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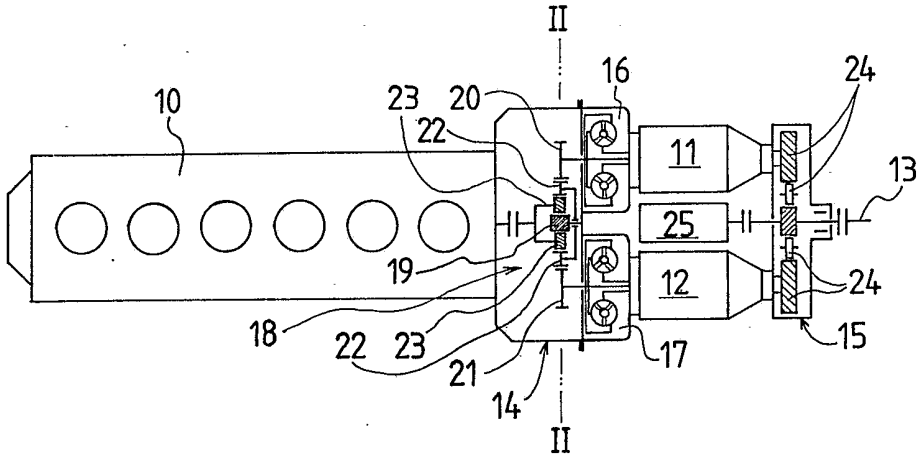
(71) Applicant
Sven-Olof Kronogard,
Karstorpsvagen 31,
234 00 Lomma,
Sweden
(72) Inventor
Sven-Olof Kronogard
(74) Agent and/or address for service
Marks and Clerk,
Alpha Tower,
Suffolk Street,
Queensway,
Birmingham,
B1 1TT

(54) An automotive power plant

(57) In order to reduce production costs and also reduce the required mounting space, a power plant for a vehicle, requiring a large, powerful prime mover (10), is provided with a transmission comprising at least two gear box sets (11, 12) of conventional passenger car type operating in parallel. The input ends of these gear sets are connected to a distribution gearing (14), while their output ends are connected to a collecting gearing (15). The distribution and/or the collecting gearing may be designed so that a certain exchange ratio, up or down, respectively, may be obtained within the same. The gear box sets (11, 12) may further be arranged so that different gear steps therein are slightly displaced in relation to each other.

The gear box sets may be provided with torque converters (16, 17) and may be of the automatic type, e.g. hydrodynamic, hydrostatic or mechanical CVT. They may be operated by a common gear shifting device of mechanical, electric or hydraulic type.

FIG. 1



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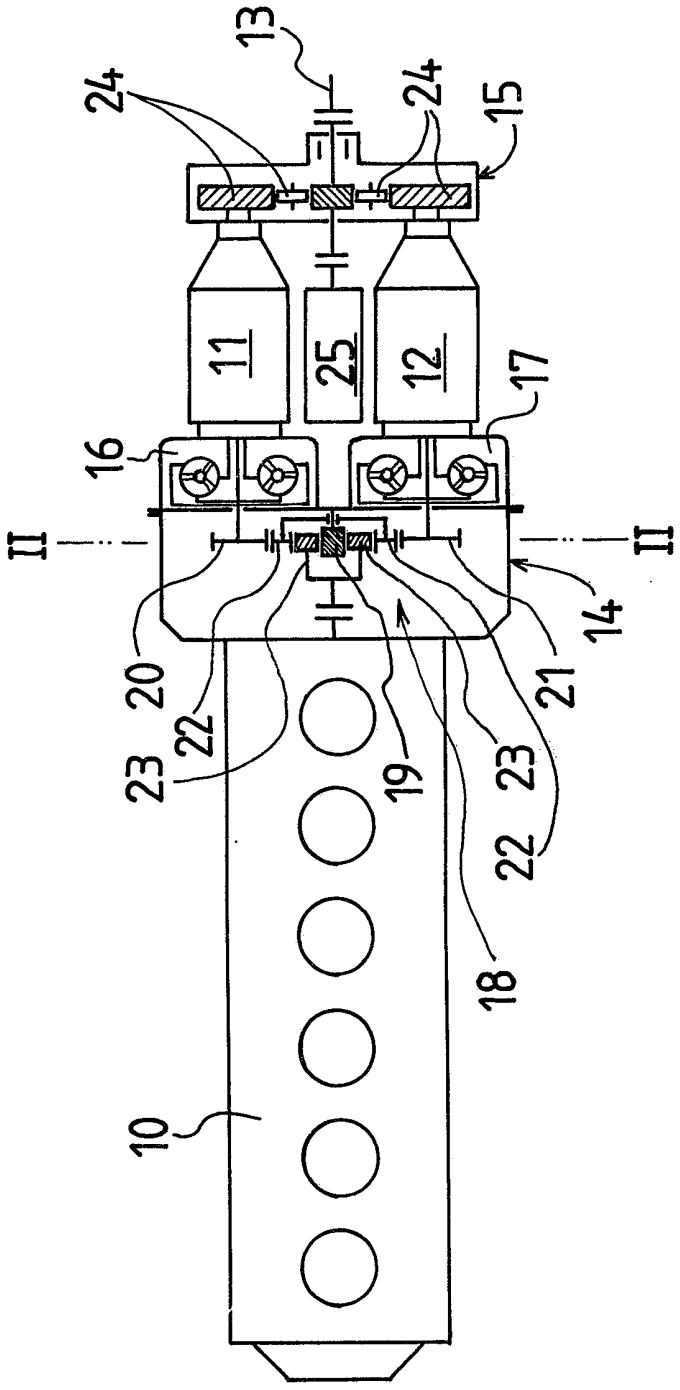


