April 24, 1956 M. C. WEINER 2,742,664

HINGE CONSTRUCTION

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Fig. 4.

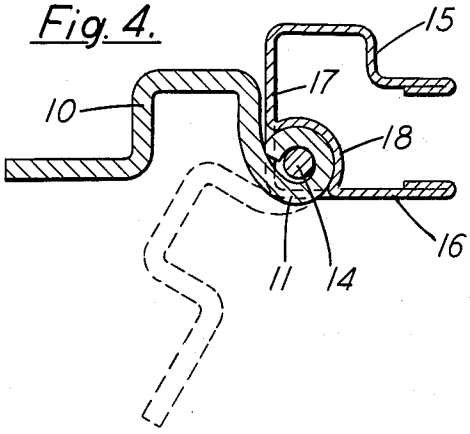


Fig. 5.

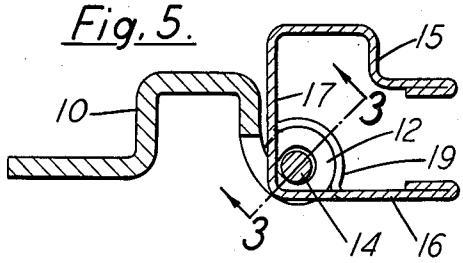
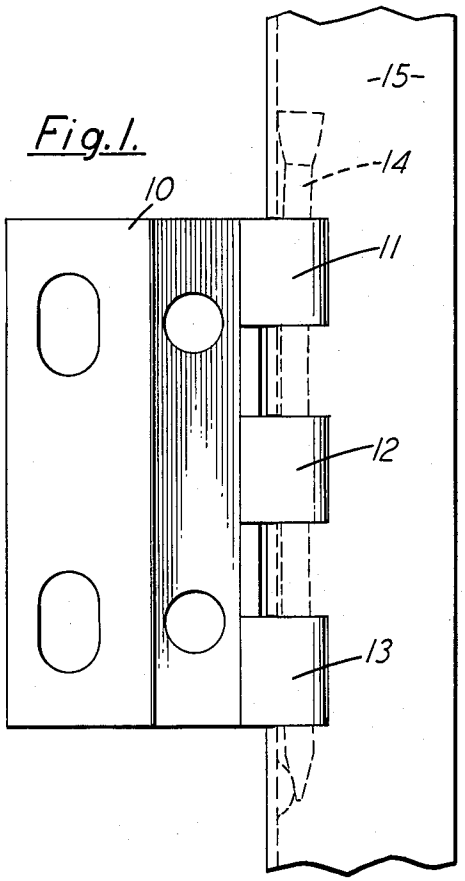


Fig. 1.



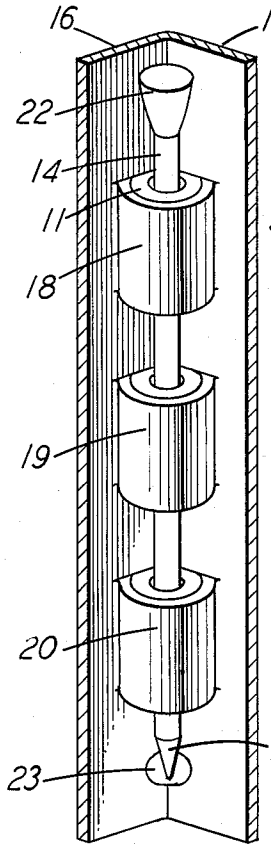


Fig. 2.

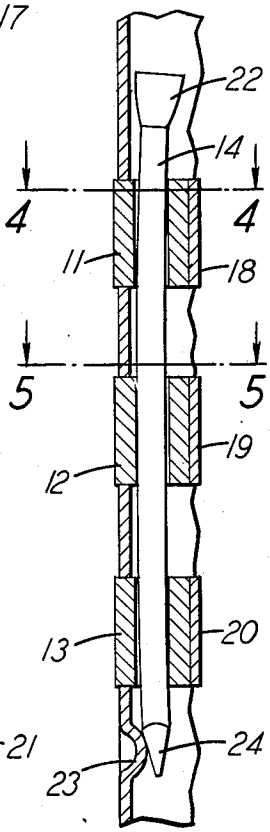


Fig. 3.

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HINGE CONSTRUCTION

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5 Claims. (Cl. 16—128)

This invention relates to the construction of hinges, and particularly to that class of hinges in which cost is a very important factor. A hinge of conventional construction which is tight enough to cause the hinge pin and the journals to mate within a few tenths of a thousandth of an inch will usually have a smooth, quiet, and constant performance. If the amount of freedom between the pin and the bearings is increased by just a few thousandths of an inch, the net result will be a feeling of looseness such that one hinge member may be moved with respect to another to the accompaniment of a rattling noise and a feeling of loose-jointed construction. Having in mind that the standard manufacturing tolerances for all but precision-made goods does not permit hinge construction of tolerances of tenths of a thousandth, it has been extremely difficult to economize in hinge construction without tremendous sacrifice in the overall impression of the quality of the product. The present invention supplies a long-felt need for providing a construction which is completely free of a feeling of looseness, and which provides quiet and durable operational characteristics and is fairly easily lubricated. All of these very valuable characteristics are accompanied by what approaches an absolute minimum in cost of construction.

