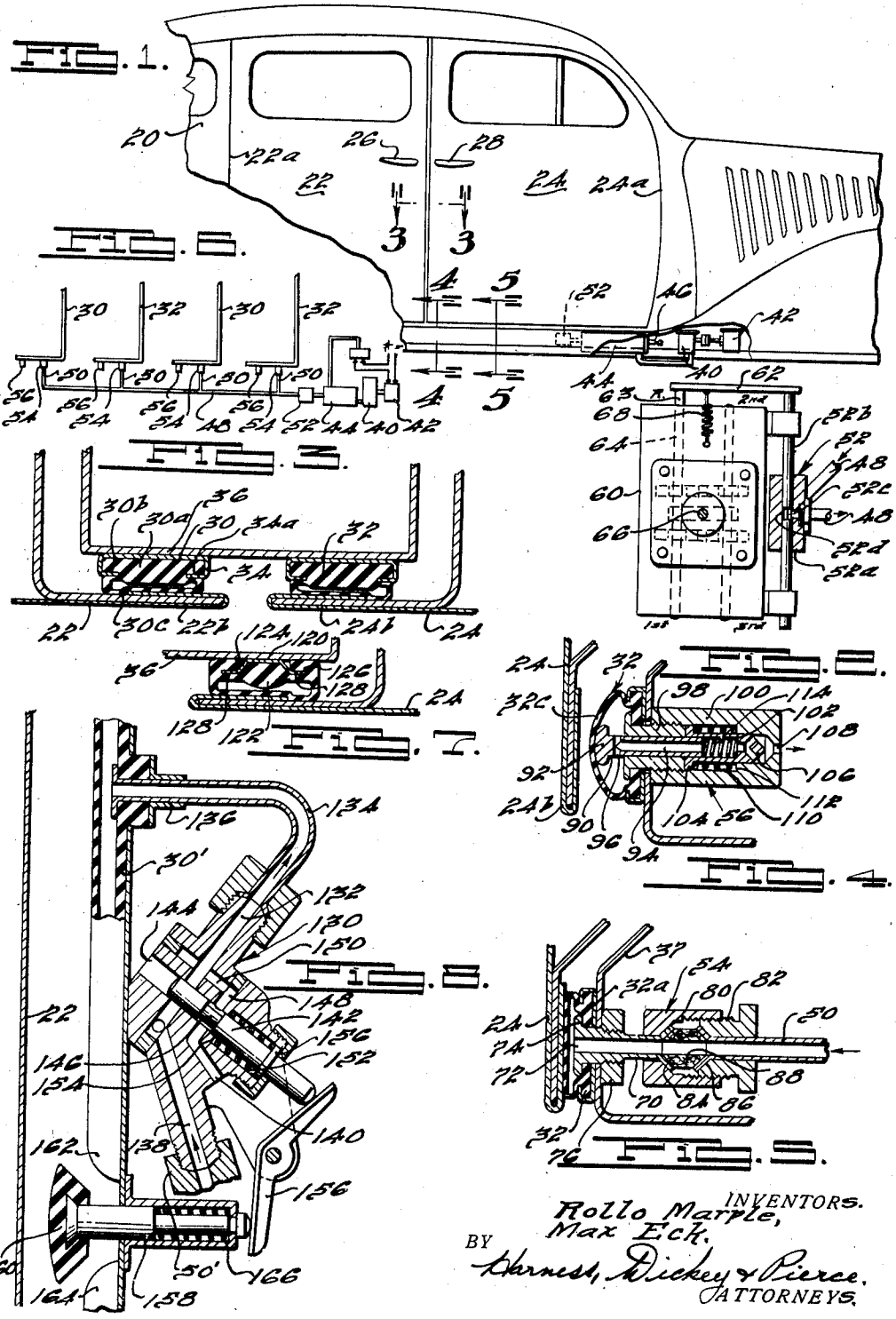
Nov. 17, 1942. R. MARPLE ET AL 2,301,963

METHOD OF AND APPARATUS FOR SEALING AND SUPPORTING CLOSURES

Filed Jan. 17, 1938 2 Sheets-Sheet 1



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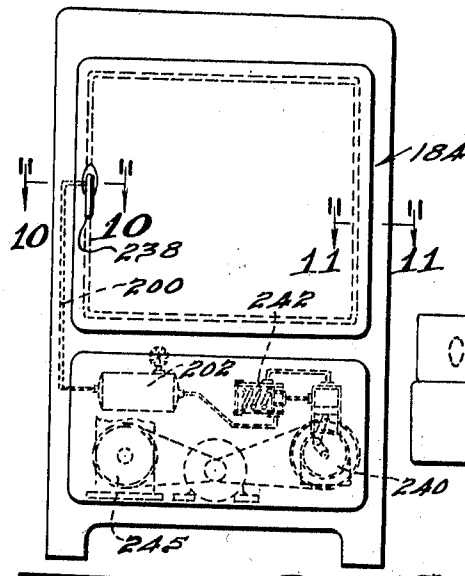


FIG. 9.

