July 1, 1947. P. H. PHILLIPS 2,423,155

PRESSURE RESTRICTING DEVICE

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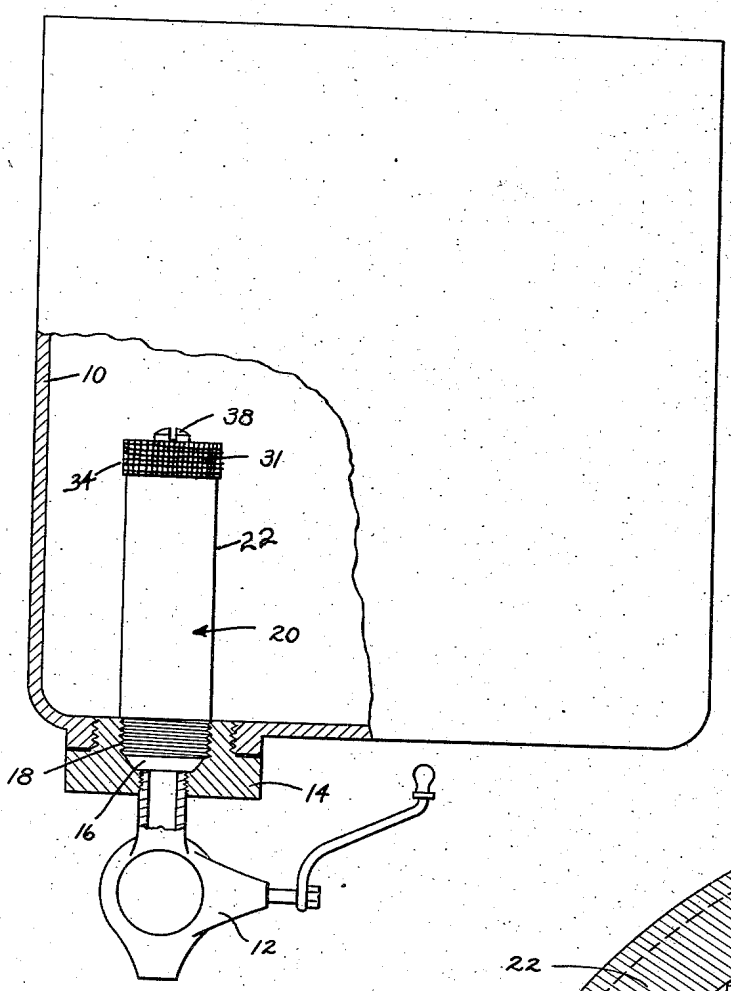

