



(43) International Publication Date
15 November 2012 (15.11.2012)

- (51) International Patent Classification:
A47L 7/00 (2006.01)
- (21) International Application Number:
PCT/US2011/035590
- (22) International Filing Date:
6 May 2011 (06.05.2011)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant (for all designated States except US): **NIL-FISK-ADVANCE, INC.** [US/US]; 14600 21st Avenue North, Plymouth, Minnesota 55447-3408 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **HALL, Aaron T.** [US/US]; 3390 County Highway 97, Carey, Ohio 43316 (US). **JOHNSON, Kale R.** [US/US]; 1506 Washington Street Northeast, Minneapolis, Minnesota 55413 (US).
- (74) Agent: **SCHWEGMAN, LUNDBERG & WOESSNER, P.A.**; P.O. Box 2938, Minneapolis, MN 55402 (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).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

[Continued on next page]

(54) Title: SQUEEGEE RETAINER CLIP

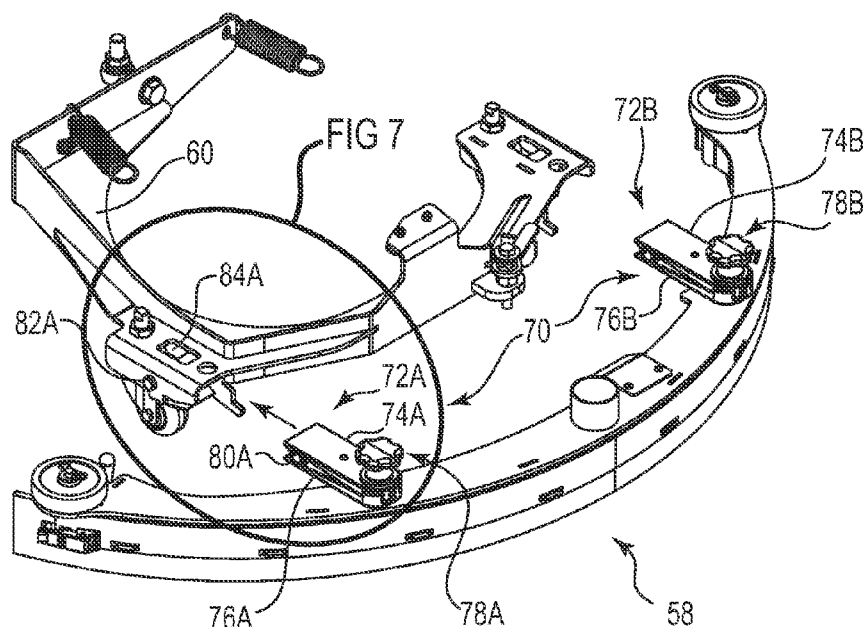


Fig. 6

(57) Abstract: A retainer clip for a squeegee assembly comprises top and bottom clip members each having an interior surface and an exterior surface. The interior surface of the top clip member includes a first channel portion adjacent to a first end and a first interlocking feature adjacent to a second end. The interior surface of the bottom clip member includes a second channel portion adjacent to a first end and a second interlocking feature adjacent to a second end. Mating the first interlocking feature with the second interlocking feature positions the first channel portion adjacent to the second channel portion to form a pin receiving channel.

WO 2012/154161 A1



Published:

— *with international search report (Art. 21(3))*

SQUEEGEE RETAINER CLIP

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to a cleaning apparatus. More specifically, the present invention relates to a retainer clip for a squeegee assembly that allows the squeegee assembly to detach or “break away” from the cleaning apparatus upon contact with an obstruction so as to prevent damage to the squeegee or to its mounting structure.

[0002] Industrial and commercial floors are cleaned on a regular basis for aesthetic and sanitary purposes. There are many types of industrial and commercial floors ranging from hard surfaces such as concrete, terrazzo, wood, and the like, which can be found in factories, schools, hospitals, and the like, to softer surfaces such as carpeted floors found in restaurants and offices. Different types of floor cleaning equipment such as scrubbers, sweepers, and extractors, have been developed to properly clean and maintain these different floor surfaces.

[0003] A typical scrubber is a walk-behind or drivable, self-propelled, wet process machine that applies a liquid cleaning solution from an on-board cleaning solution tank onto the floor through nozzles fixed to a forward portion of the scrubber. Rotating brushes forming part of the scrubber rearward of the nozzles agitate the solution to loosen dirt and grime adhering to the floor. The dirt and grime become suspended in the solution which is collected by a vacuum squeegee fixed to a rearward portion of the scrubber and deposited into an onboard recovery tank.

[0004] Scrubbers are very effective for cleaning hard surfaces. Unfortunately, debris on the floor can clog the vacuum squeegee, and thus, the floor should be swept prior to using the scrubber. Therefore, sweepers are commonly used to sweep a floor prior to using a scrubber. A typical sweeper is a self-propelled, walk-behind or drivable dry process machine that picks debris off a hard or soft floor surface without the use of

liquids. The typical sweeper has rotating brushes which sweep debris into a hopper or “catch bin.”

[0005] Combination sweeper-scrubbers have also been developed that provide the sweeping and scrubbing functionalities in a single unit.

[0006] In a typical squeegee assembly used to collect dirty solution from a floor surface, the front and rear blades of the squeegee are always in contact with the floor surface so that any liquid on the floor surface is exposed to, picked up, and carried by airflow in the squeegee assembly. The rear blade in particular is provided with sufficient downward force to bend the blade outward so that only one edge of the blade engages the floor surface. Exemplary squeegee assemblies are disclosed in U.S. Pat. No. 7,254,867, U.S. Patent No. 6,557,207, U.S. Patent No. 6,397,429, and U.S. Patent No. 6,519,808.

[0007] FIG. 1 is a perspective view of one exemplary squeegee assembly 10 of the prior art. As illustrated in FIG. 1, the squeegee assembly 10 generally includes a front flexible blade 12, a rear flexible blade 14, a support 16, and a suction tube 18 structured for connection to a vacuum source. The front and rear flexible blades 12 and 14 extend from a bottom side of the support 16, and are structured and designed to contact a floor surface. An upper end 20 of the suction tube 18 extends from a top side 22 of the support 16. Also extending from the top side 22 of the support 16 are connection means 24 for connecting the squeegee assembly 10 to a surface cleaning machine.

[0008] In operation, the squeegee assembly 10 may be coupled to a surface cleaning machine by the connection means 24 such that the front blade 12 is oriented with respect to the forward movement of the surface cleaning machine. Solution tends to pass through openings or slots in the front blade 12 or underneath the front blade 12 and is not directed to travel past the ends of the squeegee assembly.

[0009] The connection means 24 is typically a threaded fastener type mechanism having a vertical post (not shown) that slides into an open-ended channel 26 of a mounting plate 27 on the back end of the surface cleaning machine as more clearly illustrated in FIG. 2. When the vertical post is inserted into the open-ended channel 26, the connection means 24 is tightened so as to “sandwich” the open-ended channel 26 between the top side 22 of the squeegee assembly support 16 and the connection means 24.

[0010] FIG. 3 illustrates an alternative connection means in the form of a locking lever 28. The locking lever 28 may include a vertical post portion that is structured to be received within an open-ended channel 29 as described above with regard to FIG. 2.

[0011] Although numerous connection means exist for connecting a squeegee assembly to a surface cleaning machine, such prior art designs do not reliably allow the squeegee assembly to detach or “break away” from the machine to which it is attached upon contact with an obstruction. As appreciated by those skilled in the art, it is not uncommon for a squeegee assembly to “hit” fixed objects such as doorways, posts, or the like during operation. However, contact with such fixed objects or obstructions risks damage to the squeegee assembly and/or surface cleaning machine if the squeegee assembly is unable to detach upon application of a sufficient amount of force.

[0012] Thus, there is a need for an improved connection means for releasably connecting a squeegee assembly to a surface cleaning machine.

SUMMARY OF THE INVENTION

[0013] The present invention addresses the foregoing needs by providing a retainer clip for a squeegee assembly that comprises top and bottom clip members each having an interior surface and an exterior

surface. The interior surface of the top clip member includes a first channel portion adjacent to a first end and a first interlocking feature adjacent to a second end. The interior surface of the bottom clip member includes a second channel portion adjacent to a first end and a second interlocking feature adjacent to a second end. Mating the first interlocking feature with the second interlocking feature positions the first channel portion adjacent to the second channel portion to form a pin receiving channel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a perspective view of one exemplary squeegee assembly of the prior art.

[0015] FIG. 2 is one exemplary prior art connection means for connecting the squeegee assembly of FIG. 1 to a surface cleaning machine.

[0016] FIG. 3 is a diagram illustrating another exemplary prior art connection means for connecting the squeegee assembly of FIG. 1 to a surface cleaning machine.

