Aug. 13, 1935. J. N. TUTTLE 2,011,328

COATING METHOD AND APPARATUS

Filed Jan. 25, 1934

Fig. 1.

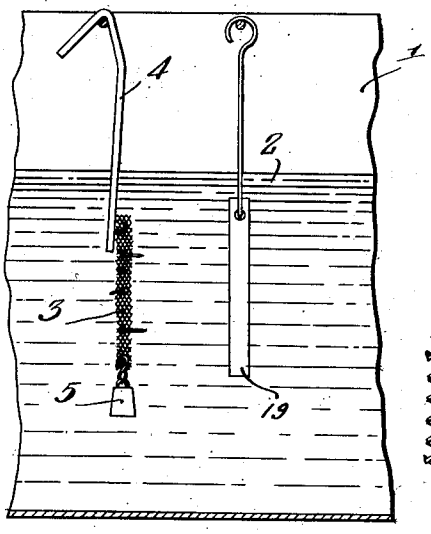


Fig. 2.

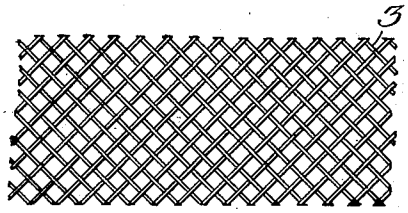


Fig. 3.

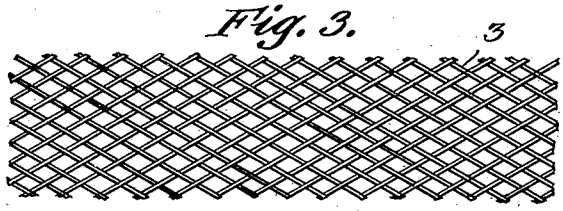


Fig. 4.

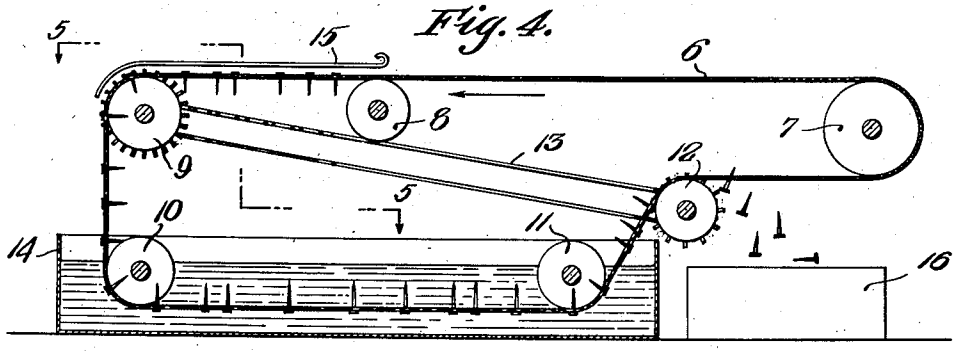


Fig. 6.

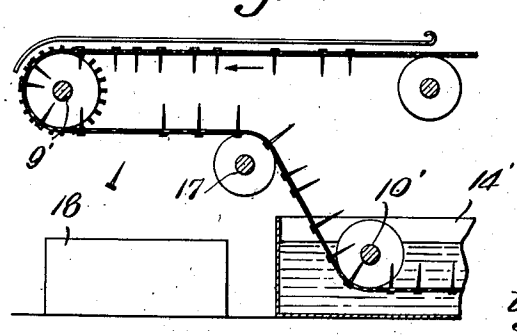
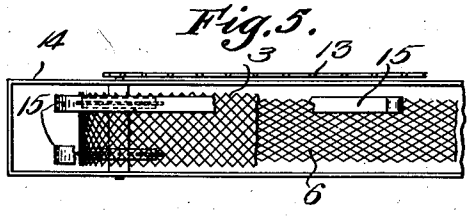


Fig. 5.



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UNITED STATES PATENT OFFICE

2,011,328

COATING METHOD AND APPARATUS

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Application January 25, 1934, Serial No. 708,213

13 Claims. (Cl. 204—5)

This invention relates to the art of coating or otherwise treating articles and especially to electrolytic coating, with metal when the articles are connected to the cathode or an oxide when the articles are connected to the anode.

Objects of the invention are to provide a facile and reliable way of clamping and unclamping the articles before and after the treating step and generally to improve the art of treating small articles.

According to this invention the articles are clamped between a series of bars interconnected for conjoint movement toward and from each other with openings therebetween which are larger than the articles where the bars are in one position in relation to each other and which contract when the bars are moved to another position in relation to each other.

In a more specific aspect of the invention the bars are interwoven in the form of wire mesh arranged to be stretched diagonally so that the wires have a lazy-tong movement in relation to each other which causes the articles to be pinched or gripped. By forming the wires of conducting material they also serve to conduct current to or from the articles; and by making the wires of flexible material articles of somewhat different sizes may be firmly gripped in openings which are adjacent to each other or at least juxtaposed.

