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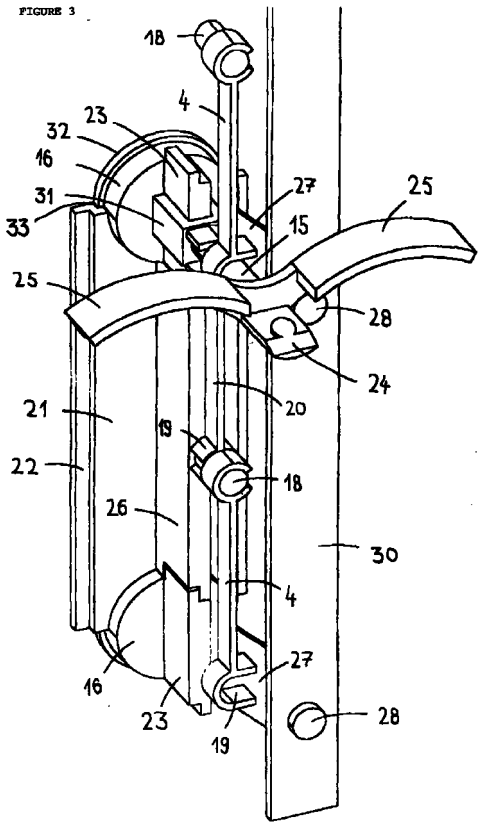
(54) Pull-up louvered shutter

(57) A pull-up louvered shutter comprising a predetermined number of solid slats adapted to be lowered or raised along substantially parallel rails provided on both sides of a window or door opening, said slats slidably attached at their ends to said rails, wherein said slats are aligned in parallel, connected to a collapsible suspending means suspended over said opening, whereby when said suspending means is it is slack state, said slats may be reoriented between a first horizontal overlapping orientation and a second vertical upright orientation by tilting means, and wherein said slats, when oriented in said first horizontal overlapping orientation may be raised and lowered along said rails.



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a window shutter. More particularly it relates to a pull-up louvered shutter with axially-tiltable slats.

BACKGROUND OF THE INVENTION

[0002] Common window roller shutters consist of a plurality of horizontal slats which are flexibly interconnected along their adjoining edges, allowing raising the shutter by winding it up on a horizontal shaft mounted above the window opening.

[0003] When lowered, shutters protect the room from sunlight, providing shade, and when up the room is exposed to direct sunlight. Lowered shutters may also protect the room against unauthorized entry.

[0004] Shutter slats used to be made from wood, and later from plastic, but for some years now it is customary to make shutter slats from aluminum, in order to render the shutter tougher (additional fortification, in the form of metal bars positioned horizontally across the shutter slats, makes the shutter even harder to break and therefore preferable as security means against unauthorized breaking and entry).

[0005] However when rolled up common roller shutters do not provide any protection against unauthorized entry, leaving the window opening wide open.

[0006] The so-called Venetian blind provide a plausible solution, offering coverage of the window opening and yet allowing light to get into the room, however they do not comprise effective blockage against entry. Venetian blinds comprise overlapping horizontal slats which may be raised and drawn together above the window opening by pulling a cord that interconnects the slats together. The whole structure of the Venetian blinds is suspended over the window opening by cords and can be easily be pushed aside. Moreover Venetian blind slats are made of a thin pliable material, which is rather flexible and does not pose a real barrier against forceful entry.

[0007] In US Patent No. 5,566,738 (Yedidya), titled LOUVERED MOVABLE WINDOW SHUTTER, there was disclosed a roller shutter comprising a plurality of solid slats, which are flexibly interconnected along their adjoining edges in a wound up or raised state, and which are automatically separated from each other into separate components in a completely louvered state, thus permitting rotation of each slat about its horizontal axis into louvered alignment of all slats of one shutter. In particular, each slat includes alternately bent edges of hook-shaped cross section which engage with the respective hook-shaped edge of the adjoining upper and lower slat and hold all slats in firm connection while the shutter is in raised or wound-up state, and their axes are at a maximum distance from each other, but which permit rotation of each slat out of engagement of adjoining edges, as soon as the bottom slat is in its lowermost position and the distance between the axes of adjoining slats is thereby reduced to a minimum, by means of stops on each slat defining this distance.

[0008] The slats are guided in parallel, preferably channel-shaped, guide rails mounted on both sides of the window, or door, opening and in the vertically positioned slots of rotors which are horizontally and rotatably mounted in the guide rails at a distance coextensive with the minimum distance between the slats. Each slat is provided at its two ends with sideways protruding flat lugs, each engaging with a slot in the corresponding rotor as soon as the shutter has been lowered into its lowermost position, whereafter simultaneous angular displacement of all rotors and slats effects mutual disengagement of the hook-shaped edges of the slats, and rotation of all slats into louvered position. In this position every slat is firmly held in its respective rotors on both sides by a rim surrounding each rotor and the lug positioned in the rotor slot, preventing its forceful removal.

[0009] A certain drawback in the above mentioned shutter is the fact that if the user desires partial shading of the room, and for that purpose raises partially the shutter, leaving some of the window opening uncovered and some covered, the slats cannot remain in their horizontal alignment, where sunlight can pass through, but rather are positioned in their vertical alignment, blocking any light from coming through between them. In fact, the inventors have learnt that most users prefer to have their shutter allow light to pass through it, even when partially raised, whereas full blockage of light is only required when the shutter is fully lowered.

[0010] Venetian blinds, on the other hand, can be partially raised and still allow light to enter the room through the gaps between the slats.

[0011] In fact, the inventors have learnt that most users prefer to have their shutter allow light to pass through it, even when partially raised, whereas full blockage of light is only required when the shutter is fully lowered.

[0012] It is the purpose of the present invention to provide a pull-up shutter, whose slats may be tilted between two positions: horizontal or vertical.

[0013] It is another purpose of the present invention to provide such shutter whose slats can be raised in a horizontal tilt position.

[0014] Yet another purpose of the present invention is to provide such a shutter which is suitable for the prevention of unauthorized entry, i.e. is firmly attached to the window opening and is made of strong durable material.

