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(54) **METHOD AND SYSTEM OF SECURING WEARABLE EQUIPMENT**

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CPC A45F 5/02; A45F 5/021; A45F 2200/0591; F41C 33/045
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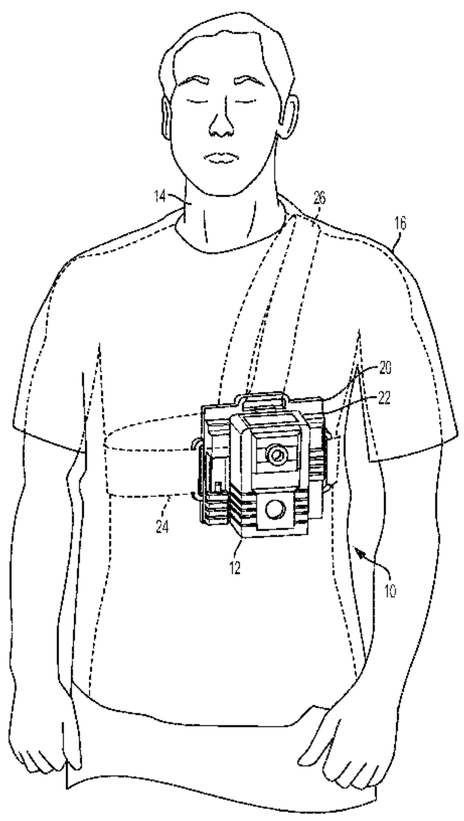
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(57) **ABSTRACT**

A system and method for attaching a device to a user includes securing a first plate to a user. The first plate can be secured to the user, for example, via one or more straps and/or a hook and loop fastener. The system and method further include securing a second plate to the first plate, wherein an article of the user's clothing is sandwiched in between the first plate and the second plate. The first plate and second plate may be secured to each other by a magnetic connection, by engagement of a sliding pin that pierces a portion of the first plate and the second plate, or a combination of a magnetic connection and an engagement of a sliding pin.

21 Claims, 8 Drawing Sheets



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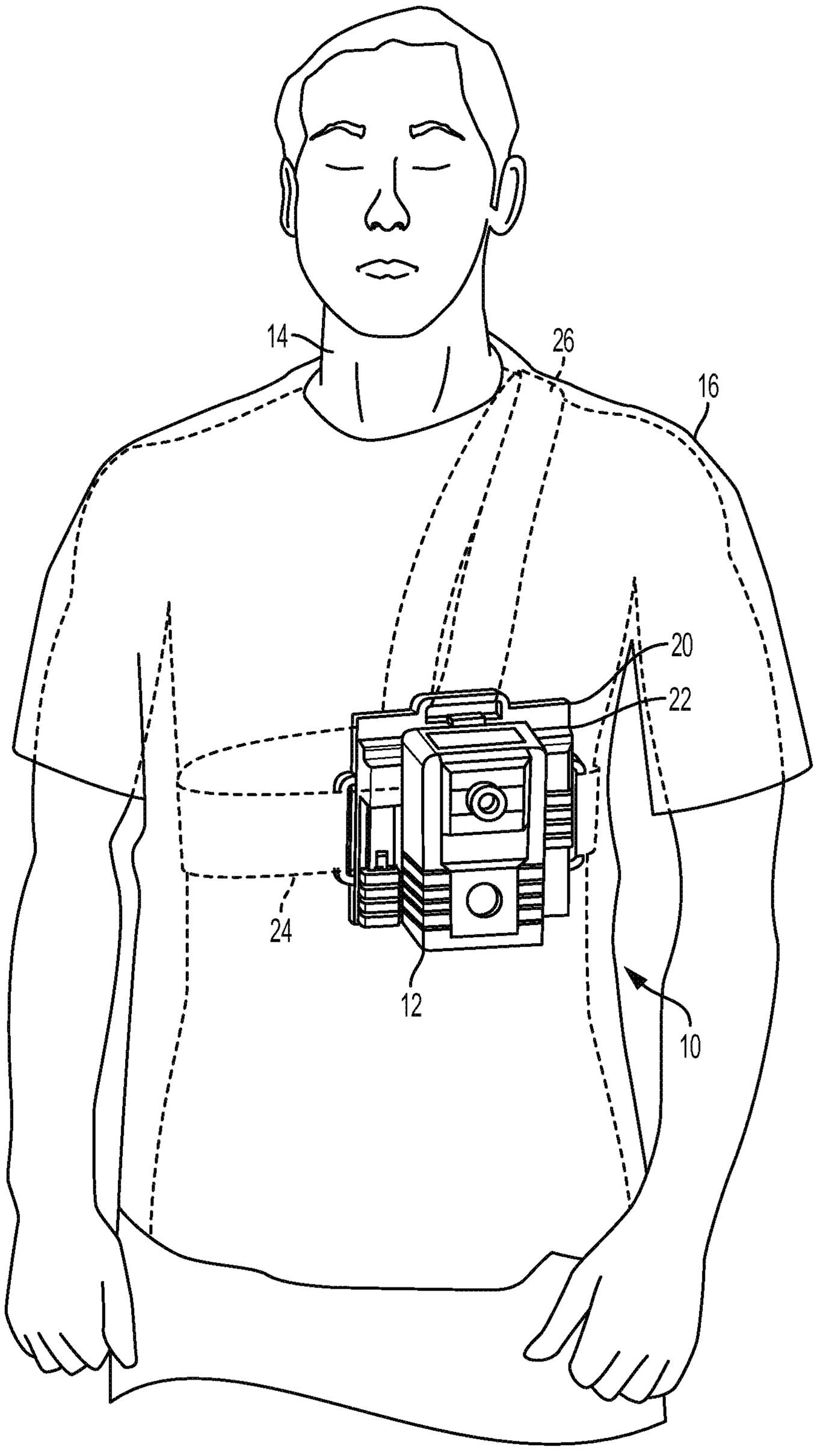


