

Oct. 28, 1941.

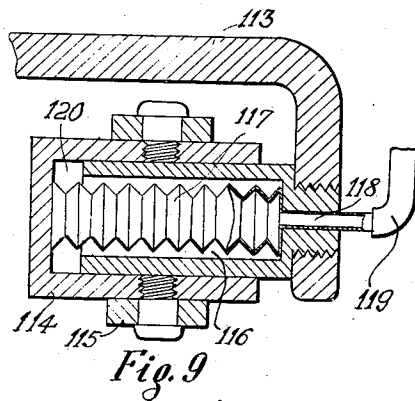
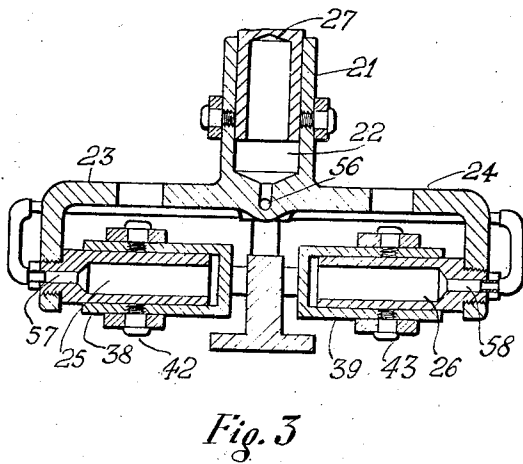
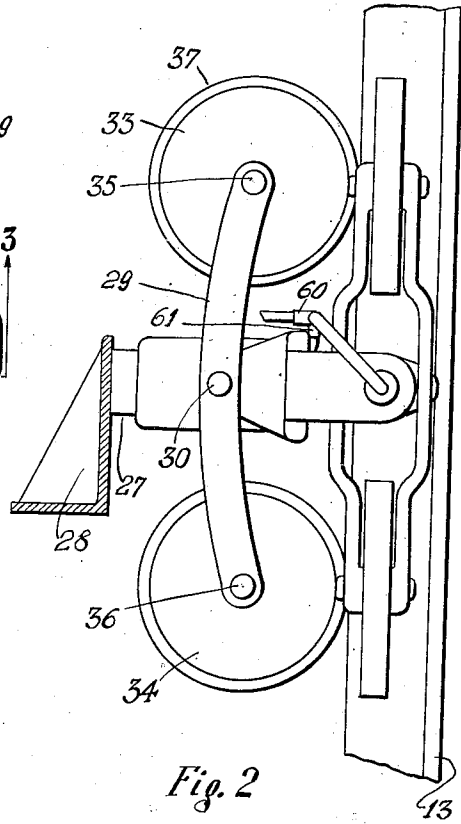
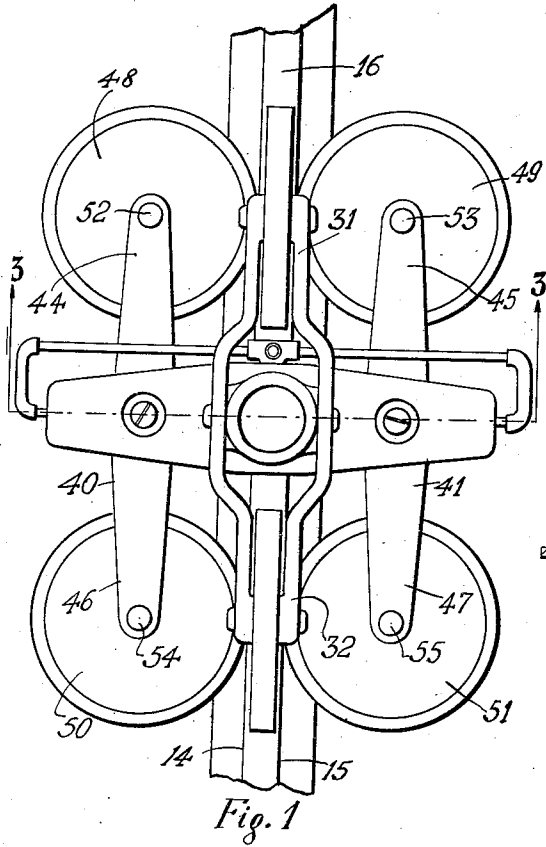
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2,260,922

FLUID CONTROLLED GUIDE FOR ELEVATOR CARS

Filed July 6, 1940

4 Sheets-Sheet 1



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FLUID CONTROLLED GUIDE FOR ELEVATOR CARS

