A44B 11/06 (2006.01) A44B 13/00 (2006.01)

PCT/US2012/020600

Applicant for all designated States except US: HONEYWELL INTERNATIONAL INC., [US/US]; Patent Services M/S AB/2B, 101 Columbia Road, P.O. Box 2245, Morristown, NJ 07962-2245 (US).

Inventors: JOANNY, Romain [FR/FR]; 5 Rue Claude Nicolas Ledoux, Chalon Sur Saone, F-71100 Saone et Loire (FR), BOILLOT, Xavier [FR/FR]; 24 Rue Des Oncheres, F-70290 Plancher Bas (FR).

Title: SYSTEM FOR ADJUSTING AND LOCKING A METAL MESH BAND

Abstract: A retaining assembly comprises a fastener, a hook, and a portion of a metal mesh material releasably engaged with the fastener and engaged with the hook. The fastener, the hook, and the portion of the metal mesh material are configured to adjust an overall length of the retaining assembly.
System for Adjusting and Locking a Metal Mesh Band

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] None.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

REFERENCE TO A MICROFICHE APPENDIX

[0003] Not applicable.

BACKGROUND

[0004] Metal mesh material is generally used as a protective material over a variety of body parts in various industries. The metal mesh material is effective at preventing gashes, cuts, and similar injuries from sharp objects that may be common, for example, in the food preparation and handling industries. Metal mesh material is generally formed from interwoven metal rings to produce a material that is highly flexible, thereby providing for a degree of flexibility to the wearer. However, the flexibility of the metal mesh material makes it susceptible to movement during use.

[0005] In order to prevent the movement of protective clothing formed from a metal mesh material, various straps and fasteners have been developed. The straps may typically be formed from a polymeric material (e.g., a polyamide) and have a push-stud mechanism for retaining the strap to the metal mesh. Various other retaining mechanisms include sprayed on silicon to provide a strip of stretchable material to retain the item of protective clothing such as a glove.

[0006] In general, fabric buckles, clasps, and/or stretchable materials (collectively "fasteners") are difficult to clean effectively, as may be required by certain industrial standards (e.g., food handling requirements). The fasteners must generally be removed for cleaning separately from the metal mesh material and any adjustment of the elements may be lost. Further, fabric fasteners may wear faster than the metal mesh material so that replacement of the
fabric fasteners may be required. With respect to the stretchable material bands, the embedded elastomeric material may not be removable for cleaning, thereby requiring replacement of the entire item of protective clothing when the bands wear out.

**SUMMARY**

[0007] In an embodiment, a retaining assembly comprises a fastener, a hook, and a portion of a metal mesh material releasably engaged with the fastener and engaged with the hook. The fastener, the hook, and the portion of the metal mesh material are configured to adjust an overall length of the retaining assembly.

[0008] In an embodiment, a fastener comprises a cover comprising a retaining member; and a back plate rotatively coupled to the cover. The cover and the back plate are configured to engage a metal mesh material, and a distance between an end of the retaining member and a surface of the back plate is between a peak height and a valley height of the metal mesh material.

[0009] In an embodiment, a method comprises releasably engaging a portion of a metal mesh material with a fastener, wherein a first end of the metal mesh material is coupled to a hook; engaging the metal mesh material with a connection point coupled to a metal mesh garment; and releasably coupling the hook to an attachment point on the fastener.

[0010] These and other features will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings and claims.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0011] For a more complete understanding of the present disclosure, reference is now made to the following brief description, taken in connection with the accompanying drawings and detailed description, wherein like reference numerals represent like parts.

[0012] Figure 1 illustrates a top view of a metal mesh material according to an embodiment.

[0013] Figure 2 illustrates a side view of a metal mesh material according to an embodiment.

[0014] Figure 3 illustrates a perspective view of a metal mesh garment disposed on a user and retained by an embodiment of a retaining assembly.
Figure 4 illustrates a perspective view of a fastener according to an embodiment.

Figure 5 illustrates another perspective view of a fastener and a metal mesh material according to an embodiment.

Figures 6A-6D illustrate various cross-sectional views of a fastener and a metal mesh material according to an embodiment.

Figure 7 illustrates still another perspective view of a fastener, a metal mesh material, and a hook according to another embodiment.

Figures 8A and 8B illustrate a schematic layout of the connections of a retaining assembly to a metal mesh material according to an embodiment.

