Sept. 6, 1966 S. G. JOHNSON 3,270,427

THREAD GAGE SETTING OR CLAMPING DEVICE

Filed Aug. 5, 1963 2 Sheets-Sheet 1

FIG. 1.

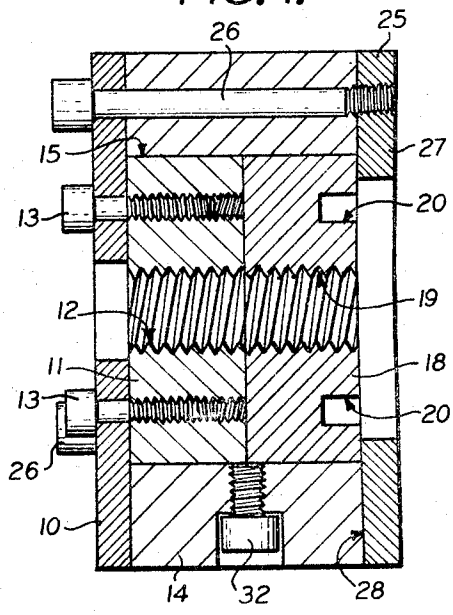



FIG. 2.

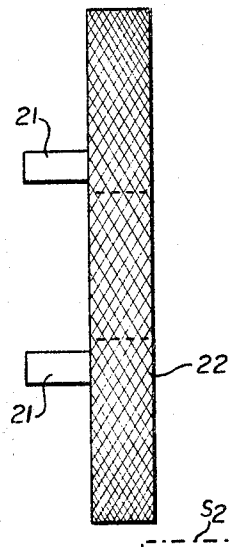



FIG. 4.

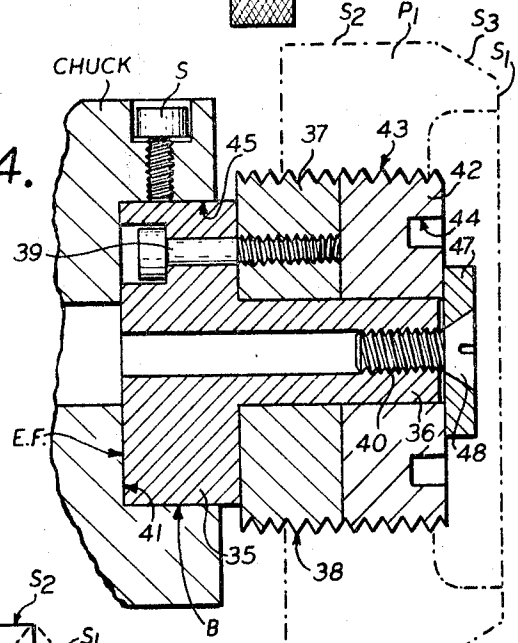
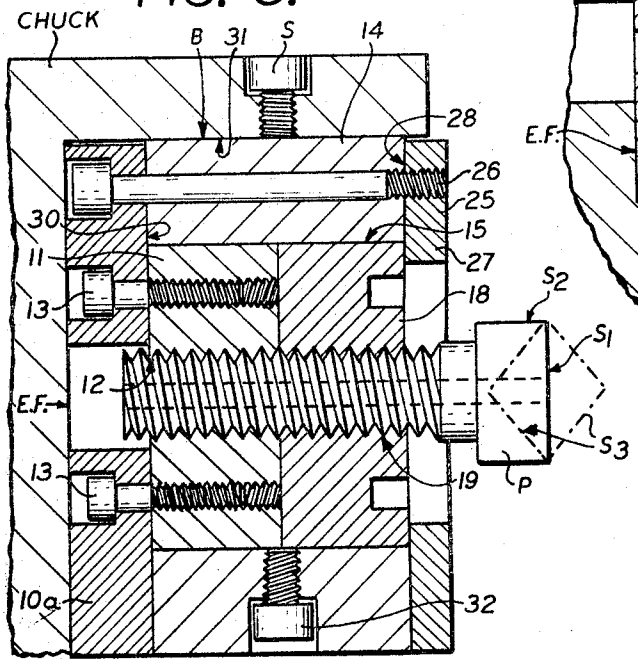



FIG. 3.




