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⑤④ **System for stacking panels, particularly for stacking hatch covers.**

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**DE-A-1 431 306  
GB-A-1 000 114  
GB-A-2 065 037**

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**EP 0 091 325 B1**

## Description

The present invention relates to a system for stacking panels and more particularly for stacking hatch covers in a ship.

In known systems for stacking panels, hydraulic arms are used to lift the panels. In one known system a hydraulic arm is extended to support and lift a panel. A second panel is then moved underneath the first panel and the arm is retracted. The arm is then extended again to support and lift both the panels. This procedure continues until all the panels are stacked in position one above the other. Such a system is disclosed in GB—A—2065037.

These known systems require the provision of a hydraulic power supply. In addition the hydraulic arm and its associated equipment occupies a substantial amount of space, for example below the level of the deck.

It is an object of the present invention to overcome or reduce one or more of the above disadvantages.

According to the present invention there is provided a system for stacking panels from a first disposition in which the panels (10—14) are arranged substantially horizontally and in an end-to-end relationship into a second disposition in which the panels are arranged substantially horizontally in a substantially vertical stack characterised in that the system comprises a plurality of link elements (41—43) provided on or adjacent the edges of the panels at least in their stacked disposition, each link element being arranged to engage the edge (50—54) of a respective panel whereby the link element can support at least one of the panels, and lifting means (31) arranged to apply a lifting force to the panels via the link elements.

Such a system has the advantage of compactness. In addition a hydraulic supply is not necessary.

The link elements may be constituted by generally hook-shaped elements which are arranged to hook under the edge of a respective panel.

The top element may be attached to the leading panel. In this case the elements may be attached to one another but arranged for sliding movement relative to each other in a telescopic manner. Alternatively the elements may be attached end-to-end in the manner of a chain. In a further alternative each of the elements is attached to one panel and arranged to be movable to engage and support the edge of a respective adjacent panel.

A preferred embodiment of the present invention will now be described by way of example only, with reference to the accompanying drawings, of which:

Fig. 1 shows a perspective view of a system for stacking panels in accordance with the present invention, with three panels in a stack;

Fig. 2 shows an enlarged end view of one side

of the system of Fig. 1 with five panels in the stack;

Fig. 3 shows a further enlarged end view of the system of Fig. 1 with the panels in their end-to-end disposition;

Figs. 4 and 5 show views corresponding to Fig. 3 when the panels are stacked; and

Fig. 6 shows the telescopic hook elements of the above system.

The figures show a system in accordance with the present invention for stacking the panels 10, 11, 12, 13, 14 of a hatch cover arrangement on board a ship. In use the panels are arranged end-to-end to cover the opening of a hold 20. The system shown is for use with tween deck hatch covers where space is at a premium and where it is sometimes required that the panels are stacked completely clear of the hold to permit containers etc. to be stored projecting through the opening of the hold 20. The arrangement shown in the Figures has four hatch cover panels 11, 12, 13, 14 and a storage end panel 10 which always remains in the stowage space. As shown in Fig. 1 panels 10, 11, 12 are in a stack 30 and panels 13 and 14 have been left in position over the hold.

The panels are moved between the opening of the hold 20 and the bottom of stack 30 by a long chain drive system comprising an endless chain 21 operated by one or more electric winches 22. The chain 21 passes down the side well and is selectively attachable to the panels by a towing connection 24 so that desired panels may be moved towards the position of stack 30.

In order to roll it in and out of stowage each panel is fitted with four wheels 56 which run on a guide rail 57 in the side wells. In order to allow the panel to sit down in its closed position pockets or depressions are created in the wheel guide rails 57. The pockets and wheels are arranged such that when the hatch covers have travelled one panel length (i.e. one panel into the stowage area ready for stacking) all the panels sit down due to the wheel/pocket relationship. This gives a stable condition for the panels in the well while the stacking of the panel in stowage is taking place. It also gives a partial opening facility. The hatch cover panels are connected to one another by detachable junction pieces (not shown). Thus when all junction pieces are connected the panel connected to the chain drive system will pull or push the panels in the direction of the drive. A partial opening of the hatch is achieved by disconnecting the required junction pieces and only moving the remaining panels.