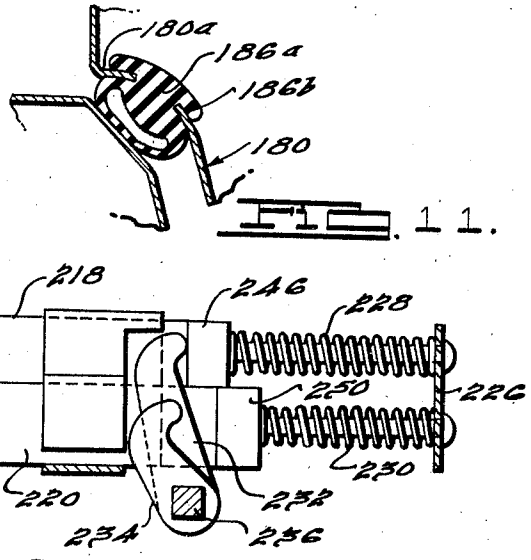


FIG. 11.

FIG. 12.

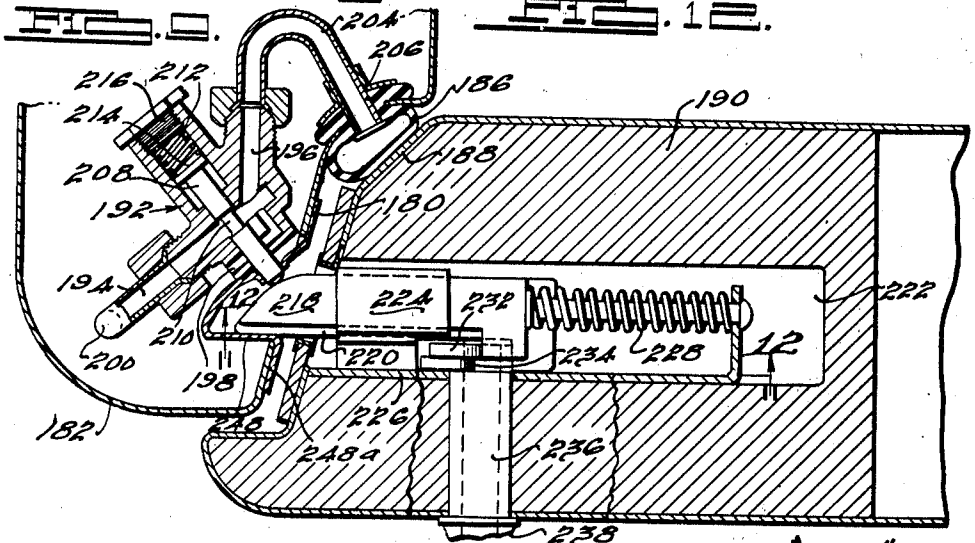


FIG. 10.

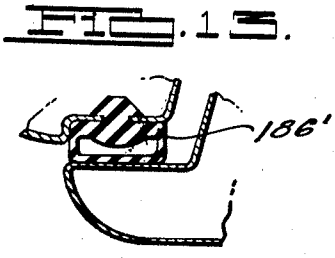


FIG. 13.

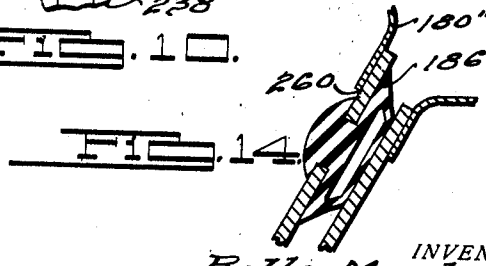


FIG. 14.

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METHOD OF AND APPARATUS FOR SEALING AND SUPPORTING CLOSURES

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Application January 17, 1938, Serial No. 185,376

15 Claims. (Cl. 296—44)

The present invention relates to methods of and apparatus for sealing a joint between a closure or door and its associated member, as well as for forming a supporting or anti-rattling connection therebetween.

It will be appreciated from a complete understanding of the present invention that the improvements thereof may be practiced in widely differing forms and for widely differing purposes. By way of illustration but not of limitation, the invention is herein specifically disclosed, in one embodiment, as applied to the doors of an automobile, and, in another embodiment, as applied to the door of a refrigerator.

It has long been the practice to provide rubber bumpers or stops for cooperation between an automobile door and its associated door pillar or other frame structure, which are adapted to be somewhat compressed when the door is moved to the fully locked position, and so yieldingly hold it and prevent rattling thereof. More recently, it has become the practice to extend the door stops or checks completely around the frame for the door, so as to provide a sealing effect as well as an anti-rattling effect. The sealing effect is becoming of increasing importance, due to the present tendency to provide automobiles with so-called air conditioning equipment.

