Jan. 21, 1941. P. W. SULLIVAN 2,229,315

HINGE

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Fig. 1.

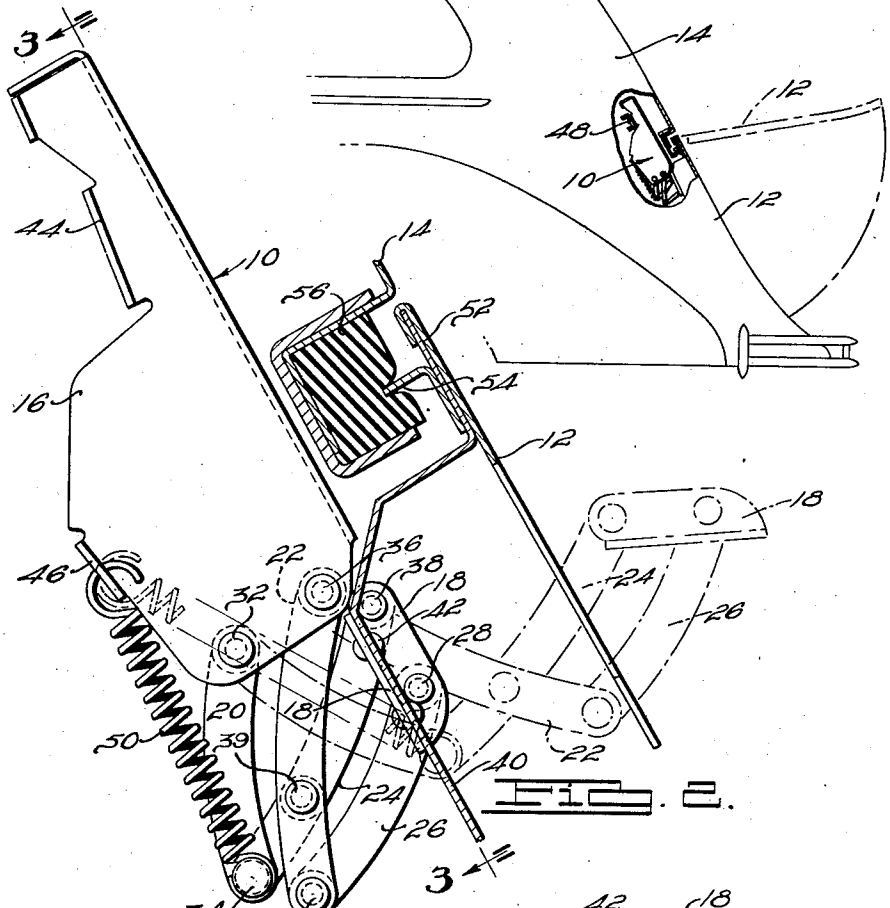


Fig. 2.

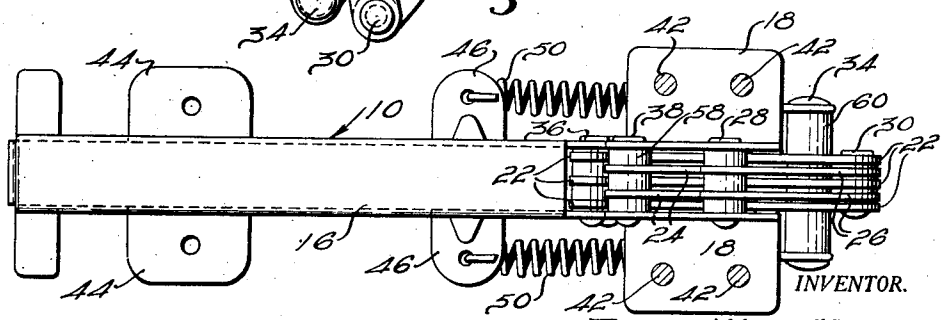


Fig. 3.

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HINGE

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13 Claims. (Cl. 16—163)

The present invention relates to hinge connections, particularly of the type in which the hinge butts are connected together through interconnected links.

Principal objects of the present invention are to provide a hinge embodying two butts pivotally connected together through links which are pivoted respectively to the hinge butts and to each other; and to provide an improved toggle action in such a hinge as well as in other types of hinges.

It is a further object of the present invention to provide a hinge of the above stated type in which the link connection between the hinge butts comprises two pairs of links, the links of each pair being pivoted at one end to an associated butt and at the other end to an end of a corresponding link of the other pair; and one link of each pair being pivoted together at a point intermediate the ends thereof.

