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(54) **MOBILE CASTER**

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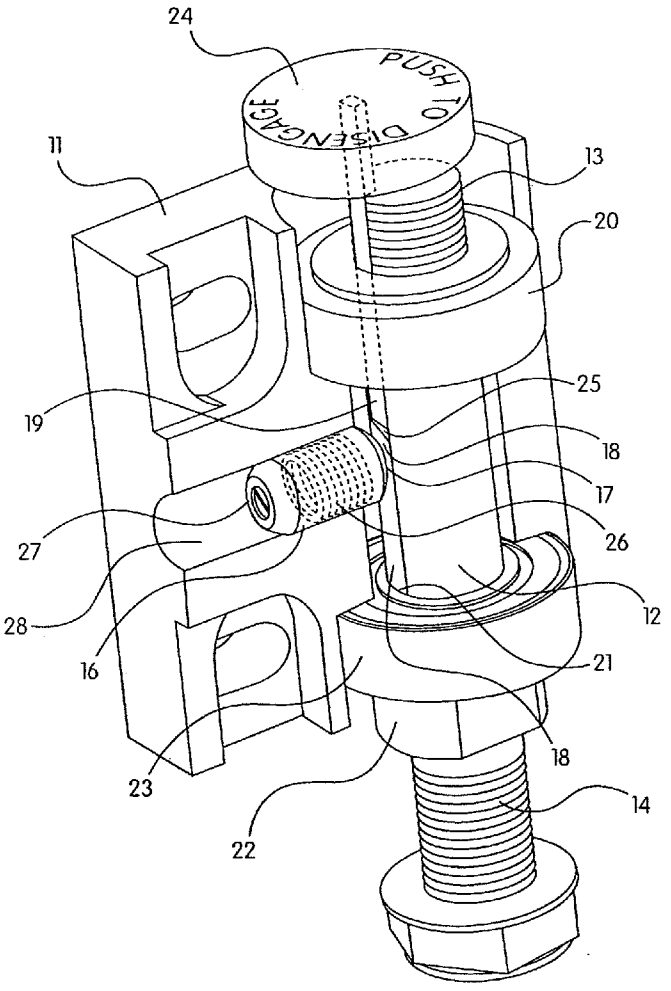
(52) **U.S. Cl.** ..... **16/45**; 16/18 R

(57) **ABSTRACT**

Caster alignment mechanism having a first component operably connected to a leg of a mobile device and a second component operably connected to a caster of the mobile device. The first and second components are positioned in parallel orientation to each other wherein alignment. of the caster with the leg of the mobile device is achieved by the attractive characteristics of the first component with an upper magnet to the second component with a lower magnet. One embodiment of the caster alignment mechanism includes a fixed gap between the upper magnet and the lower magnet for an always engaged or "on" mode. The fixed gap can be adjusted to vary magnetic field strength depending on user specifications for ease of turning. Another embodiment of the caster alignment mechanism includes a switching mechanism to change modes between engaged or "on" mode and disengaged or "off" mode.



