



(51) International Patent Classification:

A47L 13/258 (2006.01) A47L 13/24 (2006.01)
A47L 13/254 (2006.01)

(21) International Application Number:

PCT/US2011/023221

(22) International Filing Date:

31 January 2011 (31.01.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/300,748 2 February 2010 (02.02.2010) US

(71) Applicant (for all designated States except US): **DI-
VERSEY, INC.** [US/US]; 8310 16th Street, M/s 509,
P.O Box 902, Sturtevant, WI 53177-0902 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **BAHR, Thomas**
[CH/CH]; Eichbühlstrasse 4, CH-9545 Wangi (CH).
WINDMEISSER, Dieter [CH/CH]; Hauptstrasse 19,
CH-8269 Fruthwilen (CH). **WIDMER, Alfred, Adolf**
[CH/CH]; Feldegstrasse 1, CH-9500 Wil (CH).

(74) Agent: **BOLLIS, Gregory, S.**; Diversey Inc., 8310 16th
Street, M/S 509, P.O. Box 902, Sturtevant, WI
53177-0902 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: ARTICULATED FLOOR TOOL WITH LOCK

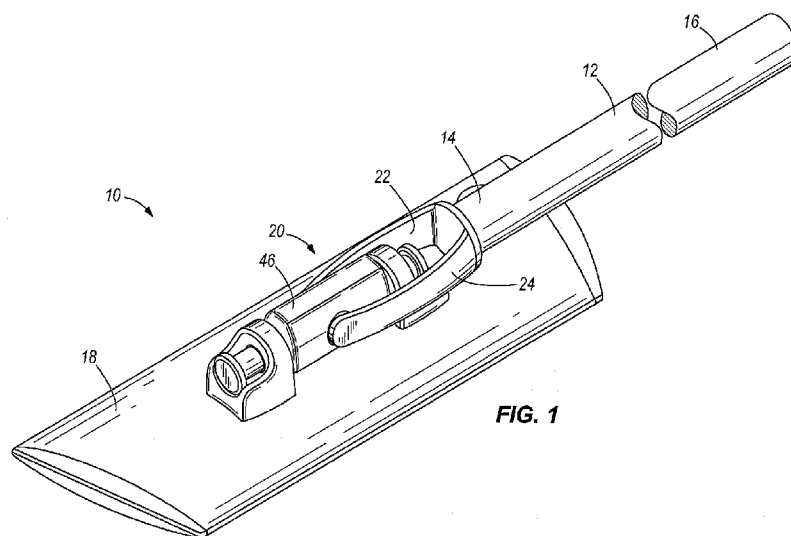


FIG. 1

(57) Abstract: A floor tool and method of locking a floor tool in which a handle is coupled to an articulated tool head by a joint that can be selectively locked by movement of a lock between different positions with respect to a pivot of the joint. The joint can include two different pivots, one of which can at least partially house the lock while permitting the lock to slide to different longitudinal positions therein. The lock can engage a pivot of the joint in different manners based upon the different positions of the lock, thereby defining different types of permitted tool head movement.



ARTICULATED FLOOR TOOL WITH LOCK

BACKGROUND

[0001] Floor tools for use in a variety of cleaning, material deposit, and other applications are often available with heads that are articulated to enable head movement in one or more degrees of freedom, such as about a longitudinal axis and/or a lateral axis of the tool head. Such articulation enables the head of the floor tool to be positioned and oriented with greater flexibility relative to the user, and can therefore improve the ability of a user to clean, deposit, material, and perform other functions using the tool.

[0002] However, in some cases, it is desirable to enable a user to selectively prevent motion of the floor tool head in one or more manners based upon the type of work being performed using the tool, or the particular position of the user with respect to the floor tool head in use. This ability to secure the floor tool head against movement in one or more manners typically comes at the price of floor tool complexity, user difficulty in switching the floor tool between modes of operation (i.e., between states in which different types of head motion are permitted), and the like.

[0003] Articulated floor tools enabling a user to easily adapt the floor tool to different modes of operation in which the floor tool head is movable in different manners while utilizing a simple and easy to use design continue to be welcome additions to the art.

SUMMARY

[0004] Some embodiments of the present invention provide an articulated floor tool. The floor tool includes an elongate handle having a proximal end and a distal end; a tool head defining a longitudinal axis and a cross axis; a joint between the tool head and the elongate handle, the joint configured to selectively permit rotation of the tool head with respect to the handle about the longitudinal axis and the cross axis; and a lock movable in a direction parallel to the longitudinal axis to selectively inhibit rotation of the tool head with respect to the handle about at least one of the longitudinal axis and the cross axis.

[0005] In some embodiments of the present invention, a method of selectively locking a tool head with respect to a handle of a floor tool is provided, and the method includes rotating the tool head with respect to the handle about a longitudinal axis and a cross axis when a lock

is in a first position; laterally actuating the lock in a direction substantially parallel to the longitudinal axis from the first position into a second position; and rotating the tool head with respect to the handle about one of the longitudinal axis and the cross axis and inhibiting rotation of the tool head with respect to the handle about the other of the longitudinal axis and the cross axis when the lock is in the second position.

[0006] Some embodiments of the present invention provide a method of selectively locking a tool head with respect to a handle of a floor tool, and the method includes rotating the tool head with respect to the handle about a longitudinal axis and a cross axis when a lock is in a first position; laterally actuating the lock in a direction substantially parallel to the longitudinal axis from the first position into a second position; and rotating the tool head with respect to the handle about the cross axis and inhibiting rotation of the tool head with respect to the handle about the longitudinal axis when the lock is in the second position.

[0007] Some embodiments of the present invention provide an articulated floor tool. The floor tool includes an elongate handle having a proximal end and a distal end; a tool head; and a joint between the tool head and the elongate handle. The joint has a first pivot defining a cross axis and a second pivot defining a longitudinal axis, and the joint selectively permits rotation of the tool head with respect to the handle about the cross axis and the longitudinal axis. The floor tool also includes a lock directly engaged with the first pivot to selectively inhibit rotation of the tool head with respect to the handle about the cross axis. The lock is further directly engaged with the second pivot to selectively inhibit rotation of the tool head with respect to the handle about the longitudinal axis.

[0008] Other aspects of the present invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1 is a perspective view of a floor tool according to an embodiment of the present invention.

