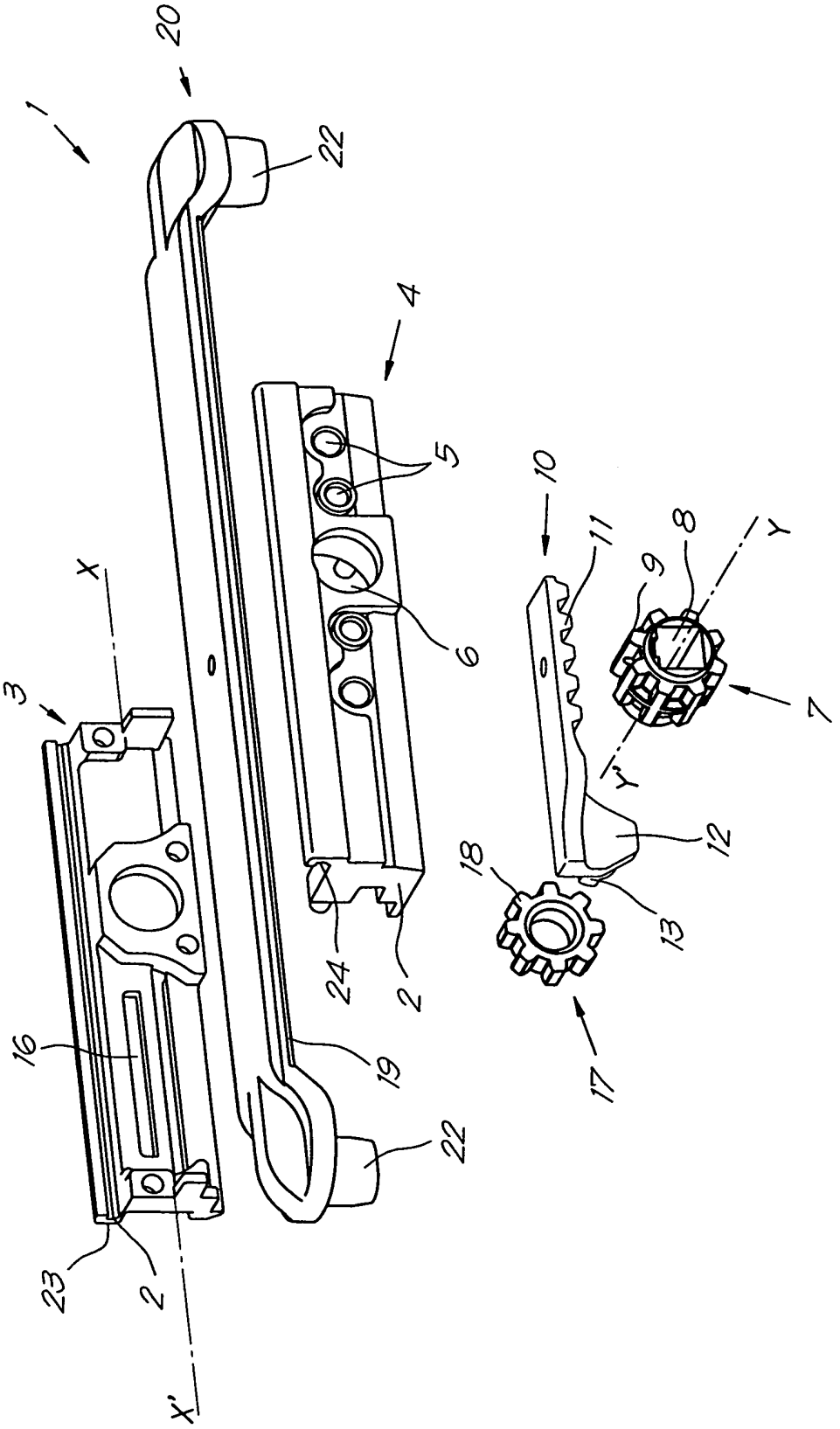

Fig.1

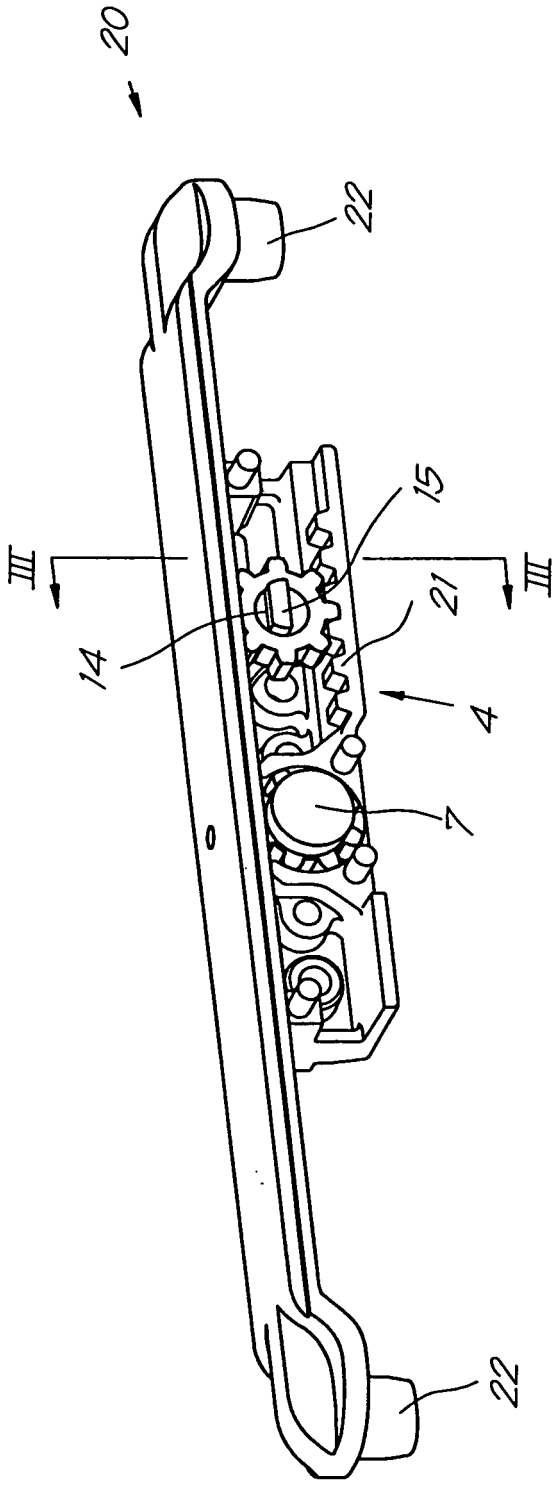

