Aug. 22, 1961 J. T. ROOS 2,997,068

FLUID DISTRIBUTOR

Filed May 9, 1960 4 Sheets-Sheet 1

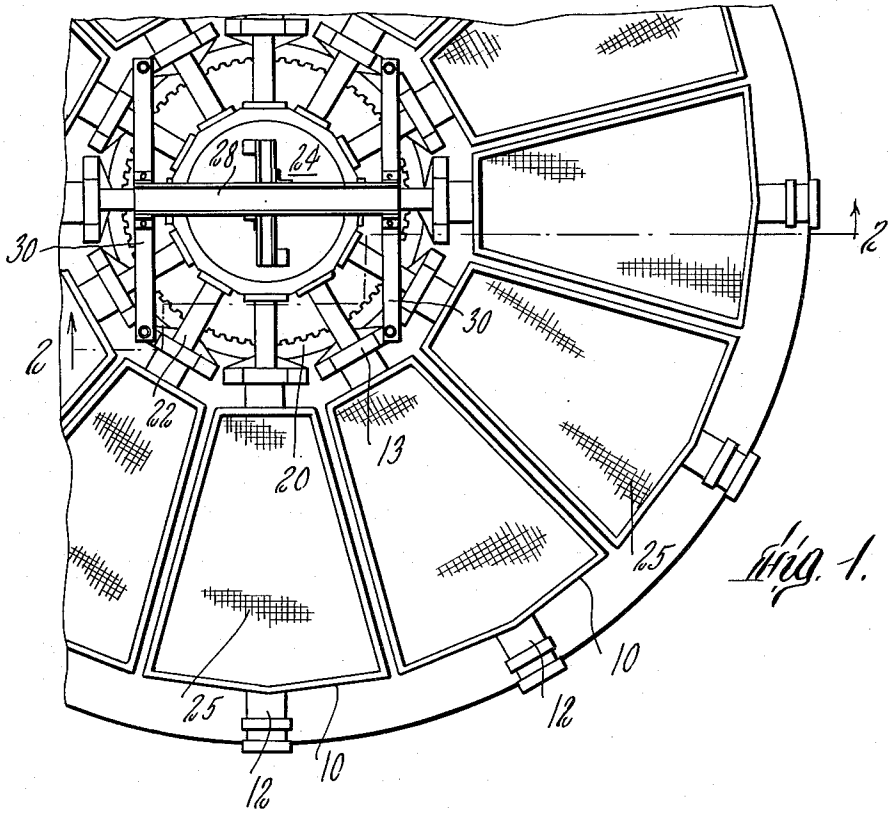


Fig. 1.

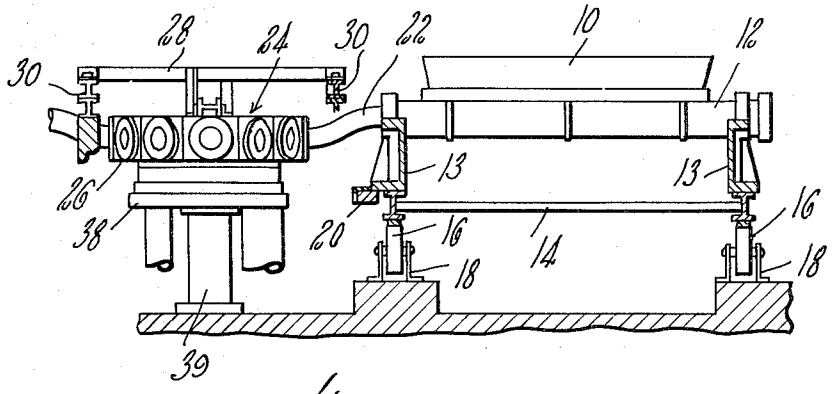


Fig. 2.

