United States Patent [19]

Remick

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[54] **INCORPORATED HINGE WITH STOP AND REMOVABLE LOCK PIN**

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[52] **U.S. Cl.** ..... **16/128 R,** 16/172, 16/191

[51] **Int. Cl.** **E05d 3/02**

[58] **Field of Search** ..... 16/172, 171, 176, 191, 16/DIG. 13, 128 R; 220/315

[56] **References Cited**

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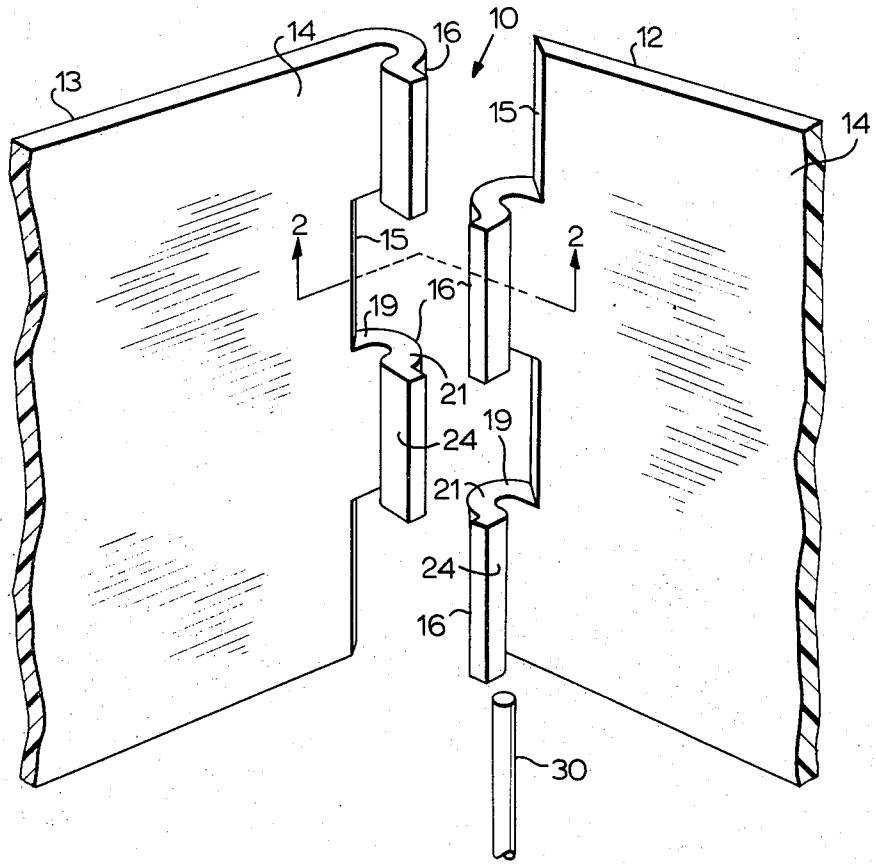
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Attorney, Agent, or Firm—Sim & McBurney

[57] **ABSTRACT**

This invention provides a hinge member which may co-operate with another similar hinge member to form a hinge. Each hinge member includes a plate element and at least one hinge knuckle extending outwardly from a straight edge of the plate element to define a U-shape of which one arm joins the plate element and of which the other arm terminates in a ledge extending away from said one arm.

