Feb. 7, 1939. H. A. DANNECKER 2,146,466

DRESSING FIXTURE FOR GRINDING WHEELS

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Fig. 1.

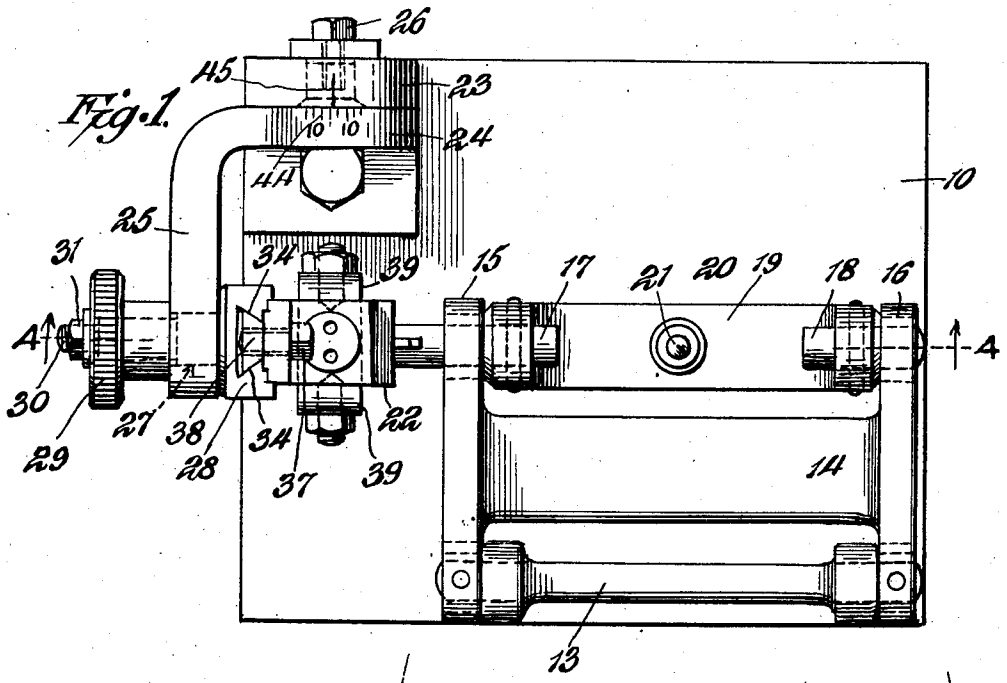
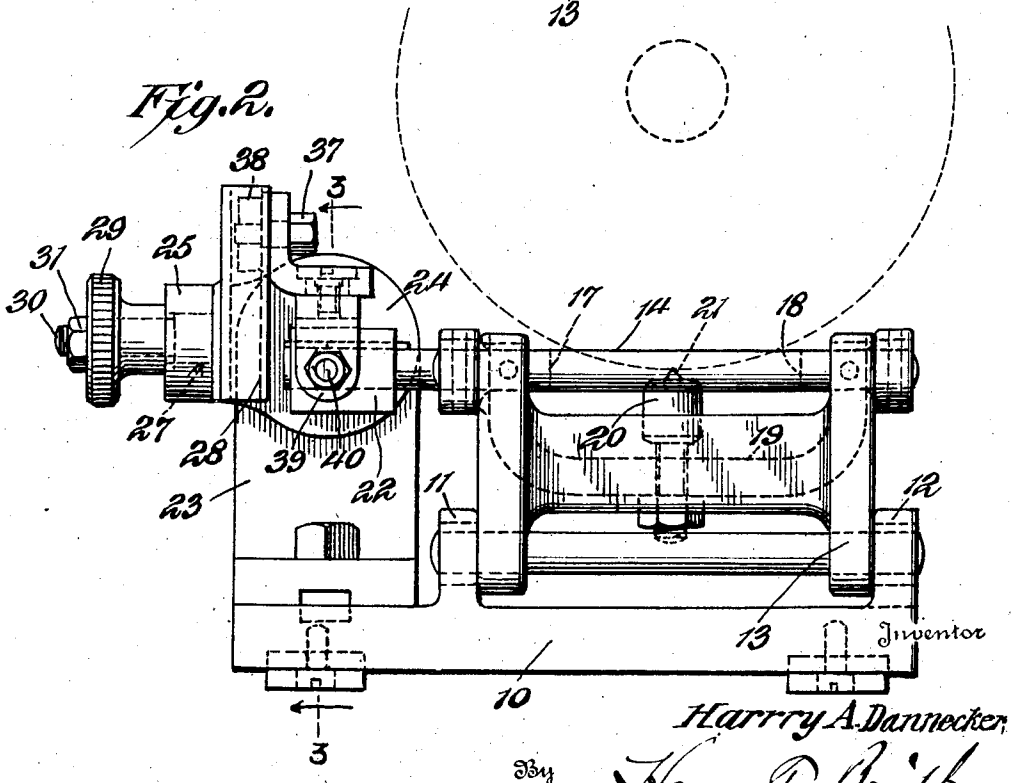


