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(54) Title: UNIVERSAL CONNECTOR FOR A FLUID MOP

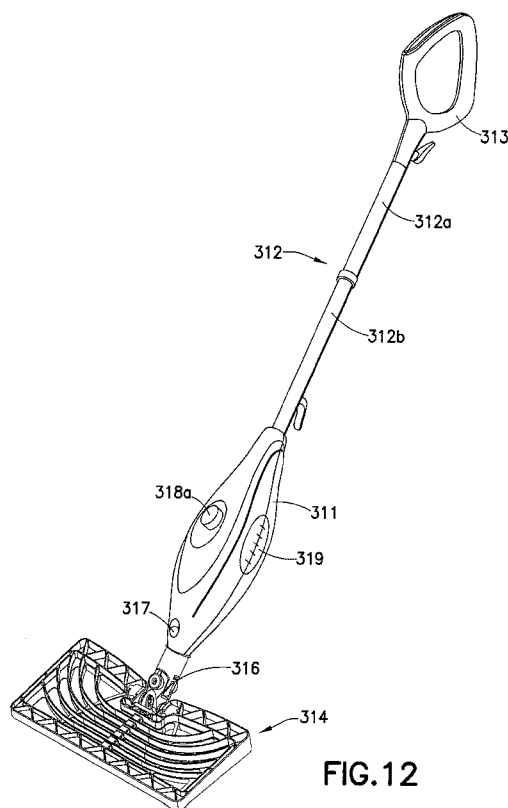


FIG. 12

(57) Abstract: A steam appliance with a universal connector for connecting a steam frame to a fluid source in the appliance housing is provided. The universal connector includes an upper connection piece with a proximal end for connection to the housing and a distal end with a pair of pivot arms. A lower connection piece having a pair of pivot plates for connecting to the pivot arms provides for a pivotal connection with the of upper connection piece for side to side pivot. A fluid conduit passes through the upper and lower connection pieces for connecting the fluid source to the frame for distribution of steam within the frame. The frame includes a central steam passageway for distribution of steam between baffles within the frame. The lower connection piece may be a distributor with a pair of opposed elongated hollow arms for coupling to the frame with a fluid conduit passing through an upper nipple portion for distribution of steam into the frame through the hollow distributor arms. The end of the distributor arms maybe adapted to slip into a key slot in the mop frame and provide an axis to pivot the joint in an up and down direction. Fabric mop towel envelopes with an cut-out to permit rotation of the mop frame about the distributor are also disclosed.



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UNIVERSAL CONNECTOR FOR A FLUID MOP

BACKGROUND OF THE INVENTION

[0001] The invention relates generally to a fluid mop, and more particularly to a universal connector for connecting a mop steam frame to a fluid source in the mop housing.

[0002] Wet and dry mops have been widely used for cleaning floors. A type of wet mop is a steam mop, which works as a steaming device.

[0003] Steaming devices used to apply steam to household objects are well known. The uses of the devices vary widely, and may include the application of steam to drapes or other fabrics to ease wrinkles, and the application of steam to objects to assist in cleaning the objects.

[0004] Typical steam devices have a reservoir for storing water that is connected to an electrical water pump with an on/off switch. The exit from the electric water pump is connected to a steam boiler with a heating element to heat the water. The heated water generates steam, which may be directed towards its intended destination through a nozzle which controls the application of the steam. Variation of the shape and size of the nozzle allows for preferred distribution of generated steam to an object to be cleaned. The nozzles may be disconnectable from the steam generator to allow different nozzles to be utilized, based on the object to be steamed. The nozzle may be either closely coupled to the steam generator, or located at a distance from the steam generator, requiring tubing or other steam transfer structures to be interconnected between the steam generator and the discharge nozzle. Typically, these connections provide suitable limited steering capabilities.

[0005] Accordingly, it is desirable to provide a universal connector for connecting the mop frame to a fluid source for changing the angle between the housing and frame, to provide a full range of steering and that easily disconnects from the mop frame.

SUMMARY OF THE INVENTION

[0006] Generally speaking, in accordance with the invention, steam appliance and a universal connector for connecting an appliance frame to a fluid source in a appliance housing and having improved steering features is provided. The universal connector includes an upper connection piece connected to the appliance housing at one end and having a pair of parallel pivot plates at the other end. A lower connector piece has pivot plates pivotally connected to the pivot plates and that includes two side arms that are engaged by the frame and free to pivot up and down. A flexible steam hose passes through the upper and lower connection pieces and feeds steam into a control manifold running from the back to the front of the steam frame. Steam openings are provided along the manifold between baffles that cross the manifold at right angles and then extend to the sides and back edges of the steam frame.

[0007] The lower connection piece may be a fluid distributor having a complimentary pair of pivot arms for pivotally connecting to the pivot plates of the upper connection piece. The distributor has a pair of opposed elongated hollow arms for coupling to a mop frame and a hollow nipple portion for connecting to the fluid source. The end of the distributor arms are adapted to engage the mop frame and provide an axis to pivot the connector in an up and down direction. A flexible fluid conduit passes through the upper connector piece and is connected to the nipple portion of the fluid distributor for distribution of fluid to the mop frame through the hollow distributor arms.

[0008] Accordingly, it is an object of the invention to provide an improved steam appliance.

[0009] It is another object of the invention to provide an improved universal connector that easily connects and disconnects a mop frame to a fluid source.

[0010] It is a further object of the invention is to provide a connector for a mop that allows for turning over a mop frame for improved cleaning.

[0011] Yet a further object of the invention is to provide a universal connector that provides a full range of steering for mop frames.

[0012] Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

[0013] The invention accordingly comprises a product possessing the features, properties, and the relation of components which will be exemplified in the product hereinafter described, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] For a fuller understanding of the invention, reference is made to the following description taken in connection with the accompanying drawing(s), in which:

[0015] FIG. 1 is a perspective view of a steam appliance with a steam frame with fabric towel installed on the frame and a universal connector constructed and arranged in accordance with one embodiment of the invention;

[0016] FIG. 2 is a perspective view of the universal connector in the appliance of FIG. 1 installed on a steam frame in accordance with the invention;

[0017] FIG. 3 is a perspective view of an upper connector piece of the universal connector of FIG. 1;

[0018] FIGS. 4A and 4B are rear elevational views of the universal connector showing how the connector pivots to the right and left, respectively;

[0019] FIG. 5 is a perspective view of a lower connector piece with fluid distributor of the universal connector of FIG. 1;

[0020] FIG. 6 is an elevational view in partial section of the fluid distributor of FIG. 5;

[0021] FIGS. 7A and 7B are partial sectional views of a distributor engaged in the frame;

[0022] FIG. 8 is a side elevational view of the distributor as it is removed or installed from the frame;

[0023] FIG. 9 is a perspective view of the universal connected to a rectangular frame and appliance housing in accordance with an embodiment of the invention;

[0024] FIG. 10 is a perspective view of an appliance with universal connector and a fabric steam towel having a pivot slit installed on a steam frame in accordance with another embodiment of the invention;

[0025] FIG. 11 is a perspective view of fabric steam towel of FIG. 10 having a tab in accordance with an embodiment of the invention;

[0026] FIG. 12 is a perspective view of a steam mop having a universal connector and steam frame with a central steam manifold constructed and arranged in accordance with an embodiment of the invention;

[0027] FIG. 13 is a front view of the mop housing in section showing a reservoir, a pump and a boiler of the mop of FIG. 12;

[0028] FIG. 14 is a front elevational view of the mop housing of FIG. 12 in section showing connections for reservoir, boiler and steam mop frame;

[0029] FIG. 15 is a perspective view of the steam mop frame and universal connector of FIG. 14 in accordance with the invention;

[0030] FIG. 16 is a perspective view of the universal connector shown in FIGS. 14 and 15; and

[0031] FIG. 17 is rear perspective view of the steam frame shown in FIGS. 12 and 15.

DETAILED DESCRIPTION OF THE INVENTION

[0032] FIG. 1 is a schematic perspective view of a steam appliance 10 having a housing 11 including a water tank 21 and a steam generator or boiler 17 with a fabric covered steam pocket 12 attached thereto. Steam pocket 12 includes a substantially rigid steam frame 14 with a fabric steam towel 13 installed thereon. The specifics of fabric steam pocket 12 will be described below. Steam frame 14 is connected to housing 11 by a universal connector 16 constructed and arranged in accordance with the invention for distribution of steam generated by a boiler 17. Steam is fed through a steam hose 18 into steam frame 14 through connector 16.

[0033] FIG. 2 is a perspective view of universal connector 16 shown connected to steam frame 14 to allow housing 11 and steam frame 14 to pivot up and down and left to right and allow steam to be fed to frame 14. Universal connector 16 includes an upper connection piece 22 having a housing or pipe end 22a that connects to housing 11 and a pair of inner pivot plates 23 and 23b shown in FIG. 3 with pivot buttons 24 at an other end 22b for pivotal connection to a lower connection piece 25 with a fluid distributor 26 shown in FIGS. 5 and 6. Fluid distributor 26 includes a hollow nipple portion 27 and a pair of pivot arms 28 that engage frame 14 as will be discussed in more detail below.

[0034] Frame 14 as shown in FIG. 2 is substantially rectangular in shape and includes two steam chambers 29, one on each side of connector 16 with a plurality of baffles 31 that are separated by a partition 32 and connector 16. Steam frame 14 has a pair of receiving slots 32 with a key hole 33 for receiving for engaging fluid distributor side arms 28 as shown in FIGS. 7A and 7B. In this embodiment steam is distributed into steam chambers 29 through distributor 26. Mop steam frame 14 may be any convenient shape, such as oval or triangular so long as it has appropriate receiving slots 32 for receiving distributor 26.

[0035] Referring now to FIG. 5, lower connection piece with fluid distributor 26 is shown with two upwardly extending distributor arms 27a and 27b with holes 28a and 28b for aligning with pivot buttons 24 for connecting to upper connection pivot plates 22a and 22b, respectively. This provides the right and left pivot connection between upper connection piece 22 and fluid distributor 26.

