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Ziebarth et al.

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[54] **OSCILLATING BARRELS INCLUDING ELECTRICAL CONTACT MEANS**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 145,254, May 20, 1971, Pat. No. 3,723,284.

[52] **U.S. Cl.** **204/222,** 204/213, 259/75

[51] **Int. Cl.** **C23b 5/78**

[58] **Field of Search** 204/213, 214, 222; 259/89

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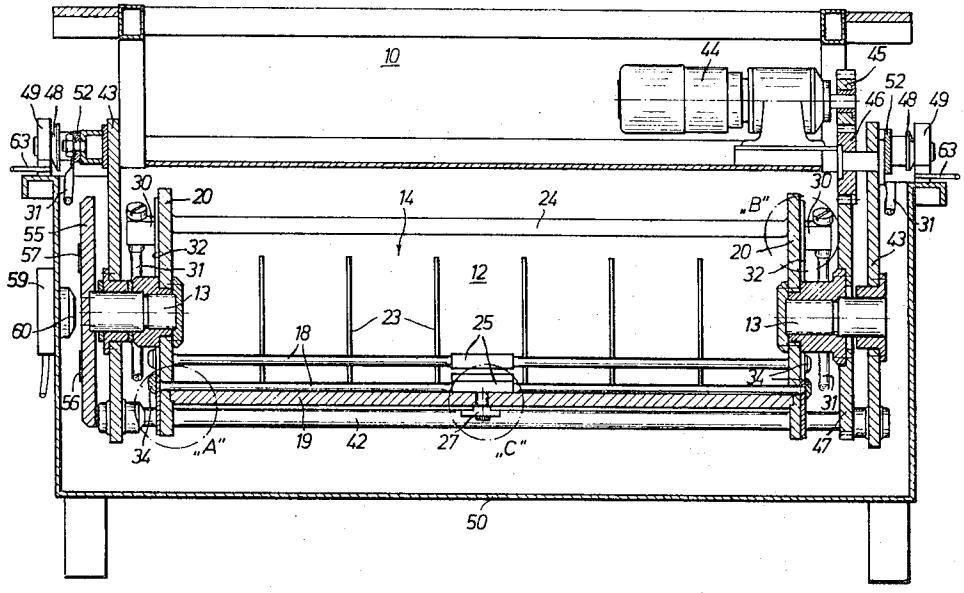
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Assistant Examiner—W. I. Solomon
Attorney, Agent, or Firm—Leonard H. King

[57] **ABSTRACT**

A galvanizing device comprising a plastic, pivotally mounted drum having longitudinal, perforated walls to hold workpieces, means for rocking the drum to a limited extent, a carrying frame in which the drum is pivoted, the transverse cross-section of the walls being partially heart-shaped, longitudinal strengthening bars attached to the walls and to the ends of the drum, the bars carrying partially exposed current-carrying contact rods, and connections from the rods to a low-voltage high current electric supply. The drum dips into a vat containing treatment liquid which penetrates the holes in the walls and contacts the workpieces in the drum.

