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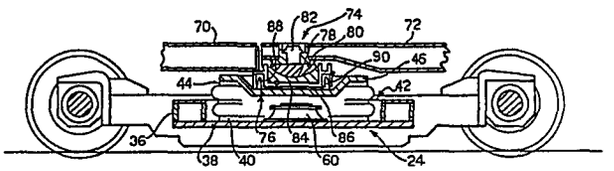
(54) Two-axle load-bearing bogie.

(57) A two-axle load-bearing bogie for railway or tramway vehicles incorporates a secondary suspension formed by a single central vertical and transverse suspension pneumatic spring (42) carrying at its upper end a load-bearing base (46) to support the articulation (74) between the two coach bodies (70, 72) of a railway or tramway vehicle.



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Two-axle load-bearing bogie

The present invention relates in general to railway or tramway vehicles, with special reference to a two-axle load-bearing bogie designed for use in such vehicles.

The present invention aims to provide a load-bearing bogie of relatively simple and economic manufacture, and of such reduced height that the carriage of the vehicle to which it is fitted may be designed with a low step for ease of passenger access

With this object in view, the present invention provides a two-axle load-bearing bogie for railway or tramway vehicles characterised in that it incorporates a secondary suspension consisting of a single central vertical and transverse suspension spring supporting at its upper end a load-bearing base for supporting the body of a railway or tramway vehicle.

The central suspension spring preferably comprises a pneumatic spring with a flexible casing.

According to a preferred embodiment of the invention, the bogie comprises:

- a frame formed by a pair of longitudinal side members and a pair of transverse axles articulated to the opposite ends of the two side members, each axle bearing a respective pair of small diameter wheels,
- a central platform supported within the frame by the middle sections of the two side members, and on which the said central suspension spring rests,
- a pair of longitudinal arms pivotally connecting the opposite sides of the said base to the front and rear ends respectively of the platform, and
- lateral stop means for limiting transverse displacements of the suspension spring relative to the frame.

In the present specification and in the Claims that follow, the term "wheel of small diameter" means a wheel the diameter of which is appreciably less than, and approximately equal to half (35 cm), that of traditional bogie wheels.

The structure of the bogie according to the invention enables the primary suspension to be eliminated in practice, thus drastically reducing the height of the bogie. This characteristic, together with the wheel size, enables the provision of a railway or tramway vehicle utilizing this bogie, the step level of which is lowered to a height of approximately 45 cm from the level of the rail, even in the area directly above the bogie.

According to one particularly advantageous embodiment, the invention provides for a railway or tramway vehicle having a carriage formed by two coach bodies with underlying ball joint articulation and incorporating a load-bearing bogie of the above-defined type situated below the articulation between the two coach bodies.

Preferably one of the two coach bodies has an end section resting rotatably on the load-bearing base of the bogie so as to define a housing having a spherical surface within which is engaged a complememtary spherical surface of an articulating member, carried by an end connecting section of the other coach body.

The invention will now be described in detail with reference to the appended drawings, supplied by way of non-limiting example only, in which:

Figure 1 is a diagrammatic side elevational view of part of a railway or tramway vehicle employing a bogie according to the invention;

Figure 2 is an overhead plan view of the bogie;

Figure 3 is a partial longitudinal sectional view taken along line III-III in Figure 2, and

Figure 4 is a diagrammatic partial cross section taken along line IV-IV in Figure 2.

In the drawings, reference numeral 10 indicates generally a load-bearing two-axle bogie for tramway vehicles in particular.

The bogie 10 comprises a frame 12 formed by two box-section longitidunal side members 14, 16 of steel plate, the ends of which 14a, 16a and 14b, 16b are interconnected by a pair of transverse axles 18, 20 respectively, each bearing flanged wheels 21. The wheels 21 have a diameter appreciably less than that of traditional bogie wheels currently employed in tramway vehicles. According to the invention, this diameter is preferably of the order of 35 cm.

The axles 18, 20 are rotatably mounted relative to the ends 14a, 14b and 16a, 16b of the two longitudinal side members 14 and 16 by means of resilient bushes 22 acting as ball joints to enable limited mutual rotation of the axles 18, 20 around the longitudinal axis A of the bogie 10. The resilient mounting of the axles 18 and 20 also ensures a considerable degree of comfort and allows the vehicle using this bogie to adapt easily to track irregularities.