[0010] Fig. 2 is a front view of the floor tool of Fig. 1.

[0011] Fig. 3 is a cross-sectional view taken along line 3-3 of Fig. 2.

[0012] Fig. 4 is a top view of the floor tool of Fig. 1.

- [0013] Fig. 5 is a cross-sectional view taken along line 5-5 of Fig. 4.
- [0014] Fig. 6 is a bottom view of the floor tool of Fig. 1.
- [0015] Fig. 7 is a cross-sectional view taken along line 7-7 of Fig. 6.
- [0016] Fig. 8 is a detail view of Fig. 7, illustrating a lock of the floor tool head in a first position.
- [0017] Fig. 9 is a detail view of Fig. 7, illustrating the lock in a second position.
- [0018] Fig. 10 is detail view of Fig. 7, illustrating the lock in a third position.

DETAILED DESCRIPTION

[0019] Before any embodiments of the invention are explained in detail, it is to be understood that the present invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the accompanying drawings. The present invention is capable of other embodiments and of being practiced or of being carried out in various ways.

[0020] Figs. 1-10 show a floor tool 10 for applying a fluid, such as a wax, polish, cleaning product and the like, to a floor surface. Alternatively, the tool 10 can instead be used for performing work on any other surface desired, including without limitation on walls, ceilings, windows, and other structures. The illustrated floor tool 10 includes a handle 12 having a proximal end 16 and a distal end 14. The distal end 14 of the handle 12 is rotatably coupled to a tool head, such as the illustrated mop head 18, via a joint 20. In the illustrated embodiment, the joint 20 includes first and second flanges 22 and 24 extending from the distal end 14 of the handle 12, a first pivot 25 to which the first and second flanges 22, 24 are rotatably connected, and a second pivot 46 to which the first pivot 25 is rotatably connected. In other embodiments, the handle 12 can be rotatably connected to the pivot pin 25 in any other suitable manner, such as by a single flange 22, 24. The rotatable connection between the first and second flanges 22 and 24 and pivot pin 25 of the illustrated embodiment permit rotation of the handle 12 with respect to the mop head 18 about a cross axis 26 (see Fig. 4).

[0021] The mop head 18 has a top surface 28 spaced from a floor surface in operation of the floor tool 10, and a bottom surface 30 that faces a floor surface in operation of the floor

tool 10. The illustrated first surface 28 is has a bowed shape, but other shapes and configurations of the top surface 28 are possible. The illustrated second surface 30 is substantially planar, and can include one or more attachment fixtures operable to receive and/or removably couple a cleaning cloth, sponge, pad or other cleaning material or implement to the head 18.

[0022] In the illustrated embodiment, the second pivot 46 is pivotably coupled to the mop head 18 by first and second mounts 32, 34 at spaced locations along a longitudinal axis 36 of the mop head 18 (see Fig. 4). The first and second mounts 32, 34 of the illustrated embodiment are secured to the mop head 18 with respective first and second fasteners 38 and 40. In other embodiments, the first and second mounts are integrally formed with the top surface 28 of the mop head 18 or are coupled to the mop head 18 in any other suitable manner. Also in other embodiments, any other number of mounts (e.g., a single mount, or three or more mounts) having any other suitable shape can be used to pivotably secure the second pivot 46 to the mop head 18, and fall within the spirit and scope of the present invention.

[0023] As best shown in Figs. 7-10, the second pivot 46 of the illustrated embodiment defines a first end portion 48, a second end portion 50, and a middle portion 52 extending between the first and second mounts 32 and 34. First and second apertures 42, 44 within the first and second mounts 32, 34, are dimensioned to pivotably receive the first and second end portions 48, 50 of the second pivot 46, respectively. In this manner, the second pivot 46 can pivot about the longitudinal axis 36, thereby enabling the handle 12 to also pivot about the longitudinal axis 36 and the cross axis 26. In other embodiments, the second pivot 46 can be pivotably coupled to the first and second mounts 32, 34 in any other suitable manner, such as by protrusions of the first and second mounts 32, 34 being received within the ends of the second pivot, by bearings connecting each end portion 48, 50 to a respective mount 32, 34, and the like.

[0024] In some embodiments, such as the illustrated embodiment, the middle portion 52 of the second pivot 46 has a cross-sectional shape that is larger than the first and second apertures 42 and 44 of the mounts 32, 34 to retain the joint 20 in proper position between the first and second mounts 32 and 34. Also, each of the first and second apertures 42, 44 can extend inwardly to a wall 54, 56 defined by the mount 32, 34, thereby further limiting the ability of the second pivot 46 to move with respect to the mop head 18.

[0025] In the illustrated embodiment, the second pivot 46 is substantially tubular in shape, and thereby defines a hollow area 58, 60 at each end portion 48, 50 of the second pivot 46 joined by an internal intermediate chamber 62. Although the interior space(s) within the second pivot 46 can have any desired shapes and sizes, the intermediate chamber 62 has a larger cross-sectional shape (e.g., diameter) than that of either end portion 48, 50.

[0026] One or more internal protrusions 64 are located within the second pivot 46, and can be located at any point along the interior of the second pivot 46. By way of example only, internal protrusions 64 in the illustrated embodiment are shown extending inwardly from interior walls of the intermediate chamber 62 within the second pivot 46. Any number of such internal protrusions 64 can exist at any circumferential locations about the interior of the second pivot 46.

[0027] The joint 20 shown in Figs. 1-10 further includes a lock 66 movable to different positions to limit pivotal movement of the tool head 18. In some embodiments, the lock 66 is made of resiliently deformable material, such as plastic. In the illustrated embodiment, the lock 66 is laterally movable within the second pivot 46 in a direction substantially parallel to the longitudinal axis 36. The illustrated lock 66 includes a first end portion 68 extending within the first aperture 42 of the first mount 32 and the hollow area 58 of the first end portion 48 of the second pivot 46, a second end portion 70 extending within the second aperture 44 of the second mount 34 and the hollow area 60 of the second end portion 50 of the second pivot 46, and a middle portion 72 extending within the intermediate chamber 62 of the second pivot 44. Also, the illustrated lock 66 includes a first knob 74 at the first end portion 68, and a second knob 76 at the second end portion 70. The knobs 74, 76 are accessible to a user of the floor tool 10, such as by a user grasping either knob 74, 76 with his or her hand, a user pushing either knob 74, 76 with his or her finger(s) or foot, and the like. Other configurations and arrangements of the first and second end portions 68 and 70 and the first and second knobs 74 and 76 are possible, and fall within the spirit and scope of the present invention. For example, either or both knobs 74, 76 can be replaced by a flange, button, or any other type of user-manipulatable control located at the end portions 68, 70 of the lock 66 and still enabling the user to move the lock 66 as described herein.