Fig. 2.



Inventor

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By Henry T. Bright

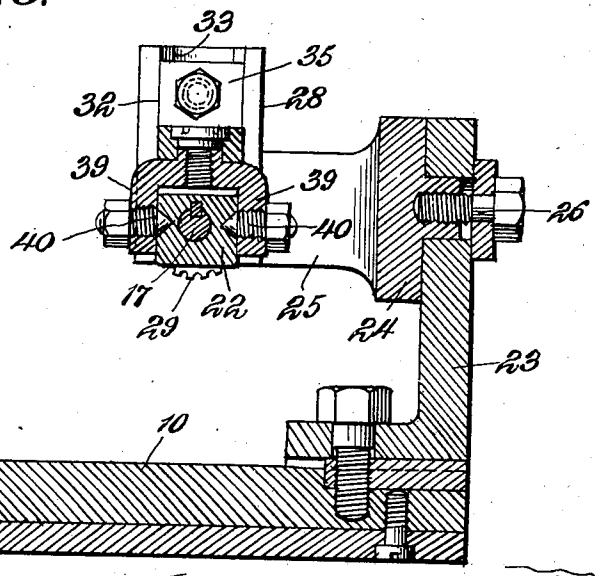
Attorney

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Fig. 3.



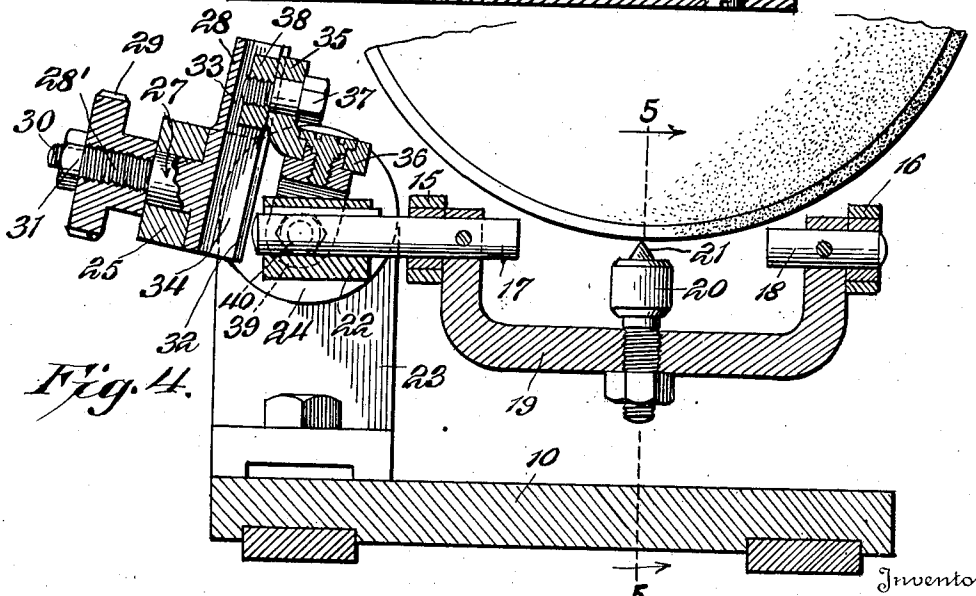


Fig. 4.

