

Aug. 18, 1942.

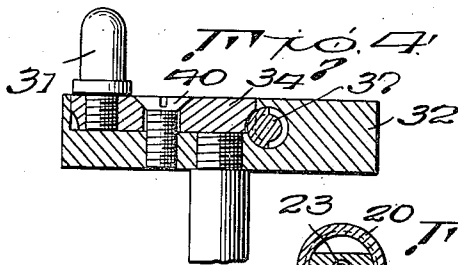
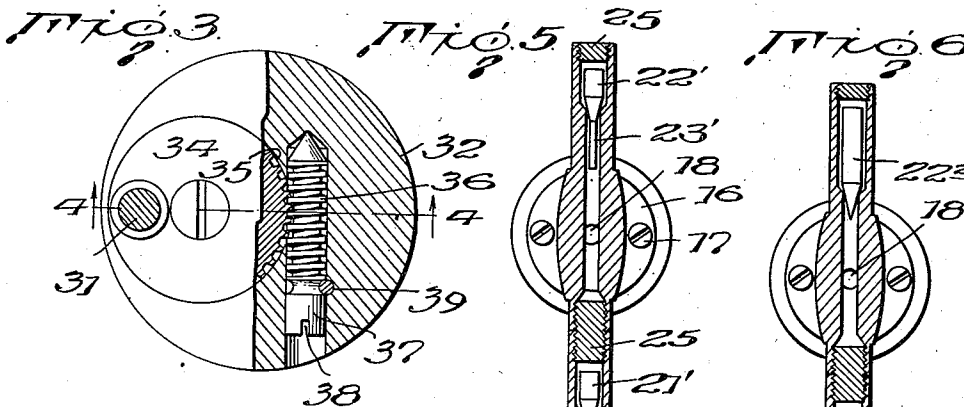
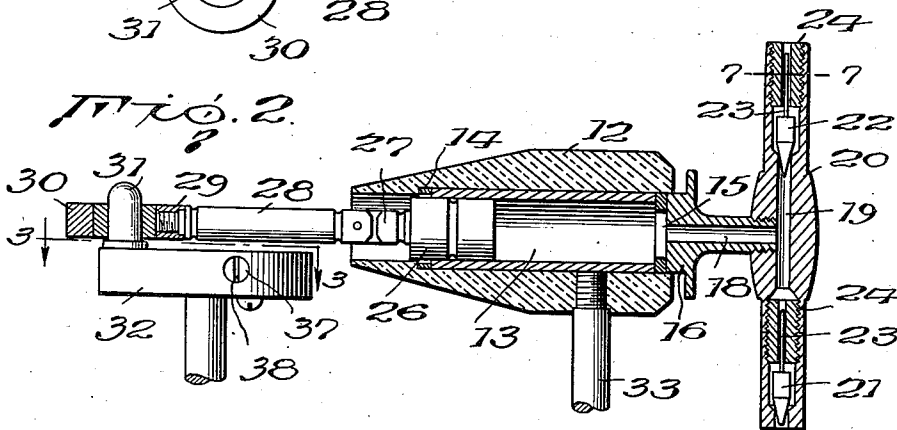
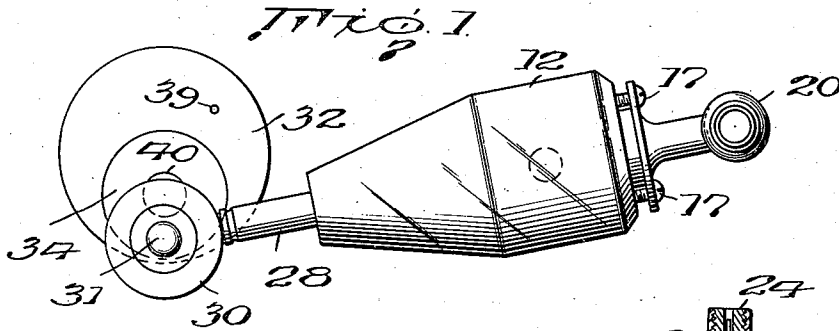
S. T. MARTIN

