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(54) Beer dispensing tap

(57) A beer dispensing tap has a valve member 2 which is biassed closed by a spring 7 and engages a valve seat 19 on an annular piston 18 held by the member against the bottom of a chamber 5 surrounding the entrance to an outlet spout 16. When the tap is opened by rocking the handle 11, the valve member 2 is initially lifted from the seat 19 to allow beer to flow smoothly and without frothing from the inlet 15 through the chamber 5 and the outlet spout 16, following which the piston 18 is then lifted with the member 2, by means of a lost motion coupling 27 to 29, to create a small reservoir chamber 30 below the piston which fills with beer via passages 26 and which is isolated from the spout 16 by a tubular extension 20 projecting into the spout. When the tap is closed, the spring 7 first moves the valve member 2 to engage the seat 19 to shut off the beer flow, and then to drive the piston 18 to expel the beer from the reservoir 30 through a small outlet 31 as a high velocity jet which is directed into the beer just dispensed to thereby create a head.

Fig. 1.

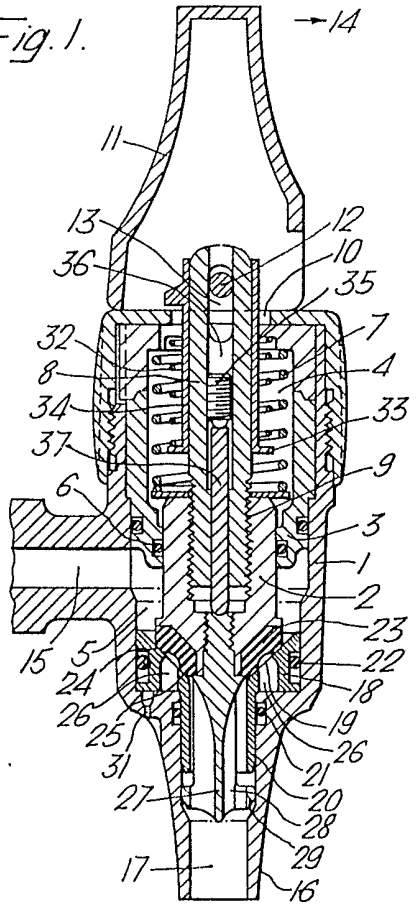

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Fig. 1.

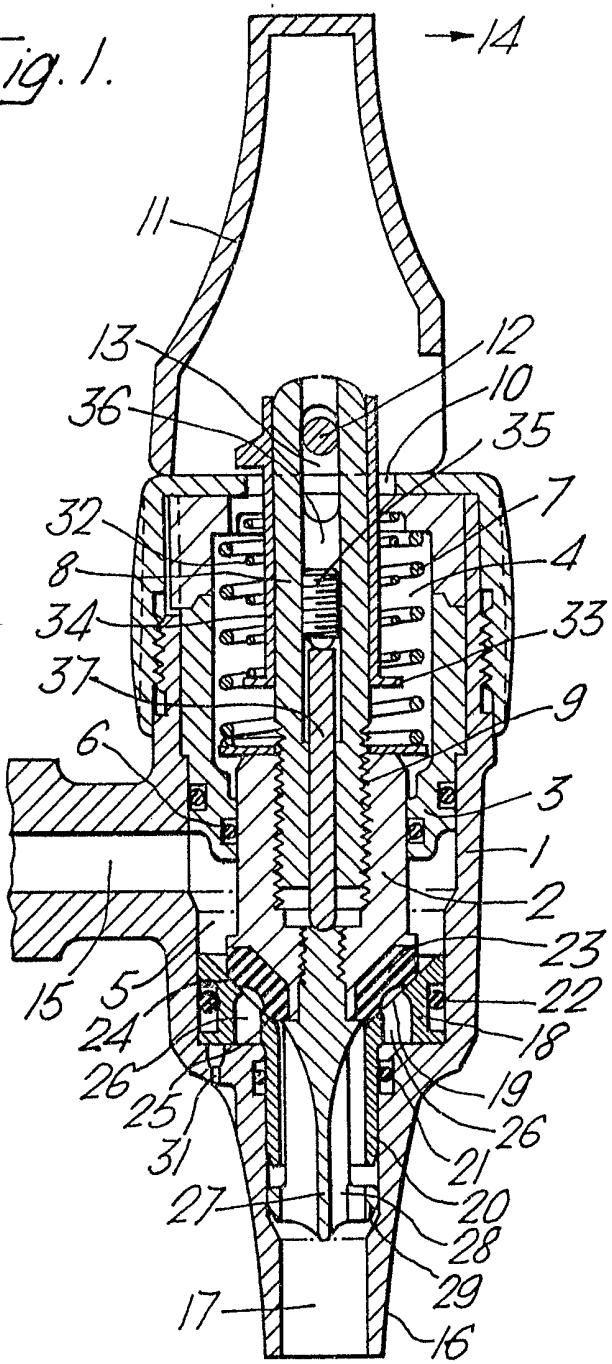
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Fig. 2.

