

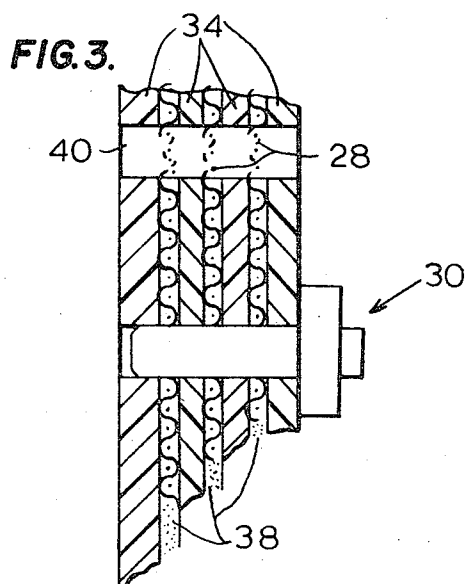
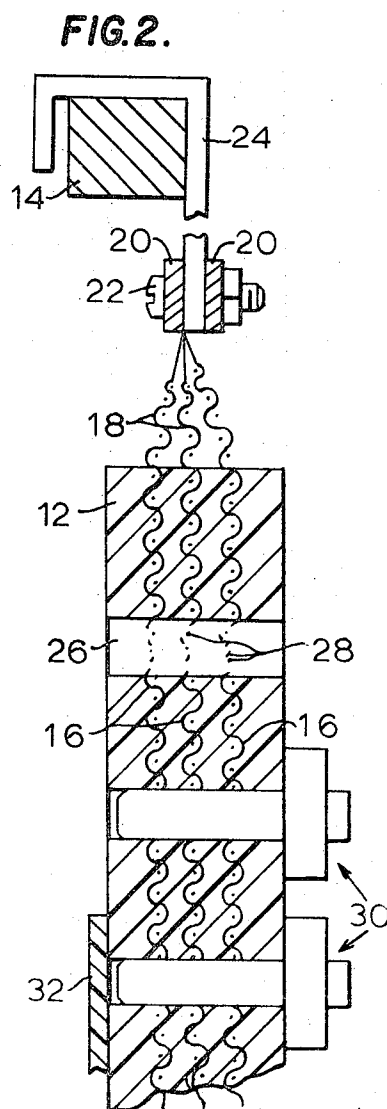
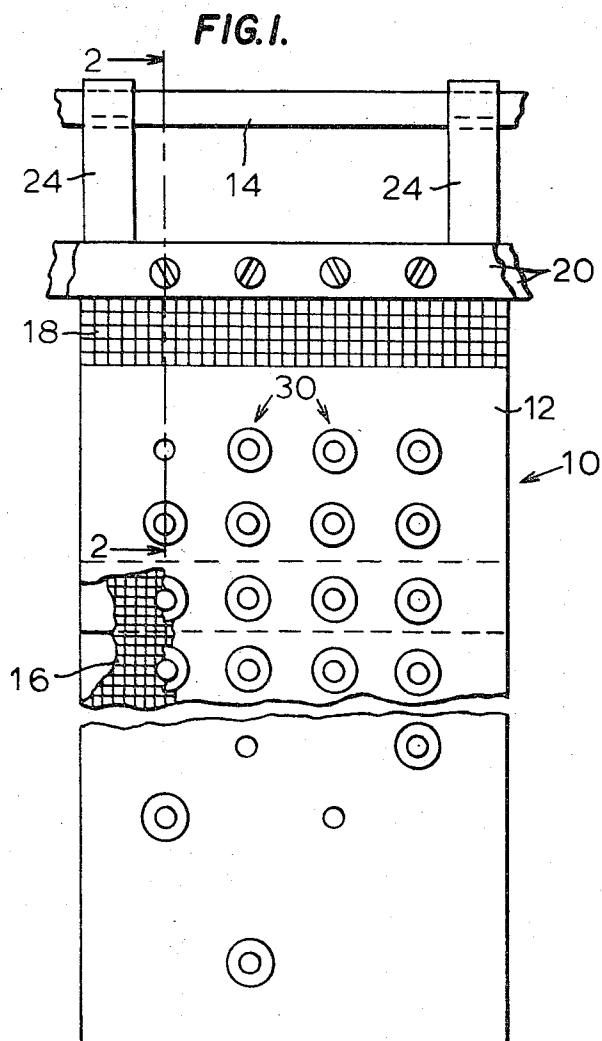
Jan. 5, 1971

D. W. COIR

3,553,096

ARTICLE HOLDER FOR ELECTRODEPOSITING COATINGS ON ARTICLES

Filed Nov. 18, 1968



INVENTOR.
DONALD W. COIR.
BY
Palmer B. Parker
ATTORNEY.

