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(54) IMPROVEMENTS IN AND RELATING TO A SUSPENSION SYSTEM FOR OPERABLE PARTITIONS

(71) We, HOUGH MANUFACTURING CORPORATION, a corporation organised under the laws of the State of Connecticut, United States of America, of 1027 South Jackson Street, Jamesville, Wisconsin, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a suspension system for operable partitions.

The term "operable partition" in the folding partition field has an established meaning in the industry, namely it means a movable wall in the sense that the wall is a series of discrete panels (as distinguished from an accoridian type partition) which are mounted for movement among a track . . . as by being suspended from an overhead track . . . between the point of use and a storage area that may be remote from the space to be subdivided.

Thereby, operable partitions are distinguished from those partitions employing so-called demountable panels which are not supported from or on a track, and which are physically separated from the room space ceiling and floor structure when they are to be moved between the point of storage and the point of use; such demountable partitions are ordinarily hand carried, or otherwise carried by the workers assembling them or disassembling them.

In operable partition arrangements intended for use in hotels, clubs, convention halls, and the like, for the temporary subdivision of a large room space into small rooms, it is usually required that the partition suspension arrangement provide for movement of the panels between the point of use and the storage area that is removed from the space being subdivided. This involves an overhead track arrangement that com-

monly includes right angled turns, crossover and right angle intersections, and the like. Panels for installations of this type are large and heavy, and they may have to be arranged acoustically for minimum sound transmission therethrough, which adds further to the weight of the individual panels.

Panels for operable partitions of this type are usually each separately supported from the track in unhinged relation and by a pair of carriers located adjacent either side edge of the respective panels. The individual panels are moved between points of storage and points of use by being moved in their planes along the track straight away, and around right angle or wide turns and across intersections as the track layout requires. Some installations require that as part of the storing of the panels, they be moved in a path that is perpendicular to their respective planes.

A significant problem with operable partition arrangements of this type is providing for ready moving of the panels along the track and through the track intersections, right angle turns, etc. One type of the prior art carrier employed for this purpose uses a trolley arrangement in which two pairs of wheels are provided in which the wheels of one pair are at right angles to the wheels of the other pair, and all the wheels operate about horizontal axes. Carriers of this type present the problem that at through intersections, the wheels drop into the track intersecting slots involved; since the individual panels are quite heavy, it is therefore difficult to move them through the intersection and about a right angle turn at the intersection.

Another type of prior art carrier is in the form of a glide disc or puck that is to slide along the track. The disc of the carrier is horizontally disposed so that it is supported between opposed co-planar track flanges between which the carrier support

member extends down to the panel for connection therewith. The glide disc cannot rotate as the carrier is moved, since the opposite edges of the guide disc slidably engage the opposed track flanges, so the operator has to contend with sliding friction in manoeuvring the panels, with the result that, since the panels of this type are so heavy, movement of same even along track straightaways is difficult and wearing on the carriers, track and operator.

In another disc type carrier arrangement, the disc is equipped with a number of bearing balls that are adapted to ride along the track. Experience has shown that the bearing balls of this type of carrier do not roll as intended, but rather slide along the track, due to friction forces acting between the individual balls and the carrier disc as the result of the weight suspended from the disc.

Another familiar difficulty with operable partitions of this general type is that extra equipment is required in connection with the track, such as the familiar crossover switches, pivot switches, and glide switches. Track curves, which materially add to the expense of the track, are also commonly required.

The principal object of this invention is to provide an operable partition suspension arrangement which permits both easy movement of the heavy panels along track straightaways and easy negotiation of track intersections, right angle and Y turns, and the like, without requiring any form of track switch.

According to the present invention there is provided an operable panel type top supported partition arrangement for temporarily subdividing room space including a plurality of discrete panels, an overhead track system from which said panels are suspended for movement between a storage position and selected wall forming positions within the room space, with the respective panels each being suspended from the track system by a pair of carrier supporting the panel adjacent the side edges of same, and with the track system defining one or more right angle turns and intersections over which the carriers of at least some of the respective panels are to move when being moved between said positions, said track system comprising a plurality of track sections assembled in end to end relation for transfer of the carriers therebetween for moving the panels between their said positions, each track section defining a trackway including a pair of vertically spaced rollerway defining ledges disposed one on either side of the respective track sections and an operating slot between said ledges along which the carriers supported by the respective track sections move when the panel supported thereby is moved along such track

