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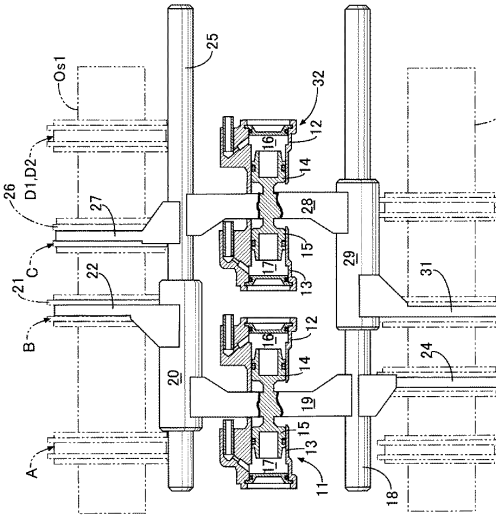
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The present invention arranges the 1st output shaft and the 2nd output shaft in parallel to a plurality of input shafts arranged on the same axis, and relates to the gearbox which drives with an actuator a plurality of engagement engagement devices provided to the 1st output shaft and the 2nd output shaft, respectively, and establishes a predetermined gear ratio.
[Background of the Invention]
[0002]
While having an input shaft arranged to the coaxial duplex, and a pair of output shaft arranged to the coaxial duplex, respectively and inputting the driving force of a driving source into which input shaft selectively via two friction clutches, In the so-called gearbox of the dual clutch type which outputs the driving force selectively from which output shaft, The gearbox (refer to Fig.32) which attained multistage-ization to ten steps by using together the transmitting power course which outputs direct-drive power to one output shaft, and the transmitting power course which outputs driving force through both of output shafts from an input shaft from an input shaft while avoiding enlargement of the skeleton is publicly known by the following Patent document 1.
[Citation list]
[Patent literature]
[0003]
[Patent document 1] DE 10 2011 117 046 A1
[Summary of Invention]
[Problem to be solved by the invention]
[0004]
By the way, although the number of an actuator is reduced by carrying out engagement of the pair of synchro device which adjoined on the same output shaft and is arranged selectively with a common actuator, the above-mentioned conventional gearbox, In order to carry out engagement of the other synchro device individually with a respectively corresponding actuator, it had left room to further reduce the number of an actuator.
[0005]
The present invention was made in view of the above-mentioned situation, and an object of the present invention is to reduce the number of the actuator to which engagement of the synchro device is carried out, and to attain the miniaturization of a gearbox.
[Means for solving problem]
[0006]
To achieve the above objects, the 1st input shaft that was connected to the driving source via the 1st friction engaging device according to invention described in Claim 1, The 2nd input shaft that has been arranged on the same axis at the periphery of the 1st above-mentioned input shaft, and was connected to the aforementioned driving source via the 2nd friction engaging device, The 3rd input shaft that has been arranged on the same axis at the periphery of the 2nd above-mentioned input shaft, and was connected to the aforementioned driving source via the 3rd friction engaging device, The 1st input gear fixed to the 1st above-



Representative drawing

mentioned input shaft, and the 2nd input gear fixed to the 2nd above-mentioned input shaft, The 3rd and 4th input gear fixed to the 3rd above-mentioned input shaft, and the 1st above-mentioned input shaft, the 1st output shaft arranged at parallel and the 2nd output shaft, it being arranged on a same axis at the periphery of the 1st above-mentioned output shaft, and passing the 1st engagement engagement device -- the [combinable with the 1st output shaft] -- with 1 secondary output shaft, it being arranged on a same axis at the periphery of the 2nd above-mentioned output shaft, and passing the 5th engagement engagement device -- the [combinable with the 2nd output shaft] -- with 2 secondary output shaft, the [above-mentioned] -- it being supported by 1 secondary output shaft, enabling free relative rotating, and passing the 2nd engagement engagement device -- the [the] -- the [the 1st output gear combinable with 1 secondary output shaft, and / above-mentioned] -- it being supported by 1 secondary output shaft, enabling free relative rotating, and passing the 3rd engagement engagement device -- the [the] -- with the 2nd output gear combinable with 1 secondary output shaft, the [above-mentioned] -- it being supported by 1 secondary output shaft, enabling free relative rotating, and passing the 4th engagement engagement device -- the [the] -- with the 3rd and 4th combinable output gear selectively to 1 secondary output shaft, the [above-mentioned] -- it being supported by 2 secondary output shaft, enabling free relative rotating, and passing the 6th engagement engagement device -- the [the] -- with the 5th output gear combinable with 2 secondary output shaft, the [above-mentioned] -- it being supported by 2 secondary output shaft, enabling free relative rotating, and passing the 7th engagement engagement device -- the [the] -- with the 6th output gear combinable with 2 secondary output shaft, the [above-mentioned] -- it being supported by 2 secondary output shaft, enabling free relative rotating, and passing the 8th engagement engagement device -- the [the] -- with the 7th combinable output gear selectively to 2 secondary output shaft, The 1st final drive gear fixed to the 1st above-mentioned output shaft, and the 2nd final drive gear fixed to the 2nd above-mentioned output shaft, The 1st shift rod that operates with the 1st actuator, and the 2nd shift rod that operates with the 2nd actuator, The 1st shift fork to which it is connected to the 1st above-mentioned shift rod, and engagement of the above-mentioned 2nd engagement engagement device is carried out by the operation to one way of the 1st above-mentioned actuator, The 2nd shift fork to which it is connected to the 1st above-mentioned shift rod, and engagement of the above-mentioned 6th engagement engagement device is carried out by the operation for another side of the 1st above-mentioned actuator, The 3rd shift fork to which it is connected to the 2nd above-mentioned shift rod, and engagement of the above-mentioned 3rd engagement engagement device is carried out by the operation to one way of the 2nd above-mentioned actuator, It has the 4th shift fork to which it is connected to the 2nd above-mentioned shift rod, and engagement of the above-mentioned 7th engagement engagement device is carried out by the operation for another side of the 2nd above-mentioned actuator, The 1st above-mentioned input gear gets into gear to the 1st above-mentioned output gear and the 5th above-mentioned output gear, The 2nd above-mentioned input gear gets into gear to the 2nd above-mentioned output gear and the 6th above-mentioned output gear, the 3rd above-mentioned input gear gets into gear to the 3rd above-mentioned output gear, and a gearbox, wherein the 4th above-mentioned input gear gets into gear to the 4th above-mentioned output gear and the 7th above-mentioned output gear is proposed.

[0007]

The 1st input shaft that was connected to the driving source via the 1st friction engaging device according to invention described in Claim 2, The 2nd input shaft that has been arranged on the same axis at the periphery of the 1st above-mentioned input shaft, and was connected to the aforementioned driving source via the 2nd friction engaging device, The 1st input gear group fixed to the 1st above-mentioned input shaft, and the 2nd input gear group fixed to the 2nd above-mentioned input shaft, The 1st above-mentioned input shaft, the 1st output shaft arranged at parallel, and the 2nd output shaft, it being arranged on a same axis at the periphery of the 1st above-mentioned output shaft, and passing the 1st engagement engagement device -- the [combinable with the 1st output shaft] -- with 1 secondary output shaft, it being arranged on a same axis at the periphery of the 2nd above-mentioned output shaft, and passing the 2nd engagement engagement device -- the [combinable with the 2nd output shaft] -- with 2 secondary output shaft, the [above-mentioned] -- it being supported by 1 secondary output shaft, enabling free relative rotating, and passing the 3rd engagement engagement device group -- the [the] -- with the 1st output gear group combinable with 1 secondary output shaft, the [above-mentioned] -- it being supported by 2 secondary output shaft, enabling free relative rotating, and passing the 4th engagement engagement device group -- the [the] -- with the 2nd output gear group combinable with 2 secondary output shaft, The 1st final drive gear fixed to the 1st above-mentioned output shaft, the 2nd final drive gear fixed to the 2nd above-mentioned output shaft, the 1st shift rod that operates with the 1st actuator, and the 2nd shift rod that operates with the 2nd actuator, The 1st shift fork to which it is connected to the 1st above-mentioned shift rod, and engagement of one of the above-mentioned 3rd engagement engagement device groups is carried out by the operation to one way of the 1st above-mentioned actuator, The 2nd shift fork to which it is connected to the 1st above-mentioned shift rod, and engagement of one of the above-mentioned 4th engagement engagement device groups is carried out by the operation for another side of the 1st above-mentioned actuator, The 3rd shift fork to which it is connected to the 2nd above-mentioned shift rod, and engagement of one of everything [the] but the above-mentioned 3rd engagement engagement device group is carried out by the operation to one way of the 2nd above-mentioned actuator, It has the 4th shift fork to which it is connected to the 2nd

