Feb. 3, 1953

J. E. BECKER

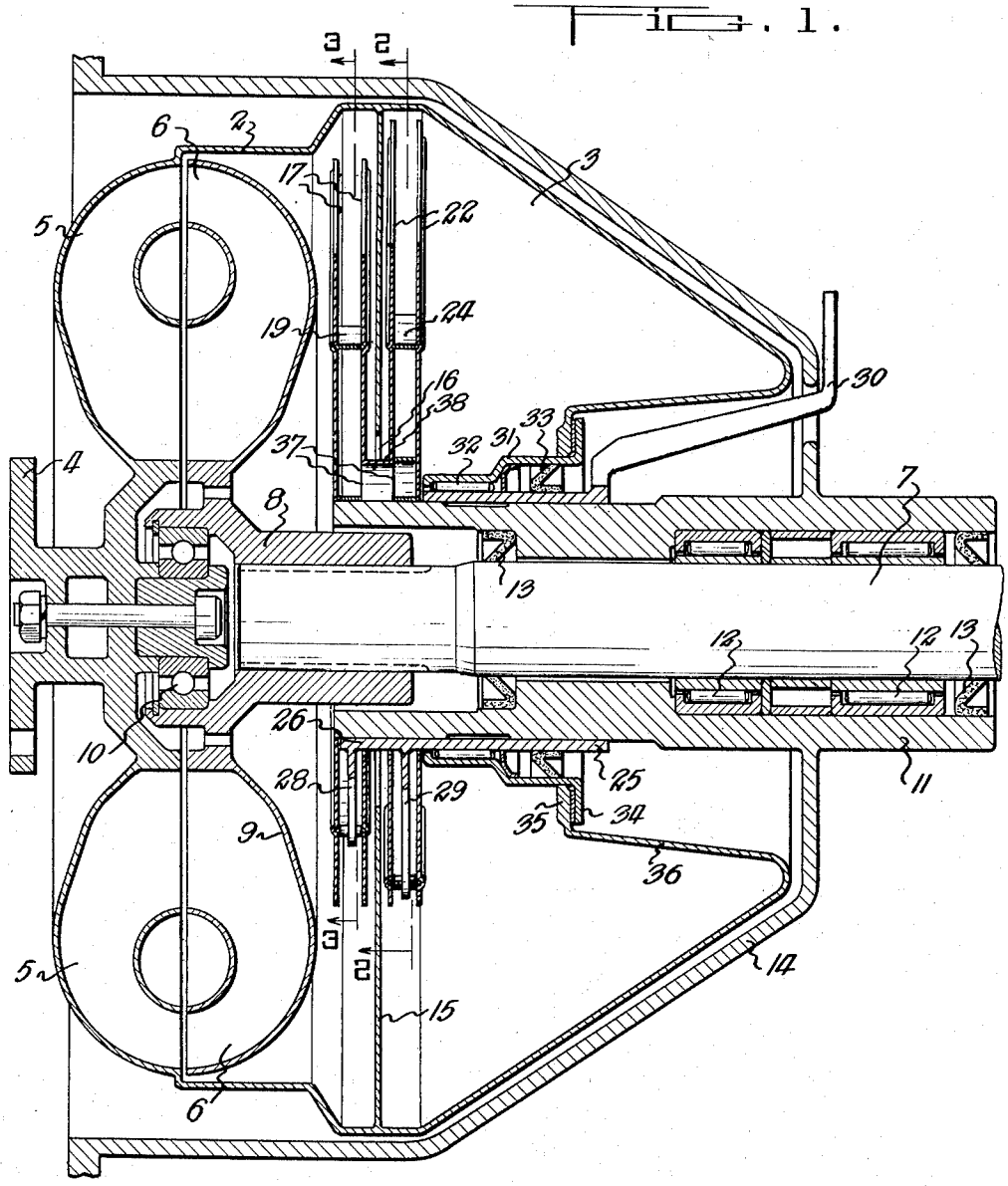
2,627,167

FLUID TRANSFER DEVICE FOR ROTARY PUMP AND TURBINE FLUID COUPLINGS

Filed April 22, 1952

3 Sheets-Sheet 1

Fig. 1.



