Sept. 3, 1940. E. E. WHITE 2,213,601

CLOSURE MEANS

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Fig. 2.

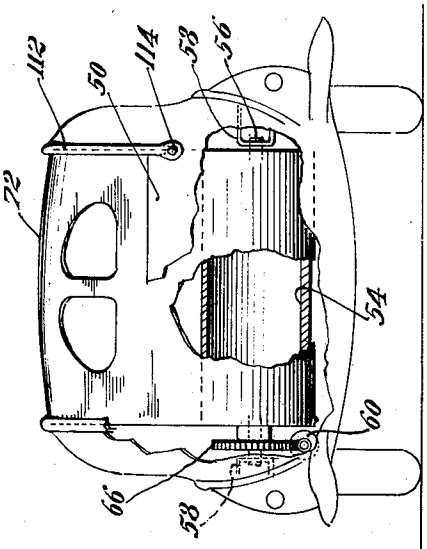


Fig. 3.

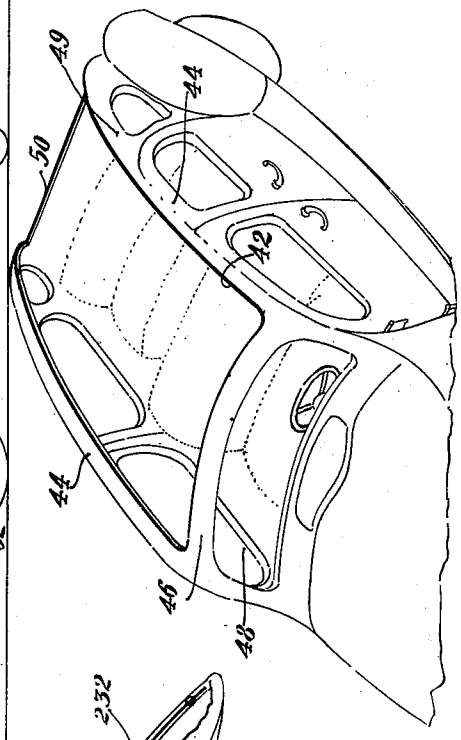
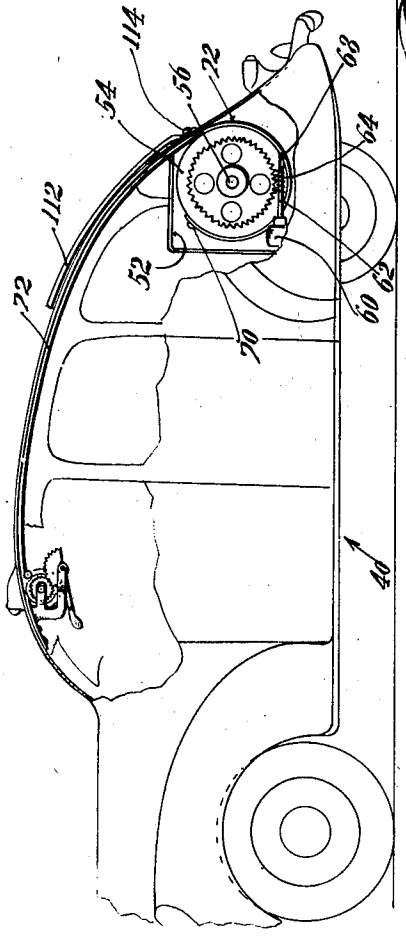


Fig. 1.



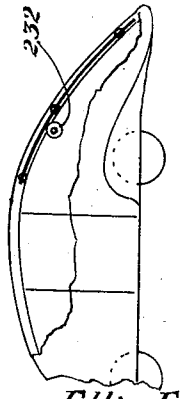


Fig. 31.

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CLOSURE MEANS

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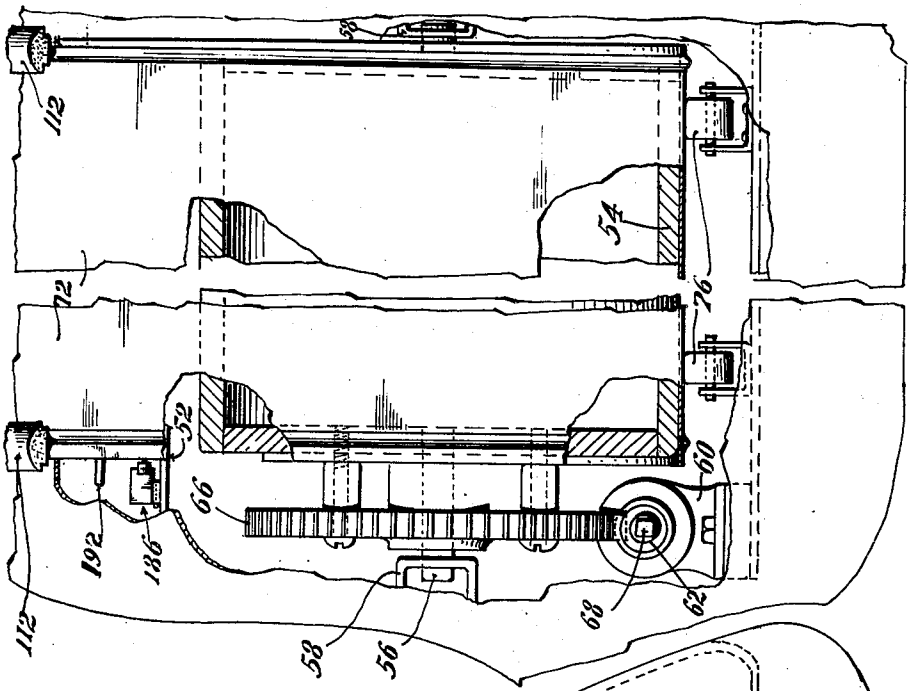


Fig. 3.

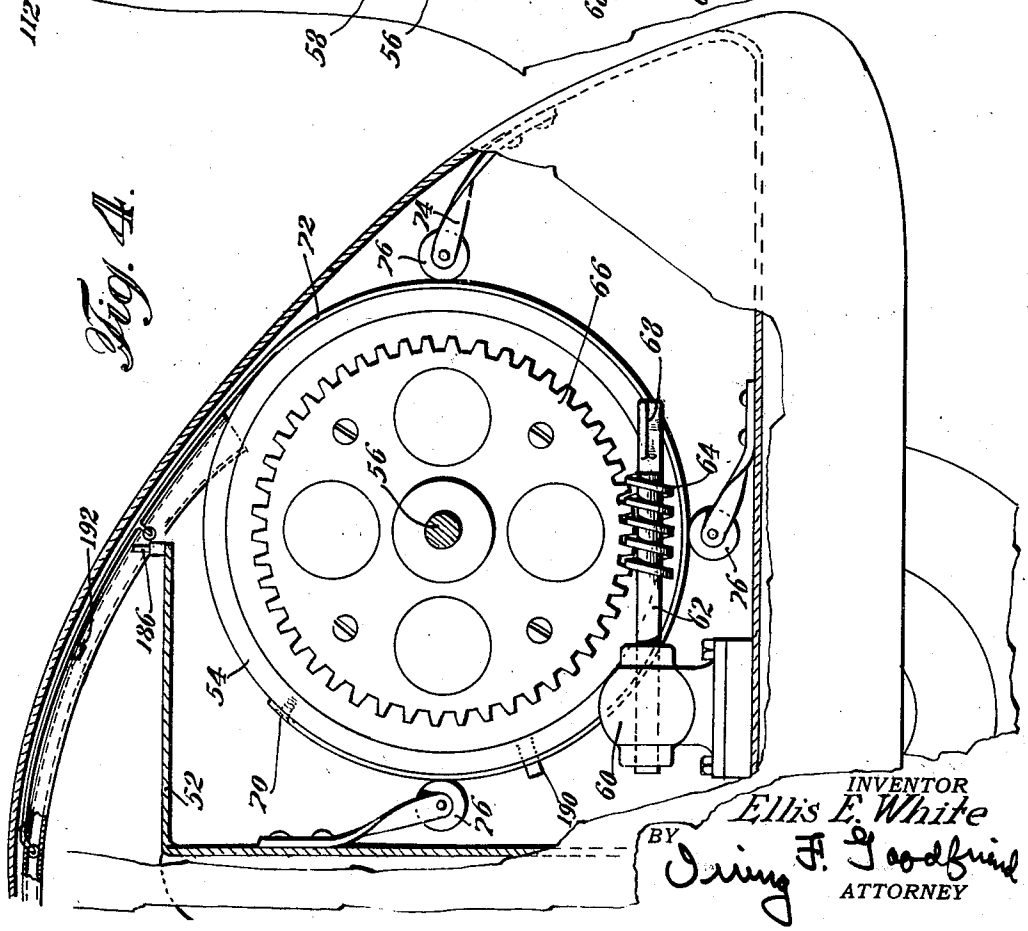


Fig. 4.

