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C. J. SOSS

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CONCEALED HINGE

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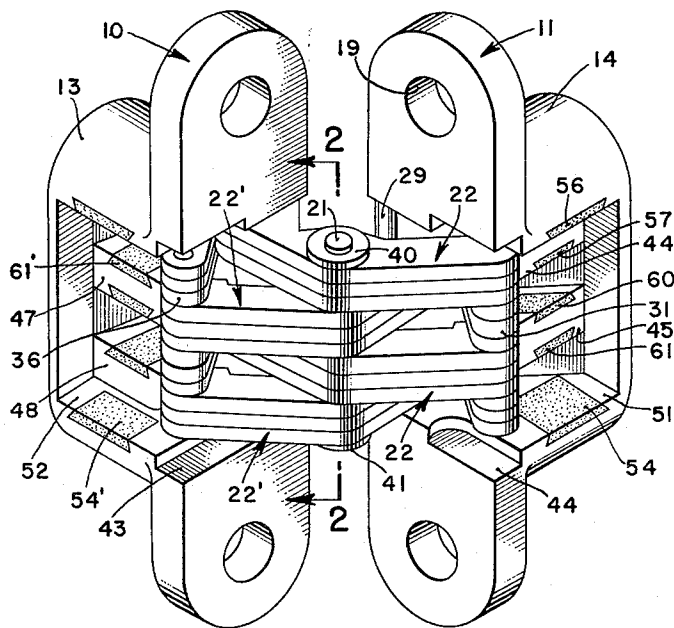


FIG. 1.

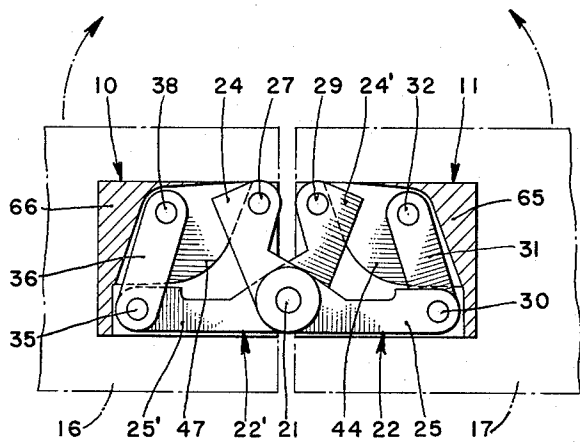
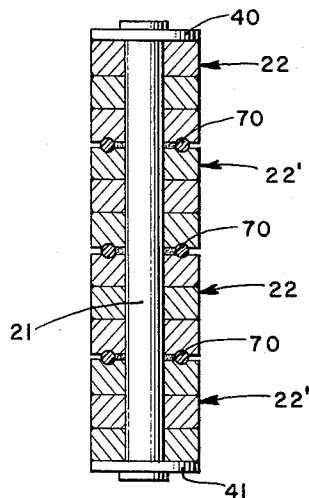


FIG. 3.

FIG. 2.



CHARLES J. SOSS
INVENTOR.

BY *Edward C. Walsh*

ATTORNEY.

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CONCEALED HINGE

Charles J. Soss, 805 N. Alta Drive, Beverly Hills, Calif.

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This invention relates to improvements in hinges and more particularly, to that type of hinges known as concealed or invisible hinges.

In this type of hinge, the hinge parts are connected by pivoted linkages hinged on a hinge pin. The parts of the hinge are received in rabbeted openings in the door and the door jamb and when the door is closed, the hinges are concealed, the linkages being within pockets or compartments within the hinge parts, that is, the hinge plates or butt plates.

Hinges of this type are known in the prior art wherein the butt plates are linked together by elbow levers mutually hinged to a hinge pin, pivoted at one end to respective butt or hinge plates, and pivoted at the opposite end to links which are in turn pivoted to the respective butt plates within the compartments therein. In this type of arrangement as will become more apparent as the description herein proceeds, there are a total of seven pivots in the hinge mechanism.

