Jan. 6, 1953 C. EPSTEIN 2,624,334

BLOOD PRESSURE TAKING DEVICE

Filed Sept. 11, 1951 3 Sheets-Sheet 1

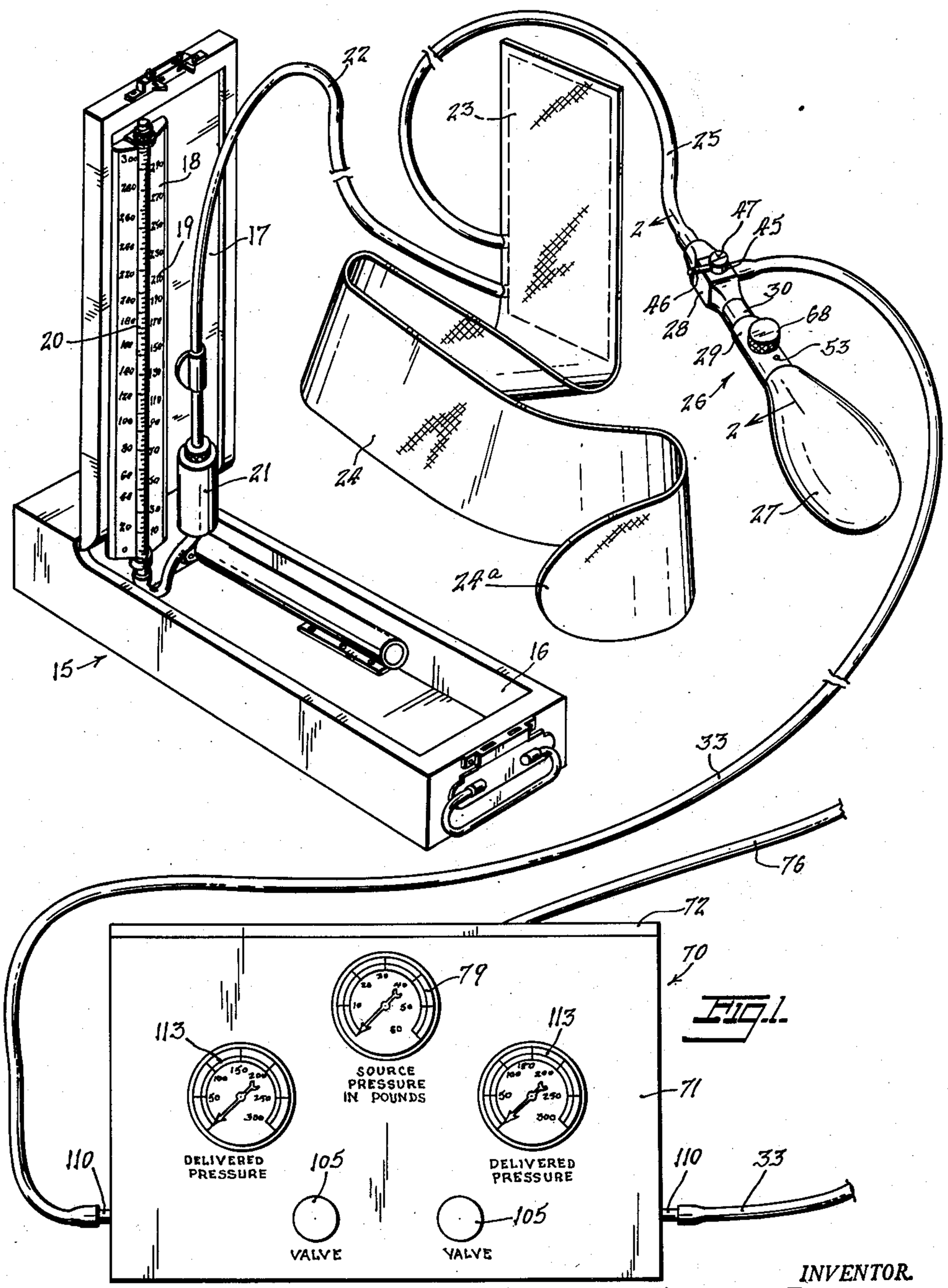

FIG. 1.

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BLOOD PRESSURE TAKING DEVICE

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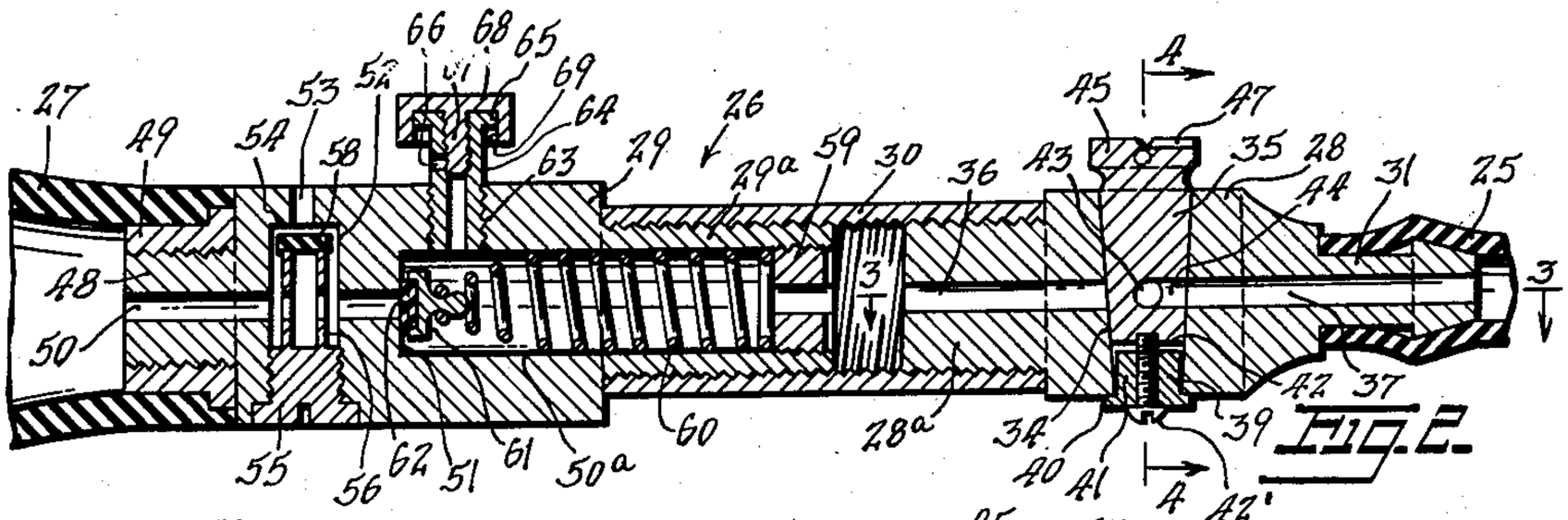

FIG. 2.

