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E. H. LAYER, JR., ET AL
METHOD AND APPARATUS FOR PROVIDING A SPIRAL
CUT IN SMALL RESISTANCES

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2 Sheets-Sheet 1

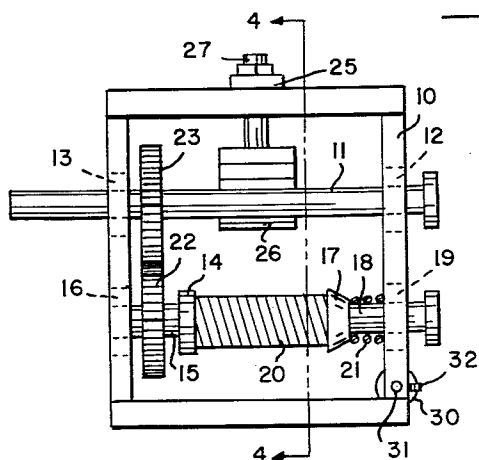


Fig-1

Fig-2

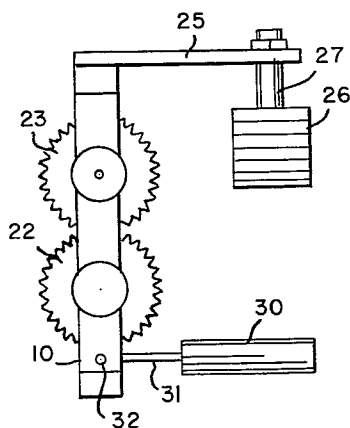
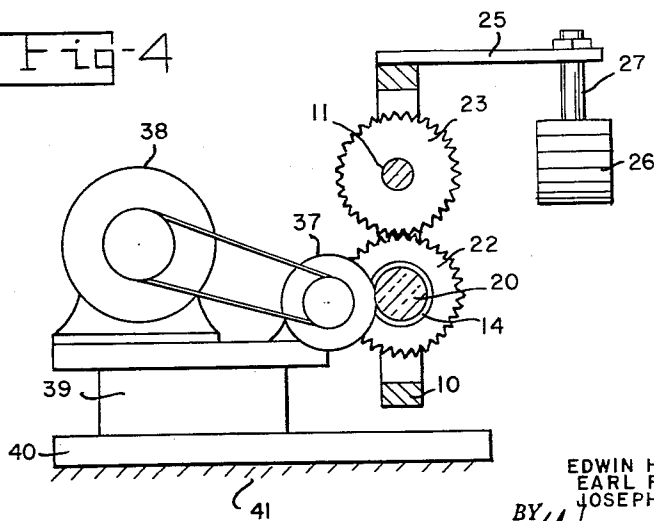


Fig-4



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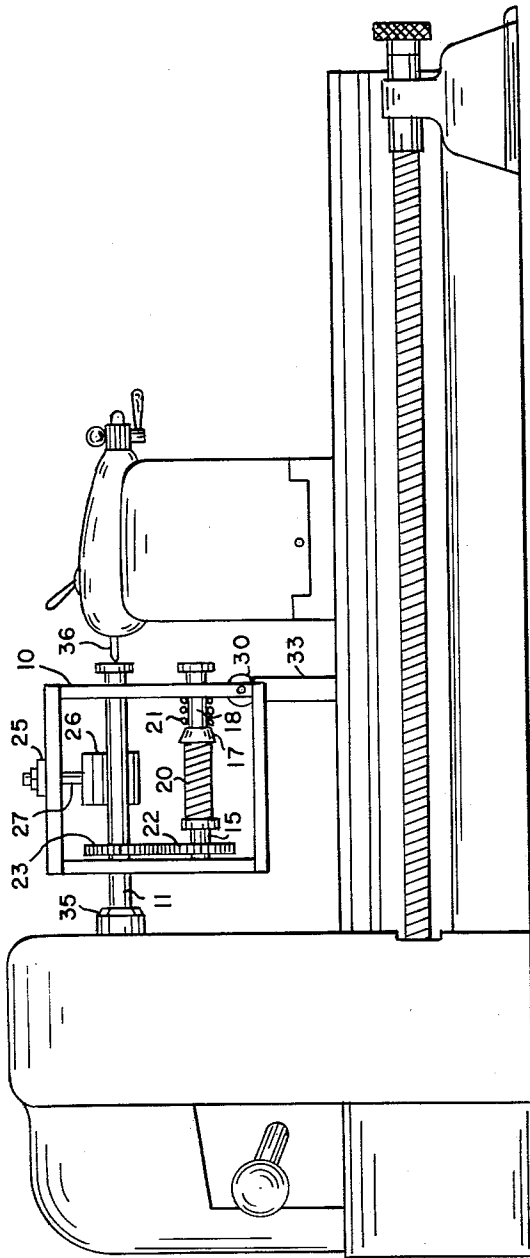


