This invention relates generally to a side coiling articulated partition and to a drive mechanism therefor.

In the past side coiling partitions have often been difficult to maintain in alignment because of the tendency of the members forming the partition to separate which made the partition difficult to coil. Portions of this type in the past have also been difficult to coil because as the partitions were coiled the diameter of the coiled partition gradually increased and therefore increased the power required to rotate the coil at the same rate of speed. When the coil was rotated at the same rate of speed, the partition would be coiled much more rapidly towards the end of the coiling operation than at the beginning of the coiling operation which is objectionable.

In general, it is an object of the present invention to provide a side coiling articulated partition and drive mechanism therefor which overcomes the above mentioned disadvantages.

Another object of the invention is to provide a side coiling partition of the above character which is coiled and uncoiled at a constant speed.

Another object of the invention is to provide a self-coiling partition of the above character which can be either motor or hand operated.

Another object of the invention is to provide a partition of the above character which is constructed in such a manner as to prevent separation of the slats forming the partition.

Another object of the invention is to provide a partition of the above character which is adequately supported and guided throughout its path of travel.

Another object of the invention is to provide a drive mechanism of the above character which may be concealed.

Another object of the invention is to provide a partition and drive mechanism therefor of the above character which can be readily assembled, shipped and installed.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a front elevational view of a side coiling partition and drive mechanism therefor incorporating the present invention;

Figure 2 is a cross sectional view taken along the line 2—2 of Figure 1;

Figure 3 is an enlarged detail view of a portion of the side coiling partition shown in Figure 1;

Figure 4 is a cross sectional view taken along the line 4—4 of Figure 3;

Figure 5 is a cross sectional view taken along the line 5—5 of Figure 8;
The pins are arranged on the disc in a spiral commencing at a point in line with the recesses 54 on the hoops 53 and continuing in a number of rows to the outer end of the disc, the number of rows being determined by the length of the partition as hereinafter described. The pins are spaced diametrically of the disc a distance which is determined by the thickness of the slats in the partition.

A pin gear pinion 59 is adapted to engage the pins 57 and is splined on a shaft 61 for movement longitudinally of the shaft 61. The pin gear pinion consists of an intermediate member 62 which is provided with recesses 54 to accommodate the pins 51. Shrouds 64 and 66 are fixed to both sides of the intermediate member 62 by screws 67. The shrouds have diameters equal to the diameter of the intermediate member 62 to insure that the pin gear pinion 59 will follow the spiral arrangement of the pins 57.

One end of the shaft 61 is rotatably mounted in a bearing 69 which is carried by the channel member 71 fixed to the bearing block 72. The other end of the shaft 61 is rotatably mounted in a bearing pillow block 73 which is fixed to the bottom plate 17. A sprocket wheel 75 is mounted on the outer end of the shaft 61 and is driven by a chain 74 which in turn is driven by a sprocket wheel 76. Sprocket 76 is carried by a shaft 77 which is rotatably mounted in a mounting plate 78 which is fixed to the framework forming the coil box 12. The shaft 77 also carries an additional sprocket wheel 79 which drives a chain 81 which in turn drives a sprocket 82 fixed to the output shaft of a suitable rotating limit switch such as the one identified by number CR9441 manufactured by the General Electric Company. The limit switch 83 is fixed to a bedplate 84 which is mounted on the framework forming the coil box 12.

The shaft 77 is driven by a miter gear 86 which is fixed to the shaft 77 and which engages another miter gear 87. The miter gear 87 is splined on one end of an output shaft 88 of a gear reduction unit 69.

The gear reduction unit 89 consists of a part housing 91 which is fixed to the mounting plate 78 by suitable means such as the bolts 92. The output shaft 88 extends through the housing 91 and is engaged by a splined extension 94 of the miter gear 87 as shown particularly in Figure 9. The splined extension 94 is rotatably carried by suitable means such as roller bearings 96 mounted within the walls of the housing 91. A worm gear 97 is secured to the splined extension 94 between the bearings 96 and extends to a worm 94 keyed to an input shaft 95.