Aug. 22, 1961 J. T. ROOS 2,997,068

FLUID DISTRIBUTOR

Filed May 9, 1960 4 Sheets-Sheet 2

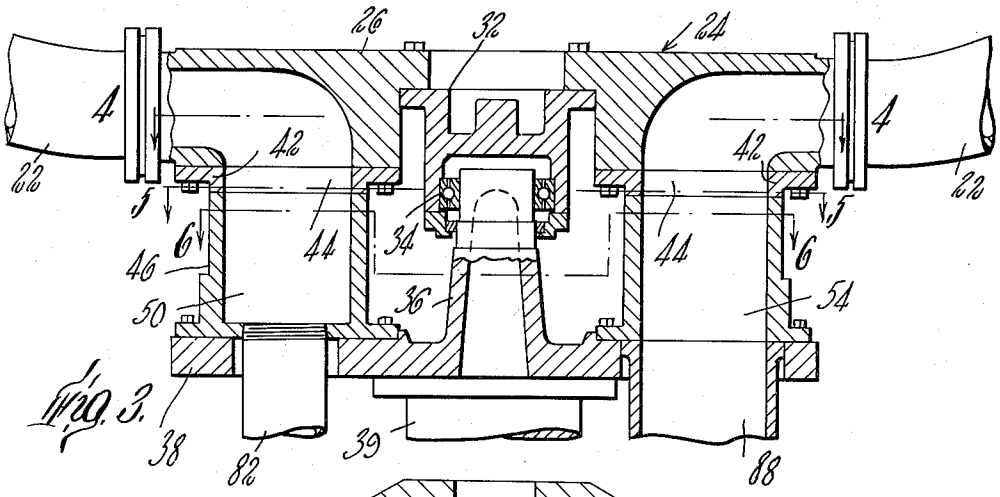


Fig. 3.

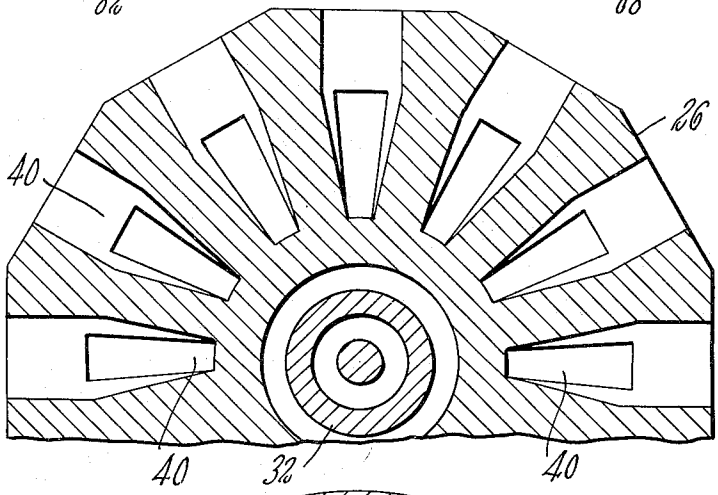


Fig. 4.

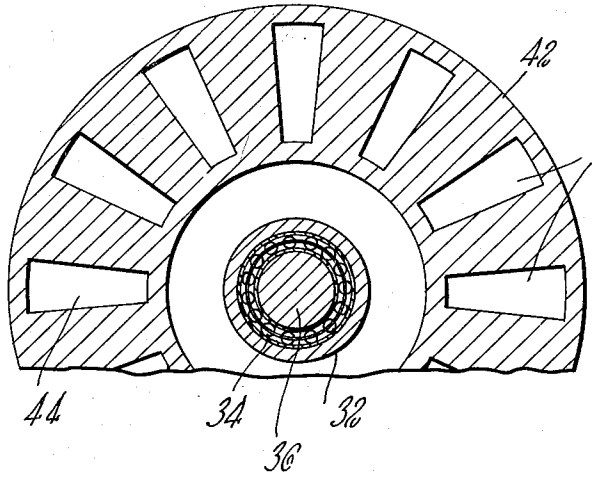


Fig. 5.

