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(71) Applicant: **WHIRLPOOL CORPORATION**
Benton Harbor
Michigan 49022 (US)

(72) Inventors:
• **De Caprio, Salvatore**
21025, Comerio (IT)

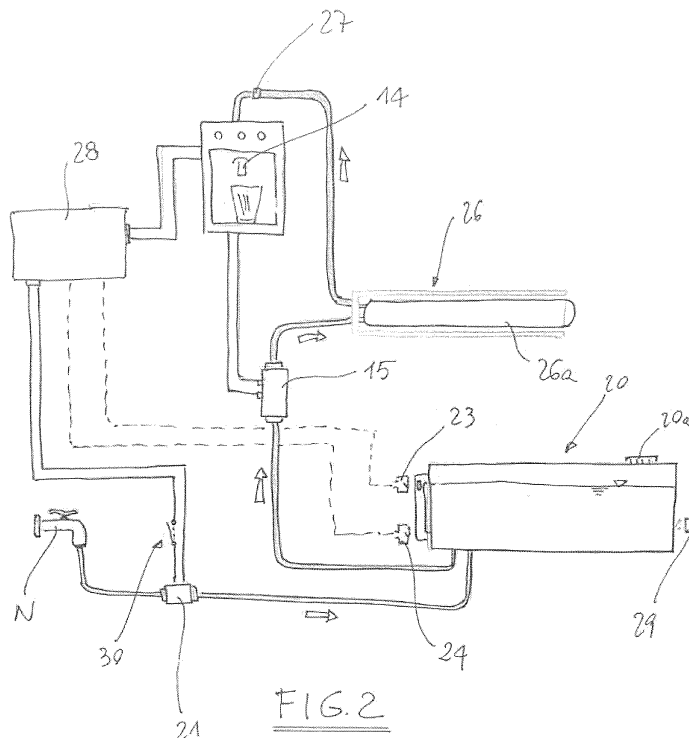
- **Fusi, Anna**
21025, Comerio (IT)
- **Tavolazzi, Stefano**
21025, Comerio (IT)
- **Koeningsknecht, Tony**
21025, Comerio (IT)
- **Arresta, Giuseppina**
21025, Comerio (IT)

(74) Representative: **Guerci, Alessandro**
Whirlpool Europe S.r.l.
Patent Department
Viale G. Borghi 27
21025 Comerio (VA) (IT)

(54) **Domestic refrigerator with water dispenser assembly**

(57) A DOMESTIC refrigerator (10) has a water dispenser assembly comprising a cool water reservoir (20) installed inside the refrigerator and a water supply pump (15) supplying the cool water from the reservoir to the outside of the refrigerator. The cool water reservoir (20)

is connected to a water supply valve (14) which is adapted to be connected to an external water network, so that the water dispenser assembly can be used either with water supplied manually by the user to the reservoir or with water supplied automatically by the external water network.



Description

[0001] The present invention relates to a refrigerator having a water dispenser assembly comprising a cool water tank installed inside the refrigerator and a water supply pump supplying cool water from the cool water tank to the outside of the refrigerator.

[0002] A refrigerator of this kind is disclosed by JP-A-2002006014. Other kinds of refrigerators are directly connected to a water supply network installed outside the refrigerator, and one of them is disclosed by GB-A-2329460.

[0003] With these known refrigerators the user buys a product of the second kind when the layout of the kitchen (where the refrigerator has to be installed) does allow an easy connection to plumbing. If this is not the case, the customer has to buy a product of the first kind, where he refills manually the water tank.

[0004] The above present situation does create problems when the user has to move the refrigerator from one position to another or from one house to another, since in the new environment the refrigerator of the second kind (automatic) may not be connectable to plumbing. In this case the user has to use the refrigerator as a traditional one without the water dispenser. Another problem is on the appliance producer side, since it has to design and to store in warehouses two different products, with problems in managing an higher number of products and spare parts, with related higher cost of products.

