Patented Mar. 15, 1949 2,464,486

UNITED STATES PATENT OFFICE

2,464,486

METHOD OF TUMBLING BARREL FINISHING AND MATERIAL AND PRODUCTION THEREOF

Carl H. Castle, Sturgis, Mich., assignor to The Sturgis Products Company, Sturgis, Mich., a corporation of Michigan

No Drawing. Application November 21, 1946, Serial No. 711,468

12 Claims. (Cl. 51—282)

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This invention relates to improvements in methods of tumbling barrel finishing and materials and production thereof.

This application is a continuation in part of my application Serial No. 640,982, filed January 12, 1946, and which issued as Patent No. 2,439,156, on April 6, 1948.

The main objects of the invention are:

First, to provide a method of tumbling barrel finishing whereby metal parts may be processed to remove flash, sharp corners and surface irregularities employing limestone fragments as an aggregate, the same limestone fragments employed to produce a smooth and lustrous finish on the work by tumbling methods, and the process repeated with a second batch of work employing the same limestone fragments with such additional fragments as may be desired.

Second, to provide a method of finishing parts which enables the removal therefrom of flash, sharp corners and other undesirable surface irregularities and the final polishing thereof without removing the aggregate and the work from the tumbling barrel.

Third, to provide a method of finishing which results in a smooth and lustrous finish in a relatively short period as compared with usually practiced methods and very economically.

Fourth, to provide a new tumbling material and a new method of producing the same.

Further objects and advantages will appear from the following description. The invention is defined and pointed out in the claims.

The applicant is familiar with the methods and materials of the Balz and Davidson Patents Nos. 2,318,678, 2,318,579 and 2,318,581, all issued May 11, 1943, disclosing the use of irregular fragments of crushed limestone of a plurality of sizes and shapes and of the commercial developments and uses of the inventions of such patents.

The applicant employs as an aggregate or as polishing elements irregular fragments of crushed limestone of varying sizes and shapes and removes the sharp points and edges thereof by tumbling, with or without an abrasive powder. The fragments are then washed to remove the abrasive, if abrasive has been used, and in any event the fine residuum of the tumbling. The limestone fragments desirably vary in size from approximately $\frac{1}{8}$'' to 2''. The applicant employs the word "limestone" in the broadest sense of its usage and as the term is generally used commercially in the stone industry to include stone having a high content of calcium carbonate and/or magnesium carbonate, sometimes designated magnesium limestone, dolomite and/or the crystallized and metamorphic limestone commonly classed as marble.

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The limestone fragments are placed in a tumbling barrel with the work, the volume of limestone fragments preferably substantially exceeding the volume of the work so that the work is well surrounded and immersed in the limestone fragments.

A soapy solution with or without a powdered abrasive material is then introduced and the mass tumbled to remove flash, sharp corners and surface irregularities from the work, the soapy solution preferably having pH exceeding 10.5. The tumbling is continued until flash, sharp corners and the like have been removed from the work. This period of operation depends, as will be appreciated, from the character of the work, that is, whether it is steel or hard metal or relatively soft metal such as, for example, zinc. Non-metallic work may also be treated.

After the work has been tumbled to the desired degree to remove the flash, sharp corners and surface irregularities, the fluid is drawn off and the work, the limestone fragments and the tumbling compartment washed to remove the residual material. For coating the washed limestone fragments for the honing or final polishing operation I then introduce water and a compound composed of a mixture of sodium soap, lignin sulphonate and sodium chromate. The product commercially known by the trade name "Goulac" may be used to supply or as the source of the lignin sulphonate ingredient of the compound. A practical formula is by weight 45% sodium soap, 50% Goulac and 5% sodium chromate. The pH of this solution is less than 10.5, the pH of alkali free soap solutions commonly ranging from 9.7 to 10.2. However, it is desirable that the pH should be above 7.0. The important ingredients, insofar as coating the chips or fragments of rocks is concerned, is the sodium soap and lignin sulphonate. The sodium chromate is used to inhibit corrosion on ferrous parts and may be omitted where it is not necessary to inhibit such corrosion. I am aware that there are other lignin sulphonates or ligno-sulphonate compounds on the market which may be used in lieu of the product known as Goulac.