[0017] FIG. 4 is a top perspective view of one exemplary sweeper-scrubber that utilizes squeegee retainer clips in accordance with the present invention to couple a squeegee assembly to a squeegee support bracket.

[0018] FIG. 5 is a bottom perspective view of the exemplary sweeper-scrubber of FIG. 4.

[0019] FIG. 6 is a perspective view of the squeegee assembly detached from the squeegee support bracket and illustrating first and second retainer clips in accordance with the present invention.

[0020] FIG. 7 is an enlarged partial perspective view of the first retainer clip adjacent to a clip receiving slot in the squeegee support bracket.

[0021] FIG. 8 is a cross-sectional view of the squeegee assembly and squeegee support bracket illustrating the first retainer clip pivotally and releasably coupled to the support bracket.

[0022] FIG. 9 is a perspective view of the squeegee assembly with the components of the first and second retainer clips exploded so as to illustrate the connection to the squeegee assembly.

[0023] FIGS. 10A-10D illustrate various views of one of the clip member portions.

[0024] FIG. 11 is a diagram illustrating a side view of the assembled first retainer clip with a circular retaining pin in a corresponding opening in the clip.

[0025] FIG. 12 is a diagram similar to that shown in FIG. 11 illustrating the operation of the first retainer clip.

DETAILED DESCRIPTION OF THE INVENTION

[0026] Generally speaking, the present invention relates to a retainer clip for a squeegee assembly that allows the squeegee assembly to detach or “break away” from the cleaning apparatus to which it is attached upon contact with an obstruction so as to prevent damage to the squeegee assembly. As will be appreciated by those skilled in the art, squeegee retainer clips in accordance with the present invention may be used to releasably attach squeegee assemblies to any floor cleaning system that requires the use of a squeegee for liquid pick-up without departing from the intended scope of the present invention. However, for purposes of example and not limitation, the squeegee retainer clips of the present

invention will be described as applied to a combination sweeper-scrubber system.

[0027] FIGS. 4 and 5 are top and bottom perspective views, respectively, of one exemplary sweeper-scrubber 30 that utilizes squeegee retainer clips in accordance with the present invention. As illustrated in FIGS. 4 and 5, the sweeper-scrubber 30 includes a sweeper system 32 for sweeping a floor surface and a scrubber system 34 for scrubbing the floor surface. Thus, as will be discussed in further detail below, the sweeper-scrubber 30 is operable to sweep dirt and debris from the floor surface and then apply a liquid cleaning solution from an onboard cleaning solution tank onto the floor being cleaned, agitate the cleaning solution, and use suction to draw the cleaning solution into an onboard recovery tank.

[0028] Providing a floor cleaning system having both a sweeper system 32 and a scrubber system 34 allows the operator to perform both “dry” and “wet” cleaning with the same system. As will be appreciated by those skilled in the art, the sweeping and scrubbing modes may be operated either separately or simultaneously depending upon the type of cleaning required.

[0029] As further illustrated in FIGS. 4 and 5, the sweeper-scrubber 30 includes a chassis 36 having a forward end 38 and a rearward end 40 joined by sides 42. The chassis 36 is supported by floor engaging front wheels 44 and a rear steerable wheel 46. The rear steerable wheel 46 is operatively connected to a steering wheel 48 through the chassis 36.

[0030] A driver seat 50 is supported by the chassis 36 rearward of the steering wheel 48 for use by an operator operating the sweeper-scrubber 30. The operator sits on the driver seat 50 to operate the steering wheel 48 and foot operated control pedals 52, such as a brake and accelerator supported above the chassis top surface 54.

[0031] In operation, liquid cleaning solution is applied from an onboard cleaning solution tank onto the floor being cleaned. The cleaning solution can be gravity fed or alternatively pumped out of the cleaning solution tank onto the floor. The cleaning solution applied onto the floor is then agitated by a plurality of ground engaging agitation brushes 56 extending from a bottom surface of the chassis 36. As illustrated in FIGS. 4 and 5, the ground engaging agitation brushes 56 have parallel axes of rotation that are substantially perpendicular to the floor surface. The ground engaging agitation brushes 56 are rotatably driven by a suitable motor, and agitate the cleaning solution sprayed onto the floor to dislodge dirt and grime adhered thereto. In addition to the agitation brushes 56, the scrubber system 34 further includes a floor engaging vacuum squeegee assembly 58 disposed proximal the chassis rearward end 40. The agitated cleaning solution and suspended dirt and grime are drawn off the floor through the squeegee assembly 58 and into the recovery tank for disposal.

[0032] The squeegee assembly 58 is coupled to a squeegee support bracket 60 pivotally fixed relative to the chassis 36, and can be moved between an operating position and a stored position (when not in use). The squeegee assembly 58 is operable to dry the floor surface being cleaned by the sweeper-scrubber 30 and includes a forward arcuate squeegee blade 62 nested in a rearward arcuate squeegee blade 64. The nested squeegee blades 62 and 64 extend substantially across the width of the system, and define a crescent shaped vacuum zone 66. The squeegee blades 62 and 64 are typically formed from a flexible, elastomeric material such as rubber, plastic, or the like, which can sealingly engage the floor surface.

[0033] The forward squeegee blade 62 collects the cleaning solution on the floor surface, and typically includes notches in its floor engaging edge which allows the cleaning solution to enter the vacuum zone 66. The rearward squeegee blade 64 typically has a continuous floor engaging

edge in order to prevent the escape of the cleaning solution rearwardly from the vacuum zone 66.

[0034] As illustrated in FIGS. 4 and 5, a pair of side disk brooms 68 are rotatably mounted proximal the chassis forward end 38 forward of the ground engaging agitation brushes 56, and are driven by a suitable motor controlled by control circuitry. Each side broom 68 is rotatable about a vertical axis proximal one of the chassis sides 42 and urges debris towards a centerline of the chassis 36 for pick up by a main sweeper broom 69 that is rotatable about a horizontal axis. As illustrated in FIGS. 4 and 5, each side broom 68 extends radially from its vertical axis past one side 42 of the chassis 36 in order to sweep the floor along a wall or other vertical surface. Similar to the squeegee assembly 58, the side brooms 68 may be vertically movable between an operating position and a storage position.

[0035] Now that one exemplary and non-limiting floor cleaning system has been described that may utilize the squeegee retainer clips of the present invention, the structure and operation of the squeegee retainer clips will now be described in detail with reference to FIGS. 6-12. Particularly, FIG. 6 is a perspective view of the squeegee assembly 58 detached from the squeegee support bracket 60 and isolated from the remainder of the sweeper-scrubber 30. As illustrated in FIG. 6, the squeegee assembly 58 is attachable to the squeegee support bracket 60 with a suitable squeegee retainer mechanism 70. In one exemplary embodiment as shown in FIG. 6, the squeegee retainer mechanism 70 includes a first retainer clip 72A having a first or top clip member 74A and a second or bottom clip member 76A, and a second retainer clip 72B having a first or top clip member 74B and a second or bottom clip member 76B. The first retainer clip 72A may be secured to the squeegee assembly 58 with a first locking means 78A while the second retainer clip 72B may be secured to the squeegee assembly 58 with a second locking means 78B.

[0036] As those skilled in the art will appreciate, the first and second retainer clips 72A and 72B are identical in both structure and function. Thus, for purposes of simplicity and brevity, the following description will focus on the structure and function of the first retainer clip 72A only. However, it should be understood that the description applies in a similar manner to the second retainer clip 72B of the squeegee retainer mechanism 70.

[0037] With further reference to FIG. 6, the first retainer clip 72A is structured such that when the top clip member 74A and bottom clip member 76A are clamped together on top of the squeegee assembly 58 they form a substantially circular shaped opening 80A that is roughly the size of and may be retained onto a pin 82A located in a clip receiving slot 84A on a first side of the squeegee support bracket 60. An enlarged partial perspective view of the first retainer clip 72A adjacent to the clip receiving slot 84A is shown in FIG. 7.

[0038] As will be appreciated by those skilled in the art, the first locking means 78A is structured to “clamp” the top and bottom clip members 74A and 76A together, as well as secure the assembled retainer clip 72A to the squeegee assembly 58. The form of the first retainer clip 72A is similar to that of a spring loaded clothes pin or the like. Thus, the top and bottom clip members 74A and 76A are structured to act as spring members and are able to be spread apart, such that they can detach from the pin 82A in the event that the squeegee assembly 58 contacts a fixed object during movement of the machine. The angle formed between the top and bottom clip members 74A and 76A and the pin 82A, along with the spring rate of the clip members, allows for a predictable and repeatable force necessary to extract the retainer clip 74A from the pin 82A (without damage or degradation to either member).

