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DESCRIPTION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from patent application in Luxembourg No. 101640 filed on February 14, 2020.

TECHNICAL FIELD

[0002] The present invention relates to a freight vehicle with a driver's cab.

BACKGROUND ART

[0003] In the goods storage and handling sector, e.g. of steel products such as steel bars, steel pipes, sheet metal rolls, or simple packs of sheet metal sheets, the arrangement of goods to be handled above dedicated portal frame or bridge-type support structures with floor support feet is well known.

[0004] For the handling of these goods, the use of rubberised vehicles designed to fit beneath the above-mentioned support structures - each one comprising a frame defining a support surface or loading bed, on which the support structure rests, a driver's cab born by the frame, and a plurality of rubberised wheel assemblies supporting the frame - is also known.

[0005] The rubberised wheel assemblies are equipped with height-adjustable suspensions and, normally, solid wheels are preferred to wheels with inner tubes because they are immune to the problem of frequent puncturing in particularly hostile environments, such as, for example, a steelworks.

[0006] In the above-mentioned vehicles, the height adjustment of the suspensions allows the support surface to be brought to a lowered fitting position or minimum height position, which, once reached, allows the vehicle to be fitted beneath the portal frame support structures.

[0007] The height-adjustable suspensions also make it possible to raise the support surface and, together with this, the whole portal frame structure, and its corresponding load, until it reaches a raised transport position, wherein the support feet of the portal frame support structure are raised from the ground.

[0008] In the known vehicles described above, the cab is a dedicated cab in that it is configured to be arranged completely beneath the support surface. For this reason, the cab has a very low height that is sufficient to accommodate the driver, on the one hand, and to

enable the frame to be arranged in its lowered loading position, on the other. For this purpose, the cab has its own front portion, in the vehicle's forward direction, which is hinged to the frame by means of a hinge device, in order to rotate around a fixed hinge axis parallel to the load support surface, and is always coupled, at the back of the frame, by means of an air spring that enables small oscillations around the fixed hinge axis under the control of suspension and damping elements.

[0009] Although widely used, known transport vehicles of the type described above are not very satisfactory from a driving comfort point of view, especially during the load transport phase when the vehicle is inevitably subject to jolts and, in general, high vertical acceleration values, which are transmitted to the driver. Vertical accelerations are also more noticeable to the driver when the tyres are solid tyres, since they have a reduced damping action when compared to other tyres.

[0010] In such conditions, in fact, the cab follows the frame to which it is directly hinged and discharges, therefore, the jerking action on the driver. This is despite the fact that the hinge device may comprise blocks of elastomeric material, of the type known by the commercial term "silent blocks", which are arranged around the fixed hinge axis.

[0011] In some known solutions, the stress in the vertical direction that is transferred from the cab to the driver is partly mitigated by providing cushioned seats, e.g. pneumatic seats.

[0012] However, although these seats have high degrees of damping, making driving comfortable, they are extremely bulky, as the height of their seat from the floor of the cab is much greater than that of conventional seats. Therefore, in order to avoid the driver's head impacting against the cab ceiling, it is essential to increase the height of the cab. This is because it is impossible to decrease the distance of the cab's floor from the rolling surface of the wheels, as this distance is dictated by the arrangement of the frame in its fitting position. The increase in height of the cab translates to an inevitable raising of the vehicle's support surface in relation to the rolling surface when the loading bed is arranged in its lowered fitting or loading position.

[0013] This raising is, however, severely hampered by the users of the handling service and by the steelworks, in particular, as it requires all existing portal frame support structures to be raised entailing high costs and adjustment times.

[0014] Not only that, but the raising of the support surface of the portal frame structure means that the existing transport vehicles will have to operate in different conditions from those anticipated in the design phase, both in the fitting or loading condition and in the transport condition. This means that the useful travel of their suspensions is reduced and the overall centre of gravity is shifted upwards. CH-A5-639326 shows the preamble of claim 1.

DISCLOSURE OF INVENTION

[0015] The purpose of the present invention is to provide a transport vehicle with a driver's cab, which makes it possible to resolve the problems described above simply and economically.

