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(54) **A gyroscopic propulsion system**

(57) A gyroscopic propulsion system comprises a series of hollow spheres (e, c, f, g) rotatably mounted one within the other. A series of three equi-angularly, spaced gyroscopes (g1) are located in a vertical plane around the inner surface of inner sphere (e) which is rotated about a horizontal axis. The gimbals of the gyroscope (g1) can be locked in sequence to produce gyroscopic precessional torque impulses for driving a craft, in which the system is located, in horizontal directions. A further series of gyroscopes (e2) are located at equi-angularly spaced locations in an annular chamber fixed externally to sphere (e). These gyroscopes are also mounted in gimbals which can be locked to produce further torque impulses for moving the craft in vertical directions.

FIG 7

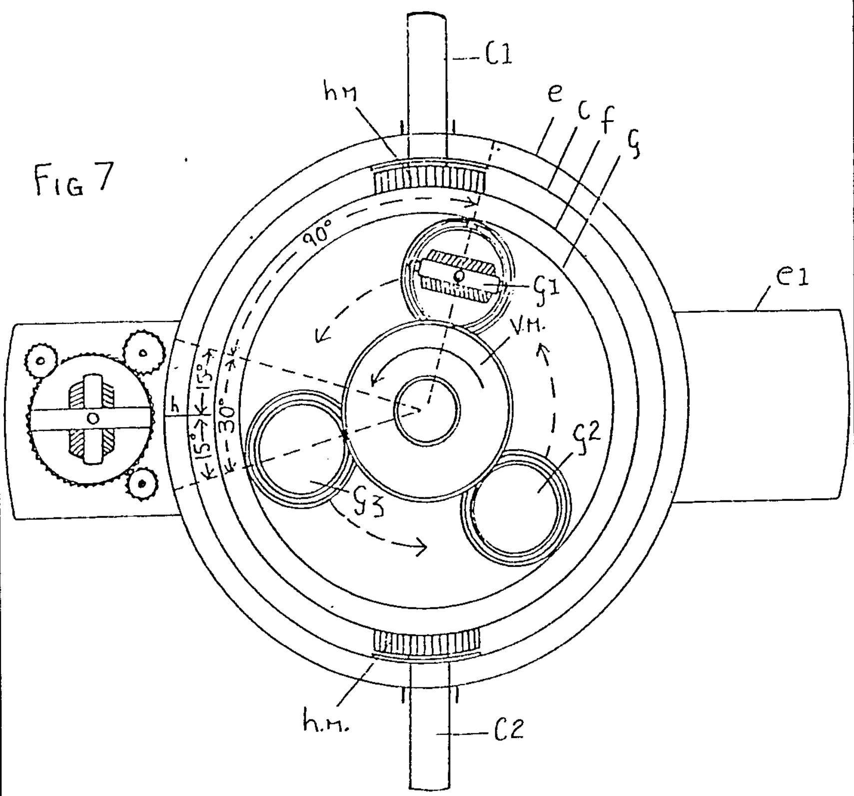

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Fig 1

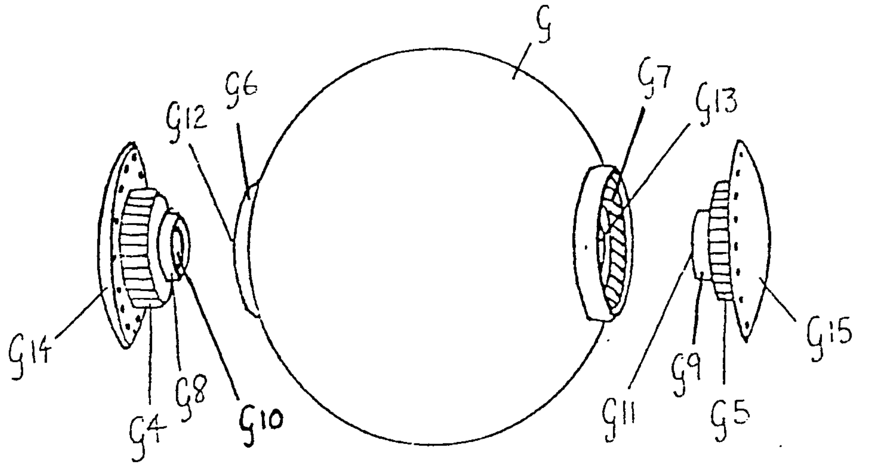


Fig. 2

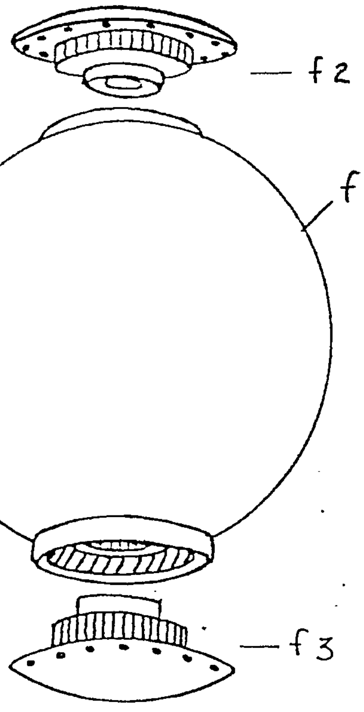


Fig. 3

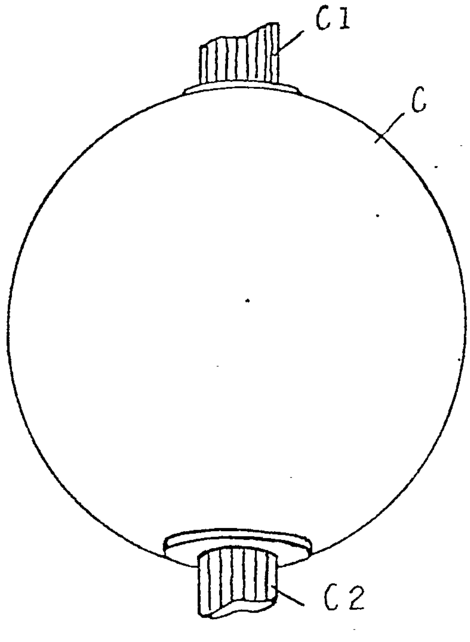


Fig. 4

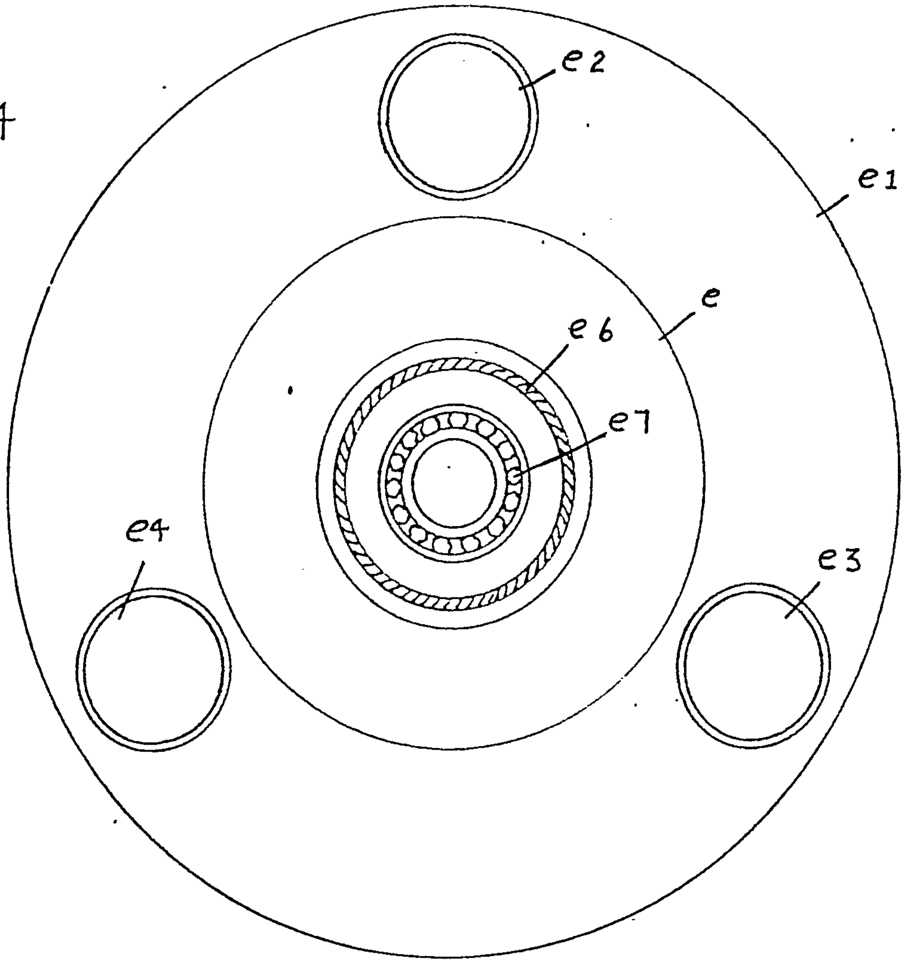
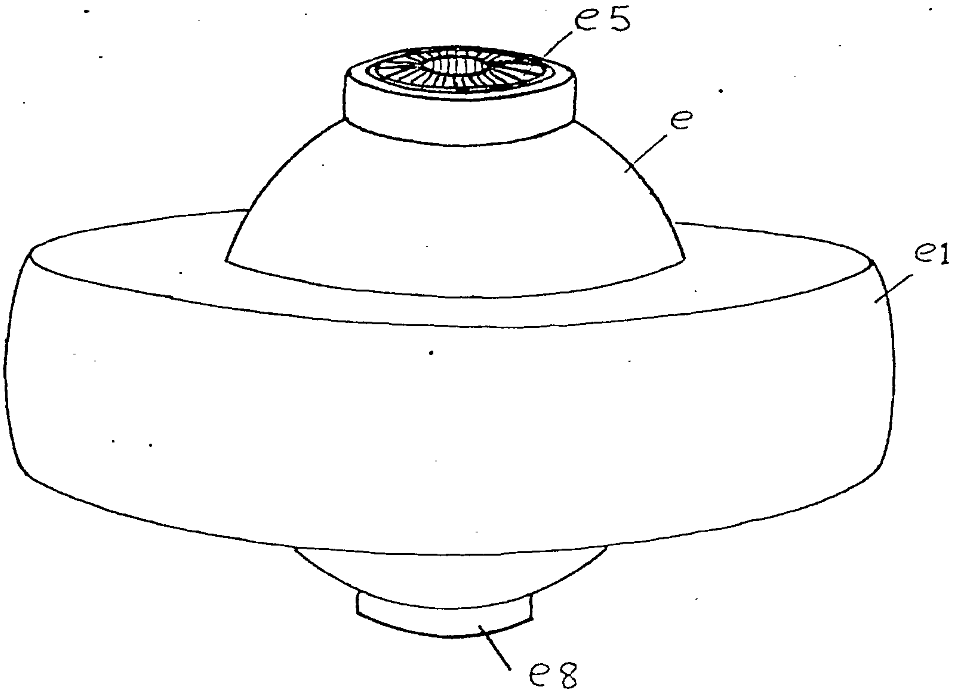