Aug. 22, 1961 J. T. ROOS 2,997,068

FLUID DISTRIBUTOR

Filed May 9, 1960 4 Sheets-Sheet 3

Fig. 6.

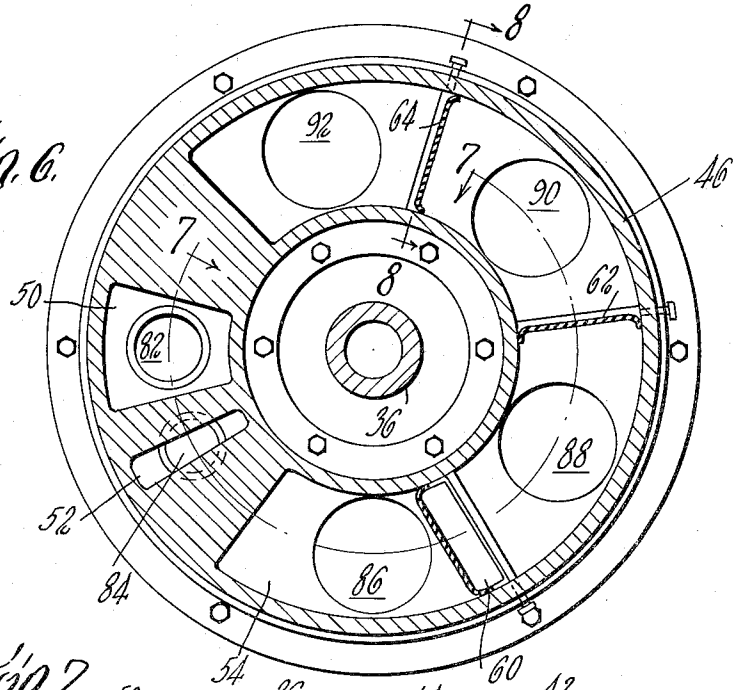


Fig. 7.

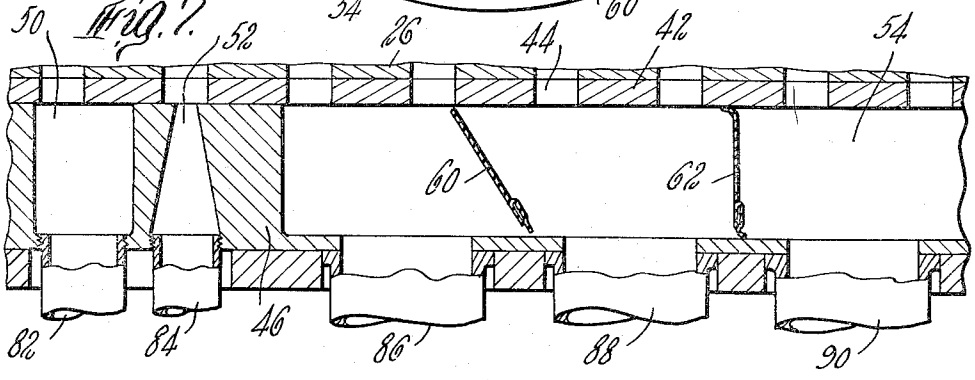


Fig. 8.

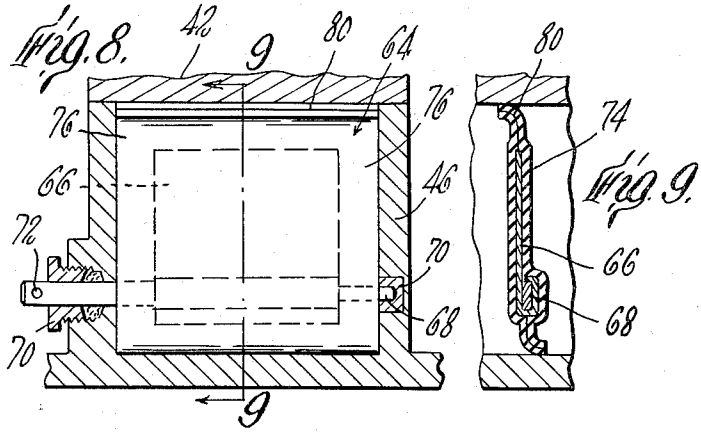


Fig. 9.

