March 2, 1954 W. S. KENDRICK 2,670,755

COMBINED AIR VENT VALVE AND PRESSURE RELIEF PLUG

Filed Sept. 9, 1949

FIG. 5.

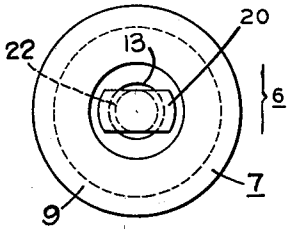


FIG. 1

FIG. 2.

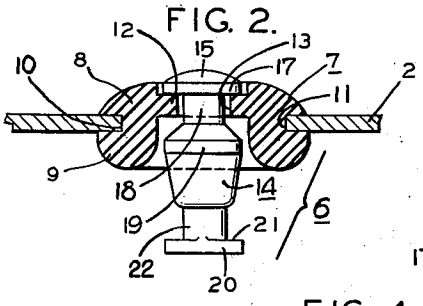


FIG. 3

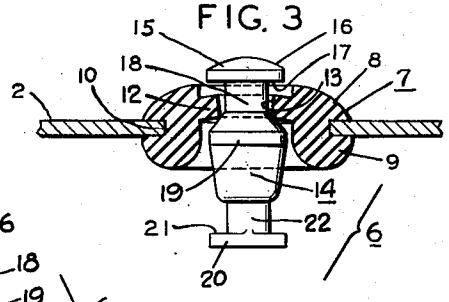


FIG. 4

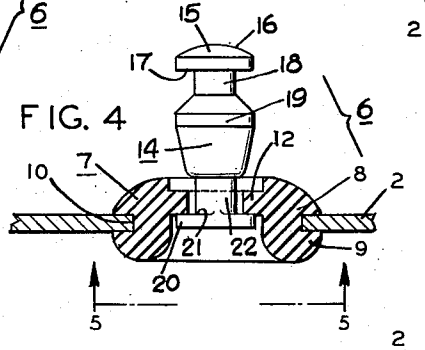


FIG. 6

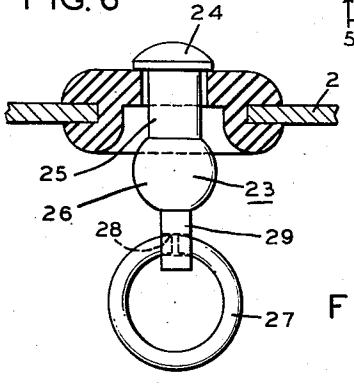


FIG. 7

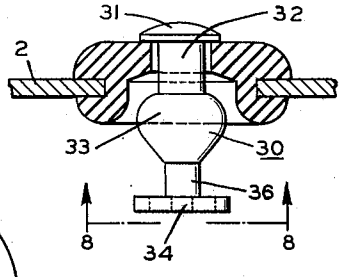
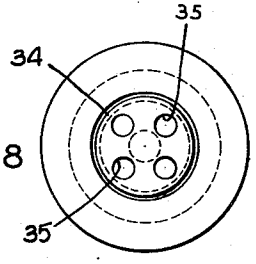


FIG. 8



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COMBINED AIR VENT VALVE AND PRESSURE RELIEF PLUG

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9 Claims. (Cl. 137—467)

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This invention relates to pressure cookers, and more particularly to an improvement in a device adapted for air venting and excess pressure release as disclosed in a copending application of C. R. Turner, Serial No. 674,707, filed June 6, 1946, now U. S. Patent No. 2,619,982, issued December 2, 1952.

The device disclosed in said patent comprises a resilient disc seated in an opening in a pressure cooker and a relatively movable member disposed in an orifice in the resilient disc. An important feature of that device is the ability of the movable member to be ejected through the orifice of the retaining disc in the event that pressure in excess of the normal operating value is attained within the cooker. However, in performing this function, a problem is encountered. On ejection, the movable member is frequently lost and subsequent operation of the pressure cooker is prevented until this member is replaced. Further, forcible ejection of the movable member presents a source of hazard to the user.

It is therefore the principal object of this invention to provide a pressure cooker valve of the type having a member movable to effect excess pressure venting, with means for preventing ejection of the movable member during the excess pressure venting period. Other objects will be evident from the description that follows.