[0036] As shown by arrow A connector 16 pivots right or left as shown by arrow B around pivot buttons 24 as shown in FIGS. 4A and 4B. As shown in FIG. 6, fluid distributor 26 includes hollow nipple portion 27 with a passageway 27a for connecting to hose 18 from the fluid source. Pivot arms 28 that fit into receiving slots 32 of mop steam frame 14 for connecting universal connector 16 to mop frame 14 for pivoting up and down are hollow with a fluid passageway 28a through there. Distributor arms 28 may have two opposed flat surfaces 28b and 28c at their respective ends for coupling to mop frame 14.

[0037] FIGS. 7A and 7B shows mop steam frame 14 with connector openings with a slot and a key hole 33 opening on each side for receiving distributor arms 28. This provides for easy insertion and engagement of distributor arms 28 and universal connector 16. When engaged in key hole opening 33, distributor pivot arms 18 are free to pivot up and down. Fluid enters hollow nipple portion 27 and is fed through opening 28a to steam chambers 29 of mop steam frame 14.

[0038] FIG. 8 shows how universal connector 16 with distributor 26 is withdrawn from key hole slot 32 of mop steam frame 14. Here, when flat surfaces 28b and 28c of pivot arms 28 are aligned with slots 32, a user can easily reconnect or disconnect universal connector 16 from mop frame 14.

[0039] FIG. 9 illustrates another steam appliance 110 having a housing 11 connected to a steam frame 114 by a universal connector 116 at a connection section 115. Housing 111 includes a water tank 119 and a boiler or steam generator 117. Water tank 119 has a water outlet 121 connected to an inlet 123 of steam generator 117 via a pump. At the other end of water tank 119 is a water inlet 122 for adding water thereto. When the water in steam

generator 117 is heated and converted to steam, steam exits steam generator 117 through steam outlet 124 via a steam hose 126. Steam hose 126 is connected to an upper connector piece 120 of universal connector 116. Steam frame 114 is shown as a rectangular form with baffles running from back to front, but may be any convenient shape such as a triangle or oval so long as there is a receiving section 115 along one wall thereof. Baffles may also be differently shaped.

[0040] Referring now to FIG. 1, fabric steam towel 13 is configured to slip over frame 14. Towel 13 is formed of a first layer of fabric 13a on the upper surface of frame 14 and an opposed second layer of fabric 13b on the lower surface, each having a substantially rectangular shape with two opposed long edges 13c and 13d and two opposed short sides 13e and 13f. Long edge 13c and two opposed short sides 13e and 13f are stitched to form an envelope for forming steam pocket 12. Accordingly, fabric steam towel 13 is open on long edge 13d. The fabric along the opening on long edge 13d may be optionally closed with a hook and loop fastener, buttons or snaps. Here, steam towel 13 is cut along a line 15 to form a slot 15a around the width of universal connector 16 on the first layer 13a and opposed second layer 13b of fabric towel 13. Slot 15a has a length 15b from rear edge 13d to the front of arms 28 of fluid distributor 16. This allows for vertical rotation and pivoting of housing 11 without bending the fabric of fabric towel 13 and use both sides of steam 13 for cleaning without having to remove and re-install steam towel 13 on frame 14.

[0041] FIG. 10 shows another steam pocket 212 connected to a steam appliance housing 211 by a universal connector 216 in accordance with another embodiment of the invention. Here, fabric steam towel 213 is configured to slip over frame 214 and is formed of a first layer of fabric 213a and an opposed second layer of fabric 213b. Each layer 213a and 213b has a rectangular shape with two opposed long edges 213c and 213d and two opposed short sides 213e and 213f. Long edge 213c and two opposed short sides 213e and 213f are stitched together to form steam towel 213 into an envelope 213. Accordingly, fabric steam pocket 213 is open on long edge 213d. The fabric along open edge 213d may be

optionally closed after installation with a hook and loop fastener, buttons or snaps as discussed above.

[0042] In order to accommodate the width of universal connector 216 steam pocket towel 213 has a pivot slit 215 on first layer 213a and opposed second layer 213b. Slit 215 has a length 215a from rear wall 213b to the pair of arms of fluid distributor to allow for vertical pivoting without being restricted by steam pocket fabric 213. Slit 215 remains closed on the side of steam pocket facing the floor when in use. This allows a user full use of both sides of steam pocket 212 for cleaning.

[0043] FIG. 11 shows steam towel 213 with a pull tab 219 stitched to long edge 213c opposed to slit 215 on long edge 213d. Pull tab 219 may be sewn onto the fabric of steam towel 213 by stitches 219a. Pull tab 219 allows a user to remove steam pocket towel 213 from frame 214 merely by pulling on it. Tab 219 also may be added to steam pocket towel 13 of FIG. 1.

[0044] FIGS. 12-17 illustrate a steam mop 310 constructed and arranged in accordance with the invention. Mop 310 includes an elongated housing 311 with a water reservoir 321 and a boiler 323. A pole 312 having an upper tube section 312a and a lower tube section 312b connected to one end of housing 311. A handle 313 is attached to the end of upper tube 312a. A steam frame 314 is operatively connected to the other end of housing 311 by a universal connector 316 constructed and arranged in accordance with the invention. In this embodiment, connector 316 and frame 314 may be removed from housing 11 by pressing a release button 317 at the base of housing 311. Water is introduced into reservoir 321 at a water inlet or opening 318a. The level of water present in a reservoir 321 in housing 311 can be viewed through a sighting window 319.

[0045] FIG. 13 is a front plan view in section showing the location of elements in housing 311. Water container 321 is positioned adjacent and surrounds boiler 323 to generate steam fed to frame 314 through steam hose 318. A one-way pump 322 pumps water from reservoir 321 to boiler 323 in response to the push-pull movement of mop 310.

This movement of handle 313 causes operation of one way valve 337 as will be described in detail below. Here, water container 321 wraps around the back of housing 311.

[0046] FIG. 14 is a detailed front view showing the hoses connecting water container 321 to one-way pump 322 and boiler 323. Water pump 322 includes a pump body 333 having a pump cavity 333a. A pump piston 334 is connected to a push rod 336 which in turn is connected to pole 312 or handle 313. As mop handle 313 is pulled by a user piston 334 creates a negative pressure in cavity 333a. This draws water from reservoir 321 into a water supply hose 321a that feeds into pump water inlet 327 through a one-way inlet valve 337 to fill cavity 333a. As handle 313 is pushed during use, piston 334 moves downward and water in cavity 333a is expelled through a one-way outlet valve 338 into pump outlet hose 328. This water is then introduced into a boiler inlet 323a in boiler 323. Water in boiler 323 is heated by a heating element 339 in a boiler cavity 341. Heating element 339 is connected to electrical connectors 339a and 339b. Steam generated in boiler cavity 341 is fed through a steam valve 342 into a steam chamber 343. Steam is then expelled through a steam outlet 344 to a steam hose 346 for connector to universal connection 316.

[0047] One-way inlet valve 337 and one-way outlet valve 338 are duck-bill valves formed of a flexible elastomeric material, such a rubber. The valves are conical in shape so that when handle 313 is pulled, water is drawn through inlet valve 337 while outlet valve 338 remains closed. Similarly, when handle 313 is pushed, water is forced out through outlet valve 338 and inlet valve 337 remains closed and water is fed into boiler 323. In another embodiment, a mechanical bellows pump that may be used in steam mop housing 311 to pump water from water container 321 to boiler 323. Alternatively, the pump can be a two-way piston pump that pumps water when its piston is displaced both in the forward direction and also in the return backwards motion. This type of pump is shown in co-pending application Serial No. 11/842,478, the contents of which are incorporated herein by reference in its entirety.

[0048] While a mechanical pump has been described it is within the scope of the invention to utilize an electrical pump. Such an electrical pump can be actuated by a micro-

switch or a motor switch. In the illustrated embodiments, steam pocket towels 13 and 213 are a cloth or towel. They may be formed of any suitable fabric such as cotton or a synthetic fabric, such as polyester or polyolefin fiber. Preferably, the fabric of pocket 12 and 212 is a microfiber. Most preferably, the microfiber is a synthetic polyester microfiber.

[0049] FIG. 15 is a perspective view showing the details of construction of a universal connector 416 and a steam frame 414 of the type used in FIG. 12. Frame 414 is substantially rectangular in shape, open at the top and bottom with a plurality of baffles 431.

[0050] Universal connector 416 includes an upper connector piece 422 similar in construction to upper connector piece 22 in FIG. 3 that allows a frame 414 and a housing 411 to pivot side to side and up and down with respect to each other. Upper connection piece 422 is pivotally connected to a lower connection piece 426 having a different construction. Here, lower connection piece includes two pivot arms 428a and 428b with a central opening 428c for passage of a flexible steam hose 430 to feed steam to frame 414. Frame 414 includes a connector receiving slot 414a for receiving arms 428a and 428b pivotally secured to there by cylindrical cavities 432 below two mounting plates 432a and 432b to allow for rotation of arms 428a and 428b.

[0051] In this embodiment frame 414 includes a central steam passageway or manifold 433 that runs from the rear of frame 414 at receiving slot 414a to a front border 414b. A plurality of steam release openings 434 are formed on both sides of manifold 433 along the top and bottom thereof. These release openings 434 are positioned between each baffle 431. Baffles 431 are substantially orthogonal to manifold 433 in the center of frame 414 and extend sideways and curve rearward to the side edges and rear wall of frame 414.

[0052] Steam frame 414 includes a rear wall 414a with a connector receiving opening 415 in the center of rear wall 414a, a front wall 414b and a right side wall 414c and a left side wall 414d. Steam hose 430 is connected to manifold 433 by a hose plate 431 mounted at the entrance to manifold 433. Short fins 435 extend from the sides of manifold 433 and edges 414c and 414d approximately at the mid-height of manifold 433 and side walls 414c

and 414d to assist in distribution of steam to the upper and lower surfaces of a steam towel installed on frame 414 when in use.

[0053] Universal connector 16, 116, 216 and 416 provides many advantages for ease of use because they easily connect and disconnect to a mop handle and a mop frame while providing a user with universal pivoting and steering capability. The user has more control of the appliance and frame by the universal connection to clean whatever areas that need to be clean and allows use of both sides of steam frame 1, 114, 214 and 414 for cleaning. In addition, the mop frame may be rotated for easy steering and allows a user to use both sides of the mop steam frame to clean. In addition, the universal connector may be attached to any variety of differently shaped mop frames.

