BEER KEG PROTECTIVE DEVICE

The safety device is disposable in the gas line connecting between a gas source under pressure and a tapping device installed in a keg. The safety device includes a valve housing carrying a spring biased axially movable piston including a stem and an axially adjustable element on the upstream side of the stem, the element and piston having axial passages. On the downstream side of the piston, a slit valve is provided. In use, gas flowing into the valve through the passages in the element and piston flows into the keg through the slit valve. Upon an increase in gas line pressure above a predetermined pressure, the gas acts on the piston to displace it in an upstream direction against the bias of the spring to seal the stem against the element and preclude further ingress of gas into the keg. When keg pressure is relieved as by drawing beer from the keg, the spring returns the piston to open the gas passage through the valve at the predetermined pressure. The gas check valve precludes backflow of liquid and gas through the gas passage.

1 Claim, 13 Drawing Figures
BEER KEG PROTECTIVE DEVICE

This is a continuation of application Ser. No. 82,783, filed Oct. 26, 1970, and now abandoned.

The present invention relates to a protective device for beverage dispensing systems particularly those systems for drawing liquids, such as beer, from containers, such as beer kegs or barrels, using a gas to drive the liquid from the container and particularly relates to a protective device including a safety valve for precluding ingress of gas above a predetermined pressure into the keg, regulating the gas pressure within the keg to maintain a predetermined keg pressure thereby to maintain the quality of the beer issued from the keg, and preventing backflow of gas and/or liquid from the keg through the gas line.

As has occurred in the past, failure of a fluid pressurization system in a keg or like container tapping system has resulted in large surges of highly pressurized gas through the tapping system into the keg. Keg overpressurization beyond safe limits can and has culminated in an explosion of the keg. Overpressurization also causes the kegs, due to their peculiar shape, to elongate thus making complete withdrawal of the beer from the keg virtually impossible utilizing existing tapping equipment. Because of the variety of keg or container sizes, designs, materials of construction, histories of use and abuse, states of structural fatigue, a precise maximum safe internal pressure has been difficult to determine.

Also, the degree of hazard associated with a structural failure of the keg or container varies with the degree to which the liquid has already been drawn from the keg, i.e., the quantity of remaining gas volume. An internal pressure of 60 psi gauge is generally considered the maximum safe upper limit. However, when high gas pressures obtain in the keg, albeit within the safe limit of 60 psi gauge, overcarbonization of the beer may occur resulting in a change in the taste of the beer. Surges of gas pressure into the keg thus deleteriously affect the quality of the beer withdrawn from the keg.

There are two sources of keg pressurization, (1) internally generated pressure resulting from the evolution of CO₂ gas normally dissolved in the beer, and (2) the gas pressure supplied through the tapping system from an external source. The first is not considered as a source of keg overpressurization sufficient to explode the keg as extreme temperatures, unlikely to occur, would have to be obtained before the maximum safe pressure could be realized. The more common danger of keg explosion as well as reduction in the quality of the beer due to excess pressure, is a result of the use of high pressure air or CO₂ bottles as the gas pressurization source.

It has been found that excessive pressure in systems utilizing CO₂ bottle are caused by (a) mechanical failure of the pressure regulator to shut off completely when a predetermined pressure is obtained, and (b) full open mechanical failure of the regulator which usually results from structural failure of the pressure diaphragm. Excessive pressure can also be caused by human failure in turning the regulator adjustment in the wrong direction or by inverting the CO₂ bottle. In regulators, prevalent cause of failure is contamination resulting from beer backed up into the gas feed line during tapping. Thus, in those systems wherein the beer has backed up, the beer contaminates and corrodes the valve oftentimes in a manner precluding full shutoff. Full open failure of the regulator has also occurred. An appreciation of the consequences of such a failure can be obtained by noting that a conventional and commonly employed CO₂ bottle in tapping beer kegs and the like is capable of dumping its full capacity of gas under pressure, for example, in certain instances about 900 psi gauge into a keg in less than 1 second. It has been found in actual tests that a half-barrel keg in poor condition and 90% full would rupture under the foregoing conditions approximately 0.9 seconds after failure of the regulator and that the same keg 10% full would rupture in approximately 8 seconds.

