Nov. 9, 1937. C. F. ERN, JR 2,098,283

APPARATUS FOR POLISHING RAZORS AND OTHER ARTICLES

Filed March 28, 1936 3 Sheets-Sheet 1

Fig. 1.

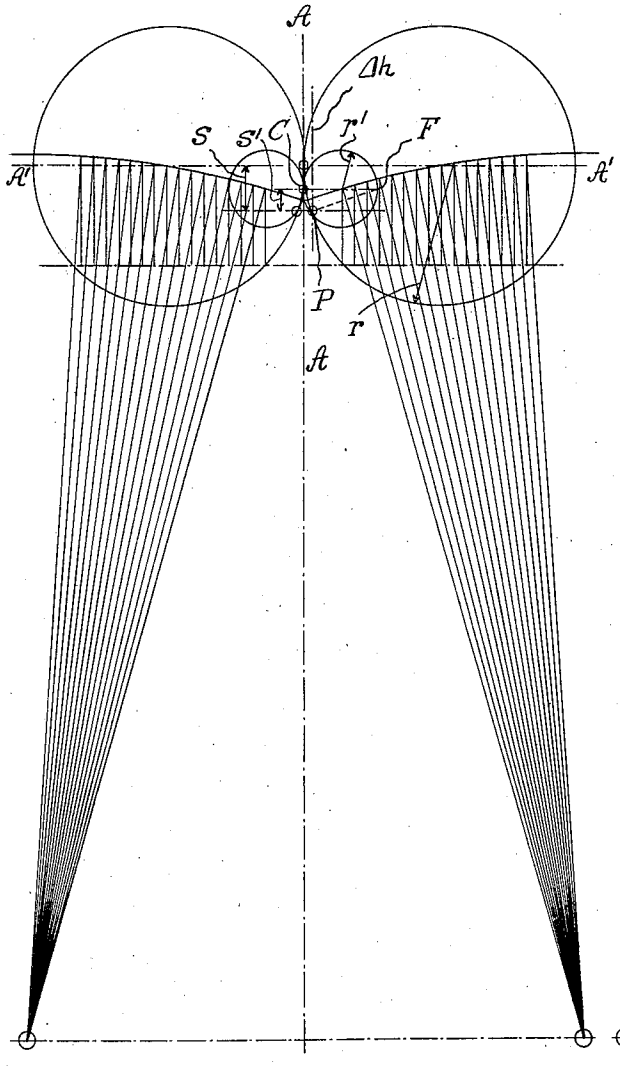
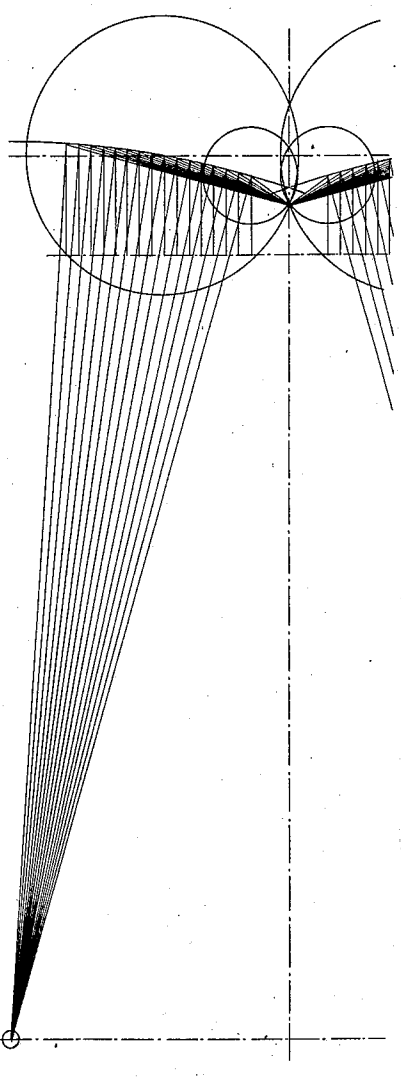


Fig. 2.



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Filed March 28, 1936 3 Sheets-Sheet 2

FIG. 3.