[0054] It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above product without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

[0055] It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

[0056] The present invention may be embodied in other specific forms without departing from the spirit or essential attributes of the invention. Accordingly, reference should be made to the appended claims, rather than the foregoing specification, as indicating the scope of the invention.

CLAIMS

WHAT IS CLAIMED IS:

1. A universal connector for a fluid mop, comprising:

an upper connection piece with a proximal end for connection to a mop housing including a fluid source and a distal end with a pair of pivot arms;

a lower connection piece with a pair of pivot plates for pivotal connection to the pivot arms of the upper connection piece for side to side pivot and a pair of opposed arms at right angles to the pivot plates for coupling to a mop frame;

the ends of the arms adapted to be engaged by the mop frame and provide an axis to pivot the connector in an up and down direction; and

a fluid conduit passing through the upper and lower connection pieces from the fluid source and connected to a portion of the frame for distribution of fluid to the mop frame .

2. The universal connector for a fluid mop of claim 1,

wherein the lower connection piece is a fluid distributor having a hollow nipple portion for connecting to the fluid source and a pair of pivot plates for pivotal connection to the upper connector piece for side to side pivot and a pair of opposed elongated hollow arms for coupling to a mop frame; and

a fluid conduit passing through the upper connection piece from the fluid source and connected to the nipple portion of the distributor for distribution of fluid to the mop frame through the hollow distributor arms.

3. A steam appliance having a housing including a water reservoir and a steam generator connected to the reservoir by a pump responsive to movement of the appliance, the housing connected to a steam frame, comprising;

a universal connector for connecting the housing to the frame having an upper connection piece with a proximal end for connection to the output of the steam generator in the housing and a distal end with a pair of pivot arms;

a lower connection piece with a pair of pivot plates for pivotal connection to the pivot arms of the upper connection piece for side to side pivot and a pair of opposed arms at right angles to the pivot plates for coupling to the mop frame;

the ends of the arms adapted to be engaged by the mop frame and provide an axis to pivot the connector in an up and down direction; and

a fluid conduit connected to the output of the steam generator and passing through the upper and lower connection pieces and connected to a portion of the frame for distribution of fluid to the mop frame.

4. The steam appliance of claim 3, wherein the mop frame is substantially rectangular in shape.

5. The steam appliance of claim 3, wherein the mop frame is football shaped.

6. The steam appliance of claim 3, wherein the mop frame is substantially triangular in shape.

7. The steam appliance of claim 3, wherein the frame includes a rear edge having a notch for receiving the lower connection piece of the connector and a steam passageway extending from the notch to the front of the frame with steam openings for distribution of steam into the interior of the frame.

8. The steam appliance of claim 7, wherein the frame includes a plurality of baffles within the perimeter of the frame that cross the steam passageway at substantially right angles and extend to the edges of the frame with at least one steam opening between each baffle.

9. The steam appliance of claim 8, wherein the frame is substantially rectangular and the baffles extend from the steam passageway and then curve towards the rear edge of the frame.

10. The steam appliance of claim 8, wherein the frame is substantially triangular and the baffles extend from the steam passageway and then curve towards the rear edge of the frame.

11. The steam appliance of claim 3, with a fabric mop towel in the shape of an envelope for installation on the steam frame having a first fabric layer of a geometric shape and an opposed corresponding second layer, the first and second layers stitched along all edges except one unsecured edge to form an opening to allow the towel to be fitted over the mop frame,

12. The steam appliance of claim 11, wherein the first and second fabric layers have an opening cut in the unsecured edge to allow for pivoting of a mop frame connector.

13. The steam appliance of claim 12, wherein the opening is a cut-out having a width the size of a connector for the mop frame and a length the distance from the rear edge of the frame to allow the connector to pivot.

14. The steam appliance of claim 13, including a pull tab on the edge of the fabric towel opposed to the unsecured edge to allow for detachment of the fabric towel from the frame.

15. The steam appliance of claim 13, wherein the lower connection piece is a fluid distributor having a hollow nipple portion for connecting to the fluid source and a pair of pivot plates for pivotal connection to the upper connector piece for side to side pivot and a pair of opposed elongated hollow arms for coupling to the steam frame; and

a fluid conduit passing through the upper connection piece from the fluid source and connected to the nipple portion of the distributor for distribution of fluid to the mop frame through the hollow distributor arms.

16. A fabric mop pocket for a fluid mop, comprising a first fabric layer of a geometric shape and an opposed corresponding second layer, the first and second layers stitched along all edges except one unsecured edge to form an opening to allow the pocket to be fitted over a mop frame,

wherein the first and second layers having an opening cut in the unsecured edge to allow for pivoting of a mop frame connector.

17. The fabric mop pocket of claim 16, wherein the first and second layers are rectangular with one long side and two short sides secured, and the opening cut in the unsecured long side.

18. The fabric mop pocket of claim 17, wherein the opening is a slit the distance between the edge of a mop frame and a pivot for a connector connecting the frame to a mop housing.

19. The fabric mop pocket of claim 17, wherein the opening is a cut-out having a width the size of a connector for the mop frame and a length the distance from the edge of a mop frame to a pivot for the connector.

20. The fabric mop pocket of claim 16, including a pull tab on the edge of the fabric mop pocket opposed to the unsecured edge to allow for detachment of the fabric mop pocket from the fluid mop frame.

