United States Patent

[11] **3,570,704**

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[54] **PRESSURE COOKERS**
5 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** **220/44,** 99/234, 99/450, 126/369, 277/207
[51] **Int. Cl.** **B65d 51/16**
[50] **Field of Search** ..... 99/450, 234 (A), 449, 450, 418, 415, 416, 339, 340; 220/44, 25, 55 (P.C.); 126/(Inquired), 369; 277/207, 209

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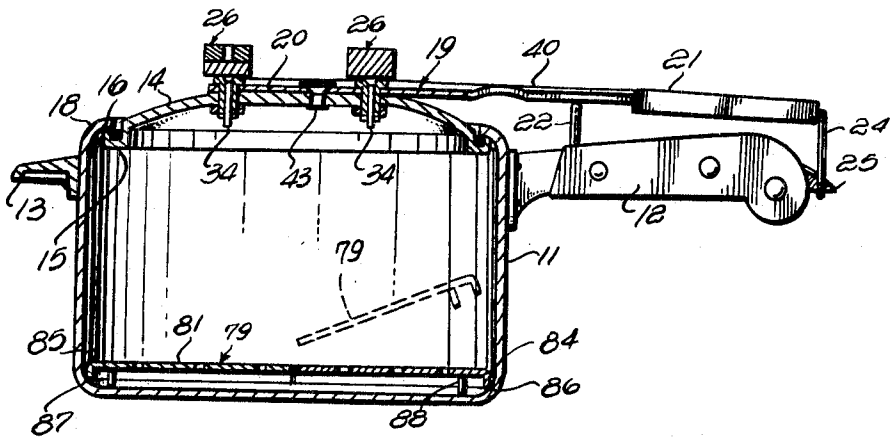
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ABSTRACT: Pressure cooker with a simple and easily operable valve system which includes a stopper with an external counterweight that can be optionally lifted with a manually rotatable cam system. A two-part food carrying grid may be inserted which has means for supporting the same a certain distance from the inner bottom of the cooker.

A deformable, annular gasket is used between the lid and the inwardly turned rim of the cooker vessel, the gasket having a projection, which is in intimate sealing contact with portions of the lid and the rim, except for an outer side surface which has freedom of expansion when the gasket is deformed in its sealing position. The projection may be given different transitional engaging areas.



