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(54) **ADJUSTABLE FIT TACTICAL CUMMERBUND**

(71) Applicant: **Agilite Ergonomics (E.B.) Ltd.**, Holon (IL)

(72) Inventors: **Lev Israel Friedman**, Herzliya (IL); **Tomer Menachem van der Kooij**, Haarlem (NL); **Gal Oz**, Ramat Gan (IL)

(73) Assignee: **Agilite Ergonomics (E.B.) Ltd.**, Holon (IL)

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(63) Continuation-in-part of application No. 18/238,631, filed on Aug. 28, 2023.

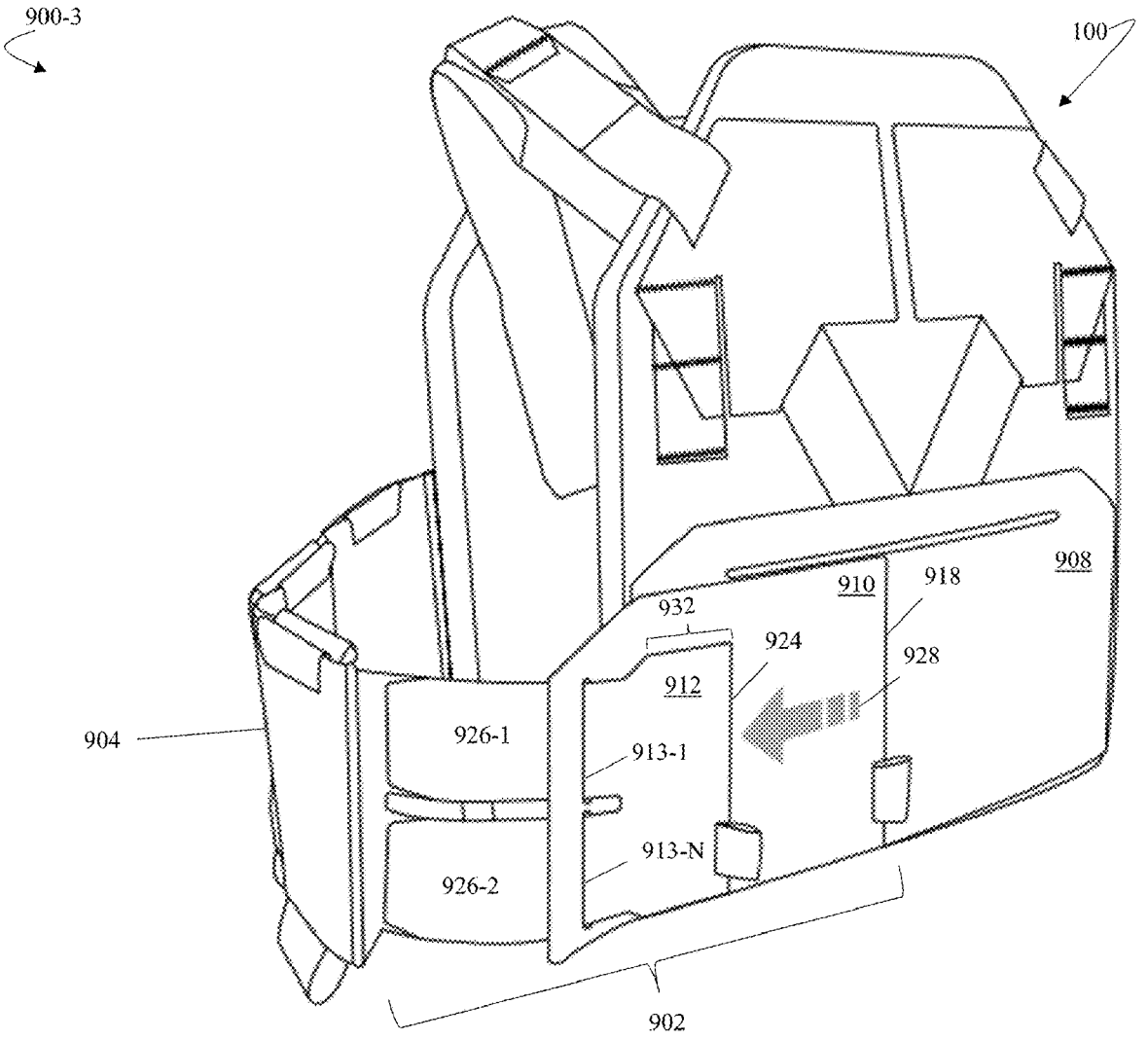
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A45F 5/02 (2006.01)

(52) **U.S. Cl.**
CPC . ***A41D 1/04*** (2013.01); ***A45F 5/02*** (2013.01)

(57) **ABSTRACT**

In one embodiment, a system for fit adjustment of a tactical vest may include a cummerbund configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; and a first attachment panel slidably interconnected to a second attachment panel attached to the cummerbund, wherein the first attachment panel is configured to releasably attach to an attachment panel on the first panel of the tactical vest, wherein the second attachment panel is configured to releasably attach to the first attachment panel, and wherein the second attachment panel is configured to provide wearable length adjustments to the cummerbund based on an amount of overlap between the first attachment panel and the second attachment panel.



