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MEASUREMENT GAUGES FOR CARTRIDGE CASES

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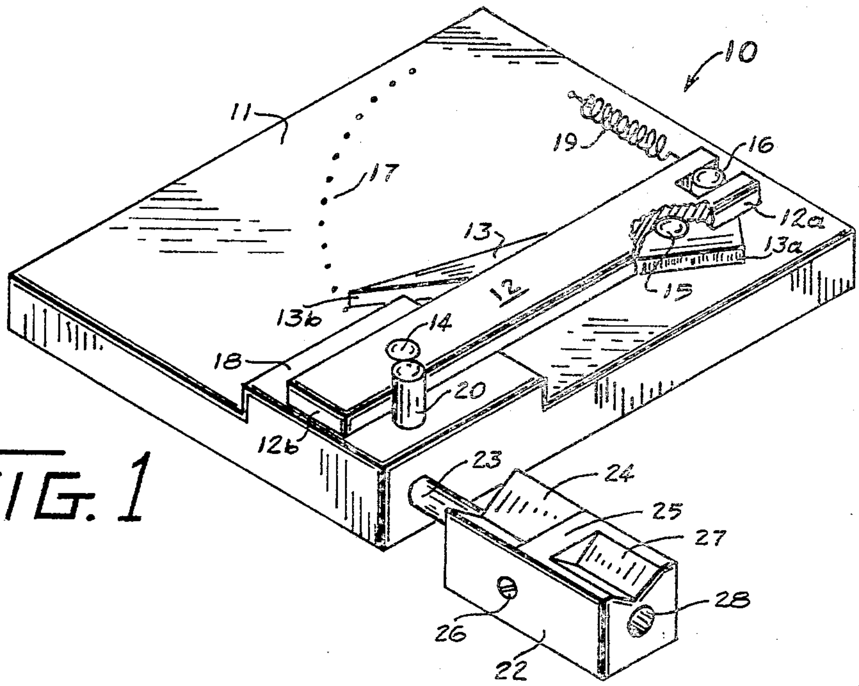


FIG. 1

FIG. 2

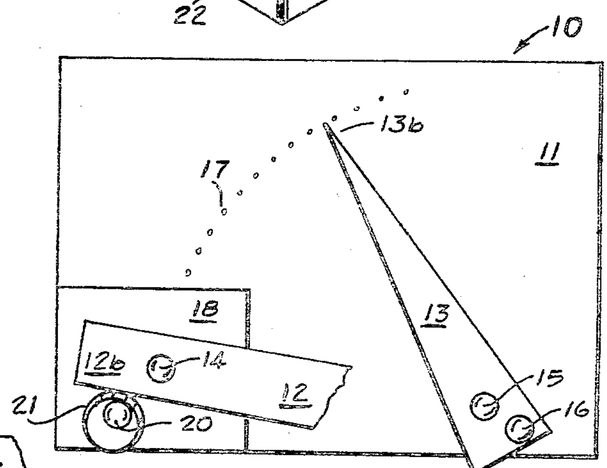
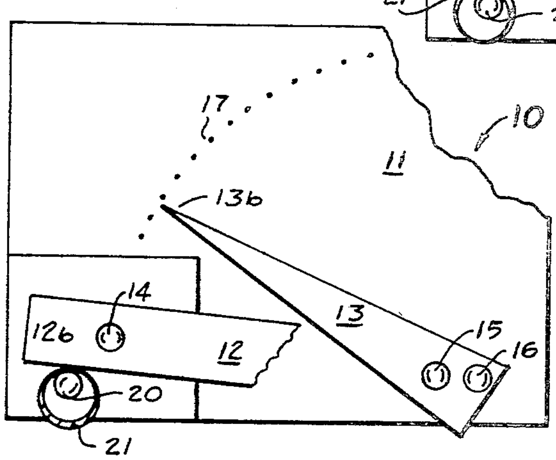


FIG. 3



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MEASUREMENT GAUGES FOR CARTRIDGE CASES

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ABSTRACT OF THE DISCLOSURE

A "go-no go" type of measuring device is disclosed for providing comparative indications of the degree of eccentricity of the neck bore of an unloaded cartridge case. An upright post and two pivotally mounted interconnected levers are arranged on a base so that rotation of a cartridge case neck receiving the post will be effective to move one of the levers through an arcuate path related to the wall thickness of the neck and produce a corresponding, but amplified, motion of the other lever which is sufficient to determine the relative eccentricity of the cartridge case neck. Means are also provided to allow relative length measurements to be made with the disclosed device.