The wheels 21 may be fixed to the respective axles 18, 20 for rotation therewith or, as in the example illustrated, they may be mounted to rotate freely on the axles. In the latter case the two wheels 21 of each axle 18, 20 are free to rotate independently of one another, thus eliminating any undesirable sliding between the wheels and the rails when travelling around a curve. When curves in a tramway are taken with wheels of such small diameter, such sliding could cause premature wear of the flanges of the wheels.

Fixed to the central area of the inside of the longitudinal side members 14 is a substantially circular central platform-cross member disposed horizontally within the frame 12. Thus the platform-cross member 24 is rigidly fixed at one end to the longitudinal side member 14, whilst the connection of its opposite end to the other side member 15 is effected by means of a

resilient articulated joint 26, seen in detail in Figure 4, This joint 26 comprises a transverse pin 28 carried by a vertical structure 30 fixed to the platform 24 and inserted in a tubular sleeve 32 projecting from the longitudinal side member 16, with an interposed elastic bush 34.

The platform 24 has a peripheral box-type reinforcement section 36 which defines a central supporting part 38 to which is anchored the base 40 of a pneumatic spring 42 having a flexible casing and forming the secondary vertical and transverse suspension of the bogie 10.

Fixed to the top 44 of the pneumatic spring 42 is a load-bearing base 46 having two lateral lugs 48 which bear respective transverse pivot pins 50 for the articulation of two longitudinal arms 52 the opposite ends of which are articulated to respective transverse pins 54 borne by supports 56 projecting from the front and rear ends respectively of the platform 24.

The free ends 48a of the lugs 48 face two sprung stop buffers 58 supported from the two opposite sides of the platform 24, one by the support 30 carrying the pin 28, and the other by a similar vertical support 30, serving to limit transverse displacements of the load-bearing base 46 supported by the pneumatic spring 42.

Reference numeral 60 indicates a resilient buffer member fixed to the part 38 of the platform 24 in correspondence with the central zone of the pneumatic spring 42 and arranged to cooperate with the corresponding zone of the load-bearing base 46. The buffer member 60 serves to support the body in the event of a lack of air in the pneumatic spring 42.

The bogie 10 incorporates electromagnetic brake shoes 62, guided between guide elements 64 fixed to the external sides of the two longitudinal side members 14, 16 in the regions between the wheels 21, and operated in known manner by means of actuating levers 66.

The load-bearing base 46 supports the body of the vehicle to which the bogie 10 is fitted.

As stated above, the bogie according to the invention may be fitted with particular advantage in tramway vehicles. Its configuration provides an efficient solution to the problem of lowering the step level of the vehicle carriage in order to facilitate passenger access to the interior of the carriage. The vertical dimension of the bogie according to the invention is, in fact, very much reduced relative to that of conventional load-bearing bogies, due on the one hand to the absence of a true primary suspension and the conformation of the secondary suspension formed by the central pneumatic spring 42, and on the other hand to the reduced diameter of the wheels 21. This in practice enables a lower carriage floor to be provided, even in the regions of the load-bearing bogies according to the invention.

The drawings show a preferred embodiment of the bogie 10 for a tramway vehicle, comprising two coach bodies, shown diagrammatically as 70, 72, articulated together on their undersides by means of a ball joint indicated generally 74 and disposed in correspondence with the bogie 10, resting on the load-bearing base 46.

As may be more clearly seen in Figure 3 the ball joint 74 is formed by a vertical axis cylindrical housing 76, fixed to the end of the coach body 70 and defining a seat 78 with a spherical surface, into which is inserted a head 80 with a complementary spherical surface, the head 80 being carried by a pin 82 fixed to the corresponding end of the other coach body 72.

The end wall 84 of the housing 76 rests rotatably on a guide surface 86 of the load-bearing base 46, whilst the side wall of the housing 76 has an external axially extending annular element 88 facing a corresponding annular projection 90 projecting from the load-bearing base 46 for the transmission of longitudinal thrust between the bogie 10 and the joint 74.

This configuration provides for very a small distance between the floor levels in the two coach bodies 70 and 72 and the level of the rail, thus ensuring better comfort and ease of passenger access to the carriage.

