United States Patent Application Publication	20250261714
Kind Code	A1
Publication Date	August 21, 2025
Inventor(s)	Harris; Richard H. et al.

METHOD OF ASSEMBLING A MAGNETIC SYSTEM

Abstract

A method including accessing a support strip and placing a plurality of magnetizable backing members along the support strip. The method further includes, after the first placing step, placing a magnet on or adjacent to each backing member such that each magnet is magnetically coupled to an associated backing member to thereby position each magnet on the support strip. The method also includes placing the support strip on or in a garment.

Inventors: **Harris; Richard H. (Beavercreek, OH), Cantrell; Audriana LaNell (Ezel, KY), York; Kathryn Ann (Dayton, OH), Gray; Alysha Lynn (Beavercreek, OH)**

Applicant: **LION GROUP, INC.** (Dayton, OH)

Family ID: **1000008586947**

Appl. No.: **19/202075**

Filed: **May 08, 2025**

Related U.S. Application Data

parent US division 17374194 20210713 parent-grant-document US 12336579 child US 19202075
us-provisional-application US 63051073 20200713
us-provisional-application US 63058537 20200730

Publication Classification

Int. Cl.: **A41F1/00** (20060101); **A41D31/06** (20190101); **A41H37/00** (20060101); **A44B1/18** (20060101)

U.S. Cl.:

CPC **A41F1/002** (20130101); **A41D31/06** (20190201); **A41H37/001** (20130101); **A44B1/18**

(20130101); A44D2203/00 (20130101)

Background/Summary

[0001] This application is a divisional of U.S. application Ser. No. 17/374,194 entitled Magnetic Fastener System filed on Jul. 13, 2021, which in turn claims priority to U.S. Provisional Patent Application No. 63/051,073 filed on Jul. 13, 2020, and entitled Magnetic Fastener System, and to U.S. Provisional Patent Application No. 63/058,537 filed on Jul. 30, 2020 and entitled Magnetic Fastener System. The entire contents of both of all three of these patent applications are incorporated herein by reference. [0002] This application relates to a magnetic fastener system method of assembly, and more particularly, to a magnetic fastener system method of assembly for use with protective garments.

BACKGROUND

[0003] Protective or hazardous duty garments are used in a variety of industries and settings to protect the wearer from hazardous conditions such as heat, smoke, cold, sharp objects, chemicals, liquids, fumes and the like. The protective garments often include closures to secure portions of the garment. However, existing closures may not be sufficiently easy to operate and/or sufficiently durable.

SUMMARY

[0004] In one embodiment the invention is a method including accessing a support strip and placing a plurality of magnetizable backing members along the support strip. The method further includes, after the first placing step, placing a magnet on or adjacent to each backing member such that each magnet is magnetically coupled to an associated backing member to thereby position each magnet on the support strip. The method also includes placing the support strip on or in a garment.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0005] FIG. **1** is a front perspective view of a coat, having a storm flap in a closed position;
[0006] FIG. **2** is a front perspective view of the coat of FIG. **1**, with portions of various layers cut away, and showing the storm flap in a retracted position;
[0007] FIG. **3** is a front perspective view of the coat of FIG. **2**, with the flap and body components exploded outwardly therefrom;
[0008] FIG. **4** is a side cross-section taken along line **4-4** of FIG. **3**;
[0009] FIG. **5** is a side cross-section taken along line **5-5** of FIG. **3**;
[0010] FIG. **6** is a partial front perspective front view of a flap component or body component;
[0011] FIG. **6**A is an alternate view of the flap component or body component of FIG. **6**, showing one embodiment of a visual identifier or indicia;
[0012] FIG. **6**B is a further alternate view of the flap component or body component of FIG. **6**, showing another embodiment of a visual identifier or indicia;
[0013] FIG. **6**C is a further alternate view of the flap component or body component of FIG. **6**;
[0014] FIG. **7** is a side cross-section taken along line **7-7** of FIG. **1**, with the flap component and the body component slightly spaced away from each other;
[0015] FIG. **8** shows the components of FIG. **7**, with the flap component and the body component in contact with each other;
[0016] FIG. **9** is an alternate side cross-section taken along line **4-4** and/or line **5-5** of FIG. **3**;
[0017] FIG. **10** is another alternate side cross-section taken along line **4-4** and/or line **5-5** of FIG. **3**;
[0018] FIGS. **11**A, **11**B, **11**C, **11**D, **11**E, **11**F and **11**G are a series of view showing a method for

manufacturing a flap or body component;
[0019] FIG. **12** is a front perspective view of a pair of trousers with a magnetic fastener system along the fly of the trousers;
[0020] FIG. **13** shows a coat for use in conjunction with a magnet closure supply system;
[0021] FIG. **13**A is a schematic representation of a magnet closure supply system for use with the coat of FIG. **13**;
[0022] FIG. **13**B shows the throat tab of the garment of FIG. **13** in a retracted position;
[0023] FIG. **14** is a front perspective view of a coat with a throat tab, showing the throat tab in a closed position;
[0024] FIG. **14**A is a cross section of the throat tab taken along line **14**A-**14**A of FIG. **14**;
[0025] FIG. **15** is a rear view of the coat of FIG. **14**;
[0026] FIG. **16** is a front perspective view of a coat of FIG. **14**, with an end of the throat tab folded back for illustrative purposes;
[0027] FIG. **17** is a front perspective view of the coat of FIG. **14**, with the throat tab in its retracted position;
[0028] FIG. **18** is a front view of the coat of FIG. **14**, with the throat tab in a different closed position;
[0029] FIG. **19** is a rear view of the coat of FIG. **17**;
[0030] FIG. **20** is a front perspective view of a boot and a lower portion of a pair of trousers, illustrating a trousers/boot coupling system, with the trousers spaced away from the boot;
[0031] FIG. **21** is cross section taken along line **21**-**21** of FIG. **20**; and
[0032] FIG. **22** illustrates the trousers and boot of FIG. **20**, with the boot received inside the trousers.

DETAILED DESCRIPTION

[0033] FIGS. **1** and **2** illustrate a protective or hazardous duty garment in the form of a firefighter's garment or coat, generally designated **10**. The coat **10** may include a body or body portion **12** having a left front panel or first garment portion **14**, right front panel or second garment portion **16** and a back panel **18**. The left front panel **14** and right front panel **16** may be releasably attachable by a fastener or coat fastener **20**, such as a zipper, snaps, clasps, clips, hook-and-loop fastening material (e.g., VELCRO® fastening material), magnets, combinations of these components or the like. The body portion **12** may define a torso cavity **22** that is shaped and configured to receive a wearer's torso therein. The coat **10** may include a pair of sleeves **24** coupled to and extending generally outwardly from the body portion **12** and shaped to receive a wearer's arms therein.
[0034] The coat **10** may include various layers through its thickness to provide various heat, moisture and/or abrasion resistant qualities to the coat **10** so that the coat **10** can be used as a protective, hazardous duty, and/or firefighter garment. For example, the coat **10** may include an outer shell, outer layer or outer material **26**, a moisture barrier **28** located inside of and adjacent to the outer shell **26** (e.g. positioned between the outer shell **26** and the torso cavity **22**), a thermal liner or barrier **30** located inside of and adjacent to the moisture barrier **28**, and an inner liner or face cloth **32** located inside of and adjacent to the thermal barrier **30**.
[0035] The outer shell **26** may be made of or include a variety of materials, including a flame, heat and abrasion resistant material such as a compact weave of aramid fibers and/or polybenzamidazole fibers. Commercially available aramid materials include NOMEX and KEVLAR fibers (both trademarks of E.I. DuPont de Nemours & Co., Inc. of Wilmington, Delaware), and commercially available polybenzamidazole fibers include PBI fibers (a trademark of PBI Performance Fabrics of Charlotte, North Carolina). Thus, the outer shell **26** may be an aramid material, a blend of aramid materials, a polybenzamidazole material, a blend of polybenzamidazole fibers, a blend of aramid and polybenzamidazole materials, a poly-phenylene benzobisoxazole (PBO) material, a thermostable organic polymer material, such as KERMEL material sold by Kermel SAS of Colmar, France, a blend of any of the materials listed above, or