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SHEET 1 OF 3

FIG. 1

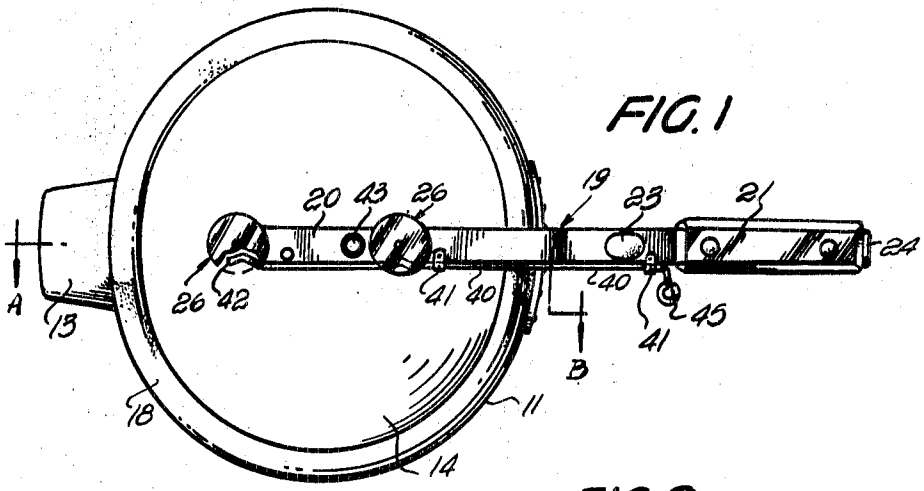


FIG. 2

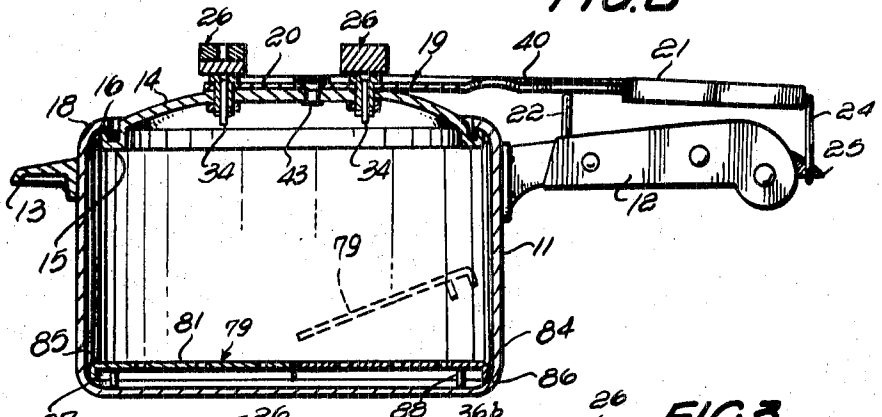


FIG. 3

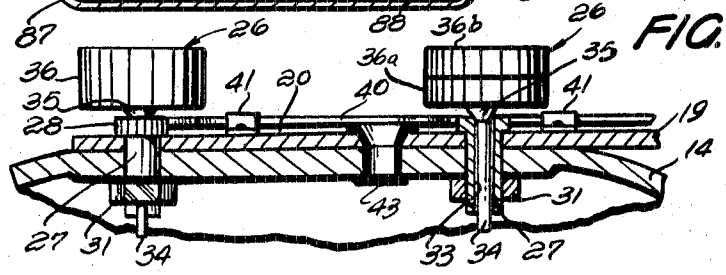
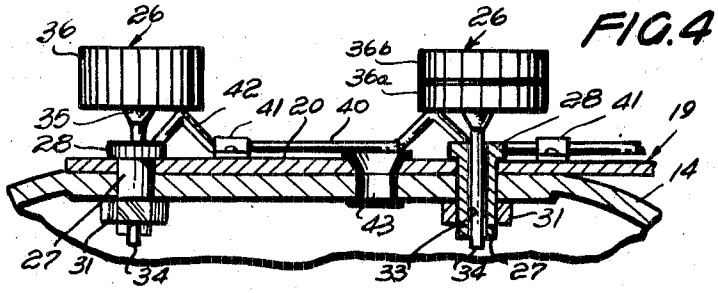


FIG. 4



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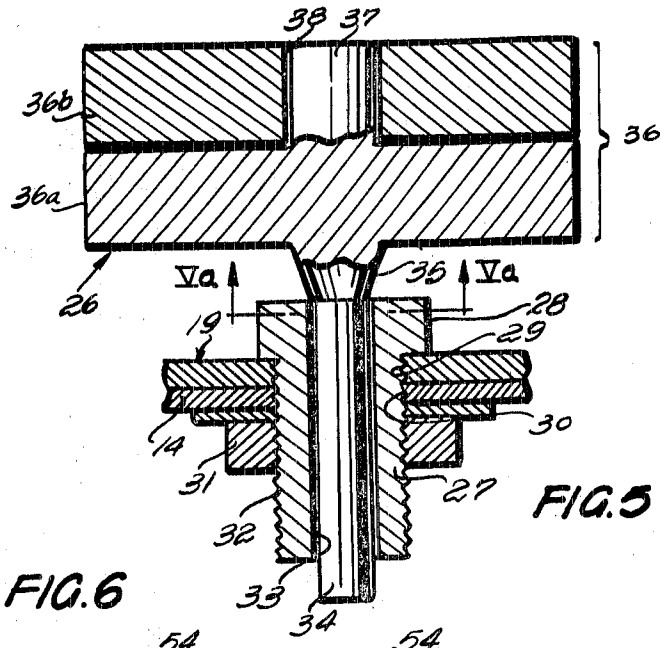


FIG. 5

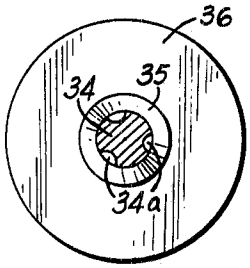


FIG. 5a

FIG. 6

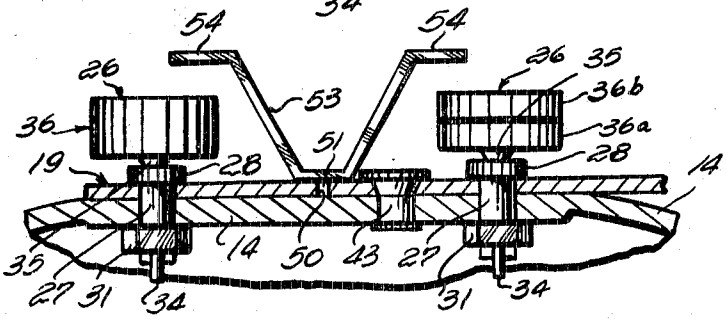
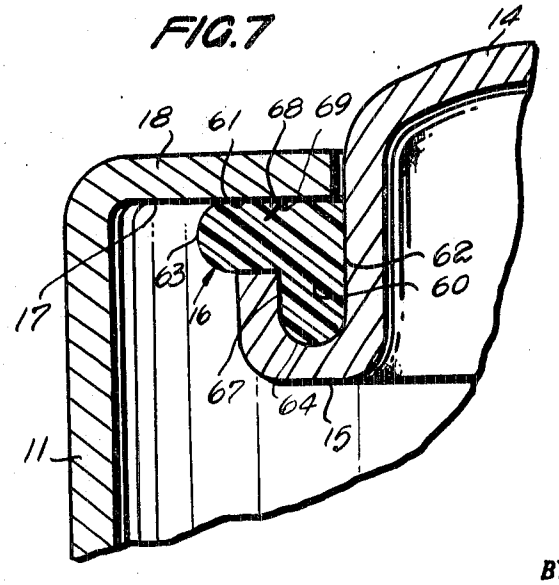


