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Linstromberg et al.

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[54] **REFRIGERATOR OR THE LIKE WITH EXTERNALLY MOUNTED WATER VALVE**

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[52] **U.S. Cl.** **62/177,** 62/340, 62/299

[51] **Int. Cl.** **F25d 17/06**

[58] **Field of Search** ..... 62/340, 177, 440, 62/353, 299; 251/139; 339/14 R, 14 P, 117, 118; 137/382

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[57] **ABSTRACT**

An appliance, such as a refrigerator, having means requiring the delivery of water thereto, such as an automatic ice maker. Means are provided for delivering water to the water requiring means through a control valve mounted externally of the cabinet of the appliance. Quick connect means are provided for facilitated installation of the valve means both as to connection thereof to electrical control means of the appliance and to the water requiring means. The valve may be mounted in a suitable recess in the cabinet which may be provided in the rear wall adjacent the water requiring means for simplified connection therebetween.

11 Claims, 4 Drawing Figures

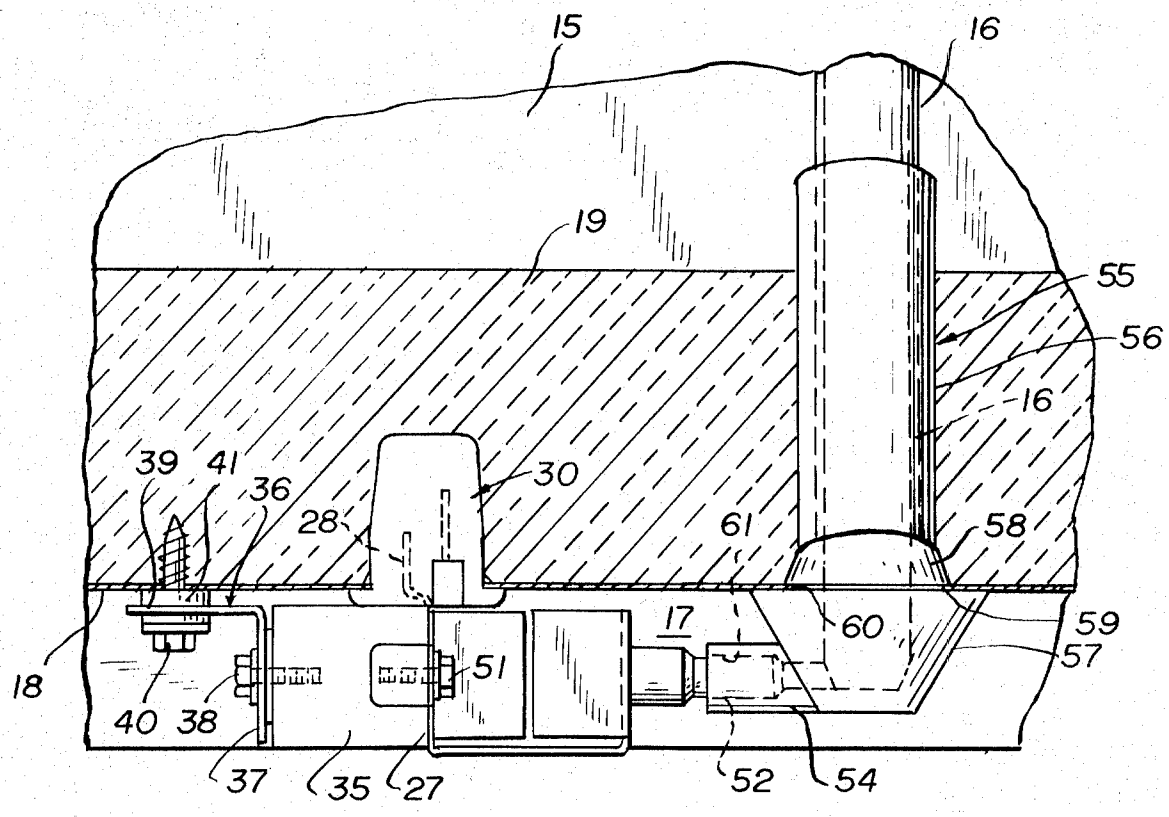


FIG. 1

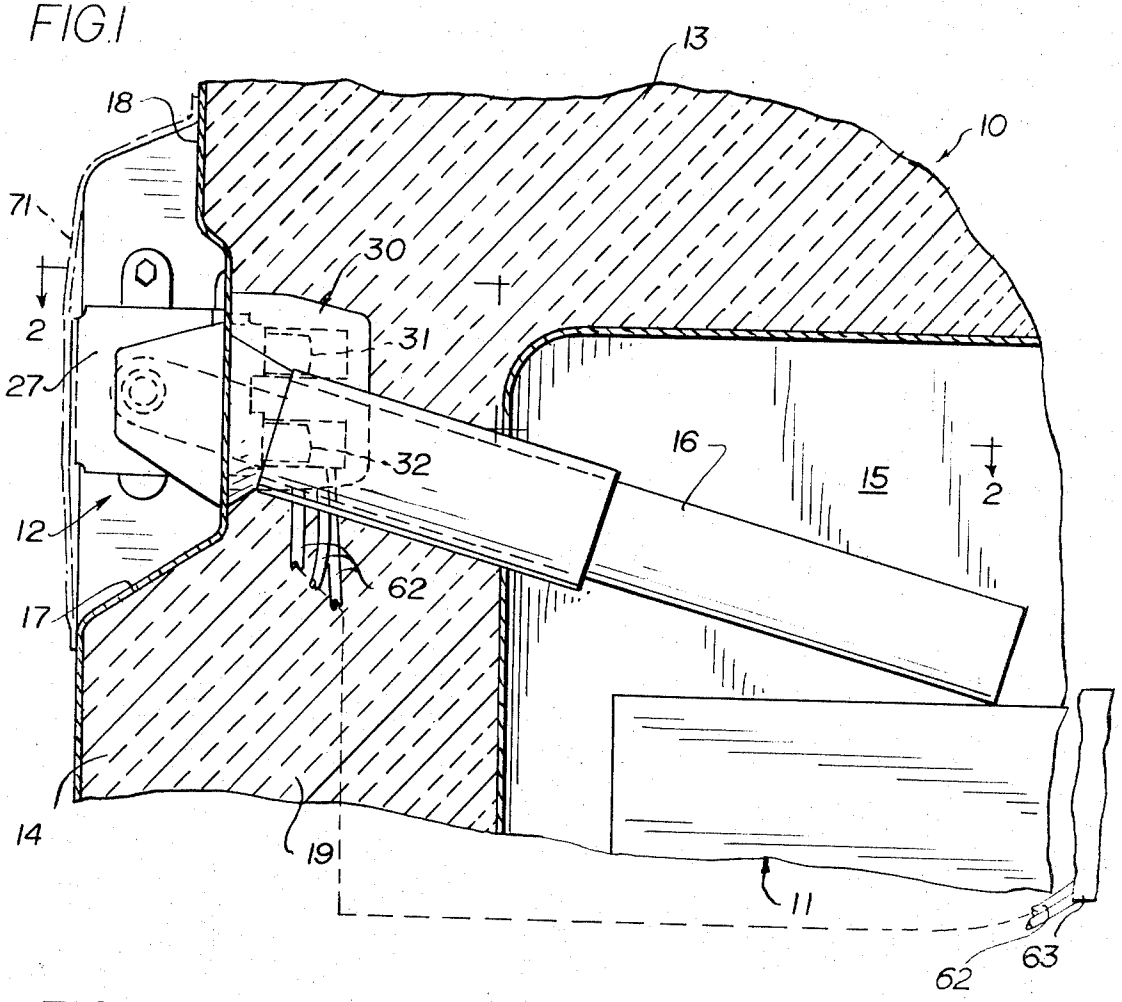
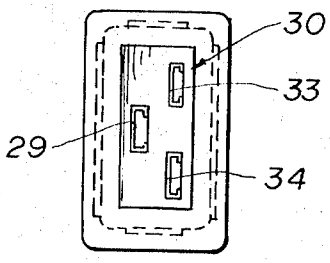