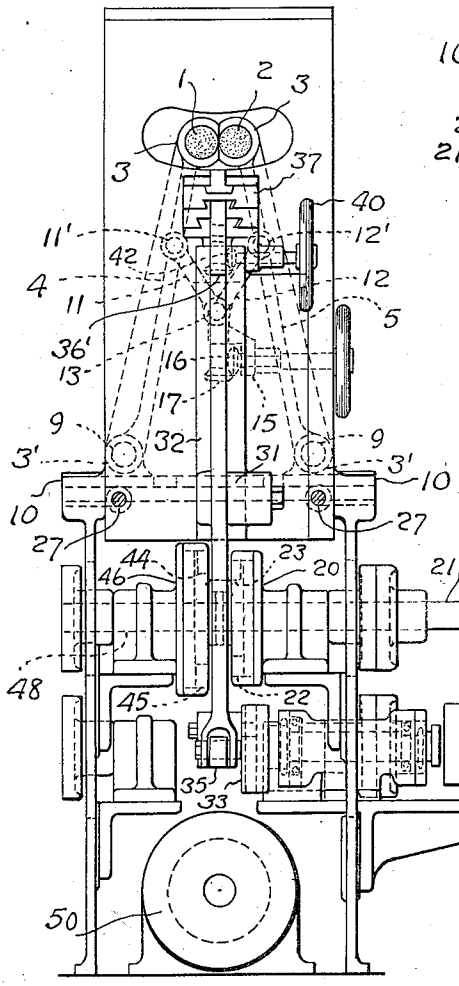
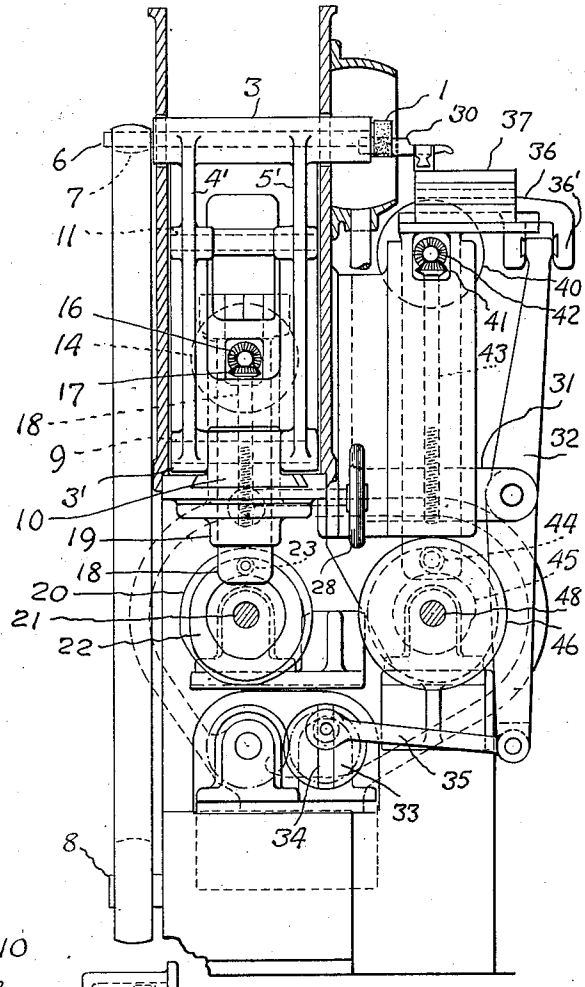


FIG. 4.



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APPARATUS FOR POLISHING RAZORS AND OTHER ARTICLES

Filed March 28, 1936 3 Sheets-Sheet 3

Fig. 5.

