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WASHING APPARATUS

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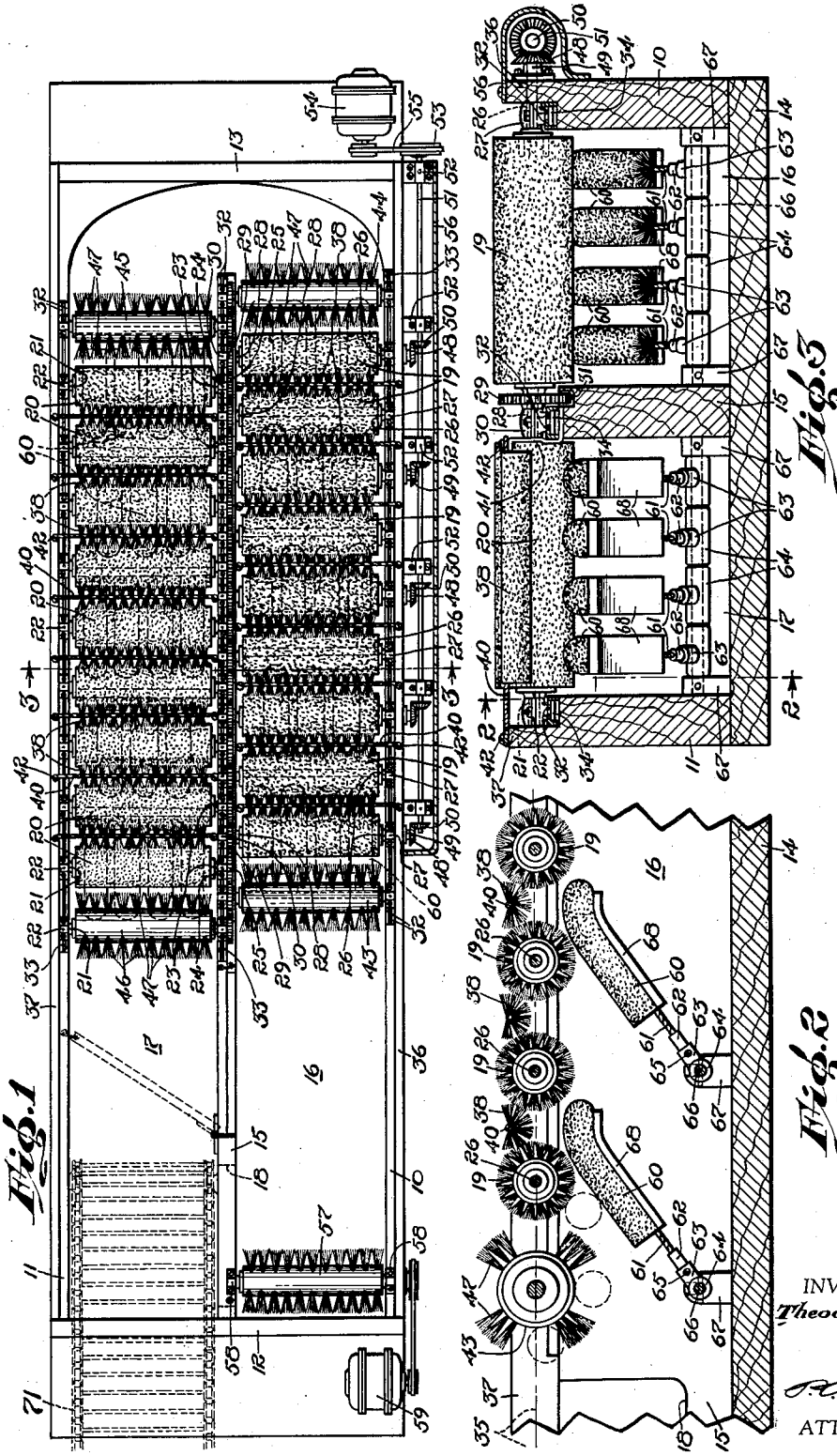


Fig. 1

Fig. 2

Fig. 3

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WASHING APPARATUS

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9 Claims. (Cl. 146—202)

This invention relates to a washing apparatus and more particularly to an apparatus for washing round objects, fruits and the like, and especially fruits and vegetables which are easily bruised and which require careful handling.

