Feb. 20, 1940. J. M. ATWATER 2,191,269

AUTOMOBILE BODY CONSTRUCTION

Filed April 14, 1937

Fig. 1.

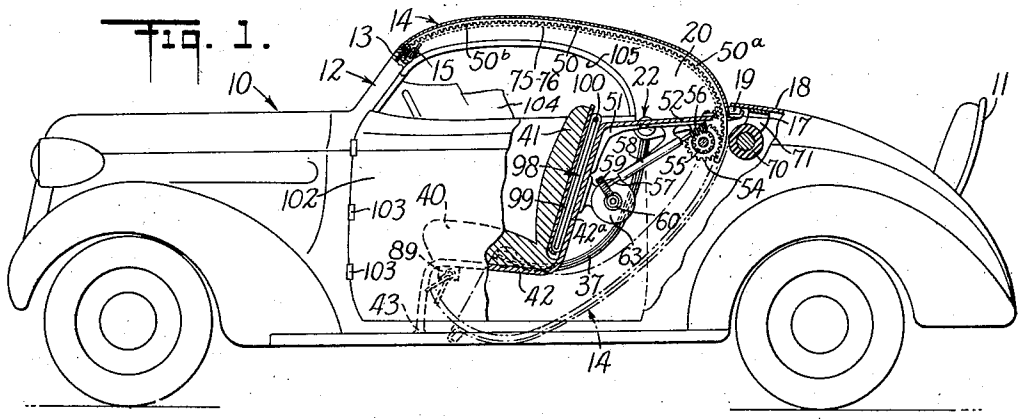


Fig. 2.

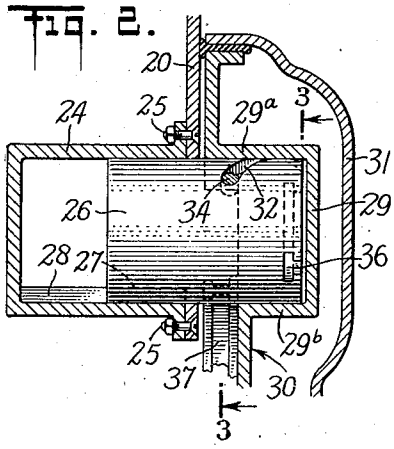


Fig. 3.

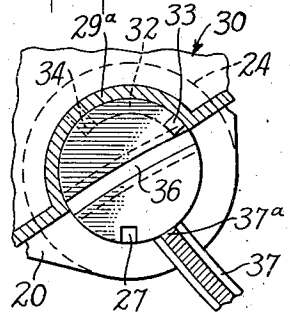


Fig. 5.

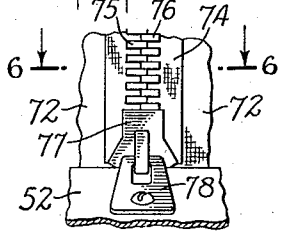


Fig. 6.

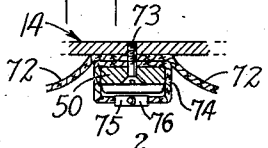


Fig. 7.

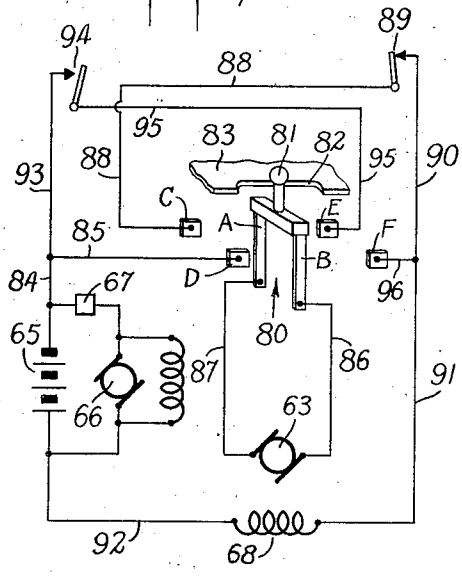
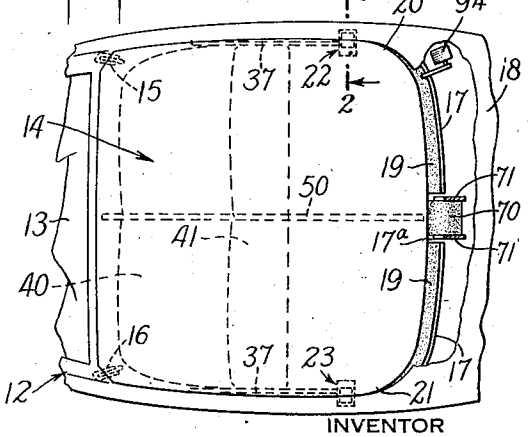


Fig. 4.