Aug. 22, 1961 J. T. ROOS 2,997,068

FLUID DISTRIBUTOR

Filed May 9, 1960 4 Sheets-Sheet 4

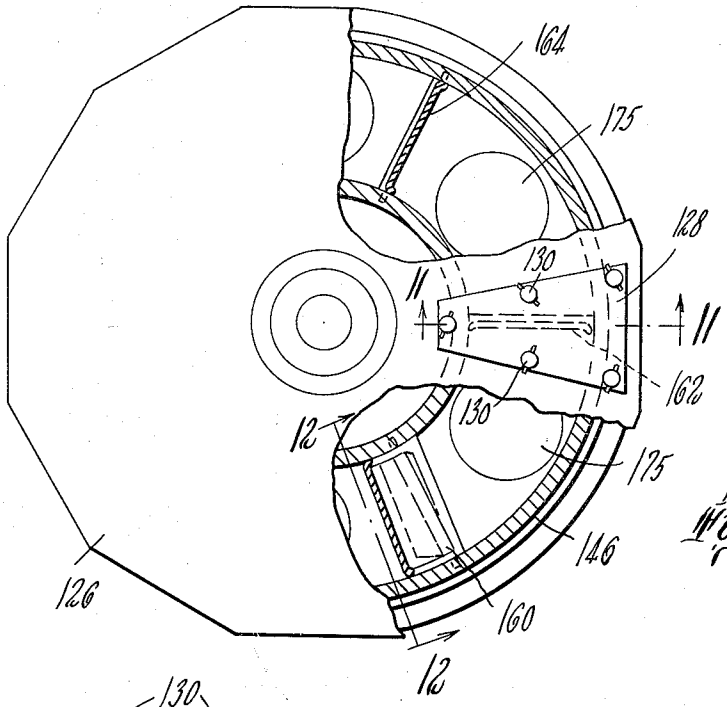


Fig. 10.

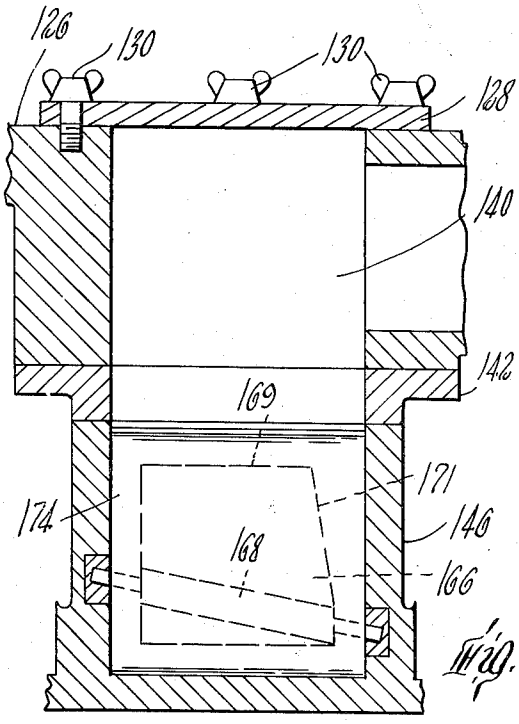


Fig. 11.

