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(54) **AUTOMATED NON-SYNCHRONIZED GEAR-CHANGE TRANSMISSION AND METHOD FOR GEAR CHANGE IN SUCH A TRANSMISSION**

(75) Inventors: **Martin Grillenberger**, Stuttgart (DE); **Markus Heinzel**, Donzdorf (DE); **Andreas Kolb**, Wernau (DE); **Juergen Lang**, Backnang (DE)

Correspondence Address:
CROWELL & MORING LLP
INTELLECTUAL PROPERTY GROUP
P.O. BOX 14300
WASHINGTON, DC 20044-4300 (US)

(73) Assignee: **DaimlerChrysler AG**

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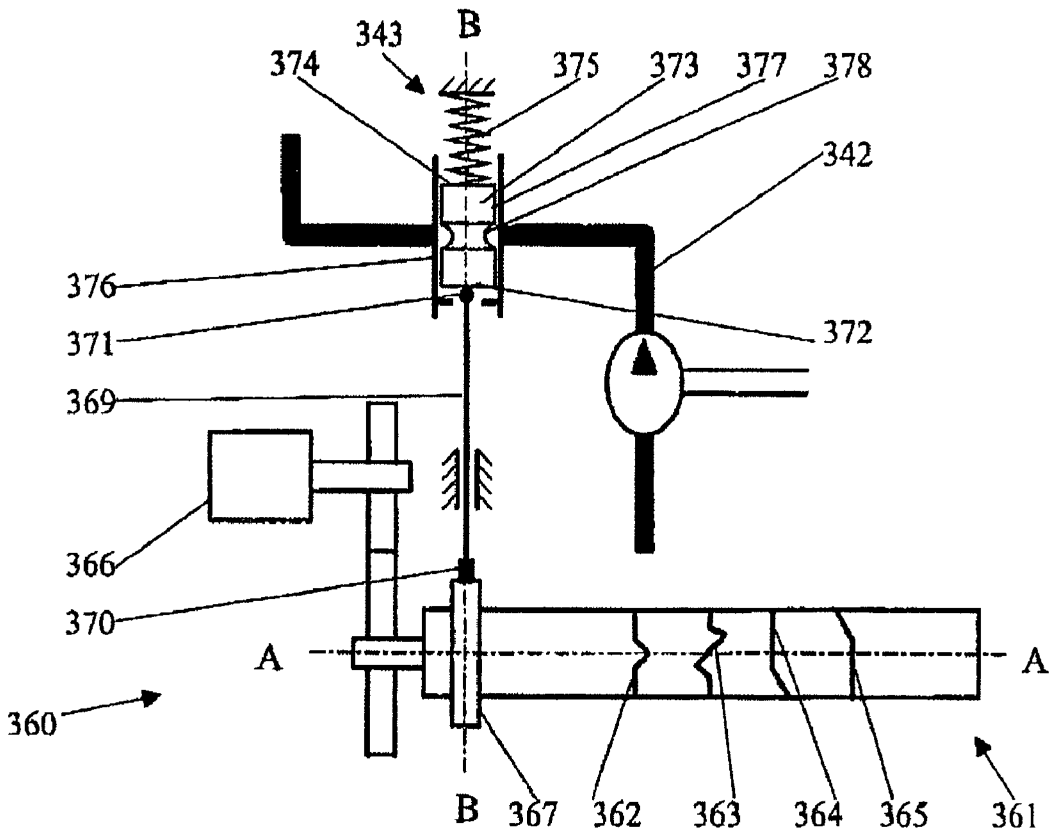
(57) **ABSTRACT**

An automated non-synchronised gear-change transmission for a motor vehicle includes a transmission input shaft and a pressure-oil lubrication device. The pressure-oil lubrication device includes a pump driven at least indirectly by the transmission input shaft, and a cross-section modification device disposed on a downstream side of the pump. The cross-section modification device is configured to modify a flow cross section on the downstream side of the pump.



