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(54) **PERIPHERAL TUNNELS PROPELLER**

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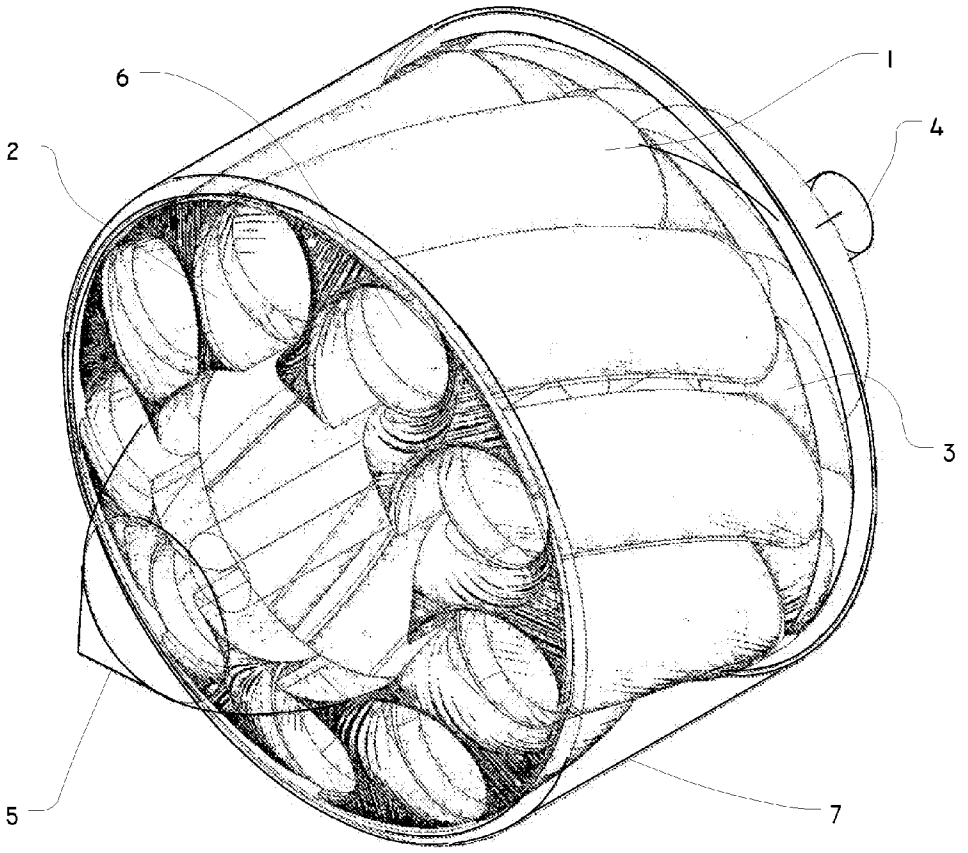
(57) **ABSTRACT**

This disclosure is related with propeller noise and cavitation abatement in applications like propulsion, ventilation, pumping or turbine systems on liquid or gas fluids working like a propellers, pumps, fans or turbines, by novel techniques that allows a stronger propellers and improves laminar flow and allow a smooth acceleration or deceleration of the liquid or gas by means of a propeller that consist on a rotating cylindrical block with one or more tunnels around it axis, said cylindrical block also may have flow separators structures at both input and output that helps to keep laminar flow of the fluid or gas with it surrounding media, having This rotating cylindrical block tunnels with either circular or irregular oval section that accelerates fluid or gas by means of both combined centrifugal and axial movement.



