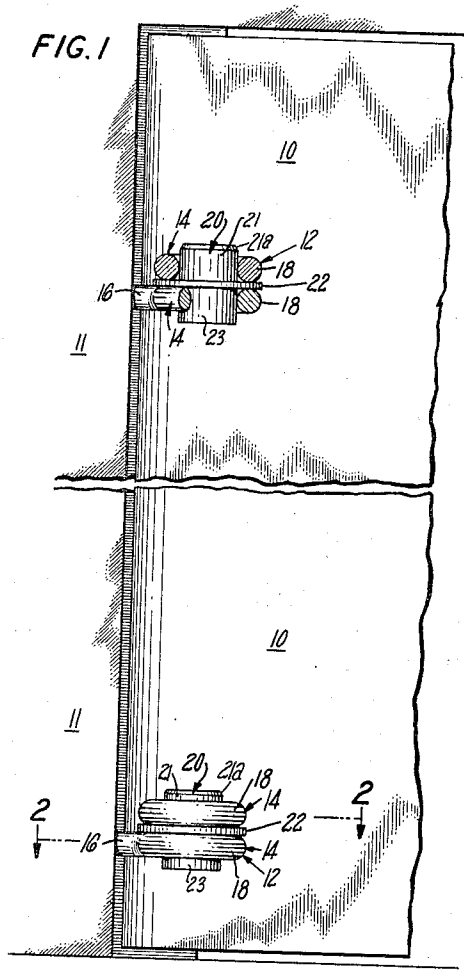
April 2, 1968 C. R. SUSKA 3,375,544

HINGE

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FIG. 1



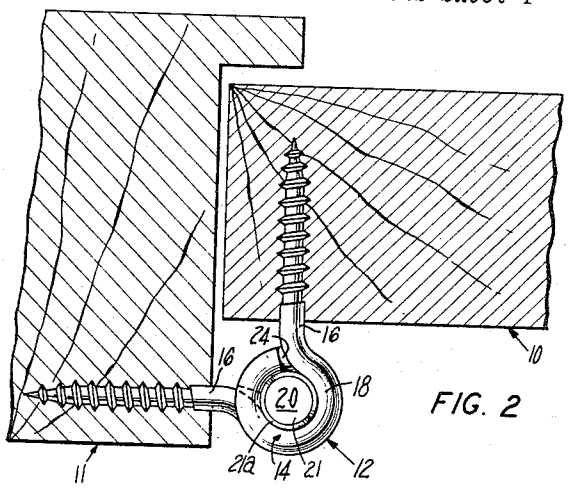




FIG. 2

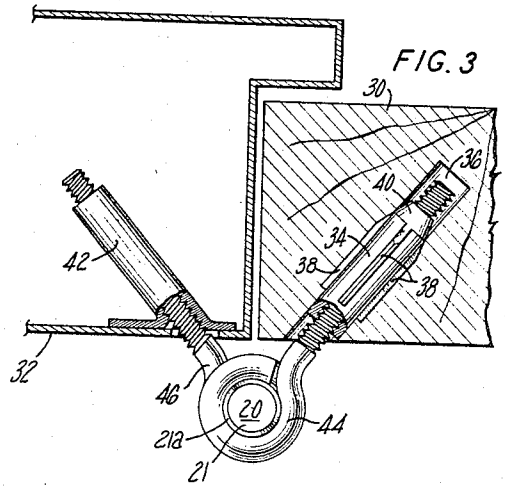



FIG. 3

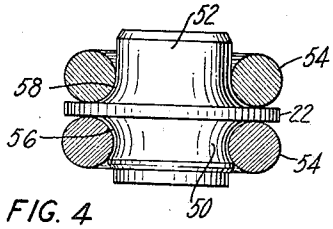



FIG. 4

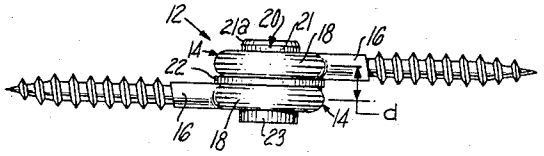



FIG. 5

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FIG. 6

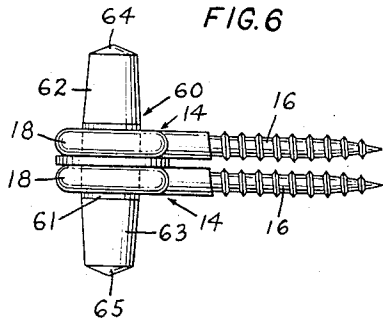



FIG. 7

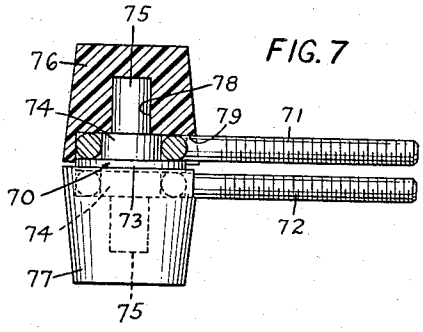



FIG. 8

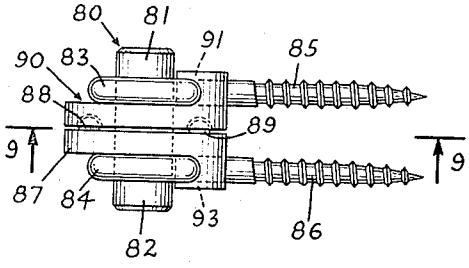



FIG. 9

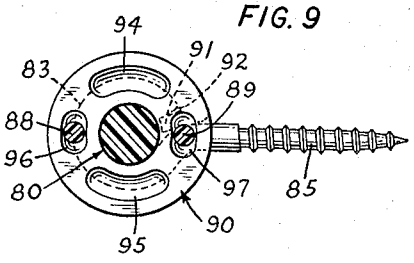
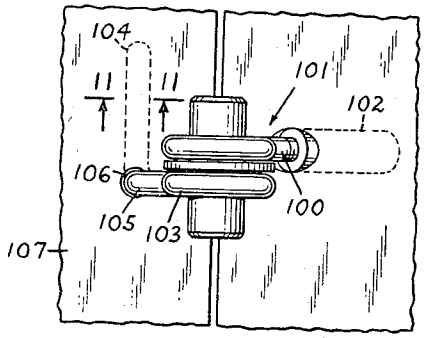



FIG. 10



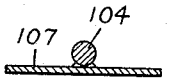




FIG. 11

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United States Patent Office 3,375,544 Patented Apr. 2, 1968



3,375,544

# HINGE

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Filed Aug. 27, 1965, Ser. No. 483,227
4 Claims. (Cl. 16—128)

## ABSTRACT OF THE DISCLOSURE

The improvement is a hinge which is characterized by a pair of hinge elements formed as screw eyes and having a pintle formed of a low-friction plastic material with end portions fitting in the screw eyes and an integral flange fitted between the screw eyes to reduce friction and avoid the need for lubrication and enabling the hinges to be readily applied and adjusted for alignment and door-positioning with a minimum of difficulty, the hinge also including modifications to enable the pintle to be detachably connected with one of the screw eyes by means of a peripheral groove receiving one of the screw eyes and also being adapted to receive elements fixed with relation to the screw eyes which will retain the hinge in adjusted open or closed positions.

This invention relates to hinge mounted door constructions and the like and particularly to improved, readily attached and adjustable hinges for facilitating the mounting and positioning of doors and the like in their frames.

Conventional hinges having leaves provided with a plurality of interfitting knuckles, joined by a hinge pin or pintle have been used for many years for mounting doors in buildings, cabinets and the like. The butt type of hinge which is widely used requires the mortising of the door frame and the door to conceal the hinge leaves and enable a snug fit of the door in the door frame.

The face mounted hinges do not require mortising but must be located and aligned accurately to center the door in the door frame with proper clearance and hinge pin alignment.

In some types of doors, for example, prehung storm doors, piano type hinges are used to support the door and maintain its alignment while the door frame is being mounted in a building opening. All of these hinges are satisfactory despite shortcomings which have become more apparent as the technology of building has improved and changed. All of these hinges present difficulties for the home craftsman, particularly in their installation and proper alignment and this is especially true of the butt type hinge which requires accurately located and formed mortises for receiving the hinge leaves. Likewise, even in factory assembled doors and door frames, such hinges present problems of alignment and location to produce a satisfactory product.

