

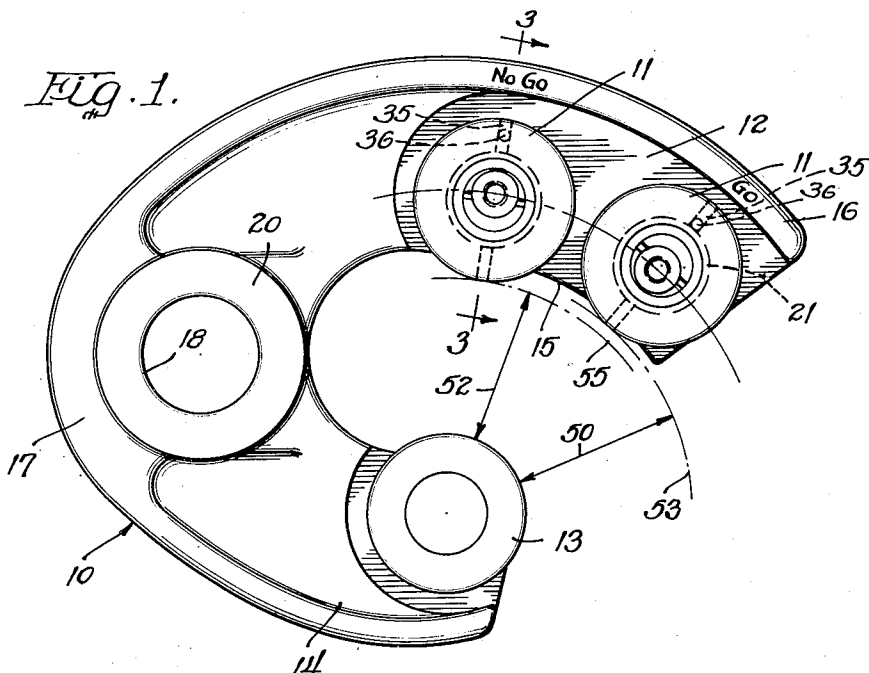
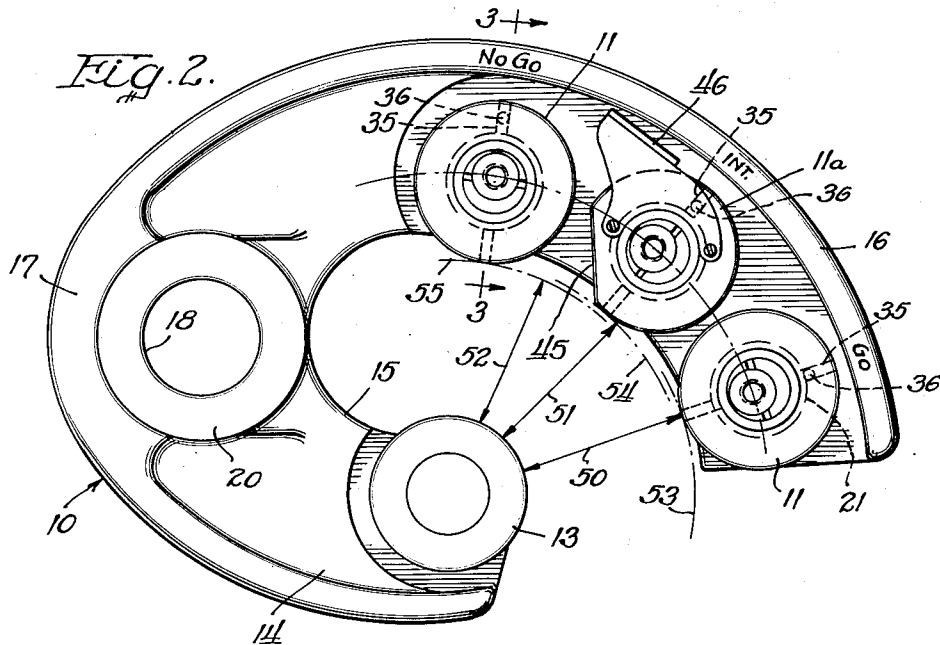
March 17, 1953

