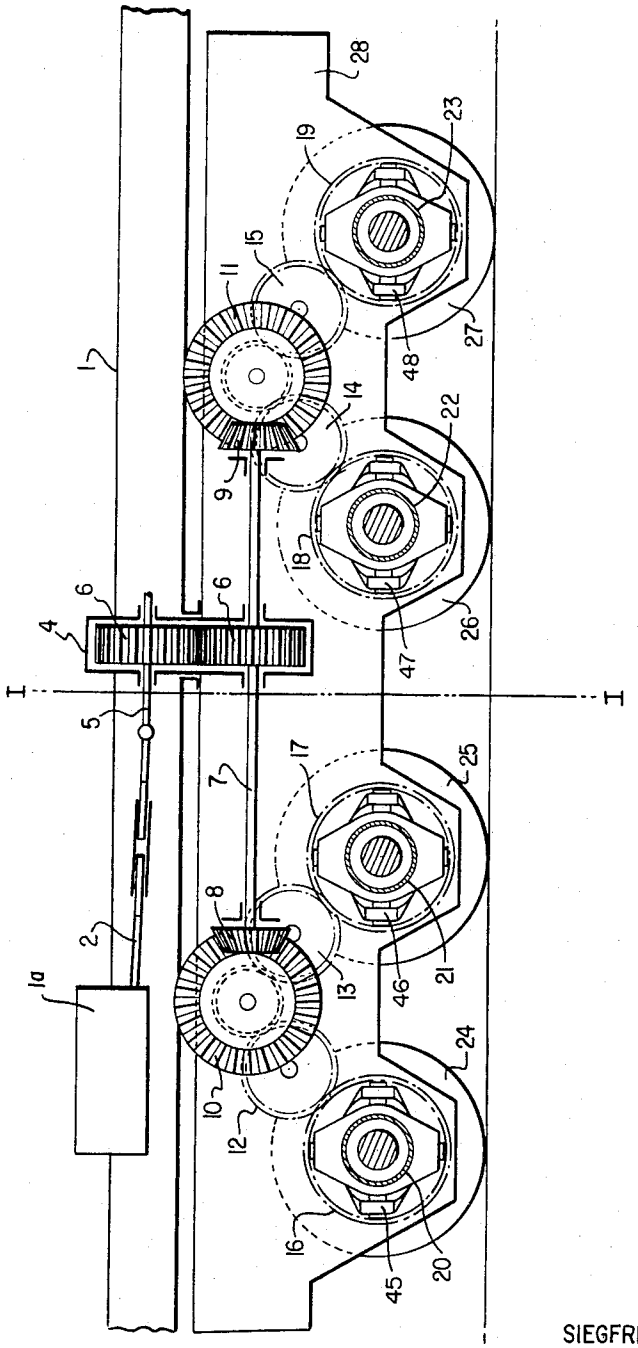
Nov. 5, 1968 S. KADEMANN ETAL 3,408,954

DRIVING MECHANISM FOR A RAILWAY TRUCK

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FIG. 1



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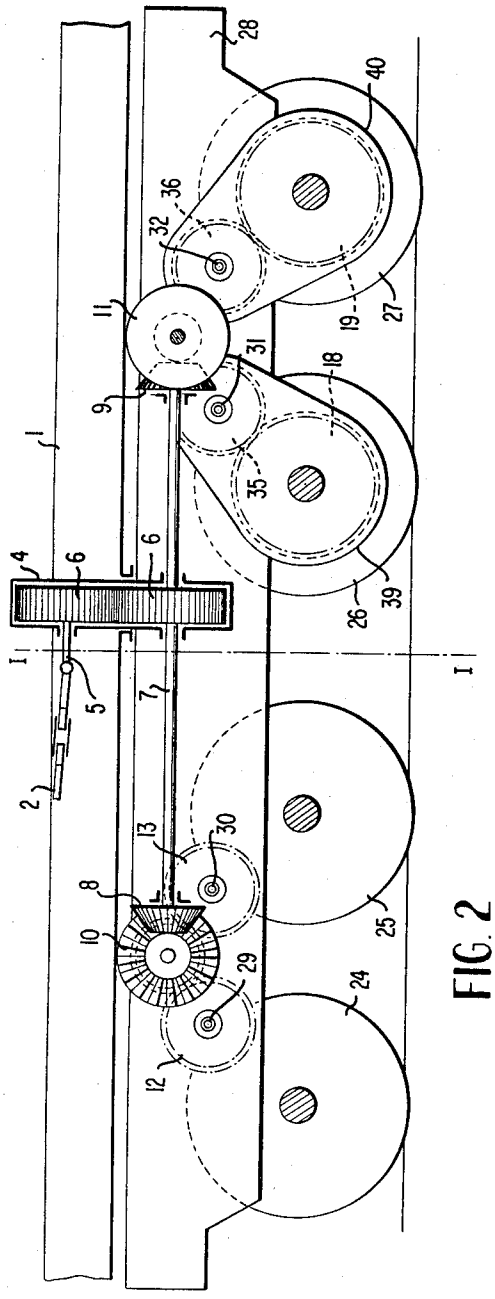


