United States Patent

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[54] **SELF-STORING ROLLER SCREENS**
3 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **160/23,** 160/133, 279
[51] **Int. Cl.** **E06b 9/20**
[50] **Field of Search** 160/23, 133, 274, 279

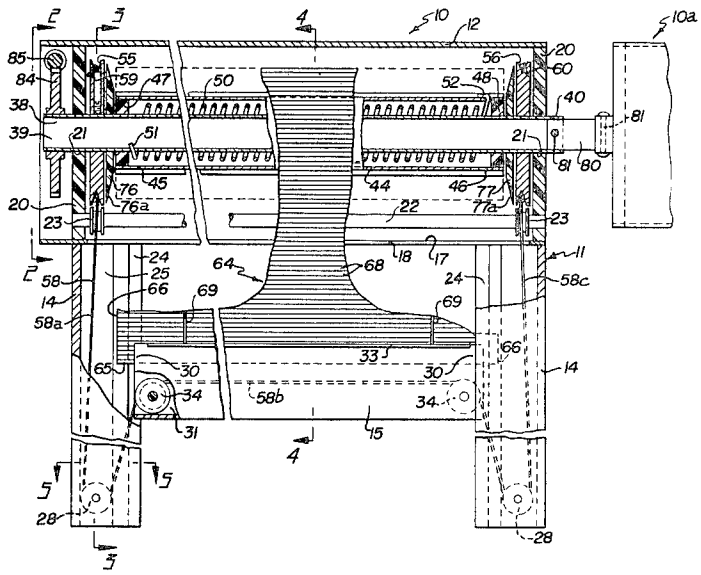
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ABSTRACT: A screen including a frame-supported shade capable of being rolled up and stored in a frame part and extended to position of use by remotely operated means.



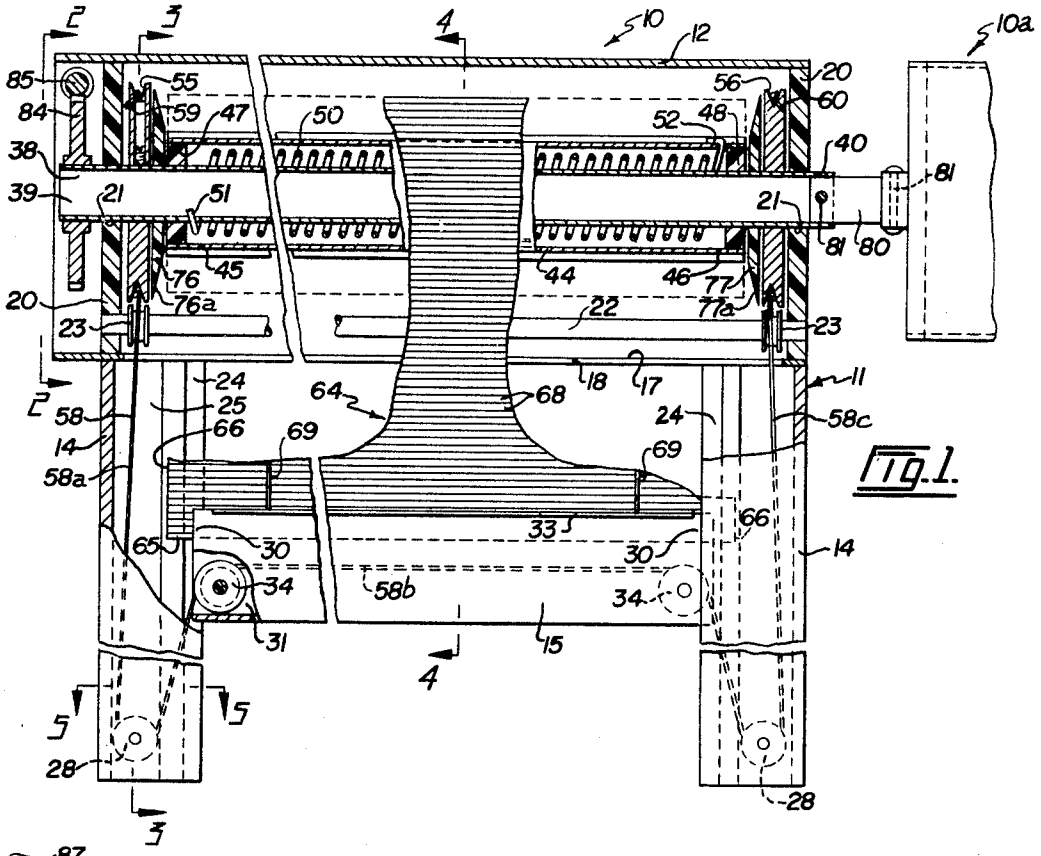


Fig. 1.

