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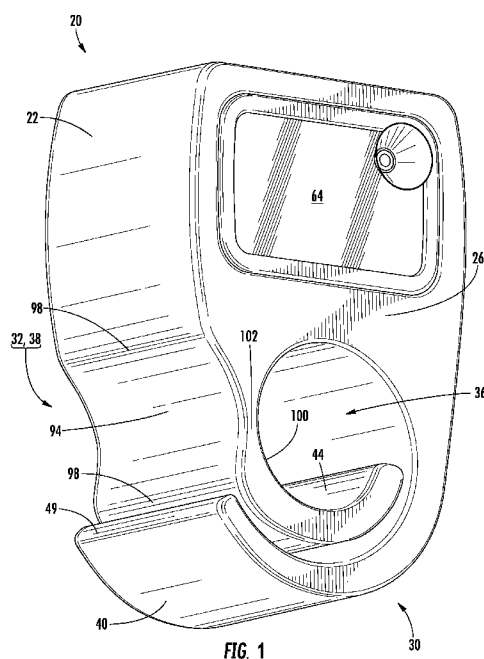
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(54) Title: ATTACHMENT APPARATUS FOR ELECTRONIC DEVICE



(57) Abstract: An attachment apparatus for attaching an electronic device to at least one appendage of a user can include first and second receptacles that are each configured to releasably receive at least a portion of a respective digit of a user. Each of the first and second receptacles can be configured to at least partially receive the respective digit via relative movement between the receptacle and the respective digit in a first direction, and release the respective digit via relative movement between the receptacle and the respective digit in a second direction that is crosswise to the first direction.

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ATTACHMENT APPARATUS FOR ELECTRONIC DEVICEFIELD OF THE INVENTION

[0001] The present invention relates to attachment apparatuses for electronic devices and, more particularly, to such attachment apparatuses that can be attached to users of the electronic devices.

BACKGROUND

[0002] Hand-held electronic devices are used in various environments to perform a variety of tasks. In some situations, a user may operate a hand-held electronic device repeatedly throughout an extended period of time. As an example, an employee working at a point-of-sale station in a retail store may frequently operate a hand-held imager, such as a laser scanner, for scanning barcodes on products to be sold.

[0003] When a user is required to operate the same hand-held electronic device over and over, it can be beneficial to attach the device to the user, such as the user's hand and/or wrist. Not only does this keep the device within easy accessibility for the user, it may also free the user's hands to perform other tasks. Because of these advantages, the user may be able to perform his or her duties more efficiently.

[0004] It is known for an electronic device to include or be associated with an attachment apparatus that is configured to attach to a user's finger. It is desirable for such attachment apparatuses to provide a new balance of properties.

SUMMARY

[0005] An aspect of this disclosure is the provision of an attachment apparatus for attaching an electronic device to at

least one digit of a user, the attachment apparatus comprising first and second receptacles that are each configured to releasably receive at least a portion of a respective digit of a user, comprising each of the first and second receptacles being configured to at least partially receive the respective digit via relative movement between the receptacle and the respective digit in a first direction, and release the respective digit via relative movement between the receptacle and the respective digit in a second direction that is crosswise to the first direction.

[0006] In another example, the attachment apparatus is in combination with the electronic device, wherein the electronic device comprises a switch mechanism proximate the first receptacle, and the first receptacle is positioned between the switch mechanism and the second receptacle.

[0007] In another example, the first receptacle comprises a partial band having an inner surface extending partially around an area configured to at least partially receive the respective digit, and the second receptacle comprises a recess defined by an outer surface of the partial band, the recess being configured to at least partially receive the respective digit.

[0008] In another example, the outer surface of the partial band comprises a concave portion, and the concave portion at least partially defines the recess.

[0009] In another example, the partial band is an inner partial band; and the attachment apparatus further comprises an outer partial band extending only partially around the inner partial band so that the recess is substantially not covered by the outer partial band.

[0010] In another example, the attachment apparatus comprises a support structure configured to support at least a portion of the electronic device, and the first and second receptacles are each connected to the support structure.

[0011] In another example, the support structure comprises opposite first and second sides, the first side is configured to have at least a portion of the electronic device positioned proximate the first side of the support structure, and

[0012] the first and second receptacles are positioned proximate the second side of the support structure.

[0013] In another example, at least a portion of an electronic device is connected to the first side of the support structure, the electronic device comprises a switch mechanism proximate the first receptacle, and the first receptacle is positioned between the switch mechanism and the second receptacle.

[0014] Another aspect of this disclosure is the provision of an attachment apparatus for attaching an electronic device to at least one digit of a user, the attachment apparatus comprising: support structure; a partial band extending from the support structure at least partially around an inner area configured to at least partially receive at least a first digit of a user; and a recess defined by an outer surface of the partial band and configured to at least partially receive at least a second digit of the user, wherein each of the inner area and the recess is configured to at least partially receive the respective digit via relative movement between the partial band and the respective digit in a first direction, and release the respective digit via relative movement between the partial band and the respective digit in a second direction that is crosswise to the first direction.

[0015] In an example, an outer surface of the partial band comprises a concave portion, and the concave portion at least partially defines the recess.

[0016] In another example, the partial band is an inner partial band, and the attachment apparatus further comprises an outer partial band extending only partially around the inner partial band so that the recess is substantially not covered by the outer partial band.

[0017] In one example, at least one of the two or more receptacles can be configured in a manner that seeks to allow the electronic device to be manually stabilized, such as for improving functionality of the electronic device. For example, when an electronic device is fastened to a user and includes an imager, for example a laser scanner for scanning barcodes, too much instability associated with the attachment apparatus may decrease clarity of the image or scan captured by the electronic device.

[0018] As another example, at least one of the two or more receptacles can be configured so that the attachment apparatus is readily detachable from (e.g., can "breakaway" from) the user's digit(s) in the case of an emergency, for example if the electronic device becomes caught in moving parts of machinery or otherwise becomes undesirably stuck.

[0019] The foregoing summary provides a few brief examples and is not exhaustive, and the present invention is not limited to the foregoing examples. The foregoing examples, as well as other examples, are further explained in the following detailed description with reference to accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Fig. 1 is front, bottom, left pictorial view of an electronic device, wherein the electronic device includes an attachment apparatus, in accordance with an embodiment of this disclosure.