FIG. 2

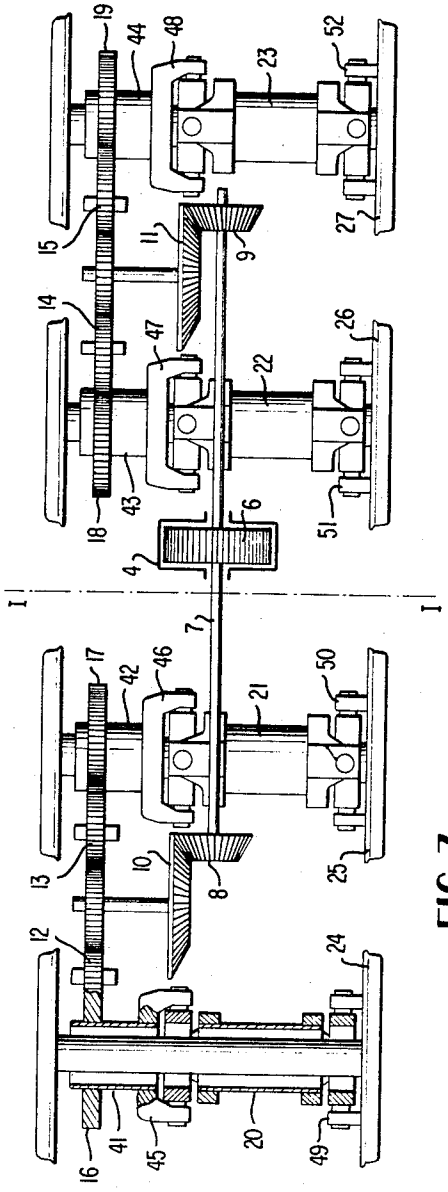


FIG. 3

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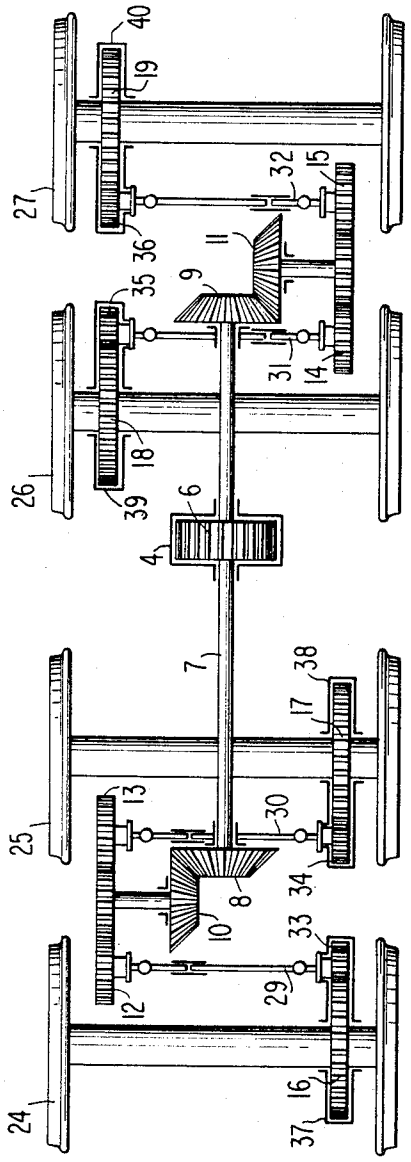
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DRIVING MECHANISM FOR A RAILWAY TRUCK

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FIG. 4



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DRIVING MECHANISM FOR A RAILWAY TRUCK