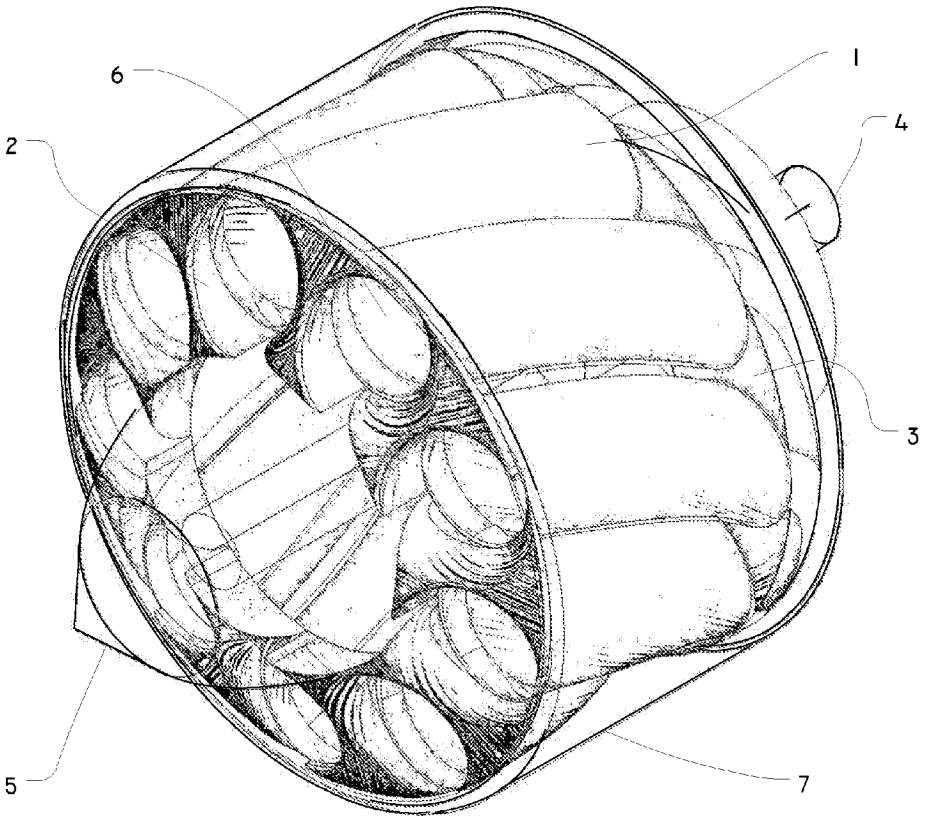


FIG. 1A

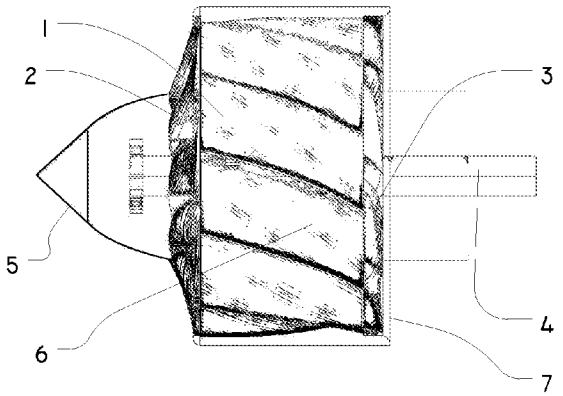


FIG. 1B

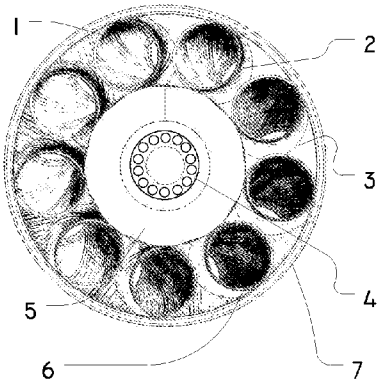


FIG. 1C

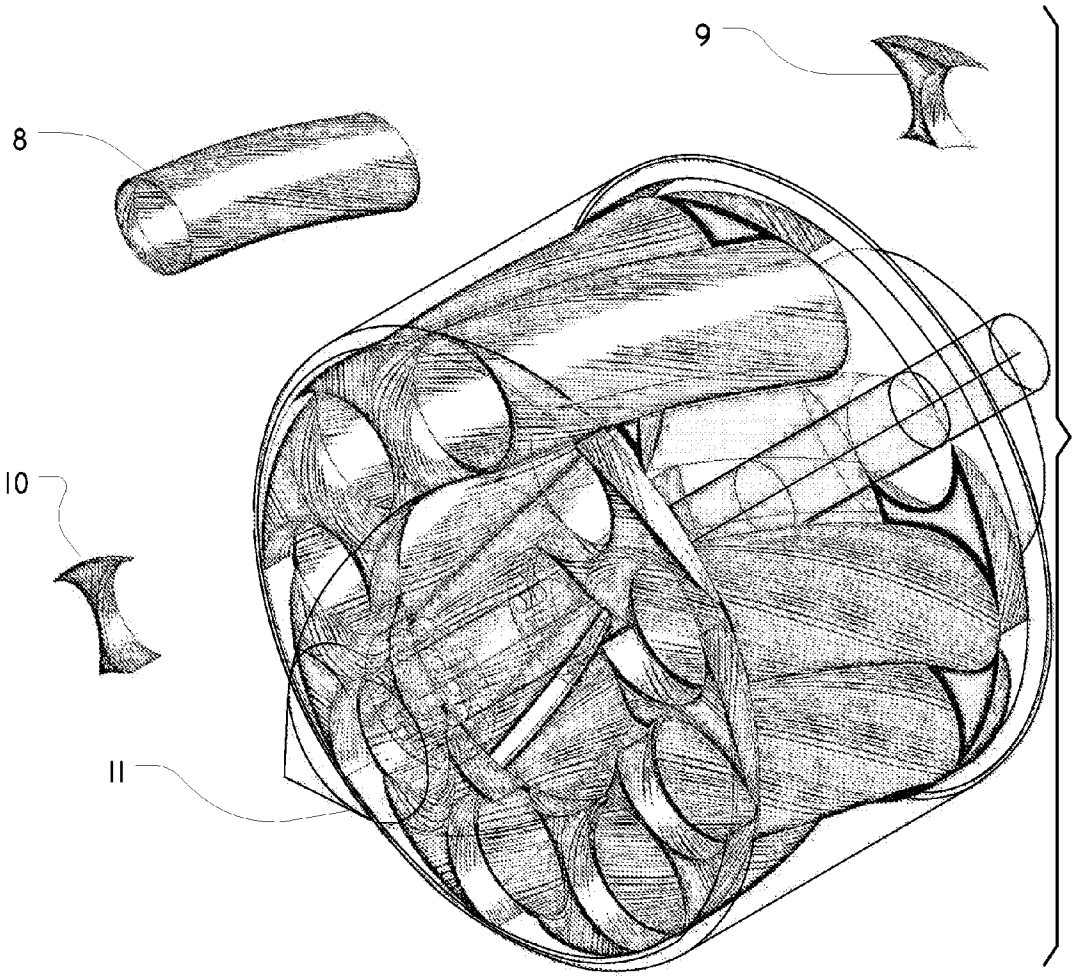


FIG. 2

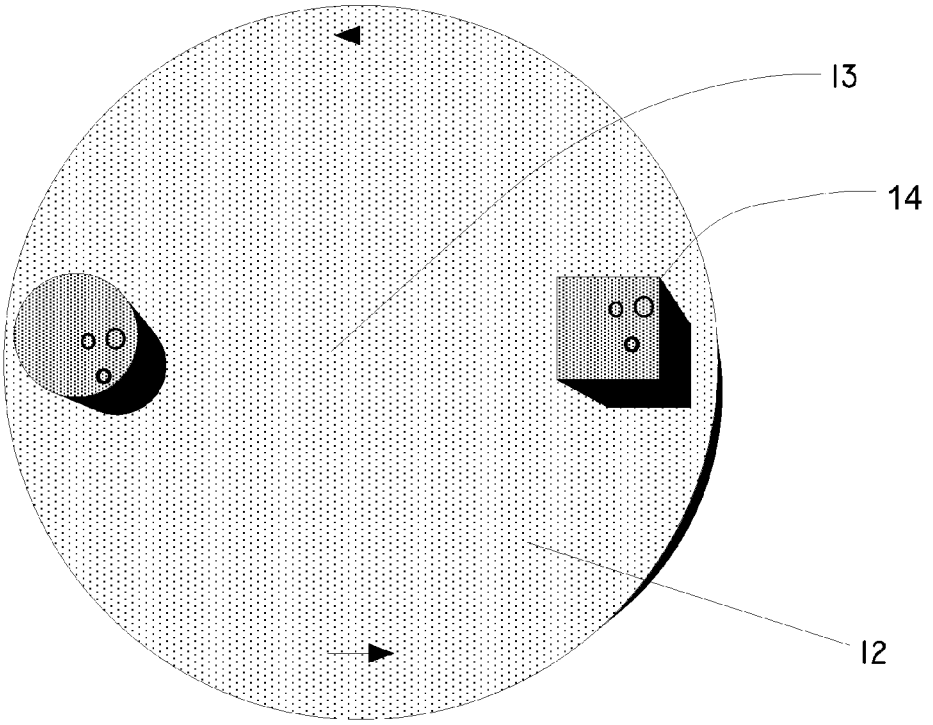


FIG. 3A

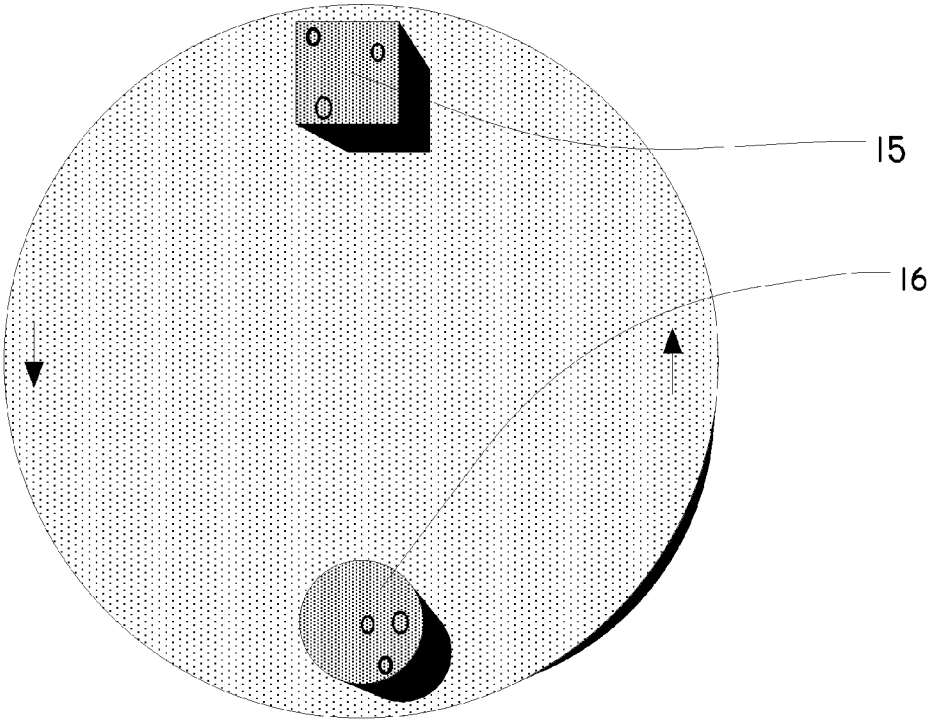


FIG. 3B

PERIPHERAL TUNNELS PROPELLER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Provisional application No. 61/228,133 Filed on Jul. 23, 2009

BACKGROUND OF THE INVENTION

[0002] 1. Field of invention

[0003] The invention disclosed herein relates to propeller improvement, particularly to noise and cavitation abatement on propellers used on marine propulsion, fluid pumps, fans, and power turbines. Noise is always undesirable collateral of machine function, is source of illness, operational restrictions, and service life shortened on devices affected by noise, and also is a security concern to deal when discrete operation is required.