It is a further object of the present invention to provide a hinge of the last stated type in which each link is composed of a plurality of parallel but spaced elements connected together through hinge pins.

It is a further object of the present invention to provide a hinge of the above stated type in which the separate elements of each link are disposed in a plane normal to the plane of the associated hinge pin, and in which at each pivotal interconnecting point of adjacent links, the elements thereof are stacked alternately.

Further objects of the present invention are to provide a hinge of the above stated type adapted for toggle action, and in which the toggle action is introduced by springs connected respectively to a hinge butt and to a link or links.

It is a further object of the present invention to provide a hinge of the above stated type in which the toggle springs are connected to one or more of the hinge pins.

It is a further object of the present invention to provide an improved hinge connection between an automobile body and a deck or other panel portion thereof, in which, in being opened and closed, the portion swings about a pivotal hinge point and also moves towards and away from such pivotal point.

It is a further object of the present invention to provide an improved hinge connection of the above mentioned character, which may be economically manufactured, readily assembled, and which is durable and positive in its operation.

Other objects and advantages of the present construction appear in the following description and in the appended claims.

In the drawing, throughout the several views of which corresponding reference characters are used to designate corresponding parts,

Figure 1 is a diagrammatic view of an improved hinge connection between an automobile body and a rear deck portion thereof;

Fig. 2 is a detailed view of the improved hinge connection shown generally in Fig. 1; and,

Fig. 3 is a detailed view taken along the line 3—3 of Fig. 2.

In its illustrated form, the improved hinge connection of the present invention is applicable generally where it is desired that a hinging movement of two hinged members embody both a pivoting movement of said members with respect to each other, and also a movement of the members toward and away from each other. In a more restricted sense the improved hinge connection of the present invention is adapted particularly to the hinging together of automobile body parts. One illustrated embodiment comprises a hinged support for the rear deck of an automobile. In accordance with conventional construction, the rear deck includes, along the hinged side thereof, a deck flange which supports a sealing flange in cooperative relation to an upwardly presented frame channel member. The hinge action is such that in being opened the center of rotation of the deck shifts so that the deck swings upwardly with respect to the body and the hinged side thereof also moves outwardly from the body to enable the deck flange and sealing flange to clear the body channel.

Various hinge constructions have been proposed which embody certain of the operating characteristics of the improved hinge of the present invention, with regard to which, however, the present hinge construction is regarded as an improvement both as to the arrangement of the elements thereof and the mode of operation thereof. In the form illustrated the improved hinge of the present invention comprises a pair of hinged butts which may be appropriately shaped to permit them to be conveniently secured to the parts of an automobile body or other structure which are to be hinged together, and which are interconnected by an arrangement of links. The links themselves are arranged in two pairs, one link of each pair is connected at one end to the associated hinge butts, and at the other end is pivotally connected to one end of the other link of the other pair. The remaining link of each pair is connected at one end to the associated hinge butt, and at an intermediate point is pivotally connected to a corresponding intermediate point of the corresponding link of the other pair.

A feature of the present invention is the construction of each link of a plurality of spaced parallel link elements and the connecting together of pivotally related links with the respective elements thereof disposed in alternate re-

lation. The connecting means, as illustrated, comprises straight link pins with respect to which the respective elements are disposed at right angles. Certain of the links are subjected to bending stresses which act, however, in the plane of the major dimension or width of the link elements. With this relationship, as will be understood, the respective link elements may be relatively thin in comparison to their width, and, accordingly, the overall weight of the hinge is minimized. By forming each link of a plurality of such relatively light spaced elements, adequate rigidity is provided to resist bending forces transverse to those previously mentioned. By varying the number of elements in each link, hinges of various capacities are readily produced with the one standard link size.

The respective link elements themselves, being relatively thin, may be economically stamped from sheet metal and the construction also is such that the respective link elements may be relatively simple in outline. It will be seen, therefore, that the completed hinge structure may be assembled from economically manufactured parts.

A further feature of the improved hinge of the present invention is its adaptability to toggle action. In applying it to deck hinging, the present invention provides for the connection of one or more springs at one or both sides of each hinge, and which form a resilient connection between the supporting structure and the hinge. The relationship is such that the spring acts to bias the hinge to either a closed or an opened position. As illustrated, the springs, one of which is located at each side of the hinge, are conveniently connected thereto through the same pin which constitutes the pivotal connection between two of the hinge links.

