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HINGE

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Fig. 1.

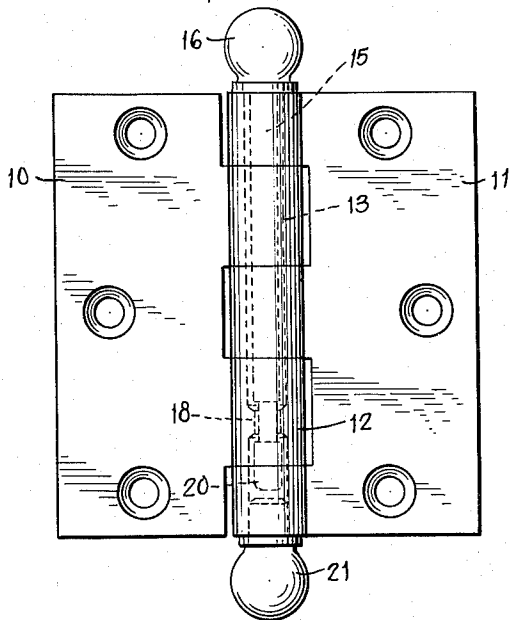


Fig. 2.

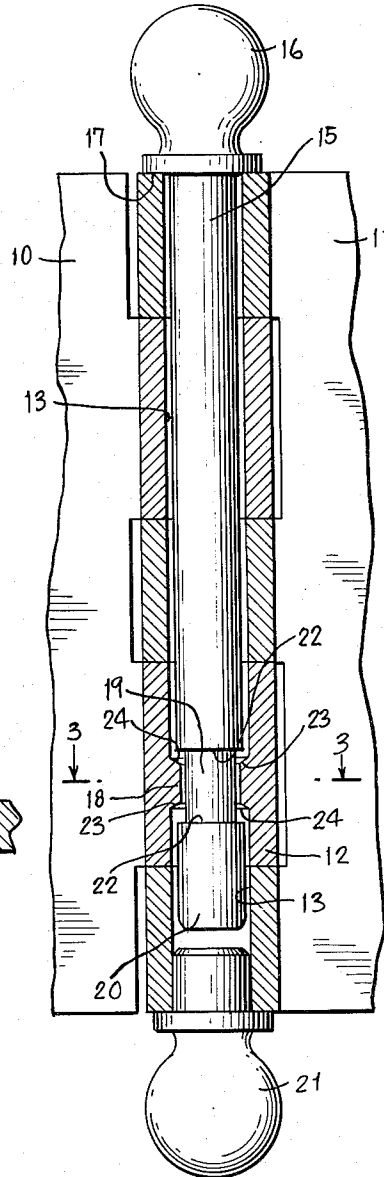


Fig. 3.

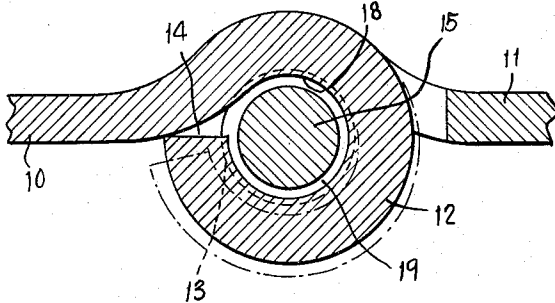
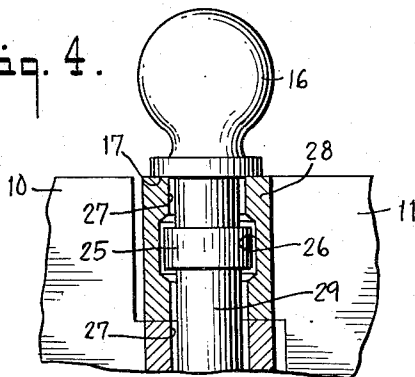


Fig. 4.



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1

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4 Claims. (Cl. 16-169)

This invention relates to hinges and more particularly a novel form of pintle or hinge pin construction.