section, and said ledges of the respective track sections each defining an upwardly facing load support surface, said carriers each comprising: a vertical support member disposed between said ledges of the track section supporting the respective carrier and defining a vertical axis extending longitudinally of same, means for anchoring the respective support member to the respective panel, the support member having coaxially journaled on same, in vertically spaced relation, and for rotation about said axis, a pair of horizontally disposed carrier discs, each of said carrier discs defining a downwardly facing load support surface, and with said surface of the upper of said discs of the respective carrier riding on said surface of the upper of said trackway ledges on one side of said operating slot and said surface of the lower of said discs of the respective carrier riding on said surface of the lower of said trackway ledges on the other side of said operating slot, said surfaces of said discs being of substantially identical frustoconical configuration at an angle relative to the horizontal, and said surfaces of said ledges having downward, oppositely directed angulation transversely of said track sections that complements the angulation of said disc surfaces, whereby said support member of each of said carriers is vertically suspended from the track section supporting same and said angulation of said surfaces effects a centering of said support member within said operating slot under the action of gravity, with said discs making a line type rolling contact with their respective ledge supporting surfaces, with said upper of said carrier discs being free of engagement with the trackway on the other side of said operating slot and the lower of said carrier discs being free of engagement with the trackway on said one side of said slot, whereby said discs roll in opposite directions on the respective ledge surfaces as the panel supported thereby is moved longitudinally of the trackway, said ledges underlying said discs in proportion to their radii for maintaining said carriers supported within the trackway when crossing the turns and intersections by engagement of said discs with said ledges, those of said track sections defining the right angle turns and intersections of the track system further defining, on said one side of said operating slot a masking ledge at the level of and opposing said lower trackway ledge thereof but spaced therefrom by said operating slot, said ledges at and across the right angle turns and intersections being disposed in close fitting guiding relation to the support members of the respective carriers up to the intersecting operating slots of the turns and intersections involved for maintaining same centered relative to the operating slots at the turns and intersections, said discs in passing through said

intersections tending to drop a perceptible amount when centered at the intersection, but being retained within the trackway, for providing an indication of their position therein, and the configuration of said disc and ledge surfaces and the rolling action of said discs along said ledges and across the turns and intersections permitting ready camming of the respective discs out of and away from such intersections and turns.

In order that the invention may be well understood, there will now be described an embodiment thereof, given by way of example only, reference being had to the accompanying drawings, in which:—

Figure 1 is a diagrammatic side elevational view of an operable partition arrangement of the individual panel operated type, showing several discrete operable panels suspended in accordance with an embodiment of this invention, with the track being shown in vertical section;

Figure 2 is a diagrammatic perspective view showing one of the panels as suspended in accordance with the same embodiment of this invention moving around a track right angle intersection;

Figure 3 is a diagrammatic vertical section through one of the panels illustrating more particularly the details of the track and carrier;

Figure 3A is a fragmental cross-sectional view taken substantially along line 3A-3A of Figure 3;

Figure 4 is an enlarged view of the sectional view showing of Figure 3 relative to the track and carrier, showing also the carrier discs in section;

Figure 5 is a plan view of an embodiment of track crossover intersection;

Figure 6 is a plan view of an embodiment of track right angle intersection; and

Figure 7 is a plan view of an embodiment of track right angle turn.

Reference numeral 10 generally indicates an embodiment of operable partition arrangement of the individual operated panel type, which comprises a plurality of partition panels 12 each suspended from a track 14 by a pair of carriers 16 connected adjacent the respective side edges 18 and 20 of the respective partition panels.

Referring to Figures 3 and 4, in accordance with this invention, the track 14 is formed to define on either side of same a pair of vertically spaced rollerway forming ledges 22 and 24, which are spaced apart horizontally to define between them an operating slot 26 along which the respective carriers 16 move.

The respective carriers 16 each comprise an upper load support disc 28 and a lower load support disc 30, with the discs 28 and 30 preferably, but not necessarily, being of identical construction; the discs 28 and 30

are coaxially journaled on a pendant bolt 32 that is suitably connected to the partition panel it supports.

The disc 28 is formed with a lower load support frusto-conical side surface 34 and the disc 30 is formed with a lower load frusto-conical support side surface 36. As shown in Figures 3 and 4, and particularly in Figure 4, the load support surface 34 rides on rollerway surface 38 of the upper ledge 22, while the load support surface 36 of the disc 30 rides on rollerway surface 40 of the lower ledge 24.

In the specific form of track shown, the ledge 22 is opposed by a guidance ledge 42, while the ledge 24 is opposed by guidance ledge 44. However, the ledges 42 and 44 serve no carrier support functions, as it is intended that the discs 28 and 30 be supported on the respective rollerway surfaces 38 and 40 so as to be spaced above the ledges 42 and 44, as clearly shown in Figure 4. Ledges 42 and 44 come into play at intersections and corners of the type shown in Figures 5-7, with the ledges 22, 24, 42 and 44 being formed for the close fitting relation with the carrier that is indicated in Figures 3 and 4 for guidance and centering purposes.

The result is that as the individual panels 12 are moved along the track 14, the discs 28 and 30 are in rolling engagement with rollerway surfaces 38 and 40 respectively. The discs 28 and 30 thus rotate in opposite directions about the pendant bolt 32 to provide a carrier track engaging arrangement that is essentially of the rolling friction type.

As indicated in Figures 3 and 4, the rolling disc or puck load support surfaces 34 and 36, and their corresponding rollerway surfaces 38 and 40, are angled in a complementary manner relative to the horizontal. This angulation is preferably of the order of 10 degrees, which seems to be most effective for load distribution and centering functions, and for effecting rotation of the carrier discs as the panel is moved down the track.

