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(54) A HINGE AND A METHOD FOR MAKING THE SAME

(71) I, YOSHITAKA NAKANISHI, of 12-9, Yawata 5-chome, Ichikawa-shi, Chiba-ken, Japan, of Japanese Nationality, 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:—

The present invention relates to a hinge for doors of buildings, furniture such as cabinets, and other articles, and to a method for making the same.

A conventional method for fabricating a hinge is known in which firstly one side edge of each hinge leaf is rolled up to form a circular shape forming a cylindrical knuckle part, and then a rod member for use as either a hinge pintle or a thrust bearing for supporting a hinge pintle at one end thereof is tightly inserted into an aperture of the cylindrical knuckle part so as to be rigidly secured therewithin. In the foregoing conventional method, the rod member is rigidly secured within the cylindrical knuckle part by piercing a check pin through apertures formed on both the cylindrical knuckle part and the rod member. However, with this conventional method, it is very difficult to carry out the processes for inserting the rod member tightly into the aperture of the cylindrical knuckle part; for forming an aperture, to insert the check pin therein, on both the cylindrical knuckle part and the rod member engaged within the cylindrical knuckle part; and for fixing the rod member securely within the cylindrical knuckle part by inserting the check pin into the apertures, and therefore a lot of labour and time is needed for fabricating a hinge by this method. Furthermore, a hinge produced in this way is apt to lack solidity in structure because the rod member is often only loosely surrounded by the cylindrical knuckle part.

One object of the present invention is to provide a solidly constructed hinge.

Another object of the present invention is to provide a hinge which can be made

simply and economically with less labour and in a shorter period of time.

According to the invention, there is provided a hinge comprising two hinge leaves, each of which comprises a cylindrical knuckle part formed by rolling up one side edge of the hinge leaf into a cylindrical shape, and a rod member securely fixed within one of said cylindrical knuckle parts by welding the rod member at the outer peripheral surface thereof to the longitudinal side edge of the cylindrical knuckle part.

There is also provided a method of fabricating a hinge comprising forming a blank for a hinge leaf from a metal plate, welding a rod member to one side edge of said blank, and forming a cylindrical knuckle part by winding the side edge of said hinge leaf around said rod member to form a cylinder.

In the accompanying drawings:

Figures 1a—1e are respectively schematic views of a hinge according to the present invention showing each step of a series of processes to bend up a hinge leaf to form a cylindrical knuckle part thereon;

Figures 2—4 are schematic views of a bending device to be used for the bending processes;

Figure 5 is a longitudinal sectional view of a hinge formed by the method according to the present invention.

Figure 6 and Figure 7 are sectional views of the hinge respectively taken along lines VI—VI and VII—VII of Figure 5;

Figure 8 and Figure 9 are longitudinal sectional views of further embodiments of the hinge fabricated according to the method of the present invention respectively;

Figure 10 and Figure 11 are sectional views taken along lines X—X and XI—XI of Figure 9.

Figures 1a—1e respectively show a side edge of a hinge leaf, wherein each step of a series of processes is shown for rolling up a rod member in one side edge of the hinge leaf. Each step of the series of processes is as follows:

(A) A metal plate is cut off to a desired

size and shape to prepare a blank (1) for a hinge leaf as shown in Figure 1a;

(B) The blank (1) is bent up at one side edge (2) thereof to form a slight arc shape in profile as shown in Figure 1b;

(C) A rod member (3) having an appropriate length applicable to either a hinge pintle or a thrust bearing is placed on the portion (2) bent up to form the arc shape in profile, and the rod member is welded on the outer periphery thereof at the junction (4) with the end plane of the arc portion (2) is shown in Figure 1c;

(D) The arc portion (2) is wound around the rod member (3) until the end plane of the arc portion (2) abuts against the main body (5) of the hinge leaf to form a cylindrical knuckle part (6) as shown in Figure 1d;

(E) The wound portion (6) is turned down to be displaced within the plane of the main body (5) as shown in Figure 1e;

According to the aforementioned method of the present invention, when the cylindrical knuckle part (6) is formed on one side edge of a blank (1) for a hinge leaf, the rod member (3) suitable for use as either a hinge pintle or a thrust bearing has already been surrounded tightly by the cylindrical knuckle part (6) along with the cylindrical knuckle part (6) being able to roll up the rod member (3) therein as an internal mould, whereby a steady hinge without looseness can be fabricated economically with less labour and in a shorter period of time as compared with the prior art.