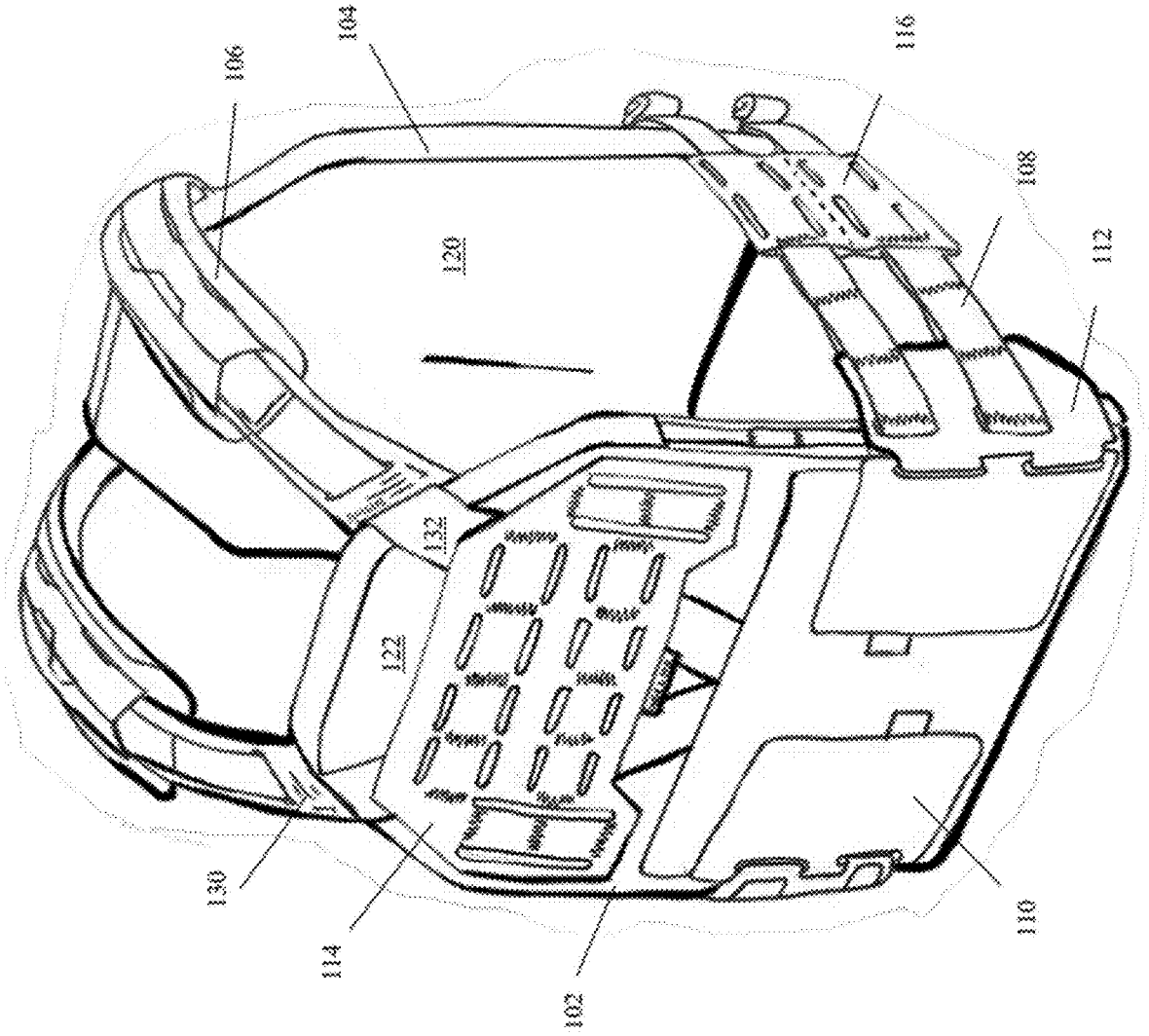


FIG. 1A

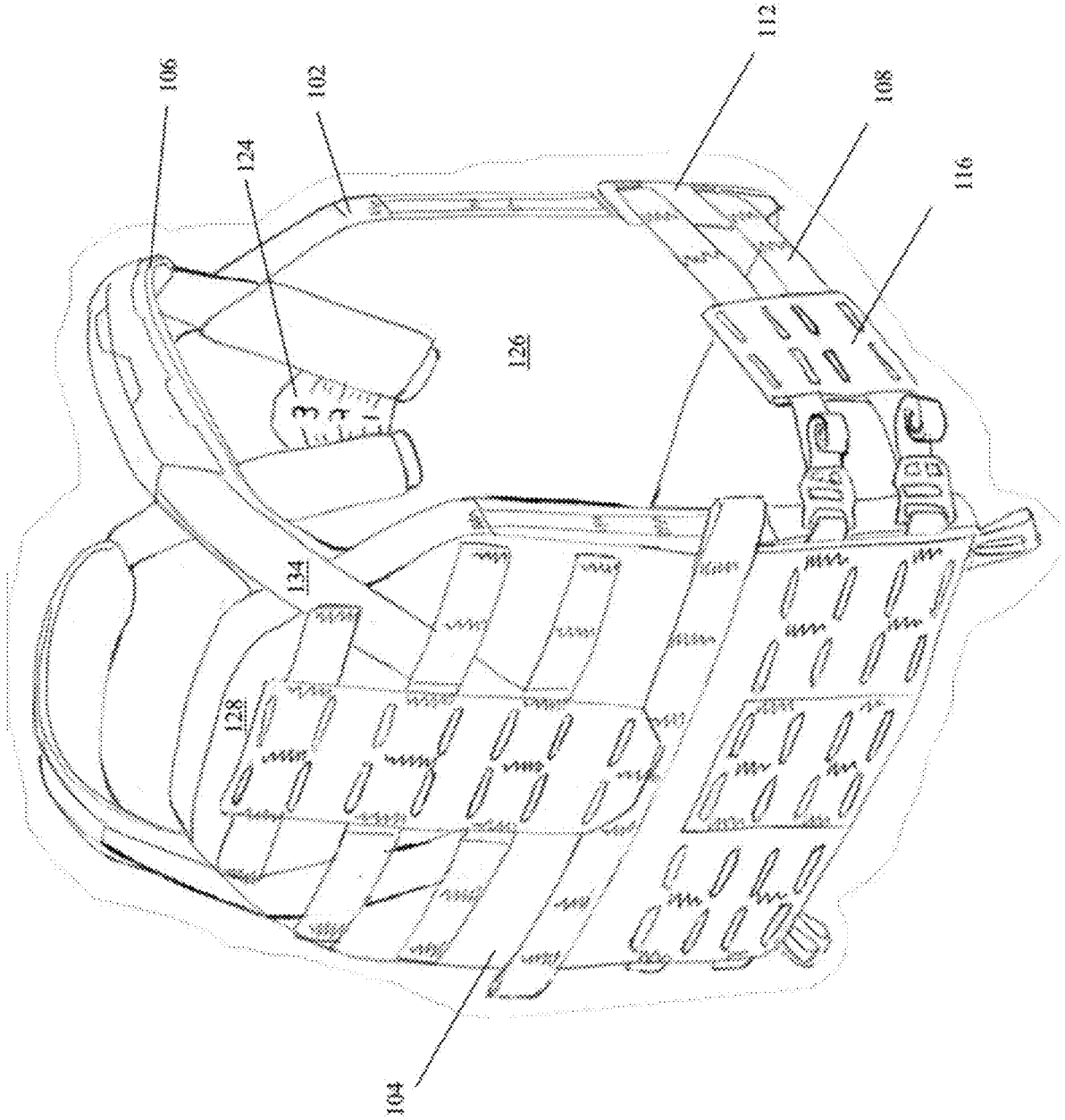


FIG. 1B

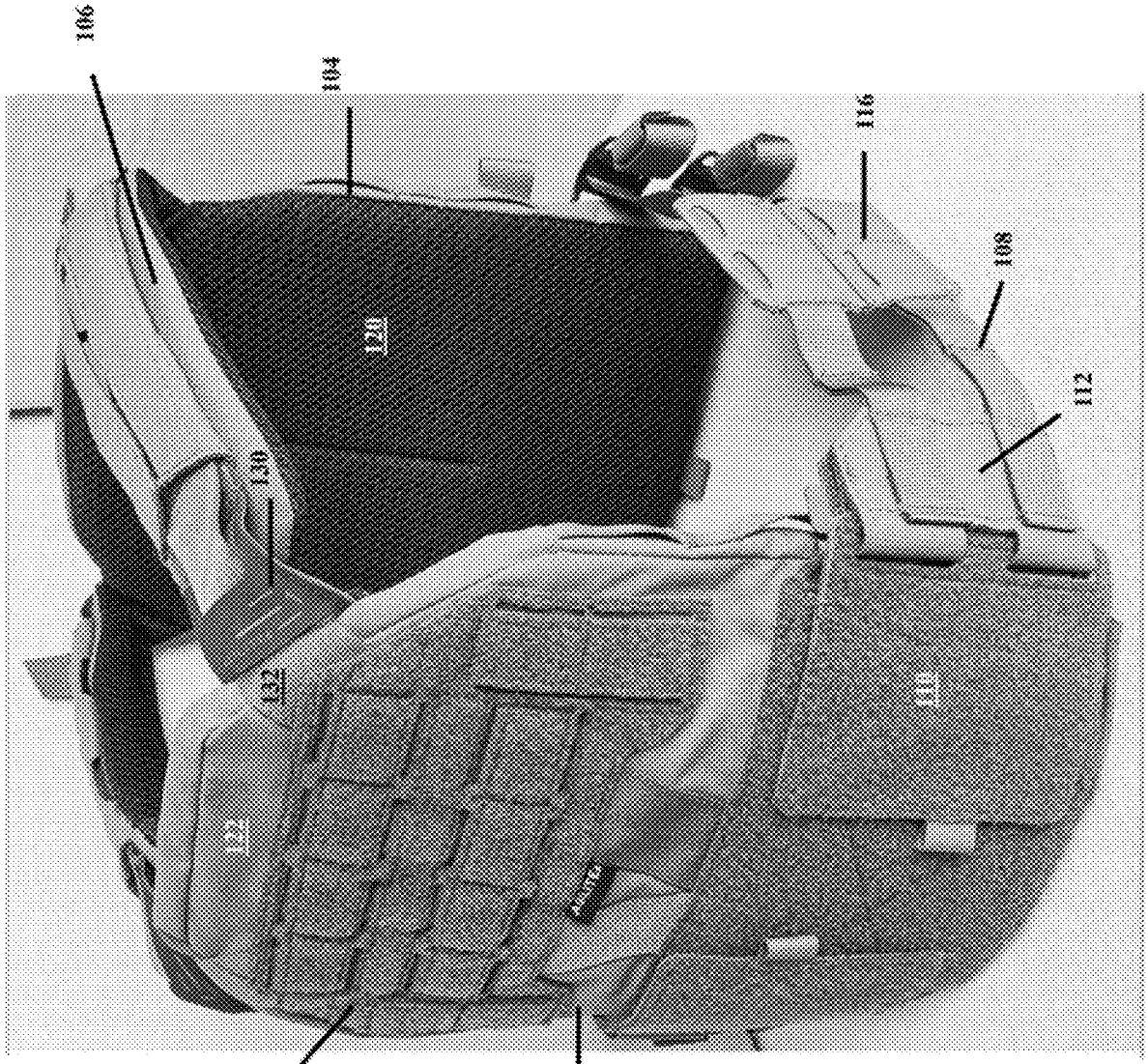


FIG. 1C

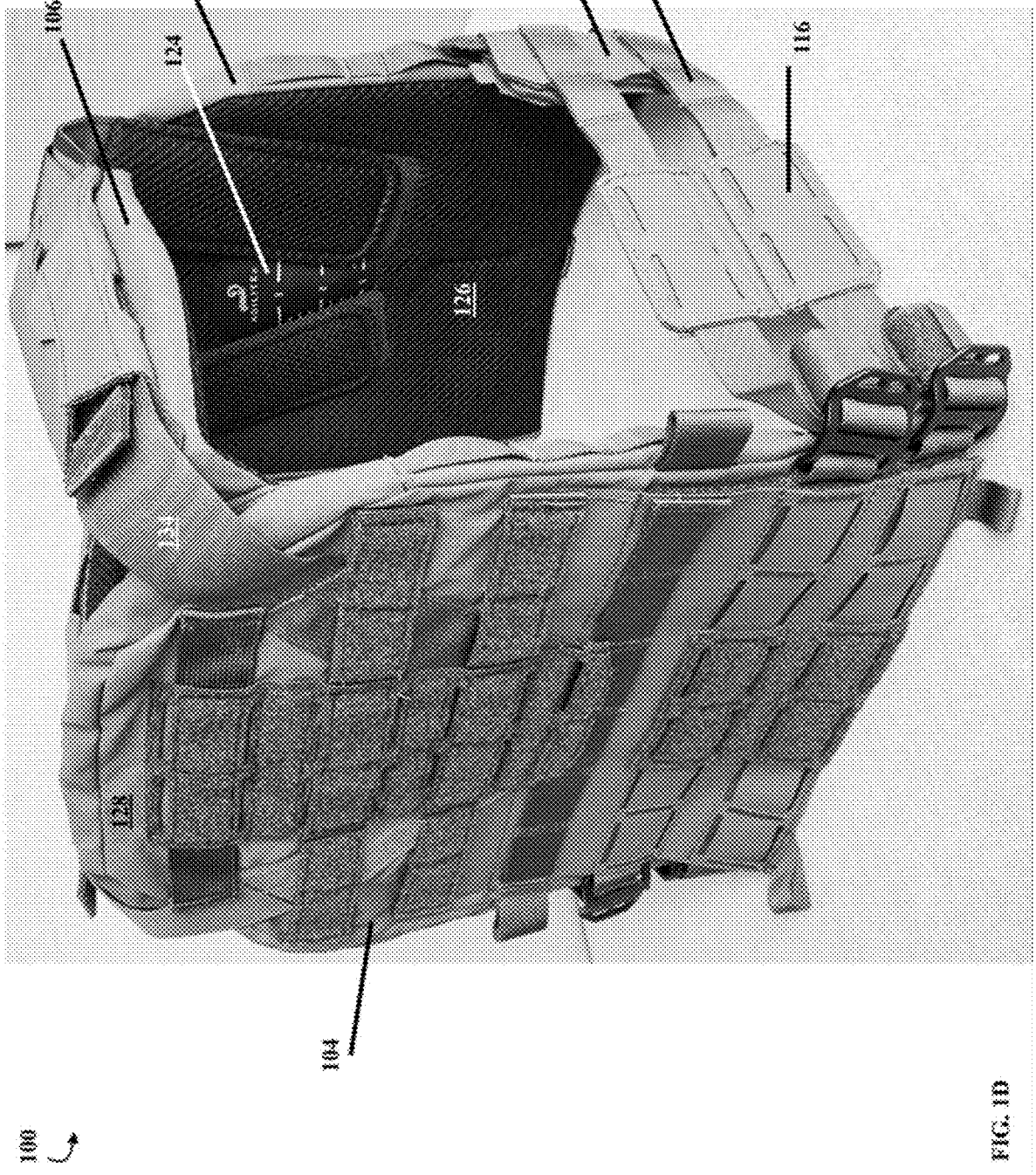


FIG. 1D

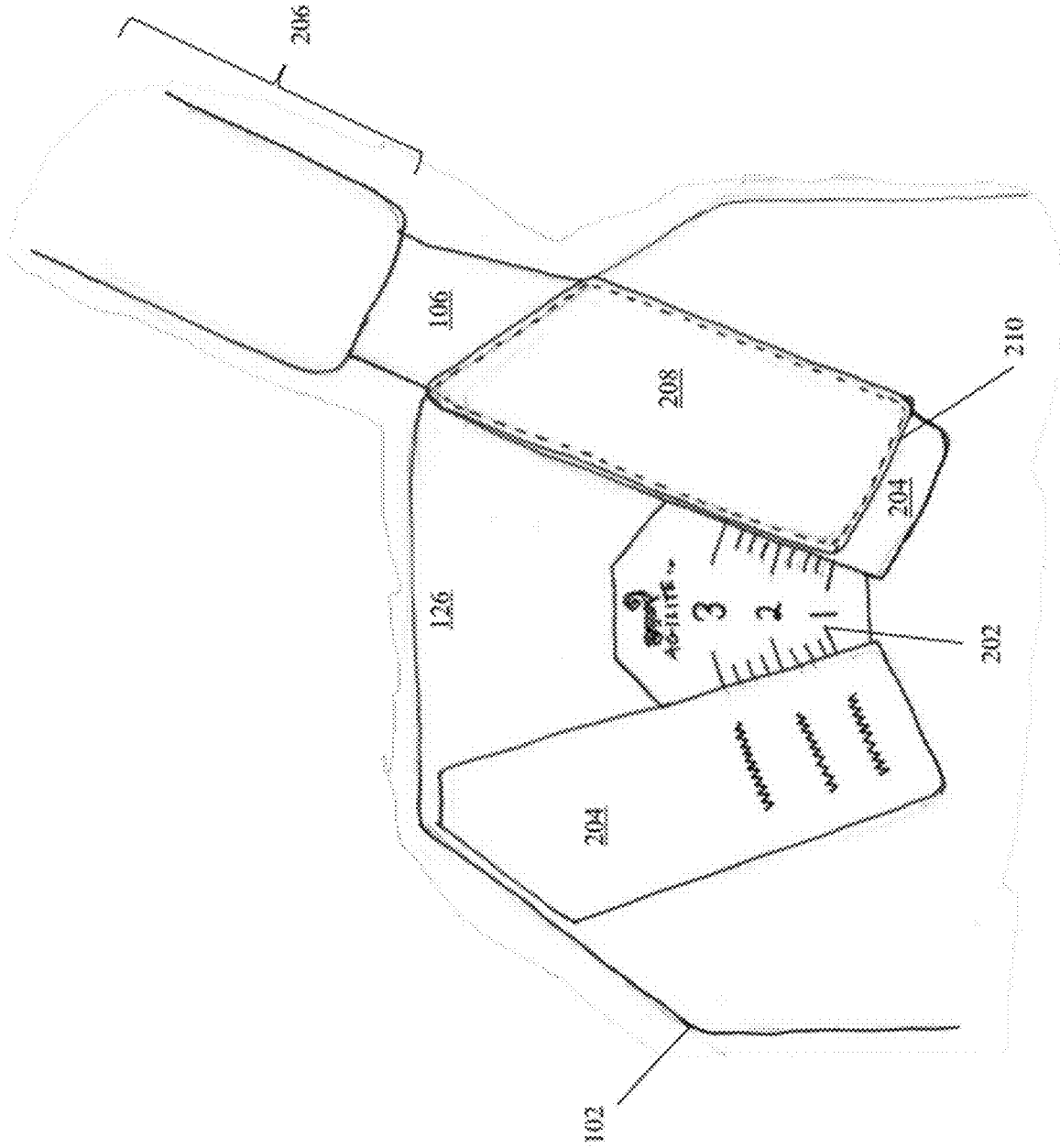


FIG. 2A

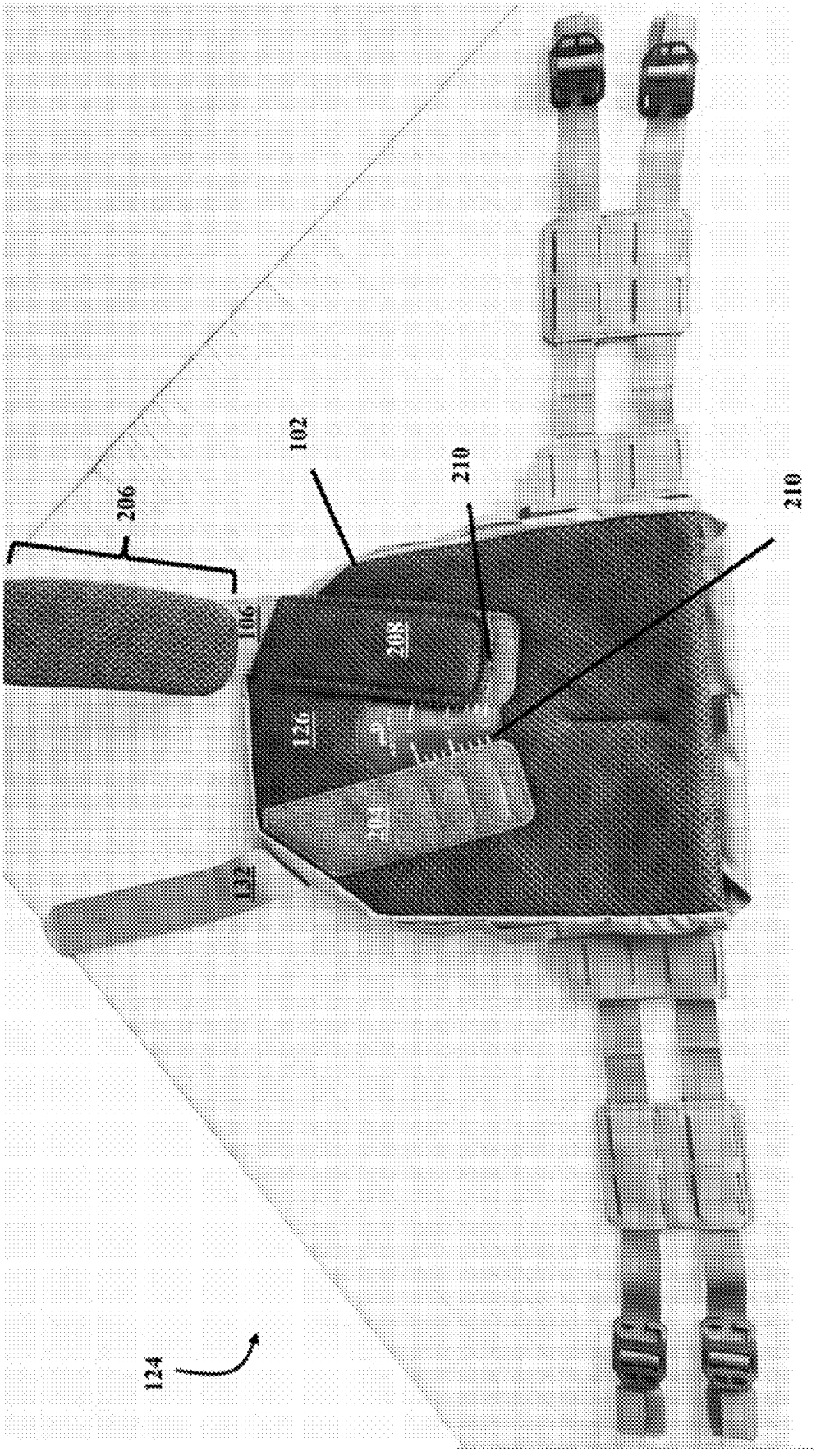


FIG. 2B

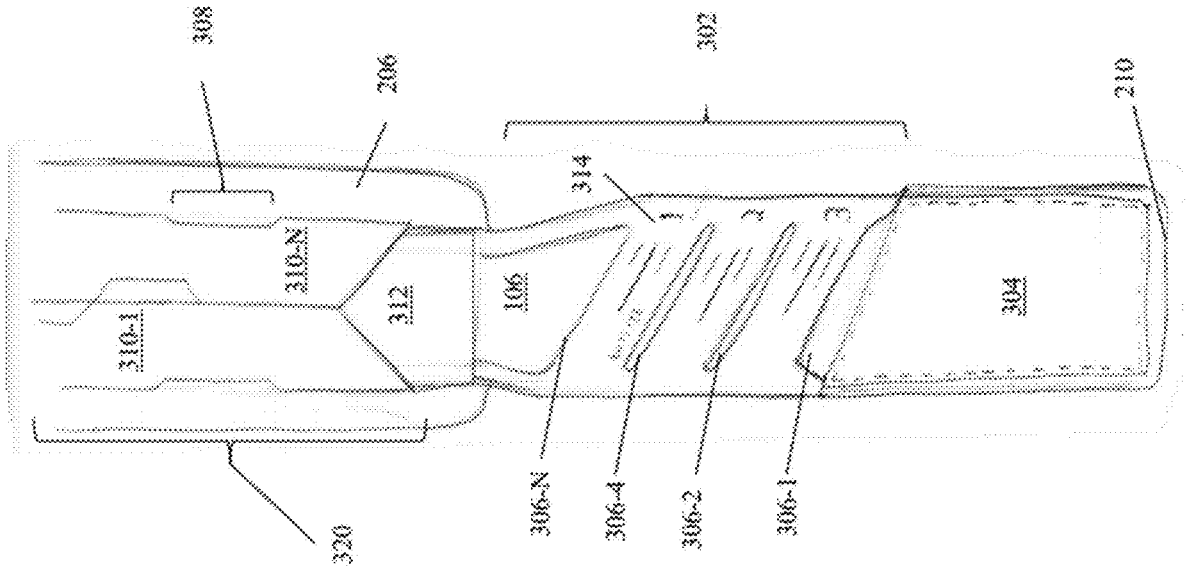
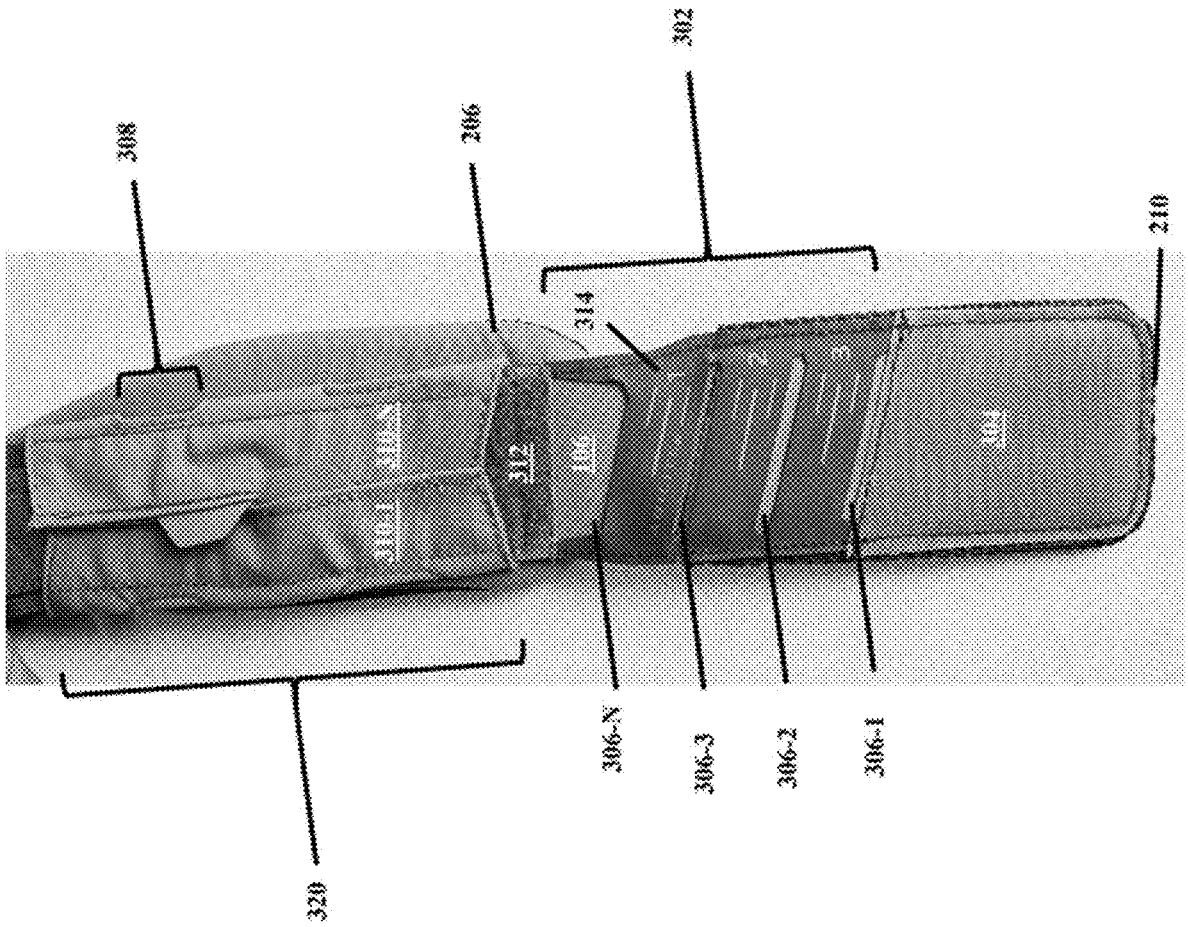

