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Hall

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[54] **COMBINED WINDOW AND LOUVER CONSTRUCTION**

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[52] **U.S. Cl.** **160/107,** 49/64, 160/176

[51] **Int. Cl.** **E06b 9/264**

[58] **Field of Search** 49/64, 51, 74, 86; 160/107, 160/164, 166, 176, 177

[56] **References Cited**

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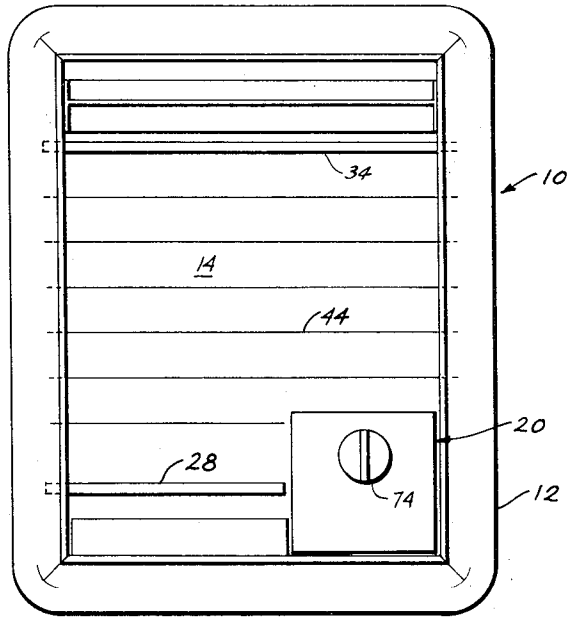
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[57] **ABSTRACT**

A combined window and louver construction for adjustable sun control. An adjustable louver arrangement is placed within the space between the glass panes of a double pane hermetically sealed insulating window. The louver arrangement is constructed by interconnecting a series of louver slats by pairs of vertical, multistrand stainless steel cables. Eyelets are attached to the cables to engage small holes in the edges of the slats. Control and orientation of the slats is accomplished by synchronous, vertical, opposing travel of the inboard and outboard cables.