In connection with refrigerator doors, it has long been the practice to provide either the door or the door frame with a resilient sealing strip, adapted to be slightly compressed during the movement of the door to the fully closed position, so as to afford a substantially air-tight seal between the door and the frame.

It has been found that a sealing arrangement which is effective to provide a substantially air-tight seal in the case of refrigerator doors and the like, or is effective to both provide a seal and prevent rattling in the case of automobile doors or the like, has, on the other hand, the objectionable effect of making it difficult to move the associated door to the fully closed position.

With the above as well as other considerations in view, the primary objects of the present invention are to provide an improved method of and apparatus for sealing a joint between a closure and its associated member, characterized in that the sealing means may be collapsed or retracted until such a time as the associated closure is moved to the fully closed position, and thereafter may be expanded or projected to form a tight seal and also to support the closure; to provide such a method and arrangement characterized in that the sealing means includes a collapsible and expansible tube extending around the closure, in combination with selectively actuable means to effect the expansion and collapse thereof; to provide such an arrangement in which the expansion and collapse may be controlled by the opening and closing movements of the closure; to provide such an arrangement in which, as applied to automobiles or the like, the expansion and collapse of the sealing means may also be controlled in accordance with the operation of the automobile; and to provide, in general, a sealing and supporting arrangement for closures which is simple in construction, economical of manufacture, may be readily installed, and is durable and efficient in operation.

With the above as well as more detailed objects in view, which appear in the following description and in the appended claims, preferred but illustrative embodiments of the invention are shown in the accompanying drawings, throughout the several views of which corresponding reference characters are used to designate corresponding parts and in which:

Figure 1 is a view in side elevation of an illustrative embodiment of the invention as applied to the door of an automobile;

Fig. 2 is a top plan view of suitable valve actuating mechanism which may be utilized with the construction of Fig 1;

Fig. 3 is a detailed view in horizontal section, taken along the line **3—3** of Fig. 1;

Fig. 4 is a view in horizontal section, taken along the line **4—4** of Fig. 1, but with the door incompletely closed;

Fig. 5 is a view in horizontal section, taken along the line **5—5** of Fig. 1;

Fig. 6 is a schematic diagram of the fluid circuits preferably utilized with the structure of Figs. 1 through 5;

Fig. 7 is a view in horizontal section of a modified construction of the sealing tube;

Fig. 8 is a view in section of a modified valve construction;

Fig. 9 is a view in front elevation of an embodiment of the invention in a refrigerator door;

Fig. 10 is a view in horizontal section, taken along the line **10—10** of Fig. 9;

Fig. 11 is a view in horizontal section, taken along the line **11—11** of Fig. 9;

Fig. 12 is a view taken along the line **12—12** of Fig. 10; and

Figs. 13 and 14 are fragmentary views in horizontal section of further modifications of the invention.

Referring first to the arrangement of Figs. 1

through 5, the illustrative vehicle 20 is provided with the usual doors 22 and 24, at one side thereof, which are hinged at the respectively rear and front edges 22*a* and 24*a* thereof and are provided with the usual locking devices represented by the handles 26 and 28 to retain them in the fully closed position.

In accordance with the present invention, the usual sealing arrangement between the doors 22 and 24 and the associated frame members of the vehicle 20 may be eliminated, and replaced by the tubular sealing members 30 and 32 (Fig. 3). The tubular sealing member 30 is associated with the door 22, and the tubular sealing member 32 is associated with the door 24. It will be appreciated that the seals 30 and 32 are formed to extend completely around the associated door opening and that, when the associated door is fully closed, they are engaged and compressed, so as to form a tight seal, by the flanges of the associated doors 22*b* and 24*b*. The doors at the opposite side of the vehicle are, of course, similarly equipped.

Within the broader aspects of the present invention, the tubular seals 30 and 32 may be constructed in various ways. As specifically shown in Fig. 3, each seal is formed as a continuous tube, having a thickened base portion such as 30*a*, provided with grooves or recesses 30*b* at the sides thereof to receive the flanges 34*a* of the associated backing member 34, and provided with a relatively thin outer casing portion 30*c*. The associated backing member 34 is directly secured to the outer face of the associated door opening, this supporting relation being clearly shown in Fig. 3, in which the member 36 is the door pillar which extends between the two doors 22 and 24.

In order to effect the expansion of the tubular seals such as 30 and 32, it is preferred to provide the vehicle with a suitable source of compressed air or its equivalent. This mechanism is diagrammatically indicated in Fig. 1, as including a suitable compressor 40, a motor 42 or the like for driving the compressor, a suitable accumulator 44, and conventional relief valve mechanism indicated by the reference character 46. The quantity of air required for the seals for all of the doors associated with a vehicle is relatively small and the accumulator 44 may readily be made large enough to accommodate a substantial surplus quantity of air. With this arrangement, the compressor 40 is required to operate only intermittently. Preferably and as illustrated the motor 42 is provided with a conventional pressure operated switch 43, which functions, as will be understood, to start the motor whenever the pressure in the accumulator 44 falls below a set valve and to stop the motor as soon as the pressure again reaches the normal value. The check valve 46, as will be understood, is set to open at slightly above the just mentioned normal pressure, and so prevents building up of an excessive pressure within the seals 30 and 32.

