April 21, 1925. 1,534,356

J. P. BURKE

MICROMETER TUNING DIAL

Filed Aug. 1, 1924

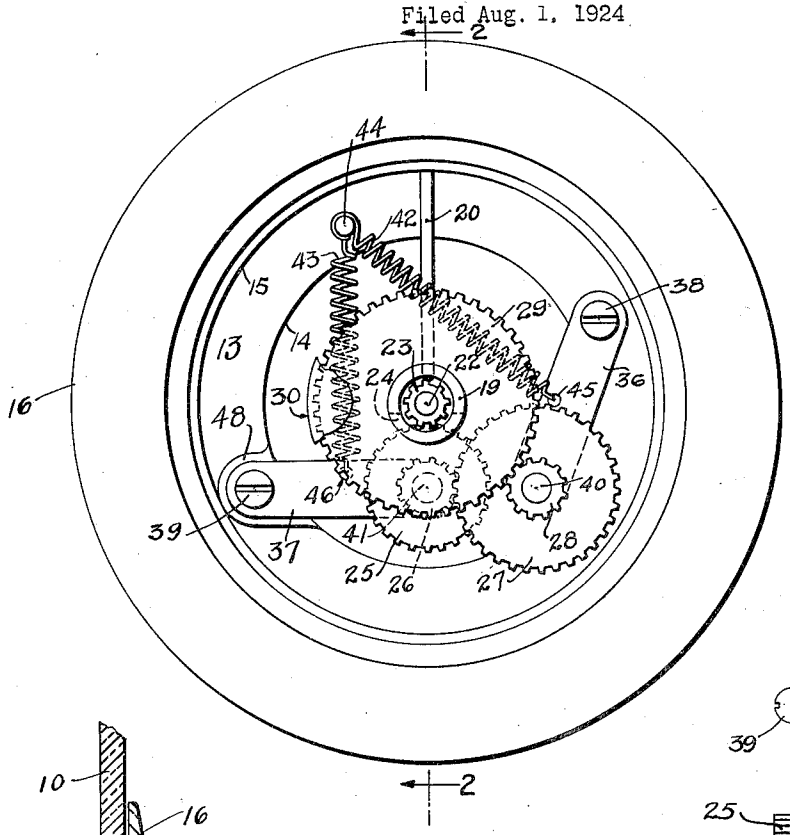


Fig. 1

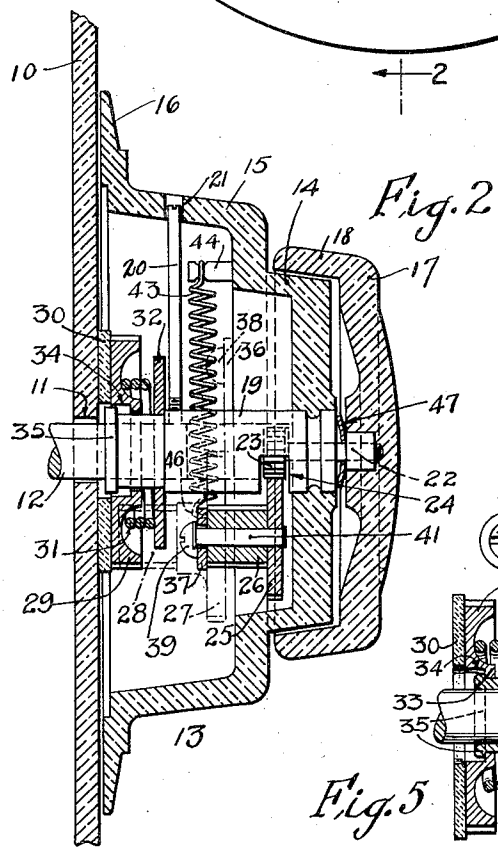


Fig. 2

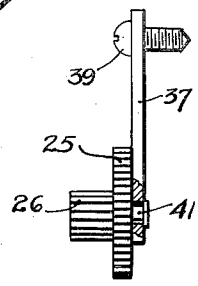


Fig. 3

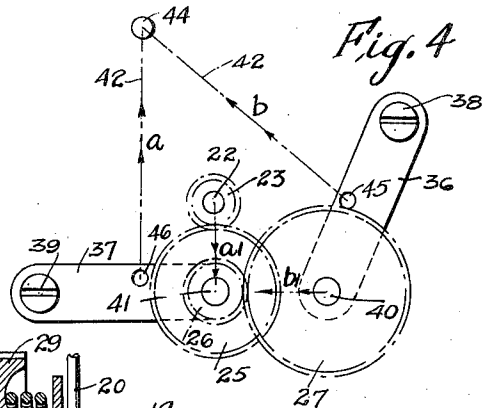


Fig. 4

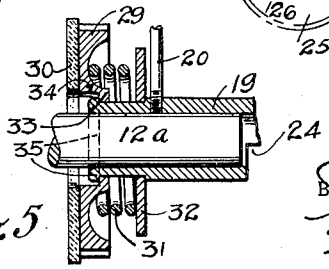


Fig. 5

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UNITED STATES PATENT OFFICE.

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MICROMETER TUNING DIAL.

Application filed August 1, 1924. Serial No. 729,460.

To all whom it may concern:

Be it known that I, JAMES P. BURKE, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Micrometer Tuning Dials, of which the following is a specification.

This invention relates generally to rotary indicators and especially to radio receiving apparatus and more particularly to micrometer tuning devices.

Among the objects of this invention is to provide a micrometer tuning device or dial so arranged as to be actuatable by means of a knob or the like for a micrometer adjustment, said dial being likewise directly actuatable manually whereby the dial can be operated rapidly for an initial setting thereof independently of the knob.

Another object of this invention is to provide a micrometer tuning device or dial which shall be so arranged as to conserve to a maximum the space therein and thereby to permit of a considerable variation in the adjustment or setting of said device to increase the adaptability thereof for use in connection with different types of receiving sets.

Another object of this invention is to provide a micrometer tuning device which can be more readily mounted upon a panel board or the like.

Still another object of this invention is to provide a new and unique way of mounting a set of gears whereby the time and expense incident to said mounting is greatly diminished; and whereby, moreover, the precise centers of said gears are rendered variable, and forces are provided for acting between the centers of the gears, the result being that backlash and other irregularities in the gears are automatically taken up; this arrangement being incorporated within my micrometer tuning device not only to increase the effectiveness and sensitiveness thereof but to enhance its commercial value.

With the foregoing and other objects in view the invention consists in the arrangement and combination of parts hereinafter described and claimed, and while the invention is not restricted to the exact details of construction disclosed or suggested herein, still for the purpose of illustrating a practical embodiment thereof reference is had to the accompanying drawings in which like reference characters designate the same parts in the several views, and in which—

Figure 1 is an inside view of my dial showing the mechanism therein.

Fig. 2 is a section on the line 2—2 of Fig. 1 showing the dial mounted upon a receiving set.

Fig. 3 is a detail view of one of the gear carriers.

Fig. 4 is a diagram of a feature of the invention.

Fig. 5 is a detail view of Fig. 2 showing the position of certain parts in normal detached position.