Considering the above mentioned elements in more detail, and referring particularly to Figs. 1, 2 and 3, one or more of the improved hinges 10 of the present invention are arranged to provide a hinged connection between a rear deck or lid 12 and the main body panel or portion 14 of an automobile. Each hinge 10 comprises the hinge butts 16 and 18, and the four groups of interconnecting links 20, 22, 24 and 26, each of which is composed of a series of relatively thin strips which are preferably formed of stamped metal. Link 26 is pivotally connected to the hinge butt 18 by the pin 28. The other end of link 26 is pivotally connected to a corresponding end of link 22 by pin 30. Similarly, one end of link 20 is pivotally connected by pin 32 to the hinge butt 16 and the other end thereof is pivotally connected to a corresponding end of link 24 by a pin 34. Pins 36 and 38 form corresponding pivotal connections between the remaining ends of links 22 and 24, and hinge butts 16 and 18 respectively. A pin 39 also forms a pivotal connection between an intermediate point on link 22 and a corresponding point on link 24.

It will be seen, accordingly, that link 20 and the portion of link 22 between pins 36 and 39 form a link system similar to a parallel motion system, and correspondingly govern the movement of pin 38. The connection of pin 28 to link 22 (through link 26) being more remote from the pin 36 than the connection of pin 38 thereto, the transverse motion of pin 28 is greater than that of pin 38, so that transverse motion of butt 18 is accompanied by rotation thereof, and consequently of deck 12. Because of the transverse motion, however, the opening rotative movement of butt 18 is accompanied by a shifting of the center of such rotative movement. As will be understood, the relative lengths of the several links and the location of the pin 39 serve to determine any desired relation between the rotation of butt 18, and the change in position of the center of rotation thereof.

Hinge butt 18 is formed of two similar angle sections, which may be connected to the deck portion 40 in any suitable manner, as by the rivets 42. Hinge butt 16 is formed preferably of a single piece of metal, illustrated as generally U-shaped, having the outwardly struck ears 44 and 46. It will be understood that the shape of butt 16, as well as of butt 18, is determined by the frame structure to which these elements are to be connected, and in the illustrated form, ears 44 are provided for connection to a supporting bracket 48 (Fig. 1) which forms a portion of the main automobile body structure. The ears 46 are provided to form a support for toggle springs 50, one of which is disposed on each side of the hinge assembly and the other end of each of which is connected at an end of the pivot pin 34.

As best shown in Fig. 2, the relative positions of the parts are such that the hinge is given a toggle action by the springs 50. With the parts in the deck closing position shown in full lines in Fig. 2, it will be evident that springs 50 act to positively maintain the parts in such closed position. Springs 50 are also effective to resist an opening movement during the travel of the parts from the full line position shown in Fig. 2 to a position in which the connection of springs 50 to lugs 46, pin 34, and pin 32, lie upon the same straight line. Further opening movement moves pin 34 past such straight line position, rendering springs 50 effective to act in a hinge opening direction. The reverse action, of course, occurs during a hinge closing movement, such closing movement being resisted by springs 50 until pins 34 and 42, and lugs 46, lie upon a straight line, after which springs 50 act in a hinge closing direction.

In operation, accordingly, the lid or deck 12, when closed, is continuously urged to a closed position and when open is continuously urged to an open position. This arrangement is advantageous in that it positively resists rattling when the parts are in the closed position, and when in the open position, makes it unnecessary to use supplemental means to hold the parts in such open position. Conventionally, the hinged edge of the deck 12 includes a deck flange portion 52 and a sealing flange 54, which normally engages a rubber bumper 56 disposed within the upwardly presented channel portion 14. During an opening movement, because of the previously mentioned shifting of the center of rotation of deck 12, the flanges 52 and 54 move in a direction generally to the right as viewed in Fig. 2, to positions in which they clear the upturned channel formed in body 14. With this arrangement, as will be understood, the hinge point for deck 12 may be located a substantial distance away from the hinged edge thereof.

In the interest of clarity, but not by way of limitation, the hinged edge of the deck or lid 12 is referred to in certain of the claims as the rear edge thereof, under which circumstances, as will be understood, the edge remote from such hinged edge may be regarded as the forward edge. Also, under these circumstances, the bodily movement of the deck or lid, which, as is set forth in the

preceding paragraph, is in a direction generally to the right, as viewed in Fig. 2, may be regarded as a forward movement of the lid or deck.

A further feature of the present invention resides in the ease with which the links may be assembled and interconnected.

