United States Patent

Sadwith

[15] **3,645,791**

[45] **Feb. 29, 1972**

[54] METHOD FOR WASHING INDUSTRIAL ARTICLES

[72] Inventor: **Howard M. Sadwith,** Colts Neck, N.J.

[73] Assignee: **Industrial Washing Machine Corporation,** Matawan, N.J.

[22] Filed: **Dec. 4, 1969**

[21] Appl. No.: **879,969**

Related U.S. Application Data

[62] Division of Ser. No. 679,097, Oct. 30, 1967, Pat. No. 3,517,675.

[52] **U.S. Cl.** .....**134/25 A,** 134/25 R, 134/30, 134/33, 134/34, 134/37, 134/144, 134/148, 134/153, 134/176, 134/199

[51] **Int. Cl.** **B67c 1/00,** B08b 3/02

[58] **Field of Search** .....134/140, 141, 176, 179, 25 A, 134/25 R, 144, 148, 153, 199, 33, 34, 30, 37

[56] **References Cited**

UNITED STATES PATENTS

987,544	3/1911	Branden	134/148
2,127,778	8/1938	Lewis	134/25 A UX
2,619,099	11/1952	Young	134/25 A UX
2,698,628	1/1955	Zademach et al.	134/153 X
2,837,100	6/1958	Way et al.	134/141 X
2,936,770	5/1960	Emanuel	134/199 X
3,011,501	12/1961	Beranek	134/144 X
3,327,722	6/1967	Nolte	134/176 X
3,419,429	12/1968	Zadron et al.	134/144 X
3,460,550	8/1969	Zanussi	134/141 X

FOREIGN PATENTS OR APPLICATIONS

1,182,042	6/1959	France	134/144

Primary Examiner—Morris O. Wolk
Assistant Examiner—Barry S. Richman
Attorney—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

The method of washing industrial articles, involving the steps of placing the articles to be washed on a platform rotating at a predetermined speed in an enclosure; directing a series of streams of water on said articles, said streams of water issuing from nozzles on a rotating spray head, whereby through the rotation of the articles and the rotation source of the streams of water, variation in the incident angles of the streams of water impinging on the articles is greatly increased to produce a scrubbing, scouring, or lifting effect on dirt and foreign matter present on the articles being washed.

