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Keller et al.

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[54] **MECHANISM FOR LIMITING DEFLECTION OF A DOOR**

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[51] **Int. Cl.** **E05f 5/06**

[58] **Field of Search** 16/85, 145, 82, 142

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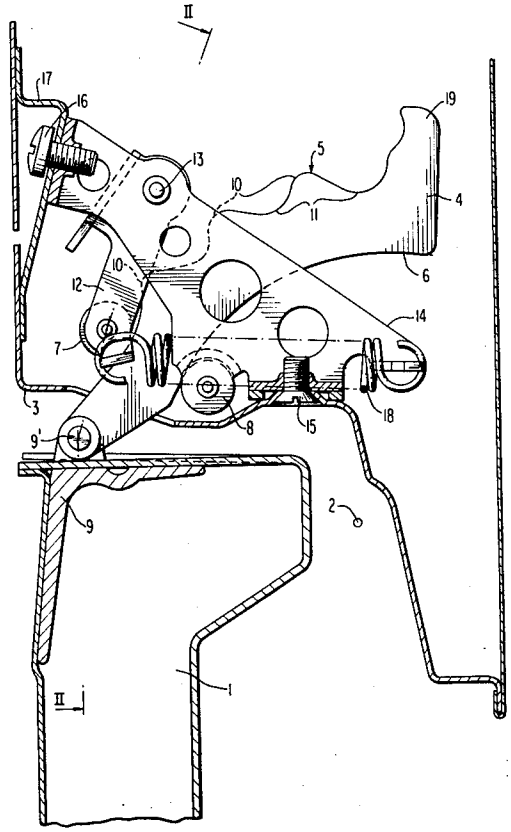
[57] **ABSTRACT**

A mechanism for limiting the outward swinging movement of a door, especially of the door of a passenger motor vehicle, which is secured by hinges at a fixed part of the vehicle; a spring held roller is arranged on the inside of the door to which is coordinated a curved plate-like cam member secured at the fixed part and including a running surface provided with one or several detents for the roller to hold the door in one or several open positions.

