Feb. 8, 1944. M. H. DAMRON 2,341,137

COMPACT SPHYGMOMANOMETER

Filed Feb. 6, 1943

Fig. 1.

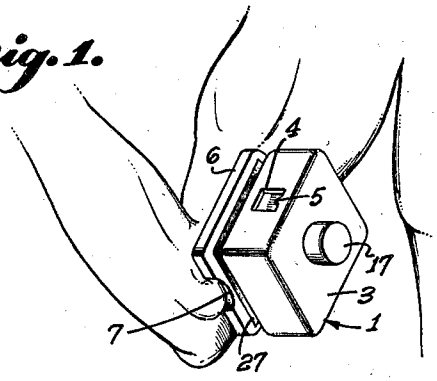
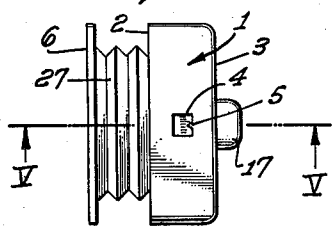


Fig. 2.



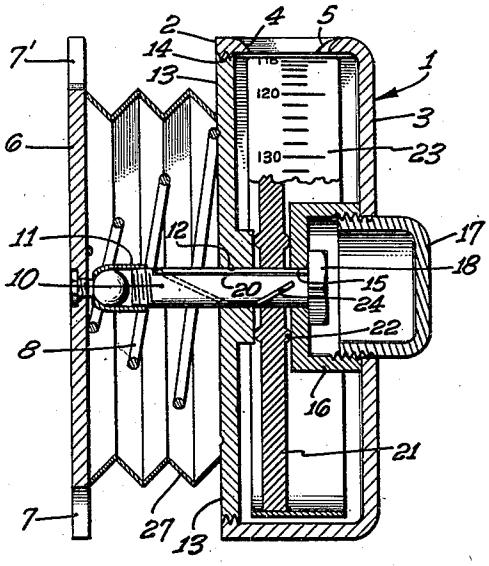


Fig. 5.

Fig. 3.

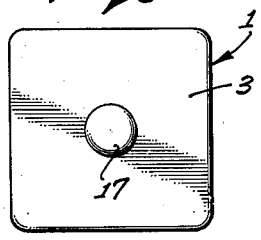
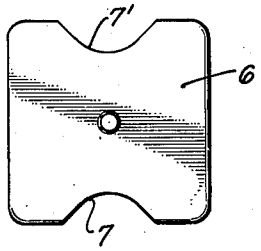


Fig. 4.



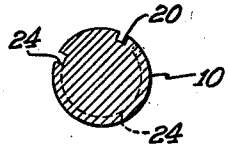


Fig. 6.

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Patented Feb. 8, 1944

2,341,137

UNITED STATES PATENT OFFICE

2,341,137

COMPACT SPHYGMOMANOMETER

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Application February 6, 1943, Serial No. 475,025

4 Claims. (Cl. 128—2.05)

This invention pertains to a rugged, nonbreakable, inexpensive, compact sphygmomanometer or apparatus for determining blood pressure. It is particularly well adapted for use by the armed forces in the field, although it may also be employed to advantage whenever and wherever it is desired to ascertain diastolic or systolic blood pressure. The device is characterized by its simplicity, freedom from fluids and usefulness. It is adapted to permit readings to be made rapidly and the patient may take his own blood pressure without the assistance of others.

The device comprises, in effect, a unitary, pressure applying and indicating means, the dial of the instrument being calibrated directly in millimeters of mercury for systolic pressure as determined by a stethoscope and a mercury manometer.

The most common type of sphygmomanometer employs a silk covered bandage-like, inflatable tube which is wrapped around the arm and inflated by means of a hand pump, this inflatable bandage being associated with a mercury manometer. It is impossible to take a rapid reading with this type of instrument and means must be provided for supporting the manometer in a vertical position. As a result, the instrument is unsuited for use in the field or with the armed forces and is bulky, breakable and ordinarily requires the use of a stethoscope in order to take readings.

In comparison, the device of the present invention is extremely small and compact and substantially unitary, inasmuch as the pressure applying and indicating means are an integral part of the device.

Generally stated, the device comprises a small housing provided with a window through which a calibrated dial is visible, the dial being calibrated in millimeters of mercury. A yieldable pressure plate forms one side of the device. In use, the pressure plate is applied to the inner arm so as to compress the brachial artery against the lower part of the humerus, the pressure being gradually increased until the pulse can not be felt. The systolic pressure can then be read directly through an opening or window in the case. The yieldable pressure of the pressure plate is supplied by a spring so that the device is substantially gearless, free from fluids and practically nonbreakable.

It is an object of the present invention, therefore, to disclose and provide a sphygmomanometer which is inexpensive, rugged and compact.

A further object of the present invention is to disclose and provide an improved compact sphygmomanometer which is adapted to permit readings to be made rapidly.

A still further object of the invention is to disclose and provide a compact sphygmomanometer in which the pressure applying and indicating means are substantially integral, the sphygmomanometer being free from fluids, gearing and other delicate, breakable parts.