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Fig. 5.

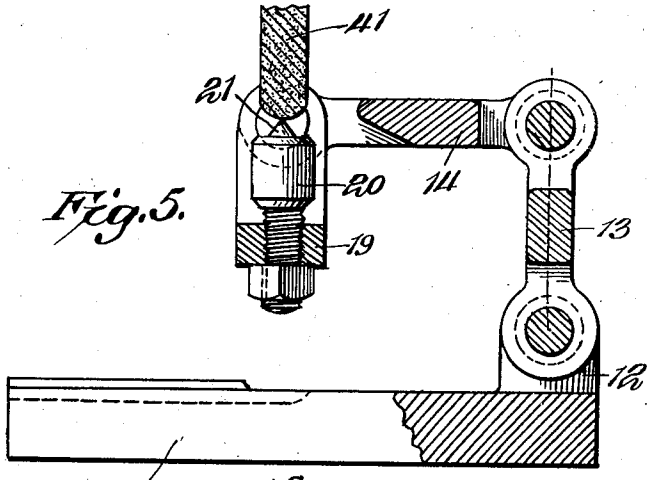


Fig. 6.

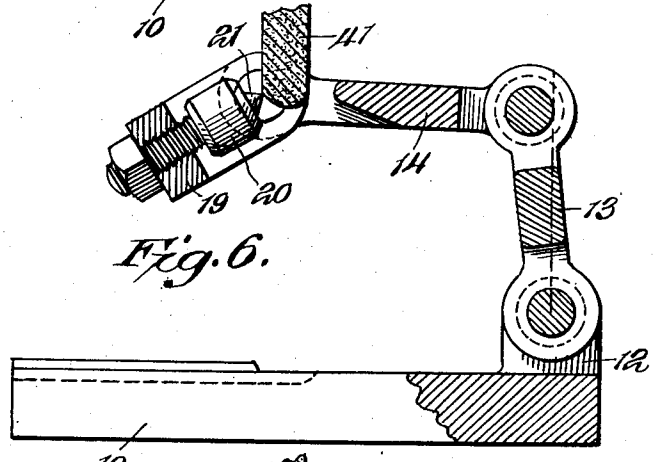


Fig. 7.

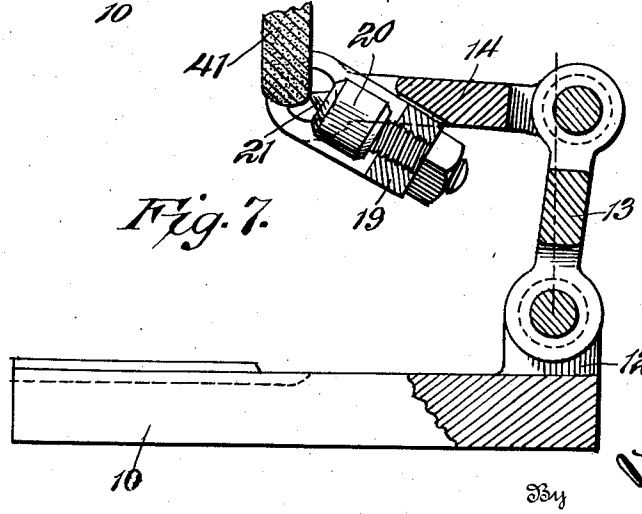


Fig. 8.

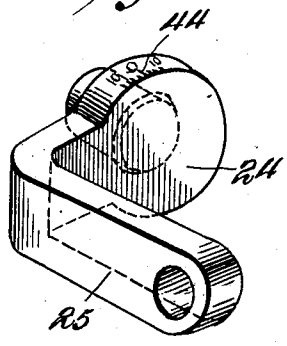


Fig. 9.

