MAGNETIC FIELD PLASMA CONFINEMENT FOR COMPACT FUSION POWER

TECHNICAL FIELD

[1] This disclosure generally relates to fusion reactors and more specifically to magnetic field plasma confinement for compact fusion power.

BACKGROUND

[2] Fusion power is power that is generated by a nuclear fusion process in which two or more atomic nuclei collide at very high speed and join to form a new type of atomic nucleus. A fusion reactor is a device that produces fusion power by confining and controlling plasma. Typical fusion reactors are large, complex, and cannot be mounted on a vehicle.

SUMMARY OF PARTICULAR EMBODIMENTS

[2a] According to a first aspect of the present invention, there is provided a fusion reactor comprising: an enclosure comprising: a centerline running down a center axis of the enclosure; a first end and a second end that is opposite from the first end; and a midpoint that is substantially equidistant between the first and second ends of the enclosure; a plurality of internal magnetic coils suspended within the enclosure and centered on the centerline, the plurality of internal magnetic coils each having a toroidal shape, the plurality of internal magnetic coils comprising: at least one first internal magnetic coil located between the midpoint and first end of the enclosure; and at least one second internal magnetic coil located between the midpoint and the second end of the enclosure; a plurality of

encapsulating magnetic coils centered on the centerline, the encapsulating magnetic coils having a larger diameter than the plurality of internal magnetic coils, the plurality of encapsulating magnetic coils comprising: at least one first encapsulating magnetic coil located between the midpoint and the first end of the enclosure; and at least one second encapsulating magnetic coil located between the midpoint and the second end of the enclosure; a center magnetic coil centered on the centerline and located proximate to the midpoint of the enclosure; and a plurality of mirror magnetic coils centered on the centerline and comprising: at least one first mirror magnetic coil located between the midpoint and first end of the enclosure; and at least one second mirror magnetic coil located between the midpoint and second end of the enclosure; wherein the magnetic coils are operable, when supplied with electrical currents, to form magnetic fields for confining plasma within the enclosure.

[2b] According to a second aspect of the present invention, there is provided a fusion reactor comprising: an enclosure comprising: a first end and a second end that is opposite from the first end; and a midpoint that is substantially equidistant between the first and second ends of the enclosure; at least two internal magnetic coils suspended within the enclosure; one or more encapsulating magnetic coils positioned on each side of the midpoint of the enclosure, each encapsulating magnetic coil being coaxial with the internal magnetic coils; and at least two mirror magnetic coils coaxial with the internal magnetic coils; wherein the magnetic coils are operable, when supplied with electrical currents, to form magnetic fields for confining plasma within the enclosure.

[2c] According to a third aspect of the present invention, there is provided a fusion reactor comprising: a plurality of internal magnetic coils suspended within an enclosure; one or more center magnetic coils coaxial with the plurality of internal magnetic coils; a plurality of encapsulating magnetic coils coaxial with the internal magnetic coils, the encapsulating magnetic coils being operable to maintain a magnetic wall that prevents plasma within the enclosure from expanding; and a plurality of mirror magnetic coils coaxial with the internal magnetic coils.

[3] According to one embodiment, a fusion reactor includes a plurality of internal magnetic coils suspended within an enclosure, one or more center magnetic coils coaxial with the plurality of internal magnetic coils, a plurality of encapsulating magnetic coils coaxial with the internal magnetic coils, and a plurality of mirror magnetic coils coaxial with the internal magnetic coils. The encapsulating magnetic coils maintain a magnetic wall that prevents plasma within the enclosure from expanding.

[4] Technical advantages of certain embodiments may include providing a compact fusion reactor that is less complex and less expensive to build than typical fusion reactors. Some embodiments may provide a fusion reactor that