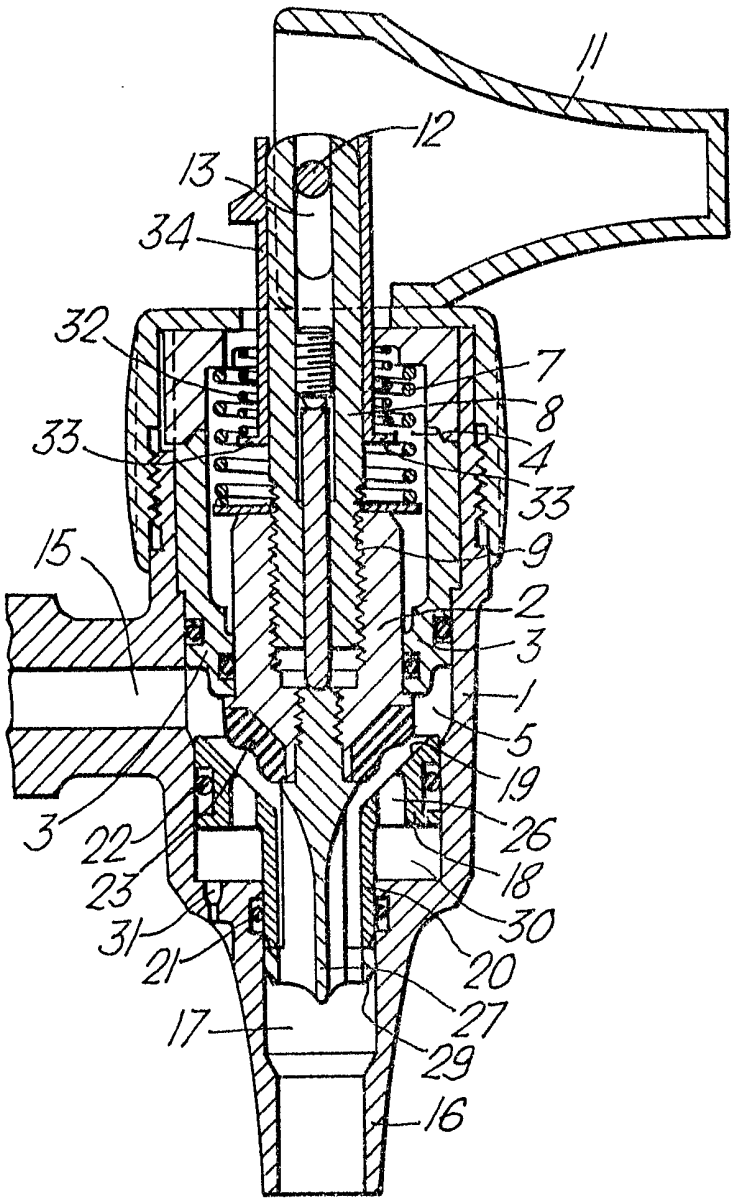
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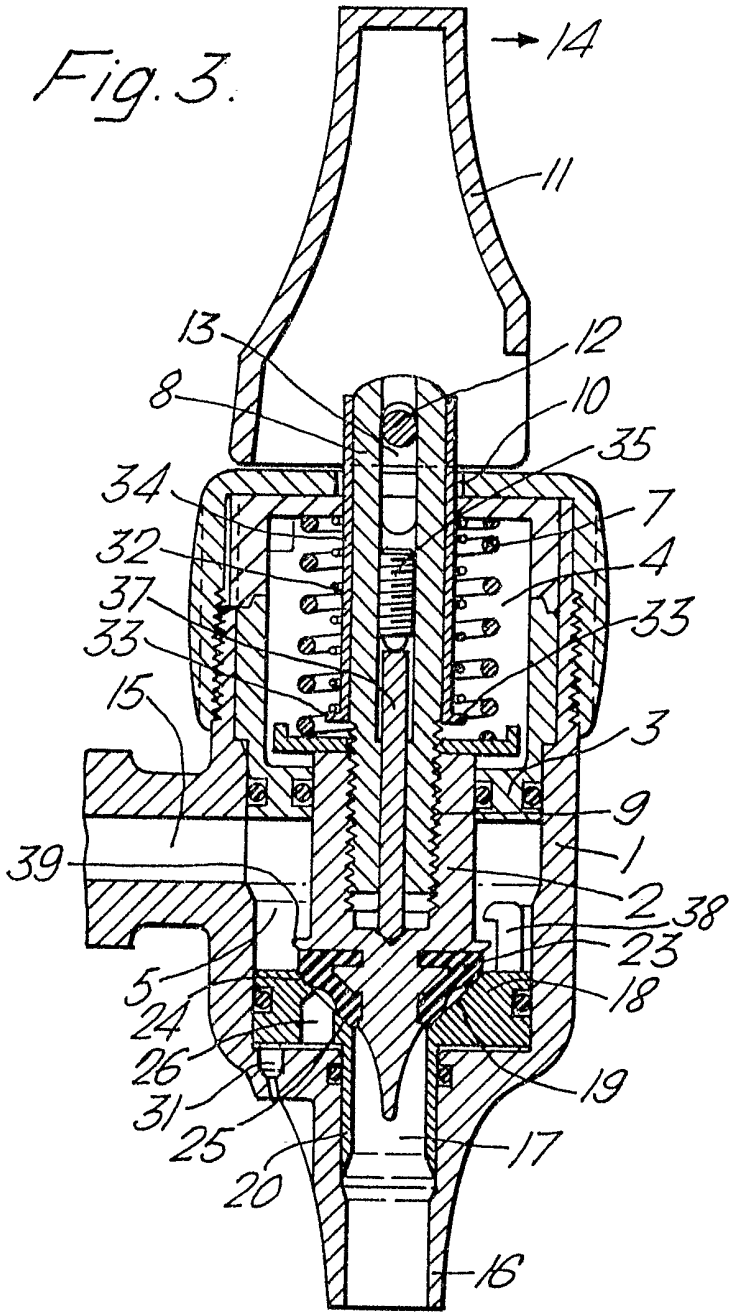
Fig. 3.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SPECIFICATION