It is the object of the present invention to provide a special form of hinge pin for a hinge having a formation therein adapted for retaining cooperation with an opposed oppositely arranged formation in one of the intermediate knuckles of the hinge construction adapted to restrain the said pintle against longitudinal outward movement.

It is the further object of the present invention to provide a pintle construction or hinge pin having formed therein adjacent to one end an annular groove, and cooperating therewith formed within an intermediate knuckle of the said hinge, an annular land adapted for cooperative nesting and retaining engagement loosely within the said groove.

It is the further object of the present invention to form on a hinge pintle an annular land of slightly increased diameter adapted for loose cooperative retained engagement within a corresponding elongated groove formed upon the interior of one of the hinge knuckles.

It is the still further object of the present invention to provide in a hinge construction a series of interdigitated knuckles arranged in aligned relation for cooperatively receiving a hinge pin with at least one of said knuckles having a free end portion normally in substantial contact with another portion of said knuckle to thereby form a resilient flexible extension of the respective leaf from which the said knuckle extends, said knuckle in response to an inward or outward thrust of the pintle being adapted to spring laterally outward slightly establishing a spaced relation between said free end portion and the said knuckle to permit the introduction of the above described hinge pin in assembled relation with the land upon the interior of the aforementioned resilient knuckle.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawing, in which:

FIG. 1 is a front elevational view of a hinge incorporating the present invention;

FIG. 2 is a fragmentary vertical section thereof on an enlarged scale;

FIG. 3 is a section on the line 3-3 of FIG. 2 on an enlarged scale showing in full lines the normal position of a hinge knuckle and showing in dot-and-dash lines and on an exaggerated scale the strained position of the hinge knuckle during a partial unrolling thereof incident to the movement of the hinge pin to or from its operative position shown in FIG. 2; and

FIG. 4 is a view in fragmentary vertical section similar to an upper portion of FIG. 2, but illustrating a modified form of the invention.

It will be understood that the above drawing illustrates merely certain preferred embodiments of the present invention, and that other embodiments are contemplated within the scope of the claims hereafter set forth.

Referring to the drawing, in FIG. 1, there is shown a hinge including a pair of opposed leaves 10 and 11, with each of the leaves having projecting therefrom in opposed interdigitated relation, a series of spaced formed knuckles of the form illustrated in FIG. 3, which, in the preferred embodiment, have free end portions 14 normally in substantial contact with another portion of a

2

knuckle so as to form a resilient flexible extension of the respective leaf.

While it is not necessarily required that all the knuckles have this type of construction, at least one of the knuckles must be so constructed.

Each of the knuckles as formed has a predetermined internal diameter defining a substantially cylindrical bore 13 adapted to slidably and cooperatively receive the hinge pin or pintle 15, the diameter of which is slightly less than the said bore or diameter 13.

Hinge pin 15 has at one end a substantially spherical head 16 terminating at its base in an annular shoulder 17 adapted for cooperative registry with the end knuckle of leaf 11 for thereby limiting longitudinal movement of the hinge pin 15 in one direction.

Upon the interior of one of the knuckles forming a part of leaf 10, for example, there is formed an annular land 18 which is of appreciable length and which terminates at its opposite ends in the shoulders 23, as shown in FIG. 2, which shoulders are tapered outwardly towards the respective opposite ends of the particular knuckle, as indicated at 24.

The internal diameter of the land 18 is less than the diameter of the bore or opening 13 of the said knuckles. The said land is of uniform diameter and the said shoulders defining said land are of the same uniform diameter.

The hinge pin 15 projected through said knuckles in pivotal relation and in a conventional manner has formed therein an annular groove 19 of greater axial length than the axial length of the land 18. Said groove defines within pin 15 a pair of spaced annular shoulders 22 in the said pin, the lower shoulder being so located on the pin with respect to the land 18 as to be loosely and retainingly engaged by the adjacent shoulder 23 of the land 18, but at the same time providing for limited relative longitudinal movement of the pin relative to said land.

In the preferred embodiment of the present invention the shoulder 17 at one end of the pin actually limits longitudinal movement of the pin in one direction (downward). Accordingly, the over-size length of groove 19 is actually adapted to permit a limited relative longitudinal movement of the said pin in the opposite direction (upward).