Pressure relief devices have been provided in tapping units in the past purportedly for the purpose of dumping the excess gas, when a failure occurs, before the maximum safe pressure of the keg is exceeded. For example, a pressure relief valve has been provided in the coupler of the tapping assembly described and illustrated in U.S. Pat. No. 3,228,413. However, it has been found, after stringent examination of the coupler and its operation, that overpressurization of the keg beyond the maximum safe keg pressure is, in fact, not prevented. The relief valve has been found to be ineffective as (1) its orifice is simply not large enough to dump the pressure quickly enough to preclude overpressurization of the keg beyond the maximum safe pressure, (2) the spring which biases the valve structure into a closed position actually decreases the orifice size in response to increasing pressure due to the closing of the coils, and (3) the pressure at which the relief valve opens changes due to setting of the O-ring seal over the course of use of the coupler. As a result, this pressure relief valve has been found to be unsatisfactory.

As noted previously, the quality of beer is diminished whenever it is exposed in a keg to excess pressurization. Excess pressurization of the keg occurs when gas surges through the gas supply line into the keg at higher than normal tapping pressures. In present tapping systems, the bartender has no way of determining whether surges of excess gas pressure have been supplied to the tapped keg and thus has no way of determining whether the quality of beer withdrawn from the keg has been affected by excess gas pressure. Thus, by tasting the beer in which event the damage to the beer has already occurred and cannot be repaired.

It has been found desirable to maintain the pressure in the keg at a predetermined pressure, for example, on the order of about 20 pounds. Under normal circumstances, such pressure is maintained in the keg by means of the regulator at the gas pressure source. However, as noted previously, gas pressure surges can occur through human and mechanical error resulting in pressurization of the keg beyond the desired twenty pounds pressure. Should the gas pressure in the keg exceed the desired gas pressure but not sufficiently as to (a) cause structural failure of the keg as previously discussed or (b) obtain the actuating pressure for the pressure relief valves, the general overall quality including taste of the beer is diminished. The pressure setting for the foregoing described relief valves and at which pressure such valves are actuated is normally determined at a relatively high pressure in comparison with normal tapping pressure as the purpose of such relief valves is purportedly to prevent keg explosion rather than for any reasons affecting the quality of the beer. That is to say, when the pressure in the keg has obtained the actuating
3,848,631

pressure for the relief valves, the beer in the keg has already been diminished by its overpressurization beyond the normally lower tapping pressures. Thus, the standard relief valve heretofore provided on tapping devices often cannot perform its intended function of preventing explosion of the keg and does not and cannot serve in any manner to maintain the quality of the beer through any sort of pressure regulation.

It is also common practice, particularly in establishments dispensing a large quantity of beer, to couple the tapping devices of a plurality of kegs to a common manifold with a single gas source supplying gas under pressure to the manifold. In those tapping devices utilizing positively acting gas valves, i.e., valves which, when the keg is tapped remain in an open condition, there is a tendency for backflow of liquid and gas into the manifold whereby the beer from one keg is permitted to flow into the other kegs through the various gas lines in open communication with the manifold. This is completely unsatisfactory from a sanitary standpoint and also from the standpoint that the beer in different types of kegs is being intermingled and mixed. While certain prior tapping devices do provide a check valve in the coupling to purportedly preclude backflow of beer through the gas line, such valves have been found to be ineffective for their intended purposes and have, in fact, been found to migrate through the gas line. Thus, intermingling of beer from multiple kegs connected to a common manifold supplying gas thereto has been a problem heretofore unsolved.

