United States Patent [19]

Garrison

[11] **3,734,337**

[45] **May 22, 1973**

[54] SPIN CENTRIFUGE BASKETS

[75] Inventor: **William H. Garrison,** Richmond, Va.

[73] Assignee: **American Spin-A-Batch Company,** Richmond, Va.

[22] Filed: **Oct. 13, 1971**

[21] Appl. No.: **188,738**

Related U.S. Application Data

[60] Continuation-in-part of Ser. No. 183,539, Sept. 24, 1971, Pat. No. 3,699.918, which is a division of Ser. No. 771, Jan. 5, 1970, abandoned.

[52] **U.S. Cl.** **220/22,** 118/52, 118/429, 220/19, 220/23.4

[51] **Int. Cl.** **B65d 25/06**

[58] **Field of Search**.....118/423, 425, 429, 118/52–57; 233/26; 220/19, 22, 16, 17, 23.4; 210/381; 95/89 R, 89 L, 89 D, 200, 93, 96–98; 294/27, 28, 30, 68, 73; 134/157, 158; 117/101

[56] **References Cited**

UNITED STATES PATENTS

792,755	6/1905	Cautley	210/381
1,124,196	1/1915	Baynton	95/93
1,227,608	5/1917	Godfrey	206/DIG. 23
1,612,585	12/1926	Jackson	118/52 X
1,629,285	5/1927	Mabee	95/100
1,796,820	3/1931	Adams	118/54
2,541,261	2/1951	Martinson	294/68
2,548,515	4/1951	Broadbent	210/381 X
2,867,106	1/1959	Stone, Jr. et al.	34/58 X
3,119,505	1/1964	Petersen et al.	294/68 X
3,417,687	12/1968	Hills	95/93

FOREIGN PATENTS OR APPLICATIONS

987,940	4/1951	France	210/381

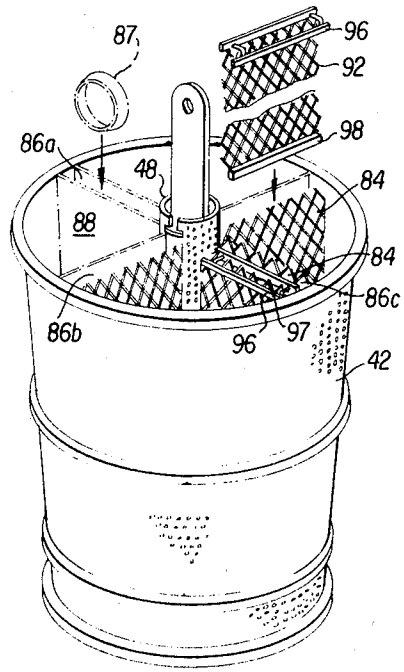
Primary Examiner—Morris Kaplan

Attorney—B. Franklin Griffin, Jr., Alan E. J. Branigan, Gary S. Kindness et al.

[57] **ABSTRACT**

A perforate spin basket is compartmented by perforate walls extending radially from the axial center thereof. Compartment volume is modified by a plate member disposed within a selected compartment and attached to one of said walls. Means are provided for lifting tilting and inverting the basket.