1

3,553,096

ARTICLE HOLDER FOR ELECTRODEPOSITING COATINGS ON ARTICLES

Donald W. Coir, Detroit, Mich., assignor to Burroughs Corporation, Detroit, Mich., a corporation of Michigan
Filed Nov. 18, 1968, Ser. No. 776,611
Int. Cl. C23b 5/70

U.S. Cl. 204—297

4 Claims

ABSTRACT OF THE DISCLOSURE

An article holder for supporting articles while being subjected to electrodepositing action, such as electroplating, which is composed of a relatively thick pad or sheet of resiliently compressible, electrically insulating material having embedded therein one or more woven wire mesh screen being in planes parallel to and spaced apart from one another and to the opposite surfaces of the sheet. For retaining the articles in place during this operation, the insulating sheet is drilled or otherwise shaped to provide holes each opening out on at least one surface of the sheet and extending through the embedded wire screens so that severed wires are exposed in the holes. Articles to be subjected to electrodepositing action are shaped with a part thereof which is snugly received in a hole and held or retained in this manner on the holder while other exposed areas of the article receive the electrodeposited coating. The inserted part of each such article is engaged by the exposed severed wires of the screens to form an electrical connection therewith. Provision is made for electrically connecting each such embedded wire screen to an external source of electrical energy.

BACKGROUND OF THE INVENTION

The field of art to which the present invention pertains is concerned with holders or racks for supporting articles while being subjected to the electrodeposition of a coating thereon. Holders of this nature have been designed in the past for retaining a plurality of articles and to this end they have been provided with a plurality of holes each designed for receiving an inserted part of an article while other portions of the article are exposed to the electrodeposition action. In one prior art device of this character, an electroplating rack is constituted by a relatively thick, perforated metallic member having an electrical insulating coating to prevent deposition thereon. The rigidity of the perforated member preventing a snug fit on the inserted parts of the articles and its thickness provided a weighty and relatively high cost item. In another prior art device, a holder for electroplating articles is formed of a composite of specially shaped non-conducting members, some formed of rigid synthetic plastic and others of yieldable rubber, together with rigid conductive plates or strips for the purpose of making contact with the inserted parts of the articles. The complexity of such a holder and the time required to assemble and remove articles supported thereby made it a relatively costly item to use.

SUMMARY OF THE INVENTION

The invention described herein overcomes the objections of the prior art devices mentioned and other more remotely pertinent equipment by providing a simple lightweight holder for supporting articles while subjected to electrodeposition action which is inexpensive to fabricate and use. Moreover, the holder sealingly protects the held parts from electrodeposit and by a simple internal provision achieves a reliable electrical connection of the supported articles to an external source of electrical energy. More specifically, the holder of the present invention is

2

formed of two basic constituents, a relatively thick perforated pad or sheet of resilient, electrical insulating material and electrical conductive material embedded in the pad in the form of thin woven wire meshed screens. In their embedded condition, the wire screens extend in spaced apart relation to one another and to the opposite external surfaces of the holder. At the top of the holder, the screens project therefrom and are collected together for joint connection to an external electrical conductor. The holes forming the perforations in the holder are preferably circular in cross section and extend sufficiently far into the pad to intersect the wire screens with the result that cut wire filaments of the screens enter each hole and make firm electrical contact with the part of the article introduced therein. The resiliency of the material is availed of for forming a tight seal around the inserted parts of the articles; the holes are preferably formed so as to be slightly undersize of the inserted parts so that the latter are snugly received therein and make electrical contact with the barbs of the wire screens exposed in the holes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plane view of an article holder constructed in accordance with this invention and shown suspended from a bus bar of an electroplating apparatus,

FIG. 2 is an enlarged vertical cross sectional view of the holder taken along line 2—2 of FIG. 1 and showing the interior construction of the holder including the presence of woven wire screens therein, and

