

July 6, 1937.

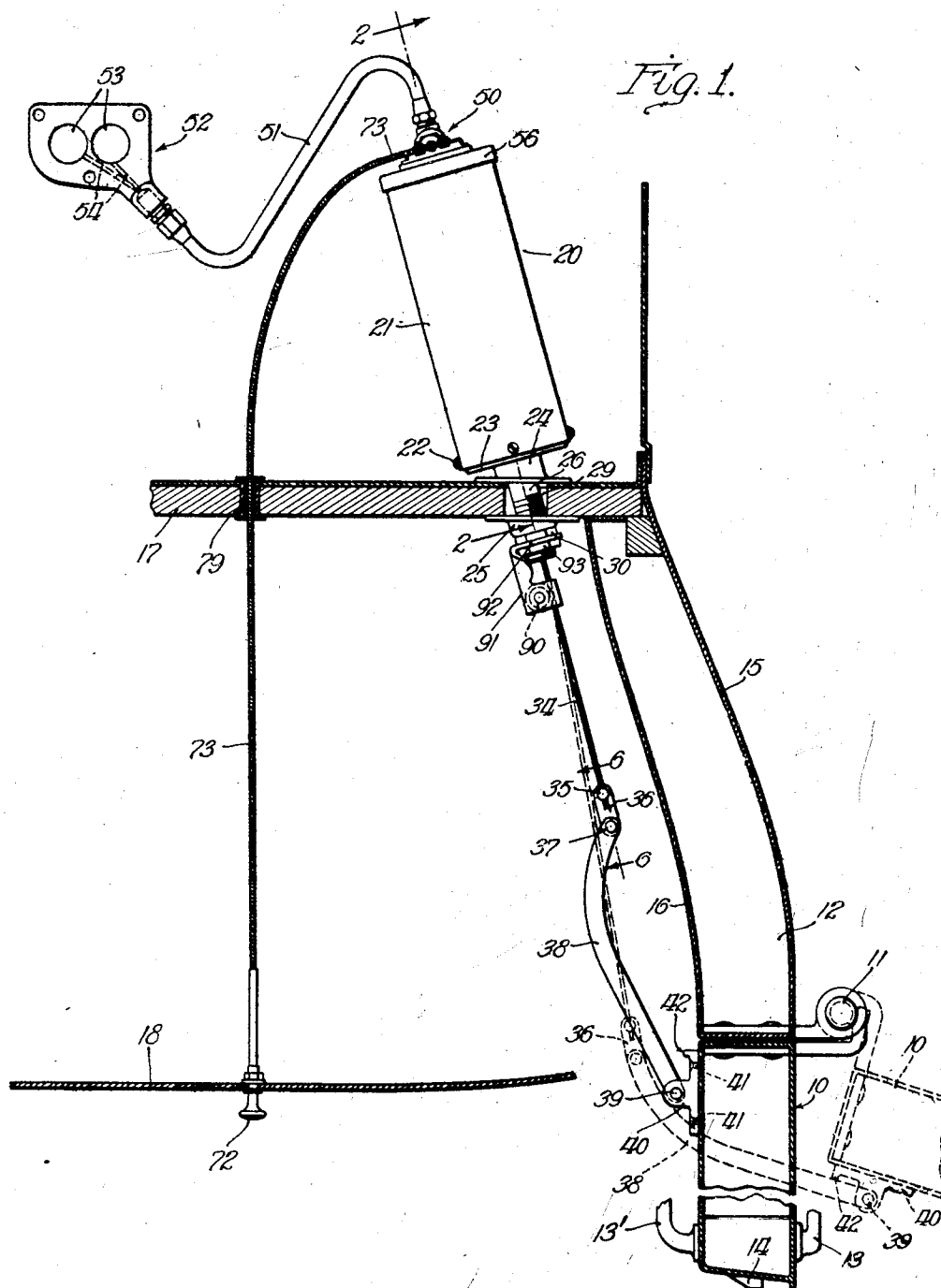
M. W. GANO, JR

2,086,025

MEANS FOR CLOSING AUTOMOBILE DOORS AND THE LIKE

Filed March 16, 1936

4 Sheets-Sheet 1



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MEANS FOR CLOSING AUTOMOBILE DOORS AND THE LIKE

