CLAIMS

1. An assembly comprising:

a tube ~~including a~~ with an inner and outer wall and a void ~~defined~~ therein~~;~~, and

a cylinder ~~that fits into the tube void, the tube and~~ , the cylinder ~~being in a kinematic relationship allowing both axial and rotational~~ moving relative ~~motion;~~to the tube in an axial translation into and out of the tube void and rotationally relative to tube, ~~wherein, in use,~~ a shaft that the cylinder rotates around;

wherein the tube, cylinder and ~~tube~~shaft share a common central axis of rotation; wherein the tube and cylinder comprise one or more conductive members and magnetic members, configured so that, when the tube and cylinder have different relative speeds of rotation, eddy current drag forces are produced between the members resisting relative rotation between the tube and cylinder when the tube and cylinder overlap;

wherein axial movement of the cylinder is urged by an axial force imposed on the cylinder as a reaction to a rotational torque imposed on the shaft; and

when the cylinder and tube magnets and conductors interact together due to an overlap and different relative speeds of rotation to each other ~~and wherein the tube and cylinder or a part thereof interact to alter~~, an eddy current ~~induced~~ braking force is induced against different relative speed of motion of the tube and cylinder with a modulation of braking force arising due to a balance of the forces on the tube and cylinder caused by both rotational movement and axial movement of the tube and cylinder along the longitudinal axis to an equilibrium position of the tube and cylinder axially and rotationally to provide a controlled eddy current induced braking torque, wherein the tube rotates in a counter rotational direction to the cylinder and, as a result of axial translation of the cylinder, overlap between the tube and cylinder, and counter rotation, eddy current forces are generated between the tube and cylinder creating a drag force on rotation of the tube and cylinder thereby causing the relative speed of rotation of the tube and cylinder to reduce.

~~1. The assembly as claimed in claim 1 wherein the cylinder moves relative to the tube via two separate degrees of movement being:~~

~~(a) axial translation of the cylinder relative to the tube so that the cylinder can pass at least partially into or out of the tube void; and~~

~~(b) rotation of the cylinder relative to the tube about a longitudinal axis, the axis passing through the tube void.~~

2. The assembly as claimed in claim 1 wherein the ~~tube moves relative to the cylinder via two separate degrees of movement being:~~conductive member(s) is/are on the tube or

the tube itself is a conductive member and the magnetic member(s) are on the cylinder or the cylinder itself is a magnetic member.

3. The assembly as claimed in claim 1 wherein the conductive member(s) is/are on the cylinder or the cylinder itself is a conductive member and the magnetic member(s) are on the tube or the tube itself is a magnetic member.

4. The assembly as claimed in claim 1 wherein, prior to axial movement of the cylinder, the tube and the cylinder completely or partly overlap each other.

5. The assembly as claimed in claim 1 wherein prior to axial movement of the cylinder, the tube and the cylinder do not overlap each other.

6. An assembly comprising:

a tube with an inner and outer wall and a void therein, and

a cylinder, the cylinder moving relative to the tube in an axial translation ~~of the tube relative to the cylinder so that the cylinder can pass at least partially~~ into ~~or~~and out of the tube void~~;~~ and rotationally relative to tube,

a shaft that the cylinder rotates around;

wherein the tube, cylinder and shaft share a common central axis of rotation ~~of the tube relative to the cylinder about a~~ ;

wherein the tube and cylinder comprise one or more conductive members and magnetic members, configured so that, when the tube and cylinder have different relative speeds of rotation, eddy current drag forces are produced between the members resisting relative rotation between the tube and cylinder when the tube and cylinder overlap;

wherein axial movement of the cylinder is urged by an axial force imposed on the cylinder as a reaction to a rotational torque imposed on the shaft; and

when the cylinder and tube magnets and conductors interact together due to an overlap and different relative speeds of rotation to each other, an eddy current braking force is induced against different relative speed of motion of the tube and cylinder with a modulation of braking force arising due to a balance of the forces on the tube and cylinder caused by both rotational movement and axial movement of the tube and cylinder along the longitudinal axis~~, the axis passing through the tube void.~~ to an equilibrium position of the tube and cylinder axially and rotationally to provide a controlled eddy current induced braking torque;

~~The assembly as claimed in any one of the above claims~~ wherein~~, coupled~~ the shaft is attached to ~~the tube and~~ a spool of line to which an object is attached and, as a torque force is applied on the line and spool, line is paid out from the spool causing rotation of

the spool and shaft leading to cylinder rotation and subsequent axial movement into the tube void thereby causing an eddy current brake interaction between the cylinder and tube and thereby slowing cylinder rotation and hence pay out of line from the spool.

7. The assembly as claimed in claim 6 wherein the conductive member(s) is/are on the tube or the tube itself is a conductive member and the magnetic member(s) are on the cylinder or the cylinder itself is a magnetic member.