[0015] And it is a purpose of the present invention to provide such shutter whose operating mechanism is simple, that is simple to use and that is relatively inexpensive to manufacture.

BRIEF DESCRIPTION OF THE INVENTION

[0016] It is therefore thus provided, in accordance with a preferred embodiment of the present invention, a pull-up louvered shutter comprising a predetermined number of solid slats adapted to be lowered or raised along substantially parallel rails provided on both sides of a window or door opening, said slats slidably attached at their ends to said rails, wherein said slats are aligned in parallel, connected to a collapsible suspending means suspended over said opening, whereby when said suspending means is it is slack state, said slats may be reoriented between a first horizontal overlapping orientation and a second vertical upright orientation by tilting means, and wherein said slats, when oriented in said first horizontal overlapping orientation may be raised and lowered along said rails.

[0017] Furthermore, in accordance with a preferred embodiment of the present invention, said slats are each provided with two shafts, one on each of their ends whose distal ends are slidably mounted over said rails.

[0018] Furthermore, in accordance with a preferred embodiment of the present invention, said tilting means comprises a predetermined number of aligned equidistant rotors along said rail , each provided with a plurality of bars, each bar located across one of said rotors, in parallel to the other bars, said rotors adapted to simultaneously be rotated, so that when the slat shafts are positioned over said bars, the rotation of said rotors causes said slats to tilt.

[0019] Furthermore, in accordance with a preferred embodiment of the present invention, each one of said rotors is provided with a lateral lug which is engaged to a vertical slat that can be lowered or raised, thus simultaneously rotating the rotors.

[0020] Furthermore, in accordance with a preferred embodiment of the present invention, said vertical slat is manually operated.

[0021] Furthermore, in accordance with a preferred embodiment of the present invention, said vertical slat is operated using at least one motor.

[0022] Furthermore, in accordance with a preferred embodiment of the present invention, said motor is located on or near said rail.

[0023] Furthermore, in accordance with a preferred embodiment of the present invention, the louvered shutter further comprises a plurality of bars, each located and aligned between said rotors, so that when said rotors rotate, the bars on the rotors can be brought to be aligned with said plurality of bars, so as to allow said slats to be moved along said bars.

[0024] Furthermore, in accordance with a preferred embodiment of the present invention, said suspending means comprise a chain of a plurality of links, interconnected in a loose connection by joints.

[0025] Furthermore, in accordance with a preferred embodiment of the present invention, said suspending means comprise a chain of a plurality of links, interconnected in a loose connection by joints, each link length being half of the distance between the centers of two adjacent rotors, wherein each joint is alternately defined either by two adjacent links mounted rotatably over one of said shafts or over an adapter which connects between two links, halfway between two adjacent shafts.

[0026] Furthermore, in accordance with a preferred embodiment of the present invention, the louvered shutter further comprises raising and lowering means for raising or lowering said shutter slat along the rail.

[0027] Furthermore, in accordance with a preferred embodiment of the present invention, said raising and lowering means comprise a lever coupled to an end of a strap or cord, suspended from the top of said window or door opening, long enough to reach, when fully slack beneath the shaft of the lowermost slat of said plurality of slats, when said lowermost slat is positioned in its lowermost position at the bottom of the opening.

[0028] Furthermore, in accordance with a preferred embodiment of the present invention, said strap is manually operated.

[0029] Furthermore, in accordance with a preferred embodiment of the present invention, said strap is attached to a wheel coupled to and rotatable by a motor, said motor positioned over said opening.

[0030] Furthermore, in accordance with a preferred embodiment of the present invention, said motor is further provided with transmission box and a switch adapted to allow a person to actuate the lowering or raising of said shutter slats.

[0031] Furthermore, in accordance with a preferred embodiment of the present invention, said slats are made of aluminum.

[0032] Finally, in accordance with a preferred embodiment of the present invention, said slats are made of plastic material.

BRIEF DESCRIPTION OF THE FIGURES

[0033] In order to better understand the present invention, and appreciate its practical applications, the following Figures are provided and referenced hereafter. It should be noted that the Figures are given as examples only and in no way limit the scope of the invention as defined in the appending Claims. Like components are denoted by like reference numerals.

Figure 1 illustrates an elevated view of a part of the louvered shutter operating mechanism with the guide rail inside the guide rail housing, and a slat attachment.

Figure 2 illustrates a front-side view of a part of the louvered shutter operating mechanism inside the guide rail housing, and a slat attachment.

Figure 3 illustrates a front-side view of a part of the guide rail mechanism.

Figure 4 illustrates a back view of a part of the guide rail mechanism.

Figure 5 is a lateral cross-section view of the guide rail housing.

Figure 6 is a partial view of a louvered shutter in accordance with a preferred embodiment of the present invention, with several slats in their vertical upright orientation.

Figure 7 illustrates a partial view of a louvered shutter in accordance with a preferred embodiment of the present invention, with several slats in the horizontal orientation when raised.

Figure 8 illustrates a window with a louvered shutter in accordance with a preferred embodiment of the present invention, installed over it.

DETAILED DESCRIPTION OF THE INVENTION AND FIGURES

[0034] A main aspect of the pull-up louvered shutter of the present invention is the provision of a movable louvered shutter, which can be lowered or raised with its slats in a laterally horizontal louvered orientation, and when lowered to its lowermost position, the shutter slats may be jointly oriented in a laterally vertical upright position, leaving no substantial gap between their adjoining edges, reoriented in the horizontal overlapping orientation, or any intermediary orientation.

[0035] A pull-up louvered shutter in accordance with a preferred embodiment of the present invention basically comprises two substantially parallel guide rails mounted on both sides of a window or door opening, a plurality of slats, aligned in parallel, positioned one over the other between the guide rails, provided with raising and lowering means, for raising or lowering of the slats when the slats are in a laterally horizontal louvered position, and tilting means for simultaneously tilting the slats between two positions, the first position being when the slats are in a laterally horizontal louvered position, and the second position being when the slats are in a laterally vertical upright position. The later position can be assumed only when the shutter is in its lowermost position.

