United States Patent

McCabe

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[54] **HINGE**

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[52] **U.S. Cl.** **16/178**

[51] **Int. Cl.** **E05d 1/04**

[58] **Field of Search** 16/171, 178

[56] **References Cited**

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Primary Examiner—Bobby R. Gay

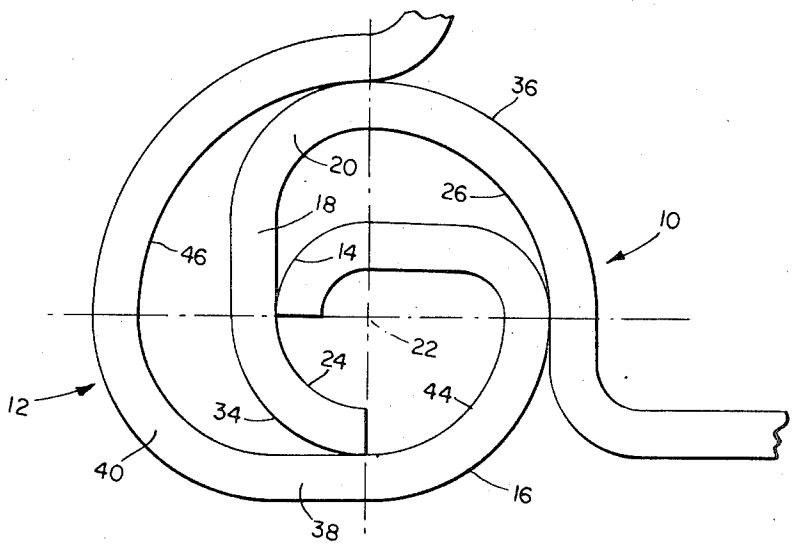
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[57] **ABSTRACT**

A hinge means comprises complimentally configured hinge portions having curved surfaces which cooperate to provide ball and socket action over at least 180° degrees of travel.