FIG. 1

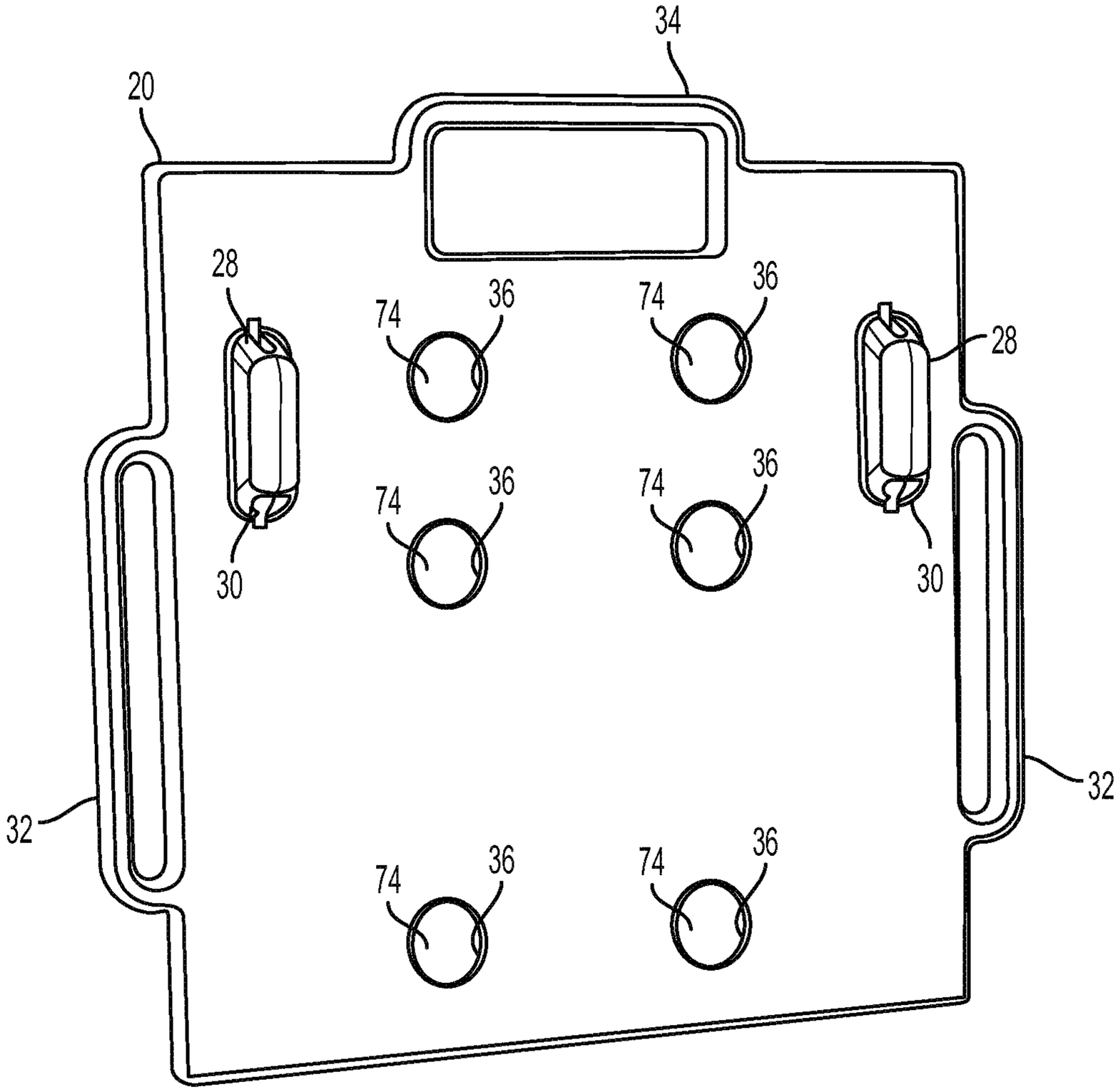


FIG. 2A

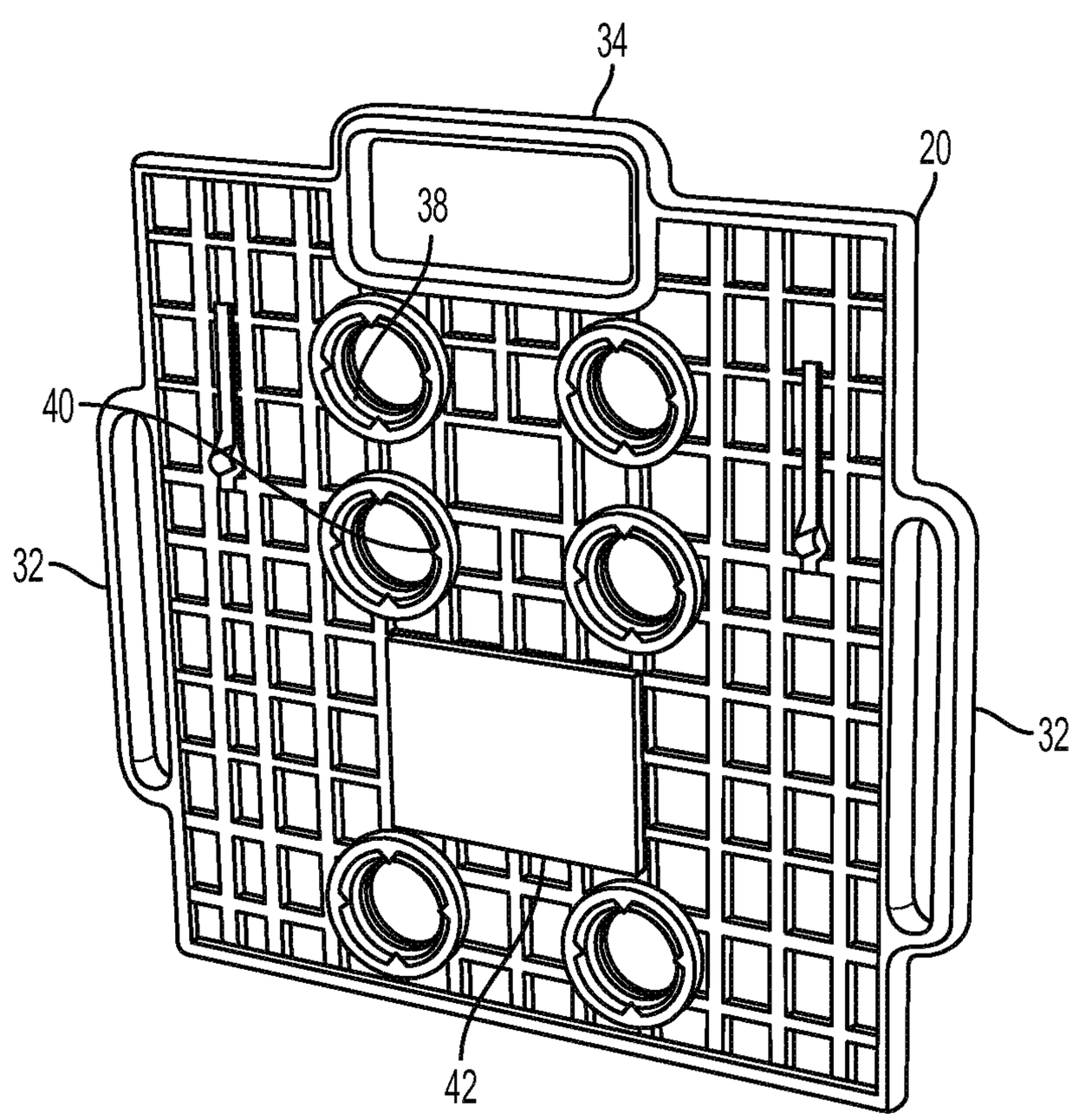


FIG. 2B

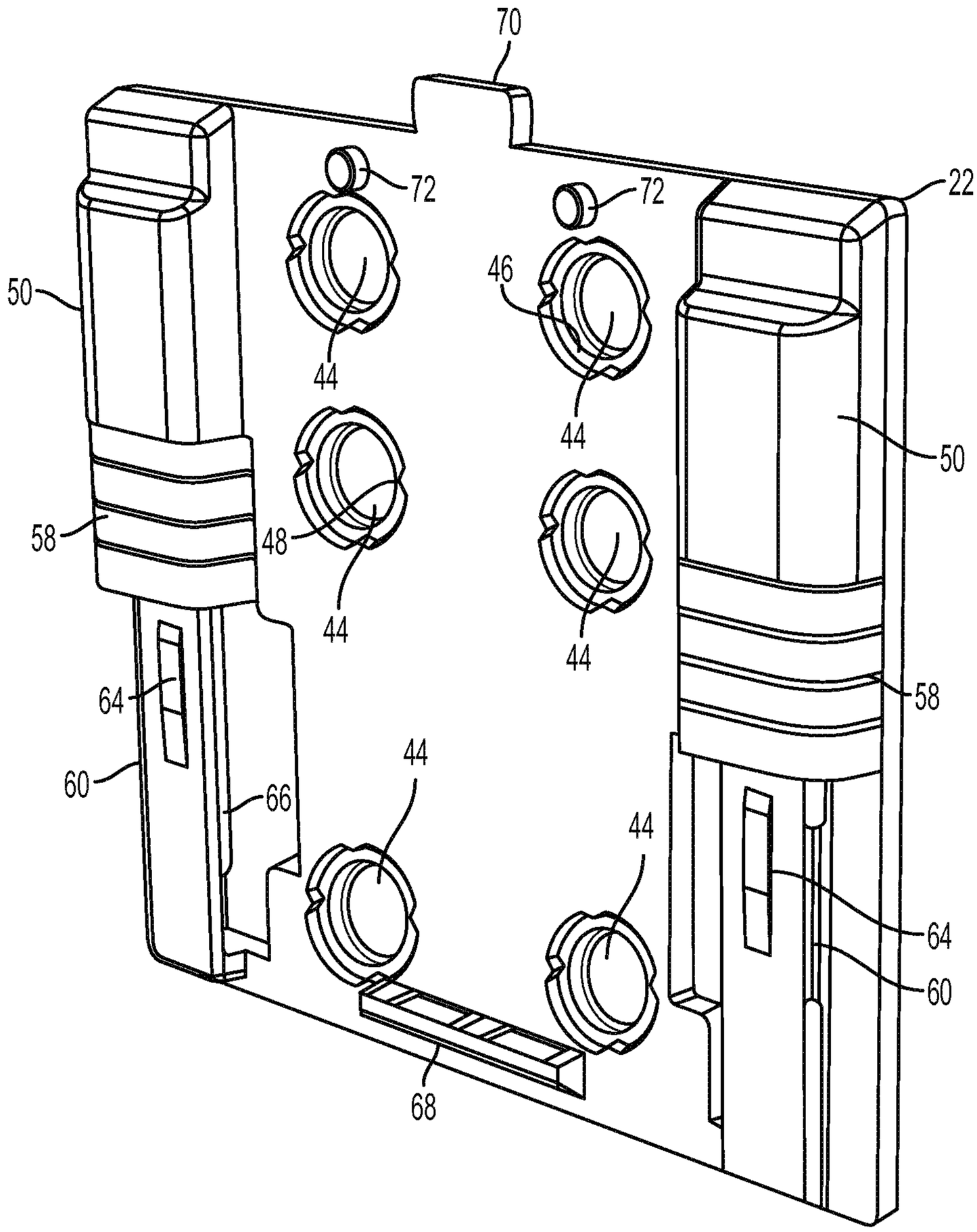


FIG. 3A

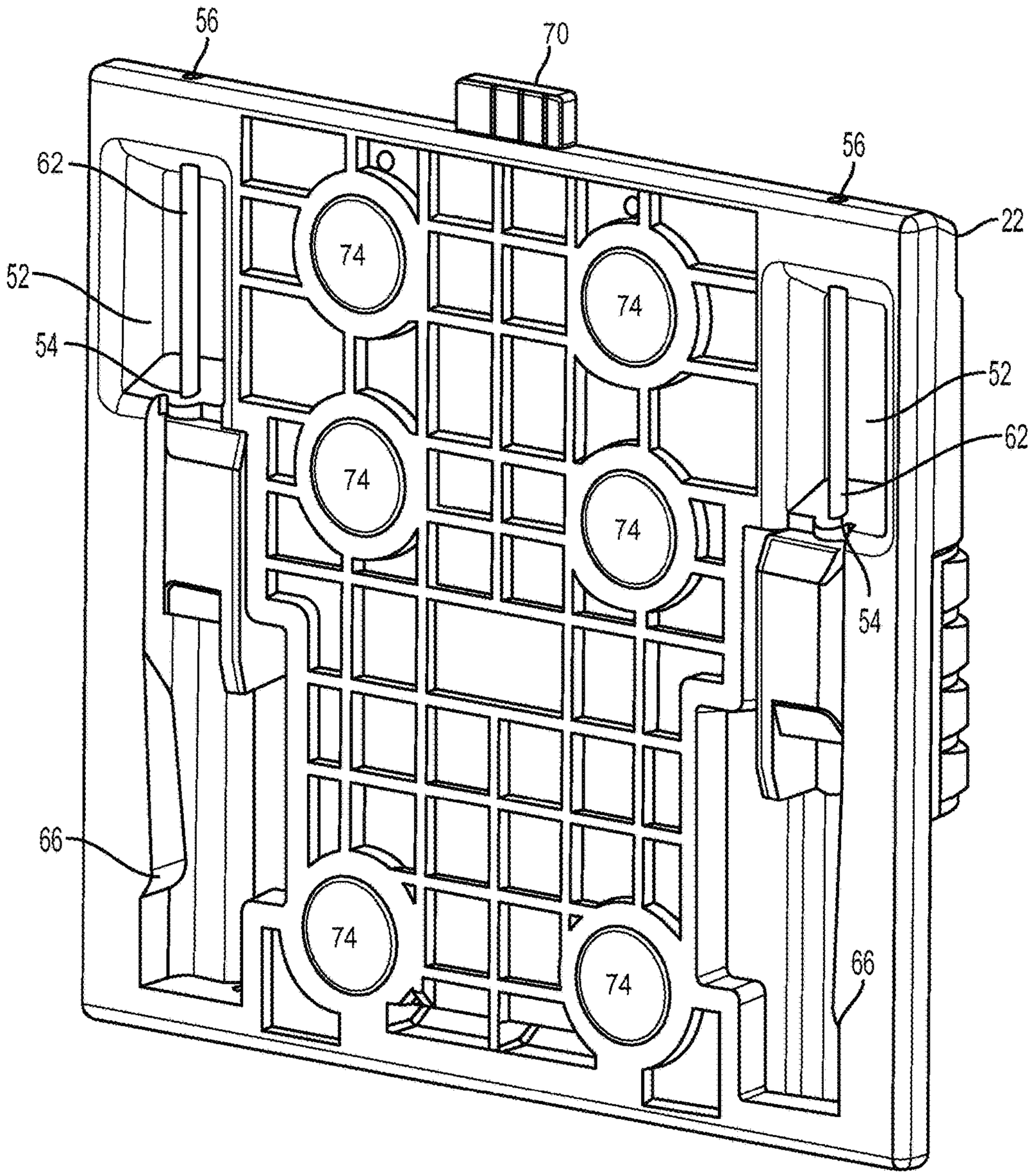


FIG. 3B

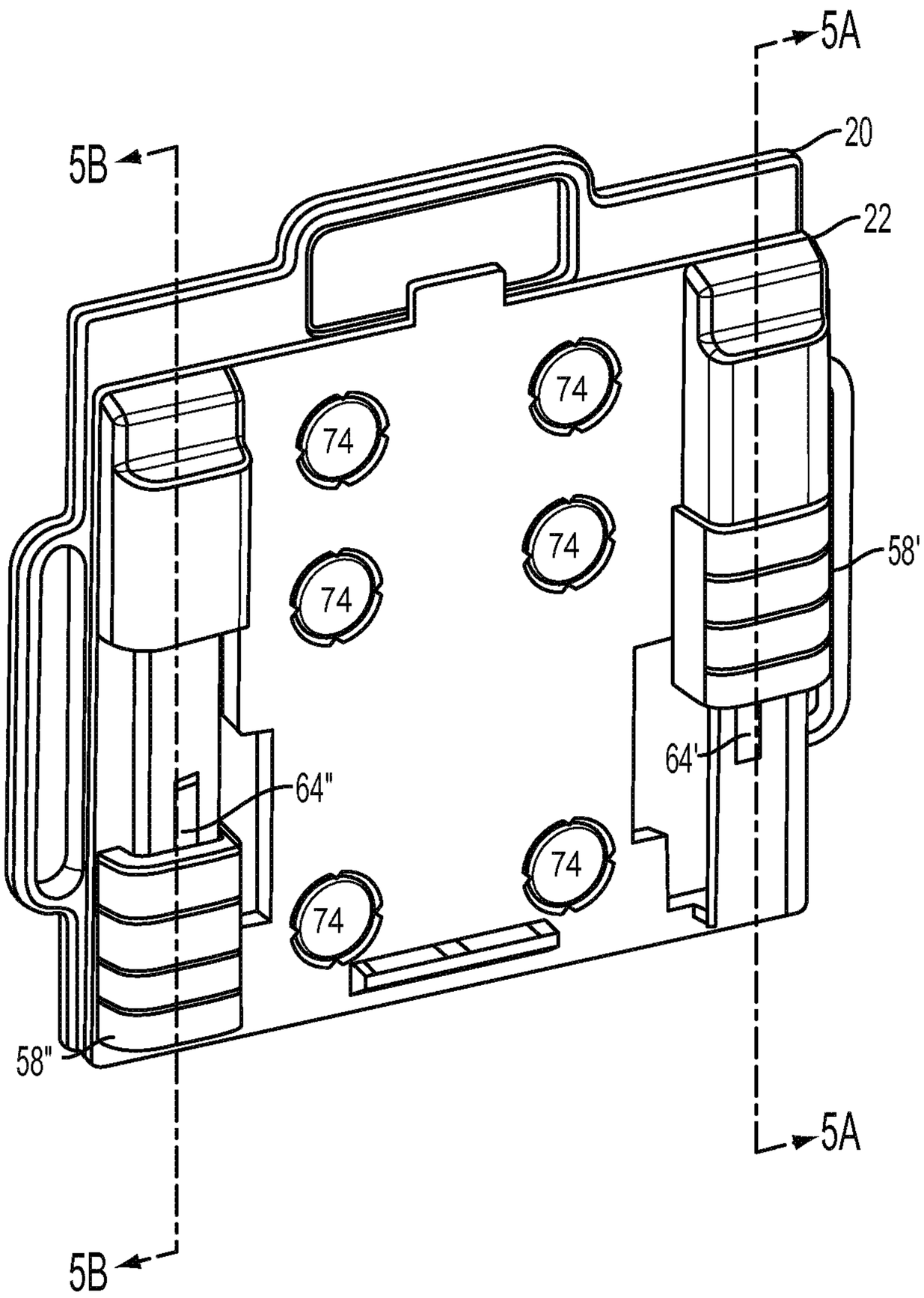


FIG. 4

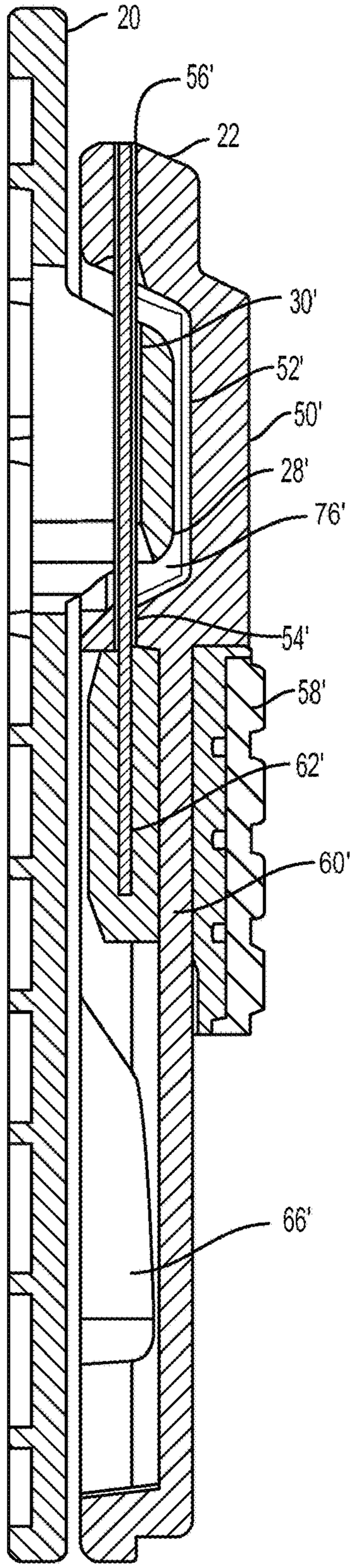


FIG. 5A

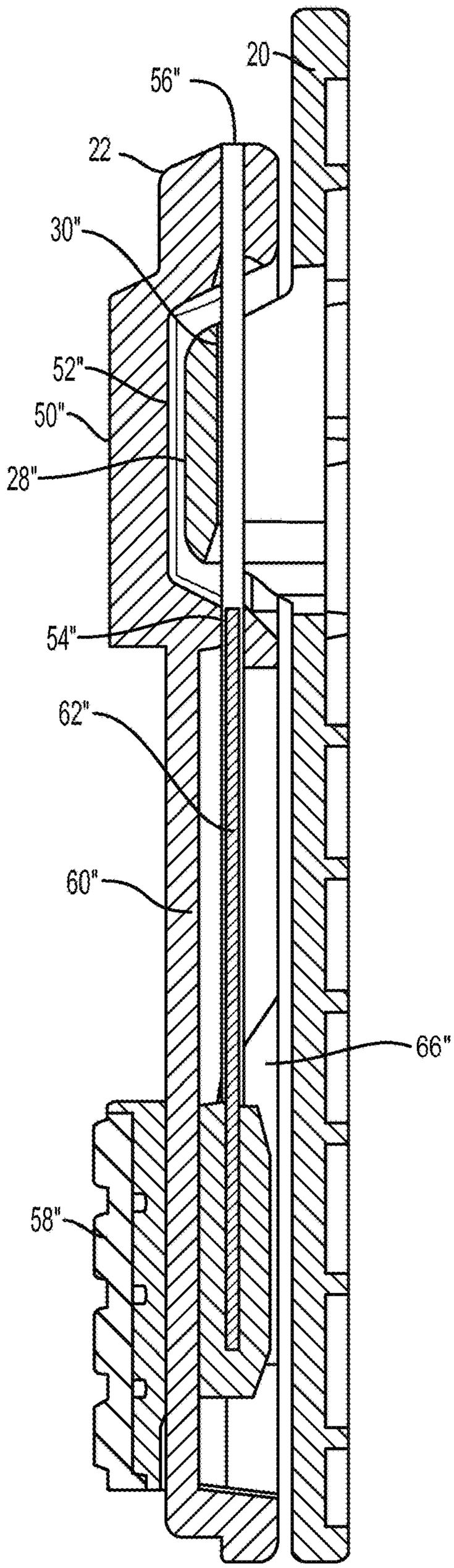


FIG. 5B

METHOD AND SYSTEM OF SECURING WEARABLE EQUIPMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 14/821,148, filed on Aug. 7, 2015. U.S. patent application Ser. No. 14/821,148 claims the benefit of