A salient object of the present invention is the provision of an apparatus which is characterized by its ability to thoroughly clean the exterior surface of the articles washed thereby, without bruising the same, or injuring the surface thereof.

Another object of the invention is to provide an apparatus of the character referred to, in which the articles to be washed are moved in a liquid, under a number of moving brushes or cleaning elements.

A further object of the invention is to provide an apparatus in which the articles to be washed are submerged in a moving liquid and moved under a number of revoluble cleaning elements; to provide in said liquid, yielding elements against which the articles engage during their travel and by the aid of which said articles are turned and given additional motion; to further provide at spaced intervals in said liquid, rows of such elements in the form of movably mounted finger brushes, which are yieldingly supported in the path of the articles being washed, and to further provide such brushes or elements which are buoyantly supported.

Still another object of the invention is to provide an apparatus of the character referred to, in which the articles to be washed are automatically submerged into a moving liquid from the surface thereof, and conveyed by said liquid under a series of revolving cleaning brushes; and to further provide a submerging device which consists of a revoluble member provided with spaced rows of brushes which define channels therebetween for receiving the articles, whereby said articles float on the surface of the moving liquid into said channels and are carried beneath the surface thereof.

A further object is the provision of an apparatus of the character referred to which is compact, simple of construction and exceptionally economical to manufacture.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of one embodiment thereof. For this purpose one form is shown in the accompanying drawing and forming part of the present specification. I shall now proceed to describe this form in detail, which illustrates the general principles of the invention; but it is to be understood that this description is not to be taken in a limiting sense, since the scope of the invention is best defined in the appended claims.

Referring to the drawing:

Figure 1 is a top plan view of an apparatus constructed in accordance with the present invention.

Figure 2 is a fragmentary sectional view taken as indicated by line 2—2 of Figure 3 and

Figure 3 is an enlarged transverse sectional view taken as indicated by line 3—3 of Figure 1.

Referring more in particular to the drawing, the form of applicant's apparatus shown therein includes a liquid container having side walls 10 and 11, ends 12 and 13, a bottom 14 and a center partition 15, which defines two longitudinal channels or troughs 16 and 17. Communication between the two troughs is provided at either end of the liquid container. At one end, the center partition 15 ends at a distance from the end wall 13 of the liquid container, and at the other end an opening 18 (shown clearest in Figure 2) is provided in the center partition. Thus, it will be seen that a circuitous channel is provided for the cleaning liquid, which is circulated therethrough in a manner hereinafter fully described.

A plurality of cylindrical brushes 19—19 are revolubly supported in the trough 16 and a plurality of similar brushes 20—20 are in like manner supported in the trough 17. Stub shafts 21—21 extend from one end of the brushes 20—20 and are journaled in bearings 22—22 on the wall 11 of the liquid container. The opposite ends of the brushes 20—20 carry stub shafts 23—23 which are journaled in bearings 24—24 on the center partition 15. These stub shafts extend through the bearings 24—24 and carry on their ends fixed gears 25—25. One end of the cylindrical brushes 19—19 (Figure 3) are provided with stub shafts 26—26, which are journaled in bearings 27—27 supported on the wall 10 of the liquid container, and the opposite ends of said brushes carry stub shafts 28—28 upon which are fixedly mounted, gears 29—29. These stub shafts extend through the gears 29—29 and are journaled in bearings 30—30, which are positioned intermediate of the bearings 24—24 on the center partition. Thus, it will be seen that the supporting bearings for the stub shafts 23—23 and 28—28 of the respective cylindrical brushes 20—20 and 19—19 are in alignment. The gears on said stub shafts are also in alignment, as clearly shown in Figure 1, and are intermeshed to form a train of coacting driving elements for affecting a rotation

of the two series of brushes 19—19 and 20—20 in opposite directions. A longitudinal slot 31 in the upper edge of the center partition 15, serves to receive the lower portion of said gears.

