

Jan. 5, 1965

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PIVOTED DISTRIBUTOR ARM SUPPORTING A DISCHARGE
HOSE IN A LIQUID DISPENSING DEVICE
Filed Nov. 14, 1962

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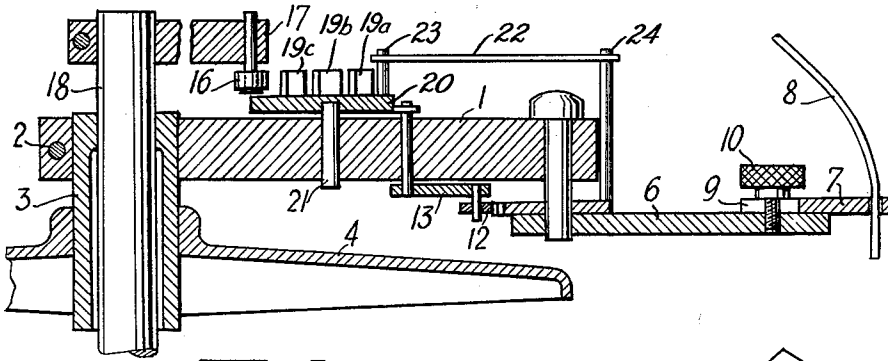


FIG - 1

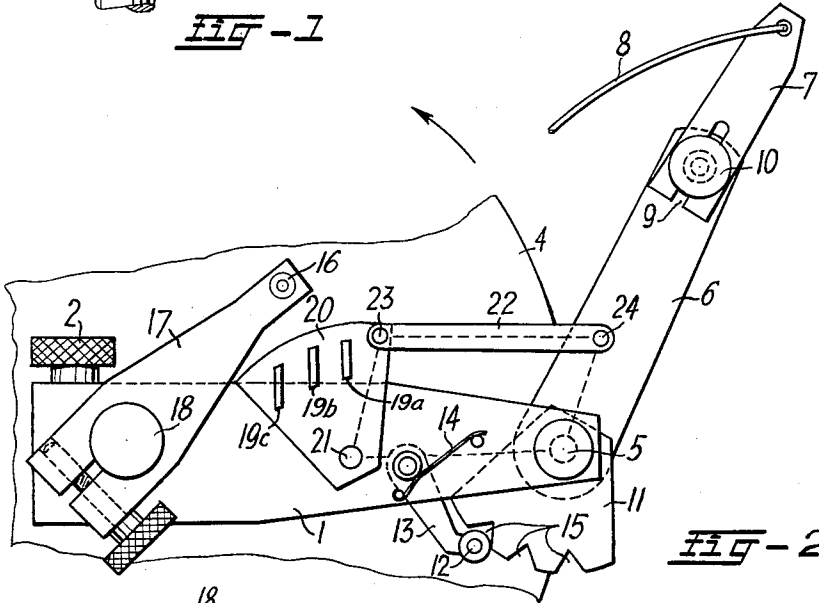


FIG - 2

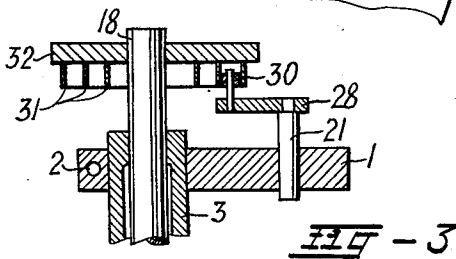


FIG - 3

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PIVOTED DISTRIBUTOR ARM SUPPORTING A DISCHARGE HOSE IN A LIQUID DISPENSING DEVICE

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Filed Nov. 14, 1962, Ser. No. 237,561

Claims priority, application Czechoslovakia, Nov. 18, 1961, 6,832/61

6 Claims. (Cl. 222-527)

The present invention relates to a liquid dispensing device and more particularly to a device of this type supplying liquid to vessels placed in a plurality of circular rows around a rotary fraction collector in preparatory chromatography and in similar processes, where a relatively large number of fractions has to be collected.

In dispensing devices heretofore used, fractions are collected in vessels which are placed in one circle around a rotary collector, whose rotatable part carries an arm, usually a simple tube arranged for stepwise rotary movement and provided with a mouthpiece from which the liquid to be collected is discharged, the mouthpiece travelling step by step above the collecting vessels. These known devices usually collect the liquid in bottles, whose necks are provided with funnels almost contacting one another, in order to prevent the liquid from flowing outside the bottles during the periods when the mouthpiece travels from one bottle to the next.