[0036] Reference is now made to Figure 1, illustrating an elevated view of a part of the louvered shutter operating mechanism with the guide rail inside the guide rail housing, and a slat attachment. It is noted that the Figures generally depict only one side of the shutter, for the purpose of brevity, as the other side is basically identical (it being, in fact, a mirror-image of the side depicted in the Figures). A guide rail 1 is mounted on each side of the window or door opening on which the shutter is installed. The guide rail 1 houses an incorporated guiding and tilting mechanism 2 (whose details are explained hereafter). A shutter slat 3, having a wavy surface, in order to resemble two ordinary shutter slats joined together, is coupled at its end to a slat connector 10, which connects the slat 3 to a shaft 15 engaged to bar 23 on rotor 16 in a manner explained hereafter (with reference to Figure 3).

[0037] Reference is now made to Figure 2, illustrating a front-side view of a part of the louvered shutter operating mechanism inside the guide rail housing, and a slat attachment. The guide rail housing 1 is provided with a vertical longitudinal slot 17, so that shaft 15 with the slat connector 10 protrude out of it, whereas the rotor 16 remains inside.

[0038] Figures 3 and 4 illustrate a front-side view and a back-side view of a part of the guide rail mechanism with an attached slat. The construction of the guide rail mechanism is in fact duplicated in a predetermined number of duplicates matching the number of the shutter slats. Slat connector 10 comprises top arcuate support 25 and bottom support 24 having a projection which is supposed to nest within a corresponding recess (not shown in the Figures) on the slat surface to hold it firmly in place. Rotor 16 is provided with a longitudinal bar 23 passing across the rotor, having two projections (one on each side) each in the form of a step, designed to fit into a matching recess on a bar 26 that extends between rotor 16 and the rotor of the next slat (see below). Bar 26 is an integral part of a separator 21, which is a longitudinal flat member, designed to keep the rotors 16 in place, aligned and evenly spaced. There is a plurality of such bars, equidistant from each other along the guide rail. Rotor 16 is provided with rim 32 designed to be fittingly seated inside a matching annular recess 33 on each of the ends of separator 21, so as to allow rotor 16 to rotate freely but prevent lateral displacement of the rotor. Note that as there is a plurality of rotors located along the rail, the bars across the rotors have to be aligned in parallel to each other, and rotate simultaneously, as will be explained hereafter.

[0039] The projection and corresponding recess on bars 23 and 26 are designed to limit the rotary motion of rotor 16 and prevent it from further rotation when the slat it brought to the horizontal orientation (as presented in Figures 2 and 3). Rotor 16 has a lateral lug in the form of a lever 27, having a cylindrical protrusion 28, which is designed to be engaged to a corresponding bore on a vertical slat 30 that runs along the guide rail, substantially parallel to the rotors. When vertical slat 30 is raised it pulls lugs 27 upwards, causing the rotors 16 to rotate and consequently tilt the shutter slats to their interlaced vertical upright position. When vertical slat 30 is lowered, it pulls lugs 27 downwards, causing rotors 16 to rotate in the opposite direction, until bars 23 interlock

with vertical bars 26, bringing the shutter slats to their lateral horizontal position, as shown in Figure 3. The actuation of the tilting mechanism may be done manually, for example by a lever connected to the vertical slat which can be accessible by the person wishing to operate the tilting of the slats, or it can be done by engaging the vertical slat 30 to a motor (or several motors) located along the guide rail housing or near it, and actuated by a switch.

[0040] Shaft 15, bearing on one end the slat connector 10 has on its other end a U-shaped block 31 adapted to be slidably mounted over bar 23.

[0041] In order for the tilting mechanism to operate, U-shaped block 31 bearing shaft 15 and the shutter slat connected to it, should be positioned substantially over the axis of rotation of the rotor 16. To achieve this accurate positioning, rotors 16 need to be aligned, evenly spaced, equidistant from each other, and shaft 15 and the rest of the shutter slats' shafts (not shown in the Figure) need to be similarly equidistant. This is accomplished by a chain of solid links 4, to which all shafts 15 are connected, the chain suspended from the top of the window opening, or from above it.

[0042] Links 4 are interconnected in a loose connection by joints, each link 4 length being half of the distance between the centers of two adjacent rotors. Each link 4 has a U-shaped connector 19 on both ends. Each joint is alternately defined either by two adjacent links mounted rotatably over shaft 15 or over cylindrical adapter 18, which connects between two links 4, halfway between two adjacent shafts 15.

[0043] Note that in order to provide interlaced slats each shutter slat is provided with a flat rim 34 on one lateral edge, and an elevated flat rim 35 on the other edge, which are designed to fit and overlap when the shutter slats are tilted to their vertical upright position. Preferably the lower rim (when the slat is in the vertical orientation) should be placed on top of the rim of the slat beneath it, so that when it rains water will run over the slats and not penetrate through the edges into the room.

[0044] In their lowered position, the shutter slats are suspended from the top by the chain of links, in its slack state, connected to the shafts 15 as described herein. Each shaft 15 is positioned over a rotor 16, with the u-shaped block 31 positioned substantially over the center of rotation of the rotor 16. In this state the slats may be rotated to the louvered position or to the vertical upright orientation, or to any intermediary orientation.

[0045] When it is desired to raise the slats, they first have to be brought to the horizontal orientation, so that bars 23 and bars 26 are aligned and u-shaped block 31 of shaft 15 can slide over the bars freely.

[0046] Then the lowermost slat is raised, causing the links between this slat and the slat over it to collapse and fold sideways, and allowing the lowermost slat to be drawn nearer to the slat over it. When the lowermost slat comes in contact with the slat over it, it pushes the second slat upwards causing it too to be raised. Consequently if the raising operation is conducted for enough time, all slats are raised.

[0047] In order to facilitate the lowering of the raised shutter slats, the lowermost slat needs to be lowered. As it is lowered the remaining slats are lowered too and when the chain of links is finally freely suspended, the slats realign over their corresponding rotors, ready to be tilted as desired.

