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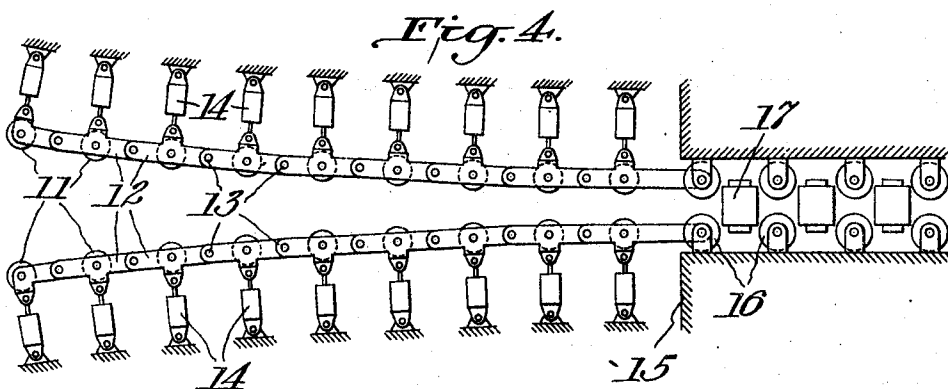
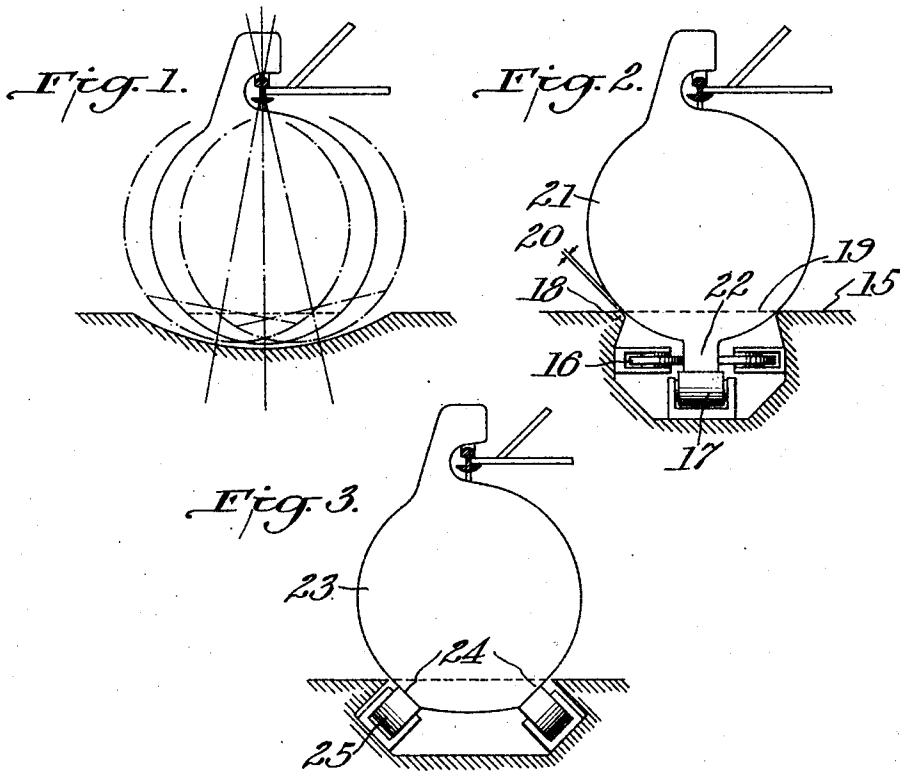
F. KRUCKENBERG ET AL