8. The assembly as claimed in claim 6 wherein the conductive member(s) is/are on the cylinder or the cylinder itself is a conductive member and the magnetic member(s) are on the tube or the tube itself is a magnetic member.

9. The assembly as claimed in claim 6 wherein, prior to axial movement of the cylinder, the tube and the cylinder completely or partly overlap each other.

10. The assembly as claimed in claim 6 wherein prior to axial movement of the cylinder, the tube and the cylinder do not overlap each other.

11. The assembly as claimed in claim 6 wherein the tube is fixed against rotation, the cylinder rotates, and as a result of axial translation of the cylinder, overlap between the tube and cylinder, and differing relative speeds of rotation, eddy current forces are generated between the tube and cylinder creating a drag force on rotation of the cylinder thereby causing the cylinder speed of rotation to reduce.

12. The assembly as claimed in claim 6 wherein the tube rotates in the same direction as the cylinder but at a different relative speed to the cylinder and, as a result of axial translation of the cylinder, overlap between the tube and cylinder, and differing relative speeds of rotation, eddy current forces are generated between the tube and cylinder creating a drag force on rotation of the tube and/or cylinder thereby causing the relative speed of rotation of the tube and cylinder to reduce.

13. An assembly comprising:

a tube with an inner and outer wall and a void therein, and wherein the tube comprises multiple concentric walls;

a cylinder, the cylinder moving relative to the tube in an axial translation into and out of the tube void and rotationally relative to tube, the tube comprising complementary wall openings, with the multiple concentric walls of the tube nesting within the complementary concentric wall openings of the cylinder;

a shaft that the cylinder rotates around;

wherein the tube, cylinder and shaft share a common central axis of rotation;

wherein the tube and cylinder comprise one or more conductive members and ~~one or more~~ magnetic members, configured so that, when the tube and cylinder ~~each having either magnetic member(s) or conductive member(s) and~~ have different relative speeds of rotation, eddy current drag forces are produced between the ~~conductive~~ members resisting relative rotation between the tube and cylinder when the tube and ~~magnetic members orientated to interact with each other.~~cylinder overlap;

~~2. The assembly as claimed in any one~~ wherein axial movement of the ~~above claims wherein the tube and~~ cylinder ~~have a common axis of rotation.~~

~~The assembly as claimed any one of the above claims wherein~~ is urged by an axial force imposed on the cylinder ~~rotates about a rotating member passing through the axis of rotation of the cylinder and tube.~~as a reaction to a rotational torque imposed on the shaft; and

~~3. The assembly as claimed in claim any one of the above claims wherein the tube and cylinder are connected in a manner wherein a kinematic relationship exists where relative rotation of the tube and cylinder along their axes is linked to a corresponding relative translational motion.~~

~~4. The assembly as claimed in any one of the above claims wherein the conductive member or members are wider than the magnetic member or members.~~

~~5. The assembly as claimed in any one of the above claims wherein a gap between the magnetic and conductive members is minimised in order to maximise the braking force on rotation due to eddy current formation.~~

~~6. The assembly as claimed in any one of the above claims wherein the tube is fixed in place and the cylinder moves axially and rotationally relative to the tube.~~

~~7. The assembly as claimed in any one of claims 1 to 9 wherein the cylinder is fixed in place and the tube moves axially and rotationally relative to the cylinder.~~

~~8. The assembly as claimed in any one of claims 1 to 9 wherein the cylinder and tube rotate at a different relative speeds in a co-current or counter-current direction.~~

~~9. The assembly as claimed in any one of the above claims wherein the cylinder and tube are at least partially separate when the cylinder and/or tube are not rotating.~~

when the cylinder and tube magnets and conductors interact together due to an overlap and different relative speeds of rotation to each other, an eddy current braking force is induced against different relative speed of motion of the tube and cylinder with a modulation of braking force arising due to a balance of the forces on the tube and cylinder

caused by both rotational movement and axial movement of the tube and cylinder along the longitudinal axis to an equilibrium position of the tube and cylinder axially and rotationally to provide a controlled eddy current induced braking torque.

14. The assembly as claimed in claim 13 wherein the conductive member(s) is/are on the tube or the tube itself is a conductive member and the magnetic member(s) are on the cylinder or the cylinder itself is a magnetic member.

15. The assembly as claimed in claim 13 wherein the conductive member(s) is/are on the cylinder or the cylinder itself is a conductive member and the magnetic member(s) are on the tube or the tube itself is a magnetic member.

16. The assembly as claimed in ~~any one of claims 1 to 12~~claim 13 wherein, prior to axial movement of the cylinder ~~is at least partially inside,~~ the tube ~~when~~and the cylinder ~~and/~~completely or ~~tube are not rotating.~~ partly overlap each other.

