Oct. 6, 1959 O. W. ROBERTSON 2,907,492

PRESSURE SEAL FOR CONTAINERS

Filed Feb. 21, 1958 4 Sheets-Sheet 1

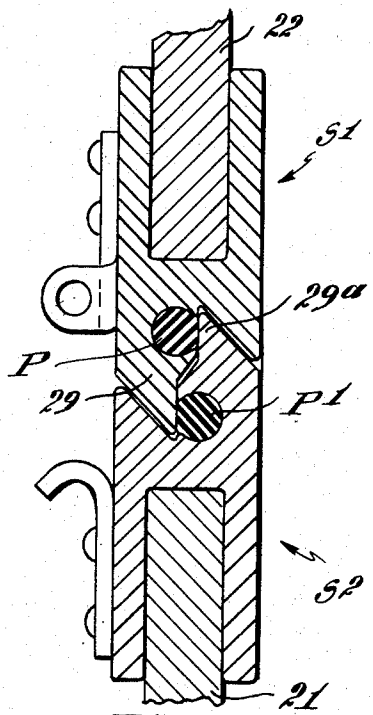


FIG. 1

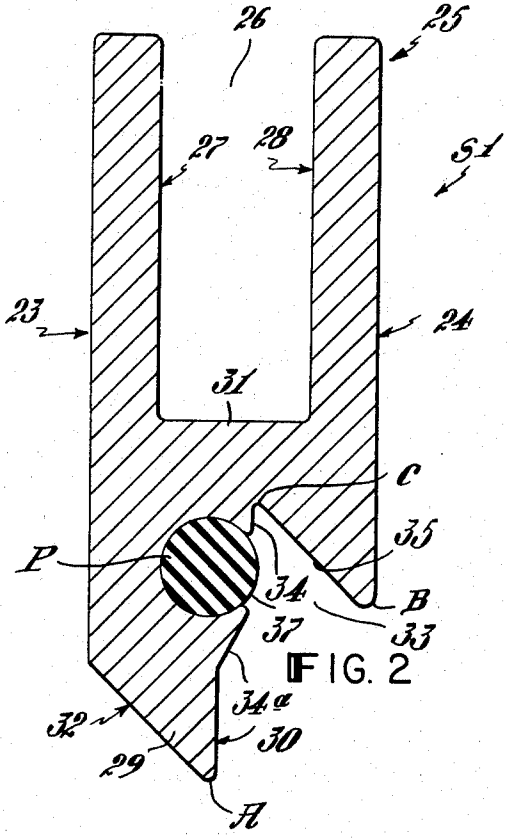


FIG. 2

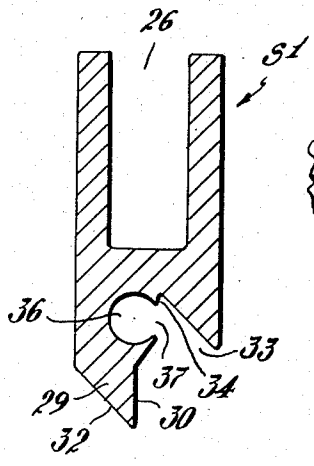


FIG. 2a

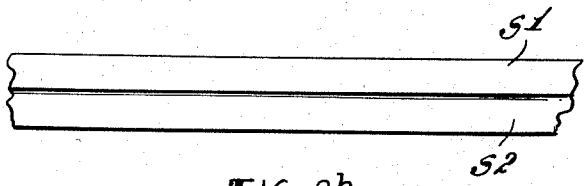


FIG. 2b

INVENTOR.
OLIVER W. ROBERTSON

BY

Roberts Cushman & Grover

ATT'YS.