[0004] 2. Discussion of the Prior Art.

[0005] Propellers moves a fluid accelerating it by hitting it against a rotating blade, such acceleration provides the thrust, common noise cause is the turbulence on the fluid, cavitation and the vibration of the propellers' blades, some designs achieve lower noise by mean of a hardened blade structure, or surrounding the entire propeller with a duct, other designs also reinforce the blade structure linking all blades to a ring at the propeller perimeter, and other using screw blade propellers.

[0006] Turbulence is often caused by the blade itself, the flat shape of a blade generates parasite waves that generate turbulence, this turbulence generates noise when knocking the blade's surface or other structures near the propeller, and this impact creates structural tension that when released generates sound waves, to reduce the noise caused by the structural tension reinforcements to the propeller's blades structures are introduced, some reinforcements strategies use a greater blade section, other reinforced materials on blade structures, and others a ring attached at the extremes of the blades surrounding the propeller(see U.S. Pat. Nos. 1,441, 852, 1,518,501 and 4,684,324 and its citations).

[0007] The basic technique of laminar turbulence reduction on the blades has been yet to design screw blade propellers as on U.S. Pat. No. 1,518,501, where the blades describe an open semicircular chamber, said shape helps to avoid turbulence generated by flat shapes, while helps to reduce the angular momentum perturbation on the particles .

[0008] The Inertial cavitation phenomena is caused when the fluid pressure falls below it's vapor pressure due high acceleration momentum, the cavitation causes shock waves that are a powerful noise source, prior art systems fight the cavitation by mean of lower fluid acceleration of the fluids using higher diameter propellers to move a bigger volume (and mass) of fluid at a lower acceleration, other system just inject gas where the under pressure as expected, this avoids the shock waves but introduces a new source of noise to the system due the turbulence that generate such gas (see U.S. Pat. No. 4,188,906 and its citations).

[0009] All these solutions actually improved the noise abatement on prior art, but didn't deal with the root of the problem: the turbulence generated by the particle circular momentum against the blade surface, this causes always a noise whose frequency is proportional to the rotational speed of the propeller.

BRIEF SUMMARY OF THE INVENTION

[0010] The present invention is a propeller device consisting on its preferred embodiment on a cylindrical block with peripherals tunnels, each tunnel describing an axial spiral tunnel around a shaft or hub, having each tunnel a constant circular section and shape but not limited to a circular section shape, and having also inside each tunnel a jacket **6** of a material with a natural resonace frecuency different from the material of the cylinder, and flow guide structures that mixes the flow input and output with its environment.

[0011] To Move a Fluid, is needed to transfer movement from a device to the fluid, on propellers this is done rotating the propeller, on previous art propellers use to have a flat, concave or convex shape as on previous art, when the propeller moves, the fluid hits harder the propeller extremes because a higher relative speed at the extreme of the blade, but also the fluids do a counter-revolving movement due its own inertia, each molecule being accelerated tend to keeps it momentum on the environment, this fluid momentum opposes to transform the volume shape from a triangular section (or any polygon that shapes the propeller) pointing to some angle to a triangular section pointing to another angle, this creates turbulence and parasite shock waves on the fluid.