4 Claims, 7 Drawing Figures

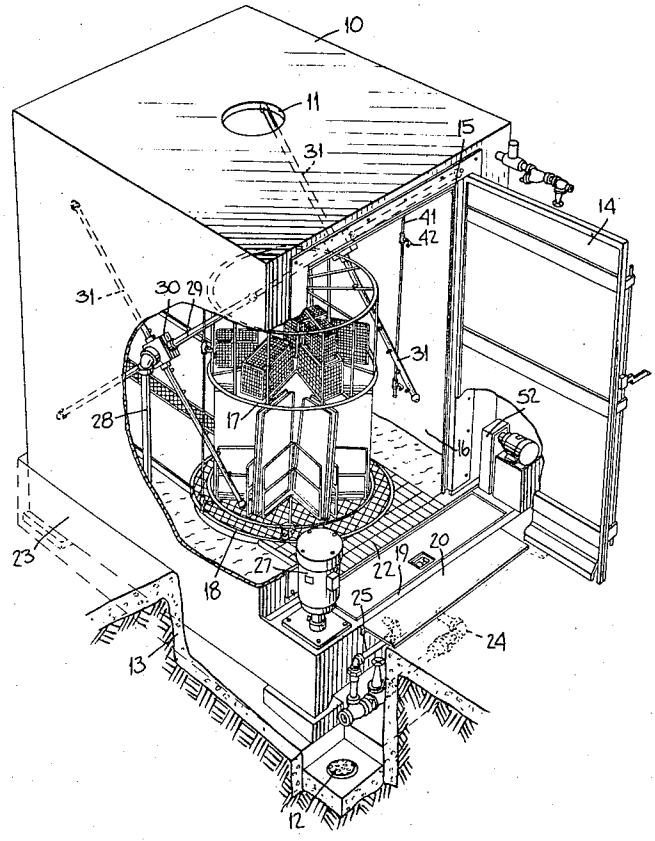
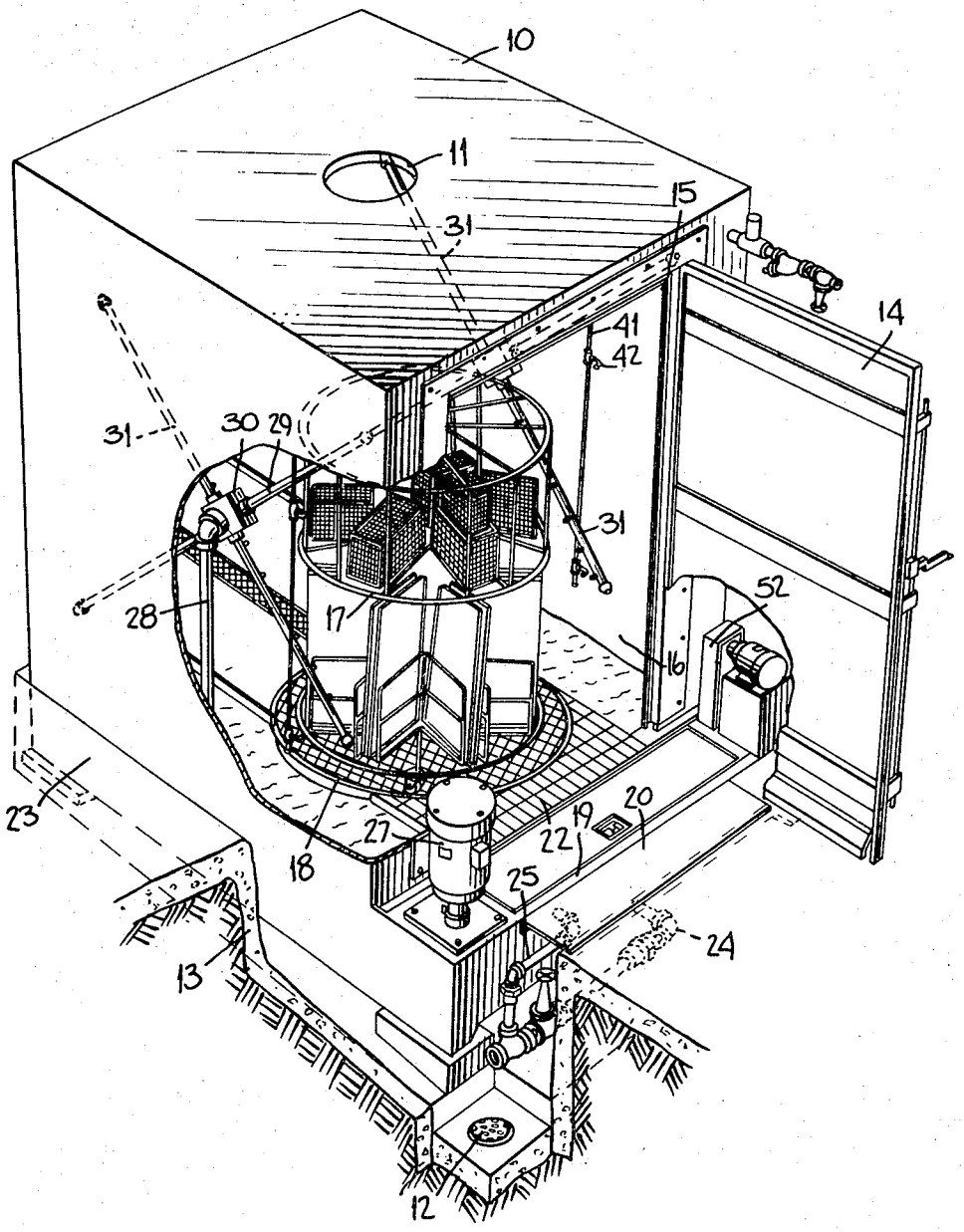


Fig. 1.


