

Dec. 29, 1953

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2,663,980

POLISHING METHOD AND MATERIAL

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2 Sheets-Sheet 1

FIG. 1

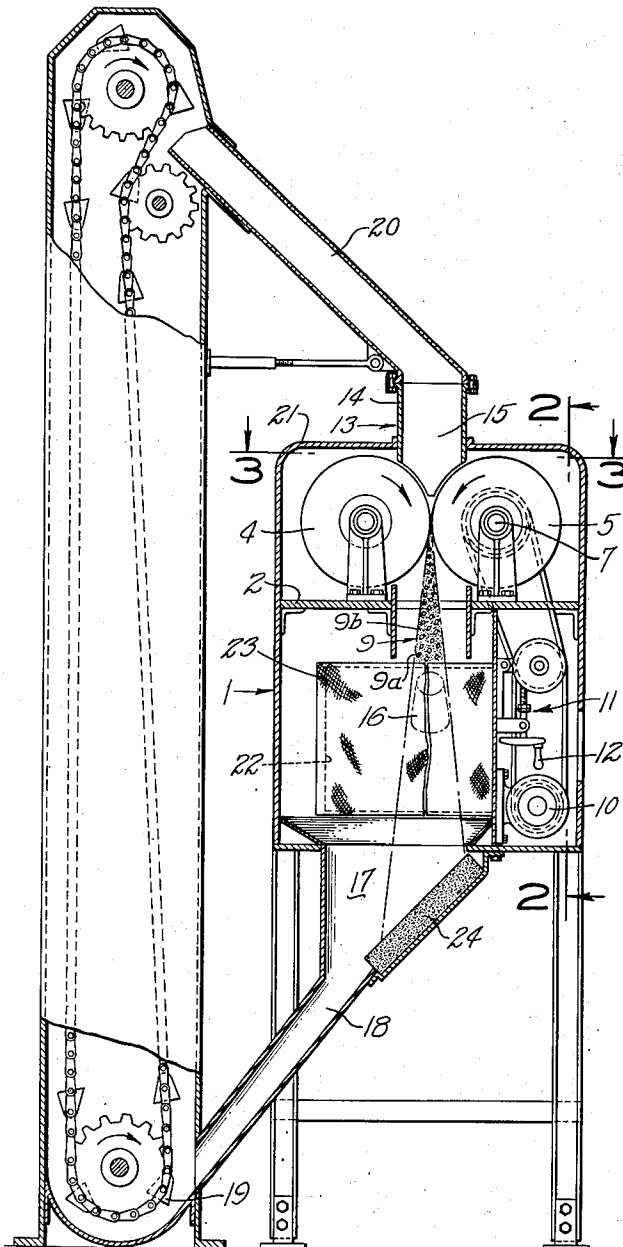
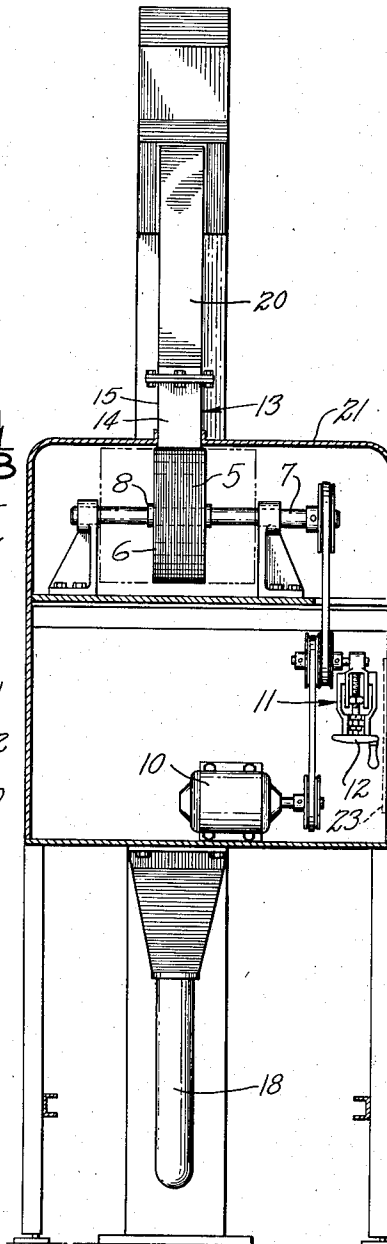


