April 3, 1956 R. E. HALL 2,740,626

AUTOMATIC WINDOW CONTROL

Filed Nov. 10, 1952 2 Sheets-Sheet 1

Fig. 1

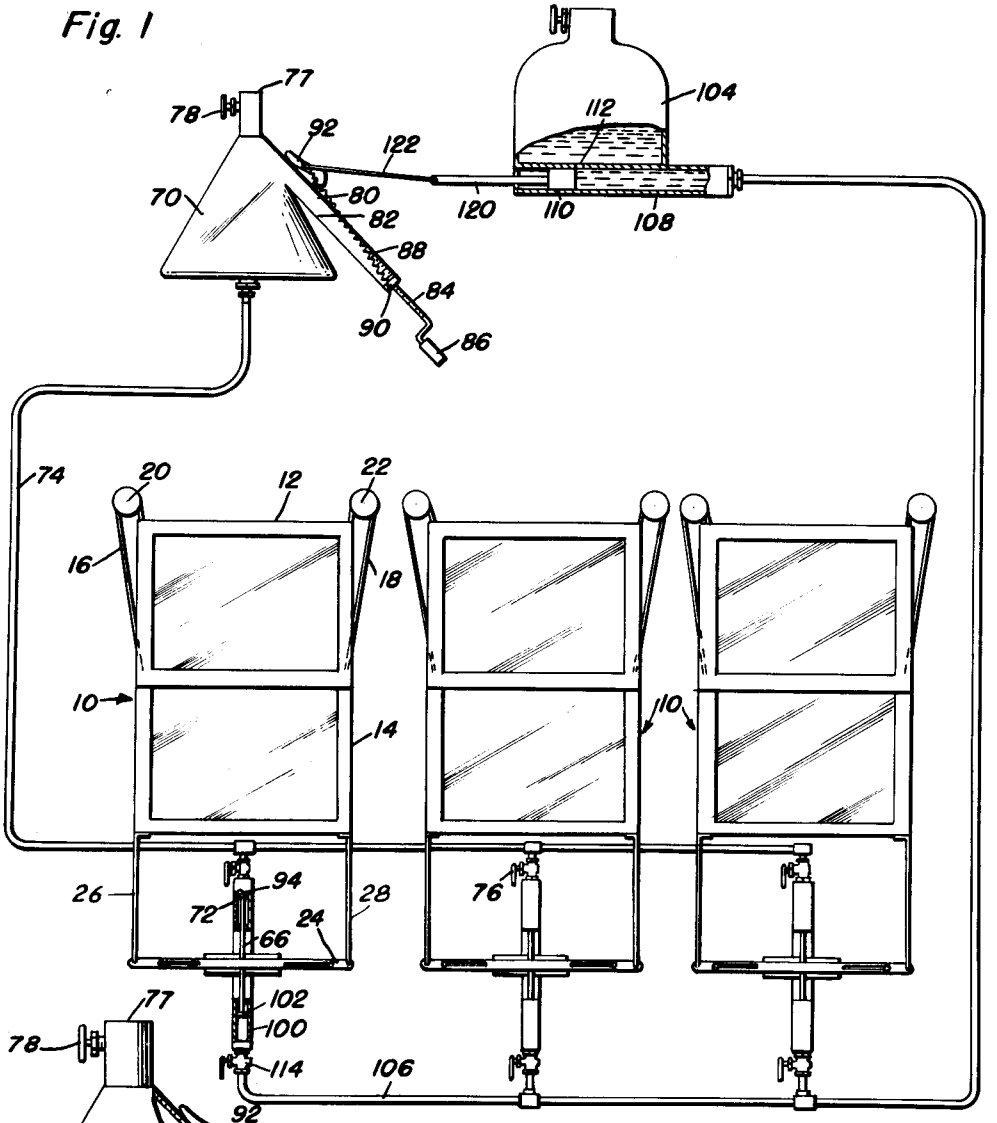


Fig. 5

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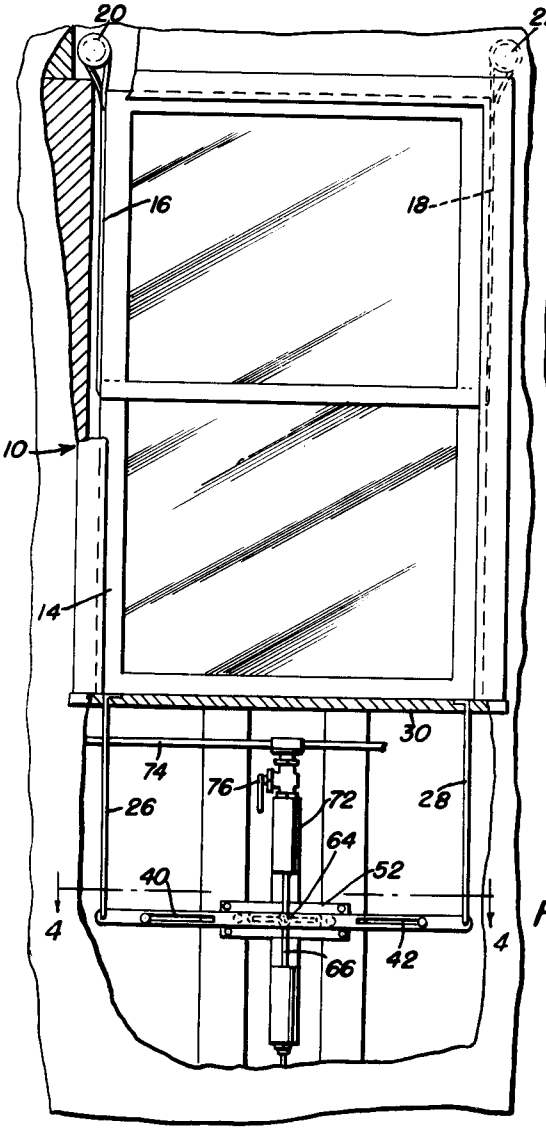