Beer dispensing tap

This invention relates to the dispensing of beer from a keg or other container in which the beer is stored under a top pressure of carbon dioxide and from which the beer is delivered, either by means of the top pressure or by means of a pump, through a supply pipe to a dispense tap. In particular the invention is concerned with controlling the dispense so that the beer can be dispensed quickly into a glass or other vessel and a good quality stable head of foam formed consistently on the beer in the vessel.

On dispensing beer under pressure into a glass or other drinking vessel there is of course a tendency for the beer to foam and form a head automatically as a result of the pressure reduction and disturbance experienced by the beer entering the glass causing carbon dioxide release from the beer. Consequently most beer dispensing systems currently in use are intended to be operated so that a head is produced simultaneously as the beer is dispensed. However, in order to reduce customer waiting time and increase sales it is desirable that the dispense rate should be as fast as possible, but the factors contributing to a fast dispense rate, i.e. a system with few bends and obstructions in the flow path and a relatively large outlet passage having a low dynamic pressure drop through it, are virtually the opposite to those contributing to good head formation, i.e. a relatively high dynamic pressure drop through the outlet passage and a turbulent discharge to entrain air with the dispensed beer. Present dispensing systems therefore tend to compromise between these requirements. For example, in one known system the outlet spout of the tap is provided with a device, known as a sparkler, for introducing turbulence to the beer flowing through the spout, thereby increasing air entrainment and carbon dioxide break out so that head formation is increased, but at a reduced flow rate due to an increase in the pressure drop across the sparkler.