The present invention provides a novel and improved protective device for beverage dispensing systems, particularly beer tapping systems which overcomes or minimizes the problems associated with prior beer tapping systems as set forth above, and provides a protective device which (1) precludes overpressurization of the keg and keg explosion, (2) precludes diminution of the quality of the beer withdrawn from the keg by maintaining a predetermined normal tapping pressure in the keg, (3) automatically regulates and maintains the normal keg tapping pressure irrespective of the pressure of the gas supplied to the keg, and (4) in one form hereof, vents gas in the gas supply line in response to pressures in excess of a predetermined gas pressure higher than the normal tapping pressure. To this end, the present invention provides a valve housing carrying a spring biased axially movable piston having a stem projecting toward an axially adjustable element. The piston, stem and element have axial gas passages therethrough and gas flows from one end of the valve housing through the element and into the axial passage of the piston and stem and through a check valve on the downstream side of the piston. The element carries a seal in alignment with the end of the stem. When the gas line pressure exceeds a predetermined pressure acting against the downstream face of the piston, the latter shifts axially against the bias of the spring to locate the stem in sealing engagement against the seal carried by the element precluding further flow of gas through the supply line into the keg. Upon relief of the pressure in the keg, for example, by drawing beer therefrom, and obtaining the predetermined pressure, the spring displaces the piston from sealing engagement with the element whereby gas again flows through the piston and into the keg. Axial movement of the piston to open and close the gas passage through the valve is automatically repeated in response to a sensing of the backpressure in the keg respectively below and above the predetermined pressure and thus the valve is repeatedly actuated to maintain a predetermined tapping pressure in the keg notwithstanding higher pressures or surges in the gas supply line. To preclude backflow of gas and beer through the gas line, a check valve comprising a disc of resilient material and having a slit therethrough is provided on the downstream side of the piston. The slit valve closes in response to a pressure in the keg greater than the pressure on the downstream side of the piston's face. In another form hereof, there is provided a second spring biased member in communication with the supply line pressure. The member has working faces against which the supply pressure acts to shift the member against the bias of its spring and thereby open the supply line to atmosphere. The spring pressure is set such that the supply line pressure must significantly exceed the normal tapping pressure before the gas supply line is vented to the atmosphere, i.e., venting takes place only when a catastrophic failure occurs.

Accordingly, it is an object of the present invention to provide a protective device for beer kegs or the like for preventing overpressurization of the keg.

It is another object of the present invention to provide a protective device for beer kegs and the like including a valve operable to regulate the pressure within the keg to a predetermined normal tapping pressure irrespective of higher pressures in the gas supply line. It is another object of the present invention to provide a protective device for beer kegs and the like wherein a predetermined tapping pressure is maintained in the keg whereby diminution of the quality of the beer due to even slight overpressurization of the keg is prevented.

It is still another object of the present invention to provide a safety valve for beer kegs and the like including a check valve for preventing backflow of beer from the keg through the gas line.

It is a further object of the present invention to provide a safety valve for beer kegs and the like for venting the gas supply line to atmosphere in response to a predetermined pressure.

It is still a further object of the present invention to provide a safety valve for beer kegs and the like which is reliable, efficient and repeatable in operation at precise predetermined pressures.

It is a related object of the present invention to provide a protective device for beer kegs and the like for use with current keg tapping devices.

These and further objects and advantages of the present invention will become more apparent upon reference to the following specification, claims and appended drawings, wherein:

FIG. 1 is a schematic view illustrating a beer tapping apparatus including a gas source, a keg and a faucet and further illustrating the disposition of a protective device constructed in accordance with the present invention in the gas supply line between the gas source and kegs; keg;

FIG. 2 is an enlarged longitudinal cross sectional view of the valve illustrated in FIG. 1;

FIGS. 3, 4 and 5 are cross sectional views thereof taken generally about on lines 3—3, 4—4, and 5—5 in FIG. 2;