Fig. 2

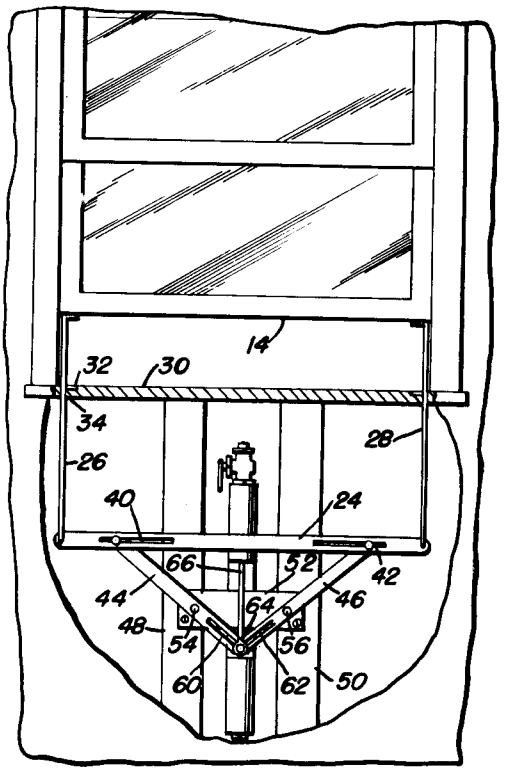
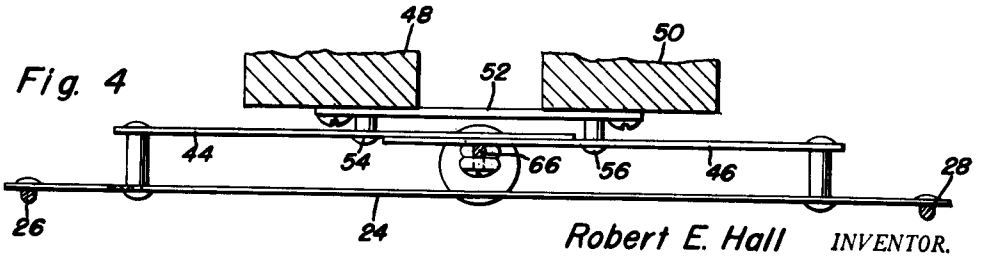


Fig. 3

Fig. 4



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AUTOMATIC WINDOW CONTROL

Robert E. Hall, Larkinsville, Ala.

