JET BRIDGE FALL PROTECTION ASSEMBLY

BACKGROUND

[0001] Fall protection and fall arrest systems that protect workers are used in work locations where a fall could cause injury or death. A typical fall arrest system includes a safety harness that is donned by the worker, a lifeline that is attached to the harness, and a support structure to which the lifeline is connected. This system works well in typical situations where a stationary stable support structure is available for attachment. However, it is desired in the art for a safety system where a stationary support is not available.

[0002] For the reasons stated above and for other reasons stated below which will become apparent to those skilled in the art upon reading and understanding the present specification, there is a need in the art for a protection assembly for workers required to work on an expanding and retracting housing without a stationary support structure available for use.

SUMMARY OF INVENTION

[0003] The above-mentioned problems of current systems are addressed by embodiments of the present invention and will be understood by reading and studying the following specification. The following summary is made by way of example and not by way of limitation. It is merely provided to aid the reader in understanding some of the aspects of the invention.

~~**[0004]** In one embodiment, a fall protection system is provided. The fall protection system includes at least one rail section, at least one shuttle and at least one connecting member. The at least one rail section is configured and arranged to be coupled to a structure that changes in length. The at least one shuttle is configured and arranged to movably engage the at least one rail section. In addition, the at least one connecting member is configured and arranged to provide a connection point to the at least one shuttle.~~

[0004] According to an aspect of the present invention, there is provided a fall protection system comprising:

at least one rail section configured and arranged to be coupled to a structure that changes in length;

at least one shuttle configured and arranged to slidably engage the at least one rail section; the at least one shuttle including,

a main body portion having at least one main body connector, the at least one main body connector having a locking groove,

a locking body portion having at least one locking body connector, the locking body connector of the locking body portion pivotally coupled to the at least one main body connector of the main body portion, the locking body connector including a locking body chamber,

at least one locking member at least partially received in the locking body chamber of the at least one locking body connector of the locking body portion, the locking member having a barrel portion, a recessed portion and a bore in an end of the locking member,

a biasing member for each locking member, the biasing member at least partially received in the bore of the locking member, the biasing member configured and arranged to bias the locking member so that the barrel portion of the locking member is received in the locking groove of the at least one main body connector to lock the locking body portion in a static configuration in relation to the main body portion; and

at least one connecting member configured and arranged to provide a connection point to the at least one shuttle.

[0004a] According to another aspect of the present invention, there is provided a fall protection assembly comprising:

at least a first elongated rail configured and arranged to be coupled along a length of a first structure;

at least a second elongated rail configured and arranged to be coupled along a length of a second structure, wherein the second structure is slidably received within the first structure; and

at least one shuttle configured and arranged to slidably engage at least one of the at least one first elongated rail and the at least one second elongated rail, each shuttle including,

a main body portion,

a locking body portion pivotally coupled to the main body portion, the locking body portion configured to selectively pivot in relation to the main body portion to selectively engage and disengage the at least one elongated member, and

a connecting member pivotally coupled to the main body portion configured and arranged to provide a connection point to the at least one shuttle, wherein the at least one shuttle further comprises:

the main body portion including a pair of main body connectors, the pair of main body connectors having aligned body connector passages, each main body connector further having a connection groove;

the locking body portion including a pair of locking body connectors, the pair of locking body connectors having aligned locking connector passages, each locking body connector positioned adjacent a respective main body connector of the main body portion with the locking connector passages of the locking body connectors aligned with the body connector passages of the main body connectors, each locking body connector further having a locking body chamber;

a connection rod received in the body connector passages and locking connector passages to pivotally couple the main body portion to the locking body portion;

a locking member for each locking body connector, each locking member having a first end and a second end, each locking member further having an engaging portion proximate the first end, a barrel portion proximate the second end and a recessed portion positioned between the engaging portion and the barrel portion, at least a first portion of the barrel portion of each locking member configured and arranged to be slidably received in a locking body chamber of a respective locking body connector;

a biasing member for each locking member, each biasing member configured and arranged to bias a respective locking member so that the barrel portion of a respective locking member is received in a respective connection groove of a respective main body connector of the main body portion to lock the locking body portion in a static position in relation to the main body portion; and the connecting member pivotally coupled to the main body portion via the connection rod.