other appropriate materials.
[0036] If desired, the outer shell **26** may be coated with a polymer, such as a durable, water repellent finish or coating (i.e. a perfluorohydrocarbon finish, such as TEFLON finish sold by E. I. Du Pont de Nemours and Company of Wilmington, Delaware, or a fluorine free water repellent finish). The materials of the outer shell **26** may have a weight of, for example, between about five and about ten oz./yd.sup.2. Moreover, if desired the outer shell **26** may have a self-decontaminating finish or coating applied thereto.
[0037] The moisture barrier **28** and thermal barrier **30** may be generally coextensive with the outer shell **26**, or spaced slightly inwardly from the outer edges of the outer shell **26** (i.e., spaced slightly inwardly from the outer ends of the sleeves **24**, the collar **34** and/or from the lower edge or hem of the coat **10**) to provide moisture and thermal protection throughout the coat **10**. The moisture barrier **28** may include a semi-permeable membrane layer **28***a* and a substrate **28***b*.
[0038] The membrane layer **28***a* may be generally water vapor permeable but generally impermeable to liquid moisture. The membrane layer **28***a* may be made of or include expanded polytetrafluoroethylene ("PTFE") such as GORE-TEX or CROSSTECH materials (both of which are trademarks of W.L. Gore & Associates, Inc. of Newark, Delaware), STEDAIR particulate barrier material sold by Stedfast, Inc. located in Quebec Canada, polyurethane-based materials, neoprene-based materials, cross-linked polymers, polyamid, or other materials. The membrane layer **28***a* may have microscopic openings that permit moisture vapor (such as water vapor) to pass therethrough, but block liquids (such as liquid water) from passing therethrough. The membrane layer **28***a* may be made of a microporous material that is either hydrophilic, hydrophobic, or somewhere in between. The membrane layer **28***a* may also be monolithic and may allow moisture vapor transmission therethrough by molecular diffusion. The membrane layer **28***a* may also be a combination of microporous and monolithic materials (known as a bicomponent moisture barrier), in which the microporous or monolithic materials are layered or intertwined.
[0039] The membrane layer **28***a* may be bonded, adhered or otherwise coupled to a substrate **28***b* of a flame and heat resistant material to provide structure and protection to the membrane layer **28***a*. Thus, either the membrane layer **28***a* alone, or the membrane layer **28***a* in combination with the moisture barrier substrate **28***b*, may be considered to constitute the moisture barrier **28**. The substrate **28***b* may be or include aramid fibers similar to the aramid fibers of the outer shell **26**, but may be thinner and lighter in weight. The substrate **28***b* may be woven, non-woven, spunlace or other materials. In the illustrated embodiment, the membrane layer **28***a* is located between the outer shell **26** and the substrate **28***b*. However, the orientation of the moisture barrier **28** may be reversed such that the substrate **28***b* is located between the outer shell **26** and the membrane layer **28***a*.
[0040] The thermal barrier **30** may be made of nearly any suitable flame resistant material that provides sufficient thermal insulation. In one embodiment, the thermal barrier **30** may include a layer of bulk material **30***a* in the form of relatively thick (i.e. between about 1/16″- 3/16″) batting, felt or needled non-woven bulk or batting material. The bulk material **30***a* can include aramid fiber batting (such as NOMEX batting), aramid needlepunch material, an aramid non-woven material, an aramid blend needlepunch material, an aramid blend batting material, an aramid blend non-woven material, foam (either open cell or closed cell), or other suitably thermally insulating materials. The bulk material **30***a* may trap air and possess sufficient loft to provide thermal resistance to the coat **10**.
[0041] The bulk material **30***a* may be quilted or otherwise coupled to a thermal barrier face cloth **30***b* which can be a weave of a lightweight aramid material. Thus, either the bulk material **30***a* alone, or the bulk material **30***a* in combination with the thermal barrier face cloth **30***b*, may be considered to constitute the thermal barrier **30**. In the illustrated embodiment, the thermal barrier bulk material **30***a* is located between the outer shell **26** and the thermal barrier face cloth **30***b*. However, the orientation of the thermal barrier **30** may be reversed such that the thermal barrier face cloth **30***b* is located between the outer shell **26** and the bulk layer **30***a*. If desired, the thermal

barrier **30** may be treated with a water-resistant or water-repellent finish. In one embodiment, the thermal barrier **30** (and/or the coat **10** as a whole) may have a thermal protection performance ("T PP"), as specified in the 1986 revision of the National Fire Protection Association ("NFPA") 1971, Protective Clothing for Structural Fire Fighting Standards, of at least about twenty, and the coat **10** as a whole may have a TPP of at least about thirty-five, although the TPP values can vary.
[0042] Although the moisture barrier **28** is shown as being located between the outer shell **26** and the thermal barrier **30**, the positions of the moisture barrier **28** and thermal barrier **30** may be reversed such that the thermal barrier **30** is located between the outer shell **26** and the moisture barrier **28**, or additional moisture barrier **28** and/or thermal barrier layers **30** can be utilized or various other orientations or configurations may be used.
[0043] The face cloth **32** may be the innermost layer of the coat **10**, located inside the thermal barrier **30** and moisture barrier **28**. The face cloth **32** can be made of, for example, chambray fabric and provide a comfortable surface for the wearer and protect the thermal barrier **30** and/or moisture barrier **28** from abrasion and wear. The face cloth **32** may be quilted to the adjacent layer (i.e. the thermal barrier **30** in the illustrated embodiment). However, the face cloth **32** is optional and may be excluded if desired. In addition, the coat **10** may not necessarily include the moisture barrier **28** and/or the thermal barrier **30** in certain cases.
[0044] Each layer of the coat **10** disclosed herein, including the layers and components described above, as well as those described below, and the coat 10 as a whole and other garments disclosed herein, may meet the National Fire Protection Association ("NFPA") 1971 standards for protective firefighting garments ("Protective Clothing for Structural Firefighting"), which standards as of the filing date of this application are entirely incorporated by reference herein. The NFPA standards specify various minimum requirements for heat and flame resistance and tear strength. For example, in order to meet the NFPA standards, the outer shell **26**, moisture barrier **28**, thermal barrier **30** and face cloth **32** must be able to resist igniting, burning, melting, dripping, separation, and/or shrinking more than 10% in any direction after being exposed to a temperature of 500° F. for at least five minutes. Furthermore, in order to meet the NFPA standards, the combined layers of the coat **10** must provide a TPP rating of at least thirty-five.
[0045] Alternately or in addition to the NFPA Standard 1971, the coat **10** and other garments disclosed herein may meet standards of other countries or regions, including the European Norm ("EN") standards for firefighting garments set by the European Committee for Standardization (also known as Comité Européen de Normalisation ("CEN")). These standards include EN 469:2005 Level 1 and Level 2 certification. The EN standards for firefighter and protective garments in place as of the filing date of this application are entirely incorporated by reference herein.
[0046] As shown in FIGS. **1-3**, the coat **10** may include a storm flap or covering flap **36** that is configured to selectively cover and protect the fastener **20**. The storm flap **36** can in one case be made of or include the same materials described above for the material of the outer shell **26**. In one case the storm flap **36** is made of two plies of the material of the outer shell **26** that are secured together such that an abrasion-resistant outer surface of the outer shell **26** faces outwardly on both sides of the storm flap **36**, and a storm flap cavity **38** is positioned therein.
[0047] The storm flap **36** can extend generally the entire length/height of the coat **10**/fastener **20** and be pivotable about an axis extending along its length between a closed/covering position (FIG. **1**) wherein the storm flap **36** generally covers, overlies and/or is positioned over the fastener **20**, and an open/retracted position (FIG. **2**) wherein the storm flap **36** is spaced away from, and generally does not cover or overlie, or is not positioned over, the fastener **20**. The storm flap **36** can be permanently coupled to one of the panels **14**, **16** (such as by stitching in one case), and releasably coupled to the other one of the panels **14**, **16** when in the covering position. The storm flap **36** may be pivotable when moving between the covering and retracted positions.
[0048] The coat **10** may include a magnetic fastener system **40** which can be used to secure the