[0028] With continued reference to the illustrated embodiment of Figs. 1-10, the middle portion 72 of the lock 66 is larger than the first and second end portions 68, 70, and defines an outer peripheral surface 78. The outer peripheral surface 78 engages the internal

protrusions 64 of the second pivot 46 in at least one position of the lock 66 within the second pivot 46, thereby preventing pivotal motion of the tool handle 12 from being transferred to pivotal motion of the second pivot 46. In this regard, either or both end portions 68, 70 of the lock 66 are shaped to prevent rotation of the end portions 68, 70 of the lock 66 within the first and second apertures 42, 44 of the mounts 32, 34 when the lock 66 has been moved to at least one longitudinal position within the second pivot 46 (e.g., far right in Figs. 7-10), and are shaped to permit such rotation when the lock 66 is in at least one other longitudinal position within the second pivot 46 (e.g., to the far left in Figs. 7-10). Respective cross-sectional shapes that prevent such rotational movement include, for example, a rectangle within a rectangle. Respective cross-sectional shapes that permit such rotational movement include, for example, concentric circular shapes, a square within a circle, and a circle within a square.

[0029] As discussed above, the middle portion 72 of the lock 66 in the illustrated embodiment defines an outer peripheral surface 78 that engages the internal protrusions 64 of the second pivot 46 in at least one position of the lock 66 within the second pivot 46. By way of example only, the middle portion 72 of the lock 66 shown in the illustrated embodiment has an outwardly extending protrusion 80 extending around at least a portion of the periphery of the middle portion 72. The illustrated outwardly extending protrusion 80 includes a ramp portion 82 and a planar portion 84. The ramp portion 82 can be sloped between the outer surface 78 and the planar portion 84 as shown, such that the middle portion 72 has a larger size proximate the planar portion 84, and has a smaller size spaced from the planar portion 84. It will be appreciated that other peripheral surface shapes 78 enabling selective engagement within the interior of the second pivot 46 based upon longitudinal position of the lock 66 are possible, and fall within the spirit and scope of the present invention.

[0030] Referring again to the illustrated embodiment of Figs. 1-10, the middle portion 72 of the lock 66 also has an aperture 90. The aperture 90 receives the first pivot 25 and extends along the longitudinal axis 36. Also, the aperture 90 is stepped, tapered, or otherwise has a width that varies along the length of the aperture 90. In the illustrated embodiment, the aperture 90 is stepped, and the diameter of the stepped aperture 90 increases from a first end 92 of the stepped aperture 90 (near the first end portion 68) to a second end 94 of the stepped aperture 90 (near the second end portion 70). The first end 92 of the stepped aperture 90 defines a first width 96 of the aperture 90, and the second end 94 of the stepped aperture 90 defines a second width 98 of the aperture 90 greater than the first width 96.

[0031] The stepped aperture 90 of the illustrated embodiment includes a first notch 100 proximate the second end 94 and having a width greater than the first width 96 of the aperture 90 and smaller than the second width 98. The stepped aperture 90 of the illustrated embodiment further includes a second notch 102 proximate the first end 92, having a width greater than the first width 96 and smaller than the second width 98 and the width of the first notch 100. The first and second notches 100 and 102 can be curved to correspond to the shape of the first pivot 25, such as by having the same or similar curvature as the first pivot 25.

[0032] In operation, a user pushes either the first knob 74 or the second knob 76 to move the lock 66 along the longitudinal axis 36 between a first position (shown in Figs. 7 and 8), a second position (shown in Fig. 9) and a third position (shown in Fig. 10). In the first position, the first end portion 68 of the lock 66 extends through the hollow area 58 on one end of the second pivot 46 as far as permitted by the geometry of the joint 20. In the first position, the first pivot 25 is received in the second end 94 of the stepped aperture 90. Little or no friction between the first pivot 25 and the second end 94 of the stepped aperture 90 is experienced. In this first position, little or no friction or engagement exists between the inward protrusion 64 and the lock 66. Accordingly, when the lock 66 is in the first position, the handle 12 is permitted to rotate with respect to the mop head 18 about both the cross axis 26 and the longitudinal axis 36.

[0033] When it is desired to at least partially lock the handle 12 with respect to the mop head 18, the first knob 74 is pushed to move the lock 66 along the longitudinal axis 36 toward the second end portion 50 of the second pivot 46, to a second position illustrated in Fig. 9. In the second position, the first pivot 25 is received in the first notch 100 of the stepped aperture 90. Little or no friction between the first pivot 25 and the first notch 100 of the stepped aperture 90 is experienced. In the second position, the inward protrusion 64 of the second pivot 46 is in position to bear against the lock 66 (e.g., the planar portion 84 of the outwardly extending protrusion 80) when the handle 12 of the tool 10 is attempted to be pivoted about the longitudinal axis 36. This engagement inhibits relative movement of the second pivot 46 with respect to the lock 66. Accordingly, when the lock 66 is in the second position, rotation of the handle 12 with respect to the mop head 18 about the cross axis 26 is permitted, but rotation of the handle 12 with respect to the mop head 18 and the longitudinal axis 36 is inhibited.

[0034] When it is desired to further lock the handle 12 with respect to the mop head 18, the first knob 74 is pushed to further move the lock 66 along the longitudinal axis 36 toward the second end portion 50 of the second pivot 46, to a third position illustrated in Fig. 10. In the third position, the first pivot 25 is received in the second notch 102 of the stepped aperture 90. Sufficient friction exists between the first pivot 25 and the second notch 102 of the stepped aperture 90 to inhibit rotation of the first pivot 25 within the stepped aperture 90. In the third position, the inward protrusion 64 is still in a position to bear against the lock 66 (e.g., the planar portion 84 thereof) when the handle 12 of the tool 10 is attempted to be pivoted about the longitudinal axis 36. Accordingly, when the lock 66 is in the third position, rotation of the handle 12 with respect to the mop head 18 about both the cross axis 26 and the longitudinal axis 36 is inhibited.