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CLOSURE MEANS

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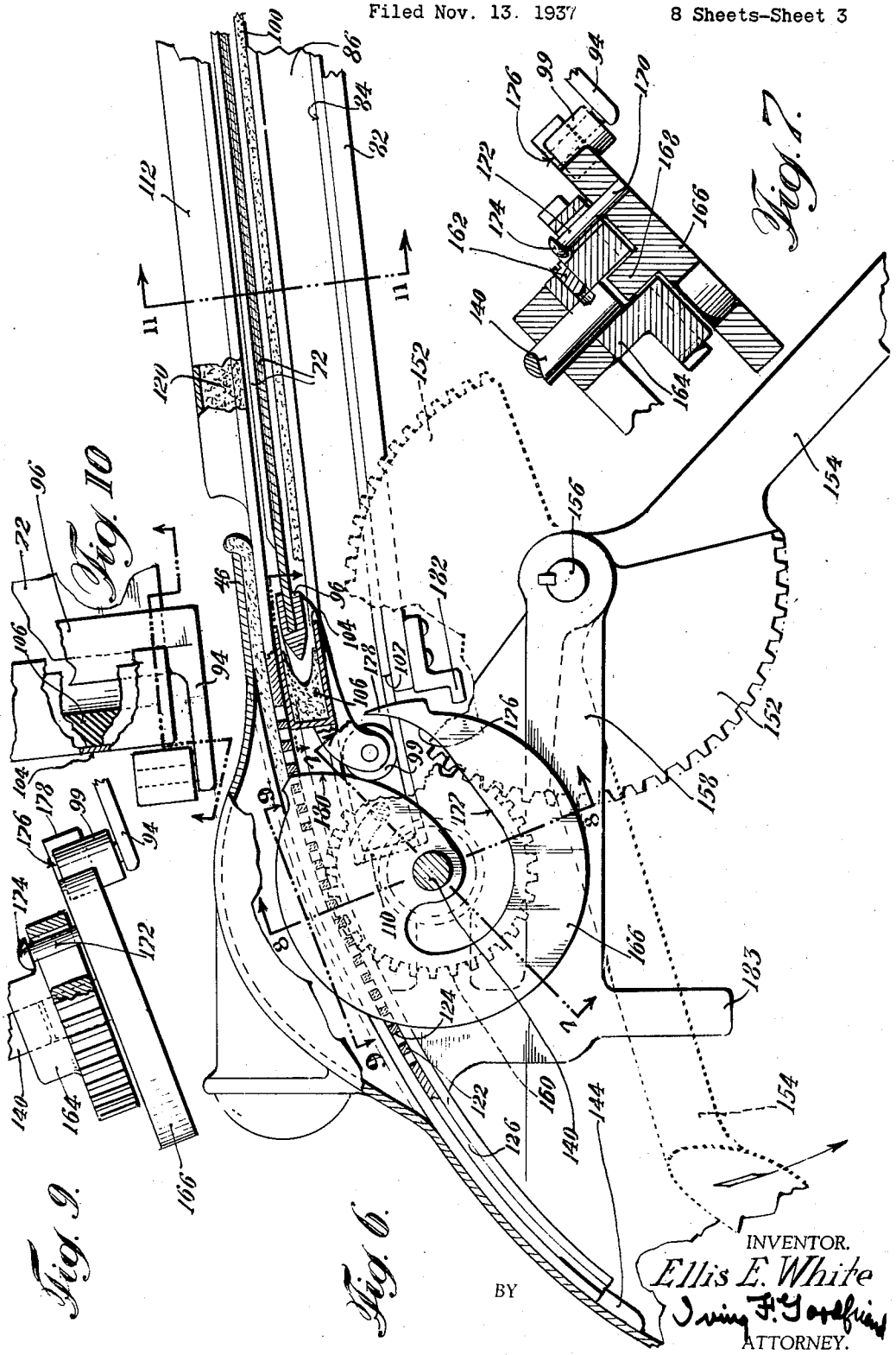


Fig. 9.

Fig. 10

Fig. 7.

Fig. 6.

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CLOSURE MEANS

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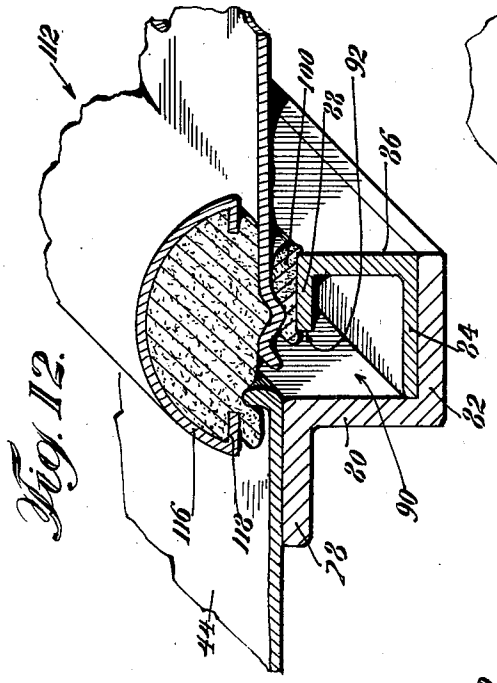


Fig. 12.

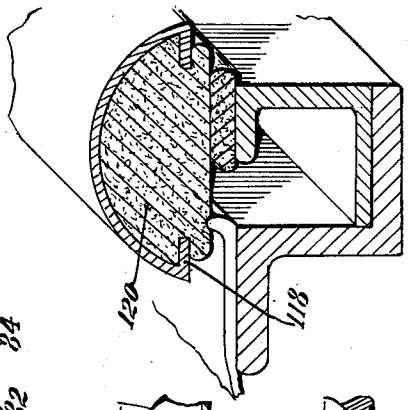


Fig. 13.

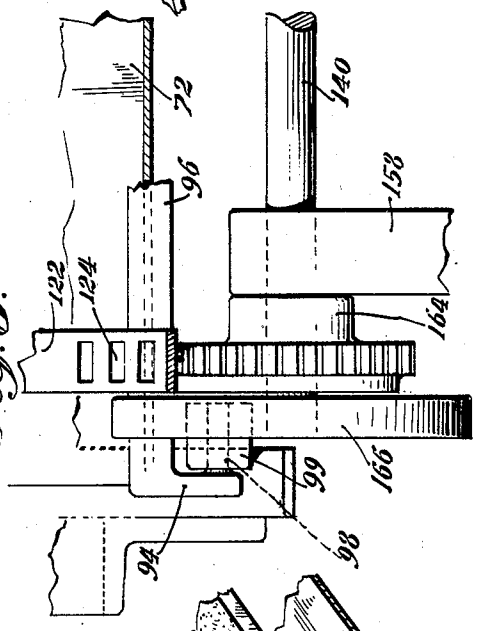


Fig. 8.

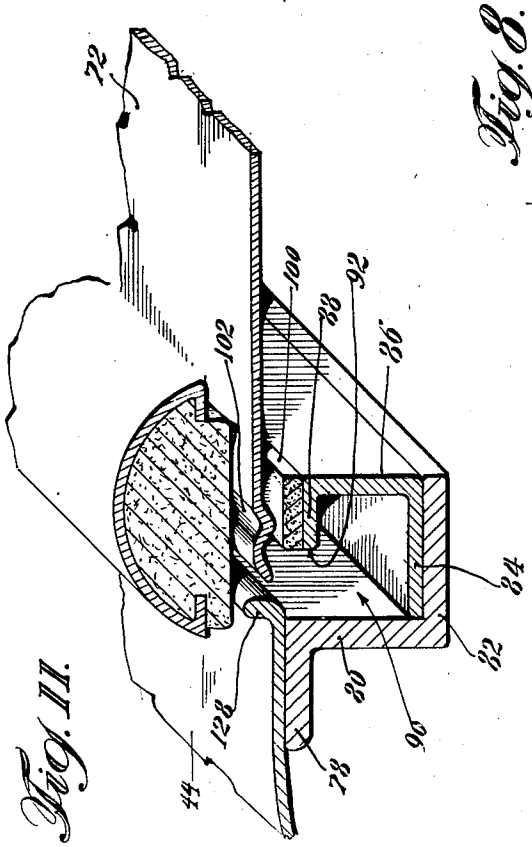


Fig. 11.