storm flap **36** in the closed/covering position, and extends parallel to and adjacent to the fastener **20**. The magnetic fastener system **40** of FIGS. **1-11** can include a first or flap component/device **42** which is coupled to (in one case, inserted in) the storm flap **36**, and a second or body component/device **44** which is coupled to (in one case, inserted in) the body or fixed portion of the coat **10**, adjacent to the fastener **20**. The flap component **42** and body component **44** (or portions thereof) are magnetically attracted to each other, particularly when the storm flap **36** is in the closed position, to magnetically couple and retain the storm flap **36** in the closed position. Additionally or alternatively, the flap component **42** and body **12**/right front panel **16** (or portions thereof or other components) can be magnetically attracted to each other when the storm flap **36** is in the open position, to magnetically couple and retain the storm flap **36** in the open position, as will be described in greater detail below.

[0049] As shown in FIGS. **3-5**, the flap component **42** and body component **44** can each include a backing or support strip **46** of generally flexible material, a plurality of spaced-apart magnets **48** coupled to or forming part of the support strip **46** or supported thereby, and a plurality of backing members or strike plates **50** positioned between at least part of the support strip **46** and the magnets **48**. The support strip **46** can be made of a relatively thin, pliable aramid and fire-resistant and flame-resistant material that is manually bendable such as, in one case, a woven material, a knit material, a non-woven material, a pressure-sensitive tape with a cloth or mesh backing such as duct tape, or the like. The support strip **46** provides a supporting material upon which the magnets **48**/backing members **50** can be positioned, and in one case the support strip **46** extends continuously the entire length of the associated component **42**, **44**.

[0050] In the illustrated embodiment, each support strip **46** includes an inner ply **46***a* and an outer ply **46***b*, with the magnets **48** and backing members **50** positioned between the two plies **46***a*, **46***b*. The plies **46***a*, **46***b* can, in one case, be entirely separate pieces of material, or in another case (as shown in FIG. **6**) both plies **46***a*, **46***b* are formed from a single piece of material, folded about itself along a longitudinal fold or crease line **51**. Further alternately, each support strip **46** can be made of only a single ply **46***a* or **46***b*.

[0051] The plies **46***a*, **46***b* can be made of the same or different materials, and in one case are made of a fire resistant textile or fabric, such as aramid, para-aramid or fire resistant cotton material, an E-88 material such as a spunlace flame-resistant meta-aramid material or fabric such as NOMEX material or KEVLAR material. In one embodiment, the flap component **42** and body component **44** and/or the associated support strips **46**, at least after assembly, are generally water tight such that the magnets **48** and/or backing members **50** positioned therein are generally or completely fluidly sealed from each other and/or the surrounding environment to protect the magnets **48** and backing members **50** and/or first magnet coupling components **49** and/or second magnetic coupling components **53** (as defined below) from moisture, corrosive chemicals, oxygen or the like. In one case, as will be described in greater detail below, the two plies **46***a*, **46***b* can be coupled to each other in a facial bond, such as by sonic welding or the like, to form a waterproof seal.

[0052] Each of the magnets **48** is, in the illustrated embodiment, generally flat and circular in front view, taking the form of “button” magnets, with their poles oriented perpendicular to the flat end surfaces. In one case the magnets **48** are “solid” and continuous magnets that lack any hole or opening formed therethrough, particularly any center hole/opening and/or any hole/opening through a center thereof. Such a magnet **48** provides ease of construction/assembly, and results in a magnet **48** which is stronger, more robust, and has a better magnetic response such that it is more magnetically attracted to the other magnet(s) **48** and/or backing plates **50**. However, the magnets **48** can have any wide variety of shapes and configurations. In one embodiment the magnets **48** are each generally flat and have a relatively small thickness, such as less than about one-half in one case, or less than about one-quarter in another case, of the longest dimension (such as length or diameter) of the magnet **48**.

[0053] The magnets **48** may in one case have a pull force (either magnet-to-magnet or magnet-to-

magnetizable plate) of between about 10 lbs. and about 20 lbs. at a distance of 0 inches, and between about 0.5 lbs. and about 5 lbs. at a distance of 0.2 inches. In one case, the pull force provided by the magnets **48** is selected to be similar to the pull force required to open typical hook-and-loop fasteners used in firefighter turnout gear. The magnets **48** can be permanent magnets made of various materials, and in one case are rare earth magnets, such as neodymium magnets (in one case N 48 magnets or 48 M GO megagauss oersteds magnets) with a nickel or other corrosion resistant coating (shown as layer **39** in FIG. **11**G). A given component **42**, **44** may have all of its magnets **48** arranged in the same polarity (e.g. with their poles facing the same direction) or the magnets **48** can be arranged to have varying polarity, such as an alternating polarity in one case.
[0054] As noted above, the flap component **42** and/or body component **44** can also include the plurality of backing members **50**, each of which is located between a magnet **48** and at least one ply **46***a*, **46***b* of the support strip **46**. Each backing member **50** can be made of a material which is non-magnetic but magnetizable, such as ferrous metals, including steel with a nickel or other corrosion resistant coating (see layer **39** in FIG. **11**G), or the like. Each backing member **50** can have a size and shape (in front view) that generally corresponds to a size and shape of the corresponding magnet **48**. For example, when the magnets **48** are generally circular in front view, each of the backing members **50** can also be circular in front view and have the same or approximately the same radius. Each backing member **50** may have a radius and/or surface area in front view that is within about +/−10 percent of the radius/surface area of the associated magnet **48**. In one case each backing member **50** is generally flat, and lacks any holes/openings and lacks any raised lip about a perimeter thereof (or elsewhere/anywhere) and thus is not a cup, and/or lacks any axially-extending pin or protrusion, such as a pin or protrusion located at a center thereof. Providing a generally flat backing member **50** provides ease of construction/assembly, reduces catch points, and results in a backing member **50** which is stronger, more robust, and has a better magnetic response such that it is more magnetically attracted to the associated magnet **48**.
[0055] Each backing member **50** can have a thickness that is less than a thickness of the magnets **48** since in some cases the thinner material may be sufficient to provide the desired functionality (described below) of the backing member **50**. In one case each backing member **50** has thickness that is less than about one half, or less than about one third in another case, of the thickness of the associated magnet **48**.
[0056] The magnets **48**/backing members **50** are, in one case, discrete, spaced-apart components that are regularly spaced along the entire length of the support strip **46** and have a spacing therebetween of at least about ½ inch in one case, or at least about one inch in another case, and less than about six inches in another case. This spacing can provide sufficient magnetic connections without causing undue efforts by the wearer in making and breaking magnetic connections, and while providing sufficiently low weight.
[0057] As noted above, additionally or alternatively, the flap component **42** and body **12**/right front panel **16** (or portions thereof) can be magnetically attracted to each other when the storm flap **36** is in the open/retracted position, to magnetically couple and retain the storm flap **36** in the open position. In this case, as shown in FIG. **1**, a magnet component **43** (which can be a magnet **48** and/or strike plate **50**; and can be considered part of the magnetic fastener system **40** in one case; and/or can be considered a third magnetic coupling component) can be positioned on the panel **16** to magnetically interact with the flap component **42** and magnetically retain the flap component **42** in the open position. Although only a single magnet component **43** is shown, more than one magnet component **43**, such as a line of magnet components **43** extending parallel to the storm flap **36**, may be used.
[0058] The backing members **50** can aid in securing the magnets **48** to the support strip **46** during manufacture/assembly of the components **42**, **44**. In particular, the handling and placement of magnets **48** can in some cases be challenging since machines and equipment typically are made of or include metal or other magnetizable materials, which can cause the magnets **48** to move and/or

stick to the machines or equipment during assembly. This can, in turn, make it difficult to precisely locate the magnets **48** on the support strip **46**.

