

PATENT SPECIFICATION (11)

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(54) HINGE AND LINK DEVICE FOR DOORS, PARTITIONS AND THE LIKE

(71) I, ANTHONY CHARLES WORRALLO, of 15, Sprott Road, Auckland 5, New Zealand, British Subject, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to hinge structures. According to the present invention there is provided a hinge structure comprising a first hinge component including a gear segment and a base element, a second hinge component including a gear segment and a base element, the segments meshing with one another, and a link pivotally connected to each gear segment, the axes of the gear segments co-inciding with the axes of the pivotal connections between the link and the gear segments, said base elements being of elongated form, and the gear segments having formations for engagement with corresponding formations of the base elements, each gear segment being mounted on the respective base element by inter-engaging the formations of the respective base element and gear segment and sliding the gear segment on to the base element in the direction of the length of the base element.

In a preferred construction form, each gear segment includes a radial spoke in which there is formed a bore co-incident with the axis of the gear segment, said bore receiving an element which forms the means for pivotally connecting said link to that gear segment. Each element can be a pin which is push-fit in said bore or can be a screw.

For better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:—

Figure 1 is a pictorial view of a hinge structure,

Figure 2 is a plan view of a base element,

Figure 3 is a plan view of a gear segment,

Figure 4 is a plan view of a spacer,

Figure 5 is a plan view of an end cap, and

Figure 6 illustrates various modes of use of the hinge structure.

The hinge structure shown in Figure 1 comprises two identical hinge components each referenced 10. Each hinge component comprises a base element 12, two gear segments 14, a spacer 16 and two end caps 18. Two links 20 (only the upper of which is visible) and four pins 22 (only the upper two of which are shown) join the hinge components 10 to one another.

The base element 12 (Figure 2) is in the form of a length of aluminium extrusion of generally H-shape. Edge portions 24 provide mountings for the end caps 18 and further edge portions 26 provide mountings for the segments 14 and the spacer 16. This will be described in more detail hereinafter. Semi-circular portions of the extrusion define bores 28 which receive screws 30 (Figure 1) to secure the end caps 18 in position. The screws 30 may be of the self-tapping type.

The gear segment 14 shown in Figure 3 comprises a curved portion 32 which has axially elongated teeth 34 on the outer face thereof. A diametrically extending spoke 36 is integral with the portion 32, the spoke joining the portion 32 mid-way between its ends. The free end of the spoke 36 is vee-shaped so as to provide two lips 38 which engage behind the edge portions 26 to locate the gear segment 14 in place. At the centre about which the portion 32 is generated there is an axial bore 40 which is open along one side. By reference to the position of this bore it will clearly be seen that the portion 32 is somewhat greater than semicircular in extent.

The spoke 36 can be elongated in the axial direction so that the length thereof in this direction is equal to the length of the portion 32 in the same direction. Alternatively, the spoke can be relatively short in the axial direction and only be provided at the upper ends of the upper segments 14 and at the lower ends of the lower segments 14. The former construction is preferred as it is mechanically stronger.

Each spacer 16 is approximately D-shaped having a substantially semi-circular portion 42 and two limbs 44. The limbs terminate adjacent one another and along their free edges are formed with lips 46 which engage behind the edge portions 26. Semi-circular recesses 46.1 are formed in the facing surfaces of the lips 46. These permit a screw or other element to be driven-in to force the lips apart so as to enhance the frictional engagement between the edge portions 26 and the lips. This inhibits axial movement of each spacer 16. Hence each spacer 16 has an arcuate face, the arcuate faces of the spacers being in mutual contact.

The end cap 18 as illustrated in Figure 5 has screw holes 48 which receive the screws 30. Legs 50 protrude from one face of the end cap 18 and each leg is T-shaped in section. The 'upright' of the 'T' fits between the edge portions 24 and the 'cross-bar' of the 'T' fits behind these edge portions. The dimensions of the legs 50 and of the base element 12 are such that the caps are push-fits in the ends of the base element. The screws 30 which pass through the bores 48 and into the bore 28 provide security against the end caps accidentally being detached from the base elements. In view of the fact that the end caps are push-fits sufficient security against accidental removal of the end caps can usually be provided by means of a single screw 30.

