952,795

PATENT SPECIFICATION

DRAWINGS ATTACHED

952,795

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COMPLETE SPECIFICATION

Driving Axle Assembly for Vehicles

We, LANCIA & C. FABBRICA AUTOMOBILI TORINO S.p.A., an Italian Joint Stock Company, of 27, via Vicenzo Lancia, Turin, Italy, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to driving axle assemblies for motor vehicles, incorporating a differential gear, two half axles arranged in a rigid axle housing, wheel brakes and a reducing gear in the hub of each wheel.

In known axle assemblies of this type which are adapted to be connected to the chassis of a vehicle through resilient suspension members, a different kind of axle assembly must be used in order to obtain either a high or a low floored vehicle. Also, the known arrangement with disc brakes located beside the wheels of the vehicle meets with difficulties in both dispersing heat generated on the discs during braking and in the arrangement of the brake control members, which makes it impossible to employ both a pneumatic control utilising the air pressure normally available on board of present vehicles and a separate mechanical leverage coutrol.

An object of this invention is to provide a driving axle assembly which is suitable for use either in vehicles having a very low floor, such as passenger vehicles, or a high floor, such as trucks and lorries for the transport of goods over uneven roads, where an ample clearance between the axle assemblies and the ground is required.

Another object of this invention is to provide such an axle assembly with disc brakes requiring a relatively low pressure for actuation of the brake calipers, the said pressure being more particularly of the order of the air pressure normally available on board of vehicles (generally about 6 to 7 atmospheres).

According to this invention there is provided a driving axle assembly for motor vehicles adapted to be connected to the vehicle by means of resilient suspension members and comprising a differential, two half axles extending therefrom, two axle housings supporting wheel spindles, wheel hubs containing a reducing gear mounted on each wheel spindle, and brake means adapted to brake the wheels, wherein the axle assembly comprises an intermediate frame rigidly supporting the differential gear and having two non-rectilinear axle housings fixed to either side of said frame and supporting the wheel spindles at their free ends, the axis common to both wheel spindles being parallel but not coincident with the axis of the output shafts of the differential gear, the said two axes together defining a plane which is situated approximately vertically when assembled on a motor vehicle.

In order that the invention may be more clearly understood, one embodiment thereof will now be described by way of example and with reference to the accompanying drawings.

Figure 1 is a plan view of a rear axle unit for a commercial vehicle according to this invention;

Figure 2 is a part-sectional elevational view of Figure 1 along the arrow X, showing the arrangement of the axle unit on assembly on a vehicle with a low loading floor;

Figure 3 is a sectional view of Figure 2 on line III—III;

Figure 4 is a similar view to Figure 2 and shows the arrangement of the rear axle unit on a vehicle having a high floor.

In the accompanying drawings, 1 denotes an intermediate frame comprising three similar steel tubes 2, each having welded to each end thereof a screw-threaded spigot 5.

The tubes 2, which are arranged with parallel axes according to the apices of an isosceles triangle, are attached at their ends

to two flanges 6 formed on two lateral axle housings 7.

Each axle housing 7 is of approximate S-shape and is open at both ends, its inner end facing the intermediate frame 1 and carrying an inner flange 6, and the other end carrying an outer flange 8 to which a wheel spindle 9 is bolted.

The flange 6, which is formed with an axial extension forming a collar 11, has three holes 10 bored therethrough according to the apieces of an isosceles triangle.

The ends of the three tubes 2 abut the flanges 6, the screw-threaded spigots 5 extending through the holes 10 and receiving projecting ends from locking nuts 3 by means of which the tubes 2 and flanges 6 are locked together to form a rigid cage.

The intermediate frame 1 also has bolted thereto on the tubes 2 a housing 4 enclosing a differential gear, the output shafts of which extend parallel to the axis of the tubes 2, and which are connected by means of a first pair of universal joints 12 to the ends of the two half axles 13 opposedly arranged in the axle housings 7.