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4 Sheets-Sheet 2

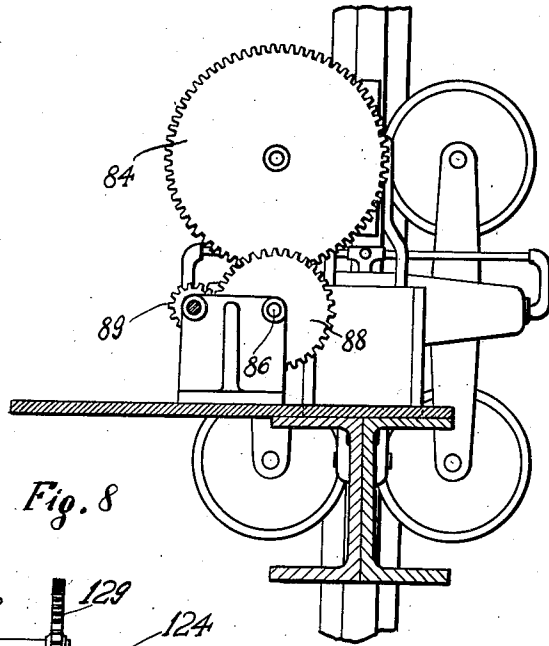


Fig. 8

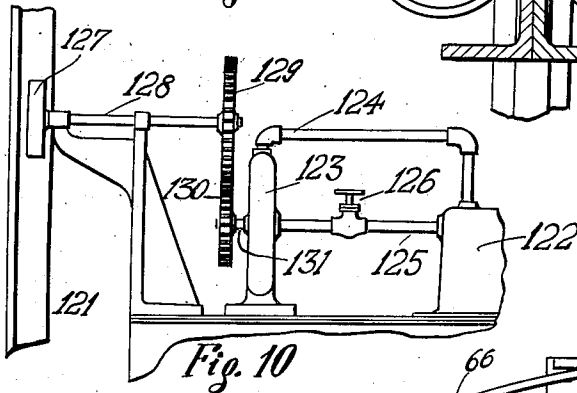


Fig. 10

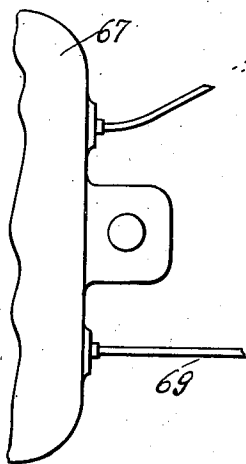
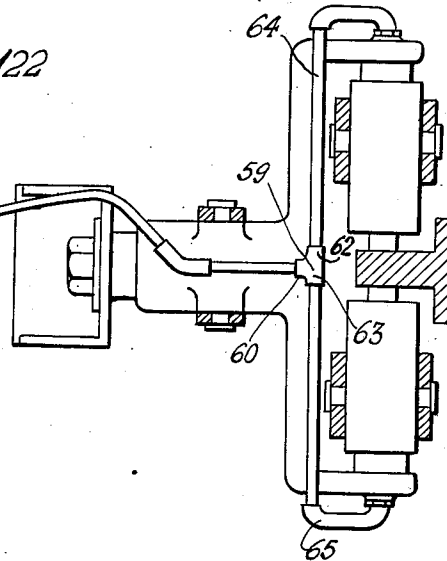


Fig. 4



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FLUID CONTROLLED GUIDE FOR ELEVATOR CARS