U.S. Provisional Patent Application 62/067,586, filed on Oct. 23, 2014. Each of U.S. patent application Ser. No. 14/821,148 and U.S. Provisional Patent Application No. 62/067,586 is incorporated by reference herein in its entirety.

BACKGROUND

In order to allow a user of equipment such as, for example, a camera, the use of both hands, the equipment can be attached to the user's body via, for example, clothing worn by the user. Attachment and removal of the equipment must be easily achieved; however, the equipment also must be securely attachable to the user's body in order to ensure the equipment will not detach when detachment is not desired such as, for example, during strenuous activity by the user. Moreover, the equipment must be secured tightly to the user's body to prevent the equipment from experiencing undesired movement away from the user's body.

SUMMARY

The present invention relates generally to a system and method for securing a device to a user. In one embodiment, the present invention relates to a device-mounting system that includes first and second plates that are selectively attachable to one another. The first plate includes a protrusion that extends outwardly from a face of the first plate. The protrusion includes a pin channel that is adapted to receive a pin. The second plate includes a protrusion housing that includes a recess for receiving the protrusion. The protrusion housing further includes a pin hole that is coaxially aligned with the pin channel when the protrusion is inserted into the recess. The second plate also includes a pin that is slidably mounted to the second plate and is further adapted to penetrate the pin channel and the pin hole when the pin is in a closed position.