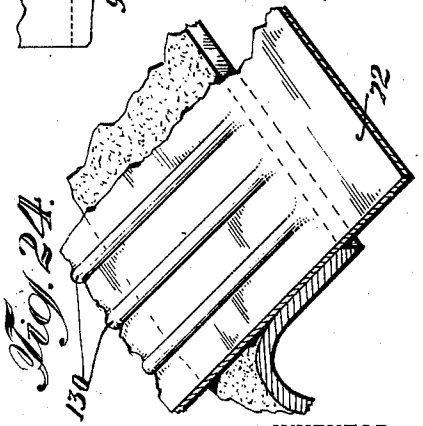


Fig. 24.

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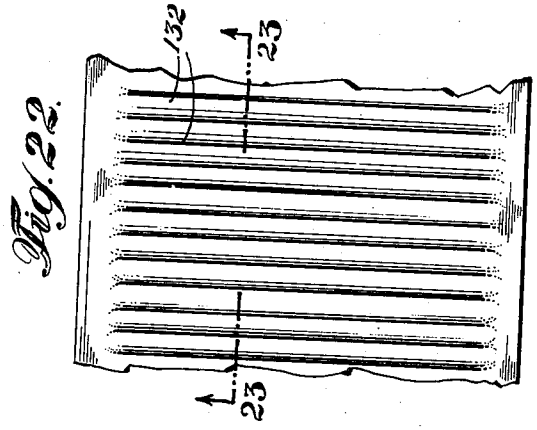


Fig. 22.



Fig. 23.

Fig. 25.

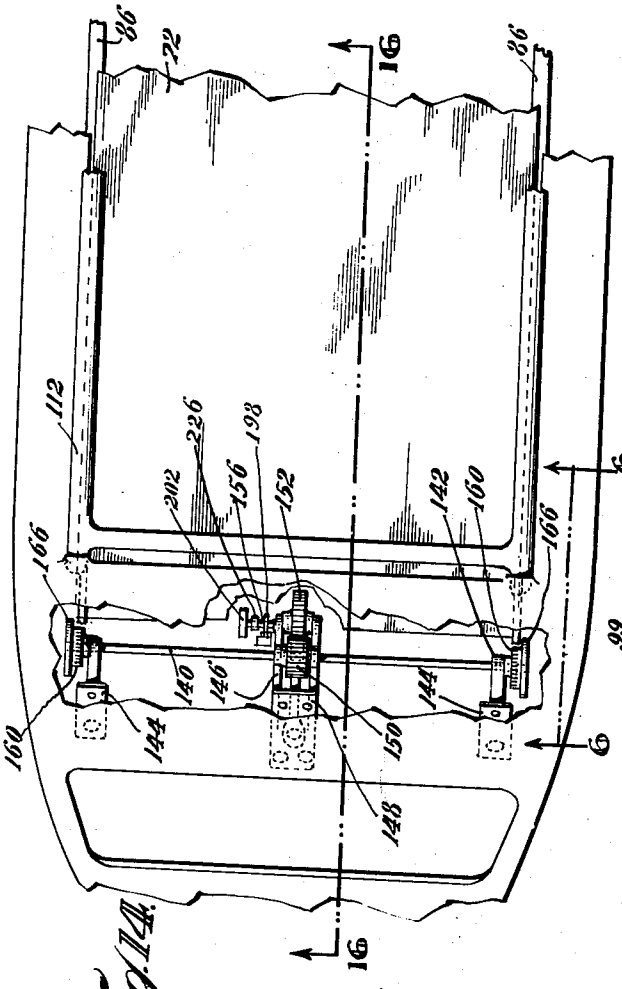


Fig. 14.

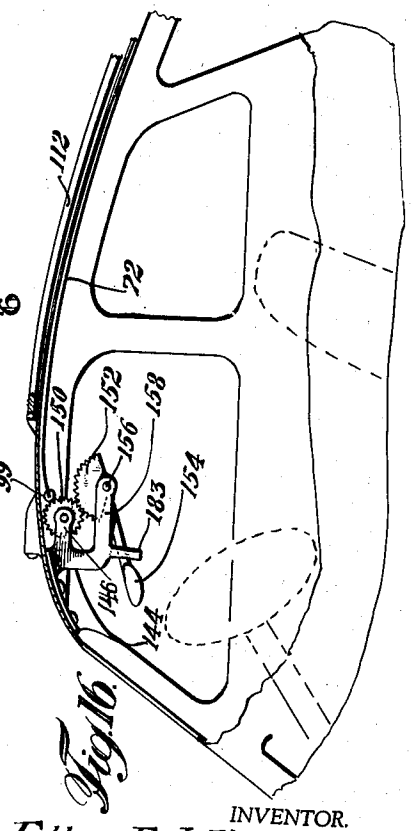


Fig. 16.

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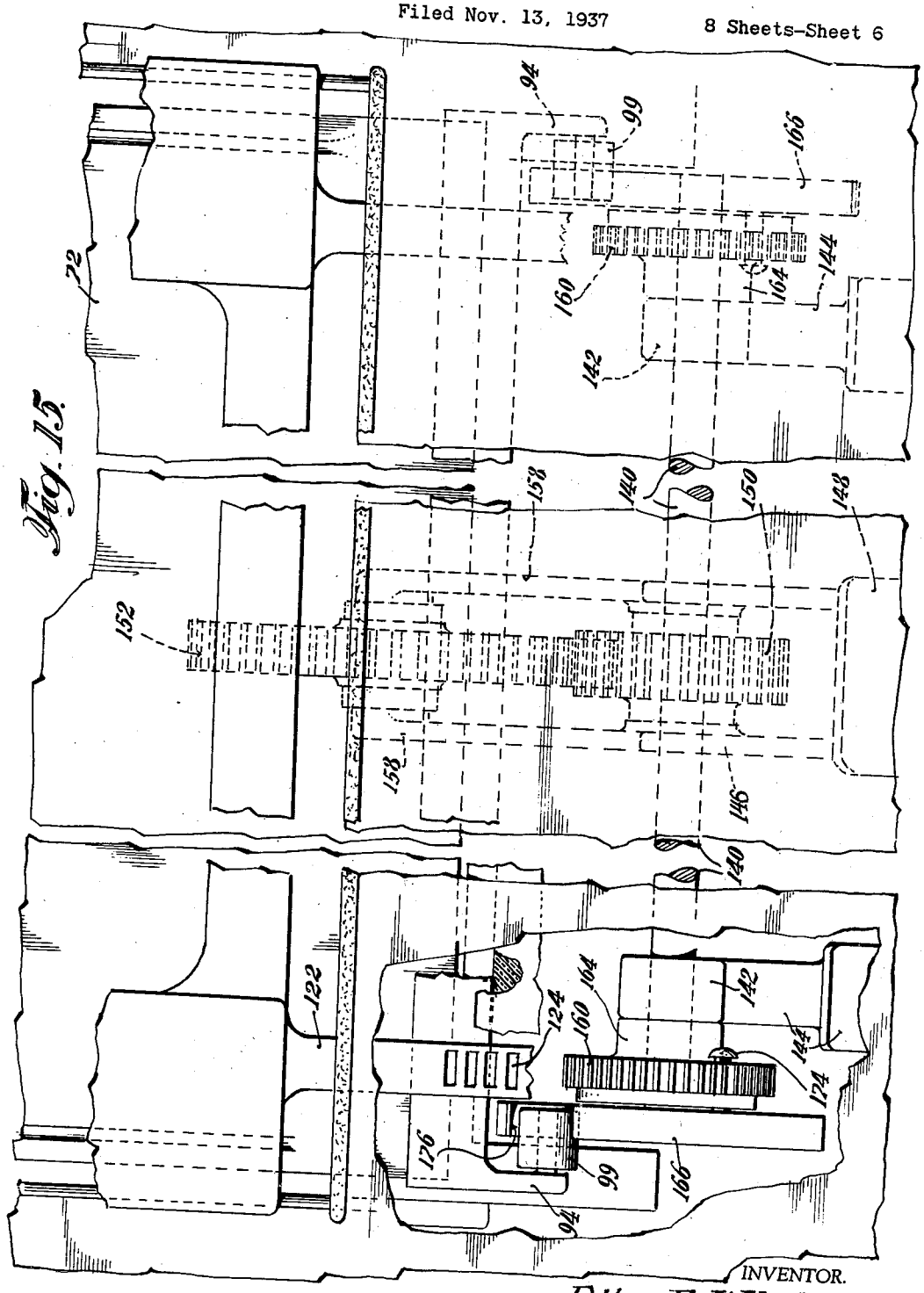
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Fig. 15.



