Nov. 12, 1968 R. E. BATES 3,410,027

HYDRAULIC THRESHOLD

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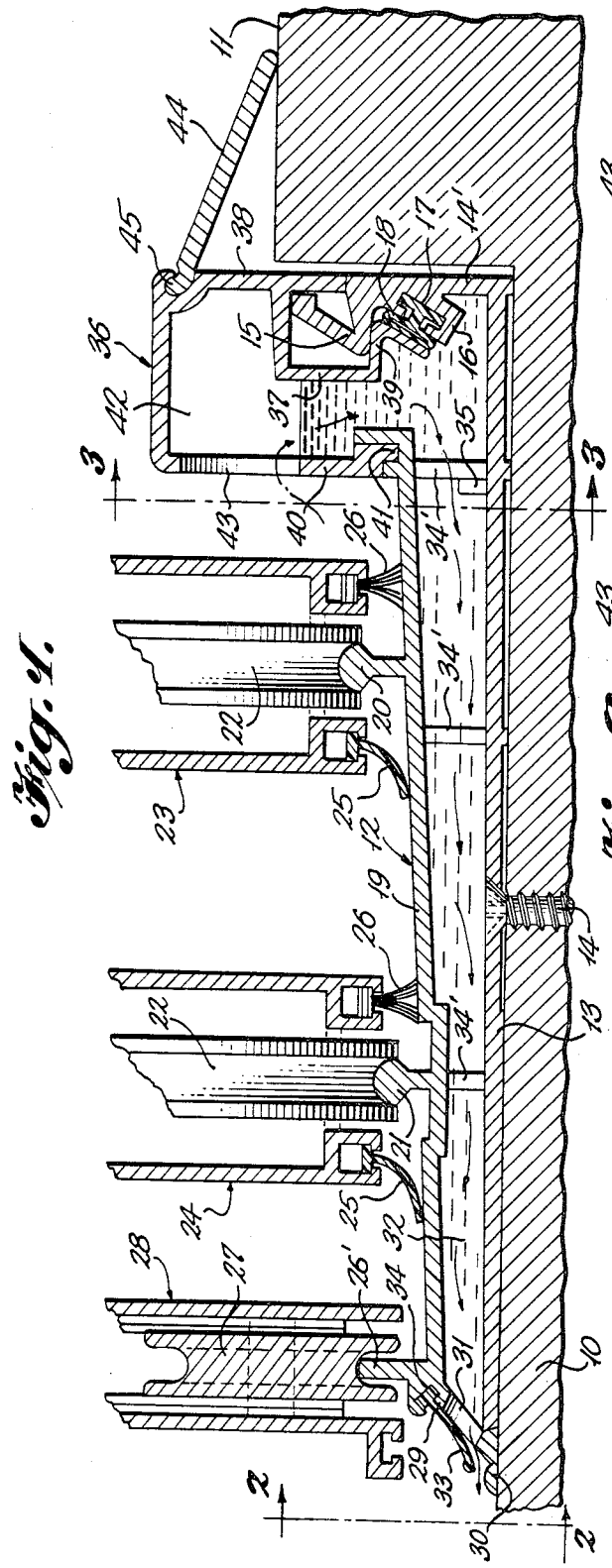


Fig. 1.

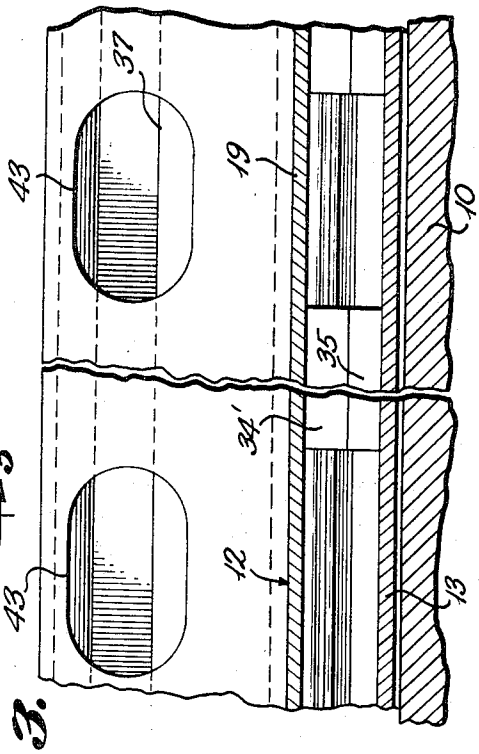


Fig. 3.

