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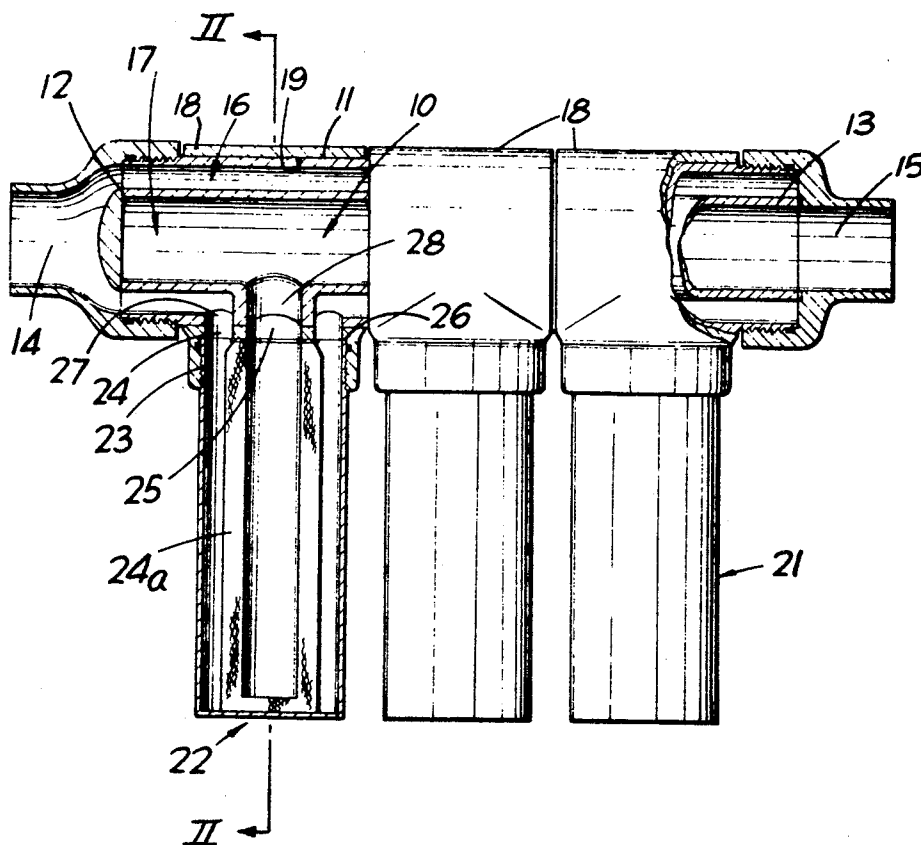
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