Fig.2

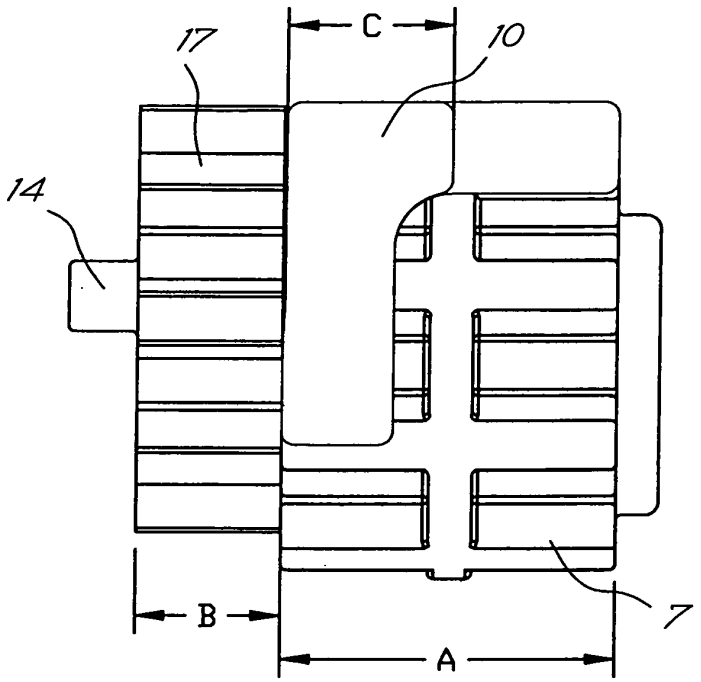

Fig.3

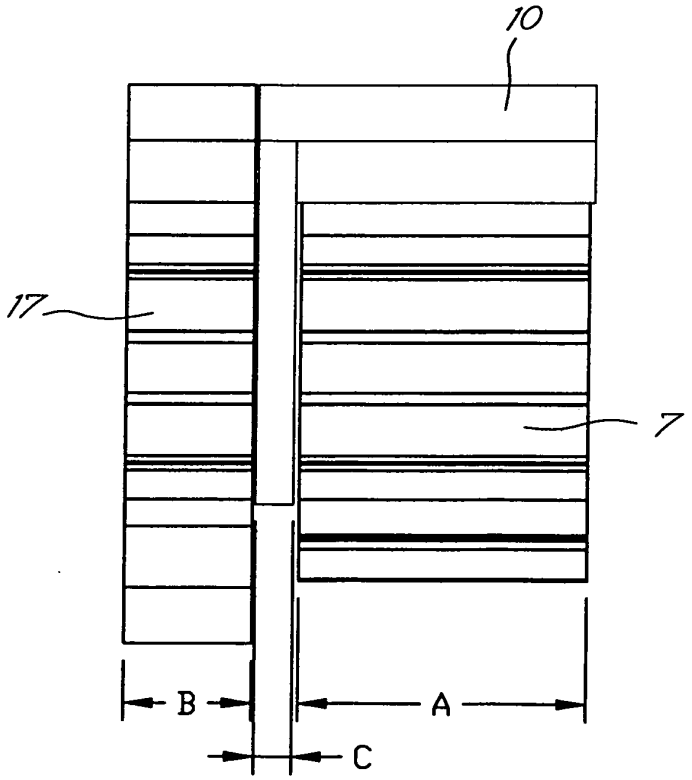