FIG. 4



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FIG.2

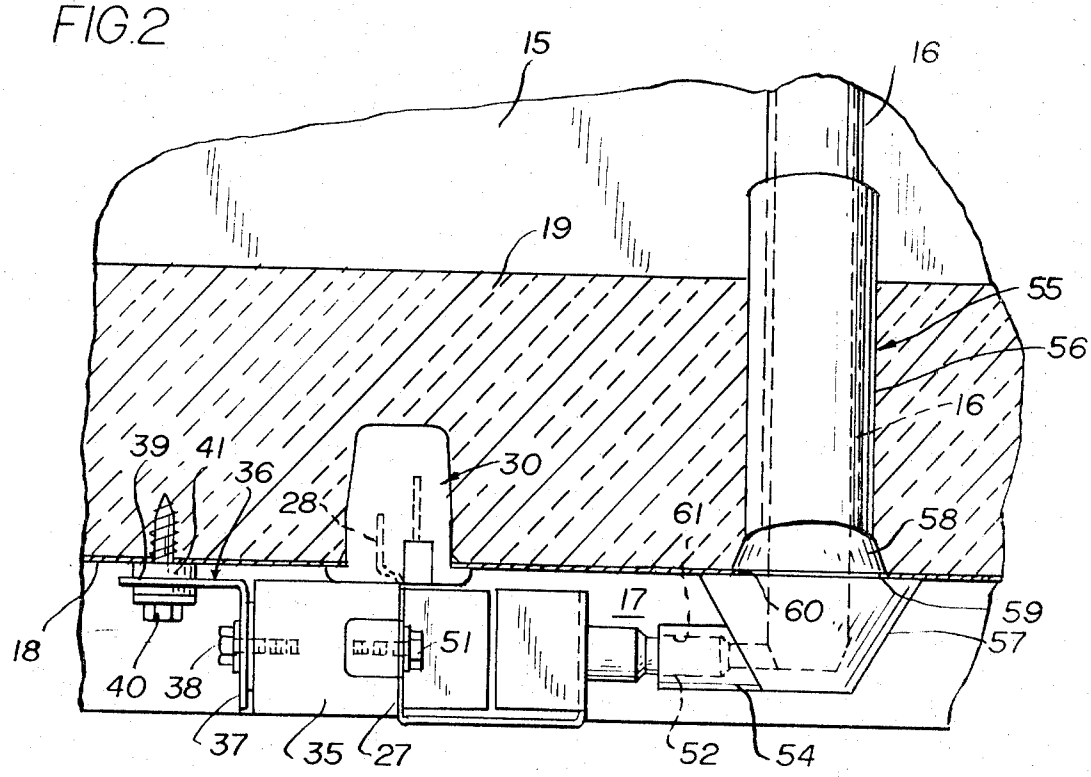
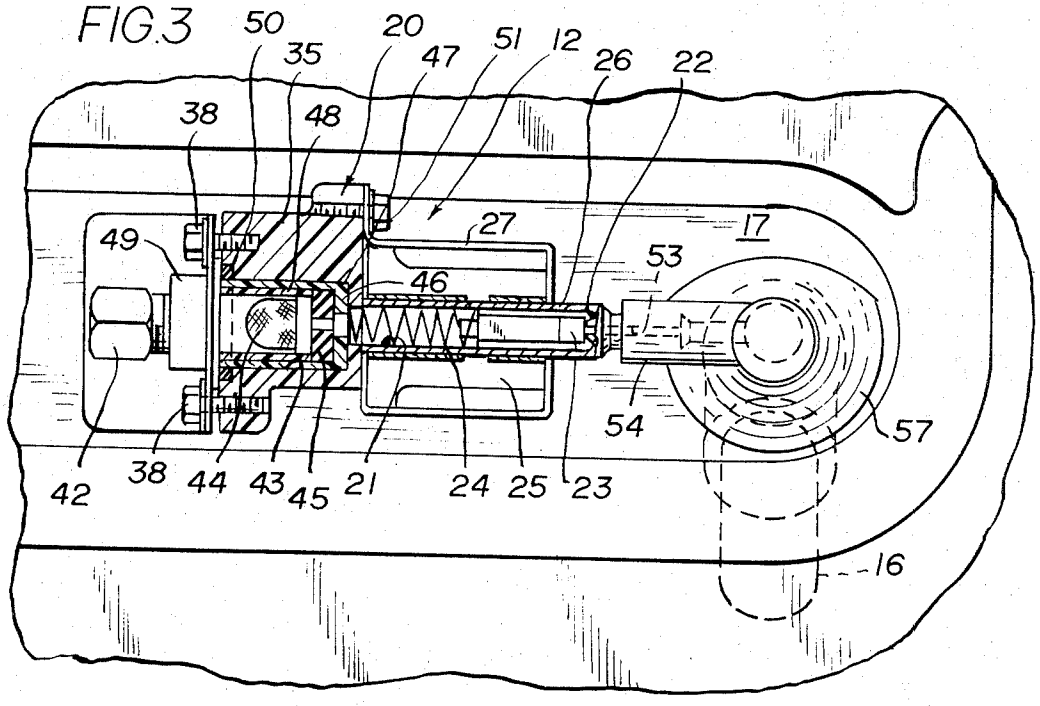

