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(71) **Applicant** *(for all designated States except US)*: **SCANIA CV AB** [SE/SE]; S-151 87 Södertälje (SE).

(72) **Inventors; and**

(75) **Inventors/Applicants** *(for US only)*: **STRÖMBOM, Vidar** [SE/SE]; Dellensvägen 32, 3 tr, S-120 58 Årsta (SE). **MEIJER, Lars** [SE/SE]; Nyponvägen 43, S-155 31 Nykvarn (SE).

(74) **Agent**: **WESTMAN, Mimmi**; Scania CV AB, S-151 87 Södertälje (SE).

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(54) **Title**: DEVICE FOR DISTRIBUTING LUBRICANT IN A MOTOR VEHICLE, AND MOTOR VEHICLE

(57) **Abstract**: The invention relates to a device (299) for vehicles, for distributing lubricant from a lubricant bath (205) incorporated in a gear housing (210) to a rotatable cover (240) and back, whereby a shaft (260) driven via a crown wheel (215) runs between the housing (210) and the cover (240) and lubricant is intended to be transferred from said bath (205) to distribution means (220, 280) by the crown wheel(215). The distribution means (220, 280) comprise a sleeve (280) fitted round the shaft (260) and running in a shaft journal (230) for a powered wheel (261; 262). The sleeve delineates spaces (P2, P3) between the drive shaft (260) and the surrounding shaft journal (230), which spaces (P2, P3) participate in the distribution of the lubricant from said bath (205) to the cover (240) and back. The invention relates also to a motor vehicle (100; 110) equipped with the device (299).

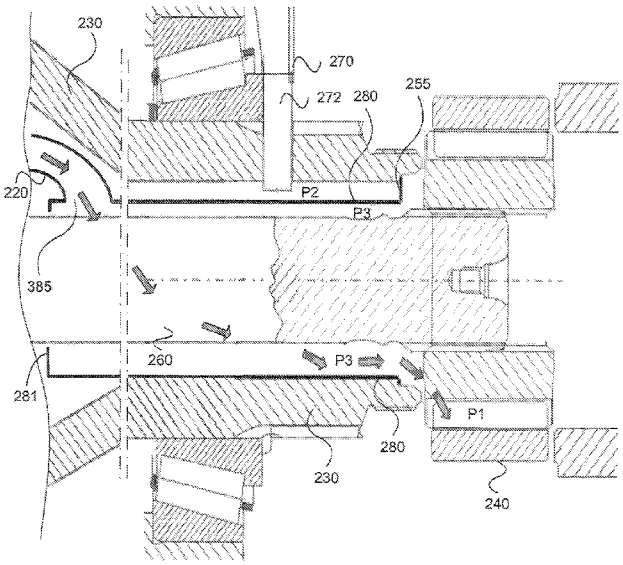

Fig. 3a

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Device for distributing lubricant in a motor vehicle, and motor vehicle

TECHNICAL FIELD

The present invention relates to a device for distributing lubricant in relation to a drive shaft of a motor vehicle. The invention relates also to a motor vehicle equipped with such a device.

BACKGROUND

Certain motor vehicles today are equipped with a device for distributing oil in relation to their drive shafts. The oil is used for lubricating and cooling vehicle components which cooperate with drive shafts, e.g. a central gear and planetary gears associated with the vehicle's powered wheels.

An existing device for distributing oil may comprise an oil pipe adapted to intercepting oil which is flung off by a rotating crown wheel of a central gear of the vehicle. The central gear is situated in a gear housing which has in its bottom an oil bath. A shaft journal is fastened to the gear housing and supports a cover which is rotatable relative to shaft journal and which forms part of a hub gear of planetary type associated with a powered wheel of the vehicle. A drive shaft situated in the shaft journal transmits driving power between the central gear and the planetary gear and thereby to the powered wheel.

The oil pipe runs between the gear housing and the cover and leads the oil from the gear housing to the cover in order therein to lubricate the planetary gear. The oil pipe is configured in the shaft journal and runs in relation to the drive shaft.

The cover rotates when the vehicle is in motion, causing part of the oil present in the cover to be pressed against the inside of the cover and to form thereon an oil film. A wiper fitted to shaft journal and situated in the cover comprises a blade which wipes oil off from the inside of the rotating cover. The wiper comprises also a passage adapted to leading the wiped-off oil to the shaft journal. The shaft journal is configured to lead the oil supplied by the wiper back to the oil bath in the gear housing.

The device described above for distributing oil in relation to a motor vehicle currently functions satisfactorily but entails certain shortcomings described below.

The fact that the oil pipe configured between the gear housing and the cover runs in a space in the shaft journal makes it difficult to modify the dimensions of the drive shaft. In certain cases it is desirable for a drive shaft to have a larger diameter than the currently prevailing dimensions. A drive shaft with a larger diameter makes it possible to achieve such characteristics as, for example, reduced vibration of a vehicle's power train during operation. Today's vehicles which have drive shafts with a smaller diameter may be felt by a driver to be somewhat less comfortable than vehicles which have drive shafts with larger diameters. Moreover, vehicles which have drive shafts with a larger diameter may perform better as regards torque transmission in their power train.

