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2,031,408

CONTROL DEVICE

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Fig. 1

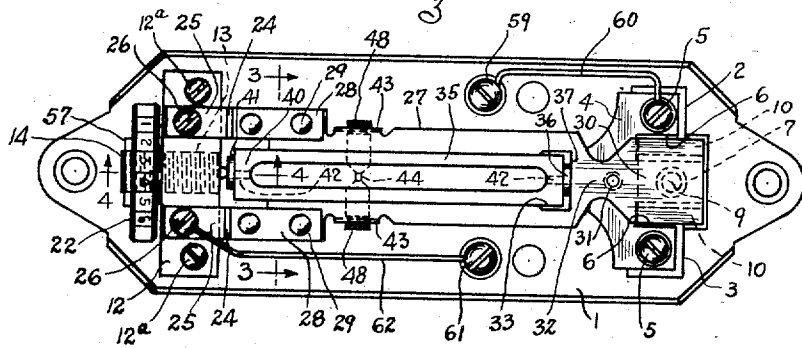


Fig. 2

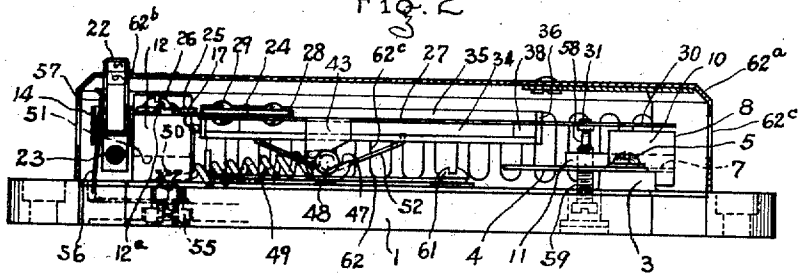
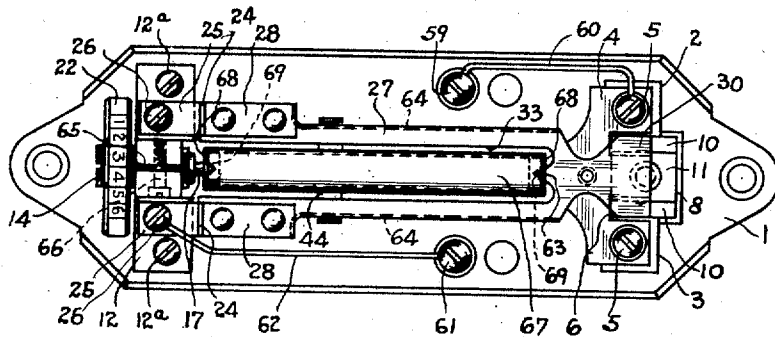


Fig. 5

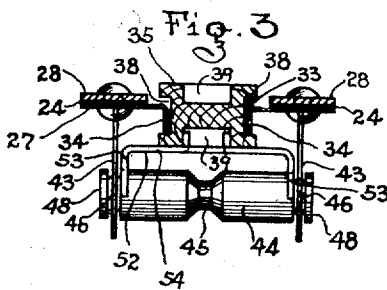


Fig. 3

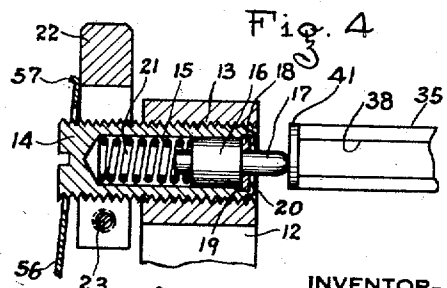


Fig. 4

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CONTROL DEVICE

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22 Claims. (Cl. 200—52)

My invention relates to new and useful improvements in control devices, and more particularly to a device which is responsive to moisture content of air or other gases.

5 An object of my invention is to provide a device which will respond readily to slight variations in moisture content of air or other gases to actuate a switch element, for example.

10 Another object is to provide such a device particularly adapted for operation in response to variation or change in humidity of the atmosphere.

