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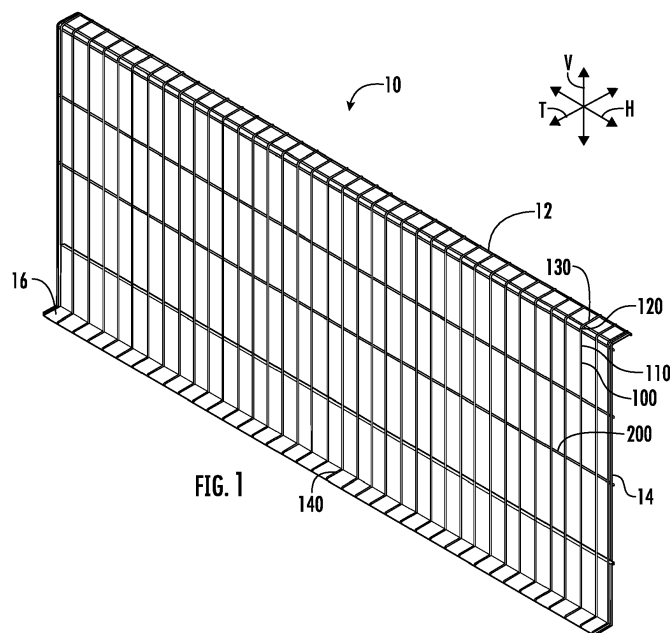
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EDGE PROTECTION BARRIER

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A barrier that includes a plurality of first wires that each have a vertical portion that extends in a vertical direction and a transverse portion that extends within sixty degrees of a transverse direction is provided. The transverse portions of each of the plurality of first wires can collectively define a midline that extends in a horizontal direction and can substantially bisect the transverse portions of each of the plurality of first wires. The
- midline can define a proximal portion for each of the transverse portions and a distal portion for each of the transverse portions. The barrier can include a plurality of second wires that each extend in the horizontal direction. At least one of the plurality of second wires can be coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires.



Description

TECHNICAL FIELD

[0001] The present application relates generally to a barrier. More specifically, the present application relates to an edge protection barrier.

BACKGROUND

[0002] Barriers, such as steel mesh barriers, are often installed on or near an edge of a structure, such as a building, to prevent debris or an individual from falling from the edge of the structure. It is desirable for barriers to be as light as possible while achieving a minimum strength or stiffness. The inventors of the present disclosure have developed a barrier that is lighter than traditional barriers while achieving a desired minimum strength or stiffness.

[0003] The inventors have identified numerous deficiencies and problems with the existing technologies in this field. For example, existing technologies are either too heavy or do not achieve a desired minimum strength or stiffness. Through applied effort, ingenuity, and innovation, many of these identified deficiencies and problems have been solved by developing solutions that are structured in accordance with the embodiments of the present disclosure, many examples of which are described in detail herein.

BRIEF SUMMARY

[0004] In general, embodiments of the present disclosure provided herein include apparatuses to provide for improved barriers.

[0005] In various aspects, a barrier that defines a horizontal direction H, a vertical direction V that is orthogonal to the horizontal direction H, and a transverse direction T that is orthogonal to the horizontal direction H and the vertical direction V is provided. The barrier can include a plurality of first wires that each have a vertical portion that extends in the vertical direction V and a transverse portion that extends within sixty degrees of the transverse direction T. The transverse portions of each of the plurality of first wires can collectively define a midline that extends in the horizontal direction H and can substantially bisect the transverse portions of each of the plurality of first wires. The midline can define a proximal portion for each of the transverse portions and a distal portion for each of the transverse portions. The barrier can include a plurality of second wires that each extend in the horizontal direction H. At least one of the plurality of second wires can be coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires.

[0006] In various examples, at least another one of the plurality of second wires is coupled to the distal portions of each of the transverse portions of the plurality of first

wires.

[0007] In various examples, each of the plurality of first wires have an end. The at least another one of the plurality of second wires can be coupled to the ends of the plurality of first wires.

[0008] In various examples, each of the plurality of first wires and each of the plurality of second wires comprise steel.

[0009] In various examples, the transverse portions of each of the plurality of first wires are first transverse portions. Each of the plurality of first wires can have a second transverse portion that extends in a direction opposite to the first transverse portion. The vertical portions of each of the plurality of first wires can be positioned between the first transverse portions and the second transverse portions.

[0010] In various examples, each of the plurality of first wires have a curved portion that connects the transverse portion to the vertical portion.

[0011] In various examples, at least one of the plurality of second wires is coupled to the vertical portions of the plurality of first wires at a location proximate to the transverse portions.

[0012] In various examples, a distance D1 is defined that extends in the transverse direction T from the vertical portions of the plurality of first wires to a position that corresponds to a center of the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires. The transverse portions of each of the plurality of first wires can have a length that defines a distance D3. A ratio D1:D3 between the distance D1 and the distance D3 can be less than 1:2.

[0013] In various examples, the ratio D1:D3 between the distance D1 and the distance D3 is less than 1:5.

[0014] In various examples, at least another one of the plurality of second wires is coupled to the distal portions of each of the transverse portions of the plurality of first wires. A distance D4 is defined that extends from the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires to the at least another one of the plurality of second wires that is coupled to the distal portions of each of the transverse portions of the plurality of first wires. A ratio D1:D4 between the distance D1 and the distance D4 can be at least 1:4.5 and up to 1:3.9.

[0015] In various examples, at least one of the plurality of second wires is coupled to the vertical portions of the plurality of first wires. A distance D2 can be defined that extends in the vertical direction V from a center of the at least one of the plurality of second wires that is coupled to the vertical portions of the plurality of first wires to a position that corresponds to a center of the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires. A ratio D1:D2 between the distance D1 and the distance D2 can be at least 1:0.5

and up to 1:0.11.