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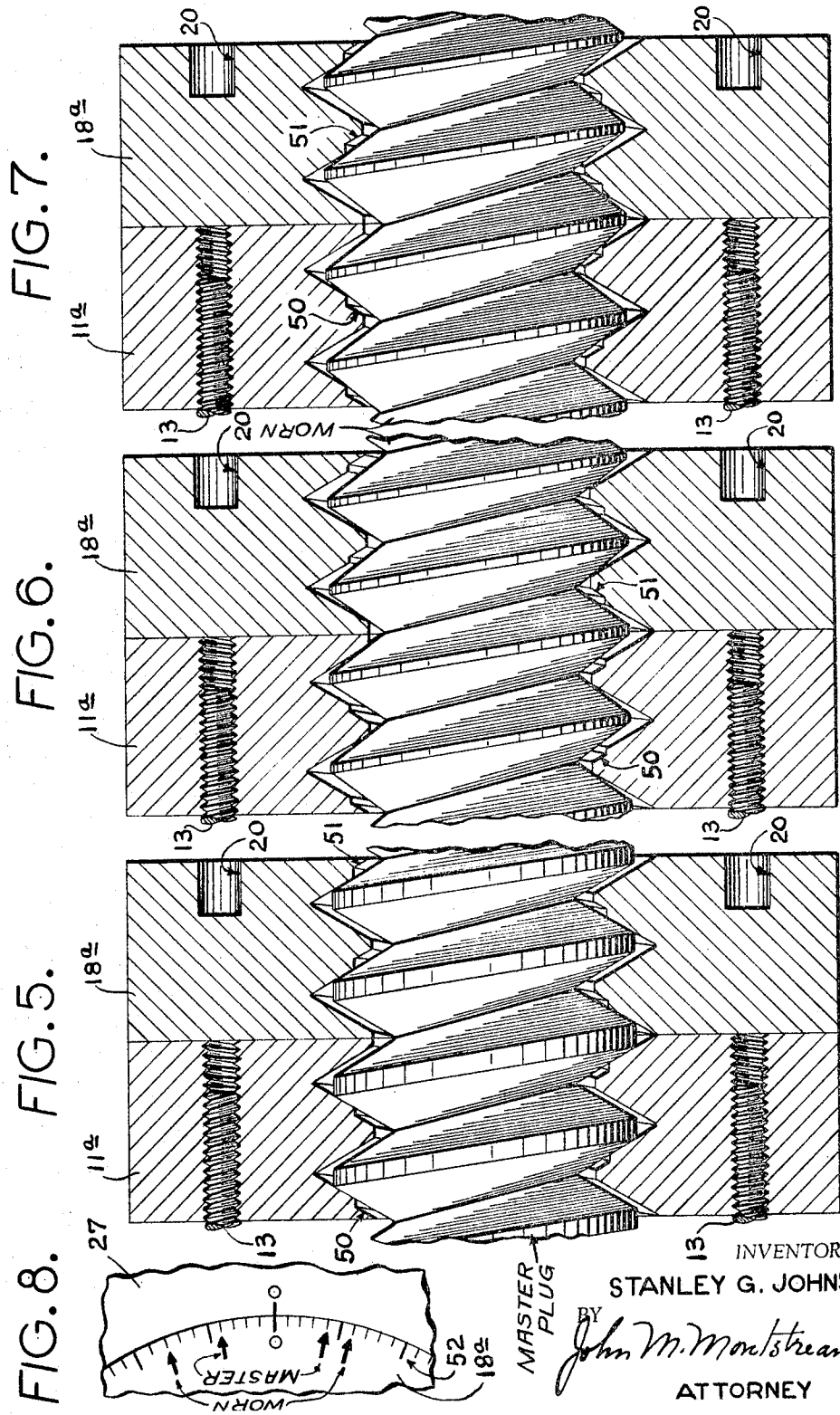
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THREAD GAGE SETTING OR CLAMPING DEVICE