15 Another object is to provide a device which is of rugged but simple construction and which will be efficient in operation.

20 The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated two embodiments of my invention, in which drawing—

25 Figure 1 is a top plan view of a control device embodying my invention, but having a cover or casing member removed to show the internal construction;

30 Fig. 2 is a view of the device in side elevation but with the cover or casing member in place and shown in longitudinal central section;

Fig. 3 is a detail view in section on the line 3—3 of Fig. 1;

35 Fig. 4 is a detail view in section on the line 4—4 of Fig. 1, and

Fig. 5 is a top plan view of another form of control device embodying my invention, the cover or casing being removed.

Referring to the drawing by characters of reference, 1 designates a base or supporting member of insulating material, such as bakelite, for example. Adjacent one end of the member 1 there are laterally positioned and spaced supporting bosses or post members 2, 3. Mounted on the 45 substantially parallel to the plane of the base member 1 and which is rigidly secured to the top faces of the members 2, 3 by screws 5, or the like. The plate 4 is provided with substantially parallel end slots 6 which provide therebetween a tongue portion 7 which is positioned between the members 2, 3. A U-shaped or horseshoe permanent magnet 8 is secured to the portion 7 which overlies the base of the magnet and is rigidly 50 secured thereto by a rivet, or the like, 9. The

magnet 8 has its poles 10 projecting upward through the end slots 6 with the top faces thereof lying substantially parallel to the plane of the base member 1. The rivet, or the like, 9 also serves to secure a block member 11 in position between the magnet poles, the block member extending from the magnet, as clearly indicated in Fig. 2, in the direction opposite to that of the tongue portion 7.

Adjacent the other end of the base member 1 10 there is a supporting block 12, which is secured to the base member 1 by screws, or the like, 12^a, and which extends transversely of the base member. The supporting block 12 has an internally screw-threaded aperture 13 therethrough having 15 its longitudinal axis substantially parallel to the base member 1 and substantially in the longitudinal center line thereof, which is midway between the members 2, 3. An adjustment member 14, preferably a screw plug, see Fig. 4, is threaded 20 into the bore or aperture 13. The member 14 is provided with a longitudinal recess 15 open at its end toward the magnet 8. Within the recess 15 there is a plunger member 16 having a reduced end portion 17, preferably in the form of a pin, which 25 projects through an aperture in an annular stop member or washer 18 secured in the open end of the recess 15. The member 18 seats against a shoulder 19 and is clamped thereagainst by turning over the end portion of the member 14, as at 30 20, against the outer face of the member 18. The plunger 16 is normally urged toward the member 18 by a coil spring, or the like, 21 positioned within the recess 15 and held under compression between the end or bottom wall of the recess and 35 the plunger. The member 14 is preferably provided with an operating member 22, preferably a segmental plate, which is rigidly clamped and positioned on the member 14 by a binding screw, or the like, 23. Secured to the top face of the block 40 12 there are laterally positioned hinge members 24, which are preferably of resilient sheet metal, preferably spaced equidistantly from the longitudinal center line of the base member 1 and extending toward the magnet 8. Each of the hinge 45 members is provided with a clamping plate 25 which extends slightly beyond the edge of the supporting block 12. The plates 25 are tightly clamped upon the top faces of the hinge members by screws, or the like, 26 which are threaded into 50 the block 12 and which also serve to rigidly secure the members 24 in position. The free ends of the hinge members 24 are secured to the side edge portions of a lever or operating member 27, which is preferably of sheet metal. The hinge 55