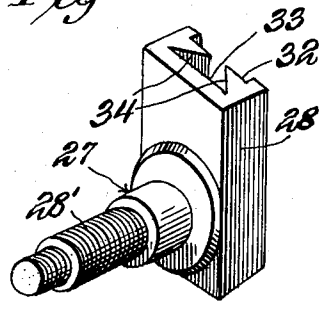
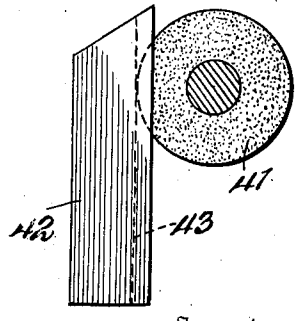


Fig. 10.



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Patented Feb. 7, 1939 2,146,466

UNITED STATES PATENT OFFICE

2,146,466

DRESSING FIXTURE FOR GRINDING WHEELS

Harry A. Dannecker, Newcastle, Ind.

Application July 6, 1938, Serial No. 217,824

10 Claims. (Cl. 125—11)

My invention relates to a dressing fixture for grinding wheels and particularly to a dressing fixture designed to provide the periphery of a grinding wheel with an elliptical cross section of such curvature that when a form tool is ground therewith it will produce a true circular cutting edge in the plane of the top or cutting face of the tool whereby, the tool so ground when utilized in an automatic machine will operate upon the work to embody in the latter a true sphere.

It is my object to provide a dressing fixture for grinding wheels of the type and for the purpose specified which will avoid the necessity of extensive mathematical computations and the use of templets in moving the tool through different selected curvilinear paths and thus render the proper and successful operation of fixture within the ability of unskilled labor.

It is also the object of my invention to render the fixture easily adjustable for the purpose of moving the diamond tool through the curve of the proper ellipse in accordance with the radius of the spherical form desired to be produced by the form tool to be ground.

Furthermore, it is the object of my invention to produce a fixture beneficially capable of dressing the periphery of a grinding wheel to an elliptical cross section regardless of the diameter of the grinding wheel being dressed.

A still further object of my invention is to provide a dressing fixture for grinding wheels having the beneficial capabilities set forth and which at the same time will be much simpler in construction and cheaper to manufacture than any prior device for the same purpose which avoids the necessity of extensive mathematical computation or the use of guiding templets.

I will describe my invention in the best form known to me at present but it will be understood that the same is susceptible to change in form and proportions and to desirable additions with the exercise of only ordinary mechanical skill and without departing from the spirit thereof.

In the drawings chosen to illustrate my invention the scope whereof is set forth in the appended claims.

Figure 1 is a plan view of a dressing fixture for grinding wheels constructed in accordance with my invention, the parts being in the positions they would relatively occupy when it is desired to dress the periphery of a grinding wheel transversely in a circular curve or arc or when it is desired to effect relative adjustment of the parts to determine the radius of the spherical form desired to be produced by the form tool to be ground by the dressed grinding wheel;

Figure 2, a side elevation of Figure 1;

Figure 3, a section on the line 3—3 of Figure 2;

Figure 4, a section on the line 4—4 of Figure 1 with the parts of the fixture adjusted to a position effective to dress the periphery of a grinding wheel transversely with a predetermined elliptical curve essential to grinding a form tool of a given rake angle so that said tool will be provided with a circular cutting edge in the plane of its top face to thereby render said tool capable of operating upon the work to produce a true spherical form;

Figures 5, 6 and 7 are sectional views on the line 5—5 of Figure 4 showing different positions of the parts in the operation of dressing the periphery of a grinding wheel with an elliptical cross section.

Figure 8, a detail view of the adjustable bearing arm;

Figure 9, a detail view of the rotary operating head of the fixture which has bearing in the arm shown in Figure 8; and

Figure 10, a detail view showing a grinding wheel dressed by my fixture in operative relation to a form tool being ground thereby to provide a circular cutting edge on the tool in the plane of its top face.