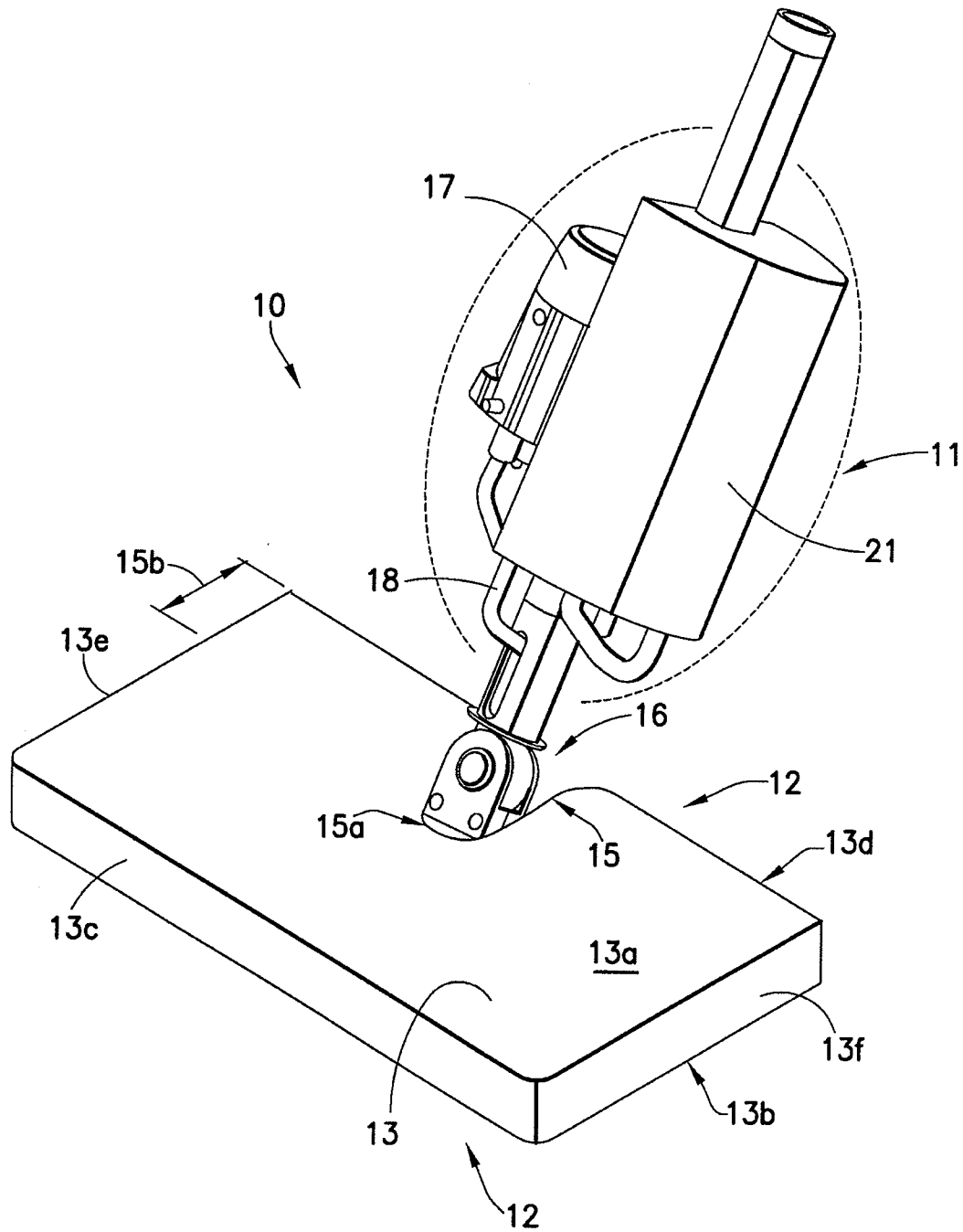


FIG. 1

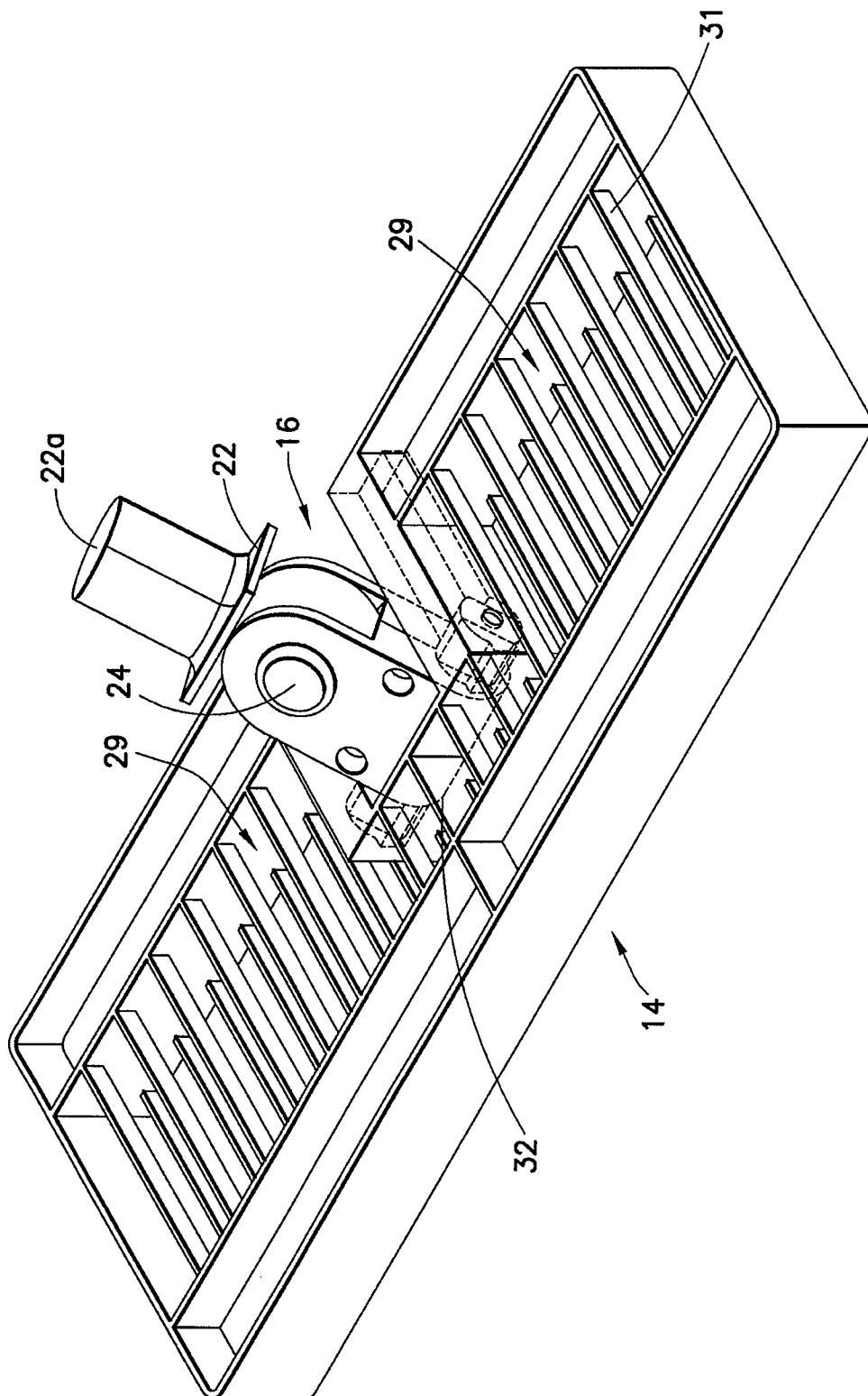


FIG. 2

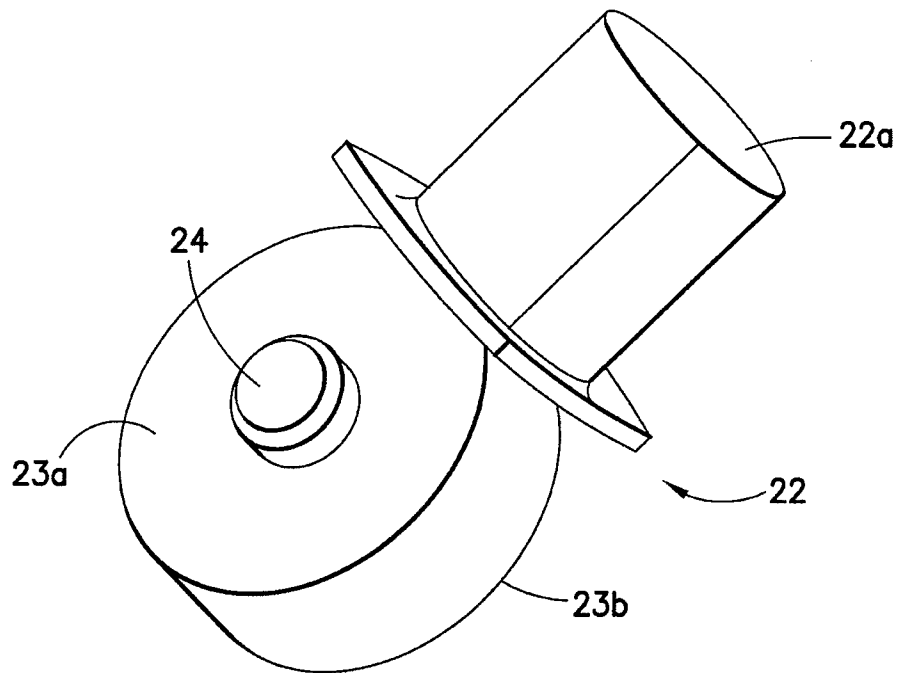


FIG. 3

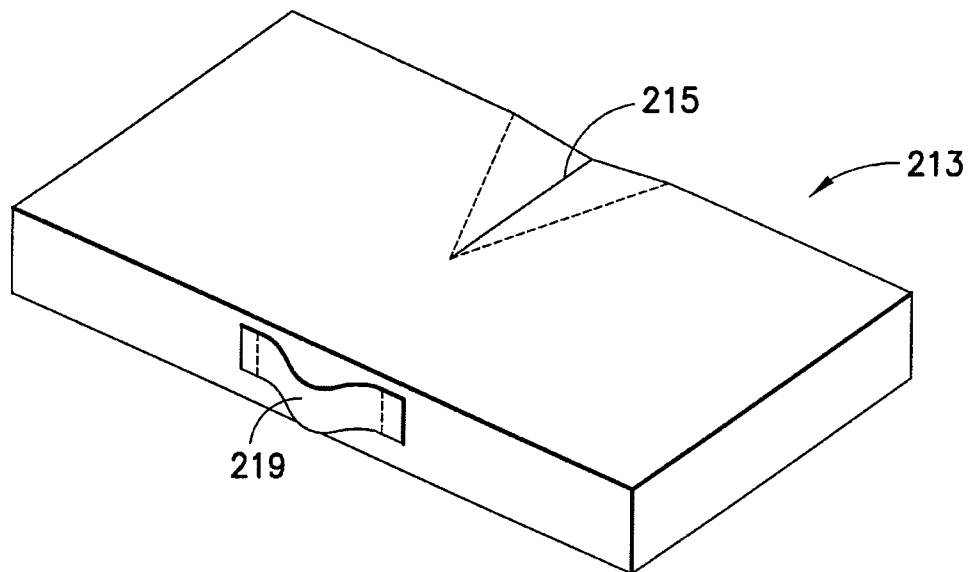
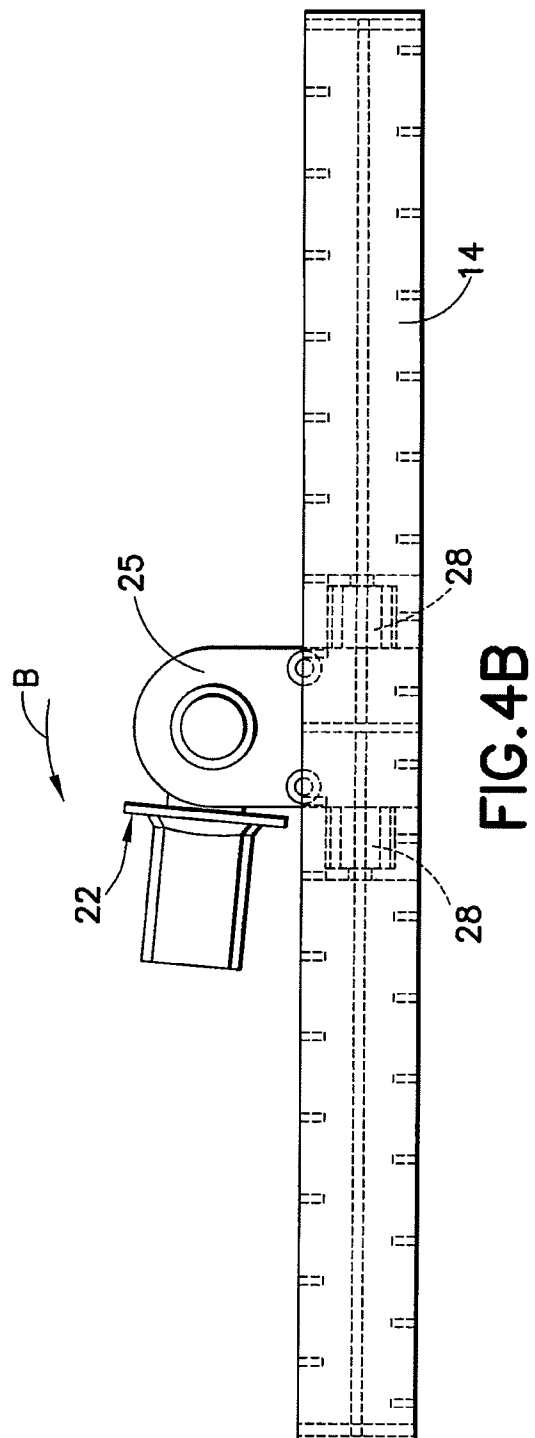
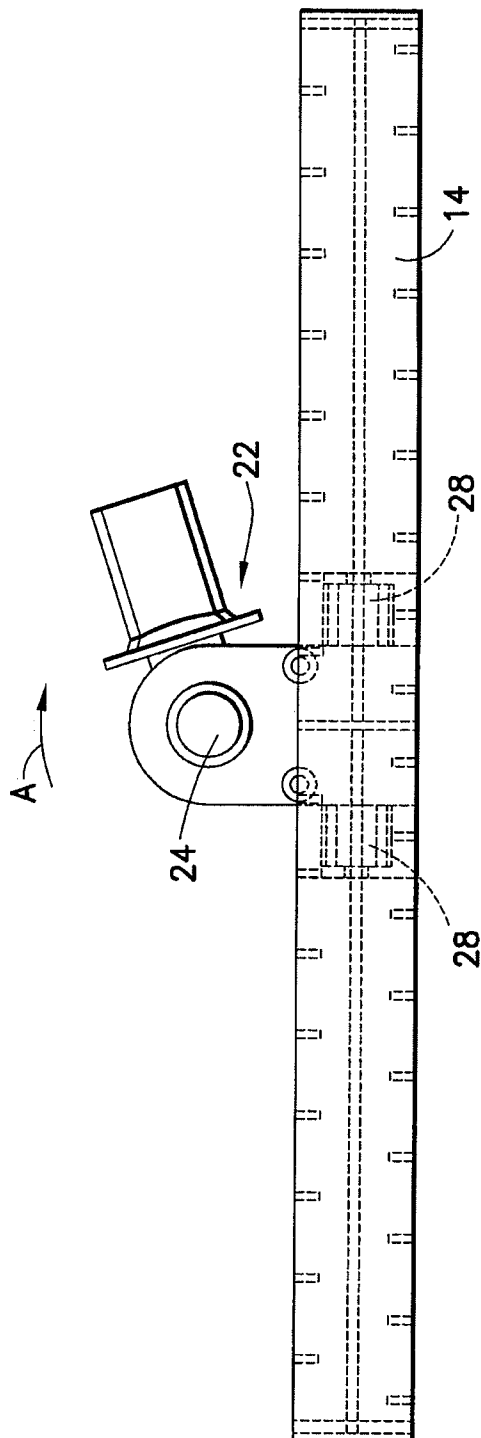


