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DISTRIBUTION OF FLUIDS

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FIG. 1

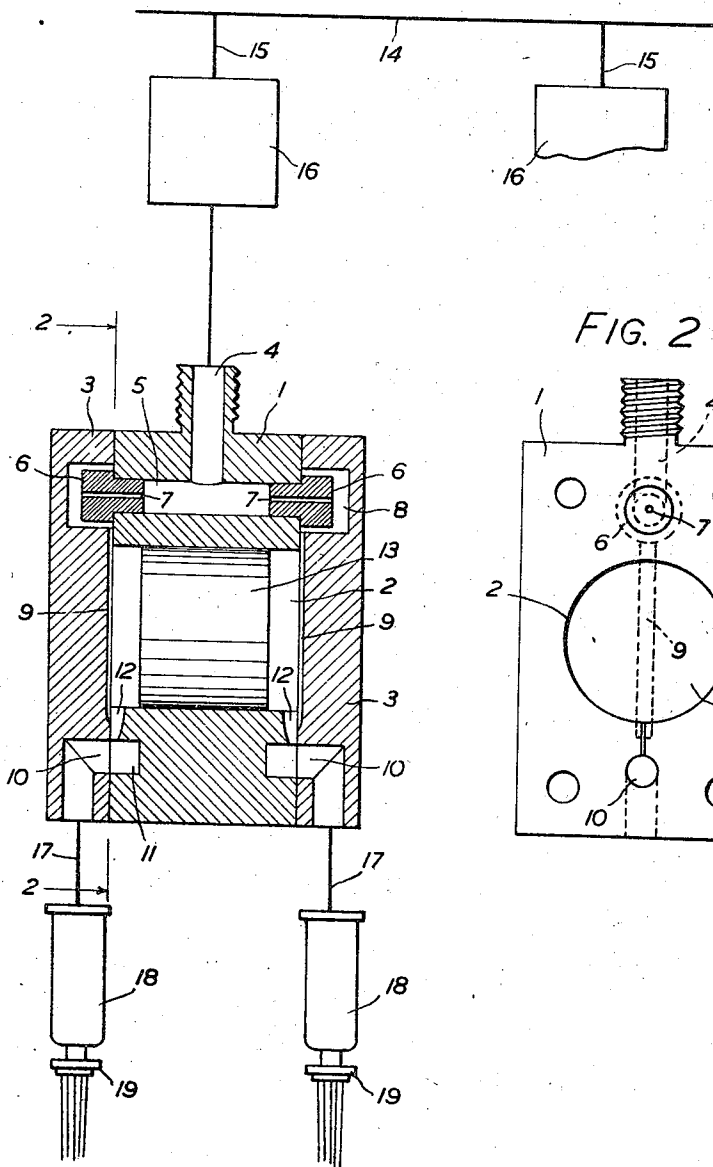
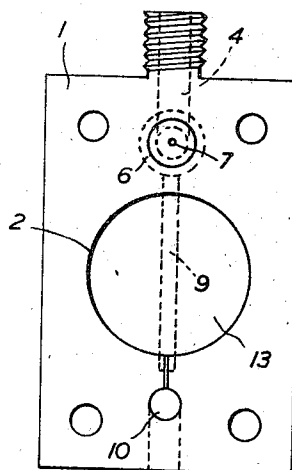


FIG. 2



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DISTRIBUTION OF FLUIDS

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4 Claims. (CL 137—166)

This invention relates to the distribution of fluids in the manner described and claimed in U. S. Patent No. 1,993,790 according to which fluid from a single source of supply is divided into a number of paths in definite ratio, irrespective of differences and variations in the resistance to flow offered by such paths.

The apparatus according to the prior specification comprises means for dividing the fluid into two paths, means in each of said paths adapted to offer a resistance to fluid flow, throttling means in each of said paths, and means for adjusting said throttling means in accordance with the variations of the ratio of the pressure drops across said resistances from a given desired ratio, said adjustment being so directed as to restore the constant ratio of the pressure drops.

The present invention comprises such an apparatus in which the throttling means comprise ports in a cylinder adapted to have their free area increased or decreased by means of a simple piston in the cylinder when the piston moves by reason of differences in the pressure drops through the resistances arising from any tendency for the fluid flow to be divided otherwise than in the desired ratio. Apart from the simplicity of construction of the throttling means comprised by the ports and the piston, the apparatus as a whole is simple in construction, since it may be formed with only one moving part, viz. the piston itself.

The cylinder is preferably of substantial area so as to provide sensitive actuation of the piston under the out-of-balance conditions set up by any slight change in flow. The body of fluid at each end of the cylinder also serves as a reservoir assisting to maintain the desired ratio of flow as the piston moves in response to any tendency to change of flow, and for this reason the piston may have an initial idle movement before it begins to change the area of one or the other of the ports.

