

July 15, 1924.

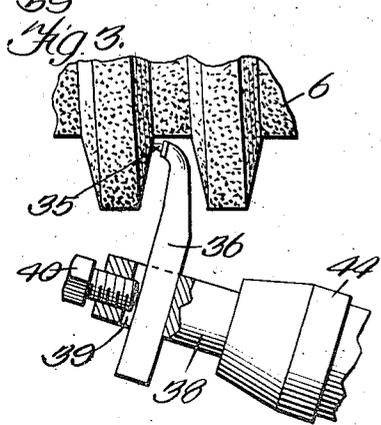
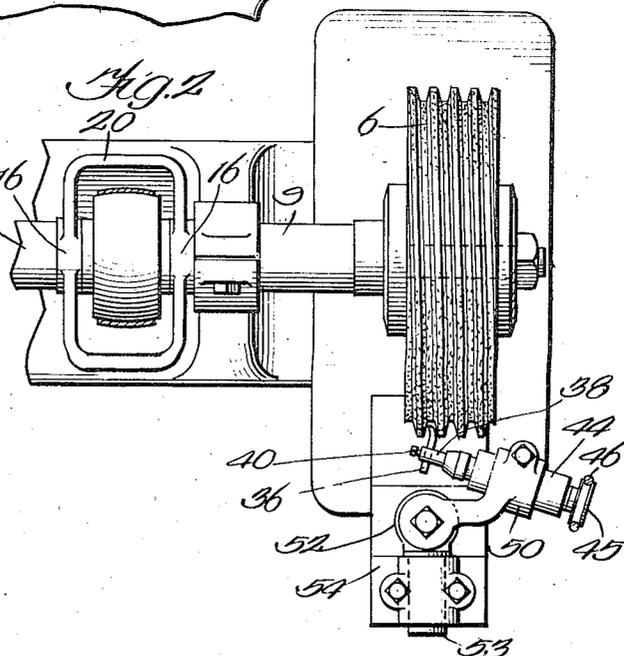
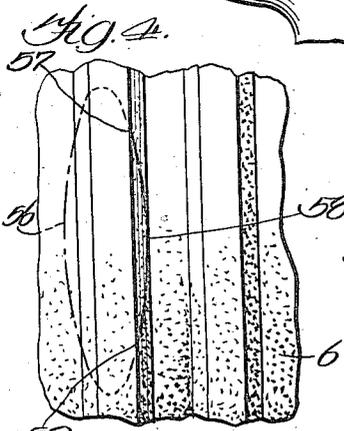
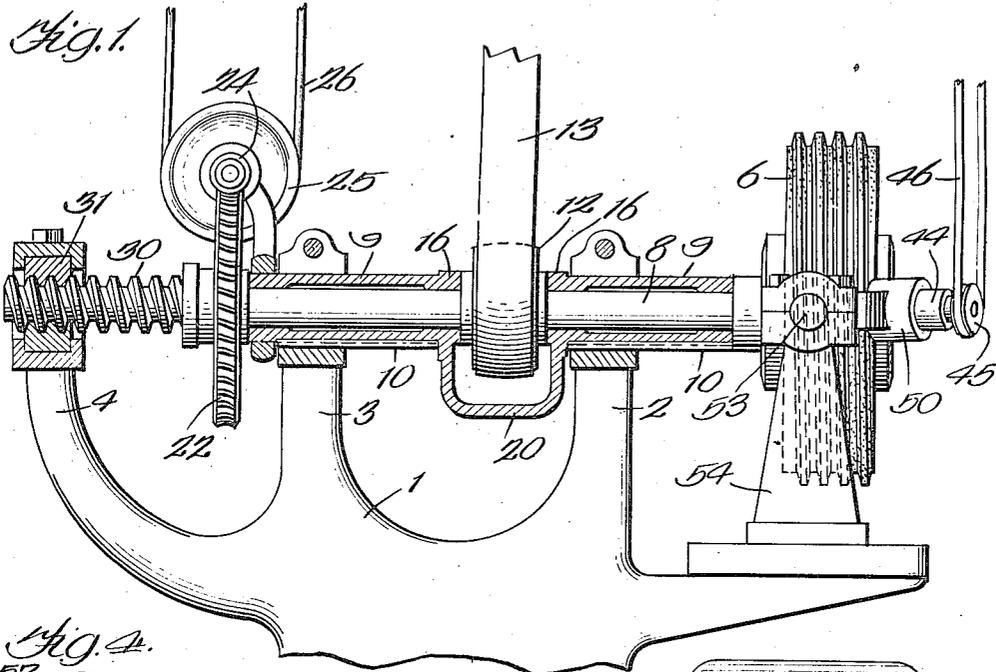
1,501,230

C. G. OLSON

MACHINE FOR PRODUCING ABRASIVE HELICOIDS

Filed Oct. 31, 1921

3 Sheets-Sheet 1



inventor:
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Fig. 8.

