United States Patent [19]

Coch

[11] **3,776,186**

[45] **Dec. 4, 1973**

[54] **SYSTEM FOR WET IMPACT PLATING**

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[22] Filed: **May 23, 1972**

[21] Appl. No.: **256,191**

Related U.S. Application Data

[62] Division of Ser. No. 53,123, July 8, 1970, Pat. No. 3,690,935.

[52] **U.S. Cl.** **118/603**, 118/418, 209/268

[51] **Int. Cl.** **B05c 3/08**

[58] **Field of Search** 118/19, 418, 603, 118/429; 117/101, 109; 51/19, 164, 263; 134/109; 209/268, 10

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Primary Examiner—Morris Kaplan
Attorney—Peter H. Smolka

[57] **ABSTRACT**

A system for wet impact plating of metal parts utilizing single tumbling barrel for independent parts rinsing and impacting operations respectively when interchangeable, smaller perforate and imperforate barrel doors are secured to a larger door of the barrel. Rinsing water is supplied to the barrel while rotating with the perforate door in position. Water expenditure is thereby minimized and the rinsing effluent is thereby effectively separated from the impacting medium. A stationary bin with a screen for separating parts from the impacting medium and aqueous solutions is positioned beneath the barrel. Communicating with the bin in selectively operable relationship is a venturi eductor which, together with a pump communicating with a water storage tank, is operable to rapidly transfer the impacting medium to a hopper positioned over the barrel for reuse while generating sufficient turbulence to tend to cleanse the impacting medium of spent plating material and promoter chemicals. These spent materials pass, with overflow water, through an overflow strainer in the hopper to the water storage tank where they settle and are subsequently removed. Substantially all water is thereby recovered and reused, and the frequency of impacting medium rectification is materially lessened. Two separate charges of impacting medium are used in the system, and several tumbling barrel units may be supported by a single water storage tank where the water level and temperature are controlled.

12 Claims, 5 Drawing Figures

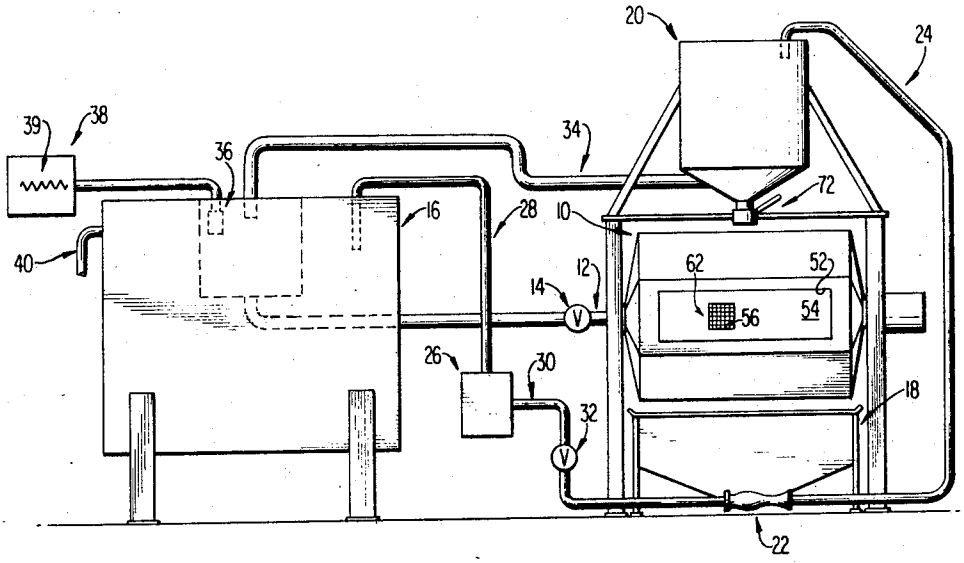
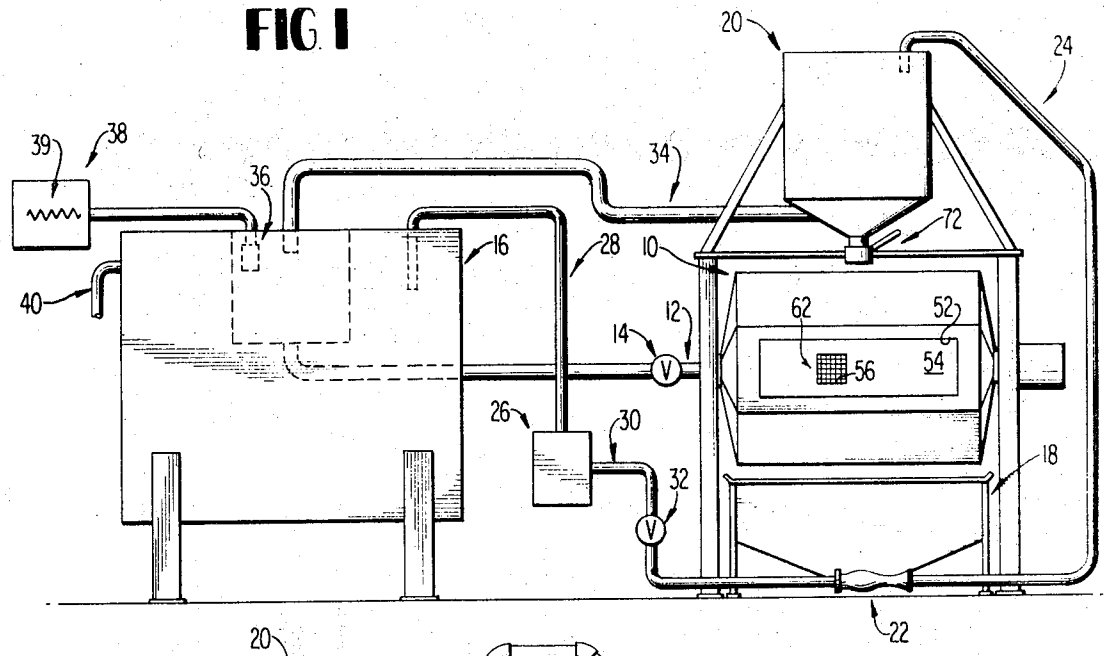