INVENTOR

Jack M. Atwater

BY

William T. Kniesner

ATTORNEY

Patented Feb. 20, 1940 2,191,269

UNITED STATES PATENT OFFICE

2,191,269

AUTOMOBILE BODY CONSTRUCTION

Jack M. Atwater, New York, N. Y.

Application April 14, 1937, Serial No. 136,720

13 Claims. (Cl. 296—107)

This invention relates to vehicle construction and more particularly to automobile body construction.

One of the objects of this invention is to provide a practical and dependable all-metal body construction in which the roof portion is capable of being telescoped, in a practical, dependable and easily controllable manner, into the body portion proper when it is desired to convert the vehicle from a closed type to an open type. Another object is to provide a body construction of the above-mentioned character in which the control of the position of the roof portion and its movement is simple, convenient and reliable. Another object is to provide a construction of the above-mentioned character in which the roof portion, when withdrawn from its normal position, will be effectively out of sight and in which the resultant exterior of the body will have or may be given a neat, sleek, and unbroken appearance. Another object is to provide a body construction which may be quickly and easily converted from a coupé type of construction to an open or roadster type of construction, or vice versa. Another object is to provide a construction of the last-mentioned character in which the conversion may be achieved without unduly, if at all, encroaching upon the rear space of the body, such as the space usually utilized for a so-called rumble seat. Another object is to provide a construction of the above-mentioned character whereby such objects as those set forth may be carried out without awkwardness or abnormality of appearance and whereby, if desired, present-day standards of shape, appearance and ornamentation may be retained.

Another object is to provide a readily convertible all-metal body construction of the above-mentioned character in which the structural features are such that existing methods of routine or line construction and assembly may be adhered to or carried out. Another object is to provide a convertible construction of the above-mentioned character in which such advantages and objects, avoidance of rattling, compactness of construction, power actuation of the movable part of the body, simple and convenient control thereof, and the like, may be carried out and achieved in a practical, dependable and inexpensive manner. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown a preferred embodiment of my invention,

Figure 1 is a side elevation of an automobile having certain parts broken away and certain parts sectioned in order to better portray certain features of construction;

Figure 2 is a vertical central sectional view on an enlarged scale of one of the pivot structures and related coacting and controlling parts for pivoting the movable body portion and may be considered to be a vertical sectional view along along the line 2—2 of Figure 4 which is later described herein;

Figure 3 is a vertical sectional view of the pivot construction as seen along the line 3—3 of Figure 2;

Figure 4 is a fragmentary plan view as seen from above in Figure 1, certain parts being broken away to show certain features more clearly;

Figure 5 is an elevation as seen from the inside of the closed body showing a construction whereby certain operating parts related to the roof construction may be maintained covered;

Figure 6 is a sectional view on an enlarged scale as seen along the line 6—6 of Figure 5, and

Figure 7 is a diagrammatic representation of an electric circuit capable of controlling the power actuation of the movable part of the vehicle body.

Similar reference characters refer to similar parts throughout the several views in the drawing.

Referring now first to Figure 1, I have shown in side elevation an automobile whose body illustratively and preferably has the shape and appearance of a so-called coupé; the body proper is indicated generally by the reference character 10 and excepting for features later described herein may be of usual or standard construction, having related thereto in the usual manner any usual type of prime mover and running and operating gear. It may also, for example, have at its rear end a usual form or shape of opening covered by the cover 11 which when opened up, as shown in Figure 1, forms the back for a rumble seat of usual shape, location and construction.

At the rear of the hood, the body is provided with an upwardly and rearwardly slanting frame generally indicated at 12 and extending transversely of the body and in the frame 12 is mounted and completely framed thereby the front glass or window 13 (Figure 4) usually called the windshield. The upper portion of the body, forming

what I shall term the roof portion, is indicated generally by the reference character 14. Like the other portions of the body it is preferably made of a suitable sheet metal and illustratively conformed and shaped substantially as shown, having forward, lateral and rear curvatures to merge neatly and gracefully into the body proper of the vehicle. At its forward or left-hand portion, as viewed in Figures 1 and 4, the roof portion 14 is shaped, as is also the upper portion of the windshield frame 12, in any suitable manner to interfit, as, for example, by a rabbeted or tongue and groove interrelationship with which also is preferably related any suitable gasket means, such as rubber stripping, to form a sealed and hence weather-tight connection between the two parts.

Preferably, also, these two parts have related to them, preferably interiorly thereof, suitable disconnectable catches or latches, illustratively two in number, as indicated at 15 and 16 in Figure 4; these devices may, for example, comprise disconnectable toggle connectors analogous to those used, for example, on trunks. By them the above-mentioned interfitting of the parts 12 and 14 may be maintained tight and secure and also against rattling, and thus also the forward part of the roof portion 14 is given a strong and dependable support. At the same time, the undoing of these toggle connectors from the interior may be quickly achieved manually, for purposes later described.