In another embodiment, the device mounting system includes a first magnet secured to the first plate and a second magnet secured to the second plate. The first and second magnets are positioned on the first and second plates, respectively, so that the second magnet aligns with the first magnet when the protrusion is inserted into the protrusion housing.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention thereof, reference may now be had to the following description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a perspective view of a wearable mounting system secured to a user;

FIG. **2**A is a perspective view of a front side of a bottom plate of a wearable mounting system;

FIG. **2**B is a perspective view of a back side of a bottom plate of a wearable mounting system;

FIG. **3**A is a perspective view of a front side of a top plate of a wearable mounting system;

FIG. **3**B is a perspective view of a back side of a top plate of a wearable mounting system;

FIG. **4** is a perspective view of a top plate stacked on a bottom plate of a wearable mounting system;

FIG. **5**A is a sectioned view of a top plate stacked on a bottom plate of a wearable mounting system with a slideable pin in a closed position; and

FIG. **5**B is a sectioned view of a top plate stacked on a bottom plate of a wearable mounting system with a slideable pin in an open position.

DETAILED DESCRIPTION

Various embodiments of the present invention will now be described more fully with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein.

Referring now to FIG. **1**, a wearable mounting system **10** securing a device **12** to a user **14** is shown. The wearable mounting system **10** includes a bottom plate **20** and a top plate **22**. The bottom plate **20** and the top plate **22** may be made from various materials, such as, for example, various plastics or metals. In a typical embodiment, the bottom plate **20** and the top plate **22** may be made from polycarbonate/acrylonitrile butadiene styrene. In a typical embodiment, the bottom plate is attached to the user **14** underneath an article of clothing **16** using lateral strap **24** and a shoulder strap **26**. The lateral strap **24** attaches at each end of the lateral strap **24** to the bottom plate **20** and extends around a torso of the user **14**. The shoulder strap **26** attaches at a first end to the bottom plate **20** and at a second end to a portion of the lateral strap **24** that is proximate to a back of the user **14**. Straps **24** and **26** can be made of various materials, such as, for example, nylon, and can include various adjustment and clasp mechanisms to secure the straps **24** and **26** and provide adjustability.

In another embodiment, the bottom plate **20** may be secured to the user **14** via a hook and loop fastener. For example, the user **14** may wear a vest, such as, for example, a piece of body armor that includes a loop fastener. The bottom plate **20** can include a hook fastener **42** to secure the bottom plate **20** to the vest (e.g., see FIG. **2**B). In such an embodiment, the use of lateral strap **24** and shoulder strap **26** is optional. As would be appreciated by a person of ordinary skill in the art, placement of the hook and loop fastener **42** on the bottom plate **20** can be varied as desired to ensure contact with a corresponding hook and loop fastener attached to a user. For example, the hook and loop fastener **42** may comprise one ore more pieces of hook and loop fastener disposed about the bottom plate **20**.

The top plate **22** is adapted to be secured to the bottom plate **20** on an outside of the article of clothing **16**, thereby sandwiching the article of clothing **16** between the bottom plate **20** and the top plate **22**. In a typical embodiment, the top plate **22** is attached to the bottom plate **20** using one or more of a magnetic connection between the bottom plate **20** and the top plate **22**, and engagement of the bottom plate **20** by a pin **62** of the top plate **22** (best seen in FIG. **5**A).

The device **12** attaches to the top plate **22**. The device **12** can be any device, such as, for example, a camera, that the user **14** desires to secure to himself. The top plate **22** includes one or more device-mounting features that interact with the device **12** to secure the device **12** thereto. Exemplary device mounting-features will be discussed in more detail with respect to FIG. **3**A.

Referring now to FIGS. **2**A and **2**B, a front side and a back side of the bottom plate **20**, respectively, are shown in perspective view. In a typical embodiment, the bottom plate **20** includes a pair of protrusions **28**, a pair of lateral strap attachment points **32**, a shoulder strap attachment point **34**, and a plurality of holes **36**. The pair of protrusions **28** extend outwardly from the bottom plate **20** and are adapted to fit within a pair of protrusion housings **50** of the top plate **22** (e.g., see FIG. **5**A). Each of the pair of protrusions **28** includes a pin channel **30**. Pin channel **30** is adapted to receive therethrough the pin **62**, which pin **62** is slidably attached to the top plate **22** (best seen in FIGS. **5**A and **5**B). Each of the pair of lateral strap attachment points **32** are attached to the bottom plate **20** on opposite sides of the bottom plate **20** from one another, and are adapted to each receive one end of the lateral strap **24**. The shoulder attachment point **34** is attached to a top side of the bottom plate **20** and is adapted to receive one end of the shoulder strap **26**. Each of attachment points **32** and **34** are shown as loops. In another embodiment, the attachment points **32** and **34** can comprise various other clasps, button snaps, or the like to secure the lateral strap **24** and the shoulder strap **26** to the bottom plate **20**.

The plurality of holes **36** is adapted to receive magnets **74** to facilitate a magnetic coupling of the bottom plate **20** with the top plate **22**. Each of the plurality of holes **36** includes a lip **38** and a plurality of crush tabs **40**. Magnets **74** may be secured to holes **36** by pressing the magnets **74** into the holes **36**. As the magnets **74** enter the holes **36**, the crush tabs **40** deform and establish a force fit between the magnets **74** and the holes **36**. The magnets **74** may be further secured to the holes **36** by lining the lips **38** with adhesive. The lips **38** are formed into the bottom plate **20** so that the lips **38** are flush with the front side of the bottom plate **20**. Locating the lips **38** in this way helps prevent the magnets **74** from passing through the holes **36** when in close proximity to additional magnets **74** that are secured to the top plate **22**. In another embodiment, the back side of the bottom plate **20** may include a portion of a hook and loop fastener **42** to enable the bottom plate **20** to be attached to a corresponding hook and loop fastener disposed on, for example, a vest of the user **14**. In another embodiment, the hook and loop fastener **42** may comprise multiple pieces of hook and loop fastener disposed about the back of the bottom plate **20**.