FIG. 1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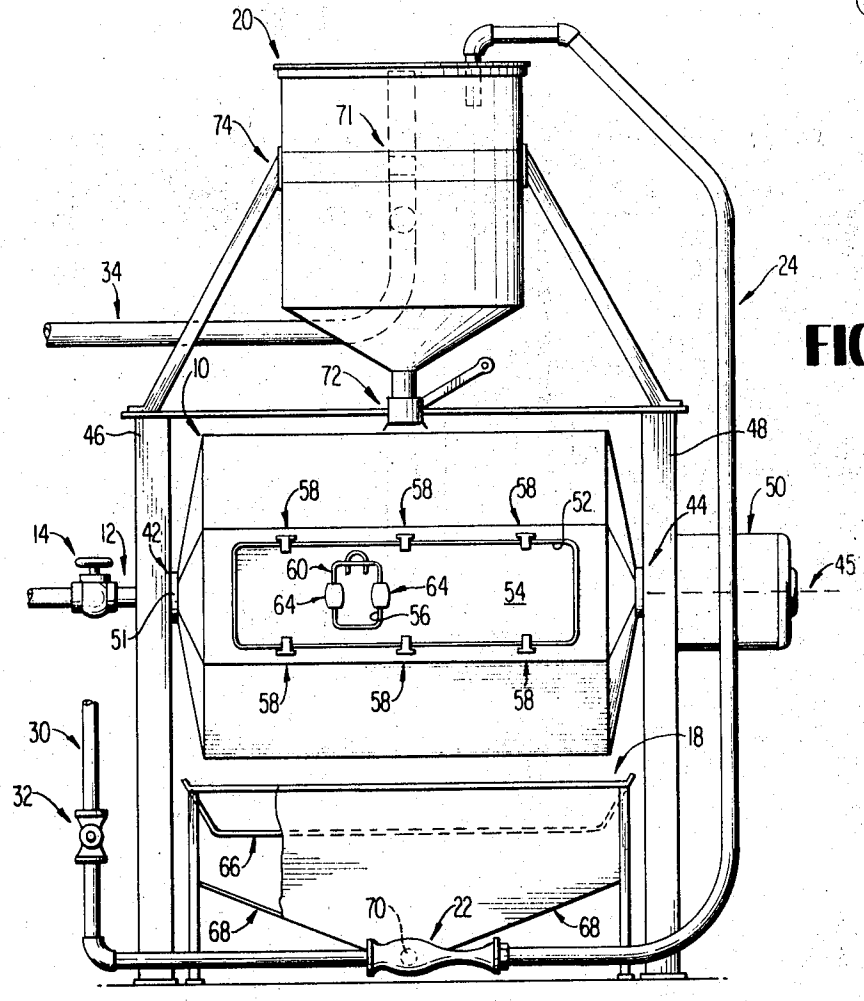
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FIG. 2

