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[54] **THROTTLE MEANS FOR MAINTAINING
 CONSTANT FLOW**
9 Claims, 4 Drawing Figs.

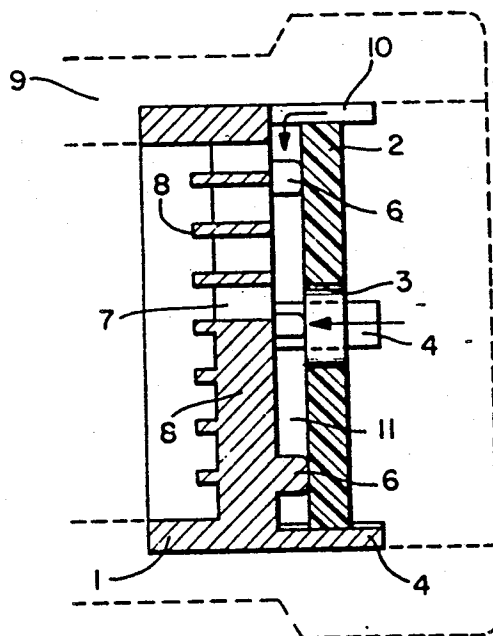
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ABSTRACT: The invention relates to a throttle device for maintaining a constant flow through a pipe when the delivery pressure varies. The device includes a rigid perforate plate and a resilient disc having a central orifice, the disc being maintained in spaced relation to the plate by spacing elements extending transversely from the plate. Increased pressure in the pipe deflects the resilient disc towards the perforate plate so that the perforations of the plate are closed by the disc to a greater or lesser degree depending on the pressure. As the pressure increases the closing of the perforations reduces the effective cross-sectional area of the pipe to maintain a constant flow through the pipe.



THROTTLE MEANS FOR MAINTAINING CONSTANT FLOW

The invention relates to a throttle means for maintaining a constant flow through a pipe when the delivery pressure varies, this means comprising a resilient disc which is disposed transversely of the flow, is held by a plurality of backing elements at a distance from a perforate rigid plate and can deflect towards this plate under the effect of the flow pressure.

Throttling means of this kind are known in which the resilient disc is supported at the edge and cooperates with a single central orifice in the plate. In a known construction, the support arrangement consists of a protuberance at the edge of the disc, which protuberance is divided into four arcuate supporting elements by four gaps in the circumference of the disc. Formed at the center of the disc is a cone which projects into the orifice in the plate.

With a construction of this kind it is very difficult or even impossible to maintain a constant flow over a wide pressure range. In this connection it has to be borne in mind that the device is normally fitted in a pipe and its overall dimensions are therefore very small (2 centimeters diameter for example). When the quantities of the medium flowing through is small, it is desirable for the orifice in the rigid plate to be as large as possible so that a sufficiently large quantity flows through at lower pressures. However, the greater the cross section of the orifice, the more difficult it is to effect the throttling action at higher pressures. The greater the cross-sectional area, the more quickly arises the danger of the disc, pressed towards the orifice, being subjected to shear loads and becoming damaged at higher pressures.

The object of the invention is to provide a throttle means whereby flow can be kept constant over a wide pressure range in a better manner than hitherto.

According to the invention, this object is achieved by the plate having a plurality of orifices which are located, at least in part, between adjacent backing elements and are covered by the disc.

In this construction, the parts of the resilient disc located between adjacent backing elements cooperate, independently of each other, with the orifices that they cover in the rigid plate. This corresponds to a parallel arrangement of a plurality of throttle means without involving increased expense. There is no difficulty in making the total cross section of all the orifices so large that a sufficient quantity of the medium flows through even at low pressures. Conversely however, the orifices themselves can be made smaller than in the case of a single-hole throttling device, so that the risk of shear stresses occurring can be avoided for example. Since the distance between adjacent backing elements can be utilized for regulating purposes and this distance is relatively small or can be made small, it is possible, even at higher pressures, still to achieve sufficiently small changes in the distance between the disc and the plate such as are necessary for the correct throttling action for achieving constant flow.

It is particularly advantageous if each backing element is surrounded by orifices. This not only results in a very large total cross-sectional area of the orifices, which is desirable in the case of low pressures, but better regulation is also achieved for high pressures, since the closer the point in question is to the backing element, the smaller is the effect of a change in pressure on a change in the distance between disc and plate.

In a further aspect of the invention, practically the entire area of the plate can contain orifices, thus resembling a sieve. In this way an optimally large cross section is obtained for the orifices. Nevertheless, the regulating function at high pressures is not interfered with, since the disc in such cases bears partially against the plate and can close some of the orifices.

If at least three backing elements are provided over a circle having a smaller radius than that of the plate, then, on the one hand, the desired small distances between adjacent backing

elements are achieved and, on the other hand, an unoccupied middle portion is obtained in which the resilient disc can bear against the rigid plate at higher pressures, and can close some of the orifices.