In some cases all the hatch cover panels have attachment means to which the chain towing connection 24 can be fitted enabling panels to be moved individually.

The stowage end panel 10, also known as the stacker panel, is connected to a deck head hoisting system comprising an electric winch 33. The connection may be permanent or detachable. The electric winch 33 is connected to panel 10 via four wires which pass over respective deckhead sheaves 32 to sheaves 31 attached to panel 10.

At the sides of panel 10 are provided four sets of telescopic hook elements 41, 42, 43, two sets at each side. In the embodiment shown there are three hooks in each set (i.e. one less than the number of hatch cover panels). Pins on one hook travel in corresponding slots in the adjacent hook. The hooks are arranged to travel in a guide system comprising vertical channels 66 which protect the hooks in their extended position (see Fig. 2). The channels 66 also provide a guide for the stacker panel 10 and the other panels 11—14 when in the stowed or stacked position.

These channels do not necessarily carry ship loads in the sense of pillars therefore need only be guided top and bottom. They can therefore be arranged so as to be lifted out when the hatch covers are closed thereby reducing obstruction in the stowage space. This would normally be the arrangement when the hoisting system was detachable. Such an arrangement would give a tween deck area completely free of obstructions (except for normal ship support structure) when the hatch covers are closed.

The panels 10—14 have respective end support sections 50—54 which are arranged to be engaged in the hooks. Adjacent the end sections 50—54 continuous thrust blocks 59 and rest pads 58 are provided.

In use, the stacker panel 10 is hoisted the equivalent of one panel depth plus clearance in the stowage space on the hoisting system. The hooks 41 on the stacker panel 10 extend to a position ready to engage with the next panel 11 into stowage. When the panel 11 arrive in stowage and sits down in the stowage area, the mode switches back to hoisting. The panel 11 is picked up on the four hooks 41 hanging from the stacker panel and raised once again the equivalent of one panel depth plus clearance. The next set of hooks 42 extend ready to accept the next panel. This sequence continues until all the panels except the last one are hanging on the hooks from the stacker panel. The last panel is then driven into stowage where it sits down. The stack of panels are then lowered onto this panel thereby releasing the load from the hoisting system and stacking the panels at the stowage end.

In their stacked position the weight of the panels is transmitted downwards by means of the rest pads 58. Relative movement and vibration of the panels is prevented or at least reduced by the rest pads 58, so that the ship may go to sea with the panels in their stacked position.

The hatch cover closing process is virtually the reverse of the opening process.

From the stacked position the stacker panel 10 is raised in order for each set of hooks to pick up its appropriate panel and allow the bottom panel 14 to be driven one panel length out of stowage, where it sits down due to the pockets in the guide rail. The stack is then lowered until the bottom panel 13 sits in stowage, and the hooks 43 disengage. The junction pieces between panels 13 and 14 are then engaged either manually or

automatically. The panels 13, 14 are then driven one panel length out of stowage and the next panel 12 lowered, until all panels are lowered and the stacker panel 10 then covers the stowage space.

The above described stacking system has the advantage that it occupies only a very small space. In addition a hydraulic supply is not necessary, the system being easily operable by means of an electric winch or any available derrick or crane. Moreover a minimum of manual handling is required; in fact if partial opening is not required, the system may be completely automatic.

Various modifications can be made to the above described system. For example, the hooks need not be telescopic and can be arranged to collapse side by side. Alternatively the hooks may not be collapsible and may be arranged, when not in use, project below the level of the hatchcover opening. Alternatively the hooks can be arranged in the form of a chain. For example a desired number of pivotally-linked hooks can form an endless loop with a length of wire; this arrangement is operated rather like a conveyor belt. In a further modification the hook elements are pivotally or foldably attached to their respective panels.

It is not essential that the top hook element 41 is permanently attached to the stacker panel 10.

Although hook 41 is shown attached to panel 10 with its end engaging panel 11 to support the latter, it is possible in modified arrangements for the hook 41 to be attached to panel 11 and to extend upwards with its end engaged round the edge of panel 10 so that raising of panel 10 lift panel 11.

The sheaves 31 may be replaced by other lifting means for permitting the panels to be lifted by a conventional deck-head hoisting system. The lifting means may be releasably attached to the stacker panel 10 to permit removal when not in use, thus leaving a flush deck area.

