

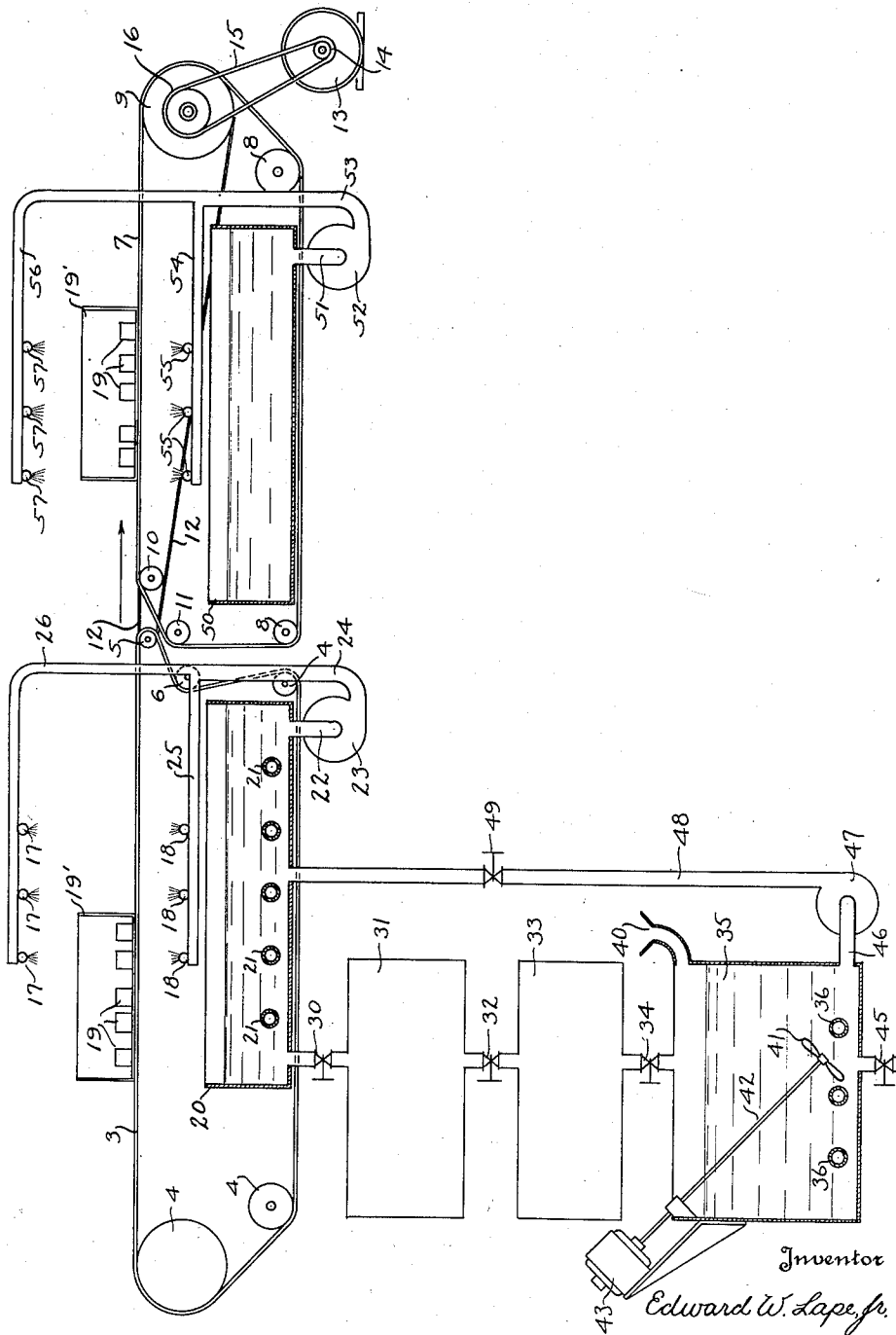
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METHOD OF CLEANING ARTICLES

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METHOD OF CLEANING ARTICLES

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This invention relates to the cleaning of articles to remove impurities from the surface thereof.

