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(54) **OVERHEAD TRAVELLING CRANE.**

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**EP-A-0 040 292
EP-A-0 046 210
DE-A-2 545 907
DE-B-2 728 881
FR-A-2 193 769
FR-A-2 333 090
FR-A-2 387 149
FR-A-2 508 949
GB-A-1 349 590
GB-A-2 067 490
JP-A-57 131 687
JP-U-57 133 462
JP-Y-38 017 038
US-A-2 825 291
US-A-3 092 039
US-A-4 171 670**

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Description

The present invention relates to an overhead travelling conveyor adapted to travel on an I-shaped monorail. More particularly, it is concerned with an overhead travelling conveyor suitable for conveyance which may involve frequent starting and stopping, especially sudden stopping, and which is also suitable for a curved rail.

Conventional overhead travelling conveyors have a structure in which right and left wheels of a carrier travel on a rail composed of a pair of channel members fixed to a support member and in which bus bars for supplying power to a running motor are disposed inside the rail. This structure ensures safety even in the use of bare bars, but since the wheel diameter is restricted to a relatively small diameter, it is necessary to increase the number of wheels when the conveyed load is large. In the case of a curved rail, moreover the wheels creak and make running noises and the rail wears, so a special quenched rail must be used with the result that the rail weight becomes larger.

In an effort to overcome such drawbacks there has been proposed an overhead travelling conveyor of a structure in which right and left wheels of a carrier travel on a rail comprising an I-beam and in which bus bars for supplying power to a running motor are supported in a horizontally juxtaposed state by a support member fixed to the rail. According to this structure, the wheel diameter can be enlarged within the dimensional range of the I-beam, but as to running noises and the wear of the rail this structure also involves the same drawbacks as in the conventional structure firstly described above. Furthermore, because of deterioration of the trolley line mounting accuracy, it is necessary to provide a degree of freedom sufficient to maintain a good contact for the collectors on the carrier side. As a result, the collectors are required to have a larger size, and a larger space is required for the mounting of bus bars.

In the conventional I-shaped rail, moreover, a large number of machining steps are required for the formation of many mounting holes, and the mounting position of rail hanger means and that of support means for power supplying and signalling trolley lines are restricted by such mounting holes. Furthermore, since the connection of rails sections is made merely by tightening of bolts through a rail connecting plate attached to a side face of the rail web, differences in height between rail sections easily occur.

Our JP—A—57-131687 describes an I-shaped monorail, carrier wheels for which roll along the upper surface of this rail. Guide wheels are positioned to engage the edges of the top and bottom flanges of the monorail to receive lateral forces and reduce wear on the carrier wheel bearings.

FR—A—2387 149 describes an I-shaped monorail, the upper flange surface of which is conversely curved to support the wheel of the carrier,

which has a corresponding peripheral groove to fit over the rail. Guide wheels are positioned to engage the bottom flanges of the rail to provide lateral stability and receive lateral forces on the carrier wheel. The upper and lower flange surfaces form recesses on both sides of the monorail by virtue of their shape.

It is an object of the present invention to provide an overhead travelling conveyor which can eliminate the above-mentioned drawbacks of the conventional structures and fully withstand a frequent repetition of starting and sudden stopping of a carrier and centrifugal forces induced at sharp curves of a rail and which permits easy machining and mounting of a rail and easy mounting and maintenance of power supply and signalling bus bars.

According to the present invention there is provided an overhead travelling conveyor including a monorail which comprises

a rail of I-shaped section;

driving and driven carriers adapted to travel on the monorail each through a single cylindrical wheel formed of rubber or synthetic resin;

a load bar supported at both ends thereof pivotably through vertical pins which are fixed at the respective opposite ends to frames of the driving and driven carriers;

guide rollers on each carrier, positioned to engage the edges of the top and bottom flanges of the I-shaped rail in front of and behind the wheels;

transmission means for connecting the wheel axle of the driving carrier to a motor through a toothed belt;

busbars vertically arranged and supported by a side face of the monorail; and

current collectors fixed to the frame of the driven carrier, the current collectors being in elastic contact with sliding contact faces of the bus bars; characterized in that

the top and bottom flanges of the I-shaped monorail have projections forming recesses on both sides of the monorail for engagement by rail connecting plates, rail hanger means and bus bar supporting means which are clamped therein.

The following effects are obtained by the present invention.

(1) Since cylindrical wheels run on a flat upper surface of the rail, the wheel diameter can be selected so as to give a desired face pressure without being restricted by the rail structure. Besides, the wheels do not receive a lateral force from the rail even at curved rail portions, and this permits the use of a single rubber or synthetic resin wheel for each of the driving and driven carriers and permits such wheels to run on the rail in a safe posture without generating running noises and without causing wear of the rail.

(2) Since the bus bars are each enclosed throughout its full length with an insulation sheath capable of being easily attached to and detached from the bus bar, the bus bars can be laid in a minimum space with a high dimensional accuracy in proximity to a side face of the rail.

Consequently, the elastic operation range of each collector is small, thus permitting reduction in size of the collector.

(3) Because of the use of a toothed belt for the driving of each wheel, the running motor can be mounted in the most convenient position not interfering with rail support fittings, particularly complicated support fittings at a rail branch portion. From the aspect of manufacturing accuracy, the manufacturing and maintenance of the transmission means are easy. Besides, since the elasticity of the toothed belt serves as a buffer against starting and stopping of the carrier, the conveyor of the present invention is suitable for uses which require a frequent repetition of starting and stopping or a sudden stopping. Further, the toothed belt driving system is far superior to the gear driving system in point of transmission efficiency, thus permitting reduction of the output of the running motor, dispensing with lubrication with grease or the like, and thus a maintenance-free characteristic can be attained.

(4) Since the load bar is connected at both ends thereof to the carrier frames through pins which are fixed at both ends thereof to the carrier frames, a sufficient strength of connection can be easily obtained even against uses requiring a frequent repetition of sudden stopping or involving sharp curves.

(5) Since the bus bars are disposed on one side of the I-shaped rail, not only a high mounting accuracy and the supply of power can be ensured, but also the mounting and removal of the bus bars are easy and a superior maintainability, including a visual inspection, can be attained.

(6) The number of holes to be formed in the rail is so small (only the bolt holes for joining rail sections are machined) that the number of machining steps is reduced to a remarkable extent, that is, the manufacture of the rail becomes so much easier. Moreover, the rail hanger means and the support means for the power supplying and signalling bus bars are fixed to the rail by being brought into pressure contact with the clamp-type mounting projections formed on the opposed faces of the upper and lower flanges of the rail and projecting along the longitudinal direction of the rail, and therefore their fixing positions are not restricted along the longitudinal direction of the rail. Further, since the rail has recessed portions formed in the side faces of its web for fitting therein of rail connecting plates, it is possible to connect rail sections easily without causing a difference in height between the rail sections.