Figure 2 shows a method of bending one side edge of the blank (1) for a hinge leaf to form a slight arc shape in profile as shown in Figure 1b by means of a lower die (7) and an upper die (8). The blank (1) for a hinge leaf is initially placed on the horizontal surface (14) of the lower die as indicated by the two dots and dash line so that one end (9) of the blank comes into contact with an upright plane (13) by crossing over a groove (12) formed by a concave arcuate surface (10) provided on the lower die and an oblique surface (11) extending in an upward inclination from the end of the concave arcuate surface. After having placed the blank (1) on the lower die, the upper die (8) slides down along the upright plane (13) of the lower die to press one side edge of the blank (1) by an arcuate nose (15) of the upper die, whereby the one side edge is bent nearly to an arc corresponding to the concave groove in profile as indicated by the solid line.

Figure 3 illustrates a method for rolling up the bent portion (2) of the blank in a circular shape as shown in Figure 1d by employing a lower die (16) and an upper die (17). The bent portion (2) formed at one side edge of the blank welding on the rod member (3) is placed on a semicircular

groove (18) provided on the lower die (16) as indicated by the solid line to set the main body portion (5) of the blank for a hinge leaf to be upright along a vertical plane (19) of the lower die (16), and the upper end of the blank is pressed by the bottom plane (20) of the upper die (17) which slides downwards so as to form a cylindrical knuckle part (6) at the bent portion (2) which is rolled up in a circular shape along the inner profile of the groove (18) as indicated by the chain line.

Figure 4 illustrates a method for turning up the main body of the blank at the point A by employing an upper die (21) and a lower die (22) so as to displace the cylindrical knuckle part (6) thus rolled up in a circular shape within the plane of the main body portion (5) for a hinge leaf as shown in Figure 1e. The cylindrical knuckle part (6) is engaged within a semi-circular groove (23) of the lower die (22) as indicated by the chain line to support the main body portion of the hinge leaf at one free end (24) thereof on a horizontal plane (25) of the lower die (22), whereby a clearance (26) is formed between the main body (5) of the hinge leaf and the horizontal plane (25). When the main body (5) of the hinge leaf is pushed downward by the upper die (21) at a smooth bottom plane (27) thereof, the main body of the hinge leaf is subjected to be turned up at the point A, however, the cylindrical knuckle part (6) is, in this instance, adapted to be engaged within a recess (28) provided on the upper die (21), to keep it from being crushed down.

Some examples of the application of the rod member (3) as either a hinge pintle or a thrust bearing are illustrated in Figures 5—11.

As for the hinge shown in Figures 5—7, a portion of a hinge pintle (29) is accommodated within the cylindrical knuckle part (6) formed on one leaf (30) of the hinge leaves by means of the method according to the present invention, and a protruding portion (29a) of the hinge pintle is inserted into a cylindrical knuckle part (6a) of the other hinge leaf (30a), so that the load of a door does not act on the hinge pintle but is exerted upon the contact surfaces (31) and (31a) of the cylindrical knuckle part (6).

As for the hinge shown in Figure 8, a hinge pintle (29) of one hinge leaf (30) together with a thrust bearing (32) of the other hinge leaf (30a), the bearing being in contact with one end of the hinge pintle, are accommodated within the cylindrical knuckle parts (6)—(6a) by means of the method of the present invention. In this instance, the load does act on both contact surfaces (31) and (31a) of cylindrical knuckle parts (6) and (6a) but is exerted upon the contact surface of the hinge pintle (29) with the

thrust bearing (32) so that the hinge leaves rotate more smoothly. Moreover, the hinge leaves may be further pivotable more smoothly with the help of, for instance, a steel ball (33) provided at one end of the hinge pintle (29) and steel bearing disc (34) disposed to be in contact with the steel ball at one end of the thrust bearing so as to set the hinge pintle and the thrust bearing to a point contact engagement.

As for the hinge shown in Figures 9—11, the thrust bearing (32) and the cylindrical knuckle part (6a) surrounding the thrust bearing are provided in a middle part on one side of the hinge leaf (30a) by means of the method of the present invention, whilst at the upper and the lower ends on one side edge of the other hinge leaf (30) are formed two cylindrical knuckle part (6) spaced at an appropriate distance from the central cylindrical knuckle part (6a). The two hinge leaves are connected with each other by means of two hinge pintles (29), and each of hinge pintles is adapted to be inserted into the cylindrical knuckle part (6) through the outer end thereof formed on the hinge leaf to be aligned in a row intermediately between the cylindrical knuckle parts, and the nose of each hinge pintle is in contact with the thrust bearing (32). The hinge can be used facing in either the upward or the downward direction by disposing two hinge pintles to be in contact with the thrust bearing thus arranged as mentioned above.