[0005] A further problem with refrigerators connected to plumbing is an uneven flow rate of supplied water due to variable pressure in the plumbing.

[0006] Accordingly, it is an object of the present invention to provide a refrigerator with water dispenser that overcomes the aforementioned problems encountered in the background art.

[0007] According to the present invention, such object is attained by means of a refrigerator having the features listed in the appended claims.

[0008] One of the main advantages of a refrigerator according to the present invention is to offer users the choice of manual and plumbed version, depending on the availability of plumbing in their homes, thanks to an "all in one solution". The user has therefore the possibility of using the water dispenser either when connected to an external water network or when such connection cannot be made. All components for both configurations (auto/manual) are in the product; and no change to the product is required by the customer or by a technician.

[0009] Another advantage is that for both configurations (automatic or manual filling), the water is always filtered.

[0010] According to another feature of the invention, the water tank or reservoir is removable for cleaning and refilling also for automatic system, while in the known automatic solutions the reservoir cannot be easily removed or cleaned.

[0011] The use of a pump also in the configuration of

the refrigerator connected to an external water network does give a constant flow rate of filtered water that is independent on line pressure.

[0012] The characteristics and advantages of a refrigerator according to the present invention will be made evident by the following detailed description of different embodiments thereof, that are illustrated as a non limiting example in the enclosed drawings, in which:

- figure 1 is a perspective view, partially sectioned, of a refrigerator according to the present invention, with its door in an open configuration;
- figure 2 is a schematic view of the hydraulic system of the water dispenser used in the refrigerator of figure 1;
- figures 3-4 are perspective view of two further embodiments according to the present invention;
- figures 5-6 are perspective views (in an assembled and disassembled configuration respectively) of a further embodiment of the present invention; and
- figures 7-8 are perspective views (in an assembled and disassembled configuration respectively) of another embodiment of the present invention.

[0013] With reference to the drawings, a refrigerator 10 is provided with a door 12 having, on its front face, a water supply port 14 for pouring cool water from a water supply pump 15. The pump 15 is connected to a water reservoir 20 with a cap 20a that is filled automatically by an electro-valve 21, which is plumbed to a home water network N. The electro-valve 21 is activated by a high level sensor 23 associated to the water reservoir 20 until this latter is filled. When the reservoir 20 is full, the high level sensor 23 detects a 'reservoir full' condition and the electro-valve 21 is deactivated by a control board 28 of the refrigerator 10.

[0014] The water pump 15 is activated when the user actuates the water dispenser by acting on a paddle switch (not shown) associated to the water port 14. The water pump 15 pulls water from the reservoir 20 and forces the flow of water through a water filter 26. The filtered water flows through a check valve 27 to the water supply port 14 where the user's water container is filled. When the container is filled the consumer pulls away from the water dispenser paddle and the pump 15 is deactivated. The check valve 27 prevents water drips at the water port 14 and prevents air from reentering the system, in order to avoid bacteria growth inside of the water filter 26.

[0015] During these actions the reservoir 20 is automatically filled by the electro-valve 21 when the high-level sensor 23 detects a 'low water' condition. In a condition where the reservoir 20 is emptied faster than it can be filled, a low level sensor 24 detects a 'empty reservoir' condition and terminates the activation of the pump 15.

[0016] In the above configuration (automatic) of the water dispenser, a dual water level sensing is used for automatic fill, according to which the high level does control the electro-valve 21, while the low level controls the

pump 15, which is also controlled by the paddle switch.

[0017] If the refrigerator 10 is not to be connected to the home water network N (for instance because plumbing is not available), the electro-valve 21 is deactivated by the user using a switch 30. Then the user can manually fill the system. The water reservoir 20 is removable for manual filling and cleaning and is filled by the consumer as needed. The reservoir presence is detected by a reservoir switch 29 to prevent the system from being operated without a reservoir. The high level sensor 23 in the "manual" condition is not used.

