Sept. 27, 1949. F. A. LOHUTKO 2,482,784

MEANS FOR DRESSING THREADED ABRASIVE WHEELS

Filed Dec. 4, 1946 2 Sheets-Sheet 1

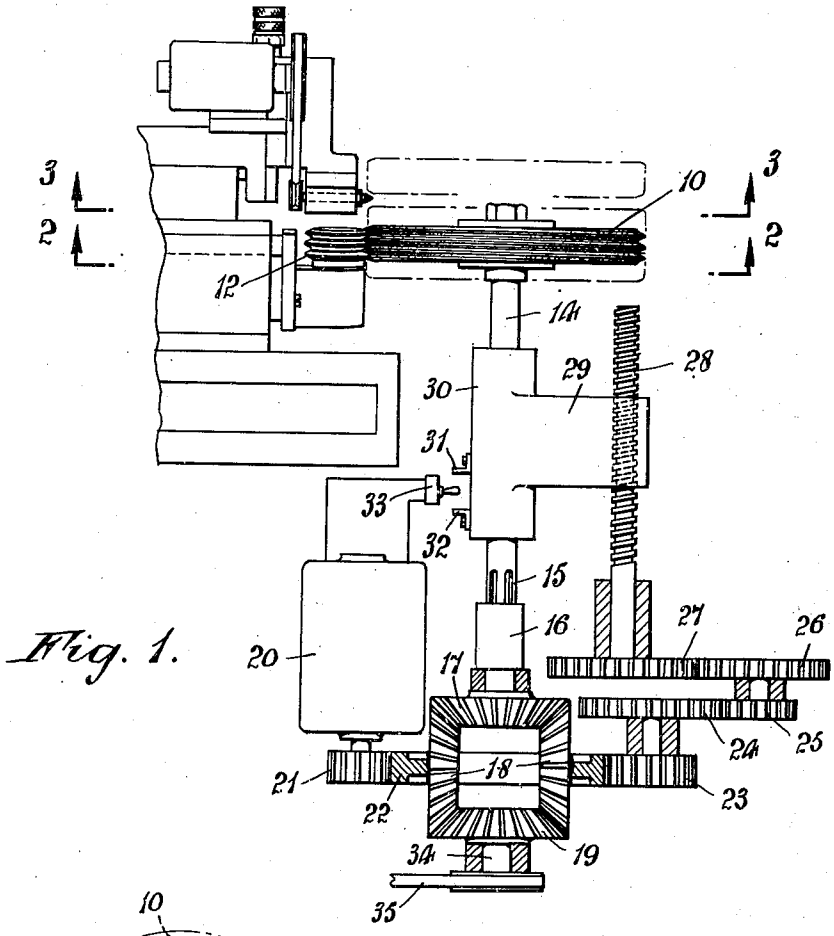

Fig. 1.

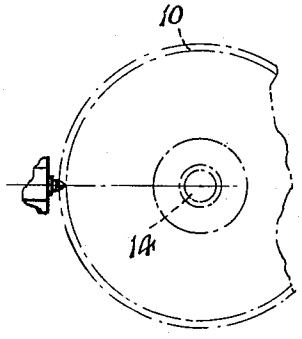

Fig. 3.

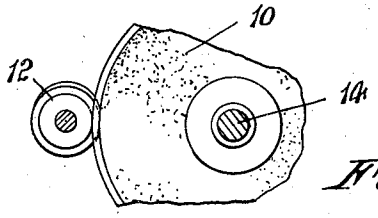

Fig. 2.

INVENTOR.
BY Floryan A. Lohutko
Stanley Seigfoot
ATTORNEY.