A conceivable solution to deal with the disadvantages described above may be to incorporate a flattened oil pipe which runs between the gear housing and the cover, resulting in a larger space in the shaft journal and thereby making it possible to implement a larger drive shaft. However, tests have shown that the oil flow in the oil pipe is too adversely affected for this solution to be attractive.

Another way of making it possible to implement a larger drive shaft might be to modify the shaft journal. If the shaft journal was modified, a number of nearby components of the vehicle would also have to be repositioned or modified, entailing large development costs.

There is therefore a need to provide a device for distributing oil to a motor vehicle's powered wheel shafts which makes it possible to increase the dimensions of the drive shafts without appreciably affecting the oil flow and without involving modifications of the shaft journal.

US 5,535,850 describes a device for a drive shaft of a vehicle which has a circulation system for a lubricant. Driving the circulation flow of the lubricant involves the expense of an oil pump situated between a gear housing and a planetary gear.

SUMMARY OF THE INVENTION

An object of the present invention is to propose a novel and advantageous device for distributing lubricant in relation to a powered wheel shaft of a motor vehicle.

Another object of the present invention is to propose a device for distributing lubricant which makes effective transfer of lubricant possible between a lubricant bath of a central gear and a planetary gear associated with the vehicle's powered wheels without involving modification of a shaft journal situated between them.

A further object of the present invention is to propose a robust device for distributing lubricant in relation to a motor vehicle's powered wheel shafts.

These objects are achieved with a device for distributing lubricant in relation to a motor vehicle according to claim 1.

An aspect of the invention is a device associated with a vehicle's powered wheel shafts in order to distribute lubricant from a lubricant bath incorporated in a gear housing situated in the wheel shaft to a rotatable cover associated with the vehicle's powered wheels, and back, in which gear housing a crown wheel drives via a differential a drive shaft which runs from the gear housing, through a shaft journal fastened to the gear housing, to a gear situated in the cover, whereby lubricant is intended to be transferred from said bath to distribution means via the crown wheel, said distribution means comprising a sleeve which is placed round the shaft, runs in the shaft journal and delineates spaces between the drive shaft and the surrounding shaft journal, which spaces participate in the distribution of the lubricant from said bath to the cover and back.

It is thus made possible with advantage for lubricant to be led into a space between the drive shaft and the sleeve, which means that part of the oil line pipe which in prior art ran between the gear housing and the cover can be eliminated.

In an embodiment of the invention, the lubricant is transferred by force of gravity from the lubricant bath to the cover, resulting in no need for a pump such as that described in prior art (see US 5,535,850). The device according to the invention therefore represents a cost-effective solution to the above problem.

The device is easy to implement in existing motor vehicles. In cases where a new drive shaft with a larger diameter is installed in a vehicle, the innovative device may also be installed. Installing the device according to the invention is simple and therefore cost-effective.

The device for distributing lubricant according to the invention may be installed in the vehicle during the manufacture of the vehicle. A purchaser of

the vehicle may thus have the option of choosing a vehicle with larger drive shafts and associated lubricant distribution devices.

The distribution means makes it possible to lead the lubricant to the cover via a space between the sleeve and the shaft, enabling effective transfer of the lubricant from the lubricant bath to the cover and back.

The sleeve may be adapted to leading the lubricant externally from the cover. The sleeve thus has a number of functions. It may therefore serve as a carrier for the lubricant. The fact that the sleeve together with the surrounding shaft journal can be used to lead the lubricant from the cover back to the lubricant bath results in a device with a closed circulation system for the lubricant, eliminating the need for further components and providing a cost-effective solution to the abovementioned problem.

The lubricant is preferably an oil, e.g. lubricating oil or alternatively a lubricating emulsion. The invention is not limited to any particular type of lubricant, as various suitable lubricants may be used.

A pipe may be adapted to intercepting lubricant flung off by the crown wheel and to leading the lubricant into the sleeve through an aperture in the sleeve. The pipe may be provided with an inlet, e.g. a slit, for receiving oil flung off by the crown wheel. The pipe may with advantage be made of plastic and hence be a relatively inexpensive component, contributing to a cost-effective solution to the abovementioned problem. The pipe may be of any desired configuration and may therefore be fitted in a manner which is appropriate in the light of the geometry of adjacent components. Leading lubricant into the sleeve through an aperture in the sleeve results in a simple configuration. An aperture in, e.g. a circular hole running through, the sleeve to accommodate the pipe which leads the lubricant may be formed during the manufacture of the sleeve, making the lubricant distribution device simple to install by reducing the number of fitting steps to be carried out by a fitter.

The sleeve is provided with an end element which prevents incorrect flow of the lubricant. The end element is adapted to hindering or completely preventing lubricant from running out of the space between the sleeve and the drive shaft incorrectly, e.g. at an end of the sleeve which points towards the gear housing. The result is a lubricant distribution device which has an effective and desirable flow from the gear housing to the cover. The end element may be of any desired configuration which wholly or partly covers at least the lower portion of the sleeve's end which points towards the gear housing.

In an alternative embodiment, the pipe adapted to intercepting lubricant flung off by the crown wheel may lead the lubricant into the sleeve through the end element which faces towards the gear housing. The result is an alternative configuration of the device for leading lubricant from the central gear housing to the planetary gear housed in the cover associated with the vehicle's powered wheels. An aperture in, e.g. a circular hole running through, the end element can easily be made during the manufacture of the end element, to accommodate the pipe which leads the lubricant. This makes the lubricant distribution device easy to install when fitting the wheel shaft.