6 Claims, 3 Drawing Figures



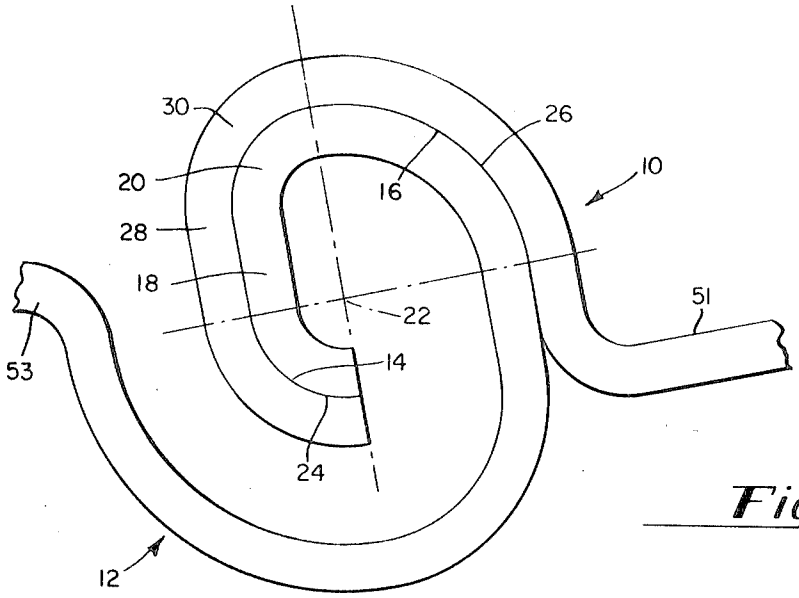


Fig. 1

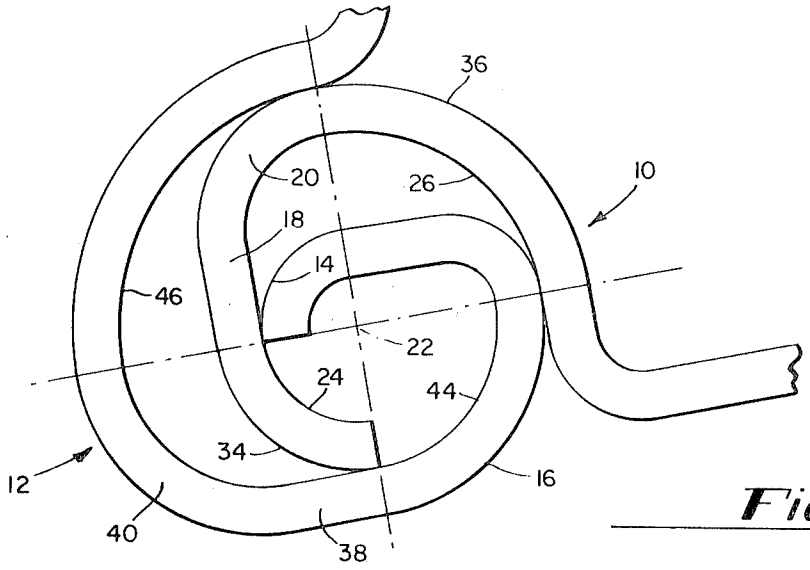


Fig. 2

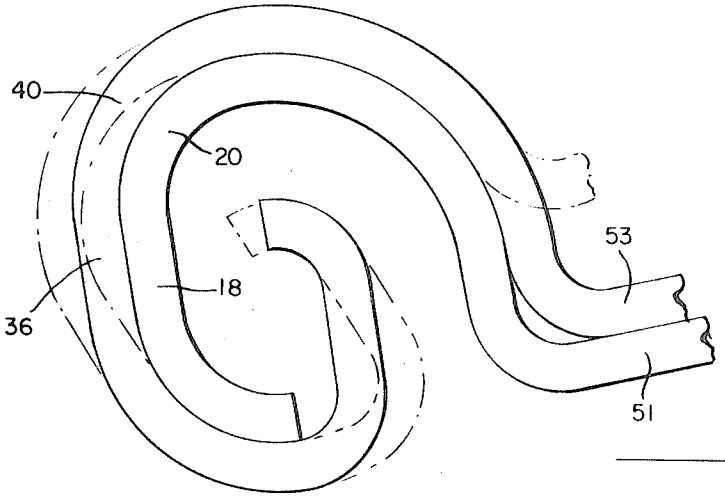


Fig. 3

HINGE

BACKGROUND OF THE INVENTION

This invention relates to hinges of the type that can be extruded in two pieces, which, when slipped together axially form, without more, an articulating means.

In the prior art there are many such devices. See for example U.S. Pat. No. 3,273,632 issued to me on Sept. 20, 1966 which discloses hinge elements in combination with a blade of a fire damper. This type of device provides a ball and socket arrangement for a portion of its articulation and, what I describe as a laminar entry action over the remainder of its articulation. Thus, such a device provides a shifting motion simultaneously with a rotating motion.

In the present invention, I have eliminated the shifting action.

SUMMARY OF THE INVENTION

In this invention I have provided an articulation means of the type described which rotates about an axis. My hinge means comprises complementally configured hinge elements having diametrically opposed sets of curved surfaces, comprising quadrants of concentric circles which are spacially arranged to provide ball and socket actions over at least 180 degrees of rotation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view of a hinge means in accordance with an embodiment of my invention;

FIG. 2 is a view of the embodiment shown in FIG. 1 with a portion of the hinge means in an alternate position; and

FIG. 3 is a view of the embodiment shown in FIG. 1 with a portion of the hinge means shown in further alternate position, with an intermediate position shown in phantom.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claims.

The hinge means in accordance with the preferred embodiment of my invention is preferably made of a light gauge metal material such as 10 gauge steel having a thickness of about 0.134 inches with a working tolerance of ±0.005 inches. This tolerance in itself provides sufficient clearance when the parts are formed as more fully explained hereinafter. Of course other materials could be used and the parts need not be roll formed and in fact are ideally suited for extruding in continuous lengths; the end elevation of which appears in FIG. 1.

As shown, the hinge means comprises two separate elements designated **10** and **12**. Each element has a plurality of surfaces some of which form a ball and some of which form a socket. These surfaces are spacially arranged so that in articulating the element **12** with respect to the element **10** from the position shown in FIG. **1** to the position shown in FIG. **3** a ball and socket action is constantly present.

The particular relationship which I have found to be the most preferred in accordance with my invention comprises a portion of a ball within a portion of a socket which in turn is concentric within a portion of a larger ball and socket. The disposition of the portions is such that when the inner ball portions are disposed at the interface of engagement with the portions of their mating socket, the portions of the larger ball are at the interface of engagement with the portions of their mating socket.