The input shaft is rotatably mounted in the housing 91 and is fixed to a sprocket 101 which engages a chain 102 which is driven by sprocket 103 and mounted on the output shaft of a gear motor 104. The gear motor 104 is mounted on the bedplate 84.

The other end of the output shaft 88 drives a cable drum 106. As shown in the drawing, the shaft 88 extends through a hub 107 and is rotatably mounted in the hub by bearings 108 and 109. A cylindrical member 111 has one end fixed to the hub 107 and has the other end fixed to a hub 112. The cylindrical member is provided with a plurality of cable threads 113 extending over a predetermined length of the cylindrical member 111 for a purpose hereinafter described.

A shaft tie head 114 is fixed to the shaft 88 by suitable means such as a pin 116 and is also fixed to one of the angle members 117. The end of a spring 117 is secured to the tie head 114 so that it will rotate with the tie head. The other end of the spring 117 is fastened to another shaft tie head 118 which is fixed to a shaft 119 by a pin 121. The shaft 119 extends through the hub 112 and is fixed to the hub 112 by a pin 122 so that the hub 112 and the cylindrical member 111 rotate with the shaft 119.

The outer end of the shaft 119 is provided with acme threads 123 which engage a nut 124 carried within a retainer bracket 126. The retaining bracket 126 serves to prevent rotation of the nut 124 and is fixed to a mounting bracket 127 which is carried by the framework forming the coil box 12.

The side coating partition 11 consists of a plurality of vertical slats 131 of suitable material such as wood. The slats 131 have a modified tongue and groove design as shown in Figure 4. The slats 131 are fastened to the hoops 53 so that the innermost slat is adjacent the recesses 54 by a plurality of cables 134 which extend through the slats and through holes 132 in the hoops 54 and have their ends fitted with clamps 133 which prevent the cables from pulling out of the holes. The ends of the cable 134 are fastened at 136 in the slat next to the outermost slat as shown in Figure 4. The two outer slats are mounted within a suitable U-shaped retaining member 137 of suitable material as aluminum. A meeting stile 138 is mounted on the outer surface of the retaining member 137. The meeting stile consists of a foam rubber central portion 139 and an outer covering 141 of suitable resilient material such as neoprene. The covering 141 is substantially U-shaped and has its extremities 142 secured to the retaining member 137.

Suitable means is provided for carrying and guiding the side in return position. Such means can take the form of a track 146 which consists of a pair of substantially Z-shaped members 147 spaced apart to provide a guide slot 148. The Z-shaped track members are fixed to the ceiling or ceiling member 151 by suitable means such as the threaded studs 152 which are mounted in the ceiling member 151 and provided with plates 153 which engage the track members 147. Spacer blocks 154 are provided which form a recess 155 for a purpose hereinafter described.

A shoe 156 is mounted on the top portion of each of the slats 131 and consists of spread apart portions 157 which fits over the top of the slat and are secured thereto by suitable means such as rivets 158 and a pressed together portion 159 upon which there is mounted a pair of rollers 161 of suitable material such as nylon and which are adapted to engage the track members 147 as shown. Suitable means is also provided for guiding the bottom of the articulated partition and consists of a bottom track 163. The bottom track is comprised of a pair of angle members 164 which are mounted on the top edges of a recess 166 rectangular in cross-section provided in the floor 167. A pair of plates 168 are mounted on the angle members 164 and are provided with depending nose portions 169 which are spaced apart a predetermined distance to provide a longitudinal slot or groove 170 in which the shoes 171 fixed to the bottom of the slats 131 may move.

The bottom shoes 171 are constructed in a manner similar to the top shoes 156 and are provided with spread apart portions 172 which are fixed to the slats 131 by rivets 173. The shoes 171 are also provided with a pressed together portion 174 which is adapted to ride in the groove 170 formed by the depending nose portions 169.