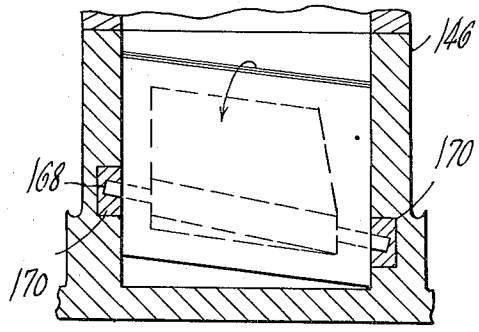


Fig. 12.

United States Patent Office 2,997,068 Patented Aug. 22, 1961

2,997,068

FLUID DISTRIBUTOR

John T. Roos, Westwood, Mass., assignor to Bird Machine Company, South Walpole, Mass., a corporation of Massachusetts

Filed May 9, 1960, Ser. No. 27,841
7 Claims. (Cl. 137—624.13)

This invention relates to a distributor for controlling the flow of fluids in sequence through a plurality of ports and pertains more specifically to a variable-port distributor for use with moving-cell filters or concentrators of the belt or rotary type.

Distributors for controlling the flow of fluids sequentially customarily comprise two relatively movable members, each of which carries an array of ports, each port in one member being brought into communication with each opposing port of the other member in sequence during their movement. In many cases it is desired to have one or more of the ports of varying length so that such ports will remain in communication with the opposing ports for a period of time different from the remaining ports during each cycle of operation. Once such a cycle has been determined, however, it has not been possible to vary it without dismantling the distributor in order to change the relative port size. This is a major operation which involves a time-consuming shut-down of the mechanism or device with which the distributor is associated.

One object of the present invention is to provide a distributor of the type described having a plurality of ports or apertures the relative length of which may be varied from the outside of the distributor without the necessity for dismantling it.

Another object is to provide a variable-port distributor of the type described in which the relative length of the ports may be varied from outside the distributor without interrupting operation of the device.

Still another object is to provide a filter of the moving-cell type having a variable-port distributor synchronized with the movement of the cells and in which the relative length of individual ports may be varied from outside the distributor without interrupting its operation.

Other and further objects will be apparent from the drawings and from the description which follows.

In the drawings:

FIG. 1 is a plan view, partly broken away, showing a moving-cell filter of the rotary tilting-cell type embodying a distributor of the present invention;

FIG. 2 is a view in section along line 2—2 of FIG. 1;

FIG. 3 is a view in vertical section through the center of the distributor embodied in FIG. 1;

FIG. 4 is a view in section, partly broken away, taken along line 4—4 of FIG. 3;

FIG. 5 is a view in section, partly broken away, taken along line 5—5 in FIG. 3;

FIG. 6 is a view in section taken along line 6—6 of FIG. 3;

FIG. 7 is a view in section, partly broken away, taken along line 7—7 of FIG. 6;

FIG. 8 is a view in section, partly broken away, taken along line 8—8 of FIG. 6;

FIG. 9 is a view in section taken along line 9—9 of FIG. 8;

FIG. 10 is a top plan view, partly broken away and in section, showing another embodiment of the distributor of the present invention;

FIG. 11 is a view in section taken along line 11—11 of FIG. 10; and

FIG. 12 is a view in section taken along line 12—12 of FIG. 10.

One embodiment of the distributor of the present invention as illustrated in the accompanying drawings will

be described as employed in conjunction with a rotary tilting-cell-type filter. However, it will be understood that the distributor may also be employed in conjunction with moving-cell filters of the straight or linear belt type or of the rotary type in which the filter cake is scraped from the surface of the cells without tilting them.

As shown in the drawings, the rotary filter embodies an annular array of filter cells 10, 10, each of which is mounted on a shaft 12 journaled in bearing pedestals 13, 13 supported on a frame 14 which is mounted for rotational movement about the vertical axis forming the center of the array, the frame being supported on rollers 16, 16 journaled in fixed brackets 18, 18. Rotational movement of the array may be provided by a conventional motor and drive pinion (not shown) meshing with ring gear 20. Suitable cams and cam followers may be provided for tilting cells 10 on their shafts 12 at the appropriate time during their rotation about their common center in order to dump the filter cake therefrom, as is well known to the art.