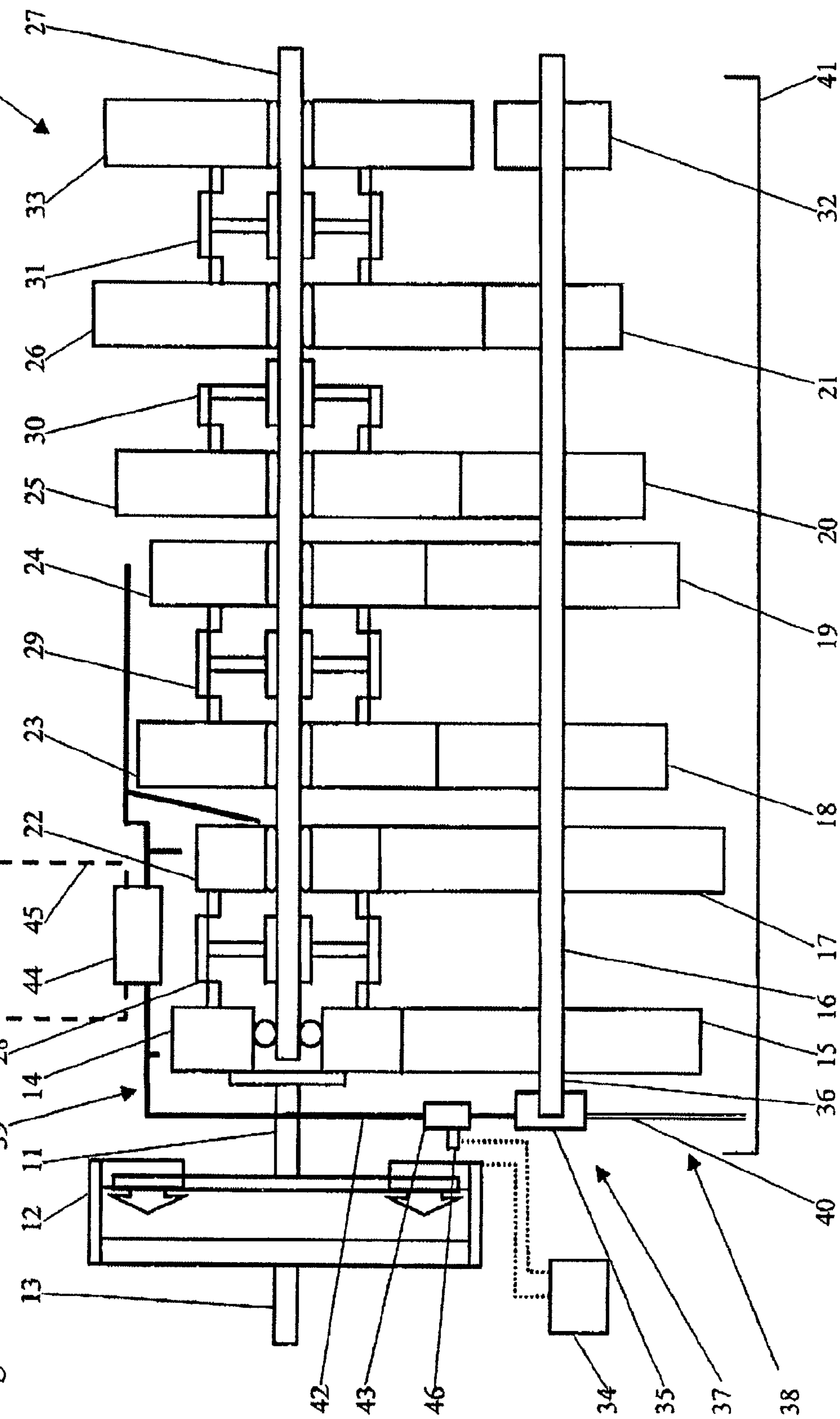

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Fig. 1

Fig. 2

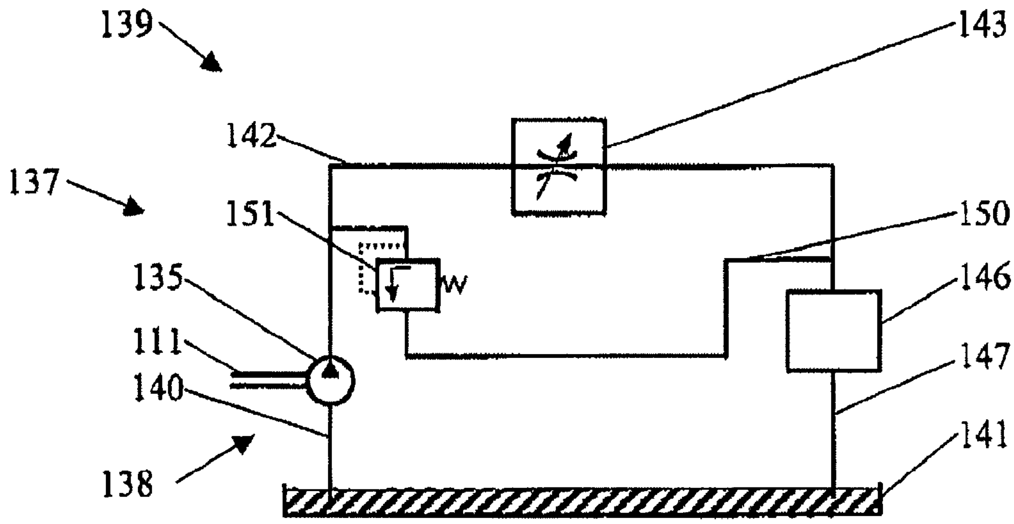
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Fig. 3

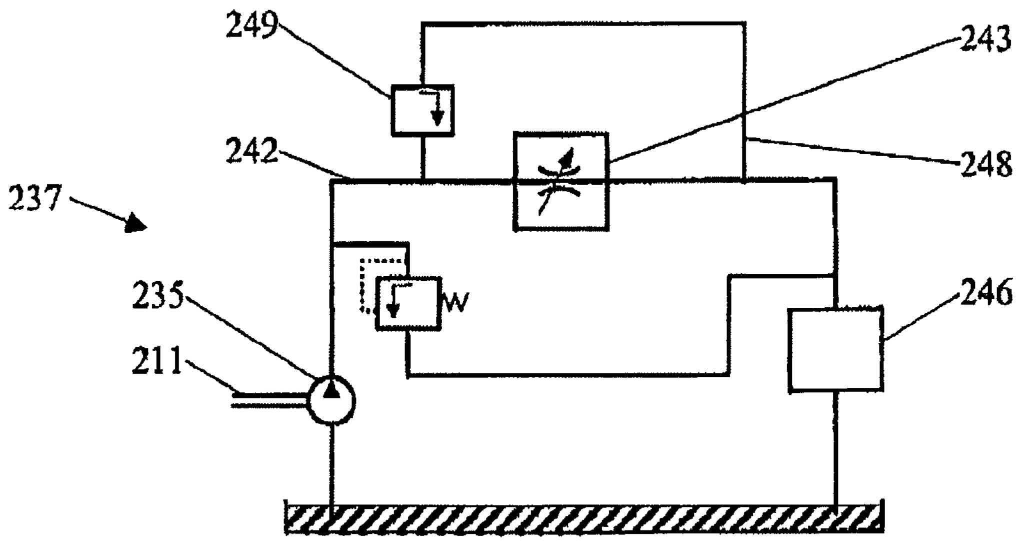
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Fig. 4