FIG. 1

FIG. 2

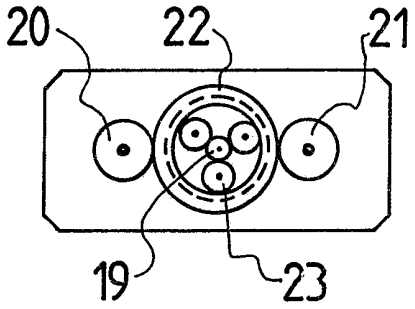


FIG. 3

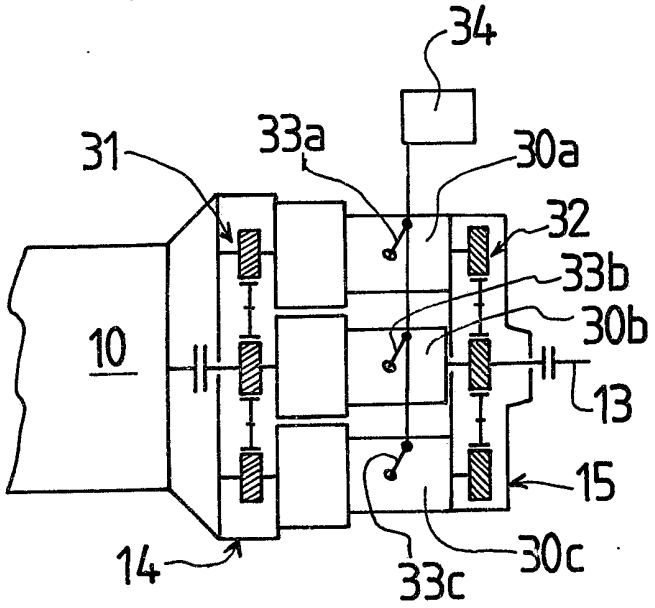


FIG. 4

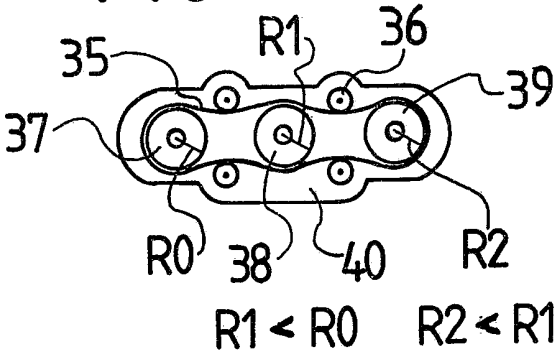


FIG. 5

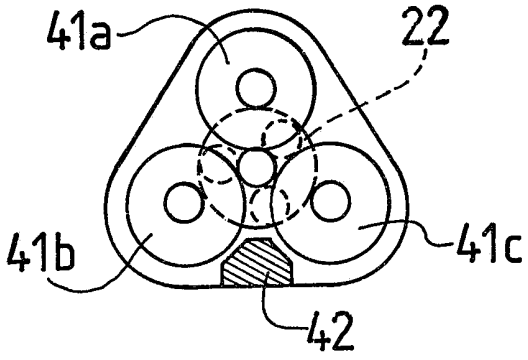


FIG. 6

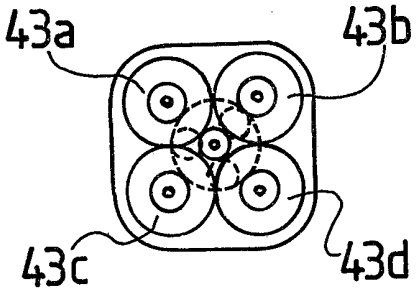
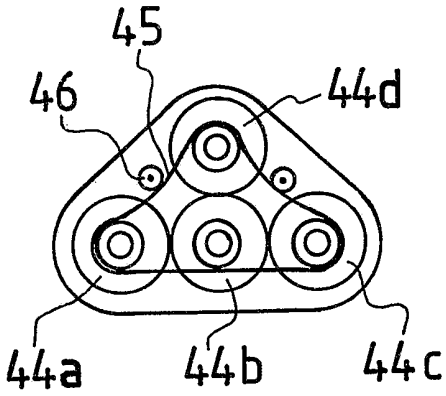


FIG. 7



SPECIFICATION

An automotive power plant

Long series of products are desirable within the mechanical workshop industry, as such series will offer considerable advantages concerning tooling costs, storage of parts etc. Within the car industry the production of passenger cars is many times that of the production of trucks and other vehicles requring a powerful prime mover. Even if vehicles of last mentioned type are produced in relatively large series, the number of individual components will be comparatively low, and thus the relative cost proportionally high. The requirements concerning load performance and operating time is of course different.

A truck will require a larger engine than a passenger car, and thus also a heavier gear box and other transmission elements. The object of the present invention is to provide an automotive power plant including a transmission means for vehicles requiring a powerful prime mover, whereby it is possible, by the use of standard passenger car gear boxes, to reduce production costs, and also to obtain advantages concerning space requirements. By changing the specific load capacity it is possible to compensate different load cycles.

According to the invention there is provided an automotive power plant comprising a prime mover and a gear transmission connecting it to an output shaft, wherein the gear transmission comprises at least two parallel gear box sets as well as a distribution gearing connecting their input ends and a collecting gearing connecting their output ends.

The gear box sets as well as the distribution and collecting gearings are preferably formed into an integral unit. The distribution gearing preferably includes a load distributing differential.

The distribution gearing and/or the collecting gearing preferably contains gear steps making possible an adjustment of speed or torque at the input or the output ends, respectively, of the gear box sets and may include members permitting different operating speeds and/or different moments of gear step exchange at associated gear box sets providing a smooth running, especially with gear boxes of the automotive type.