CLAIMS

1. Two-axle load-bearing bogie for railway or tramway vehicles, characterised in that it incorporates a secondary suspension formed by a single central vertical and transverse suspension spring (42) supporting at its upper end a load-bearing base (46) for supporting the body (70, 72) of a railway or tramway vehicle.

2. Bogie according to Claim 1, characterised in that the central spring is a pneumatic spring with a flexible casing (42).

3. Load-bearing bogie according to Claim 1 or Claim 2, characterised in that it comprises:

- a frame (12) formed by a pair of longitudinal side members (14, 16) and by a pair of transverse axles (18, 20) articulated to the opposite ends (14a, 16a; 14b, 16b) of the two side members (14, 16), each axle (18, 20) carrying a respective pair of small diameter wheels (21),
- a central platform (24) supported within the frame (12) by the middle sections of the two side members (14, 16) and on which the said central suspension spring (42) rests,
- a pair of longitudinal arms (52) pivotally connecting the opposite sides (48) of the load-bearing base (46) to the front and rear ends respectively of the platform (24), and
- lateral stop means (48a, 58) for limiting transverse displacements of the load-bearing base (46) relative to the frame (12).

4. Bogie according to Claim 2 or Claim 3, characterised in that a resilient buffer member (60) is associated with the base (40) of the pneumatic spring (42) and is fixed to the platform (24) for cooperation with the load-bearing base (46).

5. Bogie according to Claim 3, characterised in that the said lateral stop means comprise two lateral lugs (48) projecting

transversely from the load-bearing base (46) and a pair of resilient stop buffers (58) carried on the opposite sides (30) of the platform (24) and facing the said lateral lugs (48).

6. Bogie according to Claim 5, characterised in that the two lateral lugs (48) of the load-bearing base (46) bear respective transverse pivot pins (50) for the corresponding ends of the two said longitudinal arms (52).

7. Bogie according to Claim 3, characterised in that the central platform (24) is rigidly fixed on one side to one of the longitudinal side members (14) whilst on the opposite side it has an articulated connection (26) to the other longitudinal side member (16).

8. Bogie according to Claim 3, characterised in that respective ball joint elements (22) are interposed between the axles (18, 20) and the respective bearing ends (14a, 14b; 16a, 16b)of the longitudinal side members (14, 16).

9. Bogie according to Claim 3, characterised in that it further comprises electromagnetic shoe braking means (62), adjacent and parallel to the outer sides of the two longitudinal side members (14, 16).

10. Bogie according to Claim 3, characterised in that the wheels (21) have a diameter of the order of 35 cm.

11. Railway or tramway vehicle having at least one load-bearing bogie according to any one or more of the preceding claims.

12. Railway or tramway vehicle formed by two coach bodies (70, 72) articulated together, characterised in that the two coach bodies (70, 72) are articulated by means of a ball joint (74) and in that the vehicle incorporates a load-bearing bogie (10) according to any one or more of Claims 1 to 10 situated below the articulation (74) between the two coach bodies (70, 72).

13. Vehicle according to Claim 12, characterised in that one of the two coach bodies (70) has an end bearing part (76) resting rotatably on the load-bearing base (46) of the bogie (10)and defining a seat (78) with a spherical surface in which is engaged an articulating member (80) having a complementary spherical surface carried on an end connecting part (82) of the other coach body (72).

14. Vehicle according to Claim 13, characterised in that the said end bearing part (76) is shaped as a cylindrical housing having an end wall (84) which rests slidably on a guide part (86) of the load-bearing base (46) and a side wall which incorporates an axially extending annular element (88) associated with a complementary annular projection (90) projecting from the load-bearing base (46) for transmitting longitudinal thrust between the bogie (10) and the two coach bodies (70, 72).