[0035] Although the three relative longitudinal positions of the lock 66 within the second pivot 46 are as shown in Figs. 7-10 in the illustrated embodiment, it will be appreciated that in other embodiments, the three states of the tool head 18 described herein can correspond to different longitudinal positions of the lock 66 simply by changing the shape of the aperture 90 and the relative position of the lock 66, the protrusions 64, and the apertures 42, 44.

[0036] Various features and advantages of the invention are set forth in the following claims.

CLAIMS

What is claimed is:

1. An articulated floor tool, comprising:
 - an elongate handle having a proximal end and a distal end;
 - a tool head defining a longitudinal axis and a cross axis;
 - a joint between the tool head and the elongate handle, the joint configured to selectively permit rotation of the tool head with respect to the handle about the longitudinal axis and the cross axis; and
 - a lock movable in a direction parallel to the longitudinal axis to selectively inhibit rotation of the tool head with respect to the handle about at least one of the longitudinal axis and the cross axis.
2. The articulated floor tool of claim 1, wherein the lock has a first position in which rotation of the tool head about the longitudinal axis and the cross axis is permitted, a second position in which rotation of the tool head about one of the longitudinal axis and the cross axis is inhibited, and a third position in which rotation of the tool head about both the longitudinal axis and the cross axis is inhibited.
3. The articulated floor tool of claim 2, wherein the lock includes a first end having a first knob and a second end having a second knob, each knob engageable by a user to move the lock between the first, second and third positions.
4. The articulated floor tool of claim 2, wherein the distal end of the elongate handle further comprises first and second flanges extending toward the tool head and attached to the joint for rotation of the tool head with respect to the handle about the cross axis when the lock is in the first position and the second position.
5. The articulated floor tool of claim 2, wherein the tool head includes first and second mounts rotatably engaged with the lock.
6. The articulated floor tool of claim 1, wherein the lock is resiliently deformable.

7. A method of selectively locking a tool head with respect to a handle of a floor tool, the method comprising:

rotating the tool head with respect to the handle about a longitudinal axis and a cross axis when a lock is in a first position;

laterally actuating the lock in a direction substantially parallel to the longitudinal axis from the first position into a second position; and

rotating the tool head with respect to the handle about one of the longitudinal axis and the cross axis and inhibiting rotation of the tool head with respect to the handle about the other of the longitudinal axis and the cross axis when the lock is in the second position.

8. The method of claim 7, wherein laterally actuating the lock includes sliding the lock through an aperture.

9. The method of claim 7, further comprising further laterally actuating the lock in the direction from the second position into a third position; and inhibiting rotation of the tool head with respect to the handle about both the longitudinal axis and the cross axis when the lock is in the third position.

10. The method of claim 9, wherein further laterally actuating the lock includes sliding the lock through an aperture in at least one mount on the tool head.

11. A method of selectively locking a tool head with respect to a handle of a floor tool, the method comprising:

rotating the tool head with respect to the handle about a longitudinal axis and a cross axis when a lock is in a first position;

laterally actuating the lock in a direction substantially parallel to the longitudinal axis from the first position into a second position; and

rotating the tool head with respect to the handle about the cross axis and inhibiting rotation of the tool head with respect to the handle about the longitudinal axis when the lock is in the second position.

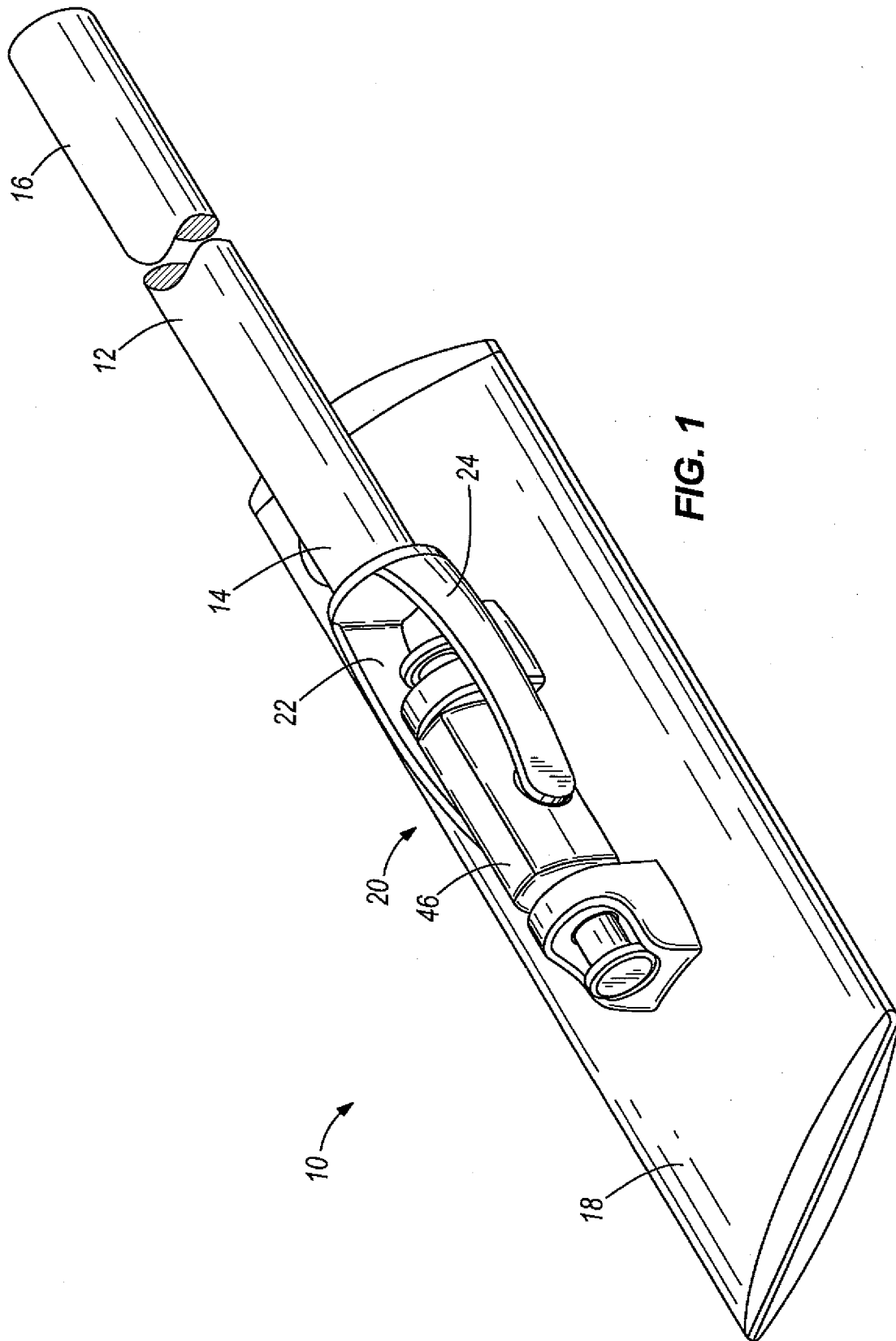
12. The method of claim 11, wherein laterally actuating a portion of the lock includes sliding the lock through an aperture.