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FIG. 3A



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FIG. 3B

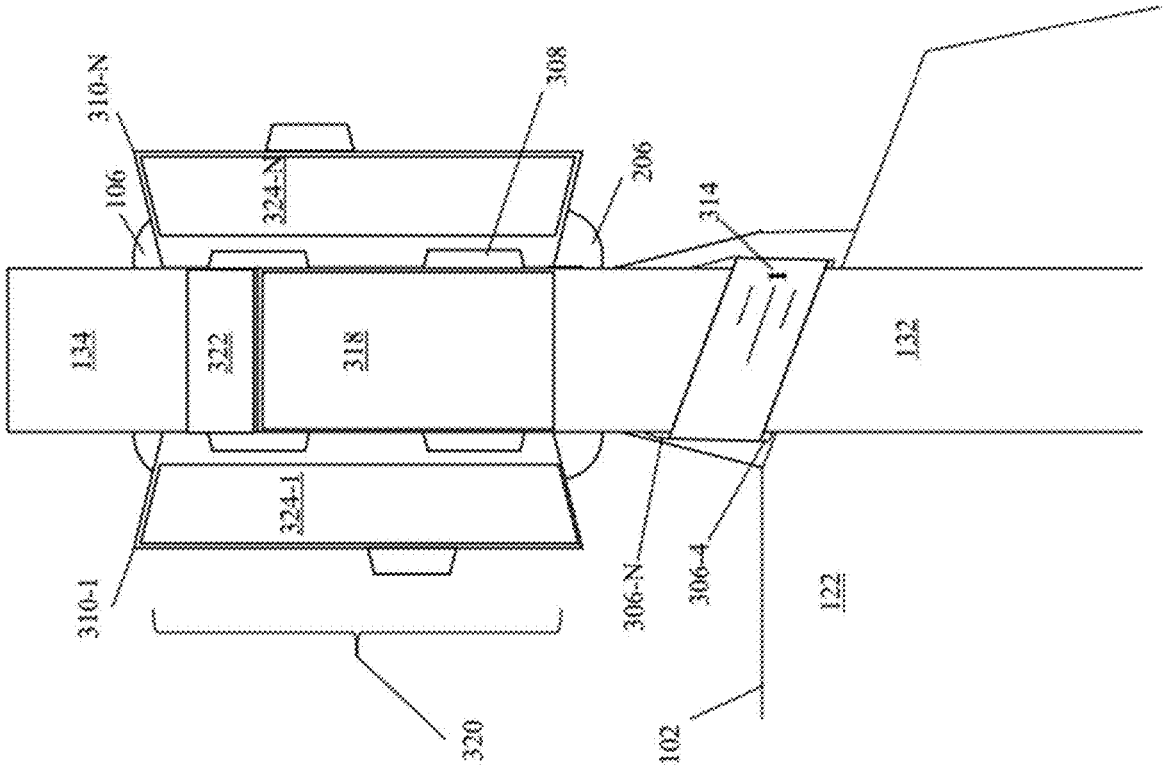

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FIG. 4A

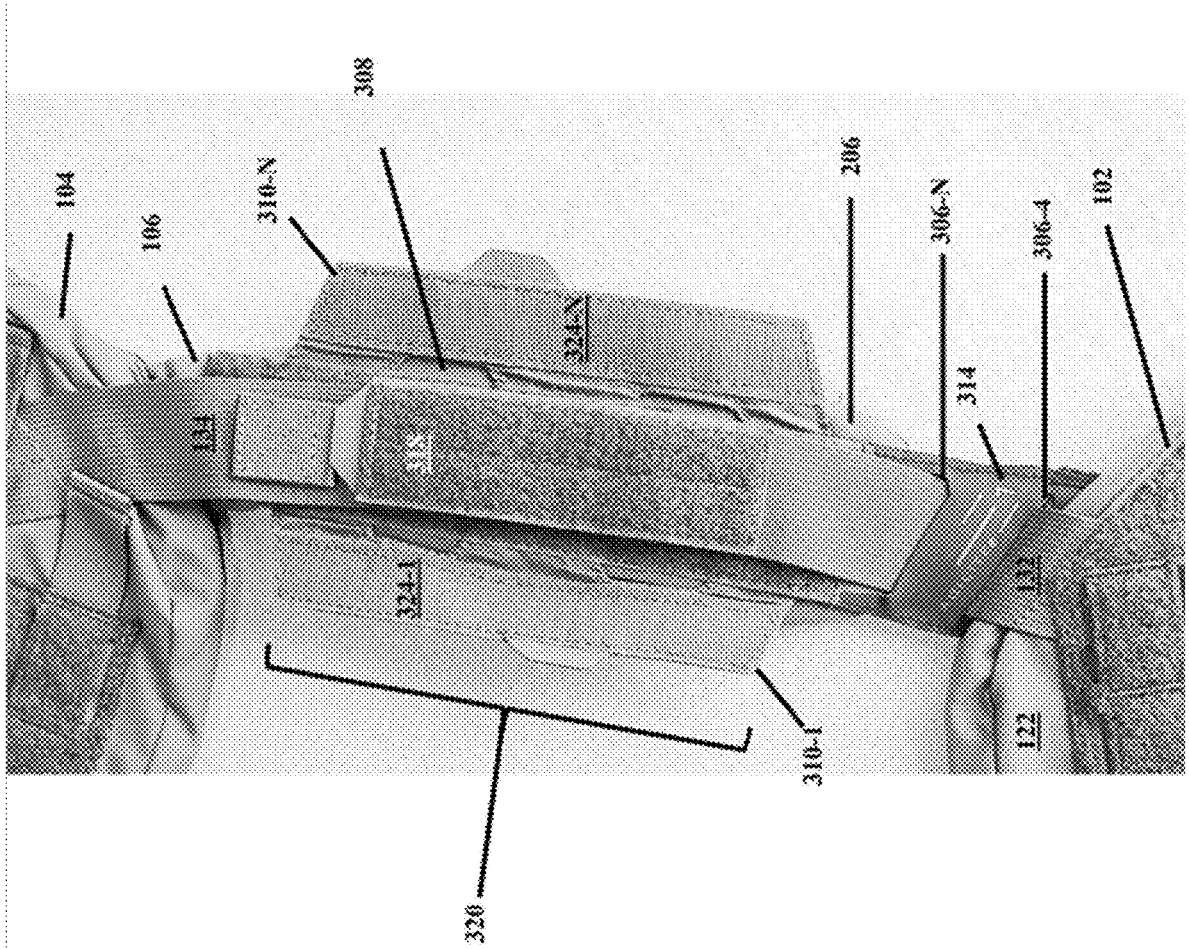

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FIG. 4B

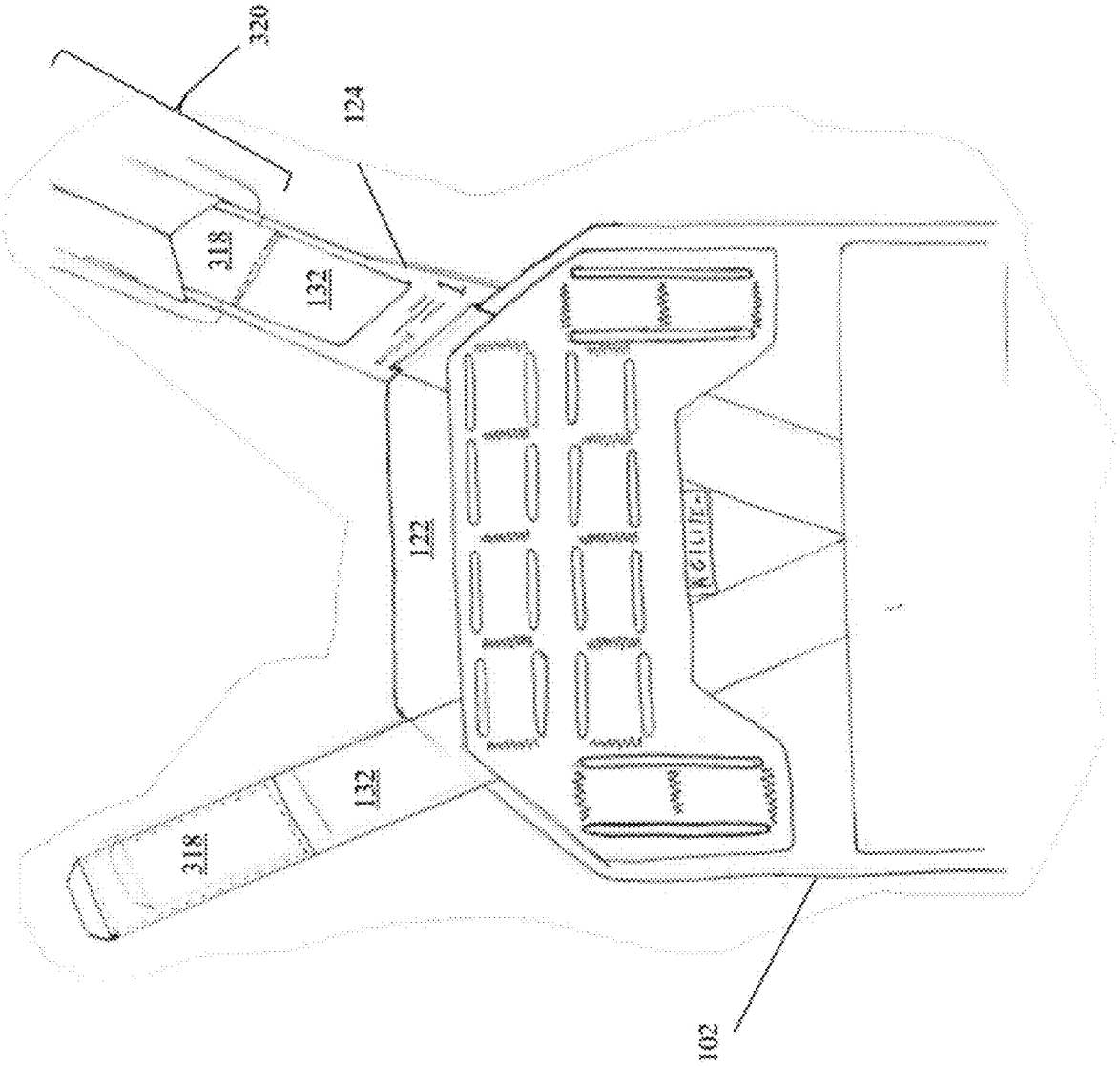


FIG. 5A

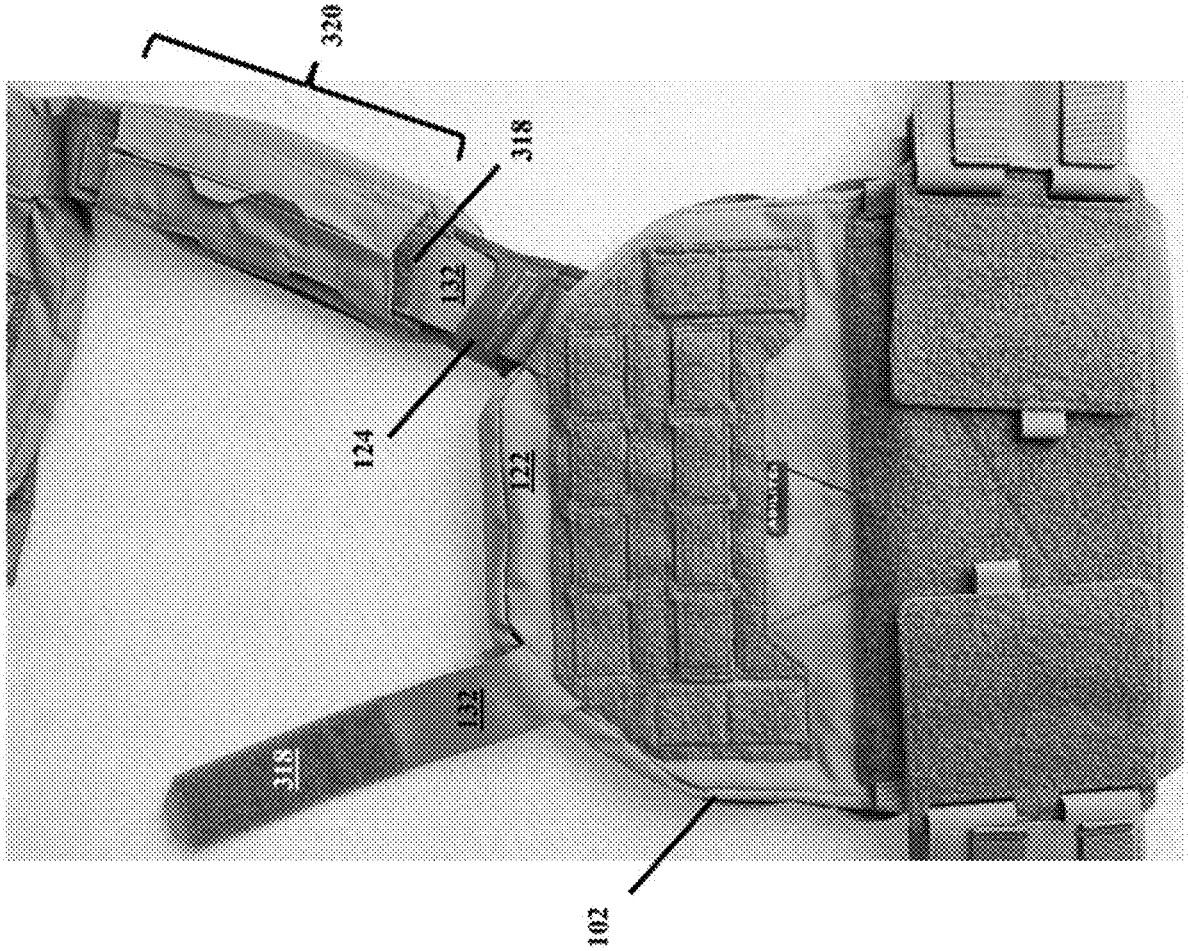


FIG. 5B

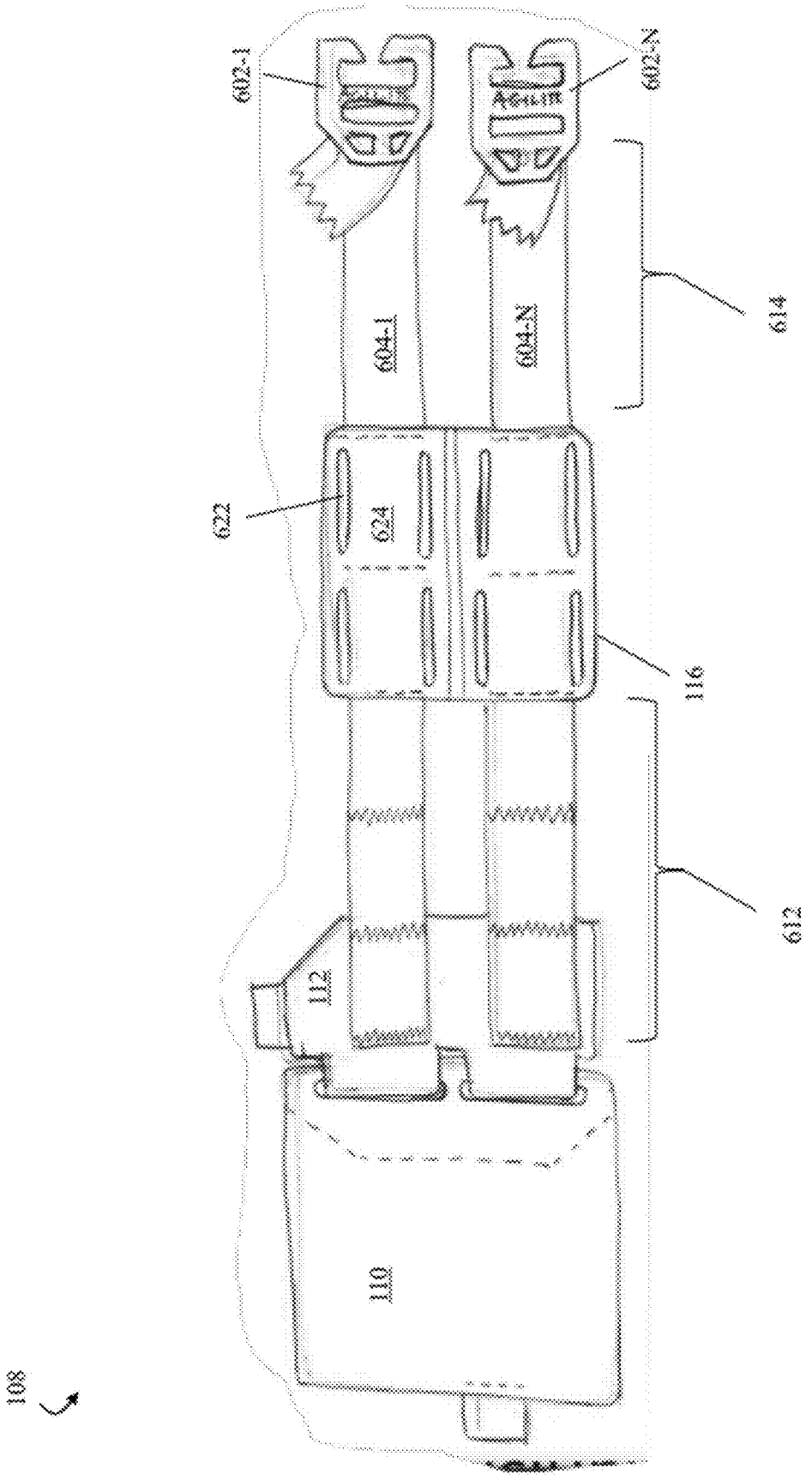


FIG. 6A

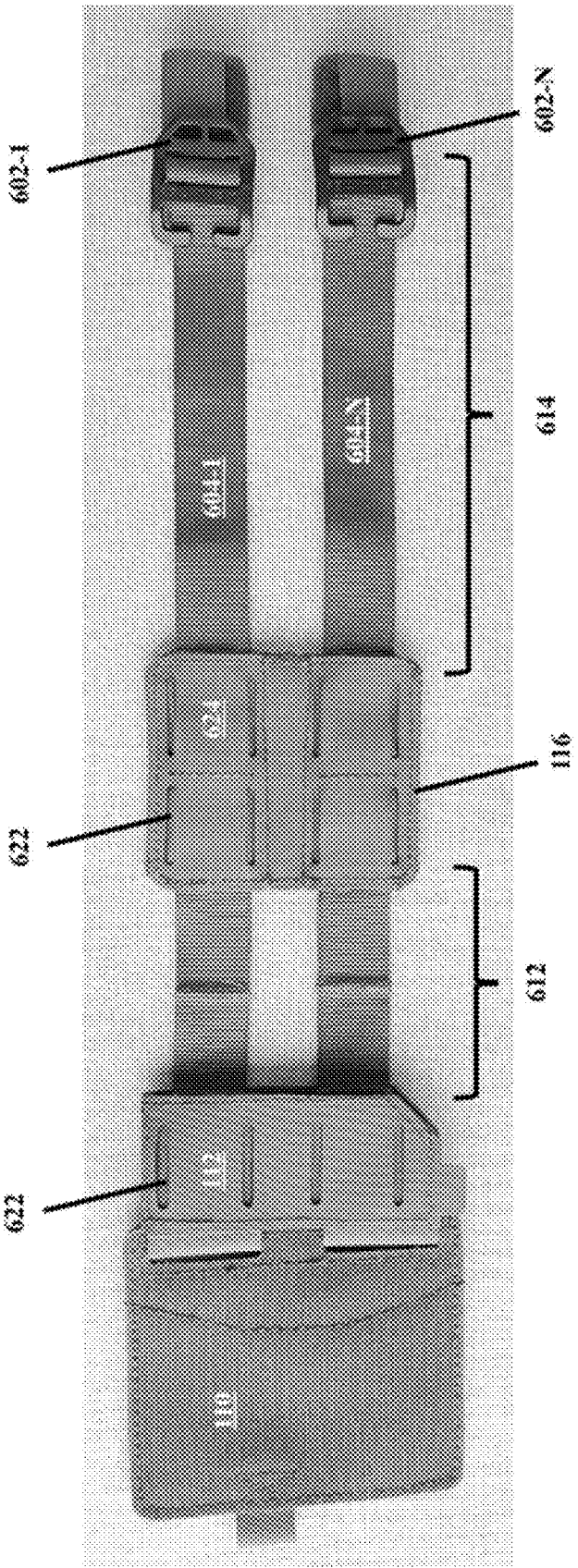


FIG. 6B

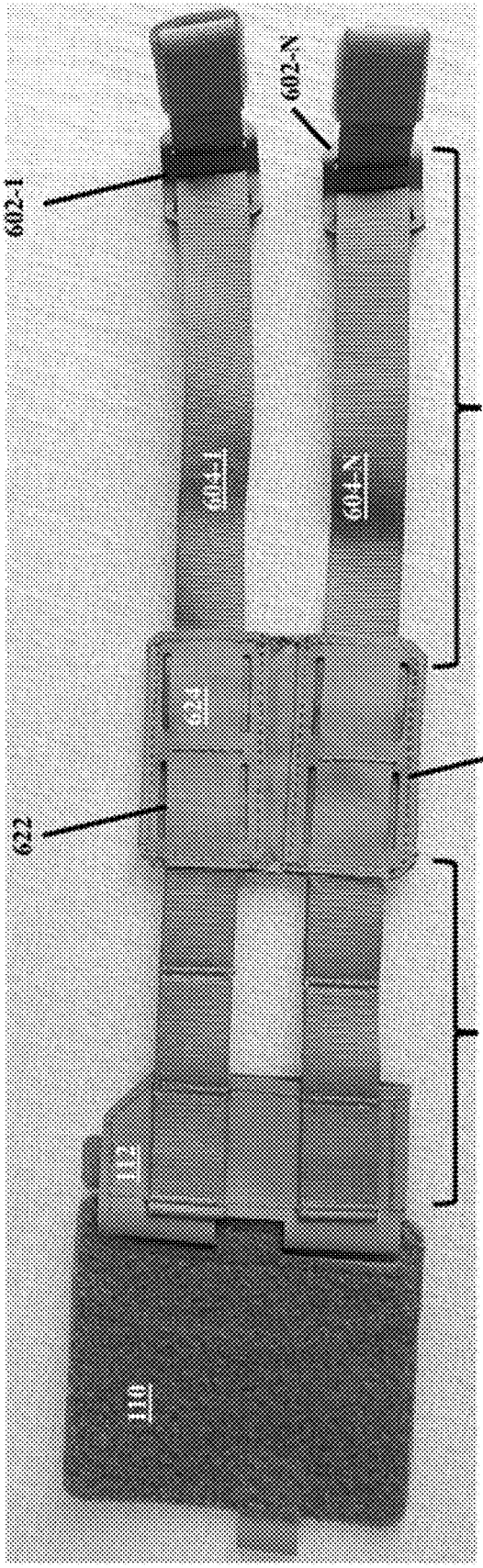


FIG. 6C

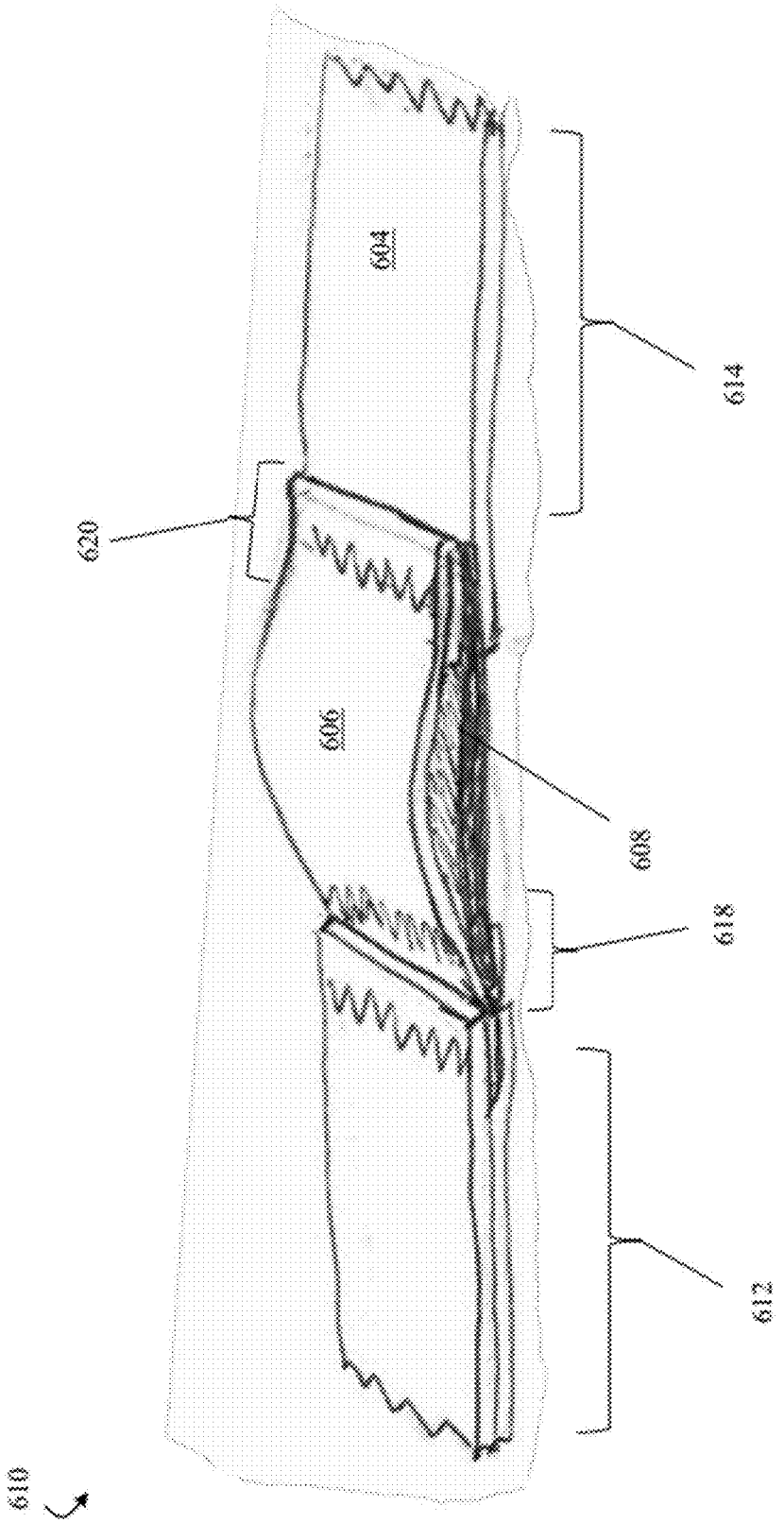


FIG. 7A

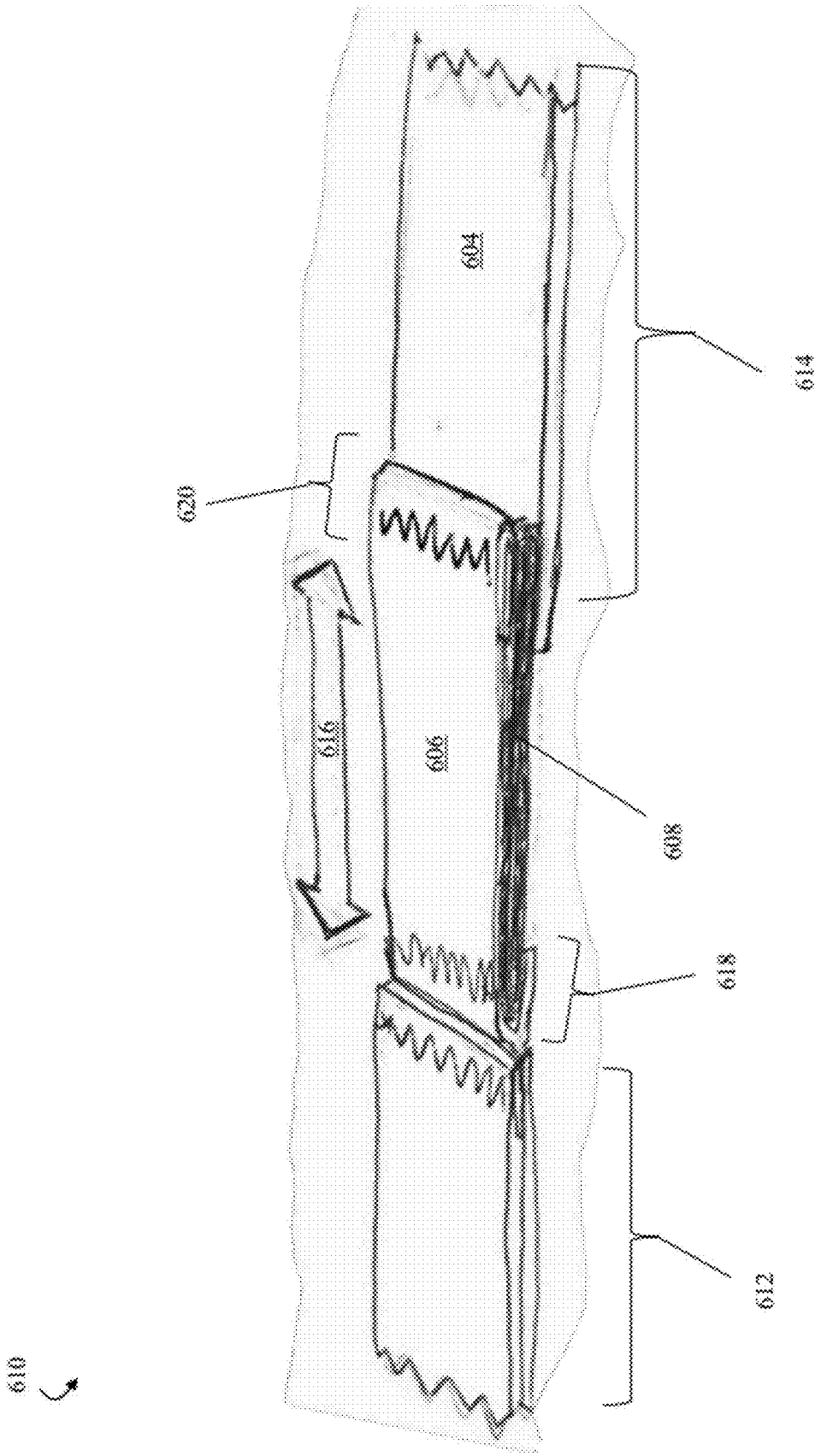


FIG. 7B

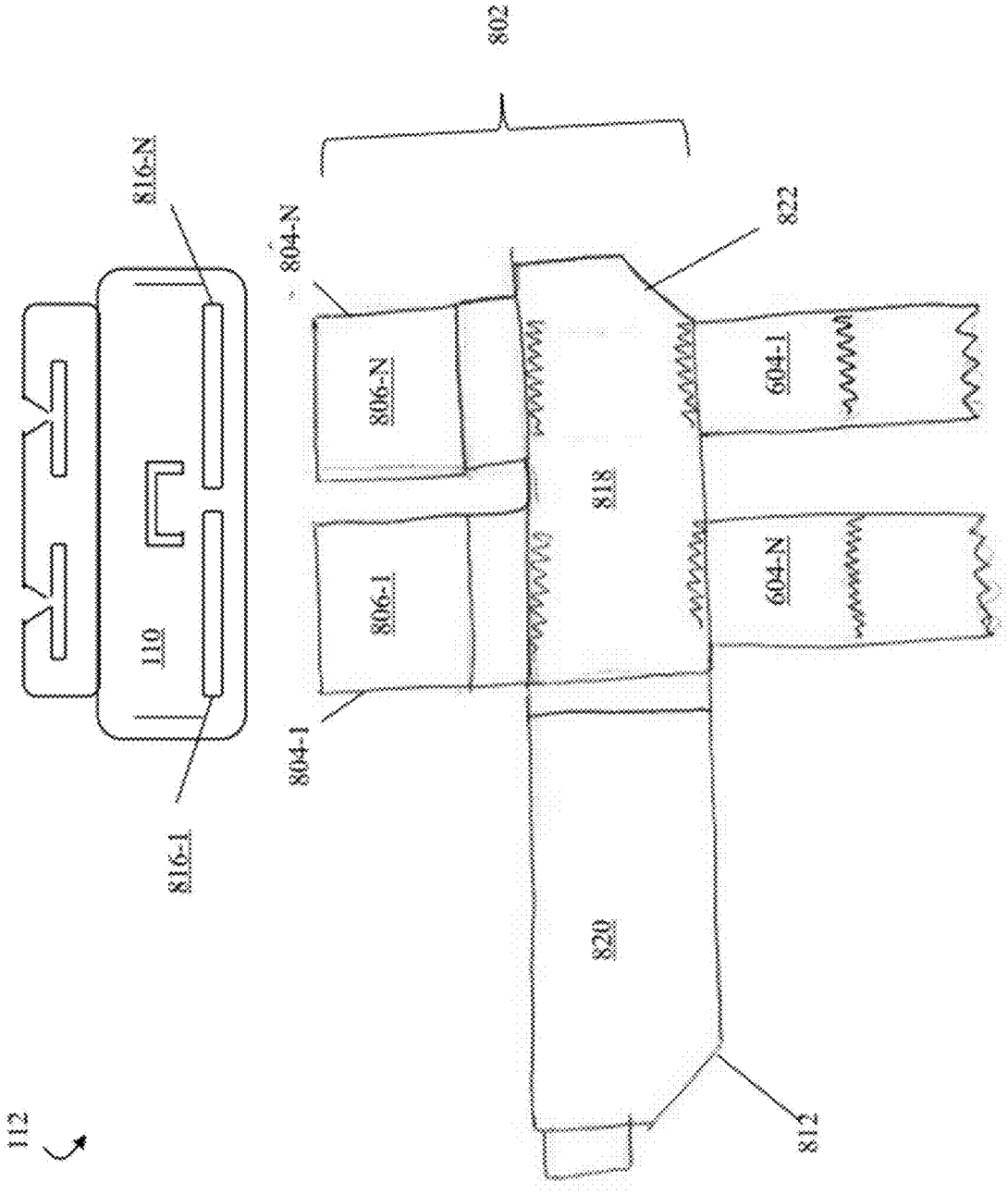
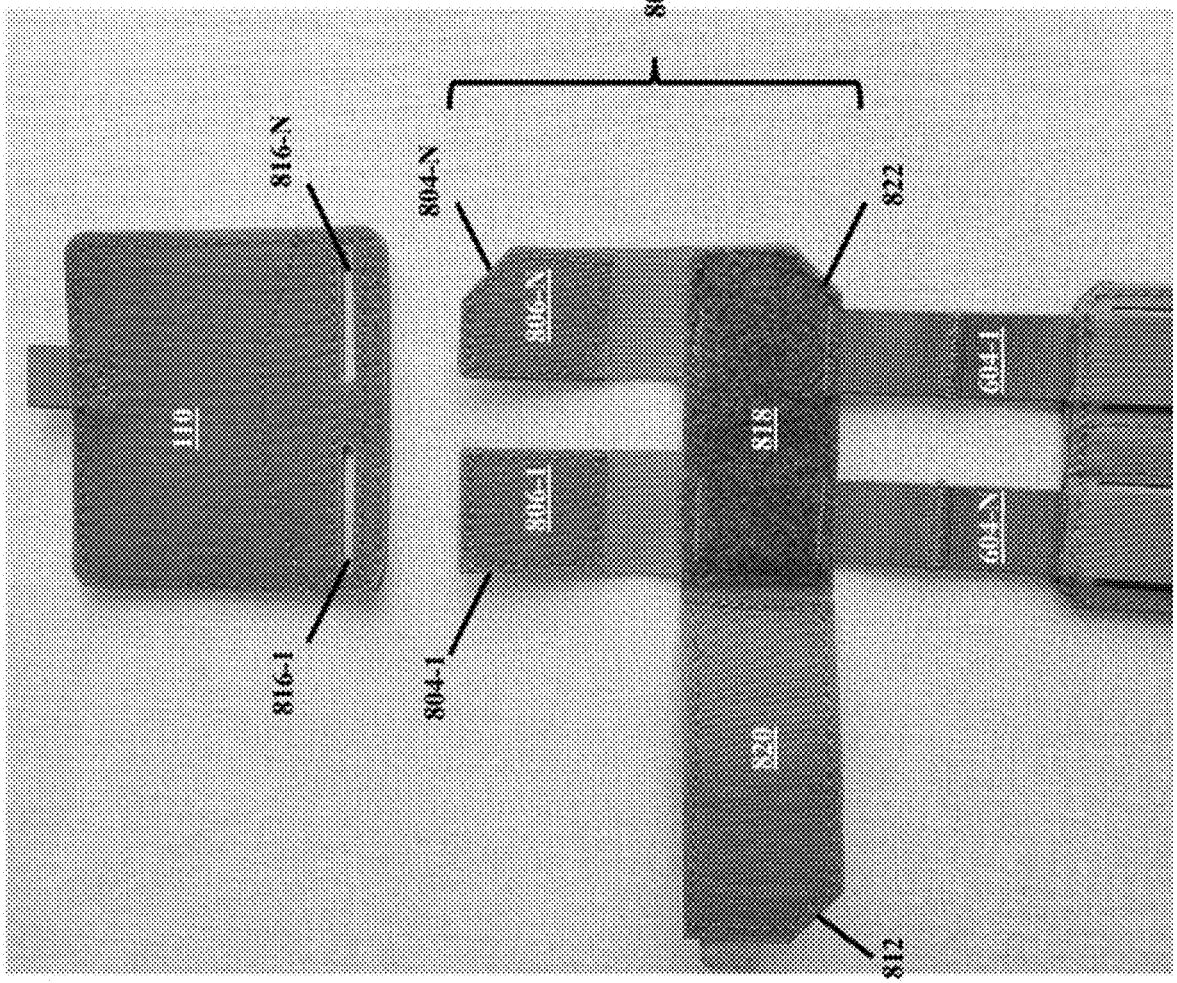