One form of apparatus according to the invention will now be described in greater detail with respect to the accompanying drawing in which—

Fig. 1 is a front elevation in section of a flow-dividing device, showing diagrammatically the application of the device to the delivery of spinning fluid for the manufacture of artificial filaments; and

Fig. 2 is a side elevation taken on the line 2—2 of Fig. 1.

The flow-dividing device comprises a central body member 1 bored from face to face to form a cylinder 2, and two end cover plates 3 serving

to close the cylinder. In the body member an inlet passage 4 communicates with a passage 5 running parallel to the cylinder, each end of the passage being closed by a throttling resistance in the form of a nipple 6 bored with a fine capillary opening 7. Opposite each capillary a recess 8 is formed in each cover plate to provide for free flow of fluid emerging from the capillary.

Passages 9 milled in the faces of the cover plates 3 pass diametrically across the ends of the cylinder to continue the paths for the fluid from the recesses 8 to the cylinder, the passages terminating just short of outlet openings 10 bored in the cover plates. Each outlet opening 10 registers with a blind hole 11 in the body member 1. A fine slit 12 cut in the face of the body member connects one end of the cylinder 2 with the blind opening to continue the path for the fluid from the cylinder to the outlet openings 10, and the milled passage 9 registers with the slit and overlaps it. A plain piston 13 rests in the cylinder between the two ports formed by the fine slits.

In each of the two streams into which the fluid is divided resistance to flow is provided first by the capillary passage 7 and then by the fine slit 12. So long as the two flows are equal, similar pressure conditions occur at corresponding points throughout the two halves of the apparatus. Should, however, some tendency to diminish the flow arise in one half of the apparatus, the pressure drop across the capillary 7 in that half varies and the piston 13 is subjected to out-of-balance pressures. The piston is thus caused to move so that it partially blocks one of the slits 12, this adding increased throttling at this point and restoring equality of flow.

The length of the piston 13 is somewhat short of the distance between the two slits 12, and the piston must make an idle movement before it begins to block the slit towards which it is moving, and during this movement the change in volume of the bodies of fluid at the ends of the cylinder provides an initial compensation for the change of flow. If this compensation is insufficient, further movement of the piston then brings about additional throttling at one of the slits.

The overlapping of the passages 9 and the slits 12 ensures that the flow is not entirely cut off, even if the piston 13 moves to the end of the cylinder 2.

Fig. 1 shows the device receiving spinning fluid (which may already be under considerable pressure) from a header 14 through a branch pipe 15 in which is fitted a measuring pump 16 that ensures a constant flow of fluid to the de-

vice. The outlets 10 are connected by pipes 17 to spinning filters and jets 18, 19, the operation of the device serving to divide the flow accurately between the two jets 19, even when variable choking of the two filters 18 tends to make the flows uneven.

A further application of the flow-dividing device is in the hydraulic operation of retractable undercarriages for aircraft, the interposition of the device between a single pump and the hydraulic gear of each undercarriage ensuring that the two undercarriages are projected at the same rate, notwithstanding any variation in resistance that may be encountered.

Having described my invention, what I desire to secure by Letters Patent is:

1. Apparatus for the distribution of fluids comprising means for dividing a fluid flow along two paths, means in each of said paths adapted to offer a resistance to fluid flow, a cylinder having its ends communicating with said paths, a piston in the cylinder, and ports in the cylinder providing a continuation of said paths, said ports providing throttling means and being adapted to have their free area increased or decreased by the piston when the piston moves in response to differences in the pressure drops through the resistances.

2. Apparatus according to claim 1 wherein the cylinder is closed by cover plates provided with passages cut in their inner surfaces for the fluid to flow to the ends of the cylinder.

3. Apparatus for the distribution of fluids comprising means for dividing a fluid flow along two paths, means in each of said paths adapted to offer a resistance to fluid flow, a cylinder having its ends communicating with said paths, a piston in the cylinder, and fine slits cut in the cylinder wall to provide a continuation of said paths and to constitute throttling means, the free area of the slits being increased or decreased by the piston when the piston moves in response to differences in the pressure drops through the resistances.

4. Apparatus for the distribution of fluids comprising means for dividing a fluid flow along two paths, means in each of said paths adapted to offer a resistance to fluid flow, a cylinder having its ends communicating with said paths, a piston in the cylinder, fine slits cut in the cylinder wall to provide a continuation of said paths and to constitute throttling means and cover plates closing the cylinder and provided with passages cut in their inner surfaces to form the communication between the cylinder and the two fluid paths, and to register with and overlap the slits, the free area of the slits being increased or decreased by the piston when the piston moves in response to differences in the pressure drops through the resistances.

EDWARD KINSELLA.