Inventor
JOHN. E. BECKER

By

Attorney

Feb. 3, 1953 J. E. BECKER 2,627,167

FLUID TRANSFER DEVICE FOR ROTARY PUMP AND TURBINE FLUID COUPLINGS

Filed April 22, 1952 3 Sheets-Sheet 2

Fig. 2.

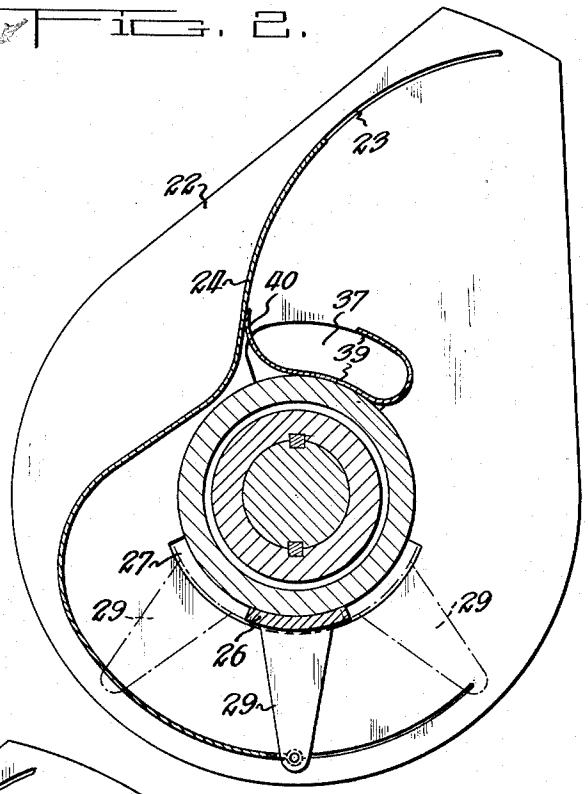
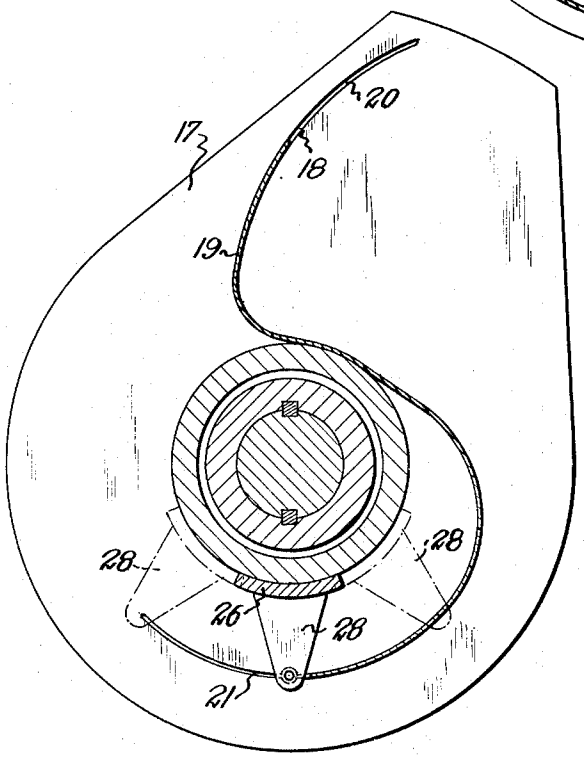


Fig. 3.