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4 Sheets-Sheet 2

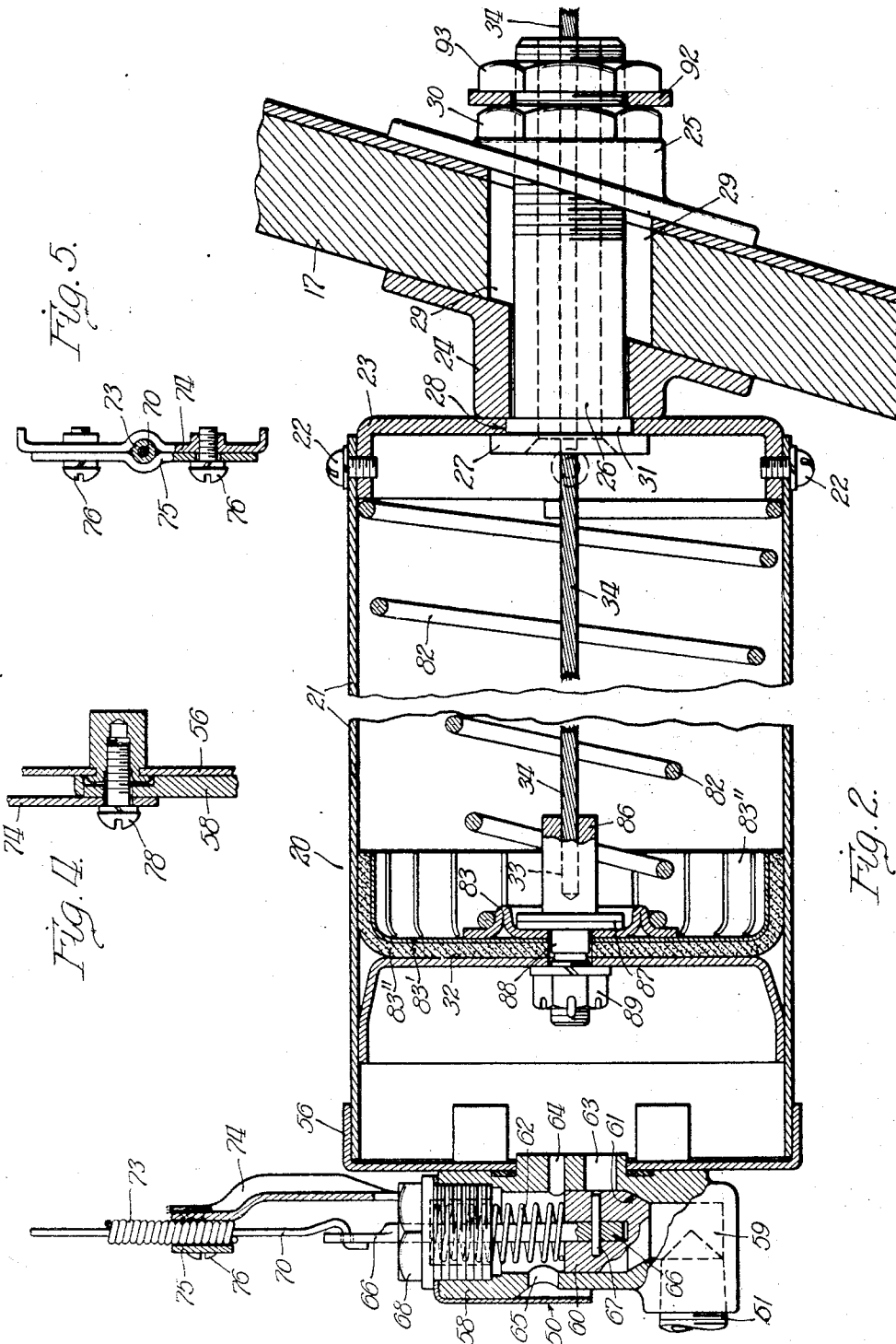


Fig. 2.

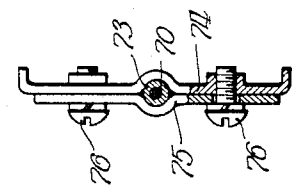


Fig. 5.

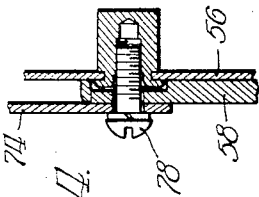


Fig. 1.

