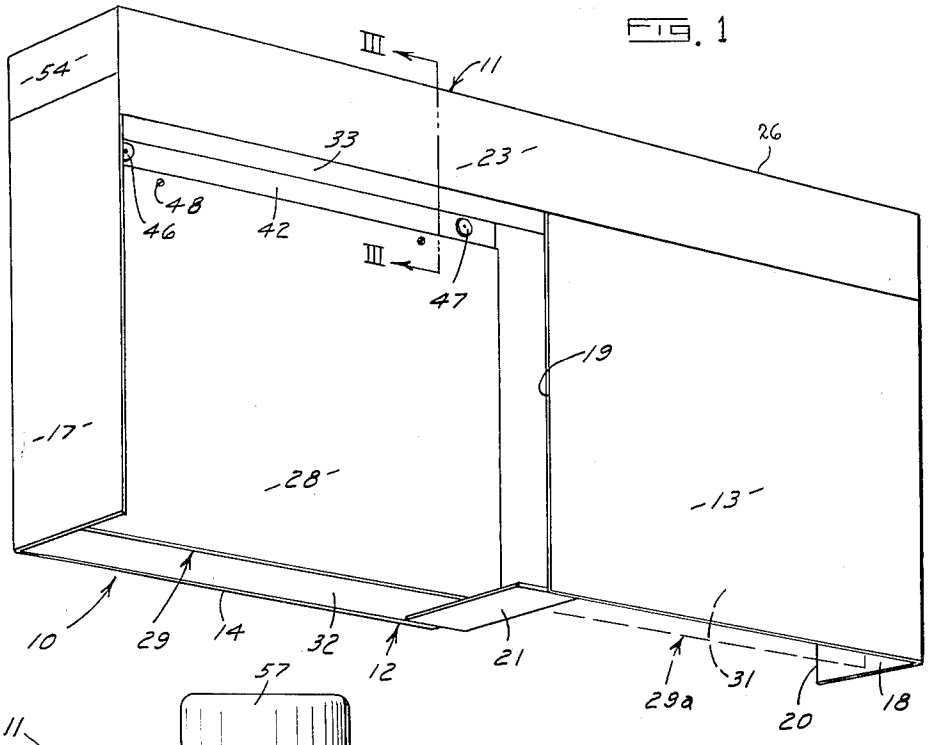
Jan. 16, 1962 R. E. SWANK 3,016,640

AUTOMATIC DISPLAY DEVICE

Filed April 30, 1959 4 Sheets-Sheet 1

FIG. 1



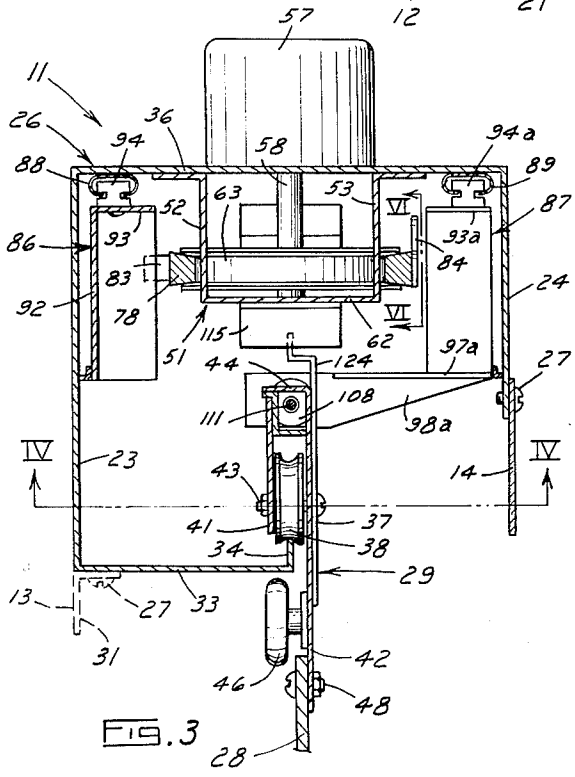


FIG. 3

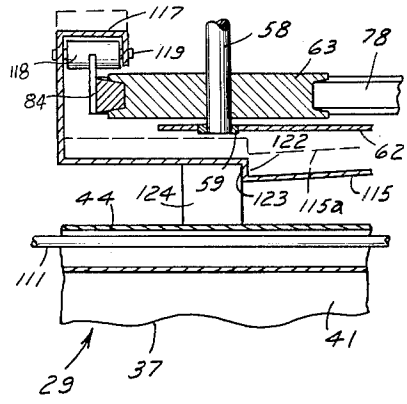


FIG. 5

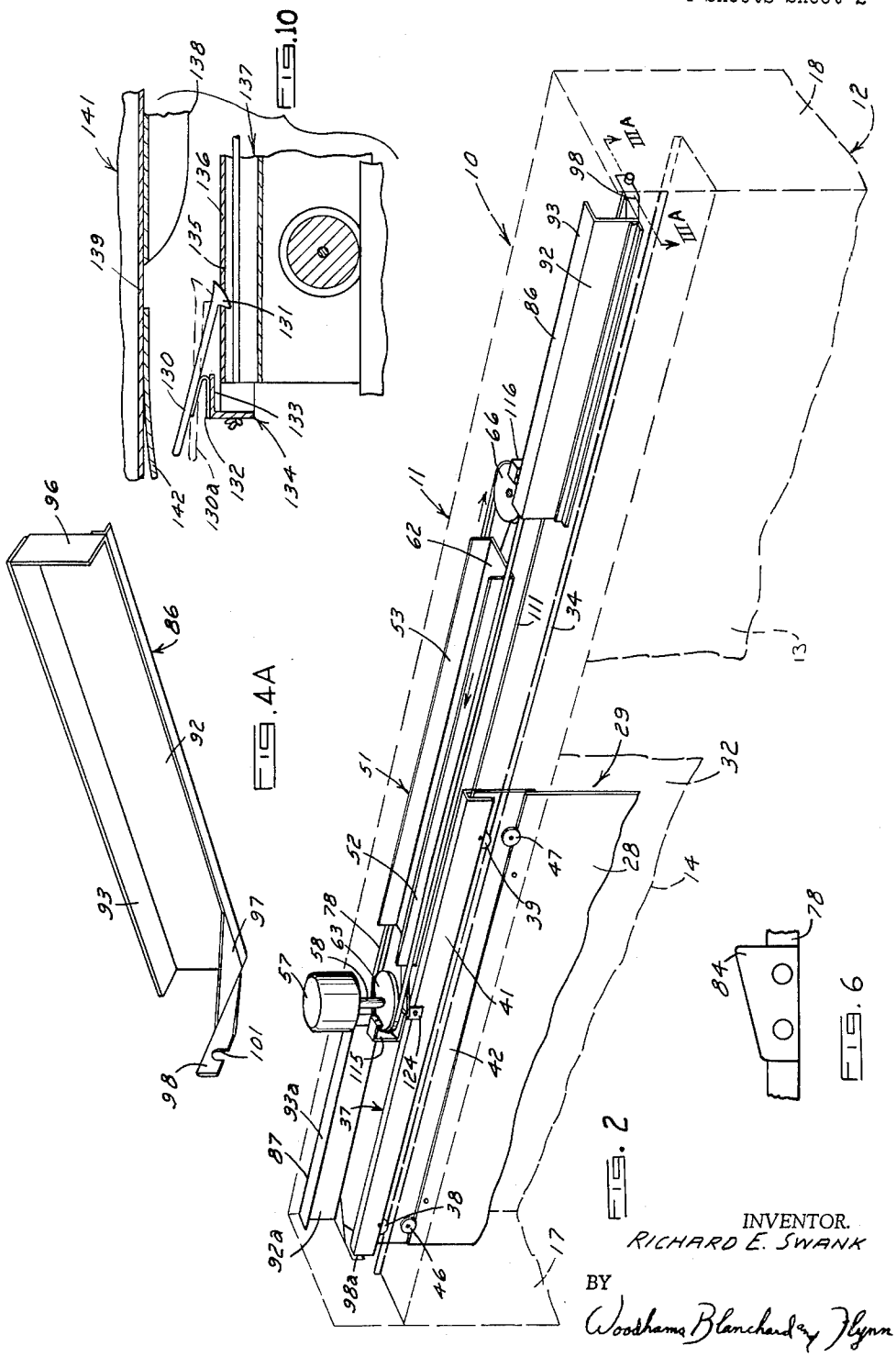
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AUTOMATIC DISPLAY DEVICE