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3,270,427

# THREAD GAGE SETTING OR CLAMPING DEVICE

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5 Claims. (Cl. 33—199)

The invention relates to a thread gage setting, clamping and thread testing device which is applicable to internal threads or external threads, although the economic factors of the device as a gage setting means appears to be greater and more material with respect to an expandible thread plug gage having external threads. For a thread gage setting device to be used to set an expandible thread plug gage, the setting device is a thread ring means with internal threads which is adjustable over a relatively narrow range that is a range for one thread solely but with different tolerances.

An object of the invention is to construct a thread gage setting device using two members, each member having a thread of the same size and pitch and in axial alignment and one member being rotatable with respect to the other and to which is applied a frictional drag for assuring that the setting device holds its setting.

Another object is to construct a thread clamping device as described in the preceding paragraph for clamping the thread of a threaded part in which the frictional drag provides more positive clamping of a threaded part so that another surface or surfaces on the part may be processed square and/or concentric with respect to the thread on the part.

A more particular object is to construct an adjustable thread gage setting device or thread ring device of two members with one member being rotatable with respect to the other and each having a thread of the same size and pitch and in axial alignment which can be set with a relatively inexpensive master thread plug and held set so that the ring gage setting device may then be used for setting an expandible thread plug gage to proper size for gaging threaded holes.

Another object is to construct a device for measuring the wear on a plug gage of the solid and expandible type.

Other objects of the invention will be more apparent from the following description when taken in connection with the accompanying drawings illustrating preferred embodiments thereof in which:

FIG. 1 is a section through a thread gage setting and clamping device having an internal thread;

FIG. 2 is an adjusting wrench for the device;

FIG. 3 is a section through the device serving as a thread clamping means to grip the thread of a threaded part.

FIG. 4 shows a like device constructed with external threads.

FIG. 5 is a section of the rings with a master plug.

FIG. 6 is a section of the rings with a worn thread plug therein engaging one flank.

FIG. 7 is a section of the rings with a worn thread plug therein engaging the other thread flank.

FIG. 8 is a view of a scale carried by the device.

The device illustrated in FIG. 1 includes a frame member which could be one part, however manufacturing convenience makes it desirable to be as particularly shown. The frame member is made up of three parts including an end plate **10**, a first or fixed ring **11** having an internal thread **12** and secured to the end plate by screws **13**. The frame also includes a case **14** having a bore **15** which receives the ring **11**.



A second or cooperating member is a ring **18** which is mounted in the bore **15** of the case **14** for rotation or angular displacement or adjustment with respect to the ring **11**. The cooperating ring **18** has an internal thread **19** which is of the same size as the thread **12** and of the same pitch and is in alignment therewith. The cooperating ring **18** may be adujsted rotatively relatively to ring **11** by any suitable means, that illustrated including holes **20** in the outer face thereof for receiving pins **21** carried by an adjusting wrench **22**.

Means are provided to apply a frictional drag on the cooperating ring sufficient to keep this ring in adjusted position. The frictional means shown is combined with an end or friction plate **25** secured to the frame member by screws **26**, which screws also secure the casing to the plate **10**. Angularly spaced screws **26** are shown. The end plate has a retaining and friction portion **27** extending inwardly which engages or overlaps the outer face of the cooperating ring **18** so that it also retains the cooperating ring in the frame member.

