

Nov. 6, 1956

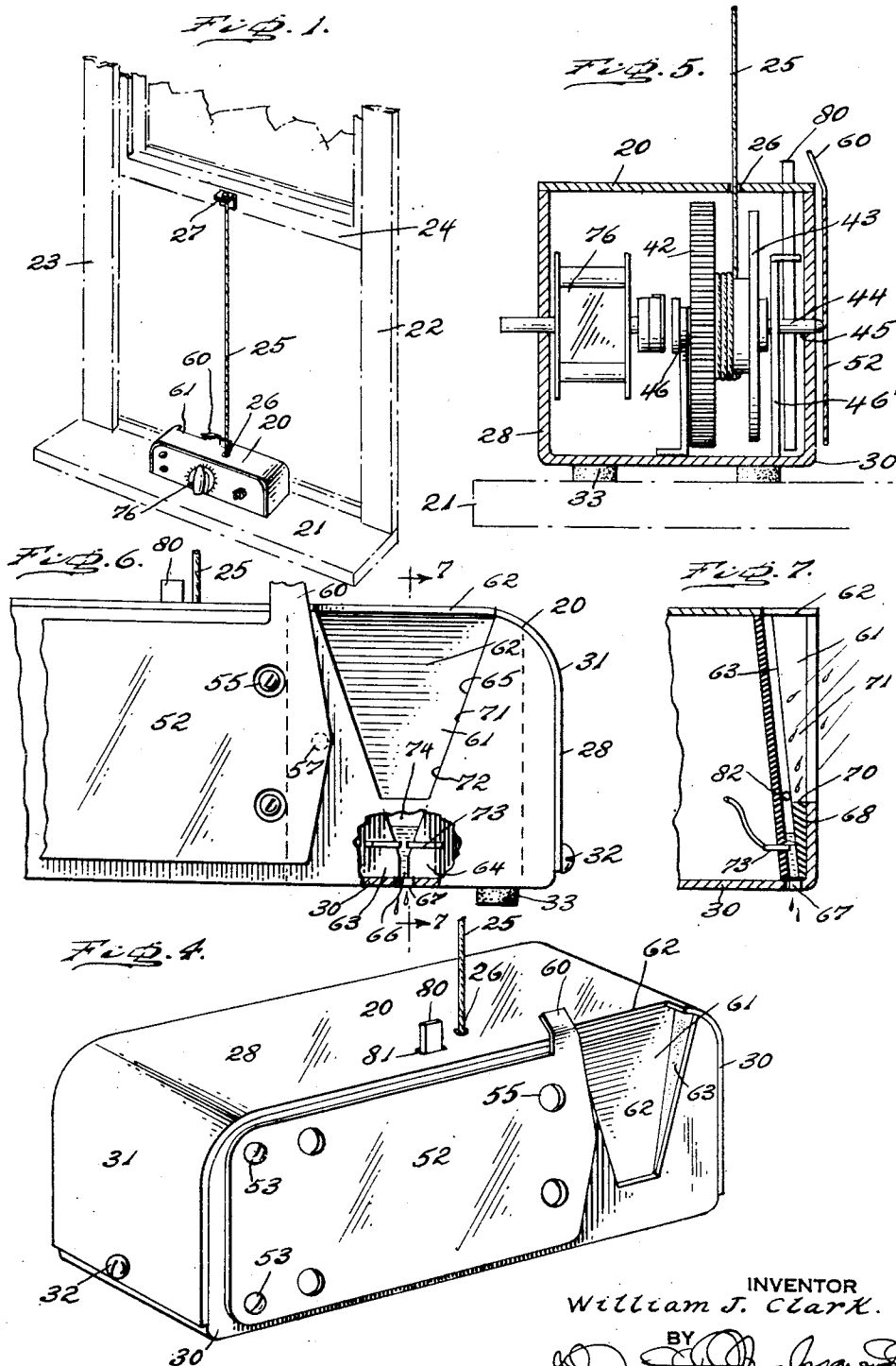
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2,769,872

