Appeal decision

Appeal No. 2017-6894

Tokyo, Japan
Appellant HONDA MOTOR CO., LTD.

Tokyo, Japan
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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2013-116092 "Drive device and control method thereof" [the application published on Dec. 15, 2014: Japanese Unexamined Patent Application Publication No. 2014-234054, 20 claims] has resulted in the following appeal decision:

Conclusion

The examiner's decision is revoked.

The applicant shall be granted a patent for the inventions of the present application.

Reason

No. 1 History of the procedures

The present application is an application filed on May 31, 2013, reasons for refusal were notified on Jul. 15, 2016, a written opinion was submitted on Sep. 23, 2016, and a decision of refusal was made on Feb. 3, 2017. Against this, an appeal against the examiner's decision of refusal was demanded on May 12, 2017.

No. 2 Outline of the examiner's decision

The outline of the Examiner's decision (the decision of refusal as of Feb. 3, 2017) is as follows.

• Regarding reason 1 (Article 29(1)(iii) of the Patent Act), and reason 2 (Article 29(2) of the Patent Act)

· Claims 1 and 14
· Cited document 1

In paragraph [0084] of cited document 1, it is described, "In the case where the total value is equal to or greater than 0, the management ECU 9 stops the driving command to the hydraulic brake in the side of an electric motor for which regenerative torque has been requested. At this time, regenerative torque in a direction to engage the one-way clutch 50 is being applied to the electric motor in question. For this reason, the ring gear is locked by the one-way clutch 50 even when the lock by the hydraulic brake is released. Therefore, output torque from the electric motors 2A and 2B is transmitted to the rear wheel Wr, and the vehicle 3 is accelerated. On the other hand, in the case of the total value being less than 0, the management ECU 9 maintains

the driving command to the hydraulic brake in the side of the electric motor for which regenerative torque is requested so as to maintain the locking state of the ring gear."

In this statement, to "stop the driving command to the hydraulic brake" means to make "a fastening/releasing means (hydraulic brake) be controlled from the fastening state to the releasing state," and, therefore, "at this time" is a time when the hydraulic brake is controlled from the fastening state to the releasing state.

In addition, that "regenerative torque in a direction to engage the one-way clutch 50 is being applied to the electric motor in question" means that control is conducted in such a way that rotative power in one direction of a predetermined magnitude is generated from the electric motor.

Furthermore, since it is described that "For this reason, the ring gear is locked by the one-way clutch 50 even when the lock by the hydraulic brake is released," it is obvious that, "at the time of starting release of the hydraulic brake," control to generate rotative power in one direction of a predetermined magnitude from the electric motor has already been made.

From the above, it is described in cited document 1 that, when the hydraulic brake is controlled from the fastening state to the releasing state, at the point of time to start release of the hydraulic brake, control to generate rotative power in one directiion of a predetermined magnitude from the electric motor is being conducted.

Therefore, the inventions according to claims 1 and 14 are, as has been described in the written notice of reasons for refusal, identical with the invention described in cited document 1, or are ones that could have been invented by a person skilled in the art with ease based on cited document 1.

• Regarding reason 2 (Article 29(2) of the Patent Act)

· Claims 2 to 5, and 15 to 18
· Cited documents 1 to 3

The inventions according to claims 2 to 5, and 15 to 18 could have been invented by a person skilled in the art with ease based on Cited documents 1 to 3, and, therefore, the inventions are not patentable in accordance with the provisions of Article 29(2) of the Patent Act.

· Claims 6 to 13, and 19 and 20
· Cited documents 1 to 4

The inventions according to claims 6 to 13, and 19 and 20 could have been invented by a person skilled in the art with ease based on Cited documents 1 to 4 as has been described in the written notice of reasons for refusal.

List of cited documents and the like
1. Japanese Unexamined Patent Application Publication No. 2011-31746
2. Japanese Unexamined Patent Application Publication No. 2011-98706
3. Japanese Unexamined Patent Application Publication No. 2005-143243
4. Japanese Unexamined Patent Application Publication No. 2007-210359

No. 3 The Invention

The inventions according to claims 1 to 20 of the present application (hereinafter, respectively referred to as "Invention 1" to "Invention 20") are recognized as follows as viewed from the description, the statements of the scope of claims, and the drawings at the initial application.