[0016] In various examples, at least another one of the plurality of second wires is coupled to the distal portions of each of the transverse portions of the plurality of first wires. A distance D4 can be defined that extends from the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires to the at least another one of the plurality of second wires that is coupled to the distal portions of each of the transverse portions of the plurality of first wires. A ratio D1:D4 between the distance D1 and the distance D4 can be at least 1:4.5 and up to 1:3.9.

[0017] In various examples, at least one of the plurality of second wires is coupled to the vertical portions of the plurality of first wires. A distance D2 can be defined that extends in the vertical direction V from a center of the at least one of the plurality of second wires that is coupled to the vertical portions of the plurality of first wires to a position that corresponds to a center of the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires. A ratio D1:D2 between the distance D1 and the distance D2 can be at least 1:0.5 and up to 1:0.11.

[0018] In various aspects, an edge protection barrier is configured to be coupled proximate to an edge of a building, the edge protection barrier defining a horizontal direction H, a vertical direction V that is orthogonal to the horizontal direction H, and a transverse direction T that is orthogonal to the horizontal direction H and the vertical direction V. The edge protection barrier can include a plurality of first wires that each have a vertical portion that extends in the vertical direction V and a transverse portion that extends within sixty degrees of the transverse direction T. The transverse portions of each of the plurality of first wires can collectively define a midline that extends in the horizontal direction H and substantially bisects the transverse portions of each of the plurality of first wires. The midline can define a proximal portion for each of the transverse portions and a distal portion for each of the transverse portions. The edge protection barrier can include a plurality of second wires that each extend in the horizontal direction H. At least one of the plurality of second wires can be coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires.

[0019] In various examples, at least another one of the plurality of second wires is coupled to the distal portions of each of the transverse portions of the plurality of first wires.

[0020] In various examples, at least one of the plurality of second wires is coupled to the vertical portions of the plurality of first wires at a location proximate to the transverse portions.

[0021] In various examples, a distance D1 is defined that extends in the transverse direction T from the vertical portions of the plurality of first wires to a position that

corresponds to a center of the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires. The transverse portions of each of the plurality of first wires can have a length that defines a distance D3. A ratio D1:D3 between the distance D1 and the distance D3 can be less than 1:2.

[0022] In various examples, the ratio D1:D3 between the distance D1 and the distance D3 is less than 1:5.

[0023] In various examples, at least another one of the plurality of second wires is coupled to the distal portions of each of the transverse portions of the plurality of first wires. A distance D4 can be defined that extends from the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires to the at least another one of the plurality of second wires that is coupled to the distal portions of each of the transverse portions of the plurality of first wires. A ratio D1:D4 between the distance D1 and the distance D4 can be at least 1:4.5 and up to 1:3.9.

[0024] In various examples, at least one of the plurality of second wires is coupled to the vertical portions of the plurality of first wires. A distance D2 can be defined that extends in the vertical direction V from a center of the at least one of the plurality of second wires that is coupled to the vertical portions of the plurality of first wires to a position that corresponds to a center of the at least one of the plurality of second wires that is coupled to the proximal portions of each of the transverse portions of each of the plurality of first wires. A ratio D1:D2 between the distance D1 and the distance D2 can be at least 1:0.5 and up to 1:0.11.

[0025] The above summary is provided merely for purposes of summarizing some example embodiments to provide a basic understanding of some aspects of the present disclosure. Accordingly, it will be appreciated that the above-described embodiments are merely examples and should not be construed to narrow the scope or spirit of the present disclosure in any way. It will be appreciated that the scope of the present disclosure encompasses many potential embodiments in addition to those here summarized, some of which will be further described below. Other features, aspects, and advantages of the subject matter will become apparent from the description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Having thus described certain example embodiments of the present disclosure in general terms above, non-limiting and non-exhaustive embodiments of the subject disclosure are described with reference to the following figures, which are not necessarily drawn to scale and wherein like reference numerals refer to like parts throughout the various views unless otherwise specified. The components illustrated in the figures may or may not be present in certain embodiments described

herein. Some embodiments may include fewer (or more) components than those shown in the figures.

FIG. 1 provides a perspective view of a barrier, in accordance with an example embodiment.

FIG. 2 provides a perspective view of a portion of the barrier of FIG. 1, in accordance with an example embodiment.

FIG. 3 provides a side view of the barrier of FIG. 1, in accordance with an example embodiment.

FIG. 4 provides a side view of a portion of the barrier of FIG. 1, in accordance with an example embodiment.

FIG. 5 provides a side view of a portion of a barrier, in accordance with an example embodiment.

DETAILED DESCRIPTION

[0027] One or more embodiments are now more fully described with reference to the accompanying drawings, wherein like reference numerals are used to refer to like elements throughout and in which some, but not all embodiments of the inventions are shown. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the various embodiments. It is evident, however, that the various embodiments can be practiced without these specific details. It should be understood that some, but not all embodiments are shown and described herein. Indeed, the embodiments may be embodied in many different forms, and accordingly this disclosure should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements.

[0028] As used herein, the term "exemplary" means serving as an example, instance, or illustration. Any aspect or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects or designs. Rather, use of the word exemplary is intended to present concepts in a concrete fashion. In addition, while a particular feature may be disclosed with respect to only one of several implementations, such feature may be combined with one or more other features of the other implementations as may be desired and advantageous for any given or particular application. Furthermore, to the extent that the terms "includes" and "including" and variants thereof are used in either the detailed description or the claims, these terms are intended to be inclusive in a manner similar to the term "comprising."

[0029] As used herein, the term "or" is intended to mean an inclusive "or" rather than an exclusive "or". That is, unless specified otherwise, or clear from context, "X employs A or B" is intended to mean any of the natural inclusive permutations. That is, if X employs A; X employs B; or X employs both A and B, then "X employs A or B" is satisfied under any of the foregoing instances. In ad-

dition, the articles "a" and "an" as used in this application and the appended claims should generally be construed to mean "one or more" unless specified otherwise or clear from context to be directed to a singular form.

