United States Patent

Richter

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[54] APPARATUS FOR TREATING METALS

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Related U.S. Application Data

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[52] **U.S. Cl.**.....**51/5,** 51/14

[51] **Int. Cl.**.....**B24c 3/04**

[58] **Field of Search**.....51/3, 4, 5, 8, 14, 319, 320, 51/321, 323, 326

[56] **References Cited**

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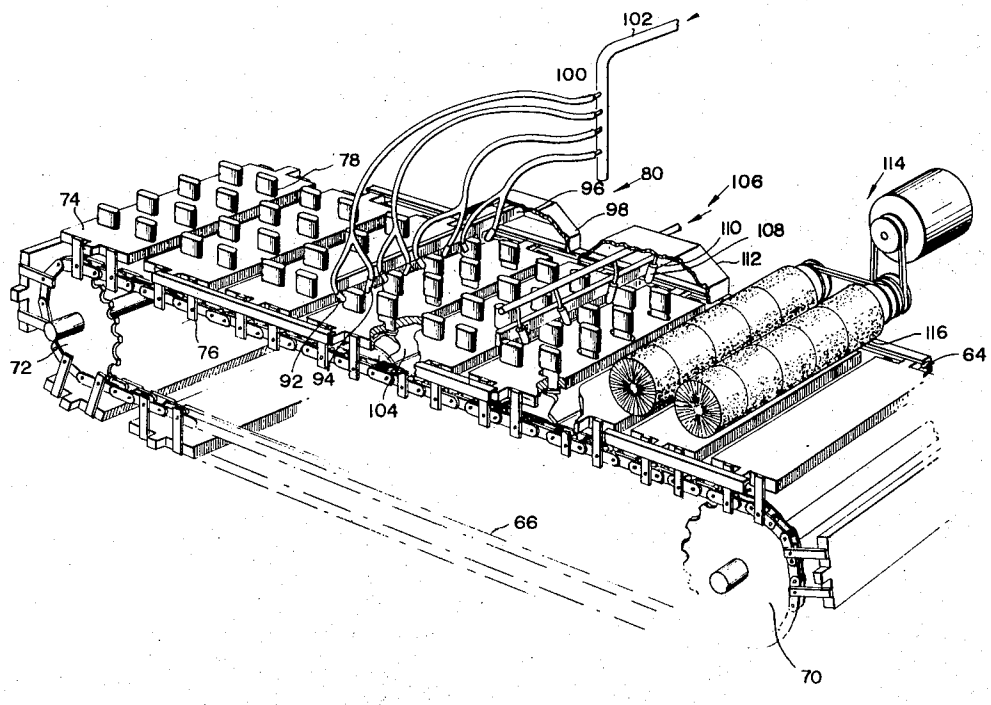
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[57] **ABSTRACT**

Metals are treated by directing a high pressure jet of high hardness particulate material in a fluid medium against the surface of the metal. The fluid material is comprised of small marble particles dispersed in a liquid medium such as water and in some instances including other substances, such as clay and rust inhibitors. The high pressure jets prepare the metal for plating, remove flash, markings and imperfections from the metal. The metal is then washed and buffed. The apparatus for carrying out the process includes high pressure systems for delivering the fluid mixture from nozzles at a station through which the metal is carried. A recovery system recirculates the material so that it is continuously re-used. The process and apparatus are useful for either sheet metal or individual metal parts.