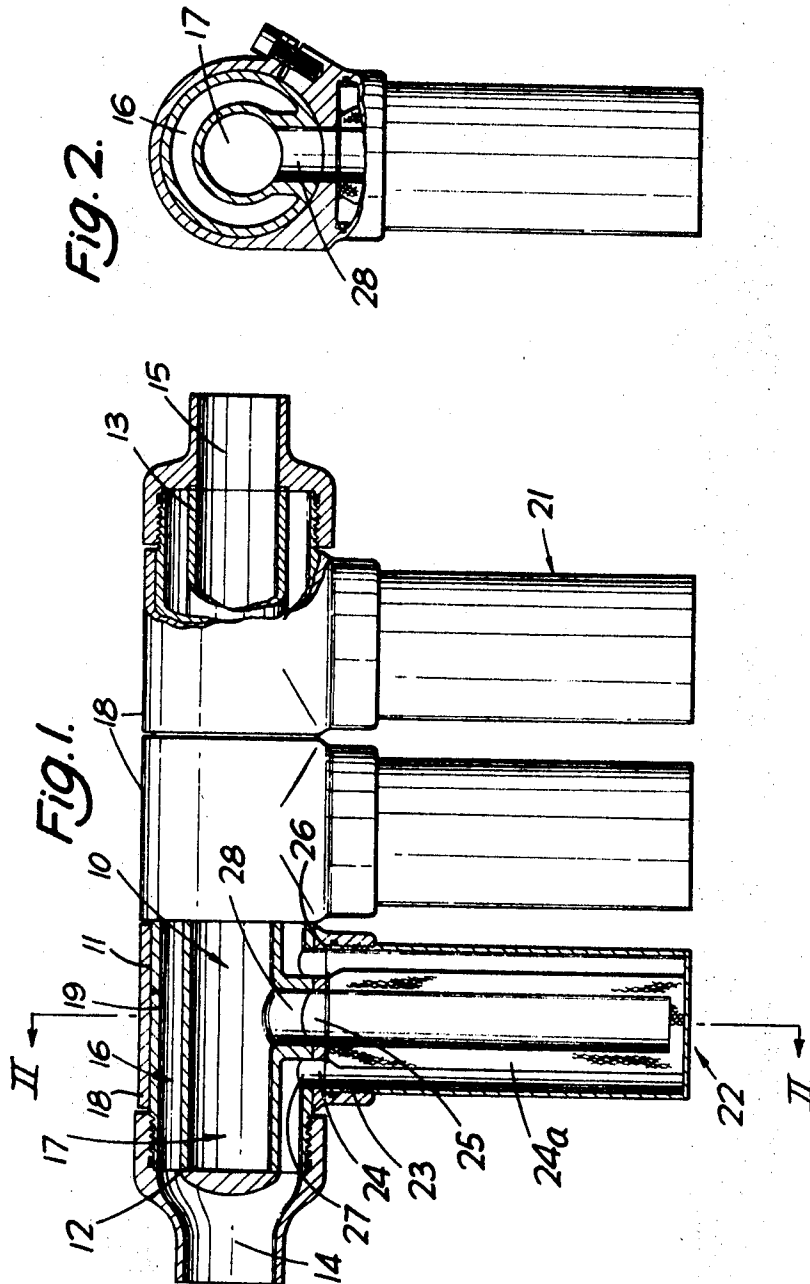
[54] **PLURAL PARALLEL FILTERS AND FLOW CONTROL MEANS**
12 Claims, 10 Drawing Figs.

