Sept. 17, 1940. J. H. KNOWLES ET AL 2,215,181

LIQUID DISTRIBUTOR

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FIG. 1.

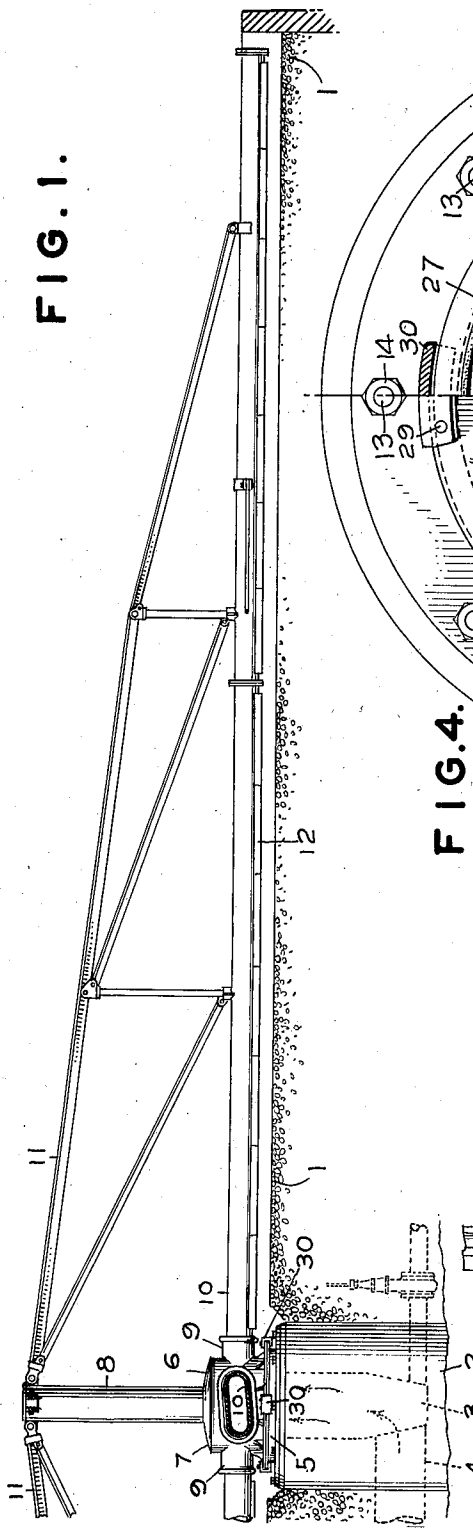


FIG. 4.

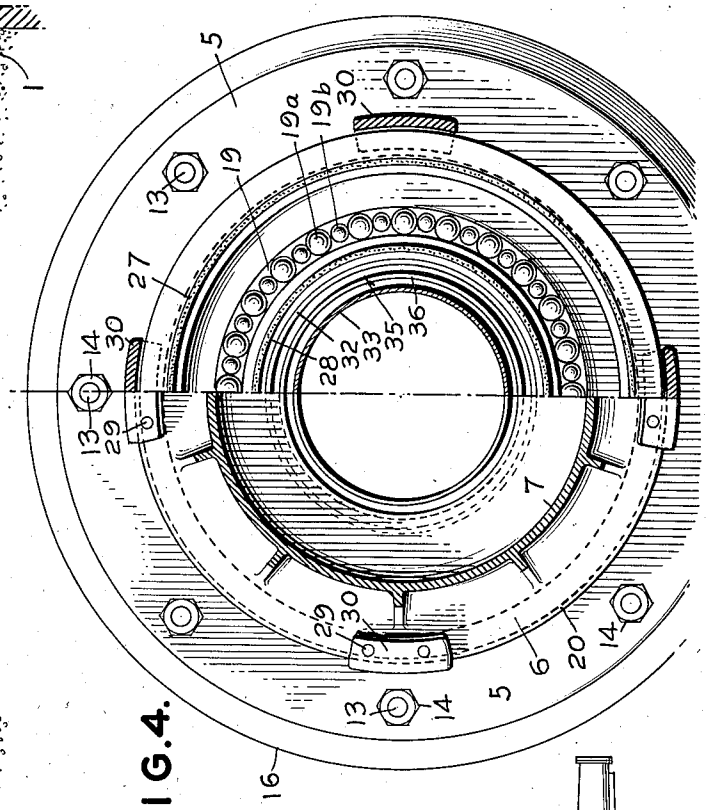
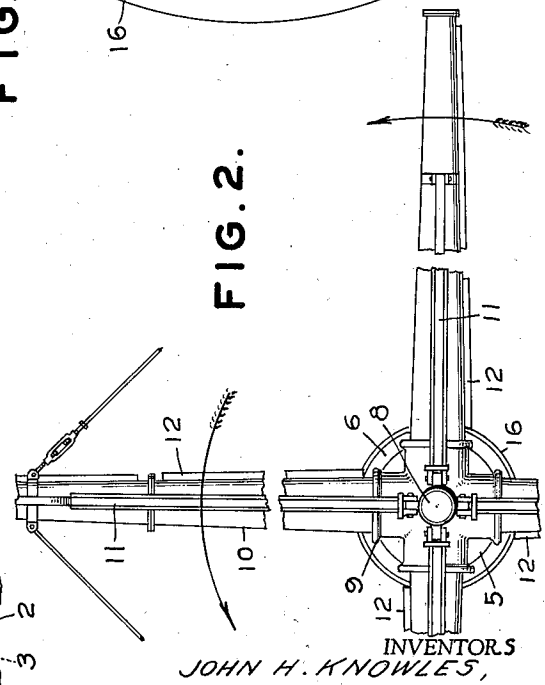