[0030] As used herein, the terms "coupled," "fixed," "attached to," and the like refer to both direct coupling, fixing, or attaching, as well as indirect coupling, fixing, or attaching through one or more intermediate components or features, unless otherwise specified herein. As used herein, coupling can be accomplished through welding one component to another component.

[0031] As used herein, the term "positioned directly on" refers to a first component being positioned on a second component such that they make contact. Similarly, as used herein, the term "positioned directly between" refers to a first component being positioned between a second component and a third component such that the first component makes contact with both the second component and the third component. In contrast, a first component that is "positioned between" a second component and a third component may or may not have contact with the second component and the third component. Additionally, a first component that is "positioned between" a second component and a third component is positioned such that there may be other intervening components between the second component and the third component other than the first component.

[0032] Referring now to FIG. 1, a perspective view of a barrier 10 is provided, in accordance with an example embodiment. The barrier 10 can define horizontal direction H, a vertical direction V that is orthogonal to the horizontal direction H, and a transverse direction T that is orthogonal to the horizontal direction H and the vertical direction V. The barrier 10 can define a top portion 12 and a main portion 14. The barrier 10 can also include a bottom portion 16. The top portion 12 can extend generally along a plane defined by the horizontal direction H and the transverse direction T (e.g., within sixty degrees, such as within fifty degrees, such as within forty degrees, such as within thirty degrees, such as within twenty degrees, such as within ten degrees, such as within five degrees, such as within two degrees of the plane defined by the horizontal direction H and the transverse direction T). The main portion 14 can extend generally along a plane defined by the horizontal direction H and the vertical direction V. The bottom portion 16, when included, can extend generally along a plane defined by the horizontal direction H and the transverse direction T (e.g., within sixty degrees, such as within fifty degrees, such as within forty degrees, such as within thirty degrees, such as within twenty degrees, such as within ten degrees, such as within five degrees, such as within two degrees of the plane defined by the horizontal direction H and the transverse direction T). The top portion 12 can be configured as a handrail of the barrier 10. The main portion 14 can be configured as a debris mesh for the barrier 10. The bottom portion 16, when included can be configured as a toeboard for the barrier 10.

[0033] The barrier 10 can be configured to be coupled at a location proximate to an edge of a structure, such as a building. The barrier 10 can be configured as an edge protection barrier 10 that may prevent an individual and/or debris from falling from the edge of the structure. Multiple barriers 10 can be coupled together to form an edge protection system.

[0034] Referring now to FIG. 2, a perspective view of a portion of the barrier 10 of FIG. 1 is provided, in accordance with an example embodiment. The barrier 10 can include a plurality of first wires 100. Each of the plurality of first wires 100 can have a vertical portion 110 that extends in the vertical direction V and a transverse portion 130 that extends within sixty degrees of the transverse direction T, such as within fifty degrees, such as within forty degrees, such as within thirty degrees, such as within twenty degrees, such as within ten degrees, such as within five degrees, such as within two degrees of the transverse direction T. Each of the plurality of first wires 100 can have a curved portion 120 that joins the vertical portion 110 with the transverse portion 130. Each of the plurality of first wires 100 can include a metal, such as aluminum or steel.

[0035] Referring briefly to FIG. 1, each of the plurality of first wires 100 can have a second transverse portion 140 that extends in a direction opposite to the first transverse portion 130. In various examples, the transverse portions 130 of each of the plurality of first wires 100 can define the top portion 12 of the barrier 10, which can be configured as a handrail for the barrier 10. The vertical portions 110 of each of the plurality of first wires 100 can define the main portion 14 of the barrier 10, which can be configured as a debris mesh for the barrier. The second transverse portions 140, when included, can define a bottom portion 16 of the barrier 10, which can be configured as a toeboard for the barrier 10. Each of the plurality of first wires 100 can extend generally parallel to each other along a full length of each of the plurality of first wires 100.

[0036] Referring again to FIG. 2, the transverse portions 130 of each of the plurality of first wires 100 can collectively define a midline 135 that extends in the horizontal direction H and substantially bisects the transverse portions 130. The midline 135 can divide each of the transverse portions 130 of the plurality of first wires 100 into a proximal portion 131 and a distal portion 139. For each of the plurality of first wires 100, the proximal portion 131 can be closer to the vertical portion 110 than the distal portion 139.

[0037] The barrier 10 can include a plurality of second wires 200. Each of the plurality of second wires 200 can include a metal, such as aluminum or steel. Each of the plurality of second wires 200 can extend generally in the horizontal direction H along a full length of the plurality of second wires 200. In various examples, and as depicted in FIG. 2, at least one of the plurality of second wires 200, such as wire 200b, can be coupled to (e.g., welded to) the proximal portions 131 of each of the transverse

portions 130 of the plurality of first wires 100. Another one of the plurality of second wires 200, such as wire 200a, can be coupled to the distal portions 139 of each of the transverse portions 130 of the plurality of first wires 100. Stated differently, in various examples, at least one of the plurality of second wires 200, such as at least wire 200a and/or wire 200h (FIG. 5), can be coupled to the transverse portions 130 of the plurality of first wires 100 on an opposite side of the midline 135 as another one of the plurality of second wires 200, such as at least wire 200b and/or wire 200i (FIG. 5). For example, and as depicted in FIG. 2, wire 200a can be positioned at the ends of each of the plurality of first wires 100. Another one of the plurality of second wires 200, such as wire 200c, can be coupled to the vertical portions 110 of each of the plurality of first wires 100 at a location that is proximate to the curved portion 120.