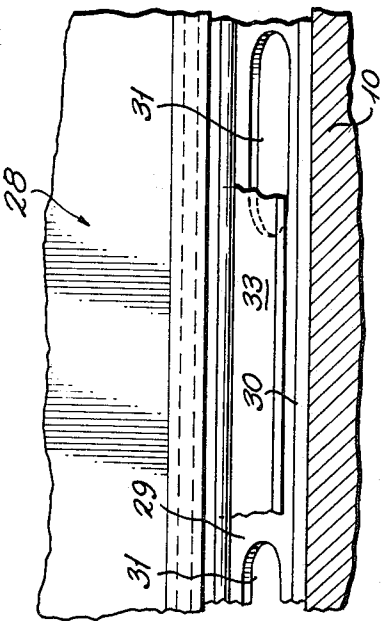


Fig. 2.

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HYDRAULIC THRESHOLD

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ABSTRACT OF THE DISCLOSURE

A threshold structure particularly for sliding panel closures having a fluid pressure head portion which accumulates sufficient water to overbalance the pressure of the elements on the external side of the closure and produce an actual flow of water from the internal to the external side of the closure automatically and continuously, to thereby eliminate the infiltration of water through the closure.

Background of the invention

The prior art reveals a number of closure structures including thresholds which are capable of draining accumulated water to a certain degree. These prior art devices have failed to take into account the pressure differential encountered between the outside and inside of sliding glass door closures and the like. Conditions of high wind and driving rains or snow are responsible in the prior art devices for a very significant infiltration of water through the entire closure structure, the water being forced by the external pressure under rails and between panel astragals or interlocks throughout the construction. The prior art structures offer resistance to water spillage into the interior only through the lack of sufficient exterior pressure to cause the head of water adjacent to the sill riser to overspill and enter the interior side of the frame. Overspilling frequently occurs since it is possible to experience external pressures far in excess of that which a maximum head of water in the conventional threshold could balance, thereby causing profuse leakage.

The present invention overcomes these difficulties and solves the problem by incorporating in the threshold structure a head section capable of accumulating sufficient water whose pressure will overbalance the pressure on the external side of the closure and actually cause a flow of water from the internal to the external side of the frame through the interior of the threshold.

Summary of the invention

The invention embodies a chambered or hollow threshold including track means for sliding panels of a closure structure and an interior side elevated head into which water may flow up to a certain elevation as it tends to migrate through the closure under the influence of external weather pressure. When a certain water head pressure is obtained in the threshold, a normally closed valve element on the outer side thereof automatically opens to initiate a water flow from the interior side of the closure frame to the outside thereof, thus preventing any water from spilling over the sill riser and entering the interior of the building or the like. The device is self-cycling, automatic and continuous in operation, and the head section is designed to meet the maximum needs of a particular locality based on calculations and Weather Bureau statistics obtained over a period of time.

Brief description of the drawing

FIGURE 1 is a fragmentary vertical section through a threshold and sliding panel closure embodying the invention;

FIGURE 2 is a fragmentary side elevation taken on line 2—2 of FIGURE 1; and

FIGURE 3 is a fragmentary vertical section taken on line 3—3 of FIGURE 1.

Description of the preferred embodiment

Referring to the drawing wherein like numerals designate like parts throughout the same, the numeral **10** designates an existing deck or floor and the numeral **11** the somewhat elevated interior floor of a building lobby or the like. The hydraulic threshold forming the heart of the present invention is indicated in its entirety at **12** and comprises a base plate **13** which is essentially flat and level and anchored to the deck **10** by suitable screws or fasteners **14**, as shown. On its interior side, the base plate **13** includes a vertical riser portion **14'** integral therewith, in turn carrying an integral latch extension or shoulder **15** at its upper end for an important purpose to be described. Below the latch shoulder **15** an integral projection **16** on the riser portion **14'** is grooved at **17** to receive a bulb or seal **18**, formed of a suitable elastomer. It will be understood that this seal is continuous for the entire length of the threshold, which length is a variable and will be determined by the overall width of the opening to be enclosed. For this reason, FIGURES 2 and 3 depict fragments only of the frontal side of the structure whose total length may vary considerably.