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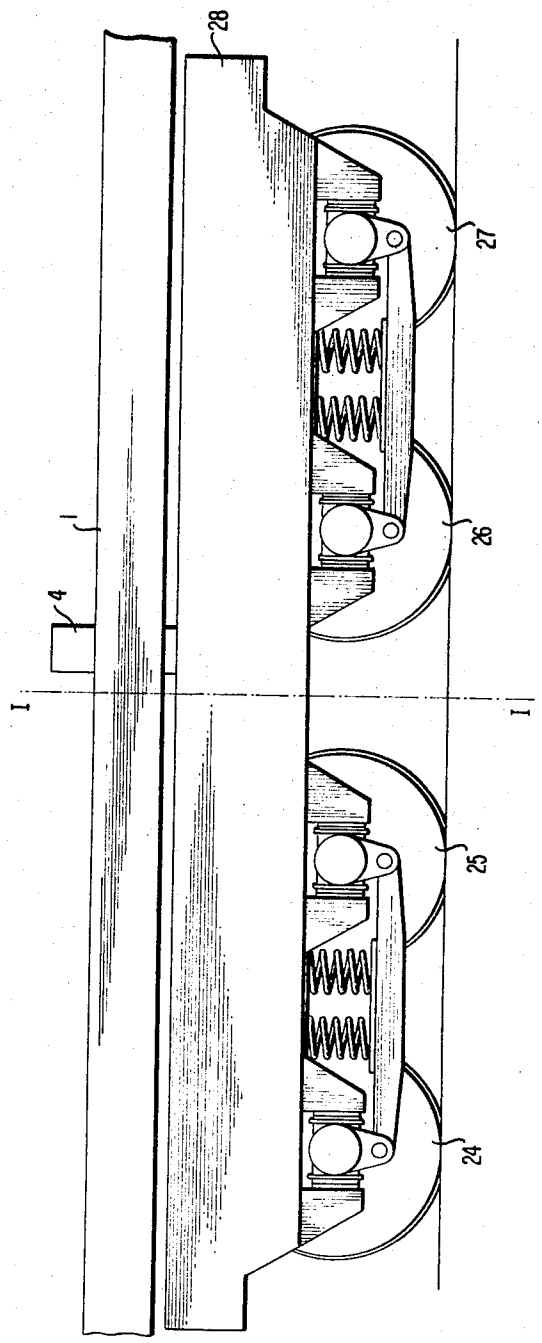


FIG. 5

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3,408,954

DRIVING MECHANISM FOR A RAILWAY TRUCK

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8 Claims. (Cl. 105—34)

ABSTRACT OF THE DISCLOSURE

This invention relates to a driving mechanism for a railway truck and, more particularly, to a driving mechanism for driving a series or group of axles on a railway truck in which power from a source mounted on the bridge girder of a railway vehicle is transmitted to the truck through a shaft having a universal joint therein, which shaft is positioned in the longitudinal direction of the vehicle. The reversal of the rotary movement from a direction of rotation about a longitudinal axis to a direction of rotation about transversely-positioned axles is effected by means of bevel gear drives and the driving axles are coupled with one another by means of spur gear.

In a group or series drive of axles in locomotive trucks, it is generally customary to effect the transmission of power from a source on the bridge girder to the truck, then to the distributor gear, and then to the individual axles through shafts having universal joints therein, all of which extend in the longitudinal direction of the vehicle and in which the axle gear, which reverses the rotary movement about the longitudinal axis into a rotary movement about the transversely-positioned axles by means of bevel gears and axle-drive or spur-bevel gears, serves as the last element in the power train. In such an arrangement of bevel gear drives as axle gears, the bevel gear drives are positioned at the point where the greatest torque occurs in case of a reduction in the speed of the vehicle. Increased power output also increases the size of the bevel gear drives, particularly that of the spur-bevel gears and, as a result of the small dimensions of the driving gears conventionally used in rail vehicles having trucks, the transmittable power per set of driving wheels is limited by the diameter of the spur-bevel gears of the axle drive.

It is desirable to shift and accommodate the bevel gear drives required for the reversal of the direction of rotation to a point where either the torques are smaller, as a result of a greater speed of the rotating shafts, or where sufficient space is available for providing adequately large bevel and spur-bevel gears. In such case, the drive of the driving axles is effected through spur gears and, for the purpose of compensating the spring play or spring range, hollow shaft drives of known construction, or transversely-positioned shafts having universal joints therein, or similar arrangements, are employed.

In locomotives having trucks with twin axles, it is known to effect the drive of the sets of driving wheels in a manner such that power is transmitted, from a power source on the bridge girder, through a longitudinally-positioned shaft having a universal joint therein, into the truck and to a shaft being rigidly secured thereto, at which time a reversal of the direction of rotation, about a right angle, is attained by employing a bevel gear drive mounted on the latter shaft. The distribution of the output or power to the two sets of driving wheels is effected by spur gears, in known manner.