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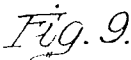
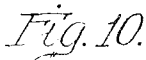
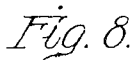
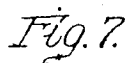
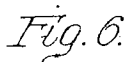
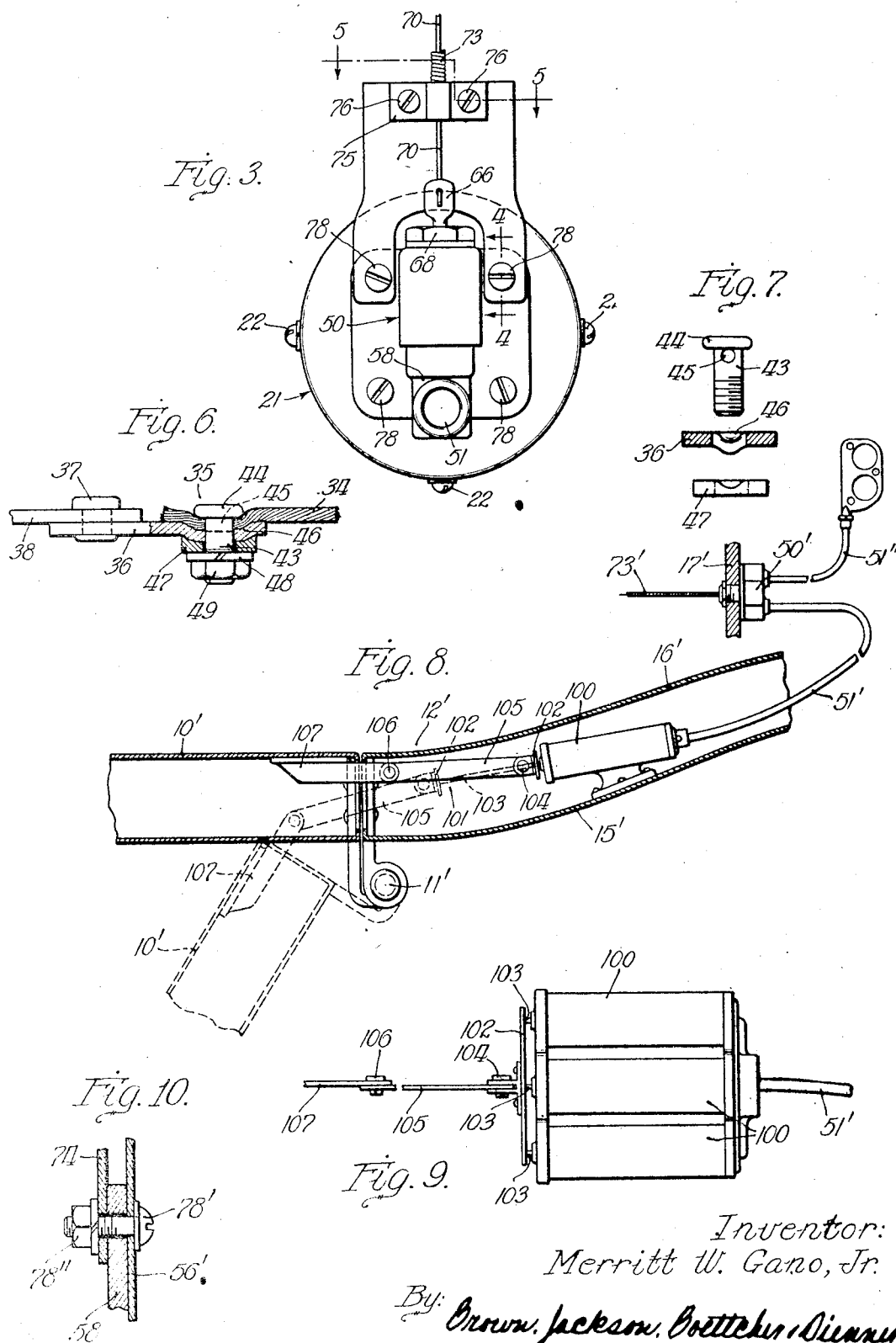
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MEANS FOR CLOSING AUTOMOBILE DOORS AND THE LIKE