The extreme rearward end of the roof portion 14 has a horizontal peripherally extending flange 17 which with the roof porton 14 in the position shown in Figure 1 laps over the sheet metal 18 of the top of the rear body portion; between the parts 17 and 18 and secured to one of them, illustratively to the flange 17, is a gasket 19 preferably in the form of relatively soft rubber of relatively substantial cross-section. The gasket 19 not only causes the mechanical interconnection between the roof portion 14 and the rear body portion but also effects a weather-tight sealing joint or connection therebetween, when the roof portion 14 is positioned and held in the relationship shown in Figure 1.

Extending forwardly from the lower rear but forwardly curved portions of the roof portion 14 are two arm-like members 20 and 21 which may be, and preferably are, formed integrally with the roof portion 14, particularly where they form the lateral and downwardly curved and extending parts of the structure 14. The arms 20, 21 extend forwardly and as about to be described are related to respective pivot structures generally indicated at 22 and 23 in Figure 4. These pivot structures are of similar and symmetrical construction and action and hence it will suffice to describe only one in detail, and accordingly reference may now be made to Figures 2 and 3, in which a preferred form is shown.

In Figure 2 is shown the arm 20 provided on its face toward the central longitudinal plane of the vehicle body with a preferred cylindrical housing 24 related thereto in any suitable manner, as by bolts 25, being open at its end toward the outside of the car; housing 24 carries a pivot pin or stud 26, preferably solid. Stud 26 is nonrotatably but slidably related to the housing 24; accordingly, the stud 26 has a slot or keyway 27 in which engages the key or spline 28, the latter being fixed to the interior of the housing 24. Accordingly, the pivot stud 25 must rotate with the arm 20 when the latter swings but can slide along its axis relative to the housing 24. In Figure 2 the pivot stud is shown as extended outwardly of the housing 24, being in its outermost position.

In this position pivot stud 26 is entered into a cylindrical bearing housing 29 of a sheet metal member 30 fixedly positioned just to the inside of the side sheet metal portion 31 of the body 10. The bearing housing 29 is shaped as is shown in Figures 2 and 3, having an upper cylindrical wall portion 29^a of substantially 180° extent but of greater axial dimension than the lower and complementary cylindrical wall portion 29^b which is also of 180° extent, for a purpose later described.

The pivot stud 26 has a helical groove or slot 32 extending throughout substantially 90° (Figures 2 and 3) and terminating in the right-hand or front face of the stud 26, as at 33. In axial extent the slot 32 is proportioned with respect to the axial extent of the overhanging cylindrical wall portion 29^a, substantially as indicated in Figure 2; in the part 29 is fixedly mounted a pin 34 which extends into the slot 32.

Accordingly, it will be seen that if the arm 20 is swung toward the observer, viewing Figure 2, as happens when the roof portion 14 of Figure 1 is swung in clockwise direction about the pivots 22, 23, the bearing housing 24 and the pivot stud 26 partake of a corresponding rotary movement but since the pin 34 is stationary, the resultant cam action between the pin and the groove 32 causes the pivot stud 26 to go toward the left. By the time it has completed this leftward movement, its right-hand end is brought out of engagement with the axially-shorter cylindrical wall portion 29^b, so that the support of the pivot stud 26 and its related parts by the bearing housing 29 ceases. The pivotal connection is thereby disengaged, the same thing happening with respect to the other pivotal structure 23, whence a motion of translation of the roof portion 14 in a downward direction may take place, that roof portion by that time having assumed a substantially vertical, as distinguished from its present horizontal, position..

Extending crosswise of the end of the pivot stud 26 is a T-slot 36, preferably slightly curved but substantially diametrical; it is so positioned that by the time the above-described 90° rotary movement of the stud 26 has taken place, the T-slot 36, theretofore positioned as shown in Figure 6, is brought into alinement with the upper end 37^a of a guide rail 37 cross-sectioned as shown in Figures 2 and 3. The disconnection of the pivot stud 26 from the bearing housing 29 is thus at once succeeded by the telescoping of the T-slot 36 over the upper end 37^a of the guide rail 37, a similar action taking place in the pivot stud 23 on the other side of the vehicle.

The ensuing motion of translation of the roof structure 14 is thus guided by the two side rails 37, 37 (Figure 4) which in extent and curvature are substantially as is better shown in Figure 1. The guide rail 37 is secured to the inner face of the member 30, and the curvature of the slot 36 matches the curvature of the rail 37.