[0038] Referring now to FIG. 3, a side view of the barrier 10 of FIG. 1 is provided, in accordance with an example embodiment. In various examples, at least one of the plurality of second wires 200, such as wire 200g, can be positioned directly on, or coupled to, the second transverse portions 140 of each of the plurality of first wires 100 at the bottom portion 16 of the barrier 10. Also, in various examples, at least one of the plurality of second wires 200, such as wire 200d, wire 200e, and wire 200f, can be positioned directly on, or coupled to, the vertical portions 110 of the plurality of first wires 100 and spaced from the transverse portions 130. However, in various other examples, the barrier 10 includes more, or less, second wires 200 than depicted in FIG. 3.

[0039] Referring now to FIG. 4, a side view of a portion of the barrier 10 of FIG. 1 is provided, in accordance with an example embodiment. In various examples, and as depicted in FIG. 4, a distance D1 that extends in the transverse direction T from a vertical portion 110 of a first wire 100 to a position that corresponds to a center of one of the second wires 200b that is positioned directly on, or coupled to, the proximal portion 131 of the transverse portion 130 of the first wires 100 can be approximately 15.4 millimeters (mm), such as at least 13.4 mm and up to 17.4 mm. However, in other examples, the distance D1 can be less than 15.4 mm, such as less than 14 mm, such as less than 12 mm, such as less than 10 mm, such as less than 5 mm. In yet other examples, the distance D1 can be greater than 15.4 mm, such as at least 17 mm and up to 45 mm.

[0040] The inventors have discovered that positioning the second wire 200b proximate to (e.g., within 18 mm of, such as within 16 mm of, such as within 14 mm of) the vertical portion 110 of the first wire 100 may increase an overall strength and/or stiffness of the barrier. As will be discussed in more detail, the increase to the overall strength and/or stiffness of the barrier 10 by incorporating the second wire 200b proximate to the vertical portion 110 of the first wire 100 allows the diameters of the first wires 100 to be reduced without decreasing an overall strength and/or stiffness of the barrier 10.

[0041] In various examples, and as depicted in FIG. 4, a distance D2 that extends in the vertical direction V from a center of one of the second wires 200c that is on the vertical portions 110 of the first wires 100 to a position that corresponds to a center of another one of the second wires 200b that is on the transverse portions 130 of the first wires 100 can be approximately 12 mm, such as at least 10 mm and up to 14 mm. However, in other examples, the distance D2 can be less than 10 mm, such as less than 8 mm, such as less than 6 mm. In yet other examples, the distance D2 can be greater than 14 mm, such as greater than 16 mm, such as greater than 18 mm.

[0042] The lengths of the transverse portions 130 of each of the plurality of first wires 100 can define a distance D3 that extends in the transverse direction T. In various examples, and as depicted in FIG. 4, the distance D3 can be approximately 90.2 mm, such as at least 88.2 mm and up to 92.2 mm. However, in various examples, the distance D3 can be less than 88.2 mm, such as less than 80 mm, such as less than 70 mm. In yet other examples, the distance D3 can be greater than 92.2 mm, such as at least 100 mm, such as at least 120 mm.

[0043] In various examples, and as depicted in FIG. 4, a distance D4 that extends from one of the second wires 200b that is positioned on the proximal portion 131 of the transverse portion 130 of the plurality of first wires 100 to another one of the second wires 200a that is positioned on the distal portion 139 of the transverse portion 130 of the plurality of first wires 100 can be approximately 65 mm, such as at least 63 mm and up to 67 mm. However, in various examples, the distance D4 can be less than 63 mm, such as less than 55 mm. In yet other examples, the distance D4 can be greater than 67 mm, such as at least 75 mm.

[0044] In various examples, and as depicted in FIG. 4, each of the plurality of first wires 100 have a diameter that is approximately 4.8 mm, such as at least 4.7 mm and up to 4.9 mm, such as at least 4.6 mm and up to 5 mm. In various examples, and as depicted in FIG. 4, each of the plurality of second wires 200 have a diameter that is approximately 6.75, such as at least 6.7 mm and up to 6.8 mm, such as at least 6.6 mm and up to 6.9 mm. However, in various other examples, the diameter of the plurality of first wires 100 and/or the diameter of the plurality of second wires 200 is at least 2 mm and up to and including 15 mm.

[0045] In various examples, and as depicted in FIG. 4, each of the plurality of first wires 100 and each of the plurality of second wires 200 are generally cylindrical shaped such that they have circular cross-sectional shapes. However, in various other examples, each of the plurality of first wires 100 and/or each of the plurality of second wires 200 have non-circular cross-sectional shapes. For example, each of the plurality of first wires 100 and/or each of the plurality of second wires 200 can have cross-sectional shapes that are triangle-shaped, quadrilateral-shaped, pentagon-shaped, hexagon-shaped, etc.

[0046] It should be understood that the specific dimensions provided in relation to FIG. 4 are exemplary and that the barrier 10 can be sized larger or smaller for certain applications. As such, the specific dimensions provided may increase or decrease as the barrier 10 is sized larger or smaller. Therefore, the distances D1, D2, D3 and D4 can define ratios that may provide various benefits, which will be discussed.