13. The method of claim 11, further comprising further laterally actuating the lock in the direction from the second position into a third position; and inhibiting rotation of the tool head with respect to the handle about both the cross axis and the longitudinal axis when the lock is in the third position.
14. The method of claim 13, wherein further laterally actuating the lock includes sliding the lock through an aperture in at least one mount on the tool head.
15. An articulated floor tool, comprising:
an elongate handle having a proximal end and a distal end;
a tool head;
a joint between the tool head and the elongate handle, the joint having a first pivot defining a cross axis and a second pivot defining a longitudinal axis, the joint configured to selectively permit rotation of the tool head with respect to the handle about the cross axis and the longitudinal axis; and
a lock directly engaged with the first pivot to selectively inhibit rotation of the tool head with respect to the handle about the cross axis, the lock further directly engaged with the second pivot to selectively inhibit rotation of the tool head with respect to the handle about the longitudinal axis.
16. The articulated floor tool of claim 15, wherein the lock is movable in a direction parallel to the longitudinal axis to selectively inhibit rotation of the tool head with respect to the handle about at least one of the longitudinal axis and the cross axis.
17. The articulated floor tool of claim 15, wherein the lock has a first position in which rotation of the tool head about the longitudinal axis and the cross axis is permitted, a second position in which rotation of the tool head about one of the longitudinal axis and the cross axis is inhibited, and a third position in which rotation of the tool head about both the longitudinal axis and the cross axis is inhibited.
18. The articulated floor tool of claim 17, wherein the lock includes a knob engageable by a user to move the lock between the first position, the second position, and the third position.

19. The articulated floor tool of claim 15, wherein the second pivot includes a protrusion frictionally engaged by the lock in response to movement of the lock to inhibit rotation of the tool head with respect to the handle about the longitudinal axis.

20. The articulated floor tool of claim 19, wherein the lock has a notch, and wherein the first pivot is frictionally engaged with the lock within the notch in response to movement of the lock to inhibit rotation of the tool head with respect to the handle about the cross axis.

