

Feb. 27, 1945.

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2,370,463

ANODIZING METHOD

Filed June 19, 1943

Fig. 1.

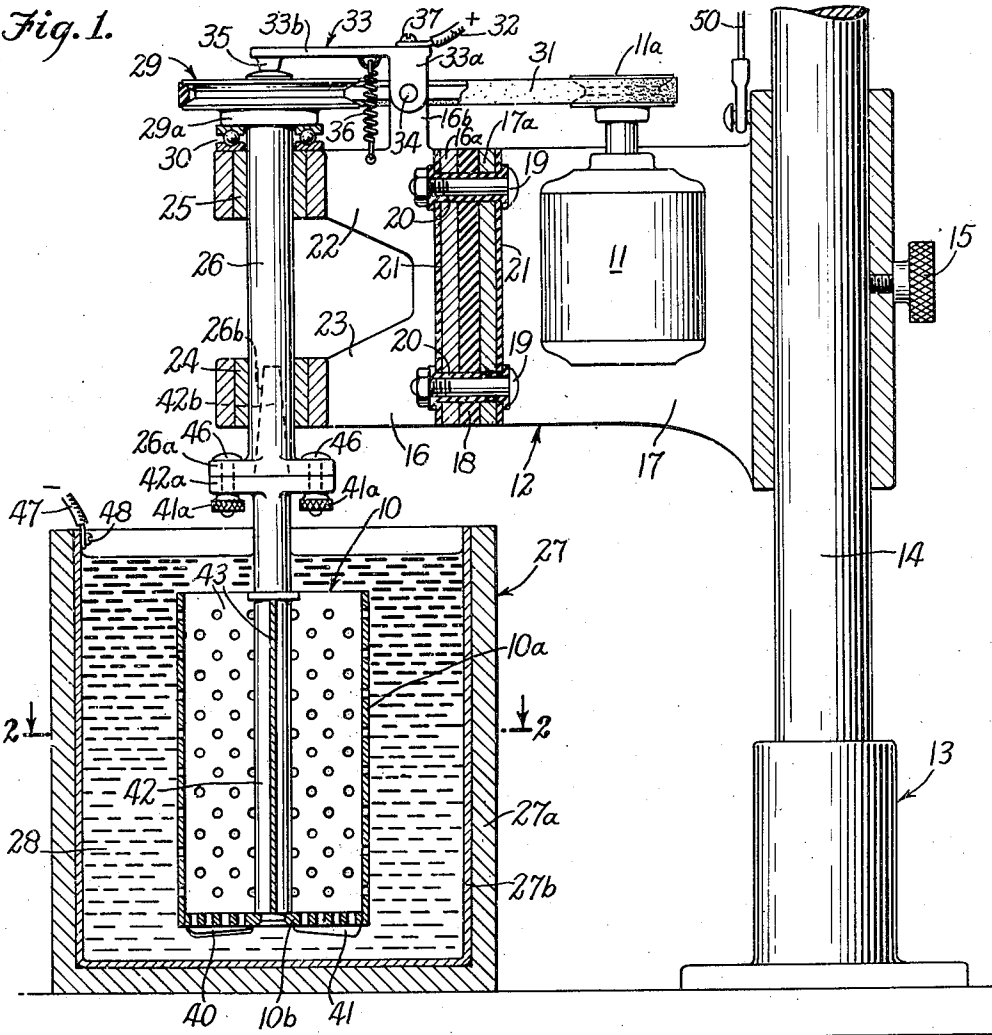
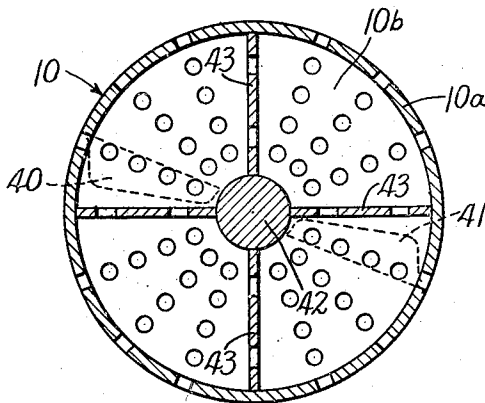


Fig. 2.