In this connection, the internal diameter of the land 18 and its shoulders 23 are greater than the diameter of pin 15 at the said groove 19, but at the same time, are of less diameter than the diameter of the shoulders 22 of the said pin, whereby the said pin is restrained against appreciable inadvertent relative longitudinal movement in said opposite (upward) direction.

Pin 15 is adapted for assembly and disassembly with respect to said knuckles by forcing the pin longitudinally past the land 18, which has the effect of partially unrolling and expanding the resilient knuckle 12 within which the said land 18 is formed as indicated in dot-and-dash lines in FIG. 3.

This slight expansion of the knuckle in effect spaces the free end 14 of the expanded knuckle from the body of the knuckle sufficiently to permit the movement of the forward end portion 20 of the pin past the land 18 and until the land is in opposed registry with groove 19, at which time the knuckle resiliently returns to its initial position, as shown in full lines in FIG. 3.

Accordingly, the opening resilient movement of knuckle 12, as in FIG. 3, is the resultant of the longitudinal thrust which must be applied to the pin as against the transverse inherent resiliency of the land carrying knuckle.

The same thing is true with respect to removal of the hinge pin 15. For this purpose, and in view of the over-

size length of said groove 19 with respect to the land 18, any suitable means may be employed, such as a tip of a screw driver for effecting an initial movement of the pin and its top shoulder 17 longitudinally away from the top knuckle of the leaf 11. This provides an aperture sufficiently wide into which the screw driver tip may be inserted for forcefully projecting the pin longitudinally outward in such a manner as partially to flex the resilient knuckle 12 of FIG. 3 outwardly, so that the shoulder 22 and the end portion 20 of the pin 15 may be slid frictionally through the land 18.

In the preferred embodiment of the present invention the shoulders at the opposite ends of land 18 are slightly tapered as at 24 and are, therefore, adapted for camming engagement with the respective opposite end portions of pin element 20 to facilitate introduction of the pin into the knuckle 12, expanding the same, and also to facilitate the removal of the said pin.

As shown in FIGS. 1 and 2, there is a conventional stud with a substantially spherical head 21 which is mounted at the opposite end of the series of aligned knuckles and which is projected frictionally up into the outer knuckle of leaf 11, for illustration, to complete the hinge assembly.

A slight variation of the present invention is fragmentarily illustrated in FIG. 4. Within one of the knuckles 28 of the hinge there is formed an elongated annular groove 26 of appreciable length of an internal diameter greater than the bore 27 or longitudinal opening of the knuckle at portions other than at the groove 26. Formed upon a corresponding portion of the hinge pin 29 there is provided an annular land 25 of appreciable length, the diameter of which is greater than that of the bore 27 of the knuckles, but somewhat less than the internal diameter of the groove 26 in the knuckle 28, so as to establish an interlocking relationship between the land 25 and the elongated groove 26.

Here, as in FIG. 1, the shoulder 17 at one end of the pin 29 limits the longitudinal movement of the pin in one direction (downward as shown). The oversize length of the groove 26 in a vertical direction as shown with respect to the land 25 will permit limited longitudinal movement of the pin 29 in the opposite direction or upwardly as shown in FIG. 4.

The knuckle 28 is of a construction similar to that shown in FIG. 3 and also would have a free end portion similar to the end portion 14 shown in FIG. 3 and normally in contact with the body portion of the knuckle, this knuckle being formed as a resilient extension of the leaf 11. Accordingly, there will be a resilient temporary expansion of the knuckle 28 as the land 25 is moved longitudinally along the internal bore or opening 27 of the knuckle and until the land 25 moves into nesting registry within the annular groove 26.

During the forceful entry of the land 25 along the bore 27, the free end as 14, will be slightly spaced outwardly from the body of the knuckle in the same way as is illustrated in FIG. 3; and upon registry of the land 25 with the annular groove 26, the knuckle 28 will return to its normal position similar to the full line showing in FIG. 3.