Each shaft 12 supporting a filter cell 10 is hollow and is connected by means of hose 22 to the distributor indicated generally by the numeral 24. Each hollow shaft communicates with the bottom of cell 10 beneath the filter cloth 25, which is mounted in it in the usual manner, and serves to remove from the cell the liquid which passes through the filter cloth, as will be described in greater detail below.

The embodiment of the distributor shown in the drawings comprises a manifold 26 of generally circular configuration which is mounted for rotation about its center. A cross head 28 is secured to the top of manifold 26 in any suitable manner, as by welding or the like, cross head 28 being secured in turn to beams 30, 30 which are bolted to bearing pedestals 13, 13 so that manifold 26 is rotatably driven in synchronism with the array of filter cells 10, 10.

Manifold 26, as best appears in FIG. 3, is bolted to centering spider 32 which is centered by suitable bearings 34 upon a fixed center post 36 of flange 38 which in turn is secured to pedestal 39. Manifold 26 includes a plurality of ports 40, 40 in annular array about the central axis, the number of such ports being equal to the number of filter cells, each port being connected by means of a hose 22 to the hollow shaft 12 of a cell. A sealing ring 42 made of suitable bearing material and provided with ports 44, 44 corresponding with ports 40, 40 is secured to the bottom of manifold 26 to form a flat bottom bearing face perpendicular to the axis of rotation which is in rotary sliding sealing engagement with the upper face of stationary head 46 which is secured to flange 38 supported by pedestal 39, flange 38 conveniently being a single casting integral with center post 36.

The upper face of head 46, as best appears in FIG. 6, carries a plurality of openings 50, 52, 54 in position to communicate in sequence with ports 44 during rotation of the manifold 26 and the sealing ring 42. Of these openings in the upper face of head 46, the one indicated by numeral 54 is an elongated arcuate orifice extending continuously through about three-fourths of the circumference of the head so that it communicates with several ports 44, 44 simultaneously, as appears best in FIG. 7. Mounted transversely within elongated orifice 54 are several partitions 60, 62, 64 the upper marginal portions of which preferably extend to the top face of head 46 and are in rubbing contact with the bottom face of sealing ring 42. Each partition comprises a stiff rigid core member 66 secured to a shaft 68 journaled in bearings 70, 70 in the inner and outer walls of head 46, and each partition extends generally radially with respect to head 46. One end of each shaft 68 extends through the outer wall

of head 46 and is adapted to be rotated by means of a suitable tool engaging hole 72 in the end of the shaft. Core 66 in the preferred embodiment is covered with a layer of resilient, flexible, rubber-like material 74 which extends outwardly beyond the periphery of core member 66 sufficiently far so that both lateral margins 76, 76 of each partition are flexible and are in rubbing sealing engagement with the inner and outer side walls of orifice 54 in head 46. In addition, as appears best in FIGS. 7 and 9, the flexible upper marginal portion 80 of each partition is preferably sufficiently long so as to be maintained in rubbing engagement with the bottom face of sealing ring 42 even when the partition is pivoted to a considerable extent away from the vertical position, as shown by partition 60 in FIGS. 6 and 7, although satisfactory results can also be obtained when the marginal portion is stiff, not flexible, and when it is spaced from the bottom face of ring 42. Separate conduits 82, 84 are connected to the bottom of each opening 50, 52 respectively in head 46 and additional separate conduits 86, 88, 90, 92 are provided to communicate with an opening in the bottom of each of the respective separate chambers formed in elongated orifice 54 by the partitions 60, 62, 64.

For operation of the distributor with the rotary filter shown, conduit 82 may be connected in the usual manner to a source of air or steam under pressure, while conduit 84 is connected to suction. Each of the remaining conduits 86, 88, 90, 92 is connected to a separate source of suction.