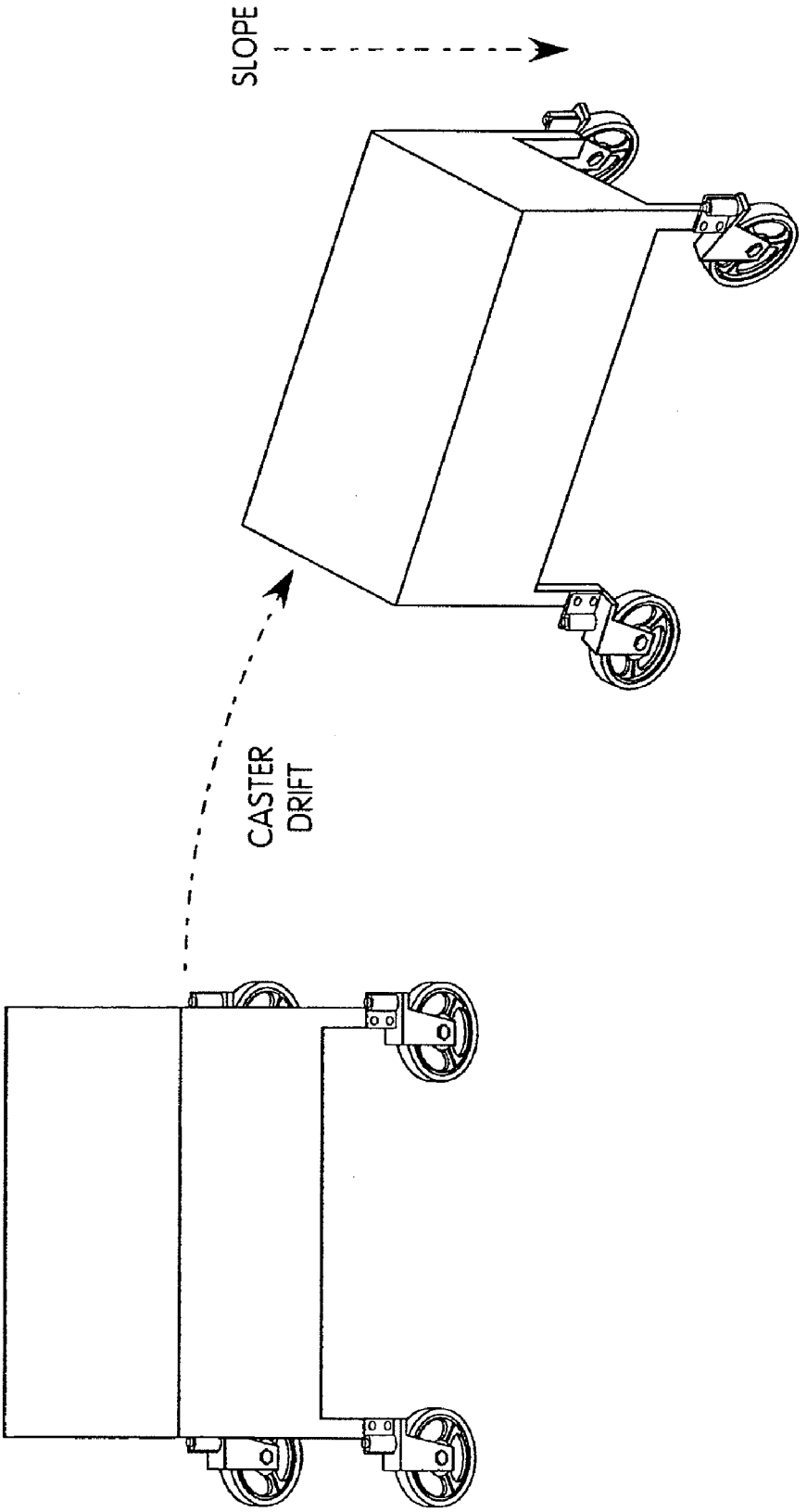


FIG. 1

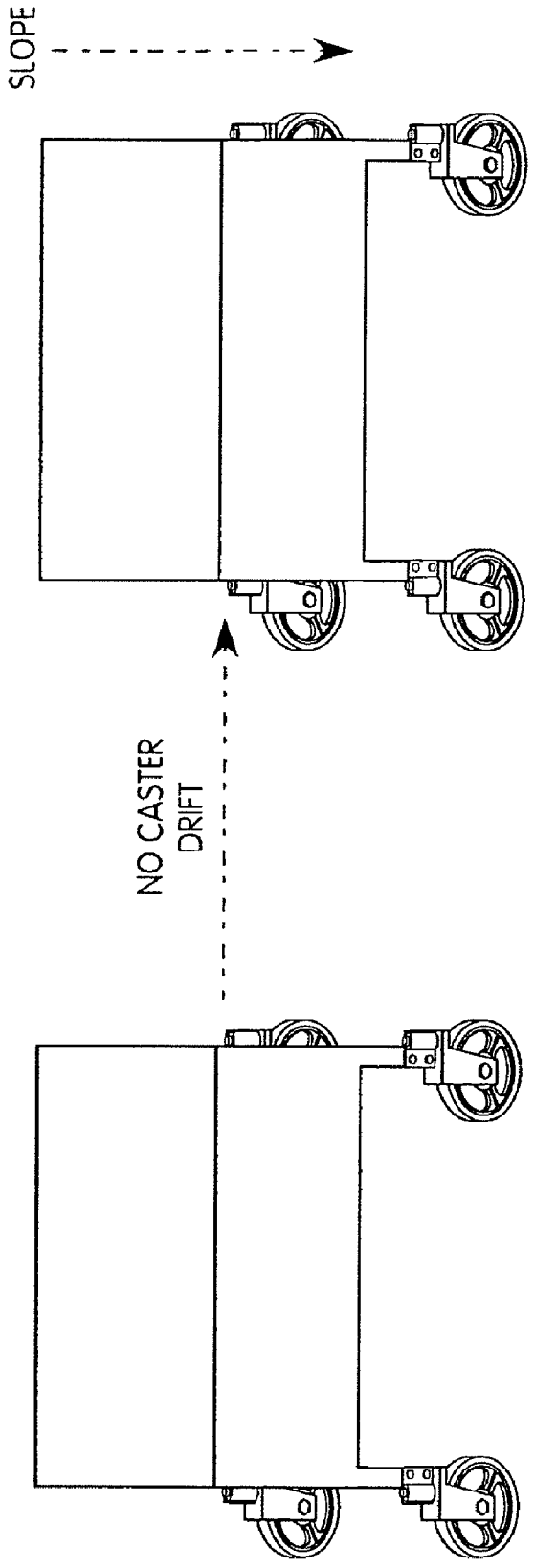


FIG. 2

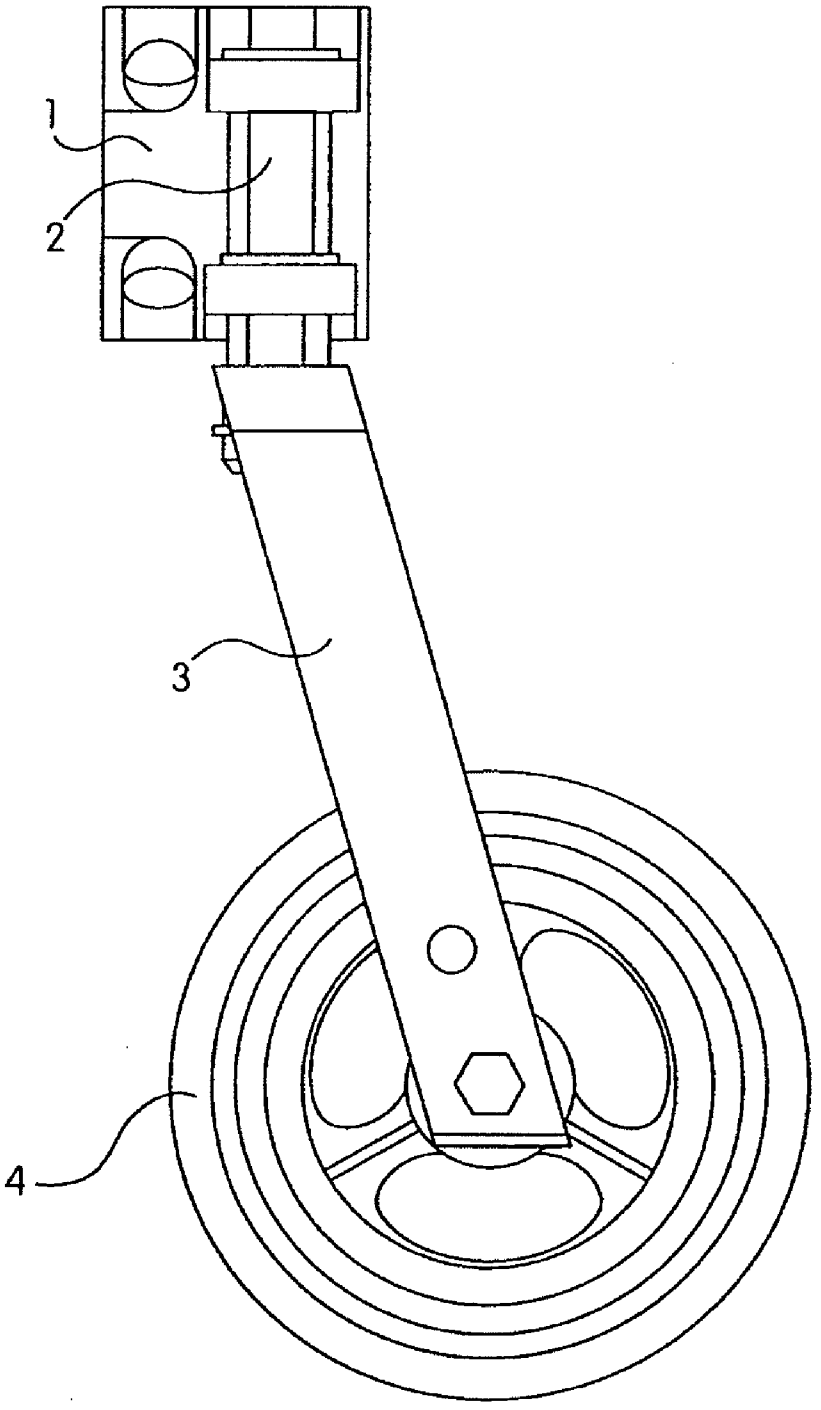


FIG. 3

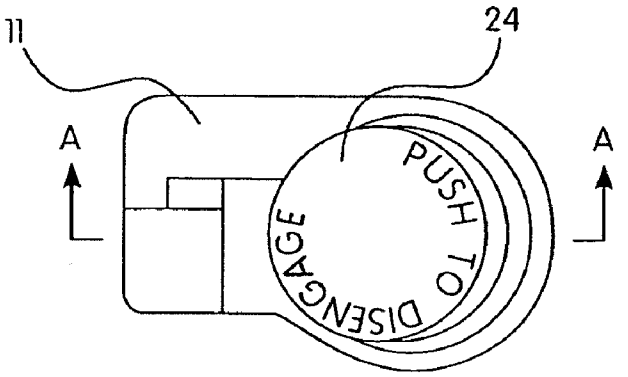


FIG. 4A

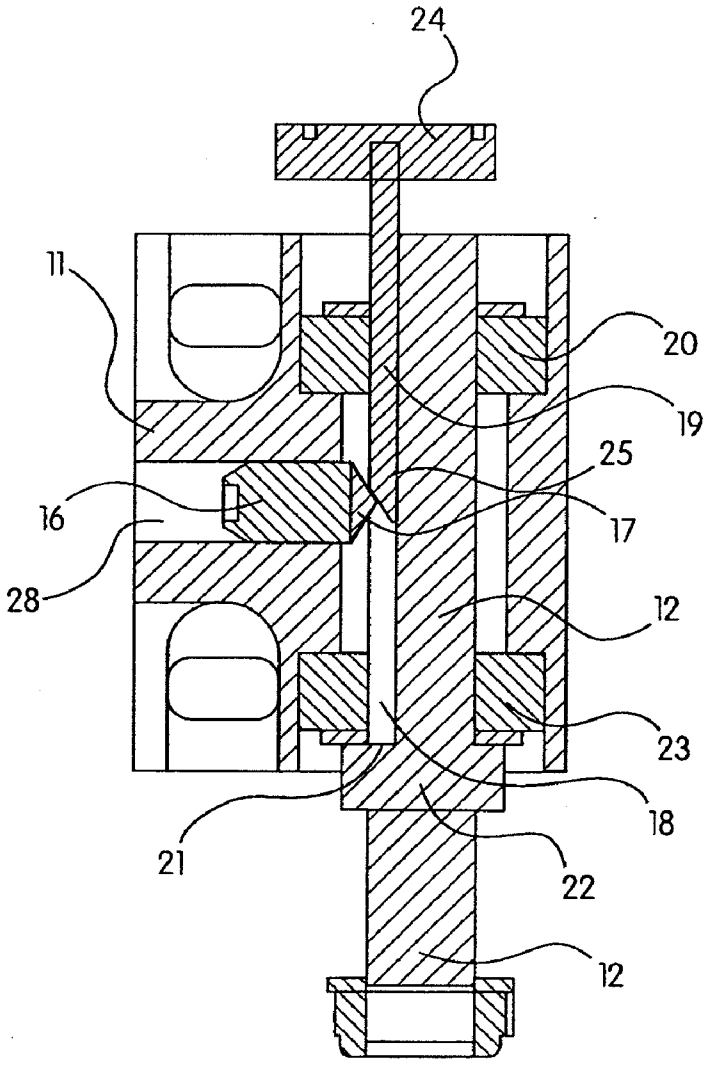
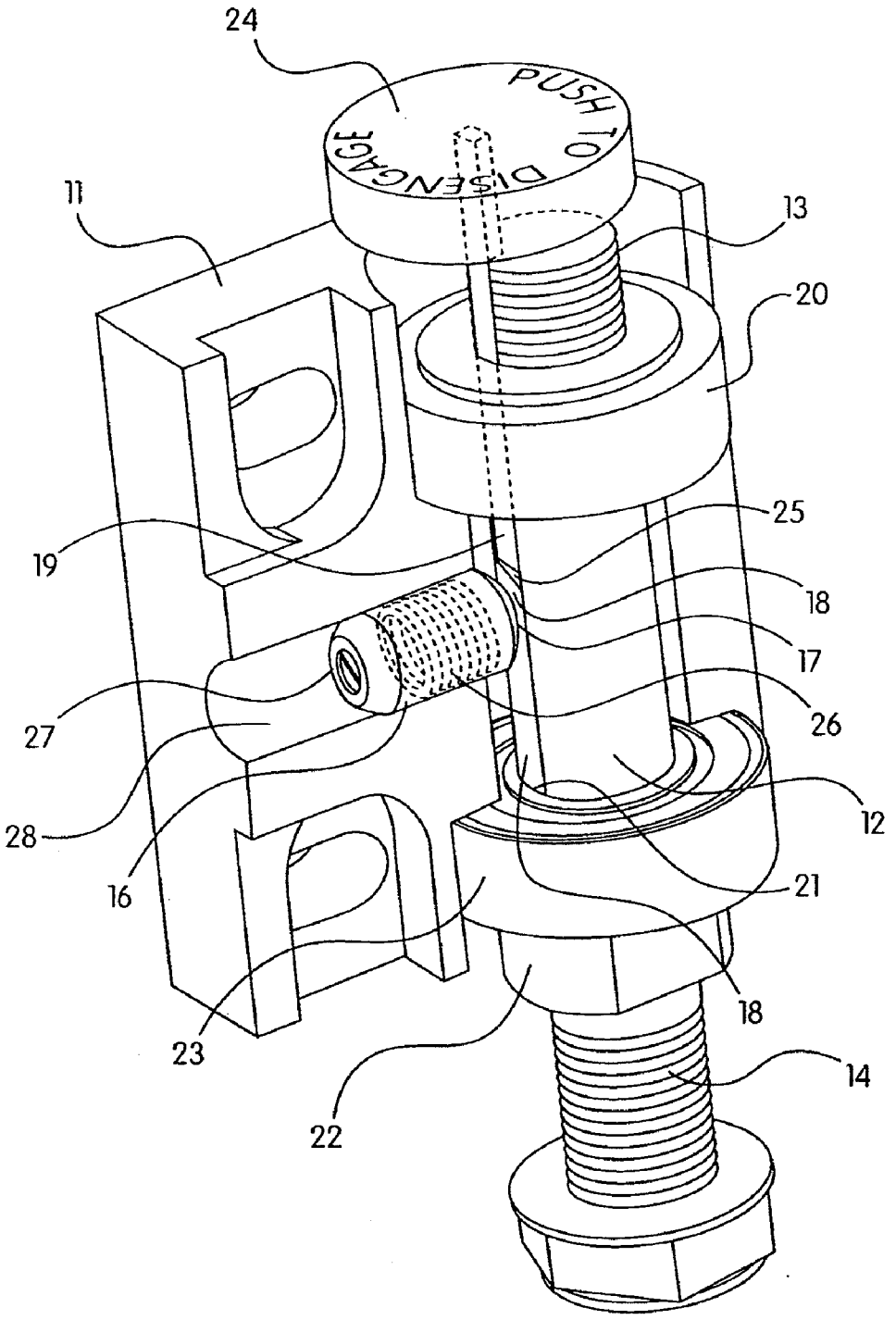


FIG. 4B


24
PUSH TO DISENGAGE
11
13
20
25
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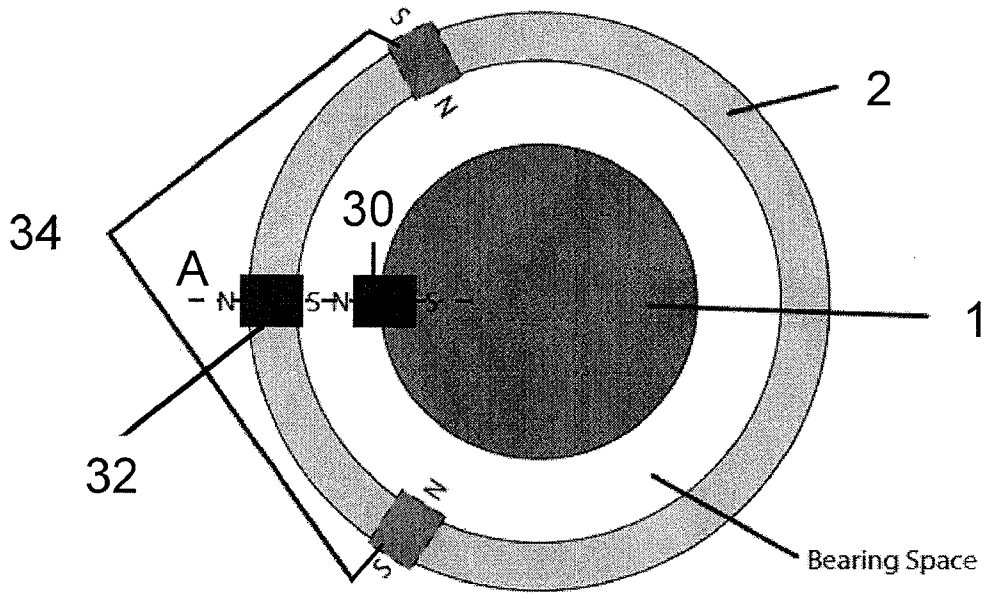
18
17
27
26
28
12
16
21
18
23
14
22

FIG. 5


S
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30
A
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N
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1
32
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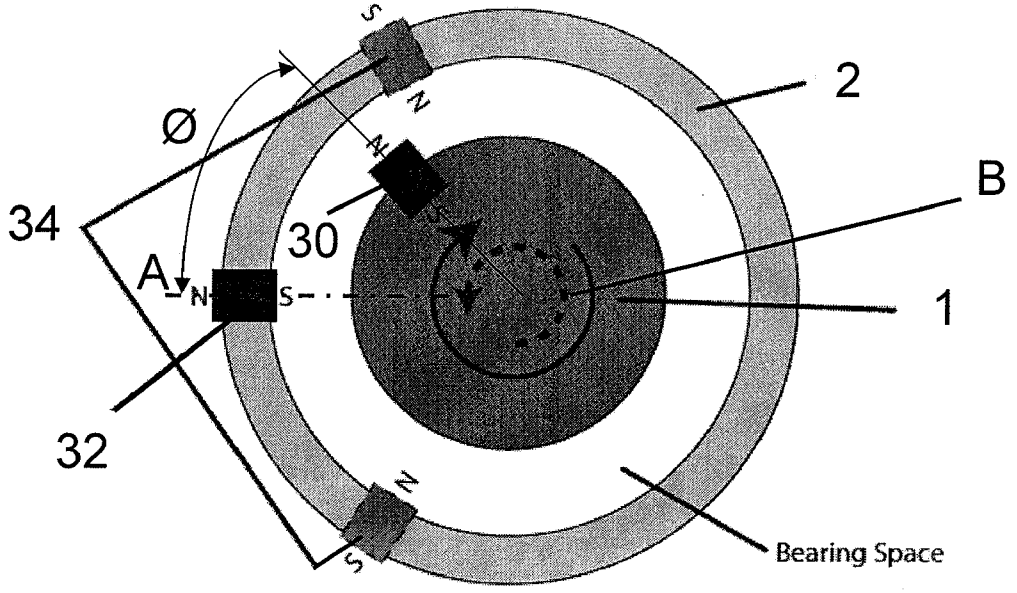
S
Bearing Space