RAIN DETECTOR ELEMENT

Original Filed Dec. 1, 1951

3 Sheets-Sheet 1



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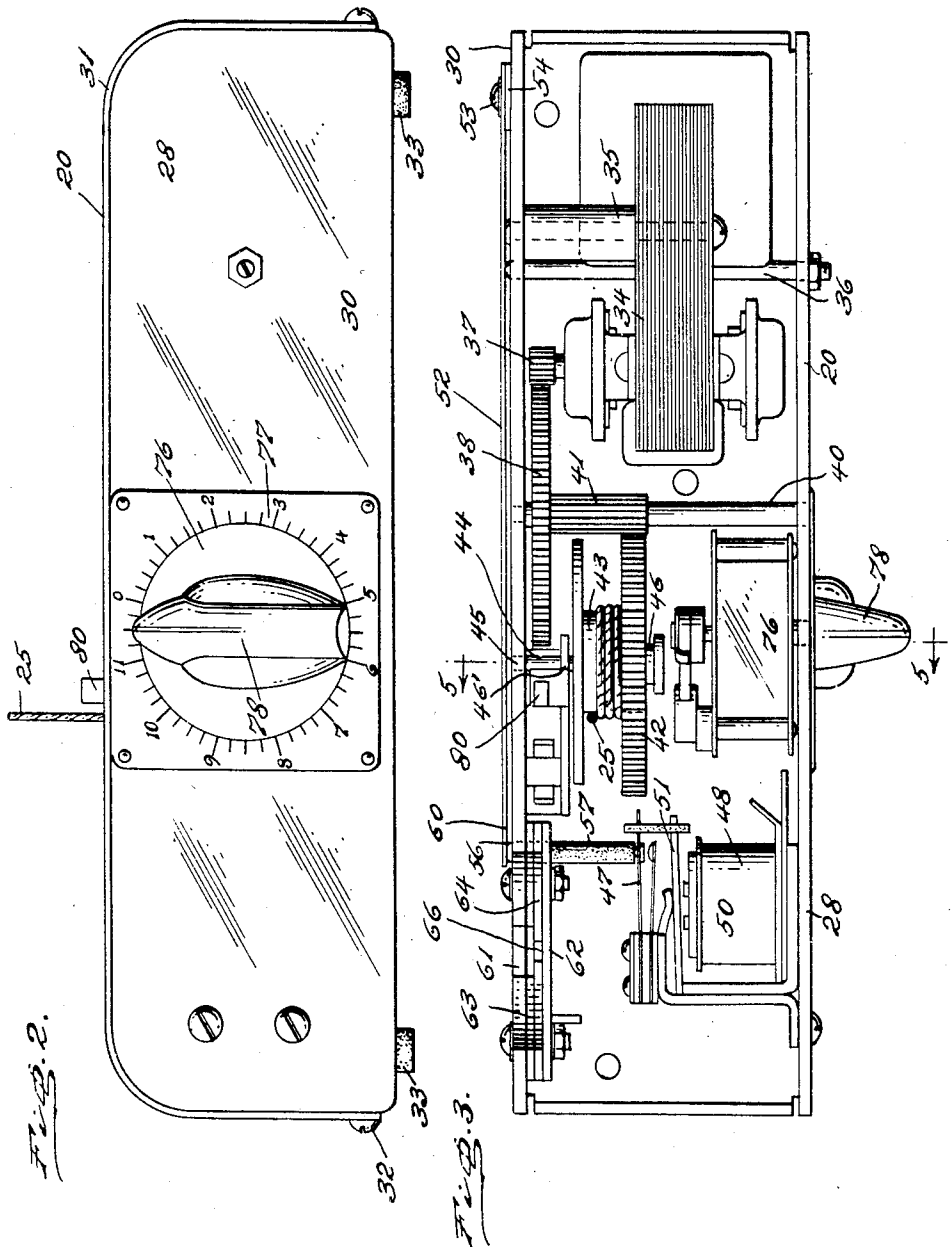
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 8.

