Oct. 12, 1965 P. W. WOZENA ETAL 3,211,492

FLEXIBLE GLASS WINDOW REGULATING MEANS

Filed April 30, 1963 2 Sheets-Sheet 1

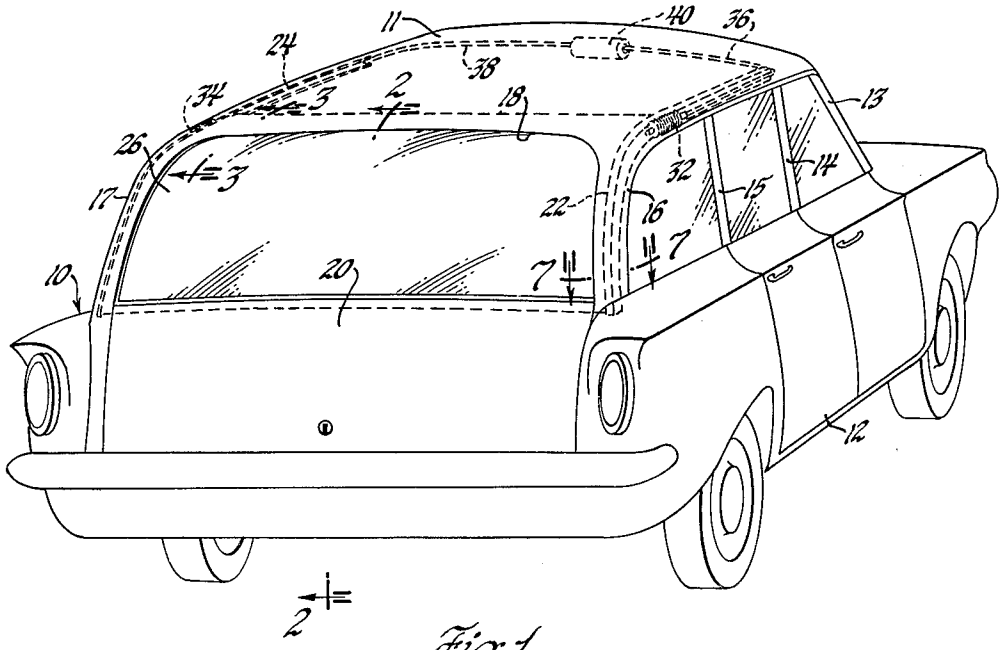

Fig. 1

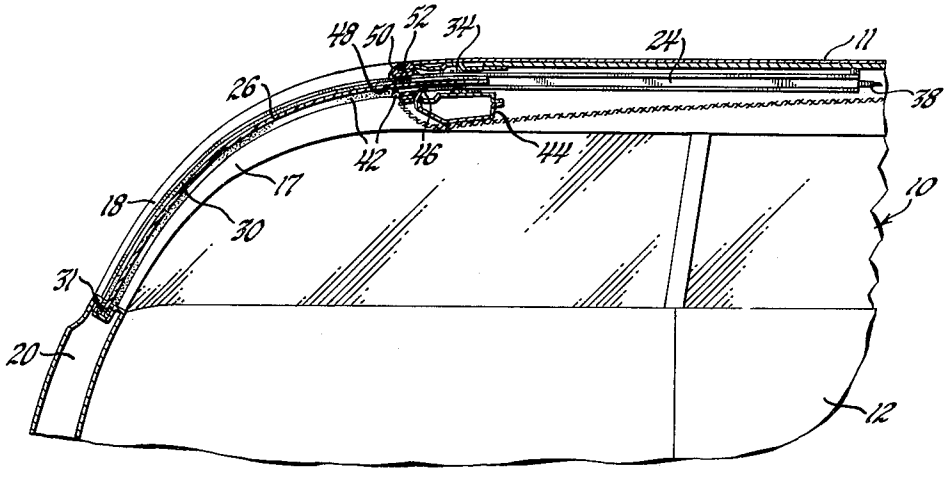

Fig. 2

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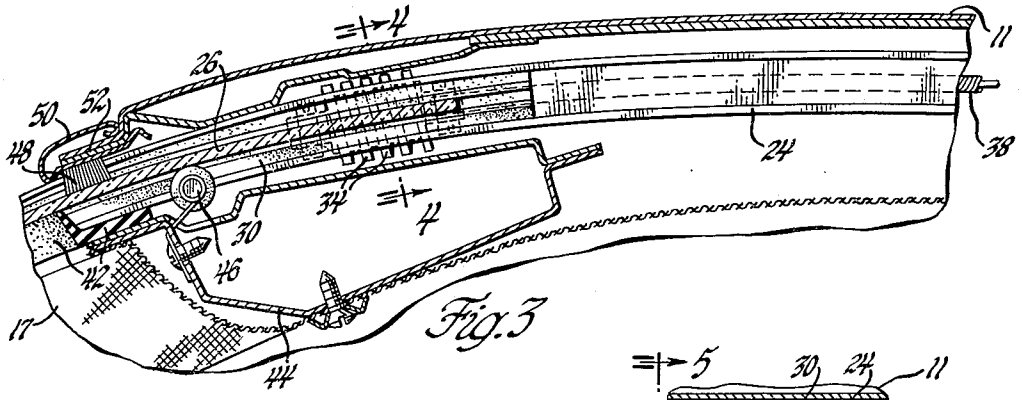

Fig. 3

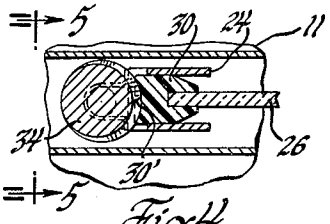

Fig. 4

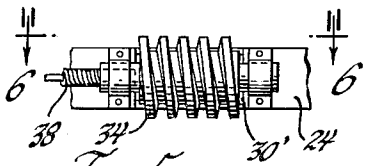

Fig. 5

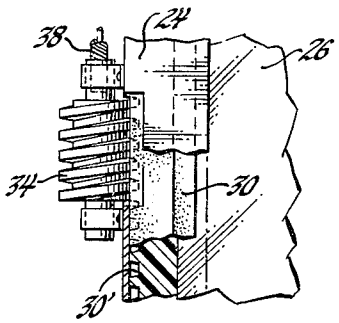

Fig. 6

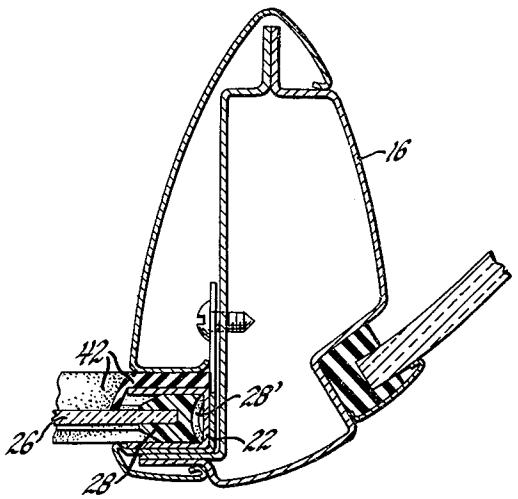

Fig. 7

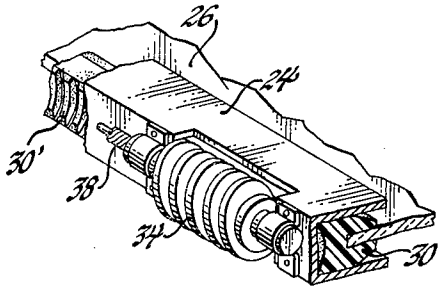

Fig. 8

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FLEXIBLE GLASS WINDOW REGULATING MEANS

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4 Claims. (Cl. 296—44)

This invention relates generally to a window structure; more particularly to a retractable window for vehicle bodies and the like; and with regard to certain specific aspects, to a window retractable to partially close a passenger or load compartment access opening with a cooperating door movable to close the remainder of the access opening, such as in an automotive station wagon vehicle.

In the past, automotive vehicle doors have generally had windows mounted for movement between a retracted opened position within the door and an extended position closing a window opening either defined by the upper door frame or defined between the door and the upper portion of the door opening. For safety, these windows have been generally of relatively thick tempered or laminated safety glass and therefore quite heavy. The required thickness and weight of such window mounting doors have necessitated the use of relatively large heavy-duty hinges, door checks and hold-open devices and have often required counterbalancing to assist door opening and closing movement. In doors of substantial width, the weight of the window glass makes it desirable to provide power means selectively operable to actuate the window between its opened and closed positions. Retractable window doors also present problems relating to proper sealing of both the window and door. Provision must also be made for the disposal of moisture collected in the interior of the door to prevent destructive rusting of the door, corrosion and fouling of the window regulating mechanism, and leakage through the interior door panels.