This type of hinge is very desirable and has many and varied applications and has been widely commercialized. Such hinges as previously known have not, however, been completely perfect and have been subject to certain deficiencies. It is a primary object of this invention to eliminate or minimize the imperfections in the known art hinges of this type and to overcome the existing deficiencies. More particularly, it is an object of this invention to provide a hinge of this type possessing maximum strength for its size and yet highly adapted to be built in virtually any size and applied in many and varied environments.

It is a further object of this invention to provide an improved hinge of this type characterized in that there are provided within the hinge plate means forming support and bearing surfaces for the moving linkages connecting the hinge plates. It is an object to provide a conformation wherein these support and bearing surfaces have optimum area and therefore maximum effectiveness for their purposes. In this way, maximum support and bearing surface is provided for those parts of the mechanism, that is, the arms or linkages which connect the jamb and the door. Support and bearing surface is therefore provided where it is most needed so that the door is supported without sagging and for free movement. A further object of the invention is to provide an improved hinge as described which is operative with a minimum of friction, prior art hinges of this type having been the subject to the deficiency that they operated with a considerable amount of undesirable friction.

The bearing and support surfaces referred to in the foregoing are provided on both sides of the moving parts of the linkages. The hinge accordingly may be inverted and used in either position with the same beneficial results. It is a further object of the invention to provide in the said bearing surfaces inserts formed of a composition or material having long-wearing qualities and providing for operation with a minimum of sliding friction. Preferably, this material may be Teflon. These inserts are preferably keyed in, that is, they are dove-tailed and fit into a dove-tailed groove or channel to insure permanency.

A further object of the invention is to provide a hinge structure of the type described which makes maximum utilization of the space within the pockets or compartments within the hinge plates so that a hinge of maximum

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strength for its size is realized. Preferably, each of the hinge levers and links is made up of leaves laminated into a unitary member. This provides for extra strength for the same size of parts. The linkages have levers that are of such a size that with the aforesaid support and bearing surfaces which are preferably in the form of abutments within the hinge plates, the available space remaining therein is utilized to the maximum effective extent. In other words, the parts are made so as to have the optimum size and strength and the optimum bearing and support surface consistent with the space available in a particular size of hinge.

A further object is to provide an improved hinge of the type described having multiple elbow levers connecting the hinge parts and hinged on a hinge pin with bearing means provided between adjacent elbow levers preferably in the form of either split or complete circular O-rings made of a material having long wearing qualities and providing for a minimum of friction. Preferably, such bearing means are made of Teflon.

Further objects and numerous additional advantages of the invention will become apparent from the following detailed description and annexed drawings, wherein:

FIG. 1 is a perspective view of a preferred form of the invention in open position;

FIG. 2 is a sectional view taken along the line 2-2 of FIG. 1; and

FIG. 3 is an illustrative view of the hinge mounted in a door and jamb showing the position of the linkages with the door closed.

The following description has reference to a particular form and embodiment of the invention which is illustrative of it. It is to be understood that the hinge of this invention may be utilized not only with ordinary doors of any size but with virtually any type of hinged or swinging panel. It may be built in many and varied sizes. The embodiment as shown in FIG. 1 comprises hinge or butt plates 10 and 11 having extending housing or compartment portions 13 and 14 adapted to be mortised or rabbeted into that type of opening in a jamb and door as illustrated at 16 and 17 in FIG. 3. The plates 10 and 11 themselves fit into openings in the door and jamb. The hinge is completely concealed and invisible when the door is closed.

The hinge has a main hinge pin 21 to which are pivoted a plurality of connecting elbow levers as illustrated at 22. These levers are alike but are interleaved in alternate or reverse positions as illustrated at 22 and 22' in FIG. 1 and FIG. 3. For maximum strength in the space available, each of these elbow levers is made up of leaves of the same shape and laminated together as shown. The elbow levers have the shape as may be seen in FIG. 3 including a shorter arm 24 and a longer arm 25. The shorter arms 22 of alternate of the elbow levers are pivoted to a pivot pin or stem 27 at the back of the hinge plate 10 as may be seen in FIG. 3. The shorter arms of the other alternate elbow levers 22', that is, 24', are pivoted to a pivot pin 29 which is at the back part of the hinge plate 11 and as may be seen in FIG. 1.

