DESCRIPTION

TITLE OF INVENTION: LATCH ACTIVATION BETWEEN ELEMENTS

TECHNICAL FIELD

Described herein is a system, method of use and Self Retracting Lifeline (SRL) apparatus using the system to control relative speed between members.

BACKGROUND ART

The applicant's co-pending and granted patents in the field of eddy current related devices include US 8,851,235, US 8,490,751, NZ619034, NZ627617, NZ627619, NZ627633, NZ627630 and other equivalents all incorporated herein by reference. NZ627617 in particular, describes a method of achieving a latch operation between elements the contents of which are incorporated herein by reference. While the devices described in NZ627617 may be useful, other methods of controlling relative movement and/or braking may also be achieved or at least provide the public with a choice.

Further aspects and advantages of the system, method of use and Self Retracting Lifeline (SRL) apparatus should become apparent from the ensuing description that is given by way of example only.

SUMMARY

Described herein is a system, method of use and Self Retracting Lifeline (SRL) apparatus using the system that govern a dynamic response between members causing a halt in relative motion between the members. Magnetic interactions, eddy current drag forces and centrifugal and/or inertial forces may provide various mechanisms of governing movement.

In a first aspect, there is provided a system with at least two members in a kinematic relationship, the system comprising a means of coupling a first member to at least one

further member and in doing so causing synchronised relative motion between the members, wherein coupling occurs in response to a prescribed system dynamic response, the dynamic response selected from at least one of:

(a) a particular velocity action of one or more of the members;
(b) a particular acceleration action of one or more of the elements;
(c) a particular jerk action of one or more of the elements.

In a second aspect, there is provided a method of governing relative movement between members by the steps of:

(a) selecting the system substantially as described herein;
(b) applying a motive force on the system causing movement of at least one member in the system;
(c) causing coupling between the members when the prescribed system dynamic response occurs.

In a third aspect, there is provided a Self Retracting Lifeline (SRL) incorporating the system substantially as described herein.

The system, method of use and SRL device described offer the advantage of providing alternative ways of achieving movement control or at least provide the public with a choice.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects of the system, method of use and SRL device will become apparent from the following description that is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 illustrates a simplified elevation view of one embodiment of incorporating a magnetic interaction between a braking and moving element;

Figure 2 illustrates a simplified elevation view of an alternative bi-stable embodiment;

Figure 3 illustrates a graph showing the magnetic force interaction for the above bi-stable embodiment;

Figure 4 illustrates a perspective view and elevation view of an alternative embodiment employing a cogging torque approach;

Figure 5 illustrates two graphs showing the velocity dependent result from the cogging torque approach;

Figure 6 illustrates a simplified elevation view of a cogging torque approach of a barking and moving element;

Figure 7 illustrates a simplified elevation view of an alternative embodiment utilising a rotational degree of freedom;

Figure 8 illustrates elevation views of alternative cam path embodiments;

Figure 9 illustrates elevation views of alternative cam path embodiments;

Figure 10 illustrates perspective views of alternative cam path embodiments;

Figure 11 illustrates a simplified perspective view of an alternative cam path embodiment;

Figure 12 illustrates simplified perspective and elevation views of an alternative cam path embodiment;

Figure 13 illustrates a simplified elevation view of an alternative cam path embodiment;

Figure 14 illustrates various elevation views of an alternative embodiment using a combination of a cam, geometry, inertial response and eddy current;

Figure 15 illustrates a simplified elevation view of an art velocity sensitive device using pawls;

Figure 16 illustrates a simplified elevation view of an art acceleration sensitive device using pawls;

Figure 17 illustrates a simplified elevation view of a jerk sensitive device;

Figure 18 illustrates a simplified elevation view of the jerk sensitive device of

Figure 17 in a varying alignment;

Figure 19 illustrates a simplified elevation views of the magnetic interaction from the embodiment of Figures 17 and 18; and

Figure 20 illustrates a simplified elevation view of an alternative jerk sensitive device.