FIG. 6A


S
N
2
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Bearing Space

FIG. 6B

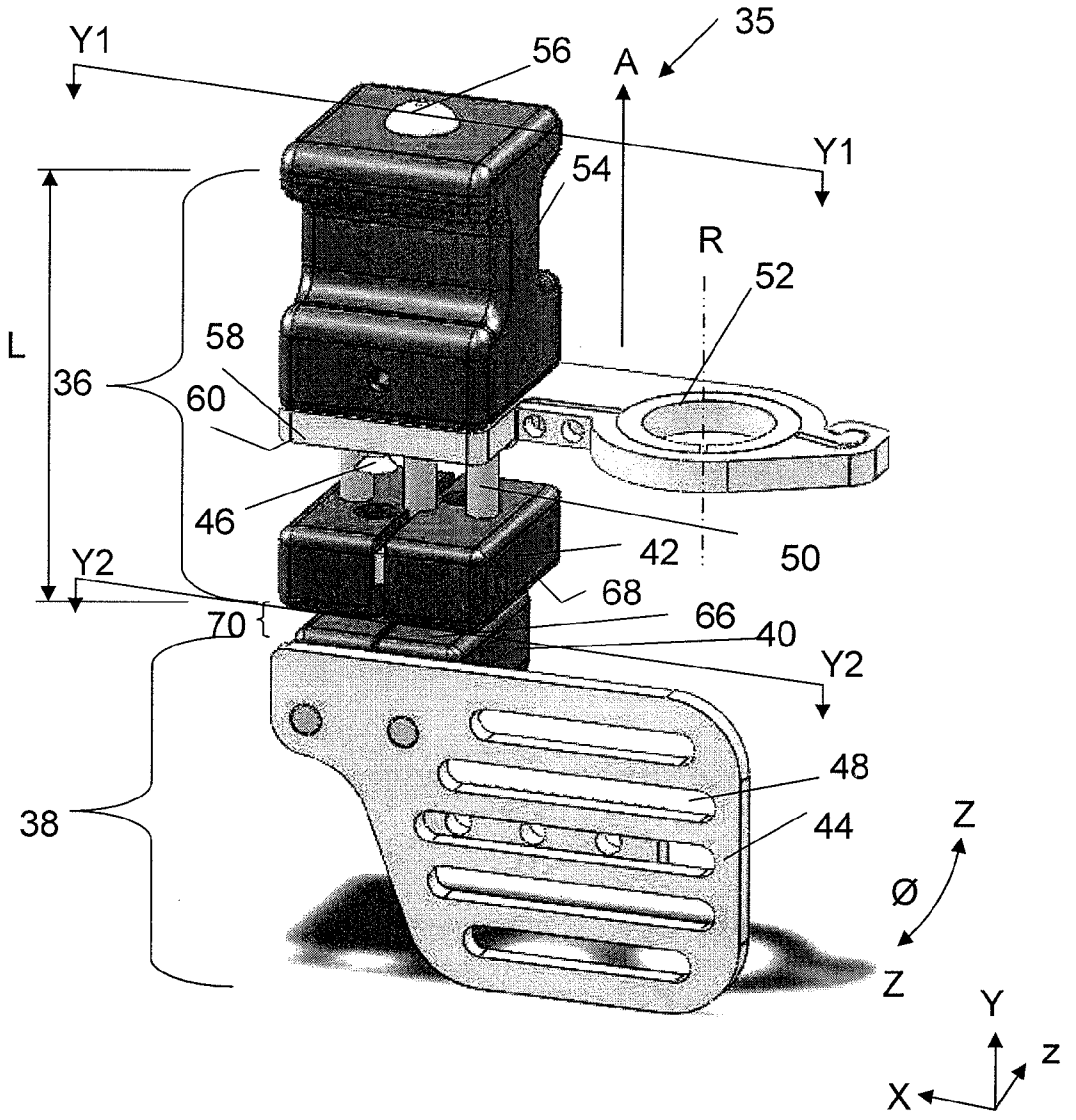
Y1
56
A
35
Y1
54
R
52
L
58
36
60
46
42
50
Y2
68
70
66
40
Y2
48
38
44
Z
Ø
Z
Y
z
X