Oct. 6, 1959 O. W. ROBERTSON 2,907,492

PRESSURE SEAL FOR CONTAINERS

Filed Feb. 21, 1958 4 Sheets-Sheet 2

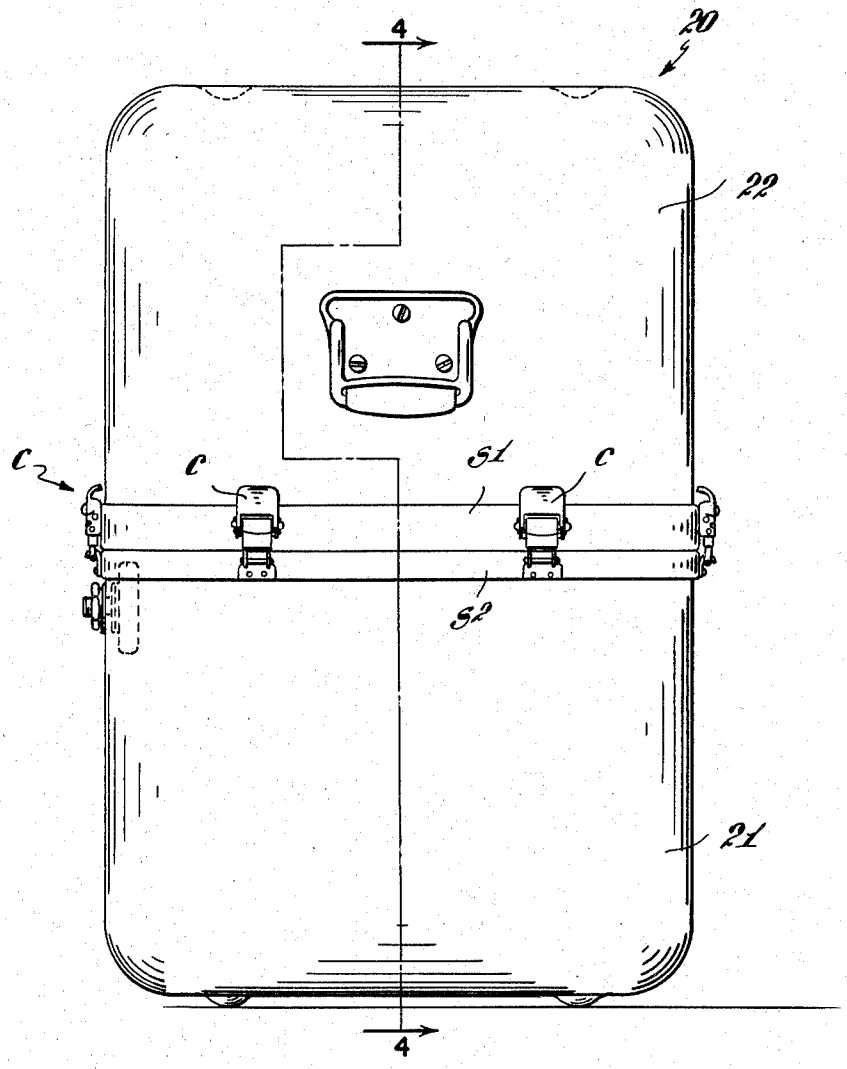


FIG. 3

INVENTOR.
OLIVER W. ROBERSTON

BY

ATT'YS