[0059] Since the backing members **50** can be made of a non-magnetic material, it is relatively simple and straightforward during manufacturing/assembly to supply a support strip **46** (FIG. **11**A) and locate the backing members **50** at the desired positions on the support strip **46** (FIG. **11**B). For example, in one case each backing member **50** can be simply adhered to the desired location on one ply **46***a*, **46***b* of the support strip **46**. Each magnet **48** can then be simply dropped in place on the backing member **50** (FIG. **11**C). The other ply **46***a*, **46***b* can then be placed in position and/or folded in place on top of the magnets **48** and backing members **50** (folding about fold line **51** as shown by the arrow of FIG. **11***c*). Next stitching **52**, if implemented, can be applied (FIG. **11**D). Due to the magnetic attraction and the generally corresponding size/shape, each magnet **48** can be easily aligned with the associated backing member **50** to thereby properly align and couple each magnet **48** to the support strip **46**. If desired an adhesive **47** (see FIG. **11**G) can be positioned between the backing member **50** and magnet **48** to secure those components together.

[0060] During use of the coat **10**, the backing members **50** may provide protective/shunting effects to reduce certain undesirable effects of the magnets **48**. In particular, by shunting the magnetic field of the magnets **48**, the backing members **50** reduce the ability of the magnets **48** of components **42** and **44** to attract loose, magnetizable items such as tools, metal portions of the wearer's other garments, etc. In addition, the backing members **50** of the body component **44** shunt or reduce inwardly-facing magnetic field of the magnet **48** to reduce any potential magnetic interference with any medical devices on or in the wearer's body, while the outwardly-facing magnetic field of the magnets **48** of body component **44**, which is utilized for closure/attraction, is not effected. However, as will be described in greater detail below it should be understood that the backing members **50** are optional, and when the backing members **50** are not utilized the magnets **48** can be directly coupled to/retained in the associated support strip **46** (e.g. in one case, positioned in contact with both plies of the support strip **46**) and/or backing members can be used in place of the magnets **48** on one of the components **42**, **44**.

[0061] After or while the magnets **48** (and backing members **50**, if utilized) are placed on the associated support strip **46**, the magnets **48** and backing members **50** can be secured in place. In one embodiment, when both magnet **48** and backing members **50** are used on a single component **42**, **44** only the backing members **50** (and not the magnets **48**) are secured to the support strip **46**, such as by adhesives. Such adhesive can be applied during manufacturing/assembly, or may be pre-existing on the support strip **46**, such as when the strip **46** includes or takes the form of pressure-sensitive adhesive tape. When the backing members **50** are directly secured to the strips **46**, such as by an adhesive, due to the magnetic attraction between the magnets **48** and the backing members **50**, it may not be required to separately secure each magnet **48** directly to the support strip **46**.

[0062] However, the magnets **48** and/or backing members **50** can be secured in place by a variety of methods. For example, as shown in FIGS. **4**-**11**, in one case stitching **52** is positioned around/adjacent to each magnet **48**/backing member **50** to essentially lock each magnet **48**/backing member **50** in place and limit the motion/travel thereof. The stitching **52** can extend around any free edges of the support strip **46** (e.g. any edges of the support strip **46** that are not formed by the fold **51**) and for example extend across a lateral width of the support strip **46** and through the thickness of the support strip **46**, and also extend longitudinally to form a closed, or generally closed perimeter around each magnet **48**/backing member **50**. However, various other methods, mechanisms and means can be utilized to secure the magnets **48**/backing members **50** to the support strips **46**. For example, in place of or in addition to the stitching **52**, the plies **46***a*, **46***b* of the support strip **46** can be made of or include sonically bondable materials with a sonic bonding layer **69** positioned therebetween as shown in FIG. **11**G. In this case the plies **46***a*, **46***b* can be sonically bonded together about their facing surfaces to trap the magnets **48** and/or backing members **50** in place and form a strong and waterproof/water-resistant bond.

[0063] As shown in FIG. **11**E, in one case a tube or tubular member **55** can be provided, into which the support strip **46**, with magnets **48**/backing members **50** is inserted. The tube **55** can in one case be permanently coupled to the coat **10**, and positioned in the storm flap cavity **38**, at the time the support strip **46** is inserted into the tube **55**. Alternatively, the support strip **46** is inserted into the tube **55**, and the tube **55**/support strip **46** are then together inserted into storm flap cavity **38** and then coupled to the coat **10**.

[0064] The tube **55** can have two plies **55***a* and **55***b*, and be made of a variety of materials. In one embodiment the inner ply **55***a* (located closer to a wearer of the garment **10** in one case) is made of an outer material or fabric **57** such as an E-88 material such as a spunlace flame-resistant meta-aramid material or fabric such as NOMEX material, and an inner layer **59** such as a foam, and more particularly a closed cell foam to providing cushioning and protection to the support strip **46** and magnets **48**/backing members **50**. The outer ply **55***b* of the tube **55** (located more distant from a wearer of the garment **10**) can in one case be made of a para-aramid material. In one case, the outer ply **55***b* is made of a relatively thin material (thinner than inner ply **55***a*, in one case due to the foam layer **59**). Making the outer ply **55***b* of relatively thin material reduces the distance between the magnets **48**/backing members **50** of the support strip **46**, relative to the other support strip **46**, to provide increased magnetic response and attraction. Alternatively both plies **55***a*, **55***b* of the tube **55** can be made of the same material, including any of the materials outlined above for any layer or ply **55***a*, **55***b* of the tube **55**, and combinations thereof.

[0065] The magnets **48** of the flap component **42** can be arranged such that their poles are opposite to the poles of the magnets **48** of the body component **44**, when the flap component **42** and body component **44** are stacked on top of/positioned adjacent to each other in a thickness direction, as shown in FIGS. **1**, **7** and **8**. Thus, when the storm flap **36** is moved from its retracted position (FIG. **2**) to the engaged position (FIGS. **1** and **8**) the magnets **48**/backing members **50** of the flap component **42** magnetically interact with the magnets **48**/backing members **50** of the body component **44** to magnetically couple the components **42**, **44** thereby retaining the storm flap **36** in its closed position. Also, the magnets **48**/backing members **50** of the flap component **42** can magnetically interact with the magnets **48**/backing members **50** of the body component **44** to magnetically couple the components **42**, **44** thereby retaining the storm flap **36** in its open position. For the sake of clarity, it is noted that the magnetic coupling component **53** on the body **12** positioned to hold the storm flap **36** closed can take the form of a magnetizable material such as backing members **50**, and/or can take the form of magnets **48** as a magnetic coupling component **53**.