FIG. 7A

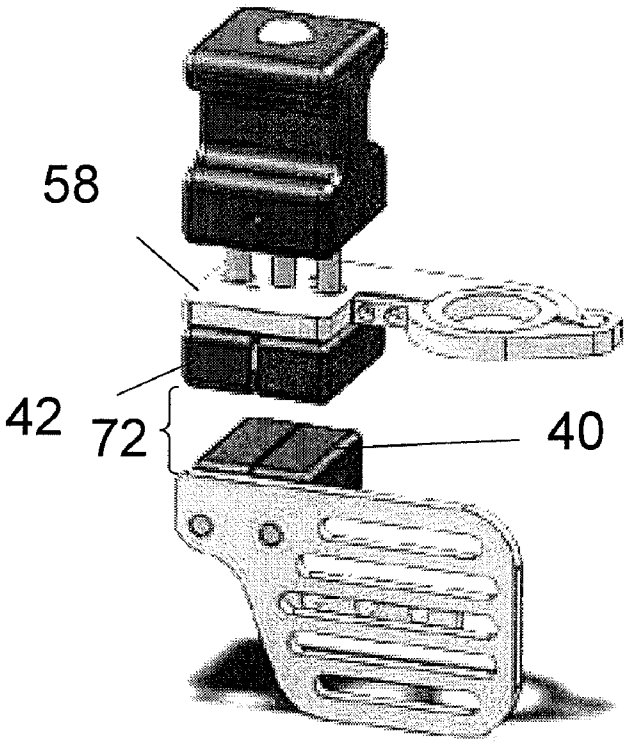

FIG. 7B

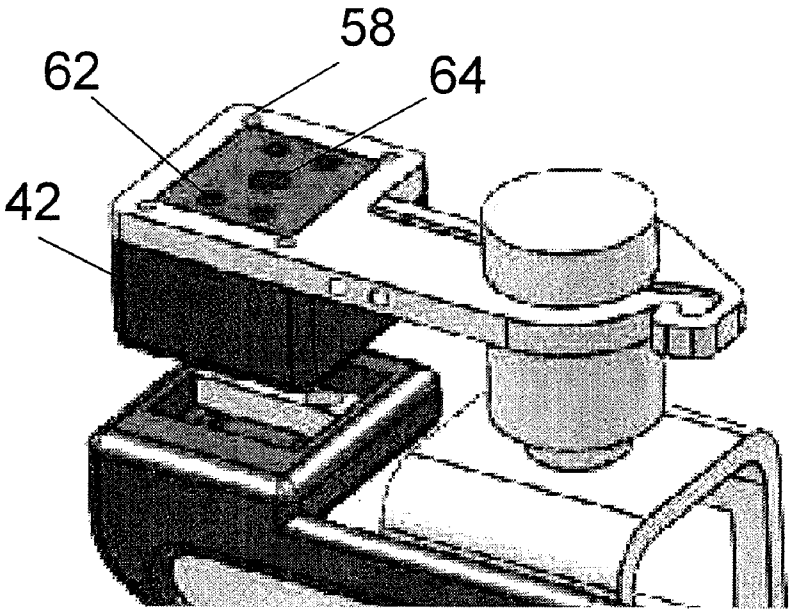

FIG. 7C

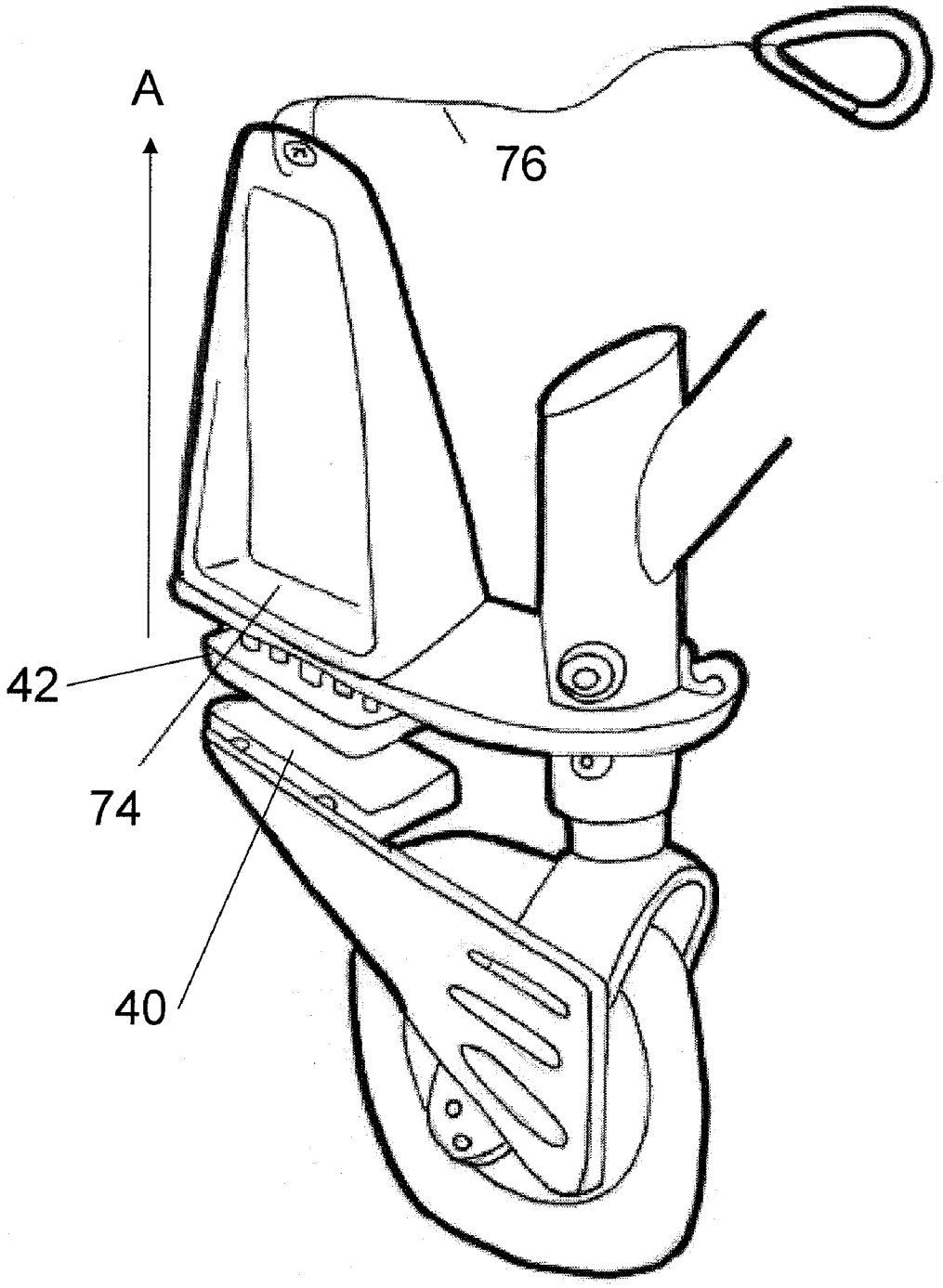

FIG. 8

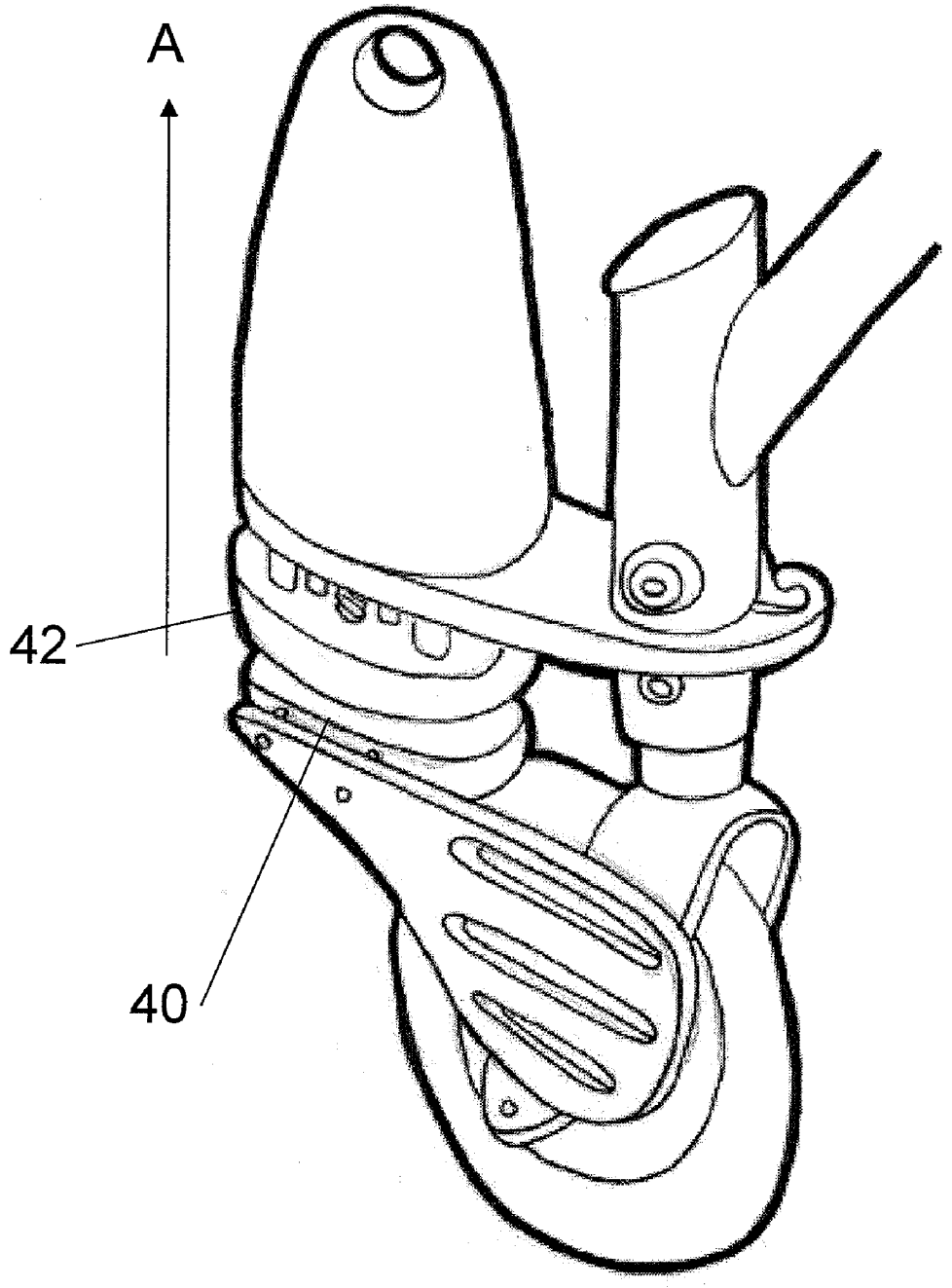

FIG. 9

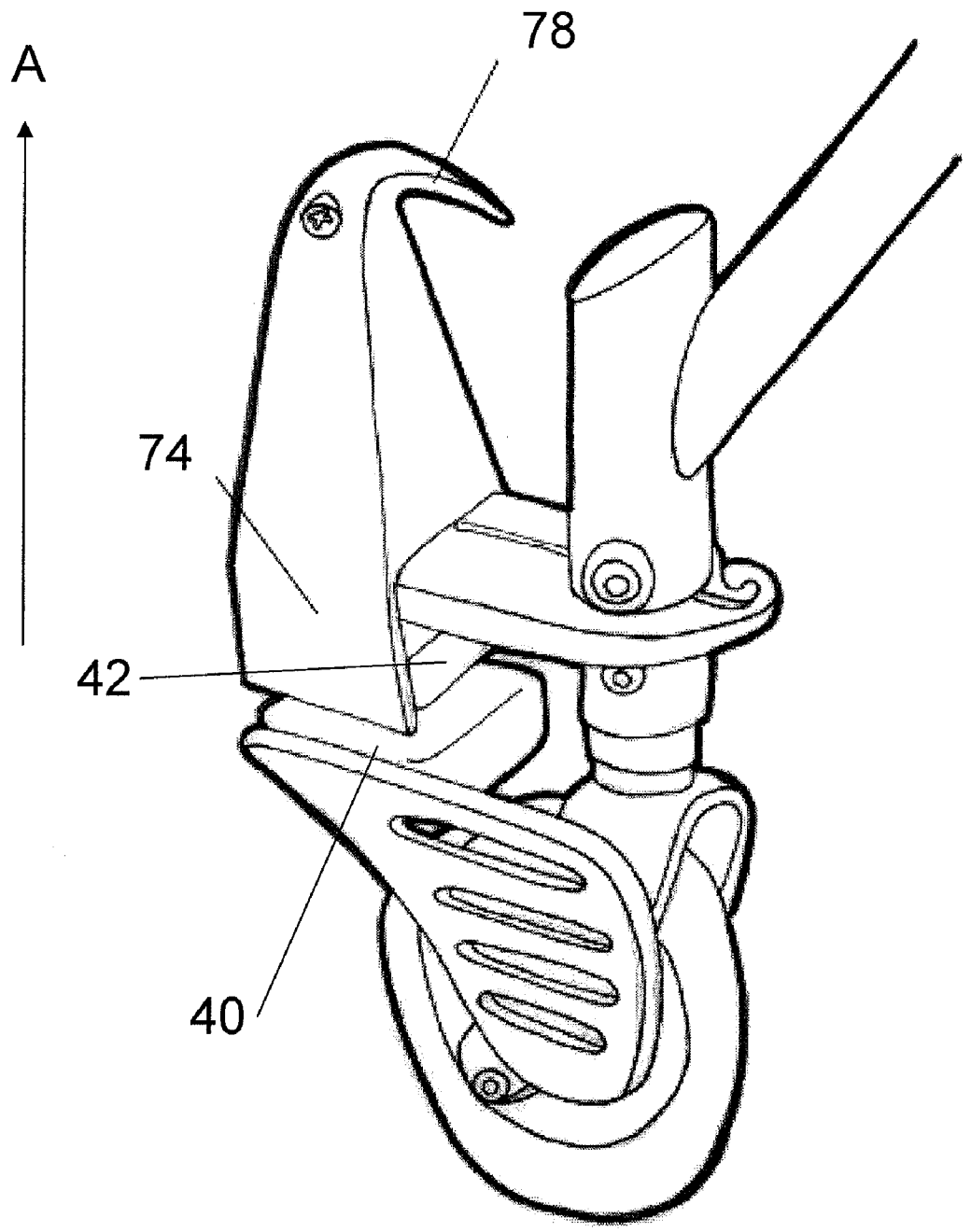

FIG. 10

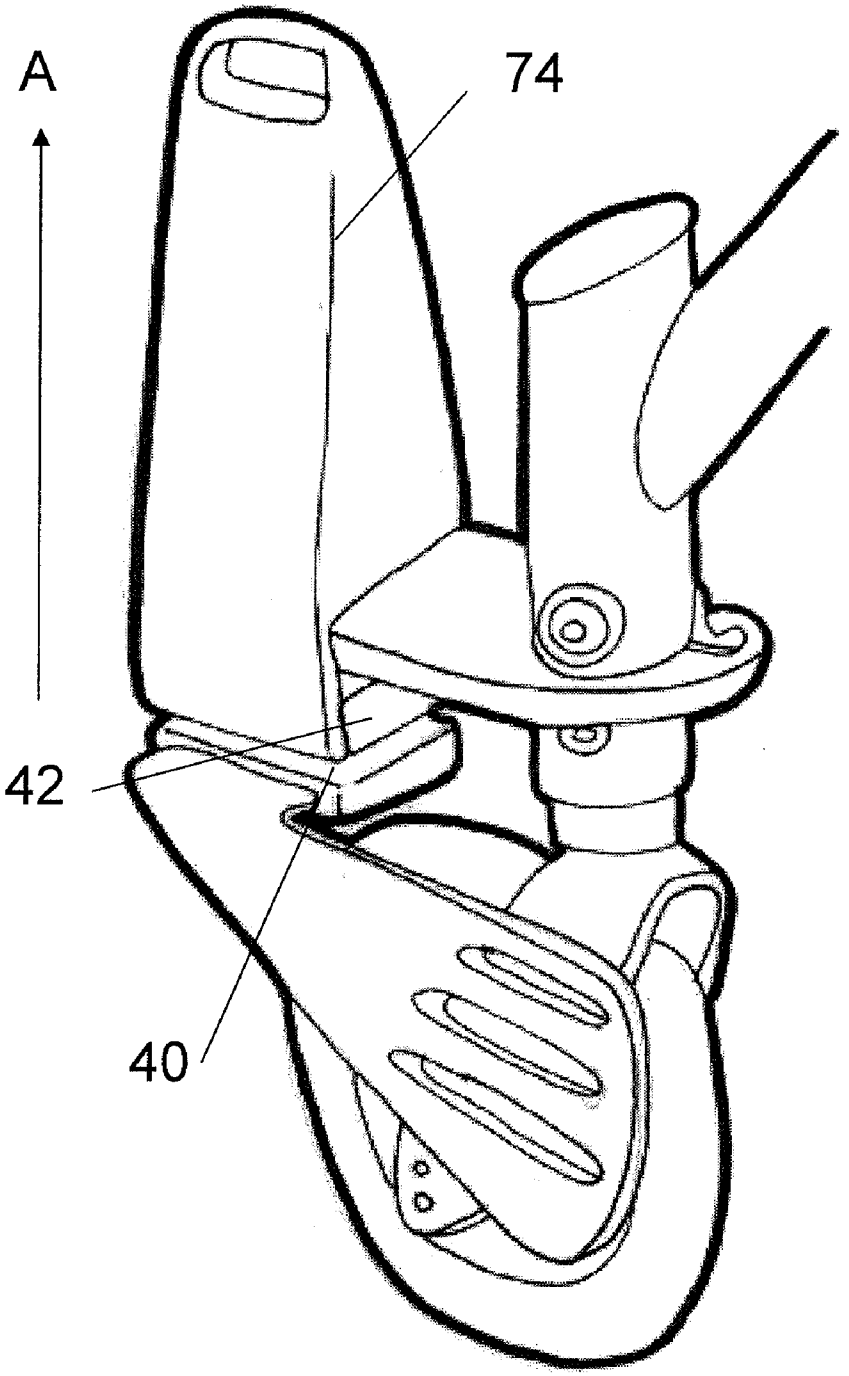

FIG. 11

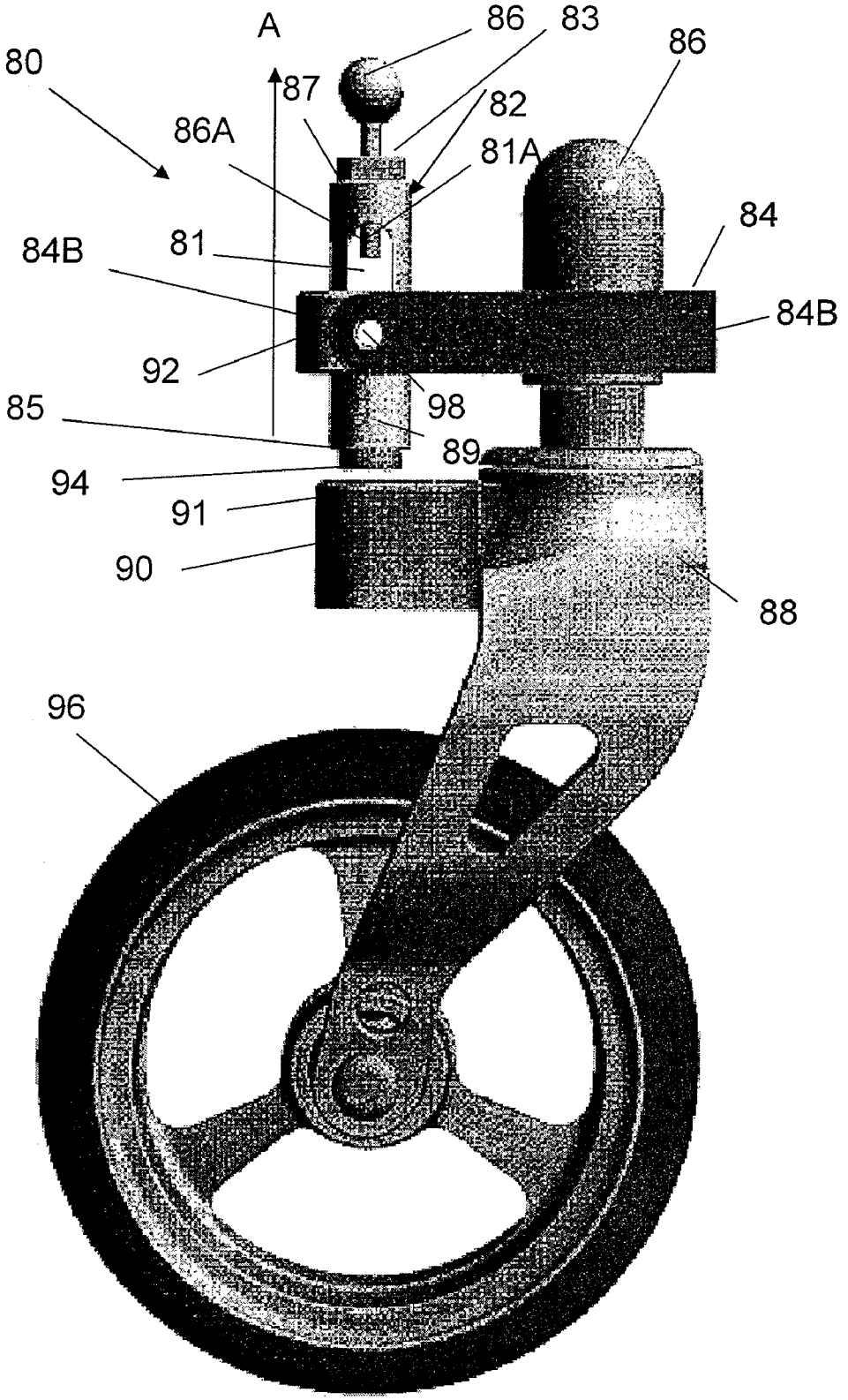

FIG. 12

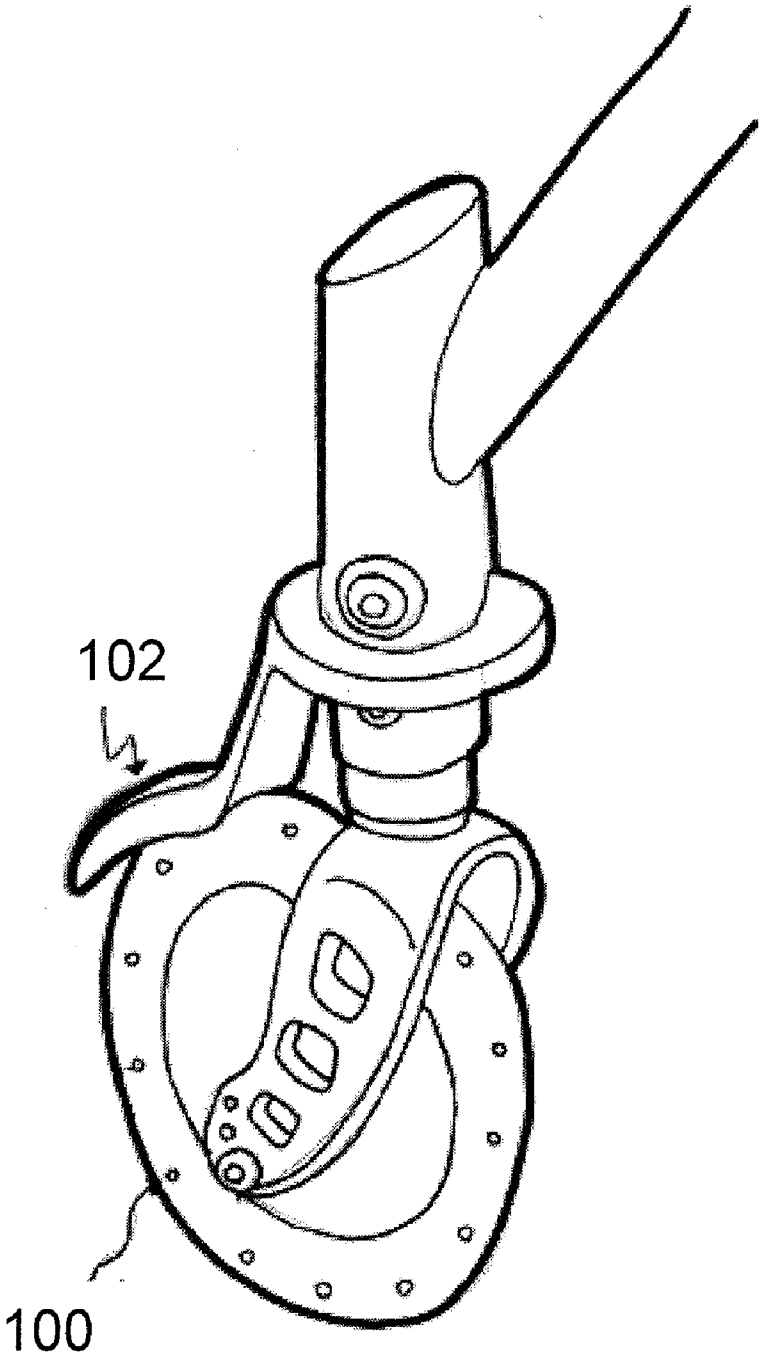

FIG. 13

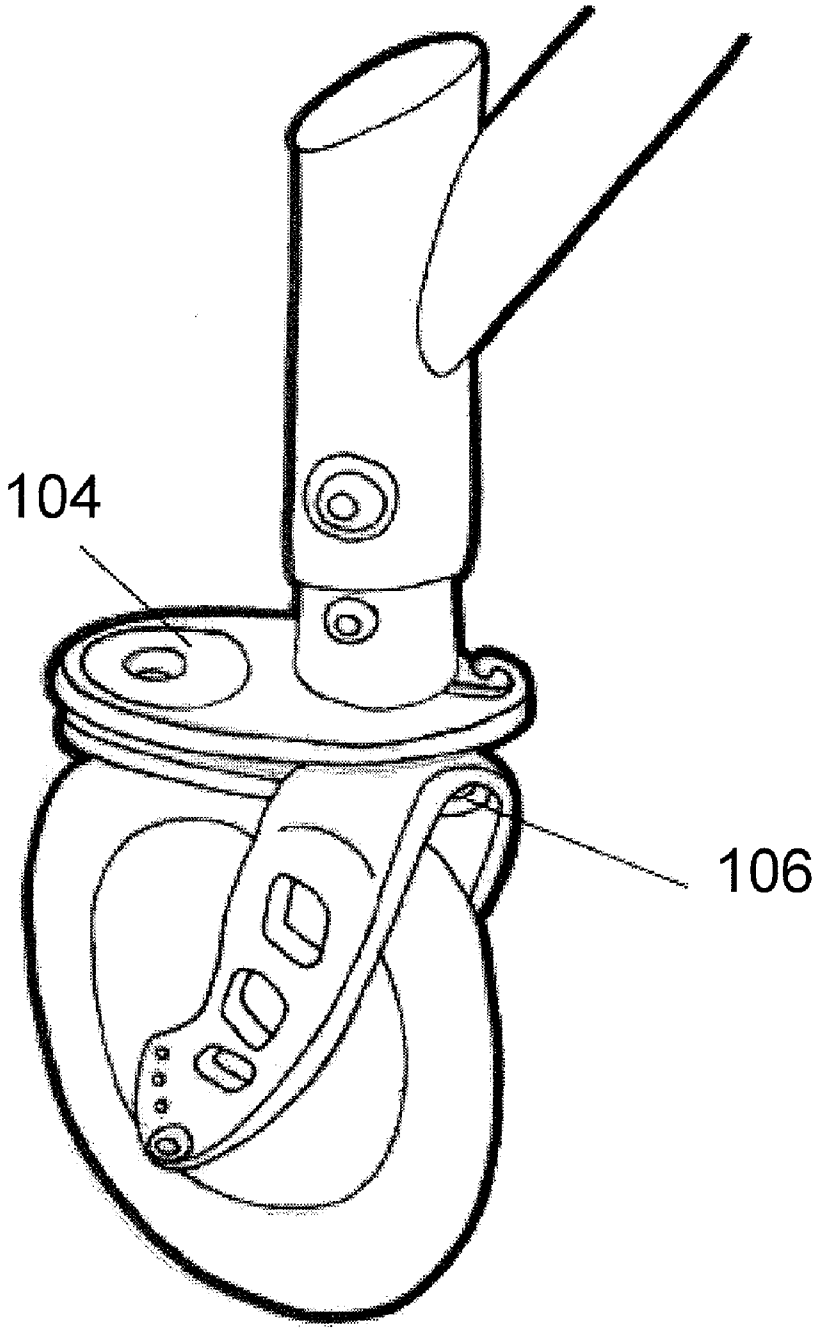

FIG. 14

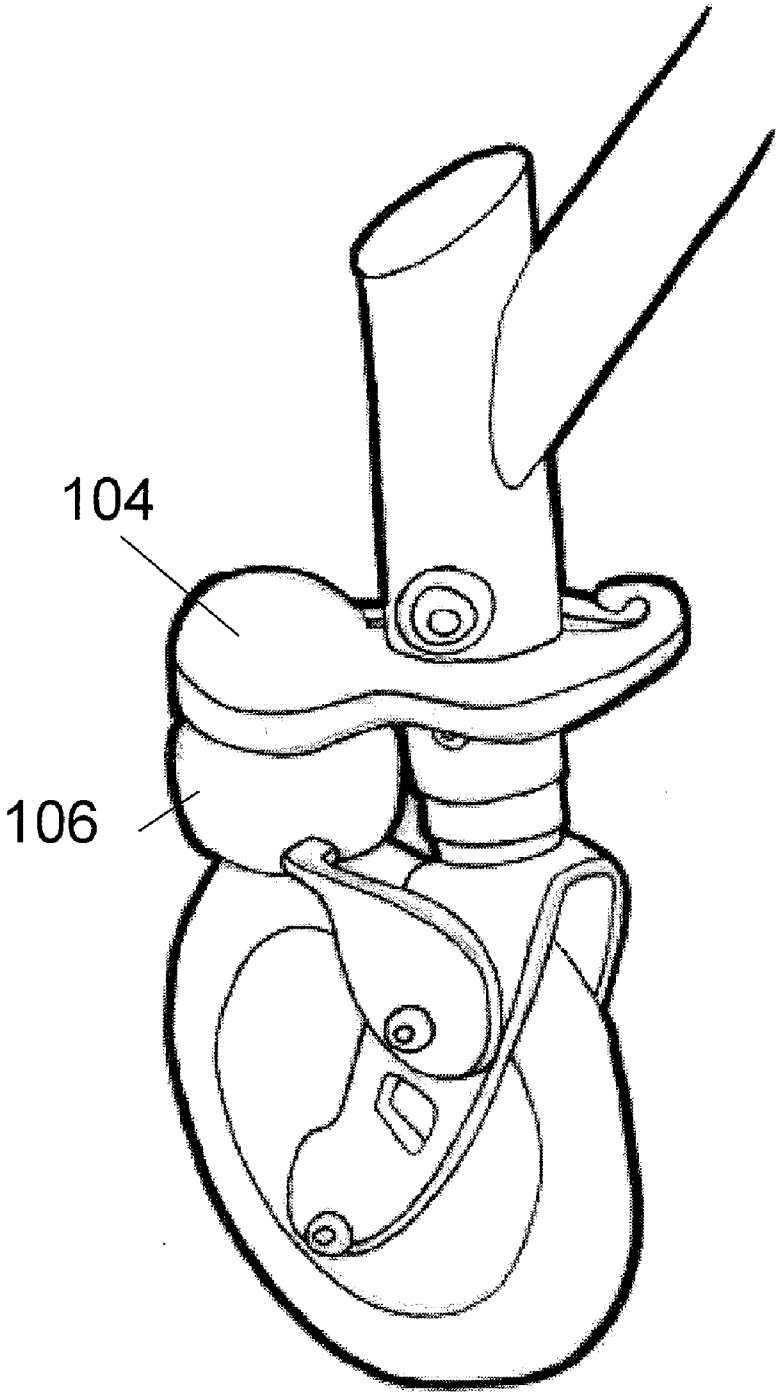

FIG. 15

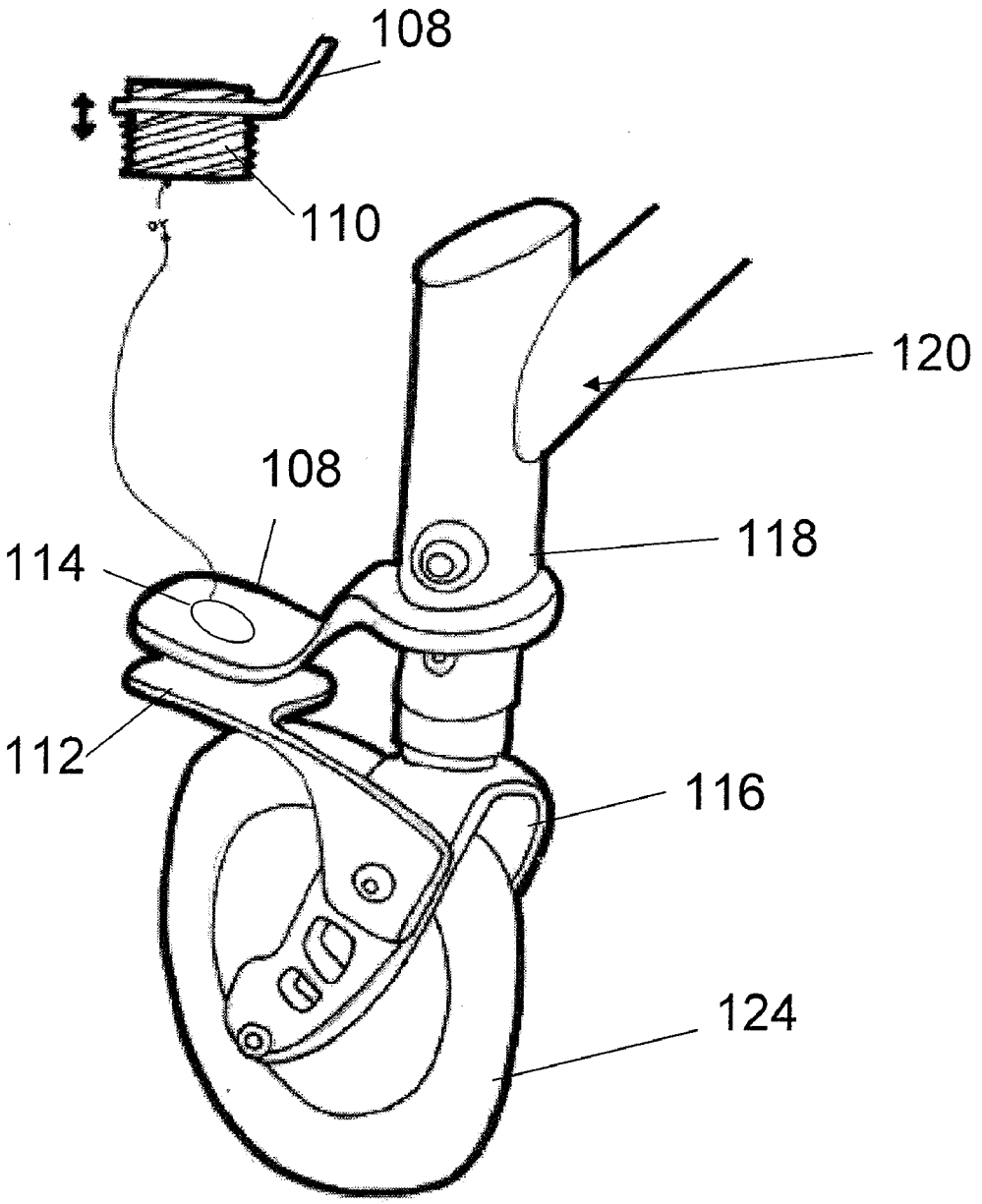

FIG. 16

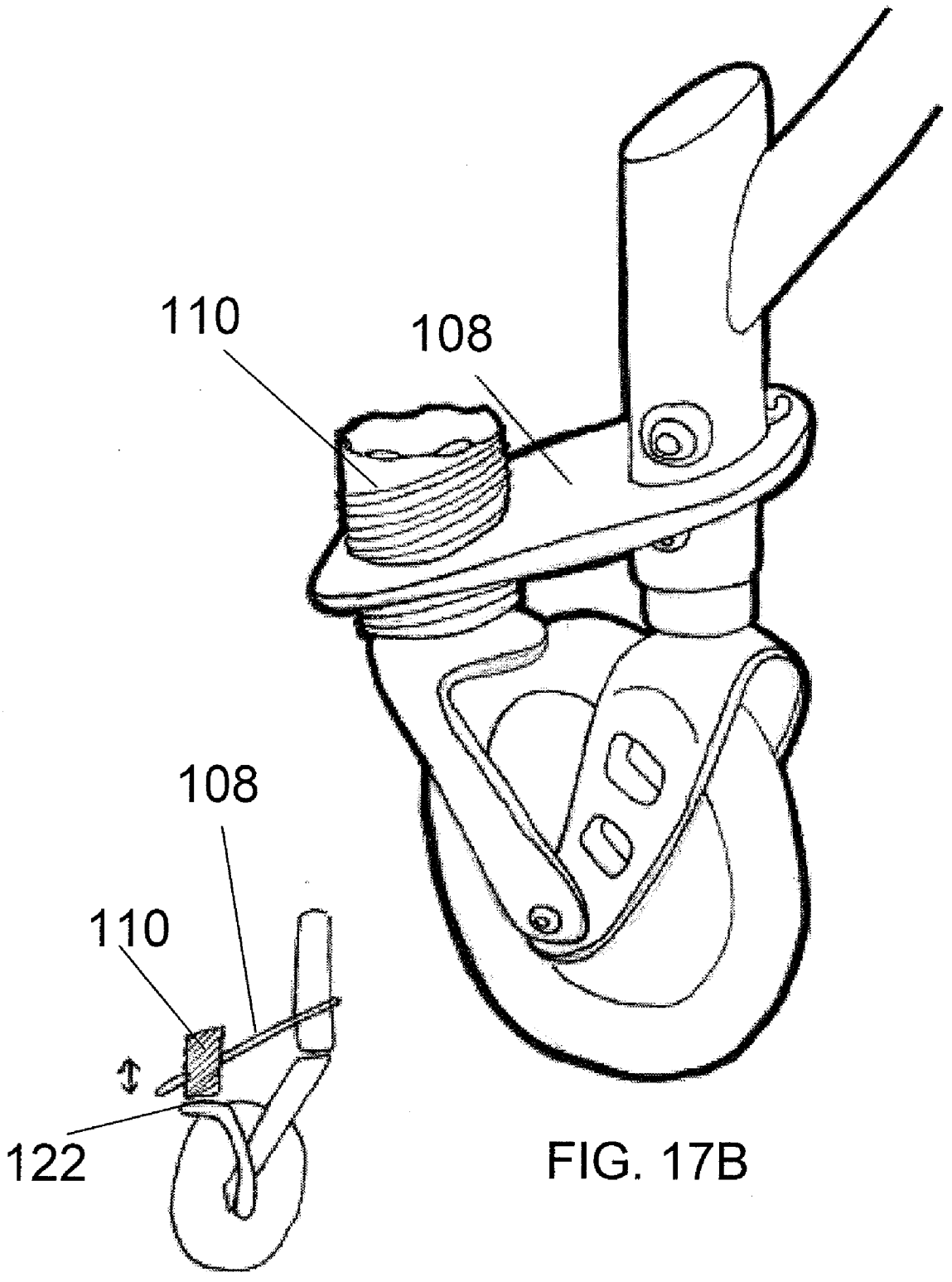

FIG. 17A

FIG. 17B

MOBILE CASTER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a Continuation in Part application of U.S. Ser. No. 12/070,939, title IMPROVED CASTER AND SYSTEM FOR MOBILE DEVICE, filed on Feb. 22, 2008, which claims priority to U.S. Provisional Application Ser. No. 60/903,256, title IMPROVED CASTER AND SYSTEM FOR MOBILE DEVICE, filed on Feb. 23, 2007, which are both incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] The invention was made with government support under grant number B3142Cawarded by the Department of Veteran Affairs. The United States Government has certain rights to the invention.

FIELD OF THE INVENTION

[0003] This invention relates generally to a caster and caster system for a mobile device and more particularly relates to an improved caster and caster system which prevents caster drift and flutter and otherwise promotes tracking while a mobile device is traversing a side-sloped surface.

BACKGROUND OF THE INVENTION

[0004] Wheelchair users constantly encounter difficulties while traversing various terrains during their daily activities. One specific problem a wheelchair user faces is caster drift while traversing side-sloped surfaces. As the wheelchair moves across a side-sloped surface, caster wheels tend to rotate down the slope (see e.g., FIG. **1**). The user's downward limb must work very hard to keep the wheelchair climbing the incline or merely traveling straight across the side-sloped surface. This can result in pain or injury to the overworked limb.

[0005] It is advantageous to eliminate the great force the user must exert on his or her downward limb for safety reasons. One particular design created for such purposes is U.S. Pat. No. 6,607,250, entitled "Caster block and wheel lock for wheelchair". This reference features a locking mechanism that can be used to eliminate caster wheel rotation. Once engaged, this device locks the caster in the trailing position and fixes the path of the wheelchair. Although this system prevents caster drift, it also severely limits the viability of the caster for indoor use, on uneven surfaces, or in any condition under which regular turning is required. In contrast, the caster and caster system of the present invention allows users to turn the wheelchair or other device and make changes to the path of travel, while the caster is engaged and while still preventing caster drift (see, e.g. FIG. **2**, where the path of a device using the caster and caster system of the present invention does not follow the slope).

[0006] Outside of the wheelchair realm, delivery persons and others using carts and dollies frequently encounter trouble turning or navigating the related art devices, especially if the devices are heavily loaded. Further, because of caster drift, materials can fall off of the cart or dolly while the user is attempting to maintain a straight course on a sloped surface.