FIG. 2



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FIG. 3

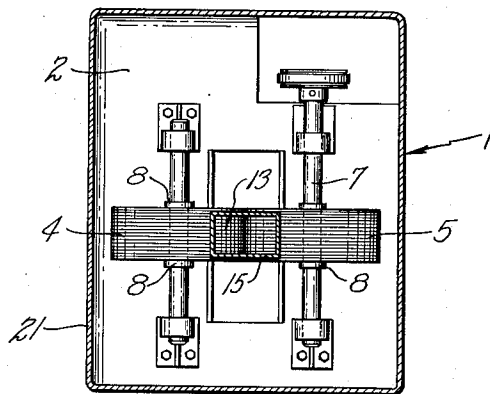


FIG. 4

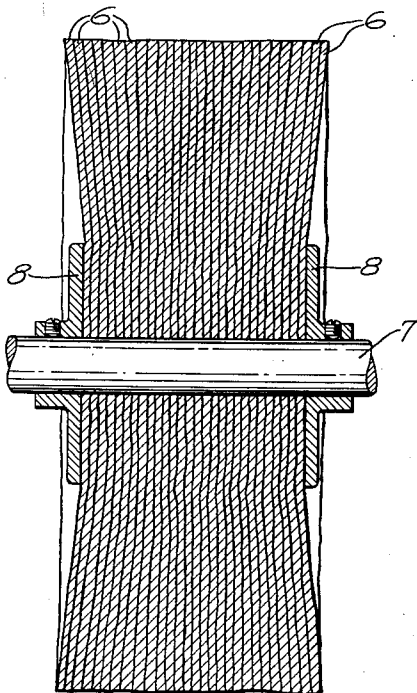
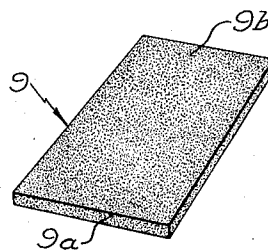


FIG. 5



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10 Claims. (Cl. 51-282)

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The present invention relates to surface finishing of articles formed of metal and other material by means of abrasives and to novel abrading material and apparatus for performing the method of the invention.

More particularly, the invention relates to the abrading practices which generally are referred to as "polishing," and which involves scratching or cutting the surfaces of castings or other articles with coarse abrasive particles or grits and removing or crossing out the coarse or deep scratches or cuts with successively finer scratches made by successively finer grits, and to "coloring," which involves removing or crossing-out the polish or fine scratches of the least coarse grits with pumice, Tripoli, rouge or similar gloss-producing or "coloring" material.

Heretofore, polishing and coloring generally has been performed by bringing the surfaces to be finished into contact with abrasive wheels or with belts, buffs or brushes laden with grits, pumice, rouge or the like and rotating at high speeds.

Numerous problems and disadvantages are encountered with these practices, particularly with irregularly shaped articles requiring uniform finishing without loss of shape. The time and labor involved in presenting the surfaces of an article to buffs carrying successively finer grits even with semi-automatic equipment is high for the simplest shapes and increases rapidly with irregularities in the shape of the article to be finished. The automatic and semi-automatic equipment is limited in its use to the finishing of a specific article or type of article and is expensive to design and construct. In addition, the buffs, wheels, brushes, belts and the like are worn out rapidly.