The other ends of the propeller shafts 13 are connected through a further pair of universal joints 15 to two stub shafts 14 carried by wheel spindles 9 through the interposition of ball bearings 16.

The stub shafts 14 drive in a manner known *per se* epicyclic reducing gears 17 transmitting motion to the hubs 18 of wheels 19 fitted on the wheel spindles 9 through the interposition of ball bearings 21.

The common axis of the two wheel spindles 9 is parallel but not coincident with the axis of the output shafts of the differential gear, these two wheel spindle axes defining a plane situated substantially vertically in the position of assembly of the rear axle unit on a motor vehicle.

A brake disc 20 is keyed to each output shaft of the differential gear between the housing 4 and universal joints 12.

Two calipers 22 provided on their cheeks with friction linings 23 and operated in a manner known *per se* by pneumatic power units 24 are hinged by their arms to the rear tube 2.

The edge of each disc 20 is interposed between two cheeks of a caliper 22 which is clamped against the disc 20 on actuation of the vehicle brakes.

The calipers 22 are further controlled in a manner known *per se* by means of a set of rods and levers 25, which are actuated independently of the pneumatic unit.

The axle housings 7 are each formed externally with two flat bearing surfaces 26 which are situated substantially horizontally on assembly of the rear axle unit on a vehicle, opposite each other and equally spaced from the axis of the differential gear output shafts.

The surfaces 26 are adapted to alternately support the vehicle suspension members in the low and high floor constructions, respectively, as indicated in Figures 2 and 4, the latter position being obtained from the former on assembly of the rear axle unit on a vehicle by rotating the rear axle unit through an angle of 180° about the wheel axis.

The above described arrangement of the brake members permits actuation of the calipers 22 by a relatively low pressure, due to the fact that the discs 20 rotate during drive at the same angular speed as the differential output shafts, which is higher than the angular speed of the wheels 19 arranged past the reducing gears 17.

Consequently, the braking action of the above described brakes is more efficient than that of similar brakes arranged on the wheel hub 18.

Moreover, in the arrangement according to this invention, the caliper control of members of each brake are not located within the limited annular space available between the wheel rim and hub, and this facilitates both the arrangement of separate pneumatic and mechanical controls and at the same time cooling of the discs 20, this latter feature always being a problem with conventional arrangements.

WHAT WE CLAIM IS:—

1. A driving axle assembly for motor vehicles adapted to be connected to the vehicle by means of resilient suspension members and comprising a differential, two half axles extending therefrom, two axle housings supporting wheel spindles, wheel hubs containing a reducing gear mounted on each wheel spindle, and brake means adapted to brake the wheels, wherein the axle assembly comprises an intermediate frame rigidly supporting the differential gear and having two non-rectilinear axle housings fixed to either side of said frame and supporting the wheel spindles at their free ends, the axis common to both wheel spindles at their free ends, the axis common to both wheel spindles being parallel but not coincident with the axis of the output shafts of the differential gear, the said two axes together defining a plane which is situated substantially vertically when assembled on a motor vehicle.

2. An axle assembly as claimed in claim 1, wherein the intermediate frame comprises a cage made of similar tubes having parallel axis, the ends of said tubes being rigidly attached to the axle housings.

3. An axle assembly as claimed in claims 1 and 2, wherein each axle housing is of approximately S-shape and is open at both ends, its end facing the intermediate frame

having an inner flange for attachment to the tubes of the intermediate frame and its free end having an outer flange fast with one of the wheel spindles.

4. An axle assembly as claimed in claims 1 to 3, wherein the axle housings are each formed with two opposed bearing surfaces, which are horizontal of the axle assembly is fixed onto a vehicle, and equally spaced from the axis of the differential gear output shafts, and are adapted to alternately support the suspension for the vehicle in either low floor and high floor positions.

5. An axle assembly as claimed in claims 1 to 4, wherein the intermediate frame is formed by three tubes, the axes of the tubes being arranged along the apices of an isosceles triangle, and the ends of the said tubes being provided with screw-threaded spigots extending through holes in the inner flanges of respective axle housings to which they are secured by means of nuts.