Sept. 27, 1949. F. A. LOHUTKO 2,482,784

MEANS FOR DRESSING THREADED ABRASIVE WHEELS

Filed Dec. 4, 1946 2 Sheets-Sheet 2

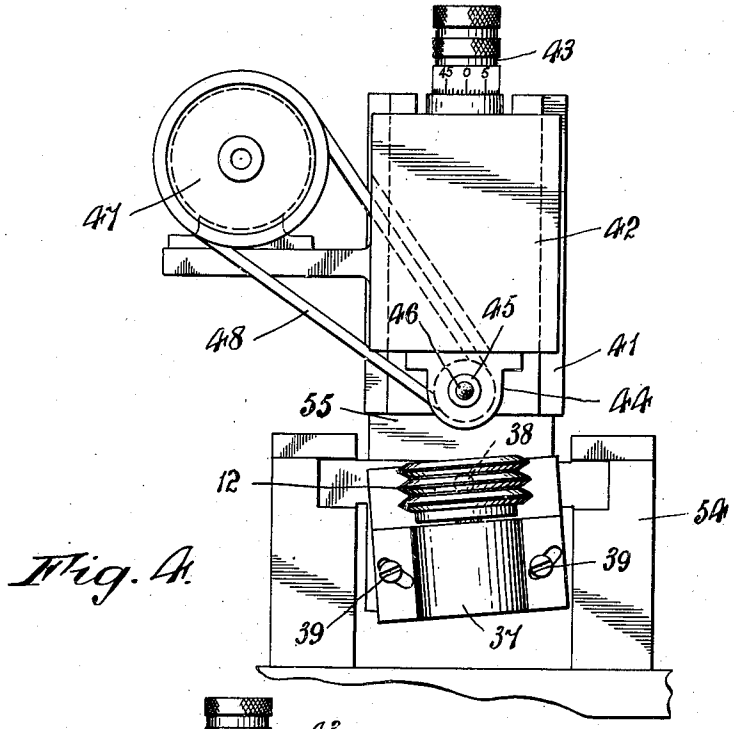

Fig. 4.

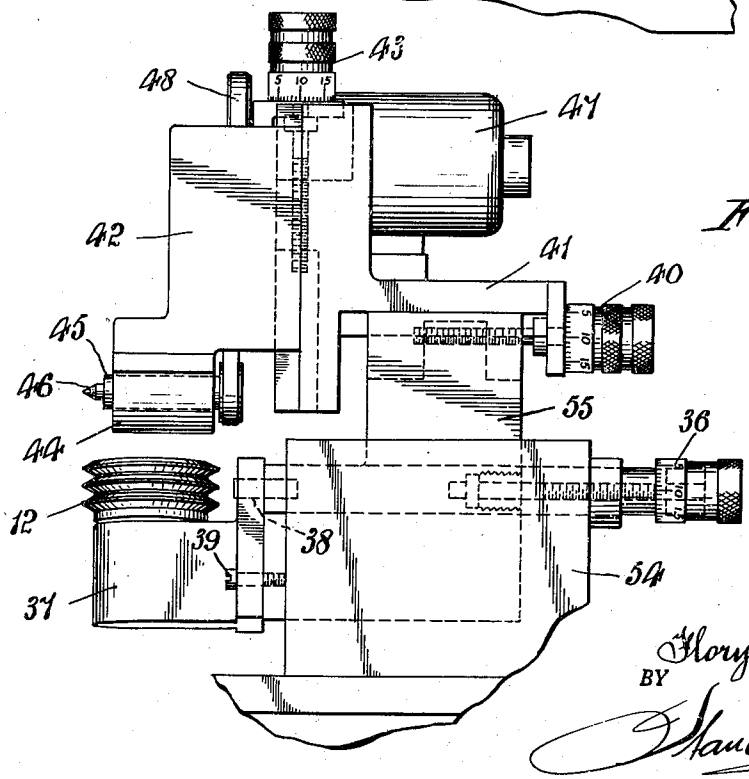

Fig. 5.

INVENTOR.
Horyan A. Lohutko.
BY
Stanley Seigfoot
ATTORNEY.