Filed April 30, 1959 4 Sheets-Sheet 2



Jan. 16, 1962 R. E. SWANK 3,016,640

AUTOMATIC DISPLAY DEVICE

Filed April 30, 1959 4 Sheets-Sheet 3

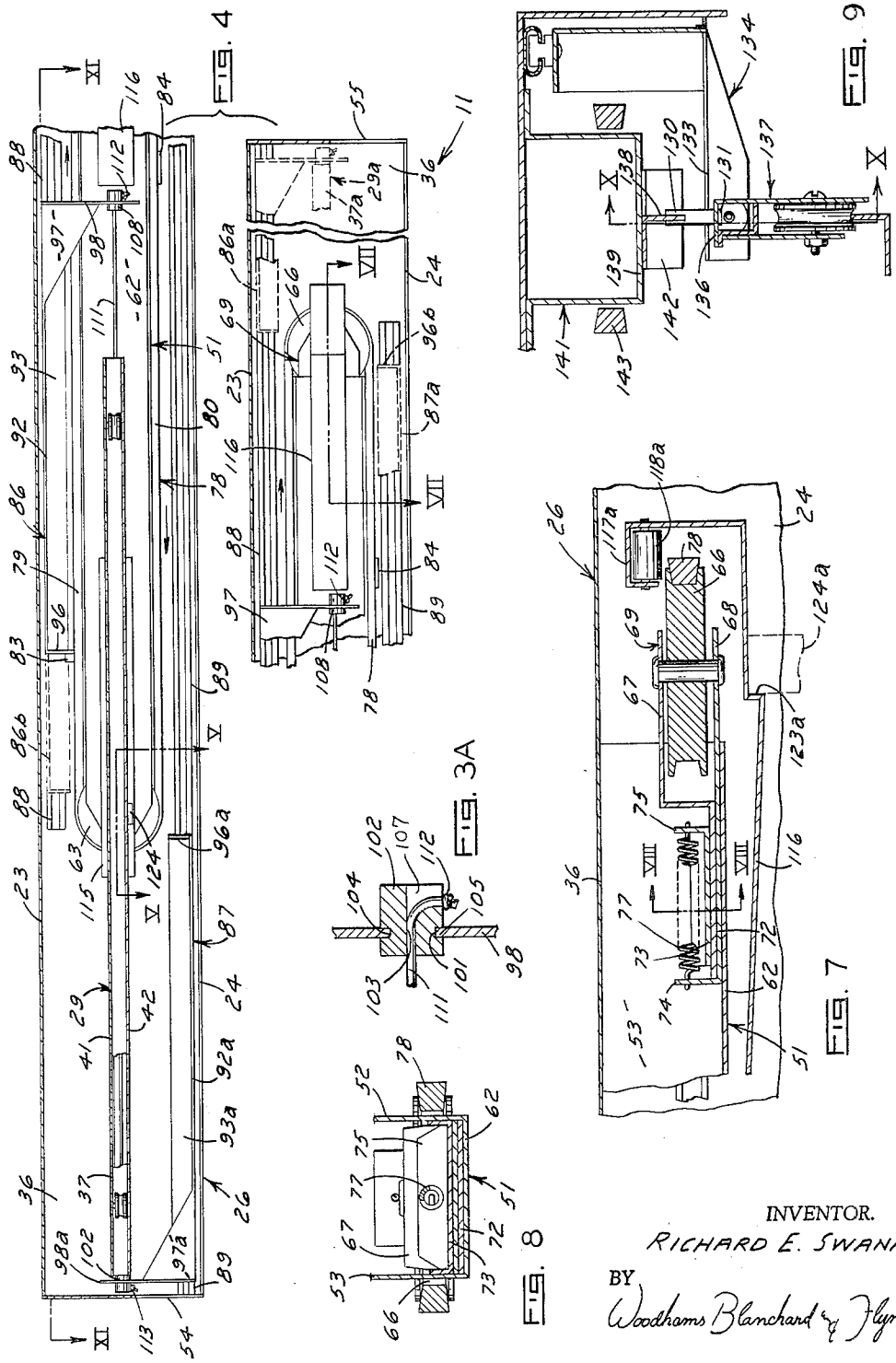


FIG. 4

FIG. 9

FIG. 3A

FIG. 8

FIG. 7

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Jan. 16, 1962 R. E. SWANK 3,016,640