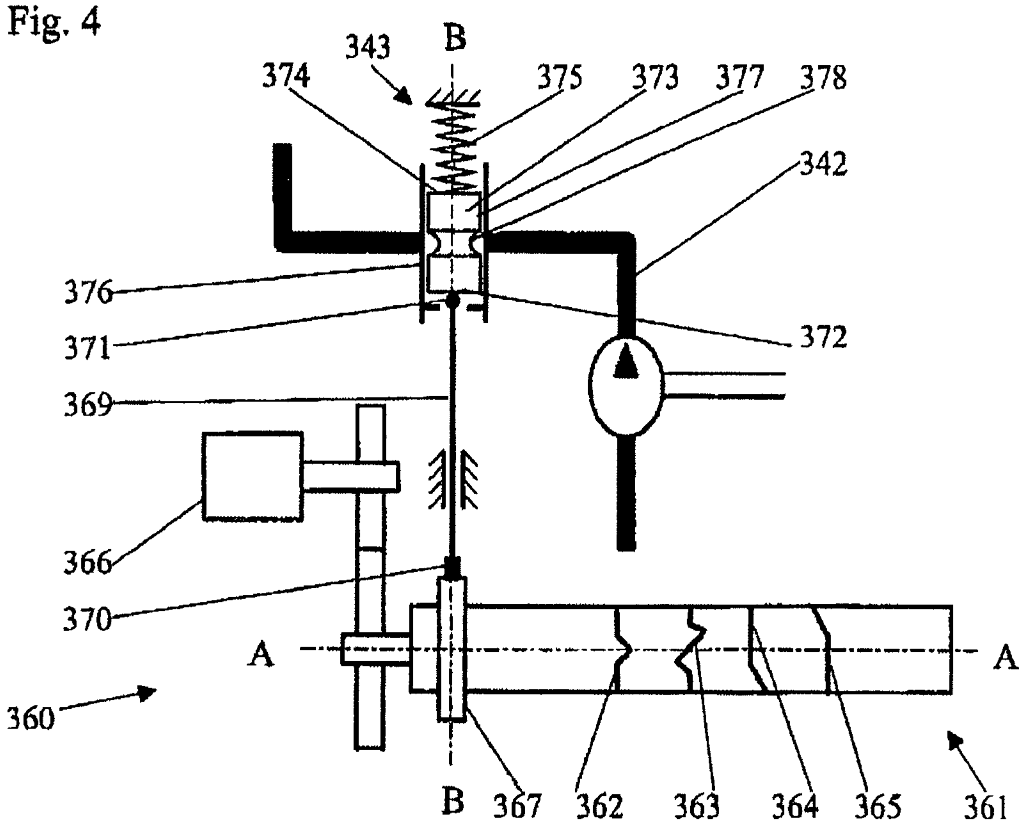
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Fig. 5

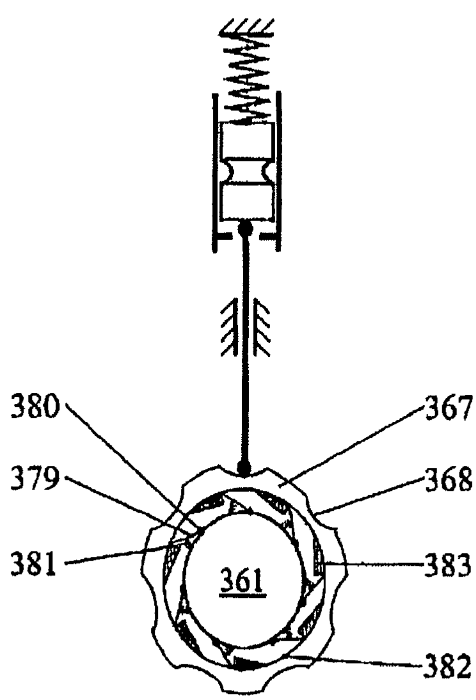
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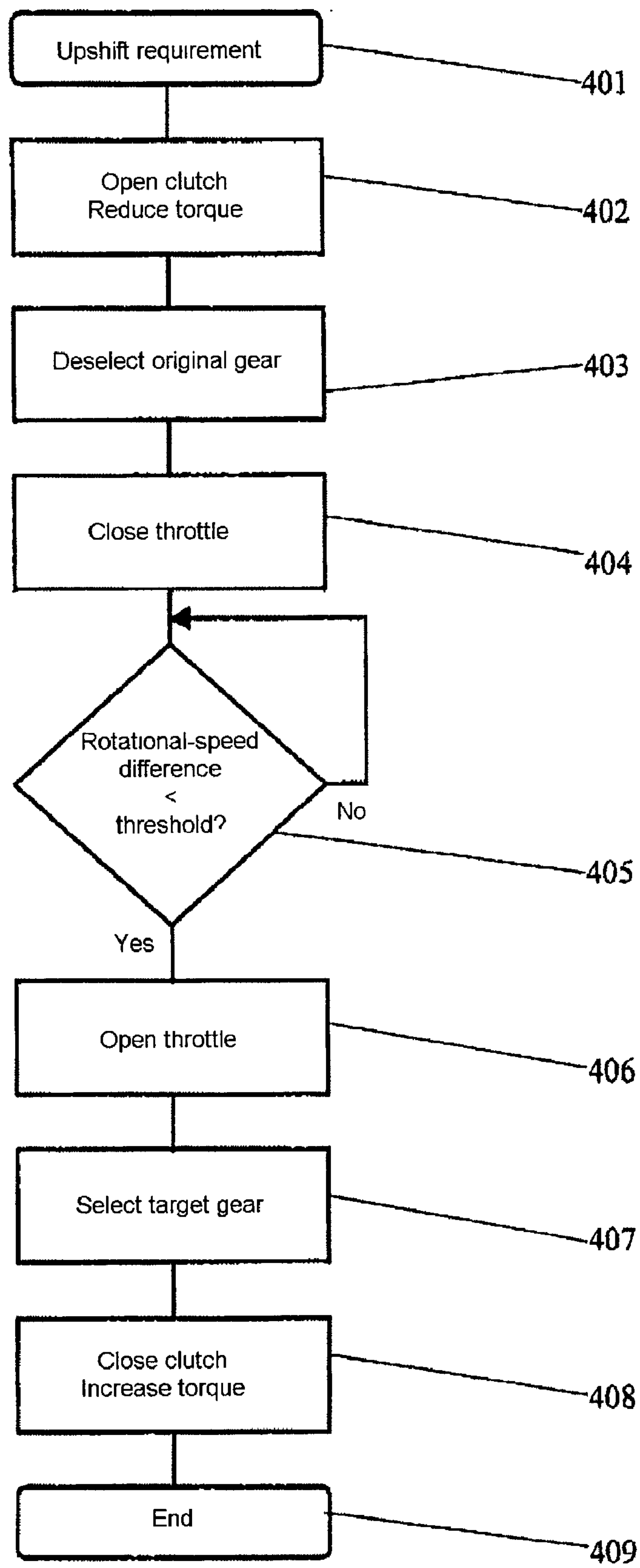
Fig. 6