[0047] In various examples, a ratio D1:D3 can be defined that describes the positioning of one of the plurality of second wires 200b along the length of the transverse portion 130 of the plurality of first wires 100, which corresponds to distance D3. For example, and as depicted in FIG. 4, the ratio D1:D3 is approximately 1:5.9, such as at least 1:6.4 and up to 1:5.4. The inventors of the present disclosure have discovered that positioning at least one of the plurality of second wires 200b on the proximal portion 131 of the transverse portion 130 of the plurality of first wires 100, which results in a D1:D3 ratio that is less than 1:2, has various benefits. For example, incorporating a wire 200b and having a D1:D3 ratio that is less than 1:2 may increase the stiffness and/or strength of the barrier 10. Additionally, having a D1:D3 ratio that is less than 1:2 may allow the overall weight of the barrier 10 to be reduced. For example, because incorporating the second wire 200b and having a D1:D3 ratio that is less than 1:2 increases the stiffness and/or strength of the barrier 10, a diameter of each of the plurality of first wires 100 can be reduced, which reduces the weight of the barrier 10. The inventors have discovered that the additional weight gained by incorporating at least one second wire 200b on the proximal portions 131 of the transverse portions 130 of the plurality of first wires 100 is less than the weight reduction of reducing the diameters of each of the plurality of first wires 100, while also maintaining or improving a strength and/or stiffness of the barrier 10. As such, incorporating at least one second wire 200b on the proximal portions 131 of the transverse portions 130 of the plurality of first wires 100 reduces an overall weight of the barrier 10 and may also increase or maintain an overall stiffness of the barrier 10.

[0048] The inventors have also discovered that a D1:D3 ratio that is less than 1:5, such as less than 1:5.5, such as less than 1:6, such as less than 1:6.5, such as less than 1:7 optimizes the amount of weight that can be removed from the barrier 10 by increasing the reduction of the diameters of the plurality of first wires 100 while also maintaining or improving an overall strength and/or stiffness of the barrier 10. For example, a D1:D3 ratio that is less than 1:5 may increase the overall strength and/or stiffness of the barrier 10 more than a ratio that is greater than 1:5. As such, positioning the wire 200b such that a D1:D3 ratio that is less than 1:5 is defined may provide additional strength and/or stiffness to the barrier, which allows an increase to the diameter reduction of the first wires 100.

[0049] Other ratios, such as a ratio D1:D4 that is approximately 1:4.2, such as at least 1:4.5 and up to 1:3.9,

and/or a D1:D2 ratio that is approximately 1:0.8, such as at least 1:0.5 and up to 1:0.11, may also optimize a weight reduction by allowing the diameters of the first wires 100 to be reduced while maintaining an overall strength and/or stiffness of the barrier 10 in conjunction with the incorporation of wire 200b and a D1 :D3 ratio that is less than 1:5.

[0050] Referring now to FIG. 5, a side view of a portion of a barrier 10 is provided, in accordance with an example embodiment. The barrier 10 of FIG. 5 is similar to the examples provided in FIGS. 1-4. However, in this example, the plurality of second wires 200 of the barrier 10 includes a wire 200h and another wire 200i that are positioned on an upper portion of the transverse portions 130 of the plurality of first wires 100. One of the wires 200h of the plurality of wires 200 can be positioned on the proximal portion 131 of the transverse portion 130 of the plurality of first wires 100 at a location opposite to another one of the wires 200b of the plurality of second wires 200 that is also positioned on the proximal portion 131 of the transverse portion 130 of the plurality of first wires 100. One of the wires 200i of the plurality of wires 200 can be positioned on the distal portion 139 of the transverse portion 130 of the plurality of first wires 100 at a location opposite to another one of the wires 200a of the plurality of first wires 100 that is also positioned on the distal portion 139 of the transverse portion 130 of the plurality of first wires 100. The addition of wires 200h and 200i can increase an overall strength and/or stiffness of the barrier 10, which may allow the diameter of the plurality of first wires 100 to be reduced, which may result in a decrease in weight of the barrier 10.

Conclusion

[0051] The above descriptions of various embodiments of the subject disclosure and corresponding figures and what is described in the Abstract, are described herein for illustrative purposes, and are not intended to be exhaustive or to limit the disclosed embodiments to the precise forms disclosed. It is to be understood that one of ordinary skill in the art may recognize that other embodiments having modifications, permutations, combinations, and additions can be implemented for performing the same, similar, alternative, or substitute functions of the disclosed subject matter, and are therefore considered within the scope of this disclosure. Therefore, the disclosed subject matter should not be limited to any single embodiment described herein, but rather should be construed in breadth and scope in accordance with the appended claims below. Moreover, although the foregoing descriptions and the associated drawings describe example embodiments in the context of certain example combinations of elements and/or functions, it should be appreciated that different combinations of elements and/or functions may be provided by alternative embodiments without departing from the scope of the appended claims. In this regard, for example, different combinations

of elements and/or functions than those explicitly described above are also contemplated as may be set forth in some of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. A barrier (10) that defines a horizontal direction H, a vertical direction V that is orthogonal to the horizontal direction H, and a transverse direction T that is orthogonal to the horizontal direction H and the vertical direction V, wherein the barrier (10) comprises:

a plurality of first wires (100) that each have a vertical portion (110) that extends in the vertical direction V and a transverse portion (130) that extends within sixty degrees of the transverse direction T,

wherein the transverse portions (130) of each of the plurality of first wires (100) collectively define a midline (135) that extends in the horizontal direction H and substantially bisects the transverse portions (130) of each of the plurality of first wires (100),

wherein the midline (135) defines a proximal portion (131) for each of the transverse portions (130) and a distal portion (139) for each of the transverse portions (130); and

a plurality of second wires (200) that each extend in the horizontal direction H, wherein at least one of the plurality of second wires (200) is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100).

2. The barrier (10) of claim 1, wherein at least another one of the plurality of second wires (200) is coupled to the distal portions (139) of each of the transverse portions (130) of the plurality of first wires (100).

3. The barrier (10) of claim 1, wherein each of the plurality of first wires (100) have an end, and wherein at least another one of the plurality of second wires (200) is coupled to the ends of the plurality of first wires (100).

4. The barrier (10) of claim 1, wherein the transverse portion (130) extends within two degrees of the transverse direction T.