AUTOMATIC DISPLAY DEVICE

Filed April 30, 1959 4 Sheets-Sheet 4

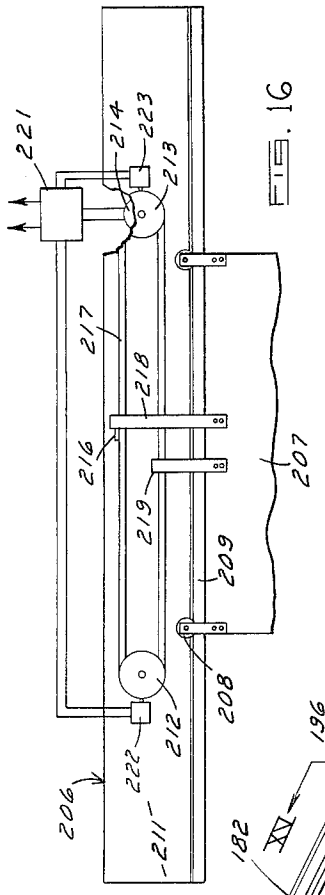


FIG. 16

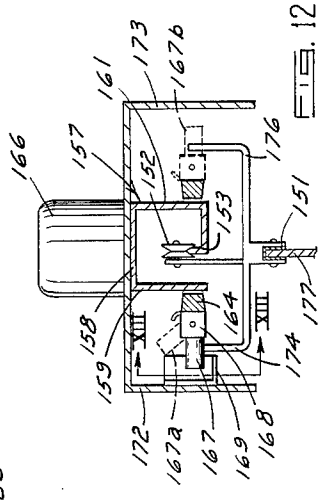


FIG. 12

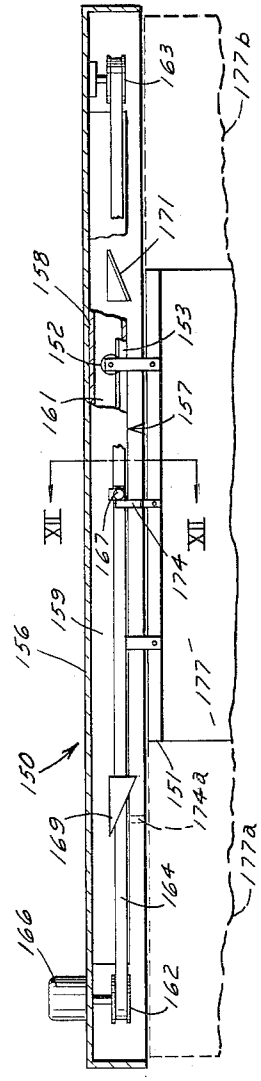


FIG. 11

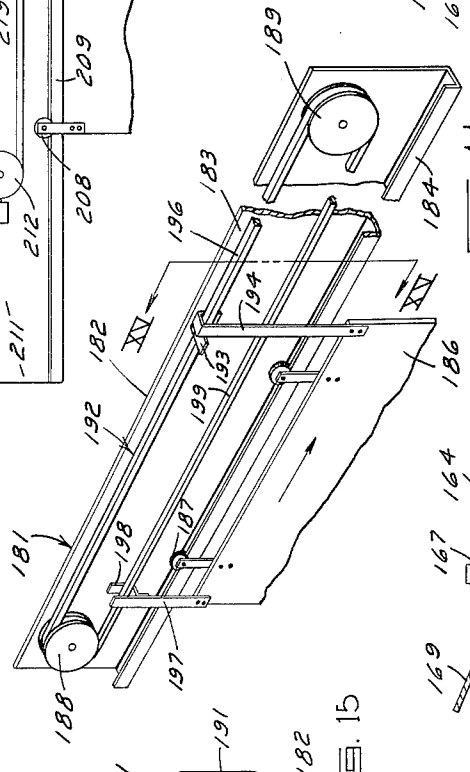


FIG. 14

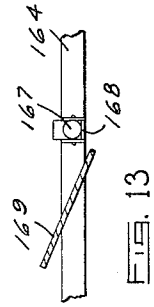


FIG. 13

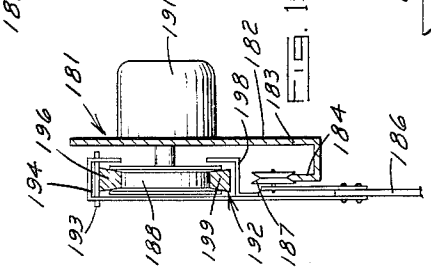


FIG. 15

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United States Patent Office 3,016,640 Patented Jan. 16, 1962

3,016,640

AUTOMATIC DISPLAY DEVICE

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Filed Apr. 30, 1959, Ser. No. 810,037
4 Claims. (Cl. 40—36)

This invention relates in general to an apparatus whereby a display panel is supported for movement in a horizontal direction substantially within the plane defined by said panel into and out of a display position and, more particularly, to a type of apparatus whereby said panel is caused to remain in the display position for a selected period of time and whereby a large panel can be moved with a small amount of power.

The advantages of visual aids, such as a movable display, for the purposes of attracting attention and promoting interest, are well known. In fact, many types of devices and mechanisms have been provided over a long period of time for the purpose of effecting the movement of display items, such as panels, into and out of a display position. For example, one type of such display apparatus is disclosed in my patent application Serial No. 744,196, filed June 24, 1958. However, prior display apparatuses for moving panels have been designed primarily for use indoors or, at least, in a location or cabinet where the panels are not directly exposed to rigorous weather conditions.

In many types of two-dimensional displays, especially those involving written materials, it is necessary to provide large panels which often are in excess of four or five feet square. Outdoor advertising display panels are, of course, the principal examples of such use. However, such panels may also be found in large buildings or partially enclosed structures, such as stadiums, other athletic parks and the like. Where such display panels are used out-of-doors, they are usually exposed directly to the weather, including rain, snow and wind. Thus, where a movable display panel of a relatively large size is used out-of-doors, it must be arranged and constructed so extreme weather conditions, such as snow, sleet or high winds, will not adversely affect the operation of the apparatus. Moreover, it becomes necessary to provide a panel-moving apparatus which does not require large amounts of energy for the purpose of effecting the movement of the panels.

Existing structures for effecting the movement of panels have not, insofar as I am aware, been adapted to any material extent for use with relatively large panels, particularly for out-of-doors use. In some instances, this appears to be due to the excessive power which would be required to convert them to such use, and/or the complicated structures involved which would be too expensive to reproduce on a large scale. In other instances, existing structures for these purposes require a complete and full enclosure to protect their operating mechanisms as well as their panels from adverse weather conditions, such as sleet, rain, snow and high winds.

Accordingly, a primary object of this invention has been the provision of a display apparatus having mechanism for moving a substantially vertical display panel in a horizontal direction substantially within the plane defined by said panel into and out of a display position, said mechanism being capable of maintaining said panel in said display position for a selected period of time.

A further object of this invention has been the provision of a display apparatus, as aforesaid, wherein the panel-moving mechanism can be operated with a minimum of power, completely automatically and continuously, and wherein the display panel can be at least partially exposed to normally severe weather conditions without adversely affecting the satisfactory operation of the apparatus.

A further object of this invention has been the provision of a panel-moving mechanism, as aforesaid, which is simple and inexpensive to fabricate, which requires little or no maintenance, which can be set into operation by remote control, and which will operate without attention.

A further object of this invention has been the provision of a display apparatus, as aforesaid, which can be shipped to the site of its use in a knockdown condition and then assembled according to simple instructions by any installer of average ability.

A further object of the invention has been the provision of a display apparatus, as aforesaid, which is pleasing in appearance, which can be adapted to panels of a variety of sizes and shapes, and which will operate efficiently under extremely adverse weather conditions.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon reading the following specification and examining the drawings in which:

FIGURE 1 is an oblique view of a display apparatus embodying the invention.

FIGURE 2 is an oblique, partially schematic view of the principal operating parts in the display apparatus.

FIGURE 3 is a sectional view taken along the line III—III in FIGURE 1.

FIGURE 3A is a sectional view taken along the line IIIA—IIIA in FIGURE 2.

FIGURE 4 is a broken sectional view taken along the line IV—IV in FIGURE 3.

FIGURE 4A is an oblique view of a drive member for stretching the resilient member that motivates the panel.

FIGURE 5 is a sectional view taken along the line V—V in FIGURE 4.

FIGURE 6 is the tripping cam fastened to the drive belt, as viewed from the cutting line VI—VI in FIGURE 3.