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ARRANGEMENT FOR GUIDING SUSPENDED HIGH SPEED RAILWAY VEHICLES

Filed April 27, 1928

2 Sheets-Sheet 1



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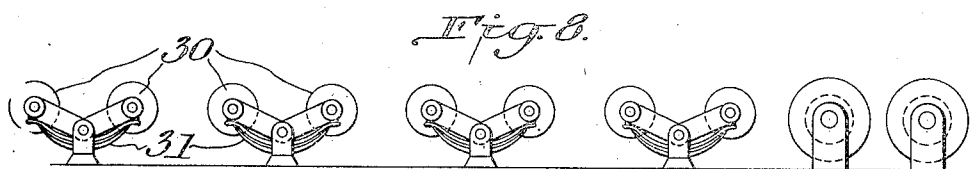
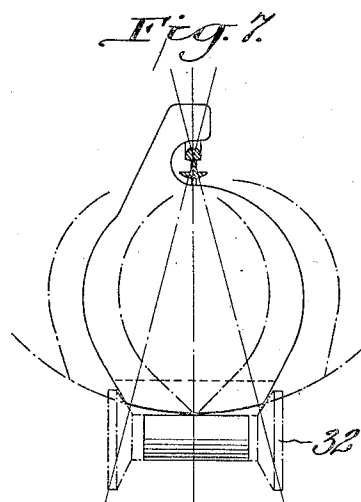
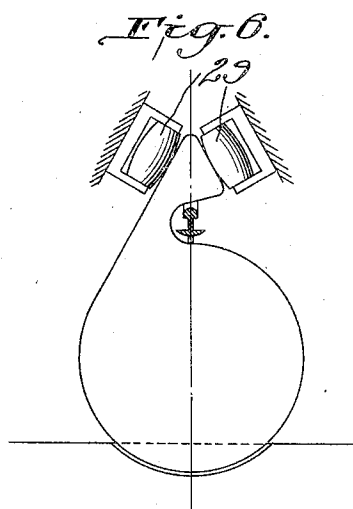
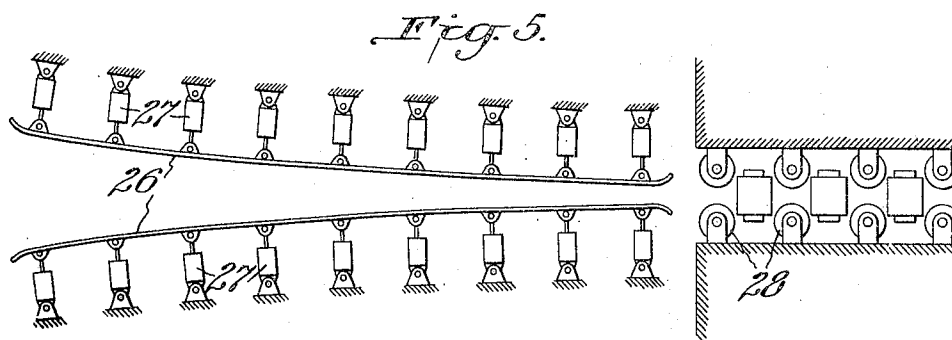
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ARRANGEMENT FOR GUIDING SUSPENDED HIGH SPEED RAILWAY VEHICLES

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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ARRANGEMENT FOR GUIDING SUSPENDED HIGH-SPEED RAILWAY VEHICLES

Application filed April 27, 1928, Serial No. 273,318, and in Germany May 14, 1927.

The vehicles of suspended railways and particularly of high speed suspended railways are so arranged for the purpose of automatic banking on curves that they can swing freely about the upper side of the rail in monorailways or about an axis below the running gear in double rail lines. Owing to this possibility of free swinging the vehicles will naturally swing not only under the influence of centrifugal force, but also under other actions, for example side winds, rail unevennesses and the like. During running on the open line these relatively small swingings are of no special importance and can in general be permitted.

It is different in the stations. A rapid traffic necessitates not only the raising of the running speed to the highest value, but also the reduction of the standing time in the stations to the lowest possible value. The standing in the stations is controlled principally by the time necessary for the exit and entrance of the passengers. Along with the guidance of the traffic on the platform, the number and size of the doors and so forth, the arrangement of the passage between the vehicle and platform is the most decisive for the time of traffic change. The passage must be adapted to personal characteristics without stairs or large gaps so that the passengers can pass from the platform into the vehicle or vice versa without having to watch their steps. In double railed surface railways or in suspended railways without provision for swinging, this can be very simply obtained by suitable arrangement of the doors and platform, but not in monorail suspended vehicles which swing freely. The platform edge in the latter case must be at a distance from the vehicle allowing for the amplitude of swing. If the vehicle is set swinging by the entrance and exit of passengers this distance between the vehicle and the edge of the platform con-

stantly changes and leads to delays and accidents.