members 24 overlie the end edge portions of the member 27 and are clamped thereto by clamping plates 28 and rivets 29. The adjacent ends of the pairs of plates 25 and 28 are spaced slightly from each other so as to permit flexing of the members 24 and movement of the lever member 27 toward and from the base member 1. The lever member 27 terminates at its free end in an armature portion 30 which overlies the magnet 8 within the magnetic influence of the poles 10. Adjacent the magnet 8, but between it and the supporting block 12, the lever member 27 is provided on its underface with a contact point or member 31. The member 27 is preferably provided with a reduced neck-like portion 32 adjacent the contact member 31, which serves to render the armature portion flexible relative to the body of the member 27. The member 27 is longitudinally slotted from its end adjacent the block 12 to a point adjacent the reduced portion 32, and the longitudinal edges of this slot 33 are provided with down-turned, substantially parallel, spaced flanges 34. A moisture responsive element 35 is positioned within the slot 33 and has one end, which is preferably provided with an abutment member 36, seating against the inner end wall 37 of the slot 33, the end wall 37 serving as an abutment. The element 35 is of wood, preferably oak, and has the grain of the wood substantially at right angles to the length of the element. The wood element 35, which is substantially rectangular, is provided with longitudinal grooves 38 in its side faces into which the flanges 34 extend. The element 35 is preferably provided with longitudinally extending recesses 39 in its top and bottom faces, which provide extended moisture receiving surfaces and which also serve to reduce the weight of the element 35. The other end of the element 35 projects from the open end of the slot 33, as at 40, and is provided with an abutment member 41 which is engaged by the pin portion 17 of the plunger 16. The abutment members 36 and 41 are preferably flat metal plates having projections 42 which seat in apertures in the ends of the element 35 to hold the members 36 and 41 in position. The side edges of the member 27 have depending, substantially parallel, supporting arms 43 which are positioned opposite to each other and adjacent the hinge members 24. The arms 43 are joined by a cross member 44 which is preferably substantially cylindrical and which has intermediate its ends, and preferably midway therebetween, a circumferential groove 45 providing a substantially cylindrical reduced portion. Adjacent its ends the member 44 is provided with circumferential grooves 46 which are received by slots 47 in the arms 43. The slots 47 preferably open from the side edge of the arms 43 opposite to the supporting block 12, and are also preferably downwardly inclined. The grooves 46 provide end head portions 48 on the member 44, which serve to retain the member 44 in position between the arms 43. The lever member 27 and the armature portion 30 are normally urged toward the magnet 8 by a spring 49, which is under tension, having one end provided with a loop or hook secured around the element 44 within the groove 45 so as to prevent lateral movement thereof, and having its other end, also provided with a loop or hook, secured to a post or stud member 50 fixed in the base member 1. The block 12 is preferably recessed on its underside, as at 51, to provide space for the end of the spring 49 and the post 50. The

flanges 34 are held in engagement with the lower edges of the slots 38 by a spring member 52 which is substantially rectangular in top plan, having side portions 53 which are provided with downward open recesses which seat on the element 44 adjacent the depending arms 43. The side portions 53 are inclined upwardly toward the block 12 and toward the magnet 8 on the opposite sides of the element 44, and are joined by cross members or portions 54 which bear against the under face of the element 35, so that the inherent resilience of the portions 53 act to urge the element 35 upward against the flanges 34. The post 50, which is preferably in the form of a bolt extending through an aperture in the base member 1 and clamped in position by a nut 55, also serves to rigidly fix one end of a substantially L-shaped leaf spring 56 to the base member. The spring 56 has an upwardly extending arm 57 which is apertured to receive the end of the screw plug 14 and which bears against the adjustment member 22 to frictionally maintain it in adjusted position. The contact member 31 cooperates with a contact member 58 carried by a screw 59 adjustably threaded through the plate 4 and the member 11. The contact member 58 is electrically connected to a terminal 59 by a lead wire 60 in contact with the plate 4 and secured thereto by one of the screws 5. The contact 31 is electrically connected to a terminal 61 by a lead wire 62 which is connected to one of the hinge member retaining screws 26, with the circuit being completed through the hinge 24 and lever member 27. A housing or casing 62^a is preferably provided to enclose the operating mechanism and has an aperture 62^b therethrough for projection of the member 22 through the casing, such that it may be manipulated from the outside of the casing. The side and end walls of the casing 62^a are preferably provided with elongated apertures 62^c so that the element 35 will be responsive to atmosphere surrounding the casing 62^a.

