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**[54] AUTOMOBILE DOOR HINGING**  
**2 Claims, 6 Drawing Figs.**

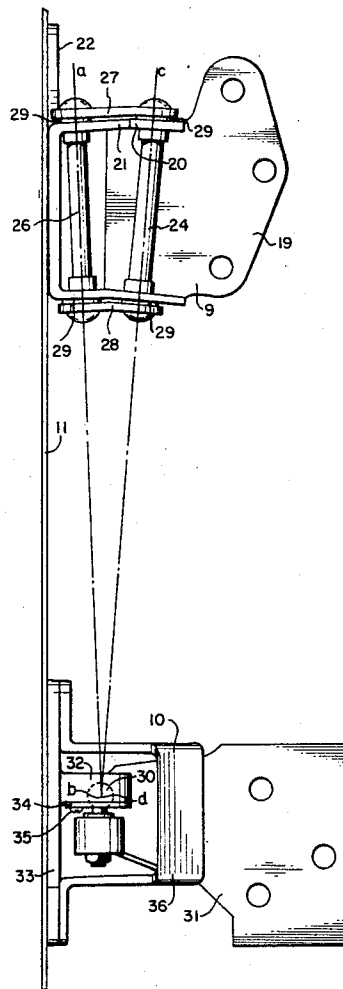
[52]	U.S. Cl.....	16/163, 49/242
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[50]	Field of Search.....	16/163, 164, 165; 49/246, 208, 107, 242

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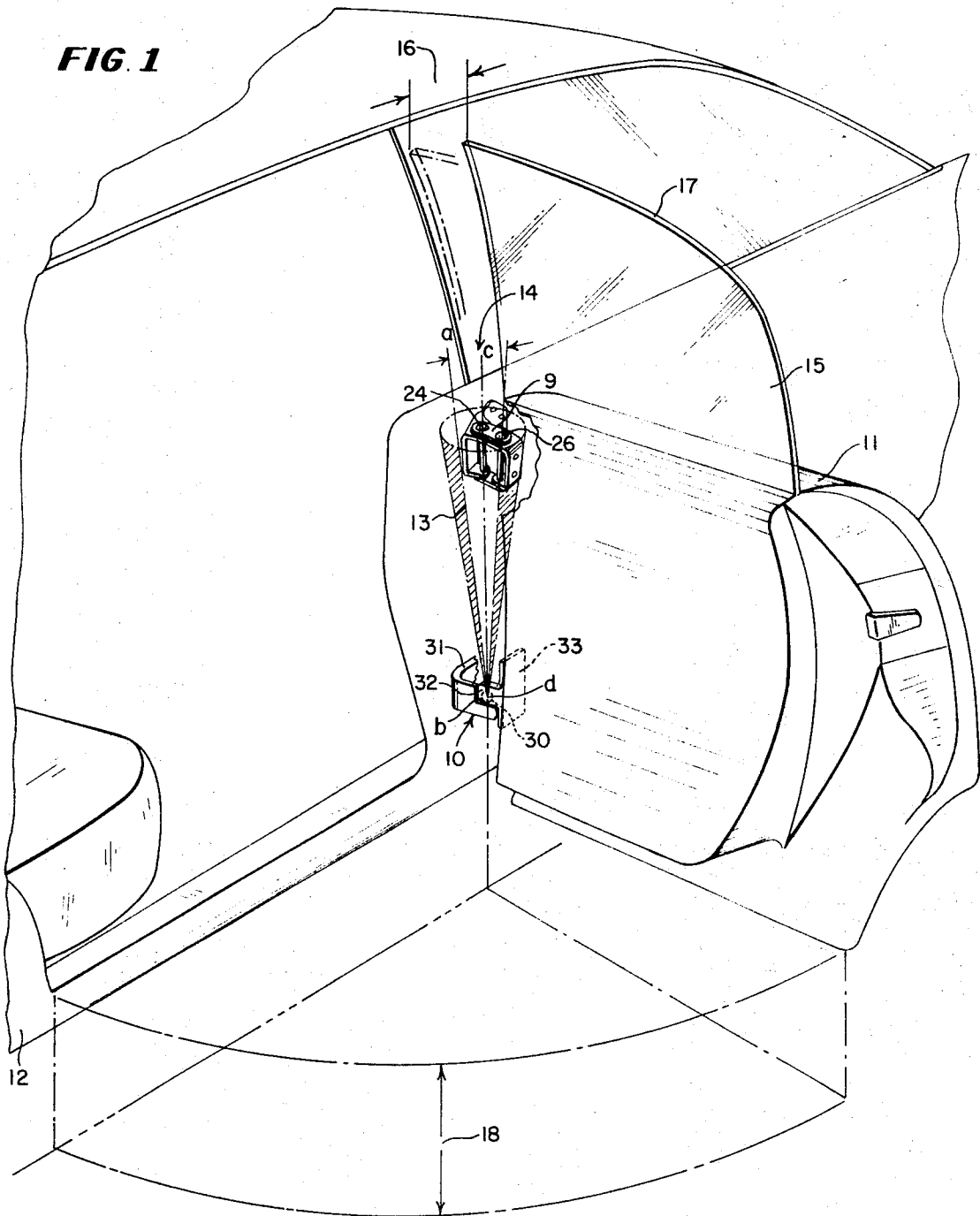
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**ABSTRACT:** The geared link hinge herein disclosed was designed with the latest streamlined designs of cars in mind and gives outward and forward throw to the hinged edge of the door for added space in entering and leaving the car, and, in particular, gives added headroom to avoid bumping one's head on the upper edge of the glass on the door with resultant cutting or bruising. One segmental gear on the body member is fixed, and another segmental gear on the door member has rolling meshing engagement on the first segmental gear. Pintles in the door and body members are disposed on the centers of the arcs of said segmental gears and have links pivotally connected with the opposite ends thereof to keep the teeth of the gears in meshing engagement. For conical hinging, the pintles are disposed in acute angle relationship so the movable pintle on the door member describes a portion of a cone the axis of which includes the pintle on the door member. The lower hinge is of the ball and socket type.