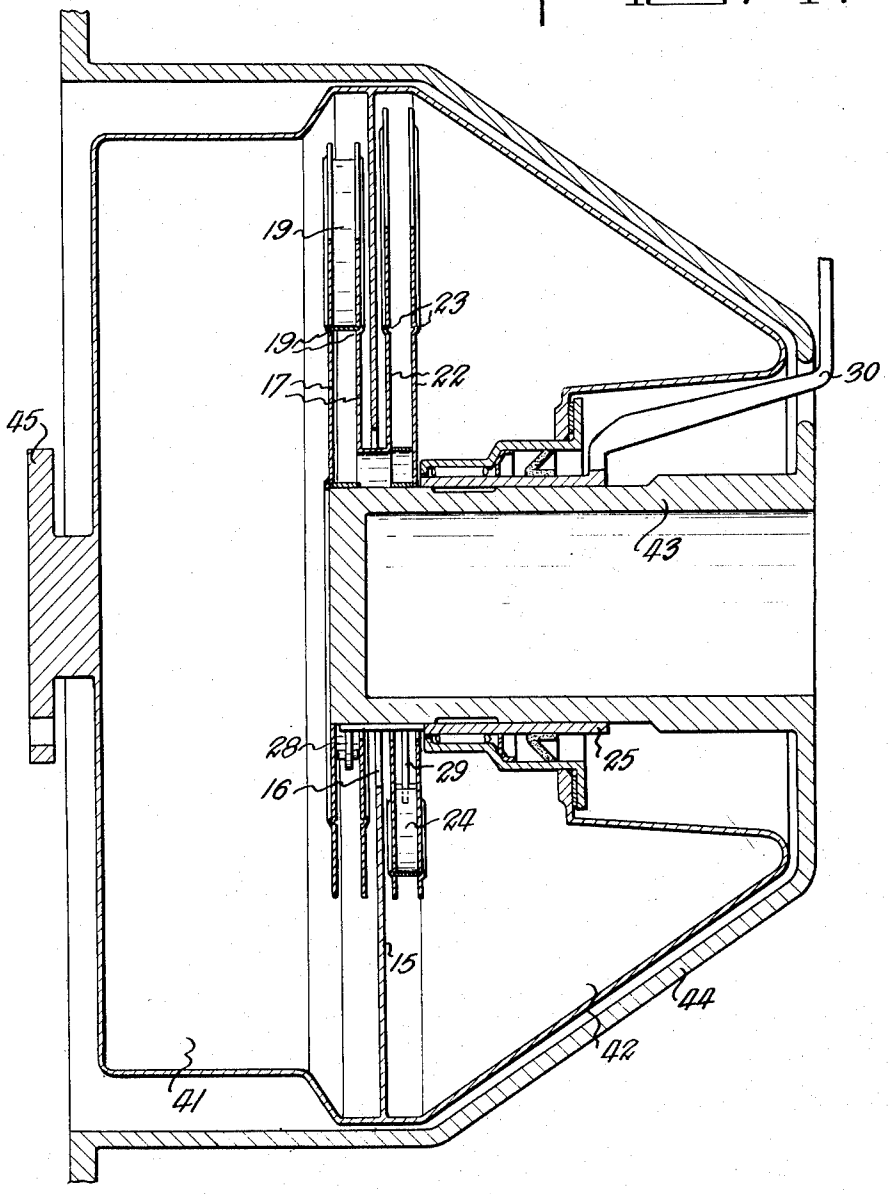
Inventor
JOHN E. BECKER
By
Attorney

Feb. 3, 1953 J. E. BECKER 2,627,167

FLUID TRANSFER DEVICE FOR ROTARY PUMP AND TURBINE FLUID COUPLINGS

Filed April 22, 1952 3 Sheets-Sheet 3

Fig. 4.



Inventor
JOHN E. BECKER
By
Attorney

Patented Feb. 3, 1953 2,627,167

UNITED STATES PATENT OFFICE

2,627,167

FLUID TRANSFER DEVICE FOR ROTARY PUMP AND TURBINE FLUID COUPLINGS

John Edward Becker, Darlington Township, Durham County, Ontario, Canada, assignor to Atlas Polar Company Limited, Toronto, Ontario, Canada, a company of Ontario

Application April 22, 1952, Serial No. 283,725

8 Claims. (Cl. 60—54)

1

My invention relates to improvements in rotary pump and turbine fluid couplings and the purpose of this invention is to furnish an improved arrangement for transferring a predetermined volume of fluid from a centrifugal fluid ring in one rotating reservoir to another rotating reservoir and vice versa, such transferring means comprising a pair of communicating fluid scoop arrangements which are contained within the reservoirs and capable of adjustment to govern the volume of fluid transferred from one reservoir to the other.

The object of the invention is to provide a fluid scooping arrangement in each reservoir which broadly comprises a slidable ribbon extending substantially radially from the vicinity of the axis of the reservoir to the vicinity of the periphery of the reservoir and mounted between a pair of stationary side plates whereby the side plates and the ribbon form a fluid scooping device; the distance the ribbon projects into the centrifugal fluid ring governing the volume of fluid removed therefrom.

Another feature of the invention is to provide an arrangement for simultaneously sliding the scooping ribbons in the two reservoirs, the arrangement being such that when one ribbon is being slid towards its reservoir periphery the other ribbon is retracted from its reservoir periphery.