The hinge components 10 are secured together by the upper and lower links 20. Each end of each link 20 is secured to one of the components 10 by one of the pins 22. The pins 22 pass through apertures in the links and into the axial bores 40. As will clearly be seen in Figure 1, the teeth 34 of the two upper segments 14 mesh as do the teeth of the lower segments. It will be understood that the axes of the pivotal connections between the links and the segments co-incide with the axes about which the portions 32 are generated.

The hinge structure illustrated can be used for a wide variety of purposes. For example, it can be employed to mount doors on supporting door posts or to connect together adjacent doors of a folding door structure. It can also be used to mount lids such as box lids and panels such as swing-down front panels of cabinets. Where, for example, a lid of fairly light weight is concerned, a single hinge structure as illustrated can be employed. For heavier structures such as doors etc., several spaced hinge structures can be used.

If desired, three or more hinge components can be employed in conjunction with one another. For example, where three are used, the links between the centre component and the two outer components can over-

lap and a single pin can pass through the overlapping links.

In a form which has not been illustrated, each link has two pins integral therewith in contra distinction to the structure illustrated where the pins and links are separate items.

The outside diameter of the spacers can be such that their surfaces are in mutual contact to form a light and draught excluding seal.

In a simpler form of the structure, which has not been illustrated, each hinge component includes a single gear segment mounted on a base. In other words, the second gear segment of each hinge component is omitted as is the spacer 16 and the base element is shortened commensurately. Two links 20 can be provided, these being attached to each end of the two gear segments. In this form the spoke 36 is of the same axial extent as the portion 32.

If factors such as loading make it desirable, each gear segment can be solid and slightly greater than cylindrical in extent.

In Figure 6a, three panels 52, 54, 56 are hinged together and in Figure 6b there are four panels 52, 54, 56 and 58. The panels of Figure 6a form parts of the walls of three offices or rooms and the panels of Figure 6b bound four offices or rooms. For storage the panels 52 and 56 of Figure 6a can be swung to positions on opposite sides of, and adjacent to, the panel 54 to form a stack. Similarly, panels 54 and 56 in Figure 6b can swing to parallel, proximate positions, and panels 52 and 58 can swing against the outer faces of panel 54 and 56 respectively to form a stack of four linked panels.

In Figure 6c a straightforward connection of two panels 52 and 54 is illustrated. The Figure also illustrates that further panels (one of which is shown at 56) can be connected in series with those shown.

WHAT I CLAIM IS:—

1. A hinge structure comprising a first hinge component including a gear segment and a base element, a second hinge component including a gear segment and a base element, the segments meshing with one another, and a link pivotally connected to each gear segment, the axes of the gear segments co-inciding with the axes of the pivotal connections between the link and the gear segments, said base elements being of elongated form, and the gear segments having formations for engagement with corresponding formations of the base elements, each gear segment being mounted on the respective base element by inter-engaging the formations of the respective base element and gear segment and sliding the gear segment on to the base element in the direction of the length of the base element.



Each spacer 16 is approximately D-shaped having a substantially semi-circular portion 42 and two limbs 44. The limbs terminate adjacent one another and along their free edges are formed with lips 46 which engage behind the edge portions 26. Semi-circular recesses 46.1 are formed in the facing surfaces of the lips 46. These permit a screw or other element to be driven-in to force the lips apart so as to enhance the frictional engagement between the edge portions 26 and the lips. This inhibits axial movement of each spacer 16. Hence each spacer 16 has an arcuate face, the arcuate faces of the spacers being in mutual contact.

The end cap 18 as illustrated in Figure 5 has screw holes 48 which receive the screws 30. Legs 50 protrude from one face of the end cap 18 and each leg is T-shaped in section. The 'upright' of the 'T' fits between the edge portions 24 and the 'cross-bar' of the 'T' fits behind these edge portions. The dimensions of the legs 50 and of the base element 12 are such that the caps are push-fits in the ends of the base element. The screws 30 which pass through the bores 48 and into the bore 28 provide security against the end caps accidentally being detached from the base elements. In view of the fact that the end caps are push-fits sufficient security against accidental removal of the end caps can usually be provided by means of a single screw 30.