M. E. STECZYNSKI  
ADJUSTABLE SNAP GAUGE FOR THREADED  
AND OTHER TEST PIECES

2,631,377

Filed Dec. 6, 1946

5 Sheets-Sheet 1



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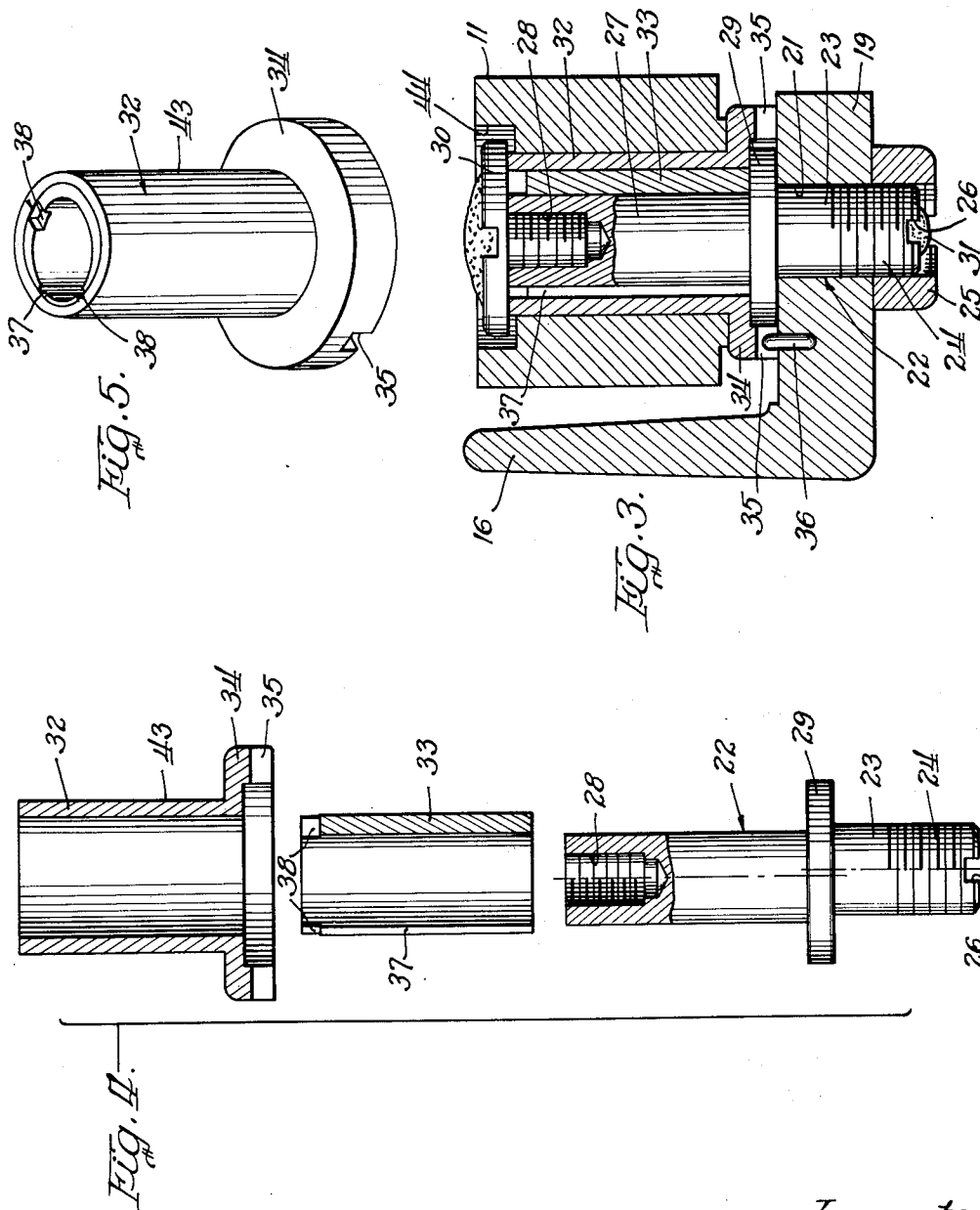
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5 Sheets-Sheet 3

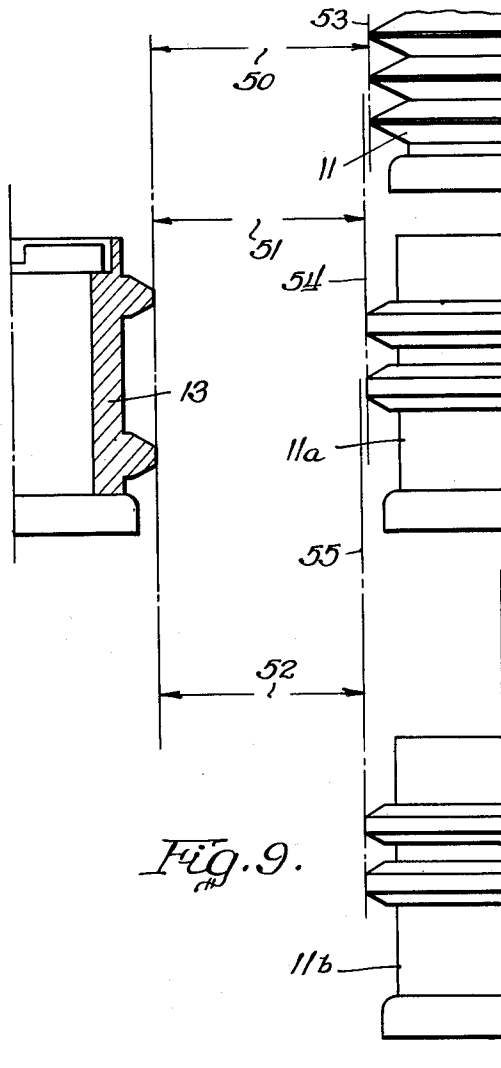
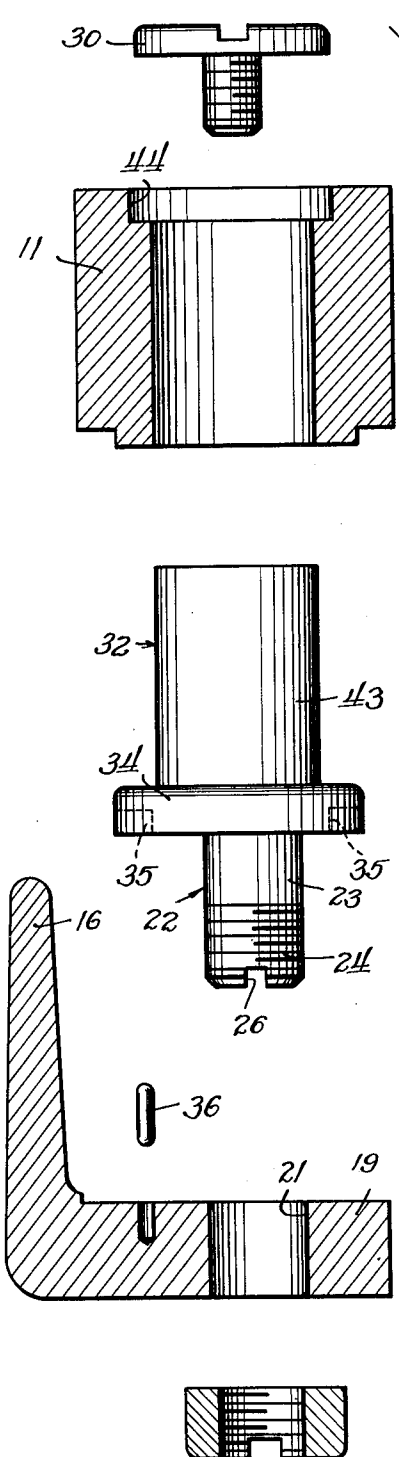