Application November 10, 1952, Serial No. 319,723

7 Claims. (Cl. 268—125)

This invention relates to an automatic window control and particularly to a device for opening and closing windows in response to the temperature and means for permanently closing and locking the windows while rendering the temperature responsive means inoperative.

In many institutions such as schools, hospitals and the like it is desirable to raise the windows to control the temperature in the rooms. This has heretofore been done in a hit and miss fashion so that it is frequently too warm before the windows are opened or too cold before they are closed. Also, it is desirable that all windows may be closed at a certain given time and the temperature responsive means rendered inoperative.

The present invention provides a window control system in which a temperature responsive device opens and closes the windows to provide ventilation in dependence upon a predetermined temperature scale. It is thus possible for the windows to be opened and closed so that there will be proper ventilation in response to the temperature and there will be no necessity of disturbing class rooms or other functions in order to secure the proper opening of the windows. Likewise, it is desirable at a certain period of the day, such as closing time, to be able to close all windows from a given point and to render the temperature responsive device inoperative. The present invention provides this by providing a reservoir of temperature expansive fluid and providing a master work cylinder to open the windows if the cylinder is fed by the expansion of fluid in the reservoir. A control system is provided for the reservoir so that a certain amount of expansion of the fluid may take place so that the windows will open at a pre-set temperature. Likewise, after all of the windows are closed a vacuum may occur in the chamber if the shrinkage of the temperature responsive fluid continues. In order to provide a closing system a separate set of master cylinders are provided and a pump connected with a reservoir of pressure fluid is operatively connected to the various control cylinders so that operation of the pump will close all windows. A pressure responsive system is provided with a control system or release so that the pressure fluid may expand at will with temperature increase or decrease and for this purpose a release lever is provided for releasing the adjusting device. The release lever is also connected to the pump cylinder so that the actuation of the pump releases the adjustment of the temperature responsive fluid reservoir so that the closing of the windows will not be impeded by expansion of the fluid in the temperature responsive device.

It is accordingly an object of the invention to provide an automatic window control system.

It is a further object of the invention to provide a system utilizing a fluid expansive in response to temperature for opening and closing windows.

It is a further object of the invention to provide an automatic locking system for windows.

It is a further object of the invention to provide an automatic locking system which automatically deenergizes the pressure temperature responsive device.

It is a further object of the invention to provide a window control system utilizing an expansive fluid to propel a master cylinder which opens and closes windows.

It is a further object of the invention to provide an improved closing device operated by a fluid piston.

Other objects and many of the attendant advantages of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawing in which:

Figure 1 is a schematic illustration of a window control system according to the invention.

Figure 2 is an enlarged elevation of a window of the system in closed position with parts broken away and in section;

Figure 3 is a similar view of the window in partially open position;

Figure 4 is an enlarged cross section taken substantially on the plane indicated by the line 4—4 of Figure 2 and showing the linkage for operating the window; and

Figure 5 is an enlarged elevation partially broken away and in section of the temperature responsive controller.

In the exemplary embodiment of the invention a plurality of windows **10** are provided with upper and lower sections **12** and **14** which are connected together by means of flexible tensioning elements **16** and **18**, the tensioning elements being extended over suitable pulleys **20** and **22**.

In order to properly manipulate the window sections **12** and **14** an actuating bar **24** is connected to one of the window sashes such as the bottom sash of section **14** by suitable arms **26** and **28**. As herein shown the window sill **30** is provided with recesses **32** associated with apertures **34** so that the arms **26** and **28** may readily reciprocate through the sill and be seated in the sill when the windows are closed. Each of the actuating bars **24** is provided with a pair of longitudinal slots **40** and **42** and a pair of arms **44** and **46** are pivoted intermediate the ends thereof on a supporting frame work **48** and **50** by means of a suitable base member **52**. The arms **44** and **46** are attached to the base plate **52** by means of suitable pins **54** and **56**. Preferably the pins **54** and **56** are off-center so that the ends of the arms **44** and **46** connected to the operating bar **24** are longer than the remaining ends.