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Fig. 17.

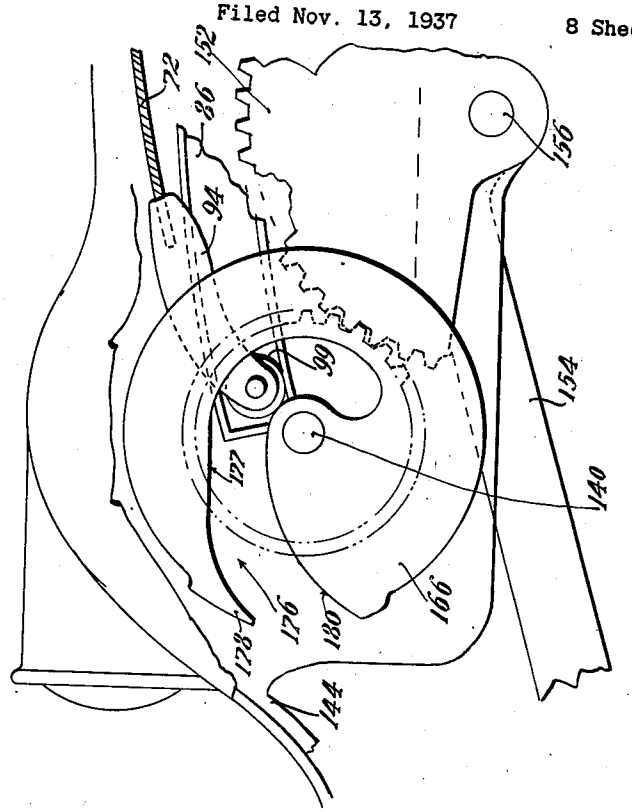


Fig. 18.

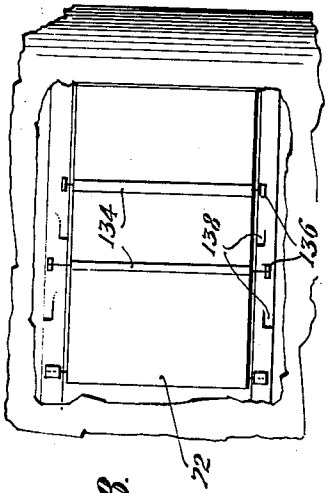


Fig. 19.

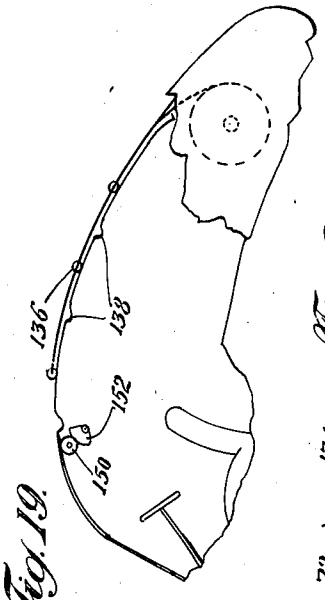


Fig. 20.

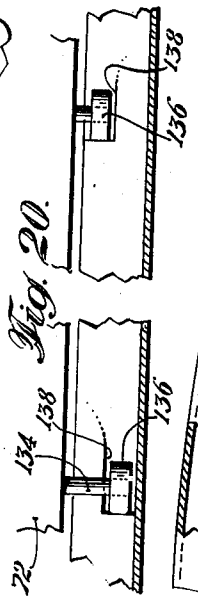
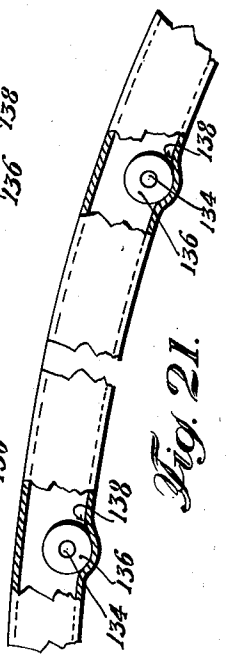


Fig. 21.



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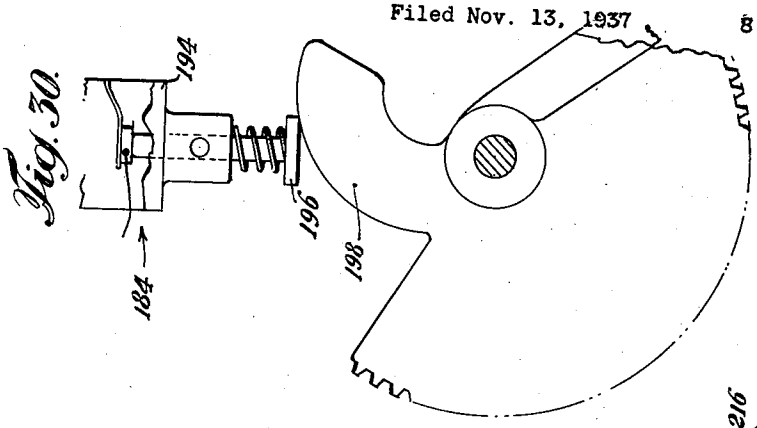


Fig. 30.

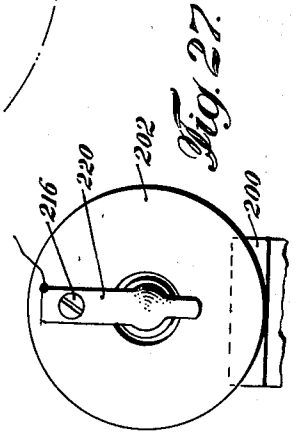


Fig. 27.

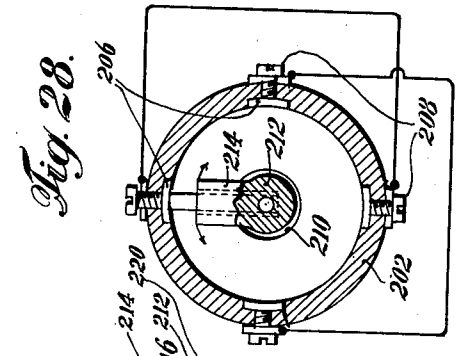


Fig. 28.

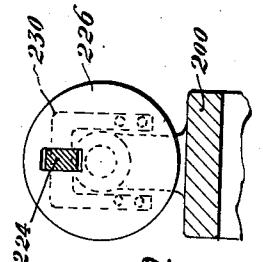


Fig. 29.

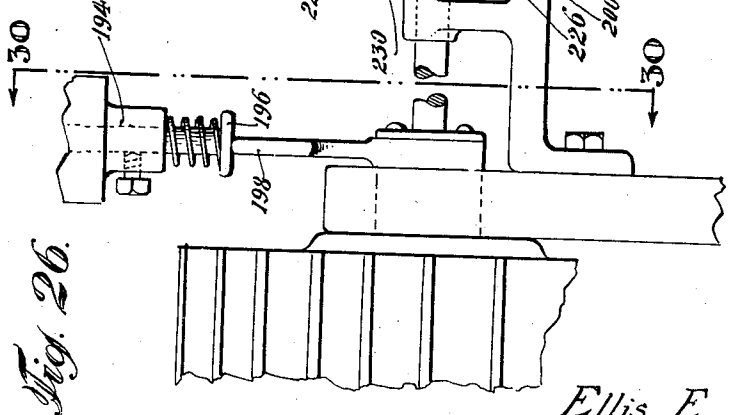


Fig. 26.

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UNITED STATES PATENT OFFICE

2,213,601

CLOSURE MEANS

Ellis E. White, New York, N. Y.