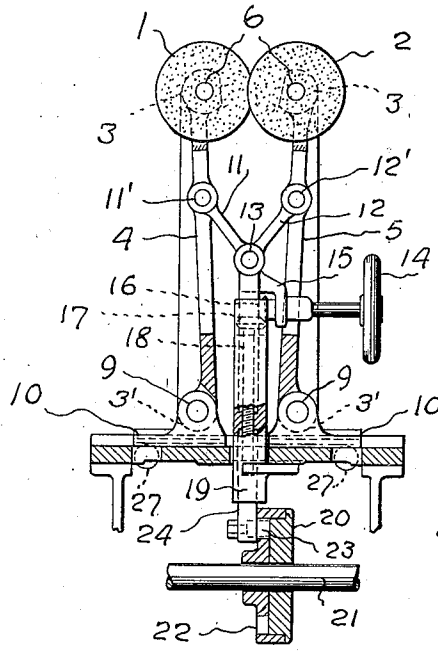
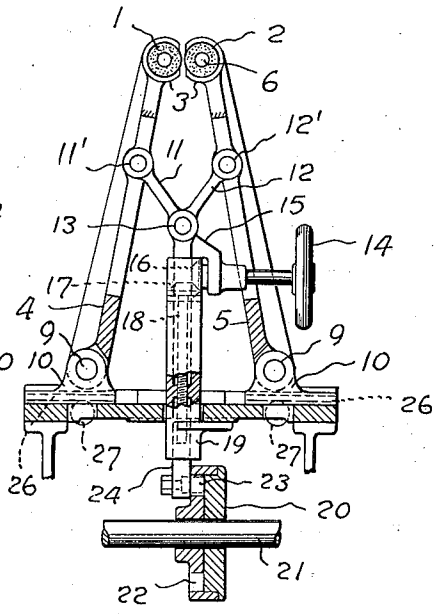


Fig. 6.



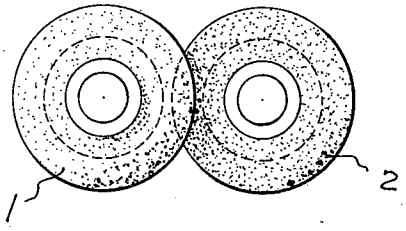
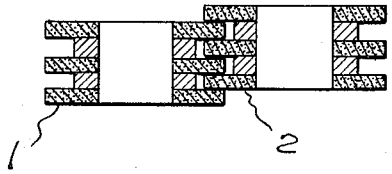


Fig. 7.

Fig. 8.



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Patented Nov. 9, 1937 2,098,283

UNITED STATES PATENT OFFICE

2,098,283

APPARATUS FOR POLISHING RAZORS AND OTHER ARTICLES

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Application March 28, 1936, Serial No. 71,389
In Germany April 2, 1935

10 Claims. (Cl. 51—84)

The invention relates to apparatus for grinding, rough-polishing, fine-polishing and sharpening on one and the same machine tools such as razors, razor blades, table knives, long knives (bread knives, kitchen knives), scissors and pen-knives.

In the well-known machines of this kind the grinding axles as a rule are placed on carriages in one plane.

Machines of this type have been heretofore proposed in which the grinding axles are supported on swinging levers but in all such known machines the arrangement of these swinging levers is such that with wear, or by the employment of grinding wheels having diameters which vary from an established form of construction, the point of attack of the grinding wheels as regards the work also changes in the direction of height.

In the known machines the bearing points of the swinging levers moreover are stationary. Since, according to the shape of the cross section of the work or according to the nature of the grinding to be done, the grinding wheels have to be made to attack at different points of the work, while in the known machines, however, there is no possibility of shifting the cutting point of the two grinding wheels to different points of the work, only a special kind of tool can be ground on these machines at any time.

These difficulties have heretofore necessitated the use of a plurality of grinding machines, which at any time could only be used for one and the same shape of work or for definite groups of work shapes.

One object of the present invention is to provide an apparatus wherein the distance of the bearing points of the two swinging levers carrying the grinding wheel from the central grinding plane and their length have such relationship with each other that the point of attack of the grinding wheels does not change its height with any of the grinding wheel diameters entering into consideration.

A further object is to provide means whereby the diameter of the grinding wheels can be chosen at will, without the height of the tool having to change in this connection. It is therefore possible to use either large or small grinding wheels. Furthermore, no detrimental reactions result when the diameter of the grinding wheel changes during the grinding operation due to the natural wear and tear. This is of special advantage because in handling hard tools the grinding wheel decreases in diameter at each grinding, even if only by a small amount.