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FIG.3


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REFRIGERATOR OR THE LIKE WITH EXTERNALLY MOUNTED WATER VALVE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to water supply control devices and in particular to water supply control devices for use in appliances such as refrigerators or the like.

2. Description of the Prior Art

In the conventional refrigerator type appliance having an automatic ice maker installed therein, water is supplied to the ice maker from an external pressurized source. Flow of water to the ice maker is automatically controlled by suitable electrical control means associated with the ice maker operating a solenoid operated valve connected in the water line. Conventionally, such valves are disposed internally of the refrigerator cabinet and substantial lengths of fluid ducts and wiring between the control and solenoid operated valve are required. Further, the conventional solenoid operated valve requires special fittings, adaptors, and tubing to utilize the conventionally available solenoid valves for such use.

Such structures further have the disadvantage of difficulty of manufacture and servicing because of the relative inaccessibility thereof within the cabinet.

In a common form of such apparatus, the solenoid valve is disposed in the machinery compartment of the refrigerator, which compartment is conventionally at the bottom of the refrigerator, whereas the ice maker is conventionally located in an upper portion of the refrigerator and in one common form of such refrigerator is located in the freezer compartment thereof at the top of the refrigerator.

SUMMARY OF THE INVENTION

The present invention comprehends an improved apparatus having a water utilizing means disposed within a cabinet thereof with means for controlling delivery of water to the water utilizing means mounted externally of the cabinet for facilitated accessibility, ease of manufacture and low cost.

More specifically, the invention comprehends an improved refrigeration apparatus having an automatic ice maker wherein the water flow control valve is disposed exteriorly of the refrigerator cabinet adjacent the ice maker mechanism. In one preferred embodiment, a recess is provided in the rear wall of the refrigerator cabinet permitting the valve means to be disposed substantially fully within the recess while yet providing the highly desirable accessibility thereto.

The valve means may comprise a solenoid operated valve and the means for connecting the valve means to the apparatus may include quick disconnect means both for the electrical connections of the solenoid to the electrical control of the apparatus and for the fluid flow connections from the valve to the duct leading to the automatic ice maker.

The solenoid of the valve may be provided with a metal cover having an integral ground terminal adapted to be electrically connected to the ground terminal of the connector means carried by the cabinet for automatically grounding the solenoid of the valve when installed.

The fluid duct means is effectively minimized in the present appliance structure by locating the valve immediately adjacent the ice maker. Thus, the supply line may be connected to the inlet of the valve and the outlet of the valve connected to the duct extending directly through the cabinet wall to the ice maker eliminating the lengthy piping required in the conventional apparatus where the valve is located remotely from the ice maker, such as in the machinery compartment. Further, the electrical control wiring is minimized by virtue of the short connection permitted between the automatic ice maker control and the solenoid valve which may be disposed immediately adjacent each other in the disclosed arrangement.

