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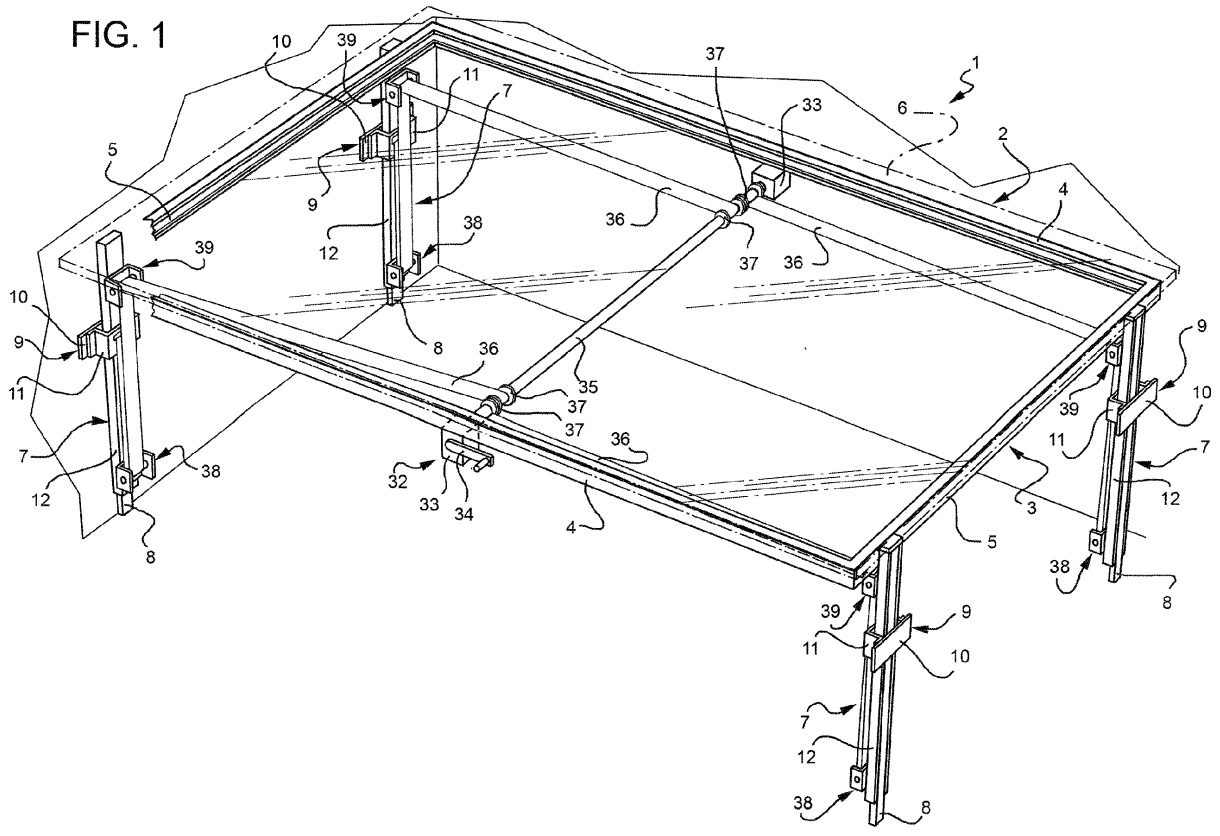
(54) **Height-adjustable bunk bed**

(57) A bed (1) with a height-adjustable bunk (2), the bed (1) having a number of posts (7), each defined by a guide (8) fixable in a vertical position, and by a slide (12) integral with the bunk (2) and fitted to the guide (8) to slide a given length along the guide (8), under the control of an actuating device (32), to move the bunk (2) between a bottom level and a top level; the guide (8) extending to a level at most equal to the bottom level; and the slide (12) having a top portion connecting it to the bunk (2), and which projects from the top of the guide (8) when the bunk (2) is at the top level.

FIG. 1



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Description

[0001] The present invention relates to a height-adjustable bunk bed.

[0002] Beds of this type are normally used in campers, truck cabs, leisure boats or similar, and comprise a bunk which, when not in use, is adjustable in height to allow access to floor space, or to define the top of a compartment normally communicating with the outside and usable for storage, e.g. for stowing a motor vehicle.

[0003] The bunk of known beds of the above type is normally suspended by a system of belts from a top support, or mounted to slide along vertical rails.

[0004] In other words, in some known beds of the above type, as described for example in WO 96/41558 and WO 03/070145, the bunk lifting system is located at least partly over the bunk, and is therefore not only bulky and unsightly, but also potentially user-hazardous by comprising moving parts directly accessible from the outside.

[0005] Other known height-adjustable bunk beds, as described for example in GB 1459735 and US 638755, have lifting systems which, though located beneath the bunk, have the drawback of requiring more and more effort to raise the bunk as it gets higher.

[0006] It is an object of the present invention to provide a height-adjustable bunk bed designed to eliminate the above drawbacks.

[0007] According to the present invention, there is provided a height-adjustable bunk bed as claimed in Claim 1 and preferably in any one of the succeeding Claims.

[0008] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective, with parts removed for clarity, of a first preferred embodiment of the bed according to the present invention;
Figures 2 and 3 show schematic longitudinal sections of the Figure 1 bed in two different operating configurations;
Figures 4 and 5 show side views, with parts removed for clarity, of a Figure 1 detail in two different operating positions;
Figure 6 shows a section along line VI-VI in Figure 4;
Figures 7, 8 and 9 show schematic plan views of respective variations of the Figure 1 bed.

[0009] Number 1 in Figure 1 indicates as a whole a bed comprising a height-adjustable bunk 2 defined by a rectangular frame comprising two longitudinal members 4 and two cross members 5, and by a rectangular plate 6 on top of and integral with frame 3, and the periphery of which, in the example shown, projects outwards of frame 3.