Fig. 6.

Fig. 9.

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Fig. 7.

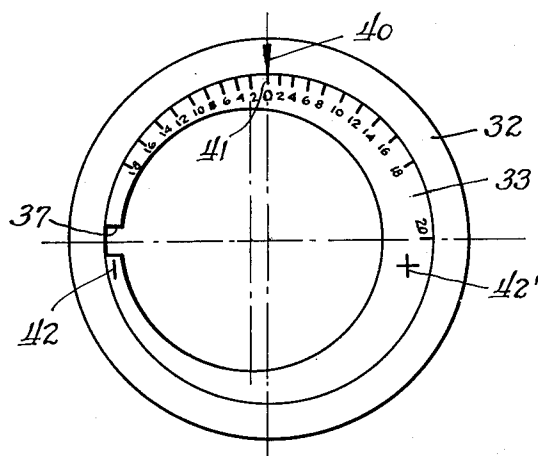
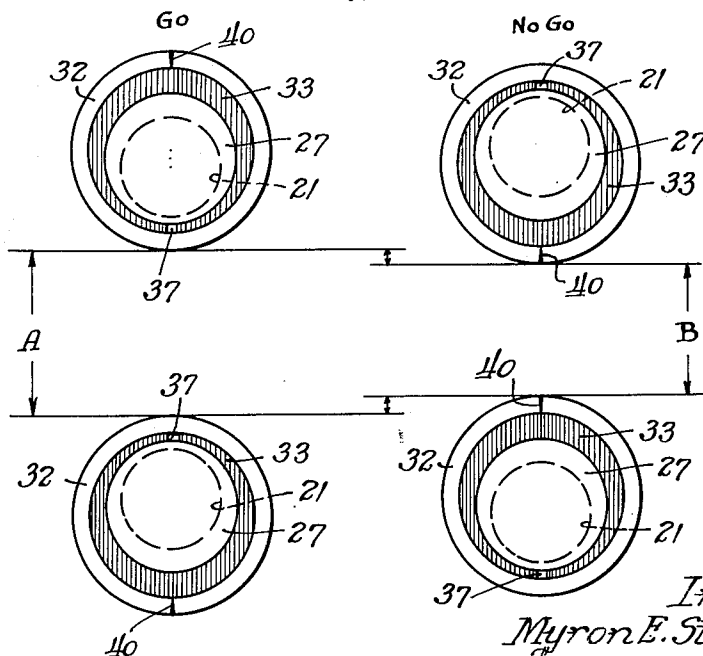


Fig. 8.