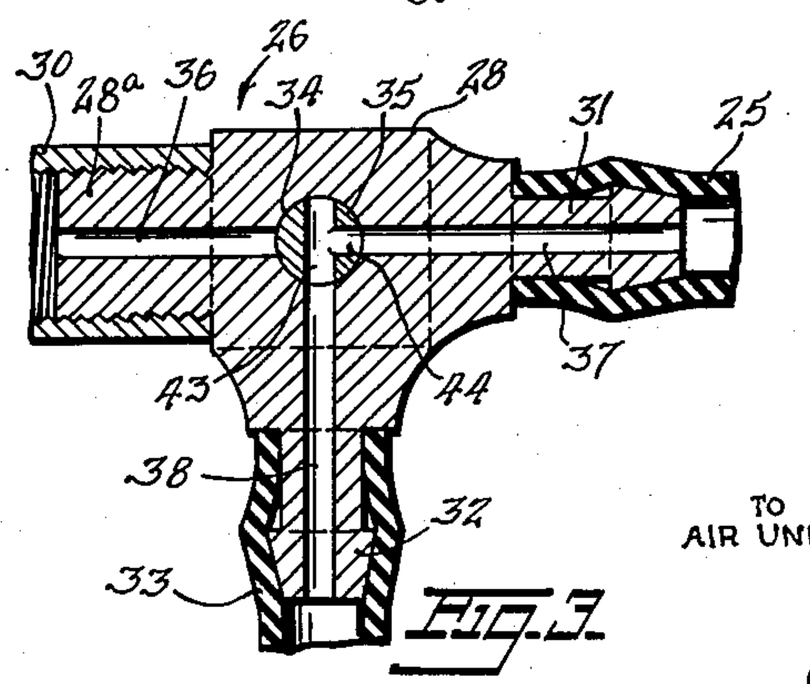

FIG. 3.

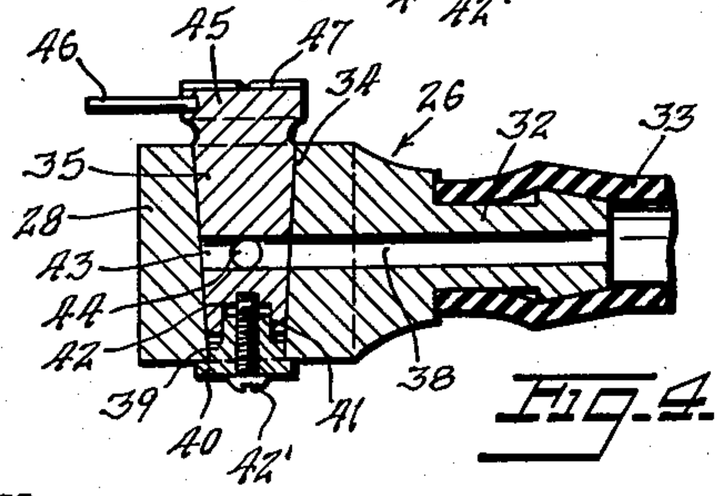

FIG. 4.

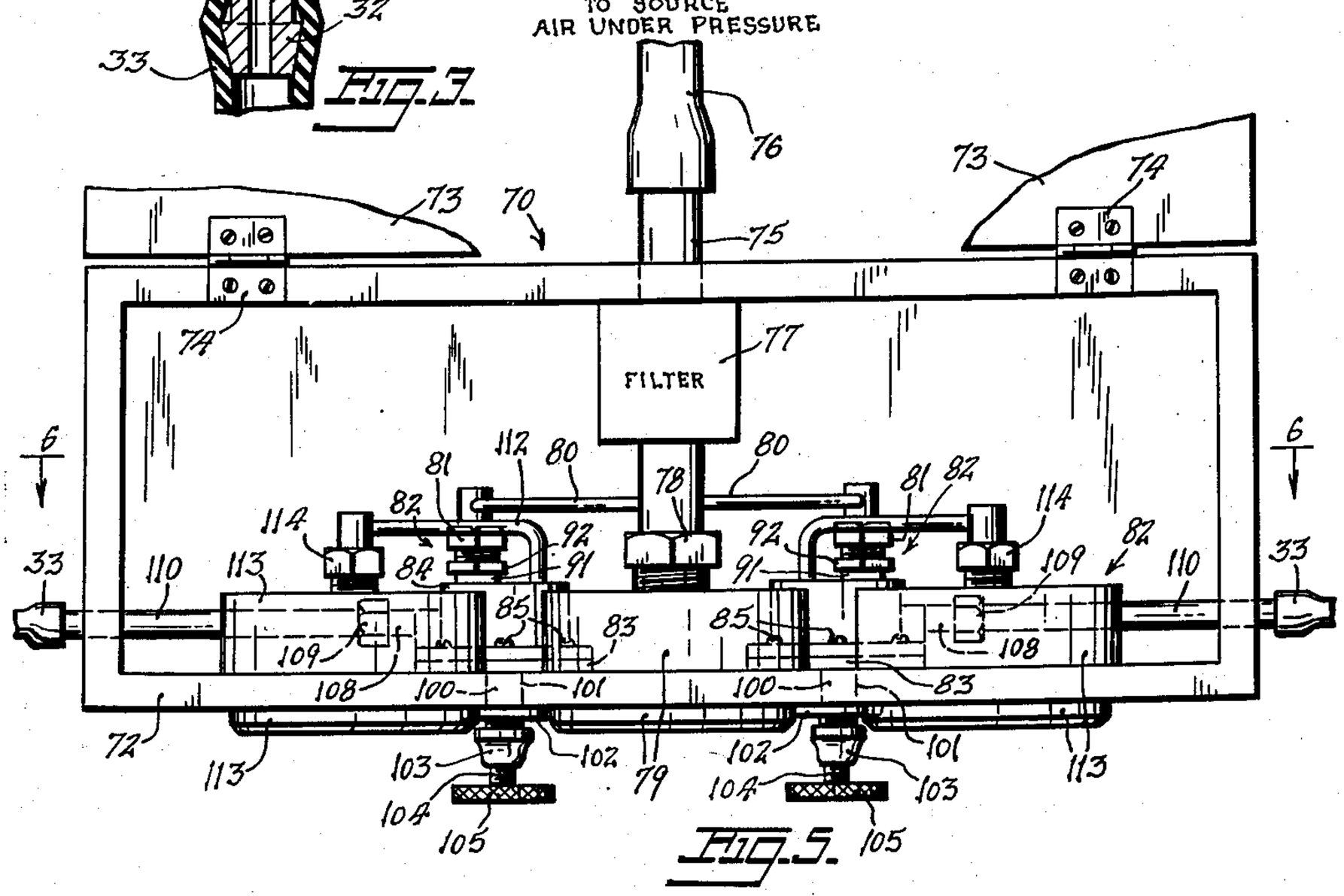

FIG. 5.