10
11
15
31
14
41
42
31
30
29
31
28
17
52
16
23
27
18
22
19
20
25
24
13
12

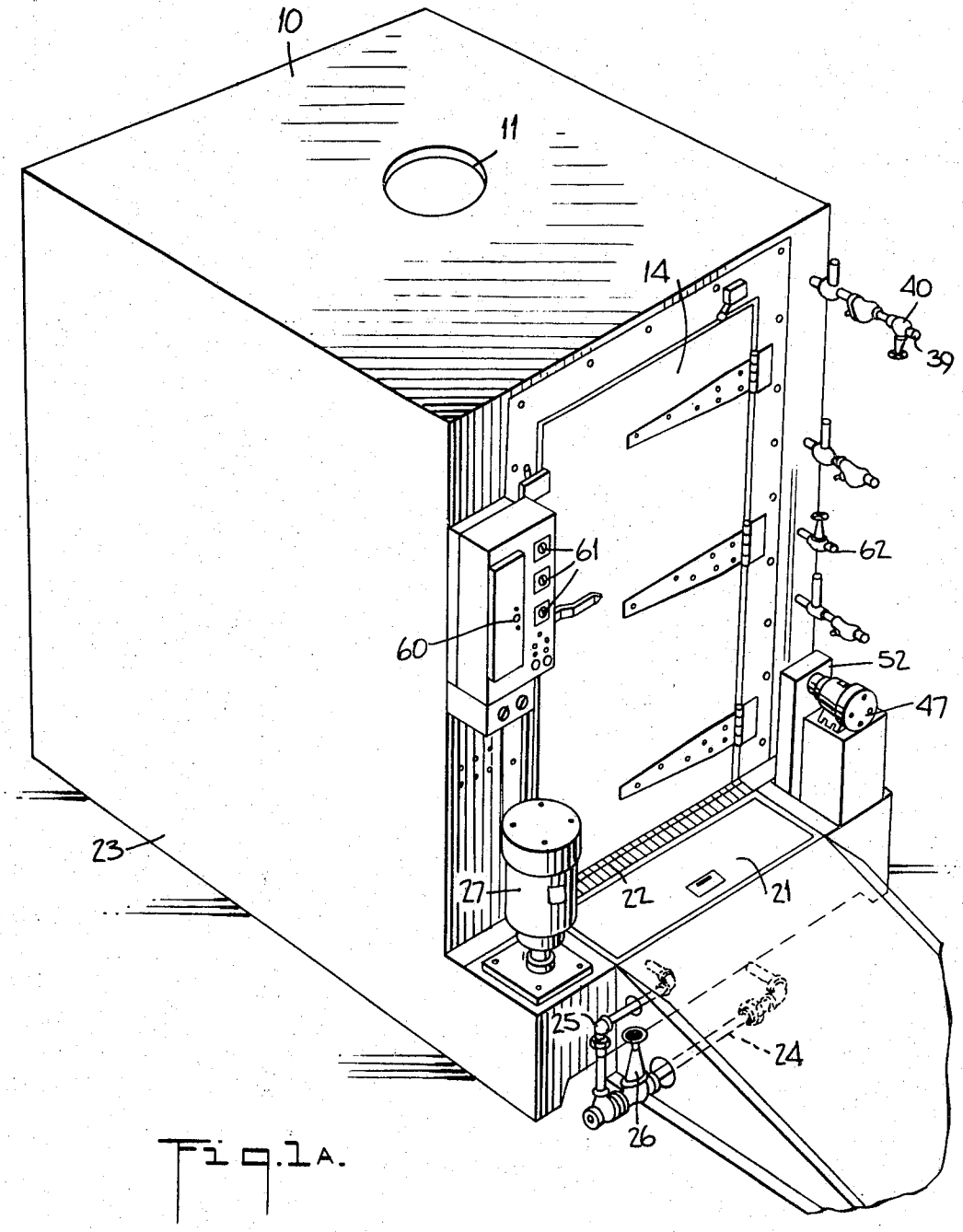


Fig. 1A.