6. An axle assembly as claimed in claims 1 to 5, wherein the inner flange on each axle housing is formed with an extension forming a collar which encloses and is adapted to guide the ends of the tubes of the intermediate frame.

7. An axle assembly as claimed in claims 1 to 6, wherein the brake means comprises a disc member keyed to each output shaft of the differential gear and a caliper member attached to one of the tubes of the intermediate frame.

8. An axle assembly substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

FORRESTER, KETLEY & CO.,
Chartered Patent Agents,
Jessel Chambers, 88/90 Chancery Lane,
London, W.C.2,
and
Central House, 75 New Street,
Birmingham, 2,
Agents for the Applicants.

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FIG. 1.

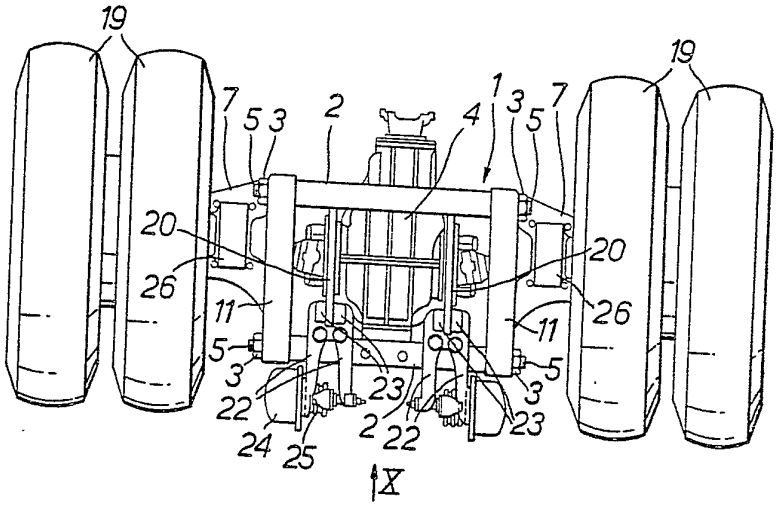
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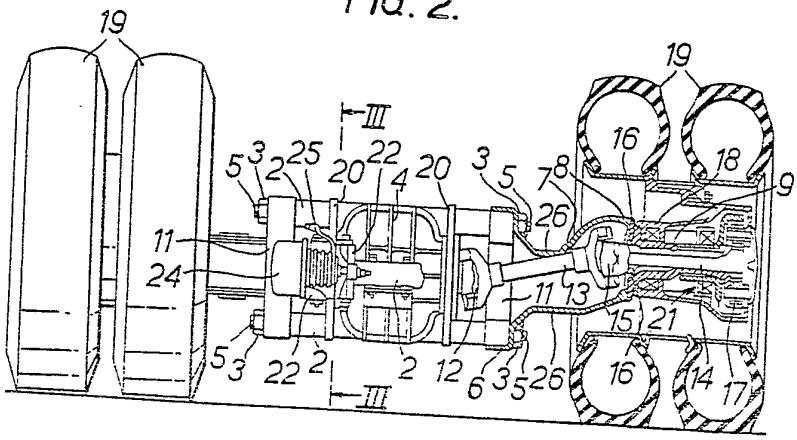
FIG. 2.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952795 COMPLETE SPECIFICATION
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Sheets 1 & 2

FIG. 3.