10 Claims, 8 Drawing Figures



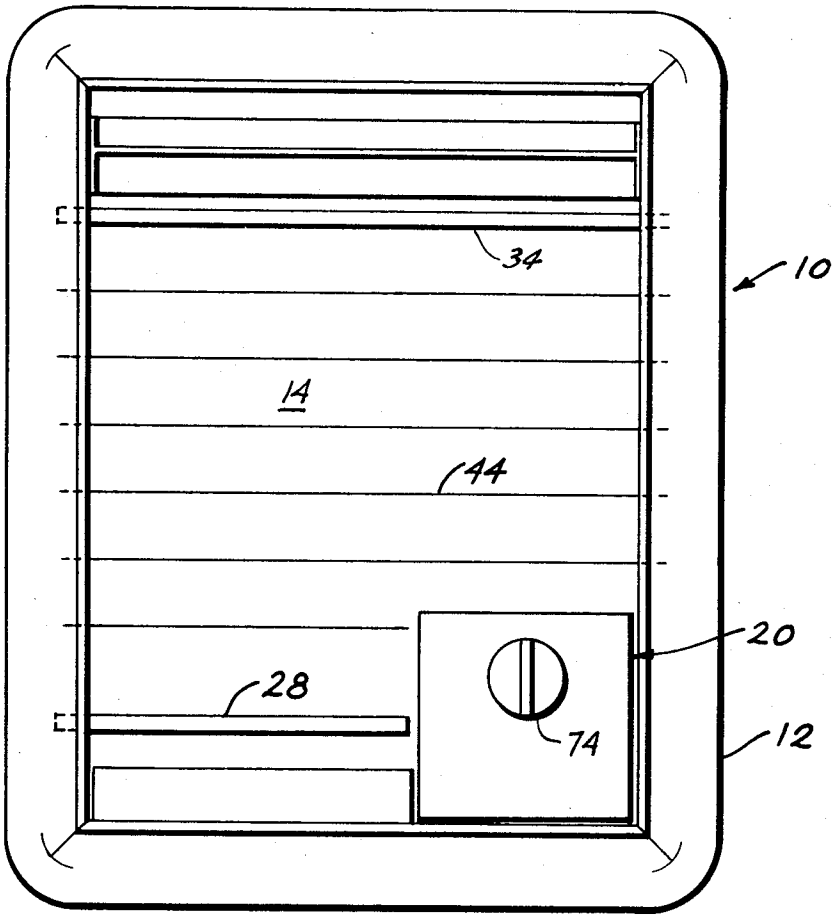


FIG-1

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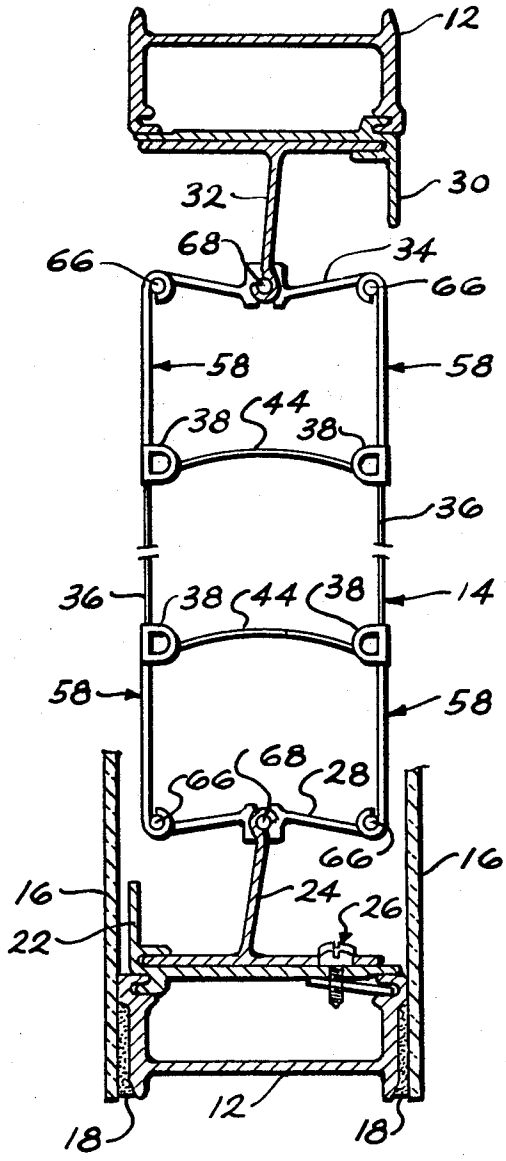


FIG-2

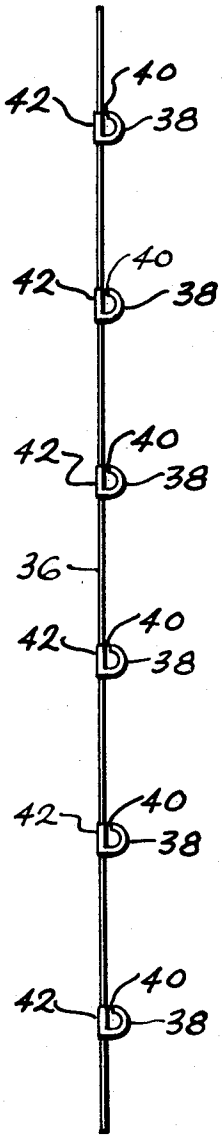


FIG-3

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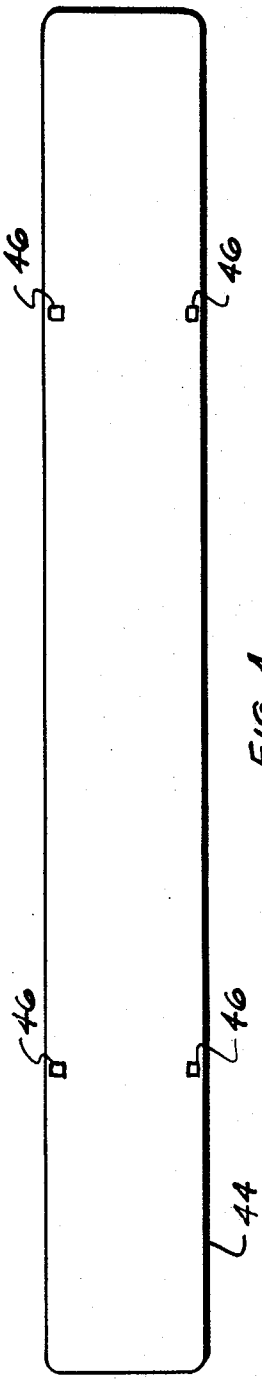