[0021] Fig. 2 is a rear, top, right pictorial view of the electronic device of Fig. 1.

[0022] Fig. 3 is a front elevation view of the electronic device of Fig. 1.

[0023] Fig. 4 is a schematic front elevation view of the electronic device of Fig. 1, wherein dashed lines depict fingers, and dashed lines also depict a receptacle in a relatively widely open configuration.

DETAILED DESCRIPTION

[0024] An aspect of this disclosure is the provision of an attachment apparatus that may be used to attach an electronic device to at least one appendage (e.g., finger) of a user. As examples, embodiments of electronic devices including attachment apparatuses are disclosed in the following. The present invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. For example, features disclosed as part of one embodiment can be used in the context of another embodiment to yield a further embodiment.

[0025] Figs. 1-3 depict a hand-held electronic device 20 in accordance with an embodiment of this disclosure. In the example shown in Figs. 1-3, the electronic device 20 includes a frame or housing 22, and an attachment apparatus is mounted to a lower portion, base or lower wall of the housing. The attachment apparatus can include an upper support structure 26

connected to the housing 22 and configured to be used in supporting, or at least partially supporting, the housing. The support structure 26 can be part of the housing 22, for example so that the attachment apparatus may include at least a portion of the housing.

[0026] The attachment apparatus can further include one, two, or more receptacles, for example first and second receptacles 30, 32 (e.g., receptacles for fingers) that are connected to, supported by and/or otherwise associated with the support structure 26. For ease of discussion, and not for the purpose of limiting the scope of this disclosure, the first and second receptacles 30, 32 and other features can be referred to with the same frame of reference used in the above description of the drawings. Accordingly, the first and second receptacles 30, 32 can be respectively referred to as right and left receptacles 30, 32.

[0027] As will be discussed in greater detail below, the right and left receptacles 30, 32 can be configured to releasably receive at least a portion of at least one appendage of a user. In the specific examples discussed in greater detail below, each of the receptacles 30, 32 is configured to at least partially receive a portion of a respective digit of a user, so that the user can support the electronic device 20 by hand, by way of the attachment apparatus. For example, each of receptacles 30, 32 can be configured to releasably receive a portion of at least one finger of a user, so that the user's hand can support the electronic device 20 by way of the attachment apparatus.

[0028] Figs. 1-3 depict the right receptacle 30 in its normal, relaxed (e.g., non-strained), substantially closed configuration. In the embodiment depicted in the drawings,

the attachment apparatus, or at least portions of the receptacles 30, 32, are formed from, or otherwise comprise, elastic material and/or comprise other suitable biasing mechanisms (e.g., springs) so that the right receptacle is biased toward the relaxed, substantially closed configuration depicted in Figs. 1-3.

[0029] The receptacles 30, 32 can at least partially receive the respective fingers via relative movement between the receptacles and the respective fingers in a first direction extending along the lengthwise axis 80 (Fig. 3) of an inner area 36 of the right receptacle 30. In the substantially closed configuration of the embodiment depicted in the drawings, the right receptacle 30 is configured in a manner that seeks to allow a portion of a user's respective finger to be securely, yet releasably, held within the inner area 36 of the right receptacle, so that the user can hold and securely stabilize the electronic device 20 by way of his or her respective fingers and the support structure 26. More generally, the receptacles 30, 32 can be configured to removably receive receive digit(s) (e.g., finger(s) or thumb(s)), wrist(s), hand(s) or other suitable appendage(s) of a user.

[0030] Dashed lines in Fig. 4 schematically illustrate what is believed to be a possible, non-limiting example of the right receptacle 30 in a relatively widely open configuration that can be achieved by applying predetermined forces that deform (e.g., elastically deform) the attachment apparatus. In the relatively widely open configuration of the embodiment depicted in the drawings, the receptacles 30, 32 are configured in a manner that seeks to allow portions of a user's respective fingers to be released from the relatively

widely opened inner areas 36, 38 of the receptacles, so that the receptacles 30, 32 are configured to provide a "breakaway" feature for allowing the attachment apparatus to be readily detachable from the user's fingers, or the like, in the case of an emergency. For example, such an emergency may include the electronic device 20 accidentally becoming caught in moving parts of machinery or otherwise becoming undesirably stuck.

[0031] In the embodiment depicted in the drawings, the receptacles 30, 32 can release the respective fingers via relative movement between the receptacles and the respective fingers in a second direction schematically represented in Fig. 4 by arrows 34. In the embodiment depicted in the drawings, the second direction 34 (e.g., emergency removal direction) is crosswise to, or more specifically can be perpendicular to, the first or insertion direction that extends along the lengthwise axis 80 (Fig. 3) of an inner area 36 of the right receptacle 30.

[0032] At least partially reiterating from above for the embodiment depicted in the drawings, the right and left receptacle 30, 32 respectively comprise the right and left inner areas 36, 38. More specifically, the attachment apparatus can include first and second lower portions or extension members 40, 44 that at least partially form the receptacles 30, 32 and further at least partially define the inner areas 36, 38. In the example shown in Figs. 1-4, the lower portions or extension members 40, 44 are connected to and extend downwardly from the upper support structure 26 of the attachment apparatus. The first and second portions 40, 44 can be respectively referred to as an outer partial band 40 and an inner partial band 44. Each of the extension members or partial bands 40, 42 can be arcuate and generally in the

form of a C-shaped band or C-band. For example, the partial bands 40, 42 can be curved members having a profile with a shape in the form of, or substantially in the form of, the letter "C". In the embodiment depicted in the drawings, the outer partial band 40 extends partially around the inner partial band 44. The partial bands 40, 42 can respectively include arcuate, concave inner surfaces, and arcuate, convex outer surfaces.

