

[54] PINLESS HINGE

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 860,373, Sept. 23, 1969, abandoned.

[52] U.S. Cl.16/178

[51] Int. Cl.E05d 1/04

[58] Field of Search.....16/178, 171, 172, 175, 179; 160/235

[56] References Cited

UNITED STATES PATENTS

2,641,018 6/1953 Snyder160/235

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[57] ABSTRACT

A pinless hinge wherein a spirally configured hollow receiver has engaged therein an arcuate engaging member which is movable along and in the spiral hollow of the receiver for relative swinging movement between the receiver and engaging member. The pinless hinge includes a plurality of limit stops, one of which receives most of the load thereby minimizing damage to the other limit stops which serve functions in addition to this stopping. A plurality of beads is located in the relative path of movement between the receiver and engaging member to improve the fit therebetween eliminating play. The receiver may be constructed in any of several shapes to simultaneously engage a plurality of engaging members.

8 Claims, 14 Drawing Figures

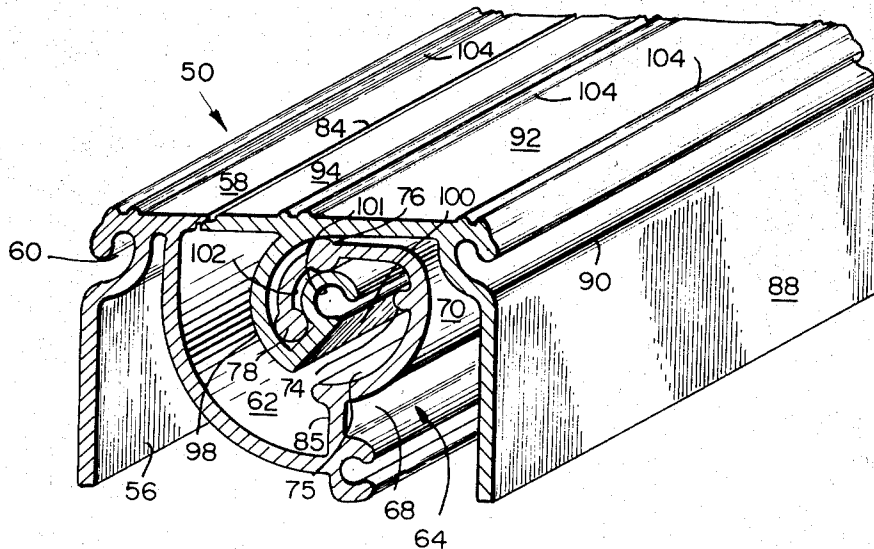


FIG. 1

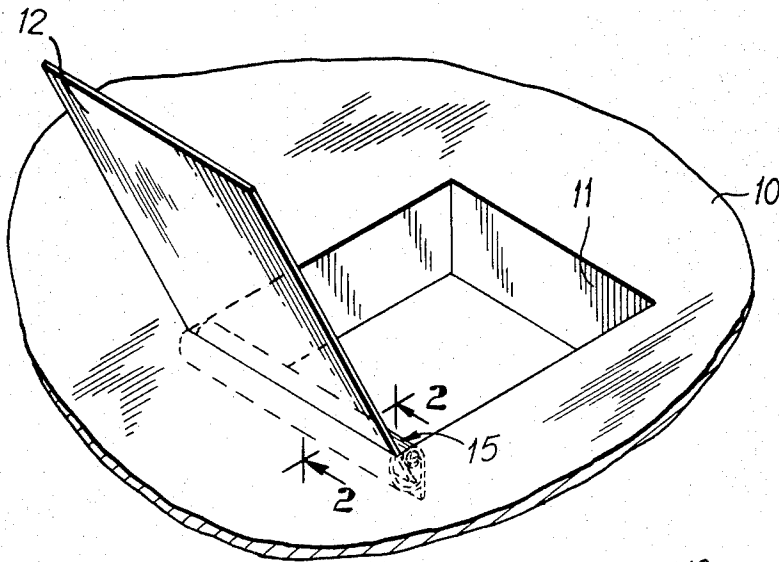


FIG. 2

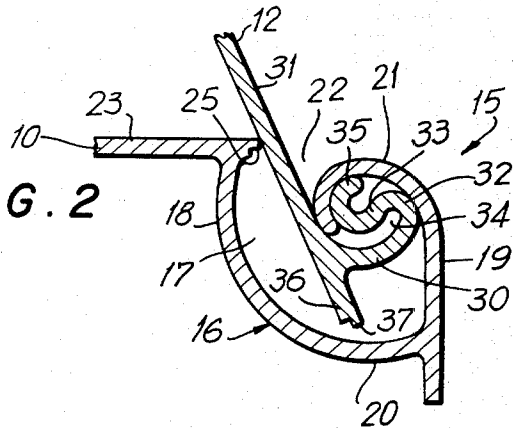
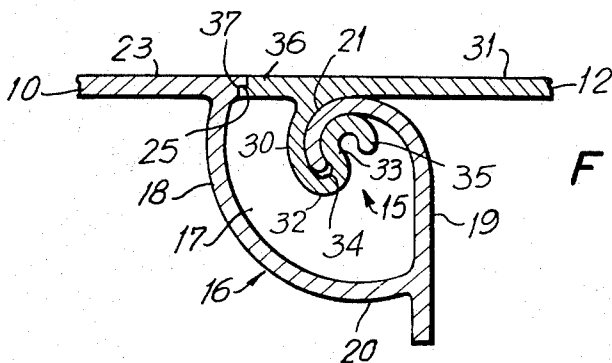