FIG. 7



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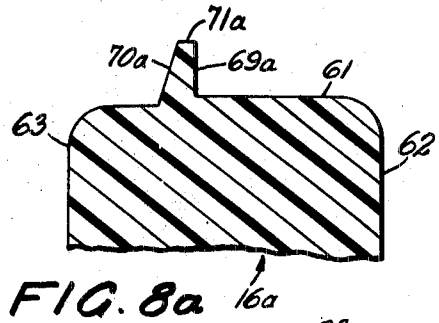


FIG. 8a

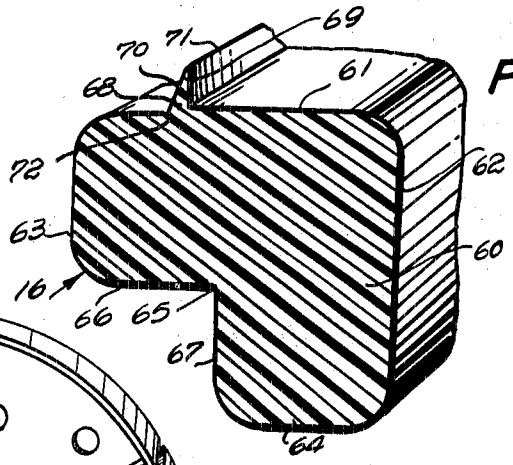


FIG. 8

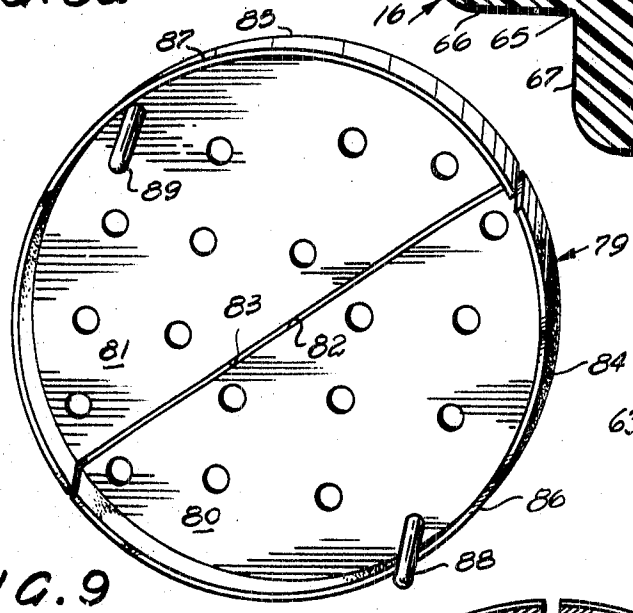


FIG. 9

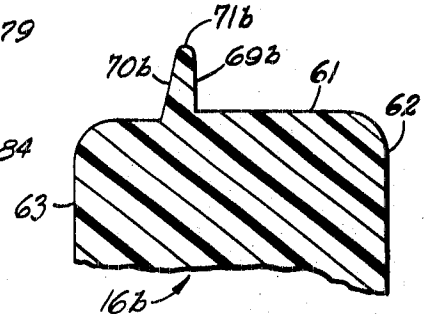


FIG. 8b

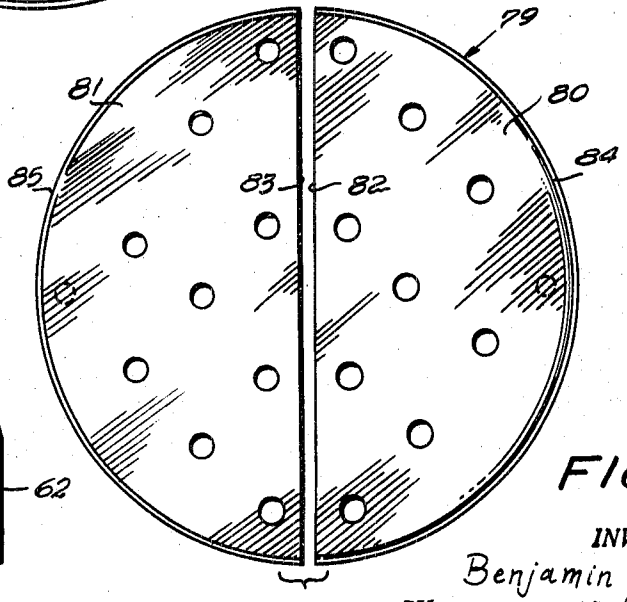


FIG. 10

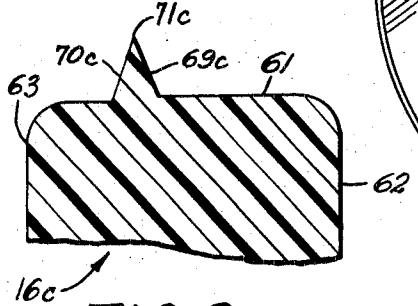


FIG. 8c

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PRESSURE COOKERS

The present invention relates to pressure cookers.

It is a well known fact that the common cooking pot works with an uneven heat distribution, since heat at the bottom thereof is greater than at higher levels.

Advantages of pressure cookers over the common pot reside in the fact that internal temperature is uniform throughout the former, and said temperature is invariable during cooking whatever the amount of heat applied may be, provided the cooker's valve allows proper exhaust of excess steam.

The several known pressure cookers are subject to a series of disadvantages, as follows:

1. Care must be taken before using the pressure cooker that the valve be perfectly clean;

2. During the cooking, the user is forced to watch the operation of the pressure cooker, because when steam begins to escape through the valve, heat must be reduced.

3. To open prior art pressure cookers, cold water must be poured over them to condense the steam and thus annul the pressure inside.

4. Since to open the pressure cooker the user must first douse it with cold water, it becomes impossible for him to open it readily at any moment during the cooking process, either to control the process or to add materials requiring less cooking time than those originally loaded.

5. As uncovering the pressure cooker is a bothersome task, the cook must control cooking time as exactly as possible by means of previously worked out timing tables, for if the pressure cooker is opened before cooking is completed, it shall be necessary to heat it up again.

6. Furthermore, despite any amount of precautions, there is always the danger of obstruction of the valve (either in the valve passage, the labyrinth, or both).

All the above-described disadvantages are the reasons why the pressure cooker has not been widely adopted by housewives; understandably they are unwilling to put up with the inconveniences in the handling and the risks involved in the use of prior art pressure cookers.

It is therefore an object of this invention to provide a pressure cooker wherein the above described disadvantages have been eliminated.

Since obstruction of the valve passages is impossible in the inventive cooker, decompression is allowed, without need of pouring cold water over it, by the simple expedient of raising the valve.