[0039] As illustrated in FIG. 7, the top clip member 74A may include an alignment hole 83 that is visible through an opening 85A in the squeegee

support bracket 60 when the first retainer clip 72A is properly positioned within the clip receiving slot 84A. Although not shown, the bottom clip member 76A may include a similar alignment hole. Alternatively, printed markings or other surface features may be used in place of alignment holes that may be visible through the opening 85A in the squeegee support bracket 60 as will be appreciated by those skilled in the art.

[0040] FIG. 8 is a cross-sectional view of the squeegee assembly 58 and squeegee support bracket 60 illustrating the first retainer clip 72A pivotally and releasably coupled to the circular pin 82A. When coupled as shown in FIG. 8, the circular pin 82A and corresponding circular opening 80A in the retainer clip 72A allow the squeegee assembly 58 to pivot in relation to the squeegee support bracket 60 on the rearward end 40 of the machine chassis 36. This is possible due to the fact that the circular pin 82A has a diameter that is less than a diameter of the opening 80A formed between the top and bottom clip members 74A and 76A.

[0041] As will be appreciated by those skilled in the art, alternative embodiments of the retainer clips are contemplated where a pivot is not included in the design. In such embodiments the attaching pin 82A need not be circular and the clip members 74A and 76A need not be stacked on top of one another, only positioned opposite one another to allow for retention onto the squeegee support bracket 60. Thus, alternative embodiments of the pin 82A may be defined by various non-circular cross-sectional shapes such as oval, elliptical, rectangular, or the like without departing from the intended scope of the present invention.

[0042] FIG. 9 is a perspective view of the squeegee assembly 58 removed from the sweeper-scrubber 30 with the components of the retainer clips exploded so as to illustrate their connection to the squeegee assembly 58. As illustrated in FIG. 9, the top and bottom clip members 74A and 76A of the first retainer clip 72A include apertures 86 that are structured to receive a post member 90A therethrough that extends from a

top surface of the squeegee assembly 58. The post member 90A may be designed with an outer diameter that is less than an inner diameter of the apertures 86 so as to allow at least slight rotation of the squeegee assembly 58 relative to the first retainer clip 72A about the post member 90A.

[0043] As further illustrated in FIG. 9, the first locking means 78A may be in the form of a rotatable knob 92A having a threaded inner channel (not shown) that is structured to engage with an exteriorly threaded shaft 94A extending from the post member 90A. Thus, turning the rotatable knob 92A in a clockwise direction 96 may result in a tightening of the knob and corresponding clamping force placed upon the top and bottom clip members 74A and 76A. Conversely, turning the rotatable knob 92A in a counterclockwise direction 98 may result in a loosening of the knob and corresponding reduction in the clamping force placed upon the top and bottom clip members 74A and 76A.

[0044] The first retainer clip 72A and the first locking means 78A may be designed such that tightening the rotatable knob 92A results in a substantially fixed and repeatable amount of clamping force between the top and bottom clip members 74A and 76A. However, in alternative embodiments, the first retainer clip 72A and the first locking means 78A may be designed such that the amount of clamping force between the top and bottom clip members 74A and 76A depends upon the extent to which the rotatable knob 92A is tightened. In other words, the amount of clamping force may be directly linked to the position of the rotatable knob 92A with respect to the exteriorly threaded shaft 94A.

[0045] As will be appreciated by those skilled in the art, a locking means that includes a threaded knob that is engageable with a threaded shaft to tighten the knob is merely one type of locking means that may be used in accordance with the present invention. Thus, any suitable locking means may be used without departing from the intended scope of the

present invention including, but not limited to, locking levers, bolts, or the like.

[0046] As discussed above, the first retainer clip 72A is formed from two identical clip members, i.e. first clip member 74A and 76A, which are structured to be positioned next to each other in an opposing relationship. The exemplary and non-limiting structure of the clip members that allows for such assembly will now be described with reference to FIGS. 10A-10D. Particularly, FIG. 10A is a perspective view of the top clip member 74A, FIG. 10B is a view illustrating an interior surface of the top clip member 74A, FIG. 10C is a view illustrating an exterior surface of the top clip member 74A, and FIG. 10D is a view illustrating a first side of the top clip member 74A. Although only the top clip member 74A is illustrated, it should be understood that the features and structure of the bottom clip member 76A are identical.

[0047] As illustrated in FIGS. 10A-10D, the top clip member 74A includes a forward end 100, a rearward end 102, an interior surface 104, an exterior surface 106, a first side surface 108, and a second side surface 110. Adjacent the forward end 100 on the interior surface 104 is a substantially semicircular channel 112 that forms approximately one-half of the substantially circular shaped opening 80A discussed above for retaining the circular pin 82A. Adjacent the rearward end 102 is an interlocking feature 114 that is defined by at least one protrusion 116 and at least one recess 118. Particularly, the interlocking feature 114 of the top clip member 74A includes a pair of protrusions 116 and a pair of recesses 118. As will be appreciated by those skilled in the art, when assembled as illustrated in FIGS. 6 and 7 the protrusions 116 of the top clip member 74A are structured to be received within and mate with the recesses 118 of the bottom clip member 76A and the protrusions 116 of the bottom clip member 76A are structured to be received within and mate with the recesses 118 of the top clip member 74A. This interlocking

structure prevents lateral as well as rotational movement of the top clip member 74A relative to the bottom clip member 76A.

[0048] As will be appreciated by those skilled in the art, the interlocking feature 114 of the present invention may utilize any suitable interlocking geometry without departing from the intended scope of the present invention. Thus, protrusions 116 and recesses 118 are described and illustrated merely for purposes of example and not limitation. Alternative interlocking features may comprise, for example, a circular/radial locking mechanism having a plurality of radially extending teeth that are structured to mate with a corresponding plurality of grooves. Numerous such “meshing” designs are possible and within the intended scope of the present invention.

[0049] The interior surface 104 of the top clip member 74A may include a substantially flat region 120 and an angled or pitched region 122 disposed between the semicircular channel 112 adjacent the forward end 100 and the interlocking feature 114 adjacent the rearward end. Although not a necessary feature of the top clip member 74A, an angled or pitched region 122 may provide the ability to change the amount of force required to release the pin.

[0050] FIG. 11 is a diagram illustrating a side view of the assembled first retainer clip 72A with the circular pin 82A of the squeegee support bracket 60 in the circular opening 80A. As illustrated in FIG. 11, the flat regions 120 provide a point of contact between the top and bottom clip members 74A and 76A when mated together. The flat regions 120 also help to stabilize the top and bottom clip members 74A and 76A and distribute the clamping force when the rotatable knob 92A is tightened. As further illustrated in FIG. 11, the semicircular channels 112 of the top and bottom clip members 74A and 76A may each include forward edges 126 that are spaced slightly apart. As will be appreciated by those skilled in

the art, the space between the forward edges 126 of the clip members may affect the amount of force required to remove the pin.

[0051] FIG. 12 is a diagram similar to that shown in FIG. 11 illustrating the first retainer clip 72A being pulled from the circular pin 82A in the direction indicated by arrow 128 due to contact of the squeegee assembly with a fixed obstacle or obstruction. As discussed above, the first retainer clip 72A is structured and designed to require a predictable and repeatable amount of force in order to extract the clip 72A from the pin 82A without damaging either component. One advantage of providing a circular pin 82A and a corresponding circular opening 80A is that as the first retainer clip 72A is being pulled away from the pin 82A, the pin contacts and “rides” up the curved surfaces of the semicircular channels 112. Thus, the circular pin 82A does not get caught up in the opening 80A but instead is guided out of the opening until it is completely released from the clamping force of the retainer clip. As further illustrated in FIG. 12, the forward ends of the first and second clip members 74A and 76A may have beveled edges 130 to assist with guiding the circular pin 82A away from the retainer clip 72A after being released or guiding the pin 82A into the opening.

[0052] Although the retainer clips of the present invention have been described herein as being formed by two separate and identical clip members that when stacked on top of one another interlock thereby preventing rotation therebetween, numerous alternative designs are also contemplated. For example, in one exemplary alternative embodiment the retainer clips may be manufactured as a single part that forms both the top and bottom clip members. In another exemplary alternative embodiment, the retainer clips may be formed by separate and non-identical clip members.

[0053] Furthermore, retainer clips in accordance with the present invention may be formed from any suitable material including, but not

limited to, plastic, hard rubber, metal, or various nylons such as glass filled nylon. Embodiments that are formed from more than one material are also contemplated.