[0010] Bed 1 comprises a number of (in the example shown, four) posts 7, which support bunk 2 and extend downwards from cross members 5 of frame 3.

[0011] As shown more clearly in Figures 2 to 5, each post 7 comprises a vertical guide 8, which is either positioned with its bottom end resting on the floor, or is fixed at a given height to a supporting wall by a bracket 9 fitted integrally to an intermediate point on an outer surface of guide 8 facing outwards of frame 3. Bracket 9 comprises a plate 10 positioned contacting said outer surface of guide 8; and a U-bolt 11 integral with plate 10 and defining with it a channel through which to insert guide 8.

[0012] Each post 7 also comprises a slide 12, which extends through the channel defined by U-bolt 11, is integral with the corresponding cross member 5, is fitted to guide 8, and is slid a given length along guide 8, by an actuating device 13 described below, to move frame 3, and therefore bunk 2, between a bottom level (Figures 1, 2 and 4) at which bed 1 is normally used, and a top level (Figures 3 and 5).

[0013] As shown in Figures 4 and 5, slide 12 has a top portion connecting it to respective cross member 5 of frame 3, and which projects from the top of guide 8 (Figure 5) when frame 3 is at the top level, and is at most on a level with the top end of guide 8 (Figure 4) when frame 3 is at the bottom level.

[0014] As will be clear from Figures 1 to 5 and the above description, posts 7 extend completely beneath plate 6, regardless of the level bunk 2 is set to.

[0015] As shown in Figure 6, guide 8 is defined by a substantially rectangular cross section rod, which has two opposite minor longitudinal lateral surfaces in respective planes crosswise to respective cross member 5. And slide 12 has a U-shaped cross section, is positioned astride guide 8, and comprises a central core 14 facing an inner major longitudinal lateral surface 15 of guide 8; and two lateral wings 16, each facing outwards of frame 3 and having an inner surface 17 facing the corresponding minor longitudinal lateral surface 13 of guide 8. In each inner surface 17 and corresponding minor longitudinal lateral surface 13, respective grooves 18 and 19 are formed facing each other, and define a longitudinal channel 20 communicating with the outside through two opposite, coplanar, longitudinal openings 21 between inner surface 17 and corresponding minor longitudinal lateral surface 13.

[0016] Transverse detachment of slide 12 from guide 8 is prevented by a retaining device 22, which, for each longitudinal channel 20, comprises a rolling guide 23, in turn comprising a retainer 24 fitted through longitudinal channel 20 and engaging longitudinal openings 21 in sliding manner, and a number of rollers 25 fitted to retainer 24 to roll along the inside of longitudinal channel 20.

[0017] Retaining device 22 also comprises a centre plate 26, which is interposed between major longitudinal lateral surface 15 of guide 8 and central core 14 of slide 12, is perpendicular to the two retainers 24, and connects the two retainers 24 to define a rolling bridge guide 27 movable with slide 12 along guide 8 at half the speed of slide 12.

[0018] As shown more clearly in Figures 4 and 5, to

limit travel of slide 12 along guide 8, the latter is fitted with a bottom stop 28 and a top stop 29, both housed inside a central longitudinal groove 30 along major longitudinal lateral surface 15; and central core 14 of slide 12 is fitted with a catch 31, which engages central longitudinal groove 30 to cooperate directly with bottom stop 28 when the slide is at the bottom end of its travel, and to cooperate indirectly with top stop 29, with the interposition of central plate 26 of rolling guide 27, when slide 12 is at the top end of its travel.

[0019] As shown in Figure 1, slide 12 on each post 7 is moved along guide 8 by an actuating device 32 common to all of posts 7 and comprising two reducers 33, which are located under respective longitudinal members 4, are operated alternatively by hand by means of respective cranks 34 (only one shown), and have a common output shaft 35 parallel to cross members 5.

[0020] For each post 7, actuating device 32 comprises a flexible transmission member 36, which extends under bunk 2, regardless of the level bunk 2 is set to, and is interposed between post 7 and a respective winding drum 37 fitted to output shaft 35. More specifically, the end of flexible transmission member 36 opposite the end wound about respective winding drum 37 is connected integrally to guide 8 by a fastener defined by U-bolt 11; slide 12 comprises, underneath bunk 2, two pulleys 38 and 39 located below and above U-bolt 11 respectively, and connected to the outer surface of central core 14 facing inwards of frame 3; and flexible transmission member 36 extends from U-bolt 11, under pulley 38, and over pulley 39 to respective winding drum 37.

[0021] As will be clear from the above description:

- actuating device 32 is located entirely underneath bunk 2 at all times;
- turning either one of cranks 34 adjusts the distance between pulley 38 and U-bolt 11 to raise or lower bunk 2; and
- U-bolt 11 being fitted to guide 8, and pulleys 38 and 39 being fitted to slide 12, the portions of flexible transmission member 36 extending between U-bolt 11 and pulley 39 are vertical, i.e. extend in the same direction as the weight force, so the torque applied to cranks 34 to raise bunk 2 remains constant, regardless of the level of bunk 2.

[0022] In the Figure 1-6 embodiment, flexible transmission member 36 is a belt; each pulley 38, 39 comprises a fork with a transverse pin or roller; and each belt comprises a straight portion extending between respective pulley 39 and respective winding drum 37, and which extends substantially parallel to bunk 2 and longitudinal members 4, and substantially perpendicular to major longitudinal lateral surface 15 of respective guide 8.

[0023] In the embodiments shown in all the other drawings, flexible transmission member 36 is cable, which, compared with a belt transmission member, has the advantage of allowing winding drums 37 to be located at any point under bunk 2, and enabling full preassembly of actuating device 32 before fitting it to bunk 2 and posts 7.