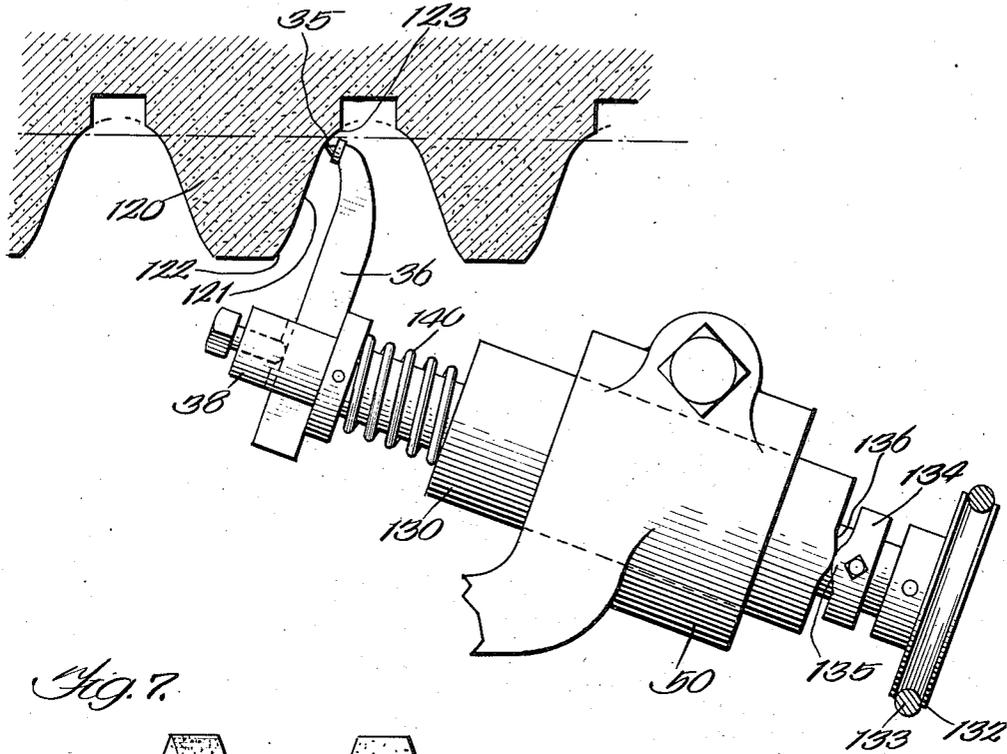
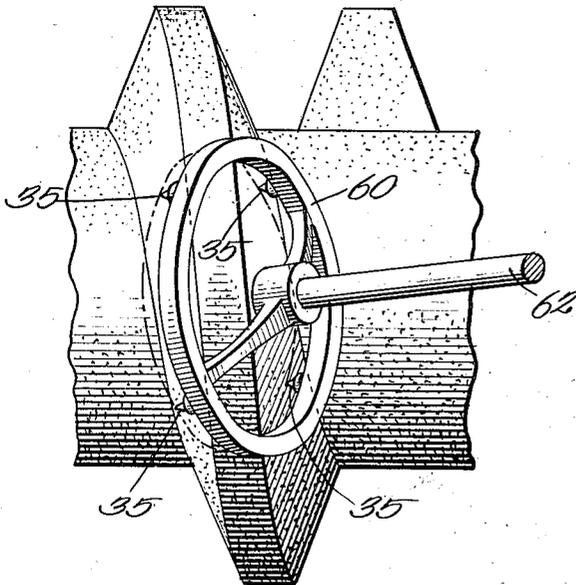


Fig. 7.



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Patented July 15, 1924.

1,501,230

UNITED STATES PATENT OFFICE.