[0048] Figure 5 is a lateral cross-section view of the guide rail housing. The lowermost slat can be raised by a lever 36, which is coupled to the distal end of a strap or cord 37, suspended from the top of the window, optionally passing along the guide rail housing, long enough to reach when fully slack beneath shaft 15 of the lowermost slat, when it is positioned in its lowermost position at the bottom of the window opening. Strap 37 can be manually pulled up, or can be attached to a wheel 40 that may be rotated by a motor 41, positioned over the window (see Figure 8 illustrating a window with a louvered shutter in accordance with a preferred embodiment of the present invention, installed over it), pulling up or lowering the strap as desired (depending on the direction of rotation of the wheel 40 which can be governed by a transmission box 42. operated by the user (by a switch electrically connected to the transmission box 42). Note that when the strap is rolled down the weight of the slats will cause them to be lowered until the chain of links reaches its stack state, with the slats positioned each against a rotor. The axle of motor 41 may run over the entire window, and operate the raising and lowering mechanism on the other side of the window too, operating the raising and towering mechanisms on both sides of the window simultaneously.

[0049] It should be again emphasized that the Figures depict only one side of the window, showing the raising and towering mechanism and the tilting mechanism on one side of the window only. In principle the shutter of

> the present invention can be operated by a raising and lowering mechanism and tilting mechanism

[0050] Note that guide rail housing 1, may also house a motor (or a plurality of motors aimed at operating the tilting mechanism, shifting vertical bar 30 between its positions.

[0051] Optionally a gathering box 44 may be installed over the window, so that the raised slats may be stored inside it when fully raised, totally removed from the window opening.

[0052] Figure 6 is a partial view of a louvered shutter in accordance with a preferred embodiment of the present invention, with several slats in their vertical upright orientation.

[0053] Figure 7 illustrates a partial view of a louvered shutter in accordance with a preferred embodiment of the present invention, with several slats in the horizontal orientation when raised.

[0054] The slats can be made of plastic material or other solid material, but are preferably made from aluminum or other solid material possessing enough strength to yield it resistant to withstand attempts of forceful breaking and entry.

[0055] It should be clear that the description of the embodiments and attached Figures set forth in this specification serves only for a better understanding of the invention, without limiting its scope as covered by the following Claims.

[0056] It should also be clear that a person skilled in the art, after reading the present specification could make adjustments or amendments to the attached Figures and above described embodiments that would still be covered by the following Claims.

Claims

1. A pull-up louvered shutter comprising a predetermined number of solid slats adapted to be lowered or raised along substantially parallel rails provided on both sides of a window or door opening, said slats slidably attached at their ends to said rails, wherein said slats are aligned in parallel, connected to a collapsible suspending means suspended over said opening, whereby when said suspending means is it is slack state, said slats may be reoriented between a first horizontal overlapping orientation and a second vertical upright orientation by tilting means, and wherein said slats, when oriented in said first horizontal overlapping orientation may be raised and lowered along said rails.

2. The louvered shutter as claimed in Claim 1, wherein said slats are each provided with two shafts, one on each of their ends whose distal ends are slidably mounted over said rails.

3. The louvered shutter as claimed in Claim 1 or 2, wherein said tilting means comprises a predetermined number of aligned equidistant rotors along said rail , each provided with a plurality of bars, each bar located across one of said rotors, in parallel to the other bars, said rotors adapted to simultaneously be rotated, so that when the slat shafts are positioned over said bars, the rotation of said rotors causes said slats to tilt.

4. The louvered shutter as claimed in Claim 3, wherein each one of said rotors is provided with a lateral lug which is engaged to a vertical slat that can be lowered or raised, thus simultaneously rotating the rotors.

5. The louvered shutter as claimed in Claim 4, wherein said vertical slat is manually operated.

6. The louvered shutter as claimed in Claim 4, wherein said vertical slat is operated using at least one motor.

7. The louvered shutter as claimed in Claim 6, wherein said motor is located on or near said rail.

8. The louvered shutter as claimed in Claim 3, further comprising a plurality of bars, each located and aligned between said rotors, so that when said rotors rotate, the bars on the rotors can be brought to be aligned with said plurality of bars, so as to allow said slats to be moved along said bars.

9. The louvered shutter as claimed in claim 1 wherein said suspending means comprise a chain of a plurality of links, interconnected in a loose connection by joints.

10. The louvered shutter as claimed in Claim 8 wherein said suspending means comprise a chain of a plurality of links, interconnected in a loose connection by joints, each link length being half of the distance between the centers of two adjacent rotors, wherein each joint is alternately defined either by two adjacent links mounted rotatably over one of said shafts or over an adapter which connects between two links, halfway between two adjacent shafts.

11. The louvered shutter as claimed in Claim 1 further comprising raising and lowering means for raising or lowering said shutter slat along the rail.

12. The louvered shutter as claimed in Claim 11, wherein said raising and lowering means comprise a lever coupled to an end of a strap or cord, suspended from the top of said window or door opening, long enough to reach, when fully slack beneath the shaft of the lowermost slat of said plurality of slats, when said lowermost slat is positioned in its lowermost position at the bottom of the opening.

13. The louvered shutter as claimed in Claim 12, wherein said strap is manually operated.

14. The louvered shutter as claimed in Claim 12, wherein said strap is attached to a wheel coupled to and rotatable by a motor, said motor positioned over said opening.

15. The louvered shutter as claimed in Claim 14, wherein said motor is further provided with transmission box and a switch adapted to allow a person to actuate the lowering or raising of said shutter slats.