"[Claim 1] A drive device, comprising:

a driven unit to propel a transport vehicle;

a driving source to drive the driven unit;

fastening/releasing means, disposed on a power transmission path between the driving source and the driven unit, to make the driving source side and the driven unit side be in a cutoff state or a coupled state by being made to be a releasing state or a fastening state;

a one-way power transmission means disposed on the power transmission path between the driving source and the driven unit in parallel with the fastening/releasing means, the one-way power transmission means coming to be in an engaged state when rotative power in one direction on the driving source side is inputted to the driven unit side, coming to be in a disengaged state when rotative power in another direction on the driving source side is inputted to the driven unit side, coming to be in a disengaged state when rotative power in one direction on the driven unit side is inputted to the driving source side, and coming to be in an engaged state when rotative power in another direction on the driven unit side is inputted to the driving source side;

a driving source control device to control rotative power generated by the driving source; and

a fastening/releasing means control device to control the fastening/releasing means, wherein,

when the fastening/releasing means control device controls the fastening/releasing means to the releasing state from the fastening state, at the point of time starting release of the fastening/releasing means, the driving source control device performs control in such a way that rotative power in one direction of a predetermined magnitude is generated from the driving source.

[Claim 2] The drive device according to claim 1, wherein

the rotative power of a predetermined magnitude is set in such a way that the rotative power of a predetermined magnitude is larger than minimum rotative power necessary for closing up microgaps between members existing on the power transmission path between the driving source and the one-way power transmission means.

[Claim 3] The drive device according to claim 1 or 2, wherein

the rotative power of a predetermined magnitude is set in such a way that the rotative power of a predetermined magnitude is smaller than minimum rotative power necessary for moving the transport vehicle.

[Claim 4] The drive device according to any one of claims 1-3, wherein

the driving source control device stops generation of the rotative power of a predetermined magnitude after the fastening/releasing means control device has completed release of the fastening/releasing means.

[Claim 5] The drive device according to claim 4, wherein

the driving source control device conducts control in such a way that a decreasing speed of rotative power when stopping generation of the rotative power of a

predetermined magnitude is smaller than an increasing speed of rotative power when generating the rotative power of a predetermined magnitude.

[Claim 6] The drive device according to any one of claims 1-5, wherein

the transport vehicle comprises noise obtaining means for obtaining a movement noise generated along with movement of the transport vehicle, wherein,

when the movement noise is less than a predetermined value, the driving source control device generates the rotative power of a predetermined magnitude at the point of time starting release of the fastening/releasing means, and, when the movement noise is no less than the predetermined value, does not generate the rotative power of the predetermined magnitude.

[Claim 7] The drive device according to claim 6, wherein

the noise obtaining means obtains a movement noise based on a moving speed of the transport vehicle.

[Claim 8] The drive device according to any one of claims 1-7, wherein

the driven unit includes a left driven unit and a right driven unit located rightward and leftward relative to a traveling direction of the transport vehicle,

the driving source includes a left driving source and a right driving source to drive the left driven unit and the right driven unit separately and independently,

a left differential having three rotational elements is provided on a power transmission path between the left driving source and the left driven unit, and

a right differential having three rotational elements is provided on a power transmission path between the right driving source and the right driven unit, wherein

first rotational elements of the left differential and the right differential are mechanically connected to the left driving source and the right driving source, respectively,

second rotational elements of the left differential and the right differential are mechanically connected to the left driven unit and the right driven unit, respectively,

third rotational elements of the left differential and the right differential are mechanically connected to each other integrally rotatably, and

the fastening/releasing means and the one-way power transmission means are disposed on the third rotational elements connected to each other.

[Claim 9] The drive device according to claim 8, wherein

the rotative power of a predetermined magnitude is generated from the left driving source and the right driving source.

[Claim 10] The drive device according to claim 9, wherein

control is conducted in such a way that rotative power generated from the left driving source is of an approximately identical magnitude with rotative power generated from the right driving source.

[Claim 11] The drive device according to claim 8, wherein

the rotative power of a predetermined magnitude is generated from only one of the left driving source and the right driving source.

[Claim 12] The drive device according to any one of claims 1-11, wherein

the driving source is an electric motor.

[Claim 13] The drive device according to any one of claims 1-12, wherein

the transport vehicle is a wheeled vehicle, and

the driven unit is a wheel.

[Claim 14] A control method of a drive device, the drive device comprising:

a driven unit to propel a transport vehicle;

a driving source to drive the driven unit;

fastening/releasing means, disposed on a power transmission path between the driving source and the driven unit, to make the driving source side and the driven unit side be in a cutoff state or a coupled state by being made to be a releasing state or a fastening state;

a one-way power transmission means disposed on the power transmission path between the driving source and the driven unit in parallel with the fastening/releasing means, the one-way power transmission means coming to be in an engaged state when rotative power in one direction on the driving source side is inputted to the driven unit side, coming to be in a disengaged state when rotative power in another direction on the driving source side is inputted to the driven unit side, coming to be in a disengaged state when rotative power in one dirction on the driven unit side is inputted to the driving source side, and coming to be in an engaged state when rotative power in another direction on the driven unit side is inputted to the driving source side;

a driving source control device to control rotative power generated by the driving source; and

a fastening/releasing means control device to control the fastening/releasing means, the method comprising:

a first step of the driving source control device generating, when the fastening/releasing means control device controls the fastening/releasing means to a releasing state from a fastening state, the rotative power in one dirction of a predetermined value from the driving source; and

a second step of the fastening/releasing means control device starting release of the fastening/releasing means in a state that the rotative power in one dirction of a predetermined magnitude is being generated.