2,293,675

TRANFERENCE APPARATUS

Filed July 17, 1939

2 Sheets-Sheet 1



Inventor
Sterling T. Martin,

By Bernard S. Lowrey
Attorney

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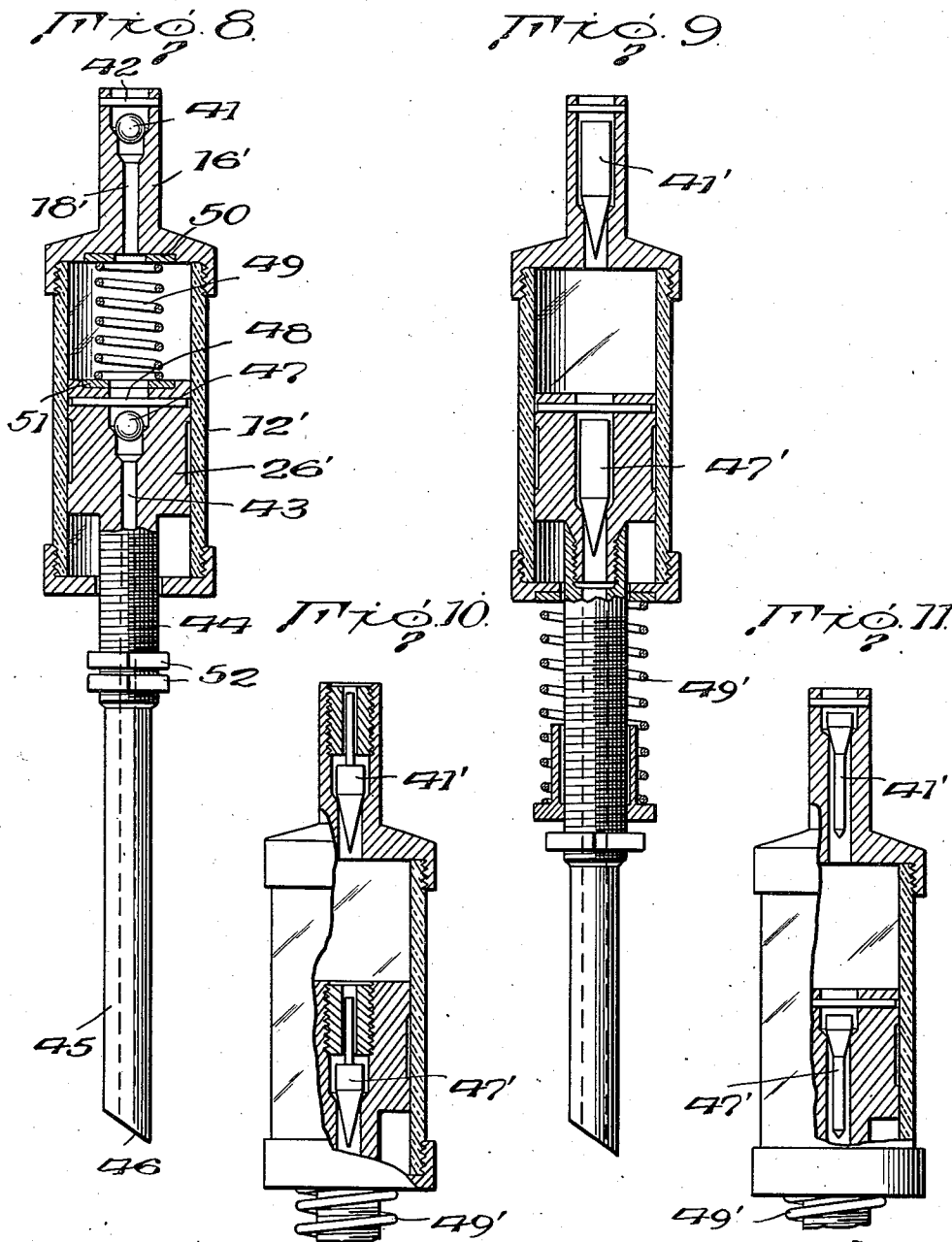
S. T. MARTIN