FIG. 2.



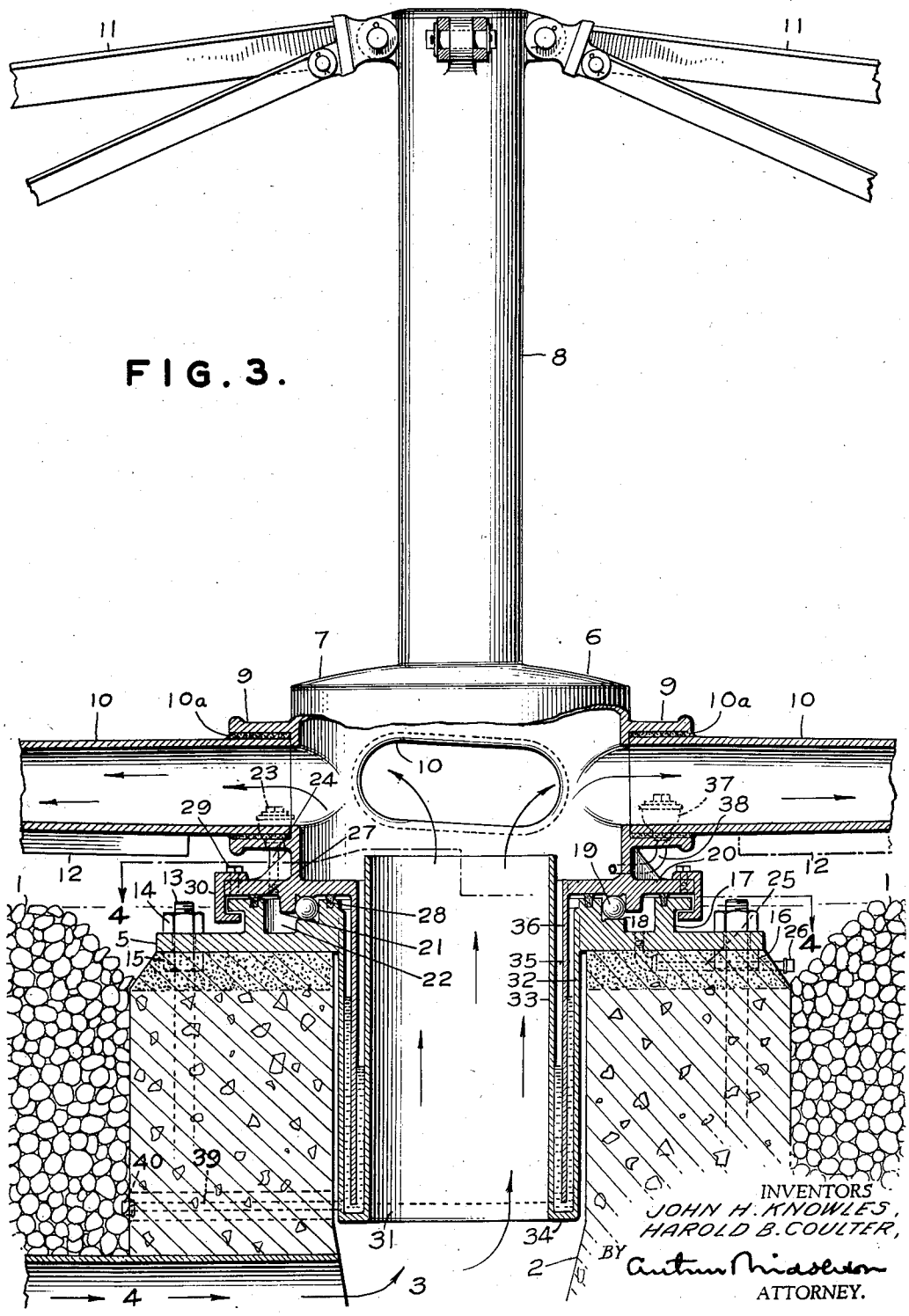
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FIG. 3.