CARL G. OLSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO ILLINOIS TOOL WORKS, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MACHINE FOR PRODUCING ABRASIVE HELICOIDS.

Application filed October 31, 1921. Serial No. 511,795.

To all whom it may concern:

Be it known that I, CARL G. OLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Machines for Producing Abrasive Helicoids, of which the following is a specification.

My invention relates to machines for producing abrasive helicoids or grinding hobs. My machine operates upon the principle shown in my copending application for method of producing abrasive elements, filed October 12, 1921, Serial No. 507,219. The object of my present invention is to provide means for producing such abrasive helicoids or grinding elements.

I accomplish this object by the mechanism illustrated in the accompanying drawings in which—

Figure 1 is a front elevation partly in section of one form of machine embodying the invention.

Figure 2 is a plan view of the right end portion of Figure 1.

Figure 3 is an enlarged detail showing the cooperative relation of the scarifying or dressing tool with the work.

Figure 4 is a diagrammatic view illustrating the principle of operation of the scarifying tool.

Figure 5 is a plan view showing a modified form of machine embodying the invention. This second type is adapted for the production of abrasive helicoids whose general form is conical.

Figure 6 is a front elevation of the parts shown in Figure 5.

Figure 7 is a perspective view of a multi-pointed scarifying or dressing tool, showing it in position on the work.

Figure 8 is a detail showing a modified form of mechanism in which the diamond point instead of traveling in a plane orbit, travels in an orbit a part or all of which is warped or at least does not lie in any single plane.

Like numerals denote like parts throughout the several views.

To give a preliminary view, details of which may be obtained from the above mentioned applications; I have discovered that spur gears and similar articles may be ground by a method which is continuous in distinction to the indexing method here-

before in vogue. My continuous method employs an abrasive element, either cylindrical or conical in its general configuration, on which is formed a continuous abrasive thread or helicoid. This abrasive element operates somewhat after the manner of a hob, and the gear to be ground (in fact, a complete stack of gears), may be completely ground as a result of a single setting of the machine. I have solved the problem of producing such abrasive elements by employing the method described in the said method application and by constructing a machine forming the subject of the present application. One of the specific objects of my present invention may be therefore said to be the provision of a machine capable of operating upon the principle described in my said method application. According to that method the abrasive helicoids are given their final form by a scarifying tool, such as a diamond point, rotating at high speed in a certain orbit. In some cases the orbit lies in a plane perpendicular to the axis of the work. In other cases it lies in a plane oblique to the axis of the work, and in still other cases it does not lie in any single plane. The mechanism for taking care of these three situations will be described in the order mentioned.

Referring first to the type one, shown particularly in Figures 1, 2 and 3, the machine has a main frame 1 supporting three columns 2, 3, 4. The work 6 is rigidly fastened to a work arbor 8 which is journaled in a sleeve 9 which slides longitudinally in the columns 2, 3, but is prevented from rotating by splines 10. It will be understood that grinding elements have to be redressed more or less frequently in order to maintain their proper configuration, and thus accurately grind the gear wheel or other object upon which they are to work. When the abrasive element is to be used as a grinder it will rotate at high speed. When it is to be dressed it will rotate at low speed. It is desirable to produce a machine capable of rotating the abrasive element at a high speed for grinding purposes and at slow speed for dressing purposes. The present invention is not concerned with the high-speed rotation nor the use of the abrasive helicoid, but rather with the producing (dressing or scarifying) of the abrasive helicoid. There-

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extends at an angle relatively to the arbor 72, the degree being determined by the angular slope of the sides of the conical helicoid which constitutes the work.

5 Lead screw 98 works in a stationary split nut 102 carried at one end of a carriage 104 slidingly mounted upon a slide 105. At the opposite end to the nut 102 the carriage 104 is provided with a bearing 103 which is in
10 the form of a clamp adapted to hold the housing 44 of the tool spindle 38. The spindle carries the scarifying tool 36, the parts being so arranged that the axis of the spindle is parallel to the axis of the work
15 arbor. The spindle is rotated by a sheave 110 driven by a belt 111.