21 Claims, 11 Drawing Figures



Patented May 22, 1973 3,734,337

2 Sheets-Sheet 1

FIG. 1

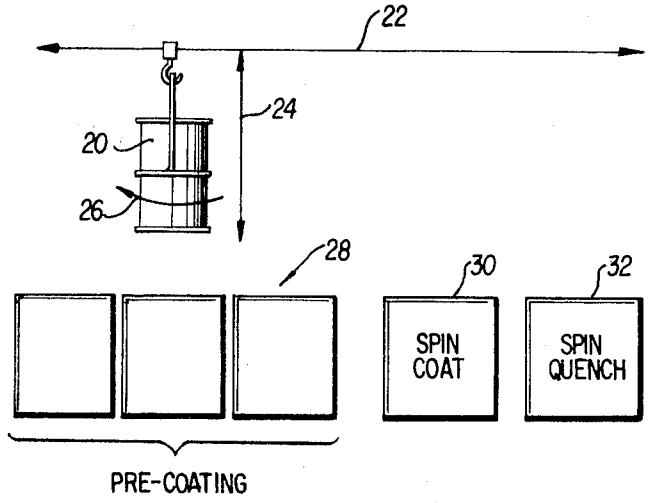


FIG. 2

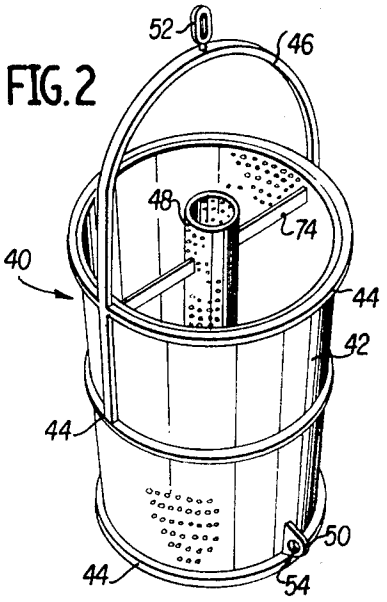


FIG. 3

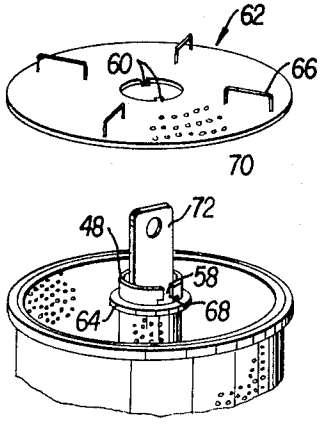
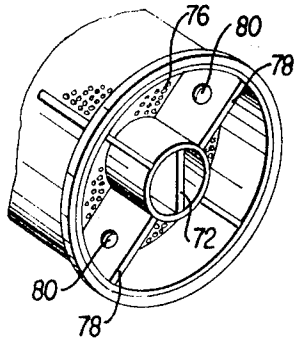


