

The present invention concerns a novel method of constructing tipper vehicles ("semi-tipper" lorries, tipper trailers and the like) which are widely used, notably in civil engineering, for handling and transporting many materials. These vehicles have a tipper, mounted so as to tilt from the front towards the rear, and the invention relates to the structure of these tippers. Currently, these tippers include essentially a fixed chassis, itself formed by two longitudinal members connected by cross members and boxes welded electrically, and support a tilting hopper constructed from a steel base with bevelled corners, itself stiffened by steel sectional members and sides also stiffened by steel sectional members.

This normal method of construction, although extremely widespread, still has many drawbacks:

- the chassis supports the hopper at a relatively great height, which effects the stability of the vehicle;
- manufacture involves many operations of cutting, welding, assembly, etc, the cost of which is high;
- conversely, to keep the cost of the vehicle to an acceptable level, it is necessary to be content with steel which is relatively cheap and which therefore has a fairly low impact resistance and elastic limit. As a result the total weight of the vehicle is relatively great, because of the need for all the reinforcement designed to support the expected load;
- in addition, this method of construction determines in advance the type of axle, which is not interchangeable, for each type of chassis.

The state of the art can be defined by the following patents:

- FR.749.022: this patent relates to improvements to road tankers. It describes in particular the mode of construction shown in Figures 5 and 6. The tank itself forms the chassis of the trailer and rests directly on the carrier axles and has at the front a special shape for resting on the tractor. The bodywork is then mounted on supports fixed to the wall of the tank.

In this case this is not a tilting tipper but a road tanker. There is no correlation between the hopper and the chassis-cradle.

- DD.60.494: this patent describes a conventional tipper which rests in a conventional manner on its chassis, which is of a normal type. The only novelty is that the body or hopper is double bottomed and makes it possible to obtain a semi-cylindrical hopper.

The tipper hopper does not fit into a chassis-cradle, there being only a special shape of the bottom of the tipper hopper mounted on a conventional chassis.

- FR-A-596.836: this patent describes a support for tanks on tank lorries characterised by the fact that it is formed from two pieces of sheet metal each comprising a lateral wall and two flanges folded inwards and extending along the top and bottom edges of the wall following the contour of the support, these two pieces being joined in the position in which their flanges fit together, the flanges being oriented towards each other so as to form a double top wall and a double bottom wall between two supporting webs, spaced apart, formed by the lateral walls. The two pieces forming the support are joined to each other by welds provided on the flanges fitted together. The middle part of the top flanges on the support pieces and the top edge of the webs are given the form of a cradle or other concave shape suitable for constituting a tank seat. A curved bedplate rests on the concave wall forming the

cradle and is joined to this wall.

This patent does not describe a tilting tipper. In fact, the problems posed by a tilting tipper are very specific.

The cradle is produced from one or more cross members which simply receive the base of the tank. There is no fitting together. The proof is that straps or bands are necessary to hold the tank on the supporting cross members.

- US 3.093.254: the invention concerns wagons and particularly a wagon on which the body is designed to serve as a running mechanism, in the manner of a connecting structure between the front and rear wheels and the vehicle axle.

The main object of the invention is to provide an original wagon which is inexpensive and robust and which would use the structure of a box with an overall cylindrical shape, which would extend between the front and rear wheels and the axle, and in which the structure of the box is used as a torsion zone between the front and rear wheels.

A more particular object of the invention is to procure an original sheet steel box, with a straight shape, which is curved transversely between its ends and which is mounted on an original cradle, resting on the front and rear wheels and on the axle, the connections between the front and rear wheels and the axle and the box taking place at positions which afford the maximum support for the box and allow for the twisting movements of the wheels and axle, which enables the wagon to travel on bumpy terrain.

This patent describes a semi-cylindrical wagon for transporting grains. The tank is simply placed on the chassis.

Chocks prevent the tank from rolling. There is no fitting

between the hopper and cradle to obtain the specific advantage of tilting tipper.

The present invention makes it possible to eliminate all these drawbacks, through an original mode of construction of the chassis-box coupling.

According to the invention, the box, which will hereinafter be referred to as "the hopper", consists of a body with an overall prismatic or cylindrical appearance, obtained by folding or bending a rectangular metal sheet on a press, and the chassis, which will hereinafter referred to as "the cradle", also consists of a body with an overall prismatic or cylindrical appearance also obtained by folding or bending a rectangular metal sheet, these two parts having cross sections which are practically concentric and of the same dimensions, so that the lower portion of the said hopper fits exactly into the said cradle.