One of the principal objects of the invention is to provide a method of cleaning impurities from articles, which is simple, economical and highly effective, and which admits of continuous operation with a minimum of manual labor.

Another object of the invention is to provide a method of cleaning articles of a coating of impurities, such as buffing compound, containing waxy or greasy ingredients which melt at temperatures above the boiling point of water.

Still another object of the invention is to provide apparatus for carrying out the above method.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and appended claims.

In the drawing, which discloses a preferred embodiment of the invention, the single figure is a diagrammatic illustration of apparatus constructed in accordance with this invention.

The invention is described herein with reference to the removing of surface coatings of buffing compounds used in the polishing of metals, although capable of more general application. Buffing compounds generally comprise an abrasive such as tripoli powder, pumice, rouge, lime or other finely powdered abrasives held together in cake form by a binder of stearic acid, stearine, processed greases, mineral waxes, and the like.

The buffing compound is generally applied to the periphery of a rapidly rotating cloth wheel and the materials to be polished are then held in contact with the wheel surface. Considerable heat is generated during the polishing and this causes the buffing compound to melt and to attach itself in the form of a dirty black smudge to the surface of the articles being polished. Portions of the black smudge collect in the grooves and crevices of the articles being polished; and as this material cools, after the polishing is completed, it hardens and becomes very difficult to remove.

Referring to the drawing, articles to be cleaned are placed upon an endless perforate conveying belt 3 of a washing machine, the belt being supported upon guide rollers 4 and a driving roller 5, and is adapted to move the articles to be cleaned in the direction of the arrow. The guide roller 5 is constructed of a comparatively small diameter and the conveying belt 3 travels about a large portion of the surface of the roll and into contact with an idler roller 6. Supported adjacent the driving roller 5 is a second conveying

belt 7 carried by idler rollers 8 and a driving roller 9. The portion of the belt 7 adjacent the discharge end of the belt 3 is supported in an inclined plane by means of idler rollers 10 and 11. The arrangement is such that articles carried on the belt 3 are dropped therefrom, or transferred onto, the inclined portion of the conveying belt 7, so that a continuous passage of the articles is secured through the washing machine. The conveying belt 7 is driven in the direction of the arrow by means of a motor 13 having a pulley 14 on the motor shaft connected by belt 15 with pulley 16 on the shaft of driving roller 9, suitable speed reducing mechanism being incorporated in the motor drive to provide the proper rate of travel for the conveyor. The roller 9 is in turn connected by driving belt 12 with driving roller 5, so that a single motor serves to drive the several conveying belts at coordinated speeds. The belts may be driven at the same speed, or preferably the conveying belt 7 is driven at a slightly greater speed than the conveying belt 3 so that the danger of articles jamming between the belts on their transfer from one belt to another is minimized.

The articles 19 to be cleaned are placed upon the perforate conveyor belt generally within racks or wire mesh baskets 19', and as the belt travels forward the articles are brought within the range of a series of sprays 17 and 18 which are preferably arranged both above and below the conveyor belt or in other advantageous positions to direct powerful streams of washing liquid against the articles.

The washing liquid with which the articles are treated has such physical properties that it is capable of being heated while in liquid form to a temperature well above the melting point of the impurities to be removed, such as the bonding grease which forms the base of the buffing compound. A liquid having a boiling point materially above 300° F., and which is comparatively inert with respect to the metal or is not objectionably acid in reaction, so that it will not remove the gloss from the surface thereof, is quite satisfactory. A mineral oil of low viscosity, when heated, and having a flash point above 350° F. is very satisfactory for this work, as it may be raised to a temperature in excess of the melting point of the bonding grease. In addition to removing the grease by melting it, such a mineral oil also has a solvent action on the grease which adds to the rapidity of the cleaning operation. When the grease melts, under action of the hot oil, the buffing compound including the greases and the

abrasive material, is washed completely from the surface of the articles by the force of the sprays, and the grease coating is replaced by a thin surface coating of the hot oil which is subsequently removed in another washing operation.