[0004b] According to another aspect of the present invention, there is provided a shuttle for a fall protection assembly comprising:

a main body portion having opposed first and second sides, the main body including,

a first holding member extending along the first side of the main body portion, the first holding portion configured and arranged to fit around a first edge of a rail, and

at least one main connector coupled proximate the second side of the main body portion, the at least one main connector of the main body portion including a groove,

a locking body portion having opposed first and second sides, the locking body portion including,

a second holding member extending along the first side of the locking

body portion configured and arranged to fit around a second edge of a rail, and

at least one locking connector coupled proximate the second side of the

locking body portion, the at least one locking connector pivotally coupled to the at least one main connector of the main body portion;

at least one locking member configured and arranged to selectively lock the locking body portion in a static position in relation to the main body portion, the at least one locking member being movably coupled to the locking body portion, the at least one locking member selectively received in the groove of the at least one main connector to lock the locking body portion in a static position in relation to the main body portion, the at least one locking connector of the locking body portion including a locking chamber;

the at least one locking member having an engagement portion, a barrel portion and a recessed portion, the recessed portion extending between the engagement portion and the barrel portion, the barrel portion having a bore, the barrel portion movably coupled in the locking chamber of the at least one locking connector;

a biasing member for each locking member, each biasing member received in the bore in the barrel of an associated locking member, the biasing member providing a biasing force on the associated locking member to retain the barrel portion of the associated locking member in a groove of an associated main connector to lock the locking body portion in the static position in relation to the main body portion, wherein a force on the engagement portion of the associated locking member counters the biasing force to position the recessed portion about the groove of the associated main connector to allow the locking body portion to pivot in relation to the main body portion; and

a connector coupled to the shuttle configured and arranged to provide a connection point to the shuttle.

Claims:

1. A fall protection system comprising:

at least one rail section configured and arranged to be coupled to a structure that changes in length, each rail section including opposed first and second edges and opposed first and second surfaces, a height of the rail defined by the distance between the first surface and the second surface, the first surface having a first width defined by the distance between the first and second edges, the second surface having a second width defined by the distance between the first and second edges, wherein the first and second edges taper in from the first surface to the second surface, the second surface configured and arranged to engage a surface of the structure;

at least one shuttle configured and arranged to slidably engage the at least one rail section; and

at least one connecting member configured and arranged to provide a connection point to the at least one shuttle.

2. The fall protection system of claim 1, further comprising:

at least one end stop configured and arranged to prevent the at least one shuttle from sliding off of an end of the at least one rail section.

3. The fall protection system of claim 1, wherein the height of the rail is less than 0.366 of an inch.

4. The fall protection system of claim 1, wherein the at least one shuttle further comprises:

a main body portion having opposed first and second sides, the main body portion having

a first holding member extending along the first side of the main body portion, the first holding portion configured and arranged to fit around the first edge of the at least one rail section;

a locking body portion having opposed first and second sides, the first side of the locking body portion pivotally coupled to the second side of the main body portion, the locking body portion having a second holding member extending along the second side of the locking body

portion, the second holding member configured and arranged to fit around the second edge of the at least one rail section; and

at least one locking member configured and arranged to selectively lock the locking body portion in a static position in relation to the main body portion, wherein when the locking portion is locked in a static position in relation to the main body portion, the shuttle forms a receiving track portion configured and arranged to receive the at least one rail section.

5. The fall protection system of claim 4, further comprising:

at least one main body roller rotationally coupled to the first holding member of the main body portion, wherein the at least one main body roller is configured and arrange to engage the first edge of the at least one rail to enhance movement of the at least one shuttle along the at least one rail; and

at least one locking body roller rotationally coupled to the second holding member of the locking body portion, wherein the at least one locking body roller is configured and arrange to engage the second edge of the at least one rail to enhance movement of the at least one shuttle along the at least one rail.

6. A fall protection assembly comprising:

at least one elongated rail configured and arranged to be coupled to a section of a structure that changes length, the at least one elongated rail further includes a first surface, a second surface, a first edge and a second edge, the width of the rail across the first surface being wider than the width of the rail across the second surface such that both the first and second edges of the at least one elongated rail taper in from the first surface to the second surface, the second surface of the at least one elongated rail configured and arranged to engage a surface of the structure;

at least one shuttle configured and arranged to slidably engage the at least one elongated rail, each shuttle including,

a main body portion,

a locking body portion pivotally coupled to the main body portion, the locking body portion configured to selectively pivot in relation to the main body portion to selectively engage and disengage the at least one elongated member, and

a connecting member pivotally coupled to the main body portion configured and arranged to provide a connection point to the at least one shuttle.