In the present invention, moreover, a conveyance article holding means is supported through a spherical bearing attached to the conveyance article holding means suspending portion of the load bar, so even if a lateral load is exerted on the conveyance article holding means and the conveyance article itself during travelling on a curved portion of the rail or during working, such load can be absorbed by the spherical bearing. Consequently, only vertical loads are imposed on the

wheels and the guide rollers do not undergo a large lateral load, so that the rail is not subject to a torsional load nor are the load bar connecting pins subject to an excessive load.

As a result, a smooth and stable curve travelling performance of the overhead travelling conveyor is attained, and the service life of the wheels and that of the guide rollers can be prolonged. Further, the breakage of the connecting pins caused by an excessive load is prevented to thereby prevent a falling-off accident. Additionally, the rail is prevented from being deformed by torsion, whereby the accident, e.g. breakage, of the rail hanger portion can be prevented.

In the present invention, moreover, a notched portion of a size which permits the lower portion of the carrier to be removed sideways of the monorail is formed in part of the lower portion of the monorail of I-shaped section, and a rail piece corresponding to such notched portion is fixed detachably to the notched portion. By such an extremely simple construction, requiring neither a rail lift device nor guide device as in the prior art, the working efficiency and safety in the carrier mounting and removing operation are improved to a remarkable extent, the mounting space required is minimized and the reduction of costs can be attained.

In the drawings:—

Fig. 1 is an elevation of the entirety of an overhead travelling conveyor embodying the invention; Figs. 2 and 3 are an elevation and a side view, respectively, of a driving carrier; Figs. 4 and 5 are an elevation and a side view, respectively, of a driven carrier; Fig. 6 is a transverse sectional view showing an installed state of bus bars; Fig. 7 is a view illustrative of bus bars supporting means attached to a web side face; Fig. 8 is a perspective view of an I-shaped rail; Fig. 9 is a side view showing the rail as suspended and fixed by rail hanger means; Fig. 10 is a front sectional view thereof; Fig. 11 is a view illustrative of a patch plate disposed on a web side face; Fig. 12 is a side view showing rail sections as coupled together; Fig. 13 is a front sectional view thereof; Fig. 14 is a sectional view of a principal portion for supporting a conveyance article holding means through a spherical bearing; Fig. 15 is an elevation of a monorail having a notched portion; Fig. 16 is an elevation of a rail piece; Figs. 17 and 18 are an elevation and a side view, respectively, showing an assembled state; and Fig. 19 is a side view showing a state of use.

An embodiment of the present invention will be described below with reference to the drawings.

In Fig. 1, a carrier 11 comprises a driving carrier 13 and a driven carrier 14 both adapted to travel on a rail 12 of I-shaped section and interconnected through a load bar 15. From the load bar 15 is suspended conveyance article holding means 16 such as an electrically operated chain block, hoist, or the like.

As shown in Figs. 2 and 3, the driving carrier 13 has a generally E-shaped frame 20 on the upper part of which is mounted a bearing portion 21

which supports an axle 23 of a cylindrical wheel 22 adapted to travel on the rail 12, the wheel 22 being formed of rubber or synthetic resin such as nylon. Just above and under the rail 12 there project an upper arm 24 and an intermediate arm 25 of the frame 20, respectively, on which are mounted vertical-axle guide rollers 26 and 27, respectively, adjacent to both sides of the rail 12, the guide rollers 26 and 27 being formed of rubber or synthetic resin. The guide rollers 26, which are disposed so as to form a gap required for passing curved rail portions with respect to the rail 12, function to prevent swerving of the wheel 22 and restrict the travelling direction. The guide rollers 27 prevent lateral swinging of the driving carrier 13. Therefore, only a single pair of right and left guide rollers 27 may be provided below the wheel 22.

Both ends of a vertical pin 29 are inserted and fixed into holes respectively formed in the intermediate arm 25 and a lower arm of the frame 20 on a perpendicular which passes the center of the wheel 22, and one end of the load bar 15 is fitted on an intermediate portion of the pin 29 through a bushing.

A running reduction motor 30 is attached to the back of the lower portion of the frame 20. In a recessed portion formed in the back of the frame the wheel axle 23 and the motor shaft are connected for power transmission through toothed belt wheels 31 and 32 and a toothed belt 33. The toothed belt 33 is kept tensioned by a roller 34 mounted on the frame 20.

The driven carrier 14, as shown in Figs. 4 and 5, is similar to the driving carrier 13 and has an E-shaped frame 35, a cylindrical wheel 36, guide rollers 37 and 38 and a pin 39. The other end of the load bar 15 is fitted and supported on the pin 39 similarly to the case of the pin 29. The driven carrier is further provided with collector means for receiving power for the running motor 30 and the electrically operated chain block from trolley lines 40 and for transmitting and receiving control signals.

Referring to Fig. 6, there is shown a support structure for the trolley lines 40, in which many grooves 43 are formed in the outside of support means 41 and a notched concave 44 is formed between adjacent grooves 43 to form resilient deformable legs 45 at opposite sides of each groove 43, and a latch portion 46 projecting into the groove 43 is formed on the outer end of each leg 45.

Each of the bus bars 40 comprises an extruded member having a generally square external form and a hollow portion 47. It is provided with a longitudinal opening 48 at one side of the hollow portion and with retaining portions 49 projecting on both sides of the opening 48. A side wall opposed to the opening 48 is slightly inwardly concaved to form a slightly concaved outer surface of the side wall which outer surface serves as a sliding contact surface 50, and projecting portions 51 are formed on both sides of the sliding contact

surface 50. Each of the bus bars 40 has such a sectional shape.

The bus bars 40 are each fitted into an insulation sheath 52 having a S-shaped section and held in place by projections 53 formed at both edges of the sheath 52. The assembly thus fabricated is press-fitted into the groove 43 and held in place by the latch portions 46. In the junction of trolley lines, a connector fitting 54 which spans both trolley lines is inserted into the hollow portion 47 and a screw 55 is threadedly inserted through the opening 48 and is fastened so that the leading end of the screw is brought into pressure contact with the inner wall of the hollow portion 47, whereby both side portions of the connector 54 are forcedly contacted with the inner surfaces of the retaining portions 49.