[0018] As in the automatic configuration, the water pump 15 is activated when the user actuates the water dispenser paddle switch. The water pump 15 pulls water from the reservoir 20 and forces the flow of water through the water filter 26. The filtered water flows through the check valve 27 to the water port 14 of the water dispenser where the consumer's water container is filled. When the container is filled the consumer pulls away from the water dispenser paddle and the pump 15 is deactivated.

[0019] In a condition where the reservoir 20 is empty, the low-level sensor 24 detects a 'empty reservoir' condition and terminates activation of the pump 15. In this case the customer needs to refill the reservoir 20 to continue using the system.

[0020] According to the embodiment shown in figure 1, the water reservoir 20 is removably installed in the upper part of a door shelf S. The shelf has a bottom double-walled portion F where the filter 26, the pump 15 and the electro-valve 21 are installed. For an easy access to such components, the water reservoir 20 is removed from the shelf S. Moreover, the filter 26 is provided with a cylindrical removable cartridge 26a that can be removed laterally from the bottom portion F of the shelf S.

[0021] According to the embodiment shown in figure 3, the water reservoir 20' is box shaped and it is installed in a seat K in the bottom portion F of the door shelf S. The upper portion of the shelf S has a recess C for containing bottles and/or food products, as an usual door shelf. In this embodiment the reservoir 20' can be easily removed from its seat K in the bottom portion F of the door shelf, and the whole shelf S can be removed from the door for adjusting its position or for cleaning or maintenance purposes. In this case the water pump 15 and the electro-valve 21 can be installed in another part of the refrigerator 10, and only the filter 26, whose cartridge 26a is shown in an unloading condition, is contained in the shelf S.

[0022] The embodiment shown in figure 4 is similar to the one shown in figure 3, with a smaller water reservoir 20" and a box-shaped container 32 which is removably installed in a seat 32a of the bottom portion F of the shelf S and which is used for containing the water pump and/or the electro-valve. The hydraulic connections between the above components and with the rest of the hydraulic circuit is obtained by means of well known quick fastening means which do not need to be described here in detail.

[0023] In the two embodiments shown in figures 5-8

the water reservoir is placed between two door shelves, next to a vertical container for the filter. In the embodiment of figures 5-6 the vertical water reservoir 20''' has an elongated shape and has a L-shaped cross section corresponding to the external shape of a container 34 for the filter 26. Therefore the reservoir 20''' can be shape-lockingly mounted on the container 34. As shown in figure 6, the reservoir 20''' can be easily removed from the container 34 for its refilling. For replacing the cartridge 26a of the filter 26, the upper shelf S' has to be removed from the door of the refrigerator.

[0024] In the embodiment shown in figures 7-8, similar to the previous one, the reservoir 20'''' has a quadrangular cross-section and it is shape-lockingly inserted in a C-shaped container 34' for the filter 26.

[0025] In both the above embodiments the container 34 or 34' can contain other components of the water dispenser assembly, like the valve 21 and/or the water pump 15.

Claims

1. A refrigerator (10) having a water dispenser assembly comprising a cool water reservoir installed inside the refrigerator and a water supply pump supplying the cool water from the reservoir to the outside of the refrigerator, **characterized in that** the cool water reservoir (20, 20', 20'', 20''', 20''') is connected to a water supply valve (21) which is adapted to be connected to an external water network (N), so that the water dispenser assembly can be used either with water supplied manually by the user to the reservoir (20, 20', 20'', 20''', 20''') or with water supplied automatically by the external water network (N).
2. A refrigerator according to claims 1, **characterized in that** filter means (26, 26a) are interposed between the water supply pump (15) and a water supply port (14).
3. A refrigerator according to claim 2, **characterized in that** the cool water reservoir (20, 20', 20'', 20''', 20''') is provided with a high level sensor (23) adapted to activate the water supply valve (21) when the level in the reservoir is lower than a predetermined level, in an automatic configuration of the water dispenser assembly.
4. A refrigerator according to claim 2, **characterized in that** the reservoir (20, 20', 20'', 20''', 20''') is provided with a low level sensor (24) adapted to interrupt the water supply pump (15) when the level in the reservoir is lower than a predetermined low level.
5. A refrigerator according to any of claims 2-4, **characterized in that** upstream the water supply port (14) the water dispenser assembly is provided with