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4 Sheets-Sheet 3

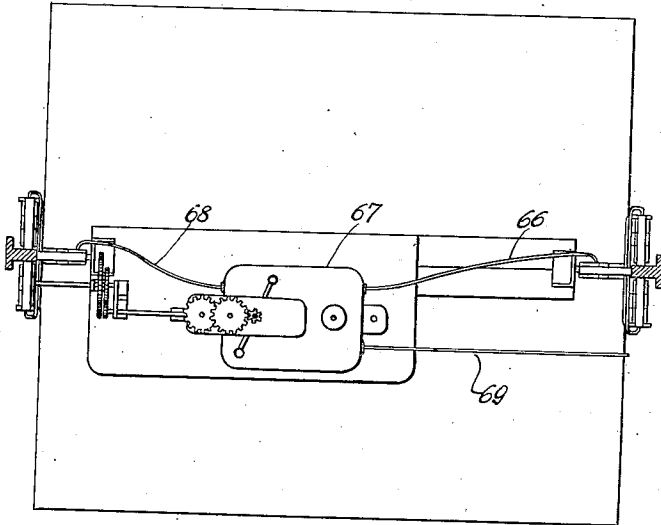


Fig. 6

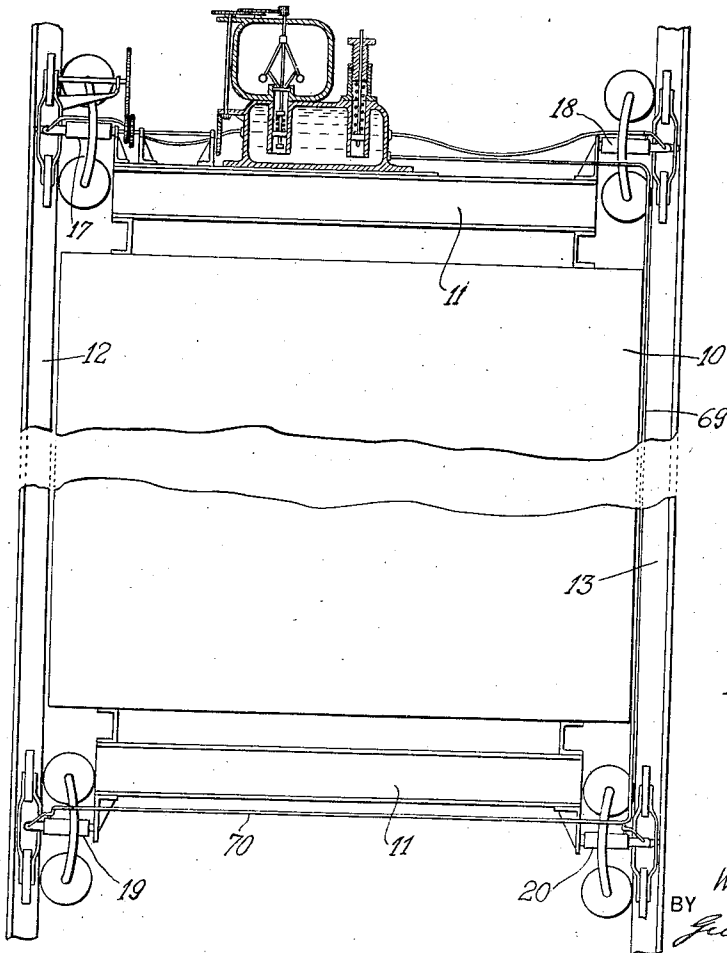


Fig. 5

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FLUID CONTROLLED GUIDE FOR ELEVATOR CARS