In operating this type of machine the operator starts the belt 86, which causes the work to rotate at slow speed without shifting axially. The rotation of the work arbor is transmitted to the lead screw 98 by the worm and gear mechanism, with the result that the tool spindle travels obliquely at the same angle as the slope of the conical
25 helicoid. The operator also starts the belt 111 which rotates the scarifying or dressing tool at high speed, and this dresses the surface of the helicoid upon the same principle as before. A multitude of arcuate cuts or
30 scarfs are produced in the helicoid, and as the work revolves and the tool travels the cuts or scarfs will, in the aggregate, cover the entire surface to be dressed.

It may happen that abrasive helicoids are
35 required in which a profile of the helicoid will show a compound curve, as illustrated in Figure 8. In such case the scarifying tool cannot travel merely in a plane orbit, but must travel in an orbit part of which
40 is warped or at least lies outside of the plane. Referring to this type of work the helicoid 120 has a profile in which the center portion 121 is approximately flat while the outer portion 122 and inner portion 123 are
45 curved. In this case the tool spindle 38 is not only rotatable but is slidable in the housing 130. The spindle is rotated by a sheave 132 driven by a belt 133. A collar 134 is rigidly fastened to this spindle at
50 the rear end of the housing, and has a nose 135 which engages a cam 136 formed at the rear end of said housing. The result is that as the spindle rotates it also shifts axially, and by properly forming the cam any desired modification of the orbit of the grinding
55 tool may be produced. A coiled compression spring 140 surrounds the spindle between the forward end of the housing and the back of the tool 36 thus yieldingly keeping the collar at all times in contact with the cam surface at the rear end of the
60 housing.

From the foregoing it will be seen that my machine is capable of producing a series
65 of arcuate cuts or scarfs in an abrasive

helicoid to dress the same or true it to its proper and desired form. In order to accomplish this, it is not necessary that the tool rotate with any specific timed relation to the rotation of the work except that the
70 speed of the tool must be great enough compared to the speed of the work to cause the arcuate scarfs in the aggregate to cover the entire helicoidal surface to be dressed. The machine goes further however, and causes
75 this high speed tool, whose point is eccentric to its axis, to travel at a definite rate of speed in proportion to the helicoid. The drawings show that in practice the work may travel relatively to the tool or the tool
80 may travel relatively to the work. The drawings also show that a single or a multiple scarifying tool may be employed and they also show that the axis of the tool may either be parallel to the axis of the
85 work or oblique to it.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. A machine for dressing preformed surfaces, having a pointed scarifying tool, means for causing it to revolve about an axis non-coincident with the point of the tool, and a rotatable work holder having an axis non-coincident with the axis of rotation of the scarifying tool, the plane defined by the point of the tool being approximately at right angles to the axis of the work and the point of the tool traveling in an orbit only a part of which lies in the surface to be produced, and the scarfs in the aggregate enveloping the surface to be produced.

2. A machine for producing abrasive helicoids, having a scarifying tool, means for causing it to rotate about an axis distant from the point of the tool, means for causing successive portions of the helicoid to pass in contact with said tool for a limited arc of its orbit, and means for causing relative travel of the tool and work in conformity with the lead of the helicoid.

3. A machine for producing abrasive elements, having a pointed dressing tool, means for causing it to travel at high speed in a definite orbit, and means for rotating the work at slow speed to bring successive portions of it into contact with said tool for a limited arc of the orbit thereof, said means being so timed that the scarfs made by the tool will, in the aggregate, cover substantially the entire area of the work which comes within said arc.

4. A machine for producing abrasive helicoids, having a pointed dressing tool, means for causing it to travel at high speed in a definite orbit, means for rotating the work at slow speed to bring successive portions of it into contact with said tool for a limited arc of the orbit thereof, and means for si-

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multaneously producing relative travel between the tool and the work in conformity with the lead of the helicoid.

5 5. A machine for dressing a warped surface in the form of an oblique helicoid having a cylindrical envelope (as shown in
10 Figures 1 to 4) said machine having means for rotating the helicoid, a spindle, a scari-
fying tool supported by said spindle at a
15 distance from the axis thereof, and means for supporting the spindle in such position
that an arc of the orbit of the tool will intersect the envelope of the helicoid, the sup-
porting means holding the spindle at an
20 oblique angle to the axis of the work such that the intersecting arc of the orbit will lie
substantially in the warped surface, throughout the major portion of the inter-
sected arc of the envelope.
25 6. A machine for dressing a warped surface in the form of an oblique helicoid having a cylindrical helicoid, said machine
having means for rotating the helicoid, a
30 spindle, a scarifying tool supported by the spindle at a distance from the axis thereof,
means for supporting the spindle in such position that an arc of the orbit of the tool
will intersect the envelope of the helicoid,
35 the supporting means holding the spindle at an oblique angle to the axis of the work
such that the intersecting arc of the orbit will lie substantially in the warped surface
throughout the major portion of the inter-
sected arc of the envelope, means for caus-
ing relative travel of the tool and the work

in conformity with the lead of the helicoid thereof.

