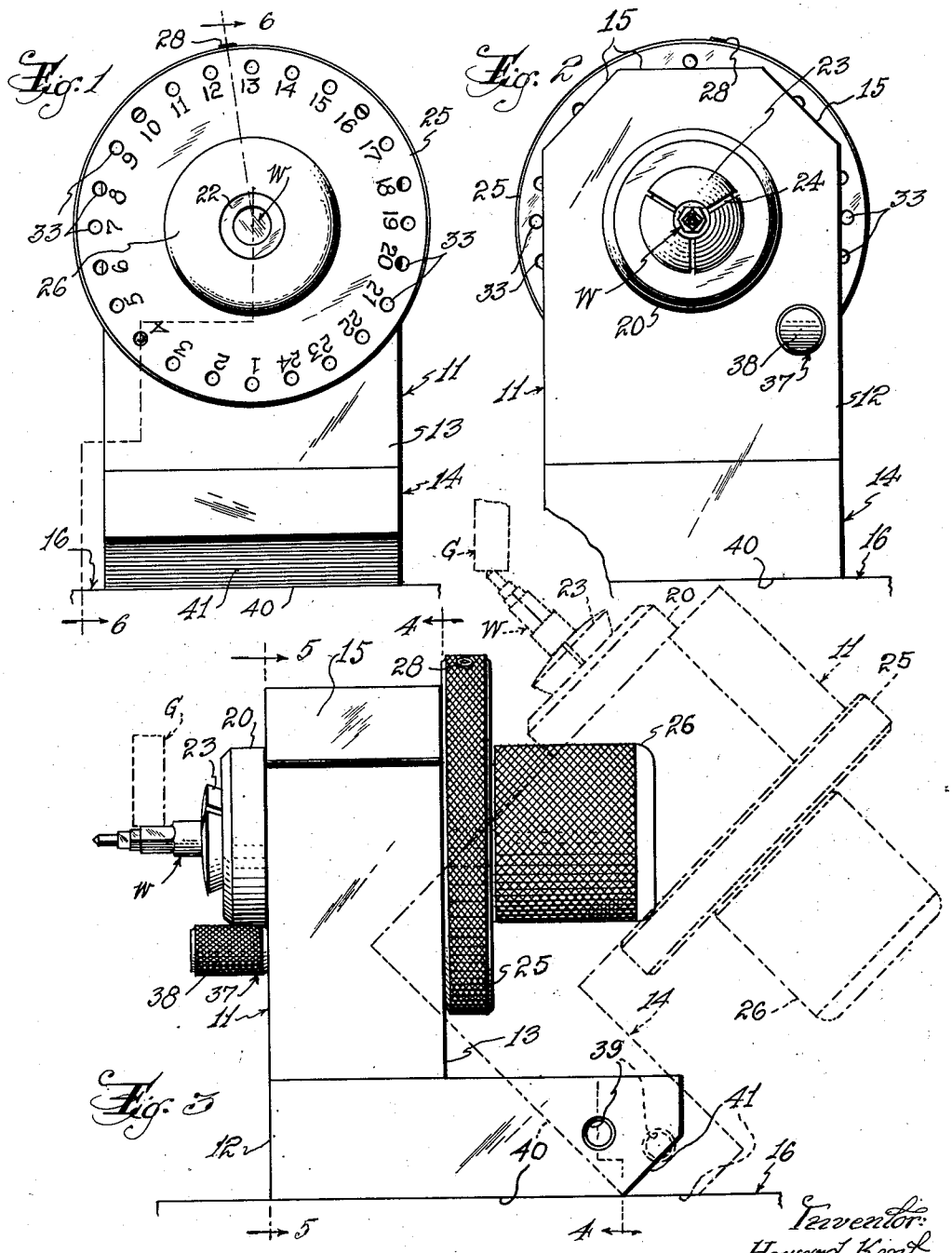
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SIMPLIFIED INDEXING GRINDING FIXTURE