[52] U.S. Cl. 210/340
 [51] Int. Cl. B01d 29/24
 [50] Field of Search 137/315,
 549, 625.19; 210/234, 235, 238, 239, 240, 329,
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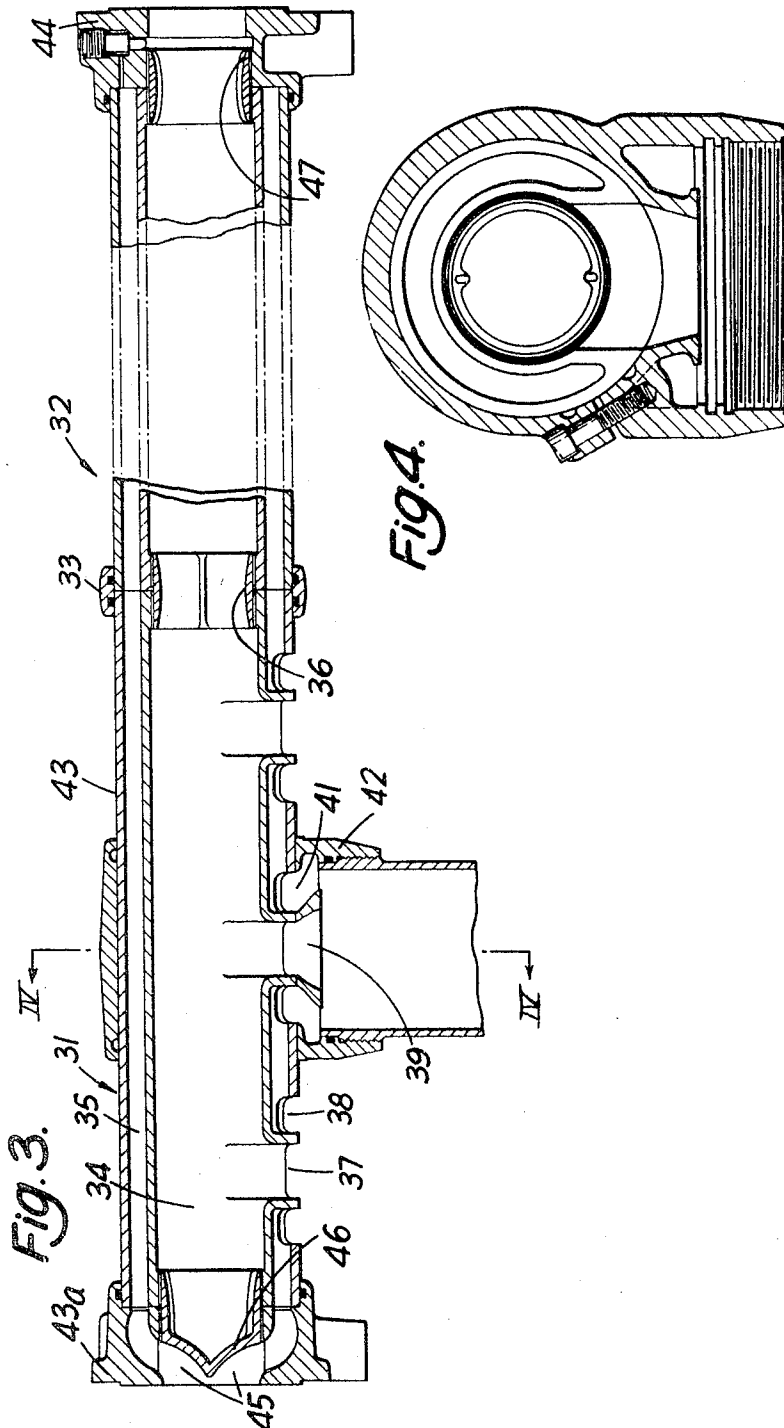
ABSTRACT: A fluid treatment apparatus having a plurality of treatment units, one of which units can be isolated from a stream of fluid flowing through the apparatus by rotation of the unit about galleries through which fluid normally flows to and from that unit.