Referring particularly to Fig. 6, the accumulator 44 is provided with a suitable outlet line 48, provided with a plurality of branches 50 arranged in parallel with each other, and which lead to the sealing tubes such as 30 and 32, associated with the several doors of the vehicle. A main control valve 52, described below, is interposed in the main supply line 48. Each sealing tube is provided with a suitable inlet 54, described below, and is also provided with a suitable relief valve 56, also described below. With this arrangement, it will be appreciated that so long as the main control valve 52 is in the open position, the accumulator 44 is effective to supply air at suitable pressure to the several sealing tubes, through the inlets 54. Closure of the main control 52 serves to trap the air within the sealing tube 30 and 32 and so retain them in the expanded condition. As described below, the relief valves 56 are arranged to be opened when the corresponding door is opened, and serve to exhaust or collapse all of the sealing tubes associated with the several doors, and so permits these doors to be readily closed while the tubes are in the collapsed position.

It is preferred to arrange the main control valve 52, so that it is open when the vehicle is at rest, or is in normal forward operation, but to provide means readily controllable by the operator to close the valve 52. A preferred arrangement for accomplishing this is shown in Fig. 2, in which the valve 52 is illustrated as comprising a valve body 52*a* and a valve plunger 52*b* provided with a valve recess 52*c*. With the parts as shown in Fig. 2, the recess 52*c* registers with a recess 52*d* formed in the valve body, and provides communication between the two portions of the fluid supply line 48. The valve 52 is suitably secured to the side of the vehicle transmission 60, and the push rod 52*b* is provided with a laterally extending arm 62, which is disposed in the path of an extension 63 on the usual gear shift rod 64. The arrangement is thus one in which actuation of the gear shift lever 66 to any one of the forward operating or neutral positions permits the centering spring 68 to move the push rod 52*b* to the open position shown in Fig. 2. Actuation of the gear shift lever 66 to the reverse position, on the other hand, moves the push rod 52*b* to a position in which the recess 52*c* is out of registry with the recess 52*d*, thus closing off the connection between the two portions of the line 48.

Each previously mentioned inlet 54 is preferably constructed as shown in detail in Fig. 5, and comprises a tubular member 70, having a bore 72 therethrough, and having an enlarged head 74, which passes through and overlaps the base 32*a* of the associated sealing strip. The member 70 is secured to the associated door opening 37 by means of the lock nut 76. Lock nut 76 also serves to form a tight seal between the enlarged head 74 and the sealing strip. The tubular member 70 is jointed to the previously mentioned supply line 50 through a connection comprising an outer sleeve 80 which is threaded onto an inner member 82. The inner portions of the members 80 and 82 abut, respectively, the outwardly flared ends 84 and 86 of the tubular member 70 and the supply line 50, and these flanges are retained in spaced relation by a suitable gasket 88. It will be appreciated that by threading the member 80 onto the member 82, the tubular member 70 and the supply line 50 are forced into sealing relation to the gasket 88.

The previously mentioned relief valves 56 are preferably constructed as shown in Fig. 4, and comprise a valve plunger 90, having an enlarged rounded head 92, adapted to bear against the outer casing 32*b* of the associated seal 32. The plunger 90 is provided with an axial bore 94 and a radial bore 96.

The valve plunger 90 is slidably received in a nipple 98, which is similar in construction to the previously mentioned nipple 70 and extends through the base of the associated seal. The

outer end of the nipple **98** is provided with external threads, through which it is connected into a tubular body **100**. The extreme end of the plunger **90** is slidably received in a supplemental valve body **102**, which is slidably supported in the previously mentioned body **100**. The valve body **102** has a flange **104** at its outer end, and is provided with a suitable valve **106** at its inner end. The valve **106** is adapted to seat upon and selectively open or close an exhaust port **108** formed in the body **100**. A compression spring **110** surrounds the supplemental valve member **102**, and is seated between the previously mentioned flange **104** and a shoulder **112** formed in the body **100**. An additional spring **114** is seated between the end of the valve plunger **90** and the base of the central bore of the supplemental valve member **102**.

With this relation of the parts, it will be appreciated that the springs **112** and **114** normally retain the parts in the positions shown, in which the enlarged head **92** of the valve plunger bears against the outer casing **32***c* of the seal and in which the interior of the seal is in direct communication with the exhaust port **108** through the previously mentioned radial and axial bores **96** and **94**, and through the body of the supplemental valve member **102**. If the door **24** associated with the seal **32** is closed, the flange **24***b* thereof moves into engagement with the plunger head **92**, and forces the plunger **90** inwardly to a position in which the radial port **96** is enclosed. The inward movement of the plunger **90** is imparted to the supplemental valve **102** through the heavier spring **114**. This movement occurs against the force of the spring **112**, and ultimately brings the valve **106** into seating relation with the port **108**, closing off the latter.