[0066] The magnets **48**/backing members **50** of the flap component **42** can generally have a spacing that corresponds to a spacing of the magnets **48**/backing members **50** of the body component **44**. In one case, the geometric centers of the magnets **48**/backing members **50** of one component **42**, **44** are generally aligned with the geometric centers of the magnets **48**/backing members **50** of the other component **42**, **44** (such as when the storm flap **36** is in the closed or covering position). In another case each magnet **48**/backing member **50** of one components **42**, **44** can at least partially overlap with a corresponding magnet **48**/backing member **50** of the other component **42**, **44**, in a direction perpendicular to the thickness of the coat **10**, such as when the storm flap **36** is in the closed position.

[0067] In an alternate embodiment, as noted above and shown in FIG. **9**, one or both of the flap component **42** or body component **44** may lack the backing member **50**, and the component **42**, **44** includes only the magnets **48** directly coupled to the associated support strip **46** by adhesives, stitching, or other mechanisms as described above. In yet another alternate embodiment, as shown in FIG. **10** one or the other of the flap component **42** or body component **44** can utilize, instead of magnets **48**, a magnetizable or metal material, or magnetizable body, such as in one case the backing member **50**. The magnetizable body in this case can have generally the same qualities and configuration as the backing members **50** outlined above, or can have different qualities such as

differing size, shape, thickness, etc., but in any case may be of a magnetizable material that is not a permanent magnetic material, which can be magnetically attracted to the magnet **48** and/or magnet **48**/backing member **50** of the other component **42**, **44**.

[0068] In the embodiment of FIGS. **4**-**8**, when magnets **48** and backing members **50** are used, the magnets **48** (or the magnets **48** along with the associated backing members **50**) of the flap component **42** can be termed first or flap magnetic coupling components **49**, and the magnets **48** (or the magnets **48** along with the associated backing members **50**) of the body component **44** can be termed second or body magnetic coupling components **53**. When the embodiment of FIG. **9** is utilized, the magnet **48** can be termed a first or flap magnetic coupling component **49**, or a second or body magnetic coupling component **53**, depending upon the location of the magnet **48** of FIG. **9** on either the flap component **42** or body component **44** of the coat **10**. When the embodiment of FIG. **10** is utilized, the magnetizable body/backing members **50** can also be termed a first or flap magnetic coupling component **49**, or a second or body magnetic coupling component **53**, depending upon the location of the component **50** of FIG. **10** on either the flap component **42** or body component **44** of the coat **10**. It should be understood that when the embodiment of FIG. **10** is utilized, it can be utilized in either the flap component **42** or the body component **44**, but the other one of the flap component **42** or body component **44** would include a magnet **48** (either with or without a backing member **50**).

[0069] When the magnetic coupling components **49**, **53** of both the flap component **42** and the body component **44** take the form of magnets **48**, or more particularly magnets **48** with a backing member **50** as shown in FIG. **8**, flap component **42** and body component **44** provide the benefit of being self-aligning. In particular, when the magnets **48** are brought together, they will be attracted to each other via their polarities such that the magnets **48** are concentrically aligned to ensure that the storm flap **36** is not only closed, but also positioned in the proper configuration. In contrast, when one of the flap component **42** or body component **44** takes the form of the embodiment of FIG. **10** (e.g. when one set of magnetic coupling components **49**, **53** are not magnets), the storm flap **36** will be securely retained in its closed position, but will not necessarily be self-aligning. However, assembly and manufacture of the embodiment of FIG. **10** may be easier and more inexpensive since magnets **48** are not included in one of the components **42**, **44**.

[0070] The flap component **42** and body component **44** can each be relatively long, linear strips having a length significantly greater than their width. For example, each of the flap component **42** and body component **44** can be generally flat and elongated, and have a length at least about five times the width thereof in one case, or at least about ten times greater than the width thereof in another case. As shown in FIG. **3**, each flap component **42** and body component **44** (along with the tube **55**, if utilized) can be received within a pocket, slot or the like (such as the cavity **38** of the storm flap **36** and body **12** of the coat **10**) in the associated garment portions and if desired secured therein by loops similar to belt loops, or snaps, hook-and-loop fastening material, or other fastening systems. Thus, the flap component **42** and body component **44** may be removably coupled to the coat **10** for ease of manufacture, repair, cleaning of the coat **10**, etc.

[0071] As noted above, the magnetic fastener system **40** can in one case be utilized to secure the storm flap **36** in its closed position (shown as magnetic fastening system **40***a* in FIGS. **13** and **13**A). As also mentioned above, the magnetic fastening system **40** can also or instead be utilized to secure the storm flap **36** in the open position, which corresponding changes to the positioning of the body component **44** (e.g. the body component **44** can be positioned below the storm flap **36**, when the storm flap **36** is in its open or retracted position shown in FIG. **2**). Moreover, the magnetic fastener system **40** can additionally, or instead, be used to secure various other portions of the coat **10**, such as securing pocket flaps **58** in the closed position (FIG. **13**) (shown as magnetic fastening systems **40***b*, **40***c* in FIGS. **13** and **13**A), securing a throat tab or movable collar **62** (FIGS. **13** and **13**B, shown as magnetic fastening system **40***d* in FIG. **13**A, and also shown in FIGS. **14**-**19**), securing the fly **54** of a pair of trousers **56** (shown as magnetic fastening system **40***e* in FIG. **12**), etc. where

the associated components are received in cavities of the garment **10**, **56** in the appropriate position. In the embodiment of FIG. **12**, the trousers **56** may include a traditional mechanical fastener, such as a zipper, hook-and-loop fastener, or other components described above for the fastener **20**, and the fly **54** is a protective cover or covering flap positionable over the traditional fastener in the same manner that the storm flap **36** covers the fastener **20**.

[0072] In the embodiment of FIGS. **13**, **13**A and **13**B, and as outlined above, the magnetic fastening system **40***d* for securing the throat tab or movable collar **62** can have a magnet **48** on the movable throat tab **62**, and two magnets **48** of an opposite polarity on the body **12** of the coat **10**. This enables the throat tab **62** to be coupled to the body **12** to a left one (relative to a wearer) of the magnets **48** to provide a relatively tight fit for the throat tab **62**, or be coupled to the right one of the magnets **48** to provide a relatively loose fit. Although two magnets **48** are shown, if desired the body **12** of the coat **10** can include only one magnet **48** or more than two magnets **48**; and in addition or alternatively the throat tab **62** can have two or more magnet **48**. In addition it should be understood that instead of magnets **48**, the throat tab **62** and/or body **12** of the coat **10** can utilize a strike plate **50** and/or a strike plate **50** in combination with a magnet **48** (e.g. first, second and third magnetic coupling components) to provide magnetic attraction as outlined above, and plies **46***a*, **46***b* etc. as used in conjunction with the strips **46** as outlined above.

[0073] Moreover, the magnetic fastener system **40** can be used in any of a wide variety of garments beyond protective and fire fighter garments and indeed used in any of a wide variety of applications, systems or methods. For example, FIG. **12** illustrates a pair of trousers **56** that may be able to be used in conjunction with or separately from the coat **10**. The trousers **56** can be made of the same materials and layers, and in the various configurations with the same qualities as the coat **10** outlined above. The magnetic fastener system **40***e* can be utilized in connection with the fly **54** of the trousers **56** wherein the fly **54** is closed in the same or similar manner as the storm flap **36** described above.