Patented Sept. 27, 1949

2,482,784

UNITED STATES PATENT OFFICE

2,482,784

MEANS FOR DRESSING THREADED ABRASIVE WHEELS

Floryan A. Lohutko, Detroit, Mich., assignor, by mesne assignments, to Niles-Bement-Pond Company, West Hartford, Conn., a corporation of New Jersey

Application December 4, 1946, Serial No. 714,026

4 Claims. (Cl. 125—11)

1

This invention relates to a novel process and means for the dressing of threaded abrasive wheels, such as are intended for the finish forming of the teeth of gears, and has for its object to provide for the finish dressing of such abrasive wheel by means which will obtain extreme accuracy of thread form to meet the particular grinding requirements of the finally dressed wheel.

More particularly, the invention proposes to provide means for the process of finish dressing of the thread of a helicoidal abrasive wheel, such means being in the nature of a free cutting frusto-conical tool, such as of diamond impregnated carboloy or similar material, arranged to rotate on an axis perpendicular to the axis of the abrasive wheel and to be fed across the face of the wheel at a speed commensurate with the lead of said thread while the abrasive wheel and the dressing tool are both being rotated about their respective axes.

Still further objects or advantages additional or subsidiary to the aforesaid objects, or resulting from the construction or operation of the invention as it may be carried into effect, will become apparent as the said invention is hereinafter further disclosed.

In carrying the said invention into effect, I may utilize the novel arrangement of elements hereinafter described, by way of example, having reference to the accompanying drawings, wherein:

Figure 1 is a somewhat schematic elevation of a mechanism for the profiling of an abrasive gear grinding wheel by means of a crusher roll and its finished dressing by means of a frusto-conical dressing tool in accordance with the novel process, the precise proportions of the elements of the structure as shown being departed from or exaggerated for purposes of clear and simple illustration;

Figure 2 is a partial sectional elevation showing the relationship of abrasive wheel and crusher roll taken on a plane indicated by the line 2—2 in Figure 1;

Figure 3 is a similar view showing the relationship between the conical dressing tool and the abrasive wheel taken on a plane indicated by the line 3—3 in Figure 1;

Figure 4 is a front elevation of the crusher roll and dressing tool together with their mountings; and

Figure 5 is a side elevation of the elements shown in Figure 4.

2

Similar characters of reference indicate similar parts in the several figures of the drawings.

Referring first to Figure 1 of the drawings; 10 indicates an abrasive wheel, such as may be intended for the grinding or forming of teeth on a spur wheel blank, the said abrasive wheel being characterized by its having formed on its periphery a thread 11 which is in cross-section conjugate to the rack form of the gear to be ground; and the present invention relates to the means of forming this thread on the periphery of the abrasive wheel.

For such purposes I utilize an annularly ribbed crushing roll 12 having a rib to rib spacing, which is equivalent to the circular pitch of the gear which the abrasive wheel is eventually intended to grind.

The abrasive wheel 10 and the crusher roll 12 are intended to have relatively reciprocal motion imparted thereto, and, in the present example, such reciprocation is confined to the abrasive wheel although as a matter of design it could be imparted to the crusher roll to produce the same result as will be well understood; and it is desired that throughout the present description and in interpreting the claims that the utilization of the terms "reciprocating the abrasive wheel" be considered in such broad sense as to embrace the obvious alternative of the reciprocation of the pressure roll relative to the abrasive wheel.

The abrasive wheel 10 is shown as being mounted for rotation on and by the shaft 14 which is splined, as at 15, for longitudinal sliding connection with a driving coupling 16, the latter being in turn driven by the bevel gear 17 of a differential which includes pinions 18 and a further meshing bevel gear 19.

20 is a driving motor, preferably of the variable speed type, operating a driving pinion 21 which meshes with ring gear 22 of the said differential, this ring gear also meshing with the first of a train of change speed gears 23, 24, 25, 26 and 27. The said gear 27 drives a feed screw 28 which is threaded into the arm 29 of a bracket 30 secured to the said shaft 14. This bracket 30 is provided with suitably adjustable stops 31 and 32 positioned for the timed operation of a reversing switch 33 for effecting the reversing of the drive motor 20 as said switch is operated by one or another of said stops.