The present invention provides arrangements which gradually reduce the swinging of the arriving vehicles to zero and positively guide the vehicles in the station vertically and horizontally.

The invention is illustrated in the accompanying drawings wherein Figs. 1, 2 and 3 are views showing transverse cross-sections taken through apparatus constructed according to the invention.

Fig. 4 is a top plan view of the catching device of Fig. 2.

Fig. 5 is a similar view of a modified form of catching device.

Figs. 6 and 7 are views similar to Figs. 1, 2 and 3, showing modified forms of the invention, and

Fig. 8 is a side elevational view of a modified form of catching device.

In essence the damping of the swinging, that is the "catching" of the arriving vehicles is effected by their being provided say on the underside with guide surfaces or projecting keels, with which they enter guides expanding to meet them, which are arranged opposite them at the line section ends.

Figures 4 and 5 of the accompanying drawings, show such guides in plan. In Figure 4 the guide is formed by rollers with vertical axes. The roller holding frames 12 are advantageously hinged to one another at the points 13 in order to stop the swinging of the vehicles with the minimum amount of shock or jarring thereof. The springing of the rollers 11 is effected by damping springs or fluid buffers 14. The springing or buffing effect increases in stiffness towards the station (commencing at 15) and in the station itself the springs or buffers may be replaced by an elastic covering of the rollers 16.

To compensate the play of the carrying springs, particularly with resiliently sus-

pended vehicles, in the station additional rollers 17 with horizontal axes are so arranged that an entirely empty vehicle just touches them. In this way the result is obtained that the vehicles, whatever their condition of loading, always take the same position vertically.

Figure 2 of the accompanying drawings shows the arrangement of the rollers 16 and 17 in the station, in cross section. The platform 18 is so arranged in height that it is in the same plane as the vehicle floor 19. The gap 20 between vehicle 21 and platform edge 18 can be reduced to a very small value owing to the guidance, only irregularities in the external form of the vehicle being allowed for.

While with this first described arrangement a special keel 22 is provided on the vehicle 21, the vehicle 23, Figure 3 has laterally arranged guide surfaces 24 on which engage correspondingly arranged rollers 25. The angle of inclination of the roller axes is such that the rollers can effect vertical as well as horizontal guidance.

With light vehicles the forces on the guides are relatively small owing to the great distance of the guide engaging points from the swinging axis. To stop the swinging of the vehicle with the minimum amount of jarring, care must be taken that the guide masses which have to be accelerated by the arriving vehicle are as small as possible. The buffer device of Figure 5 is designed with this in view. Here there are no rollers for guiding, but light guide rails 26, say of spring steel band, which are supported by damping springs or fluid buffers 27 of increasing stiffness towards the station. In this case the vehicles advantageously have coverings of wood or the like, which can be lubricated, on the engaging parts. In the station, in view of running and particularly starting friction, guide rollers 28 are provided in place of sliding rails.

In all the examples described above it has been assumed that the guides are to engage on the vehicle body or on the underside of the vehicle. These arrangements have the advantage that owing to the great distance from the centre of swing, the power expenditure is low. Since the forces, particularly with light vehicles, are very small, the guides in certain circumstances can naturally be located at any other desired part of the vehicle, for example at the top of the vehicle as shown in Figure 6 of the accompanying drawings. The vertical guidance is effected in this last case by the vehicles being pressed downwards by the rollers 29 into the position they would occupy when in full loaded condition. Any increase in the size of the vehicle top necessitated by the guiding arrangements forms a compensating surface

which decreases the undesirable effect of side winds.