FIG. 6 is an enlarged longitudinal cross sectional view similar to FIG. 2 illustrating a further form of the present invention;
FIG. 7 is a cross sectional view thereof taken generally about on line 7—7 in FIG. 6.  
FIG. 8 is a fragmentary side elevational view of a keg tapping device secured within a keg opening with parts broken out and in cross section illustrating the device hereof as forming an integral part of coupling unit for the keg tapping device;  
FIG. 9 is a cross sectional view thereof taken generally about on line 9—9 in FIG. 8;  
FIG. 10 is a fragmentary cross sectional view of a further form of the valve hereof;  
FIG. 11 is a cross sectional view thereof taken generally about on line 11—11 in FIG. 10;  
FIG. 12 is a view similar to FIG. 8 illustrating device hereof as a fitting for a known keg tapping device; and  
FIG. 13 is a reduced elevational view of the valve illustrating a further form thereof. 

Referring now to the drawings and particularly to FIG. 1, there is schematically illustrated a conventional beer keg 10 having an opening 12 in its top wall 14 in which opening there is received a keg adapter 16, the adapter being semi-permanently installed in the keg 10. A normally closed opening 18 is formed in the side wall of the keg. A coupler unit 20 is connected to keg adapter 16 to form a keg tapping device. The keg tapping device may comprise the keg adapter and tapping unit as illustrated in U.S. Pat. No. 3,422,448 of common assignee herewith or may comprise other conventional tapping device, the safety valve hereof being capable of use with virtually any type of tapping device. Coupler 20 has a gas inlet port 22 having a fitting adapted to receive the end of a gas supply line 24, the opposite end of which communicates with a gas supply source 26, a CO₂ bottle being here shown. Coupler 20 also has a beer exit fitting 28 which is adapted to receive an end of a flexible beer line 30 through which beer is conducted from the keg through the tapping device to a conventional faucet 32. The arrangement of FIG. 1 is illustrated merely for the purpose of showing the environment of the present invention. The components thereof including the keg, tapping device, gas supply source, and faucet are conventional and do not comprise a part of the present invention and further description thereof is believed unnecessary. It is sufficient for present purposes to note that the safety valve, generally indicated 34, is disposed in the gas supply line 24 as desired or, in later described forms hereof, may be provided as a portion of the coupler of the tapping device or at the regulator of the gas source as hereinafter amplified. It will be appreciated that, in the arrangement shown, gas is supplied from source 26 through gas supply line 24 and through the tapping device comprising coupler 20 and keg adapter 16 into the keg. The gas in the keg then drives the beer outwardly through the tapping device and beer supply line 20 for dispensing at faucet 32. 

Referring now to FIG. 2, there is disclosed the safety valve 34 hereof, comprising a valve housing including a generally cup-shaped outlet fitting 36 defining a chamber 38 and having a nipple 40 projecting from its base 42 and through which is provided an axial passage 44. The valve housing also includes an inlet fitting 46 having a nipple 48 and an axial passage 50. Fitting 46 includes diametrically enlarged portions 52 forming a square in cross section, (FIG. 3), the corners of which are suitably secured about the opening of cup-shaped fitting 36. As illustrated in FIG. 3, a plurality of ports 54 open into chamber 38 to vent it to the atmosphere. Nipple 40 and 48 have external axially spaced shoulders and tapered portions adapting the same for connection to the usual tubing forming portions of gas supply line 24 and connecting between the gas pressure source and the tapping device. 

Inlet fitting 46 includes an internally threaded portion 56 intermediate its ends and about passage 50 and in which portion 56 is threadedly received an axially adjustable externally threaded element 58. Element 58 includes an axial passage 60 terminating at its inner end in a pair or radial openings 62 and opening at its outer end in an enlarged hex socket 63 for purposes to be described. Mounted on the inner end of element 58 is a valve seat 64 preferably formed of silicone rubber and bonded to the inner end of element 58. A piece of friction material 66 is disposed along one side of element 58 and frictionally engages inlet fitting 46 to maintain element 58 in a selected axial position in valve 34. 