The frictional drag may be secured by making the combined width of rings **11** and **18** slightly greater than the width of the case **14** say about $\frac{1}{1,000}$ of an inch so that when the screws **26** are tightened, the portion **27** of the ring **18** presses against the outer face of the cooperating ring **18** and establishes a frictional drag therebetween as well as pressing the inner face of the cooperating ring against the abutting face of the ring **11** so that there is also frictional drag on the abutting face of the ring **18**. In order to avoid precise manufacture, a better construction is to taper inwardly the end face **28** of the case **14** by about 1 degree and make the combined widths of the rings **11** and **18**, about 1- or 2-thousandths of an inch less than the width of the casing. The end plate **25** has sufficient flexibility to frictionally engage the end face of the ring **18** for example for a one quarter inch thread the clamping plate is about one-sixteenth of an inch thick. In other words in the construction particularly shown the rotatable cooperating ring is lightly clamped between the ring **18** and the end or friction plate.

In using the device for setting an expandible thread plug gage, a master threaded plug of the desired thread size is threaded into the thread **12, 19** and the cooperating ring or member **18** is then rotated with respect to the frame member until the thread **12, 19** removably or lightly binds the master thread plug with the thread of one ring engaging one flank of the thread of the master thread plug and the thread of the other ring engaging the other flank of the master. The master plug is then unscrewed from the thread **12, 19** and the gage setting device has the proper size for setting an expandible thread plug gage. The frictional drag provided on the rotatable cooperating member **18** is sufficient to retain this member in its set position against inadvertent changing of the setting such as would occur when the master thread plug is unthreaded from the gage setting device if there were no or insufficient frictional drag to hold the setting.

Using the device as a clamping means for holding a manufactured threaded part P for additional processing is illustrated in FIG. 3. The thread device used as a thread clamping means is secured such as by a screw or spaced screws S in a chuck or socket means which has a bore B therein and an end face EF at the bottom of the bore. The face EF is accurately square with respect to the axis of the bore. The end face **30** of the thread clamping device is accurately square with respect to the axis of the threads **12, 19** and when engaging the end face EF of the bore, it is known that the axis of the thread **12, 19** is at right angles to the axis of the chuck or the

face EF. The surface S1 of the part P may then be ground or lapped with assurance that the surface will be processed square with respect to the axis of the thread on the part P.

The part P is threaded into the thread 12, 19 of the frame member and cooperating member whereupon the cooperating member 18 is rotated until the thread of the port is gripped on one flank by the thread 12 and on the other flank by the thread 19. The frictional drag provided on the rotatable cooperating member 18 with the friction means or clamping plate assures that under the processing there will be no unloosening of the part because there is superimposed upon the gripping action of the threads 12, 19 on the thread of the part P, the additional frictional drag imposed against rotation or unloosening applied by the rotatable cooperating member 18. It will be noted that if the clamping action were solely in the threads 12, 19 that this clamping action is on a helix or inclined plane of the thread which may tend to unloosen the same when the part is being processed whereas the frictional drag on the rotatable cooperating member 18 is the same at all times, and added to the gripping action on the threads of the part.

Often times concentricity is desired of the surface S2 or S3 with respect to the axis of the thread on the part P. If this is the processing to be performed on the part P then the peripheral surface 31 of the frame of the device is accurately ground concentric with respect to the axis of the thread 12, 19. The bore of the chuck or socket is made accurately concentric with the axis of the chuck. The gripping action of the threads 12, 19 centers the thread of the part on the axis of the threads 12, 19. When the surface S2 of the part P is then ground, lapped, or otherwise processed, it is known that this surface is concentric with the axis of the thread of the part P. If both squareness and concentricity of surfaces with respect to the thread of the part is desired, then the face EF of the chuck is made square with respect to its axis and the bore B is made concentric with respect to the axis of the chuck. The part P may have either an external cone or an internal cone S3 as shown in dot-dash lines which must be accurately processed concentric with the thread of the part. The thread clamping device assures that such conical surface on part P will be accurately concentric with the axis of the thread of the part. The part P may have any one or more of the surfaces mentioned for processing.

