CLAIMS

What is claimed is:

~~1. An electro-mechanical cross-steer device for a vehicle comprising:~~

~~a first and a second motor;~~

~~a first and second output planetary gear set, each having a transfer gear assembly mechanically connected to said first and second motors, respectively;~~

~~a differential mechanically connected to said first and second output planetary gear sets via a mainshaft connected to said first and second output planetary gear sets;~~

~~first and second input shafts mechanically connected to said first and second transfer gear assemblies and to said differential;~~

~~first and second output shafts respectively connected to said first and second output planetary gear sets, each of said output shafts operable to drive a particular side of a vehicle;~~

~~wherein conditioning speeds of said first and second motors to equal values, speed ratios between first and second output shafts are 1:1 and the vehicle moves in a straight line; and~~

~~wherein conditioning said speeds of said first and second motors to unequal values, said speed ratios between first and second output shafts is not 1:1 and braking energy from an output shaft is~~

transferred to the other output shaft thereby allowing steering of the vehicle without braking energy being dissipated as heat.

2. A method for electro-mechanically cross-steering a vehicle comprising:

providing a first and a second motor;

providing a first and second output planetary gear set, each having a transfer gear assembly mechanically connected to said first and second motors, respectively;

providing a differential mechanically connected to said first and second output planetary gear sets via a mainshaft connected to said first and second output planetary gear sets;

providing first and second input shafts mechanically connected to said first and second transfer gear assemblies and to said differential;

providing first and second output shafts respectively connected to said first and second output planetary gear sets, each of said output shafts operable to drive a particular side of a vehicle;

wherein conditioning speeds of said first and second motors to equal values, speed ratios between first and second output shafts are 1:1 and the vehicle moves in a straight line; and

wherein conditioning said speeds of said first and second motors to unequal values, said speed ratios between first and second output shafts is not 1:1 and braking energy from an output shaft is

~~transferred to the other output shaft thereby allowing steering of the vehicle without braking energy being dissipated as heat.~~

1. A cross-steer device for a vehicle, comprising:

a first planetary gear set (first PGS) drivably connected to a first side of the vehicle;

a second planetary gear set (second PGS) drivably connected to a second side of the vehicle;

a third planetary gear set (third PGS) drivably coupled to the first PGS and the second PGS via a mainshaft;

a first motor separately drivably connected to the first PGS and the third PGS to allow the first motor to individually drive the first side of the vehicle, via the first PGS, and the second side of the vehicle, via the third PGS and the second PGS; and

a second motor separately drivably connected to the second PGS and the third PGS to allow the second motor to individually drive the second side of the vehicle, via the second PGS, and the first side of the vehicle, via the third PGS and the first PGS.

2. The cross-steer device of claim 1, wherein the third PGS defines a first planet gear, a second planet gear, and a carrier supporting the first and second planet gears, the first motor being drivably coupled to the carrier via the first planet gear, the second motor being drivably coupled to the carrier via the second planet gear, the first PGS and the second PGS being drivably coupled in common to the carrier via the mainshaft.

3. The cross-steer device of claim 2, wherein the third PGS is free of any ring gears.

4. The cross-steer device of claim 1, further comprising:

a first transfer gear assembly for connecting the first PGS and the third PGS to the first motor via separate gears of the first transfer gear assembly; and

a second transfer gear assembly for connecting the second PGS and the third PGS to the second motor via separate gears of the second transfer gear assembly.

5. The cross-steer device of claim 1, wherein the first PGS is drivably connected to the first side of the vehicle via a carrier of the first PGS that is coupled to the mainshaft via a ring gear of the first PGS.

6. The cross-steer device of claim 5, wherein the second PGS is drivably connected to the second side of the vehicle via a carrier of the second PGS that is coupled to the mainshaft via a ring gear of the second PGS.

7. The cross-steer device of claim 1, further comprising:

a clutch disposed between the third PGS and the mainshaft to allow selective engagement of the third PGS to the mainshaft; and

a brake operably coupled to the mainshaft to allow selective arresting of rotation of the mainshaft to prevent driving of the mainshaft by the first PGS and the second PGS when the clutch disengages the third PGS from the mainshaft.

8. The cross-steer device of claim 7, further comprising:

a coupling clutch, the first motor and the second motor mechanically coupled to each other via the coupling clutch separately from the third PGS such that engagement of the first motor to the second motor via the coupling clutch allows power flow from the first motor to the second motor separately from the third PGS.

9. The cross-steer device of claim 7, wherein the third PGS is coupled to the mainshaft via a carrier of the third PGS, the cross-steer device further comprising:

a differential brake operably coupled to the carrier of the third PGS to allow selective arresting of rotation of the carrier of the third PGS.

10. A vehicle comprising the cross-steer device of claim 1.

11. A method of cross-steering a vehicle, comprising:

providing a first planetary gear set (first PGS) drivably connected to a first output shaft, the first output shaft operable to drive a first side of the vehicle;

providing a second planetary gear set (second PGS) drivably connected to a second output shaft, the second output shaft operable to drive a second side of the vehicle;

providing a third planetary gear set (PGS) drivably coupled to the first PGS and the second PGS via a mainshaft;

providing a first motor separately drivably connected to the first PGS and the third PGS to allow the first motor to individually drive the first

side of the vehicle, via the first PGS, and the second side of the vehicle, via the third PGS and the second PGS; and

providing a second motor separately drivably connected to the second PGS and the third PGS to allow the second motor to individually drive the second side of the vehicle, via the second PGS, and the first side of the vehicle, via the third PGS and the first PGS, wherein conditioning speeds of said first and second motors to equal values, speed ratios between first and second output shafts are 1:1 and the vehicle moves in a straight line, and conditioning said speeds of said first and second motors to unequal values, said speed ratios between first and second output shafts is not 1:1 and braking energy is transferred between the first and second output shafts to thereby allow steering of the vehicle without braking energy being dissipated as heat.