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BLOOD PRESSURE TAKING DEVICE

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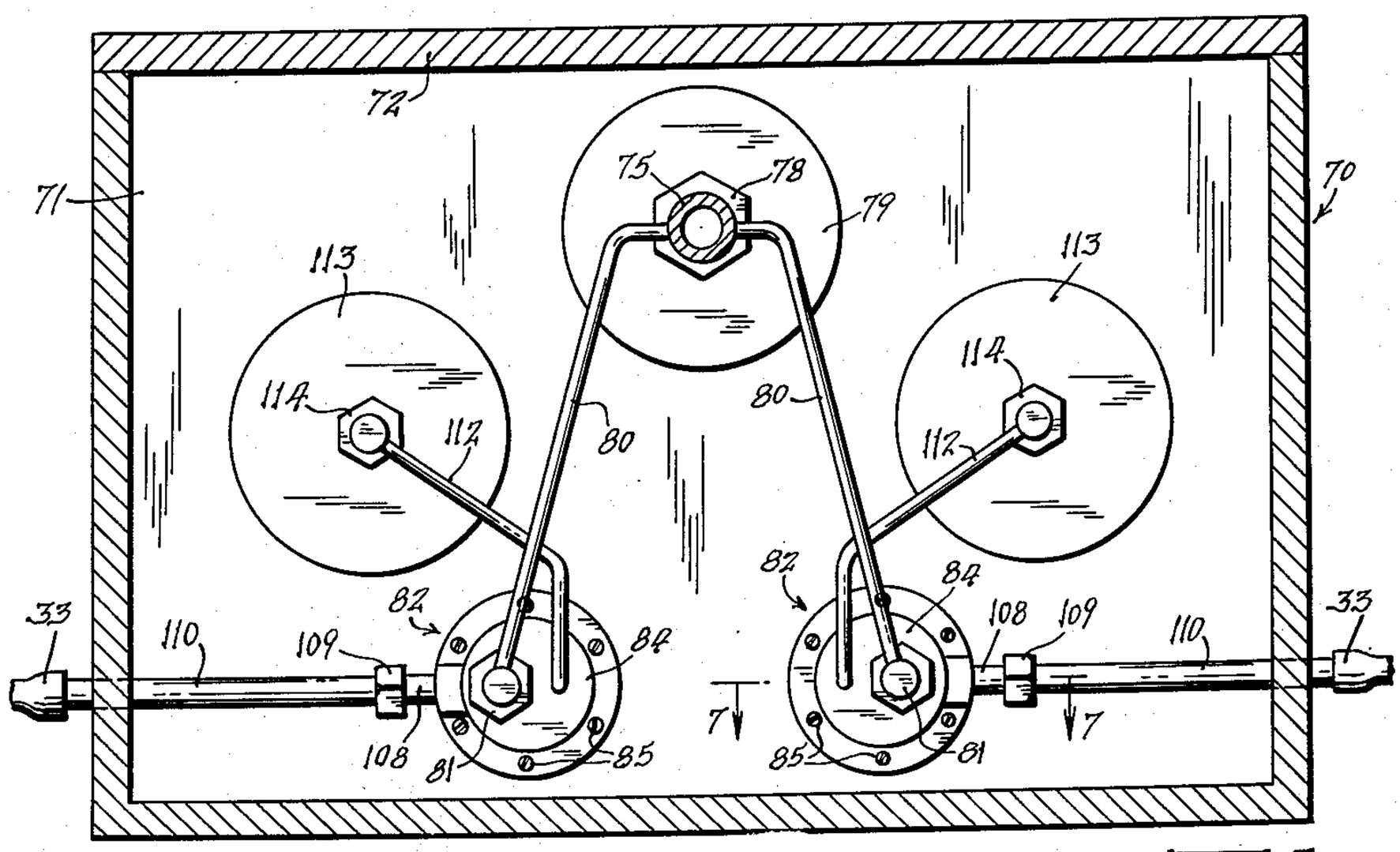

Fig. 6.

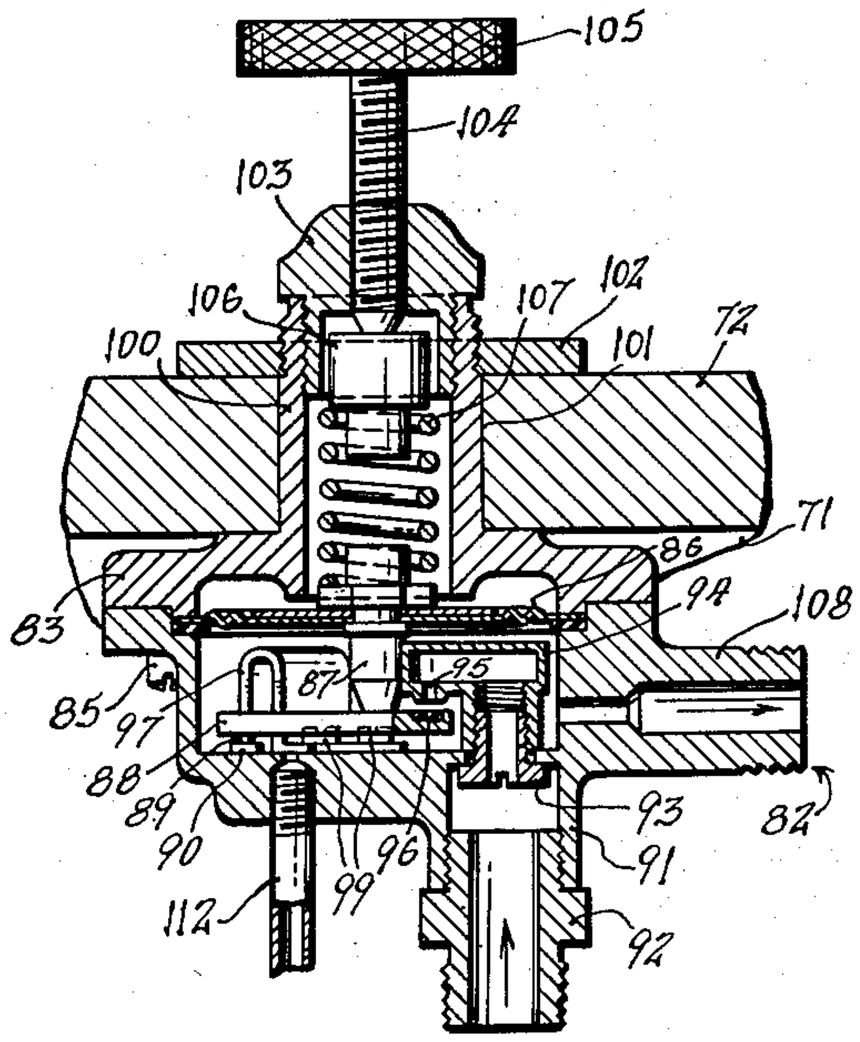

Fig. 7.