In operation of the filter, when each filter cell is rotated to the position at which its corresponding port 44 has passed opening 52, moving counter-clockwise as seen in FIG. 6, a supply of the liquid slurry to be filtered is deposited in the cell in the usual manner from a suitable pipe (not shown). As the cell continues to advance and its corresponding port 44 in rotating sealing ring 42 comes into communication with the first chamber of orifice 54, the mother liquor is drawn off by suction through conduit 86. Wash liquid is then supplied to the cell in the usual manner from an overhead pipe and is drawn off through port 44 when the latter has passed over partition 60 and when the cell is in communication with suction conduit 88. Successive washes are carried out as the cell continues to advance, the wash liquid being removed through conduits 90 and 92. The cell is then inverted by a cam in the known manner and air or steam pressure is applied through conduit 82 when the port 44 comes into communication with opening 50 to aid in the removal of the filter cake. The cell then resumes its upright horizontal position, and as its port 44 passes over opening 52 suction applied through conduit 84 ensures removal of any liquid which may have been trapped in the cell and also restores the filter cloth to its original flat condition in preparation for receiving a new charge of slurry.

In the event that the nature of the slurry being filtered is changed, or if it is desired to change the extent to which mother liquor is withdrawn from the filter cake prior to the first washing, a tool is inserted in hole 72 of the shaft on which partition 60 is mounted and the shaft is turned to pivot the partition until its marginal portion 80 engages the bottom face of sealing ring 42 at a different position along the length of orifice 54. Similarly, the remaining two partitions 62 and 64 may be adjusted by pivoting on their respective shafts until the relative lengths of the several chambers, hence the lengths of the time intervals during which the cell is subjected to suction by each of the four conduits 86, 88, 90 and 92, have been adjusted to the desired values.

While in the embodiment shown it is essential that the lateral marginal portions of each partition be resilient and flexible in order to conform to the curved side walls of orifice 54, it will be understood that the orifice may comprise one or more segments each of which has straight walls adjacent each partition, thus facilitating the sealing of the lateral margins of the partitions against the walls of the orifice. It will also be apparent that the present invention may be embodied in distributors in which the sliding movement of manifold with respect to head is linear or reciprocatory instead of rotational.

In the embodiment shown in FIGS. 10 to 12 of the drawing, manifold 126, mounted for rotation about a vertical axis, is similar to manifold 26 shown in FIGS. 1 to 4 except that it is provided with an access opening in its upper face having a closure or lid 128 removably secured by thumbscrews 130, 130. The access opening opens into one of ports 140. Stationary head 146 is similar to head 46, having its upper surface in sliding engagement with the bottom of sealing ring 142 which in turn is secured to manifold 126 and is provided with an arcuate orifice 154, but partitions 160, 162, 164 are mounted on shafts 168 which slope downwardly and outwardly from the central axis of manifold 126, each end of each shaft being pivotally mounted in a bearing 170 fixed in the wall of orifice 154. The frictional engagement of each shaft within its bearings is such that the partition will maintain its position under normal operation conditions, but can be pivoted for purposes of adjustment without undue difficulty. Each partition comprises a rigid core 166 secured to shaft 168, the top margin 169 being parallel to the interface between sealing ring 142 and head 146 when the partition is in an upright position and having its outer margin 171 slanting inwardly and upwardly in order to provide adequate clearance between it and the wall of arcuate orifice 154 when the partition is pivoted on its shaft. Core 166 is covered in the preferred embodiment with a resilient, flexible, rubber-like material 174 which extends outwardly beyond the periphery of core 166 with its lateral margins in flexible rubbing sealing engagement with the inner and outer side walls of orifice 154. The top margin of flexible material 174 preferably extends upwardly beyond core 166 a sufficient extent to maintain rubbing engagement with the bottom of sealing ring 142 even when the partition is pivoted away from its upright position to some extent, and the bottom margin similarly extends downwardly to engage the bottom of orifice 154. In this embodiment, as in that shown in FIGS. 6 to 8, the top margin may be rigid and may be spaced from the bottom face of sealing ring 142. Openings 175, 175 are provided in the bottom of orifice 154 on opposite sides of each partition, and may be connected to conduits in the same manner as the embodiment shown in FIGS. 6 to 8.