above-mentioned shift rod, and engagement of one of everything [the] but the above-mentioned 4th engagement engagement device group is carried out by the operation for another side of the 2nd above-mentioned actuator, A gearbox, wherein the driving force of the aforementioned driving source is outputted via the gear of the above-mentioned 1st output gear group or the gear of the above-mentioned 2nd output gear group from the gear of the above-mentioned 1st and 2nd input gear group is proposed.
[0008]
The engine P of an embodiment corresponds to the driving source of invention of Claim 1, and the 1st friction clutch C1 - the 3rd friction clutch C3 of an embodiment correspond to the 1st - the 3rd friction engaging device of invention of Claim 1, The 1st synchro device [of an embodiment] A - the 8th synchro device H correspond to the 1st - the 8th engagement engagement device of invention of Claim 1.
[Effect of the Invention]
[0009]
According to the composition of Claim 1, the 1st shift fork and the 2nd shift fork are provided to the 1st shift rod that is connected to the 1st actuator and moves, the 1st shift fork -- the, while connecting with the 2nd engagement engagement device provided to 1 secondary output shaft, the 2nd shift fork -- the -- since it connected with the 6th engagement engagement device provided to 2 secondary output shaft, engagement of the 2nd engagement engagement device and the 6th engagement engagement device can be independently carried out by driving the 1st actuator for one way and another side. moreover -- providing the 3rd shift fork and the 4th shift fork to the 2nd shift rod that is connected to the 2nd actuator and moves -- the 3rd shift fork -- the, while connecting with the 3rd engagement engagement device provided to 1 secondary output shaft, the 4th shift fork -- the -- since it connected with the 7th engagement engagement device provided to 2 secondary output shaft, engagement of the 3rd engagement engagement device and the 7th engagement engagement device can be independently carried out by driving the 2nd actuator for one way and another side. thereby -- the -- the [1 secondary output shaft and] -- it can become possible to carry out engagement of the four engagement engagement devices which distributed to 2 secondary output shaft and are arranged convenient with two actuators, the number of parts can be reduced, and it can contribute to the miniaturization of a gearbox.
[0010]
According to the composition of Claim 2, the 1st shift fork and the 2nd shift fork are provided to the 1st shift rod that is connected to the 1st actuator and moves, the 1st shift fork -- the, while connecting with one of the 3rd engagement engagement device groups provided to 1 secondary output shaft, the 2nd shift fork -- the -- since it connected with one of the 4th engagement engagement device groups provided to 2 secondary output shaft, engagement of one of the one and 4th engagement engagement devices of the 3rd engagement engagement device group can be independently carried out by driving the 1st actuator for one way and another side. moreover -- providing the 3rd shift fork and the 4th shift fork to the 2nd shift rod that is connected to the 2nd actuator and moves -- the 3rd shift fork -- the, while connecting with one of everything [the] but the 3rd engagement engagement device group provided to 1 secondary output shaft, the 4th shift fork -- the -- since it connected with one of everything [the] but the 4th engagement engagement device group provided to 2 secondary output shaft, engagement of one of everything [the] but one and the 4th engagement engagement device group of everything but the 3rd engagement engagement device group can be independently carried out by driving the 2nd actuator for one way and another side. thereby -- the -- the [1 secondary output shaft and] -- it can become possible to carry out engagement of the four engagement engagement devices which distributed to 2 secondary output shaft and are arranged convenient with two actuators, the number of parts can be reduced, and it can contribute to the miniaturization of a gearbox.
[Brief Description of the Drawings]
[0011]
[Drawing 1]The skeleton figure of a gearbox.
[Drawing 2]The axial direction arrow view of Fig.1.
[Drawing 3]The figure showing the number of teeth of each input gear and each output gear.
[Drawing 4]The figure showing the ratio of each gear ratio, and the common ratio of each gear ratio.
[Drawing 5]A friction clutch and the engagement table of a synchro device.
[Drawing 6]1st speed gear ratio -> the explanatory view of the sequential speed changing process of a 2nd speed gear ratio.
[Drawing 7]2nd speed gear ratio -> the explanatory view of the sequential speed changing process of a 3rd speed gear ratio.
[Drawing 8]3rd speed gear ratio -> the explanatory view of the sequential speed changing process of a 4th speed gear ratio.
[Drawing 9]4th speed gear ratio -> the explanatory view of the sequential speed changing process of a 5th speed gear ratio.
[Drawing 10]5th speed gear ratio -> the explanatory view of the sequential speed changing process of 6 ********.
[Drawing 11]6 ******** -> the explanatory view of the sequential speed changing process of 7 ********.
[Drawing 12]7 ******** -> the explanatory view of the sequential speed changing process of 8 ********.
[Drawing 13]8 ******** -> the explanatory view of the sequential speed changing process of