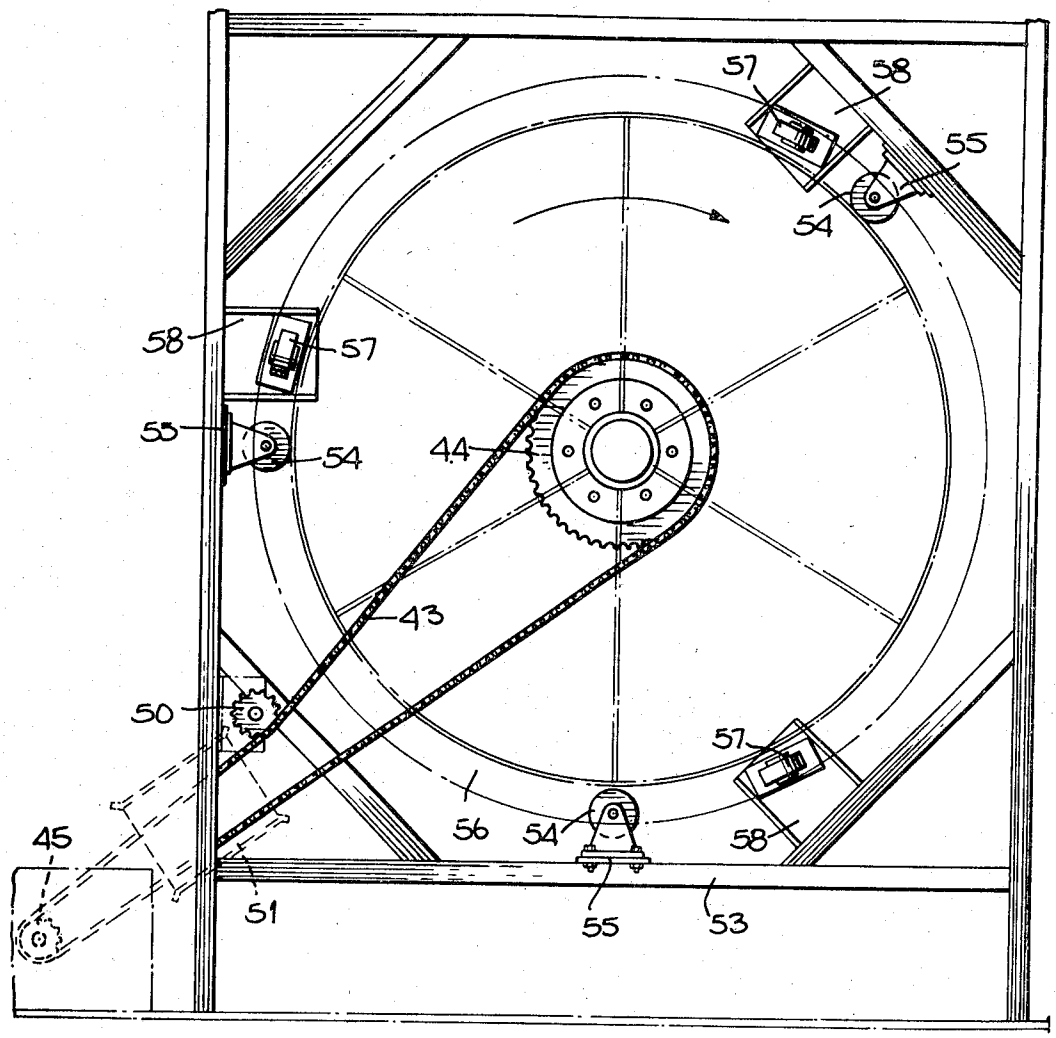

57
58
55
54
58
57
55
54
44
43
50
57
56
54
58
45
51
55
53

Fig. 2.

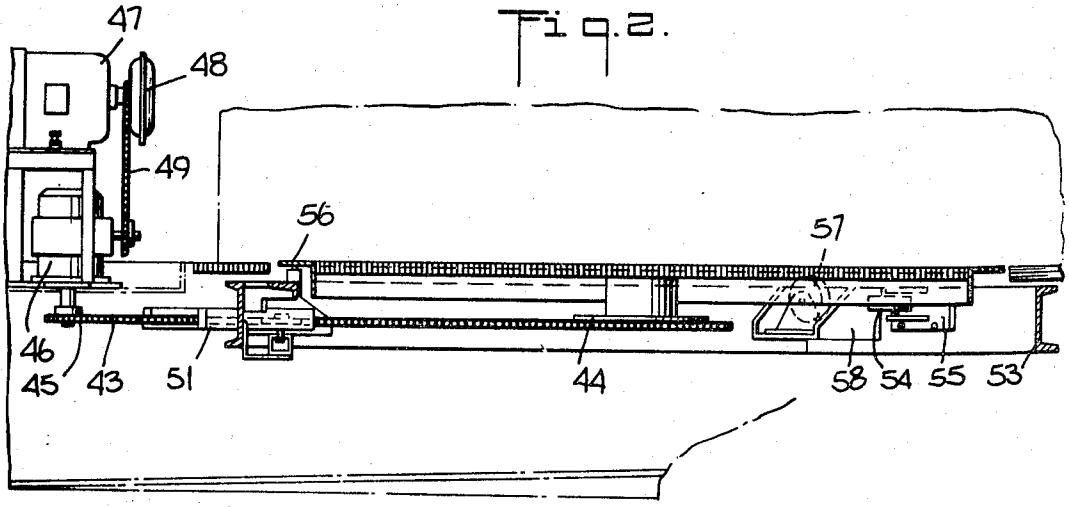

47
48
49
56
57
46
45
43
51
44
58
54
55
53

Fig. 3.

Fig. 5.

