March 10, 1953 C. E. EKSTEN, JR 2,630,796

SPHYGMOMANOMETER

Filed Aug. 16, 1951

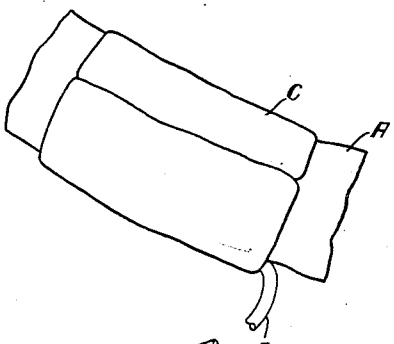


Fig. 1

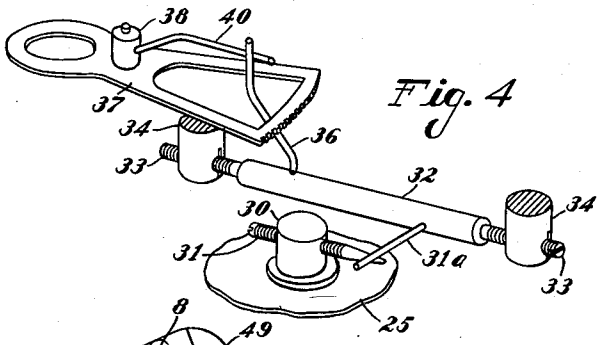


Fig. 4

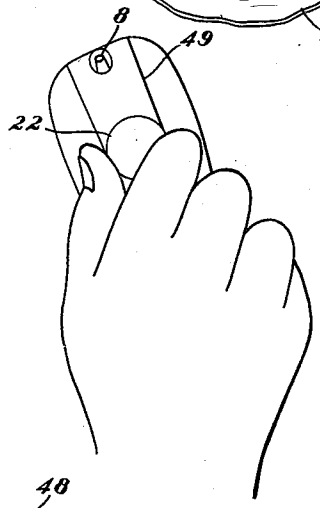


Fig. 2

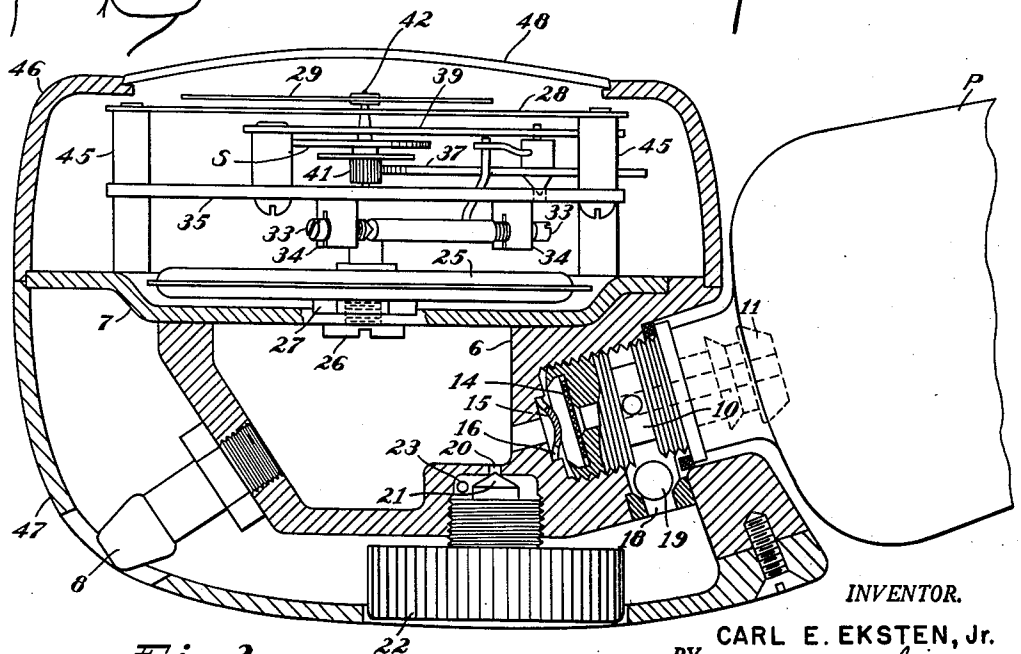


Fig. 3

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Patented Mar. 10, 1953 2,630,796

UNITED STATES PATENT OFFICE

2,630,796

SPHYGMOMANOMETER

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Application August 16, 1951, Serial No. 242,094

6 Claims. (Cl. 128—2.05)

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This invention relates to sphygmomanometers and the like.