There is no difficulty in so rating the resilience of the disc that it bears partially against the webs between the orifices when the operating pressure is higher.

In a preferred embodiment, the backing elements are formed as projections on the plate. Since the sieve-like plate is preferably produced by moulding, these projections can be formed on it at the same time.

A still finer graduation of the regulating function can be achieved by the backing elements being of different heights. This means that when the flow pressure rises, backing elements of smaller height also become effective.

In the simplest case, the disc is circular and is centered by means of fingers on the circumference of the plate. The water can then flow over the entire peripheral zone between disc and plate, with the exception of the fingers. Furthermore, the disc can also have a central hole, so that the medium can pass under the disc from outside and inside.

The invention will now be described in more detail by reference to two embodiments illustrated in the drawing, in which:

FIG. 1 is a plan view of a rigid plate forming part of the throttle means of the invention,

FIG. 2 is a cross section through the throttle means on the line A-A of FIG. 1,

FIG. 3 is a plan view of the plate used in a second embodiment, and

FIG. 4 is a cross section through a throttle means on the line B-B of FIG. 3.

The throttle device of FIGS. 1 and 2 consists of a rigid plate 1 and a resilient disc 2. The resilient disc 2 is circular and contains a central hole 3. It is centered by its outer circumference by means of fingers 4, which are formed on the edge 5 of the plate 1. The disc 2 bears on backing elements 6 which take the form of projections on the plate 1. The plate 1 contains orifices 7 over practically its entire area, which orifices are separated from each other by webs 8 at right angles to each other. The backing elements 6 are in each case located at the points of intersection of two webs. Consequently, the backing elements are surrounded by orifices 7. Furthermore, several orifices 7 are located between adjacent backing elements 6, these orifices being covered by the disc 2.

In FIG. 2 there is shown in broken lines a pipe 9 in which the throttle means can be fitted and held by any suitable means, e.g. a resilient clip.

The arrangement operates as follows. At very low pressure, the resilient disc 2 has the shape substantially as illustrated in FIG. 2. The medium flows, as indicated by arrows, through the central hole 3 in the disc 2 and through zones 10 which are defined by the circumference of the disc, the wall of the pipe 9 and the fingers 4, and passes into the space 11 between the disc and the plate. From here, the medium can flow on through all the orifices 7 in the plate 1 without any great pressure loss. As the pressure rises, the disc 2 deflects, a throttling action occurring between the underside of the disc 2 and the webs 8. The deflection of the disc is variable because of the elements 6 providing separate backing. Deflection is greatest at the center of the disc. Somewhat less pronounced deflection occurs between adjacent backing elements 6, i.e. in the region of the orifice 7a for example. The least degree of deflection is encountered around the backing element 6, i.e. near the orifices 7b. Consequently, some of the orifices 7 are completely closed as pressure rises. On the other hand however, a regulating function still takes place near the backing element 6 when the pressure is at its highest. A predetermined basic flow volume can be guaranteed with the help of the central hole 3.

In the construction shown in FIGS. 3 and 4, a rigid plate 12 cooperates with a similar resilient disc 13. The latter contains a central hole 14 and is centered by means of fingers 15 on the

plate 12. In this case the webs 16 extend along arcs of circles and radially. The orifices 17 then have a corresponding segmental form. In the at-rest position the disc 2 bears on first backing elements 18. Additional backing elements 19, of reduced height, are also provided against which the disc 13 additionally bears as the pressure rises. In this manner, an undesirably violent throttling action is prevented when the pressure rises.

I claim:

1. A fluid flow throttle device for maintaining a constant flow through a pipe when the fluid pressure varies, comprising a rigid perforated plate adapted to be fixedly attached internally of a pipe and having a framework forming a lattice having multiple openings in a plane substantially parallel to the direction of fluid flow, a resilient disc having a circular orifice, a plurality of spacing elements extending transversely from said plane, said elements being arranged circumferentially relative to said orifice, said disc being in abutting engagement with said elements and being increasingly displaceable with increasing pressure so as to bear partially against said lattice to close some of said openings.

2. A throttle device according to claim 1 wherein said framework forms a plurality of openings surrounding each of

said elements.

3. A throttle device according to claim 1 wherein said lattice forms a sieve.

4. A throttle device according to claim 1 wherein said plate has a circular periphery, said elements being at least three in number and being within the confines of said periphery.

5. A throttle device according to claim 1 wherein the resilience of said disc is rated to bear in part on said framework when subjected to pressurized fluid forces.

6. A throttle device according to claim 1 wherein said elements have the form of projections.

7. A throttle device according to claim 1 including two sets of said spacing elements, the elements in one of said sets being of greater height than the elements in the other of said sets.

8. A throttle device according to claim 4 wherein said plate has a plurality of centering fingers extending transversely from said periphery of said plate, said disc being centered by said fingers.

9. A throttle device according to claim 1 wherein said orifice is centrally located relative to the circumference of said disc.

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