A still further object of the invention is to disclose and provide a compact and rugged sphygmomanometer particularly well adapted for use by the armed forces on the field of battle.

These and other objects, uses, advantages, adaptations and modifications will become apparent to those skilled in the art from the following detailed description of an exemplary form in which the present invention may be embodied. In the description given hereinafter, reference will be had to the appended drawing, in which:

Fig. 1 shows the device in use.

Fig. 2 is a front elevation.

Fig. 3 is a side elevation.

Fig. 4 is a side elevation of the pressure plate side of the device.

Fig. 5 is an enlarged transverse section taken along the plane V—V of Fig. 2.

Fig. 6 is an enlarged transverse section through the stem only.

By referring to the drawing, it will be noted that the device comprises a housing generally indicated at 1, having the sides 2 and 3. An opening or window 4 is provided in the housing, said window including a pointer or other index member 5 to facilitate accurate reading of a calibrated dial positioned within the housing as described hereafter. The device also includes a pressure plate 6 which, as best illustrated in Fig. 4, is provided with a concave edge 7 adapted to cooperate with a portion of the human anatomy and thereby facilitate the application and use of the device. If desired, a similar concave edge 7' may be formed in the opposite margin of the pressure plate 6. The pressure plate 6 is yieldably urged away from the housing 1 as by means of a spiral compression spring 8 positioned between the pressure plate 6 and the side of the housing 1. Circular grooves may be formed in the side 2 and the inner surface of the plate 6 to receive and hold the ends of the spring 8 and thereby prevent shifting of the spring with respect to a stem 10 centrally disposed with respect to the plate 6. The stem 10 may be attached to the plate 6 in any suitable manner, although it has been found desirable to employ

a hinged or even a ball and socket connection so as to permit the plate 6 to be tilted somewhat out of a plane perpendicular to the axis of the stem 10. A ball and socket type of joint is illustrated in detail in Fig. 5, the outer end of the stem 10 being provided with a ferrule 11 whose fingers grasp a ball-ended bolt attached to the pressure plate 6.

The stem 10 extends through a port 12 formed in the side 2 of the housing 1. The port 12 may be formed directly in the side 2 of the housing or it may be formed in a removable disc 13 threadedly connected as indicated at 14, to the side 2. The stem 10 also extends through a port 15 formed in a partition 16 within the housing 1, this partition, in cooperation with a dome 17 formed in the side 3 of the housing, forming a space within which one end of the stem 10 may move. The end of stem 10 is provided with a head 18 which abuts the partition 16 and limits the outward movement of the stem 10 under the influence of the spring 8.

The partition 16 may be in the form of a thimble whose edge abuts the inner surface of the side 3, said thimble being threadedly connected to the dome 17. Serrations in the edge of the thimble 16 may then cooperate with slit ridges in the inner surface of the side 3 so as to prevent rotation of the partition thimble 16.

Means are provided for preventing rotation of the stem 10. Such means may comprise a longitudinal or axial groove 20 formed in the outer surface of the stem 10 and a dog or key cooperating with such groove, the dog or key being a part of or mounted in the disc 13.

Rotatably mounted within the housing 1 is a rotatable member, such as a disc or wheel 21, provided with an axial opening through which the stem 10 extends. The hub wheel 21 may be provided with small, circular, outstanding beads 22 adapted to act as anti-friction means between said wheel, the disc 13 and the partition 16.

The wheel or disc 21 is preferably provided with indices which may be carried by the flange 23, the indices being thus made readily visible through the opening or window 4 in the housing 1.

Means are provided for translating the axial movement of the pressure plate 6 and stem 10 into rotary motion of the disc or wheel 21. Such means may comprise a spiral groove 24 formed in the stem 10, and a suitable dog or key carried by the wheel 21 and adapted to extend into the groove 24. Since the wheel 21 is restricted from axial movement by the disc 13 and the partition 16, axial movement of the stem 10 will be translated into rotary movement of the wheel 21.

A light bellows made of silk, cloth or any other suitable material may extend between the plate 6 and the side 2 of the housing 1, as indicated at 27, for the purpose of protecting the spring 8 and the stem 10 from moisture, dust and the like. The bellows 27 is preferably attached to both the plate and the side of the housing.

The spring 8 preferably has a resistance equal to about 250 millimeters of pressure, thereby making certain that the arterial flow of blood will be stopped when the pressure plate 6 is applied to an artery or to the skin immediately above a relatively exposed artery on the body and pressure is applied to the opposing side 3 of the housing so as to virtually collapse the spring 8. The calibrations or indices carried by the flange 23 of the wheel 21 are in millimeters of mercury and are so arranged that the index 5 in the window 4 will point to the figure representing the pressure with which the pressure plate is actually pressed against a surface or artery.