DETAILED DESCRIPTION

As noted above, described herein is a system, method of use and Self Retracting Lifeline (SRL) apparatus using the system that govern a dynamic response between members causing a halt in relative motion between the members. Magnetic interactions, eddy current drag forces and centrifugal and/or inertial forces may provide various mechanisms of governing movement.

For the purposes of this specification, the term ‘about’ or ‘approximately’ and grammatical variations thereof mean a quantity, level, degree, value, number, frequency, percentage, dimension, size, amount, weight or length that varies by as much as 30, 25, 20, 15, 10, 9, 8, 7, 6, 5, 4, 3, 2, or 1% to a reference quantity, level, degree, value, number, frequency, percentage, dimension, size, amount, weight or length.

The term ‘substantially’ or grammatical variations thereof refers to at least about 50%, for example 75%, 85%, 95% or 98%.

The term 'comprise' and grammatical variations thereof shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements.

The term ‘jerk’ or grammatical variations thereof refers to a change in acceleration, typically a rapid and sudden change in acceleration compared to normal operating parameters.

In a first aspect, there is provided a system with at least two members in a kinematic relationship, the system comprising a means of coupling a first member to at least one

further member and in doing so causing synchronised relative motion between the members, wherein coupling occurs in response to a prescribed system dynamic response, the dynamic response selected from at least one of:

(a) a particular velocity action of one or more of the members;
(b) a particular acceleration action of one or more of the elements;
(c) a particular jerk action of one or more of the elements.

The inventors have in effect produced a system relating to coupling members together based on the system dynamic response. The aim is to bring the members into synchronised motion under predetermined conditions.

Coupling between the members may be achieved:

(a) mechanically;
(b) magnetically;
(c) a combination of mechanically and magnetically.

Coupling may occur passively and once coupled the members may be remain coupled or may be releasably coupled. Coupling may instead be achieved via an active means.

The synchronised motion may be a zero absolute velocity or halting effect. This effect for example may be useful where all motion needs to stop, for example in a fall safety apparatus.

Coupling may also be based on, or at least influenced by, eddy current induced drag. This is not essential in the inventors experience but may be useful to further tune the dynamic response characteristics.

In one specific embodiment, coupling between the members may be achieved via mechanical coupling between at least one pawl linked to the first member, the pawl having an oscillatory movement action, and at least one latch member on, or being, the at least one further member, coupling occurring at a speed threshold according to the prescribed system dynamic response.

A bias relationship may exist between the pawl and the latch member, the bias being achieved through use of at least one magnet arranged for attraction, repulsion, or alternating attraction and repulsion, of the pawl.

At least one magnetic element may be located on both the pawl and first member and when rotation of the pawl and first member occurs, a varying bias results and hence oscillatory pawl movement occurs. The pawl may be axially mounted on the first member and the pawl centre of gravity may be off set from the pawl axis of rotation thereby further influencing the oscillation effect.

As may be appreciated, the degree of oscillation of the pawl may be varied depending for example on the relative rates of motion of the first member and pawl (or first member and at least one further member.

The pawl dynamic response may be further tuned by varying the inertia of the pawl. As noted above, the centre of mass of the pawl may be off set from the pawl axis of rotation assuming the pawl is connected in this manner to the first member. A part or parts of the pawl may be weighted so as to tune the inertia of the pawl to movement thereby tuning the dynamic response of the system.

The system may act as follows:

(a) at a predetermined speed, coupling may occur when the pawl moves to a deployed position for a sufficient time period such that it couples with the latch member; and
(b) at speeds below the predetermined speed, the pawl may not couple.

Coupling may be avoided by having the pawl skip over the latch member – that is the pawl may not be sufficiently deployed to interfere with the latch member. Skipping over may continue until the inertial effects of the pawl are overcome and the pawl deploys sufficiently far to couple with the latch member.