[Claim 15] The control method of a drive device according to claim 14, further comprising:

a third step of the fastening/releasing means control device completing release of the fastening/releasing means; and

a fourth step of the driving source control device stopping generation of the predetermined rotative power, wherein,

after the third step, the fourth step is performed.

[Claim 16] The control method of a drive device according to claim 14 or 15, wherein

the rotative power of a predetermined magnitude is set in such a way that the rotative power of a predetermined magnitude is larger than minimum rotative power necessary for closing up microgaps between members existing on the power transmission path between the driving source and the one-way power transmission means.

[Claim 17] The control method of a drive device according to any one of claims 14-16, wherein

the rotative power of a predetermined magnitude is set in such a way that the rotative power of a predetermined magnitude is smaller than minimum rotative power necessary for moving the transport vehicle.

[Claim 18] The control method of a drive device according to claim 15, wherein

the driving source control device performs control in such a way that a decreasing speed of rotative power when stopping generation of the rotative power of a

predetermined magnitude in the fourth step becomes smaller than an increasing speed of rotative power when generating the rotative power of a predetermined magnitude in the first step.
[Claim 19] The control method of a drive device according to any one of claims 14-18, wherein

the transport vehicle comprises noise obtaining means for obtaining a movement noise generated along with movement of the transport vehicle, wherein,

when the movement noise is less than a predetermined value, the driving source control device generates the rotative power of a predetermined magnitude at the time point of starting release of the fastening/releasing means, and, when the movement noise is no less than the predetermined value, does not generate the rotative power of a predetermined magnitude.
[Claim 20] The control method of a drive device according to claim 19, wherein

the noise obtaining means obtains a movement noise based on a moving speed of the transport vehicle."

No. 4 Cited documents

1 The described matters of cited document 1 and cited invention

In Japanese Unexamined Patent Application Publication No. 2011-31746 (hereinafter, referred to as "Cited document 1") that was cited in the reasons for refusal described in the examiner's decision and was distributed before the application of the present application, the following matters are described along with drawings (Note that underlines were given by the body for the purpose of facilitating understanding. The same applies hereafter.).

(1) "[0012]

In order to solve the above-mentioned issues and achieve the above purpose, a drive control device of the invention described in claim 1 is a drive control device of a wheeled vehicle (for example, the vehicle 3 in the embodiment) that includes: a drive source (for example, the internal-combustion engine 4 and the electric motor 5 in the embodiment) capable of outputting drive power to a first axle (for example, the main drive shaft 8 in the embodiment) which is one of the front and rear wheel axles; an electric motor (for example, the electric motors 2A and 2B in the embodiment) capable of outputting drive power to a second axle (for example, the axles 10A and 10B in the embodiment) which is the other axle; a reduction gear (for example, the epicyclic reduction gears 12A and 12B in the embodiment) installed on a power transmission path between the second axle and the electric motor; a one-way power transmitting unit (for example, the one-way clutch 50 in the embodiment), provided on the power transmission path in series with the reduction gear, for transmitting the power-running drive power from the electric motor to the second axle; and a brake (for example, the hydraulic brakes 60A and 60B in the embodiment), provided on the power transmission path in parallel with the one-way power transmitting unit, for transmitting a rotational power from the second axle to the electric motor through the reduction gear when the regenerative drive of the electric motor is performed, the drive control device comprising: a first detection unit (for example, the vehicle speed sensor 117 or the rotation speed sensors 117a and 117b in the embodiment) to detect a speed of the

vehicle or the rotation speed of the second axle; a determining unit (for example, the management ECU 9 in the embodiment) to determine a target rotational speed of the electric motor on the basis of the speed of the vehicle or the rotation speed of the second axle detected by the first detection unit; a second detection unit (for example, the resolvers 20A and 20B, and the management ECU 9 in the embodiment) to detect the rotational speed of the electric motor; and a control unit (for example, the management ECU 9 in the embodiment) which, when starting the drive of the electric motor in the traveling state of the vehicle by drive power from the drive source, controls the electric motor so that the rotational speed of the electric motor is synchronized with the target rotational speed, and controls the output torque of the electric motor or the drive of the brake." (Paragraph [0012])

(2) "[0019]

Hereinafter, an embodiment of the present invention will be described by reference to FIG. 1-FIG. 4.