There are of course other factors which affect the dispensing, such as the top pressure in the container from which the beer is drawn and the temperature of the beer in the system pipework, and it is common practice for a person operating the dispensing system to control the dispensing and head formation as necessary by, for example, varying the opening of the tap, tilting the glass so that the beer runs down the side rather than dropping directly into the beer already in the glass, varying the height of drop into the glass, or submersing the outlet spout in the beer already dispensed. In addition it is known to provide taps with means for adjusting the maximum cross sectional area of the flow passage through the tap when opened. Furthermore, it is also known to provide taps with a creaming facility. With this facility, if the operator decides that the head formed during the normal dispensing operation is not satisfactory, the tap can be opened in a way which causes the beer to foam through a very restricted opening under the action of the very high pressure drop across the opening, and a creamy foam dribbles from the outlet spout onto the top of the previously dispensed beer in the glass.

According to the present invention, a tap for controlling the dispensing of beer from a keg or other container in which the beer is stored under a top pressure of carbon dioxide and from which the beer is delivered under pressure to the tap through a supply pipe, comprises an inlet for connection to the supply pipe, a primary outlet, a valve member which is biased by a spring to a rest position in which it closes a passage through the tap from the inlet to the primary outlet and which is movable by an operating handle to an open position in which the passage is open to permit a relatively low velocity, high volume, flow of beer through the primary outlet into a vessel placed beneath the outlet, the valve member moving to close the passage immediately on release of the operating handle to allow the spring to return the valve member to its rest position, a reservoir chamber which is arranged to fill with beer when the valve member is in the open position, and means for expelling the beer from the reservoir chamber through an auxiliary outlet under the action of the spring returning the valve member to the rest position after the operating handle is released and the valve member has moved to close the passage, the auxiliary outlet being arranged so that the beer from the reservoir chamber is expelled as a relatively high velocity jet directly into the vessel containing the beer already dispensed through the primary outlet.

With a tap in accordance with the invention, the bulk of any volume to be dispensed into a glass or other drinking vessel is dispensed when the tap is open, and on closure of the tap a predetermined small volume of beer is automatically jetted at high velocity into the beer already in the glass to create a head on the beer. It is important that the jet impinges directly onto the surface of the beer in the vessel, i.e. without first touching any other surface which would break up the jet, and that the jet is of sufficient velocity to achieve a substantial depth of penetration into the beer in the vessel. The deep penetration of the jet into the beer causes carbon dioxide release which, together with air entrained by the jet, collects surface active materials from a substantial proportion of the beer and results in the formation of a tight, stable, head of foam on the beer. The entrainment of air into the beer by the jet is important since this significantly contributes to the greater stability of the head produced by a tap in accordance with the invention compared with that produced by a creaming tap, which relies on head formation solely by carbon dioxide break out from beer in the tap as a result of a high pressure drop across a very small opening.

Because the functions of dispensing and head formation are substantially separated, the tap in accordance with the invention may be designed to dispense the beer as smoothly and as efficiently as

possible, without any attempt to generate a head, when the tap is open, i.e. by designing the inlet, the through passage, and the primary outlet to give a smooth controlled pressure drop and allow a relatively low velocity, high volume flow through the passage with little or no turbulence in the flow. The tap is therefore able to dispense carbonated beers under pressure quickly and smoothly, and consistently to produce a good, tight, long lasting head on the dispensed beer.

The volume of beer which needs to be jetted from the reservoir chamber to produce a satisfactory head is dependent upon the velocity of the jet and the carbonation level of the beer, but in general it will be less than 1% of the total volume dispensed. The higher the jet velocity, the lower the jet volume required to entrain the same quantity of air necessary to produce a satisfactory stable head. For any particular dispensing system therefore, the required head may be achieved by selecting the jet velocity and adjusting the volume jetted, or vice versa. The jet velocity is determined by the size of the auxiliary outlet, the means for expelling the beer from the reservoir chamber, and the force exerted by the valve member return spring, and may be from 2 to 20 metres per second but is preferably in the region of 5 or 6 metres per second.

The means for expelling the beer from the reservoir chamber may be the valve member itself, such as in a construction in which the valve member is a piston which slides within a cylinder having the inlet and the primary outlet opening through its side adjacent the extreme upper position of the piston, and the auxiliary outlet opening from the bottom of the cylinder. Preferably however, the means for expelling the beer from the reservoir chamber is a piston which is coupled to the valve member for a reciprocating movement therewith.