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FIG. 8A


802
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FIG. 8B

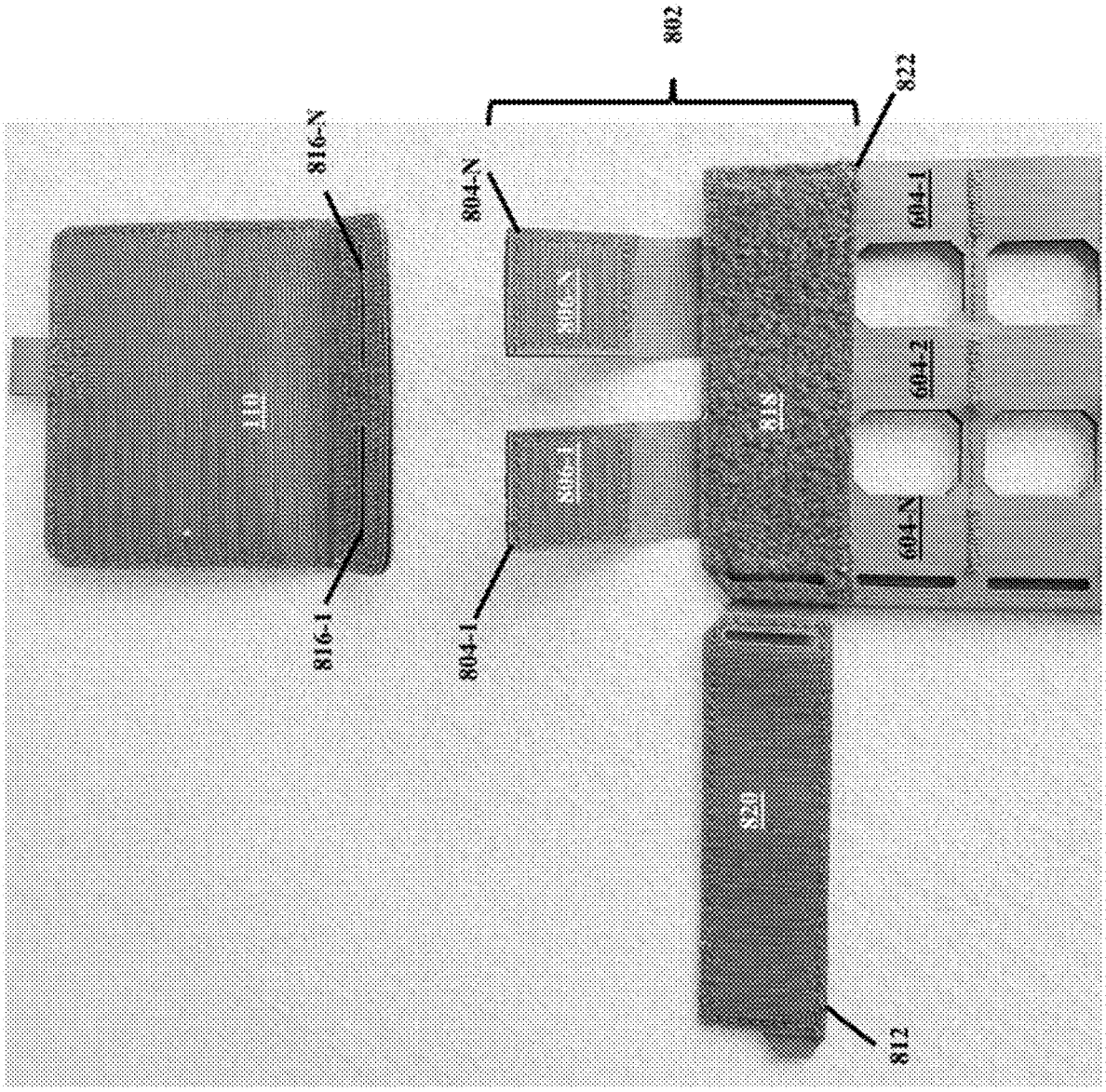

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FIG. 8C

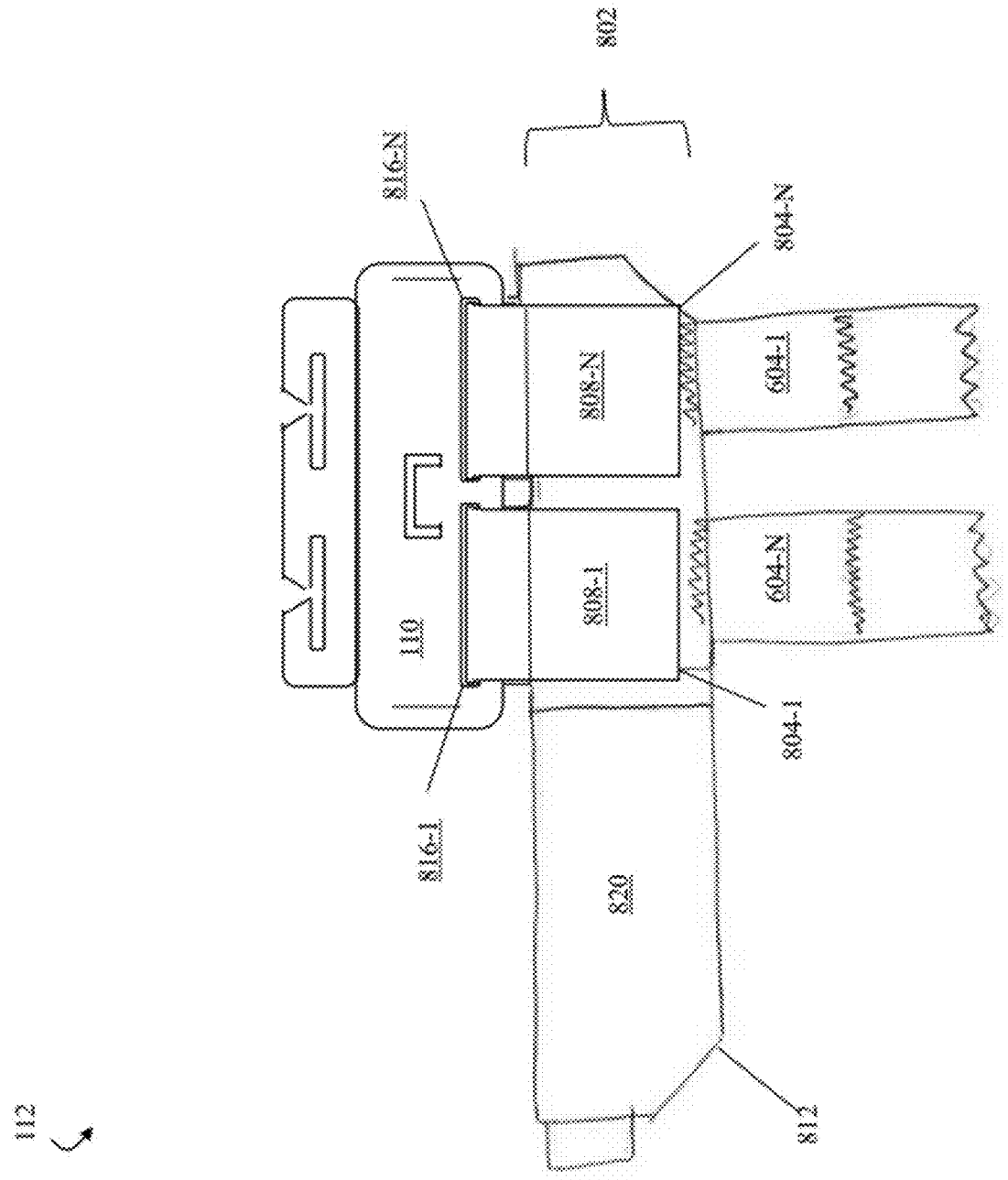


FIG. 8D

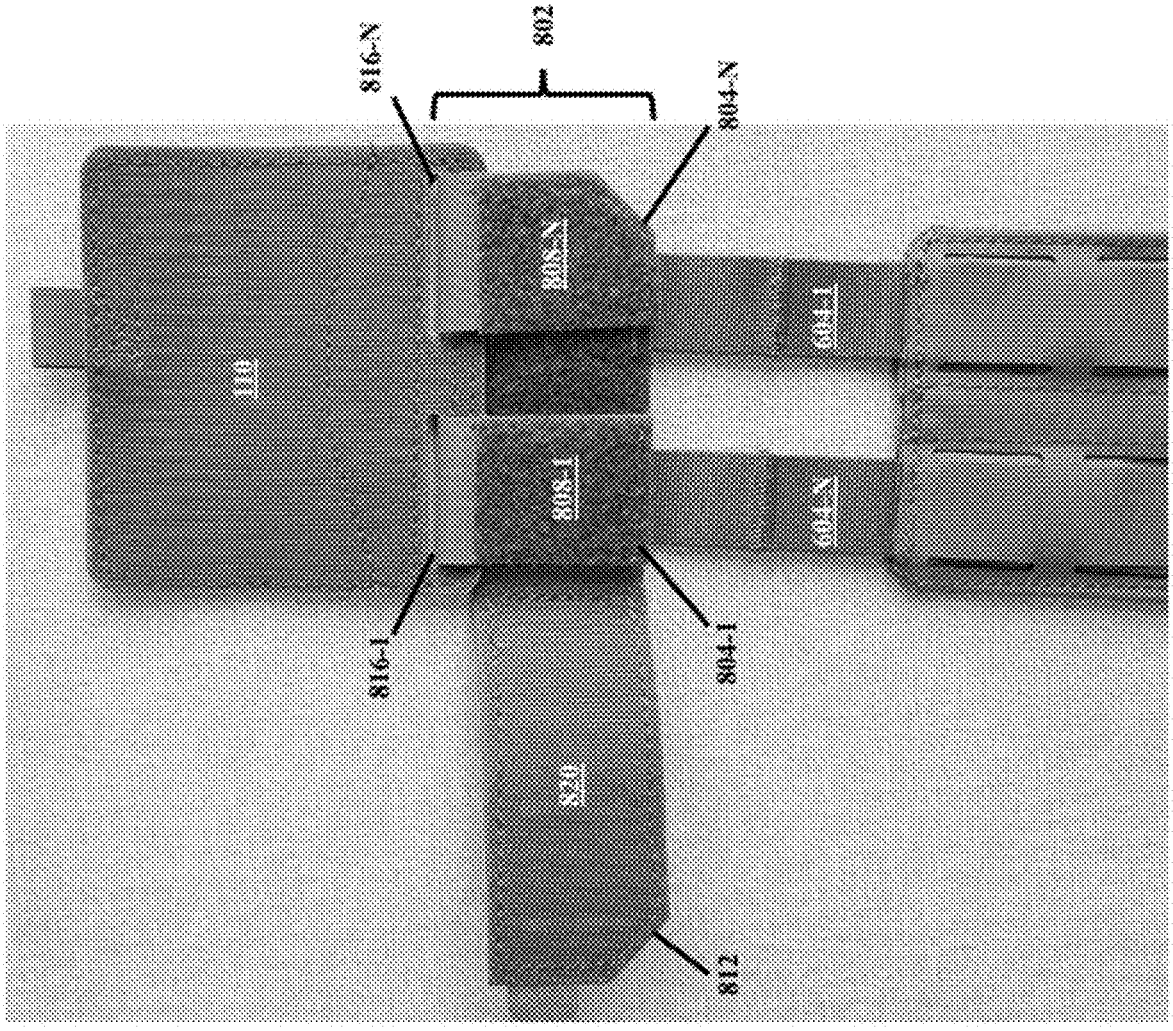


FIG. 8E

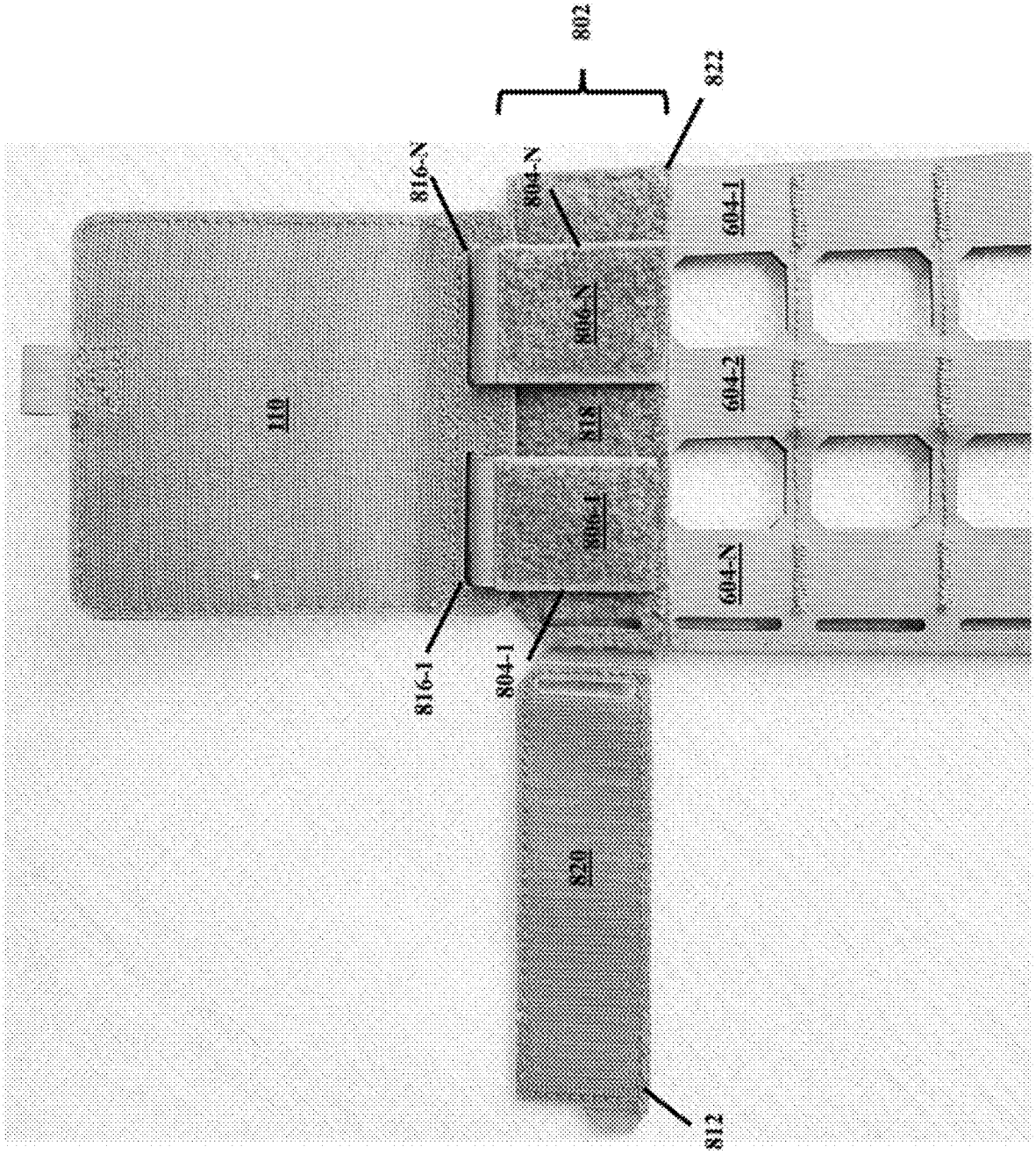

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FIG. 8F

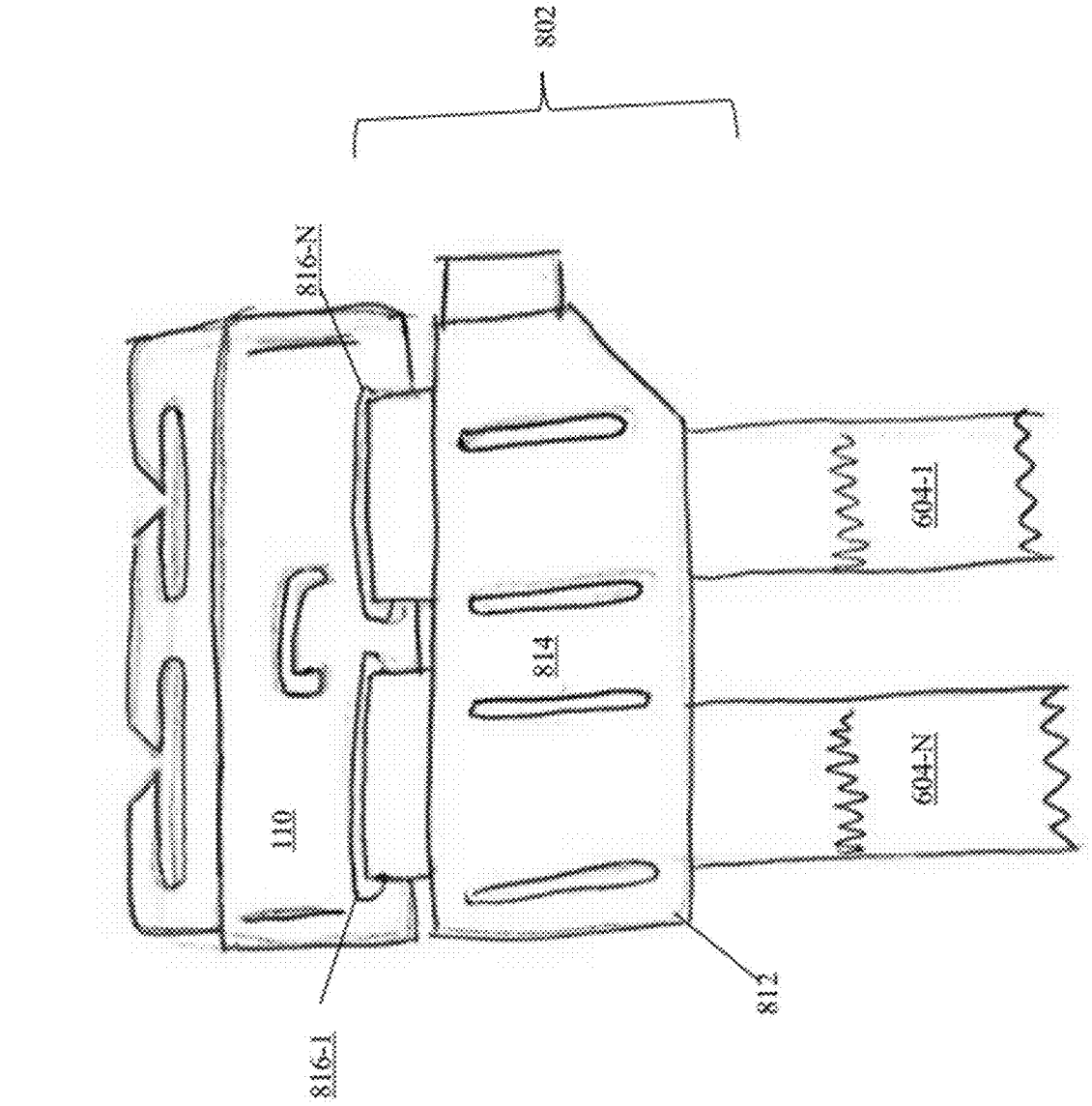
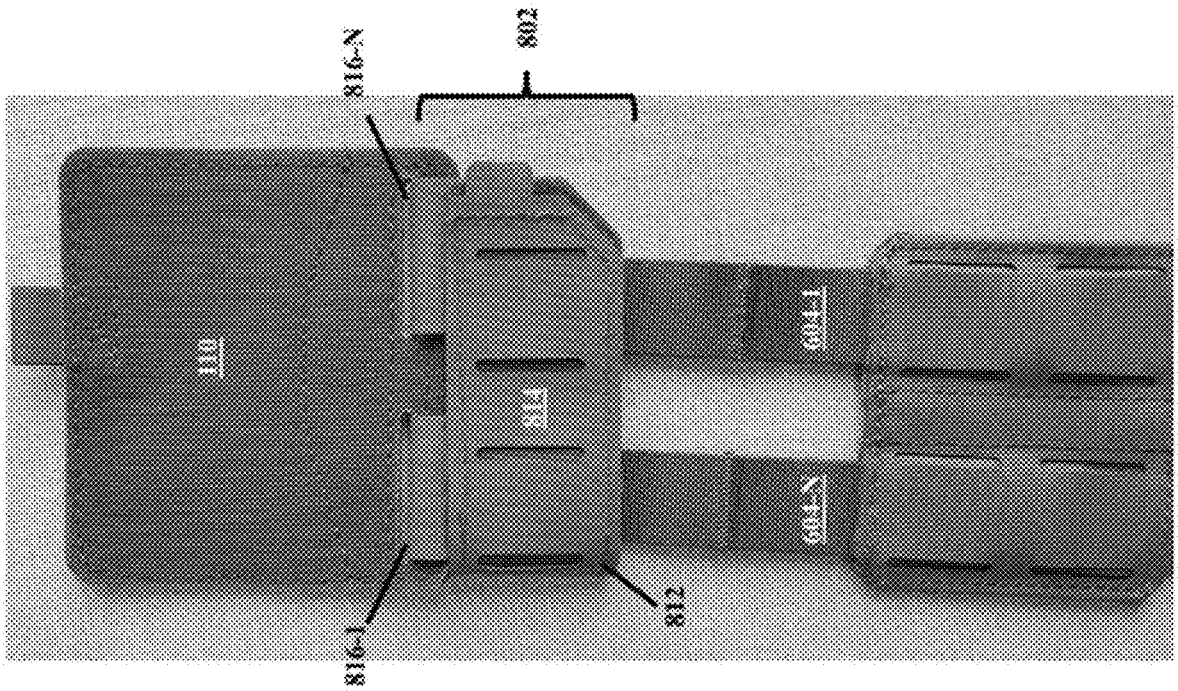
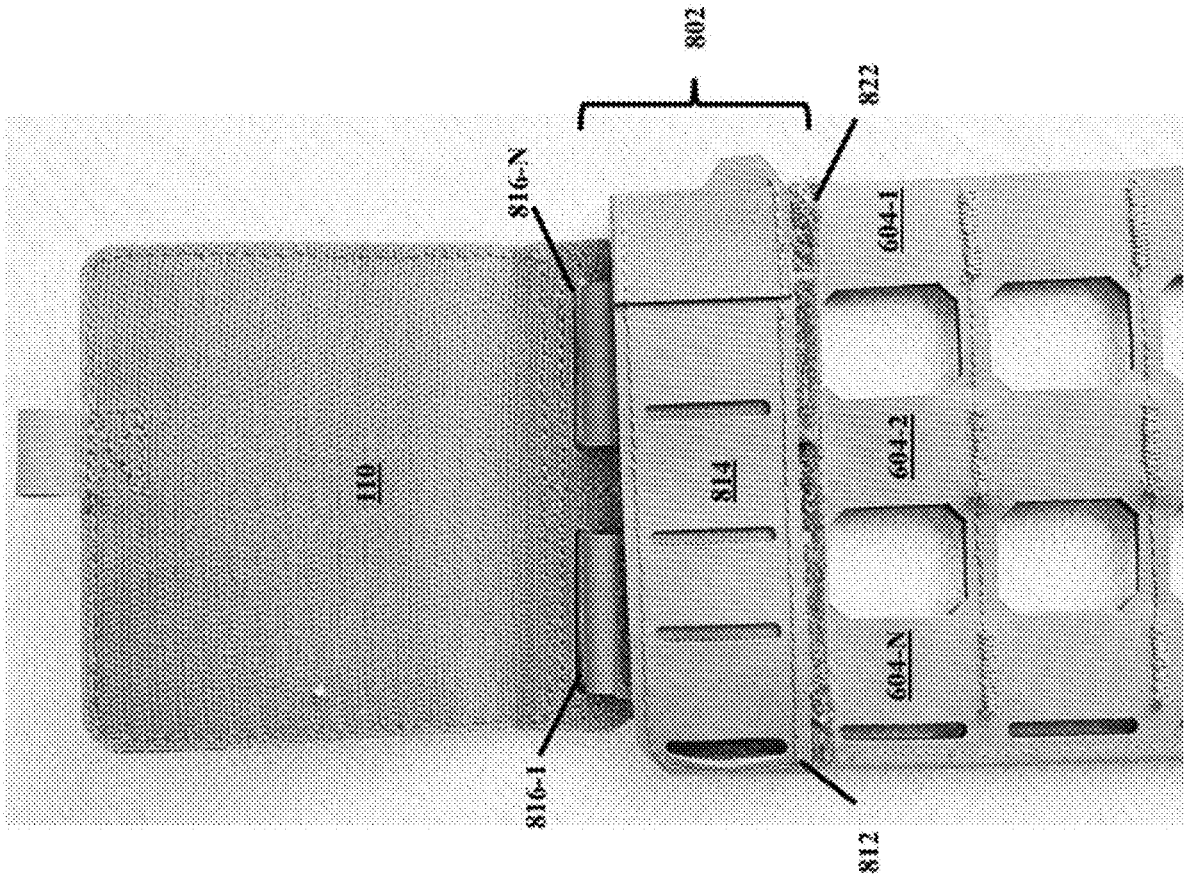


