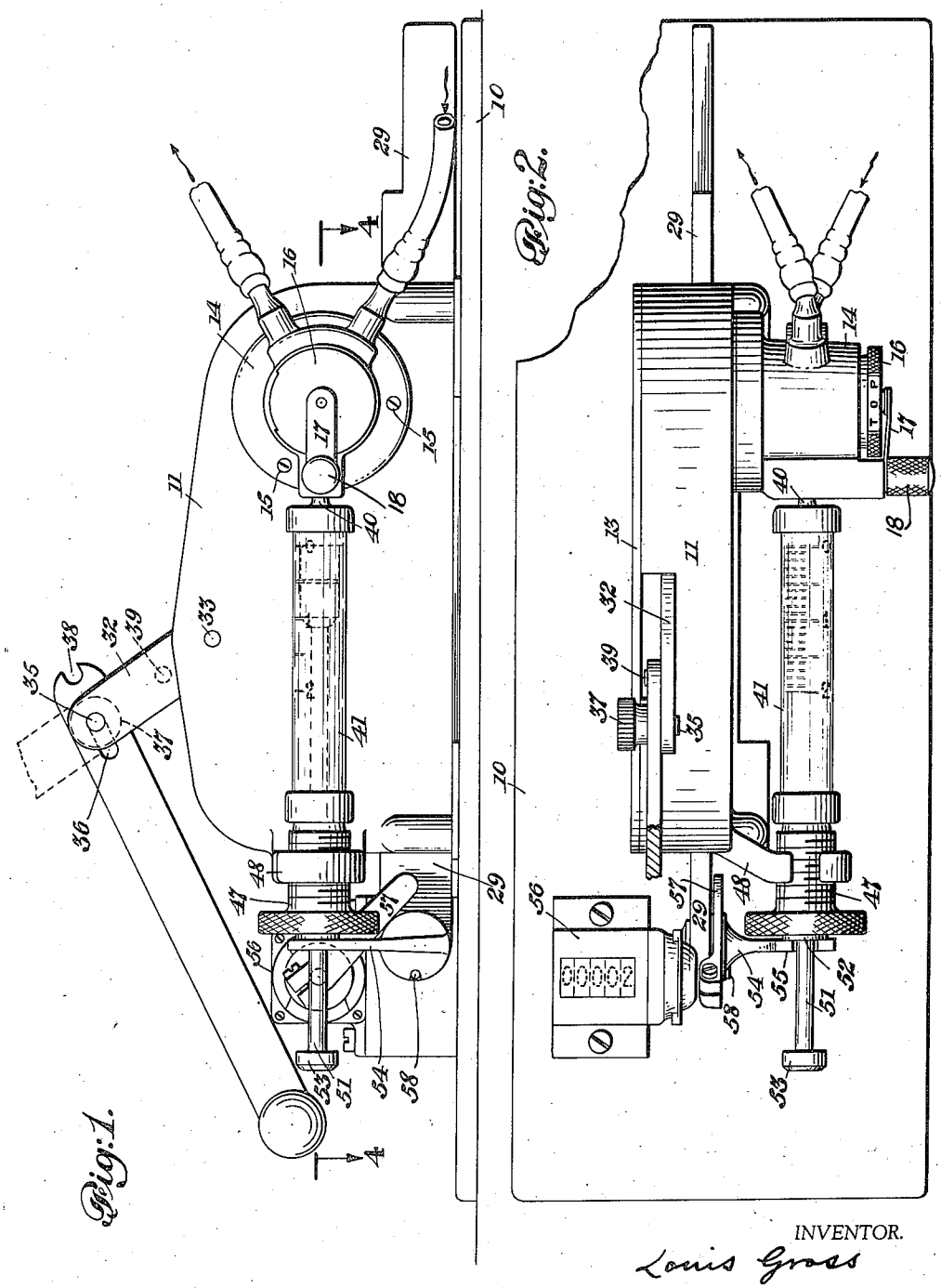
Nov. 17, 1936. L. GROSS 2,061,399

BLOOD TRANSFUSION MACHINE

Filed April 17, 1935 2 Sheets-Sheet 1

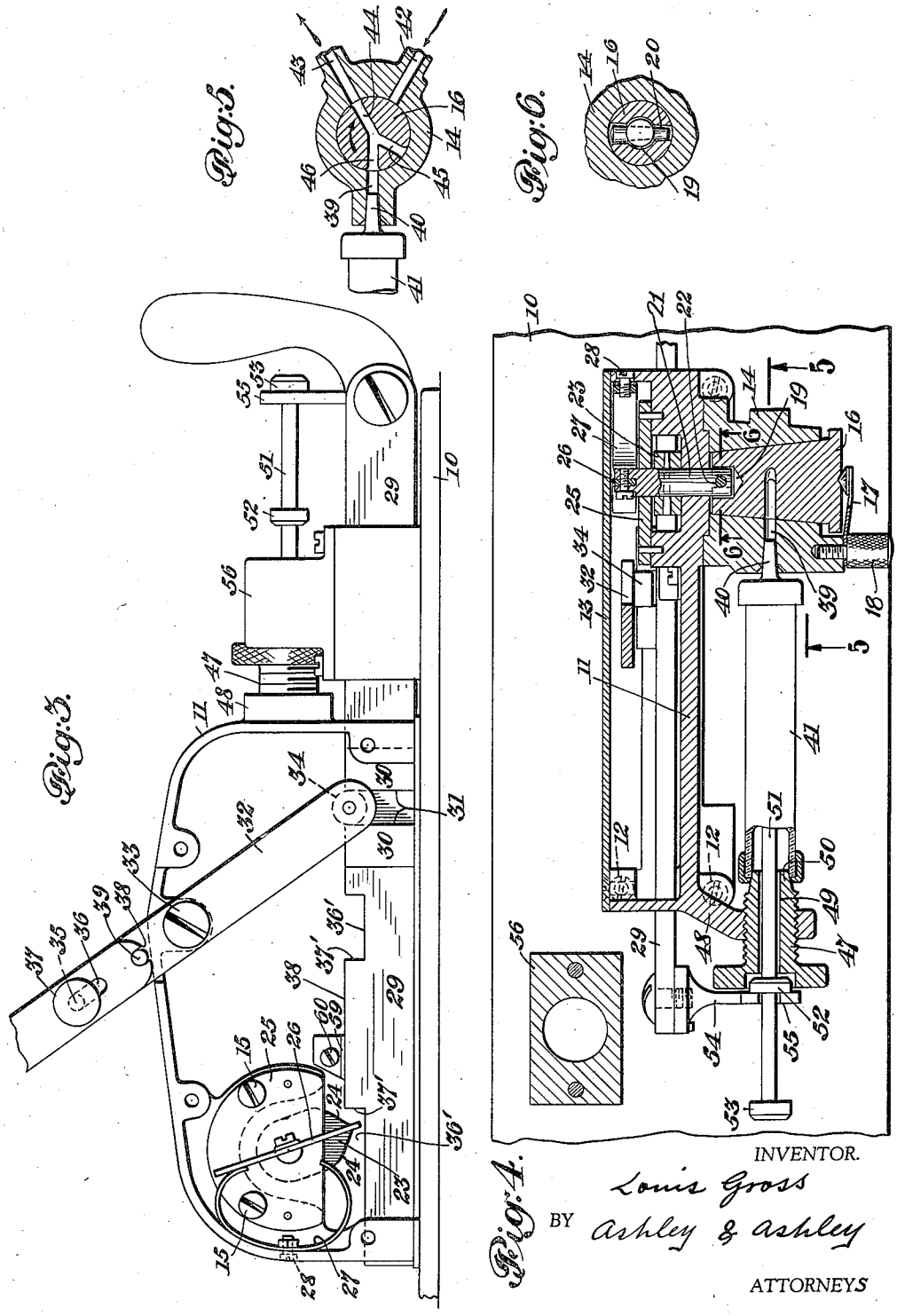


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Patented Nov. 17, 1936 2,061,399

UNITED STATES PATENT OFFICE

2,061,399

BLOOD TRANSFUSION MACHINE

Louis Gross, New York, N. Y.

Application April 17, 1935, Serial No. 16,747

8 Claims. (Cl. 128—214)

My invention relates to machines by means of which blood may be transferred from one person to another and are generally referred to as "transfusion machines".

The object of my invention is to provide a machine by means of which the blood of one person may be transferred to another rapidly and positively without danger of injury to the donor or recipient.

A further object is to provide a machine of simple construction comprising relatively few parts; that is light in weight; that can be sterilized in toto; that can be rapidly operated, and in which the blood flow is positive in one direction only, the construction being such that the parts cannot be assembled to operate otherwise.

Further objects of my invention will appear hereinafter.

Referring to the drawings which form a part of these specifications:

Fig. 1 is a front side view of a machine embodying my invention.

Fig. 2 is a plan view thereof.

Fig. 3 is an elevational view of the back of the machine with the casing cover removed.

Fig. 4 is a sectional plan view taken on line 4—4 of Figure 1.

Fig. 5 is a longitudinal sectional view taken on line 5—5 of Figure 4.

Fig. 6 is an end view of the inner end of the plug of the valve used in the present construction and generally known as a plug-valve.

10 indicates a metal base-plate on which is mounted a metal casing 11, secured thereto by screws 12 which extend upwardly thru the base plate, as illustrated in dotted lines.

14 indicates the body portion of a plug-valve which is secured to the front side wall of the casing by a number of screws 15.