FIG. 4



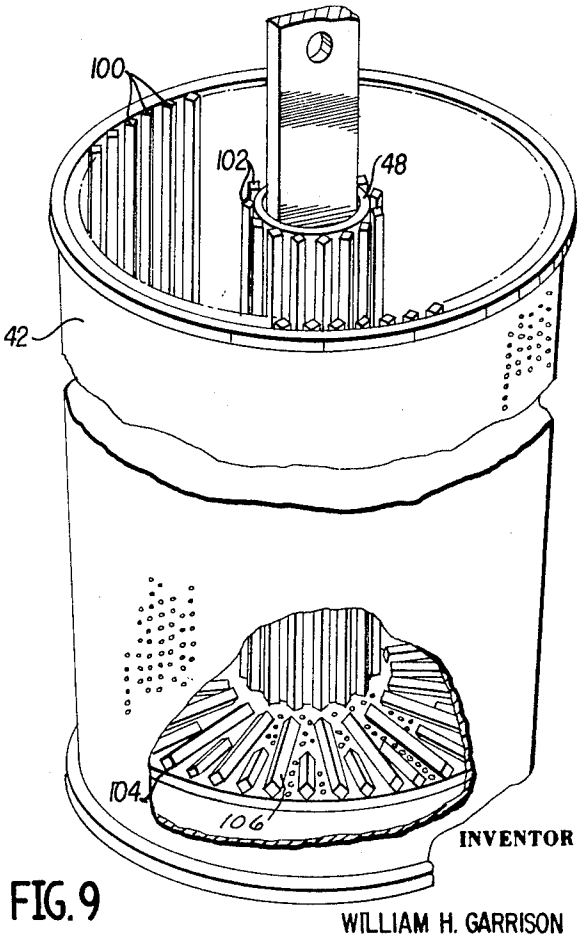


FIG. 9

INVENTOR
WILLIAM H. GARRISON

BY Griffin, Branigan & Kindness
ATTORNEYS

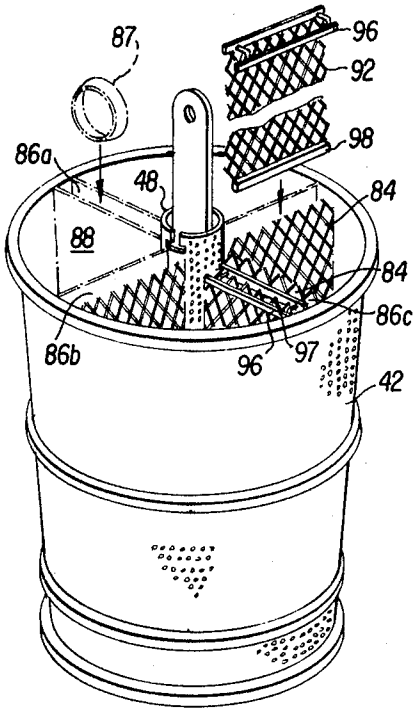


FIG. 5

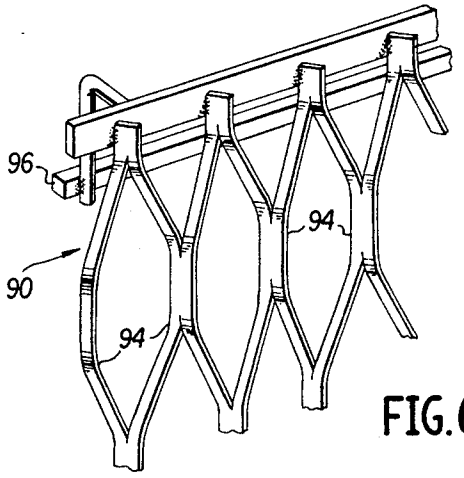


FIG. 6

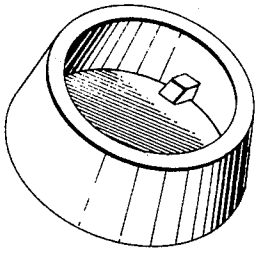


FIG. 7

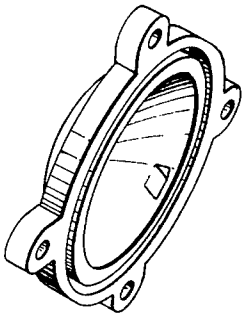


FIG. 8

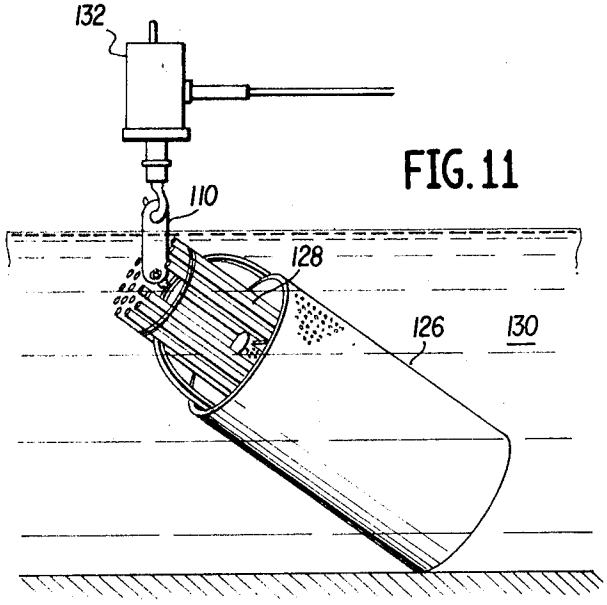


FIG. 11

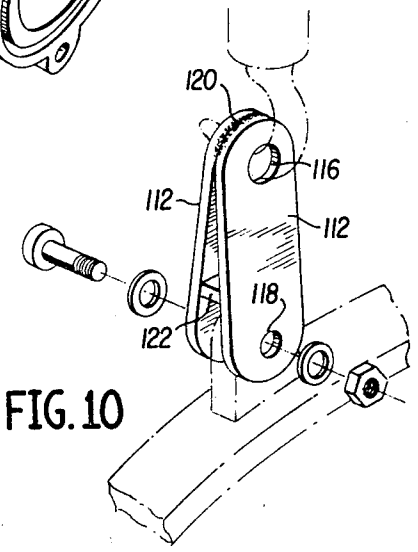


FIG. 10

SPIN CENTRIFUGE BASKETS

BACKGROUND OF THE INVENTION

This is a continuation-in-part of commonly assigned U.S. application Ser. No. 183,539, filed on Sept. 24, 1971 now U.S. Pat. No. 3,699,918 and entitled "Galvanizing Method and Apparatus" which, in turn, is a divisional application of commonly assigned U.S. application Ser. No. 771 filed on Jan. 5, 1970, now abandoned and also entitled "Galvanizing Method and Apparatus". In this respect, in accordance with a notice in Volume 859 of the Official Gazette dated Feb. 11, 1969, the subject matter of the above-identified applications is incorporated herein by reference.

The referenced applications pertain to a method and apparatus for portably suspending articles from a linear track and, as said articles are moved along said track, providing vertical motion to said articles to dunk them in precoating, coating, and quenching solutions; while, at the same time, spinning the articles as desired. In this regard, it is brought out in those applications that pickling, rinsing, and pre-fluxing steps are normally more rapid and more adequate when the articles to be coated are spun than when they are not. Further, it is pointed out that spinning in the zinc bath aids in cleaning flux from the coated articles; and moving the spinning basket directly from the zinc bath to a position over the quench tank dramatically improves the quality of the finished product because the articles are quenched before they have had time to "freeze." In this manner, the coated articles do not stick together; have a brighter more uniform coating; and are substantially spurless.