Application November 13, 1937, Serial No. 174,285

19 Claims. (Cl. 296—98)

The present invention relates to closed bodies for vehicles such as automobile bodies and is more particularly directed to adjustably retractable roofs for such closed bodies, of the type that may be completely or partially opened, at will, to expose the interior of the body to the atmosphere.

Many previous attempts have been made to provide removable or retractable roofs for closed vehicle bodies, but few of them have been successful because of certain difficulties and disadvantages inherent in their construction. Such disadvantages consisted, frequently, in weakening the vehicle body as well as the roof itself, thereby providing a structure subject to wear and easy breakage and one increasingly subject to damage in case of accident; in difficulty to open or shut the roof as and when desired; in difficulty to provide weather-tight closures when the roof was completely closed; in difficulty of providing tight, rattleproof construction, and in the complexity of the roof moving and closing mechanism which made it unsightly and subject to frequent breakdowns.

The present invention contemplates the elimination of these disadvantages and the provision of a retractable and adjustable roof of simple construction, inherent strength and ease of operation, and which possesses many other advantages and desirable features which will hereinafter be fully described and set forth.

The present invention contemplates the provision of vehicle body adjustable roofs of unitary or telescoping resilient construction, longitudinally flexible and retractable into the rear of the vehicle body, occupying little space therein, which are readily and easily operable from the operator's seat, within the vehicle, by means of an ingenuous arrangement of combined locking means and automatically operated switches for the roof operating motor.

The present invention further contemplates the provision of weatherproof sealing means for the retractable roof which will simultaneously act to make the roof structurally tight and rattleproof either when open or closed.

A further improvement contemplated by the present invention is the provision of locking means which will simultaneously lock the roof in closed position and adjust the weatherproofing means in weather-tight, rattleproof position without having the latter operation interfere with the former.

The structural details by which the accomplishment of the above objects is contemplated are simple, having comparatively few and simple parts which operate without difficulty and without any tendency to get easily or frequently out of order, and which are susceptible of being incorporated into the vehicle body in compact and neat arrangement and in harmony in finish and appearance with the rest of the vehicle body.

Further objects of my invention will be apparent from the description which follows and from the accompanying drawings, wherein several embodiments of the present invention are disclosed, and in which

Fig. 1 is a diagrammatic side elevational view, partly in section, of a vehicle body provided with a retractable roof of the present invention and showing the relative positions of the roof actuating and the roof locking mechanisms.

Fig. 2 is a rear end view of the vehicle body shown in Figure 1, partly broken away and in section, illustrating roof winding means and mounting therefor and the weather and rattleproofing means for the roof.

Fig. 3 is a view in perspective of a closed automobile body with the roof entirely removed, showing details of the body construction to illustrate its strength and rigidity.

Fig. 4 is an enlarged fragmentary view, in side elevation and partly in section, of the rear end of the vehicle body shown in Figure 1, illustrating, in detail, the roof winding mechanism and its motivating means.

Fig. 5 is a top plan view of the rear end of the vehicle body, partly broken away and partly in section, to show details of the mounting and operating means of the roof winding mechanism.

Fig. 6 is a vertical sectional view, partly broken away, taken along line 6—6 of Fig. 14 showing details of the mechanism for guiding and for locking the roof in closed position to make it weather-tight and rattleproof.

Fig. 7 is a fragmentary sectional view taken along line 7—7 of Figure 6.

Fig. 8 is a similar view taken along line 8—8 of Figure 6.

Fig. 9 is a similar view taken along line 9—9 of Figure 6.

Fig. 10 is a fragmentary top plan view of one corner of the roof of the present invention and the means for receiving the forward edge thereof.

Fig. 11 is a sectional view taken along line 11—11 of Figure 6 showing the weather and rattleproofing construction in loose position.

Fig. 12 is a similar view of the same when in closed and tightened position, with the roof in closed position.

Fig. 13 is a similar view of the same showing

details of rattleproofing and weatherproofing when the roof is retracted.

Fig. 14 is a fragmentary top plan view of the vehicle body showing, diagrammatically, the retractable roof in closed position, the permanent part of the roof being partly broken away to illustrate the arrangement of the roof locking mechanism and the forward switches for the motor.

Fig. 15 is an enlarged top plan view of the front part of Figure 14, partly broken away to show, in greater detail, the roof locking and tightening mechanism of the present invention.

Fig. 16 is a diagrammatic vertical sectional view taken along line 16—16 of Figure 14 to show the relation of the locking mechanism to the interior of the vehicle.

Fig. 17 is an enlarged, detailed view of the roof engaging cam of the roof locking mechanism, showing the same when the roof is fully closed but before it is tightened for weather and rattleproofing.

Fig. 18 is a top plan view of the vehicle body, partly broken away, illustrating, diagrammatically, a modified reinforced retractable roof and an improved, grooved guiding channel thereof.

Fig. 19 is a diagrammatic vertical sectional view of a body having the roof embodiment and guiding channel therefor shown in Fig. 18.

Fig. 20 is an enlarged fragmentary top plan view, in detail, of the modified guiding channel shown in Fig. 18.

Fig. 21 is an enlarged fragmentary end view, partly broken away, of the same.

Fig. 22 is a top plan view of a fragment of a modified, transversely reinforced roof.

Fig. 23 is a longitudinal sectional view of the same taken along line 23—23 of Fig. 22.

Fig. 24 is a fragmentary view in perspective of another modified form of roof of the present invention, transversely reinforced by means of ribs.

Fig. 25 is a diagrammatic representation of the electric circuits for the reversible motor to open and close the roof.

Fig. 26 is a view in side elevation, and partly in section showing the arrangement and construction of an embodiment of the master switch and the front auxiliary switches for operating a roof moving motor.

Fig. 27 is an end view of the auxiliary switch shown in Fig. 26 taken along line 27—27 thereof.

Fig. 28 is a vertical sectional view taken along line 28—28 of Fig. 26.

Fig. 29 is a vertical sectional view taken along line 29—29 of Fig. 26.

Fig. 30 is a vertical sectional view taken along line 30—30 of Fig. 26.

Fig. 31 is a diagrammatic view of a modified embodiment of the present invention wherein a winding drum is eliminated.

The retractable roof of the present invention is particularly adaptable, although not limited, for use on vehicle bodies of the unitary welded steel construction, such as is in prevalent use today on motor passenger vehicles and as illustrated and generally designated in the drawings by the numeral 40.

Such body construction may be made with substantially the entire central top portion thereof eliminated, providing a roof opening 42, which may, preferably, extend from the front of the top of the body to a point rearwardly of the back seats thereof, leaving as permanent portions the side roof edges 44 and the front roof edge 46 which joins and braces the sides of the car and may be continuous with the top of the windshield frame 48.

To the rear, the body is provided with a rear wall 50 which connects and braces the side walls and which, together with the front and side roof edges 44 and 46 respectively, may be suitably reinforced to compensate for the lack of a complete roof structure.

The rear wall 50 may be streamlined to slope rearwardly, to provide a space in back of the rear seats wherein may be provided a compartment 52 within which may be housed a winding drum 54, mounted rotatably by means of axles 56, extending from the sides of the drum 54 and journaled in brackets 58 suitably secured on the side walls of the compartment 52.

Either or both manual and mechanical means for turning the drum may be provided. I prefer to provide a combined manual and mechanical drum turning means which may comprise a motor 60 preferably a reversible motor, and preferably an electric motor, which may be positioned within the compartment 52. The motor shaft 62 may carry a worm gear 64 which engages operatively a gear wheel 66 mounted on one of the axles and fixedly secured to the contiguous drum side. The shaft 62 may be extended beyond the worm and provided with a squared end 68 which may be engaged by a winding key, not thought necessary to be here shown, by means of which the drum may be manually turned.

Passing into the compartment 52, directly underneath the rear wall 50 and secured to the drum, in any desirable and suitable manner, such as by the bolts or rivets 70, is the rear edge of a rectangular retractable roof member 72. Such roof member 72 may be of sufficient length to reach to the front end of the opening 42 when it is substantially completely unwound from the drum and of a width slightly less than the width of the roof opening 42, for a purpose which will hereinafter become clear.

