

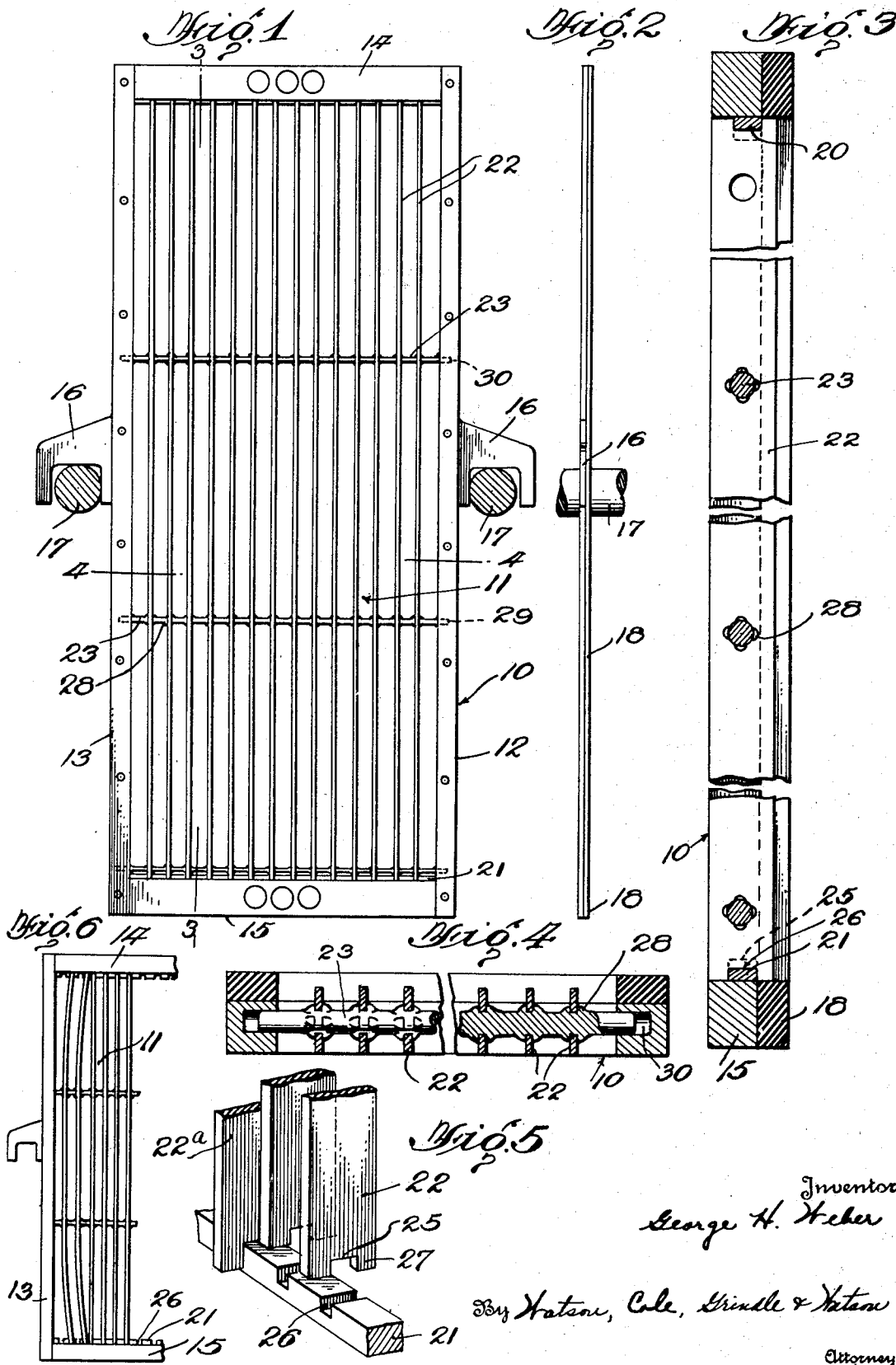
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FRAME FOR DIALYZING APPARATUS

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FRAME FOR DIALYZING APPARATUS

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The present invention relates to dialyzing apparatus and particularly to the devices designed to support the membranes or diaphragms which comprise the partitions between adjacent cells of such an apparatus.