The lubricant distribution device may further comprise a wiper adapted to capturing lubricant from the rotating cover and to leading the lubricant to an outside of the sleeve. The wiper comprises a blade which is firmly attached to the shaft journal and whose position can be preset. The position of the blade determines the maximum thickness of the lubricant film formed on the inside of the cover when the latter rotates during operation of the vehicle. The wiper thus has the effect of regulating a lubricant flow of the device in order to distribute lubricant in a predetermined way.

The wiper comprises also a passage adapted to leading wiped-off lubricant from the blade to the outside of the sleeve.

The device may further comprise a second end element for preventing incorrect flow of the lubricant. The second end element is adapted to hindering or completely preventing lubricant from being incorrectly transferred at the end of the sleeve which points towards the cover. The second end element directs the flow of the lubricant towards the lubricant bath in the gear housing so that lubricant from the wiper is prevented from returning immediately to the cover. The result is a lubricant distribution device which has an effective and desirable flow.

The sleeve may be firmly fitted in the shaft journal and may with advantage be situated eccentrically relative to a drive shaft of the vehicle, not only resulting in a robust structure but also facilitating the flow of lubricant through the spaces delineated by the sleeve relative to the shaft journal and the drive shaft.

The device may comprise a pumping element situated in a space between the sleeve and the drive shaft. The pumping element may increase the flow velocity of the lubricant and thereby improve the effectiveness of the device. The pumping element may be a coil wound round the drive shaft. When the drive shaft rotates, the coil will increase the flow of the lubricant. The coil may be made of plastic and hence be an inexpensive component.

The above objects are also achieved with a motor vehicle comprising the features of the device indicated in claims 1-12. The vehicle may be a truck, a bus, a wheeled loader or a construction site vehicle.

An advantage of the innovative device for distributing lubricant in relation to a motor vehicle's drive shafts is that the self-regulating effect is achieved. When the vehicle moves slowly, there will be a larger amount of lubricant in the bottom of the cover. When the vehicle moves more quickly, lubricant will

to some extent flow back to the lubricant bath, which is desirable in that the friction in the planetary gear would otherwise become too great.

Further objects, advantages and novel features of the present invention will be apparent to specialists from the details set out below and from applying the invention. The description of the invention set out below is intended to indicate that the invention is not limited to the specific details described. Specialists having access to the teachings herein will recognise further applications, modifications and incorporations in other fields, which are within the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For fuller understanding of the present invention and its further objects and advantages, the following detailed description should be read together with the accompanying drawings, in which the same reference notations apply to similar parts in the various diagrams, and in which:

Figure 1a illustrates schematically a vehicle according to an embodiment of the invention;

Figure 1b illustrates schematically a subsystem of the vehicle depicted in Figure 1a, according to an embodiment of the invention;

Figure 2 illustrates schematically a device for distributing lubricant in relation to the vehicle depicted in Figure 1a, according to an embodiment of the invention;

Figure 3a illustrates schematically in more detail part of a device for distributing lubricant in relation to the vehicle depicted in Figure 1a, according to an embodiment of the invention; and

Figure 3b illustrates schematically in more detail part of a device for distributing lubricant in relation to the vehicle depicted in Figure 1a, according to an alternative embodiment of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1a is a side view of a vehicle 100. The vehicle 100 exemplified comprises a tractor unit 110 and a trailer 112. The vehicle may be a heavy vehicle, e.g. a truck or a bus. The vehicle may alternatively be a wheeled loader or a construction site vehicle, e.g. an excavator.

Figure 1b depicts a subsystem 199 of the vehicle 100. The vehicle 100 is engine-powered and comprises a combustion engine 150 and a power train for transmitting torque from the engine 150 to powered wheels 261, 262 of the vehicle 100. The torque is intended to be transmitted via a gearbox 160 and a propeller shaft 170 to a central gear 212. The central gear 212 comprises a crown wheel and a differential to which two drive shafts 260 are connected. The drive shafts 260 each drive their respective powered wheel 261 or 262.

The vehicle 100 may be equipped with any desired number of powered wheel shafts. According to a version, the vehicle may be a so-called 6x4, i.e. a vehicle with has six wheels, four of them powered, i.e. a total of three wheel shafts, two of them powered. The vehicle depicted in Figure 1b is of the 4x2 type. Two non-powered forward wheels of the vehicle 100 have been omitted from Figure 1b.

Figure 2 depicts a device 299 for distributing lubricant in relation to the depicted wheel shaft of the vehicle 100 depicted in Figure 1a. The device 299 is installed in the tractor unit 110. Figure 2 shows only one device 299 for distributing lubricant in relation to a drive shaft 260. It will be obvious to one skilled in the art that two drive shafts each run from the central gear 212 to respective gears associated with mutually opposite powered wheels. The lubricant bath 205 is common to the two drive shafts, e.g. the drive shafts 260 depicted in Figure 1b.

