Oct. 12, 1971 W. MEYER 3,611,474

INVISIBLE HINGE

Filed Oct. 21, 1969 2 Sheets-Sheet 1

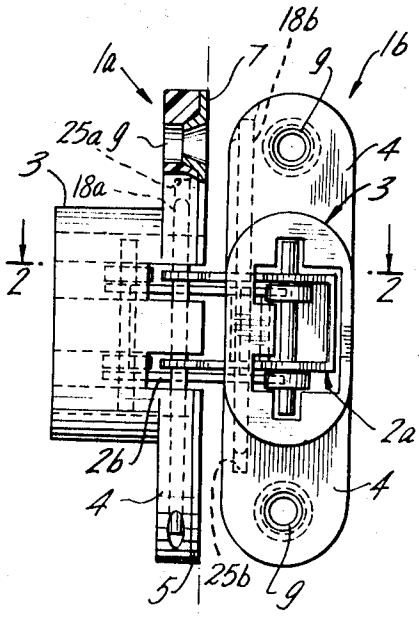


FIG. 1

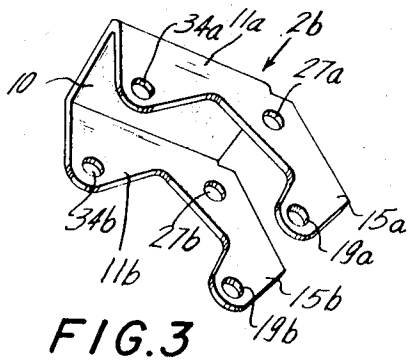


FIG. 3

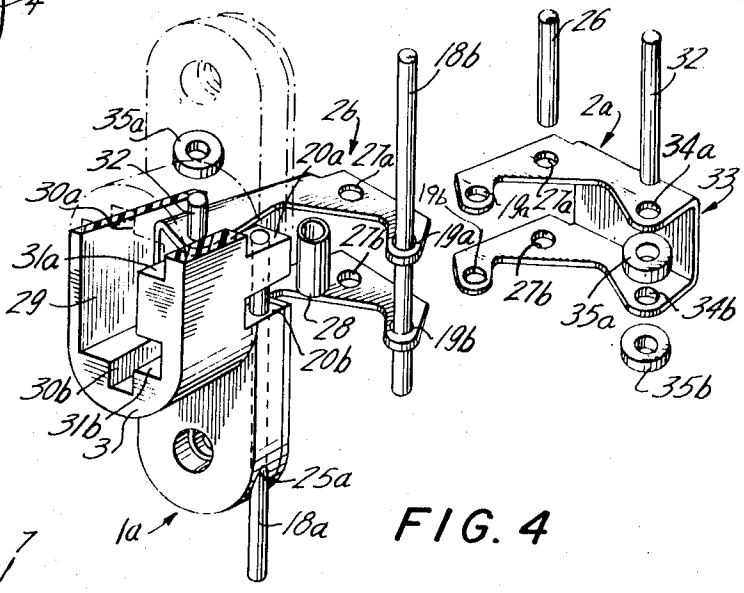


FIG. 4

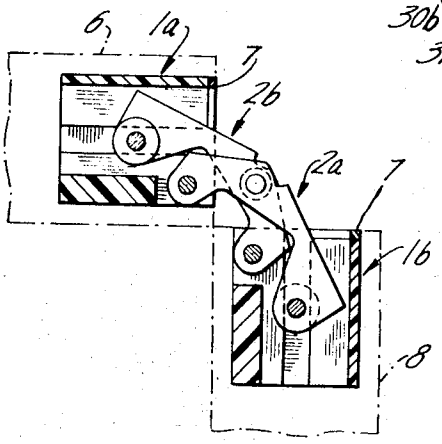


FIG. 2

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INVISIBLE HINGE

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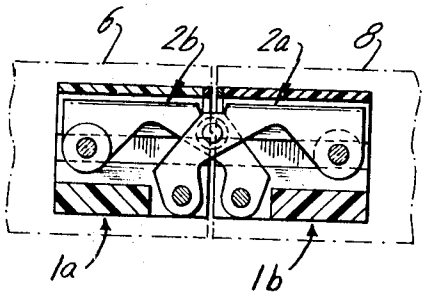