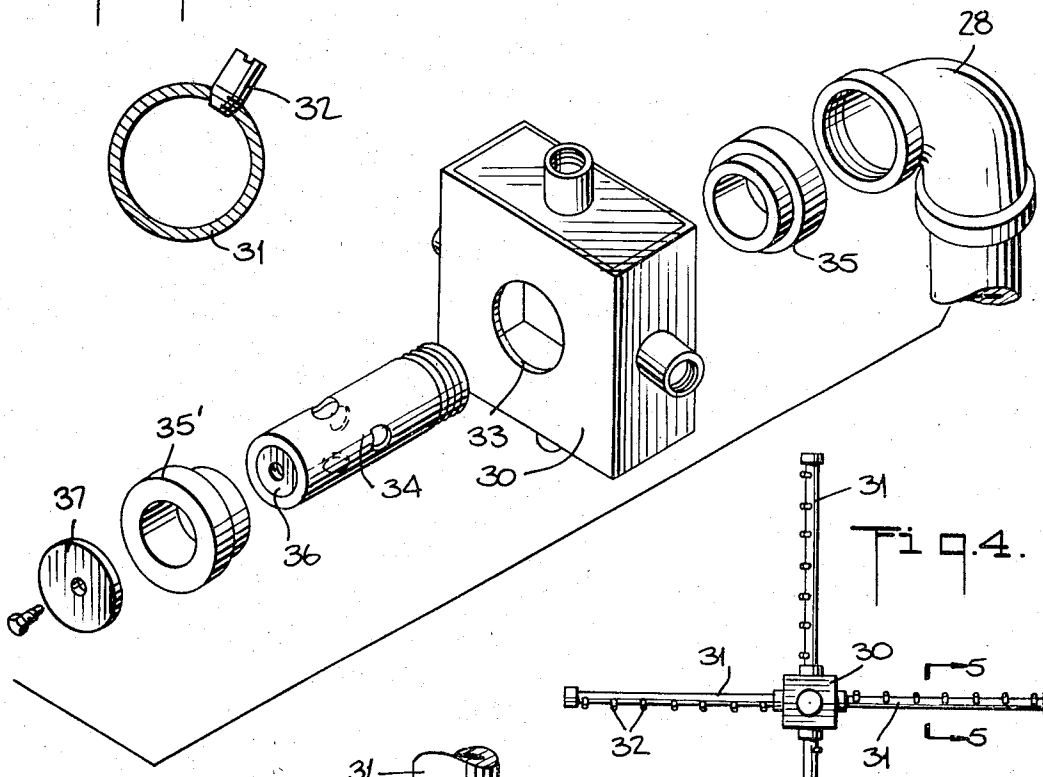


Fig. 4.

Fig. 6.

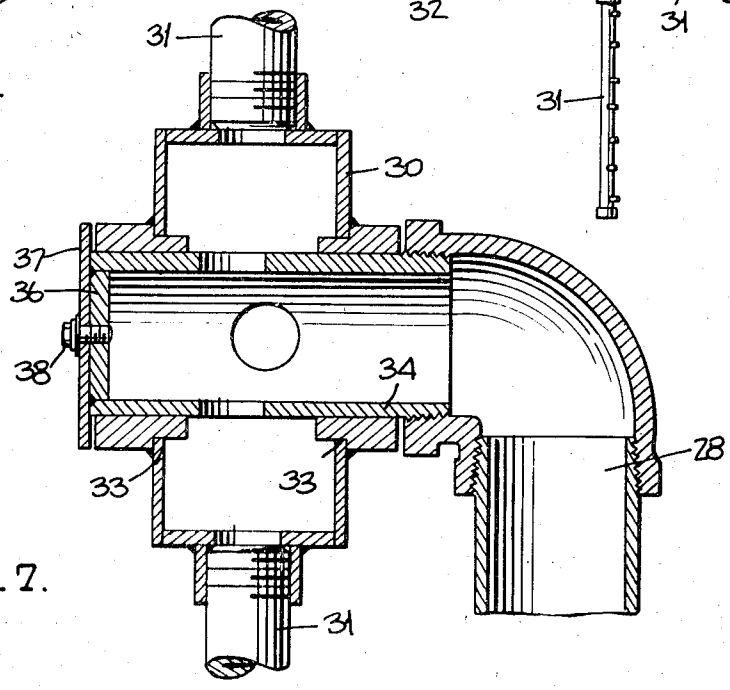


Fig. 7.

METHOD FOR WASHING INDUSTRIAL ARTICLES

This is a division of application Ser. No. 679,097 filed Oct. 30, 1967, now U.S. Pat. No. 3,517,675, issued June 16, 1970.

This invention relates to a method of washing substantially rigid industrial articles and parts, the method being particularly well suited for use in connection with cleaning laboratory cages and racks, or in another use for cleaning pans, racks and other utensils utilized in connection with commercial pie, cake, and bread baking.

The prior art washing machines have been troubled by the fact that areas of the space where the articles being washed reside are often relatively untouched by washing solution. These hard-to-get-at areas or gaps have been inherent in the prior art washing machines. Although attempted solutions have been introduced, as by the introduction of rotating turntables, these attempted solutions have not been entirely successful. For example, the introduction of rotating turntables has merely ensured that certain concentric areas traced by the impinging streams of water as the articles are rotated under them will receive wash solution, still leaving gaps between these concentric areas and also within these areas.

What has really been necessary has been an approach which would change not only the areas which are exposed to sprays of wash solution but also the angles of attack and angles of incidence of the wash solution sprays being directed at the articles. It is this condition which the inventor believes he has brought about by the method which he discloses in this invention. The invention herein further enables a one-unit automated method of automatically cleansing scouring and sanitizing articles. It has been found that the present invention also produces an effect much like scouring. This is achieved as a result of an almost infinite variation in the angle at which the washing liquid strikes the surface being washed.

The method of this invention makes it possible to achieve a more thorough cleansing of articles; this is particularly advantageous in situations where a very high standard of cleanliness is essential. Particularly noteworthy areas are the food industry, and the research laboratory area. The high level of cleanliness which this invention brings about is also performed in a more economical, rapid, and above all, scientific manner than was previously available with the somewhat random washing techniques heretofore available.

The method hereinafter described provides a commercially attainable standard of cleanliness which could heretofore be ensured only through time consuming and extremely limited hand operations. This standard of cleanliness is accomplished by the present invention far more speedily and more economical than in hand operations, and above all with a uniform result which only scientific experimentation can make possible.

It is therefore a first object of the invention to vary the angle of incidence of the washing solution as it impinges on the various specific spots on the articles being washed, and to reach all spots on the articles.

A further object of the present invention is to provide a more efficient and scientific method of cleaning utensils.

Still another object of the present invention is the production of a scouring effect over the areas of the utensils being washed.