In said known collecting devices the positioning of the vessels in relation to the collector has to be performed with great care and the number of fractions to be collected is limited by the size and shape of the vessels and their above referred to funnels which have to conform to the number of steps which the collector is able to effect during one revolution and, which are available in a limited number of types and further in view of the available working space and the length of the describing arm.

The present invention aims at removing the aforementioned disadvantages. According to my invention the vessels are placed in a plurality of concentric circular rows or in a continuing helical row and the known rigid distributing arm is replaced by an arm permitting the mouthpiece for the discharge of the liquid to be brought successively into operative positions relative to receiving vessels which are at least partly differently distanced from the rotational axis of the distributing arm.

The distributor arm according to the invention rotating with a spindle of a rotatable fraction collector comprises a central or base part and a peripheral or extension part; the outer end of the central part is journaled to one end of the peripheral part of the distributor arm, the other end of said peripheral arm adjustably supporting a holder for the supply hose. The said parts of the distributor arm are connected by spring catch means for example it carries at that end where it is journaled to the central part of the arm, a segment provided with notches, in which a roller is pressed by a spring, said roller being mounted on a lever arranged for rocking movement in the central part of the arm. The end of the immovable axis of the rotary fraction collector carries an immovable arm with a roller adapted to engage one of the guide members secured to an auxiliary segment which is journaled for swivelling movement about an axis fixed in the central part of the distributor arm. The rotatable auxiliary segment is connected to the peripheral part of the distributor arm by means of a connecting rod and pins.

When the vessels are placed in a continuous spiral, the auxiliary segment, which is rotatable about the axis fixed in the central part of the distributor arm, carries a

guide roller engaging a spiral guide fixed by means of a plate to the immovable axis of the rotary fraction collector.

The distributor arm according to the invention can be arranged as a supplementary device in connection with most conventional types of rotary fraction collectors as are generally used in laboratories.

In order that the invention may clearly be understood and readily carried into effect, it will now be described in detail with reference to the accompanying drawing, in which

FIG. 1 shows schematically, certain parts shown in FIG. 2 being omitted, an elevational sectional view of my new device.

FIG. 2 shows a plan view thereof, and

FIG. 3 shows in elevational section a modified detail of the device.

The same reference numerals indicate the same parts in all figures.

In the embodiment illustrated in FIGS. 1 and 2 a conventional rotary fraction collector is represented by disk 4 attached to a stepwise rotatable hollow shaft 3 which is rotatably mounted on a stationary axle 18. The upper end of this axle extends beyond the hollow shaft 3 and a radially extending arm 17 is adjustably fastened thereto.

A distributor arm consisting of an arm base 1 attached to the shaft 3 and an arm extension 6 jointed thereto by pivot 5 guides the discharge end of a supply hose 8 stepwise to a plurality of receiving vessels arranged in at least two concentric circular rows in even spacings conforming to stepwise displacement of the discharge end of the hose 8. This discharge end is held in a holder 7 which is adjustably attached to the outer end of the arm extension 6 for example by a screw 10 engaging a slot 9 thereof.

The arm extension 6 is held by conventional spring catch means in variable angular positions relative to the arm base 1 so that the effective rotational radius of the discharge end of the supply hose 8 held by its holder 7 may be changed. For example as shown the arm extension 6 may be provided with a ratchet segment 11 attached thereto and including notches 15 which are engaged by a roller 12 of a pawl 13 swingably mounted on the arm base 1 and loaded by a spring 14 to ensure the engagement of the roller 12 into one or the other notch 15. It will be understood that the arm extension 6 will partake in the stepwise rotation of the spindle 3 and that the discharge end of the hose will rotate in different circular rows as the roller 12 engages one or the other notch 15.

The radially extending arm 17 attached to the stationary axle 18 holds a follower such as roller 16 which is adapted to engage successively a plurality of steering plates 19a, 19b, 19c and to pass through the space between neighboring steering plates. These steering plates are supported by a swing member 20 pivotable about stud 21 on arm base 1 and the swing member 20 is linked to the arm extension 6 by a connecting rod 22 at 23, 24 in such manner that the joints 5, 21, 23, 24 define a parallelogram linkage as indicated by the dotted lines in FIG. 2.

My distributing device operates as follows:

After roller 16 has engaged steering plate 19a, and the distributing arm 1-6 has completed a full revolution in anticlockwise direction as indicated by the arrow in FIG. 2, said roller 16 engages the steering plate 19b and passes between the neighboring steering plates 19b, 19c, until after another full revolution of the distributing arm 1-6 it engages the steering plate 19c thereby causing the swing member 20 to turn in three stages in clockwise direction and to push by means of the connecting rod 22 the arm extension 6 outwardly until the roller 12 snaps into the next notch 15 of the ratchet member 11, bringing the discharge end of the hose 8 into operational location

relative to the next following circular row of receiving vessels.