Accordingly, FIG. 4 merely illustrates the reverse relation of land and knuckle shown in FIG. 2.

The purpose in both cases is to prevent appreciable inadvertent longitudinal movement of the hinge pin in the opposite direction from the direction of insertion of the pin within the hinge leaves.

It is contemplated as a part of the present invention that a substantial portion of the length of end portions 20 of the pin 15, FIG. 2, may be of a reduced exterior diameter, slightly less than the internal diameter of the land 18, to facilitate passage of the reduced end portion 20 past the land. It is contemplated, however, that a part of the portion 20 adjacent to the shoulder 22 will

be of the maximum diameter of the said pin in order to be cooperatively and retainingly engaged by the land 18 and its shoulders to prevent accidental or undesirable longitudinal outward movement.

While there is herein shown and described but two principal forms of the invention, it is recognized that other variations and equivalents will suggest themselves to those skilled in the art from the foregoing particular disclosure. It is intended that all such equivalents which fall within the scope of the appended claims shall be considered within the purview of the present invention.

#### I claim:

1. A loose-pin hinge for use as a door hinge, comprising a complementary pair of leaves provided with integral interfitting knuckle members formed by rolling up portion of said leaves and providing, when assembled together, a substantially continuous and axially aligned series of openings; a hinge pin member extending through and disposed in said openings in the normal assembled position of the hinge; and means for preventing the inadvertent axial movement of said hinge pin member away from its normal position in the assembled hinge, including a substantially annular land formed on one of said members, and a substantially annular groove formed in the other of said members and arranged in free registry with said annular land in the normal assembled position of the hinge with said land projecting radially into said groove, the diameter at a mid portion of said annular land, wherein said diameter is the inside diameter when the lands extends inwardly from the knuckle member and is the outside diameter when the land extends outwardly from the hinge pin member, being so related to the diameter of said other of said members at portions other than at said groove, the last named diameter being the outside diameter of the hinge pin member when the land extends inwardly from the knuckle member and being the inside diameter of the one of said knuckle members in which said groove is formed when the land extends outwardly from the hinge pin member, that axial movement of said hinge pin member to and from its normal position in said hinge is permitted only by the flexing of at least one of said knuckle members within its elastic limit and in such manner as partially to unroll the knuckle member during such flexing, but axial movement is prevented by the relative diameters of said land and the one of said members in which said groove is formed as aforesaid in the absence of such unrolling type flexing of a hinge knuckle member.

2. A hinge in accordance with claim 1, in which said hinge pin has a flange arranged to abut against an end one of said knuckles in the assembled position of said hinge; and wherein said annular land and said annular groove are both of such axial length with respect to each other and are so spaced from the end of said knuckle member against which said flange on said hinge pin abuts, that said hinge pin may be moved axially without the flexing of any of said knuckle members for a sufficient distance to permit the insertion of a tool between said flange and the adjacent end of the knuckle member against which said flange abuts.

3. A hinge in accordance with claim 1, in which said annular land is formed on the interior of one of said knuckle members and said annular groove is formed in said hinge pin at a point opposite said land when said hinge pin is in its normal assembled position in the hinge.

4. A loose-pin hinge for use as a door hinge, comprising a complementary pair of leaves provided with integral interfitting knuckle members formed by rolling up portions of said leaves and providing, when assembled together, a substantially continuous and axially aligned series of openings; a hinge pin member extending through and disposed in said openings in the normal assembled position of the hinge; and means for preventing the inadvertent axial movement of said hinge pin member away from

its normal position in the assembled hinge, including a substantially annular land formed on said hinge pin member, and a substantially annular groove formed in the interior of one of said knuckle members and arranged in free registry with said annular land in the normal assembled position of the hinge with said land projecting radially into said groove, the maximum outside diameter of said annular land being so related to the inside diameter of said one knuckle member at portions other than at said groove that axial movement of said hinge pin member to and from its normal position in said hinge is permitted only by the flexing of said one knuckle member within its elastic limit and in such manner as partially to unroll the knuckle member during such flexing.

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