The device 299 comprises a central gear 212 situated in a gear housing 210 which has in its bottom the lubricant bath 205. A shaft journal 230 is fastened to the gear housing 210 and supports via rolling bearings a rotatable cover 240 which is itself fastened to a powered wheel (not depicted). The cover 240 is part of a planetary gear depicted only schematically in Figure 2 which in a conventional manner transmits driving force from a drive shaft 260 to the powered wheel. The drive shaft 260 is situated in the gear housing 210 and the shaft journal 230 and transmits torque between the central gear 212 and the powered wheel via the planetary gear in the cover 240. A lubricant pipe 220 in the gear housing 210 has an aperture 225 for intercepting lubricant flung off by a rotating crown wheel 215 which is in contact with the lubricant in the lubricant bath 205 in the gear housing 210.

The lubricant pipe 220 is configured between the gear housing 210 and a substantially cylindrical sleeve 280 which is fastened to the shaft journal 230 and which surrounds the drive shaft 260. The external dimensions of its cylindrical portions make it possible for the sleeve 280 to be so placed that it surrounds the drive shaft 260 and yet is, at least in its upper portion, at a clear radial distance from the surrounding shaft journal 230. The axial extent of the sleeve 280 may run from the axial outer portion of the shaft journal 230 to the transition between the shaft journal 230 and the gear housing 210. With advantage, the sleeve extends axially in towards the gear housing 210 but only to a position at which there is sufficient space in the radial direction between the shaft journal 230 and the drive shaft 260 to enable the lubricant pipe 220 to be large enough to be able to lead desirable lubricant flows to the sleeve 280. The sleeve 280 may be made of metallic material or of plastic and may have protrusions (not depicted) on its outer surface which support it relative to the inner surface of the surrounding shaft journal 230.

The sleeve 280 is fastened to an element 255 which is situated in the region at the sleeve's outer end which points towards the planetary gear. The

element 255 takes with advantage the form of an annular end wall extending radially outwards from the sleeve 280. The element 255 may be fastened by press-fit to a shoulder formed on the end of the shaft journal 230 which points towards the planetary gear. Alternatively, the element 255 may take substantially the form of a crescent moon with its largest width situated vertically above the drive shaft 260. The fastening of the element 255 to the shaft journal may of course be by one or more separate fastening elements. Moreover, the element 255 may be made integrally with the sleeve or in the form of a separate annular unit fastened to the sleeve 280, e.g. by welding.

The element 255 is with advantage associated eccentrically with the sleeve 280 and so fitted in the shaft journal that an oil flow occupying a space P2 (see Figures 3a and 3b) is formed in the vertically upper portion between the sleeve 280 and the radially inner wall of the shaft journal 230. However, the eccentricity means that substantially no space is formed at the vertically lower portion between the sleeve 280 and the radially inner wall of the shaft journal 230. The sleeve's dimensioning relative to the drive shaft surrounding it also results in the formation of a space P3 between the sleeve and the drive shaft 260. Owing to the eccentric positioning of the sleeve 280, this space exhibits a larger distance between the sleeve 280 and the drive shaft 260 in the vertically lower portion than in the upper portion. The sleeve 280 thus forms with advantage at least two spaces P2 and P3 relative to the shaft journal 230 and the drive shaft 260. The sleeve 280 may be attached firmly to the shaft journal 230 in any desired way. One or more supporting elements may also be provided on the outside of the sleeve 280 to supportingly guide the sleeve relative to the inner surface of the shaft journal 230.

An end element 281 provided in a similar way in the region at the end of the sleeve 280 which points towards the central gear takes with advantage the form of an annular end wall extending radially from the sleeve 280 towards the outer surface of the drive shaft 260. The end element 281 reaches close

to, but does not come into contact with, the outer surface of the drive shaft 260 which rotates when the vehicle is in operation. In the same way as the element 255, the element 281 may be of substantially greater radial height in the vertically lower portion than in the upper portion. Owing to the sleeve's eccentric positioning, the greater height of the element 281 may cover a larger portion of the whole radial distance between the sleeve 280 and the outer surface of the drive shaft 260. Said larger portion may amount to substantially the whole of said distance in the case of the largest drive shaft dimension for which the wheel shaft is intended. The end element 281 serves as a radial wall preventing lubricant from running out from the space P3 in the sleeve 280 in a "wrong direction". Instead, the end element 281 guides the lubricant so that the lubricant flow is directed towards the cover 240. The end element 281 may be made integrally with the sleeve 280 or take the form of a separate annular unit fastened to the sleeve 280, e.g. by welding.

The lubricant pipe 220 in a version depicted in Figure 3a is fastened to the sleeve 280 and connects via an aperture 385 to the sleeve 280 and to the space P3 between the sleeve 280 and the drive shaft 260 at the sleeve's end which points towards the central gear 212. The lubricant is intended to be led through the lubricant pipe 220 by gravity from the gear housing 210 to the space P3. This is made possible by the fact that a height level of the lubricant pipe 220 at which the lubricant flung off by the crown wheel 215 is intercepted is higher than a height level at which the lubricant runs out from the sleeve 280 to the cover 240. The space P3 constitutes a passage for leading the lubricant towards the cover 240 in order to lubricate the planetary gear. The lubricant pipe 220 may be fastened to the sleeve 280 or to the surrounding gear housing 210 or the shaft journal 230 in any desired way whereby its outlet connects to the aperture 385 in the sleeve 280. According to a version there are sealing elements at the aperture 385 of the sleeve 280 to minimise the risk of lubricant leakage.