5 Claims, 8 Drawing Figures



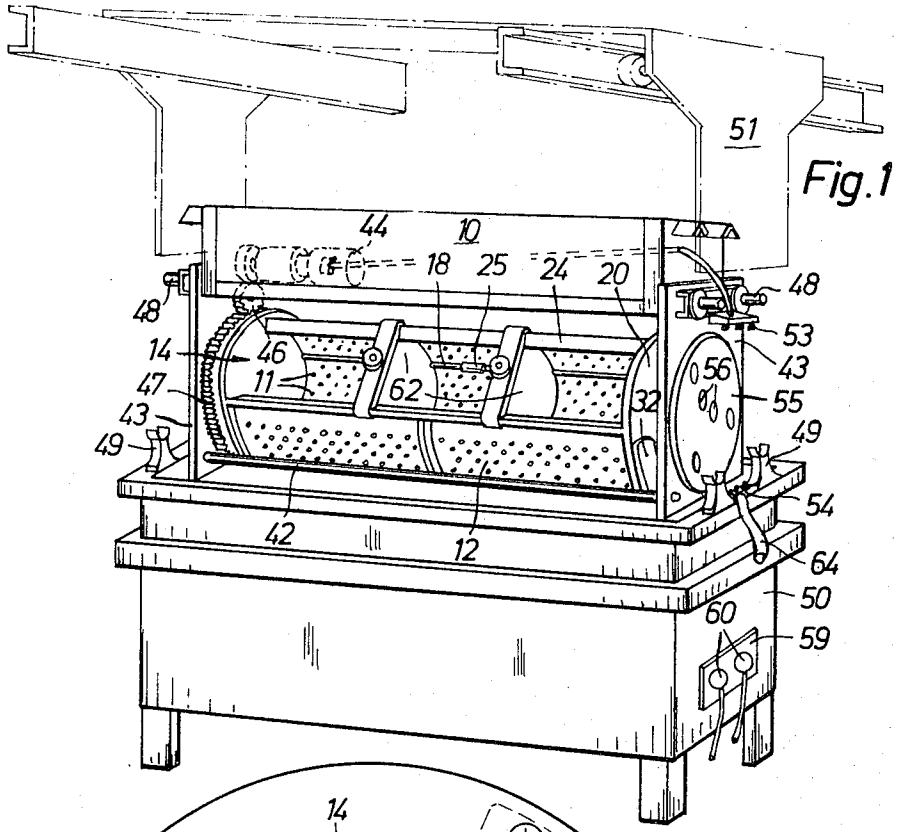

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Fig.1

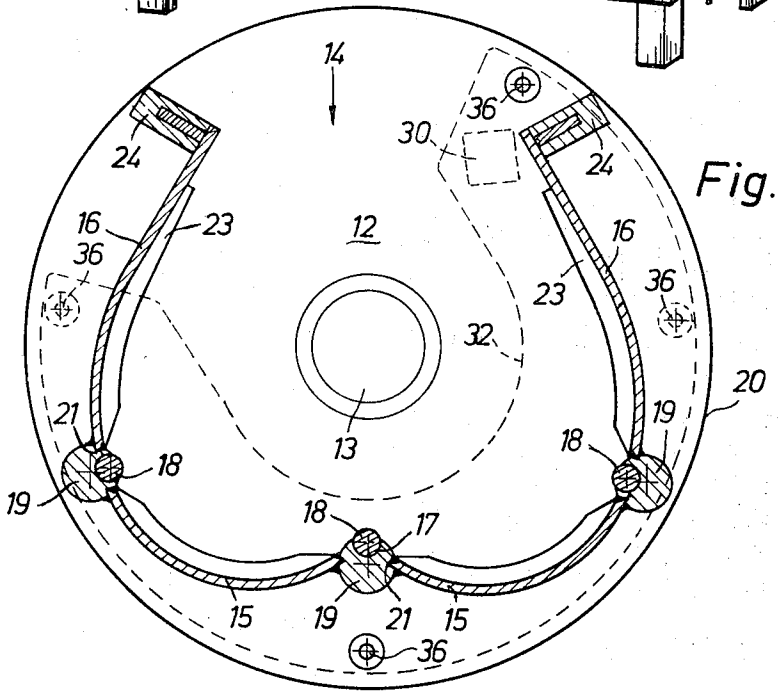

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Fig.2

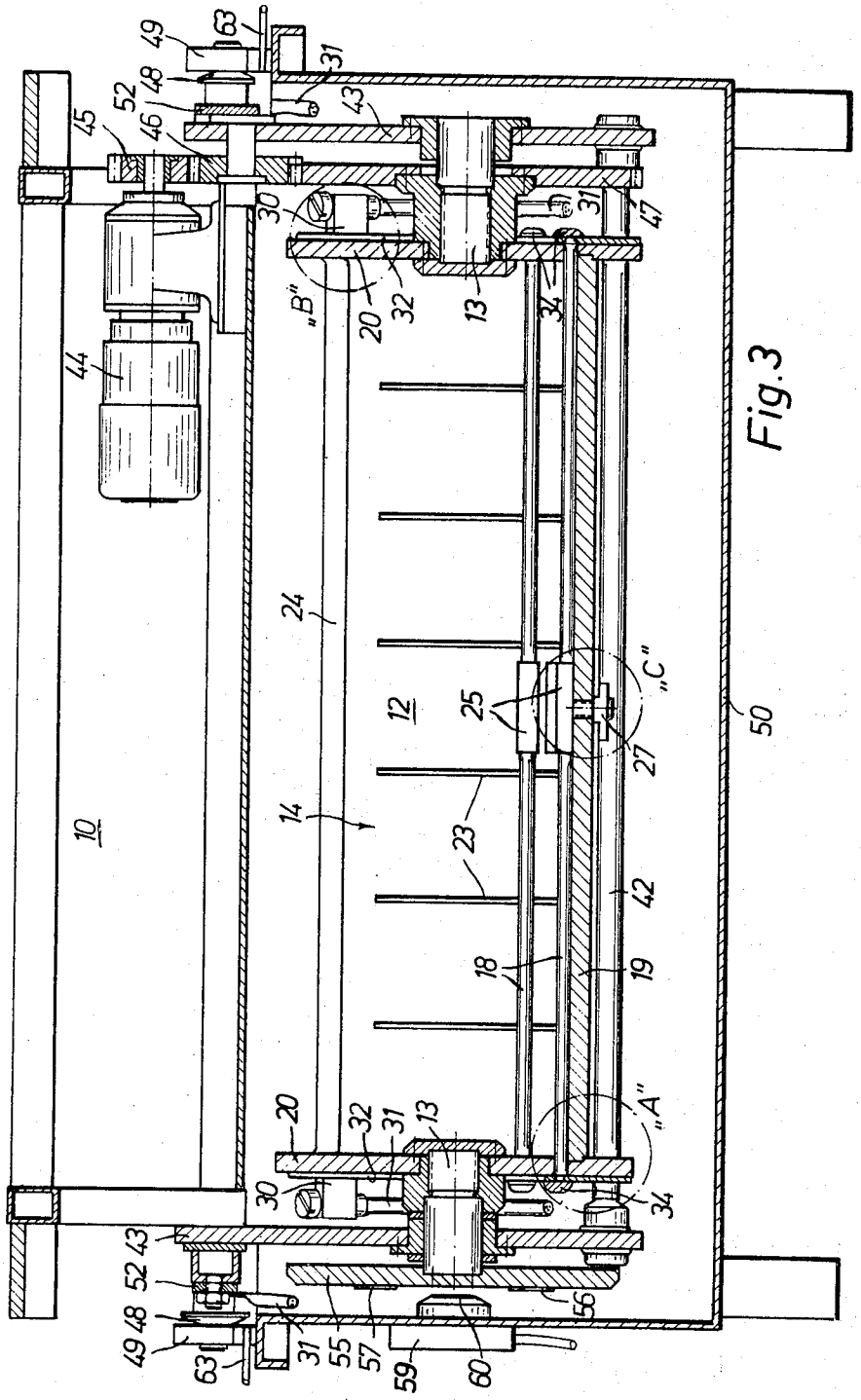

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Fig.3