In certain vehicles such as station wagons, a sealed window mounting door has been hinged to the underroof structure for swinging movement relative to the upper portion of the vehicle body door opening. Here again the weight of the tempered safety glass and its supporting door frame generally require the use of relative heavy-duty counterbalanced hinges capable of maintaining the opened window mounting door clear of the door opening. The housings for such hinges necessarily protrude downwardly and substantially reduce the effective heighth of the door opening. Such hinged window mounting doors also present sealing problems with respect to the adjacent upper body portions and a cooperating door mounted for opening and closing movement relative to the lower body portion. Such a cooperating door also requires a latch mechanism capable of latching the lower door with respect to both the lower body portion and the window mounting upper door.

The instant invention broadly contemplates the use of a flexible high strength glass of relatively thin section and reduced weight mounted for curvilinear movement in a vehicle body between an extended window closing position and a retracted window opening position stored within the body structure adjacent the window opening by guide means defining a smooth continuous window bending curvature between these extreme window positions. The invention further broadly contemplates the provision of a relatively simple, inexpensive means for mounting and actuating such a flexible glass window between its extreme window positions without binding, which simplifies and reduces the sealing requirements for such a window and permits remote actuation of the window by either a manual regulator or by selective operation of a reversible motor.

With regard to its more specific aspects, the invention has particular application to an automotive station wagon vehicle and is shown and described in such an environment. In the illustrative embodiment, the vehicle body has an interior compartment defined between a roof structure and a lower body portion. A plurality of spaced pillars support the roof above the lower body portion and form a plurality of window and door openings therebetween. Two rear body pillars define a door opening accessible to the rear of the interior compartment. The lower portion of this rear opening is closable by a tailgate, door or closure member hinged for swingable movement about a horizontal axis between a substantially horizontal opened position and a vertically inclined closed position. Above this lower door, the rear body pillars are curved upwardly and forwardly of the vehicle to provide a curved window opening substantially continuous with the outer curvature of the adjacent roof structure.

A pair of laterally opposed guide channel members are secured within the rear body pillars above the lower body portion and are similarly curved to coextend smoothly and continuously forwardly into substantially straight window storing portions mounted within the underroof body structure. A window of high strength flexible safety glass is slidably mounted in the opposing guide channels by flexible bearing members preferably of channeled plastic material for movement between an underroof retracted opened position and an extended curved position in window closing sealed engagement with the upper edge of the rear tailgate closure member.

The flexible bearing members secured to opposite sides of the window glass are outwardly formed to provide gear racks or nut segments having helically formed teeth of opposite hand. The underroof portions of the guide channel members each have an opening immediately forwardly of the rear window opening. These openings provide driving access to the rack teeth of the flexible window mounting members. Worm gears or screws of opposite hand are journaled adjacent each of these guide channel openings and have helical teeth drivingly engaging the rack teeth of the adjacent flexible channel member. These worm gears are rotatably driven by flexible shafts drivingly connected to a common reversible motor mounted in the vehicle body remotely of the rear window opening. The motor is selectively energizable to actuate the flexible window alternately between its retracted underroof position and its extended window closing position.

While the invention has particular utility in the station wagon rear window application of the illustrative embodiment, it is not deemed to be so limited. Certain of its broader and more specific aspects appear to be generally applicable to other retractable window structures for vehicle bodies and like enclosures.

The foregoing and other objects, advantages and features of the invention will be apparent from the following description of the illustrative embodiment, having reference to the accompanying drawings, in which:

FIGURE 1 is a right rear quarter perspective view of a station wagon automotive vehicle embodying the invention;

FIGURE 2 is a fragmentary sectional view taken substantially in the direction of the arrows and in the plane of the line indicated at 2—2 of FIGURE 1 and shows the slidable mounting of a flexible glass window to partially close the rear access opening of a station wagon in accordance with the invention;

FIGURE 3 is an enlarged fragmentary sectional view similar to a portion of FIGURE 2 but taken substantially in the direction of the arrows and in the plane of the line indicated at 3—3 of FIGURE 1 and shows the illustra-

tive flexible glass mounting drive arrangement in greater detail;

FIGURE 4 is a fragmentary sectional view further detailing the mounting and drive of the flexible glass window substantially in the plane of the line indicated at 4—4 in FIGURE 3;