Oct. 6, 1959 O. W. ROBERTSON 2,907,492

PRESSURE SEAL FOR CONTAINERS

Filed Feb. 21, 1958 4 Sheets-Sheet 3

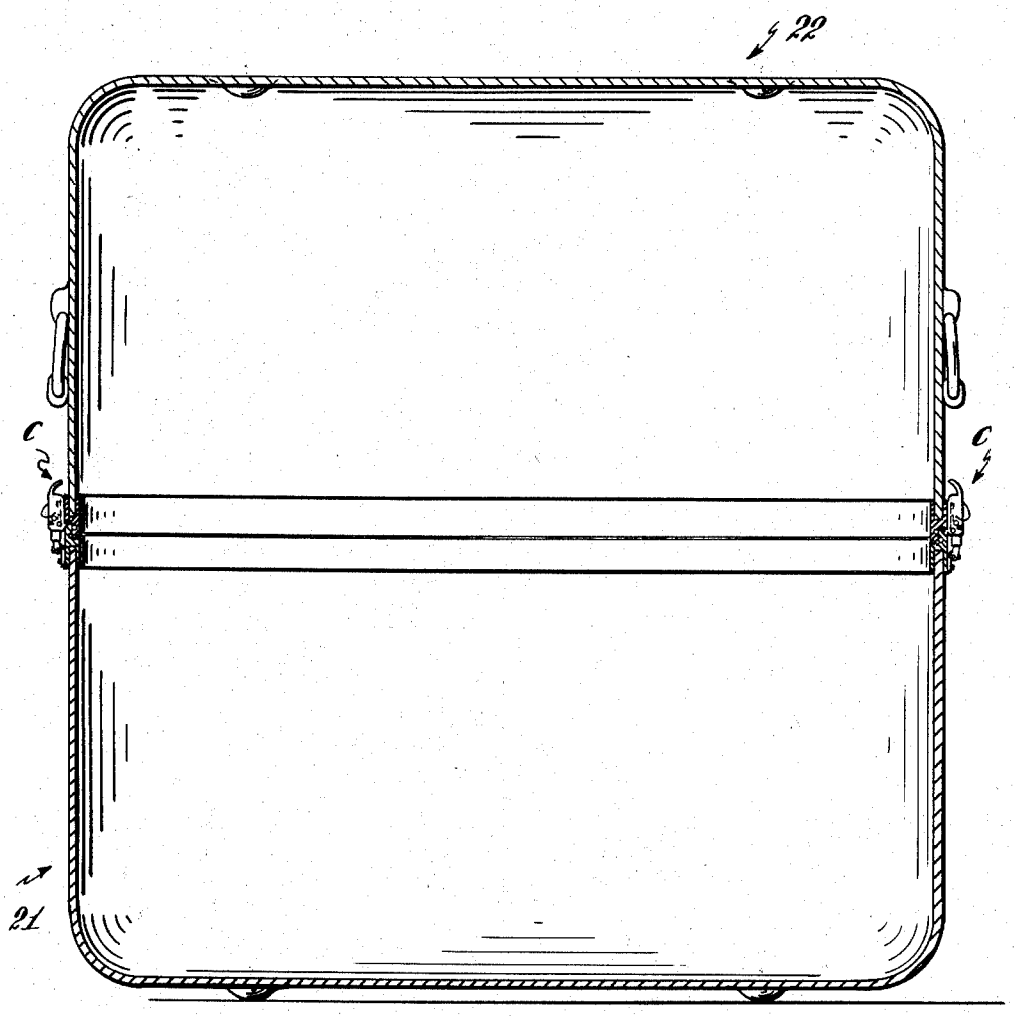


FIG. 4

INVENTOR.
OLIVER W. ROBERTSON

BY

ATT'YS.