Upshift requirement
401
Open clutch
Reduce torque
402
Deselect original gear
403
Close throttle
404
Rotational-speed difference < threshold?
No
405
Yes
Open throttle
406
Select target gear
407
Close clutch
Increase torque
408
End
409

AUTOMATED NON-SYNCHRONIZED GEAR-CHANGE TRANSMISSION AND METHOD FOR GEAR CHANGE IN SUCH A TRANSMISSION

[0001] This application claims the priority of German Patent Document No. 101 38 115.8, filed Aug. 3, 2001, the disclosure of which is expressly incorporated by reference herein.

BACKGROUND AND SUMMARY OF THE INVENTION

[0002] The invention relates to an automated non-synchronized gear-change transmission for a motor vehicle and to a method for gear change in such a gear-change transmission.

[0003] DE 195 44 322 A1 discloses an automated non-synchronized gear-change transmission in the form of a vehicle transmission, with a pressure-oil lubrication device in the form of a lubricant distributor system. The lubricant is distributed to various wheels and bearings of the gear-change transmission by means of a fluid pump from a sump in a transmission case. The fluid pump is connected to a shaft in the gear-change transmission, the shaft being driven by a drive machine in the form of an engine, so that the fluid pump is driven rotatably by the shaft whenever the gear-change transmission is in operation.

[0004] By contrast, an object of the invention is to propose an automated non-synchronized gear-change transmission and a method for gear change in such a gear-change transmission, by which a particularly comfortable operation of the gear-change transmission becomes possible.

[0005] The gear-change transmission has a transmission input shaft and a pressure-oil lubrication device, by which lubricating oil can be delivered from a transmission sump to various wheels and bearings of the gear-change transmission. The pressure-oil lubrication device has a pump which can be driven at least indirectly by the transmission input shaft. A drive of the pump is connected positively or non-positively to the transmission input shaft. The pump may be driven, for example, directly by the transmission input shaft or by a countershaft which is operatively connected to the transmission input shaft. The pressure-oil lubrication device has a cross-section modification device, by which a flow cross section of the pressure-oil lubrication device can be modified on a delivery side of the pump. The drive torque to be applied for the pump and the drive power can consequently be modified. A rotational speed of the transmission input shaft can therefore be influenced. Gear changes can consequently be carried out in a particularly comfortable way.

[0006] When first gear or reverse gear is selected, with the motor vehicle at a standstill, a transmission output shaft is stationary. Since a clutch, which is arranged between a drive machine and the gear-change transmission, can transmit a little torque, even in the open state, the transmission input shaft can rotate. Unacceptably high rotational-speed differences may therefore occur between corresponding shift elements and gearwheels of the gears. A selection of the gears would lead to unacceptable noises. By the cross-section modification device of the pressure-oil lubrication device, the transmission input shaft can be braked to a standstill. A particularly comfortable selection of first gear and of reverse gear thus becomes possible. Moreover, the synchronous rings for first gear and reverse gear which are used in conventional gear-change transmissions may be dispensed with. This leads to a particularly cost-effective gear-change transmission.