Referring now more specifically to the drawings 10 represents a panel board or other suitable plate or support having a hole 11 through which a shaft 12 is adapted to pass, said shaft being secured or journaled at an end thereof to a variable condenser or other tuning instrument, which being conventional is omitted here, the shaft being broken off as shown, while the other end of the shaft supports a dial or housing 13 in substantially perpendicular relation to the panel board. The dial comprises a pair of conical communicating right frustums 14 and 15 which are concentric with each other and are set base to base and with the elements thereof substantially parallel. The dial is secured to the low speed shaft 12 so as to be non-rotatable relatively thereto, an angular movement of the dial causing a corresponding and equal movement of the shaft and a consequent change in adjustment of said instrument as will be described hereinafter. A usual circular flange or plate extension 16 is provided at the base of the frustum 15 and in proximity to the panel board and parallel thereto and adapted to bear a scale or the like for indicating the rotation of the dial in any suitbale manner. A cap or chambered knob 17 mounted upon the dial and concentric therewith formed substantially symmetrical to the frustum 14 and of larger diameter so as to be adapted to receive the same has a flange or ring extension 18 to facilitate the gripping of said knob by the hand of the operator. The knob is rotatable relatively to the dial so as to actuate the mechanism within the dial for rotation of the same as will soon be described. Referring to the knob and to its co-operating frustum 14 it will be particularly noted that it has been customary in the prior art to construct the knob of smaller diameter and to

set it with the edge of flange 18 abutting against the face or end wall of the dial structure. However, since it is desirable and often necessary that the dial receive a shaft which may be considerably longer than the usual or standard shaft without the necessity of cutting the same, as shown at 12ª of Fig. 5, the precise arrangement thereof being explained hereinafter, it becomes at once necessary and valuable to use a knob of the type disclosed herein and so to make available a large portion of the space that would otherwise be occupied thereby.

The dial or housing 15 is connected to the shaft 12 for purposes of actuation and support by means of an intermediary sleeve 19 or the like which is concentric with the dial and an end of which is embedded within the wall of the dial adjacent to the knob, while the other end portion receives said shaft and is fastened nonrotatably thereby by means of a pin or set screw 20 which, in order to be readily accessible, is arranged to enter through the side of the dial as shown at 21, the dial, sleeve, and shaft being thus compelled to rotate at the same angular velocity. Journaled within the sleeve at the end thereof adjacent to the knob is a spindle 22, an end thereof extending without the dial and secured in any suitable manner to the knob so as to support the same and to rotate therewith, while the other end of the spindle within the sleeve bears a pinion 23, somewhat smaller than the internal diameter of the sleeve within which it is housed. The sleeve is notched or cut away at a side thereof adjacent to the pinion as at 24, so as to permit meshing of the pinion with a gear 25 mounted in substantially the same plane. A pinion 26 is concentric with the gear 25 and actuated thereby to rotate a gear 27 having a pinion 28 which is of rather considerable width for a purpose soon to be described, said pinion engaging in turn a gear 29 which is adapted to lie adjacent to the panel board. The gear train thus causes a relative rotation and a very great difference in angular velocity as between the gear 29 and the knob. The gear 29 is mounted upon the sleeve 19 in rotatable and axially slidable relation thereto. It will be referred to hereinafter as the clutch gear since it has the definite function of frictionally engaging the panel board or other portion of the apparatus to prevent rotation of itself, which function is accomplished preferably by means of a cork gasket or friction member 30 or the like secured in any suitable manner to the face of the clutch gear adjacent to the panel board. A spring 31 acts between the clutch gear and a plate or collar 32 secured to the sleeve against sliding motion by a shoulder or the like to cause the gear to move along the sleeve and outwardly of the dial and beyond the plane of the dial flange 16 so as to cause the gasket 30 to bear against the panel board as aforesaid. The clutch gear is constructed with a shoulder 33 extending inwardly of its bearing 34, so as to prevent the spring 31 from causing the same to slide off the sleeve by abutting against a circumferential shoulder 35 spun preferably at the extreme end of the sleeve which terminates somewhat within the plane of the dial flange, the face of the gear nearest the panel being thus adapted to pass beyond the end of the sleeve. The bearing surface of the clutch gear consists therefore, in effect, of two co-operating and oppositely formed shoulders or collars. The interaction of the shoulders to limit the rearward movement of the clutch gear as aforesaid under actuation of the spring, the dial being in unmounted or normal position, is shown clearly in Fig. 5. The pinion 28 is sufficiently wide to engage the clutch gear even when in unmounted position. When, however, the dial is mounted as described hereinbefore, the shaft 12 being received within the sleeve 19 until the gasket 30 abuts against the panel board, pressure is then exerted upon the body of the dial to overcome the force of the spring 31 and cause a further movement of the dial toward the panel board until the flange 16 is in relatively close proximity thereto, the set screw 20 being then tightened down, the clutch gear will have been actuated rearwardly to the position shown in Fig. 2, and the spring compressed, the frictional contact between the gasket 30 and said panel being correspondingly increased.