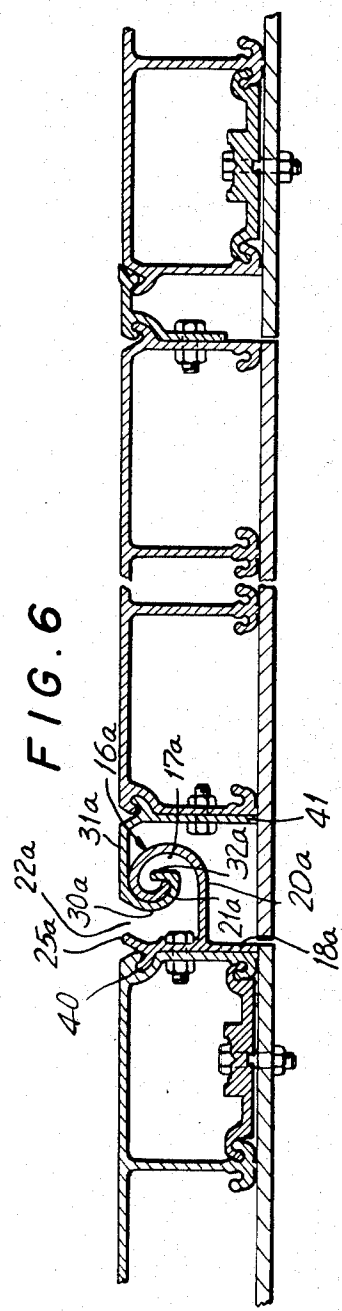
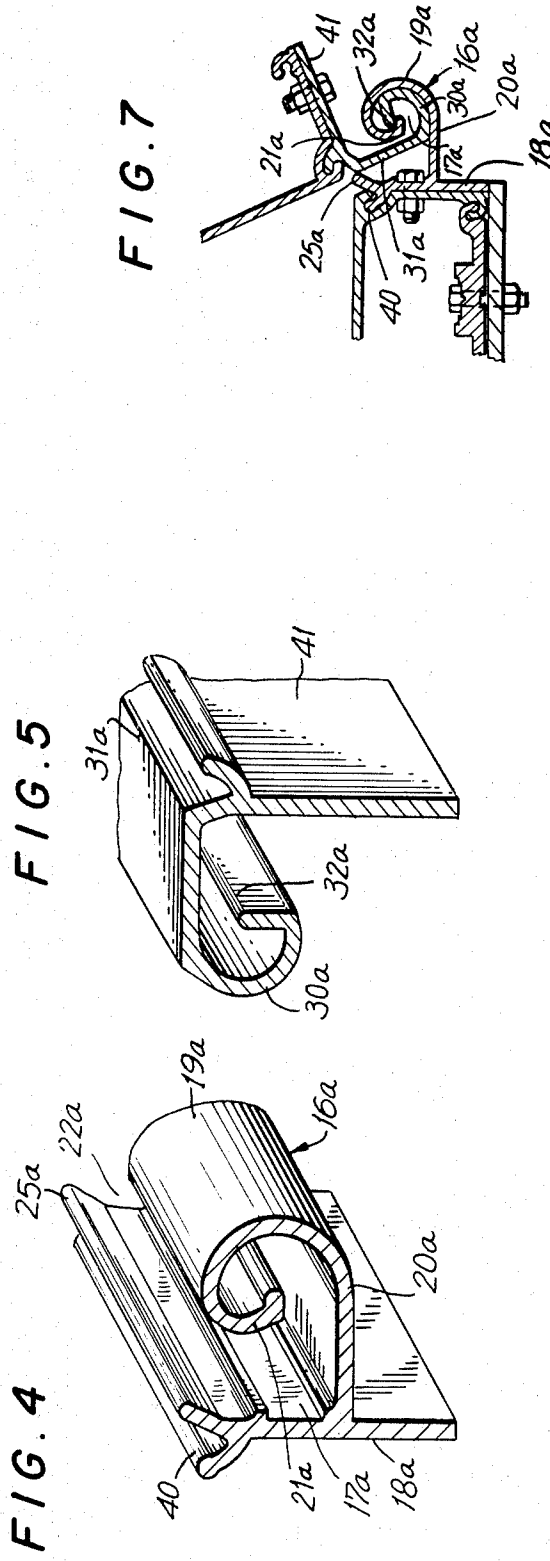
FIG. 3