The system may further act so that:

(a) the pawl may remain coupled when the speed of motion is insufficient to overcome the inertial effects of the pawl; and
(b) decoupling may occur when the speed of motion is sufficient to overcome the inertial effects of the pawl.

The degree of bias noted above causing oscillation may be configured to provide the desired dynamic response behaviour of the pawl.

In an alternative specific embodiment, coupling between the members may be achieved by a mechanical cam system based on the reaction effects of inertial forces and/or applied drag forces according to the prescribed system dynamic response.

In the above system, the first and at least one further member may be aligned together and the cam feature may be located between the first and at least one further member. In effect, the system has at least two independent but moving members.

The at least one further member may be configured with either or both of inertial characteristics and/or retarding drag due to motion such that it is subject to a slowed motion with respect to the first member when a motive force is applied on the system.

Relative velocity between the first and at least one further member may provide a displacement between the members and may urge the members to separate due to the cam profile prescribed movement path. Separation refers to the members moving apart with respect to each other.

Movement of the at least one further member may cause coupling with a latch member on or about the first member, coupling at least one anchor on the at least one further member to the latch member.

As may be appreciated, coupling of the further member to the latch member also results in coupling indirectly between the first and further member.

Coupling may be achieved via:

(a) a geometric latching interface;
(b) attraction of magnetic poles; or
(c) a combination of a geometric latching interface and attraction of magnetic poles.

In a further specific embodiment, coupling may rely on magnetic forces between the members wherein the magnetic forces between the members are configured to achieve an attraction force between the members, the attraction force being sufficient to slow and halt relative motion between the members resulting in synchronised relative motion according to the prescribed system dynamic response.

The magnetic forces may be imposed by magnetic pole elements acting between the members. For the purposes of this specification, magnetic pole action is termed 'cogging'. The cogging system may be designed in consideration of the dynamic behaviour of the connected system and any peripheral energy absorbing means such that the system achieves a stop and hold action under the intended conditions. The magnetic pole elements may be configured to be ineffective or inactive under predetermined conditions. Variation in magnetic pole action may for example be achieved by varying the separation distance between members or parts thereof containing the magnet or magnets thereby reducing the magnetic interaction forces.

The system above may be a continuously coupled system where an externally applied motive force results in initial movement of the members, but a slow and halt action takes effect immediately between the members provided the motive force is sufficient to induce the prescribed system dynamic response.

As may be appreciated, in the first aspect above and the specific embodiments described, the members may move in a substantially linear kinematic relationship. Alternatively, the members may move in a substantially rotational kinematic relationship. Both actions may be possible and appropriate depending on the device in which the system may be used. Examples given or used herein are described in the rotational embodiment. Linear equivalent embodiments will be obvious to someone skilled in the art.

In a yet further specific embodiment, the members may be in a substantially rotational kinematic relationship and coupling between the members may be achieved via a centrifugal based system designed so that, on application of a motive force of a predetermined magnitude, the members couple together according to the prescribed system dynamic response.

The centrifugal forces acting on the members may be influenced by use of at least one weight or weighted element or part thereof.

The first and at least one further member may be aligned together and the centrifugal feature or features may be located between the first and at least one further member.

Velocity of the members may urge a displacement of the centrifugal feature or

features which in turn urges the members to separate due to the centrifugal force imposed on the at least one further member.

Movement of the at least one further member may cause coupling with a latch member on or about the first member, coupling at least one anchor of the at least one further member to the latch member. As may be appreciated, coupling of the further member to the latch member also results in coupling indirectly between the first and further member.

Coupling may be achieved via:

(a) a geometric latching interface;
(b) attraction of magnetic poles; or
(c) a combination of a geometric latching interface and attraction of magnetic poles.