Fig. 5



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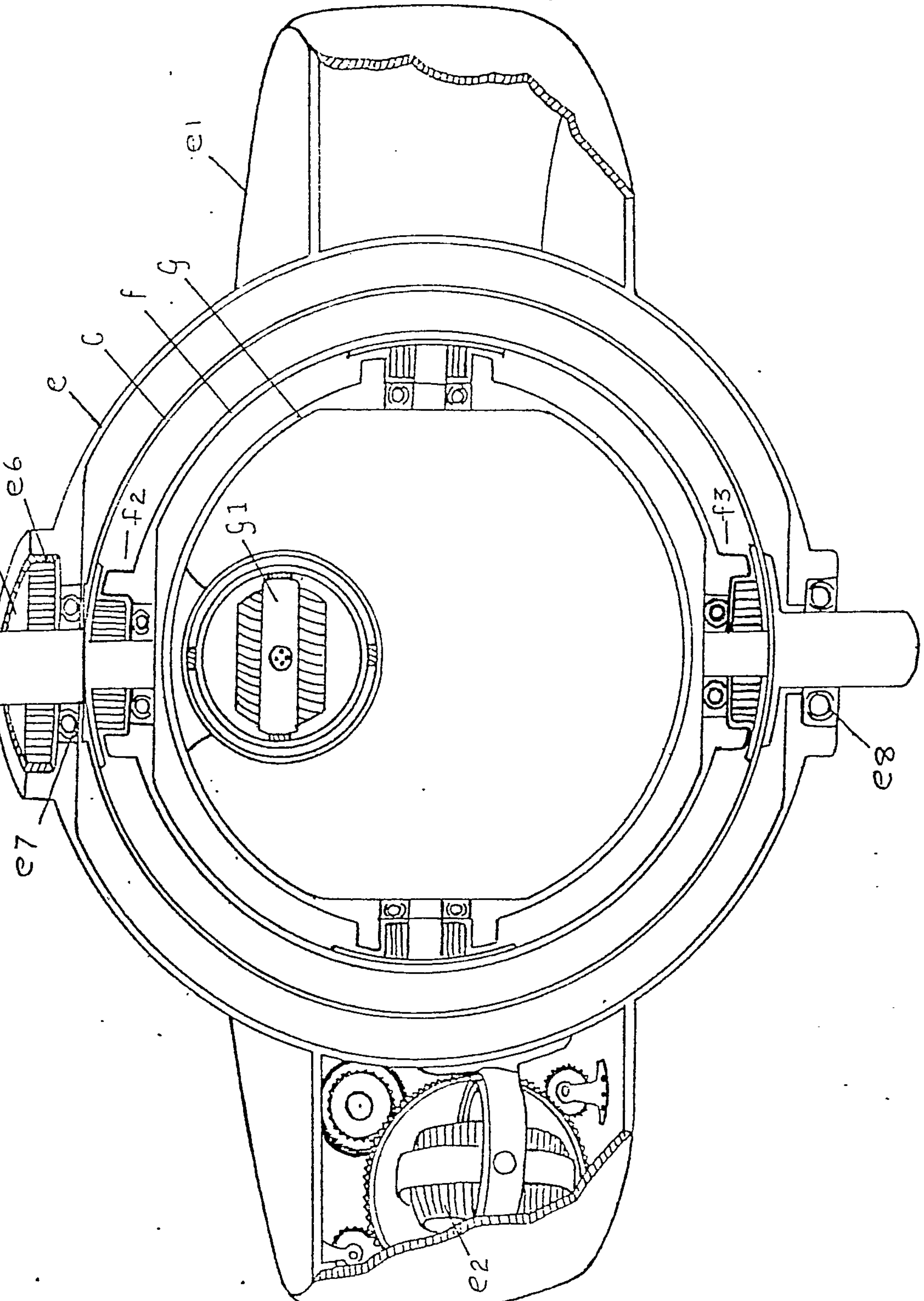
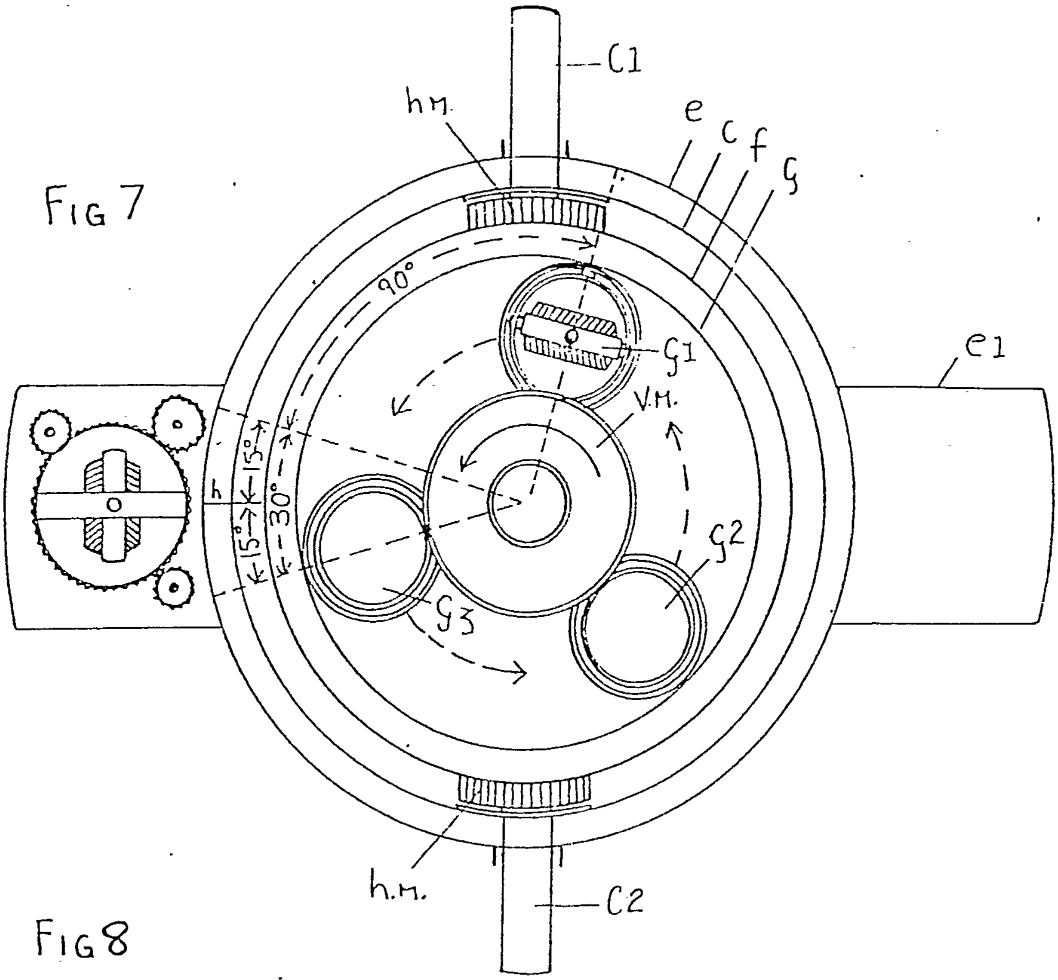