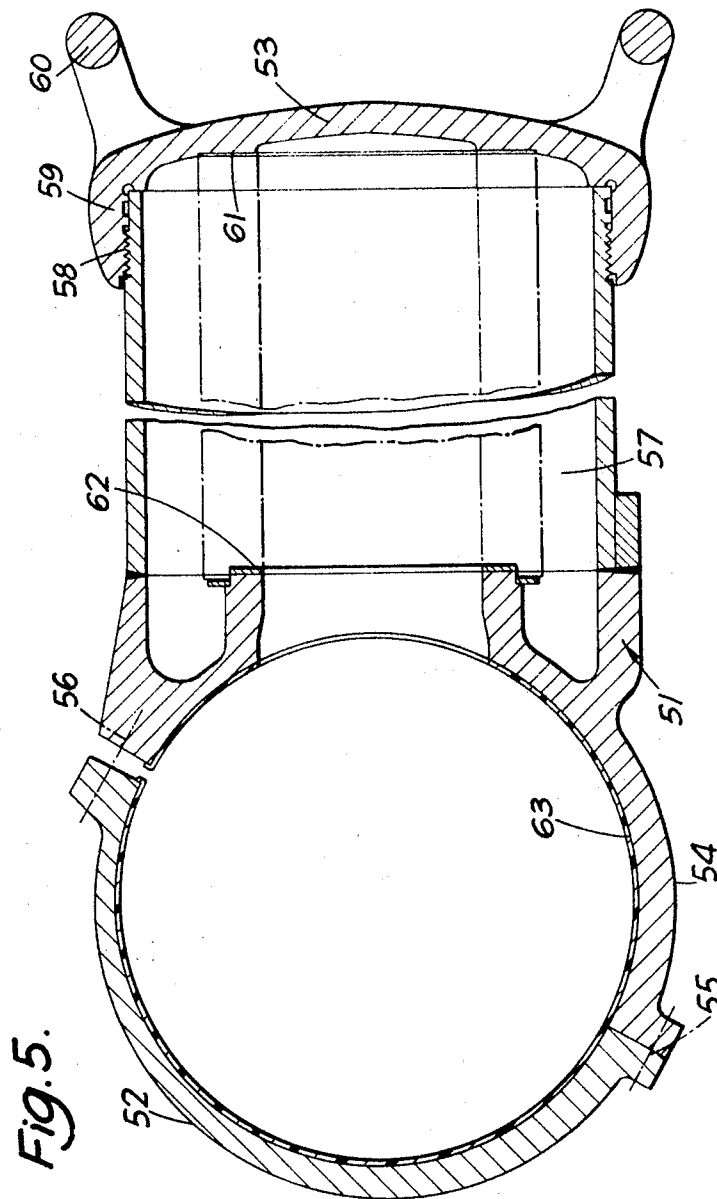


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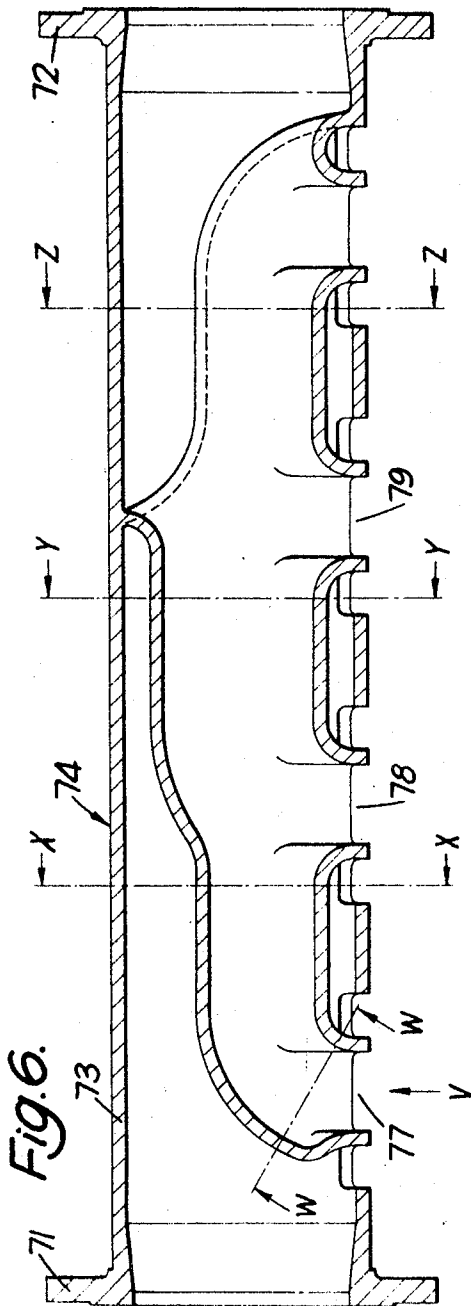


Fig. 6.

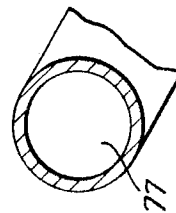


Fig. 7.

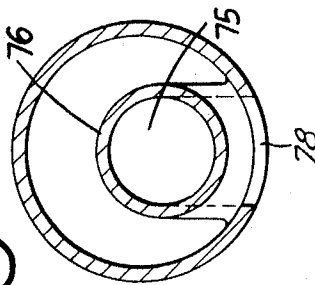


Fig. 8.

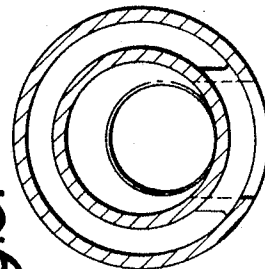


Fig. 9.

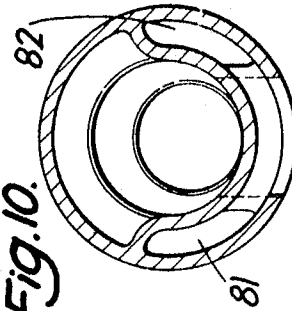


Fig. 10.