In a still more specific aspect the wire mesh is formed as an endless belt having the wires extending diagonally, with means for feeding the belt along a predetermined path in one portion of which the belt is more or less relaxed to receive the articles and in another portion of which the belt is stretched to grip the articles.

For the purpose of illustration typical concrete embodiments are shown in the accompanying drawing, in which:

Fig. 1 is a sectional view of one embodiment;

Fig. 2 is a plan view of a section of unstretched wire mesh suitable for use in each of the embodiments;

Fig. 3 is a plan view of the wire mesh in stretched condition;

Fig. 4 is a side elevation, with parts in section, showing another embodiment of the invention;

Fig. 5 is a plan view taken on the line 5—5 of Fig. 4; and

Fig. 6 is a side elevation of another embodiment similar to that shown in Fig. 4.

The particular embodiment shown in Fig. 1 comprises a tank 1 containing a body of liquid 2, a piece of wire mesh 3, a hook 4 for supporting the wire mesh and a weight 5 for stretching the mesh. As illustrated in Figs. 2 and 3 the wires or bars of the mesh extend diagonally so that when the mesh is stretched the openings between the wires change from the substantially square shape shown in Fig. 2 to the rhomboidal shape shown in Fig. 3. Thus as the mesh is stretched the wires have a lazy-tong movement relatively to each other, thereby tending to pinch articles which have been inserted into the openings between the wires before the mesh is stretched.

The articles to be coated may be readily inserted into the openings and removed from the openings while the mesh is in relaxed condition, as shown in Fig. 2. For example, in the case of small screws, by placing the mesh in horizontal position the screws may be dumped upon the mesh and then by shaking the mesh the shanks of the screws may be caused to fall into the openings between the wires until the heads of the screws seat on the wires. After the clamp is then stretched to grip the screws the clamp may be turned to any position without danger of the screws falling out. Even though the screws may vary somewhat in diameter a relatively large screw does not prevent an adjacent screw of somewhat smaller diameter from being firmly gripped owing to the resilient nature of the wires constituting the clamp. After the articles have been coated they may be readily discharged from the clamp merely by holding the clamp in an inverted position and then relaxing the tension on the mesh until the screws fall out. In case the articles are to be coated electrolytically the support 4 may serve as a conductor for conducting the current through the clamp, articles, liquid and the other electrode 19.

In the embodiment illustrated in Figs. 4 and 5 the mesh clamp is in the form of an endless belt 6 which is fed in the direction of the arrow over the rollers 7 to 12 inclusive. As shown in Fig. 4 only the rollers 9 and 12 have teeth to mesh into the openings in the belt but of course it will be understood that other of the rollers may likewise be provided with teeth. These two rollers 9 and 12 are mechanically interconnected, as for example by means of the sprocket chain 13, so that the two rollers are constrained to rotate in synchronism at all times. In applying the belt to the rollers the portion spanning the spaces between rollers 9, 10, 11 and 12 is stretched before it is engaged over the teeth of the rollers 9 and 12, while the portion spanning the spaces between rollers 12, 7, 8, and 9 is left unstretched. The

stretched span between rollers 10 and 11 is located within the tank 14, whereby the articles in the belt are coated as they pass around the roller 10, thence from roller 10 to a roller 11 and thence upwardly around the roller 11. When treating the articles electrically one side of the circuit is connected to the articles through the belt, as for example through one of the rollers, the other side of the circuit being connected to an electrode in the tank. While the articles to be coated may be placed in the unstretched portion of the belt at any location between the rollers 7 and 9, the loading station is preferably confined to the span between rollers 8 and 9 where guards 15 are provided to prevent the articles from being placed in the two rows of openings through which the teeth of rollers 9 and 12 extend as the belt passes over these rollers. The horizontal stretch between rollers 7 and 12 constitutes an unloading station where the articles are automatically dumped into a suitable receiver 16 inasmuch as the belt changes from stretched condition to unstretched condition at the roller 12.

While the teeth on rollers 9 and 12 may be spaced apart equidistantly, they are preferably spaced differently as illustrated in Fig. 4, the spaces between the teeth on roller 9 being equal to or a multiple of the spacing of the openings in the unstretched portion of the belt and the spaces between the teeth on roller 12 being equal to or a multiple of the spacing of the openings in the stretched portion of the belt. In this way the unstretched belt feeds freely onto the teeth of roller 9 and the stretched belt feeds freely onto the teeth of roller 12.

The modification shown in Fig. 6 is like that shown in Fig. 4 except in that an additional roller 17 is provided between the rollers 9' and 10' (corresponding to rollers 9 and 10 of Fig. 4) thereby to provide a horizontal stretch between rollers 9' and 17 so that any article which is not firmly clamped may fall into the receiver 18 before reaching the tank 14'.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. Apparatus for treating small articles, comprising a clamp in the form of a series of adjacent bars interconnected for parallel movement toward and from each other with openings therebetween which are larger than the articles when the bars are in one position in relation to each other and which contract when the bars are moved to another position in relation to each other, means for holding the bars in the latter position to grip articles placed in the openings while the bars are in the former position, and means for treating the articles while clamped as aforesaid.