[0033] In the example depicted in the drawings, at least a portion of the electronic device 20, or more specifically the electronic device housing 22, extends generally upwardly from, or upwardly from proximate, a first or upper side of the support structure 26. In contrast, proximal portions of the extension members or partial bands 40, 42 can extend generally downwardly from, or downwardly from proximate, a second or lower side of the support structure 26. For example, the proximal portions of the partial bands 40, 42 can extend downwardly from, or downwardly from proximate, opposite right and left ends of the support structure 26. Additionally, the proximal portions of the partial bands 40, 42 can extend in the downward direction. Distal portions of the partial bands 40, 42 can extend inwardly from the proximal portions of the partial bands, so that the distal portions extend convergently toward one another.

[0034] The electronic device 20 can be or can include a camera, optical imager, laser scanner, laser pointer, counting device, calculation device, or other suitable portable electronic device(s). The housing 22 of the electronic device 20 can at least partially contain (e.g., hide from view) conventional components such as, but not limited to, an optical imager, conventional laser scanner and/or other conventional features

configured to capture images or signals associated with symbologies (e.g., barcodes) for decoding purposes, so that the symbologies, or more specifically barcodes, can be decoded. Optionally, the electronic device 20 can be associated with one or more other electronic devices that operate cooperatively with the electronic device 20 to facilitate the decoding and/or perform other functions.

[0035] A field of view of the electronic device 20 extends forwardly, outwardly from at least one opening and/or transparent window 64 at the front end of the electronic device. Other and/or additional peripheral or an ancillary devices may be associated with the electronic device 20 for providing information to and/or and receiving information from the electronic device.

[0036] The electronic device 20 of the embodiment depicted in the drawings further includes a switch mechanism 72 positioned adjacent to the attachment apparatus. The first or right receptacle 30 can be positioned between the switch mechanism 72 and the second or left receptacle 32. The switch mechanism 72 can be in the form of a trigger, lever, pushbutton (e.g., key) or other suitable mechanism that optionally can be positioned adjacent to the attachment apparatus. For example, the switch mechanism 72 can be associated with (e.g., conventionally electrically connected to) the conventional internal components of the electronic device 20 for actuating the optical imager, laser scanner and/or other suitable feature(s) of the electronic device.

[0037] The switch 72 can be mounted to, or otherwise incorporated into or associated with, attachment apparatus and/or the housing 22 of the electronic device 20. In the embodiment depicted in the drawings, the switch 72 includes a

pushbutton 74 movably (e.g., reciprocatively) mounted to a button housing.

[0038] As one example of a method of use, while the right receptacle 30 is in its relaxed, substantially closed configuration, two of a user's adjacent and straight fingers can be respectively introduced into the inner areas 36, 38 by causing relative movement between the two fingers and the inner areas 36, 38 while the lengthwise axes of the straight fingers are substantially coaxial with the respective lengthwise axes 80, 96 (Fig. 3) of the inner areas. For example, the receptacles 30, 32 can at least partially receive the respective fingers via relative movement between the receptacles and the respective fingers in an insertion direction extending along the lengthwise axes 80, 96 of the inner areas 36, 38.

[0039] In accordance with the embodiment depicted in the drawings, the receptacles 30, 32 (e.g., at least the partial bands 40, 42) are configured to allow a user with fingers positioned in the inner areas 36, 38 to hold and securely stabilize the electronic device 20 by way of the receptacles during the substantially closed configuration, so that substantially clear images and/or signals can be captured by the electronic device 20. That is, the receptacles 30, 32, partial bands 40, 42 and/or other features of the attachment apparatus can be configured to function as a stable support for the electronic device 20. For example, the partial bands 40, 42 can be elastically configured to provide inwardly directed forces against the finger in the inner area 36.

[0040] In another example of a method of use, while portions of a user's fingers are respectively in the inner areas 36, 38 and the right receptacle 30 is in its substantially closed

configuration, the right receptacle 30 can be forced into its relatively widely open configurations (e.g., shown in dashed lines in Fig. 4) by causing crosswise, or more specifically perpendicular, relative movement between the subject fingers and the lengthwise axes 80, 96 (Fig. 3) of the inner areas 36, 38. For example, the receptacles 30, 32 can release the subject fingers via relative movement between the receptacles and the fingers in the second or emergency removal direction 34 (Fig. 4). Reiterating from above, the first or insertion direction can be crosswise to, or more specifically can be perpendicular to, the second or emergency removal direction 34.

[0041] In the embodiment depicted in the drawings, the receptacles 30, 32 (e.g., at least the partial bands 40, 42) are configured in a manner that seeks to allow the right receptacle 30 to become automatically reconfigured to the relatively widely open configuration (e.g., shown in dashed lines in Fig. 4) in response to predetermined forces, so that the attachment apparatus is detachable from the user's fingers, or the like, in the case of an emergency, for example if the electronic device becomes caught in moving parts of machinery or otherwise becomes undesirably stuck. That is, the receptacles 30, 32, partial bands 40, 42 and/or other features of the attachment apparatus can be elastically configured to provide a "breakaway" feature for allowing the attachment apparatus to be readily detachable from the user's fingers.

[0042] In accordance with the embodiment depicted in the drawings, the attachment apparatus is configured so that, when the respective portions of the fingers are fully inserted into the inner areas 36, 38, the inner surfaces of the partial bands 40, 42 substantially encompass and securely engage the exterior of the portions of the finger therein, so that the

user can hold and securely stabilize the electronic device 20 by way of support structure 26. In the embodiment depicted in the drawings, the thumb of the hand with fingers in the inner areas 36, 38 is proximate the pushbutton 74, so that the thumb can be used to press or otherwise actuate the pushbutton or other suitable switch mechanism. The receptacles 30, 32 are configured in a manner that seeks to allow the user to simultaneously: press or otherwise actuate the pushbutton 74, or the like; and hold and securely stabilize the electronic device 20 by way of support structure 26.

[0043] As one example, the attachment apparatus is constructed of elastic material so that there can be a range of substantially closed configurations (e.g., in which the user's fingers are substantially encompassed and securely engaged by the right receptacle 30 for differently sized users' fingers. For example, the right receptacle 30 defines an expandable, substantially cylindrical shape (e.g., inner area 36) having an inner diameter that can range from about 15.5 mm to about 28 mm (which approximately corresponds to U.S. ring sizes ranging from about 5 to about 20) so as to substantially encompass and securely engage differently sized fingers. When the partial bands 40, 42 are expanded or forced outward to accommodate a larger finger or ring size, the gap between the free ends of the partial bands typically remains small enough so that the inner surfaces of the partial bands 40, 42 continue to substantially encompass and securely engage the exterior of the portion of the finger in the inner area 36, so that the user can hold and securely stabilize the electronic device 20 by way of support structure 26. In contrast, in the relatively widely open configuration, the gap between the free ends of the partial bands 40, 42 becomes sufficiently large so

that the fingers can freely pass through the gap between the free ends of the partial bands and exit the inner area 36.