A drive device 1 according to the present invention uses electric motors 2A and 2B as a driving source to be used for driving an axle, and, for example, is used in the vehicle 3 having a drive system as shown in FIG. 1.

The vehicle 3 illustrated in FIG. 1 is a hybrid vehicle having a drive unit 6 in which the internal-combustion engine 4 and the electric motor 5 are connected in series in the front part of the vehicle, and power of the drive unit 6 is transmitted to a front wheel Wf via a transmission 7 and the main drive shaft 8, while the power of the drive device 1 provided aside from the drive unit 6 in the rear part of the vehicle is transmitted to a rear wheel Wr (RWr, LWr). The electric motor 5 of the drive unit 6 and the electric motors 2A and 2B of the drive device 1 in the side of the rear wheel Wr are connected to a battery via a PDU (power drive unit) that is not shown, and electric power supply from the battery and energy regeneration to the battery is carried out through the PDU. In addition, the management ECU (MG ECU) 9 controls each operation of the electric motors 2A and 2B and the hydraulic brakes 60A and 60B which are included in the drive device 1.

[0020]

FIG. 2 is a vertical sectional view illustrating the whole of the drive device 1, and, in this figure, symbols 10A and 10B denote the right and left axles in the side of the rear wheel Wr of the vehicle 3, and the axles are arranged coaxially in the vehicle-width direction. The reduction gear case 11 of the drive device 1 is formed into an approximately cylindrical shape as a whole, and, in its inside, the electric motors 2A and 2B for axle driving, and the epicyclic reduction gears 12A and 12B to reduce a drive rotation speed of the electric motors 2A and 2B are arranged coaxially with the axles 10A and 10B. The electric motor 2A and the epicyclic reduction gear 12A control the left rear wheel LWr, the electric motor 2B and the epicyclic reduction gear 12B control the right rear wheel RWr, and the electric motor 2A and the epicyclic reduction gear 12A are arranged symmetrically with the electric motor 2B and the epicyclic reduction gear 12B in the vehicle-width direction in the reduction gear case 11. Then, as shown in FIG. 4, the reduction gear case 11 is supported by supporting units 13a and 13b of a frame member 13 that is a part of a frame to be the framework of the vehicle 3 and by the frame of the drive device 1 that is not shown. The supporting units 13a and 13b are provided left and right relative to the center of the frame member

13 in the vehicle-width direction. Further, the arrows in FIG 4 indicate a positional relationship in the state where the drive device 1 is mounted on the vehicle 3." (Paragraphs [0019] and [0020])

(3) "[0022]

In addition, the epicyclic reduction gears 12A and 12B include sun gears 21A and 21B, a plurality of planetary gears 22A and 22B to be engaged with the sun gear 21, planetary carriers 23A and 23B to support these planetary gears 22A and 22B, and ring gears 24A and 24B to be engaged in the outer perimeter side of the planetary gears 22A and 22B. Then, drive power of the electric motors 2A and 2B is inputted from the sun gears 21A and 21B, and decelerated drive power is outputted through the planetary carriers 23A and 23B.

[0023]

The sun gears 21A and 21B are formed integrally to cylindrical shafts 16A and 16B. In addition, as shown in FIG. 3, for example, the planetary gears 22A and 22B are duplex pinions having first pinions 26A and 26B of a large diameter to be directly engaged with the sun gears 21A and 21B and second pinions 27A and 27B of a diameter smaller than that of the first pinions 26A and 26B, and the first pinions 26A and 26B and the second pinions 27A and 27B are formed integrally in a state being coaxial and having an offset in the axis direction. The planetary gears 22A and 22B are supported by the planetary carriers 23A and 23B, and axial direction inner ends of the planetary carriers 23A and 23B extend inward in the diameter direction, are spline-fitted into the axles 10A and 10B to be integrally rotatably supported, and are supported by intermediate walls 18A and 18B through bearings 33A and 33B." (Paragraphs [0022] and [0023])

(4) "[0028]

In the case of the hydraulic brakes 60A and 60B, fixing plates 35A and 35B are supported by an outside-diameter-side support unit 34 extending from the reduction gear case 11, while rotation plates 36A and 36B are supported by the ring gears 24A and 24B. Therefore, when the plates 35A and 35B and the plates 36A and 36B are pressed against each other by pistons 37A and 37B, braking force by friction engagement between the plates 35A and 35B and the plates 36A and 36B acts on the ring gears 24A and 24B to be fixed, and when, from that state, the engagement according to the pistons 37A and 37B is released, free rotation of the ring gears 24A and 24B is allowed." (Paragraph [0028])

(5) "[0029]