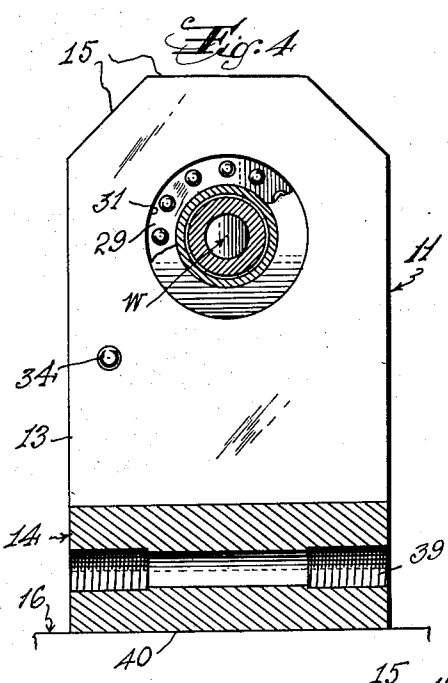
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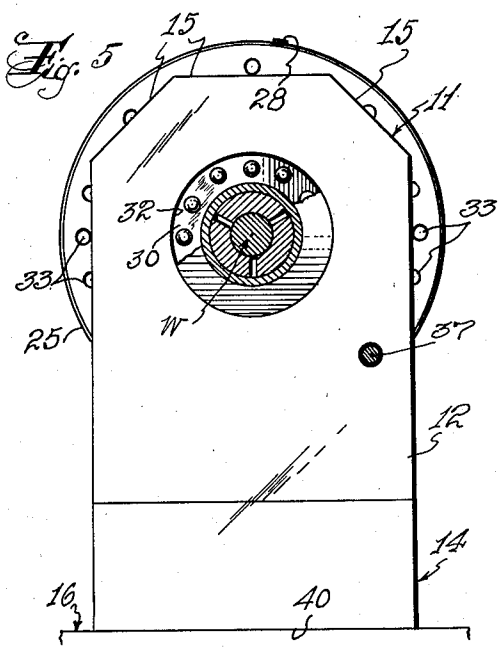


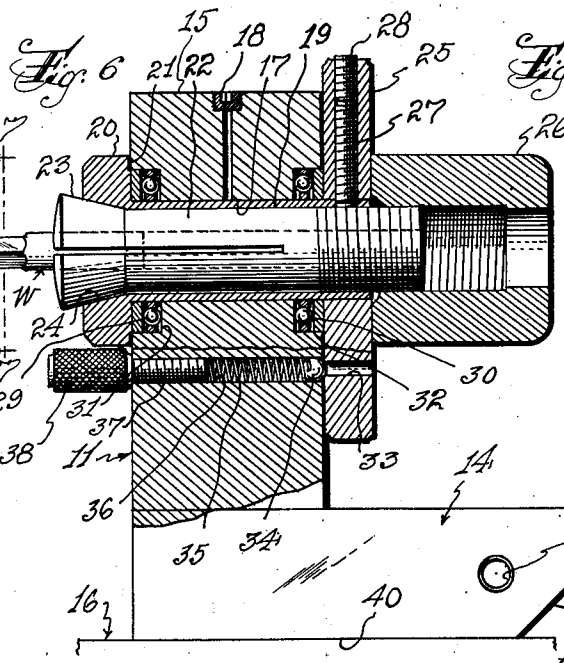
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SIMPLIFIED INDEXING GRINDING FIXTURE

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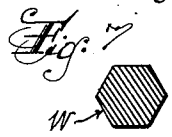














Inventor:
Howard Kent

BY Dudley B. Howard
Attorney.

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SIMPLIFIED INDEXING GRINDING FIXTURE

Howard Kent, Florham Park, N. J.

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2 Claims. (Cl. 51—217)

The invention relates to indexing workpiece holding fixtures for grinding machines and has for its primary object to improve upon prior art devices of this kind by reducing the number of component parts and the overall size without sacrificing any of the usual functional capabilities.

Another important object of the invention is to provide chuck adjusting and indexing means that afford greater ease, speed and precision of manipulation than is possible in use of the prior art devices.

A further object is to provide a workpiece holding fixture that has novel means in conformance with the underlying principle of extreme simplicity by which the angular relation of the rotational axis of the workpiece-holding chuck and the axis of the grindstone of the machine to which the fixture is attached may be varied without the use of complex screw mechanisms or the like.

The above and other objects, features and advantages of the present invention will be more fully understood from the following specific description when considered in connection with the accompanying drawings, in which:

Fig. 1 is a rear elevation of the improved fixture when mounted on a grinding machine table with the rotational axis of its chuck in horizontal position; Fig. 2 is a front elevational view of the same, partly broken away; Fig. 3 is a side elevation, showing a tilted arrangement of the device for taper grinding in broken lines; Fig. 4 is a vertical transverse section on line 4—4 of Fig. 3; Fig. 5 is a similar view on line 5—5 of Fig. 3; and Fig. 6 is an axial section on line 6—6 of Fig. 1.