The preferred form of the present invention includes mating hinge members, one of these being preferably formed in conjunction with a sheet metal member which is angular in cross section. One set of bearing members is formed by a series of indentations made in this angular member which displaces sheet metal to form axially-spaced bearing portions which receive in radial bearing similarly positioned journal portions on the opposite mating hinge member. The hinge members therefore cooperate in a fashion somewhat resembling a ball and socket joint. Hinge forces which are conventionally transmitted through the hinge pin in all directions are in this construction transmitted directly from one hinge member to another over a large sector of possible directions of force application. The insertion of the hinge pin not only maintains the assembled relationship of one hinge member with respect to the other, but also establishes a biasing action urging the two hinge members into more solid engagement and thereby eliminating all looseness which would otherwise result from ordinary accumulations of manufacturing tolerances.

The several features of the present invention will be discussed in detail through an analysis of the particular embodiments illustrated in the accompanying drawing. In the drawing,

Figure 1 is a view taken on a plane parallel to the axis of the hinge.

Figure 2 is a perspective view taken at the inside of the angle and showing the relative arrangement of the assembled hinge.

Figure 3 is a section taken along the plane 3—3 as shown on Figure 5.

Figure 4 is a view taken on a plane perpendicular to the axis of the hinge, and is in projection with respect to Figure 1. The position of the plane of Figure 4 is indicated in Figure 3.

Figure 5 is a section taken on the plane 5—5 of Figure 3.

Referring to the several figures of the drawing, a hinge member 10 is formed of sheet metal, and is provided with the loops 11, 12, and 13, which form sleeves for receiving the hinge pin 14. The particular configuration of the remainder of the hinge member 10, except for the presence of the sleeve 11, 12, and 13, forms no part of the present invention. Such configuration has been merely selected for a particular installation for cooperation with supporting structure.

An opposite and mating hinge member is provided by the beam 15, a portion of which may be considered as angular in cross section, and including the sides 16 and 17. The beam 15 is preferably formed of sheet metal and in the illustrated form of the invention, may be manufactured as a "rolled section." The hinge functions of the beam 15 are made possible by the formed areas 18, 19, and 20, which have been displaced from the material forming the sides 16 and 17 to create bearing portions on the inside of the angle established by those sides. The bearing portions 18, 19, and 20 are similarly disposed axially with respect to the sleeves 11, 12, and 13, and receive these sleeves in rotative radial bearing engagement against forces which are directed at the sector covered by the bearing portions. With respect to these forces, hinge loading is transferred directly from the hinge member 10 over to the beam 15 via the bearing portions 18, 19, and 20 without involving the hinge pin 14. The function of the hinge pin with regard to these particular forces is to urge the sleeves 11, 12, and 13 into more solid engagement with the bearing portions, and to maintain a constant loading in this direction so as to remove any feeling of looseness in the hinge. This biasing effect is accomplished in the preferred form of this invention as best shown in Figure 3. As the pin 14 is inserted in the hinge assembly beginning with the tapered point 21, a progressive resistance to such insertion is generated due to the fact that the head 22 of the hinge pin begins to bear against the sides 16 and 17. The head dimensions, coupled with the particular radii of the bearing portions 18, 19, and 20, and also taking into consideration the thickness of metal of the sleeves 11, 12, and 13, are such that the hinge pin 14 cannot be axially inserted to the point where the head 22 abuts the sleeve member 11 without bending the hinge pin rather severely.

A similar action takes place at the opposite end of the pin where the tapered point 21 engages the formed abutment 23 at the apex of the angle formed by the sides 16 and 17. This abutment and the tapered point 21 develop a wedging action which forces the hinge pin 14 in a direction to more firmly urge the sleeve 13 into engagement with the bearing portion 20. The combined effect of the head 22 as it engages the sides 16 and 17 on axial insertion, and the tapered point 21 as it bears against the abutment 23, is to force the hinge pin to act as a beam supported at opposite ends by the sides 16 and 17, and bearing at intermediate points on the sleeve members 11, and 13 of the hinge member 10. Due to the curvature developed as the hinge pin 14 is loaded in this fashion, it is most likely that it will not bear at its central point against the sleeve 12. In this connection, it is preferable that a sufficient amount of clearance be allowed between the diameter of the hinge pin 14 and the inside diameter of the sleeve 12 so as to permit a considerable amount of deflection of the hinge pin without generating an outward pressure on the sleeve 12 oppo-

site in direction to that generated to the sleeves 12 and 13.