Furthermore, it is known in railway trucks having three axles to couple all of the wheel sets in the manner described above by means of spur gears. In such an arrangement, however, the gear box becomes very large and heavy and this is also true to an increased extent where four-axle trucks are employed.

The present invention provides a series or group drive for a plurality of axles in a truck or a railway vehicle which eliminates the disadvantages of heretofore known constructions. The series or group drive of the present invention satisfies, with minimum weight, all requirements to be met by railway vehicles, by a combination of longitudinally and transversely-positioned shafts and spur gear and bevel gear drives. The present invention is primarily concerned with a railway vehicle equipped with trucks having three, four, or more axles.

In the construction of the present invention, power from a source mounted on the bridge girder of a railway vehicle is transmitted to the truck through a shaft having a universal joint therein, which shaft is mounted in the longitudinal direction of the vehicle. Reversal of a rotary movement from a direction of rotation about a longitudinal axis into a direction of rotation about transversely-positioned axles is effected by bevel gear drives and, further, the driving axles are coupled with each other by means of spur gears.

The power which is transmitted by the shaft having a universal joint therein, and which extends from the power source on the bridge girder, is transmitted, by means of a pair of spur gears, to a longitudinally-extending shaft which is positioned thereunder in the frame of the truck. At the ends of this shaft, the reversal of the rotary movement from a direction of rotation about a longitudinal axis into a direction of rotation about transversely-positioned axles is effected by gevel gears and spur-bevel gears. Meshing with each of the spur-bevel gears is a reduction and distribution gear consisting of spur gears which transmits the power to the sets of driving gears on the driving wheels. The reduction and distributor gear connects two sets of driving gears each with one another in a force-locking manner. The force-locking connection of the two groups of driving gear sets with each other is effected by means of the longitudinally-positioned shaft which is mounted in the frame of the truck.

For the purpose of transmitting power from the spring-suspended part to the non-spring-suspended part of the truck, either a hollow shaft drive or a drive through transversely-positioned shafts having universal joints therein, or a combination of these two mechanisms may be employed. On the longitudinally-positioned shaft mounted in the truck, the two sections between the upper pair of spur gears and the two bevel gears have the same degree of torsional rigidity.

The present invention achieves an equal amount of rotary elasticity between the driving engine and each set of driving gears, which does not exist in the conventional type of pure longitudinal universal joint arrangement with bevel gear drives as axle drives. In addition, the spatial construction and mounting of the bevel gear drives is not obstructed and these drives are, moreover, mounted at a point where the torque is less than it is at the axles. Due to the rigid connection or coupling of the sets of driving gears, on the one hand by means of spur gears, and, on the other hand by means of the longitudinally-positioned shaft mounted in the truck, favorable starting properties are obtained. The number of spur gears is small as is, accordingly, the weight and structural mass of the drive housings since only two sets of driving gears each are connected by spur gears which, in turn, are connected in pairs in a space-saving and simple manner through the longitudinal shaft which is positioned thereover.

Two embodiments of the present invention are shown in the accompanying drawings, in which

FIGURE 1 is a longitudinal view in longitudinal sec-

tion of a railway truck constructed in accordance with the present invention, using hollow shafts for transmitting power from the spring-suspended part to the non spring-suspended part,

FIGURE 2 is a longitudinal view in longitudinal section of a railway truck constructed in accordance with the present invention, using transversely-positioned shafts having universal joints therein for transmitting power from the spring-suspended part to the non spring-suspended part,

FIGURE 3 is a schematic top view of the embodiment according to FIGURE 1,

FIGURE 4 is a schematic top view of the embodiment according to FIGURE 2, and

FIGURE 5 is a longitudinal view of the embodiments according to FIGURE 1 and FIGURE 2 showing schematically the spring suspension of the axles.