These and other disadvantages of known practices are eliminated by the present invention which involves feeding flexible or non-rigid abrading members, each of which has considerably greater weight than the individual grit particles secured to its surfaces, between a pair of peripherally contacting or closely contiguous buffs or brushes which rotate at high speed in opposite directions and throw the abrading members against the surface to be abraded. The speed of the abrading members coupled with their weight or mass cause the grits to dig into and scratch the work surface while the flexible yielding character of the non-rigid backing or supporting members for the grits, assures that the members slide along the work surface and press the grits into cutting or scratching en-

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gagement rather than permitting them to bounce and produce a peening or chiseling action.

The method of the present invention is not to be confused with a sand blasting operation which is usually carried out by feeding abrasive particles such as sand, shot or the like into a confined stream of high pressure air and discharging the sand entrained in the air at high velocity through a nozzle into the surface to be treated. This sand blasting is a cleaning operation in which the particles of sand effect a hammering or peening action which roughens and cleans and is the action which the present invention avoids. The particles of sand bounce off or are deflected by contact with the work piece. They do not slide along the surface of the work piece and follow its contour to produce, despite irregularities in contour, a continuous scratch or cut. Producing the latter action with freely moving members is unique with the present invention and may be obtained by throwing the abrading particles, grits, pumice, rouge or the like together with a multitude of flexible members, such as pieces of leather, cloth, paper, or the like, which slide along rather than bounce off the surface at which they are impelled at high speed and press the grits or other polishing or coloring particles into polishing or coloring engagement with the work piece as the flexible members slide over the work surface, following closely any irregularities thereof.

It will be apparent from the foregoing brief statement, that it is an object of the present invention to provide a method by means of which articles requiring polishing or coloring may be polished and colored readily and economically and which assures a highly effective and uniform polishing of irregular as well as uniform shapes. This invention produces a polish which has been virtually impossible to obtain on highly irregular surfaces by polishing methods and equipment heretofore known and employed, and a polish on plain surfaces more readily and economically than by known practices of the art.

A further object is to provide a process in which finishing is effected by throwing abrasive or coloring particles loosely with, or bonded to members of greater size, weight and flexibility than the particles, at high speed against the surfaces to be polished or colored.

The process may be performed with a polishing apparatus in which the polishing or coloring materials are entrained by and thrown from between a pair of wheels rotating at high speed in opposite directions and wherein the portions

of each wheel engaged by the materials are not connected laterally or circumferentially and, therefore, are not subject to, or capable of having circumferential or transverse stresses. More particularly, the invention contemplates the use of multiple ply cloth wheels or buffs, brushes or the like which do not present laterally or circumferentially connected peripheral surfaces that resist and are themselves rapidly mutilated, especially where the surfaces contacted and pressed against abrasive particles are stretched and under tension stresses. Rather, the buffs, brushes or the like employed in accordance with the invention, freely receive and accommodate the polishing materials and present little if any resistance to the abrasive particles. Wear and deterioration of the wheels is negligible.

The cooperating wheels preferably rotate at substantially the same speed so that there is no appreciable relative movement and wearing action between the wheels, or between the wheels and the abrasive, such as would be present if the wheels rotated at substantially different speeds, or if one of the wheels were replaced by a stationary member or shoe.

Although these and other objects and features characteristic of the invention are set forth in the appended claims, the invention itself, as well as its objects and advantages, and the manner in which it may be practiced, may be better understood from the following description of an illustrative embodiment made with reference to the accompanying drawings, in which:

Figure 1 is a side elevational view partially in section of the apparatus for handling and throwing the polishing or coloring materials in accordance with the invention;

Fig. 2 is a cross-sectional view taken generally on line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view, taken on line 3—3 of Fig. 1;

Fig. 4 is an enlarged cross-sectional view of one of the two identical buffs shown in Figs. 1—3; and

Fig. 5 is an enlarged perspective view of one form of abrading material which may be employed, in accordance with the invention, in the illustrative apparatus shown in Figs. 1—3.