Oct. 6, 1959 O. W. ROBERTSON 2,907,492

PRESSURE SEAL FOR CONTAINERS

Filed Feb. 21, 1958 4 Sheets-Sheet 4

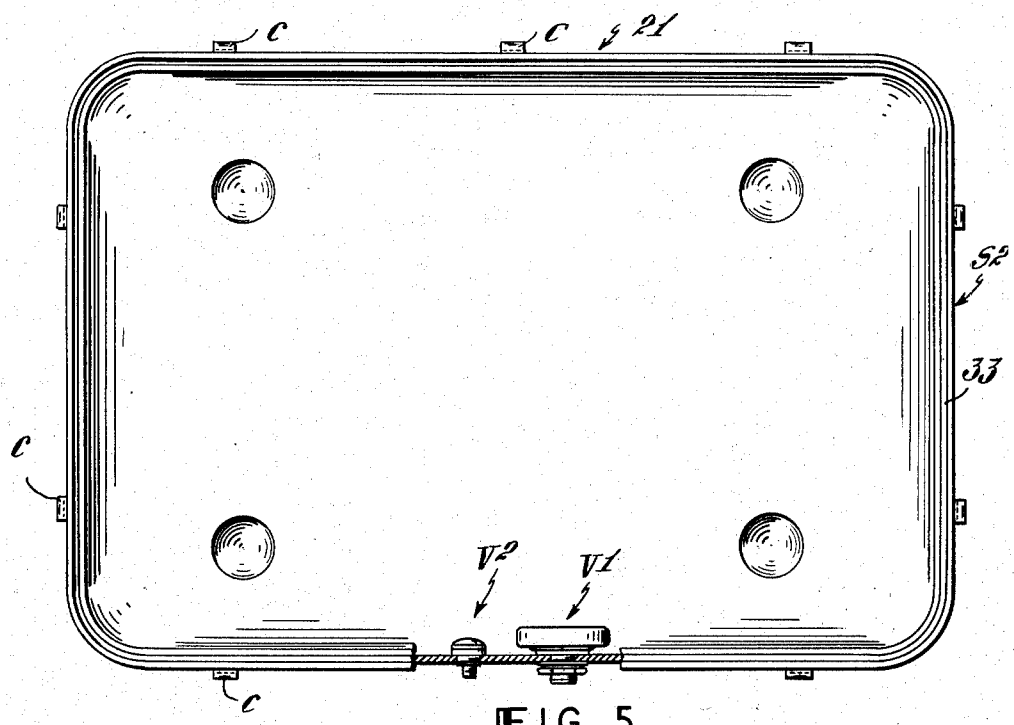


FIG. 5

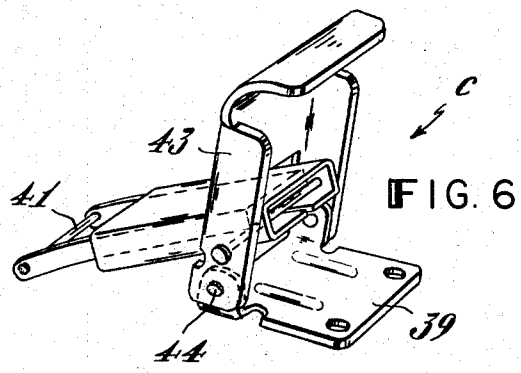


FIG. 6

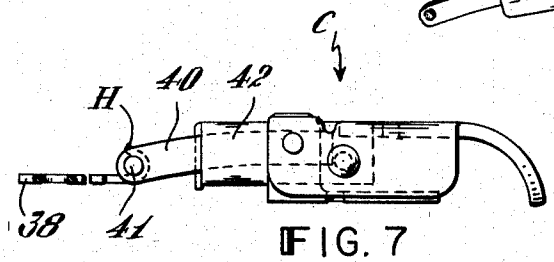


FIG. 7

INVENTOR.
OLIVER W. ROBERTSON
BY
Roberts Cushman & Groner
ATT'YS.

United States Patent Office 2,907,492 Patented Oct. 6, 1959

2,907,492

PRESSURE SEAL FOR CONTAINERS

Oliver W. Robertson, Brookline, Mass.

Application February 21, 1958, Serial No. 716,743

10 Claims. (Cl. 220—81)

This invention pertains to containers of the kind wherein normally assembled but separable parts define a chamber wherein fluid pressure, different from that outside of the container, is to be maintained, and relates more especially to an improved pressure seal designed to provide a pressure-tight joint between adjacent parts of the assembly.

While of more general application, the invention is of a special utility in the aeronautical field, wherein so-called "pressurized" compartments, in which the air pressure is kept substantially constant regardless of the elevation to which the airplanes may rise, are commonly employed. Such a compartment may, for example, take the form of a shipping container for use in shipping devices or materials which may be injuriously affected by exposure to low pressure or to rapidly varying pressure. For specific instance, certain types of scientific instruments, having parts which are extremely sensitive to pressure variations must be protected against such variations in pressure during shipment.

An object of the present invention is to provide an air-tight container comprising a casing or shell consisting of two or more assembled but separable parts and wherein, when such parts are assembled, the interior of the container is safely sealed against leakage of air either inwardly or outwardly. A further object is to provide a rigid walled container comprising a plurality of assembled parts and with sealing means at the junctions of adjacent parts, the sealing means being so devised that it is not destroyed when the parts are separated but is effective to provide a dependable seal during repeated uses. A further object is to provide sealing means of any desired length for application to the marginal portion of sheet metal or other material of uniform thickness. A further object is to provide a novel sealing device comprising complementary parts for application to the opposed edges respectively, of two container members and wherein the complementary parts of the seal are of identical size and shape so that they can be made by the use of the same mold or die. A further object is to provide a sealing device wherein a resilient packing or gasket element is employed but wherein such packing or gasket is subjected to but slight deformation and is thus capable of repeated use. A further object is to provide sealing means having inclined mating faces so devised that when the parts are forced together no substantial unbalanced component of force is developed in a direction transverse to the container wall. A further object is to provide a sealing device comprising complementary rigid parts having opposed inclined contacting faces of substantial extent and with resilient packing means so located between said parts as to be compressed transversely as said inclined contacting faces are brought into engagement. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein:

Fig. 1 is a transverse section, to large scale, showing

portions of the walls of a container base and cover with sealing means according to the present invention applied thereto.