7. The fall protection assembly of claim 6, the at least one shuttle further comprising:

the main body portion including a first side, a second side, a first surface and a second surface, the main body portion further including,

a first holding portion extending along the first side of the main body portion beyond a plane formed by the second surface of the main body portion, the first holding portion configured to envelope a first edge of the at least one elongated rail; and

the locking body portion including a first side, a second side, a first surface and second surface, the locking body portion further including,

a second holding portion extending along the first side of the locking body portion beyond the second surface of the locking body portion, the second holding portion configured to selectively envelope a second edge of the at least one elongated rail, wherein the first holding portion and the second surface of the main body portion and the second holding portion and the second surface of the locking body portion selectively form a receiving track to receive the at least one elongated rail.

8. The fall protection assembly of claim 7, wherein the connecting member extends from the first surface of the main body portion.

9. The fall protection assembly of claim 8, wherein the at least one shuttle has a midpoint halfway between the first holding portion of the main body portion and the second holding portion of the locking body portion, the connecting member coupled to the shuttle at a select distance away from the midpoint.

10. The fall protection assembly of claim 6, further comprising:

at least one end stop coupled to at least one end of the at least one elongated rail to prevent the shuttle from sliding off an end of the at least one elongated rail.

11. The fall protection assembly of claim 10, wherein the at least one end stop is a backend stop configured and arranged to be engaged with a respective end of the at least one elongated rail.

12. The fall protection assembly of claim 10, wherein the at least one end stop is a frontend stop, the frontend stop including a ramp portion configured and arranged to prevent an end of an associated elongated rail from catching up on a retracting section of the structure.

13. A shuttle for a fall protection assembly comprising:

a main body portion having opposed first and second sides, the main body including,

a first holding member extending along the first side of the main body portion, the first holding portion configured and arranged to fit around a first edge of a rail, and

at least one main connector coupled proximate the second side of the main body portion,

a locking body portion having opposed first and second sides, the locking body portion including,

a second holding member extending along the first side of the locking body portion configured and arranged to fit around a second edge of a rail, and

at least one locking connector coupled proximate the second side of the locking body portion, the at least one locking connector pivotally coupled to the at least one main connector of the main body portion;

at least one locking member configured and arranged to selectively lock the locking body portion in a static position in relation to the main body portion;

a connector coupled to the shuttle configured and arranged to provide a connection point to the shuttle;

the at least one main connector of the main body portion including a groove; and

the at least one locking member being movably coupled to the locking portion body, the at least one locking member selectively received in the groove of the at least one main connector to lock the locking body in a static position in relation to the main body portion.

14. The shuttle of claim 13, further comprising:

the at least one locking connector of the locking body portion including a locking chamber;

the at least one locking member having an engagement portion, a barrel portion and a recessed portion, the recessed portion extending between the engagement portion and the barrel portion, the barrel portion having a bore, the barrel portion movable coupled in the locking chamber of the at least one locking connector; and

a biasing member for each locking member, each biasing member received in the bore in the barrel of an associated locking member, the bias member providing a biasing force on the associated locking member to retain the barrel portion of the associated locking member in a groove of an associated main connector to lock the locking body portion in a static position in relation to the main body portion, wherein a force on the engagement portion of the associated locking member counters the biasing force to position the recessed portion about the groove of the associated main connector to allow the locking body portion to pivot in relation to the main body portion.

15. The shuttle of claim 13, further comprising:

at least one main body roller rotationally coupled to the first holding member of the main body portion, wherein the at least one main body roller is configured and arrange to engage the first edge of the rail to enhance movement of the shuttle along the rail; and

at least one locking body roller rotationally coupled to the second holding member of the locking body portion, wherein the at least one locking body roller is configured and arrange to engage the second edge of the rail to enhance movement of the shuttle along the rail.

16. The shuttle of claim 13, wherein the connector further comprises:

a base portion rotationally coupled to the main body portion of the shuttle;

a connection loop; and

an elongated member extending between the base portion and the connection loop.

17. The shuttle of claim 16, wherein the shuttle has a select width, the width defined between the first holding member extending along the first side of the main body portion and the second

holding member extending along the first side of the locking body portion, the shuttle further having a midpoint along the width, the base portion rotationally coupled to the main body portion a select distance from the midpoint of the shuttle.