The roof member 72 may be made of any suitable material, preferably of a strong, resilient material, and of unitary, telescoping, articulated or laminated construction, provided it has sufficient rigidity to be advanced forwardly when it is unwound from the drum and possesses sufficient longitudinal flexibility to be wound thereon. A preferred type of such roof member may comprise thin sheet steel, preferably spring steel and preferably provided with an inherent outward curve somewhat in conformity with the upper body curve, which sheet steel may be covered on one or both sides with weatherproofing layers, such as of electroplated or bonded rubber and with the necessary coat or coats of paint, lacquer or the like. The natural curve of the spring sheet steel comprising the roof member 72 will give the roof member a tendency to assume, of its own accord, a halfway open position, and thus relieve the driving motor of the greater part of the torque of starting, in either direction.

Within the compartment 52 are also provided a plurality of idlers to keep the roof member snugly on the winding drum as it is wound thereon and to prevent its buckling when unwound therefrom. Such idlers may comprise suitably bent and adjusted leaf springs 74 secured by one end to the compartment walls and carrying on the free end a roller 76 adapted to rest against the drum surface.

Provided in the vehicle body as a permanent part thereof are guiding means and supporting

means for the roof member, the latter being necessary because the roof member 72 is disposed within the roof opening 42 and is of lesser width than the latter. Such guiding and supporting means may preferably be combined in a unitary structure along the side edges of the roof opening and may comprise a substantially Z-shaped bar supported from the underside of the side edges 44 by its horizontal flange 78 and having a vertical connecting wall 80 and a lower horizontal or supporting flange 82, directed inwardly into the body space, underneath the roof opening 42. The flange 82 may support a U-shaped member resting thereon on one of its sides 84 having a connecting side 86 substantially parallel to and shorter than the vertical side 80 of the Z bar, and an upper side member 88, substantially parallel to and shorter than its lower side 84.

The walls 80, 84 and 88 of the Z bar and the U-shaped member, respectively, define a substantially rectangular guiding channel 90 with an opening 92 in its upper surface formed between the inner edge of the side 88 and the wall 80, which opening communicates with the space provided between the side edges 44 of the body and the edges of the roof member 72, and permits the passage therethrough of forwardly and downwardly directed arms 94 extending from a wedge-shaped edge piece 96, preferably of metal, and preferably also rubber covered, carried on the front edge of the roof member 72. The arms 94 may carry on their free ends a fixed horizontal pin 98 on which may be rotatably mounted rollers 99 which are supported and guided within the channels 90 to facilitate and direct the movement of the roof 72.

The upper surface of the side 86 of the U-shaped member serves as a support for the edge of the roof 72, and it may be coated with a layer of resilient material 100, which may preferably comprise rubber, preferably of the sponge variety or the like, to serve as a sound or rattleproofing layer between the roof and the support 88 and to cooperate with a crimp or bead 102 which may be provided along the edge of the roof to form a weatherproof seal when the roof is in taut, closed position.

A seat for the front edge of the roof may be provided at the front of the body by securing a substantially rectangular trough or channel member 104 secured by one of its sides in transverse position below the front edge of the body 46, its open side facing rearwardly. Within the trough member 104 there may be provided a resilient, waterproof cushion 106, preferably of rubber and preferably shaped to nest the front edge piece of the roof in sealed, weather and rattleproof relation, when the roof is in locked, closed position.

The guiding channels 90 may extend for a substantial distance forward of the rear end of the front roof edge 46 and below it, the floor of the guiding channel having the portion in advance of the trough member 104 partly cut away as at 107, to expose part of the roller 99 for engagement by the roof locking means to be hereinafter described. At their forward ends the channels 90 may be closed by a wall 110 to brace and support the sides of the channel against collapsing.

Positioned party over each side edge and partly over each roof edge is a molding or weather strip 112 anchored on the rear wall 50 at a point below the roof opening 42, as at 114, and extending along the entire length of the roof opening. Such molding or weather strip may comprise, preferably, a substantially semi-circular hollow metal strip 116 which may retain by means of inwardly turned flanges 118 a resilient filling or cushion 120, preferably of rubber, and preferably sponge rubber, or similar resilient, waterproof material. The front end of the molding 116 may terminate by tapering or otherwise into a flat metal strip or ratchet 122 having ratchet openings 124 adapted to engage gear teeth, which ratchet extends into and is guided by a channel 126, provided for the purpose, below the front roof edge 46.

It is apparent that when the molding is pulled taut, it will form a completely sealed weatherproof and rattleproof closure between the edges of the retractable roof member 72 and of the permanent roof edges 44. In such position the molding will press downwardly, the resilient cushion 120 pressing downwardly upon the roof member and upon the roof edge, which may be provided with a slightly upturned lip 128 that will press into the resilient cushion 120 which will also expand into the trough of the crimp 102 and will press its ridge into the resilient layer 100, forming airtight waterproof and rattleproof seals at the three points.

When the roof is retracted, similar and similarly effective sealing will be provided between the molding filling 120 on the one hand and the lip 128 and the resilient layer 100 on the other, preventing noise and rattling and the accumulation of dust, grit or moisture within the channels 90.

Certain variations and modifications in the construction of the roof member 72 and its guiding means may be made to improve its strength and transverse rigidity and to facilitate its movement. Thus the roof member may be provided with transverse ribs 130 as shown in Fig. 24, or with transverse corrugations 132 as shown in Figs. 22 and 23, such ribs or corrugations extending transversely along the central portion of the roof member, the edges of the same remaining free of them, in order not to interfere with the sealing closures made between the roof and the molding.

The reinforcement of the roof member may also be accomplished by means of a plurality of transverse bracing bars or strips 134 secured, preferably, to the underside of the roof member.

These rods or strips may serve to support additional rollers 136 operating within the guiding channels 90. The channels may also be provided with roller seats 138 which may slope gently downwardly toward the front and may be positioned in the channel floors in staggered relation, to cooperate and receive rollers which are also fixed in staggered relation. Thus, in Figs. 18, 19, 20 and 21, two sets of auxiliary rollers and two sets of cooperating seats are shown, the front rollers and front seats being shown spaced farther apart than the rear ones, so that as the roof is moved forward from an open position or backward from a closed position, the front rollers will not fall into the rear seats.

Combined means, either mechanically or hydraulically operated, to lock the roof member in closed position and to draw the molding taut, to seal the roof closure, may be provided at the front of the body interior, within reach of the vehicle operator. A mechanical embodiment of the locking means is illustrated, and may comprise a transversely positioned jack shaft 140 journaled in bearings 142 on side brackets 144

carried on the underside of the front roof edge 46 and on the upper set of forked arms 146 of a centrally secured bracket 148. Fixed on the jack shaft between the arms 146 is a gear wheel 150 which meshes operatively with a gear segment 152 having an operating handle 154 carried on a shaft 156 journaled, preferably, in a second lower and longer pair of arms 158 of the central bracket 148.

Secured on each end of the jack shaft, outwardly of the brackets, in position to engage with its teeth the openings in the molding ratchet 122 are a pair of gear wheels 160 which may be secured on the end of the shaft by means of a stud pin 162 passing through the gear hub 164.

Mounted on each molding engaging gear 160, exteriorly thereof, is a cam disc 166 which may be retained on the gear by a short shaft 168 nesting in the opening of the hub 164 and one or more pins 170 passing through one or more slotted openings 172 in the molding gear 160, the pins having heads 174 to retain the cam disc 166 upon the gear 160.

The cam disc 166 is provided with a curved or cam slot 176, its outer portion being slightly flattened, as at 177, to give a cam effect, and its inner portion being completely circular, the rear edge of the slot forming a substantially sharp lip 178 and its forward edge a curved substantially blunt shoulder 180.

The various gears and discs carried by the jack shaft 140 are so fixed in position in relation to one another that when the operating handle 154 is in the extreme rearward position, the roof is unlocked and the molding in loose contact with it, the lip 178 of the cam disc 166 being directly below the rear edge of the cut out portion of the channel 90 resting on a shelf 182 depending from the supporting flange 82 of the Z-bar, which may be provided for the purpose.

The manner of operation of the locking and sealing means is as follows:

When the roof is to be closed the handle 154 is pulled back, the molding 112 is thus loosened, and the slot 176 is brought around to have its mouth immediately below the channel opening 107, and the pin 170 rests against the forward end of the slot 172. As the roof moves into closed position, the roller strikes against the shoulder 180 of the cam slot, tilting the cam disc forward, until the pin 170 rests against the rear end of the slot 172 and the lip 178 is thereby raised above the channel floor behind the forward roller 99, thereby preventing any retraction of the roof. This is automatically done, without turning the jack shaft 140 or moving the handle 154. The locking means is now in the position shown in Fig. 6.