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PLURAL PARALLEL FILTERS AND FLOW CONTROL MEANS

The invention relates to fluid treatment apparatus.

The invention provides a fluid treatment apparatus having two galleries and a plurality of treatment units through which fluid may flow between the galleries, in which apparatus the units are so connected to the galleries that the flow of fluid between the galleries through one unit can be interrupted, whereby the unit can be serviced without stopping the flow of fluid through the apparatus as a whole, and in which said unit is mounted for rotation about the galleries, and communicates with the galleries by way of ports which are opened and closed by rotation of the units.

Preferably the galleries are in a housing having a cylindrical outer surface, and the units have annular portions with inner surfaces which make sealing engagement with and are rotatable on the cylindrical surface.

It is preferred that the units are disposed in side-by-side relation along the galleries, and it is also preferred that the ports are spaced axially along the galleries. There may be means to lock the treatment units in a chosen position.

In one form of the invention one gallery has an inlet connection at one end of the apparatus and the other has an outlet connection at the other end of the apparatus.

In an alternative form the inlet and outlet connections are both at the same end of the galleries.

The galleries may be generally concentric, or may taper inversely from one end of the apparatus to the other.

According to a feature of the invention the treatment unit is divisible into two parts, one of which is attached to the gallery, and the other of which is removable together with a treatment element within it.

Alternatively there is a cap portion removably fixed to a part of the unit away from the galleries, which cap portion is removable to allow access to a treatment element within the unit.

In one form of the invention the galleries are segmented, and each pair of galleries has connections for attachment to adjacent galleries in sealing relationship.

In this form there may be interchangeable end members for closing the ends of the galleries.

Preferably there are inlet and/or outlet connections to the galleries formed in the end members, and there are blank end members for use in conjunction with said end members in which there are both inlet and outlet connections.

Some specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings of which:

FIG. 1 is a partially sectioned side view of a first embodiment;

FIG. 2 is a section along the line II-II in FIG. 1;

FIG. 3 is a longitudinal section on parts of a second embodiment;

FIG. 4 is a section along the line IV-IV in FIG. 3;

FIG. 5 is a split sectional view of a third embodiment;

FIG. 6 is a longitudinal view of a fourth embodiment; and

FIGS. 7 to 10 are sections along the lines W-W, X-X, Y-Y and Z-Z respectively in FIG. 6.

As shown in FIGS. 1 and 2 a multiple housing has an elongated fluid transfer vessel 10, the outer surface 11 of which is cylindrical with a smooth finish; and the ends 12 and 13 of which are fitted with closures incorporating fluid entry and exit connections 14 and 15 respectively. The inner space of the transfer vessel is divided into two fluid galleries 16 and 17 which do not communicate with each other within the vessel, but which traverse substantially the whole length of the vessel and communicate respectively with the entry and exit connections 14 and 15 respectively.

On the outside and along the length of the cylindrical outer surface 11 of the vessel 10 are disposed three container heads 18. Each head has a cylindrical inner surface 19 cooperating

with the outer surface 11 of the vessel and adapted to grip it tightly but allowing the head to be occasionally rotated on the vessel. Either the cylindrical outer surface of the vessel or the cylindrical inner surfaces of heads or both may be lined or coated with a layer of resilient material or they may be manufactured with a high degree of accuracy so as to effect a fluid tight seal.

Each of the heads 18 has attached to it, at a substantial angle to the axis of the fluid transfer vessel, an elongated container 21 which is preferably of cylindrical or prismatic shape. The end 22 of the container furthest from the head is closed and the other end 23 is adapted to make a fluidtight but easily removable joint in combination with the head. In the container there is a fluid conditioning element 24a such as a filter.