Considering the operation of the above described arrangement as a whole, it will be appreciated that when all of the doors of the vehicle are closed, all of the relief valves **56** associated therewith are correspondingly closed, due to the compressed condition of the plungers **90** thereof. If any one of the doors is opened, the corresponding relief valve **56** is permitted to move to the open position as described above, and, as clearly appears from the parallel arrangement of the valves shown in Fig. 6, this action exhausts all of the sealing tubes associated with all of the doors of the vehicle. The just mentioned open door, as well as any subsequently opened one of the doors, may accordingly be readily reclosed, since the corresponding seals yield readily during the closing movement. The proportioning of the seal is preferably such, however, that even when collapsed, they form a sufficient seal with the door to minimize drafts and the entrance of dust or other foreign material.

As previously mentioned, the motor **42** for the compressor **40** is automatically controlled so as to maintain a substantially uniform pressure in the accumulator **44**. Also, the accumulator **44** is preferably proportioned to accumulate a sufficient quantity of air to accommodate a number of successive opening and closing movements of the doors. Accordingly, a sufficient supply of compressed air is continuously available to expand the tubes, and, as soon as all doors are reclosed, the seals thereof are expanded. The pressure within the seals is so adjusted as to force the tubular seals into tight sealing relation with the associated door flanges, and, at the same time, to effectively but yieldably prevent any rattling of the associated door. It is thus seen that the present sealing elements, in addition to performing the usual anti-rattling function, also serve to provide a relatively air-tight seal between the door and the door opening. The herein disclosed constructions are advantageous in respect to each, as well as both of, the just mentioned functions, and in the claims, accordingly, the terms sealing element, seal, or the like are employed in a generic sense as comprehending either or both of such functions.

If the gear shift lever is moved into reverse position, following the just described expanding operation of the seals, but before any door is opened, such movement of the gear shift lever serves to close the main control valve **52**. This action traps the previously supplied air within the tubular seals, thus retaining the seals in the expanded position. The opening of any door, as previously mentioned, permits all of the seals to collapse, the re-expansion thereof being dependent upon a subsequent operation of the gear shift lever to neutral or one of the forward positions.

With the foregoing arrangement, it will be appreciated that at any time that the vehicle is in operation, with all of the doors closed, all of the doors are tightly sealed and held against rattling. The opening of any door, on the other hand, collapses all of the seals, permitting it and any other subsequently opened door to be reclosed without substantial obstruction from the seals.

In the modified arrangement shown in Fig. 7, the backing member **120**, by which the seal **122** is secured to the associated door opening, is completely concealed within the associated seal. To this end, the seal is provided with a recess **124** in the base thereof, and is also provided with inwardly presenting recesses **126**, which receive the flanges **128** of the backing member **120**. In all other respects, the arrangement of Fig. 7 may correspond to the previously described arrangement.

The arrangement of Fig. 8 is advantageous, where it is desired that the opening of a particular door shall exhaust the sealing member for only that door, without altering the expanded condition of the sealing members associated with the other doors. In Fig. 8, each sealing tube **30'**, which may correspond structurally to the previously described sealing tube **30**, except as noted below, is provided with a main control valve **130**, instead of the valve **56** and the inlet **54**. The outlet **132** of the valve **130** is connected through a tube **134** with an inlet **136**, which may correspond in function to the previously described inlet **54**. The inlet **138** of the valve **130** is suitably connected to a line **50'** which may correspond in all respects to the previously described lines **50**. The valve **130** is also provided with a suitable exhaust port **140** which communicates directly with the atmosphere.

The outlet **132** is arranged to be selectively connectible to either the inlet **138** or the exhaust port **140** by means of the valve plunger **142**, which is slidable within a bore **144** provided in the valve body. The plunger **142** is provided with a portion **146** of reduced radius which is disposed to selectively register either with the exhaust port **140** and a communicating passage **148**, or with the inlet **138** and the valve outlet passage **132**. The passage **148** communicates directly with the outlet **132** through a branch passage **150**. The plunger **142** is normally retained in the exhaust position shown, by means of a compression spring **152**, which surrounds the

plunger and is seated between a shoulder 154 formed on the valve body and an enlargement 146 formed on the plunger. The plunger may, however, be moved to its opposite position by a bellcrank 156 which is pivotally connected to the valve body, and which is arranged for actuation by a plunger 158. The plunger 158 is provided with an enlarged head 160, disposed in the path of movement of the flange of the associated door. Preferably and as illustrated, the sealing tube 30' is formed to have two closed ends 162 and 164, which are slightly spaced from each other to accommodate the head 160. The plunger 158 is provided with a compression spring 166, which normally acts to retain it in the projected position shown.