The pins **28**, **30**, **32**, **34**, **36**, **38** and **39** may be, and preferably are, rivetlike, having a diameter which provides a relatively free bearing strip with corresponding openings formed in the links. One end of each pin is formed to provide a head, and the other end is disposed to be peened over to complete an assembly operation. Proper spacing between the several link elements on each pin is secured by the sleevelike spacers such as **58**. Similar sleevelike spacers **60** are provided to properly position the ends of the toggle springs **50**.

The link elements themselves, as previously mentioned, are preferably stamped from sheet metal and are of such shape as may be effected by a relatively simple stamping operation. As will be evident from Fig. 2, the link elements **22** and **24** are subjected to bending stresses as well as to compression and tension during the operation of the hinge. The link elements, however, are positioned with their major dimensions parallel to the direction through which such bending forces are exerted and thus, though relatively thin, are effective to withstand substantial such bending forces. The use of a plurality of separate link elements in each link, disposed in spaced relation, also produces a hinge structure of substantial rigidity and effective to withstand substantial compressional forces without collapsing or bending of the links. Also, hinges to meet a variety of different duties may be built up from link elements of standard size by suitably varying the number of such link elements in each link.

Although specific embodiments of the present invention have been described, it will be evident that various changes may be made in the form, number and arrangement of parts within the spirit and scope thereof.

What is claimed is:

1. A hinge comprising, in combination, a first hinge butt, a second hinge butt, means forming a pivotal connection between said hinge butts comprising link elements disposed to rotate one of said hinge butts with respect to the other and to simultaneously shift the center of rotation thereof comprising a system of links, pivotal connections between said hinge butts respectively and certain of said links, additional pivotal connections between said links, a pair of toggle springs positioned at opposite sides of said hinge, one end of each of said toggle springs being connected to one of said hinge butts and the other end thereof being connected to certain of said pivotal connections between said links in such relation that during a hinging movement of said hinge said springs pass over-center positions.

2. A hinge comprising, in combination, a first hinge butt, a second hinge butt, a first link pivotally connected at one end to said first butt, a second link pivotally connected at one end to said first butt, a third link pivotally connected at one end to said second butt, a fourth link pivotally connected at one end to said second butt, a pivotal connection between the other ends of said first and third links, a pivotal connection between the other ends of said second and fourth links, a pivotal connection between said second and third links at a point intermediate the ends thereof, and a pair of toggle springs, one disposed at each side of said hinge, and having corresponding ends connected to said first hinge butt and to said first mentioned pivotal connection in such relation that during a hinging movement of said hinge said springs pass over-center positions.

3. In combination, a first butt adapted for association with one of two pivotally related members, a second butt associated with the other of said members, means forming a pivotal connection between said butts comprising a system of links pivotally connected to said butts and to each other, a pin included in the pivotal connection between certain of said links, and a toggle spring connected at one end to one of said butts and connected at the other end to said pin in such relation that during pivoting movement between said butts said spring passes an over-center position.

4. In combination, a first butt adapted for association with one of two pivotally related members, a second butt associated with the other of said members, means forming a pivotal connection between said butts comprising a system of links pivotally connected to said butts and to each other, a pair of toggle springs disposed respectively at opposite sides of said means, each of said springs being connected at one end to one of said butts and connected at the other end to said link system in such relation that during a pivotal movement between said butts said springs pass over-center positions.

5. In combination, a first butt adapted for association with one of two pivotally related members, a second butt associated with the other of said members, means forming a pivotal connection between said first and second butts including a system of links, pivotal connections between each of said butts and certain of said links respectively, additional pivotal connections between certain of said links, a pair of toggle springs disposed respectively at opposite sides of said means, each of said springs being connected at one end to one of said butts and connected at the other end to the pivotal connection between said certain of said links in such relation that during a pivotal movement between said butts said springs pass over-center positions.

6. A unitary closure for an opening comprising a member defining the marginal edge of the opening and having a seating part, a cover seating upon the seating part and having a depending marginal flange, compensating hinges permanently connecting the inside of the member and the under side of the cover and each comprising two operatively interconnected rocking lever and link connections cooperating to elevate and swing the cover about a movable center in a manner to cause the marginal flange at the hinged side of the cover to clear the upper edge of the member when the cover is thrown back and the hinged side is swung inwardly, a lifting spring connecting the levers and member, the spring being offset with respect to the pivotal point of one lever to provide a toggle action and facilitate both lifting movements and final seating during closing movement of the cover, and deformable means for sealing the cover which is compressed between the member and the cover during seating movement of the cover under the action of the spring.