Fig.4

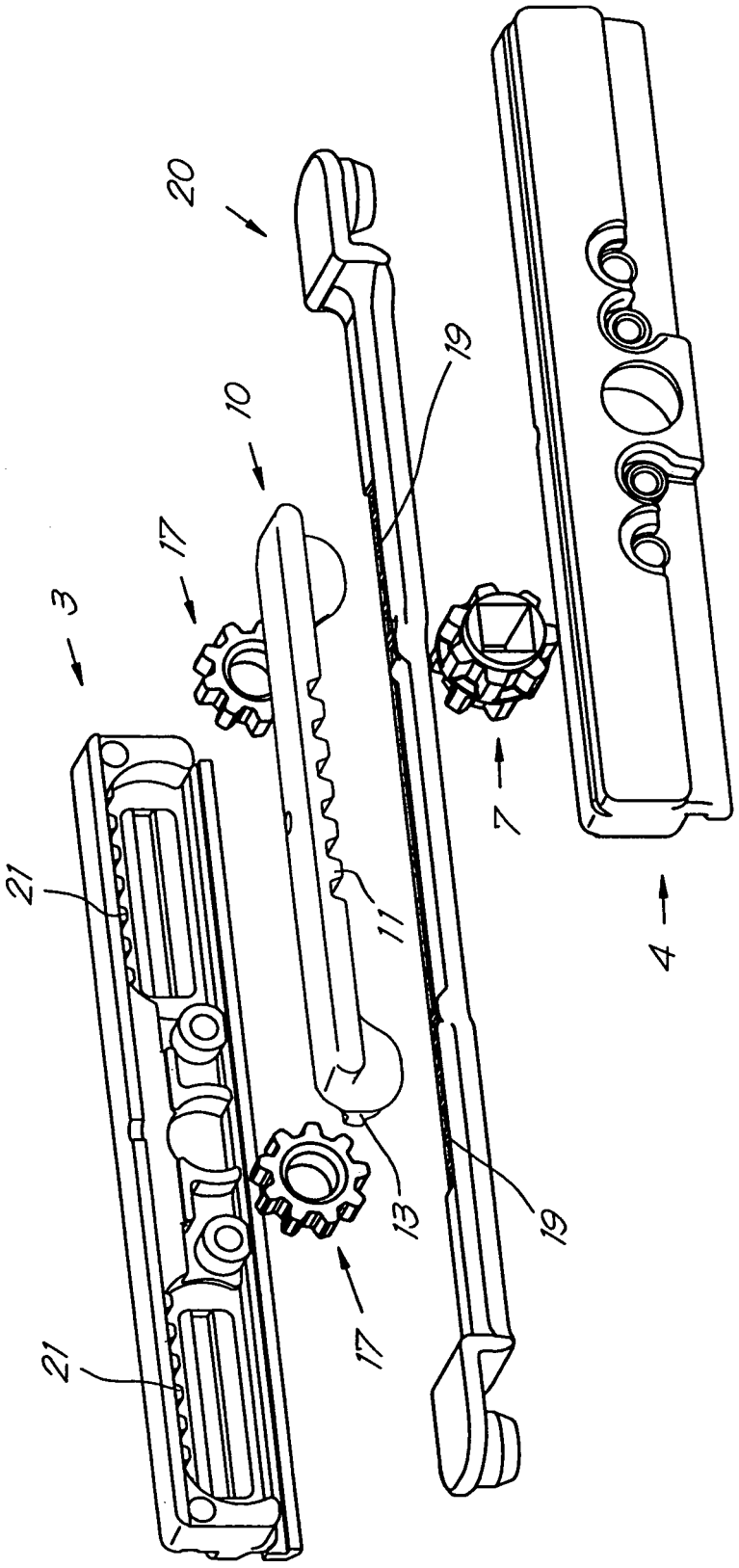

Fig.5

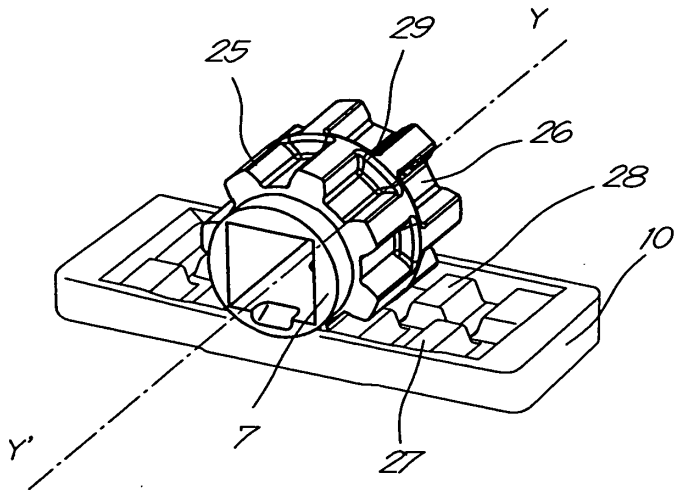