The hinge components 10 are secured together by the upper and lower links 20. Each end of each link 20 is secured to one of the components 10 by one of the pins 22. The pins 22 pass through apertures in the links and into the axial bores 40. As will clearly be seen in Figure 1, the teeth 34 of the two upper segments 14 mesh as do the teeth of the lower segments. It will be understood that the axes of the pivotal connections between the links and the segments co-incide with the axes about which the portions 32 are generated.

The hinge structure illustrated can be used for a wide variety of purposes. For example, it can be employed to mount doors on supporting door posts or to connect together adjacent doors of a folding door structure. It can also be used to mount lids such as box lids and panels such as swing-down front panels of cabinets. Where, for example, a lid of fairly light weight is concerned, a single hinge structure as illustrated can be employed. For heavier structures such as doors etc., several spaced hinge structures can be used.

If desired, three or more hinge components can be employed in conjunction with one another. For example, where three are used, the links between the centre component and the two outer components can over-

lap and a single pin can pass through the overlapping links.

In a form which has not been illustrated, each link has two pins integral therewith in contra distinction to the structure illustrated where the pins and links are separate items.

The outside diameter of the spacers can be such that their surfaces are in mutual contact to form a light and draught excluding seal.

In a simpler form of the structure, which has not been illustrated, each hinge component includes a single gear segment mounted on a base. In other words, the second gear segment of each hinge component is omitted as is the spacer 16 and the base element is shortened commensurately. Two links 20 can be provided, these being attached to each end of the two gear segments. In this form the spoke 36 is of the same axial extent as the portion 32.

If factors such as loading make it desirable, each gear segment can be solid and slightly greater than cylindrical in extent.

In Figure 6a, three panels 52, 54, 56 are hinged together and in Figure 6b there are four panels 52, 54, 56 and 58. The panels of Figure 6a form parts of the walls of three offices or rooms and the panels of Figure 6b bound four offices or rooms. For storage the panels 52 and 56 of Figure 6a can be swung to positions on opposite sides of, and adjacent to, the panel 54 to form a stack. Similarly, panels 54 and 56 in Figure 6b can swing to parallel, proximate positions, and panels 52 and 58 can swing against the outer faces of panel 54 and 56 respectively to form a stack of four linked panels.

In Figure 6c a straightforward connection of two panels 52 and 54 is illustrated. The Figure also illustrates that further panels (one of which is shown at 56) can be connected in series with those shown.

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1. A hinge structure comprising a first hinge component including a gear segment and a base element, a second hinge component including a gear segment and a base element, the segments meshing with one another, and a link pivotally connected to each gear segment, the axes of the gear segments co-inciding with the axes of the pivotal connections between the link and the gear segments, said base elements being of elongated form, and the gear segments having formations for engagement with corresponding formations of the base elements, each gear segment being mounted on the respective base element by inter-engaging the formations of the respective base element and gear segment and sliding the gear segment on to the base element in the direction of the length of the base element.

(9)

2. A hinge structure as claimed in claim 1, wherein each gear segment includes a radial spoke in which there is formed a bore co-incident with the axis of the gear segment; each bore receiving a connecting element which forms the means for pivotally connecting said link to that gear segment.
3. A hinge structure as claimed in claim 2, wherein each of said connecting elements is a pin which is a push-fit in a respective one of said bores.
4. A hinge structure as claimed in claim 2, wherein each of said connecting elements is a screw.
5. A hinge structure as claimed in any preceding claim, wherein each of said base elements is formed with a slot extending in the direction of the axis of each gear segment mounted thereon, the slot being bounded by a pair of edge portions, and wherein each gear segment has a pair of oppositely directed lips, said lips fitting behind said edge portions to retain each segment in place.
6. A hinge structure as claimed in claim 5 when dependant on claim 2, wherein said lips of each gear segment are formed at the end of the spoke remote from its junction to the remainder of each gear segment, said spoke passing through said slot.
7. A hinge structure as claimed in claim 5 or 6, wherein each hinge component comprises a pair of axially spaced, co-axial gear segments with a spacer therebetween, said gear segments and said spacer all being mounted on said base element.
8. A hinge structure as claimed in claim 7, and including two links, three being a link joining each meshing pair of gear segments.
9. A hinge structure as claimed in claim 7 or 8, wherein each spacer has an arcuate face, the arcuate faces of the spacers being in mutual contact.
10. A hinge structure substantially as hereinbefore described and as illustrated in the accompanying drawings.

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