In Fig. 6, the upper three bus bars are power supply lines for the motor and the lower two are control signal lines for insulating a specific section from the other sections to effect starting or stopping of the carrier. The bus bars 40 are covered with the insulation sheath 52 as previously noted, and it is only a slight projection of the screw 55 that projects at the junction of trolley lines. Therefore, the bus bars 40 can be laid easily and compactly with a high accuracy in proximity to the web 18. For mounting the bus bars 40, tip end portions of upper and lower rail fixing members 42 of the bus bars supporting means 41 are inserted into concave portions formed between a side face of the web 18 and projections 17, then bolts 42a are threadedly fitted into threaded portions 42' formed in the rail fixing members 42 and tightened to let the leading ends of the bolts 42a come into pressure contact with the side face of the web 18 and the rail fixing members 42 into pressure contact with side faces of the projections 17, whereby the bus bars supporting means 41 is fixed to the rail 12.

The bus bar supporting means 41, as shown in Fig. 7, is first disposed sideways on a side face of the rail web 18 and then turned to a predetermined position.

Collector shoes 57 which are in sliding contact with the bus bar 40 are attached to an insulation plate 56 which is fixed by screws to the frame 35 of the driven carrier 14, as shown in Fig. 5. Since the driven carrier 14 scarcely undergoes a lateral vibration as previously noted, there may be used small-sized collector shoes 56 having only a limited range of movement, whereby a good current collecting effect can be attained.

The I-shaped rail 12, as shown in the perspective view of Fig. 8, is formed of aluminum or other material by extrusion. Recessed portions 18a for a rail connecting plate are formed along the longitudinal direction in both side faces of a web 18, and pressure-mounting projections 17 for the rail hanger means and for the power supplying and signalling bus bars supporting means are formed along the longitudinal direction of the side faces of the web 18 on the opposed faces of upper and lower flanges 12c

which form a running surface 12a for the wheels of the monorail travelling conveyor and guide surfaces 12b for the guide rollers of the conveyor.

On both side faces of the web 18 are provided many reference lines 18b for drilling along the longitudinal direction.

Referring now to Figs. 9 and 10, which are a side view and a front sectional view, respectively, there is shown the rail 12 as suspended and fixed by rail hanger means 60. More specifically, a rail fixing member 61 provided at the tip end portion of the rail hanger means 60 which is fixed to the ceiling is brought into abutment with the outer surfaces of one projections 17 of the rail flanges 12c, then bolts 63 are each inserted through a bolt hole 62 of the rail fixing member 61 into a threaded portion 65 of a patch plate 64 which is partially fitted in the concave portions formed between the side face of the web 18 and the projections 17, and then tightened, whereby both side faces of the projections 17 of the rail flanges 12c are gripped by the rail fixing member 61 of the rail hanger means 60 and the patch plate 64 to thereby fix the rail 12 to the rail hanger means 60.

The patch plate 64 is first sideways disposed on a side face of the web 18 and then turned to a predetermined position, as shown in Fig. 11.

Referring now to Figs. 12 and 13, there is shown a coupled state of rail sections of which are a side view and a front sectional view, respectively, there is shown a coupled state of rail sections of the rail 12. More specifically, a rail connecting plate 70 which spans both rail sections of the rail 12 is fitted in the rail connecting plate fitting recessed portion 18a formed on a side face of the web 18, and two patch plates 71 are disposed on the other side face of the web 18, then bolts 72 are inserted through bolt holes 73 and 74 respectively formed in the rail connecting plate 70 and the rail web 18 into threaded portions 75 of the patch plates 71, and then tightened, whereby the rail web 18 is gripped by the rail connecting plate 70 and the patch plates 71 to thereby join the rail sections. The numeral 76 denotes a mounting space for the connector fitting for connection of power supplying and signalling bus bars formed in each rail section. Since the drilling reference lines 18b are provided on the side faces of the web 18 along the longitudinal direction, it is very easy to machine the rail connecting bolt holes 74, etc.

Both ends of the load bar 15 are supported by the pins 29 and 39 which are supported at the respective both ends by the frames 20 and 35, respectively, as previously noted. This mounting provides a highly strong resistance against the inertia force of the conveyance article induced at the time of sudden stopping and also against a bending moment applied to the pins 29 and 39 due to the conveyance load at a sloped portion of the rail.

In the case of suspending a conveyance article by a hanger attached to the load bar 15, the hanger is supported by the load bar 15 through a ball bearing. In this case, the pins 29 and 39 act as

both end-supported beams, so can maintain a sufficient strength even against a sharp curve, and the surface pressure of the guide rollers 27 and 38 is reduced remarkably and their life much prolonged.

Referring now to Fig. 14, which is a sectional view of a principal portion for supporting the conveyance article holding means by a spherical bearing, in which the conveyance article holding means 16 such as a chain block or hoist is supported in a suspended state through a suspending connection pin 81 by a spherical bearing 80 which is attached to the conveyance article holding means suspending portion of the load bar 15. According to this construction, in the case of hoisting a conveyance article by means of a hoist or the like and conveying it, even if an excessive lateral load induced by a centrifugal force is exerted on the hoist and the conveyance article during travelling on a curved rail portion, the load can be absorbed by the spherical bearing 80 attached to the load bar 15, so that no excessive load is applied to the guide rollers, wheel, rail, load bar, connection pin, etc. Consequently, these members are prevented from being deformed or damaged, and a smooth and stable running is ensured even at curved rail portions.

Reference will now be made to the method of detaching the conveyor of the present invention from the rail. As shown in Figures 15 through 18, in part of the lower portion of the rail 12 is formed a notched portion 90 of a size which permits the lower portion of the carrier to move out therefrom sideways of the rail 12. In the notched portion 90, a rail piece 91 corresponding to the notched portion 90 is fixed with bolts 93 to a mounting plate 92 which is fixed to one side of the web 18 in the position of the notched portion 90. According to this construction, when the driving and driven carriers 13 and 14 are to be detached from the rail 12, first the rail piece 91 is removed from the rail 12, then those driving and driven carriers after removal therefrom of the conveyance article holding means 16 such as an electrically operated chain block or hoist and the load bar 15 are each successively brought into the position of the notched portion 90 of the rail 12, and the carrier now located in that position is moved sideways, whereby the driving and driven carriers 13 and 14 can each be detached from the rail 12. The carriers 13 and 14 can be loaded onto the rail 12 in accordance with operations reverse to the operations just described.

Claims

1. An overhead travelling conveyor including a monorail which comprises
 - a rail (12) of I-shaped section;
 - driving and driven carriers (13, 14) adapted to travel on the monorail each through a single cylindrical wheel (22, 36) formed of rubber or synthetic resin;
 - a load bar (15) supported at both ends thereof pivotably through vertical pins (29, 39) which are

fixed at the respective opposite ends to frames (20) of the driving and driven carriers;

guide rollers (26, 27, 37, 38) on each carrier (13, 14), positioned to engage the edges of the top and bottom flanges of the I-shaped rail in front of and behind the wheels;

transmission means (31, 32) for connecting the wheel axle of the driving carrier to a motor (30) through a toothed belt (33);

bus bars (40) vertically arranged and supported by a side face of the monorail; and

current collectors (57) fixed to the frame of the driven carrier, the current collectors being in elastic contact with sliding contact faces of the bus bars; characterized in that

the top and bottom flanges of the I-shaped monorail (12) have projections (17) forming recesses on both sides of the monorail for engagement by rail connecting plates (70), rail hanger means (60) and bus bar supporting means (42) which are clamped therein.