Referring to the drawings, there is shown a frame generally designated 1 having a horizontal table 2 on which is mounted two rotatable buff wheels 4 and 5 that are identical and are built up to a desired width by a number of plies of cloth discs 6 pressed together on shafts 7 by flanges 8. While each of the buffs 4 and 5 preferably consists of the same number of discs 6, the number of discs 6 in the buffs may be varied to increase or decrease the thickness of the buffs and the width of a stream of polishing or coloring materials 9 which can be received and discharged by the buffs in a manner to be hereinafter described.

The buffs 4 and 5 may be individually and independently rotated in opposite directions with their peripheries adjacent to or in contact with one another or, as shown in the illustrated embodiment, only one of the wheels need be driven, the engagement of driven buff 5 with the freely rotatable buff 4, either directly or through their mutual engagement with the polishing or coloring materials 9, being sufficient to rotate the buff 4 at the speed of the driven buff 5.

The drive for the buffs may vary, the one shown being from an electric motor 10 through a belt and pulley variable speed charger, generally designated 11, which may be adjusted manually

by means of hand wheel 12 to vary the speed of the buffs while they are rotating.

The polishing or coloring material 9 may be fed directly to the trough formed by the buffs 4 and 5 from a hopper 13 which includes side walls 14 and front and back walls 15, the lower edges of which conform and are closely adjacent to, but out of contact with the buffs.

In accordance with the invention, the polishing or coloring material 9 consists of a quantity of generally identical members 9a, each of which is formed of flexible material on which grits or other abrading or coloring particles 9b are carried. The flexible members 9a may, for example, be short strips of cloth, rubber, leather, paper or the like, which are mixed or impregnated with grits, pumice, Tripoli, rouge, or other abrading, polishing or coloring particles 9b to provide the finishing material 9. In the form shown in Fig. 5, the grits 9b are bonded to the flexible body members 9a on its edges as well as on principal surfaces, whereas the material shown in Fig. 1 consists of members 9a and particles 9b loosely mixed together. As shown in Fig. 5, the flexible member is a planate body or sheet having top and bottom generally parallel plane surfaces the lengths and width of each of which is many times the side thickness of the body. It also is apparent that the polishing particles 9b are relatively so small that a multitude of them may be disposed over the top and bottom plane surfaces and, if desired, even over the thin sides of the planate member 9a.

The abrading or coloring particles 9b preferably are of substantially the same fineness for any particular batch of material 9. However, it will be understood that different batches of the material 9 may be provided with particles 9b of increasing fineness so that the coarse scratches produced by a first or coarse grade of particles will be crossed out and obliterated by successively finer particles of successive batches and they, in turn, obliterated by the action of like flexible members 9a carrying coloring compound or rouge particles of greater fineness.

As the material 9 is fed from the hopper 13 it is caught and drawn away by the rotating buffs 4 and 5, the component discs of which freely yield to receive and accommodate the material 9 without appreciable wear on the wheels and, thereafter, discharge the material 9 at high speed in a stream against the surface of a workpiece 16. Preferably, the workpiece is suitably chucked so that it may be rotated or otherwise moved to present successive portions of its surface to the action of the stream of polishing material 9.

As previously pointed out, the members 9a slide over the surface of the workpiece into its depressions as well as over high points. The particles 9b scratch, cut, or color and effect a generally uniform action at all points without distorting or obliterating the original configuration of the surface.

Preferably the work surface being polished or colored is angularly disposed to the stream so as to facilitate sliding of the members 9a over the surface and is close to the line of contact of the buffs 4 and 5 from which the stream is discharged. The large surface area of the members 9a relative to their weight and thickness decelerates the speed of the members so that their velocity and consequently their abrading action in combination with the particles 9b is less pronounced at a distance from the wheels 4 and 5. As a result, the velocity of the material 9 which avoids, as

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well as that which strikes and is decelerated by the workpiece, is not as great when it reaches the recovery hopper 17 located below the workpiece and the hopper is not excessively abraded.

