July 16, 1935. E. B. G. LEFEVRE 2,008,257

CONCEALED DOOR HINGE

Filed Feb. 9, 1934

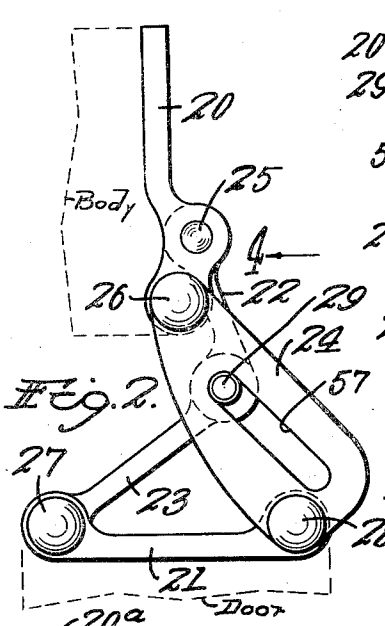

Fig. 2.

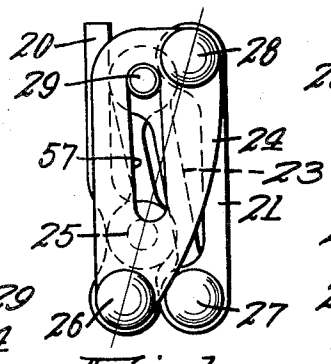

Fig. 1.

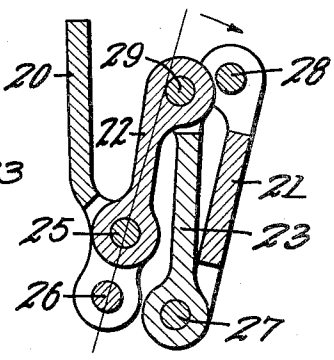

Fig. 3.

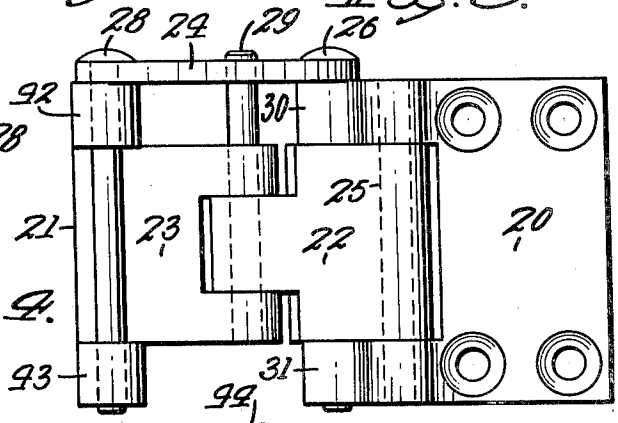

Fig. 4.

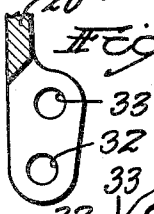

Fig. 12.

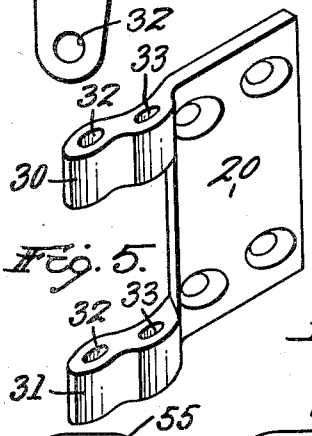

Fig. 5.

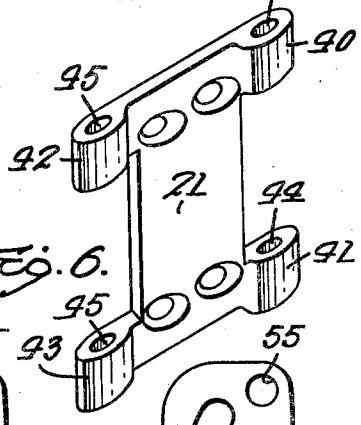

Fig. 6.

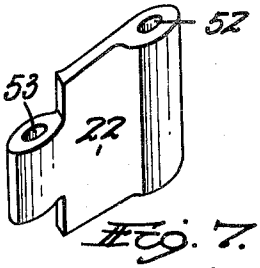

Fig. 7.

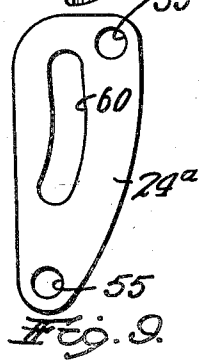

Fig. 9.