FIGURE 7 is a sectional view taken along the line VII—VII in FIGURE 4.

FIGURE 8 is a sectional view taken along the line VIII—VIII in FIGURE 7.

FIGURE 9 is a fragment of the sectional view shown in FIGURE 3 including a modified construction.

FIGURE 10 is a sectional view taken along the line X—X in FIGURE 9.

FIGURE 11 is a sectional view substantially as taken along the line XI—XI in FIGURE 4 disclosing a modified construction.

FIGURE 12 is a sectional view taken along the line XII—XII in FIGURE 11.

FIGURE 13 is a sectional view taken along the line XIII—XIII in FIGURE 12.

FIGURE 14 is a broken, oblique view of an alternate construction for said display apparatus.

FIGURE 15 is a sectional view taken along the line XV—XV in FIGURE 14.

FIGURE 16 is a side elevational view of a modification of the display apparatus shown in FIGURE 14.

For the purpose of convenience in description, the terms "upper," "lower," "front," "rear," "left," "right" and derivatives thereof will have reference to the display apparatus of the invention in its normal position of operation and as appearing in FIGURES 1, 2, 11, and 16. The terms "inner," "outer" and derivatives thereof will have reference to the geometric center of said apparatus and parts associated therewith.

General description

The objects and purposes of the invention, including those set forth above, have been met by providing a display apparatus comprised of an elongated mounting structure from which a display panel is suspended for horizontal movement lengthwise of the mounting structure, said panel remaining substantially within the plane defined thereby. A pair of spaced and radially aligned, circular members, such as pulleys, the axes of which are substantially parallel, are rotatably supported upon said mounting structure. An elongated endless element is supported upon and extends around said pulleys so that the reaches of said endless element are substantially parallel with and near to the upper edges of said display panel. One of said pulleys is connected to drive means, such as a motor, whereby said endless element is moved around said pulleys. Mechanism associated with said endless element effects movement of said panel into a display position, where it remains for a selected period of time, after which said panel is moved out of said display position and, after another selected period of time, the cycle is repeated.

Detailed construction

The display apparatus **10** (FIGURE 1), which has been selected to illustrate a preferred embodiment of the invention, is comprised of a substantially rectangular housing **12** including a horizontally elongated mounting structure **11** extending along the upper portion of said housing **12**. The panel housing **12** (FIGURES 1 and 2) includes a front wall **13**, a rear wall **14** and a pair of end walls **17** and **18**. The front and rear walls have windows **19** and **20**, respectively, which extend in opposite directions from near the centers of said front and rear walls to the end walls **17** and **18**, respectively. However, other arrangements of said windows **19** and **20** may be provided and, under some circumstances, one window may be adequate. The lower edges of said front and rear walls are connected to the opposite ends of the cross brace **21**.

The mounting structure **11** (FIGURES 1 and 4) includes a channel-shaped header **26** (FIGURE 3) having front and rear, downwardly extending flanges **23** and **24**, respectively. The front and rear walls **13** and **14**, respectively, of the housing **12** are secured along their upper edges to the front and rear flanges **23** and **24** on the channel-shaped header **26** by means, such as the screws **27** (FIGURE 3).

A panel assembly or unit **29** (FIGURES 1, 2 and 3), which includes the panel **28** and panel engaging member **37**, is suspended from the mounting structure **11** within the housing **12** for movement lengthwise thereof by means described hereinafter. One side of the panel **28** can be viewed through the window **19** and the other side can be viewed through the window **20**. Thus, the panel **28** has two display positions, in this embodiment, at opposite ends of the housing **12**.

The inside surface **32** (FIGURE 2) of the rear wall **14** can be seen through the front window **19** when the display panel **28** is being viewed through the rear window **20**. Thus, the inside surface of the rear wall serves as an additional, nonmovable display panel. In the same manner and for the same purposes, the inside surface **31** (FIGURE 3) of the front wall **13** can be viewed through the window **20** (FIGURE 2) in the rear wall **14**.

The panel housing **12** and panel **28** may be made from any suitable material, such as sheet metal or plywood, and the windows **19** and **20** may be transparent sheets or simply openings in said front and rear walls.

The front flanges **23** (FIGURE 3) on the header **26** has a lower edge portion **33** which is bent inwardly or rearwardly at right angles and then bent upwardly to provide a rail **34** which is disposed about midway between the planes defined by the flanges **23** and **24** and is spaced downwardly substantially from the web **36** of the header **26**. The elongated, channel-shaped panel engaging member **37** (FIGURE 2) of the panel assembly **29** is supported

by means of a pair of wheels **38** and **39** upon the rail **34**. The wheels **38** and **39** are mounted upon and between the flanges **41** and **42** (FIGURE 4) of the panel engaging member **37** by means of bolts **43** so that said wheels are spaced downwardly from the web **44** (FIGURE 3) of the panel engaging member **37**. The rear flange **42** preferably extends below the lower edge portion **33** of the front flange **23** on the header **26** where it supports a pair of rollers **46** and **47** (FIGURE 2) which engage the lower surface of the edge portion **33** (FIGURE 3) when the rail **34** is engaged by the wheels **38** and **39**. The panel **28** is secured to the flange **42** on the engaging member **37** by means of the bolts **48**, and hangs downwardly therefrom.

An elongated, channel-shaped belt guide **51** (FIGURES 2 and 3) has upwardly extending flanges **52** and **53** which are secured along their upper edges (FIGURE 3) to the lower surface of the web **36** on the header **26** so that said flanges are spaced from the flanges **23** and **24**, respectively, of the header **26**. The belt guide **51** (FIGURE 4) is approximately half as long as the header **26** and is preferably spaced equidistantly from the end walls **54** and **55** thereof. A motor **57** (FIGURE 3) is supported upon the upper surface of the web **36** of the header **26** above the leftward end of the belt guide **51** (FIGURE 2), and the motor shaft **58** extends through the web **36** (FIGURE 3) where its lower free end may be rotatably supported within a bearing **59** (FIGURE 5) in the web **62** of the belt guide **51**. A pulley **63** is mounted upon the motor shaft **58** for rotation therewith adjacent to the web **62** of said belt guide. The motor **57** is preferably of the slow speed type including reduction gears whereby a very slow shaft speed can be obtained.

Another pulley **66** (FIGURES 2, 4 and 7) is rotatably supported upon and between the flanges **67** and **68** of an H-shaped pulley bracket **69** (FIGURES 7 and 8) which is slidably supported upon the upper surface of the web **62** of the belt guide **51** between the flanges **52** and **53**. The bracket **69** has a flat extension **72** which is substantially coplanar with the lower flange **68** thereof and is slidably held against the web **62** by a guide plate **73** which is secured to and extends between the flanges **52** and **53** of said belt guide **51**. The free end of the extension **72** (FIGURE 7) and the remote edge of the guide plate **73** have integral, upwardly extending lips **74** and **75**, respectively, which are connected to the opposite ends of a resilient member, such as the spiral spring **77**. The pulley bracket **69**, hence the pulley **66** supported thereon, is continuously and resiliently urged outwardly of the belt guide **51** by the spring **77** to a point where the lip **74** engages the inner edge of the guide plate **73**.