In the latter case the piston preferably comprises a valve seat which is engaged by the valve member to close the passage to the primary outlet, and the coupling between the piston and the valve member includes a degree of lost motion which allows the valve member to move relative to the piston to open and close the passage, the valve member preferably leaving the valve seat to open the passage at the start of its movement from the rest position to the open position and re-engaging the seat to close the passage at the start of its movement from the open position to the rest position.

In a particularly compact and preferred form of tap in accordance with the invention, the piston is annular and its central opening leads through a tubular extension which projects slidably into the primary outlet and forms part of the passage, the tubular extension separating the reservoir chamber from the primary outlet. The reservoir chamber preferably fills from the passage when the valve member is open through at least one duct which extends through the piston and which opens into the valve seat so that it is closed by the valve member when the valve member engages the seat to close the passage.

The valve member is preferably moved by the operating handle through a connecting rod which is connected at one end to the valve member and is connected at its other end to the handle by means of a pin carried by the handle and extending through a hole in the connecting rod, rocking movement of the handle about a fulcrum from an off to an on position moving the valve member from its rest position to the open position. The valve member return spring is preferably a coil spring which surrounds the connecting rod and is housed in a chamber of the tap which is separated from the passage and the inlet, the spring acting between a fixed portion of the tap and the valve member or a part bearing on the valve member.

In a preferred embodiment of the invention, the hole in the connecting rod which receives the pin is a slot, and the position occupied by the pin in the slot when the tap is in its off position is adjustable, such as by means of a screw connection between the connecting rod and the valve member. In this way the point at which the valve member begins to move when the handle is moved from its off to its on position can be varied, and hence the open position of the valve member when the handle is in the on position is also varied. Since the volume of beer which can be held by the reservoir chamber is dependent on the open position of the valve member, this arrangement enables adjustment of the volume of beer which is jetted through the auxiliary outlet when the tap is turned off and the valve member returns to its rest position.

A preferred example of a tap in accordance with the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a vertical section through the tap showing it in the off position;

Figure 2 is a view similar to that of Figure 1 but showing the tap in its on position; and,

Figure 3 is a view similar to that of Figure 1 but showing an alternative form of the tap.

The tap shown in Figures 1 and 2 comprises a hollow body 1 in which a valve member 2 is vertically slidable through a central portion 3 of the body 1 which acts as a guide for the member 2 and which divides the body into upper and lower chambers 4 and 5 respectively, the two chambers being sealed from each other by means of a sealing ring 6 acting between the guide portion 3 and the valve member 2. The upper chamber 4 houses a coil spring 7 which acts at one end on the body 1 at the top of the chamber 4 and acts at its other end on the upper end of the valve member 2 to bias the valve member downwards towards a closed position as shown in Figure 1. The spring 7 surrounds a vertically extending connecting rod 8 which is screwed at its lower end 9 into the top of the valve member 2 and which projects at its upper end through a hole 10 in the top of the body 1. At its upper end the connecting rod 8 is pivotally connected to an operating handle 11 by means of a link pin 12 which is carried by the handle 11 and which

extends transversely through a vertical slot 13 in the rod 8. In the closed position of the tap shown in Figure 1 the handle 11 adopts the vertical position shown. To open the tap the operating handle 11 is tilted to the right as indicated by the arrow 14, the handle 11 pivoting on the top of the body 1 so that the pin 12 engages the top of the slot 13 and lifts the connecting rod 8 and the valve member 2 against the action of the spring 7 to the open position shown in Figure 2.

The body 1 has a lateral inlet port 15 which opens into the lower chamber 5 just below the valve guide portion 3. In addition the body 1 has a dispensing spout 16 at its lower end and defining an outlet port 17 leading centrally from the lower end of the chamber 5. Slidably mounted in the lower chamber 5 is an annular piston 18 having an inverted conical valve seat 19 in its upper surface leading into a tubular spigot portion 20 which projects downwards from the lower end of the piston and is a sliding fit within the spout 16. A sealing ring 21 is provided between the tubular spigot 20 and the inside of the spout 16, and a sealing ring 22 is provided between the periphery of the piston 18 and the wall of the chamber 5.