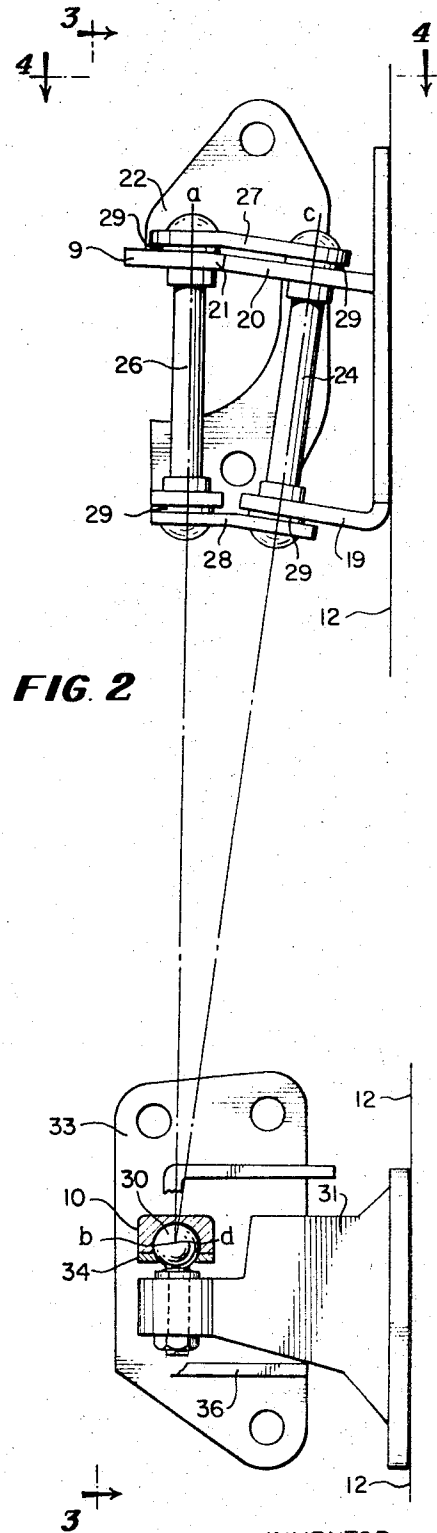
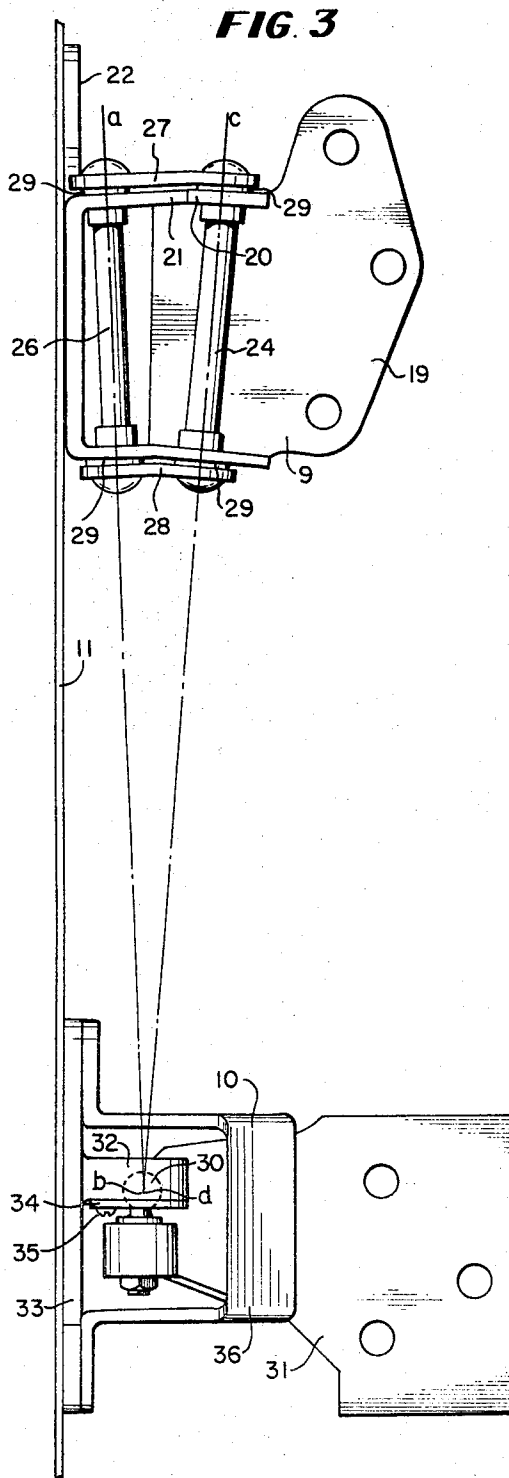
**FIG. 1**