FIGURE 5 is a fragmentary side elevational view of the window mounting drive taken substantially in the direction of the arrows indicated at 5—5 of FIGURE 4;

FIGURE 6 is a fragmentary plan elevational view taken substantially in the direction of the arrows indicated at 6—6 of FIGURE 5 with portions thereof broken away and sectioned to show the mounting and drive of the flexible glass window within the guide channel;

FIGURE 7 is a fragmentary sectional view through the right rear window pillar of the illustrative station wagon and illustrates the mounting of the flexible glass window within the pillar mounted guide channel substantially in the plane of the line indicated at 7—7 in FIGURE 1; and

FIGURE 8 is a perspective view further showing certain details of the window mounting and drive arrangement of the invention.

Referring more particularly to FIGURE 1, the body of a station wagon automotive vehicle is indicated generally by the reference numeral **10** and has a closed passenger and load compartment. A roof structure **11** is supported in spaced relation above the lower body portion **12** by a plurality of spaced pillars **13, 14, 15, 16** and **17** forming a plurality of door and window openings therebetween. The two rear pillars **16** and **17** cooperate with the roof structure **11** to define a rear window opening **18** above a tailgate or closure member **20** suitably hinged in a conventional manner for swinging movement about a horizontal axis between a vertically inclined closed position and a substantially horizontal position rearwardly continuing the load deck of the interior load compartment.

As best seen in FIGURE 2, the rear pillars **16** and **17** are curved forwardly above the tailgate and lower body to provide a curved rear window opening and an outer body contour of substantially continuous curvature with the roof. Opposing guide channel members **22** and **24** are partially housed within the rear pillars above the tailgate, as shown in FIGURE 7, and are curved upwardly and forwardly therewith to coextend smoothly and continuously into substantially straight window storing portions mounted within the underroof structure. In accordance with the invention, a rear window **26** of a flexible high strength safety glass, known commercially as Chemcor, is slidably mounted within the laterally spaced guide channels for movement between a relatively flat opened position retracted within the underroof structure and an extended window closing position. In the illustrative embodiment, such guide channel mounting of the window is provided by a pair of flexible bearing channels **28** and **30** secured to opposite sides of the flexible glass. In moving to its closed position, the window is deflected downwardly by the curved guide channel members and engages a tailgate mounted weatherseal **31**.

The flexible window mounting members **28** and **30** are preferably of a suitable plastic bearing material, such as nylon or Teflon, and formed to provide outwardly disposed gear racks or threaded nut segments having helically formed teeth **28'** and **30'** of opposite hand. As shown in FIGURES 3–6 and 8 with reference to the guide channel mounting and drive of the flexible window on the left hand side of the vehicle, the underroof portions of the guide channel members **22** and **24** each have an opening located immediately forwardly of the rear window opening **18**. Two worm gears or screws **32** and **34** are suitably journaled and laterally intersect the opening in each guide channel member. These worm gears have helical teeth or threads of opposite hand drivingly engaging the teeth of the adjacent channel mounted flexible bearing member. The worm gears **32** and **34** are drivingly connected through

flexible shafts **36** and **38**, respectively, to opposite ends of a common reversible motor **40** mounted remotely of the rear window opening. This motor is selectively energizable to rotate the worm gears in opposite directions thereby alternately actuating the flexible window between its retracted underroof stored position and its curved window closing extended position. The motor **40** may be supported by the underroof structure forwardly of the retracted position of the window, as shown in FIGURE 1, or it may be remotely located in the lower body structure with flexible shafts extending upwardly through several roof supporting pillars to rotatably drive the window actuating worm gears.

In its closed position, the curved flexure of the window **26** tends to maintain suitable sealing engagement between the flexible plastic bearing members **28** and **30** and their mounting guide channel members **22** and **24**. As shown in FIGURES 3 and 7, the pillars **16** and **17** and a transverse rear roof header **44** mount a simple lip seal **42** which slidably engages the inner surface of the flexible glass **26** and further assures proper sealing of the window. As best seen in FIGURE 3, a plurality of leaf spring mounted rollers **46** are spaced laterally of the rear roof header **44** and support the window glass **26** adjacent the window opening **18**. These rollers bias and maintain the upper surface of the glass in transverse sealing engagement with a felt or pile fabric seal **48** carried by a molding strip **50**. The molding strip **50** is suitably secured to a roof terminating pinchweld **52** which extends transversely of the vehicle in slightly spaced parallel relation above the rear roof header **44**.