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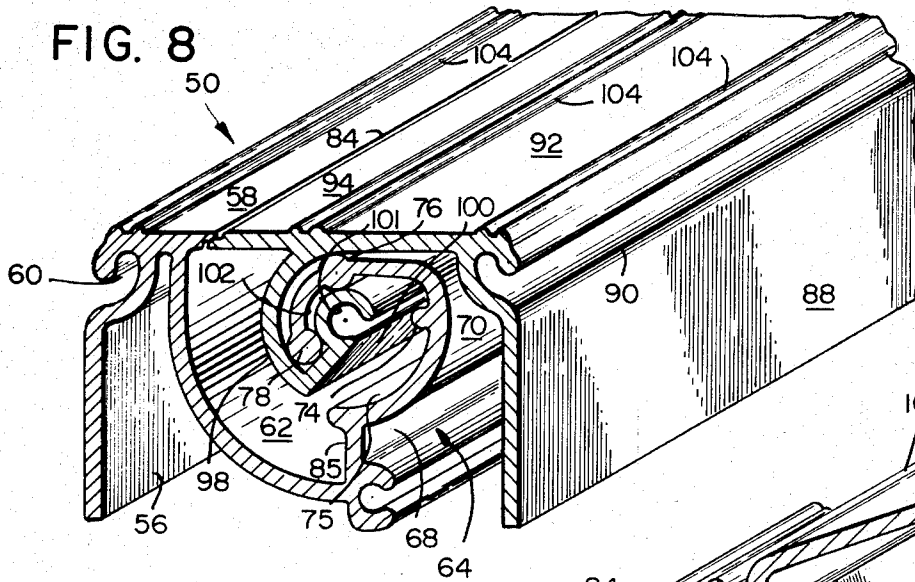


FIG. 9

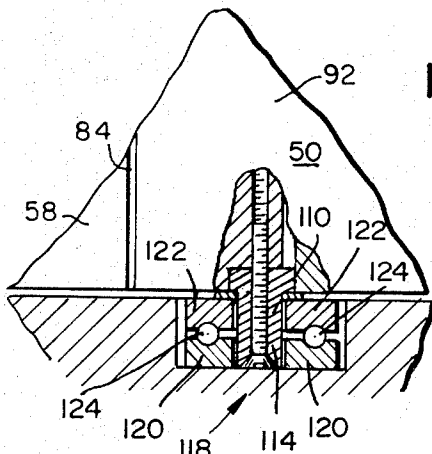
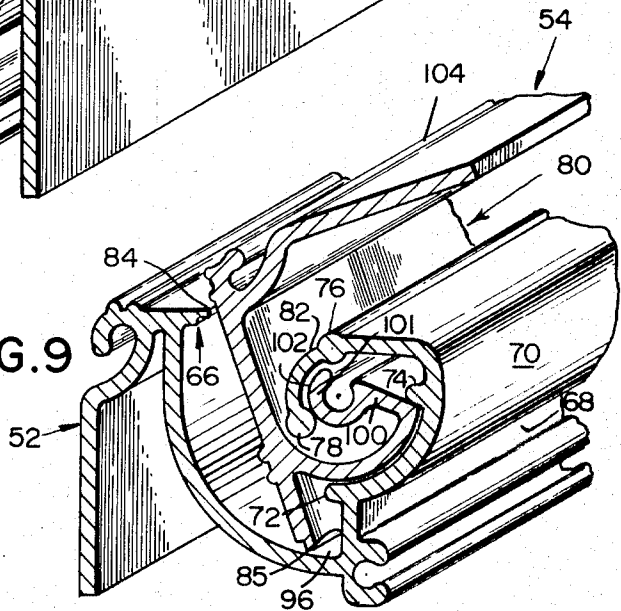


