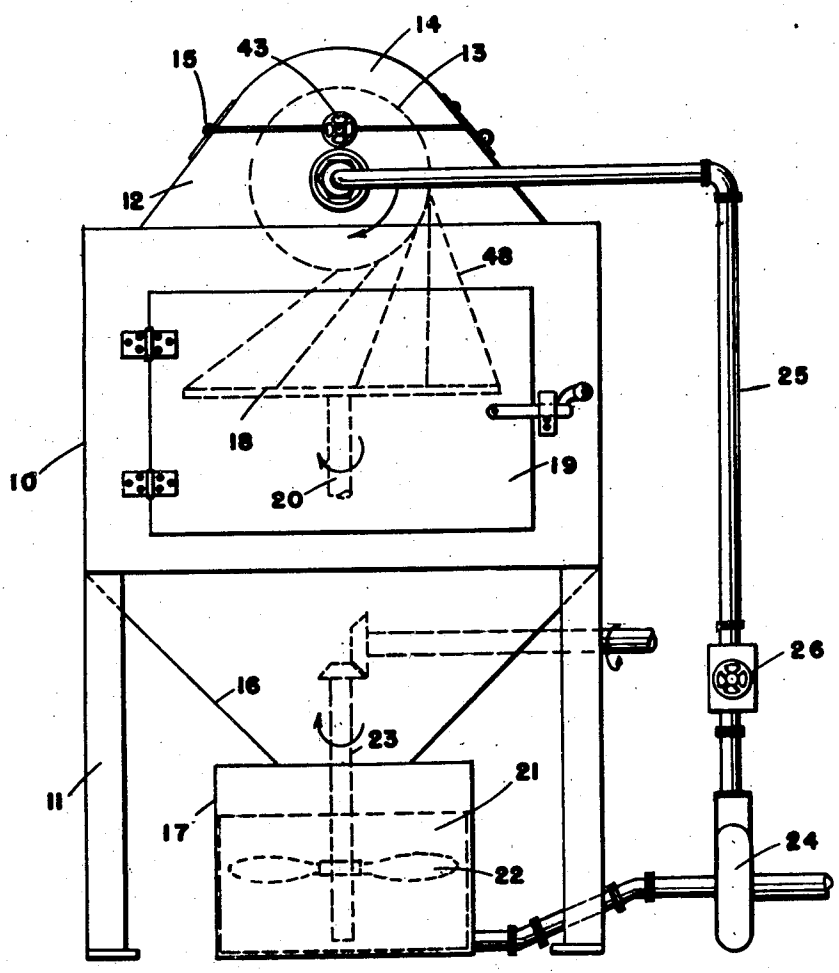
Oct. 28, 1947. K. H. BARNES 2,429,742

TREATING SURFACES OF WORKPIECES WITH ABRASIVES

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FIG. 1



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FIG. 2

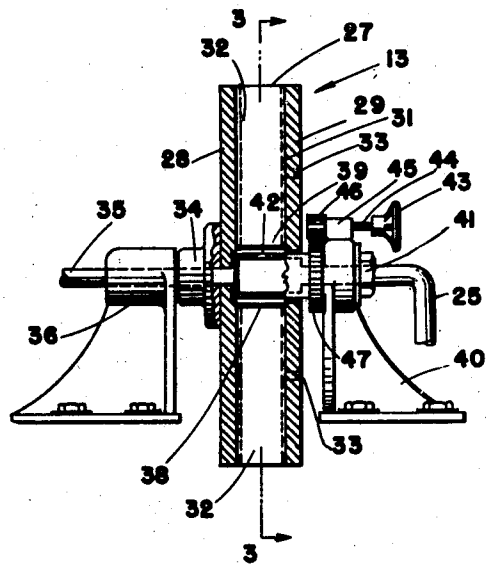
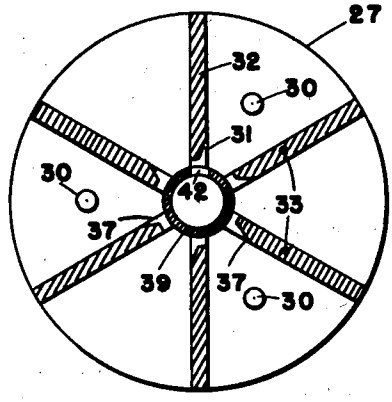


FIG. 3



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TREATING SURFACES OF WORKPIECES WITH ABRASIVES

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2 Claims. (Cl. 51—9)

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This invention relates to a method and device for the treatment of surfaces of work pieces.