The pulleys **63** and **66** (FIGURES 2 and 4) are radially aligned and preferably rotate around substantially vertical axes. An elongated endless element, such as the V-belt **78**, extends around the pulleys **63** and **64** so that its reaches **79** and **80** (FIGURE 3) are disposed adjacent to the outer surfaces of the flanges **52** and **53**, respectively, of the belt guide **51**. The length of the belt **78** is selected so that the pulley bracket **69** is moved inwardly of its outermost position when both pulleys are engaged by the belt **78**. Thus, the spiral spring **77** serves to apply a continuous tension upon the belt **78**. A sidewardly or radially extending drive pin **83** (FIGURES 3 and 4) is secured to the belt **78**. An upwardly extending releasing cam **84** (FIGURES 3, 4 and 6) is secured to said belt **78** at a point thereon spaced substantially from said drive pin **83**. The functions and relative locations of the pin **83** and cam **84** will be discussed hereinafter.

A pair of drive members **86** and **87** (FIGURES 2 and 4), which are preferably identical, are slidably supported by means including the rails **88** and **89**, respectively, within the header **26** on opposite sides of the belt guide **51** and adjacent to the flanges **23** and **24**, respectively. The rail **88** (FIGURE 3) which is substantially channel-shaped, is secured by any convenient means to the lower

surface of the header web 36 between the header flange 23 and the belt guide 51. Said rail 88 (FIGURE 4) extends from the rightward end of the header 26 to a point about even with the leftward end of the belt guide 51. The rail 89, which is preferably similar to the rail 88, is secured to the lower surface of the header web 36 between the header flange 24 and the belt guide 51. The rail 89 extends from the leftward end of the header 26 to a point about even with the rightward end of the belt guide 51.

The drive member 86 (FIGURES 2 and 4A) has a pair of elongated, integral flanges 92 and 93 which define an L-shaped cross section (FIGURE 3), the flange 92 being substantially parallel with and adjacent to the front flange 23 on the header 26, and the flange 93 extending horizontally and inwardly from the upper edge of the flange 92 adjacent to the web 36. Sliders 94 are secured to the upper surface of the flange 93 for slidably engaging the rail 88. The drive member 86 (FIGURES 4 and 4A) has at its leftward end an inwardly extending, vertical flange 96, and at is opposite end a horizontal flange 97 integral with and extending inwardly from the lower edge of the flange 92. The end portion of the flange 97 is bent downwardly to provide the stop flange 98 which is substantially parallel with, and out of alignment with, the end flange 96. That is, the stop flange 98 is disposed downwardly of a horizontal plane defined by the lower edges of the end flange 96 and the vertical flange 92.

The stop flange 98 (FIGURES 3A and 4A) has a downwardly opening slot 101 near its free end. A cylindrical, resiliently flexible bumper 102 (FIGURE 3A), having a central opening 103 therethrough, has a pair of parallel, transverse grooves 104 and 105 on opposite sides thereof for reception of the portions of the stop flange 98 adjacent to the slot 101. A notch 107 is provided in the outer end of the bumper 102 and extends between the central opening 103 and the periphery of the bumper.

The structure of the drive member 87 (FIGURES 2 and 4) may be, and preferably is, substantially identical with the structure of the drive member 86. Accordingly, parts of the drive member 87, where discussed herein, will be referred to by the same numerals as their counterparts in the drive member 86 and will be distinguished by the suffix "*a*" added to the corresponding numerals. A bumper 108 (FIGURE 3) which may be substantially identical to the bumper 102, is mounted in a slot on the stop flange 98*a* in substantially the same manner as the bumper 102 is supported upon the stop flange 98.

When the drive members 86 and 87 (FIGURE 4) are supported upon the rails 88 and 89, respectively, the stop flanges 98 and 98*a* (FIGURE 2) extend into the path of, and are engageable by the opposite ends of, said member 37. The paths of movement of the drive members 86 and 87 lengthwise of the mounting structure 11 are such that the flanges 96 and 96*a* move closely adjacent to the corresponding reaches of the belt 78. Thus, when the said flanges are in a position between the ends of the belt reaches, they are engageable by the drive pin 83.

An elongated, resiliently flexible element, such as a long coiled spring or the elastic band 111 (FIGURE 4), extends through the central openings in the bumpers 102 and 108 and lengthwise through the panel-engaging member 37 between the web 44 thereof and the wheels 38 and 39. The band 111 has a knot 112 (FIGURE 3A) at one of its ends which is larger than the width of the notch 107 in the bumper 102. The band 111 is anchored with respect to the bumper 102 by inserting the portion thereof adjacent said knot 112 into said slot 107 so that said knot engages the peripheral surface of the bumper 102 and thereby prevents movement of the end portion of the elastic band 111 back through the notch 107 and the central opening 103. The opposite end of the elastic band 111 (FIGURE 4) has a knot 113 which is anchored with respect to the bumper 108 in a similar manner.

The elastic band 111 (FIGURE 4) or other resilient element is selected so that its unstretched length is substantially less than the length of the panel-engaging member 37. Thus, the stop flanges 98 and 98*a* are continuously urged by said band 111 toward the opposite ends of the panel-engaging member 37, hence toward and into their closest relative positions. The inner ends of the bumpers 102 and 108 cushion the engagement of the drive members 86 and 87 with the opposite ends of the panel-engaging member 37. The outer ends of said bumpers 102 and 108 are engageable with the end walls 55 and 54, respectively, for cushioning the engagement of the drive members 86 and 87 therewith. The elastic band 111 is selected from material which will not appreciably fatigue when continuously stretched to a length substantially in excess of twice its normal unstretched length.

A pair of elongated, resiliently flexible holding members 115 and 116 (FIGURE 4) are aligned lengthwise of, and are rigidly secured at their adjacent ends to, the lower surface of the web 62 on the belt guide 51 near to, but spaced from, the opposite ends thereof. The holding member 115 (FIGURE 5) extends leftwardly from its point of engagement with the web 62 beyond the leftward end thereof where it is bent upwardly, then rightwardly and back downwardly again to provide an integral, roller-supporting bracket 117. A roller 118 is supported upon the bracket 117 by the pin 119 so that the periphery thereof is near to the belt 78 and is engageable by the releasing cam 84. The roller 118 is preferably arranged so that its axis is disposed within a vertical plane containing a radius of the pulley 163 to facilitate engagement with the cam 84.

The holding member 115 has an upward offset 122 (FIGURE 5) adjacent the motor shaft 58 providing a shoulder 123 engageable with a holding element 124 secured to, and extending upwardly from, the panel- engaging member 37, approximately midway between the ends thereof. Engagement of the roller 118 by the cam 84 effects an upward flexing of the holding member 115 into the broken line position 115*a* thereof, whereby the holding element 124 is released from engagement with the shoulder 123.

The holding member 116 (FIGURE 7) may be substantially identical in construction with the holding member 115. Accordingly, where parts of the holding member 116 are mentioned herein, they are identified by the same numerals as the corresponding parts of the holding member 115 and are distinguished therefrom by adding the suffix "*a*" to the numerals applied to their counterparts in the holding member 116.