[0007] In the gear-change transmission according to the invention having a pressure-oil lubrication device, components subject to high load can be supplied with lubricating oil. A reliable operation of the gear-change transmission can consequently be achieved. In gear-change transmissions without pressure-oil lubrication, splash lubrication is necessary. In this case, rotating gearwheels dip into the transmission sump and take up oil. By the rotation of the gearwheels, the oil is thrown away and is consequently distributed randomly for lubrication in the gear-change transmission. Dipping into the oil sump brings about a braking force on the gearwheels, with the result that a drag torque of the gear-change transmission rises and efficiency falls. This leads to increased fuel consumption of the motor vehicle. In the case of gear-change transmissions with pressure-oil lubrication, an oil level in the transmission sump may be lowered to an extent such that a dipping of gearwheels no longer occurs. Drag losses of the gear-change transmission are therefore lower than in the gear-change transmissions with splash lubrication. This leads advantageously to a lower fuel consumption of the motor vehicle. Moreover, the lubricating-oil quantity can be reduced, thus leading to a saving in terms of cost and weight.

[0008] In the method according to the invention, in the event of an upshift from an original gear into a target gear, after a disengagement of the original gear a flow cross section of the pressure-oil lubrication device is reduced on a delivery side of a pump which is connected positively or non-positively to an input shaft of the gear-change transmission. In the event of an upshift, the transmission input shaft must be brought to a synchronous rotational speed of the target gear which is lower than the rotational speed of the transmission input shaft in the original gear. The synchronous rotational speed is reached when a shift element of the target gear and a gearwheel of the target gear have the same or virtually the same rotational speed. By reducing cross section, the pressure of a lubricating oil rises downstream of the pump, with the result that the drive torque to be applied for the pump and the drive power rise. A rotational speed of the transmission input shaft therefore falls rapidly in the direction of the synchronous rotational speed. The rotational-speed difference therefore does not have to be absorbed by the shift element. The absorption of the rotational-speed difference by the shift element would lead t a jolt in the motor vehicle and to a pronounced generation of noise. The target gear can thus be selected comfortably and after a short time. Since there is no need for absorption, the useful life of the shift elements increases or the shift element can be made lighter and more cost-effective. A selection of the target gear after a short time is advantageous particularly in the case of a drive machine designed as an internal combustion engine with an exhaust-gas turbocharger. In such drive machines, a gas throughput falls during this shift, with the result that a rotational speed of the exhaust-gas turbocharger likewise falls. Consequently, a torque required after the gear change can be made available by the drive machine only with a delay. If the time until the target gear is selected is short, no delay arises.

[0009] The method according to the invention can be used for single and multiple shifts.

[0010] In a preferred embodiment of the invention, the cross-section modification device reduces the flow cross section of the pressure-oil lubrication device during upshifts from an original gear into a target gear for the purpose of reducing a rotational speed of the transmission input shaft. The drive torque to be applied for the pump and the drive power are consequently increased. A rotational speed of the transmission input shaft therefore falls rapidly in the direction of the synchronous rotational speed. The target gear can therefore be selected comfortably and quickly. The duration of the upshift is very short, and, consequently, an interruption in traction on driven wheels of the motor vehicle is also short. The pump, in conjunction with the cross-section modification device, therefore acts as a central synchronization device for upshifts. Synchronization in the case of downshifts can be carried out by the drive machine, with the clutch closed or partially closed.

[0011] In another embodiment of the invention, the cross-section modification device is arranged on an oil distribution duct of the pressure-oil lubrication device. The oil distribution duct follows the pump. The lubricating oil is led by the oil distribution duct to the components to be lubricated. This leads to a particularly cost-effective refinement of the gear-change transmission, since a conventional pump can be used.

[0012] In still another embodiment of the invention, the cross-section modification device has an actuator which can be activated by a control device and the activation takes place as a function of at least one state variable of the motor vehicle and/or of the gear-change transmission. The actuator may be designed, for example, as an electromagnet, stepping motor, solenoid valve or hydraulic slide. Activation may take place, for example, as a function of the type of shift (traction upshift, traction downshift, overrun upshift, overrun downshift), the original or target gear, vehicle acceleration, vehicle speed, torque output by the drive machine, the position of a power requirement member and/or the rotational speed of the drive machine. This allows a particularly comfortable operation of the gear-change transmission, since a braking of the transmission input shaft can be activated in a highly specific manner.

[0013] In a further embodiment of the invention, the cross-section modification device can be actuated by an actuating device, by which shift elements of the gear-change transmission can also be actuated. The shift elements may be designed, for example, as sliding sleeves. In an automated gear-change transmission, the shift elements are actuated by a suitable actuating device which has actuators activated by a control device. The actuating device may have, for example, a shift roller or shift rods. This constitutes a particularly cost-effective refinement, since additional actuators do not have to be used.

[0014] In a still further embodiment of the invention, the pressure-oil lubrication device has a pressure-limiting device on the delivery side. The pressure-limiting device may be designed, for example, as a pressure relief valve. In the case of a reduced flow cross section on the delivery side of the pump, the pressure of the lubricating oil on the delivery side and therefore the drive torque to be applied for the pump depend closely on a driving rotational speed of the pump. If the pressure-oil lubrication device has a pressure-limiting device, the pressure is independent of the driving rotational speed within a wide rotational-speed range. Consequently, gear changes can be controlled or regulated more effectively and a more comfortable operation of the gear-change transmission is ensured.

[0015] In a yet further embodiment, the pressure-oil lubrication device has at least one heat exchange element. The heat exchange element may be designed, for example, as a (air) cooler or a heat exchanger.

[0016] By means of the heat exchanger, the lubricating oil can exchange heat with lubricants or coolants of other assemblies of the motor vehicle, such as, for example, cooling fluid or lubricating oil of the drive machine. A temperature of the gear-change transmission can consequently be influenced specifically. If the gear-change transmission is at a low temperature, efficiency is poorer than in an optimum temperature range. In order to increase the efficiency of the gear-change transmission as quickly as possible when the motor vehicle is started, the generated heat can be utilized by other assemblies such as drive machines. This leads advantageously to a low fuel consumption of the motor vehicle. By cooling the lubricant, it is possible to ensure that a defined temperature of the gear-change transmission is not exceeded. This increases the useful life of the gear-change transmission.