In addition, a space is also secured between connection units 30A and 30B of the ring gears 24A and 24B that are opposite to each other in the axial direction, and, within that space, the one-way clutch 50 that transmits only one directional power to the ring gears 24A and 24B and shuts off power of the other direction is arranged. The one-way clutch 50 is one that interposes a plurality of sprags 53 between an inner race 51 and an outer race 52, and it is configured such that the inner race 51 rotates integrally with small diameter units 29A and 29B of the ring gears 24A and 24B by spline-fitting. The outer race 52 is positioned and whirl-stopped by an inside-diameter-side support unit 40. The one-way clutch 50 is configured to lock rotation of the ring gears 24A

and 24B by engaging with the ring gears on the occasion that the vehicle 3 moves forward. More specifically, the one-way clutch 50 is configured to lock or separate the ring gears 24A and 24B depending on an action direction of torque that acts on the ring gears 24A and 24B, and, assuming that the rotation direction of the sun gears 21A and 21B on the occasion that the vehicle 3 moves forward is made to be the normal rotation direction, locks rotation of the ring gears 24A and 24B when torque of a reverse rotation direction is applied to the ring gears 24A and 24B.

[0030]

Next, control of the drive device 1 constituted in this way will be described. FIG. 5-FIG. 10 indicate alignment charts in respective states, and symbols S and C in the left side respectively indicate the sun gear 21A of the epicyclic reduction gear 12A connected to the electric motor 2A, and the planetary carrier 23A connected to the axle 10A. Similarly, S and C in the right side respectively indicate the sun gear 21B of the epicyclic reduction gear 12B connected to the electric motor 2B, and the planetary carrier 23B connected to the axle 10B. Further, R indicates the ring gears 24A and 24B, BRK the hydraulic brakes 60A and 60B, and OWC the one-way clutch 50. In the following description, the rotation direction of the sun gears 21A and 21B at the time of moving forward is made to be the normal rotation direction. In addition, in the figures, the upper side from the parked state is rotation in the normal rotation direction, the lower side is rotation in the reverse rotation direction, and, regarding the arrows, up-arrows indicate torque of the normal rotation direction, and down-arrows indicate torque of the reverse rotation direction.

... snip ...

[0032]

FIG. 6 is an alignment chart when the vehicle 3 travels forward by motor torque of the electric motors 2A and 2B of the drive device 1; that is, when the vehicle 3 travels forward in a manner that the drive device 1 is on the drive side. When the electric motors 2A and 2B are driven, torque in the normal rotation direction is added to the sun gears 21A and 21B. At this time, as previously mentioned, the ring gears 24A and 24B are locked by the one-way clutch 50, and lock torque in the normal rotation direction is added to the ring gears 24A and 24B trying to rotate in the reverse rotation direction. By this, the planetary carriers 23A and 23B rotate in the normal rotation direction and forward traveling is made. Meanwhile, to the planetary carriers 23A and 23B, a running resistance from the axles 10A and 10B in the reverse rotation direction is applied. In this way, on the occasion of traveling of the vehicle 3, by turning on the ignition and increasing torque of the electric motors 2A and 2B, the one-way clutch 50 is made to mechanically engage to lock the ring gears 24A and 24B, and, therefore, it is possible for the vehicle 3 to start moving without causing operation of an oil pump 70 for driving the hydraulic brakes 60A and 60B. By this, it is possible to improve responsiveness at the time of traveling start of a vehicle.

[0033]

FIG. 7 is an alignment chart in a case where the electric motors 2A and 2B are stopped in a state that the vehicle 3 is traveling forward by the drive unit 6; that is, the drive device 1 is on the coast side and, in addition, the electric motors 2A and 2B are stopped. When the electric motors 2A and 2B are stopped from the state of FIG. 6, torque in the normal rotation direction to try to continue forward traveling is applied from the axles 10A and 10B to the planetary carriers 23A and 23B, and, therefore,

torque in the reverse rotation direction acts to the ring gears 24A and 24B to release the one-way clutch 50. Accordingly, the ring gears 24A and 24B run idle at a speed faster than that of the planetary carriers 23A and 23B. By this, when there is no need of regeneration by the electric motors 2A and 2B, and if the ring gears 24A and 24B are not secured by the hydraulic brakes 60A and 60B, the electric motors 2A and 2B are stopped, and corotation of the electric motors 2A and 2B can be prevented. Further, at this time, cogging torque in the normal rotation direction acts on the electric motors 2A and 2B, and the total torque of the cogging torque and torque that balances with the friction of the ring gears 24A and 24B will be the axle loss of the axles 10A and 10B.
...snip ...
[0035]