Operation

With the display apparatus 10 (FIGURE 1) assembled as described above, operation of said apparatus is commenced by energizing the motor 57 (FIGURE 2) which drives the pulley 63 and thereby moves the belt 78 at a relatively slow, continuous rate around the pulley 66 and in a direction indicated by the arrows. For convenience, it will be assumed that the part of the mounting structure 11, which parts move during the operation of the display apparatus 10, are in their solid line positions as appearing in FIGURE 4 at the beginning of the sequence of operations. In such case, the rear drive member 87 will be at the extreme leftward end of its travel, also shown in FIGURE 2, where it is held by the panel unit 29, which is in turn held at the leftward end of its travel by engagement between the holding element 124 thereon and the shoulder 123 in the holding member 115 (FIGURE 5).

The end flange 96 (FIGURE 4) on the front drive member 86 will be engaged by the drive pin 83 on the belt 78, whereby the stop flange 98 will be held away from the adjacent rightward end of the panel unit 29, in spite of the contrary urging by the elastic band 111. Movement of the belt 78, as indicated by the arrows (FIGURE 4), will act through the drive pin 83 to move the drive member 86 rightwardly along the rail 89 toward its broken line position 86*a* (FIGURE 4) at the extreme

rightward end of its travel. During such rightward movement of the front drive member 86, the rear drive member 87 does not move and, therefore, the tension upon the elastic band 111, which is anchored at its opposite ends on the stop flanges 98 and 98*a*, is steadily increased. When the drive member 86 reaches its FIGURE 2 position, which is slightly before it reaches said broken line position 86*a*, the releasing cam 84 (FIGURE 5) will engage the roller 118 and thereby move the holding member 115 from its solid line position to its broken line position 115*a*. The holding element 124 is thus disengaged from the shoulder 123 whereby the elastic band 111, acting through the bumper 108 and the stop flange 98*a* (FIGURE 4) will move the drive member 87 and panel unit 29 into their broken line positions 87*a* and 29*a*, respectively, at the rightward end of the mounting structure 11.

The releasing cam 84 is so positioned upon the belt 78 (FIGURE 4) that the panel unit 29 will be released thereby to engage the bumper 102 just before the drive member 86 reaches its broken line position 86*a*. Thus, the drive member 86 absorbs some of the force and momentum effecting the rightward movement of the panel unit 29 and drive member 87. The engagement between the bumper 102 and the right end wall 55 of the header 26 terminates such rightward movement.

As the panel unit 29 reaches its position in FIGURE 2, the holding element 124 (FIGURE 4) will move into its broken line position 124*a* (FIGURE 7) where the shoulder 123*a* on the holding member 116 will releasably engage the holding element 124*a* and thereby hold the panel unit 29 and the drive member 86 in their broken line, rightward positions 29*a* and 86*a*, respectively (FIGURE 4).

With the drive member 86 in its broken line position 86*a* (FIGURE 4), the drive pin 83 can move the belt 78 past the end flange 96 and around the pulley 66. Thus, the drive pin 83 now engages the flange 96*a* in its rightward position 96*b* in FIGURE 4, whereby the drive member 87 is moved leftwardly from its broken line position 87*a* to its solid line position 87, thereby stretching the elastic band 111 in substantially the same manner as it was stretched previously by rightward movement of the drive member 86. Just before the drive member 87 reaches its solid line position in FIGURES 2 and 4, the releasing cam 84 (FIGURE 6) will engage the roller 118*a* (FIGURE 7) thereby moving it upwardly and, as a result, disengaging the holding member 116 from the holding element 124*a*. The stretched elastic band 111, which is anchored upon the stop flange 98 of the drive member 86, is now permitted to move the drive member 87 and the panel unit 29 from their broken line positions 87*a* and 29*a* (FIGURE 4) into their solid line positions at the leftward end of the structure 11.

Just before the panel unit 29 (FIGURE 4) reaches the leftward end of its path, it engages the bumper 108 whereby part of the force effecting its leftward movement is absorbed by the drive member 87. At the same time, the drive member 86 will move into its broken line position 86*b* at the leftward end of its path of movement and the holding element 124 will be moved to the leftward side of the shoulder 123, which will obstruct immediate rightward movement of both the panel unit 29 and the rear drive member 87. With the drive member 87 in its leftward, solid line position, the drive pin 83 can pass the end flange 96*a* thereon and move around the pulley 63 where it again engages the end flange 96 on the drive member 86, which member is in its broken line position 86*b*. The front drive member 86 is again moved rightwardly while the panel unit 29 (FIGURE 5) is held in its leftward position by the holding member 115, which is later released by the cam 84, as set forth above in the initial steps of the operation.

Accordingly, a cycle of operation has now been completed during which the drive member 86 was slowly moved rightwardly by the belt 78 while the panel 28 was held by the panel-engaging member 37 in front of the window 19 and the band 111 was stretched. As the member 86 approached the rightward end of the mounting structure 11, the panel unit 29 and the drive member 87 were released from their leftward positions and pulled into their rightward positions by the elastic band 111. This was followed by the leftward movement of the drive member 87 while the panel 28 was held in front of the window 20 and the elastic band 111 was again stretched. As drive member 87 approached the leftward end of its travel, the panel unit 29 was again released and the panel 28 was moved leftwardly by the band 111 into its initial display position. This cycle of operation can continue as long as the motor 57 continues to move the belt 78.

While the front side of the panel 28 is being viewed through the window 19, the display material on the inside surface 31 of the front wall 13 can be viewed through the window 20. When the panel 28 is viewed through the window 20, the display material on the inner surface 32 of the rear wall 14 can be viewed through the front window 19. Thus, a single apparatus 10 can be used to display the same or different materials from opposite directions. The periods of display can be controlled simply by controlling the rotational speed of drive pulley 63, which may be accomplished in any conventional manner.

The entire panel unit 29, including the panel-engaging member 37 and the panel 28, can be easily removed from the mounting structure 11. First, the elastic band 111 is disconnected from the drive members 86 and 87 by moving the bumpers 102 and 108 downwardly out of engagement with the stop flanges 98 and 98*a*. The panel unit 29 is then pivoted in a counterclockwise direction, as appearing in FIGURE 3, until the rollers 46 and 47 (FIGURE 1) are no longer below the edge portion 33 of the front flange 23, after which the panel unit 29 is moved upwardly to disengage the wheels 38 and 39 (FIGURE 2) from the rail 34. The panel unit 29 can now be dropped through the bottom of the housing 12 and replaced with a similar panel unit by reversing the removal procedures. While the panel unit is removed from the housing, the drive members 86 and 87 may be removed from their rails 88 and 89 by sliding them off the leftward and rightward ends thereof, respectively (FIGURE 4). The panel 28 can be easily removed from the panel-engaging member 37 by removing the bolts 43, which connect the panel to the rear flange 42 on the panel-engaging member. The pulley bracket 69 serves not only as a belt tensioning device, but also permits easy removal of the belt 78 from engagement with the pulleys 63 and 63.

