

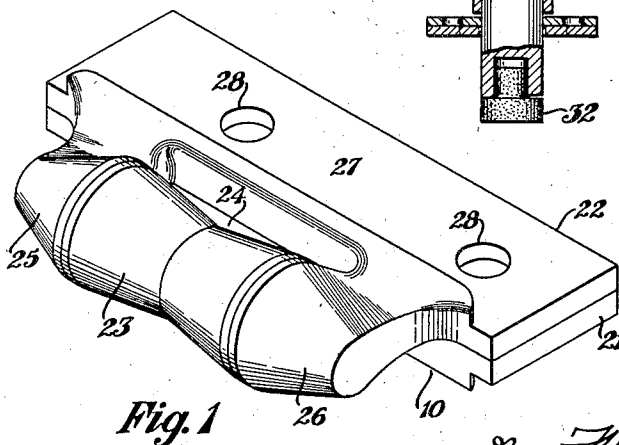
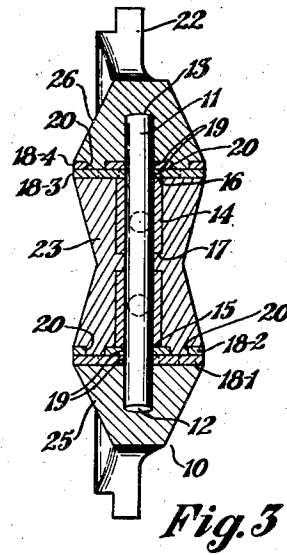
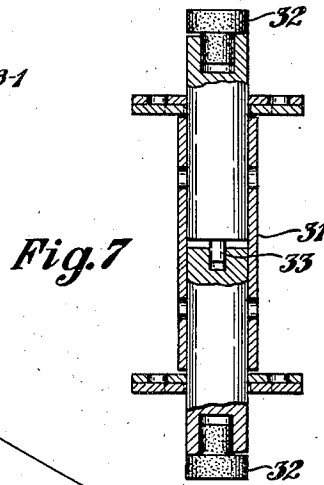
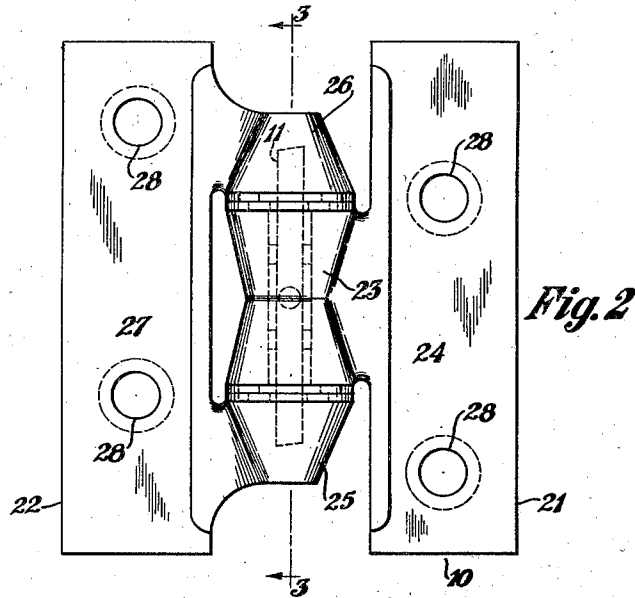
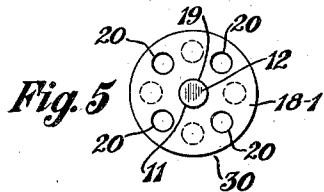
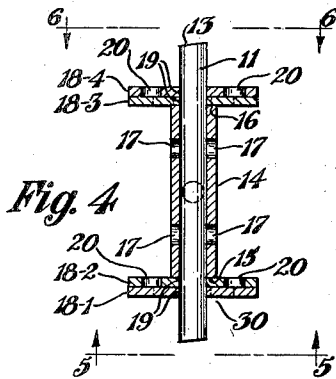
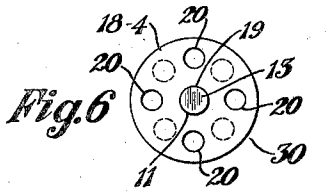
April 20, 1937.