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2,215,181

UNITED STATES PATENT OFFICE

2,215,181

LIQUID DISTRIBUTOR

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Application October 2, 1937, Serial No. 167,002

4 Claims. (Cl. 299—69)

This invention relates to distributors or disseminating devices for spraying liquids such as sewage, onto filter beds or the like.

More particularly it relates to the rotary type of distributor having radial distributing or spray arms and, in the preferred embodiment, contemplates improvements in the rotary hydraulically operated type of machine wherein rotation of the spray arms is produced by the hydraulic reaction of sprays of liquid emited from orifices arranged laterally in the radial arms or spray pipes which are carried by suitable rotative supporting structure.

It is an object of the present invention to provide an improved rotative liquid distributor of sturdy and compact construction having a minimum of constructional elements and requiring relatively small vertical space for its proper positioning and functioning with regard to the filter bed.

Another object is to provide, in liquid distributing devices, a center assembly or rotative supporting structure for the spray arms that may be mounted in a rigid and substantial manner and which will rotate with a minimum amount of friction, thus increasing the effect of the hydraulic reaction of the sprays when the device is in operation.

A further object is to provide a liquid distributing device so constructed as to permit a higher rate or volume of liquid feed to the device than has been possible with prior constructions.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and set forth in the claims hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings:

Figure 1 is an elevation partly in section and with certain parts broken away, of a liquid distributing device embodying features of the present invention.

Fig. 2 is a fragmentary top plan view of the apparatus shown in Fig. 1.

Fig. 3 is an enlarged sectional elevation showing in detail the center assembly or rotative supporting structure of the present invention.

Fig. 4 is a horizontal section on the line 4—4 of Fig. 3.

Referring to the drawings in detail, the numeral 1 designates a filter bed, preferably circular in configuration and comprising an aggregate of relatively coarse filter media as shown. Centrally disposed of the filter bed 1 and upstanding therein is a stationary supporting foundation 2 of concrete or other suitable material having a central conduit or passageway 3 for conducting therethrough liquid which is supplied through the inlet pipe or conduit 4. The foundation 2 supports a stationary bearing member 5 which in turn accommodates a rotatable supporting structure generally indicated by the numeral 6. The supporting structure 6 includes a hollow body portion 7, an upstanding tubular section 8 and radially extending sockets 9 which carry and support the radial spray arms or pipes 10, the same being firmly secured in the sockets by suitable packing 10a. These spray pipes may be of any desired length, size and configuration, but are herein shown to be substantially eliptical in cross-section and tapering from their inner to their outer ends. The spray pipes are further supported by means of the upstanding tubular section 8 and connecting guying structure 11 in a manner well-known in the art. The arms 10 are provided substantially throughout their length with a plurality of aligned openings for the discharge of liquid onto the filter bed 1 which liquid is caused to assume a fanlike spray upon emission from the various openings by means of deflector elements 12 extending substantially throughout the length of the spray arms, the ends of the arms being closed in any suitable manner. The peculiar shape and arrangement of the spray arms 10, the arrangement of the discharge ports and the deflector elements 12 form no part of the present invention, these features being covered in the pending application of Nels B. Lund, Serial No. 200,940, filed April 8, 1938.