Alternate construction

Under some circumstances of rigorous operation, the holding element 124 (FIGURE 5) may fail to make engagement with the shoulder in one of the holding members, such as the holding member 115. Accordingly, as the driving member 86 is removed by the driving pin 83 toward the right end of the mounting structure 11, the elastic band 111 will cause the panel unit 29 and the drive member 87 to be moved rightwardly with the drive member 86. As the two drive members and panel unit 29 approach the rightward end of the mounting structure, the drag between the slow moving holding element 124 and the holding member 116 may be sufficient to overcome the contrary urging of the slightly stretched elastic band 111 so that the holding element 124 will fail to engage the shoulder in the holding member 116. Accordingly, when the drive member 87 is urged leftwardly by the pin 83, the panel unit 29 and the drive member 86 will also be moved leftwardly. This unison movement of the two drive members and panel unit, which may continue indefinitely, can reduce the effectiveness of the display apparatus 10 wherein it is desirable for the panel 28 to remain motionless in the display position for at least a few seconds.

In order to overcome this problem, a lever 130 (FIGURE 10) having a hook 131 on its inner end is pivotally supported by means of the leaf spring 132 upon the upper surface of the horizontal flange 133 of the drive member 134 so that the hook 131 will engage the walls of an opening 135 in the web 136 of a panel-engaging member 137, which may be substantially identical to the panel-engaging member 37. An elongated cam 138 (FIGURE 9) is secured to the lower surface of the web 139 on the channel-shaped belt guide 141, which may be substantially identical to the belt guide 51 shown in FIGURE 3. The cam 138 (FIGURE 10) preferably extends between a pair of holding members, which may be substantially identical to the holding members 115 and 116, respectively, and one of which is shown at 142. The cam 138 is arranged so that it will engage thhe outer end of the lever 130, thereby moving said lever into its broken line position 130*a* (FIGURE 10), whenever said drive member 134, and especially the flange 133 thereon, is near its position between the said holding members. With the lever in its broken line position 130*a*, the hook 131 is moved out of a position engageable with that portion of the web 136 defining the opening 135 therein. As the flange 133 on the drive member 134 moves toward its position remote from the holding members, the lever 130 becomes disengaged from the cam 138, thereby permitting the hook 131 to engage the web 136. Thus, the panel-engaging member 137 will be positively pulled by the drive member 134 into engagement with the holding member 142 past which said panel-engaging member is being moved. Another lever, not shown, which may be similar to the lever 130, may be supported on the other drive member for engagement with the walls of an opening at the other end of the panel-engaging member 137.

The cam 138 is provided to positively prevent engagement and movement of the panel-engaging member 137 by the hook 131 on the lever 130 (or the lever not shown) whenever the engaging member 137 is engaged by, and held against such movement by, a holding member, such as the holding member 142.

However, the hook 131 can and will engage the panel-engaging member 137 substantially before the engaging member can engage, and be slowed down by, the holding member past which it must move to become engaged therewith, thereby positively assuring that it will be moved into a locked position with such holding member before another cycle of operation is completed.

If the panel-engaging member 137 has been properly held at one end of its path during the movement of the drive member 134 ahead of it toward the other end of such path, the hook 131 will have nothing to engage as the lever is disengaged from the cam 138. However, when the engaging member 137 is finally released and moves to the end of its path where the hook 131 is located, said hook 131 will be engaged by the web 136 and will slide into the opening 135, thereby preventing the engaging member 137 from bouncing back past the point of engagement with the holding member during the short period between the time the drive member is engaged by the panel-engaging member 137 and the time when said drive member 134 reaches the end of its path.

It will be seen from the above description that a valuable feature of applicant's invention resides in the capability thereof to move the display panel 28 abruptly between one display position and another, or between a display position and a storage position even though the belt movement is relatively slow, which permits the use of a weak power source. By controlling the belt movement, the period of time during which the display panel remains in a given display position can be varied rather substantially without altering in any way the speed with which the display panel moves into and out of the display position.

Under some circumstances, at least some of the objects of the invention may be met by providing a simplified display apparatus 150 (FIGURE 11) wherein the panel-engaging member 151 is directly engaged by means secured to the belt and moved therewith into and out of the display position. An elongated, channel-shaped belt guide 157 (FIGURE 12) has its web 158 secured to the web 154 of the header 156, and a pair of preferably parallel side flanges 159 and 161 which extend downwardly from said webs. An elongated track 153 is integral with the lower edge of the rear flange 161, in this embodiment, and is disposed between and parallel with the flanges 159 and 161. The panel-engaging member 151 is supported by the wheels 152 upon the track 153 for movement lengthwise thereof.

A pair of pulleys 162 and 163 (FIGURE 11) are rotatably supported upon and within the header 156 at opposite ends of the belt guide 157 and are encircled by an endless belt 164, the reaches of which are parallel with, and located between, the belt guide 157 and the flanges 159 and 161. The pulley 162, for example, may be mounted upon the shaft of the motor 166 for rotation thereby, hence for moving the belt 164.

A drive pin 167 (FIGURE 12) is pivotally supported by means of the bracket 168 upon the belt 164 so that said pin normally extends outwardly and horizontally from the belt. Said pin 167 is pivotable around a substantially horizontal axis parallel with said belt between a substantially horizontal position, as shown in solid lines in FIGURE 12, and an upright position as shown at 167*a* in broken lines. The drive pin is urged by gravity to remain in its substantially horizontal position 167 and is moved into its broken line upright position 167*a* by engagement with one of the inclined cams 169 and 171 which are supported upon the adjacent sides of the flanges 172 and 173, respectively, of the header 156.

A pair of engaging pins 174 and 176 are mounted upon the panel-engaging member 151 so they extend sidewardly, in opposite directions, and then upwardly into the path of movement of the drive pin 167 on opposite sides of the belt 164. The engaging pins 174 and 176 are preferably mounted upon the panel-engaging member 151 approximately midway between the lengthwise ends thereof. The cams 169 and 171 are preferably located so that they will effect an upward pivoting of the drive pin 167 just as the leading end of the panel-engaging member 151 approaches a position adjacent to the end of the header 156 toward which the panel-engaging member is being moved by the drive pin 167.

In operation, the motor 166 is energized whereby the pulley 162 is rotated thereby driving the belt 164 at a substantially constant and slow speed. The drive pin 167 will engage one of the engaging pins 174 and 176, such as the pin 174, and thereby move the panel-engaging member and the panel supported thereby until the drive pin 167 (FIGURE 13) engages the cam 169, for example.

The drive pin 167 is pivoted upwardly by said cam 169 into its broken line position 167*a* (FIGURE 12), thereby releasing the engagement between the drive pin 167 and the engaging pin 174. At this point, the engaging pin 174 and the panel 177 are approximately in their broken line positions 174*a* and 177*a*, respectively, of FIGURE 11. The driving pin 167 continues to move leftwardly with the belt 164 around the pulley 162 and then rightwardly until, as shown at 167*b* in FIGURE 12, it engages the engaging pin 176. During this movement of the belt 164, the panel-engaging member 151 and its panel 177 remain at the leftward end of their movement path in a display position. The drive pin 167 now moves the engaging pin 176, hence the panel-engaging member 151, rightwardly until the panel approaches its broken line position 177*b* (FIGURE 11), when the cam 171 disengages the drive pin 167 from the engaging pin 176. The drive pin continues to move rightwardly with the belt 164 around the pulley 163 and then leftwardly into engagement with the engaging pin 174, whereby the cycle is completed and may be repeated.