J. F. HINES

2,078,076

HINGE OR JOINT

Original Filed July 10, 1934



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UNITED STATES PATENT OFFICE

2,078,076

HINGE OR JOINT

James F. Hines, Lakewood, Ohio, assignor to Russell J. Hines, Lakewood, Ohio

Original application July 10, 1934, Serial No. 734,489. Divided and this application February 25, 1935, Serial No. 8,033

10 Claims. (Cl. 16—128)

The invention relates to hinges, and this application is a division of my prior application for U. S. Letters Patent, Serial No. 734,489, filed July 10, 1934, which matured into Patent No. 2,004,810, June 11, 1935, and was reissued as Patent No. Re-issue 20,089 Sept. 1, 1936.

Hinges available prior to the present improvements sag in use, squeak, rust, and their joints collect moisture and/or dust, because of imperfect fitting and excessive clearance between the hinge leaves and pins.

The imperfect fitting and excessive clearance between the leaves and pins of usual hinges arises from the fact that the cost of and the time required for manufacturing usual hinges according to usual methods so as to attain precision fitting and clearance between the hinge leaves and pins would be prohibitive.

The objects of the present improvements include the provision of an improved hinge which is sagless, squeakless, rustless, and proof against the accumulation of water and/or dust in its joints, and which is adapted for economical and rapid manufacture.

The foregoing and other objects are attained by the improvements, apparatus, parts, combinations, and sub-combinations, which comprise the present invention, and the nature of which is set forth in the following general statement, and preferred embodiments of the improvements, apparatus, parts, combinations, and sub-combinations, together with their mode of use, and a preferred method of making the same, are set forth in the following description, and the improvements, apparatus, parts, combinations, and sub-combinations of the invention are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the improved hinge of the present invention may be described in general terms as including a hinge pin which may be made of a length of round steel rod, preferably of a stock size, the ends of the pin being formed out of square. A shorter sleeve of preferably seamless tubing is rotatably located on the pin and may be of brass or bronze, and pairs of brass or bronze washers are located with the pin rotatably fitting in their central apertures, each pair being located at one end of the sleeve with one of the washers in abutment with the adjacent end thereof.

The sleeve and washers are preferably provided, as by means of apertures formed in their walls, with engaging portions or surfaces adapted to be engaged by metal cast thereon. The hinge leaves are cast of metal or other suitable material about the pin, sleeve, and washers, so that one leaf engages the sleeve and the inner washers and the other leaf engages the pin and the outer washers.

The nature of the preferred improved method for making the improved hinge of the present invention may be described in general terms as pre-assembling the pin, sleeve, and washers in their desired permanent locations with respect to each other, placing the pre-assembled pin, sleeve, and washers as a core unit in a mold having leaf forming cavities, and then pouring molten material having a lower melting point than that of the pin, sleeve, and washers into the mold cavities and about the pin, sleeve, and washers, and on cooling the cast material shrinks wax tight on the pin, sleeve, and washers, and forms the improved hinge.

For many purposes the material of the several parts of the hinge may be metallic, and the cast metal forming the hinge leaves preferably has a lower melting point than that of the metal of the pin, sleeve, and washers.

In the case of relatively large hinges, in order to attain proper cooling of the leaf material about the ends of the hinge pin, it is desirable to associate cores with the opposite ends of the hinge pin and to cast the hinge leaf engaging the outer ends of the hinge pin about the cores as well as the outer ends of the hinge pin; or to provide telescoping means in the hinge pin intermediate its ends, to permit it to contract endwise with the cast material.

Preferred embodiments of the improved hinge and of the pin, sleeve, and washer unit thereof, are illustrated in the accompanying drawing forming part hereof, in which

Figure 1 is an isometric view of one embodiment of the improved hinge with the leaves in closed position;

Fig. 2, a plan view thereof with the leaves in open position;

Fig. 3, a longitudinal sectional view thereof as on line 3—3, Fig. 2;

Fig. 4, a detached view of the pin, sleeve, and washer unit, with the sleeve and washers shown in longitudinal axial section;

Fig. 5, an end view thereof looking in the direction of the arrows 5—5, Fig. 4;

Fig. 6, an end view thereof looking in the direction of the arrows 6—6, Fig. 4; and

Fig. 7, a view similar to Fig. 4 illustrating a pin, sleeve, and washer unit for a large hinge, with cores applied to the opposite ends of the hinge pin, and also telescoping means in the hinge pin, for permitting proper cooling and shrinking of the cast material forming the leaf engaging the outer ends of the hinge pin.