As noted above, the dynamic response may be in one of three ways. In more detail, specific examples of how the three actions might take place may be as follows:

- A velocity sensitive device may be configured using pawls that are activated by centripetal forces acting against the constraint of a biasing element;
- An acceleration sensitive device may make use of the inertial behaviour of a pawl causing rotation of the pawl about its pivot in response to acceleration of the pawl mounting plate;
- A jerk sensitive device may be configured by making use of the non-linear shear force capacity that exists between a pair of magnetic poles.

As should be appreciated, the configuration may be varied and the above options should be seen as non-limiting examples only.

In a second aspect, there is provided a method of governing relative movement between members by the steps of:

(a) selecting the system substantially as described herein;
(b) applying a motive force on the system causing movement of at least one member in the system;
(c) causing coupling between the members when the prescribed system dynamic

response occurs.

In a third aspect, there is provided a Self Retracting Lifeline (SRL) incorporating the system substantially as described herein.

As noted above, the devices described may be used in SRL devices. The ability to detect and activate a braking element is important for SRL apparatus.

Detection of a fall event is commonly triggered by a mechanism that responds to a change in state of the line. Mechanisms can potentially be triggered by the displacement, velocity, acceleration or jerk (rate of change of acceleration) of the line, or by a combination of these signals.

Existing SRLs commonly make use of velocity or acceleration mechanisms, typically using a ratchet and pawl arrangement to couple the spool to a brake. Either the ratchet plate or the pawl set can be attached to the rotating spool.

A linear configuration may comprise a means of sensing a change in acceleration (jerk) of a carrier (moving element). The carrier may be attached to a rider (braking element) of known mass with a given inertia. When a contact force is applied to the carrier the rider and carrier remain coupled and aligned. A change in the applied force to the carrier (jerk) causes the rider to slip relative to the carrier due to the inertial effects. The inertial effects may then be tracked through displacement between the rider and carrier. When the carrier acceleration changes, the relative displacement between the rider and carrier also changes.

The same principle may be used in a rotational sense. The rider may be free to rotate with the carrier. A change in angular acceleration applied to the carrier may be resolved as a relative angular displacement between the carrier and rider.

Besides SRL applications, the devices and methods may be used for a variety of other applications, non-limiting examples including speed control or load control of:

- An autobelay device;
- A rotor in a rotary turbine;
- Exercise equipment e.g. rowing machines, epicyclic trainers, weight training equipment;

- Roller-coasters and other amusement rides;
- Elevator and escalator systems;
- Evacuation descenders and fire escape devices;
- Conveyer systems:
- Rotary drives in factory production facilities;
- Materials handling devices such as conveyer belts or a braking device in a chute;
- Roadside safety systems e.g. the energy absorber may be connected in a system to provide crash attenuation though the dissipation of energy via the energy absorber;
- Seat belts in vehicles;
- Zip lines;
- Braking mechanisms for trolleys and carriages;
- Bumpstops in transport applications;
- Bumpstops in crane applications;
- Torque or force limiting devices in mechanical drive train;
- Structural overload protection in wind turbines;
- Load limiting and energy dissipation in structures, buildings and bridges.

The system, method of use and SRL device described above offer the advantage of providing alternative ways of achieving movement control beyond for example reliance on centrifugal and/or eddy current forces alone. In addition, the relationship between the parts and the rate at which movement control occurs may also be influenced using the embodiments described herein.

The embodiments described above may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which the embodiments relate, such known equivalents are deemed to be incorporated herein as of individually set forth.

Where specific integers are mentioned herein which have known equivalents in the

art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

WORKING EXAMPLES

The above described system, method of use and examples of Self Retracting Lifeline (SRL) apparatus using the devices are now described by reference to specific examples.

EXAMPLE 1

General examples are provided below of magnetic latching caused by movement of a braking element.

Figure 1 illustrates an example of magnetic latching caused by movement of a pawl. Direct attractive forces exerted by permanent magnets 10 may be used to either augment or replace eddy current drag forces (if eddy current forces are used) as a means of activating a pawl 11 between the spool 12 (the first member) and a concentric external element 13 (the further member). When the pawl 11 is latched with the concentric external element 13, movement between the spool 12 and concentric external element 13 is synchronised.