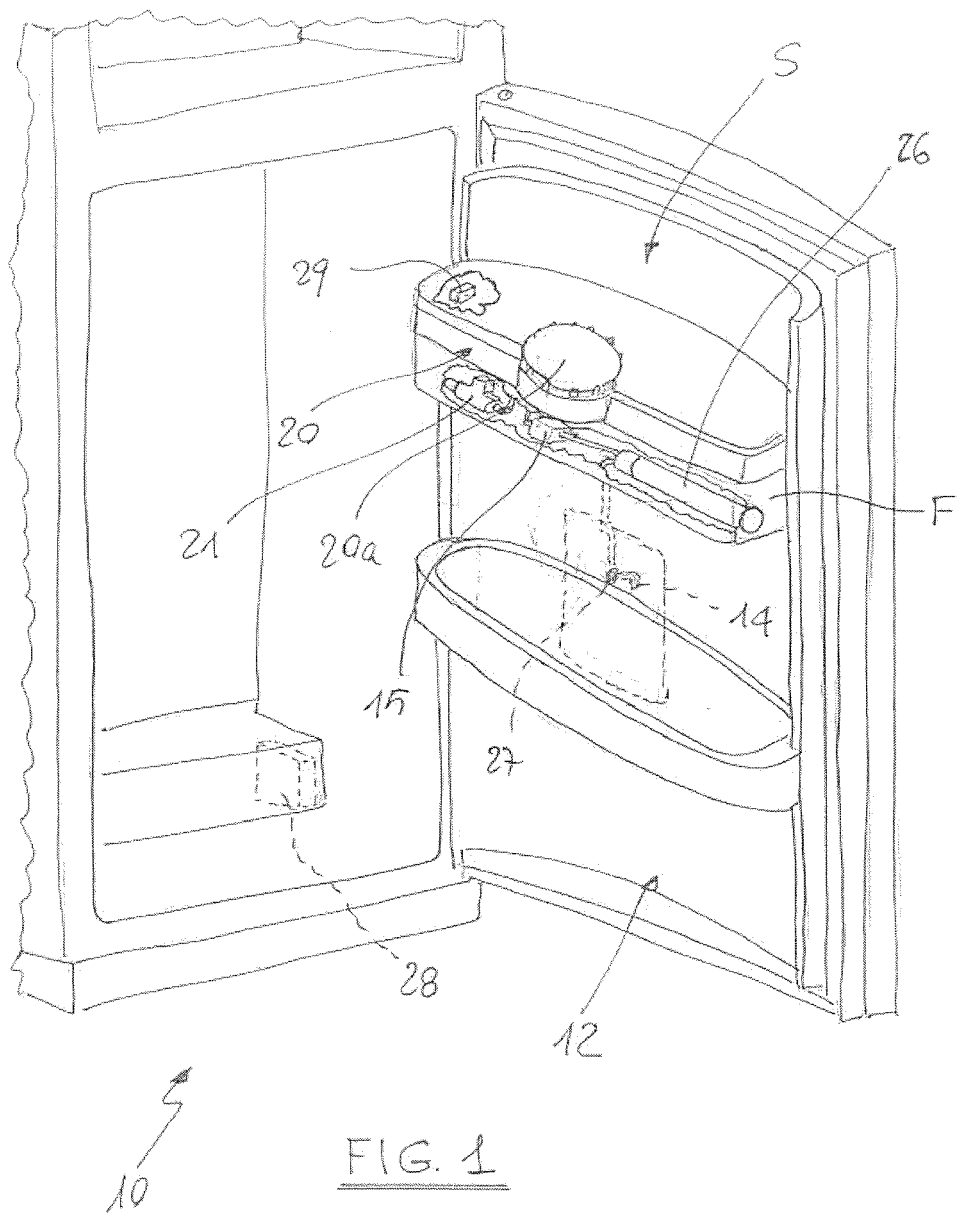
a check valve (27) in order to prevent water from dripping at the water supply port (14).