34 is a shaft through which rotation of the gear 19 of the differential may be effected from any suitable source, as by a belt 35, to control the speed of rotation of the shaft 14 relative to that of the driving motor to meet special cir-

cumstances; but this is not an essential part of the present invention which relates to the dressing operation only and need not be discussed in any further detail herein. For the purposes of this description, the gear 19 may be considered as fixed.

It will be apparent that by means of the gearing described and the operation of the feed screw 28 thereby, the abrasive wheel 10 may be caused to reciprocate, say, to the extent indicated by the dotted lines in Figure 1, while it is at the same time being rotated, and that, as this reciprocation is reversed by the operation of the reversing switch 33 in any conventional manner, the direction of rotation of the abrasive wheel will at the same time be reversed; so that any stationary point presented to the surface of the grinding wheel during such operation thereof will traverse a helical path thereon and retrace the same path in the opposite direction upon reversal of the motions described.

As a section of the threaded abrasive wheel taken on a plane at right angles to the lead of the thread is comparable in all its elements to a rack of the gear to be ground thereby, the cross-sectional form of the ribs of the crusher roll are accordingly in counterpart of such rack. Thus the crusher roll, when applied to the abrasive wheel in the manner illustrated with requisite feed-in adjustment toward the axis of the wheel and relative longitudinal feed, in the illustrated example, of the abrasive wheel to conform with the lead of the thread or threads to be formed thereon, will crush the thread form including the top of the thread, and also crush the root of the thread somewhat below the depth to which it is to be finally dressed.

The present invention relates to the means and process of effecting this final dressing of the abrasive wheel thread after crushing and also to the combination of such means with provision for its setting relative to the crusher roll as will be now further described.

The crusher roll 12 is shown as being mounted for adjustment and operation in a fixture, as shown in Figures 4 and 5, which includes a frame structure 54 carrying a slide 55 which is adjustable by micrometer feed 36 toward and from the axis of the abrasive wheel 10. The front end of the said slide carries a bracket 37 on which the crusher roll 12 is mounted for free rotation, this bracket being pivoted at 38 for swinging about an axis passing transversely through the axes of the crusher roll 12 and the abrasive wheel 10. It is preferred that this pin 38 be so located that its axis passes directly through one of the ribs of the crusher roll as shown in the said Figures 4 and 5.

39 are locking screws for securing the bracket 35 in positions of angular adjustment about the axis of the said pin 38. The purpose of this angular adjustment is to secure the required setting angle of the crusher roll 12 relative to the axis of the abrasive wheel 10 as dictated by the helix angle of the thread to be crushed into the peripheral surface of the said abrasive wheel.

Also mounted on the top of the slide 35 and adjustable thereon by the micrometer feed 40 is a supplementary slide 41 carrying the vertical adjustable bracket 42; 43 being the micrometer device for determining such vertical adjustment. This bracket 42 is provided with a bearing member 44 in which the spindle 45 of a dressing tool 46 is mounted with the axis of the said spindle radial to the axis of the abrasive wheel 10. By

means of the micrometer adjustment 43 the axis of the said spindle 45 may also be adjusted so that it will be spaced from the ribs of the crusher roll to an extent whereby it will occupy a position which would be that of one of the said ribs if the crusher roll were extended to that point. In other words, if, following the crushing of a thread by the roll on the periphery of the abrasive wheel in the manner understood, the axial feed of the abrasive wheel be continued in the required direction until it passes in front of the said spindle 45, then the axis of the said spindle would trace a true path along the root of the thread.