9 ********.
[Drawing 14]9 ******** -> the explanatory view of the sequential speed changing process of 10 ********.
[Drawing 15]10 ******** -> the explanatory view of the sequential speed changing process of 11 ********.
[Drawing 16]The figure showing a conventional case and the number of gear engagement of each gear ratio of an embodiment.
[Drawing 17]The figure showing the simple torque flow of each gear ratio.
[Drawing 18]The explanatory view of the effect of having provided three friction clutches.
[Drawing 19]The figure showing the number of steps of jump gear change of an embodiment.
[Drawing 20]The figure showing the number of steps of jump gear change of a conventional case.
[Drawing 21]The figure showing the drive mechanism of the 2nd, 3rd, 6th, and 7th synchro devices.
[Drawing 22]The operation explanatory view of the 1st hydraulic actuator.
[Drawing 23]The figure showing the operation of the 1st hydraulic actuator in a 1st speed gear ratio.
[Drawing 24]The figure showing the operation of the 1st hydraulic actuator in a 4th speed gear ratio.
[Drawing 25]The figure showing the operation of the 1st hydraulic actuator in 7 ********.
[Drawing 26]The figure showing the operation of the 1st hydraulic actuator in 10 ********.
[Drawing 27]The operation explanatory view of the 2nd hydraulic actuator.
[Drawing 28]The figure showing the operation of the 2nd hydraulic actuator in a 2nd speed gear ratio.
[Drawing 29]The figure showing the operation of the 2nd hydraulic actuator in a 5th speed gear ratio.
[Drawing 30]The figure showing the operation of the 2nd hydraulic actuator in 8 ********.
[Drawing 31]The figure showing the operation of the 2nd hydraulic actuator in 11 ********.
[Drawing 32]The skeleton figure of a gearbox. (Conventional case)
[Description of Embodiments]
[0012]
Hereinafter, an embodiment of the invention is described based on Fig.1 - Fig.31.
[0013]
As shown in Fig.1 and Fig.2, the gearbox T of a triple clutch type of 11 steps of advance of this embodiment is provided with the following.
1st input-shaft Im1 connected to the engine P via the 1st friction clutch C1.
2nd input-shaft Im2 which fitted into a periphery of 1st input-shaft Im1, enabling free relative rotating, and was connected to the engine P via the 2nd friction clutch C2.
3rd input-shaft Im3 which fitted into a periphery of 2nd input-shaft Im2, enabling free relative rotating, and was connected to the engine P via the 3rd friction clutch C3.
The 1st friction clutch C1, the 2nd friction clutch C2, and the 3rd friction clutch C3 are put together between the axis end of 1st input-shaft Im1, 2nd input-shaft Im2, and 3rd input-shaft Im3, and the engine P, and are arranged.
[0014]
1st output-shaft Om1 and 2nd output-shaft Om2 are arranged in parallel to 1st input-shaft Im1, 2nd input-shaft Im2, and 3rd input-shaft Im3 -- the periphery of 1st output-shaft Om1 -- the, while 1 secondary output-shaft Os1 fits in enabling free relative rotating, the periphery of 2nd output-shaft Om2 -- the -- 2 secondary output-shaft Os2 fits in, enabling free relative rotating.
[0015]
1st input gear Gi1 is fixed to 1st input-shaft Im1, 2nd input gear Gi2 is fixed to 2nd input-shaft Im2, and 3rd input gear Gi3 and 4th input gear Gi4 are fixed to 3rd input-shaft Im3.
[0016]
1st input gear Gi1 -- the -- with 1st output gear Go1 supported to 1 secondary output-shaft Os1 enabling free relative rotating, the -- gearing to 5th output gear Go5 supported to 2 secondary output-shaft Os2 enabling free relative rotating, 2nd input gear Gi2, the -- the [2nd output gear Go2 supported to 1 secondary output-shaft Os1 enabling free relative rotating, and] -- gearing to 6th output gear Go6 supported to 2 secondary output-shaft Os2 enabling free relative rotating, 3rd input gear Gi3, the -- gearing to 3rd output gear Go3 supported to 1 secondary output-shaft Os1 enabling free relative rotating -- 4th input gear Gi4 -- the -- the [4th output gear Go4 supported to 1 secondary output-shaft Os1 enabling free relative rotating, and] -- it gears to 7th output gear Go7 supported to 2 secondary output-shaft Os2 enabling free relative rotating.
[0017]
the [1st output-shaft Om1 and] -- 1 secondary output-shaft Os1, can join together by the 1st synchro device A, and 1st output gear Go1 passes the 2nd synchro device B -- the -- it being able to combine with 1 secondary output-shaft Os1, and, 2nd output gear Go2 passes the 3rd synchro device C -- the -- can combine with 1 secondary output-shaft Os1, and 3rd output gear Go3 and 4th output gear Go4 pass the 4th synchro device D1 and D2 -- the -- it is selectively combinable with 1 secondary output-shaft Os1. the 4th synchro device D1 and D2 -- the moving rightward of a sleeve -- 3rd output gear Go3 -- the -- combining with 1 secondary output-shaft Os1 -- a rightward movement of a sleeve -- 4th output gear Go4 -- the -- it combines with 1 secondary output-shaft Os1.
[0018]

the [2nd output-shaft Om2 and] -- 2 secondary output-shaft Os2, can join together by the 5th synchro device E, and 5th output gear Go5 passes the 6th synchro device F -- the -- it being able to combine with 2 secondary output-shaft Os2, and, 6th output gear Go6 passes the 7th synchro device G -- the -- can combine with 2 secondary output-shaft Os2, and 7th output gear Go7 passes the 8th synchro device H -- the -- it is combinable with 2 secondary output-shaft Os2.

[0019]

2nd final-drive-gear Gf2 which were fixed to 2nd output-shaft Om2 gear with 1st final-drive-gear Gf1 fixed to 1st output-shaft Om1 to the final driven gear Gf fixed to the case of the differential gear Gd which distributes driving force to the right and left driving wheels W and W.

[0020]

Although the gearbox T provided with such a skeleton can establish a total of 25 steps of gear ratios at the maximum with the combination of the alternative engagement of the 1st friction clutch C1 - the 3rd friction clutch C3, and the alternative engagement of the 1st synchro device A - the 8th synchro device H, According to this embodiment, it is used from the inside of a total of 25 steps of gear ratios, choosing a total of 11 steps of gear ratios.

[0021]

The number of teeth of 1st input gear Gi1 - 4th input gear Gi4 and 1st output gear Go1 - 7th output gear Go7 and the gear ratio of the gear which gears to mutual [of them] are shown in Fig.3. It turns out that the ratio of the 1st speed gear ratio attained by the above-mentioned number-of-teeth setting out - 11 ******** and the common ratio between the adjoining gear ratios are shown in Fig.4 (A) and Fig.4 (B), and the ratio of a 1st speed gear ratio - 11 ******** is distributed at the suitable interval.

[0022]

Fig.5 is an engagement table of the 1st friction clutch C1 - the 3rd friction clutch C3 and the 1st synchro device A - the 8th synchro device H, and the friction clutch and synchro device which are engaged for each gear ratio are shown by O seal. The synchro device with which the synchro device which a 1st speed gear ratio - 11 ******** are the explanatory views of the process of up shifting sequentially, and is being engaged there is shown by black painting, and is carrying out engagement release of Fig.6 - the Fig.15 is shown by white.

[0023]

Hereinafter, the torque flow of a 1st speed gear ratio - 11 ******** is described in order.

[0024]

<1st speed gear ratio>

At the time of establishment of a 1st speed gear ratio, the 1st friction clutch C1 is engaged and the 1st synchro device A, the 4th synchro device D1 (moving rightward side), the 6th synchro device F, and the 8th synchro device H are engaged. As a result, so that clearly from Fig.6 (A) the driving force of the engine P, the 1st friction clutch C1 -> 1st input shaft -- the [Im1 -> 1st input gear Gi1 -> 5th output gear Go5 -> 6th synchro device F->] -- the 2 secondary output-shaft Os2 -> 8th synchro device H-> 7th output gear Go7 -> 4th input gear Gi -- the [4 -> 3rd input-shaft Im3 -> 3rd input gear Gi3 -> 3rd output gear Go3 ->] -- four. the [synchro device D1 (moving rightward side) ->] -- 1 secondary output-shaft Os1-> -- it transmits to the driving wheels W and W the 1st synchro device in the course of the A-> 1st output-shaft Om1 -> 1st final-drive-gear Gf1 -> final driven gear Gf-> differential gear Gd.

[0025]

<2nd speed gear ratio>

At the time of establishment of a 2nd speed gear ratio, the 2nd friction clutch C2 is engaged and the 1st synchro device A, the 4th synchro device D1 (moving rightward side), the 7th synchro device G, and the 8th synchro device H are engaged. As a result, so that clearly from Fig.7 (A) the driving force of the engine P, the 2nd friction clutch C2 -> 2nd input shaft -- the [Im2 -> 2nd input gear Gi2 -> 6th output gear Go6 -> 7th synchro device G->] -- the 2 secondary output-shaft Os2 -> 8th synchro device H-> 7th output gear Go7 -> 4th input gear Gi -- the [4 -> 3rd input-shaft Im3 -> 3rd input gear Gi3 -> 3rd output gear Go3 ->] -- four. the [synchro device D1 (moving rightward side) ->] -- 1 secondary output-shaft Os1-> -- it transmits to the driving wheels W and W the 1st synchro device in the course of the A-> 1st output-shaft Om1 -> 1st final-drive-gear Gf1 -> final driven gear Gf-> differential gear Gd.

[0026]

<3rd speed gear ratio>

At the time of establishment of a 3rd speed gear ratio, the 3rd friction clutch C3 is engaged and the 1st synchro device A and the 4th synchro device D1 (moving rightward side) are engaged. As a result, so that clearly from Fig.8 (A) the driving force of the engine P, 1st synchro-device A-> 1st output-shaft Om1 -> 1st final-drive-gear Gf1 -> final driven-gear Gf-> the 3rd friction clutch C3 -> 3rd input shaft Im -- the [3 -> 3rd input gear Gi3 -> 3rd output gear Go3 -> 4th synchro device D1 (moving rightward side) ->] -- 1 secondary output-shaft Os1-> -- It transmits to the driving wheels W and W in the course of the differential gear Gd.

