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(54) **IMPROVED CLOSURE SYSTEM**

VERSCHLUSSSYSTEM

SYSTEME DE FERMETURE AMELIORE

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FR-A- 1 303 251
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EP 0 991 844 B1

Description

FIELD OF THE INVENTION

[0001] This invention relates to doors, windows, and the like, of a kind comprising a number of elongated closure panels moveably interconnected, and more particularly to a stowable closure system wherein the plurality of closure panels is stackable in a stowed position.

BACKGROUND OF THE INVENTION

[0002] Closure systems having a plurality of closure panels are almost universally used as closures in such locations as home garages, as well as in commercial garages, warehouses, and other installations where a closure is desired which stores out of the way. The conventional closure system has a carrier track on either side of the opening, and head room must be provided in the interior of the opening to accommodate the door in the raised position. Where a conventional overhead door and carrier track cannot be used, folding or roll-up doors have been utilized. The prior art folding and roll-up doors suffer from a number of disadvantages, however, primarily being the complexity of the mechanism necessary to permit operation. Thus, a need presently exists for a closure system that is economical and simple to produce, as well as effective in accomplishing the overall function of the door which is to completely close the opening in a deployed position and completely open the opening in a stowed position.

[0003] FR-A-874309 discloses a closure system as described in the pre-characterising portion of claim 1.

[0004] The present invention provides a closure as defined in claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The invention in its advantages may be understood in more detail by reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a closure system constructed in accordance with the present invention as installed in a building opening;
Figure 2A is partially broken-away side view taken along lines 2A-2A on Figure 1;
Figure 2B is a view similar to Figure 2A, with the closure system in the stowed position;
Figure 2C is a sectional view taken along lines 2C - 2C of Figure 2A; and Figures 3A - 3E are enlarged views showing the sequence of the operation of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0006] Referring initially to Figure 1, a closure system 10 is installed in a building opening having sides 12 and 14. A perpendicular side wall 16 extends from side 12. Closure system 10 includes a plurality of closure panels 17 adapted to be moved between deployed and stowed positions along a pair of carrier tracks 20 on opposite sides 12, 14 of the building opening. Figure 1 illustrates the closure system in the deployed position. In the deployed position, closure panels 17 span across the opening. At the top of the building opening, is provided an enclosure 22 in which the closure panels 17 are stowed when in the stowed position. As can be seen, closure 22 is relatively compact compared to the overhead space normally required for a conventional overhead door.

[0007] Figure 1 illustrates closure system 10 in an environment where it is vertically oriented in the vertical opening. It will be understood that the closure system is not limited to this environment, and that the system can be oriented horizontally, that is where the closure panels move from side-to-side with carrier tracks being located at the top and bottom of the building opening. It will be understood from this description, and the claims that follow, that terms such as "top", "bottom", and "side" refer only to the preferred embodiment, and that similar structure for a system in a horizontal configuration is the equivalent. In addition, closure panels 17 may be solid for weather, sound and security proofing, such as for a garage door, or equivalently may be open grids for visibility and security, such as for a gate or store front.

[0008] Reference is now made to Figures 2A - 3E, where like numerals indicate like and corresponding elements with Figure 1. Closure system 10 is shown in the Figures 2A and 3A in the deployed position. Each closure panel 17 has an actuator 18 on each end. In the deployed position, actuators 18 have abutting top and bottom edges 30 and 32, which may be seen more clearly in the enlarged views 3A - 3E. For clarity purposes, reference numerals 30 and 32 appear only once on Figure 2A. Reference numerals 30 and 32 are applied in all appropriate instances in Figure 2B.

[0009] The actuators 18 in the closure panel deployed position also have parallel side surfaces 34, such that closure panels 17 span across the building opening. For similar reasons as above, reference numeral 34 only appears once in Figure 2B, but in all appropriate circumstances in Figure 2A.

[0010] In the closure panel stowed position, as best shown in Figure 3E, the actuators 18 have abutting inner and outer side surfaces 34 and parallel top edges 30 and parallel bottom edges 32. Top and bottom edges 30, 32 maintain their top and bottom orientation as shown in Figure 3E. Thus, the closure system of the present invention is not an "accordion" type of folding door, where top and bottom positions reverse their orientation on every other closure panel. The present invention is a stacking type of closure system as opposed to a folding, "accordion" type of closure system. As shown in Figure 3E, the bottommost actuator 18' need

not be entirely moved to a position where the side surfaces 34 are abutting. The object of the invention is accomplished if substantially all of the actuators have abutting-inner-and outer side surface and parallel top and bottom edges, when in the stowed position.

[0011] Non-rigid security links 36 span in between actuators 18. Security links 36 are best seen in Figures 3A - 3E. The security links have lengths and attachment points 37 on the actuators adapted and arranged such that the security links 36 are taut when the closure panels 17 are in the deployed and stowed position but loose as the closure panels 17 transition between the deployed and stowed positions. As shown in Figure 2A, all security links are taut. This provides a closure for the building opening that has no gaps and is suitably secure. Similarly, in Figure 2B security links 36 are taut, with the possible exception of the bottommost security link 36' which optionally may be loose to permit faster deployment from the stowed position. Figure 3E also illustrates the taut position of security links 36 in the stowed position. Figures 3B, 3C and Figure 3D illustrate the transition of the closure panels 17 between the deployed and stowed position as well as the looseness of the security links 36 as the closure panels 17 undergo such transition. The looseness of the security links 36 during transition of the closure panels effectively decouples the closure panels from each other and permits the carrier rollers 38 to smoothly travel in carrier track 20. As best shown in Figure 3A - 3E, carrier track 20 splits into an upper carrier track 40 and a lower carrier track 42 within enclosure 22. Carrier track 20 below enclosure 22 is approximately twice as wide as the carrier rollers 38, as best shown in Figure 2C, but close tolerance fitted to enhance weather tightness.

[0012] As best shown in Figures 3A - 3E, the vertical orientations of the security link attachment points 37 are reversed as the closure panels 17 transition between the deployed and stowed positions. The top and bottom edges 30 and 32 are slightly angled from horizontal when the closure members are in the deployed position, while the side surfaces 34 are slightly angled from vertical when the closure members are in the stowed position. Carrier rollers 38 on actuators 18 are adapted and arranged to engage the carrier tracks 20 such that the closure members tilt from vertical (Figure 2A) to a slightly tilted orientation (Figures 3A - 3E) as the closure panels 17 transition between the deployed and stowed positions. The feature of tilting permits smooth separation of the closure members 17 as they transition from deployed and stowed positions, and as shown in Figure 3A for example, permits the disengagement of a weather stripping lip and accompanying groove in the top and bottom edges of the closure members 17.