From the recovery hopper 17 the members 9 may be fed through chute 18 to a bucket hoist 19 which returns the polishing or coloring material 9 to the feed hopper 13 through a delivery chute 20.

A housing 21 may be provided to enclose the wheels 4 and 5 and the workpiece 16, accesses to the workpiece being had through an opening 22 which may be shielded by a curtain 23 or other suitable means for preventing the discharge of stray material 9 from the housing.

Although multiple ply cloth disc buffs 4 and 5 are employed in the illustrated and described embodiment of the invention, brushes or other wheels also may be employed. The wheels 4 and 5 preferably are those which can freely receive and accommodate the members 9 with little if any appreciable wear. However, wheels having connected lateral or peripheral surfaces, in which tension stresses may be established normal to the pressure exerted by the members 9a when they are between the wheels, are not desirable as deterioration of such wheels may be excessive.

As previously pointed out, the particles 9b may be loosely mixed with, bonded to, or impregnated in the members 9a. In addition, the invention contemplates locating a cake 24 of polishing or coloring compound, as in the hopper 17 or elsewhere, so that the members 9a will strike the cake 24 with sufficient force to replenish their supply of the compound containing the particles 9b before being returned to the feed hopper 13 and again discharged by the wheels 4 and 5 against the workpiece 16. It also is preferable where the members 9a are formed of cloth to cut the members on the bias so that the threads are angularly disposed relative to the edges. Such an arrangement has been found to minimize unraveling.

While the present invention has been more or less specifically illustrated and described it should be understood that various changes may be resorted to within the scope of the appended claims, and that the materials, components and methods may be modified as varying conditions or finishes may demand.

Having thus described the invention, I claim:

1. The method of polishing a surface of an article which comprises throwing at the surface of the article polishing abrasive particles and a directed stream of larger planate members having a large top surface to edge surface area and wherein the large members slide over the surface while pressing the particles thereagainst to effect a cutting action thereon.

2. The method of polishing described in claim 1 and wherein said larger members are soft and flexible.

3. The method of polishing described in claim 1 wherein said polishing particles and said members are thrown together in a directed stream at the surface of the article.

4. The method of polishing a surface of an article which comprises throwing abrasive particles having minute weight at the surface of the article at a velocity at which the individual particles would tend to be deflected by and to bounce from said surface and simultaneously throwing admixed flexible planate sheet members which have many times greater weight and have a high top surface area to side surface area ratio and which cling to and slide over said surface while pressing said particles against the surface.

5. The method of polishing described in claim 4 and wherein the particles are carried by said members.

6. The method of polishing described in claim 5 and wherein the material consisting of said particles and said members is collected and re-thrown at said surface and the supply of particles carried by said members are replenished between successive throwings.

7. The method described in claim 5 wherein the particles are replenished by impact of the stream of said members with a supply of said particles.

8. The method of polishing a surface of an article which consists in mechanically propelling a batch of material containing polishing particles and larger planate flexible members having large top surface to edge surface area in a directed stream at high speed against said surface.

9. Finishing material consisting of a batch of generally like flexible planate sheet members each of length and width many times greater than thickness and of finishing particles and wherein the length and width of the flexible planate sheet members are each many times the thickness of the members and the finishing particles are of a substantially uniform degree of fineness.

10. Polishing material as described in claim 9 and wherein the finishing particles are substantially uniformly distributed over and bonded to the surface area and side edges of the flexible planate members.

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References Cited in the file of this patent UNITED STATES PATENTS

Number	Name	Date
1,352,598	Hart	Sept. 14, 1920
1,588,768	Moulton	June 15, 1926
2,092,962	Fay et al.	Sept. 14, 1937
2,225,482	Mulvany	Dec. 17, 1940
2,421,806	Perry	June 10, 1947
2,426,072	Wall et al.	Aug. 19, 1947