The gear boxes may be of the automotive type, for instance hydrodynamic, hydrostatic or mechanical CVT, and may be operable by a common actuator means of mechanical, electric or hydraulic type.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 schematically shows an automotive power plant according to the present invention;

Figure 2 shows a section through the distribution gearing, along line II—II in Figure 1;

Figure 3 shows a modification of the plant according to Figure 1, comprising three parallel gear boxes;

Figure 4 shows a section through a distribution or a collecting gearing of the belt or chain type, adapted for three gear boxes, and

Figures 5—7 show various ways of mounting three or four gear boxes.

The automotive power plant very schematically shown in Figures 1 and 2 comprises a powerful internal combustion engine 10 of the type common in trucks and similar heavy vehicles. The engine is connected to an output shaft 13 by way of two gear boxes 11, 12 of a type commonly used in passenger cars.

The two gear boxes 11, 12 are arranged in parallel and are interconnected by means of a distribution gearing 14 and a collecting gearing 15. Respective torque converters 16, 17 are connected to the input shafts of the gear boxes.

The distribution gearing 14 comprises a planet gearing 18, the sun wheel 19 of which is stationary in relation to the housing of the distribution gearing. Gear wheels 20, 21 at the shafts of the torque converters mesh with the external gear rim of a ring wheel 22, the internal gear rim of which meshes with planets 23 driven by the crank shaft of the engine.

The collecting gearing 15 comprises conventional, meshing gear wheels 24. Between the two gear boxes 11, 12 a space is available for the mounting of an electric generator 25 and/or other auxiliaries, for instance hydraulic servo pumps or fan driving means, which can be driven by the collecting gearing, as shown.

The two small gear boxes will ensure a low profile, which is advantageous with vehicles of low ground clearance, for instance buses or cross-country vehicles, but also with racing cars. The low profile will be more evident with some of the following embodiments.

The gear boxes may be of the automatic type e.g. hydrodynamic, hydrostatic or mechanical CVT, and it is possible to introduce a certain difference in the gear ratio at the distribution and the collecting gearing, respectively. The exchange steps will then be slightly displaced in relation to each other, which will ensure a smooth running. Gear shifting means of conventional kind are included, but have not been shown, as they are well known in the art.