Fig. 2 is a transverse section, to larger scale than Fig. 1, showing a single one of the sealing members;

Fig. 2*a* is a view like Fig. 2 but omitting the packing gasket;

Fig. 2*b* is a small scale, fragmentary front elevation showing two lengths of sealing strip, embodying the present invention, in assembled relation to each other, but unattached to any other part;

Fig. 3 is an end elevation of a container, comprising upper and lower parts, provided with clamping means for connecting the parts and for drawing the sealing means into operative assembled relation;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3;

Fig. 5 is a plan view, partly in section, showing the bottom or base member of the container, the top member being removed, and illustrating one of the complementary sealing strips as it is applied to one of the container members;

Fig. 6 is a perspective view illustrating a clamping device, such as may be employed for drawing the two container members into assembled relation; and

Fig. 7 is a side elevation of the same clamping device with its parts positioned as they appear when holding the container parts in assembled relation.

Referring to the drawings, the numeral **20** (Fig. 3) designates a container having the sealing means of the present invention embodied therein. As illustrated, this container comprises the bottom or base member **21** and the top or cover member **22**. These parts may be of any suitable material with reference to the particular purpose for which the container is intended; but, if the container is for airplane use, it is suggested that the wall of the container may be of molded fiber glass impregnated with a polyester resin and with an embedded steel reinforcement if desired. Merely by way of illustration and without any limitation, a shipping container for aeronautical use, such as here illustrated, may be substantially rectangular in horizontal section and of a transverse width of the order of twenty-eight inches and a front-to-rear width of the order of eighteen inches and with a total height of the container of the order of twenty-eight inches. As illustrated, the edges and corners of this container are smoothly rounded and the wall of the container is of substantially uniform thickness. A wall thickness of approximately 5/16 of an inch is suggested for a container of the above dimensions and of the material suggested for illustration. Obviously, the above dimensions are merely by way of example and in no sense limiting. The bottom **21** and the cover or top **22** are here illustrated as of the same depth and of identical dimensions otherwise and, when they are assembled, the lower edge of the top or cover **22** is in accurate registry with the upper edge of the lower part **21**. In accordance with the present invention, the joint between the bottom member **21** and the cover **22** is made air-tight by the sealing means now about to be described. The sealing means employed comprises two sealing strips S1 and S2 (Fig. 2*b*) of identical shape in transverse section and so designed that the strips may be made by an extrusion process, for example from aluminum or aluminum alloy, thus permitting the strips to be made in unlimited lengths from which suitable pieces may be cut for use in making a seal for any size container, or to provide a seal between two parts which need not necessarily form elements of a container.

As illustrated, in Figs. 2 and 2ª, the strip S1, which is here selected for specific description and which is the one shown as associated with the cover **22**, is of a gen-

erally rectangular contour in transverse section, having the flat and parallel outside and inside faces 23 and 24, respectively. The strip S1 has the upper face 25 which is perpendicular to the faces 23 and 24. In this face 25, there is formed a deep longitudinally extending slot 26 having the parallel side walls 27 and 28 which are spaced apart a distance such as to permit the lower marginal portion of the wall of the cover 22 to be fitted snugly into the slot. For a container of the above-described dimensions, the slot is desirably of approximately ¾ of an inch in depth, the lower wall 31 of the slot being horizontal, that is to say, parallel to the plane of the joint between the bottom and cover of the container. In assembly the strip S1 with the cover, the lower edge of the cover is forced down into the slot 26 and the parts may be permanently bonded together air-tight in any suitable way according to the materials employed; for example if the wall of the cover be of the material above-suggested, the strip may be bonded to the cover by the employment of a suitable cement.

The lower edge of the strip S1, as shown in Figs. 2 and 2a, is shaped to provide the tongue 29 which is of substantially triangular shape in transverse section and which has one face 30 which is flat and perpendicular to the surface 31, that is to say, to the plane of the joint which is to be formed. This tongue 29 also has the inclined face 32 hereafter referred to as the outer "contact" or "cam" face extending downwardly from the outer face 23 of the strip and converging toward the face 30 at an angle of 45°. Preferably, the faces 30 and 32 do not meet at an acute edge but merge to form a smoothly rounded edge A which may, for example, be of a radius of 1/64 of an inch.