[0024] When flexible transmission members 36 are in the form of cables, as shown by way of example in Figures 7 to 9, each of pulleys 38, 39 (only one shown in the drawings) is preferably fitted in rotary manner to a fork pivoting about an axis perpendicular to the pulley axis; output shaft 35 is preferably a projecting shaft connected to one reducer 33; and winding drums 37 are generally grouped together, either under a central portion of bunk 2 (Figures 7 and 8), or to one side, close to one of longitudinal members 4 (Figure 9).

Claims

1. A bed with a height-adjustable bunk (2), the bed (1) comprising a number of posts (7) supporting the bunk (2); each post (7) comprising a guide (8) fixable in a vertical position, and a slide (12) integral with the bunk (2) and fitted to the guide (8) to slide a given vertical length along the guide (8) to move the bunk (2) between a bottom level and a top level; the guide (8), when fixed in said vertical position, extending to a level at most equal to the said bottom bevel; the slide (12) having a top portion connecting it to the bunk (2), and which projects from the top of the guide (8) when the bunk (2) is at the top level; and the bed also comprising actuating means (32) for controlling the vertical sliding movement of the slide (12), and which comprise, for each post (7), a flexible transmission member (36) connected to the guide (8) and the slide (12), and located entirely under the bunk (2), regardless of the level of the bunk (2); the bed being **characterized in that** the slide (12) is fitted, under the bunk (2), with a top pulley (39) and bottom pulley (38) for the flexible transmission member (36), the top (39) and bottom (38) pulleys being movable with the slide (12); and the guide (8) is fitted with a fixed fastener (11) for the flexible transmission member (36); the fixed fastener (11) being interposed between the top pulley (39) and the bottom pulley (38), regardless of the position of the slide (12) along the guide (8).

2. A bed as claimed in Claim 1, wherein the actuating means (32) comprise a shaft (35) movable with and fitted under the bunk (2) to rotate about its own axis; and, for each flexible transmission member (36), a winding drum (37) fitted to the shaft (35); a first end of the flexible transmission member (36) being integral with said fixed fastener (11); a second end of the flexible transmission member (36) being wound about the respective drum (37); and the flexible transmission member (36) extending from the fixed fastener (11), under the bottom pulley (38), and over the top pulley (39) to the respective drum (37).

3. A bed as claimed in Claim 1 or 2, wherein the flexible transmission member (36) is a belt.

4. A bed as claimed in Claim 3, wherein each belt comprises a straight portion extending between the respective top pulley (39) and relative drum (37), and which extends substantially parallel to the bunk (2) and substantially perpendicular to the respective guide (8).

5. A bed as claimed in Claim 1 or 2, wherein the flexible transmission member (36) is a cable.

6. A bed as claimed in Claims 2 and 5, wherein the drums (37) are grouped together under a central portion of the bunk (2).

7. A bed as claimed in Claims 2 and 5, wherein the drums (37) are grouped together under any portion of the bunk (2).

8. A bed as claimed in one of Claims 2 to 7, wherein the actuating means (32) comprise a crank (34) for rotating said shaft (35) by hand.

9. A bed as claimed in Claim 1 or 2, wherein the guide (8) comprises a rod with two opposite longitudinal lateral surfaces (13); the slide (12) has a U-shaped cross section, is positioned astride said rod, and comprises a central core (14) facing said rod, and two lateral wings (16), each having an inner surface (17) facing a corresponding said longitudinal lateral surface (13) of the guide (8); and retaining means (22) are interposed between the slide (12) and the guide (8) to keep the slide (12) connected in sliding manner to the guide (9).

10. A bed as claimed in Claim 9, wherein each longitudinal lateral surface (13) of the guide (8) has a first longitudinal groove (19), and the inner surface (17) of each said wing (16) has a second longitudinal grove (18) defining, with the respective first longitudinal groove (19), a respective longitudinal channel (20) housing said retaining means (22) and communicating with the outside through two opposite coplanar longitudinal openings (21) parallel to the respective said longitudinal lateral surface (13) of the guide (8).

11. A bed as claimed in Claim 10, wherein the retaining means (22) comprise, for each said channel (20), a rolling guide (23) comprising a retainer (24) fitted through the channel (20) and engaging the longitudinal openings (21) in sliding manner, and a number of rolling members (25) fitted to the retainer (24) to roll along the inside of the channel (20).

12. A bed as claimed in Claim 11, wherein the retaining means (22) also comprise a centre plate (26), which is interposed between the guide (8) and the slide (12), and is perpendicular to, and connects, the two retainers (24) to define a rolling bridge guide (27) movable with the slide (12) along the guide (8).

13. A bed as claimed in Claim 1 or 2, wherein stop means (28, 29, 31) are provided to stop the slide (12) at each end of its travel with respect to the guide (8).

14. A bed as claimed in Claim 13, wherein the stop means (28, 29, 31) comprise a first and second stop (28, 29) fixed to a bottom and top point of the guide (8) respectively; and a catch (31) fitted to the slide (12), and which cooperates with the first stop (28) when the slide (12) is at the bottom end of its travel, and cooperates with the second stop (29) when the slide (12) is at the top end of its travel.

15. A bed as claimed in Claim 13 or 14, wherein the first and second stop (28, 29) are defined by the bottom pulley (38) and top pulley (39) respectively.

16. A bed as claimed in Claims 12 and 14 or 15, wherein the catch (31) is located to cooperate with the first stop (28) directly, and with the second stop (29) via the interposition of said centre plate (26).