The handle 154 is then pushed forward, the cam and molding gears 166 and 160, respectively, being turned counterclockwise. During the first part of the forward movement the flattened portion 177 of the cam slot 176 acts to tighten the roof. Simultaneously, the molding gear 160 pulls the molding 112 tightly in place. During the latter part of the forward movement, the roof position is not changed any further because of the circular shape of the last part of the cam slot 176; only the molding gear 160 acts on the molding strip 122 to pull the molding 112 tighter against the roof, as far as possible. Means, of any desirable type such as the spring clasp 183, may be provided to engage the handle 154 when it is in extreme forward position, to prevent its being accidentally loosened.

Conversely, when the roof is to be opened, the handle 154 is pulled rearwardly. The gears 160 turn clockwise to loosen the molding 112, and, lagging slightly behind the said gears 160, the cam discs 166 turn to release the rollers 99 and at the end of the turn when the rollers are above the edge 178, the shoulders 180 push the roller backwardly to loosen the roof member and start its rearward movement, thus relieving the roof moving motor of the starting torque.

Means for controlling the operation and direction of the reversible motor 60 and the movement of the roof, automatically and simultaneously with the movement of the handle 154 to lock or release the roof, may be readily provided with the locking mechanism of the present invention and its arrangement. Such means may comprise a double electric circuit, one to drive the motor forward, to close the roof, and the other to drive it in reverse, to retract it. The two circuits may be controlled by three switches, a master switch designated in the diagrammatic representation of the circuit given in Figure 25 as 184, and a pair of auxiliary switches, one positioned preferably near the motor, and preferably adapted to be operated directly by the roof 72, designated as 186, and one positioned at the front of the vehicle, and operable preferably by the movement of the handle 154, the last switch being designated in the drawings as 188.

The rear auxiliary switch 186 may be, preferably, of the toggle type and may be positioned preferably back of the roof opening 42, at such a point where it may be tripped by lugs or other suitable devices 190 and 192, respectively positioned near the rear end and the front end of the roof member, preferably at or adjacent one of its edges. The rear lug 190 may be so placed that when the roof is in closed position it will trip the toggle switch to close the motor reversing circuit but will not pass the toggle switch arm, so as to avoid reversing the switch at the commencement of the roof retracting movement. Similarly, the front lug 192 is so placed upon the roof that when the roof is fully opened it will trip but not pass the toggle switch to close the second circuit for driving the roof forward.

The master switch 184 may be positioned under the front roof edge 46, adjacent the bracket 148, and may comprise a simple push button switch, or one similar to it, designated as 194, with the button 196 depending and adapted to be pushed upwardly to close the circuit within the switch when the arm 154 is completely drawn back, by means of a cam 198, carried on the gear segment shaft 156 externally of the central bracket arms 158 and rotatable with such shaft, to have the switch 184 opened when the arm 154 is moved away from such extreme back position.

The second auxiliary switch 188 may be a rotary switch mounted on an arm 200 secured to the bracket arm 158 and comprising a circular insulated box 202, with four contact members 206 contacting the four binding posts 208 which are equally spaced on the circumference of the box. The box 202 may have a central opening 210 within which is rotatably positioned a rotating member 212, having a brush 214 adapted to contact, intermittently, the contact members 206, the said brush being in electrical connection with the binding post 216 by means of a screw 218 and a leaf spring 220 which contacts the screw. The rotating member 212 carries a

ratchet 222 which contacts a pawl 224 carried in a block 226 fixed on a shaft 228 which is coextensive and rotatable with the shaft 156. The pawl may be pressed against the ratchet by means of leaf spring 230, secured to the surface of the block. Each two alternating contact members 216 are within the same circuit, one pair in the roof closing circuit and one pair in the roof opening circuit and each contact member is adapted, by itself, to close the circuit within which it is connected.

The operation of the above described circuits and switches may be explained as follows:

Assuming that the roof is closed and locked in place, the handle 154 being in forward position, against the windshield 48. The rear toggle switch has been thrown during the closing of the roof, by the rear lug 190, to close the reverse circuit for opening the roof.

The front switch is still set with its brush 214 contacting a contact member 206 within the forward roof closing circuit, and the master switch is open.

It is now desired to open the roof. For that purpose it is necessary to release the rollers from the cam slots 176 by moving the handle 154 back to its extreme backward position. Such movement of the handle turns the block 226 and the pawl 224 which engages the ratchet 222 and turns the brush 214 to bring it in contact with the next contact member 206 which is in the reversing circuit, for opening the roof. The backward movement of the handle, when it is completed, also closes the master switch 184 and the reversing circuit is now completely closed at all three points. The motor, therefore, will begin to operate to retract the roof.

When the roof is completely opened, the front lug 192 will trip the toggle of the switch 186 to break the reversing circuit at that point and to close the forward circuit. The motors will stop, although the master switch is still closed, because the front switch will still remain in the reversing circuit. The handle will now be moved forward to tighten the weather strip 112, thus breaking the circuit at the master switch. This forward movement of the handle will not affect the front switch because the ratchet 122 will not be engaged by the pawl 224 but will slip by it, and the front switch will still remain in the reversing circuit, until the handle is moved back again to release the motor in preparation for closing the roof. The last backward movement of the handle will move the front switch 188 again to set it for forward movement in readiness to operate the motor forwardly when the master switch is closed, when the backward movement of the handle is completed.

It will be apparent that the principles and elements entering into the present invention include a movable roof which is retractable to the rear part of the vehicle body to leave a roof opening, and that to support and guide this roof there are provided combined supporting and guiding means in the roof opening which also operate to retain the roof in place against removal. These supporting and guiding means cooperate with weatherproofing means on the exterior of the vehicle body to seal its interior against wind and rain when the roof is closed and to make the removable roof substantially noise and rattle-proof. Cooperating with the foregoing elements there are locking means which serve to lock the roof when it is in closed position and simultaneously to adjust the weatherproofing strip to effective position, the locking mechanism being provided with means to create a lag in time between the locking of the roof and the tightening of the weather strip to prevent the latter from interfering with the former. The invention also includes means for moving the roof which are controllable and operable partly by the roof itself and partly by the operation of the roof locking means.

Within the scope of the foregoing broadly described elements and principles of the invention, many variations in the practical embodiment described above may be made. The roof may be varied from a unitary construction to an articulated or telescoped one. The retracting means for the roof may also be varied. The winding drum, for instance, may be eliminated, as shown, diagrammatically, in Figure 31, where the roof just slides back into the streamlined rear portion of the body and where the roof motivating means consists of a motor and a gear wheel 232 on the motor, which engages suitable teeth or ratchets on one or both edges of the roof, which are not thought necessary to be shown in detail.

So, also, the supporting and guiding means and the manner in which the roof is retained upon them may be substantially varied as well as the specific arrangement of the roof locking mechanism and its parts. I desire, therefore, to be protected for any such variation of the present invention which may be made by the mere application of mechanical skill and within the spirit and scope of the present invention and the claims hereto appended.

I claim:

1. A closure for a structure having a roof member with an opening therein, comprising a closure member adapted to be movably disposed within the said opening, weatherproofing means overlapping contiguous and spaced edges of the roof member adjacent said opening and of the closure member and adapted to be adjustably held against the said contiguous edges and touching same, means for moving the closure member in and out of the said opening and means for locking and releasing the closure member and simultaneously controlling the said closure member moving means.

2. A closure for a structure having a roof member with an opening therein, comprising a movable closure member retractably disposed within the said opening, means for moving the said closure member in and out of the said opening and weatherproofing means overlapping contiguous but spaced edges of the roof member adjacent said opening and of the closure member and adapted to touch and to be adjustably pressed against the said contiguous edges.

3. A closure for a structure having a roof member with an opening therein, comprising a longitudinally flexible and transversely rigid closure member movably disposed within the said opening, a support member secured to said roofing member and projecting into said opening arranged under said closure member and adapted to support same, means for advancing the said closure member into and retracting it from the said opening and weatherproofing means overlapping contiguous but spaced edges of the roof member adjacent said opening and the closure member and adapted to be adjustably pressed against the said contiguous edges.