[0027]

<4th speed gear ratio>

At the time of establishment of a 4th speed gear ratio, the 1st friction clutch C1 is engaged and the 1st synchro device A and the 2nd synchro device B are engaged. As a result, so that clearly from Fig.9 (A) the driving force of the engine P, the 1st friction clutch C1 -> 1st input shaft -- the [Im1 -> 1st input gear Gi1 -> 1st output gear Go1 -> 2nd synchro device B->] -- the 1 secondary output-shaft Os1 -> 1st synchro device A -- -> 1st output-shaft Om1 -> 1st final-drive-gear Gf1 -> final driven gear Gf-> differential gear Gd. It transmits to the driving wheels W and W by ******.

[0028]
<5th speed gear ratio>
At the time of establishment of a 5th speed gear ratio, the 2nd friction clutch C2 is engaged and the 1st synchro device A and the 3rd synchro device C are engaged. As a result, so that clearly from Fig.10 (A) the driving force of the engine P, the 2nd friction clutch C2 -> 2nd input shaft -- the [Im2 -> 2nd input gear Gi2 -> 2nd output gear Go2 -> 3rd synchro device C->] -- the 1 secondary output-shaft Os1 -> 1st synchro device A -- -> 1st output-shaft Om1 -> 1st final-drive-gear Gf1 -> final driven gear Gf-> differential gear Gd. It transmits to the driving wheels W and W by ******.
[0029]
At the time of establishment of <6 ********>6 ********, the 3rd friction clutch C3 is engaged and the 1st synchro device A and the 4th synchro device D2 (rightward movement side) are engaged. As a result, so that clearly from Fig.11 (A) the driving force of the engine P, 1st synchro-device A-> 1st output-shaft Om1 -> 1st final-drive-gear Gf1 -> final driven-gear Gf-> the 3rd friction clutch C3 -> 3rd input shaft Im -- the [3 -> 4th input gear Gi4 -> 4th output gear Go4 -> 4th synchro device D2 (rightward movement side) ->] -- 1 secondary output-shaft Os1-> -- It transmits to the driving wheels W and W in the course of the differential gear Gd.
[0030]
<7 ********>
At the time of establishment of 7 ********, the 1st friction clutch C1 is engaged and the 5th synchro device E and the 6th synchro device F are engaged. As a result, so that clearly from Fig.12 (A) the driving force of the engine P, the 1st friction clutch C1 -> 1st input shaft -- the [Im1 -> 1st input gear Gi1 -> 5th output gear Go5 -> 6th synchro device F->] -- the 2 secondary output-shaft Os2 -> 5th synchro device E -- -> 2nd output-shaft Om2 -> 2nd final-drive-gear Gf2 -> final driven gear Gf-> differential gear Gd. It transmits to the driving wheels W and W by ******.
[0031]
<8 ********>
At the time of establishment of 8 ********, the 2nd friction clutch C2 is engaged and the 5th synchro device E and the 7th synchro device G are engaged. As a result, so that clearly from Fig.13 (A) the driving force of the engine P, the 2nd friction clutch C2 -> 2nd input shaft -- the [Im2 -> 2nd input gear Gi2 -> 6th output gear Go6 -> 7th synchro device G->] -- the 2 secondary output-shaft Os2 -> 5th synchro device E -- -> 2nd output-shaft Om2 -> 2nd final-drive-gear Gf2 -> final driven gear Gf-> differential gear Gd. It transmits to the driving wheels W and W by ******.
[0032]
<9 ********>
At the time of establishment of 9 ********, the 3rd friction clutch C3 is engaged and the 5th synchro device E and the 8th synchro device H are engaged. As a result, so that clearly from Fig.14 (A) the driving force of the engine P, the 3rd friction clutch C3 -> 3rd input shaft -- the [Im3 -> 4th input gear Gi4 -> 7th output gear Go7 -> 8th synchro device H->] -- the 2 secondary output-shaft Os2 -> 5th synchro device E -- -> 2nd output-shaft Om2 -> 2nd final-drive-gear Gf2 -> final driven gear Gf-> differential gear Gd. It transmits to the driving wheels W and W by ******.
[0033]
<10 ********>
At the time of establishment of 10 ********, the 1st friction clutch C1 is engaged and the 2nd synchro device B, the 4th synchro device D1 (moving rightward side), the 5th synchro device E, and the 8th synchro device H are engaged. As a result, so that clearly from Fig.15 (A) the driving force of the engine P, the 1st friction clutch C1 -> 1st input shaft -- the [Im1 -> 1st input gear Gi1 -> 1st output gear Go1 -> 2nd synchro device B->] -- 1 secondary output-shaft Os1 -> 4th synchro device D1 (moving rightward side) -> 3rd output gear Go3-> -- 3rd input gear Gi3 -> 3rd input-shaft Im3 -> 4th input gear Gi4 -> 7th output gear Go7. the [-> 8th synchro device H->] -- 2 secondary output-shaft Os2-> -- it transmits to the driving wheels W and W the 5th synchro device in the course of the E-> 2nd output-shaft Om2 -> 2nd final-drive-gear Gf2 -> final driven gear Gf-> differential gear Gd.
[0034]
<11 ********>
At the time of establishment of 11 ********, the 2nd friction clutch C2 is engaged and the 3rd synchro device C, the 4th synchro device D1 (moving rightward side), the 5th synchro device E, and the 8th synchro device H are engaged. As a result, so that clearly from Fig.15 (D) the driving force of the engine P, the 2nd friction clutch C2 -> 2nd input shaft -- the [Im2 -> 2nd input gear Gi2 -> 2nd output gear Go2 -> 3rd synchro device C->] -- 1 secondary output-shaft Os1 -> 4th synchro device D1 (moving rightward side) -> 3rd output gear Go3-> -- 3rd input gear Gi3 -> 3rd input-shaft Im3 -> 4th input gear Gi4 -> 7th output gear Go7. the [-> 8th synchro device H->] -- 2 secondary output-shaft Os2-> -- it transmits to the driving wheels W and W the 5th synchro device in the course of the E-> 2nd output-shaft Om2 -> 2nd final-drive-gear Gf2 -> final driven gear Gf-> differential gear Gd.
[0035]
As mentioned above, a 1st speed gear ratio - 11 ******** carry out probability by controlling the engagement of the engagement of the 1st friction clutch C1 - the 3rd friction clutch C3 and the 1st synchro device A - the 8th synchro device H.
[0036]