Suitable means is also provided in the side ceiling partition to maintain alignment of the slats and also to maintain the spacing between the slats. An elongate flexible member 176 of suitable material such as spring steel tape is provided near the top and bottom edges of the partition and each of the slats 131 are secured to the flexible member 176 to maintain the spacing between the slats. As shown particularly in Figure 11, the pressed together portions 174 and 159 of the bottom and top shoes are and secured to these pressed together portions by suitable means such as rivets 177.

Another embodiment of our invention is shown in Figures 11 and 12 in which an elongate flexible member 178 is mounted in slots 179 cut into the tops and bottoms of the slats 131. The flexible member 178 is normally
of such a width that it is between the two outer rivets 158 and 173 in the top and bottom shoes and is secured to the shoes and the slats by suitable means such as third rivets 159 and 174. Since the slats are actually secured to the elongate flexible member 176, it is readily apparent that the spacing between the slats will be maintained at all times even when the slats are rolled upon the barrel 13.

A cable 186 is provided for uncoiling the partition curtain from the coil box 12. The cable has its ends secured at points 187 and 188 on the cable drum 106. Since the cable 106 is provided with right handed cable threads, the lower end of the cable is secured to the lower portion of the cable threads and the other end of the cable is secured at the point 188 which is intermediate the ends of the cable threads. If the cable drum had been provided with left handed threads for rotation in an opposite direction, one end of the cable would be mounted at the top of the cable threads rather than at the bottom.

The cable 186 may be revected in any number of different ways to accomplish the uncoiling operation. However, one arrangement found to be particularly satisfactory is shown in the drawing in which the cables are reveted over pulleys 191 and 192 rotatable mounted on a plate 193 which is fixed to the framework of the coil box. The portion of the cable extending downwardly from the pulley 191 is reveted over another pulley 194 which is rotatably mounted on a bracket 195 which is fixed to the bottom plate 17. The cable then passes over a pulley 197 which is rotatably mounted on a bracket 198 also fixed to the bottom plate 17. The cable then extends out of the coil box through the opening 21 and into the recess 166 provided in the door 167. At the end of the recess 166, the cable passes over a lower idler 201 and then over a return pulley 202. The cable 186 then passes upwardly through an opening 203 provided between the two outer end slats 131 of the partition as shown particularly in Figure 4 and passes out of the upper end of the partition. The cable then passes over an upper return pulley 206 and through the recess 155 between the spacer blocks 154 through the opening 21 in the coil box and over a pulley 208 which is rotatably mounted on a bracket 209 fixed to the top plate 18. The cable then passes over a pulley 211 rotatably carried in the top plate 18 by a bracket 212 and then downwardly over the pulley 192 to the cable drum as hereinafter described.

Operation of our side coiling articulated partition and the drive mechanism therefor may now be briefly described as follows: Let it be assumed that the side coiling partition is in the position shown in Figure 1 and that the partition is being uncoiled to close the opening in which the partition is mounted. It is apparent that when the partition 11 moves to the right of the coil box 12 as shown in Figure 1 of the drawing, the cable drum 106 must rotate in a clockwise direction as viewed in Figure 1 in order to wrap the cable 186 on the drum. However, it should be pointed out that it is within the scope of this invention to provide a door which is uncoiled to the left from a coil box and in which case the cable drum 106 would be rotated in a counterclockwise direction.

As the cable drum 106 rotates in a clockwise direction, the cable 186 is wrapped onto the cable threads 113 provided on the cable drum. Wrapping of the cable on the cable drum pulls the cable over the various pulleys in the rewinding arrangement hereinafter described so that the outer margin of the door is pulled to the right as viewed in Figure 1 to gradually close the opening.

At the same time that the cable 186 is being wrapped on the cable drum 106, the cable drum 106 is moved downwardly to receive the cable and the barrel 13 is rotated downwardly 13 which is by regulating the rotation of the barrel 13, constant tension is maintained on the side coiling partition as it is moved inwardly and outwardly with respect to the coil box 12.