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2,370,463

ANODIZING METHOD

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Application June 19, 1943, Serial No. 491,432

3 Claims. (Cl. 204—58)

This invention relates to a method of anodizing and to apparatus for use in connection therewith.

One of the objects of this invention is to provide new and improved apparatus for anodizing. Another object is to provide apparatus of the above character which will be simple, practical, and thoroughly durable. Another object is to provide apparatus of the above character, the operation of which will result in substantial saving of labor. Another object is to provide apparatus of the above character which will be sturdy and will be able to withstand hard usage. A further object is to provide apparatus of the above character, in which a maximum of articles may be anodized in a minimum of time. Still another object is to provide a new and improved method of anodizing. A still further object is to provide an efficient and practical anodizing method. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing in which is shown one of the various possible embodiments of this invention,

Figure 1 is a side elevation of the anodizing apparatus, certain parts thereof being in section; and,

Figure 2 is a horizontal section taken on the line 2—2 of Figure 1.

Similar reference characters refer to similar parts throughout the several views of the drawing.

As conducive to a clearer understanding of certain features of this invention, it might here be pointed out that considerable difficulty has been experienced with present methods of anodization and apparatus used in connection therewith. One of the principal methods now in use is to connect each article being anodized to the source of current by a conductor. This practice is inefficient because of the labor and time required to properly connect articles to conductors. Other methods of forming the necessary electrical connection with the articles to be anodized, such as packing the articles under compression in an anodizing chamber, have not solved this problem because proper electrical con-

tact is not always achieved between a large number of articles and the source of current. If proper electrical contact is not achieved, the articles must be sorted after anodization, which again is inefficient. It is accordingly another object of this invention to overcome the above-mentioned difficulties.

Referring first to Figure 1, the anodizing apparatus includes a container or basket capable of conducting an electrical current, generally indicated at 10. This container is preferably made of aluminum and holds the articles being anodized during anodization. This container is rotated through means to be described hereinafter by a motor, generally indicated at 11, and is connected to the positive side of a source of current. The articles within the container 10 are held by centrifugal force against the side wall of the container 10 and against each other, thus assuring a good electrical connection between each article and the positive source of current.

Specifically, container 10 and motor 11 are mounted on a bracket, generally indicated at 12, which is vertically movable on a support, generally indicated at 13. Bracket 12 is mounted on a column 14 for vertical movement with respect thereto and may be held in a set position with respect thereto by a set screw 15. Bracket 12 includes left and righthand sections 16 and 17 which are insulated from each other. Preferably, these sections have flanges 16a and 17a formed thereon which are separated by electrical insulation material 18. Bolts 19 extend through flanges 16a and 17a and insulation material 18 to hold sections 16 and 17 in assembled relationship. Bolts 19 are insulated from flanges 16a and 17a by insulating sleeves 20 and by sheets of insulating material 21. Thus, sections 16 and 17 when in assembled relationship are electrically insulated from each other.

Section 16 has a pair of arms 22 and 23 having bearings 24 and 25 mounted in the ends thereof. A metal shaft 26, which is vertically positioned with respect to the electrolyte tank 27, is mounted for rotational movement in bearings 24 and 25. This shaft has a pulley, generally indicated at 29, connected to its upper end in any suitable manner, such as by brazing. This pulley is driven by motor 11 through motor pulley 11a and belt 31. A thrust bearing 30 is positioned between the hub 29a of pulley 29 and the upper surface of arm 22 to permit free rotation of container 10 by motor 11.