FIG. 8G



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FIG. 8H



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FIG. 8I

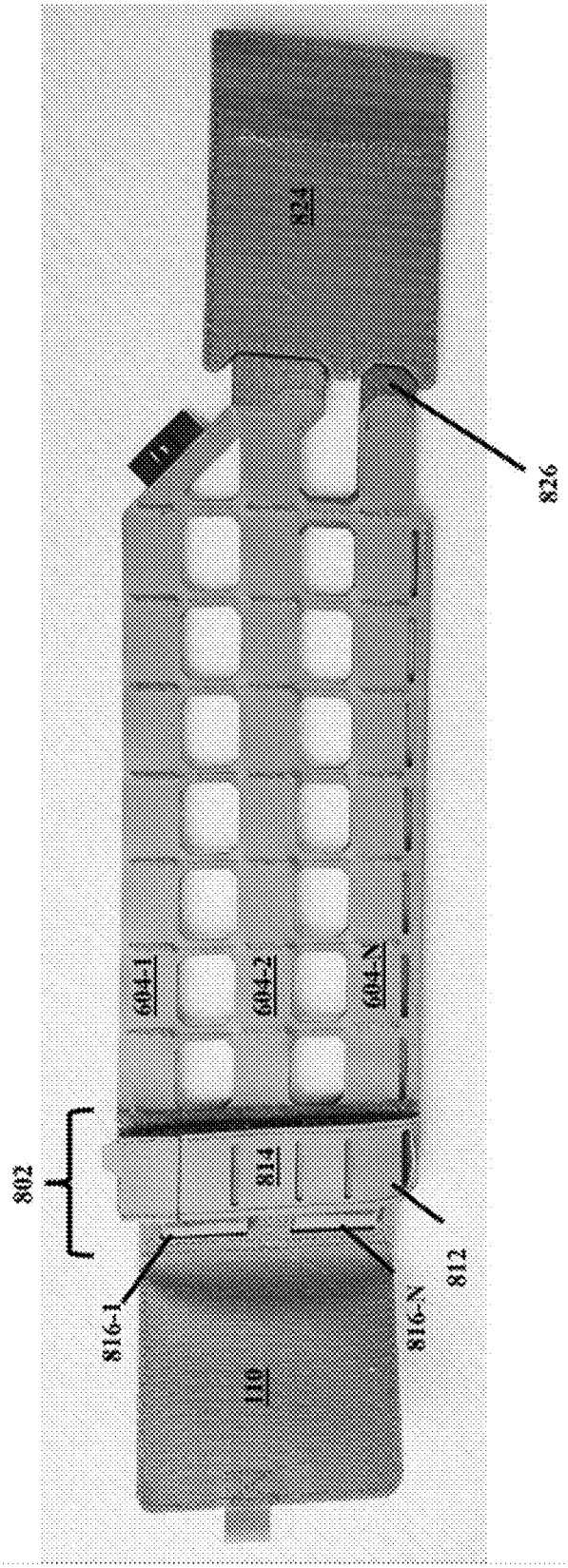


FIG. 8J

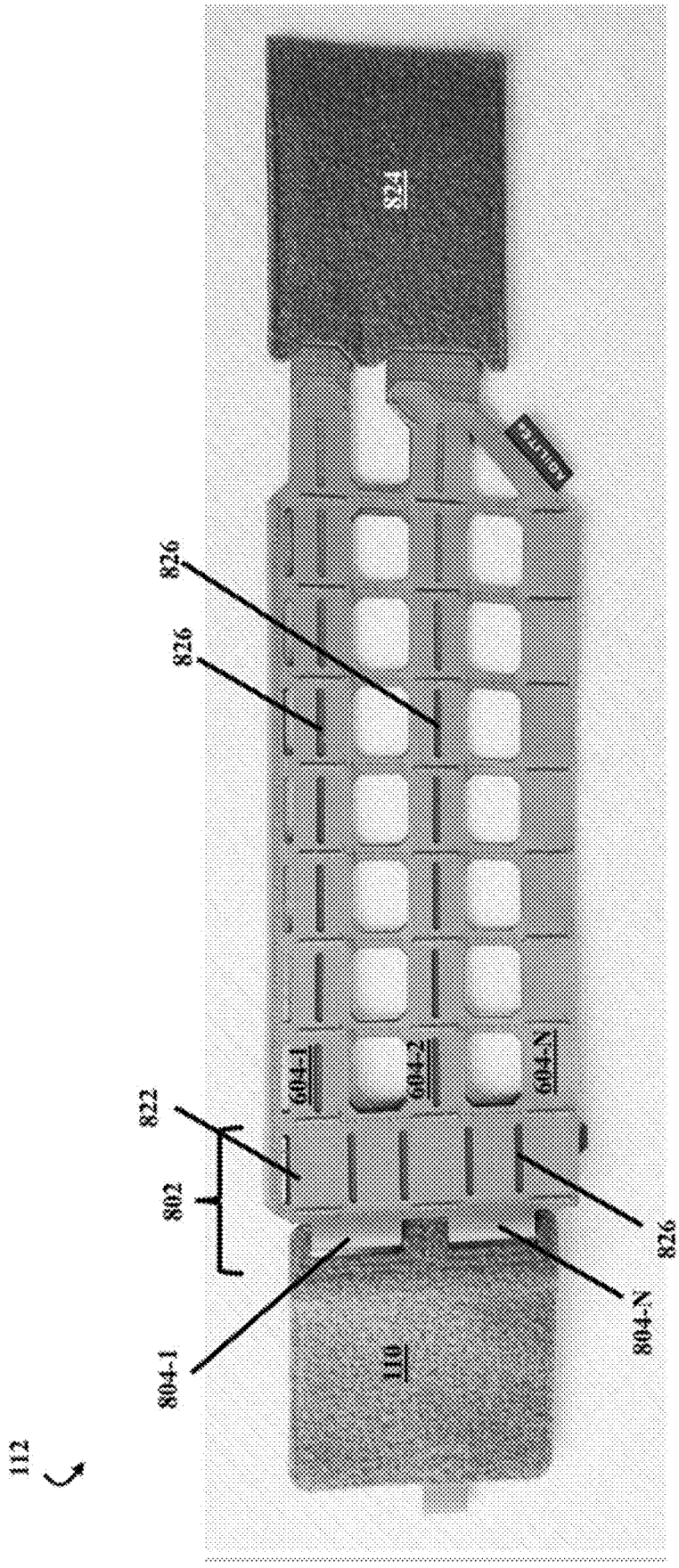


FIG. 8K

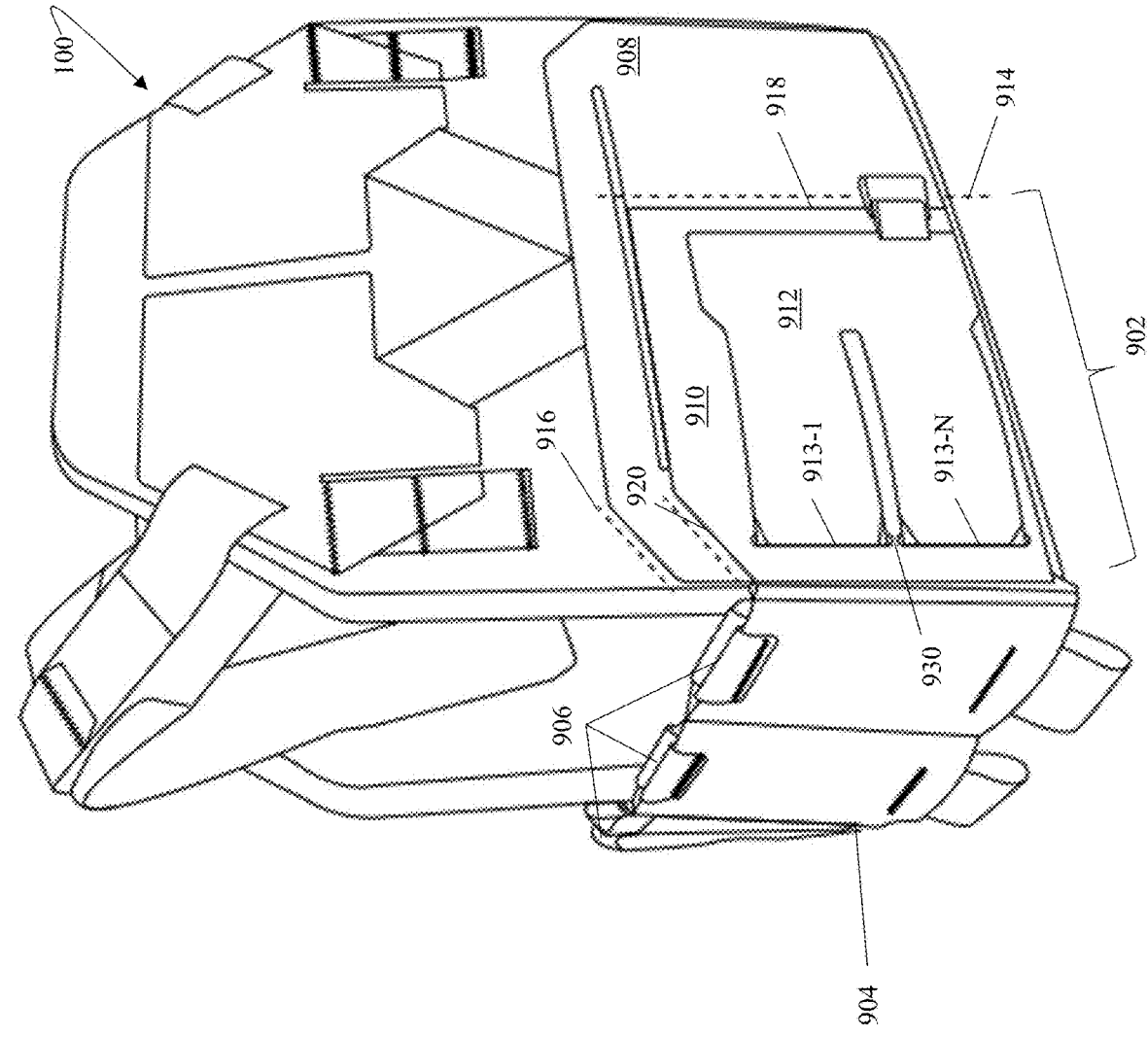


FIG. 9A

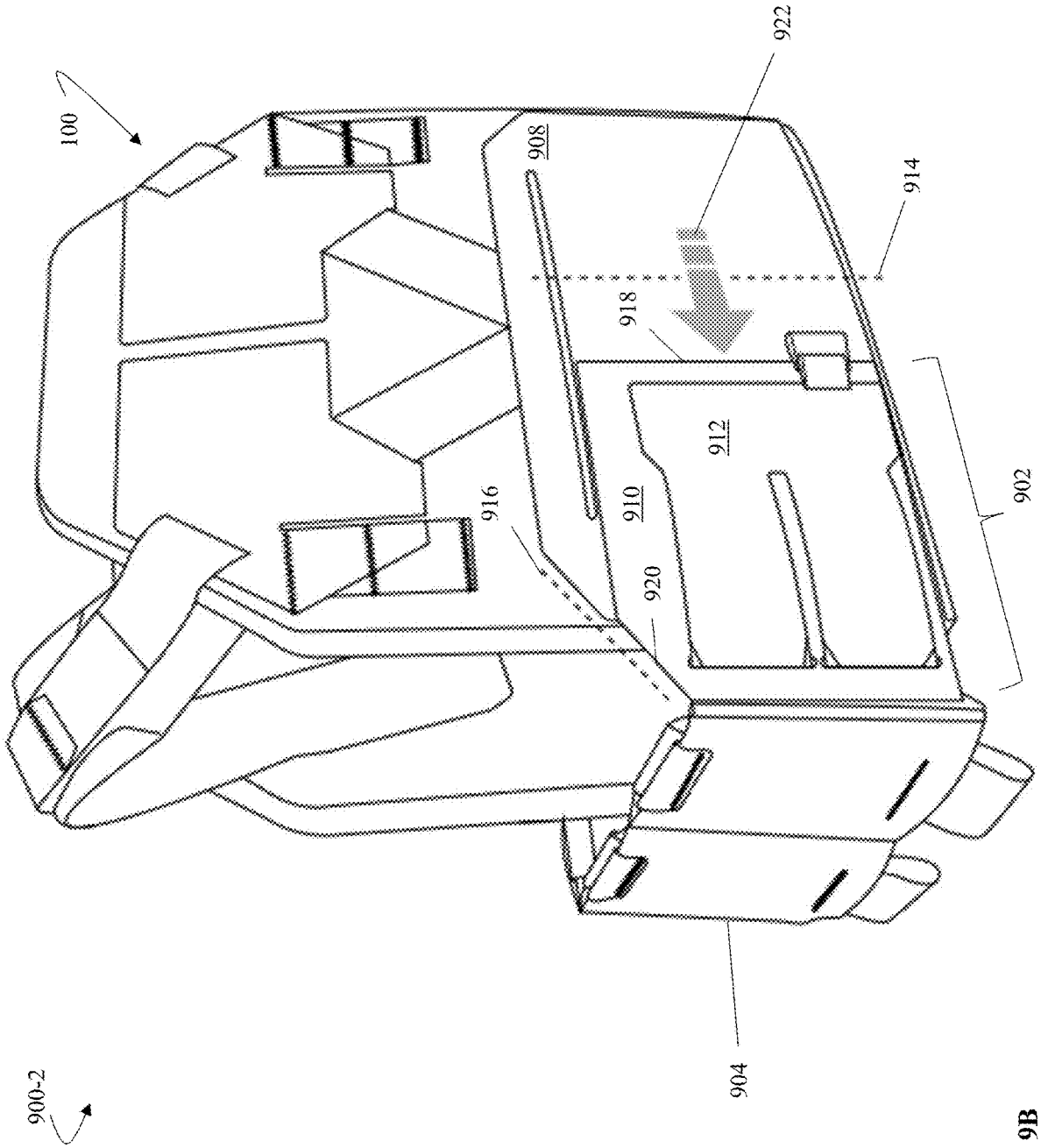


FIG. 9B

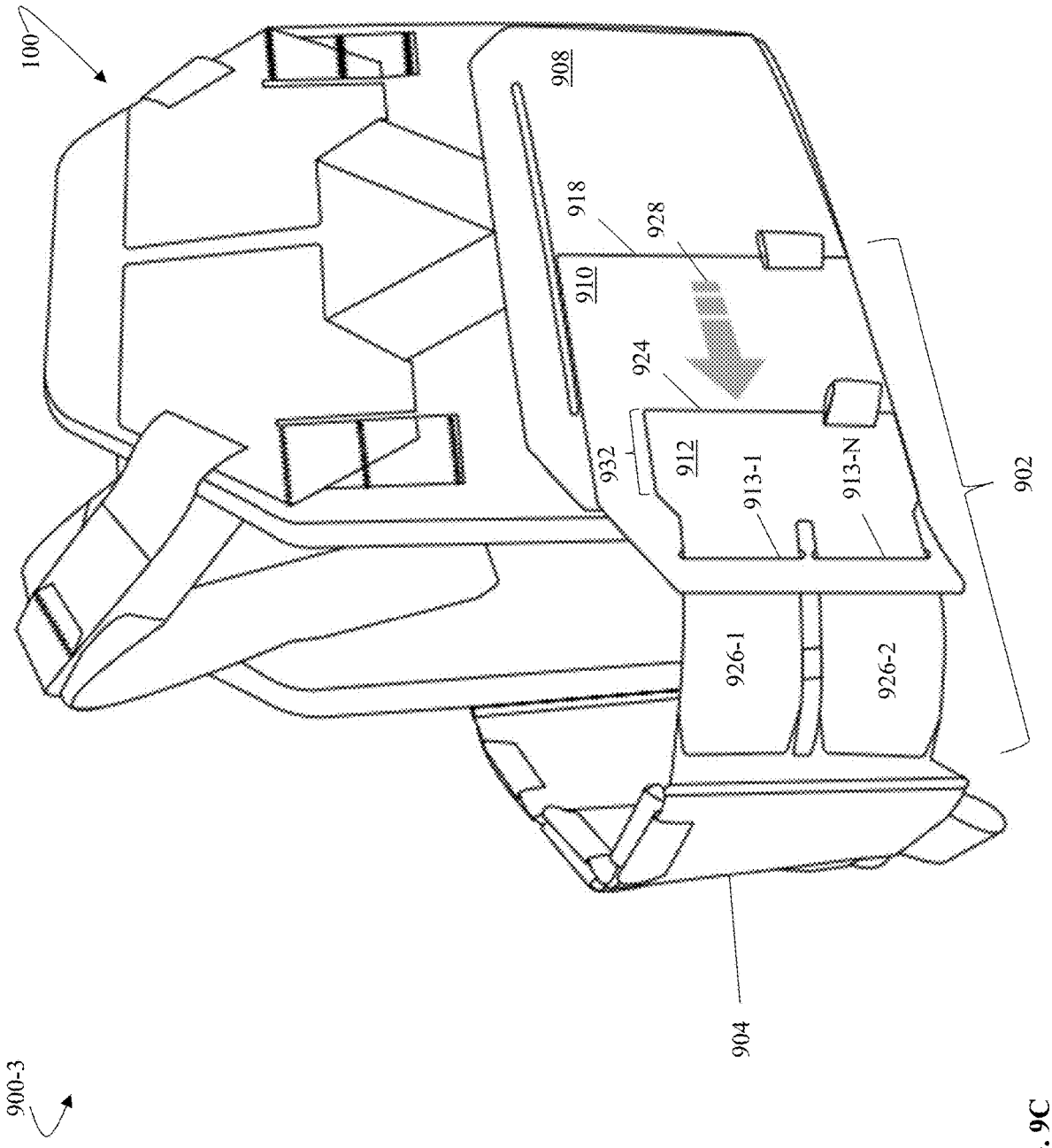

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FIG. 9C

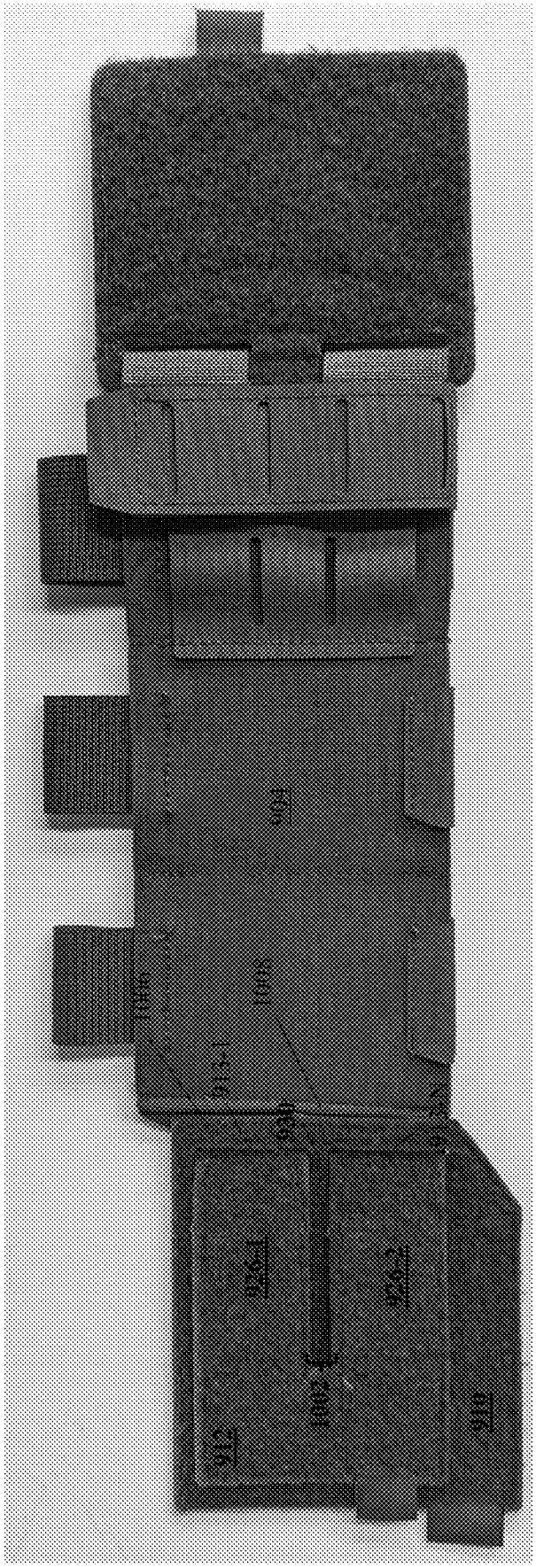


FIG. 10A

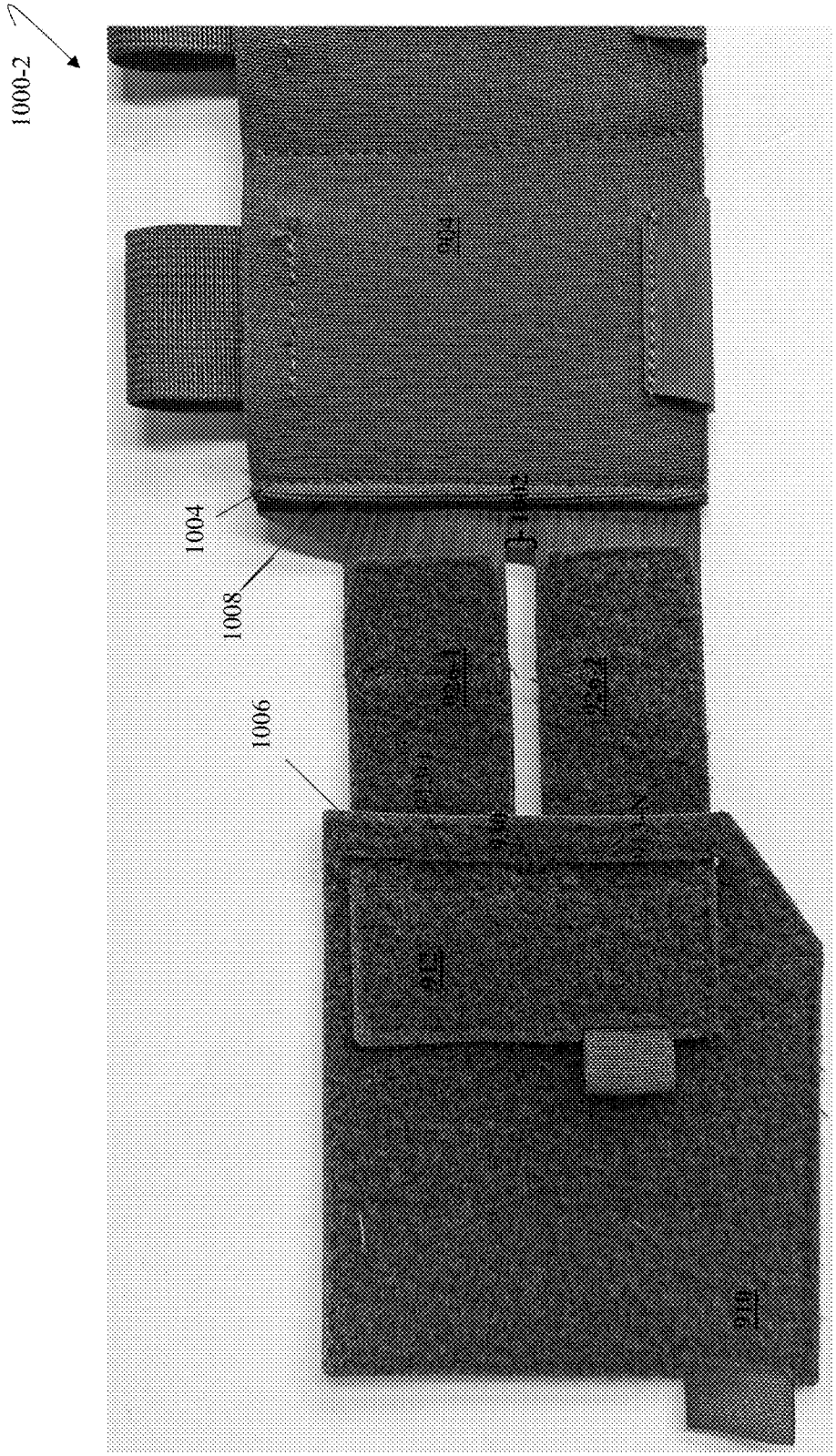


FIG. 10B

ADJUSTABLE FIT TACTICAL CUMMERBUND

RELATED APPLICATION

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 18/238,631, filed Aug. 28, 2023, for an "ADJUSTABLE FIT TACTICAL VEST," by Friedman, et al., the contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to the field of equipment bearing garments such as tactical vests for sporting, military, law enforcement, and tactical applications. More specifically, the invention pertains to an adjustable fit tactical vest and/or cummerbund that offers enhanced comfort, mobility, load leveling, and customization options for users.

BACKGROUND

[0003] A wide variety of tactical vests are available catering to a range of operational needs and/or preferences. For example, tactical vests can include plate carriers, chest rigs, tactical harnesses, sporting vests, load-bearing vests, concealed carry vests, etc. Often, tactical vests are essential pieces of equipment worn by military personnel, law enforcement officers, and other professionals operating in high-risk environments. These vests play a critical role in equipping a wearer for a tactical engagement by providing them a platform for carrying mission-critical gear and equipment. In addition, some tactical vests can serve as a crucial line of defense offering protection against ballistic threats during tactical engagements.

[0004] A tactical vest should be configured to ensure the safety, comfort, and mobility of the wearer. Unfortunately, the current market offerings often fall short of meeting these critical requirements. Many existing systems are designed with fixed sizes and limited adjustability options, resulting in a "one-size-fits-all" approach that fails to accommodate the diverse range of body types and preferences among users. Existing tactical vest adjustable elements are clumsy elements that require laborious efforts (e.g., doffing, adjusting, disassembling, reconfiguring gear, etc.) over multiple attempts to achieve coarse and/or imprecise fit adjustments that are not adaptive.

[0005] Consequently, users frequently encounter issues related to poor fit, discomfort, restricted movement, and compromised functionality. Ill-fitting tactical vests can lead to chafing, restricted range of motion, and even fatigue, negatively impacting the performance and effectiveness of those relying on this crucial piece of protective gear. Often relied upon in situations where the consequence of suboptimal performance is injury or loss of life, these shortcomings pose an unacceptable risk to wearers. Conversely, a well-fitting tactical vest not only enhances individual performance but also contributes to overall mission success. Improved comfort and freedom of movement allow wearers to respond swiftly and effectively, enabling them to perform critical tasks with confidence and precision.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The embodiments herein may be better understood by referring to the following description in conjunction with the accompanying drawings in which like reference numerals indicate identically or functionally similar elements, of which:

[0007] FIGS. **1**A-**1**D illustrate perspective views of an example of an adjustable fit tactical vest;

[0008] FIGS. **2**A-**2**B illustrate examples of first shoulder strap adjustment mechanism;

[0009] FIGS. **3**A-**3**B illustrate examples of a second shoulder strap adjustment mechanism not engaged with a tactical vest panel;

[0010] FIGS. **4**A-**4**B illustrate examples of the second shoulder strap adjustment mechanism engaged with a tactical vest panel;

[0011] FIGS. **5**A-**5**B illustrate examples of a second shoulder strap adjustment mechanism engaged with a tactical vest panel;

[0012] FIGS. **6**A-**6**C illustrate examples of cummerbunds with a first cummerbund adjustment mechanism;

[0013] FIGS. **7**A-**7**B illustrate examples of an expansion joint of the first cummerbund adjustment mechanism;

[0014] FIGS. **8**A-**8**K illustrate examples of a second cummerbund adjustment mechanism progressing through various stages of engagement with a reconfigurable panel attachment portion;

[0015] FIGS. **9**A-**9**C illustrate examples of adjustable fit configurations achievable utilizing a third cummerbund adjustment mechanism; and

[0016] FIGS. **10**A-**10**B illustrate examples of configurations of the third cummerbund adjustment mechanism.

DESCRIPTION OF EXAMPLE EMBODIMENTS

Overview

[0017] According to one or more embodiments of the disclosure, a system for fit adjustment of a tactical vest may comprise shoulder straps configured to have independently adjustable wearable lengths and to be releasably attachable to a face of a chest panel of the tactical vest or a back panel of the tactical vest at any of a plurality of potential shoulder strap attachment positions; and a set of reference markings on the face of the chest panel or the back panel, each reference marking of the set of reference markings indicating a respective potential shoulder strap attachment position of the plurality of potential shoulder strap attachment positions, wherein the set of reference markings is configured such that releasably attaching each of the shoulder straps to the face of the chest panel of the tactical vest or the back panel of the tactical vest so that corresponding portions of the shoulder straps align with equivalent reference markings causes the shoulder straps to have an equivalent wearable length.

[0018] Another embodiment relates to a tactical vest fit adjustment apparatus comprising a first panel including a set of panel reference markings to identify a shoulder strap attachment position among a plurality of potential shoulder strap attachment positions where a shoulder strap is releasably attached to a face of the first panel; and shoulder straps configured to couple the first panel to a second panel across shoulders of a wearer, wherein each of the shoulder straps is configured to have an independently adjustable wearable length dictated by its shoulder strap attachment position and wherein the shoulder straps are configured to have a same wearable length when the shoulder straps are releasably

attached to the first panel in alignment with equivalent reference marking of the set of panel reference markings.

[0019] Another embodiment relates to a tactical vest, comprising a chest panel comprising an external face and an internal face and having a set of reference markings indicating respective strap attachment positions on the internal face; a back panel; a first strap attached to the chest panel and having a first releasable attachment portion configured to engage a corresponding portion of a third strap; a second strap attached to the back panel and having a second releasable attachment portion configured to engage a corresponding portion of the third strap; the third strap attached to the back panel and having: a chest panel engaging portion configured to releasably attach to the internal face of the chest panel, and a slotted channel portion including a set of channel reference markings corresponding to the set of reference markings indicating the respective strap attachment positions on the internal face of the chest panel, the slotted channel portion configured to accept the first strap through a slot indicated by a channel reference marking as corresponding to a strap attachment position on the internal face where the third strap is releasably attached; and a cummerbund configured to couple the chest panel to the back panel.

Description

[0020] Before turning to the figures, which illustrate the exemplary embodiments in detail, it should be understood that the application is not limited to the details or methodology set forth in the description or illustrated in the figures. It should also be understood that the terminology is for the purpose of description only and should not be regarded as limiting.

[0021] As noted above, ill-fitting tactical vests can negatively impact the performance and effectiveness of those relying on this crucial gear. Meanwhile, a well-fitted tactical vest can enhance individual performance and contribute to overall mission success. However, it is not practical for each tactical vest to be manufactured and/or procured as a unique highly tailored garment that is dimensionally bespoke to a particular wearer. In reality, tactical vests are often acquired in bulk orders of a particular vest for distribution to an entire police force, military unit, etc. comprising members of various heights, weights, builds, etc. Further, even if built to the precise dimensions of a user, such a tactical vest would likely fail to offer a perfect fit across all situations (e.g., being worn with different equipment weights, being worn with different equipment configurations/distributions, being worn over/under different types or amount of clothing, etc.).

[0022] Ideally, for tactical vests to perform optimally they should be both a uniform or structurally generic piece of equipment that is able to be distributed to and/or used by any wearer and a precisely adjustable piece of equipment that can quickly be personalized to particular dimensions and/or preferences of a wearer to offer optimal fit and comfort. Currently, attempts to introduce adjustability have done little more than introduce multiple failure points, snag risks, and/or superfluous materials that, at best, offer marginal adjustability that ultimately lacks the granularity of adjustment and adaptability necessary to achieve an ideal fit.

[0023] Further, these designs are notorious for falling out of adjustment with movement and under asymmetrical loads. Furthermore, designs offering independent adjustability of structurally symmetrical components are equally notorious for producing an asymmetric fit to a tactical. Moreover, many of these designs involve complex adjustments and even require switching out of components which may involve entirely doffing the tactical vest. Unnecessarily removing a tactical vest is at best annoying and at worst a dangerous proposition in many of the environments where they are used. Further, equipment may need to be removed and/or reconfigured to accommodate many of these adjustments with existing designs (e.g., swapping out entire components laden with attached equipment).

[0024] In contrast, the mechanisms described herein introduce an adjustable fit tactical vest and/or an apparatus and system for adjusting the fit of a tactical vest in a manner that overcomes all of the limitations of the existing solutions. For example, the adjustable fit tactical vest described herein is highly adjustable and offers a high degree of granularity of adjustment. The described mechanisms seamlessly incorporated this adjustability into the design of the vest such that the precision fit is achieved without introducing multiple failure points, snag risks, and/or superfluous materials. Instead, adjustability is achieved through adjustment mechanisms that are cleanly and securely tucked away and/or are protected from damage or jostling while still being rapidly accessible for quick adjustments. These rugged and protected mechanisms deliver multiple facets of fine-grained adjustments that can be quickly performed in the field without requiring repeated doffing.

[0025] The mechanisms introduced herein also firmly secure the adjustment once completed. For instance, once adjustments are made, they are securely fixed and, although this engagement is releasable, the tactical vest will not fall out of adjustment. In addition, the mechanisms incorporate adaptive fit features that allow the fit of the tactical vest to adaptively adjust to the movement and body of the wearer during use without sacrificing the targeted fit of the tactical vest. That is, these mechanisms can accommodate movement, posture changes, external forces, etc. by momentarily adapting the fit the of tactical vest to these instances to avoid pinching, slipping, chaffing, movement restriction, breathing restriction, etc. before automatically returning to the baseline fit of the tactical vest as initially configured and secured by the wearer.

[0026] FIGS. **1**A-**1**D illustrate perspective views of examples of an adjustable fit tactical vest, according to various embodiments. Tactical vest **100** may be any type of tactical vest including a plate carrier, chest rig, tactical harness, sporting vest, load-bearing vest, concealed carry vest, etc. As illustrated, tactical vest **100** is a plate carrier configured as a load bearing platform that includes various equipment attachment surfaces (e.g., equipment attachment surface **114**, etc.). The equipment attachment surfaces may include a variety of attachment mechanisms such as hook and loop fasteners, modular lightweight load-carrying equipment (MOLLE), buckles, hooks, snaps, quick release mechanisms, etc. that may be used to attach various tactical accessories (e.g., patches, holsters, pouches, medical kits, radios, wires, drink bladders, tools, etc.).

[0027] Tactical vest **100** may be configured to carry ballistic armor plate, panels, inserts, etc. The ballistic armor may be made up of any ballistically protective material such as Kevlar, polyethylene, steel, ceramic, etc. These materials may be carried in panels such as chest panel **102**, back panel **104**, and/or a side panel. These panels may include internal pouches (e.g., sandwiched between the external face **122** and

the internal face **126** of the chest panel, sandwiched between internal face **120** and external face **128** of the back panel, etc.) configured to securely house ballistic armor inside. The ballistic armor may be releasably secured within the panels such that a ballistic panel may be removed and/or replaced whenever desired (e.g., ballistic armor becomes damaged, ballistic armor reaches expiration date, a different type of ballistic armor is desired, operational requirements change, etc.).

[0028] Tactical vest **100** may be configured to fit a human torso. For example, chest panel **102** may be configured to be suspended over the front of a wearer and cover their chest area including the portion of their chest behind which their vital organs are internally located. Back panel **104** may be configured to be suspended over the back of a wearer and cover their back area including the portion of their back behind which their vital organs are internally located.

[0029] A tactical vest **100** may include shoulder straps (e.g., shoulder strap **106**). The shoulder straps may couple the chest panel **102** to the back panel **104** of tactical vest **100**. The shoulder straps may be configured to rest across a wearer's shoulder and suspend chest panel **102** and back panel **104** in their respective intended positions (e.g., covering the wearer's vital organs). As described in greater detail below, the shoulder strap **106** may ultimately serve as a base strap that may be attached (e.g., stitched) to at least one panel and which may be utilized as a platform to securely engage a plurality of other straps (e.g., chest panel strap **132**, back panel strap **134**, etc.) into a releasable sandwiched engagement that collectively serves as a shoulder strap in addition to offering the fit adjustments described below.