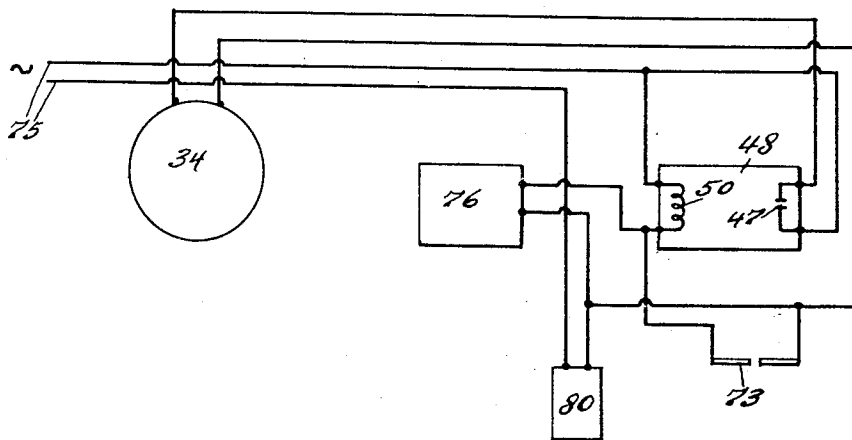
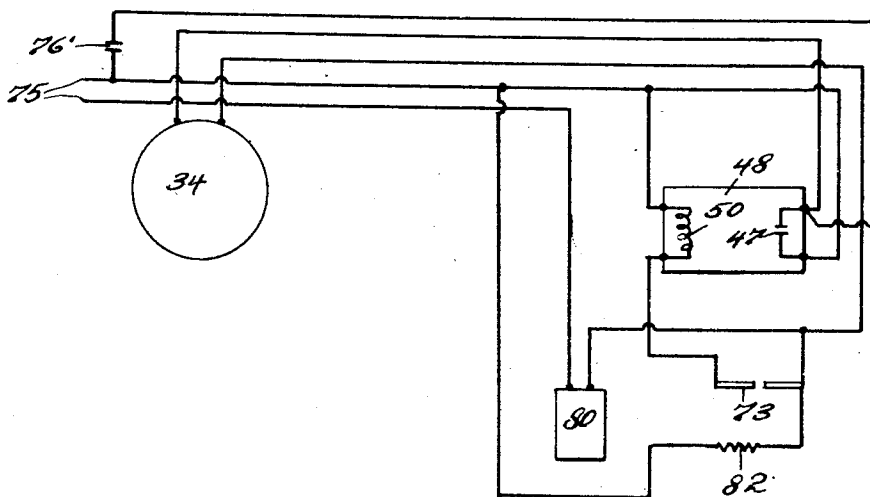


Fig. 9.



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1

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RAIN DETECTOR ELEMENT

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Original application December 1, 1951, Serial No. 259,460. Divided and this application December 21, 1953, Serial No. 406,530

3 Claims. (Cl. 200—61.05)

The present invention relates to window closers of the type which may be used to close a bedroom window when inclement weather develops.

This application is a division of my co-pending application, Serial No. 259,460 for Window Closure, filed December 1, 1951.

A purpose of the invention is to create a compact self-contained window closer which will be adequately responsive to changes in weather conditions, but will be largely free from protruding response elements which are readily damaged either by unintentional contact with the moving parts of the window, by the elements themselves, or by the user.

A further purpose is to permit the enclosure of all fragile operating parts of the window closer in a housing, with the exposure on the outside of a few sensing elements and with a minimum of projection of the sensing elements from the housing.

A further purpose is to simplify the control circuit of the window closer and eliminate the necessity of additional switches which are likely to cause difficulty from the standpoint of maintenance and will add to the expense.

A further purpose is to place water responsive contacts in a water trough at the base of V-shaped downwardly converging end walls of insulating material and immediately above a drainage opening at the bottom of the V.

A further purpose is to incline the insulating back wall of the water trough forwardly and downwardly in spaced relation to the insulating front wall so as to deflect a maximum of horizontal area of rainfall into the water trough without requiring a large amount of space in the housing.

A further purpose is to place the water electrodes in series with the electromagnet of the motor relay, and desirably in parallel with a timer switch which is also in series with the electromagnet.

A further purpose is to place the relay switch in series with the window closer motor, to operate the relay switch by a wind vane, and to interpose one or more sensing switches in series with the electromagnet of the relay, and in parallel with one another, while interposing a limit switch in series between all of the circuit branches and one side of the source.

Further purposes appear in the specification and in the claims.