FIG. 9 is an alignment chart in the case where the vehicle 3 travels backward by motor torque of the electric motors 2A and 2B of the drive device 1; that is, moves backward in a manner that the drive device 1 is on the drive side. When the electric motors 2A and 2B are driven in the reverse rotation direction, torque in the reverse rotation direction is added to the sun gears 21A and 21B. At this time, torque in the normal rotation direction acts on the ring gears 24A and 24B to release the one-way clutch 50. On this occasion, by engaging the hydraulic brakes 60A and 60B to add lock torque in the reverse rotation direction to the ring gears 24A and 24B, the ring gears 24A and 24B are secured, and, in conjunction with this, the planetary carriers 23A and 23B rotate in the reverse rotation direction to carry out backward traveling. Further, running resistance in the normal rotation direction from the axles 10A and 10B is acting on the planetary carriers 23A and 23B.
[0036]

FIG. 10 is an alignment chart at the time when the vehicle 3 is backward traveling by the drive unit 6 and the drive device 1 is on the coast side. At this time, since torque in the reverse rotation direction to try to continue backward traveling is applied from the axles 10A and 10B to the planetary carriers 23A and 23B, the ring gears 24A and 24B are locked by the one-way clutch 50, and lock torque in the normal rotation direction is added to the ring gears 24A and 24B trying to rotate in the reverse rotation direction. Along with this, counter electromotive force in the normal rotation direction occurs in the electric motors 2A and 2B." (Paragraphs [0029] to [0036])

(6) "[0082]

In the present embodiment, the electric motor 2A and the epicyclic reduction gear 12A of the drive device 1 control the left rear wheel LWr, and the electric motor 2B and the epicyclic reduction gear 12B of the drive device 1 control the right rear wheel RWr. Accordingly, when drive of the electric motors 2A and 2B is needed while the vehicle 3 is turning, the management ECU 9 makes different torque demands to the electric motors 2A and 2B in the right and left, respectively. That is, the management ECU 9 calculates each demanded torque to the right and left electric motors 2A and 2B based on a traveling state of the vehicle 3 at the time.
[0083]

In this regard, however, on the occasion that the vehicle 3 turns, it is conceivable that demanded torque to one of the right and left electric motors 2A and 2B is driving torque, and demanded torque to the other is regenerative torque. In this case, the management ECU 9 performs the control indicated in FIG. 13 to an electric motor for

which driving torque is requested, and performs the control indicated in FIG. 16 to an electric motor for which regenerative torque is requested. Furthermore, the management ECU 9 determines that rotational speed synchronization of the electric motors 2A and 2B has been completed, then determines whether the total value of these two pieces of demanded torque is equal to or greater than 0.
[0084]

In the case where the total value is equal to or greater than 0, the management ECU 9 stops the driving command to the hydraulic brake in the side of an electric motor for which regenerative torque has been requested. At this time, regenerative torque in a direction to engage the one-way clutch 50 is being applied to the electric motor in question. For this reason, the ring gear is locked by the one-way clutch 50 even when the lock by the hydraulic brake is released. Therefore, output torque from the electric motors 2A and 2B is transmitted to the rear wheel Wr, and the vehicle 3 is accelerated. On the other hand, in the case of the total value being less than 0, the management ECU 9 maintains the driving command to the hydraulic brake on the side of the electric motor for which regenerative torque is requested so as to maintain the lock of the ring gear." (Paragraphs [0082] to [0084])

(7) Matters that can be seen from the statements of the above-mentioned (1), (4), (5), and (6)

A From the statements of the above-mentioned (1) and the above-mentioned (5) (paragraph [0032], in particular), it can be seen that the axles 10A and 10B are ones that are driven so as to make the vehicle 3 run.

B From the statements of the above-mentioned (1), (4), and (5), it can be seen that the hydraulic brakes 60A and 60B are ones that make rotative power from the axles 10A and 10B be transmitted, or not be transmitted to the electric motors 2A and 2B by being engaged or being released from engagement.

C From the statement of the above-mentioned (5), it can be seen that the one-way clutch 50 locks the ring gears 24A and 24B when torque in the normal rotation direction acts on the sun gears 21A and 21B, performs release when torque in the reverse rotation direction acts on the sun gears 21A and 21B, performs release when torque in the normal rotation direction acts on the planetary carriers 23A and 23B, and locks the ring gears 24A and 24B when torque in the reverse rotation direction acts on the planetary carriers 23A and 23B.

D From the statement of the above-mentioned (6), it can be seen that, when the management ECU 9 stops a driving command of the hydraulic brake on the side of an electric motor for which regenerative torque is requested, in the case when the total value of driving torque requested to one of the electric motors and regenerative torque requested to the other electric motor is equal to or greater than 0, regenerative torque is acting on the electric motor for which regenerative torque is requested.

(7) Cited invention

When the above-mentioned (1) to (7) are integrated, there is described in Cited document 1 the following invention (hereinafter, referred to as "the Cited invention").