The overlapping ends of the levers **44** and **46** are provided with longitudinally extending slots **60** and **62** through which is extended the pivot bolt **64** which is secured intermediate the ends of a piston rod **66**. It will thus be seen that the motion of the piston rod **66** is well multiplied when applied to the actuating bar **24** so that a relatively short movement of the piston rod will cause a considerably larger movement of the actuating bar **24** and the associated window sections.

In order to actuate the windows in response to changes in temperature a reservoir **70** is provided and filled with a temperature responsive fluid such as mercury which will readily expand when heated to produce a pressure which is communicated to a cylinder **72** by means of a conduit **74**. Preferably a plurality of windows are associated with the elevating device and valves **76** will be associated with various windows so that windows may be opened or closed as may be selected. The expansion fluid reservoir **70** is provided with a filling opening **77** having a suitable closure valve **78**. A control cylinder **80** is provided with a control piston **82** which may be readily adjusted in the cylinder **80** by means of a screw-threaded connection **84**. Preferably the screw-threaded connection **84** is provided with a crank **86** so that the piston **82** may be adjusted at will in the cylinder **80**. As some of the windows might be blocked off an excessive pressure might develop in the pressure container **70** and to prevent damage to the system, resilient means **88** is connected to the control block **90**. The springs **88** are of sufficient

strength so that all of the windows will be operated before the block **90** will be moved so that the piston **82** will slide in the cylinder **80** under the accumulation of an excessive pressure in the reservoir **70**. An eccentric lever **92** is pivotally mounted adjacent the cylinder **80** and carries the end of the spring **88** so that the tension of the spring **88** may be adjusted by adjusting the lever **92**. When the lever **92** is in set position as indicated in Figures 1 and 5 the spring **88** will be tensioned and the adjusting block **90** will be held rigidly against the cylinder **80** and the piston **82** will be maintained in adjusted position. However, by reversing the position as shown in phantom in Figure 5, the spring **88** will be released, releasing the adjusting block **90** so that the fluid in the reservoir **70** may readily expand without injuring any portion of the equipment. The piston rod **66** is connected to a piston **94** in the cylinder **72** so that expansion of the fluid in the reservoir **70** when the lever **90** is in set position will cause an exertion of compression force on the piston **94** and shift the piston rod **66** so that the levers **44** and **46** will assume an angular position as indicated in Figure 3. A cylinder **100** is mounted in opposition to the cylinder **72** and is provided with a piston **102** which is connected to the opposite end of the piston rod **66**. A fluid reservoir **104** is provided with suitable pressure fluid such as oil and is connected to the cylinders **100** by means of a conduit **106**. The top portion of the conduit **106** is a pump barrel **108** in which is mounted a pump piston **110**. A fluid aperture **112** is provided in the bottom of the reservoir **104** and communicates with the pump barrel **108** when the piston **110** is withdrawn to its fullest extent. With the piston **110** withdrawn to its fullest extent the aperture **112** communicates through the conduit **106** with each of the cylinders **100** so that the cylinders **100** will be inoperative and the piston **102** may move freely therein displacing the oil into the reservoir **104**. Preferably each of the cylinders **100** is provided with a control valve **114** so that any one of the windows may be locked in closed or open position as the case may be and be independent of the control system.

The piston **110** is provided with a piston rod **120** which is connected by a link **122** to the lever **92** so that opening of the lever **92** will depress the piston **110** and force fluid through the conduit **106** into each of the cylinders **100** and cause the pistons **102** to move the piston rod **66** to forcibly close all of the windows connected with the compression system.