It is pointed out that it is immaterial which side of the track the respective rollerways 38 and 40 are on. Thus, in the showing of Figures 3 and 4, the ledge 22 could be in the place of ledge 42, and the ledge 24 could be in the place of ledge 44. In the specific embodiment illustrated, the ledges 22 and 24 are of somewhat thicker dimension than their opposing ledges 42 and 44, respectively to space the respective discs 28 and 30 above the respective ledges 42 and 44, but the same effect may be achieved by other suitable means, as by eliminating the angulation of the upwardly facing surfaces of the ledges 42 and 44.

In utilizing the invention, track having the cross-sectional configuration shown in

Figures 3 and 4, is applied to the building ceiling in one of the familiar flush or suspended mounting arrangements (a flush mounting arrangement is diagrammatically illustrated) with the track extending between the point of storage and point of use of the panels. In many installations for use in clubs, hotels, convention halls, and the like, it is desirable to have storage of the panels in remote locations so that the track, in addition to its usual straightaway portions, will include crossover intersections, right angle intersections, right angle turns, wide turns, and the like, as may be necessary due to the building construction involved to move the individual panels between point of storage and point of use.

In the showing of Figure 5, a track intersecting cross over assembly 50, is illustrated, while in Figure 6 a right angled track intersection of "tee" assembly 52 is illustrated. In Figure 7 a 90 degree corner or right angled turn assembly 54 is illustrated.

The assemblies 50, 52, and 54 have track ledges 22, 24, 42 and 44 formed in same which serve the same purposes described in connection with the showing of Figures 3 and 4. Of course, Y turns and other track equipment of this general type may be similarly formed as will now be apparent. The cooperation of the ledges 22, 24, 42 and 44, discs 28 and 30, and the carrier pendant bolt, that is indicated by the proportioning and close fitting relationships indicated in Figures 3 and 4 is especially important in providing ease of movement of carriers 16 across intersection and right angled turn assemblies.

The assemblies 50, 52 and 54 and others that may be required are assembled as part of the track 14, with the individual panels 12 suspended from the track by employing the carriers 16 that are illustrated. As is conventional with operable partitions of the type illustrated, the panels 12, are unhinged and the carrier 16 are applied to a panel and located adjacent their respective edges 18 and 20 of the respective panels.

Movement of the individual panels along the trackway 14 is easy as there is a rolling friction type engagement between the panel carrier discs 28 and 30 and the trackway. For instance, it has been found that with panels having a weight of 8 pounds per square foot, only a 4 pound thrust is required to start the panel moving, and after the panel is once moving, only a 2 pound thrust is required to keep it moving; the panel may be moved and kept moving by gently urging same in a forward direction adjacent the lower end of the panel, something not possible where the carriers make sliding engagement with their trackway.

The manner of moving the panels along track 14 for the individually operated type

panels will be immediately apparent; thus, panels 12 may be readily moved in their planes along track straightaways, and at track intersections or turns, the panels may be moved straight across the intersection, or manipulated to roll the leading and trailing carriers into the track sections that define the new direction of movement desired (as illustrated in Figure 2 in connection with the track crossover intersection there illustrated) with complete assurance that the carriers 16 will be fully supported and guided in moving through same, even through the geometry of the track at intersections and right angled turns widens the space that the rolling discs 28 and 30 operate in.

The trackway 14 as specifically illustrated is shown to be of the flush mounted type, but, of course, it will be immediately apparent that the principles of the invention are equally applicable to suspended mount type track applications.

In the form shown, the track along its straightaway may be in the form of lengths of a channel shaped member 60 disposed in end to end relation and defining a web portion 62 and spaced flange portions 64 and 66 that respectively are formed to define the respective ledges 22, 24, 42 and 44. The channel member 60 also defines the upwardly directed extensions 76 and 78 that define the upwardly facing abutment portions 80 and 82 against which the mounting channel member 84 is secured by a bolt 86 applied to an attachment plate 88 formed with a threaded opening 90 for threadedly receiving the bolt 86. The channel member 84 is an entirely conventional component formed with suitable openings to receive suspension bolts 92 and 93 that suspend the channel member 84 from the ceiling in an entirely conventional and well recognized manner.

The track flange portions 64 and 66 also each define a pair of upwardly directed projections 94 and 96, respectively, to which are applied in a conventional manner the respective trim pieces 98 and 100 that support suitable ceiling panels 102.

The track 14 may be formed from any suitable material, such as steel or aluminum or suitable alloys of same. In one embodiment of the invention a suitable aluminum alloy is employed and the track lengths are extruded to the transverse cross-sectional shape shown in Figures 3 and 4. In the form shown, the ledges 22 and 44 of the track flange portion 64 are defined by parallel cross flanges 106 and 108, while in the track flange portion 66, the ledges 42 and 24 are defined by cross flanges 110 and 112 which respectively oppose the respective cross flanges 106 and 108. Flanges 106 and 112 are proportioned so that the load bearing surfaces 34 of the disc 28 and 30

will be above the respective flanges 108 and 110 approximately 1/16th of an inch when the individual panels are suspended in their operating positions.