DETAILED DESCRIPTION

It should be understood at the outset that although illustrative implementations of one or more embodiments are illustrated below, the disclosed systems and methods may be implemented using any number of techniques, whether currently known or not yet in existence. The disclosure should in no way be limited to the illustrative implementations, drawings, and techniques illustrated below, but may be modified within the scope of the appended claims along with their full scope of equivalents.

Disclosed herein are systems and methods for retaining a metal mesh garment or material in a desired position using a retaining assembly. The retaining assembly may be formed of metal components, which may allow the retaining assembly to remain with the metal mesh garment or material during cleaning. This may allow for ease of cleaning and a reduction in lost retainer assemblies for the metal mesh garments or materials. Further, the retaining assembly uses an adjustment system that can be easily adjusted and does not have to be removed or changed during use, removal, or cleaning of the metal mesh material or garment. This may reduce the amount of time and effort required to place on, wear, and remove the metal mesh garment or material. Still further, the retaining assembly allows for the adjustment to be
maintained without having any loose material (e.g., a loose strap end) that may present a safety hazard in certain industrial settings. These and other advantages are more fully described herein.

[0022] The metal mesh material 100 generally comprises a network of interlocking metallic rings. Various configurations of the rings are possible. As illustrated in FIG. 1 and FIG. 2, an embodiment of the metal mesh material 100 comprises multiple rows 101, 102, 103 of interlocking of rings 104 arranged one beside the other, each row 102 that does not form an edge of the metal mesh material 100 is coupled to a first adjacent row 101 on a first side and a second adjacent row 9 of rings 104 on a second side. Each ring 104 within the row 102 that is not positioned on the edge of the metal mesh material 100 engages two adjacent rings 104 of the first adjacent row 101 from a first side 202 of the metal mesh material 100 and two adjacent rings 104 of the second adjacent row 103 from a second side 204 of the metal mesh material 100. The metal mesh material 100 then comprises a repeating pattern in which each ring 104 that is not at an edge or a seam is coupled to four adjacent rings. The metal mesh material 100 may then comprise the raised and alternating cross-sectional pattern of rings 104 as illustrated in FIG. 2 (e.g., a "zigzag" or peak-and-valley pattern). This configuration allows the metal mesh material 100 to expand in a direction indicated by the arrow 106 while resisting expansion and/or contraction in a direction aligned with the rows 101, 102, 103. The direction aligned with the rows 101, 102, 103 may be referred to in some contexts as the "grain direction" of the metal mesh material 100.

[0023] Various types of garments and coverings may be formed from the metal mesh material. In an embodiment, suitable metal mesh garments may include, but are not limited to, shoulder guards, gloves, arm protectors, leg protectors, and/or chest protectors. Shoulder guards may generally cover the shoulder of a user up to about the neck, a portion of the chest, a portion of the back, and some distance down the arm (e.g., to about the elbow). As shown in Figure 3, shoulder guards may be retained through the use of a retaining assembly, as described in more detail herein, which connect to both the chest and back portions and pass around the neck of a
user and/or under the opposite arm of the user. Similarly, arm protectors, leg protectors, and/or chest protectors may be retained through the use of a retaining assembly that connects to one or more connection points and passes around a portion of a user’s body or connects to another component worn by a user. In addition to the various metal mesh garments, a protective layer for equipment, personnel, animals, and the like may be used for various purposes and retained by the retaining assembly described herein. For example, a metal mesh curtain may be retained in an adjustable fashion using the retaining assembly described herein.

[0024] Due to the flexible nature of the metal mesh material, movement of the garment or material may occur during use. As shown in FIG. 3, a retaining assembly 300 may be configured to engage and retain the metal mesh garment 304 or material in the desired location on a user 306 and/or on any associated equipment. The retaining assembly 300 may allow for an adjustable fit of the metal mesh garment 304 or material through an adjustment of the overall length of the retaining assembly 300. In an embodiment, the retaining assembly 300 described herein comprises a fastener 302 and a hook 308. In an embodiment, a portion of the metal mesh material may be coupled to the fastener 302, pass through a loop coupled to the hook 308 and then be releasably engaged through the fastener 302. An end of the metal mesh passing through the fastener 302 may be coupled to a connection point on the metal mesh garment. The hook 308 may then be used to engage a second connection point 312 of the metal mesh material. In another embodiment, the hook may be coupled to a portion of the metal mesh material that is also connected to the first connection point. The fastener 302 may be engaged on the portion of the metal mesh material. The hook may then pass through a loop or other connection type at the second connection point 312 and then pass back and be coupled to the fastener 302. In either case, the fastener, at least one hook, and the portion of the metal mesh material are configured to adjust an overall length of the retaining assembly 300. A variety of additional configurations of the fastener 302 and hook 308 may also be possible as described in more detail herein.
[0025] The fastener 302 may be configured to releasably engage a portion 310 of the metal mesh material and provide a moveable and adjustable location for retaining the metal mesh material on a user and/or in a desired location. In an embodiment, the fastener 302 may be configured to releasably engage a strip of the metal mesh material. This may allow a user to adjust the connection point of a retaining assembly 300 to their desired size and then maintain this positioning of the connection point during removal and cleaning of the metal mesh garment. Upon receiving the cleaned garment, the user's fit may be maintained as a result of the maintaining the connection point of the fastener 302 as part of the retaining assembly 300.