1/6



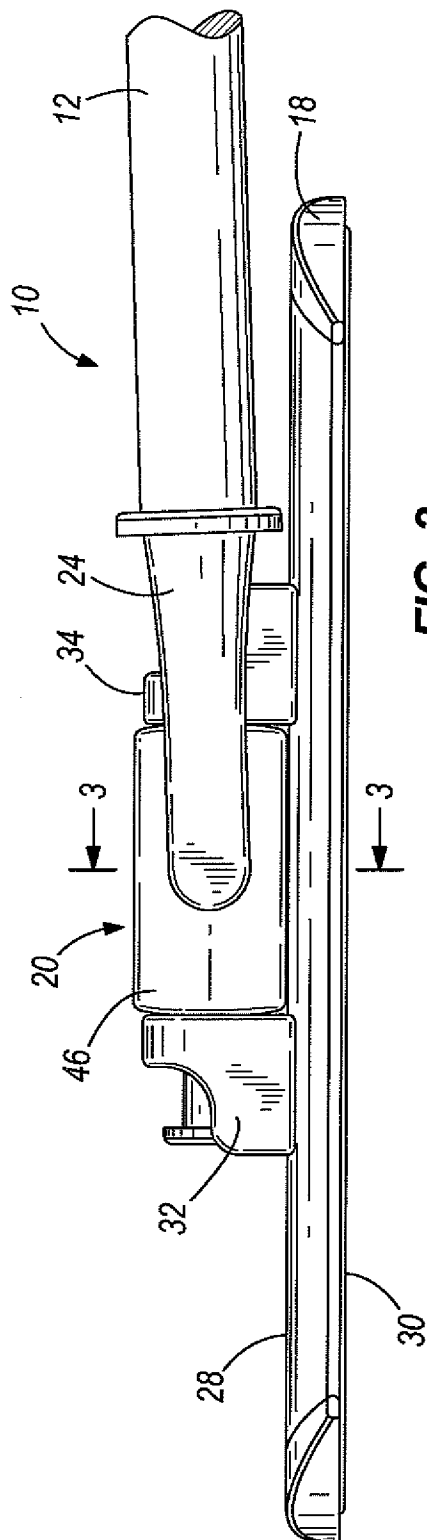


FIG. 2

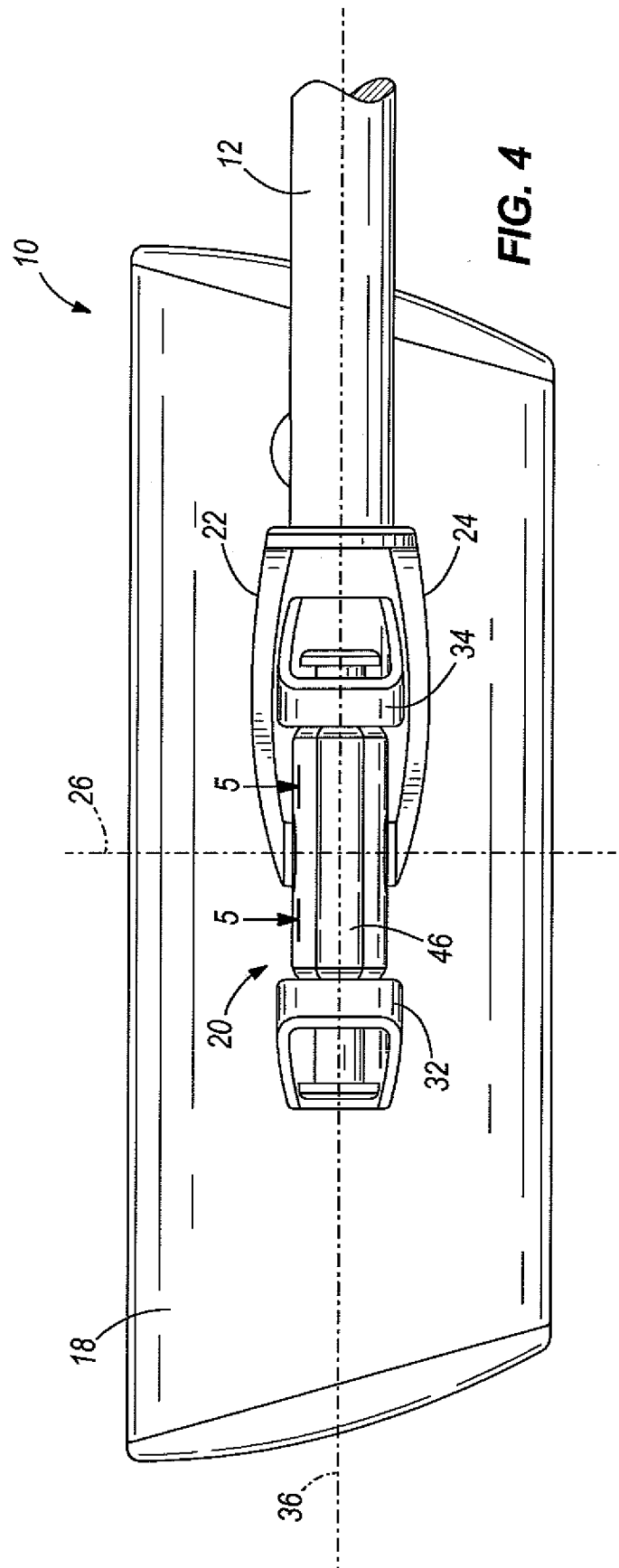


FIG. 4

3/6

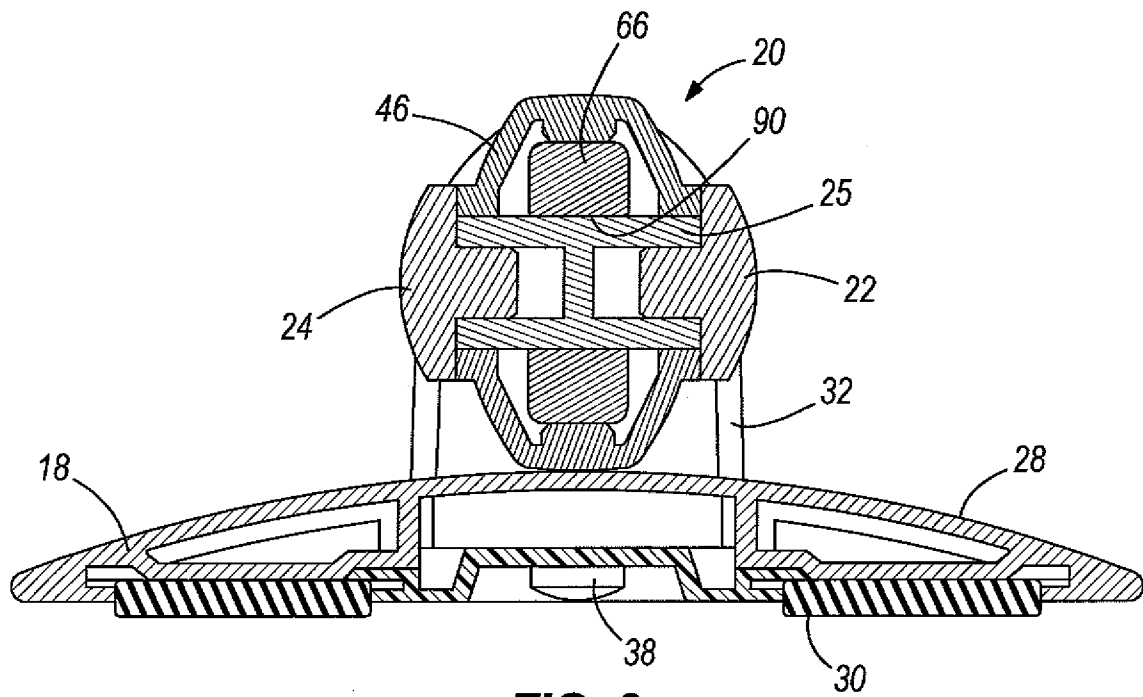