#### Claims

1. A system for stacking panels from a first disposition in which the panels (10—14) are arranged substantially horizontally and in an end-to-end relationship into a second disposition in which the panels are arranged substantially horizontally in a substantially vertical stack characterised in that the system comprises a plurality of link elements (41—43) provided on or adjacent the edges of the panels at least in their stacked disposition, each link element being arranged to engage the edge (50—54) of a respective panel whereby the link element can support at least one of the panels, and lifting means (31) arranged to apply a lifting force to the panels via the link elements.

2. A system according to claim 1 wherein the link elements (41—43) are constituted by hook-shaped elements which are arranged to hook under the edge of a respective panel.

3. A system according to claim 1 or 2, wherein the link elements are disposed vertically, the top link element (41) being attached to the panel (10) which is at the top when the panels are stacked.

4. A system according to any preceding claim wherein the link elements (41—43) are slidable relative to each other in an telescopic manner.

5. A system according to claim 4 wherein pin means on one link element (41, 42) travel in slot means in an adjacent link element (42, 43).

6. A system according to claim 1 or 2 wherein each of the link elements (41—43) is attached to a respective panel (10—12).

#### Patentansprüche

1. System zum Stapeln von Platten von einer ersten Aufstellung, in der die Platten (10—14) im wesentlichen horizontal und Ende an Ende liegen, in eine zweite Aufstellung, in der die Platten im wesentlichen horizontal in einem im wesentlichen vertikalen Stapel angeordnet sind, dadurch gekennzeichnet, daß das System eine Vielzahl von Zwischenelementen (41—43) aufweist, die an oder neben den Rändern der Platten mindestens in ihrer gestapelten Aufstellung vorgesehen sind, wobei jedes Zwischenelement am Rand (50—54) einer jeweiligen Platte angreift, so daß das Zwischenelement mindestens eine der Platten stützen kann, und daß Hebeeinrichtungen (31) vorgesehen sind zur Ausübung einer Hebekraft an den Platten mittels der Zwischenelemente.

2. System nach Anspruch 1, dadurch gekennzeichnet, daß die Zwischenelemente (41—43) durch hakenförmige Elemente gebildet sind, die zum Einhaken unter den Rand einer jeweiligen Platte vorgesehen sind.

3. System nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Zwischenelemente vertikal angeordnet sind, und daß das oberste Zwischenelement (41) an der im Plattenstapel obersten Platte (10) angebracht ist.

4. System nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Zwischenelemente (41—43) relativ gegeneinander teleskopartig verschiebbar sind.

5. System nach Anspruch 4, dadurch gekennzeichnet, daß ein Stift an einem Zwischenelement (41, 42) in einem Schlitz eines benachbarten Zwischenelementes (42, 43) beweglich ist.

6. System nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß jedes der Zwischenelemente (41—43) an einer jeweiligen Platte (10—12) angebracht ist.

#### Revendications

1. Système d'empilage de panneaux d'une première disposition, dans laquelle les panneaux (10—14) sont disposés sensiblement horizontalement et bout à bout relativement l'un à l'autre, en une deuxième disposition dans laquelle les panneaux sont disposés sensiblement horizontalement en une pile sensiblement verticale, caractérisé en ce que le système comprend une pluralité d'éléments de liaison (41—43) prévus sur les bords ou auprès des bords des panneaux au moins quand ils sont disposés en pile, chaque élément de liaison étant disposé de manière à entrer en prise avec le bord (50—54) d'un panneau correspondant, de sorte que l'élément de liaison puisse supporter au moins l'un des panneaux, et des moyens de levage (31) disposés de manière à appliquer aux panneaux une force de levée par l'intermédiaire des éléments de liaison.

2. Système suivant la revendication 1 dans lequel les éléments de liaison (41—43) sont constitués par des éléments en forme de crochet qui sont disposés de manière à s'accrocher au dessous du bord d'un panneau correspondant.

3. Système suivant la revendication 1 ou 2, dans lequel les éléments de liaison sont disposés verticalement, l'élément de liaison supérieur (41) étant fixé au panneau (10) qui se trouve au sommet quand les panneaux sont empilés.