2. An overhead travelling conveyor according to claim 1, further including

a spherical bearing (80) attached to a portion of the load bar (15) to support article holding means (16).

3. An overhead travelling conveyor according to claim 1 or claim 2, further including

a notched portion (90) formed in part of the lower portion of the monorail (12), of a size which permits the lower portion of each carrier to be removed sideways from the monorail, and

a rail piece (91) for insertion in the notched portion (90) to maintain the continuity of the rail (12).

Patentansprüche

1. Einschienen-Deckenrollförderer mit einer Schiene (12) mit einem I-förmigen Querschnitt;

angetriebenen und geschleppten Trägern (13, 14), die jeweils mit Hilfe eines einzigen zylindrischen Rades (22, 36) aus Gummi oder Synthetikharz auf der Einzelschiene laufen;

einer Laststange (15), die an beiden Enden mit Hilfe von vertikalen Bolzen (29, 39) schwenkbar gestützt ist, wobei die Bolzen an den jeweils gegenüberliegenden Enden an Rahmen (20) der angetriebenen und geschleppten Träger befestigt sind;

Führungsrollen (26, 27, 37, 38) an jedem Träger (13, 14), die so angeordnet sind, daß sie die Ränder der oberen und unteren Flansche der I-Schiene vor und hinter den Rädern berühren;

Übertragungsmitteln (31, 32) zum Verbinden der Radachse des angetriebenen Trägers mit einem Motor (30) mit Hilfe eines Zahnriemens (33);

Stromschienen (40), die vertikal übereinander angeordnet und von einer Seitenfläche der Einzelschiene gestützt sind; und

Stromsammlern (57), die an dem Rahmen des angetriebenen Trägers befestigt sind und mit den Schleifkontaktflächen der Stromschienen in elas-

tischem Kontakt stehen; dadurch gekennzeichnet, daß

die oberen und unteren Flansche der I-förmigen Einzelschienen (12) Vorsprünge (17) aufweisen, die auf beiden Seiten der Einzelschiene Taschen zum Eingriff von Schienenverbindungsplatten (70), Schienenaufhängemitteln (60) und Stromschienenstützmitteln (42) bilden, die darin geklemmt werden.

2. Deckenrollförderer nach Anspruch 1, der zusätzlich ausgestattet ist mit

einem sphärischen Lager (80), das an einem Abschnitt der Laststange (15) angebracht ist, um Haltemittel (16) für Artikel zu stützen.

3. Deckenrollförderer nach Anspruch 1 oder 2, der zusätzlich ausgerüstet ist mit

einem ausgeklinkten Abschnitt (90), der in einem Teil des unteren Abschnitts der Einzelschiene (12) gebildet ist und eine GröÙe aufweist, die dem unteren Abschnitt jedes Trägers gestattet, seitlich aus der Einzelschiene entfernt zu werden, und

einem Schienenstück (91) zum Einsetzen in den ausgeklinkten Abschnitt (90), um die Stetigkeit der Schiene (12) zu erhalten.

Revendications

1. Transporteur aérien comportant un monorail qui comprend:

un rail (12) à section transversale en forme de I; un porteur d'entraînement et un porteur entraîné (13, 14) conçus pour se déplacer sur le monorail, chacun à l'aide d'une roue cylindrique unique (22, 36) faite en caoutchouc ou en une résine synthétique;

une barre porteuse (15) supportée à ses deux extrémités par des tiges verticales (29, 39) sur lesquelles elle peut pivoter et qui ont chacune une extrémité fixée respectivement aux cadres (20) du porteur d'entraînement et du porteur entraîné;

des rouleaux de guidage (26, 27, 37, 38) sur chaque porteur (13, 14) disposés pour s'engager sur les bords des brides supérieures et inférieures du rail en forme de I à l'avant et à l'arrière des roues;

un moyen de transmission (31, 32) permettant de relier le moyeu de la roue du porteur d'entraînement au moteur (30) par l'intermédiaire d'une courroie dentée (33);

des barres conductrices superposées verticalement (40) et tenues par une face latérale du monorail; et

des collecteurs de courant (57) fixés sur le cadre du porteur entraîné, les collecteurs de courant étant en contact élastique avec les faces de contact glissantes des barres conductrices; caractérisé en ce que:

les brides supérieures et inférieures du monorail en forme de I (12) ont des projections (17) formant des creux sur les deux côtés du monorail pour l'engagement et le serrage des plaques de connection du rail (70), des moyens de suspension du rail (60) et des moyens de support des barres conductrices (42).

2. Transporteur aérien selon la revendication 1 comportant en outre

un palier sphérique (80) fixé à une portion de la barre porteuse (15) pour supporter le moyen pour tenir l'article (16).

3. Transporteur aérien selon la revendication 1 ou la revendication 2 comportant en outre une portion découpée (90) formée dans la

partie inférieure du monorail (12) d'une taille permettant à la portion inférieure de chaque porteur d'être enlevée latéralement du monorail (12) et

5 une pièce de rail (91) s'insérant dans la portion découpée (90) pour assurer la continuité du rail (12).