Fig 6

FIG 7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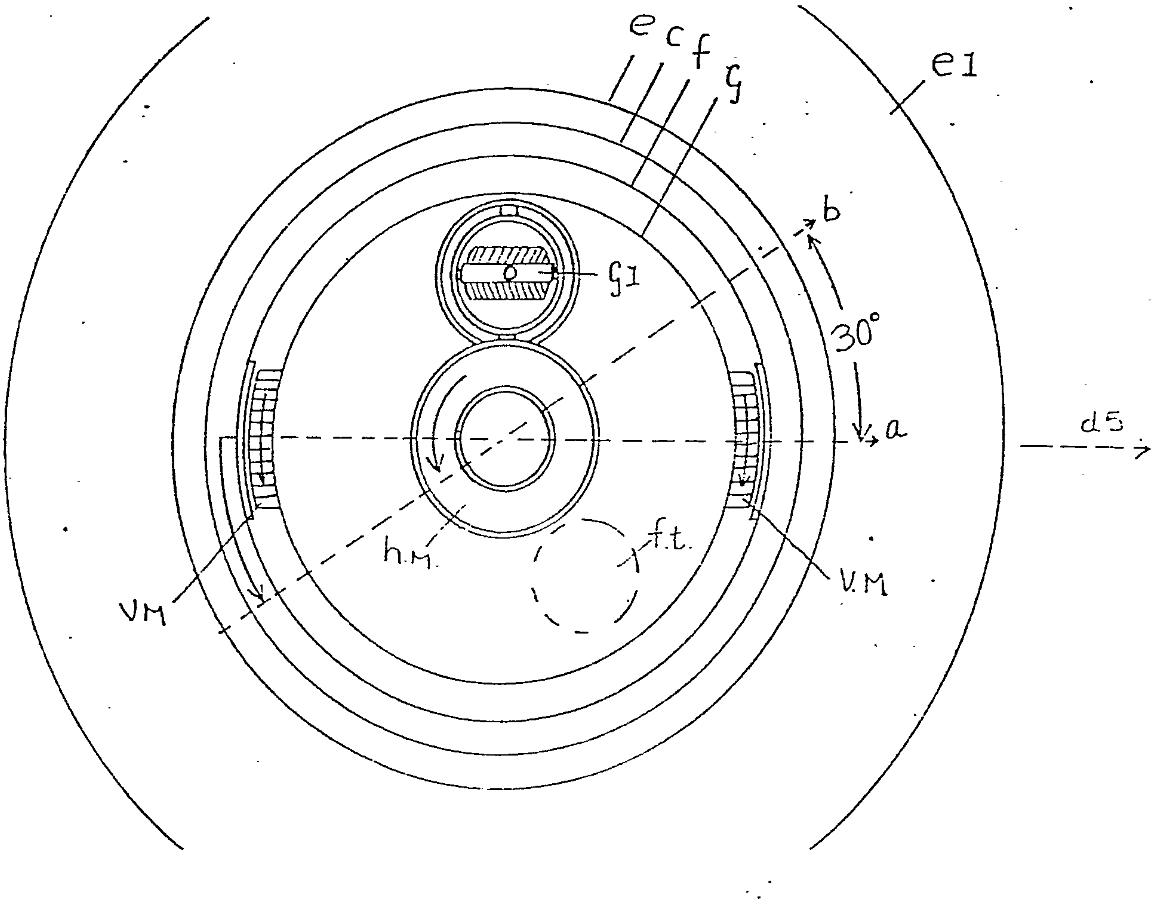
hM
e
c
f
g
90°
g1
e1
V.M.
15°
h
30°
15°
g2
g3
h.M.
C2

FIG 8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c
f
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e1
b
g1
30°
a
d5
VM
h.M.
f.t.
V.M