The features of the present invention will be seen in detail in Figs. 3 and 4. The concrete base supports the stationary bearing element 5 through the medium of the embedded bolts 13, nuts 14 and 15, and grouting 16. In erecting the apparatus, the bearing member 5 is positioned on the bolts 13 which are embedded in the concrete base and rests upon the nuts 15. The nuts 14 and 15 may be adjusted to position the bearing member 5 at the desired elevation and in the desired plane. Thereafter the grouting 16 is applied and when set, there is afforded a firm, stationary and rigid base for support of the rotatable center assemoly 6.

The stationary bearing member 5 preferably is in the form of an annular casting and is provided at its upper face with an annular upstanding flange 17 which, in cross-section, is in the shape of an inverted L. Spaced from the flange 17, the bearing member is stepped as indicated at 18 to form a support or seat for the bearing elements 19 herein shown to be ball bearings. It is understood that the ball bearings 19 are the preferred anti-friction medium but any other bearing surface may be used which will serve the purpose as hereinafter described.

The center assembly or rotatable supporting structure 6 is provided with a bottom or under surface 20 constituting a rotatable bearing surface or member and which is adapted to be supported upon the stationary bearing member 5 for rotation thereon. There is therefore provided a downwardly depending annular flange 21 which is offset from the stepped portion 18 of the member 5 in order to form a bearing retaining pocket or raceway as clearly seen in Fig. 3 of the drawings. It will be seen that the under surface 20 of the rotatable supporting member 6 rests upon the ball bearings 19 so that it may rotate freely thereon. The space between the inverted L-shaped flange 17 and the stepped portion 18 affords a chamber for retaining a lubricant as indicated at 22. Oil or grease may be deposited in the receptacle 23, which is provided with a removable cap, and is then free to flow through the connecting pipe 24 into the lubricant chamber 22 from which it may be drained as occasion requires through the drain pipe 25 normally closed by a removable cap 26. In order to maintain the lubricant within the chamber 22 and in intimate contact with the bearing elements 19, there are provided the annular fibrous sealing strips 27 and 28 which are embedded in upstanding portions of the stationary bearing member 5 and normally engage with the under surface 20 of the rotatable supporting structure so as to effectively prevent escape of the lubricant.

It will be noticed that the balls 19 are shown to be alternately and successively of large and small diameter. In other words, the balls 19*a*, which furnish the actual bearing surface, are of a suitable substantially uniform diameter and are spaced from one another by spacing balls 19*b*, all of a diameter less than that of the balls 19*a*. This arrangement affords a composite ball bearing structure which will operate easily and with a minimum of friction. It will be understood, however, that this construction is merely that preferred and the balls may be all of substantially uniform size or any other suitable form of bearing surface may be substituted for that shown herein.

At several points around its periphery, herein shown to be four equally spaced points, to the upper outer edge of the rotatable bearing member 20 there are attached by means of bolts 29 the channel sections or U-shaped members 30. As will be seen, one flange of the channel sections 30 is rigidly attached to the portion 20 of the rotatable supporting structure and the other flange of the channel sections extends under and substantially interlocks with the inverted L-shaped flange 17. By this interlocking arrangement it will be seen that any substantial inclination of the supporting structure 6 to tilt in any direction from the vertical will be opposed by the interengagement of these elements so that any tilting of the rotatable supporting structure is effectually prevented. Sufficient clearance is provided between the channels 30 and the flange 17 so that there will be no frictional engagement of the two under normal operating conditions, but the relationship of these elements is close enough so that the rotatable structure 6 can deviate very little at all from a vertical position.

Depending from the inner annulus of stationary bearing member 5, either integral therewith or attached thereto in suitable manner, is a double-walled cylinder 31 supplying the dual functions of an inlet for liquid being supplied to the spray arms and a chamber for retaining a sealing liquid. The outer and inner walls 32 and 33 respectively of this cylindrical member are closed at the bottom as at 34 and spaced from one another to provide the annular chamber 35 for retaining a sealing liquid as will be further described. As illustrated by the arrows in Fig. 3, the liquid to be treated flows through the inlet pipe 4 into the passageway 3 and thence upwardly through the double-walled cylindrical conduit 31 into the hollow body portion 7 of the rotatable supporting structure and then passes out into the radial spray pipes 10 to be distributed over the surface of the filter bed by means of suitable ports and the deflectors 12.