The invention moreover renders it possible, without changing the height at which the work is located, to produce different grinding shapes in one and the same machine. A razor, for instance, having a certain width can be ground concavely on wheels of a diameter of from 180 millimeters down to 30 millimeters without changing the height of location. In this connection the thickness of the back of the blades always remains the same.

Another object of the invention is to obtain displaceability of the base bearings for the swinging levers carrying the grinding wheels, in the horizontal direction in order to regulate the distance of the bearing points of the swinging levers from the central grinding plane.

By means of this adjustment the same cutting point of the radii of the grinding wheels is always effected on different distances from the center line, that is to say, in connection with thicker work-pieces the fulcrums may be pushed away farther from the center line, in connection with thinner ones they can be brought closer to the center line.

Still another object of the invention is to provide a special device for gripping or clamping the tool in order always to keep the same in the right grinding position. This then results in an additional possibility for carrying out under certain conditions in a fully automatic manner the entire grinding, polishing and sharpening operation.

Further details of the invention and the other characteristics still essential for the same are shown by the following description of the form of embodiment represented in the drawings by way of example.

Figs. 1 and 2 diagrammatically show the special relations between the length of the swinging levers and the distance of the fulcrums from the central grinding plane, i. e. Fig. 1 in connection with grinding wheels directly opposite each other for carrying out concave grinding work and the like, and Fig. 2 when using grinding wheel pairs which overlap each other by a certain amount.

Fig. 3 shows a front view of the machine with its main parts.

Fig. 4 is an end view in partial section.

Figs. 5 and 6 show the swinging levers and the adjusting devices therefor with grinding wheels of different diameters in different working positions.

Figures 7 and 8 show in side view and in section respectively a pair of grinding wheels according to Fig. 2.

The grinding wheels which, as already emphasized, run either with or against each other and are opposite each other, separated by a distance of 0.2 millimeter, or which overlap, as shown by Figs. 7 and 8, are designated throughout by 1, 2 in the drawings for the sake of simplicity. They are rotatively supported in the heads 3 of two swinging levers 4, 5, being located on axles 6 which can turn in the swinging lever heads developed in the shape of hubs. The swinging levers individually and in detail have the shape shown by Fig. 4, that is to say, they consist of double arms 4', 5' which run together in long hubs at the top and at the bottom.

On the ends of axles 6 are pulleys 7 which are driven from a shaft 8 by means of a suitable belt transmission. The pulleys can be jointly operated in opposite directions by means of a single belt which is guided over a suitable reversing roller, which latter may serve at the same time as a belt tightener. The lower ends of the swinging levers are developed as hubs 3' and can rotate around pins 9 which are supported in carriages 10.

A special characteristic of the invention consists of the fact that the length of the swinging arms and the distance of the fulcrums from the central grinding plane have a special relation to each other.

According to Fig. 1, it must be assumed that the straight line A—A is given as the central grinding plane. Furthermore the point P and thus the vertical distance of the straight line A—A which in Fig. 1 is designated by Δh, is a given quantity. What is looked for are the curvature centers of all circles which touch the straight line A—A and pass through the point P.

For a circle corresponding to the diameter of a grinding wheel having the radius r_1, there results a distance s_1 from the point of contact C with the straight line. The rectangular triangle PFC in which the distance s_1 is the height, results in the relationship $s_1^2=\Delta h\ (2r_1-\Delta h)$. For any other circle with the radius r there results for the same reason: $s^2=\Delta h\ (2r-\Delta h)$.

If the straight lines A—A and A'—A' are considered as the axle cross of a system of coordinates, s and r designate the corrdinates of the circle centers, and the equation to be derived $s^2=\Delta h\ (2r-\Delta h)$ corresponds to the equation of the curve which represents the geometrical place for all the curvature centers entering into consideration. The equation corresponds to that of a parabola. The vertex of this parabola lies in the center of the vertical distance of the straight line A—A from the point P.

As the arrangement of a parabola guide is not very desirable for constructive reasons, the parabola in the practical execution of the machine is replaced by a circular arc which, within the scope of the stationary border cases for the diameter deviations, coincides with the shape of the parabola in a manner entirely adequate from a practical point of view.