CLAIMS:

1. A fall protection system comprising:

at least one rail section configured and arranged to be coupled to a structure that changes in length;

at least one shuttle configured and arranged to slidably engage the at least one rail section; the at least one shuttle including,

a main body portion having at least one main body connector, the at least one main body connector having a locking groove,

a locking body portion having at least one locking body connector, the locking body connector of the locking body portion pivotally coupled to the at least one main body connector of the main body portion, the locking body connector including a locking body chamber,

at least one locking member at least partially received in the locking body chamber of the at least one locking body connector of the locking body portion, the locking member having a barrel portion, a recessed portion and a bore in an end of the locking member,

a biasing member for each locking member, the biasing member at least partially received in the bore of the locking member, the biasing member configured and arranged to bias the locking member so that the barrel portion of the locking member is received in the locking groove of the at least one main body connector to lock the locking body portion in a static configuration in relation to the main body portion; and

at least one connecting member configured and arranged to provide a connection point to the at least one shuttle.

2. The fall protection system of claim 1, further comprising:

at least one end stop configured and arranged to prevent the at least one shuttle from sliding off of an end of the at least one rail section.

3. The fall protection system of claim 1, wherein each rail section further comprises:

opposed first and second edges and opposed first and second surfaces, a height of the rail defined by the distance between the first surface and the second surface, the first surface having a first width defined by the distance between the first and second edges, the second surface having a second width defined by the distance between the first and second edges, wherein the first and second edges taper in from the first surface to the second surface, the second surface configured and arranged to engage a surface of the structure.

4. The fall protection system of claim 3, wherein the height of the rail is less than 0.366 of an inch.

5. The fall protection system of claim 3, wherein the at least one shuttle further comprises:

the main body portion having opposed first and second sides, the main body portion having a first holding member extending along the first side of the main body portion, the first holding portion configured and arranged to fit around the first edge of the at least one rail section; and

the locking body portion having opposed first and second sides, the first side of the locking body portion pivotally coupled to the second side of the main body portion, the locking body portion having a second holding member extending along the second side of the locking body portion, the second holding member configured and arranged to fit around the second edge of the at least one rail section, the shuttle forming a receiving track portion configured and arranged to receive the at least one rail section.

6. The fall protection system of claim 5, further comprising:

at least one main body roller rotationally coupled to the first holding member of the main body portion, wherein the at least one main body roller is configured and

arranged to engage the first edge of the at least one rail to enhance movement of the at least one shuttle along the at least one rail; and

at least one locking body roller rotationally coupled to the second holding member of the locking body portion, wherein the at least one locking body roller is configured and arranged to engage the second edge of the at least one rail to enhance movement of the at least one shuttle along the at least one rail.

7. The fall protection assembly of claim 1, further comprising:

at least one end stop coupled to at least one end of the at least one elongated rail to prevent the shuttle from sliding off an end of the at least one elongated rail.

8. The fall protection assembly of claim 7, wherein the at least one end stop is a backend stop configured and arranged to be engaged with a respective end of the at least one elongated rail.

9. The fall protection assembly of claim 7, wherein the at least one end stop is a frontend stop, the frontend stop including a ramp portion configured and arranged to prevent an end of an associated elongated rail from catching up on a retracting section of the structure.

10. A fall protection assembly comprising:

at least a first elongated rail configured and arranged to be coupled along a length of a first structure;

at least a second elongated rail configured and arranged to be coupled along a length of a second structure, wherein the second structure is slidably received within the first structure; and

at least one shuttle configured and arranged to slidably engage at least one of the at least one first elongated rail and the at least one second elongated rail, each shuttle including,

a main body portion,

a locking body portion pivotally coupled to the main body portion, the locking body portion configured to selectively pivot in relation to the main body portion to selectively engage and disengage the at least one elongated member, and

a connecting member pivotally coupled to the main body portion configured and arranged to provide a connection point to the at least one shuttle, wherein the at least one shuttle further comprises:

the main body portion including a pair of main body connectors, the pair of main body connectors having aligned body connector passages, each main body connector further having a connection groove;

the locking body portion including a pair of locking body connectors, the pair of locking body connectors having aligned locking connector passages, each locking body connector positioned adjacent a respective main body connector of the main body portion with the locking connector passages of the locking body connectors aligned with the body connector passages of the main body connectors, each locking body connector further having a locking body chamber;

a connection rod received in the body connector passages and locking connector passages to pivotally couple the main body portion to the locking body portion;

a locking member for each locking body connector, each locking member having a first end and a second end, each locking member further having an engaging portion proximate the first end, a barrel portion proximate the second end and a recessed portion positioned between the engaging portion and the barrel portion, at least a first portion of the barrel portion of each locking member configured and arranged to be slidably received in a locking body chamber of a respective locking body connector;

a biasing member for each locking member, each biasing member configured and arranged to bias a respective locking member so that the barrel portion of a respective

locking member is received in a respective connection groove of a respective main body connector of the main body portion to lock the locking body portion in a static position in relation to the main body portion; and the connecting member pivotally coupled to the main body portion via the connection rod.