Articles to be galvanized are usually left in the zinc bath until they are "cooked out." That is, until they have stopped bubbling. It has been found, however, that articles located in the outer portions of the basket cook out sooner than the articles located in the basket's interior. Hence, in order that all parts become adequately coated, the parts in the basket's outer portion become to heavily coated or "overcooked." Hence, it is an object of this invention to provide a basket structure which permits the coated parts to be more uniformly "cooked out" to result in more uniformly coated parts.

When relatively small parts are spin galvanized they tend to float. Hence, when the basket is lowered into the zinc bath the parts tend to float out of the top of the basket. Consequently, it is another object of this invention to provide a means for cooperating with the basket to prevent the parts from floating out of the basket and into the tank.

Prior to the advent of the PSC method of galvanizing, it was extremely difficult to galvanize parts having recesses or cupped shapes. This was because the zinc tended to become trapped in the recesses and could not be satisfactorily removed. Moreover, even with the PSC method of galvanizing there has been an unusually high rejection rate connected with the galvanizing of such parts. Consequently, it is another object of this invention to provide a basket structure which can accommodate various sizes of recessed or cupped-shaped articles so that they can be galvanized without any appreciable reject rate.

Still another object of this invention is to provide a basket for spin galvanizing long lengths of chain by the PSC method.

Prior to the development of the PSC method it was also quite difficult to adequately and cleanly galvanize long articles such as anchor bolts or rods. Moreover, since most zinc-bath tanks are less than about 5 feet deep, even the baskets about to be described are not satisfactory for spin coating articles over about four feet in length. Consequently, it is another object of this invention to provide a structure for adapting the baskets so that presently existing zinc tanks can be used to spin galvanize articles that are longer than the depth of a given tank.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention as illustrated in the accompanying drawings, wherein reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale. Instead, they are merely presented so as to illustrate the principles of the invention in a clear manner.