The cable drum 106 is driven by the gear motor 104. This is accomplished through the drive chain 102 which drives a sprocket 101 mounted on the input shaft of the gear reduction unit 89. The input shaft drives a worm 98 which drives a worm gear 97 which causes rotation of the output shaft 88. As described previously, the output shaft is rotatably mounted in a hub 107 and is fixed to a shaft tie head 114. The shaft tie head is connected to one end of the spring 117, the other end of which is connected to another tie head 118. The shaft tie head 118 is fixed to the shaft 119 which is fixed to the hub 112. Thus as the shaft 88 is rotated by the gear motor 104, the rotation of the shaft will be transmitted through the spring 117 to rotate the cable drum 106. The spring 117 serves to provide compensation to take care of inaccuracies in the machining of the threads 113 on the cable drum and the placement of the pins 57 on the pin wheel 41 and other inaccuracies in the gearing which may occur as hereinafter described.

As the shaft 119 is rotated, the outer portion of the shaft which is provided with the acme threads 123 engages the nut 124 and causes the cable drum to be moved downwardly a predetermined amount to ensure that the cable 186 will be properly wrapped into the threads provided on the outer surface of the cable drum 106. Thus as the ends of the cable are wrapped progressively upwardly on the threads provided on the cable drum, and it is for this reason that approximately one half of the cable drum is provided above each of the fastening points 187 and 188.

The downward movement of the cable drum 106 provided by the acme threads 123 is accompanied by the splined end of the shaft 88 which moves longitudinally with respect to the keyed extension 94 provided on the miter gear 87.

At the same time the cable drum 106 is being rotated, the pin gear or wheel 41 is also rotated. This is accomplished from the miter gear 87 which is splined on the shaft 88 and drives the miter gear 56 which in turn drives the sprocket 76, the chain 74 and the sprocket 73. The sprocket 73 drives the splined shaft 61. The splined shaft 61 drives the pin gear pinion 59 which is splined on the shaft 61. The pin gear pinion 59 engages the pins 57 on the pin wheel 41 and is moved longitudinally along the shaft 61 as the pin gear follows the spirally arranged pins 57.

The pin gear pinion 59 travels at a substantially continuous speed; however, it is readily apparent that when the pin gear pinion moves towards the outer periphery of the pin gear 41 the pin gear will be driven at a gradually decreasing speed or when the pin gear pinion is moved inwardly towards the center of the pin gear, the pin gear will be driven at a gradually increasing speed.

When the curtain or partition 11 is being drawn out of the coil box 12 by the cable 186 which is being wrapped on the cable drum 106 as hereinafter described, the pin gear pinion 59 will be following the pins 57 on the pin gear or wheel 41 and will move towards the center of the pin gear. When the partition is being pulled outwardly, the pin gear pinion 59 engaging the pin gear 41 serves to maintain the partition in tension so that it can be uncoiled readily and will travel smoothly in the upper and lower tracks.

Since the drum 106 is rotating at a substantially continuous speed, the cable 186 will be wrapped on the drum at a continuous rate to pull out the partition at a constant speed. The inner end of the partition or curtain is fastened to the barrel 13 and for that reason the outward movement of the partition is also controlled by the pin gear pinion 59. When the pin gear pinion 57 on the pin gear 41 in a spiral fashion, the pin gear takes care of the fact that the curtain or partition is being
unrolled from a coil continuously decreasing in diameter and for that reason serves to maintain the proper tension on the partition at all positions of the partition. Any minor decrease in diameter over the opening, the limit switch 83 is operated to turn off the gear motor 164.

Now let it be assumed that it is desired to remove the partition from the opening and to coil the partition into the coil box 12. The gear motor 164 is then reversed to commence coiling of the partition or partition onto the barrel. Upon rotation of the barrel 13, the curtain or partition is coiled onto the barrel in a substantially perfect spiral because of the spiral-shaped hoops 53. The hoops are formed in such a manner that they compensate for the thickness of the slats 131 forming the partition. The coiling of the partition is controlled by the pin gear 41 which is rotated at a gradually decreasing speed as the diameter of the coil on the barrel increases so that the partition is moved into the coil box at a constant speed. The pin gear pinion 59 moves outwardly gradually as it follows the spirally arranged pins 57 on the pin gear 41.