FIG. 11



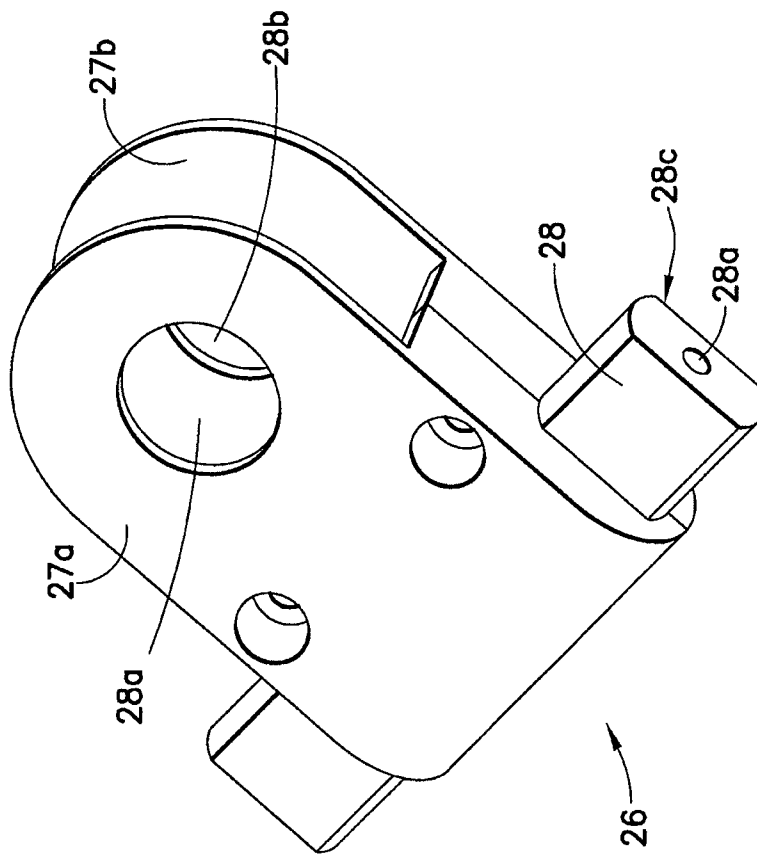


FIG. 5

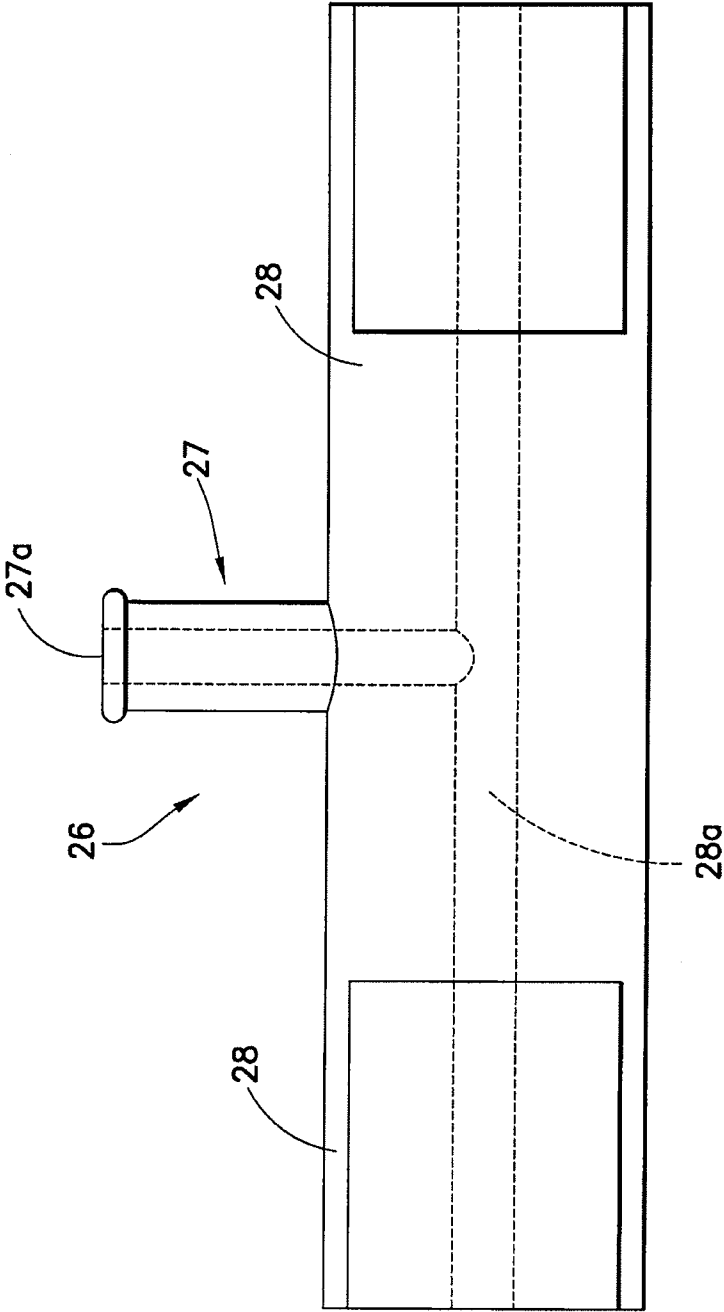


FIG. 6

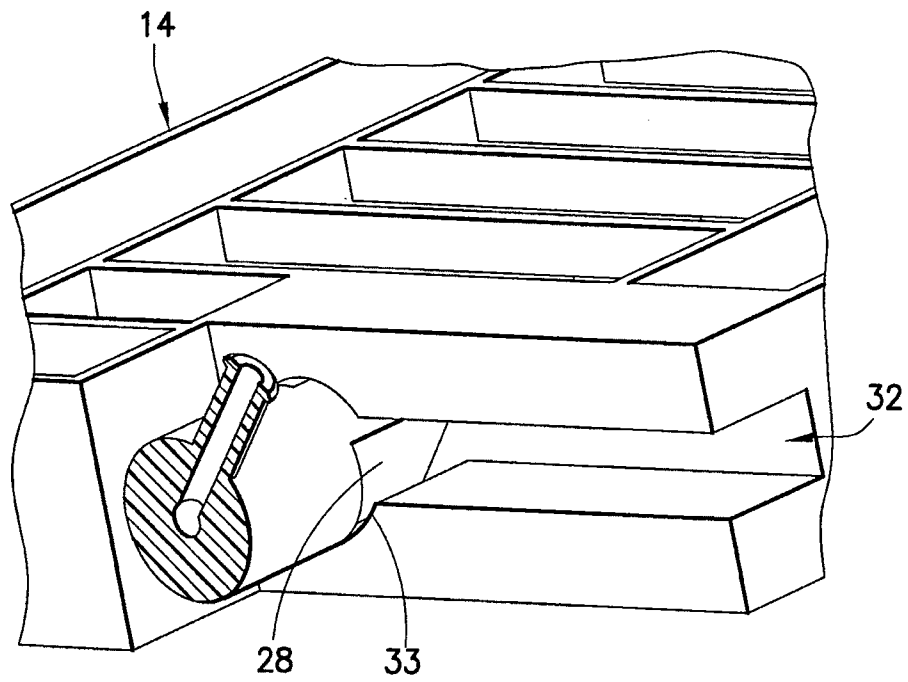


FIG. 7A

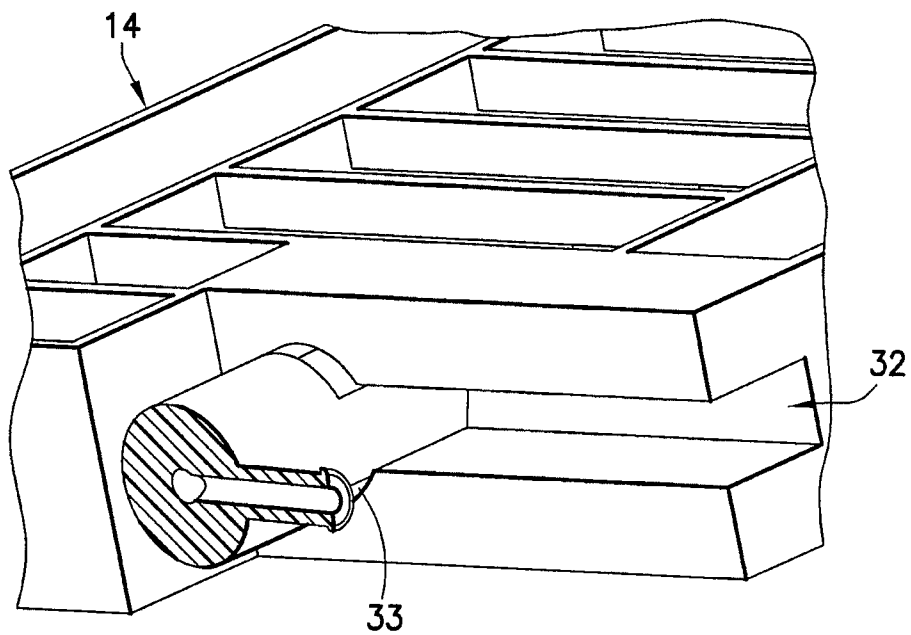