7. In combination with a member defining the marginal edge of an opening and a cover

seating upon the edge of the member and having a depending marginal flange, separate brackets attached to the inside of the member and the under side of the cover, two sets of links and levers connected in parallel to both of said brackets, means for pivotally connecting the link of one set to the lever of the other set in a manner to cause said sets to collectively function as a compensating hinge operating to elevate and swing the cover about a movable center in a manner to cause the marginal flange at the hinged side of the cover to clear the upper edge of the member when the cover is thrown back and the hinged side is swung inwardly, and a spring connected to one of said brackets and to the lever of one of said sets at a point spaced beyond its fulcrum so that the spring will move past said center with respect to said fulcrum to facilitate both lifting and closing movement of the cover.

8. In mechanism for hingedly relating and controlling swinging movement between two swingably related members adapted for relative movement between open and closed positions, the combination of a first means comprising a first butt connected to one of the members and a first link having a pivotal connection to the first butt, a second means comprising a second butt connected to the second member and a second link having a pivotal connection to the second butt, said links having a pivotal connection with each other and being caused to swing relative to each other during a said relative movement between the members, and a pair of toggle springs disposed on respectively opposite sides of said first link, one end of each spring being connected to said first means and the other end of each spring being connected to the second link in such relation that during a said relative swinging movement of said links the lines of action of said springs pass from one side to the other side of at least one of said pivotal connections.

9. In mechanism for hingedly relating and controlling swinging movement between two swingably related members adapted for relative movement between open and closed positions, the combination of a first means comprising a first butt connected to one of the members and a first link having a pivotal connection to the first butt, a second means comprising a second butt connected to the second member and a second link having a pivotal connection to the second butt, said links having a pivotal connection with each other so as to form a toggle which is collapsed by the swinging of the links relative to each other as the members are moved towards closed position and is straightened by the swinging of the links relative to each other as the members are moved toward open position, a pair of toggle springs disposed on respectively opposite sides of said first link, one end of each spring being connected to said first means and the other end of each spring being connected to the second link in such relation that during a said relative swinging movement of said links the lines of action of the springs pass from one side to the other side of at least one of said pivotal connections, and means associated with the links for forming a limit to said opening movement when said links reach a position in advance of a fully straightened condition of said toggle.

10. In an automobile, the combination with a panel constituting a portion of the outer surface of the automobile body, said panel having a lid supporting ledge thereon, and a part extending forward of said ledge, a lid in closed position having the rear edge thereof disposed upon said ledge, of a hinge structure fixedly supported from said part for pivotal movement and attached for pivotal movement to the under side of said lid forward of said rear edge, said structure comprising means for bodily supporting and guiding said lid forwardly upon opening movement to clear said ledge, and means for controlling the pivotal movement of said lid about said first means.

11. In an automobile, the combination with a part of the automobile body having a panel constituting a portion of the outer surface of the body, said panel having a lid supporting ledge thereon, and having a part thereof disposed forward of said ledge and below at least a portion thereof, a lid in closed position having the rear edge thereof disposed upon said ledge, of a hinge structure fixedly supported from said part defining pivotal connections below a portion of said ledge, said structure being attached to and having pivotal connections with the under side of said lid forward of said rear edge, said structure comprising means including said pivotal connections for bodily supporting and guiding said lid forward to clear said ledge upon initial movement and for pivotal movement thereafter.

12. In an automobile, the combination with a panel constituting a portion of the outer surface of the automobile body, said panel having a lid supporting ledge thereon, and a part extending forward of said ledge, a lid in closed position having the rear edge thereof disposed upon said ledge, of a hinge structure having members respectively fixedly attached to said part and to the underside of the lid forward of said rear edge and having links pivotally connected to said members and to each other, said pivotally connected links and members providing means to bodily support and guide the lid forwardly upon opening movement to clear said ledge, and means for controlling the pivotal movement of said lid about said first means.

13. In an automobile, the combination with a part of the automobile body having a panel constituting a portion of the outer surface of the body, said panel having a lid supporting ledge thereon, and having a part thereof disposed forward of said ledge and below at least a portion thereof, a lid in closed position having the rear edge thereof disposed upon said ledge, of a hinge structure having means fixedly supported from said part defining pivotal connections below a portion of said ledge, said structure having means attached to said lid and defining pivotal connections at the underside of said lid forward of said rear edge, and said structure comprising links pivotally connected to said means respectively and to each other for bodily supporting and guiding said lid forward to clear said ledge upon initial movement and for pivotal movement thereafter.

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