[0013] As best shown in Figure 3A, the tilting of the closure panels 17 during transition, in the preferred embodiment, is enabled by a dimension "x" between the initial points of curvature of the upper and lower carrier tracks 40, 42. Dimension "x" is smaller than a dimension "y" defined by the vertical spacing between carrier rollers 38 on the actuators 18.

[0014] Lift cable 44 and counterbalance cable 46 are both connected to each of the bottommost actuators 18'. Cables 44, 46 pass over idler pulleys 48 at the upper forward corners of enclosure 22. Lift cable 44 then passes over idler pulley 50 into a motorized winder 52. Counterbalance cable 46 passes directly into a spring-loaded winder 54, which is connected to a counterbalance spring (not shown) The counterbalance spring in the preferred embodiment provides a preload sufficient to carry the weight of the door.

[0015] In operation, when opening the system the bottommost panel 17 is lifted by cables 44, 46. Cable 46 is connected to the counterbalance spring which is designed to keep a programmed weight on the bottom edge at all times (approx. 20-25 lbs.). The lift cable 44 is attached to the motorized winder 54, a power lifting device. The double cable arrangement gives a fail safe design.

[0016] As the closure system is raised, the top carrier roller 38 on each actuator 18 contacts the arc of the upper carrier track, which causes the panel to tilt. This causes the joint between top and bottom edges 30,32 to open up, scissor- like, creating an angle between the edges which, combined with the slight diagonal cut of the joint, allows the panel to be pushed into the storage area of enclosure 22. The tipping of the panel also swings the lower roller into position to catch the lower carrier track, and as the panel is pushed in, the next lower panel goes past and repeats the procedure until all panels are properly stored.

[0017] As the closure system is lowered, the bottommost, first panel out of storage is not in the upper and lower carrier tracks but is suspended on the cables in the up position. As the lift cable 44 is reversed, the preprogrammed weight permitted by the counterbalance spring causes the panel to lower by gravity with the speed governed by feed of the lift cable. if the panel strikes any obstruction causing the lift cable to slacken, an automatic reverser (not shown) will retrieve the panels. Should the reverser malfunction, the maximum weight to rest on the obstruction is the 20-25 lbs. preprogrammed into the counterbalance string. If no obstruction occurs each panel will pull out the following panel by use of the security links and guided into proper position by the lower side of carrier track.

[0018] With all of the system panels enclosed in a storage enclosure 22, the use of dual cables 44,46, and the avoidance of a traditional closer pushing the door system down, this is the safest closure system available. If the counterbalance spring breaks, it is contained within the enclosure 22, and the lift cable 44 will safely lower the panels. On traditional systems, if a spring breaks, the broken piece will many times ricochet around the room like a bullet.

[0019] Whereas, the present invention has been described with the respect to a specific embodiment there-

of, it will be understood that various changes and modifications will be suggested to one skilled in the art, and it is intended to encompass such changes and modifications as fall within the scope of the appended claims.

Claims

1. A closure system, comprising:

a plurality of closure panels (17) adapted to be moved between deployed and stowed positions along a pair of carrier tracks (20, 40, 42) on opposite sides of a building opening, each closure panel (17) having two opposite ends and an actuator (18) on each end;
each actuator (18) having a first edge (30) and a second edge (32) between which extend parallel surfaces (34);
the actuators (18) in the closure panel (17) deployed position having abutting first and second edges (30, 32) such that the closure panels (17) space across the building opening;
the actuators (18) in the closure panel (17) stowed position having abutting inner and outer surfaces (34) and parallel first edges (30) and parallel second edges (32) with the first and second edges (30, 32) of an actuator maintaining their direction of relative orientation; and
characterized by
non-rigid security links (36) spanning between adjacent actuators (18), the security links having lengths and attachment points (37) on the actuators (18) adapted and arranged such that the security links (36) are taut when the closure panels (17) are in the deployed and stowed positions but loose as the closure panels (18) transit between the deployed and stowed positions.

2. The closure system of claim 1 wherein the first edges are top edges (30), the second edges are bottom edges (32), the parallel surfaces are parallel side surfaces (34) and the actuators (18) in the closure panel (17) deployed position having abutting top and bottom edges (30, 32) and parallel side surfaces (34), such that the closure panels (17) space across the building opening;

the actuators (18) in the closure panel (17) stowed position having abutting inner and outer side surfaces (34) and parallel top edges (30) and parallel bottom edges (32), with top and bottom edges (30, 32) maintaining their top and bottom orientation.

3. The closure system of claim 1 wherein the first edges are left (or right) side edges, the second edges are right (or left) side edges, the parallel surfaces are parallel side surfaces and the actuators (18) in the closure panel (17) deployed position having abutting left (or right) and right (or left) edges and parallel side surfaces (34), such that the closure panels (17) space across the building opening;

the actuators (18) in the closure panel (17) stowed position having abutting inner and outer side surfaces (34) and parallel left (or right) edges (30) and parallel right (or left) edges (32), with left (or right) and right (or left) edges (30,32) maintaining their left (or right) and right (or left) orientation.

4. The closure system of any preceding claim with relative vertical orientations of the attachment points (37) of adjacent closure panels (17) being reversed as the closure panels (17) transition between the deployed and stowed positions.

5. The closure system of claim 2 with the top and bottom edges (30, 32) being slightly angled from horizontal when the closure members (17) are in the deployed position.

6. The closure system of claim 2 with the side surfaces (34) being slightly angled from vertical when the closure members (17) are in the stowed position.

7. The closure system of claim 2 with carrier rollers (38) on ends of the closure members (17) being adapted and arranged to engage the carrier tracks (20, 40, 42) such that the closure members (17) tilt from vertical to a slightly tilted orientation as the closure panels (17) transition between the deployed and stowed positions.

8. The closure system of any preceding claim with the distance (x) between transition points on the carrier tracks (20, 40, 42) being smaller than the spacing (y) between the carrier rollers (38).