4. Système suivant l'une quelconque des revendications précédentes, dans lequel les éléments de liaison (41—43) sont mobiles à glissement d'une manière télescopique relativement l'un à l'autre.

5. Système suivant la revendication 4, dans lequel un doigt disposé sur un élément de liaison (41, 42) se déplace dans une rainure réalisée dans un élément de liaison voisin (42, 43).

6. Système suivant la revendication 1 ou 2, dans lequel chacun des éléments de liaison (41—43) est fixé à un panneau (10—12) correspondant.

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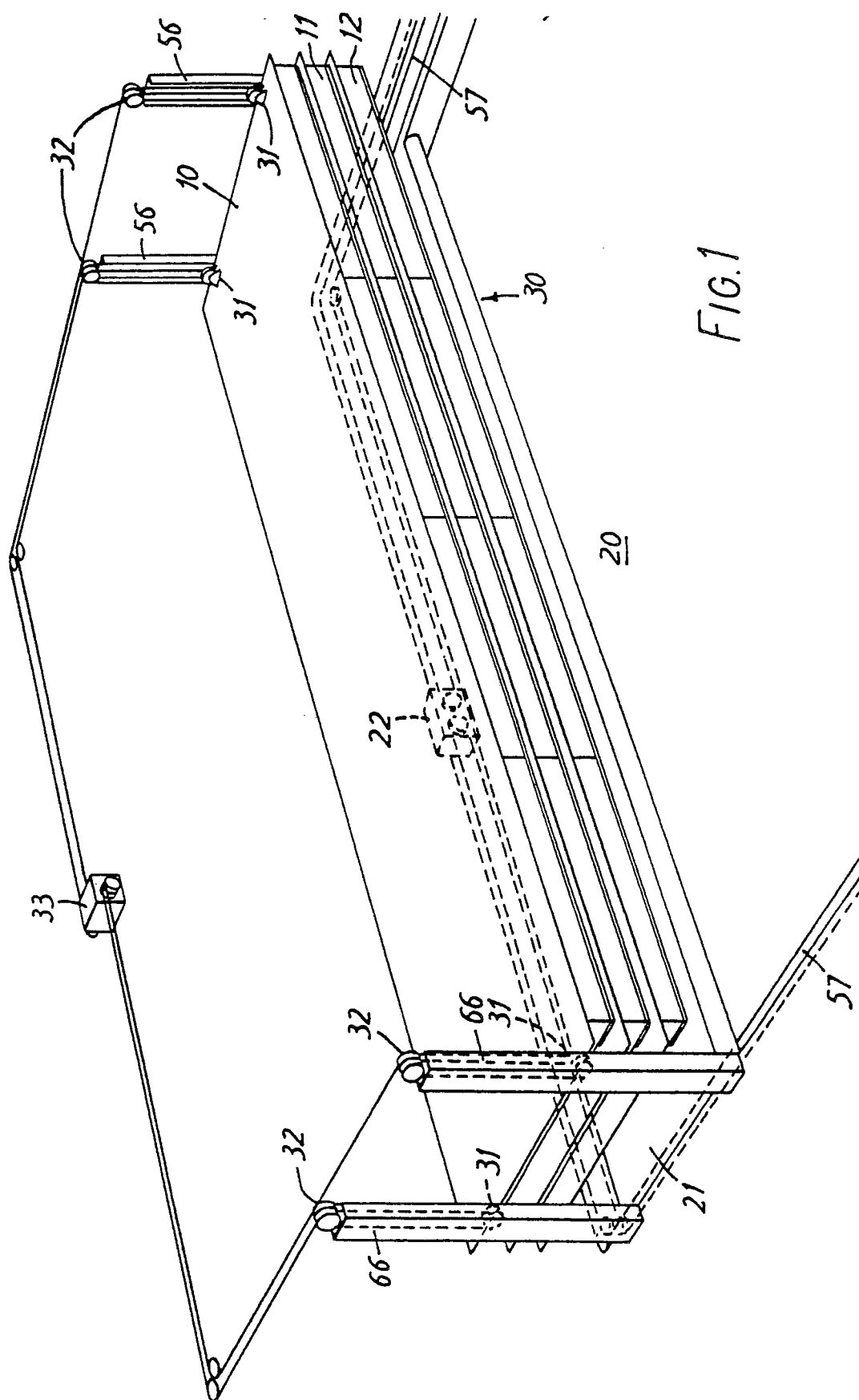
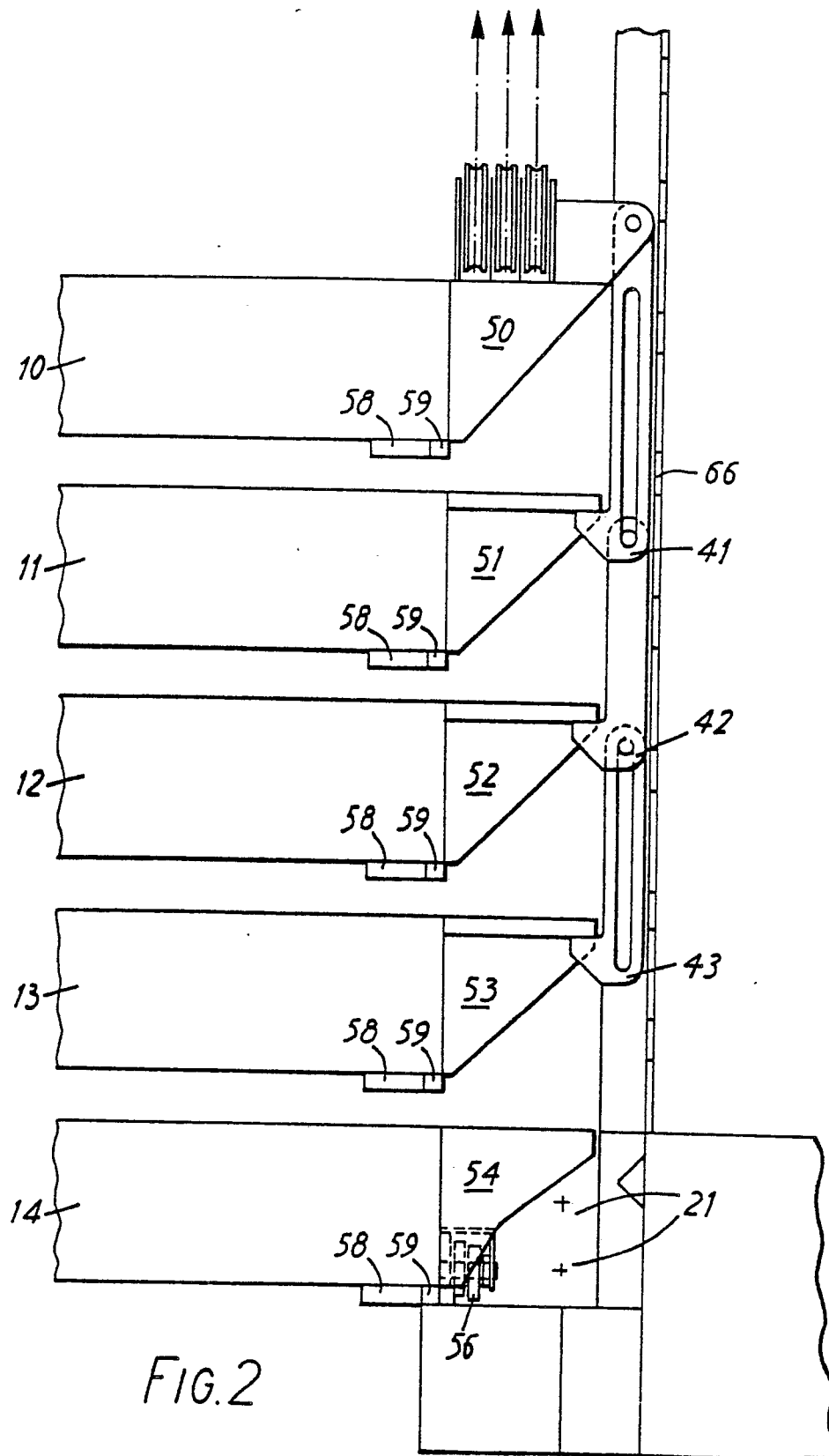


