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(71) Applicant: **RE-FLEX S.r.l.**
Via Maddalena 3
I-20122 Milano(IT)

(72) Inventor: **Fornasari, Paolo**
Via Pestalozzi 10
I-33084 Cordenons, Pordenone(IT)

(74) Representative: **Busca, Luciano et al**
PROPRIA Protezione Proprietà Industriale srl
Via Mazzini 13
I-33170 Pordenone (IT)

(54) Anti-flooding arrangement for water supply hoses of household appliances.

(57) The arrangement comprises a shut-off valve (32) mounted in a connector means (10) of the water supply hose (18) and carrying a first magnet (40). An anhydrous, compressed sponge (50) is situated outside said connector means (10) so as to be hit and drenched by the water in case of a breakdown of the water supply hose (18).

A lever (44) located ouside the connector means is capable of being actuated by the swelling of said sponge (50) drenched by the water, so as to displace a second magnet (46) of equal polarity from a position in which it faces said first magnet (40) to keep the valve (32) open, to a position in which it is moved away from said first magnet to enable said valve to close under the pressure of the water.

A spring (54) biases the lever against said position in which said second magnet (46) is facing said first magnet (40).

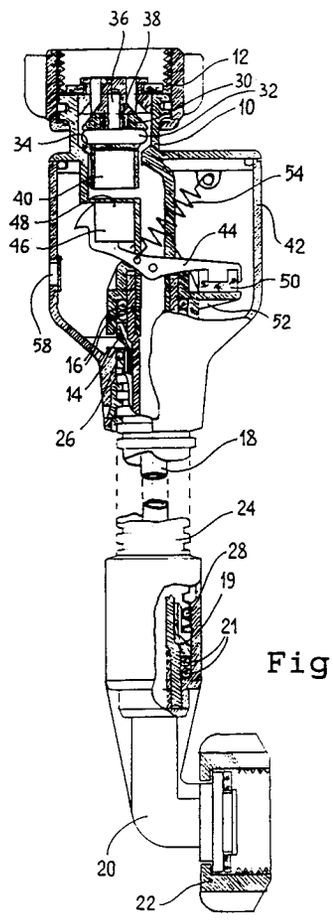

Fig. 1

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The present invention relates to an anti-flooding arrangement for water supply hoses of household appliances.

Household appliances, such as for instance clothes washing machines and dishwashing machines, are connected to the water supply mains through a flexible hose made of reinforced rubber material. Owing to material aging, shocks and repeated bending during use, as well as possible failure of the related connection fittings, it may occur that the hose breaks eventually down under serious flooding risks.

An anti-flooding arrangement has already been proposed, which is responsive to changes in the air pressure differential to shut off the water supply when the water supply hose breaks down, ie. when a leakage occurs in the water supply hose. The operation of such an arrangement is a critical one since, owing to the fact that it must operate in a pneumatically closed (ie. isolated) system, it is very sensitive to variations in barometric pressure and temperature, as well as pressure oscillations in the water supply mains.

A further anti-flooding arrangement known from the prior art uses an anhydrous, compressed sponge located externally of the regular path followed by the water flow in the hose, but in communication with the interstice existing between the hose itself and a sheath surrounding the hose. The sponge is soaked by the water entering the interstice in case of a breakdown of the hose. It therefore starts to swell and press against the stem of a valve so as to cause it to shut off the water supply at the tap, thereby breaking off the flow through the hose.

The arrangement based on the use of an anhydrous sponge is quite effective owing to both the simple mechanisms involved and its not being dependent on any such critical parameters as water pressure and/or temperature. However, its reliability record is limited by the fact that the valve and its stem are constantly immersed in water for quite long periods of time and, as a consequence, tend to be subject to scaling and, therefore, to eventually jam up and be prevented from operating when they are required to do so following a water leakage.

It is therefore desirable and an object of the present invention to provide an anti-flooding safety arrangement of the anhydrous-sponge type, to be used in connection with water supply hoses for household appliances, which is more reliable than the prior-art arrangements in particular as far as scaling and related effects are concerned.

A further object of the present invention is to provide an anti-flooding safety water supply hose for household appliances, which is less expensive than the various prior-art arrangements.

These and further scopes and advantages of the present invention, as they will become apparent from the following description, are achieved through an anti-flooding arrangement according to the appended claim 1.

For a better understanding, the invention will anyway be further described by way of non-limiting example with reference to the accompanying drawings in which:

- Figure 1 is a side view of a partially cross-sectioned anti-flooding arrangement associated with a water supply hose for household appliances according to a preferred embodiment of the present invention, said arrangement being shown in its resting condition;
- Figure 2 is a side view of the anti-flooding arrangement according to Figure 1, however shown in its working condition.