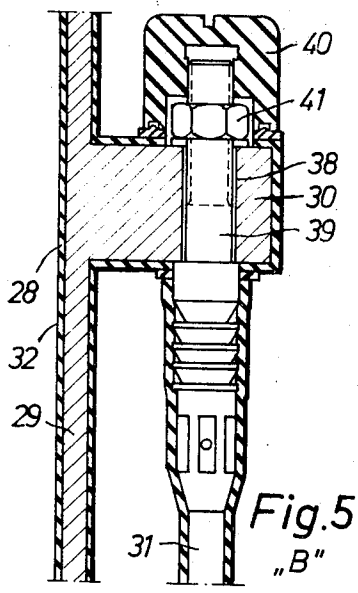
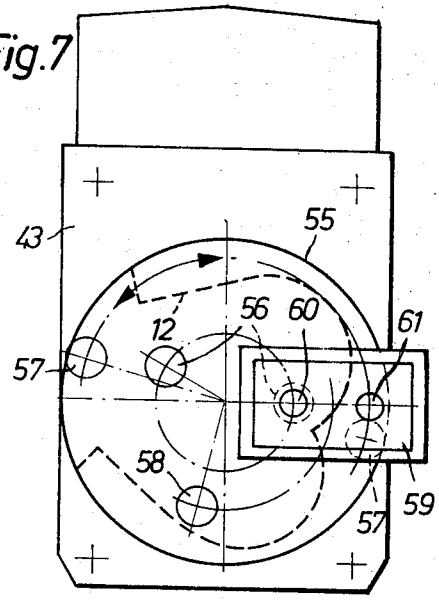


Fig.5
„B"

Fig.7



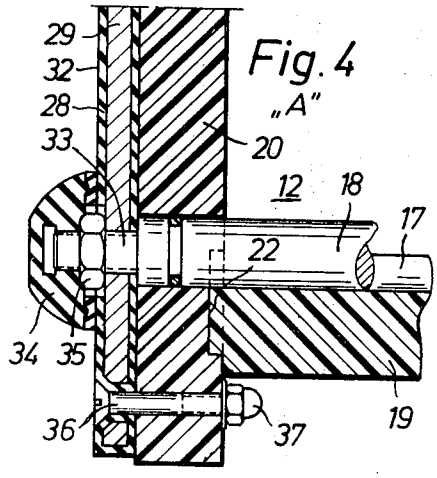
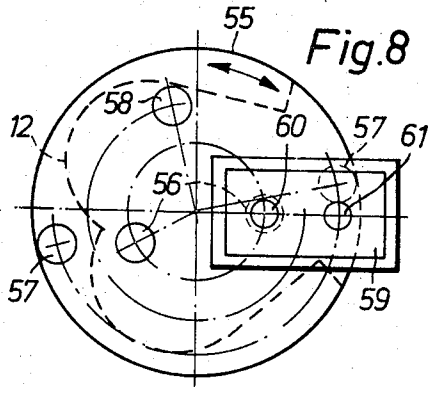


Fig. 4
„A"

Fig.8



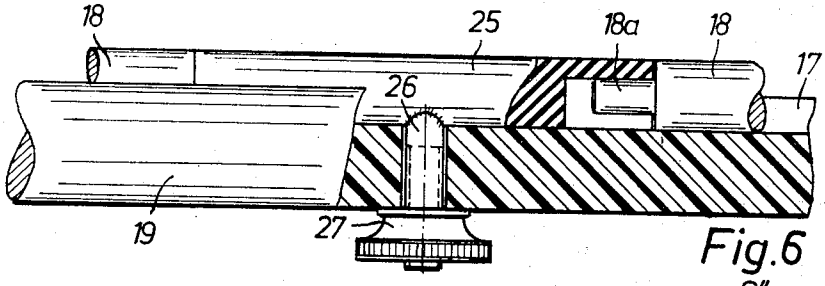


Fig.6
„C"

OSCILLATING BARRELS INCLUDING ELECTRICAL CONTACT MEANS

This application is a continuation-in-part of copending application, Ser. No. 145,254, filed May 20, 1971, and now U.S. Pat. No. 3,723,284 granted Mar. 27, 1973.

The aforementioned abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

The invention relates to a galvanizing device having a drum adaptd to receive the articles to be galvanically treated.