A conventional sphygmomanometer comprises a pneumatic tourniquet or cuff for restricting the arterial flow of blood in the arm or leg of a patient, a pump for inflating the cuff, and a gage for measuring the air pressure in the cuff, these three separate parts being connected together by two flexible rubber tubes. The gage, if of the mercury type, is usually placed on a table near the patient. However the gage, if of the aneroid type, is usually hooked on the cuff while it embraces the patient's arm. In any case, the gage is not located in the easiest position for reading, especially if the light is subdued as is frequently the case in a sickroom. Furthermore three separate pieces of equipment, namely the cuff, the pump and the gage, are awkward to manipulate in use or to store when not in use.

The main feature of the present invention relates to the combination of the gage and the pump of a sphygmomanometer into a single unit which can be held in the doctor's hand in the best position for reading the gage while the cuff is being inflated or deflated.

Another feature of the invention relates to a sphygmomanometer gage which has as its handle, a compressible bulb by which the cuff is inflated.

The various features and advantages of the invention will appear from the detailed description and claims when taken with the drawings in which:

Fig. 1 is a perspective view of the sphygmomanometer of the present invention with the cuff thereof applied to a patient's arm, also showing the physician's hand to illustrate how the combined gage and pump are manipulated;

Fig. 2 is a perspective rear view of the gage and a physician's hand indicating how the several parts including the needle valve are manipulated;

Fig. 3 is a vertical section through the combined gage and pump; and

Fig. 4 is a detail perspective view illustrating a portion of the operating mechanism of the gage.

The present sphygmomanometer comprises a pneumatic tourniquet or cuff C applied to the arm A of a patient, a pump P for inflating the cuff and a gage G for indicating the pressure in the cuff. This cuff may be similar in construction to that shown in the patent to Hubbard et al. No. 2,235,030, granted March 18, 1941, except that it is provided with a single flexible coupling tube

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5 through which the cuff is inflated by the pump P and through which the pressure in the cuff is communicated to the gage G.

The combined gage and pump comprises a cup-shaped block 6 suitably apertured to provide communicating air passages therein. This block is in the form of a hollow die-casting to the rim of which a cover plate 7 is secured in air-tight relation. The hollow block has threaded into one of the apertures therein, a connection nipple 8 to be embraced by one end of the rubber tube 5 whereby the cuff communicates with the space in the block. The lower part of the block communicates through a threaded aperture to receive in threaded engagement an axially apertured spool-shaped member 10, which terminates at its lower end in a nipple 11. This nipple is adapted to receive the neck of a compressible rubber bulb P of a pneumatic pump, the bulb having the general shape of a truncated cone with its base attached to the gage. This bulb which is shaped to fit the hand has a sufficient degree of rigidity and its connection to the nipple 11 which is sufficiently firm that the bulb also serves as a main handle for the block and the gage supported thereon. This spool-like member has its intermediate portion reduced to provide an annular space while its ends are externally threaded to engage the internal threads of the block. This member is provided with a passage extending axially therethrough from one end to the other and is also provided with a cross bore leading from the annular space to this passage. The inner end of the member 10 (Fig. 3) is engaged by a flexible disc 14 to constitute a valve enabling air from the bulb to be forced into the block and thence into the cuff but is normally held in engagement with the mentioned inner end of the member to prevent air from returning to the pump. A rigid washer 15 with a centrally depressed portion and with its sides notched at 16 limits the inward movement of the disc but enables air to pass by the disc and through the notches 16 when the disc is forced inward by air from the bulb. Air from the atmosphere is admitted to the bulb through a passage 18 in the block controlled by a ball 19, the ball constituting a check valve preventing the air in the bulb from escaping to the atmosphere when the bulb is compressed. However when the bulb is released air is drawn through the check valve and through the cross bore in the member 10 to communicate with the axial passage therein which communicates with the bulb.