Referring now to Figure 1, it can be noticed that an inlet connector means 10 is equipped with a threaded-nut hose fitting 12 for connection to the water supply tap (not shown) of a water supply mains. A flexible water inlet hose 18 of a washing machine is connected in a watertight manner to said connector means 10 by tightening a coupling sleeve 14 and inserting corresponding sealing rings 16 therebetween. At its opposite end, said flexible hose 18 is connected, even in this case through a coupling sleeve 19 and a pair of sealing rings 21, to an outlet connector means 20, which is in turn equipped with a threaded-nut fitting 22 for connection to a washing machine (not shown). A corrugated sheath 24, which is clamped at both its ends on to the corresponding connectors with sealing rings 26, 28, is provided around the flexible hose 18.

The connector means 10 houses the body of a valve 30 equipped with an O-ring 32 arranged to press against the conical seat 34, guided by a pin 36 and biased against said conical seat 34 by a weak spring 38. Said valve 30 carries a permanent magnet 40 featuring a pole shoe facing downwards.

Associated with said inlet connector means 10 is a box 42, which is hydraulically isolated from the flexible hose 18, but communicates with the sheath 24. Pivotally mounted in said box 42 is a lever 44 which carries at one of its ends a magnet 46 that has, in front of the magnet 40, a polar shoe 48 that is equal in sign to the polar shoe of the magnet 40. At its opposite end said lever carries an anhydrous, compressed sponge 50 of cellulose-based material, resting on a bracket 52 that is integral with said inlet connector means 10. A weak spring 54 ensures that said lever is normally kept in the position shown in Figure 1.

In the condition illustrated in Figure 1, the magnet 46 exerts a repulsion on the magnet 40, thereby keeping the valve 30 at a distance from the

conical seat 34 and, as a consequence, in its open state. When water starts leaking from the flexible hose 18 following a breakdown, the same water collects inside the sheath 24, thereby flooding the box 42 and soaking the sponge 50.

As it can be inferred from the illustration in Figure 2, the soaked sponge 50 starts swelling and, overcoming the pulling force of the spring 54, it thereby moves the magnet 46 away from the magnet 40, so that no repulsion can be exterted on the latter any longer. Under these conditions, the valve 30 then moves downwards against the conical seat 34 owing first to the action of the spring 38 and then the pressure of the water from the supply mains against its upper surface. The water inlet flow is in this way shut off.

As it can be inferred, the actuation of the arrangement by magnetic force is instrumental in preventing water from possibly seeping through along sliding or rotating elements, such as this would generally occur in the case of a direct mechanical actuation, while moving mechanical elements are in contact with water only when the hose breaks down. As a consequence, the risks of jamming due to scale build-up on moving mechanical elements are sensibly reduced.

Furthermore, the valve of the afore described arrangement is biased to close by the spring 38 associated therewith, and is normally kept open by the anti-flooding arrangement. This type of operation enhances the reliability of the arrangement, since possible failures of component parts thereof, such as for instance a demagnetization of the magnets or a breakdown of the spring 54, would not impair the anti-flooding effectiveness of the arrangement, causing at the most the water supply to be shut off improperly.

In a preferred way, as shown in Figure 2, the new operating condition of the arrangement is indicated by a coloured surface 56 of the lever 44, which becomes visible through a viewing window 58 provided in the wall of said box 42.

Both the connector means 10 and the box 42 are preferably made of a thermoplastic material, such as cross-linked polyethylene, polyamidic material or even polyvinyl chloride.

A preferred embodiment of the invention has been described and illustrated herein. It will be appreciated that it may of course be the subject of any functionally equivalent modifications and changes that may be devised by anyone skilled in the art on the basis of the teachings contained herein without departing from the scopes of the invention. For instance, the extension spring 54 might be replaced by a compression spring, or the spring might be provided to act on the opposite arm of the lever 44. Even the magnets might be arranged in a different way and might be provided to operate by attraction instead of repulsion.

These and further modifications shall be contemplated as falling within the scopes of the invention, as this is defined in the appended claims.

Claims

1. Anti-flooding arrangement for water supply hoses of household appliances, comprising a shut-off valve provided in a connector means of the water supply hose, **characterized in that** it further comprises:
   a) a first magnet (40) carried by the valve (32);
   b) an anhydrous, compressed sponge (50) arranged outside the connector means (10) so as to be contacted and drenched by the water in case of a breakdown of the water supply hose (18);
   c) moving means (44, 54) arranged outside said connector means, capable of being actuated by the swelling of said sponge (50) so as to displace a second magnet (46) of equal polarity from a position in which it is facing said first magnet (40) to keep said valve (32) open, to a position in which it is moved away from said first magnet to enable said valve to close under the pressure of the water.

2. Anti-flooding arrangement according to claim 1, **characterized in that** said moving means (44, 54) are formed by a lever (44) carrying said second magnet (46) at one of its ends and biased by first elastic means (54) against said position in which said second magnet (46) is facing said first magnet (40).

3. Anti-flooding arrangement according to claim 1 or 2, **characterized in that** said valve (32) is biased to close by second elastic means (38) against the force exchanged between said first magnet (40) and said second magnet (46) when they are facing each other.

4. Anti-flooding arrangement according to any of the preceding claims from 1 to 3, **characterized in that** said force exchanged between said first and said second magnets (40, 46) is a repulsive one.