Electrical contact is established between positive conductor 32 and shaft 26 through a metal

contactor, generally indicated at 33. This contactor includes an arm 33a pivotally connected by pin 34 to a portion 16b of bracket 12. Another arm 33b of contactor 33 extends inwardly over pulley 29 and has a carbon brush contact member 35 extending downwardly from its left-hand end, as viewed in Figure 1. A spring 36 connected to the under side of arm 33 and to bracket 12 resiliently urges the brush contact member into contact with the upper end of shaft 26. Thus the contactor establishes an electrical connection between shaft 26 and conductor 32.

Anodizing container 10 includes a cylindrically shaped side wall 10a (Figure 2) and a bottom 10b (Figures 1 and 2). A metal shaft 42 extends through the center of the anodizing container and is connected to the bottom 10b in any suitable manner. A plurality of perforated radial metal partitions 43 (Figures 1 and 2) are connected to shaft 42 and side wall 10a. These partitions, in addition to strengthening the anodizing container serve to divide the anodizing container into a series of compartments of similar size. These partitions aid the operator in evenly loading the anodizing container and thus minimize the out-of-balance strain upon bearings 24 and 25 during operation of the apparatus.

The bottom 10b, side wall 10a, and partitions 43 are perforated. The perforations in the side wall 10a permit the electrolyte in the container to be thrown outwardly during rotation of container 10 and the perforations in the bottom of the container and its open top permit the electrolyte to enter the container. The perforations in the partitions permit the electrolyte to circulate around shaft 42 within the container, and the number, position, and size of these perforations, in addition to the number, position, and size of the perforations in the side wall of the container, may be used to control the degree of circulation through the container. Furthermore, it should be noted that the number and size of the perforations are varied to suit the size of the articles being anodized and that the number and size of the perforations shown in the drawing are diagrammatic. Thus, excellent circulation of the electrolyte through the anodizing container during anodization is assured.

To supplement circulation of the electrolyte through the container described hereinabove, a pair of fins 40 and 41 may be mounted on the bottom 10b and extend therebelow. When the anodizing container is rotated, these fins force the electrolyte up through the perforations in the bottom of the anodizing container. Thus, the perforations in the side wall 10a, the open top of the container, the perforations in the bottom 10b, and the fins 40 and 41 cause circulation of the electrolyte through the container in the direction of the arrows in Figure 1 during anodization.

The upper end of shaft 42 has a flange 42a thereon and a frusto-cone 42b extending thereabove. The lower end of shaft 26 has a flange 26a formed thereon and a hole 26b complementary to the shape of frusto-cone 42b extending upwardly therein. When frusto-cone 42b is seated in hole 26b, the axes of shafts 26 and 42 are aligned and flanges 26a and 42a abut against each other. Bolts 46, which extend through flanges 26a and 42a hold shafts 26 and 42 in assembled relationship. These bolts are provided with knurled nuts 46a, thus permitting shaft 42 and accordingly the anodizing container to be

easily disconnected from shaft 26. Furthermore, the connection of shafts 42 and 26 completes the electrical connection between container 10 and conductor 32, the current during operation of the apparatus passing through shaft 26, shaft 42, and radial partitions 43 into container side wall 10a.

The tank 27 holding electrolyte 28 preferably consists of a shell 27a made of an insulating material having a steel lining 27b. Lining 27b is connected to electrical conductor 47 in any suitable manner such as by screw 48. To aid in moving bracket 12 and its associated parts upwardly and downwardly with respect to column 14 and thus move the container 10 out of the electrolyte in tank 27, a counterweight (not shown) is provided. This counterweight is connected by a cable 50 (Figure 1) to bracket 12, and when it is desired to remove the container 10 from tank 27, set screw 15 is loosened and bracket 12 and its associated part may be easily moved upwardly on column 14.