For various reasons many sportsmen and gun enthusiasts find it desirable to "hand load" their own cartridges. In addition to being less expensive, it is generally accepted that more accurate shooting can be accomplished with such carefully loaded cartridges than with most commercially purchased ammunition. For example, in a typical random sampling of cartridge cases, it is not at all uncommon for the neck bores of 20 to 30 percent of them to be unduly eccentric in relation to the central axes of the cases. Experiments have shown that bullets fired from such imperfect cartridge cases will tend to wobble or yaw during flight. Although such eccentricities may not exceed more than a few thousandths of an inch, bench-firing tests have proven that they can cause a bullet to miss its aiming point by as much as 1 inch at a range of only 100 yards.

Accordingly, to eliminate such imperfect cartridge cases, the more particular hand-loading enthusiast will carefully measure the neck bores of a large quantity of cases and select only the more perfect cases in the lot. To do this heretofore, it has been necessary to use micrometers and other conventional precision measuring devices to tediously measure the wall thickness at several spaced intervals around the neck of each cartridge case. This obviously takes a great deal of time and the less zealous hand-loaders often resign themselves to making only cursory visual examinations.

Accordingly, it is an object of the present invention to provide new and improved measuring means for quickly determining the eccentricity of the neck bores as well as overall lengths of cartridge cases.

This and other objects of the present invention are obtained by so arranging a first pivotally mounted lever relative to a stationary anvil that movement of this lever away from contact with the anvil will be translated into a corresponding but amplified movement of a second pivotally mounted lever connected to the first lever. Accordingly, when the open end of the neck bore of a cartridge case is disposed over the anvil, the first lever will be shifted away from the anvil a distance equal to the thickness of the neck of the case between the anvil and that lever. A fairly accurate measurement of this thickness will be provided by the position of the second lever in relation to an appropriately graduated scale. Similarly, by interposing the length of a cartridge case

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between this first lever and an adjustable fixed stop, the length of the case can also be determined.

The novel features of the present invention are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation together with further objects and advantages thereof, may best be understood by way of illustration and example of a certain embodiment when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an isometric view of a preferred embodiment of the present invention; and

FIGS. 2 and 3 are views of the apparatus of FIG. 1 as it is being used to successively measure the thickness of the neck wall of a typical cartridge case.

Turning now to FIG. 1, a preferred embodiment is shown of a measuring device **10** arranged in accordance with the principles of the present invention. In general, the device **10** is comprised of a generally planar base **11** on which is pivotally mounted divergent gauging and indicating arms **12** and **13** intersecting one another near one end *12a* and *13a*, respectively, of each arm. By proportioning the relative lengths of the arms **12** and **13** on each side of their respective pivots **14** and **15** and connecting the arms at their intersecting ends **12*a*** and **13*a*** by suitable motion-translating means **16**, the motion of the opposite, free end **12*b*** of the gauging arm is compounded to produce a corresponding but greatly amplified motion of the oposite, free end **13*b*** of the indicating arm. A graduated arcuate scale **17** on the base **11** adjacent to the path of the free end **13*b*** of the indicating arm **13** is appropriately calibrated to provide an indication of the extent of movement of the free end **12*b*** of the gauging arm **12** in some convenient units of measurement as, for example, thousandths of an inch or millimeters.

More particularly, the gauging arm **12** is an elongated lever of a convenient shape that is journalled near its free end **12*b*** to the base **11** by means, such as an upright pivot **14** secured to a boss or elevated portion **18** of the base, for pivotal movement in a plane above and generally parallel to the upper surface of the base. Biasing means, such as a tensioned spring **19** connected between the base **11** and the intersecting end **12*a*** of the arm **12**, normally urge the free end **12*b*** of the gauging arm against an anvil or upright cylindrical pin **20** projecting upwardly from the raised base portion **18**. In this manner, it will be appreciated that the spring **19** normally maintains the free end **12*b*** of the gauging arm **12** against the adjacent side of the anvil **20** and resists the movement of that end away from the anvil. It is readily apparent, of course, that by locating the pivot **14** substantially closer to the free end **12*b*** of the gauging arm **12** than to its distant end **12*a***, displacement of the free end from the anvil **20** will produce a corresponding but greatly amplified movement of this distant end. The degree of this amplified movement will, of course, be directly proportional to the ratio of the distances between the pivot **14** and each of the lever ends **12*a*** and **12*b***. By way of example, the pivot **14** may be so located on the arm **12** to provide a ratio in the order of 10:1.