In the drawings one embodiment of the invention is shown, with a variation, selecting the form illustrated from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a fragmentary perspective showing the window closer applied on a standard bedroom window having vertically moving sash.

Figure 2 is a front elevation of the window closer of the invention.

2

Figure 3 is a top plan view of the window closer of Figure 2, with the cover removed.

Figure 4 is a perspective of the device of the invention viewed from the rear or outside.

Figure 5 is a section of Figure 3 on the line 5—5.

Figure 6 is a fragmentary rear elevation of the device of the invention, with the lower part of the water trough broken out to show the electrodes.

Figure 7 is a fragmentary section of Figure 6 on the line 7—7.

Figure 8 is a circuit diagram showing the preferred circuit.

Figure 9 is a circuit diagram illustrating a variation. Describing in illustration but not in limitation and referring to the drawings:

Automatic window closers have heretofore been developed with a view to closing a window when inclement weather arises, either to prevent damage to the interior of the house from rain, wind or the like, to prevent intrusion into the house of the cold, damp or otherwise inclement air, or to assure closing of the window at a predetermined time. While such window closers may be used in other parts of the house as to assure the closing of windows in case of a storm when the householder is absent, the widest application has been on bedroom windows with the purpose of closing the window when a storm comes up and also closing the window sufficiently before the hour of rising so that comfortably warm conditions can be established in the bedroom by the time that the sleeper awakes.

Such prior devices have frequently been bulky, expensive, and subject to high maintenance, particularly because of protruding parts which are likely to be damaged, as by those cleaning the interior of the room or cleaning or painting the windows.

The present invention concerns a window closer in which the important operative parts (in some cases with the exception of the clock) are enclosed in an extremely compact housing, and the sensing elements which must be exposed at the outside are rendered safe against damage either from the window or from people in the neighborhood.

The operative parts have been greatly simplified, so that the cost of manufacture and the difficulty of maintenance are reduced correspondingly.

In accordance with the invention, closing by wind is accomplished by a vane which is positioned close to the outside of the housing and is protected by support from the housing in case of excessive deflection. The vane has a handle and is used for a manual closing switch.

The space requirements of the water trough have been greatly reduced. While the trough collects moisture from a substantial horizontal area at the top, it slopes toward the outside of the window and thus greatly reduces the space requirement in the housing. The trough converges along the two end walls to the electrodes, and drainage is provided between the end walls immediately below the electrodes, so that the electrodes respond to a predetermined rate of moisture precipitation, and not merely to the presence of moisture. Since the walls at all sides of the trough are of insulating material, the tendency of the electrodes to cause window closing merely from the presence of a high humid condition on metal surfaces or the like is avoided.

The water closing terminals are placed in parallel with the time switch and both are in series with the electromagnet of the relay, while the relay switch is in series with the motor and desirably also with a limit switch which is opened by closing of the window. The wind vane operates on the relay switch directly, thus avoiding the necessity of using an additional switch.

As shown in Figure 1, the window closer 20 in ac-

cordance with the invention is suitably mounted on the interior sill 21 of a window 22 having a frame 23 and a lower sash 24 moving up and down in the frame.

A flexible connection 25 extends from the top of the window closer through an opening 26, and is secured to a bracket 27 on the inside of the bottom of the lower sash, protruding inwardly a sufficient distance to operate the limit switch as later explained.

The window closer comprises a housing 28 suitably formed of a channel-shaped body 30 which forms the bottom and front and back walls and an inverted U-shaped cover 31 which forms the top and end walls and is suitably secured to the body by screws 32. The body is suitably mounted on resilient cushion legs 33 of rubber or the like, and is fastened to the window sill as by screws passing through openings (not shown) in the legs.

At one end of the interior of the housing an electric motor 34 is mounted as best seen in Figure 3. The motor is secured in the housing as by a bolt 35 extending into the rear wall and suitably insulated from the motor. An adjusting screw 36 extends through an opening in the motor and adjusts the vane as later described. The motor may be of any suitable type, but will preferably be capable of operating on 110 volts alternating current or any suitable commercial voltage at any desired commercial frequency such as 60 cycles or 25 cycles.