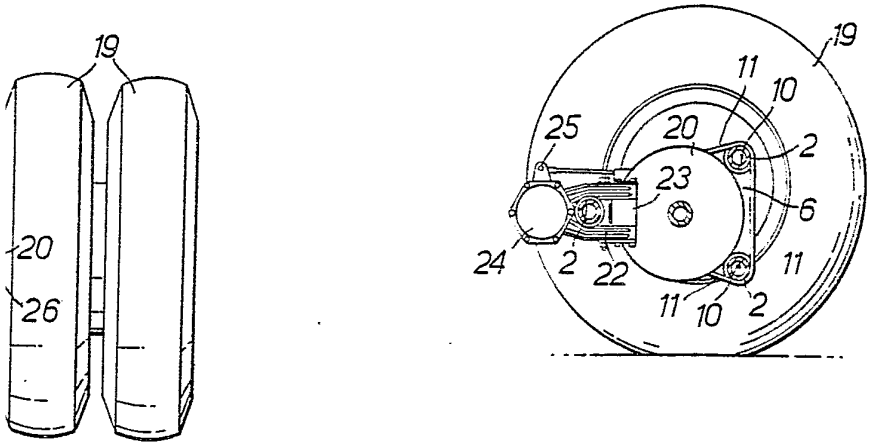
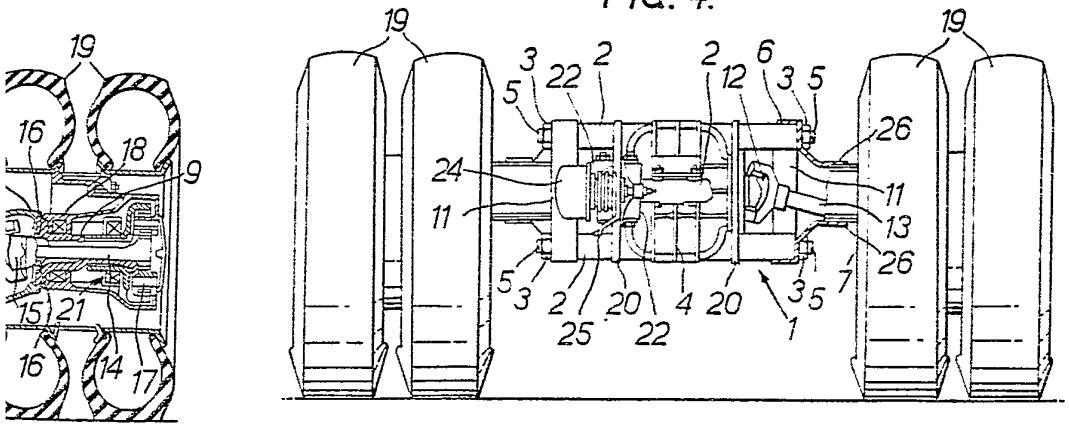


FIG. 4.



952795 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

FIG. 1.

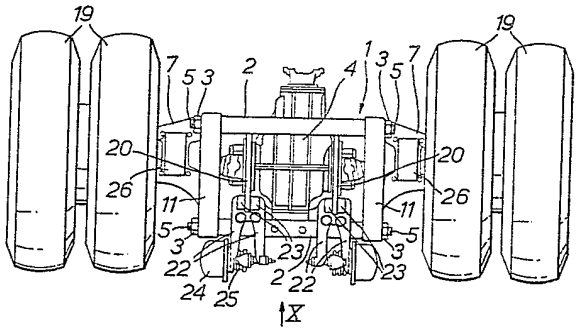


FIG. 3.

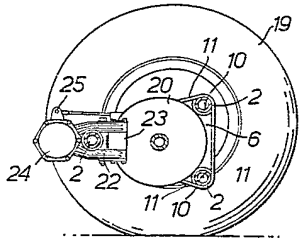


FIG. 2.

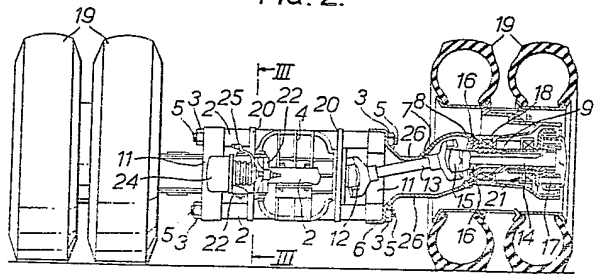


FIG. 4.