Claims

1. A system comprising:

   a cryogenic engine having a first motive power output member and which operates by vaporizing a working fluid in the form of cryogenic liquid, and having a first tank for storing said working fluid; at least one working fluid injector for injecting said working fluid from the first tank into the cryogenic engine; at least one expander for extracting power from the working fluid by expanding the working fluid; a heat exchange fluid tank for storing heat exchange fluid; and at least one heat exchange fluid pump for transferring the heat exchange fluid from the heat exchange fluid tank to the cryogenic engine wherein heat is transferred from the heat exchange fluid to heat the working fluid;

   an independently operable waste heat generating power generation apparatus having a second motive power output member,

   a first transfer means configured to transfer waste heat expelled by the power generation apparatus to the heat exchange fluid tank;

   a transmission system operably connected for receiving motive power inputs from one or other or both the first and the second motive power output members; and

   a transmission output operably connected for receiving motive power from the transmission system and including a controller for controlling the operation of each of the cryogenic engine and the power generation apparatus such as to cause the supply of motive power from one or other or both thereof to said transmission system.

2. A system as claimed in claim 1 wherein the transmission system includes a summing mechanism and wherein the first and second motive power output members are each coupled to said summing mechanism and wherein the transmission system includes a common final output member which is shared between the cryogenic engine and the power generation apparatus, and the cryogenic engine and the power generation apparatus are configured to output power via the common final power output member.

3. A system as claimed in claim 2 and further including first and second driven wheel sets operably connected to said transmission system for receiving

motive power therefrom and including a first clutch between the first drive wheel sets and the transmission system.

4. A system as claimed in claim 2 and further including first and second driven wheel sets operably connected to said transmission system for receiving motive power therefrom and including a second clutch between the second drive wheel sets and the transmission system.

5. A system as claimed in claim 1 and wherein said transmission system includes separate first and second auxiliary output members operably connected to the transmission system for receiving motive power from one or other of the cryogenic engine or the power generation apparatus, said auxiliary output members also being configured to direct motive power to individual and separate drive wheel sets.

6. A system according to claim 1 wherein the cryogenic engine and the power generation system are coupled with each other to permit transfer of thermal energy between the cryogenic engine and the power generation system.

7. A system according to claim 6, further comprising a first transfer means configured to transfer waste heat expelled by the power generation apparatus to the cryogenic engine system.

8. A system according to claim 6 wherein the cryogenic engine includes a Heat Exchange Fluid (HEF) tank and the HEF tank of the cryogenic engine is integrated with the power generation apparatus.

9. A system according to claim 8 wherein the HEF tank is insulated and/or comprises a thermal energy storage means, such as a phase change material.

10. A system according to any of claim 8 wherein the power generation apparatus comprises a heat rejection means for expelling waste heat from the power generation apparatus.

11. A system according to claim 10 wherein the heat rejection means expels waste heat from the system.

12. A system according to claim 10 wherein the heat rejection means comprises a radiator and wherein the cryogenic engine and the power generation apparatus can be decoupled from each other to permit expulsion of waste heat from the power generation system whilst the cryogenic engine is not in operation.

13. A system according to claim 10 wherein the heat rejection means comprises a radiator and wherein the cryogenic engine and the power generation apparatus can be partially decoupled from each other to permit expulsion of waste heat from the power generation system via the heat rejection means whilst the cryogenic engine is in operation.

14. A system according to claim 10 wherein the cryogenic engine and the power generation apparatus are coupled with each other such that a working fluid of the cryogenic engine provides cooling to the power generation apparatus.

15. A system according to claim 1 wherein the cryogenic engine and the power generation apparatus are coupled with each other to permit the cryogenic engine and the power generation apparatus to output power via the transmission output independently of each other and in co-operation with each other.

16. A system according to claim 1, wherein the system is operable in a first mode, a second mode and a third mode, and wherein:
in the first mode, one of the cryogenic engine and the power generation apparatus outputs power via the transmission output;
in the second mode, the other of the cryogenic engine and the power generation apparatus outputs power via the transmission output ; and
in the third mode, both of the cryogenic engine and the power generation apparatus output power via the transmission output.

17. A system according to claim 16 wherein one of the cryogenic engine and the power generation apparatus outputs power via the transmission output in the first mode, and the other of the cryogenic engine and the power generation apparatus outputs power via the transmission output in the second mode.

18. A system according to claim 16 wherein the system is configured to operate in

the first mode below a first predetermined system power output threshold and in the second mode above the first predetermined system power output threshold.

19. A system according to claim 16 wherein the system is configured to operate in the second mode below a second predetermined system power output threshold and in the third mode above the second predetermined system power output threshold.

20. A system according to claim 19 wherein the second predetermined system power output threshold corresponds to a higher system power output than the first predetermined system power output threshold.

21. A system according to any of claims 1-20 wherein a working fluid of the cryogenic engine comprises at least one of liquid nitrogen, liquid air, liquefied natural gas, hydrogen, carbon dioxide, oxygen, argon, compressed air or compressed natural gas.

22. A system according to any of claims 1-21 wherein the power generation apparatus comprises at least one of an internal combustion (IC) engine or a fuel cell apparatus.

23. A vehicle driven by a system according to any of claims 1-22.

24. A static power unit driven by a system according to any of claims 1 to 22.