[0054] Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

What is claimed is:

1. A retainer clip for a squeegee assembly comprising:
 - a top clip member having an interior surface and an exterior surface, the interior surface including a first channel portion adjacent to a first end; and
 - a bottom clip member having an interior surface and an exterior surface, the interior surface including a second channel portion adjacent to a first end;wherein the first channel portion is structured to be positioned adjacent to the second channel portion to form a pin receiving channel.
2. The retainer clip of claim 1, wherein the first and second channel portions are each defined by a curved channel surface.
3. The retainer clip of claim 2, wherein the curved channel surfaces are semi-circular in shape such that the pin receiving channel has a generally circular cross-section.
4. The retainer clip of claim 3, further comprising:
 - a first interlocking feature adjacent to a second end of the top clip member; and
 - a second interlocking feature adjacent to a second end of the bottom clip member;wherein mating the first interlocking feature with the second interlocking feature positions the first channel portion adjacent to the second channel portion.
5. The retainer clip of claim 1, wherein the first and second interlocking features each comprise one or more protrusions and one or more recesses.

6. The retainer clip of claim 5, wherein each of the protrusions in the first interlocking feature is structured to mate with a corresponding recess in the second interlocking feature, and wherein each of the protrusions in the second interlocking feature is structured to mate with a corresponding recess in the first interlocking feature.
7. The retainer clip of claim 6, wherein the top and bottom clip members each include an aperture that is structured to receive a post extending from a squeegee assembly.
8. The retainer clip of claim 7, wherein the apertures are substantially circular and define a pivot point to allow the retainer clip to rotate relative to a squeegee assembly.
9. The retainer clip of claim 1, further comprising a locking means that is structured to provide a predetermined amount of clamping force upon the top and bottom clip members.
10. The retainer clip of claim 9, wherein the locking means comprises a rotatable knob having a threaded inner channel that is structured to engage with an exteriorly threaded shaft that extends through apertures in the top and bottom clip members.
11. The retainer clip of claim 1, wherein the top and bottom clip members are formed from a glass reinforced nylon material.
12. The retainer clip of claim 1, wherein the top clip member and the bottom clip member are identical.
13. A retainer clip for a squeegee assembly comprising:
 - a first clip member having an interior surface and an exterior surface, the interior surface including a first curved channel portion adjacent to a first end and a first interlocking feature

adjacent to a second end, the first interlocking feature comprising a first protrusion and a first recess; and

a second clip member having an interior surface and an exterior surface, the interior surface including a second curved channel portion adjacent to a first end and a second interlocking feature adjacent to a second end, the second interlocking feature comprising a second protrusion structured to be received within the first recess and a second recess structured to receive the first protrusion;

wherein mating the first interlocking feature with the second interlocking feature positions the first channel portion adjacent to the second channel portion to form a pin receiving channel.

14. The retainer clip of claim 13, wherein the interior surfaces of the first and second clip members are pitched between the first end and the second end.

15. The retainer clip of claim 13, wherein the pin receiving channel has a generally circular cross-section.

16. The retainer clip of claim 13, wherein the first ends of the first and second clip members are beveled.

17. The retainer clip of claim 13, further comprising a locking means that is structured to provide a predetermined amount of clamping force upon the first and second clip members.

18. The retainer clip of claim 17 wherein the locking means comprises a rotatable knob having a threaded inner channel that is structured to engage with an exteriorly threaded shaft that extends through apertures in the first and second clip members.

19. A retainer clip comprising:
- a first clip member having an interior surface and an exterior surface, the interior surface including a first channel portion adjacent to a first end; and
 - a second clip member having an interior surface and an exterior surface, the interior surface including a second channel portion adjacent to a first end that together with the first channel portion defines a pin receiving channel;
- wherein the first and second clip members are joined at respective second ends.
20. The retainer clip of claim 19, wherein the first and second clip members are formed integral with one another.
21. The retainer clip of claim 19, wherein the first and second clip members are separable from one another.