Patentansprüche

1. Verschlusssystem, umfassend:

eine Mehrzahl von Verschlussplatten (17), die ausgeführt sind, um entlang einem Paar Trägerschienen (20, 40, 42) auf entgegengesetzten Seiten einer Gebäudeöffnung zwischen einer ausgezogenen- und einer eingezogenen Position bewegt zu werden, wobei jede Verschlussplatte (17) zwei einander entgegengesetzte Enden und an jedem Ende einen Steller (18) hat,

wobei jeder Steller (18) einen ersten Rand (30) und einen zweiten Rand (32) hat, zwischen denen sich parallele Flächen (34) erstrecken,

wobei die Steller (18) in der ausgezogenen Verschlussplatten-(17)-position aneinander stoßende erste und zweite Ränder (30, 32) haben, sodass die Verschlussplatten (17) über die Gebäudeöffnung ausgebreitet sind,

wobei die Steller (18) in der eingezogenen Verschlussplatten-(17)-position aneinander stoßende innere und äußere Flächen (34) und zu den ersten und zweiten Rändern (30, 32) eines ihre Richtung relativer Ausrichtung aufrecht erhaltenden Stellers parallele erste Ränder (30) und parallele zweite Ränder (32) haben; und **dadurch gekennzeichnet, dass** sich nichtstarre Sicherheitszwischenglieder (36) zwischen aneinander grenzenden Stellern (18) erstrecken, wobei die Sicherheitszwischenglieder Längen und Anbringungspunkte (37) an den Stellern (18) haben, die dergestalt ausgeführt und angeordnet sind, das die Sicherheitszwischenglieder (36) gespannt sind, wenn die Verschlussplatten (17) in der ausgezogenen Position und in der eingezogenen Position sind, aber beim Übergang der Verschlussplatten (18) zwischen der ausgezogenen und der eingezogenen Position lose sind.

2. Verschlusssystem nach Anspruch 1, bei dem die ersten Ränder obere Ränder (30) sind, die zweiten Ränder untere Ränder (32) sind, die parallelen Flächen parallele Seitenflächen (34) sind und die Steller (18) in der ausgezogenen Verschlussplatten-(17)-position aneinander stoßende obere und untere Ränder (30, 32) und parallele Seitenflächen (34) haben, sodass die Verschlussplatten (17) über die Gebäudeöffnung ausgebreitet sind,

wobei die Steller (18) in der eingezogenen Verschlussplatten-(17)-position aneinander stoßende innere und äußere Seitenflächen (34) und parallele obere Ränder (30) und parallele untere Ränder (32) haben, wobei obere und untere Ränder (30, 32) ihre obere und untere Ausrichtung beibehalten.

3. Verschlusssystem nach Anspruch 1, bei der die ersten Ränder linke (oder rechte) Seitenränder sind, die zweiten Ränder rechte (oder linke) Seitenränder sind, die parallelen Flächen parallele Seitenflächen sind und die Steller (18) in der ausgezogenen Verschlussplatten-(17)-position aneinander stoßende linke (oder rechte) und rechte (oder linke) Ränder und parallele Seitenflächen (34) haben, sodass die Verschlussplatten (17) über die Gebäudeöffnung ausgebreitet sind,

wobei die Steller (18) in der eingezogenen Verschlussplatten-(17)-position aneinander stoßende innere und äußere Seitenflächen (34) und parallele linke (oder rechte) Ränder (30) und parallele rechte (oder linke) Ränder (32) haben, wobei linke (oder rechte) und rechte (oder linke) Ränder (30, 32) ihre Links- (oder Rechts-) und Rechts- (oder Links-) -ausrichtung beibehalten.

4. Verschlusssystem nach einem der vorangehenden Ansprüche, wobei relative Vertikalausrichtungen der Anbringungspunkte (37) von aneinander grenzenden Verschlussplatten (17) beim Übergang der Verschlussplatten (17) zwischen der ausgezogenen und der eingezogenen Position umgekehrt werden.

5. Verschlusssystem nach Anspruch 2, wobei sich die oberen und unteren Ränder (30, 32) in einem leichten Winkel zur Horizontalen befinden, wenn sich die Verschlusselemente (17) in der ausgezogenen Position befinden.

6. Verschlusssystem nach Anspruch 2, wobei sich die Seitenflächen (34) in einem leichten Winkel zur Vertikalen befinden, wenn sich die Verschlusselemente (17) in der eingezogenen Position befinden.

7. Verschlusssystem nach Anspruch 2, wobei die Trägerrollen (38) an Enden der Verschlusselemente (17) zum Eingriff in den Trägerschienen (20, 40, 42) ausgeführt und angeordnet sind, so dass die Verschlusselemente (17) beim Übergang der Verschlussplatten (17) zwischen der ausgezogenen und der eingezogenen Position aus der Vertikalen auf eine leicht geneigte Ausrichtung geneigt werden.

8. Verschlusssystem nach einem der vorangehenden Ansprüche, wobei der Abstand (x) zwischen Übergangspunkten an den Trägerschienen (20, 40, 42) kleiner ist als der Zwischenraum (y) zwischen den Trägerrollen (38).

Revendications

1. Système de fermeture, comprenant :

une pluralité de panneaux de fermeture (17) adaptés pour être déplacés entre des positions déployée et repliée le long d'une paire de rails porteurs (20, 40, 42) sur des côtés opposés d'un ouverture de bâtiment, chaque panneau de fermeture (17) ayant deux extrémités opposées et un actionneur (18) sur chaque extrémité :

chaque actionneur (18) ayant un premier bord (30) et un deuxième bord (32) entre lesquels s'étendent des surfaces parallèles (34) ;
les actionneurs (18) dans la position déployée des panneaux de fermeture (17)

ayant des premier et deuxième bords contigus (30, 32) de telle sorte que les panneaux de fermeture (17) s'étendent en travers de l'ouverture de bâtiment ;

les actionneurs (18) dans la position repliée des panneaux de fermeture (17) ayant des surfaces internes et externes contiguës (34) ainsi que des premiers bords parallèles (30) et des deuxièmes bords parallèles (32), les premiers et deuxièmes bords (30, 32) d'un actionneur maintenant leur sens d'orientation relative ; et **caractérisé par**

des liaisons de sécurité non rigides (36) s'étendant entre des actionneurs adjacents (18), les liaisons de sécurité ayant des longueurs et des points d'attache (37) sur les actionneurs (18) adaptés et disposés de telle sorte que les liaisons de sécurité (36) soient tendues quand les panneaux de sécurité (17) sont dans les positions déployée et repliée mais lâches quand les panneaux de fermeture (18) transitent entre la position déployée et la position repliée.