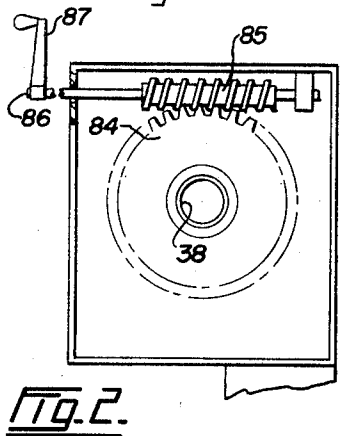


Fig. 2.

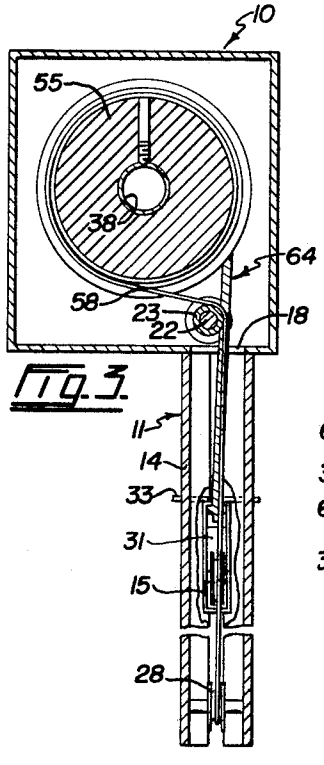


Fig. 3.

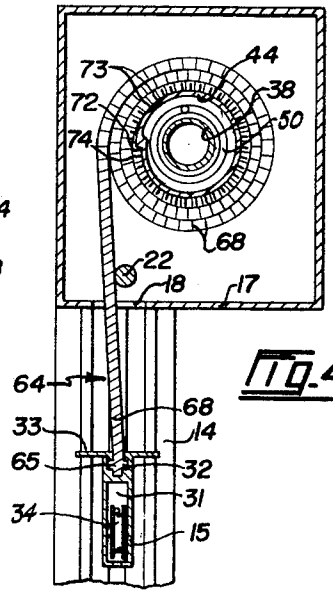


Fig. 4.

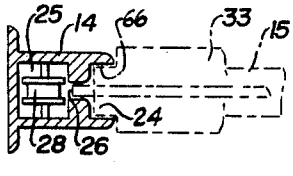


Fig. 5.

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SELF-STORING ROLLER SCREENS

BACKGROUND OF THE INVENTION

This invention relates to window screens and particularly to screen units adapted to be assembled with other similar units on an office building or the like having rows of closely spaced windows.

The devices presently in use to exclude the direct rays of the sun from a room are not entirely suitable for use on an office building where a large number of windows must be shaded. It is desirable that the shades of all the windows of each floor be operated in unison and the trend today is towards the use of automatic equipment to operate the window shades. For example, a photo-electric cell may be employed to respond to outside light intensity so that all the shade units on one side of the building will be raised or lowered according to the sun exposure on that particular building side. Since conventional screens are required to be operated individually, or at least in small groups, it is neither economical nor practical to install the screens on an office building if the use of such sophisticated operating equipment is contemplated.

SUMMARY OF THE INVENTION

The present screen includes a frame on which a shade and connected cords are roller-mounted to form the equivalent of an endless belt which can be moved in either direction by rotation of a centre shaft included in the roller structure. The centre shaft can be coupled to the corresponding shaft of an adjacent screen with the second shaft being coupled to a third and so on, so that drive means connected to the shaft of one screen can readily raise and lower the shades of a multitude of screens covering all the windows of one floor of an office building. The several moving parts making up the screen are supported and guided in such a way that a small electric motor or the like will supply sufficient power for the drive means or, if desired, a simple hand-operated crank can be used to rotate the several connected shafts. When not extended across the window, the shade is stored within a housing which protects it from the weather. The shade is maintained under tension and this tension is increased as the shade is lowered so that there is little likelihood of the shade being moved about in the supporting frame by the wind and creating a noise which the occupants of an office might find distracting.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a fragmentary front elevation of the invention, partly in section,

FIGURE 2 is an end elevational as viewed in the direction indicated by the line **2-2** of **FIGURE** 1,

FIGURE 3 is a vertical section taken on the line **3-3** of **FIGURE** 1,

FIGURE 4 is a vertical section taken on the line **4-4** of **FIGURE** 1, and

FIGURE 5 is a sectional plan view taken on the line **5-5** of **FIGURE** 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The screen, generally indicated by the numeral **10**, is provided with a rectangular frame **11** formed of a top housing **12**, side rails **14**, and a bottom rail **15**.