If the threaded rings 11 and 18 should not be in precise alignment with the exterior surface or periphery of the device it can be adjusted through adjusting screws 32 carried by the case 14, three of which screws are located 120° apart in the case. The end of the screw engages the periphery of the two thread rings or members and will shift and lock them in position with the periphery of the case or frame member in alignment with the thread axis.

In the construction of FIG. 4, a gage setting and clamping device is illustrated with an external thread for setting a contractible internal thread gage or for holding a part P1 with an internal thread for further processing of another surface or surfaces, such as grinding or lapping, so that the surface is or surfaces are square and/or concentric with respect to the axis of the thread of the part. This device comprises a frame member 35 having an external screw thread 38 and a co-operating member 42 which is rotatable with respect thereto and has an external screw thread 43. The frame member includes a mounting means 36 and a separate threaded ring 37 received on the mounting means although the parts 35 and 37 may be one part. The ring 37 has an external thread 38. The ring is secured to the spindle 35 by the screws 39 so that the frame member could be an integral member if desired.

A co-operating ring 42 is also received on the mounting means 36, and is rotatable thereon. The co-operating ring has an external thread 43 which is the same size and pitch and in alignment with the thread 38. The co-operating ring 42, is turned on the mounting means such as through the holes 44, which receive the wrench of FIG. 2.



A drag means is provided to apply frictional pressure on the cooperating member. The manner in which this may be provided in the construction illustrated, is to make the length of the mounting means 36, slightly less than the combined widths of the rings 37 and 42, so that the outer face of the cooperating member extends slightly beyond the end of the mounting means, such as 1/1000th of an inch. A clamp and retaining plate 47 has an outer portion thereof engaging the front face of the cooperating ring 42. The plate 47 is attached to the frame member or particularly to the mounting means 36 such as by a screw 48, so that tightening of the screw 48 brings the outer portion of the clamp plate 47 into frictional contact with the face of the cooperating member 42 and also presses the abutting faces of the two rings into frictional contact to give the desired drag on the cooperating ring. The end face of the mounting means may be tapered or inclined as in the construction of FIGS. 1 and 3 if desired.

A part P to be processed is threaded onto the thread 38, 43 after which the cooperating ring 42 is turned so that the thread 38 engages one flank of the thread on the part P1 and thread 43 engages the other flank of the internal thread of the part to clamp or grip the part thereon. The frictional drag on the cooperating ring 42 augments or is added to the gripping or clamping action on the thread to assure a firm grip on the thread for processing of at least one other surface such as S1, S2 and S3 of the part.

It is desired to have the face S1 square with respect to the internal thread of the part, the end face 41 of the frame member is accurately square with respect to the axis of the thread 38. With the bottom of the bore of the chuck accurately square with respect to its axis and with the end face 41 engaging the bottom of the bore it is known that the clamping device and its thread 38, 43 is square with the respect of the axis to the chuck. The face S1 of the part P may then be processed and it will be square with respect to the internal threads of the part P.

If it is desired to have the surfaces S2 and/or S3 of the part P concentric with respect to the axis of the internal thread, then the periphery 45 of the frame member 35 is accurately ground concentric with the axis of the thread and the bore B of the chuck is ground concentric with the axis of the chuck, so that when the frame member is mounted therein, it is known that the axis of the frame member is concentric therewith. The surface S2 or S3 or both when ground will be concentric with the internal thread of the part P1. It is clear that with the bottom or end face EF of the bore square with respect to the axis of the chuck and the bore B being concentric with the axis of the chuck, then surface S1 may be processed square with respect to the axis of the internal thread, and the surfaces S2 and S3 when processed will be concentric with the internal thread of the part.

The externally threaded device may be used for setting a contractible thread gage, however, the economic factor is not as favorable as with an external thread because such gage can be set on a solid thread plug. As a clamping device for gripping a threaded part for additional processing to secure a surface which is square with respect to the thread of the part and/or one or more surfaces which are concentric with respect to the thread of the part, it has all of the advantages of the internally threaded clamping device. The gage setting and clamping device by virtue of its construction will also compensate for a slight taper in the thread of the part P or P1. For a setting and clamping device for a quarter inch thread a frictional drag of about 3 inch pounds is satisfactory. For larger sizes of threads the frictional drag should be greater. The number of threads 19 or 43 is of no par-

ticular importance and may be one thread on each ring or any greater number of threads.