16 indicates the rotatable plug which is preferably cone-shaped as shown, and which is held under light spring pressure in the body portion by an arm 17 formed to provide a spring, and held in position by a thumb-screw.

The arm, when held tight by the thumb-screw 18, exerts a predetermined pressure against the end of the plug, sufficient to hold it firmly in position without danger of its being jammed tightly in the body portion.

By loosening the thumb-screw, the arm may be swung downward out of the path of the plug, and the plug removed freely from the body portion 14.

The inner end of the plug is recessed as shown at 19 and a slot 20 having converging side walls, is formed in the end of the plug and intersects said recess.

A spindle 21 extends thru the side wall of the casing in axial alignment with the plug, and carries on its inner end a tapered pin 22 which fits loosely in the slot 20 thereby forming a coupling such as to insure the proper position of the plug in the body portion 14, and also serving to prevent the displacement of the spindle.

Mounted tight on the spindle adjacent the wall of the casing, is a depending lever 23, the lower end of which is formed to provide oppositely disposed cam surfaces 24—24 respectively.

A cover 25 carried by the casing, combines therewith to inclose the lever 23 on three sides, and to support the spindle which extends therethru.

Fixed in the outer end of the spindle is a flat plate 26 the opposite ends of which alternately abut springs 27—27 respectively formed integral and secured to the casing 11 as illustrated at 28.

A flat bar 29, rectangular in cross section, extends longitudinally thru the casing end walls, being supported and guided by the walls of the respective slots formed therein.

Fixed on the outer side of the bar are two vertically extending ribs 30—30 respectively, which are spaced to provide abutments 31—31 respectively.

A lever 32 hinged to the casing at 33 carries a roller 34 at its lower end which rests in the slot formed between the abutments.

The lever is made in two parts, the upper end being hinged on the shank of a screw 35 which extends thru a slot 36 in one part of the lever, and thru a hole in its other part, the two parts being secured together by a thumb-nut 37.

A slot 38 is formed in the lower end of the upper part of the lever and engages a pin 39 fixed in the lower part; the arrangement being such that the lever may be folded, as illustrated in Figure 1.

The upper side of the bar is recessed at 36'—36' respectively to provide abutments 37'—37' respectively which are spaced apart a predetermined distance, and function to alternately swing the lever 23 to operate the valve plug 16 when the bar is reciprocated.

During the movement of the bar 29 the cam surfaces 24—24 respectively, alternately slide on the straight surface 38 of the bar to hold the plug firmly in its position of rest, assisted by a spring 27 which bears against the flat plate 26 and is compressed when the lever 23 is riding on

the surface **38**, and at the end of each stroke of the bar, the compressed spring acts to throw the end of the lever positively below the top of the adjacent abutment so that on the reverse stroke of the bar, the plug will be rotated a definite distance corresponding to the spacing of the ports of the valve.

Referring now to Figure 5, the body portion of the valve is provided with a straight passage **39** having slightly tapered side walls, into which the nipple **40** of the pump, hereinafter called the syringe, snugly fits.

42 and **43** indicate the inlet passages respectively, formed in the body portion.

The passages thru the plug **16** are formed in the shape of a Y, and are easily cleaned by a soft flexible brush such as those generally used for cleaning the stems of pipes used for smoking tobacco.

The inlet passage to the syringe comprises the bores **44** and **45**, and the outlet passages **44** and **46**, shown in Figure 6 of the drawings.

The syringe is supported in operative position by its nipple **40** which rests in the passage formed in the body portion of the valve, and by a thumb-screw **47** at its opposite end.

The thumb-screw is carried by an arm **48** formed integral with the casing, and is provided with a slot **48'** formed in the top side which extends to the threaded bore therein.

The thumb-screw is slotted thruout its length as shown at **49** and its inner end **50** is tapered to fit snugly into the adjacent end of the syringe.

A piston is fitted in the syringe in the usual manner, and is actuated by a piston-rod **51**, on the outer end of which is mounted abutment rings **52** and **53** spaced apart a predetermined distance.

A bracket **54** is carried on the adjacent end of the bar **29** and is formed with a yoke **55** extending between the abutment rings, thru which the piston-rod extends.

The slots in the yoke and thumb-screw and bracket, when open, permit the piston-rod and syringe to be freely lifted from its supported position when the thumb-screw is retracted.

By this arrangement the thumb-screw is not disengaged from the arm **48**, also the syringe may be inserted quickly for use, or exchanges made during an operation without loss of time.

56 indicates a counting register which is mounted on the base plate adjacent one end of the bar.

It is operated by a lever **57** which is mounted on the central spindle **58** of the register.

The lower end of the lever is located in the path of the bracket **54** carried by the bar, the bracket abutting the lever on each inward stroke of the piston.