[0026] In the embodiment illustrated in FIGS. 4 and 5, the fastener 302 comprises a cover 402 and a back plate 404 that are rotatingly coupled about an axis aligned between two points to form a hinge 406. The cover 402 and back plate 404 may also comprise one or more latch mechanisms configured to retain the cover 402 in a closed position relative to the back plate 404. One or more attachment points 414 may be coupled to or formed as a part of the back plate 404 for connecting the metal mesh material and/or the hook.

[0027] In an embodiment, the cover 402 comprises a top 418, two sides 418, and a retaining member 420. The cover 402 may be a stamped and bent piece formed from a single piece of material. A protrusion or other indicator 408 may be disposed on one or both of the sides 418 as part of an optional latch mechanism. The retaining member 420 may be configured to engage the metal mesh material when the fastener 302 is in a closed position, and rotate out of engagement with the metal mesh material when the fastener 302 is in an open position. The outer edge of the retaining member 420 may comprise one or more features 422 configured to cooperatively interact with the metal mesh material. In an embodiment, the features 422 may comprise teeth, scallops, corrugations, castellations, and/or the like. These features may allow the edges of the rings of the metal mesh to be disposed between the surfaces of adjacent features and thereby limit the movement of the rings when the fastener is in a closed position as described in more detail herein. The cover 402 may also comprise a pin 424 configured to engage a
corresponding bearing feature or member 426. The pin 424 may be integrally formed with the
cover and/or the retaining member 420, for example, by stamping the pins from a single piece of
material during the formation of the cover 402.

[0028] In an embodiment, the back plate 404 comprises a bottom 428 and two sides 430. The back plate 404 may be sized to engage the cover 402 with the sides 418 of the cover 402 being disposed within the sides 430 of the back plate 404. In some embodiments, at least a portion or all of the sides 418 of the cover 402 may be disposed outside the sides 430 of the back plate 404. The back plate 404 may be a stamped and bent piece formed from a single piece of material. A recess, aperture, or other indicator 410 corresponding to the indicator 408 on the cover 402 may be disposed on one or both of the sides 430 as part of an optional latch mechanism. The back plate 404 may also comprise a bearing feature or member 426. In an embodiment, the bearing feature 426 comprises an aperture formed in the sides 430. The bearing feature 426 may be configured and sized to receive the pin 424 disposed on the cover 402. One or more attachment points 414 may be disposed on the bottom 428 and/or sides 430 of the back plate 404. In an embodiment, the attachment point 414 may comprise an elongated slot formed in the bottom 428 of the back plate 404. The attachment point 414 may be configured to couple to and/or engage one or more rings of the metal mesh material and/or the hook. In an embodiment, the bearing feature 426, the indicator 410, and/or the one or more attachment points 414 may be integrally formed with the back plate 404, for example, by stamping, cutting, drilling, grinding, and/or otherwise forming the features from a single piece of material during the formation of the back plate 404.

[0029] As illustrated in FIGS. 4 and 5, the cover 402 may be rotatably coupled to the back plate 404 to form the fastener 302. In an embodiment, the hinge 406 may be formed through the engagement of the pin 424 disposed on the cover 402 within the bearing feature 426 disposed on the back plate 404. While FIG 5 illustrates the hinge 406 as being formed from the pin 424 and the bearing feature 426 any of a variety of corresponding features may be used on the cover 402
and the back plate 404 to form a hinge 406 configured to provide a rotational movement between
the cover 402 and the back plate 404. In an embodiment, the rotational movement may occur
about a rotational axis that is substantially perpendicular to the direction in which the metal mesh
material passes through the fastener 302. In an embodiment, the rotation movement may occur
about a rotational axis that is substantially parallel to the direction of the grain of the metal mesh
fabric passing between the cover 402 and the back plate 404.