FIG-4

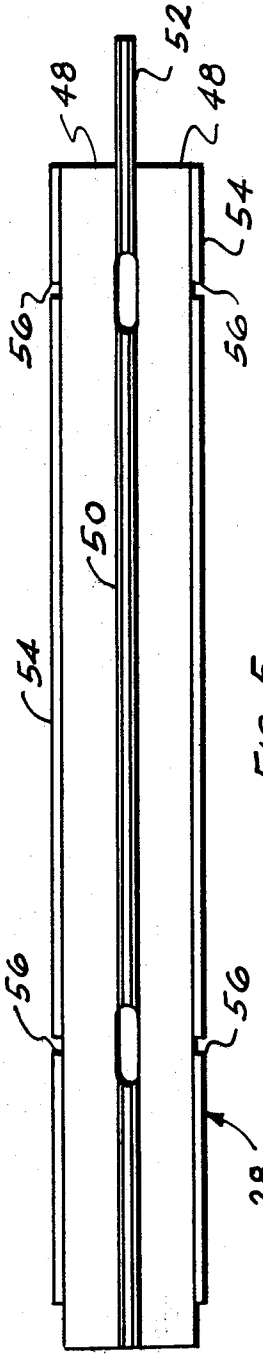


FIG-5

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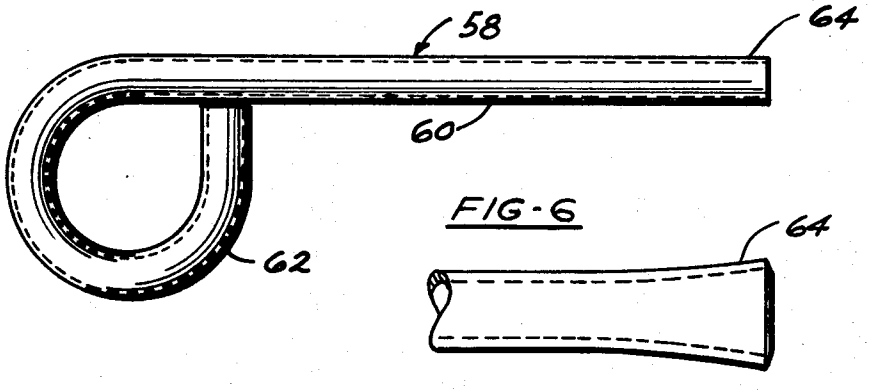


FIG-6

FIG-6A

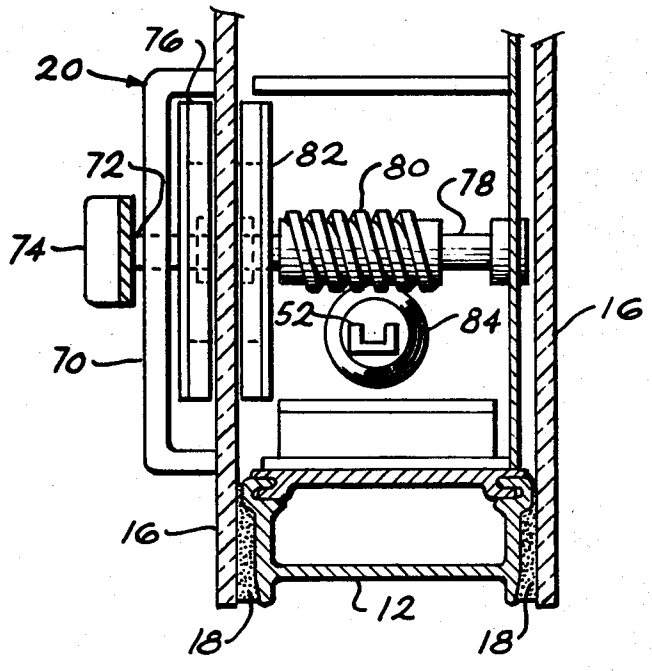


FIG-7

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COMBINED WINDOW AND LOUVER CONSTRUCTION

BACKGROUND OF THE INVENTION

An effective and economical means for sun control through windows into building interiors has long been desired. Outside louvers, tinted or heat absorbing glass, and inside Venetian blinds have all been tried but suffer from deficiencies as to effectiveness and/or economy. Outside louvers are expensive and are not aesthetically favored by architects while Venetian blinds are prone to dust collection as well as generating unwanted heat. Tinted windows, on the other hand, in addition to their initial expense offer no ability for adjustable control.