In particular, the manufacture and installation of the prior hinges has involved a great deal of labor and time which add substantially to the cost of the door construction.

Another factor of importance in the hardware industry is the cost of transportation of such hinges particularly in relation to the competitive sales prices of such hinges. All of the above described hinges are heavy and bulky and consequently the cost of shipping from one part of the country where the hinges are manufactured to another part of the country for use are high so that a manufacturer in one part of the country cannot compete with another manufacturer in or supplying another part of the country.

Others have attempted to provide hinges of satisfactory appearance and light weight by forming the hinges of thinner or lighter weight materials but the changes in material and less attractive appearance of the hinges has failed to offset the decreased shipping costs.



Simple hinges formed of inexpensive and readily available parts such as screw eyes have been used, for example, in folding furniture, gate hinges and the like where appearance and accuracy of fit and positioning of parts are of no moment. However, these hinges have not been made as precision parts or made suitable in appearance for such uses as door hinges, cabinet hinges and the like where an attractive appearance and satisfactory operation are essential.

In accordance with the present invention, hinges are provided which are composed of readily available and inexpensive parts, such as, for example, screw eyes and a pintle or hinge pin formed of a resilient plastic having low friction properties assembled in such relation that a strong, freely movable and precisely aligned and operating hinge assembly is obtained.

Hinges of the type embodying the present invention have many advantages over the prior art leaf type hinge in that ready and precise adjustment of pairs or multiple hinges is possible to bring them into accurate alignment and to locate a door accurately with respect to the door frame by screwing the screw eyes into the frame and door to greater or lesser extents. By use of a plastic hinge pin having low friction properties the hinges, according to the present invention, operate silently and easily without lubrication and provide long trouble-free life under any and all normal service conditions. Moreover, hinges embodying the present invention can be readjusted easily even after installation to maintain proper door alignment if warpage of the door should occur or misalignment results from shifting of the building or other structure in which the hinges are used.

Moreover, the new hinges greatly facilitate the hanging of prehung doors by enabling the door to be packed with the frame and allowing the door to be unhinged readily from the frame to enable the frame to be attached in a building opening without the weight of the door thereon. Also, the new hinges are of such construction that when a door mounted with them is closed, it cannot be unhung or removed as is the case with doors having removable hinge pins or pintles.

Of great commercial significance is the fact that the new hinges are less bulky and much lighter in weight than leaf hinges of equivalent strength and hence can be shipped or transported from place to place and can be stored and handled much more economically. Also, the new hinges can be readily installed by the home craftsman with a minimum of tools and experience and without the problems involved in mortising, aligning and positioning the hinges and the like which the ordinary home craftsman may be ill-equipped to solve.

In particular, some forms of the new hinges require only the predrilling of two holes which can be accomplished by means of a hand or electric drill and after installation of the hinges precise alignment of the hinge pins of spaced apart hinges and proper positioning of a door in a door opening can be accomplished by screwing the screw eyes into and out of the holes.

The new hinges also lend themselves to modification in ornamentation and appearance to fit into the decor of the home or to blend with many different types of furniture and they can be readily painted without affecting their operation.

For a better understanding of the present invention, reference may be had to the accompanying drawing in which:

FIGURE 1 is a fragmentary front elevational view of a door installation including the hinge construction of this invention;

FIGURE 2 is a sectional view of the door installation of FIGURE 1 showing the inset mounting of the door in its jamb;

FIGURE 3 is a sectional view similar to FIGURE 2 showing another door installation in which the door is flush-mounted in its jamb and showing a modified hinge construction;

FIGURE 4 is an enlarged fragmentary cross-sectional view of a modified form of the hinge;

FIGURE 5 is a side view of the hinge of FIGURE 1;

FIGURE 6 is a side elevational view of a modified form of hinge embodying the invention;

FIGURE 7 is a side elevational and partial sectional view of still another form of hinge embodying the invention;

FIGURE 8 is a side elevational view of another form of hinge embodying the invention;

FIGURE 9 is a view in section taken on line **9—9** of FIGURE 8;

FIGURE 10 is a fragmentary front elevational view of a door mounted on a metal jamb by a modified form of hinge embodying the invention; and

FIGURE 11 is a view in section taken on line **11—11** of FIGURE 10.