[0030] The hinge 406 may allow the cover 402 to rotate relative to the back plate 404 to any
position between an open position and a substantially closed position. As shown in FIG. 6A, the
cover 402 may be rotated away from the bottom of the back plate 404 in the open position, and
the retaining member 420 may be disposed above a surface 604 defined by the rings 104. In this
position, the metal mesh material may be able to move between the cover 402 and the back plate
404, which may be used to position and adjust the position of the fastener relative to the metal
mesh material. For example, the fastener may be configured in the open position, and an
adjustment strip of metal mesh material may then be passed between the cover 402 and the back
plate 404 to position the adjustment strip to a desired location before closing the fastener.

[0031] Upon configuring the fastener in the closed position by rotating the cover 402 about
the rotational axis 602 (where rotational axis 602 is directed into the plane of FIGS. 6A and 6B)
to engage the back plate 404, the cross-section of the fastener may be configured as illustrated in
FIG. 6B. In this position, the end 605 of the retaining member 420 may be disposed below the
surface 604 defined by the rings 104. The end 605 generally refers to the surface of the retaining
member 420 that does not include the one or more features (e.g., teeth, castellations, etc.). The
end 605 of the retaining member 420 may be aligned with a row of rings and be disposed within
a valley created between two adjacent rows creating peaks. In an embodiment, the end 605 of
the retaining member 420 may cross between adjacent rows of rings 104, and one or more
features on the end 605 of the retaining member 420 (e.g., teeth, castellations, etc.) may allow for
a portion of one or more rings to remain above the level of the end 605 without being crimped or
deformed. As described herein, the zigzag or peak and valley structure of the rings may generally have a surface 604 at the peak height 608 and a valley height 606 below the peak height 608. The fastener may be configured so that the end 605 of the retaining member 420 is disposed a closure distance 609 apart from the back plate 404. In an embodiment, the closure distance 609 may be greater than the valley height 606, and the closure distance 609 may be less than the peak height 608. This configuration may allow the fastener to engage and retain the metal mesh material without relying on a clamping force between the cover 402 and the back plate 404. This configuration represents an advantage over other types of fasteners that apply a pressure to the rings, potentially leading to deformation and potential failure of the rings and associated metal mesh material.

[0032] The mechanism by which the fastener retains the metal mesh material, in one embodiment, is illustrated in FIGS. 6C and 6D. When the metal mesh material is subjected to a force directed to the left of FIG. 6C, the peak of the metal mesh material adjacent the end 605 of the retaining member 420 may engage the retaining member 420, thereby restricting further movement of the metal mesh material. The resulting force on the adjacent rings may be directed in the approximate direction of the arrows 610. The force on the adjacent rings may prevent the rings from collapsing downward and passing under the end 605 of the retaining member 420. Further, the location of the hinge and rotational axis may be selected so that the force applied to the retaining member by the adjacent rings results in a rotational force about the axis of rotation of the cover, thereby further applying a force to close the fastener. As a fastener for retaining the metal mesh material on a user or in a desired location, the force on the metal mesh material, and consequently the fastener, may generally be expected to occur as illustrated in FIG. 6C. Thus, the fastener may be configured to convert the force into a closure force, thereby maintaining the fastener in the closed position during use.

[0033] When the metal mesh material is subjected to a force directed to the right of FIG. 6D, the peak of the metal mesh material adjacent the end 605 of the retaining member 420 may
engage the retaining member 420, thereby restricting further movement of the metal mesh material. The resulting force on the adjacent rings may be directed in the approximate direction of the arrows 612. The force on the adjacent rings may prevent the rings from collapsing downward and passing under the end 605 of the retaining member 420. The location of the hinge and rotational axis may result in a force applied to the retaining member by the adjacent rings that may apply a force to open the fastener. In order to prevent this force from opening the fastener, a latch mechanism may be used to prevent the opening of the faster until a force above a threshold has been applied. Alternatively, the fastener may be configured with a compression fit between the cover 402 and the back plate 404 to prevent the inadvertent opening of the fastener without the application of a desired force.