The distribution and the collecting gearings may include members permitting a changing of the gear ratio, and these gearings and the gear boxes are built together into an integral unit, which may be mounted and dismounted as a unit, while maintaining individual service and replacement facilities.

The distribution gearing shown in Figures 1 and 2 will provide a certain upstepping, but it is possible, on other occasions, to use a conventional load distributing differential, which may be designed so that it does not vary the input speed.

When a four-wheel drive is desired, the electric generator 25 will have to be mounted for driving elsewhere, and its driving shaft is extended and connected to the front wheel differential.

The embodiment according to Figure 3 mainly

corresponds to that of Figure 1, but here three gear boxes 30*a, b, c* are mounted in parallel between distribution and collecting gearings 14, 15 respectively on this occasion comprising simple gear wheel transmissions 31, 32. Gear shifting levers 33*a, b, c* of the gear boxes are connected to a common governing or actuator device 34, which may be of mechanical, electric or hydraulic type.

Figure 4 shows an alternative embodiment of a distribution or a collecting gearing for three gear boxes, where the torque transferring member is a belt or a chain 35, which runs past chain tensioning wheels 36. In order to obtain the displacement of the gear steps, above referred to, the radius R0 of a first driven gear wheel 37 is slightly bigger than the radius R1 of the adjacent driving gear wheel 38, the radius of which, in turn, is slightly bigger than the radius R2 of the following driving wheel 39.

A common oil pan 40 is provided for gearings and gear boxes, and is connected to a cooler (not shown). When a chain drive is used the housing is closed in use, but with belt drive the housing will have to be partly open to ensure a satisfactory cooling.

Figure 5 shows an embodiment, where three gear boxes 41*a, b, c* are interconnected to a unit, in which two gears form a basis for the third, superposed gear. Driving is preferably brought from a ring wheel in a planetary gearing, corresponding to ring wheel 22 of Figure 1. The triangular cross-section permits a very compact structure. On occasions, the apex of the triangle may be turned downwards, i.e. gear box 41*a* is located below the two other. A common oil pan is denoted at 42.

The embodiment shown in Figure 6 has four parallel gear boxes 43*a, b, c, d*, which preferably are driven by a ring wheel 22 having internal and external gear rims, and forming part of a planetary gearing. The four gear boxes may alternatively be arranged so that gear box 43*a* will be located on top of gear box 43*d* in a vertical plane, while gear boxes 43*b* and 43*c* will be located side by side in a horizontal plane.

Figure 7 shows a further arrangement, where three gear boxes 44*a, b, c* are arranged side by side with a gear box 44*d* on top of gear box 44*b*. The driving here preferably occurs by way of a chain or a belt 45, running over chain tensioning wheels 46.

The embodiments above described and shown in the drawings are to be regarded as examples only, and the components forming parts thereof may be combined and varied in many ways within the scope of the appended claims. The prime mover 10 may be of arbitrary known kind, for instance a gas turbine.

Claims

1. An automotive power plant comprising a prime mover and a gear transmission connecting it to an output shaft, wherein the gear transmission comprises at least two parallel gear box sets as well as a distribution gearing connecting their input ends and a collecting gearing connecting their output ends.

2. A power plant as claimed in claim 1, wherein the gear box sets as well as the distribution and collecting gearings are formed into an integral unit.

3. A power plant as claimed in either of claim 1 or claim 2, wherein the distribution gearing includes a load distributing differential.

4. A power plant as claimed in any one of the preceding claims, wherein the distribution gearing and/or the collecting gearing contains gear steps making possible an adjustment of speed or torque at the input or the output ends, respectively, of the gear box sets.

5. A power plant as claimed in any one of the preceding claims, wherein the distribution gearing and the collection gearing include members permitting different operating speeds and/or different moments of gear step exchange at associated gear box sets.

6. A power plant as claimed in any one of the preceding claims, wherein the gear sets are of the automatic type.

7. A power plant as claimed in any one of claims 1 to 5, wherein the gear box sets are connected to a common actuator means of mechanical, electrical or hydraulic type.

8. A power plant as claimed in any one of the preceding claims, wherein a torque converter is provided at the input of each gear box set and the power plant auxiliaries are located between the gear box sets, and driven by the collecting gearing.

9. An automotive power plant substantially as hereinbefore described, with reference to, and as shown in Figures 1 and 2, or Figure 3, or Figure 4, or Figure 5, or Figure 6, or Figure 7 of the accompanying drawings.

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