FIG. 3

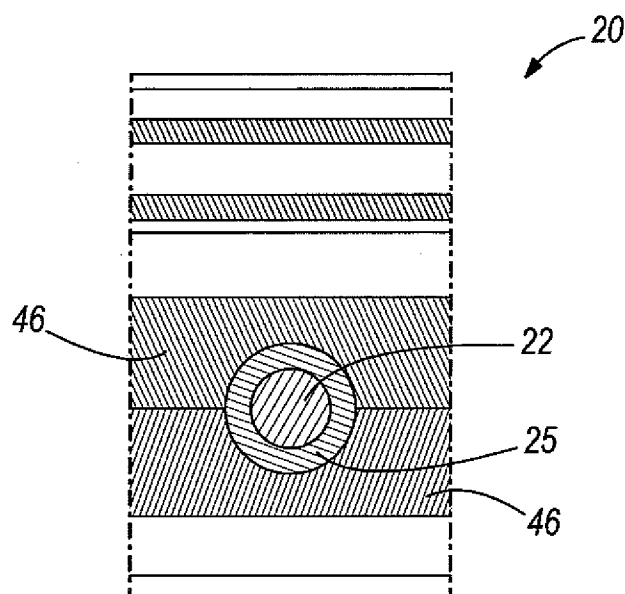


FIG. 5

4/6

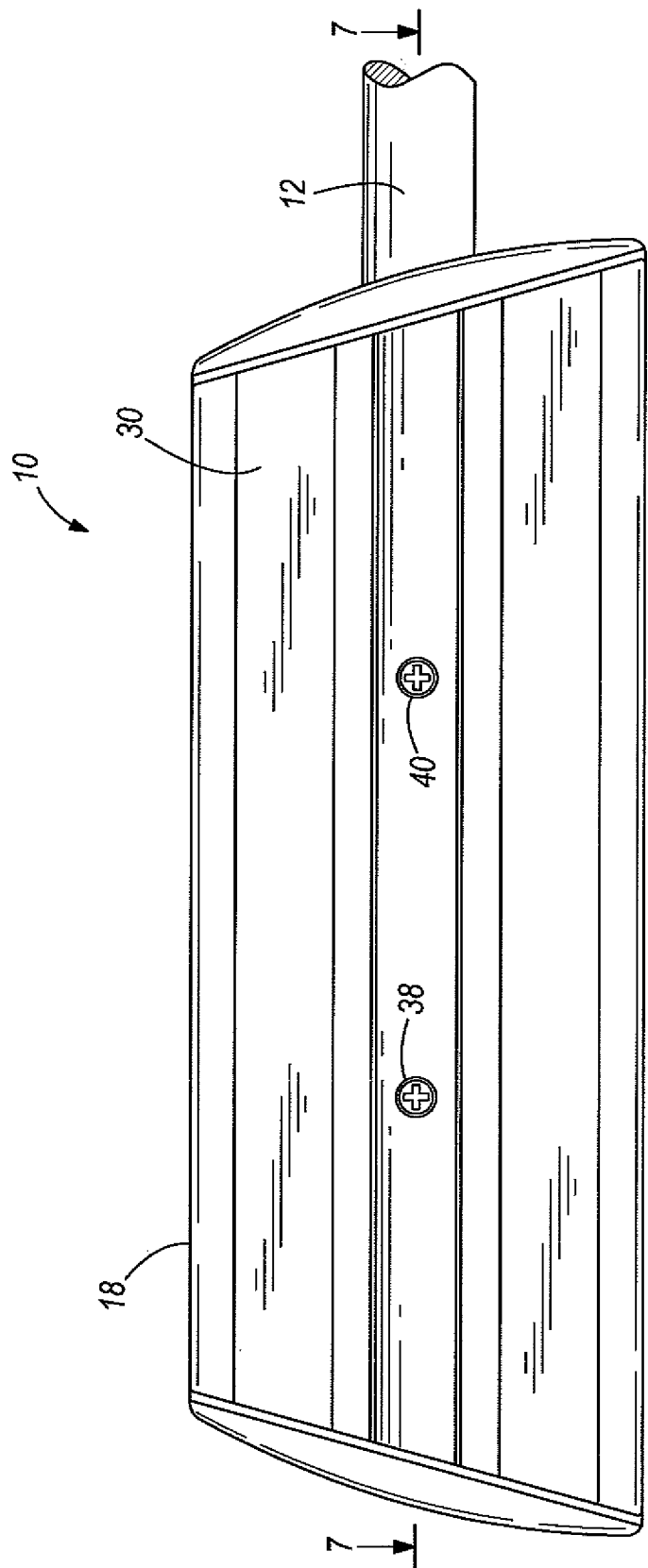
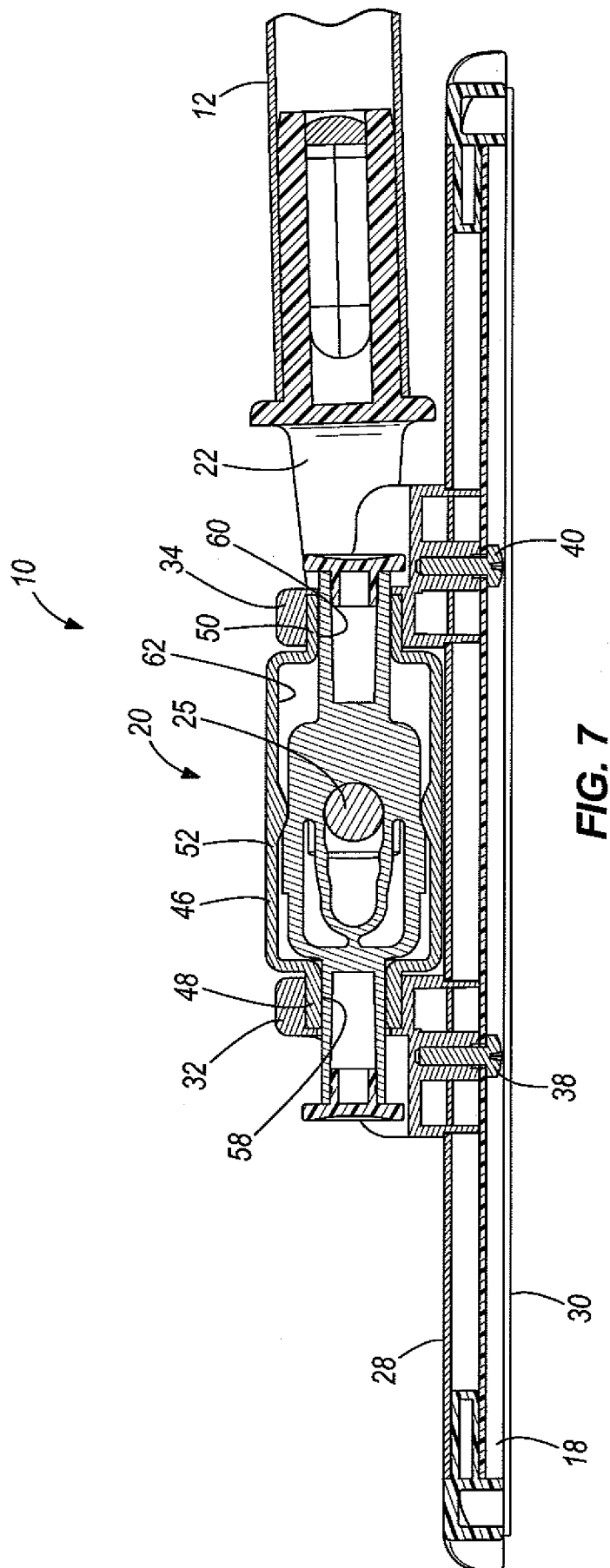