In an embodiment, an optional latch mechanism may be used to retain the fastener in a closed position. As shown in FIGS. 4 and 5, the latch mechanism may generally comprise a protrusion or other indicator 408 disposed on one or both of the sides 418 of the cover 402 and a corresponding recess, aperture, or other indicator 410 disposed on one or both of the sides 430 of the back plate 404. In an embodiment, the one or more indicators 408 may generally comprise a protrusion extending beyond the outer surface of the side 418 and having a slope configuration shaped like a cone or pyramid extending from the surface of the side 418. The one or more indicators 408 may extend a distance beyond the outer surface of the side 418 that is greater than the distance between the outer surface of the sides 418 of the cover 402 and the inner surface of the sides 430 of the back plate 404. Upon closure of the cover 402, the one or more indicators 408 may engage the edge of the sides 430 of the back plate 404. Upon applying a closure force to the cover 402, the sides 418 may act like springs with respect to the top 416 and compress inwards towards the center of the fastener 302. Alternatively or in addition to the compression of the sides 418, the sides 430 of the back plate 404 may act like springs with respect to the bottom 428 and expand outwards away from the center of the fastener 302. The resulting movement of one or both of the sides 418, 430 may provide sufficient distance between the outer surface of the
sides 418 of the cover 402 and the inner surface of the sides 430 of the back plate 404 to allow the indicator 408 to pass by until engaging the indicator 410 in the back plate 404. The indicator 410 may comprise an aperture configured to be aligned with the one or more indicators 408 when the fastener 302 is in the closed position. Upon alignment, the indicator 408 may engage the indicator 410, thereby allowing the one or more sides 418, 430 to at least partially return to a resting position. The force required to displace one or more of the sides 418, 430 and engage the latch mechanism may be determined at least in part by the strength of the sides 418, 430, the configuration and number of the one or more indicators 408, and the distance between the outer surface of the sides 418 of the cover 402 and the inner surface of the sides 430 of the back plate 404. Upon opening the fastener from the closed position, the same force may be applied in order to reverse the process.

[0035] While the latch mechanism has been described with respect to corresponding indicators as illustrated in FIGS. 5 and 6, the relative positioning of the indicators may be reversed. That is, the indicator comprising the protrusion may be disposed on the back plate 404 and the indicator comprising the recess or aperture may be disposed on the cover 402. Alternatively, a variety of additional latch mechanisms may be used to retain the fastener in a closed position. For example, various pin and latch mechanisms, spring mechanisms, and the like may be used with the fastener described herein to maintain the fastener in the closed position.

[0036] The hook is configured to provide a releasable connection point for the retaining assembly. The hook may be configured to be releasably coupled to the fastener and/or a connection point on a metal mesh garment or covering. In an embodiment, the retaining assembly may comprise a plurality of hooks to couple a metal mesh material to one or more connection points on a metal mesh garment or covering. In an embodiment illustrated in FIG. 7, the hook 700 comprises a metal mesh connection 702 coupled to a hook mechanism 708. The metal mesh connection 702 may be configured to engage a portion of the metal mesh material in
a fixed or adjustable engagement. In an embodiment, the metal mesh connection 702 may be configured to allow the metal mesh material to pass through the metal mesh connection 702 and move relative to the metal mesh connection 702. In some embodiments, the metal mesh material may be coupled to the metal mesh connection 702 to provide for a limited amount of movement between the metal mesh material and the metal mesh connection 702. For example, the metal mesh material may pass through the metal mesh connection 702 and connect to itself near to the metal mesh connection 702. Alternatively, a portion of the metal mesh connection 702 may be coupled to the individual rings of the metal mesh material.

[0037] While the metal mesh connection 702 is illustrated as a ring, various additional metal mesh connection and/or additional or connection structures may be used. For example, the metal mesh connection 702 may comprise a loop having various cross sections such as round, oval, triangular, square, crescent, and the like. Alternatively, the metal mesh connection 702 may comprise a flat, plate-like structure with one or more apertures therein. One or more individual rings of the metal mesh material may then engage and/or couple to the individual apertures in order to couple the metal mesh material to the metal mesh connection 702. Various additional suitable structures may also be used and are considered within the scope of the present disclosure.

[0038] The hook mechanism 708 may generally be configured to releasably engage a corresponding connection structure. In an embodiment, a closing mechanism 704 may be used with the hook 700 to secure the hook mechanism 708 to the connection point. The closing mechanism 704 may form a locking engagement and/or a non-locking engagement with the hook mechanism 708. In an embodiment, the closing mechanism 704 may comprise a spring loaded or biased straight latch, a bent latch, and/or a wire latch to allow for the formation of a non-locking engagement with the hook mechanism 708. In an embodiment, the closing mechanism 704 may comprise a spring loaded twist-type latch, a spring loaded sleeve-type latch, a threaded-
latch, and/or a pin and latch mechanism to allow for the formation of a locking engagement with the hook mechanism 708.