The dressing tool 46 is in the form of a pencil having a conical or frusto-conical cutting end which may be of diamond impregnated carboloy, the angle of the cone corresponding to the thread angle to be dressed on the wheel, so that when the cone end of the dressing tool is brought to the proper dressing depth by the means provided it has line contact with both oblique sides of the previously crushed thread. There is no necessity of providing different setting angles when using this form of conical dressing tool for different helix angles of threads such as are required when disk crushing tools or grinding wheels are used for such final dressing operation.

During a dressing operation, the grinding wheel is given relatively slow rotation while the pencil dressing tool is rotated at high speed, as by means of the motor 47 mounted on a slide 42 and coupled to the spindle 45 by means of the belt 48. The free-cutting dressing tool will thus finish the sides of the threads in the abrasive wheel removing tooth tip and tooth flank errors that may have developed on the thread form during the initial crushing operation.

It will be observed that the dressing operation described may be effected, upon completion of the crushing operation by the crusher roll 12, by simply continuing the advance of the axial feed of the abrasive wheel until the pencil type dressing tool referred to traces the path of the root of the crushed thread by reason of the relative positioning of the dressing tool to the crusher roll in the manner hereinbefore referred to.

It should also be understood that the action of the free-cutting pencil type dressing tool is quite different to that of finish dressing by means of an auxiliary crushing operation or of the usual type of abrasive wheel as the action presents an infinite number of line contacts to the thread of the abrasive wheel as the operation proceeds producing a properly and extremely accurate thread contour and resulting in a highly desirable grain structure on the working surfaces of the thread for the eventual form finishing of gears and similar objects.

This invention may be developed within the scope of the following claims without departing from the essential features of the said invention, and it is desired that the specification and drawing be read as being merely illustrative of a practical embodiment of the same and not in a strictly limiting sense.

It will be understood that, where back lash in transmission is to be contended with, the dressing described may be effected in one longitudinal direction, the dressing tool being withdrawn from contact with the abrasive wheel during its reverse or return stroke such as by the manual means provided and described.

What I claim is:

1. The method of finish forming a helically threaded abrasive wheel of the type described

which comprises first roughly forming helicoidal surfaces on said wheel with a crusher wheel contacting therewith and thereafter progressively subjecting the flanks of the wheel thread to the cutting action of a dressing tool of substantially conical form rotating on an axis perpendicular to the axis of said abrasive wheel during rotation of said wheel.

2. The method of finish forming a helically threaded abrasive wheel of the type described which comprises first roughly forming helicoidal surfaces on said wheel with a crusher wheel contacting therewith and thereafter progressively subjecting the flanks of the wheel thread to the cutting action of a dressing tool of free-cutting material and of substantially conical form, said dressing tool being rotated at high speed on an axis perpendicular to the axis of said abrasive wheel.

3. Means for finish forming a helically threaded abrasive wheel of the type described, said means comprising a rotary dressing tool of free-cutting material and of a substantially coned form in counterpart of the thread spacing, means for rotating said abrasive wheel at a relatively slow speed, means for rotating said dressing tool at a relatively high speed, and said mechanism providing relative motion between said abrasive wheel and said dressing tool whereby said tool will traverse the thread space

of said abrasive wheel while maintained perpendicular to the axis of said abrasive wheel.

4. In a machine for forming a helical thread on the periphery of an abrasive wheel, in combination, a crusher roll, means effecting relative axial movement between said crusher roll and said abrasive wheel during rotation of said abrasive wheel whereby said roll will crush a thread formation into the periphery of said wheel, a high-speed rotary dressing tool of substantially coned form rotating on an axis perpendicular to the axis of said abrasive wheel and positioned so that its cutting end may enter and traverse the thread space of said wheel upon further relative axial motion of said wheel, and means effecting said further axial motion upon the completion of the initial crushing operation to provide the thread finishing operation by said rotary dressing tool.

FLORYAN A. LOHUTKO.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,501,229	Olson	July 15, 1924
2,145,202	Rickenmann	Jan. 24, 1939
2,321,102	Pelphrey	June 8, 1943