FIG. 2

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METHOD AND APPARATUS FOR PROVIDING A SPIRAL CUT IN SMALL RESISTANCES

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This invention relates to a device for use when using a lathe to provide a spiral cut in small resistances.

One object of the invention is to provide a means for providing a spiral cut in a small resistance element which maintains a substantially constant force on the resistance element during grinding.

Another object is to provide a device for use in providing a spiral cut in a small resistance element which will not produce excessively deep cuts or skipping.

These and other objects will be more fully understood from the following detailed description taken with the drawing, wherein:

FIG. 1 is a front elevational view of the device of the invention;

FIG. 2 is a side view of the device of FIG. 1;

FIG. 3 shows the device of the invention mounted in the lathe; and

FIG. 4 is a sectional view of the device of FIG. 1 along the lines 4—4, also showing the relative location of the grinding wheel of the lathe.

Prior art devices have not been able to control the forces on the resistor with sufficient accuracy to prevent excessively deep cuts or skipping due to slight misalignment of the chuck or slightly crooked base rods. Various methods have been used for producing spiral cuts in small resistors, but none of these have been entirely successful. Suspension of the entire grinding motor and spindle in a free swinging mount was found to be satisfactory when working with large resistor sizes but this method was found to be unsatisfactory for very small resistors because the grinding force could not be accurately controlled due to the excessive friction in the bearings and the large mass of the swinging mount combined with the lack of straightness in the rods. According to this invention, more sensitive control and greater constancy of the grinding force is provided with the use of a light-weight frame constructed to hold the resistor in a free swinging position beneath the lathe spindle axis with rotation transmitted from the spindle to the resistor through spur gears. The frame is provided with a spring loaded conical chuck to hold the resistor. A dash pot is provided to damp out sudden changes in the position of the frame. A counterweight arm is fastened to the frame near the main axis of the unit to which weights are suspended to provide a substantially constant force of the resistor against the grinding wheel.

Referring more particularly to FIG. 1 of the drawing, a frame 10 has a shaft 11 supported in bearings 12 and 13, which is adapted to be connected between the centers of a lathe. A chuck 14 connected to shaft 15 is supported in bearing 16. A second chuck 17 connected to shaft 18 is supported within bearing 19. Bearings 12, 13, 16 and 19 are miniature precision bearings which provide minimum friction. In operation, a resistor blank 20 is supported between chucks 14 and 17 and is held in place by means of a spring 21. The assemblies 15, 14, 20, 17 and 18 are driven by means of a pair of spur gears 22 and 23. While these gears have been shown to be substantially the same size to provide the same rate of rotation for the resistor 20 as for the shaft 11, it is obvious that in certain cases different gear ratios might be desired. Also, if the direction of rotation is critical,

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it is obvious that an idler gear between gears 22 and 23 may be provided if desired. As can be seen from FIG. 2, a lever arm 25 is suspended from the top of the frame 10 and a counterbalance 26 is attached thereto by means of a support rod 27. A dash pot 30 is provided to damp out sudden motion of the frame 10. The dash pot may be secured to the support for the lathe or to the lathe itself. The dash pot is connected to the frame 10 by means of a rod 31 which is secured within the frame by means of a set screw 32. FIG. 3 shows the manner in which the frame may be connected between the centers 35 and 36 of a lathe. A support 33 for the dash pot is shown in this figure. The tool carriage slide assembly has been omitted for clarity.