[0030] Tactical vest **100** may include cummerbund **108**. A cummerbund **108** may be a sash, a waist strap, a side strap, etc. which rests on a wearer's side and/or waist and couples chest panel **102** to back panel **104**. Cummerbund **108** may stabilize the tactical vest **100** against the wearer facilitating a secure fit against a wearer's body and retention of the chest panel **102** and back panel **104** in their intended positions. Cummerbund **108** may help keep the tactical vest **100** from shifting during movement. Cummerbund **108** may also provide additional equipment storage and/or equipment attachment surfaces.

[0031] Tactical vest **100** is an adjustable fit tactical vest configured with adjustment mechanism providing adjustable fit via a plurality of adjustment points. The adjustment mechanisms at these adjustment points accommodate coarse and fine-grained fit adjustments to the tactical vest **100**. Once the precise desired fit is achieved, these mechanisms securely retain the fit while still allowing the fit of the tactical vest **100** to adapt to the movement of the wearer. Further, these mechanisms facilitate independent adjustment at the various adjustment points but also include referential mechanisms to ensure symmetrical fit adjustments. In addition, the mechanisms facilitate adjustability in the attachment mechanisms connecting the various components (e.g., cummerbund **108**, chest panel **102**, back panel **104**, shoulder strap **106**, etc.) of tactical vest **100**.

[0032] For example, tactical vest **100** may include a first shoulder strap adjustment mechanism **124**. The first shoulder strap adjustment mechanism **124** may include a releasable attachment mechanism where a portion of a shoulder strap **106** can releasably mate the internal face **126** of the chest panel **102**. Alternatively, or additionally, the first shoulder strap adjustment mechanism **124** could be used as an interface between the shoulder strap **106** and the internal face **120** of the back panel **104**.

[0033] In various embodiments, the first shoulder strap adjustment mechanism **124** may include a region of hook and loop fastener incorporated into the internal face **126** of the chest panel **102**. Shoulder strap **106** may include a corresponding complementary region of hook and loop fastener that can releasably mate to the region of hook and loop fastener incorporated into the internal face **126** of the chest panel **102**. Hook and loop fastener connections may provide a high degree of adjustability since they do not require precise positioning to achieve engagement. For instance, shoulder strap **106** may be secured to the region of hook and loop fastener incorporated into the internal face **126** of the chest panel **102** at any of a plurality of potential shoulder strap attachment positions where the corresponding hook and loop regions overlap to some extent.

[0034] Each of the shoulder straps can be adjusted independently. That is, each of the shoulder straps may be positioned and attached to any of the plurality of potential shoulder strap attachment positions independently. Since each of the shoulder straps are independently positioned, it is possible that they may end up having different wearable lengths upon adjustment. In some instances, the different wearable lengths can produce an asymmetric fit to tactical vest **100**.

[0035] To prevent an inadvertent asymmetrical fit, the first shoulder strap adjustment mechanism **124** may include a set of reference markings. The set of reference markings may be used as relative position indicators that provide a reference marking against which a relative attachment position of the shoulder strap **106** on the internal face **126** of the chest panel **102**. In some examples, a wearer may align the end of the shoulder strap **106** with a reference marking. Then, a wearer may align the end of the other shoulder strap to the same or an equivalent reference marking. Since the two shoulder straps are coaligned with the same or equivalent reference marking they will then be configured with the same wearable length. It should be appreciated that although illustrated as a shared reference marking scale with shared numbering, the set of reference markings may be located and/or configured in any manner that still allows identification of equivalent relative shoulder strap positioning by reference thereto.

[0036] In various embodiments, tactical vest **100** may include a second shoulder strap adjustment mechanism **130**. The second shoulder strap adjustment mechanism **130** may be a component of the shoulder strap **106**. The second shoulder strap adjustment mechanism **130** may include a releasable attachment mechanism through which a chest panel strap **132** is laced when releasably mated to shoulder strap **106** (e.g., via a hook and loop fastener). The chest panel strap **132** may be a load bearing strap which is fastened, such as by stitching, to an external face **122** of chest panel **102**. The second shoulder strap adjustment mechanism **130** may include a slotted channel through which the chest panel strap **132** is fed. Depending on which of the slots of the slotted channel that the chest panel strap **132** is laced through, a different angle of hang and/or top of panel height for the chest panel **102** may be achieved. The adjustments offered by lacing through each of the slots may be fine-grained and/or incremental adjustment since the slots are relatively close together.

[0037] The slotted channel may include reference markings that are interleaved between the slots. The reference markings may be used as relative position indicators that provide a reference marking against which a relative position of the chest panel strap **132**, fed through the slotted channel and into engagement with the shoulder strap **106**, can be determined and related to an attachment position of its corresponding shoulder strap to the first shoulder strap adjustment mechanism **124**. This is possible because the reference markings of the second shoulder strap adjustment mechanism **130** are configured to correspond to the reference markings on the first shoulder strap adjustment mechanism **124**. For example, reference markings on the second shoulder strap adjustment mechanism **130** may be equivalent to corresponding reference markings on the first shoulder strap adjustment mechanism **124**. The relationships and/or correspondence in reference markings may facilitate hang angle and panel height adjustments at the second shoulder strap adjustment mechanism **130** that are designed to be precisely matched to the shoulder strap attachment position of the shoulder strap **106**. For example, if the shoulder strap attachment position and the slotted channel slot position are identical or equivalent with respect to the reference markings, then the hang angle and/or panel height may be configured within a range that is tailored to the wearable length of the shoulder strap **106**. Of course, the further back the wearer draws the chest panel strap **132** before securing to shoulder strap **106**, the tighter, higher, and more altered angular hang of the panels, hence the fit, hang angle and/or panel height is configured to match within a range of adjustments to the shoulder strap attachment position.

[0038] Tactical vest **100** may also include a first cummerbund adjustment mechanism **116** and/or second cummerbund adjustment mechanism **112**. The first cummerbund adjustment mechanism **116** may include an expandable joint housed within a sheath located between an attachment point to the chest panel **102** of the tactical vest **100** and an attachment point to the back panel **104** of the tactical vest **100**. This expansion joint may be configured to elastically expand within a limit to increase the wearable length of the cummerbund **108** under tension, acting like a shock absorber. Being located within the sheath may prevent the expansion join from being snagged, being damaged, and/or catching or chaffing against a wearer. In addition, the external face of the sheath may be configured to include equipment attachment surfaces, providing additional real estate for attaching equipment along a wearer's side.

[0039] The second cummerbund adjustment mechanism **112** may include a reconfigurable panel attachment portion **110** that can be swapped between any of a plurality of panel attachment mechanisms (e.g., cummerbund closure mechanisms such as hook and loop fastener panels, buckles, quick release tubes, hooks, etc.). For example, the second cummerbund adjustment mechanism **112** may include an attachment mechanism adapter configured to releasably secure a variety of panel attachment mechanisms to cummerbund **108** 'on-the-fly'. That is, a wearer may utilize a universal attachment mechanism adapter to switch out panel attachment mechanisms of a cummerbund **108** without doffing, donning, removing or reconfiguring attached equipment, etc. of cummerbund **108**.

[0040] FIGS. **2**A-**2**B illustrate examples of first shoulder strap adjustment mechanism **124**, in accordance with one or more embodiments described herein. First shoulder strap adjustment mechanism **124**, in combination with second shoulder strap adjustment mechanism **130** described in further detail below, can be utilized to both securely position and hold a back panel **104** and/or chest panel **102** and its contents (e.g., a ballistic plate) while providing a clear, straightforward, quantitative system of shoulder strap length adjustment that can be quickly and repeatedly made symmetrical.

[0041] Tactical vests such as plate carriers typically have adjustment systems for fitting the carrier to different sized wearers. Many designs use overlapping hook and loop overlays on the shoulder straps, or a pass-through flap that can be overlapped back on itself to lengthen or shorten each shoulder strap. However, a common problem with existing shoulder adjustment systems is the difficulty in adjusting both shoulders to a symmetrical length.

[0042] As described above, hook and loop fastening systems provide a seemingly limitless range of adjustability since they are not limited to a few fixed adjustment positions (e.g., unlike snap points, buckle points, etc.). Given this expansive adjustability, frequently independent adjustments to two different shoulder straps of the same tactical vest yield different wearable lengths of the shoulder straps. Different wearable lengths of shoulder straps may mean that the length of the shoulder strap that is actually wearable (e.g., contacts a wearers shoulder, conforms to a wearer, not the portion of the strap that is stowed/looped back/excess, the portion that rests on the shoulder of the wearer and defines the height at which attached panels hand, etc.) and therefore influences the fit and load bearing symmetry of the vest is different between the shoulder straps. In various embodiments, the wearable length of a shoulder strap may be the length of the shoulder strap spanning between the back panel **104** and/or chest panel **102** attachment points.

[0043] Wearing a tactical vest with an asymmetrical fit can lead to one shoulder bearing more load than the other, causing inconsistent fatigue between shoulders, discomfort, injuries, decreased performance, and accidents among various other negative outcomes. Moreover, improper height adjustment of back panel or chest panel, as may be associated with an asymmetric fit, can also lead to improper ballistic plate coverage, as the plates may not be covering the wearer's vital organs properly. Often, there is simply not enough time and/or the danger is too high for users to doff and don a tactical vest multiple times, adjusting fit in between, until a reasonably symmetric fit is achieved with existing adjustment mechanisms. Unfortunately, most wearers simply give up and wear an asymmetrical plate carrier at the cost of their tactical efficacy, comfort, health, and safety.

[0044] In contrast, the first shoulder strap adjustment mechanism **124** and/or second shoulder strap adjustment mechanism **130** are configured to provide wearers with a wearer-friendly manner of symmetrically adjusting the fit of a tactical vest. These mechanisms provide the wearer with a simple easy-to-understand mechanism to repeatedly identify and achieve a precise symmetrical fit on a first attempt basis. For example, first shoulder strap adjustment mechanism **124** allows each shoulder strap **106** to have its wearable length independently adjusted while providing the wearer with a reference mechanism by which a precise and repeatable symmetrical fit is identified and/or achieved across both shoulder straps.

[0045] First shoulder strap adjustment mechanism **124** may include a first set of reference markings (e.g., reference markings **202**). The reference markings **202** may be emblazoned on the internal face **126** of the chest panel **102** and/or on one or more panel attached (e.g., stitched) to the internal face **126** of the chest panel **102**. The reference markings **202** may be visible to the wearer when viewing the internal face **126** of chest panel **102**.

[0046] The reference markings **202** themselves may be graduated markings. A portion of the reference markings **202** may be labeled with and/or distinctly identifiable by a corresponding letter, number, symbol, etc. For example, reference markings **202** may be configured to have a similar appearance to that of a ruler with markings at regularly spaced intervals with some of the markings being labeled with a number or other symbol.

[0047] For instance, reference markings **202** may include graduated markings appearing on the internal face **126** of chest panel **102** spaced one quarter of an inch apart from one another. Some of those markings (e.g., those that are located one inch from one another) may be elongated relative to their intervening markings and they may be labeled with a symbol (e.g., a one-, two-, or three-inch indicator, respectively).

[0048] The reference markings **202** may be configured to appear next to a shoulder strap attachment panel **204** attached (e.g., stitched) to the internal face **126** of the chest panel **102**. The shoulder strap attachment panel **204** may be a panel configured with a fastening mechanism to mate with a complementary fastening mechanism on the chest panel **102**. For instance, the shoulder strap attachment panel **204** may be panel of hook and loop fastener that is configured to releasably attach to a complementary panel of hook and loop fastener attached (e.g., stitched) to a side of the shoulder strap **106** that will be facing the internal face **126** of the chest panel **102** when the tactical vest is worn. The shoulder strap attachment panel **204** may be longer than the complementary panel of hook and loop fastener attached to the shoulder strap **106** (e.g., twice as long) in order to accommodate a wide variety of attachment positions and/or wearable length configurations of the shoulder strap **106** along its length.

[0049] Each marking of reference markings **202** may be a reference mark for potential shoulder strap attachment positions along shoulder strap attachment panel **204**. Being a reference mark for a potential shoulder strap attachment position may mean that the mark provides an indication of an exact attachment position but also a relative marker for attachment positions that may not be in exact alignment with the markings (e.g., in-between two graduated markings of the scale of markings). Each marking of reference markings **202** may be arranged in a scale or ruler pattern escalating along the length of the shoulder strap attachment panel **204**. For example, each marking of reference markings **202** may extend perpendicularly from the elongated side of the shoulder strap attachment panel **204** approximately parallel with the bottom edge of the shoulder strap attachment panel **204**.

[0050] The reference markings **202** may be used to referentially identify and/or quantify an exact attachment position of a shoulder strap **106** to an internal face **126** of chest panel **102**. For example, when the shoulder strap **106** is attached to the internal face **126** of chest panel **102**, a bottom edge **210** of shoulder strap **106** may be used as a reference edge that is aligned with and/or positionally referred against the reference markings **202**. For example, shoulder strap **106** is illustrated being releasably attached to shoulder strap attachment panel **204** such that bottom edge **210** is aligned with the reference marking labeled with the numeral one.

[0051] Quantifying the attachment position in this manner may allow a user to easily identify a precise attachment position that has historically provided the wearer with a proper fit of the tactical vest. For instance, the user may know from previous experience that aligning the bottom edge **210** of shoulder strap **106** with the reference marking labeled with the numeral one provides him or her with a good fit. In this manner, the reference markings may be utilized as indicators of wearer fit presets.

[0052] Using the reference markings as indicators of wearer presets with respect to fit is not only convenient but it may significantly improve the safety of the wearer. For example, in combat or training a wearer may experience prolonged periods of inactivity (e.g., waiting, observing, staging, eating, sleeping, etc.) punctuated by periods of high intensity activity (e.g., engaging in combat, building fortifications, exercising, running drills, etc.) and/or may be exposed to different weather or environmental conditions throughout the day. Any of these changes may cause a wearer to want to add or shed base layers worn under the tactical vest. Often, the tactical vest will need to be removed to change base layer clothing. Since the tactical vest may house ballistic protection and/or combat equipment, removing it in the field may expose the wearer to additional dangers associated with lacking these protections.

[0053] However, with first shoulder strap adjustment mechanism **124**, a wearer of a tactical vest may know from previous experience what their fit presets are with respect to different base layer configurations. For example, a wearer may know that that when they add certain additional base layers, they need to realign the bottom edge **210** of shoulder strap **106** so that it aligns with the reference marking labeled with the numeral two in order to provide themselves with a good fit over those base layers. In that case, the user can rapidly and precisely adjust the wearable length of the shoulder straps and/or the fit of the tactical vest to this preset attachment position and rapidly redon the equipment rather than fumbling with and/or adjusting the fit multiple times to try to blindly find the right fit. In short, the first shoulder strap adjustment mechanism **124** may reduce the amount of time that a wearer has their tactical vest removed when performing transitions, thereby reducing their unprotected exposure to ballistic and other threats. This is also realized by using the second shoulder strap adjustment mechanism described in further detail below.

[0054] In addition to facilitating the rapid and repeatable fit adjustments, the reference markings of the first shoulder strap adjustment mechanism **124** facilitate a symmetrical fit. That is, although both shoulder straps of a tactical vest can have their wearable length adjusted independently, first shoulder strap adjustment mechanism **124** provides a mechanism by which the wearable lengths across both shoulder straps and/or the overall fit of the tactical vest can be rapidly and repeatably made symmetrical.

[0055] For example, a first shoulder strap (e.g., shoulder strap **106**) may be releasably attached to a first shoulder strap attachment panel (e.g., shoulder strap attachment panel **204**) at an attachment position where its bottom edge (e.g., bottom edge **210**) is aligned with the reference marking labeled with the numeral one (e.g., this reference marking having historically provided the wearer a good fit). Then a

second shoulder strap may be attached to a second shoulder strap attachment panel at an attachment position where its bottom edge is also aligned with the reference marking labeled with the numeral one. In this manner, the wearable length of the first and second shoulder straps is identical and/or symmetrical given their same relative position to the equivalent reference markings. This will automatically produce a symmetrical fit to the tactical vest without having to perform additional independent adjustments to the shoulder straps. Again, this significantly decreases the amount of time and effort to achieve a symmetrical fit and renders the same fit reproducible across adjustments.

[0056] Moreover, first shoulder strap adjustment mechanism **124** facilitates rapid and reproducible fit adjustments even when they involve different wearable lengths. Say, for instance, that a wearer's anatomy, loadout, base layer configuration, etc. renders their anatomical geometry asymmetric and/or causes the tactical vest to fit asymmetrically even when both shoulder straps are adjusted to the same wearable length. In these instances, the wearer may quickly realize that perhaps a right side shoulder strap needs to be attached to its corresponding shoulder strap attachment panel at an attachment position where its bottom edge is aligned with the reference marking labeled with the numeral one, while a left side shoulder strap needs to be attached to its corresponding shoulder strap attachment panel at an attachment position where its bottom edge is aligned with the reference marking labeled with the numeral two in order to produce a symmetrical fit despite asymmetric wearable lengths. The wearer may utilize this positioning and/or its implied spatial offset to rapidly and reproducibly achieve a symmetrical fit that is tailored to their unique geometry.

[0057] In addition, each shoulder strap may be configured with one or more padded portions to aid in the wearer's comfort and help minimize fatigue and injury. For example, shoulder strap **106** may include a chest padding portion **208**. The chest padding portion **208** may include a padding panel attached (e.g., stitched) to a side of the shoulder strap **106** that will be facing and/or contacting the wearer's chest when the tactical vest is worn. Additionally, or alternatively, the shoulder strap may include a shoulder padding portion **206**. Shoulder padding portion **206** may include a padding panel attached (e.g., stitched) to a side of the shoulder strap **106** that will be facing and/or contacting the wearer's shoulder when the tactical vest is worn.

[0058] FIGS. **3**A-**3**B illustrate examples of a view of a second shoulder strap adjustment mechanism **130** not engaged with a tactical vest panel, in accordance with one or more embodiments described herein. Second shoulder strap adjustment mechanism **130**, in combination with first shoulder strap adjustment mechanism **124** described above, can be utilized to both securely position and hold a back panel **104** and/or chest panel **102** and its contents (e.g., a ballistic plate) while providing a clear, straightforward, quantitative system of fit adjustment that can be quickly and repeatedly made symmetrical. Moreover, the second shoulder strap adjustment mechanism **130** can facilitate fine-grained adjustments to the hanging angle and/or hanging height of the back panel **104** and/or chest panel **102** that can be made on-the-fly (e.g., without doffing the tactical vest).

[0059] Second shoulder strap adjustment mechanism **130** may be a complementary mechanism to and/or configured to be used in tandem with first shoulder strap adjustment mechanism **124**. Second shoulder strap adjustment mechanism **130** may be integrated with each shoulder strap (e.g., shoulder strap **106**). The second shoulder strap adjustment mechanism **130** may be located above the bottom edge **210** and/or the shoulder strap attachment panel **304**, which is configured to releasably mate with shoulder strap attachment panel **204**.

[0060] The second shoulder strap adjustment mechanism **130** may include a slotted channel **302**. Slotted channel **302** may include a panel attached (e.g., stitched) along its elongate sides to shoulder strap **106**. Slotted channel **302** may be left unattached to shoulder strap **106** at its top, bottom, and in between the stitched elongate sides such that a channel is formed between the panel and the shoulder strap **106** within the stitched elongate sides. The slotted channel **302** may include a plurality of slots **306** (e.g., **306-1** . . . **306**-N) forming elongate openings into the channel along the length of the panel. Each of the plurality of slots **306** may be dimensioned to accommodate passage of a corresponding panel strap (e.g., back panel strap **134**, chest panel strap **132**, etc.) into and/or out of the channel.

[0061] The slotted channel **302** may include slotted channel reference markings **314**. The slotted channel reference markings **314** may be emblazoned on an external face of the slotted channel **302** such that they are visible on its face. The slotted channel reference markings **314** may be at least partially visible in the front on view of the chest panel **102** even when the shoulder strap **106** is fully engaged with shoulder strap attachment panel **204**.

[0062] The slotted channel reference markings **314** may correspond to the reference markings **202** of the first shoulder strap adjustment mechanism **124** (e.g., those appearing on the internal face **126** of chest panel **102**). That is, each of the slotted channel reference markings **314** may correspond to an equivalent reference marking appearing on the internal face **126** of chest panel **102**. This correspondence may indicate which of the plurality of slots **306** that a panel strap should be laced through in order to provide a hang angle, plate height, fit, etc. that matches the shoulder strap attachment position in which the shoulder strap **106** is attached. For instance, if a bottom edge **210** of shoulder strap **106** is aligned with the reference marking labeled with the numeral one on the first shoulder strap adjustment mechanism **124** then the second shoulder strap adjustment mechanism **130** may be configured such that lacing the panel strap into and out of the slots (e.g., **306-4** and **306**-N) bordering the slotted channel reference marking labeled with the numeral one may automatically tailor the hang angle, the panel height, the fit, etc. of the tactical vest to that shoulder strap attachment position.

[0063] Above the final slot (e.g., **306**-N) of the slotted channel **302**, second shoulder strap adjustment mechanism **130** may include a locking channel **320**. Locking channel **320** may be configured to releasably capture and/or lock (e.g., with a hook and loop fastening mechanism) a panel strap within a channel. For instance, locking channel **320** may include a locking channel floor **312**. The locking channel floor **312** may include a releasable fastener such as a panel of hook and loop material attached (e.g., stitched) to shoulder strap **106** (e.g., to a same face as the shoulder strap attachment panel **304**, to a face opposite the shoulder padding portion **206**, etc.).

[0064] In addition, locking channel **320** may include one or more flaps such as locking flaps **310** (e.g., **310-1** . . . **310**-N). The locking flaps **310** may include articulable flaps

with extension portions attached (e.g., stitched) to the shoulder strap **106** under the locking channel floor **312**. The locking flaps **310** may open to expose the locking channel floor **312** and may close to seal the locking channel **320** and form its roof. In various embodiments, the locking flaps **310** may include a fastener panel **324** (e.g., **324-1** . . . **324**-N) (e.g., hook and loop material) attached (e.g., stitched) to the internal face of the locking flaps **310** that will face the inside of the locking channel **320** when closed. When an item such as a panel strap (e.g., chest panel strap **132**, back panel strap **134**, etc.) is inserted in locking channel **320** and the locking flaps **310** are closed, then the item, which may include fasteners such as hook and loop material itself, will be releasably locked into place via releasable engagement with the fastener panels **324** of the locking flaps **310** and/or the locking channel floor **312**.

[0065] As previously mentioned, the locking flaps **310** may include extension portions attached to shoulder strap **106**. Between these extension portions, the body of the locking flaps **310** may be discontinuous such that a pass-through slot **308** is formed in between each of the extension portions. A pass-through slot **308** may form a side entrance into the locking channel **320**. Each pass-through slot **308** may be used to accommodate the passage of straps and/or auxiliary equipment (e.g., for cable routing/management, equipment mounting, equipment storage, etc.) within locking channel **320**. Therefore, locking channel **320** may accommodate and/or releasably lock into place both panel straps and auxiliary equipment such as by sandwiching them between the layers locked within the locking channel **320**.

[0066] FIGS. **4**A-**4**B illustrate examples of the second shoulder strap adjustment mechanism **130** engaged with a tactical vest panel, in accordance with one or more embodiments described herein. Specifically, the second shoulder strap adjustment mechanism **130** is illustrated engaged with chest panel **102**.

[0067] Chest panel **102** may include a chest panel strap **132**. Chest panel strap **132** may be a thirty-eight-millimeter nylon strap. Chest panel strap **132** may be attached (e.g., stitched) to an external face **122** of chest panel **102**. The chest panel strap **132** may extend down the external face **122** of the chest panel **102** to a point at or below halfway down the chest panel **102**. A chest panel **102** may include two or more chest panel straps that run diagonally from a corner of a chest panel **102** collectively forming a V-shape attachment to the external face **122**. The chest panel strap **132** may be used to help distribute the load of ballistic plates and hold the chest panel **102** snuggly against the body of the wearer when engaged in locking channel **320**. Back panel straps (e.g., back panel strap **134**) may be similarly configured with respect to the back panel **104**.

[0068] Again, the slotted channel reference markings **314** may be configured to correspond to the reference markings **202** of the first shoulder strap adjustment mechanism **124** (e.g., those appearing on the internal face **126** of chest panel **102**). Here, bottom edge **210** of shoulder strap **106** is aligned with the reference marking labeled with the numeral one on the first shoulder strap adjustment mechanism **124** as illustrated in FIGS. **2**A-**2**B. Therefore, chest panel strap **132** is laced into and out of the slotted channel at slots (e.g., **306-4** and **306**-N) bordering the slotted channel reference marking labeled with the numeral one on the second shoulder strap adjustment mechanism **130**. Accordingly, the hang angle, the panel height, the fit, etc. of the chest panel **102** and/or the back panel of the tactical vest is automatically tailored to the shoulder strap attachment position corresponding to the number one on the second shoulder strap adjustment mechanism **130**.

[0069] Additional fine-grained adjustments may be achieved by pulling the chest panel strap **132** tighter and releasably fixing it in place further back within locking channel **320**. For example, the further back in the locking channel **320** that the chest panel strap **132** is releasably fixed, the higher the chest panel **102** and/or back panel may ride when worn. Adjustments to the back panel strap **134** may produce similar effects. The chest panel strap **132** may be releasably captured in the locking channel **320** overlapping the back panel strap **134** that is also captured in the locking channel. For instance, back panel strap **134** and chest panel strap **132** may include fastener panels (e.g., chest panel strap fastener panel **318**, back panel strap fastener panel **322**) on both faces of the strap so that they can be releasably locked into a sandwich configuration by engagement with each other and/or by engagement with the locking channel floor **312** and/or the fastener panels **324** on the internal face of the locking flaps **310**. When the locking channel **320** is closed, the back panel strap **134** and the chest panel strap **132** may be locked into place releasably securing the tactical vest fit.

[0070] FIGS. **5**A-**5**B illustrate examples of a view of the second shoulder strap adjustment mechanism **130** engaged with a tactical vest panel, in accordance with one or more embodiments described herein. Second shoulder strap adjustment mechanism **130** is illustrated engaged with a chest panel strap **132**. The chest panel strap **132** is attached to an external face **122** of chest panel **102** and is laced through the slotted channel of second shoulder strap adjustment mechanism **130**. The chest panel strap **132** is illustrated locked in to locking channel **320** with chest panel strap fastener panel **318** releasably engaged within the locking channel **320**.