The vehicle of the tipper type, having a hopper tipping from the front to the rear and in the idle position resting in a supporting cradle fixed to the chassis of the vehicle, is characterised in that the said hopper and cradle consist of bodies with concentric cross sections so that the said hopper fits into the said cradle, the said hopper has a lower surface which is convex downwards in a vertical plane parallel to the horizontal transverse tipping axis of the said hopper, the said cradle having a top surface which is concave upwards in the said vertical plane, the said convex bottom surface and concave top surface fit into each other when the said hopper is in its lowest position, so that the bottom part of the said hopper fits into the said cradle.

The said cross sections are in the form of regular polygons with the same number of sides.

The said cross sections are in the form of irregular polygons

where the number and dimensions of the sides correspond between the box and cradle so as to ensure that they fit together.

The said cross sections are circular.

Naturally, the two components of this hopper/cradle coupling may have any desired dimensions, particularly with regard to the length, diameter and thickness of the sheet metal used, depending on the expected use of the equipment, and in accordance with the tolerances laid down by law.

However, the angle of opening of each cylindrical body will be variable, on the one hand to allow the hopper to fit into the cradle and on the other hand according to the intended use of the appliance. Thus, firstly, the cradle will have an angle of opening of between 90° and 120° approximately, to allow the hopper to tilt and position itself horizontally without jamming. Secondly, the angle of opening of the box will be able to vary between for example 180° (semi-cylindrical body) and a complete cylinder (then including spouts or manholes) in order to have the desired volume. For example, for a cereal semi-tipper, this angle can be 270° (three quarters of a circle).

Since the manufacture of these novel vehicles according to the invention is highly simplified, requiring only a powerful press, it becomes possible, without burdening the cost of them, to use a highly superior grade of steel, such as for example the one sold by the company I.M.S. SERVICES under the name "CREUSABRO 5000" (registered trade mark), the strength of which is eight times greater than that of the steels currently used for the same purpose. Because of the mechanical properties of this grade of steel, it then becomes possible to use much lower thicknesses of sheet metal, resulting therefore in equipment which itself is much lighter.

In this connection, the invention finds a particularly advantageous application, for example, in the manufacture of rockfill tippers. In fact, since the box then exactly fits the shape of the cradle with a very slight separation, the thicknesses of their respective walls are added to each other, which increases the resistance of this equipment to impacts from rocks when loading. By way of example, a semi-rockfill tipper manufactured from 10 mm thick "CREUSABRO 5000" sheet steel will have a weight of only approximately 6.5 tonnes, whilst with the current equipment the weight of a comparable semi-tipper would be 10 tonnes. The resulting saving is therefore considerable.

Likewise, whilst for the cradle a steel with high resistance to abrasion and high elasticity is preferable, for the hopper, steels of a lower grade, and which are therefore cheaper, may be acceptable in certain cases, such as the transport of cereals, or lighter metals such as aluminium may be sought.

This equipment also has a whole range of other technical advantages over existing equipment:

- because of its construction, the weight is concentrated at the centre and decreases at the sides. The centre of gravity is therefore much lower, which provides better stability for an identical volume;
- the separation between the load and the base of the cradle, which can be referred to as the "clearance" and which is of the order of 25 to 30 cm and more in the known equipment, is reduced to only 2 to 5 cm. This considerable decrease is an essential factor which reveals the present invention to represent considerable progress. In fact, there results from this a much better stability of the vehicle, both on the road, where the risk of overturning is greatly reduced, and when tipping, that is to say at the time of discharge by raising the hopper. An additional consequence of this is a great

decrease in wear on the tyres, which may, because of the invention, last for twice the mileage;

- this construction makes it possible to eliminate the holding stanchions or reinforcements which create a shearing effect in the sheet metal and on which the hopper wears rapidly; likewise, it makes it possible to eliminate the cross members holding the hopper, which results in a significant gain in width (twice 10 cm, the thickness of one cross member), and in weight;

- finally, this construction makes it possible to lower the height of the sides of the hopper by approximately 30 cm, which allows it to be loaded by means of small machines.