FIG. 11

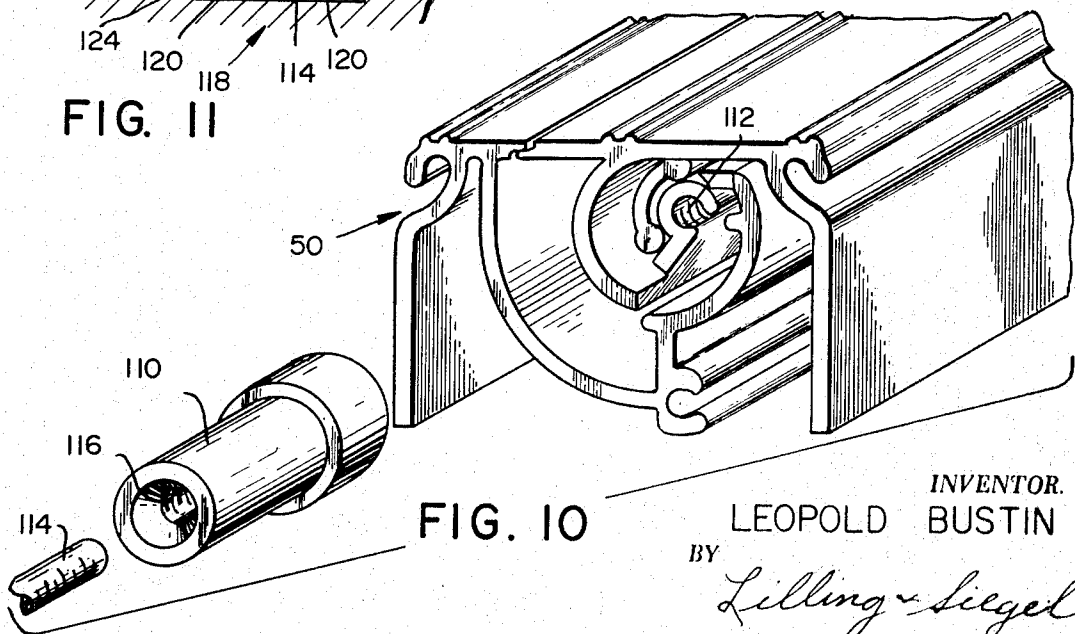


FIG. 10

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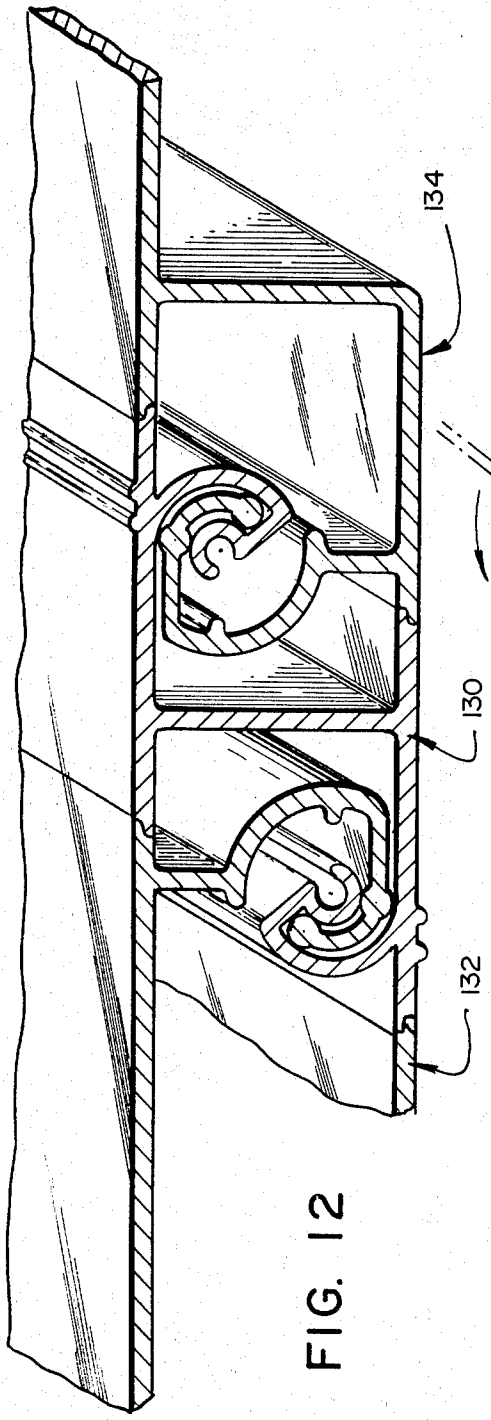