A piston 70 carrying a stem 72 is disposed within chamber 38. The piston includes an axially extending passage 74. Piston 70 is biased for movement in a direction to seat piston face 76 against a shoulder 78 formed at the base of member 36 by a spring 80, opposite ends of which bear against the opposite face of piston 70 and a shoulder 82 formed on inlet fitting 46. Piston 70 carries an O-ring seal 84 within a groove 86 formed about its periphery for sealing engagement about the inner walls of fitting 36. Terminal portions of stem 72 project within an enlarged diameter chamber 88 formed by an inwardly projecting annular portion 90 of inlet fitting 46. An O-ring seal 92 is provided about stem 72 in chamber 88, O-ring 92 being fixed by a pair of retaining rings 96 and 98 carried by annular portion 90 of fitting 46. Accordingly, O-ring 92 seals between chambers 88 and 38. 

In a reduced diameter portion 100 of the base of outlet fitting 40, there is provided a check valve generally indicated 103 comprising disc 104 having a plurality of openings 106 spaced circumferentially about a peripheral portion thereof. Between disc 104 and a shoulder 108 formed on base 42 of fitting 36, there is provided a valve including a disc 110 formed of resilient material, preferably silicone rubber, and having a diametrically extending slit 112 therethrough, opposite ends of the slit being spaced inwardly from the edges of disc 110. The disc 104 and check valve disc 110 are clamped about their margins against shoulder 108 by means of a resilient retaining ring 114. 

It will be appreciated that safety valve 34 is secured in the gas supply line 24 for transmitting gas from gas pressure source 26 for delivery to the keg tapping device. In use and when the valve lies in an open condition, the gas under pressure flows axially through passages 50 and 66 and radially outwardly through openings 62 into chamber 38. The gas in chamber 88 flows into axial passage 74 in piston 70 and through the opening in retaining ring 114, the openings 106 in disc 104 and, due to its high pressure, bellows resilient valve disc 110 outwardly in a downstream direction such that the gas flows through slit 112 and downstream through passage 44 toward the tapping device. When the regulator, not shown, at the gas pressure source is properly set and the gas flows through the safety valve at the predetermined pressure required for withdrawing beer from the keg, the valve remains in the illustrated open posi-
tion with the gas flowing therethrough as previously described. In the event of a sudden surge of pressure in the gas supply line 24 or a catastrophic failure of the regulator at the CO₂ source 26 whereupon the entirety of the gas in pressure source 26 is dumped through supply line 24 to valve 34, the excess gas pressure acts against the downstream face 76 of piston 70 to axially displace piston 70 in the upstream direction against the bias of spring 80 whereupon the upstream end of stem 72 about passage 74 engages and seals against seat 64 of element 58. It will be appreciated that the spring 80 is of such weight as to permit movement of piston 70 in the upstream direction in response to a predetermined pressure acting on the piston, such pressure being proportional to the keg pressure. The engagement of stem 72 against seat 64 seals passage 74 against further transmission of the gas through the valve irrespective of the magnitude of the gas pressure from source 26 above a predetermined pressure. For example, if it is desirable to maintain the keg pressure at about 20 pounds, the spring 80 is set such that gas pressure slightly in excess of 20 pounds, for example 21 pounds, acting on the face 76 of piston 70 displaces the piston against the bias of the spring to effect the seal between stem 72 and seat 64. Accordingly, until the keg pressure is relieved, valve 34 will remain closed irrespective of the gas pressure in the supply line between the gas source and valve 34 above a predetermined gas pressure. Once the gas pressure is relieved as by withdrawing beer from the keg, the pressure acting against piston face 76 decreases to the predetermined keg pressure whereupon spring 80 axially displaces piston 70 in a downstream direction to space stem 72 from seat 64. Additional gas under pressure is thus admitted into the keg and the previously described valve closing action is repeated should the additional gas provide a pressure acting against piston face 76 in excess of the predetermined keg pressure. Valve 34 thus maintains the keg at a normal tapping pressure notwithstanding higher supply line pressures. Thus, at no time is the keg subjected to an internal gas pressure in excess of a predetermined normal tapping pressure. By threadedly adjusting element 58 within housing element 46 by engaging a tool in the hex socket 65, a spacing between seat 64 and the end of stem 72 can be varied whereby the pressure at which the valve will close can be adjusted as desired and within a predetermined range.