<The Cited invention >
"A drive control device, comprising:

axles 10A and 10B to be driven in order for a vehicle 3 to run;

electric motors 2A and 2B capable of outputting drive power to the axles 10A and 10B;

hydraulic brakes 60A and 60B provided on a power transmission path between the electric motors 2A and 2B and the axles 10A and 10B, to make rotative power from the axles 10A and 10B be transmitted or be not transmitted to the electric motors 2A and 2B by being engaged or being released from engagement;

a one-way clutch 50, provided on the power transmission path between the electric motors 2A and 2B and the axles 10A and 10B in parallel with the hydraulic brakes 60A and 60B, to lock ring gears 24A and 24B when torque in the normal rotation direction acts on sun gears 21A and 21B, perform release when torque in the reverse rotation direction acts on the sun gears 21A and 21B, perform release when torque in the normal rotation direction acts on planetary carriers 23A and 23B, and lock the ring gears 24A and 24B when torque in the reverse rotation direction acts on the planetary carriers 23A and 23B; and

a management ECU 9 to control output torque of the electric motors 2A and 2B, and control drive of the hydraulic brakes 60A and 60B, wherein,

when the management ECU 9 stops a driving command of the hydraulic brake in the side of an electric motor for which regenerative torque is requested, in the case when the total value of driving torque requested to one of the electric motors and regenerative torque requested to the other electric motor is equal to or greater than 0, regenerative torque is acting on the electric motor for which regenerative torque is requested."

No. 5 Comparison / Judgment

1 Regarding the Invention 1

When Invention 1 and Cited invention are compared, as viewed from their functions, structures, or technical significance, "the vehicle 3" in the Cited invention corresponds to "transport vehicle" in the Invention 1. In a similar fashion, "the axles 10A and 10B" correspond to "driven unit" or "driven unit side", "axles 10A and 10B to be driven in order for a vehicle 3 to run" to "driven unit to propel a transport vehicle", "electric motors 2A and 2B" to "driving source" or "driving source side", "electric motors 2A and 2B capable of outputting drive power to the axles 10A and 10B" to "driving source to drive the driven unit", "being engaged or being released from engagement" to "being made to be a releasing state or a fastening state", "to make rotative power from the axles 10A and 10B be transmitted or be not transmitted to the electric motors 2A and 2B" to "to make the driving source side and the driven unit side be in a cutoff state or a coupled state", "the hydraulic brakes 60A and 60B" to "fastening/releasing means", "in the normal rotation direction" to "in one direction", "torque in the normal rotation direction" to "rotative power in one direction", "the sun gears 21A and 21B" to "driving source side", "act" to "is inputted", "lock the ring gears 24A and 24B" to "coming to be in a engaged state", "the reverse rotation direction" to "another direction", "torque in the reverse rotation direction" to "rotative power in another direction", "release" to "coming to be in a disengaged state", "the planetary carriers 23A and 23B" to "driven unit side", "the one-way clutch 50" to "one-way power

transmission means", "output torque of the electric motors 2A and 2B" to "rotative power generated by the driving source", "control drive of the hydraulic brakes 60A and 60B" to "control the fastening/releasing means", "the management ECU 9" to "driving source control device" and "fastening/releasing means control device", and "drive control device" to "drive device".

Regarding "when torque in the normal rotation direction acts on the sun gears 21A and 21B" in the Cited invention, since the torque in question is inputted to the planetary carriers 23A and 23B side, it corresponds to "when rotative power in one direction on the driving source side is inputted to the driven unit side" in Invention 1, and, in a similar fashion, "when torque in the reverse rotation direction acts on the sun gears 21A and 21B" in the Cited invention corresponds to "when rotative power in another direction on the driving source side is inputted to the driven unit side" in Invention 1.

In addition, regarding "when torque in the normal rotation direction acts on the planetary carriers 23A and 23B" in the Cited invention, since the torque in question is inputted to the sun gears 21A and 21B side, it corresponds to "when unidirectional rotative power in in the driven unit side is inputted to the driving source side" in Invention 1, and, in a similar fashion, "when torque in the reverse rotation direction acts on the planetary carriers 23A and 23B" in the Cited invention corresponds to "when rotative power in another direction in the driven unit side is inputted to the driving source side" in Invention 1.