5 The crossover assembly 50 generally comprises a base plate 120 to which are suitably secured four short sections 122, 124, 126 and 128 of the trackway 14 that are suitably mitered as indicated at 130 for convergence
10 on the center line 132 of the intersection. The track sections 122, 124, 126 and 128 are secured to the base plate by employing attachment plates and bolts (not shown) similar to plate 88 and bolt 86 of Figures
15 3 and 4. Base plate 120 is, of course, suitably suspended in operating relation, as by bolts applied to its bolt holes 129. The attachment assembly 50 is not shown in Figure 2 as that figure is intended to be
20 a diagrammatic illustration only.

Of course, the straight sections 133 of track that are shown in broken lines in Figure 5 are arranged to have their ends 134 in close working relation to the squared
25 ends 136 of the sections 122, 124, 126 and 128, respectively.

In Figure 6, the right angle intersection assembly 52 comprises a base plate 140 to which are affixed a straight section 142 of the track 14 that is notched as at 144 to receive in right angled relation thereto short
30 track section 146. The adjacent straight track sections 148 have their respective ends 150 disposed in close adjacency to the respective ends 152 of the sections 142 and 146. Of course, base plate 140 is suitably
35 suspended to place the sections 142 and 146 in horizontal alignment with the straight track section 148, and track sections 142 and 146 are secured to the base plate 140 in the same manner as described with reference
40 to assembly 50.

In Figure 7, base plate 160 has affixed thereto track sections 162 and 164 which
45 have their ends 166 aligned with the adjacent ends 168 of straight track sections 170. Again, base plate 160 is suitably secured or mounted in place to place the sections 162 and 164 in alignment with the
50 straight track sections 170, and track sections 162 and 164 are secured to plate 160 in the same manner as described in connection with assembly 50.

In this connection, it is to be understood
55 that the intersecting and right angled turn assemblies shown in Figures 5-7 contemplate track transverse cross-sectional configurations comparable to those shown in Figures 3 and 4.

60 A further improvement that is indicated in Figures 5-7 is that it is not essential in constructing a particular track circuit to be sure that the flanges 22 and 24 of the intersecting track lengths involved be on the same
65 side of the track in adjacent lengths. For

instance, in the assembly 50 of Figure 5, while the track sections 124 and 128 are arranged so that their ledges 22 and 24 are aligned horizontally and are respectively on the same side of the track, the track sections
70 122 and 126 have their ledges 22 and 24 on the opposite sides of the track; the latter is also true with regard to the track sections involved in assemblies 52 and 54. The nature of the carrier discs or pucks 28 and
75 30 and the guidance of ledges 22, 24, 42 and 44 on carriers 16, as illustrated, is such that the carriers 16 readily transfer between track section lengths regardless of which side, on adjacent track lengths, the supporting track
80 ledges 22 and 24 are on.

It has also been found that with this invention, alignment of adjacent track ends is not especially critical as reasonably close adjacency and levelness will satisfy operating
85 requirements. Heretofore in suspending arrangements involving carriers of the disc type, the fitting together of track joints has been quite critical.

Referring now to the carriers 16, the discs
90 or pucks 28 and 30 are of identical construction and each comprises an annular body 180 shaped to define the load support surfaces 34 and 36, a cylindrical, or substantially cylindrical, rim surface 182, and a top
95 side surface 184 that has the same angulation as the load support surfaces 34 and 36 so that the surfaces 34 and 36 and 184 may be interchangeable. The disc body 180 is suitably recessed as at 186 on either side
100 of same to receive the respective thrust bearing units 188 that may be of any conventional design, but which in the form shown comprise a suitable housing 190 in which is seated races 192 and 196 between which
105 are interposed a plurality of bearing balls 194, all arranged in any convenient and conventional manner for thrust and radial bearing journaling purposes. The inner races of the bearing units 188 suitably receive the
110 shank 198 of the pendant bolt 32.

The discs 28 and 30 are separated by an annular guidance spacer ring 202, and below the lower disc 30 a second annular guidance spacer ring 204 is applied against which
115 nut 206 is drawn along the threaded portion 208 of bolt shank 198 to draw the spacers and discs together against the head 210 of the bolt 32. Nut 206 preferably is of a suitable self-locking type, although, of
120 course, any suitable way of locking the nut 206 in the desired operating position of the discs 28 and 30 may be employed.