The necessary measurements can be ascertained with the requisite accuracy both arithmetically and by means of drawings. For the arithmetical ascertainment no further instructions are necessary. Neither does the ascertainment according to the rules of drawing, of the geometrical place, that is to say the construction of the parabola by taking as a basis the given quantities and the replacement of the parabola piece entering into the question by a suitable circle arc afford any difficulties. The examples given in Figures 1 and 2 show the essential details. It is seen here that in connection with a radius of 350 millimeters on the part of the swinging levers and a distance of the fulcrums of the swinging levers from the central grinding plane of 112 millimeters within a scope of diameter changes of the grinding wheels of between 180 to 50 millimeters, i. e., a very large interval, the effect according to the invention is obtained.

In order to be able to uniformly adjust the grinding wheels around their swinging points 9 with reference to the central grinding plane, the two swinging levers 4, 5 are engaged by guides 11, 12 which are rotatively supported at a common bearing place 13. The bearing place 13 is connected with an arm 15 carrying a hand wheel 14. On the shaft of the hand wheel there is secured a bevel gear 16 which engages a second bevel gear 17 arranged on a spindle 18.

The spindle 18 engages a socket 19 provided with a suitable screw thread and secured on the machine frame.

When the hand wheel 14 is turned, the spindle 18 is displaced in the screw thread whereby the arm 15 carrying the bevel gears 16, 17 and the hand wheel 14 goes up or down together with the said bearing place 13 for the two guides 11, 12 and thereby compulsorily and uniformly moves the two swinging levers 1, 2 towards or away from each other with reference to the central grinding plane.

The hand adjustment is required in order to set the machine for the corresponding work in the first place. In addition to the hand adjustment an automatic adjustment is also provided in the example of execution for the two swinging levers 4, 5.

This automatic adjustment consists of a regulating shaft 21 coupled with the main driving shaft 8a and carrying a cam 20. The suitably constructed groove 22 of the cam 20 is engaged by a roller 23 which is connected with a rod 24 running through the already mentioned socket or bushing 19 and likewise raising or lowering the bearing arm 15 carrying the two bevel gears 16, 17 and the hand wheel 14 or the bearing 13 for the two guides 11, 12. The fulcrums 11' and 12' for the guides 11 and 12 and the distance of these fulcrums from the bearing 13 are chosen in such a way that when adjusting the swinging points 9, the bearing place 13 of the two guides remains stationary.

The swinging points 9 of the two swinging levers are adjustable in the horizontal direction, the respective bearing pins resting on carriages 10 provided with teeth 26. The teeth or cogs 26 of the carriages are engaged by pinions 27 which are adjustable, for instance on each side by itself, by a hand wheel 28 etc.

The arrangement, however, can also be made in such a way that the two gears are coupled with each other by any intermediate gears and this coupling is disconnected, if only one of the base bearings of the swinging levers is to be adjusted in the horizontal direction.

The non-uniform displacement of the two carriages 10 only enters into consideration for such work as has a non-symmetrical cross sectional shape, as, for instance, when grinding scissors, etc.

The supporting of the work 30 (Fig. 4) is effected by means of a special clamping device

which is constructed in a form peculiar to the clamping of the work in this machine.

The clamping device is moveable crosswise to the grinding wheels i. e., in a direction parallel to the axes of these wheels by means of a carriage guide in order to bring the different parts of the edge to be ground successively into engagement with the grinding tools. As a rule, a constant moving back and forth of the tools takes place during the entire grinding operation.

The drive of this reciprocal movement of the work carrier takes place by means of a lever **32** (Figure 4) rotatively supported in an extension **31** of the machine standard, which lever is driven by the main driving shaft via a cam drive **33**, **34**, **35**. The slotted crank plate **33**, **34** used in this drive is arranged adjustably so that the stroke of the carriage can be changed to adapt itself to the carrying lengths of the work.

The support **37** is moreover arranged so that it can go up and down. The extension **36'** of the carriage **36** which engages the head of the lever **32**, as well as the latter itself have for this purpose the embodiment shown by Fig. 4.