Similar numerals refer to similar parts throughout the several views.

The embodiment of the improved hinge illustrated in the drawing is indicated generally by 10 and includes a hinge pin 11 which is made of a length of round rod, which may be a steel

rod and is preferably of a stock size, and the end faces 12 and 13 of the pin 11 are for the purposes of the invention preferably formed out of square with the cylindric longitudinal outer surface of the pin, as by diagonally cutting the rod from which the pins 11 are formed.

A sleeve 14 rotatably fits on the pin 11, and the sleeve 14 is substantially shorter in length than the pin 11 and the end faces 15 and 16 of the sleeve 14 are square with its cylindrical inner and outer longitudinal surfaces.

The sleeve 14 has a plurality of engaging apertures 17 formed in its tubular wall.

As a convenient mechanism for providing thrust bearing surfaces within the hinge joint, which surfaces will be of harder material than the cast body, sets of washers 18-1 and 18-2, and 18-3 and 18-4 fit on the outer ends of the pin 11. The washers have the same external diameters, and all four may conveniently be exactly alike. The inner washers 18-2 and 18-3 must be rotatable on the pin 11. It is not material whether or not the outer washers 18-1 and 18-4 are rotatable on the pin, because the casting of the caps 25 and 26, hereafter described, forms pin, outer washers, and caps into a unitary structure. Opposite faces of the washers 18-1 and 18-2 thrust abut against each other and the inner face of the washer 18-2 abuts against the end face 15 of the sleeve 14, and similarly the opposite faces of the washers 18-3 and 18-4 thrust abut against each other and the inner face of the washer 18-3 abuts against the end face 16 of the sleeve 14.

Each washer has a plurality of apertures 20 formed therein to engage the cast material.

The sleeve 14 and washers 18-1, 18-2, 18-3, and 18-4 may be made of bronze in the hinge 10, and the sleeve 14 is preferably a length of seamless tubing.

The hinge 10 furthermore includes one-piece leaves 21 and 22 which may be made of cast aluminum alloy, and the one-piece leaf 21 includes a tubular portion 23 which surrounds the sleeve 14 and engages the apertures 17 of the sleeve 14, and the opposite ends of the tubular portion 23 abut the inner faces of the washers 18-2 and 18-3 and engage the apertures 20 thereof.

The hinge leaf 21 furthermore includes a connector plate 24 which extends from one side of the tubular portion 23.

The one-piece hinge leaf 22 includes end caps 25 and 26; and the end cap 25 surrounds and engages the outer end of the hinge pin 11 beyond the washer 18-1, and abuts the outer face of the washer 18-1 and engages the apertures 20 thereof; and similarly the end cap 26 surrounds and engages the other end of the hinge pin 11 beyond the washer 18-4, and abuts the outer face of the washer 18-4 and engages the apertures 20 thereof.

The hinge leaf 22 furthermore includes a connector plate 27 extending from one side of the end caps 25 and 26.

The connector plate 24 of the hinge leaf 21 and the connector plate 27 of the hinge leaf 22 are provided as illustrated with apertures 28 whereby the hinge leaves may be connected as by bolts or screws with the members or parts (not shown) to be hinge connected by the hinge 10.

The improved hinge 10, (in the smaller sizes) is preferably made by forming a core unit indicated generally by 30 in Figs. 4, 5, and 6, and

which includes the pin 11 with the sleeve 14 and the washers 18-1 and 18-2, and 18-3 and 18-4 positioned thereon in the desired permanent locations with respect to one another, each set of washers being arranged so that the engaging apertures 20 thereof do not register with one another, as best shown in Figs. 5 and 6.

The core unit 30 is then placed as a core in mold cavities of a mold, not shown, the cavities being formed to make the hinge leaves 21 and 22.