24 Claims, 2 Drawing Figures



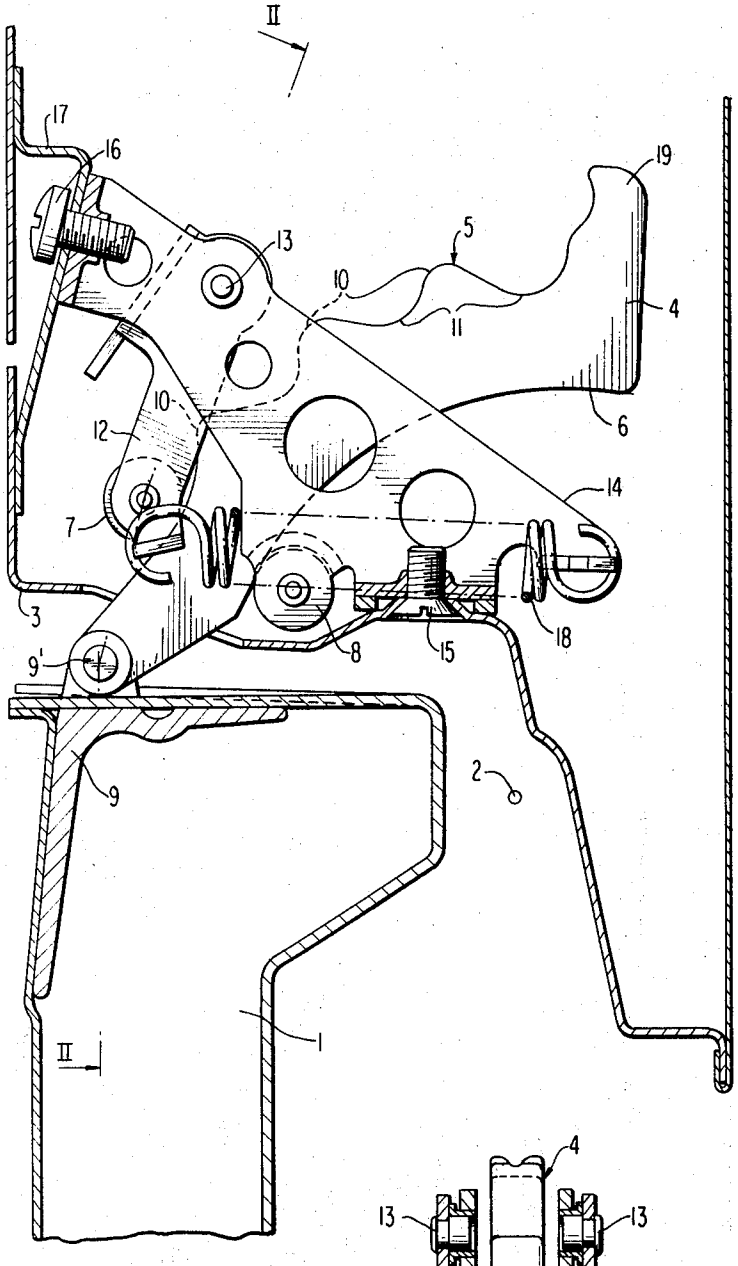

II
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FIG.1

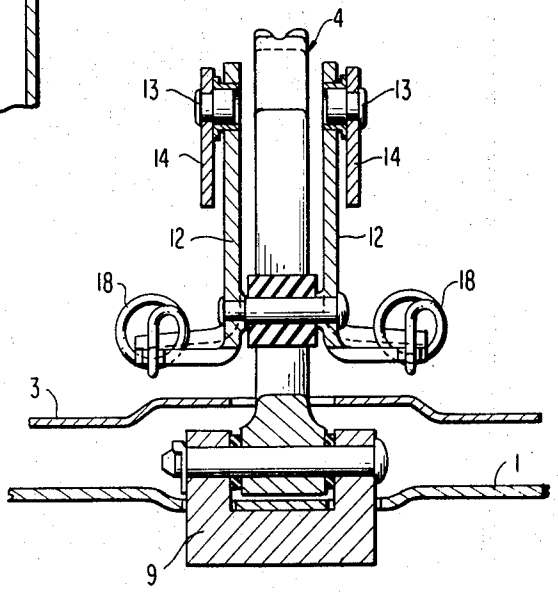
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FIG.2

MECHANISM FOR LIMITING DEFLECTION OF A DOOR

The present invention relates to a mechanism for limiting the outward swing of a door, especially of the door of a passenger motor vehicle, which is pivotally secured at a fixed part by means of hinges.

A limitation of the door movement in the outward direction is necessary to prevent that the outer surface of the door and the rear edge of a fender or the like come in contact with each other and are damaged thereby. For a known type of construction, which is designed in particular for long and heavy doors, for example, of two-door passenger motor vehicles, frequently the necessary installation space is lacking by reason of the configuration of the panes and/or by reason of the arrangement of additional aggregates.

The present invention is concerned with the task to provide an installation of the aforementioned type which additionally makes possible a holding of the door in one or several opening positions whereby an improved boarding and leaving is made possible in motor vehicles. The present invention essentially consists in that a spring-held roller is arranged on the inside of the door, to which is coordinated a curved metallic plate member mounted at the fixed part, which includes a contact or running surface provided with detent places for the roller.

In an advantageous embodiment of the present invention provision is made that the curved plate member is pivotally secured at the fixed part about an axis parallel to the axis of the spring-held roller and is guided within the door between the spring-held roller and a support roller. The considerable advantage results therefrom that only essentially tensional forces still occur in the cam-like palte member so that its dimensioning becomes relatively simple. It is thereby favorable if the curved plate member is secured at a bearing support disposed with its axis parallel to the hinge axis whereas its running surfaces are constructed as concentric circular sections with respect to the hinge axis. It is favorable for the occurring loads and stresses if the spring-held roller and the support roller are arranged approximately radially to the hinge axis one behind the other whereby the support roller is disposed inwardly.