Fig - 1

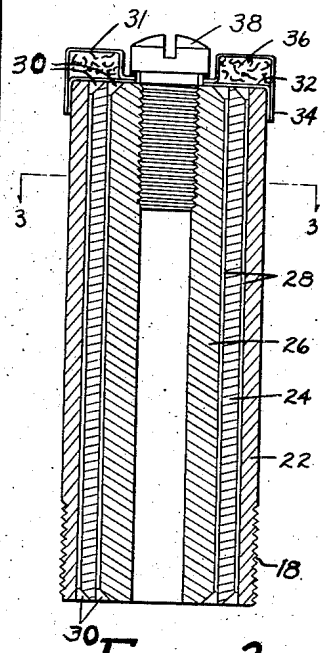

Fig - 2

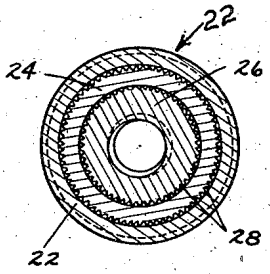

Fig - 3

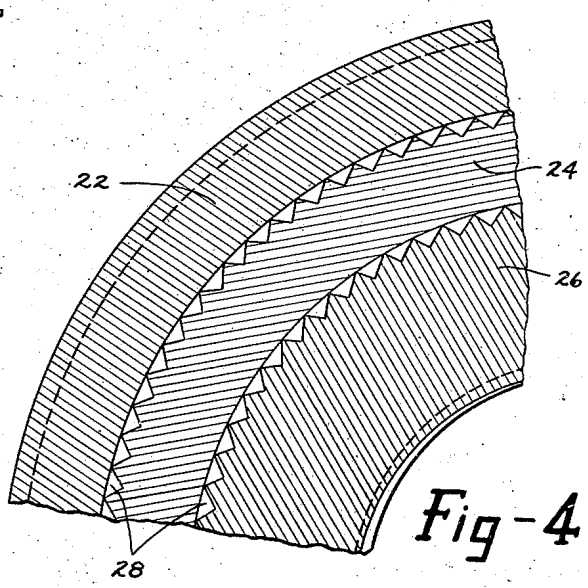

Fig - 4

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PRESSURE RESTRICTING DEVICE

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3 Claims. (Cl. 138—40)

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The present invention relates to a device, herein referred to as a pressure restrictor, for effecting a substantial pressure drop in the fluid passing therethrough. As an instance of a use to which my improved pressure restrictor may be applied, reference may be had to the dispensing of carbonated liquid from a carbonator where it is desirable to substantially reduce the pressure of the liquid so that the liquid will issue from the carbonator at a greatly reduced velocity but at substantially full flow.

An object of the present invention is to provide a pressure restrictor wherein a full flow of liquid, such as carbonated water, is obtained with minimum exit velocity and at a pressure substantially below that under which the liquid is forced through the restrictor.

Another object of the invention is to provide a restrictor which is relatively simple and compact, which is simple in construction so that it may be readily manufactured at a low cost, and which is highly efficient for the purposes intended.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawing, wherein I have shown one embodiment which the present invention may take:

Figure 1 is a view of a carbonating apparatus embodying the invention herein and partly broken away to show the pressure restricting means;

Fig. 2 is a vertical sectional view of the pressure restricting means;

Fig. 3 is a horizontal cross sectional view through the pressure restricting means, the same being taken substantially on line 3—3 of Fig. 2; and

Fig. 4 is an enlarged fragmentary view of Fig. 3.

Referring to the drawing, I have shown, in Fig. 1, for illustrative purposes, a carbonating apparatus which includes a chamber 10 into which water and carbon dioxide gas are introduced in any suitable way to provide a carbonated liquid. The liquid may be withdrawn from the chamber 10 through a conventional quick-opening valve 12 mounted in a plug or adapter 14 secured to the base of the chamber 10.

In accordance with the present invention, there is located within the chamber 10 and in close proximity to, and directly above, the valve 12,

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pressure reducing means having a large number of parallel non-circular channels or conduits 28 extending throughout the length thereof and through which the water must pass from the chamber 10 to the valve 12. Each conduit has a very small hydraulic radius, preferably from .0015 to .05", whereby a subtantial pressure drop in the liquid is obtained while maintaining a full flow of liquid through the valve 12 at a minimum exit velocity. My improved pressure restrictor comprises a plurality of tubular members tightly telescoped into one another, there being between adjacent members longitudinally extending individual channels 28 formed by the provision of grooves in one peripheral surface of each pair of such contacting surfaces. The grooves are parallel to one another, are of like size, and may extend for the full length of the members. In the present illustrative disclosure, three such members, respectively designated by the numerals 22, 24, and 26, are provided, but it is understood that the number thereof employed may be varied to suit requirements. In the present instance, the grooves are formed in the external peripheries of the inner member 26 and the intermediate member 24. The ends of these peripheral surfaces are chamfered, as at 30, so as to facilitate the flow of the liquid into and out of the restrictor. In the present instance, the tubular members are shown as being formed of metal. The external diameters of the tubular members 24 and 26 are initially slightly greater than the respective internal diameters of the members 22 and 24 so that, when the members are assembled by a telescoping operation, the outer edges of the ribs or teeth on the outer surfaces of the members 24 and 26 closely engage the inner surfaces of the members 22 and 24 respectively. In the drawings, the grooves are shown as being generally V-shaped in cross section so that each individual channel is generally triangular in cross section, but it is understood that the shape of the grooves may be varied. The tubular members may be formed of plastic materials or glass. The grooves may be formed by simple milling, knurling, extrusion, or molding methods. The outer member 22 constitutes a casing, the lower end of which is externally threaded, as at 18, so as to be screwed into an exit chamber 16 provided in the adapter 14.