2 Claims, 3 Drawing Figures



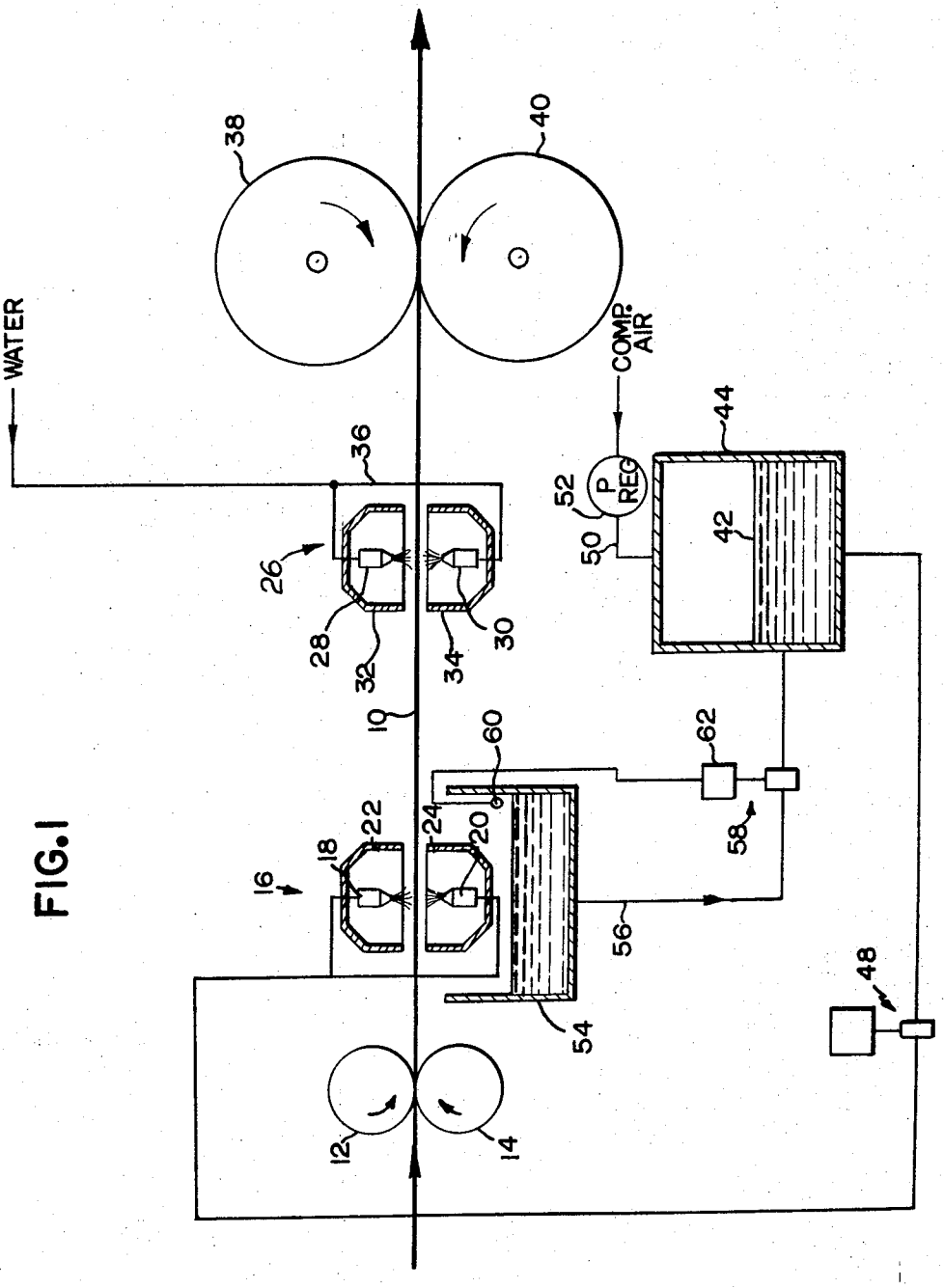


FIG. 1

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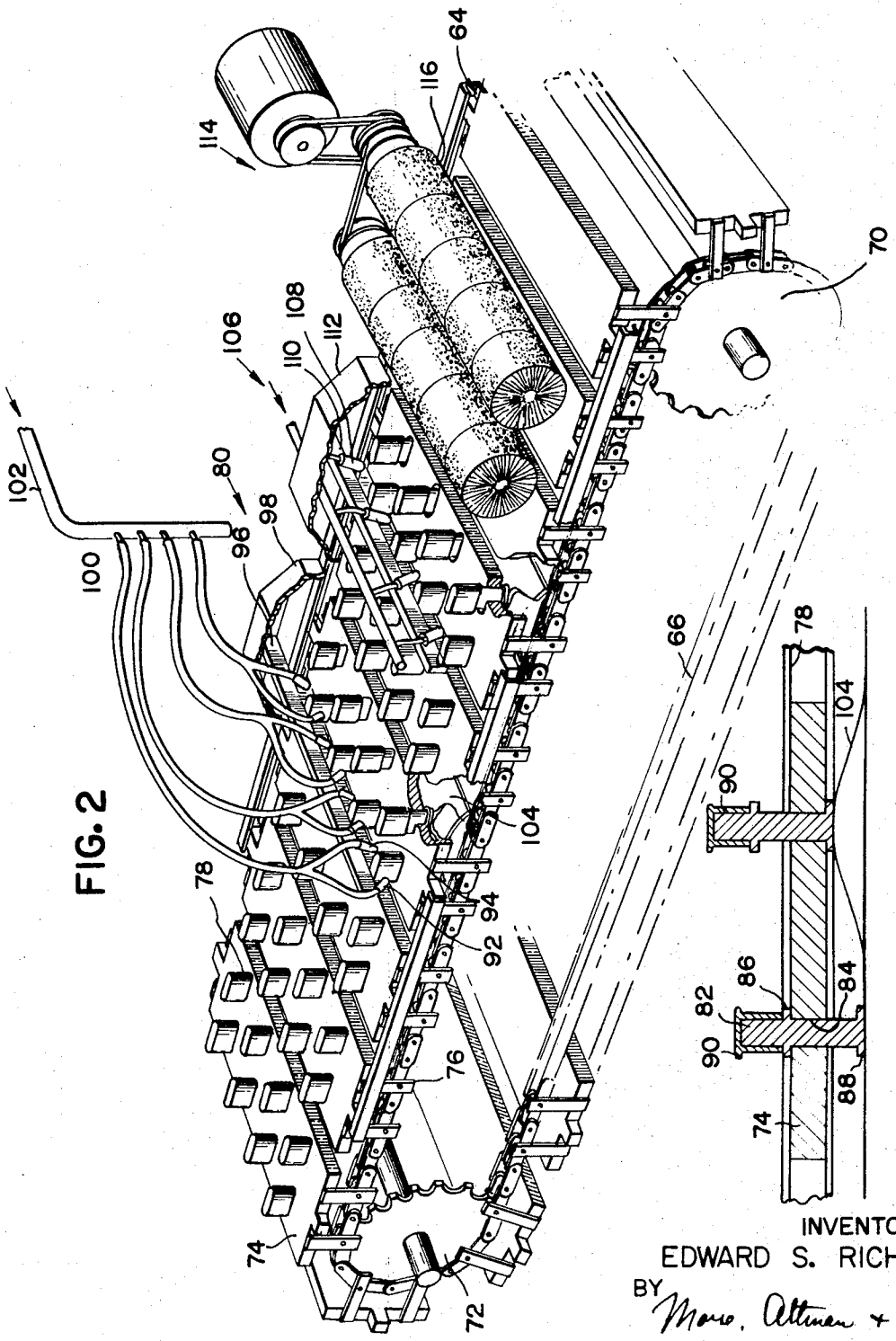


FIG. 2

FIG. 3

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APPARATUS FOR TREATING METALS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a division of U.S. application Ser. No. 740,948, filed June 28, 1968 now U.S. Pat. No. 3,559,351 dated Feb. 2, 1971.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to metal treatment and more particularly is directed towards a new and improved apparatus useful in the preparation of ferrous and non-ferrous metals for plating, removing tool and die marks, fish eyes and sheet imperfections as well as cracks, and fissures.

2. Description of the Prior Art

In preparing metal surfaces for plating or the like, the practice has been heretofore to employ a battery of buffing wheels against the work with a buffing paste applied to the wheels. The paste is applied on a substantially continuous basis, is quite expensive and is not reusable. A typical eight hour shift may use 3,600 lbs. of the buffing compound in processing eight thousand parts, for example. The technique requires that the buffing wheels be continuously adjusted in and out of position, this resulting in a loss on the order of 20 percent of the paste. Sand blasting techniques can also be employed to treat surfaces for such purposes as applying a pebble finish on the metal. In common practice, this technique involves driving small glass beads against the metal surface. The beads produce a shallow dent on the metal surface but the dent is rather short-lived usually wearing off within a period of a few months. This latter process has a further disadvantage in that the beads are shattered on impact, are not reusable and flying glass particles may cause injury to workers. Silicate sand has also been tried but is not satisfactory and may cause silicosis to develop in the workers.

Accordingly, it is an object of the present invention to provide a new and improved apparatus for treating metals, which process is capable of high speed, economical operation adapted to treat a variety of metals and to apply a variety of long-lasting finishes on metals.