[0039] Referring to Figure 3, various types of connection points may be used to couple the retaining assembly to the metal mesh garment or material. In an embodiment, one or more portions (e.g., portion 310) of metal mesh material may be integrally formed with the metal mesh garment or material. In this embodiment, the portion 310 of the metal mesh material may be coupled to the larger metal mesh garment 304 or material through the repeating pattern of individual interlocking rings, thereby forming a continuous portion of the metal mesh material for use with the retaining assembly. In an embodiment, one or more connection points (e.g., the second connection point 312) may comprise a connection mechanism similar to the metal mesh connection 702 discussed with respect to Figure 7. The connection mechanism may correspond in shape and be configured to releasably engage the hook 700. In an embodiment, the connection mechanism may comprise a loop having a shape configured to allow the hook 700 to engage the loop. The loop may then be coupled to the metal mesh through a variety of mechanisms such as a connector (e.g., screw, rivet, bolt, one or more weld points, etc.) and/or any of the connection mechanism described with respect to the metal mesh connection 702.

[0040] In use, the retaining assembly may be configured to engage and retain the metal mesh garment or material in the desired location on a user and/or on any associated equipment. The use of the fastener and hook may allow for an adjustable engagement of the metal mesh garment and/or material, where the adjustment can be maintained while placing the metal mesh garment on, wearing the metal mesh garment and/or material, and/or removing the garment and/or material. In an embodiment, the retaining assembly may be used to retain the metal mesh garment on a user via a retaining assembly that comprises a fastener, at least one hook, and a portion of a metal mesh material releasably engaged with the fastener and coupled to the at least one hook, where the fastener, the at least one hook, and the portion of the metal mesh material are configured to adjust an overall length of the retaining assembly. The metal mesh garment
may be fitted to a user by adjusting the position of the portion of the metal mesh material relative to the fastener.

[0041] In an embodiment shown in Figure 8A, the retaining assembly 800 is schematically shown in the position in which it would be used to retain the metal mesh garment and/or material during use. Figure 8A is illustrated in exaggerated form to show the connections and arrangement of parts. As illustrated, the retaining assembly 800 is coupled to the metal mesh garment 304 and/or material at a first connection point 806 and a second connection point 804. The first connection point 806 may represent a location at which a connection mechanism similar to the metal mesh connection 702 discussed with respect to Figure 7 is coupled to the metal mesh garment 304 and/or material. A hook mechanism 805 may then releasably engage the first connection point 806. A first portion 310 of the metal mesh material may be coupled to a metal mesh connection 807, which may also engage a first hook mechanism 805. The first portion 310 may pass through the fastener 302 as described above before engaging a second metal mesh connection 803 that is coupled to a second hook mechanism 808. The second hook mechanism 808 may be releasably engaged with a second connection point 804. In an embodiment, the portion 310 of the metal mesh material engaging the metal mesh connection 803 may be moveable with respect to the metal mesh connection 803. For example, the portion 310 of the metal mesh material may be retained by the metal mesh connection 803 while being configured to slide or move relative to the metal mesh connection 803. The first portion 310 of the metal mesh material may then pass back to engage and be coupled to the fastener 302 at an attachment point that may be the same as or similar to the attachment point of the fastener 302 as described above.

[0042] The retaining assembly 800 may be adjusted by opening the fastener 302 and positioning the portion 310 of the metal mesh material between the cover and back plate to fit the user, whereupon the fastener may be closed to retain the relative position of the portion 310 of the metal mesh material relative to the fastener 302. The adjustment of the retaining assembly
800 may be performed during use of the retaining assembly 800, such as when the first hook mechanism 805 and the second hook mechanism 808 are both engaged and coupled to the metal mesh garment 304 and/or material through the first connection point 806 and the second connection point 804, respectively. In an embodiment, the metal mesh garment and/or material may be placed in a desired position or removed without removing the retaining assembly 800. The adjustment may then be maintained during removal and/or cleaning.