The motor carries, on the shaft, pinion 37 which meshes with reduction gear 38 which freely turns on shaft 40. Shaft 40 is stationary and is mounted on the front and rear of the housing. Gear 38 has pinion 41 secured thereto which meshes with reduction gear 42. Gear 42 is rigid with winding drum 43 and the gear and drum turn freely on shaft 44 secured at 45 in the rear wall of the housing at one end and in bracket 46 from the base at the other end. A stationary bracket 46' (Figure 3) engages one end of drum 43 and limits its motion axially and bracket 46 engages the opposite end of gear 42 to prevent axial movement of the gear and drum.

One end of flexible connection 25 is secured to the winding drum as by extending through an opening in the drum (not shown) and the flexible connection winds up on the drum when the window is pulled down under the action of the motor.

As best seen in Figure 8, the motor 34 is in series with switch 47 of relay 48 having electromagnet 50. The switch is closed when the relay is energized by pulling armature 51 (Figure 3) toward the electromagnet as well known. When the relay is not energized the relay switch is normally open as shown in Figure 3.

On the rear of the housing toward the outside of the window a wind deflecting vane 52 is placed. The vane is of readily flexible or resilient material such as thin gage steel, stainless steel or brass and suitably has a spring character which tends to make the vane return to its neutral position when no wind is encountered. The vane extends along the rear wall of the housing in spaced relation from the housing but close to the housing, and is mounted by bolts 53 against spacers 5 at one end of the vane. Thus the vane is held in uniform spaced relation close to the housing. In case the vane is deflected as by contact with some part of the window or with the hand or foot of a person cleaning the room or cleaning or painting the window, the deflection of the vane toward the housing which is possible is terminated by the housing so that it is very unlikely that the vane will be damaged by distortion.

The vane suitably has cutouts 55 for bolt heads in housing so that it can be deflected without encountering the bolt heads.

An opening 56 extends through the housing in line with the otherwise free end of the vane and in line with the relay switch and a plunger 57 of insulating material extends through the opening 56 as best seen in Figure 3 in contact with the vane in neutral position. When the vane

is deflected by the wind the plunger 57 closes the relay switch 47.

An ear 60 on the top of the free end of vane 52 forms a handle by which the vane can be pulled in to close relay switch 47 against the spring of the switch.

On the rear of the housing at a position not covered by the wind vane, a water trough 61 is located as best seen in Figures 3, 4, 6 and 7. The cover is recessed at 62 to provide a comparatively large horizontal area which can receive rain or other precipitation.

A back wall 62 of the water trough consists of suitable insulating material such as phenolic plastic and extends generally vertically, but is inclined slightly downwardly and rearwardly or toward the outside. End walls 63 and 64 desirably also of similar insulating material extend downwardly in a V 65, and at the apex at the bottom of the V continue downwardly at 66 in spaced relation to form a bottom drain, which is in line with a drain opening 67 in the bottom of the housing.

An outside wall 68, suitably of similar insulating material, is disposed on the rear of the end walls, and extends up a slight distance above the bottom of the V, terminating in a cross portion 70, and then continuing up to the top of the V in diverging walls 71 which conform with the V. The outside wall 68 is of wedge shape section as shown in Figure 7 and slopes on the face toward the back of the water trough generally downwardly and toward the outside as shown. A truncated V is formed at 72 in the body of the housing to conform with the truncated V in the wall 68.

Thus in effect the walls of the water trough are of insulating material converging downwardly and sloping toward the outside. A comparatively large horizontal cross section at the top of the trough reduces to a small cross section at the bottom, so that little space is taken by the trough from the inside of the housing. Metallic electrodes 73, suitably of L shape, extend through the rear wall 62 of the water trough adjacent the bottom of the V and then extend inwardly in opposed spaced relation, nearly meeting but not quite meeting as shown in Figure 6. Thus there is a water pocket 74 above the electrodes which will trap water and allow current flow between the electrodes as long as the rate of inflow of water is greater than the rate of drain through the drainage opening.

The electrodes 73 are placed in series with the electromagnet 50 across the current source 75, and the circuit branch containing the water electrodes 73 and the electromagnet 50 is in parallel with the circuit branch containing the motor 34 and the relay switch 47.