The longer arms of the interleaved elbow levers 22 are pivotally connected to links within the housing 14 of hinge plate 11. The longer arms of the other interleaved elbow levers 22' are pivoted to links which are in turn pivoted within the housing 13 of hinge plate 10. Thus, the longer arm 25 of elbow lever 22 is pivoted to a link 31 by way of a pivot pin 30 which is to be referred to as a moving pivot. The other end of link 31 is pivoted on a pivot pin 32 mounted at the back of compartment 14 of hinge plate 11. Link 31 is of a construction similar to that of elbow lever 22, that is, it is made up of a plurality of similarly shaped leaves laminated to-

gether to provide maximum strength in a minimum of space.

The end of the longer arm 25' of elbow lever 22' is similarly pivoted on a pivot pin 35 to the end of a link 36, the other end of which is pivoted on a pivot pin 38 at the back of the compartment 13 in plate 10. Link 36 is of the same type of construction as link 31. The other elbow levers and links are of the same construction and have the same type of mounting as just described and therefore need not be described in further detail. Furthermore, the hinge construction is similar but not identical on opposite sides of an axis through the main hinge pin 21.

The hinge pin 21 may have retaining plates or washers 40 and 41 on its ends. The hinge plates 10 and 11 may be recessed out as shown by way of example at 43 and 44 to accommodate such securing means when the hinge parts are in the position shown in FIG. 3.

A very important part of this invention is the internal configuration of the pockets or compartments within the extending parts 13 and 14 of the hinge plates. The compartment 14 has formed therein inwardly extending abutments forming support and bearing surfaces as designated at 44 and 45 in the drawings. The compartment in part 13 has similar inwardly extending abutments forming support and bearing surfaces as designated at 47 and 48. The inner edge of all of these abutments has a rounded shape and configuration as may be seen at 44 and 47 in FIG. 3. This curvature corresponds to the curvature, that is, the path of movement of the moving pivot pins 30 and 35. As will be observed by those skilled in the art, the abutments 45 and 47 are in fact interleaved between their adjacent link members.

In addition to the bearing surfaces just described, the inner surfaces at the top and bottom of the compartments within parts 13 and 14 provide additional bearing surfaces for the moving members at the top and bottom of the assembly. The bottom one of such bearing surfaces is designated at 51 for part 14 and at 52 for the part 13. In each of these surfaces, there is provided an insert formed of a material having long wearing qualities and providing for a minimum of sliding friction. Such insert is preferably Teflon and is preferably of a dove-tailed construction fitting in a dove-tailed channel as indicated at 54 in FIG. 1. The insert at the top is designated at 56. The abutment 44 has a similar insert 57 and the abutment 45 has similar inserts 60 and 61. The surfaces in the compartment of housing 13 have similar corresponding inserts which are not further described in detail since they correspond to the ones just described.

Attention is further called to the internal configuration of the pockets within the parts or housings 13 and 14 as shown in FIG. 3. The wall portions as shown at 65 and 66 are thickened as shown and have an internal configuration and shape such that when the hinge is in the position shown in FIG. 3, the links 31 and 36 are closely adjacent these surfaces. This construction contributes to the realization of maximum strength in proportion to size.

FIG. 2 shows in detail the main hinge pin 21 and the parts of the elbow levers pivoted to it. The leaves or laminations of adjacent elbow levers are provided with O-ring grooves so as to receive bearing rings as designated at 70 in FIG. 2. These rings in a preferred form of construction may be either complete O-rings or split rings and are made of a material having long-wearing qualities and providing for a minimum of friction, the material preferably being Teflon. Such a bearing is provided between all of the adjacent elbow levers. Similar bearings may be provided if desired between adjacent moving parts at all of the pivots.