In a structurally advantageous manner the contact or running surface of the curved plate member for the spring-held roller may be provided with several cams which form recesses therebetween whose radius of curvature corresponds approximately to the radius of the roller. The number of the cams and the location of the recesses depends on the desired number of stop positions, i.e., door holding positions. Furthermore, with this embodiment of the present invention, the curved plate member includes at its end an extension directed radially outwardly to the hinge axis, toward which rises the contact or running surface provided with the cams. This radial extension serves as end abutment whereby for purposes of reaching this end abutment the spring-held roller has to be displaced against the spring force so that the movement of the door is braked gently shortly before reaching its end position.

In an advantageous construction of the present invention the roller is held by a pivot arm arranged approximately tangentially to the contact or running surface of the curved plate member, provided with the cams which pivot arm is spring-loaded by means of springs engaging within the area of the roller. This arrangement of the pivot arm permits sufficient movements of the springy roller whereas it can be constructed itself relatively short.

For the appropriate utilization of the existing structural space, it is favorable if the roller and the support roller are arranged within the area of the front surface of the door. As a result thereof, in particular the curved cam-like plate member can be dimensioned relatively short. In order to achieve a favorable spring effect, it is advantageous if the springs are disposed approximately parallel to the front surface of the door.

In a structurally particularly advantageous embodiment of the present invention the rollers, the pivot arm, the springs and the support roller possess a common support mount or bracket which is inserted into the door. As a result thereof, the installation can be constructed far-reachingly as a pre-assemblable structural unit.

Accordingly, it is an object of the present invention to provide a mechanism for limiting the outward swing of a door, especially of a passenger motor vehicle, which avoids by simple means the aforementioned shortcomings and drawbacks encountered in the prior art.

Another object of the present invention resides in an installation for limiting the outward swinging movements of a door, especially of a passenger motor vehicle, which requires relatively little space for its installation.

A further object of the present invention resides in an installation for limiting the outward deflections of a door which additionally makes possible a holding of the door in one or several opened positions.

Still a further object of the present invention resides in a mechanism of the type described above which is simple in construction, utilizes relatively few parts and permits an appropriate design of the parts in relation to the stresses occurring therein.

Another object of the present invention resides in a mechanism for limiting the outward swinging movement of a vehicle door which can be readily preassembled to a large extent prior to installation into the car.

These and other objects, features and advantages of the present invention will become more apparent from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein:

FIG. 1 is a plan view of a mechanism for limiting the outward deflection of the swinging movement of a door in accordance with the present invention, and

FIG. 2 is a partial cross sectional view taken along line II—II of FIG. 1.

Referring now to the drawing wherein like reference numerals are used throughout the two views to designate like parts, and more particularly to FIG. 1, a front door column 1 is illustrated in this Figure as a fixed part of a passenger motor vehicle, on which is secured the motor vehicle door 3, illustrated only within the area of its front portion, by means of one or several hinges (not shown) whose hinge pin or pins 2 are disposed outside of the door. Additionally, a mechanism is mounted between the door column 1 and the door 3, by means of which the door is limited in its movement into its com-

pletely open position and by means of which several detent positions for the door are produced in several intermediate positions.

This mechanism essentially consists of a curved plate member **4** secured at the door column **1**, which is provided with two running or contact surfaces generally designated by reference numeral **5** and **6** for a spring-held roller **7** and a support roller **8** of the door, respectively. The curved plate member **4** is pivotally secured at the door column **1** by means of a bearing support **9** whose pivot shaft **9'** extends parallel to the hinge pin **2.** The curved plate member **4** extends horizontally into the door **3** whereas the axes of the spring-held roller **7** and of the support roller **8** are disposed parallel to the axis **9'** of the bearing support **9.** The running or contact surfaces **5** and **6** of the curved plate member **4** are constructed as concentric circular arcs in relation to the hinge axis **2.** The running surface **5** is thereby provided with cams **10** for the spring-held roller **7** which form therebetween recesses **11** whose radius of curvature corresponds approximately to the radius of the spring-held roller **7.**