The bearings for supporting the cylindrical brushes 19 and 20, are all similarly mounted in the manner shown clearest in Figure 3 of the drawing. Pairs of cooperating angle strips 32—32 are supported along the upper edges of the outside walls 10 and 11 and also on the upper edge of the center partition 15. Each pair is arranged so as to form an inverted channel, with a space between their upper adjacent edges which forms a longitudinal slot 33 therebetween. The bearings are mounted on these cooperating angle strips and the bolts for holding the bearing parts together pass through the slot 33 and are provided on their lower ends with nuts 34—34, which are movable longitudinally in the channelway defined by the angle strips. Thus, an adjustment is provided between the coacting gears 25 and 29 and their respective brushes.

The form of applicant's invention shown in the drawing is particularly adaptable for washing citrus fruit, and he finds it advantageous to have the level of the liquid in the troughs 16 and 17 at about the center of the revoluble cleaning brushes 19 and 20, as indicated by the dotted line position at 35 in Figure 2. Accordingly, he prefers to use bearings of the liquid-cooled type for supporting these revoluble brushes. The sides 10 and 11 of the liquid container are extended upwardly as at 36 and 37, to confine the liquid therein. Stationary brushes 38—38 are supported between the revoluble cleaning brushes 19 and 20. They serve to help clean the articles and also prevent the same from passing upwardly between the revoluble cleaning brushes. Figure 3 best shows the method of supporting these stationary brushes 38—38. They are provided with twisted wires 40—40, to which the brush bristles are secured. Supporting brackets 41—41 are mounted along the top of the center partition 15 and extend upwardly therefrom. The wires 40—40 are secured to the upwardly extended portions of the outside walls 10 and 11, and to the supporting brackets 41—41, as by the aid of screws 42—42.

Revoluble elements 43 and 44 (shown clearest in Figure 1) are provided, one at either end of the series of revoluble cleaning brushes 19—19 and similar elements 45 and 46 are provided at either end of the series of cleaning brushes 20—20. The elements 44 and 46 serve as propellers or paddles to circulate or move the liquid through the troughs 16 and 17, while the elements 43 and 45 perform the additional function of feeding the articles to be washed, underneath the surface of the liquid. For purposes of explanation, the elements 43 and 45 will hereinafter be referred to as feeder elements or feeder brushes. The fragmentary view Figure 2, shows the construction of the feeder element 43, which is typical of the other revoluble elements 44, 45, and 46. It is provided with spaced rows of radially projecting brushes 47—47, which define therebetween, valleys or channels, into which the articles float on the surface of the liquid and from which they are submerged under the surface thereof and carried under the revoluble cleaning brushes 19 by the moving liquid. In like manner, the feeder brush 45 receives the articles from the surface of the liquid after they have passed under the cleaning brushes 19—19, and submerges them for passage under the cleaning brushes 20—20. The elements 43, 44, 45, and 46 are all revolubly supported by bearings mounted on the cooperating pairs of angle strips 32—32 in the same manner as the revoluble cleaning brushes 19 and 20. They are provided with corresponding gears, similar to the ones carried by said cleaning brushes and which form a part of the gear train heretofore described.

Figures 1 and 3 best show the means of driving the various revoluble elements heretofore described. At various intervals, the stub shafts 26—26, of the cleaning brushes 19—19, extend through their supporting bearings 27—27, and pass through the upwardly extending portion 36 of the container wall 10, and carry on their outer ends, bevel gears 48—48. Said shafts also pass through packing glands 49—49, secured to the outer surface of the wall 10. These bevel gears are driven by corresponding bevel gears 50—50, secured to a drive shaft 51. Said shaft is supported at intervals along its length, by bearings carried on bearing brackets 52—52, secured to the wall 10. It carries on one end thereof, a pulley 53, which is driven by the aid of an electric motor 54 and flexible driving element 55. Thus, in operation, all of the revoluble members in the trough 16 are rotated in a counter-clockwise direction, as indicated by the arrows in Figure 2, while the revoluble members in the trough 17 are simultaneously rotated in an opposite or clockwise direction. A housing 56 encloses the driving mechanism heretofore described. Although applicant has shown one means only for driving the various revoluble elements, he is aware that numerous other means might be satisfactorily employed. For instance, the train of coacting gears might be driven by worms, mounted on a drive shaft supported over said gear train.