SUMMARY OF THE INVENTION

This invention features a novel apparatus for treating ferrous and non-ferrous metals by directing a fluid medium under high pressure against the metal surface. The medium is comprised of a mixture of marble and similar rocks milled to a sieve size on the order of 100 to 30 mesh in different mixtures according to the type of material treated and the finish desired. The medium may include a small quantity of clay and a rust inhibitor. Nozzles are mounted to direct the medium against the material which is moved past the nozzles and subsequently washed and then buffed. A recovery system is employed to recapture the medium which may be reused continuously in a substantially closed loop system. The apparatus is useful for treating sheet metal or individual metal objects. When applied to metal objects they are carried by a conveying system which causes individual objects to oscillate in the vicinity of the nozzles to insure complete treatment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a somewhat schematic diagram showing a system made according to the invention for treating a running metal web,

FIG. **2** is a view in perspective, somewhat schematic, of a system for treating individual metal objects, and,

FIG. **3** is a detailed sectional view of a portion of the conveyor shown in FIG. **2**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. **1** of the drawings there is illustrated a system for use in the treatment of a running metal web **10** which may be ferrous or non-ferrous. The web **10** moves from left to right as viewed in FIG. **1** passing between a pair of rolls **12** and **14** to a treatment station generally indicated by reference character **16**. The treatment station comprises upper and lower rows of nozzles, **18** and **20** respectively, positioned above and below the web **10** and directed against opposite surfaces of the web. The nozzles are spaced across the width of the web so that the entire width of the web will be treated as the web moves between the two rows of nozzles. The nozzles are enclosed by hoods **22** and **24** which serve to confine the discharge from the nozzles within the treatment station and also to assist in recovering the discharge for subsequent use.

The sheet moves continuously through the treatment station and from the treatment station passes through a rinsing station **26** comprised of upper and lower rows of nozzles **28** and **30** located above and below the web **10** and directed against opposite surfaces thereof. The nozzles may be housed in hoods **32** and **34** to confine the discharge from the nozzles. The nozzles **28** and **30** are connected by a conduit **36** to a water supply and the rinsing station serves to wash away any of the material carried by the web from the treatment station **16**.

From the rinsing station **26** the web moves between pairs of color buffing wheels **38** and **40** located above and below the web **10**. The function of the buffing wheels is to bring back the original color of the metal in the web **10** and, typically, the buffing wheels are of conventional cotton canvas construction well known in the art.

The nozzles **18** and **20** at the treatment station **16** are furnished with a fluid medium **42** from a storage tank **44** through a conduit **46**. A pump **48** is provided to deliver the fluid medium under pressure. In place of the pump **48** or in addition thereto pressure may be developed in the conduit **46** by means of charging the tank **44** with compressed air through a conduit **50** connected to a source of compressed air. A pressure regulator **52** may be employed to maintain a constant pressure head within the tank **44**. In the practice of the invention a pressure of at least 90 psi is maintained in the tank **44** to insure delivery of the fluid medium from the nozzles under high pressure. The fluid medium is recovered from the treatment station by means of a recovery tank **54** located below the station and adapted to collect the fluid as it drains from the web **10** and from the hoods enclosing the nozzles. The tank is connected by a conduit **56** to the main storage tank **44** and, in the illustrated embodiment, is provided with a pump

58 which may be operated by a liquid level sensing device 60 in conjunction with a motor 62.

The medium employed in the system is comprised of a mixture of marble and similar rocks milled to a sieve size ranging from 100 mesh to 30 mesh, the particular mixture and mesh size being dependent upon the type of material which is being treated and the type of finish desired. For example, in treating brass 7030 optimum results have been obtained using a mixture comprised of 80 percent of 60 mesh marble and the balance being of 80 mesh marble. These materials are mixed with water on the ratio of 10 gallons of water to six pounds of the particular matter. The same mixture has been employed satisfactorily on 1008 and 1010 steel and on sand castings. For removing flash from forgings 35 mesh marble has been found more satisfactory due to its greater cutting capacities. When treating softer brass metal about 10 percent of the finer sieved material is added to obtain a better finish and on very soft metal there is added approximately 5 percent clay mixture (Fullers earth). In addition to the clay suitable rush inhibitors may also be added to the mixture.

The fluid mixture being directed under high pressure against the metal surface prepares the metal, whether it is ferrous or non-ferrous, for plating as well as removing flash from castings, tool and die marks, fisheyes and sheet imperfections. The process will also peen all fissures and imperfections which commonly cause cracks or cavities in castings. The process may also be employed to produce a pebble finish of a very permanent nature over the metal surface and this pebble finish may be uniform throughout or by the use of masks may be limited to defined areas.

Referring now more particularly to FIGS. 2 and 3, there is illustrated an apparatus for treating small metal parts on a mass production basis. The system includes a conveyor 64 comprised of link belt chains 66 and 68 driven by wheels 70 and 72. The belts are connected to plates 74 typically of steel and approximately 1 ½ inch thick, for example. The plates engage the belts by means of pivot connectors 76 and the opposite edges of the plates ride in the channels of grooved rails 78 along the upper reach of the conveyor. The rails serve to guide the plates along the conveyor and to hold the plates in the horizontal plane when it passes through the treatment station 80.