In the course of observing the blood pressure,

the physician gradually reduces the inflation of the cuff by permitting air therein to escape to the atmosphere. In the present arrangement the block is provided with a passage 20 controlled by a needle valve 21. This valve is carried on a stem in threaded engagement with the block and terminating in a knurled head 22 for easy opening and closing of the needle valve. An opening 23 in the block leading to the atmosphere, permits air to escape after passing the needle valve.

The cover plate 7, which is centrally apertured, carries a capsular chamber 25 preferably made of thin metal having flexible walls. The capsular chamber is attached on the plate 7 by means of a bolt 26 which can be screwed into a hexangular nut 27 soldered on the rear surface of the capsular chamber, the nut being received in a hexangular recess in the plate to facilitate assembly. The bolt 26 is apertured along its axis to permit intercommunication between the interior of the block and the interior of the chamber. This capsular chamber forming part of the gage, operates any suitable indicating mechanism. However, the mechanism herein illustrated is preferred since it permits the graduated dial 28 of the gage and the rotatable index or needle 29 cooperating therewith, to be mounted in a desired angular relation with respect to the main axis of the bulb. Thus the bulb while conveniently inflating the cuff, naturally holds the dial of the gage in the best position for reading by the physician, even in greatly subdued light.

The mechanism for operating the index over the dial in response to changes in the pressure inside of the capsular chamber, comprises a post 30 projecting centrally from the front face of the capsular chamber. This post has a transverse bore therethrough which is internally threaded to receive the threaded adjusting screw 31 having a tapered end portion. As the capsular chamber expands and contracts in response to changes in pressure within the block and within the communicating cuff, the post 30 moves in and out so that the screw engages an arm 31*a* on a rotatably mounted shaft 32 to rock this shaft about its axis. Preferably the shaft is provided with end bearings to receive the adjustable pivot screws 33. These screws are carried in spaced pillars 34 projecting from the rear surface of the frame plate 35 of the gage. The shaft 32 is provided with a rocking arm 36 which extends through an opening in the frame plate and through an opening in the sector arm 37. This sector arm is secured on a staff 38 pivotally mounted in the frame plate and in the parallel spaced supporting plate 39. The staff 38 is provided with a crank arm 40 which is engaged by the rocking arm 36 to rotate the staff and the sector arm 37, the sector arm being rotated in a plane parallel to the parallel planes of the supporting plate and the frame plate. The teeth on one end of the sector arm mesh with the teeth on a pinion 41 secured on a second staff 42 rotatably mounted at its ends in the frame plate 35 and in the supporting plate 39. The front end of staff which projects through the supporting plate and through the center of the graduated dial 28, has mounted thereon a needle or index 29 which swings with reference to the graduations on the dial, the dial being supported in spaced relation to frame plate by suitable pillars 45. A restoring coil spring S, tends to rotate the staff 42 in a counterclockwise direction to restore the index 29 to its zero position when atmospheric pressure is present in the cuff. The block and the gage are enclosed in a divided case or housing comprising the parts 46 and 47. The part 46 includes a transparent crystal 48 through which the dial is visible while the rear part 47 of the case has a projecting rib or supplemental handle 49 through the sides of which there projects the knurled edge of the head 22 of the needle valve.

From Fig. 2, it will be seen that thumb and forefinger of the physician's hand conveniently grasps the head of the needle valve so that the pressure in the cuff can be controlled with extreme niceity while the remaining fingers and the palm of his hand are cupped around the bulb for easy inflation of the cuff. The bulb thus serves as a main handle for the gage as well as a pump for inflating the cuff, while the rib 49 serves as a supplemental handle for the gage with all of the controls of the sphygmomanometer at the finger tips of the grasping hand.