16. The louvered shutter as claimed in Claim 1, wherein said slats are made of aluminum.

17. The louvered shutter as claimed in Claim 1, wherein said slats are made of plastic material.

FIGURE 1

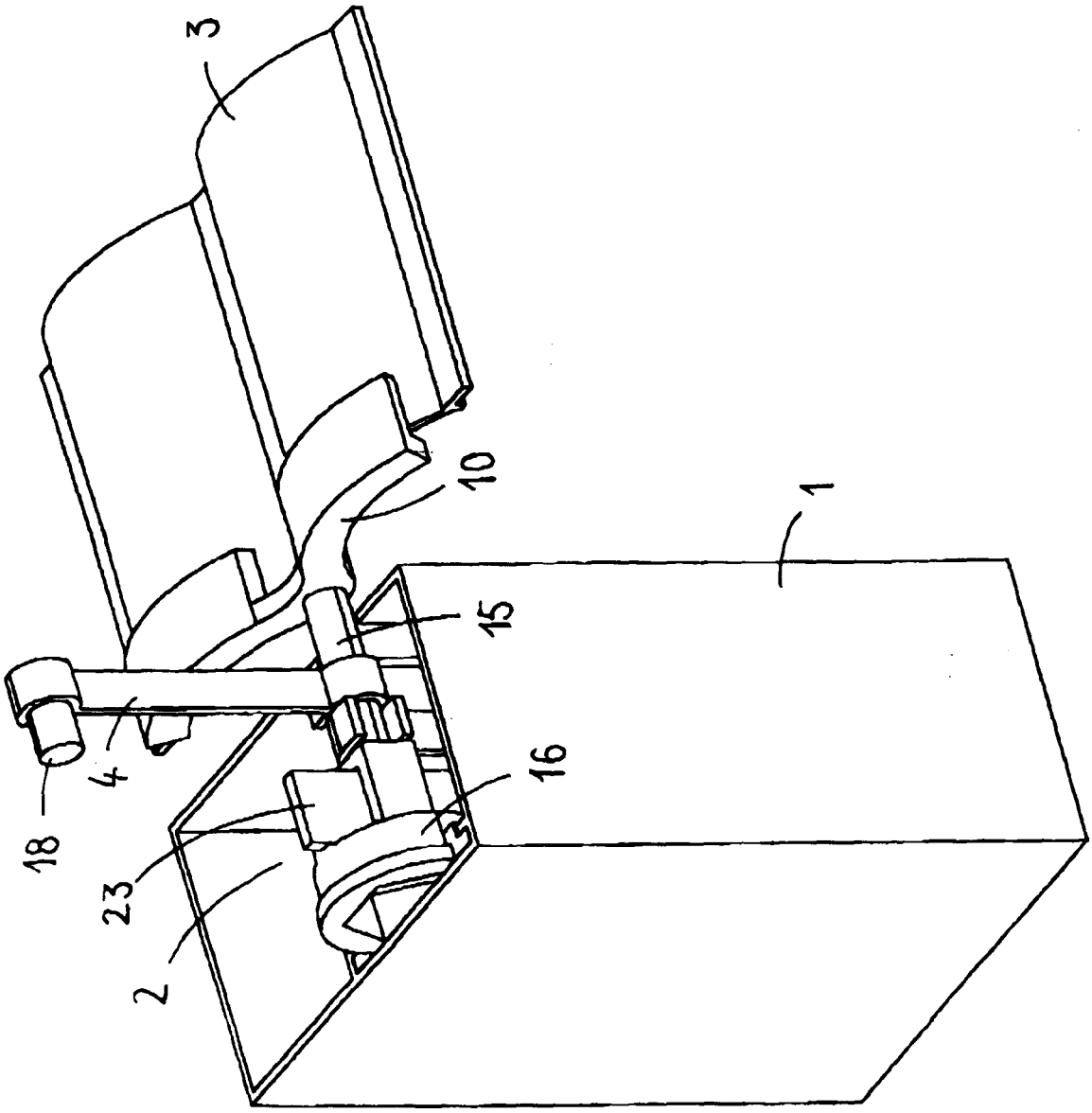

FIGURE 2

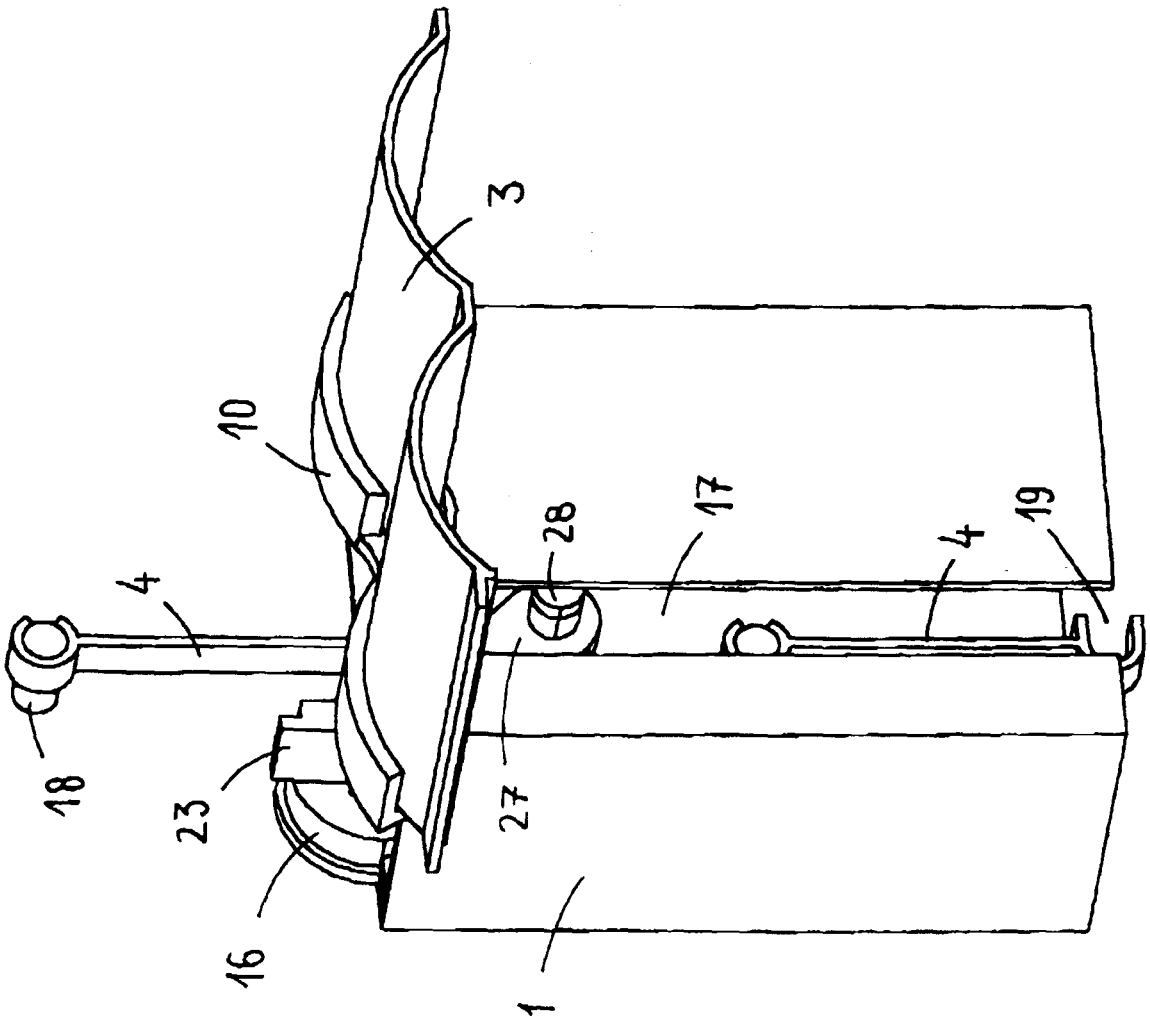

FIGURE 3

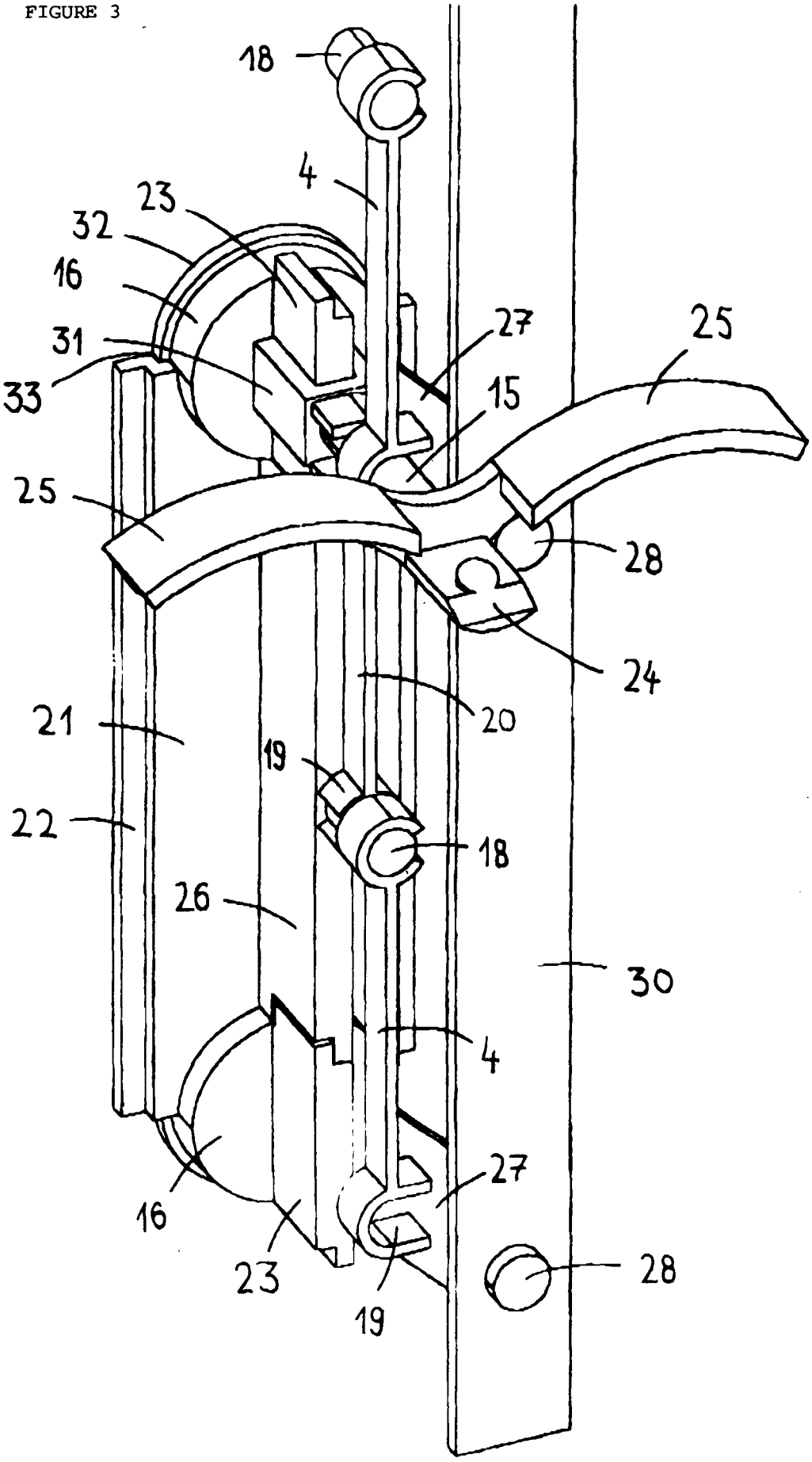
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FIGURE 4