In the closed position of the tap shown in Figure 1, the piston 18 is held at the lower end of the chamber 5 by the valve member 2 which is pressed downwards by the spring 7, the valve member bearing on the valve seat 19 of the piston through an annular sealing member 23 whereby the outlet port 17 is sealed off from the chamber 5. The sealing member 23 in fact has two axially spaced circumferential sealing lips 24 and 25 which engage the valve seat 19 on opposite sides of a number of passages 26 extending through the piston 18 from the valve seat to the underside of the piston. At its lower end the valve member 2 has a thin portion 27 which projects axially through the tubular spigot 20 and carries by means of radial webs 28 a lifting ring 29 within the spout 16 below and slightly spaced from the lower end of the spigot 20.

The tap is opened by a single continuous movement of the handle 11 from the position shown in Figure 1 to that shown in Figure 2. This raises the valve member 2, initially lifting the sealing member 23 away from the valve seat 19 of the piston 18 to open the outlet port 17 to the chamber 5 so that beer is able to flow from the inlet portion 15 through the chamber 5 and out of the dispensing spout 16 freely and without frothing, and also moving the lifting ring 29 into engagement with the lower end of the spigot 20 so that the continued raising of the valve member 2 towards its fully open position also raises the piston 18. This opens up an annular space 30 at the bottom of the chamber 5 beneath the piston 18, and the space 30 thereupon fills with beer from the chamber 5 via the passages 26 through the piston, the spigot extension 20 of the piston preventing the escape of beer from the space 30 through the dispensing spout 16.

To close the tap, the handle 11 is moved, again in a single continuous movement, from the position shown in Figure 2 to that shown in Figure 1. This allows the spring 7 to move the valve member 2 downwards, initially moving the sealing member 23 into engagement with the valve seat 19 to shut off the flow of beer through the outlet port 17 and also to close the passages 26, and then pushing the piston 18 downwards into the position shown in Figure 1. In moving to this position the piston 18 expels the beer in the space 30 through a small outlet orifice 31 which is located in the bottom wall of the body 1 adjacent the spout 16 and which is arranged to form a high velocity jet directed towards a point beneath the spout 16.

The volume of beer which is dispensed in the jet is of course dependent on the volume of the space 30 when the tap is open, and can be adjusted by adjustment of the screw connection 9 between the connecting rod 8 and the valve member 2. This adjusts the position occupied by the link pin 12 in the slot 13 of the connecting rod when the tap is off, and hence adjusts the positions at which the handle 11 starts to raise the valve member 2 (i.e. when the pin 12 engages the top of the slot 13) during the movement of the handle to open the tap. As a result of course, when the tap is closed the valve member 2 will reach its fully closed position shown in Figure 1 while the handle 11 is still between its open and closed positions shown in Figures 2 and 1 respectively. Therefore, in order to return the handle 11 to the upright off position shown in Figure 1, a second coil spring 32 is provided in the chamber 4 to act at one end on the body 1 at the top of the chamber and to act at its other end on a flange 33 carried by a sleeve 34 which is slidable on the connecting rod 8 and which is pivotally connected to the link pin 12 for movement therewith.

When the required maximum volume of the space 30 has been set by adjustment of the screw connection 9 between the connecting rod 8 and the valve member 2, the screw connection may be locked in position by means of a locking screw 35 located in a tapped portion of an axial bore 36 extending through the connecting rod 8, the locking screw 35 bearing on a thrust rod 37 which in turn bears on the valve member 2.

The alternative form of tap shown in Figure 3 is very similar in construction to that of Figures 1 and 2, and corresponding parts have been given the same reference numerals. The main difference between the two taps lies in the form of the lost motion coupling between the piston 18 and the valve member 2. Instead of the valve member having the projection 27 carrying the lifting ring 29 below the lower end of the spigot 20, the piston 18 has a number of equiangularly spaced hooks 38 upstanding from its upper face outwardly of the valve seat 19. When the valve member 2 is raised, a shoulder 39 on the valve member engages beneath the hooks 38 to lift the piston 18. As will be appreciated, the absence of these hooks 38 in the tap shown in Figures 1 and 2 enables the body 1 to be made slimmer and more attractive, and also avoids hindrance of the

beer flowing through the chamber 5 when the tap is open.