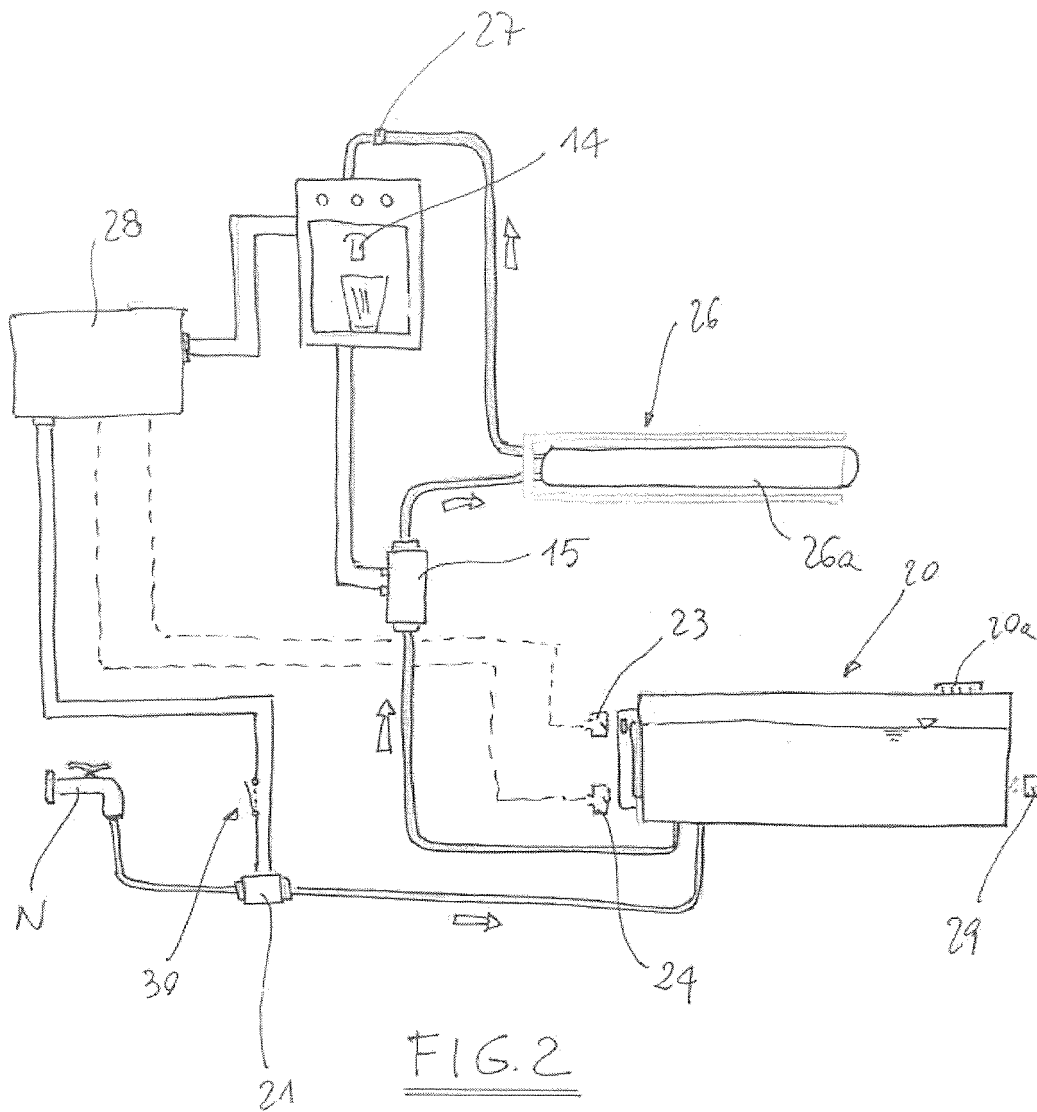
6. A refrigerator according to any of claims 2-4, **characterized in that** the filter means (26, 26a) and the cool water reservoir (20, 20', 20", 20"', 20''') are installed on a door (12) of the refrigerator, on a rear side thereof. 5
7. A refrigerator according to claim 6, **characterized in that** the filter means (26, 26a) and the reservoir (20, 20', 20", 20"', 20''') are removably installed in a shelf (S) of the door (12). 10
8. A refrigerator according to claim 7, **characterized in that** the reservoir (20', 20") is installed in a seat (K) of a lower portion (F) of the shelf (S). 15
9. A refrigerator according to claim 7 or 8, **characterized in that** the filter means comprise a removable cartridge (26a) which can be removed from the shelf (S, F) 20
10. A refrigerator according to any of the preceding claims, **characterized in that** it comprise a sensor (29) for detecting the presence of the cool water reservoir (20, 20', 20", 20"', 20'''), such sensor providing a signal to a control unit (28), when the reservoir (20, 20', 20", 20"', 20''') has been removed by the user, that inhibits the water supply pump (15) and the water supply valve (21). 25 30
11. A refrigerator according to claim 6, **characterized in that** the filter means (26, 26a) and the water reservoir (20"', 20''') are removably installed between two shelves (S, S') of the door (12). 35
12. A refrigerator according to claim 11, **characterized in that** the reservoir (20"', 20''') is shape-lockingly mounted on a vertical container (34, 34') for the filter means (26, 26a). 40

