March 8, 1927. 1,620,519

M. S. CLAWSON

ELECTRICAL ABRASION PROCESS

Filed April 18, 1922 2 Sheets-Sheet 1

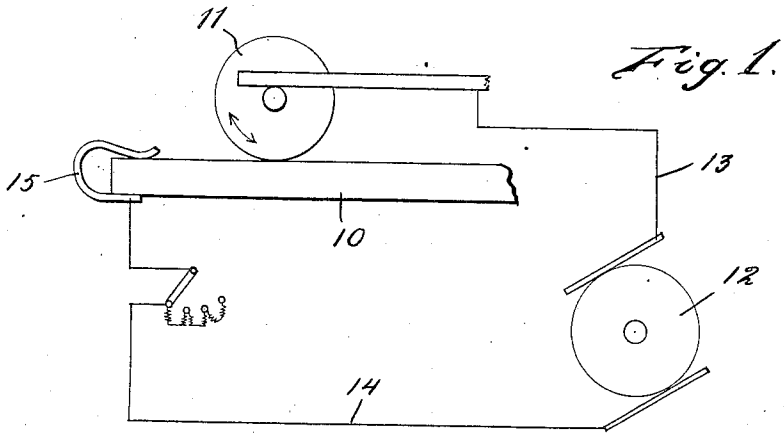


Fig. 1.

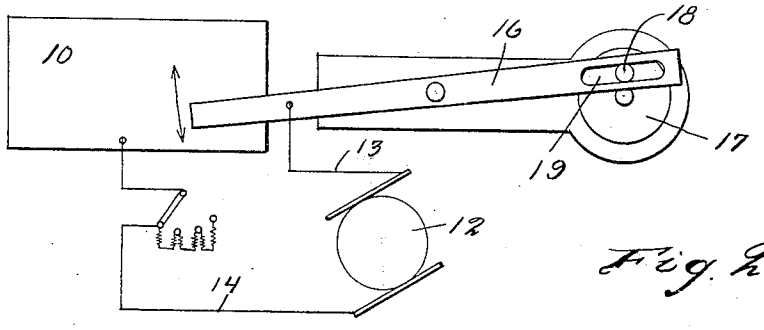


Fig. 2.

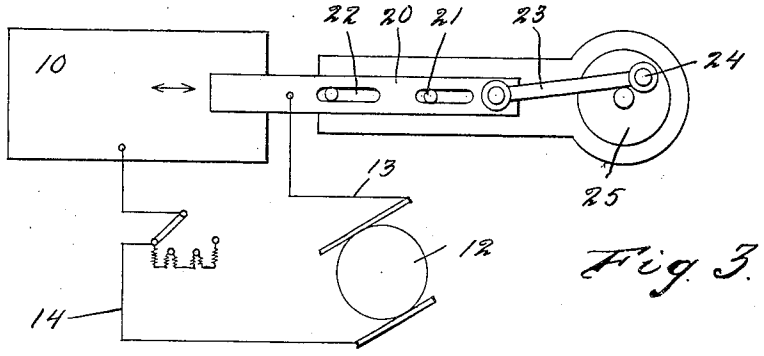


Fig. 3.

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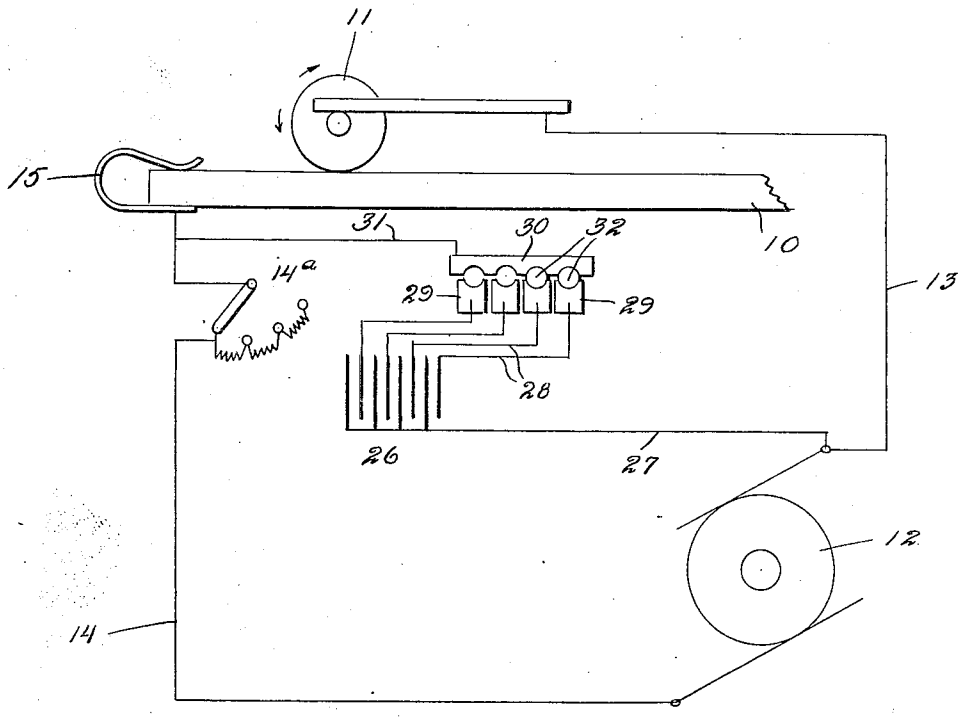


Fig. 4.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL ABRASION PROCESS.