Fig. 7 is a large scale cross-sectional view of the exemplary workpiece shown in Figs. 1 to 6 taken on line 7—7 of Fig. 6; Fig. 8 is a similar view on line 8—8 of Fig. 6; Fig. 9 is a similar view on line 9—9 of Fig. 6; and Fig. 10 is a similar view on line 10—10 of Fig. 6.

Referring now in detail to the drawings, wherein like reference characters designate corresponding parts in the several views, housing 11 preferably is block-like in form. For convenience of orientational reference to parts of the device hereinafter, it will be considered that the vertical exterior surface 12 of housing 11 which faces the workpiece is its front face and the opposite surface 13 is its rear face. A foot-like base 14 projects rearward from housing 11 and may be detachably secured in any suitable manner to the latter, or within the scope of the invention both housing and base may be fabricated in one piece (not shown). At its top, for a purpose to be explained later herein, housing 11 is provided with angularly arranged finger-rest precision-adjustment faces 15.

It is preferred to affix the device to the table of a grinding machine by magnetic attraction in accordance with well known practice, so magnetizable material, such as steel, is used in the construction of housing 11 and base 14. In order to strengthen the magnetic attachment, housing 11 and base 14 at least should be as massive as is consistent with compactness.

Housing 11 is provided with a through bearing opening 17 which extends from front to rear and the axis of which is horizontal when said housing is in the position shown in solid lines in Fig. 3. The bearing surfaces of opening 17 may be lubricated by means of the oiler fitting 18.

Chuck means for grippingly engaging and rotating a workpiece W includes a chuck sleeve 19 which is journaled in bearing opening 17 and is of such length that

both ends protrude from said opening. The front end of sleeve 19 is enlarged to provide an annular head 20 having a flat inner face 21 in parallel proximity to the front face 12 of housing 11. The chuck means is completed by a chuck collet 22 which is fitted slidably in chuck sleeve 19. The front end of chuck collet 22 has the conventional slotted and tapered head 23. In cooperation with chuck collet 22, head 20 of chuck sleeve 19 has a flaring mouth 24 corresponding in shape to tapered collet head 23 and adapted to fit the same. The tail end of chuck collet 22 projects to a considerable extent beyond rear face 13 of housing 11 to accommodate a manipulatable indexing disk 25 and also a manipulatable draw nut 26 which has screwthreaded engagement with said tail end of the chuck collet externally adjacent to said manipulatable indexing disk, which latter is affixed to chuck sleeve 19 by suitable means such as setscrew 27. A locking screw 28 may be added to prevent loosening of setscrew 27 by vibration. Both indexing disk 25 and draw nut 26 may be peripherally knurled, as shown, to afford a firm handgrip. Draw nut 26 will draw chuck collet 22 rearwardly when turned in the proper direction on the tail end of the latter, while bearing against the rear face of indexing disk 25. When this is done, the tapered head 23 of chuck collet 22 will be compressed by flaring mouth 24 of the head of chuck sleeve 19 into gripping engagement with the shank of workpiece W. At the same time, the front face of draw nut 26 will become frictionally engaged with the rear face of indexing disk 25 so securely that said nut may be used very effectively under certain operating conditions in addition to, or in substitution for, indexing disk 25 as means for rotating or indexing the workpiece. In order to afford sufficient leverage for its primary collet operating function and its additional chuck rotating function, draw nut 26 should be substantially equal in external diameter to half that of indexing disk 25. The practical utility of this dimensional relation will become apparent as the operation of the device is described later herein.

Thrust bearing means for chuck sleeve 19 is provided by inserting front and rear anti-friction bearing units 29 and 30 of annular shape into recesses 31 and 32, respectively, formed by countersinking the front and rear ends of bearing opening 17 in housing 11. Anti-friction bearing unit 29 is interposed between head 20 of chuck sleeve 19 and the inner wall of recess 31. Similarly, anti-friction bearing unit 30 is interposed between indexing disk 25 and the inner wall of recess 32. Both anti-friction bearing units thus insure adequate clearance between housing 11 and the adjacent faces of head 20 of chuck sleeve 19 and indexing disk 25. In this way, the bearing friction of rotatable assembly 19—22—25—26 is reduced to a minimum.