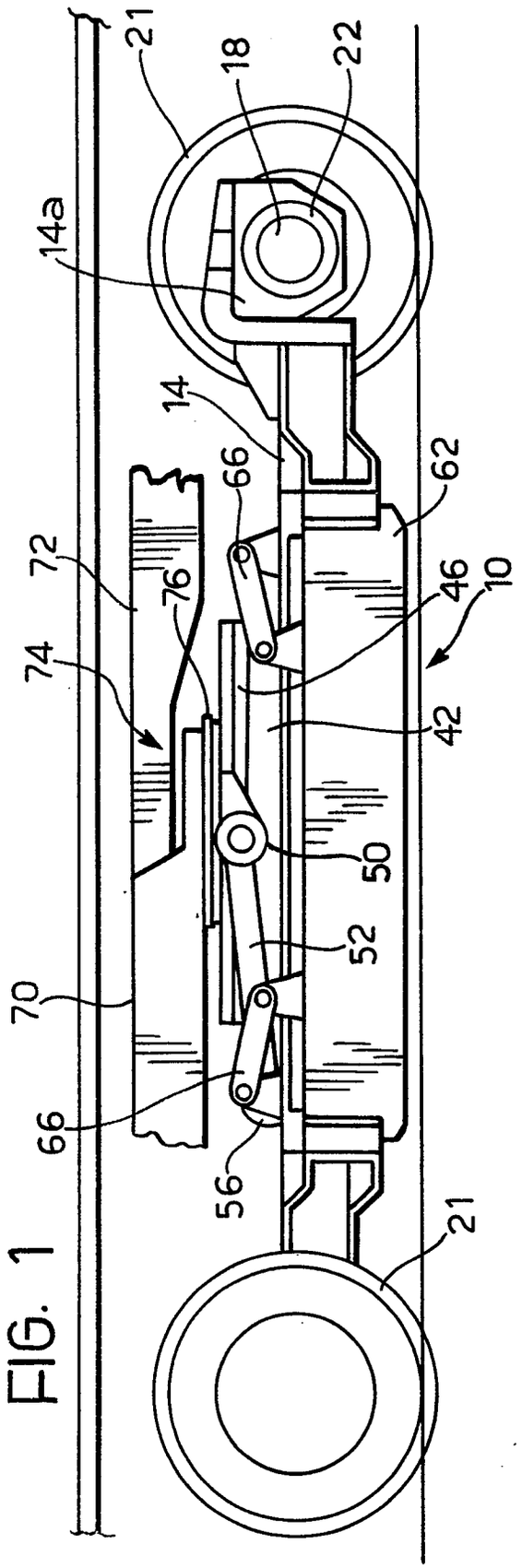
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FIG. 1

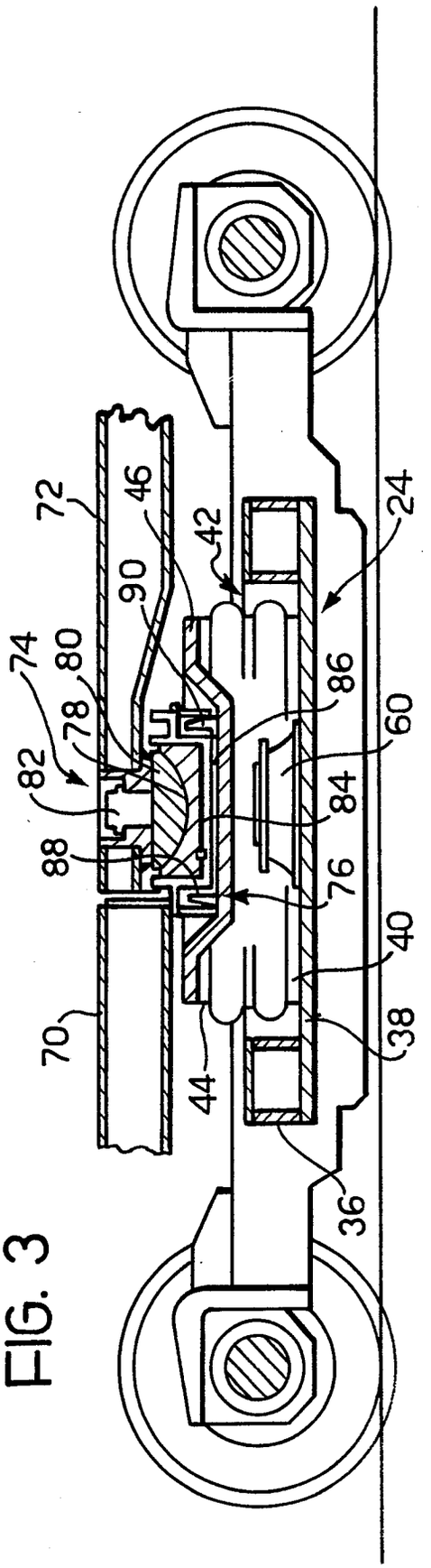
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FIG. 3