In the construction shown in Fig. 5, the lever member 27 is not provided with the depending flanges 34, and at the inner end of the slot has a bearing point 63. The lever 27 of Fig. 5 is also preferably provided with side flanges 64 in lieu of the arms 43, which serve to lend rigidity to the intermediate portion of the lever member. These flanges 64 serve to support the cross member 44 as in the construction above-described and shown in Fig. 1. The spring 56 is eliminated and in lieu thereof the block 12 is slotted, as at 65, in its top face into the bore 13 and the edges of the slot are drawn together by a screw 66 to frictionally resist turning movement of the screw plug 14. Positioned in the slot 33 of the lever member, there is a moisture responsive element 67, preferably of wood having the grain extending transversely to its length, which is substantially externally cylindrical and has a cylindrical bore longitudinally therethrough. The element 67 is provided with end caps 68 having reduced portions which fit in the longitudinal bore, and having substantially conical, oppositely directed recesses 69 in their outer end faces. The projections 63 and 17 seat in the recesses 69 and serve to support the element 67 in operative position. The remaining structure of Fig. 5 is substantially identical with that of Fig. 1 above-described and, therefore, the reference characters applied to Fig. 1 designate like parts in Fig. 5. If desired, the armature portion 30 may be short-

ened, as shown in Fig. 5, to reduce its weight and vary its sensitivity to the magnetic influence of the magnet 8.

The operation of the construction shown in Figs.

1 to 4 is as follows: The wood element 35, as shown in Fig. 2, has contracted, due to decreased moisture content in the atmosphere, sufficiently to permit the spring 49 to pull the lever member 27 toward the base member 1 on its hinges 24 to thereby make contact between the members 31 and 58. As the relative humidity or the moisture content of the air or atmosphere increases, the moisture will be absorbed by the element 35, and due to the fact that the grain of the wood is transverse to its length, the element 35 will swell or expand longitudinally. As the expansive force of the element 35 increases, the combined opposing forces exerted by the attraction of the magnet for the armature portion 30 and of the spring 49 acting through the arms 43 on the lever member 27 will be overcome. The attractive force of the magnet 8 is such that the contact between the members 31 and 58 will be broken with a quick and substantially snap action since the magnet 8 will hold the contact members in engagement until the expansive force of the wood element 35 has slightly bowed the lever member 27 in opposition to the force of spring 49. The armature portion 30 is preferably prevented by engagement between contact members 31 and 58 from contacting with the magnet poles 10 so that a slight air gap is maintained which renders the device very sensitive to movement of the portion 30 relative to the poles 10. Adjustment of the plug 14 by the member 22 will regulate the range of operation of the device. Movement of the portion 17 toward the magnet 8 will decrease the extent to which the element 35 must expand and the force to be exerted thereby in order to overcome the spring 49 and the magnet 8 so that contact will be made and broken at a less relative humidity. It may be noted that variation in the air gap between the armature portion 30 and the magnet poles 10 will regulate the differential operation of the device, and that the air gap may be increased or decreased by adjustment of the screw 59. Increase in the air gap by decreasing the extent to which the lever moves in making contact will decrease the differential of operation, that is, will cause the contacts to be made and broken at a less difference in relative humidity than when the air gap is small. The spring 21 serves as a safety means to take up overtravel of the element 35 on expansion.

The construction shown in Fig. 5 operates similarly to that above described, and it is believed the operation will be obvious from the foregoing description. The hollow wood element 67 renders the device of Fig. 5 more sensitive to variation in moisture content of air or atmosphere as it provides a relatively thin shell having a sufficient extended surface relative to its wall thickness to quickly take up or give off moisture from or to the atmosphere.

What I claim and desire to secure by Letters Patent of the United States is:

1. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, and a moisture respon-

sive element positioned between said support and said abutment and operable upon variation of moisture content to move said lever member relative to said base member.

2. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, a moisture responsive element positioned between said support and said abutment and operable upon variation of moisture content to move said lever member relative to said base member, and means resisting movement of said lever member by said moisture responsive element.

3. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, and an elongated wood element positioned between said support and said abutment and operable upon change in dimension by variation of moisture content to move said lever member relative to said base member.

4. A device of the character described, comprising a base member, a support mounted on said base member, a lever member having a fulcrum comprising, resilient hinge means rigidly secured to said lever member and to said support, said lever member being movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, and a moisture responsive element positioned between and engaging said support and said abutment and operable upon absorption of moisture to flex said hinge means and move said lever member relative to said base member.

5. A device of the character described, comprising a base member, a support mounted on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, and a moisture responsive element extending longitudinally of said lever member, said element being positioned between and having its ends engaging said abutment and said lever member support whereby said element is operable upon absorption of moisture to move said lever member relative to said base member.

6. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, a moisture responsive element positioned between and engaging said abutment and said support and operable upon absorption of moisture to move said lever member relative to said base member, and a heli-

cal coil spring under tension having one end anchored and having its other end secured to said lever member and normally resisting movement of said lever member by said element.

7. A device of the character described, comprising a base member, a support mounted on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an abutment, a moisture responsive element engaging said abutment and operable upon absorption of moisture to move said lever member relative to said base member, supporting members extending from the sides of said lever member toward said base member, a cross member joining said supporting members and carried thereby, and a spring having one end secured to said cross member and resisting movement of said lever member by said element.

8. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member carried by said support and movable relative to said base member, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, said lever member having an armature, a magnet cooperable with said armature and carried by said base member, said lever member having an abutment, and a moisture responsive element positioned between and engaging said abutment and said support and operable upon absorption of moisture to move said lever member relative to said base member.

9. A device of the character described, comprising a base member, a support mounted on said base member, a lever member carried by said support and movable relative to said base member, said lever member having a longitudinal slot open at one end adjacent said support, a contact member carried by said lever member adjacent the other end of said slot, a contact member carried by said base member and cooperable with said first-named contact member, and a substantially rigid moisture responsive element positioned in said slot and having one end engaging the end wall of said slot, the other end of said element engaging said support whereby expansion of said element upon absorption of moisture will move said lever member.

10. A device of the character described, comprising a base member, a support mounted on said base member, a lever member carried by said support and movable relative to said base member, said lever member having a longitudinal slot open at one end adjacent said support, a contact member carried by said lever member adjacent the other end of said slot, a contact member carried by said base member and cooperable with said first-named contact member, a substantially rigid moisture responsive element positioned in said slot and having one end engaging the end wall of said slot, and an adjustable abutment carried by said support, the other end of said element engaging said adjustable abutment whereby expansion of said element upon absorption of moisture will move said lever member.

11. A device of the character described, comprising a base member, a support mounted on said base member, a lever member having a longitudinal slot open at one end, resilient hinge members

secured to said lever member at the sides of said slot adjacent the open end thereof, means securing said hinge members to said support, an abutment member carried by and projecting from said support, a substantially rigid moisture responsive element positioned in said slot and having one end engaging the end wall of said slot, the other end of said element engaging said abutment member, said element acting upon absorption of moisture to move said lever member, and means opposing movement of said lever member by said element.

12. A device of the character described, comprising a base member, a lever member movably supported on said base member, said lever member having a longitudinal slot open at one end, flanges on said lever member at the side edges of said slot, a moisture responsive element positioned in said slot and having one end engaging the end wall of said slot, an abutment member engaging the other end of said element, said element having longitudinal recesses in its side faces receiving said flanges, and means opposing movement of said lever member by said element.

13. A device of the character described, comprising a base member, a lever member movably supported on said base member, said lever member having a longitudinal slot open at one end, flanges on said lever member at the side edges of said slot, a moisture responsive element positioned in said slot and having one end engaging the end wall of said slot, an abutment member engaging the other end of said element, said element having longitudinal recesses in its side faces receiving said flanges, means normally acting to maintain said flanges in engagement with the side edges of said recesses, and means opposing movement of said lever member by said element.