In Figure 1 is shown a seat which extends entirely across the interior of the car body; it comprises the cushioned seat portion 40 and back 41 supported by a strong metal frame 42 shaped as shown, the frame 42 being secured in any suitable manner, as at the point 43, to a rigid part of the vehicle structure. The shape of the frame 42 will be seen to leave the under and rear sides of the seat unobstructed and it is to the respective

upper side ends of the frame 42 that the members 30 (Figure 2), which carry the respective bearing housings 29 and which are of appropriate shape and expanse (not shown in detail), are secured; the resultant forward and downward extensions of the rails 37 (Figures 1 and 4) thus pass each to one side of the seat, toward which they respectively face. Thus, with a rigid and strong seat frame 42, the pivot structures 22, 23 and the guide rails 37 are given solid and rigid support. The sheet metal parts 30, also, prevent exposure to view from the exterior of the vehicle, when the doors are opened, of the rails and related mechanisms. Likewise, there is afforded rigid support for certain other parts later to be described.

Along the central longitudinal axis of the roof portion 14 which, as above noted, is preferably made of sheet metal like the rest of the body, is secured and extends a rack 50 (Figures 1, 4 and 6). The rack may be of any suitable construction and may, for example, be made of suitably heavy sheet metal. It preferably conforms to the shape of the roof portion, as better appears from Figure 1, and preferably its right-hand portion 50^a is given a curvature or arc whose center of curvature is at the common axis of the two pivot structures 22, 23 and for reasons later set forth this rack portion 50^a is extended downward beyond the lower rear edge of the roof portion 14, as shown in Figure 1. Illustratively, the curved portion 50^a may be of an extent substantially equal to 90°. In Figure 1 the forward portion is indicated by the reference character 50^b.

Secured to the rear or upstanding part 42^a of the seat frame 42 is a bracket 51 which may and preferably does have a horizontally extending cover plate 52 which closes and forms a shelf over the gap between the rear of the seat back 41 and the lower rear end of the roof portion 14.

The rack 50 meshes with an appropriate gear, such as a spur gear 54, and the latter I prefer to drive from a suitable source of power, preferably a source of energy derived from the power plant or motive power of the vehicle. A preferred form of drive may take the following form: The bracket 51 is shaped or constructed to provide a strong rotatable support for a spur gear 54 which meshes with the rack 50 and which, like the latter, is therefore positioned in the central longitudinal plane of the vehicle body. Coaxial with the spur gear 54 and rigidly connected to it is a worm wheel 55 which meshes with a worm 56 on the upper end of an inclined shaft 57 which may be given bearing supports 58 that depend from the bracket 51. At the other end of the shaft 57 is a worm wheel 59 that meshes with a worm 60 on the shaft of an electric motor 63 which is secured to the back 42^a of the seat frame 42.

The inclusion of at least one worm and worm wheel in this driving train insures, aside from the resultant gear reduction, an irreversible drive, a feature which I preferably employ to achieve certain other advantages later noted.

The motor 63 derives its energy preferably from the usual storage battery 65 carried by the vehicle for operating other auxiliaries, such as the light, starting motor for the engine, and the like, or from a generator 66 (Figure 7) driven by the prime mover of the vehicle or from both battery and generator depending upon whether or not a suitable automatic switch 67 connects the generator and storage battery together as it usually does during charging of the battery. Also, and preferably, the motor 63 is a series motor and hence, as shown in Figure 7, has a series field winding 68. An advantage in utilizing a motor resides in the ease with which it may be reversed and hence the ease with which the position of the roof portion 14 may be changed. Illustrative and preferred circuit arrangements are later described.

As is better shown in Figures 1 and 4, there is secured to the underside of the rear body portion 18 a roller 70 preferably of relatively large diameter and preferably also relatively broad-faced, being as shown and preferably provided with a relatively thick yieldable face or surface; the latter is illustratively and preferably made of rubber. The roller 70 may be supported as by a bracket 71 secured to the under side of the sheet metal portion 18 and its left-hand edge is in alinement with the path of movement of the outer surface of the roof portion 14 as the latter is swung upwardly and downwardly. The roller 70 is, moreover, positioned on the longitudinal axis of the body and hence, as the roof portion 14 is moved by the gear 54, roller 70 forms a strong and slightly yieldable backing or guide for the roof portion 14 and particularly for the rack 50, roller 70 and gear 54 being in juxtaposition to each other and forming together a throat between which the rack 50 and the interposed part of the roof portion 14 must always pass or move. Also, the yielding surface of the roller 70 insures against marring the finish of the exterior of the roof portion 14. As shown in Figure 4 the underlapping flange 17 with rubber gasket 19 is cut away as at 17^a so as to bypass the roller 70.

The interior face of the roof portion 14 may be finished off in any usual or standard manner as by cloth, leather, or other fabric or sheet material. In Figures 5 and 6 such finishing material is shown at 72 and the rack 50 may be secured as by screws or rivets 73 directly against the finishing material 72 which thus becomes interposed between the rack 50 and the sheet metal of the roof portion 14, the rack thus aiding in holding the material 72 in place.