The threshold further comprises an upper somewhat inclined, although generally level, track plate **19** having interior and outer track elements **20** and **21** mounted thereon and formed integral therewith to be engaged by the rollers **22** of interior and outer panel units **23** and **24**. The panel units **23** and **24** are conventional and contain the usual glass plates, not shown, and are shiftable laterally relative to each other on the respective tracks **20** and **21**. As shown, these panel units are equipped with conventional weather seals **25** and weather piles **26** which engage the track plate **19**. Two panel units are shown in the drawings for illustrative purposes, and the invention threshold structure is not limited to a particular number of shiftable panels and the number may be varied. An additional track element **26'** is formed upon the plate **19** near the outer side thereof to engage rollers **27** of a screen panel assembly **28**. Again, the invention can be constructed with or without the screen panel unit and this is optional and is shown in the drawings for the purpose of illustration.

Also formed integral with the upper track plate **19** at its outer side is an inclined wall **29** having an abrasion extension **30** and a series of spaced openings or slots **31** communicating with the shallow chamber **32** formed between the two plates **13** and **19**. A resilient flap valve **33** is anchored in a groove **34** of the track plate **19** and extends across all of the slots **31** of the threshold and is tensioned to normally cover or seal the same at the outer surface of the inclined wall **29**. This flap valve will open to the approximate position shown in FIGURE 1 under certain conditions of internal pressure in the chamber **32**, as will be described. To add rigidity to the threshold structure, supporting lugs **34'** and **35** on the respective plates **19** and **13** span the shallow chamber **32** and help to bear the weight placed on the plate **19** during use. These lugs are spaced laterally so as not to interfere with fluid flow through the chamber **32** and through the openings **31**.

A very important element of the invention consists of an elevated head member **36** or cap which is permanently assembled upon the rear of the threshold and projects considerably above the chamber **32** and plate **19**. This head member **36** has a somewhat resilient locking extension **37** formed on its interior vertical wall **38** including a shoulder or detent part **39** which snaps under the shoulder **15** of riser portion **14'** so as to lock the head member onto the threshold permanently. The forward vertical wall

40 of the head member has a tongue and groove connection at 41 with the plate 19 and this joint need not be provided with a fluid seal. Once the parts are thus assembled, they cannot be taken apart without destroying at least the head member. The elevated head member thus forms on the threshold at the interior side thereof an elevated pressure chamber 42 into which infiltrating water may pass by way of several slots 43 formed through the wall 40. The height of the head member 36 and consequently the height of the water head which may accumulate therein is determined by calculation based partially on known weather data in a particular area and on certain technical flow characteristics of water. Depending upon weather extremes in given localities, several different heights of head chambers may be utilized in the invention structure and it is contemplated to make the invention with at least three different head members, which should satisfy the requirements as a practical matter in all areas. However, the invention is not limited to a precise height for the head member 36 or any precise number of head members having different heights. In any event, it will not be necessary in achieving the objectives of the invention, even in rather violent storm conditions, to have the head member 36 project an objectionable distance above the inside floor level 11.

Nevertheless, to compensate for the projection above the floor level 11 which does exist, there is provided as a part of the invention structure, a plate 44 or ramp member, pivotally interconnected at 45 with the head member 36 so as to be capable of angular adjustment at different installations. The member 44 provides an easy and safe transition between the two elevations defined by the top of head member 36 and the internal floor level 11.

Operation

The purposeful operation of the invention will take place only in weather conditions where the exterior of the panel closure is subjected to air pressure and water concentrations. Under these conditions, there will be a substantial pressure differential between the exterior and interior sides of the closure and water will force its way through, around and under the several panel units of the closure, notwithstanding the presence of conventional seals or weather strips. The infiltrating water will eventually reach the area between the interior panel unit 23 and the head member 36. Due to continued exterior pressure caused by the weather, such infiltrated water will rise and eventually spill through the slots 43 and enter the head chamber 42, first filling the shallow chamber 32 and then rising within the deeper chamber 42. The flap valve 33 will be closed at this time and will remain closed until such time as the water rises to a sufficient level in the chamber 42 where it can actually exert sufficient pressure through the slots 31 on the valve element 33 to force the same open.