Adjustment of the instrument within the apparatus may be secured directly by grasping the frustum or dial housing 15, and thus causing the shaft 12 to rotate as well as the mechanism mounted within the dial, the friction gasket 30 sliding against the panel in the following manner: In order to take up the torque upon the spindle 22 which is transmitted thereto from the clutch gear 29 and tends to cause the knob 17 to rotate when the dial is actuated directly for rapid rotation as aforesaid, frictional means in the form of a spring washer 47 or the like is provided concentric with said spindle and adapted to act in any suitable manner between the shaft 22 and the shaft 12 as by frictional contact between the sleeve 19 and the knob. The frictional turning resistance or reaction of this spring washer or clutch will be magnified by the gear train and transmitted thereby to the gasket 30 thus insuring that the frictional contact of the panel therewith will be broken when the dial is rotated directly, a sliding contact being substituted so that the gear train will be inactive and the knob rotate uniformly with the dial. When, however, the use of

the micrometer mechanism is desired for sensitive adjustment of said instrument, the knob 17 alone is grasped and turned causing the gear train to operate, the clutch gear being held against rotation as aforesaid by the gasket 30, thereby causing an infinitesimal rotation as aforesaid of the dial and the low speed shaft 12, the torque being imparted to the dial by the gears which are intermediary between the pinion 23 and the clutch gear at their points of attachment to the dial, said dial in turn transmitting the torque to the shaft 12 by means of the sleeve 19 and the pin 20. Thus it will be seen that the clutch gear is in effect at this time a fixed abutment around which the gears adjacent thereto revolve causing the rotation of the main dial or casing to rotate in the same direction at low speed.

To permit of an inexpensive and relatively flexible mounting of the gear train, I use levers or arms 36 and 37 constructed in any suitable manner and secured to the dial rotatably as by screws 38 and 39 or the like at an end thereof, the other ends having bearings within which the pins 40 and 41 are journaled to support gears or the like in the usual manner. Since the arms are movable, resilient means in the form of tension members or the like are provided acting in connection with each arm to actuate the same in predetermined direction so that the gear supported thereby will be caused to move toward the center of the gear that is to co-operate therewith, whereby said gears will normally remain in engagement. Thus springs 42 and 43 act between a pin 44 or the like and said arms as at holes 45 and 46 to cause intermeshing of the gear train. If it is desired to mount the arm 37 in a plane offset inwardly of the arm 36 to facilitate construction of the gear train, a lug 48 can be provided for the purpose.

The theory and operation of my method of mounting a gear train will be readily apparent by referring to the diagram of Fig. 4 as taken from Fig. 1. It will be observed that since the pinion 23 has a fixed center, it is adapted to take up the thrust of the gear 25 caused by the spring 43 acting on the arm 37 in the direction indicated by the arrow a, the reaction of the spindle 22 to which the pinion is secured to take up the turning movement of the force a about the screw 39 being indicated by the arrow a^1 lying between the centers of the pinion and the gear. The gear 27 is in turn actuated by the pinion 26 which is likewise mounted upon the arm 37, a component of the force b of the spring as indicated by the arrow b^1 tending to cause the gear 28 in turn to move along the line joining the centers of the pinion and the gear, the force b^1 being taken up by the reaction of the screw 39 fastened to the dail. It will be observed that a gear train can be constructed in this manner comprising two or more gears arranged in any conceivable fashion. The principal advantages of thus mounting the gears are that the points or places of support of said gears are removed from that comparatively congested region immediately about the gear train, being in effect at the screws 38 and 39, while at the same time the arms are rapidly mounted within the dial as required, looseness or irregularities in the gears such as backlash or the like being automatically taken up since the centers of the gears are variable though actuated toward each other, thus eliminating lost motion and preventing a burr or the like from causing the gear teeth to stick or jam, the width of the arms insuring a smooth operation of the mechanism.