At the same time that the pin gear is being rotated, the cable 186 is being unwound from the cable drum 106. The cable is unwound at a constant predetermined rate so that the partition is maintained under proper tension at all times. The compensating spring 117 within the cable drum 106 serves to take care of any discrepancies created by the gearing connecting the pin gear 41 and the cable drum 106 so that the tension on the curtain is relatively constant.

As the cable is unwound from the cable drum 106, the cable drum is moved upwardly by the acme thread 123 in the same manner as it moved downwardly. Particular care must be taken so that the cable drum 106 is properly timed with the pin gear 41. As hereinbefore explained, the pin gear 41 is laid out so that the pins 57 form a spiral which corresponds exactly to the spiral formed by the partition or curtain when it is coiled on the barrel 13. In timing the pin gear, the pinion 59 is engaged with the pin gear in such a manner that the distance of the pin gear pinion from the axis of the barrel is equal to the distance the tangent slot of the partition is from the axis of the barrel. The tangent slot is the slot which has last been rolled onto the barrel. If this is true, any movement of the pin gear pinion will move the partition a linear distance equal to the total linear distance the pin gear pinion has moved the pin gear at the point of the engagement of the pin gear by the pin gear pinion.

When the partition is coiled onto the barrel 13, the limit switch 83 is again operated to stop the gear motor 164.

It is apparent from the foregoing that we have provided a side coiling articulated partition and drive mechanism therefor which has many advantages. The construction of the partition is such that it will always remain in alignment and the spacing between the slats will be maintained. The construction of the partition is also such that it may be readily rolled in and out of the coil box in a straight line. The drive mechanism for the partition is particularly advantageous in that the partition is coiled and uncoiled at a constant speed. During the coiling and uncoiling, the partition is maintained under tension to prevent binding of the upper and lower portions of the partition in the track. The apparatus is constructed in such a manner that the partition or curtain can be coiled onto the barrel within the coil box and the entire assembly shipped assembled within the coil box. Although only motor operation has been shown, it is readily apparent that the drive mechanism could be hand operated by providing an extension on the input shaft 99 of the reduction unit 99 which will accommodate a hand operated crank.

We claim:

1. In apparatus of the character described, enclosed framework having an elongate opening therein, a barrel rotatably mounted in said framework, an articulated partition having one end secured to said barrel and adapted to be coiled thereon through the opening in the framework, a drum rotatably mounted on said framework, flexible cable-like means secured between said drum and the free end of said partition, said cable-like means being adapted to be coiled on said drum and common operating means mounted within the framework and including motive means for rotating said drum and said barrel for coiling or uncoiling said partition at a substantially constant speed, said common operating means serving to maintain said partition under tension in all positions of said partition.

2. Apparatus as in claim 1 together with means for compensating for the inaccuracies in the timing between said cable drum and said barrel.

3. Apparatus as in claim 1 wherein said common operating means includes variable speed drive means operatively connected to said barrel and driven by said motive means.

4. In apparatus of the character described, a framework, a barrel rotatably mounted in said framework, an articulated partition having one end secured to said barrel and adapted to be coiled thereon, the partition having a substantially constant thickness so that as it is coiled onto the barrel, the diameter of the coil increases substantially, variable speed drive means secured to said barrel, a cable drum rotatably mounted on said framework, a flexible cable secured between said cable drum and the free end of said partition, said cable drum and variable speed drive means serving to coil or uncoil said partition at a substantially constant speed and also serving to maintain said partition under tension at all positions thereof.

5. Apparatus as in claim 4 together with means for compensating for inaccuracies in the timing between the rotation of said cable drum and the rotation of said barrel.

6. Apparatus as in claim 4 wherein said articulated partition is formed of a plurality of slats, a pair of flexible elongate strap-like members mounted in the opposite ends of said slats, said member being concealed in said slats, means for securing the ends of each of said slats to said flexible elongate members to maintain a predetermined spacing between the slats and shoe-like means mounted on each end of the slats and secured to the strap-like members.