Various types of membrane supporting devices have been heretofore designed or suggested, and many placed in actual use. Generally speaking, the type of diaphragm support heretofore most widely used has comprised, in combination with a rectangular metallic supporting frame, a plurality of bars disposed in the plane of the frame, the ends of the bars being secured to the frame members. Usually the supporting frame is elongated and the majority of the bars employed extend longitudinally of the frame, are disposed in closely spaced parallel relationship, and are transversely supported by stiffening bars. It is the purpose of the present invention to improve upon membrane supporting devices generally but particularly to provide an improved device of the type just above referred to, in which a plurality of elongated bars are disposed in spaced parallel relationship and are maintained in such relationship not only by the supporting frame but by transversely extending stiffening elements.

Dialyzing apparatus is, as is well-known, made use of in the treatment or refining of many different types of liquids. The membrane supporting devices are subjected to the action of these liquids and it is found that certain liquids attack and oxidize the welds which attach the membrane supporting bars to the frames, when these bars are actually attached to the frames by welding, which is a preferred method of attachment. It is therefore highly desirable to provide a membrane supporting device in which the various members are not secured together by means of welds and, in accordance with the present invention, this objective is realized.

It is likewise a highly desirable attribute of a membrane supporting device for a dialyzing machine that the bars be secured to the frame members in such manner that they may not be displaced accidentally, if not secured by welding, and that the bars be so connected to the frame members that ready assembly with the rectangular supporting frame may be had, and ready disassembly if need be, for the purpose of substituting bars of one kind or character for bars of another composition or type, as may be desired by the operator. Finally, it is much to be desired that the device as an entirety be of inexpensive character inasmuch as large numbers of such devices must be employed in a single dialyzing

apparatus and a very considerable proportion of the cost of the entire apparatus is due to the cost of the many membrane supports employed. By way of example one form of the invention is shown in the accompanying drawing, in which:

Figure 1 is a front elevation of the membrane support in its entirety;

Figure 2 is an edge view of the same;

Figure 3 is a section on line 3—3 of Figure 1, upon a larger scale, and partially broken away;

Figure 4 is a section on line 4—4 of Figure 1;

Figure 5 is a perspective view showing the ends of certain of the longitudinally extending bars of the grid and the frame member with which they are detachably interlocked; and

Figure 6 shows on a reduced scale, portion of the dialyzer frame of Figure 1, showing certain of the longitudinally extending bars in partially assembled relation to the frame.

The frame itself is generally indicated at 10 and the grid at 11. The frame is preferably fabricated of metal and comprises parallel elongated metallic members 12 and 13, which are normally vertically disposed when the frame is assembled in the dialyzing apparatus, and the parallel top and bottom frame members 14 and 15, normally disposed horizontally. Attached to the side members 12 and 13 are the brackets 16 which normally rest upon the horizontally extending parallel bars 17, respectively, thus supporting the frame in a vertical plane, as indicated in Figure 2. To each frame is affixed a resilient facing layer, indicated at 18 in Figures 2 and 3, this layer preferably being of rubber and the membranes, which are not illustrated, are gripped between the resilient facing 18 of one supporting frame, and the back of the next adjacent frame, all in well-known manner.

Secured to the underside of the upper frame member 14 and to the upper side of the lower frame member 15 are elongated notched ribs indicated at 20 and 21, respectively. These ribs are preferably rectangular in transverse section and are notched at intervals as most clearly shown in Figure 5, the lower rib 20 having notches spaced similarly to and positioned directly below the notches formed in the upper rib 21. These ribs may be integral with or secured to the frame members 14 and 15 but in any event may not be dislodged and comprise rigid portions of the grid supporting frame.

The grid comprises a plurality of elongated membrane supporting bars 22 and one or more bracing rods or bars 23 extending transversely of the bars 22. Bars 22 are relatively thin and

wide and are preferably fabricated of metal so as to be somewhat flexible or deformable. Each end of each bar may be said to be centrally cut away, as shown in Figure 5, or to have a central portion, indicated at 25, adapted to enter a notch such as 26 forward in a supporting rib, and to have spaced longitudinally projecting rib engaging elements 27 on either side of the notch entering portion 25, it being the function of these longitudinally projecting elements 27 to extend downwardly on opposite sides of the adjacent rib after the associated bar has been definitely positioned and to prevent movement of the bar transversely to the rib. The walls of notch 26 engaging the opposite faces of the portion 25 of the bar, of course will prevent movement of the end of the bar longitudinally of the rib after the bar has once been placed in interlocking engagement with the grid. Hence no relative movement of grid and bar can thereafter occur.