8 Claims, 4 Drawing Figures



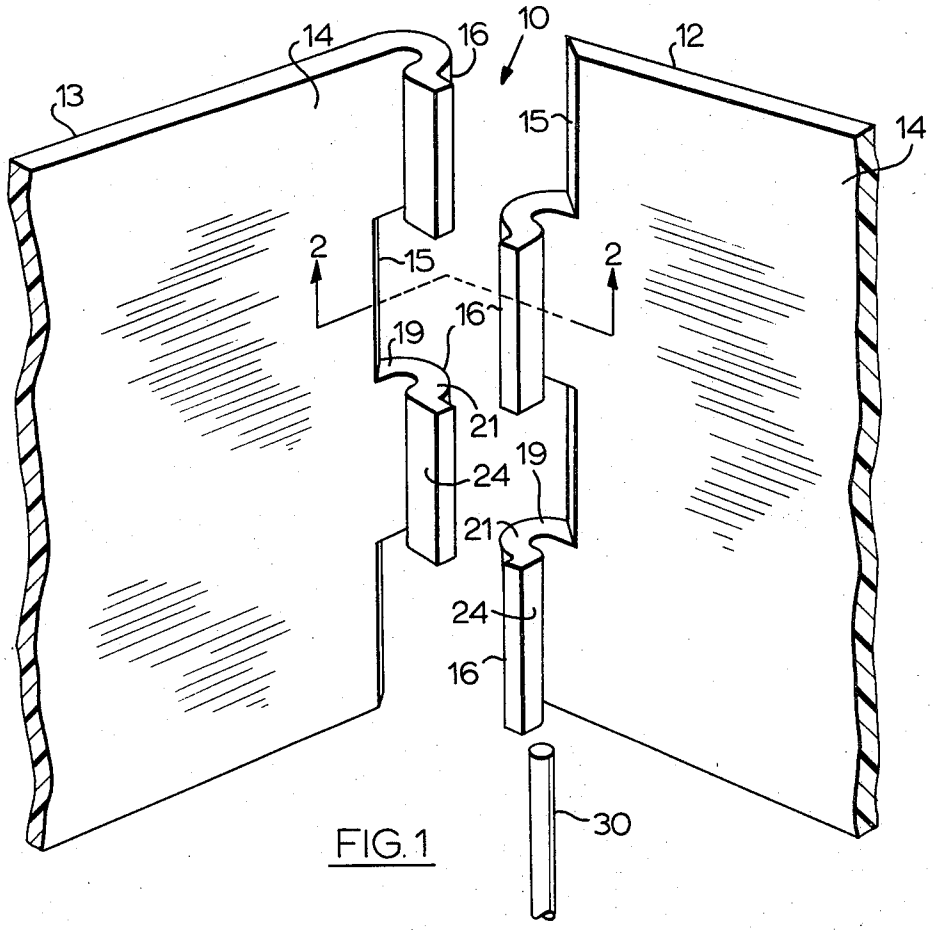


FIG. 1

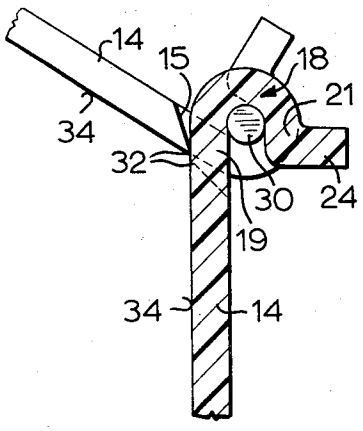


FIG. 2

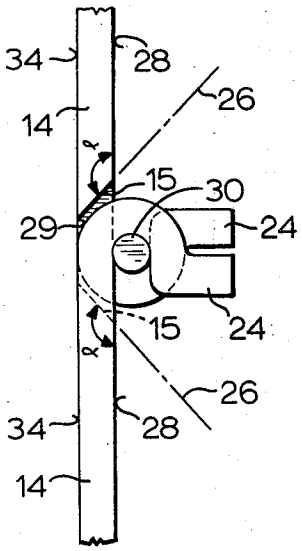


FIG. 3

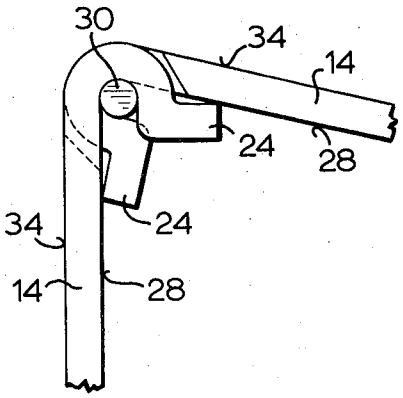


FIG. 4

INCORPORATED HINGE WITH STOP AND REMOVABLE LOCK PIN

This invention relates generally to hinges, and has to do particularly with a hinge construction of which the knuckles do not form closed loops, thereby permitting the knuckles and the plate elements to be molded integrally in a single operation.