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FIG. 1

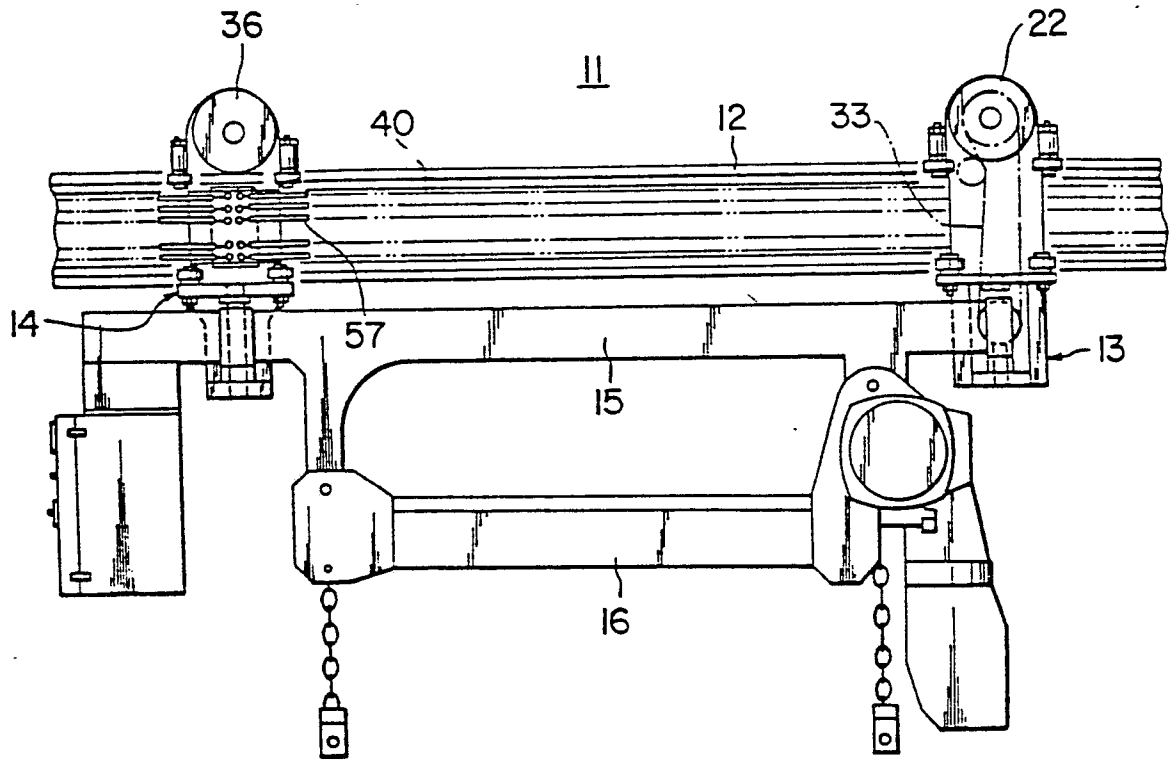


FIG. 2

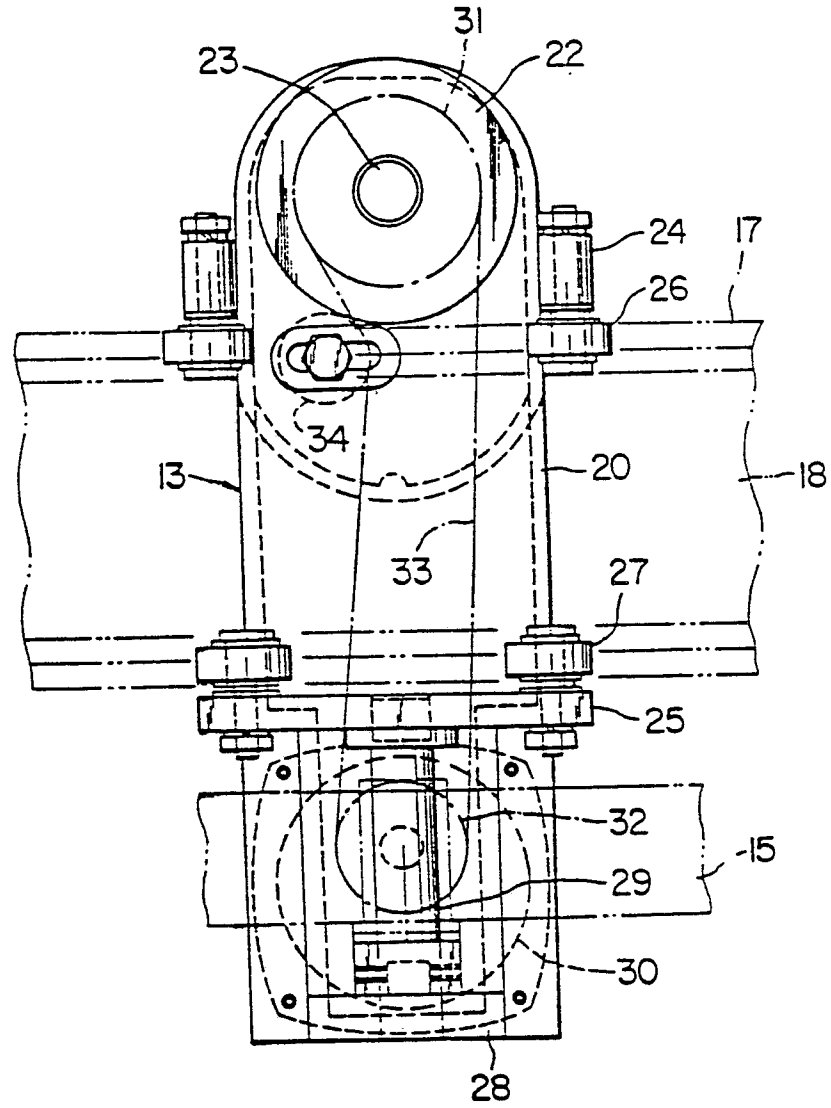


FIG. 3

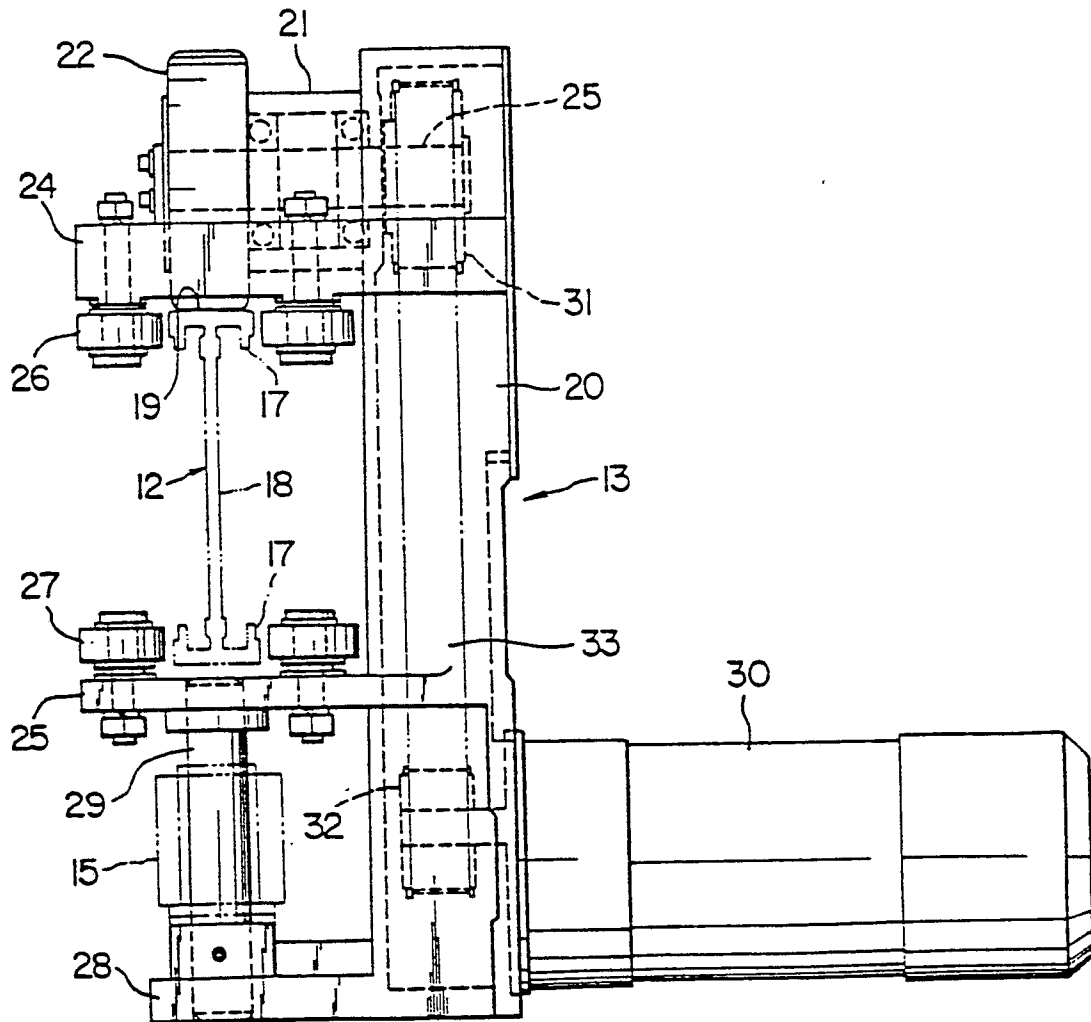


FIG. 4

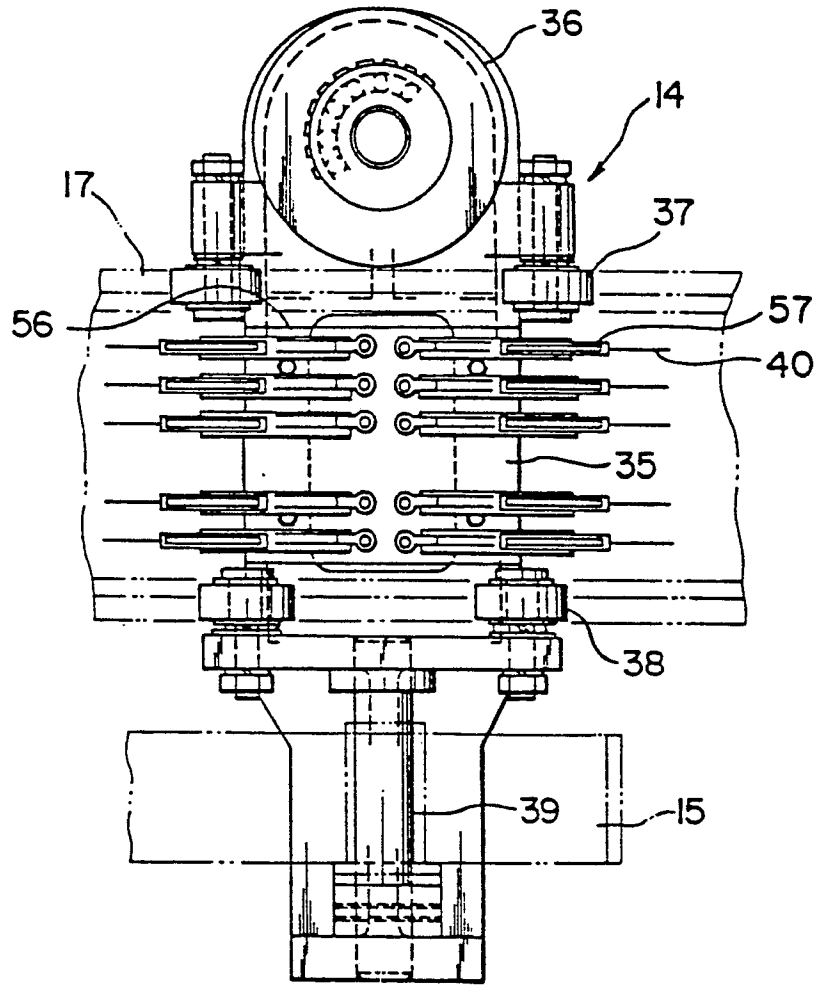