The roller **7** is pivotally supported in a pivot arm **12** which, in its turn, is pivotally mounted with its pivot shaft **13** in a bearing bracket **14** (FIGS. **1** and **2**) which is secured by means of screws **15** and **16** (FIG. **1**) at the front edge and the interior edge of the door **3** and at a reinforcing sheet metal plate **17.** The draw springs **18** are suspended in the pivot arm **12** arranged approximately radially to the running surface **5** within the area of the roller **7** in ends angularly bent off at the top and at the bottom, while the other ends of the springs **18** are held by the bearing bracket **14.** The rollers **7** and **8** are disposed within the area of the front surface of the door **3** whereas the springs **18** extend approximately parallel to the front surface. Also the support roller **8** is supported in the bearing bracket **14** so that a structural unit is created thereby which can be inserted as a whole into the door **3** and secured thereat.

In the closed position of the door **3** the roller **7** and the support roller **8** assume the position illustrated in the drawing. During the opening of the door the roller **7** runs up along the cam **10** whereby the draw springs **18** are expanded, and thereafter engages in the first recess **11** which corresponds to a first intermediate position with an opening angle of 21° for the door **3.** Out of this first intermediate position the door **3** can only be swung further out or back if the force of the springs **18** is overcome which is effective when the roller **7** runs up on the cams **10.** During the further opening of the door **3,** for which purpose again a predetermined force is necessary, the roller **7** passes over the second cam **10** and engages in the second recess **11** which corresponds to an opening angle of 39° for the door **3.** Out of the second intermediate position the door **3** is again movable into the completely open position or in the closing direction only by the application of a sufficient force. If the door is further opened, then the roller **7** passes over the third cam **10** and engages in the third recess **11** which corresponds to an opening position of 57° for the door **3.** The door **3** can be further moved slightly beyond the open position whereby the roller **7** runs up against a radial extension **19** of the curved plate member **4** serving as end abutment. The running surface **5** of the curved plate member **4** rises in the direction toward this extension **19** so that, in order to reach the end position, the springs **18** have to be expanded whereby the movement of the door is braked softly.

While we have shown and described only one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to those skilled in the art and we therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

What we claim is:

1. A mechanism for limiting the outward swing of a door which is pivotally secured to a relatively fixed part by hinge means, characterized in that a spring-held roller means is arranged within the door which is coordinated to a curved member mounted at the fixed part, said curved member being provided with running surface means forming detent means for the roller means, characterized in that the fixed part is in the form of a door column, said curved member being pivotally secured at said door column about an axis disposed substantially parallel to the axis of the spring-held roller means and being guided in the door between the spring-held roller means and a support roller means, characterized in that the curved member is secured in a bearing support means having a pivot axis disposed substantially parallel to the hinge axis whereas the running surface means of the curved member are constructed as concentric circular arcs relative to the hinge axis, and characterized in that the spring-held roller means and the support roller means are arranged approximately radially to the hinge axis one behind the other whereby the support roller means is disposed radially inwardly of the spring-held roller means.

2. A mechanism according to claim **1,** characterized in that the running surface means of the curved member for the spring-held roller means is provided with several cams which form therebetween recesses whose radius of curvature corresponds approximately to the radius of the spring-held roller means.

3. A mechanism according to claim **2,** characterized in that the curved member is provided at its end with an outwardly directed extension projecting radially outwardly with respect to the hinge axis, the running surface means provided with the cams rising in the direction toward said extension.

4. A mechanism according to claim **3,** characterized in that the spring-held roller means is retained by a pivot arm arranged approximately tangentially to the running surface means of the curved member, said pivot arm being spring loaded by spring means engaging thereon within the area of the spring-held roller means.

5. A mechanism according to claim **4,** characterized in that the spring-held roller means and the support roller means are arranged within the area of the front surface of the door.