FIG. 3 is a vertical cross sectional view similar to that of FIG. 2 but showing a modified form of construction of the holder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With specific reference to the drawings, FIGS. 1 and 2 illustrate one embodiment of the invention wherein the bulk of the holder, generally indicated at 10, is constituted by a relatively thick pad or sheet 12 of resilient material which in use is shown suspended from an electrically conducting bus bar 14 (FIG. 2). A highly desirable material for this purpose is a liquid casting of a vinyl (plastisol) elastomeric compound which forms a resiliently compressible medium for grippingly retaining the articles in place on the holder. Embedded within the pad are one or more woven wire meshed screens 16, three of which are illustrated in section in FIG. 2. Conventional copper window screening serves this purpose in an excellent manner. Such screens are thin and of relatively fine mesh and provide the desired electrical contact and conductivity as will be pointed out more particularly hereinafter. The wire screens 16 are embedded in the resilient pad in parallel planes spaced apart from one another and from the opposite exterior surfaces of the pad as evident in FIG. 2. The screens preferably occupy an area substantially equal to that of the pad except that at the top of the pad they extend beyond the pad to provide exterior marginal portions 18.

The marginal extensions 18 of the wire screens contribute in a highly satisfactory way to the suspension of the pad 12 as well as aiding the electrical connection to the bus bar 14. They are convergently collected together as shown in FIG. 2 and clamped between bars 20—20 by means of nut and bolt assemblies 22 or any suitable fastening means. Sandwiched between the bars are a pair of hangers 24—24 for hooking the device over the bus bar 14 in a manner such as illustrated in FIG. 2. In this manner the holder 10 may be suspended in an electroplating solution. A modified form of suspension may be utilized for supporting and conveying the holders laden with articles in a gaseous environment in which ionized

particles are sprayed upon the exposed surfaces of the articles.

In one preferred embodiment, the holder 10 is formed by a casting process in which an initial soft layer of a vinyl (plastisol) elastomeric compound is poured and allowed to partially cure, following which is woven copper wire screen is placed over the partially cured layer, then pouring a second layer of the compound and allowing it to partially cure before a second similar wire screen is laid thereover. These steps are repeated until a sufficient thickness of the compound is built up containing three or more wire screens therein. The result is the pad or sheet-like body shown in FIG. 2 in which the resilient plastic compound extends through the interstices of the screens securing them in different spaced apart planes.

Following completion of the building-up of the pad 12, it may be further cured to strengthen its resistance to deformation but nevertheless retaining its resilient compressibility. The pad is then drilled or otherwise cut away to form a plurality of holes therein. Preferably, these holes are arranged in the rows and columns of a matrix as shown and are drilled completely through the pad so that all screens 16 are also pierced as clearly indicated by the uppermost hole in FIG. 2. The mesh of the screens is sufficiently fine that at least several interstices appear in each hole 26. As a result of this drilling operation, wire filaments of the screens encircle the walls of the holes. As each portion of the screen is pierced by the drill, it is deflected against the yielding body of the pad in the direction of the drilling operation with the result that the severed ends of the wires protrude slightly into the hole when the drill is removed to form barbs 28 which make excellent electrical contact with the part of an article received in the hole.

In FIG. 2 the uppermost hole 26 is shown devoid of an inserted article in order to more clearly illustrate the sharp projections or barbs 28 formed by the severed wires of the screens. In the lower holes 26 of FIG. 2, articles to be treated generally indicated at 30 have cylindrical shank portions received in the holes. However, the articles may be of any shape and the apertures formed in the pad are dimensioned to receive and hold parts thereof so that the balance of the articles are supported in exposed condition on the pad. Because of the inexpensiveness of the material of which the pads are formed and the ease in which they may be drilled or otherwise cut away to form the holes, the pads may be made up in advance in unapertured condition and the holes formed therein only after the dimensions of the articles to be treated are known. Moreover, it is desirable to make the holes 26 slightly undersize of the inserted parts of the articles. Because of the inherent resiliency of the material of which the pad 12 is formed, the walls of the holes will be pressed out or enlarged as the articles are fitted therein to thus tightly gripping the same as well as protectingly sealing the inserted parts of the articles from the electrodepositing action. The resilient expansion of the plastic material around the holes will of course expose more of the wires of the screens thus providing better electrical contact between the same and the articles.