Referring to FIGURE 1 and FIGURE 2, a driving engine **1***a* is mounted on the bridge girder **1** and may be, for example, either an electric motor, an internal combustion engine, or a high-speed steam engine, comprising all of the elements required for torque conversion and for reversal of the direction of travel. The driving engine drives through the shaft **2**, having a universal joint therein and being provided with slide members, the shaft **5** which is rotatably mounted in the truck and the fulcrum between the shaft **2** having the universal joint therein and the shaft **5** is provided as close as possible to the axis of rotation I—I of the truck. The torque is transmitted from the shaft **5** through a pair of spur gears **6**, enclosed in a gear box **4**, to the longitudinally-positioned shaft **7** which, similarly to the gear box **4**, is mounted in the truck frame **28**. The pair of spur gears **6** preferably should have no reduction but, instead, a step-up to a higher speed is desirable so that the bevel gear drives which are mounted at the ends of the shafts **7** need transmit only as small a torque as possible. These bevel gear drives consisting of the bevel gears **8** and **9**, respectively, and the spur-bevel gears **10** and **11**, respectively, change the direction of rotation, at a right angle, to a direction of rotation about transversely-positioned axles. Up to the spur-bevel gears **10** and **11** there is no fundamental difference between the embodiments due to FIGURE 1 and FIGURE 2.

Now referring to FIGURE 1 and FIGURE 3, meshing with the spur bevel gear **10** is a reduction and distribution gear consisting of the spur gears **12** and **13** and the driving gears **16** and **17** which latter are arranged on short hollow shafts **41** and **42**. These hollow shafts as well as the spur and bevel gears are housed in a gear box which forms part of the truck frame **28**. Power transmission to the sets of driving wheels **24** and **25** is effected by the hollow shafts **20** and **21** which are connected by universal joints **45** and **46** with the short hollow shafts **41** and **42**, respectively, and in the same manner by the universal joints **49** and **50** with the driving wheels **24** and **25**, respectively.

In an analogous manner, the spur gears **14** and **15** mesh with the gears **18** and **19**, respectively, and with the spur-bevel gear **11** to drive the driving wheels **26** and **27** by means of the universal joints **47** and **48**, the hollow shafts **22** and **23** and the universal joints **51** and **52**. With exception of the wheelsets **24**, **25**, **26** and **27**, the universal joints **49**, **50**, **51** and **52** and about a half of the hollow shafts **20**, **21**, **22** and **23** all elements of the truck are spring-suspended.

Referring to FIGURE 2 and FIGURE 4, another means of transmitting the torque from the spur gears **12**, **13**, **14**, and **15** to the wheel sets **24**, **25**, **26**, and **27**, respectively, is shown. Connected to each of the spur gears **12**, **13**, **14**, and **15**, is a universal joint shaft **29**, **30**, **31**, and **32**, respectively, which connects to the end pinions **33**, **34**, **35**, and **36**, respectively, of the single-stage axle drives **37**, **38**, **39**, and **40**, respectively, the driving gears of which, **16**, **17**, **18**, and **19**, respectively, are mounted directly on the wheel axles. The shafts **29**, **30**, **31**, and **32** compensate, by means of the joints therein as well as the illustrated slide members, the relative movements due to the spring play or travel between the wheel sets **24**, **25**, **26**, and **27**, and the truck frame **2**. As may be seen from the drawings, all parts of the truck are spring-suspended with exception of the wheelsets **24**, **25**, **26**, and **27** and the axle drives **37**, **38**, **39**, and **40**, which are mounted on the axles, as well as about a half of the shafts **29**, **30**, **31**, and **32**. Referring to FIGURE 5, the spring suspension of the wheelsets **24**, **25**, **26**, and **27**, to the truck frame **28** is schematically shown.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

What is claimed is:

1. A driving mechanism for a railway truck comprising a plurality of spring-suspended axles which includes a power source, means for transmitting power from the power source to a shaft mounted on the truck and extending in the longitudinal direction of the latter, gear means mounted on the shaft at each end thereof, and a pair of gear train means mounted on the truck, each of which meshes with one of the gear means and with at least one driving gear on at least one axle.

2. A driving mechanism according to claim **1** in which the means for transmitting power from the power source to the shaft mounted on the truck includes a shaft having a universal joint therein and a pair of spur gears.

3. A driving mechanism according to claim **1** in which the gear means mounted on the shaft at each end thereof is a bevel gear.

4. A driving mechanism according to claim **1** in which each gear train means includes a spur-bevel gear and at least one pair of spur gears.

5. A driving mechanism according to claim **1** in which each gear train means meshes with one of the gear means and at least two driving gears on at least two axles.

6. A driving mechanism according to claim **1** in which a hollow shaft drive is employed for transmitting power from a spring-suspended part to a non-spring-suspended part of the truck.

7. A driving mechanism according to claim **1** in which transversely-positioned shafts having universal joints therein are employed for transmitting power from a spring-suspended part to a non-spring-suspended part of the truck.

8. A driving mechanism according to claim **1** in which the shaft is connected to a spur gear intermediate the ends thereof and the two shaft sections thus formed have the same degree of torsional rigidity.

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