In order to make the invention better understood, a description of one non-limitative example of an embodiment will now be given, with reference to the accompanying drawing, in which:

- Figure 1 is a highly diagrammatic perspective view of a semi-tipper lorry, manufactured according to the invention, the tipper being in the raised position;

- and Figure 2 is a vertical cross section of the same equipment, the tipper being in the lowered position.

This drawing shows diagrammatically at 1 the chassis of the lorry, fitted in the usual way with a cab 2, and wheels 3 carried by axles 4.

The chassis 1 carries a cradle 5 in which rests a tipper 6 tilting from front to rear about an axis 7, under the action of a ram 9, to allow the discharge, through a rear panel 8, of the load contained in the tipper 6.

According to the invention, the cradle 8 and tipper 6 each

consist of a body which, in the case shown by way of example, has an overall prismatic appearance, that is to say where the cross section (Figure 2) has the shape of a portion of a regular polygon, the common centre of which is situated at 0, on the horizontal diameter defining the body 6.

As a result, each body 5 and 6 consists of a set of longitudinal panels 5' and 6' joined at ridges 5" and 6".

This structure in a form of flat panels connected by ridges has the best stiffness and most effective resistance to the bending forces resulting from the repeated action of the ram 9 on the end of the body 6.

The body 6, in the idle position, fits exactly into the cradle 5, concentric with it, which consequently has the many advantages set out above compared with the existing equipment for the same use.

In addition to the above advantages, the following features can be mentioned:

- this equipment accepts, without modification, axles with different tracks, only changing the height and position of the fixing points on the chassis or cylindrical cradle;
- all the accessory equipment (suspension, brake system, lifting ram systems, coupling device, wheels and tyres, lighting, etc) naturally remain the same as at present, and can easily be adapted to this new design;
- finally, because the box fits into the cradle, this equipment also behaves particularly well for transport when empty. However, according to a subsidiary characteristic of the invention, to avoid the hopper lifting up accidentally, for example under the effect of shaking or vibration, there is provided, on the front projection of the cradle, a single-

acting horizontal ram, the male stem of which fits, under the action of a return spring, into a cone fixed onto the front end board of the hopper. When the tipper is raised, the hydraulic pressurisation will release this stem in opposition to the spring. When the tipper returns, since the spring is released, it once again pushes back the locking stem, without any manual intervention.

Naturally, the above description does not entail any limiting character, and the present patent application on the contrary embraces all variant embodiments of the invention, in all possible applications of it, and notably all the ratios between the angles of opening of the hopper and cradle, provided that the angle of opening of the cradle is always less than the angle of opening of the hopper.

In particular, the cross section of each prismatic body may also consist of a circle or irregular polygon. In the latter case, of course, the dimensions of the sides of the polygons corresponding to the cradle and hopper must be arranged to ensure that one fits into the other.

REFERENCES

1. Chassis
2. Cab
3. Wheels
4. Axles
5. Cradle
- 5'. Longitudinal panel
- 5". Ridge
6. Tipper
- 6'. Longitudinal panel
- 6". Ridge
7. Axis
8. Rear panel
9. Ram



CLAIMS

1. Vehicle of the tipper type, having a hopper (6) tipping from the front to the rear and in the idle position resting in a supporting cradle (5) fixed to the chassis (1) of the vehicle, characterised in that the said hopper (6) and cradle (5) consist of bodies with concentric cross sections so that the said hopper (6) fits into the said cradle (5), the said hopper (6) has a bottom surface which is convex downwards in a vertical plane parallel to the horizontal transverse tipping axis of the said hopper, the said cradle (5) having a top surface which is concave upwards in the said vertical plane, the said convex bottom surface and concave top surface fit into each other when the said hopper (6) is in its lowest position, so that the bottom part of the said hopper (6) fits into the said cradle (5).
2. Vehicle according to Claim 1, characterised in that the said cross sections are circular, the hopper (6) consisting of a cylindrical body with an angle of opening of between 90° and 360° and the cradle (5) consisting of a cylindrical body with an angle of opening of between 90° and 120° .
3. Vehicle according to Claim 1, characterised in that the said cross sections are in the form of regular polygons with the same number of sides.
4. Vehicle according to Claim 1, characterised in that the said cross sections are in the form of irregular polygons where the number and dimensions of the sides correspond between the box (6) and cradle (5) so as to ensure that they fit together.
5. Vehicle according to Claim 1, characterised in that the said cross sections are circular.