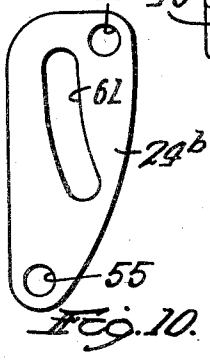

Fig. 10.

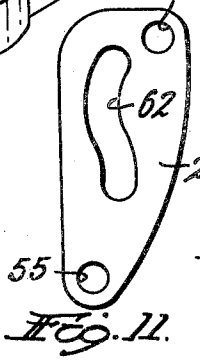

Fig. 11.

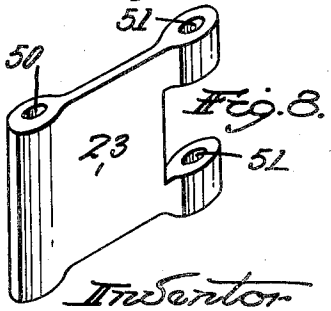

Fig. 8.

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CONCEALED DOOR HINGE

Emil B. G. Lefevre, Detroit, Mich.

Application February 9, 1934, Serial No. 710,436

5 Claims. (Cl. 16—166)

This invention relates to hinges designed for automobile doors or for other purposes where a pronounced offset or throw-out action is desired.

It is the general object of my invention to provide an improved hinge for such purposes, so designed that the initial opening movement of the door will be a simple swinging movement, followed by an abrupt throw-out movement after the edge of the door has cleared the door jamb.

A further object of my invention is to provide a hinge by which substantially increased clearance for the open door is effectively attained.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawing, in which

Fig. 1 is a plan view of my improved hinge in closed position;

Fig. 2 is a plan view of the hinge in open position;

Fig. 3 is a sectional plan view of the hinge when slightly open;

Fig. 4 is a side elevation of the open hinge, looking in the direction of the arrow 4 in Fig. 2;

Figs. 5, 6, 7 and 8 are perspective views of four of the component parts of the hinge;

Figs. 9, 10 and 11 are plan views of modified cam plates, and

Fig. 12 is a detail sectional plan view illustrating any slight modification.

Referring to the drawing, I have shown a hinge comprising hinge plates 20 and 21, links 22 and 23, a cam plate 24 (Fig. 2), hinge pins 25, 26, 27 and 28, and a guide-pin 29.

The hinge plates 20 and 21 are provided with openings to receive screws or bolts by which the plate 20 may be attached to a supporting structure, such as the body or pillar post of an automobile, and by which the plate 21 may be attached to the edge of a door or other swinging member.

The plate 20 is provided with upper and lower bearing portions 30 and 31, which in turn are provided with spaced bearing openings 32 and 33. The axes of these openings are parallel and are preferably located in a plane at a substantial acute angle to the planes of the hinge plate 20, as clearly shown in Figs. 1 and 3.

While this angular relation of the bearing openings is usually preferred, it is sometimes desirable to place the openings in a plane forming only a slight angle, if any, with the hinge plate 20, as indicated in the modified hinge plate 20^a shown in Fig. 12.

The hinge plate 21 is provided with upper and lower bearing portions 40 and 41 at one edge and with similar bearing portions 42 and 43 at the other edge, these bearing portions having bearing openings 44 and 45 for the hinge pins 27 and 28 respectively.

The link 23 has a bearing opening 50 at one edge and spaced bearing portions at the opposite edge, provided with a bearing opening 51. The link 22 has a bearing opening 52 at one edge and a bearing opening 53 in an opposite edge portion of reduced length. The cam plate 24 has bearing openings 55 at its opposite ends, and is provided with a cam slot 57, as shown in Fig. 2.

In assembling the parts, the hinge pin 25 is passed through the bearing openings 33 in the plate 20 and the bearing opening 52 in the link 22, thus pivotally connecting these parts. The hinge pin 26 is inserted in the bearing openings 32 of the plate 20, and in an opening 55 at one end of the cam plate 24, which plate 24 swings about the axis of said hinge pin 26.

The opposite end of the cam plate 24 is pivoted to the hinge plate 21 by the hinge pin 28, which is inserted in the bearing openings 45 of the plate 21. The hinge pin 27 passes through the bearing openings 44 of the plate 21 and through the bearing opening 50 of the link 23.

The links 22 and 23 are connected by the guide pin 29, which extends through the bearing openings 51 and 53 and has a close friction fit in one of these members. The upper end of the guide pin 29 extends through the slot 57 in the cam plate 24, as shown in Figs. 2 and 4.