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4 Sheets-Sheet 4

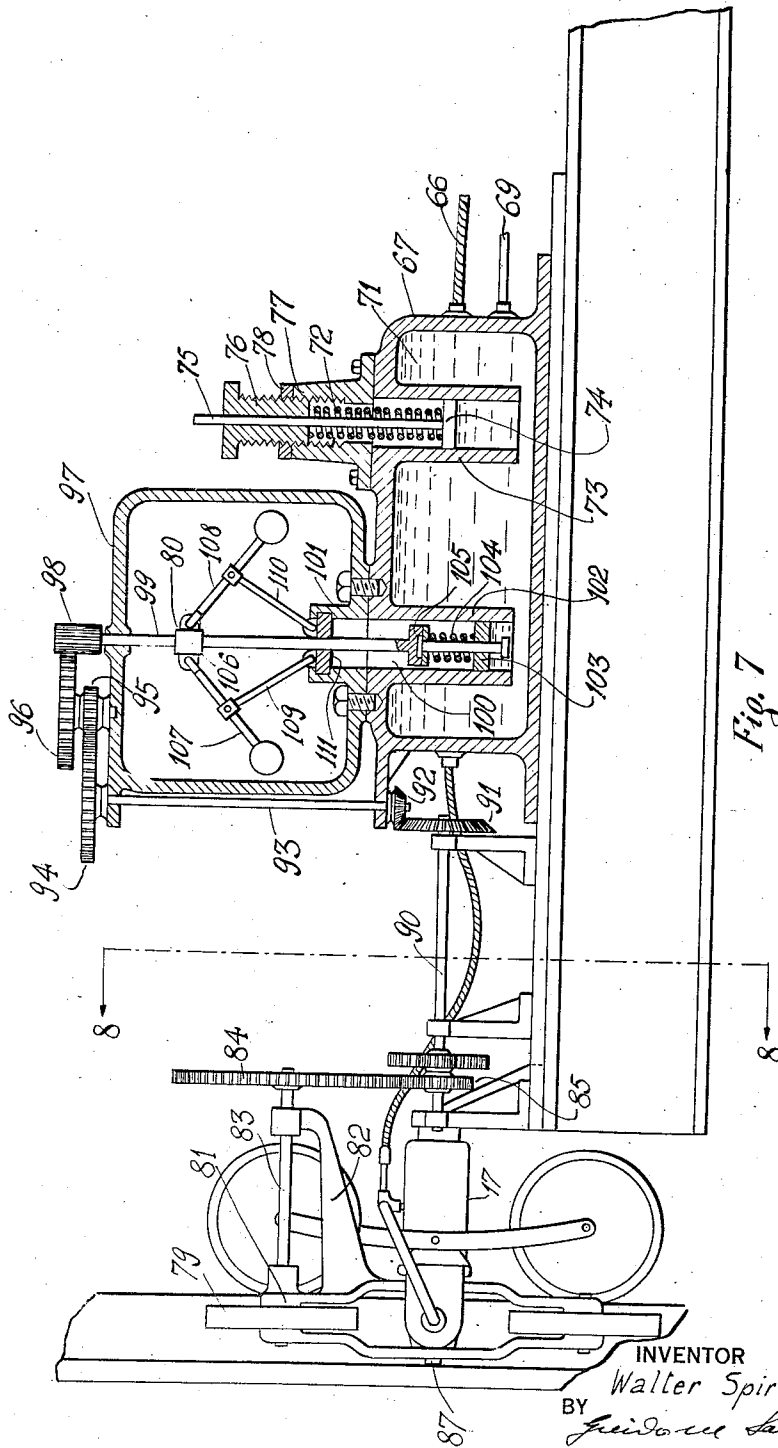


Fig. 7

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UNITED STATES PATENT OFFICE

2,260,922

FLUID CONTROLLED GUIDE FOR ELEVATOR CARS

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Application July 6, 1940, Serial No. 344,258

13 Claims. (Cl. 187—95)

This invention relates to elevators, and more particularly refers to improvements in rail guides for use on elevator cars.

Elevator cars are commonly provided with guides for cooperating with the guide rails in guiding the car in its movement in the shaftway. Whether the guides are of the sliding shoe or of the roller type, they always include resilient means to hold the guide members in contact with the guide rail, a mechanical spring being commonly used for this purpose.

In many elevator installations, the guide rails are not perfectly straight and smooth, so that with solid guide shoes there is a tendency for the car to sway as it travels up and down the shaftway, this tendency being more pronounced as the speed of the car increases.

The advent of the high speed elevator has made it desirable to employ guides of the roller type in preference to the sliding shoe type, especially guides where provisions are made for the automatic compensation of the bends and irregularities which may be present in the guide rails.

A roller guide of the automatic compensation type has been described and claimed by me in a copending application entitled Roller guides for elevator cars, filed May 27, 1940, Serial No. 337,477.

In said guide a good contact between the rollers and the guide rail is maintained by the action of springs pressing against the roller bearing elements. However, this is not an ideal method, because, in the first place, if the several springs are not adjusted to substantially equal tension, there will be a tendency to throw the car to one side or another, and, secondarily, the inertia of a mechanical spring may prevent it from acting with sufficient promptness to avoid chattering.

The primary object of the present invention is to provide a novel and improved method of controlling the contact pressure between the guiding elements and the guide rails, whereby equalization of the pressure in all the guides will be automatically assured.

Another object is to provide, in an elevator guide, an improved system of guide member control, whereby sudden movements of one or another of the guide members may be absorbed by deformation of much smaller amplitude, of the resilient pressure exerting means, which may thus be instantly responsive to exert a compensating pressure upon the other guide members in order to maintain a constant contact between the guides and the guide rails.

A further object is to provide, in an elevator car, a system of guides in which all the guides are interconnected by fluid transmission means, causing pressure originating from a single source

to be equally exerted upon all the guides without the necessity of separate adjustment.

A still further object is to provide a novel and improved arrangement of guides in an elevator car, whereby the pressure exerted by the guides against the guide rail is responsive to variations in the speed of the car, said pressure increasing or decreasing with the increase or decrease of the traveling speed.