A further and important object of the invention is to provide a fluid transfer device which is particularly designed for use in fluid couplings wherein the drive between the driving shaft and the driven shaft is governed by the volume of fluid in the impeller housing of the coupling.

With the foregoing and other objects in view as shall appear, my invention consists of a fluid transfer device constructed and arranged all as hereinafter more particularly described and illustrated in the accompanying drawings in which:

Fig. 1 is a longitudinal cross-sectional view through a fluid coupling in which the fluid transfer device is incorporated.

Fig. 2 is a cross-sectional view showing the fluid scooping arrangement in the right hand reservoir of Fig. 1, the view being along the line 2—2, Fig. 1.

Fig. 3 is a similar view to Fig. 2 showing the fluid scooping arrangement in the coupling impeller housing being along the line 3—3, Fig. 1, and

Fig. 4 is a longitudinal cross-sectional view through a pair of coupled rotatable reservoirs in

2

which a pair of fluid scoops of the type illustrated in Figs. 1 to 3 are contained.

Like characters of reference indicate corresponding parts in the different views of the drawings.

Fig. 1 illustrates a fluid coupling of the same general type as disclosed in my United States Patent No. 2,532,952, January 22, 1952, and wherein an impeller housing 2 and a fluid reservoir 3 are rotatably mounted about a common axis, the impeller housing carrying a coupling plate 4 for attachment to a driving shaft and containing a plurality of radial impeller vanes 5 which drive a plurality of runner vanes 6 mounted upon a driven shaft 7 extending through the reservoir 3 into the impeller housing 2.

In the arrangement as illustrated in Fig. 1, the inner end of the driven shaft 7 is keyed within a collar 8 upon which the runner vanes 6 and their housing 9 are carried. The collar is mounted upon a ball bearing race 10 positioned within the central portion of the impeller housing from which the impeller vanes rotate.

The driven shaft 7 rotates within a stationary hollow shaft 11 containing suitably arranged roller bearings 12 and oil seal rings 13, the hollow shaft being supported by a stationary shell 14 within which the coupling assembly is contained. A wall 15 forms the partition between the impeller housing 2 and the reservoir 3 and contains a central orifice 16 surrounding the axial assembly of the coupling and through which the air pressure in the coupling is equalized as fluid is transferred from one centrifugal fluid ring to the other.

The impeller housing 2 and fluid reservoir 3 each contains a similar slidable ribbon fluid scooping arrangement. The fluid scooping arrangement in the impeller housing 2 comprises a pair of transversely arranged parallel side plates 17 of preferably the general shape as shown in Fig. 3. The plates are mounted upon the inner end of the stationary hollow shaft 11 which protrudes through the partition wall orifice 16 into the impeller housing. The inner opposite faces of the plates contain a pair of similar curved grooves 18 which are positioned opposite one another to constitute a track containing a slidable scoop ribbon 19 which extends between and slides within the grooves.

The coupling, as illustrated, is designed to rotate in a counter-clockwise direction and in order to obtain fluid scooping efficiency, the outer ends 20 of the track grooves 18 are curved towards the counter-clockwise direction of rota-

tion of the coupling. The inner ends 21 of the track grooves 18, as illustrated in Fig. 3, are curved in a clockwise direction around the hollow stationary shaft 11, and in the ribbon is slid by a suitably swinging arm arrangement extending to the inner ends of the track forming the grooves, as shall be hereinafter explained.

The fluid reservoir 3 contains a pair of plates 22 which are arranged in a similar manner to the pair of plates 17 and are also carried upon the hollow shaft 11. The plates contain a pair of grooves 23 which are similarly curved at their outer ends to the outer ends 20 of the grooves 18 in the plate 17, and carry a sliding ribbon 24. The inner ends of the grooves 23 are curved in a counter-clockwise direction around the stationary shaft 11, as illustrated in Fig. 2.

To slide the ribbons 19 and 24 in opposite directions in unison a turnable sleeve 25 is carried upon the stationary hollow shaft 11 and formed with a projection 26 on the lower part of its inner face and which extends through aligned curved slots 27 in the pair of plates 22 and the inner adjacent plate 17. The sleeve projection 26 carries a pair of arms 28 and 29, the arm 28 being positioned between the pair of plates 17 and the arm 29 positioned between the pair of plates 22. The outer ends of the arms are attached to the ends of the ribbons 19 and 24. The sleeve is manually turnable in any suitable manner, such as by a lever 30 extending from its outer end through an orifice in the shell 14.