[0044] Reiterating from above, the attachment apparatus, or at least portions of the receptacles 30, 32, can be formed from, or otherwise comprise, elastic material and/or comprise other suitable biasing mechanisms (e.g., springs) so that the right receptacle is biased toward the relaxed, substantially closed configuration. More specifically, the attachment apparatus can be formed from a moldable material in a single mold so that all components of the attachment apparatus are integrally formed and integrally connected to one another. The moldable material can be a suitable elastic rubber material, for example urethane or polyurethane. The rubber material can have a hardness in the range from about Shore 70A to about Shore 90A, preferably (e.g., optionally) with a hardness of about Shore 80A. It is believed that such a hardness can provide sufficiently secure attachment to fingers or gloved fingers within the ranges of ring sizes of 5 to 20. It is believed that such hardness can provide a reasonably tight enough fit to securely mount the attachment apparatus to a suitable range of finger sizes, without causing discomfort to the user. It is believed that such hardness would allow expansion to various ring sizes and also enable the breakaway feature. Also, the rubber material of the attachment apparatus may be more easily cleaned as compared, for example, to at least some fabric materials.

[0045] At least partially reiterating from above, in substantially closed configuration of the embodiment depicted in the drawings, the right receptacle 30 can define an expandable, substantially cylindrical shape (e.g., inner areas 36) that has an inner diameter that can range from about 15.5

mm to about 28 mm, which approximately corresponds to U.S. ring sizes ranging from about 5 to about 20. When the extension members or partial bands 40, 44 (e.g., C-bands) are expanded or forced outward to accommodate a larger finger or ring size, the respective surfaces of the partial bands 40, 44 continue to substantially encompass and securely engage the exterior of the portions of the fingers therein, so that the user can hold and securely stabilize the electronic device 20 by way of support structure 26. In contrast, when a force of predetermined magnitude is applied that is sufficient to cause reconfiguration of the attachment apparatus into the relatively widely open configuration, gaps between the free ends of the partial bands 40, 44 become sufficiently large so that the finger can freely pass through the gap (e.g., widely formed opening to the inner area 36) and exit the inner area.

[0046] In the substantially closed configuration of the embodiment depicted in the drawings, the inner partial band 44 extends from the support structure 26 in an arcuate, counter-clockwise direction so that an arcuate, concave inner surface of the inner partial band extends partially around and at least partially defines the right inner area 36. For the embodiment depicted in the drawings, the outer partial band 40 extends in an arcuate, clockwise direction, so that the inner surface of the outer partial band extends partially around the inner partial band 44, and an elongate gap can be defined between the adjacent inner and outer surfaces of the inner and outer partial bands.

[0047] In the substantially closed configuration of the embodiment depicted in the drawings, the outer partial band 40 at least partially surrounds the inner partial band 44, so

that the outer partial band 40 peripherally overlaps the inner partial band 44 along an arc.

[0048] The outer partial band 40 and inner partial band 44 define an expandable, substantially cylindrical shape having an inner circumference that can range from about 50mm to about 88mm, which approximately corresponds to U.S. ring sizes ranging from 5 to 20. When the outer partial band 40 and inner partial band 44 are expanded or forced outward to accommodate a larger finger or ring size, the partial bands 40, 44 may be positioned such that the free end of the inner partial band 44 is more closely proximate to, substantially aligned with and/or adjacent the free end of the outer partial band 40. In one possible example of this configuration, the partial bands 40, 44 may have no radially overlapping sections with respect to one another.

[0049] At a maximum ring size (e.g., a ring size of 20, which has an inner circumference of about 88.2 mm), the partial bands 40, 44 may be expanded to a maximum ring size for accommodating a relatively large finger.

[0050] A gap formed between the free ends of the partial bands 40, 44 can be formed and farther expanded to provide the relatively widely open configuration of the right receptacle 30 and, thus, allow the user to remove the attachment apparatus in a breakaway fashion. This breakaway feature typically includes pulling the user's finger in a radial direction to create or widen a gap between the free ends of the partial bands 40, 44 that is large enough for the respective finger to pass through the gap. The attachment apparatus is configured to provide adequate attachment force to the user's fingers at the maximum radius ring and yet allows a sufficient gap to be created between the free ends

of the partial bands 40, 44 to enable the attachment apparatus to break away, if needed, when a predetermined force is applied in a radially outward direction.

[0051] When the attachment apparatus is in the normal, relaxed (e.g., non-strained), substantially closed configuration, the outer partial band 40 has an inner radius that can be greater than an outer radius of the inner partial band 44.

[0052] In the embodiment depicted in the drawings, the left receptacle 32 comprises a recess 38 (e.g., hole) defined by an arcuate, concave surface portion 94 of the outer surface of the inner partial band 44. In the example of Fig. 3, the surface portion 94 can curve about an axis (e.g., axis of curvature 96) that extends along, or more specifically can extend parallel to, the axis 80 or elongate center point 82 of the inner area 36 of the right receptacle 30. While the electronic device 20 is in its vertical or upright configuration shown in Fig. 3, the axes 80, 96 can extend in or substantially extend in the same horizontal plane and be horizontally or substantially horizontally spaced apart from one another.

[0053] Referring to Figs. 1-3, the concave surface portion 94 of the outer surface of the inner partial band 44 can be positioned between and contiguous with convex surface portions 98 of the outer surface of the inner partial band 44 surface. The concave surface portion 94 of the outer surface of the inner partial band 44 and the adjacent arcuate, concave inner surface 100 of the inner partial band 44 can be adjacently configured with respect to one another to define an area of relatively narrow thickness (e.g., neck 102) positioned between the opposite ends of the inner partial band 44.