2,293,675

TRANSFERENCE APPARATUS

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2 Sheets-Sheet 2



Inventor

Sterling T. Martin,

By *Bernard F. Lawley*
Attorney

UNITED STATES PATENT OFFICE

2,293,675

TRANSFERENCE APPARATUS

Sterling T. Martin, Charleston, W. Va., assignor of
one-third to Guy M. Robertson, Clendenin,
W. Va.

Application July 17, 1939, Serial No. 285,019

2 Claims. (Cl. 103—159)

The present invention consists of a fluid transference apparatus and is a continuation in part of my application on transference apparatus, filed August 24, 1937, Serial No. 160,698, including the species of invention divided out of my above referred to application.

The invention relates to an apparatus for transferring fluids from one body to another particularly in routine analytical work such as agglutination tests employed in the testing for bangs disease, pullorum, also in the Kahn and Wasserman tests. In addition to this type work the same apparatus may be used by varying the sizes and material in the construction of parts for any work in which a fluid is required to be transferred in accurate amounts from one source to a recipient, vials or any other manner of container.

It is particularly aimed to provide a novel construction wherein a control head is provided to which a measuring chamber is attached and which head utilizes gravity valves operating without resort to springs or similar parts. More particularly, it may be used in the transfer of antigens or other solutions required in routine analysis such as employed in the agglutination tests for bangs and pullorum diseases. Also in the transfer of acids or other aqueous solutions in routine analysis in chemical, pathogenic, and bacteriology laboratories.

Another object of the present invention is the production of a simplified and easily operated device which can be readily prepared or disassembled for sterilization by a person ordinarily skilled in the handling of laboratory or surgical instruments; to provide a machine of the character stated which will be more rapid in operation than the hand types now in general use and much more accurate; to provide means by which the valves are guided to the valve seats.

The apparatus when being used invokes the action of gravity in the operation of the valves. It will be noted that the shape of the valve, in one form of the invention, is conical as is the valve seat, the conical taper of the valve being at a smaller angle than that of the seat to insure positive cut-off action. To insure more positive action the valve is guided by means of removable guides through which the stem of the valve passes. This type valve is used because of its advantages over the ball and other types in that the action in opening and cutting off is much more sensitive and may be accomplished with much greater speed.

Still another object of this machine is the

provision of a positive and accurate means for measuring a desired quantity of liquid, the apparatus including a means whereby the measurement may be changed at the will of the operator.

My invention also contemplates an apparatus which although specifically adaptable for measuring bacto-agar and other medias and viscous solutions, is susceptible of a variety of other uses. By the use of this invention the cumbersome and unwieldy method employed in bacteriology laboratories of pouring the media from a cooker into suspended glass funnels, etc. is discontinued and instead the bottles or other receptacles remain in their tray and the media is transferred directly from the cooker to the receptacle by a pump action. After many experiments with various fluids and under different operating conditions, I have found that this apparatus will positively expedite all laboratory transfer measuring operations which are at present accomplished by rheometers and like devices.

Other objects of the invention will be apparent from the following description of the present preferred forms of the invention, taken in connection with the accompanying drawings, wherein:

Fig. 1 is a plan view of a transference apparatus constructed in accordance with the present invention,

Fig. 2 is a fragmentary vertical sectional view thereof showing to advantage the cylinder and valve column construction,

Fig. 3 is a detail fragmentary sectional view taken on the line 3—3 of Fig. 2, looking in the direction of the arrows and illustrating to advantage the means for urging the throw of the piston,

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 3, looking in the direction of the arrows,

Fig. 5 is a vertical sectional view of a modified form of valve column and valves the latter being shown in elevation,

Fig. 6 is a similar view of another modified form of valve column and valves, the latter being shown in elevation,

Fig. 7 is a detail sectional view taken on the line 7—7 of Fig. 1, illustrating to advantage the manner of mounting one of the valves in a valve column carried bushing,

Figs. 8, 9, 10 and 11 are fragmentary vertical sectional views of modified forms of fluid transference apparatus, constructed in accordance with the present invention.