The recent development and growing popularity of double pane glass insulating windows has provided a new expedient for sun control; i.e., the placement of louvers between the glass panes of insulating windows. Window units of this type must be hermetically sealed to provide an effective dead air space for sufficient insulation as well as to prevent dust, dirt and moisture from collecting on the louvers or the inside of the glass panes. Thus, while placement of louvers between the panes of insulating windows provides an efficient means of sun control, this arrangement does present a unique problem in that normal maintenance is impossible. Therefore, the louver structure must be constructed in such a way and of such material that it will last the anticipated life of the window unit.

Venetian blind type louvers have heretofore been supported by standard ladder tapes and rungs of cloth or nylon, or by an individual support of each louver slat at its opposite ends in pivot bearings. The standard ladder type support arrangement is deficient in necessary long life characteristics in that it is detrimentally effected by the particular environment between the glass panes. Due to the fact that the area between the panes is a dead air space, ultraviolet rays from the sun are permitted to attack any cloth or nylon within the space to destroy it. The individual pivot lower support arrangement must also shield against the action of the ultraviolet rays if other than metal bearings are used. Additionally, the individual pivot arrangement requires a great deal of mechanical parts adding to the expense as well as to the increased likelihood of unit failure.

SUMMARY OF THE INVENTION

It is the object of this invention to provide a combined window and louver construction for efficient sun control which is more economical and has greater reliability than previous units of this type. Within the space between the glass panes of a double pane, hermetically sealed, insulating window, a louver arrangement for adjustable sun control is constructed by interconnecting a series of louver slats by pairs of vertical, multistrand stainless steel cables. Eyelets are attached to the cables to engage small holes in the edges of the slats. Control of the orientation of the slats is accomplished by synchronous, vertical, opposing travel of the inboard and outboard cables.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a sun control window unit incorporating the novel louver arrangement according to this invention.

FIG. 2 is a side view partly in section of the louver arrangement of this invention.

FIG. 3 is a side view of a slat support cable.

FIG. 4 is a plan view of a typical slat of the novel louver arrangement.

FIG. 5 is a plan view of the bottom rail of the novel louver arrangement.

FIG. 6 is an enlarged view of the tubular connector end fixture for the support cables. The FIG. 6A is an enlarged view of the flared end of the tubular connector and fixture of FIG. 6.

FIG. 7 is a side view, partly in section, of the louver angle control mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. 1 shows an adjustable sun control insulating window unit **10** incorporating the novel louver arrangement of this invention. The window unit **10** has a box frame **12** within which the louver arrangement **14** is positioned between the panes of glass **16** thereof. The panes of glass **16** are hermetically sealed to the frame **12** by means of an appropriate sealant **18** (see FIG. 2). Located in one corner of the frame **12** is a louver angle remote control mechanism **20**, the construction of which is explained hereinbelow.

As best seen in FIG. 2, a bottom insert **22** which supports a bottom rail anchor **24** is secured to the frame **12** by means of a holddown mechanism **26**. The bottom rail anchor **24** positions the bottom rail **28** of the louver arrangement **14** as well as providing a pivot point therefor. A similar structure serves to support the top of the louver arrangement **14**. That is, a top insert **30** is fixed to the frame **12** and supports a top rail anchor **32**. The top rail anchor **32** supports a top rail **34** of the louver arrangement **14** and serves as the pivot point therefor.

Connected between the top rail **34** and bottom rail **28** and serving as the louver slat support mechanism are a plurality of pairs of multistrand stainless steel cables **36**. As seen in FIG. 3, a typical cable **36** has eyelets **38** fixed thereto at spaced intervals therealong. The eyelets **38** are formed by U-shaped portions fixed at one end to straight portions **42** in such a manner so that there will be an opening **40** between one leg of the U-shaped portion and the straight portion **42**. The straight portions **42** are secured to the cable at the proper intervals by staking, soldering, welding, adhesive bonding or die casting. The openings **40** serve to permit assembly of the slats of the louver arrangement **14** with the cables **36**.