However, before thus securing the rack in position, there is interposed between it and the finishing material 72 a longitudinally slit sleeve 74, preferably made of a material similar to or matching the finishing material 72 and provided along its two longitudinal edges with interlocking or interengageable prongs or parts 75 and 76 operable by a relatively slidable locking member 77 (Figure 5), these elements 75, 76 and 77 being of the usual or well-known zipper type of construction. They are related to the slit sleeve 74 in such a manner that the sleeve is closed if the locking member 77 were moved therealong toward the right, as viewed in Figure 1, and opened if moved toward the left. However, the locking member 77 is anchored as by an anchoring link 78 (Figure 5) to the closure or shelf 52, the anchorage being as shown in Figure 1 just above the gear 54.

Accordingly, if the roof portion 14 is swung in clockwise direction, as viewed in Figure 1, the zipper lock member 77 remains stationary while the rack with its slit sleeve is made to move downwardly past the anchored lock member 77, thus parting or opening up the theretofore closed sleeve as the latter with the rack is swept or moved past the anchored lock member 77. Thus, as the rack 50 is presented to the gear 54

through the transverse narrow space between the closure 52 and the rear body portion 18 (Figure 1), the rack is uncovered and exposed to the gear for actuation thereby. Reverse actuation of the roof portion 14 into the position shown in Figure 1 brings about a reverse action in that the zipper parts 75, 76 become interlocked and thus at no time is the rack 50 exposed to sight or view, and neatness and trimness of appearance is maintained.

An illustrative circuit arrangement for the motor 63 is shown in Figure 7 and preferably it embodies limit switches as well as a reversing control for the motor. Thus, a reversing switch, generally indicated at 80, may have two movable switch members A and B insulated from each other and provided with a suitable handle 81 for manual actuation. The switch 80 may, for example, be positioned on the so-called dashboard of the vehicle or at any other convenient place, even the floor for foot operation, the handle 81 for that purpose projecting through a suitable slot 82 in the dash panel, floor, or like member, 83. When moved to the left, contacts A and B engage contacts C and D and when moved to the right they engage contacts E and F, respectively.

In the former position, the motor 63 is driven in one direction, for example in a direction to move the roof portion 14 from its present position of Figure 1 to its disappeared position; the resultant circuit for the motor 63 is thus as follows:

From one terminal of the source of electrical energy, such as the battery 65, conductor 84, conductor 85, contacts D and B, conductor 86, motor armature 63, conductor 87, switch contacts A and C, conductor 88, limit switch 89 (in closed position), conductors 90 and 91, series field winding 68 and by way of conductor 92 back to the other side of the battery 65. As just stated, limit switch 89, for that circuit, is in closed position; it may be of any suitable construction, preferably spring-actuated in circuit-closing direction, and may be positioned with relation to any suitable moving part of the arrangement above described to be opened when the roof portion 14 reaches its desired or limiting position within the vehicle body. Thus, in Figure 1 and by way of illustration, I have shown the limit switch 89 positioned underneath the seat frame 42 and in a position to be engaged by the downwardly extending or right-hand end of the rack 50 when the latter has reached its desired and extreme position. Upon being thus engaged (see dotted line position in Figure 1), switch 89 is opened and the above-described driving circuit of the motor 63 is interrupted. Switch lever 81 may be left in its left-hand position, and an advantage achieved by the above-described circuit arrangement is thus that for a subsequent actuation of the roof portion 14 to restore it to its body-covering position, no more is needed than to actuate the switch lever 81 in the only remaining direction of which it is capable.

Actuating the lever toward the right, therefore, brings contacts A and B into engagement with contacts E and F and effects a reverse rotation or drive of the motor 63 through a circuit which may be traced as follows:—

From one side of the source of electrical energy, conductor 84, conductor 93, limit switch 94 (now closed), conductor 95, switch contacts E and A, conductor 87, motor armature 63, conductor 86, switch contacts B and F, conductor 96, conductor 91, series field winding 68, and by way of conductor 92 back to the other side of the source.

The motor thus restores the roof portion 14 to the position shown in Figure 1 and when that position is reached, limit switch 94 is actuated to interrupt the motor circuit and hence stop the drive of the motor. Limit switch 94 may be given any suitable position with relation to any appropriate moving part of the arrangement above-described in detail, and illustratively it may be positioned as indicated in Figure 4 at 94 to have its movable part engaged by the flange 17 and moved into circuit-opening position only when the flange 17 reaches its uppermost position, as shown in Figure 1.

Having thus restored the roof portion 14, the catches 15 and 16 earlier above described, and of course released when necessary, are restored to effect the above-described tight interlocking between the frame part 12 and the roof portion 14.