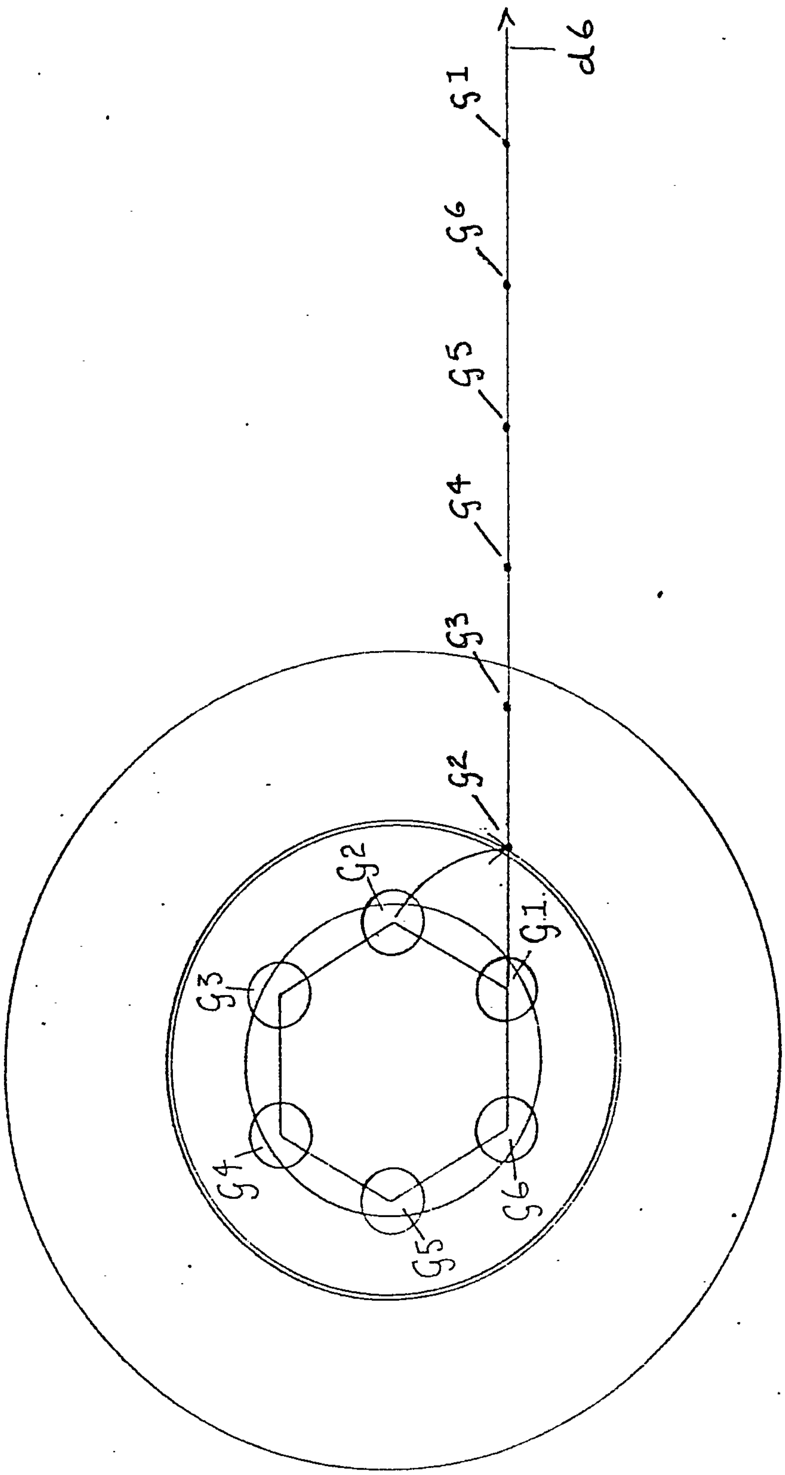


FIG 9

FIG: 10

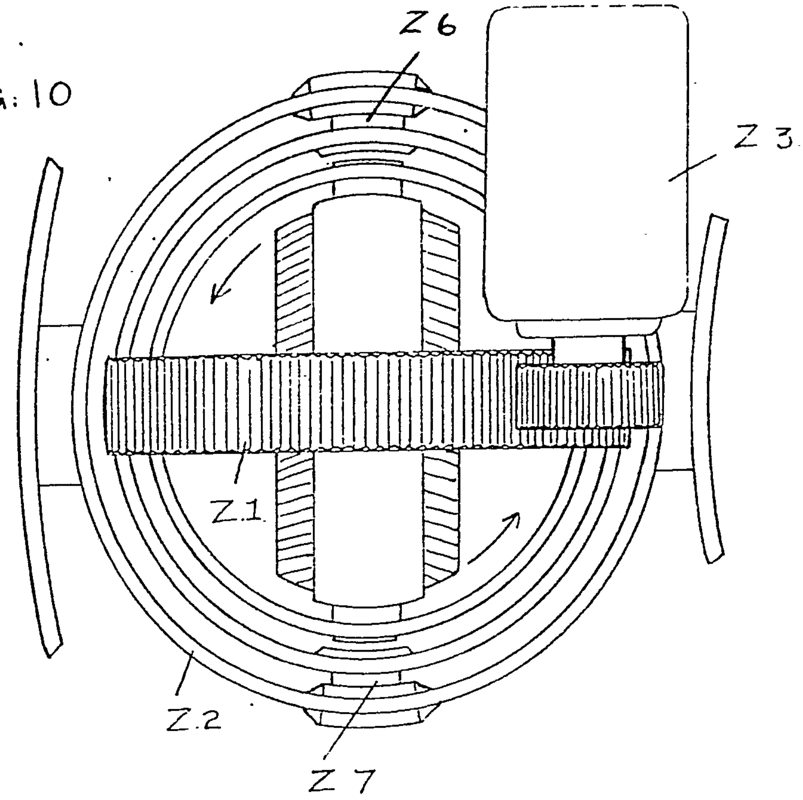


FIG 11

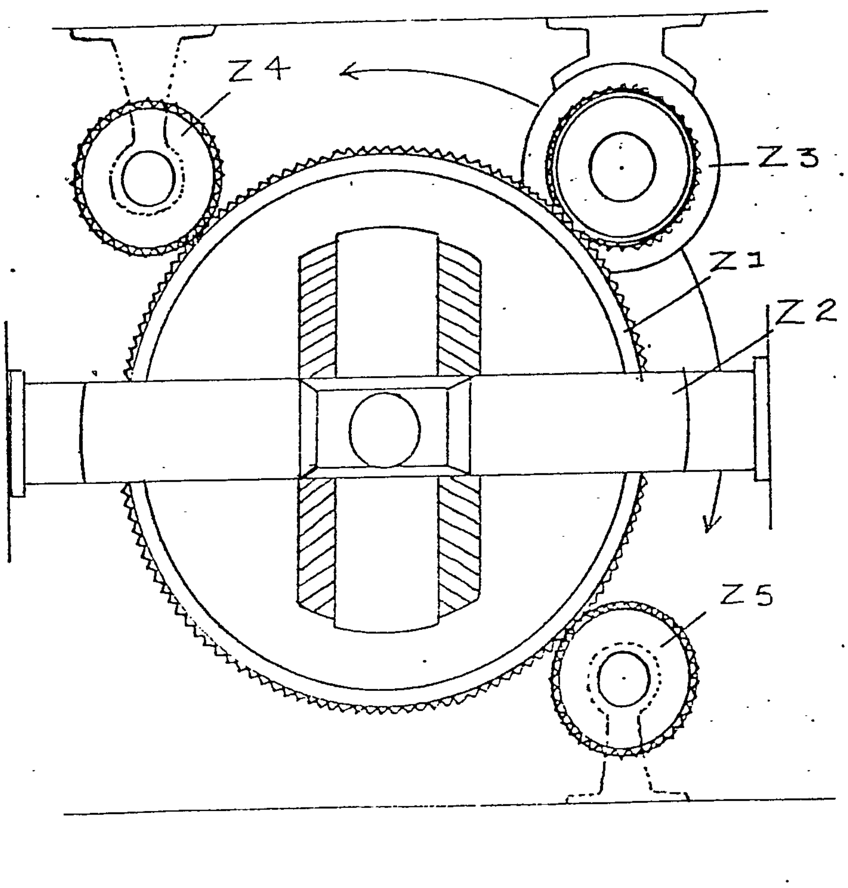


Fig. 12

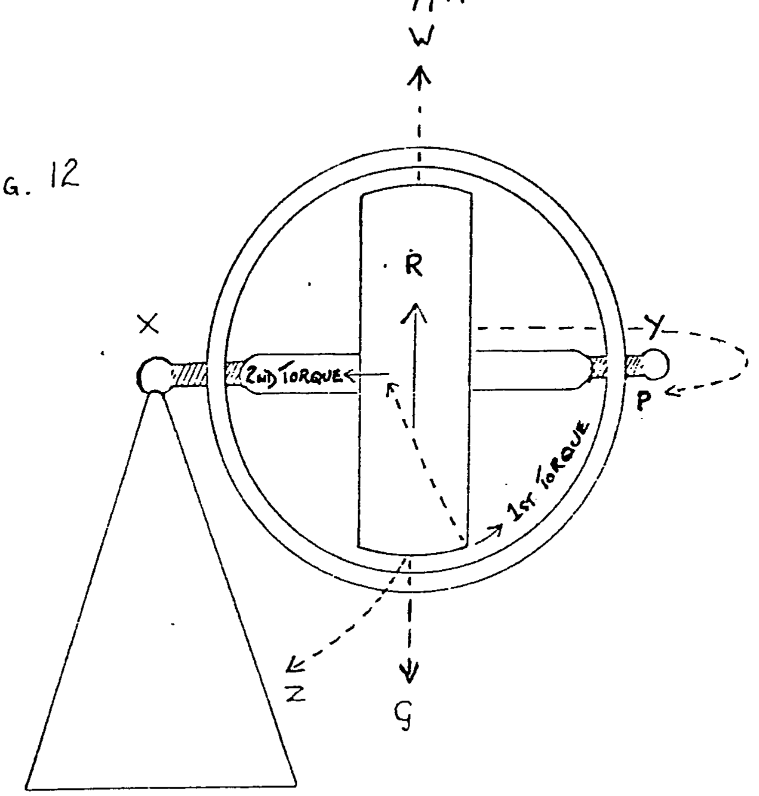


Fig. 13

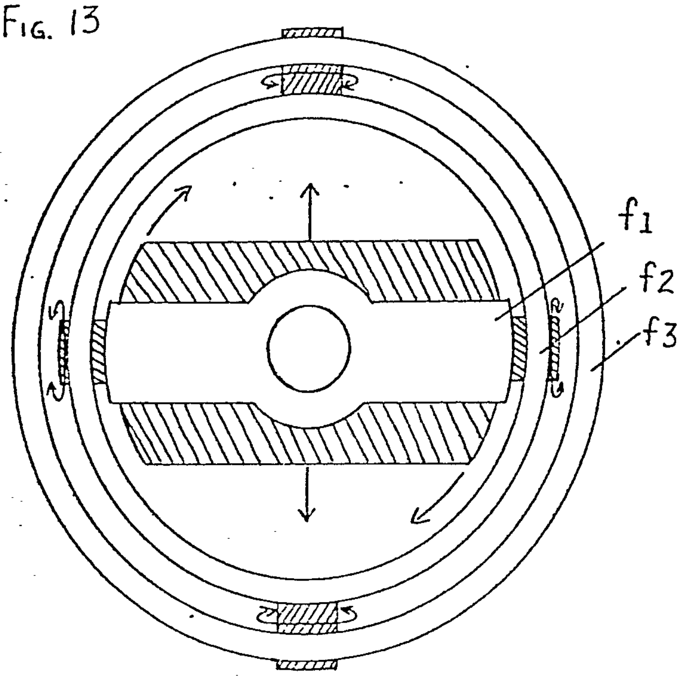


FIG. 14

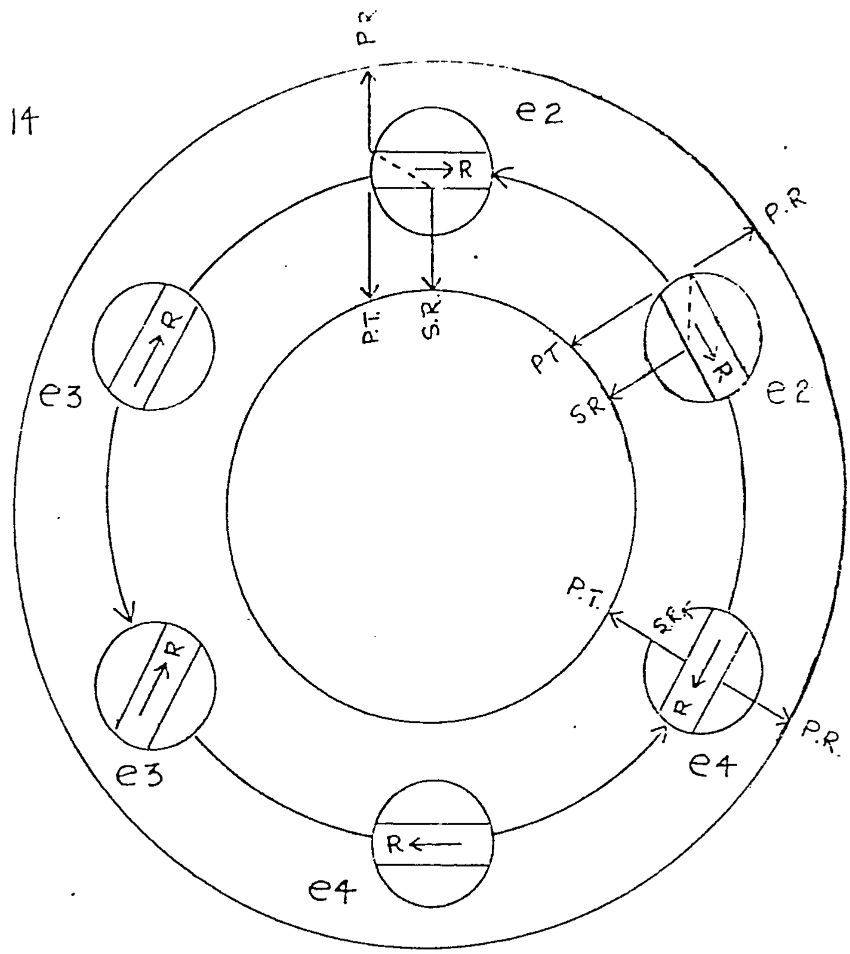


FIG. 15

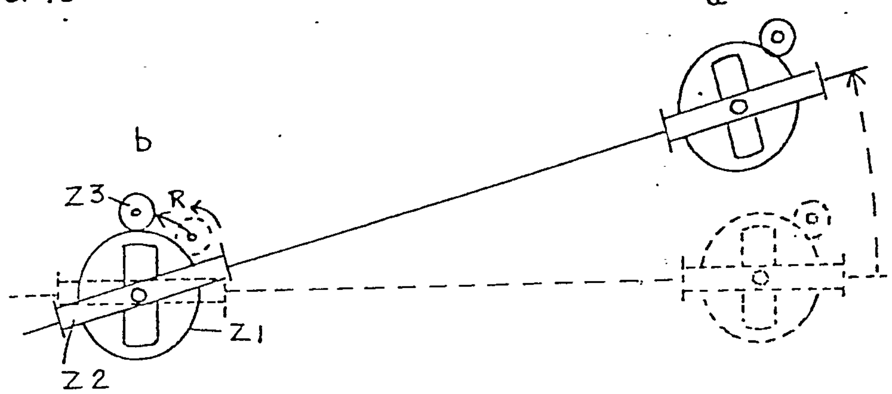


Fig 16

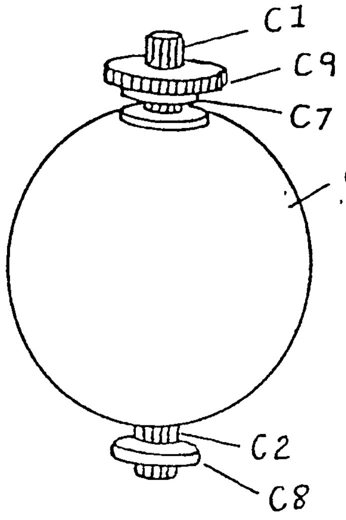


Fig 17