From this description, it will be evident that the hinge pin 28 must always move in the arc of a circle about the axis of the hinge pin 26 as a center, while the links 22 and 23 act as a toggle to project the hinge pin 27 outward, the action of the toggle being controlled by the guide pin 29 and the cam slot 57.

In the operation of my improved hinge, the initial opening movement is a simple swinging movement about the axis of the hinge pin 26. As soon, however, as the edge of the door clears the door jamb, and as soon as the cam plate 24 has simultaneously moved slightly to the right, as indicated in Fig. 3, the guide pin 29 controlled by the cam slot 57 tends to straighten the toggle formed by the links 22 and 23, and thus effects a rapid throw-out movement of the hinge pin 27, while the hinge pin 28 swings about the fixed axis of the pin 26.

The hinge plate **21** is thus moved quickly to the position shown in Fig. 2, in which position the hinge plate **21** is very substantially offset away from the hinge plate **20** and from the outer surface of the body or other part to which the plate **20** is secured.

The guide pin **29**, by engagement with the inner end of the slot **57** (Fig. 2) constitutes a stop to define the open position of the hinge.

In Figs. 9, 10 and 11 I have shown additional cam hinge plates **24a**, **24b** and **24c** respectively, in which cam slots **60**, **61** and **62** of modified position or outline are provided. By thus varying the outline and angular position of the cam slot, the offset or throw-out movement may be timed and controlled as desired.

It will be noted that substantially all of the weight of the door is carried by the hinge links **22** and **23**, and that little if any weight is carried by the cam plate **24** which is provided solely for directing the movement of the guide pin **29**.

This type of concealed door hinge is particularly desirable where the outer surface of the body adjacent the hinge is provided with a substantially projecting bead or molding, or in cases where a pair of spaced hinges are used on a body having a surface outwardly curved between the points where the hinges are attached.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:—

1. A concealed door hinge comprising a hinge plate to be attached to a supporting part, a hinge plate to be attached to a swinging part, a pair of toggle links each having one end pivotally connected to one of said plates, a projecting guide pin pivotally connecting the opposite ends of said links together, and a cam plate pivoted at each end to one of said hinge plates, said cam plate having a cam slot into which the projecting end of said guide pin extends, and said cam slot and guide pin thereby controlling the opening and closing movements of said swinging hinge plate.

2. A concealed door hinge comprising a hinge plate to be attached to a supporting part, a hinge plate to be attached to a swinging part, a pair of toggle links each having one end pivotally connected to one of said plates, a projecting guide pin pivotally connecting the opposite ends of said links together, and a cam plate pivoted at each end to one of said hinge plates, said cam plate having a cam slot into which the projecting end of said guide pin extends, and said cam slot and guide pin thereby controlling the opening and closing movements of said swinging hinge plate and providing a stop to limit such opening movement.

3. A concealed door hinge comprising a hinge plate to be attached to a supporting part, a hinge plate to be attached to a swinging part, a pair of toggle links each having one end pivotally connected to one of said plates, a projecting guide pin pivotally connecting the opposite ends of said links together, and a cam plate pivoted at each end to one of said hinge plates, said cam plate having a cam slot into which the projecting end of said guide pin extends, and said cam slot and guide pin thereby controlling the opening and closing movements of said swinging hinge plate, said toggle links supporting substantially the entire swinging load and said cam plate having substantially a directional function only.

4. A concealed door hinge comprising a first hinge plate to be attached to a supporting part, a second hinge plate to be attached to a swinging part, a pair of toggle links pivotally connected together and also connecting one end of said second hinge plate to said first hinge plate, and a cam plate connecting the opposite end of said second hinge plate to said first hinge plate, said cam plate having a cam slot therein and said toggle links having an element projecting from their point of pivotal connection and cooperating with said cam slot to control the action of said toggle links as said hinge is opened or closed.

5. A concealed door hinge comprising a first hinge plate to be attached to a supporting part, a second hinge plate to be attached to a swinging part, a pair of toggle links pivotally connected together and also connecting one end of said second hinge plate to said first hinge plate, and a cam plate connecting the opposite end of said second hinge plate to said first hinge plate, said cam plate being effective to control the action of said toggle links as said hinge is opened or closed, the axis of the pivotal connection of said toggle links to said first hinge plate being parallel to the axis of the pivotal connection of said cam plate to said first hinge plate and said two axes positioned in a plane at a substantial acute angle to the plane of said first hinge plate.

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