14. A device of the character described, comprising a base member, a lever member carried by said base member and having a longitudinal slot open at one end, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, a hollow wood element positioned in said slot and having one end engaging the end wall of said slot, and an abutment member carried by said base member and engaging the other end of said element whereby expansion of said element upon absorption of moisture will move said contact members relative to each other.

15. A device of the character described, comprising a base member, a lever member carried by said base member and having a longitudinal slot open at one end, a contact member carried by said base member, a contact member carried by said lever member and cooperable with said first-named contact member, the end wall of said slot having a pointed abutment member, a pointed abutment member carried by said base member, a hollow wood element positioned between said abutment members, and end caps on said element having recesses receiving said abutment members.

16. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member carried by said support and movable relative to said base member, cooperable controlling elements carried by said base member and by said lever, said lever member having an abutment, and a moisture responsive element positioned between and engaging said abutment and said support and operable upon variation of

moisture content to move said lever member relative to said base member whereby to move said cooperable elements relative to each other.

17. A device of the character described, comprising a base member, a support mounted on said base member, a lever member having a longitudinal slot open at one end, resilient hinge members secured to said lever member at the sides of said slot adjacent the open end thereof, means securing said hinge members to said support, an abutment member carried by and projecting from said support, a substantially rigid moisture responsive element positioned in said slot and having one end engaging the end wall of said slot, the other end of said element engaging said abutment member, said element acting upon absorption of moisture to move said lever member, control means actuated by said lever member, and means opposing movement of said lever member by said element.

18. A device of the character described, comprising a base member, a support mounted on said base member, a lever member, a resilient sheet metal hinge member bridging a gap between and rigidly secured to said members to provide a fulcrum for said lever member, cooperable contact members carried by said base member and said lever member, and moisture responsive means cooperable with said lever member and operable to move said lever member and one of said contact members relative to the other of said contact members.

19. A device of the character described, comprising a base member, a support mounted on said base member, a lever member movable toward and from said base member, a resilient sheet metal hinge member bridging a gap between and rigidly secured to said members to provide a fulcrum parallel to the plane of said base member for said lever member, cooperable contact members carried by said base member and said lever member, and moisture responsive means extending longitudinally of and cooperable with said lever member, said responsive means being operable upon variation of moisture content to move said lever member and one of said contact members relative to the other of said contact members.

20. A device of the character described, comprising a base member, a support mounted on

said base member, a lever member carried by said support and movable relative to said base member, said lever member having an abutment facing said support, cooperable controlling elements carried by said base member and by said lever member adjacent said support, a substantially rigid moisture responsive element having one end engaging said abutment, and an adjustable abutment member carried by said support, the other end of said element engaging said adjustable abutment member whereby expansion of said element upon absorption of moisture will move said lever member.

21. A device of the character described, comprising a base member, a support mounted adjacent one end of and on said base member, a lever member secured at one end to said support and movable relative to said base member, said lever member having an abutment facing said support, cooperable controlling elements carried by said base member and by the other end of said lever member, a substantially rigid moisture responsive element having one end engaging said abutment, and an adjustable abutment member adjustably screw-threaded through and carried by said support, the other end of said element engaging said adjustable abutment member whereby expansion of said element upon absorption of moisture will move said lever member.

22. A device of the character described, comprising a base member, a support mounted on said base member, a lever member carried by said support and movable relative to said base member, said lever member having an abutment facing said support, cooperable controlling elements carried by said base member and by said lever member adjacent said support, a substantially rigid moisture responsive element having one end engaging said abutment, an adjustable abutment member carried by said support, the other end of said element engaging said adjustable abutment member whereby expansion of said element upon absorption of moisture will move said lever member, a cover member housing said lever member and said responsive element and having an opening, and an adjustment member carried by said abutment member and extending through said opening.

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