Upon reference to Figs. 2 and 3, it will be seen that when the sleeve 25 and its arms 28 and 29 are swung in a clockwise direction that the scoop ribbon 19 will be retracted and the scoop ribbon 24 moved outwardly. When the sleeve 25 and its arms 28 and 29 are swung in a counter-clockwise direction the scoop ribbon 19 is moved outwardly and the scoop ribbon 24 retracted.

As the fluid reservoir 3 rotates about the sleeve 25 which slides the fluid scooping ribbons, I provide a fluid tight construction wherein a sleeve 31 rotatably surrounds the sleeve 25 and contains suitable roller bearings 32 and seal rings 33 engaging the sleeve 25. The outer end 34 of the sleeve 31 is attached to a lip 35 formed upon the inturned end of the cylindrical wall 36 of the reservoir 3.

To provide a fluid transfer conduit between the two scooping assemblies, the adjacent plates 17 and 22 are formed with orifices 37 through which fluid may pass from the space between the plates 17 to the space between the plates 22 and vice versa. The conduit formed by the two plate orifices 37 is bounded by a shell plate 38 to confine the fluid in its passage from one scoop to the other. In the space between the plates 22 a shell plate 39 is contained and formed with a curved lip 40 bearing against the scooping face of the ribbon 24 so that fluid is directed into the orifice 37 in the plate 22 when fluid is being scooped by the ribbon 24.

Fig. 4 illustrates the fluid scooping and transferring arrangement incorporated in a pair of reservoirs 41 and 42 and wherein exactly the same arrangement as previously described is used for transferring fluid from one reservoir to the other. The reservoirs are shown supported upon a stationary hollow shaft 43 extending inwardly from a stationary supporting shell 44, the reservoirs being rotated by means of a driving shaft connected to a coupling plate 45. The stationary hollow shaft 43 has exactly the same function as the stationary hollow shaft 11 previously described and carries the turnable sleeve 25 through the medium of which the scooping devices are actuated.

In Fig. 4 the ribbon 24 between the plates 22 is shown completely retracted towards the axis of its reservoir and the ribbon 19 between the plates 17 completely extended towards the periphery of its reservoir. The reservoirs and impeller housing are formed with peripheral walls sloping outwardly towards their greatest diameter portions containing the pairs of side plates 17 and 22 whereby a substantially complete evacuation of fluid from the centrifugal fluid rings may be obtained.

Although I have shown and described a particular mounting and construction of the reservoirs and impeller housing in which the fluid scooping arrangements are contained, it will be appreciated that I do not necessarily have to confine my invention to this particular construction nor do I have to confine my fluid scooping arrangement to the construction shown, it being understood that I can make such changes and alterations as I may at any time deem necessary without departing from the spirit of my invention as set forth in the appended claims.

What I claim as my invention is:

1. In a rotary pump and turbine fluid coupling, a device for removing a predetermined volume of fluid from a centrifugal fluid ring in a reservoir rotating about its axis and comprising a stationary track contained within the reservoir and extending from the vicinity of the axis of the reservoir to the vicinity of the periphery of the reservoir, a fluid scoop ribbon slidably contained within the track with its scoop face opposed to the direction of rotation of the reservoir, a pair of side plates positioned along the sides of the ribbon edges whereby the side plates and the ribbon form a fluid scooping trough, means for sliding the ribbon along the track between the side plates, and a fluid conduit extending from the reservoir axis end of said fluid scooping trough to the exterior of the reservoir.

2. A device as claimed in claim 1, wherein two reservoirs rotate about a common axis and fluid is transferable from one reservoir to the other and vice versa, and wherein each reservoir contains a ribbon track and slidable ribbon and side plate fluid scoop trough forming arrangement, the means for sliding the ribbons being so coupled that when one ribbon is being slid towards its reservoir periphery the other ribbon is being retracted from its reservoir periphery, the fluid conduit extending from the reservoir axis end of one fluid scooping trough to the reservoir axis end of the other fluid scooping trough.