It is another object of the present invention to provide a self-cleaning valve system for pressure cookers, which does not require any special care in use.

Still another object of this invention is to free the user from having to watch the pressure cooker operation.

By means of the valve system of the invention, the user need not keep watch over the pressure cooker awaiting the initial issue of steam through the valve. When steam begins to flow out, the user may lower the heat to save fuel, but there is no absolute need to do this. On the other hand, one has the certainty that if there is no discharge of steam it is because the internal pressure has not yet reached the suitable value, while with conventional pressure cookers the user is always assailed by the doubt that steam may not be issuing due to an obstruction in the valve.

It is a still further object of the present invention to provide a valve system having a valve passage wherein no solid particles can become lodged because the valve stem will prevent it.

It is another object of the present invention to provide a pressure cooker which can be safely used for cooking in moving vehicles.

According to the present invention a valve is provided which works in perfect equilibrium, and at the same time is prevented from being shot out, in the case of a sudden violent movement of the vehicle. This is accomplished by the provision of a simple retaining device which, while allowing the valve full freedom for operative movement, prevents its being thrown out by violent lurching of the vehicle.

It is still another object of the invention to provide a pressure cooker with a valve system wherein, even when the valve passage is obstructed, the valve may be expelled by the cooker's internal pressure.

In the valve system of the present invention any possible but unlikely obstruction would be momentary; since the valve member, if seated, is at all times in contact with the internal pressure through the intermediary of the valve stem. If two exhaust valves are provided in the cooker according to the invention, the degree of safety is further enhanced.

It is a still further object of the present invention to provide a pressure cooker with a valve system which allows decompression of the cooker and elimination of steam inside without need of cooling the cooker and causing condensation of the steam contained therein.

By means of the valve system of the invention, steam is discharged in 30 seconds, at most, through the valve passage, thus allowing a prompt uncovering of the pressure cooker, which on being covered back will regain in another 30 seconds the normal internal pressure. Furthermore, since steam is exhausted from the cooker, no condensation in droplets falling on the food will ensue.