7. In apparatus of the character described, a framework, a barrel rotatably mounted in said framework, a plurality of spiral hoops mounted on said barrel and spaced axially of the barrel, an articulated partition having one end secured to said hoops and adapted to be coiled thereon, the barrel being rotatable, the partition being of substantially thickness so that as it is coiled onto the barrel, the diameter of the coil increases substantially, a cable drum rotatably mounted on said framework, a flexible cable secured between said cable drum and the free end of said partition, variable speed drive means operatively connected to said cable drum and said variable speed drive means for said barrel for coiling or uncoiling said partition at a substantially constant speed, the par-
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In apparatus of the character described, a rotatable barrel, an articulated partition having one end secured to the barrel and adapted to be coiled thereon, the partition being of substantial thickness so that as it is coiled onto the barrel, the diameter of the coil increases substantially, variable speed drive means operatively connected to said barrel, a rotatable drum, a flexible elongate member connected between said drum and the free end of said partition, said flexible member being adapted to be wrapped onto said drum as the partition is uncoiled from the barrel, constant speed drive means operatively connected to the drum and common operating means for operating said constant speed drive means and said variable speed drive means to cause said partition to be coiled or uncoiled at a substantially constant speed.

10. Apparatus as in claim 9 together with means disposed within the drum for compensating for inaccuracies in timing between rotation of the drum and the rotation of the barrel.

11. Apparatus as in claim 9 wherein said variable speed drive means includes a pin gear which consists of a disc fixed to said barrel and a plurality of spirally arranged pins mounted on said disc and projecting outwardly from one side of the disc at right angles to the plane of the disc, a drive shaft, a pin gear pinion splined on said drive shaft and being adapted to engage said pins as it is rotated to cause rotation of the pin gear, said pin gear pinion being moved axially of the driving shaft as the pin gear is rotated.

12. In an apparatus of the character described, a rotatable barrel, an articulated partition having one end secured to the barrel and adapted to be coiled thereon, variable speed drive means operatively connected to said barrel, a rotatable drum, a flexible elongate member connected between said drum and the free end of said partition, said flexible member being adapted to be wrapped onto said drum as the partition is uncoiled from the barrel, constant speed drive means operatively connected to said drum and common operating means for operating said constant speed drive means and said variable speed drive means to cause said partition to be coiled or uncoiled at a substantially constant speed, said constant speed drive means including a shaft rotatably mounted in one end of said drum, an additional shaft affixed in the other end of said drum, said shafts being axially aligned with said drum, spring means connecting the shafts to compensate for inaccuracies in timing between the rotation of the drum and rotation of the barrel, a driving member splined on the shaft rotatably mounted in said one end of said drum, and a fixed threaded member threaded onto the additional shaft fixed to the other end of said drum, the threaded connection serving to move the drum and the first named and additional shafts axially as the drum is rotated by the driving member.

13. Apparatus as in claim 9 wherein said variable speed drive means, said constant speed drive means, and said common operating means and said barrel are mounted within an enclosed housing having an elongate opening therein and wherein the partition is coiled or uncoiled through said opening.

14. In an apparatus of the character described, a rotatable barrel, an articulated partition having one end secured to the barrel and adapted to be coiled thereon, the partition being of substantial thickness so that as it is coiled onto the barrel the diameter of the coil increases substantially, variable speed drive means operatively connected to said barrel, a rotatable drum, a flexible elongate member connected between said drum and the free end of said partition, said flexible member being adapted to be wrapped onto said drum as the partition is uncoiled from the barrel, constant speed drive means operatively connected to the drum and common operating means for operating said constant speed drive means and said variable speed drive means to cause said partition to be coiled or uncoiled at a substantially constant speed, said constant speed drive means including a shaft rotatably mounted in one end of said drum, an additional shaft fixed in the other end of said drum, said shafts being axially aligned with said drum, and spring means connecting the shafts to compensate for inaccuracies in timing between the rotation of the drum and rotation of the barrel.

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