The supplementary device for changing the height of location of the work carrier **37** is constructed similarly to the adjusting device **14** to **19** for the swinging levers **4**, **5**. It consists of a hand wheel **40** located, as shown by Figs. 3 and 4, above the hand wheel **14** and laterally thereof, this hand wheel **40** being secured on a shaft carrying the bevel gear **42**. The bevel gear **42** engages a second bevel gear **41** resting on a spindle **43**. The spindle in turn engages a corresponding spindle nut.

This adjusting device, too, is developed moreover in such a way that, independently of the above mentioned actuation by hand, it may also receive an automatic compulsory drive. This consists of a roller **44** arranged on an extended shank of the spindle and engaging the groove **45** of a cam **46** which is keyed on a shaft **48** and, the same as the cam **22**, receives its drive through suitable gears. The ratios are indicated in Fig. 3 at **51**.

With the new machine not only it is possible to obtain a fully automatic operation for a definite manner of working, but several machines may be arranged according to the invention alongside or in back of each other and to each machine there may be assigned a special working operation, in such a way, for example, that in the first machine preliminary grinding is done, then in the next machine rough polishing is effected and in an additional machine fine polishing takes place, while the work then receives the final sharpening in still another machine.

The conveying of the work through the different machines can be automatically effected by guiding the clamping device with the work in it successively through the different grinding or polishing machines. This is possible for instance on a carriage or slide track extending throughout all the machines. Under certain circumstances a conveying device may also be used which is connected with the driving mechanism of the machine and automatically conveys the work carriers after a certain working time in one machine to the next one, leaving it there for a suitable length of time and then passing it on to another machine.

In this construction the working times of the work-piece in the different machines can be varied by a suitable construction of the control cams according to the nature of the operation. It is, of course, also possible to accomplish the various gradations which are necessary according to the nature of work in fully automatic operation, by selecting a corresponding number of grinding, polishing and sharpening machines.

What I claim is:

1. Machine for the grinding or polishing of tools of different cross sectional shapes, comprising grinding wheels arranged at opposite sides of a central grinding plane, two adjustable levers, bearings in said levers for the grinding wheels, pivot bearings for the levers, and means for swinging the levers to move the wheels through circular arcs of comparatively slight curvature, the distance between the wheel bearing and the pivot bearing in each lever being substantially greater than the distance between the latter bearing and the said grinding plane, and the latter distance having such a ratio to the length of each lever that the point of contact of the grinding wheel with the tool remains constant in height for grinding wheels of different diameters.

2. Grinding machine according to claim 1, comprising a device for adjusting the swinging levers consisting of a pair of guides, a joint fulcrum for the guides, and means for the vertical adjustment of the fulcrum.

3. Grinding machine according to claim 1, comprising means for adjusting the swinging levers consisting of a pair of guides, a fulcrum for the guides and bevel gears and a nut and screw spindle for raising and lowering the fulcrum.

4. Grinding machine according to claim 1, comprising adjusting means for the pivot bearings of the swinging levers to displace such bearings horizontally towards and away from the said grinding plane.

5. Grinding machine according to claim 1, comprising means for clamping the pivot bearings of the swinging levers and means for adjusting each of said bearings independently of the other in a direction at right angles to the central grinding plane.

6. Grinding machine according to claim 1, comprising a carriage supporting the bearing of each swinging lever, a toothed member on each carriage, and a toothed wheel engaging each of said members for adjusting the bearing of the swinging lever.

7. Grinding machine according to claim 1, comprising means for turning the swinging levers about their bearings, means for adjusting said bearings towards and away from each other, and cam mechanism for automatically operating the said turning and adjusting means.

8. Grinding machine according to claim 1, comprising a tool carrier, and bevel and screw mechanism for adjusting the height of said carrier.

9. Grinding machine according to claim 1, comprising a tool carrier, and cam mechanism for automatically raising the said carrier.

10. Grinding machine according to claim 1, comprising a tool carrier, a swinging member for reciprocating the said carrier and tool during the grinding operation, a slotted crank plate for operating the said swinging member, and means for varying the height of the tool carrier without interrupting the reciprocation of the tool and its carrier.

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