To preclude backflow of liquid from the keg through the gas line, the valve disc 110 seats against the central portion of disc 104 in response to a pressure on the downstream side of valve 110 higher than a pressure on the upstream side thereof. The slit 112 is thus biased against the central portion of disc 104 and seals the slit against precluding backflow of liquid or gas through valve 34.

Referring now to the embodiment hereof illustrated in FIGS. 6 and 7, there is illustrated a safety valve 34a having, in addition to the foregoing described features of safety valve 34 illustrated in FIGS. 2-5, a pressure relief to the atmosphere in response to pressures in the supply line above a predetermined pressure set well above the predetermined tapping pressure at which the valve will close. By venting the valve to atmosphere at a considerably higher pressure, for example 60 pounds, the high pressure gas in the supply line will vent before rupture of the gas line and valve housing occurs while simultaneously gas will not be lost should the supply line pressure exceed to a limited extent the normal tapping pressure. In this form, the outlet fitting 36a, stem 72a, spring 80a and check valve 103a are identical to the corresponding parts previously described and further description thereof is believed unnecessary. Inlet fitting 46a includes a nipple 48a, and a longitudinally adjustable element 58a identical to the corresponding parts of the previous embodiment. In this form, however, inlet fitting 46a includes a cylindrical recess 120 having an annular seat 121 and formed about its inner end for receiving the base portion 123 of a sleeve 122. Base portion 123 has a polygonal configuration as illustrated by the edges 124 in FIG. 7 and carries an O-ring seal 126 for sealing against seat 121. The opposite end of sleeve 122 carries a pair of retainer rings 128 and 130 between which is mounted an O-ring 132 for sealing against stem 72a and sleeve 122. A similarly formed sleeve 134 of enlarged sleeve 122 is engageable with portion 136 of polygonal cross section is suitably fixed to outlet fitting 36a. The base portion 136 provides a seat for one end of spring 80a for piston 70a. The opposite end of sleeve 134 has an intumescence flange 137 defining central opening 138 in which is received the inner end of sleeve 122. A spring 140 is disposed between sleeves 122 and 134 and with opposite ends of spring 140 seating against the base portion 123 of sleeve 122 and intumescence flange 137 of sleeve 134 respectively. Spring 140 thus biases inner sleeve 122 in an axial upstream direction to normally engage O-ring 126 against seat 120.

In use, gas flows through the inlet passages 50a and 61a, outwardly through radial openings 62a of element 58a, and into the chamber 88a within sleeve 122. Gas flows from chamber 88a through the axial passage 74a in piston 70a and passes through the check valve 103a in the manner previously described. Upon obtaining supply line pressures in excess of the predetermined normal tapping pressure of the keg, the gas acts against the downstream face 76a of piston 70a to axially displace the latter in the upstream direction whereupon the end of stem 72a about passage 74a engages and seals against seat 64a similarly as previously described in the embodiment illustrated in FIG. 2. Upon obtaining pressures in the gas supply line between the gas source and valve 34c in excess of a second predetermined pressure well in excess of the normal keg tapping pressures, i.e., 60 pounds, such pressure acts in chamber 88a against retaining ring 120a to axially displace sleeve 122 in a downstream direction thereby displacing O-ring seal 126 from seat 121. Accordingly, gas in chamber 88a is vented about O-ring 126 and through the slots between the walls of recess 120 and the edges 124 of the base 123 of sleeve 122. When the pressure in the supply line obtains the predetermined pressure, i.e., 60 pounds, the spring 140 displaces sleeve 122 to reseat O-ring 126 against seat 123. It will be noted that at all times during the venting of the gas to the atmosphere, piston 70a remains sealingly engaged against seat 64a precluding overpressurization of the keg.