In the course of the movement of the roof portion 14 into the vehicle body, several unique coactions take place. Thus, for example, the gear 54 is, of course, effective first upon the 90° sector or portion 50^a of the rack and hence throughout that action is effective to tilt the roof portion 14 throughout substantially 90° about the axes of the pivot structures 22 and 23. But by the time that 90° swinging movement has taken place, the two pivot studs 26 (Figure 2) of the two pivot structures have been likewise rotated through 90° and by the action above described in detail are withdrawn from the bearing housing 29 and their respective T-slots 36 have become alined to receive the guide rails 37. The power driven gear 54 of course continues to rotate and in coaction with the backing roller 70 to feed now the remaining portion 50^b of the rack downwardly; with the pivot supports theretofore provided by the parts 26—29, now lacking, the power of the gear 54 coupled with the weight of the parts causes the entire roof portion 14 as a unit to partake of movement of translation coupled by a tilting movement in clockwise direction, both of these movements resulting from the coaction between the particular curvature of the guide rails 37 (see Figure 1) and the continued drawing downwardly between the gear 54 and the roller 70 of the remaining portion 50^b of the rack 50, the roof portion 14 finally assuming a position as indicated in the broken lines in Figure 1. In that position it will be seen that its normal rear and lower portion becomes telescoped down in under the seat 40 or seat frame 42 while its normal left-hand or front portion comes to a stop just below the left-hand edge of the rear sheet metal body portion 18, limit switch 89 insuring the halting at such a point that gear 54 remains meshed with the rack and remains backed up by the yielding-faced roller 70. These two parts act to sustain that end of the roof portion while the guide rails 37 act to sustain the weight of the other end of the roof portion. Rattling or movement of the roof portion in this position is dependably precluded because of these supports, it being noted that the worm and worm wheel connections effectively prevent the weight of the roof portion 14 from driving or rotating the gear 54 and hence the latter acts as a dependable anchoring or fastening for the roof portion when in this position, just as much as it does when in its normal or body-covering position, as shown in Figure 1.

When thus telescoped in under the seat, an

apron or boot may, if desired, be set over the shelf or closure 52; this boot is generally indicated in Figure 1 at 98; it is preferably of sheet metal having slotted side flanges 99 and is normally telescoped into a suitable space provided between the frame part 42a and the seat back 41. Suitable pins 100 engage in the slots in the lateral flanges 99, and act also as a hinged connection, pins 100 being suitably supported from the seat frame 42a.

The boot or apron 98 may thus be hauled upwardly out of its above-described telescopic relationship, and by the time the pins 100 engage the lower ends of the lateral slots, the apron 98 may be swung in clockwise direction to cover over the shelf 52 and the narrow spaces through which the roof portion 14 has disappeared into the vehicle body. Any suitable weather-tight connection of the apron with the body portion 18 of the vehicle may be provided.

The vehicle now becomes an open or roadster type of vehicle, the front frame portion 12 with its window functioning as a windshield. The side doors 102, hinged as at 103, continue to function in the usual or normal way and the usual type of window glass 104 with which they are provided and arranged to be raised or lowered may be, when the vehicle is open, utilized or not as desired, it being understood, of course, that when the roof 14 is in its normal or covering position, such window glasses coact therewith to complete the side closures or to close over the gaps between the lower edges 105 of the downwardly curved side paths of the roof portion 14 and the doors 102. Preferably, the paths of upward movement of the glasses 104 of the two doors are inclined upwardly toward each other slightly to insure that the glasses interfit appropriately with the edges 105, respectively.

To restore the roof portion 14 to its covering position, the apron 98 is restored to its telescopic relationship in back of the seat back 41. Switch 80 is actuated as above described, gear 54 begins to turn, and in coaction with the roller 70 and the curvatures of the guide rails 37, effects a motion of both translation and swinging of the roof portion 14 upwardly and in counter-clockwise direction. By the time the gear 54 has reached the 90° sector 50a of the rack 50, the pivot studs 26 have ridden out of engagement with the rails 37 and further motion of translation of the roof portion 14 is halted because of the engagement of the pivot studs 26 with the overhanging portion 29a of the bearing housing 29 and pin 34 is engaged with the cam slot 32. Preferably pin 34 is diametrically opposite the upper end of rail 37 so that upward movement of the pivot stud 26 just before the latter disengages from the rail 37 effects entry of pin 34 into the slot 32. The continued drive of the gear 54 is thus made to effect thereafter a counter-clockwise pivoting or swinging movement of the roof portion 14 and hence also of the pivot studs 26, the latter being by the action of the pin 34 and cam slot 32 projected into the bearing housing 29 to thereafter afford a dependable pivotal support for the roof portion 14.

By the time the forward portion of the roof portion 14 interengages the frame portion 12, so that the catches 15 and 16 may be operated, the limit switch 94 has stopped the drive of the motor and now the gear 54 acts to take part in the supporting of the roof structure 14 against rattling or movement.