[0016] In particular, the purpose of the present invention is to provide a transport vehicle with a cab, the cab of which ensures a high level of driving comfort without requiring either dimensional changes to the support structures of the goods to be handled or to the planned suspension configuration of the vehicles already operating.

[0017] It is a further purpose of the present invention to provide a transport vehicle, the cab of which can guarantee a high level of driving comfort for the driver regardless of the conditions of the rolling surface of the wheel assembly wheels and the type of wheels used on the same wheel assemblies.

[0018] According to the present invention a freight vehicle is provided comprising:

a frame defining a support surface for the goods to be handled; a plurality of rubberised wheel assemblies arranged beneath the frame and each one having a respective suspension;

adjustment means for adjusting the height of the respective suspension and for varying the height of the support surface from the rolling surface of the wheels;

a driver's cab arranged beneath said support surface;

means of coupling said cab to said frame; and

damping elastic means placed between said frame and said cab;

characterised in that said coupling means comprise a crank drive unit and actuating means placed between said frame and said cab and configured to move the whole cab vertically with respect to said support surface between two extreme end positions, one approaching said support surface and one spaced apart from said support surface, and to arrange the cab in a cushioned intermediate position for the transport of the load.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The invention will now be described with reference to the appended drawings, which illustrate a non-limiting embodiment thereof, wherein:

Figure 1 shows, schematically and in perspective view, a support structure for a load to be handled resting on a freight vehicle equipped with a driver's cab and made according to the dictates of the present invention; and

Figures 2 to 4 show a side view of the driver's cab of the vehicle shown in Figure 1 arranged in different functional conditions.

BEST MODE FOR CARRYING OUT THE INVENTION

[0020] In Figure 1, the reference number 1 indicates, as a whole, a freight vehicle 2 for transporting, for example, steel products.

[0021] In particular, the vehicle 1 is a vehicle configured for the loading and handling of goods arranged on a portal frame or bridge support structure 4, known in itself, and of the type comprising a support platform 5 for goods 2 to be handled and a plurality of pillars 6 having an upper portion firmly connected to the platform 5 and ending, at the bottom, in support feet 7 on a rolling surface 8 of the vehicle 1. The support feet 7 rest on the surface 8 during the loading of the goods onto the platform 5, and during the loading of the platform itself onto the vehicle, as shown with a dotted line in Figure 1. The support feet are, instead, raised from the surface 8 itself at the end of the loading onto the vehicle 1, and during a transport phase, shown with a continuous line in Figure 1.

[0022] Again with reference to Figure 1, the vehicle 1 comprises a frame 10 defining a support surface or loading bed 11 on which the platform 5 rests, a driver's cab 12, and a plurality of rubberised wheel assemblies 13 coupled to the frame 10, in a way that is known and not described in detail.

[0023] The wheel assemblies 13 are equipped with the corresponding height-adjustable suspensions 14, which are known in themselves and only shown schematically in Figure 1, and with the corresponding wheels 15 rolling in contact with the surface 8. Conveniently, the wheels 15 are solid wheels.

[0024] Each suspension 14 comprises hydraulic adjustment cylinders 16, known in themselves and schematically shown, which enable the frame 10 to be shifted in relation to the surface 8 between a fully lowered loading or minimum height position of the support surface 11, in which the same support surface 11 is arranged beneath the platform 5 so as to enable the vehicle 1 to slide beneath the structure 4, and a raised transport position (Fig. 1), in which the platform 5 is lying on the surface, the support feet 7 are raised from the surface 8, and the vehicle 1 can, therefore, advance in a forward direction 18 (Fig. 1).

[0025] Again with reference to Figure 1, the driver's cab 12 is arranged beneath the frame 10 and comprises a back 12A and a floor 12B on which a conventional seat (not shown) is arranged for the driver of the vehicle 1.

[0026] The cab 12 is coupled, overhanging, to a front portion 19 of the frame 10 facing the

back 12, by means of a motorised elastic transmission unit 20, and is configured to make it possible for the whole cab 12 to move vertically in relation to the frame 10, both from and towards the surface 11 of the frame 10 itself, and, in use, from and towards the surface 8.