The valve may be of conventional construction eliminating the need for special fittings, as the inlet may be provided with a conventional compression-type fitting for connecting conventional copper tubing thereto and the outlet may comprise a slip fit tubular element adapted to be received in a flexible tubular connector leading to the automatic ice maker.

Thus, the means for controlling the delivery of water to the ice maker of the present invention is extremely simple and economical of construction while avoiding the disadvantages of the structures of the prior art and providing the highly desirable features and advantages discussed above.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a fragmentary vertical elevation of a portion of a refrigerator having an improved means embodying the invention for controlling the delivery of water to a water-utilizing device within the refrigerator cabinet;

FIG. 2 is a fragmentary horizontal section thereof;

FIG. 3 is a fragmentary transverse vertical section thereof looking from the rear of the apparatus; and

FIG. 4 is an elevation of a quick connect electrical connector carried by the cabinet.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, an appliance generally designated **10** having a water utilizing device generally designated **11** illustratively comprises a refrigerator wherein the water utilizing device comprises an automatic ice maker in which the delivered water is formed automatically into batches of ice bodies. The water for forming the ice bodies is periodically delivered to the ice maker under the control of an automatically operated valve means, herein comprising a valve means **12** carried on the wall **13** of the refrigerator cabinet and more specifically, is carried on the rear wall **14** immediately adjacent the space **15** within the cabinet wall **13** in which the ice maker **11** is disposed. A water fill duct **16** is provided extending through the rear wall **14** for delivering the water to be formed into ice bodies therein. The present invention comprehends that the valve means **12** be disposed adjacent space **15** in a readily accessible arrangement for facilitated installation and servicing and for minimizing the cost of the apparatus by effectively minimizing the length of water duct structures and electrical wiring in the apparatus **10**.

Valve means **12** is preferably received in a recess **17** opening rearwardly in rear wall **14** so as to be substantially fully disposed therein whereby the rear of the re-

frigerator may be closely juxtaposed to a building wall, or the like, notwithstanding the mounting of the valve means on the rear of the apparatus. As shown in FIG. 1, the rear cabinet panel 18 may be formed to define the recess 17 extending into the insulating material 19 of the cabinet wall 13.

As best seen in FIG. 3, valve means 12 comprises a water valve having a body 20 provided with a through bore 21 defining, at an intermediate position, an annular valve seat 22 which is selectively closed by a plunger 23 biased toward the valve seat by a coil spring 24. The plunger is selectively urged away from valve seat 22 by a solenoid coil 25 concentrically surrounding a reduced diameter portion 26 of valve body 20. The solenoid is enclosed in a metal housing 27 having a ground terminal 28 extending therefrom for insertion into a ground female terminal 29 of a female receptacle generally designated 30 carried by cabinet wall 14 at the rear of recess 17. The solenoid is provided with a pair of power terminals 31 and 32 received in female terminals 33 and 34, respectively, of the receptacle 30 when the valve means 12 is plugged thereinto, as shown in FIG. 1. Alternately, solenoid coil 25 may be of a double insulated construction eliminating the need for a ground connection through terminals 28 and 29.

The lefthand end of valve body 20 comprises a diametrically enlarged cylindrical portion 35 and is adapted to be mounted on the metal wall panel 18 by a resilient mounting means comprising an L-bracket 36 having one leg portion 37 fixedly secured to body portion 35 by a pair of screws 38 and a second leg portion 39 fixedly secured to panel 18 by a screw 40 and a resilient grommet 41.