FIG. **1** is a schematic representation of apparatus for practicing a PSC method of galvanizing;

FIG. **2** is a pictorial view of a basket embodying principles of the invention;

FIG. **3** is an exploded pictorial view of a portion of a basket of the invention including a float-prevention lid;

FIG. **4** is a partial pictorial view of the bottom of a basket embodying the invention;

FIG. **5** is a pictorial view of an alternative embodiment of the basket of the invention. This embodiment is particularly adapted for spin galvanizing oddly shaped articles such as those having recesses therein;

FIG. **6** is an enlarged fragmentary view of a space adapter used with the FIG. **5** basket for adapting it to accommodate thinner parts.

FIG. **7** is a pictorial view of a cup-shaped article representing the type of article for which the FIG. **5** basket is particularly well suited;

FIG. **8** is a pictorial representation of an article to be galvanized in a FIG. **5** type basket when a FIG. **6** type space adapter is installed;

FIG. **9** is a partially broken-away pictorial view of another embodiment which is particularly adapted for spin-galvanizing long lengths of chain;

FIG. **10** is a pictorial view of clevis for adapting a spin galvanizing basket for use in connection with the galvanizing of articles which are longer than the depth of a given molten-zinc tank; and

FIG. **11** is a schematic illustration of the operation of the FIG. **10** clevis.

DETAILED DESCRIPTION

FIG. **1** illustrates the PSC process in which the apparatus of this invention is employed. Therein, a perforate basket **20** is adapted for horizontal movement as illustrated by arrows **22**; vertical motion as illustrated by arrows **24**; and spinning motion as illustrated by arrow **26.** Normally, the perforate basket and the parts to be coated are first dunked into one or more precoating tanks **28.** The articles are next dunked in a zinc coating tank **30** and then moved along the workpath directly from above the zinc bath to a position above the quench tank **32** into which the basket and articles are dunked while the basket is spinning at a high rate of

speed. In this manner, the zinc is not permitted to freeze prior to quenching so that the articles are uniformly brightly coated and do not have spurs which are so characteristic of articles that are galvanized by more conventional basket methods.

The basket 40 in FIG. 2 comprises a perforate outer wall 42 re-enforced by square steel rings 44 and having a bale 46 extending semi-circularly across the top thereof and down the sides as illustrated. A hollow central column 48 is also perforated and extends from above the level of upper square ring 44 and through a perforated bottom member (not shown in FIG. 2) so that molten zinc from the bath can flow through the interior of the column 48, out of its perforations, and into the basket itself.

The basket 40 also includes pads 50 on either side of the lower portion of the basket; and a suspension ring 52 affixed to the top of the bale 46. The suspension ring 52 is used to attach the basket to a suitable spinning mechanism such as a pneumatic centrifuge described in the parent applications; and the pads 50 have holes 54 therein for engagement by a dumping mechanism for inverting the basket and dumping out coated articles upon completion of the PSC process.

The perforations in the hollow center column 48 are quite significant because it is by virtue of these perforations that a more uniform cook-out is obtained. That is, the bath's zinc enters the basket not only through the perforations in the outer shell 42, but also through the perforations in the tubular column 48. Consequently, the parts in the interior portions of the basket begin to "cook" sooner than if the center column is non-perforate. In this manner, the over-all cook-out time is less; the parts on the basket's interior are more throughly coated; the parts on the basket's exterior are not excessively coated; and the over-all products are far more uniformly coated than in previously disclosed hot dip spin baskets.