Housing **12** is a box-like structure, preferably formed of aluminum, and having a bottom wall **17** in which a longitudinally extending slot **18** is formed. The ends of housing **12** are closed by removable plates **20** which are of nylon or other suitable plastic material. These plastic end plates **20** of the housing are provided with central openings which form longitudinally aligned bearings **21**. A locating rod **22** is suitably connected to the end plates **20** to extend through the housing **12** parallel to the wall **17** and near the slot **18**. Not far from the plates **20**, the rod **22** is fitted with rotatably mounted pulleys **23**.

The side rails **14** are identical and consist of lengths of extruded aluminim or plastic to provide opposing channels **24** and passages **25** which are connected by slots **26**, see particularly **FIGURE** 5. A small guide pulley **28** is rotatably mounted in the lower end of each tubular side rail **14** with its axis of rotation at right angles to the corresponding axis of a vertically aligned pulley **23**. Preferably, the pulleys **23** and **28** are of the same diameter.

Bottom rail **15** is also an extruded aluminum strip and the opposite open ends **30** of this tubular rail are slidably received in the channels **24** of the side rails so that the bottom rail can move freely up and down in the frame **11**. Rail **15** has a longitudinal passage **31**, a T-shaped channel **32** which extends along the upper edge of said rail, and top flanges **33**. At each open end **30** of the bottom rail, a small guide pulley **34** is mounted for rotation about a transverse axis.

Journalled in the bearings **21**, is an inner shaft **38** formed of steel tubing or the like and having ends **39** and **40** which project a short distance outwardly of the walls **20**. Shaft **38** extends through the centre of an outer tube **44**, the opposite ends **45** and **46** of this tube being spaced inwardly of the housing walls **20**. Bearings **47** and **48**, preferably of plastic material, rotatably support the ends **45** and **46** of the outer tube on the inner shaft **38**.

Mounted between the inner shaft **38** and the outer tube **44** is a torsion spring **50** having opposite ends **51** and **52**. As shown in **FIGURE** 1, the spring end **51** is secured to the tubular shaft **38** while the opposite end **52** of said spring is anchored to the tube **44**. Thus, any tendency of the inner shaft and outer tube to counter-rotate is resisted by the torsion spring **50**.

Secured to the inner shaft **38** is a sheave **55**, this sheave being disposed near the inner face of the left wall **20** (**FIGURE** 1) and spaced from the end **45** of the outer tube. Another sheave **56** of the same size is locked to the shaft **38** near the right wall **20** and this sheave is spaced from the end **46** of the outer tube.

The V-groove sheaves **55** and **56** are connected by a nylon cord **58**. One end **59** of this cord is suitably anchored to the sheave **55** and is wound therearound an appropriate number of turns. From the sheave **55**, a length **58a** of the flexible cord **58** extends over an adjacent pulley **23** and through slot **18** and passage **25** of the left side rail, said cord length then being trained over pulley **28**. Cord **58** then has an intermediate length **58b** which extends through passage **31** of the bottom rail and is guided in this passage by the two end pulleys **34**. Next, a length **58c** of the cord passes over the lower pulley **28** of the right side rail **14** and travels through the passage **25** of this rail to pass over the pulley **23** thereabove. Finally, the cord length **58c** again projects through the slot **18** and is wound around the sheave **56** with the cord end **60** being secured in some suitable manner to this sheave. It will be noted, the cord **58** is wrapped around both sheaves in the same direction and by the same number of turns.