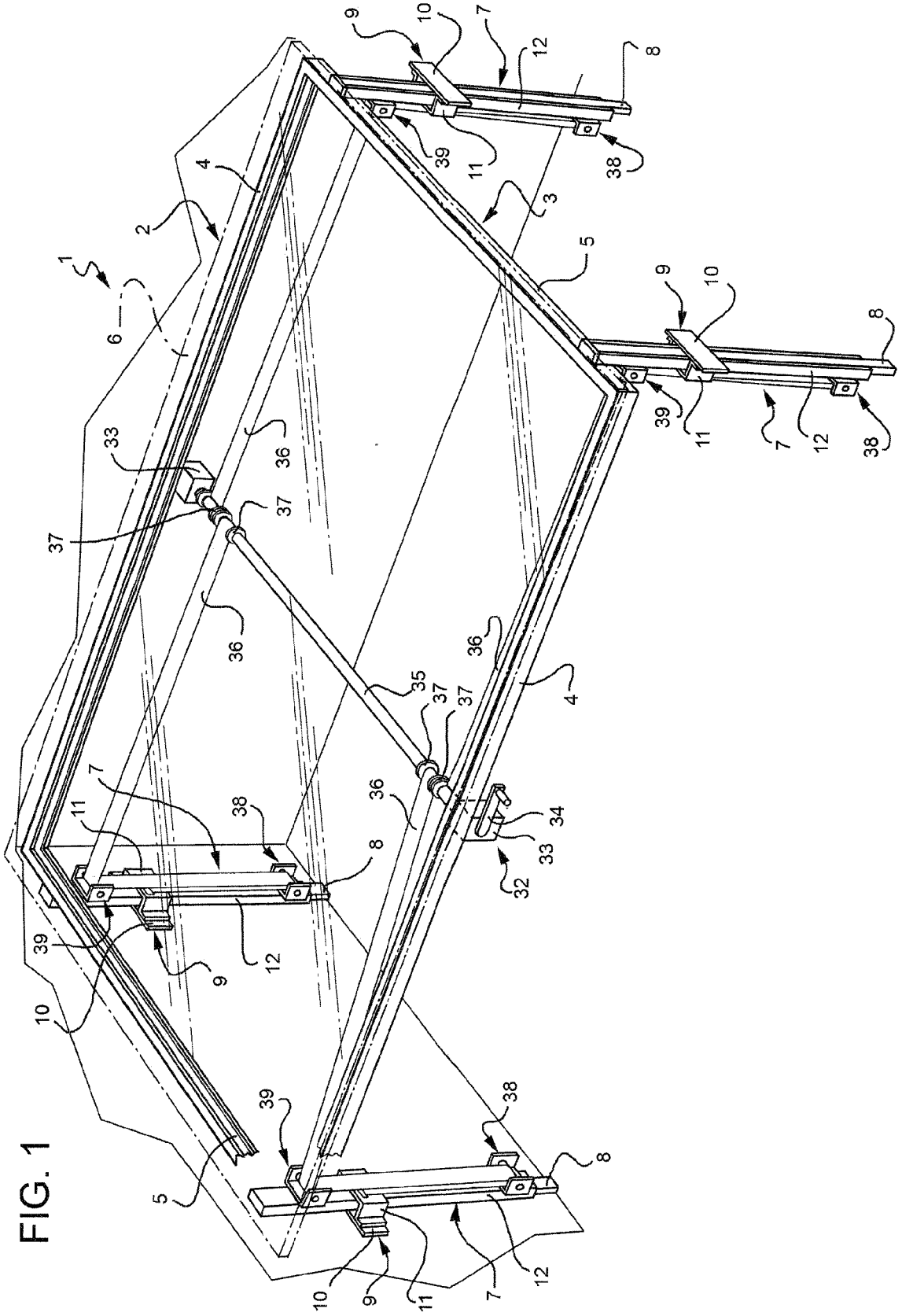

FIG. 1

FIG. 2

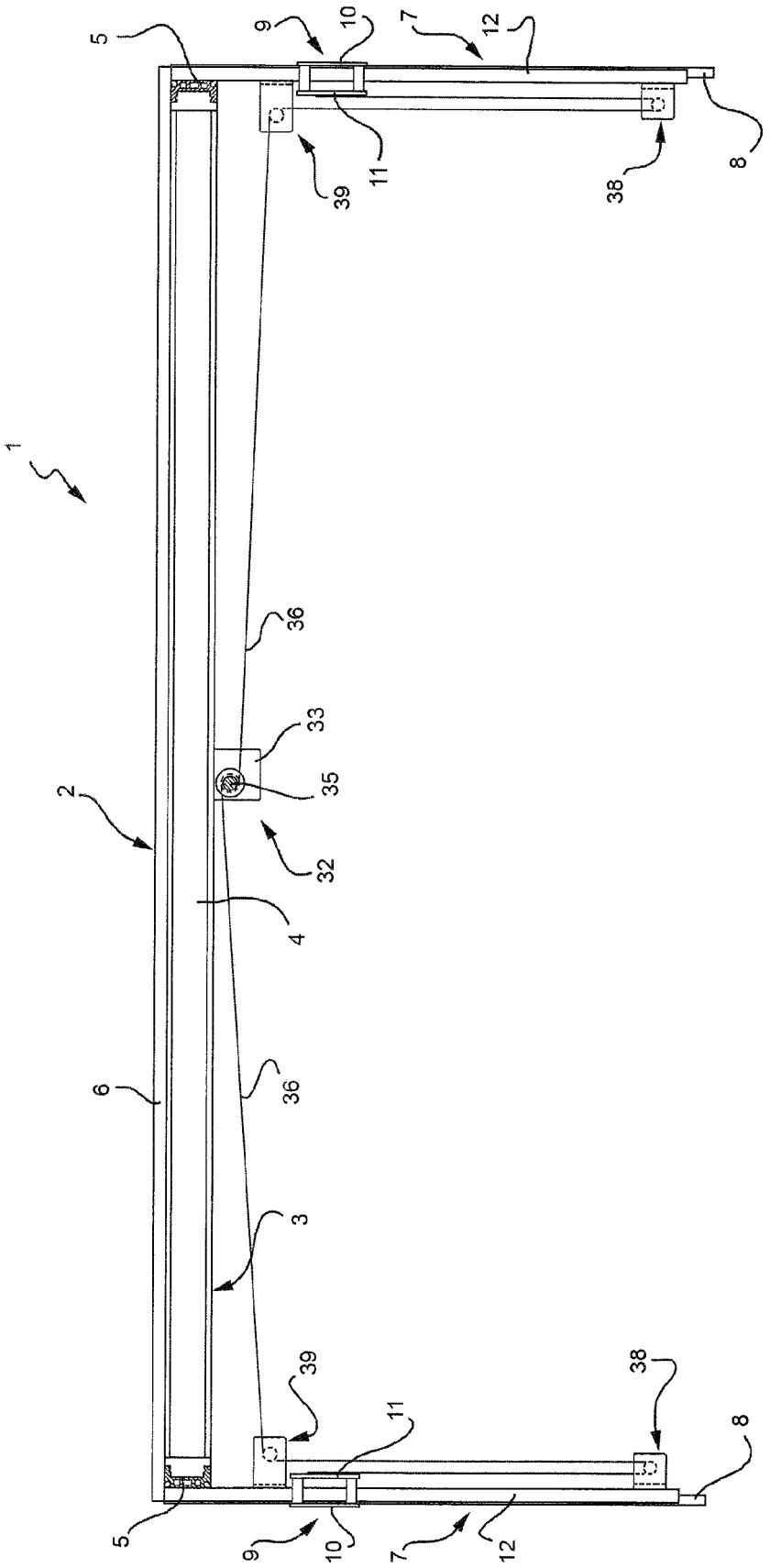

FIG. 3

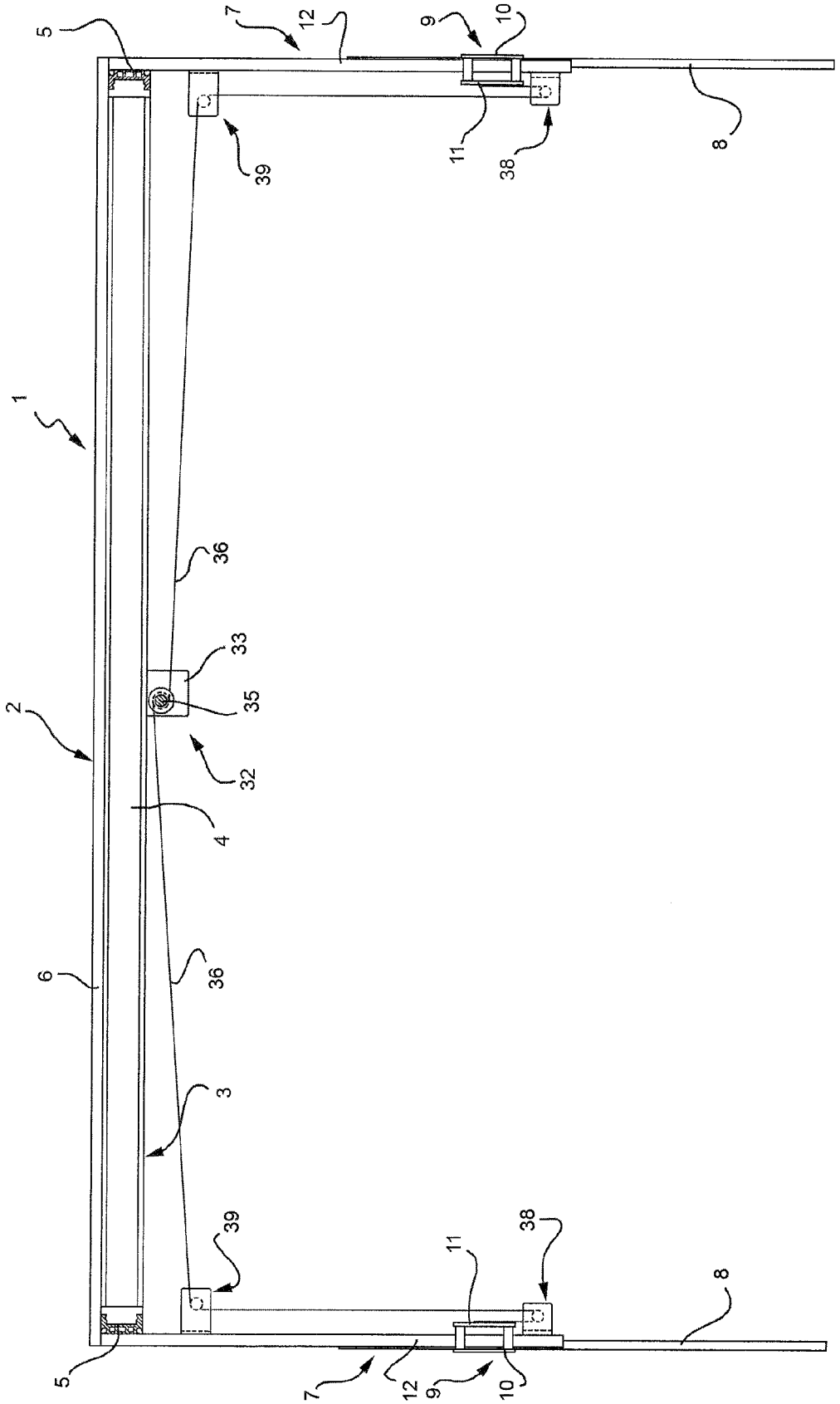

FIG. 4