Each plate carries one or more spuds 82 and for small parts each plate may be provided with a large number of spuds arranged in one or more rows. Each plate is formed with an opening 84 to receive each spud which is mounted for sliding reciprocating movement with respect to the plate. Spaced shoulders 86 and 88 are provided to limit the upward and downward movement of the spud with respect to the plate. The upper end of the spud is formed as a male mate for a female part 90 which is to be treated. In the illustrated embodiment the metal piece 90 is a hollow body portion of a cigarette lighter customarily formed from brass and subsequently plated with chrome or the like. Obviously, a wide variety of metal parts may be processed and the spud will be configured to accommodate the particular part. In practice, one or more operators will be located at the left-hand side of the conveyor as seen in FIG. 2 and will place parts 90 on upper ends of the spuds as the plates move up onto the horizontal reach of the conveyor. The parts may be removed at the right-hand end of the conveyor either manually or by gravity as the plate moves from the upper to the lower reach of the conveyor. In any event, the spuds are arranged in rows on the plate so that each row will move past a pair of nozzles 92 and 94 at the treating station. The nozzles are directed downwardly and inwardly so that each row of parts moves between the nozzles and the fluid medium will be directed under pressure against both sides of the parts carried by the spuds. It will be understood that there will be sufficient pairs of nozzles in the treating station to direct a flow of material from both sides of each row of parts as they move past. The nozzles may be mounted on a racket 96 with all the nozzles enclosed within a hood 98 to confine the discharge within the treatment station. The nozzles are connected by conduits 100 to a manifold 102 which in turn is connected to a pressurized supply and recovery system such as shown in the system of FIG. 1.

To insure that each part is fully treated as it moves through the treatment station, a fixed cam 104 is provided directly below the nozzles and in position to engage the bottoms of the spuds as they are carried past on the plate. The cam 104, as best shown in FIG. 3, causes the spud to ride upwardly through the plate which is restrained by the rails 78 and this in turn moving the part 90 upwardly and downwardly as it passes between the nozzles 92 and 94. This action insures that the part 90 received full treatment over its entire surface. The spud with its part returns to its normal position once it has cleared the cam 104.

From the treatment station 80 the parts are carried through a rinsing station 106 comprised of an array of nozzles 108 arranged in a manner similar to the nozzles in the treatment station but in this instance connected to a water supply system for rinsing the parts as they move past.

Again the nozzles are supported by a suitable bracket 110 and the assembly enclosed in a hood 112 to confine the spray.

From the rinsing station the parts are then carried to a buffing station 114 comprised of color-buffing wheels 116 which buff the parts and restore their original color. From the buffing station, the parts are carried along for further treatment or removal for additional processing such as plating or the like.

The above apparatus makes possible greatly increased production being capable of an output on the order of 5,000 pieces per hour at a very low operating cost since the mixture which is employed may be continuously re-used. There are no bits of glass flying about, no danger to health such as silicosis and the finish applied to the metal is superior to that available by other techniques.

While the invention has been described with particular reference to the illustrated embodiments, it will be understood that numerous modifications thereto will appear to those skilled in the art. Accordingly, the above description and accompanying drawings should be taken as illustrative of the invention and not in a limiting sense.

Having thus described the invention, what I claim and desire to obtain by Letters Patents of the United States is:

1. Apparatus for treating metal, comprising

a. a treatment station,

b. first means for delivering marble particles in a fluid medium under pressure at said station,
c. second means connected to said first means for directing said marble particles in a fluid medium against said metal,
d. a washing station,
e. third means for delivering a washing medium at said washing station,
f. fourth means connected to said third means for directing said washing medium against said metal,
g. a buffing station,
h. movable buffing members mounted at said buffing station and adapted to engage said metal,
i. fifth means for moving said metal sequentially along a path through said treatment station, said washing station and said buffing station,
j. recovery and recirculating means for the particles and fluid medium operatively associated with said treatment station, and,
k. sixth means at said treatment station for causing temporary relative displacement between said metal and at least said second means in a direction generally transverse to said path.

2. Apparatus according to claim **1** wherein said sixth means includes a plate connected to said fifth means and adapted to be moved through said treatment station, at least one spud mounted for reciprocating movement to said plate and adapted to support a metal object thereon and fixed cam means at said treatment station engageable with said spud upon passage through said treatment station and adapted to reciprocate said spud.

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