Thus, it will be seen that there has been provided in this invention a construction in which the various objects hereinbefore noted, together with many thoroughly practical advantages, are successfully achieved. It is seen that the construction is thoroughly practical, is arranged and constructed so that unit assembly may be readily achieved and hence so that existing methods of procedure in constructing and assembling automobiles may be utilized in constructing vehicles embodying my invention on a like quantity basis.

Furthermore, the construction will be seen to be compact. The mechanism is capable of incorporation into the vehicle in unobtrusive form or relationship to other parts, the interfitting of the roof portion when depressed with the seat makes for efficient utilization of effective space, and in that connection it may be noted that neither the mechanism nor the depression of the roof portion needs make any encroachment upon the usual manner of utilization of the rearmost portion of the vehicle body, such as, for example, for a rumble seat. Also, the mechanism will be seen to be dependably foolproof and easily controlled or actuated and hence well adapted to meet the varying conditions of practical use.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In construction of the character described, in combination, a vehicle body of the coupé type having a seat with a space in back of it and a space in under it and a roof portion extending forwardly over the seat and rearwardly and downwardly in back of the seat, said roof portion having rack means extending lengthwise thereof and partaking of the same curvature, gear means meshing with said rack means, and means forming a connection between said roof portion and said body for pivotally supporting the former throughout a first range of actuation of said gear and rack means to effect tilting of said top portion into said first-mentioned space and for movably supporting and guiding said roof portion for motion of translation during a second range of actuation of said gear and rack means to carry said roof portion substantially completely into said body and to be accommodated in both of said spaces, said rack having a portion that is of a curvature appropriate to coact with said gear during pivoting of said roof portion throughout said first range of actuation and having another portion whose configuration is appropriate to maintain coaction with said gear during the motion of translation of said roof portion during said second range of actuation.

2. In construction of the character described, in combination, a vehicle body of the coupé type having a seat with a space in back of it and a space in under it and a roof portion extending forwardly over the seat and rearwardly and downwardly in back of the seat, said roof portion having rack means extending lengthwise thereof and partaking of substantially the same curvature, gear means meshing with said rack means, and means forming a connection between said roof portion and said body for pivotally supporting the former throughout a first range of actuation of said gear and rack means to effect tilting of said top portion into said first-mentioned space and for movably supporting and guiding said roof portion for motion of transla-

tion during a second range of actuation of said gear and rack means to carry said roof portion substantially completely into said body and to be accommodated in both of said spaces, said connection-forming means comprising two guide means and two two-part disconnectable pivot structures, one pivot structure at each side of said roof portion, and means responsive to the completion of said first range of actuation of said gear and rack means for effecting disconnection of said two pivot structures, the parts of said two pivot structures and said two guide means thereafter coacting to effect said motion of translation during said second range of actuation of said gear and rack.

3. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, said roof portion having on the inner face thereof a rack substantially approximating the contour thereof, driving means including gear means meshing with said rack, said gear means being positioned substantially in the upper portion of said space, flexible means closing over said rack to substantially cover it from view when said roof portion is in its normal position, and means responsive to movement of said roof portion for operating upon said flexible means to uncover said rack as said roof portion moves into said space and to cover said rack as said roof portion moves out of said space.

4. A construction as claimed in claim 3 in which said flexible cover means is slit and has zipper prongs along its adjacent edges and lock means for effecting interlocking of said prongs upon relative movement therebetween, said movement-responsive means comprising said lock means and means for holding said lock means against movement whereby said zipper connection is actuated as said roof portion is moved relative to said lock means.

5. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, driving means for effecting movement of said roof portion and comprising a reversible electric motor, and a manually operable reversing switch therefor, said reversing switch having two possible positions, and two limit switches responsive respectively to the two possible extreme positions of said roof portion for respectively interrupting a circuit of the motor independently of said reversing switch and at the completion of its driving operation and preparing a reversing circuit for said motor to be completed when said switch is moved to its other position, there being disconnectable fastening means between said vehicle body and said roof portion at at least one of said two extreme positions for holding the limit switch actuated at said extreme position in actuated position and for holding said roof portion against movement in a direction toward the other of said extreme positions.

6. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a rigid self-contained roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, said roof portion being movable as a unit, means mounting said roof portion for movement in a direction into said space or out of said space, said roof portion having extending therealong in said direction of movement an elongated rack on one side of its wall, said body having a rear part terminating short of said seat to provide a mouth for said space, a gear positioned adjacent the upper part of said space and the said mouth and meshing with said rack, and a roller carried by said rear body part and at said mouth and juxtaposed to said gear but on the other side of said roof portion and forming with said gear a throat for receiving said elongated rack, and for maintaining said rack in driving connection with said gear and for effecting a proper feeding of said roof portion with its rack to said gear as said roof portion is moved.

7. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, said mounting means including two spaced guideways each having a follower and each follower having means forming a disconnectable pivotal connection with side portions of said roof portion, and mechanism actuated in response to movement of said roof portion for operating upon said disconnectable pivot means to effect disconnection thereof at a point intermediate of the entire range of movement of said roof portion according to the direction of movement of the latter, whereby movement of said roof portion takes place in two stages one of which is a pivoting movement and the other of which includes movement of translation.

8. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, said mounting means including two spaced guideways each having a follower and each follower having means forming a disconnectable pivotal connection with side portions of said roof portion, rack and gear means for effecting movement of said roof portion in a direction into or out of said space and mechanism actuated in response to the completion of a certain portion of such movement for operating upon said disconnectable pivot means and effecting connection or disconnection thereof according to the directions of movement of said roof portion.

9. In construction of the character described, in combination, a closed vehicle body having a roof portion with means movably mounting said roof portion for movement in opening or closing position, said roof portion having on a face thereof a rack extending in the general direction of movement of said roof portion, driving means including gear means meshing with said rack for effecting movement of said roof portion, flexible means closing over said rack to substantially cover it from view when said roof portion is in its normal position, and means responsive to movement

of said roof portion for operating upon said flexible means to uncover said rack as said roof portion moves into opening position and to cover said rack as said roof portion moves into normal or closing position.

10. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, said mounting means including two spaced guideways each having a follower and each follower having means forming a disconnectable pivotal connection with side portions of said roof portion, and means responsive to movement of said roof portion for effecting disconnection or connection of said disconnectable pivot means at a point intermediate of the entire range of movement of said roof portion according to the direction of movement of the latter, whereby movement of said roof portion takes place in two stages one of which is a pivoting movement and the other of which includes movement of translation, said means forming a disconnectable pivotal connection comprising a stud and a socket-like housing therefor, said means responsive to movement of said roof portion for effecting disconnection or connection of said disconnectable pivot means comprising mechanism actuated by the movement of the roof portion for moving said stud into or out of said socket-like housing according to the direction of movement of said roof portion.

11. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, said mounting means including two spaced guideways each having a follower and each follower having means forming a disconnectable pivotal connection with side portions of said roof portion, and means responsive to movement of said roof portion for effecting disconnection or connection of said disconnectable pivot means at a point intermediate of the entire range of movement of said roof portion according to the direction of movement of the latter, whereby movement of said roof portion takes place in two stages one of which is a pivoting movement and the other of which includes movement of translation, said means forming a disconnectable pivotal connection comprising a stud and a socket-like housing therefor, said means responsive to movement of said roof portion for effecting disconnection or connection of said disconnectable pivot means comprising mechanism actuated by the movement of the roof portion for moving said stud into or out of said socket-like housing according to the direction of movement of said roof portion, said follower comprising an end portion of said stud, said end portion being shaped to coact with its guideway.

12. In construction of the character described, in combination, a vehicle body of the coupé type having a space in back of the seat thereof and having a roof portion extending forwardly over said seat and rearwardly and downwardly over the space in back of said seat, means mounting said roof portion for movement in a direction into said space or out of said space, said mounting means including two spaced guideways each having a follower and each follower having means forming a disconnectable pivotal connection with side portions of said roof portion, and means responsive to movement of said roof portion for effecting disconnection or connection of said disconnectable pivot means at a point intermediate of the entire range of movement of said roof portion according to the direction of movement of the latter, whereby movement of said roof portion takes place in two stages one of which is a pivoting movement and the other of which includes movement of translation, said means forming a disconnectable pivotal connection comprising a stud and a socket-like housing therefor, said means responsive to movement of said roof portion for effecting disconnection or connection of said disconnectable pivot means comprising mechanism actuated by the movement of the roof portion for moving said stud into or out of said socket-like housing according to the direction of movement of said roof portion, said follower comprising an end portion of said stud, movement of said stud as aforesaid into or out of said socket-like housing effecting also the bringing of said end stud portion out of or into operative engagement with its guideway.

13. In construction of the character described, in combination, a vehicle body of the closed type having a seat with a space in back thereof and having a rigid self-contained roof portion over said seat and separable from and movable relative to the rest of said vehicle body, and a combined mounting and moving means for said roof portion for moving it in a direction into or out of said space and comprising driving means, driven means actuated by said driving means and having operative connection with said roof portion to effect movement thereof, means forming a pivot for said roof portion, and mechanism coacting with and operating in response to actuation of said driving means and driven means for effecting movement of said roof portion in two successive stages, one of which is a pivoting movement of said roof portion about the axis of said pivot-forming means and the other of which is a movement of translation of said roof portion and includes means for effecting change in position of said axis of pivoting.

JACK M. ATWATER.