At the same or lower end of the strip S1, the latter is provided with a recess 33 which is of substantially triangular transverse section, having the face 34 (hereafter referred to as the "grooved" face) which is perpendicular to the surface 31 and thus parallel to the face 30 of the tongue, but which is spaced from the plane of the face 30 a distance, for example of the order of 1/16 of an inch. The recess 33 also has the face 35 hereafter referred to as the inner "contact" or "cam face" which is parallel to the face 32 of the tongue and thus converges toward the face 34 to make an included angle of 45°. The faces 34 and 35 do not intersect to form an acute angle but merge in a smooth curve at C of a radius, for example of 1/164 of an inch. The face 35 of the recess also converges toward the outer face 24 of the strip S1, but merges with the latter in a smoothly curved edge B of a radius, for example of 1/32 of an inch.

The strip S1 is provided with an internal groove 36 or channel of approximately circular transverse section with its center to the left of the plane of face 35. However, the center of the circle is so located that the periphery of the circle intersects the wall 34 so as to leave a slot 37 (Fig. 2a) leading from the groove into the recess 33 at a point opposite the wall 35. The groove or channel 36 is thus actually segmental in transverse section and, for example, of an arcuate extent of approximately 270°. Below the slot the wall 34 has a continuation 34a which intersects the compression face 30. Within this groove, there is located a normally circular body P of resilient packing material, for example rubber, which normally protrudes from the slot 37, as illustrated in Fig. 2, so that it projects a short distance beyond the plane of the face 34.

A suitable length of the strip material S1 is cut and bent at the proper points so that this strip may be fitted onto the lower margin of the wall of the cover 22 and the meeting ends of the strip may be welded or otherwise united so as to form a continuous, uninterrupted sealing element, extending about the entire periphery of the cover. Another similar length of the material is cut to form the strip S2 and this strip, having been bent to the proper shape is applied to the upper edge of the base 20 of the container. The packing material P may be introduced into the groove 36 before or after the desired length has been cut from the strip material. The strips S1 and S2 are permanently bonded, air-tight to the cover and face in any suitable manner as above suggested.

It will be noted from Fig. 1 that the strips S1 and S2, when thus applied are arranged in reverse relation so that the tongue 29 of the strip S2 is at the outside of the container while the tongue 29a of the strip S1 is located nearer to the inside of the container. When the cover is applied to the bottom member 21, the tongue 29a enters the recess 33 of the strip S1, while the tongue 29 enters the corresponding recess of the lower strip S2. As the tongues enter the recesses, the inclined contact or cam face 32 of the tongue of one strip engages the inclined contact or cam face 35 of the recess of the opposite strip and these surfaces act as cams, tending to force the strips transversely toward each other. In so doing, the "compression" face 30 of one strip contacts the protruding portion of the packing P of the opposite strip and, as the tip of each tongue nears the bottom of the corresponding recess, the face 30 compresses the packing member P transversely, thus providing a pressure-tight seal wherein the packing is subjected only to transverse pressure and a limited amount of deformation. It will be noted that in assembling the two strips, the tip of the tongue of one never actually bottoms in the inner end of the recess of the other, so that the approach of the two strips is limited by the opposition of the packing member to compression. Thus, a very reliable and substantially perfect seal is provided.

For drawing the strips toward each other in attaining the above result any desirable means may be provided. However it is preferred to provide the container with a series of toggle-type clamps such as illustrated, for example, in Figs. 6 and 7. These clamps C (Fig. 5) are arranged in spaced relation about the periphery of the container, for example, at intervals of from six to nine inches apart. The clamps here illustrated, are of a conventional type, each clamp having an anchoring element 38 (Fig. 7) which is secured, for example by welding or riveting, to the strip S2 (as here illustrated) and a second anchoring element 39 (Fig. 6) is similarly attached to the strip S1. The anchoring element 38 is provided with a hook member H (F27) which, after the cover has been put in place, is engaged by a pintle 41 carried by the spaced parallel arms of a lever device 42 which is hinged to an actuating lever 43 which is pivotally secured at 44 to the anchoring member 39. When the parts 41 have been engaged with the hooks H of the anchoring members 38, the levers 43 are swung downwardly toward the anchoring members 39 and, in so moving, exert force tending to draw the cover 22 downwardly toward the bottom member 21, thus forcibly pulling the sealing strip S1 downwardly toward the sealing strip S2. There is thus provided a secure and reliable seal throughout the entire periphery of the container, although this seal is such as may readily be broken by swinging the lever members 43 downwardly when it is desired to remove the cover from the container. For certain purposes, it may be desirable to regulate the air pressure within the container, and for this purpose, valves indicated at V1 and V2 of any suitable type may be fixed in the container wall at desired points.