FIG. 5

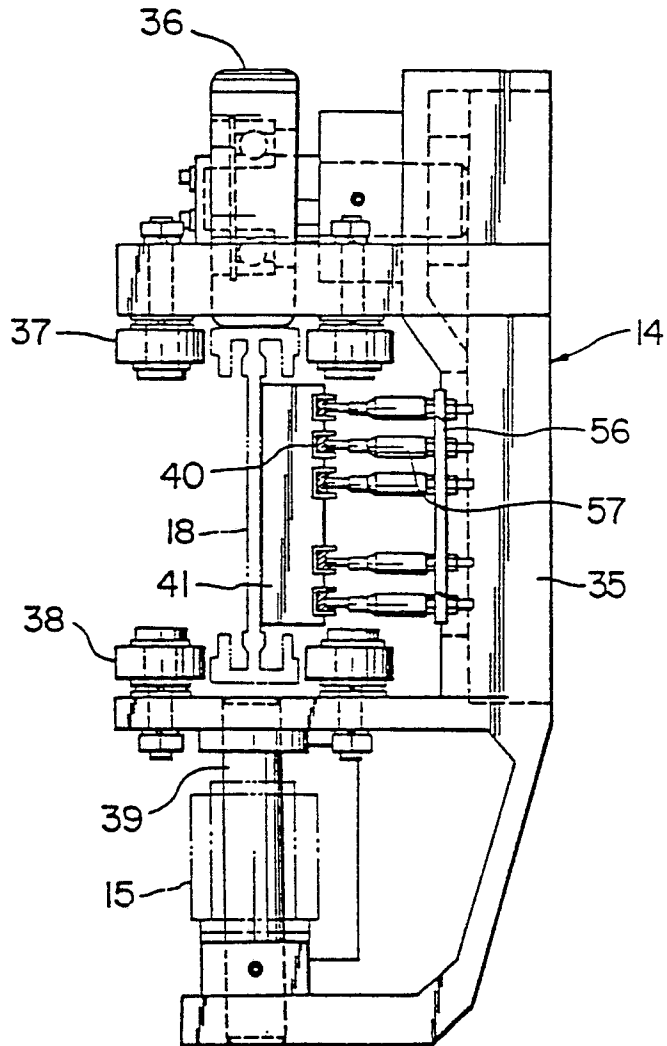


FIG. 6

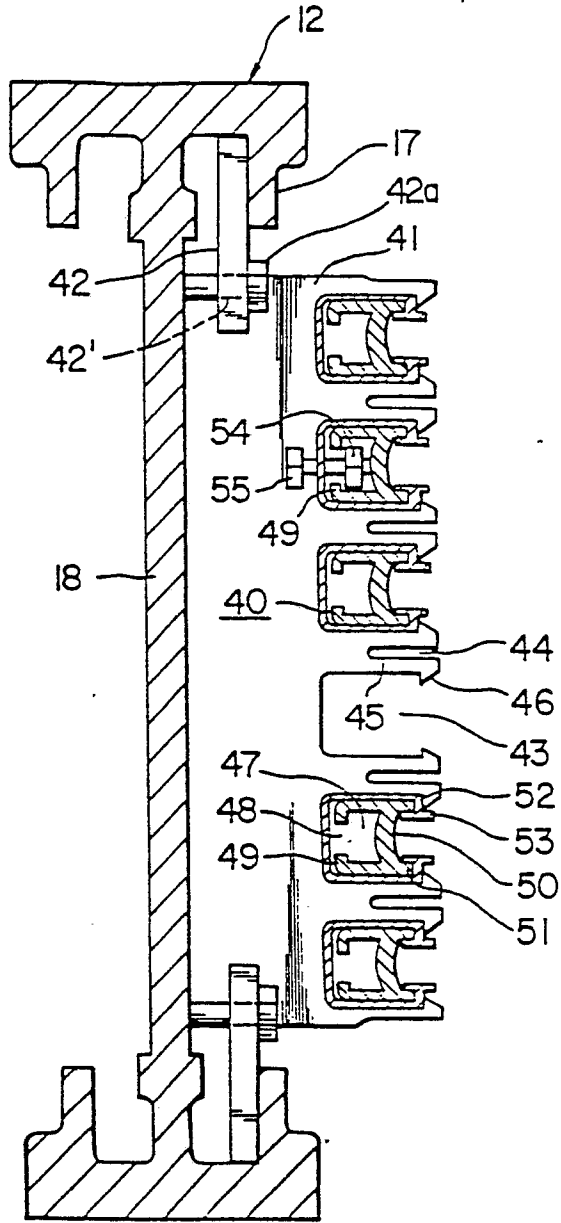


FIG. 7

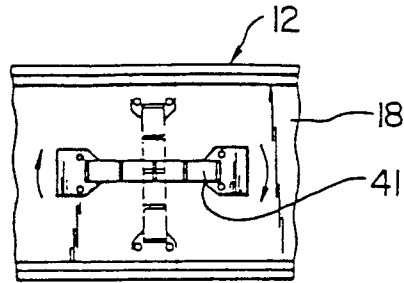


FIG. 8

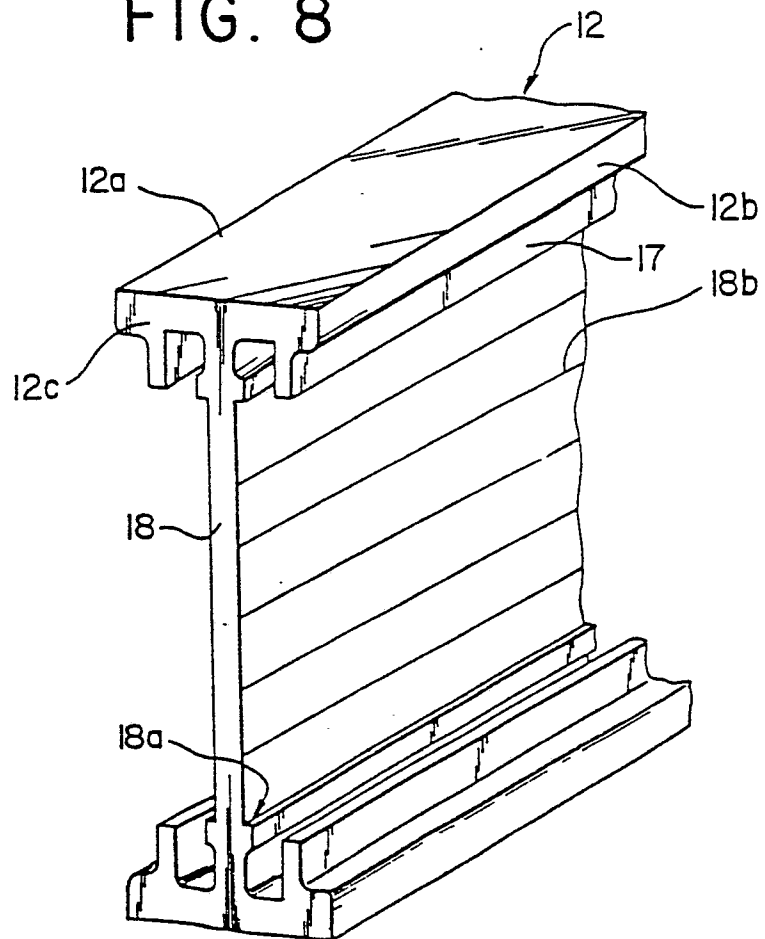


FIG. 9