Inside each head 18 there are two sets of fluid passages 24 and 25 traversing the wall between the aforesaid cylindrical inner surface 19 and the internal face 26 cooperating with the said container. The two sets of passages are arranged to communicate respectively with the two galleries aforesaid through cooperating openings 27 and 28 in the two cylindrical surfaces, said openings being arranged sequentially in the sense parallel to the axis of the cooperating cylindrical surfaces. Measured in terms of angle in a plane perpendicular to the axis of the cylindrical surfaces the openings 27 and 28 are arranged to lie within an angle of less than 120°.

On the other side of the wall the two sets of passages are arranged to communicate respectively with the entry and exit sides of the fluid-conditioning element 24a in the container.

The shape and distribution of the said two sets of openings are arranged in a manner to ensure that entry and exit sides of the fluid-conditioning elements in all of the containers communicate respectively with the aforesaid entry and exit connections provided that the heads are correctly positioned along the length of the transfer vessel.

In normal operation fluid enters through the entry connection 14, passes along the entry gallery 16 of the transfer vessel to any of the said sets of passages 24, 27 through which it arrives at the entry to one of the several conditioning elements 24a. Having passed through the conditioning elements, it travels through the other set of passages 25, 28 along the exit gallery 17 to the exit connection 15. In the preferred embodiments of the invention approximately equal proportions of the fluid pass through each of the several heads, containers and conditioning elements.

When the conditioning elements 24a need renewal the head 18 together with the container 21 is rotated on its cylindrical inner surface through an angle somewhat greater than the said angular measurement of the cooperating openings in the cylindrical surfaces, measured in the plane perpendicular to the axis of the said cylindrical surfaces. This motion will sever communication between the galleries 16 and 17 and the two sets of passages 24 and 25 in the head being rotated, establishing a fluidtight closure on the corresponding openings in the transfer vessel. In this new position the container may be removed, giving access to the conditioning element 24a without spilling more and in fact considerably less fluid than was trapped in the container.

Upon effecting the renewal, the container is replaced, its fluidtight joint with the head is restored and the head is rotated back to its former position. Each container in turn can be serviced in this manner.

As shown in FIG. 3 the housing may be formed of several gallery components joined in end to end relationship. In this Figure a first gallery component 31 is joined to a second gallery component 32 by way of a threaded bush 36 and sealed by a ring 33 incorporating torroidal fluidtight joints. The gallery component 31 has inner and outer galleries for fluid, and designated 34 and 35 respectively. The gallery 35 is sealed externally by the joints 33 and internally by the threaded bush 36, which also serves as a seal for the inner gallery 34. The galleries 34 and 35 have fluid passages 37 and 38 respectively which are arranged to feed corresponding passages 39 and 41 respectively in a head member 42 which forms the part of the

conditioning unit nearest to the gallery. The head 42 is rotatable on the outer surface 43 of the gallery component 31.

The gallery component 32 is similarly formed and has several conditioning units mounted on it in a like manner to that described with reference to the gallery component 31.

The ends of the composite gallery are formed by end members 43a and 44. The end member 43a has a divergent annular duct 45, having a central core supported by four symmetrical webs, which duct leads to upper and lower parts of the fluid gallery 35. There is a plug 46 which forms an end member for the gallery 34, thus blanking off the end of the gallery 34 which abuts the end member 43a. The plug 46 acts as a seal between the inner gallery and the end member 43a.

The end member 44 has an internal bore which receives a threaded bush 47 which in combination with the body of the end member 44 forms an effective seal for the end of the annular outer gallery 35.

FIG. 5 illustrates one form of fluid treatment unit for use in connection with the apparatus above described. The unit has a head casting 51, a clamp casting 52, and a cover casting 53. The body of the unit is formed of the head casting 51 which comprises a half cylindrical mating surface 54 for connection to the clamp 52 by means of bolts which are received in holes 55 and 56. The head member contains the fluid treatment element above referred to, which element is here designated 57. The fluid treatment element 57 is of hollow cylindrical form, and within the member there is an extension of the central passage leading to the middle gallery, and outside the fluid treatment element there is an annular passage which leads to the outer gallery. In the case illustrated the treatment unit is closed by the cover 53 which is screw-threaded at 58 to engage the external surface of the head. There is a seal 59 adjacent the edge of the head, and there are flat faces 61 and 62 on the cover and head respectively which faces act as sealing abutments for the fluid treatment element 53.