FIG.5

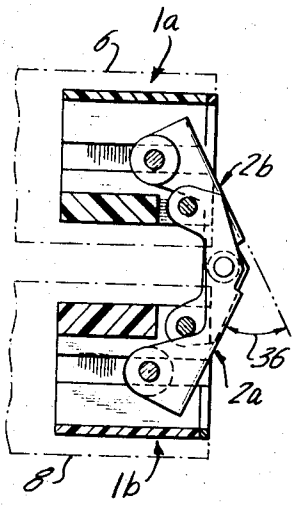


FIG.6

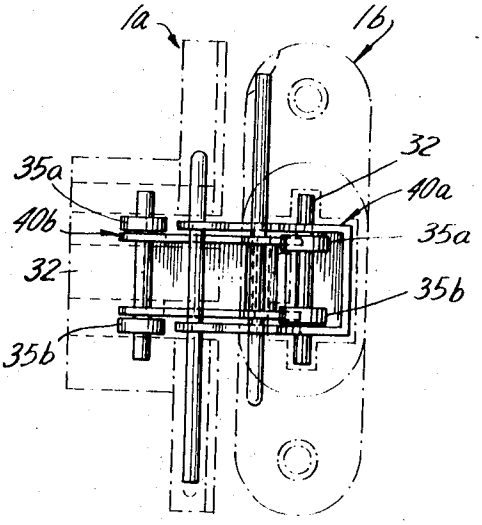


FIG.7

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INVISIBLE HINGE

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Claims priority, application Italy, Oct. 31, 1968, 23,193/68
Int. Cl. E05d 3/06
U.S. Cl. 16—164 2 Claims

ABSTRACT OF THE DISCLOSURE

An invisible hinge for doors and the like includes a pair of mounting blocks formed from a low-friction material such as nylon and joined by a pair of interlocked links. A pivot pin connects the links which are each pivotally connected at one end to the mounting blocks. The other ends of the links are mounted in slide bearings formed in the blocks to enable the links simultaneously to rotate with respect to their pivot pin and the block pivot pins, and to slide in the blocks, so that the axis of rotation of the blocks is not fixed in space. Hence the hinge is invisible upon closure of a door on which it is mounted.

BACKGROUND OF THE INVENTION

This invention relates to an improvement in invisible hinges used for doors and the like.

Invisible hinges heretofore known have been subject to relatively rapid wear due to their use of complex mechanisms. To provide for longer life, periodic lubrication of such hinges was required, with its disadvantages, and upon the not infrequent failure to lubricate, the hinges had a tendency to operate with difficulty or to jam completely.

The present invention overcomes the deficiencies of the prior invisible hinges by providing a relatively simple mechanism that does not require lubrication. In particular, the inventive hinge is preferably formed with a pair of mounting blocks consisting at least partially of a low-friction plastic, such as nylon, which are joined by a pair of angular links. A pivot pin joins the links intermediate their ends which, in turn, are pivotally connected to the blocks and slidably received in bearings in the blocks, respectively. This arrangement enables the links simultaneously to rotate with respect to their pivot pin and the block pivot pins, and to slide in the blocks so that the axis of rotation of the blocks is not fixed in space. Thus upon closure of a door hung by the inventive hinge, the hinge mechanism substantially retracts into the mounting blocks and is invisible.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a top view of a typical invisible hinge in accordance with the invention;

FIG. 2 is a sectional view of the hinge taken along the line 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a view in perspective of a typical connecting link used in the hinge;

FIG. 4 is an exploded view in perspective showing the assembly of the hinge;

FIG. 5 illustrates the position of the hinge when it is fully closed;

FIG. 6 illustrates the position of the hinge when it has rotated 180 degrees; and

FIG. 7 shows another embodiment of the invention wherein the two connecting links differ from those of FIG. 1.