In view of the above, Invention 1 and the Cited invention are identical in the point of

"A drive device, comprising:

a driven unit to propel a transport vehicle;

a driving source to drive the driven unit;

fastening/releasing means, disposed on a power transmission path between the driving source and the driven unit, to make the driving source side and the driven unit side be in a cutoff state or a coupled state by being made to be a releasing state or a fastening state;

one-way power transmission means disposed on the power transmission path between the driving source and the driven unit in parallel with the fastening/releasing means, the one-way power transmission means coming to be in an engaged state when rotative power in one direction on the driving source side is inputted to the driven unit side, coming to be in a disengaged state when rotative power in another direction on the driving source side is inputted to the driven unit side, coming to be in a disengaged state when rotative power in one direction on the driven unit side is inputted to the driving source side, and coming to be in an engaged state when rotative power in another direction on the driven unit side is inputted to the driving source side;

a driving source control device to control rotative power generated by the driving source; and

a fastening/releasing means control device to control the fastening/releasing means," and are different in the following point.

(Different feature)

A point that, in Invention 1, "when the fastening/releasing means control device

controls the fastening/releasing means to the releasing state from the fastening state, at the point of time starting release of the fastening/releasing means, the driving source control device performs control in such a way that rotative power in one direction of a predetermined magnitude is generated from the driving source," whereas, in the Cited invention, when the management ECU 9 stops a driving command of the hydraulic brake in the side of an electric motor for which regenerative torque is requested, in the case when the total value of driving torque requested to one of the electric motors and regenerative torque requested to the other electric motor is equal to or greater than 0, regenerative torque is acting on the electric motor for which regenerative torque is requested (hereinafter, referred to as "the Different feature").

Here, the aforementioned different feature will be discussed below.

The above-mentioned "regenerative torque" in the Cited invention is torque that acts on an electric motor from the axle side, and therefore it is substantially different from the above-mentioned "rotative power in one direction of a predetermined magnitude" in Invention 1 that occurs "from a driving source," and, in the Cited invention, when the management ECU 9 stops a driving command of a hydraulic brake on the side of an electric motor for which regenerative torque is requested in the case when the above-mentioned total value is equal to or greater than 0, the electric motor for which regenerative torque has been requested is not outputting rotative power at that time. Therefore, Cited invention does not have the constitution corresponding to the matters specifying the invention of Invention 1 concerning the aforementioned different feature. In addition, it cannot be said that it is a design-related matter to implement, in the Cited invention, matters specifying the invention of Invention 1 concerning the aforementioned different feature.

In addition, in Japanese Unexamined Patent Application Publication No. 2011-98706 (hereinafter, referred to as "Cited document 2"), Japanese Unexamined Patent Application Publication No. 2005-143243 (hereinafter, referred to as "Cited document 3"), and Japanese Unexamined Patent Application Publication No. 2007-210359 (hereinafter, referred to as "Cited document 4") that were cited in the Examiner's decision and distributed before the application of the present application, there is no disclosure nor suggestion regarding the matters specifying the invention of Invention 1 concerning the aforementioned different feature.

Therefore, Invention 1 is not identical with the Cited invention, and could not have been easily invented by a person skilled in the art based on the Cited invention and the matters described in Cited document 2 to Cited document 4.

2 Regarding Invention 2 to Invention 13

Since claims 2 to 13 of the scope of claims of the present application are ones that were described in a manner directly or indirectly citing the description of claim 1 without substituting the statement by another statement, Invention 2 to Invention 13 include completely the matters specifying the invention of the Invention 1.

Therefore, as with Invention 1, Invention 2 to Invention 13, could not have been invented by a person skilled in the art with ease respectively based on the Cited

invention and the matters described in Cited document 2 to Cited document 4.

3 Regarding Invention 14 to Invention 20

Since Invention 14 is nothing but one that was made by changing the category of invention from "device" to "method" with respect to Invention 1, Invention 14 is not identical with the Cited invention as with Invention 1, and could not have been invented by a person skilled in the art with ease based on the Cited invention and the matters described in Cited document 2 to Cited document 4.

Then, claims 15 to 20 of the scope of claims of the present application are ones that were described in a manner directly or indirectly citing the statement of claim 14 without substituting the statement by others, and hence, Invention 15 to Invention 20 include all the matters specifying the invention of the Invention 14.

Therefore, as with Invention 14, Invention 15 to Invention 20 could not have been easily invented by a person skilled in the art based on the Cited invention and the matters described in Cited document 2 to Cited document 4.

No. 6 Closing

As above, Invention 1 and Invention 14 are not identical with the Cited invention, and Invention 1 to Invention 20 are not ones that could have been easily invented by a person skilled in the art based on the Cited invention and the matters described in Cited document 2 to Cited document 4. Accordingly, the Invention cannot be rejected by the reason of the Examiner's decision,

In addition, no reasons for refusal were found.

Therefore, the appeal decision shall be made as described in the conclusion.

Jan. 22, 2018

Chief administrative judge: KANAZAWA, Toshio
Administrative judge: YAGI, Makoto
Administrative judge: MATSUSHITA, Akira