EXAMPLE 2

A bi-stable arrangement can be used in conjunction with a tube and cylinder (plunger) approach described in the applicants co-pending application NZ619034. In this example, as illustrated in Figure 2, a plunger 50 eddy current brake configuration is shown as a means of delaying the initial relative motion between the active brake element/plunger 50 and the lead screw 51 and/or to latch and lock the brake 50 at the end of the plunger axial travel stroke 52, 53. The output in terms of force/movement interaction is graphed in Figure 3 showing how the force at either end of the plunger stroke 52, 53 is high and subsequently drops through the travel phase of the plunger stroke 52, 53 noting that the term force refers to the force

required to translate the plunger sideways and movement is the lateral movement of the plunger.

EXAMPLE 3

In a further embodiment, a cogging example is illustrated in Figure 4. A cogging torque results from magnetic poles rotating with respect to each other generally indicated by arrow 60. This results in a speed-dependent torque relationship best seen in the graphs shown in Figure 5 where F refers to the force/degree of oscillation and o refers to the movement path that can enable low-speed lock-off of a brake that relies on eddy current braking (the highest latching force occurs at low speed).

Figure 6 shows how the magnets 60 align at low speed thereby halting further movement. This embodiment allows a complete halt in relative movement between the parts but without part interference or friction – that is braking is frictionless.

Figure 6 also illustrates a centrifugal embodiment. One of the members includes weighted balls that move along a defined path. At maximum rotation force, the balls move to alter the centre of gravity thereby changing the dynamic response of the system.

EXAMPLE 4

Magnetic latching of a braking element can also be configured about a rotational degree of freedom normal to the primary drive axis, in this example being the rotation axis 70 of the braking element 71 relative to the moving element 72 (a rotor). Figure 7 illustrates three embodiments of this type of system. Also shown in the Figure 7 embodiments is the use of a bias (magnets and/or springs) that further tune the dynamic response of the system.

EXAMPLE 5

Relative rotation between the moving and braking elements may also be further

influenced by use of inertial or centrifugal forces resulting in differential velocity between the elements. In one embodiment, a differential velocity may be used to drive an axial displacement via a cam path 100 as illustrated in Figures 8 to 13. Different profiles can be used to control ball movement and thus alter the centrifugal force acting on the parts and their movement characteristics.

The axial load required to maintain contact between the two halves in the embodiments shown in Figures 8 to 13 may be generated by a spring force, a magnetic repulsive force or as a result of eddy current drag torque acting through the cam 100 angle. Additional detail on this force generation is shown in Figures 12 and 13.

EXAMPLE 6

Another arrangement that exploits the combination of cam geometry, inertial response and the eddy current drag force-speed relationship is shown in Figure 14.

EXAMPLE 7

As noted above, the ability to detect and activate a braking element is important for SRL apparatus.

Detection of a fall event is commonly triggered by a mechanism that responds to a change in state of the line. Mechanisms can potentially be triggered by the displacement, velocity, acceleration or jerk (rate of change of acceleration) of the line, or by a combination of these signals.

Existing SRLs commonly make use of velocity or acceleration mechanisms, typically using a ratchet and pawl arrangement to couple the spool to a brake. Either the ratchet plate or the pawl set can be attached to the rotating spool.

An art velocity sensitive device can be configured using pawls (braking elements) 110 that are activated by centripetal forces acting against the constraint of a biasing element (spring) 111 as illustrated in Figure 15.

An art acceleration sensitive device can make use of the inertial behaviour of the pawl

112 causing rotation of the pawl 112 about its pivot 113 in response to acceleration of the pawl 112 mounting plate. This approach is illustrated in Figure 16.

EXAMPLE 8

A jerk sensitive device can be configured by making use of the non-linear shear force capacity that exists between a pair of magnetic poles.