FIG. 12

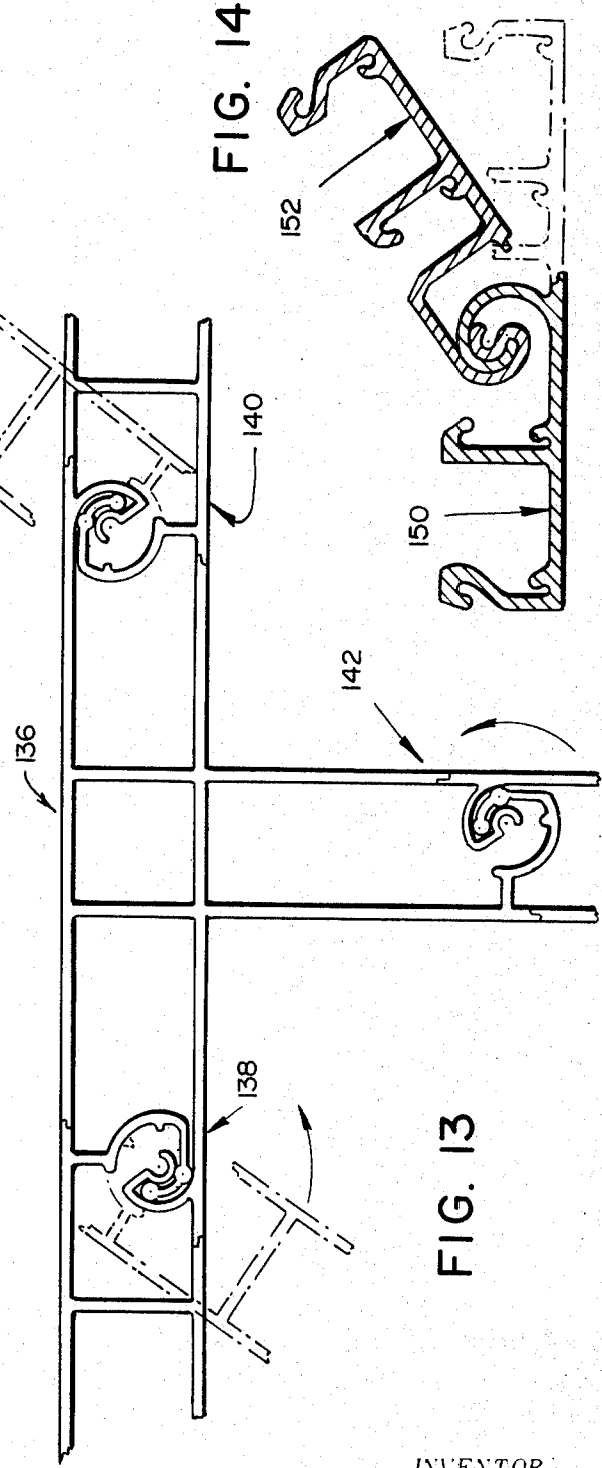


FIG. 14

FIG. 13

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PINLESS HINGE**CROSS-REFERENCES TO RELATED APPLICATIONS**

The instant application relates to improvements in PINLESS HINGES, such as may be employed in the structures disclosed in my copending patent application Ser. No. 773,395 entitled INTERLOCKING CHANNEL SECTIONS FOR USE IN THE CONSTRUCTION OF FLOORS, CEILINGS, WALLS AND THE LIKE now U.S. Pat. No. 3,595,468. In addition, the instant application is a continuation-in-part of my prior application entitled PINLESS HINGES, having patent application Ser. No. 860,373, filed Sept. 23, 1969 now abandoned.

BACKGROUND OF THE INVENTION

While there have been proposed various pinless hinge constructions in the past, such constructions have not been free from difficulty, and have therefore not found wide acceptance. For example, prior pinless hinges have been relatively expensive to manufacture, and subject to relatively rapid wear, resulting in unreliable operation in use.

Prior pinless hinges generally are limited in nature and in use and, therefore, are not commonly employed in such applications as conveyor belts, rolling doors, escalators, hanging access doors and the like. Further, such prior art pinless hinges are complex in nature and relatively difficult to install, thus impeding their utilization.

Accordingly, it is an important object of the present invention to provide a pinless hinge construction which overcomes the above-mentioned difficulties, is extremely simple in structure, capable of economic manufacture and installation, and which is durable and reliable throughout a long useful life.

It is another object of the present invention to provide a pinless hinge construction having the advantageous characteristics mentioned in the preceding paragraph, which is well adapted for use on any type of door or hatch cover, and may be employed where considerable weight is involved, as by the simple use of a thrust bearing to eliminate wear on the hinge parts. Conversely, the hinge construction of the instant invention is equally well suited for use in conjunction with escape hatches through ceilings, permitting the ceiling and hatch to remain flush when the hatch is closed.

It is another object of the present invention to provide a pinless hinge construction of the type described which is capable of many varied applications, including conveyor belts, rolling doors, vertical and horizontal escalators, hanging access doors, inspection hatches, emergency exits, trap doors, and many other construction applications wherein swinging movement through approximately 110° is adequate.

It is still another object of the present invention to provide a pinless hinge construction of the type described which is capable of quick and easy installation at a minimum of cost, adapted to be fabricated in substantial length by extrusion for effecting economies in manufacture while permitting hinges of any desired length.

It is still a further object of the present invention to provide a pinless hinge construction wherein provision is made for employing pins, rods, pinless or the like, if desired for special applications.

It is still another object of the present invention to provide a pinless hinge which substantially minimizes and eliminates play between the cooperating pivoting members.

It is still a further object of the present invention to provide a pinless hinge which eliminates damage to the hinge, normally occasioned when the frame of the hinge serves as a limit stop.

Still another object of the present invention is to provide a pinless hinge including simultaneously a receiver suitable for use with a plurality of engaging members.

Yet a further object of the present invention is to provide a pinless hinge which is outwardly opening and especially suited for emergency exits and roof trap doors.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, the above objects are accomplished by providing a pinless hinge comprising a hollow receiver of substantially spiral configuration to define therein a spirally configured hollow, an arcuate engaging member adapted to engage in said spiral hollow and movable therealong while simultaneously rotating relative to the receiver. The pinless hinge is suitable for use with a thrust bearing such as may be found with large and heavy doors. The receiver is provided with a plurality of beads to minimize play while a door or the like is rotated.

It may be appreciated that the hinge of the present invention substantially eliminates the problems found with prior art pin hinges and pinless hinges. These advantages and features will be more fully understood by referring to the following description.

IN THE DRAWINGS

FIG. 1 is a partial perspective view illustrating a hatchway and hatch cover constructed in accordance with the teachings of the present invention.

FIG. 2 is a fragmentary sectional view, greatly enlarged for detail, taken generally along the line 2-2 of FIG. 1.

FIG. 3 is a sectional view similar to FIG. 2, but showing the hatch cover of FIG. 1 in a closed position.

FIG. 4 is a partial perspective view illustrating a slightly modified hinge element in accordance with the teachings of the instant invention.

FIG. 5 is a partial perspective view illustrating another modified hinge element for use in conjunction with the element of FIG. 4.

FIG. 6 is a sectional view illustrating the hinge elements of FIGS. 4 and 5 in a wall construction.