My invention therefore provides a dial of simplified construction possessing the numerous advantages set forth herein and comprising a new method of mounting the gear train and the clutch means, and a new type of knob permitting the use of a longer sleeve within the dial for the reception of a driven shaft of variable length, the dial being so arranged that it is operative manually for direct rapid rotation, or by means of said knob which actuates a driving shaft which in turn operates an intermediate gear train for causing a rotation of said dial at a greatly reduced velocity.

I claim:

1. In a micrometer device, the combination with a low speed shaft and a relatively high speed shaft, of a clutch acting therebetween, a housing secured to one of said shafts, and means mounted upon said housing and connecting said shafts to cause one of them to rotate at a lower velocity than the other as aforesaid, said housing being manually operable in co-operation with said clutch to render ineffective the means aforesaid and to cause said shafts to rotate at the same rate, said means mounted upon the housing comprising a clutch member tending to oppose the action of the first mentioned clutch and having a mechanical advantage to render the second mentioned clutch superior to the other clutch.

2. The combination as in claim 3 wherein said means includes a gear train secured to the housing, one end of said train being actuated by a shaft other than the one supporting the housing, external means being provided to normally hold the other end of the train against rotation, thereby causing the housing to rotate.

3. In a micrometer device, the combination with a low speed shaft and a relatively high speed shaft, of a housing constituting a dial secured to and upon one of the shafts to rotate in unison therewith, a clutch acting between said shafts, means for direct

rotation of the high speed shaft, and means carried by said housing and connecting said shafts to cause one of them to rotate at a lower velocity than the other when the high speed means is operated as aforesaid, said housing being manually operable to cause said shafts in co-operation with said clutch to rotate at the same rate, said means carried by the housing comprising a clutch member and other means serving to make the torque upon the high speed shaft effective to move said housing dial at low speed when the high speed shaft is rotated directly, said clutch member being ineffective when both shafts rotate at the same rate.

4. The combination as in claim 3 wherein said other means is a gear train co-operating with the first-mentioned clutch at the high speed end thereof, and the other clutch member at the low speed end thereof, whereby the force of the second-mentioned clutch is rendered superior to that of the first.

5. In a micrometer device, the combination with a low speed shaft and a relatively high speed shaft, of means connecting said shafts to cause one of them to rotate at a lower velocity than the other as aforesaid, said means comprising a clutch member, external means being provided to co-operate with said member to facilitate the object aforesaid, manually operated means acting in co-operation with the means aforesaid to cause said shafts to rotate at the same rate and at the velocity of the high speed shaft, and another clutch member to render said manually operated means effective to overcome the resistance of the first-mentioned member.

6. The combination as in claim 5 wherein said micrometer device is adapted to be mounted upon a board, the first-mentioned clutch member being adapted to engage said board.

7. In a gear train, the combination of a plurality of gears, one of which is mounted to rotate around a fixed axis, a plurality of arms each of which is adapted to support rotatably a gear, and resilient means acting upon said arms from different directions, said arms being rotatable to swing one with its gear toward said gear having the fixed axis, and the other under the influence of its resilient means to bring its gear toward the end of the other arm so as to cause the gears supported by the arms to mesh in a direction at an angle to the line of engagement between the first arm gear and the fixed axis gear.

In testimony whereof I affix my signature.

JAMES P. BURKE.