Next, the procedure of sequential gear change of the up shifting from a 1st speed gear ratio to 11 ******** is described.
[0037]
<1st speed gear ratio -> 2nd speed gear ratio>
from the run state in the 1st speed gear ratio shown in Fig.6 (A), the 7th synchro device G is engaged in the shift preparation process shown in Fig.6 (B) -- 6th output gear Go6 -- the -- PURISHIFUTO to a 2nd speed gear ratio is performed by combining with 2 secondary output-shaft Os2. the [to which driving force is transmited in the transmitting power course of the 1st speed gear ratio since the 2nd friction clutch C2 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 2 secondary output-shaft Os2 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.
[0038]
If engagement release of the 1st friction clutch C1 is carried out and the 2nd friction clutch C2 is engaged in the clutch change process shown in Fig.6 (C), Torque transmission by the transmitting power course of a 1st speed gear ratio is no longer performed, and a 2nd speed gear ratio is established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged for the 1st speed gear ratio by the shift release process shown in Fig.6 (D), for a 2nd speed gear ratio, the up shifting to a 2nd speed gear ratio is completed by carrying out engagement release of the unnecessary 6th synchro device F.
[0039]
<2nd speed gear ratio -> 3rd speed gear ratio>
Since the synchro device newly engaged for a 3rd speed gear ratio to a 2nd speed gear ratio does not exist, when shifting to the shift preparation process shown in Fig.7 (B) from the run state in the 2nd speed gear ratio shown in Fig.7 (A), operation in particular is not performed.
[0040]
If engagement release of the 2nd friction clutch C2 is carried out and the 3rd friction clutch C3 is engaged in the clutch change process shown in Fig.7 (C), Torque transmission by the transmitting power course of a 2nd speed gear ratio is no longer performed, driving force newly comes to be transmited in the transmitting power course shown as a solid line, and a 3rd speed gear ratio is established, without a torque omission occurring. And although engaged for the 2nd speed gear ratio by the shift release process shown in Fig.7 (D), for a 3rd speed gear ratio, the up shifting to a 2nd speed gear ratio is completed by carrying out engagement release of the unnecessary 7th synchro device G and the 8th synchro device H.
[0041]
<3rd speed gear ratio -> 4th speed gear ratio>
from the run state in the 3rd speed gear ratio shown in Fig.8 (A), the 2nd synchro device B is engaged in the shift preparation process shown in Fig.8 (B) -- 1st output gear Go1 -- the -- PURISHIFUTO to a 4th speed gear ratio is performed by combining with 1 secondary output-shaft Os1. the [to which driving force is transmited in the transmitting power course of the 3rd speed gear ratio since the 1st friction clutch C1 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 1 secondary output-shaft Os1 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.
[0042]
If engagement release of the 3rd friction clutch C3 is carried out and the 1st friction clutch C1 is engaged in the clutch change process shown in Fig.8 (C), Torque transmission by the transmitting power course of a 3rd speed gear ratio is no longer performed, and a 4th speed gear ratio is established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged for the 3rd speed gear ratio by the shift release process shown in Fig.8 (D), for a 4th speed gear ratio, the up shifting to a 4th speed gear ratio is completed by carrying out engagement release of the 4th unnecessary synchro device D1 (moving rightward side).
[0043]
<4th speed gear ratio -> 5th speed gear ratio>
from the run state in the 4th speed gear ratio shown in Fig.9 (A), the 3rd synchro device C is engaged in the shift preparation process shown in Fig.9 (B) -- 2nd output gear Go2 -- the -- PURISHIFUTO to a 5th speed gear ratio is performed by combining with 1 secondary output-shaft Os1. the [to which driving force is transmited in the transmitting power course of the 4th speed gear ratio since the 2nd friction clutch C2 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 1 secondary output-shaft Os1 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.
[0044]
If engagement release of the 1st friction clutch C1 is carried out and the 2nd friction clutch C2 is engaged in the clutch change process shown in Fig.9 (C), Torque transmission by the transmitting power course of a 4th speed gear ratio is no longer performed, and a 5th speed gear ratio is established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged for the 4th speed gear ratio by the shift release process shown in Fig.9 (D), for a 5th speed gear ratio, the up shifting to a 5th speed gear ratio is completed by carrying out engagement release of the unnecessary 2nd synchro device B.
[0045]

<5th speed gear ratio ->6 ********>
from the run state in the 5th speed gear ratio shown in Fig.10 (A), the 4th synchro device D2 (rightward movement side) is engaged in the shift preparation process shown in Fig.10 (B) -- 4th output gear Go4 -- the -- PURISHIFUTO to 6 ******** is performed by combining with 1 secondary output-shaft Os1. the [to which driving force is transmited in the transmitting power course of the 5th speed gear ratio since the 3rd friction clutch C3 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 1 secondary output-shaft Os1 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.
[0046]
If engagement release of the 2nd friction clutch C2 is carried out and the 3rd friction clutch C3 is engaged in the clutch change process shown in Fig.10 (C), Torque transmission by the transmitting power course of a 5th speed gear ratio is no longer performed, and 6 ******** are established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged for the 5th speed gear ratio by the shift release process shown in Fig.10 (D), at 6 ********, the up shifting to 6 ******** is completed by carrying out engagement release of the unnecessary 3rd synchro device C.
[0047]
<6 ******** ->7 ********>
From the run state in 6 ******** shown in Fig.11 (A), in the shift preparation process shown in Fig.11 (B), the 5th synchro device E and the 6th synchro device F are engaged -- the -- while combining 2 secondary output-shaft Os2 with 2nd output-shaft Om2 -- 5th output gear Go5 -- the -- PURISHIFUTO to 7 ******** is performed by combining with 2 secondary output-shaft Os2. Since the 1st friction clutch C1 is still in an engagement release state at this time, driving force is not simultaneously transmited in the transmitting power course shown in the final driven gear Gf with which driving force is transmited in the transmitting power course of 6 ******** with a dashed line, and there is no possibility that interlock may be generated.
[0048]
If engagement release of the 3rd friction clutch C3 is carried out and the 1st friction clutch C1 is engaged in the clutch change process shown in Fig.11 (C), Torque transmission by the transmitting power course of 6 ******** is no longer performed, and 7 ******** are established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged by 6 ******** in the shift release process shown in Fig.11 (D), at 7 ********, the up shifting to 7 ******** is completed by carrying out engagement release of the unnecessary 1st synchro device A and the 4th synchro device D2 (rightward movement side).
[0049]
<7 ******** ->8 ********>
from the run state in 7 ******** shown in Fig.12 (A), the 7th synchro device G is engaged in the shift preparation process shown in Fig.12 (B) -- 6th output gear Go6 -- the -- PURISHIFUTO to 8 ******** is performed by combining with 2 secondary output-shaft Os2. the [to which driving force is transmited in the transmitting power course of 7 ******** since the 2nd friction clutch C2 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 2 secondary output-shaft Os2 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.
[0050]
If engagement release of the 1st friction clutch C1 is carried out and the 2nd friction clutch C2 is engaged in the clutch change process shown in Fig.12 (C), Torque transmission by the transmitting power course of 7 ******** is no longer performed, and 8 ******** are established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged by 7 ******** in the shift release process shown in Fig.12 (D), at 8 ********, the up shifting to 8 ******** is completed by carrying out engagement release of the unnecessary 6th synchro device F.
[0051]
<8 ******** ->9 ********>
from the run state in 8 ******** shown in Fig.13 (A), the 8th synchro device H is engaged in the shift preparation process shown in Fig.13 (B) -- 7th output gear Go7 -- the -- PURISHIFUTO to 9 ******** is performed by combining with 2 secondary output-shaft Os2. the [to which driving force is transmited in the transmitting power course of 8 ******** since the 3rd friction clutch C3 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 2 secondary output-shaft Os2 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.
[0052]
If engagement release of the 2nd friction clutch C2 is carried out and the 3rd friction clutch C3 is engaged in the clutch change process shown in Fig.13 (C), Torque transmission by the transmitting power course of 8 ******** is no longer performed, and 9 ******** are established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged by 8 ******** in the shift release process shown in Fig.13 (D), at 9 ********, the up shifting to 9 ******** is completed by carrying out engagement release of the unnecessary 7th synchro device G.
[0053]
<9 ******** ->10 ********>
From the run state in 9 ******** shown in Fig.14 (A), in the shift preparation process shown

in Fig.14 (B), the 2nd synchro device B and the 4th synchro device D1 (moving rightward side) are engaged -- 1st output gear Go1 and 3rd output gear Go3 -- the -- PURISHIFUTO to 10 ******** is performed by combining with 1 secondary output-shaft Os1. the [to which driving force is transmited in the transmitting power course of 9 ******** since the 1st friction clutch C1 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 2 secondary output-shaft Os2 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.

[0054]

If engagement release of the 3rd friction clutch C3 is carried out and the 1st friction clutch C1 is engaged in the clutch change process shown in Fig.14 (C), Torque transmission by the transmitting power course of 9 ******** is no longer performed, and 10 ******** are established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And in the shift release process shown in Fig.14 (D), an unnecessary synchro device completes the up shifting to 10 side gear ratio, without operating it, especially since it is not being engaged.

[0055]

<10 ******** ->11 ********>

from the run state in 10 ******** shown in Fig.15 (A), the 3rd synchro device C is engaged in the shift preparation process shown in Fig.15 (B) -- 2nd output gear Go2 -- the -- PURISHIFUTO to 11 ******** is performed by combining with 1 secondary output-shaft Os1. the [to which driving force is transmited in the transmitting power course of 10 ******** since the 2nd friction clutch C2 is still in an engagement release state at this time] -- driving force is not simultaneously transmited to 2 secondary output-shaft Os2 in the transmitting power course shown with a dashed line, and there is no possibility that interlock may be generated.