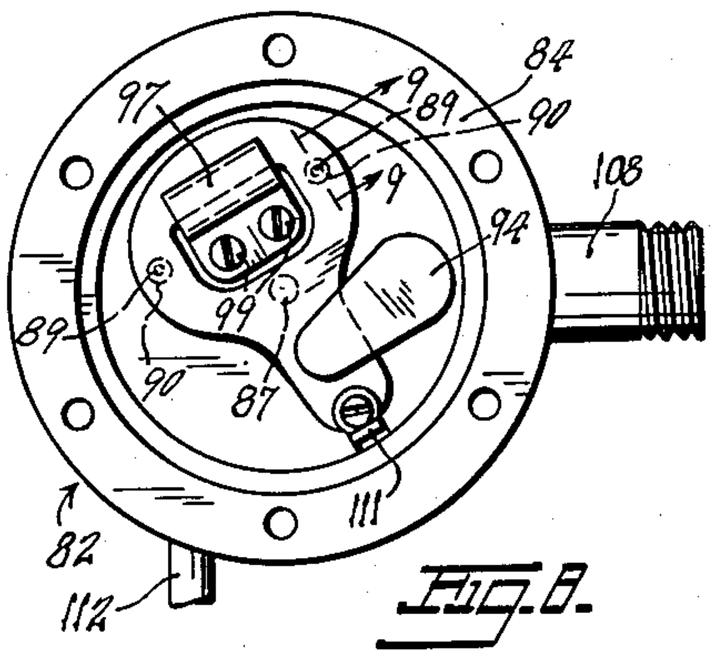

Fig. 8.

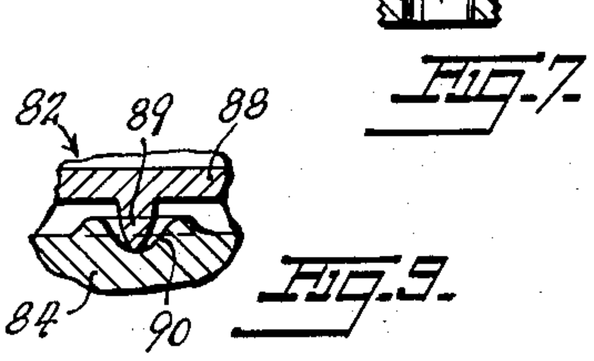

Fig. 9.

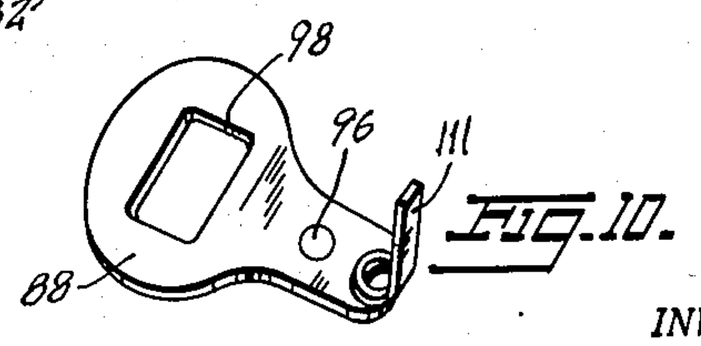

Fig. 10.

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UNITED STATES PATENT OFFICE

2,624,334

BLOOD PRESSURE TAKING DEVICE

Charles Epstein, New York, N. Y.

Application September 11, 1951, Serial No. 246,035

10 Claims. (Cl. 128—2.05)

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This invention relates to new and useful improvements in a device for taking blood pressures.

More specifically, the present invention proposes the construction of a device which makes it easier and faster to take the blood pressures of one or more individuals with considerably less physical effort on the part of the person making the blood pressure determinations.

Still further, the present invention proposes the construction of a blood pressure taking device employing one or more conventional manometers having the usual measuring tubes connected by tubes with pressure bags mounted within armlets for engagement about the patients' arms and which pressure bags are connected to a manually controllable source of air under pressure for feeding compressed air into the pressure bags in a manner to raise the pressure within the bags thus reducing the physical effort required on the part of the person making the blood pressure determinations by eliminating the need for manually pumping the air into the pressure bag.

Another object of the present invention proposes retaining the usual manually compressible bulb as a part of the manometer in a manner to be used for making fine adjustments of the air pressure within the pressure bag after the pressure within the bag has been brought to the desired maximum by the compressed air from the source of air under pressure.

The present invention further proposes the use of a novel valve unit having a manually controllable valve for first connecting the pressure bag of the armlet to the source of air under pressure for the initial raising of the pressure within the pressure bag after which the pressure bag can be connected to the manually compressible bulb for final adjustment of the pressure within the pressure bag.

As a further object, the present invention proposes constructing the valve unit to include a manually operable relief valve for bleeding the pressure in the pressure bag downward until the first sound is detected as one listens with a stethoscope over the brachial artery with bleeding of air continued until the pulse beats disappear or lose intensity at the diastolic level of blood pressure.

Still further, the present invention proposes leading the air under pressure on its way from the source to the pressure bag of the armlet through a manually adjustable air pressure regulator valve which is adjusted in a manner to shut off the compressed air when the pressure within the pressure bag reaches a point beyond

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which the average patient would be made too uncomfortable by the pressure around his arm.

A still further object of the present invention proposes providing a gauge for recording the pressure of the compressed air from the source and a gauge for recording the pressure for which the air pressure regulator valve has been set in a manner to permit that valve to be set to operate to shut off the source of compressed air at the desired pressure in terms of millimeters of mercury—the measurement commonly used in blood pressure determinations.

It is a further object of the present invention to construct a device for taking blood pressures which is simple and durable, which is simple to operate, which is effective for its intended purposes, and which can be manufactured and sold at a reasonable cost.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

On the accompanying drawings forming a material part of this disclosure:

Fig. 1 is a view of the blood pressure taking device constructed in accordance with the present invention.

Fig. 2 is an enlarged longitudinal sectional view of the valve unit taken on the line **2—2** of Fig. 1.

Fig. 3 is a partial longitudinal sectional view taken on the line **3—3** of Fig. 2.

Fig. 4 is a transverse sectional view taken on the line **4—4** of Fig. 2.

Fig. 5 is a plan view of the control box with the top cover pivoted to its open position and broken away.

Fig. 6 is a sectional view of the control box taken on the line **6—6** of Fig. 5, but with the top cover in its closed position.