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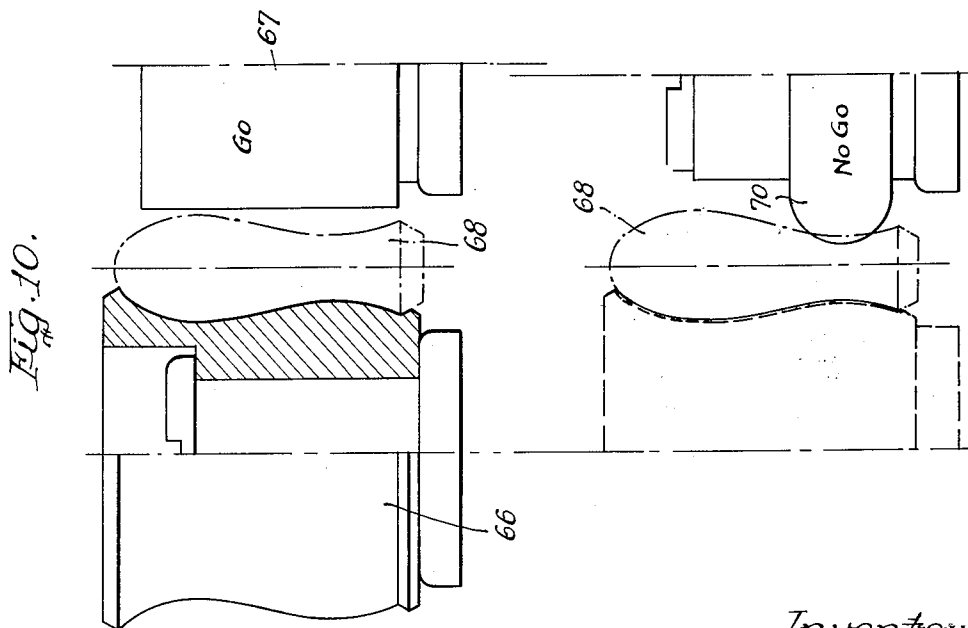
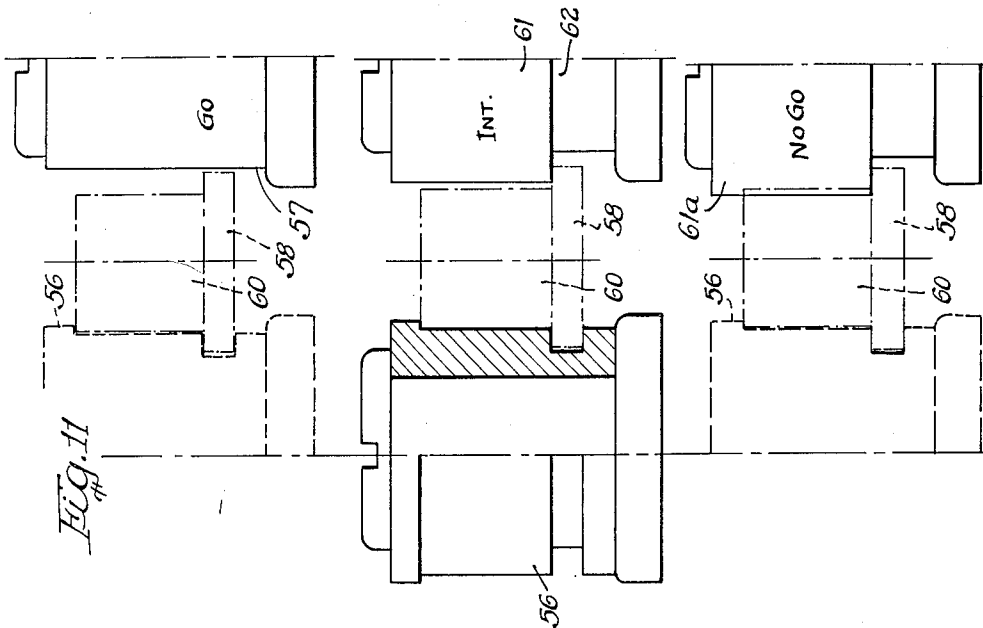
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## UNITED STATES PATENT OFFICE

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ADJUSTABLE SNAP GAUGE FOR THREADED  
AND OTHER TEST PIECES

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Application December 6, 1946, Serial No. 714,403

14 Claims. (Cl. 33—168)

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The present invention relates to snap gauges of the "go" and "no go" type employed to gauge the sectional dimensions and contours of articles of manufacture including nontapering screw threads as distinguished from pipe threads.

Heretofore in gauging screw threads the practice has been to provide a U-shaped frame on which two sets or pairs of gauging rollers are mounted for free rotation. Each pair comprises cooperating rollers disposed on opposite sides of the throat between the legs of the frame as shown in the Johnson Patent No. 1,660,335. The pair of rollers nearest the mouth of the throat checks the maximum tolerance limit and is generally referred to as the "go" gauge, while the other pair of rollers deeper in the throat behind the first pair checks the minimum tolerance limit and is generally referred to as the "no go" gauge. The rollers if used for threads are usually multi-ribbed to check lead, thread angle, and pitch diameter of a thread upon the workpiece. If the "go" rollers refuse to pass the workpiece, the thread is oversize in some respect and is rejected or re-cut. If the "no go" rollers pass the workpiece the thread is undersize in some respect and is rejected. If the workpiece will pass the "go" rollers and not the "no go" rollers the thread is accepted as being within the tolerance limits. The ribs on the rollers are constructed or shaped to test any particular thread character desired including the minimum and maximum thread diameters. Likewise any portion of the thread along its length may be checked by suitable rollers if that portion of the thread is particularly critical.

In setting up these conventional gauges, two or more separate master gauges or master plugs (called plugs or discs) of the correct size are employed, one for each pair of gauge rollers. The process is one in which the journal or pin of one of the rollers nearest to the end of the frame is tightened to rigidity with the roller in place. The maximum diameter master plug is then brought to bear against that roller. The other roller of the pair is mounted upon an eccentric pin. This pin is adjusted and tightened in place when its supported roller contacts the master plug with the proper degree of snugness. The master plug is then removed and put away and the minimum diameter master plug is picked up and employed in a like manner to set the "no go" rollers located deeper in the throat of the frame.

The chief objection encountered when snap gauges of this type are used by a machine shop

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or manufacturer is in the fact that a very large number of master plugs must be kept on hand in order to set all of the snap gauges to the proper dimensions. This large number is inevitable because the tolerances and allowances and other variables for each nominal thread size are numerous depending on the class of fit desired and the manufacturing limits to be maintained for different runs. When it is considered that there are four different classes of screw fits in common use, many types of threads and various nominal sizes having varying pitches, the number of master plugs required becomes astronomical. Reference is made to the Kent Mechanical Engineers' Handbook, Eleventh Edition, published by John Wiley & Sons, Sections 9—03 to 9—36 which gives tables showing the multitude of thread types and dimensions for the various fits.