5. The barrier (10) of claim 1, wherein the transverse portions (130) of each of the plurality of first wires (100) are first transverse portions (130), and wherein each of the plurality of first wires (100) have a second transverse portion (140) that extends in a direction opposite to the first transverse portion (130), wherein

the vertical portions (110) of each of the plurality of first wires (100) are positioned between the first transverse portions (130) and the second transverse portions (140).

6. The barrier (10) of claim 1, wherein each of the plurality of first wires (100) have a curved portion (120) that connects the transverse portion (130) to the vertical portion (110).

7. The barrier (10) of claim 1, wherein at least one of the plurality of second wires (200) is coupled to the vertical portions (110) of the plurality of first wires (100) at a location proximate to the transverse portions (130).

8. The barrier (10) of claim 1, wherein a distance D1 is defined that extends in the transverse direction T from the vertical portions (110) of the plurality of first wires (100) to a position corresponding to a center of the at least one of the plurality of second wires (200) that is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100),

wherein the transverse portions (130) of each of the plurality of first wires (100) has a length that defines a distance D3, and
wherein a ratio D1:D3 between the distance D1 and the distance D3 is less than 1:2.

9. The barrier (10) of claim 8, wherein the ratio D1:D3 between the distance D1 and the distance D3 is less than 1:5.

10. The barrier (10) of claim 8, wherein at least another one of the plurality of second wires (200) is coupled to the distal portions (139) of each of the transverse portions (130) of the plurality of first wires (100),

wherein a distance D4 is defined that extends from the at least one of the plurality of second wires (200) that is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100) to the at least another one of the plurality of second wires (200) that is coupled to the distal portions (139) of each of the transverse portions (130) of the plurality of first wires (100), and
wherein a ratio D1:D4 between the distance D1 and the distance D4 is at least 1:4.5 and up to 1:3.9.

11. The barrier (10) of claim 8, wherein at least one of the plurality of second wires (200) is coupled to the vertical portions (110) of the plurality of first wires (100),

wherein a distance D2 is defined that extends in the vertical direction V from a center of the at least one of the plurality of second wires (200) that is coupled to the vertical portions (110) of the plurality of first wires (100) to a position that corresponds to a center of the at least one of the plurality of second wires (200) that is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100), and

wherein a ratio D1:D2 between the distance D1 and the distance D2 is at least 1:0.5 and up to 1:0.11.

12. The barrier (10) of claim 9, wherein at least another one of the plurality of second wires (200) is coupled to the distal portions (139) of each of the transverse portions (130) of the plurality of first wires (100),

wherein a distance D4 is defined that extends from the at least one of the plurality of second wires (200) that is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100) to the at least another one of the plurality of second wires (200) that is coupled to the distal portions (139) of each of the transverse portions (130) of the plurality of first wires (100), and
wherein a ratio D1:D4 between the distance D1 and the distance D4 is at least 1:4.5 and up to 1:3.9.

13. The barrier (10) of claim 9, wherein at least one of the plurality of second wires (200) is coupled to the vertical portions (110) of the plurality of first wires (100),

