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COMPOSITION FOR REMOVING CORROSION REACTION PRODUCTS FROM METALS

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2 Claims. (Cl. 252—152)

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This is a continuation in part of my application for patent Serial No. 769,322, filed August 18, 1947, now abandoned, entitled Compound for Cleaning and Removing Impurities from Metals.

This invention relates to a composition for cleaning metals and removing impurities from the same, and more particularly to a composition which is useful in cleaning moulds used in the manufacture of glassware; cleaning and deoxodizing iron, steel and other alloy metals; removing flux from metals which have been welded or brazed; cleaning clogged metal tubing such as in automobile or other radiators; cleaning pipes of heating systems; and pickling or bath immersion treating of various metals in the manufacture and processing thereof.

The composition herein disclosed has many and varied uses. As an example of one of the uses of this composition, it has been found that discolored metals such as chrome plated metals which have been rejected for discoloration can be successfully restored through treatment with this composition. After treatment the metal can be either plated over again or used with its full value simply as a result of the treatment.

The composition of this invention is extremely valuable in that in the use thereof there are no objectionable fumes to contend with and it is absolutely harmless to the hands or clothing of the workmen employed in using the composition. The composition has found use in the process of plating, enamelling, metalizing, painting and anodyzing various metals.

The present composition can be used in place of ordinary pickling solution or cleaning preparations which are used now commonly in the metal industries. Furthermore, the present composition can be used over and over again without deterioration until it becomes too dirty and too full of the end products which have been removed to be of practical further use. The essential ingredients of this composition will not evaporate, the only evaporation being that of the water, and when this is replaced in the proper amount, the composition is again usable.

In the matter of non-ferrous metals, the same beneficial results of cleaning with this composition will be obtained as with other metals and no harmful effect on the metals being cleaned will result. Furthermore, the metal treated does not require burnishing. It has been found that with this composition the time required for cleaning or pickling metals is very materially reduced. In most cases the immersion of not more than ten minutes, and ranging anywhere from three

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to ten minutes, will be amply sufficient. It has been found for example, in the cleaning of moulds used in making glassware that even the most encrusted moulds will yield to an immersion of not more than ten minutes, being at the end of such time fully suitable for further use.

While this composition is as stated a composition having many uses, it will be noted that it is of special value and great benefit in the glass moulding industry. In this industry the methods of cleaning the moulds heretofore used have been very expensive in that considerable time and effort was needed to remove the carbon with which the moulds become encrusted, and furthermore, the moulds had to be ground to remove the foreign matter. This resulted in a loss of the moulds because eventually the grinding or sand blasting caused the moulds to become of improper size. It has been found by actual test that by using the present composition the moulds need only be immersed for not more than ten minutes, and on an average only about five minutes to fully clean them. Instead of grinding or sand blasting the moulds and then polishing them, it is only necessary to lightly polish or burnish the surface after immersion in the present composition to have the moulds almost instantly clean and ready for use. Furthermore, the cleaning with this solution takes place at ordinary room temperature.

Further important objects and benefits of this invention will become apparent from the description and the appended claims.

The essential ingredients of the composition herein described are water at ordinary room temperature, the water being optionally either distilled or ordinary tap water; potassium hydroxide solution, this solution consisting of potassium hydroxide flakes in the proportion of 2⅓ ounces flakes dissolved in 11⅔ ounces of water; ammonium hydroxide, ordinary commercial grade, 26° Bé.; and sulphuric acid, commercial grade, 94% to 96% pure, 66° Bé.

The exact proportions of the four ingredients, which proportions are extremely important and are absolutely critical, are as follows:

	Ounces
Water	93.08
Potassium hydroxide solution (prepared as before indicated)	11.64
Ammonium hydroxide	11.64
Sulphuric acid	11.64

These ingredients in the specific proportions as stated may be mixed together at ordinary room temperature in any suitable vessel, but preferably

a lead lined vessel, and they must be mixed under constant agitation and what is extremely important, they must be mixed together in the following order:

(1) Water
(2) Potassium hydroxide solution
(3) Ammonium hydroxide
(4) Sulphuric acid

The final solution as measured on any ordinary hydrometer will have a specific gravity of 1.100 to 1.112. Although the solution is immediately ready for use as soon as the ingredients have been properly mixed together, it has been found practical to allow a cooling before storing in shipping containers as during the mixing operation the temperature will rise from 30° Fahrenheit to sometimes 40° Fahrenheit above normal room temperature. It will be observed that during the mixing of the ingredients, that when acid is added to the first three, the mixture will turn from an ordinary clear colorless liquid into a liquid having a very dark brown color. This dark brown color immediately disappears and the solution again becomes clear and colorless as soon as the right amount of acid has been added, the correct amount being as indicated in the proportions hereinbefore stated.