FIG. 1



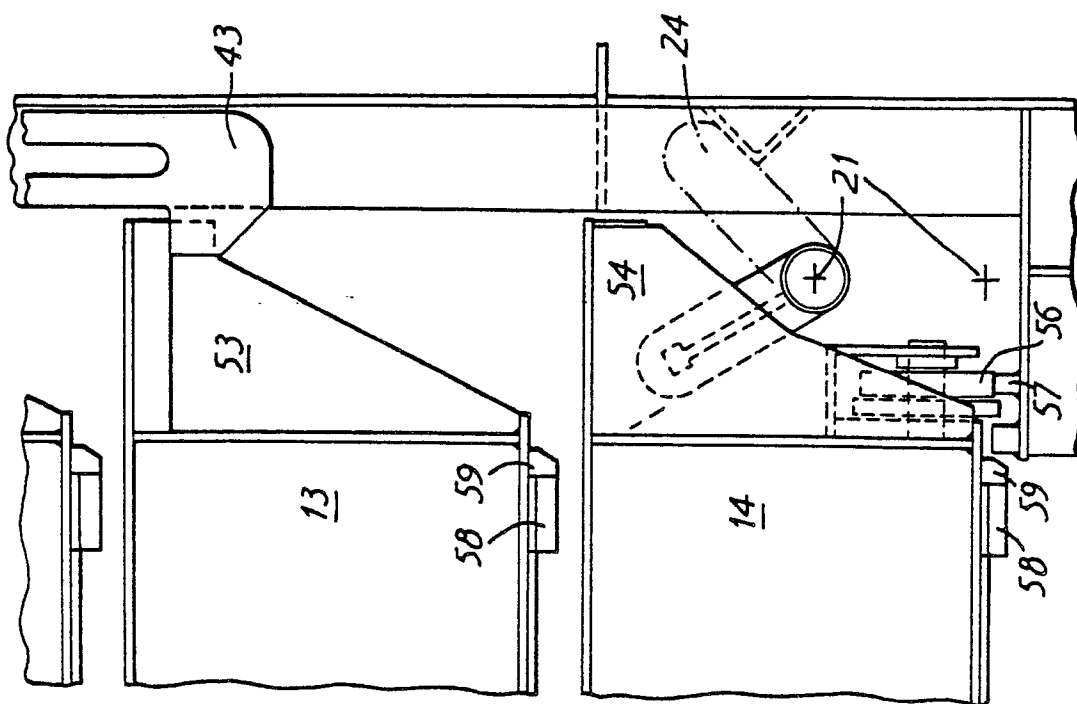


FIG. 4

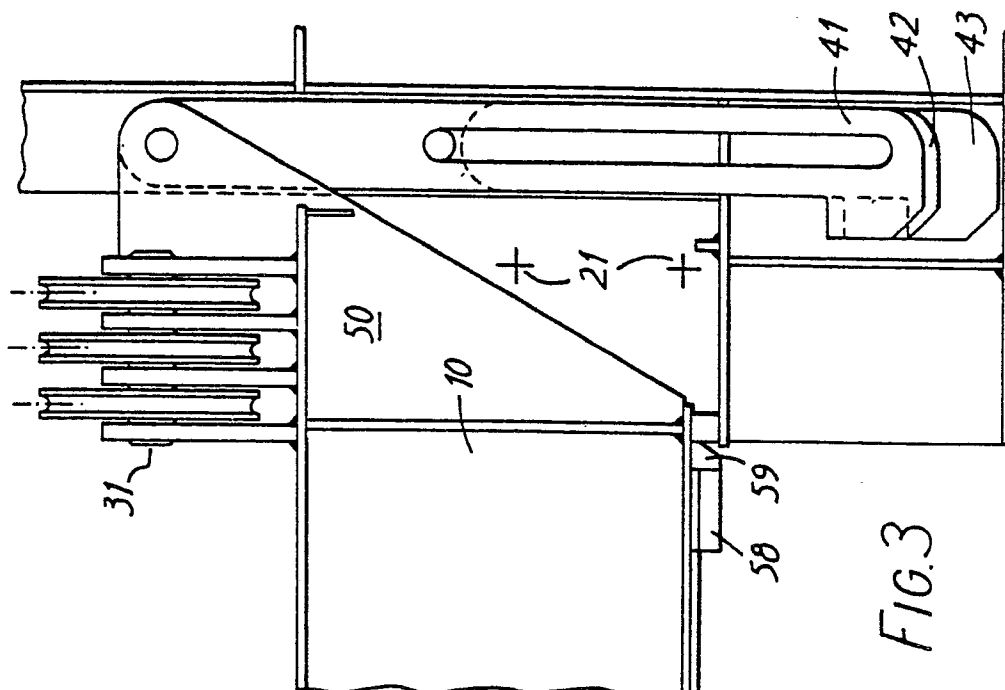