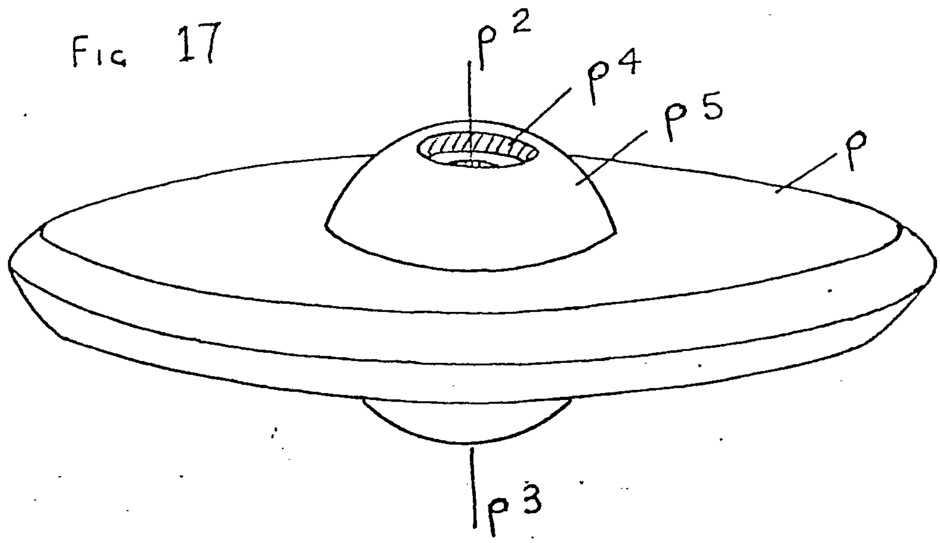


Fig 18

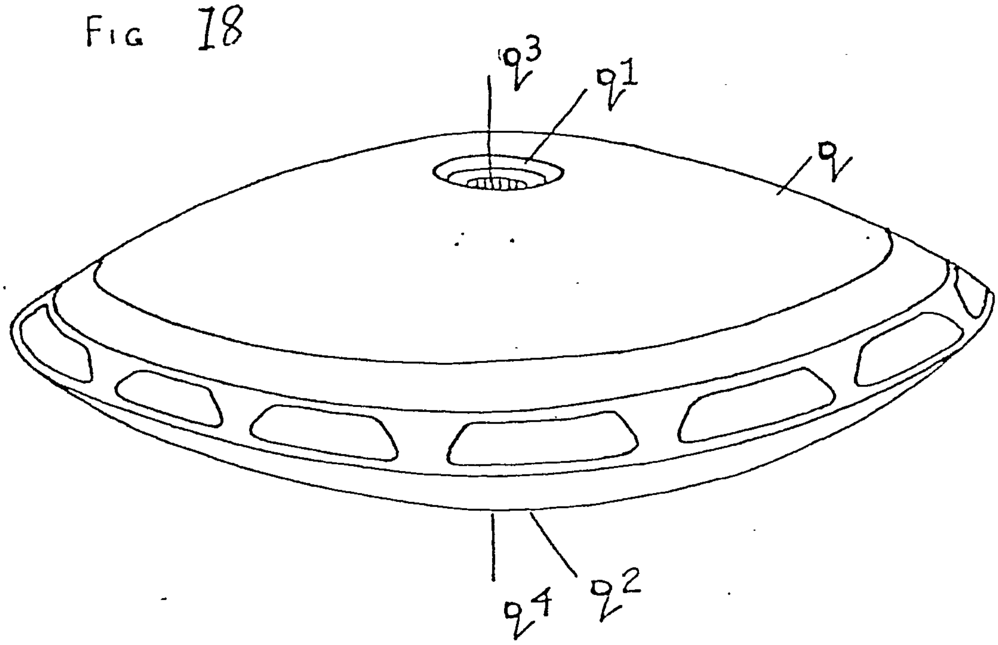


Fig 19

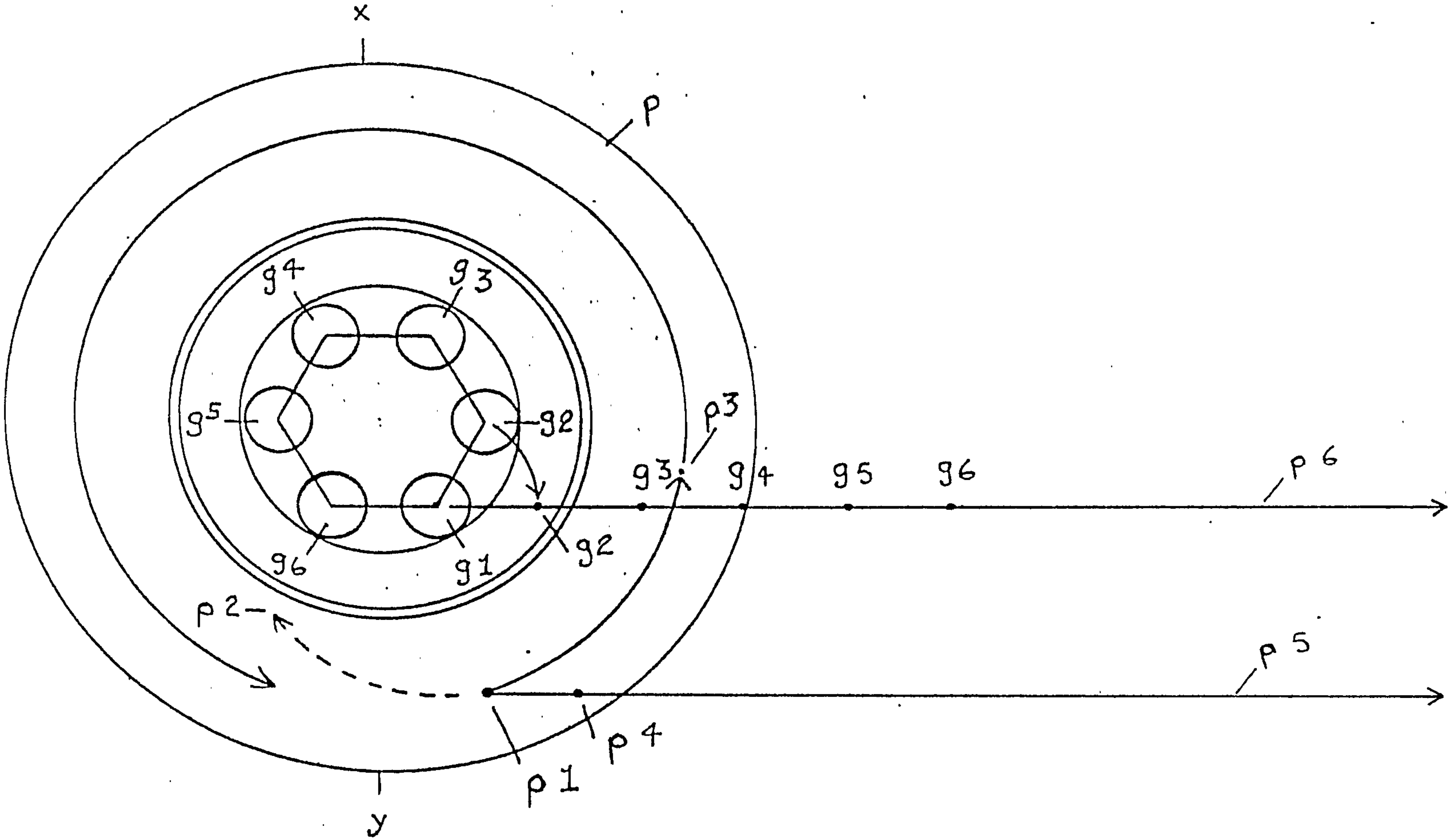


Fig. 20

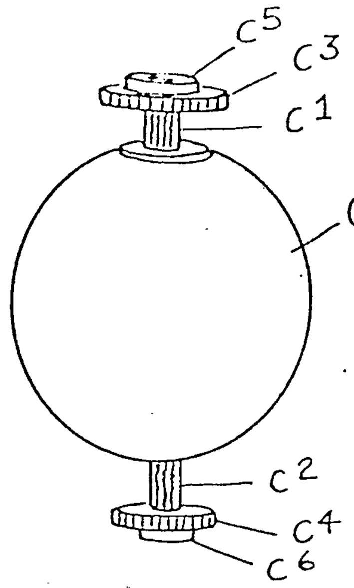


Fig. 21

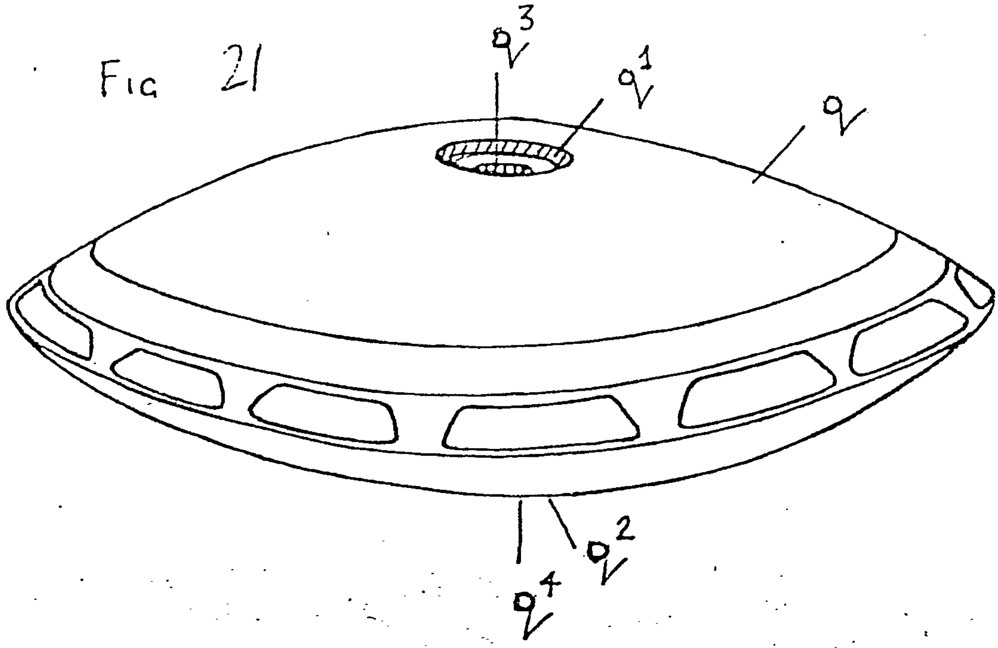
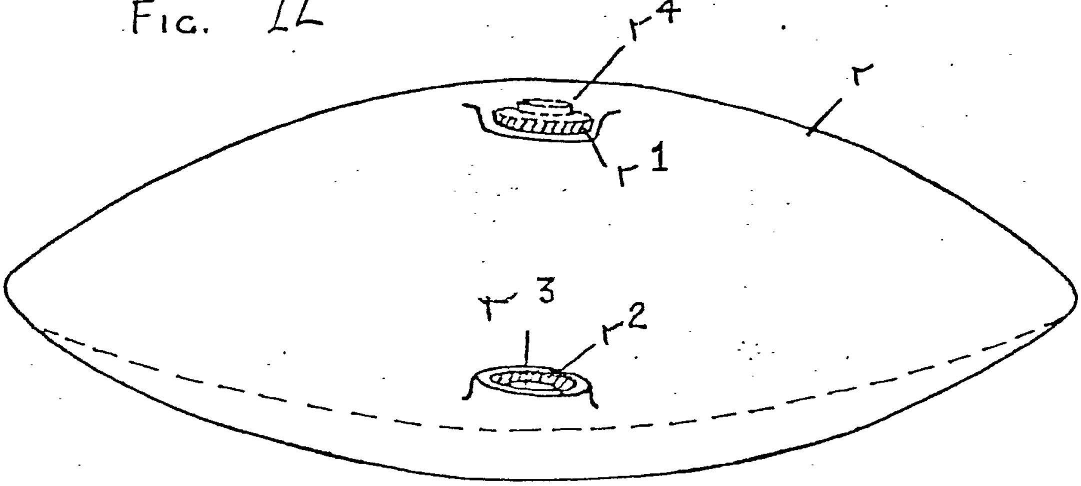


Fig. 22



SPECIFICATION

A gyroscopic propulsion system

The invention relates to a gyroscopic propulsion system and a craft incorporating such a system.