It will be seen that the conduits 28 have a small non-circular cross sectional area but a large wetted perimeter resulting in a small mean hydraulic radius which effectively causes a gradual pressure drop in the liquid flowing therethrough.

With this construction, a very short length of restrictor suffices to reduce the pressure effectively, and by providing a large number of conduits, the desired flow is obtained. It will also be noted that the conduits **28** are of identical size and shape and thus the same hydraulic radius holds whether the conduits are considered individually or collectively. By having the conduits of like size and shape, the mean hydraulic radius remains fixed and thus, by increasing the number of conduits, a greater flow is obtained for any given length with the pressure drop remaining substantially constant. If the hydraulic radius is increased, the pressure drop decreases unless the length of the conduits is increased in direct proportion to the increase in hydraulic radius. From the foregoing, it is apparent that any desired set of conditions, namely pressure drop and rate of flow, may be readily obtained by selecting a conduit having a proper hydraulic radius.

In practical application, it is desirable to provide the restrictor with a filter **31**. The filter may consist of two cup members **32** and **34** formed of wire mesh and shaped to provide an annular channel which may be filled with a high grade felt **36**. The filter is secured in place by a screw threaded into the upper end of the bore of the inner tubular member **26**.

As a specific example of a device embodying the invention herein, let it be assumed that the overall length of restrictor member **22** is two inches and its outside diameter .75 inch and inside diameter .6205 inch. The second member **24** is of equal length and has an outside diameter of .6210 inch and an inside diameter of .4745 inch. The third member **26** is also of equal length and has an outside diameter of .4750 inch and the central opening closed as desired. Each of the outer peripheral faces of members **24** and **26** are knurled to provide fifty teeth per inch of circumference, each having .010 inch depth of tooth with a 90° included angle and a .020 inch circular pitch. In this way, when the restrictor is assembled, one hundred and seventy-three conduits will be provided. Such a restrictor is suitable for dispensing carbonated water made at sixty to ninety pounds at full flow with a small exit velocity making the water highly effervescent.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. A pressure restrictor comprising a plurality of tubular members telescoped one within the other, the outer peripheral surface of each tubular member within the outer one being provided with longitudinally extending parallel grooves with V-shaped ribs therebetween, the outer edges of said ribs being in close engagement with the inner peripheral surface of the next larger member so as to provide a plurality of generally triangular-shaped parallel channels open at their opposite ends, said channels being identical to one another and having the same hydraulic radius between the limits of .0015 and .05 inch.

2. A pressure restrictor comprising a plurality of tubular members telescoped into one another so as to closely engage the outer peripheral surface of each succeeding smaller diameter member with the internal peripheral surface of the next larger one, one of the peripheral surfaces of each pair of contacting surfaces having a plurality of like parallel grooves extending longitudinally thereof and cooperating with the adjacent contacting surface to provide a plurality of independent non-circular channels, said channels being open at their opposite ends.

3. A pressure restrictor comprising a plurality of tubular members telescoped into one another, the outer peripheral surfaces of the members within the outer member being provided with longitudinally extending grooves cooperating with the inner surface of the next succeeding larger member to provide a plurality of separated non-circular channels open at their opposite ends, said channels being identical to one another and each having a small hydraulic radius.

PHILIP H. PHILLIPS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,132,011	Bennett et al.	Oct. 4, 1938
1,539,256	Gfeller	May 26, 1925
1,453,048	Kraft et al.	Apr. 24, 1923
1,984,472	Friederich et al.	Dec. 18, 1934
1,095,555	Crone	May 5, 1914
2,212,186	Ricardo et al.	Aug. 20, 1940

FOREIGN PATENTS

Number	Country	Date
192,956	Great Britain	Feb. 15, 1923