[0071] FIGS. **6**A-**6**C illustrate examples of cummerbund **108** with a first cummerbund adjustment mechanism **116**, in accordance with one or more embodiments described herein. Cummerbund **108** is configured as an expandable coupler between a chest panel and a back panel of a tactical vest. Cummerbund **108** may be configured to couple the panels of a tactical vest across the sides of a wearer's torso (e.g., at the rib cage, at the waist, at the sides of abdomen, etc.).

[0072] Cummerbunds typically include one or more cummerbund straps that span between connection points to the tactical vest panels. Cummerbund straps may be made of a high tensile strength material such as nylon webbing. While such materials have some elasticity, they generally have a much higher modulus of elasticity and/or are less elastic than elastic banding. Generally, nylon webbing in cummerbunds is not elastic enough to avoid restricting the wearer's freedom of movement and/or reducing oxygen intake by torso constriction during periods of heightened activity. However, while elastic banding can alleviate this restriction, it is prone to damage, snagging, snapping, etc. and consumes valuable real estate on the tactical vest. That is, utilizing elastic banding for the entire length of a cummerbund means that the surface of the cummerbund cannot be used as an attachment point for additional equipment and/or pouches since it necessarily needs to expand and contract.

[0073] In contrast, the first cummerbund adjustment mechanism **116** of cummerbund **108** provides dynamic expansion and contraction of the cummerbund **108** that

responds to a wearer's movement. The first cummerbund adjustment mechanism **116** additionally protects both the expansion mechanism (e.g., from abrasion, snagging, over-stretching, etc.) and the wearer (e.g., from discomfort, friction, pinching, chaffing, etc.). Moreover, first cummerbund adjustment mechanism **116** adds additional attachment points to the tactical vest.

[0074] Cummerbund **108** includes cummerbund straps **604** (e.g., **604-1** . . . **604**-N). Cummerbund straps **604** may be constructed of a high tensile strength material such as nylon webbing or tape that are configured to span across the sides of a wearer to couple a chest panel to a back panel of a tactical vest. The cummerbund straps **604** may include a first portion **612** and a second portion **614**. The first portion **612** may include a double layer of the high-tensile strength material attached (e.g., stitched) to one another at regular intervals. The second portion **614** may include a single layer of the high-tensile strength material. The first portion **612** may be attached (e.g., stitched) to a second cummerbund adjustment mechanism **112** which may be releasably attached to a reconfigurable panel attachment portion **110**. Reconfigurable panel attachment portion **110** may be configured to releasably engage with a complementary attachment mechanism on a panel of the tactical vest (e.g., a hook and loop panel, etc.). The second portion **614** may be attached to another panel attachment portion such as a pincer buckle **602** (e.g., **602-1** . . . **602**-N). The pincer buckle **602** may be configured to be releasably attached to attachment mechanisms such as MOLLE, etc.

[0075] Cummerbund **108** may include expansion joints (e.g., one for each of the cummerbund straps **604**) that are housed within an expansion joint sheath **624**. Each expansion joint may include a mechanism which allows the wearable length of the cummerbund to dynamically adapt to loads experience during movement of a wearer. Specifically, the expansion joint may stretch under load and return to its original state once the load is released. This action may allow the wearer greater freedom of movement and reduced oxygen restriction/torso constriction during periods of heightened activity. The expansion joint and its integrated protective mechanism are described in greater detail below with respect to FIGS. **7**A-**7**B.

[0076] The expansion joint sheath **624** may surround and contain the expansion joint within a pouch inside of the sheath. The expansion joint may remain within expansion joint sheath **624** whether in its expanded or unexpanded state. The expansion joint sheath **624** may be attached (e.g., stitched) to the cummerbund straps **604** at one end. For example, the expansion joint sheath **624** may be attached directly to the first portion **612** of the cummerbund straps **604** but not to the second portion **614** of the cummerbund straps **604**. This asymmetrical attachment may make it such that the second portion **614** of the cummerbund straps **604** is not fully trapped within the expansion joint sheath. Therefore, any load on the second portion **614** of the cummerbund straps **604** is transferred to the expansion joint housed within the expansion joint sheath **624**. Under load, the expansion joint may expand within expansion joint sheath **624**. This may allow the second portion **614** of the cummerbund straps **604** to slip partially out of the expansion joint sheath **624** under load. As a result, the wearable length of the cummerbund straps **604** may expand under load as the length of the cummerbund between the panels is momentarily elongated.

[0077] The expansion joint sheath **624** may house the expansion joint protecting it from snagging, catching, tangling, abrading, running, damage, etc. In addition, the expansion joint sheath **624** may act as pad or shield that protects the wearer from discomfort, friction, skin abrasion, clothing damage, injury, changing, pinching, etc. caused by the expansion and contraction of the expansion joint and its movement along the sides of the wearer. The external face of the expansion joint sheath **624** may include a mounting surface **622**. The mounting surface **622** may include attachment mechanisms such as hook and loop fasteners, MOLLE, buckles, hooks, snaps, quick release mechanisms, etc. that may be used to attach various tactical accessories. In addition, at external face of second cummerbund adjustment mechanism **112**, described in greater detail with respect to FIG. **8**A-**8**F below, may also include mounting surface **622**.

[0078] FIGS. **7**A-**7**B illustrate an example of an expansion joint **610** of first cummerbund adjustment mechanism, in accordance with one or more embodiments described herein. Expansion joint **610** may be located within an expansion joint sheath of a cummerbund as outlined with respect to FIGS. **6**A-**6**C. As outlined, each of the cummerbund straps **604** may include a corresponding expansion joint. In FIG. **7**A, expansion joint **610** is illustrated in its non-expanded configuration. Conversely, in FIG. **7**B, expansion joint **610** is illustrated in an expanded configuration under load **616**.

[0079] Expansion joint **610** may be a connection point or joint between the first portion **612** and the second portion **614** of a respective cummerbund strap. The expansion joint **610** may include an elastic component **608** and/or a limiting component **606**. The elastic component **608** may be an elastic band, webbing, tape, etc. material. Elastic component **608** may be configured to elastically lengthen under a load (e.g., load **616**) and return to its original length once the load is removed. Since elastic component **608** serves as a connection point or joint between the first portion **612** and the second portion **614** of a respective cummerbund strap, when it lengthens under load the wearable length of that cummerbund strap is thereby lengthened until the load is removed.

[0080] The limiting component **606** may be a non-or less-elastic band, webbing, tape, etc. material. For instance, the limiting component **606** may be a high-tensile strength material such a nylon webbing or tape. In some instances, the limiting component **606** may be the same material as the material of cummerbund strap **604**. The limiting component **606** may be less elastic and/or have a significantly higher modulus of elasticity than the elastic component **608** such that it will not appreciably lengthen under the load (e.g., load **616**) causing the lengthening of elastic component **608**.

[0081] The limiting component **606** may be attached (e.g., stitched) to and/or overlay the clastic component **608**. For example, at first end **620** a limiting component **606** may be folded over on itself to form a double edge which may be layered on top of an end of the elastic component **608** and a cummerbund strap **604**. At second end **618** a limiting component **606** may be folded over on itself to form a double edge with an end of the elastic component **608** being sandwiched within the fold over and both being attached to the cummerbund strap **604**.

[0082] The limiting component **606** may be configured to be a longer length than the length of the elastic component **608** when it is not under a load (e.g., not stretched), causing the limiting component **606** to have slack along its length when not experiencing load **616**. Therefore, when load **616**

is applied to cummerbund straps **604**, the elastic component **608** will lengthen (e.g., thereby lengthening the wearable length of the cummerbund). In response to this lengthening the slack will be taken out of limiting component **606** as its two ends are stretched apart by virtue of their connection to the ends of the elastic component **608**. Eventually, all the slack may be taken out of the limiting component **606** and it may be taut. At this point, lengthening of the elastic component **608** and/or the wearable length of the cummerbund may be arrested, and further lengthening may be prevented since the limiting component **606** resists further stretching. Hence, even though the elastic component **608** alone could continue to lengthen under load **616**, the limiting component **606** prevents this by resisting load **616**.

[0083] In this manner, limiting component **606** may protect the elastic component **608** by preventing it from damage or failure caused by over-stretching. In addition, limiting component **606** may increase the strength and longevity of the cummerbund. The action afforded by this configuration may enable the first cummerbund adjustment mechanism to behave as a shock absorber mechanism facilitating dynamic expansion and contraction of the cummerbund.

[0084] FIGS. **8**A-**8**K illustrate examples of the second cummerbund adjustment mechanism **112** progressing through various stages of engagement (e.g., pre-engagement in FIG. **8**A-**8**C, partial engagement in FIG. **8**D-**8**F, and full engagement in FIG. **8**G-**8**K) with a reconfigurable panel attachment portion **110**, in accordance with one or more embodiments described herein. Second cummerbund adjustment mechanism **112** may be used to swap out and/or switch between any of a plurality of panel attachment mechanisms to achiever a wearer's preferred configuration and fit for a tactical vest. For example, a plurality of different cummerbund closure mechanisms exist such as hook and loop fastener panels, buckles, quick release tubes, hooks, etc.

[0085] A particular wearer may prefer a certain closure mechanism because it is more familiar, provides them with a better fit, provides them with the ability to have their tactical vest quickly removed for convenience or safety, etc. In addition, at times the closure mechanism already mounted to the tactical vest may become damaged or inoperable. Unfortunately, with conventional cummerbund closure mechanisms, both of these instances require a wearer to doff the cummerbund being replaced and/or tactical vest, remove any equipment from the cummerbund being replaced, install the preferred and/or operational cummerbund, install and configure any equipment removed from the cummerbund being replaced on the newly installed preferred and/or operational cummerbund, and/or make any fit adjustments to the newly installed preferred and/or operational cummerbund. This can be a cumbersome, frustrating, and/or dangerous endeavor in many circumstances.

[0086] In contrast, second cummerbund adjustment mechanism **112** facilitates swapping out and/or switching between any of a plurality of panel attachment mechanisms 'on-the-fly,' without replacing the entire cummerbund, and/or without involving the removal, reinstallation, and/or reconfiguration of equipment on the cummerbund. Instead, the second cummerbund adjustment mechanism **112** allows a wearer to quickly switch out the panel attachment mechanism alone without disturbing the other components of the cummerbund. For example, the second cummerbund adjustment mechanism **112** may be utilized to switch out the reconfigurable panel attachment portion **110** for another without involving removal, reconfiguration, reattachment, and/or manipulation of a rear panel attachment portion **824** (e.g., which may have any number of configurations such as a pincer buckle **602** illustrated in FIGS. **6***a*-**6**C) that remains releasably engaged with a rear panel of the tactical vest.

[0087] Second cummerbund adjustment mechanism **112** may facilitate this swapping using an attachment mechanism adapter **802** configured to releasably engage with a range of reconfigurable panel attachment portions (e.g., reconfigurable panel attachment portion **110**). The diverse range of reconfigurable panel attachment portions may have an equally diverse range of panel attachment mechanism configurations (e.g., hook and loop fastener panels, buckles, quick release tubes, hooks, etc.) for attaching to a tactical vest panel and/or attaching to a complementary attachment mechanism attached to the tactical vest panel. That is, attachment mechanism adapter **802** may function as a generic adapter capable of securely engaging any type of reconfigurable panel attachment portion **110** to a cummerbund regardless of its particular panel attachment mechanism configuration.

[0088] For example, an attachment mechanism adapter **802** may include a locking flap. The locking flap may be made up of a bottom flap **822** and a top flap **812**. Cummerbund straps **604** may be attached (e.g., stitched) to the bottom flap **822**. For instance, cummerbund straps **604** may be attached to an external face of the bottom flap **822**. An internal face **818** of the bottom flap **822** may include region (e.g., an attached panel) of hook and loop fastener. An internal face **820** of top flap **812** may include a region (e.g., an attached panel) of hook and loop fastener that is complementary to the region on the internal face **818** of the bottom flap **822**.

[0089] In various embodiments, such as those illustrated in FIGS. **8**C, **8**F, **81**, **8**J, and **8**K, second cummerbund adjustment mechanism **112** may be integrated into a skeletonized, semi-rigid, and/or stiffened cummerbund. A semi-rigid and/or stiffened cummerbund may be more resistance to sag and/or separation when bulky equipment is attached.

[0090] In these types of semi-rigid and/or stiffened cummerbunds, a portion (e.g., all, only some, only first strap **604-2** and second strap **604**-N, etc.) of cummerbund straps **604** may be reinforced or stiffened (e.g., with a semi-rigid material **826** such as a polymer, carbon fiber, plastic, etc. fixed between two fabric-like layers of nylon webbing or tape). In addition, in such embodiments the bottom flap **822** may also be reinforced or stiffened (e.g., with a semi-rigid material **826** fixed between an internal face **818** of bottom flap **822** and a fabric-like layer of nylon webbing or tape making up a bottom and/or external face of bottom flap **822**).

[0091] Bottom flap **822** may include one or more extensions that form engagement straps **804** (e.g., **804-1** . . . **804**-N). Each engagement strap may be a thirty-eight-millimeter-wide extension of the bottom flap **822**. The internal faces **806** (e.g., **806-1** . . . **806**-N) of the engagement straps **804** may include a region (e.g., an attached panel) of hook and loop fastener that is complementary to the region on the internal face **818** of the bottom flap **822**. External faces **808** (e.g., **808-1** . . . **808**-N) of engagement straps **804** may include a region (e.g., an attached panel) of hook and loop fastener that is complementary to the region on the internal face **820** of the bottom flap **822** of top flap **812**.

[0092] Each type of reconfigurable panel attachment portion **110**, regardless of its particular panel attachment mecha-

nisms, may include one or more opening such as adapter mating openings **816** (e.g., **816-1** . . . **816**-N). Each of the adapter mating openings **816** may be a slit dimensioned (e.g., as a thirty-eight to forty-millimeter slot) to accommodate passage and/or retention of a corresponding engagement strap passed therethrough. Each of the engagement straps **804** may be configured to be looped through a corresponding one of the adapter mating openings **816**.

[0093] Once looped through the adapter mating openings **816**, the engagement straps **804** may be folded over having their internal face releasably attached to the internal face **818** of bottom flap **822**. Then, the top flap **812** of the locking flap may be folded over so that internal face **820** of top flap **812** is releasably attached to the external faces **808** of engagement straps **804** and/or to any uncovered portions of the internal face **818** of bottom flap **822**. In this fully engaged configuration, the reconfigurable panel attachment portion **110** may be securely releasably engaged to the cummerbund through attachment mechanism adapter **802**. This releasable attachment can be reversed to release the reconfigurable panel attachment portion **110** and quickly swap it out by repeating the process with another reconfigurable panel attachment portion **110**.

[0094] Either or both of external face **814** of top flap **812** and/or the external face of bottom flap **822** may include an attachment mechanism such as hook and loop fasteners, MOLLE, buckles, hooks, snaps, quick release mechanisms, etc. that may be used to attach various tactical accessories (e.g., patches, holsters, pouches, medical kits, radios, wires, drink bladders, tools, etc.). As such, the portions of a cummerbund where tactical accessories may be mounted are not removed from the cummerbund when swapping between reconfigurable panel attachment portions. Therefore, there is no need to reconfigure, remove, reinstall, etc. equipment when performing these swaps. Further, a tactical vest and/or cummerbund does not need to be doffed in order to perform these swaps. In various embodiments, such as when integrated with skeletonized, semi-rigid, and/or semi-stiffened cummerbunds, the bottom flap **822** may act as a stiffened platform having semi-rigid or stiffened characteristics relative to the top flap **812** since the bottom flap **822** may be mounted on top of a semi-rigid material **826**.

[0095] The mechanisms described herein, therefore, introduce an adjustable fit tactical vest and/or an apparatus and system for adjusting the fit of a tactical vest in a manner that achieves a rapid, repeatable, and symmetric fittings. Further, the described configurations minimize the amount of time and instances that a wearer must remove his or her tactical vest in order to achieve this fit. Furthermore, the described structures combine to offer a wearer a dynamic cummerbund portion of a tactical vest that can adjust to the wearer's movement via sheathed shock absorber-like components and adapter mechanisms that facilitate on-the-fly panel attachment mechanism swaps outs.

[0096] According to the embodiments herein, an illustrative system for fit adjustment of a tactical vest may comprise: shoulder straps configured to have independently adjustable wearable lengths and to be releasably attachable to a face of a chest panel of the tactical vest or a back panel of the tactical vest at any of a plurality of potential shoulder strap attachment positions; and a set of reference markings on the face of the chest panel or the back panel, each reference marking of the set of reference markings indicating a respective potential shoulder strap attachment position of the plurality of potential shoulder strap attachment positions, wherein the set of reference markings is configured such that releasably attaching each of the shoulder straps to the face of the chest panel of the tactical vest or the back panel of the tactical vest so that corresponding portions of the shoulder straps align with equivalent reference markings causes the shoulder straps to have an equivalent wearable length.

[0097] In one embodiment, each of the shoulder straps includes a slotted channel through which a panel strap attached to the chest panel of the tactical vest or the back panel of the tactical vest can be engaged at any of a plurality of potential panel strap attachment positions to provide an adjustment to a hanging angle of the chest panel of the tactical vest or the back panel of the tactical vest. In one embodiment, each slotted channel is marked with a secondary set of reference markings that indicate a plurality of potential panel strap attachment positions that are matched to the plurality of potential shoulder strap attachment positions. In one embodiment, the system for fit adjustment of a tactical vest further comprising a cummerbund configured to couple the chest panel of the tactical vest to the back panel of the tactical vest.

[0098] In one embodiment, the cummerbund includes an expandable joint housed within a sheath located between an attachment point to the chest panel of the tactical vest and an attachment point to the back panel of the tactical vest. In one embodiment, the expandable joint comprises: an expansion strap bridging adjacent portions of the cummerbund and being configured to elastically expand to increase a wearable length of the cummerbund under tension; and a limiting strap coupled to the expansion strap and configured to limit an amount of expansion by the expansion strap under tension. In one embodiment, an exterior of the sheath is configured as an equipment bearing side panel of the tactical vest equipped with equipment attachment points. In one embodiment, the cummerbund includes a reconfigurable panel attachment portion that can be switched among a plurality of panel attachment mechanisms. In one embodiment, the cummerbund includes an attachment mechanism adapter comprising an engagement strap configured to be looped through a corresponding slot in a panel attachment mechanism and releasably captured within a locking flap attached to the cummerbund to releasably secure the panel attachment mechanism to the cummerbund.

[0099] According to the embodiments herein, an illustrative tactical vest fit adjustment apparatus may comprise: a first panel including a set of panel reference markings to identify a shoulder strap attachment position among a plurality of potential shoulder strap attachment positions where a shoulder strap is releasably attached to a face of the first panel; and shoulder straps configured to couple the first panel to a second panel across shoulders of a wearer, wherein each of the shoulder straps is configured to have an independently adjustable wearable length dictated by its shoulder strap attachment position and wherein the shoulder straps are configured to have a same wearable length when the shoulder straps are releasably attached to the first panel in alignment with equivalent reference marking of the set of panel reference markings.

[0100] In one embodiment, the tactical vest fit adjustment apparatus further comprising a cummerbund configured to couple the first panel to the second panel across sides of the wearer, wherein the cummerbund includes an attachment

mechanism adapter configured to releasably capture each of a plurality of structurally distinct panel attachment mechanisms to attach the cummerbund to the first panel. In one embodiment, the tactical vest fit adjustment apparatus further comprising a cummerbund configured to couple the first panel to the second panel across sides of the wearer, wherein the cummerbund includes an expandable joint housed within a sheath configured to be positioned along a wearer's side. In one embodiment, the tactical vest fit adjustment apparatus further comprising further comprising a panel strap attached to an opposing face of the first panel and configured to releasably engage with a corresponding shoulder strap.

[0101] In one embodiment, each of the shoulder straps includes a slotted channel configured to receive the panel strap laced through slots marked with a secondary set of reference markings that indicate their correspondence to each of the plurality of potential shoulder strap attachment positions. In one embodiment, each of the shoulder straps includes a locking channel configured to capture and releasably lock a corresponding panel strap attached to the first panel and a corresponding panel strap attached to the second panel to that strap. In one embodiment, the locking channel includes pass-through slots to accommodate auxiliary equipment within the locking channel.

[0102] According to the embodiments herein, an illustrative tactical vest may comprise: a chest panel comprising an external face and an internal face and having a set of reference markings indicating respective strap attachment positions on the internal face; a back panel; a first strap attached to the chest panel and having a first releasable attachment portion configured to engage a corresponding portion of a third strap; a second strap attached to the back panel and having a second releasable attachment portion configured to engage a corresponding portion of the third strap; the third strap attached to the back panel and having: a chest panel engaging portion configured to releasably attach to the internal face of the chest panel; and a slotted channel portion including a set of channel reference markings corresponding to the set of reference markings indicating the respective strap attachment positions on the internal face of the chest panel, the slotted channel portion configured to accept the first strap through a slot indicated by a channel reference marking as corresponding to a strap attachment position on the internal face where the third strap is releasably attached; and a cummerbund configured to couple the chest panel to the back panel.

[0103] In one embodiment, the cummerbund is elastically expandable at an expandable joint located within a sheath located along a portion of the cummerbund between an attachment point to the chest panel and an attachment point to the back panel. In one embodiment, the cummerbund includes a panel attachment mechanism capture strap configured to be passed through coinciding slits in any of a plurality of different panel attachment mechanisms and folded back on itself to secure each plurality of different panel attachment mechanisms to an end of the cummerbund. In one embodiment, the third strap includes a padded portion opposite the slotted channel portion and configured to contact the shoulder of a wearer.

[0104] According to the embodiments herein, an illustrative tactical cummerbund adjustment apparatus may comprise: cummerbund straps configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; and an attachment mechanism adapter attached to the cummerbund straps and including an engagement strap configured to be looped through a corresponding slot in a panel attachment mechanism and releasably captured within a locking flap of the attachment mechanism adapter.

[0105] In one embodiment, the locking flap includes a top flap and a bottom flap and wherein the engagement strap is releasably captured within the locking flap when sandwiched between the top flap and the bottom flap. In one embodiment, an internal face of a top flap of the locking flap includes a first fastener region and an internal face of a bottom flap of the locking flap includes a second fastener region and wherein the first fastener region and the second fastener region are complementary. In one embodiment, a first face of the engagement strap includes a third fastener region and a second face of the engagement strap, opposite the first face, includes a fourth fastener region and wherein the third fastener region is complementary to the first fastener region on the internal face of the top flap and the fourth fastener region is complementary to the second fastener region on the internal face of the bottom flap.

[0106] FIGS. **9**A-**9**B illustrate examples of adjustable fit configurations **900** for a tactical vest **100** achievable utilizing a third cummerbund adjustment mechanism **902**, in accordance with one or more embodiments described herein. As previously mentioned, the anatomy, loadout, base layer configuration, etc. of different wearers can vary substantially. However, for tactical vests to perform optimally they should be both a uniform or structurally generic piece of equipment that is able to be distributed to and/or used by any wearer and a precisely adjustable piece of equipment that can quickly be personalized to particular dimensions and/or preferences of a wearer to offer optimal fit and comfort.

[0107] One approach to providing this level of adjustability includes utilizing a hook and loop panel affixed to an end of a cummerbund to releasably attach the cummerbund along an attachment panel of a tactical vest. By facilitating attachment of the cummerbund to the front and/or back panels at a variety of positions, these panels allow the user to adjust the wearable length and/or tautness of cummerbund material connecting the front and back panels, and thereby the fit of the tactical vest. For example, if a hook and loop panel affixed to an end of a cummerbund is attached at a mid-point of a tactical vest it will translate to a tighter fitting tactical vest with smaller torso cavity than if that same hook and loop panel was attached further away from the mid-pint and closer to the sides of the tactical vest panel.

[0108] While this approach may introduce adjustment to the wearable length of the cummerbund, it may also degrade the functionality of the cummerbund. For example, to achieve a tighter fit or to accommodate a slimmer build/less clothing, the hook and loop panel affixed to the end of a cummerbund may be moved toward the opposite side (e.g., the side opposite the side along which the cummerbund extends) of the panel of the vest during attachment. However, this configuration may cause a portion of the cummerbund to overlap with the panel of the tactical vest. In some instances, this may interfere with and/or cause a loss of functionality of the cummerbund. For instance, if the cummerbund includes one or more equipment pouches along its length, then overlapping these pouches against the panel of the tactical vest may cause these pouches to become pinched, inaccessible, and/or lose its function.

[0109] Moreover, these types of pouches do not typically include attachment mechanisms (e.g., hook and loop panels) on them. Therefore, occupying real estate on the tactical vest panel with material that does not serve as an attachment mechanism may prevent the attachment of covers and/or additional equipment or accessories on the panel.

[0110] Alternatively, to achieve a looser fit or to accommodate a larger build/more clothing, the hook and loop panel affixed to the end of a cummerbund may be moved outward toward the same side along which the cummerbund extends from the panel of the vest during attachment. In some instances, the hook and loop panel may only be partially attached to the panel of the tactical vest to provide extra room to the wearer. However, this configuration reduces the surface area of hook and loop connection between the cummerbund and the tactical vest and therefore the integrity of the connection between the cummerbund and the tactical vest.

[0111] As such, the cummerbund-to-tactical vest connection and therefore the tactical vest may fail under load, with movement, and/or in critical moments, injuring or endangering the wearer or mission critical equipment. Further, this configuration may expose a surface (e.g., the portion partially attached and partially hanging off the panel) of the hook and loop panel (e.g., the male surface) to the environment including dirt, debris, lint, etc. This exposure can degrade the function of the panel and/or contribute to its failure.

[0112] Furthermore, the exposed surface of the hook-and-loop panel, when partially attached to the panel of the tactical vest to provide extra room to the wearer, poses other issues to the wearer. Namely, the exposed surface (e.g., an exposed male hook-and-loop surface) poses a risk of abrasion or damage to the wearer's clothing, equipment, and skin when worn. The tendency of the exposed surface to catch on and/or damage surrounding materials during use can lead to premature wear or failure of underlying gear and can cause discomfort or injury through friction against the skin.

[0113] In contrast, the third cummerbund adjustment mechanism **902** facilitates a wide range of fit adjustment for tactical vest **100** achieved without jeopardizing the functionality of the cummerbund **904** or the integrity of the cummerbund **904** to tactical vest **100** attachment across the range of fit adjustments. For example, the third cummerbund adjustment mechanism **902** may be configured to provide a first adjustable fit configuration **900-1**. The first adjustable fit configuration **900-1** may be a closed configuration. This configuration may be a relatively most compact configuration which may provide a relatively tightest or slimmest fit of the tactical vest **100** relative to the other fit configurations.