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FIG. 2

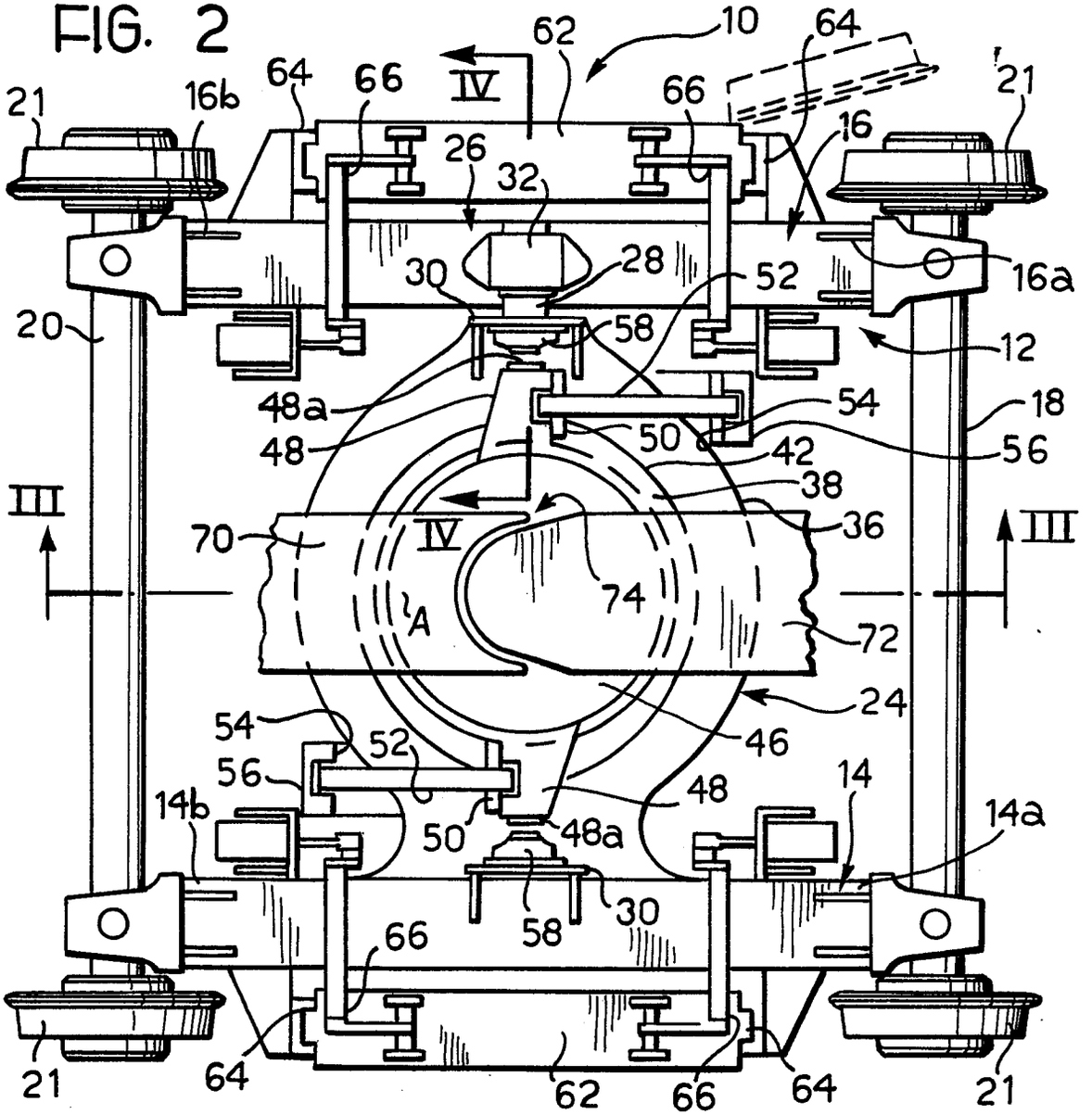

FIG. 4