5. Anti-flooding arrangement according to any of the preceding claims from 1 to 4, **characterized in that** the sponge (50) and the moving means (44, 54) are housed in a box (42) being integral with the connector means (10).

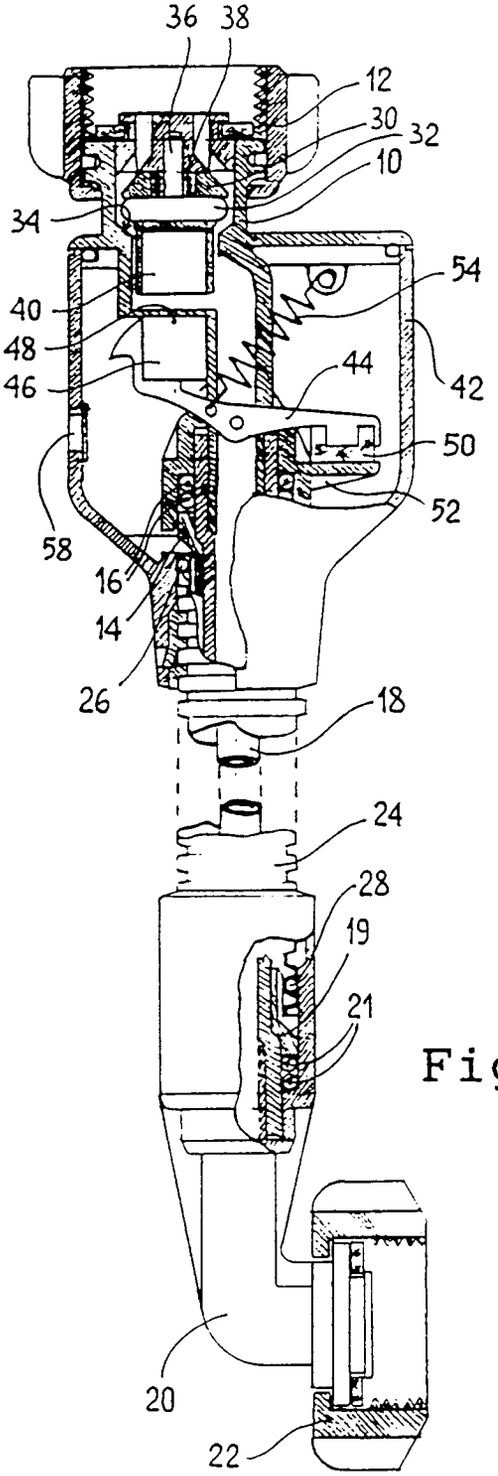
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Fig. 1

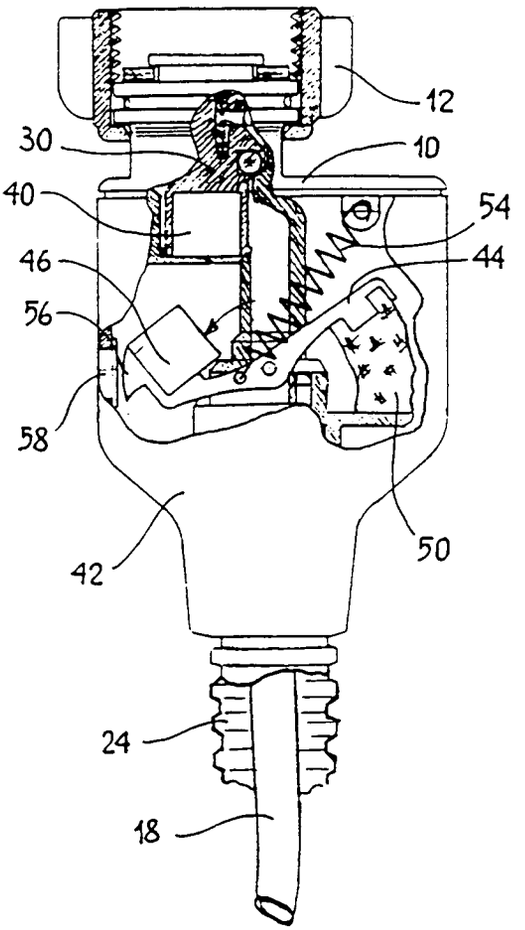
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Fig. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 10 1058

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	DE-A-3 743 842 (ELTEK) * column 3, line 5 - line 40; figure 2 *	1	D06F 39/08 F16K 31/00
A	---	5	F16K 31/08
Y	DE-A-3 236 078 (ELBI INTERNATIONAL) * claim 1; figure 2 *	1	
A	* page 10, line 19 - line 32 * ---	3	
A	DE-A-3 618 258 (ELTEK) * claim 1 * ---	1	
A	DE-B-1 024 303 (TRIST & CO) * figure 1 * -----	2,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D06F
F16K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	29 APRIL 1993	SCHLABBACH M.

CATEGORY OF CITED DOCUMENTS

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