In operation, this embodiment functions in the same way as the one described above. However, when it is desired to adjust the position of one of partitions 160, 162, 164, access opening cover 128 is removed, enabling an operator to reach and to adjust the position of each partition as the opening passes over it. Because of the relatively slow rate of rotation of manifold 126, there is ample time to effect the desired adjustment without stopping the device or interrupting its operation. Because of the slope of shaft 168 the radially outer portion of the top margin of each partition moves a greater distance along orifice 154, when shaft 168 is rotated, than does the inner portion, thus tending to maintain the top margin in a position which is generally radial with respect to the axis of manifold 126 whether or not the partition is in an upright position. This arrangement is desirable in that it permits a sharp separation between mother liquor and wash water or between wash water from successive washes.

This application is a continuation in part of copending application Serial No. 752,861 filed August 4, 1958, now abandoned.

Although specific embodiments of the invention have been described herein, it is not intended to limit the invention solely thereto, but to include all of the obvious variations and modifications within the spirit and scope of the appended claims.

What is claimed is:

1. A distributor adapted to control the flow of fluids through a plurality of ports in sequence comprising a manifold having an array of ports arranged in sequence and a head having an elongated orifice arranged to communicate with a plurality of said ports simultaneously at the interface of said manifold and head, said manifold and said head being mounted for sliding movement with respect to each other along said interface to bring said orifice into communication with successively different ports during said movement, said head having at least one partition pivotally mounted within said orifice transversely thereof extending across the width thereof and having an upper marginal portion extending toward said interface, said partition being pivotable to change the number of ports communicating with the orifice at opposite sides of said partition and having flexible bottom and lateral marginal portions in sealing engagement with the bottom and opposite sides of said orifice, said orifice having separate openings at opposite sides of said partition.

2. A distributor as defined in claim 1 in which said upper marginal portion extends to said interface and is resiliently flexible.

3. A distributor adapted to control the flow of fluids through a plurality of ports in sequence comprising a manifold having an annular array of ports arranged about a central axis and a head having an elonagated orifice arranged to communicate with a plurality of said ports simultaneously, said manifold and said head being mounted for rotary sliding movement with respect to each other about said axis along an interface perpendicular to said axis to bring said orifice into communication

with successively different ports during said rotary movement, said head having at least one partition pivotally mounted within said orifice transversely thereof extending across the width thereof and having an upper marginal portion extending toward said interface, said partition being pivotable to change the number of ports communicating with the orifice at opposite sides of said partition and having flexible bottom and lateral marginal portions in sealing engagement with the bottom and opposite sides of said orifice, said orifice having separate openings at opposite sides of said partition.

4. A distributor as defined in claim 3 in which said upper marginal portion extends to said interface and is resiliently flexible.

5. A distributor as defined in claim 3 in which said partition is mounted on a shaft extending through the wall of the orifice to permit adjustable pivoting of said partition from outside said distributor by manipulation of the protruding end of said shaft.

6. A distributor as defined in claim 3 in which an access opening is provided in said manifold to permit adjustable piovting of said partition.

7. A partition as defined in claim 3 in which the axis of said manifold extends vertically and each said partition is mounted for pivoting about an axis which slopes downwardly and outwardly from the first said axis.

References Cited in the file of this patent

UNITED STATES PATENTS

1,701,993	Wills	Feb. 12, 1929
2,188,840	McCue	Jan. 30, 1940
2,489,681	Smith et al.	Nov. 29, 1949
2,797,707	Hursh	July 2, 1957