The parts are shown in Fig. 8 with the associated door in the open position, in which the plunger 158 is retained in the projected position by means of the spring 166 and the valve plunger 142 is retained in its exhaust position by the spring 152. With the latter plunger in the exhaust position, the interior of the seal 30' is in direct communication with the atmosphere through the line 130, the outlet passage 132, branch passages 150 and 148, and the outlet passage 140. The supply line 50' for the associated door is, however, closed by the plunger 142. Accordingly, the associated door 22 may be moved to the fully closed position without substantial obstruction by the seal 30. During this closing movement of the door, the plunger 160 is engaged by the door flange, and is moved inwardly against the force of the associate compression spring 166. This inward movement of the plunger 158 rotates the bellcrank 156 about its pivot pin, and forces the plunger 142 inwardly of the valve body. Inward movement of the plunger 142 moves the portion of reduced radius 146 out of registry with the exhaust passage 140, thus closing off the exhaust line and moves the portion 146 into registry with the inlet passage 138. This action connects the interior of the seal 30' with the supply line 50', and causes a corresponding expansion of the tubular seal. An opening movement of the door 22 again releases the plunger 158, permitting the valve 130 to be restored to the illustrated position, exhausting the tubular seal. The movement of the valve associated with the particular door is, however, effective to exhaust only the associated seal and does not affect the expanded or collapsed condition of the seal associated with the other doors. Except as described above, the arrangement and operation of the system as a whole, utilizing the valve of Fig. 8, corresponds to that described above.

Referring to the embodiment shown in Figs. 9 through 12, the door opening 180 of the frame 182 of the illustrative refrigerator 184, is provided with a tubular sealing member 186, which is secured to and extends continuously therearound in the manner described with respect to the previously mentioned arrangements. The outer face of the seal 186 is disposed for engagement and compression by the rail member 188 of the door 190 of the refrigerator.

The admission to and venting of pressure from the tubular seal 186 is arranged for control by a valve 192 which corresponds generally to the previously described valve 130. Valve 192 is provided with an inlet passage 194, an outlet passage 196, and an exhaust passage 198. The inlet passage 194 is directly connected to a suitable supply line 200, which leads to the hereinafter described accumulator 202. The outlet 196 is connected through conduit 204 with a nipple 206 connected into the tubular seal 186. The outlet passage 196 may be selectively connected to either the exhaust passage 198 or the inlet passage 194 by means of a plunger 208, having a portion 210 of reduced radius. The plunger 208 is slidable within the body of the valve 192, and is normally retained in an exhaust position in which the recess 210 registers with the exhaust passage 198 by means of a compression spring 212 which is seated between the head 214 of the valve and a plug 216. The plunger 208 may be moved to and retained in the open position of the valve in which the recess 210 is in communication with the inlet 194 by a plunger bolt 218, the outer end of which engages the valve plunger 208 when the door is in the fully closed position.

The plunger bolt 218 is supplemental to and movable independently of a main latch bolt 220. The bolts 218 and 220 are slidably mounted within a recess 222 provided therefor in the door 190, and are retained in unit relation by a sleeve 224 or equivalent means, which is in turn secured to the casing 226 of the locking means. A pair of springs 228 and 230 cooperate with the bolts 218 and 220, respectively, to continuously urge them to the projected positions thereof. These springs are seated between the ends of the respective bolts and the casing 226 of the lock. The means for retracting the bolts 218 and 220 includes the two roll-back members 232 and 234, respectively, which are carried upon a suitable spindle 236. The spindle 236 projects outwardly of the door 190 and may be rotated by the usual door handle 238. The two roll-back members 232 and 234 are slightly angularly offset with respect to each other, the relation being such that the roll-back 232 becomes effective to retract the plunger bolt 218 prior to the time that the roll-back 234 becomes effective to retract the bolt 220. The purpose of this arrangement, as described below, is to ensure that the tubular seal 186 is deflated prior to the time that the latch bolt 220 is retracted, thereby minimizing the effort required to retract the bolt 220.

In a broad sense, the previously mentioned accumulator 202 may be supplied with air or equivalent fluid under pressure in any suitable way. Preferably, and as illustrated, the accumulator 202 is provided with a compressor 240 individual thereto, and a conventional relief valve mechanism 242 is connected between the accumulator and the compressor. Compressor 240 is illustrated as being driven by a motor 244, which also serves to drive the usual refrigeration unit 245 for the refrigerator.