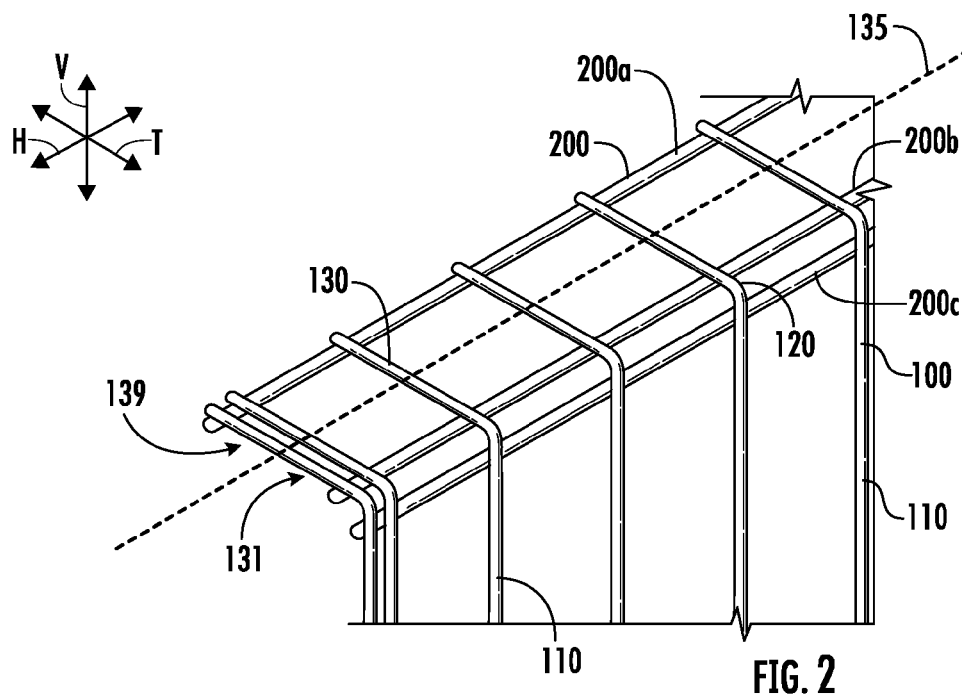
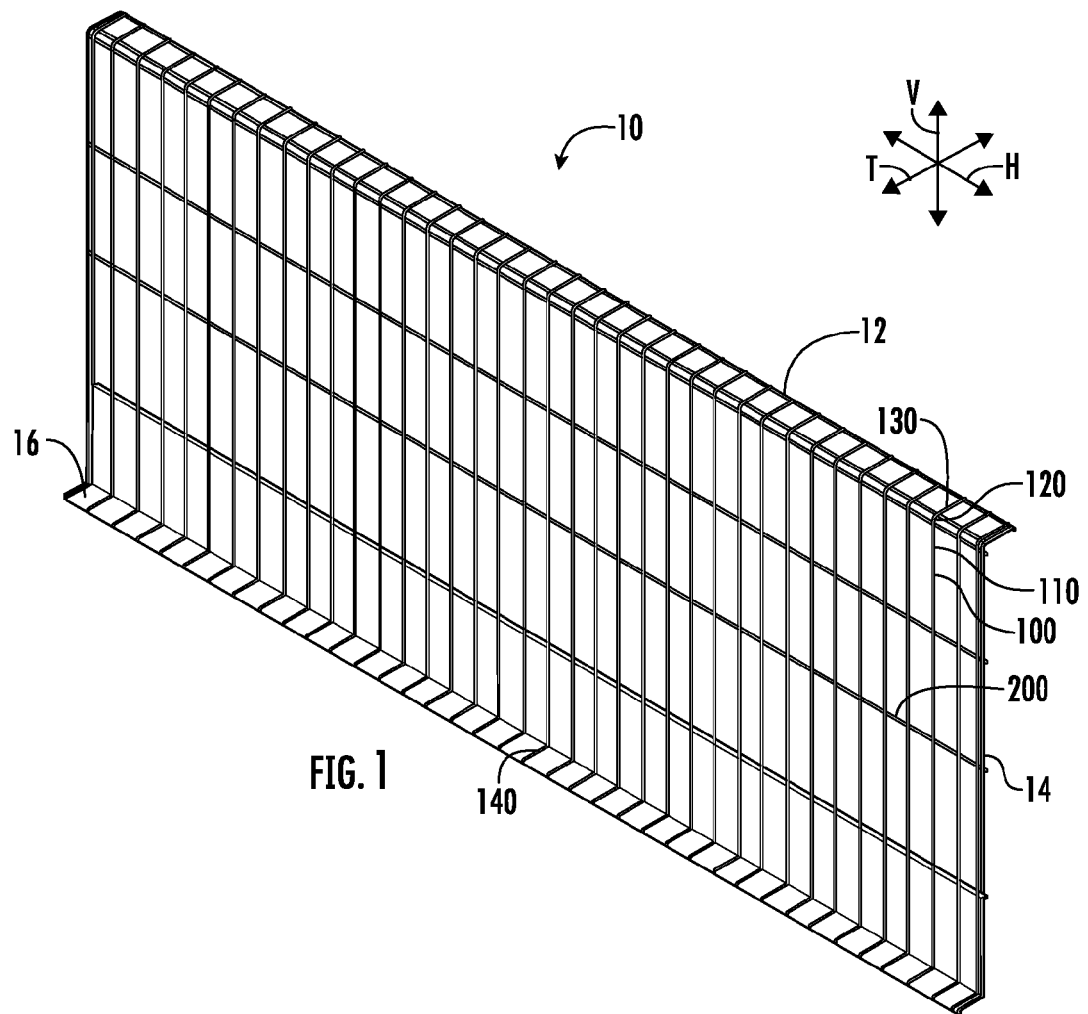
wherein a distance D2 is defined that extends in the vertical direction V from a center of the at least one of the plurality of second wires (200) that is coupled to the vertical portions (110) of the plurality of first wires (100) to a position that corresponds to a center of the at least one of the plurality of second wires (200) that is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100), and
wherein a ratio D1:D2 between the distance D1 and the distance D2 is at least 1:0.5 and up to 1:0.11.

14. An edge protection barrier (10) configured to be coupled proximate to an edge of a building, the edge protection barrier (10) defining a horizontal direction H, a vertical direction V that is orthogonal to the horizontal direction H, and a transverse direction T that is orthogonal to the horizontal direction H and the vertical direction V, wherein the edge protection bar-

rier (10) comprises:

a plurality of first wires (100) that each have a vertical portion (110) that extends in the vertical direction V and a transverse portion (130) that extends within sixty degrees of the transverse direction T, wherein the transverse portions (130) of each of the plurality of first wires (100) collectively define a midline (135) that extends in the horizontal direction H and substantially bisects the transverse portions (130) of each of the plurality of first wires (100), wherein the midline (135) defines a proximal portion (131) for each of the transverse portions (130) and a distal portion (139) for each of the transverse portions (130); and a plurality of second wires (200) that each extend in the horizontal direction H, wherein at least one of the plurality of second wires (200) is coupled to the proximal portions (131) of each of the transverse portions (130) of each of the plurality of first wires (100).

15. The edge protection barrier (10) of claim 14, wherein at least another one of the plurality of second wires (200) is coupled to the distal portions (139) of each of the transverse portions (130) of the plurality of first wires (100).