2. Système de fermeture selon la revendication 1, dans lequel les premiers bords sont des bords supérieurs (30), les deuxièmes bords sont des bords inférieurs (32), les surfaces parallèles sont des surfaces latérales parallèles (34) et les actionneurs (18) dans la position déployée des panneaux de fermeture (17) ayant des bords supérieurs et inférieurs contigus (30, 32) et des surfaces latérales parallèles (34), de telle sorte que les panneaux de fermeture (17) s'étendent en travers de l'ouverture de bâtiment ;

les actionneurs (18) dans la position repliée des panneaux de fermeture (17) ayant des surfaces latérales internes et externes contiguës (34) ainsi que des bords supérieurs parallèles (30) et des bords inférieurs parallèles (32), les bords supérieurs et inférieurs (30, 32) maintenant leur orientation supérieure et inférieure.

3. Système de fermeture selon la revendication 1, dans lequel les premiers bords sont des bords latéraux gauches (ou droits), les deuxièmes bords sont des bords latéraux droits (ou gauches), les surfaces parallèles sont des surfaces latérales parallèles et les actionneurs (18) dans la position déployée des panneaux de fermeture (17) ayant des bords gauches (ou droits) et droits (ou gauches) contigus et des surfaces latérales parallèles (34), de telle sorte que les panneaux de fermeture (17) s'étendent en travers de l'ouverture de bâtiment ;

les actionneurs (18) dans la position repliée des panneaux de fermeture (17) ayant des surfaces latérales internes et externes contiguës (34) ainsi que des bords gauches (ou droits) parallèles (30) et des bords droits (ou gauches) parallèles (32), les bords gauches (ou droits) et droits (ou gauches) (30, 32) maintenant leur orientation gauche (ou droite) et droite (ou gauche).

4. Système de fermeture selon l'une quelconque des revendications précédentes, avec des orientations verticales relatives des points d'attache (37) de panneaux de fermeture adjacents (17) inversées lorsque les panneaux de fermeture (17) transitent entre la position déployée et la position repliée.

5. Système de fermeture selon la revendication 2, les bords supérieurs et inférieurs (30, 32) étant légèrement inclinés par rapport à l'horizontale quand les éléments de fermeture (17) sont dans la position déployée.

6. Système de fermeture selon la revendication 2, les surfaces latérales (34) étant légèrement inclinées par rapport à la verticale quand les éléments de fermeture (17) sont dans la position repliée.

7. Système de fermeture selon la revendication 2, comprenant des rouleaux porteurs (38) aux extrémités des éléments de fermeture (17) adaptés et agencés pour engager les rails porteurs (20, 40, 42) de telle sorte que les éléments de fermeture (17) penchent par rapport à la verticale dans un sens légèrement incliné quand les panneaux de fermeture transitent entre la position déployée et la position repliée.

8. Système de fermeture selon l'une quelconque des revendications précédentes, la distance (x) entre les points de transition sur les rails porteurs (20, 40, 42) étant inférieure à l'espacement (y) entre les rouleaux porteurs (38).