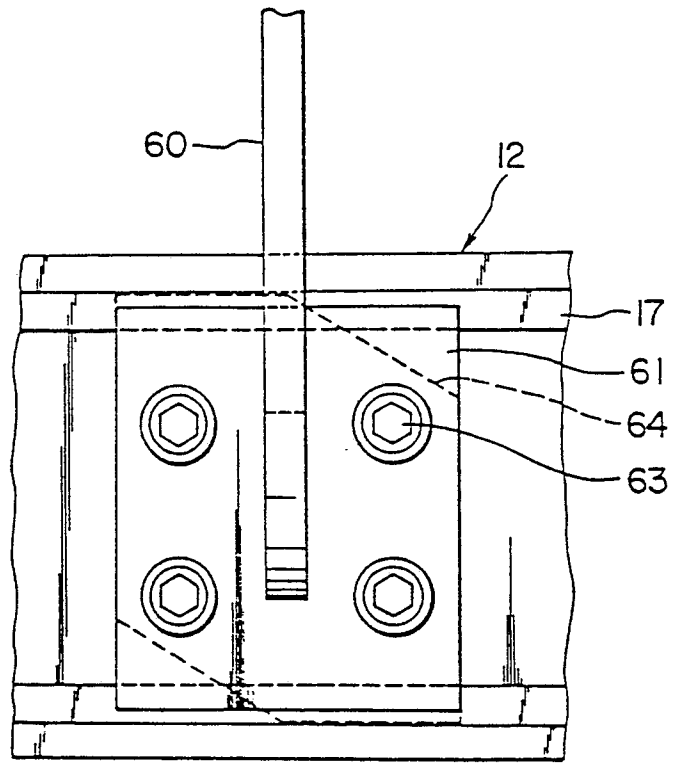


FIG. 10

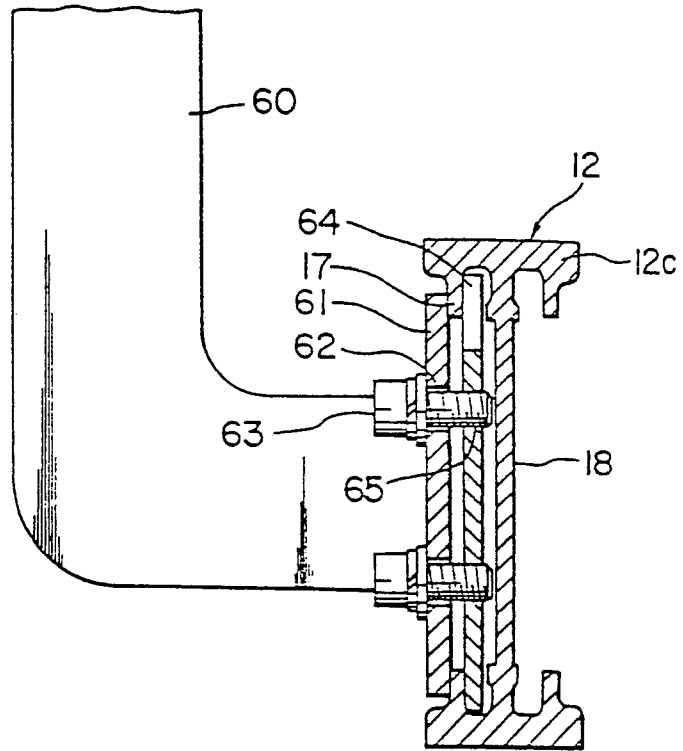


FIG. 11

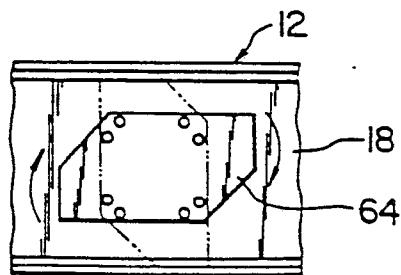


FIG. 12

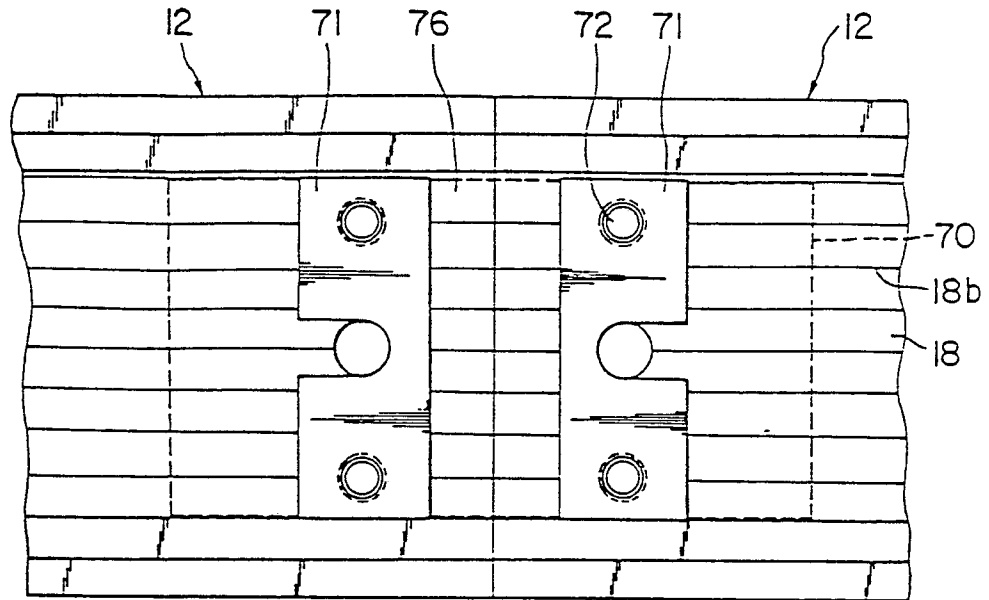


FIG. 13

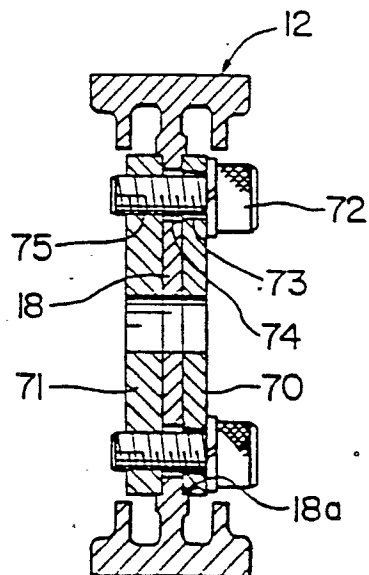