And yet another object of the present invention is the production of a scientific standard of cleanliness heretofore unattainable.

Additional objectives, novel features and benefits of this new and inventive method will be apparent to men skilled in the industrial washing art, from the following specification, drawings and appended claims. Wherein:

FIG. 1 is a front, partially sectioned, perspective view of an industrial washing machine embodying this invention in a working environment.

FIG. 1*a* is a front perspective view of the machine of the invention.

FIG. 2 is a plan view of the rotating turntable mechanism of the machine of the invention.

FIG. 3 is a broken side view of that portion of the machine of the invention shown in FIG. 2.

FIG. 4 is a side view of the rotating wash spray head mechanism of the invention shown in FIG. 1.

FIG. 5 is a sectional view of a spray arm of rotating wash spray head mechanism taken generally along lines 5—5 in FIG. 4.

FIG. 6 is an exploded perspective view of the rotating junction box and fresh rinse pipe shown in FIGS. 1 and 4.

FIG. 7 is a partially sectioned side view of the elements shown in FIG. 6.

The method conceived by the applicant for the washing and sanitizing of laboratory or industrial parts comprises the novel process for cleaning articles by streams of wash liquid which are caused to scour every portion of the articles to be cleaned in a manner such that every specific spot is scoured by the impinging of the streams at different and varying angles of incidence. The method further comprises rotating the articles to be washed about one axis and simultaneously directing a plurality of spray streams of wash fluid generally at the rotating articles while moving said streams substantially parallel to a plane which is substantially parallel to the axis about which the articles are being rotated. It has been found that by such a method the entire exposed surfaces of the articles to be washed will be directly scoured by a stream of washing fluid and that, these spots will be scoured by the stream or streams impinging in the varying angles of incidence.

It has been further found desirable to control the speed of rotation of the articles relative to the speed of movement of the streams so that at some point in the rotation of a specific spot on an article, the stream impinging on that spot will be caused to track with it for a moment. Taking into account the fact that the stream impinging on an article scours a small area in the immediate vicinity in the center of the streams impinging, this control of the relative speeds of the article rotation and stream movement will cause the aforementioned spot to be scoured for a finite period of time and the scouring will take place at a constantly varying angle of incidence.

An important apparatus for cleaning items in connection with this method and for washing and sanitizing industrial articles which is described below in greater detail is a unit which automatically washes, scours, fresh rinses and blows off with steam, the utensils placed in the unit. These utensils may be placed in the unit in a specially designed mobile rack or may be placed directly on the turntable of the unit. The operation of the unit encompasses three distinct cycles: a washing-scouring cycle, a fresh rinse cycle and a steam blowoff cycle. During each cycle a turntable, holding the utensils being sanitized or washed, is rotated about a substantially vertical axis at a predetermined speed. As a result of such rotation, the various surfaces of the articles to be sanitized or washed are exposed to washing solutions, rinsing solutions, and steam under pressure at a great variety of angles. Additionally, during one of the three cycles of a complete sanitizing operation not only is the angle of incidence of wash liquid on the utensils varied by reason of the rotation of the turntable about a vertical axis but also the angle of the incidence of wash liquid is further varied as a result of the wash liquid's issuing from wash spray heads rotating in a vertical plane and located adjacent the rotating turntable. The spray from nozzles located on the wash spray heads is directed generally toward the area holding the utensils. The cumulative effect of the rotation of the articles and the rotation of the wash spray heads is an almost infinite variation in the angle of incidence of the wash liquid upon the various areas of the utensils. This results in a scouring type wash which provides complete coverage of the surfaces of the utensils being sanitized and produces bacteria-free sanitized utensils. The variation in the angle of incidence also further insures that caked and hardened material will be dislodged by the cumulative effect of wash solution impinging on these deposits from a variety of angles. This variation further insures that all cracks crevices and oddly disposed gathering places for waste material, bacteria and the like are scoured free.

The washing machine parts as shown in FIG. 1 are generally enclosed and supported by a unitary housing/frame 10. Housing/frame 10 has an exhaust port 11 located in its ceiling for

release of steam and vapor, to which may be connected an exhaust fan and exhaust system.

Housing/frame 10 as shown in FIG. 1 is pit mounted with sump 12 off pit enclosure 13. The unit is capable of being mounted to fit any production setup, as for example surface mounted with a ramp entrance as in FIG. 1a. Housing/frame 10 has a door 14, shown open in FIG. 1, to allow placement of utensils through loading entrance 15 into sanitizing compartment 16.