Application filed April 18, 1922. Serial No. 554,558.

This invention relates to the polishing and grinding art and has for its object the provision of a novel process by means of which metallic surfaces may be smoothed or dressed.

I have discovered that if an electric current is passed through two conductors rubbed together there is set up a certain drag or friction which will operate to produce an abrasive effect even though the metals be of such hardness that there will be no effect in the absence of current. I am aware of the fact that various devices have been designed for marking metals, as for instance numbering tools, engraving and the like, but these prior devices operate on an entirely different principle inasmuch as they involve the burning away of the metal which leaves the resultant cavity blackened and pitted, a condition which would render the use of these devices unsuitable for finishing metal surfaces.

More specifically, the present invention has for its object the provision of a process which involves rubbing of the surface to be dressed by an element which has very rapid movement while current is passed through the rubbing element and the work, the movement being either rotary, angularly reciprocatory or rectilinearly reciprocatory, as may be preferred.

In order that a clearer understanding of the process may be had, reference is made to the accompanying drawings which illustrate, rather diagrammatically, various forms of apparatus which may be capable of carrying out the process.

In the drawings:

Figure 1 is a side elevation showing a rotary type of rubbing element.

Figure 2 shows an angularly reciprocatory element.

Figure 3 shows the rectilinearly movable type of element, the electric circuit being disclosed in each figure.

Figure 4 is a view of another form showing the use of condensers.

In Figure 1 the numeral 10 designates the work to be dressed or surfaced and 11 designates a rotary disk which is designed to be given very rapid rotation by any desired means, as for instance by means of a flexible shaft or the like driven from a suitable motor. The numeral 12 designates a suitable source of current which might be a dynamo or the like and which has one terminal connected with the axle of the disk 11 by a wire 13, and which has its other terminal connected by a wire 14 with a suitable contact clamp 15 which engages the work. It is of course essential that the work and the rotary disk be of conducting material. It is preferable to provide a control rheostat 14^a for regulating the current.

Instead of using a rotary disk I may prefer to employ a rocker arm 16 which is given a very rapid oscillatory or angularly reciprocatory movement, as for instance by means of a rotary drive element 17 carrying an eccentric pin 18 engaging in a slot 19 in the rocker arm, this modification being illustrated in Figure 2.

If preferred, I may use the structure illustrated in Figure 3 which shows a longitudinally reciprocatory strip or plate 20 guided in its movement as for instance by means of pins 21 passing through slots 22 and driven, for example, by a pitman 23 operated from an eccentric pin 24 on a rotary drive element 25. This form is designed primarily, or in any event is adapted most particularly, for use in dressing out cavities or the edges of shoulders and the like.

In actual practice, it is possible to make use of either alternating or direct current. In case alternating current is employed the speed of movement of the reciprocatory type of tool must be such that the number of reciprocations should be greater than the frequency of the current and in case a rotary type of tool is used the number of revolutions should be greater than the frequency of the current. In case direct current is employed in connection with either type of tool, the speed of the tool, either in regard to reciprocations or number of revolutions per second, should be sufficiently high to quench the spark. It may also be necessary to keep the voltage within certain limits to prevent arcing at the point of contact of the movable element with the work so as to avoid any possibility of spotting or pitting.

In Figure 4 I have shown a means for practically eliminating all arcing. In this instance I provide a series 26 of condenser units which have one set of plates connected by a wire 27 with one terminal of the source of current 12. The other plates of the units are connected by wires 28 with switch ele-

ments 29 adjacent a block 30 which is connected by a wire 31 with the wire 14 leading from the other terminal of the source of current. By inserting plugs 32 any desired number of units of this variable condenser may be thrown into parallel with the circuit to the work. By properly varying the capacity in accordance with the voltage, the spark which might otherwise occur will be avoided.

From experimentation I have found that during the entire operation the surface of the movable element and the surface being treated both remain bright at all times and that very little heat is evolved.

Having thus described my invention I claim:

The method of abrading comprising engaging a rapidly reciprocating conductor upon the work, the work being also a conductor, and simultaneously passing an alternating current through the reciprocating conductor and the work, the moving conductor being reciprocated a greater number of times per second than the number of cycles of the current per second.

In testimony whereof I hereto affix my signature.

MONROE S. CLAWSON.