Referring now to FIGS. **3**A and **3**B, a front side and a back side of the top plate **22**, respectively, are shown in perspective view. In a typical embodiment, the top plate **22** includes a plurality of holes **44**, a pair of protrusion housings **50**, and a pair of sliders **58**. Similar to the plurality of holes **36**, the plurality of holes **44** are adapted to receive magnets **74**. The plurality of holes **44** similarly include lips **46** and crush tabs **48**. The lips **46** are formed into the top plate **22** so that the lips **46** are flush with the back side of the top plate **22**. Locating the lips **46** in this way helps prevent the magnets **74** from passing through the holes **44** when in close proximity to additional magnets **74** that are secured to the bottom plate **20**.

The pair of protrusion housings **50** extends outwardly from the front side of the top plate **22**, and each protrusion housing **50** includes a recess **52**, a pin hole **54**, and a pin hole **56**. Each recess **52** is adapted to receive one of the pair of protrusions **28**. The pin holes **54** and **56** are coaxially aligned with each other, and are further positioned to be coaxially aligned with the pin channel **30** of the protrusion **28** when the protrusion **28** is inserted into the recess **52**.

Each of the pair of sliders **58** is slidably coupled to the top plate **22** via tracks **60**, and each of the pair of sliders **58** includes a pin **62** that can be engaged and disengaged with the pin holes **54** and **56** of the protrusion housing **50** by sliding the slider **58** along the track **60**. In some embodiments, the tracks **60** include a step **64** that biases the slider **58** into a closed or open position. The step **64** is slightly raised above the track **60** so that the slider **58** must travel up and over the step **64** when being moved along the track **60** between open and closed positions. Other biasing means, such as, for example, a spring, can be used to bias the slider **58** in the closed position. A spring may be attached at a first end to a slider **58** and at a second end to housing **50**. In this embodiment, pulling the slider **58** away from the housing **50** is resisted by the spring.

The top plate **22** can further include a pair of tapered shoulders **66** that biases the pair of sliders **58** in the closed position. The tapered shoulders **66** include a ramp-like feature that urges against the pair of sliders **58** as they are retracted away from the protrusion housing **50**. When the pair of sliders **58** are fully retracted from the protrusion housings **50**, the tapered shoulders **66** act as a temporary stop that biases the pair of sliders **58** in the open position (e.g., see FIG. **5**B).

In some embodiments, the top plate **22** further includes various device-mounting features. For example, the top plate **22** may include a lip **68** and a tab **70** that interacts with the device **12** to secure the device **12** to the top plate **22**. The top plate **22** can also include a post **72** that fits within a hole or groove in the device **12** to help secure the device **12** against shear forces. Multiple posts **72** may be included on the top plate **22** depending on the design of the device **12**. In another embodiment, the top plate **22** may include other device mounting-features such as, for example, clamps, screws, slots, hook and loop fasteners, magnets, and the like.

Referring now collectively to FIGS. **4**, **5**A, and **5**B, the top plate **22** is shown stacked on top of the bottom plate **20**. The article of clothing **16** is not shown in FIGS. **4**, **5**A, and **5**B to allow a better view of the interaction between the bottom plate **20** and the top plate **22**. The top plate **22** is positioned on top of the bottom plate **20** so that each of the pair of protrusions **28** extends into each of the pair of recesses **52**. As the top plate **22** approaches the bottom plate **20**, the protrusions **28** and an attraction between the magnets **74** of the bottom plate **20** to the magnets **74** of the top plate **22** guides the top plate **22** into an initial attachment position with the bottom plate **20**. In the initial attachment position, each pin channel **30** of the pair of protrusions **28** is coaxially aligned with the corresponding pin hole **54** and the pin hole **56** of the corresponding housing **50** to receive the pin **62**. The initial attachment position temporarily secures the top plate **22** to the bottom plate **20** until the sliders **58** are slid into a closed position to engage the pins **62** with the pin hole **54**, the article of clothing **16**, the pin channel **30**, and the pin hole **56** (e.g., see FIG. **5**A).

In one embodiment, the magnets **74** may each be installed in the bottom plate **20** with their magnetic poles oriented in the same direction. In this instance, the magnets **74** installed in the top plate **22** are likewise installed with their magnetic poles all facing the same direction so as to facilitate a magnetic coupling between the two plates. In another embodiment, the magnets **74** may be installed in the bottom plate **20** with their magnetic poles facing in different directions. For example, the bottom plate **20** may include a first row of magnets **74** with their magnetic poles oriented in a first direction, while a second row of magnets **74** may be oriented with their magnetic poles oriented in a second, opposite direction. In this instance, the magnets **74** installed in the top plate **22** are correspondingly installed so that

magnetic coupling between the two plates can occur. Alternating the direction of the magnetic poles of the magnets **74** assists with an alignment of the two plates because, if the plates are not properly aligned, the magnets **74** will repel one another. It will be apparent to those having skill in the art that the protrusions **28** also assist with the alignment of the top plate **22** with the bottom plate **20**. However, in embodiments where the protrusions **28** and the protrusion housings **50** are omitted, arrangement of the magnets **74** can help ensure proper alignment of the top plate **22** with the bottom plate **20**.

FIG. **4** shows slider **58'** in a closed position and slider **58"** in an open position. Throughout this disclosure, a part number accompanied by a "prime" symbol indicates a part located on a right side of the wearable mounting system **10** when viewed from the top of the wearable mounting system **10**, and a double "prime" indicates a part located on the left side of the wearable mounting system **10** when viewed from the top of wearable mounting system **10**. Apart from their relative locations, the parts indicated by "prime" and double "prime" are otherwise the same. In the closed position, a back edge of the slider **58'** abuts the step **64'** and the pin **62'** penetrates the pin hole **54'**, the pin channel **30'**, the pin hole **56'**, and the article of clothing **16**. A sectioned view of the slider **58'** in the closed position about line A-A is shown in FIG. **5**A. In the open position, a front edge of the slider **58"** abuts the step **64"** and the pin **62"** is retracted from the pin hole **56"** and the pin channel **30"**. In one embodiment, the pin **62"** is not completely retracted from the pin hole **54"**. By not retracting the pin **62"** entirely out of the pin hole **54"**, the tip of the pin **62"**, which is sharp, is covered by the pin hole **54"** and limits the possibility of accidental injury to a user. In another embodiment, the pin **62"** may be retracted completely from the pin hole **54"** when the slider **58** is in the open position. A sectioned view of the slider **58"** in the closed position about line B-B is shown in FIG. **5**B.