[0007] Additionally, consumers frequently encounter wheel flutter in shopping carts because the current caster stems are freely rotating and somewhat loose fitting within the caster mount. This wheel flutter causes the entire cart to shake and/or become difficult to navigate.

[0008] The present invention overcomes the disadvantages of the related art as discussed in detail below.

SUMMARY OF THE INVENTION

[0009] An object of the caster and caster system of the present invention is to reduce the risk of upper limb pain and injury to wheelchair users by decreasing the forces required to traverse a side-sloped surface. The present invention further prevents caster drift and wheel flutter, by applying a forward or rearward biasing force on the caster wheel, thus lowering the forces required by the downhill limb to maintain a straight path.

[0010] Another object of the present invention is to provide a caster biasing mechanism or means that can be retrofitted to an existing caster system of a mobile device such as a wheelchair, cart, shopping cart, or dolly.

[0011] Additionally, the caster fork and wheel of the present invention rotate to allow a user to steer the wheelchair, cart, shopping cart, dolly or other mobile device, when necessary, and provide users with a greater degree of control while traversing a side-sloped surface.

[0012] Specifically, what is provided is an improved caster and caster system comprising a caster mount attachable to a frame of a mobile device, a caster stem attached to the caster mount and a biasing means for biasing the caster in a desired rotational position. In one embodiment, the biasing means involves having one or more notches defined in the caster stem, and at least one spring plunger, having a ball defined on one end. The ball is biased against the caster stem and situates within the one or more notches to prevent caster drift and flutter and to promote tracking. In this embodiment, an optional disengaging pin can be provided, which slideably engages the one or more notches to disengage the ball from a notch or notches and allow for the free rotation of the caster.

[0013] Optionally, magnets located in the caster mount and stem, by using attracting and repelling poles, can also be used to bias the caster stem in a desired location. Other biasing means may also be used.

[0014] The caster stem and caster mounts, as modified or retrofitted with the biasing means of the present invention are operable to attach to a standard caster fork and wheel assembly. As such, the improved caster of the present invention is adapted to replace any existing caster on a mobile device.

[0015] Caster alignment mechanism having a first component operably connected to a leg of a mobile device and a second component operably connected to a caster of the mobile device. The first and second components are positioned in parallel orientation to each other wherein alignment. of the caster with the leg of the mobile device is achieved by the attractive characteristics of the first component with an upper magnet to the second component with a lower magnet. One embodiment of the caster alignment mechanism includes a fixed gap between the upper magnet and the lower magnet for an always engaged or "on" mode. The fixed gap can be adjusted to vary magnetic field strength depending on user specifications for ease of turning. Another embodiment of the caster alignment mechanism includes a switching mechanism to change modes between engaged or "on" mode and disengaged or "off" mode.

[0016] Another embodiment of the caster alignment mechanism includes a switching mechanism to change