Open knuckle hinges have been described in the prior art, particularly in U.S. Pat. No. 2,766,901, Sunko, entitled "Hinge" and issued Oct. 16, 1956. However, a serious disadvantage of prior art open-knuckle hinges, as exemplified by U.S. Pat. No. 2,766,901, relates to the fact that some means must be provided to ensure that the pin does not fall out of the knuckles when the open portions of all knuckles are aligned. In the Sunko patent, washers are provided for this purpose, but such a provision requires additional parts that can break or malfunction, and of course additional expense.

In view of the above disadvantage of the prior art structures, it is an object of this invention to provide an open-knuckle hinge construction designed to prevent the hinge plates from reaching a mutual orientation in which the knuckle openings are aligned, thereby ensuring that the hinge pin will always remain in place without the necessity for additional members such as washers.

Accordingly, this invention provides a hinge member adapted to cooperate with another similar hinge member to define a hinge, the hinge member comprising: a plate element having a straight edge, and at least one hinge knuckle extending integrally from the straight edge to define substantially a U-shape of which one arm is contiguous with the plate element and of which the other arm terminates in a ledge extending away from said one arm.

This invention further provides a hinge comprising two hinge members and a pin, each hinge member including: a plate element having a straight edge, and at least one hinge knuckle extending integrally from the straight edge to define a substantially U-shaped section of which one arm is contiguous with the plate element and of which the other arm terminates in a ledge extending away from said one arm, the two hinge members hinged to each other about said pin which passes through the crook of the U-shaped sections, the said other arms of the knuckles of the plate elements all lying to one side of both plate elements when the latter extend away from each other.

One embodiment of this invention is illustrated in the accompanying drawings, in which like numerals denote like parts throughout the several views, and in which:

FIG. **1** is a partly broken away perspective view of the hinge structure of this invention; and

FIGS. **2, 3** and **4** are axial sectional views taken along the line 2—2 in FIG. **1** with the different parts assembled together, showing three mutual angulations of the hinge parts.

Attention is first directed to FIG. **1**, in which a hinge structure generally indicated at **10** is seen to include a first hinge member **12** and a second hinge member **13**. Each hinge member **12, 13** includes a plate element **14** having a straight edge **15** from which two hinge knuckles **16** integrally extend. While the particular embodiment shown includes two hinge knuckles on each hinge member, it will be appreciated from what follows that the invention does not concern itself with the number of hinge knuckles, but rather with their sectional profile. Thus, any number of hinge knuckles, including a single hinge knuckle, could be provided on each of the hinge members **12** and **13.**

Although not essential to this invention, the longitudinal dimension of all of the hinge knuckles in the embodiment shown is the same, and the spacing between two adjacent hinge knuckles on a single hinge member is slightly greater than the longitudinal dimension of a single knuckle. This permits the knuckles of the two hinge membes **12** and **13** to be "interlaced" in the usual manner for a hinge. Again, these dimensional criteria are not essential. The only requisite is that the knuckles and the spaces between adjacent knuckles be dimensioned such that the usual "interlacing" can take place between the two hinge members **12** and **13.**

It will be seen from all of the accompanying figures that each hinge knuckle extending away from its respective straight edge **15** defines a U-shaped section **18** of which one arm **19** is contiguous with and parallel to its respective plate element **14,** and of which the other arm **21** terminates in a ledge **24** which extends away from the said one arm **19** in a direction substantially perpendicular to the said one arm **19.**

Furthermore, the straight edge **15** is oblique to the plane of its respective plate element **14,** the plane of obliquity **26** (FIG. **3**) defining an obtuse angle α with the surface **28** of the plate element **14,** the surface **28** being that which is closest to the ledge **24.** The obtuse angle α shown in FIG. **3** for the obliquity of the straight edge **15** is approximately 135° (thus, the slope would normally be defined as a 45°slope) although this precise angle is not critical. The only purpose for the obliquity of the edge **15** is to provide a surface contact rather than an edge contact with the outer, rounded surface **29** of the adjacent hinge knuckle, whenever the plate elements **14** are moved toward one another in the FIG. **3** configuration. If one visualizes the knuckle of the lower plate element **14** moving up to contact the upper oblique edge **15,** it will be seen that the edge **15** will have tangential contact with the outer surface **29** of the knuckle. By contrast, if the edge **15** were at right angles to the major plane of the plate element **14,** then upward movement of the lower knuckle would engage the rightward boundary of the upper edge **15** in FIG. **3,** which would be essentially a corner contact. This would cause wear of the edge, and possible binding, both of which are undesirable.