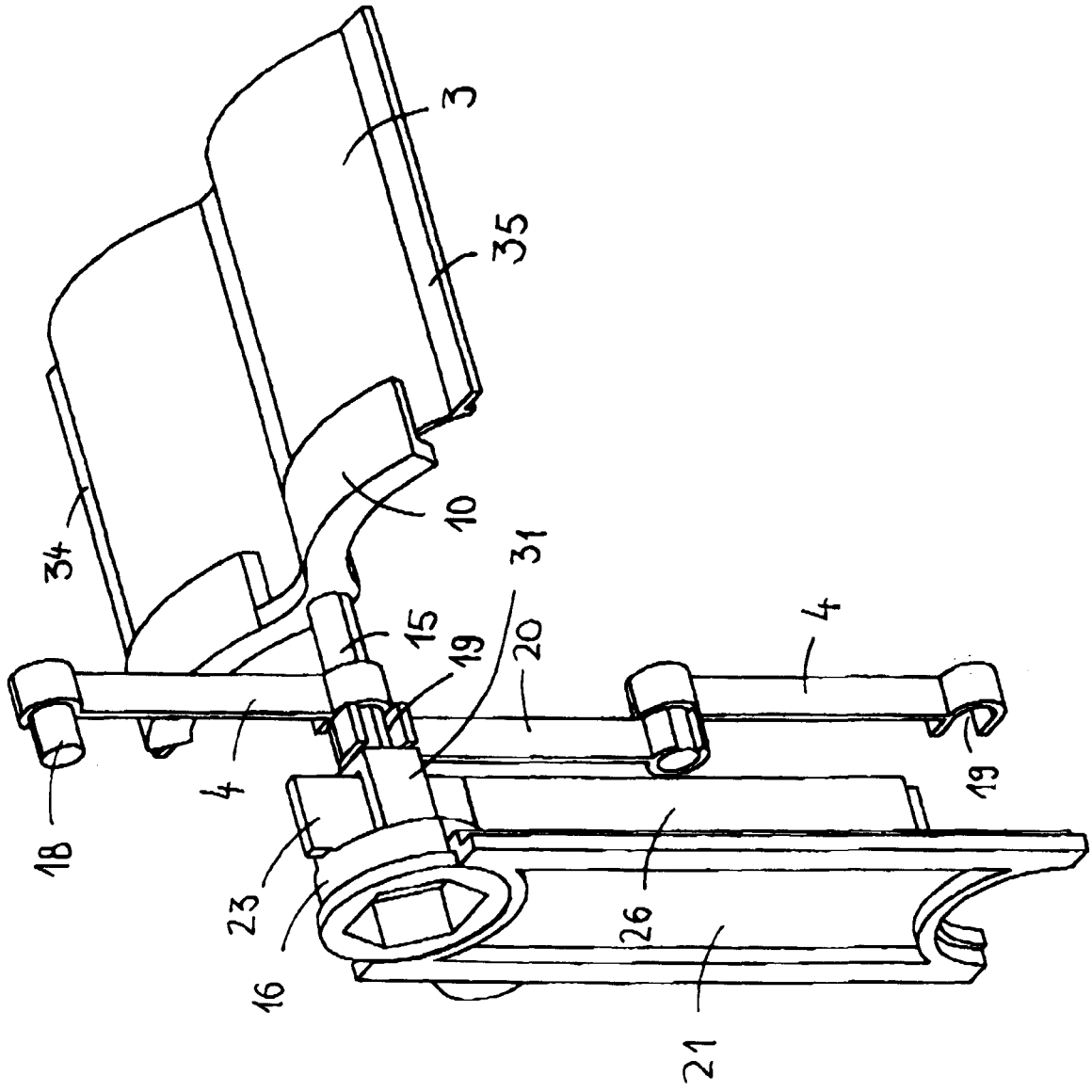

FIGURE 5

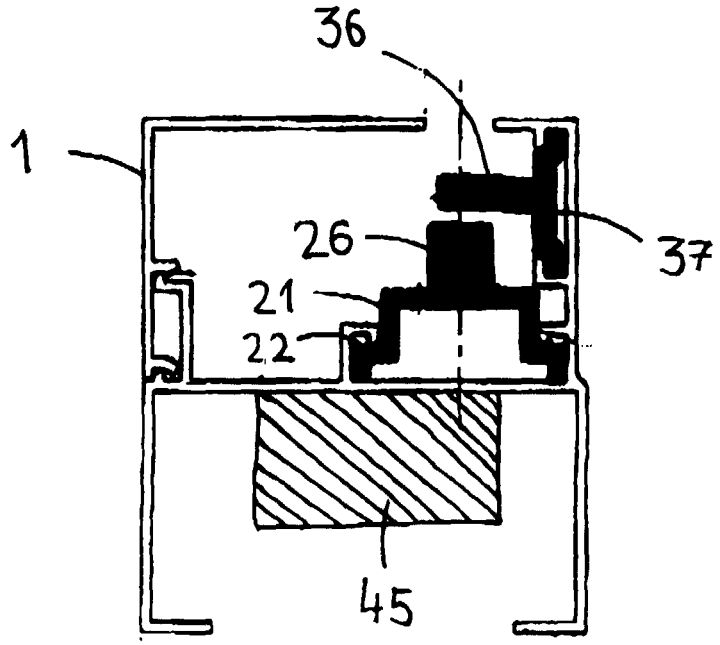

FIGURE 6