FIG. 7 is a partial sectional view similar to FIG. 6, but showing the hinge elements in another position of relative swinging movement.

FIG. 8 is a partial perspective view of another embodiment of the pinless hinge of the present invention shown in the closed position.

FIG. 9 is a perspective view similar to FIG. 8 showing the pinless hinge in an open position.

FIG. 10 is an exploded view of the pinless hinge of the present invention illustrating a hollowed out end portion suitable for use with a thrust bearing support.

FIG. 11 is a fragmentary side sectional view showing the pinless hinge and thrust bearing arrangement.

FIG. 12 is a partial perspective view of the pinless hinge of the present invention which simultaneously engages two engaging members.

FIG. 13 is a side view of the pinless hinge of the present invention which simultaneously engages three engaging members.

FIG. 14 is an end sectional view of another arrangement of a pinless hinge which is outwardly opening.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the drawings, and specifically to FIG. 1 thereof, a wall or deck is there generally designated 10, and provided with a through opening or hatchway 11. A hatch or hatch cover 12 is interposed in the opening 11, and hingedly mounted therein, as by the pinless hinge means 15 of the present invention.

Referring now in greater detail to the hinge means 15, as best seen in FIGS. 2 and 3, the hinge includes a receiver hinge element, generally designated 16, which is of an overall spiral configuration, as viewed endwise or in cross-section. That is, the hinge element of receiver 16 may be considered as generally of a planar spiral configuration, thereby providing an interior hollow 17, which is also of spiral configuration. Considered in greater detail, the receiver 16 includes a pair of laterally spaced, facing side walls 18 and 19, connected together at their lower regions by a bottom wall 20. One side wall 19 may extend arcuately inwardly and downwardly, as at 21, through an arc of approximately 180° terminating in a medial region of the receiver 17, the arcuate inwardly and downwardly extending receiver wall portion 21 combining with the remaining receiver walls 18, 20 and 19 to define the spirally configured hollow 17 of the receiver 16. The receiver hollow 17 opens upwardly, as at 22, and a hinge plate 23 may extend from the upper region of receiver side wall 18 away from the hollow opening 22. In practice, the hinge plate 23 may be integral with the wall 10. Extending from the hinge plate 23 or upper edge of the receiver wall 18, into or partially across the opening 22 of spiral hollow 17, is a stop member or abutment 25.

In addition to the receiver 16, the hinge construction 15 includes an engaging member 30 of arcuate configuration and engaging into the spiral hollow 17 of the receiver. The engaging member 30 is of a curvature or radius similar to that of the receiver portion 21, having an angular extent of roughly 100°, merging at one end into a generally flat hinge plate 31, which may be integral with the hatch cover or closure 12. The arcuate engaging member 30, at its end remote from the hinge plate 31, is radially inwardly reversely bent, as at 32, and there provided with an arcuate extension 33 located in conforming, radially inwardly spaced relation with respect to the arcuate engaging member 30. That is, the arcuate engaging member 30 and its radially inwardly spaced extension 33 may be generally parallel, or have their centers of curvature approximately coincident, so as to define therebetween an arcuate passageway 34 terminating at the reverse bend 32. The arcuate passageway 34 is configured to conformably and slidably receive the arcuately extending

receiver portion 21, so that the engaging member 30, its extension 33, and the hinge plate 31 are all positively constrained to a swinging movement relative to the receiver 16.

Further, the arcuate extension 33 is provided with a arcuately continuous terminal portion 35, which combines with the arcuate extension to define an angular extent of approximately 340°. Thus, the terminal portion 35 terminates approximately 15 or 20 angular degrees from the arcuate extension 33 and combines therewith to define an open loop or eye, as for possible reception of a pivot pin, threaded fastener, or the like.

In addition, the hinge plate 31 is provided with a projection 36 projecting in the opposite direction from the hinge plate 31 beyond the engaging member 30, and is provided on its distal end with an abutment or stop 37 configured for limiting engagement with the abutment 35 as in the position of FIG. 3. That is, the engaging member 30 and its arcuate extension 33 are constrained to sliding movement along the arcuate receiver portion 21 between the limiting positions of FIGS. 2 and 3, the latter position being defined by engagement between abutments 25 and 37, wherein the hinge plates 23 and 31 may be substantially flush.

Referring now to the embodiment shown in FIGS. 4-7, a receiver is there generally designated 16a, including spaced side walls 18a and 19a connected together by a bottom wall 20a. The side wall 19a includes an arcuately extending portion 21a which curves inwardly and downwardly into the receiver 16a, combining with the receiver walls 18a, 20a and 19a to form a spiral configuration which defines therewithin a spirally configured hollow 17a. The receiver 16a may have its wall 18a provided with an abutment 25a extending into the opening 22a of the spiral passageway 17a; and may be further provided with a formation 40 for interfitting engagement with sections constructed in accordance with said copending patent application.

An arcuate engaging member is designated 30a in FIG. 5, including an extension on one end designated 31a, and provided on its other end with an inturned abutment portion or stop 32a. Extending from the plate portion 31a may be a wall section 41 of the type described in said copending patent application.