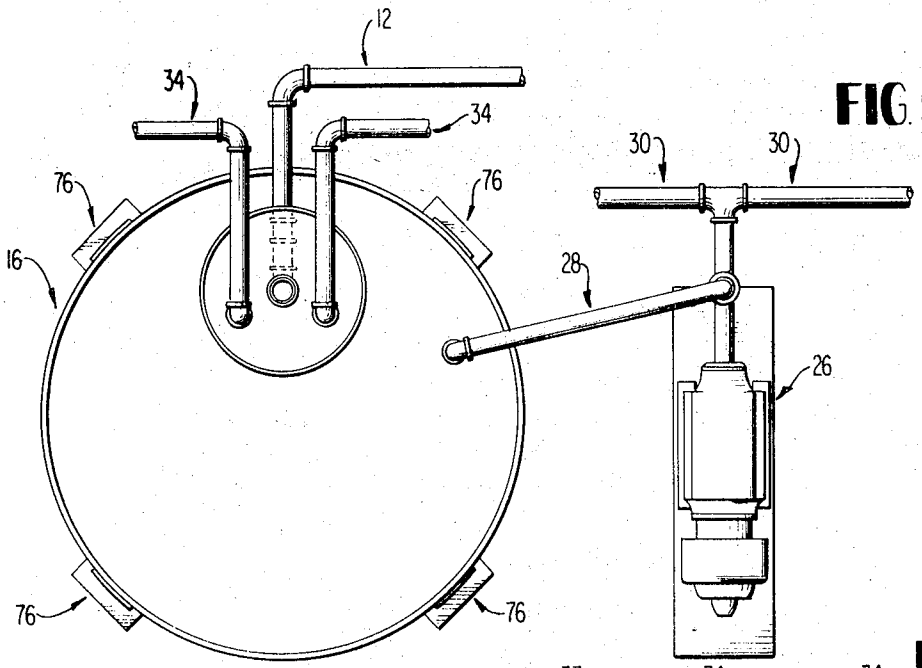

FIG. 5

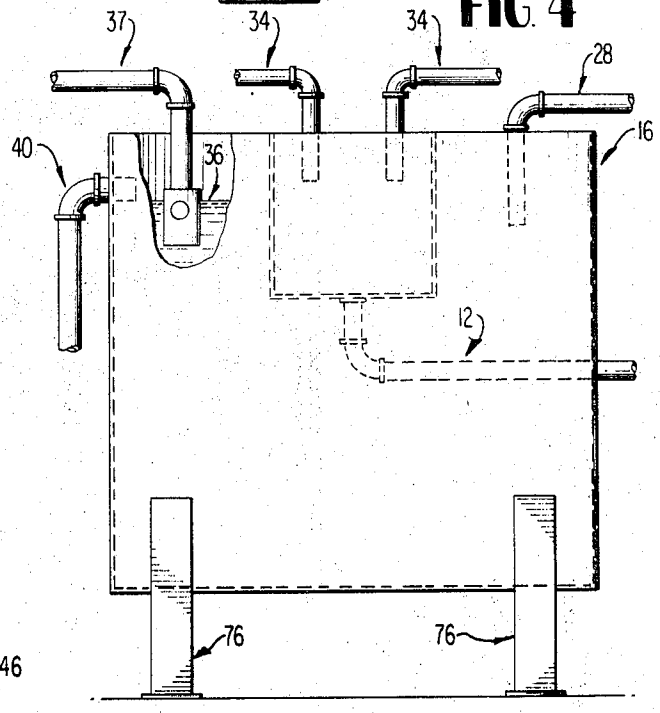

FIG. 4

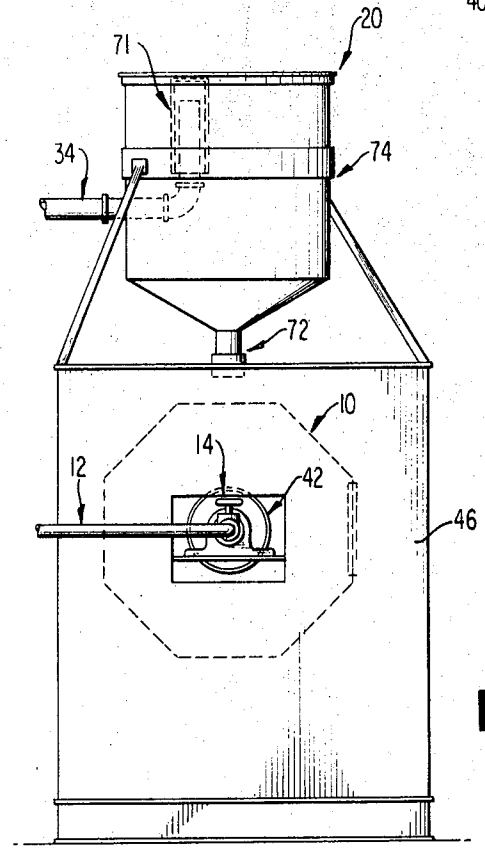

FIG. 3

SYSTEM FOR WET IMPACT PLATING

This is a continuation, division of application Ser. No. 53,123, filed July 8, 1970 and now U. S. Pat. No. 3,690,935.

BACKGROUND OF THE INVENTION

This invention relates to wet impact plating of metal parts. More particularly, this invention relates to an improved system for wet impact plating of such parts.

It has been common for many years to provide a base metal with a bright and permanently adhered metallic coating through wet mechanical plating processes. Such processes generally involve the utilization of metal dust particles that are cold welded to the base metal by impacting against its surfaces. An impacting medium placed with the particles in an agitated container, with or without promoter chemicals to aid in the plating process, and immersed in a liquid carrier such as water, serves to provide the impacting force necessary to the plating operation.

Generally the parts to be plated are cleansed prior to the actual plating operation. Other phases of the entire operation involve the separation of the plated parts from the impacting medium.

One prior art proposed system of the type discussed above is disclosed in U.S. Pearson Pat. Nos. 3,442,691 and 3,494,327. This system includes two separate parts container units, one, a generally solid unit functioning as a pre-treating and plating barrel, and the other, a generally sieve-like unit, functioning as a separating drum. Parts to be plated may be cleansed in the first container or barrel into which a chemical solution is placed. The parts are then plated in the same barrel. Transfer of the barrel contents to the separating drum is followed by rotation of that drum.

The drum is specially constructed so that rotation in one direction tumbles the load, with liquid and small particles falling through perforations in the drum. Opposite rotation discharges the parts from the drum. Water may be added for cleansing purposes and to aid in the separation. The entire drum contents passing through the perforations are collected in a pan and then transferred to the first container, or barrel, for further use.

Although such systems may be adequate for some purposes, their use may sometimes prove undesirable for a number of reasons. For example, cleansing and impact plating of the parts in the same solid barrel may result in unnecessary attrition of the impacting medium or in the need for substantial fresh water rinsing and ensuing effluent disposal. During a cleansing operation in the solid barrel, corrosion, scale and carbon smut, etc. is often removed from the parts to be plated. In the absence of some special steps taken for complete removal of these elements from the barrel prior to the plating operation, contact of the impacting medium with these elements while agitating the barrel during plating may adversely affect the impacting medium and/or the quality of the finished product. It will be appreciated that in the prior proposed system, a chute for drainage during rinsing cycles is provided. Although this chute may permit disposal of the rinsing effluent prior to plating, the use of substantial fresh water is required for rinsing since the rinse water must be spilled or overflowed out of the barrel into the chute.

It would, therefore, be highly desirable to provide a wet impact plating system wherein cleansing and rinsing are accomplished prior to plating while minimizing the amount of rinse water required and insuring separation of the rinse water and effluent from the parts prior to plating.

A particularly significant disadvantage of the prior proposed system involved the reuse of the impacting medium transferred to the plating barrel from the pan beneath the separating drum. Since spent plating material and promoter chemicals are present in the mass of material so transferred, and since these spent materials become present in increasing amounts during subsequent cycles, the length of time between periods of needed rectification of the impacting medium may be extremely short. Since the quantity of impacting medium utilized is generally disporoportionally great in relation to the quantity of parts plated, the requirement of frequent rectification may make commercial plating operations impractical.