Fig. 7 is an enlarged transverse sectional view of one of the air regulator valves taken on the line **7—7** of Fig. 6.

Fig. 8 is an elevational view looking into the inner part of the air regulator valve.

Fig. 9 is an enlarged partial sectional view taken on the line **9—9** of Fig. 8.

Fig. 10 is a perspective view of the valve lever used in the air regulator valve.

The device for taking blood pressures, according to the present invention, is constructed to operate two manometers **15** similar to the single one shown in Fig. 1, as will become clear as this specification proceeds. The manometer **15** is

essentially of conventional construction and has a box 16 having an open top arranged to be closed by a pivotally mounted cover 17. Mounted on the inner face of the cover 17 there is a plate 18 provided with a scale 19 calibrated in millimeters of mercury—the measurement commonly used in blood pressure determinations. Mounted on the plate 18 in proper alignment with the scale 19, there is a measuring tube 20 connected at its bottom end with a container 21 also mounted on the inner face of the cover 17. The container 21 is provided for containing the mercury, not shown, which is to be forced upward within the measuring tube 20 by air under pressure for recording the blood pressure as generally known in the art to which the present invention pertains.

Extending from the container 21, there is a flexible, non-expandable tube 22 which is connected at its other end with the usual pressure bag 23 mounted within a cloth armlet 24 which is to be wrapped about the patient's arm just above the elbow. On the drawing, the armlet 24 is illustrated as being the type having a narrow end portion 24a to be tucked in between the turns of the armlet for holding it securely wrapped about the patient's arm. Extending from the pressure bag 23, there is a second flexible, non-expandable tube 25 through which air under pressure is to be fed into the pressure bag for blowing up the same after the armlet 24 has been engaged in position about the patient's arm. As known in the art, as the pressure increases within the pressure bag 23 it will flow out through the tube 22 and cause the mercury to rise within the measuring tube 20.

The manometer 15 shown on the drawings is known as the mercury or fluid-displacement type, but it is appreciated that the device could also be used with the aneroid type of manometer which is calibrated to record blood pressures in terms of millimeters of mercury. Further constructional details of the manometer will not be given in this specification as they are generally known in the art and are disclosed in U. S. Patent No. 1,594,039 granted to William A. Baum on July 27, 1926.

The particular type of manometer 15 shown on the drawing is by way of illustration only as any other type can be used in connection with the development of the present invention.

Mounted on the free end of the pressure inlet tube 25, there is a valve unit 26. The valve unit 26 is provided for connecting the pressure bag 23 of the armlet 24 with a source of air under pressure or with the usual manually compressible bulb 27 which can be used for inflating the pressure bag. The bulb is mounted on the valve unit 26 at the end remote from the end to which the inlet tube 25 is connected.

Constructional details of the valve unit 26 are shown in Figs. 2 to 4 and it includes two separate valve bodies 28 and 29. The valve body 28 is formed with an extension 28a which is disposed in end alignment with a similar extension 29a of the valve body 29. The extensions 28a and 29a are externally threaded and joined together by an internally threaded tube 30, see Figs. 2 and 3. Extending from the valve housing 28 on the side opposite the extension 28a, there is a nipple 31 over which the end of the inlet tube 25 is fitted. Extending from the side of the valve housing 28, at right angles to the extension 28a and the nipple 31, there is a second nipple 32 over which the end of a flexible, non-expanding

tube 33 is engaged and which leads from a source of air under pressure.

Extended through the valve body 28 at right angles to the extension 28a and the nipples 31 and 32, there is a tapered bore 34 within which a tapered valve member 35 is turnably mounted. The extension 28a is formed with a coaxial passageway 36 which communicates at its inner end with the tapered bore 34. The nipple 31 is formed with a coaxial passageway 37 arranged in end alignment with the passageway 36 and which also communicates at its inner end with the tapered bore 34. The nipple 32 is formed with a concentric passageway 38 arranged with its axis on the same level as the axes of the passageways 36 and 37. The inner end of the passageway 38 communicates with the bore 34.

The valve member 35 is extended nearly completely through the bore 34 from the wider top end thereof. Projected into the bore 34 from the narrow end thereof, there is a plug 39 formed at its outer end with a flange 40 which seats against the adjacent face of the valve body 28. The inner end of the plug 39 has a transverse rib 41 which engages a complementary transverse groove 42 in the adjacent end of the valve member 35. The interengaged rib 41 and groove 42 connect the valve member 35 and the plug 39 for unitary turning movements. A screw 42', see Figs. 2 and 4, is passed through the plug 39 and threaded into the end of the valve member 35. When the screw 42' is tightened in position, it draws the valve member 35 into the tapered bore 34 to seal the contacting surfaces of the valve member and the walls of the valve body 28 defining the tapered bore 34 against the loss of air pressure. However, the screw 42' is not tightened so tight as to impede rotation of the valve member 35.

Within the bore 34, the valve member 35 is formed with a passageway 43 extended diametrically therethrough and a radially extended passageway 44 extending from one side of the passageway 43. Thus, the passageways 43 and 44 are arranged to be T-shaped as best shown in Fig. 3. To facilitate rotation of the valve member 35, it has at its wide end an enlarged head 45 which extends from the bore 34 and which is formed with a radially extended handle 46 by which the valve member 35 can be conveniently turned. The top surface of the head 45 is flat and formed with a T-shaped marker 47, best shown in Fig. 1, which is aligned with the T-shape formed by the passageways 43 and 44 so that the operator can know the exact location of the passageways 43 and 44 by looking at the T-shaped marker.

In one turned position of the valve member 35, that shown in Figs. 2 to 4, one end of the passageway 43 of the valve member is aligned with the inner end of the passageway 38 and the end of the passageway 44 is aligned with the inner end of the passageway 37. In that position of the valve member 35, the handle 46 is extended radially from the head 45 on the side of the valve body 28 opposite the nipple 32, see Figs. 1 and 4, and air under pressure passing through the tube 33 will be fed through the inlet tube 25 into the pressure bag 23 of the armlet 24 for inflating the pressure bag. While holding the bulb 27 in one hand, the valve member 35 can be given a quarter turn in a counterclockwise direction as viewed in Fig. 3, by thumb or index finger pressure against the end of the handle 46. The handle 46 will now be extended rearward toward the

bulb 27 and the ends of the passageway 43 of the valve member 35 will be aligned with the ends of the passageways 36 and 37. In that position of the passageway 43, the bulb 27 can be used for forcing additional air into the pressure bag 23 or the air can be bled from the pressure bag as will become clear as the description proceeds.

The positions of the passageways 43 and 44 with relation to the passageways 36, 37 and 38 can be quickly determined by noting the position of the T-shaped marker 47 on the head 45 of the valve member 35. The head 45 and the valve body 28 can, if desired, be provided with stops for limiting the rotation of the valve member 35 to the two positions referred to supra.