U.S. Pat. No. 3,058,902 discloses a rotary drum which has contact rods in the drum space which are secured to an end face of the drum and to a metallic contact disc incorporated in the end face of the drum. The contact disc is slipped over a bearing sleeve which is mounted so as to be rotatable on a bearing pin that is electrically connected to the current supply in order to provide a central current supply through the bearing of the drum. This method of current collecting is a disadvantage because of the line contact existing during drum rotation; that is, bearing play occurs between the bearing axle and the bearing sleeve and produces a relatively bad current collection which requires a longer treatment period for the components and hence an increase in costs for the galvanizing. Moreover, the shape of the drum and the rotary motion of the drum frequently results in inadequate turning over of the articles to be galvanized, especially since the articles are moved in one direction. The contact disc moreover cannot be replaced when required without detaching the end face parts of the drum.

U.S. Pat. Nos. 2,830,946 and 2,479,323 disclose oscillating drums in which current is supplied to the articles being galvanized by means of cables projecting into or suspended in the interior of the drum having contact members at the end faces. The ends of the contact cables, remote from the interior of the drum, are located on contact discs provided with a central current supply passing through the bearing between the bearing axle and the bearing bore. Herein too there is an inferior current supply to the articles being galvanized and hence a longer galvanizing period required, which is uneconomical. In these patents the oscillating drum is provided with a base of W-shaped transverse cross-section. However, because of the straight surfaces of both channels of this W-shaped base the drum does not provide sufficient movement (revolution and intermixture) of the articles being galvanized.

The object of the invention is an improved galvanizing device with which satisfactory galvanizing may be obtained in a relatively short time. The drum, comprising this invention, is of simple structure, stable, has a long life, and is provided with a reliable current supply, permitting proper current collection. Moreover, the drum comprising this invention is formed as an oscillating drum and has a cross-section which ensures an improved intermixture of the articles to be galvanized.

The galvanizing drum in accordance with the invention is distinguished by a simple, stable structure and an optimum current collection from the current supply. Due to a high current supply, the structure of the present invention permits shorter galvanizing times than galvanizing drums hitherto available, thus ensuring an economical operation.

The current supply is preferably not coupled to the drum mounting, but occurs at two contact members so as to be readily interchangeable at each end face of the drum. The contact rods leading into the drum interior are located so as to be readily interchanged. The contact members may be interchanged and/or replaced without dismounting them from the drum.

Moreover, the preferred heart shape or inverted heart shape of the drum cross-section ensures a better intermixing of the articles being galvanized, since in each of the two trough-like channels or grooves of the drum base a favorable rolling motion and intermixing of the individual parts occurs during the oscillation of the drum. The two base hollows ensure a substantially better intermixing of the parts to be galvanized than heretofore with known V-channels of a W-shaped oscillating drum base.

BRIEF DESCRIPTION OF THE DRAWING

In the various figures of the drawing, like reference characters designate like parts.

In the drawing:

FIG. **1** is a perspective view of an electroplating device comprising this invention;

FIG. **2** is a transverse cross-section view through the pendulum drum shown in FIG. **1**;

FIG. **3** is a longitudinal sectional view through the pendulum drum shown in FIG. **1**;

FIG. **4** is a fragmentary sectional view taken at point "A" in FIG. **3**;

FIG. **5** is a fragmentary sectional view taken at point "B" in FIG. **3**;

FIG. **6** is a fragmentary view, partially in section, taken at point "C" in FIG. **3**;

FIG. **7** is an end elevational view of a pendulum drum in accordance with this invention; and

FIG. **8** is an end elevational view of the index ring of FIG. **7** in an inverse pivotal position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A plating device of the invention for the galvanic surface treatment of merchandise (shaped parts) possesses a pendulum drum **12,** which is mounted so as to be pivotable to and fro in a carrying frame **10,** and defines openings **11** on the side of the casing for the passage of a medium, the drum being rotatably and detachably supported in the carrying frame **10** by means of two facing bearings **13** which form a pivotal axis.