Applicant prefers to provide an independent means for circulating or moving the liquid through the troughs 16 and 17 in addition to the revoluble elements. Various means might be employed for accomplishing this action. For instance, a pump might be employed. However, applicant prefers to use a revoluble element 57, similar to the revoluble elements 43, 44, 45 and 46. It is supported in one end of the trough 16 by bearings 58—58 and is rotated by a motor 59.

An important feature of applicant's invention resides in the means which he employs for rotating or turning the articles during their travel under the revolving cleaning brushes 19 and 20. This feature includes rows of finger-like brushes or elements 60—60, positioned at spaced intervals within the liquid troughs 16 and 17, as indicated in light broken lines in Figure 1. Reference is had to the enlarged Figures 2 and 3, which best show these elements and the means of mounting the same. Applicant prefers to form the finger-like elements of brushes, which have the usual twisted wires 61—61 to which the brush bristles are anchored. The wires 61—61 extend from said brushes and carry handle portions 62—62 on their ends which are entrant into bosses 63—63 of the supporting sleeves 64—64 and are removably held therein by the aid of screws 65—65. The sleeves 64—64 are pivotally mounted on the stationary shafts 66—66, which are fixedly supported in brackets 67—67. Each row of sleeves are in abutment and their corresponding finger brushes 60—60 are accordingly held against lateral movement in the liquid troughs, as shown clearly in Figure 3. The finger brushes are buoyantly supported in the angular position shown in Figure 2 by the aid of float

elements 68—68, preferably of cork or the like. These elements may be secured to the bottom of the finger brushes in any suitable manner. The finger brushes are all inclined in the direction of the flow of liquid in the troughs, as indicated by the arrows. Thus, the finger brushes in the trough 16 are inclined toward the end 13 of the liquid container and the finger brushes in the trough 17 are inclined toward the end 12 thereof. The article-engaging surfaces of the finger brushes are curved, said brushes themselves being substantially semi-circular in cross section as shown in Figure 3.

In operation applicant prefers to maintain the level of the liquid in the troughs at about the elevation indicated by the light broken line position at 35 in Figure 2. The liquid is circulated or moved in a counter-clockwise direction through the troughs 16 and 17, chiefly by the revolving propeller brush 57 and the other revolving elements 43, 44, 45 and 46. The articles to be washed are placed in the trough 16, between the propeller brush 57 and the feeder brush 43. They float on the surface of the moving liquid, into the channels or troughs defined by the brushes 47 of said revolving feeder brush, and are carried beneath the surface of the liquid. The submerged articles are then carried with the moving liquid, and engage the curved surfaces of the finger brushes 60—60, whereby they are turned or rotated relative to their movement with liquid. The finger brushes yield in response to the engagement of said articles and permit them to pass as they are yieldingly urged against the revolving cleaning brushes 19—19. The buoyancy of the articles tends to keep them in engagement with the revolving cleaning brushes, which due to their rotative movement, assist the articles in their travel as well as to clean them. When the articles have passed under the revolving cleaning brushes 19—19 of the trough 16, they come to the surface of the liquid and float into the trough 17, where they enter the channels of the revolving feeder brush 45 and are again submerged into the liquid. The same procedure takes place as the articles move under the revolving cleaning brushes 20—20. If it is desired to rerun the articles through the cleaning apparatus, a gate 70 in the center partition can be swung open to the dotted line position in Figure 1, to permit the articles to pass from the trough 17 back into the trough 16 for re-washing. A conveyer 71, shown in light broken lines, may be used to remove the washed articles from the trough 17.

I claim:

1. An apparatus for washing buoyant articles, comprising in combination, two communicating troughs arranged side by side for containing liquid, two sets of revoluble cleaning elements respectively supported transversely of each of said troughs and extending thereinto, means interconnecting the adjacent ends of said two sets of elements for effecting their rotation in opposite directions, common power means for rotating said elements, and spaced rows of movably anchored brushes arranged within said troughs transversely thereof, said brushes having curved article engaging surfaces which define scrubbing troughs between adjacent brushes whereby said articles are adapted to move through the liquid and successively enter said rows of troughs as they move under the revoluble cleaning elements.