FIG. 14

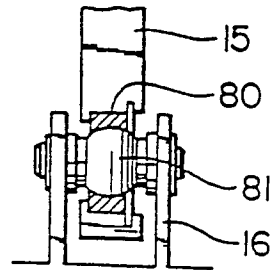


FIG. 15

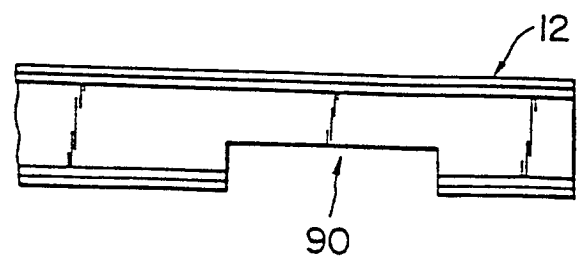


FIG. 16



FIG. 17

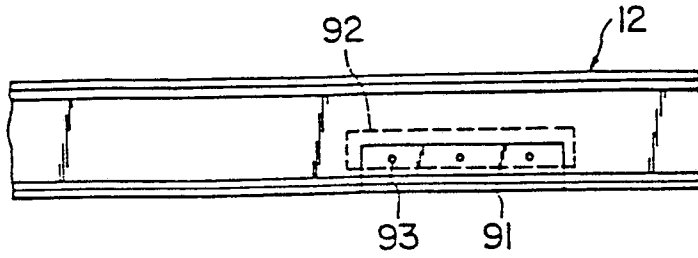


FIG. 18

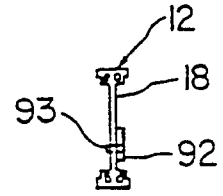


FIG. 19