If there is no objection against radially extending the stationary arm 17, the base member 20 may be pivoted directly on the pivot 5 thus eliminating the connecting rod 22. The amended device will operate as described before.

If desired the receiving vessels may be placed evenly spaced in a continuously helical row around the fraction collector. In this case the device is modified as indicated in FIG. 3. The swing plate 20 is provided with a roller or other follower 30 which engages a spiral shaped steering member 31 arranged on the support 32 fixed to the stationary axle 18. The spring catch members 11, 12, 13, 14 may also be modified in any known manner to permit a controlled swing movement of the arm extension 6 relative to the arm base 1.

Where a great number of rows is used and when the vessels have to be placed closely next to each other so as to achieve the advantage of an automatic fixing of the vessels without any holders or without the need of placing the vessels on marking or the like, the device has to be supplemented by a correction member, for instance by substituting a rolling joint for the simple rotatable joint 5 in order to link the parts of the arm together. A more general additional movement can thus be achieved, said movement following exactly also the shapes of general spiral arcs.

If required, the vessels may be placed in a continuous spiral. In this event the mechanism of the distributor arm has to be modified so as to effect the corresponding part of a radial displacement of the hose mouthpiece upon each step of the collector.

This is accomplished according to the invention in a way shown diagrammatically in FIG. 2. The auxiliary segment 20 mounted for rotation about the axis 21 arranged in the central part 1 of the distributor arm, carries a roller or follower 30 which engages a spiral guide 31 fixed by means of a plate 32 to the immovable axis 18 of the rotatable fraction collector.

What is claimed is:

1. In combination with a rotary fraction collector dispensing means for supplying liquids to stationary receiving vessels placed evenly spaced in a plurality of circular rows centered on the rotatable central shaft of the collector, particularly for use in preparatory chromatography, said dispensing means comprising

- (a) a two-part distributor arm including an arm base fixed for stepwise rotation to the central shaft of the collector and an arm extension jointed with one end to the arm base;
- (b) a supply hose for carrying liquid to the receiving vessels;
- (c) holding means for the discharge end of the supply hose at the free end of the arm extension;
- (d) spring catch means between the arm base and the arm extension to hold these distributor arm parts temporarily in different angular relation and thus to vary the effective rotational radius of the discharge end of the supply hose;
- (e) and indexing means associated with the distributor arm parts and adapted to change the said angular relation after each full revolution of the arm base, thereby placing the discharge end of the supply hose in operational position relative to the receiving vessels arranged in concentric circular rows.

2. Dispensing means according to claim 1 wherein the said indexing means comprise a plurality of steering plates; a support for said plates swingably mounted on the arm base; a connecting rod linking said support with the arm extension in a parallelogram linkage; and a stationary follower mounted for succeeding cooperation with the said steering plates.

3. Dispensing means according to claim 1 wherein the said indexing means comprise a plurality of steering plates; a support for said plates swingably mounted on the arm base; a connecting rod linking said support with the arm extension in a parallelogram linkage; a stationary axle coaxial with the rotatable shaft of the collector; an arm fixed to said axle; and a follower at the free end of said arm for succeeding cooperation with the said steering plates.

4. Dispensing means according to claim 1 comprising a plurality of steering plates; a support for said plates swingably mounted on the arm base at its joint with the arm extension; connecting means between said support and the arm extension; and a stationary follower mounted for succeeding cooperation with the steering plates.

5. Dispensing means according to claim 1 wherein the said indexing means comprising a plurality of steering plates mounted on the arm extension and a stationary follower mounted for succeeding cooperation therewith.

6. In combination with a rotary fraction collector dispensing means for supply liquids to stationary receiving vessels placed evenly spaced in a helical row centered on the rotational axis of the central shaft of the collector, particularly for use in preparatory chromatography, said dispensing means comprising

- (a) a two-part distributor arm including an arm base fixed for stepwise rotation to the central shaft of the collector and an arm extension jointed with one end to the arm base;
- (b) a supply hose for carrying liquid to the receiving vessels;
- (c) holding means for the discharge end of the supply hose at the free end of the arm extension;
- (d) spring catch means between the arm base and the arm extension to hold these distributor arm parts temporarily in different angular relation and thus to vary the effective rotational radius of the discharge end of the supply hose;
- (e) a follower and a support therefor swingably mounted on the arm base;
- (f) a connecting rod linking said support with the arm extension in a parallelogram linkage;
- (g) a stationary helically shaped steering member co-centered with the rotational axis of the central shaft of the collector and mounted for engagement with said follower.

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