The present invention includes a cylinder

which may be of any desired configuration and constructed from any suitable materials, being provided with a bore, a portion of which is recessed to receive a liner 13. The liner is insertable in the bore of the cylinder through one end of the latter and has interposed between its inner end and a shoulder at the bottom of the cylinder recess, a spacing washer 14. The outer end of the liner falls short of the end of the cylinder through which the liner is inserted leaving sufficient space to accommodate a compression washer 15 and the inner end of a cylinder head 16, the latter being superimposed on the washer 15. The washer 15 is adapted to be compressed against the outer terminal of the liner 13, the compressive action being effected by any suitable means, such for instance, as screws 17 mounted in an annulus forming a part of the head 16, the screws extending into complementary recesses formed in a terminal of the cylinder. The cylinder head is provided with a bore 18 which communicates with a bore or passageway 19 which latter extends longitudinally through a valved column or stem 20. In the form of invention illustrated in Fig. 2 the column is provided with inlet and outlet needle valves 21 and 22, respectively, each of which is provided with a guide stem 23 slidably mounted in a corresponding bore of a removable bushing 24. In this form the valves 21 and 22 have the major portion of their weight above the point of contact of the conical ends thereof with the valve seats to effect positive engagement of the valves with their seats. In Fig. 5 the modified inlet and exhaust valves 21' and 22' are somewhat similarly constructed with the valve stems 23' being located beneath the valves instead of above the latter. In this form of invention the bushings 24 are eliminated and in their stead abutments 25 are employed, the abutments being removable and of similar cross sectional configuration to the bushings 24, with the bore or opening deleted. The modified form of valved column, shown in Fig. 6, differs from the form of invention illustrated in Fig. 5 only in that the inlet and exhaust valves 21² and 22² are elongated and are not equipped with valve stems. These different forms of valves are adaptable for different classes of work and use fluids varying in consistency and specific gravity. In each instance the column 20 is removable from the cylinder head 16 and the valves readily removed from their columns to facilitate cleaning.

The cylinder and liner may be transparent, if desired, and may be equipped with any suitable conventional form of measuring means. The cylinder liner has reciprocally mounted therein a piston 26, which latter is equipped with a stub shaft or rod 27. The stub shaft is pivotally engaged with one end of a pitman 28, the upper end of the latter being detachably mounted, as indicated at 29, in an auxiliary disc 30. The disc 30 is sleeved over a crank pin 31, the latter being carried by a movable part, more fully hereinafter described, on a crank 32 which is of discal construction. Rotation of the crank 32 effects reciprocation of the piston 26 in the cylinder 12. Concurrently the cylinder 12 is oscillated on a shaft or rod 33. Upon reference to Fig. 2 of the drawings it will be apparent that the pitman 28 is articulate so as to move in a vertical plane, but does not permit independent lateral displacement. In addition the crank is provided with suitable means for adjusting the throw of the

piston. After much experiment I have found that the means best adapted for this purpose may consist of a rotatable block 34 countersunk in the upper face of the crank and provided with teeth 35 which complement and mesh with threads 36 formed on a worm screw 37. The screw is provided with a kerf 38 to facilitate turning movement thereof. Casual rotation of the screw is prevented by a lock pin 39. The block is provided with a central opening through which a screw 40 extends, the screw being anchored in the crank 32. The pin 31 is detachably mounted in the block 34 and is bodily movable with the latter. It is consequently apparent that after the screw 40 has been released, the worm screw 37 may be rotated to increase or decrease the eccentricity of the pin 31 to correspondingly increase or decrease the throw of the piston 26. In this way the quantity or volume of fluid taken into the cylinder is varied at the option of the user.

