

CLAIMS

Claim 1. A device (Figure 1) including a controller (101) for generating a cold fusion reaction in a target (102) in a reaction chamber (103) retained in partial vacuum being fed an ion beam from a plasma chamber to impinge upon the target generating cold fusion heat, heat from said reaction being transmitted to a second set of devices (104) by a heat exchange mechanism (105), possibly some of said second set of devices converting the heat into electricity with possibly others using the heat directly, wherein the improvements include: a low-power microwave (108) creating and sustaining a plasma (107) in the plasma chamber (106) connected to the reaction chamber; a fuel container (109) connected to the plasma chamber for supplying fuel to the plasma chamber; the method whereby the controller repeatedly alternates between first enriching the target for cold fusion and second initiating and sustaining cold fusion (401 – 409); and a device (110) for extracting unused fuel from both chambers to be recycled to be used again as fuel supplied to the fuel container and/or to the plasma chamber.

Claim 2. A device (Figure 1) including a controller (101) for generating a cold fusion reaction in a target (102) in a reaction chamber (103), heat from said reaction being transmitted to a second set of devices (104) by a heat exchange mechanism (105), possibly some of said second set of devices converting the heat into electricity with possibly others using the heat directly, wherein the improvements include: the reaction chamber extracting an ion beam (111) which creates cold fusion in the target (102) from a low-energy, low-temperature plasma (107) created by a microwave device (108) attached to a plasma chamber (106) attached to the reaction chamber; the said plasma being fueled by a fuel container (109) attached to the plasma chamber for supplying the ion beam to the reaction chamber; further including a device (110) for extracting unused fuel from the reaction chamber and its attached plasma chamber to be recycled to either the fuel container or the plasma chamber to be used again as fuel.

Claim 3. A device (Figure 1) including a controller (101) for generating a plasma in a plasma chamber retained in partial vacuum from which a beam of ions is drawn to effect a cold fusion reaction in a target (102) in a reaction chamber (103) also retained in partial vacuum and attached to the plasma chamber, heat from said reaction being transmitted

to a second set of devices (104) by a heat exchange mechanism (105), possibly some of said second set of devices converting the heat into electricity with possibly others using the heat directly, wherein the improvements include: a plasma chamber (106) in which a low-energy, low-temperature plasma (107), created by a microwave device (108) and fueled by a fuel container (109), supplies an ion beam (111) to the attached reaction chamber to impact upon the target; further including a device (110) for extracting unused fuel from the plasma chamber and its attached reaction chamber to be recycled to either the plasma chamber or the fuel container to be used again as fuel.

Claim 4. A method controlled by a controller (101) for initiating and sustaining a cold fusion reaction in a reaction chamber (103) by first enriching a target (102) to prepare it for cold fusion and then initiating cold fusion whose heat can be used by a second set of devices (104), possibly some of said second set of devices converting the heat into electricity with possibly others using the heat directly, with the improvements including: beginning in an idle state (401); a state for responding to a start command resulting in venting the inert gas used for safe shipping and storage (402); a state for starting the generation of fuel (403); a state for adjusting fuel flow and an ion beam for enrichment (404); a state for turning an unenriched or partially enriched side of the target to the ion beam (405); a standby state (406) wherein the plasma is retained but neither enrichment nor cold-fusion are taking place; a state for adjusting the fuel flow and ion beam for cold fusion (407); a state where cold fusion is sustained to actively produce heat (408) to be used possibly directly and possibly to generate electricity; and a state wherein the least depleted side of the target is turned to the ion beam (409) to continue to provide heat from cold fusion.

Claim 5. The device and method of Claim 1, wherein the improvement includes: additional low-power electrodes (113) and magnets (114) to accelerate and focus the ion beam thus reducing or eliminating the requirement for a cold fusion reaction and potentially eliminating the optional method whereby the controller repeatedly alternates between first enriching the target for cold fusion and second initiating and sustaining cold fusion (401 – 409).

Claim 6. The device of Claim 2, wherein the improvement includes: optionally further accelerating the ion beam (111) using low-power electrodes (113) and focusing the beam with low-power or permanent magnets (114) which creates heat from impact of the ion beam with the target to reduce or eliminate the requirement for a cold fusion reaction and for said ion beam also optionally enriching the target (102).

Claim 7. The device of Claim 3, wherein the improvements include: additional low-power electrodes (113) to accelerate and magnets (114) to focus the ions to impact upon the target, thus generating heat from the impact and reducing or eliminating the requirement for cold fusion.

Claim 8. The method of Claim 4, wherein the improvement includes: such method being readily modified to incorporate a simpler set of states (Figure 5) where cold fusion is reduced or not required thereby reducing or eliminating the requirement to reside in many of the states in Figure 4 (403 – 405 and 407 – 409).

Claim 9. A method controlled by a controller (101) for initiating and sustaining heat in a reaction chamber (103), which heat can be used by a second set of devices (104), possibly some of said second set of devices using the heat directly with possibly others converting the heat into electricity, with the improvements including: beginning in an idle state (501) which is a state for responding to a start command; a standby state (502) wherein the plasma is retained but a beam is not being extracted; a state (503) where the volume and speed of the ion beam is adjusted using low power electrodes (113) and the shape is adjusted using low-power or permanent magnets (114) to the amount of heat required; a state (504) where heat is generated by impact of ions with a target to be used possibly directly and possibly to generate electricity; such method being readily modified to incorporate modes (Figure 4) where cold fusion is required and also separately where the target needs to be replenished with atoms lost to ablation by the ion beam.