The washing oil is supplied to the jets 17 and 18 from a collecting sump or tank 20 which is positioned below the jets 18. The tank 20 serves as a storage compartment for the oil and acts also as a catch basin for the oil that issues from the jets and drains from the articles being cleaned. The tank 20 is supplied with heat from some suitable source such as the steam pipes 21 or electrical heating elements, to thereby keep the oil within the tank at an effective working temperature of approximately 275° F. to 325° F. The tank 20 is provided with a pipe 22 connected to the intake side of a pump, such as the centrifugal pump 23, which may be driven by a motor (not shown). The pump discharge is carried through pipe 24 to a branch extension pipe 25 to which the jet nozzles 18 are attached. The jet nozzles of the pipe 25 are directed upwardly towards the bottom of the perforated conveyor belt 3. Another branch pipe 26, connected to the discharge pipe 24, supplies the jet nozzles 17 with the cleaning liquid under pressure, these nozzles 17 being directed downwardly to flow the cleaning liquid over the tops of the articles being cleaned. Under the action of the pump 23 the hot oil issues from the nozzles 17 and 18 with considerable velocity, and provides a scouring operation which reaches practically all parts of the articles being cleaned.

After continued use the washing oil may become so saturated with molten grease and other ingredients of the buffing compound that it is no longer effective in its cleaning action. This spent washing oil is then drained off from the tank 20 through a valved outlet 30 which communicates with a storage tank 31. From the storage tank 31 the used oil passes through a valved outlet 32 into a conventional oil filter 33 where the solid ingredients, which are carried in suspension in the washing oil, are removed. The oil with the dissolved greases of the buffing compound is then passed through a valved outlet 34 from the filtering tank into a cleaning tank 35 which serves to regenerate or purify the oil for further use. The tank 35 is supplied with heat as by means of the steam coils 36 to keep the solution within the tank at a proper temperature for the effective action of a cleaning agent such as a strong caustic soda or potash solution which is introduced into the tank through the opening 40, and which serves to saponify the greases but does not deleteriously affect the mineral oil. The purifying action is accelerated by the use of the heating coils 36 which serve to keep the alkaline solution close to the boiling point. This action may be further accelerated by the use of an agitator such as the propeller or paddle 41 attached to the end of the shaft extension 42 of a motor 43 mounted on the side of the tank. The agitator is driven at a high rate of speed to produce turbulence within the container and consequent rapid saponification of the dissolved greases. After sufficient purifying treatment the mass is allowed to stand until its stratifies and settles out into a lower water layer containing the caustic solution and the saponified greases in the form of dissolved soaps, and an upper layer of cleaned mineral oil. A discharge outlet 45 in the bottom of the tank 35 permits the removal of the sep-

arated lower layer containing the waste ingredients after the removal of which the purified oil may be returned to the tank 20 for further use. A discharge pipe 46 is provided adjacent the bottom of the tank 35 and is connected to a pump 47 which has its discharge outlet 48 communicating with the tank 20 through a valve 49. Upon opening the valve 49 in the discharge line of the pump 47 and setting the pump into operation the reclaimed oil within tank 35 is returned to the tank 20. Sufficient oil is preferably supplied to the system to make the washing operation continuous; one batch of oil being under treatment while another batch of oil is being circulated from the tank 20 to the jets 17 and 18.