Moreover, even if the water utilized in the prior system to transfer the impacting medium to the barrel for reuse were drained off prior to a plating operation, the spent materials may not be effectively removed and, at any rate, drainage may significantly increase the amount of fresh water utilized.

It would, therefore, be desirable to provide a wet impact plating system wherein the frequency of impact medium recitification is reduced through separation of spent materials therefrom. It would also be desirable to incorporate a water recovery and reuse mechanism in the system so as to minimize fresh water expenditure.

OBJECTS AND SUMMARY OF A PREFERRED EMBODIMENT OF THE INVENTION

It is, therefore, a general object of the invention to provide a system for wet impact plating of metal parts which obviates or minimizes disadvantages of the sort previously noted.

It is a particular object of the invention to provide a system for wet impact plating of metal parts wherein the frequency of rectification of the impacting medium is substantially decreased.

It is a related object of the invention to provide such a system wherein efficient separation of spent materials from the impacting medium is involved and which may utilize alternately two charges of impacting medium in order to further decrease the frequency of impacting medium rectification.

It is a further object of the invention to provide a system for wet impact plating of metal parts wherein a water recovery and re-use mechanism is employed in the rapid transfer of the impacting medium for reuse while effectively separating the spent material from the impacting medium, both with virtually minimal fresh water expenditure and disposal of effluent.

It is yet another object of the invention to provide a system for wet impact plating of metal parts wherein separate and independent parts rinsing and impacting operations are performed in the same container with the rinsing operation involving minimal fresh water expenditure and effluent disposal and insuring efficient separation of the rinse water and effluent from the parts prior to plating.

A preferred form of the invention intended to accomplish at least some of the foregoing objects comprises a system for wet impact plating of metal parts wherein a single tumbling barrel rotatable about a generally horizontal axis is utilized for independent parts cleans-

ing, rinsing and impacting phases of the system operation. A rinsing valve communicates with means defining an opening in the barrel on the axis of rotation. A side opening extends longitudinally of the barrel between opposite ends, the barrel being otherwise imperforate. A large, imperforate door having an access opening is selectively securable to the barrel coextensively with the side opening thereof.

Selectively and interchangeably securable to the large, imperforate door coextensively with its access opening are a smaller perforate door and a smaller imperforate door. The perforate door is sized to retain the metal parts and the impacting medium utilized in the process while permitting aqueous solutions to pass through the perforations in the door. The smaller imperforate door, together with the larger imperforate door when both are secured in position, entirely blocks the side opening of the barrel.

A stationary bin is positioned beneath the barrel and supports a screen adjacent the bin top. The screen is sized to retain the plated parts and to pass the impacting medium and aqueous solutions. A venturi eductor communicates with the bottom of the bin in selectively operable relationship and a conduit provides communication between the venturi eductor and an overhead hopper positioned above the barrel. The bottom of the overhead hopper is provided with a valve selectively operable to permit the hopper contents to fall into the barrel.

In gravity feed communication between the top of the overhead hopper and a water storage tank is an overflow strainer, the strainer blocking passage of the impacting medium. A pump is provided for pumping water from the water storage tank through the venturi eductor and to the overhead hopper from which overflow water and suspended spent materials pass to the water storage tank. Several container systems may be supported by a single water storage tank, and the tank water level as well as its temperature are controlled.

In operation the metal parts to be plated are loaded into the tumbling barrel through the side opening thereof. The selectively operable valve, or pet cock, of the overhead hopper is opened to permit a charge of impacting medium settled at the bottom of the overhead hopper to drop into the barrel through its side opening. An amount of water in the overhead hopper, usually enough to cover the charge in the hopper, is also permitted to pass into the barrel with the impacting medium. The larger imperforate door is then secured in position on the barrel across its side opening.

Conventional cleansing chemicals are then added to the barrel through the access opening in the larger imperforate door. Upon securing of the smaller imperforate door to the larger imperforate door so as to block its access opening, the barrel is rotated about a generally horizontal axis for a time period sufficient to cleanse the parts. At the same time the cleansing chemicals will effect the cleansing of the impacting medium.

Thereafter the smaller imperforate door is replaced with the perforate door. Used cleansing chemicals and dirty solution may be rinsed out by opening the rinsing valve and admitting rinsing water to the barrel during rotation thereof. Thus a rolling rinse is accomplished with minimum water expenditure. During the time period of the rinsing cycle, the parts the impacting medium are retained in the barrel by the perforate door and the rinsing effluent comprised of the remaining barrel contents passes through the perforate door, through the screen adjacent the top of the bin beneath the barrel, and into the bin.

Removal of the perforate door is followed by the addition of plating materials through the access opening in the larger imperforate door. Conventional promoter chemicals may also be added at this time. Afterwards the smaller imperforate door is secured in position across the access opening of the larger imperforate door.

The barrel is then rotated about the generally horizontal axis for a time period sufficient to impact plate the parts through the interaction of the impacting medium, the plating material and the parts. During this period, water which has been added to the barrel serves as a carrier for the plating material and as a mass lubricant whereby damage to the parts through abrasion and tangling of the parts is minimized.

Following removal of the larger imperforate door from the tumbling barrel, the barrel contents are emptied onto the screen adjacent the top of the bin. The screen serves to separate the plated parts from the remaining barrel contents which pass into the bin through the screen. The parts may be hosed down at this time. Since the bin is generally sized to accommodate the volume of a single impacting medium charge utilized, virtually all of the rinsing effluent previously accumulated in the bin is displaced out of the bin.