In operation, tank 27 is filled with an electrolyte suitable for anodizing, such as chromic acid. Next container 10 is loaded with the articles to be anodized, connected to shaft 26 by nuts 46, and then the bracket 12 is lowered so that the top of container 10 is positioned a substantial distance below the level of the electrolyte in tank 27. This insures contact of the electrolyte with all of the articles being anodized when container 10 is being rotated during the anodizing process. Next the switch for motor 11 is thrown and container 10 is rotated at a speed of approximately 600 R. P. M. It should be noted here that the rate of rotation of container 10 may be varied and that the rate depends on both the size of the articles being anodized and the diameter of the container. The rate of rotation should be sufficient to cause centrifugal force to throw the articles outwardly from shaft 42 against wall 10a with sufficient force to establish good electrical contact between the articles and the wall 10a of the container and between the articles themselves.

After the container 10 has reached this speed, the switch controlling the passing of current through the electrolyte is thrown. By waiting until good electrical contact is established between the container and the articles before throwing the switch, damage to the articles through arcing at partially established contact points is prevented. When the switch is thrown, current from conductor 32 passes through shaft 26 and shaft 42 into the partitions 43 and wall 10a of the anodizing container 10, the circuit to conductor 47 being completed through the electrolyte and the steel lining 27b of tank 27. From the wall and partitions, the current passes into the articles in contact with the side wall and partitions of the container and thence into the remainder of the articles in the container. Thus, centrifugal force insures a good contact between the positive source of current and all of the articles being anodized in the container 10. Furthermore, during rotation of container 10, excellent circulation of the electrolyte through the container is maintained as described hereinabove.

The container is rotated for a sufficient time to form an anodic film on the articles being anodized. The centrifugal force normally holds the articles locked or immobilized in set positions throughout the period during which the container is rotated. This prevents damage to the articles and also prevents damage to the anodic film being formed on them. However, if an article

should shift its position during anodization, the pressure of the centrifugal force is sufficient to break through the electrical resistance of the anodic film already formed on the article and form a new electrical contact between the container and the article so that anodization of the article is completed.

After the anodic film has been formed, the current passing through the electrolyte and the current to the motor are shut off in succession. Then container 10 is raised, removed from bracket 12, and the articles given a cold water rinse followed by a hot water seal. After this, the work is air-dried and dumped from the container 10. The anodizing container 10 is then stripped of the anodic film formed thereon during anodization to assure a good contact between the new load to be placed therein and the container. The anodic film may be stripped by placing the container in a caustic bath.

It will thus be seen that practical and efficient apparatus for anodizing a plurality of articles at one time has been disclosed. The use of this apparatus results in substantial saving of labor and time and also results in the formation of a good anodic film on the articles being anodized. Furthermore, a practical and efficient method of anodization has been disclosed.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth, or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a process for anodizing a multiplicity of

aluminum articles, the steps of loading a cylindrical metal container with the articles to be anodized, connecting the container to the anode of an anodic treatment bath, and rotating said container in the anodic bath with sufficient speed to utilize centrifugal force solely to cause the articles to establish firm electrical contacts with the side wall of said container and with each other and to hold said articles in set positions during the period of anodic treatment.

2. In a process for anodizing a multiplicity of aluminum articles, the steps of loading a cylindrically shaped perforated metal container with the articles to be anodized, connecting the container to the anode of an anodic treatment bath, rotating said container in said anodic bath with sufficient speed to utilize centrifugal force solely to establish firm electrical contacts with the side wall of said container and with each other and to hold said articles in set positions during the period of anodic treatment, and then energizing the circuit through said anodic bath.

3. In a process for anodizing a multiplicity of aluminum articles, the steps of loading a perforated cylindrical metal container with the articles to be anodized, connecting the perforated metal container to the anode of an anodic treatment bath, rotating said container in the anodic bath with sufficient speed to utilize centrifugal force to cause the articles to establish firm electrical contacts with the side wall of said container and with each other and to hold said articles immobilized in set positions during the period of anodic treatment, and circulating the anodic bath through the container and between said articles during anodization.

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