FIG. 3

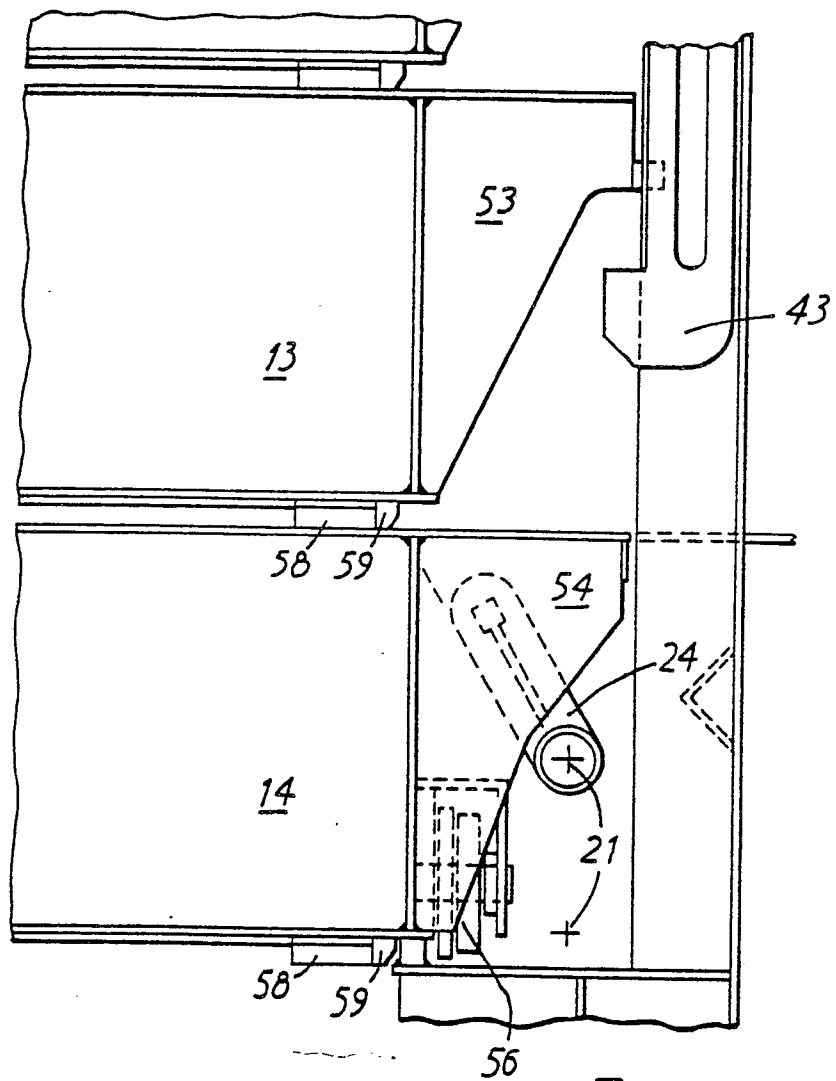


FIG. 5

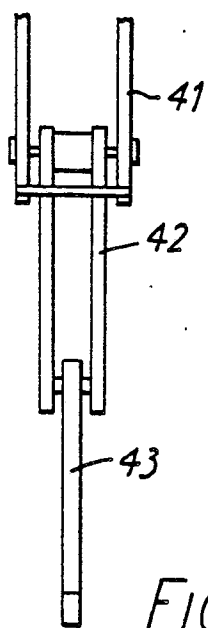


FIG. 6