4. A closure for a structure having a roof member with an opening therein, comprising an

arched, longitudinally flexible, transversely rigid closure member movably disposed within the said opening, means for advancing the said closure member into and retracting it from the said opening and weatherproofing means overlapping contiguous but spaced edges of the roof member adjacent said opening and the closure member and adapted to be adjustably pressed against the said contiguous edges.

5. A closure for a structure having a roof member with an opening therein, comprising a closure member movably disposed within the said opening, means for moving the said closure member to advance it into and to retract it from the said opening, weatherproofing means overlapping contiguous and spaced edges of the roof adjacent said opening and the closure member, and adapted to be adjustably pressed against the said contiguous edges, means for locking the closure member against retraction from the opening when fully advanced therein, means to adjust the pressure of the weatherproofing means against the said contiguous edges and means for simultaneously actuating the said closure locking means and the said pressure adjusting means.

6. A closure for a structure having a roof member with an opening therein, comprising a closure member movably disposed within the said opening, reversible actuating means for the closure member adapted to advance and retract the closure member within the said opening, weatherproofing means overlapping contiguous and spaced edges of the roof adjacent said opening and of the closure member and adapted to be adjustably pressed against the said edges, means for locking the closure member in position when fully advanced within the said opening, means to adjust the pressure of the weatherproofing means against the said edges and means for simultaneously actuating the said locking means and pressure adjusting means and controlling the closure member actuating means.

7. In a vehicle body having a roof member and an opening in said roof member, a closure member movably disposed within the said opening, guiding and supporting means for the closure member disposed along opposed edges of the roof adjacent said opening and projecting into said opening, guiding members on the closure member cooperating with the guiding and supporting means and engaging the same to prevent removal of the closure member from the opening, and weatherproofing means overlapping contiguous edges of the said roof adjacent the opening and the said closure member and adapted to be adjustably pressed against the said edges.

8. In a vehicle body having a roof member, and an opening in said roof member, a closure member movably supported within said opening, weatherproofing means fixed at one end to the vehicle body and extending over opposed edges of the roof adjacent the opening and adapted to overlap contiguous and spaced edges of the closure member, and adapted to be adjustably held against said edges, means for engaging the other end of the weatherproofing means to adjust the said weatherproofing means over the said contiguous edges, means for engaging the closure member when fully advanced within the opening to lock it therein against retracting therefrom, and means for simultaneously operating said weatherproofing engaging means and said closure engaging means.

9. In a vehicle body having a roof member and an opening in the said roof member, a closure member movably disposed within said opening and adapted to be advanced and retracted therein, combined guiding and supporting means for said closure member disposed along opposed edges of the roof member adjacent said opening and comprising a channel and a shoulder partly overhanging said channel, means for retaining said closure member on the supporting means comprising guiding elements on the closure member extending into the channel and engaging the shoulder against lateral withdrawal from the channel, closure locking means adapted to engage said guiding elements when the closure is fully advanced within the opening thereby to prevent its retraction therein.

10. In a vehicle body having a roof and an opening in the said roof, a closure member movably disposed within said opening and adapted to be advanced and retracted therein, combined guiding and supporting means for said closure member disposed along opposed edges of the said opening and comprising a channel and a shoulder partly overhanging said channel, means for retaining said closure member on the supporting means comprising guiding elements on the closure member extending into the channel and engaging the shoulder against withdrawal from the channel, weatherproofing means fixed at one end to the said vehicle body and extending over opposed edges of the roof adjacent said opening and adapted to overlap contiguous edges of the closure member spaced from said roof edges and to be adjustably held against said edges, means for engaging the other end of the weatherproofing means to adjust the said weatherproofing means over the said contiguous edges, closure locking means adapted to engage said guiding elements when the closure is fully advanced within the opening thereby to prevent its retraction therein, and means for operating said weatherproofing engaging means and simultaneously operating the said closure member locking means to lock said closure in weatherproof arrangement with said roof.

11. In a vehicle body having a roof with an opening, and a closure member movably disposed within said opening, weatherproofing means overlapping contiguous but spaced edges of the roof adjacent said opening and the said closure member and adapted to be adjustably pressed against the said edges, said weatherproofing means having a resilient member, and means on the closure and on the edge of the roof adjacent said opening adapted to contact and be pressed into the said resilient member upon adjustment of the waterproofing means.

12. In a vehicle body having a roof and an opening in the roof, a flexible member substantially rigid in its longitudinal plane of lesser width than the opening movably arranged therewithin, a reversibly rotatable drum arranged adjacent said opening, said closure member being secured by one end to said drum and adapted to be wound on and unwound from said drum whereby said closure member may be pushed into and withdrawn from said roof openings, means for supporting and guiding said closure member arranged within said opening along parallel sides thereof and weatherproofing means arranged above said supporting and guiding means adapted to overlap contiguous edges of the roof opening and the closure member and to be adjustably held thereagainst.

13. In a vehicle body having a roof and an opening in the roof, a flexible closure member substantially rigid in its longitudinal plane mov-

ably arranged within the said roof opening, reversible means for pushing the said closure member into and retracting it from the said opening arranged adjacent one end thereof, means for guiding and supporting longitudinal edges of the closure member arranged within the said opening, said guiding and supporting means comprising a guiding channel having a shoulder partly overhanging the same, said shoulder supporting the edges of the closure member, a roller at each forward corner of the closure member reciprocating within the said channel and engaging the underside of the shoulder against removal from the channel, weatherproofing means arranged above the said supporting means and adapted to overlap contiguous edges of the roof opening and the closure member, means at the forward edge of the roof opening for engaging the said rollers when the closure is in advanced position to lock the same against withdrawal, means for engaging the forward end of the weatherproofing means to adjustably press the weatherproofing means against the said contiguous edges and unitary means for successively operating the said locking means and the said weatherproof adjusting means.

14. In a vehicle body having a roof, an opening in the roof, a closure member in the said opening, guiding means for the said closure member including a roller at the forward end thereof and weatherproofing means overlapping contiguous edges of the said closure member and the said opening secured to the roof by its rear end and having a rack at its free end, means for locking the said closure member and simultaneously and successively adjusting the said weatherproofing means into weather sealing position comprising a rotatable shaft arranged transversely of the said opening adjacent the forward end thereof, a cam slotted disc fixed on the said shaft and adapted to be turned to receive and hold the said roller and a gear wheel fixed on the said shaft and engaging the said rack and means for rotating the said shaft.

15. The structure of claim 14 wherein the slot is eccentrically formed throughout the forward portion thereof, whereby the closure is locked and drawn taut and is circular throughout the remaining portion thereof whereby the said shaft may be turned to further tighten the weatherproofing means without further moving the closure member.

16. In a vehicle body having a roof opening and a retractable closure for said opening, said closure having rollers at its forward end, means for locking the closure within the opening comprising a rotatable member having an eccentric slot, said slot adapted, upon rotation of the said rotary member, when the closure is in advanced position within the opening, to engage the said roller and draw it forward, to thereby draw the closure taut and lock it in position.

17. In a vehicle body having a roof opening and a closure for the opening, combined means for supporting the said closure within the opening and for weather sealing the space between the closure and the opening comprising a guiding channel arranged within the opening alongside an edge thereof, said channel having a shoulder adapted to support the edge of the closure, a resilient waterproof layer arranged on the said shoulder, a crimp formed on the edge of the closure adapted to rest on the said resilient layer, an upwardly extending bead formed on the edge of the roof opening, a weatherproof member arranged on the roof and adapted to overlap the said bead and the said closure crimp, said weatherproofing member having a waterproof resilient contacting surface, said weatherproofing member being fixed by one end adjacent one end of the roof opening and adjustable means engaging the other end thereof whereby it may be adjustably pressed against the said bead and the said crimp to form a rattle and weatherproof seal between the roof opening and the closure member.

18. The structure of claim 17 wherein the adjustable means for engaging the free end of the weatherproof member comprises a rack on the free end of the weatherproof member, a rotatably mounted gear wheel engaging the said rack and means to rotate the said gear wheel.

19. A closure for a structure having a longitudinally curved substantially convex roof member with an opening therein comprising a closure member of spring-like material and provided with an inherent substantially convex curve in the same direction as the roof member whereby said closure member tends to be self-opening, said closure member being adapted to be movably disposed within said opening and means for moving the closure member in and out of said opening.

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