A conventional compression-type tube connector 42 is connected to valve body portion 35 at the lefthand end 43 of bore 21, which is diametrically enlarged to receive a conventional filter screen 44 and a resilient orifice 45 held against an inturned end 46 of a cup-shaped body 47 by a tubular retainer 48. Connector 42 is connected to the valve body by means of an adaptor 49 and a ring seal 50 is provided coaxially about bore portion 43. Solenoid cover 27 may be secured to body portion 35 by a suitable screw 51 for facilitated disassembly of the solenoid structure relative to the valve body when desired. Alternately, screw 38 may extend through body portion 35 to secure solenoid cover 27 to body portion 35. When bracket 36 is metal and screw 38 extends through body portion 35 to secure solenoid cover 27 to body portion 35, ground terminal 28 and female terminal 29 may be eliminated inasmuch as solenoid cover 27 can be grounded to cabinet 17 by screw 40.

The valve body further includes a further reduced diameter distal end portion 52 defining an outlet bore 53 downstream of the valve seat 22 for conducting water passed through the valve to the water fill duct 16. Tubular end 52 is slip fitted into a tubular end 54 of a water tube connector 55 having an inner portion 56 extending through the insulating material 19 and an outer head portion 57 from which tubular end 54 extends at a right angle to inner portion 56. Connector 55 is preferably formed of a flexible material, such as a synthetic plastic, having minimum taste-affecting characteristics relative to the water conducted therethrough and herein is formed of polyvinylchloride. Illustratively, the tubular portion 56 may be provided with an annular enlarged portion 58 spaced from head end 57 for gripping the edge 59 of the panel 18 defining an opening therethrough. Thus, the connector 55 is removably installed on the wall panel 18 permitting flexing of the outer portion 54 substantially to accept the insertion of valve body end 52 therein to provide a quick connect connection of the valve to the water delivery tube 16 for delivering water into the mold (not shown) of the ice maker 11.

The installation of valve means 12 is extremely simple. The valve assembly, including bracket 36, is installed in recess 17 by inserting the electrical terminals 28, 31 and 32 into the female socket terminals 29, 33 and 34 of connector 30 while concurrently inserting the tubular end 52 of the valve body into the bore 61 of the connector portion 54 which may be swung outwardly to permit such insertion. The valve body is then resiliently retained in place, with the terminals 28, 31 and 32 held in positive electrical connected association with the plug 30 and the fluid transfer connection of body portion 52 to connector 55 effectively maintained, by means of screw 40.

Plug 30 is connected by suitable electrical wires 62 to the electrical control 63 of ice maker 11 for automatic controlled delivery of water to the ice maker by suitable selective energization of the solenoid coil 25 of valve means 12. As shown in FIG. 1, the valve means is substantially fully received in recess 17 thereby permitting a substantially flush disposition of the rear wall 14 of the refrigerator cabinet with a rearwardly adjacent building wall for minimizing space requirements of the refrigerator and effectively avoiding damage to the valve means as might occur where the valve means projects rearwardly from the cabinet wall. As the recess 17 is fully opened rearwardly, access to the valve means for facilitated connection of the incoming water line to connector 42 is provided and servicing of the valve means may be readily effected.

While in the preferred embodiment the recess 17 is fully open, it is to be appreciated that a removable cover for enclosing recess 17 could be provided for aesthetic reasons. As shown in FIG. 1, a cover 71 could be provided extending across recess 17 enclosing the valve means 12. Such a cover 71 would tend to reduce transmission of noise generated by operation of the valve means 12.

Removal of the valve means from the apparatus when desired requires only the removal of screw 40 and the quick disconnect of the electrical and water flow connecting means. Metal housing 27 of the solenoid effectively grounds the solenoid means through the ground connection 29 of the electrical circuit plug 30 automatically upon installation of the valve means as discussed above.

As the valve means is disposed immediately adjacent the ice making mechanism, the length of wiring 62 and the length of the water flow duct from the valve is effectively minimized for low cost of construction and facilitated maintenance. As the solenoid is spaced substantially from the machinery space wherein heat is normally generated by the operation of the appliance operating means, improved life of the solenoid is obtained. The use of resilient grommet 41 and the resilient connector portion 54 further assures minimizing vibration transfer from the valve means to the cabinet while yet maintaining the desired electrical and flow conducting connections. The use of the flow control washer 45 permits facilitated regulation of the flow of

water through the valve means and in the illustrated embodiment, may be preselected to control the flow rate at approximately 0.25 gallons per minute for optimum filling of the ice maker mold.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