After accumulation of the charge of impacting medium in the bin, water is pumped from the storage tank through the venturi eductor to hydraulically transfer the bin contents to the overhead hopper. During this time sufficient turbulence is generated so as to tend to cleanse the impacting medium of spent plating material, and promoter chemical if utilized. Overflow water is drained from the overhead hopper, with the spent material, to the water storage tank through the overflow strainer. The strainer retains the impacting medium in the hopper and the impacting medium then settles to the hopper bottom.

The spent material which is carried with the overflow water into the storage tank settles out, by reason of the turbulent free condition in that tank, and may be manually cleaned from the storage tank periodically.

In practice, a single storage tank may support a plurality of tumbling barrel systems, with the water level in the storage tank being maintained constant through a float valve. Make-up water supplied through the float valve to the storage tank may be thermostatically controlled to control the temperature of water in the system.

Throughout the operation the need for frequent impacting medium rectification is further minimized through the use of two impacting medium charges. One charge is present in the overhead hopper while the other remains in either the tumbling barrel or the bin. Prior to transfer of the one charge from the bin to the overhead hopper, the tumbling barrel is recharged with the impacting medium maintained in the hopper.

Other objects and advantages of the present invention will become apparent with reference to the following detailed description taken in conjunction with the accompanying drawings in which:

THE DRAWINGS

FIG. 1 is a schematic illustration of an overall system for wet impact plating of metal parts according to the present invention;

FIG. 2 is a side elevational view illustrating the relationship of a tumbling barrel, overhead hopper, and lower bin which may be utilized in the system of FIG. 1;

FIG. 3 is an end elevational view of the structure illustrated in FIG. 2;

FIG. 4 is a side elevational view of a water storage tank assembly which may be utilized in the system of FIG. 1;

FIG. 5 is a top plan view of the water storage tank assembly shown in FIG. 4, together with a pump utilized to draw water from the tank assembly.

DETAILED DESCRIPTION

Detailed Structure:

With reference now to FIG. 1, an overall system for wet impact plating of metal parts according to the present invention may be understood.

The system includes a tumbling barrel **10** which is utilized for independent parts cleansing, rinsing and impacting phases of the system operation. A conduit means **12** provides, through a valve means **14** (which for convenience is hereinafter termed a rinsing valve) selective communication between a source of water and the barrel **10**.

The water source may be provided in any convenient manner and for purposes of example is illustrated as being provided by a water storage tank **16**. As hereinafter more fully described, this water storage tank **16** also serves to provide a source of water for conveying an impacting medium for reuse, and to provide a portion of a water recovery system.

Positioned beneath the tumbling barrel **10** is a stationary bin assembly **18**; and an overhead hopper **20** is mounted above the tumbling barrel. For a purpose which will hereinafter become apparent, the bin assembly **18** is in selectively operable communication with a venturi eductor **22**, the eductor being in communication with the hopper **20** through a suitable conduit means **24**.

A pump **26** is provided for selectively pumping water from the water storage tank **16** through the venturi eductor **22** and to the overhead hopper **20**. Suitable conduit means, such as those indicated at **28** and **30** provide for water flow respectively from the storage tank **16** to the pump **26** and from the pump **26** toward the venturi eductor **22**. A suitable valve means **32**, for example a simple gate valve, is located in the conduit means **30** for the purpose of selectively controlling the supply of water through the venturi eductor.

It will be appreciated that the overhead hopper **20** is also in fluid communication with the water storage tank **16**, through gravity flow, by a further conduit means **34**. Thus, the supply of water to the hopper **20** by means of the pump **26** need not be controlled to a great degree, since overflow into the storage tank **16** is permitted. As will hereinafter become apparent, an amount of such overflow is in fact desired during operation of the system.

The water level in the water storage tank **16** is maintained substantially constant by means of a conventional float valve means **36** located adjacent the top of the storage tank **16**. A suitable source of water schematically indicated at **38**, supplies make-up water to the storage tank **16** through a conduit means **37** communicating with the float valve means **36** in order to maintain the water level in the storage tank substantially constant. The water at the make-up source **38** may be thermostatically controlled by suitable means **39** so as to ultimately control the temperature of the water in the storage tank, and therefore in the system. As indicated at **40**, an overflow conduit means may be provided to place the water storage tank **16** in gravity feed relationship with a water disposal area (not shown). It will be appreciated that the outlet from the storage tank **16** into the overflow conduit means **40** is located at a level adjacent the level of the float valve **36**.

With particular reference to FIGS. **2** and **3**, the particular structure of the tumbling barrel **10**, stationary bin assembly **18** and overhead hopper **20** may be seen. The tumbling barrel **10** is provided with axle and bearing assemblies **42** and **44** on opposite ends thereof. These assemblies **42** and **44** mount the tumbling barrel **10** for rotation about a generally horizontal axis indicated at **45** and are supported on suitable frame members **46** and **48** stationarily positioned on opposite sides of the barrel. Adjacent one axle and bearing assembly **44** a suitable motor means **50** may be provided for revolving the barrel **10** at selected times and at a desired adjustable rate. The axle of the other barrel axle and bearing assembly **42** is hollow and provides communication between the barrel interior (through means defining a barrel end opening at **51** located on the axis **45**) and the previously identified conduit means **12** in which the rinsing valve **14** is located. It will be appreciated that when water is supplied to the barrel through that conduit means **12** from the water storage tank **16** the level of connection of the conduit means to the water storage tank is elevated above the end opening of the barrel so as to permit water to flow to the interior of the barrel by gravity (see FIG. **1**).