7. A machine for dressing abrasive heli-
coids having a pointed tool, means for caus-
ing it to rotate about an axis distant from
40 the point of the tool, means for rotating the
work to cause successive portions of the
helicoid to pass in contact with the tool for
a limited arc of the orbit thereof, means
45 for causing relative travel of the tool and
work in conformity with the lead of the
helicoid, and means for simultaneously vary-
ing the distance between the axis of the tool
and the axis of the work.

8. A machine for dressing preformed sur-
50 faces formed on bodies whose cross sections
are circular when taken at or nearly at right
angles to the axis of the work, said machine
having a plurality of pointed scarifying
55 tools, a rotatable tool holder whereon said
tools are arranged with their points lying
substantially in a circle at right angles to
and coaxial with the axis of revolution of
the holder, and a rotatable work holder
60 having an axis lying in the same plane as
the axis of the tool holder and roughly par-
allel with it, and in such position that the
circle defined by the points of the tool will
intersect the circle of cross section of the
65 work taken at the point of contact of the
tool with the work.

In witness whereof, I have hereunto sub-
scribed my name.

CARL G. OLSON.

July 15, 1924.

I. A. PARRY

1,501,231

BREAD RAISER

Filed April 26, 1922

Fig. 1.

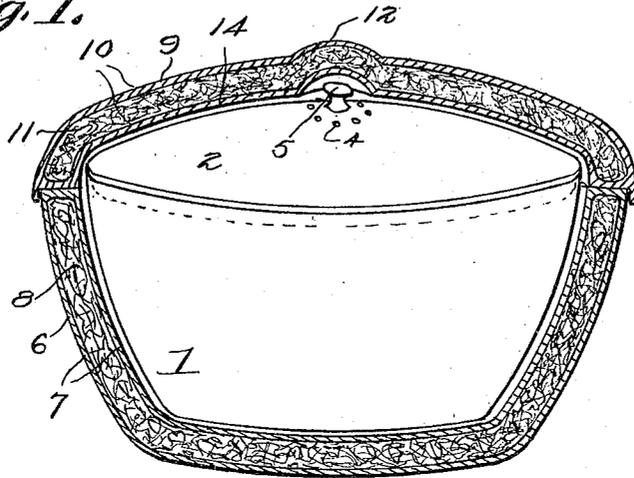
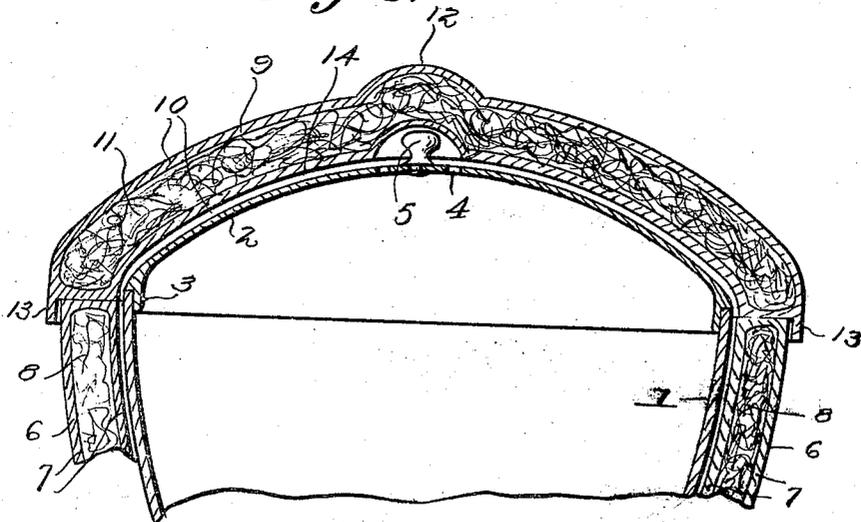


Fig. 2.



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