[0056]

If engagement release of the 1st friction clutch C1 is carried out and the 2nd friction clutch C2 is engaged in the clutch change process shown in Fig.15 (C), Torque transmission by the transmitting power course of 10 ******** is no longer performed, and 11 ******** are established by driving force newly being transmited in the transmitting power course shown as a solid line, without a torque omission occurring. And although engaged by 10 ******** in the shift release process shown in Fig.15 (D), at 11 ********, the up shifting to 11 ******** is completed by carrying out engagement release of the unnecessary 2nd synchro device B.

[0057]

As mentioned above, according to this embodiment, sequential gear change of up shifting can be completed what is called clutch to clutch gear change, i.e., by holding the 1st - the 3rd friction clutch C1, C2, and C3 again, where PURISHIFUTO is performed, without generating a torque omission. Similarly, sequential gear change of down shifting can be completed by clutch to clutch gear change, without generating a torque omission.

[0058]

Next, the advantage of the gearbox T of this embodiment to the gearbox (henceforth a conventional case) of the description to the above-mentioned Patent document 1 is described.

[0059]

Although ten steps of gear ratios are establishable by a total of 12 gears consisting of four input gears supported to the input shaft, and eight output gears supported to the pair of output shaft, the conventional case shown in Fig.22, This embodiment can establish 11 steps of gear ratios by a total of 11 gears consisting of four input gears supported to the input shaft, and seven output gears supported to the pair of output shaft, and can make a number of speeds increase by one step with the number of gears with few one piece to a conventional case.

[0060]

As shown in Fig.16, a conventional case is number [of a gear] of engagement =2 in three of ten steps of gear ratios, but the number of engagement of a gear is 4 in the seven remaining steps, and 2 engagement rate used as number of engagement =2 is low with 30%. It is said that the transmitting power efficiency of a gearbox is deteriorated 1.5% for every one engagement of a gear, and since a conventional case has many gear ratios of number of engagement =4, there is a problem on which transmitting power efficiency is deteriorated.

[0061]

This embodiment is number [of a gear] of engagement =2 in seven of 11 steps of gear ratios, it is number [of a gear] of engagement =4 in the four remaining steps, and 2 engagement rate used as number of engagement =2 is high with 64%. Thus, this embodiment is that the number of the gear ratios of number of engagement =4 decreases, and decline in transmitting power efficiency is minimized.

[0062]

Fig.17 shows the torque flow for every gear ratio of the gearbox of this embodiment in simple. A torque flow the driving force of 1st input-shaft Im1, 2nd input-shaft Im2, or 3rd input-shaft Im3, the -- the [1 secondary output-shaft Os1 and] -- with the simple flow (number of engagement =2) outputted to the differential gear Gd only via either of 2 secondary output-shaft Os2, the driving force of 1st input-shaft Im1, 2nd input-shaft Im2, or 3rd input-shaft Im3 -- the -- the [1 secondary output-shaft Os1 and], although classified into the complicated flow (number of engagement =4) outputted to the differential gear Gd via both of 2 secondary output-shaft Os2, The 1st speed gear ratio and 2nd speed gear ratio which are speed gear stage groups in this embodiment, Since the torque flow of a total of four gear ratios with 10 ******** and 11 ******** which are high-speed gear ratio groups turns into a complicated

flow and the remaining 3rd speed gear ratios - the torque flow of a total of seven gear ratios of 9 ******** turn into a simple flow, Decline in transmitting power efficiency is minimized because the ratio of the gear ratio of a simple flow increases and the number of engagement of a gear decreases. And since it becomes a skeleton which it gears and can summarize the 3rd speed gear ratio which is a gear ratio of the simple flow of number =2 - 9 ******** in a frequently-used medium-speed gear ratio group, the fuel consumption improvement in a common region is expectable.

[0063]

However, a conventional case is that the ratio of the gear ratio of a complicated flow increases and the number of engagement of a gear increases since only three of ten steps of gear ratios are simple flows and the seven remaining steps are complicated flows, and transmitting power efficiency will be deteriorated.

[0064]

So that clearly from Fig.17 this embodiment, The torque flow of a 1st speed gear ratio and a 2nd speed gear ratio which is a speed gear stage group is similar, The 3rd speed gear ratio of the medium-speed gear ratio groups - the torque flow of 6 ******** are similar, Since the torque flow of 7 ******** of the medium-speed gear ratio groups - 9 ******** is similar and the torque flow of 10 ******** and 11 ******** which is a high-speed gear ratio group is similar, By change of the transmitting power course between the gear ratios which adjoin sequentially at the time of gear change being minimized, i.e., the operating frequency of a synchro device is minimized, the improvement in transmitting power efficiency and improvement in a gear change response are attained.

[0065]

and -- a speed gear stage group and a high-speed gear ratio group -- the -- the [1 secondary output-shaft Os1 and], since driving force is transmited via 3rd input gear Gi3 and 4th input gear Gi4 between the 2 secondary output shafts Os2, While operating 3rd input gear Gi3 and 4th input gear Gi4 as a reduction gear for a 1st speed gear ratio and a 2nd speed gear ratio and making the change gear ratio of a speed gear stage group increase, In 10 ******** and 11 ********, the ratio range of the gearbox T is expandable by operating 3rd input gear Gi3 and 4th input gear Gi4 as an accelerating gear, and decreasing the change gear ratio of a high-speed gear ratio group.

[0066]

Since all driving force is outputted from 1st output-shaft Om1 in the 1st speed gear ratio which is the low speed side gear ratio - 6 ******** and all driving force is outputted from 2nd output-shaft Om2 in 7 ******** which are the high speed side gear ratios - 11 ********, By change of the transmitting power course between the gear ratios which adjoin sequentially at the time of gear change being minimized, i.e., the operating frequency of a synchro device is minimized, the further improvement in transmitting power efficiency and the further improvement in a gear change response are attained.

[0067]

By the way, when flying and changing gears to a target gear ratio from the present gear ratio, in order to avoid generating of a torque omission and interlock, while interposing a temporary gear ratio between the present gear ratio and a target gear ratio, it may be necessary to change gears. The jump gear change which needs to interpose two or more temporary gear ratios is called multi-step gear change between the present gear ratio and a target gear ratio. The big advantage of this embodiment to a conventional case is in evasion of the multi-step gear change at the time of jump gear change. Hereinafter, why multi-step gear change is avoided in this embodiment is described.

[0068]

As shown in Fig.18, in this embodiment by the engagement of the 1st friction clutch C1, the driving force of the engine P -- the [of 1st input-shaft Im1 / 1st input gear Gi1 to] -- the [of 1 secondary output-shaft Os1 / 1st output gear Go1 or] -- with the transmitting power course transmited to 5th output gear Go5 of 2 secondary output-shaft Os2, the engagement of the 2nd friction clutch C2 -- the driving force of the engine P -- the [of 2nd input-shaft Im2 / 2nd input gear Gi2 to] -- the [2nd output gear Go2 of 1 secondary output-shaft Os1, or] -- by the transmitting power course transmited to 6th output gear Go6 of 2 secondary output-shaft Os2, and the engagement of the 3rd friction clutch C3, the driving force of the engine P -- the [3rd input gear Gi3 or 4th input gear Gi4 of 3rd input-shaft Im3 to] -- the [3rd output gear Go3 of 1 secondary output-shaft Os1, 4th output gear Go4, or] -- the transmitting power course transmited to 7th output gear Go7 of 2 secondary output-shaft Os2 exists. Thus, probability that interlock will generate an input in a speed changing process when three lines turned can be made small using the 1st - the 3rd friction clutch C1, C2, and C3, and the number of required temporary gear ratios can be decreased.