The device described hereinabove may be used most successfully in the determination of systolic (and diastolic) pressure by causing one of the concave portions 7 or 7' of the pressure plate to fit above the internal condyle of the humerus, thereby causing the pressure plate to assume a position on the internal surface of the human arm above the elbow and directly over the brachial artery. By holding the instrument against the palmar surface of the fingers of one hand and placing the pressure plate against the inner side of the patient's arm in the manner indicated, the device may be pressed against such inner surface so as to cause the pressure plate 6 to press against the brachial artery to shut off the flow of blood through said artery. The arterial pulse in the wrist is simultaneously felt by the operator, who observes the movement of the calibrated dial or wheel through the window 4 of the device. The pressure (as indicated by the calibrated disc or wheel) at which the arterial pulse ceases will be noted and represents the systolic blood pressure of the patient.

Preferably this reading is taken rapidly, that is, the pressure of the device against the inner arm is raised quickly so as to shut off the flow of blood through the artery, thereby preventing collateral circulation (through other arteries of the arm) from masking the readings.

The diastolic blood pressure may also be obtained by the use of the device and by the use of a stethoscope, the bell of which is applied to the patient's arm at the bend of the elbow distal to the point on the brachial artery where the instrument is applied.

The entire device, with the exception of the spring and bellows, may be made of a thermoplastic or thermosetting material or of any of the compositions (resinous, phenolic, etc.) having the desired strength and rigidity. The plate 6 should be sufficiently strong to present a smooth, flat, virtually incompressible surface during use. The instrument may be made in large part by injection molding. It will be understood that the present invention is not limited to the use of any specific materials or compositions of matter nor to the precise size or form of the instrument. In actual practice, however, it has been found that the entire device need not exceed two inches square in a cross section transverse to the axis of the stem 10.

Those skilled in the art will appreciate that various changes and modifications may be made without departing from the spirit of the invention here disclosed. For example, the rotatable member or wheel 21 need not carry the flange 23 but instead indices may be carried along the edge portions of the wheel 21, the window 4 being then placed in the side 3 of the device so as to permit readings to be made easily. Moreover, various forms of thrust bearings may be employed instead of the anti-friction beads 22. The precise form of device here illustrated is particularly well adapted for use on the brachial artery against the lower part of the humerus. The shape of the pressure plate may be changed, however, in the event it is desired to use the device on other arteries.

When the patient takes his own blood pressure, the device may be properly located by causing one of the indentations 7 or 7' to engage the condyle, whereupon the entire device may be pressed by the arm against the side of the

body, permitting the patient to take his own pulse and simultaneously observe the reading. When an operator is taking another person's blood pressure with the instrument, it has been found desirable to place the patient's arm across the body of the observer with the inner side of the arm away from the body of the observer, whereupon the observer may take the pulse with the fingers of one hand and press the device against the brachial artery with the other hand, the patient's arm being thus held between the device and the body of the observer. These are suggestive and illustrative modes of use, other methods readily occurring to the operator with changing circumstances.

All modifications and adaptations coming within the scope of the appended claims are embraced thereby.

I claim:

1. A compact and rugged sphygmomanometer comprising: a housing; a port into one side of the housing; a stem axially movable through said port, said stem being provided with a spiral groove on its surface; a rotatable member in the housing, said member being provided with an axial bore and a dog adapted to engage the spiral groove on the stem; means for restraining said stem from rotation with respect to the housing; a pressure plate carried by the outer end of said stem; a universal connection between said pressure plate and stem; spring means between the housing and said plate yieldably urging said plate and stem away from the housing; a window in said housing adjacent the edge portion of the rotatable member; and indices carried by the edge portion of the rotatable member and visible through said window, said indices denoting pressure in terms of millimeters of mercury.

2. A sphygmomanometer of the character described in claim 3 characterized in that the edge of the pressure plate is provided with a concavity adapted to cooperate with the internal condyle in facilitating the placement of the device with respect to the brachial artery.

3. A compact and rugged sphygmomanometer comprising: a housing; a port in one side of the housing; a stem axially movable through said port; means for restraining said stem from rotation; a pressure plate carried by the outer end of said stem, said plate being adapted to be placed over an artery; spring means between the housing and said plate yieldably urging said plate and stem away from the housing; a rotatable member in the housing; means for translating axial movement of the stem into rotation of the rotatable member, said means comprising a spiral groove formed on the surface of the stem, and a dog carried by the rotatable member, said dog being adapted to engage the spiral groove on said stem; a window in said housing adjacent the edge portion of the rotatable member; and indices carried by the edge portion of the rotatable member and visible through said window.

4. A compact and rugged sphygmomanometer comprising: a housing; a port in one side of the housing; a stem axially movable through said port; means for restraining said stem from rotation; a pressure plate carried by the outer end of said stem, said plate being provided with a virtually flat face adapted to be placed over an artery; spring means between the housing and said plate yieldably urging said plate and stem away from the housing; a member mounted in the housing for rotation in a plane perpendicular to the axis of the stem; means for translating axial movement of the stem into rotation of the rotatable member; a window in said housing adjacent the edge portion of the rotatable member; and indices carried by the edge portion of the rotatable member and visible through said window.

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