Other objects and advantages of the present invention will more fully appear as the description proceeds and will be set forth and claimed in the appended claims.

My invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a front view in elevation of an elevator rail guide embodying my invention;

Fig. 2 is a side view in elevation thereof;

Fig. 3 is a horizontal section of the guide and rail through line 3—3 of Fig. 1;

Fig. 4 is a plan view of the same, partly sectioned, showing the connections between said guide and a reservoir of liquid under pressure;

Fig. 5 is a front view in elevation, partly broken away, of an elevator installation embodying my invention;

Fig. 6 is a plan view thereof;

Fig. 7 is a fragmentary view in elevation of the same, partly sectioned, illustrating a possible arrangement for maintaining under pressure a body of liquid controlling the action of the guides;

Fig. 8 is a fragmentary vertical section of the same through line 8—8 of Fig. 7;

Fig. 9 is a fragmentary horizontal section through one of the yoke-carrying ends of a guide frame, embodying my invention in an alternative form; and

Fig. 10 is a fragmentary view in elevation illustrating an alternative arrangement for varying the pressure of the liquid according to the speed of the elevator car.

My invention essentially consists in providing a novel method of controlling the guides with which an elevator car is equipped, whereby two main advantages may be realized; namely, (1) all the guide elements included in the system will be automatically urged against the surfaces of the guide rails with the same pressure without the necessity of separately adjusting the pressure for each guide element; and (2) the deformations induced in the resilient pressure exerting means employed, due to bends or irregularities in the guide rails, will be greatly reduced as against those which would take place in a guide of the usual type where springs are employed to press directly against the guide elements.

The resulting condition causes the system to be instantly responsive to correction, insuring smooth and noiseless operation of the car.

If desired, the pressure in the central reservoir

may be rendered responsive to variations in the speed of the elevator car; thus, it is possible to hold the guide elements under more or less pressure as the car moves faster or slower, even to the point of causing the guides to act as a brake in case the car speed becomes excessive.

Referring to Figs. 1 to 8, 10 designates an elevator car, carried by a car sling 11, said car traveling between two guides rails 12, 13.

The guide rails shown are of the customary T-shape and have side surfaces 14, 15, and an end surface 16 for cooperation with the guides 17, 18, 19, 20, mounted on the upper and lower cross members of the car sling to guide the car in its movement in the shaftway.

Except for a possible modification of one of the guides, which will be described later, all the guides are of identical construction and, therefore, the description in detail of only one guide will be sufficient to convey an understanding of the working of the entire system.

In the particular embodiment of the invention shown, the guides employed are of the roller type, these being preferable to the solid sliding shoe type of guide under modern high speed elevator conditions.

Referring more particularly to Figs. 1 to 4, it will be seen that the guide therein illustrated comprises a frame consisting of a central hub portion 21 bored to form a cylinder chamber 22, and an elongated member integral with said frame extending at each side thereof to form goose-neck portions 23, 24. Each goose-neck portion has an inwardly directed stationary hollow piston member 25, 26, said two piston members being coaxial with each other, having their common axis directed at right angles to the axis of the hub portion 21. In operation the hub portion 21 registers with and is carried by a stationary hollow piston member 27 outwardly extending from a support, such as 28, mounted on the car sling.

The hub portion 21 carries a yoke 29, pivotally connected to said hub portion at 30, said yoke having upwardly and downwardly extending bifurcated arms 31, 32, carrying wheels or rollers 33, 34, respectively, rotatably mounted at 35, 36. Said wheels or rollers are preferably equipped with tires 37, made of rubber or other resilient material.

Each hollow piston member 25, 26 carries a cylinder member 38, 39, slidably mounted thereon, and each of said cylinder members 38, 39 carries a yoke 40, 41, pivotally mounted on said cylinder at 42, 43.

Said yokes 40, 41 have upwardly extending bifurcated arms 44, 45, and downwardly extending bifurcated arms 46, 47, carrying wheels or rollers 48, 49, 50, 51 mounted at the end of said arms at 52, 53, 54, 55.

It will be observed that wheels or rollers 33, 34 are arranged in a vertical plane passing through the axis of hub portion 21, while wheels 48, 49, 50, 51 are arranged in a vertical plane passing through the axis of pistons 25, 26. Suitable means (not shown) will, of course, be provided to maintain the yokes in their proper alignment, so that wheels or rollers 33, 34 will ride against the end surface 16 of the guide rail and wheels 48—50, 49—51 will ride against side surfaces 14, 15 of the guide rail, respectively.