11. The fall protection assembly of claim 10, the at least one shuttle further comprising:

the main body portion including a first side, a second side, a first surface and a second surface, the main body portion further including,

a first holding portion extending along the first side of the main body portion beyond the second surface of the main body portion, the first holding portion configured to envelope a first edge of the at least one track member; and

the locking body portion including a first side, a second side, a first surface and second surface, the locking body portion further including,

a second holding portion extending along the first side of the locking body portion beyond the second surface of the locking body portion, the second holding portion configured to selectively envelope a second edge of the at least one track member, wherein the first holding portion and the second surface of the main body portion and the second holding portion and the second surface of the locking body portion selectively form a receiving track to receive the at least one elongated rail.

12. The fall protection assembly of claim 11, wherein the connecting member extends from the first surface of the main body portion.

13. The fall protection assembly of claim 12, wherein the at least one shuttle has a midpoint halfway between the first holding portion of the main body portion and the second holding portion of the locking body portion, the connecting member coupled to the shuttle at a select distance away from the midpoint.

14. The fall protection assembly of claim 10, wherein the at least one elongated rail further includes a first surface, a second surface, a first edge and a second edge, the width of the rail

across the first surface being wider than the width of the rail across the second surface such that both the first and second edges of the at least one elongated rail taper in from the first surface to the second surface, the second surface of the at least one elongated rail configured and arranged to engage a surface of the structure.

15. A shuttle for a fall protection assembly comprising:

a main body portion having opposed first and second sides, the main body including,

a first holding member extending along the first side of the main body portion, the first holding portion configured and arranged to fit around a first edge of a rail, and

at least one main connector coupled proximate the second side of the main body portion, the at least one main connector of the main body portion including a groove,

a locking body portion having opposed first and second sides, the locking body portion including,

a second holding member extending along the first side of the locking

body portion configured and arranged to fit around a second edge of a rail, and

at least one locking connector coupled proximate the second side of the

locking body portion, the at least one locking connector pivotally coupled to the at least one main connector of the main body portion;

at least one locking member configured and arranged to selectively lock the locking body portion in a static position in relation to the main body portion, the at least one locking member being movably coupled to the locking body portion, the at least one locking member selectively received in the groove of the at least one main connector to

lock the locking body portion in a static position in relation to the main body portion, the at least one locking connector of the locking body portion including a locking chamber;

the at least one locking member having an engagement portion, a barrel portion and a recessed portion, the recessed portion extending between the engagement portion and the barrel portion, the barrel portion having a bore, the barrel portion movably coupled in the locking chamber of the at least one locking connector;

a biasing member for each locking member, each biasing member received in the bore in the barrel of an associated locking member, the biasing member providing a biasing force on the associated locking member to retain the barrel portion of the associated locking member in a groove of an associated main connector to lock the locking body portion in the static position in relation to the main body portion, wherein a force on the engagement portion of the associated locking member counters the biasing force to position the recessed portion about the groove of the associated main connector to allow the locking body portion to pivot in relation to the main body portion; and

a connector coupled to the shuttle configured and arranged to provide a connection point to the shuttle.

16. The shuttle of claim 15, further comprising:

at least one main body roller rotationally coupled to the first holding member of the main body portion, wherein the at least one main body roller is configured and arranged to engage the first edge of the rail to enhance movement of the shuttle along the rail; and

at least one locking body roller rotationally coupled to the second holding member of the locking body portion, wherein the at least one locking body roller is configured and arranged to engage the second edge of the rail to enhance movement of the shuttle along the rail.

17. The shuttle of claim 15, wherein the connector further comprises:

a base portion rotationally coupled to the main body portion of the shuttle;

a connection loop; and

an elongated member extending between the base portion and the connection loop.

18. The shuttle of claim 17, wherein the shuttle has a select width, the width defined between the first holding member extending along the first side of the main body portion and the second holding member extending along the first side of the locking body portion, the shuttle further having a midpoint along the width, the base portion rotationally coupled to the main body portion a select distance from the midpoint of the shuttle.