The utensils to be cleaned are loaded on mobile rack 17 which is specially designed for use in connection with turntable 18. A loading platform 19 provides access to turntable 18 enabling mobile rack 17 to be readily placed in sanitizing compartment 16. The loading platform 19 is composed of: bridge 20, connecting the edge of pit enclosure 13 with housing/frame 10; tank access lid 21 which also does double duty as the next portion of the loading platform 19; track 22, at the bottom of loading opening 15, provides the last portion of the platform 19. The inner edge of track 22 is shaped to the configuration of turntable 18 and is so spaced that there is a minimum of distance between track 22 and turntable 18. Thus, loaded mobile rack 17 is pushed over the platform and onto turntable 18. Door 14 is then closed and the washing machine is ready for operation. The machine also may be used without mobile rack 17; use in that manner merely requires that the utensils be placed directly on turntable 18.

Tank 23 for a washing solution or other liquid is located in the bottom of housing/frame 10 and may contain heating coils immersed therein which are in turn connected to an "Eclipse" miniature package burner (not shown). Alternatively, cleaning solution may be preheated elsewhere and supplied to the tank through tank fill connection 62 shown in FIG. 1a. Tank 23 is drained through outlet pipe 24 past drain valve 26 and overflow pipe 25 which is connected to outlet pipe 24.

The washing solution is drawn from tank 23 by wash pump 27, and pumped under pressure through spray pipes 28 and thence to rotating wash spray head 29. Details of rotating wash spray head 29 are shown in FIGS. 1, 4, 6 & 7. Projecting in a vertical plane from the four sides of rotating junction box 30 are spray arms 31 which have connected thereto brass nozzles 32. A rotating junction box 30, four spray arms 31 and the brass nozzles 32 thereon constitute one rotating wash spray head 29. The illustrated washing machine has two such rotating wash spray heads 29 which rotate in a vertical plane. Rotation of the wash spray heads 29 comes about by virtue of wash solution under pressure being released through nozzles 32. Wash solution is discharged from nozzles 32 in a direction generally paralleling the axis of rotation of the wash spray head 29, and toward mobile rack 17. However, the outlet of the nozzles 32 is so placed as to have a component of reaction force in the vertical plane and these component reaction forces from nozzles 32 cumulatively produce a clockwise torque and rotation, (FIG. 5).

FIG. 6 shows the assembly details of, and the parts making up rotating wash spray head 29. Junction box 30 has front and rear openings 33 to receive open ended, hollow bearing shaft 34 which is threaded at one end. Two bushings 35 and 35' fit into front and rear openings 33 of junction box 30, and the bushings receive the ends of bearing shaft 34. The threaded portion of bearing shaft 34 passes through rear bushing 35 and is screwed to spray pipe 28. Bearing shaft 34 is provided with openings on its circumference to facilitate the passage of wash solution from the spray pipe 28 into rotating junction box 30 and thence to the spray arms 31. In FIGS. 6 and 7, plug 36 fits into the front end of bearing shaft 34 and is braised to the inner circumference thereof. Retainer cap 37 is placed over that open end of bushing 35 which is away from spray pipe 28; bolt 38 passes through retainer cap 37 and is threaded into plug 36. The front end of bearing shaft 34 in conjunction with plug 36 and bolt 38 retains junction box 30 and the same is then free to rotate on bearing shaft 34 without sliding off. The assembled unit is shown in cross section in FIG. 7 and the path which the wash solution follows can be seen readily.

Fresh water, rinsing solution, or other liquid is supplied from a heater (not shown) to rinse inlet 39, then to inlet valve 40 in FIG. 1a and through rinse piping 41 to rinse nozzles 42. These nozzles direct a spray of rinsing liquid onto the utensils in mobile rack 17 on rotating turntable 18. Rotating turntable 18 has centrally affixed to its underside a turntable sprocket 44; a roller chain 43 connects turntable sprocket 44 with an output reducer sprocket 45 which is in turn connected to worm gear reducer 46. Worm gear reducer 46 is connected to turntable drive motor 47 by means of "Vee" belt 49. Fluid drive coupling 48 attached to turntable drive motor 47 ensures a smooth power transmittal. A takeup sprocket 50 also engages roller chain 43 to remove any slack in the chain. Roller chain guide 51 encloses roller chain 43 as it passes through the wall of housing/frame 10. Guard 52 encloses "-Vee" belt 49 as a safety precaution.

Turntable 18 is supported by turntable vertical support casters 57 which in turn are attached to vertical caster mount brackets 58 which are in turn bolted to turntable support frame 53. The turntable vertical support casters 57 provide roller supports for the weight of the turntable 19. Also mounted on turntable support frame 53 are turntable side thrust casters 54 which are mounted on side thrust caster mount brackets 55, which are in turn bolted to turntable support frame 53. Side thrust casters 54 provide a roller bearing surface for any horizontal forces imparted to the turntable by roller chain 43.

Turntable 18 has an overhanging lip 56 which forms the contact surface for turntable vertical support casters 57, while the turntable's sidewall is the contact surface for side thrust casters 54.

In operation, mobile wash rack 17, loaded with miscellaneous utensils is rolled over the loading platform 19 onto rotating turntable 18. Door 14 is closed and latched as the machine will not operate while the door is open. The machine will shut itself off automatically should the operator open the door accidentally while the machine is in operation. The operator sets the timers contained in automatic control panel 60 for each cycle, wash, rinse, and steam and then depresses the start button to initiate the automatic cleaning sequence, freeing the operator for other duties.