According to an alternative version with reference to Figure 3b, the end element 281 is provided with an aperture 386 to which the lubricant pipe 220 connects. The aperture 386 in the end element 281 is so arranged as to serve as an inlet for lubricant to the space P3 between the drive shaft 260 and the sleeve 280. In this version the lubricant will likewise have a net flow from the central gear 212 to the cover 240.

When the vehicle 100 is running, the cover 240 rotates, causing part of the lubricant present in it to be pressed against the inside of the cover 240 and thereby form a lubricant film. The thickness of the lubricant film depends inter alia on the amount of lubricant supplied to the cover 240 from the lubricant bath 205 in the gear housing 210. The more lubricant is supplied to the cover 240 from the lubricant bath 205, the thicker the lubricant film.

A conventional wiper 270 provided in the cover 240 is fastened in the shaft journal 230. The wiper 270 has a blade 271 which wipes lubricant off from the inside of the rotating cover 240. The wiper 270 comprises also a passage 272 adapted to leading the wiped-off lubricant to the shaft journal 230 and the space P2. The lubricant fed back from the wiper 270 to the lubricant bath 205 in the gear housing 210 is led through the space P2 on the outside of the sleeve 280. The lubricant film has during operation of the vehicle a maximum thickness determined by the position of the wiper.

According to a version (see Figure 3b) a coil-like element 290 is fastened round the drive shaft 260 to improve the flow of the lubricant in the space P3 between the sleeve 280 and the drive shaft 260. The coil 290 is fitted round the drive shaft 260 in a space between the sleeve 280 and the drive shaft 260. The coil 290 may be made of plastic material or metallic material.

The return flow of lubricant in the device 299 from the cover 240 to the gear housing 210 also takes place by gravity. It should be noted that a height level of the wiper 270 at which the lubricant is wiped off is higher than a

height level at which the lubricant is led back from the cover 240 to the gear housing 210, viz. at the end of the sleeve 280 which points towards the central gear 212 and at a lower portion of the shaft journal 230. The element 255 situated at the end of the sleeve 280 which points towards the planetary gear prevents "incorrect" flow of the lubricant to a lower portion of the cover 240. The element 255 thus has a sealing function and helps to ensure that the flow of lubricant from the wiper 270 is led to the space P2 between the outside of the sleeve 280 and the inside of the shaft journal 230 and then from the space P2 back to the gear housing 210.

Figure 3a illustrates schematically how lubricant is distributed according to an embodiment of the invention. The lubricant pipe 220 leads lubricant in from the gear housing 210 to the space P3 between the sleeve 280 and the drive shaft 260 via the aperture 385 in the sleeve 280. The end element 281 prevents flow of the lubricant back to the gear housing 210 and instead directs it to the space P1 in the cover 240 and the planetary gear situated therein.

During operation of the vehicle, the cover 240 rotates and the lubricant is pushed out by rotational force towards the inner surface of the cover 240. The lubricant film thus formed is continuously wiped off by the wiper 270, which leads the lubricant through the duct 272 in the wiper to the space P2 between the shaft journal 230 and the sleeve 280. The element 255 prevents the lubricant from the wiper 270 from being led from the space P2 into the space P1 in the cover 240 (see Figure 2). Instead, the lubricant runs from the space P2 back to the lubricant bath 205 (see arrows pointing left in Figure 2) via the outside of the sleeve 280 and the inside of the shaft journal 230.

Figure 3b illustrates schematically how lubricant is distributed according to an alternative embodiment of the invention. In this case the lubricant pipe 220 leads lubricant in from the gear housing 210 to the space P3 between the

sleeve 280 and the drive shaft 260 via an aperture 386 in the end element 281. This is also depicted in Figure 2. As in the solution according to Figure 3a, the end element 281 prevents flow of the lubricant back to the gear housing 210. Instead, the lubricant is fed, possibly with the help of the coil-like element 290 during its rotation together with the drive shaft 260, from said space P3 to the space P1 in the cover 240 and the planetary gear situated therein. In the same way as described with respect to Figure 3a, the lubricant is thereafter led back to the gear housing 210 via the planetary gear in the cover 240, the inner wall of the cover 240, the wiper 270, the space P2 and finally via the outside of the sleeve.

The foregoing description of the preferred embodiments of the present invention is provided to illustrate and describe the invention. It is not intended to be exhaustive or to limit the invention to the variants described. Many modifications and variations will be obvious to specialists. For example, the space P2 may be adapted to leading lubricating oil to the space P1 in the cover, in which case the space P3 will be used to lead lubricating oil back to the gear housing.

CLAIMS

1. A device (299) associated with a wheel shaft of a vehicle (100; 110) to distribute lubricant from a lubricant bath (205) incorporated in a gear housing (210) situated in the wheel shaft to a rotatable cover (240) associated with a powered wheel (261; 262) of the vehicle, and back, in which gear housing (210) a crown wheel (215) drives via a differential a drive shaft (260) which runs from the gear housing (210), through a shaft journal (230) fastened to the gear housing (210), to a gear situated in the cover (240), whereby the lubricant is intended to be transferred from said bath (205) to distribution means (220, 280) by the crown wheel (215), **characterised** in that said distribution means (220, 280) comprise a sleeve (280) which is fitted round the shaft (260), runs in the shaft journal (230) and delineates spaces (P2, P3) between the drive shaft (260) and the surrounding shaft journal (230), which spaces (P2, P3) participate in the distribution of the lubricant from said bath (205) to the cover (240) and back.