The piston-cylinder assemblies mentioned form part of a fluid control system, the object of which is to maintain the guide elements, that is, in this case the various wheels or rollers mentioned in

constant contact with the surfaces of the guide rails.

To this end, cylinder bore 22 is provided with an inlet 56, and hollow pistons 25, 26 are each provided with an inlet 57, 58; said inlets may be connected to a suitable source of fluid under pressure by tubular connections, such as shown in detail in said Figs. 1 to 4.

Said tubular connections comprise a multiple branch fitting 59, having a rearwardly extending inlet 60, downwardly extending outlet 61, and two laterally directed oppositely extending outlets 62, 63. Outlet 61 is connected to inlet 56 of cylinder bore 22 and outlets 62, 63 are connected by tubular connections 64, 65, respectively, to inlets 57, 58, of stationary pistons 25, 26.

The inlet 60 of said fitting 59 is connected by a tubular connection, including flexible section 66, to a central reservoir 67 containing the fluid under pressure used to force the movable members of the piston-cylinder assemblies outwardly. Other tubular connections, such as shown at 68, 69, extend from said reservoir to convey the fluid under pressure to the other guides 17, 20, and a branch connection 70 extends from connection 69 to convey the fluid under pressure to guide 19, as shown in Figs. 5 and 6.

For the sake of simplicity in both design and operation, as a fluid medium I prefer to use a liquid such as oil, for instance, a predetermined pressure being maintained upon the body of liquid by means of a weight, a spring, a pump, or any other suitable means.

In the drawings, I illustrate an arrangement in which the body of liquid 71, contained in reservoir 67, is maintained under a suitable pressure by means of a spring 72. To this end, the top of the reservoir is formed with a downwardly directed cylindrical extension 73, in which is snugly inserted piston 74 carried by a vertically extending piston rod 75, passing through the bore of a threaded plug member 76, mounted in a bushing 77 coaxial with cylindrical extension 73 and upwardly extending from the top of reservoir 67.

Spring 72 bears against piston 74 with a pressure which may be regulated by axial adjustment of plug member 76 with respect to bushing 77, a lock nut 78 being used to hold the plug in its set position.

It is, of course, to be understood that the entire space in the hydraulic system beyond piston 74 is filled with liquid, said space comprising the chamber of the reservoir itself, the chambers of piston members 25, 26, 27, and the extended portions of the cylinder members cooperating therewith, and the tubular connections between said cylinder-piston assemblies and the reservoir.

The bore of cylindrical extension 73 of the reservoir is preferably of a considerably larger diameter than the bores in the cylinder members of the guides, so that any axial displacement of any one of said cylinder members will result in a smaller axial displacement of piston 74 and, therefore, a relatively small deformation of the spring 72.

It will be seen that by causing the central reservoir to communicate with the cylinders of all four of the guides commonly used on an elevator car, the pressure in all of the guides will be equalized without the necessity of separate adjustment. Furthermore, any axial displacement of any one of the cylinders will be instantly translated by the fluid system into correspond-

ing deformation of the pressure exerting spring and an equalization of the pressure exerted by the liquid against all the other cylinders. The fact that the deformations of the pressure exerting spring are reduced in amplitude as compared with the axial movements of the various cylinders, causes the system to be still more responsive because the necessity of overcoming the inertia of the spring is correspondingly reduced.

As stated in the premises, if for any reason it should be desirable to cause the pressure in the system to be responsive to variations in the speed of the elevator car, suitable arrangements may be made. For instance, by way of example, in the drawings I illustrate an arrangement in which one of the wheels or rollers 79 of guide 17 is operatively associated with a centrifugal governor device 89, adapted to increase or decrease the pressure on the liquid body contained in the reservoir 67 with the increase or decrease in the car speed.

In the arrangement illustrated, the yoke 81, carrying wheel or roller 79, is formed with a bracket 82, providing an outer support for shaft 83 extending from wheel or roller 79, said shaft carrying a gearwheel 84. Referring more particularly to Figs. 7 and 8, it will be seen that said gear 84 is in mesh with a pinion 85 mounted on a shaft 86, coaxial with the pivotal support 87 of yoke 81. Therefore, any rocking movement of said yoke about its pivotal support will not disturb the operative connection between gearwheel 84 and pinion 85, and any such small axial displacement of the cylinder member carrying yoke 81 as may occur will also not disturb said operative connection.