In the assembly of FIGS. 6 and 7, the arcuate engaging member 30a is engaged in the spiral hollow 17a of the receiver 16a and there movable along the spiral receiver for relative swinging movement between the receiver and engaging member, as exemplified by the extreme positions of FIGS. 6 and 7.

In FIG. 6 it will be apparent that the arcuate engaging member 30a has been swung to a limiting position with its terminal or stop portion 32a in limiting abutting engagement with the end of the arcuate receiver portion 21a. In this condition, the hinge parts may be considered closed, while in the condition of FIG. 7 the engaging member 30a has been moved along the arcuate hollow 17a and simultaneously rotated or swung relative to the receiver 16a to a limiting position with the inturned stop portion 32a engaging the terminal receiver portion 21a, and the hinge plate 31a abutting the abutment 25a.

Another embodiment of the present invention is illustrated in FIGS. 8-13 with the hinge, itself, illustrated in FIGS. 8-10. The hinge means 50 includes a receiver

hinge element 52 and a cooperating engaging member 54. These two elements are adapted to rotatably fit together with one of the elements such as the receiver being attached to a stationary wall or the like, while the other is attached to a swinging or rotating door, or the like.

When the two cooperating members are closed, a U-shaped assembly is formed and an angle of approximately 155° is formed in the open position. Each of the members will be described hereinafter.

The receiver, which is an integral piece, is provided with a planar side edge or surface 56 which is integral with a top edge or surface 58 and terminates at the top edge in a downwardly extending groove 60, or the like. The side edge 56 may be fastened to a stationary wall fixing the receiving member to the wall. The groove 60, which is not essential to the present invention, is adapted to fit with a cooperating mating interlocking section (not shown) such as is shown in my aforementioned patent application entitled INTERLOCKING CHANNEL SECTIONS FOR USE IN THE CONSTRUCTION OF FLOORS, CEILINGS, WALLS AND THE LIKE. Therefore, the side edge 56 could be planar and terminate at approximately a 90° angle with the top surface 58.

A downwardly extending outwardly curved cantilevered intermediate member 62, which is integral with the top surface 58 terminates in an upwardly protruding segment, generally indicated as 64. The curvature of intermediate member 62 serves as a guide for the rotating motion of the cooperating members which will be more fully described below. The curved member 62, at its upper end, terminates in an outward step or ridge 66 at the top surface 58 of receiver 52.

The protruding segment, which is integral with the curved member, includes the essential members of the receiver to achieve the desired rotating action between the cooperating members. The bottom of the curved member 62 terminates in an oppositely facing upwardly extending wall member 68. The wall member 68 terminates in and serves as the base for a substantially C-shaped hollow member 70. An inwardly extending lip or ridge 72 is formed at the intersection of the top of the wall segment 68 and the bottom of the C-shaped member 70. The lip serves to guide the engaging member in a manner more particularly described below.

An inwardly projecting member 74 which depends inwardly from the inner rear surface 75 of the C-shaped member 70 serves as a limit stop for the engaging member. A first bead member 76 is formed at the front top surface or edge of the C-shaped member while a second bead member 78 is formed at the upper side of the downwardly extending mouth portion 79 of the C-shaped member. These beads serve to minimize play between the receiving and engaging members and provide for a tighter fit when these cooperating members are rotated. This lack of play is realized especially when the present hinge is used with heavy doors and the like.

The top surface of the receiver member is open, as at 80, with the opening or gap 80 formed between the top 82 of the C-shaped member and an outwardly extending flange portion 84 of the top surface 58. This gap enables the engaging member to rotate in the receiver, while the flange 84 serves as a limit stop as the hinge is

opened. This limit stop may be an auxiliary stop with limit stop 74 serving as the main limit stop. A third limit stop is formed at the inner surfaces 85 of wall member 68 abutting a portion of the movable engaging member.

The engaging member 54 is also an integral assembly and is generally L-shaped with a downwardly projecting engaging section 86. Engaging member 54 is provided with a downwardly extending side edge or surface 88 which is substantially parallel to side edge 56 of receiver 52 when the hinge is in its closed position. The side edge 88 also terminates at its top edge in a downwardly extending groove 90 which cooperates with an interlocking mating section (not shown) as described above with reference to groove 60 of side edge 56. The engaging member 54 is also provided with a relatively flat top surface or edge 92 which is integral with side edge 88. The top edge 92 extends outwardly from the side edge 88 and has a protruding or overhanging flange portion 94 rounded at its innermost tip 96. The projecting engaging section 86 has an inwardly bent or curved member 98, which has the same radius of curvature of the facing C-shaped member 70 of the receiver. The projecting section 86 terminates in an inwardly upwardly extending cantilevered portion 100, which itself terminates in a hollow C-shaped tip 101 conforming in shape to the facing upper leg 102 of the C-shaped member 70.

A plurality of ribs or ridges 104 are provided at the top surfaces of the receiving or engaging members. These ribs prevent slippage when the hinge is used as an element in a floor. Additionally, structural support may be provided by such ribs or ridges.