[0012] The present invention on its preferred embodiment, achieves its goal of noise abatement by means of moving the fluid into a cylindrical chamber (or tunnel). When a fluid is moves inside a cylinder each molecule keeps its angular inertial momentum, thus minimizing turbulence caused by hitting against the walls of the chamber, an easy way to visualize this phenomena (see FIG. **3**A) is to place a water filled cylinder **13** (as a glass) on a rotating table **12** , and do the same on the other extreme with an cubic container **14**, wait for water to calm, then add few drops of colorant inside near the border of each container (avoiding water agitation), now rotate the table 45 degrees and stop It, now watch, it must be shown as on FIG. **3***b*, you'll see the water inside the cylindrical container **16** almost un-changed, without turbulence, but on the cubic container **15** the water is now turbulent, this is due the inertial momentum of the fluid's molecules hits against the flat surface, when a mass of fluid is turn, each molecule tries to keep the fluid's shape and angle in opposition to the container's rotation, if the container can't keep the shape of the fluid then the molecules hits the surface generating waves this creates parasite flows from angular movement. Then using a cylinder as fluid container, to move a fluid in an spiral movement, I avoid this agitation due the circular shape of the container is the same at different angles, so to the fluid inertial momentum's is kept with minimal pertubation.

[0013] Another optional feature that can be added to this embodiment to abate more noise, is the sound or vibration absorbent jacket that coats the inside surface of each cylinder tunnel, this jacket cancels or absorbs extra parasite noise by absorption of energy from the laminar micro-turbulence product of the friction of the wall with the fluid, also modifies to the natural resonance frequency of the tunnel that creates and amplifies sounds (noise) inside large pipes (tunnels), to avoid the same effect that amplifies the sound of organ's tubes

(noise in this case), this jacket must be made of a material with different natural resonance frequency than the material of which is made the cylinder.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. **1***a* is a perspective view of a Quiet Propeller of the present invention;

[0015] FIG. **1***b* is a side view of a Quiet Propeller of the present invention;

[0016] FIG. **1***c* is a top view of a Quiet Propeller of the present invention;

[0017] FIG. **2** is a perspective exploded view of a Quiet Propeller of the present invention.

[0018] FIG. **3***a* is an illustration that shows how to simulate the propeller anti-turbulence principia.

[0019] FIG. **3***b* is an illustration that shows how to simulate the propeller anti-turbulence principia.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Referring now to the drawings in more detail, in FIG. **1***a* to FIG. **1***c* there is shown a cylindrical block **7** having in its preferred embodiment multiple peripherals holes as tunnels in spiral **1**, in the preferred embodiment also a inner shaft **4** provides rotation guide and torque to spin the cylindrical block, having also a fluid guide structures **2**, **3** at both sides; each tunnel **1** also having an internal jacket **6**, the cylindrical structure on its preferred embodiment ends on a conical or spherical structure **5**.

[0021] In more detail, still referring to the invention of FIG. **1***a* to FIG. **1***c*, tunnels **1** are aligned at the same radius for a single row of tunnels or at various radius for multiple rows of tunnels, tunnels have an virtual center axis that describes an spiral while extending from one side to other, such spiral on its preferred embodiment only reach a fraction of the turn and the center radius varies as the tunnels reach the output side.

[0022] Tunnels **1** section and shape also are non constant, depending on the fluid viscosity and the final speed of the propeller, the shape of the tunnel section varies on radius, shape and central axis.

Operation

[0023] The invention achieves its goal to accelerate a fluid (liquid or gas) by spinning it inside a camber (tunnel **1**) driven by shaft **4** and by both combined centrifugal and axial movement it accelerates the mass of fluid from the input to the output , the tunnels has the particularity that section matches the circular momentum of the molecules, avoiding parasite sound waves due wall collision, and thus keeping Reynolds numbers at laminar flow levels, also the jacket **6** is made from sound absorbing material that abates extra parasite sound waves and avoids the noise due tube resonance, the input and output structures **2** and **3**, provides a path for input and output of the of the fluids while it gets in and out of the tunnels **1** and blend smoothly with the environment, also the physical structure of the cylindrical block is inherently so strong that material stress just can't make sound waves or such waves are at elevated frequency so are easy to attenuate by the environment, other elements as the conical structure **5** help to keeps the fluid at laminar flow conditions.