For a complete understanding of this invention, reference should be had to the accompanying drawing in which:

Fig. 1 is a view, partly in elevation and partly in section, of the upper portion of a pressure cooker embodying the invention;

Fig. 2 is an enlarged sectional view showing the device provided by this invention in its inoperative condition;

Fig. 3 is similar to Fig. 2 with the movable member in the position that it normally assumes when cooking pressure exists in the vessel;

Fig. 4 is a similar view showing the device in the excess pressure venting condition;

Fig. 5 is a bottom view of the device;

Figs. 6 and 7 are large sectional views of other embodiments of the invention; and

Fig. 8 is a bottom view of the device shown in Fig. 7.

Referring first to Fig. 1, there is shown a portion of a pressure cooker comprising a vessel 1 having a top opening and a lid or cover 2 adapted to seat upwardly in said opening. The vessel 1 has a handle 3 and the lid has a handle 4. Preferably the vessel and lid construction are of the form shown and claimed in a copending application of C. R. Turner, Serial No. 672,363, filed May 27, 1946, now U. S. Patent No. 2,570,993, issued October 9, 1951. Disposed at the central portion of the lid 2 is a pressure control and indicating device 5 which is adapted to maintain the correct operating pressure in the cooker and to give an audible indication of continued application of excess heat to the cooker. The pressure control and indicator device is of the form disclosed in the first-mentioned Patent No. 2,619,982. Since the present invention is not concerned with the general construction of the pressure cooker or with the pressure control and indicator device, there is no need to illustrate or describe these structures in detail.

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In accordance with the present invention, there is provided on the pressure cooker a device 6 which is preferably mounted on the lid 2 adjacent to the venting and indicating device 5. The device 6 includes a resilient seating and retaining member 7 which is generally of annular form and which has the cross sectional shape shown in Fig. 2. This member may be formed of synthetic rubber or other suitable material. It is formed so as to provide peripheral retaining portions 8 and 9 between which is an annular recess 10. The lid 2 has a suitable opening 11 within which the resilient member 7 may be positioned, the annular edge portion of the lid about said opening seating in recess 10, while portions 8 and 9 engage the upper and lower surfaces of said edge portion.

The resilient member 7 has an internal inwardly extending annular projection 12 having substantially flat upper and lower surfaces in which there is provided an opening or orifice 13. A member 14, which may be formed of metal or other relatively rigid material, is loosely supported by the resilient member 7, as shown. The rigid member 14 is provided with a cap or stop 15 having a rounded top 16 and a shoulder 17 to prevent said rigid member from becoming disengaged from the resilient member when pressure does not exist in the pressure cooker. Below said cap is a cylindrical portion 18 of such diameter as to provide a clearing space with the orifice 13 in said resilient member. Adjacent this cylindrical portion is an enlarged portion 19 having a substantially conical shaped upper portion for seating against the lower surface of the annular projection 12. The slope on the conical portion further cooperates with the resilient member 7 for it acts to cam the inwardly extending annular projection 12 upward so that pressures in the vessel in excess of the normal operating value act to force the enlarged portion 19 of the rigid member through the orifice

13. At the lower end of the rigid member, there are squared feet 20 having a substantially flat upward surface 21, said squared feet being adapted to prevent ejection of the rigid member from its resilient retaining member when excessive pressures cause the enlarged portion 19 to be forced through the orifice 13. A cylindrical section 22 adjacent the lower section of the rigid member is of such diameter as to permit free venting of excess pressures in the vessel. As evidenced by Fig. 5, the ends of the squared feet 20 are milled to provide sufficient clearance for unrestrained passage of steam through the orifice.