The pendulum drum **12** shows in cross-section several wall parts **15** and **16,** connected together to form an incomplete heart shape, with a filling and emptying aperture **14,** the wall parts **15** have cross-sections which are annular, and the wall parts **16,** in cross-section, are part curved, part straight.

Adjacent wall parts **15** and **15,** as well as **15** and **16** are connected together by a common strengthening bar **19** which simultaneously forms a support **17** for a contact bar **18,** which is partly enclosed therein, and is connected to a current supply. The individual wall parts **15** and **16** of the drum **12** are fastened by welding to the strengthening bars and by welding to end plates **20,** which terminate the drum **12** at each end.

To facilitate a welded connection between wall parts **15** and **16,** and strengthening bars **19,** the edge regions of the wall parts **15** and **16** fit in channels **21** of the

strengthening bars **19**, which are preferably formed as extrusion profiles.

Each strengthening bar **19**, which has a circular, angular, or oval cross-section, defines a recess **17** over the entire length of the bar, which is the same shape as the cross-section of the contact bar **18**. There is a channel **21** on both sides of this recess to receive walls parts **15** and **16**, which are welded with the strengthening bars **19** to the inside and outside of the drum, in the region of these channels **21**.

Each contact bar is formed from two cathode rods which are arranged coaxially, and are electrically connected, each rod having a circular cross-section.

To agree with the cross-section shape of the cathode rods, each strengthening rod **19** has a partially circular recess in which the two coaxially running cathode rods **18** are mounted, and from which part of their surface projects is exposed to make contact with the shaped parts to be galvanized.

The heart shape of the pendulum drum **12** is formed by the four wall parts **15** and **16**, which are connected together by three strengthening bars **19**. The two adjacent partially circular (annular) shaped wall parts **15** represent the floor region of the drum **12**, and to each wall part **15** the curved part of a wall part **16** is connected the rectilinear regions of the wall parts forming the opening **14** at the top.

The ends of the strengthening bars **19** fit into recesses **22**, which extend part way through the ends **20**.

The wall parts **15** and **16** are braced on the inside of the drum by ribs **23**, and in the region of the filling and emptying opening **14**, by exterior bars **24**.

The wall parts **15** and **16**, the strengthening bars **19**, the end walls **20** and the stiffening ribs **23**, as well as stiffening bars **24** of the pendulum drum **12**, are of plastics material such as polypropylene, and the wall parts **15** and **16** preshaped while hot.

The wall parts **15** and **16** extend in over the entire length of the drum; they can, however, be formed from several parts, extending over the longitudinal direction of the drum.

Each contact bar, which runs the entire length of the drum, and is formed from two coaxially arranged cathode rods **18**, mounted in a common recess **17** of the strengthening bar **19**, is held detachably in the drum **12**, in the central longitudinal region or elsewhere, by a bridge **25** of non-conducting material; this bridge **25** consisting of plastics material, covers a joint between the two coaxial cathode rods **18**, the joints including a spigot **18***a* of the adjacent contact bar. The bridge is fixed detachably according to position, by a bolt **26** which passes through the strengthening bar **19**, and is secured by a nut screwed onto the outside of the drum, in the connection region of two cathode rods **18**.

Each cathode rod **18**, at its end away from the plastics bridge **25**, passes sealingly through the end wall **20** of the drum, and is connected to a contact part **32** which is covered by an insulation layer **28** which is insulated from the end wall **20** of the drum and fastened detachably to the outside of it; there is a terminal **30** for an electric current supply line **31**.

The contact part **32** is formed from a metal plate **29**, with the metal terminal **30** fastened on it, and an insulation layer **28**, preferably of rubber, which surrounds this metal core **29** and the terminal **30** on all sides up to the points of contact with the cathode rods **18** and the current cable **31** (compare FIGS. **4** and **5**).