Referring now in detail to the drawings in which like numerals refer to like parts throughout the various figures, there is shown in FIGURE 1 a door **10** hingedly mounted in a door frame **11** by means of a pair of hinges **12** embodying the present invention.

Each of the hinges **12** comprises a pair of hinge members **14** each being a screw eye formed of wire or rod having a round cross section of uniform diameter. Each of the screw eyes **14** has a cylindrical shank portion **16** at one end for securing them to the door **10** or door frame **11**, respectively. The other end of each screw eye is curved to form an annular ring portion **18** which, for purposes hereinafter more fully described, provide a pair of thrust bearing surfaces **18***a* and **18***b*, respectively, lying in the planes of the upper and lower surfaces of the shank portions **16**.

A one-piece pintle **20**, which is formed of a molded low friction, resilient plastic such as nylon, is positioned in the aperture in the annular end portion **18** of each of the screw eyes **14**. The pintle **20** is provided with thin annular flange **22** which extends between the ring portions **18** of the screw eyes **14** to provide a load bearing surface therebetween. This annular flange **22**, being integrally formed on the pintle **20** further serves to retain the pintle **20** within the hinge.

The pintle **20** is dimensioned to provide a close running fit with the apertures of the ring portions **18** of the screw eyes. In this regard, as shown in FIGURE 2, the ring portion **18** may be interrupted as at **24** to provide an axial gap. This gap provides a slight resiliency in the ring portion to accommodate variations in the relative diameters of the screw eyes and the pintle, and may also serve to secure the pintle non-rotatably to one of the screw eyes by the use of a slight interference fit or by the use of a projection received within the axial gap **24**.

As shown in FIGURE 1, the diameter of the circle of generation of each ring portion **18** is at least two times the axial distance *d* between the axes of the cylindrical shank portions **16** of the screw eyes (see FIGURE 5). Also, the flange **22** has parallel sides disposed perpendicularly to the longitudinal axis of the barrel portion of the pintle. The dimensional relations between the diameters of the ring portions and the thickness of the flange stabilize the screw eyes against canting or turning when subjected to load so that misalignment between the screw eyes of each hinge and between aligned hinges is minimized.

As best shown in FIGURE 2, wherein the hinge **12** of this invention may be utilized in mounting an inset door to a wooden frame member, the shank portion **16** of each screw eye **14** has the same diameter from one end



substantially to the other and is provided with helical threads for securing the respective screw eyes to the door and frame members. The threads may be formed by rolling or in any other way.

In the mounting of a door to its frame by the use of the hinges of this invention, the cylindrical shank portion **16** of each screw eye **14** is installed in the desired positions on the door and door frame respectively through the use of appropriate predrilled or self-formed holes extending at an acute angle to the plane of the door and frame and located by means of a suitable template. With the screw eyes **14** so mounted and the apertures of the hinges in axial alignment, a pintle **20** is inserted in one of each of the pairs of screw eyes and the door lifted so that the screw eyes thereon are positioned over the opposite end of the pintles, respectively. The door is then lowered so that the upper and lower surfaces of the annular rib **22** respectively engage the thrust surfaces of the annular portions **18** of the screw eyes to complete the mounting of the door.

One of the features of this invention is that the screw eyes **14** are secured to the door and door frame in such a manner as to facilitate easy alignment of the door and its frame during assembly. This is accomplished by turning one or both of the screw eyes **14** of a hinge relative to the door or door frame until the desired position of the hinge axis relative to the door frame is obtained. Since this adjustment may be accomplished in small steps corresponding with the rotation of either screw eye through 180°, the coplanar alignment of the surface of the door with the frame, as well as the adjustment of the clearance between the door and its frame, is readily and accurately achieved during installation.

Another feature of this invention is the manner in which the screw eyes **14** are automatically placed in precise coaxial alignment during assembly. Inasmuch as the cylindrical shank portions **16** of the screw eyes may be turned or rotated during the mounting of the door without affecting the capacity of the hinge to support the door, it is readily apparent that the hinge construction of this invention will permit the axes of the pair of hinges mounting the door to be adjusted into axial alignment with respect to each other. Thus, the bending forces on the pintle of each of the hinges due to any misalignment of the axis of conventional hinges is avoided.