Claim 10. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8, further including: a means for the controller to

determine whether a portion of the target is enriched sufficiently to permit cold fusion to commence.

Claim 11. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8 or Claim 9, further including: having several distinct optional modes controlled by the controller (Figure 4, Figure 5); including a method and devices (113, 114) for controlling the speed, shape, density and focus of an ion beam (111) extracted from the plasma differently for different modes (404, 407, 503); including a mode in which heat and optionally a cold fusion reaction is created by impinging ions into a side of the target thus generating heat (408, 504); including a mode in which the target is enriched with impinging ions (405); including a mode in which the plasma is maintained intact but no ion beam extracted (406, 502); including a mode in which the plasma is collapsed to fuel molecules and no ion beam can be extracted (401); including a mode for venting inert gas installed in the fuel container for shipping (402); including a mode for generating fuel for the device (Figure 3) so that incoming fuel can be readily transformed into a low power, low-temperature plasma (403), and including a mode wherein the target can be replenished with atoms to replace any that have been lost due to ablation by the ion beam.

Claim 12. The device of Claim 11, further including: a mode (405) wherein a target (Figure 2) with multiple sides (201) can be rotated and each side successively enriched with ions absorbed into the target.

Claim 13. The device of Claim 11 or Claim 12, further including: a means (not drawn) to move the target and/or focus the ion beam so that the ion beam can focus on a portion of the target surface to enrich the target; and including a means (113, 114) to move and/or focus the ion beam on a portion of the target to initiate and sustain the cold fusion reaction.

Claim 14. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8, further including: wherein the container (109) of

the fuel for creating a cold fusion reaction includes a means (112) whereby it can be attached and detached with a minimum loss of fuel.

Claim 15. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8 or Claim 9, further including: wherein the fuel contained in the container (109) is in the form of a gas or a compressed gas, which gas may be further partially compressed to a liquid and/or to a solid form.

Claim 16. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8, further including: wherein the fuel container (109, 301) contains a liquid composed of a set of active fuel components and a set of passive fuel components, including a set of devices (301 - 307) and a method for separating the set of active fuel components from the set of passive fuel components.

Claim 17. The device as in either Claim 14 or Claim 15 or Claim 16 including the means (323) to heat the fuel container (301) so that the liquid does not freeze in low temperature environments.

Claim 18. The device of Claim 16, further including: a device and method where the separation chambers (306, 307) can be filled with inert gas for shipping.

Claim 19. The device of Claim 16, further including: a device and method where the separate gas chambers (306, 307) can be evacuated preparatory to startup operation and filled with their respective operational components.

Claim 20. The device of Claim 16, further including: monitor(s) (315, 316) for detecting that the gas extraction chamber(s) are filled with liquid fuel due to disturbance during shipping or accident; including the method that upon said detection the fuel is prevented from flowing and the entire reaction is placed into the shutdown mode.

Claim 21. The device of Claim 18, further including: a method that starts device operation only after the gas chambers (306, 307) have been evacuated of inert gas and refilled with active and passive components, respectively.

Claim 22. The device of Claim 16, further including: a device and a method wherein the passive component(s) (307) can be vented to the atmosphere (313) at the discretion of the controller (101).

Claim 23. The device of Claim 16, further including: a device and a method wherein the collected passive component (307) can be recombined in a recombination chamber (310) with the active component (311) recovered from the chambers to resupply via a pump (320) and a conduit (321) the fuel canister (drawn) and or the plasma chamber (not drawn.)

Claim 24. The device of Claim 12 or Claim 13, further including: a device (Figure 2) and a method (Figure 4) where the device is switched to enrichment mode during periods when enrichment is required and heat is not required, and where the device is switched to heat and optional cold fusion mode when heat is required, and optionally similarly for replenishment of the target surface following ablation by the ion beam.

Claim 25. The device of Claim 24, further including: a method whereby the target (102, 201) is rotated so the target side being presented for enrichment by the ion beam is not currently fully enriched, or optionally similarly where the target side is being presented for replenishment where the target side has been ablated.

Claim 26. The device of Claim 12, further including: a device wherein the target is attached to a shaft (202) orthogonally to the ion beam but parallel to the axis of rotation, and the shaft attached to the target (202) is fixed to the target (201) and is connected in line to a fixed shaft (203) using a swivel (204) so the first shaft section attached to the target can be rotated using a gear (205) to present the appropriate side of the target to the beam.

Claim 27. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8 or Claim 9, further including: the shafts (202, 203) are made of heat insulating material except where they contact the target where they are preferably made of heat conducting material, are hollow, and within which flows a liquid or a gas for transferring heat from the target to a device for heating and/or for converting the heat to electricity.

Claim 28. The device of Claim 27, further including components comprising a heat exchanger (105), a vapor-driven turbine or engine (118), a generator (119) and a condenser (120) for producing electricity, where the vapor is pentane or another hydrocarbon compound or water.

Claim 29. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8, further including: a method to modify the creation of the target to improve the efficacy of the enrichment process and/or the heat or cold fusion reactions, whereby the target is formed by 3D printing.

Claim 30. The device of Claim 1 or Claim 2 or Claim 3 or Claim 5 or Claim 6 or Claim 7 or the methods of Claim 4 or Claim 8 or Claim 9, further including: a device for extending the heat exchanger (105) to obtain ancillary heat from various components of the device including possibly the plasma chamber (106), the pumps (115, 116), the vapor-driven turbine or engine (118) and/or the generator (119) reducing or even eliminating the requirement for heat from cold fusion and/or from kinetic energy of the ion beam.