One of the several points of economy of this hinge construction is the fact that the characteristics of the hinge pin outlined above may be obtained in an ordinary finishing nail. Such a nail is preferably used as the hinge pin 14; and, depending upon circumstances and various tolerances, the nail may either take a position rotatively fixed with respect to the hinge member 10 or with respect to the beam 15, depending upon whether the resistance to rotation is greatest at the sleeves 11, 12, and 13, or between the head 22 and the sides 16 and 17. In either case, it appears that a few oscillations of the hinge will suffice to seat one member against the pin sufficiently to establish a tendency to prevent axial withdrawal of the hinge pin as the hinge is used. Any slight depression in one member where it is engaged by the pin will tend to lock those members in relative axial position, even though the tapered point 21 will generate a tendency to withdraw the hinge pin due to its bearing against the abutment 23.

The large surface area of bearing between the sleeves 11, 12, and 13, and the bearing portions 18, 19, and 20 provides an excellent lubricant reservoir for either oil or grease. This factor adds to the feeling of a well-machined unit and thereby contributes to the impression of quality. A well lubricated hinge free from all looseness is a very valuable structural feature to incorporate into a product, and becomes particularly valuable when the cost of incorporating is as low as can be achieved by the structure provided by the present invention.

The particular embodiments of the present invention which have been illustrated and discussed herein are for illustrative purposes only, and are not to be considered as a limitation upon the scope of the appended claims. In these claims, it is my intent to claim the entire invention disclosed herein, except as I am limited by the prior art.

I claim:

1. A hinge, comprising: a first hinge member, said first hinge member having a plurality of pin-receiving sleeves; a second hinge member, said second hinge member having a cross-section forming an angle and having bearing portions extending between the portions forming said angle and correspondingly disposed to the sleeves of said first hinge member, and adapted to receive said sleeves in rotative radial bearing engagement, said second hinge member having an abutment adjacent the axis of said bearing portions and on the opposite side of said axis from at least a part of said bearing portions; and hinge pin means in the form of a finishing nail having an enlarged head and a tapered point, said head being of such dimensions that said pin cannot be inserted in said sleeves axially fully to the point of axial engagement of said head without deflecting said nail in bending due to engagement of said head with the said portions forming said angle, said nail having the point thereof disposed to engage said abutment.

2. A hinge, comprising: a first hinge member, said first hinge member having at least one pin-receiving sleeve; a second hinge member, said second hinge member having a cross-section forming an angle and having a bearing portion extending between the portions forming said angle and correspondingly disposed to the sleeve of said first hinge member, and adapted to receive said sleeve in rotative radial bearing engagement, said second hinge member having an abutment adjacent the axis of said bearing portion and on the opposite side of said axis from at least a part of said bearing portion; and hinge pin means in the form of a finishing nail having an enlarged head and a tapered point, said head being of such dimensions that said pin cannot be inserted in said sleeve axially fully to the point of axial engagement of said head without deflecting said nail in bending due to engagement of said head with the said portions forming said angle, said nail having the point thereof disposed to engage said abutment.

3. A hinge, comprising: a first hinge member, said first hinge member having at least one pin-receiving sleeve; a second hinge member, said second hinge member having a bearing portion correspondingly disposed to the sleeve of said first hinge member, and adapted to receive said sleeve in rotative radial bearing engagement, said second hinge member also having at least one surface substantially parallel to the axis of said bearing portion and on the opposite side of said axis therefrom, said second hinge member having an abutment adjacent said axis and on the same side thereof as said surface; and hinge pin means having on one end an enlargement of such dimensions that said pin cannot be inserted in said sleeve axially fully to the point of axial engagement of said enlargement without deflecting said hinge pin in bending due to the engagement of said enlargement with said surface, said pin having the opposite end thereof tapered and disposed to engage said abutment.

4. A hinge, comprising: a first hinge member, said first hinge member having at least one pin-receiving sleeve; a second hinge member, said second hinge member having a bearing portion correspondingly disposed to the sleeve of said first hinge member, and adapted to receive said sleeve in rotative radial bearing engagement, said second hinge member also having at least one surface substantially parallel to the axis of said bearing portion and on the opposite side of said axis therefrom, said second hinge member having an abutment adjacent the axis of said bearing portion and on the same side thereof as said surface; and hinge pin means having on one end an enlargement of such dimensions that said pin cannot be inserted in said sleeve axially fully to the point of axial engagement of said enlargement without deflecting said hinge pin in bending due to engagement of said enlargement with said surface, said pin having the opposite end thereof disposed to engage said abutment.

5. A hinge, comprising: a first hinge member, said first hinge member having at least one pin-receiving sleeve; a second hinge member, said second hinge member having a bearing portion correspondingly disposed to the sleeve of said first hinge member, and adapted to receive said sleeve in rotative radial bearing engagement, said second hinge member also having at least one surface substantially parallel to the axis of said bearing portion and on the opposite side of said axis therefrom, and hinge pin means having on one end an enlargement of such dimensions that said pin cannot be inserted in said sleeve axially fully to the point of axial engagement of said enlargement without deflecting said hinge pin in bending due to engagement of said enlargement with said surface.

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