A side opening, indicated at **52**, extends longitudinally of the barrel between opposite ends, and except for that opening and the barrel end opening, the barrel **10** is otherwise imperforate. The side opening **52** is sufficiently large to permit easy access to the barrel interior during loading of the metal parts to be plated. A large door **54** may be selectively secured to the barrel coextensively with the side opening **52**. The large door **54** is itself provided with an access opening indicated at **56**, the door being otherwise imperforate. Suitable means **58** are provided for removably securing the large door **54** to the barrel in substantially water tight engagement.

Selectively securable to the large door **54** are either of two smaller doors, one being perforate and the other being imperforate. The imperforate door **60** is illustrated in FIG. **2** while the perforate door **62** is shown in the schematic diagram of the overall system in FIG. **1**. Each of these doors **60** and **62** have overall dimensions coextensive with the access opening **56** in the large door **54**. Again, suitable means **64** may be provided for releasably securing the smaller doors **60** and **62** in position. When the small imperforate door **60** is secured in position, the barrel is substantially water tight. The small perforate door, however, is sized with a mesh sufficient to retain the metal parts and the impacting medium utilized in the process while permitting

aqueous solutions to pass through the perforations in the door.

It will be appreciated that the door arrangements thus far described function to selectively maintain a peripheral side portion of the barrel or container in a perforate or imperforate condition. Other arrangements that function to do the same may be employed if desired.

The previously identified stationary bin assembly **18** is positioned beneath the barrel **10** between the frame members **46** and **48** supporting the barrel. Adjacent the top of the bin assembly **18**, a stationary screen **66** is mounted, with the screen extending entirely across the bin assembly **18**. It will become apparent that the overall extent of the bin assembly should be at least commensurate with the longitudinal extent of the side opening **52** in the barrel **10** so that the barrel contents may be unloaded into the bin assembly merely by removing the large door **54** and rotating the barrel to a position wherein the side opening **52** overlies the screen **66**.

The screen **66** is sized with a mesh sufficient to retain the plated parts while permitting the impacting medium and aqueous solutions to pass through. Since the bottom of the bin is sloped, as indicated at **68**, when the impacting medium is to be conveyed to the overhead hopper **20** through the utilization of the venturi eductor **22**, the impacting medium readily passes down the sloped bottom. Communication between the lower portion of the bin assembly **18** and the venturi eductor **22** is provided in any suitable manner as shown at **70**. Water supplied through the venturi eductor **22** creates a pressure differential which tends to draw the contents of the bin along with the water to the overhead hopper **20**. For a purpose hereinafter described, the bin assembly **18** is generally sized so as to be capable of holding substantially the exact volume of one charge of the impacting medium utilized in the system.

During hydraulic transfer of this charge of the impacting medium to the overhead hopper, sufficient turbulence is generated so as to tend to cleanse the impacting medium by removing spent plating material or promoter chemicals used in the process and which may have adhered to the particles of the impacting medium. It will be apparent to one skilled in the art that such turbulence may be created by proper sizing of the conduit means **24** to which the impacting medium is transferred with the sizing taking into account such factors as the hydrostatic head available for transfer, the transfer time, etc.

When the impacting medium is transferred to the overhead hopper **20**, excess water supplied overflows and passes from the overhead hopper back to the storage tank **16** through the previously identified return conduit means **34**. The portion of the return conduit means **34** in communication with the hopper interior is located within a strainer **71**. This strainer **71** is sized so as to have a mesh sufficient to retain the impacting medium in the hopper while permitting overflow water to hydraulically transfer suspended particles to the water storage tank **16**. The retained impacting medium, of course, settles to the bottom of the hopper **20**. At the hopper bottom, a selectively operable valve **72**, or pet cock, is provided.

As illustrated in FIGS. **2** and **3**, the hopper **20** is supported by suitable strut assemblies **74** mounted on the frame members **46** and **48** so that the pet cock **72** generally centrally located over the tumbling barrel **10**. During the portion of the system cycle when the tumbling barrel **10** is to be supplied with a charge of the impacting medium, the tumbling barrel **10** is rotated to a position wherein its access opening **52** is directly beneath the pet cock **72**.

With reference to FIGS. **4** and **5**, details of a suitable water storage and supply system may be seen. The previously identified water storage tank **16** is stationarily supported by suitable legs **76**. Communicating with the top of the tank is the previously identified conduit means **34** which provide gravity return of overflow fluid from the hopper **20**. Two such conduit means **34** are illustrated since, in practice, a single water storage tank **16** may support several impacting medium handling units (i.e. barrel **10**, overhead hopper **20** and bin assembly **18**), and thus may communicate with the hoppers of each of these assemblies.

The previously identified pump **26** may be a high capacity, open impeller, centrifugal pump which at appropriate times, draws water from the storage tank **16** through the conduit means **28**. Leading from the pump is the conduit means **30** for supplying water to the venturi eductor **22**. Again two such conduit means **30** are illustrated insofar as water may be pumped to the eductors of the several impacting medium handling units supported by the single water storage tank **16**. The supply of water by means of the centrifugal pump **26** may be controlled in any suitable manner with a conventional line pressure valve (not shown) being preferred so that upon manual opening of the gate valve **32** in the conduit means **30** the necessary water will be supplied to the eductor **22**.

The condition of the water in the storage tank **16** is generally turbulent free so that the microscopic particles separated from the impacting medium and carried into the tank from the overhead hopper **20** tend to settle out. Periodically, these materials may be manually cleaned from the tank. It is readily apparent that access to the water storage tank **16** for this purpose may be had through the provision of any suitable door or the like.

It will thus be seen that by means of the return conduit means **34** and the pump **26** both being in communication with the water storage tank, the system of the present invention provides for water recovery and reuse, thereby minimizing water expenditure. That water which is supplied to the tumbling barrel through the conduit means **12** and which is lost as subsequently described, is minimal and is replenished through the make-up water conduit means **37** extending from the make-up water source **38**.