A further object of this invention is to provide a lid having a gasket which will take up all deformations that may be produced in the internal under surface of the cooker's inturned flanged edge, while compensating for deformation of the flat surface of the gasket and preventing sticking thereof to said under surface of the flanged edge when the lid is removed.

It is finally a still further object of the invention to provide a food-carrying grid for pressure cookers, which covers the whole circular inside surface of the cooker, said grid being formed in two separate semicircular halves of perforate sheet metal, capable of being supported at a convenient distance from the bottom, each semicircle having support means providing suitable positioning thereof.

With the purpose of rendering the invention clearly understandable, the following description is given with reference to preferred examples of embodiments, with a purely illustrative but not limitative intention, it being hereby expressly stated that the scope of the present invention is defined in the claims attached hereto. In the drawings:

FIG. 1 is a top plan view of a pressure cooker according to the present invention;

FIG. 2 is a sectional view taken along line II–II in FIG. 1, wherein the dotted lines show the manner of placing the food carrying grid;

FIG. 3 shows a partial section of the valve system, when the valves are seated;

FIG. 4 shows a section similar to FIG. 3, wherein the valves are in their raised position to allow decompression of the cooker;

FIG. 5 illustrates a longitudinal section of one of the valves in the pressure cooker according to the present invention;

FIG. 5*a* is a sectional view of the valve stem, with three exemplary grooves therein, taken along line V*a*–V*a* of FIG. 5;

FIG. 6 is a sectional view similar to FIG. 3, wherein the retaining device has been applied for using the pressure cooker in moving vehicles;

FIG. 7 shows a partial sectional view of the airproof seal of the pressure cooker of the present invention wherein the improved gasket has been installed;

FIG. 8 is a cross section of the improved gasket alone, used in the pressure cooker of the present invention, as shown in FIG. 7;

FIGS. 8*a*, 8*b* and 8*c* show alternative embodiments of the resilient, deformable, annular gasket as shown in FIG. 8;

FIG. 9 illustrates a perspective view of the food carrying grid, as seen from below; and

FIG. 10 shows a top plan view of the grid illustrated in FIG. 9.

The pressure cooker of the present invention comprises a cooking vessel indicated generally at 11, provided with a handle 12 and a grip 13 diametrically opposed to handle 12. The

cooker is completed with a lid 14 provided with a peripheral lip 15 which receives a resilient gasket 16 bearing against a down-facing surface 17 of an in-turned flanged rim 18 of the cooking vessel 11. The opening defined by said flanged rim 18 and the peripheral contour of lid 14 have an adequate configuration, for example, an oval, which in one position permits insertion of the lid into the vessel, and subsequently a second position in which the flanged rim 18 overlaps gasket 16 and peripheral lip 15 or lid 14.

Lid 14 has a lid handle 19 having an end portion 20 fixed diametrically across lid 14 and an opposite end portion 21 extending beyond the periphery of lid 14 and projecting over handle 12 of cooking vessel 11.

Handles 12 and 19, respectively carry means for effecting pressure sealing of peripheral lip 15 of lid 14 with the down-facing surface of in-turned flanged rim 18 of vessel 11. In the embodiment herein illustrated said means are comprised of a pin 22 projecting upwards from handle 12, the free end of said pin engaging a centering recess 23, which acts as a fulcrum for handle 19, which at the end of portion 21 thereof carries a swinging ring 24, capable of locking into a hook 25 provided at the free end of handle 12 when lid handle 19 is resiliently flexed downward as pressure is applied on portion 21 thereof.

Handle 19 is secured to lid 14 by a pair of valves 26, of which only one will be described, as the two are similar. Valve 26 comprises a tubular body 27 with a peripheral flange 28 provided at the outer end thereof, said tubular body being disposed through respective coaxial openings 29 and 30 provided in handle 19 and lid 14 in such a manner that flange 28 bears against said handle 19, while the tubular body 27 of the valve is secured at its other end by means of a nut 31 tightly screwed on a threaded outer surface 32 of tubular body 27.

Valve 26 further comprises a stopper member of valve passage 33 in tubular body 27, said stopper member comprising a valve stem 34 having a diameter somewhat smaller than the internal diameter of valve passage 33 and being longer than the overall length of tubular body 27, valve stem 34 having at the upper end thereof a frustoconical valve seat 35 integral and concentric with a stopper member body 36 acting as a counterweight.

FIG. 5 constitutes a sectional view taken in FIG. 5, in upward direction and along line V*a*–V*a*, across the stem 34 but omitting the surrounding flange 28 for the sake of clarity. Three grooves are shown in this figure, as a matter of example, identified by numeral 34*a;* the valve seat and the stopper member 35, 36, respectively, are also visible, together with the bottom surface of the respective valve 26. This arrangement allows the passage of fluid between the stem and the valvular passage, along the grooves 34*a* provided in the stem.