The cathode rod **18** is fastened to the contact part **32** by a threaded end **33**, and is detachably connected to the contact part **32** by a nut **35** which is screwed on to the outside of the end **33**. The nut is covered by an insulation cap **34**; the contact connection between cathode rod **18** and contact part **32** takes place inside the bore of the metal core **29**, which accepts the threaded end **33**.

The contact part **32** provided on the outside of each end wall **20** of the drum extends part-circularly around the bearing axis **13** of the drum, and is detachably fastened by means of several screws **36** which penetrate through bore-holes covered by the insulation layer **28**, and by nuts **37**, to the end wall **20** of the drum.

The terminal **30** extends from an end region of the partially circular contact part **32**, and has a hole **38** to receive a contact end **39** of the conductor **31**, which is insulated against moisture. The contact end **39** is connected detachably to the terminal **30** by a nut **41** which is screwed onto the end **39** and which is covered by an insulation cap **40**. All cathode rods **18** are supplied with current by this terminal **30**, one of which is provided on each contact part **32**.

The carrying frame **10** is formed from two carrying plates **43** which are connected together by tie rods **42**, and accept the stub shafts **13** of the drum. On this carrying frame **10** is mounted a propulsion device **44**, a driving motor with gearing, which is connected, by its driving pinion **45** via an intermediate wheel **46** to a toothed wheel **47** which is fastened to one end of the drum. The motor drives the pendulum drum **12** with a rocking (to and fro) movement.

The carrying frame **10** has two carrying plates **43** with two pins **48** with which the carrying frame **10** and its pendulum drum **12** can be suspended as a unit in the forks **49** of a treatment bath container **50**, a filling or emptying container, a drying kiln, a transport device **51** or the like.

Each carrying frame plate **43** has a conductor rail **52** to which the current conductor **31**, which leads to the contact part **32**, is connected. The current supply for the pendulum drum **12** is derived from a low voltage source with a high current output (e.g. 750 amp. at 15v). The current is brought to the conductor rail **52**, in each case via a current supply line **63** which is connected to the forks **49**, and the pins **48** enclosed therein, from which the current reaches the cathode rods **18** via the line **31** connected to it (and via the insulated contact part **32**).

The current supply for the propulsion motor **44** is separately derived from a connector **53** which is located at one end of the frame **10**. This connector **53**, upon insertion of the drum **12** in the bath container **50**, is connected to a complementary part **54** which is arranged on the container **50**; three-phase current is used for the propulsion motor **44**, the current being fed through a line **64** of the counter-contact device **54**.

On the front of the drum facing the gear motor **44**, there is a plastic index ring **55** surrounding the stub shaft **13**, to which several metallic switching plates **56**, **57** and **58** are fastened, which cooperate with a commutator **59** fastened detachably on the container **50** for control of the drum **12** between its two end positions, and the filling or emptying position. The commutator has an index ring **55** on which there are two metal plates **56**, two metal plates **57** and one metal plate **58**, which are spaced from one another, and at three differ-

ent diameters, two approximately diametrically opposite metal plates **56** of which are arranged on the smallest diameter, and serve to limit the extreme pivotal positions of the drum. Two further metal plates **57** which are also approximately diametrically opposite, and are displaced against the direction of rotation of the drum in relation to the metal plates **56,** represent security contacts, and are situated at the largest diameter.

A metal plate **58,** which is arranged on the medial diameter between the four previous contacts, forms a contact for the location of the pendulum drum **12** in its emptying position.

The commutator **59** has two fixed brushes **60** and **61,** which are spaced apart, the brush **60** being on the diameter of the metal plates **56,** and the brush **61** on the diameter of the contact **57.** These brushes **60** and **61** are so located that in the event of their touching one of the contacts **56** and **57,** the motor **44** for rotating the drum is switched off and reversed, or switched right off in an emergency.