CLAIMS

1. A tap for controlling the dispensing of beer from a keg or other container in which the beer is stored under a top pressure of carbon dioxide and from which the beer is delivered under pressure to the tap through a supply pipe, the tap comprising an inlet for connection to the supply pipe, a primary outlet, a valve member which is biased by a spring to a rest position in which it closes a passage through the tap from the inlet to the primary outlet and which is movable by an operating handle to an open position in which the passage is open to permit a relatively low velocity, high volume, flow of beer through the primary outlet into a vessel placed beneath the outlet, the valve member moving to close the passage immediately on release of the operating handle to allow the spring to return the valve member to its rest position, a reservoir chamber which is arranged to fill with beer when the valve member is in the open position, and means for expelling the beer from the reservoir chamber through an auxiliary outlet under the action of the spring returning the valve member to the rest position after the operating handle is released and the valve member has moved to close the passage, the auxiliary outlet being arranged so that the beer from the reservoir chamber is expelled as a realtively high velocity jet directly into the vessel containing the beer already dispensed through the primary outlet.

2. A tap according to claim 1, in which the means for expelling the beer from the reservoir chamber is the valve member itself.

3. A tap according to claim 1, in which the means for expelling the beer from the reservoir chamber is a piston which is coupled to the valve member for reciprocating movement therewith.

4. A tap according to claim 3, in which the piston comprises a valve seat which is engaged by the valve member to close the passage to the primary outlet, and the coupling between the piston and the valve member includes a degree of lost motion which allows the valve member to move relative to the piston to open and close the passage.

5. A tap according to claim 4, in which the coupling is arranged so that the valve member leaves the valve seat to open the passage at the start of its movement from the rest position to the open position and re-engages the seat to close the passage at the start of its movement from the open position to the rest position.

6. A tap according to claim 5, in which the piston is annular and its central opening leads through a tubular extension which projects slidably into the primary outlet and forms part of the passage, the tubular extension separating the reservoir chamber from the primary outlet.

7. A tap according to claim 6, in which the piston has at least one duct extending through it to allow the reservoir chamber to fill from the passage when the valve member is open, the or each duct opening into the valve seat so that it is closed by the valve member when the valve member engages the seat to close the passage.

8. A tap according to claim 6 or claim 7, in which the valve seat is conical.

9. A tap according to any one of claims 6 to 8, in which the coupling comprises a projection on the valve member which extends through the tubular extension of the piston and is arranged to engage under the end of the extension to lift the piston with the valve member after the valve member has moved initially to open the passage.

10. A tap according to any one of the preceding claims, in which the valve member is moved by the operating handle through a connecting rod which is connected at one end to the valve member and is connected at its other end to the handle by means of a pin carried by the handle and extending through a hole in the connecting rod, rocking movement of the handle about a fulcrum from an off to an on position moving the valve member from its rest position to the open position.

11. A tap according to claim 10, in which the valve member return spring is a coil spring which surrounds the connecting rod and is housed in a chamber of the tap which is separated from the passage and the inlet, the spring acting between a fixed portion of the tap and the valve member or a part bearing on the valve member.

12. A tap according to claim 10 or claim 11, in which the hole in the connecting rod which receives the pin is a slot, and the position occupied by the pin in the slot when the tap is in its off position is adjustable in order to adjust the open position of the valve member when the handle is in the on position and thereby adjust the volume of beer which is held by the reservoir chamber and which is subsequently jetted through the auxiliary outlet.

13. A tap according to claim 12, in which the connecting rod is screwed to the valve member so that their combined length can be adjusted in order to adjust the position occupied by the pin in the slot when the tap is in its off position.

14. A tap according to claim 12 or claim 13, including a second spring which biases the operating handle to its off position so that the handle will be returned to the off position in situations where the adjustment of the pin and slot is such that the valve member reaches its rest position before the handle reaches its off position.

15. A tap according to claim 14, in which the second spring is a coil spring which acts between a fixed portion of the tap and a flange on a sleeve

which is slidable on the connecting rod and which is pivotally connected to the pin for movement therewith.

16. A tap according to claim 1, substantially as described with reference to Figures 1 and 2, or Figure 3 of the accompanying drawings.

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