The louver arrangement **14** is made up of a series of slats **44** (see also FIG. 4). The slats **44** are shown as being of a general rectangular shape, slightly bowed along the minor rectangular dimension, similar to the slats of typical Venetian blind arrangements, but may be flat, S-shaped or custom designed. Small openings **46** are particularly positioned along the edges of the slats **44**. These openings **46** are slipped over the openings in the eyelets **38** of the wire cables **36** and then the eyelet openings **40** are closed in any suitable manner, such as by pressing, so as to positively retain the slats **44** in specific relationships between the cables **36**.

The bottom rail **28** which controls the angular movement of the louver arrangement **14** has flat portions **48** which are connected to a central channel **50**. The outer edges of the flat portions **48** (opposite the channel **50**) have rolled edges **54**. The rolled edges **54** have openings **56** therein to accommodate pivotal connections to the cables **36** in a manner to be explained hereinbelow. The channel **50** has an extension **52** which is connected to the louver angle remote control mechanism **20** to initiate angular control. It is noted that the top rail **34** is of identical construction to the bottom rail **28** with the exception that there is no extension to the central channel and the length of the top rail **34** extends fully across the width of the frame **12** whereas the length of the bottom rail **28** is somewhat less than the full width due to the positioning of the louver angle control mechanism **20** within the frame **12** (see FIG. **1**).

Special tubular connectors **58** are provided to pivotally fix the cables **36** in a proper orientation to the bottom rail **28** and top rail **34**. A typical tubular connector **58** (see FIG. **6**) is comprised of a hollow body **60** having a looped end **62** and an opposite flared end **64** (FIG. **6A**). The hollow body **60** is made of stainless steel which is bonded to the ends of the cable **36**, the flared end **64** abutting the eyelets **38** closest to the ends of the cable. The tubular connectors **58** are then inserted in the openings **56** in the bottom rail **28** (and corresponding openings in the top rail **34**), and pivot pins **66** are inserted under the rolled edges **54**. Thus the connectors are pivotally locked to the top and bottom rails (**34**, **28**). The dimension of the tubular connectors **58** are such that on construction of the louver arrangement **14** a precise orientation of the upper and lower slats **44** with respect to the top and bottom rails is accomplished. The top and bottom rails are in turn pivotally fixed to the top rail anchor **32** and bottom rail anchor **24** by means of pivot pins **68** which ride in the channels of the rails (e.g. the channel **50** of bottom rail **28**).

Angular orientation of the louver arrangement **14** to provide adjustable sun control is accomplished by synchronous, vertical, opposing travel of the inboard and outboard cables **36** (the inboard cables being those closest to the inner pane of glass **16** and the outboard cables being those closest the outside pane of glass). This synchronous movement is initiated by the louver remote angle control mechanism **20** which is comprised of a housing **70** fixed to the inside pane of glass **16**. The housing **70** rotatably supports a first shaft **72** which has a control knob **74** fixed to the end thereof extending outwardly from the housing **70**, and a first magnet **76** fixed to the other end of the shaft **72** located within the housing **70**.

Within the hermetically sealed space between the panes of glass **16** there is supported a second shaft **78** which has a first gear **80** mounted thereon intermediate the length of the shaft **78**. On the end of shaft **78** at the opposite side of the glass **16** from the first magnet **76** is mounted a second magnet **82** for corresponding movement with the first magnet **76**. Engaging the first gear **80** is a second gear **84** which is mounted on the channel extension **52** of the bottom rail **28**.

As a result of this construction, it can be seen that rotation of the control knob **74** will cause rotation of the first magnet **76**. The second magnet **82** will rotate a corresponding degree to the rotation of the first magnet **76** rotating the gear **80** to drive the gear **84**; rotation of the bottom rail **28** about the pivot **68** through movement of the channel extension **52** will thus be effected. This rotation of the bottom rail **28** will cause the requisite synchronous, vertical, opposing travel of the inboard and outboard cables due to the pivot actions of the tubular connectors **58** about the pivot pins **66** and the pivot of the top and bottom rails about the pivots **68** resulting in regulatable tilting of the slats **44**.