The invention provides a method and device for treating a surface to produce a diffused smooth appearance, for removing impurities from a surface without injury to the surface or alteration of close surface tolerances, for applying a finish to machined surfaces to increase their lubricant retaining ability, for increasing the fatigue life of the treated parts and many other purposes.

According to the invention a mixture, emulsion colloid, or suspension of a finely divided abrasive and a liquid is prepared and is fed onto the blades of a centrifugal throwing wheel driven at high speed. The blades of the throwing wheel break up the stream of the mixture, emulsion colloid, or suspension into small particles, each particle consisting of liquid with abrasive suspended therein. The broken-up particles are accelerated directly by the wheel and are projected at high velocity in a fan-shape blast without the aid of a carrying or enveloping air jet or liquid jet, and strike the surface of the work piece where they perform the desired surface treating action. The stream of particles discharged from the centrifugal throwing wheel covers a large area of impact. The surface treating action of the particles is substantially uniform throughout that area, insuring an even treatment of parts at all points within a large area without formation of spots or focuses as are commonly formed where air jets or liquid jets are employed for projecting abrasive.

Work pieces to be treated may either remain fixed within the projected stream of particles for a predetermined period of time, or may be moved through the stream by suitable means, such as a conveyer belt, a turntable, a chain; or the like.

Various kinds of abrasives and liquids may be employed. The abrasive may be organic matter, such as pulverized husks or shells, or may be inorganic matter, such as emery, pumice, marble dust, silicon carbide and similar material and may vary in fineness from relatively coarse particles to extremely fine powder of the order of 2500 mesh. The liquid may be water or a non-oxidizing or corrosion retarding liquid such as kerosene, light oils, carbon tetrachloride, trichlorethylene or other liquids. The selection of the liquids is determined according to the materials treated and the particular action desired. For example, it is often advantageous to employ a liquid which is a solvent of impurities to be removed from the surface of the material.

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The invention produces economically and at a high rate of production, surface conditions which are not obtainable in any other way. For example, a velvety-smooth surface of extremely fine and only microscopically perceptible grain may be produced on aluminum parts without change of very close tolerances of the treated work piece. Aircraft engine parts, such as pistons, may be cleaned economically according to this method without wear or change in the dimensions of the treated parts.

These and other features, advantages, and objects will appear more fully from the detailed description which follows, accompanied by drawings showing for the purpose of illustration, a machine for practicing this invention.

The invention also consists in certain new and original features of construction, combination of parts, and steps of procedure, as hereinafter set forth and claimed.

Although the novel features, which are believed to be characteristic of this invention, will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out may be better understood by referring to the following detailed description taken in connection with the accompanying drawings forming a part thereof in which—

Fig. 1 is a front elevation, partly in section of a machine for practicing this invention;

Fig. 2 is the side elevation, partly in section, of a centrifugal throwing wheel of the machine, shown in Fig. 1; and

Fig. 3 is an elevation view of the rotor of the throwing wheel, shown in Fig. 2, a section being taken on line 3—3 of Fig. 2.

The machine, shown in Fig. 1, comprises a cabinet 10 resting on a suitable base 11. A chamber 12 on the top of the cabinet 10 houses a centrifugal throwing wheel 13 accessible through a cover 14 hinged at 15. The bottom of the cabinet 10 may be funnel-shaped as shown at 16 and opens into a tank 17.

The cabinet 10 contains suitable means for supporting work pieces, such as a turntable 18 accessible through a door 19.

The turntable 18 has a central shaft 20 driven by suitable means.

The tank 17 contains a charge of a mixture 21 consisting of a liquid and a finely divided abrasive. The abrasive is maintained in suspension in the liquid by a paddle wheel 22 on a shaft 23 driven by suitable means. The agitated mixture has the character of an emulsion, colloid, or suspension.

Liquid and abrasive mixture is withdrawn from the tank 17 by a pump 24 driven by suitable means and fed to the centrifugal throwing wheel through a conduit 25 equipped with a valve 26 for controlling the amount of mixture fed to the wheel 13.

Details of the centrifugal throwing wheel 13 are shown in Figs. 2 and 3. The wheel comprises a rotor 27 built up of parallel face plates, 28 and 29, held together by connecting posts for spacers 30. The face plates have radially extending grooves 31 adapted to receive throwing blades 32 held in place by set screws 33. The rotor 27 has a hub 34 mounted on a drive shaft 35 supported in a bearing 36. The drive shaft 35 is connected to a suitable source of motive power, such as an electric motor, capable of driving the wheel at high speeds.