The hinge means of the present invention may be in a closed position as seen in FIG. 8 or in an open position as seen in FIG. 9. The upper leg 106 of the C-shaped member 70 of the receiver fits between projecting curved member 98 and C-shaped tip 101. The area between the leg 106 and projecting curved member forms a spiral hollow portion of the receiver with the engaging member being engaged in this hollow. As the cooperating members are rotated, the C-shaped tip 101 of the engaging member bears against and slides along the first and second beads 76 and 78 of the receiver. These beads provide for minimum play between the cooperating elements during the movement of the cooperating hinge members, and project into the spiral hollow.

Flange 84 of top surface 58 of receiver 52 abuts against the top of top surface 92 when the engaging member is opened. Similarly, overhanging flange 94 of the top surface 92 of the engaging member 54 abuts against the inner surface 85 of wall member 68 of upwardly protruding segment 64, while projection 74 abuts against the upwardly extending cantilevered section 100. These three limit stops may be arranged with either serving as the primary stop, although preferably, projection 74, which projects into the spiral hollow of receiver 52, serves as the main limit stop because of the structural considerations described above.

FIGS. 10 and 11 illustrate one application of the present pinless hinge utilized to support a relatively heavy door providing a heavy axial load on the hinge. In order to secure a thrust bearing support 110 to one end of the pinless hinge, the central axial portion of the hinge is recessed. In particular, C-shaped tip 101 and

its facing upper leg 102 of C-shaped member 70 of receiver 54 are each recessed to an equal depth permitting the cylindrical bearing support 110 to be inserted into the end of the hinge. The inner surface 112 of C-shaped tip 101 is threaded. After the thrust bearing is set in place into the recessed axial segment, a suitable threaded screw or bolt 114 is inserted through an axial bore 116 of bearing support 110 to engage the threaded surface 112. As illustrated in FIG. 11, the hinge is used to support a vertically extending door or the like which is rotated by means of a thrust bearing 118. Thrust bearing assembly 118 is provided with a bottom fixed race 120 and an upper rotating race 122 separated by a thrust bearing 124. Use of a thrust bearing member with a relatively heavy load such as a door minimizes wear on the cooperating elements and is well-suited for the sturdy hinge of the present invention.

In accordance with another feature of the present invention, the receiver member may include a plurality of receiver segments, each capable of simultaneously engaging a respective cooperating engaging member. In particular, and as shown in FIG. 12, the receiver may be a common post 130 having back-to-back pinless hinge assemblies, 132 and 134. This back-to-back assembly may be suitable for a back-to-back door arrangement or the like. The operative elements in the pinless hinge are those described with reference to FIGS. 8 and 9, although those elements described previously with reference to FIGS. 1-6 may also be utilized. An alternate arrangement for the common post receiver member is illustrated in FIG. 13, where a T-shaped configuration 136 is formed having three receiver elements, 138, 140 and 142, respectively, capable of simultaneously engaging respective engaging members. Other configurations may be utilized, such as a cross configuration with the receiver serving as the common post and engaging a plurality of respective engaging members.

FIG. 14 illustrates another embodiment of the present invention in which the pinless hinge previously described is capable of opening in an outward fashion which is suitable for use with ceiling access doors and escape hatches. In particular, the receiver 150 and engaging member 152 have their cooperating elements reversed as compared with the prior described hinge arrangements. This reversal of parts, especially in the spiral hollow axial region of the hinge, permits a reversal of movement enabling it to be outwardly opening.

From the foregoing, it is seen that the present invention provides a pinless hinge construction which fully accomplishes its intended objects, being admirably well suited for economic manufacture and assembly from

extruded components of any desired length, and which is otherwise well adapted to meet practical conditions of manufacture, installation and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention.

What is claimed is:

1. An improved pinless hinge construction comprising, in combination: first and second longitudinally extending members adapted to be slipped together axially to form said pinless hinge; said first member comprising at least one substantially planer portion and a hollow receiver portion extending therefrom of substantially arcuate configuration; said second member comprising at least one substantially planer portion, a substantially arcuate portion extending therefrom, and an engaging portion substantially of arcuate configuration and extending from said arcuate portion; a plurality of bead means disposed between said hollow receiver portion of said first member and said engaging portion of said second member for minimizing play and providing a smooth rotatable fit between said hollow receiver portion and said engaging portion; and limit stop means limiting the rotational movement of said first member.

2. An improved hinge according to claim 1, wherein said bead means are integrally formed with said engaging portion.

3. The improved hinge according to claim 1, wherein said limit stop means is integrally formed with said engaging portion.

4. The improved hinge according to claim 3, wherein a secondary limit stop means is provided between said substantially arcuate portion and said engaging portion and is adapted for limiting the movement of a longitudinal edge of said planer portion of said first member.

5. The improved hinge according to claim 4, wherein a further limit stop means is provided by an edge formed at about the intersection of said planer portion and said substantially arcuate portion of said second member.

6. The improved hinge according to claim 2, wherein one of said bead means is disposed at the distal end of said engaging portion.

7. The improved hinge according to claim 2, wherein said bead means comprising ribs disposed on diametrically opposite sides of said engaging member.

8. The improved hinge according to claim 7, wherein said ribs extend longitudinally for the entire length of said second member.

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