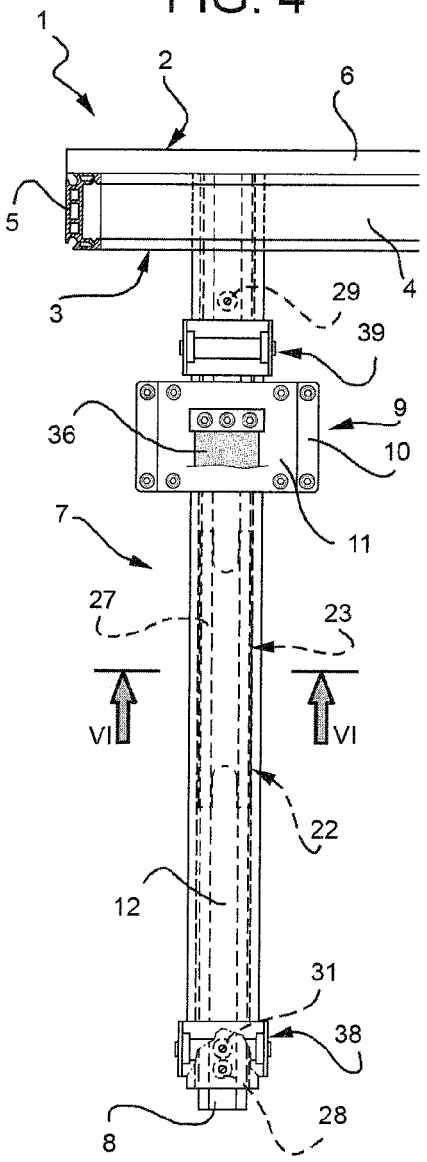
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FIG. 5

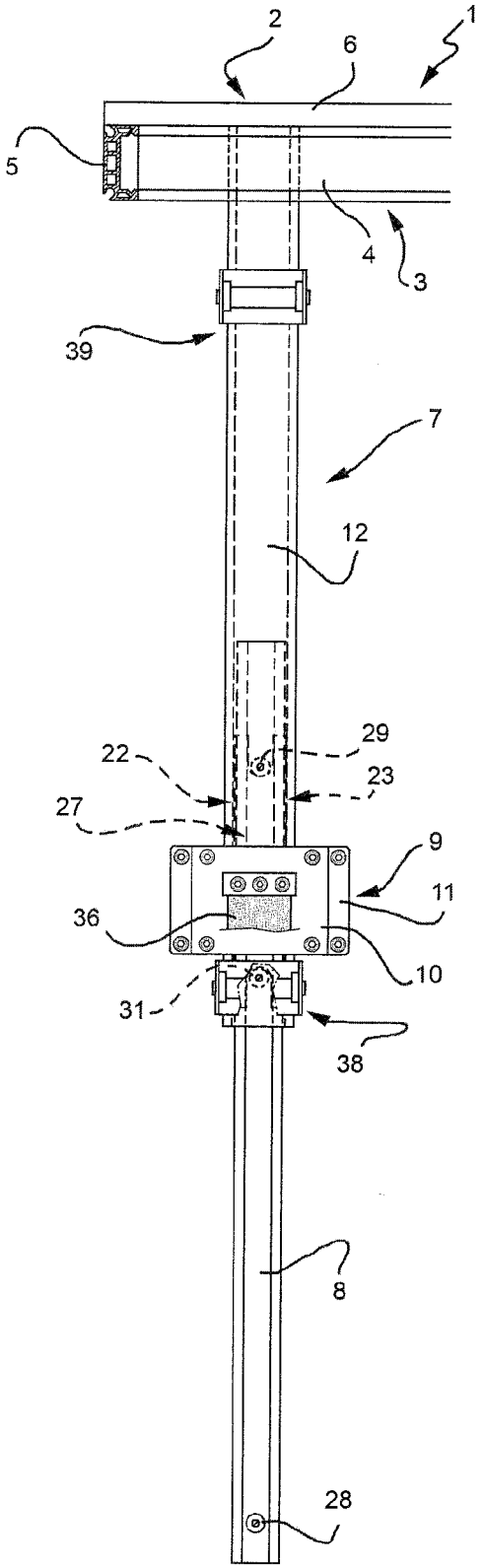