From the foregoing, those skilled in the art will readily observe and appreciate the operation of the hinge and its significant improvements and advantages. When the hinge is opened, the parts move from a position as shown

in FIG. 3 towards a position as shown in FIG. 1. In the position of FIG. 3, the main hinge pin 21 is substantially aligned with the pivots 30 and 35; the pivots 27, 29, 32 and 38 are substantially aligned and this line is substantially parallel to the line of the other pivots. Maximum bearing and support surface is provided as will be observed for all of the moving parts of the elbow levers and links. In other words, maximum support with a minimum of friction is provided for the moving connecting members which connect and extend between the two hinge plates 10 and 11. A hinge is accordingly provided having maximum strength capable of supporting a door or comparable element for operation with a minimum of friction and without sag. The hinge may be used in either position, that is, it may be inverted from the position of FIG. 1 and still have the same characteristics. To illustrate more in detail representatively, the link 31 moves relatively to and is provided with support by the insert 60 in abutment 44. The bottom link corresponding to 31 is provided with support and bearing surface by the insert 54. The pivot pin 30 moves around the curved edge of abutment 44 so as may be seen, maximum area of support and bearing surface is provided. Similarly, the insert 54 provides support and bearing surface for the bottom link corresponding to link 31.

On the other side of the hinge, the insert 61' similarly provides bearing and support surface for the upper link, that is the link corresponding to 36 in FIG. 5. Similarly, the insert 54' provides bearing and support surface for the lower of the elbow levers, that is, the longer arm of that lever. The insert in abutment 48 provides bearing and support surface for the link moving above it and relative to it. The pivot pin 35 similarly moves in conformity with the inner curved surface of the abutment 47.

As may be observed, if the hinge is inverted, there are support and bearing surfaces comparable to those just described for the moving parts of the links and elbow levers. In this way, maximum bearing and support surface is provided for the moving parts of the hinge irrespective of its position. The bearing structure as shown in FIG. 2 contributes to the ease and friction-free operation of the hinge although embodied within a hinge of maximum strength. The bearings as described occupy a minimum of space between the hinged levers but provide for freedom of pivotal movement relatively of the elbow levers.

From the foregoing, those skilled in the art will observe that the invention as described achieves and fulfills the objects stated in the foregoing. An improved hinge is provided particularly from the standpoint of strength, size and operating qualities.

The foregoing disclosure is representative of a preferred form and embodiment of the invention and is to be interpreted as illustrative thereof rather than limiting thereon. The invention is accordingly to be accorded the full scope of the claims appended hereto.

What is claimed is:

1. In a concealed hinge of the type comprising butt plates having compartments formed therein, means comprising elbow levers, a hinge pin, said elbow levers being pivotally mounted on the said hinge pin, means pivotally mounting one end of each of the elbow levers within the respective butt plates and means comprising spaced apart links pivotally mounted at one end within the respective butt plates, the other ends of said spaced links having moving pivots pivotally connected to the other ends of said elbow levers, the improvement comprising; means rigid with said butt plates and defining abutments within said compartments and extending between adjacent spaced links, extending substantially to said moving pivots and having bearing support surfaces slideably engaging said spaced links, along the major part of their lengths, the edges of said abutments adjacent said

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moving pivots being curved to lie adjacent and parallel to the path of movement of said moving pivots.

2. A hinge as set forth in claim 1 including flush inserts in the bearing surfaces of said abutments, said inserts being of a composition having long-wearing qualities with a minimum of friction whereby the parts of said connecting links bearing on said surfaces are provided with support and bearing surfaces by said inserts. 5

3. A hinge as set forth in claim 1 wherein adjacent elbow levers are provided with opposed circular grooves concentric to said hinge pin, and an O-ring of Teflon seated in said opposed grooves and constituting a thrust and anti-friction bearing between said adjacent elbow levers. 10

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