modes between engaged or "on" mode and disengaged or "off" mode. The switching mechanism includes the upper magnet in slideable relationship with a magnet or magnetic material operably attached to a frame of the first component. As the upper magnet is moved away from the lower magnet, the attractive force between the first component and the second component diminishes and the caster is free to draft. As the upper magnet approaches the magnetic frame, the upper magnet is attracted to the first component and is held connected to the first component until the user pushes down the handle connected to the upper magnet.

BRIEF DESCRIPTION OF THE FIGURES

[0017] FIG. **1** shows a prior art caster system wherein, caster drift is shown while the wheelchair traverses a side-sloped surface;

[0018] FIG. **2** shows one embodiment of the caster and caster system of the present invention traversing a side-sloped surface without caster drift;

[0019] FIG. **3** is a side view of a typical caster system;

[0020] FIG. **4**A is a top view of one embodiment of the caster stem and caster mount in the caster system of the present invention;

[0021] FIG. **4**B is a side cut-away view of the caster stem and caster mount along line A-A shown in FIG. **4**A;

[0022] FIG. **5** is a perspective cut-away view of the caster stem and caster of the present invention shown in FIGS. **4**A and **4**B;

[0023] FIG. **6**A is an illustration of alternative embodiments of the biasing force mechanism with one pair of magnets and two pair of magnets of the present invention, where the initial magnets are aligned in the desired position A;

[0024] FIG. **6**B is an illustration of alternative embodiments of the biasing force mechanism with one pair of magnets and two pair of magnets of the present invention, where one of the initial magnets is not aligned in the desired position A;

[0025] FIGS. **7**A-**7**C are pictorial illustrations of an alternative embodiment of the present invention with a slideable alignment engagement (FIG. **7**A) and disengagement (FIG. **7**B) mechanism;

[0026] FIGS. **8-12** are pictorial illustrations of other alternative embodiments of the present invention with slideable alignment engagement mechanisms shown in the engagement position (down) capable of being disengaged when mechanism moved in A direction (upward);

[0027] FIG. **13** is a pictorial illustration of yet another alternative embodiment of the present invention having an adjustable, fixed gap between a magnet embedded in the caster wheel and an attractive magnet attached to the mobile device frame;

[0028] FIGS. **14-15** are pictorial illustrations of yet other embodiment of the present invention having an adjustable, fixed gap between a magnet attached to the caster wheel fork and an attractive magnet attached to the mobile device frame; and

[0029] FIGS. **16** and **17**A-B are pictorial illustrations of exemplary embodiments showing a gap adjustment mechanism to vary magnetic attractive force strength.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0030] The invention will now be described in detail in relation to the preferred embodiments and implementation thereof which is exemplary in nature and descriptively specific as disclosed. As is customary, it will be understood that no limitation of the scope of the invention is thereby intended. The invention encompasses such alterations and further modifications in the illustrated apparatus, system or method, and such further applications of the principles of the invention illustrated herein, as would normally occur to persons skilled in the art to which the invention relates.