From the foregoing description, it will be seen that the illustrative rear station wagon window embodiment provides a relatively simple inexpensive means for accomplishing the various objects and advantages of the invention. It will be further apparent that the invention is capable of similar advantageous application in other retractable window installations and that various modifications and changes might be made in and from the disclosed structure without departing from the spirit and scope of the invention as defined in the following claims.

We claim:

1. In a vehicle body having a curved window opening therein, a pair of opposing guide channel members having parallel curved portions secured to the curved opposite sides of said window opening and extending smoothly and continuously into substantially straight tangential portions mounted inwardly of the adjacent body structure, a window of flexible high strength glass slidably mounted in said guide channel members for movement between a retracted stored position and an extended window closing position, a pair of flexible rack members secured to the opposite guide channel mounted edges of the flexible window glass and having oppositely inclined rack gear teeth formed thereon, a pair of worm gears journaled adjacent said guide channel members inwardly from the window opening and having helical teeth of opposite hand drivingly engaging the teeth of said flexible rack members, a selectively energized reversible motor, and flexible shaft means drivingly connecting said worm gears for rotation by said motor thereby actuating said window between its retracted stored position and its extended window closing position in accordance with the selective energization of said motor.

2. In a vehicle body having a roof structure supported in spaced relation to a lower body portion by pillars defining a plurality of window and door openings therebetween, the pillars defining at least one of said openings being curved upwardly and inwardly from said lower body portion to provide a window opening of substantially continuous curvature with the vehicle roof, a pair of curved opposing guide channel members extending upwardly of the pillars defining said one window opening and curved smoothly inwardly under the roof structure, a flexible window adapted for sliding movement in said guide chan-

nel members between a retracted stored position under the roof structure and an extended position closing said one window opening, a pair of flexible channel members secured to the opposite side edges of said window and slidably mounting said window in said curved guide channel members, said flexible channel members having rack teeth formed outwardly thereon, said guide channel members each having an opening therethrough inwardly of said one window opening, a pair of worm gears journaled adjacent each guide member opening and having helical threads of opposite hand extending therethrough and drivingly engaging the rack teeth of the adjacent flexible channel members, and window regulating means operably connected to rotate said worms in synchronously phased relation to actuate said flexible window between its retracted stored position and its extended closed position.

3. In the combination of claim 2, said window regulating means including a selectively operable reversible motor mounted in said vehicle body remotely of said one window opening and flexible shaft means drivingly connecting said worm gears for window actuating rotation by said reversible motor whereby said flexible window is alternately actuated between its retracted underroof position and its extended closed position in accordance with the selective energization of said reversible motor.

4. In a station wagon type vehicle body having an interior compartment defined by a roof structure supported in spaced relation to a lower body portion by a plurality of pillars forming window and door openings therebetween, said pillars and lower body portion defining one opening for access to the rear of the interior compartment, a closure member hinged for swinging movement about a horizontal axis between a substantially horizontal opened position and a vertically inclined position closing the lower body portion of said rear opening, the pillars defining said rear opening above said closure member and lower body portion being curved upwardly and forwardly to provide a rear window opening having substantially continuous curvature with the vehicle roof, a pair of curved opposing guide channel members extending upwardly of the rear opening body pillars above the lower body portion and curved smoothly forwardly to substantially straight window storing portions mounted within the vehicle underroof structure, a window of high strength flexible safety glass slidably mounted in said guide channel members for movement between a retracted position stored within the underroof structure and an extended curved position in weathersealing engagement with the rear closure member thereby closing said rear window opening, a pair of flexible channel members of plastic bearing material secured to and slidably mounting the opposite side edges of said flexible glass window in said curved guide channel members, said flexible channel members each having rack teeth formed outwardly thereon, said guide channel members each having an opening therethrough forwardly of the rear window opening, a pair of worm gears journaled adjacent and having helical threads extending through the openings of the guide channel members to drivingly engage the rack gear teeth of the flexible channel members, a selectively operable reversible motor mounted in said vehicle body remotely of said rear window and door opening, and flexible shaft means drivingly interconnecting said worm gears for synchronous window actuating rotation by said reversible motor whereby said flexible window is alternately actuated between its retracted underroof position and its extended closed position in accordance with the selective energization of said reversible motor.

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