Referring now to FIG. **5**A, a sectioned view about line A-A from FIG. **4** is shown. The slider **58'** is shown in the closed position with the pin **62'** penetrating the pin hole **54'**, the pin channel **30'**, and the pin hole **56'**. Though not shown, the article of clothing **16** is disposed within a gap **76'** between the bottom plate **20** and the top plate **22** when the wearable mounting system **10** is secured to the user **14**. When the slider **58'** is in the closed position, the pin **62'** pierces the article of clothing **16** in two places. The first pierce occurs between the pin hole **54'** and the pin channel **30'**, and the second pierce occurs between the pin channel **30'** and the pin hole **56'**. When sliders **58'** and **58"** are both in the closed position, the top plate **22** is secured to the bottom plate **20**.

Referring now to FIG. **5**B, a sectioned view about line B-B from FIG. **4** is shown. The slider **58"** is shown in the open position with the pin **62"** retracted from the pin channel **30"** and the pin hole **56"**, but still partially disposed within the pin hole **54"**. When sliders **58'** and **58"** are in the open position, the top plate **22** may be removed from the bottom plate **20**.

Although various embodiments of the method and system of the present invention have been illustrated in the accompanying Drawings and described in the foregoing Specification, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit and scope of the invention as set forth herein. It is intended that the Specification and examples be considered as illustrative only.

What is claimed is:

1. A device-mounting system comprising:
- a first plate comprising a face and a protrusion, wherein the protrusion extends outwardly from the face;
- a second plate comprising a protrusion housing, wherein the protrusion housing comprises a recess for receiving the protrusion;
- a first magnet secured to the first plate;
- a second magnet secured to the second plate; and
- wherein the second magnet aligns with the first magnet when the protrusion is inserted into the protrusion housing.

2. The device-mounting system of claim **1**, wherein the protrusion comprises a pin channel.

3. The device-mounting system of claim **2**, wherein the protrusion housing comprises a pin hole that is aligned with the pin channel when the protrusion is inserted into the recess.

4. The device-mounting system of claim **3**, wherein the second plate further comprises a pin slideably mounted to the second plate and adapted to penetrate the pin channel and the pin hole when the pin is in a closed position.

5. The device-mounting system of claim **1**, further comprising:
- a third magnet secured to the first plate;
- a fourth magnet secured to the second plate; and
- wherein the first magnet is secured to the first plate with a first magnetic pole orientation and the third magnet is secured to the first plate with a second magnetic pole orientation that is opposite the first magnetic pole orientation.

6. The device-mounting system of claim **5**, wherein the second magnetic pole orientation is opposite the first magnetic pole orientation to facilitate a magnetic coupling between the first and second plates.

7. The device-mounting system of claim **1**, wherein the first magnet is secured to the first plate within a hole comprising a crush tab and a lip.

8. The device-mounting system of claim **1**, further comprising:
- a first strap attachment point disposed on a first edge of the first plate;
- a second strap attachment point disposed on a second edge of the first plate; and
- a shoulder strap attachment point disposed on a third edge of the first plate.

9. The device-mounting system of claim **4**, further comprising:
- a track disposed on a face of the second plate; and
- a slider movably attached to the track and coupled to the pin.

10. The device-mounting system of claim **9**, further comprising a spring attached at a first end to the slider and at a second end to the second plate.

11. A device-mounting system comprising:
- a first plate comprising:
  - a first magnet and a second magnet disposed within a face of the first plate;
- a second plate comprising:
  - a third magnet and a fourth magnet disposed within a face of the second plate; and
- wherein the third magnet aligns with the first magnet and the fourth magnet aligns with the second magnet when the first plate and second plate are stacked;
- a protrusion that extends outwardly from the face of the first plate, the protrusion comprising a pin channel;

a protrusion housing disposed on the second plate, the protrusion housing comprising a recess for receiving the protrusion when the first magnet aligns with the third magnet and the second magnet aligns with the fourth magnet.

12. The device-mounting system of claim **11**, wherein the first and second magnets are disposed within the face of the first plate with their magnetic poles oriented in opposite directions.

13. The device-mounting system of claim **11**, wherein the first plate further comprises:

a first lateral strap attachment point on a first side of the first plate; and

a second lateral strap attachment point on a second side of the first plate.

14. The device-mounting system of claim **11**, wherein the second plate further comprises a device-mounting feature.

15. The device-mounting system of claim **11**, wherein:

the protrusion housing comprises a recess for receiving the protrusion and a pin hole that is aligned with the pin channel when the protrusion is inserted into the recess; and

a pin slideably mounted to the second plate and adapted to penetrate the pin channel and the pin hole when the pin is in a closed position.

16. A method of manufacturing a device-mounting system, the method comprising:

forming a first plate comprising a protrusion, wherein the protrusion extends outwardly from a face of the first plate;

forming a second plate comprising a protrusion housing for receiving the protrusion;

securing a first magnet to the first plate; and

securing a second magnet to the second plate; and

positioning the second magnet to be in alignment with the first magnet when the protrusion is inserted into the protrusion housing.

17. The method of claim **16**, wherein the protrusion comprises a pin channel.

18. The method of claim **17**, wherein the protrusion housing comprises a pin hole aligned with the pin channel when the protrusion is inserted into the protrusion housing.

19. The method of claim **18** further comprising:

slideably mounting a pin to the second plate, wherein the pin is configured to penetrate the pin channel and the pin hole when the pin is in a closed position.

20. The method of mounting a device of **16**, further comprising:

providing a third magnet secured to the first plate;

providing a fourth magnet secured to the second plate; and

wherein the first magnet is secured to the first plate with a first magnetic pole orientation and the third magnet is secured to the first plate with a second magnetic pole orientation that is opposite the first magnetic pole orientation.

21. The method of mounting a device of claim **16**, further comprising:

providing the first plate with a hole comprising a crush tab and a lip; and

wherein the first magnet is secured in the hole of the first plate, the hole comprising a crush tab and a lip.

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