Shaft 86 also carries a gearwheel 88, meshing with another pinion 89 carried by a shaft 90, said shaft 90 carrying at its inner end a conical gearwheel 91 meshing with a conical pinion 92, carried by a vertically extending shaft 93.

At its upper end said shaft 93 carries a gearwheel 94, meshing with a pinion 95 integral with another gearwheel 96, said couple 95—96 being rotatably mounted on top of a frame 97, gearwheel 96 meshing with a pinion 98, carried by a governor shaft 99, rotatably mounted in said frame 97.

Said shaft 99 extends downwardly to and within a cylindrical chamber 100, formed by the base 101 of frame 97 and by a cylindrical part 102 downwardly extending from the top of the reservoir.

Within chamber 100 is snugly inserted a piston 103 which is pressed downwardly by a spring 104 interposed between said piston and the head 105 formed at the lower end of shaft 99.

Shaft 99 carries the centrifugal governor device 80, comprising a collar 106 fixed on said shaft, two weighted arms 107, 108, swingably depending from said collar and two links 109, 110, connecting said arms to a rotatable member 111, suitably restrained against axial movement.

Besides being rotatably mounted, shaft 99 is also capable of axial displacement, the pinion 98 carried by said shaft extending sufficiently in an axial direction to insure constant meshing between said pinion and gearwheel 96 between the two limits of axial displacement of said shaft 99.

When the device is at rest the weighted arms 107, 108 will hang down vertically and reacting against links 109, 110 will cause collar 106 and with it shaft 99 to occupy its uppermost position where spring 104 will be extended and will exert a minimum amount of pressure against piston 103.

As with the rotation of wheel or roller 79, occurring during the travel of the elevator car, shaft 99 is caused to rotate, the weighted arms of the governor will gradually extend outwardly, as will be readily understood, and the greater the speed, the wider the angle of displacement of said arms will be. The outward movement of arms 107, 108, due to centrifugal force, will in turn result in a downward movement of shaft 99 which will compress spring 104 and thus increase the pressure exerted against piston 103 as the speed of travel of the elevator car increases.

For exerting the necessary pressure upon the body of liquid, the reservoir may be equipped with only one or the other of the pressure exerting devices described, if desired. Preferably, however, in order to decrease the range of duty of the centrifugal device, the two pressure exerting arrangements should be used in combination, as shown, the governor controlled spring determining only increases dependent upon speed, over and above a minimum pressure permanently exerted by the spring 72.

In order to avoid the necessity of insuring the tightness of the piston-cylinder assemblies by means of packings or other means, the fluid pressure may be exerted against the cylinders by means of closed expansible members, such as, for instance, bellows.

Such a possibility is illustrated in Fig. 9, where 112 designates a hollow stationary piston member extending from one of the ends of frame 113, 114 designates the cylinder member mounted on said piston member and 115 designates the yoke carried by said cylinder member. In the chamber 116 of the piston member is housed an expansible bellows 117, having a tubular inlet 118 connected to the fluid pressure system by a tubular connection 119, said bellows 117 and inlet 118 forming with the fluid system a hermetically closed system. The bellows is of a suitable length so that it will bear against the bottom of chamber 116 of the piston member and the bottom of chamber 120 of the cylinder member when expanded, so that the pressure exerted on the fluid of the fluid system will be transmitted by the bellows to the cylinder member.

In order to cause the pressure in the system to be responsive to variations in the speed of the elevator car, it is, of course, possible to use arrangements different from that previously described. For instance, in Fig. 10 I show a simple arrangement in which the liquid reservoir 122 is connected with a centrifugal pump 123 by means of the discharge pipe 124 and the return pipe 125 of said pump, one of said pipes, for instance, the return pipe, being equipped with a pressure regulating valve 126.

The pump is actuated by a wheel or roller 127 contacting with the guide rail 121, said wheel being mounted on shaft 128, carrying a gearwheel 129 in mesh with pinion 130 mounted on shaft 131 of the pump impeller. It is obvious that the pressure in the reservoir will vary with the speed of the pump impeller for any given setting of the pressure regulating valve.

It is obvious that means other than springs can be used to generate pressure in the body of liquid; also it is obvious that with suitable modifications a gaseous instead of a liquid fluid could be used.

These and other changes are possible in the arrangement described without departing from the inventive idea. The drawings should, therefore,

be understood as being intended for illustrative purposes only and not in a limiting sense.