[0027] In particular, with reference to Figures 2 to 4, the transmission unit 20 comprises two motorised articulated quadrilateral transmissions 21 arranged on opposite lateral sides of the cab 12. Only one of these transmissions is visible in Figures 2 to 4.

[0028] Each transmission 21 comprises a lower crank 22 and an upper crank 23 that have the same length.

[0029] The cranks 22 and 23 are hinged, on one side, to the front portion 19 of the frame by means of respective hinge pins, in order to rotate around respective fixed hinge axes 25 in relation to the frame 10, and they are vertically spaced apart. On the other side, they are hinged to the back 12A of the cab 12 by means of respective hinge pins, in order to rotate around respective mobile hinge axes 26 in relation to the frame 10, and they are vertically spaced apart.

[0030] Conveniently, the distance between the axes 25 is equal to the distance between the other axes 26. In this way, each transmission 21 is an articulated quadrilateral transmission.

[0031] Again with reference to Figures 2 to 4, each transmission 21 comprises its own air actuator 30 that is pressure-controlled, e.g. Controlled by means of a known and not shown levelling valve. Each actuator 30 is hinged, on one side, to the front portion 19 at the back and at the same height above the ground as the axis 25 of the crank 22 in order to rotate around an axis 31 parallel to the axes 25. On the other side, each actuator is hinged to a free end of a respective bracket 32 that is permanently connected to the back 12A and projecting, overhanging, from the back 12A towards the front portion 19 of the frame 10. Conveniently, each bracket 32 is permanently connected halfway up the height of the back 12A.

[0032] Finally, each transmission 21 comprises a damping member 33, known in itself, having a sleeve 34 hinged to the portion 19 in order to rotate around the axis 25 of the crank 22, and a stem 35 hinged to the crank 23 coaxially to its axis 26.

[0033] Again with reference to Figures 2 to 4, the unit 21 comprises a position transducer 36 to detect the actual height position of the cab 12 in relation to the frame 10 when the driver is on board, so as to adjust the position of the cab 12, taking into account the weight of the driver. Conveniently, the transducer 36 is an angle transducer joined to one of the axes 25. Alternatively, the transducer 36 is joined to the axes 26 or the axis 31.

[0034] According to one variant, the transducer 36 is a linear transducer placed between the frame 10 and the cab 12.

[0035] In use, the spring 30 is controlled in a synchronised manner with the suspensions 14 to

shift the cab 12 vertically in relation to the frame 10, and, therefore, to the support surface 11, between two extreme end operating positions. One of these positions is raised, shown in Figure 4, wherein the cab 12 is arranged adjacent to the surface 11 so as to enable the frame 10 to be brought into its lowered or minimum height position, and one is lowered, shown in Figure 3. In the lowered position, the cab 12 is spaced from the surface 11 and raised from the surface 8 by a sufficient amount to avoid scraping against the same surface 8.

[0036] Conveniently, but not necessarily, when the cab 12 is in its lowered position, the spring 30 is fully compressed. The maximum compression of the spring 30 does not create substantial problems from a driving comfort point of view since the lowered cab condition occurs when the vehicle is stationary or advancing at extremely low speed. Thus, the driver is, in practice, not subject to appreciable vertical accelerations.

[0037] In the driving or load-shifting condition, the cab 12 is, however, arranged in an intermediate position between the two extreme positions and, for example, in the condition shown in Figure 2. In the latter, when subjected to vertical accelerations, the cab is free to oscillate vertically in relation to the frame 10 and the loading bed 11, under the sole control of the spring 30 and the damper 33, always ensuring a high degree of driving comfort for the driver.

[0038] It is clear from the above that the special elastic and damped articulated parallelogram configuration of the group 20 makes high travel or controlled movements of the cab 12 in a vertical direction possible, and, therefore, effectively reduces or dampens the vertical accelerations transmitted to the driver.

[0039] The above is due to the fact that, compared to the known solutions, the crank unit 20 eliminates, in essence, any rigid vertical connections between the cab 12 and the frame 10, which are present, on the other hand, with the direct coupling of the cab to the frame.