[0069]

In the gearbox of the conventional dual clutch type which has a two-step clutch, Since clutch to clutch gear change which does not have a torque omission by hold substitute of two friction clutches is enabled, When the clutch engaged for the present gear ratio and the clutch engaged for a target gear ratio are the same clutches that is, it becomes impossible to carry out direct clutch to clutch gear change in jump gear change of an one-step jump or jump gear change of a three-step jump.

[0070]

On the other hand, since clutch to clutch gear change which does not have a torque omission by hold substitute of the three friction clutches C1, C2, and C3 is enabled in the gearbox T of this embodiment, When the friction clutch engaged for the present gear ratio and the friction

clutch engaged for a target gear ratio are the same clutches that is, it becomes impossible to carry out direct clutch to clutch gear change in jump gear change of a three-step jump or jump gear change of a six-step jump.
[0071]
Thus, since the three friction clutches C1, C2, and C3 are alternately engaged in order of the row of a gear ratio, the gearbox T of this embodiment not only has the three friction clutches C1, C2, and C3, but, The probability that clutch to clutch gear change will be attained without passing a temporary gear ratio because the probability that the friction clutch engaged for the present gear ratio and the friction clutch engaged for a target gear ratio are the same clutches decreases from 1/2 to 1/3 to the gearbox of the conventional case which has two friction clutches increases.
[0072]
As for Fig.19, the gearbox T of this embodiment shows gear change, one-step jump gear change, two-step jump gear change, three-step jump gear change, and the number of steps in the case of four steps flying and changing gears sequentially. For example, the display of "1->2" shows that it is possible for the sequential gear change for a 2nd speed gear ratio from a 1st speed gear ratio not passing a temporary gear ratio, without causing a torque omission and interlock. The display of "2-> (3) ->4" shows that it is necessary to interpose a temporary 3rd speed gear ratio between the 2nd speed gear ratio which is the present gear ratio, and the 4th speed gear ratio which is target gear ratios, in order to perform one-step jump gear change for a 4th speed gear ratio from a 2nd speed gear ratio, without causing a torque omission and interlock.
[0073]
Although 15 cases where it is necessary to interpose one temporary gear ratio sequentially among all the patterns of gear change - four-step jump gear change exist in this embodiment, when it is necessary to interpose two or more temporary gear ratios (i.e., when multi-step gear change is needed), it does not exist once. This is equivalent to the gearbox of the conventional dual clutch type which adopts only a simple flow.
[0074]
On the other hand, the gearbox of the conventional case which shows Fig.20 to Fig.22 shows gear change, one-step jump gear change, two-step jump gear change, three-step jump gear change, and the number of steps in the case of four steps flying and changing gears sequentially. In this conventional case, the multi-step gear change which needs to interpose two or more temporary gear ratios sequentially among all the patterns of gear change - four-step jump gear change exists no less than 11 times, and there is concern in which a gear change response is deteriorated by multi-step gear change.
[0075]
As mentioned above, the thing for which according to this embodiment the input system was increased to three lines with three friction clutches, the 1st friction clutch C1, the 2nd friction clutch C2, and the 3rd friction clutch C3, and generating of interlock was inhibited, While avoiding generating of multi-step gear change and improving a gear change response by having reduced the probability that the same friction clutch will be engaged for the present gear ratio and a target gear ratio, many gear ratios can be made with the smaller number of gears.
[0076]
Next, the structure of the drive mechanism of the 2nd synchro device B, the 3rd synchro device C, the 6th synchro device F, and the 7th synchro device G and an operation are described.
[0077]
the 1st arranged so that the 1st actuator 11 that operates the 2nd synchro device B and the 6th synchro device F may oppose mutually, as shown in Fig.21 -- cylinder 12 -- and it having 13 [cylinder / 2nd] and, The 1st piston 14 that fits into 12 slidably the 1st cylinder, and the 2nd piston 15 that fits into 13 slidably the 2nd cylinder are connected integrally. While the 1st oil chamber 16 is partitioned between 1st cylinder 12 and the 1st piston 14, The 2nd oil chamber 17 is partitioned between 2nd cylinder 13 and the 2nd piston 15, if oil pressure is supplied to the 1st oil chamber 16, the 1st and 2nd piston 14 and 15 will carry out moving rightward from a center valve position by one, and if oil pressure is supplied to the 2nd oil chamber 17, the 1st and 2nd piston 14 and 15 will move to the right from a center valve position by one.
[0078]
the -- the 1st shift rod 18 arranged in parallel along with 2 secondary output-shaft Os2 is not illustrated -- a change gear case -- an axial direction -- it being supported slidably and, the 1st shift rod 18 -- the -- the 1st circular connecting arm 19 extended toward 1 secondary output-shaft Os1 being fixed, and, The 1st cylindrical guide member 20 extended to an axial direction is fixed to the 1st connecting arm 19, and the 1st shift fork 22 that engages with the sleeve 21 of the 2nd synchro device B is fixed to the 1st guide member 20. The 2nd shift fork 24 that engages with the sleeve 23 of the 6th synchro device F is fixed to the 1st shift rod 18. To the 1st shift fork 22, the 2nd shift fork 24 deviates to axial direction left-hand side, and is arranged.
[0079]
If it is connected to the 1st connecting arm 19, therefore the 1st actuator 11 is driven, the 1st shift fork 22 and the 2nd shift fork 24 will move the 1st and 2nd piston 14 and 15 of the 1st actuator 11 to an axial direction by one.
[0080]

the -- the 2nd shift rod 25 arranged in parallel along with 1 secondary output-shaft Os1 is not illustrated -- a change gear case -- an axial direction -- it is supported slidably and the 3rd shift fork 27 that engages with the sleeve 26 of the 3rd synchro device C is fixed to the 2nd shift rod 25. moreover -- the 2nd shift rod 25 -- the -- the 2nd circular connecting arm 28 extended toward 2 secondary output-shaft Os2 being fixed, and, The 2nd cylindrical guide member 29 extended to an axial direction is fixed to the 2nd connecting arm 28, and the 4th shift fork 31 that engages with the sleeve 30 of the 7th synchro device G is fixed to the 2nd guide member 29.

[0081]

If it is connected to the 1st and 2nd piston 14 and 15 of the 2nd actuator 32 of the same structure as the 1st actuator 11, therefore the 2nd actuator 32 is driven, the 3rd shift fork 27 and the 4th shift fork 31 will move the 2nd connecting arm 28 to an axial direction by one.

[0082]

If the 1st cylindrical guide member 20 has fitted into the periphery of the 2nd shift rod 25 slidably and the 1st actuator 11 is driven, the 1st guide member 20 will be guided at the 2nd shift rod 25, and will move it to an axial direction. Similarly, if the 2nd cylindrical guide member 29 has fitted into the periphery of the 1st shift rod 18 slidably and the 2nd actuator 32 is driven, the 2nd guide member 29 will be guided at the 1st shift rod 18, and will move it to an axial direction. By thus, the thing for which the 2nd guide member 29 is guided with the 1st shift rod 18, and the 1st guide member 20 is guided with the 2nd shift rod 25, The attitude of the 1st shift fork 22, the 2nd shift fork 24, the 3rd shift fork 27, and the 4th shift fork 31 is stabilized, and a smooth operation can be enabled.

[0083]

Since the 1st connecting arm 19 and the 2nd connecting arm 28 were circularly formed as shown in Fig.2, the 1st connecting arm 19 and the 2nd connecting arm 28 can bypass the outside of 1st input-shaft Im1 arranged at a same axis, 2nd input-shaft Im2, and 3rd input-shaft Im3, and can avoid interference.

[0084]

carrying out moving rightward of the 2nd synchro device B by a 4th speed gear ratio and 10 ********, as shown in Fig.22 -- 1st output gear Go1 -- the -- it combining with 1 secondary output-shaft Os1, and, the 6th synchro device F moves to the right by a 1st speed gear ratio and 7 ******** -- 5th output gear Go5 -- the -- 2 secondary output-shaft Os2 being combined and, All the gear ratios for which the moving directions at the time of the engagement differ mutually, and the 2nd synchro device B and the 6th synchro device F operate differ, and do not operate simultaneously.