[0024] The invention size depends on specific applications the cylindrical block **7** maybe as small as 2 millimeter or less and as big as 50 meter or more limited only by the fabrication process, and it's longitude proportion depend to the longitude required by the pipe **1** to accelerate the fluid just below the cavitation inertial limit, the number of pipes **1** on the preferred embodiment are nine in a single row not being limited for these numbers and maybe one or more pipes, distributed on one or more pipe rows.

[0025] Although the embodiments shown include all features, the applicant specifically contemplate that features **1**, **4**, **5** and **6** disclosed herein may be used together or in combination with any other feature on any embodiment of the invention. It is also contemplated that any of the cited features may be specifically excluded from any embodiment of an invention.

Construction

[0026] The construction details of the invention as shown in Fi FIG. **1***a* to FIG. **1***c* are the cylindrical block **7** could be made from fiber glass reinforced composites, metal alloy, ceramics, reinforced concrete, and any material suitable for fabrication of molded pieces; the shaft **4** could be made of the same material of the cylindrical block **7** or from higher strength materials as steel, if made from a different material the cylindrical block **7** such block **7** must be molded around a previously machined shaft **4**; the jacket **6** must be made from any material with different natural resonance frequency as ((without limitation) polyethylene, rubber or metals like beryllium, and the same material of the cylinder **7** with different density, also the jacket maybe build by coating with such sound attenuating material to a finished cylindrical block **7**; the input and output structures **2** and **3** maybe made from the same material the cylindrical block **7** or from the material of the jacket **6**, conical structure **5** is made from the same material as the cylindrical block **7**, in the preferred embodiment the cylindrical block **7** and the intake and exhaust structures **2** and **3** and the conical structure **5** all are molded together.

[0027] FIG. **2** show the alternate build from individual parts, in this embodiment jackets **6**, the cylindrical block **7** and the intake and exhaust structures **2** and **3** all are molded individually and joint together by means of adhesives, welding or bolts or any other joint technique.

[0028] The tunnels **1** path (central radius) is defined in the Cartesian coordinates system is the followings formulas: x(t) =u.sin(t.k**1**); y(t)=u.cos(t.k**1**); z(t)=t.k**2**; where (t) is a magnitude that represent the propeller's chords length (assigned to Z order), (k**1**) and (k**2**) are arbitrary constants multiple of Pi, (u) is the espiral expansion factor, maybe a constant or the result of another arbitrary equation with (t) as coeficient, the tunnel radius perimeter is defined by the following formula using the cartesian system: x(r) a.sin(r); y(r)=b.cos(r); where (a) and (b) are a constant or maybe the result of another arbitrary equation with (r) as coeficient, this formula applies to a single tunnel, embodyments with multiple tunnels must derive its path fromula from this.

[0029] The advantages of the present invention include, without limitation, Quieter operation, very strong structure on a wide variety of materials not suitable on other designs, Enviromentally friendly minimizing injuries to men and anymals arround from metal and or composites to reinforced concrete, also modulating torque this propeller maybe used to mimic others devices noise allowing the disguise of the machine's natural sounds.

[0030] While the foregoing written description of the invention enables one of ordinary skill to make and use what is considered presently to be the best mode thereof, those of ordinary skill will understand and appreciate the existence of

variations, combinations, and equivalents of the specific embodiment, method, and examples herein. The invention should therefore not be limited by the above described embodiment, method, and examples, but by all embodiments and methods within the scope and spirit of the invention.

What is claimed is:

1. A Propeller having a cylindrical block spinning around a central axis, such cylindrical block having one or more spiral tunnels surrounding such spinning axis, such tunnels having the input and output at both cylinder's faces.

2. A Propeller as claimed in claim **1** and wherein said tunnels or holes have an internal jacket made of some material with a diferent natural resonance frequency to that the material of which is made the cylindrical block.

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