The functions of the device 6 may be best understood by considering the operation of the pressure cooker. Let us assume that the cooker has just been placed in operation and that heat is being applied thereto at a relatively high rate to bring the cooker rapidly to the desired operating condition. Member 14 is in its normal position as shown in Fig. 2. As soon as the water inside the vessel 1 commences to boil, the generated steam forces the air out of the vessel through the venting device 6. The spaces or clearances about the member 14 permit the air to escape. In a very short time after the attainment of boiling temperature, steam is generated with such volume as to cause sufficient pressure within the vessel to raise the member 14, at which time the conical portion of the enlarged section 19 engages the lower edge of the annular projection 12 and effects therewith complete sealing of the venting opening, as shown in Fig. 3. This action of the device 6 permits building up of pressure within the vessel to the desired operating value, which is thereinafter controlled by the device 5 or similar means. As explained in Patent No. 2,619,982, this device at first gives a visual indication to the user that the heat input should be reduced and the timing of the cooking operation should be commenced. In the event that the visual indication remains unnoticed, the same device is adapted to emit an audible whistling sound. The device is further adapted to relieve the pressure within the vessel and maintain the correct pressure during the cooking operation.

At the end of the cooking time, the cooking operation is terminated by interrupting the heat supply, and the user then takes steps to reduce the pressure within the vessel 1. Experience has shown that the safest and easiest way for the average user to do this is to hold the cooker under water running from a faucet or to set it in a pan which is partly filled with water. The temperature within the vessel 2 is rapidly reduced thereby and consequently the pressure within the vessel decreases to approximately atmospheric pressure, at which time the member 14 is permitted to drop to its normal position. This indicates to the user that it is time to remove the lid or cover 2. Thus the novel venting device 6 provides a position indication as to whether or not substantial pressure exists in the cooker.

In the event of failure of the pressure regulating device 5 to maintain a safe pressure within the cooker during operation, due to plugging of the valve or some other condition, the enlarged portion 19 of member 14 will be forced through the orifice 13. The force exerted by the pressure within the vessel causes the camming surface of the conical portion of section 19 to deform the resilient inwardly-extending annular projection 12. When the holding strength of the projection 12 is exceeded by the upper force, which in this embodiment is arranged to be approximately 25 lbs. per sq. in, vessel pressure, the member 14 is moved upward until the flat upper surface 21 of the squared feet 20 engage the lower surface of the projection 12. The excess pressure holds the member in the venting position shown in Fig. 4. This device thus serves as a safety means for preventing development of dangerous pressures within the cooker.

The air venting and indicating device disclosed in the Turner Patent No. 2,619,982 comprises only the upper cap portion 15, the cylindrical portion 18 and an enlarged portion similar to that at 19. In that device the presence of an excess of pressure in the vessel causes the rigid member to be forcibly ejected from its retaining member, resulting in frequent loss of the ejected member with consequent inconvenience to the user. It is also obvious that the device presents a source of hazard. In the improved device of the present invention, the provision of the cylindrical portion 22 and the squared feet portion 20 obviates these difficulties.

If for any reason, in this device or in the device of the Turner Patent No. 2,619,982, the movement of the rigid member 14 is prevented, or if motion does occur but the excess pressure escape ports become clogged, the entire device is adapted to blow out of the opening in the pressure cooker lid. This pressure is usually set about 45 lbs./sq. in. and thus acts as an additional safety measure to make for safe pressure cooker operation.

Another embodiment of this invention is shown in Fig. 6. In this embodiment, a movable member 23 is provided, having a cap or stop 24, a cylindrical portion 25 and an enlarged portion 26, which are essentially similar to the corresponding portions of member 14 of the previous embodiment. At the bottom of member 23 is disposed a metal retaining ring 27 which is held in a hole 28 provided in cylindrical portion 29.

A third embodiment is shown in Fig. 7. In this embodiment a movable member 30 includes a cap or stop 31, a cylindrical portion 32 and an enlarged portion 33, which are essentially similar to the previous embodiment. The retaining means on this device, however, consists of a disc-like section 34 having a plurality of holes 35 provided therein (see Fig. 8). A cylindrical section 36 connects the enlarged portion 33 to the disc-like section 34.

It is obvious that the metal retaining ring 27 of member 23 (Fig. 6) and the disc-like section 34 of member 30 (Fig. 7) operate in a manner similar to that of the squared foot section 20 of member 14 to permit free escape of excess pressure within the vessel without loss of the movable member.

Thus in each of the illustrated embodiments the movable member is provided with a retaining portion or stop to prevent ejection of said member.

It is evident that other embodiments or modifications of the device are possible, and it is to be understood that the invention is not limited to the embodiments disclosed.