[0040] At the same time, the unit 20 enables, again in comparison to the known solutions, the vertical dimension of the conventional driver's cabs to be kept unchanged. Therefore, both the distance of the loading platform 5 of the structure 4 from the ground and the functional or operating conditions of the suspensions 14 of the conventional wheel assemblies 13 (both in loading conditions and during transport) can also be kept unchanged.

[0041] In other words, the transmission unit 20 guarantees the high degree of driving comfort that is required by the most restrictive regulations in force and, at the same time, makes it possible to use both the conventional portal frame support structures and the current transport vehicles sized according to the features of these same support structures.

[0042] Not only that, the construction features of the unit 20 make it possible to retrofit or modernise current transport vehicles in an extremely simple, economical, and fast way, since the unit 20 is totally autonomous and independent.

[0043] Finally, the articulated parallelogram transmissions make it possible for the cab 12 to be shifted between the above-mentioned extreme end positions, while always keeping the walking wall 12B of the cab 12 itself parallel to itself, to the support surface 11, and, substantially, to the rolling surface of the wheels 5, unlike the known solutions where the hinge connection with a fixed rotation axis allowed the walking wall to be rotated around a fixed hinge axis in relation to the frame of the vehicle.

[0044] The absence of rotations between the walking wall 12B and the support surface 11, and, therefore, the rolling surface, helps to improve driving comfort.

[0045] From the above it is apparent that modifications and variations may be made to the crank unit 20 described herein without departing from the scope of the claims. In particular, articulated parallelogram transmissions 21 may comprise a different number or arrangement of cranks 22, 23, which may also have different lengths. In particular, it would be possible to provide only one transmission 21.

[0046] Not only that, the pneumatic springs 30 and/or dampers 33 could also be arranged in different positions from those indicated by way of example; thus, a number of springs 30 and/or dampers 33 *other than the one indicated* could be provided.

REFERENCES CITED IN THE DESCRIPTION

Cited references

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Patent documents cited in the description

- LU101640 **[0001]**
- CH639326A5 **[0014]**

PATENTKRAV

1. Godskøretøj, der omfatter:
en ramme (10), der definerer en støtteflade (11) til det gods, som skal håndteres,
en flerhed af gummierede hjulsamlinger (13), der er anbragt under rammen, idet hver har en respektiv affjedring (14),
justeringsmidler (16) til justering af højden på den respektive affjedring og til ændring af støttefladens højde fra hjulenes rulleflade,
et førerhus (12), der er anbragt under nævnte støtteflade,
midler (20) til kobling af nævnte førerhus til nævnte ramme, og
elastiske dæmpningsmidler (33), der er placeret mellem nævnte ramme og nævnte førerhus,
kendetegnet ved, at nævnte koblingsmidler omfatter en krumtaptransmissionsenhed (21) og aktiveringsmidler (30), der er placeret mellem nævnte ramme og nævnte førerhus og indrettet til at flytte hele førerhuset lodret i forhold til nævnte støtteflade mellem to yderendepositioner, én der nærmer sig nævnte støtteflade, og én der er anbragt med afstand fra nævnte støtteflade, og til at anbringe førerhuset i en affjedret mellemposition til transport af lasten.

2. Køretøj ifølge krav 1, kendetegnet ved, at nævnte krumtaptransmissionsenhed omfatter krumtappe (22, 23), der er hængslet på den ene side til nævnte støtteramme, med henblik på at rotere i forhold til støtterammen omkring de respektive faste hængselsakser (25), og til nævnte førerhus, med henblik på at rotere omkring mobile hængselsakser (26) parallelt med nævnte faste hængselsakser.

3. Køretøj ifølge krav 2, kendetegnet ved, at nævnte krumtappe udgør en del af mindst én leddelt firkantet transmission.

4. Køretøj ifølge krav 2 eller 3, kendetegnet ved, at nævnte krumtappe alle har samme længde.

5. Køretøj ifølge krav 3 eller 4, kendetegnet ved, at nævnte krumtappe udgør en del af to leddelte firkantede transmissioner, hvilke to leddelte firkantede transmissioner er anbragt på modstående laterale sider af nævnte førerhus.

6. Køretøj ifølge et af kravene 2 til 5, kendetegnet ved, at nævnte krumtappe strækker sig i parallelle positioner uanset førerhusets position i forhold til nævnte støtteflade.