The other valve body 29 of the valve unit 26 at its end opposite the tubular extension 29a is formed with another externally threaded tubular extension 48. Secured by vulcanization in one side of the bulb 27, there is an internally threaded tubular bushing 49 which is threaded onto the tubular extension 48 making the bulb 27 an integral part of the valve unit 26.

Extended completely through the valve body 29 from the end of the extension 29a to the end of the extension 48, there is a passageway 50. The end portion 50a of the passageway 50 extended in from the end of the extension 29a is enlarged forming a shoulder 51 within the valve body 29 intermediate of its ends. Traversing the passageway 50 beyond the inner end of the enlarged portion 50a thereof, the valve body 29 is formed with a bore 52 which continues at its inner end into a reduced air entrance port 53 arranged concentric with the bore 52 forming a shoulder 54. The end of the bore 52 remote from the air entrance port 53 is closed by a bolt-like member 55 which is threaded into the open end of the bore 52. The inner face of the bolt-like member 55 continues into a tubular extension 56 formed on diametrically opposite sides with holes 57 aligned with the passageway 50. Positioned between the inner end of the tubular extension 56 and the shoulder 54, there is a valve disc 58 of rubber or the like material. The spacing of the end of the extension 56 from the shoulder is slightly greater than the thickness of the valve disc 58 so that the valve disc will have freedom of movement in the space between the end of the extension and the shoulder.

The valve disc 58 is provided to permit filling of the bulb 27 with air when it expands after having been collapsed as will be explained.

The open end of the enlarged end portion 50a of the passageway 50 is threaded and has a tubular plug 59 threaded thereinto, see Fig. 2. Positioned within the enlarged end portion 50a there is an expansion coil spring 60 which has its outermost coil bearing against the inner face of the tubular plug 59. The innermost coil of the spring 60 is wound about an enlargement on a cup-shaped retainer member 61. The retainer member 61 has its open side facing the shoulder 51 and has a valve disc 62 mounted therein. The coil spring 60 functions to urge the retainer member 61 into a position in which the valve disc 62 will be seated against the shoulder 51 preventing the back flow of air into the bulb 27

The action of the valve discs 58 and 62 in controlling the flow of air to and from the bulb 27 when the bulb is being used for adjusting the pressure within the pressure bag 23 of the armlet 24 is as follows: It is appreciated, of course, that to permit the use of the bulb 27 for that purpose it is essential that the valve

member 35 be turned to a position in which its passageway 43 is aligned with the passageways 36 and 37—the position in which the handle 46 is extended back toward the bulb 27. Upon compression of the bulb 27, the contained air will be forced out into the passageway 50. Some of that air will enter the extension 56 through the holes 57 and unseat the valve disc 58 from the end of the extension and force it against the shoulder 54. The valve disc 58 will then block the air entrance port 53 preventing the air from discharging through that entrance port. The air will then continue through the passageway 50 and unseat the valve disc 62 from the shoulder 51 against the action of the coil spring 60 so that the air will enter the enlarged portion 50a of the passageway and pass out of that enlarged portion through the tubular plug 59 and continue on into the pressure bag 23. When the bulb 27 is released to expand, the spring 60 will immediately reseat the valve disc 62 on the shoulder 51 blocking the passageway 50 against the back flow of air from the pressure bag 23 into the bulb 27. That will cause a partial vacuum to be created within the bulb so that the pressure of the outside air bearing against the valve disc 58 will unseat that disc from the shoulder 54 returning it to its position on the end of the extension 56. Outside air then passes through the air entrance port 53, the bore 52 and the passageway 50 rearward of the valve disc 62 and into the bulb 27. The bulb 27 will then expand completely sucking in outside air and will be ready for another compression.

The valve body 29, between the shoulder 51 and the connecting tube 30, is formed with a relief valve through which a part or all of the air can be bled when the valve member 35 is turned to its position having its passageway 43 aligned with the passageways 36 and 37. That relief valve is characterized by a threaded hole 63 formed in the valve body 29 and into which a tubular member 64 is threaded. The tubular member 64 has a portion extended from the valve body 29 and which is formed at its outer end with an outwardly directed flange 65. Between the valve body 29 and the flange 65, the tubular member 64 is formed with a relief port 66 in one side thereof. A valve pin 67 is threaded into the outer end of the tubular member 64 and is formed with a hollow cap portion 68 which fits over the flange 65. The valve pin 67 is of a length to block the relief port 66 when turned completely into the tubular member 64—a position in which the inner face of the hollow cap portion 68 abuts the flange 65, see Fig. 2. When the valve pin 67 is turned outward, by rotation of the cap portion 68, the inner end of the valve pin will move free of the relief port 66 so that air from the pressure bag 23 can pass out through that port 66. One side of the cap portion 68 is formed with a small inwardly directed extension 69 for abutting the flange 65 preventing the valve pin 67 from being turned completely out of the tubular member 64 thus retaining it against possible loss.

A control unit 70 is provided for controlling the flow of air from the source through the tube 33 and into the pressure bag 23 of the armlet 24. The control unit 70 is constructed to include a box 71 having a front wall 72 and an open top. The open top of the box 71 is closed by a cover 73 which is pivotally supported along its rear edge on the box 71 by several hinges 74, see Fig. 5. Extended from the rear of the

box 71, there is a length of pipe 75 over which one end of a length of flexible, non-expanding hose 76 is engaged, see Fig. 5. The other end of the hose 76 is connected to a source of air under pressure, not shown on the drawing. Within the box 71, the pipe 75 is provided with a filter 77 of any desired design for removing impurities and moisture from the air under pressure. The inner end of the pipe 75 is connected by a union 78 to the rear of a pressure sensitive gauge 79 mounted through the front wall 72 of the box. The gauge 79 will function to record the source pressure in terms of pounds of air pressure.

Extending from opposite sides of the pipe 75, between the filter 77 and the gauge 79, there are branch pipes 80 which are connected at their free ends by unions 81 to air regulator valves 82 also mounted through the front wall 72 of the box 71 of the control unit 70. The air regulator valves 82 are provided for delivering air at a predetermined pressure from the source to the pressure bag 23 of the armlet to inflate the same to the desired pressure in terms of millimeters of mercury and to then automatically shut off the air from the source of air under pressure should the manometer reading rise to the level set at the respective regulator valve 82. The operative parts of the air regulator valve 82 are shown in Figs. 7 to 10. The valves 82 are alike in construction and each consists of a pair of opposed hollow casing sections 83 and 84 which are secured together by removable screws 85. A flexible diaphragm 86 is clamped between the casing sections 83 and 84 and carries a concentric stud 87 which bears against a valve lever 88. The valve lever 88 is contained within the casing section 84 and pivotally retained in position by a pair of spaced pivot pins 89 which are seated in spaced complementary recesses 90, formed in the adjacent wall of the casing section 84, see particularly Figs. 7 to 9. The pivot pins 89 permit the valve lever 88 to have a slight rocking motion. Extending from the rear of the casing section 84, there is a tubular extension 91 into which a nipple 92 is threaded and to which one end of the respective branch pipe 80 is secured by the union 81. Within the extension 91, there is a tubular bushing 93 which is threaded into and which mounts a hollow valve box 94 in position within the casing section 84. The valve box 94 is constructed to have one end overhang the free end of the valve lever 88 and that one end is formed with a discharge port 95, see Fig. 7.