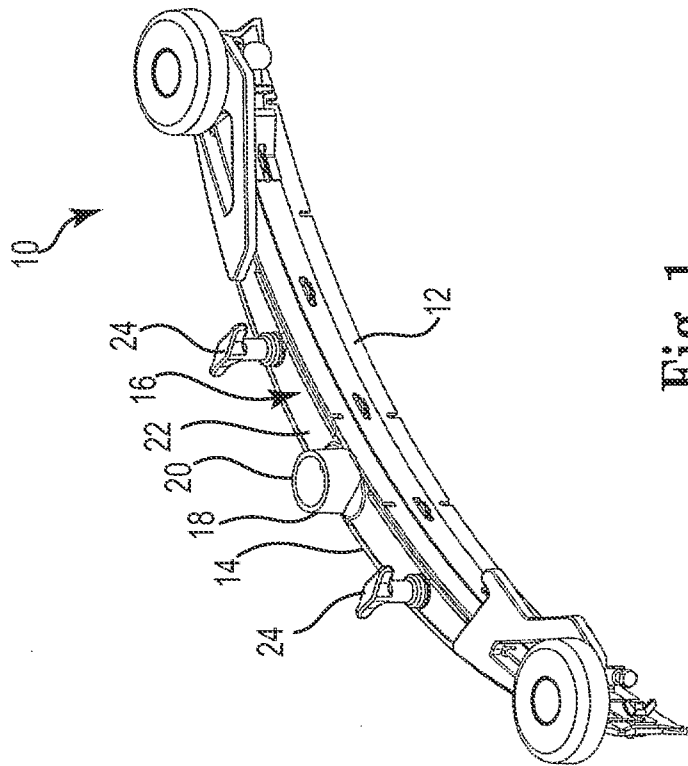


Fig. 1
PRIOR ART

2/12

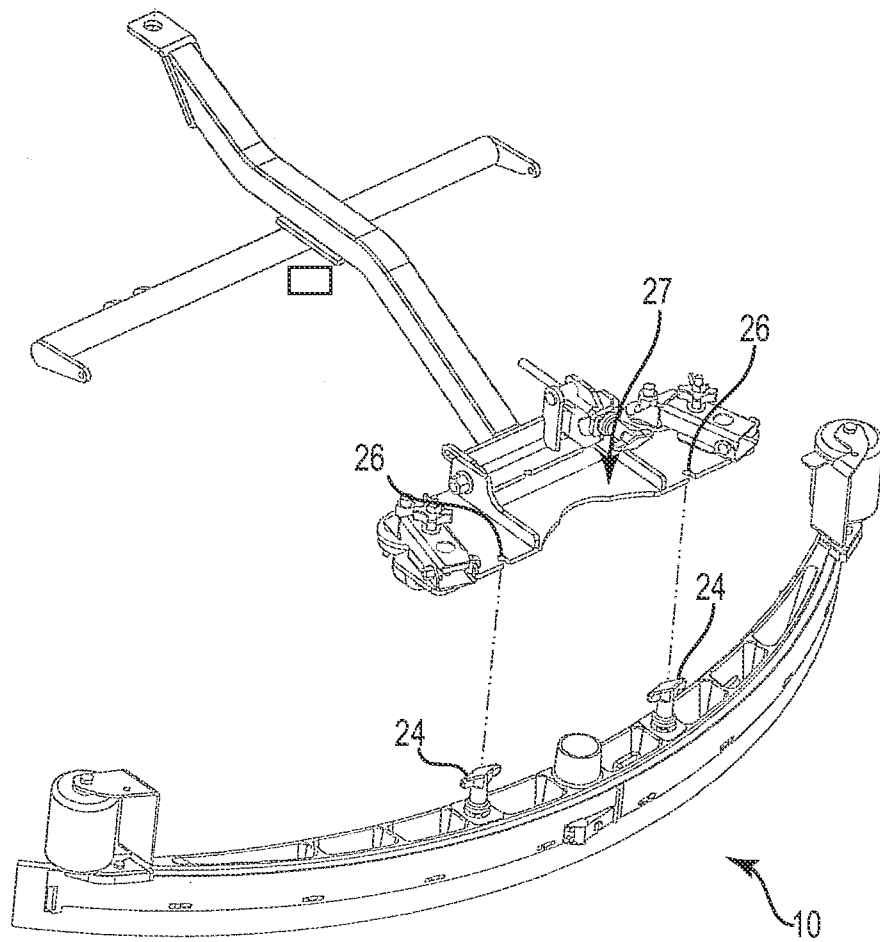


Fig. 2
PRIOR ART

3/12

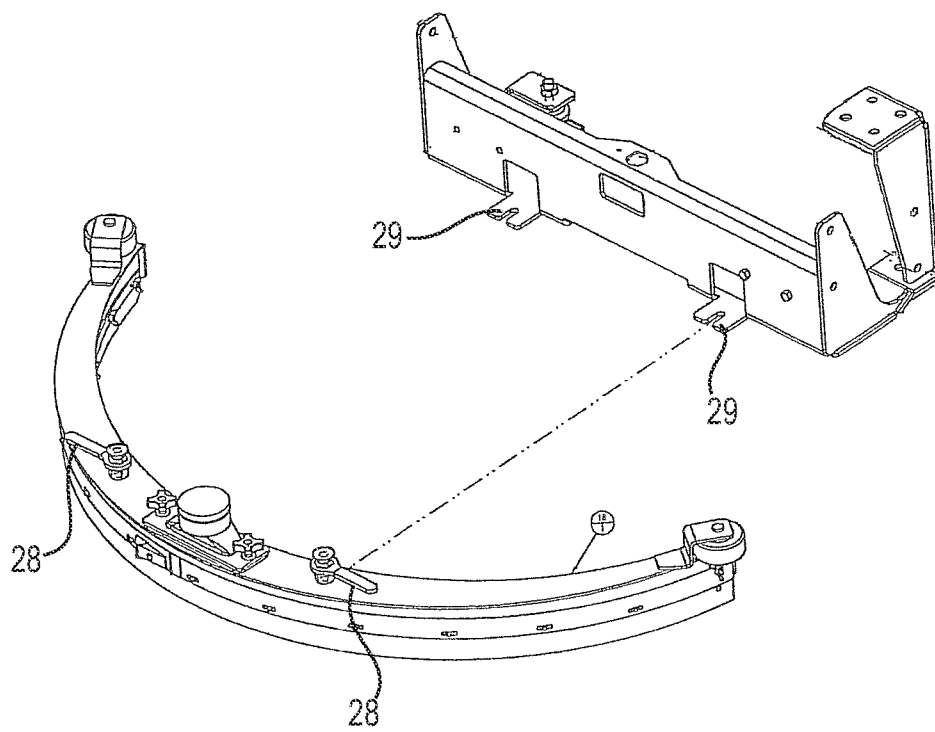


Fig. 3
PRIOR ART

4/12

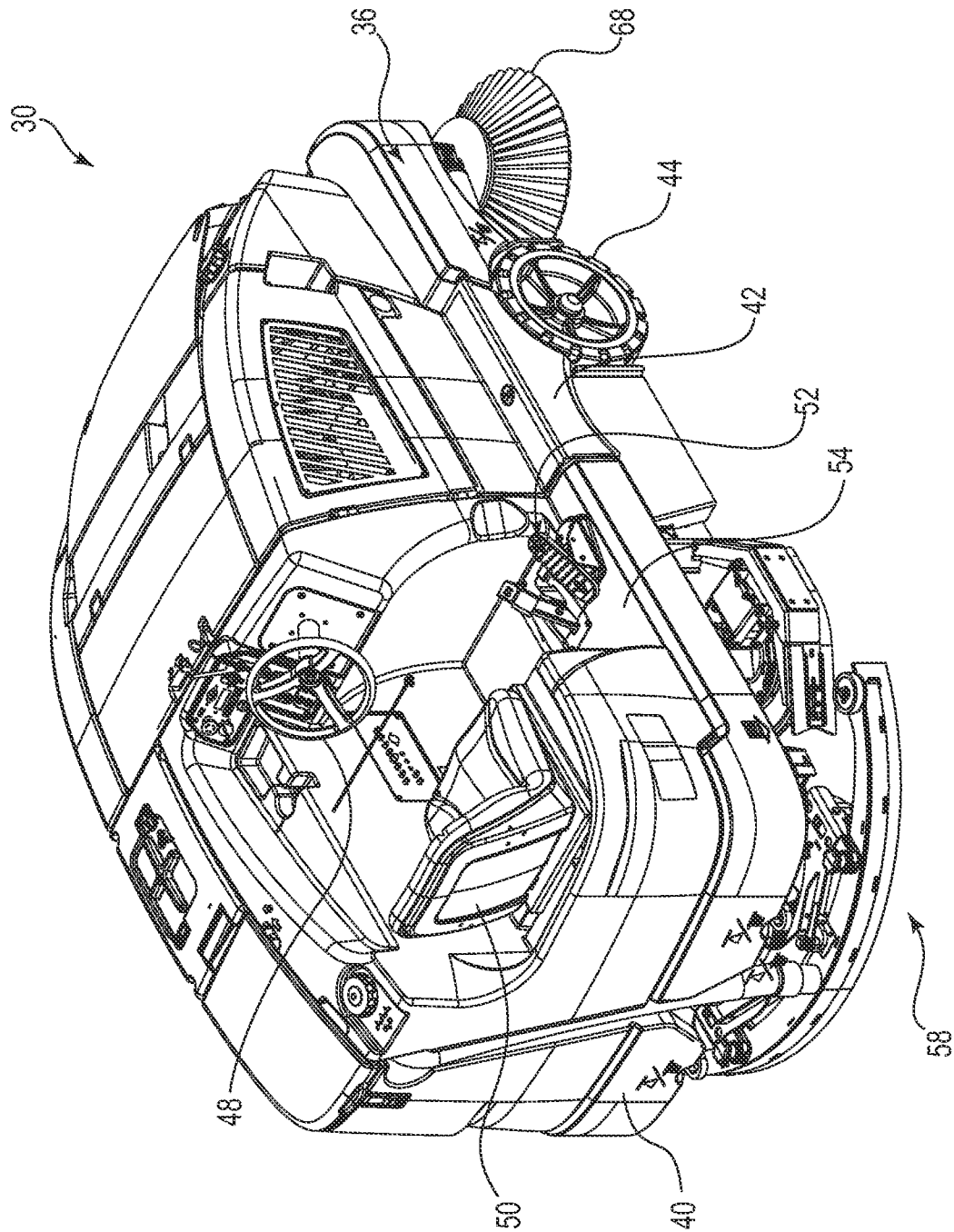


Fig. 4

5/12

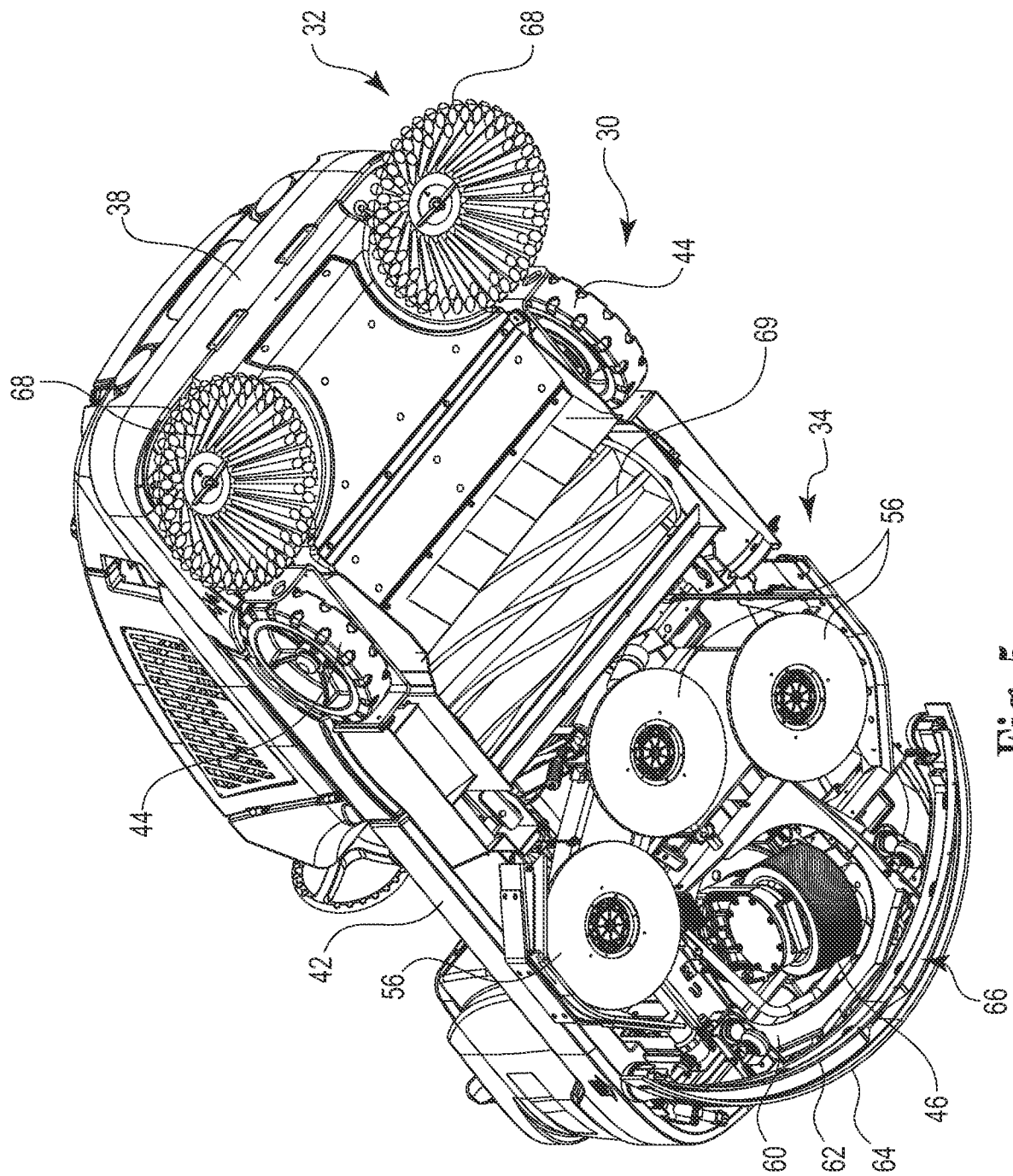


Fig. 5

6/12

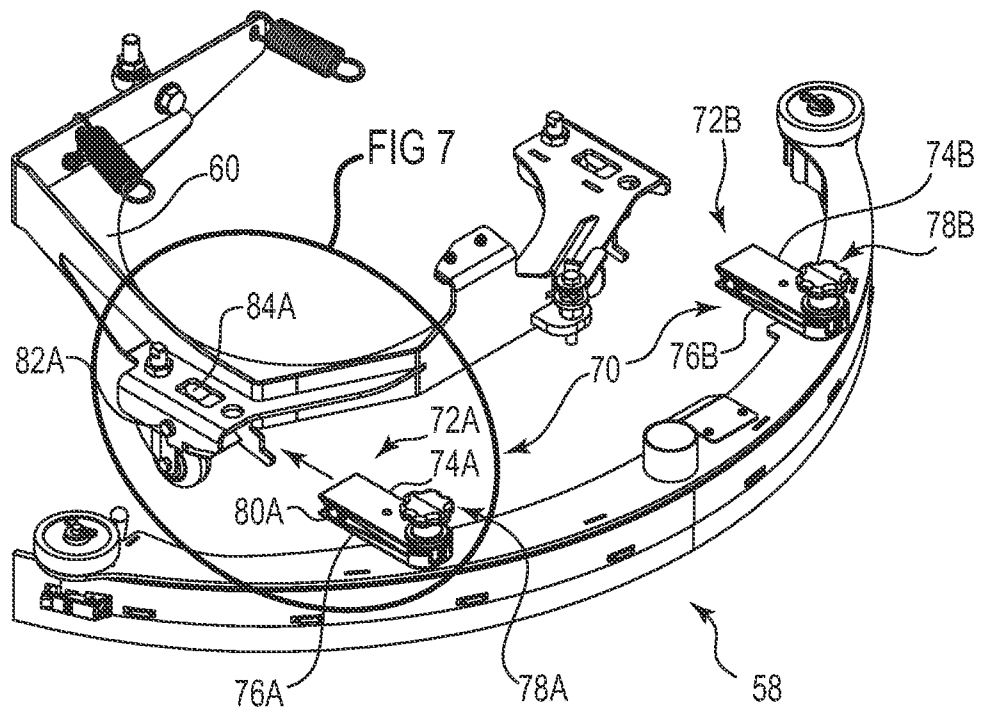


Fig. 6

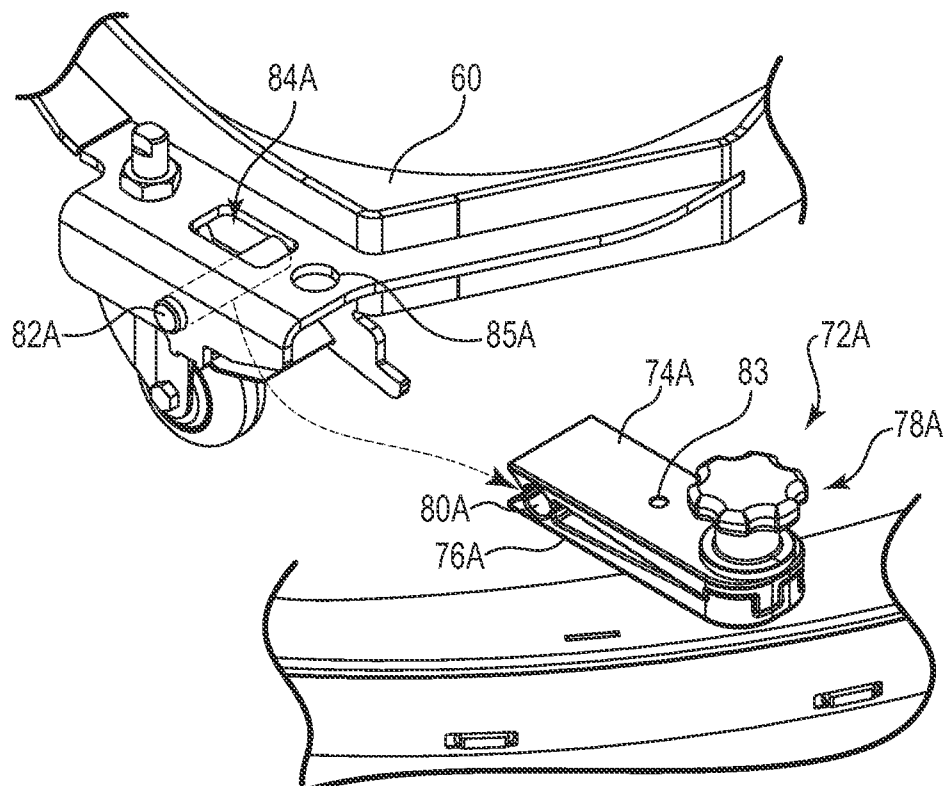


Fig. 7

7/12

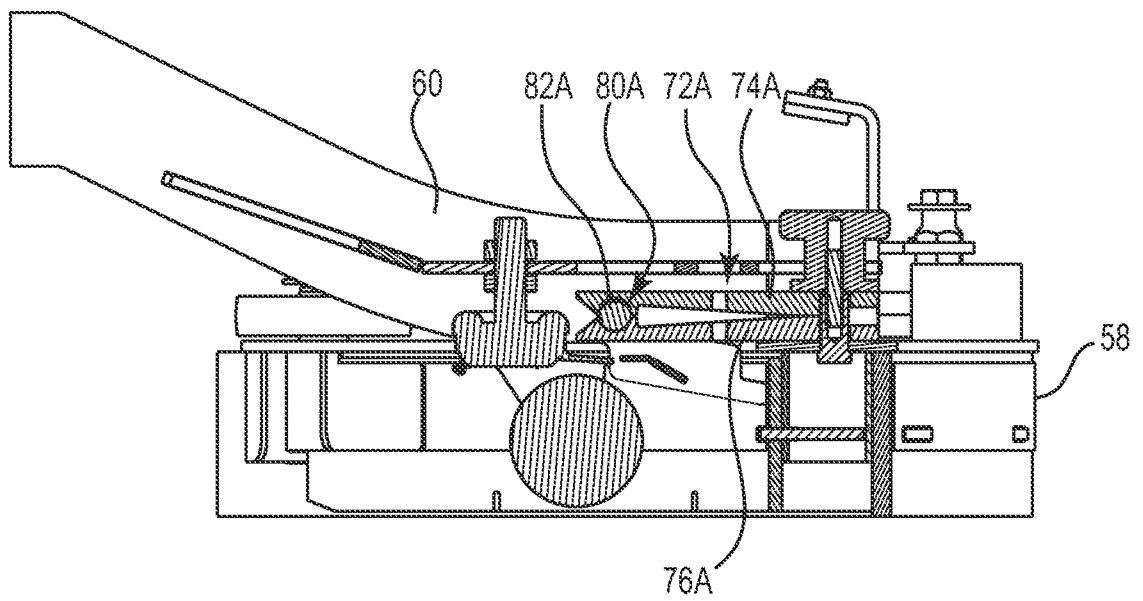


Fig. 8

8/12

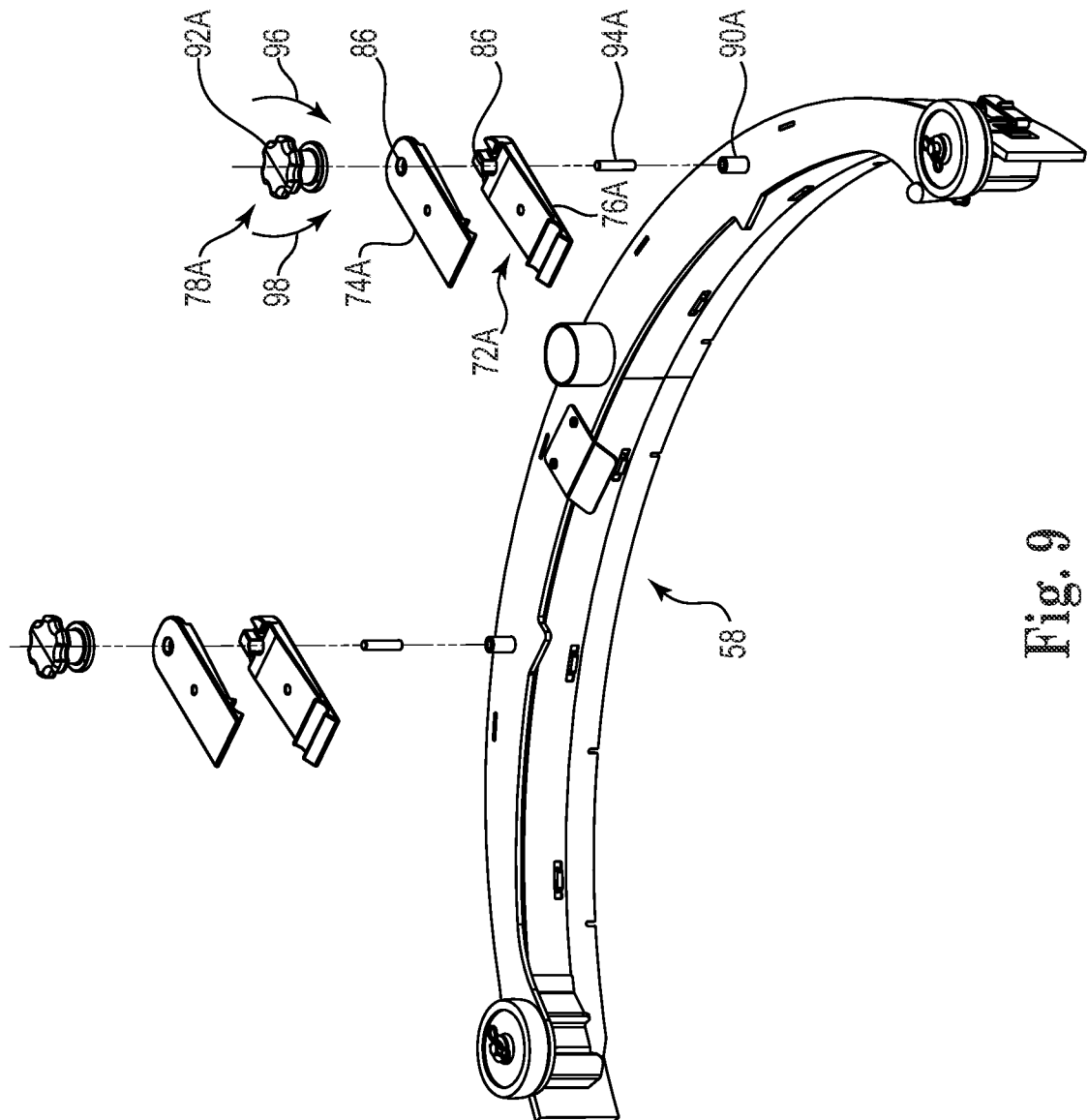


Fig. 9

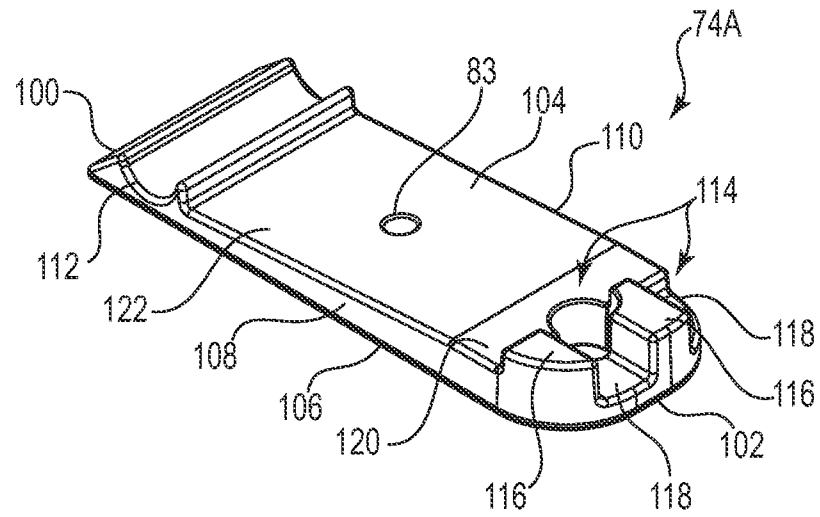