Goulac is the calcium and magnesium salts of ligno-sulphonic acids which includes certain other ingredients which, however, are not important in the process. The lignin sulphonate reacts with the soluble sodium soap to precipitate an insoluble calcium-magnesium soap which

collects on the limestone chips which applicant believes to be due to a preferential attraction for the same and due to the mechanical action of the chips being constantly rubbed together, and in constant contact with this precipitation calcium magnesium soap which is maintained in solution as fine particles suspended in the water used with the process. Applicant has not found or observed such attraction or result between the insoluble calcium magnesium soap and siliceous chips such as quartzite or true granite. No coating has ever been observed on wood or rubber. It is only noticed on metal parts being processed with chips when the chips are heavily coated and there seems to be an excess of the insoluble soap present.

With this solution the work is again tumbled, and this results in the limetsone fragments becoming coated with a film or coating which constitutes a lubricating and polishing surface, the irregularities of the limestone which would result in an abrasive action being filled in and covered. The result is that a polished and lustrous finish is produced on the work.

From an analysis of the film or coating formed on the limestone fragments by the process above described it is estimated the film to be as follows:

	Per cent
Calcium and magnesium soaps	43
Sodium soap	23
Sulfite liquor residue	34
Sodium chromate ---------- trace--	(0.08)

When the desired finish is attained, the solution is drawn off and the work separated from the limestone fragments and the limestone fragments used with another batch of work with a soapy solution and a powdered abrasive if desired, the soapy solution having a pH exceeding 10.5 which results in removing the coating from the limestone fragments. The tumbling is continued until the sharp corners, flash and other irregularities of the work which it is desired to remove, are removed when the washing is repeated and the step of introducing the solution of Goulac and sodium soap with the limestone to produce the coating on the limestone is repeated.

For the soluble sodium soap above described any other soluble soap may be substituted in the process. Water soluble soaps are usually considered to be sodium, potassium and ammonia soaps. Although there are others, these are the common ones. They are the result of reacting water soluble alkaline materials with fatty acids or substances containing materials which can be saponified by alkalies. Low titer or oleate soaps are better for producing a desirable film on the limestone chips than the high titer or stearate soaps, although either may be used with success. Also there are many other types of water soluble soaps than the oleates and stearates that will work satisfactorily—in fact, any water soluble soap can be used successfully.

For the lignin sulphonate such for example as the commercial Goulac before referred to as a convenient source of soluble calcium, almost any other water soluble, metallic salt or compound, other than those of sodium and potassium, may be substituted to cause the insoluble precipitate. The commoner materials and those which would be most effective are the water soluble compounds or salts of calcium, magnesium or aluminum. Less common compounds which could be used include water soluble compounds or salts of zinc,

copper, lead, nickel, iron, etc. In other words, a water soluble sodium oleate or stearate soap which is in a water solution is converted to insoluble calcium soap by adding calcium stearate or calcium chloride to the solution containing the soluble sodium oleate or stearate soap. Soluble compounds of magnesium, aluminum or zinc could be used similarly to the calcium acetate or chloride to cause the insoluble soap to form when reacted with a soluble soap solution.

As mentioned above, mechanical action is important because it keeps the precipitated soap in a state of suspension and as such the material is collected on the surface of the limestone fragments by some means of preferential attraction.

By coating the limestone through this reaction the limestone fragments are economically coated, and although the coating is desirably in the nature of a film, it is effective for the purpose and the work produced has a very high quality.

It will be apparent that the material which results in the practicing of the second step could be produced outside of the actual tumbling operation and then used as a finishing aggregate. However, one of the desirable features is that of economy resulting from the carrying on of the two steps in the tumbling charge or load and the fact that this may be made a continuous operation—that is, one batch processed after another, additions being made to the limestone aggregate as may be required to maintain the volume.

As I have stated, I use the term "limestone" in its broad sense, comprehending stone of the limestone group generally considered as belonging to this group because of their chemical composition.

Fragments of shell, such for example, as clam shell, may be used particularly for some work, as they have a high calcium content and coat similarly to the limestone when the method is followed, or the shell fragments may be used with the stone fragments for certain work.