From the foregoing it is apparent that there has herein been accomplished the arrangement of an efficient and economical sun control window unit which is of simple and reliable construction. Multistrand stainless steel cables are used in place of cloth or nylon ladders and tapes to support slats of the louver arrangement. The slats are fixed to the cables by means of metal eyelets through holes in the edges of the slats. The cables are in turn particularly positioned and attached to top and bottom rails which may be pivoted so as to accomplish synchronous, vertical, opposing travel of inboard and outboard cables to tilt the slats to give the necessary adjustable sun control. This simplified structure is placed between the panes of a hermetically sealed, insulating window and is operated by means of a magnet and gear control arrangement. Since the louver arrangement is entirely of metal, it will not be effected by the environment within the hermetically sealed window thus yielding a reliable, efficient organization of considerable life span.

It will be understood that various changes in the details, materials, and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

What is claimed is:

1. A combined double pane insulating window and louver construction for adjustable sun control comprising: a series of louver slats, pairs of stainless steel cables, metal support means fixed at spaced intervals to said cables, said metal support means providing the sole support and guide for said louver slats, upper and lower pivot means located between the panes of glass for support of said pairs of cables, tubular end connectors fixed to the ends of said cables and connected respectively to said upper and lower pivot means, and a remote louver slat angular control means for rotating said upper and lower pivot means to regulate the angle of said louver slats for adjustable sun control.

2. The apparatus of claim **1** wherein said stainless steel cables are of the multistrand wound type and wherein said metal support means comprise eyelets having a straight portion fixed to said cables at particular locations thereon and U-shaped portions extending outwardly from said straight portions, one leg of the U-shaped portion being shorter than the other so as to form an opening between said shorter leg of said U-shaped portion and said straight portion to permit assembly with said louver slats.

3. The apparatus of claim **2** wherein said louver slats have openings formed at particular locations adjacent the edges thereof to accommodate said eyelets upon assembly.

4. The apparatus of claim 1 wherein said window and louver construction includes a circumferential frame, an upper anchor fixed to said frame along an inside edge thereof, said upper anchor pivotally supporting said upper pivot means, and a lower anchor fixed to said frame along an inside edge thereof opposite said first mentioned inside edge, said lower anchor pivotally supporting said lower pivot means.

5. The apparatus of claim 4 wherein said upper and lower pivot means each comprise an elongated channel, flat portions extending outwardly from the upper edges of said channel, the outer edges of said flat portions opposite said channel being of a rolled configuration, the concavity of said rolled edges being oppositely directed to the concavity of said channel.

6. The apparatus of claim 5 wherein said tubular end connectors comprise hollow tubular metal bodies, one end thereof being flared and the opposite end thereof being of a looped configuration, the ends of said cables being fixed within the flared end of respective tubular connectors.

7. The apparatus of claim 6 wherein said looped portions of said tubular end connectors intersect said rolled edges of said upper and lower pivot means, and pivot pins are placed within the looped portion of said tubular end connectors and said rolled edges of said upper and lower pivot means at the intersections thereof so as to form the pivotal connections therebetween.

8. The apparatus of claim 7 wherein said channel of said lower pivot means has an extension thereof, said extension being operatively associated with said remote louver slat angular control means to permit said angular control means to regulate the angle of said louver slats through rotation of said pivot means.

9. The apparatus of claim 8 wherein said remote louver slat angular control means comprises a first shaft having control means on one end for angular rotation of said first shaft and rotational initiation means on said opposite end immediately adjacent one pane of the insulating window for remote initiation of rotation, a second shaft supported by the said panes of said insulating window, said second shaft having induced rotational means located on the end of said shaft immediately adjacent said pane of said window and juxtaposed said rotational initiation means for rotation dependent upon rotation of said first rotational initiation means, a first gear located intermediate said second shaft, a second gear mounted on said channel extension and engaging said first gear, whereby rotation of said first shaft and said rotational initiation means by said control means will cause rotation of said induced rotational means to rotate said first and second gear to rotate said channel extension for adjustable louver slat angular control.

10. The apparatus of claim 9 wherein said rotational initiation means and said induced rotational means are opposed magnets.

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