To permit indexing of the workpiece-holding chuck constituted by sleeve 19 and collet 22 selectively for the purpose of grinding various polygonal or circular faces on a workpiece, manipulatable indexing disk 25 has been provided with a circular row of uniformly angularly spaced axial apertures 33. In the present illustrative example, there are exactly twenty-four apertures, which thus divide a circle into angular segments of fifteen degrees each. To permit checking of indexing disk 25 in each of the twenty-four angularly adjusted positions for which provision has been made, detent means has been installed in a single fixed position in housing 11. The preferred detent means includes a detent member 34 proper of spherical form and a compression spring 35 which are enclosed and guided in through bore 36 provided in housing 11 preferably near the lowermost part thereof. Detent member, or ball, 34 is freely slidable axially in bore 36 but is larger in diameter than each aperture 33 of indexing disk 25. Spring 35 is backed by tension regulating member 37 which has screw-threaded engagement within the front portion of bore 36 and tends, when compressed by said member 37, to force detent member 34 into checking, or locking, engagement with any selected aperture 33 of indexing disk 25 that may be in registration with bore 36. Whether indexing disk 25 will be lightly checked in motion to cause a "clicking" count-aiding sound, will be positively locked

against motion in any selected indexed position, or will be free for noiseless rotation, depends upon the tension intentionally applied to spring 35 by regulating member 37. To aid in precise manipulation of member 37, it has been provided with a knurled manipulating head 38 on its exteriorly protruding end.

In order to permit alternative clamping of base 14 of the fixture between the upstanding lugs of a conventional securing device (not shown) instead of using magnetic attraction, said base has been provided with a horizontal transverse through hole 39 which is terminally screwthreaded for engagement by the usual clamping bolts (not shown) of the securing device. The precise position of bolt hole 39 under usual circumstances might be immaterial, but in the present instance there is a reason for locating it in the position shown near the free end of base 14. It will be observed that, in addition to the large-area table-contact under face 40 of base 14, which is parallel to the rotational axis of chuck sleeve 19, there is a further table-contact face 41 inclined at an angle of forty-five degrees to face 40. As a result of this provision, the fixture may be tilted into the position shown in broken lines in Fig. 3 to facilitate the grinding of tapered surfaces on a workpiece. Table-contact face 41 is located in a position wherein, as with face 40, the center of gravity of the fixture will be stabilized in relation to said face 41. In other words, whenever the fixture is resting on either face 40 or 41, it will be in a state of balance because the center of gravity will not be outside the marginal line of support. Clamping bolt hole 39 has been located in the position shown equidistant from both table-contact faces 40 and 41 to accommodate the standard clamping device (not shown) in either angular position of the fixture.

In this connection, it is to be understood that, while only two stabilized angularly arranged table-contact faces have been illustrated, it is within the scope of the present invention to incorporate a greater number of faces and to vary the angular arrangement to suit practical requirements. The inventive principle resides in the simplified means which has been substituted for the usual slides and screw-fed devices for angular adjustment of the rotational chuck axis.

It will be observed upon reference to Figs. 2 and 3 in particular that the peripheral portion of indexing disk 25 projects radially outward from finger-rest precision-adjustment faces 15 of housing 11. This dimensional relation cooperates with the further relation of the outside diameter of indexing disk 25 to that of draw nut 26 to permit an operator to rest the palm of his right hand upon the knurled periphery of nut 26 while the knurled periphery of indexing disk 25 is engaged by the thumb and fingers and the tips of at least two fingers are resting upon precision-adjustment faces 15. With this manner of manipulating grasp and fingertip rest made possible, the operator is enabled to adjust the detent means 34—35—36 to intermediate "clicking" position by use of the left hand and then rotate the entire chuck assembly with great precision in the desired direction while counting "clicks" to determine the degrees of angular change.

The improved fixture is adapted, of course, to use in holding any of various types of workpieces while grinding flat or circular faces thereon, an instance being a broach which must have a series of polygonal sections of the same shape but of progressively decreasing diameter created thereon. However, to illustrate the mode of operation of the indexing means provided in the present invention, the specific form of workpiece illustrated in the accompanying drawings has been chosen as an example of the grinding work that can be done with this device. The operational use of the fixture to produce this illustrative form will now be described.