From the foregoing discussion, however, it will be appreciated that the particular slope of the edge **15** is to some extent dependent upon the relative thicknesses of the plate **14** and the U-shaped channel between the two arms **19** and **21** of the U-shaped knuckle. If the U-shaped channel of the knuckle were considerably greater in diameter than the thickness of the plate element **14,** then the obliquity of the edge **15** would have to be increased so that the angle α were greater than 135°, in order to ensure tangential contact rather than corner contact.

Extending through all knuckles of both hinge members **12** and **13** is a hinge pin **30** adapted to fit snugly but slidably within the U-shaped knuckle **16.** The pin **30** must be inserted longitudinally, and cannot be slipped into the hinges laterally for reasons which will become clear from the following discussion.

Particular attention is now directed to FIGS. 2, 3 and 4, with the help of which will be discussed that property of the hinge structure which ensures that the pin 30, once in place, is incapable of being removed laterally, i.e. in a direction normal to its main axis. FIGS. 2 and 4 show the limit positions for the two hinge members 12 and 13. FIG. 4 shows a limit positions in which the ledge 24 of each knuckle 16 abuts the surface 28 of the other plate element 14. The plate elements 14 cannot close to a smaller acute angle than that shown in FIG. 4 without breaking or rupturing the ledges 24. It will be appreciated that, in the absence of the ledges 24, it would be possible tb bring the plate elements 14 closer together to a parallel orientation, in which the U-shaped channels in all of the knuckles 16 of both plate elements 14 would be aligned, thereby permitting the pin 30 to fall out or be taken out of the knuckle in a lateral direction. This is undesirable, and therefore the ledges 24 are provided to ensure that it does not happen.

If it is now imagined that the plate elements 14 in the FIG. 4 position are opened out to the coplanar position shown in FIG. 3, it will be quite obvious that it is impossible to remove pin 30 other than longitudinally, because the two plate elements 14 cannot be moved toward each other beyond a very small amount determined by the tolerance (distance) between the outer surface 29 of each knuckle and the adjacent edge 15.

Moving the plate elements 14 further to the FIG. 2 position will cause the hinge structure to reach the other limit, in which the actute angle boundary 32 of each edge 15 abuts the surface 34 of the opposite plate element 14.

It will be appreciated that the hinge members 13 and 14 of the hinge structure disclosed herein can be molded integrally, including the knuckles 16, from a wide variety of thermoplastic and other substances.

What I claim is:

1. A hinge comprising two hinge members and a pin, each hinge member including:

A plate element having a straight edge.

and at least one hinge knuckle extending integrally from the straight edge to define a substantially u-shaped section of which one arm is contiguous with the plate element and of which the other arm terminates in a ledge extending away from the said one arm,

the two hinge members hinged to each other about said pin which passes through the crook of the U-shaped sections, the said other arms of the knuckles of the plate elements all lying to one side of both plate elements when the latter extend away from each other.

2. The invention claimed in claim 1, in which said one arm is substantially parallel with the plate element adjacent said straight edge.

3. The invention claimed in claim 2, in which said straight edge is oblique to the plane of the plate element.

4. The invention claimed in claim 3, in which the plane of obliquity defines an angle of 135° with the plate element surface closest to said ledge.

5. The invention claimed in claim 1, in which each hinge knuckle has its internal U-shaped recess dimensioned to snugly enclose said pin.

6. The invention claimed in claim 3, in which each hinge knuckle has its internal U-shaped recess dimensioned to snugly enclose said pin.

7. The invention claimed in claim 2, in which the straight edge of one hinge member is spaced from but closely adjacent the hinge knuckle of the other hinge member.

8. The invention claimed in claim 7, in which the straight edge of each plate element is oblique to the plane of the respective plate element, the plane of obliquity defining an angle of about 135° with the plate element surface closest to the respective ledge.

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