Fig. 10A

82

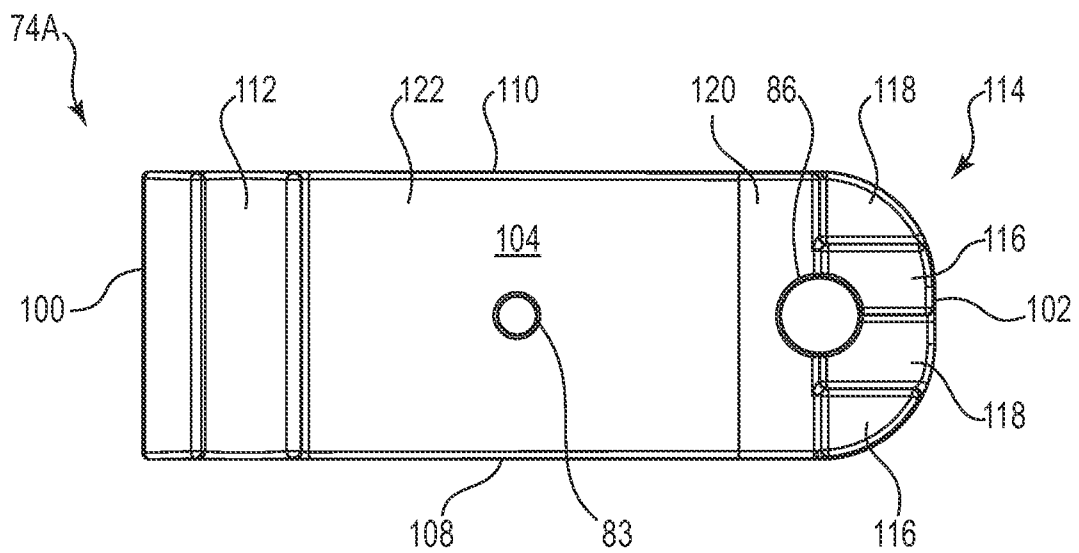


Fig. 10B

10/12

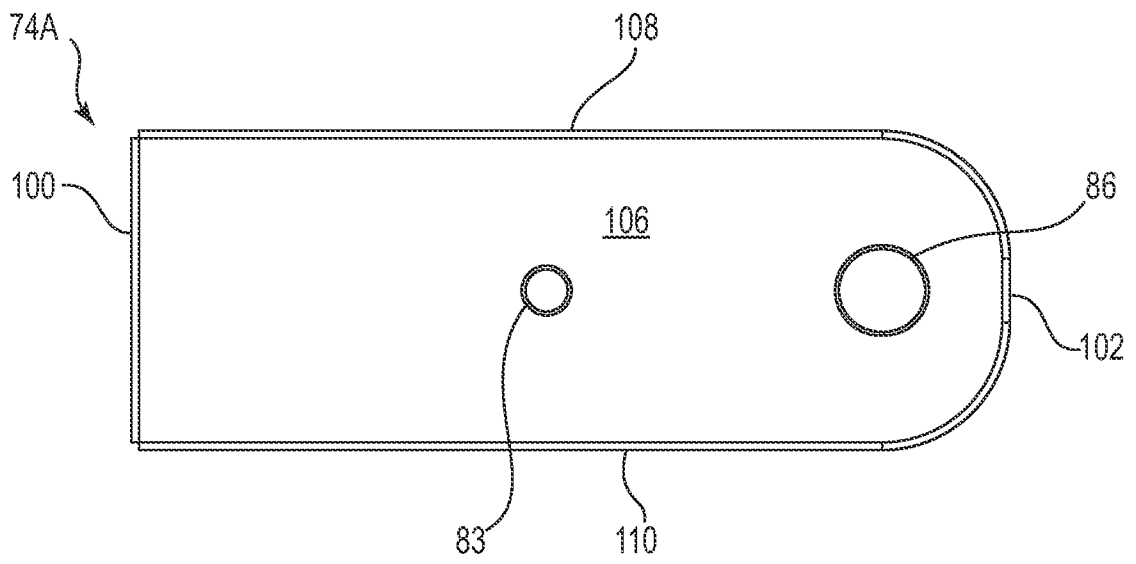


Fig. 10C

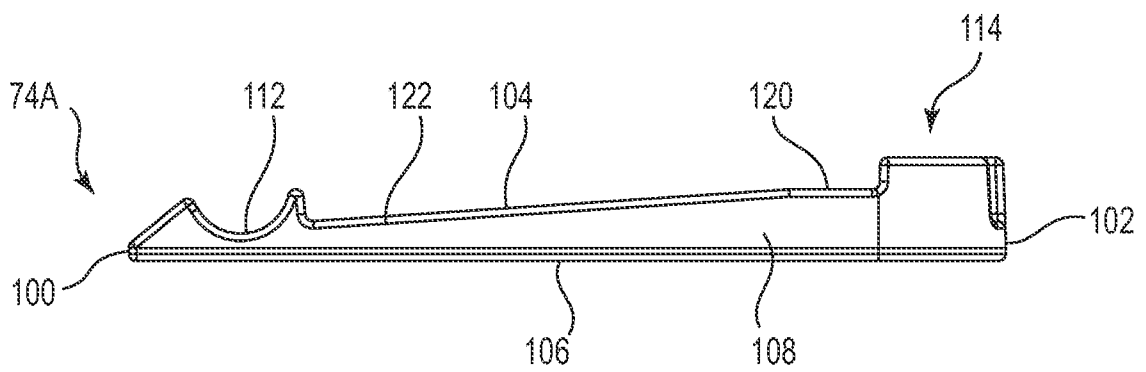
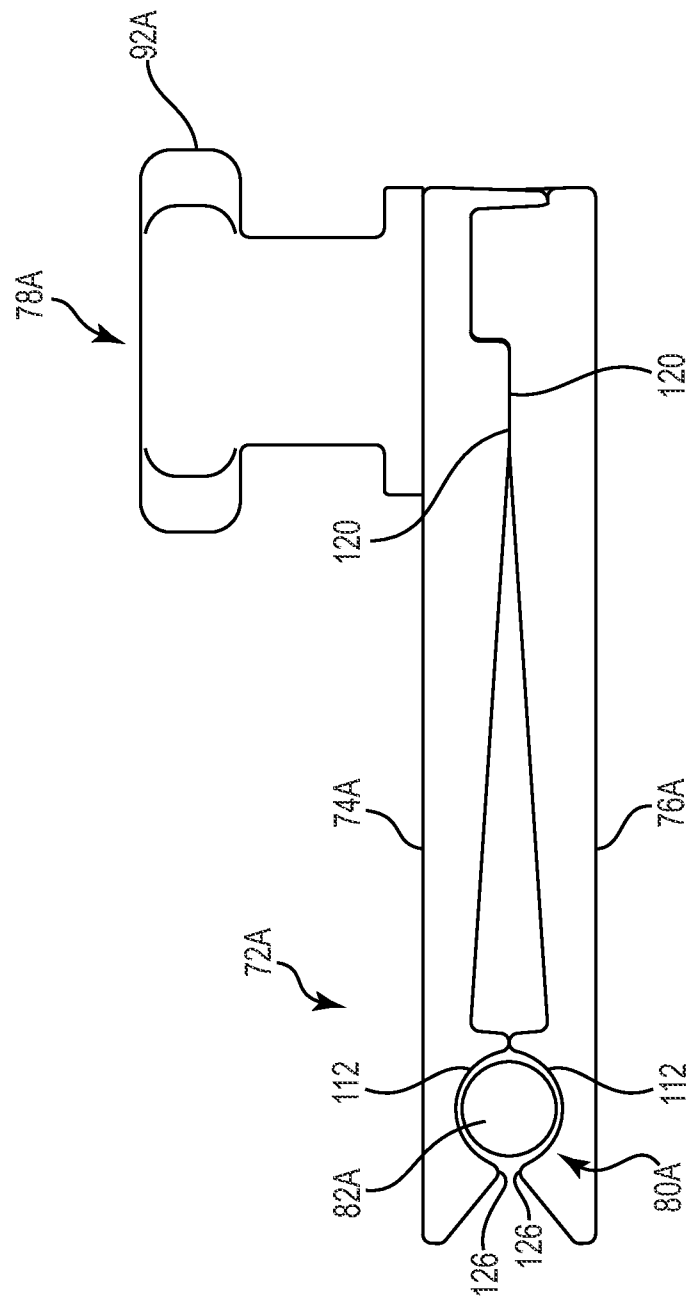
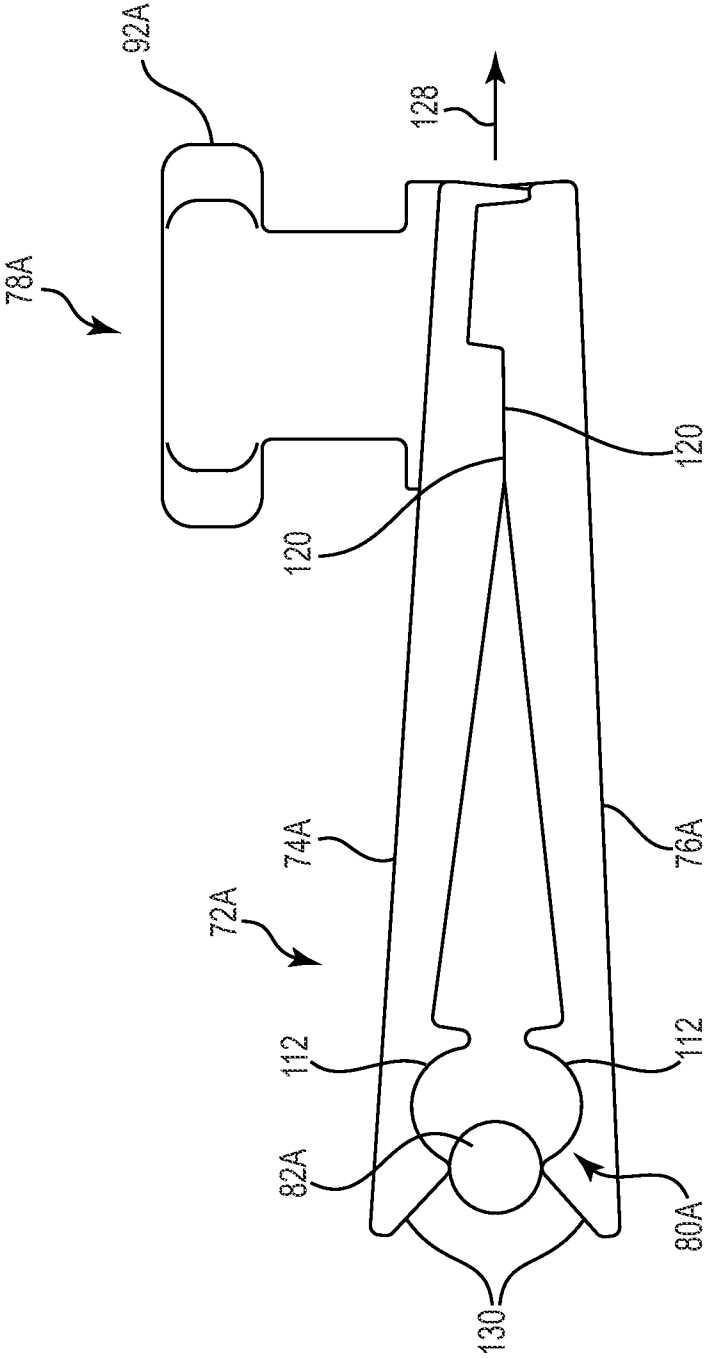


Fig. 10D



11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2011/035590

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A47L 7/00 (2011.01)

USPC - 15/401; 248/230.1

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)

IPC(8) - A47L 7/00, 11/30, (2011.01)

USPC - 15/320, 401, 402; 211/107, 182; 248/74.1, 74.4, 214, 229.1, 229.14, 229.16, 230.1, 230.5, 230.7, 231.61, 231.81, 295.11, 298.1

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

USPC - 248/316.6, 316.7, 447.2, 540, 541; 403/191, 234, 256, 289, 290, 385, 397

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

USPTO EAST System (US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT), PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1,928,626 A (LESAGE) 03 October 1933 (03.10.1933) entire document	1, 2, 3, 9, 11
--		-----
Y		4-8, 10, 13-18
X	US 4,617,775 A (PADRUN) 21 October 1986 (21.10.1986) entire document	1, 12, 19, 20
X	US 2,263,554 A (BRACH) 25 November 1941 (25.11.1941) entire document	19, 21
Y	US 2,574,007 A (ANDERSON) 06 November 1951 (06.11.1951) entire document	4-8, 13-18
Y	US 7,178,777 B1 (BANKER) 20 February 2007 (20.02.2007) entire document	10, 18

☐ Further documents are listed in the continuation of Box C.

* 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

28 July 2011

Date of mailing of the international search report

02 AUG 2011

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774