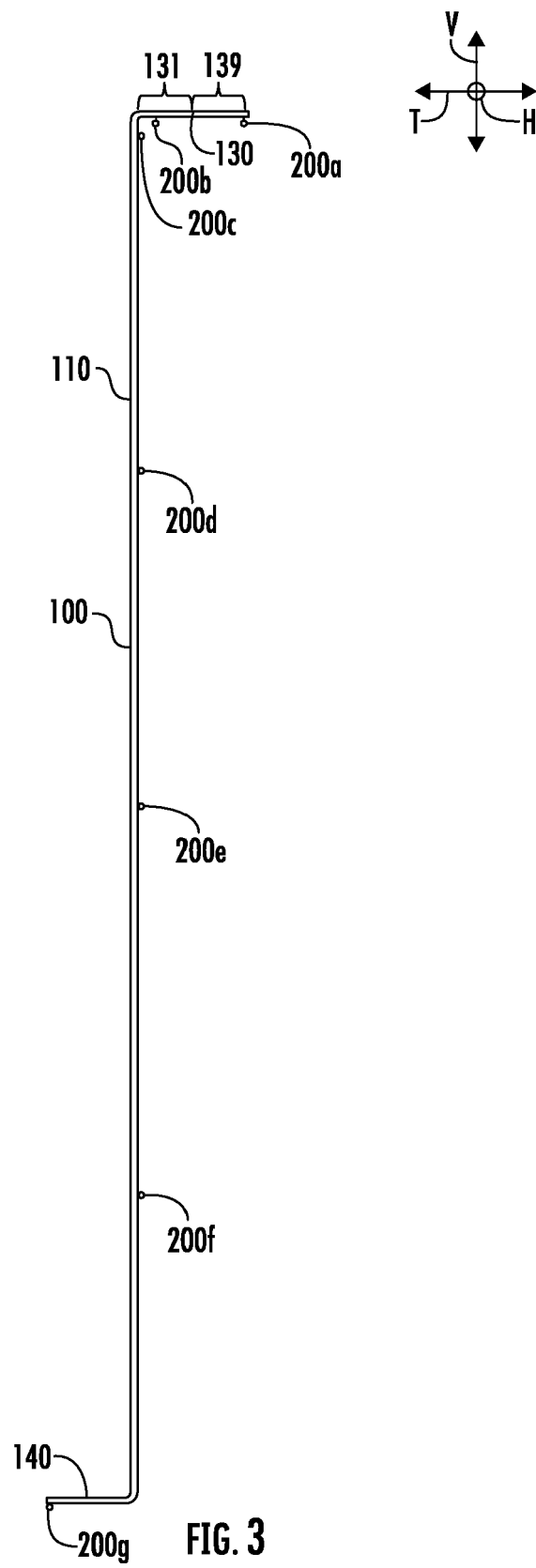
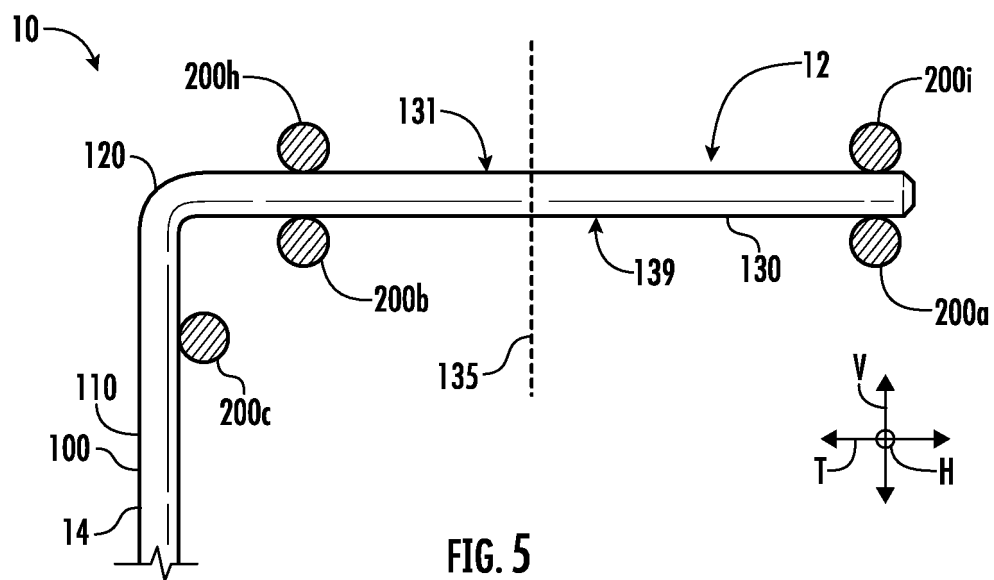
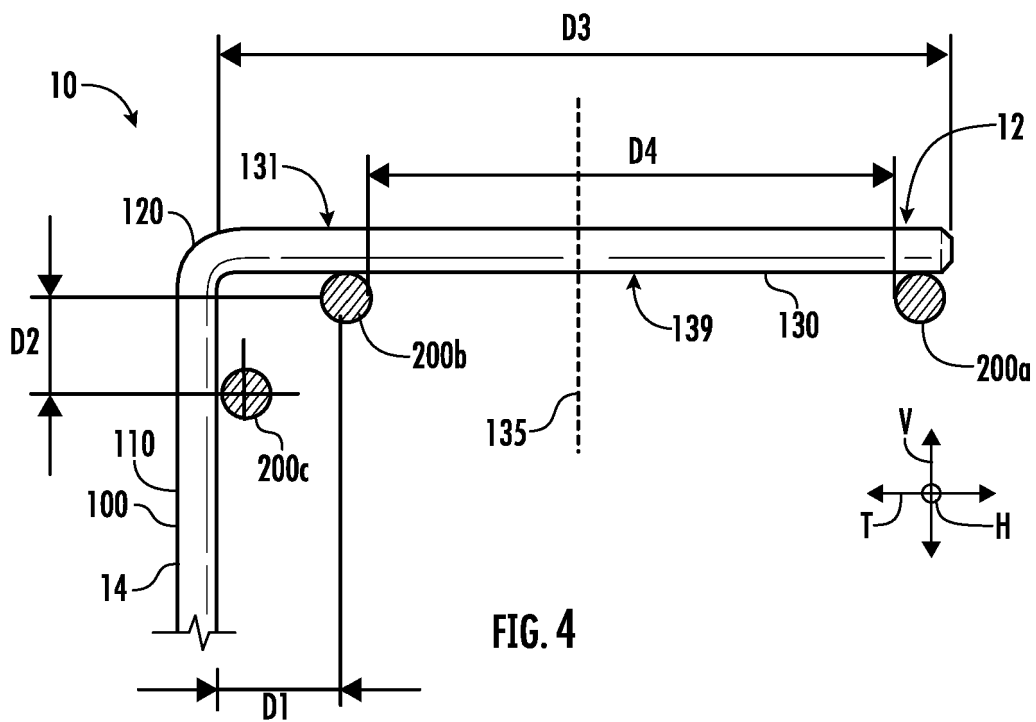


FIG. 3





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