In the arrangement shown in Figures 7 and 8 a stopping of the vehicle which is entirely free from shock is also obtained. The stopping of the vehicle swinging is here effected by pure frictional damping. Instead of running into a guideway of which the members converge toward the station, the vehicle runs before the station onto smooth rollers 30 which are pressed by springs 31 against the vehicle with a pressure in accordance with the desired damping factor. The rollers 30 are set in rotation by the vehicle running onto them, while in the swinging direction the friction effect exists until the swinging disappears. In order that the rollers may be brought to the correct speed of rotation in a short time, they must be very lightly constructed. The friction can be increased by providing either the rollers or the bottom of the vehicle with a known friction covering as used in brake discs.

For exact guidance of the vehicle in the station in a simple manner, instead of the roller arrangements described above, rollers with side flanges 32 shown dotted in Figure 7 can be used.

The guide rollers in addition to guiding, can be used for moving the vehicle forward in the station. For this purpose either all the rollers must be driven, or an endless driven band laid over the whole roller track.

Such an arrangement is of particular importance with propeller driven high speed vehicles, since the propellers must be still in the stations owing to proximity of the vehicle to the platform and because the propellers are not adapted to operate at low speeds.

We claim:

1. An arrangement for guiding suspended high speed railway vehicles, in which the vehicles are otherwise free to swing sideways and to oscillate up and down, means for gradually decreasing these movements shortly before the stations and entirely preventing them positively in the stations.

2. An arrangement for guiding suspended high speed railway vehicles, in which longitudinally running guides are provided which are applied to the vehicle bodies or parts thereof, and which at the entry are expanded for catching the swinging vehicles.

3. An arrangement according to claim 1, in which the vehicles are provided with longitudinal guide surfaces which can engage fixed guide surfaces in the stations.

4. An arrangement according to claim 1, in which guide surfaces are provided which act horizontally and vertically, in order to eliminate lateral and vertical oscillations of the vehicles.

5. An arrangement according to claim 1, in which said means is provided with an expanded portion supported on damping means,

said damping means providing a slight damping action at the expanded part and progressively greater damping in the direction of the stations.

5 6. In a suspended railway having station platforms, the combination with vehicles free to swing laterally and to oscillate vertically, of means on the approach side of each station platform for damping lateral swinging and vertical oscillation of said vehicles.

10 7. In a suspended railway having station platforms, the combination with vehicles free to swing laterally and to oscillate vertically, of means on the approach side of each station platform for damping lateral swinging and vertical oscillation of said vehicles, said means comprising guide members converging toward said station platforms and arranged to bear against said vehicle.

15 8. In a suspended railway having station platforms, the combination with vehicles free to swing laterally and to oscillate vertically, of means on the approach side of each station platform for damping lateral swinging and vertical oscillation of said vehicles, and means disposed along said platform for positioning said vehicle at said platform.

20 9. In a suspended railway having station platforms, the combination with vehicles free to swing laterally and to oscillate vertically, of means on the approach side of each station platform for damping lateral swinging and vertical oscillation of said vehicles, and means disposed along said platform for positioning said vehicle at said platform, said last-mentioned means comprising rollers arranged to bear against said vehicle.

25 10. In a suspended railway having station platforms, and vehicles free to swing laterally and to oscillate vertically, means for damping these movements at the station platforms comprising guide members converging toward said station platforms and cooperating with said vehicle to horizontally position the body thereof, and other members cooperating with said vehicle to vertically position the body thereof.

30 11. In a railway having a station platform, and a suspended vehicle free to swing laterally, means for positioning said vehicle when approaching said station platform comprising opposed, resiliently positioned guide members disposed in the general direction of travel of said vehicle and converging toward said platform.

35 12. In a railway having a station platform, and vehicles free to swing laterally, means for damping lateral swinging of said vehicles as the vehicles approach said station platform comprising guide members disposed along the path of travel of the vehicles and converging toward said station platform, and means for resiliently positioning said guide members, said means being progressively less resilient approaching the station platform.

13. In a suspended railway of the type having vehicles free to swing laterally and to oscillate vertically, the combination with means at a station platform for preventing such swinging and oscillation, of guide members converging toward said platform and provided with resilient damping means arranged to hold said guide members with progressively increasing stiffness in the direction of the station platform.

In testimony whereof we affix our signatures.

FRANZ KRUCKENBERG.
WILLY BLACK.

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