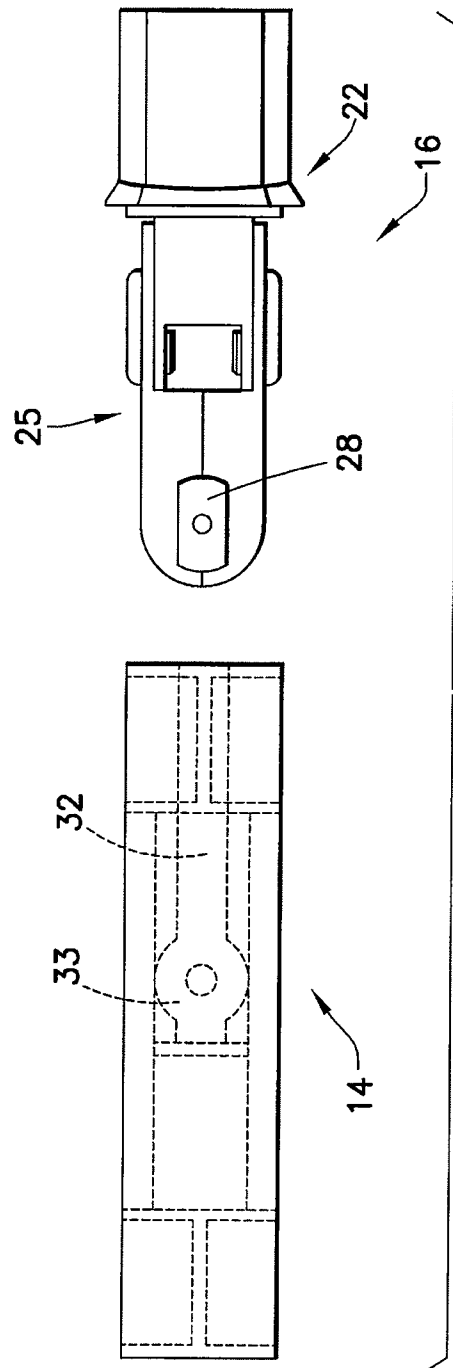


FIG. 7B



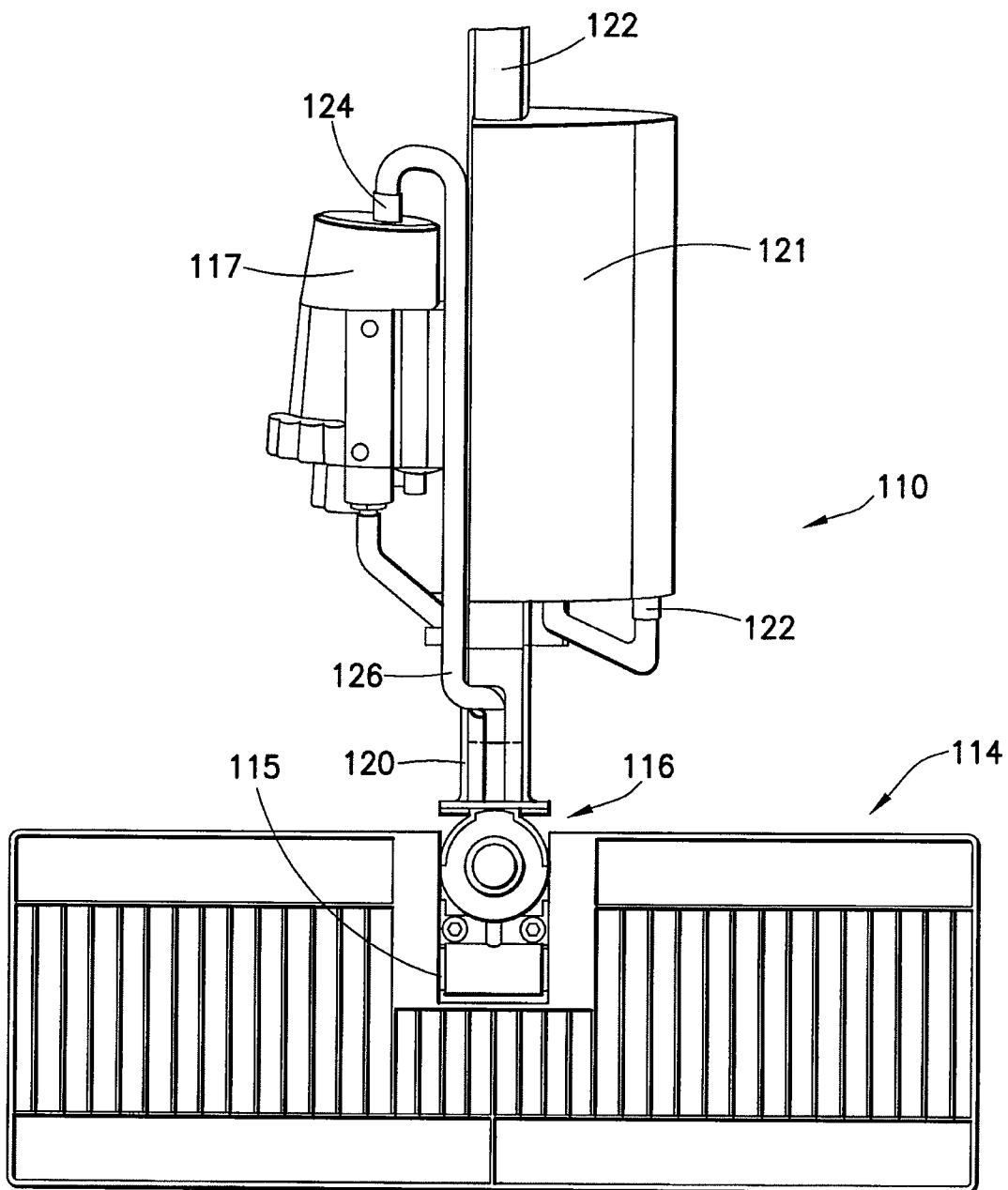


FIG. 9

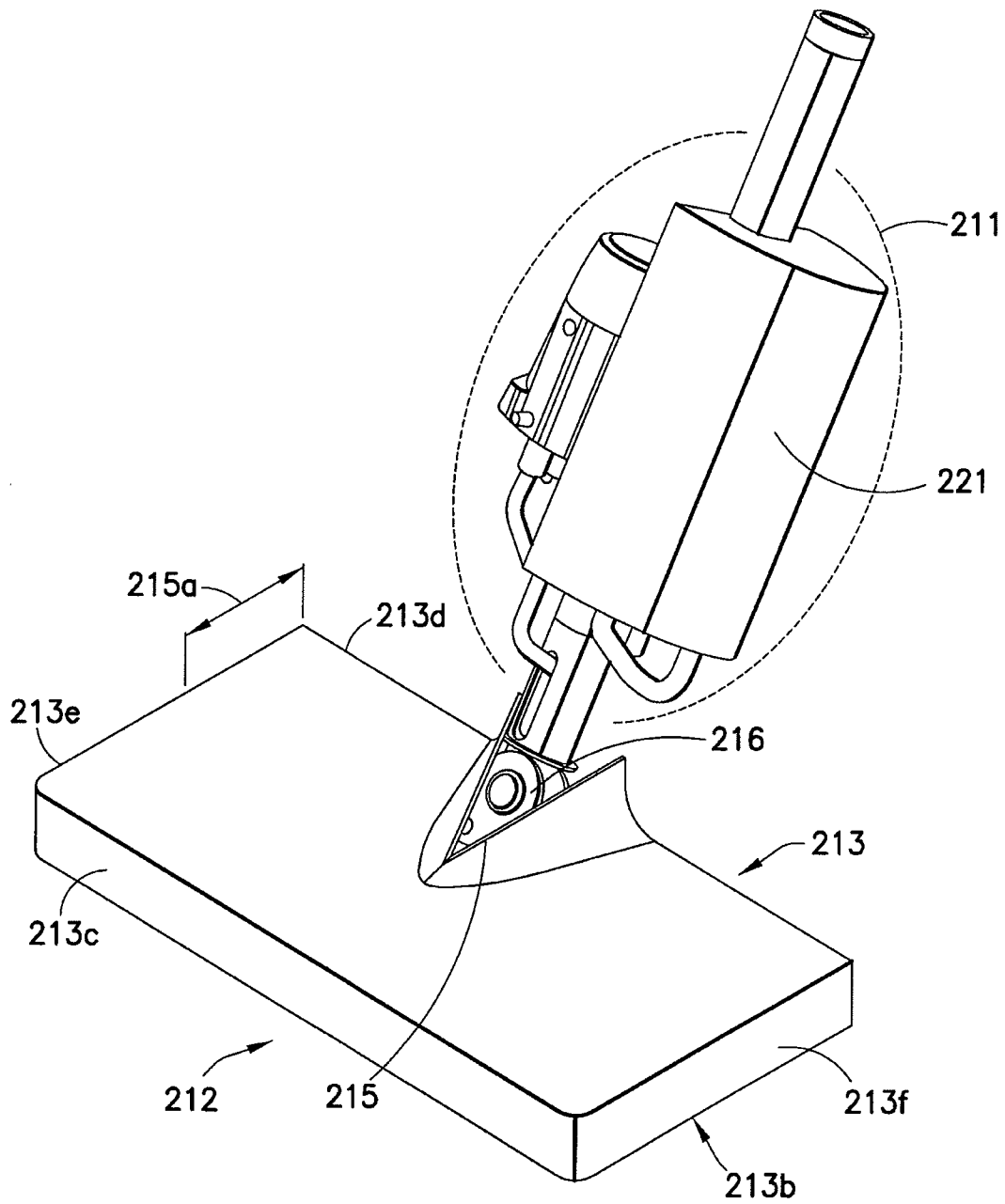
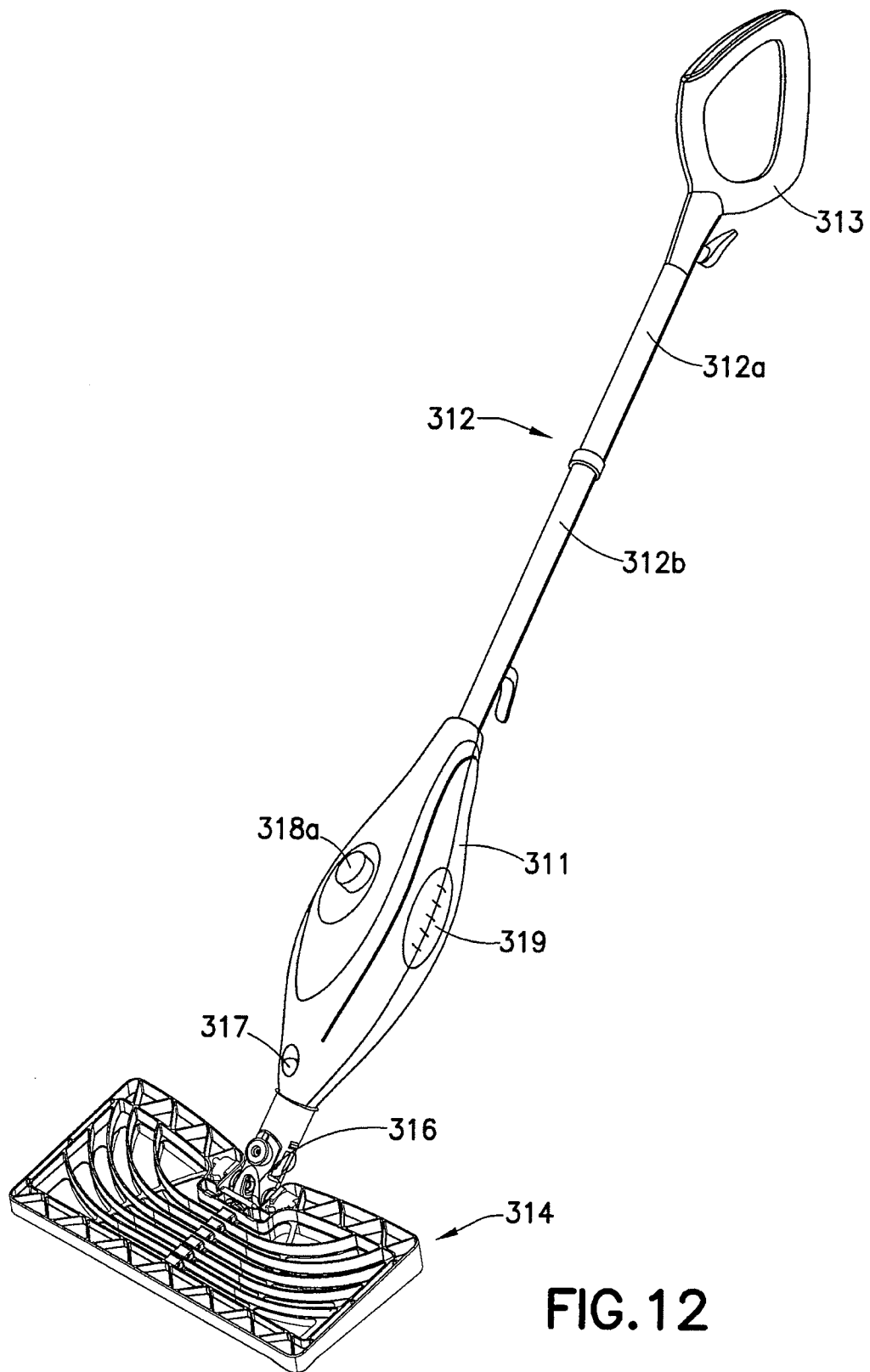