Molten metal, as aluminum alloy in the hinge 10, is then poured into the mold cavities, casting the leaves 21 and 22, and as the metal of the leaves cools, the leaves contract and wax tight engagement of the tubular portion 23 of the leaf 21 is effected with the sleeve 14 and the inner washers 18-2 and 18-3, and similar wax tight engagement of the end caps 25 and 26 is effected with the end portions of the hinge pin 11 and their out of square end faces and with the end washers 18-1 and 18-4, the apertures 17 and 20 providing engaging surfaces for the cast material.

In the hinge 10 the aluminum alloy forming the leaves 21 and 22 has a lower melting point than the hinge pin 11 and the bronze sleeve 14 and the round washers 18-1, 18-2, 18-3, and 18-4; and in any of the improved hinges of the present invention, the melting point of the cast material for forming the leaves may be lower than the melting point of the hinge pin, sleeve, and washers. Accordingly, when it is desired to cast steel leaves, a pin, sleeve, and washers of nickel iron may be used; and for malleable iron leaves, the pin, sleeve, and washers may be made of steel.

It will be understood, however, that the body of the metal in the hinge pin and in the respective washers, is so considerable, as compared with the amount of cast material which may contact through the apertures with the bearing surfaces; that the cast material will chill and freeze so quickly that it will not adhere to the bearing surfaces, even though the melting point of the cast material may not be lower than the melting point of the hinge pin, the sleeve, or the washers.

In making hinges having pins not exceeding six inches in length, it may not be necessary to make any provisions for accommodating the shrinking of the material which is cast to form the leaves; but in hinges having pins of longer lengths, it is desirable if not necessary to provide cores for crushing at the ends of the pin, or telescoping means interposed between the ends of the pins to permit a shrinking of the cast material, as illustrated in the modified pin, sleeve and washer unit 31 shown in Fig. 7.

In hinges having pins from six inches to some twelve inches in length, mushroom headed cores 32 may be used at the ends of the hinge pin, which will crush when the cast material shrinks; and in hinges having pins with a length of from twelve inches and upwards, the washers may be spaced slightly from the ends of the sleeve and the pin may be made in two slightly spaced sections with a central telescoping pin and socket connection 33 intermediate the ends, which will accommodate the shrinking of the cast material; as illustrated in Fig. 7.

The invention has been described more particularly with reference to hinges having all the parts made of metal, and the hinge pin will usually be made of steel. Steel tubing and steel washers of proper thickness are preferably used when the leaves are cast of grey or malleable iron or steel. Copper, brass or bronze washers, however,

are preferably used when the leaves are cast of non-ferrous materials, such as hard rubber, glass, bakelite and the like.

It is also desirable to carbonize or coat the sleeve, pin, and washer unit with shellac, soapstone, or the like, to produce a tight fit when the leaves are cast upon the unit.

I claim:

1. A structure for a hinge and the like, including a pin, a sleeve rotatably located on the pin, the pin being longer than the sleeve and having ends extending beyond the opposite ends of the sleeve, pairs of abutting washers provided with central apertures rotatably fitting on the pin, each pair being located at one end of the sleeve and one of the washers of each pair abutting the adjacent end of the sleeve, one piece leaves, one leaf engaging the sleeve and the washers abutting the ends thereof, and the other leaf engaging the outer ends of the pin and the other washers.

2. A structure for a hinge and the like, including a pin, a sleeve rotatably located on the pin, the pin being longer than the sleeve and having ends extending beyond the opposite ends of the sleeve, pairs of abutting washers provided with central apertures rotatably fitting on the pin, each pair being located at one end of the sleeve and one of the washers of each pair abutting the adjacent end of the sleeve, one piece leaves, one leaf engaging the sleeve and the washers abutting the ends thereof, and the other leaf engaging the outer ends of the pin and the other washers, the pin, sleeve, and washers being of metal, and the one piece leaves being of metal having a lower melting point than the metal of the pin, sleeve, and washers.