The outer tube **44** is fitted with a flexible solar shade generally indicated at **64**. It should be noted that shade **64** is wound upon the tube **44** in the opposite direction to which the cord ends **59** and **60** are wound upon their respective sheaves. The solar shade **64** extends downwardly over the locating rod **22** between the pulleys **23** and through the housing slot **18** the shade having an unrolled edge **65** and side edges **66** which latter edges are slidably received in the opposing slots **26** of the rails **14**. The lower or unrolled edge **65** of the shade is secured by any suitable means within the T-shaped channel **32** of the bottom rail. From the foregoing, it will be seen that the cord **58** and the shade **64** together form a flexible member supported by the sheaves **55** and **56**, the several pulleys **23**, **28** and **34**, and the outer tube **44**. If the solar shade is lowered, the cord **58** is unwound from the sheaves **55** and **56** and, of course, when the shade is raised, the cord is rewound onto the sheaves. The length of the cord **58** is adjusted during assembly so as to impose a slight tension on the spring **50**. Thus, the shade **64** and cord **58** are held under tension by the spring **50**

at all times whether the shade is raised or lowered in the frame **11**. It should be observed also that the diameters of the sheaves **55** and **56** are considerably larger than the outside diameter of the tube **44**. When the upper part of the shade **64** is wound upon the outer tube **44** as described and said shade is in raised position, the rolled portion of the shade has a diameter which may be substantially equal to the diameters of the two sheaves **55** and **56**. At this time, the torsion spring **50** exerts minimum pressure tending to counter-rotate shaft **38** and tube **44**. As the solar shade is lowered, the cord **58** is wound up faster than the shade **64** is paid out so that the spring **50** is subjected to greater torsion and this increased torsion is transmitted to the cord and the shade. In this manner, tension on the shade **64** and the cord **58** is progressively increased to a desirable maximum tension when the shade is fully lowered.

In this particular embodiment of the invention, the shade **64** is formed of a multitude of small horizontal louvers or slats **68** which are supported by vertical wires **69**. The slats **68** are tilted downwardly at a slight angle to the wires **69** and said wires are quite flexible so that the shade can easily be rolled about the tube **44** or unrolled therefrom.

As shown in **FIGURE** 4, the periphery of tube **44** has a longitudinally extending groove **72** and a number of circumferentially spaced fins **73**. In order to secure the shade **64** to the tube **44**, the upper edge **74** of the shade is placed in the groove **70** and the tube is then rotated so that some of the uppermost slats enter between the fins **73**. By so constructing the tube **44**, the shade is securely locked to the tube without the need for conventional fasteners.

To prevent damage to the ends of the slats **68**, shaft **38** is fitted, near the sheaves **55** and **56**, with opposing buffer discs **76** and **77**, the discs preferably being made of a suitable hard-wearing plastic material. The opposing faces **76a** and **77a** of these discs are bevelled and the discs may be rotatably mounted on the inner shaft **38**. As the shade **64** is raised or lowered in the frame **11**, the slat ends **66** are prevented from coming into contact with the sheaves by the discs **76** and **77**. Thus, the slat ends **66** are protected from damage by the discs **76** and **77** also the bevelled faces **76a** and **76b** ensure that the shade is wound and unwound evenly, without touching and thereby hindering the free rotation of the counter-rotating sheaves since to do so would impose a braking action which could interfere with the raising and lowering of the shade.

Screen **10** is particularly intended for use over a window and normally the device is mounted on the outer face of the building by securing the housing **12** and side rails **14** to appropriate building parts. Other identical screens **10a** are suitably secured to the building face alongside screen **10** so as to cover adjoining windows. The inner shafts **38** of the several screens are connected together by couplings **80** and pins **81**. When one shaft **38** is rotated by any suitable means, the shaft of the next adjacent screen is also rotated as are all the connected shafts of the row of screens extending across the face of the building.

One means for raising and lowering the shade **64** is illustrated in **FIGURES** 1 and 2. This means comprises of a worm gear **84** which is keyed to the end **39** of the inner shaft **38**. Meshing with the gear **84** is a worm **85** which is mounted on a stem **86**. This stem extends through the housing **12** and into the interior of the building. The interior end of the stem **86** is fitted with a suitable operating device such as a hand crank **87**.