Filed March 16, 1936

4 Sheets-Sheet 3



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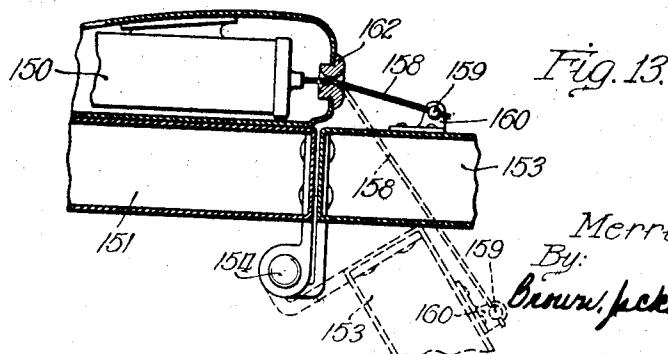
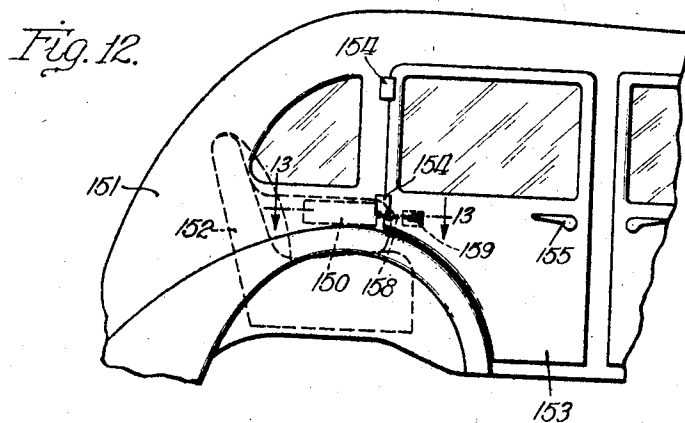
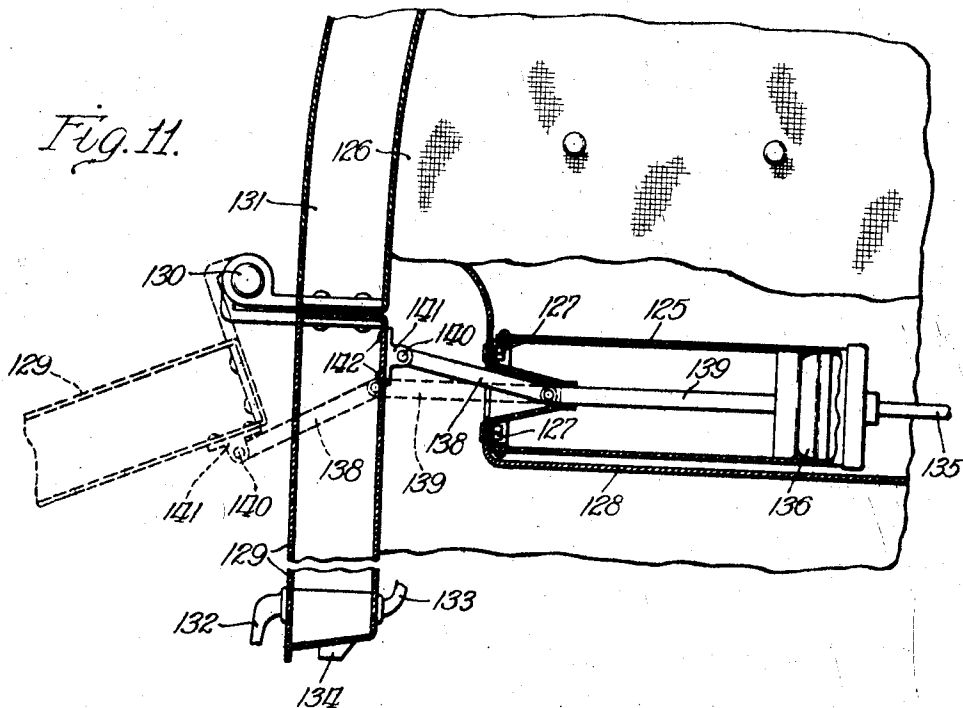
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MEANS FOR CLOSING AUTOMOBILE DOORS AND THE LIKE

Filed March 16, 1936

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,086,025

MEANS FOR CLOSING AUTOMOBILE DOORS
AND THE LIKE

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Application March 16, 1936, Serial No. 69,083

5 Claims. (Cl. 296-44)

This invention relates to means for closing automobile doors and the like, and may be characterized as an improvement upon the suction operated closer for automobile doors and the like illustrated and described in my United States Letters Patent No. 1,991,611, dated February 19, 1935.

One of the objects of the present invention is to provide a device of simple and inexpensive construction which is adapted to be easily installed or built in without material alteration of the existing parts of the vehicle, and more particularly, an improved arrangement and mounting for the suction operated device.

Another object is to provide an improved form of operating connection between the suction operated device and the door.

Another object is to provide, in conjunction with the piston of the suction operated closer device, means operable to return the piston to its door closed position when the door is operated manually.

Another object is to provide, in a device of this sort, manually operable valve means for controlling the application of suction to the suction operated device.

Another object is to provide means which will avoid the necessity for any exact predetermined relation of the suction operated device in respect to the door or its operating connection, and which, particularly, will make it unnecessary to position the suction operated device so that the piston thereof will exert a direct pull upon the operating connection between the piston and the door.