A time switch 76 of any well known character is mounted suitably at the front of the housing, and the time switch is placed in series with the relay electromagnet 50 and in parallel with the water electrodes 73 which are in series with the relay electromagnet 50 and the limit switch 80 across the line. The time switch is in parallel with the circuit branch including the relay switch 47 and the motor 34. The time switch is provided with a dial 77 and knob 78 to permit setting of the time interval at which the switch is to operate.

A limit switch 80 (Figure 8) is mounted suitably at the rear of the housing, and its operating switch element extends up through an opening 81 in the cover. The operating element is contacted by the bracket 27 to open normally closed limit switch 80 when the window closes and thus turn off the motor. The limit switch 80 is in series with the various parallel branches containing the relay and the motor and the sensing element.

In some cases it is preferred to connect the timer switch at a remote point, for example near the bed. In Figure 9 a remote timer 76' is connected in series with the motor 34 and with the limit switch 80 across the line.

In some cases also it is desired to use a heater to melt ice and snow in the water trough. Figure 9 shows a

resistance heater 82 connected in series with the limit switch across the line. The heater is shown in Figure 7.

In operation, the user on going to bed or at any other suitable time sets the window closer in operation by opening the window to the desired extent, pulling the flexible connection 25 up against the idle gear train and motor.

The user then sets the timer so that the window will be closed in any event by a certain desired hour in the morning, usually a predetermined period before the sleeper intends to rise. As soon as the window is raised, limit switch 80 can then be closed by pulling it up so that the device is ready to operate.

In case excessive wind is encountered during the night, the wind vane deflects and physically closes relay switch 47, thus energizing the motor to wind the flexible connection down and close the window.

The position of the adjusting screw 36 under the wind vane and the proximity of the end of the screw to the wind vane when the wind vane is inactive determine the wind velocity which operates the wind vane. The screw is suitably threaded only through the housing wall near its end, and may be adjusted by a screw driver applied to the head after loosening locking nut 36'. The adjusting screw is preferably located nearer the mounting end than the free end of the vane. As soon as the window closes, the bracket 27 forces the limit switch open and stops the motor.

If rain or the like falls during the night, it flows down in the water trough and out the drain. No contact is made by the water electrodes unless water bridges across between the electrodes due to an excessive rate of rainfall beyond the predetermined amount carried off by the drain. When rain in excess of the predetermined amount falls, current flows across the rain terminals and energizes the relay to close the relay switch and operate the motor to close the window. In case of cold weather, the heater melts ice or snow in the water trough.

In case the window is not otherwise closed, when the predetermined time has elapsed the normally open time switch closes, energizing the electromagnet of the relay to close the relay switch and energize the motor and close the window.

In any case, when the window closes it de-energizes the motor by opening the limit switch.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim

all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a window closer, a trough comprising downwardly sloping electrically insulating end walls of generally V formation, an electrically insulating front wall extending across the end walls near the bottom of the V, an electrically insulating back wall extending across the end walls from the top to the bottom of the V, two electrodes extending into the space within the walls to a position adjacent the bottom of the V in spaced relation, at least one of said electrodes being exclusively above the said bottom of the V in all parts which are in contact with said space within the walls, and walls forming a limited drainage opening extending downwardly below the bottom of the V, said drainage opening at least being normally open during use of the trough.

2. In a window closer, a generally vertical forwardly inclined electrically insulating rear wall, downwardly converging V-shaped end walls engaging the rear wall and continuing in spaced relation below the bottom of the V to form a drainage opening, electrodes extending through the end wall and toward one another adjacent the bottom of the V, terminating in spaced relation near the bottom of the V, and a generally vertical downwardly extending front wall extending across between the end walls at a position slightly above the bottom of the V and leaving a truncated V-shaped opening above the front wall.

3. In a window closer, a generally vertically forwardly inclined electrically insulating rear wall, downwardly converging V-shaped end walls engaging the rear wall and continuing in predetermined closely spaced relation below the bottom of the V to form a constantly open drainage opening with predetermined limited rate of flow under given conditions, electrodes extending through the end wall and toward one another above but adjacent the bottom of the V, terminating in spaced relation above but near the bottom of the V, and a generally vertical downwardly extending front wall extending across between the end walls at a position slightly above the bottom of the V and leaving a truncated V-shaped opening above the front wall.

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