2. A device according to claim 1, whereby the distribution of the lubricant from said bath (205) to the cover (240) and back is by force of gravity.

3. A device according to claim 1 or 2, whereby the sleeve (280) is fastened to the shaft journal (230) and is disposed eccentrically relative to said shaft (260) so that the distance between the sleeve (280) and the shaft journal (230) is greater above than below the drive shaft (260).

4. A device according to any one of claims 1-3, whereby said distribution means (220, 280) make it possible to lead lubricant into at least two spaces, the first of which (P3) is formed between the sleeve (280) and the drive shaft (260) and the second (P2) is formed between the sleeve (280) and the shaft journal (230).

5. A device according to claim 4, whereby the first space (P3) is adapted to leading lubricant to the cover (240) and the second space (P2) is adapted to leading lubricant from the cover (240) to the lubricant bath (205).

6. A device according to any one of the foregoing claims, whereby the sleeve (280) is provided with at least one element (281, 255) for preventing incorrect flow of the lubricant.

7. A device according to claim 6, whereby at least one element (255) is provided, at the sleeve's end which points towards the cover (240), to prevent incorrect flow of lubricant from the second space (P2).

8. A device according to claim 7, whereby at least one element (281) is provided, at the end of the sleeve (280) which points towards the gear housing (210), to prevent incorrect flow of lubricant from the first space (P3).

9. A device according to any one of the foregoing claims, whereby a pipe (220) is adapted to intercepting lubricant flung off by the crown wheel (215) and to leading lubricant through an aperture (385, 386) in the sleeve (280) which leads the lubricant to the first space (P3).

10. A device according to claim 9, whereby the aperture (386) to the first space (P3) is situated in the element (281).

11. A device according to any one of the foregoing claims, whereby a wiper (270) is adapted to intercepting lubricant on the rotating cover (240) and to leading lubricant to the space (P2) between the shaft journal (230) and the sleeve (280).

12. A device according to any one of the foregoing claims, whereby a coil-like pumping element (290) is associated with the drive shaft (260) in the space (P3) between the sleeve (280) and the drive shaft (260).

13. A motor vehicle comprising a device (299) for distributing lubricant according to any one of claims 1-12, which vehicle (100; 110) is any from among truck, bus, wheeled loader or construction site vehicle.