[0054] The free end 49 of the right or outer partial band 40 (e.g., extension member) can be positioned below, or more specifically beneath, the concave surface portion 94 of the outer surface of the inner partial band 44, so that: the right or outer partial band 40 extends only partially around the inner partial band 44 and the recess 38 is substantially not covered by (e.g., is substantially unobstructed by) the outer partial band; and/or the free end 49 of the right or outer partial band 40 is proximate or adjacent the concave surface portion 94 of the outer surface of the inner partial band 44 and, thus, the free end 49 of the right or outer partial band 40 can at least partially define a portion of the left receptacle 32.

[0055] Figs. 1-3 depict, and solid lines in Fig. 4 depict, the attachment apparatus of the embodiment depicted in the drawings in a substantially closed configuration. Dashed lines in Fig. 4 schematically illustrate what is believed to be a possible, schematic, non-limiting example of the receptacles 30, 32 in a relatively widely open configuration, for allowing digits 104 (e.g., fingers) to freely exit the receptacles 30, 32 in the emergency removal direction 34. The emergency removal direction 34 can extend crosswise to, or more specifically can be perpendicular to, a direction in which the digits 104 can be inserted into the receptacles 30, 32. It is believed that the inner partial band 44 of the embodiment depicted in the drawings (including, for example, one or more of its concave surface portion 94, axis of curvature 96, convex surface portions 98, concave inner surface 100 and/or neck 102) can be included in place of the intermediate rib member 44 of the first embodiment and the

inner partial bands 44 of the second through fourth embodiments.

[0056] Other embodiments are within the scope of this disclosure. For example, the electronic devices 20 can be configured so that the switch mechanisms 72 are in different locations and/or the electronic devices 20 can include two (or more) oppositely positioned switch mechanisms 72 so that the electronic devices 20 can have right-handed and/or left-hand configurations.

* * *

[0057] To supplement the present disclosure, this application incorporates entirely by reference the following commonly assigned patents, patent application publications, and patent applications:

[0058] U.S. Patent No. 6,832,725; U.S. Patent No. 7,128,266;

[0059] U.S. Patent No. 7,159,783; U.S. Patent No. 7,413,127;

[0060] U.S. Patent No. 7,726,575; U.S. Patent No. 8,294,969;

[0061] U.S. Patent No. 8,317,105; U.S. Patent No. 8,322,622;

[0062] U.S. Patent No. 8,366,005; U.S. Patent No. 8,371,507;

[0063] U.S. Patent No. 8,376,233; U.S. Patent No. 8,381,979;

[0064] U.S. Patent No. 8,390,909; U.S. Patent No. 8,408,464;

[0065] U.S. Patent No. 8,408,468; U.S. Patent No. 8,408,469;

[0066] U.S. Patent No. 8,424,768; U.S. Patent No. 8,448,863;

[0067] U.S. Patent No. 8,457,013; U.S. Patent No. 8,459,557;

[0068] U.S. Patent No. 8,469,272; U.S. Patent No. 8,474,712;

[0069] U.S. Patent No. 8,479,992; U.S. Patent No. 8,490,877;

[0070] U.S. Patent No. 8,517,271; U.S. Patent No. 8,523,076;

- [0071] U.S. Patent No. 8,528,818; U.S. Patent No. 8,544,737;
- [0072] U.S. Patent No. 8,548,242; U.S. Patent No. 8,548,420;
- [0073] U.S. Patent No. 8,550,335; U.S. Patent No. 8,550,354;
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[00453] U.S. Patent Application No. 14/735,717 for INDICIA-READING SYSTEMS HAVING AN INTERFACE WITH A USER'S NERVOUS SYSTEM filed June 10, 2015 (Todeschini);

[00454] U.S. Patent Application No. 14/738,038 for METHOD OF AND SYSTEM FOR DETECTING OBJECT WEIGHING INTERFERENCES filed June 12, 2015 (Amundsen et al.);

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[00458] U.S. Patent Application No. 14/743,257 for WIRELESS MESH POINT PORTABLE DATA TERMINAL filed June 18, 2015 (Wang et al.);

[00459] U.S. Patent Application No. 29/530,600 for CYCLONE filed June 18, 2015 (Vargo et al.);

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[00461] U.S. Patent Application No. 14/744,836 for CLOUD-BASED SYSTEM FOR READING OF DECODABLE INDICIA filed June 19, 2015 (Todeschini et al.);

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[00463] U.S. Patent Application No. 14/747,197 for OPTICAL PATTERN PROJECTOR filed June 23, 2015 (Thuries et al.);

[00464] U.S. Patent Application No. 14/747,490 for DUAL-PROJECTOR THREE-DIMENSIONAL SCANNER filed June 23, 2015 (Jovanovski et al.); and

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[00466] In the specification and/or figures, examples of embodiments have been disclosed. The present invention is not limited to such exemplary embodiments. Unless otherwise noted, specific terms have been used in a generic and descriptive sense and not for purposes of limitation. The use of the term "and/or" includes any and all combinations of one or more of the associated listed items.

CLAIMS

1. An attachment apparatus for attaching an electronic device to at least one digit of a user, the attachment apparatus comprising:

first and second receptacles that are each configured to releasably receive at least a portion of a respective digit of a user, comprising each of the first and second receptacles being configured to:

at least partially receive the respective digit via relative movement between the receptacle and the respective digit in a first direction, and

release the respective digit via relative movement between the receptacle and the respective digit in a second direction that is crosswise to the first direction.

2. The attachment apparatus according to Claim 7 in combination with the electronic device, wherein:

the electronic device comprises a switch mechanism proximate the first receptacle; and

the first receptacle is positioned between the switch mechanism and the second receptacle.

3. The attachment apparatus according to Claim 1, wherein:

the first receptacle comprises a partial band having an inner surface extending partially around an area configured to at least partially receive the respective digit, and

the second receptacle comprises a recess defined by an outer surface of the partial band, the recess being configured to at least partially receive the respective digit.

4. The attachment apparatus according to Claim 3, wherein the outer surface of the partial band comprises a concave portion, and the concave portion at least partially defines the recess.