Gyroscopic Propulsion is a means of propulsion which does not derive thrust in one direction from an expulsion of matter in the opposite direction as with conventional craft, but rather the craft derives its propelling influence entirely from within. The gyroscope displays this ability in its most basic form, when it is used as a stabilizing influence in large ships, the wave motion of the sea seeks to pitch and roll the ship, and the gyroscope resists these actions by bringing its rotating mass to bear upon its mountings and in turn, upon the ship itself. I have now utilized this ability of the gyroscope to provide a gyroscopic system which can be utilized for propelling a craft.

According to the invention, there is provided a propulsion system comprising at least three gyroscopes each mounted for free universal pivotal movement at positions equi-angularly spaced about an axis of rotation, means to rotate the gyroscopes about such axis, means to lock selectively each gyroscope against said free universal pivotal movement to cause the respective gyroscope to precess as the gyroscopes are rotated in use about said axis thereby to generate a precessional torque for propelling a craft in which the system is provided in use and means for permitting realignment of said axis of rotation to compensate for rotation thereof caused in use by each precessional torque impulse produced by locking the individual gyroscope assemblies in turn.

The invention also provides a craft incorporating a propulsion system a aforesaid, an annular passenger cabin rotatably mounted about the propulsion system for rotation in a direction opposite to that in which said gyroscopic precessional torque acts the skin member.

The invention further provides the aforesaid craft further including a hollow disc-like outer skin member enclosing and rotatably mounted on the assembly of the propulsion system, the annular cabin and the outer housing, and means to rotate

Embodiments of the invention will now be described by way of example, and with reference to the accompanying drawings in which:-

Figure 1 is an exploded view of a first supporting sphere of a propulsion unit according to the invention;

Figure 2 is an exploded view of a second supporting sphere of the propulsion unit;

Figure 3 is an elevation of a third supporting sphere of the propulsion unit;

Figure 4 is a plan view of an outer supporting structure of the propulsion unit;

Figure 5 is an elevation of the structure of Figure 4;

Figure 6 is a section through the complete propulsion unit;

Figure 7 is a diagrammatic representation of the propulsion unit to illustrate its operation;

Figure 8 is a further diagrammatic representation of the unit showing its operation;

Figure 9 is a diagrammatic representation illustrating the movement of a craft in one plane when driven by the propulsion unit;

Figure 10 is an elevation of part of the vertical thrust assembly of the propulsion unit;

Figure 11 is a diagrammatic representation from above of the part shown in Figure 10;

Figure 12 is a diagrammatic representation showing gyroscopic forces acting on a toy gyroscopic;

Figure 13 is a plan view of a gimbal assembly for a gyroscope of both the horizontal and vertical thrust assemblies of the propulsion unit;

Figure 14 is a diagrammatic representation of showing the positions of the gyroscopes of the vertical thrust assembly during operation;

Figure 15 is a diagrammatic representation showing positions during operation of the vertical thrust assembly;

Figures 16, 17 and *18* are perspective views of a propulsion unit, a passenger compartment and an outer frame of a gyroscopically propelled craft, respectively;

Figure 19 is a diagrammatic representation of the paths of movement of the elements of the craft of Figures 16 to 18; and

Figures 20 to *22* are perspective views of a propulsion unit, a passenger craft and an outer skin of such craft, respectively.

The primary and fundamental property of gyroscope is its inertia or rigidity. This can be stated to be the reluctance of a rotating mass to change its plane of rotation, when acted upon by an external force.

The gyroscope possesses a second characteristic known as "gyroscopic precession", which may be expressed as the angular change of its plane of rotation, under the action of an applied force. To illustrate this reference is made to Figure 12 showing how a toy gyroscope is able to evade the pull of gravity, as its precesses about its tower. A single frame gyroscope, supported at X and held at Y, is released. Because it remains supported at X, the gyroscope can only descend in an arc Z, and therefore, must change its plane of rotation W. The two forces gyroscopic rigidity, and gravity, are now pitted against each other. To overcome the gyroscopes rigidity W, gravity G must first tilt the wheel to succeed in pulling it down the arc of descent Z, but being the weaker of the two forces, it is unable to do so. However, its effects are felt by the rotating mass of the wheel, which exerts an opposite torque across the axle to maintain its plane of rotation, but because the pull of gravity is constant, the resulting opposing torque is constant and continues until the wheel is forced once again to exert a second torque, opposite to the first, to maintain its plane of rotation. This second torque could actually succeed in pulling down the gyroscope, since it is now applying a force in the same direction as gravity. However, because the wheel and the axle are rotating, the second torque is carried 90 degrees from the vertical to the horizontal where it is able to discharge itself, causing the horizontal movement P of the gyroscope, without conflicting with the primary torque, which is still occurring in a vertical sense, due to the pull of gravity. The direction of this horizontal movement or precession depends upon the direction of rotation R. To express the above more simply, I call any movement which tends to change the gyroscope's plane of rotation, the Primary Tilt (P.T.) and the first and second torques which occur as a result, the primary and secondary responses (P.R. and S.R.).

As the rotation of the wheel decreases, so does its gyroscopic rigidity. This results in an increased P.T. and therefore, an increased P.R. and S.R. which is the reason why a gyroscope precesses more rapidly as it begins to fall.

Considering first the arc of descent Z, if a number of gyroscopes can be disposed within a craft, and used in such a way that gravity would first have to overcome their rigidity, before it could pull down the craft, there is the possibility of vertical propulsion, and similarly, if the product of P.T. P.R. and S.R. is movement, this could be the basis of horizontal propulsion. Gyroscopic propulsion is, in fact, derived from a combination of these two principles.

Having stated briefly the theoretical basis upon which my invention works, the following deals with a design and method of achieving gyroscopic propulsion.

The S.R. produced by a gyroscope subjected only to the pull of gravity, is comparatively weak. To increase the S.R. one must first increase the P.T. This can be achieved by subjecting the gyroscope to a centrifugal force, which massively increases the P.T. and, therefore, also the P.R. and S.R. Although there is now an enormous S.R. potential, it is still only a twisting or pivoting torque, brough to bear upon the craft from within, and if gyroscopic propulsion is to be achieved, it can only be derived from these pivoting actions. The horizontal propulsion of the craft is derived from three gyroscopes, which are subjected to vertical centrifugal forces or rotation. This results in the P.T. and P.R. occurring in the vertical sense. The S.R. will, therefore, occur at a right angle, bring its rotating mass to bear upon, and pivot the craft horizontally. These pivoting torques must be delivered to the mass of the craft in a precise manner involving simultaneous horizontal and vertical rotations. How this is achieved, and why it is necessary can best be explained using the drawings supplied.

Figure 3 represents a sphere C. Mounted within is a second sphere f. (Figure 2) which has two motors f2 and f3 mounted vertically, with their stators attached to the inside of C, allowing horizontal rotation of sphere f from within. For reasons which will be explained later, the horizontal motors f2 and f3 are of such a design that reverse rotation is impossible. The three horizontal propulsion gyroscopes are mounted within a third sphere G (Figure 1) in a triangular disposition and are rotated vertically by two motors, mounted horizontally with their stators attached to the inside of sphere f. With this configuration, it is now possible to subject sphere G to both horizontal and vertical rotation. The vertical rotational speed of sphere G is exactly three times greater than that of its horizontal rotation, threfore, the three gyroscopes within, although subject to two centrifugal forces, responds primarily to the vertical rotation, it being the greater of the two forces. Each of the three horizontal propulsion gyroscopes are required to deliver their S.R. or torque at a precise position within a horizontal circle, so that each pivoting action of the craft occurs in a position 60 degrees forward, relative to the previous one. Figure 9 represents the craft viewed from above, G1 indicates a position within the craft at which the first gyroscopic torque and resulting pivot will occur. This 60 degree pivot to the right, aligns position G1 with G1 along the pivot line d6. The next gyroscopic torque and pivot must now occur at G.2. This process is repeated continually moving the craft in the direction of and along the pivot line d6. The vertical motors which rotate sphere G and the gyroscopes within vertically, are continually misaligned by the pivoting movement of the craft, and it is for this reason that the horizontal rotation of sphere F with sphere G within is necessary, to re-align the gyroscopes into the correct position.

Figure 13 represents a special gimbal arrangement required to allow the gyroscope complete three dimensional freedom of movement, so that it is able to maintain its plane of rotation, whatever complex motions it is subject to and without gimbal lock occurring, which could subject the craft to unwanted torques. Each of the three frames of the gimbal has a magnetic clutch arrangement (not shown) whereby they may be firmly locked or released, in any position, individually or collectively, thus giving complete control over the gyroscope. If required, a gyroscope can also be precessed by locking one frame of the gimbal, which combined with the appropriate vertical or horizontal rotation will precess the gyroscope into a desired plane of rotation.

Lastly, the full force of the gyroscopes rotating mass can be instantly brought to bear upon the craft or released, by the simultaneous locking or releasing of all three frames of the gimbal.