I claim:

1. In a pressure cooker having an opening, an apertured resilient member disposed in said opening and secured to the pressure cooker, a rigid sealing member extending through the aperture of said resilient member and movable by pressure in said cooker, a stop at the outer end of

said rigid member for preventing the same from becoming disengaged from said resilient member when pressure does not exist in said cooker, a sealing portion on said rigid member intermediate the ends thereof effective to seal said aperture in response to normal pressure but capable of passing through said aperture in response to abnormal pressure in the cooker, and a second stop at the inner end of said rigid member incapable of passing through said aperture and effective, when said portion passes through said aperture, to prevent further displacement of said rigid member while permitting venting of pressure through said aperture.

2. A structure according to claim 1, wherein the portion of said rigid member between said first stop and said sealing portion is of sufficient length to permit substantial displacement of the rigid member during normal operation, so that said rigid member gives a clear indication of whether pressure does or does not exist within said cooker.

3. In a pressure cooker having a circular air-vent opening defined by a single edge, a resilient member of general toroidal form having an annular groove to receive the edge defining said opening so as to support said member within the opening, said member also having an internal inwardly-extending annular projection, a rigid sealing member extending through said resilient member and movable by pressure in said cooker, a stop at the outer end of said rigid member engageable with said projection to prevent the rigid member from becoming disengaged from said resilient member when pressure does not exist in said cooker, a sealing portion on said rigid member intermediate the ends thereof engageable with said projection to seal the aperture of said resilient member in response to normal pressure but capable of passing through said aperture in response to abnormal pressure in the cooker, and a second stop at the inner end of said rigid member incapable of passing through said aperture and engageable with said projection, when said portion passes through said aperture, to prevent further displacement of said rigid member while permitting venting of pressure through said aperture.

4. In a pressure cooker having an air-vent and pressure-relief opening, an apertured resilient member retained in said opening and having an aperture-defining portion capable of resisting significant deformation by the normal cooking pressure existing in said cooker during operation but deformable by excessive pressures that may arise in the cooker, a rigid member freely supported by said resilient member and movable by pressures in said cooker, a sealing portion on said rigid member engageable with the inside of said aperture-defining portion and of a size and configuration to seat against said aperture-defining portion in response to the normal cooking pressure and to force itself through said aperture by deforming said aperture-defining portion in response to excessive pressure, and a stop on said rigid member spaced inwardly from said sealing portion and of a size and configuration to prohibit its passage through said aperture in response to excessive pressure but permitting venting of the pressure through said aperture.

5. A device according to claim 4, wherein said stop is generally of rectangular form.

6. A device according to claim 4, wherein said stop is in the form of a ring.

7. A device according to claim 4, wherein said stop is in the form of a disc having a plurality of holes therein.

8. In a pressure cooker having an air-vent and pressure-relief opening, an apertured resilient member retained in said opening and having an aperture-defining portion capable of resisting significant deformation by the normal cooking pressure existing in said cooker during operation but deformable by excessive pressures that may arise in the cooker, a rigid member freely supported by said resilient member and movable by pressures in said cooker, a sealing portion on said rigid member engageable with the inside of said aperture-defining portion and of a size and configuration to seat against said aperture-defining portion in response to the normal cooking pressure and to force itself through said aperture by deforming said aperture-defining portion in response to excessive pressure, an indicating portion on said rigid member extending from said sealing portion within said aperture and projectable outwardly beyond said resilient member when said sealing portion seats against said aperture-defining portion, the projection of said indicating portion serving to indicate the existence of pressure in said cooker, and a stop on said rigid member spaced inwardly from said sealing portion and of a size and configuration to prohibit its passage through said aperture in response to excessive pressure but permitting venting of the pressure through said aperture.

9. In a device according to claim 8, said indicating portion including a stop further serving to prevent said rigid member from becoming disengaged from said resilient member when pressure does not exist in said cooker.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
360,781	Nye	Apr. 5, 1887
701,607	Park	June 3, 1902
1,313,554	Nielsen	Aug. 19, 1919
2,160,398	Crowley	May 30, 1939
2,276,502	McCoy	Mar. 17, 1942
2,403,691	States	July 9, 1946
2,429,149	Wittenberg	Oct. 14, 1947