The inner ends of the throwing blades 32 are tapered as at 37, and define a central space 38 into which a tubular discharge cage 39 extends. The discharge cage is rotatably supported on a bracket 40. The interior space of the cage 39 communicates with the pressure duct 25 which leads to a coupling 41 in the bracket 40. The control cage has a discharge port 42 in its periphery through which liquid and abrasive mixture is discharged in a predetermined direction against the inner ends of the throwing blades 32.

The direction of discharge from the wheel may be controlled by adjustment of the clock-dial position of the discharge port 42 of the cage 39. The adjusting mechanism comprises a hand wheel 43 on a shaft 44. The shaft 44 is mounted in a bearing 45 and carries at its outer end a spur gear 46 meshing with a further gear 47 integral with the hollow discharge cage 39. A rotation of the hand wheel 43 causes a rotation of the discharge cage 39 relatively to the supporting bracket 40 and an adjustment of the direction in which liquid mixture is issued through the discharge port 42 against the inner ends of the blades 32 of the wheel 13.

Driven at high speeds and supplied with a mixture of abrasive and liquid, the throwing wheel 13 discharges a fan-shaped blast 48 of particles or droplets (see Fig. 1) against the turntable carrying the parts to be treated.

The operation of the device is as follows:

The tank 17 of the machine is filled with a mixture of a suitable liquid and a finely divided abrasive. Parts to be treated are placed on the turntable 18. The centrifugal throwing wheel 13 is brought up to operating speed and liquid mixture is admitted to the wheel by opening the valve 26. The paddle wheel 22 agitates the abrasive and liquid mixture, so that the mixture maintains the character of a uniform suspension.

The turntable 18 moves the parts to be treated slowly through the fan-shaped blast 48 discharged from the centrifugal throwing wheel. The surface treatment may be interrupted simply by turning off the supply of abrasive and liquid mixture at the supply valve 26, whereupon the parts on the turntable may be removed.

The rotation of the turntable may also be interrupted at will in order to discharge mixture against the parts while the parts are at rest.

The surface of the treated parts is comparable, in appearance and in mechanical properties to a honed surface. Impurities are removed without change in the close tolerance of the treated parts. This is a particular feature in reconditioning machine or engine parts, such as parts of aircraft engines.

The method is very economical and requires only a fraction of the time required for conventional honing.

Another feature of the invention is the uniform action of the blast over a large area, as distinct from methods and machines operating on the air-jet or liquid-jet principle, where the jets usually leave an objectionable track pattern on the treated surfaces.

A further feature of the invention is the unusually favorable ratio of amount of mixture discharged per unit of power consumed. The power required for discharging a given amount of mixture according to this invention is only a very small fraction of the power required in methods employing an air blast for accelerating the particles of the mixture.

A further feature of the invention is the elimination of objectionable moving air masses which tend to form a shielding film, or cushion, on the surface to be treated through which the abrasive and liquid particles have to be driven. The result is a more efficient treatment of the surface for a given amount of mixture discharged thereagainst.

It has been found that treatment of machine parts according to the invention increases fatigue life of the part considerably. This is probably due to the elimination and rounding out of sharp marks and crevices which, although only of microscopic magnitude, are found in practically all machined parts.

Obviously the advantages of the invention are not limited to the specific examples given, nor is the method limited to the use of the particular machine hereinbefore described. Various modifications, additions, omissions and substitutions may be made by persons skilled in the art without departure from the spirit and the teaching of this invention.

What is claimed is:

1. The method of surface treating, utilizing a centrifugal throwing wheel, which comprises forming a slurry in which finely divided solid blast particles are suspended in a carrying liquid, directionally discharging under pressure a stream of said slurry at a substantial velocity onto the inner ends of substantially radial blades of the centrifugal throwing wheel adjacent its axis, rotating said wheel to accelerate centrifugally the slurry received by the blades and to throw it as a controlled directional stream of uniformly dispersed liquid and solid mixture.

2. In a system for directionally throwing a slurry in which solid particles are homogeneously suspended in a carrying liquid, a blasting wheel for directionally projecting the slurry, said wheel comprising a central portion, means for rotating the wheel, a plurality of blades extending from said central portion to the outer periphery of the wheel, a stationary closed chamber within said central portion, said chamber having a discharge

orifice adjacent to the inner ends of the blades adapted to discharge said liquid slurry onto the inner ends of said blades, a pressure duct terminating in said chamber, means for supplying said slurry under pressure to said duct, the interior of said chamber being free of obstructions, whereby the flow of said slurry from said pressure duct to said discharge orifice is unimpeded.

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