Figure 7 represents the horizontal propulsion unit viewed from the side, showing the three gyroscopes G1 to G3 within sphere G which are spaced 120 degrees apart in a triangular disposition. Sphere G is rotated 90 degrees vertically until G1 is within 15 degrees of the horizontal, at which point its gimbal is locked,and is rotated through a further 30 degrees before the gimbal is released. The horizontal S.R. or torque which occurs as a result, is in direct opposition to the horizontal rotation of motors F2 and F3, but because they are incapable of reverse rotation, the S.R. of G1 is able to take effect pivoting the craft horizontally 30 degrees. Figure 8 represents a view from above the horizontal propulsion unit. The vertical motors V.M. are shown in the position they would be after the 30 degree pivoting action of the craft has occurred. It is the job of the horizontal motors H.M. to rotate sphere G. back to position b indicated in Figure 8, but no rotation will occur while gyroscope G1 is exerting its pivoting torque, since a force equal to the total mass of the craft is acting against the rotation of the motors F2 and F3. As soon as the torque of gyroscope G1 ceases, the F2 and F3 motors are then able to fulfil their task, re-aligning sphere G. 30 degrees from position (a) to position (b). When the gimbal of gyroscope G1 is released after pivoting the craft 30 degrees, it will no longer be exerting any gyroscopic torque, but the craft will still continue to pivot horizontally due to residual pivoting motion, thereby completing the required 60 degree pivot, by which time gyroscope G2 is in the correct position ready to repeat the process.

Two complete vertical revolutions of the triangular arrangement of gyroscopes, will subject the craft to six pivoting torques, which occur at positions relative to the intersection of a hexagonal. The craft will have made one complete horizontal rotation, and can be expected to have covered a distance equal to the craft's diameter, although the distance travelled is basically determined by the circumference of the circle in which the horizontal gyroscopes are rotated. If the vertical and horizontal motors are capable of a high rate of revolution the craft's horizontal speed will be quite remarkable.

The vertical propulsion of the craft is derived from three gyroscopes set in a triangular disposition within a drum like shape e1. (Figures 4 and 5), which has a large motor vertically mounted with its stator e5 and bearings e7 and e8 rigidly connected to main shafts c1 and c2 (Figure 3). The three gyroscopes e2 to e4 have the same gimbal arrangement as in Figure 13 with the addition of two frames z1 and z2. (Figure 10 viewed from above and Figure 11 viewed from the side), which combined with motors z3, cogs z4 and z5 play a vital role in the craft's ability to achieve vertical propulsion. The outer frame z2, motor z3, cogs z4 and z5 are rigidly connected to the inside of drum e1, with the outer frame of gimbal f3 (Figure 13) supported on two shafts z6 and z7 connected to frame z2. Also mounted on the outer frame of the gimbal (Figure 13) at a right angle to shafts z6 and z7 is frame z1. Both the outer frame of the gimbal and the frame z1 are free to rotate vertically on shafts z6 and z7, except that frame z1 is in effect a large cog, which engages with a cog on the rotor of motor z3, and cogs z4 and z5. This configuration allows the craft to rotate vertically about the frame z1, while motor z3 compensates for the change in position and at the same time maintains the gyroscopes plane of rotation within frame z1.

Figure 6 shows a cut away view of the whole propulsion unit. Figure 14 shows how the vertical gyroscopes respond to horizontal rotation under different conditions, e2 all frames locked, e3 with the f1 frame released allowing horizontal freedom, and e4 with f1 frame released, but subject also to downward tilt. Figure 15 is intended to give a general idea of how the z frame configuration operates.

Vertical lift can now be achieved in the following manner. Sphere e and drum e1 are rotated anti-clockwise, subjecting the three vertical propulsion gyroscopes e2 to e4 therein, to horizontal rotation. The e3 and e4 gyroscopes having frame f1 of their gimbals released, can maintain their plane of rotation with this horizontal freedom, while e2 having all three f frames locked, is subjected to a horizontal P.T. and P.R. which causes e2 to exert its precessional torque or S.R. upon the craft vertically, tilting it upward. This tilt is normally opposed by the e3 and e4 gyroscopes, since it acts to change their planes of rotation, but because the craft is able to rotate about them, with the z frame configuration (Figures 10 and 11) gyroscope e2 is able to exert its torque unopposed. However, the e3 and e4 gyroscopes already subject to horizontal rotation, are now also subject to a downward force or tilt, equal to the total mass of the craft and proportional to the pull that gravity exerts upon it. However, because this force acts to change their planes of rotation, the e3 and e4 gyroscopes resist this downward tilt, and respond to it by processing in the direction indicated in Figure 14. This precession is possible because the f1 frames are released allowing horizontal freedom so that the e3 and e4 gyroscopes' planes of rotation are continuously re-aligned into the angle shown in Figure 14 with their axles pointing towards the centre of the craft. If gyroscope e2, which now occupies a higher vertical position than e3 and e4 has its f1 frame released, and the e3 gyroscope has its frame f1 completely locked, it will begin to exert a torque, tilting the craft upward, while the e2 and e4 gyroscopes allow the craft to rotate about them, via the z frame configuration. It is now possible to present gravity with an insoluble problem, since it cannot pull down gyroscope e3 which is exerting an upward torque upon the craft, nor can it pull down gyroscopes e2 or e4, because the upward torque which gyroscope e3 is exerting only allows them to fall in an arc, and gravity, before it can pull them down, must first overcome their gyroscopic rigidity, which it is also unable to do. Therefore, the craft is able to move continually upwards by next releasing the f1 frame of gyroscope e3, and then locking the f1 frame of gyroscope e4 and repeating the whole process continuously.

The vertical and horizontal propulsion which the craft possesses, may be used individually, or collectively, and will allow the craft to perform precise and spectacular aerial movement, such as rapid vertical and diagonal climbs and descents, and motionless hovering. Also the nature of gyroscopic propulsion is such that the craft will be capable of extremely rapid accelerations, decelerations, and abrupt right-angle turns, potentially, enabling the craft to out manoeuvre and out fly present day craft. Gyroscopic propulsion is unique, deriving and transmitting its propelling influence entirely from within, silently, pollution free, and with a high degree of safety, because of the kinetic energy which a gyroscope possesses.

The gyroscopic propulsion system comprises a sphere g. (Figure 1) having two vertical motors v.m. mounted horizontally within a second sphere f Figure 2 via mounting plates g14 and g15, shafts g10 and g11, stators g4 and g5 and bearings g8 and g9 which fit within bearing recesses g12 and g13 and rotors g6 and g7, by which sphere g is able to be rotated vertically. Set within sphere g. are three gyroscopes g1 to g3 (Figure 7) 120 degrees apart in a triangular disposition. Gyroscopes g1 to g3 each have a gimbal (Figure 13) consisting of three frames f1 to f3 which are able to be locked or released collectively or individually by magnetic clutches (not shown). Sphere f (Figure 12) has two horizontal motors h.m. of identical design to the vertical motors v.m. which are mounted vertically within a third sphere c. (Figure 3) so that it is able to be rotated horizontally and are of such a design that reverse rotation can be prevented when required. The g1 to g3 gyroscopes within sphere g. are rotated vertically by the vertical motors in the direction indicated in Figures 7 and 8. When each gyroscope reaches 15 degrees above horizontal (Figure 7) its gimbal is locked thereby exerting a gyroscopic torque causing the craft to pivot 30 degrees horizontally (Figure 8). The gimbal is then released 15 degrees below horizontal. The vertical motors v.m. now occupy position a. and the gyroscope position g1 (Figure 8) is rotated back to position b. and ft. respectively by the horizontal motors. G1 and ft. represent a gyroscopes horizontal angle, rather than its vertical. The vertical rotation of the sphere g. is three times greater than the horizontal rotation of the sphere f so that sphere g rotates 90 degrees vertically in the time it takes sphere f. to rotate 30 degrees horizontally, which synchronizes the whole movement. The craft pivots a further 30 degrees horizontally due to residual rotation by the time the next gyroscope is in the correct position ready to repeat the process. By this method the craft is continually pivoted 60 degrees horizontally by the three gyroscopes in the direction of and along the pivot line d6 (Figure 9).

The vertical propulsion assembly comprises sphere c (Figure 3) positioned within a fourth sphere e (Figures 4 and 5) which has attached to it a drum e1. Sphere C having two shafts c1 and c2 mounted vertically, which support sphere e. via bearings e7 and e8. Sphere e. has a large motor, the stator of which is attached to shaft c1 with the rotor attached to sphere e, enabling sphere e. to be rotated anti-clockwise around sphere c. Mounted within drum e1, 120 degrees apart in a triangular disposition, are the three vertical gyroscopes e2 to e4, each having a gimbal (Figure 13) which has three frames f1 to f3, which can be firmly locked or released individually or collectively, by magnetic clutches (not shown). The outer frame f3 is supported on two axles z6 and z7 which are connected to the z2 frame attached to the inside of drum e1. Also attached to the f3 frame is a large hollow cog z1 which engages with a cog on the rotor shaft of the z3 motor. Two additional supportings cogs z4 and z5 also engage with the z1 cog. This configuration allows the craft to rotate vertically about frame z1, while the motor z3 compensates for the change in position, and at the same time maintains the gyroscopes plane of rotation within frame z1. Sphere e is rotated anti-clockwise subjecting the three vertical gyroscopes e2 to e4 within drum e1 to horizontal rotation, all three f frames of gyroscope e2 are locked which causes the gyroscope e2 to exert an upward torque upon the craft. Since the craft is able to rotate about the e3 and e4 gyroscopes via the z1 and z2 frames and the z3 motor, gyroscope e2 tilts the craft upward, bringing the mass of the craft to bear down upon the e3 and e4 gyroscopes, which they resist since it acts to change their planes of rotation. The e3 and e4 gyroscopes which have their f1 frames released, are now subject to both horizontal rotation and a downward tilt or force, and respond by precessing in the direction indicated in Figure 14 (e4); gyroscope e2 now occupying a higher vertical position than the e3 and e4 gyroscopes has its f1 frame released while at the same time gyroscope e3 has its f1 frame locked and immediately begins to exert an upward torque upon the craft. In this manner, each gyroscope in turn effects a degree of lift upon the craft while the other two oppose the downward pull of gravity achieving vertical lift or propulsion.