Fig.6

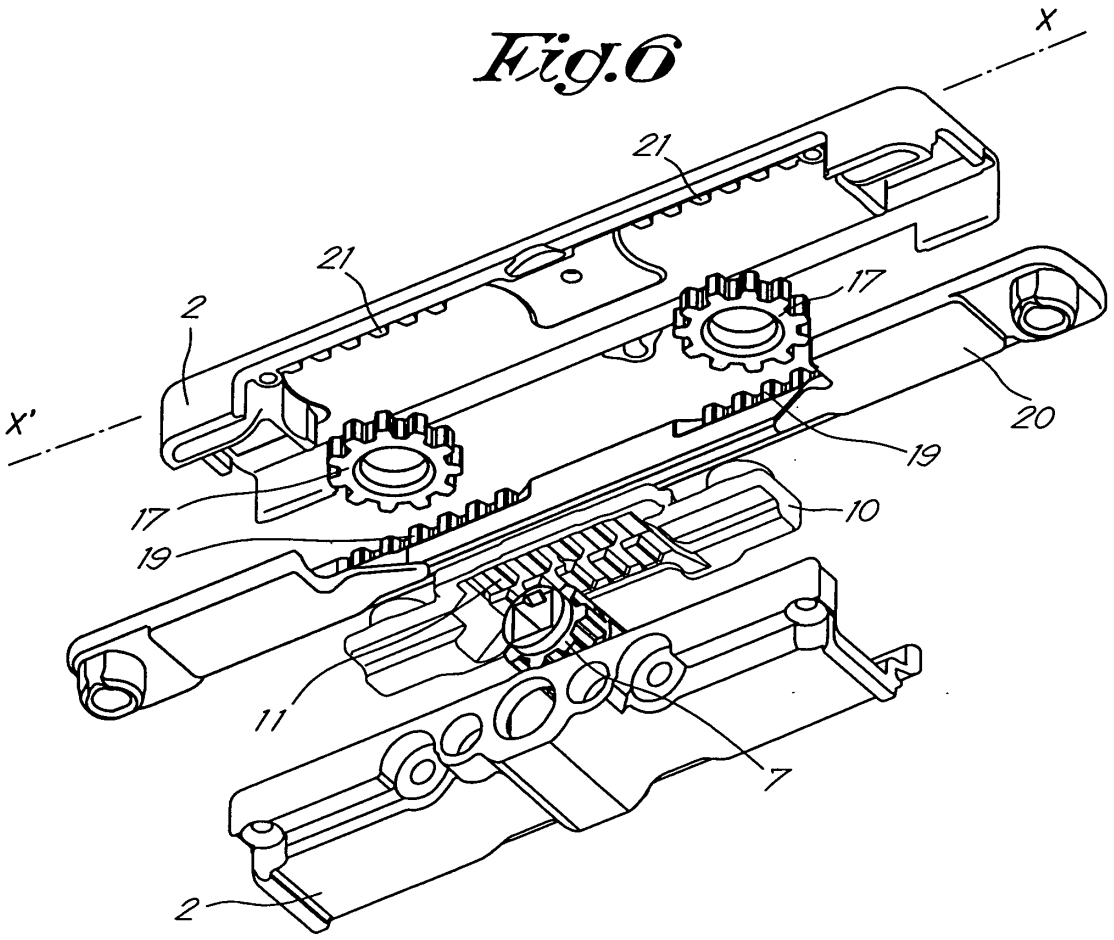

Fig.7