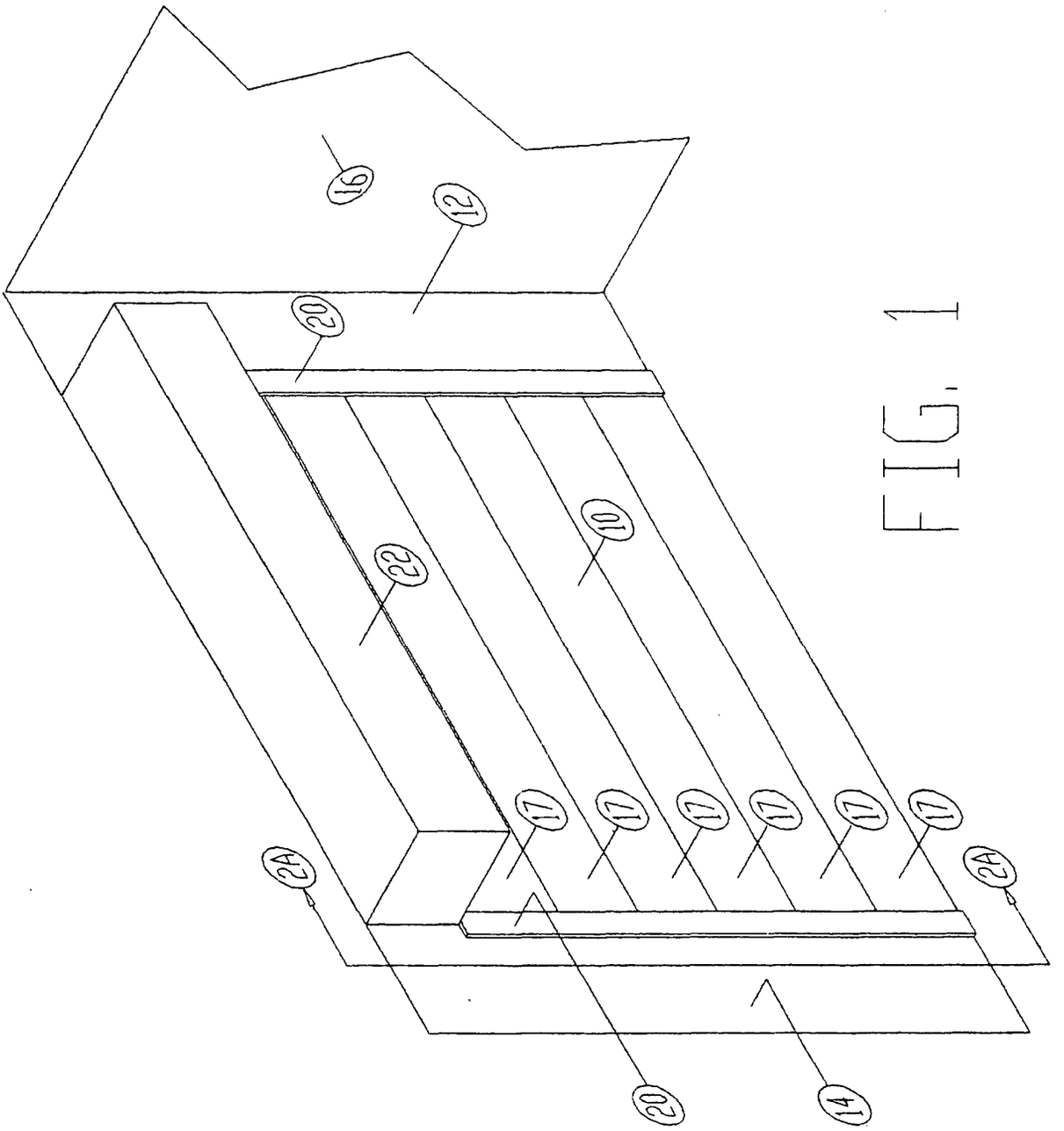


FIG. 1

FIG 2A

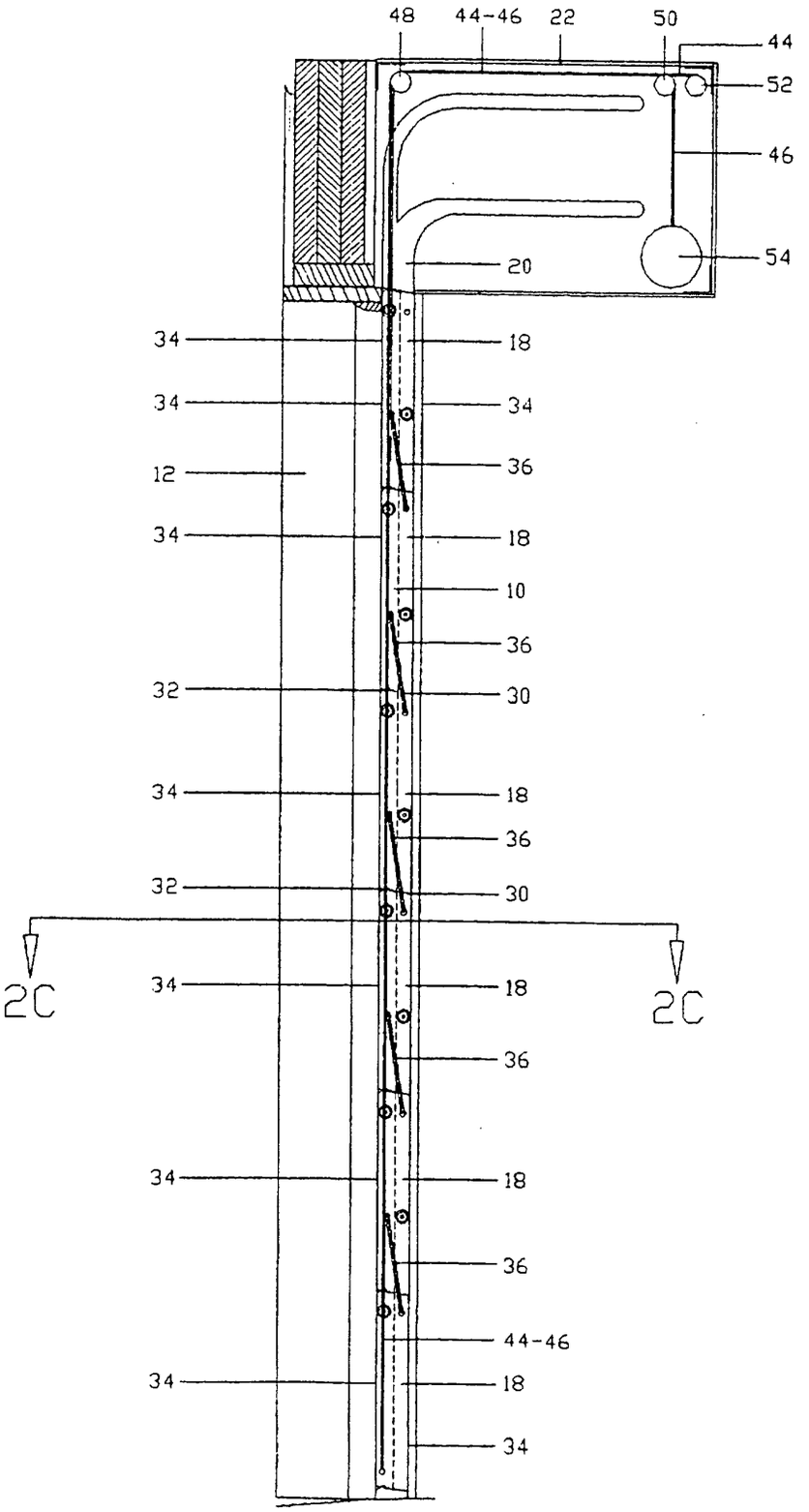

48
44-46
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2C
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44-46
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34