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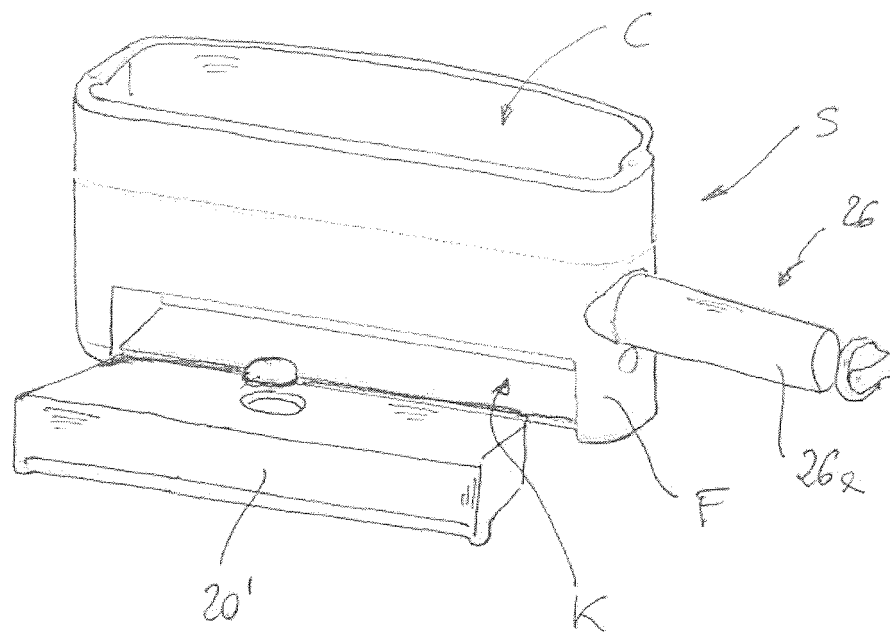