Referring to the drawings my improved fixture is shown comprising a base 10 which is adapted to seat or rest upon a grinding machine carriage whereby the fixture may be gradually elevated by the operator toward the grinding wheel being dressed all in a manner well known to those skilled in the art. On the base 10 I provide spaced lugs 11 and 12 and pivoted between these lugs on an axis parallel to the base 10 is a link element 13 and pivotally secured to the latter is another link element 14 which has free end portions 15 and 16 rotatably engaged on trunnions 17 and 18 respectively. Fixed on the trunnions 17 and 18 is a U-shaped yoke or tool carrier 19 which has mounted in its arm connecting portion a diamond tool 20 whose cutting point 21 is located in the axis of the trunnions 17 and 18. By this construction it will be apparent that the axis of the trunnions 17 and 18 and of course the cutting point 21 are beneficially capable of movement in unison in any direction in a plane at right angles to the axis of the pivotal connection between the link element 13 and base 10. The trunnion 17 is extended outwardly from the end portion 15 of link element 14 and splined on

this extension is a sleeve 22 whose purpose will presently appear.

Mounted on the base 10 is a standard 23 and carried by this standard is an L-shaped member including arms 24 and 25, the former of which has rotatable bearing in the standard 23 and is disposed parallel to the axis of the trunnions 17 and 18, while the arm 25 is at right angles to said axis. It will thus be seen that the arms 24 and 25 of the L-shaped member are angularly adjustable about the axis of the rotatable bearing of the arm 24 in standard 23, a screw 26 being provided for locking the L-shaped member in a desired angular adjustment.

Rotatably mounted in the arm 25 is a shaft 27 which has fixed on its inner end a head 28 disposed radially of the axis of rotation of said shaft. Outwardly of the arm 25 the shaft 27 has a reduced threaded portion 28' on which is screwed an operating knob 29. At its extreme outer end this shaft 27 is again reduced as at 30 and threaded on this reduced portion is a locking or jam nut 31 which coacts with the knob 29 to secure the latter against rotation on the shaft 27.

The outer side of the head 28 is provided with a groove disposed radially of the axis of rotation of the shaft 27. This groove contains a relatively wide outer portion 32 and a reduced inner portion 33 having converging sides 34. Seated in the portion 32 of said groove is an arm 35 of an L-shaped member, the other arm of said member being indicated at 36. A clamping bolt 37 extends through the arm 35 and cooperates with a clamping nut 38 located in the inner portion 33 of the groove to secure the member formed by the arms 35 and 36 in selected adjustments on the head 28 radially of the axis of rotation of shaft 27. Secured to the arm 36 is a U-shaped connection including arms 39 disposed in embracing relation to the sleeve 22 and pivotally connected respectively to said sleeve by cone bearing members 40.

In Figures 5, 6 and 7 I show a grinding wheel 41 being dressed by my improved fixture with the parts thereof in the relative positions shown in Figure 4 and wherein the fact is clearly disclosed that during the operation of the fixture the diamond tool 20 is disposed normal to the curvature of its path of movement at all times. This condition is brought about by the fact that during oscillation of the head 28 the sleeve 22 will coact with the trunnion 17 to impart an oscillating movement to the tool holder 19 relative to the linkage formed by the elements 13 and 14. These views also disclose clearly the changing relative relation of the elements of the linkage and the tool carrier during the operation of the fixture through its cycle.

Figure 10 shows a form tool 42 being ground by a grinding wheel 41 dressed with its peripheral cross section elliptical. In this view the grinding is substantially completed, the tool having ground therein through its entire length a groove 43 of elliptical cross section. However, as the face of the cutting end of the tool is in a plane inclined to the tools axis to conform to its rake angle and for which the periphery of the wheel was dressed it will be obvious that the cutting edge of the tool in said plane and within the limits of the groove will be the arc of a true circle and that when the said tool is imposed upon work, said cutting edge will operate to impart to a portion of the work a form which will constitute at least a part of a true sphere.