Referring to a typical embodiment of the invention in greater detail with reference to FIGS. 1 and 2, two hinge mounting blocks **1***a* and **1***b* are coupled by two interlocking connecting links **2***a* and **2***b*. The mounting block **1***a*, shown as being identical to the block **1***b*, and the link **2***a*, shown as being the same as link **2***b*, have corresponding parts designated by like numbers in the interests of simplicity and clarity. Furthermore, in this embodiment the mounting blocks **1***a* and **1***b* are symmetrically disposed with respect to a plane which centrally divides the mounting blocks and is normal to the axis of rotation of the hinge.

The mounting blocks **1***a* and **1***b* are constructed of a synthetic resin such as nylon, but may be any other material having suitable strength characteristics and bearing properties with respect to the connecting links. Each of the blocks **1***a* and **1***b* is shown as having a bearing section **3** from which extends a pair of attaching flanges **4** formed integrally with the bearing section. Metal plates **5** may be used with the flanges **4** to give additional strength to the mounting blocks and provide resistance to abrasion.

The mounting blocks **1***a* and **1***b* are secured in suitable recesses in a jamb **6** and door **8**, respectively, with block faces **7** flush with the surfaces. The blocks **1***a* and **1***b* are attached to the jamb and door, respectively, by suitable attaching screws or bolts passing through attachment holes **9**.

The connecting links **2***a* and **2***b* (FIG. 3 showing link **2***b*), formed of stainless steel or other material having suitable strength and a low coefficient of friction with the material of the mounting blocks, each consists of a web **10** and perpendicular flanges **11***a* and **11***b*. A pair of lugs **15***a* and **15***b* extend at an angle to the web **10** to provide an angular link.

The connecting link **2***a* is pivotally mounted on the block **1***a* by a pivot pin **18***a* and the link **2***b* is pivotally mounted on the block **1***b* by the pin **18***b*. To this end, a pair of holes **19***a* and **19***b* in the lugs **15***a* and **15***b*, and holes **25***a* and **25***b* in the blocks **1***a* and **1***b* slidably receive the pivot pins. Slots **20***a* and **20***b* are provided in the mounting blocks to provide clearance for the lugs **15***a* and **15***b* when the connecting links are rotated on the pivot pins **18***a* and **18***b*.

A pin **26** is fitted through a pair of holes **27***a* and **27***b* at pivot points in the links to connect them and enable their relative rotation about a common axis. The links **2***a* and **2***b* are positioned with their flanges interlocked, as best shown in FIG. 1, and a bushing **28** on the pin **26** prevents lateral movement of the links. Suitable enlargement of the pin **26** at its ends retains it in position.

A guide pin **32** formed of stainless steel or other material having suitable strength and wear characteristics and a low coefficient of friction with the material composing the bearing section **3**, is located in holes **34***a* and **34***b* at the ends of each link. The bearing section **3** of each mounting block is provided with a cavity **29** (FIG. 4) which includes a slide bearing formed by a pair of oppositely disposed grooves **30***a* and **30***b* into which project the ends of the guide pin **32**. A pair of grooves **31***a* and **31***b*, juxtaposed on the same side of the cavity **29**, provide clearance for the flanges **11***a* and **11***b*. While the axes of the grooves **30***a* and **30***b* are shown perpendicular to the face **7** of the mounting blocks, the grooves may be inclined to control the translative movement of the connecting links **2***a* and **2***b* so that the operative movement of the hinge may be suitably varied.

A pair of spacer washers **35***a* and **35***b* are located on each of the guide pins **32**, as shown in FIGS. 1 and 3, to enable the bearing sections **3** to accommodate the interlocking connecting links when the outside flange of the link **2***a* is either above or below that of the link **2***b*.