Similarly, the indicating arm **13** is also suitably shaped and journalled to the lower major portion of the base **11** by means such as an upright pivot pin **15**. The indicating arm **13** is arranged to move above the base **11** and in a plane parallel to but slightly below the plane of movement of the gauging arm **12** to prevent interference of the two arms with one another. Here again, it will be appreciated that by locating the pivot **15** immediately adjacent to the intersecting end **13*a*** of the indicator arm **13**, movement of this end will produce a corresponding but greatly amplified movement of its free end **13*b***. By way of example, the distance between the pivot **15** and pin **16** may be one-tenth of the distance between the pivot and the free end **13*b*** of the lever **13** to give a ratio of 10:1.

The motion-translating means **16** connecting the adjacent intersecting ends **12*a*** and **13*a*** of the arms **12** and **13** are comprised of means, such as for example a pin-and-slot connection by which movement of the one end **12*a*** will move the other end **13*a*** in the same direction. It will, of course, be appreciated that although other motion-translating means could be employed for the present invention, the pin-and-slot connection **16** provides an inexpensive but highly effective interconnection between the two arms **12** and **13** as they assume various angular positions relative to one another.

It will be appreciated, therefore, that by locating the pivot **14** relatively close to the anvil **20** and the other pivot **15** relatively close to the pin-and-slot connection **16**, the amplified movement of the intersecting end **12*a*** of the gauging arm **12** will effect a corresponding but still further amplified movement of the free end **13*b*** of the indicator arm **13**. If perchance the above-mentioned ratios of 10:1 are adopted for each of the arms **12** and **13**, this will cause the free end **13*b*** to move one-hundred times as far as the free end **12*b***. Thus, even the most minute displacement of the free end **12*b*** of the gauging arm **12** away from the anvil **20** will move the free end **13*b*** of the indicator arm **13** a substantial distance, which latter movement will, of course, be readily comparable with the graduated scale **17**.

To determine whether the neck bore of a particular cartridge case is eccentric in relation to the central axis of the case, it will be realized that either a tilting of the axis of the neck bore in relation to the central axis or a lack of concentricity will cause the neck of the case to vary in thickness around its circumference. Accordingly, as best seen in FIGS. 2 and 3, to measure the neck bore of a cartridge case **21**, the free end **12*b*** of the gauging arm **12** is moved away from the anvil **20** and the inverted cartridge case is disposed over the upright anvil. It will be appreciated that the spring **19** will urge the free end **12*b*** of the gauging arm **12** against the outside periphery of the cartridge case neck and move the immediately adjacent sectorial portion of the inner wall of the case neck against the anvil **20**. Thus, the free end **12*b*** of the gauging arm **12** will be displaced away from the anvil **20** by a distance equal to the thickness of that sectorial portion of the neck that is between the two members. It will be realized, of course, that it is preferable to make the anvil **20** of a somewhat smaller diameter than the internal diameter of the cartridge case **21**.

It will be readily apparent that where the neck bore of the cartridge case **21** is concentric, the wall thickness of the neck will be uniform. Thus, when the case **21** is rotated slowly around the anvil **20**, the free end **12*b*** of the gauging arm **12** will remain at a substantially constant distance from the anvil and little or no variation in the position of the free end **13*b*** of the indicator arm **13** will be noted in relation to the scale **17**. On the other hand, where the neck bore of the case **21** is eccentric in relation to the central axis, the wall thickness of the neck will vary as the case is rotated about the anvil **20**. Thus, as best illustrated by comparison of FIG. 2 with FIG. 3, any slight variation in wall thickness of the neck of the case **21** will be readily apparent as the free end **13*b*** of the indicator arm **13** correspondingly changes its position relative to the scale **17**.

Comparison of FIG. 2 with FIG. 3 will show that as the indicator arm **13** pivots, the effective lever length between the pivot **15** and the connector pin at **16** will vary slightly. This will, of course, change the "amplification ratio" of the indicator arm **13** somewhat. Similarly, the "amplification ratio" of the arm **12** will also vary slightly. Such errors may, of course, be adequately compensated for by properly spacing the divisions in the graduated scale **17**. On the other hand, since the primary purpose of the measuring device **10** is only to serve as a "go-no go" type of gauge, it is not essential that such pains be taken. The error created by these discrepancies will be so slight that the primary purpose of the device **10** will not be defeated.