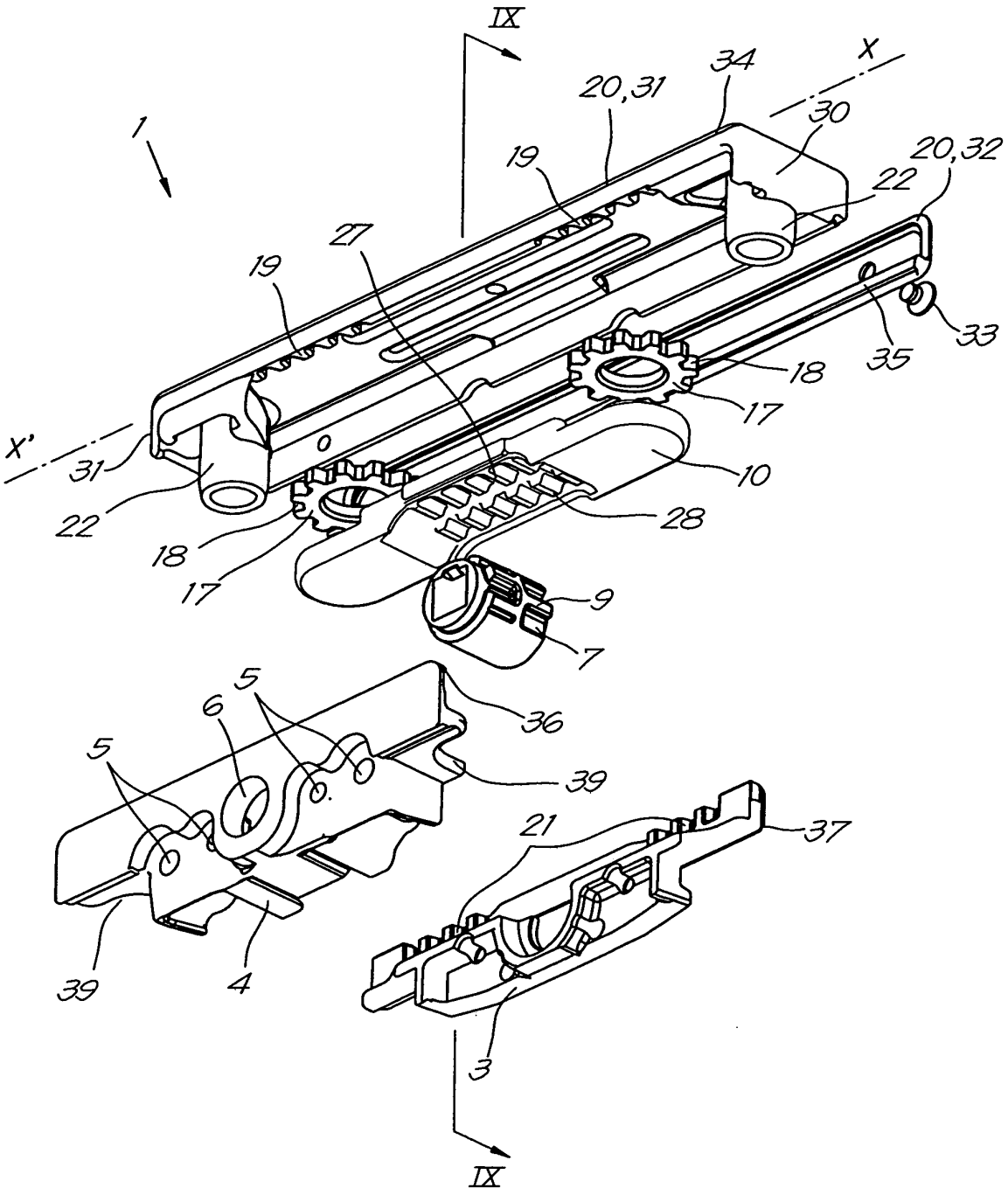
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Fig.8