FIG 2B

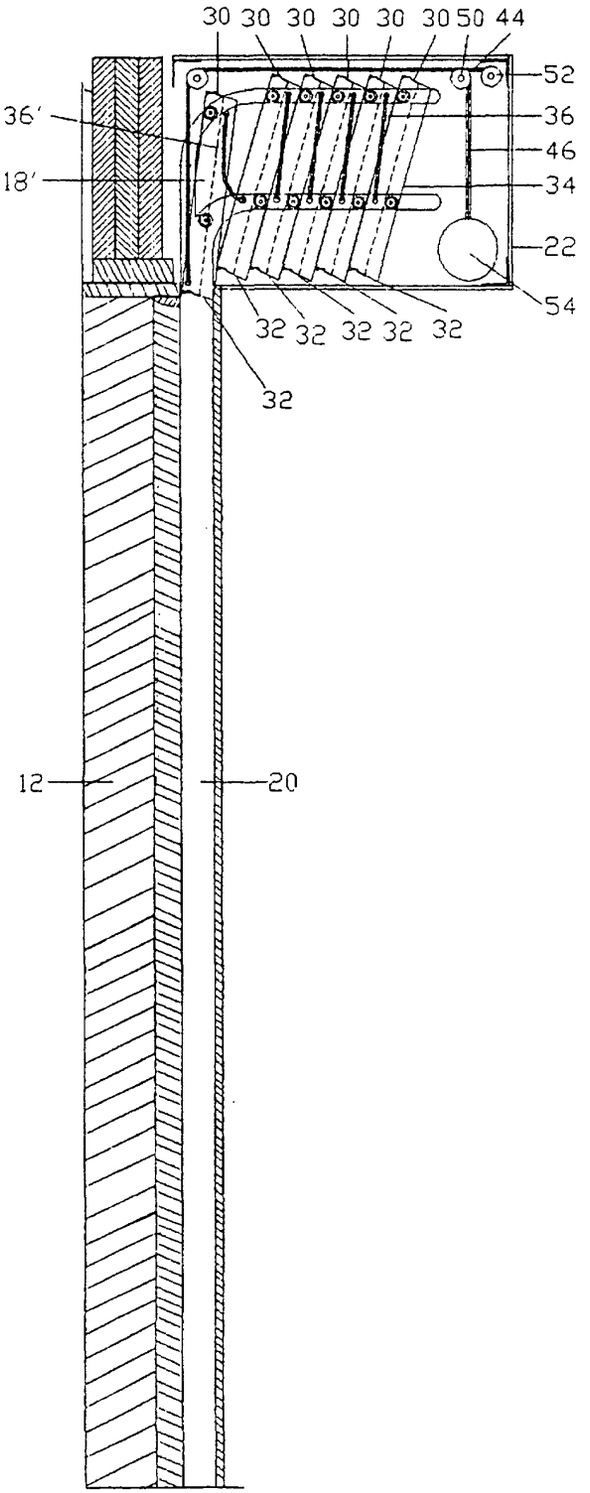


FIG 2C

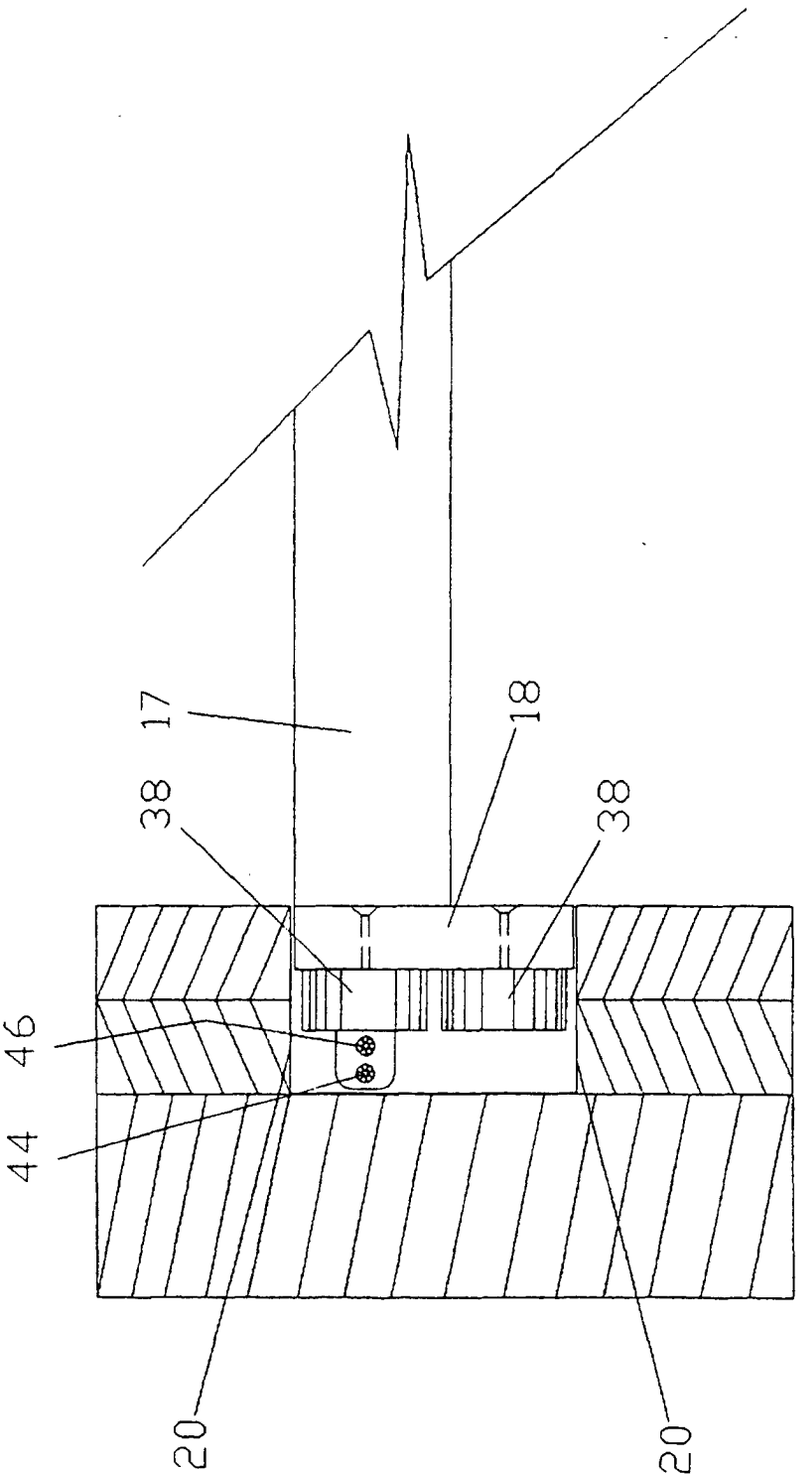


FIG 3A

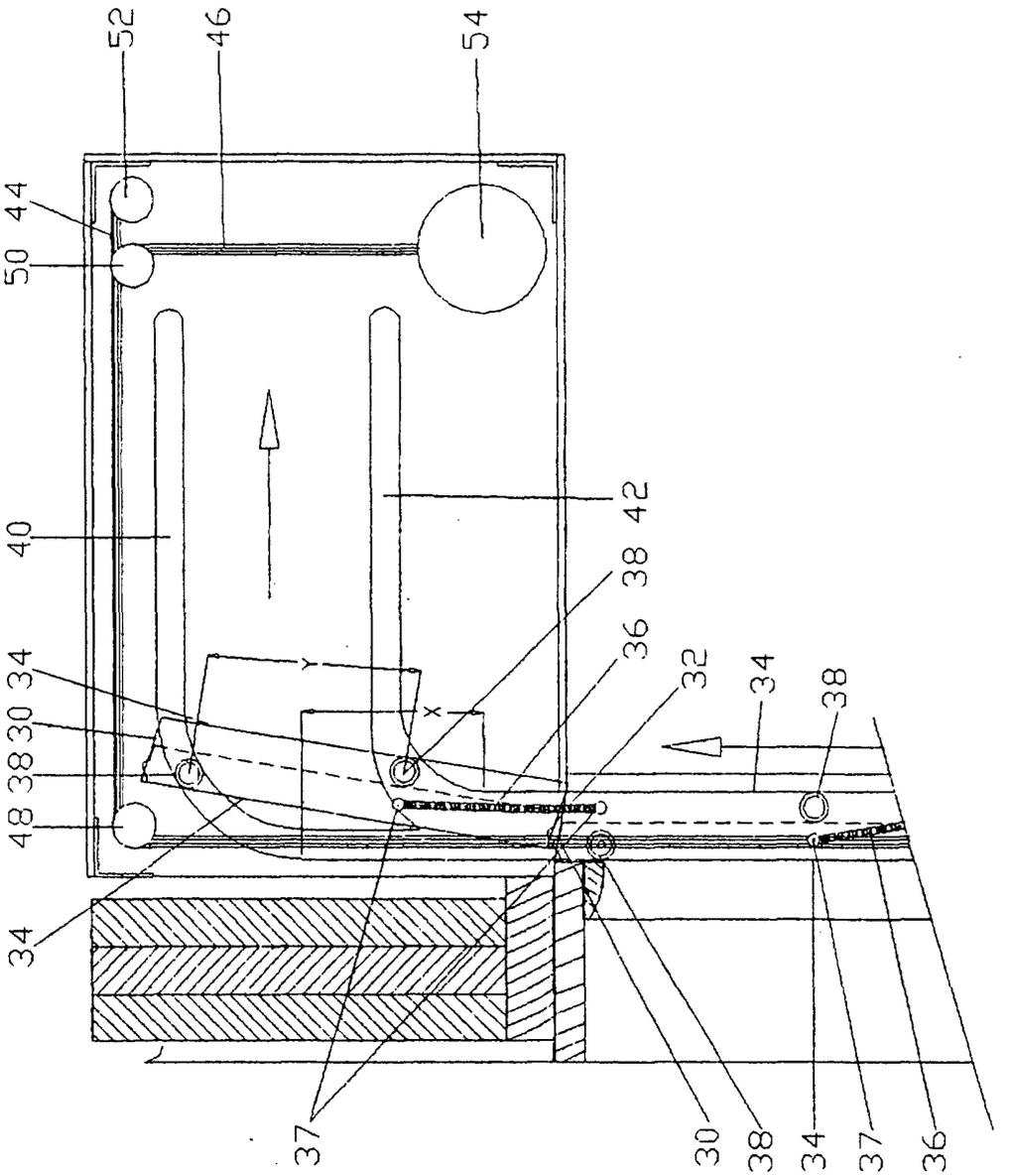


FIG 3B