All air under pressure from the branch pipe 80 flows into the valve box 94 and discharges into the interior of the regulator valve 82 through the discharge port 95. The valve lever 88 in alignment with the discharge port 95 is formed with a rubber disc 96 for closing the discharge port 95 when the lever is pivoted toward the valve box 94.

Pivoting of the valve lever 88 to engage the rubber disc 96 with the valve box port 95 closing the same is controlled by a U-shaped spring 97. The pivoted end of the valve lever 88 is formed with a hole 98 through which one arm of the U-shaped spring 97 is passed to be secured to the wall of the casing section 84 by the pair of screws 99, see Fig. 8. The other arm of the U-shaped spring 97 bears against the valve lever 88 on the side of the pivot pins 89 opposite the side on which the stud 87 of the diaphragm is located. Thus, the U-shaped spring 97 exerts a force tending to engage the rubber disc 96 with the port 95 of the valve box 94 to cut off the flow of

air under pressure from the source. The spring 97 exerts sufficient force to retain the valve lever 88 in its operative position against the maximum pressure exerted by the air under pressure from the source.

The casing section 83 is formed with a tubular neck 100 which is extended through a hole 101 formed in the front wall 72 of the box 71. The ring 102 is threaded onto the outer end of the neck 100 and against the front face of the front wall 72 mounting the air regulator valve in position. The outer end of the tubular neck 100 is closed by a cap 103 which is threaded in position. Threaded through the cap 103, there is a screw 104 provided at its outer end with an enlarged knurled knob 105 by which the screw can be turned in one direction or the other. The inner end of the screw 104 bears against a slidable bearing block 106 which in turn bears against the adjacent end of a coil spring 107. The free inner end of the coil spring 107 bears against the side of the diaphragm 86 opposite the side from which the stud 87 extends. The coil spring 107 then expends itself in flexing the diaphragm 86 inward causing the stud 87 to press on and pivot the valve lever 88 against the action of the U-shaped spring 97. That action unseats the rubber disc 96 from the discharge portion 95 of the valve box 94 and permits the air under pressure from the valve box to flow into the interior of the regulator valve. Adjustment of the tension of the spring by turning the screw 104 will vary the degree to which the rubber disc 96 is unseated from the discharge port 95.

Extending from one side of each of the regulator valves 82, there is a tubular extension 108 through which the air under pressure exits from the interior of the regulator valves 82. Unions 109 are used to connect the inner ends of laterally extended sections of pipe 110 to the extensions 108. The outer ends of the pipes 110 extend from the sides of the box 71 and have the ends of the tubes 33 connected thereto and it is those tubes 33 which have their other ends engaged in position on the nipples 32 of the valve units 26. Thus, the control unit 70 can be used for supplying air under pressure to two separate manometers 15 similar to the single one shown in Fig. 1.

As the air under pressure from the source inflates the pressure bag 23 the point will be reached where the pressure in the bag reaches the pressure for which the diaphragm 86 is adjusted. That pressure will then build up within the regulator valve 82 and flex the diaphragm 86 against the action of the spring 107 in a direction away from the valve lever 88. The stud 87 will move with the diaphragm 86 freeing the valve lever 88 to be pivoted by the U-shaped spring 97 to seat the rubber disc 96 on the discharge port 95 and stop the flow of air from the source. The free end of the valve lever 88 has secured thereto a spring clip 111, see Figs. 8 and 10, which rides on the adjacent wall of the casing section 84 guiding the movements of that free end of the valve lever.

Threaded into the rear wall of the casing section 84, there is a length of pipe 112 which is connected at its other end to a pressure gauge 113 by means of a union 114. There is a gauge 113 for each of the regulator valves 82 and those gauges are mounted through the front wall 72 of the box 71. Each of the gauges 113 will record pressures in terms of millimeters of mercury. The gauges 113 function to permit adjustment of the regulator valves 82 to deliver only the de-

sired maximum air pressure to the pressure bag **23** regardless of the higher pressure of the air in the source. The gauges **113** measure pressure in terms of millimeters of mercury and the valves **82** are preferably set to deliver 200 millimeters of pressure to the pressure bag **23**.

The operation of the device for taking blood pressure is as follows:

If two blood pressures are to be taken at the same time, then two manometers **15** are connected to the control unit **70**. If only one blood pressure is to be taken, then only one manometer **15** is connected to one side of the control unit **70**, as shown in Fig. 1, and the unused regulator valve **82** is shut off by turning the screw **104** completely outward. With the regulator valve **82** which is to be used previously adjusted to shut off when the pressure within the pressure bag **23** reaches 200 millimeters of mercury, the valve member **35** is turned to the position shown in Figs. 1 and 3 so that air from the source will flow into the pressure bag **23** inflating the same with the armlet **24** wrapped in position about the patient's arm. When the pressure in the bag **23** reaches 200 millimeters of mercury, the respective regulator valve **82** will function, as previously described, to shut off the supply of air from the source. The valve member **35** is then turned to the position in which its passageway **43** is aligned with the passageways **36** and **37** completely shutting off the source of air under pressure and connecting the pressure bag **23** with the bulb **27** and the relief valve of the valve unit **26**.

A stethoscope may be placed over the brachial artery while the pressure in the pressure bag is rising so that the sounds can be heard while the pressure is being built up so that the pressure from the source can be shut off using the handle **46** when the pressure builds up within the pressure bag to the point where it occludes arterial circulation. Arterial circulation will be stopped by the pressure within the armlet only in those cases where the patient's blood pressure is below the level of the pressure for which the respective regulator valve **82** has been set. If pressures on the way up are not heard, the regulator valve **82** will function to shut off the flow of air under pressure from the source preventing the pressure within the armlet from building up to the point where it would be too uncomfortable for the patient.