Said stopper member body 36 is of a weight corresponding to the working pressure in the pressure cooker and in accordance with the cross section area of valve passage 33, whereby when pressure inside the cooker reaches a value which is higher than the pressure exerted by the weight of stopper member body 36 and valve stem 34, said excess pressure raises body 36 and stem 34 a slight distance to allow escape of inside pressure in cooking vessel 11, along and through stem 34, tubular passage 33 and valve seat 35.

To vary the working pressure in the cooker, the stopper member body 36, which is preferably cylindrical, may be formed with two sections 36*a* and 36*b*, the upper surface of section 36*a* having a cylindrical projection 37 fitting into a mating bore 38 disposed in section 36*b*.

Handle 19 carries on one lateral edge a rod 40 mounted adjacent valves 26, and arranged rotatably through clips 41 fixed to handle 19, said rod 40 being provided, in correlation with valves 26, with cams 42 located underneath stopper member body 36 of each valve 26, capable of engaging the under-surface of said bodies 36 and raising them when rod 40 is rotated by means of an arm 45 located at the rod end adjacent portion 21 of handle 19, said arm being rotated counterclockwise from its nonoperative position shown in FIG. 3 to its operative position shown in FIG. 4, whereby valve seats 35 are lifted off engagement with respective valve passages 33.

The assembly is completed by a synthetic material plug 43 arranged in a bore through handle 19 and lid 14, between valves 26.

In the embodiment illustrated in FIG. 6, handle 19 has a threaded bore 50 located between valves 26, wherein a threaded pin 51 is received, said pin being integral with a retaining member for valves 26, comprising a shaped element 53 that on its horizontal portion is integral with pin 51, while its free ends project into respective horizontal arms 54 extending partially over bodies 36 of valves 26 at a certain distance therefrom, sufficient for allowing normal raising thereof under the action of internal pressure within the cooking vessel, but preventing valve stems 34 from being pushed out from respective valve passages 33.

Gasket 16, according to the present invention as illustrated in FIGS. 7 and 8, is formed by a resilient body 60 generally in the form of a ring, of a configuration adapted to the configuration of lid 14 of the cooking vessel wherefor it is designated.

Body 60 comprises a substantially flat upper surface 61, an inner side surface 62, an outer side surface 63 of lesser width than inner side surface 62, and a lower surface 64 of lesser width than upper surface 61, the surfaces 63 and 64 defining a recess 65 in body 60, formed by surface portions 66 and 67, respectively.

The improvement of the present invention lies fundamentally in a continuous projection 68 extending from upper surface 61, closer to outer side surface 63 than to inner side surface 62. In the embodiment illustrated, said projection 68 is formed with a vertical inner wall 69, preferably perpendicular to upper surface 61, and an inclined outer wall 70 forming an acute angle 71 with inner vertical wall 69 and an obtuse angle 72 with upper surface 61, as clearly shown in FIG. 8.

It is important to note that in the described preferred embodiment, inner wall 69 and outer wall 70 form with upper surface 61 a triangular prism, this circumstance allowing flexing of projection 68 when it is pressed against down-facing surface 17 of in-turned flanged rim 18 and matching of said projection 68 with said planar surface, conforming to slight differences the latter may present.

It can be seen from FIG. 8 that the projection 68 is formed by the inner wall 69 and the outer wall 70, joining each other by their upper edges, to form a transitional area 71 which sealingly engages the down-facing surface 17 of the rim 18. It is important that the projection 68 has the described outer side surface 63 which is given freedom of expansion when the gasket 16 is deformed in its sealing position, the remaining surfaces of the gasket being in intimate sealing contact with the peripheral edge or lip 15 of the lid 14, on the one hand, and the aforementioned down-facing surface 17, on the other hand.

FIGS. 8*a*, 8*b* and 8*c* show alternative embodiments of the gasket 16 appearing in FIG. 8, in the form of respective gaskets 16*a*, 16*b* and 16*c*. The upper surfaces 61, inner side surfaces 62 and the outer side surfaces 63 are substantially the same as for gasket 16. These gaskets 16*a*, 16*b* and 16*c* have respectively a flat transitional area 71*a*, a rounded area 71*b* and a triangular transitional area 71*c*, as shown, flanked by respective inner walls 69*a*, 69*b* and 69*c*, as well as outer walls 70*a*, 70*b* and 70*c*. It will be seen from these figures that the continuous projections on the flat upper surfaces of the respective gaskets 16*a*, 16*b* and 16*c* placed in the lid 14 are formed by the respective inner sidewalls and the outer sidewalls joining each other, forming the transitional areas 71*a*, 71*b* and 71*c*, respectively.