FIG. 3

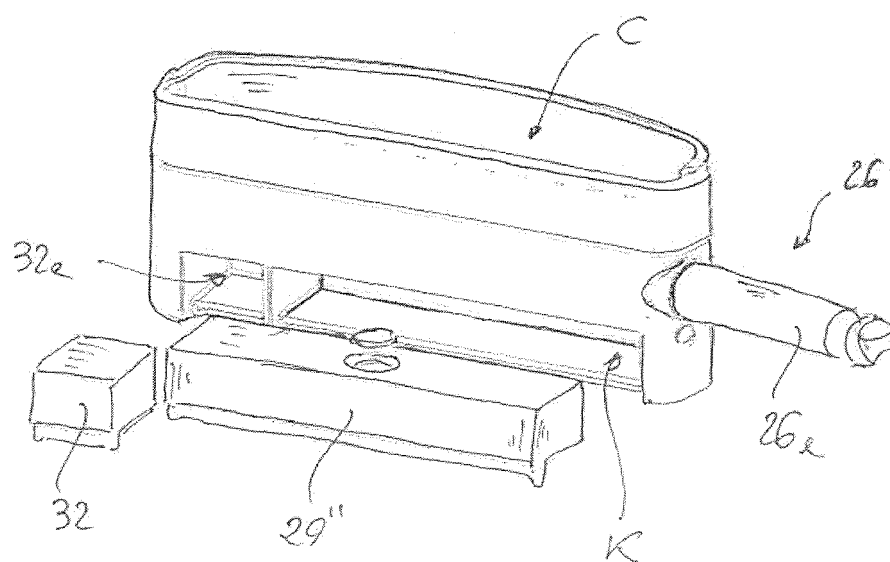


FIG. 4

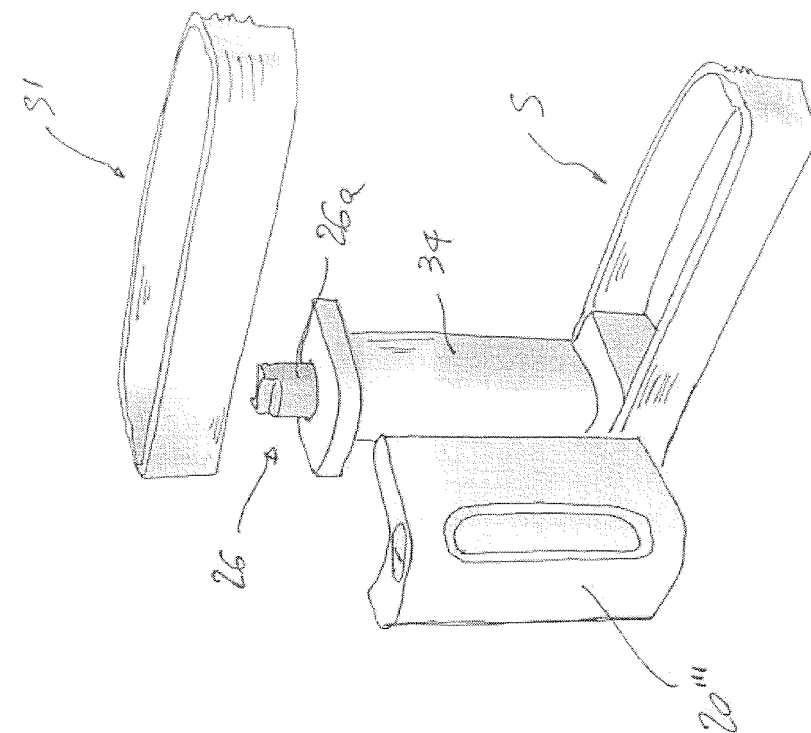


FIG. 6

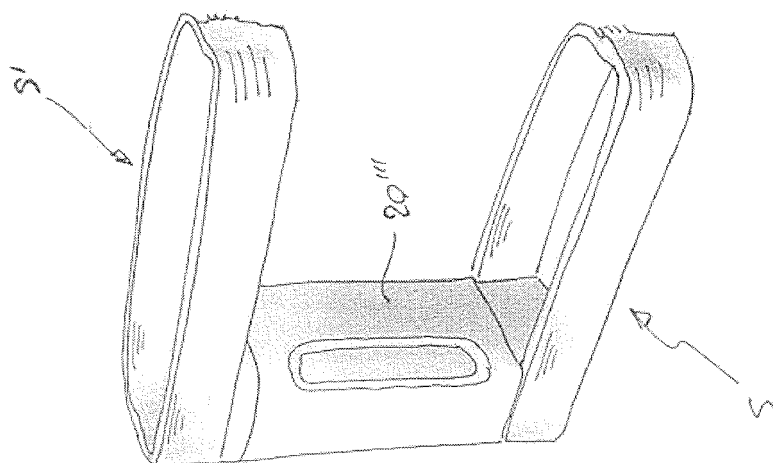