Considering the operation of the system as a whole, it will be appreciated that, as in the case of the previously described embodiments, the volume of air or equivalent fluid required to supply the tubular seal 186 is relatively small, and the accumulator 202 may be made relatively large, so that it can accumulate sufficient fluid to supply the tubular seal during periods of inactivity of the motor 240. Each time the refrigeration unit 245 is placed in operation, the compressor 240 is correspondingly started and acts to recharge the accumulator 202 to the value for which the relief valve 242 is set. The accumulator 202 may thus be regarded as continuously occupied by fluid under sufficient pressure to cause effective operation of the tubular seal 186. As long as the refrigerator door 190 occupies the closed position, the plunger bolt 218 occupies the position shown in Fig. 10, in which it is effective

to hold the valve plunger 208 in a position in which the valve inlet 194 is in direct communication with the tubular seal 186. As long as the door is closed, accordingly, the tubular seal 186 is expanded to such an extent as to cause it to form an effective seal with the rail 188 of the door 190.

To open the refrigerator door, the spindle 236 may be rotated in a clockwise direction as viewed in Fig. 12. This action correspondingly rotates both of the roll-back members 232 and 234. The initial movement of the roll-back member 232 brings it into engagement with its associated abutment 246 on the plunger bolt 218, and causes a corresponding retracting movement of the latter. This retracting movement moves the nose of the plunger bolt 218 out of range of the valve plunger 208, permitting the latter to be moved to the exhaust position under the influence of the spring 212. The just mentioned plunger movement brings the recess 210 thereof out of registry with the inlet passage 194 and into registry with the exhaust passage 198, correspondingly exhausting the tubular seal 186. The consequent collapse of the tubular seal 186 relieves the previously existing pressure between the face of the latch bolt 220 and the keeper portion 248 of the door opening. Continued movement of the spindle 236 causes a further retracting movement of the plunger bolt 218 which is without effect, and also brings the roll-back member 234 into engagement with the abutment 250 formed on the latch bolt 220. Continued such movement retracts the latch bolt 220 and permits the door to be readily opened. Due to the release of pressure between the latch bolt and its keeper 248, the retracting movement of the bolt requires only a minimum of effort on the part of the operator.

In closing the door, both the plunger and latch bolt 218 and 220 are cammed inwardly by the engagement thereof with the rounded outer face of the door opening. Due to the rounded form of the outer end of the plunger bolt 218 as well as the positioning with respect thereto of the valve plunger 208, it will be appreciated that the plunger bolt 218 does not actuate the valve plunger to the open position of the valve until after the nose of the latch bolt 218 passes beyond the outer face 248*a* of the keeper 248. As soon as this latter action has occurred, the spring 230 associated with the latch bolt becomes effective to positively force the latch bolt 220 to the fully projected position. The spring 228 associated with the plunger bolt 218 is correspondingly effective to force the plunger bolt to the fully projected position and open the valve 192.

As clearly appears in Fig. 11, the outer circumference of the tubular seal 186 may be and preferably is generally circular, the bore thereof being somewhat flattened, so as to allow for a thickened base portion 186. The seal member is provided with recesses 186*b* at the sides thereof, to receive the flanges 180*a* of the door opening. In the modified arrangement of Fig. 13, the door seal member 186' is of generally rectangular section, but is otherwise similar to the arrangement shown in Fig. 11. In the arrangement shown in Fig. 14, the tubular seal 186'' is provided with a backing member 260 which may be assembled integrally therewith, and thereafter secured as a unit to the door opening member 180''.

Although specific forms, as well as specific adaptations, of the invention have been described in detail, it will be appreciated that these are purely illustrative and that the invention, both as to method and as to apparatus, may be embodied in widely different forms and applied to widely different uses, within the spirit and scope thereof.

What is claimed is:

1. The combination with a vehicle closure and an associated member defining a closure opening, of an expansible and collapsible sealing element extending around the joint between said closure and said opening, means affording a source of fluid pressure for expanding said element, means controlled in accordance with the position of the closure for controlling the connection of said element to said source, and means actuated as an incident to the operation of the vehicle for controlling said source.

2. The combination with a door and an associated member defining a door opening of a vehicle having a gear shift lever, of a tubular member surrounding the door opening, a source of fluid pressure carried by said vehicle for expanding said tubular member, valve means controlled in accordance with the position of the door for controlling the effectiveness of said source, and additional valve means arranged for actuation by said gear shift lever for additionally controlling said source.

3. The combination with a door and an associated member defining a door opening of a vehicle having a gear shift lever, of a tubular member surrounding the door opening, a source of fluid pressure carried by said vehicle for expanding said tubular member, and valve means controlled in accordance with the position of the door and of said gear shift lever for selectively connecting said tubular member to said source and to atmosphere.

4. The combination with a door and an associated member defining a door opening of a vehicle having a gear shift lever, of a tubular member surrounding the door opening, a source of fluid pressure carried by said vehicle for expanding said tubular member, valve means controlled in accordance with the position of the door for selectively connecting said tubular member to said source and to atmosphere, and means controlled in accordance with the position of said gear shift lever for connecting said source to said valve means.