In addition, rings (35) made of synthetic resin can be disposed between the cylindrical knuckle parts, and the hinge leaves can be turned more easily with the help of the rings. On both ends of the cylindrical knuckle part are fixed plugs (36).

WHAT I CLAIM IS:—

1. A hinge comprising two hinge leaves, each of which comprises a cylindrical knuckle part formed by rolling up one side edge of the hinge leaf into a cylindrical shape, and a rod member securely fixed within one of said cylindrical knuckle parts by welding the rod member at the outer peripheral surface thereof to the longitudinal side edge of the cylindrical knuckle part.

2. A hinge as claimed in claim 1, wherein the rod member is a hinge pintle connecting the two hinge leaves with each other, a portion of said hinge pintle being securely fixed within the cylindrical knuckle part

formed on one hinge leaf and a protruding portion of said hinge pintle being inserted into the cylindrical knuckle part formed on the other hinge leaf so as to be relatively rotatable therewith.

3. A hinge as claimed in claim 1, comprising two hinge pintles connecting the hinge leaves with each other, and wherein said rod member is a thrust bearing disposed between said hinge pintles, wherein the said one cylindrical knuckle part in which the thrust bearing is welded is located in the middle of said one side edge, and the other hinge leaf comprises two cylindrical knuckle parts, one on each side of said one cylindrical knuckle part, and each of said hinge pintles is inserted into the hole of one of said two cylindrical knuckle parts so as to extend into said one cylindrical knuckle part.

4. A hinge as claimed in any preceding claim, wherein rings of synthetic resin are disposed around the or each pintle between the cylindrical knuckle parts.

5. A hinge, substantially as herein described with reference to Figures 5 to 7, 8 or 9 to 11 of the accompanying drawings.

6. A method of fabricating a hinge comprising forming a blank for a hinge leaf from a metal plate, welding a rod member to one side edge of said blank, and forming a cylindrical knuckle part by winding the side edge of said hinge leaf around said rod member to form a cylinder.

7. A method as claimed in Claim 6, in which said one side edge of said blank is first bent in an arcuate shape, and the rod member is welded to the bent portion.

8. A method as claimed in Claim 6 or 7, further comprising turning up the main body portion of said hinge leaf at the point connecting with said cylindrical knuckle part so as to displace said cylindrical knuckle part wound around said rod member within the plane of the main body of said hinge leaf.

9. A method for fabricating a hinge, substantially as herein described with reference to Figures 1 to 4 of the accompanying drawings.

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thrust bearing (32) so that the hinge leaves rotate more smoothly. Moreover, the hinge leaves may be further pivotable more smoothly with the help of, for instance, a steel ball (33) provided at one end of the hinge pintle (29) and steel bearing disc (34) disposed to be in contact with the steel ball at one end of the thrust bearing so as to set the hinge pintle and the thrust bearing to a point contact engagement.

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2. A hinge as claimed in claim 1, wherein the rod member is a hinge pintle connecting the two hinge leaves with each other, a portion of said hinge pintle being securely fixed within the cylindrical knuckle part

formed on one hinge leaf and a protruding portion of said hinge pintle being inserted into the cylindrical knuckle part formed on the other hinge leaf so as to be relatively rotatable therewith.

3. A hinge as claimed in claim 1, comprising two hinge pintles connecting the hinge leaves with each other, and wherein said rod member is a thrust bearing disposed between said hinge pintles, wherein the said one cylindrical knuckle part in which the thrust bearing is welded is located in the middle of said one side edge, and the other hinge leaf comprises two cylindrical knuckle parts, one on each side of said one cylindrical knuckle part, and each of said hinge pintles is inserted into the hole of one of said two cylindrical knuckle parts so as to extend into said one cylindrical knuckle part.

4. A hinge as claimed in any preceding claim, wherein rings of synthetic resin are disposed around the or each pintle between the cylindrical knuckle parts.

5. A hinge, substantially as herein described with reference to Figures 5 to 7, 8 or 9 to 11 of the accompanying drawings.

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