Unless the exact proportions of the material are used as stated herein, and unless the several ingredients are mixed in the exact manner herein indicated, the composition will not have the results and beneficial uses hereinbefore stated. In fact, if the composition is improperly mixed and if the exact proportions are not observed, it will be useless for any purpose.

The water serves for the necessary volume and as a vehicle for the other ingredients. The potassium hydroxide solution has a cleaning effect and it adds to the total effect of the composition in a manner which is unknown to me, except that I have found by experimentation that in using the potassium hydroxide solution made up as herein explained, as a part of my formula, I get a different and better result than as if the potassium hydroxide solution was simply mixed with water and used separately or used alone.

The ammonium hydroxide seems to act as a neutralizer and renders the composition harmless to the human skin. It also has certain other peculiar and novel results in the composition which I cannot explain other than by stating that if I used different proportions or omitted same, I do not get the proper results.

The sulphuric acid is well known as a metal cleaner and has been used in dilute solutions with water. For cleaning metal it is dangerous to use in that it attacks the metal and of course is extremely harmful to the human skin, as well as the clothing of the operator. My composition does not attack the metal or other surfaces being cleaned or treated and in actual experiments has been stored in metal containers for as long as sixteen months without serious injury to the container.

The moulds used in glass making are usually of cast steel or cast iron. In use, the great heat of the glass which is as much as 2700° Fahrenheit, requires constant swabbing of the mould with graphite base oil. The heat causes a carbon deposit which up to now could only be removed by grinding or sand blasting the mould and then polishing it. This method has heretofore been the only known method in the glass industry, although much experimentation and great sums

have been spent in seeking a way of saving the moulds from the grinding effect and to reduce the expense of cleaning. With my composition the savings in the industry are calculated to be tremendous in that the moulds are quickly and easily cleaned simply by immersion in my composition for a few minutes and then washing in water. High temperatures are not required as the process operates at ordinary room temperature and in some instances no further treatment of the mould at all is required, although as a matter of practice it has been found expedient to wipe the moulds after cleaning, with steel wool or the like. The polishing operation when resorted to requires a very brief period of time, usually not more than a couple of minutes, depending on the size of the mould.

Mere uncalculated mixtures such as disclosed for example in Patents 1,973,087 of September 11, 1934, and 686,665 of November 12, 1901, of some or all of the ingredients of my composition do not have the beneficial aspects and results of my formula, as such mixtures either attack the metal if used in treating metal or are harmful to the user if contacted by the skin or clothes, or both.

It is highly desirable that while the glassware making moulds are being cleaned with the use of the solution or compound herein described, these terms being used interchangeably, that if possible, those parts of the mould which have had sufficient cleaning action, or in other words those parts from which the carbon or other objectionable deposits or encrustations have been removed, shall be protected against further unnecessary cleaning action. It will be understood that some parts of the mould may require longer treatment and more time of immersion for cleaning those other parts, depending on how dirty (carbon crusted, etc.) the several parts of the mould may happen to be. For this purpose, to protect the cleaned parts of the mould from further unnecessary action, while the rest of the mould is still taking the cleaning action, my invention or discovery is to add to the cleaning solution a certain quantity of protective substance, which substance is albumen or dry powdered white of eggs.

This protective ingredient is extremely important to the protection of the moulds after my solution or compound has done its part in the cleaning and removal of this hard carbon deposit from the moulds. It will be understood that in using the moulds they are coated with graphite based oil to keep the glass from sticking to the moulds and due to the extreme heat generated in the moulding process this coating becomes a hard carbon deposit which has to be removed before the moulds can be used over again. This protective substance, viz., the albumen or dry powdered white of eggs is added to the solution after the latter has been fully prepared ready for action and has been placed in the cleaning tank. The amount of protective substance, which term will be used in describing the albumen or dried powdered white of eggs, that is used is one ounce avoirdupois by weight to each fifty (50) gallons of the cleaning composition. The proportion of protective substance can be varied but there are practical limits which I have determined by test and which can best be explained by me as follows: That if less than the ounce is used, the protective substance will still be effective but not as much so as if the stated proportions are used and furthermore it will be impossible to determine the extent to which the protective substance is being

effective whereas if the one ounce to fifty gallons proportions are observed, the solution to which the protective substance has been added will take on an appearance as of having a foam on the surface. This foamy appearance will remain for so long as the protective substance is still effective and doing its work. When the foamy appearance disappears it is then evident that while the protective substance may still be having some degree of effectiveness in the cleaning solution of which it has been made a part, it is below the desired point of such effectiveness, this is then a signal to add more of the protective substance to the cleaning solution. This protective substance is initially, or when being added as a supplement to revive the desired effectiveness of the solution, merely stirred in by vigorous agitation by any desired means as for example by use of a paddle or the like stirrer. Mere stirring of the cleaning compound after the protective substance has diminished below the desired effectiveness will not revive the foamy appearance or revive the effectiveness of the protective substance. My theory of what happens to the mould is that when the carbon deposit has softened and dropped off the protective substance then adheres to the cleaned part of the mould. It will not stick to the uncleaned part of the mould.