[0017] In a method according to the invention, for gear change in an automated non-synchronized gear-change transmission of a motor vehicle, a clutch arranged between a drive machine and the gear-change transmission is at least partially closed at least between the disengagement of the original gear and a selection of the target gear. The clutch may be closed completely or only partially. Consequently, an output shaft of the drive machine is connected to the transmission input shaft of the gear-change transmission. In the case of an upshift, therefore, by the flow cross section being reduced, a rotational speed of the drive machine is also reduced. The gear change can therefore proceed particularly quickly.

[0018] Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] **FIG. 1** shows a diagrammatic illustration of a gear-change transmission in the neutral position, with six forward gears and one reverse gear.

[0020] **FIG. 2** shows a diagrammatic illustration of a pressure-oil lubrication device with a cross-section modification device, a bypass line, a pressure-limiting device and a heat exchange element.

[0021] **FIG. 3** shows a diagrammatic illustration of a pressure-oil lubrication device according to **FIG. 2** with a bypass line.

[0022] **FIG. 4** shows an actuating device for shift elements and a cross-section modification device with a shift roller.

[0023] **FIG. 5** shows a section through an actuating device for shift elements and a cross-section modification device.

[0024] **FIG. 6** shows a block diagram of a control program for an upshift.

DETAILED DESCRIPTION OF THE DRAWINGS

[0025] According to **FIG. 1, a** gear-change transmission **10** has a transmission input shaft **11** which can be coupled via a clutch **12** to a coaxially arranged output shaft **13** of a drive machine (not illustrated). The clutch **12** can be engaged and disengaged by an actuating device (not illustrated), which is activated by a control device **34**. A gearwheel **14** is nonrotationally connected to the transmission input shaft **11** and meshes with a gearwheel **15** which is nonrotatably connected to a countershaft **16** arranged parallel to the transmission input shaft **11**. Fixed wheels **17, 18, 19, 20** and **21** for the 6^{th}, 3^{rd}, 4^{th}, 2^{nd} and 1^{st} gears are arranged nonrotationally on the countershaft **16**. The fixed wheels **17, 18, 19, 20** and **21** mesh in each case with associated loose wheels **22, 23, 24, 25** and **26** which are arranged rotatably on a transmission output shaft **27** arranged preferably coaxially with the transmission input shaft **11**. The loose wheel **22** can be nonrotationally connected to the transmission output shaft **27** by a sliding sleeve **28**, the loose wheels **23** and **24** by a sliding sleeve **29**, the loose wheel **25** by a sliding sleeve **30** and the loose wheel **26** by a sliding sleeve **31**. For this purpose, the sliding sleeves **28, 29, 30, 31** can be moved axially within certain limits on the transmission output shaft **27** by an actuating device (not illustrated) which has an actuator activated by the control device **34**. The actuating device may have, for example, a shift roller.

[0026] A pump **35** is arranged at the clutch-side end **36** of the countershaft **16** coaxially to the countershaft **16** and is driven by the countershaft **16**. A pressure-oil lubrication device **37** has a suction side **38**, which is arranged upstream of the pump **35**, and a delivery side **39**, which is arranged downstream of the pump **35**. On the suction side **38**, the pump **35** sucks lubricating oil, via a suction line **40**, out of a transmission sump **41** which is arranged on the bottom of a case not illustrated, of the gear-change transmission **10**. On the delivery side **39**, the pump **35** is followed by an oil distribution duct **42**, by which the lubricating oil is distributed to components to be lubricated (gearwheel **14**, loose wheels **22, 24**). Arranged on the oil distribution duct **42** is a cross-section modification device in the form of a solenoid valve **43** having an electromagnet **46** which can be activated by the control device **34**. A flow cross section of the oil distribution duct **42** can be modified by the solenoid valve **43**. Moreover, a heat exchanger **44** is arranged on the oil distribution duct **42**. The heat exchanger **44** has the lubricating oil flowing through in the oil distribution duct **42** and a cooling fluid of the drive machine (not illustrated) flowing through in the cooling-fluid duct **45**. Heat exchange between the lubricating oil and the cooling fluid is thus possible.

[0027] **FIG. 2** shows a diagrammatic illustration of a pressure-oil lubrication device **137**. The pressure-oil lubrication device **137** has a pump **135** which is driven by a transmission input shaft **111** of a gear-change transmission. The pressure-oil lubrication device **137** has a suction side **138**, which is arranged upstream of the pump **135**, and a delivery side **139**, which is arranged downstream of the pump **135**. On the suction side **138**, the pump **135** sucks lubricating oil out of a transmission sump **141** via a suction line **140**. The pump **135** conveys the lubricating oil on the delivery side into an oil distribution duct **142**, on which a cross-section modification device in the form of an adjustable throttle **143** is arranged. A flow cross section of the oil distribution duct **142** can be modified by the throttle **143**. The throttle **143** is actuated by a shift roller (not illustrated), which also actuates the sliding sleeves **28, 29, 30, 31** from **FIG. 1**. Downstream of the throttle **143**, in this diagrammatic illustration, the oil distribution duct **142** terminates in a lubrication system **146**. All the feedlines and lubricating orifices for distributing the lubricating oil in the gear-change transmission are combined in the lubrication system **146**. The lubricating oil runs out of the lubrication system **146** via an outflow line **147** back into the transmission sump **141**.