This action will not occur until such time that the water head in the chamber 42 rises sufficiently to balance and actually overcome the exterior weather pressure on the closure which is causing the inward migration of water. That is to say, when the water rises in the chamber 42 to the upper limit provided for therein, this will be sufficient to exceed or overcome the pressure of the external weather and cause automatic opening of the valve 33 to create a positive flow of water continuously through the chamber 32 and openings 31 to the exterior of the threshold and closure while water may be still continuously infiltrating the closure from the outside.

When the water head in the chamber 42 is lost by the water level lowering therein, pressures are again equalized and the resilient flap valve 33 will close automatically, allowing a repetitive build-up of the head of water in the chamber 42. This cycle will continue to repeat itself indefinitely and maintain a sufficient head of water at the rear of the threshold to prevent completely any overspilling of the head member 36 and entry of water onto the floor area 11. This will not occur even in the most violent conditions experienced in a region for which the threshold has been properly designed and constructed. The essence of the operation resides in the ability of the structure to constantly and repeatedly build up its own head of pressure sufficiently to exceed the pressure behind the inwardly migrating water and to thereby open the valve 33 and, in effect, pump water out. Closing of the valve 33 will prevent any backflow in the chamber 32 caused by the outside weather pressure.

It is believed that the advantages of the invention will now be readily apparent to those skilled in the art without the necessity for any further description herein.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

I claim:

1. In a weather tight closure, a threshold comprising a base plate and an upper track plate separated from the base plate to form a relatively shalow chamber therebetween, said shalow chamber having opening means communicating with the exterior weather side of the closure, a normally closed valve element covering said opening means and adapted to open in response to sufficient fluid pressure in the shallow chamber, a somewhat elevated head member on the interior portion of the threshold forming a head chamber projecting substantially above the top of said shallow chamber and having inlet opening means near its top and above the elevation of said track plate, said head chamber communicating directly with said relatively shallow chamber, and movable closure panel means on said track plate constituting a barrier to the outside weather and through which water may migrate under the influence of weather pressure to enter the head chamber and develop a sufficient pressure head therein to open said valve element and initiate flow through the shallow chamber to the exterior weather side of the closure.

2. The invention as defined by claim 1, and wherein said valve element is a resilient flap valve element on the outer sides of the opening means from said shallow chamber.

3. The invention as defined by claim 1, and wherein the head member is a member formed separately from the base plate and track plate of the threshold and has non-detachable interlocking engagement therewith in assembly.

4. The invention as defined by claim 3, and an interior ramp member connected with the rear side of the head member to allow smooth passage from the top of the head member to an interior floor level behind the closure.

5. The invention as defined by claim 3, and a single fluid tight seal arranged between a part of the head member and the base plate of the threshold to prevent the passage of water from the interior of the theshold to the rear of the closure.

6. The invention as defined by claim 5, wherein said seal is a continuous seal for the full length of the threshold.

7. The invention as defined by claim 3, and wherein the head member includes a resilient locking part, and a coacting locking part on the base plate over which said resilient part is snapped in the assembly of the head member.

8. A threshold structure particularly for use with sliding closure panels comprising a relatively shallow threshold body portion having an interior relatively shallow chamber and outlet opening means leading from the shallow chamber on the exterior side of the threshold body portion, a normally closed valve element covering the outlet opening means and adapted to open automatically in response to a build up of pressure in the

shallow chamber so as to drain the shallow chamber, and an elevated head member on the interior side of said body portion having a relatively deep head chamber projecting above said shallow chamber, said head member having forward side opening means substantially above the top of said body portion through which infiltrating water may enter the head chamber and develop a head pressure therein of sufficient magnitude to open said valve element by overcoming the pressure of the elements at the exterior of the threshold structure and thereby initiating a positive flow of water through the shallow chamber to the exterior side of the threshold structure.

9. The invention as defined by claim **8**, and wherein the valve element is a resilient flap valve on a forward wall of the body portion spanning plural spaced outlet openings in the forward wall and opposing the pressure of the elements and tending to be closed by such pressure.

10. The invention as defined by claim **8**, wherein the head member is a member formed separately from the

threshold body portion and having interlocking engagement therewith and being coextensive lengthwise with the body portion and having plural frontal openings above the body portion, and fluid tight sealing means between parts of the body portion and head member.

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