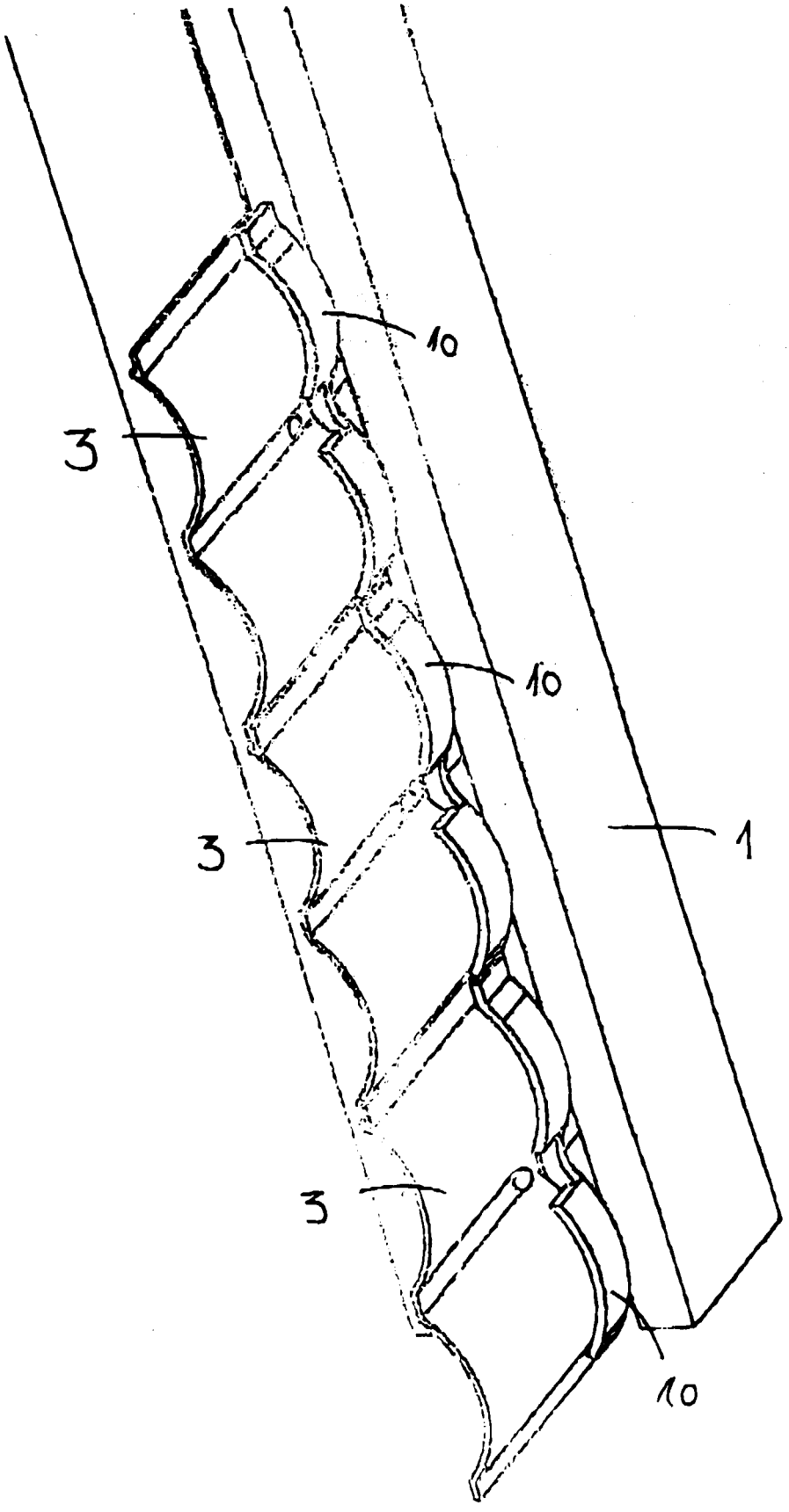

FIGURE 7

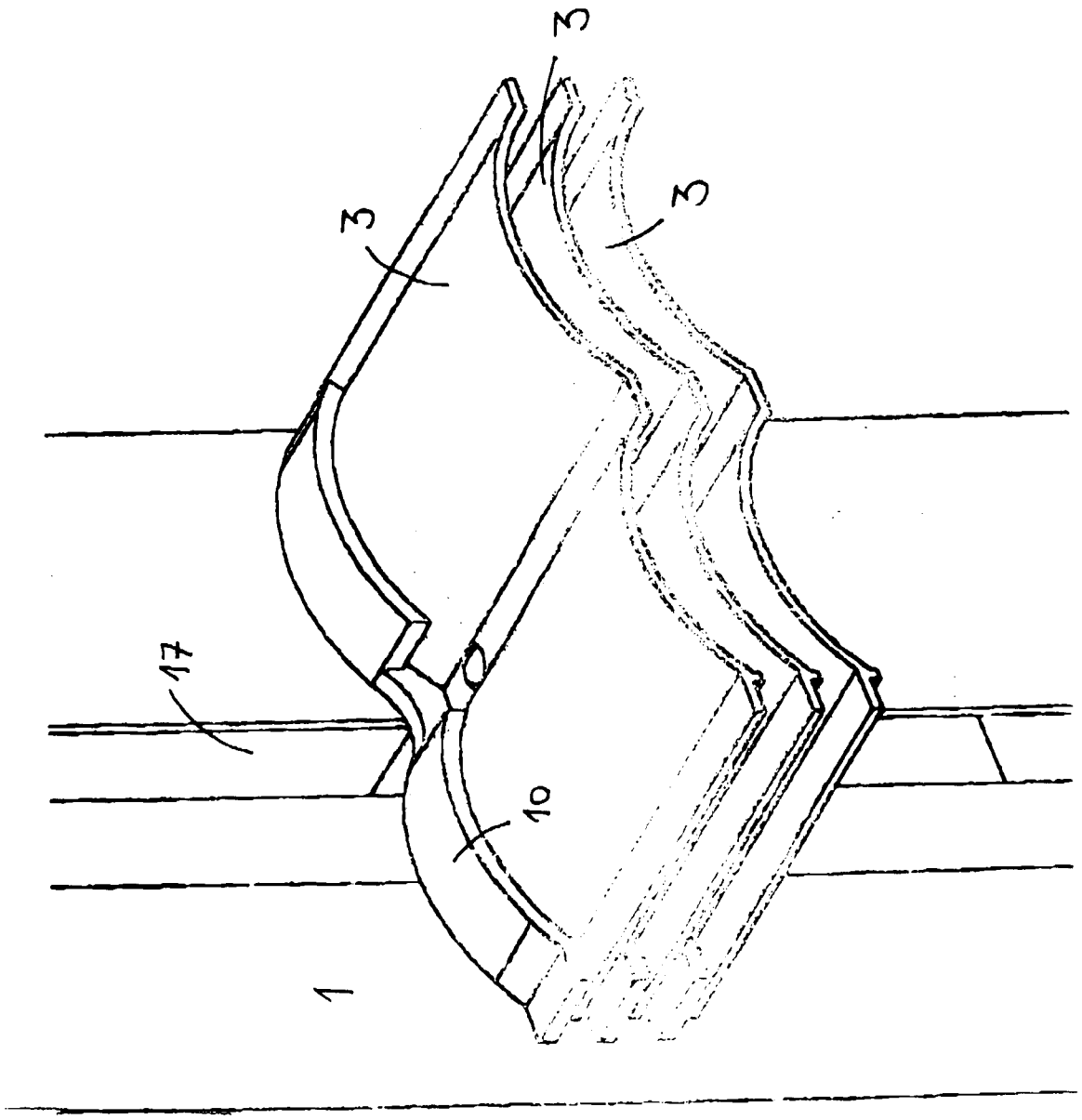

FIGURE 8