[0028] The throttle **143** can be bypassed by a line **150** which branches off from the oil distribution duct **142** upstream of the throttle **143** and which issues into the oil distribution duct **142** again downstream of the throttle **143**. A pressure-limiting device in the form of a pressure-limiting valve **151** is arranged in the line **150**. When, with the throttle **143** closed, the pressure of the lubricating oil between the throttle **143** and the pump **135** exceeds a threshold value, the pressure-relief valve **151** opens the line **150** and lubricating oil can flow out into the lubrication system **146**. When the pressure of the lubricating oil falls below the threshold value again, the pressure-relief valve **151** shuts off the line **150** again. This ensures that the pressure of the lubricating oil does not exceed the threshold value. The maximum drive torque of the pump **135** can be fixed by the selection of the threshold value.

[0029] **FIG. 3** shows a diagrammatic illustration of a pressure-oil lubrication device **237**. The pressure-oil lubrication device **237** has, in comparison with the pressure-oil lubrication device **137** from **FIG. 2, a** bypass line **248**. The bypass line **248** branches off from an oil distribution duct **242** upstream of a throttle **243** and issues into the oil distribution duct **242** again downstream of the throttle **243**. Arranged in the bypass line **248** is a valve **249**, by which the bypass line **248** can be opened or shut off. In the non-activated state, the valve **249** shuts off the bypass line **248**. The valve **249** is likewise actuated by the roller (not illustrated), by which the throttle **243** is also actuated.

[0030] In the case of an upshift, the throttle **243** is closed and the valve **249** keeps the bypass line shut off. The pressure of the lubricating oil consequently rises downstream of a pump **235**. In the case of a downshift, the throttle **243** is likewise closed by being coupled to the actuating device of the shift elements. Since, in the case of a downshift, a transmission input shaft **211** has to be accelerated, an increased drive torque of the pump **235** is undesirable. For this reason, the bypass line **248** is opened by the valve **249** and the lubricating oil can flow out in the direction of a lubrication system **246**.

[0031] According to **FIG. 4**, an actuating device **360** has a shift roller **361**. Guide tracks **362, 363, 364, 365**, by means of which the sliding sleeves **28, 29, 30** and **31** from **FIG. 1** are actuated, are introduced into the shift roller **361**. The shift roller **361** can be rotated about its axis of rotation A-A by means of an electric motor **366** which is activated by the control device **34** from **FIG. 1**.

[0032] A mainly hollow-cylindrical contour disk **367** is arranged coaxially on a circumference of the shift roller **361**. **FIG. 5** shows a section through the actuating device **360**

perpendicularly to the axis of rotation A-A, along the sectional axis B-B. The contour disk **367** has a plurality of recesses **368** on the circumference. The recesses **368** are symmetrical to the section axis B-B and extend over the entire axial extent of the contour disk **367**. According to **FIG. 4**, the contour disk **367** is operatively connected to a diaphragm **343** by a connecting rod **369** which is arranged along the sectional axis B-B. One end **370** of the connecting rod **369** is located on the circumference of the contour disk **367**; the other end **371** of the connecting rod **369** bears on a lower surface **372** of a diaphragm body **373**. Arranged on the opposite surface **374** of the diaphragm body **373** is a spring **375**, by which the diaphragm body **373** and the connecting rod **369** are pressed towards the contour disk **367** along the sectional axis B-B. The diaphragm body **373** is designed mainly cylindrically and symmetrically to the sectional axis B-B and is guided in a housing **376**. The diaphragm body **373** has on an outer surface **377** a peripheral recess **378**.

[**0033**] The diaphragm **343** is arranged in an oil distribution duct **342**. By means of a displacement of the diaphragm body **373** along the sectional axis B-B, the flow cross section of the oil distribution duct **342** can be modified. The flow cross section depends on whether and to what extent the lubricating oil can flow along the recess **378**. The position of the diaphragm body **373** and therefore the flow cross section are determined by the radial extent of the contour disk **367** at the point at which the end **370** of the connecting rod **369** comes to bear. In the position of the diaphragm body **373**, as shown in **FIG. 4**, there is a maximum flow cross section.

[**0034**] **FIG. 5** shows a section through the actuating device **360** along the sectional axis B-B. Driving tabs **379** are arranged on the circumference of the shift roller **361**. The driving tabs **379** are pivotable about a fastening point **380** and are pressed radially outwards against an inner surface **382** of the contour disk **367** by springs **381**. Wedges **383** are arranged on the inner surface **382** of the contour disk **367**. The wedges **383** are arranged in such a way that, in the event of a clockwise rotation of the shift roller **361** (downshift), the driving tabs **379** are pressed radially inwards by the wedges **383** counter to the force of the springs **381**. The contour disk **367** therefore remains stationary. In the event of anti-clockwise rotation (upshifts), the driving tabs **379** stand against the wedges **383** and co-rotate the contour disc **367**. During a rotation of the contour disc **367**, the end **370** of the connecting rod **369** slides on the circumference of the contour disc **369** and transmits the changes in the radial extent of the contour disc **367** to the diaphragm body **373**. When the end **370** is located in a recess **368**, there is a maximum flow cross section.

[**0035**] The functioning of the driving tabs **379**, springs **381** and wedges **383** corresponds to the functioning of a freewheel known.