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# AUTOMOBILE DOOR HINGING

This invention relates to new and improved automobile door hinging which I call "conical planetary hinging" designed to give added entrance and exit room into and out of the automobile, the need for relieving the cramped condition having become really acute, especially on rear doors with the recent style changes which make the radius of curvature of the glass smaller and smaller thereby increasing the so-called "tumble home" to the point where the glass on a rear door has its rear upper corner sufficiently inboard of the hinging axis so that it not only restricts entry and exit but gives rise to the danger of injury by a person striking his head on the corner or upper edge of the glass.

In accordance with the present invention, the door is so hinged that the upper portion thereof, instead of pivoting about a conventional upright axis, is given outward movement away from the body as well as forward movement relative thereto to give adequate room for easier and safer entrance and exit.

I am aware that others have worked on this problem but, so far as I am aware, their constructions have not to date been adopted for one reason or another, doubtlessly due mainly to impracticability of the hinge constructions or their prohibitive cost due to the complicated and expensive constructions proposed, or due to failure to comply with the latest safety requirements and limitations, all of which objections are avoided in the constructions of my invention.

The invention is illustrated in the accompanying in which:

FIG. 1 is a more or less diagrammatic perspective view showing how by movement of the door's hinging axis so as to define a portion of a cone at least the upper portion of the door in opening is caused to move outwardly away from the body as well as forwardly relative thereto, giving still further increased outward and forward movement to the upper edge portion of the window due to its spacing relative to the upper hinge for easier and safer entrance and exit, the door shown being a right rear door;

FIGS. 2 and 3 are views at right angles to one another of the door hinging shown diagrammatically in FIG. 1, and

FIG. 4 is a top view of the upper geared link hinge of FIG. 2 with a portion of the link broken away to better illustrate the construction.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawings, illustrating what I have termed "conical hinging," the reference numerals 9 and 10 designate the upper and lower hinges, respectively, applied to a door 11 on a body 12, with a view to having the door's moving extent axis  $a-b$  describe a portion of a cone around the fixed vertical centerline or axis  $c-d$  thereof, as indicated at 13 in FIG. 1, so that the upper portion of the door in opening swings away from the body 12 and forwardly relative thereto to the extent of the dimension indicated at 14 in FIG. 1, thereby causing the upper front corner of the window 15 to be swung away from the body and forwardly relative thereto an increased amount, as indicated at 16 in FIG. 1, to give increased entrance and exit space and much reduced likelihood of anyone upon entering or leaving the car striking their head on a too close upper edge 17 of the window and sustaining a cut or bruise. The components of the door's outward and forward movement are indicated at  $o$  and  $f$ , respectively, in FIG. 4. This hinging, as indicated by the substantially uniform dimension 18 between the two horizontal arcs, the upper one of which shows approximately the path of the lower outer corner of the door in relation to the ground or sidewalk, keeps the lower edge of the door nearly a uniform level throughout the door's movement, the actual travel pattern showing a slight rise at the midopen position, due to the inward inclination of the fixed axis  $c-d$ .