FIG. 10



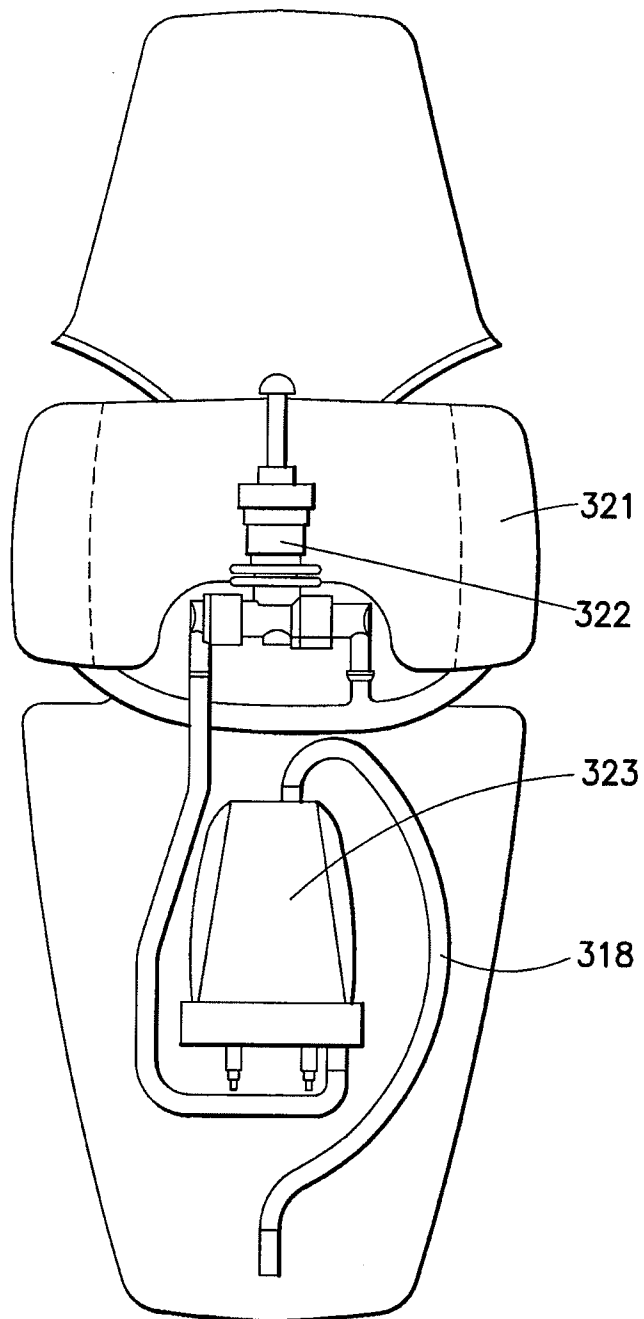


FIG.13

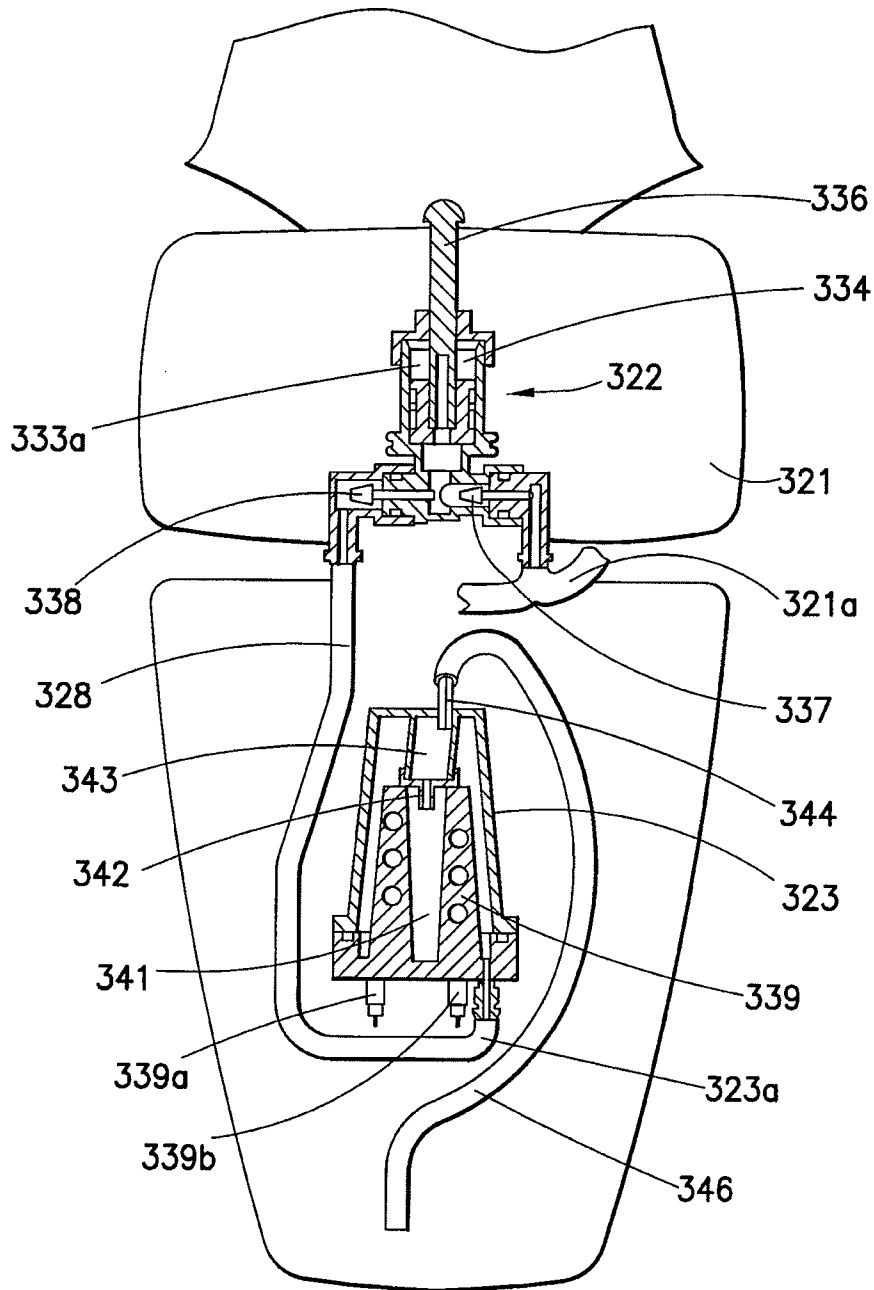
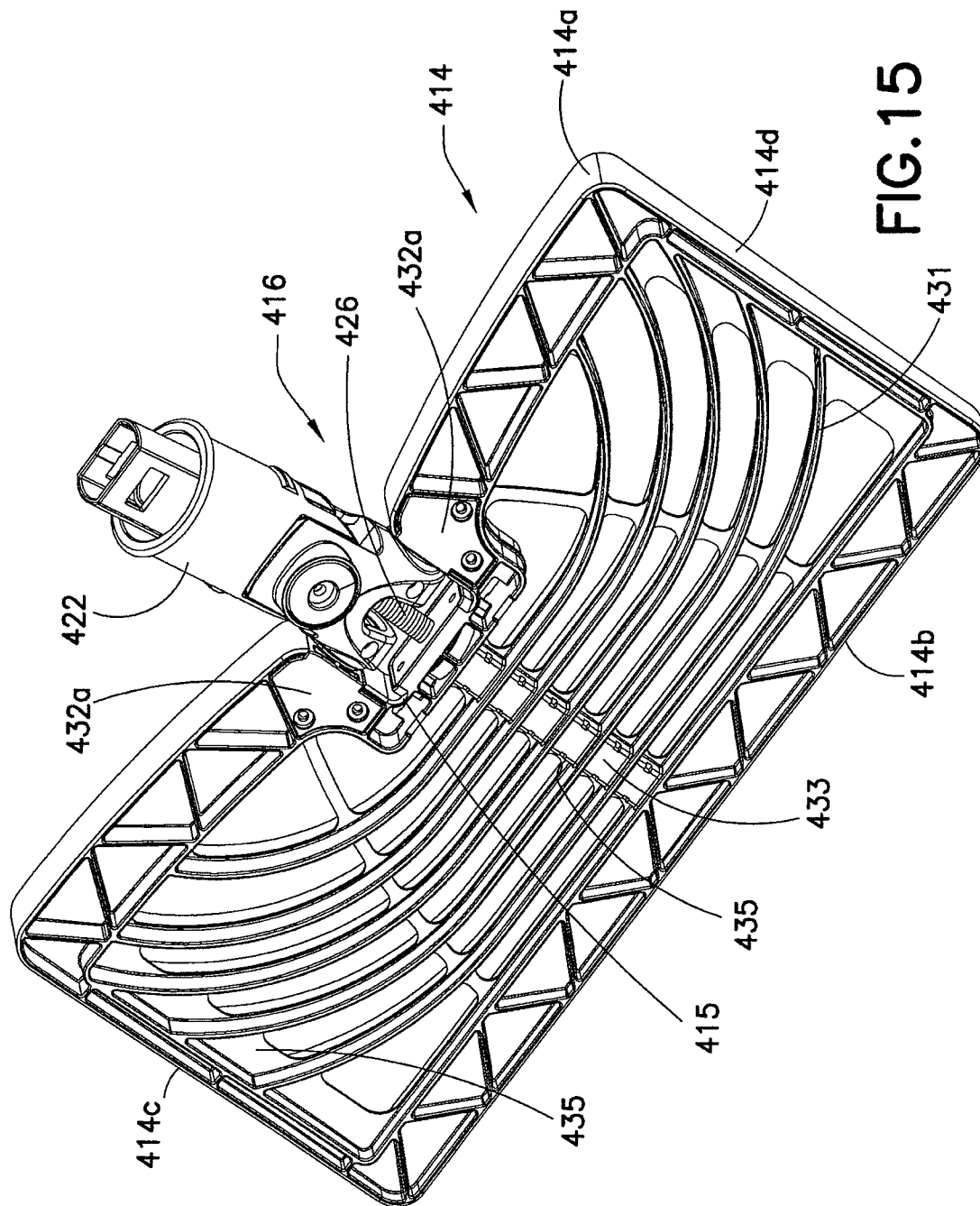