While the discs or pucks 28 and 30 are preferably formed from nylon, Delrin (Registered Trade Mark), or some other equivalent plastics material having self lubricating characteristics, they also may be formed from steel. Spacers 202 and 204 may be formed from the same materials.
130

The angulation of the side surfaces 34, 36 and 184 of the discs or pucks is of the order of 10 degrees with respect to the horizontal (in the operating position of the discs, which would be 10 degrees relative to planes extending normal to the bolt shank 198), and the corresponding complementing angulation of rollerway surfaces 38 and 40, is preferred as this angulation has been found to work best from load distribution and load centering standpoints as well as achieving full rotation of the discs as the carrier moves down the track with minimum area of contact with the track. The angulation of the disc surfaces indicated, and the corresponding angulation of the track supporting ledges 22 and 24, also serve a useful locating function in the area of intersecting crossovers and right angle intersections as the discs tends to drop slightly, under gravity, due to the geometry of the parts involved (round discs bearing on quadrilateral, or partially quadrilateral truck intersections) when the discs become centered at the intersection, thus signaling their location to the individual moving the partition. The tapered configuration of the discs and the rolling action of same that is involved permits ready shifting of the individual carriers up and out of and away from the intersection by having the discs roll and be cammed out of the center of the intersection. The disc surfaces 34 and 36 have line type contact with the respective surfaces 38 and 40 for effective load transmittal purposes with minimum friction resisting movement.

The panels 12 may be constructed in the manner that is basically similar to that described in United States Patent 3,450,185, and thus each panel comprises a frame 230 comprising a top frame member 232, spaced side members 234 (which are indicated only diagrammatically in Figure 3), and a bottom frame member 238, with the top, bottom and side members being formed from extruded lengths of aluminum or the like.

The upper and lower frame members 232 and 238 in the form illustrated are of identical but inverted transverse cross-sectional configuration (and thus are reversible), and each is in the form of a channel-shaped element 240 defined by a central web portion 242 and spaced vertically disposed side flange portions 244 and 246. The flange portion 244 defines a protuberant projecting portion 250. Protuberant edge portion 248 defines a mounting slot 252 while the edge portion 250 defines a mounting slot 254. In the embodiment illustrated, there is operably associated with the respective frame members 232 and 238, in accordance with United States Patent No. 3,755,968, the respective upper and lower floating seal strips 260 and 262 which are identical. As disclosed in said Patent 3,755,968, the strips 260 and 262

each comprise a strip 264 that is proportioned to extend the length of the respective members 232 and 238 and defines a seating wall portion 266 formed with longitudinally extending edge portions 268 and 270 that are protuberant in nature and formed to interfit with the respective slots 252 and 254 of the respective members 232 and 238 in the manner indicated in Figure 3. The outwardly facing surfaces 272 of the ceiling wall portion 266 of the strips 260 and 262 are adapted to engage the surface to be sealed (that is, the ceiling or floor surface involved), while the other side surface 274 has extending from same a pair of sealing flaps or strip portions 276 and 278 that slidably engage the inside surfaces 280 and 282 of the channel member respective flange portions 244 and 246.

The frame members 232 and 238 are also each formed with an appendage or extension structure 284 and 286 on either side of same that extend laterally of the respective flange portions 244 and 246 and define the respective recesses 288 that receive the panel covers 290 in accordance with the disclosure of said United States Patent No. 3,450,185.

While the pendant bolts 32 of the respective carriers may be secured to the respective panels in any suitable manner, in the form shown, the upper seals 260 are suitably notched to receive the respective bolts 32, and the bolt 32 of each carrier 16 has its threaded shank portion 208 threadedly received in the upstanding internally threaded tube 300 that is suitably fixed to the panel frame member 232. In the form shown, the tube 300 has its lower end 302 affixed as by welding to a base plate 304 that is secured to the underside of the web 242 of the frame member 232, as by employing suitable bolts or screws 306, with the tube 300 extending upwardly through the web 242 through suitable hole 308 formed in same. Lock nut 310 threadedly received on the bolt shank portion 208 locks the pendant bolt 32 with respect to the tube 300 in the desired position of adjustment to properly position the panel relative to the track.

It is pointed out that, with regard to the panels 12, they may be of any suitable construction, and, of course, mechanical seals (which may be of the type disclosed in said United States Patent No. 3,450,185) or conventional sweep seals may be employed instead of the floating seal illustrated, with such seals being suitably notched or opened to accommodate securement of the carrier pendant bolts to the panel top frame member. Likewise, the pendant bolts 32 may be connected to the respective panels in any suitable manner, although that illustrated is convenient for the specific type of panel illustrated.

While the invention has been disclosed

in connection with individually operated panels, the invention is equally applicable to operable partitions of the type disclosed in said United States Patent 3,450,185, in which several of the panels are hinged together in folding relation, and the panels are suspended by a single carrier located at the mid portion of the panel. In such operable panel arrangements, the track 14 and carriers have the same structural features as those that have been described and illustrated. In this connection, it is pointed out that the track 14 and its slotway 26 (that the carrier pendant bolts operate in within the track 14), the discs 28 and 30, and spacer rings 202 and 204 are proportioned so that when lateral loads are applied to the panel, the roller rim surfaces 182 will bear and ride on the track inner vertical or upstanding wall surfaces 320 or 322 (the ledges 22 and 24, and 42 and 44 where present, being spaced apart sufficient to accommodate this), depending on which direction the lateral thrusts are acting in. Thus, the carrier discs continue to roll even under the application of lateral thrusts, such as might be experienced when hinged operable partitions are unfolded.