As already noted, the sealing strips S1 and S2 are identical in shape and dimensions and are of a design such that they may be made by an extrusion process, thus greatly lessening the cost of production as compared with sealing means of usual prior types in which the seals have involved specially made castings or machined parts.

While, as above stated, certain dimensions have been suggested, it is to be understood that these are merely by way of example and with reference to good proportions, but that for any particular use other dimensions

may be preferred in accordance with the particular requirements.

While a desirable embodiment of the invention has been illustrated and described by way of example, it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claims.

I claim:

1. A pressure seal comprising two like strips of material of the same transverse dimensions, each strip having a recess in one edge and a tongue projecting from the same edge, the tongue of one strip being constructed and arranged to fit snugly within the recess of the other strip, each strip having an internal groove which extends from end to end of the strip and which opens into the recess of said strip at a point spaced from the bottom of the recess, a body of resilient packing material filling the groove and which protrudes into the recess, the tongue of each strip having a flat face for contact with the protruding portion of the packing carried by the other strip, the tongue of one strip and a wall of the recess of the opposite strip having inclined cam faces which contact when the strips are assembled and which act, as the strips are moved edgewise toward each other, to force the flat faces of the tongues of the two strips into compressive engagement with the protruding portions of the packings of the opposite strips respectively.

2. A pressure seal comprising two complementary parts of identical size and shape in transverse section, each having a tongue and a recess, the tongue and recess being of such transverse sectional shape that the tongue of each of said parts may be fitted within the recess of the other of said parts, the recess of each part having an inclined face and the tongue of each part having a similarly inclined face, the inclined face of the tongue of one of said parts contacting the inclined face of the recess of the other of said parts when they are assembled, each of said parts having therein an internal groove in which there is housed a body of resilient packing material, the groove being of such shape, in transverse section, as to retain the packing material but being open at one side of the recess so that the packing protrudes into the recess, and each of said parts having a face which, when the parts are assembled, presses laterally against the protruding portion of the packing.

3. A pressure seal comprising two elongate strips of metal of identical size and of a transverse section such that each strip may be made by the extrusion process, each strip having flat, parallel outside faces, an edge face having a deep groove of substantially rectangular transverse section disposed midway between the side faces of the strip, the opposite edge of the strip having a recess, one wall of which is flat and parallel to the adjacent outer face of the strip, and another wall of which is inclined to said outside face, the included angle between said walls being acute, the strip also having a projecting tongue at its last-named edge, one face of the tongue being parallel to the adjacent outside face of the strip and another face of the tongue being inclined, with the included angle between said faces of the tongue equal to the included angle between the aforesaid walls of the recess, the inclined face of the tongue and the inclined face of the wall being parallel, each strip having an internal segmental groove extending from end to end thereof, the groove opening into the recess at a point spaced from the bottom of the latter and at the opposite side from the inclined wall of the recess, and a body of resilient packing material filling said groove and protruding into the recess.

4. A pressure seal comprising two complementary parts of identical shape and size in transverse section, each having a tongue of triangular shape in transverse section, and a recess of substantially triangular shape in transverse section, the tongue having a compression face and the recess having a grooved face, said faces being parallel and spaced apart transversely of the seal, and the tongue and recess each having a contact face, said contact faces being parallel and intersecting the grooved face and compression face at angles of 45°, each of the two parts of the seal having an internal groove of segmental transverse section, exceeding 180° in arcuate extent, which opens at the groove face, and a body of resilient packing material of normally circular transverse section filling the groove and protruding beyond the plane of the grooved face, the tongue of one of said parts being disposed within the recess of the other of said parts when the seal is operatively assembled and with the pressure face of each respective part engaging the protruding portion of the resilient packing of the other of said parts.