A food-carrying grid 79 illustrated in FIGS. 2, 9 and 10 comprises two separate sheet members 80 and 81 each having a semicircular form and which when placed adjacently with their straight edges 82 and 83 in contact define a surface corresponding in configuration and dimensions with the configuration and dimension of the bottom of cooking vessel 11 as determined by the sidewalls thereof, for which it is desired to apply said grid 79.

Round edges 84 and 85 of respective sheet members 80 and 81 have down-turned flanges 86 and 87, respectively, extend-

ing all along said edges. Each of said sheet members 80 and 81 further has respective support means 88 and 89, each of said support means being arranged close to the round edge at the point most remote from the respective straight edge and at a point equidistant from the vertices formed by respective ends of the round and straight edges of each sheet member 80 and 81.

In the exemplary embodiment illustrated, support means 88 and 89 comprise cylindrical projections having semispherical bearing ends, but any similar shape as desired may be employed for the support means.

Operation of the pressure cooker of the present invention is remarkably very simple and has all the advantages listed in the opening passages of this specification.

In fact, when lid 14 is placed in cooking vessel 11, down-facing surface 17 of in-turned flanged rim 18 flexes projection 68 of gasket 16 in such a manner as to seat vertical inner wall 69 against adjacent upper surface 61, slightly deforming the latter, while inclined wall 70 abuts against down-facing surface 17 together with the remainder of upper surface 61. It is quite obvious that upon release of lid 14, after cooking has taken place, and on pressure against down-facing surface 17 being removed, projection 68 and side surface 63 will tend to return to their original pressure-free positions, thereby detaching upper surface 61 from said down-facing surface 17.

In the case where, due to knocks received by the pressure cooker, deformations or distortions have occurred in down-facing surface 17, such uneveness will be compensated for by projection 68, which tends to return to its erect position when pressed by lid 14 against down-facing surface 17.

The pressure cooker user, after hermetically closing same, places stopper members of respectively valves 26 in such a manner that stem 34 of each stopper member slides within valve passage 33 of the respective tubular body 27, whereby if any foreign matter or impurity should obstruct the valve passage, it will be dislodged therefrom upon insertion of stem 34. This feature is of paramount important, since it constitutes one of the main features giving the valves of the present invention their self-cleaning character.

The pressure cooker being now ready for use, with the materials to be cooked placed inside and the lid secured in position, it is placed on the stove burner for suitable heating, whereby pressure inside the cooker increases as internal temperature rises, until a pressure of, for example, about 10 p.s.i. (7 g/mm2, grams per square millimeter) is reached, this being the more usual working pressure in pressure cookers.

When said internal pressure is reached valves 26 are ready to start operating. That is to say, as soon as internal pressure increases beyond said value, rise of valves 26 and their respective stems 34 occurs, thus lifting valve seats 35 from engagement with the upper edge of respective tubular bodies 27, whereby escape of excess pressure in the form of steam is allowed.

In the assumed case that said spaces between stems 34 and tubular valve passages 33 are obstructed by food particles, valve 26 will not become isolated from the internal pressure and therefore will not be annulled in its effect, as in prior art pressure cookers, but instead pressure inside the cooking vessel will act on the lower end of valve stems 34, blowing the stopper member upwards when the pressure reaches a level above the working pressure, such as a 10 to 13 p.s.i. pressure.

Valves known up to date may become obstructed on account of the three following reasons:

a. small particles of food may become lodged in the valve passage, obstructing outflow of steam;

b. a food particle, without entering the valve passage, may adhere to the passage opening, obstructing outflow of steam;

c. when steam drags with it foam caused by starches or flours (rice, noodles, cereals, dried legumes, etc.), the valve labyrinth frequently becomes obstructed.

Regarding point a. —In the valve of the present invention, food particles cannot enter valve passage 33 because stem 34 prevents them from entering thereinto.

Regarding point b. —When a food particle is carried up to the opening of valve passage 33, it cannot remain adhered to the opening because the downward projecting end of valve stem 34 prevents this from happening. For such as obstacle to adhere to the opening of valve passage 33, it would have to push the stem upwards and to such an effect a pressure higher by 30 percent would be necessary than the pressure existing at that moment, but the latter cannot increase while the opening of valve passage 33 is not stopped.

Regarding point c. —It is a well known fact that in prior art valves, foam does not start by obstructing the valve passage, because while mixed with steam it flows easily. The problem starts when the foam leaves the valve passage and reaches the labyrinth, wherein the foam tends to adhere to hot surfaces in the labyrinth, forming a layer that quickly thickens and obstructs outflow of steam intermittently at the beginning, a complete obstruction frequently following said initial intermittent stage.

In the valve of the present invention, this type of obstruction cannot occur, because the valve 26 has no labyrinth at all: once the foam has passed the valve passage 33, it is out of the valve system. It should be noted that the valve passage 33 is not only one third the length of what other systems need.