2. Apparatus for coating small articles, comprising a clamp in the form of a series of adjacent bars interconnected for parallel movement toward and from each other with openings therebetween which are larger than the articles when the bars are in one relative position and which contract when the bars are moved to another relative position, means for holding the bars in the latter position to grip articles placed in the openings while the bars are in the former position, and means including an electric circuit conductively connected to said clamp for electrically forming a coating on said articles while clamped as aforesaid.

3. Apparatus for coating small articles, comprising a clamp in the form of a series of adjacent bars interconnected for parallel movement toward and from each other with openings therebetween which are larger than the articles when the bars are in one relative position and which contract when the bars are moved to another relative position, means for holding the bars in the latter position to grip articles placed in the openings while the bars are in the former position, and means including an electric circuit conductively connected to said clamp for electrically forming a coating on said articles while clamped as aforesaid, said holding means constituting an electric terminal for conductively connecting said circuit to said clamp.

4. Apparatus for coating small articles, comprising a clamp in the form of a series of bars interconnected for lazy-tong movement relative to each other with openings therebetween which are larger than the articles when the lazy-tong clamp is in one position and which contract when the clamp is extended in the same dimension, means for holding the clamp extended sufficiently to grip articles placed in the openings before the openings are contracted, and means including an electric circuit conductively connected to said clamp for electrically forming a coating on said articles while clamped as aforesaid.

5. Apparatus for coating small articles, comprising a clamp in the form of a series of bars interconnected for lazy-tong movement relative to each other with openings therebetween which are larger than the articles when the lazy-tong clamp is in one position and which contract when the clamp is extended in the same dimension, means for holding the clamp extended sufficiently to grip articles placed in the openings before the openings are contracted, and means including an electric circuit conductively connected to said clamp for electrically forming a coating on said articles while clamped as aforesaid, said holding means constituting an electric terminal for conductively connecting said circuit to said clamp.

6. Apparatus for treating small articles, comprising a clamp in the form of wire mesh having openings which are larger than the articles when the wires are perpendicular to each other and which contract in one dimension when the mesh is stretched in the other dimension, and means for stretching the clamp in the latter dimension sufficiently to grip articles placed in the openings before the openings are contracted.

7. Apparatus for coating small articles, comprising a clamp in the form of wire mesh having openings which are larger than the articles when the wires are perpendicular to each other and which contract in one dimension when the mesh is stretched in the other dimension, means for stretching the clamp in the latter dimension sufficiently to grip articles placed in the openings before the openings are contracted, and means including an electric circuit conductively connected to said clamp for electrically forming a coating on said articles while clamped as aforesaid.

8. Apparatus for coating small articles, comprising a clamp in the form of wire mesh having openings which are larger than the articles when the wires are perpendicular to each other and which contract in one dimension when the mesh is stretched in the other dimension, means

for stretching the clamp in the latter dimension sufficiently to grip articles placed in the openings before the openings are contracted, and means including an electric circuit conductively connected to said clamp for electrically forming a coating on said articles while clamped as aforesaid, said stretching means comprising an electric terminal for conductively connecting said circuit to said clamp.

9. The method of clamping small articles for coating treatment and the like, which comprises inserting the articles in the openings of wire mesh and then stretching the mesh diagonally to grip the articles in the openings.

10. The method of coating small articles, which comprises inserting the articles in the openings of wire mesh, stretching the mesh diagonally to grip the articles in the openings, immersing the articles in an electrolyte, and passing current through the electrolyte, articles and wire mesh in series.

11. Apparatus for coating small articles comprising an endless belt of wire mesh having its wires extending diagonally, means for feeding the belt along a predetermined path in one portion of which the belt is relaxed to receive the articles and in another portion of which the belt is stretched to grip the articles, and a tank adjacent the latter portion into which the belt dips while stretched.

12. Apparatus for coating small articles, comprising an endless belt of wire mesh having its wires extending diagonally, means for feeding the belt along a predetermined path in one portion of which the belt is relaxed to receive the articles and in another portion of which the belt is stretched to grip the articles, and a tank adjacent the latter portion into which the belt dips while stretched, said feeding means including interconnected rollers at opposite ends of the stretched portion with means for restraining slippage of the belt on the rollers.

13. Apparatus for coating small articles, comprising an endless belt of wire mesh having its wires extending diagonally, means for feeding the belt along a vertically looped path an upper stretch of which is relaxed to receive the articles, a lower portion of which is relaxed to discharge the articles and an intermediate portion of which is stretched to grip the articles, a coating tank through which the stretched portion extends to coat the articles while gripped, and means for continuously stretching and unstretching the belt at the beginning and end of said stretched portion respectively.

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