After passing through this washing operation the articles on the conveyor belt 3 are transferred to the conveyor belt 7 and advance to a washing operation where the coating of mineral oil is removed from the articles. The washing operation comprises a storage tank or sump 50 which serves as a container for washing liquid and also as a catch basin for the liquid that is sprayed onto the articles being rinsed. A discharge outlet 51 in the bottom of the tank 50 connects to the suction side of a centrifugal pump 52 driven by a motor (not shown). A discharge pipe 53 from the pump is provided with a branch pipe 54 to which are attached upwardly directed jets 55 for discharging the washing solution against the under side of the endless perforate conveyor belt 3. Another branch pipe 56 is attached to the discharge pipe 53 and is provided with downwardly directed jets 57 to direct the streams of washing liquid towards the top of articles passing through the compartment on the conveyor belt. A washing solution of hot water is sufficient to remove the thin film of oil from the articles provided it is not necessary to have the articles chemically clean, such as would be required for electroplating. If the articles are to be plated, an alkaline rinsing solution, such as a solution of sodium carbonate, will provide a degree of cleanness in which practically all traces of the oil are removed. The alkaline solution emulsifies the oil coating on the articles and leaves the surface of the articles completely free of any foreign matter.

This method of cleaning permits the use of high speed mechanical washers in removing foreign material which heretofore have necessitated manual brushing or rubbing treatment. Of course the cleaning operation may be performed without the use of mechanical washers, or with washers of other types than the projection or spray type, but for speed and economy of operation the spray type mechanical washer is preferred. However, effective cleaning is readily effected by washing, as by immersing, the articles in a suitable highly heated liquid, such as a mineral oil, and providing sufficient agitation to effect the melting and solvent action upon the resistant binder or grease. Other washing liquids, having these desirable properties, may be used for this purpose, such as suitable vegetable and animal oils, paraffin which is liquid at the temperature of use, and the like. The washing liquid has preferably a low viscosity, so that when the liquid is used in a sprayer, jets of high velocity are obtained. A liquid which is quite fluid at normal atmospheric temperatures is preferred, so that it will not clog pipe lines and nozzles when used in a pump circulating system. By thus replacing the original sludge or coating on the articles with a thin film of the washing liquid or oil, this thin film may then be readily

removed by a suitable wash liquid. Thus an alkaline solution readily emulsifies the thin film and gives a chemically clean surface. It is of course not necessary to recover the washing oil, as fresh batches may be supplied from time to time as needed, but this may be desirable from the standpoint of economy and the maintenance of a satisfactorily clean washing liquid during continuous operation.

10 While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

20 1. The method of cleaning articles of surface impurities including a grease binder which has an effective melting point above the boiling point of water, which comprises heating an oil having a boiling point above such effective melting point of the binder of the impurities to be removed to a high temperature above the boiling point of water and in excess of said effective melting point, and then washing the articles with the oil heated to such a high temperature.

30 2. The method of cleaning articles of surface impurities including hard grease which has an effective melting point above the boiling point of water which comprises heating an oil having a flash point above said effective melting point of the hard grease to a high temperature in excess

of said effective melting point, washing the articles with the oil heated to said high temperature to cause melting of the grease and concomitant removal of impurities, and then washing the resultant articles with a second washing liquid effective to remove the oil adhering to the articles. 5

3. The method of cleaning articles of surface impurities including hard grease which has an effective melting point above the boiling point of water, which comprises heating a mineral oil which has a solvent effect upon the grease and has a flash point above the effective melting point of the grease to a high temperature in excess of said effective melting point, washing the articles with the mineral oil heated to said high temperature to thereby melt and dissolve grease and remove a substantial part of the impurities and replace the same with a film of the mineral oil, and then washing the resultant articles with an alkaline solution in a manner to emulsify and remove the mineral oil film. 10 15 20

4. The method of cleaning articles of surface impurities including hard grease which has an effective melting point above the boiling point of water, which comprises moving the articles in a continuous stream, subjecting the moving articles to sprays of an oil having a boiling point above the effective melting point of the hard grease of the impurities to be removed and heated to a high temperature in excess of said effective melting point, and then washing the moving articles of oil by sprays isolated with respect to said first mentioned sprays. 25 30

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