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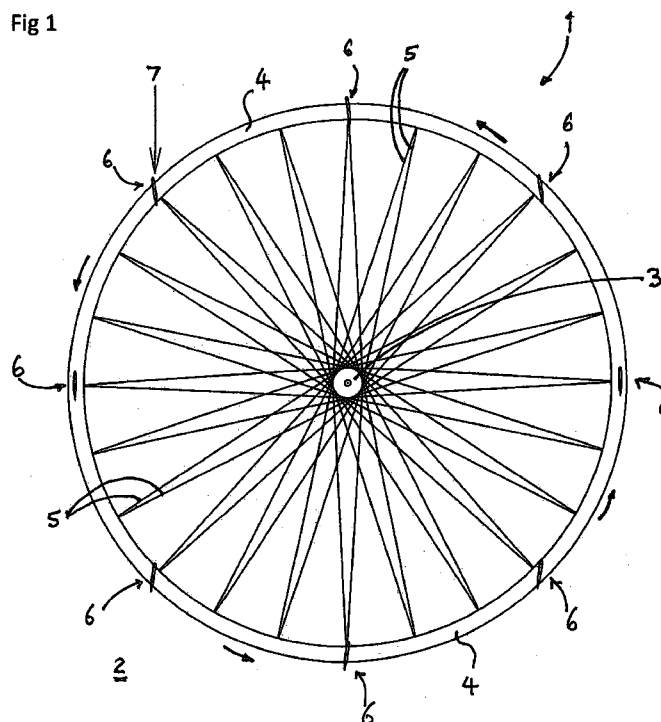
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(54) Title: VERTICAL AXIS WIND TURBINE

Fig 1



(57) Abstract: Apparatus (1) for harvesting wind energy on a large scale consists of an annular support structure (4), floating on a body of water (2), which can rotate about its hub (3). Multiple vertical aerofoil units (6, 76, 206), mounted at equal intervals around the support structure (4), can pivot independently about a vertical axis (17, 217). The aerofoil units (6, 76, 206) are each held at a suitable angle of attack relative to the ambient wind (7) by vertical canard aerofoils (13, 213) mounted to a boom (12, 212) extending forwards from a leading edge (10) of the main aerofoil (8, 208) of each aerofoil unit (6, 76, 206). A cam follower mechanism (21) in the pivot mounting of each aerofoil unit (6, 76, 206) directs the angle of attack of the canard aerofoils (13, 213), so that the angle of attack of the respective main aerofoil (8, 208) is optimised for the current position of the aerofoil unit (6, 76, 206) around the rotating support structure (4). The main aerofoils (8, 208) thus generate a torque causing the apparatus (1) to rotate. Electrical power is generated from

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AMENDED CLAIMS

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1. Wind energy gathering apparatus comprising:

central hub means defining a substantially vertical axis of rotation of the apparatus;

a horizontally-extending centrosymmetric annular support structure floating on a body of water, the annular support structure being so connected to the central hub means as to be freely rotatable about said substantially vertical axis; and

a plurality of aerofoil means, each located adjacent a circumference of the annular support structure and spaced equiangularly around said circumference; wherein each said aerofoil means is provided with a respective aerofoil base by which it is mounted to the support structure, and from which it extends substantially vertically upwardly.
2. Wind energy gathering apparatus as claimed in Claim 1, wherein means are provided to pump air beneath the floating annular support structure to create an aerated volume and optionally to create a sheath of bubbles adjacent the support structure, in order to reduce hydrodynamic drag on the support structure as it rotates through the body of water.
3. Wind energy gathering apparatus as claimed in either Claim 1 or Claim 2, in which the floating annular support structure contains tanks adapted to be filled with water, increasing a rotating mass of the support structure so as to increase its angular momentum and the kinetic energy stored therein.

4. Wind energy gathering apparatus as claimed in any one of the preceding claims, further comprising electrical energy generation means operatively connected to the central hub means and driven by rotation thereof.
5. Wind energy gathering apparatus as claimed in any one of the preceding claims, further comprising dam means surrounding the floating annular support structure, said dam means being adapted to retain water flows induced by rotation of the floating annular support structure through the body of water.
6. Wind energy gathering apparatus as claimed in Claim 5, further comprising at least one electrical energy generation means mounted to the dam means so as to be driven by the water flows induced by rotation of the floating annular support structure through the body of water.
7. Wind energy gathering apparatus as claimed in any one of the preceding claims, wherein each aerofoil means and its respective aerofoil base are rotatable about a vertical axis.
8. Wind energy gathering apparatus as claimed in Claim 7, wherein each aerofoil means is so mounted to its respective aerofoil base that the vertical axis of rotation of the aerofoil base is located between a leading edge and a centre of pressure of the aerofoil means.

9. Wind energy gathering apparatus as claimed in any one of the preceding claims, further comprising stays extending between the aerofoil means and the aerofoil base, said stays optionally being enclosed in shrouds having a low-drag aerofoil profile.
10. Wind energy gathering apparatus as claimed in any one of Claims 7 to 9, wherein each aerofoil means is rotatable through 360° about said vertical axis, and is provided with respective control means adapted to employ an incident airflow flowing over said aerofoil means to align the aerofoil means about said vertical axis at an optimum angle of attack relative to said incident airflow, independently of each other aerofoil means.
11. Wind energy gathering apparatus as claimed in Claim 10, wherein each aerofoil base is provided with a vertical pivot axle, received into a bearing housing fixed to the support structure, within which it is free to rotate.
12. Wind energy gathering apparatus as claimed in Claim 11, wherein each aerofoil means is provided with canard vane means disposed upwind of a remainder of the aerofoil means, the canard vane means being so pivotably mounted that said control means controls a pitch of the canard vane means relative to a remainder of the aerofoil means, the control means optionally comprising cam means and cam follower means disposed surrounding the pivot axle and the bearing housing, cam means and cam follower means being co-operatively connected between the support structure and the aerofoil means.

13. Wind energy gathering apparatus as claimed in Claim 12, wherein the range of the pitch between the canard vane means and the remainder of the aerofoil means is reduced by resilient sections within the control means, and optionally the control means is dis-engageable to allow the canard vane means and the aerofoil means to swing into line with the incident airflow and thus feather, generating no lift.
14. Wind energy gathering apparatus as claimed in Claim 11, wherein each aerofoil base is provided with roller elements extending radially outwardly from a circumference of the aerofoil base, said roller elements contacting and running along an underside of an in-turned upper edge of a circular wall mounted to the support structure as the aerofoil base rotates, so as to guide the aerofoil base and help to ensure smooth and controlled rotation of the aerofoil base on the support structure.
15. Wind energy gathering apparatus as claimed in any one of the preceding claims, wherein the central hub means is also supported on the body of water, preferably such that little or none of the weight of the support structure and aerofoil means of the apparatus is borne by the central hub means, and the central hub means is anchored in position, optionally by a plurality of cables extending to anchor means in a bed of the body of water.