It is also pointed out that the ledges 42 and 44 of the track 14 may be eliminated in straight track sections insofar as the function of supporting the carriers 16 is concerned since they have no carrier load support functions, although it is assumed that in the illustrated embodiment, that ledges 42 and 44 are present in straight track sections as a manufacturing convenience. However, the lower ledge 44 is desirable from the standpoint of appearance (it thus forming a masking flange) and in providing a ceiling surface for the floating seal 260. Nevertheless, at track turns and intersections it is desirable to retain the ledges 42 and 44 as they serve important guiding and locating functions when the carriers cross the turn or intersection, as will now be made evident.

As will be apparent from Figures 3 and 4 of the drawings, the inwardly projecting edges of the opposed pairs of ledges 22 and 42, and 24 and 44, are in closely spaced, or close fitting relation, to the carrier pendant bolt 32, and in the form illustrated, with respect to its spacer rings 202 and 204, and from the nature of the shaping of the parts shown in Figures 3 and 4, the locating and guiding functions referred to involves physical contact cooperation between the respective pairs of ledges 22 and 42, and 24 and 44, and the respective spacer rings 202 and 204, as well as the shaping of the carrier disc surfaces 34 and 36 and the cooperating ledge surfaces 38 and 40, in locating a carrier relative to its supporting ledges 22 and 24 at turns and intersections, so that the

discs 28 and 30 of the respective carrier 16 remain properly centered relative to the operating slot 26, whereby the discs 28 and 30 properly move across the intersection or turn. As indicated by Figures 5-7, at intersections and right angled corners the geometric shapes involved in the track result in one or both of the track vertical wall surfaces 320 and 322 of the intersecting track sections involved being void across the intersection (compare Figures 2, 5, 6 and 7) between the mitered corners that are necessarily involved at track intersections and right angled turns for the surfaces (as indicated by the showing in Figures 2 and 5-7). The diagonal spacings involved, for instance, between such corners of the track surfaces 320 and 322 of the track sections forming, for instance, assemblies 50, 52, and 54 that necessarily exist at intersections and right angled turns (see Figures 2 and 5-7) result in the roller or disc rim surfaces 182 being overly spaced from the track inner upstanding wall surfaces 320 and 322 so that lacking guiding co-operation of the respective pairs of ledges 22 and 42, and 24 and 44 with the carrier, and specifically with its spacer rings 202 and 204 (in the embodiment illustrated) at intersections and right angled turns, the carrier 16 may otherwise shift sufficiently out of the desired central alignment shown in Figures 3 and 4 (relative to the operating slot 26) to make difficult transfer of the carrier 16 over the intersection or turn, and between intersecting operating slots 26, and even result in jamming or dislodgement of the carrier. The close fitting relation between the opposed pairs of ledges 22 and 42, and 24 and 44, relative to the carrier pendant bolt 32 that is shown in the drawings thus places them for guiding relation to, and guiding contact with, the respective spacer rings 202 and 204 when the carrier 16 moves across portions of the trackway, such as at intersections and turns, where one or both of the track walls defining surfaces 320 and 322 is void (by the nature of the intersection or turn geometry involved), and surfaces 320 and 322 are thus not present to restrain lateral shifting of the carrier relative to the operating slot 26 that may be involved. Ledges 22, 24, 42 and 44 thus maintain the desired operating width of slot 26 across the intersections and turns where the track surfaces 320 and 322 are not present for engagement by the discs to serve this function, thus insuring proper centering of the individual carriers as they cross intersections and turns. This proportioning of ledges 22, 24, 42 and 44 also brings the inwardly directed edges of these ledges sufficiently close together and under the respective discs 28 and 30 so that the discs 28 and 30 remain sup-

ported by the mitered portions of the ledges 22 and 24 at intersections and right angled turns, even though, as has been indicated, the discs 28 and 30, and thus the individual carriers, tend to drop slightly (under gravity) when centered at the intersection, again due to the geometric shapes involved (round discs 28 and 30 centered on and bearing against corner portions of ledges 22 and 24 defining a quadrilateral (see Figure 5) or partially quadrilateral (see Figure 6) openings at the mid point of the intersection involved. In the showing of Figures 3 and 4, the inwardly projecting edges of the opposed pairs of ledges 22 and 42, and 24 and 44, extend under the respective discs 28 and 30 at a distance that exceeds one-half the radius of the circumference of the respective discs 28 and 30. It is preferred that such ledges 22, 24, and 42 and 44 project under the discs 28 and 30 at a distance that at least equals one-half the radius of the respective discs; in any event, a projection of the flanges 22, 24, 42 and 44 under the discs 28 and 30 of the distance of one-fourth the radius of the discs or less may result in the diagonal spacing of the ledge corners at intersections exceeding the diameter of the discs 28 and 30, with the result that the carrier 16 would drop out of the track through the intersection.

Thus the opposed pairs of ledges 22, 42 and 24 and 44 are present at intersections and right angled turns, and have the close fitting relation to the carrier pendant bolt, and the underlying relation to the carrier discs that has been indicated.