It is, of course, apparent that on the suction or intake stroke of the pump fluid is drawn into the cylinder through the inlet valve. On the pressure or exhaust stroke the piston forces the fluid from the cylinder through the exhaust valve during which period the intake valve automatically closes. It is, of course, understood that the terminals of the valved column may be equipped with tubes or other suitable means for conducting or conveying the fluids.

In the forms of invention illustrated in Figs. 8 to 11, inclusive, a cylinder 12' is illustrated which may be transparent and has mounted therein a piston 26'. A cylinder head 16' is mounted on the upper end of the cylinder and is provided with a bore or passageway 18' which issues, at its upper end, into a valve seat upon which a globular valve 41 is mounted, movement of the valve being limited by a stop pin 42. The piston 26' is provided with a bore 43 which extends through an externally screw threaded stem 44, the latter being formed integral with the piston, as shown in Figs. 8 and 10, or being detachably engaged thereto, as shown in Fig. 9. The upper screw threaded portion of the stem issues into a reduced lower terminal portion 45, the outer periphery of which is smooth, the extreme lower end of said portion being beveled, as indicated at 46. In the upper end of the bore 43, intermediate the ends of the piston, a valve seat is provided which is adapted for the reception of a valve 47, movement of the latter being limited by a stop pin 48.

The piston 26' is normally held in the lower end of the cylinder 12' by suitable means 49, which in the present instance consists of a coil spring, the convolution at the upper end thereof bearing against a wear plate or washer 50 countersunk in the inner face of the cylinder head 16'. The convolution at the opposite end of the spring bears against a wear plate or washer 51 mounted in the upper free terminal of the piston.

Movement of the cylinder 12' on the stem 44 is limited by an abutment and lock nuts 52 so that the volume or quantity of fluid entering the cylinder is subject to adjustment at the option of the user.

When it is desired to induce fluid into the cylinder 12, the beveled end 46 of the piston stem is engaged with the bottom of the receptacle from which the fluid is to be taken and the cylinder then urged downwardly against the resistance of the spring 49. This causes the spring 49 to be compressed. While the stem is still in

the fluid the spring is permitted to expand thereby urging the piston toward the lower end of the cylinder creating a suction for inducing the fluid through the bore 43 and into the space between the upper end of the piston and the cylinder head. With completion of this stroke of the piston, the valve 47 gravitates to its seat. When the contents of the cylinder is to be expelled, downward pressure is exerted on the cylinder against the resistance of the spring 49 thereby forcing the fluid upwardly through the bore 18' into engagement with the valve 41 to unseat the latter. As soon as pressure is released from the cylinder, the valve 41 gravitates to its seat.

In the form of invention shown in Figs. 9, 10 and 11, the operation of the device is the same, except that valves of different construction are used and instead of an internal spring, such as shown at 49, in Fig. 8, an external spring, designated 49' is employed. In each of these forms of invention the inlet valve, designated 47', is mounted in the piston while the outlet valve 41' is mounted in the cylinder head.

It is, of course, to be understood that although I have herein described preferred forms of my invention, I am nevertheless aware that various other forms may be used within the scope of the claims hereto appended.

What is claimed is:

1. A fluid transference apparatus including a cylinder and piston, a valved column the bore of which is intermediately constricted, the valved column being in communication with the cylinder at the point of said constriction, the valves of the column being of cone shape, and the major portion of their weights above the points of contact of the conical ends to effect positive engagement of the valves with their seats, means connected to the piston for operating the latter for drawing fluid into and expelling the same from the cylinder through said valved column, the cylinder being movable in one plane and said means movable in an opposite plane.

2. A fluid transference machine including a cylinder and piston, a valved column through which fluid, drawn into and expelled from the cylinder, passes, power means operatively connected to said piston for reciprocating the piston in the cylinder and simultaneously oscillating the cylinder, the connection between said power means and piston being articulate to permit restricted movement of the piston in a plane opposite to the plane of movement of the cylinder.

STERLING T. MARTIN.