FIG. 4 shows the manner in which the grinding wheel is used with the frame of FIG. 1. The grinding wheel 37, driven by a motor 38, is suspended from the supports 39 and 40 upon the tool carriage cross slide illustrated at 41. As can be seen from this figure, the force against the resistor 20 is determined almost entirely by the weight 26, and is substantially independent of irregularities in the resistor blank 20. Different grinding forces can be obtained by adding or subtracting weight at 26.

There is thus provided a device for maintaining the grinding force substantially constant while cutting a spiral groove in a resistor.

While certain specific embodiments have been described in some detail, it is obvious that numerous changes may be made without departing from the general principles and scope of the invention.

We claim:

1. A device for maintaining a substantially constant grinding force on a resistor during spiral grinding on a lathe to provide a spiral cut therein, comprising: a frame; means for holding said resistor within said frame; a shaft passing through said frame, adapted to be secured between the centers of said lathe; means for rotatably coupling said resistor holding means to said shaft, whereby said resistor is made to turn at a speed as determined by the rotation of said shaft; means connected to said frame for urging said resistor toward the grinding wheel on said lathe when said frame is inserted in the lathe and means connected to said frame for damping out rapid changes in the position of said frame during grinding.

2. A device which may be mounted in a lathe having a grinding wheel for maintaining a substantially constant grinding force on a resistor during spiral grinding to provide a spiral cut therein, comprising: a rectangular frame; a pair of chucks, supported by said frame, for supporting said resistor within said frame; a spring, mounted between said frame and one of said chucks for holding said resistor between said chucks; a shaft, supported by said frame, adapted to be secured between the centers of said lathe; means for rotatably coupling said one of said chucks to said shaft, whereby said resistor is made to turn at a speed as determined by the rotation of said shaft; means connected to said frame for urging said resistor toward the grinding wheel on said lathe when said frame is inserted in the lathe and means connected to said frame for damping out rapid changes in the position of said frame during grinding.

3. A device which may be mounted in a lathe having a grinding wheel for maintaining a substantially constant grinding force on a resistor during spiral grinding of said resistor, comprising: a rectangular frame; a pair of chucks, supported by said frame, for supporting said resistor within said frame; and spring mounted between said frame and one of said chucks for holding said resistor between said chucks; a shaft supported in substantially frictionless bearings in said frame, adapted to be secured between the centers of a lathe; means for providing a one to one coupling between one of said chucks

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and said shaft, whereby said resistor is made to turn at the same speed as said shaft; a lever arm connected to the top center portion of said frame; a counterweight supported by said lever arm whereby said resistor is urged toward the grinding wheel on a lathe when said frame is inserted in the lathe and means connected to said frame for damping out rapid changes in the position of said frame during grinding.

4. A device which may be mounted in a lathe having a grinding wheel for maintaining a substantially constant grinding force on a resistor during spiral grinding of said resistor, comprising: a rectangular frame; a pair of chucks, supported by said frame, for supporting said resistor within said frame; and spring mounted between said frame and one of said chucks for holding said resistor between said chucks; a shaft supported in substantially frictionless bearings in said frame, adapted to be secured between the centers of a lathe; a first spur gear on said shaft; a second spur gear connected to one of said chucks and mechanically coupled with said first spur gear, whereby said resistor is made to turn at a speed as determined by the rotation of said shaft; a lever arm connected to the top center portion of said frame; means for supporting a weight on said lever arm, whereby said

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resistor is urged toward the grinding wheel on a lathe when said frame is inserted in the lathe and means connected to said frame for damping out rapid changes in the position of said frame during grinding.

5. A method for cutting a spiral cut in a resistor on a lathe, comprising: mounting a grinding wheel with a driving means on the tool carriage of said lathe; locating the grinding wheel below a line through the turning centers of said lathe; mounting the resistor below said line and adjacent said grinding wheel; mechanically coupling said resistor to a rotational driving means connected between the turning centers of said lathe; moving said tool carriage across said resistor at a predetermined speed with respect to the rotational speed of said driving means; urging said resistor toward said grinding wheel with a substantially constant force and damping out all rapid movements of said resistor.

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