The bottom portion 20 of the rotatable supporting structure carries a downwardly depending circular sleeve 36 of appropriate diameter to be received within the chamber 35 and spaced approximately equally distant from the walls 32 and 33. Mercury or other suitable sealing liquid is supplied to the chamber 35 through the receptacle 37 which is provided with a removable cap and the connecting pipe 38. It will be seen that the sealing liquid will flow through the pipe 38 to the interior of the hollow body member 7 and down into the chamber 35, a sufficient supply being maintained within this chamber to effectively maintain a seal and prevent escape from the apparatus of the liquid being treated. Means are provided by a pipe 39 and cap 40 for draining from the chamber 35 the mercury or other sealing liquid therein whenever such action is desired.

The features of the present invention are of particular advantage in the construction and operation of liquid distributors of relatively large size and volume. Manifestly in a machine of this type having quite lengthy spray arms, there is tendency for the rotatable structure to tilt or wobble from the horizontal, particularly should the flow to the distributor be not even and smooth. The present invention obviates these difficulties by providing the large diameter bearing members 5 and 20 which support the rotatable structure at widely spaced points. The interengaging flange 17 and channel sections 30 augment this anti-tilting effect and assure a relatively true balance of the rotatable parts at all times. Furthermore, the entire construction, including the sturdy concrete foundation 2 permit the use of influent or feed conduits of large cross-sectional area, thereby allowing much greater volumes of liquid to be supplied to the distributor and at higher rates of flow than heretofore possible.

Despite the fact that distributors of the present invention may be constructed on a larger scale than has heretofore been possible, the arrangement of the bearing construction including the ball bearings 19 operating in a bath of lubricant at all times provides a rotatable structure that will operate quite easily and with a minimum of

friction. This feature is of importance in that the apparatus of necessity is frequently required to operate with only a very small head on the liquid being supplied to it or by a minimum amount of pumping force applied to the liquid being treated. Since the machine is rotated purely by the force or reaction of liquid emitted from the orifices provided throughout the length of the spray arms 10, it is manifest that in order to operate efficiently, the machine, particularly if of large and heavy construction, must be well balanced and able to rotate freely and with a minimum of friction to be overcome by the force of the liquid spray. The present invention presents just these advantages among others, and a maximum result of the spray force is realized even though the liquid is supplied under a very low head or pump pressure.

What is claimed is:

1. In a liquid distributor for filter beds and the like, a stationary foundation, a stationary bearing member carried by said foundation, a rotatable supporting structure cooperating with said stationary bearing member and adapted to rotate thereupon, liquid spray arms carried by said supporting structure, said stationary bearing member having an upstanding annular flange substantially inverted L-shaped in cross-section, and a channel section attached to a part of said rotatable supporting structure and interlocking with said annular flange to prevent substantial tilting of said supporting structure.

2. In a liquid distributor for filter beds and the like and adapted for mounting in fluid-tight engagement with a foundation constructed to provide in effect an up-flow feed conduit for the distributor, said liquid distributor having a rotary member provided with radially extending reaction-driven distributor arms, and further having annular bearing means for operatively supporting said rotary member upon said foundation, there being provided an annular stationary base member for said bearing means, which base member in turn is adapted for mounting upon said foundation, a sealing arrangement effective between the rotary and the stationary member and comprising an annular portion extending from the inner margin of said annular base member to form an inwardly disposed annular sealing cup adapted to receive a sealing liquid heavier than water, and a cylindrical sealing portion constituting part of and extending downwardly from said rotary member and into said sealing cup and adapted to engage in sealing relationship with the liquid therein.

3. A liquid distributor according to claim 2 in which the bottom portion of the sealing cup is designed to extend into the feed conduit of said foundation.

4. Apparatus according to claim 2, with the addition of anti-tilting means effective between and at the outer marginal portions of said stationary and said rotary bearing members.

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