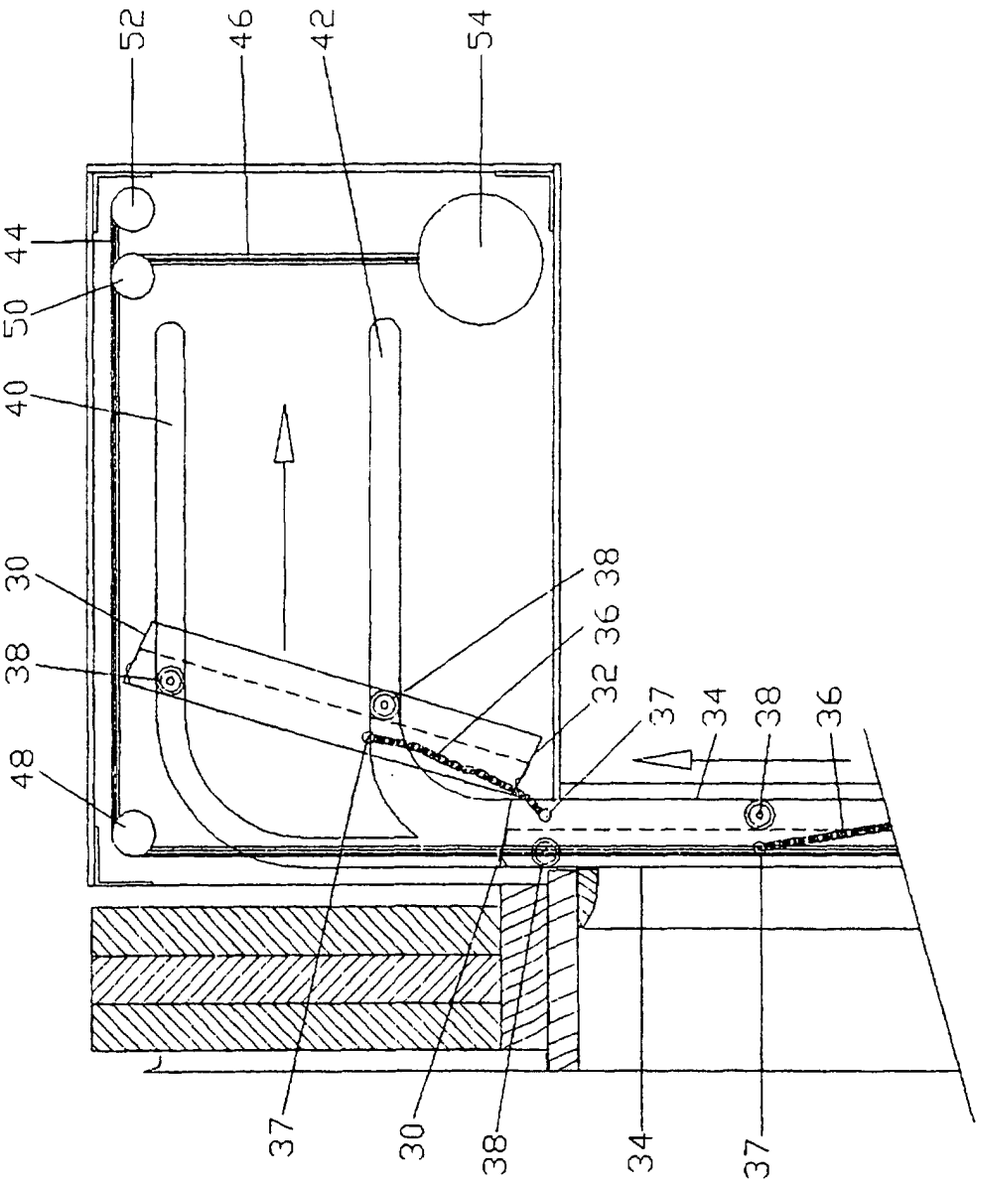


FIG 3C

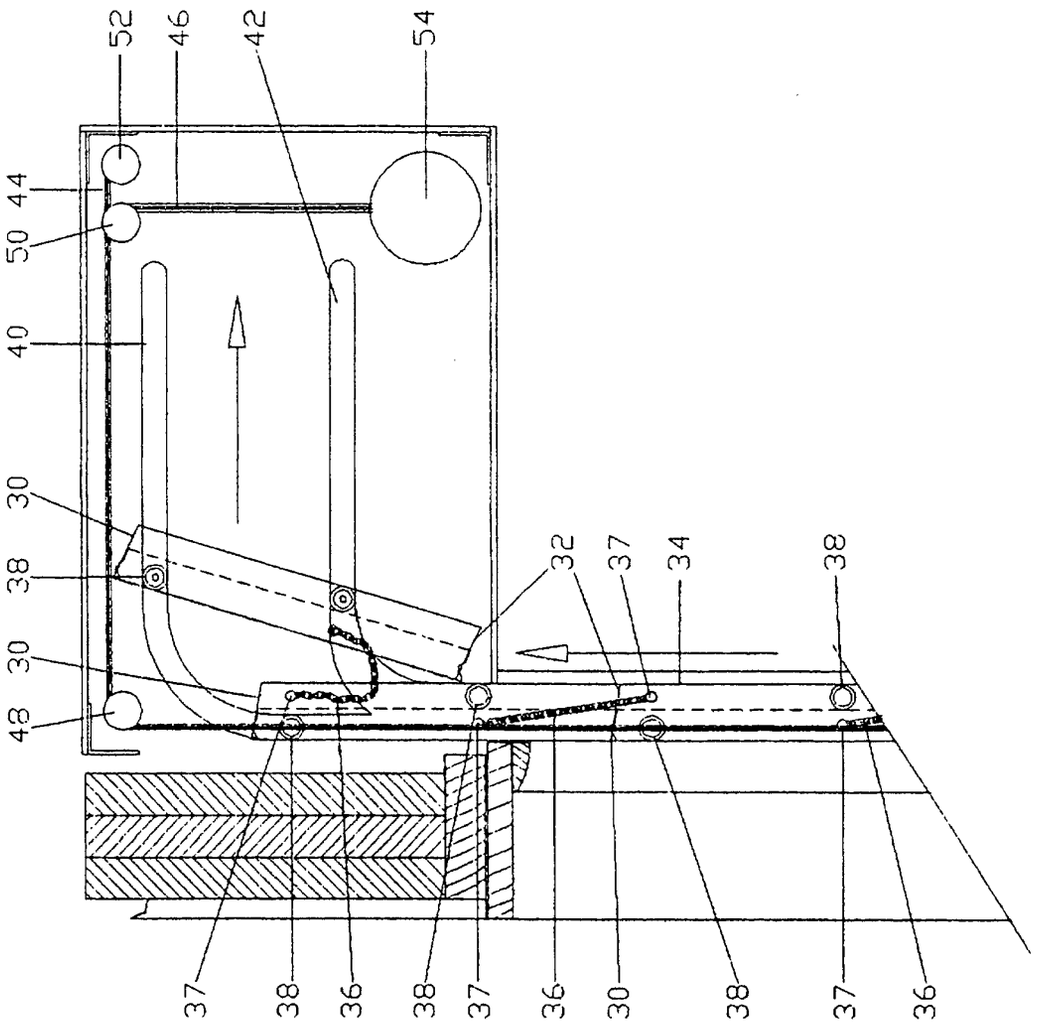

52
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37