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FIG. 6

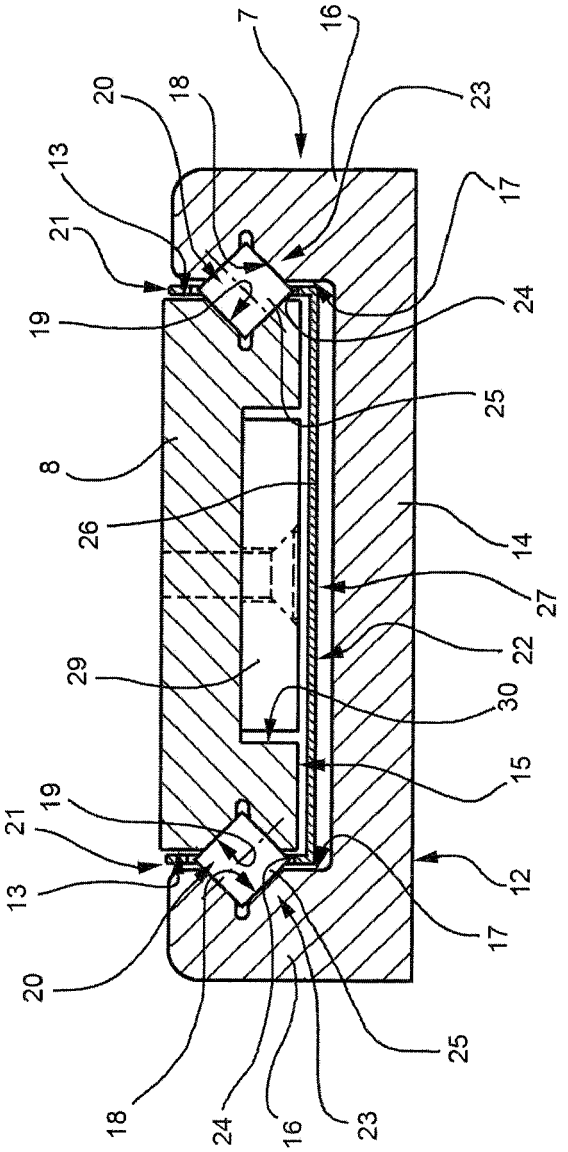
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FIG. 7