More specifically the inner ball lies on hinge element **12** and comprises arcuate surfaces **14** and **16**. These surfaces are 90 degree arcs and are joined by a straight portion **18** and a curved portion **20**. They are diametrically opposed and have a common axis at **22**. The arcs lie in alternate quadrants.

The socket in which this inner ball fits is delineated by the complimentally configured hinge element **10** which has arcuate surfaces **24** and **26** forming the socket as shown in FIG. **1**. The straight portion **28** and the curved portion **30** are likewise preferably complimentally configured to mate with the portions **18** and **20** of hinge element **12**. However, it will be apparent from the description which follows that they need not be so configured since they are merely limiting surfaces rather than working surfaces.

The mating pairs of working surfaces **14–24** and **16–26** function as do the mating surfaces in the usual ball and socket arrangement of uniform diameter. It will be noted however, that these surfaces are portions of concentric circles of different diameters.

If the hinge element **12** were to be articulated clockwise about its axis **22** while the hinge element **10** was held stationary the mating portions just described would function as a ball and socket for 90 degree of rotation. Such a condition is shown in FIG. **2**. At that point the surface **14** is at the interface of engagement with the surface **24** and the surface **16** is at the interface of engagement with the surface **26**. Any further rotation would separate these mating surfaces and the hinge elements would shift with respect to one another, that is, they would no longer have a common axis of articulation.

However, the second ball and socket is also at its innerface of engagement at which the larger ball is about to become engaged in its socket upon further rotation, just as the smaller ball is about to become disengaged from its socket upon further rotation. As will be more fully described this ball and socket has the same axis of rotation and so there will be no shifting of the hinge elements with respect to one another, save for the tolerence or clearance necessary to permit the parts to slide freely in engagement with one another. This is so even though the smaller ball and socket become completely disengaged.

The larger ball and socket comprises a ball having arcuate surfaces **34** and **36** on element **10** and a socket having arcuate surfaces **44** and **46** on element **12**. These again are diametrically opposed 90 degree arcs in alternate quadrants.

The surfaces of the ball **34–36** are joined by the straight portion **18** and the curved portion **20** previously described. The surfaces of the socket are joined by a straight portion **38** and a curved portion **40**. The portions **38** and **40** are complimentally configured to the external surfaces of the portions **18** and **20** so that they nest as in FIG. **3** to provide the limit of articulation. Again these are limiting surfaces rather than working surfaces.

The mating pairs of working surfaces **34–44** and **36–46** function as do the mating surfaces in the usual ball and socket arrangement of uniform diameter. Once again however, these surfaces are portions of concentric circles of different diameters.

Thus as the hinge element **12** is articulated clockwise about the axis **22** more than 90 degrees, the mating portions just described function as a ball and socket. And the elements **10** and **12** move through the intermediate position shown in phantom in FIG. **3** to the final position shown in full lines in FIG. **3**. This additional movement encompassed an additional 90 degrees so that the full range of articulation is 180 degrees.

The hinge means will normally have legs extending from the arcuate portions of the elements forming mounting means. Typical legs are shown in the Figures partially broken away; as **51** on element **10** and **53** on element **12**. The legs can be formed to lay flush against one another as shown in FIG. **3**. Or alternatively, they can be disposed at various angles or spaced from one another or taken off at various points on the curved portions.

It will be understood that various changes in the details, materials and arrangement of parts which have been herein described and illustrated in order to explain the nature of this invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the following claims.

In particular, the shape and thickness of the limiting portions can be altered; although the preferred form shown in the drawings includes straight portions tangent to their mating curved surfaces, and curved portions on radii tangent to the straight portions and smoothly mating with the curved portions.

What is claimed is:

1. A hinge comprising two complimentally configured elements arranged to provide continuous ball and socket actions over at least 180 degrees of articulation about a common center of rotation, said elements comprising two pairs of balls and sockets formed by diametrically opposed arcs of concentric circles of different radii.

2. The invention of claim 1 wherein the arcs on each element are connected by means limiting the extent of articulation.

3. The invention of claim 1 wherein said arcs are at least 90 degrees.

4. The invention of claim 1 wherein each of said elements has means providing a ball and a socket for mating with the socket and ball respectively, of the other.

5. The invention of claim 2 wherein each of the limiting means comprises a straight portion of the element tangent to one arc and a curved portion tangent to said straight portion.

6. The invention of claim 5 wherein said straight portions are tangent to the arcs of smaller radii.

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