OPERATION OF THE SYSTEM:

From the foregoing, operation of the wet impact plating system according to the present invention may be readily understood.

With the larger door **54** removed from the tumbling barrel **10**, metal parts to be plated are loaded into the empty barrel. The barrel **10** is then rotated so that the side opening **52** underlies the pet cock **72** of the overhead hopper **20**. The pet cock is operated to permit the charge of impacting medium located in the overhead hopper **20** to drop into the barrel **10**. At the same time water from the overhead hopper enters into the barrel. The amount of water usually utilized in this portion of the cycle is that sufficient to cover the charge within

the barrel. In the event that more water than is available from the hopper is needed, this water may be supplied through manual operation of the rinsing valve **14.**

The term impacting medium is well known in the art so that a detailed description thereof is not deemed necessary. Generally the impacting medium is comprised of a matrix material consisting of a mass of discrete solid granules, which may be metallic, ceramic, etc. and which may have various shapes, e.g. spherical or irregular. These materails are usually a great deal smaller than the articles to be plated but larger than the plating material added at a later phase of the cycle.

After supplying the barrel with the parts to be plated and with the impacting medium, the large door **54** is secured in position coextensively with the side opening **52** of the barrel. This door **54** remains in that position until the end of the process cycle.

The smaller imperforate door **60** which had been secured to the larger door during a previous portion of the cycle, is then removed. Cleansing chemicals, which together with water in the barrel form a cleansing solution, are then added to the barrel **10** through the access opening **56** in the large door **54.** These cleansing chemicals are conventionally employed in impact plating systems and need not be described in detail. The small imperforate door **60** is then secured again in position and the barrel is rotated about its generally horizontal axis for a time period sufficient to cleanse the parts. During this time the cleansing chemicals will also affect the cleansing of particles, if any, adhered to the impacting medium. Corrosion, scale and carbon smut which may be removed during the process is, however, still present in the barrel.

Therefore, after the cleansing phase of the cycle, the imperforate door is replaced by the perforate door **62.** While supplying rinse water to the barrel through the end opening **51** upon opening of the rinsing valve **14,** the tumbling barrel **10** is again rotated. During this rotation the parts and the impacting medium are retained in the barrel **10** by the perforate door **62** while the rinsing effluent passes through that door. It will be apparent that this rinsing cycle, by reason of the rolling rinse, is accomplished with a minimum of water expenditure. The rinsing effluent is thus efficiently separated from the parts to be plated and falls into the stationary bin assembly **18** through the screen **66** at the top of the bin.

At the end of the rinsing phase of the cycle, the perforate door **62** is removed. At this time, a metal plating powder such as zinc, cadmium, tin or other metal or alloy is added to the barrel **10** along with a conventional plating agent or promoter chemical. The small imperforate door **60** is then secured in position and the barrel is rotated for a time period necessary to plate the parts. Water is also added to the barrel **10** during the plating phase of the cyle. This water serves as a carrier for the plating material and as a mass lubricant so as to minimize the possiblity of damage to the parts through abrasion and tangling of the parts.

In this respect it may be mentioned that agitation of the barrel other than by pure rotation about a horizontal axis may be employed. However, this means is preferred insofar as through horizontal rotation the criticality of the time of rotation during a plating cycle as well as the criticality of differences in barrel contents during different cycles, is minimized, thereby decreasing the possiblity of deplating by abrasion in the event of variations in these factors.

At the end of the plating phase of the cyle, the parts and remaining barrel content which now need to be separated are dumped out of the plating barrel **10** and into the stationary bin aseembly **18.** The screen **66** at the top of the bin separates the plated parts from the mass of impacting medium and spent plating material and promoter chemicals which pass therethrough. At this time the parts may be hosed down to hydraulically assist in separation.

Since the bin is generally sized to accommodate the volume of a single charge of impacting medium normally utilized, the rinsing effluent previously accumulated in the bin is displaced through overflow and is disposed of. Thus the material removed during the cleansing operation are separated from the impacting medium. If desired, the rinsing effluent may be earlier drained out of the bin through suitable means (not shown).

Upon opening of the gate valve **32** water from the pump **26** serves to hydraulically transfer the bin contents to the overhead hopper **20.** During this time cleansing of spent plating materials and promoter chemicals is accomplished through the turbulence generated as previously discussed.

Overflow water drained out of the overhead hopper **20** through the conduit means **34** carries with it the suspended spent plating material and promoter chemicals to the water storage tank **16.** The overflow strainer **70** permits this material to pass through while retaining the impacting medium which settles to the hopper bottom.

In this manner, during each cycle the impacting medium is maintained relatively pure so as to lessen the frequency with which impacting medium rectification is required by reason of attrition.

This time interval is further lengthed through the utilization of two impacting medium charges in each tumbling barrel assembly. Prior to transfer of the impacting medium charge to the overhead hopper **20,** the previously transferred charge is placed into the barrel **10.** Thus, one impacting medium charge is present in the overhead hopper while the other remains in either the tumbling barrel **10** or at a later time in the bin assembly **18.**

SUMMARY OF THE ADVANTAGES

It may thus be seen that in following the present invention several advantages are realized. Particularly significant is the lessening of the frequency with which rectification of the impacting medium is required through separating the spent plating materials and promoter chemicals from the system and through the use of two impacting medium charges.

Also of importance is the use of a water recovery and reuse system which minimizes water expenditure.

Of independent significance is the provision in the system for rinsing while minimizing the amount of water expenditure required and insuring separation of the rinse water effluent from the parts prior to plating.