It will be apparent that by utilizing the valves **76** and **114** any of the windows may be isolated from the control system and left in either open or closed position in respect to the condition of the temperature or the operation of the piston **110**.

In the operation of the window control system according to the invention, the reservoir **70** is filled with a suitable thermal expansive fluid through the opening **76** and the piston **82** will be adjusted in the cylinder **80** so that the device will operate at a given temperature after which the valve **78** will be closed securing the pressure system. An increase in temperature will then increase the pressure in the reservoir **70** which will be communicated through the conduit **74** to the various cylinders **72** so that the pistons **94** will be pushed down, operating piston rod **66** and angulating the levers **44** and **46** to raise the window sections **14** and lower the window sections **12**. Obviously, on the reduction of temperature there will be a reduction of pressure in the reservoir **70** and the consequent retraction of the pistons **94** and closing action to the window sections **14** and **12**. In the event the pressure in the reservoir **70** should increase beyond the safety limits either because of undue temperature or because of the closing off of several of the valves **76** the pressure release spring **88** will allow the piston **82** to slide in the cylinder **80** and thus prevent damage to the system.

When it is desired to close all of the windows the lever **92** is operated operating the piston **110** and forcing fluid into all of the cylinders **100** forcing the pistons **102** up to close all of the windows. At the same time the operation of the lever **92** will release the spring **88** so that the piston **82** will move downwardly in the cylinder **80** and thus relieve the pressure in the chamber **70** so that the expansible fluid may return from the cylinders **72**.

It will thus be seen that the present invention provides a control system in which windows may be locked or unlocked at will and in which the windows when unlocked will open and close in response to temperature conditions.

For purposes of exemplification a particular embodiment of the invention has been shown and described according to the best present understanding thereof. It will be apparent to those skilled in the art that changes and modifications may be made therein without departing from the true spirit of the invention.

Having described the invention, what is claimed as new is:

1. A thermal responsive pressure system for automatically actuating windows in response to changes in temperature, including a closed fluid pressure reservoir containing a pressure creating thermally sensitive readily expandible fluid, a fluid motor in communication with said reservoir, a pressure responsive piston in said fluid motor and including a piston rod extending out of said fluid motor, a movable window assembly operably connected to said piston rod, adjustable pressure control means in communication with said fluid pressure reservoir for regulating in relation to temperature when pressure will be directed to the fluid motor, and pressure relief means in communication with said reservoir for preventing the excessive build-up of pressure in said reservoir.

2. In a thermal responsive pressure system as set forth in claim 1 wherein said pressure control means and pressure relief means includes a cylinder in communication with said reservoir, a piston adjustably carried in said cylinder, and resilient means operatively connected between said piston and cylinder.

3. In a thermal responsive pressure system as set forth in claim 2 wherein said resilient means comprises a tension spring connected at one end to a rod secured to the piston and extending out of said cylinder, the other end of said spring being connected to an adjustable lever pivotally mounted on said cylinder.

4. A thermal responsive pressure system as set forth in claim 2 including a second fluid pressure reservoir in communication with a second fluid motor, said second fluid motor having a pressure piston therein including a piston rod operatively connected to said movable assembly, and means connected between said pressure relief means of said first reservoir and the second reservoir for creating pressure in said second fluid motor and relieving pressure in said first fluid reservoir and first fluid motor.

5. A thermal responsive pressure system as set forth in claim 4 wherein said second fluid reservoir includes a fluid pump therein in communication with said second fluid motor, and a force transmitting element extending between said pressure relief means and the fluid pump for directing pressure to said second fluid motor while pressure is relieved in said fluid motor.

6. A thermal responsive pressure system as set forth in claim 5 wherein said first and second fluid motors have a common piston rod extending axially therebetween, said piston rod being operatively connected to a linkage assembly engaged with the movable window assembly for raising and lowering said window assembly in response to the direction of fluid pressure into said first or second fluid motor.

7. A thermal responsive pressure system as set forth in claim 1 including a control valve interposed between the fluid pressure reservoir and fluid motor for preventing the transmission of fluid pressure in said fluid motor.

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