It will be noted from Fig. 3 that the edge of the case has a flattened concave surface which is complementary to a flattened convex surface of the bulb.

What I claim is:

1. A sphygmomanometer comprising a pneumatic tourniquet, a pressure gage having a pressure responsive element for actuating the same and a pneumatic pump, a member having communicating passages therethrough, one of which provides a discharge port to the atmosphere, adjustable means including a head controlling the passage of air through said last mentioned passage, a flexible tube communicating with said tourniquet and with another of said passages, said gage being fixed on said member with the pressure responsive element thereof subject to pressure in certain of said passages, said pump being mounted on said member to serve as a handle therefor and being in communication with another of said passages which opens to the atmosphere for inflating said tourniquet, a check valve mounted in said block in said last-mentioned passage to permit air from the atmosphere to enter and to prevent the return of air therethrough to the atmosphere, said pump comprising a compressible bulb located near said head and being of such a size and shape that it can be grasped in the fingers of the partially closed hand with the index finger and the thumb of the hand engaging said head.

2. In a sphygmomanometer, a gage having a flattened concave edge surface and comprising a graduated scale and indicating means movable with respect to said scale in response to air pressure applied to the gage, an inflatable cuff in fluid communication with said gage and adapted to restrict the flow of arterial blood in a member of a patient being observed, and a handle attached to and supporting said gage, said handle comprising a compressible bulb for inflating the cuff with air, a portion of said bulb adjacent said gage having a convex surface complementary to said first-mentioned surface and adapted to cooperate therewith.

3. In a sphygmomanometer, a gage comprising a graduated scale, an index movable over said scale, and means including a pressure responsive element for moving said index over said scale, an inflatable cuff in fluid communication with said element and adapted to restrict the flow of arterial blood in a member of a patient being observed, and a handle supporting said gage, said handle comprising a compressible bulb for inflating the cuff, said bulb being in the general

form of a truncated cone with its base attached to and substantially in contact with said gage with a portion of the side surface of the cone in alinement with a portion of the rear surface of the gage.

4. In a sphygmomanometer, a pneumatic tourniquet, a gage including a housing communicating with said tourniquet to measure the pressure therein, a projecting part on the back of the housing to serve as a supplemental handle, a compressible bulb mounted on said housing in communication with said tourniquet for inflating the same, said bulb substantially merging with said projecting part to serve as a main handle for said gage whereby said bulb and said part are adapted to serve jointly as a composite handle for said gage.

5. In a sphygmomanometer, a pneumatic tourniquet, a gage in communication with said tourniquet to measure the pressure therein, said gage comprising a housing, a handle attached to said gage to support it in any desired position, said handle comprising a compressible bulb for inflating said cuff and being of such size and shape that it can be grasped in the partially closed hand, a rib on the back of the housing extending in the direction of the long axis of the bulb, a portion of the surface of said bulb merging into said rib, and a release valve mounted in said housing and controlling the escape of air from said tourniquet, said release valve having an adjustable head projecting through said rib adjacent said bulb in a position to be actuated by the thumb and index finger of the grasping hand.

6. In a sphygmomanometer, an aneroid pressure gage comprising a graduated scale means and indicating means cooperating therewith, one

of said means being relatively movable with respect to the other in response to changes in pressure applied thereto, a housing enclosing said gage, an inflatable cuff adapted to restrict the flow of arterial blood circulating in a member of a patient being observed, said cuff being in fluid pressure communication with said responsive means for operating the same, a handle supporting said gage, said handle comprising a compressible elongated pneumatic bulb pump to be grasped by the hand of the operator, means including said bulb for inflating said cuff with air at a pressure above atmospheric pressure, an elongated rib projecting from the back of said housing and extending the direction of the principal axis of the bulb and having a width whereby the sides thereof can be conveniently gripped by the thumb and index finger of the grasping hand, a release valve mounted in said housing and controlling the escape of air from said cuff, said release valve having an adjustable head projecting through the sides of said rib in a position to be adjusted by said thumb and index finger.

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