It will therefore be seen that the described arrangement provides a panel suspension arrangement for operable partitions which ensures that the panels can be moved under relatively easy rolling friction conditions, and which permits the panels to be moved around turns and through intersections without requiring use of switches of any kind. The suspension system permits the use of any desired type of seal, whether of the sweep, floating, or mechanical type, and the basic transverse cross-sectional shape of the track is the same for all track sections whether straightaways or at intersections or turns. Furthermore, the same basic track section may be employed for curved track where curved track is otherwise desired, although track curves are not essential.

The carriers 16, in addition to providing a full rolling friction type support for the panels under both vertical and lateral loads, are of simplified construction requiring no separate frame as such, since the pendant bolt also journals the carrier rolling discs or pucks.

With the construction described, only rolling friction is involved in moving the panels along the track.

The arrangement is readily adapted for tracks of both the recessed or dropped ceiling type, that provides for a simplified track and carrier arrangement of few and simple parts, and is economical of manufacture, convenient to install and use, and long lived in operation.

WHAT WE CLAIM IS:—

1. An operable panel type top supported partition arrangement for temporarily subdividing room space including a plurality of discrete panels, an overhead track system from which said panels are suspended for movement between a storage position and selected wall forming positions within the room space, with the respective panels each being suspended from the track system by a pair of carriers supporting the panel adjacent the side edges of same, and with the track system defining one or more right angle turns and intersections over which the carriers of at least some of the respective panels are to move when being moved between said positions, said track system comprising a plurality of track sections assembled in end-to-end relation for transfer of the carriers therebetween for moving the panels between their said positions, each track section defining a trackway including a pair of vertically spaced rollerway defining ledges disposed one on either side of the respective track sections and an operating slot between said ledges along which the carriers supported by the respective track sections move when the panel supported thereby is moved along such track section, and said ledges of the respective track sections each defining an upwardly facing load support surface, said carriers each comprising: a vertical support member disposed between said ledges of the track section supporting the respective carrier and defining a vertical axis extending longitudinally of same, means for anchoring the respective support member to the respective panel, the support member having coaxially journaled on same, in vertically spaced relation, and for rotation about said axis, a pair of horizontally disposed carrier discs, each of said carrier discs defining a downwardly facing load support surface, and with said surface of the upper of said discs of the respective carrier riding on said surface of the upper of said trackway ledges on one side of said operating slot and said surface of the lower of said discs of the respective carrier riding on said surface of the lower of said trackway ledges on the other side of said operating slot, said surfaces of said discs being of substantially identical frusto-conical configuration at an angle relative to the horizontal, and said surfaces of said ledges having downward, oppositely directed angulation transversely of said track sections that complements the angulation of

ported by the mitered portions of the ledges 22 and 24 at intersections and right angled turns, even though, as has been indicated, the discs 28 and 30, and thus the individual carriers, tend to drop slightly (under gravity) when centered at the intersection, again due to the geometric shapes involved (round discs 28 and 30 centered on and bearing against corner portions of ledges 22 and 24 defining a quadrilateral (see Figure 5) or partially quadrilateral (see Figure 6) openings at the mid point of the intersection involved. In the showing of Figures 3 and 4, the inwardly projecting edges of the opposed pairs of ledges 22 and 42, and 24 and 44, extend under the respective discs 28 and 30 at a distance that exceeds one-half the radius of the circumference of the respective discs 28 and 30. It is preferred that such ledges 22, 24, and 42 and 44 project under the discs 28 and 30 at a distance that at least equals one-half the radius of the respective discs; in any event, a projection of the flanges 22, 24, 42 and 44 under the discs 28 and 30 of the distance of one-fourth the radius of the discs or less may result in the diagonal spacing of the ledge corners at intersections exceeding the diameter of the discs 28 and 30, with the result that the carrier 16 would drop out of the track through the intersection.

Thus the opposed pairs of ledges 22, 42 and 24 and 44 are present at intersections and right angled turns, and have the close fitting relation to the carrier pendant bolt, and the underlying relation to the carrier discs that has been indicated.

It will therefore be seen that the described arrangement provides a panel suspension arrangement for operable partitions which ensures that the panels can be moved under relatively easy rolling friction conditions, and which permits the panels to be moved around turns and through intersections without requiring use of switches of any kind. The suspension system permits the use of any desired type of seal, whether of the sweep, floating, or mechanical type, and the basic transverse cross-sectional shape of the track is the same for all track sections whether straightaways or at intersections or turns. Furthermore, the same basic track section may be employed for curved track where curved track is otherwise desired, although track curves are not essential.

The carriers 16, in addition to providing a full rolling friction type support for the panels under both vertical and lateral loads, are of simplified construction requiring no separate frame as such, since the pendant bolt also journals the carrier rolling discs or pucks.

With the construction described, only rolling friction is involved in moving the panels along the track.

The arrangement is readily adapted for tracks of both the recessed or dropped ceiling type, that provides for a simplified track and carrier arrangement of few and simple parts, and is economical of manufacture, 70 convenient to install and use, and long lived in operation.