First, the fixture is placed in proper relation to grindstone G with table-contact face 40 resting on the upper surface of table 16 of the grinding machine (not shown). Then, workpiece W is clamped in chuck collet 22 in the obvious manner by manipulation of draw nut 26. In one indexed position of the chuck means, tension regulating member 37 of the detent means is screwed in tight (Fig. 6) to exert such pressure on detent ball 34 that indexing disk 25 will be locked positively in set position. Now, the first flat face of the hexagonal section shown in cross-section in Fig. 7 is produced by operation of the grindstone (Fig. 3). In order to index

the chuck for the next succeeding flat face on the workpiece, the detent means is decreased in tension to the midpoint condition, wherein "clicking" checking only will occur when indexing disk 25 is rotated. Thereupon, while resting the palm and fingers on draw nut 26, indexing disk 25 and precision-adjustment faces 15 of housing 11, respectively, disk 25 and nut 26 together are turned until four clicks have been heard (and felt) so as to effect an angular change in position of the workpiece of four times fifteen degrees, or a total of sixty degrees, which is required to grind an adjacent face of a hexagon. These adjustments and grinding operations are repeated until the hexagonal section has been completed.

Since the next section of the illustrative workpiece is square (Fig. 8), each angular adjustment of indexing disk 25 is through an angle of ninety degrees, accomplished by turning it through six times fifteen degrees, or until six "clicks" have been heard.

The triangular section (Fig. 9) is ground after adjusting disk 25 through an angle of one-hundred twenty degrees, accomplished by turning it through eight times fifteen degrees, or eight "clicks."

The cylindrical section (Fig. 10) is created by rotational grinding, in which the chuck is rotated freely through a sufficient number of turns to permit the grindstone to complete the grinding operation. To permit free rotation, tension regulating member 37 is screwed out until all tension on detent ball 34 has been relieved. Then, the easiest manner of rotating the chuck may be by turning draw nut 26 with the fingertips, particularly when the section to be ground is of the very small diameter indicated in the illustrative example (Figs. 3 and 6). For greater diameters, where more leverage is required, direct manipulation of indexing disk 25 may be necessary. In this instance, the turning of indexing disk 25 may be effected with great steadiness and precision by resting part of the palm or fingertips on faces 15 of housing 11.

The extreme end of the cylindrical section may be tapered as shown in Fig. 3, by tilting the fixture into the position shown in broken lines before commencing rotational grinding, which proceeds in the same manner as described for creation of the cylindrical section.

It should now be apparent that the improved workpiece holding fixture is not only a device of extreme simplicity and compactness, but is capable of being manipulated with great ease and precision. It is a very versatile tool and has great utility in grinding operations too numerous to mention.

It will be understood that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of illustration which do not constitute departures from the spirit and scope of the invention.

Having thus described the invention, I claim:

1. An indexing workpiece holding fixture for grinding machines comprising: a housing having front and rear faces and a base adapted to rest upon the table of a grinding machine, said housing being provided with a cylindrical through bearing opening extending from front to rear thereof; a chuck sleeve rotatably mounted in the bearing opening of the housing, said sleeve having a flared mouth at its front end; a chuck collet slidable in the chuck sleeve and having a tapered and slotted head cooperatively fitting the mouth of said sleeve; a manipulatable indexing disk affixed to the protruding rear end of the chuck sleeve and having plural axial apertures arranged at predetermined equal angular divisions of a circle concentric to the axis of the bearing opening in the housing; a manipulatable draw nut having screw-threaded engagement with the rear end of the chuck collet and arranged to bear against the rear face of said disk; the housing being provided with an axial through bore located at the same radial distance from the axis of the indexing disk as the row of apertures therein to permit registration with successive apertures during rotary adjustment of said disk; and indexing detent means including a spherical detent member longitudinally adjustable in said axial housing bore and being sufficiently larger in diameter than each of the indexing disk apertures to limit penetration of the latter by said detent member to a depth less than half the diameter thereof, spring means located in said housing bore to press said detent member outwardly against the indexing disk, and

means by which the tension of said spring means may be regulated selectively for respective free turning, locking and audible adjustment of the indexing disk.

2. An indexing workpiece holding fixture for grinding machines as defined in claim 1, wherein the spring means of the indexing detent means is a helical compression spring, and wherein the tension regulating means for said spring is a rotatable member having screwthreaded engagement with the housing bore for pressure contact with the adjoining end of said spring and including an external manipulating portion protruding from the front end of said bore.

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