Another object is to provide a multiple cylinder unit adapted to be built in or installed in the side or jamb of the doorway and connected to the door by the proper operating connection, whereby the desired force may be obtained for closing the door with a plurality of cylinders of relatively small diameter instead of with a single cylinder of correspondingly larger diameter, which larger diameter cylinder may preclude building in or installing the cylinder in the jamb or side of the doorway if the space there is restricted.

Further objects and advantages of my invention will appear from the following detailed description, taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary horizontal section through the door, the side of the doorway, and the dash partition of an automobile, and show-

ing in elevation the installation of an embodiment of the present invention;

Figure 2 is a longitudinal section through the suction operated device, taken on the line 2-2 of Figure 1;

Figure 3 is an end view of the suction operated device;

Figure 4 is a detail section taken on the line 4-4 of Figure 3;

Figure 5 is a detail section taken on the line 5-5 of Figure 3;

Figure 6 is a detail section taken on the line 6-6 of Figure 1;

Figure 7 is an exploded view showing the parts for effecting the connection shown in Figure 6;

Figure 8 is a view similar to Figure 1, showing a multiple cylinder unit embodying the present invention;

Figure 9 is a side elevation of the multiple cylinder unit shown in Figure 8;

Figure 10 is a detail section similar to Figure 4, showing another form of mounting of the valve casing and its associated arm upon the end of the suction operated device;

Figure 11 is a view similar to Figure 1 showing another embodiment of the invention;

Figure 12 is a fragmentary side view of a vehicle showing a further embodiment of the invention; and

Figure 13 is a section taken on the line 13-13 of Figure 12.

Referring first to Figures 1 to 7, inclusive, the automobile door 10 is hinged at 11 to the side or jamb 12 of the doorway to be swung to open and closed positions, and is provided with outside and inside handles 13 and 13' and, preferably, the usual snap latch mechanism 14 for holding the door closed. A door lock may be provided as suitable or desired.

The side or jamb 12 of the doorway has an outer wall 15 which is usually of metal and forms a part of the body of the vehicle, and an inner wall 16 which is usually of cardboard or the like, suitably finished, as desired, or other suitable material. The partition which separates the engine compartment from the driver's compartment, as well understood in the art, is indicated at 17. The usual instrument panel is indicated more or less diagrammatically at 18.

The door closer comprises a suction operated device indicated at 20, which consists of a cylinder 21. Fixed telescopically in one end of the cylinder 21, by means of screws 22, is an end member 23.

Mounting members 24 and 25 have oblique

flanges which cooperate with the partition 17. As shown in Figure 1, with the partition 17 vertically disposed, these members 24 and 25 are adapted for mounting the cylinder 21 obliquely in respect to the partition 17 so that the suction operated device will act in direct line, or substantially in direct line, with the operating connection with the door. If the partition 17 is inclined vertically as shown in Figure 2, these mounting members 24 and 25 are adapted for mounting the cylinder 21 in horizontal position upon the inclined partition, so that the suction operated device will act horizontally and not in a downward direction which would result if the cylinder were clamped directly to the partition with its axis at right angles to the partition. The members 24 and 25 are adapted to be turned to secure different angular relations of the suction operated device in respect to the partition, primarily to secure the desired direct pull where the relation between the partition and the operating connection with the door is different from that shown, or where it is desired to position the suction operated device horizontally on partitions inclined differently from the partition shown in Figure 2.

A tubular stud 26 has a head 27 which cooperates with the end member 23 to clamp the cylinder in place, and the shank of this stud passes through the axial opening 28 in the end member 23 and through members 24 and 25, and a single opening 29 which is the only opening that need be formed in the partition 17 in applying the device of the present invention. A nut member 30 is threaded upon the stud 26 and clamps the parts securely in place. The portion 31 of the stud 26 preferably fits relatively snugly in the opening 28 and centers the cylinder 21 with respect to the stud 26.

A piston or plunger 32 operates within the cylinder 21 and has connected thereto at 33 a flexible cable, wire, or other flexible element 34, which extends through the tubular stud 26 and is connected at 35 to a link 36, which link, in turn, has pivotal connection at 37 with a lever 38. The opposite end of the lever 38 is pivoted at 39 to a bracket member 40 secured at 41 to the door 10. The lever 38 is preferably curved as shown, so that the suction operated device will exert the desired closing action upon the door 10 endwise through this lever throughout the entire range of operation. A small lug 42 integral with the bracket member 40 cooperates with the lever 38 in open position of the door to hold the lever out of binding engagement with the adjacent end of the door and out of binding engagement with the door jamb. This lug 42 forms an abutment which constitutes a fulcrum for the lever 38 when the door is open whereby the force for initially starting the door to closed position is applied through a relatively great leverage. Thereafter the door closing force is applied endwise through the curved lever to move the door to full closed position. This closing arrangement operates to advantage with the relatively large and heavy doors now commonly employed.