The panel 177 is moved from one display position 177*a* to the other display position 177*b* with a somewhat slower motion than the motion with which the panel 26 (FIGURE 2) moves from one end to the other of its path. However, said panel 177 does remain motionless in the display position for a period of time during which the material thereon can be viewed.

FIGURES 14 and 15 disclose a modified display apparatus 181 comprised of a header 182 having an elongated side sheet 183 which is bent inwardly and upwardly along its lower edge to provide the track 184 upon which the panel 186 is supported by means of the wheels 187. A pair of horizontally spaced, radially aligned pulleys 188 and 189 are supported upon the side sheet 183 for rotation around substantially horizontal axes by the motor 191 which supports the pulley 189. The pulleys 188 and 189 are encircled by an endless belt 192 to which is secured a transverse drive element 193. An upper bracket 194 is secured to the upper portion of the panel 186 near one end thereof and extends upwardly therefrom past the belt 192 and around the upper reach 196 thereof so that said bracket can be engaged by the drive element 193 as it moves with the upper reach. A lower bracket 197 is secured to the opposite upper end portion of the panel 186 and has a bifurcated upper end which extends upwardly on both sides of, but is spaced from the lower reach 199 of said belt 192. The upper bracket 194 is at that end of the panel toward which the upper reach 196 of the belt 192 moves.

When the motor 191 is rotated, the belt 192 causes the drive element 193 to engage the upper bracket 194, for example, thereby moving the panel rightwardly until the high bracket is beyond the end of the pulley 189. The panel 186 remains in this position until the drive element 193 moves leftwardly and engages the low bracket 197 whereupon it slowly moves the panel 186 leftwardly until the low bracket 197 is beyond the pulley 188. The panel remains in this position until the drive element 193 moves along the upper reach and again engages the high bracket 194 whereby the cycle is completed and can be repeated.

FIGURE 16 illustrates a display apparatus 206 in which the basic structure is similar to that disclosed in FIGURE 14. That is, a panel 207 is supported by the wheels 208 upon a track 209 which is integral with a side sheet 211. A pair of horizontally spaced, axially aligned pulleys 212 and 213, one of which is mounted upon the shaft of a motor 214, are rotatably supported upon the side sheet 211. A transverse drive element 216, which may be identical with the drive element 193 in FIGURE 14, is mounted upon the belt 217 for engaging the high and low brackets 218 and 219, respectively, which are mounted upon the panel 207. The brackets 218 and 219 may be substantially identical with the brackets 194 and 197, respectively, except that they are mounted adjacent to each other near the center of the upper edge of the panel 207. This arrangement permits the panel 207 to move approximately twice as far with the same center line distance between the pulleys 212 and 213 as exists between the pulleys 188 and 189 in FIGURE 14. However, without more, it does not provide for a material dwell between the movements of the panel 207 in opposite directions.

To provide such dwell, a timing device 221 (FIGURE 16) is connected to a pair of micro switches 222 and 223 which are mounted upon the side sheet 211 adjacent to the remote sides of the pulleys 212 and 213 so that said switches can be operated by the drive element 216 as it passes them. The micro switches 222 and 223 are preferably arranged so that they open the circuit to the motor 214 and, at the same time, initiate a timing period at the termination of which the motor 214 is again energized and the belt 217, hence the panel 207, is again moved. Obviously, by a proper selection of the timer 221, the dwell of the panel 207 in a display position at the end of its horizontal traverse can be accurately controlled and varied to suit the individual purposes.

Although certain, selected embodiments of the invention have been disclosed above in detail for illustrative purposes, it will be recognized that variations or modifications of such disclosure, which lie within the scope of the appended claims, are fully contemplated.

What is claimed is:

1. An apparatus for moving a display panel between two horizontally spaced positions, comprising: an elongated, horizontally disposed mounting structure, said mounting structure having an elongated track thereon; a vertical panel disposed below said track; a plurality of rotatable rollers mounted on the upper edge of said panel for rotation about horizontal axes extending transverse to said track, said rollers resting upon said track so that said panel is supported for movement lengthwise thereof; a pair of horizontally spaced, radially aligned circular members rotatably supported on said mounting structure above said track near the path of movement of said panel for rotation about substantially parallel axes; an endless element extending around said circular members, said element having a pair of reaches extending between said circular members and substantially parallel with said track; means connected to one of said circular members for effecting rotation thereof in one direction whereby said endless element is moved in said one direction through a closed path around said circular members and lengthwise of said mounting structure; a drive finger secured to and extending outwardly from said endless element; a pair of driven members mounted on the upper edge of said panel and extending upwardly therefrom, respectively, to positions adjacent the respective reaches of said endless member so that the drive finger as it moves through each of said reaches will engage one of said driven members and will thereby move said panel in one direction or the other along said track, said drive finger being disengaged from said driven members as it passes around said circular members so that the panel remains in a non-moving position for a period of time.

2. An apparatus as defined in claim 1 wherein said circular elements are rotatable about horizontal axes and said driven members partially surround the endless element and each have an open side so that they may pass over and beyond said circular members so that the drive finger becomes disengaged therefrom as it begins to pass around the circular members.

3. The structure of claim 1 wherein said circular members are a pair of pulleys rotatable about substantially horizontal axes; wherein said means for effecting rotation of said circular members is a motor; and including a timing device connected in series with said motor and a pair of switches controlling said timer and mounted upon said structure adjacent to said pulleys, said switches being operated by said drive finger for de-energizing said motor and initiating a timing operation by said timing device, at the termination of which said motor is energized.

4. An apparatus for moving a display panel between two horizontally spaced positions, comprising: an elongated, horizontally disposed mounting structure, said mounting structure having an elongated track thereon; a vertical panel disposed below said track; a plurality of rotatable rollers mounted on the upper edge of said panel for rotation about horizontal axes extending transverse to said track, said rollers resting upon said track so that said panel is supported for movement lengthwise thereof; a pair of horizontally spaced, radially aligned circular members rotatably supported on said mounting structure above said track near the path of movement of said panel for rotation about substantially parallel axes; an endless element extending around said circular members, said element having a pair of reaches extending between said circular members and substantially parallel with said track; means connected to one of said circular members for effecting rotation thereof in one direction whereby said

endless element is moved in said one direction through a closed path around said circular members and lengthwise of said mounting structure; a drive finger secured to and extending outwardly from said endless element; a pair of driven members mounted on the upper edge of said panel and extending upwardly therefrom, respectively, to positions adjacent the respective reaches of said endless member so that the drive finger as it moves through each of said reaches will engage one of said driven members and will thereby move said panel in one direction or the other along said track; cam means adjacent said reaches and engageably with said drive finger to disengage said drive finger from said driven members as said panel arrives into one of the spaced positions thereof, so that the panel remains stationary with respect to said mounting structure in said one spaced position for a period of time.

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