It is clearly stated that the inventive pressure cooker employs two exhaust valves not in quest of a greater safety (this being unnecessary since the valve of the present invention is impossible to obstruct) but to obtain a faster decompression of the cooker.

Once the food in the pressure cooker of the present invention is cooked, for decompression thereof it is only necessary to rotate rod 40, thereby causing cams 42 to engage the underside of respective stopper member bodies 36, and upon continuation of rotation of the rod, until a quarter turn thereof is completed, said stopper members are raised, thereby lifting valve seats 35 from the upper end of respective tubular bodies 27 and allowing outflow of pressure in the form of steam in a very short time, approximately 20 seconds, after which the pressure cooker, its internal pressure totally released, may be uncovered easily.

If it is desired to steam cook a dish or food-stuff, the food carrying grid 79 is placed inside the cooker, inserting first either of the separate sheet members 80 or 81 and placing it in its position on the bottom of cooking vessel 11, in such a manner that flange portion 86, where round edge 84 forms an angle with straight edge 82, and support means 88, maintain sheet member 80 in perfect balance, the second sheet member 81 being thereafter inserted with straight edge 83 thereof abutting straight edge 82 of sheet member 80, and being equally supported by flange portion 87 at the angle formed by round edge 85 and straight edge 83 and by respective support means.

It support means 88 and 89 were not provided, sheet members 80 and 81, instead of remaining in their suitable position, would tend to overlap one over the other as flanges 86, 87 would slide down the curved bevel which the juncture of the cooker bottom and sidewalls necessarily form.

Having thus described certain preferred embodiments of the present invention, it is desired clearly to state that the inventive object is not limited to said embodiments but on the contrary various modifications of form and/or detail may be introduced therein, which fall within the scope of the invention as recited in the claims attached to this specification.

I claim:

1. A pressure cooker comprising a vessel having an inwardly turned flanged free rim, a lid for forming a sealing closure when applied against said rim, and at least one gravity valve means, the latter including a valve passage arranged in said lid in communication with the inside of said vessel, stopper means for said valve passage, including counterweight means disposed above said lid, said stopper means being capable to be lifted off its seat in said valve passage under action of the internal pressure in said vessel, against the weight exerted by said counterweight means, said stopper means further includ-

ing a valve stem passing through said valve passage and extending therebeyond, said counterweight means being attached to the outer end of said stem, the latter as well as said counterweight means being permanently acted upon by said internal pressure, at least one fluid passage being provided between said stem and the internal wall of said valve passage to allow discharge of fluid under pressure from said inside to the atmosphere when said internal pressure is sufficiently high to lift said stopper means from said seat, wherein said lid includes rotatable cam means for optionally lifting said stopper means from said valve passage in an angularly displaced position of said cam means.

2. A pressure cooker comprising a vessel having an inwardly turned flanged free rim, a lid for forming a sealing closure when applied against said rim, and at least one gravity valve means, the latter including a valve passage arranged in said lid in communication with the inside of said vessel, stopper means for said valve passage capable of being lifted off its seat in said valve passage under action of the internal pressure in said vessel, against the weight exerted by said stopper means, the latter including a valve stem passing through said valve passage and extending therebeyond, said stem being permanently acted upon by said internal pressure, at least one fluid passage being provided between said stem and the internal wall of said valve passage to allow discharge of fluid under pressure from said inside to the atmosphere when said internal pressure is sufficiently high to lift said stopper means from said seat, wherein said stem has a plurality of grooves defining further ones of said fluid passages.

3. The pressure cooker as defined in claim 2, comprising two of said gravity valve means.

4. A pressure cooker comprising a vessel having an inwardly turned flanged free rim, a lid for forming a sealing closure when applied against said rim, and at least one gravity valve means, the latter including a valve passage arranged in said lid in communication with the inside of said vessel, stopper means for said valve passage capable of being lifted off its seat in said valve passage under action of the internal pressure in said vessel, against the weight exerted by said stopper means, the latter including a valve stem passing through said valve passage and extending therebeyond, said stem being permanently acted upon by said internal pressure, at least one fluid passage being provided between said stem and the internal wall of said valve passage to allow discharge of fluid under pressure from said inside to the atmosphere when said internal pressure is sufficiently high to lift said stopper means from said seat, wherein said lid includes cam means for optionally lifting said stopper means from said valve passage, and wherein said cam means are arranged on a rod rotatably mounted on said lid and having operating means spaced away from said cam means.

5. The pressure cooker as defined in claim 4, wherein said cam means consist of a bent portion of said rod disposed beneath said stopper means, for lifting said stopper means upon rotation of said rod about its axis.