FIG. 6

5/6



6/6

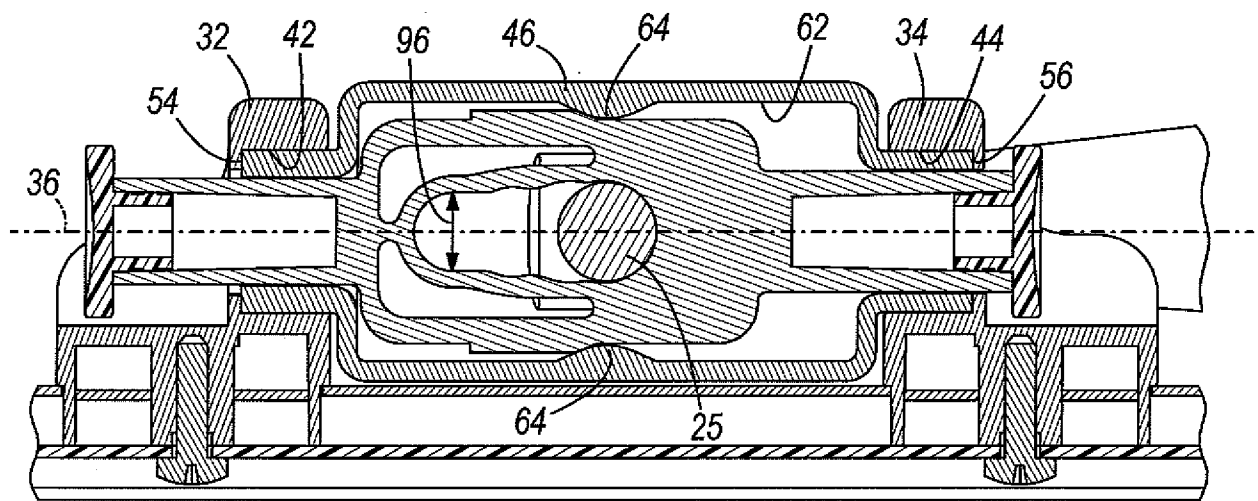


FIG. 8

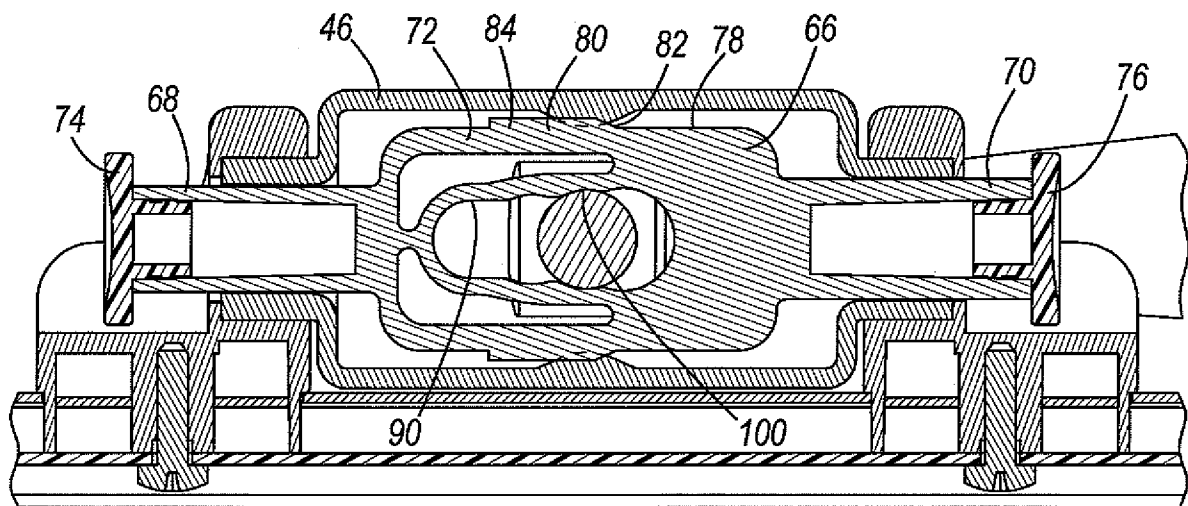


FIG. 9

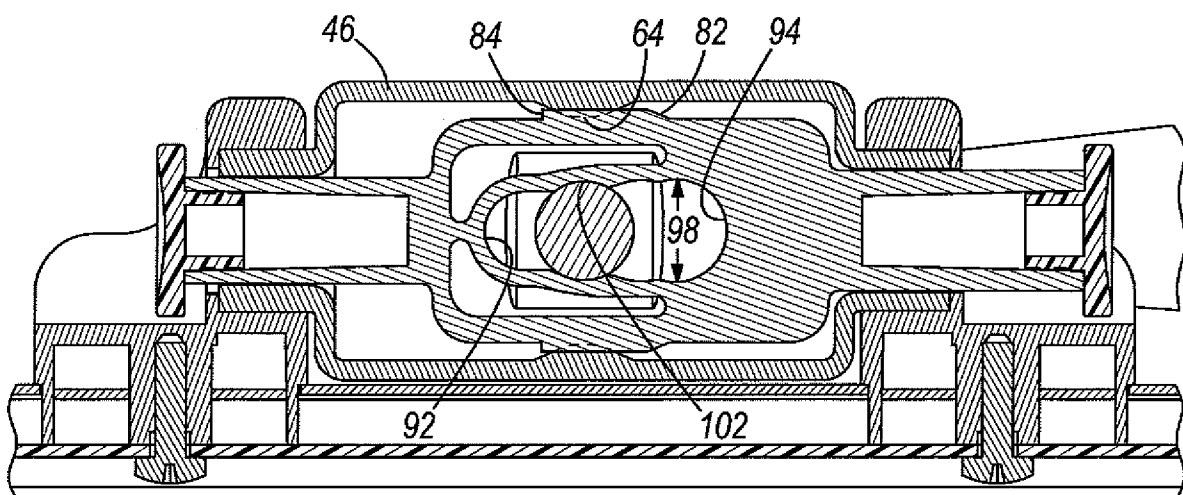


FIG. 10