It is a very simple and elementary process of setting gauges if all the master plugs are available. However, in view of the difference in tolerances and allowances for the various class fits of screw threads in each of hundreds of thread sizes and leads, it is doubtful that any manufacturer can afford to maintain a complete master gauge crib, or half of a crib, because of the great expense involved. Each conventional master gauge is very expensive to start with because it has to be almost perfect if its use in setting a snap gauge is to be acceptable.

Not only this, but to have gauges which will take care of plating or other variations from normal dimensions makes it virtually impossible to do other than order special gauges from gauge manufacturers with accompanying extra expenses and delays.

One of the objects of the invention is to provide a device whereby a gauge can be accurately set with a master gauge plug or a disc of a known size, or to a predetermined difference or intentional deviation in either direction from the master plug.

It is also an object of the present invention to provide a gauge and gauge setting process which utilizes only one master gauge for each nominal thread size regardless of class of fit or other characteristics desired in setting the "go" and "no go" gauge rollers, which gauge can also be used to set any other intermediate rollers so that the inspector of workpieces using the gauge can warn the machine operator when his tools are getting a little dull long before they begin to cut oversize enough to have parts rejected by the "go" gauge.

A further object of the invention is to provide

a gauge arrangement in which gauges can be set with basic dimensions deviating from the basic dimension of the master plug within sufficiently wide limits that even small shops can afford to stock all the master plugs needed to handle and gauge all threads of the standard series and class fits.

The invention is further characterized by its flexibility in that idle gauges may be dismantled and the frames and rollers assembled into new gauges of different dimensions for different threads or contours by even an inexperienced gauge crib attendant.

A further feature of the invention resides in the use and arrangement of gauge components which eliminate any need for inherent accuracy in the construction of the gauge frame itself other than the simplest of machining operations relating to parallelism between mounting holes for the rollers.

The invention also contemplates checking the gauge with the same gauge plug easily and quickly any time on the job during the use of the gauge, even though there is a relatively wide deviation between the basic dimensions of the master plug and the gauge.

In the present invention, the cost of master gauges can be greatly reduced, because a master gauge of a predetermined exact dimension is not required as long as its actual dimensions are known.

These being among the objects of the invention, other and further objects including ease of construction, assembly and use will appear from the drawings, the description relating thereto and the appended claims.

Referring to the figures in the several drawings:

Fig. 1 is a side view of a "go" and "no go" gauge embodying the invention.

Fig. 2 is a side view of a "go," "intermediate" and "no go" gauge embodying the invention in a modified form.

Fig. 3 is an enlarged section taken upon the line 3—3 shown in both Figs. 1 and 2.

Fig. 4 is an exploded view of three parts shown in their preferred form to embody the invention.

Fig. 5 is a perspective view of two of the parts assembled in adjusted relationship ready to be received upon the third part shown in Fig. 4.

Fig. 6 is an exploded view of the cooperating elements shown assembled in Fig. 3 excluding the roller element.

Fig. 7 is an enlarged plan view of the eccentric bushing when marked for use in gauge crib adjustment of gauges.

Fig. 8 is a diagrammatic showing of maximum adjustment attainable with a snap gauge embodying the invention.

Fig. 9 is a side view in vertical projection of "go" and "no go" reference rollers for threads located horizontally with respect to the basic roller.

Figs. 10 and 11 are vertical projections of "go," "intermediate" and "no go" gauges using contour rollers for various dimensions.

In the present invention, expensive gauge plugs which are held to predetermined dimensions are not required. As long as the exact dimensions of a gauge plug are known, regardless of what they are any snap gauge embodying the invention can be provided in a few minutes with deviations from the plug dimension of as much as .040 of an inch with perfect accuracy. This figure is merely representative. More deviation than this can be pro-

vided for where larger eccentricities in the gauge components are provided.

The mounting of the adjustable rollers upon the frame includes an eccentric bushing in addition to eccentricity present in the mounting post. This bushing is preferably slightly oversize on its external diameter and split longitudinally to expand frictionally against the inner surface of the sleeve upon which the roller is journaled. The sleeve is constructed to be received upon the post and the frame in either one of two positions, preferably spaced angularly 180° with respect to each other. The eccentric bushing and sleeve are rotatively adjustable with respect to each other and with respect to the two positions mentioned whereby the ultimate effective eccentricity of their adjustment establishes the proper deviation from basic when they are rotated 180° from the position which they were in when the eccentric post was set up to a master plug of known dimension.

After the sleeve and bushing have been turned from their primary adjusted position to their secondary position to bring into operation the deviation provided by the preliminary adjustment of the sleeve and bushing, the sleeve is rigidly clamped to the frame to support the roller for operation against all strains and stresses.

Referring now to the drawings in further detail, the frame is indicated at 10 in Fig. 1 as constructed to support two spaced reference rollers 11 on one arm 12, and a basic roller 13 on the other arm 14. It is preferred to use only one basic roller in each gauge and arrange the reference rollers in an arc around it. To accomplish this, the arm 12 is curved in a novel way and the throat 15 defined by the two arms is likewise curved to permit movement of a workpiece (not shown) around the basic roller while being tested. The outer edge of the frame is provided with a reinforcing flange 16 which also serves to protect the rollers on both arms from damage.