Having described the invention, the embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an appliance having a cabinet with a rear wall defining an outwardly opening recess, water utilizing means utilizing water supplied thereto in the operation of the appliance, and electrical control means for controlling operation of the appliance, means for controlling delivery of water to said water utilizing means, comprising: valve means; mounting means for mounting said valve means in said recess; electrical operating means for effecting the operation of said valve means; cooperating plug-in means carried by said valve means and wall for connecting said electrical operating means electrically to said electrical control means for control of the operation of said valve means by said electrical control means; water conducting means for conducting water from said valve means through said rear wall to said water utilizing means including duct means extending through said wall and slip fit means for connecting said valve means to said duct means, said electrical connecting plug-in means and said water conducting slip fit means being constructed to permit manual connection and disconnection of the valve means for facilitated servicing; and flow connecting means for connecting a source of water under pressure to said valve.

2. The appliance means of claim **1** including means for refrigerating the interior of said cabinet and said wall includes insulating means for preventing freezing of water at said valve by heat transfer from said refrigerated cabinet interior.

3. The appliance means of claim **1** wherein said water utilizing means comprises an automatic ice maker disposed within said cabinet.

4. The appliance means of claim **1** wherein said water utilizing means comprises an automatic ice maker disposed within said cabinet inwardly adjacent said valve means.

5. The appliance means of claim **1** wherein said duct means includes a flexible outer portion for facilitating the slip fitting of the valve connection thereto while concurrently making the plug-in connection of said electrical connecting means.

6. The appliance means of claim **1** wherein said valve is mounted substantially fully within said recess and wherein sound-deadening means are provided comprising cover means forming a closure for said recess enclosing said valve means within said recess.

7. The appliance means of claim **1** wherein said electrical operating means comprises a solenoid including an outer metal portion and said electrical connector means includes means for grounding said solenoid.

8. The appliance means of claim **1** wherein said valve means extends to substantially flush with the outer opening of said recess.

9. The appliance means of claim **1** comprising a refrigeration appliance wherein the water utilizing means comprises an automatic ice maker and the electrical control means coordinates the operation of the valve with the functioning of the ice maker.

10. In an appliance having a cabinet with a rear wall defining an outwardly opening recess, water utilizing means utilizing water supplied thereto in the operation of the appliance, and electrical control means for controlling operation of the appliance, means for controlling delivery of water to said water utilizing means, comprising: valve means; mounting means for mounting said valve means in said recess; electrical operating means for effecting the operation of said valve means; cooperating plug-in means carried by said valve means and wall for connecting said electrical operating means electrically to said electrical control means for control of the operation of said valve means by said electrical control means; water conducting means for conducting water from said valve means through said rear wall to said water utilizing means including duct means extending through said wall and water conducting slip fit means for connecting said valve means to said duct means, said electrical connecting plug-in means and said water conducting slip fit means being constructed to permit manual connection and disconnection of the valve means for facilitated servicing; flow connecting means for connecting a source of water under pressure to said valve; and removable cover means forming a closure for said recess.

11. In a refrigerator appliance having a refrigerated cabinet with a rear wall defining an outwardly opening recess, disposed within said cabinet and utilizing water supplied thereto in the operation of the appliance, and electrical control means for controlling operation of the appliance, means for controlling delivery of water to said ice maker, comprising: valve means; mounting means mounting said valve means in said recess; electrical operating means for effecting the operation of said valve means; cooperating electrical connecting plug-in means carried by said valve means and wall for quick-connecting and quick-disconnecting said electrical operating means relative to said electrical control means; water conducting means for conducting water from said valve means through said rear wall to said ice maker within said refrigerator cabinet including duct means extending through said wall, and water conducting slip fit means at an end of the duct means in said recess for connecting said valve connecting plug-in means and said water conducting slip fit means being constructed to permit manual quick-connection and quick-disconnection of the valve means for facilitated servicing; and flow connecting means for connecting a source of water under pressure to said valve.

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