5. The combination in a refrigerator having a member defining a door and an associated door opening, a latching mechanism for said door and a driving motor for actuating an associated refrigerator unit, of a tubular seal extending around said door and door opening and interposed therebetween, a source of fluid pressure for said tubular seal arranged for actuation by said motor, and valve means actuated by said latching mechanism for controlling the expansion and collapse of said element.

6. The combination in a refrigerator having a door and an associated member defining a door opening, a latching mechanism for said door, releasing means for said latching mechanism, and a driving motor for actuating an associated refrigerator unit, of a tubular seal extending around said door and door opening and interposed therebetween, a source of fluid pressure for said tubular seal arranged for actuation by said motor, valve means for forming a connection between said source and said tubular seal, and an actuator for said valve means arranged for actuation with but prior to actuation of said latching means

when said releasing means is operated to release said latching mechanism.

7. The combination with a door and an associated member defining a door opening of a vehicle, of a projectable and retractable element interposed between said door and said opening, means actuated as an incident to the operation of the vehicle for projecting said element, and means responsive to an opening movement of said door for retracting said element.

8. The combination with a plurality of doors in a vehicle, each having a member defining an associated door opening, of a projectable and retractable element individual to each door and interposed between it and its associated opening, means responsive to the opening of any one of said doors for effecting the retraction of the element associated with another of said doors, and additional means for controlling the projection of said elements.

9. The combination with a plurality of doors of a vehicle, each having a member defining an associated door opening, of a projectable and retractable element individual to each door and interposed between it and its associated opening, means responsive to the opening of any one of said doors for effecting the retraction of the element associated with another of said doors, and means actuated as an incident to the operation of the vehicle for controlling the projection of said element.

10. The combination with a plurality of doors associated with the vehicle, each having means defining a door opening individual thereto, of a projectable and retractable element individual to each door and interposed between it and its door opening, means actuated as an incident to the operation of the vehicle for effecting the projection of all of said elements, and means responsive to the opening of any one of said doors for effecting the retraction of the corresponding element without, however, affecting the elements associated with the other doors.

11. The combination with a door member and an associated member defining a door-opening, said door member having a portion which overlies and substantially conceals a portion of the other member when the door is closed, of a sealing element carried by one of said members and being expansible and collapsible under the influence of fluid pressure, said element being disposed when expanded to form a seal between said members, valve means carried by one of said members and disposed to control the application of fluid pressure to said element, and operating means for said valve means comprising a plunger disposed to project outwardly through said portion of said last mentioned one of said members, said plunger being disposed to be engaged and moved by said portiton of the other of said members when the door is closed, to thereby actuate the valve means and being substantially concealed between said portions when the door is closed.

12. The combination with a door and an associated structure defining a door opening, said door having a portion which overlies and substantially conceals a portion of said structure when the door is closed, of a sealing element carried by said portion of said structure and being expansible and collapsible under the influence of fluid pressure, said element being disposed to be engaged by said portion of the door when the door is closed and when expanded to form a seal between said portions, valve means carried by said structure and disposed to control the application of fluid pressure to said element, and operating means for said valve means comprising a plunger disposed to project outwardly through said portion of said structure, said plunger being disposed to be engaged and moved by said portion of the door when the door is closed, to thereby actuate the valve means and being substantially concealed between said portions when the door is closed.

13. The combination with a door member and an associated member defining a door opening, of a sealing element carried by one of said members and being expansible and collapsible under the influence of fluid pressure, said element being disposed when expanded to form a seal between said members, valve means carried by one of said members and disposed to control the application of fluid pressure to said element, and means for controlling said valve means comprising a plunger disposed within the body of said element, and disposed to be actuated by the pressure of said other member against said element when the door is closed.

14. The combination with a door member and an associated member defining a door-opening, said door member having a portion which overlies and substantially conceals a portion of the other member when the door is closed, of a sealing element carried by one of said members and being expansible and collapsible under the influence of fluid pressure, said element being disposed when expanded to form a seal between said members, valve means carried by one of said members and disposed to control the application of fluid pressure to said element, and operating means for said valve means comprising a plunger disposed to project outwardly through said portion of said last mentioned one of said members, latch means for retaining said door in the closed position and having a portion disposed to engage and operate said plunger when the door is closed.

15. The combination with a door and an associated member defining a door opening, a latching mechanism for said door, of an inflatable tubular seal extending around said door and door opening and interposed therebetween, valve means for forming a connection between the seal and a source of fluid pressure for inflating the seal, and an actuator for said valve means arranged for actuation with but prior to actuation of said latching mechanism under at least certain conditions of operation of said latching mechanism.

ROLLO MARPLE.
MAX ECK.

CERTIFICATE OF CORRECTION.

Patent No. 2,301,963. November 17, 1942.

ROLLO MARPLE, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 58, for "valve" read --value--; page 5, second column, line 52, claim 5, for "member defining a door and an associated door" read --door and an associated member defining a door--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of March, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.