In either case, with the stethoscope still in place over the brachial artery at the patient's elbow, the sounds involved, as the pressure bag **23** is released by opening the relief valve by turning the valve pin **67** outward, are heard and then disappear as the falling pressure in the armlet **24** indicates systolic and diastolic pressures. Generally, a starting pressure of 200 millimeters of mercury in the pressure bag **23** is adequate for the average pressure. At times, when the patient's blood pressure is higher than 200 millimeters of mercury, a few squeezes on the bulb **27** with the relief valve closed is sufficient to bring the pressure in the armlet **24** high enough to temporarily obliterate the arterial circulation below the armlet. Then, by the controlled release of the valve pin **67** of the relief valve, the systolic and diastolic pressures can be determined in the usual manner and read on the scale **19** of the manometer **15**, by the respective appearance and disappearance of the indicative sounds, as the pulse beat is established in the arm below the armlet **24** and as the pressure within the arm

becomes equal to the falling pressure in the armlet.

If desired, the regulator valves **82** can be set high enough to shut off at 260 or 300 millimeters of mercury, and so completely eliminate the need for using the bulb **27** even in those unusual instances when the patient's blood pressure is over 200 millimeters of mercury.

After the blood pressure has been determined, the pressure within the pressure bag **23** is released by turning the valve pin **67** of the relief valve outward permitting substantially all of the air in the pressure bag **23** to flow out through the relief port **66** of the relief valve.

The present device for providing a smooth feed of air into the pressure bag **23** of the armlet **24** makes it possible to hear more accurately and easily the sounds from diastolic to systolic pressures as the pressure in the armlet rises. As the pressure rises past the systolic pressure (as indicated in the measuring tube **20** of the manometer **15**), the supply of air from the source of air under pressure can be quickly turned off by movement of the valve member **35** from the position shown in Figs. 1 and 3, while at the same time connecting the pressure bag with the hand compressible bulb **27**. Thus, it is not necessary to allow the pressure in the armlet to rise to the pressure at which the air regulator valve **82** will shut off the supply of air under pressure, since the patient's blood pressure will in most instances be below that set at the valve. In such instances, the regulator valve **82** will be present as a safety factor to prevent excessive inflating of the pressure bag and bursting of the seams of the armlet **24** where it encloses the pressure bag **23**.

From the foregoing description, it is apparent that the present invention proposes a novel blood pressure taking device having the following advantages:

1. It can be set to determine blood pressures without having to squeeze the hand bulb **27**, eliminating the effort and work involved in using the bulb.

2. The device can be used as a combined mechanical and hand bulb air-feed, when it is desired to set the pressure at the regulator valves **82**, at a level which is greater than the systolic pressure of most persons, but not as great as that of certain individuals with excessively high blood pressures, in which case the pressure in the armlet **24** may be boosted by one or more squeezes of the bulb **27**. Also, the bulb **27** can be used to temporarily boost the pressure in the armlet **24**, should one miss an accurate reading as the air pressure is being released from the cuff.

3. The device can be used in the conventional manner, as a hand-pressure apparatus, by disconnecting the tube **33** from the nipple **32** of the valve unit **26**. This would be of use particularly in those situations where for one reason or another, there was a failure in the source of air under pressure or when the manometer must be used in a locality where no air under pressure is available.

Thus, it is apparent, that the present invention provides a novel device for taking blood pressures which particularly adapts itself to use in hospitals, clinics, blood banks, armed services, induction centers and other similar places where a great number of blood pressures must be taken within a short space of time.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the pre-

cise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit said compressible bulb and said air pressure source being connected to said pressure bag to alternately supply fluid thereto.

2. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit said compressible bulb and said air pressure source being connected to said pressure bag to alternately supply fluid thereto, and a gauge for recording the pressure of the air in said source.

3. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit said compressible bulb and said air pressure source being connected to said pressure bag to alternately supply fluid thereto, said valve unit comprising a pair of valve housings connected to one another, one of said valve housings having said inlet tube and said hose leading from said source of air under pressure connected thereto, said bulb being connected to the other of said valve housings.

4. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit, said valve unit comprising a pair of valve housings connected to one another, one of said valve housings having said inlet tube and said hose leading from said source of air under pressure connected thereto, said bulb being connected to the other of said valve housings, the said one valve housing having a turnable valve member for connecting said pressure bag either with said source of air under pressure or with said bulb.

5. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit, said valve unit comprising a pair of valve housings connected to one another, one of said valve housings having said inlet tube and said hose leading from said source of air under pressure connected thereto, said bulb being connected to the other of said valve housings, the said one valve housing having a turnable valve member for connecting said pressure bag either with said source of air under pressure or with said bulb, and a marker on said valve member for indicating the turned position thereof.

6. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit, said valve unit comprising a pair of valve housings connected to one another, one of said valve housings having said inlet tube and said hose leading from said source of air under pressure connected thereto, said bulb being connected to the other of said valve housings, the said one valve housing having a turnable valve member for connecting said pressure bag either with said source of air under pressure or with said bulb, and valve discs in said other valve housing acting in opposition to one another for controlling the flow of air under pressure from said bulb to said pressure bag.

7. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube, a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit, said valve unit comprising a pair of valve housings connected to one another, one of said valve housings having said inlet tube and said hose leading from said source of air under pressure connected thereto, said bulb being connected to the other of said valve housings, the said one valve housing having a turnable valve member for connecting said pressure bag either with said source of air under pressure or with said bulb, and valve discs in said other valve housing acting in opposition to one another for controlling the flow of air under pressure from said bulb to said pressure bag, and a relief valve on said other valve housing between said valve

discs and the said first valve housing for bleeding a part or all of said air under pressure from said pressure bag.

8. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit said compressible bulb and said air pressure source being connected to said pressure bag to alternately supply fluid thereto, said control unit including an air regulator valve for shutting off the supply of air under pressure when the pressure within said pressure bag reaches a certain predetermined pressure.

9. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit said compressible bulb and said air pressure source being connected to said pressure bag to alternately supply fluid thereto, said control unit including an air regulator valve for shutting off the supply of air under pressure when the pressure within said pressure bag reaches a certain predetermined pressure, said regulator valve being manually adjustable for shutting off the supply of air at different pressures within said pressure bag.

10. A device for taking blood pressures comprising a manometer having a measuring tube connected by a flexible tube to a pressure bag of an armlet for engagement about a patient's arm, a flexible inlet tube extending from said pressure bag, a valve unit mounted on the free end of said inlet tube a manually compressible bulb mounted on said valve unit, a hose connecting said valve unit to a source of air under pressure, and a control unit for controlling the flow of air from said source of air under pressure to said pressure bag through said valve unit said compressible bulb and said air pressure source being connected to said pressure bag to alternately supply fluid thereto, said control unit including an air regulator valve for shutting off the supply of air under pressure when the pressure within said pressure bag reaches a certain predetermined pressure, said regulator valve being manually adjustable for shutting off the supply of air at different pressures within said pressure bag, and a gauge for indicating the pressure at which said regulator valve shuts off the supply of air under pressure.

CHARLES EPSTEIN.

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The following references are of record in the file of this patent:

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