[**0036**] **FIG. 6** illustrates a block diagram of a control program for an upshift by one gear from an original gear into a target gear by an actuating device **360**, according to **FIGS. 4 and 5** and a pressure-oil lubrication device **137** according to **FIG. 2**. The control program is executed by the control device **34** from **FIG. 1**.

[**0037**] In block **401**, the control program is started by an upshift requirement. The shift requirement is generated either by a vehicle driver by a suitable operating device or by the control device **34** on the basis of state variables of the motor vehicle, such as vehicle speed, vehicle acceleration or rotational speed of the drive machine.

[**0038**] In block **402**, the clutch **12** is opened and the torque made available by the drive machine is reduced. In block **403**, the original gear is disengaged by a rotation of the shift roller **361**. By a further rotation of the shift roller **361** in block **404**, the throttle **143** is closed. By virtue of this, the pressure of the lubricating oil on the delivery side **139** and the drive torque necessary for the pump **135** rise. This drive torque acts as a braking torque on the transmission input shaft **111** and decelerates the latter. In block **405**, a check is made as to whether the rotational-speed difference between the rotational speed of the transmission input shaft **111** and the synchronous rotational speed of the target gear has undershot a threshold value. If the check is negative, the check is repeated until a positive result is obtained. In this case, in block **406**, the throttle **143** is opened again by a further rotation of the shift roller **361**. In block **407**, the shift roller **361** is again rotated further and, consequently, the target gear is selected. Subsequently, in block **408**, the clutch is closed again and the available torque of the drive machine is set according to the instructions of the vehicle driver. In block **409**, the shift is concluded.

[**0039**] The gear-change transmission may also be designed as a transmission in which the selection and disengagement of the gears are carried out by the vehicle driver and only the actuation of the clutch takes place by actuators.

[**0040**] The gear-change transmission may also be designed as a transmission with synchronizing devices, such as synchronous rings. In this case, the pressure-oil lubrication device together with the cross-section modification device relieves the synchronizing devices and therefore increases their useful life.

[**0041**] The valve of the bypass line, by which the cross-section modification device can be bypassed, may also be actuated by an actuator which is activated by a control device.

[**0042**] In the case of an upshift, it is not necessary for all the steps required to be executed in succession. The steps, such as the opening of the clutch and the disengagement of the original gear, may also be executed in parallel.

[**0043**] The clutch may also remain closed completely or partially in the case of an upshift. Consequently, the rotational speed of the drive machine can also be reduced at the same time as that of the transmission input shaft.

[**0044**] If the cross-section modification device is activated by a control device, the flow cross section during upshifts is narrowed only when this is necessary because of state variables of the motor vehicle and/or of the gear-change transmission. The flow cross section may then also be narrowed to a differing extent.

[**0045**] The pump of the pressure-oil lubrication device may convey the lubricating oil out of a separate lubricating-oil tank instead of out of the transmission sump.

[**0046**] The embodiments described are merely illustrative refinements.

[**0047**] The foregoing disclosure has been set forth merely to illustrate the invention and is not intended to be limiting.

A combination of the features described for different embodiments is likewise possible. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to persons skilled in the art, the invention should be construed to include everything within the scope of the appended claims and equivalents thereof.

What is claimed

1. An automated non-synchronised gear-change transmission for a motor vehicle, comprising:

a transmission input shaft; and

a pressure-oil lubrication device including

a pump driven at least indirectly by the transmission input shaft, and

a cross-section modification device disposed on a downstream side of the pump, wherein the cross-section modification device is configured to modify a flow cross section on the downstream side of the pump.

2. The transmission according to claim 1, wherein the cross-section modification device reduces the flow cross section during an upshift for the purpose of reducing the rotational speed of the transmission input shaft.

3. The transmission according to claim 2, wherein the cross-section modification device is arranged on an oil distribution duct of the pressure-oil lubrication device.

4. The transmission according to claim 3, wherein the cross-section modification device has an actuator which can be activated by a control device.

5. The transmission according to claim 4, wherein the cross-section modification device is controlled as a function of at least one variable of the motor vehicle.

6. The transmission according to claim 3, further comprising an actuating device, wherein the actuating device controls the cross-section modification device and shift elements of the transmission.

7. The transmission according to claim 3, wherein the pressure-oil lubrication device has a pressure-limiting device on a delivery side of the pressure-oil lubrication device.

8. The transmission according to claim 3, wherein the pressure-oil lubrication device has a heat exchange element.

9. The transmission according to claim 1, wherein the cross-section modification device is arranged on an oil distribution duct of the pressure-oil lubrication device.

10. The transmission according to claim 1, wherein the cross-section modification device has an actuator which can be activated by a control device.

11. The transmission according to claim 10, wherein the cross-section modification device is controlled as a function of at least one variable of the motor vehicle.

12. The transmission according to claim 1, further comprising an actuating device, wherein the actuating device controls the cross-section modification device and shift elements of the transmission.

13. The transmission according to claim 1, wherein the pressure-oil lubrication device has a pressure-limiting device on a delivery side of the pressure-oil lubrication device.

14. The transmission according to claim 1, wherein the pressure-oil lubrication device has a heat exchange element.

15. A method for gear change in an automated non-synchronized gear-change transmission of a motor vehicle with a pressure-oil lubrication device, the method comprising:

in the event of an upshift from an original gear into a target gear, after a disengagement of the original gear, reducing a flow cross section on a delivery side of a pump which is connected to an input shaft of the gear-change transmission.

16. The method according to claim 15, wherein at least partially closing a clutch arranged between a drive machine and the gear-change transmission at least between the disengagement of the original gear and a selection of the target gear.

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