[0074] The magnetic fastener system **40** can provide a durable, robust and protectable fastener system which retains its strength over time, including after repeated exposure to heat, laundering, etc. In addition, operation of the magnetic fastener system **40** is relatively easy. In order to separate or open the magnetic fastener system **40**, the movable/pivotable component (flap **42**) and the fixed component (body **44**) need only be manually pulled apart, and the wearer is not required to identify any particular tabs or release mechanisms, or start fastening or unfastening at a particular location, as is required for use with zipper systems or the like. The magnetic fastener system **40** can be coupled or closed simply by pivoting the movable/pivotable component in place on or over the body portion. In addition, the magnetic fastener system **40** can be operated without fine motor skills, which can provide ease of use to a wearer who is wearing gloves, or when time is limited.

[0075] A garment, such as a coat **10** and/or trousers **56**, can include multiple magnetic fastener systems **40** utilized therein. For example, as outlined above and shown in FIGS. **13**, **13**A and **13**B, the coat **10** can include a first magnetic fastening system **40***a* for securing the storm flap **36**, second **40***b* and third **40***c* magnetic fastening systems for securing pocket flaps **58**, a fourth magnetic fastening system **40***d* for securing the throat tab **60**, etc. Accordingly, in order to provide ease of manufacturing a single garment, a first continuous support strip or supply strip **46**′, which can provide magnets **48** and/or backing members **50** and/or magnetizable members (collectively, magnetic coupling components **49**, **53**), can be supplied and provides sufficient number of a first type of the magnetic coupling components **49**, **53** for inclusion in an entire coat **10**/garment during assembly/manufacturing. Similarly, a second support strip or supply strip **46**″ can be provided with a corresponding number of a second type of magnetic coupling components **49**, **53**.

[0076] As shown in FIGS. **13** and **13**A, the first strip **46**′ includes, in that particular illustrated embodiment, a plurality of equally spaced magnetic coupling components **49**, **53** in the form of magnets **48** for a total of thirteen magnetic coupling components **49**, **53**. In the illustrated embodiment eight of those magnets **48**/magnetic coupling components **49**, **53** are allocated

for/incorporated into the storm flap **36**, two of the magnets **48**/magnetic coupling components **49**, **53** are incorporated into a flap **58** of a first pocket, two magnets **48**/magnetic coupling components **49**, **53** are incorporated into a flap **58** of a second pocket, and one magnet **48**/magnetic coupling component **49**, **53** is incorporated into the throat tab **62**. The second strip **46**″ can include an equal number of magnetic coupling components **49**, **53** (also shown as magnets **48** in the illustrated embodiment) as those included in the first strip **46**′ for use in the same manner. It should be understood that the magnetic coupling components **49**, **53** of the strips **46**′, **46**″ of FIG. **13**A can be allocated in any desired manner, and the specific allocation shown in FIG. **13**A is for illustrative purposes only.

[0077] If desired, each of the strips **46**′, **46**″ can include color coding, a visual identifier or printed indicia (collectively termed "indicia" herein) or the like **77** to illustrate the polarity and/or use thereof (e.g. to indicate which component should be installed in the movable part versus the fixed/body **12** of the garment **10** and/or which side should face in which direction). For example, a segment or strip of color indicia **77** (see FIG. **6**B), such as the color gold, can be positioned on one side of strip **46**′, **46**″ to mark or indicate a surface of the magnet **48** having a south pole, and a segment or strip of indicia **77** of another color (such as the color silver) can be positioned on the other side of strip **46**′, **46**″ or another strip, to mark or indicate a surface of magnets **48** having a north pole.

[0078] In the embodiment of FIG. **6**A, the indicia **77** takes the form of a circular area positioned on each magnet **48** or magnetic coupling component **49**/**53**. In this case the positioning of the indicia **77** also helps the manufacturer to visually identify the magnets **48** or magnet orientation. In the embodiment of FIG. **6**B, the indicia **77** takes the form of a stripe passing over the underlying magnets **48** or magnetic coupling component **49**/**53**. The strips **46**′, **46**″/magnetic coupling components **49**, **53** can thus if desired be differentiated from each other by the indicia **77** that is unique to the strips **46**′/**46**″ and/or the first **49** and second **53** magnetic coupling components. The indicia **77** can be integrated into the support strips **46**, or separate from the support strip **46**. The indicia **77** can also be used to indicate the polarity of the associated magnetic coupling components **49**/**53**, ensuring the first magnetic coupling components **49** are paired with a magnetically attracted (once installed) second magnetic coupling component **53**. The indicia **77** can prevent pairing a magnetic coupling component **49**/**53** with a magnetically repulsing (once installed) magnetic coupling component **49**/**53**.

[0079] FIG. **6**C illustrates a further embodiment in which the plies **46***a*, **46***b* are made of separate pieces of material, which can be joined together. In addition, rather than having a separate circular area of indicia **77** as shown in FIG. **6**A or a stripe of indicia **77** as shown in FIG. **6**B, the entire upper surface of the inner ply **46***a* can have a colored surface to provide visual guidance to a manufacturer/assembler.

[0080] In order to utilize the strips **46**′, **46**″, the garment assembler receive the strips **46**′, **46**″, each as a continuous strip, for example in one case from a manufacturer or supplier of magnetic components. The garment assembler can simply cut or separate the strips **46**′, **46**″ at the desired locations to provide the number of desired magnetic coupling components **49**, **53**, and the resultant, smaller shorter strip can then be sewn or secured into the garment at the appropriate location and manner. For example, first smaller strips of the first **46**′ and second **46***b*″ strips can be used as the flap component **42** and body component **44**, second or supplemental smaller strips of the first **46**′ and second **46**″ strips can be used as part of a pocket closure system **40***b*, **40***c*, etc. Thus the strips **46**′, **46**″ can provide a convenient system for incorporating the magnetic coupling components **49**, **53** in a garment which can be easily implemented during garment manufacture, and can provide a predetermined number of magnetic coupling components **49**, **53** for the entire garment.

[0081] With reference to FIGS. **14-19**, the protective coat **10** can include a throat tab **62** coupled to or forming a part of the coat **10**. The throat tab **62** is movable/pivotable between a closed position (FIGS. **14**, **15** and **18**) wherein the throat tab **62** generally covers the front of the collar **64** of the

coat **10** or the throat of a wearer and does not wrap around the back of the collar **64**, and an open or retracted position (FIGS. **17** and **19**) where the throat tab **62** is moved away from the collar **64**/throat of a wearer, and generally does not cover the front of the collar **64**/throat of the wearer. Moreover, when in the open or retracted position, the throat tab **62** is not necessarily retracted into the collar **64**, but instead can at least partially wrap around the side and/or back of the neck/collar **64** of the coat **10**, and more particularly wrap around and conform to the back of the neck/collar **64** of the coat **10**, to be retained out of the way.

[0082] The throat tab **62** spans/extends across the fastener **20** when the throat tab **62** is in the closed position, and does not extend across the fastener **20** when the throat tab **62** is in the retracted position. The throat tab **62** may span, and cover, a gap **63** (FIG. **17**) between the collar portions **65** of the coat **10** when the throat tab **62** is closed to provide protection. In addition, the throat tab **62** may have a vertical height, or dimension extending along a height of the coat **10**, that is greater than all, or at least portions, of the collar portions **65**, when the throat tab **62** is in its closed position to provide increased protection when the throat tab **62** is closed. Alternatively an upper portion/edge of the throat tab **62** is positioned above an upper portion/edge of the collar portions **65**, when the throat tab **62** is closed, to provide increased protection.