FIG. 3 illustrates a modification of the FIG. 2 basket wherein the center column 48 includes a keyway 58 at its upper portion for accommodating keys 60 on a float prevention lid 62. In this respect, when the keys 60 engage the keyways 58 the lid 62 is permitted to slide over the central column 48 until the lid rests upon a collar 64 on the column 48. The lid is then rotated by handles 66 so that the keys 60 engage recesses 68 in the tubular column 48 and lock the lid in place. In this manner the articles to be galvanized are not permitted to float out of the top of the basket while molten zinc is nevertheless permitted to enter by means of perforations 70 in the floatation prevention lid.

FIG. 3 also illustrates an alternative lifting bale comprised of a flat bar 72 which extends throughout the length of the central column 48 as illustrated in FIG. 4. This bale embodiment permits the floatation lid 62 to be more easily installed than if the semi-circular bale 46 is employed; and also permits the flotation lid 62 to re-enforce the upper portion of the basket so as to eliminate the need for upper basket braces such as 74 in FIG. 2.

Although not illustrated in FIG. 2, the perforated bottom of the basket therein is level with the lower square ring 44. In other words, it is flush with the bottom of the basket. In the FIG. 4 embodiment, however, the perforated bottom 76 is recessed and rests upon braces 78 which extend between the sides of the basket and the center column 48. In this manner, the contents of the basket can be dumped by means of holes 80 in the braces 78 so as to eliminate the pads 50 of the FIG. 2 embodiment.

FIGS. 7 and 8 (sheet two) illustrate oddly-shaped recessed or cupped structures of a type which heretofor have been extremely difficult to satisfactorily galvanize. This is because the zinc tends to accumulate in the recesses or cups; and even when such articles have been individually hand dipped, the results have not been satisfactory because they have been handled by tongs or the like which mar the coated article's surface. In this respect, FIG. 7 represents a cup-shaped article which might be 2 ½ inches thick, for example; and FIG. 8 represents an article which is concave on one side and convex on the other with channels for O-rings or gaskets which must be kept free of excessive zinc. This article is also represented as being somewhat thinner than that of FIG. 7 such as about one half as thick.

The basket of FIG. 5 is particularly adapted for galvanizing structures such as that illustrated in FIG. 7. In this respect, a plurality of expanded metal gratings 84 extend from the perforated center column 48 to the perforated outer wall 42; and from the top to the bottom of the basket to form a plurality of channels or compartments 86. This structure permits articles such as those of FIG. 7 to be inserted in the compartments 86 as illustrated 87 so that the zinc will spin out of the cup-shaped portions without hinderance after the basket is removed from the zinc bath.

In some instances it may be desirable to place baffles in the wedge shaped portions such as 88 between the compartments 86*a* and 86*b* to prevent zinc (spelter) which is spun out of the cups in one of the compartments such as 86*a* from splattering onto the rear surfaces of cups located in the following compartment such as 86*b*.

The expanded metal separators can be tack welded to the center column 48 and outer shell 42; or suitable brackets can be installed on the column 48 and the inside of outer shell 42 so that the separators 84 can be removably and adjustably affixed in the basket. Also, as is apparent from the drawing, more separators can be installed if desired. It is only for convenience that four compartments have been illustrated. In this respect, the center column can be made larger to accommodate more separators and provide more compartments.

FIG. 6 is an enlarged fragmentary view of a piece of expanded metal grating 90 that is used for the separators 84 and a space adapter 92 (FIG. 5) to be described shortly. It should be noted that the expanded metal grating has a raised pattern resulting in relatively thin raised portions or ridges 94. It is these ridges which contact the articles to be coated so that they make line contact and neither stick to the grating material nor mar the uniformity or appearance of the coated surface when the PSC method is used. In short, the ridged separating material provides minimal contact area between it and the coated articles so as to result in a more uniformly coated product.