A linear configuration is illustrated in Figures 17 to 19. The configuration shows a means of sensing the change in acceleration (jerk) of a carrier. The carrier 120 is attached to a rider 130 of known mass with a given inertia. When a contact force is applied to the carrier 120 the rider 130 and carrier 120 remain coupled and aligned. A change in the applied force to the carrier 120 (jerk) causes the rider 130 to slip relative to the carrier 120 due to the inertial effects. The inertial effects may then be tracked through displacement 'd'. When the carrier 120 acceleration changes, the relative displacement between the rider 130 and carrier 120 changes.

Aspects of the system, method of use and Self Retracting Lifeline (SRL) apparatus using the system have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope of the claims herein.

CLAIMS

Claim 1: A system with at least two members in a kinematic relationship, the system comprising a means of coupling a first member to at least one further member and in doing so causing synchronised relative motion between the members, wherein coupling occurs in response to a prescribed system dynamic response, the dynamic response selected from at least one of:

(a) a particular velocity action of one or more of the members;
(b) a particular acceleration action of one or more of the members;
(c) a particular jerk action of one or more of the members; and

wherein coupling between the members is achieved via mechanical coupling between at least one pawl linked to the first member, the pawl having an oscillatory movement action, and at least one latch member on, or being, the at least one further member, coupling occurring at a speed threshold according to the prescribed system dynamic response.

Claim 2: The system as claimed in claim 1 wherein a bias relationship exists between the pawl and the latch member the bias being achieved through use of at least one magnet arranged for attraction, repulsion, or alternating attraction and repulsion, of the pawl.

Claim 3: The system as claimed in claim 2 wherein at least one magnetic element is located on both the pawl and first member and when rotation of the pawl and first member occurs, a varying bias results and hence oscillatory pawl movement occurs.

Claim 4: The system as claimed in any one of the above claims wherein the pawl dynamic response is further tuned by varying the inertia of the pawl.

Claim 5: The system as claimed in any one of the above claims wherein:

(a) at a predetermined speed, coupling occurs when the pawl moves to a deployed position for a sufficient time period such that it couples with the latch member; and
(b) at speeds below the predetermined speed, the pawl does not couple.

Claim 6: The system as claimed in any one of claims 1 to 4 wherein:

(a) the pawl remains coupled when the speed of motion is insufficient to overcome the inertial effects of the pawl; and
(b) decoupling occurs when the speed of motion is sufficient to overcome the inertial effects of the pawl.

Claim 7: A system with at least two members in a kinematic relationship, the system comprising a means of coupling a first member to at least one further member and in doing so causing synchronised relative motion between the members, wherein coupling occurs in response to a prescribed system dynamic response, the dynamic response selected from at least one of:

(a) a particular velocity action of one or more of the members;
(b) a particular acceleration action of one or more of the members;
(c) a particular jerk action of one or more of the members; and

wherein coupling between the members is achieved by a mechanical cam system based on the reaction effects of inertial forces and/or applied drag forces according to the prescribed system dynamic response; and

wherein relative velocity between the first and at least one further member provides a displacement between the members and urges the members to separate due to the cam profile prescribed movement path and movement of the at least one further member causes coupling with a latch member on or about the first member, coupling at least one anchor on the at least one further member to the latch member.

Claim 8: The system as claimed in claim 7 wherein the first and at least one further member are aligned together and the cam feature is located between the first and at least one further member.

Claim 9: The system as claimed in claim 7 or claim 8 wherein coupling is achieved via:

(a) a geometric latching interface;
(b) attraction of magnetic poles; or
(c) a combination of a geometric latching interface and attraction of magnetic poles.