[0043] In an embodiment, one or both of the first hook mechanism 805 or the second hook mechanism 808 may be disengaged from the first connection point 806 or the second connection point 804, respectively, in order to place on and/or remove the metal mesh garment and/or material. The adjustment of the retaining assembly 800 may then be performed when at least one of the first hook mechanism 805 or the second hook mechanism 808 is disengaged from the first connection point 806 or the second connection point 804, respectively. In an embodiment, the metal mesh garment and/or material may be placed in a desired position with one or both of the first hook mechanism 805 or the second hook mechanism 808 disengaged from the first connection point 806 or the second connection point 804, respectively. The first hook mechanism 805 or the second hook mechanism 808 may then be engaged with the first connection point 806 or the second connection point 804, respectively, to wear the metal mesh garment and/or material. In an embodiment, the metal mesh garment and/or material may be removed by disengaging one or both of the first hook mechanism 805 or the second hook mechanism 808 from the first connection point 806 or the second connection point 804, respectively, and removing the metal mesh garment 304 and/or material. Since the retaining assembly 800 may be placed on, worn, and/or removed through the use of one or more hooks, the adjustment obtained through the use of the fastener, which does not need to be adjusted and/or changed in order to place on, wear, and/or remove the metal mesh garment 304 and/or material, may be maintained during non-use and/or cleaning.
Another embodiment of the retaining mechanism 801 is shown in Figure 8B. The retaining assembly 801 is similar to the retaining mechanism 800 and is schematically shown in the position in which it would be used to retain the metal mesh garment and/or material during use. As illustrated, the retaining assembly 801 is coupled to the metal mesh garment 304 and/or material at a first connection point 810. The first connection point 810 may represent a location at which a first portion 310 of metal mesh material is integrally formed with the metal mesh garment 304 and/or material, though other connection mechanisms and methods may be used to couple the first portion 310 of the metal mesh material to the metal mesh garment 304 and/or material. The first portion 310 may pass through the fastener 302 as described above before engaging a second connection point 809 that is coupled to the metal mesh garment 304. The second connection point 809 may represent a location at which a connection mechanism similar to the metal mesh connection 702 discussed with respect to Figure 7 is coupled to the metal mesh garment 304 and/or material. In an embodiment, the portion 310 of the metal mesh material engaging the second connection point 809 may be moveable with respect to the second connection point 809. For example, the portion 310 of the metal mesh material may be retained by the second connection point 809 while being configured to slide or move relative to the second connection point 809. The first portion 310 may then engage a metal mesh connection 811 that is coupled to a hook mechanism 813. The hook mechanism 813 may be releasably engaged with an attachment point on the fastener 302.

The retaining assembly 801 may be adjusted by opening the fastener 302 and positioning the portion 310 of the metal mesh material between the cover and back plate to fit the user and/or position the metal mesh garment and/or material in a desired position, whereupon the fastener may be closed to retain the relative position of the portion 310 of the metal mesh material relative to the fastener 302. The adjustment of the retaining assembly 801 may be performed during use of the retaining assembly 801, such as when the hook mechanism 813 is engaged with the fastener 302. In an embodiment, the metal mesh garment 304 and/or material
may be placed in a desired position or removed without removing the retaining assembly 800. The adjustment may then be maintained during removal and/or cleaning.

[0046] In an embodiment, the hook mechanism 813 may be disengaged from the fastener 302 in order to place on and/or remove the metal mesh garment 304 and/or material. The adjustment of the retaining assembly 801 may then be performed when the hook mechanism 813 is disengaged from the fastener 302. In an embodiment, the metal mesh garment 304 and/or material may be placed in a desired position with the hook mechanism 813 disengaged from the fastener 302. The hook mechanism 813 may then be engaged with the fastener 302 to wear the metal mesh garment 304 and/or material. In an embodiment, the metal mesh garment 304 and/or material may be removed by disengaging the hook mechanism 813 from the fastener 302 and removing the metal mesh garment and/or material. Since the retaining assembly 801 may be placed on, worn, and/or removed through the use of the hook, the adjustment obtained through the use of the fastener, which does not need to be adjusted and/or changed in order to place on, wear, and/or remove the metal mesh garment and/or material may be maintained during non-use and/or cleaning.

[0047] While several embodiments of the various elements, systems, and methods have been provided in the present disclosure, it should be understood that the disclosed systems and methods may be embodied in many other specific forms without departing from the spirit or scope of the present disclosure. The present examples are to be considered as illustrative and not restrictive, and the intention is not to be limited to the details given herein. For example, the various elements or components may be combined or integrated in another system or certain features may be omitted or not implemented.