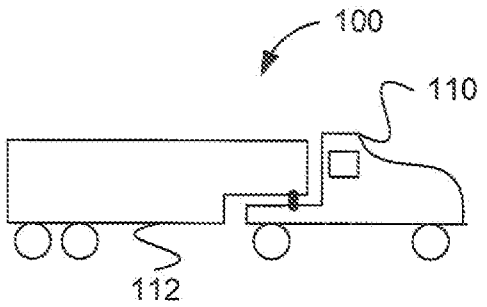

Fig. 1a

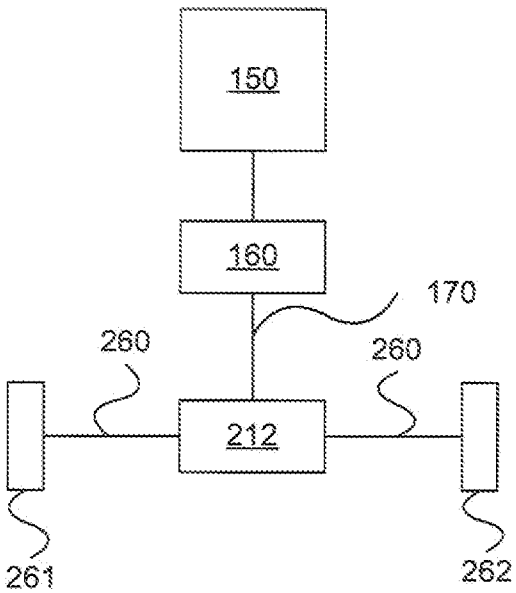

Fig. 1b

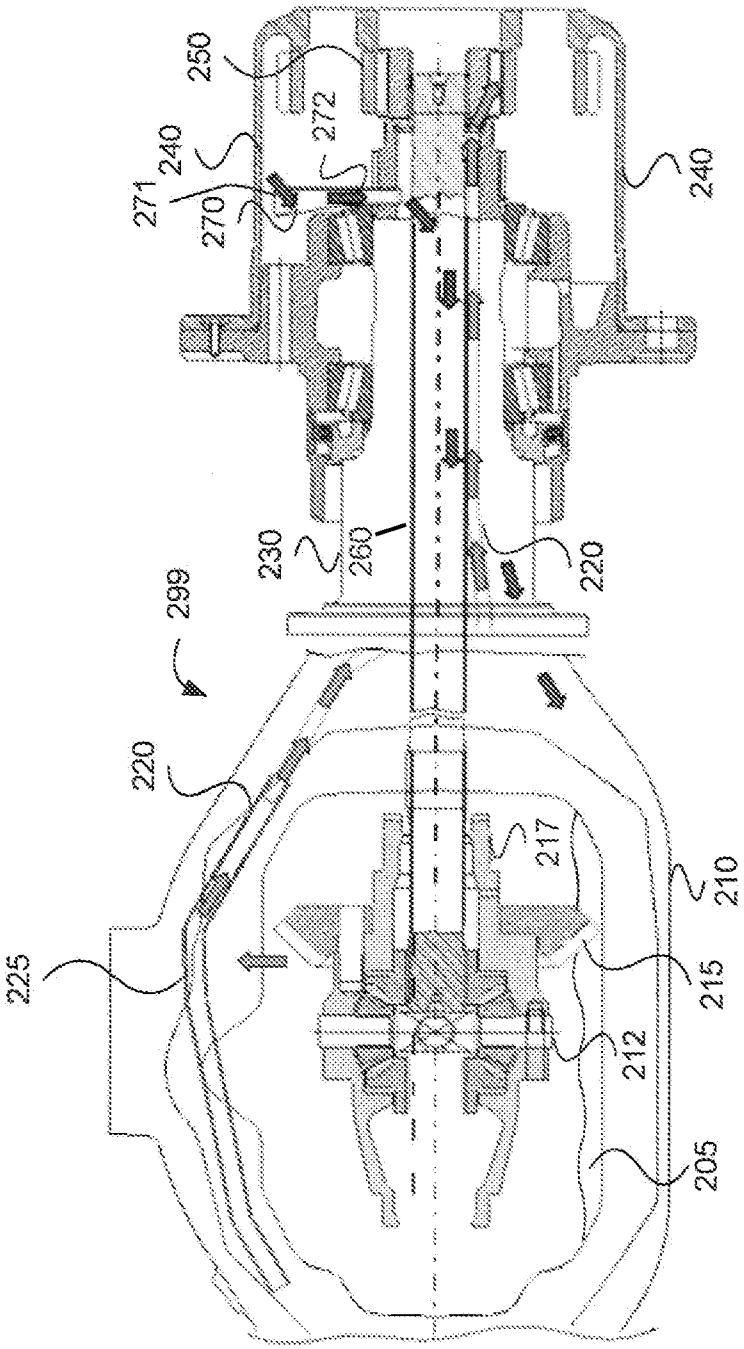
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Fig. 2