Figures 16 to 18 show a craft adapted to be driven by a gyroscopic propulsion system as described above, and comprises a circular rotatable interior cabin p, designed to function within a circular disc-shaped outer frame of the craft. The craft's movement is of a pivoting nature, which is derived from its propulsion system, these pivoting motions generate powerful centrifugal G-forces within the craft, which increase in strength proportionally to the number of pivoting actions, and the rapidity with which they occur. To avoid these centrifugal forces, the occupants who are situated within the cabin P are rotated in a direction opposite to that of the pivoting action. The combination of pivoting and rotational movements occurring simultaneously, causes all objects within the rotatable cabin to travel in a straight line as indicated in Figure 19. This arrangement enables the occupants of a craft, capable of rapid accelerations, decelerations, and abrupt right angle turns, to evade the tremendous G-forces which they would normally be subjected to, and which can never by avoided in a craft having the conventional straight line method of acceleration. Secondly, the pivoting action of the craft would be unexceptable as a means of transport without the rotatable cabin, which combined with the pivoting action of the craft, results in a smooth straight line movement for the occupants.

Since the forward movement of the craft is derived entirely from pivoting actions, the craft has angular acceleration, and since centrifugal G-force is the resistance of a mass to the rate of change of the direction and angular velocity, the force experienced must be in a direction opposite to that of the applied radial force. Therefore, a body rotated in a direction opposite to the applied radial force, cannot experience any G-Force derived from the craft's forward acceleration.

Figure 4 represents the craft as viewed from above. The pivoting motion of the craft is derived from its propulsion system. The pivoting actions occur at six intersections G1 to G6 horizontally through an angle of 60 degrees. If the first pivoting action occurs at G1 and no rotation of cable P takes place, the movement of the craft would cause a passenger P1 to be moved to position P2 and a centrifugal G-force would be experienced. If a rotation of cabin P occurred without the pivoting action at G1 a passenger P1 would be moved at P3 and would also experience a centrifugal G-force. However, if the pivoting action of G1 in a clockwise direction, and the rotation of cabin p in an anti-clockwise direction occur simultaneously, passenger P1 would be moved to position P4 along travel line P5 and experience almost zero G-force. G1 pivoting

60 degrees at its centre would move G2 to position G2 on pivot line P6, ready to repeat the process. All objects within any part of cabin P move along straight lines. P5 represents only the line along which P1 travels.

The craft comprises sphere C, shaft C1 and C2 bearings C7 and C8, and stator C9 (Figure 1) mounted within sphere P5 (Figure 2). Shafts C1 and C2 protrude through bearings C7 and C8 which are firmly held in bearing recesses P2 and P3. Stator C9 firmly fixed on shaft C1 occupies a position within rotor P4. Rotatable cabin P is rigidly connected to sphere P5 and is driven in an anti-clockwise direction by stators C9 and rotor p4. The whole assembly shown in Figure 1 and Figure 2 fits within the frame q (Figure 3) with shafts C1 and C2 protruding through shaft outlets q3 and q4 effectively locking sphere C and inner frame q rigidly together, while sphere p5 and rotatable cabin p are free to rotate around the sphere C and with the frame q.

Figures 20 to 22 show the craft of Figures 16 to 18 located in a thin rotatable outer skin 4. The rotation of this outer skin r enables the craft to minimize the tremendous heating effects, which a conventional aircraft or missile is subjected to when travelling at high supersonic speed. The aerodynamic shape of a disc is highly desirable in that it has no projections which disturb the air flow about the craft which could cause interference drag, and because the leading edge of the craft is continuously moving due to its rotation, the normal compression of air in shock waves which results in adiabatic heating is only able to act upon the same surface area of the craft for a short duration. The period of exposure to adiabatic heating effects may be determined by the rate of rotation of the outer skin. The design and propulsion systems of a conventional jet aircraft or missile make it impossible to rotate the entire surface area of the craft; this facility is only available to a craft having a circular disc shape and a completely internal propulsion system.

The craft comprises Sphere C, shafts C1 and C2, stators C3 and C4, bearings C5 and C6 (Figure 1), mounted within innter frame q (Figure 2) with shafts C1 and C2 protruding through shaft outlets q3 and q4 effectively locking sphere C and inner frame q rigidly together. Stators C3 and C4 rigidly mounted on shafts C1 and Cw are positioned in recesses q1 and q2. Sphere C and inner frame B fit within the outer skin r (Figure 4).

The rotors r1 and r2 are positioned around the stators C3 and C4 and within the recesses q1 and q2. The bearings C5 and C6 are mounted on shafts C1 and C2 fit within bearing recesses r3 and r4. The complete unit functions like a large double ended motor, driving the outer skin r in a clockwise direction.

In other embodiments the horizontal propulsion gyroscopes G1, G2, G3 may be realigned after each pivotal movement of the craft by using "reverse thrust pulses" derived by locking the gimbal assembly of each such gyroscope when they pass vertically upwards through the central horizontal plane through the propulsion unit. The additional locking of each gimbal assembly generates reverse thrust pulses which act to rotate spheres f, g, and the gyroscopes therein in an anti-clockwise direction as viewed in Figure 8. In this embodiment therefore the gyroscopes themselves are used to effect the required realignment thereof.

CLAIMS

1. A propulsion system comprising at least three gyroscopes each mounted for free universal pivotal movement at positions equi-angularly spaced about an axis of rotation, means to rotate the gyroscope about such axis, mean to lock selectively each gyroscope against said free universal pivotal movement to cause the respective gyroscope to process as the gyroscopes are rotated in use about said axis thereby to generate a precessional torque for propelling a craft in which the system is provided in use and means for permitting realignment of said axis of rotation to compensate for rotation thereof caused in use by each precessional torque impulse produced by locking the individual gyroscope assemblies in turn.

2. A propulsion system as claimed in claim 1 wherein each gyroscope is mounted in gimbals provided with releasable means for locking the pivot pins thereof.

3. A propulsion system as claimed in claim 2 wherein magnetic clutches are provided on the gimbals and arranged to clamp when actuated, said pivot pins.

4. A propulsion system as claimed in preceding claim wherein said gyroscopes are mounted as aforesaid at equally spaced locations around the inner surface of an equatorial zone of a hollow sphere which is mounted for rotation about its axis perpendicular to the plane containing the gyroscopes, which axis provides the aforesaid axis of rotation about which the gyroscopes are rotated in use.

5. A propulsion system as claimed in claim 4 wherein said sphere is rotatably mounted within a second larger diameter hollow sphere, the second sphere being rotatably mounted about an axis perpendicular to the axis of rotation of the first mentioned sphere to enable that axis of rotation to be realigned as aforesaid.

6. A propulsion system as claimed in claim 5 wherein said second sphere is rotatably mounted within a larger diameter third hollow support sphere.

7. A propulsion system as claimed in claim 5 or claim 6 wherein at least one motor is provided between the first-mentioned and the second sphere to drive the first-mentioned sphere about its axis of rotation relative to the second sphere, the motor having a stator located on the second sphere and a rotor located on the first-mentioned sphere.

8. A propulsion system as claimed in claim 6 or claim 7 when dependent on claim 6, wherein at least one motor, which is adapted for rotation in one direction only, is provided between the second and third spheres to drive the second sphere about its axis of rotation relative to the third sphere to effect realignment of said axis of rotation, the motor having a stator located on the third sphere and a

rotor located on the second sphere.

9. A propulsion system as claimed in any preceding claim wherein there is provided at least three further gyroscopes, each mounted for free universal pivotal movement at positions equi-angularly spaced about a further axis of rotation which is perpendicular to said first-mentioned axis of rotation, means to rotate the further gyroscopes about said further axis of rotation, means to lock selectively each further gyroscope against said free universal pivotal movement, and means for permitting realignment of the gyroscopes with respect to said further axis of rotation to compensate for misalignment therebetween caused, in use, by each precessional torque impulse produced by locking the individual gyroscope assemblies in turn.

10. A propulsion system as claimed in claim 9 wherein each gyroscope is mounted in gimbals provided with releasable means for locking the pivot pins thereof.

11. A propulsion system as claimed in claim 10 wherein magnetic clutches are provided on the gimbals and arranged to clamp, when actuated, said pivot pins.

12. A propulsion system as claimed in claim 10 or claim 11, wherein the outer ring of each gimbal is pivotally mounted and realigning means are provided to pivot such outer ring to effect realignment of the respective gyroscope as aforesaid.

13. A propulsion system as claimed in claim 12 wherein said realigning means comprises a ring gear rigid with said outer ring and drive means for rotating said ring gear.

14. A propulsion system as claimed in any one of claims 9 to 13, when dependent on claim 6, wherein said further gyroscopes are mounted within a hollow annular chamber which extends around an external equatorial zone of a fourth hollow sphere which surrounds and is rotatably mounted on said third support sphere.

15. A propulsion system as claimed in claim 14 wherein at least one motor is provided between the fourth and third spheres to drive the fourth sphere about said further axis of rotation relative to the third sphere, the motor having a stator located on the third sphere and a rotor located on the fourth sphere.

16. A craft incorporating a propulsion system according to any preceding claim, an annular passenger cabin rotatably mounted about the propulsion system, and means to rotate the cabin in a direction opposite that in which said gyroscopic precessional torque acts.

17. A craft as claimed in claim 16 further comprising a hollow outer housing which encloses the passenger cabin and is fixed with respect to a support structure or member of the propulsion unit.

18. A craft as claimed in claim 16 or claim 17 further comprising a hollow disc-like outer skin member which encloses and is rotatably mounted on the assembly of the propulsion system, the annular cabin and the outer housing, when provided, and means to rotate the skin member.

19. A craft as claimed in claim 18 wherein the outer surface of the skin member tapers progressively and smoothly in the radial direction from its central axis of rotation to a narrow outer peripheral edge.

20. A gyroscopic propulsion system substantially as hereinbefore described with reference to Figures 1 to 15 of the accompanying drawings.

21. A craft substantially as hereinbefore described with reference to Figures 16 to 19 or Figures 20 to 22 of the accompanying drawings.

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