I have described my invention in such detail as I believe will enable those skilled in the art to practice the same with various kinds of metal parts and with plastics or the like.

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

1. The method of polishing comprising the steps of tumbling the work with irregular fragments of limestone, a solution of a soluble soap, said solution having a pH exceeding 10.5, and a powdered abrasive material, to remove flash, sharp corners and surface irregularities from the work, drawing off the fluid, and washing the work, the limestone fragments and the tumbling container to remove the powdered residual material, introducing a solution of a soluble soap and lignin sulphonate, said solution having a pH of less than 10.5, and again tumbling and continuing the tumbling after the limestone fragments are coated with a film constituting a lubricating and polishing surface, then withdrawing the second solution and separating the work from the limestone fragments and re-using the limestone fragments with another batch of work and a solution of a soluble soap having a pH exceeding 10.5 to remove the coating from the limestone.

2. The method of polishing comprising the steps of tumbling the work with irregular fragments of limestone, a solution of a soluble soap, said solution having a pH exceeding 10.5, and a powdered abrasive material, to remove flash, sharp corners and surface irregularities from the work,

drawing off the fluid, and washing the work, the limestone fragments and the tumbling container to remove the powdered residual material, introducing a solution of a soluble soap and lignin sulphonate, said solution having a pH of less than 10.5, and again tumbling and continuing the tumbling after the limestone fragments are coated with a film constituting a lubricating and polishing surface.

3. The method of polishing comprising the steps of tumbling the work with irregular fragments of limestone, a solution of a soluble soap and a powdered abrasive material to remove flash, sharp corners and surface irregularities from the work, drawing off the fluid, and washing the work and limestone fragments, introducing a solution of a soluble soap and lignin sulphonate, and again tumbling and continuing the tumbling after the limestone fragments are coated with a film constituting a lubricating and polishing surface.

4. The method of polishing comprising the steps of tumbling the work with fragments of stone of the limestone group and with a solution of a soluble soap and lignin sulphonate containing soluble metallic compounds adapted to react with the soluble soap to precipitate an insoluble soap which by tumbling agitation collects as a film on the stone fragments to constitute a lubricating and burnishing surface, and continuing the tumbling after the stone fragments have acquired such coating, said solution having a pH less than 10.5.

5. The method of polishing comprising the steps of tumbling the work with fragments of a carbonate rock and with a solution of a soluble soap and a soluble metallic compound adapted to react with the soluble soap to precipitate an insoluble soap, and continuing the tumbling after the fragments have as a result of said precipitation and tumbling agitation become coated with said insoluble soap.

6. In a method of polishing, the steps of tumbling a carbonate rock with a solution of a soluble soap and a soluble metallic compound adapted to react with the soap to precipitate an insoluble soap, continuing the tumbling until the fragments have as a result of said precipitation and the tumbling agitation become coated with a film of said insoluble soap.

7. In a method of polishing, the steps of tumbling the work with fragments of rock and a solution of a soluble soap and a soluble metallic compound adapted to react with the soluble soap to precipitate an insoluble soap, said solution having a pH of less than 10.5, and continuing the tumbling after the fragments are coated with said insoluble soap.

8. In a method of polishing, the steps of tumbling the work with fragments of rock and a solution of a soluble soap and a soluble metallic compound adapted to react with the soluble soap to precipitate an insoluble soap, and continuing the tumbling after the fragments are coated with said insoluble soap.

9. In a method of polishing, the step of tumbling the work with water and fragments of limestone, the water containing in solution a mixture comprising by weight in approximately the following proportions, 45% sodium soap, 50% lignin sulphonate and 5% sodium chromate.

10. In a method of polishing, the step of tumbling the work with water and fragments of limestone, the water containing in solution a soluble soap and lignin sulphonate.

11. A tumbling material for polishing comprising fragments of rock coated with a film of an adherent residue of the reaction of a solution of a soluble soap and a lignin sulphonate containing soluble metallic compounds adapted to react with the soluble soap to precipitate an insoluble soap.

12. A tumbling material for polishing comprising fragments of limestone rock coated with an adhering film of an insoluble soap, said film constituting a lubricating and polishing surface.

CARL H. CASTLE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,318,581	Balz et al.	May 11, 1943