2. A fruit washing apparatus including a receptacle for containing a liquid, movably supported cleaning elements under which the articles to be washed are adapted to move, means for moving said cleaning elements, a plurality of movably anchored cleaning elements supported in the path of said articles, said cleaning elements having sides defining troughs between adjacent anchored elements into which said articles are adapted to move, thereby providing an increased cleaning surface for engaging said articles as they move under said first mentioned movably supported cleaning elements.

3. A fruit washing apparatus including a receptable for containing a liquid, movably supported cleaning elements under which the articles to be washed are adapted to move in said liquid, means for moving said cleaning elements, a plurality of pivotally anchored cleaning brushes supported in the path of said articles, and arranged in rows transversely of the direction of movement of the articles, said brushes having substantially horizontal portions the sides of which define scrubbing troughs between adjacent brushes for receiving the articles, thereby providing an increased cleaning surface for engaging the articles as they move under the movably supported cleaning elements.

4. A fruit washing apparatus including a receptacle for containing a liquid, a plurality of rotatable brushes mounted in spaced relation on separate axes of rotation and under which the articles to be washed are adapted to move and successively engage, a plurality of stationary cleaning elements supported between the adjacent rotatable brushes, said stationary cleaning elements being supported so as to permit the fruit to rise between the rotatable brushes into scrubbing contact with said stationary elements, as the fruit progresses from below a rotatable brush, and means for moving said rotatable brushes to bring the articles into simultaneous engagement with the adjacent stationary and rotatable cleaning elements.

5. A fruit washing apparatus comprising a receptacle for containing a liquid, rotatable cleaning elements under which the articles to be washed are adapted to move, means for rotating said cleaning elements, spaced rows of movably anchored cleaning elements supported in the path of said articles, said anchored elements having adjacent scrubbing surfaces which form scrubbing troughs therebetween to receive the fruit, whereby to increase the scrubbing surface on the articles as they move under the rotatable cleaning elements.

6. A fruit washing apparatus comprising a receptacle for containing a liquid, rotatable cleaning elements under which the articles to be washed are adapted to float in said liquid, means for rotating said cleaning elements, spaced rows of movably anchored cleaning elements arranged within the receptacle transversely of the direction of movement of said articles, means for buoyantly supporting the movably anchored cleaning elements in the path of the moving articles, said anchored elements having adjacent scrubbing surfaces which form scrubbing troughs for receiving the articles as they move from one rotatable cleaning element to the other.

7. A fruit washing apparatus comprising a receptacle for containing a liquid, rotatable cleaning elements under which the articles to be washed are adapted to move in said liquid, means for rotating said rotatable cleaning elements, means for circulating the liquid through said re-

ceptacle for conveying the articles successively from one rotatable cleaning element to another, and spaced rows of movably anchored cleaning elements arranged within the receptacle transversely of the direction of flow of said liquid and supported in the path of the articles, said anchored elements having adjacent scrubbing surfaces which form scrubbing troughs for receiving the articles as they move from one rotatable cleaning element to the other.

8. An apparatus for washing buoyant articles, comprising in combination, two communicating troughs arranged side by side for containing liquid, two sets of revoluble cleaning elements respectively supported transversely of each of said troughs and extending thereinto, means interconnecting the adjacent ends of said two sets of elements for effecting their rotation in opposite directions, common power means for rotating said elements, and spaced rows of movably anchored cleaning elements arranged within said troughs transversely thereof, said anchored elements being supported adjacent said revoluble cleaning elements by the buoyant force of the liquid, the adjacent sides of said anchored cleaning elements being scrubbing surfaces and forming scrubbing troughs, whereby said articles are adapted to move in the liquid and successively enter said rows of scrubbing troughs as the articles move through said troughs beneath the revoluble cleaning elements.

9. In a fruit washing apparatus, a tank, a series of rotary cleaning members supported so as to extend across the tank, liquid in the tank having a normal level such that the rotary cleaning members are at least partly immersed in the liquid, and stationary cleaning members supported intermediate adjacent rotary members and each of said stationary members defining a space with the adjacent rotary members that is limited at the top by the stationary member, whereby as the fruit emerges from beneath one rotary member, it is passed into said space to contact a stationary member before passing beneath the succeeding rotary member.

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