FIGS. 5 to 8 illustrate an additional feature in the device, the purpose of which is to test a thread plug gage either of the expandible or solid type, as to the wear which has occurred in the thread as a consequence of use. Heretofore, a solid thread plug gage was commonly tested for wear by threading the same into a master ring of minimum allowable diameter and shaking the same therein. If there is shake or the shake was deemed to be too great the plug was discarded. Obviously this test depends upon the judgment of the person and is not a particularly reliable method of determining the extent of wear. An expandible thread plug gage cannot be tested in a simple way and may require expensive equipment such as a projection tester. Usually the wear in both types of thread plugs is a minimum at the roots of the thread and may be substantial, in a gage sense, at the peaks of the thread.

FIGS. 5 to 8 illustrate threaded rings **11***a* and **18***a* which may be substituted for the rings **11** and **18** in the case **14** of FIG. 1. These two rings are identical with rings **11** and **18** in every respect excepting that the internal thread on one flank of one ring **11***a* is relieved or cut away at **50** from the peak of the thread to a point at or roughly about the pitch diameter. The opposite flank of the other ring **18***a* is similarly relieved at **51**. This relief is on one flank only of the thread of each ring and the other flank of each thread helix is a full flank. The amount of the relief provided need be only about a few thousandths of an inch, such as .002 more or less and may be somewhat greater for larger sizes. The relief is enough to enable the maximum allowable wear to be measured.

The device of FIG. 1 so modified will now test for wear which has occurred from use of a thread plug gage. The test is secured by inserting a master plug and turning the rotatable ring in both directions and noting the two readings on scale **52**. It will be noted in FIG. 5 that the relieved flank does not affect the reading with a thread master. The plug to be tested is then inserted and the rotatable ring **18***a* is turned in the same direction, as shown in FIG. 6, so that the flank of the thread of the plug being tested engages the full flank of each ring and a reading taken on the scale **52** of the angular movement of the ring. This reading provides a comparison with the scale reading for the master plug. The rotatable wing **18***a* is then turned in the opposite direction until the worn thread plug is engaged by the relieved flanks of the two rings as shown in FIG. 7 and because of the relief and the wear, the thread of the test plug excludes that portion of the thread which has minimum or no wear and as a consequence of this the ring has to be turned farther before the relieved flank of the thread of the rings will engage the flank of the thread of the thread plug under test. A comparison with the first reading as to the extent of angular movement greater than that for both the test plug and the master plug will indicate the gage is worn and the amount of this wear and at about the pitch diameter. These two readings on the test plug when compared with similar readings made with the master plug will give a good picture of the extent of wear in the solid thread plug being tested. A fair indication of wear would be given by the relative scale readings of the two tests on the worn test plug alone.

For testing an expandible thread plug gage for wear, a master thread plug is threaded into the rings and the rotatable ring is rotated first in one direction until the full flanks engage the master thread plug. With this setting the device has the gaging elements of the expandible plug gage inserted therein and expanded and the reading noted on the dial indicator thereof. The master thread plug is again threaded into the device and the rotatable ring is rotated in the opposite direction to bring the relief flanks of the two rings into engagement with the master plug. As shown in FIG. 5 the peaks of



the thread of the master plug control the position of the rotatable ring. The master plug is removed and the expandible thread gage is inserted in the device and expanded and the indicator reading noted. The difference between this reading and the reading from the first reading provides a reasonably accurate indication of the wear in the expandible thread plug gage.

It is clear that the same relief may be provided on one flank of the ring **37** and on the opposite flank of the thread of the ring **42** in which event the device of FIG. 4, may be used to test the wear in a ring gage either of the solid type or of the expandible type in the same manner as described.