The angular relation of the shaft 27 to the plane in which the diamond tool 20 moves is determined by the rake angle of the form tool to be ground by the dressed wheel. To render the adjustment of the shaft 27 to correct angular relation to said plane a simple matter I have calibrated the arm 24 as at 44 in terms of various degrees of rake angles to be registered with a positioning mark 45 on the standard 23. This adjustment of the member formed by the arms 24 and 25 and therefore the corresponding adjustment of shaft 27 is effected by loosening the clamping bolt 26 and rotating the arm 24 on its axis to the right in Figures 1 and 2 until the desired calibration corresponding to the rake angle of a desired form tool registers with the mark 45. The clamping bolt 26 is then tightened and the fixture is ready for a dressing operation corelated to the angular adjustment of shaft 27 provided the fixture has also been adjusted with a view to the ultimate production of a form tool beneficially capable of imparting to work a spherical shape having a predetermined radius. I effect this latter adjustment when the parts of the fixture are in the positions shown in Figure 2. To this end the bolt 37 is loosened and the member formed by the arms 35 and 36 adjusted radially on the head 28 until the vertical distance between the axis of the trunnions 17 and 18 and the axis of the shaft 27 equals the desired radius. This adjustment can be easily accomplished by developing a vertical measurement from the base 10 to the axis of shaft 27 and another measurement from the base 10 to the axis of 17 and 18 which is less than the first measurement by an amount equal to the desired radius. This second measurement will determine the radial adjustment of the member formed by the arms 35 and 36 with respect to the head 28. The bolt 37 is then tightened and the angular adjustment of the shaft 27 with respect to the plane in which the diamond tool moves is effected in the manner previously referred to.

When the adjustments of the fixture have been completed the grinding wheel to be dressed is rotated and the carriage of the grinding mill gradually elevated to bring the diamond tool into contact with the periphery of the wheel. At the same time the workman gripping the knob 29 oscillates the shaft 27. This oscillation of the shaft is transmitted to the trunnion 17 through the connections previously described and thereby the diamond tool is oscillated in a curved path which is a projection on the plane in which the diamond tool moves of the circular path of the head 28 and as the head 28 is disposed at an angle to said plane the diamond tool will move in an elliptical path and dress the periphery of the grinding wheel in accordance as the carriage of the grinding machine is gradually elevated during the oscillation of the diamond tool.

What I claim is:—

1. In a dressing fixture for grinding wheels, a base, a linkage having one end hinged to the base and its other end free, a tool holder carried by the free end of the linkage for movement with the linkage, a tool carried by the holder movable with the latter and in a plane at right angles to the axis of the hinge between the linkage and the base, a member mounted on the base for rotation on an axis at an angle to said plane, a connection between the member and tool holder whereby movement of said member in a circular path will operate through the holder to impart movement to the tool in a curved path which is the projection of said circular path on the plane

in which the tool moves, and means to adjust said member to dispose its rotary axis in different selected angular relations to said plane.

2. In a dressing fixture for grinding wheels, a base, a tool mounted on the base for movement in a plane at right angles to the base, a standard mounted on the base, a bearing arm parallel to said plane and mounted on said standard for angular adjustment about an axis also parallel to the plane, a member having rotary bearing in said arm on an axis at an angle to said plane, and a connection between the member and tool mounting whereby movement of said member in a circular path will impart movement to the tool in a curved path which is the projection of said circular path on the plane in which the tool moves.

3. In a dressing fixture for grinding wheels, a tool mounted on the base for movement in any direction in a plane at right angles to the base, a standard mounted on the base, a bearing arm parallel to said plane and mounted on said standard for angular adjustment about an axis also parallel to the plane, a shaft rotatably mounted in said bearing arm and having fixed thereto an arm radially thereof, a sleeve splined on the tool mounting for sliding movement in a direction at right angles to said plane, an angle member having one arm connected to the radial arm of said shaft for adjustment thereon to various positions radially of the axis of the shaft, and a connection fixed to the other arm of the angle member and pivoted to said sleeve.