[0114] The third cummerbund adjustment mechanism **902** may include a layered series of connecting elements (e.g., first attachment panel **910**, a second attachment panel **912**, etc.) to connect the cummerbund **904** to the complementary attachment mechanism **908** on a panel of the tactical vest **100**. For example, the third cummerbund adjustment mechanism **902** may include a first attachment panel **910**.

[0115] The first attachment panel **910** may be a panel including one or more attachment surfaces (e.g., hook and loop surfaces, etc.). In various implementations, the first attachment panel **910** may have a first type of attachment surface (e.g., male hook and loop, etc.) on one face and a second type of attachment surface (e.g., female hook and loop, etc.) on its opposing face.

[0116] An attachment surface of the first attachment panel **910** that is oriented toward a panel of the tactical vest **100** may be configured (e.g., as a male hook and loop panel) to be releasably mated with a complementary attachment surface (e.g., a female hook and loop panel) of the complementary attachment mechanism **908** on that panel of the tactical vest **100**. For instance, a vest-facing attachment surface of the first attachment panel **910** and the complementary attachment surface of the complementary attachment mechanism **908** may each include complementary mechanisms configured to engage with one another and form a releasable attachment point between the cummerbund **904** and the tactical vest **100**.

[0117] A second attachment panel **912** may form another layer in the layered series of connecting elements. The second attachment panel **912** may be fixed (e.g., sewn, adhered, mechanically fastened, welded, bonded, etc.) directly to the body of the cummerbund **904**. The first attachment panel **910**, however, may not be fixed directly to the body of the cummerbund **904**. Instead, the first attachment panel **910** may be slidably attached to the cummerbund via its interaction with the second attachment panel **912**. For example, the second attachment panel **912** may be laced through one or more sliding channels **913** through the first attachment panel **910**.

[0118] Like the first attachment panel **910**, the second attachment panel **912** may be a panel including one or more attachment surfaces (e.g., hook and loop surfaces, etc.). In various implementations, the second attachment panel **912** may have a first type of attachment surface (e.g., male hook and loop, etc.) on one face and a second type of attachment surface (e.g., female hook and loop, etc.) on its opposing face. The type of attachment surface on a given side of the second attachment panel **912** may correspond to the type of attachment surface of the first attachment panel **910**.

[0119] For example, an attachment surface of the second attachment panel **912** that is oriented toward that first attachment panel **910** and/or toward a panel of the tactical vest **100** may be configured (e.g., as a male hook and loop panel) to be releasably mated with an exposed complementary attachment surface (e.g., a female hook and loop panel) of the first attachment panel **910** to form a releasable attachment point between the second attachment panel **912** and the first attachment panel **910**. The attachment surface of the second attachment panel **912** that is oriented facing away from that first attachment panel **910** and/or away from a panel of the tactical vest **100** may be configured (e.g., with a female hook and loop panel) with the same type of attachment surface as the face of the first attachment panel **910** that is oriented facing away from the panel of the tactical vest **100**.

[0120] As such, the exposed portions of the complementary attachment mechanism **908**, the first attachment panel **910**, and/or the second attachment panel **912** when connected provide a uniform attachment mechanism (e.g., female hook and loop, etc.) across the panel of the tactical vest **100**. The presentation of a uniform attachment mechanism across the panel of the tactical vest **100** can be utilized as an additional connection surface for a cover, additional gear, accessories, etc.

[0121] In the first adjustable fit configuration **900-1**, the tactical vest **100** is in a closed configuration. Here, the first attachment panel **910** is fully engaged across its entire attachment surface area with the complementary attachment

mechanism **908**. In this configuration, a leading edge **918** of the first attachment panel **910** is located against a reference line **914** superimposed over tactical vest **100** and a tapered edge **920** of the first attachment panel **910** is aligned in parallel with and below a reference edge **916** superimposed over tactical vest **100**.

[0122] The second attachment panel **912** is drawn to a furthest extent possible (e.g., as limited by a stop **930**) toward the leading edge **918** of the first attachment panel **910**. In the first adjustable fit configuration **900-1**, despite being in the closed configuration, the functional features of the cummerbund **904** are still fully exposed and their functionality fully preserved. For example, the equipment pouches **906** remain entirely accessible to the user and unincumbered by the configuration.

[0123] In a second adjustable fit configuration **900-2**, the tactical vest **100** is in a first expanded configuration. Here, the wearable length of the cummerbund **904** is extended by reconfiguring the connection of the first attachment panel **910** to the complementary attachment mechanism **908**. The first attachment panel **910** is detached from the complementary attachment mechanism **908**, shifted **922** away from the reference line **914**, and reattached to the complementary attachment mechanism **908** in the new position to generate more slack in the cummerbund **904** when worn. The second attachment panel **912** remains attached to the first attachment panel **910** in the same position as it is in the first adjustable fit configuration **900-1**.

[0124] The leading edge **918** of the first attachment panel **910** has been shifted **922** away from reference line **914** and toward the edge of the panel of the tactical vest **100** and a tapered edge **920** of the first attachment panel **910** is now aligned such that it is a continuation of a reference edge **916** superimposed over tactical vest **100**. Here, the widest portion of the first attachment panel **910** remains engaged with complementary attachment mechanism **908**, while the tapered portion is now unengaged. Leaving the widest portion of the first attachment panel **910** engaged with the complementary attachment mechanism **908** may ensure that there is still sufficient surface area involved in the attachment such that the strength of the connection is not meaningfully compromised.

[0125] In a third adjustable fit configuration **900-3**, the tactical vest **100** is in a second expanded configuration. Here, the wearable length of the cummerbund **904** is extended even further than in the second adjustable fit configuration **900-2**, by reconfiguring the connection of the second attachment panel **912** to the first attachment panel **910**. Specifically, the second attachment panel **912** is detached from the first attachment panel **910**, shifted **928** away from the leading edge **918** of the first attachment panel **910**, and reattached to the first attachment panel **910** in the new position to generate more slack in the cummerbund **904** when worn. Here, extension portions **926** of the second attachment panel **912** are released from engagement with the first attachment panel **910** and are passed through the one or more sliding channels **913** such that they functionally become extensions of the wearable length of the cummerbund **904** without requiring further erosion of the connecting surface area between the first attachment panel **910** and the complementary attachment mechanism **908**.

[0126] As outlined above, the second attachment panel **912** may include an attachment surface that is oriented toward that first attachment panel **910** and/or toward a panel of the tactical vest **100** and that is configured to be releasably mated with an exposed complementary attachment surface of the first attachment panel **910**. However, in various implementations, all or a portion of a surface of each of the extension portions **926** of the second attachment panel **912** that faces the first attachment panel **910** may not include such an attachment surface or attachment mechanism (e.g., hook-and-loop, male hook-and-loop, etc.).

[0127] That is, the attachment surface of the second attachment panel **912** may be chiefly and/or entirely localized to the surface of a head portion **932** of the second attachment panel **912** that faces the first attachment panel **910**. For instance, in some implementations there may be little to no hook-and-loop fastener exposed on the side of the cummerbund **904** that faces the body of the wearer throughout a large range of size adjustability. In some instances, between seventy percent and one hundred percent of the surface of the cummerbund **904** and/or the extension portions **926** that face the body may be free of hook-and-loop fastener throughout its range of size adjustments.

[0128] In some implementations, hook-and-loop fastener may not be present on any portion of the surface of the cummerbund **904** and/or the extension portions **926** that is exposed to the body of the wearer anywhere throughout its range of size adjustments. In some implementations, the hook-and-loop fastener localized to the surface of a head portion **932** may extend more than five millimeters, five millimeters, or less than five millimeters on to the surface of the extension portions **926** that faces the wearer's body and therefore only a small amount, if any at all, may be exposed to the wearers body and only when the tactical vest **100** is in a furthest expanded configuration offering a largest fit. Again, across these implementations little to no hook-and-loop fastener is exposed on the side of the cummerbund **904** that faces the body of the wearer throughout its large range of fit adjustment.

[0129] Likewise, in some instances, any area of releasable fastening mechanism on the cummerbund **904** and/or the extension portions **926** that could be and/or are exposed to the wearer's body somewhere in the range of fit adjustment may be configured to pose a reduced risk of catching, abrading, damaging, etc. underlying equipment, clothing, and/or people. This may include using a releasable fastening mechanism in these areas that operates differently, uses different materials, has different orientations, etc. than the releasable fastening mechanism on the tactical vest **100**, cummerbund **904**, head portion **932** of the second attachment panel **912**, etc. Therefore, all or a portion of a surface of each of the extension portions **926** of the second attachment panel **912** that faces the first attachment panel **910** may include an attachment surface or mechanism that is configured to pose a lower risk of catching, abrading, damaging, etc. than other attachment mechanisms used on the or mechanism localized to the surface of a head portion **932** and/or to other types of attachment surfaces or mechanisms.

[0130] In such implementations, when the no-snag/low-snag surface of each of the extension portions **926** are exposed against the clothing, equipment, skin, etc. of the wearer, the risk of abrasion or damage to the wearer's clothing, equipment, and skin may be substantially minimized and/or eliminated. These configurations may eliminate the presence of abrasive and/or snag-prone materials without jeopardizing the integrity of the attachment between the second attachment panel **912** and the first attachment

panel **910**. This arrangement may enhance the overall efficacy, adaptability, safety, and longevity of the body armor system while also avoiding the risk of abrasion or damage to the wearer's clothing, equipment, skin, etc.

[0131] FIGS. **10**A-**10**B illustrate examples of configurations **1000** of a third cummerbund adjustment mechanism **902** incorporated into a cummerbund **904**. The first configuration **1000-1** is a collapsed configuration. This configuration may be utilized with tactical vest configurations such as first adjustable fit configuration **900-1** from FIG. **9**A, second adjustable fit configuration **900-2** from FIG. **9**B, and/or a variety of other adjustable fit configurations for the tactical vest which may not require additional wearable length.

[0132] In the first configuration **1000-1**, the extension portions **926** of the second attachment panel **912** are drawn through the one or more sliding channels **913** of the first attachment panel **910** to their fullest extent overlapping the first attachment panel **910**. In this position the trailing edge **1006** of the second attachment panel **912** abuts the leading edge **1008** of the cummerbund **904**. As such, stop **930** has traversed the entire length of a slot or channel **1002** between the extension portions **926** of the second attachment panel **912**, encountered the end of the slot or channel **1002**, and now physically limits and further travel of the second attachment panel **912** in this direction. This collapsed orientation may provide a relatively shortest wearable length.

[0133] The second configuration **1000-2** is an expanded configuration. This configuration may be utilized with tactical vest configurations such as third adjustable fit configuration **900-3** from FIG. **9**C, and/or a variety of other adjustable fit configurations for the tactical vest which require additional wearable length.

[0134] In the second configuration **1000-2**, the extension portions **926** of the second attachment panel **912** are drawn through the one or more sliding channels **913** of the first attachment panel **910** to their fullest extent outside of the footprint of the first attachment panel **910**. In this position the trailing edge **1006** of the second attachment panel **912** is spaced its furthest permissible extent from the leading edge **1008** of the cummerbund **904**. As such, stop **930** has traversed the entire length of a slot or channel **1002** between the extension portions **926** of the second attachment panel **912**, encountered the beginning of the slot or channel **1002**, and now physically limits and further travel of the second attachment panel **912** in this direction. This collapsed orientation may provide a relatively longest wearable length.

[0135] From this perspective, it can be appreciated that the first attachment panel **910** is slidably interwoven with the second attachment panel **912**. Further, the first attachment panel **910** lacks a direct attachment to the cummerbund **904**, but rather relies on the second attachment panel **912** as a conduit connection to the cummerbund **904**. Further, it can be appreciated that the second attachment panel **912** is directly connected **1004** to the cummerbund **904**. Clearly, with third cummerbund adjustment mechanism **902** incorporated many other configurations are possible such as a variety of intermediate configurations where the second attachment panel **912** and the first attachment panel **910** exhibit various amounts of overlap.

[0136] As such, the third cummerbund adjustment mechanism **902** facilitates a wide range of fit adjustment for a tactical vest without jeopardizing the functionality of the cummerbund **904**, the integrity of the cummerbund **904** to tactical vest attachment, or the functionality of features of the cummerbund **904** across the range of fit adjustments. These mechanisms facilitate maximum attachment mechanism surface area and integrity by layering in extensions that do not necessarily require the user to accept less connective force between a cummerbund **904** and a tactical vest just to gain additional wearable length. Further, the third cummerbund adjustment mechanism **902** provides a superior durability and lifecycle length given that it minimizes exposure of attachment mechanisms (e.g., male hook and loop panels) that are particularly susceptible to wear and damage to the environmental and mechanical stresses that produce that wear and damage.

[0137] As outlined above, all or a portion of a surface of each of the extension portions **926** of the second attachment panel **912** that faces the first attachment panel **910** may not include an attachment surface or attachment mechanism (e.g., may not include male hook-and-loop, may be nylon or elastic strapping without hook-and-loop affixed, etc.). It may be appreciated that this configuration avoids exposed hook-and-loop on the inside (e.g., when worn) of the cummerbund **904**. As such, when worn in the second configuration **1000-2**, the extension portions **926** may not have male hook-and-loop or other attachment surfaces internally exposed toward the wearer that can abrade, damage, and irritate. This arrangement may enhance the overall efficacy, adaptability, safety, and longevity of the body armor system while also avoiding the risk of abrasion or damage to the wearer's clothing, equipment, skin, etc.

[0138] According to implementations herein, an illustrative system for tactical vest fit adjustment may comprise: a cummerbund configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; and a first attachment panel slidably interconnected to a second attachment panel attached to the cummerbund, wherein the first attachment panel is configured to releasably attach to an attachment panel on the first panel of the tactical vest, wherein the second attachment panel is configured to releasably attach to the first attachment panel, and wherein the second attachment panel is configured to provide wearable length adjustments to the cummerbund based on an amount of overlap between the first attachment panel and the second attachment panel.

[0139] In one implementation, the system for tactical vest fit adjustment wherein the first attachment panel includes a channel. In one implementation, the system wherein a portion of the second attachment panel extends from a first side of the first attachment panel, through the channel, to a second side of the first attachment panel. In one implementation, the system wherein a first side of the second attachment panel includes a complementary attachment mechanism to an attachment mechanism of the second side of the first attachment panel.

[0140] In one implementation, the system for tactical vest fit adjustment wherein a second side of the second attachment panel and the second side of the first attachment panel have a same non-complementary attachment mechanism. In one implementation, the system wherein sliding the portion of the second attachment panel through the channel toward the first side of the first attachment panel elongates a wearable length of the cummerbund. In one implementation, the system wherein sliding the portion of the second attachment panel through the channel toward the second side of the first attachment panel reduces a wearable length of the cummerbund. In one implementation, the system wherein

the cummerbund includes an attachment mechanism adapter comprising an engagement strap configured to be looped through a corresponding slot in a panel attachment mechanism and releasably captured within a locking flap attached to the cummerbund to releasably secure the panel attachment mechanism to the cummerbund.

[0141] In one implementation, the system for tactical vest fit adjustment further comprising: shoulder straps configured to have independently adjustable wearable lengths and to be releasably attachable to a face of the first panel of the tactical vest or the second panel of the tactical vest at any of a plurality of potential shoulder strap attachment positions; and a set of reference markings on the face of the first panel of the tactical vest or the second panel of the tactical vest, each reference marking of the set of reference markings indicating a respective potential shoulder strap attachment position of the plurality of potential shoulder strap attachment positions, wherein the set of reference markings is configured such that releasably attaching each of the shoulder straps to the face of the first panel of the tactical vest or the second panel of the tactical vest so that corresponding portions of the shoulder straps align with equivalent reference markings causes the shoulder straps to have an equivalent wearable length. In one implementation, the system for tactical vest fit adjustment wherein each of the shoulder straps includes a slotted channel, marked with a secondary set of reference markings that indicate a plurality of potential panel strap attachment positions that are matched to the plurality of potential shoulder strap attachment positions, through which a panel strap attached to the first panel of the tactical vest or the second panel of the tactical vest can be engaged at any of the plurality of potential panel strap attachment positions to provide an adjustment to a hanging angle of the first panel of the tactical vest or the second panel of the tactical vest.

[0142] According to implementations herein, an illustrative tactical vest fit adjustment apparatus may comprise: a cummerbund configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; a first attachment panel configured to releasably attach to an attachment panel on the first panel of the tactical vest, wherein the first attachment panel includes a set of channels therethrough; and a second attachment panel, attached to the cummerbund, wherein a portion of the second attachment panel interconnects the second attachment panel to the first attachment panel through the set of channels, and wherein a wearable length of the cummerbund is adjustable by sliding the portion of the second attachment panel through the set of channels.

[0143] In one implementation, the illustrative tactical vest fit adjustment apparatus wherein a portion of the first attachment panel located between the set of channels passes through and is configured to travel within a slot in the portion of second attachment panel. In one implementation, the illustrative tactical vest fit adjustment apparatus wherein a length of adjustment to the wearable length of the cummerbund is limited by a length of the slot in the portion of the second attachment panel. In one implementation, the illustrative tactical vest fit adjustment apparatus wherein a wearable length of the cummerbund is releasably fixed by releasably attaching a portion of the second attachment panel that is overlapping the first attachment panel to the first attachment panel.

[0144] In one implementation, the illustrative tactical vest fit adjustment apparatus wherein the second attachment panel is configured to adjust the wearable length of the cummerbund independent from an adjustment of a connection of the first attachment panel to the attachment panel on the first panel of the tactical vest. In one implementation, the illustrative tactical vest fit adjustment apparatus wherein the cummerbund includes an expandable joint housed within a sheath configured to be positioned along a wearer's side. In one implementation, the illustrative tactical vest fit adjustment apparatus wherein the cummerbund includes an attachment mechanism adapter configured to releasably capture each of a plurality of structurally distinct panel attachment mechanisms to attach the cummerbund to the first panel.

[0145] In one implementation, the illustrative tactical vest fit adjustment apparatus further comprising: the first panel including a set of panel reference markings to identify a shoulder strap attachment position among a plurality of potential shoulder strap attachment positions where a shoulder strap is releasably attached to a face of the first panel; and shoulder straps configured to couple the first panel to the second panel across shoulders of a wearer, wherein each of the shoulder straps is configured to have an independently adjustable wearable length dictated by its shoulder strap attachment position and wherein the shoulder straps are configured to have a same wearable length when the shoulder straps are releasably attached to the first panel in alignment with equivalent reference marking of the set of panel reference markings.

[0146] According to implementations herein, an illustrative tactical cummerbund adjustment apparatus may comprise: a cummerbund body configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; and a set of attachment panels configured to overlap with one another to form a releasable connection between the cummerbund body and the tactical vest, the set of attachment panels comprising: a first attachment panel including a channel dimensioned to accommodate a portion of a second attachment panel, and the second attachment panel, attached to the cummerbund body, spanning the channel and slidable within the channel to adjust a wearable length of a cummerbund.

[0147] In one implementation, the illustrative tactical cummerbund adjustment apparatus wherein a portion of the second attachment panel that is not overlapping the first attachment panel acts as an extension of the cummerbund body. In one implementation, the illustrative tactical cummerbund adjustment apparatus wherein a portion of the first attachment panel dividing the channel prevents separation of the first attachment panel from the second attachment panel. In one implementation, the illustrative tactical cummerbund adjustment apparatus further comprising an attachment mechanism adapter attached to the cummerbund body and including an engagement strap configured to be looped through a corresponding slot in a panel attachment mechanism and releasably captured within a locking flap of the attachment mechanism adapter.

[0148] The foregoing description has been directed to specific embodiments. It will be apparent, however, that other variations and modifications may be made to the described embodiments, with the attainment of some or all of their advantages. The construction and arrangement of the adjustable fit tactical vest and cummerbund as shown in the various exemplary embodiments are illustrative only.

Although only a few embodiments have been described in detail in this disclosure, many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.).

[0149] For example, the position of elements may be reversed or otherwise varied, and the nature or number of discrete elements or positions may be altered or varied. Accordingly, all such modifications are intended to be included within the scope of the present disclosure. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions and arrangement of the exemplary embodiments without departing from the scope of the present disclosure.

[0150] Accordingly, this description is to be taken only by way of example and not to otherwise limit the scope of the embodiments herein. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the embodiments herein.

What is claimed is:

1. A system for tactical vest fit adjustment comprising:

a cummerbund configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; and

a first attachment panel slidably interconnected to a second attachment panel attached to the cummerbund, wherein the first attachment panel is configured to releasably attach to an attachment panel on the first panel of the tactical vest, wherein the second attachment panel is configured to releasably attach to the first attachment panel, and wherein the second attachment panel is configured to provide wearable length adjustments to the cummerbund based on an amount of overlap between the first attachment panel and the second attachment panel.

2. The system of claim **1**, wherein a portion of the second attachment panel extends from a first side of the first attachment panel, through a channel in the first attachment panel, to a second side of the first attachment panel.

3. The system of claim **2**, wherein the first side of the first attachment panel includes a complementary attachment mechanism to an attachment mechanism of the attachment panel on the first panel of the tactical vest.

4. The system of claim **2**, wherein a first side of the second attachment panel includes a complementary attachment mechanism to an attachment mechanism of the second side of the first attachment panel and wherein a second side of the second attachment panel and the second side of the first attachment panel have a same non-complementary attachment mechanism.

5. The system of claim **2**, wherein sliding the portion of the second attachment panel through the channel toward the first side of the first attachment panel elongates a wearable length of the cummerbund and wherein sliding the portion of the second attachment panel through the channel toward the second side of the first attachment panel reduces a wearable length of the cummerbund.

6. The system of claim **1**, further comprising:

shoulder straps configured to have independently adjustable wearable lengths and to be releasably attachable to a face of the first panel of the tactical vest or the second panel of the tactical vest at any of a plurality of potential shoulder strap attachment positions; and

a set of reference markings on the face of the first panel of the tactical vest or the second panel of the tactical vest, each reference marking of the set of reference markings indicating a respective potential shoulder strap attachment position of the plurality of potential shoulder strap attachment positions, wherein the set of reference markings is configured such that releasably attaching each of the shoulder straps to the face of the first panel of the tactical vest or the second panel of the tactical vest so that corresponding portions of the shoulder straps align with equivalent reference markings causes the shoulder straps to have an equivalent wearable length.

7. The system of claim **6**, wherein each of the shoulder straps includes a slotted channel, marked with a secondary set of reference markings that indicate a plurality of potential panel strap attachment positions that are matched to the plurality of potential shoulder strap attachment positions, through which a panel strap attached to the first panel of the tactical vest or the second panel of the tactical vest can be engaged at any of the plurality of potential panel strap attachment positions to provide an adjustment to a hanging angle of the first panel of the tactical vest or the second panel of the tactical vest.

8. The system of claim **1**, wherein the cummerbund includes an attachment mechanism adapter comprising an engagement strap configured to be looped through a corresponding slot in a panel attachment mechanism and releasably captured within a locking flap attached to the cummerbund to releasably secure the panel attachment mechanism to the cummerbund.

9. A tactical vest fit adjustment apparatus comprising:

a cummerbund configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer;

a first attachment panel configured to releasably attach to an attachment panel on the first panel of the tactical vest, wherein the first attachment panel includes a set of channels therethrough; and

a second attachment panel, attached to the cummerbund, wherein a portion of the second attachment panel interconnects the second attachment panel to the first attachment panel through the set of channels, and wherein a wearable length of the cummerbund is adjustable by sliding the portion of the second attachment panel through the set of channels.

10. The tactical vest fit adjustment apparatus of claim **9**, wherein a portion of the first attachment panel located between the set of channels passes through and is configured to travel within a slot in the portion of second attachment panel, and wherein a length of adjustment to the wearable length of the cummerbund is limited by a length of the slot in the portion of the second attachment panel.

11. The tactical vest fit adjustment apparatus as in claim **10**, further comprising:

the first panel including a set of panel reference markings to identify a shoulder strap attachment position among a plurality of potential shoulder strap attachment positions where a shoulder strap is releasably attached to a face of the first panel; and

shoulder straps configured to couple the first panel to the second panel across shoulders of a wearer, wherein

each of the shoulder straps is configured to have an independently adjustable wearable length dictated by its shoulder strap attachment position and wherein the shoulder straps are configured to have a same wearable length when the shoulder straps are releasably attached to the first panel in alignment with equivalent reference marking of the set of panel reference markings.

12. The tactical vest fit adjustment apparatus as in claim **11**, further comprising a panel strap attached to an opposing face of the first panel and configured to releasably engage with a corresponding shoulder strap, wherein each of the shoulder straps includes a slotted channel configured to receive the panel strap laced through slots marked with a secondary set of reference markings that indicate their correspondence to each of the plurality of potential shoulder strap attachment positions.

13. The tactical vest fit adjustment apparatus as in claim **9**, wherein a wearable length of the cummerbund is releasably fixed by releasably attaching a portion of the second attachment panel that is overlapping the first attachment panel to the first attachment panel.

14. The tactical vest fit adjustment apparatus as in claim **9**, wherein the second attachment panel is configured to adjust the wearable length of the cummerbund independent from an adjustment of a connection of the first attachment panel to the attachment panel on the first panel of the tactical vest.

15. The tactical vest fit adjustment apparatus as in claim **9**, wherein the cummerbund includes an expandable joint housed within a sheath configured to be positioned along a wearer's side.

16. The tactical vest fit adjustment apparatus as in claim **9**, wherein the cummerbund includes an attachment mechanism adapter configured to releasably capture each of a plurality of structurally distinct panel attachment mechanisms to attach the cummerbund to the first panel.

17. A tactical cummerbund adjustment apparatus comprising:

a cummerbund body configured to span between a first panel of a tactical vest to a second panel of the tactical vest across sides of a wearer; and

a set of attachment panels configured to overlap with one another to form a releasable connection between the cummerbund body and the tactical vest, the set of attachment panels comprising:

a first attachment panel including a channel dimensioned to accommodate a portion of a second attachment panel, and

the second attachment panel, attached to the cummerbund body, spanning the channel and slidable within the channel to adjust a wearable length of a cummerbund.

18. The tactical cummerbund adjustment apparatus as in claim **17**, wherein a portion of the second attachment panel that is not overlapping the first attachment panel acts as an extension of the cummerbund body.

19. The tactical cummerbund adjustment apparatus as in claim **17**, wherein a portion of the first attachment panel dividing the channel prevents separation of the first attachment panel from the second attachment panel.

20. The tactical cummerbund adjustment apparatus as in claim **17**, further comprising an attachment mechanism adapter attached to the cummerbund body and including an engagement strap configured to be looped through a corresponding slot in a panel attachment mechanism and releasably captured within a locking flap of the attachment mechanism adapter.

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