[0085]

If oil pressure is supplied to the 2nd oil chamber 17 of the 1st actuator 11 at the time of establishment of a 1st speed gear ratio as shown in Fig.23, the 2nd shift fork 24 will carry out engagement of the 6th synchro device F because the 1st shift fork 22 and the 2nd shift fork 24 move to the right simultaneously. Since the 1st shift fork 22 moves to the right at this time, the 2nd synchro device B engaged by moving rightward is maintained by the non-engagement state, without being affected.

[0086]

If oil pressure is supplied to the 1st oil chamber 16 of the 1st actuator 11 at the time of establishment of a 4th speed gear ratio as shown in Fig.24, the 1st shift fork 22 will carry out engagement of the 2nd synchro device B because the 1st shift fork 22 and the 2nd shift fork 24 carry out moving rightward simultaneously. Since moving rightward of the 2nd shift fork 24 is carried out at this time, the 6th synchro device F engaged by rightward movement is maintained by the non-engagement state, without being affected.

[0087]

If oil pressure is supplied to the 2nd oil chamber 17 of the 1st actuator 11 at the time of establishment of 7 ******** as shown in Fig.25, the 2nd shift fork 24 will carry out engagement of the 6th synchro device F because the 1st shift fork 22 and the 2nd shift fork 24 move to the right simultaneously. Since the 1st shift fork 22 moves to the right at this time, the 2nd synchro device B engaged by moving rightward is maintained by the non-engagement state, without being affected.

[0088]

If oil pressure is supplied to the 1st oil chamber 16 of the 1st actuator 11 at the time of establishment of 10 ******** as shown in Fig.26, the 1st shift fork 22 will carry out engagement of the 2nd synchro device B because the 1st shift fork 22 and the 2nd shift fork 24 carry out moving rightward simultaneously. Since moving rightward of the 2nd shift fork 24 is carried out at this time, the 6th synchro device F engaged by rightward movement is maintained by the non-engagement state, without being affected.

[0089]

the [as mentioned above,] -- the [the 2nd synchro device B provided by 1 secondary output-shaft Os1 and] -- the 6th synchro device F provided by 2 secondary output-shaft Os2, In order that an operating direction when engaged may be an opposite direction and may not operate simultaneously for the same gear ratio mutually, It can become possible to operate the these 2nd synchro device B and the 6th synchro device F convenient with the 1st common actuator 11, the number of actuators can be decreased, and it can contribute to the miniaturization of the gearbox T.

[0090]

carrying out moving rightward of the 3rd synchro device C by a 5th speed gear ratio and 11 ********, as shown in Fig.27 -- 2nd output gear Go2 -- the -- it combining with 1 secondary

output-shaft Os1, and, the 7th synchro device G moves to the right by a 2nd speed gear ratio and 8 ******** -- 6th output gear Go6 -- the -- 2 secondary output-shaft Os2 being combined and, All the gear ratios for which the moving directions at the time of the engagement differ mutually, and the 3rd synchro device C and the 7th synchro device G operate differ, and do not operate simultaneously.

[0091]

If oil pressure is supplied to the 2nd oil chamber 17 of the 2nd actuator 32 at the time of establishment of a 2nd speed gear ratio as shown in Fig.28, the 4th shift fork 31 will carry out engagement of the 7th synchro device G because the 3rd shift fork 27 and the 4th shift fork 31 move to the right simultaneously. Since the 3rd shift fork 27 moves to the right at this time, the 3rd synchro device C engaged by moving rightward is maintained by the non-engagement state, without being affected.

[0092]

If oil pressure is supplied to the 1st oil chamber 16 of the 2nd actuator 32 at the time of establishment of a 5th speed gear ratio as shown in Fig.29, the 3rd shift fork 27 will carry out engagement of the 3rd synchro device C because the 3rd shift fork 27 and the 4th shift fork 31 carry out moving rightward simultaneously. Since moving rightward of the 4th shift fork 31 is carried out at this time, the 7th synchro device G engaged by rightward movement is maintained by the non-engagement state, without being affected.

[0093]

If oil pressure is supplied to the 2nd oil chamber 17 of the 2nd actuator 32 at the time of establishment of 8 ******** as shown in Fig.30, the 4th shift fork 31 will carry out engagement of the 7th synchro device G because the 3rd shift fork 27 and the 4th shift fork 31 move to the right simultaneously. Since the 3rd shift fork 27 moves to the right at this time, the 3rd synchro device C engaged by moving rightward is maintained by the non-engagement state, without being affected.

[0094]

If oil pressure is supplied to the 1st oil chamber 16 of the 2nd actuator 32 at the time of establishment of 11 ******** as shown in Fig.31, the 3rd shift fork 27 will carry out engagement of the 3rd synchro device C because the 3rd shift fork 27 and the 4th shift fork 31 carry out moving rightward simultaneously. Since moving rightward of the 4th shift fork 31 is carried out at this time, the 7th synchro device G engaged by rightward movement is maintained by the non-engagement state, without being affected.

[0095]

the [as mentioned above,] -- the [the 3rd synchro device C provided by 1 secondary output-shaft Os1 and] -- the 7th synchro device G provided by 2 secondary output-shaft Os2, In order that an operating direction when engaged may be an opposite direction and may not operate simultaneously for the same gear ratio mutually, It can become possible to operate the these 3rd synchro device C and the 7th synchro device G convenient with the 2nd common actuator 32, the number of actuators can be decreased, and it can contribute to the miniaturization of the gearbox T.

[0096]

As mentioned above, although the embodiment of the invention was described, the present invention can perform various changes of design in the range which does not deviate from the summary.

[0097]

For example, although described in the embodiment about the gearbox T provided with the 1st friction clutch C1, the 2nd friction clutch C2, and the 3rd friction clutch C3, The present invention inputs the driving force of a driving source into the 1st input shaft and the 2nd input shaft selectively via the 1st friction clutch and the 2nd friction clutch, The driving force is applicable from the 1st output shaft and the 2nd output shaft also to the so-called gearbox of the dual clutch type outputted selectively (invention of Claim 2).

[0098]

In invention of Claim 2, the number of the gears of the 1st input gear group may be single, and the number of the gears of the 2nd input gear group may be single.

[0099]

The driving source of the present invention may not be limited to the engine P of an embodiment, but may be other driving sources of any like a motor generator.

[Explanations of letters or numerals]

[0100]

C1 The 1st friction clutch (the 1st friction engaging device)
C2 The 2nd friction clutch (the 2nd friction engaging device)
C3 The 3rd friction clutch (the 3rd friction engaging device)
Im1 The 1st input shaft
Im2 The 2nd input shaft
Im3 The 3rd input shaft
Om1 The 1st output shaft
Om2 The 2nd output shaft
Os1 -- the -- 1 secondary output shaft
Os2 -- the -- 2 secondary output shaft
P Engine (driving source)
A The 1st synchro device (the 1st engagement engagement device)
B The 2nd synchro device (the 2nd engagement engagement device)
C The 3rd synchro device (the 3rd engagement engagement device)

D1 The 4th synchro device (the 4th engagement engagement device)
D2 The 4th synchro device (the 4th engagement engagement device)
E The 5th synchro device (the 5th engagement engagement device)
F The 6th synchro device (the 6th engagement engagement device)
G The 7th synchro device (the 7th engagement engagement device)
H The 8th synchro device (the 8th engagement engagement device)
Gi1 The 1st input gear
Gi2 The 2nd input gear
Gi3 The 3rd input gear
Gi4 The 4th input gear
Go1 The 1st output gear
Go2 The 2nd output gear
Go3 The 3rd output gear
Go4 The 4th output gear
Go5 The 5th output gear
Go6 The 6th output gear
Go7 The 7th output gear
Gf1 The 1st final drive gear
Gf2 The 2nd final drive gear
11 The 1st actuator
18 The 1st shift rod
22 The 1st shift fork
24 The 2nd shift fork
25 The 2nd shift rod
27 The 3rd shift fork
31 The 4th shift fork
32 The 2nd actuator