FIG.14



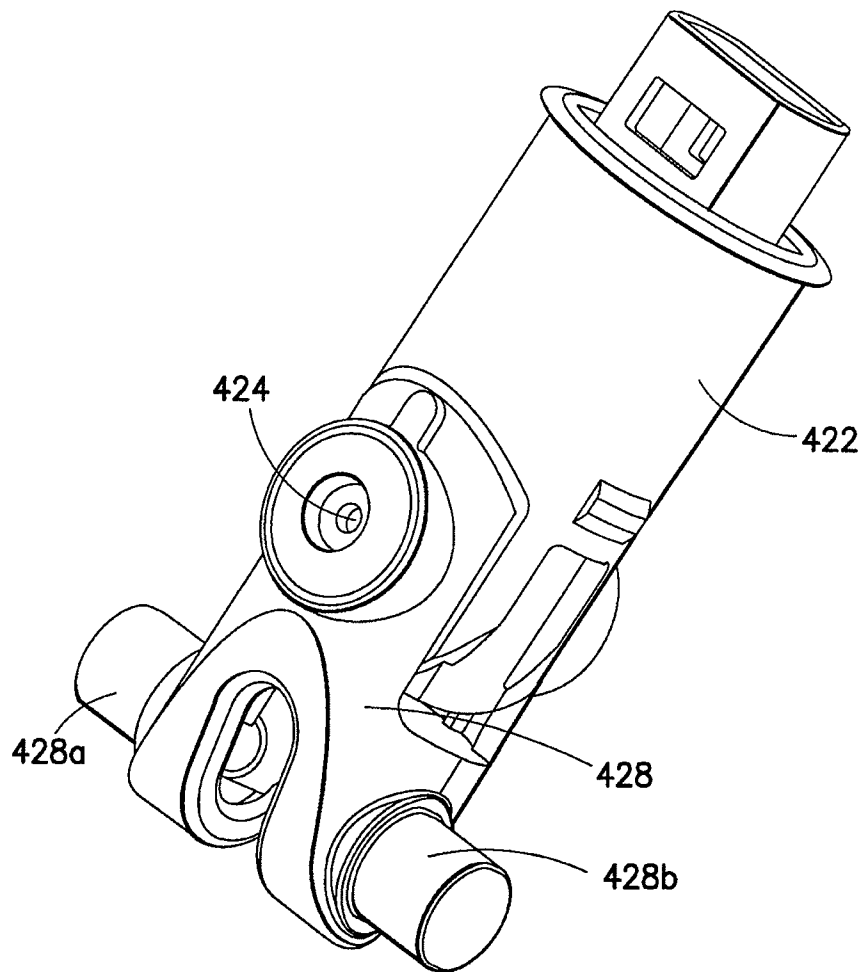


FIG.16

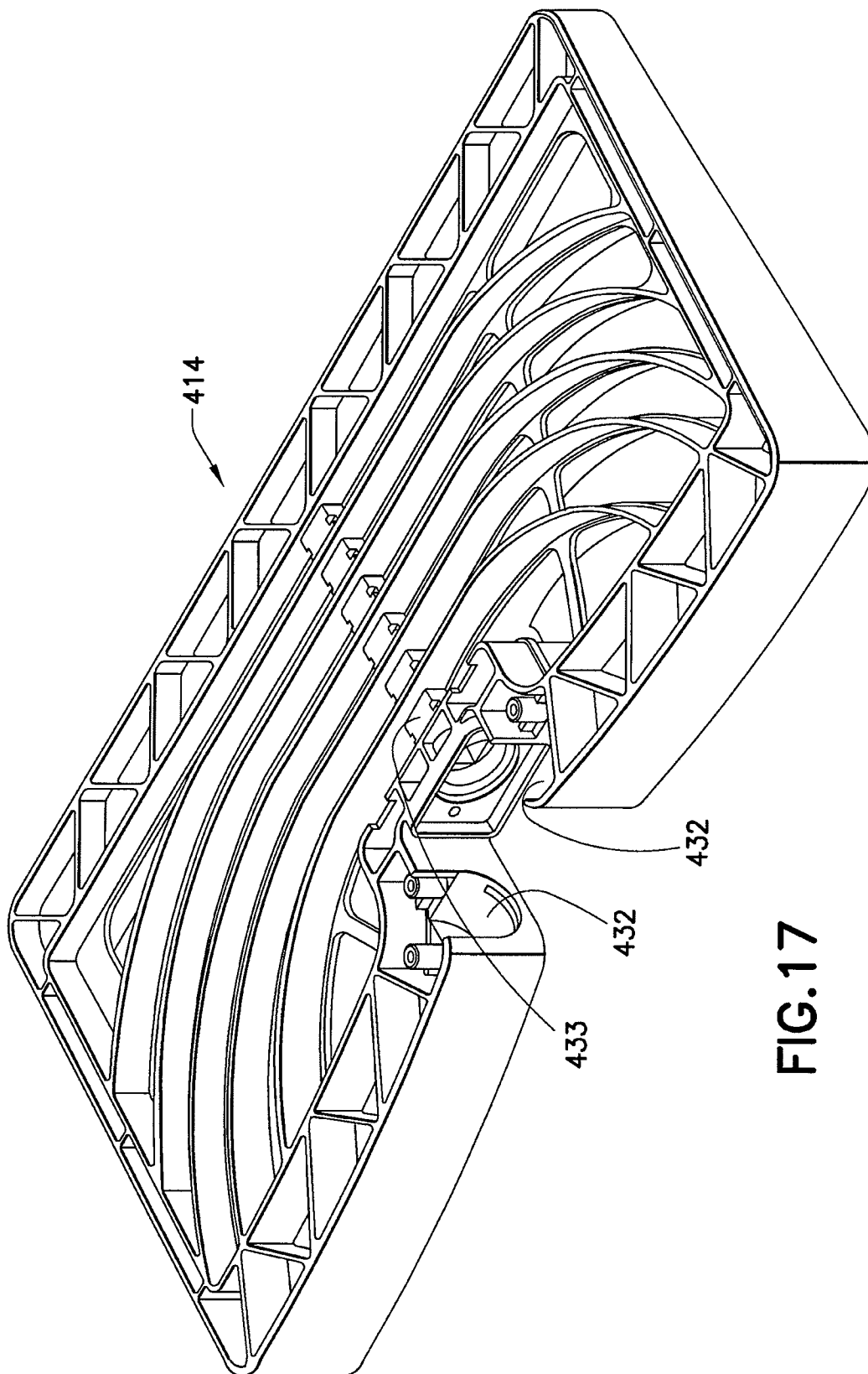


FIG.17