At the bottom of the throat 15, the frame is thickened to the width of the flange 16 to provide a handle 17 which is apertured as at 18 for mounting if desired. Around the aperture is a recess receiving a ring having a polished face 20 upon which are stamped the indicia identifying the gauge when set. The ring is replaceable for changes in settings.

As shown in Fig. 3, the flat portion 19 of the frame 10 is drilled and reamed to provide holes 21 which receive the posts 22. There are provided as many holes 21 as there are rollers and all holes are substantially alike with the flat portion faced off to a plane preferably common to and at right angles to the axes of all of the holes. Herein lies the only arrangement which must be quite accurate, namely, that either all the axes of the holes must be parallel or the upper faces of the flat portion around each hole must lie in the same or parallel planes depending upon the construction of the posts.

The holes receiving the posts of the reference rollers 11 are spaced at substantially equal distances from the hole receiving the post of the basic roller 13 and are close enough to the throat 15 that the edges of all rollers overhang the edges of the throat when mounted in working position.

The posts employed can all be the same. Preferably they comprise a member having two cylindrical ends disposed eccentrically with respect to each other and separated by a radial flange 23 of sufficient width to steady the post squarely against the face of the frame around the hole. The lower end 23 is received in the hole prefer-

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ably in body bound relationship being threaded as at 24 to receive a clamp nut 25 and kerfed on the end as at 26 to receive the end of a screw-driver for rotary adjustment. The upper end 27 is faced and internally threaded as at 28 to receive the screw 30. The kerf of the screw and the kerf 26 can be filled with a drop of sealing wax 31 to prevent meddling once all elements are tightened in place.

Upon the upper end 27 of the post 22 is mounted an assembly of a sleeve 32 and bushing 33 held together by friction between the outer face of the bushing and the inner face of the sleeve. The sleeve is provided with a cup-shaped flange 34 which accommodates the flange 29 and whose rim rests squarely on the face of the flat portion 19. The rollers 11 or 13 rest against the upper face of this flange where they are journaled on the outer cylindrical surface 43 of the sleeve, the rollers being counterbored as at 44 to permit end play on the sleeve when the retaining screw 30 is in place.

The overall length of the sleeve in place is slightly greater than the height of the post so that the screw 30 clamps the sleeve 32 rigidly in place and prevents the rollers from dropping off. Once the sleeves are clamped in place by the screw 30, the side thrust load upon the roller is carried by the sleeve to the frame to protect the post against distortion. The cup flange 34 is kerfed preferably diametrically as at 35 to accommodate a locating pin 36 mounted at one side of each of the openings 21, and as viewed in Figs. 1 and 2, these pins are preferably in line with the axes of each reference roller and the basic roller because a gauge crib attendant can comprehend more readily the proper adjustment and setting of gauges embodying the invention. The pins could be located elsewhere if desired so long as their position is determined with reference to the relative adjustment between the sleeve and bushing.

The bushing 33 has cylindrical inner and outer walls disposed eccentrically with respect to each other. Although the amount of eccentricity is a matter of choice, it has been found that .020 of an inch provides a very good working arrangement because of the evenness of the numerology and this range accommodates all normal variations from each basic size while providing an overall range of .040 of an inch as will be further discussed in connection with Fig. 3.

The bushing 33 is split as at 37 to function as an expansion C-spring against the inner wall of the sleeve and may be kerfed at its top as at 38 for wrenching purposes, if desired, or marked as shown in Fig. 7 with regard to a reference character 40 upon the end face of the sleeve 32. The reference character 40 in turn is so located with respect to the kerfs 35 (Fig. 3) that when the "0" marking 41 on the bushing aligns with the reference character, no change in the distance between the basic roller and reference roller takes place when the pin 36 is located alternatively in either of the kerfs 35.

If the reference character 40 is disposed over the pin 36 as shown when the gauge is being set with respect to a master plug, then alignment between the reference character and any numerals to the right of the "0" mark (Fig. 6) although it move in the direction of diminishment will operate to increase the distance between the rollers when the sleeve is turned 180°. On the other hand, alignment between the reference character and any numerals to the left of the "0" mark

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will operate to diminish the distance between the rollers by the set deviation when the sleeve, after adjustment to the plug is turned 180° with respect to the pin.

Consequently, the appropriateness of the marking of "+" as indicated at 41 for the right-hand numerals, and "-" at 42 for the left-hand numerals will be appreciated although this would seem to be opposite to what it should be at first glance. Furthermore, in view of the fact that the adjusted eccentricity is reversed from its initial position, the resulting deviation is twice the absolute eccentricity. This has the advantage of calibrating the total deviation within the available arc of 90° on each side of the marking "0" without need for complex computation. Furthermore, the available adjustable deviation by use of the 180° turn is twice that which would be present if the turn were lacking, it being appreciated that the bushing could be turned inside the sleeve after initial adjustment with the master plug to provide a deviation in which case the "0" position would be where the "+20" marking is shown in Fig. 6 and the increments would be marked in .001" instead of .002".

Before taking up specific gauging functions accomplished with embodiments of the invention, it would be well to consider the operation and adjustment of the invention as described thus far.