17. The assembly as claimed in ~~any one of the above claims~~claim 13 wherein ~~varying~~prior to axial movement of the cylinder, the ~~at least one magnet member strength~~ tube and~~/or position on~~ the cylinder ~~or tube varies the brake response~~do not overlap each other.

~~10.~~18. The assembly as claimed in ~~any one of the above claims~~claim 13 wherein ~~varying the at least one conductive member ferrous content and/or position on~~ the tube is fixed against rotation, the cylinder ~~or tube varies the brake response.~~

~~The assembly~~rotates, and as ~~claimed in any one~~a result of axial translation of the ~~above claims wherein varying the~~cylinder, overlap between the tube and cylinder, and differing relative speeds of rotation, eddy current forces are generated between the tube and cylinder creating a drag force on rotation of the cylinder thereby causing the cylinder speed of rotation ~~of the tube and cylinder varies the brake response.~~ to reduce.

~~The assembly as claimed in any one of the above claims~~

19. The assembly as claimed in claim 13 wherein the tube rotates in the same direction as the cylinder but at a different relative speed to the cylinder and, as a result of axial translation of the cylinder, overlap between the tube and cylinder, and differing relative speeds of rotation, eddy current forces are generated between the tube and cylinder creating a drag force on rotation of the tube and/or cylinder thereby causing the relative speed of rotation of the tube and cylinder to reduce.

~~11.~~20. The assembly as claimed in claim 6 or claim 13, wherein ~~at least part of the cylinder contains or is formed from electrically conductive material and thereby itself forms a conductive member.~~

~~12. The assembly as claimed in any one of claims 1 to 17 wherein at least part of the tube contains or is formed from electrically conductive material and thereby itself forms a conductive member.~~

~~13. The assembly as claimed~~the tube rotates in ~~any one of~~ a counter rotational direction to the ~~above claims wherein axial movement of the tube and/or~~ cylinder ~~is actuated via at least one motor.~~

~~14. The assembly~~and, as ~~claimed in any one of the above claims wherein the assembly includes a bias member that creates~~ a ~~direct or indirect axial force on~~result of axial translation of the cylinder, overlap between the tube and~~/or cylinder, biasing the tube and/or~~ cylinder ~~together or apart~~, and counter rotation, eddy current forces are generated between the tube and cylinder creating a drag force on rotation of the tube and~~/or cylinder.~~

~~15. The assembly as claimed in any one of the above claims wherein axial movement of the tube and/or cylinder is generated when the tube and/or cylinder rotates, the axial movement caused by a translation of centrifugal energy into axial translation.~~

~~16. The assembly as claimed in any one of the above claims wherein the tube and/or cylinder includes at least one weight off-set from the axis of rotation, that on rotation of the tube and/or cylinder, is subject a centrifugal force and, via a kinematic relationship, translates the centrifugal force into an axial force on the tube and/or~~ cylinder thereby causing the relative ~~axial movement~~speed of rotation of the tube and~~/or cylinder.~~

~~17. The assembly as claimed in claim 23 wherein a lever converting rotational movement of the weight to axial movement of the cylinder or tube acts to form the kinematic relationship.~~

~~18. The assembly as claimed in claim 24 wherein the weight or weights move at least partially radially on application of a centrifugal force.~~

~~The assembly as claimed in any one of the above claims wherein the axis and rotation of the tube and/or cylinder is linked to a shaft which is in turn linked~~cylinder to ~~a spool of line and wherein the assembly regulates the speed of pay out of the line from the spool.~~ reduce.

~~19. The assembly as claimed in claim 26 wherein the assembly includes a retraction mechanism that retracts paid out line back onto the spool when a retracting force is removed.~~

~~20. The assembly as claimed in claim 26 or claim 27 wherein the braking force applied to pay out of the spool of line is at a substantially constant speed for extension over a range of applied torque.~~

~~21. The assembly as claimed in any one of the above claims wherein the assembly includes a housing, the housing enclosing at least a portion of the assembly.~~

~~22. The assembly as claimed in any one of the above claims wherein the tube and/or cylinder are formed with multiple nesting concentric walls.~~

~~23. A method of braking the fall of an object by the step of linking the object or objects to a spool of line as claimed in any one of claims 26 to 28 and allowing the object or objects to fall through gravity thereby creating a torque force on the shaft which in turn causes the assembly to create a braking force on pay out of the line from the spool.~~

~~24. The method as claimed in claim 31, wherein the braking force also reduces retraction speed of the line enough to allow a fully extended line with nothing attached to the line to cleanly retract.~~

~~25. The method as claimed in claim 31 or claim 32, wherein the range of applied torque covers objects attached to the line weighing from about 9 to about 150 kilograms.~~

~~26. A fall protection safety device including an assembly as claimed in any one of claims 1 to 30.~~

~~27. An assembly as claimed in any one of claims 1 to 30 wherein the assembly is incorporated into a zip line amusement ride to control the acceleration and deceleration of a suspended zip line passenger chair.~~