3. A structure for a hinge and the like, including a pin having end faces oblique to the longitudinal axis of the pin, a sleeve rotatably located on the pin, the pin being longer than the sleeve and having ends extending beyond the opposite ends of the sleeve, pairs of abutting washers provided with central apertures rotatably fitting on the pin, each pair being located at one end of the sleeve and one of the washers of each pair abutting the adjacent end of the sleeve, one piece leaves, one leaf engaging the sleeve and the washers abutting the ends thereof, and the other leaf engaging the outer ends of the pin and the other washers.

4. A structure for a hinge and the like, including a pin, a sleeve rotatably located on the pin, the pin being longer than the sleeve and having ends extending beyond the opposite ends of the sleeve, pairs of abutting washers provided with central apertures rotatably fitting on the pin, each pair being located at one end of the sleeve and one of the washers of each pair abutting the adjacent end of the sleeve, the sleeve and washers having apertures formed therein, one piece leaves, one leaf engaging the sleeve and the washers abutting the ends thereof, and the other leaf engaging the outer ends of the pin and the other washers.

5. A structure for a hinge and the like, including a pin having end faces oblique to the longitudinal axis of the pin, a sleeve rotatably located on the pin, the pin being longer than the sleeve and having ends extending beyond the opposite ends of the sleeve, pairs of abutting washers provided with central aperture rotatably fitting on the pin, each pair being located at one end of the sleeve and one of the washers of each pair abutting the adjacent end of the sleeve, the

sleeve and washers having apertures formed therein, one piece leaves, one leaf engaging the sleeve and the washers abutting the ends thereof, and the other leaf engaging the outer ends of the pin and the other washers.

6. A hinged structure comprising a pin, washers in contiguous pairs upon said pin, and slidable axially of said pin during shrinkage of cast material thereon, a sleeve upon said pin between the inner of said washers, a cast body upon said sleeve and inner washers comprising with said sleeve and their washers a unitary knuckle, cast end bodies upon the respective ends of said pin and the outer of said washers comprising with said washers and pin a unitary structure revoluble with respect to said knuckle.

7. A hinged structure comprising circular bearings mounted in pairs, said pairs being axially disposed, a sleeve-and-pin whereon said pairs are mounted, said sleeve being rotatable on said pin, one bearing of each pair being secured to the sleeve, the other bearing of each pair being secured to the pin, cast material surrounding said bearings and sleeve-and-pin, said material being separated at axial intervals into relatively-rotatable bodies, said cast material uniting rigidly one bearing of each pair to the sleeve and the other bearing of each pair to the pin.

8. A hinged structure comprising circular bearings mounted in pairs, said pairs being axially disposed, a sleeve-and-pin whereon said pairs are mounted, said sleeve being rotatable on said pin, one bearing of each pair being secured to the sleeve, the other bearing of each pair being secured to the pin, cast material surrounding said bearings and sleeve-and-pin, said material being separated at axial intervals into relatively-movable bodies, said cast material uniting rigidly one bearing of each pair to the sleeve and the other bearing of each pair to the pin, and means for shortening the distance between the pairs in conformity to shrinkage of the surrounding metal.

9. A hinged structure comprising a knuckle revoluble between axially spaced caps, said structure comprising a sleeve and a continuous body of metal surrounding said sleeve and bound thereto by contracting stress within said metal, a pin of greater length than the sleeve and extending beyond each end of the sleeve, said caps comprising each a continuous body of metal bound upon the extensions by contracting stress within said metal, and thrust bearing members between said knuckle and said caps, said thrust bearing members being opposed in pairs and one of each pair being secured to the sleeve by the metal of the knuckle, and the other of each pair being secured to the pin by the metal of the cap.

10. A hinged structure comprising in combination a pin and a sleeve revoluble upon the intermediate portion of said pin, means conjoint with said pin for permitting reduction in the length of said pin under axial pressure due to shrinkage of molten metal thereon, members at the ends of said sleeve disposed laterally thereto, means for permitting a shortening in the axial distance between said lateral members due to shrinking of molten metal thereon, other members disposed laterally with respect to said pin and bearing facially upon the faces of said first-named lateral members, end caps on said pin joining said pin and second-named lateral members into an integral construction, a body of material upon said sleeve forming said sleeve and said first-named lateral members into an integral structure.

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