5. The attachment apparatus according to Claim 4, wherein:

the partial band is an inner partial band; and

the attachment apparatus further comprises an outer partial band extending only partially around the inner partial band so that the recess is substantially not covered by the outer partial band.

6. The attachment apparatus according to Claim 1, wherein:

the attachment apparatus comprises a support structure configured to support at least a portion of the electronic device; and

the first and second receptacles are each connected to the support structure.

7. The attachment apparatus according to Claim 6, wherein:
the support structure comprises opposite first and second sides;

the first side is configured to have at least a portion of the electronic device positioned proximate the first side of the support structure; and

the first and second receptacles are positioned proximate the second side of the support structure.

8. The attachment apparatus according to Claim 7, wherein:
at least a portion of an electronic device is connected to the first side of the support structure;

the electronic device comprises a switch mechanism proximate the first receptacle; and

the first receptacle is positioned between the switch mechanism and the second receptacle.

9. The attachment apparatus according to Claim 6 in combination with the electronic device, wherein:

the electronic device comprises a switch mechanism proximate the first receptacle; and

the first receptacle is positioned between the switch mechanism and the second receptacle.

10. An attachment apparatus for attaching an electronic device to at least one digit of a user, the attachment apparatus comprising:

support structure;

a partial band extending from the support structure at least partially around an inner area configured to at least partially receive at least a first digit of a user; and

a recess defined by an outer surface of the partial band and configured to at least partially receive at least a second digit of the user,

wherein each of the inner area and the recess is configured to

at least partially receive the respective digit via relative movement between the partial band and the respective digit in a first direction, and

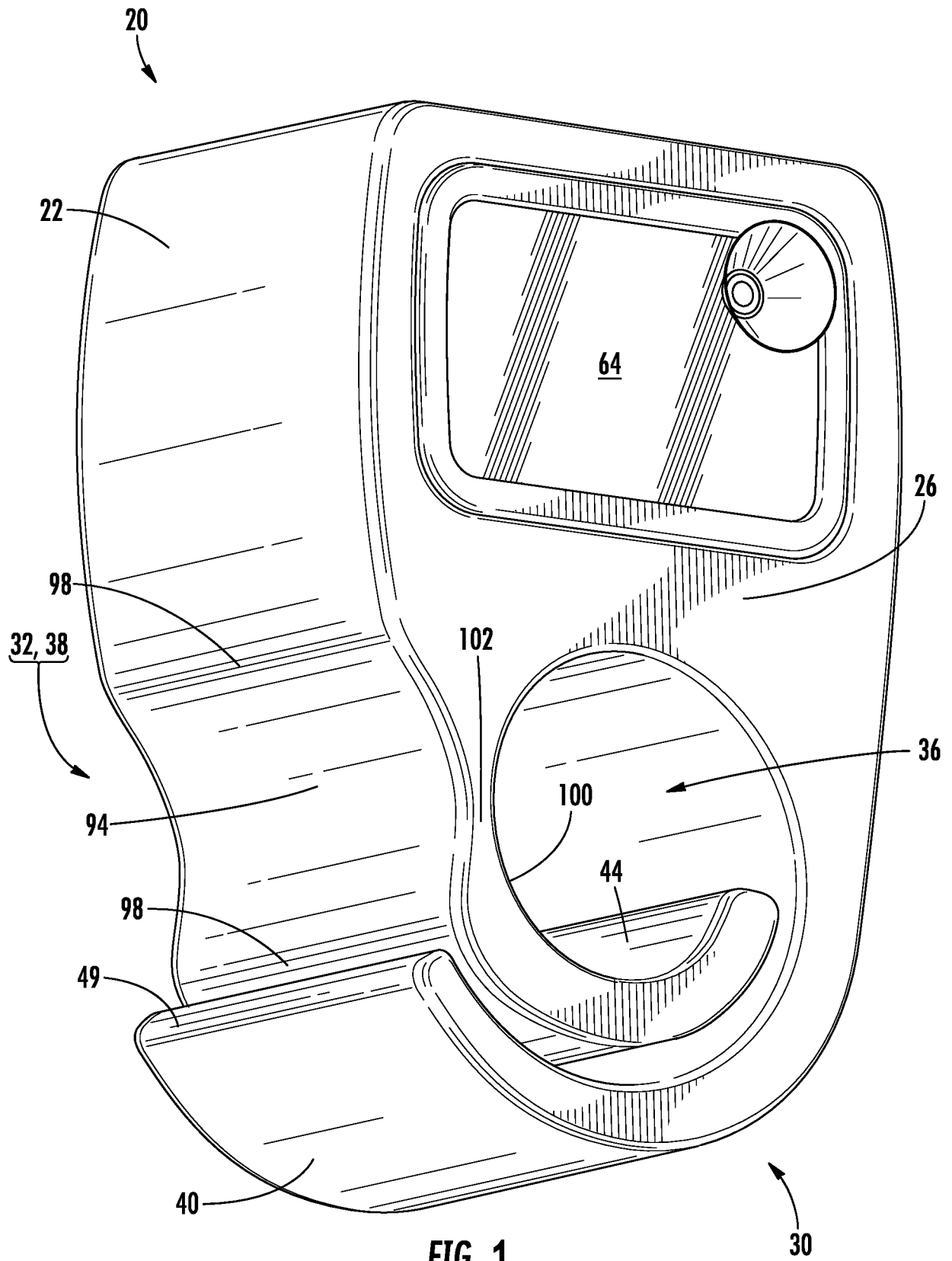
release the respective digit via relative movement between the partial band and the respective digit in a second direction that is crosswise to the first direction.

11. The attachment apparatus according to Claim 10, wherein an outer surface of the partial band comprises a concave portion, and the concave portion at least partially defines the recess.

12. The attachment apparatus according to Claim 10,
wherein:

the partial band is an inner partial band; and

the attachment apparatus further comprises an outer partial
band extending only partially around the inner partial band so
that the recess is substantially not covered by the outer
partial band.