To lower the shade **64**, the hand crank **87** is turned to rotate the shaft **38**. Rotation of shaft **38** causes the sheaves **55** and **56** to wind up the cord **58** whereupon the edge **65** of the shade is pulled downwardly against the progressively increasing resistance of the spring **50**. Since the cord **58** is free to move endwise as required through the side and bottom rails of the frame **11**, the downward pull exerted by said cord is always equal on both sides of the shade **64**. By balancing the pressure applied to pull the shade down in this manner, the bottom rail **15** always remains absolutely horizontal which eliminates any tendency of said rail and the side edges **66** of the shade to bind in the side rails **14** as the shade is lowered or raised within the frame **11**. When the shade reaches a selected position extending across the window, it is held against further movement, either up or down, by tension of the spring **50**.

As previously mentioned, when the shade is up, only reduced tension is applied by the spring **50**. This tension is increased as the shade is lowered due to the relative sizes of the sheaves **55** and **56** and the circumference of that portion of the shade which is wound upon the outer tube **44**. Thus, maximum pressure is applied to the solar shade by the torsion spring **50** when the shade is fully down and this pressure is sufficient to hold the shade tight so that it cannot be rattled or moved about to any great extent within the frame **11** by a breeze flowing past the face of the building. When the solar screen **64** is in the fully raised position, the top flanges **33** of the bottom rail **15** bear against the underside of the bottom wall **17** of the housing **12** so as to substantially seal off the slot **18** and protect working parts of the apparatus from the weather.

I claim:

1. A self-storing roller screen comprising a rectangular frame including an end housing, an inner shaft having opposite ends journalled in the end housing, an outer tube rotatably mounted on the inner shaft between the opposite ends thereof, a torsion spring connecting the inner shaft to the outer tube, a flexible shade wound upon the outer tube and having an unrolled edge extending away from the end housing, a sheave non-rotatably secured to each opposite end of the inner shaft, a length of cord wound upon each sheave in a direction opposite to the direction the flexible shade is wound upon the outer tube, said lengths of cord extending across the frame and being operatively connected to the unrolled edge of the flexible shade, means on the frame remote from the end housing around which each length of cord slidably extends in the form of a loop, and said torsion spring applying a predetermined tension to the lengths of cord and the flexible shade, and buffer discs mounted on opposite ends of the inner shaft to prevent side edges of the flexible shade from coming into contact with the sheaves.

2. A self-storing roller screen comprising a rectangular frame including a top housing, side rails and a bottom rail slidably mounted in said side rails, said top housing having end walls, an inner shaft journalled in the end walls and having opposite ends projecting therethrough, an outer tube rotatably mounted on the inner shaft between the end walls of the top housing, a torsion spring connecting the inner shaft to the outer tube, a flexible shade having one edge rolled upon the outer tube and an unrolled edge secured to the bottom rail, a sheave non-rotatably secured to each opposite end of the inner shaft, a cord having opposite ends wound upon the sheaves in a direction opposite to the direction the flexible shade is wound upon the outer tube and an intermediate length slidably secured to the bottom rail, said torsion spring applying a predetermined tension to the cord and the flexible shade, said side rails being tubular and fitted with interior guide pulleys around which the cord is looped, said bottom rail being tubular and having interior guide pulleys, said cord extending freely through the tubular side and bottom rails and being trained over the guide pulleys thereof.

3. A self-storing roller screen comprising a rectangular frame including a top housing, side rails and a bottom rail slidably mounted in said side rails, said top housing having end walls, an inner shaft journalled in the end walls and having opposite ends projecting therethrough, an outer tube rotatably mounted on the inner shaft between the end walls of the top housing, a torsion spring connecting the inner shaft to the outer tube, a flexible shade having a plurality of spaced slats, said outer tube having circumferentially spaced longitudinal fins on the periphery thereof, some said slats engaging the fins to non-rotatably secure the flexible shade to the outer tube, said flexible shade having an unrolled edge secured to the bottom rail, a sheave non-rotatably secured to each opposite end of the inner shaft, a cord having opposite ends wound upon the sheaves in a direction opposite to the

direction the flexible shade is wound upon the outer tube and an intermediate length slidably secured to the bottom rail, a small pulley mounted on each side rail remote from the top member and around which the cord is looped, said torsion spring applying a predetermined tension to the cord and the flexible shade, said sheaves having a diameter greater than the diameter of the outer tube whereby the torsion spring is actuated to proportionately increase the predetermined tension on the cord and the flexible shade as said flexible shade is unrolled, and buffer discs mounted on opposite ends of the inner shaft, said buffer discs having opposing bevelled faces to prevent side edges of the flexible shade from coming into contact with the sheave and to ensure the flexible shade is wound evenly on the outer tube.