In operation, the first thing to be done is to determine the tolerance limits to be gauged. By way of example, if it is presumed that these limits are  $1.000'' \pm .005''$ , the "go" limit will be  $1.005''$  and the "no go" limit will be  $.995''$ . The next question is to determine the dimension of the master plug available for setting up the gauge. In order to demonstrate the invention under the most difficult conditions, it is presumed that the plug reads outside of the limits prescribed, say at  $.990''$ . The "go" bushing is set to locate the arrow 40 opposite the marking .015+, dropped in place on its post, the roller mounted and the post 22 turned until proper snugness is established between the roller and the plug. The plug is removed and the sleeve is then lifted enough and turned 180° so that the other kerf drops over the pin 36. This increases the measured distance between the "go" roller and the basic roller by .015" and brings it up to  $1.005''$ .

The "no go" gauge is then set up by adjusting a second sleeve 32 to indicate a .005" spacing with the same master plug in engagement with the basic roller assembly and the roller mounted on the sleeve 32 of the "no go" gauge. Thereafter, when the second sleeve 32 is rotated 180°, the "no go" gauge is increased by .005" and provides the required measurement of .995". The ring 20 is marked accordingly and dropped into place.

In event the master gauge is  $1.010''$  then the settings of the sleeves will be on the minus side, the "go" sleeve being set at  $.005''$ — and the "no go" sleeve being set at  $.015''$ —.

Thus a gauge embodying the invention not only has a wide range or capacity for sizes, depending upon whether the eccentricities of both the post and bushing are additive in opposite directions two ways, i. e., away from each other as at A for "go" gauging or towards each other as at B for "no go" gauging in Fig. 8, but within these limits any tolerances can be gauged as set with any master plug whose measurement comes within this range.

Referring to Fig. 2, the improved gauge frame

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makes it possible to gauge a third or intermediate dimension. With this construction an intermediate roller 11a can be set from the same master plug as the other rollers to provide a tighter "go" gauge to catch workpieces of increased size due to wear upon the tools. Thus the tools can be touched or set up a little before wear becomes critical. On the other hand the intermediate roller can be set to serve as a "no go" gauge for certain thread or contour characteristics which might be critical such as minimum diameter or possible truncation.

In Fig. 2 the intermediate roller 11a is shown as a "no go" roller flattened upon one side as at 45 for clearance and provided with a lever 46 secured to the top thereof. Movement of the lever carries the flattened portion in or out of position to let a workpiece past. It is preferred to use the flange 16 as a stop in one direction and the roller can then be urged in that direction by a spring if desired. Thus the gauging portion of the roller is in operation until it has performed its function whereupon the lever is pressed counterclockwise to bring the flattened portion into position to pass the workpiece to the main "no go" gauge. Thereafter when removing the workpiece from the gauge the workpiece automatically rotates the roller 11a, if need be, to clear itself on the way out. This flattened portion can be provided on any roller which serves as a secondary "no go" gauge ahead of the main "no go" gauge roller.

Referring to Fig. 9 the basic roller for threads is a saddle type roller indicated at 13 as representative of any roller which may be desired. The top roller on the right is the "go" roller 11 of Figs. 1 and 2 to check the thread form, its angle, lead and its pitch diameter. The intermediate roller 11a can be a selective roller to check tool size for quality control; to segregate different class fits of threads or measure for plating of some parts. The bottom roller 11b can be the same as roller 11 for "no go" but as shown is similar to roller 11a. The dimensions to be checked are indicated by the dimension lines 50, 51 and 52 respectively and the difference between lines 50 and 52 is the tolerance permitted. (See also Figs. 1 and 2). Lines 53, 54 and 55, as drawn, indicate the checking for the pitch diameter, but they are indicative of other dimensions which can be checked.

In Fig. 11 contour rollers are used. The basic roller is indicated at 56. The top roller 57 on the right is the "go" roller for the diameter of the flange 58 upon the piece 60. The intermediate roller 61 has a shoulder 62 which checks the axial position of the flange 58 while the lower roller 61a is set for a "no go" gauge on the diameter of the piece 60.

Referring to Fig. 10 a modification of the rollers on the gauge shown in Fig. 1, is shown where the basic roller is indicated at 66 and the upper roller 67 on the right checks to prevent a handle 68 being too large, while the lower roller 70 checks to prevent the neck of the handle being too thin.

Consequently, it will be seen how the intermediate roller can be constructed as set to perform any one or more of many functions including, (1) to act as a warning signal in quality control; (2) to separate premium sizes from tolerated sizes as where closer tolerances are more valuable for higher class fits; (3) to check a secondary dimension of importance; (4) to check

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concentricity or axial spacing between two elements of a workpiece; and (5) to separate out two or more groups for selective assembly or for secondary operation.

Furthermore, having described certain preferred embodiments of the invention, the objects accomplished thereby and the principles of adjustment and operation, it will be appreciated by those skilled in the art how various and further changes and modifications can be made without departing from the spirit of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. In a gauge, the combination of a frame member, an eccentric post adjustably mounted on said frame, a sleeve member received on said post carrying a roller gauge element, and means for locating said members in either one of two selective positions with respect to each other including in combination an eccentric bushing carried by said sleeve, two recesses spaced from each other upon one member and a protuberance upon the other member mating with either of said recesses, said bushing causing lateral movement of one member with respect to the other as said sleeve is rotated with said bushing from one of said positions to the other and said bushing being rotatable in said sleeve to adjust the axis thereof.