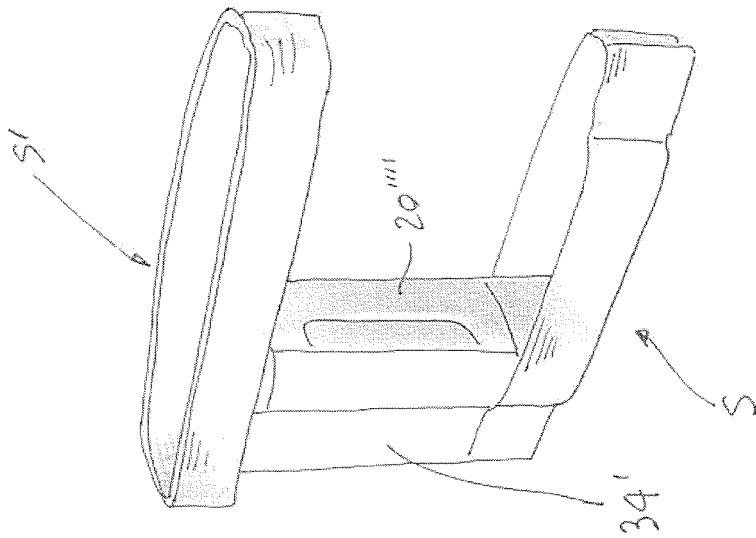
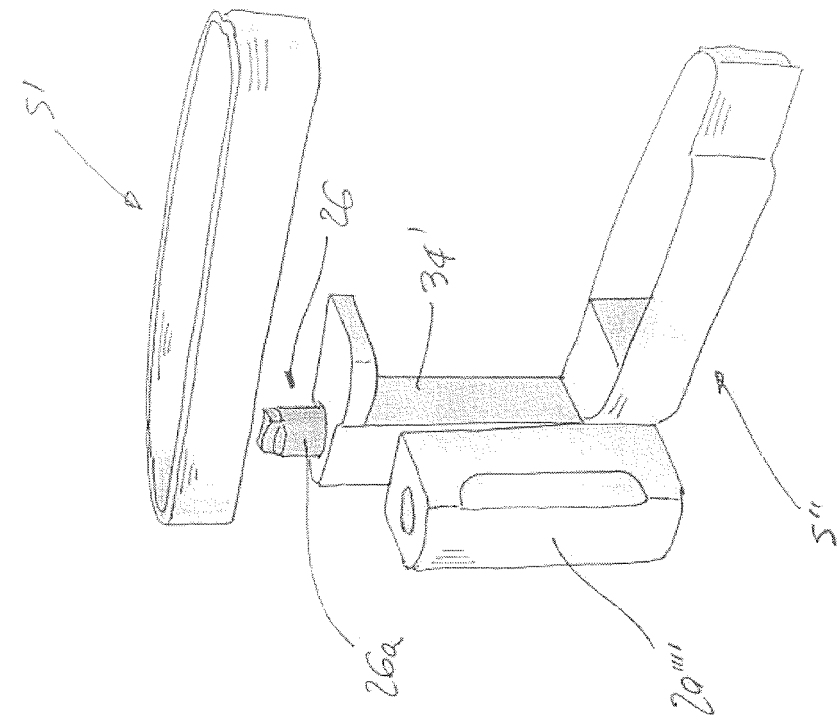


FIG. 5





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