I prefer to use a lever for operating the bar but it is obvious that I may affix a handle directly on the bar, and dispense with the lever.

Referring to Figure 3, an abutment **59** is secured to the wall of the casing by a screw **60** to limit the upward movement of the lower end of the lever at the end of its stroke.

The length of the lever **23** measured from the centre of the spindle **21**, is such that when the cam surfaces are riding the surface **38** of the bar, the ports of the plug valve will register with the proper passages in the body portion to permit the proper passing of fluid therethru.

I wish to call attention to the reason for making the fit of the spindle engagement with the inner end of the plug a loose fit, this is to permit the springs **27** to throw the end of the lever downward below the top of the adjacent abutment at the end of each stroke of the bar, without having to rotate the valve, thereby permitting the use of relatively weak springs for this purpose.

The syringe operates to withdraw relatively small quantities of blood from the donor and immediate delivery to the recipient.

In operating the machine, the lever **32** is used to reciprocate the bar **29**, which in turn reciprocates the piston which travels in the same direction, but the bar travels nearly twice the distance that the piston travels, during which time the valve is at rest, and the plug is rotated at the time that the piston is at rest.

At the end of each stroke of the bar, a spring **27** acting on the plate **26**, throws the end of the lever downward in the path of the adjacent abutment, to insure the turning of the plug by the bar on its reverse movement.

The time period between the strokes of the piston and the travel of the bar, provides an additional period of rest for both donor and recipient; between the strokes of the piston it is obvious that either the donor or recipient is at rest, this depending on the direction in which the piston is moving.

The small quantity of fluid delivered per stroke of the piston (about 2 cc.) is also a feature of value recognized by the medical profession.

The detail features of construction may be modified in a number of ways without changing the functions of the parts, and therefore I do not wish to be limited in this respect, but reserve the right to make such changes as come within the scope of the claims defining my invention.

Having thus described my invention I claim as new:

1. A machine of the character described comprising a base-plate, a casing thereon, a plug-valve carried by the casing comprising a body portion having three passages formed therein, a rotatable plug in said body portion having passages adapted to register in operative relation with the passages in the body portion, a syringe, one end of which is supported in open communication with one of said passages, means for supporting the opposite end of said syringe, a spindle supported in alignment with said plug in loose operative engagement therewith to permit a limited relative rotational movement in either direction, a lever fixed on said spindle, a bar and a spring movable thereby for moving said lever alternately in opposite directions; said syringe comprising a piston and piston-rod, and means carried by the bar for reciprocating said piston-rod.

2. The construction defined in claim 1, together with means for holding said lever in a predetermined position prior to and during each stroke of the piston.

3. A machine of the character described comprising a plug-valve, a spindle in operative engagement with the plug thereof, a lever carried by the spindle, a slidable bar having abutments thereon adapted to abut said lever and move it a predetermined distance at the beginning of each stroke of said bar, and independent means for automatically moving the lever in the path of one of said abutments prior to the beginning of each stroke of the bar.

4. The construction defined in claim 3, together with means for holding the lever in a predetermined position during the movement of the bar.

5. A machine of the character described comprising a plug-valve, a spindle in operative engagement with the plug thereof, a lever carried by the spindle, a slidable bar having abutments adapted to abut said lever and move it a predetermined distance at the beginning of each stroke of the bar, said bar being formed with a straight bearing surface between said abutments on which the lower end of the lever slides during the stroke of the bar, and means for moving the lever in the path of one of said abutments prior to the commencement of each stroke of the bar.

6. A machine of the character described comprising a casing, a plug-valve carried by the casing comprising a body portion having a plurality of passages formed therein, a syringe comprising a piston and piston-rod, supported by said body portion at one end and by a slotted screw at its opposite end, a bracket having a threaded bore in which the said screw fits, and also having a slot opening extending from the outer surface to said bore; the construction being such that when the slots register in open position and the screw retracted, the whole syringe may be freely removed from its supporting elements.

7. A machine of the character described comprising a syringe and a plug-valve for controlling the flow of liquid thereto, the plug of the valve having one end recessed to form a slot, a spindle supported in alignment with the plug with one end fitted loosely in said slot to permit a limited relative rotational movement, a reciprocating bar for rotating the spindle alternately in opposite directions, and means comprising a lever and spring for automatically rotating the spindle at the end of each stroke of the bar to position the lever for engagement therewith at the beginning of each alternate stroke of the bar.

8. A machine of the character described comprising a casing, a plug-valve carried by the casing comprising a body portion having a plurality of passages formed therein, a syringe comprising a piston and piston-rod supported by said body portion at one end and by means comprising two slotted members at its opposite end, one of said members being held at a fixed distance from the casing and holding the other member in movable relation thereto; the construction being such that the slots may register, and when in open position the whole syringe may be removed from its supporting elements.

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