Referring now to the embodiment hereof illustrated in FIGS. 8 and 9, the safety valve is incorporated as an integral part of a coupler 20b which forms, in conjunction with a keg adapter 16b, a tapping device. The coupler 20b and keg adapter 16b comprise a part of the keg tapping device more particularly described and illustrated in application Ser. No. 773,380 of common as-
3,848,631

9

signee herewith, which application is incorporated herein by reference thereto as though fully set forth herein. For present purposes, it will be appreciated that keg adapter 16b is secured within the keg opening 160 and has gas and liquid passageways in communication with the gas and liquid passageways 162 and 164 respectively of coupler 20b. A laterally projecting nipple 166 is provided on coupler 20b for communicating gas from the gas source into the gas passageway 162 of coupler 20b which, in turn, lies in communication with the gas passage in keg adapter 16b, when the coupler is secured to the adapter, for delivery of gas into the keg with the result that beer is transmitted from the keg through the adapter and through the beer passage 164 in coupler 20b. The lateral nipple 166 on coupler 20b corresponds in internal configuration to the internal configuration of the outlet fitting 26 as illustrated in FIG. 2. The chamber 38b thus defined by nipple 166 houses the piston 70b, spring 80b, check valve 103b and stem 72b in this form, inlet fitting 46b is identical in all respects with the inlet fitting 46 illustrated in FIG. 2 except that fitting 46b is provided with an interrupted thread 167 for threaded engagement with an internally threaded part of nipple 166. The interrupted thread provides openings for venting chamber 38b to atmosphere. The operation of valve 34b is identical to the valve operation previously described and further description of its operation is not believed necessary. It will be appreciated that nipple 166 and coupler head 169 may be integrally molded of a plastic material. FIGS. 10 and 11 illustrate a further manner in which inlet fitting 46b may be secured to coupler 20b. In this form, inlet fitting 46b includes, instead of a threaded flange, a lateral flange 170 which seats in a diametrically enlarged end portion of fitting 166. A retainer clip 172 is received within a groove in nipple 166 and retains fitting 46b in nipple 166.

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In the form hereof illustrated in FIG. 12, the safety valve 34c is employed with another type of tapping device such as illustrated in U.S. Pat. No. 3,228,413, the disclosure of which patent is incorporated herein by reference thereto as though herein fully set forth. In this form, valve 34c is identical in structure to either the structure illustrated in FIGS. 2 or 6 depending upon whether pressure relief is required, with the exception that the outlet nipple 180c is cylindrical in shape and has a groove 182 about its outer surface. A radial opening 184 communicates between outlet passage 44c and groove 182. Valve 34c may be secured in a lateral opening 186 formed in the coupler 20c wherein passage 44c lies in communication with the gas passage 188 in coupler 20c through the radial opening 184 and groove 182. Valve 34c may be secured and sealed to coupler 20c in any desired manner.

15

Referring now to FIG. 13, there is illustrated a safety valve 34d wherein the outlet fitting includes an externally threaded nipple 190 for threaded engagement with those couplers having threaded recesses for receiving gas line fittings. Thus, safety valve 34d may be secured directly to such coupler. Alternatively, both ends of the safety valve may be threaded whereby it may be located at the gas pressure source with one end being threaded to the gas regulator and the opposite end being threaded to a fitting for securing it to the gas supply line.