The space adapter 92 (FIG. 5) has a retaining handle 96 across its upper end and a spacer bar 98 across its lower end. When it is desired to galvanize thinner oddly shaped articles such as the recessed lid illustrated in FIG. 8, the space adapter is inserted in selected compartments 86 so that the handle 96 hangs over the adjacent separator such as 97 in FIG. 5. In this manner, the spacer bar 98 and the handle 96 locate the space

adapter in compartment **86c** between adjacent separators **97** and **84** so that the thickness of the thusly modified compartment is selectively adapted to accommodate the thinner article.

The FIG. **9** embodiment of the invention (sheet one) is particularly adapted for galvanizing long lengths of chain. In this respect, the inside of the outer shell is lined with ribs or raised portions **100.** The illustrated ribs have a substantially square cross-section and are tack welded to the outer shell along one edge so that an opposite edge faces inwardly toward the perforated center column **48.** Similar ribs **102** are tack welded to the outside of the center column so that they too have edges facing the chain or other articles to be placed into the basket for coating. In this manner, the articles, such as long lengths of chain, only come into line contact with a minimal surface area so as to prevent both sticking and non-uniform coating.

The recess perforated bottom **104** also has bars or ribs **106** tack welded to its inside surface so as to present only line contact with the articles such as chain to be inserted into the basket. It should also be noted that the bars **100, 102,** and **106,** are preferrably spaced apart by a distance less than the smallest effective dimension of the articles to be coated. In this respect, a suitable dimension for most types of chain is about one inch between centers where ⅝ inch square bars are located in a diamond configuration such as that illustrated in FIG. **9.**

In operation, the chain to be coated is merely coiled round and round the ribbed center column **48** until the basket is substantially filled. The basket and chain are then spin galvanized in accordance with the PSC method; and after quenching dumped out of the basket by means of either dumping pads such as **50** in FIG. **9;** dumping holes **80** as in FIG. **4;** or a similarly suitable means.

Relatively large items such as rods and anchor bolts over eighteen inches or so are not normally satisfactorily galvanizable by conventional basket methods. Hence, most molten zinc galvanizing kettles are not over about 5 feet deep; whereupon, even though a PSC method is employed, previously disclosed spin centrifuge baskets have not been satisfactory for galvanizing articles which are longer than the depth of a given tank. The FIG. **10** clevis (sheet two) solves this problem. In this respect, the clevis **110** is comprised of two arms **112** and **114** having holes **116** and **118** at either end. The arms are tack welded together as at **120,** but otherwise spaced apart by a spacer member **122** so that the lower end thereof in FIG. **10** is adapted to slide over a suspension ring such as **52** in FIG. **2** or the hole **80** in the flat bale **72** in FIG. **3.** In this manner the clevis is adapted to be pivotally bolted to the basket's suspension bale as illustrated in FIG. **10.**

As shown in FIG. **11,** a thusly clevis-suspended basket such as **126** is adapted to be tilted at an angle as illustrated so that threaded rods **128** can be lowered beneath the surface of the zinc bath **130.** While thusly covered with zinc a tractor or the like (not shown) can pull the spinning mechanism **132** to-and-fro along a pathway such as a track (not shown) to, in effect, shake the basket **126** and rods **128.** The spin mechanism is then raised and the basket and rods spun in the normal PSC manner.

It will be appreciated by those skilled in the art that the above described structure provides apparatus for improving the coating uniformity obtained on PSC galvanized articles. This is accomplished by decreasing their "cook-out" time and, in particular, reducing the differences in coating thickness between previously thinly coated articles at a basket's interior and excessively coated articles located at the exterior portions of a basket. Moreover, it will be appreciated that this improvement becomes still more meaningful where larger sized batches of articles are galvanized because the cook out time is longer and the differences become more pronounced.

It will also be appreciated that the variously described modifications of the above described structure provide baskets that are suitable for galvanizing small parts without "float-losses" suitable for galvanizing previously difficult-to-galvanize parts having recesses therein; and suitable for galvanizing long lengths of chain which have also been difficult to basket galvanize.