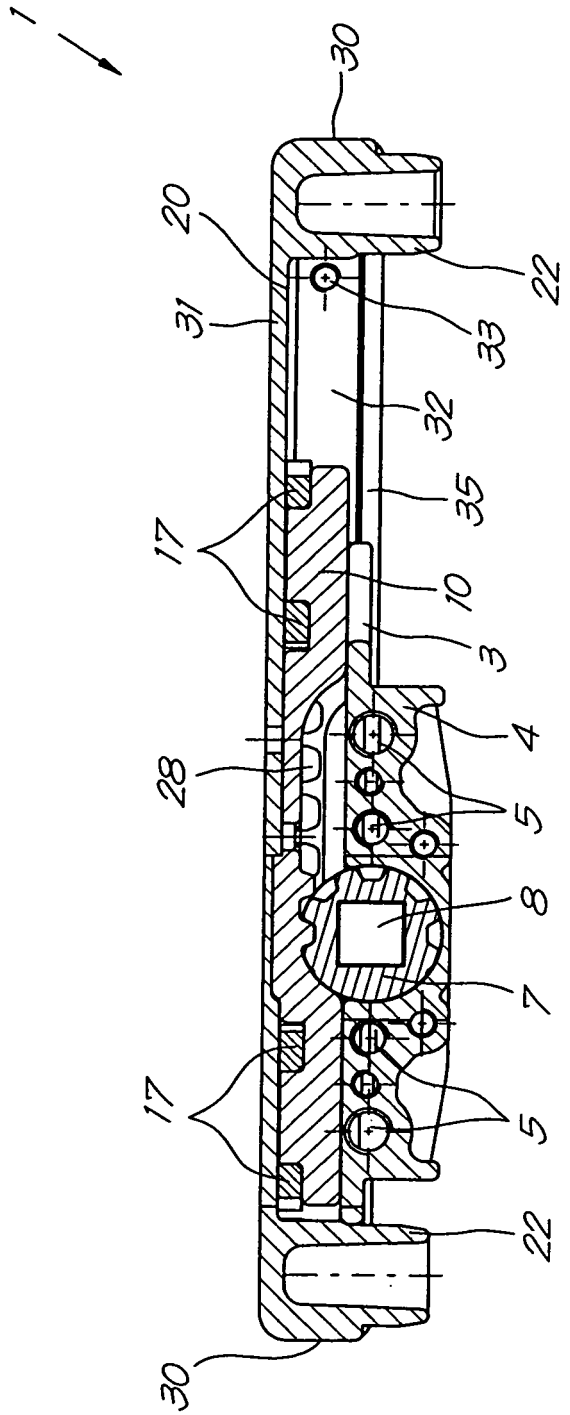

Fig.9

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EUROPEAN SEARCH REPORT

Application Number
EP 10 01 2668

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* column 3, lines 23-65; figure 1 *	3-9,11, 12	
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TECHNICAL FIELDS SEARCHED (IPC)
E05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 January 2011	Cruyplant, Lieve

CATEGORY OF CITED DOCUMENTS

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1

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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