7. Køretøj ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at nævnte førerhus strækker sig udhængende fra en endedel af nævnte ramme.

8. Køretøj ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at nævnte førerhus omfatter en bagside (12A), og ved, at nævnte krumtap-transmissionsenhed er placeret mellem nævnte bagside og en forreste del (19) af nævnte ramme, der vender mod nævnte bagside.

9. Køretøj ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at nævnte førerhus har en nedre gangvæg (12B), og ved, at nævnte krumtap-transmissionsenhed og nævnte aktiveringsmidler er indrettet til at holde nævnte gangvægs vinkel konstant i forhold til nævnte støtteflade uanset nævnte førerhus' position mellem nævnte yderpositioner.

10. Køretøj ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at nævnte aktiveringsmidler omfatter mindst én luftfjeder (30).

DRAWINGS

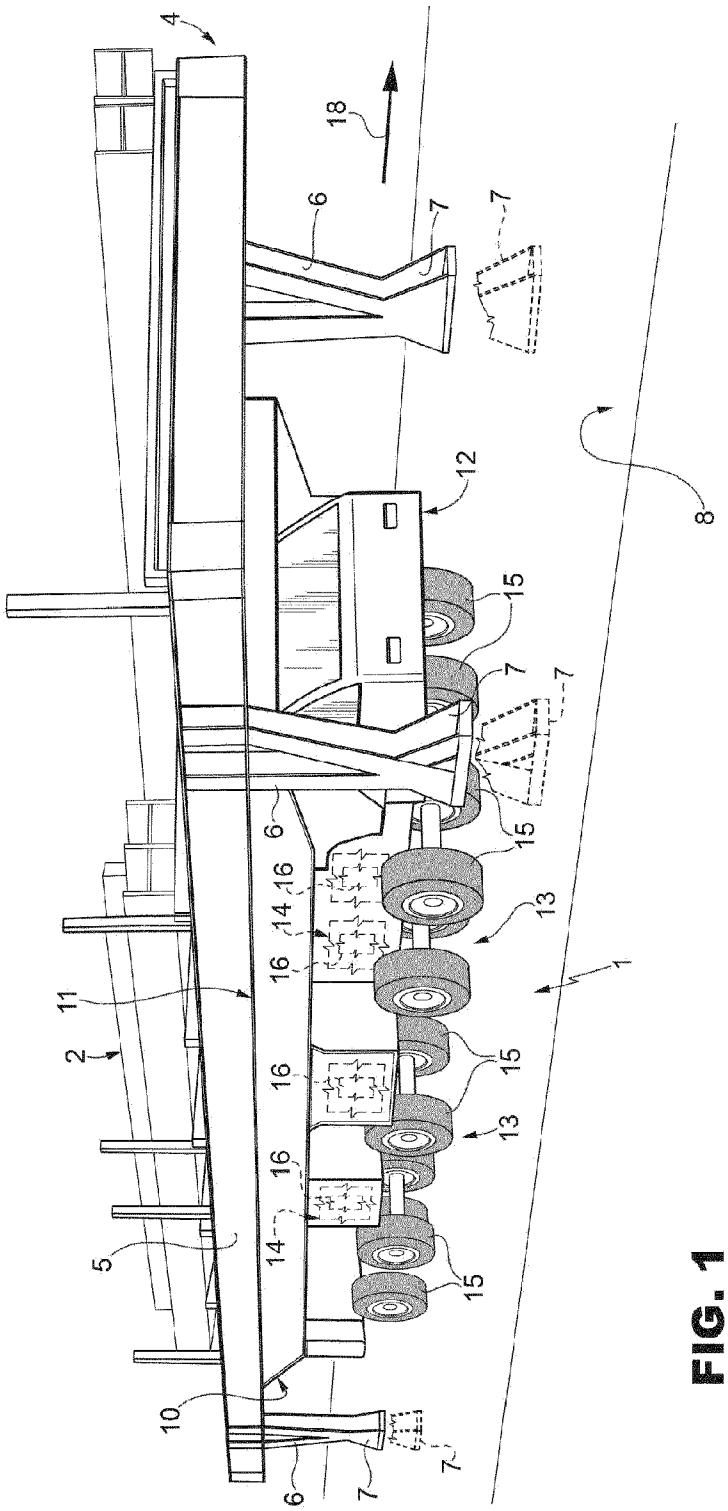

FIG. 1

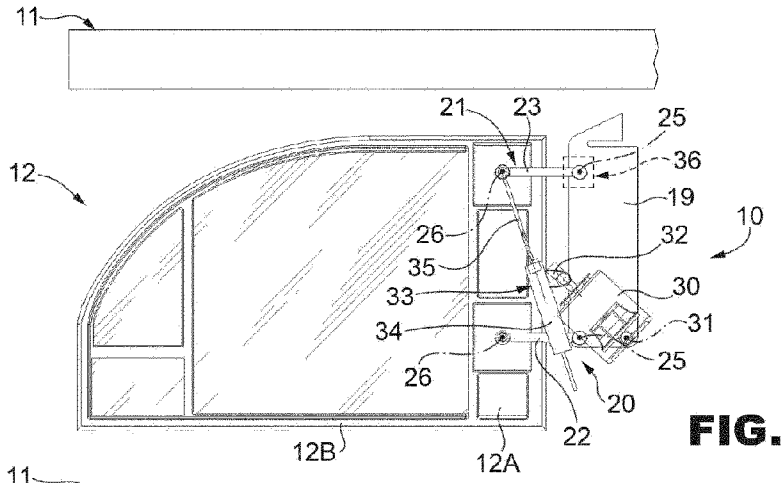

FIG. 2

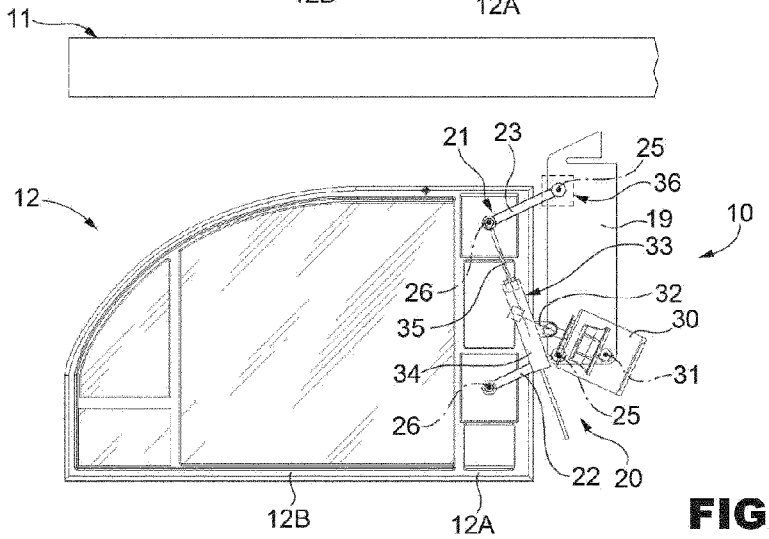

FIG. 3

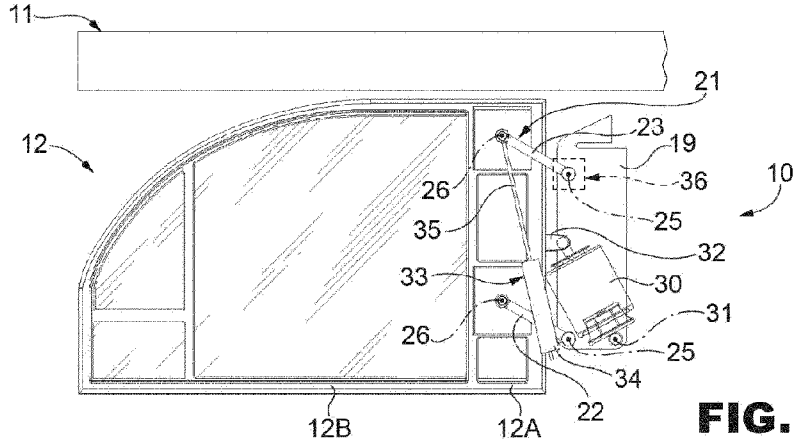

FIG. 4