The connection at 35, between the flexible element 34 and the link 36, is secured by means of a stud 43 headed at 44. The shank of this stud is provided adjacent the head 44 with a diametrical opening 45 through which the adjacent end of the flexible element 34 is inserted, and the link 36 has an aperture for the passage of the stud 43 therethrough. Adjacent this aperture the link 36 is depressed at 46, and a cooperating clamp-

ing member is provided at 47. This member 47 has an aperture which registers with the aperture in the link 36, and the member 47 is formed to fit the hump provided on the opposite side of the link 36 by the depression 46. A split washer is provided at 48 and a nut 49 is threaded upon the stud 43 and clamps the flexible element 34 into the depression 46 and to the link 36. This clamping arrangement provides a mechanically secure connection between the flexible element 34 and the link 36, and keeps the flexible element from shearing at this connection.

The opposite end of the cylinder 21 is adapted to be connected by means of a suitable valve 50 with a pipe or suction line 51. The suction line 51 is provided with means 52 for connecting the same to the intake manifold of the engine, whereby the suction or vacuum created by the engine of the automobile is utilized for closing the door or doors of the automobile. The particular suction connection means 52 shown in the drawings is adapted for use with an automobile having a dual carburetor system, the two openings 53 being adapted for register with the two intake manifolds, and drill holes 54, for example, place these two openings 53 in communication with the suction line 51. It is to be understood that the particular adapter 52 selected for illustration forms no part of the present invention, and that this adapter may be varied as desired to provide the desired suction connection of the line 51 with the intake manifolds of different vehicles.

The valve 50, which controls the application of suction or vacuum to the cylinder 21 is a manually operated valve, and, in the illustrated embodiment of the invention, is shown as mounted directly upon the end member 56 for the adjacent end of the cylinder 21, although the particular arrangement of the valve may vary widely within the scope of the present invention.

The valve 50 comprises a valve casing 58 connected at 59 to the suction line 51. A valve member 60 operates slidably in the casing 58 and, in closed position, is yieldingly seated at 61 by a coiled spring 62. In this position the valve member 60 closes the port 63 through which suction is applied to the interior of the cylinder 21 and opens ports 64 and 65 through which the interior of the cylinder is vented to atmosphere.

A valve stem 66 is connected to the valve member 60 by a diametrical pin 67, and the spring 62 is interposed between the valve member 60 and a plug member 68 threaded into the valve casing and provided with an axial opening through which the stem 66 extends. A suitable control wire 70, such as a Bowden wire, is connected to the stem 66 and leads to a suitable control button 72 on the instrument panel 18. The adjacent end of the outer helically wound wire 73 is clamped to an arm 74 by a clamping member 75 secured to the arm 74 by screws 76. The arm 74 and valve casing 58 are secured to the end member 56 by screws 78. A bushing 79 is preferably provided in the partition 17 for the passage of the control wire therethrough. The cylinder 21 is vented to atmosphere on the right-hand side of the piston 32 (Figure 2) by the opening through the tubular stud 26.

Instead of securing the arm 74 and valve casing 58 to the end of the cylinder as shown in Figure 4, this attachment may be obtained by bolts 78' inserted from the inner side of the end 56' of the cylinder and having threaded engagement with nuts 78'' as shown in Figure 10.

From the foregoing it will now be apparent that, when the door 10 is swung to open position, the operating connection between the piston 32 and the door will draw the piston toward the right-hand end of the cylinder 21 as viewed in Figure 2. With the door in open position, as shown in dotted lines in Figure 1, the driver, in order to close the door, merely grasps the button 72 and pulls the same from the panel 18 sufficiently to move the valve member 60 to open position against the tension of the spring 62. With the engine running, suction is thereupon applied through the port 63 to the left-hand side of the piston 32 (Figure 2), drawing this piston to the left as viewed in Figure 2, and thereby swinging the door to closed position through the operating connection between the piston and the door. When the door reaches fully closed position under the action of the suction applied to the piston 32, the snap latch mechanism 14 operates to hold the door in closed position.

Upon release of the button 72 the valve member 60 is returned to closed position by the spring 62 and, in this position, opens the ports 64 and 65 through which the interior of the cylinder on the left-hand side of the piston, as viewed in Figure 2, is vented to atmosphere. When the door 10 is opened the piston 32 connected thereto is moved to the right in the cylinder 21, as viewed in Figure 2, so that the closing operation may be repeated by operation of the button 72, and, with the ports 64 and 65 open, the air may act as a door check in the opening movement of the door.