[0031] As an example of one embodiment and not by limitation, this specification discusses use of the caster and caster system on or for a wheelchair, however, the caster and caster system of the present invention is not limited to such. For example, the caster or caster system can be used on a cart, shopping cart, dolly, or any other similar mobile device having wheels capable of similar attachment. The caster and caster system of the present invention also reduces caster or wheel flutter and otherwise promotes tracking in mobile devices.

[0032] For the purposes of this description, and as shown in FIG. **3**, a caster is divided into four main components or assemblies, the caster mount **1**, the caster stem **2**, the caster fork **3**, and the wheel **4**. The present invention focuses on a biasing means or hardware that can be retrofitted to an existing caster system or incorporated as improvements to the caster mount **1** and caster stem **2**. Once assembled, the caster assembly of the present invention can be installed on any wheelchair, shopping cart, cart, dolly or other mobile device that has or is adaptable for detachable caster mounts.

[0033] When a wheelchair, shopping cart, cart, dolly or like mobile device traverses a side-sloped surface, the center of mass of the user, cargo, load and/or mobile device, acting about the rear wheels, generates a "moment" on the casters. A "moment" is generally defined as a measure of the torque produced by a force which causes an object to rotate about an axis, which is equal to the force multiplied by the perpendicular distance of the axis from the line of action of the force. This moment causes casters to rotate downhill and causes the mobile device to drift in the same direction (see FIG. **1**). As shown in FIG. **2**, the caster assembly of the present invention is designed to prevent unwanted caster rotation and/or drift by preferably biasing each caster in the trailing position, that is, when wheel **4** rotates so as to trail behind a mobile device when in motion, and optionally biasing each caster in a leading position (when wheels are facing forward).

[0034] FIGS. **4**A and **4**B show one embodiment of the caster mount **11** and caster stem **12** of the present invention. The front of the caster mount housing **15** contains a biasing means in that form of at least one ball-nose spring plunger **16**. Optionally, the present invention can use two or more spring loaded ball-nose plungers **16** with the number of spring plungers **16** preferably corresponding to an equal number of notches **18** within caster stem **12**. However, in other embodiments, multiple plungers **16** may lie within a single notch **18**. For purposes of this description, an embodiment with a single plunger **16** is described, but the invention is not limited to this embodiment. The ball **17** of the spring plunger **16** protrudes into the bored center of the housing and interfaces with the notch **18** in the caster stem **12**. A spring **26** within the plunger **16** holds ball **17** into the notch **18** and thereby creates a lateral restriction against caster rotation, wobbling and/or drift. Ball **17** can have varying shapes, including a rounded, angled or pointed surface, provided that the shape of ball **17** is operable to interact with notch **18** to provide the desired lateral restriction against caster rotation, wobbling and/or drift.

[0035] The interior of the notch **18** (toward the core of the caster stem **12**) is cut and/or fabricated to accept ball **17** in such a manner that rotation of stem **12** causes the sides of notch **18** to exert a force on ball **17** and force it backwards into plunger **16**. By way of example, but not limitation, notch **18** can be rounded or V-shaped. Other shapes may also be used. The shape and size of the groove can be varied to provide for different levels of resistance to caster rotation and/or flutter.

[0036] FIG. **5** shows a detailed view of the notch **18** in the caster stem **12**. As shown, notch **18** runs lengthwise from about the midpoint **21** of the caster stem **12** and upward to the top of caster stem **12** (i.e., upper thread **13**). However, notch **18** can be of a shorter length, so long as it is placed to receive ball **17**.

[0037] Both of the ends of the caster stem **12** are preferably threaded in one embodiment. The upper thread **13** allows the caster stem **2** to be secured against the bushing **20** in the top of the caster mount **11**. The lower thread **14** allows for the attachment of a standard caster fork **3**. Just above the lower thread **14**, is a bossed, preferably cylindrical section **22**. This cylindrical section **22** abuts the bearing **23** in the bottom of the caster mount **11** and serves as an anchor point for attaching the caster fork **3** and for securing the caster stem **12** to the caster mount **11**.

[0038] In operation, when ball **17** of plunger **16** is fully engaged and caster stem **12** of the present invention begins to rotate, notch **18** in caster stem **12** turns away from ball **17** of the spring plunger **16**. As notch **18** initially turns (before full disengagement of ball **17** from notch **18**), the surface of the notch **18**, opposite the direction of rotation, pushes the ball back towards the spring **26** within the plunger **16**. This compresses spring **26** and generates an increased spring force (according to Hooke's Law), which is proportional to the angle of caster stem **12** rotation. The magnitude of the spring force can be adjusted by changing either the strength or stiffness of spring **26** or the position (depth) of the spring plunger **16** within the caster mount housing **11**. The latter adjustment can occur, for example, if plunger **16** threadably attaches to cylinder **28** in caster mount **11** and end **27** of plunger **16** is adapted to have a screw head whereby the depth of plunger **16** into notch **18** can be adjusting by screwing plunger **16** inward or outward. Other means of spring adjustment, known to those skilled in the art, are also within scope of the caster and caster system of the present invention. Further, the spring plunger **16** optionally can be replaced with other biasing means known to those skilled in the art.

[0039] When ball **17** of spring plunger **16** pushes against the side of the notch **18** upon initial rotation of caster stem **12**, the compression force of spring **26** generates a moment about the caster stem **12**. This moment increases while ball **17** remains in notch **18** and is forced backward against the spring **26** or other biasing mechanism. This moment or force is opposite in sign to, i.e., resists, the moment generated by the effects of gravity on the center of mass of the user and the wheelchair on a sloped surface. Once the magnitude of the plunger moment matches the magnitude of the moment generated by the center of mass, the caster ceases to rotate. The amount of allowable rotation can be adjusted to meet the request of a specific user or a user's activity. For example, with an increased spring strength and/or increased depth of plunger **16** into notch **18**, all caster rotation can be prevented such that the caster and caster system of the present invention serves as a caster lock.

[0040] Under normal circumstances, though, the caster and caster system of the present invention allows for at least a minimal amount of rotation to aid in navigation. Where some amount of rotation is intended, the user must overcome the force of the spring **26** or other biasing means that acts to resist caster rotation. In such an embodiment, the ball-nose spring plunger **16** (or other biasing means) is configured to provide just enough force to resist caster drift. By altering the position of the spring plunger **16**, the biasing force can be raised or lowered to meet the needs of the user.

[0041] Once the caster stem **12** is rotated far enough in either direction, ball **17** exits notch **18**, whereby the force of the spring **26** or other biasing means acts directly through the center of the caster stem **12** and no moment is applied to the caster stem **12**. This allows the user to turn a mobile device, such as a wheelchair, with only a slight resistance (due to the friction of the ball on the caster stem **12**). When a turn is complete and each caster is realigned in the trailing position, the ball **17** reengages the notch **18** in the caster stem **12**.

[0042] When wheeling indoors or in places where frequent turning is necessary, the forward or rearward bias can be removed from the casters. In the embodiment discussed above, such disengagement can occur by screwing plunger **16** outward so that ball **17** does not rest in notch **18**.

[0043] In an alternative embodiment of the present invention, disengaging pin **19** (shown in FIGS. **4**B and **5**) can act to force ball **17** into plunger **16**. Disengaging pin **19** fits within notch **18** when it runs the length of stem **12**. When push top **24** is pushed downward, the bottom end **25** of disengaging pin **19** disengages the ball **17** of the spring plunger **16** from insertion into notch **18** (i.e., ball **17** is forced into and plunger **16**), thereby allowing the caster stem **12** to rotate without lateral restriction and with only limited friction of ball **17** pressing against the outer surface of the caster stem **12**. The bottom end **25** of disengaging pin **19** is preferably tapered to gradually push ball **17** of plunger **16** out of and away from notch **18**. The push top **24** of the disengaging pin **19** is preferably large, making it easier to handle for users with limited hand function. The top of the disengaging pin **9** can optionally be any other shape or size.

[0044] In embodiments with multiple spring plungers **16** and notches **18**, a plurality of disengaging pins **19** can be optionally used. The number of disengaging pins **19** is preferably the same as the number of notches **18**. Disengaging pin **19** is an optional feature of the present invention, and the caster and caster system of the present invention can function properly with or without the disengaging pin **19**.

[0045] Other biasing means can also be used, as noted above. For example, in another embodiment, a central rod can run up and down the axle or lie outside the caster stem to create a similar caster bias. This rod interacts with the stem, either directly or indirectly, to prohibit stem rotation when the rod is engaged. Such engagement can occur, for example, when the rod is pushed downward to engage a locking mechanism associated with the rotation of the caster stem.

[0046] In yet another embodiment of the biasing force mechanism of the present invention is illustrated in FIGS. **6**A and **6**B, the biasing force can be provided magnetically, e.g., by one or two sets of magnets. In particular, one set of magnets **30**, **32** can be positioned in the caster stem **2** and the caster housing **1**, respectively, such that attracting poles face each other (e.g. the south pole of the housing magnet **32** faces inward and the north pole of the caster magnet **30** faces outward) and are closest when the caster assembly and wheel

rotates toward a desired position A (i.e., a trailing or leading position). Another embodiment of the biasing force mechanism includes one magnet and opposing ferrous material. Another embodiment of a magnetic biasing force mechanism can include an additional pair of magnets **34** further positioned in the caster housing **1** on both sides of the initial housing magnet **32** such that like repelling poles face the caster stem **2** (e.g. the north poles of the outer housing magnets face inward). The attraction of the north pole within the caster stem magnet **30** to the south pole in initial housing magnet **32** of the caster housing **2** and the repulsion of the north pole within the caster stem magnet **30** to the north poles of the outer magnets **34** in the caster housing **1** act to provide a further bias B toward a desired position A of the caster assembly and wheel. The strength of the bias is determined by the type, area, and configuration of the magnets in the caster stem **2** and housing **1**.

[0047] Caster alignment mechanism having a first component operably connected to a leg of a mobile device and a second component operably connected to a caster of the mobile device. The first and second components are positioned in parallel orientation to each other wherein alignment of the caster with the leg of the mobile device is achieved by the attractive characteristics of the first component with an upper magnet to the second component with a lower magnet. One embodiment of the caster alignment mechanism includes a fixed gap between the upper magnet and the lower magnet for an always engaged or "on" mode. The fixed gap can be adjusted to vary magnetic field strength depending on user specifications for ease of turning. Another embodiment of the caster alignment mechanism includes a switching mechanism to change modes between engaged or "on" mode and disengaged or "off" mode.

[0048] Now turning to FIGS. **7**A-**7**C that illustrate an exemplary embodiment of the present invention with a slideable magnetic alignment engagement (FIG. **7**A) and disengagement (FIG. **7**B) mechanism **35** that can be attached to a mobile device, such as a wheelchair. Slideable magnetic alignment mechanism **35** comprises an upper component **36** attachable to the barrel or leg of the wheelchair and a lower component **38** attachable to a fork of a caster. Upper component **36** comprises an upper plate **58** having a clamp **52** that attaches to any diameter barrel or leg of the wheelchair. Clamp **52** can include a Delrin insert to allow same clamp to be used form a variety of barrel diameters. Upper component **36** can include a handle **54** and upper magnet **42** being connected by shoulder bolts **50**. Plate **58** is disposed between handle **54** and upper magnet **42**. Plate **58** can be made of a magnetic material or have attached thereto a magnetic device, such as a bolt or screw **46**, in proximity to plate bottom surface **60** such that when upper magnet **42** is positioned in proximity of plate bottom surface **50**, then upper magnet **42** becomes attracted to plate **58** or magnetic device **46** to hold upper magnet **42** away from lower magnet **40** of lower component **38** in a disengaged position as shown in FIG. **7**B. Handle **54**, upper magnet **42**, and shoulder bolts **50** (straight or tapered) form a single component being in slideably orientation with plate **58**. Shoulder bolts **50** slide within holes **62** (FIG. **7**C). Threaded bolt **56** engages with upper magnet **42** to adjust height of lower surface **68** of upper magnet **42** relative to upper surface **66** of lower magnet **40**. Lower components **38** include lower magnet **40** attached to lower plate **44**. Lower plate **44** can include cut out longitudinal slots **48** or holes (not-shown) to attach to a variety of forks by bolting through complementary cut out longitudinal slots or holes in fork or referencing against the side of the fork. Upper surface **66** of lower magnet **40** is oriented substantially parallel with lower surface **68** of upper magnet **42** to form gap **70** therebetween. There is always a gap directly between upper surface **66** of lower magnet **40** and lower surface **68** of upper magnet **42** without any structure or component contacting surfaces **66**, **68** to hold or form perpendicular gap **70** such that the entire surface areas A**1**, A**2** (not shown) of upper surface **66** of lower magnet **40** and lower surface **68** of upper magnet **42**, respectively, are not obstructed for efficient attractive forces. The gap can vary from it minimum perpendicular gap **70** (FIG. **7**A) at the engaged or "on" position to its maximum perpendicular gap **72** (FIG. **7**B) at its disengaged or "off" position. Lower magnet **42** can be one or more magnets. Lower magnet **42** can slide from side-to-side to center magnets regardless of fork width.