WHAT WE CLAIM IS:—

1. An operable panel type top supported partition arrangement for temporarily subdividing room space including a plurality of discrete panels, an overhead track system from which said panels are suspended for movement between a storage position and selected wall forming positions within the room space, with the respective panels each being suspended from the track system by a pair of carriers supporting the panel adjacent the side edges of same, and with the track system defining one or more right angle turns and intersections over which the carriers of at least some of the respective panels are to move when being moved between said positions, said track system comprising a plurality of track sections assembled in end-to-end relation for transfer of the carriers therebetween for moving the panels between their said positions, each track section defining a trackway including a pair of vertically spaced rollerway defining ledges disposed one on either side of the respective track sections and an operating slot between said ledges along which the carriers supported by the respective track sections move when the panel supported thereby is moved along such track section, and said ledges of the respective track sections each defining an upwardly facing load support surface, said carriers each comprising: a vertical support member disposed between said ledges of the track section supporting the respective carrier and defining a vertical axis extending longitudinally of same, means for anchoring the respective support member to the respective panel, the support member having coaxially journaled on same, in vertically spaced relation, and for rotation about said axis, a pair of horizontally disposed carrier discs, each of said carrier discs defining a downwardly facing load support surface, and with said surface of the upper of said discs of the respective carrier riding on said surface of the upper of said trackway ledges on one side of said operating slot and said surface of the lower of said discs of the respective carrier riding on said surface of the lower of said trackway ledges on the other side of said operating slot, said surfaces of said discs being of substantially identical frusto-conical configuration at an angle relative to the horizontal, and said surfaces of said ledges having downward, oppositely directed angulation transversely of said track sections that complements the angulation of



said disc surfaces; whereby said support member of each of said carriers is vertically suspended from the track section supporting same and said angulation of said surfaces effects a centering of said support member within said operating slot under the action of gravity, with said discs making a line type rolling contact with their respective ledge supporting surfaces, with said upper of said carrier discs being free of engagement with the trackway on the other side of said operating slot and the lower of said carrier discs being free of engagement with the trackway on said one side of said slot, whereby said discs roll in opposite directions on the respective ledge surfaces as the panel supported thereby is moved longitudinally of the trackway, said ledges underlying said discs in proportion to their radii for maintaining said carriers supported within the trackway when crossing the turns and intersections by engagement of said discs with said ledges, those of said track sections defining the right angle turns and intersections of the track system further defining on said one side of said operating slot a masking ledge at the level of and opposing said lower trackway ledge thereof but spaced therefrom by said operating slot, said ledges at and across the right angle turns and intersections being disposed in close fitting guiding relation to the support members of the respective carriers up to the intersecting operating slots of the turns and intersections involved for maintaining same centered relative to the operating slots at the turns and intersections, said discs in passing through said intersections tending to drop a perceptible amount when centered at the intersection, but being retained within the trackway for providing an indication of their position therein, and the configuration of said disc and ledge surfaces and the rolling action of said discs along said ledges and across the turns and intersections permitting ready camming of the respective discs out of and away from such intersections and turns.

2. The arrangement set forth in claim 1 wherein said angulation of said disc and ledge surfaces is of the order of 10 degrees.

3. The arrangement set forth in claim 1 or claim 2, wherein said discs define a cylindrical rim portion, said ledges of the respective track sections merge into a vertical trackway wall at their outer margins, said ledges of the respective track sections are spaced apart to permit said roller rim portions to ride on the respective vertical

trackway walls on application of forces to the respective panels acting laterally thereof at locations spaced from intersections of said operating slot at the turns and intersections.

4. The arrangement set forth in any of the preceding claims, wherein said carrier support members each include a guide element interposed between the masking ledge and said lower trackway ledge adapted to be engaged thereby on passing of the carrier through the turns and intersections.

5. The arrangement set forth in claim 4 including a guide ledge on said other side of the operating slot spaced from and opposing said upper trackway ledge by said operating slot, said carrier support members each including a second guide element interposed between said guide ledge and said upper trackway ledge adapted to be engaged thereby on passing of the carrier through the turns and intersections, said masking and guide ledges extending the lengths of said track sections.

6. The arrangement set forth in any of the preceding claims, wherein in at least some of said track sections, said upper and lower rollerway defining ledges are at opposite sides of the trackway from the location of said upper and lower rollerway defining ledges in others of said track sections.

7. The arrangement set forth in any of the preceding claims, wherein said ledges underlie said discs a distance that equals at least one half the radius of said discs.

8. The arrangement set forth in any of the preceding claims, wherein said discs are journaled on the respective support members by thrust bearings, and wherein said support members each comprise a pendant bolt, and including means for clamping said thrust bearings and guide elements together.

9. The arrangement set forth in any of the preceding claims, including seal means interposed between said panels and the underside of said trackway section lower ledges for sound deadening purposes.

10. The arrangement set forth in any of the preceding claims, including seal means carried by said panels at their lower ends for sound deadening purposes.

11. An operable panel type top supported partition arrangement, substantially as herein described with reference to the accompanying drawings.

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