4. In a dressing fixture for grinding wheels, a base, a linkage having one end hinged to the base and its other end free, a tool holder carried by the free end of the linkage for movement with the linkage, a tool carried by the holder for movement in a plane at right angles to the axis of the hinge between the linkage and the base, a sleeve splined on the tool holder for sliding movement in a direction at right angles to said plane, a member rotatably mounted on the base with its rotary axis at an angle to the plane in which the tool moves, and a connection having one end fixed to the member and its other end pivoted to the sleeve.

5. In a dressing fixture for grinding wheels, a base, a U-shaped member having axially alined trunnions fixed to its arms respectively, a plural linkage having one end pivoted to said base on an axis parallel to the common axis of the trunnions and the other end rotatably engaged on said trunnions, a diamond tool mounted on the arm connecting portion of the U-shaped member with its diamond point located in the common axis of the trunnions, and means mounted on the base and connected with one of the trunnions operable to move said U-shaped member and linkage to cause the common axis of the trunnions and the diamond point to move in a predetermined curvilinear path.

6. In a dressing fixture for grinding wheels, a base, a U-shaped member having axially alined trunnions mounted in and fixed to its arms respectively, a plural linkage having one end pivoted to said base on an axis parallel to the common axis of the trunnions and the other end rotatably engaged on said trunnions, a diamond tool mounted on the arm connecting portion of the U-shaped member with its diamond point located in the common axis of the trunnions, and means mounted on the base and connected with one of the trunnions operable to move said U-shaped member and linkage to cause the common axis of the trunnions to move in a predetermined curvilinear path, and to maintain the axis of the diamond tool at all times normal to the curvilinear path in which said diamond point moves.

7. In a dressing fixture for grinding wheels, a base, a link having one end pivoted to the base, a second link having one end pivoted to the other end of the first link on an axis parallel to the pivoted axis between the first link and base and having its other end free, a tool holder carried by the free end of the second link, a tool fixedly carried by the holder for movement therewith, a shaft mounted on the base for rotation on an axis at an angle to the plane in which the tool moves, and a crank connection between the shaft and tool holder operable upon rotation of the shaft to move the tool holder and links to cause the cutting of the tool to travel a predetermined curvilinear path.

8. In a dressing fixture for grinding wheels, a base, a link having one end pivoted to the base, a second link having one end pivoted to the other end of the first link on an axis parallel to the pivotal axis between the first link and base and having its other end free, a tool holder carried by the free end of the second link, a tool fixedly carried by the holder for movement therewith, a shaft mounted on the base for rotation on an axis oblique the plane in which the tool moves, and a crank connection between the shaft and tool holder operable upon rotation of the shaft to move the tool holder and links to cause the cutting point of the tool to travel in a predetermined curvilinear path.

9. In a dressing fixture for grinding wheels, a base, a linkage formed of a plurality of links pivotally connected together at adjacent terminals, said linkage having one end hinged to the base and its other end free, a tool holder having fixed pivotal connection with the free end of the linkage, a tool carried by the holder, an operator rotatably mounted on the base, and means between the operator and tool holder responsive to the movement of the former to both move and solely control the direction of movement of the tool holder and free end of the linkage to cause the cutting point of the tool to travel in a predetermined curvilinear path.

10. In a dressing fixture for grinding wheels, a base, a linkage formed of a plurality of links pivotally connected together at adjacent terminals, said linkage having one end hinged to the base and its other end free, a tool holder having fixed pivotal connection with the free end of the linkage, a tool carried by the holder, an operator rotatably mounted on the base, and means between the operator and tool holder responsive to the movement of the former to both move and solely control the direction of movement of the tool holder and free end of the linkage to cause the cutting point of the tool to travel in a predetermined curvilinear path and simultaneously maintain the axis of the tool normal to the curvature of the path in which said cutting point moves.

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