The duration of each of the cycles—wash, fresh water rinse, and steam—is regulated by means of electrical timers which can be preset to give best results. It has been found on an average that a 2 to 3 minute period of operation for each cycle can suffice to produce sanitized items.

When the operator depresses the start button on control panel 60, wash pump 27 will start and the wash cycle will begin. The pressure provided by wash pump 27 rotates the large wash spray heads 29. These rotating spray heads 29 are situated adjacent rotating turntable 18 and have an axis of rotation at right angles to the axis of rotation of turntable 18.

The large spray arms 31 of spray head 29 spray hot detergent or wash solution under pressure at mobile rack 17.

Simultaneous with the pressing of the start button, turntable drive motor 47 starts and the drive train described hereinabove for turntable 18 transmits rotary power to the turntable 18 turning the same. A rate of rotation of 6 r.p.m. in a clockwise direction has been successfully used in one commercial model of the invention. During the wash cycle, spray heads 29 also rotate in a clockwise direction, as it has been found that best scrubbing results are achieved when the direction of rotation of turntable 18 and spray heads 29 is the same.

The speed of rotation may be controlled via the angular relationship between nozzles 32 and the plane of rotation of the spray arms 31. In some adaptations of the invention it may be desirable to drive rotating nozzles by a means other than the reaction force of the sprays, as for example by a motor. A spray head rotational speed of 15 r.p.m. was successfully used in one commercial model when turntable 18 was rotating at 6 r.p.m.

Although faster or slower rotational speeds for spray heads **29** can be utilized it must be remembered that in reaction driven spray heads any angular change of the nozzles decreases the amount of direct spray reaching the innermost portions of mobile rack **17**. This also decreased the scouring effect achieved through the interrelationship of rotation of both turntable **18** and spray heads **29**.

Upon completion of the wash cycle the wash pump **27** is automatically stopped by means of automatic timer **61** in automatic control panel **60** and the rotating spray heads **29** also stop. This cycle is automatically followed by a hot fresh rinse spray with hot fresh water being sprayed under pressure from rinse nozzles **42** of fresh rinse pipes **41** thoroughly rinsing the utensils in mobile rack **17** as turntable **18** rotates with the mobile rack thereon.

Upon completion of the rinse cycle a similar series of steps automatically takes place during which the utensils are blown off with steam. This cycle is optional however and in certain industrial operations can be eliminated.

Upon the completion of the steam blowoff cycle turntable **18** stops and the door can then be opened and the articles removed.

The above description of the invention has described one form of the invention, it should be understood that there are other variations of the invention and additions thereto, such as: additional rotating wash spray heads being mounted in the ceiling of housing/frame **10**; the addition of rotating nozzles in the fresh rinse system, plus the use of a variety of rotating wash sprays, nozzles. Additionally, variations in the direction of rotation of the turntable and the rotating wash sprays can be used.

In this connection, it should be understood that the use of the rotating wash spray heads provides a system commercially constructed for approximating that portion of the method described herein which consists in causing the streams of wash fluid to track with spots on the articles at some point during the articles' rotation. Since the velocities of the spray nozzles in the plane parallel to the axis about which the articles are rotated vary, dependent upon, among other things, the placement of the spray nozzles along one of the radial arms from the junction box, such that the tracking by a stream, from a nozzle positioned near the junction box, will take place on an article at different point during its rotation than will the tracking by a stream from a nozzle more distant from the junction box. If the radial arms are made longer as compared to the height of the articles being cleaned, this effect is only a small one. In some commercial applications, substantial variation from the theoretical ideal can be tolerated.

I claim:

1. The method of washing articles, comprising the steps of rotating articles to be washed, throwing streams of washing fluid against areas on the surfaces of said articles, simultaneously varying the incident angles of said streams while particular streams are being thrown against particular areas on the surfaces of articles, and causing the area of incidence of a particular stream of washing fluid to track with the rotating surface of the article at one point during the rotation of said article to scour said area of incidence for a finite period of time with a constantly varying angle of incidence.

2. A method of washing an article comprising the steps of rotating at least one article to be washed, directing at least one moving stream of wash liquid against the article so that the stream impinges on a portion of the surface of the article, and controlling the movement of the stream with respect to the rotation of the article so that the portion of the surface on which the stream impinges rotates with the surface thus scouring the portion with a stream of wash liquid as the portion tracks with the surface of the article.

3. A method of washing articles in accordance with claim **2** and further including the step of simultaneously varying the angle of incidence of the stream upon the portion as the portion rotates with the surface of the rotating article thus scouring the portion with a stream of wash liquid having a constantly varying angle of incidence as the portion tracks with the surface of the article.

4. A method of washing articles in accordance with claim **3** in which the stream of wash liquid is a rotating stream.

* * * * *