6. A mechanism according to claim **5,** characterized in that the spring means are disposed approximately parallel to the front surface of the door.

7. A mechanism according to claim **6,** characterized in that the spring-held roller means, the pivot arm, the spring means and the support roller means include a common mounting means which is inserted into the door.

8. An arrangement for limiting the swinging movement of a door which is secured to a relatively fixed part by hinge means for swinging pivotal movement about a hinge axis; said arrangement comprising:

camming member means attached to one of said fixed part and said door, said camming member means having a running surface with camming detent means formed therein,

and resiliently biased roller means attached to the other of said fixed part and said door for resiliently engaging with said detent means for limiting swinging movement of said door,

wherein said running surface extends substantially along a circular arc which is concentric to the hinge axis,

wherein said camming member means includes a curved support surface oppositely disposed with respect to said running surface, and wherein back-up roller means are attached to said other of said fixed part and said door for engagement with said curved support surface,

wherein said curved support surface extends substantially along a circular arc which is concentric to the hinge axis and to the circular arc of said running surface,

and wherein the roller axes of said resiliently biased roller means and said back-up roller means are parallel to said hinge axis and are aligned with one another along a radius extending from said hinge axis.

9. An arrangement according to claim 8, wherein said support surface is a smooth uninterrupted surface along the extent thereof which engages with said support roller means during movements of said door about said hinge axis.

10. An arrangement according to claim 9, wherein said camming detent means are formed as a plurality of recesses spaced circumferentially from one another along the circular arc of said running surface and extending radially inwardly in a direction toward said support surface, and wherein the respective radii of curvature of each of said recesses correspond approximately to the radius of the resiliently biased roller means.

11. An arrangement according to claim 8, wherein said back-up roller means is disposed radially inwardly of said resiliently biased roller means with respect to said hinge axis.

12. An arrangement according to claim 8, wherein said camming detent means are formed as inwardly curved recesses having radii of curvature corresponding approximately to the radius of the resiliently biased roller means.

13. An arrangement according to claim 8, wherein said camming member means is attached to said fixed part and wherein said resiliently biased roller means and said back-up roller means are attached to said door.

14. An arrangement according to claim 11, wherein said camming member means is attached to said fixed part and wherein said resiliently biased roller means and said back-up roller means are attached to said door.

15. An arrangement according to claim 11, wherein said camming detent means are formed as inwardly curved recesses having radii of curvature corresponding approximately to the radius of the resiliently biased roller means.

16. An arrangement according to claim 12, wherein said camming member means is attached to said fixed part and wherein said resiliently biased roller means and said back-up roller means are attached to said door.

17. An arrangement according to claim 8, wherein the camming member means is provided at its end with an outwardly directed extension projecting radially outwardly with respect to the hinge axis, the running surface rising in the direction toward said extension.

18. An arrangement according to claim 8, wherein said door is part of a passenger motor vehicle, and wherein said fixed part is in the form of a door column on said motor vehicle.

19. An arrangement according to claim 15, wherein said camming member means is attached to said fixed part and wherein said resiliently biased roller means and said back-up roller means are attached to said door.

20. An arrangement according to claim 19, wherein said camming member means is attached to said fixed part for pivotal motion about an axis which is parallel to said hinge axis for accommodating manufacturing tolerances in the construction of said camming member means.

21. An arrangement according to claim 17, wherein the resiliently biased roller means is retained by a pivot arm arranged approximately tangentially to the running surface of the camming member means, said pivot arm being spring loaded by spring means engaging thereon with the area of the resiliently biased roller means.

22. An arrangement according to claim 21, wherein the resiliently biased roller means and the support roller means are arranged within the area of the front surface of the door.

23. An arrangement according to claim 22, wherein the spring means are disposed approximately parallel to the front surface of the door.

24. An arrangement according to claim 23, wherein the resiliently biased roller means, the pivot arm, the spring means and the support roller means include a common mounting means which is inserted into the door.

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