In addition, the foregoing disclosure provides various novel structures for dumping or inverting spin-galvanizing baskets. The disclosed structure also solves the problems of galvanizing articles which are longer than the depth of a given tank; and provides structure for adapting a single basket for galvanizing oddly-shaped articles to accommodate such articles of varying thickness.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention. For example, the location of the line-contact ribs in the FIG. **9** embodiment can be made adjustable by affixing them to the basket's outer shell **42,** for example, by means of adjustable brackets. Similarly, although a diamond shaped expanded metal grating has been illustrated, it will be appreciated that other line-contact or point-contact types of gratings can also be used and still fall within the spirit of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A perforate basket of the type used with a spin-galvanizing apparatus for galvanizing articles by a process of moving said articles along a workpath and immersing said articles in liquid-containing tanks and selectively spinning said articles, said perforate basket comprising:

a perforate side wall;

a plurality of separating grates extending outwardly from a center axis to said perforate side wall to form compartments within said basket for holding articles to be coated; and,

a space adapter for location in one of said compartments, said space adapter being adapted to be selectively attached to one of said grates for adapting the width of one of said compartments to accommodate articles that are thinner than those corresponding to the width of said one compartment without said space adapter.

2. The perforate basket of claim **1** wherein said separating grates have raised portions on the outer surfaces thereof so that said grates make line or point contact with the articles to be coated.

3. The perforate basket of claim **2** wherein said separating grates are comprised of expanded metal.

4. The perforate basket of claim 1 wherein said space adapter has raised portions on the outer surfaces thereof for making line or point contact with the articles to be coated.

5. The perforate basket of claim 4 wherein said space adapter is comprised of expanded metal.

6. The perforate basket of claim 1 wherein said space adapter includes means at one end thereof for engaging the upper end of said one of said separating grates; and

spacing means at its lower end for spacing said space adapter from the adjacent separating grate.

7. The perforate basket of claim 1 wherein there is a hollow, centrally-located perforate column inside said basket.

8. The perforate basket of claim 8 including pads at the lower outside portion of said perforate side wall said pads adapted for engagement by means for inverting said basket.

9. The perforate basket of claim 4 including a perforate bottom on said basket; and

means located beneath said perforate bottom adapted for engagement with means for inverting said basket.

10. The perforate basket of claim 7 including perforate means for covering the top opening in said basket between said perforate side wall and the perforate center column.

11. The perforate basket of claim 7 including raised portions on the inner surface of said perforate side wall for making line or point contact with articles to be coated.

12. The perforate basket of claim 11 including such raised portions located on the outer surface of the center column.

13. The perforate basket of claim 11 wherein said basket includes a perforate bottom member and including such raised portions radially affixed to the inner surface of said perforate bottom member.

14. The perforate basket of claim 1 including raised portions on the inner surface of said perforate side wall for making line or point contact with articles to be coated.

15. The perforate basket of claim 1 including a bale; and

connecting means on said bale for connecting said bale and thereby said basket to a means for spinning said basket.

16. The perforate basket of claim 15 wherein said bale extends above said basket and is affixed to the sides thereof.

17. The perforate basket of claim 15 wherein said bale is affixed inside of said central column and extends upwardly out of the top thereof.

18. The perforate basket of claim 15 wherein said connecting means includes pivotable means to adapt said basket for angular motion to selectively place said basket and the articles therein to be coated at an angle with the vertical when said basket is immersed in a zinc bath.

19. The perforate basket of claim 18 wherein said connecting means is a clevis.

20. The perforate basket of claim 19 wherein said clevis is comprised of first and second vertical members affixed to each other at their upper ends and spaced apart at their lower ends so that said members are angularly disposed with respect to each other; and,

means for affixing the lower ends of said members to said bale.

21. The perforate basket of claim 1 including at least two separate compartments and a baffle located in said basket between said compartments for preventing spelter from articles in one of said compartments from striking articles in the other of said compartments.

* * * * *