Now as regards having more than one ounce protective substance to fifty gallons cleaning composition, or in other words, the upper limit, I have found that as much as three ounces can be safely used, but it slows the action of the cleaning composition by as much as one-half and if too much of the albumen is added, has such a deleterious effect on the cleaning composition as to make it entirely ineffective. My theory of this action is that the cleaning composition becomes entirely neutralized although for what reasons this happens, I am not entirely scientifically aware.

The time element for adding the protective substance is dependent on the number of moulds or like pieces being cleaned in a given quantity of the cleaning composition. For example, in cleaning 1010 pieces, viz., moulds as commonly used in making glassware; parts of the machinery, blanks, guide funnels, baffles, springs, neck rings, and various other things and using a fifty gallon quantity of my cleaning composition having this protective substance in it in the one ounce to the fifty gallons proportions, the protective substance was added nine times or once in each seventy-two hours.

It is essential that the cleaning solution or composition with this protective substance in it, which will be referred to as the protected solution, shall not be permitted to exceed a working temperature of 110 degrees Fahrenheit. The protected solution should be warm, viz., from 65 to 110 degrees Fahrenheit, not hot, as a higher temperature not only destroys the effectiveness of the protective substance, but may damage the mould by pitting it. However, the protected solution may also be effectively used at a temperature as low as 50 degrees Fahrenheit.

A method of determination of life of the protected solution

At sixty-five degrees Fahrenheit it will take approximately fifteen minutes to clean moulds, etc., that have been in operation ten days. Moulds, etc., in operation forty-eight hours, then cleaned, the time limit will be approximately

fifty percent less, at the same temperature. If the time element is the same in both cases, that is, the length of time the moulds are on the machine and the time is doubled in the cleaning solution, the moulds should be taken out and the new solution put in the tank. There may be a few exceptions to this rule, but that will be determined through experience.

An example of the value of my protected solution is in the fact that in my method of cleaning with my protected solution 504 pieces were cleaned in eleven hours where as formerly this required one hundred and twenty-six hours. Also, the life of the moulds has been extended by about a third beyond their normal useful life.

For use in treating chrome or the like plated articles to clean and restore the same, it is only necessary to immerse these articles for a few minutes, as a rule not exceeding ten minutes, in a sufficient quantity of my composition to completely cover the article, and then wash the article in clean water.

In the use of my composition for cleaning clogged radiators, as for example, automobile radiators, the radiator and cooling system is drained and a quantity of my composition is substituted. The radiator and cooling system is then heated by the ordinary action of running the engine of the automobile and then the contents are drained, after which the radiator need only be flushed with water. The length of time the composition is allowed to remain in the radiator and cooling system depends on the extent of stoppage or other foreign matter involved.

In cleaning flux and oxides from copper and brass assemblies, the metal while still hot and on completion of the brazing operation is immersed in my composition. The removal of flux and oxides is practically instantaneous. The assembly need then only be rinsed in water.

In using the composition as a pickling bath, the article to be treated is simply immersed in a sufficient amount of composition to completely cover it and allowed to remain for a short period of time in most cases not exceeding ten minutes, after which it is removed and washed with clear water.

In connection with other uses of my composition, it will be found as a rule that it is only necessary to cover or immerse the article in my composition or externally apply my composition, then rinse the article with water.

In referring to the same mixture but having the protective substance in it, I have called it the "protected" solution.

It will be understood that in referring to the cleaning of moulds used in making glassware, I include within such definition the various other parts of machinery and apparatus which have to be cleaned, as metallic parts and various elements of metallic nature wholly or partly fabricated, for which cleaning is necessary.

What I claim is:

1. A composition for removing corrosion reaction products from metal consisting by weight per gallon of the composition:

	Ounces
Water	93.08
Potassium hydroxide solution	11.64
Ammonium hydroxide, 26° Bé	11.64
Sulphuric acid, 66° Bé	11.64

said potassium hydroxide solution consisting of potassium hydroxide and water in the proportion

of 2⅓ ounces of potassium hydroxide flakes to 11⅔ ounces of water.

2. A composition for cleaning moulds in the manufacture of glassware consisting of the following ingredients by weight per gallon of the composition:

	Ounces
Water	93.08
Potassium hydroxide solution	11.64
Ammonium hydroxide, 26° Bé	11.64
Sulphuric acid, 66° Bé	11.64

and one ounce of albumen to each 50 gallons of said composition, said potassium hydroxide solution consisting of potassium hydroxide and water

in the proportion of 2⅓ ounces of potassium hydroxide flakes to 11⅔ ounces of water.

LEWIS MORGAN PETERS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
686,665	Shehadi et al.	Nov. 12, 1901
690,458	Pease et al.	Jan. 7, 1902
1,973,087	Markley et al.	Sept. 11, 1934
2,116,034	McGaughey	May 3, 1938