If the metal plate **56** is contacted by the brush **60,** the drive of the drum in one direction is terminated, and the motor **44** is reversed to produce the opposite rotation of the drum. If the brush **60** fails, or if one of these metal plates **56,** through a defect in the brush **60** overruns the latter, the metal plate **57** encounters brush **61** after a small further rotation of the drum **12,** and the rotation of the drum is arrested.

To empty the drum **12,** the latter is rotated until the excitation plate **58** is situated between the two brushes **60** and **61**; this brings the motor to a standstill.

The pendulum drum **12** is divided into two or more chambers by one or more dividing walls **62.** The dividing walls **62** are removably inserted in the drum **12,** and can be pushed along the longitudinal direction of the drum into the desired position; they can be fixed in position by fastening means, such as screws, clamps or the like. When the separating walls **62** are removed, long work pieces can be treated. The shiftable dividing walls **62** make possible the formation of chambers of optional dimensions.

The dividing walls **62** enable workpieces of various types to be treated separately in the drum **12.**

The plating device described can be incorporated in a plating installation having several stations arranged one after the other.

There has been disclosed heretofore the best embodiment of the invention presently contemplated. However, it is to be understood that various changes and modifications may be made by those skilled in the art without departing from the spirit of the invention.

What we claim as new and desire to secure by Letters Patent is:

1. A galvanizing device comprising, in combination:

a. a supporting frame;

b. an oscillating drum mounted in said supporting frame for reciprocating, angular movement, said drum having passage apertures for a galvanic medium formed in the walls thereof;

c. said oscillating drum in cross-section having several wall portions connected together so as to define a heart-shaped filling and emptying opening;

d. said wall portions with their adjacent longitudinal edges each being rigidly secured to a reinforcing profile that extends over the whole length of said drum;

e. said wall portions and said reinforcing profiles being rigidly secured to the end faces of said drum thereby closing said oscillating drum;

f. said reinforcing profiles at the same time forming bearing points for contact rod assemblies located within said oscillating drum, said reinforcing profiles enclosing part of the cross-section of said contact rod assemblies;

g. over the length of the drum two contact rods being arranged in rectilinear extension, said two contact rods being detachably secured by a bridge made of a non-conduting material and a screw connection to the inside surface in the region of said reinforcing profiles;

h. the ends of each of the said contact rods extending through said end faces of the drum and being connected to an insulated contact member, having an electric coupling member, secured to the outer surface end wall of the drum;

i. said contact member being formed by a metal plate member extending partially about the pivotal axis of the drum and an insulating layer enclosing the plate member with the exception of the contact points on all sides.

2. A galvanizing device as claimed in claim **1,** in which said oscillating drum is formed of two wall sections of pitch circle-shaped cross-section and two arcuate wall sections adjoining the pitch-circle-shaped wall sections at a rectilinear region whereby the two pitch circle-shaped wall sections form the base region of the drum and the two other wall sections form the lateral region, whereby the lateral regions of the wall sections define the filling and emptying opening.

3. A galvanizing device as claimed in claim **2,** wherein said wall sections of said drum are reinforced on the inside by ribs and, in the region of said filling and emptying opening by external bars, each wall section forming the cross-sectional form of the drum over the whole length of the drum being made in one piece.

4. A galvanizing device as claimed in claim **1,** wherein each contact rod assembly extends over the whole length of the drum and is formed by two cathode bars located in a common mounting recess which are interconnected in the center longitudinal region of the drum by said bridge and provided with a pin overlapped at the end face by said bridge and said bridge, by means of said screw connection including a screw passing through said reinforcing profile and a nut screwed thereon outside said drum, being located in position and detachably retained in said drum.

5. A galvanizing device as claimed in claim **1,** wherein said coupling member of said contact member is provided in an end region of the metal plate member and in a bore receives a contact pin of the electric lead insulated against dampness, whereby said contact pin is connected detachably to the coupling member by a nut screwed thereon and covered by an insulating cap.

* * * * *