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It will be appreciated that the protective device in each of the forms thereof herein illustrated includes a check valve which necessitates orienting the inlet and outlet fittings in the gas line such that gas is received in the inlet fitting and discharged through the outlet fitting. The protective device hereof can be employed without the check valve, particularly in those tapping devices having a check valve as part of the keg adapter, in which case the protective device can be disposed in the gas line with either fitting receiving the gas from the source. For example, with fitting 40 serving as the inlet fitting, gas would pass through passages 44, 74, chamber 88 and passages 66 and 50. When the predetermined tapping pressure is obtained in the keg, excess supply line gas pressure would act directly against piston face 76 to close the valve. However, in this orientation of the device, relief of the keg pressure by withdrawing beer, would not cause the valve to open and the latter would open only in response to a supply line pressure equal to or less than the normal keg tapping pressure. Thus, while the disclosed orientation of the protective device in the supply line is preferred since it serves to not only protect the keg from overpressurization but also serves to maintain normal tapping pressure in the keg irrespective of the magnitude of the supply line pressure above the normal keg tapping pressure, the protective device hereof without its check valve can be reversed in position in the gas line and still serve to prevent overpressurization of the keg. The protective device thus cannot be utilized in the gas supply line without at least serving the basic purpose of protecting the keg from the effects of excess gas pressure, i.e., keg explosion and elongation.

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It will be appreciated that there is a slight pressure drop across the check valve as well as the passages extending between the piston face 76 and the keg interior. Thus, the piston face senses a pressure directly related to the keg pressure rather than the keg pressure per se. Of course, where the protective device is disposed in the coupler and particularly where the safety valve is not employed, the sensed pressure will be very nearly identical with the keg pressure.

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The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

35

What is claimed and desired to be secured by United States Letters Patent is:

1. A pressure control device for disposition in a gas passage between a gas pressure source and a pressure vessel comprising:

an elongated housing having a gas inlet, a gas outlet, a first chamber and a valve seat; said inlet lying in communication with said first chamber and including an element receivable therein having an axial passageway and at least one radial aperture for delivery of gas from said passageway through said aperture into said chamber, the inner end of said element comprising said valve seat; a piston in said housing, said piston having a passage therethrough in communication on one side thereof with a second chamber defined at least in part by said housing and the face of said piston, said piston being movable axially between first and second posi-
ions, said second chamber lying in communication with said housing outlet; said piston having a stem defining a part of the passage through said piston, said stem having an annular end defining an inlet for the passage through said piston; a spring for biasing said piston into said first position; said piston in said first position establishing communication between said first chamber and the passage in said piston for permitting flow of gas from said housing inlet through said chamber, the passage in said piston, and the second chamber to said outlet for pressures in said second chamber less than or equal to a predetermined pressure; said piston, in response to a gas pressure in said second chamber in excess of the predetermined pressure and acting thereon adjacent said outlet, being movable against the bias of said spring into said second position to seal said annular end of the piston stem against said seat thereby to preclude transmission of gas through the passage in said piston; said spring biasing said piston for movement from said second position to said first position, said piston being movable into said first position by said spring in response to a pressure in said second chamber less than or equal to the predetermined pressure, means for venting said first chamber externally of said housing in response to a pressure therein greater than the predetermined pressure, said venting means including an annular member forming an outer wall portion for said first chamber and movable axially in said housing between first and second positions, said member in said first position forming a seal with said housing for precluding venting said first chamber, means for biasing said member into said first position, means carried by said member and responsive to a pressure in said first chamber greater than said predetermined pressure for moving said member axially against said biasing means into said second position to vent said first chamber between said member and said housing; means cooperable between said housing and said element for adjusting the axial position of said element in said housing inlet and hence the axial spacing between said valve seat and the annular end of said stem in said first position of said piston, and a check valve carried by said housing adjacent said outlet and downstream of said piston for precluding backflow through said device, said check valve including a seat and a flexible member having an opening therethrough, said flexible member being downstream of said seat and engageable thereagainst to seal about said opening.

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