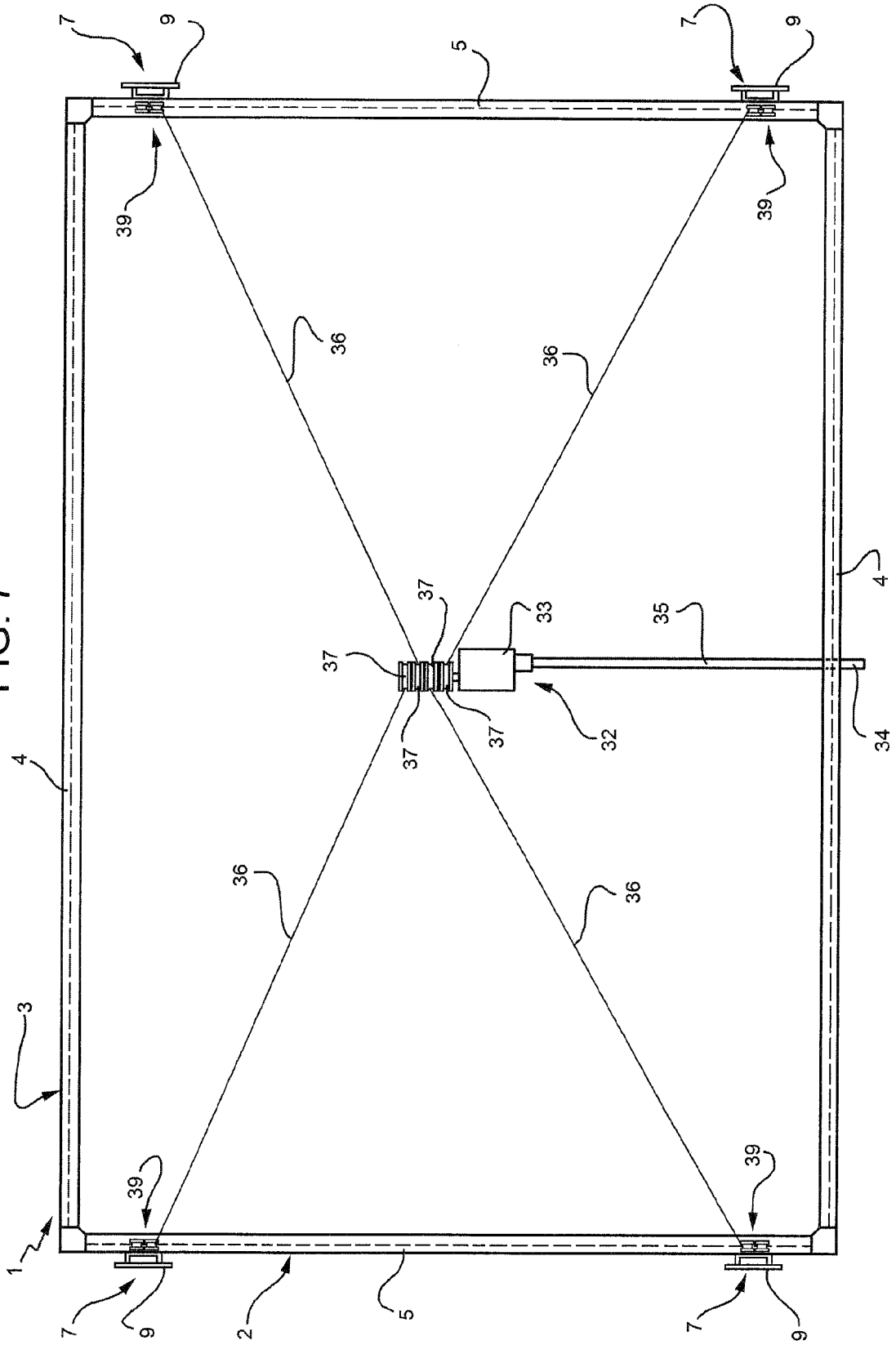


FIG. 8

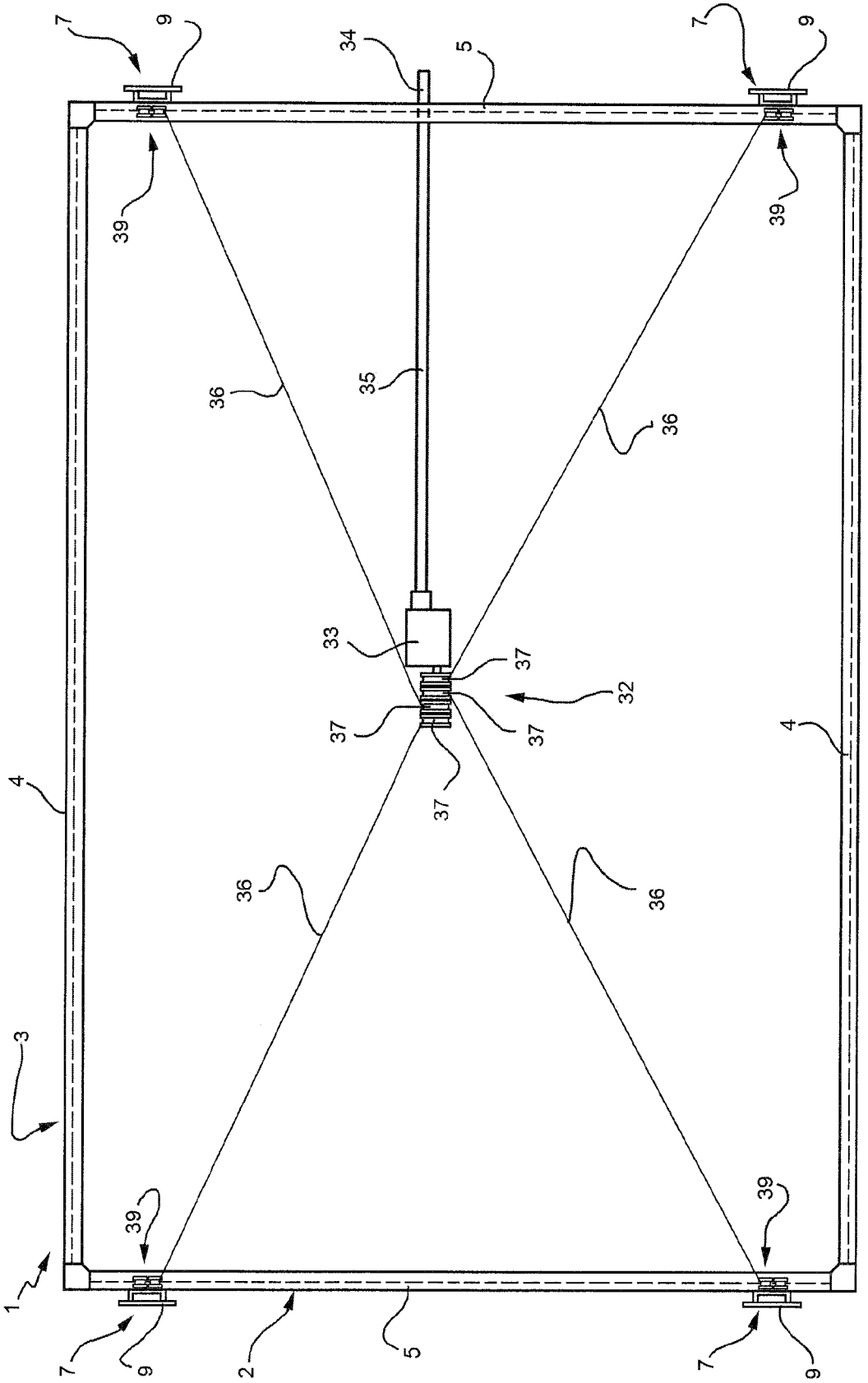
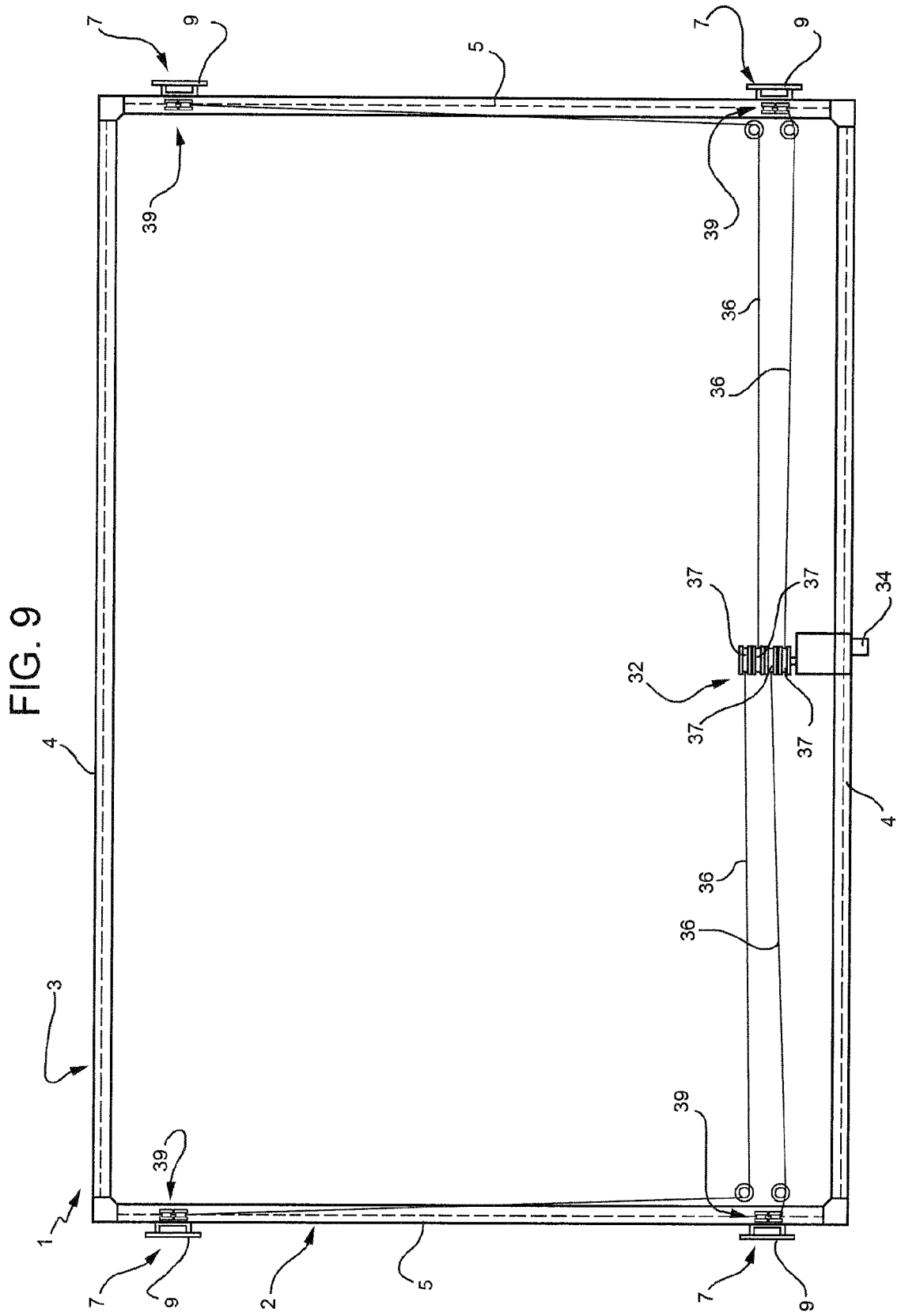


FIG. 9



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EUROPEAN SEARCH REPORT

Application Number
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TECHNICAL FIELDS SEARCHED (IPC)

A47C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 February 2012	MacCormick, Duncan

CATEGORY OF CITED DOCUMENTS

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