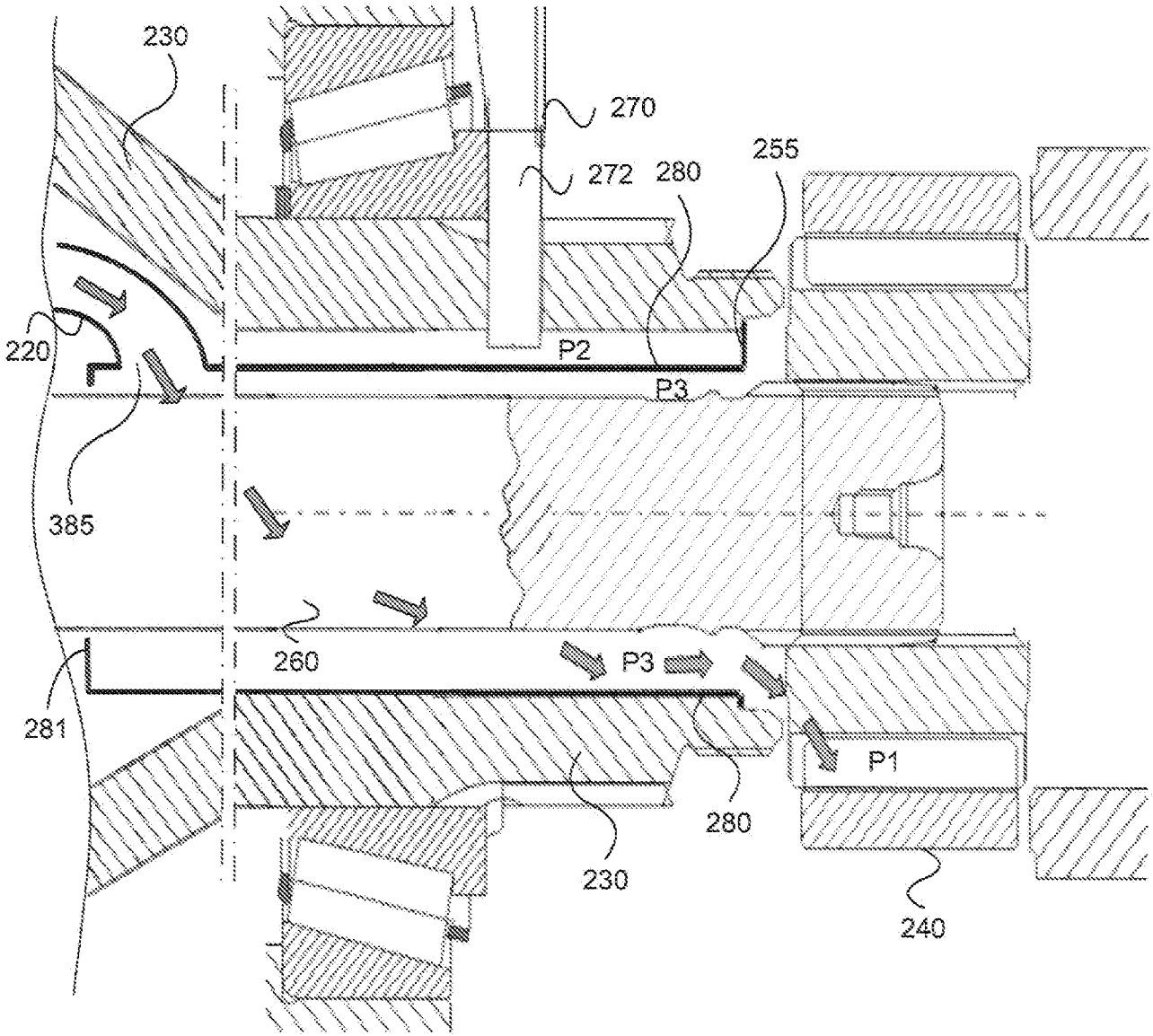

Fig. 3a

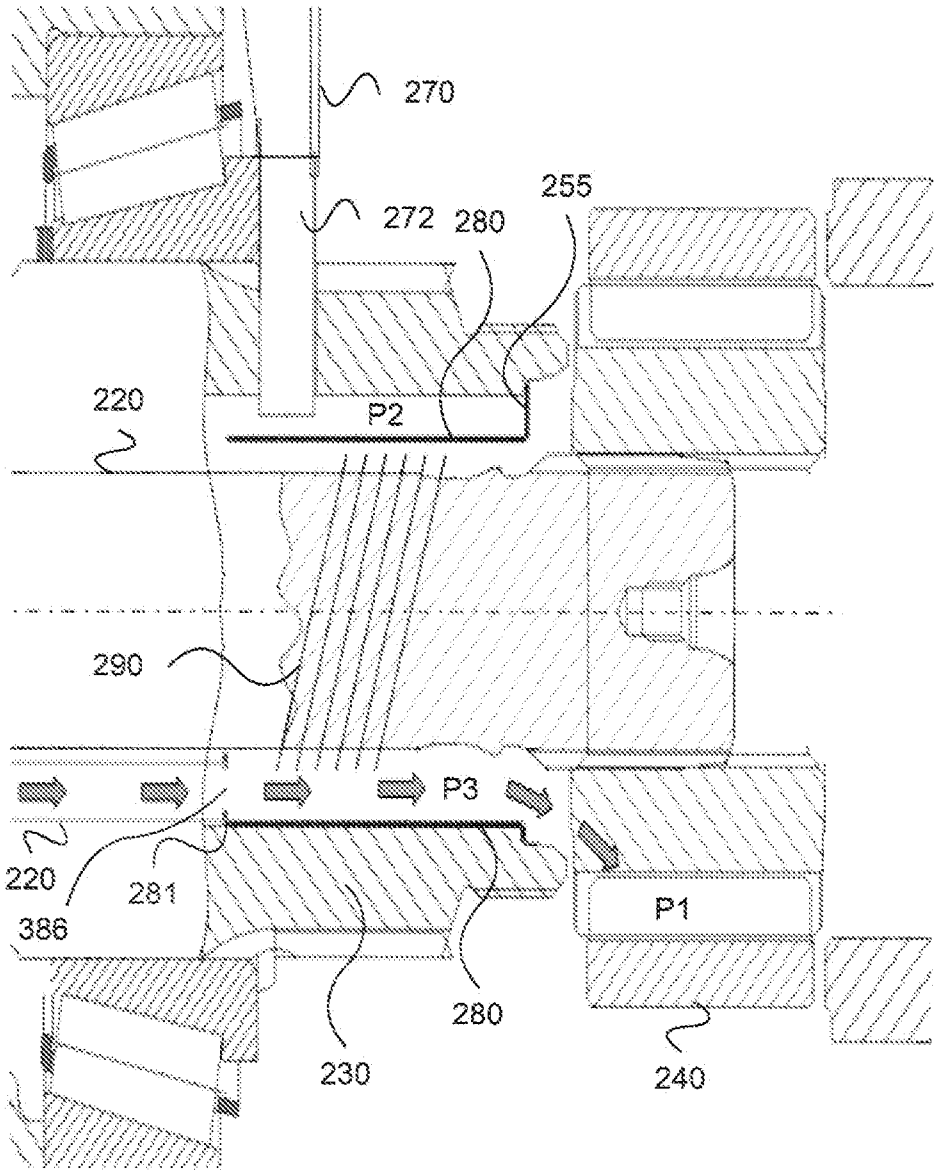

Fig. 3b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/050952

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F16H, F16N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5197929 A (SCHEIBER ET AL), 30 March 1993 (30.03.1993), figures 1-7, abstract --	1-13
A	DE 19648212 A1 (ZF FRIEDRICHSHAFEN AG), 28 May 1998 (28.05.1998), figures 1-3, abstract --	1-13
A	DE 10162864 A1 (ZF FRIEDRICHSHAFEN AG), 10 July 2003 (10.07.2003), figures 1,2, abstract --	1-13
A	US 5839327 A (GAGE), 24 November 1998 (24.11.1998), figures 1-10, abstract --	1-13

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
14 October 2010	28-10-2010
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan-Axel Ylivainio / JA A Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/050952

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5535850 A (TAR ET AL), 16 July 1996 (16.07.1996), figures 1-4, abstract -- --------	1-13

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F16H 57/04 (2010.01)

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Cited literature, if any, will be enclosed in paper form.

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