Claim 10: A system with at least two members in a kinematic relationship with a peripheral energy absorbing means, the system comprising a means of coupling a first member to at least one further member and in doing so causing synchronised relative motion between the members, wherein coupling occurs in response to a prescribed system dynamic response, the dynamic response selected from at least one of:

(a) a particular velocity action of one or more of the members;
(b) a particular acceleration action of one or more of the members;
(c) a particular jerk action of one or more of the members; and

wherein coupling occurs without part interference or friction and relies on magnetic forces between the members wherein the magnetic forces between the members are configured to achieve an attraction force between the members, the attraction force being sufficient to stop and hold relative motion between the members taking into consideration the dynamic behaviour of the peripheral energy absorbing means, resulting in synchronised relative motion according to the prescribed system dynamic response.

Claim 11: The system as claimed in claim 10 wherein the peripheral energy absorbing means slows relative motion between the first member and at least one further

member.

Claim 12: The system as claimed in claim 10 or claim 11 wherein the peripheral energy absorbing means relies on eddy current braking.

Claim 13: The system as claimed in any one of claims 10 to 12 wherein the magnetic forces are imposed by magnetic pole elements acting between the members.

Claim 14: The system as claimed in claim 13 wherein the magnetic pole elements are configured to be ineffective or inactive under predetermined conditions.

Claim 15: The system as claimed in any one of claims 10 to 14 wherein the system is a continuously coupled system where an externally applied motive force results in initial movement of the members, but a slow and halt action takes effect immediately between the members provided the motive force is sufficient to induce the prescribed system dynamic response.

Claim 16: The system as claimed in any one of the above claims wherein the members move in a substantially linear kinematic relationship.

Claim 17: The system as claimed in any one of claims 1 to 15 wherein the members move in a substantially rotational kinematic relationship.

Claim 18: A system with at least two members in a kinematic relationship, the system comprising a means of coupling a first member to at least one further member and in doing so causing synchronised relative motion between the members, wherein coupling occurs in response to a prescribed system dynamic response, the dynamic response selected from at least one of:

(a) a particular velocity action of one or more of the members;

(b) a particular acceleration action of one or more of the members;

(c) a particular jerk action of one or more of the members; and

wherein the first and at least one further member are in a substantially rotational kinematic relationship and are aligned together with a centrifugal feature or features located between the first and at least one further member; and

on application of a motive force of a predetermined magnitude to the system, a displacement of the centrifugal feature or features occurs relative to the first and at least one further member which in turn urges the members to separate via axial displacement, the members then coupling together according to the prescribed system dynamic response.

Claim 19: The device as claimed in claim 18 wherein the centrifugal forces acting on the members are influenced by use of at least one weight or weighted element or part thereof.

Claim 20: The system as claimed in claim 18 or claim 19 wherein axial displacement occurs via a cam path.

Claim 21: The system as claimed in any one of claims 18 to 20 wherein the axial load required to maintain contact between the members is generated by: a spring force, a magnetic repulsive force or as a result of eddy current drag torque.

Claim 22: The system as claimed in any one of claims 18 to 21 wherein the at least one further member couples with a latch member on or about the first member, coupling at least one mooring of the at least one further member to the latch member.

Claim 23: The system as claimed in claim 22 wherein coupling is achieved via:

(a) a geometric latching interface;

(b) attraction of magnetic poles; or

(c) a combination of a geometric latching interface and attraction of magnetic poles.

Claim 24: The system as claimed in any one of the above claims wherein coupling between the members is achieved:

(a) mechanically;
(b) magnetically;
(c) a combination of mechanically and magnetically.

Claim 25: The system as claimed in any one of the above claims wherein the synchronised motion is a zero absolute velocity or halting effect.

Claim 26: The system as claimed in any one of the above claims wherein coupling is also based on, or at least influenced by, eddy current induced drag.

Claim 27: A Self Retracting Lifeline (SRL) incorporating the system as claimed in any one of the above claims.

Claim 28: A method of governing relative movement between members by the steps of:

(a) selecting the system as claimed in any one of claims 1 to 26

(b) applying a motive force on the system causing movement of at least one member in the system;

(c) causing coupling between the members when the prescribed system dynamic response occurs.