2. In a snap gauge having a frame with two spaced arms and opposed gauging members one of which is carried by one of the arms and another on the opposite arm, a device for adjusting the other member with respect to the first member including in combination a post received for eccentric movement in a hole in one of the arms, a rotatably adjustable eccentric bushing received upon the post, a sleeve on said bushing for receiving said other member in supported relationship and means for preventing rotation of said sleeve with respect to said frame.

3. In a snap gauge having a frame with two spaced arms and opposed gauging members one of which is carried by one of the arms and another on the opposite arm, a device for adjusting the other member with respect to the first including in combination a post received for eccentric movement in a hole in one of the arms, an eccentric bushing receivable in either one of two positions upon the post, a sleeve on said bushing for receiving said other member in supported relationship, means for locating said bushing at either one of said positions approximately 180° apart including a protuberance upon the frame and recesses upon the sleeve.

4. In a snap gauge having a frame with two spaced arms and opposed gauging members one of which is carried by one of the arms and another on the opposite arm, a device for adjusting the other member with respect to the first including in combination a post received for eccentric movement in a hole in one of the arms, an eccentric bushing split longitudinally along a slight helix and receivable in either one of two positions upon the post, a sleeve on said bushing for receiving said other member in supported relationship, said bushing and sleeve having a spring fit to provide friction between them.

5. In a snap gauge having a frame with two spaced arms and opposed gauging members one of which is carried by one of the arms and another on the opposite arm, a device for adjusting the other member with respect to the first including in combination a post received for eccen-

tric movement in a hole in one of the arms, an eccentric bushing split longitudinally along a slight helix and receivable in either one of two positions upon the post, a sleeve on said bushing for receiving said other member in supported relationship, and means for locating said sleeve in either of said two positions with respect to the location of said split in the bushing including a protuberance upon the frame and two recesses upon the sleeve.

6. In a gauge the combination including a post for supporting a gauging element, a bushing member removably received on said post having inner and outer cylindrical faces disposed eccentrically with respect to each other, a sleeve member received on said bushing member, indicia on one of said members, and an index on the other of said members, said indicia being such as to indicate twice the eccentricity of the bushing member between the two faces for each 180 degrees of arc.

7. In a gauge the combination including a post for supporting a gauging element, a bushing member removably received on said post having inner and outer cylindrical faces disposed eccentrically with respect to each other, a sleeve member received on said bushing member, indicia on one of said members, and an index on the other of said members, said bushing member being so constructed as to exert a radial force against said sleeve member tending to prevent rotation of one with respect to the other.

8. In a gauge the combination of a frame, a roller on said frame journaled for free rotation about a fixed axis, an eccentric post mounted on said frame at a point spaced from said roller, an eccentric bushing received on said post, a sleeve supported upon said eccentric bushing, the two eccentric elements permitting dual adjustment of the location of the outer surface of the sleeve, a second roller journaled on said sleeve, and a locating protuberance upon the frame cooperating with a recess in the sleeve for determining the angular position of the sleeve with respect to the frame.

9. In a gauge the combination of a frame, a roller journaled for rotation about a fixed axis, a roller spaced from said first roller and journaled upon a sleeve, means for mounting the sleeve adjustably with respect to the frame including an eccentric bushing and an eccentric post for adjustably supporting said bushing received upon said frame, and calibration marks on the bushing for indicating the rotative position of said eccentric bushing with respect to said frame.

10. An adjustable roller assembly for a gauge comprising a frame, a post eccentrically mounted on said frame, a sleeve carried by said post and having a slot therein, a guide pin secured to said frame and engaging said slot, a roller member rotatably mounted on said sleeve, and means cooperating with said pin and slot for imparting movement to said sleeve relative to the frame.

11. An adjustable roller assembly for a gauge comprising a frame, a post eccentrically mounted on said frame, a sleeve carried by said post and having a keyway therein, a guide pin rigidly secured to said frame and engaging said keyway, a roller member rotatably mounted on said sleeve, and an eccentric bushing interposed between said

sleeve and said post for cooperating with said pin and keyway to impart movement to said roller relative to said frame.

12. An adjustable roller assembly for a gauge comprising a frame, a post eccentrically mounted on said frame, a sleeve carried by said post and having a slot therein, guide means secured to said frame and engaging said slot, a roller member rotatably mounted on said sleeve, an eccentric bushing interposed between said sleeve and said post for cooperating with said guide means and slot to impart motion to said roller relative to said frame, and means for locking said roller in a predetermined position relative to said frame.

13. A gauge comprising a frame, a roller assembly secured to the frame and rotatable about a fixed axis, a plurality of posts spaced from the roller assembly, a sleeve carried by each of said posts and having a slot therein, guide means secured to said frame adjacent each of the sleeves and engaging the slot, and means interposed between each of the posts and sleeves for cooperating with the guide means to impart movement to the sleeves relative to the frame substantially toward or away from the fixed axis.

14. A gauge comprising a frame, a first guide assembly secured to the frame, a second guide assembly movably mounted on the frame spaced from the first guide assembly, said second guide assembly comprising a post eccentrically movable relative to said frame, means for securing the post in a fixed position relative to said frame, an eccentric bushing movable relative to said post, a sleeve mounted on said bushing, means for securing said bushing and sleeve in a predetermined position relative to said post, and roller means rotatably mounted on said sleeve.

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