[0083] The coat **10** can include a throat tab closure system **61** including a first “mechanical” or non-magnetic fastener system **66** to retain the throat tab **62** in the closed position. The mechanical fastening system **66** may in one case lack any magnetic parts in one case, and/or lack any magnetic or magnetizable parts, components or materials (such as metal, or at least sufficient metal to be magnetized and act as a fastener/closure) in another case. In particular, in the illustrated embodiment the first fastener system **66** includes a first portion **68**, or portion of hook material **68**, positioned on and near a distal end of the throat tab **62**, and a second portion **70**, or portion of loop material **70**, positioned on the body **12** of the coat **10** or on the collar **64**. The first or hook **68** and second or loop **70** portions can cooperate, when pressed together, to secure and retain the throat tab **62** in the closed position. Of course, if desired, the positions of the hook and loop material can be reversed such that the loop material is positioned on the throat tab **62** as the first portion **68**, and the hook material is positioned on the body **12**/collar **64** as the second portion **70**. Moreover, it should be understood that various fasteners can be used as the non-magnetic fastener system **66** in place of the hook-and-loop fastening systems such as in one case other mechanical fasteners including snaps, loops, clasps, ties, buttons or the like.

[0084] The first **68** and/or second **70** portions can be relatively elongated to provide increased flexibility/adjustability in the operation of the throat tab closure system **61**. In particular, in the embodiment shown in FIGS. **14-19**, the second portion **70**, located on the body **12**/collar **64**, is relatively elongated in the length or lateral direction (left-to-right in FIGS. **14-19**). This enables the first portion **68** to be coupled to a left side (relative to a wearer) of the second portion **70**, as shown in FIG. **14**, to provide a relatively tight fit for the throat tab **62**, or be coupled to the right side of the second portion **70** as shown in FIG. **18**, to provide a relatively loose fit. The first **68** and/or second portions **70** can be elongated and have a length that is about 1.5 times in one case, or at least 2 times in another case, of the height of that portion **68**, **70**. Further alternatively, the first **68** and/or second **70** portion can extend in the transverse direction at least 2 inches in one case, or at least 3 inches in another case, or at least 4 inches in yet another case.

[0085] The coat **10** can include a second or magnetic fastener system **72** which can retain the throat tab **62** in the retracted position. In particular, in one case the throat tab **62** includes a first or throat magnetic coupling component **74** including a magnet and/or magnetizable portion. The throat magnetic coupling component **74** can take the form of a magnet, such as magnet **48** in combination with the backing plate **50** (see FIG. **14**A), or the magnet **48** and/or backing plate **50** positioned in the support strip **46** in the same manner as the magnet systems described above or the backing plate **50** alone. The backing plate **50**, if utilized, can be located on either an inner side of the magnet **48** when the throat tab **62** is in its closed position, or on an outer side of the magnet **48**. In one case the

throat magnetic coupling component **74** is positioned at or adjacent to a distal end of the throat tab **62** (in one case adjacent to the first portion **68** of the first fastener system **66** on the throat tab **62**). The body **12**/collar **64** of the coat **10**, and more particularly at the back of the collar/neck portion, can include a second or body magnetic coupling component **76** in the form of a magnet and/or magnetizable portion, positioned inside the body **12**/collar **64**.

[0086] The throat **74** and body **76** magnetic coupling components can magnetically interact, when the throat tab **62** is in the retracted position, to retain the throat tab **62** in the retracted position. For the sake of clarity, it is noted that the throat magnetic coupling component **74** can take the form of a magnet and the body magnetic coupling component **76** can take the form of a magnetizable material, or vice versa, or both the throat **74** and body **76** magnetic coupling components can take the form of magnets **48**. Moreover, if desired, the backing member **50** as described above can be utilized in conjunction with any magnets **48** utilized as the throat **74** and/or body **76** magnetic coupling component, but if desired the backing members **50** can be omitted. The magnetic fastener system **72** can utilize the various features shown and described above with respect to magnet fasteners systems utilized in other portions of the coat **10**. In one case, the magnetic fastener system **72** can include multiple magnets **48** and/or backing members **50** spaced in the circumferential direction on the throat tab **62** and/or body of the coat **10** as shown in FIGS. **13**, **13**A and **13**B and described above.

[0087] Accordingly, as can be seen, the throat tab closure system **61** includes a non-magnetic fastener system **66** to retain the throat tab **62** in a closed position, and a magnetic fastener system **72** to retain the throat tab **62** in the retracted position. In one case, on the throat tab **62**, the non-magnetic fastener system **66**/first portion **68** is positioned vertically above (e.g. closer to the upper edge of the collar **64** and/or throat tab **62**) the throat magnetic coupling component **74** when the throat tab **62** is in its closed position to help provide a more secure coupling and reduce loose flapping of the throat tab **62**. The magnetic fastener system **72** of FIGS. **14-19** includes the benefits described above for the magnetic fastener system **40** with respect to durability and ease of use for example.

[0088] In one case, because the non-magnetic fastener system **66** may remain cooler and when exposed to heat and/or not be as thermally conductive (since it can be made of non-metallic components), it may be desired to use the non-magnetic fastener system **66** along the front of the coat **10** where a wearer may be exposed to more heat and/or where the non-magnetic fastener system **66** may be exposed to more sensitive portions of the wearer (e.g. the face and/or front of the neck). In this case only a single magnet/magnetizable component/metallic component (the throat magnetic coupling component **74**) is located in the front collar area when the throat tab **62** is closed, and furthermore the collar **64** is positioned between that component **74** and the wearer to provide additional protection to the wearer from the throat magnetic coupling component **74**.

[0089] By locating part or all of the magnetic fastener system **72** along the back of the neck, and by not placing any magnets, metal, or magnetizable material on the front of the collar **64**, the user and magnetic fastener system **72** may be more isolated and protected from front-facing heat sources. Thus, in one case, the front of the collar **64** and/or the front of the coat **10** (e.g. in one case, those portions of the collar **64**/body **12** in the front half of the coronal plane) lacks any magnetic, magnetizable and/or metallic components, materials or components and/or lacks any components that the throat magnetic coupling component **74** can magnetically interact with to secure the throat tab **62** in the closed position (e.g. lacks any magnetic attraction that is sufficiently strong to sufficiently secure the throat tab **62** in place).

[0090] In addition, if a magnetic fastening system were to be used to secure the throat tab **62** in the closed position, such an arrangement could limit the adjustability of the throat tab **62**; e.g. the throat tab **62** may only be able to be secured in a single position and/or with limited adjustability. Some wearers may want to the throat tab **62** to be secured in looser or tighter configuration, and the non-magnetic fastener system **66** provides greater flexibility as described above.

[0091] FIGS. **14**, **16** and **18** show the non-magnetic fastener system **66** positioned vertically above the throat magnetic coupling component **74**/second portion **70** (when the throat tab **62** is in its closed position). However this configuration can be reversed such that the throat magnetic coupling component **74**/second portion **70** is positioned vertically above the non-magnetic fastener system **66** (when the throat tab **62** is in its closed position). In addition, if desired the throat magnetic coupling component **74**/second portion **70** can be positioned at the same height/vertical location as non-magnetic fastener system **66** (when the throat tab **62** is in its closed position). M ore particularly, in this case both the throat magnetic coupling component **74**/second portion **70** and the non-magnetic fastener system **66** are located at a same position in a direction through the thickness of the throat tab **62**, and in one case at least partially overlap in the thickness direction. This particular configuration can help the wearer to tactually locate the throat magnetic coupling component **74**, for example when coupling the throat magnetic coupling component **74** to the body magnetic coupling component **76**.