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FIG 3D

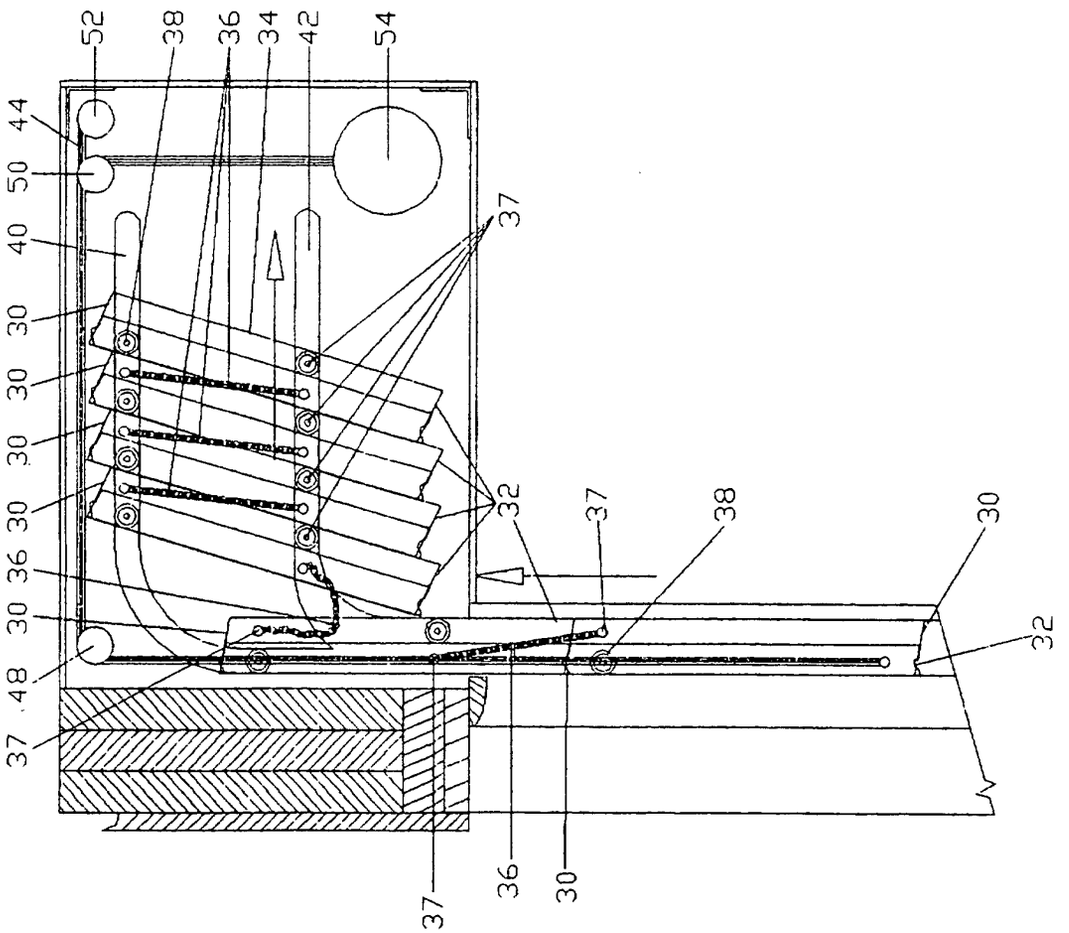

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FIG 3E