[0048] Also, techniques, systems, subsystems, and methods described and illustrated in the various embodiments as discrete or separate may be combined or integrated with other systems, modules, techniques, or methods without departing from the scope of the present disclosure. Other items shown or discussed as directly coupled or communicating with each other may be
indirectly coupled or communicating through some interface, device, or intermediate component, whether electrically, mechanically, or otherwise. Other examples of changes, substitutions, and alterations are ascertainable by one skilled in the art and could be made without departing from the spirit and scope disclosed herein. Other steps may be provided in the methods described herein, or steps may be eliminated, and other components may be added to, or removed from, the systems described herein. Other embodiments may be within the scope of the following claims.
CLAIMS

What is claimed is:

1. A system comprising:
   
a retaining assembly (300, 800, 801) comprising:
   
a fastener (302);
   
a hook (308, 700); and
   
a portion (310) of a metal mesh material releasably engaged with the fastener (302) and engaged with the hook (308, 700),
   
   wherein the fastener (302), the hook (308, 700), and the portion (310) of the metal mesh material are configured to adjust an overall length of the retaining assembly (300, 800, 801); and
   
a metal mesh garment (304) coupled to the retaining assembly (300, 800, 801) at one or more connection points (312, 804, 806, 809, 810).

2. The system of claim 1, wherein the fastener (302) comprises:
   
a cover (402) comprising a retaining member (420); and
   
a back plate (404) rotatantly coupled to the cover (402),
   
   wherein the cover (402) and the back plate (404) are configured to engage a metal mesh material, and wherein a distance (609) between an end (605) of the retaining member (420) and a surface of the back plate (404) is between a peak height (608) and a valley height (606) of the metal mesh material.

3. The system of claim 1 or 2, wherein a first end of the portion (310) of the metal mesh material is coupled to the metal mesh garment (304) at a first connection point (806) of the one or more connection points (804, 806), wherein a second end of the portion (310) of the metal mesh material is coupled to the fastener (302), wherein the portion (310) of the metal mesh material moveable engages the hook (308, 700), and wherein the hook (308, 700) is coupled to
the metal mesh garment (304) at a second connection point (808) of the one or more connection points (804, 806).

4. The system of claim 1 or 2, wherein a first end of the portion (310) of the metal mesh material is coupled to the metal mesh garment (304) at a first connection point (806) of the one or more connection points (806, 808), wherein a second end of the portion (310) of the metal mesh material is coupled to the hook (308, 700), wherein the portion (310) of the metal mesh material moveably engages the metal mesh garment (304) at a second connection point (808) of the one or more connection points (806, 808), and wherein the hook (308, 700) is coupled to the fastener (302).

5. A method comprising:

   releasably engaging a portion (310) of a metal mesh material with a fastener (302), wherein a first end of the metal mesh material is coupled to a hook (308, 700), wherein the cover (402) and the back plate (404) are configured to engage the portion (310) of the metal mesh material, and wherein a distance (609) between an end (605) of the retaining member (420) and a surface of the back plate (404) is between a peak height (608) and a valley height (606) of the metal mesh material;

   engaging the metal mesh material with a connection point (809) coupled to a metal mesh garment (304);

   releasably coupling the hook (308, 700) to an attachment point on the fastener (302); and

   engaging the portion of the metal mesh material with a second connection point (810) coupled to the metal mesh garment (304).
A. CLASSIFICATION OF SUBJECT MATTER

A44B 11/06(2006.01)i, A44B 11/25(2006.01)1, A44B 13/00(2006.01)1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A44B 11/06; B65D 63/00; A61F 5/40; B62I 11/00; B61D 45/00; A62B 35/00; A47D 15/00; B60R 22/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EKOMPASS(KIPO internal) & Keywords: retaining assembly, fatener, hook, and metal mesh

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>See abstract, claim 1, and figure 1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>See abstract, claim 1, and figures 1-11.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>US 4,438,877 A (JACKSON; WILLIAM S.) 27 March 1984</td>
<td>1-5</td>
</tr>
<tr>
<td></td>
<td>See abstract, claim 1, and figures 1-4.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>US 5,598,812 A (GRAHAM; RICHARD D. et al.) 04 February 1997</td>
<td>1-5</td>
</tr>
<tr>
<td></td>
<td>See abstract, claims 1, 11, 12, and figures 1-10.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>WO 97-36522 A1 (CHILD SAFE INTERNATIONAL, LLC) 09 October 1997</td>
<td>1-5</td>
</tr>
<tr>
<td></td>
<td>See abstract, claim 1, and figures 1-3.</td>
<td></td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. ✔ See patent family annex.

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search 25 SEPTEMBER 2012 (25.09.2012)

Date of mailing of the international search report 26 SEPTEMBER 2012 (26.09.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer
KANG, Dae Chul
Telephone No. 82-42-481-5539

Form PCT/ISA/210 (second sheet) (July 2009)
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 2011-0064535 A1</td>
<td>17.03.2011</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>US 0437230 1 A</td>
<td>08.02.1983</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>US 04438877 A</td>
<td>27.03.1984</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>US 055988 12 A</td>
<td>04.02.1997</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>