

Claims

1. A gearbox for a skid steered vehicle, the gearbox comprising:
a housing having first and second opposing sides;
a controlled differential positioned between and connecting two drive shafts and being
5 in driveable communication with each drive shaft, wherein the end of each drive shaft remote
from the controlled differential forms an output of the gearbox, wherein outputs from the
controlled differential connect directly via the drive shafts to the gearbox outputs such that
outputs of the controlled differential attach solidly to and turn at the same speed as the gearbox
outputs;
- 10 a steering input shaft in driveable communication with the controlled differential,
wherein one end of the steering input shaft forms a steering input to the gearbox;
a propulsion input shaft in driveable communication with the gearbox outputs, wherein
one end of the propulsion input shaft forms a propulsion input to the gearbox; and
a gear reduction unit and/or a gear change unit in driveable communication with the
15 gearbox outputs, wherein the propulsion input shaft, the gear reduction unit and / or the gear
change unit are connected in a parallel connection with an output of the controlled differential
to the gearbox outputs, and wherein the steering input and the propulsion input are located on
the same side of the gearbox housing.
- 20 2. A gearbox as claimed in claim 1, comprising:
a second propulsion input shaft in driveable communication with the gearbox outputs,
wherein one end of the second propulsion input shaft forms a second propulsion input to the
gearbox; and
a second gear reduction unit and/or a second gear change unit in driveable
25 communication with the gearbox outputs, wherein the second propulsion input shaft, the
second gear reduction unit and / or the second gear change unit are connected in a parallel
connection with an output of the controlled differential to the gearbox outputs, and wherein the
steering input, the propulsion input and the second propulsion input are located on the same
side of the gearbox housing.
- 30 3. A gearbox as claimed in claim 2, wherein the propulsion input shaft and the second
propulsion input shaft are located in a common plane, and wherein the steering input shaft is
spaced from said common plane.
- 35 4. A gearbox as claimed in any preceding claim, wherein the steering input and the or
each propulsion input are spaced from one another.

5. A gearbox as claimed in any preceding claim, wherein a gearbox output is located on the same side of the gearbox as the steering input and the or each propulsion input.

5 6. A gearbox as claimed in claim 5, wherein the distances between the centre of the gearbox output and the centres of the steering input and the or each propulsion input are substantially equal.

7. A gearing configuration comprising:
10 at least one drive shaft having a primary drive gear fixed thereto;
a propulsion input shaft comprising a propulsion input and a propulsion input gear fixed thereto; and
a gear change unit comprising:
a gear input shaft having first and second gears fixed thereto, wherein the first gear
15 meshes with the propulsion input gear;
a gear output shaft having a third gear fixed thereto, wherein the third gear meshes with the primary drive gear, the gear output shaft further comprising fourth and fifth gears each located around and supported for rotation on the gear output shaft, wherein the fourth gear meshes with the first gear and wherein the fifth gear meshes with the second gear; and
20 a slideable dog hub operably connectable to a gear change selector, wherein the slideable dog hub is located on the gear output shaft in slideable engagement and constrained for rotation therewith, wherein the slideable dog hub is located between the fourth and fifth gears, wherein the at least one drive shaft and the gear change unit are arranged so that the circumference of the fifth gear overlaps the circumference of the primary drive gear.

25 8. A gearbox for a skid steered vehicle, the gearbox comprising the gearing configuration of claim 7 and:

a controlled differential positioned between and connecting two drive shafts and being in driveable communication with each drive shaft, wherein the end of each drive shaft remote
30 from the controlled differential forms an output of the gearbox, wherein outputs from the controlled differential connect directly via the drive shafts to the gearbox outputs such that outputs of the controlled differential attach solidly to and turn at the same speed as the gearbox outputs; and

a steering input shaft in driveable communication with the controlled differential,
35 wherein one end of the steering input shaft forms a steering input to the gearbox, wherein the propulsion input shaft and the gear change unit are connected in a parallel connection with an output of the controlled differential to the gearbox outputs.

9. A gearbox according to any one of claims 1 to 6 having gearing configured according to claim 7.

- 5 10. A gear change unit comprising:
an input shaft comprising a drive input;
an output shaft comprising a drive output;
a first gear located around and supported for rotation on the output shaft or the input shaft;
10 a second gear located around and supported for rotation on the same output shaft or input shaft as the first gear;
a third gear located around and supported for rotation on the other of the input or output shafts not supporting the first and second gears; and
a slideable dog hub operably connectable to a gear change selector, wherein the
15 slideable dog hub is located on the same output shaft or input shaft as the first and second gears in slideable engagement and constrained for rotation therewith, wherein the slideable dog hub is located between the first and second gears, wherein the gear change unit is configured so that, in use, when the slideable dog hub is engaged with the first gear, drive is transmitted from the drive input to the drive output via a first gear chain not including the
20 second or third gears, and when the slideable dog hub is engaged with the second gear, drive is transmitted from the drive input to the drive output via a second gear chain including the first, second and third gears.

11. A gear change unit as claimed in claim 10, wherein the first gear and the third gear
25 comprise compound gears which mesh with one another.

12. A gear change unit as claimed in claim 10 or 11, wherein the first and second gears are located on the output shaft and wherein the drive input comprises a drive input gear fixed to the input shaft which meshes with the first gear.