[0092] With reference to FIGS. **20**-**22**, a trouser/boot coupling system **80** can be utilized to secure the trousers **56** to one or two boots **82**. In particular, in one case the trousers **56** includes a first, or trousers, magnetic coupling component **84**, which can take the form of a magnet or magnetizable portion, that is permanently coupled or secured to the trousers **56**, such as by stitching. The trousers magnetic coupling component **84** can be located at a lower, distal end of the trousers **56**, at or adjacent to the cuff of the trousers **56**, and can be located on or coupled to an inner surface of the trousers **56** (e.g. not coupled to the outer-facing surface of the outer-most layer of the trousers **56** for protection purposes). FIG. **21** shows the trousers magnetic coupling component **84** positioned between the outer shell **26** and moisture barrier **28**, but the trousers magnetic coupling component **84** can be located at any position throughout the thickness of the trousers **56**, in one case between the outer shell **26** and a wearer of the trousers **56**. The trousers magnetic coupling component **84** can take the form of a magnet, such as magnet **48** in combination with the backing plate **50**, or the magnet **48** and/or backing plate **50** positioned in a relatively short support strip **46** (see FIG. **21**) in the same manner as the magnet systems described above.

[0093] In one case the trousers magnetic coupling component **84** can be entirely located in the lower 5% of the trousers **56**, or in the lower 10% of the trousers **56** in another case, or in the lower 25% of the trousers **56** in yet another case, or the lower 33% of the trousers **56** in yet another case. The trousers magnetic coupling component **84** can be located at any circumferential position of the leg of the trousers **56**, but in one case is located on a circumferential outer surface of the trousers **56** (opposite the inseam) or within about 15 degrees thereof. Although FIGS. **20**-**22** show only a single leg of the trousers **56**, if desired both legs of the trousers **56** can include a trousers magnetic coupling component **84**.

[0094] The trousers **56** of FIGS. **20**-**22** may be configured for use with a boot or boots **82** (or other footwear) which include a second, or boot, or footwear magnetic coupling component **86**, which can take the form of a magnet or magnetizable portion which is permanently coupled or secured to an inner layer of the boot **82**, such as by stitching. In one case the footwear magnetic coupling component **86** can be located in about a middle area of height of the boot **82**, and be located at any circumferential position of the boot **82**, but in one case is located on a circumferential outer surface of the boot **82** (opposite the instep) or within about 15 degrees thereof. In any case, the footwear magnetic coupling component **86** can be located at a height, and circumferential position, to be aligned with the corresponding trousers magnetic coupling component **84**, or vice versa, when the trousers **56** and boots **82** are worn by a wearer.

[0095] At least one of the trousers **84** or footwear **86** magnetic coupling components may be a permanent magnet, while the other one of the associated trousers **84** or footwear **86** magnetic coupling component may be either a permanent magnet or a magnetizable material. Moreover, if desired, the backing member **50** as described above can be utilized in conjunction with any magnets **48** utilized as the trousers **84** or footwear **86** magnetic coupling components, but if desired

the backing members **50** can be omitted. The trouser/boot coupling system **80** can utilize the various features shown and described above with respect to magnet fasteners systems **40** utilized in other portions of the garment.
[0096] The trousers **84** and footwear **86** magnetic coupling components can magnetically interact when the trousers **56** and boots **82** are worn to retain the trousers **56** in place and prevent the trousers **56** (in particular the legs of the trousers **56**) from being pulled upwardly, thereby providing protection to the wearer's legs/ankles. The magnetic connection between the trousers **84** and footwear **86** magnetic coupling components may be able to be manually overcome by a wearer to decouple the trousers **84** and footwear **86** magnetic coupling components, thereby allowing the trousers **56** and/or boots **82** to be doffed. The trousers/boot coupling system **80** thus provide an intuitive, and easy-to-use system for coupling trousers **56** to footwear **82**, with little or no extra motion required by the wearer to secure or break the connection.
[0097] Having described the invention in detail and by reference to the preferred embodiments, it will be apparent that modifications and variations thereof are possible without departing from the scope of the invention.

Claims

1. A method comprising: accessing a support strip; placing a plurality of magnetizable backing members along the support strip; after the first placing step, placing a magnet on or adjacent to each backing member such that each magnet is magnetically coupled to an associated backing member to thereby position each magnet on the support strip; and placing the support strip on or in a garment.
2. The method of claim 1 further comprising: accessing a supplemental support strip; placing a plurality of magnets or magnetizable members along the supplemental support strip; and placing the supplemental support strip on or in the garment such that the supplemental support strip is configured to form a magnetic closure system with the support strip.
3. The method of claim 2 wherein the garment includes a first garment portion and a second garment portion, a releasable fastener configured to releasably couple the first garment portion to the second garment portion, and a covering flap movable between a covering position wherein the covering flap covers the releasable fastener and a retracted position wherein the covering flap does not cover the releasable fastener, and wherein the magnetic closure system is configured to selectively maintain the covering flap in the covering position.
4. The method of claim 3 wherein the garment is a coat, wherein the releasable fastener is a zipper, and wherein the covering flap is a storm flap.
5. The method of claim 3 wherein the garment is a pair of trousers, wherein the releasable fastener is a zipper, and wherein the covering flap is a fly.
6. The method of claim 1 wherein each of the magnets have about the same size and shape in front view as the backing member.
7. The method of claim 1 wherein the support strip is made of a water tight, fire resistant textile or fabric.
8. The method of claim 1 further comprising, prior to the step of placing a magnet on or adjacent to each backing member, securing each backing member to the support strip.
9. The method of claim 1 further comprising, after the step of placing a magnet on or adjacent to each backing member, folding the support strip about itself to form two plies with the magnets and backing members positioned between the two plies of the support strip.
10. The method of claim 9 further comprising, after the folding step, coupling each backing member to the support strip by passing stitching through the support strip.
11. The method of claim 10 wherein the stitching extends around at least three sides of each backing member.

12. The method of claim 10 wherein the stitching forms a closed perimeter around each backing member.
13. The method of claim 9 wherein the support strip is a continuous piece of material, and wherein after the folding step the support strip generally surrounds and seals the backing members and magnets.
14. The method of claim 1 further comprising, before placing the support strip on or in the garment, positioning the support strip in a tube, and wherein the step of placing the support strip on or in the garment includes placing the tube on or in the garment.
15. The method of claim 14 wherein tube includes two outer plies, wherein the support strip is received between the two outer plies of the tube, and wherein the tube is removably inserted into the garment.
16. The method of claim 15 wherein the tube includes an inner cushioning layer positioned between the two outer plies of the tube.
17. The method of claim 15 wherein at least one of: the outer plies of the tube are made of different material; or one outer ply of the tube is thinner than the other ply of the tube.
18. The method of claim 1 wherein each backing member is not a permanent magnet, wherein each backing member has a thickness that is less than one half of the thickness of the associated magnet, wherein each magnet is generally flat and has a thickness less than one quarter of a longest dimension of the magnet, and wherein each magnet has a pull force of between about 10 lbs., and about 20 lbs. at a distance of 0 inches.
19. The method of claim 1 wherein the garment is a firefighter garment including an outer shell, a thermal liner having a TPP of at least about thirty and configured to be positioned between the outer shell and a wearer of the garment, and a moisture barrier configured to permit moisture vapor to pass therethrough but block liquids from passing therethrough, wherein the moisture barrier is configured to be positioned between the outer shell and a wearer of the garment.
20. A method of manufacturing a garment comprising: accessing an elongated support strip; placing a plurality of magnetizable backing members along a length of the support strip; after the first placing step, placing a magnet on or adjacent to each backing member such that each magnet is magnetically coupled to an associated backing member to thereby position each magnet on the support strip; accessing a garment including a first garment portion and a second garment portion, a releasable fastener configured to releasably couple the first garment portion to the second garment portion, and a covering flap movable between a covering position wherein the covering flap covers the releasable fastener and a retracted position wherein the covering flap does not cover the releasable fastener; and placing the support strip on or in a garment to form part of a magnetic closure system is configured to selectively maintain the covering flap in the covering position.