To determine whether the neck bores of cartridge cases are within acceptable tolerances or not, it is necessary only to check a number of suitable cases to establish an allowable range over which the free end **13*b*** of the indicator arm **13** will travel. Then, as a number of cases are being checked, those that produce an indicated measurement outside of this selected range can be rejected without regard to the actual degree of their eccentricity.

It is also desirable to discard those cartridge cases that are outside of a reasonable range of overall lengths. Accordingly, referring again to FIG. 1, the measuring device **10** is also arranged to measure the overall lengths of cartridge cases. To accomplish this, an elongated block **22** is slidably mounted on an extension **23** projecting from one side of the base **11** so arranged that the block will move in a plane intersecting the free end **12*b*** of the gauging arm **12** on the opposite side of the anvil **20** from the pivot **14**. The upper surface of the block **22** is appropriately contoured to cradle a cartridge case lying thereon parallel to the axis of movement of the block with its neck resting on the elevated base portion **18** and against the side of the anvil **20**.

In one manner of contouring the block **22**, a longitudinal, convergent V-shaped recess **24** can be formed along the upper surface of the block and terminated at its rearward end by a stop **25**. An adjusting screw **26** suitably located on one side of the block **22** will permit the block to be moved along the extension **23** as necessary and secured thereto at a desired position. In this manner, a cartridge case (not shown in FIG. 1) can be laid along the recess **24** with its rear end abutting the stop **25** and the side of its neck against the anvil **20** on the side thereof nearest the viewer. Thus, after the block **22** is appropriately positioned, cartridge cases can be laid into the recess **24** and those that are overly long will cause the free end **13*b*** of the indicator arm **13** to move to one position relative to the scale **17** and those that are too short will move the indicator arm end to another position. Hereagain, comparison of various suitable cases will determine a range of measurements within which a case will be acceptable.

Where various calibers of cartridge cases are to be measured, the opposite end of the block **22** can be contoured, as at **27**, to position these cases correctly in relation to the anvil **20** and the upper surface of the elevated base portion **18**. A longitudinal bore **28** on the opposite end of the block **22** permits it to be reversed on the extension **23** and moved into a desired position.

Accordingly, it will be appreciated that the measuring device **10** of the present invention has provided new and improved means for quickly determining whether a cartridge case is within allowable dimensions. No painstaking measurements need be taken in checking a cartridge case since it is necessary only to determine if the measurement is within a predetermined range.

While a particular embodiment of the present invention has been shown and described, it is apparent that changes and modifications may be made without departing from this invention in its broader aspects; and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. Apparatus for measuring the eccentricity of the neck bore of a cartridge case comprising: a base; an upright member on said base adapted for loose insertion into the neck of a cartridge case to be rotated thereabout; first and second journal means on said base and respectively defining first and second pivotal axes parallel to said upright member; first and second levers respectively mounted on said first and second journal means at eccentrically-located points on said levers to respectively divide said levers into portions of unequal length, said levers being arranged at an acute angle to one another with the longer portion of said first lever lapping the shorter portion of said second lever and the shorter portion of said first lever being adapted to engage the outside of a cartridge case neck disposed over said upright member and to be moved away therefrom in a first arcuate path over a range of first distances proportionally related to variations in thicknesses of circumferentially-spaced wall portions of a cartridge case neck between said upright member and said shorter portion of said first lever; biasing means normally urging said shorter portion of said first lever toward said upright member; motion-translating means including an outstanding pin on one of said lapped lever portions and an elongated slot in the other of said lapped lever portions slidably receiving said pin so that movement of said shorter portion of said first lever will rotate the longer portion of said second lever in a second arcuate path over a range of greater second distances proportionally related to variations in thicknesses of such cartridge case wall portions; and indicia on said base adjacent to said second path followed by said longer portion of said second lever upon movement of said shorter portion of said first lever as the neck of a cartridge case is rotated

about said upright member for providing indications of such variations in the wall thickness of such a cartridge case neck at different circumferentially-spaced points therearound.

2. The apparatus of claim **1** further including means for measuring the overall length of such a cartridge case comprising: means for supporting a cartridge case in a plane normal to said pivotal axes; and stop means on said supporting means for engaging one end of a cartridge case to position the other end of such a cartridge case against said shorter portion of said first lever.

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