The upper hinge 9, as previously indicated, is best described as a geared link hinge, the body member 19 including a seg-

mental gear 20 which meshes with a segmental gear 21 provided on the door member 22 of the hinge. The teeth 23 of segmental gear 20 are struck on an arc with the axis of pintle 24 as the center, which is axis  $c-d$  in FIGS. 1-3. The teeth 25 on the door member 22 of the hinge 9 are struck on an arc with the axis  $a-b$  of the pintle 26 as a center. The two hinge members 19 and 22 are pivotally interconnected at the headed upper and lower ends of pintles 24 and 26 by links 27 and 28, respectively, shoulders 29 on bearing material bushings being interposed between the parts to insure adequate working clearance. Since pintles 26 and 24 are on the angularly related axes  $a-b$  and  $c-d$ , they are, of course, inclined with respect to one another, as seen in FIGS. 2 and 3. The meshed gears 20-21 positively prevent "flutter" in any position of the door and give a hard metal lockup at the hinged edge of the door so it seals tightly when closed and there is no danger of draft or rain leakage, a common objection with most ordinary link-type hinges. The present hinge 9, in other words, retains all the advantages of a standard pintle hinge, while affording all the advantages previously mentioned.

The fixed gear 20 has gear 21 run thereon as a "follower" when the link 27, which connects the pintles 24 and 26, serves as the "driver" in a planetary gearing, and hence the planetary gearing formula  $F=1+(C/B)$  applies, in which  $F$ = rotation of follower 21 per revolution of driver 27,  $C$ = radius of fixed gear 20, and  $B$ = radius of gear 21. Thus, since the radii of 20 and 21 are equal,  $F=1+(1/1)=2$ , so the follower 21 turns through  $80^\circ$  while driver 27 turns through only  $40^\circ$ , as shown in FIG. 4.

The lower hinge 10, which, as already indicated, is of the ball and socket type, has a ball-head 30 mounted on the body member 31, and this ball-head is received in a socket 32 provided on the door member 33, a retaining plate 34 being secured, as at 35, to the under side of the socket 32 to prevent displacement of the ball-head from the socket while allowing operating clearance for the small amount of inclination of the door member 33 with respect to the body member 31 in the opening and closing of the door. A yoke 36 on the door member 33 serves by abutment with the body member 31 to limit the door opening movement.

The operation should be clear from the foregoing description. Links 27 and 28 positively maintain the spaced and inclined relationship of the pintles 24 and 26, and, in the opening of the door, due to the rolling of the gear teeth 25 on the gear teeth 23, axis  $a-b$  on which pintle 26 lies moves through an angle of approximately  $40^\circ$  in the approximately  $80^\circ$  opening movement of the door, as shown diagrammatically in FIGS. 1 and 4, with the result that the upper portion of the door 11 is swung outwardly away from the body 12 and forwardly relative thereto as indicated by the dimension 14 in FIG. 1, causing the window 15 on the door to have its upper edge 17 swung out and forwardly much farther, as indicated by the dimension 16 in FIG. 1, for the purposes mentioned. The universal joint action of the lower hinge 10 permits this angular displacement of the door in relation to the body while supporting the door for steady hinging in the opening and closing movements. The lower edge of the door remains nearly parallel to the ground or sidewalk throughout this  $80^\circ$  movement as indicated at 18 in FIG. 1, being slightly higher at midopen position due to inclination of axis  $c-d$ .

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. While a preferred embodiment of the invention has been illustrated and described, this is only for the purpose of illustration, and it is to be understood that various modifications in structure will occur to a person skilled in this art.

I claim:

1. In a hinge construction for substantially vertical pivotal mounting of a door on a vehicle body, the hinge comprising a first fixed member mounted on the vehicle body and a second movable member mounted on the door, each of said members having thereon a substantially horizontal segmental planetary gear portion, the teeth of which are in rolling meshing engage-

ment, upright pintles on said members at the centers of the arcs of the respective segmental planetary gears, these pintles being inclined relative to one another and converging toward one end of the hinge and substantially horizontal links pivoted to the opposite ends of said pintles serving to keep the segmental planetary gear teeth in mesh.

2. In a door hinging construction for pivotal mounting of a door on a vehicle body, a pair of vertically spaced hinges in coaxial relationship, one of said hinges comprising a first fixed member mounted on the vehicle body and a second movable member mounted on the door, each of said members having thereon a substantially horizontal segmental planetary gear

portion, the teeth of which are in rolling meshing engagement, upright pintles on said members at the centers of the arcs of the respective planetary gears, these pintles being inclined relative to one another on axes converging toward the other hinge, and links pivoted to the opposite ends of said pintles serving to keep the segmental planetary gear teeth in mesh, and the other hinge comprising a first member mounted on the vehicle body, and a second member mounted on the door, these two members having a universal joint connection pivotally connecting the members for universal pivotal movement about the point of convergence of the aforesaid axes.

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