The several bars 22 are supported in fixed space relationship, in the case of the grid shown, by two transverse bracing rods 23. These rods are passed through aligned cylindrical apertures in rods 22 and thereafter portion of the rod on each side of each bar is deformed, as indicated at 28 in Figures 3 and 4, by means of a metal swaging or deforming tool. The several bars comprising the grid are thus prevented from moving laterally on their bracing rods 23.

In the manufacture of a device such as that which is shown, the various frame members are attached together to form the rectangular grid supporting frame and the vertical members 12 and 13 are drilled as at 29 and 30 to provide recesses for the reception of the ends of the transversely extending bracing rods 23. A grid is then formed, quite apart from the rectangular supporting frame, by disposing the requisite number of rods 22 in parallel spaced relationship and passing the bracing rods through aligned apertures in these rods, without however deforming the rods so as to form a unitary structure. Then this loosely assembled grid structure as an entirety may be assembled with the frame, the corresponding ends of the two transverse bracing rods being inserted into the previously formed apertures 29 and 30 and, by deflecting and transversely distorting the elongated rods 22, the ends of these rods may be positioned, first, so that the spaced longitudinally projecting elements 27 lie upon opposite sides of the adjacent rib of the frame and thereafter moved longitudinally of the rib until the notch entering portion 25 thereof registers with the notch 26 in the rib, into which notch it is designed to enter, whereupon the end of the rod will snap into the position indicated at 22a in Figure 5 and as shown in Figures 1 and 3. After all of the rods 22 have been similarly flexed (the two left-hand rods 22 being shown flexed in Figure 6) and positioned, a tool may be employed to deform the bracing rods 23 in the

manner shown in Figure 4 thereby positively holding the rods 22 in fixed spaced relationship and, at the same time, actually extending rods 23 so that the ends thereof penetrate more deeply into the apertures in the frame intended to receive them. The resulting membrane support is sturdy and includes no welds, is comparatively inexpensive, and efficient in operation.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A frame for a dialyzing apparatus comprising parallel top and bottom members, parallel side members, and a diaphragm supporting grid carried by said members, two of said parallel members having elongated parallel ribs thereon provided with spaced transverse notches, and the grid including parallel bars extending from rib to rib, each bar having an intermediate portion at each end thereof which lies in the adjacent notch formed in a rib, and spaced elements projecting longitudinally from said bar and laterally engaging the rib, whereby the end of the bar is retained against movement.

2. A frame for a dialyzing apparatus comprising parallel top and bottom members, parallel side members, and a diaphragm supporting grid carried by said members, two of said parallel members having elongated parallel ribs thereon provided with spaced transverse notches, and the grid including straight parallel flexible bars extending from rib to rib, each bar having an intermediate portion at each end thereof which lies in the adjacent notch formed in a rib, and spaced elements projecting longitudinally from said bar and closely engaging the sides of the adjacent rib, whereby the end of the bar is retained against movement in a plane normal to its length.

3. The combination set forth in claim 2 in which the bars are relatively wide in a direction transverse to the ribs and relatively narrow in a direction parallel to the ribs.

4. The combination which includes the elements recited in claim 1 and which in addition includes a rod interconnecting the several bars at points intermediate the ends thereof, said rod being disposed normally to the bars and passing through aligned apertures formed in the bars, each bar, however, being flexible to facilitate assembly with parallel rib carrying members of the frame.

5. The combination which includes the elements recited in claim 1 and which in addition includes a rod interconnecting the several bars at points intermediate the ends thereof, said rod being disposed normally to the bars and passing through aligned apertures formed in the bars, the rod being provided, at a point closely adjacent each side of each member with projections comprising abutments to prevent relative movement of rod and bar, for the purpose set forth.

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