I, accordingly, reserve the right to carry my invention into practice in all those ways and manners which may enter, fairly, into the scope of the appended claims.

I claim:

1. In an elevator car the combination, with a guide having a plurality of guide members adapted to ride along a guide rail, of a body of fluid under pressure, and permanently open pressure transmitting fluid connections between said body and said guide members, to maintain said guide members in constant contact with said guide rail.

2. In an elevator car the combination, with a guide having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, means for maintaining said liquid under pressure, and permanently open tubular connections between said body of liquid and said guide members, transmitting pressure from the former to the latter.

3. In an elevator car the combination, with a guide having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, resilient means for maintaining said liquid under pressure, and permanently open tubular connections between said body of liquid and said guide members, transmitting pressure from the former to the latter.

4. In an elevator car the combination, with a guide having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, resilient means for maintaining said liquid under pressure, tubular connections between said body of liquid and said guide members, transmitting pressure from the former to the latter, and means for adjusting the pressure exerted by said pressure maintaining means upon said body of liquid.

5. In an elevator car the combination, with a plurality of guides each having a plurality of guide members adapted to ride along a guide rail, of a central body of fluid under pressure, and permanently open fluid connections between said central body and all said guide members, transmitting pressure from the former to the latter.

6. In an elevator car the combination, with a plurality of guides each having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, means for exerting pressure against said liquid, and tubular connections between said body of liquid and all said guide members, transmitting pressure from the former to the latter.

7. In an elevator car the combination, with a plurality of guides each having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, a pressure member for exerting pressure against said liquid, a spring urging said pressure member in the pressure exerting direction, tubular connections between said body of liquid and all said guide members, transmitting pressure from the former to the latter, and means for adjusting the force exerted by said spring against said pressure member.

8. An elevator guide for use in connection with a guide rail having an end riding surface and two side riding surfaces, comprising a C-shaped frame extending across said guide rail, at right angles thereto, the two short legs of said frame being each formed as a hollow stationary piston di-

rected towards one of the two side riding surfaces of said guide rail, a guide member carrying cylinder slidably mounted over each piston, and means for admitting a fluid under pressure to said pistons.

9. An elevator guide for use in connection with a guide rail having an end riding surface and two side riding surfaces, comprising a C-shaped frame extending across said guide rail, at right angles thereto, the two short legs of said frame being each formed as a hollow stationary piston directed towards one of the two side riding surfaces of said guide rail, a cylinder slidably mounted over each piston, a yoke oscillatable in a plane substantially parallel to said end riding surface, carried by at least one of said cylinders, a roller at each end of said yoke, adapted to ride along the side guiding surface faced thereby, a guide member adapted to ride along the other side guiding surface, carried by the other cylinder, and means for admitting a fluid under pressure to said pistons.

10. In an elevator car the combination, with a plurality of guides each having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, means for exerting pressure against said liquid, tubular connections between said body of liquid and all said guide members, transmitting pressure from the former to the latter, and means responsive to the speed of travel of the car, for varying the force exerted by said pressure exerting means against said body of liquid.

11. In an elevator car the combination, with a plurality of guides each having a plurality of guide members adapted to ride along a guide rail, at least one of said guide members having a roller contacting the surface of said guide rail faced thereby, of a body of liquid, means for exerting pressure against said liquid, tubular connections between said body of liquid and all said guide members, transmitting pressure from the former to the latter, and a device operatively associated with said roller, responsive to the speed thereof, controlling the force exerted by said pressure exerting means against said body of liquid.

12. In an elevator car having a plurality of guides each comprising a plurality of guide members adapted to ride along a guide rail, hydraulic means exerting pressure against said guide members to maintain them in permanent contact with said guide rail, and means responsive to the speed of said car for varying the pressure exerted by said hydraulic means against said guide members.

13. In an elevator car the combination, with a plurality of guides each having a plurality of guide members adapted to ride along a guide rail, of a body of liquid, a pressure member for exerting pressure against said liquid, a spring urging said pressure member in the pressure exerting direction, tubular connections between said body of liquid and all said guide members, transmitting pressure from the former to the latter, means for adjusting the force exerted by said spring against said pressure member, a second pressure member for exerting pressure against said liquid, a spring urging said second pressure member in the pressure exerting direction, and means responsive to the speed of said car for varying the force exerted by the latter spring against said second pressure member.

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