Although the invention has been described with reference to a particular preferred system, it will be appreciated by those skilled in the art that additions, modifications, substitutions and deletions other than those mentioned may be made without departing from the spirit or scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for wet plating of metal parts utilizing an impacting medium and plating material, the apparatus comprising:
a tumbling barrel rotatable about a generally horizontal axis;
a rinsing valve communicating with an end opening of said barrel located on said axis;
means defining a side opening extending longitudinally of said barrel between opposite ends thereof;
a larger door having a single opening therein and securable to the barrel coextensively with the side opening thereof and having an access opening therein;
a smaller perforate door and a smaller imperforate door, each selectively securable to said larger door at said single opening coextensively with said access opening thereof;
said perforate door being sized to retain metal parts and the impacting medium utilized in the system and to permit aqueous solutions to pass out of said barrel;
said smaller imperforate door when secured to said larger door, together with said larger door when secured to the barrel, entirely blocking the side opening of said barrel;
a stationary bin positioned beneath said barrel;
a screen mounted adjacent the top of said bin and sized to retain the parts to be plated and to pass a mass of impacting medium and spent plating material;
an overhead hopper positioned above the barrel, the bottom of the hopper being provided with a selectively operable valve;
a venturi educator communicating with the bottom of said bin in selectively operable relationship;
conduit means providing communication between said venturi eductor and said overhead hopper;
a water storage tank;
an overflow strainer in gravity feed communication between the top of said overhead hopper and said water storage tank, said strainer being sized to pass aqueous solutions and to block passage of impacting medium;
make-up water supply means communicating with said water storage tank for maintaining the level of water in said water storage tank substantially constant; and,
means for pumping water from said storage tank through said venturi eductor and to said overhead hopper.

2. Apparatus for wet plating of metal parts utilizing an impacting medium and plating material, the apparatus comprising:
a container mounted for at least rotating movement about an axis;
closure means for selectively maintaining a peripheral side portion of said container in a perforate or imperforate condition;
means for supplying liquid to said container during rotation of said container;
said peripheral portion in its perforate condition being sized to retain the parts to be plated and the impacting medium while permitting rinsing effluent to pass through;
bin means positioned beneath said container for collecting a mass of impacting medium and spent plating material;
a first remote station;
a second station including a source of water;
means for hydraulically transferring, utilizing said water from said second station, the contents of said bin means through a conduit to said first remote station while generating sufficient turbulence so as to tend to cleanse the transferring medium;
means for hydraulically transferring aqueous solutions, including suspended spent plating material, from said first remote station to said second station while retaining said impacting medium at said first station; and
means for segregating the suspended particles of spent plating material transferred to said second station from the water at the second station so as to enable reuse of the water from said second station for hydraulically tranferring the contents of said bin means to said first remote station.

3. Apparatus according to claim 2 wherein:
said container is mounted for at least rotating movement about a generally horizontal axis.

4. Apparatus for wet plating of metal parts utilizing an impacting medium and plating material, the apparatus comprising:
a container mounted for at least rotating movement about an axis, said
closure means for selectively maintaining a portion of said container in a perforate or imperforate condition; means for supplying liquid to said container during rotation of said container;
said portion in its perforate condition being sized to retain the parts to be plated and the impacting medium while permitting rinsing effluent to pass through;
means adjacent said container for collecting a mass of impacting medium and spent plating material;
a first remote station;
a second station including a source of water;
means, utilizing said water from said second station, for hydraulically transferring said collected mass of material to said first remote station while generating sufficient turbulence so as to tend to cleanse the impacting medium;
means for hydraulically transferring aqueous solutions, including suspended spent plating material, from said first remote station to said second station while retaining said impacting medium at said first station; and
means for segregating the suspended particles of spent plating material transferred to said second station from the water at the second station so as to enable reuse of the water from said second station for hydraulically transferring the collected mass of material to said first remote station.

5. Apparatus according to claim 4 wherein:
said container is mounted for at least rotating movement about a generally horizontal axis.

6. Apparatus according to claim 4 wherein:
said means for collecting comprises bin means positioned beneath said container and wherein said first mentioned means for hydraulically transferring includes conduit means communicating with said bin means and said first remote station.

7. Apparatus according to claim 6 including:
a screen positioned adjacent the top of said bin means and sized to retain the metal parts and to

pass the mass of impacting medium and spent plating material into said bin means.

8. Apparatus according to claim **6** wherein:

said first mentioned means for hydraulically transferring included venturi eductor means communicating with the bottom of said bin means in selectively operable relationship.

9. Apparatus for wet plating of metal parts utilizing an impacting medium and plating material, the apparatus comprising:

a container mounted for at least rotating movement about an axis, said container defining an end opening on said axis;

interchangeable closure means for selectively maintaining a peripheral side portion of said container in a perforate or imperforate condition;

means for supplying liquid to said container, through said end opening, during rotation of said container;

said peripheral portion in its perforate condition being sized to retain the parts to be plated and the impacting medium while permitting rinsing effluent to pass through;

stationary bin means positioned beneath said container for collecting a mass of impacting medium and spent plating material;

conduit means communicating with said bin means and a first remote station; and

means for hydraulically transferring the contents of said bin means through said conduit means to said first remote station while generating sufficient turbulence to tend to cleanse the impacting medium of spent plating material;

means for hydraulically transferring aqueous solutions, including suspended spent plating material, from said remote station to a second station while retaining said impacting medium at said first station.

10. Apparatus according to claim **9** wherein:

said container is mounted for at least rotating movement about a generally horizontal axis.

11. Apparatus according to claim **9** including:

a supply of fluid at said second station to provide a fluid to said means for hydraulically transferring the contents of said bin.

12. Apparatus according to claim **9** including:

a screen positioned adjacent the top of said bin and sized to retain the metal parts and to pass the mass of impacting medium and sepnt plating material into said bin.

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