5. A pressure seal comprising two complementary parts of identical size and of a shape such that they may be made by an extrusion process, each part being an elongate strip of metal comprising a body portion of approximately rectangular transverse section having spaced parallel outside faces, one edge of the strip having therein a groove of symmetrical transverse section, and the opposite edge of the strip having a tongue of substantially triangular shape in transverse section, one face of which is parallel to the nearest outside face of the strip and another face of which is inclined, the included angle between said faces of the tongue being of the order of 45°, said last-named edge of the strip also having therein a recess, one wall of which is parallel to the nearest outside face of the strip, and another wall of which is inclined, the included angle between said walls of the recess being of the order of 45°, the aforesaid inclined face of the tongue and the aforesaid inclined wall of the recess being parallel, that face of the tongue and that wall of the recess which are parallel to the outside faces of the strip being spaced apart transversely of the strip and at equal distances from the vertical mid-plane of the strip, and packing material which is exposed within the recess but which is spaced from the bottom of the recess.

6. In combination, a container having a rigid shell comprising parts having opposed edges of substantially the same peripheral contour and size and which when assembled, with said edges in registry, define an interior chamber, means for sealing the joint between said opposed edges comprising two like strips of rigid material, each having a slot at one edge for the reception of the edge of one of said container parts respectively, and each having at its opposite edge an inner and an outer inclined contact face and a groove of segmental transverse section open toward its inner inclined face, the inclined outer contact face of one strip engaging the inclined inner contact face of the other strip when the parts are assembled, and a mass of resilient material filling the groove in each respective strip and normally protruding outwardly from the groove toward the inner inclined contact face of said strip, each strip also having a compression face substantially perpendicular to the plane of the joint and which presses transversely against and compresses the resilient material protruding from the groove of the opposite strip when the parts are assembled, and means for drawing the parts of the shell toward each other.

7. In combination, a container having a rigid shell whose wall is of substantially uniform thickness and which comprises two complementary parts having opposed edges of substantially the same peripheral contour and size, and which when assembled, with their said edges in registry, define a closed interior chamber, means sealing the joint between said opposed edges comprising a sealing strip extending along the edge of each of said container parts respectively, each strip having a slot in which the edge of the corresponding container part is secured, and each strip having a pair of spaced, parallel, inclined inner and outer contact faces extending inwardly from its opposite sides respectively, each strip also having a compression face which is perpendicular to the plane of the

joint between the parts of the shell, and each strip also having a groove of segmental transverse section which opens toward its inner inclined contact face and a mass of resilient material filling each of said grooves and which normally protrudes toward the inner contact face of the respective strip.

8. In combination, a container having a rigid shell and which comprises two complementary parts having opposed edges of substantially the same peripheral contour and size and which when assembled with their said edges in registry, define a closed interior chamber, means for sealing the joint between said opposed edges comprising a sealing strip which extends along the edge of each of said container parts respectively, the two strips being identical in size and shape and each comprising a body portion of generally rectangular shape in transverse section having substantially parallel inner and outer faces, and each strip having an edge provided with a slot in which the marginal edge portion of the corresponding container part is secured, the opposite edge of each strip having a recess of substantially triangular transverse section defined by a grooved face and an inclined inner contact face which extends inwardly from one of said side faces of the strip, and a tongue of triangular transverse section which is defined by a compression face, perpendicular to the plane of the joint and parallel to said grooved face and an inclined outer contact face parallel

to and spaced from the aforesaid inner contact face and which extends inwardly from the other side face of the strip, the strip having a groove of segmental transverse section which opens at said grooved face, and a normally circular body of resilient material filling said groove and normally protruding therefrom.

9. The combination according to claim 8, wherein the two strips are so arranged that when the parts are assembled the triangular tongue of one strip is housed within the triangular recess of the other strip and with the compression face of one strip contacting the protruding portion of the body of resilient material held in the groove of the other strip.

10. The combination according to claim 8, wherein the segmental groove which holds the body of resilient material is of the order of 270° in arcuate extent.

References Cited in the file of this patent

UNITED STATES PATENTS

1,389,542	Werely	Aug. 30, 1921
1,574,710	Spreen	Feb. 23, 1926
2,717,093	Mauther	Sept. 6, 1955
2,803,368	Koch	Aug. 20, 1957

FOREIGN PATENTS

501,288	Germany	Aug. 13, 1926