[0049] First component **36** and second component **38** have a common rotational axis R. First component **36** includes a center plane Y**1** that includes the common rotational axis R. Second component **38** includes a center plane Y**2** that includes the common rotational axis R. Plane Y**1** and plane Y**2** are in a common plane when first component **36** and second component **38** are substantially aligned for a straight path (see FIG. **2**). Second component **38** is capable of rotating in direction Z about the common rotational axis R relative to first component **36** to form an angular displacement Ø (see FIG. **6**B) between center plane Y**1** of first component **36** and center plane Y**2** of second component **38** while maintaining the perpendicular gap **70** between upper magnet **42** and lower magnet **40**. The attractive forces between upper magnet **42** and lower magnet **40** will cause second component **38** to be pulled back to zero angular displacement (see FIG. **6**A).

[0050] Perpendicular Gaps **70**, **72** can be set in many ways known to one of skill in the art. An embodiment of the present invention sets the gap by either adjusting upper magnet **42** by clamping **52** to the diameter barrel or leg of the wheelchair at different vertical locations while maintaining lower plate **44** in a fixed vertical position on a fork. Another embodiment of the present invention set the gap by adjusting lower magnet **40** by positioning lower plate **44** at different vertical positions on the fork while maintaining lower plate **44** in a fixed vertical position with clamp **52** at a predetermined diameter barrel or leg of the wheelchair. Another embodiment of the present invention adjusts both clamp **52** and lower plate **44** to position upper surface **66** of lower magnet **40** relative to lower surface **68** of upper magnet **42**. As mentioned above, threaded bolt **56** can engage with upper magnet **42** to adjust height of lower surface **68** of upper magnet **42** either increasing or decreasing length L of component **36**, thereby adjusting the gap between upper surface **66** of lower magnet **40** and lower surface **68** of upper magnet **42**. The attractive force of the lower magnet **40** to the upper magnet **40** eliminates caster drift (see FIG. **1**) causing lower magnet **40** to be pulled back into alignment with upper magnet **42** as lower magnet **42** is moved left or right away from upper magnet **40**.

[0051] The caster alignment mechanism includes a switching mechanism to change modes between engaged or "on" mode and disengaged or "off" mode. One embodiment of the switching mechanism comprises the upper magnet **42** connected to a handle **54** in slideable relationship with a polar opposite magnet or magnetic material **46** operably attached to a frame **58** of the first component **36**, such that the system is in the disengaged or "off" mode when an attractive force

between the upper magnet **42** and the frame magnet **58** is stronger than the attractive force between the upper magnet **42** and the lower magnet **40**. As the upper magnet **36** is moved away from the lower magnet **40**, the attractive force between the first component **36** and the second component **38** diminishes and the caster is free to draft. Upper magnet **42** is held in the disengaged or "off" mode by the an attractive force between the upper magnet **42** and the frame magnet **58** until the user pushes down the handle **54** connected to the upper magnet **42** by one or more rods **50** (straight rods).

[0052] Another embodiment of the switching mechanism comprises the upper magnet **42** connected by one or more tapered rods **50** to a handle **54**. Frame **58** is disposed between the upper magnet **42** and the handle **54**. Frame **58** includes one or more holes **62** to partially receive the one or more rods **50** for a slideable relationship with the upper magnet **42** and the frame **58**. The one or more rods **50** include a decreasing taper from the upper magnet **42** to the handle **54**, where the diameter of the rod in proximity to the upper magnet is larger than a diameter of one or more holes **62** of frame **58** to cause an interference fit between the one or more rods **50** and the one or more holes **62** of the frame when handle **54** is pulled upward (direction A) and the upper magnet **42** moves toward the frame **58**. Upper magnet **42** is held in the disengaged or "off" mode by the interference fit until the user pushes down the handle **54** connected to the upper magnet **42** towards lower magnet **40**.

[0053] FIGS. **8-11** are pictorial illustrations of other alternative embodiments of the present invention with slideable alignment engagement mechanisms shown in the engagement or "on" position (down) capable of being disengaged or "turn off" when handle **74** moved in A direction (upward). FIGS. **8-10** illustrate handle **74** used for moving upper magnet **42** away from lower magnet **40** to go from engagement or "on" mode to disengaged or "off" mode. FIG. **8** illustrates a pull string **76** that can be used to move handle **74** from the engagement or "on" mode to disengaged or "off" position. FIG. **10** illustrates a contoured or tapered handle portion **78** to move handle **74** from the engagement or "on" mode to disengaged or "off" position.

[0054] FIG. **12** illustrates another embodiment of the present invention **80** having an engagement ("on") (as shown in FIG. **12**) and disengagement mechanism ("off"). Similar to the embodiments discussed above having two components: a first component **82** attaches to the barrel **86** or leg of a wheelchair and a second component **90** attaches to fork **88** that is rotational connected to caster wheel **96**. First component **82** includes threadable handle **86** that can be secured in housing **87** by nut **83**, magnet **85** disposed at end **89** of housing **87** opposing handle **86**, and collar **84** being slideably secured to barrel **86** at one end **84***a* and through bore **92** at end **84***b* sized to slideably received housing **87**. Housing **87** includes elongated slot **81** and collar **84** included bolt **98**. Housing **87** is limited in its longitudinal travel by bolt **98** contacting slot ends **81**A and **81**B (not shown). Housing **87** longitudinal travel can be further limited by threaded handle **86** contacting bolt **98** at one end and upper magnet **85** contacting bolt **98** at the opposing end. Threaded handle **86** has a length that can be adjusted within housing **87** to determine the longitudinal displacement of housing **87** within bore **92** such that end **86***a* of handle **86** contacts bolt **98** to stop magnet **85** downward travel. Second component **90** with embedded lower magnet **91** is connected to fork **88**. Gap **94** is formed between upper magnet **85** and lower magnet **91**, which is set by adjusting handle **86** as discussed above. FIG. **12** illustrates gap **94** in the engaged or "on" position. User will disengage the magnetic alignment system **80** by pulling up handle **86** in direction A. First component **82** will be locked or retained in its disengaged or "off" position by the attractive forces of upper magnet **85** to bolt **98**.

[0055] FIG. **13** is a pictorial illustration of yet another alternative embodiment of the present invention having an adjustable, fixed gap between a ferrous metal embedded **100** in the caster wheel and an attractive magnet **102** attached to the mobile device frame. This configuration is always in the engaged or "on" position.

[0056] FIGS. **14-15** are pictorial illustrations of yet other embodiment of the present invention having an adjustable, fixed gap between a magnet **106** attached to the caster wheel fork and an attractive magnet **104** attached to the mobile device frame; and

[0057] FIGS. **16** and **17**A-B are pictorial illustrations of exemplary embodiments showing a gap adjustment mechanism to vary magnetic attractive force strength. Wheelchair **120** having barrel **118** with pivotally connected fork **116** and caster wheel **124** include lower magnet **112** attached to fork **116** and upper magnet **110** connected to barrel **118**. Magnet **110** can be threaded and screwed into hole **114** of angle barrel piece **108**. Gap **122** (FIG. **17**A) can be adjusted by screwing threaded upper magnet **110** into and out of hole **114** of angle barrel piece **108**. Also, gap **122** can be adjusted by positioning angle barrel piece **108** upward or downward on barrel **118**. Also, gap **122** can be adjusted by a combination of the above disclosed methods.

[0058] While the disclosure has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope of the embodiments. Thus, it is intended that the present disclosure cover the modifications and variations of this disclosure provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A caster alignment system of a mobile device having a fork rotationally connected to a leg of the mobile device comprising:

a first component having magnetic properties operably connected to the leg of the mobile device; and

a second component having magnetic properties operably connected to the fork of the mobile device, wherein the first and second components are positioned in parallel orientation to each other, wherein the magnetic properties of the second component are a polar opposed of the magnetic properties of the first component,

whereby alignment of a caster rotatably connected to the fork with the leg of the mobile device is achieved by the attractive force of the first component to the second component when the caster is caused to deviate from a straight path.

2. The caster alignment system according to claim **1**, wherein the first component comprises an upper magnet on its lower surface and the second component comprises a lower magnet on its upper surface, wherein a perpendicular gap is formed between the upper magnet and the lower magnet.

3. The caster alignment system according to claim **2**, wherein the first component and the second component have a common rotational axis R, wherein the first component includes a center plane Y**1** that includes the common rota-

tional axis R, wherein the second component includes a center plane Y2 that includes the common rotational axis R, wherein the plane Y1 and the plane Y2 are in a common plane when the first component and the second component are substantially aligned for a straight path, wherein the second component is capable of rotating in direction Z about the common rotational axis R relative to the first component to form an angular displacement between the center plane Y1 of the first component and the center plane Y2 of the second component while maintaining the perpendicular gap between the upper magnet and the lower magnet.

4. The caster alignment system according to claim **2**, wherein the perpendicular gap is formed without any structural member disposed between the lower surface of the first component and the upper surface of the second component.

5. The caster alignment system according to claim **2**, wherein the attractive force between the upper magnet and the lower magnet can be adjusted by varying the gap size depending on user specifications for ease of turning.

6. The caster alignment system according to claim **2**, further includes a switching mechanism to change modes an engaged or "on" mode to a disengaged or "off" mode, wherein the attractive force between the upper magnet and the lower magnet are highest at the engaged or "on" mode and are lowest at the disengaged or "off" mode.

7. The caster alignment system according to claim **6**, wherein the switching mechanism comprises the upper magnet connected to a handle in slideable relationship with a polar opposite magnet or magnetic material operably attached to a frame of the first component, such that the system is in the disengaged or "off" mode when an attractive force between the upper magnet and the frame magnet is stronger than the attractive force between the upper magnet and the lower magnet, wherein the upper magnet is held in the disengaged or "off" mode by the an attractive force between the upper magnet and the frame magnet until the user pushes down the handle connected to the upper magnet.

8. The caster alignment system according to claim **6**, wherein the switching mechanism comprises:

the upper magnet connected by one or more rods to a handle;

a frame disposed between the upper magnet and the handle, wherein the frame includes one or more holes to partially receive the one or more rods for slideable relationship with the upper magnet and the frame;

wherein the one or more rods include a decreasing taper from the upper magnet to the handle, wherein a diameter of the one or more rods in proximity to the upper magnet is larger than a diameter of the one or more holes of the frame to cause an interference fit between the one or more rods and the one or more holes of the frame when handle is pulled upward (direction A) and the upper magnet moves toward the frame.

9. A caster comprising:

a caster mount attachable to a frame of a mobile device, wherein the caster mount includes an aperture;

a spring plunger having an internal spring and a movable ball member attached to the spring;

a caster stem attached to the caster mount, a caster fork and a wheel assembly, wherein the caster stem comprises at least one notch to engage the moveable ball member to restrict the rotation of the caster stem and thereby to prevent drift and flutter of the caster fork and the wheel assembly and to promote tracking of the mobile device, wherein the at least one notch runs lengthwise along the outer surface of the caster stem from about a mid-point of the caster stem to a top of the caster stem to form an open end at the top end of the caster stem; and

at least one disengaging pin capable of being received through the open end of the top end of the caster stem and being slideably engageable within the at least one notch, wherein a bottom end of the at least one disengaging pin is tapered to retract the movable ball member inward into the spring plunger to compress the spring and allow for the free rotation of the caster fork and the wheel assembly,

whereby the movable ball member is biased outward from the spring plunger due to decompression of the spring and against the caster stem and situated within the at least one notch when the caster stem is in a desired rotational position and the at least one disengaging pin is withdrawn from the notch to a predetermined position.

10. The caster according to claim **9**, wherein the caster further comprises a push top attached to the top of the at least one disengaging pin, the push top operable to allow a user to push the disengaging pin into the notch.

11. The caster according to claim **9**, wherein the bias of the spring plunger can be adjusted by changing the location of the spring plunger, the strength of the spring or both.

12. The caster according to claim **11**, wherein the bias of the spring plunger can be adjusted to allow the user of the mobile device to exert force sufficient to overcome the bias and allow for rotation of the caster stem.

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