The scale of FIG. 8 may be provided on the end face of one of the parts namely the rotatable ring **18***a* or the friction plate **25** and a zero mark on the other part. In FIG. 8, the scale is shown as being on the face of the ring **18***a*.

Although the construction of FIGS. 5 to 8 can be used as a clamp there is no useful purpose in the relieved thread in a clamping use.

This invention is presented to fill a need for improvements in Thread Gage Setting, Clamping and Testing Device. It is understood that various modifications in structure, as well as changes in mode of operation, assembly, and manner of use, may and often do occur to those skilled in the art, especially after benefitting from the teachings of an invention. This disclosure illustrates the preferred means of embodying the invention in useful form.

What is claimed is:

**1.** A thread gage setting and clamping device comprising a frame member, a cooperating member, each member having a screw thread of the same size and pitch and with their axes in axial alignment, mounting means carried by the frame member to mount the cooperating member thereon solely for rotation on the thread axis as a center, friction means carried by the frame member and engaging the cooperating member and applying a frictional drag of a fixed amount on the cooperating member against relative rotation with respect to the frame member and in all rotary positions, and the frictional drag being of the order of three inch pounds for a thread of a quarter of an inch in size and being progressively greater for larger diameters, and circumferentially spaced screw adjusting means carried by the frame member and engaging the peripheries of the two members.

**2.** A thread gage setting device to be used with a master threaded element and clamping device comprising a frame member having a cylindrical bearing forming a mounting means, a first ring member carried on the mounting means and secured to the frame member, a cooperating ring member, each ring member having a screw thread of the same size and pitch and with their axes in axial alignment, the cooperating ring member being mounted on the mounting means solely for rotation on the thread axis as a center, the cooperating ring member having a dimension such that it projects a fixed minute amount beyond the end of the frame member, friction means carried by the end of the frame member and having a radial dimension overlapping and engaging an end of the cooperating ring member around a complete circular portion of the said member and to retain said member on the frame member, screw means carried by the end of the frame member immovably securing the friction means thereto so that the overlapping portion of the friction means pressure engages the cooperating member, the friction means having a flexibility to movably clamp the cooperating member between the friction means and the first ring member to apply a frictional drag upon the cooperating member of a fixed and constant amount against relative rotation with respect to the first ring member and in all rotative positions of the cooperating ring member, and the flexibility being such that the cooperating member is readily rotatable on the

mounting means for adjustment but with sufficient frictional drag or resistance to retain the same in adjusted position against threaded withdrawal of a master thread element.

3. A thread gage setting and clamping device as in claim 2 in which the frame member comprises a spindle, mounting means carried by the spindle, a first ring secured to the spindle on the mounting means and carrying the aforesaid thread, the thread being an external thread, the cooperating member having an external thread, the mounting means having a length slightly less than the combined width of the two rings, the friction means being a friction plate secured to the end of the spindle and having a portion engaging the end face of the cooperating ring whereby the friction plate rotatively and frictionally engages the cooperating ring between the first ring and the clamping plate.

4. A thread gage setting and clamping device as in claim 2 in which the frame member comprises an end plate, the second ring being secured to the end plate and carrying the aforesaid thread, the thread being an internal thread, a casing secured to the end plate having a bore receiving the ring, and providing mounting means therefor, the cooperating member being a ring received in the bore of the casing and its thread being an internal thread, the friction means being a friction plate carried by the end of the casing and engaging the cooperating



ring, the casing having a width slightly less than the combined width of the two rings whereby the friction plate rotatively and frictionally clamps the cooperating ring between the first ring and the clamping plate.

5. A thread gage setting clamping and testing device as in claim 4 in which one flank of the thread of one ring is relieved from the peak of the thread to the region of the pitch diameter, and the opposite flank of the other ring is relieved a like amount from the peak of the thread to the region of the pitch diameter.


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