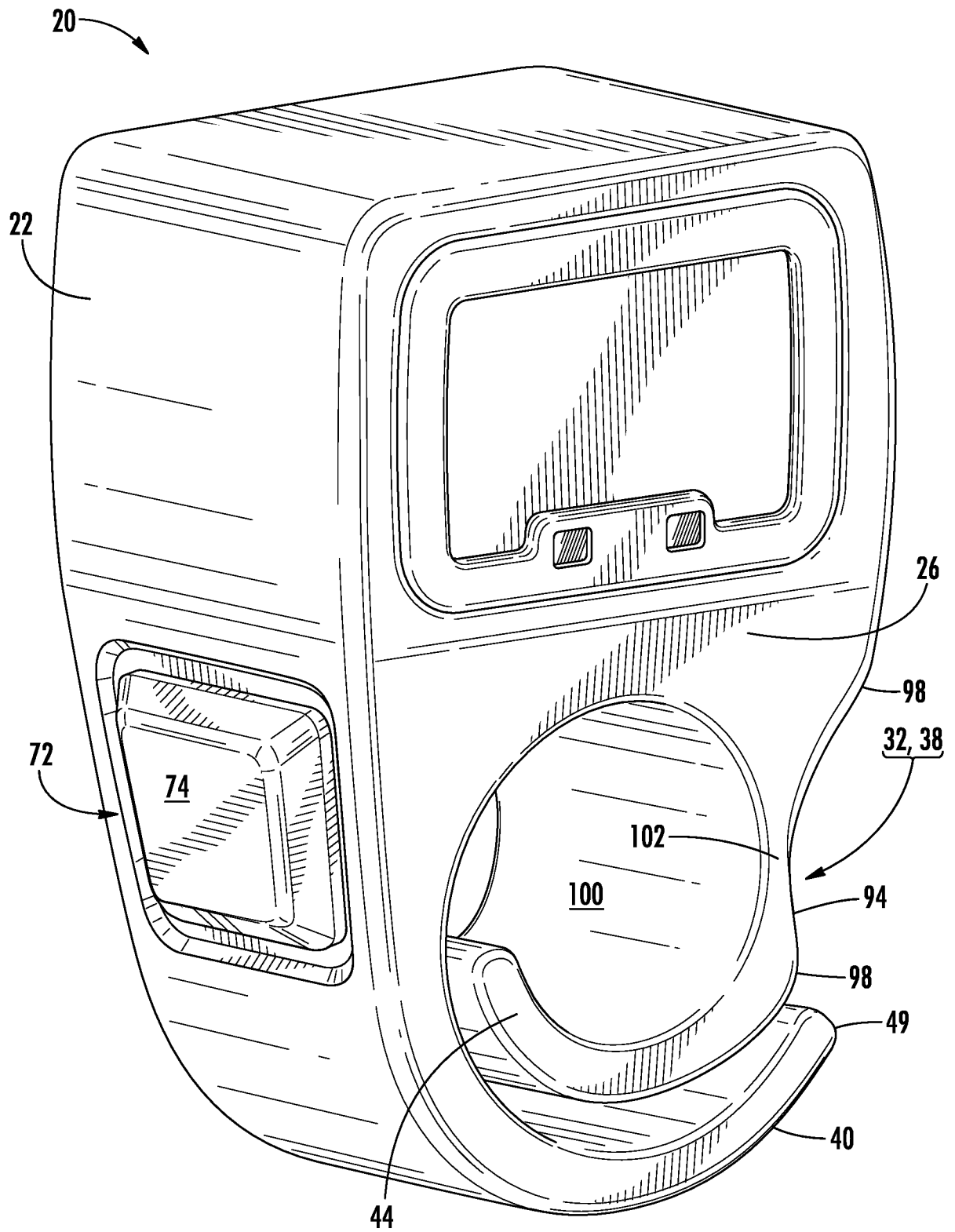


FIG. 2

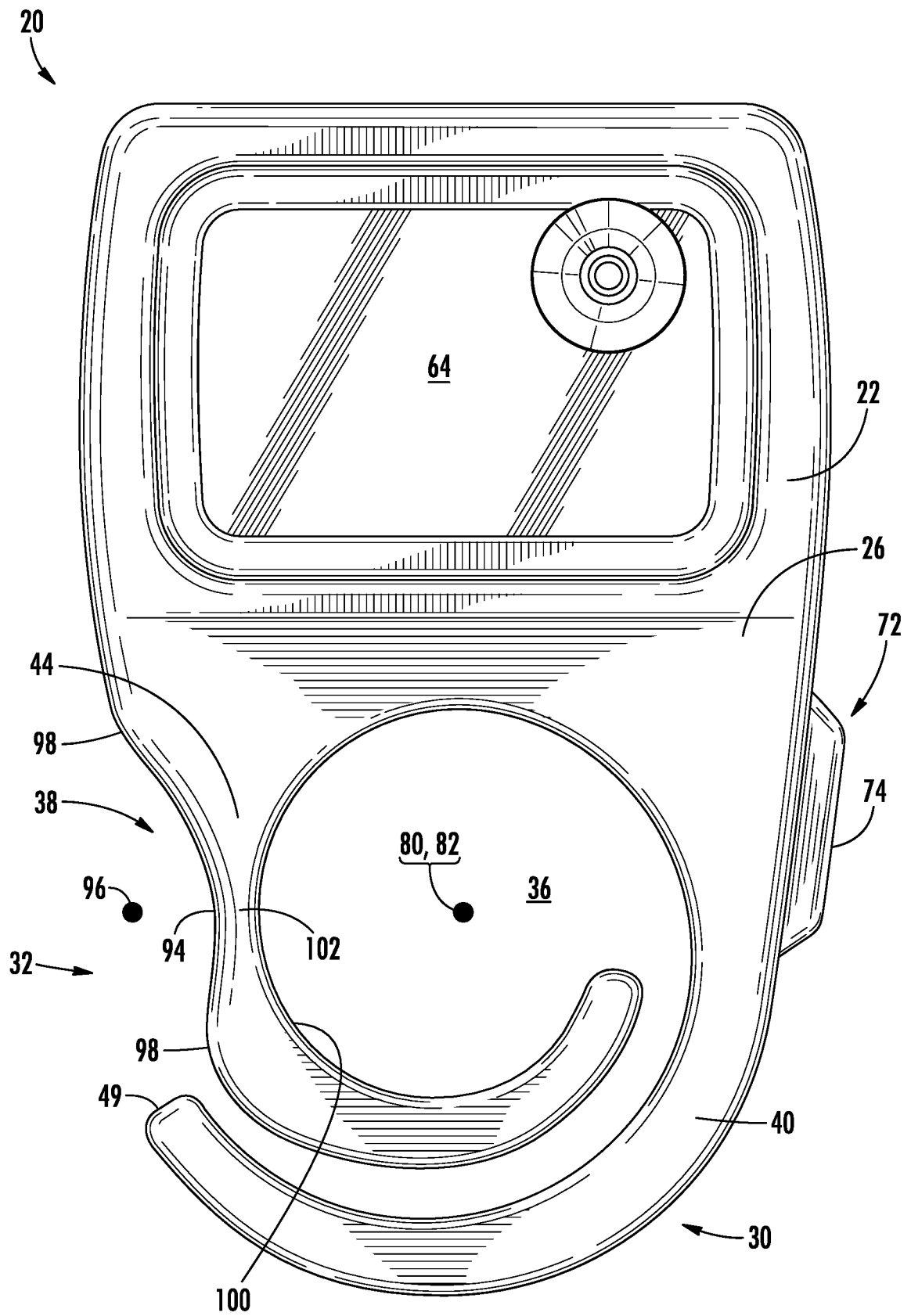


FIG. 3

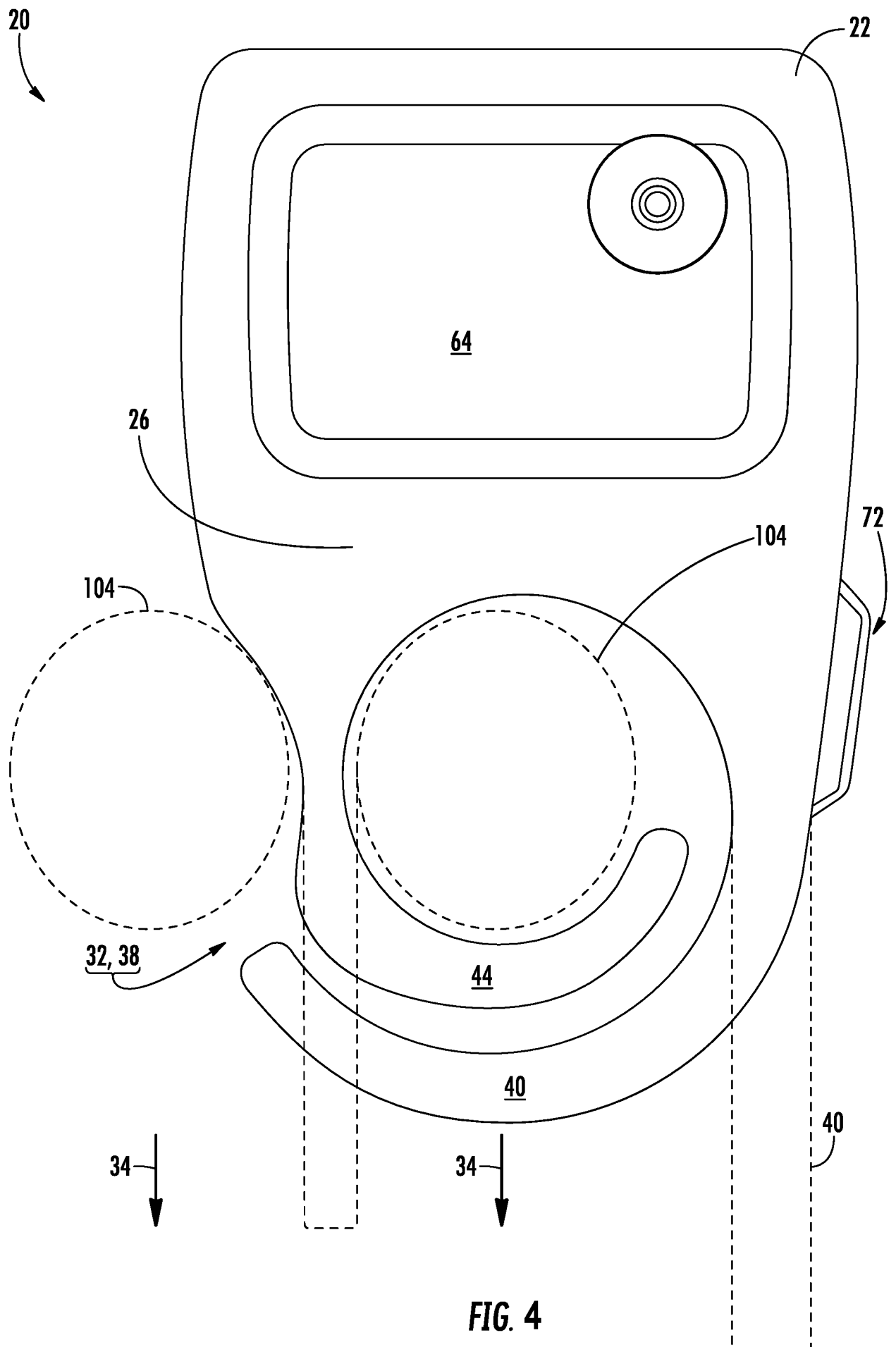


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/082716

A. CLASSIFICATION OF SUBJECT MATTER

G06K 9/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS;VEN:臂挂, 臂, 挂, attachment, 扫描, 扫描仪, finger, 设备, 绑定, 手, free, digit, hand, wrist, 戴, 手持, device, scan, scanner

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 105466564 A (HANGZHOU MEISHENG INFRARED PHOTONICS TEC) 06 April 2016 (2016-04-06) the whole document	1-12
A	US 2007017997 A1 (TALLEY HARRYET AL.) 25 January 2007 (2007-01-25) the whole document	1-12
A	US 2016267310 A1 (PRACTECH INC) 15 September 2016 (2016-09-15) the whole document	1-12
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A	WO 2004052425 A2 (PURGO CREATIONS INC) 24 June 2004 (2004-06-24) the whole document	1-12

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

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

12 January 2018

Date of mailing of the international search report

26 January 2018

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2017/082716

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