Referring to the operation of the hinge, in FIG. 5 the hinge is shown fully closed, that is, the faces **7** of the mounting blocks **1***a* and **1***b* are parallel. The hinge is concealed by the jamb **6** and door **8** and the connecting links **2***a* and **2***b* are fully retracted into the cavities **29** of the blocks. As the door **8** is opened, as shown in FIG. 2, the rotation of the hinge from its closed position is controlled by the links **2***a* and **2***b* which simultaneously: (a) rotate with respect to each other about the pin **26**, (b) pivot about the pins **18***a* and **18***b* in the blocks **1***a* and **1***b*, and (c) slide along the bearings in the section **3** of the blocks. Thus, the links emerge from the blocks and it is apparent that throughout the movement of the hinge, the true axis of rotation of the mounting blocks, and thus of the door **8**, is not fixed in space.

When an opening of 180 degrees is reached, as shown in FIG. 6, the lugs **15***a* and **15***b* of the link **2***a* contact the web **10** of the arm **2***b*, and the lugs **15***a* and **15***b* of the arm **2***b* at the same time contact the web **10** of the arm **2***a*. This contact occurs at an angle **36** on the order of 50 to 60 degrees with the links **2***a* and **2***b* having the angular shape and proportions shown in FIG. 6, such that the maximum opening of the hinge is limited to 180 degrees.

FIG. 7 illustrates a modified embodiment of the invention which differs in the construction and interlocking of the connecting links. In this embodiment a connecting link **40***a* is pivotally mounted on the mounting block **1***a* shown in phantom outline for clarity. A connecting link **40***b* is pivotally mounted on the mounting block **1***b*, also shown in phantom outline. The links **40***a* and **40***b* differ from the links **2***a* and **2***b* in that instead of interlocking, the width of the link **40***b* is less than the width of the link **40***a* so that it lies therewithin. In this structure the spacers **35***a* and **35***b* are located on the guide pins **32** carried by the arm **40***b*, as shown in FIG. 7. The spacers **35***a* and **35***b* may be omitted from the guide pin **32** carried by the arm **40***a*, if desired.

While the invention has been described in terms of the above-preferred embodiments, it may be utilized in a wide variety of applications without departing from the spirit and scope of the invention. For example, the angle of opening of the hinge may be varied from 180 degrees by varying the angularity and proportions of the connecting arms. Likewise, the relative position of the mounting blocks when closed may be varied, such that one

mounting block is higher than the other, or dislocated to one side by modifying the links and by locating at least one of the slide bearings at an angle other than 90 degrees to the face of the block. Further, it is not necessary for the blocks and links to be substantially identical.

I claim:

1. A hinge comprising first and second mounting blocks, first and second connecting links, each link consisting of a web and two flanges perpendicular thereto and the flanges being extended at one end to form a pair of lugs, a pivot opening in the flanges intermediate the ends of each link, a pivot pin extending through the pivot openings to hold the links together in an interlocking relationship, the pair of lugs extending in one direction from the pivot pin and the web extending in another direction that is angularly fixed with respect to the one direction from the pivot pin, pivot pins in the blocks mounting the lugs of the first link to the first block and the lugs of the second link to the second block, slide bearings in the blocks slidably mounting the first link in the second block and the second link in the first block to enable the links simultaneously to rotate with respect to the link pivot pin and the block pivot pins and to slide in the block bearings so that the axis of rotation of the hinge blocks is not fixed, the lugs and web of each link having such an angular relationship and proportions that at least one of the lugs on the first link engages the web on the second link after a predetermined rotation of the hinge blocks to prevent further rotation thereof.

2. A hinge as defined in claim **1**, in which the lugs and web of each link have such an angular relationship and proportions that at least one of the lugs on the first link engages the web of the second link after 180 degrees rotation of the hinge blocks to prevent further rotation thereof.

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