Finally, this invention overcomes the problems which have been heretofore encountered in efforts to produce a hinge having a low friction thrust bearing and a cylindrical shank for securing the screw eyes to the door and the door frame by minimizing the moment arm of the turning moment which tends to rotate the cylindrical shank portions of the screw eyes due to the weight of the door.

Referring now to FIGURE 3, there is shown a modified embodiment of the invention wherein a flush-mounted wooden door **30** is secured to a metal frame **32** through the use of the hinges of this invention. In this design, the wooden door **30** is predrilled and a metal insert **34** is driven into a predrilled hole **36** so as to be concealed therein. Preferably, the metal insert **34** is provided in the form of an extrusion having axial ribs **38** thereon to prevent rotation thereof relative to the hole **36** in the door. The forward end of the extruded insert is tapered at **40** so as to center the insert within the aperture and to facilitate driving it into hole **36**. If desired, the insert **34** may be secured within the hole **36** by adhesives or other fastening devices.

The metal door frame **32** is also provided with an internally threaded cylindrical mounting insert **42** disposed at an angle relative to the end of the door jamb and secured thereto in any suitable manner such as welding.

With the inserts **34** and **42** secured to the door and door frame, the screw eyes **44** and **46** are threaded into the inserts respectively and the door mounted in the manner hereinbefore described in connection with the embodiments of FIGURES 1 and 2. In the embodiment of FIG-

URE 3, it is preferable to use machine screw threads to take advantage of the greater shear strength of the metallic inserts **34** and **42** and to provide a finer adjustment of the door relative to the door frame so that the alignment of the door and the door frame is more nearly coplanar and the gaps between the door and door frame may be more accurately adjusted.

Referring now to FIGURE 4, in another form of hinge embodying this invention, an annular groove **50** is formed on one of the ends of the pintle member **52** to releasably secure the pintle member to one of the hinge members **54**. In this embodiment the bearing surface of the pintle is molded or otherwise formed as indicated at **56** and **58** to provide full surface engagement with the curved annular portion of the respective hinge members **52** to provide surface contact through an arc of 90° and thereby further minimize the wear between the hinge members **54** and the pintle **52**.

Hinges of the type described above are susceptible to considerable modification in their appearance and in their ability to accomplish other functions such as, for example, retaining a door supported by the hinges in an opened or closed condition. As shown, for example, in FIGURE 6, the overall appearance of a hinge can be modified by providing a pintle **60** having a midportion **61** like the pintles disclosed in FIGURES 1 to 5, but having at their opposite ends generally frusto-conical extensions **62** and **63** which may be provided with rounded or generally conical end portions **64** and **65** giving the hinge an overall elongated and tapering appearance which is useful with the modern types of furniture and doors. The configuration of the end extensions **62** and **63** can, of course, be modified as by fluting or the application of ornamental designs thereto to match or blend with the appearance of various types of articles, such as cabinets, desks and the like. Moreover, the pintles can be colored or otherwise treated as the purpose demands.

Still another means for changing the appearance of the hinges is disclosed in FIGURE 7. In this form of the invention, the hinge pintle **70** used with the screw eyes **71** and **72** is provided with the mid flange **73** forming a thrust bearing between the screw eyes. Portions **74** of the pintle on opposite sides of the flange have a running fit with the ring portions of the screw eyes. Extending outwardly from the portion **74** are smaller solid or tubular portions **75** on which are received cover caps **76** and **77** formed of a suitable plastic material or the like. The cap **76** includes a suitable internal recess **78** corresponding to the outer contours of the extension **75** and the ring portions of the screw eyes, with a notch **79** formed in one edge for receiving the shank of the screw eye. The caps **76** and **77** are mounted on the pintle with a press fit to enable their removal and replacement, if desired.

It will be apparent that the shape of the caps **76** and **77** can be modified widely as, for example, frusto-conical, as shown in FIGURE 7, dome-shaped or elongated and ornamented, depending upon the overall appearance sought.