In order to return the piston 32 to its door closed position and to avoid undue slack in the flexible element 34 when the door is closed manually, a coiled spring 82 is interposed between the right-hand side (Figure 2) of the piston 32 and the end member 23. This spring 82 is shown of conical form, with its large end closely fitting the inner surface of the cylinder 21 and abutting the inturned flange of the end member 23. The small end of the spring 82 fits around and is centered and held in position by an annular flange 83 formed on the metal stamping 84 which constitutes a part of the piston 32. The stamping part 83' is preferably of thin spring metal, slit radially to provide spring fingers which engage the leather part 83'' of the piston.

The connection at 33, between the flexible element 34 and the piston 32, is secured by affixing the adjacent end of the flexible element 34 in a socket in one end of the stud 86. This stud 86 is flanged at 87 and has a shank 88 which extends through the piston and has threaded engagement with a nut 89.

For the purpose of assuring proper action where the connection 35, for example, is out of line with the axis of the piston 32, as shown in dotted lines in Figure 1, the flexible element 34 is preferably trained over a suitable pulley 90. This pulley 90 is carried by a bracket member 91 which has an apertured flange 92 clamped upon the stud 26 between the nut member 30 and a second nut member 93. By turning the bracket member 91 about the axis of the stud 26, the pulley 90 may be positioned as desired for the particular disposition of the flexible element 34.

The embodiment of the invention illustrated in Figures 8 and 9 is similar to the embodiment of the invention illustrated in Figures 1 to 7, inclusive, except that in this case the suction operated device comprises a multiple cylinder unit consisting of three cylinders 100 built in or installed between the outer wall 15' and the inner

wall 16' of the side or jamb 12' of the doorway and connected directly to the door 10' by an operating connection 101. While the multiple cylinder unit is shown as comprising three cylinders, it is to be understood that two or more cylinders are contemplated within the scope of the present invention.

The operating connection 101 comprises a crosshead 102 connected to the flexible elements 103 which, in turn, are connected to the pistons 104 which operate within the cylinders 100. The crosshead 102 has pivotal connection at 104 to a lever 105, which lever has pivotal connection at 106 to an arm 107 secured to the door 10'.

The suction line for the multiple cylinder unit is indicated at 51'. The valve mechanism for controlling the application of suction to the cylinders 100 is preferably mounted upon the partition 17' as indicated at 50', and the control wire for controlling this valve mechanism from the instrument panel is indicated at 73'. The door 10' is hinged at 11' to the side or jamb 12' of the doorway as in the preceding embodiment of the invention. The adapter for connection with the intake manifold of the engine is indicated at 52' and the suction line between the adapter and the valve 50' is indicated at 51''.

The multiple cylinder unit of Figures 8 and 9 provides for securing the desired force for closing the door with a plurality of cylinders of relatively small diameter instead of with a single cylinder of correspondingly larger diameter. The small diameter of the pistons 100 permits disposition of the same in the jamb or side of the doorway, or in other restricted spaces where the width of the space is not sufficient adequately to accommodate the larger diameter cylinder required where a single cylinder suction operated device is employed.

The door shown in Figure 1 or the door shown in Figure 8 may be either a front door or a rear door within the scope of the present invention, it being understood that in the case of the embodiment of Figure 1 the cylinder may be mounted elsewhere than upon the partition 17 for proper association with the door.

It is also to be understood that one of the suction operated closers is preferably employed with each of the doors of the vehicle, at least with each door remote from the driver's position, and that in such case manipulation of the button 72 will operate to close any and all doors in open position.

In the embodiment of the invention shown in Figure 11, the cylinder 125 is positioned crosswise of the vehicle beneath the rear seat 126, and is mounted at 127 upon the metal seat support 128. The rear door 129 is hinged at 130 to the body part 131 of the vehicle, and has outside and inside handles 132 and 133 and the usual snap latch mechanism 134 for holding the door closed. The suction line to the cylinder 125 is indicated at 135, and the piston within the cylinder is indicated at 136. This arrangement has been employed with good results in a "Zephyr" automobile.

In this embodiment of the invention, the operating connection between the suction operated device and the door comprises a lever 138 pivoted at one end to the adjacent end of the piston rod 139, which rod 139 is rigidly connected to the piston 136. The opposite end of the lever 138 is pivoted at 140 to a bracket 141 secured at 142 to the door 129. The valve mechanism for controlling the application of suction to the cylinder

125 may be mounted on the separating partition between the engine and driver's compartment and controlled by a button or other suitable fingerpiece on the instrument panel, as explained in connection with the embodiment of the invention shown in Figure 8. Of course the control button may be mounted otherwise than on the instrument panel for access from the driver's position.