If it is desired to prevent any electrodeposition on the inserted ends of the parts of the articles received in the holes, each hole may be drilled less than the full thickness of the pad or, in the case where as shown the holes are drilled completely through the pad, they may be capped by puddling globs of elastomeric material into the entrances to the holes on the back side of the pad. A third provision for this purpose is illustrated in FIG. 2. A thin sheeting or layer of elastomer 32 may be bonded or vulcanized to the reverse side of the pad covering the entrances to the holes.

FIG. 3 illustrates a modification of the invention wherein the resilient pad 12 is a laminated assembly composed of a plurality of plys 34 between which woven wire screens 36 are interposed. Each ply 34 is a preformed

layer which may be composed of the same or similar material as that forming the resilient pad of FIG. 2. In fabricating the laminated structure of FIG. 3, a first ply is overlaid with a screen 36 and a liquid adhesive is then added which fills the interstices of the screen, and over this a second ply is placed. This is repeated until the pad is of the desired thickness. The laminated assembly is compressed under heat and pressure causing the adhesive material to harden and form a permanent bond between each pair of adjacent plys between which the metal screens are disposed. In its hardened form the adhesive forms thin layers in the planes of the screens as shown at 38 in FIG. 3. Marginal portions of the screens may be extended from the pad to form part of the suspension therefor, and holes 40 may be drilled or otherwise formed in the pad which intersect the screens and provide the sharpened projections in the holes for effective electrical contact with the parts of the articles inserted thereinto.

In the event the wire projections or barbs 28 formed by the screens in the holes become shortened due to wear or breakage, it is possible to increase their respective lengths by passing the pad in which this has occurred through a plating bath without any articles fastened in the holes thereof. The plating solution will enter the holes and plate on the barbs enlarging and extending their dimensions thus restoring the pads for continued usage.

While particular embodiments of the invention have been shown, it will be understood, of course, that it is not desired that the invention be limited thereto since modifications may be made, and it is, therefore, contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. An article holder for electrodepositing coatings upon articles comprising, in combination:

a pad of resilient electrically insulating material having a recess for receiving a part of an article to hold the article on the pad while exterior portions thereof receive an electrically deposited coating,

a woven wire screen embedded in said pad and lying in a plane between the opposite surfaces thereof which intersects said recess, said wire screen having severed filaments thereof exposed in said recess for making electrical contact with the part of the article received in the recess, and

means externally of the pad for electrically connecting the embedded screen to a source of electrical energy.

2. An article holder for electrodepositing coatings upon articles comprising, in combination:

a sheet of resilient electrically insulating material having a plurality of recesses each shaped to receive and closely embrace a part of an article and retain the same on the sheets while other parts of the article are subjected to an electrodeposition action,

a plurality of woven wire screens of relatively fine mesh embedded in said sheet between the opposite surfaces thereof and lying in parallel spaced apart planes which intersect said recesses, said wire screen being cut away at the points of intersection with said recesses with the result that severed wires thereof are exposed in the recesses for making electrical contact with the parts of the articles received in the recesses, and

means for electrically connecting the wire screens to a source of electrical energy.

3. An article holder for electrodepositing coatings on articles comprising, in combination:

a relatively thick pad of resiliently compressible electrically insulating material having parallelly extending opposite surfaces,

a plurality of relatively thin woven wire screens of relatively fine mesh embedded within said pad between the opposite surfaces thereof and lying in parallel planes spaced apart from one another and from the opposite surfaces of the pad,

5

said pad having a plurality of holes drilled or otherwise formed therein for receiving the inserted parts of articles to be held by the pad while subjected to the electrodeposit of coatings thereon, said holes each opening out onto a surface of said pad and extending toward the opposite surface thereof through the planes of all of the embedded wire screens and exposing severed wires of the screens therein to provide electrical contact with the inserted parts of the articles held by the pad, and means externally of the sheet for electrically connecting the wire screens to a source of electrical energy.

4. The article holder defined in claim 3 wherein marginal portions of the wire screens project beyond an edge of the pad and are coupled to a common electrical con-

6

ductor for connection to an external source of electrical energy.

References Cited

UNITED STATES PATENTS

5	148,409	3/1874	Bush	204—297
	2,011,328	8/1935	Tuttle	204—297
	2,723,230	11/1955	Godsey	204—286

FOREIGN PATENTS

10	517,869	2/1931	Germany	204—297
----	---------	--------	---------	---------

TA-HSUNG TUNG, Primary Examiner

U.S. Cl. X.R.

15 204—286