Hinges in accordance with the invention can be further modified to render them capable of retaining a door releasably in open or closed position. To that end, the pintle **80** shown in FIGURE 8 may have opposite end portions **81** and **82** engageable with a running fit in the rings **83** and **84** of the screw eyes **85** and **86**. The pintle **80** has an annular flange **87** formed integrally therewith and provided with a pair of small dome-like protrusions or projections **88** and **89**. A ring member **90** is rotatably received on the pintle **80** and is provided with a projection **91** which engages in the gap **92** between the shank **85** and the end of the ring member **83** as best shown in FIGURE 9. Similarly, the flange **87** has a projection **93** which secures it against rotation relative to the ring **84**. In this way, the pintle **80** is non-rotatably connected with the ring **84** while the ring **90** is rotatable relative to the pintle **80** and non-rotatable relative to the ring **83**. As shown in FIGURE 9, the ring **90** is provided with pairs of diametrically spaced, long, arcuate grooves **94** and **95** and shorter, diametrically spaced grooves **96** and **97** of the depth to receive the dome-like projections **88** and **89**. Accordingly, when the screw eyes are rotated to a position wherein the projections **88** and **89** engage in the recesses **96** and **97**, the hinge elements will be retained in this position which may correspond, as desired, to either the open or the closed position of a door mounted on the hinges. When the protuberances **88** and **89** are received in the longer grooves **94** and **95**, the door can be readily moved through an arc substantially equal to the arc of the grooves **94** and **95** because the faces of the flange **87** and the ring **90** are then in sliding contact, without interference between the grooves and the projections therein and thereon.

Hinges embodying the invention can be used in ways other than those described above. As shown in FIGURES 10 and 11, one of screw eyes **100** of the hinge **101** which may correspond to any of the hinges described above may be screwed into a predrilled hole or an insert **102** in a wood or metal door. The other screw eye **103** may have a portion **104** of its shank **105** bent into parallel relation with the axis of the hinge and inserted through a hole **106** in a metal jamb **107** and engaged with the inside face of the jamb. The bent portion **104** may then be brazed, soldered or welded to the jamb, thereby securely anchoring the screw eye **103** to the jamb. While only the screw eye **100** can be adjusted for aligning and spacing the door relatively to the jamb, this type of hinge mounting nevertheless is highly satisfactory in prefabricated or prehung door structures. It will be understood that the shank **105** can be provided with threads or they can be omitted and, if desired, can be flattened for greater surface contact with the jamb to facilitate its connection to the jamb.

All of the forms of hinges described above present marked advantages from the standpoint of ease of installation, smooth and quiet operation, while retaining the advantages of low cost of manufacture, shipping and storage. They can be installed readily even by an unskilled home craftsman or installed equally readily in production operations such as, for example, the mass production of prehung doors, factory-made furniture and the like, while assuring the proper alignment and location of the doors even when errors occur in a positioning of the screw eyes due to faulty work by the home craftsman or manufacturing errors or tolerances. Moreover, the appearance of the hinges can be modified and conformed to the type of article with which they are used so that they are satisfying from an ornamental as well as a structural standpoint.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

**1.** In combination, a door member, a doorway frame member and a pair of hinges mounting the door member on the doorway frame member for relative pivotal movement, said hinges comprising a pair of screw eyes each having a cylindrical threaded shank portion on one end and an annular ring portion on the other end, and a one-piece cylindrical, low-friction plastic pintle member having its ends respectively received within the annular ring portions of said hinge halves and having an intermediate annular flange fixed thereto and positioned between the annular ring portions of each of the hinge halves.

**2.** A hinge for pivotally mounting a door on a door frame comprising a pair of substantially identical wire-formed screw eyes each having a cylindrical threaded shank portion and an annular eye portion of circular cross-section, a one-piece molded nylon pintle member having an integral centrally located annular flange posi-

tioned between the thrust bearing surfaces and having cylindrical end portions respectively received in and fitting the eye portions of the two screw eyes, means on said pintle non-rotatably connecting it to one of said screw eyes, an annular member rotatably engaging said annular flange and fixedly engaging the other screw eye, and a protrusion on and a recess in opposing surfaces of said annular flange and annular member for releasably retaining said screw eyes in a predetermined angular relation.

3. The hinge set forth in claim 1 comprising a portion at each end of said pintle and a cap member frictionally mounted on each end portion and covering said end portion and an adjacent annular eye portion.

4. The hinge set forth in claim 1 comprising a peripheral groove in one of said ends of said pintle receiving one of said annular ring portions to retain said pintle in said one ring portion.




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