10 The embodiment of the invention illustrated in Figures 12 and 13 is particularly adapted for use in taxicabs and the like, although it is to be understood that this embodiment of the invention may be employed in connection with other vehicles as suitable or desired.

15 In this embodiment of the invention, the cylinder 150 is positioned lengthwise in the rear of the vehicle body 151 adjacent the end of the rear seat 152. It may be covered at 153 to provide a suitable arm rest. It is to be understood that where one of such suction devices is employed in connection with each of the rear doors, the other cylinder will be similarly arranged at the opposite end of the seat 152.

20 The rear door 153 is hinged at 154 to the body part 151 and has suitable handles 155 and snap latch mechanism (not shown) for holding the door closed.

25 In this embodiment of the invention, the operating connection between the suction operated device 150 and the door 153 comprises a flexible element 156, such as a flexible cable, wire or the like, connected at one end to the piston which operates within the cylinder 150, and connected at its opposite end at 159 to a bracket 160 secured to the door 153. The flexible element 158 may be trained around a suitable pulley, or passes through a suitable bushing 162 which guides the same in the closing and opening movements of the door.

30 It is to be understood that the particular operating connection between the suction operated device and the door, as shown in Figures 12 and 13, may be varied widely within the scope of the present invention. A leverage mechanism, or a combined leverage mechanism and flexible element, may be employed between the suction operated device and the door in lieu of the flexible element shown.

35 I do not intend to be limited to the precise details shown or described, and it is to be understood that the device may be employed with one or any number of doors as suitable or desired.

I claim:

40 1. In combination, a vehicle door hinged to be swung to open and closed positions, a suction operated device, a lever mechanism connecting said suction operated device and said door for closing the door by suction, said lever mechanism comprising a curved lever pivotally connected to the door and connected to said suction operated device whereby said suction operated device operates through said lever throughout the range of operation of said lever in closing the door, and an abutment on said door cooperating with said lever in the open position of the door and constituting a fulcrum whereby the force for initially starting the door to closed position is applied through a relatively great leverage, said lever swinging out of cooperation with said abutment in the movement of the door to closed position.

tion and the door closing force being thereafter applied endwise through said lever.

2. In combination, a vehicle door hinged to be swung to open and closed positions, a suction operated device comprising a cylinder, a piston operable within said cylinder, an operating connection between said piston and said door for closing the door by suction, said operating connection comprising a flexible element connected to the piston, and a lever mechanism connecting said flexible element and the door, and comprising a lever pivotally connected to the door, and an abutment on said door cooperating with said lever in the open position of the door and constituting a fulcrum whereby the force for initially starting the door to closed position is applied through a relatively great leverage, said lever swinging out of cooperation with said abutment in the movement of the door to closed position and the door closing force being thereafter applied endwise through said lever.

3. In combination, a vehicle door hinged to be swung to open and closed positions, a suction operated device comprising a cylinder, a piston operable within said cylinder, an operating connection between said piston and said door for closing the door by suction, said operating connection comprising a flexible element connected to the piston, and a lever mechanism connected between said flexible element and the door, said lever mechanism comprising a curved lever pivotally connected to the door at one end and connected to the flexible element at its opposite end whereby said suction operated device operates through said lever throughout the range of operation of said lever in closing the door, and an abutment on said door cooperating with said lever in the open position of the door and constituting a fulcrum whereby the force for initially starting the door to closed position is applied through a relatively great leverage, said lever swinging out of cooperation with said abutment in the movement of the door to closed position and the door closing force being thereafter applied endwise through said lever.

4. In combination, a vehicle door hinged to be swung to open and closed positions, a partition separating the engine compartment from the driver's compartment, a suction operated device comprising a cylinder, an operating connection between said device and said door for closing said door by suction, said operating connection comprising a flexible element, a stud extending from said cylinder through an opening in said partition, means cooperating with said stud and said partition for securing said cylinder in place on said partition, and a pulley carried by said stud for guiding cooperation with said flexible element.

5. In a motor vehicle, a vehicle door hinged to be swung manually to open and closed positions, a door closing device comprising a cylinder, a piston operable within said cylinder and connected to said door, a suction line, and valve means carried by and constituting a unitary part of said cylinder for applying suction from said line to said cylinder on one side of said piston to pull the door to closed position and for releasing the suction to permit the door to be opened and closed manually in the usual manner.

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