3. In a rotary pump and turbine fluid coupling incorporating a pair of fluid reservoirs rotatable about a common axis, a device for transferring a predetermined volume of a fluid from one reservoir to the other and vice versa, a stationary curved track contained within each reservoir and curved towards the direction of rotation of the reservoir, each of said tracks extending from the vicinity of the axis of its reservoir to the vicinity of the periphery of its reservoir, a fluid scoop ribbon slidably contained within each track with its scoop face opposed to the direction of rotation of its reservoir, two pairs of side plates extending substantially at right angles to the axis of rotation of the reservoirs, each pair of side plates being positioned along the sides of a ribbon edge to form with the ribbon a fluid scooping trough, means for sliding the ribbons

along the tracks between the side plates and so arranged that when one ribbon is being slid towards its reservoir periphery the other ribbon is being retracted from its reservoir periphery, and a fluid conduit extending fom the reservoir axis end of one fluid scooping trough to the axis end of the other fluid scooping trough.

4. A device as claimed in claim 3, wherein the inner ends of the tracks curve around the axis of rotation of the reservoirs, one track curving in a clockwise direction and the other track curving in a counter-clockwise direction, the means for sliding the ribbons being a swingable element having its pivotal point substantially concentric with the axis of rotation of the reservoirs and its swingable end connected to the ribbons contained within the curves of the tracks extending around the axis of rotation of the reservoirs.

5. A device as claimed in claim 3, wherein the pair of fluid reservoirs are coupled together and are rotatable about a stationary shaft projecting thereinto, the inner ends of the tracks curving around the axis of the shaft, one track curving in a clockwise direction and the other track curving in a counter-clockwise direction, the means for sliding the ribbons being a sleeve turnably carried upon the shaft interiorly of one of the reservoirs, arms radiating from the sleeve to swing therewith and having their swingable ends connected to the portions of the ribbons contained within the curves of the tracks extending around the axis of the stationary shaft.

6. A device as claimed in claim 3, wherein one of the reservoirs constitutes a driving rotatable impeller housing for a fluid coupling and is attached to a central driving shaft with which the impeller housing rotates, a plurality of impeller vanes mounted within the impeller housing and radiating from its centre, a central driven shaft freely extending through the other reservoir into the impeller housing, a runner housing mounted upon the driven shaft and contained within the impeller housing and having a plurality of radial runner vanes therein and oppositely positioned to the impeller vanes, and a stationary hollow shaft surrounding the driven shaft and upon which the fluid scooping troughs formed by the ribbons and side plates are supported.

7. A device as claimed in claim 3, wherein one of the reservoirs constitutes a driving rotatable impeller housing for a fluid coupling and is attached to a central driving shaft with which the

impeller housing rotates, a plurality of impeller vanes mounted within the impeller housing and radiating from its centre, a central driven shaft freely extending through the other reservoir into the impeller housing, a runner housing mounted upon the driven shaft and contained within the impeller housing and having a plurality of radial runner vanes therein and oppositely positioned to the impeller vanes, a stationary hollow shaft surrounding the driven shaft and upon which the fluid scooping troughs formed by the ribbons and side plates are supported, the inner ends of the tracks curving around the stationary hollow shaft, one track curving in a clockwise direction and the other track curving in a counterclockwise direction, the means for sliding the ribbons being a swingable element having its pivotal point substantially concentric with the stationary hollow shaft and its swingable end connected to the portions of the ribbon contained within the curves of the tracks extending around the stationary hollow shaft.

8. A device as claimed in claim 3, wherein one of the reservoirs constitutes a driving rotatable impeller housing for a fluid coupling and is attached to a central driving shaft with which the impeller housing rotates, a plurality of impeller vanes mounted within the impeller housing and radiating from its centre, a central driven shaft freely extending through the other reservoir into the impeller housing, a runner housing mounted upon the driven shaft and contained within the impeller housing and having a plurality of radial runner vanes therein and oppositely positioned to the impeller vanes, a stationary hollow shaft surrounding the driven shaft and upon which the fluid scooping troughs formed by the ribbons and side plates are supported, the inner ends of the tracks curving around the stationary hollow shaft, one track curving in a clockwise direction and the other track curving in a counterclockwise direction, the means for sliding the ribbons being a sleeve turnably carried upon the hollow stationary shaft interiorly of the reservoir, arms radiating from the sleeve to swing therewith and having their swingable ends connected to the portions of the ribbons contained within the curves of the tracks extending around the stationary hollow shaft.

JOHN EDWARD BECKER.

No references cited.