The cover 53 has two handles 60 projecting away from the main part of the head and by which the cover can be unscrewed from it to permit the element 57 to be removed, repaired or serviced. To give a tight seal between the head 51 and the clamp 52 on one hand, and the outer surface of the cylindrical galleries on the other, a removable lining 63 of a resilient material such as polypropylene or PTFE is inserted between the inner surface of the head and the clamp, and the outer surface of the cylindrical gallery.

Another embodiment of the gallery member is shown in FIGS. 6 to 10. In this case the two galleries are not concentric but are formed of two passageways in a unitary casting which forms the support member for the treatment heads. The support member has two ends 71 and 72 and between these two ends has an outer cylindrical wall 73. This cylindrical wall has an outer cylindrical surface 74 which permits the rotation of the treatment heads on it. The configuration of the two galleries is best seen from FIGS. 8 to 10 which are sections across successive parts of the gallery member. As shown in FIG. 8 the gallery which feeds the central opening into the treatment head is here designated 75 and is surrounded by a wall 76. This gallery leads to the opening 77 in the middle of the treatment head nearest the end 71. This gallery also leads to the passage 78 (leading to the second of the treatment heads) and the center of gallery 75 is here expanded to a larger diameter so that the two galleries are substantially concentric at section

Y-Y as shown in FIG. 9, after passing a third opening 79 for a third treatment head. The gallery leading from the end 71 now occupies only the side portions 81 and 82 of the composite gallery as shown particularly in FIG. 10.

I claim:

1. A multiple unit fluid treatment apparatus having a cylindrical principal vessel extending through the apparatus and including first and second galleries both extending along the length of said vessel, external inlet means to said first gallery and external outlet means from said second gallery; a plurality of fluid treatment units each having a fluid treatment means enclosed in a generally cylindrical container detachably connected by fluidtight means to a head surrounding part of said principal vessel and rotatable about said vessel in a fluidtight engagement, and two ports in each said head respectively connecting the inlet and outlet sides of the said fluid treatment means; a plurality of sets of two further ports in the cylindrical surface of said principal vessel, one set for each said unit, one port of each set communicating with said first gallery and the other port of each set communicating with said second gallery, and said ports in each said head being capable of being brought into and out of registration with the respective ports of a cooperating set in said principal vessel by rotation of said fluid treatment unit about said vessel to connect and disconnect the fluid treatment means in said unit so rotated with said two galleries.

2. An apparatus as claimed in claim 1 in which said units are disposed in side-by-side relation along the length of said galleries.

3. An apparatus as claimed in claim 2 in which said ports are spaced axially along the length of said galleries.

4. An apparatus as claimed in claim 1 in which there is means to lock said treatment units in a chosen position.

5. An apparatus as claimed in claim 1 in which said inlet means includes an inlet connection at one end of the apparatus and said outlet means includes an outlet connection at the other end of the apparatus.

6. An apparatus as claimed in claim 1 in which said inlet and outlet means respectively include inlet and outlet connections each located at the same end of said galleries.

7. An apparatus as claimed in claim 1 in which said first and second galleries are generally concentric with one another.

8. An apparatus as claimed in claim 1 in which said galleries taper inversely from one end of the apparatus to the other.

9. An apparatus as claimed in claim 1 in which each said treatment unit is divisible into two parts, one of which is attached to one of said galleries, and the other of which is removable together with a treatment element which is disposed within it.

10. An apparatus as claimed in claim 1 in which a cap portion is provided and is removably fixed to a part of each said unit, said cap portion being removable to allow access to a treatment element which is disposed within each said unit.

11. An apparatus as claimed in claim 1 in which said galleries are segmented, each pair of said galleries having connections for attachment to adjacent galleries in sealing relationship.

12. An apparatus as claimed in claim 11 in which interchangeable end members are provided for closing the ends of the galleries.