- 30 13. A gear change unit as claimed in claim 10 or 11, comprising:
a fourth gear located around and supported for rotation on the same output shaft or input shaft as the third gear; and second slideable dog hub operably connectable to a gear change selector, wherein the second slideable dog hub is located on the same output shaft or
35 input shaft as the third and fourth gears in slideable engagement and constrained for rotation therewith, wherein the second slideable dog hub is located between the third and fourth gears, wherein the gear change unit is configured so that, in use, when the second slideable dog hub

is engaged with the fourth gear the first and second gear chains may be selected by means of the slideable dog hub, and wherein when the second slideable dog hub is engaged with the third gear and the slideable dog hub is engaged with the first gear, drive is transmitted from the drive input to the drive output via a third gear chain not including the second or fourth
5 gears, and when the second slideable dog hub is engaged with the third gear and the slideable dog hub is engaged with the second gear, drive is transmitted from the drive input to the drive output via a fourth gear chain not including the first or fourth gears.

14. A gear change unit as claimed in any one of claims 10 to 13, wherein the propulsion
10 input shaft and the output shaft are parallel to one another and spaced from one another in a direction normal to the major axis of the propulsion input shaft.

15. A gearbox for a skid steered vehicle, the gearbox comprising:
a controlled differential positioned between and connecting two drive shafts and being
15 in driveable communication with each drive shaft, wherein the end of each drive shaft remote from the controlled differential forms an output of the gearbox, wherein outputs from the controlled differential connect directly via the drive shafts to the gearbox outputs such that outputs of the controlled differential attach solidly to and turn at the same speed as the gearbox outputs;
20 a steering input shaft in driveable communication with the controlled differential, wherein one end of the steering input shaft forms a steering input to the gearbox;
a propulsion input shaft in driveable communication with the gearbox outputs, wherein one end of the propulsion input shaft forms a propulsion input to the gearbox; and
a gear change unit according to any one of claims 10 to 14 in driveable
25 communication with the gearbox outputs, wherein the propulsion input shaft and the gear change unit are connected in a parallel connection with an output of the controlled differential to the gearbox outputs.

16. A gearbox as claimed in any one of claims 1 to 6, comprising a gear change unit as
30 claimed in any one of claims 10 to 14.

17. A gear change unit comprising:
an epicyclic gear set having an input component configured to be driven by a drive
input, and an output component, wherein the input component and the output component are
35 supported for rotation on a drive shaft; and a slideable dog hub operably connectable to a gear change selector, wherein the slideable dog hub is in slideable engagement with the drive shaft and constrained for rotation therewith, wherein the slideable dog hub is configured to be

engageable with the input component of the epicyclic gear set to connect the input component directly to the drive shaft, and wherein the slideable dog hub is configured to be engageable with the output component of the epicyclic gear set so to connect the input component to the drive shaft via the output component.

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18. A gearbox for a skid steered vehicle, the gearbox comprising:

a controlled differential positioned between and connecting two drive shafts and being in driveable communication with each drive shaft, wherein the end of each drive shaft remote from the controlled differential forms an output of the gearbox, wherein outputs from the controlled differential connect directly via the drive shafts to the gearbox outputs such that outputs of the controlled differential attach solidly to and turn at the same speed as the gearbox outputs;

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a steering input shaft in driveable communication with the controlled differential, wherein one end of the steering input shaft forms a steering input to the gearbox;

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a propulsion input shaft in driveable communication with the gearbox outputs, wherein one end of the propulsion input shaft forms a propulsion input to the gearbox; and

a gear change unit according to claim 17 in driveable communication with the gearbox outputs, wherein the propulsion input shaft and the gear change unit are connected in a parallel connection with an output of the controlled differential to the gearbox outputs.

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19. A gearbox as claimed in any one of claims 1 to 6, comprising a gear change unit as claimed in claim 17.

20. A drive unit for a skid steered vehicle, the drive unit comprising:

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a gearbox as claimed in any one of claims 1 to 6, 8, 9, 15, 16, 18 or 19;

an electric steering motor operatively connected to the steering input; and

an electric propulsion motor operatively connected to the or each propulsion input.

21. A drive unit for a skid steered vehicle, the drive unit comprising:

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a gearbox as claimed in claim 18, wherein the gearbox has two propulsion inputs and two gear change units;

an electric steering motor operatively connected to a steering input; and

two electric propulsion motors each being operatively connected to a respective propulsion input, wherein the major axes of the electric propulsion motors are co-axial and

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wherein the electric propulsion motors are arranged in a face to face configuration.

22. A drive unit as claimed in claim 21, wherein the propulsion inputs are located inboard of the gear change units.
23. A drive unit as claimed in claim 22, comprising two electric steering motors, wherein
5 the steering inputs are located inboard of the gear change units.
24. A drive unit for a skid steered vehicle, the drive unit comprising:
a gearbox as claimed in claim 18, wherein the gearbox has two propulsion inputs and two gear change units;
10 an electric steering motor operatively connected to a steering input; and
two electric propulsion motors each being operatively connected to a respective propulsion input, wherein the major axes of the electric propulsion motors define a common plane which is spaced from the drive shafts.
- 15 25. A drive unit as claimed in claim 24, comprising two electric steering motors, wherein the major axes of the electric steering motors are parallel to one another and spaced from the drive shafts.
26. A drive unit as claimed in claim 24 or 25, wherein the electric propulsion motors are
20 adjacent to one another.
27. A drive unit as claimed in any one of claims 20 to 26, wherein the or each electric steering motor is identical to the or each electric propulsion motor.
- 25 28. A drive configuration for a skid steered vehicle comprising:
a respective drive member adapted to be located at each side of the vehicle, each drive member engaging with a track or wheel of the vehicle and operable to drive the tracks or wheels of the vehicle; and
a drive unit according to any one of claims 20 to 27, wherein each drive member is in
30 driveable communication with an output of the gearbox.
29. A vehicle comprising a drive configuration as claimed in claim 28.