Feb. 11, 1969 R. A. YATUNI 3,426,773

CASE WASHER APPARATUS

Filed June 22, 1966 Sheet 1 of 3

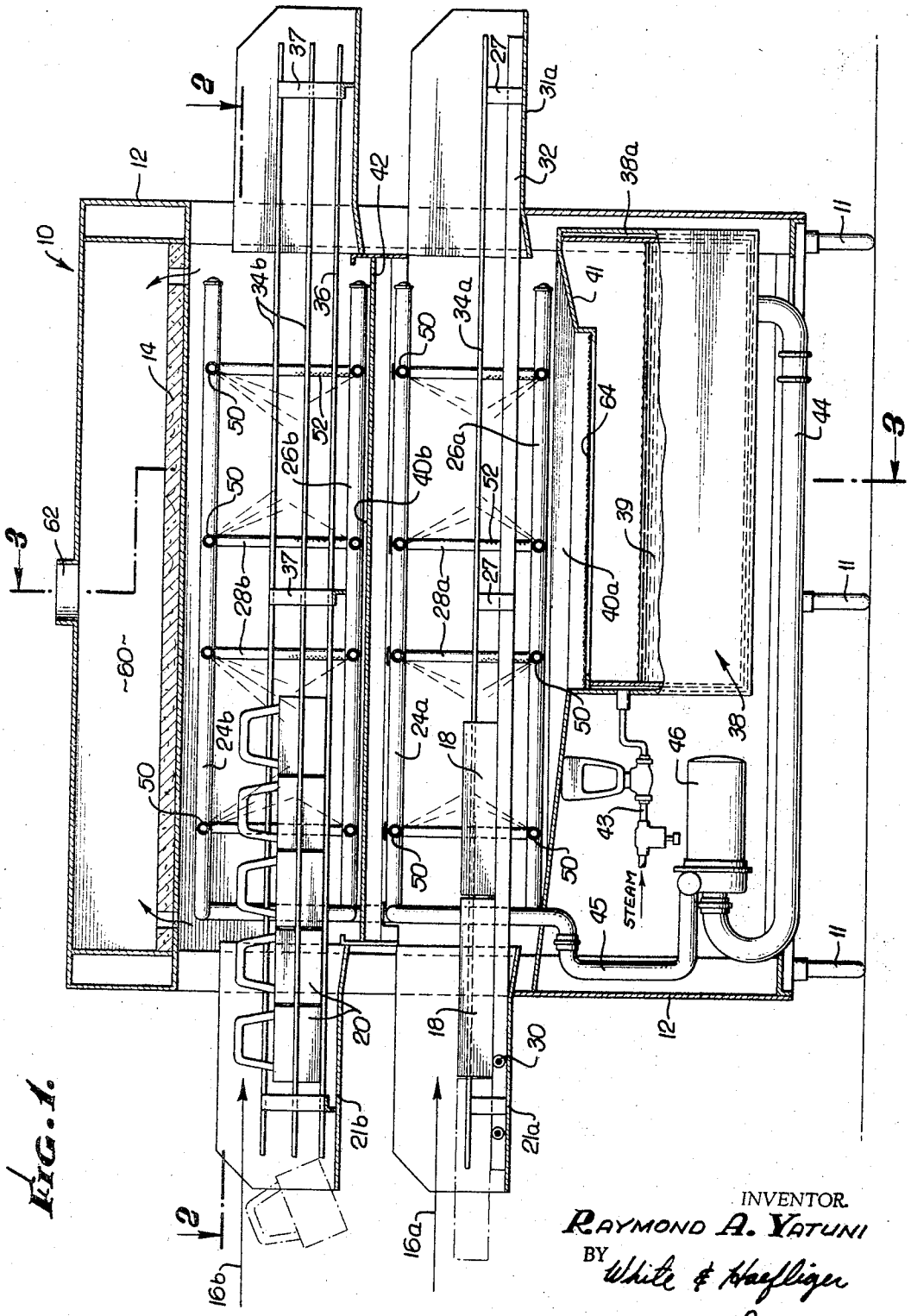


FIG. 1.

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Filed June 22, 1966 Sheet 2 of 3

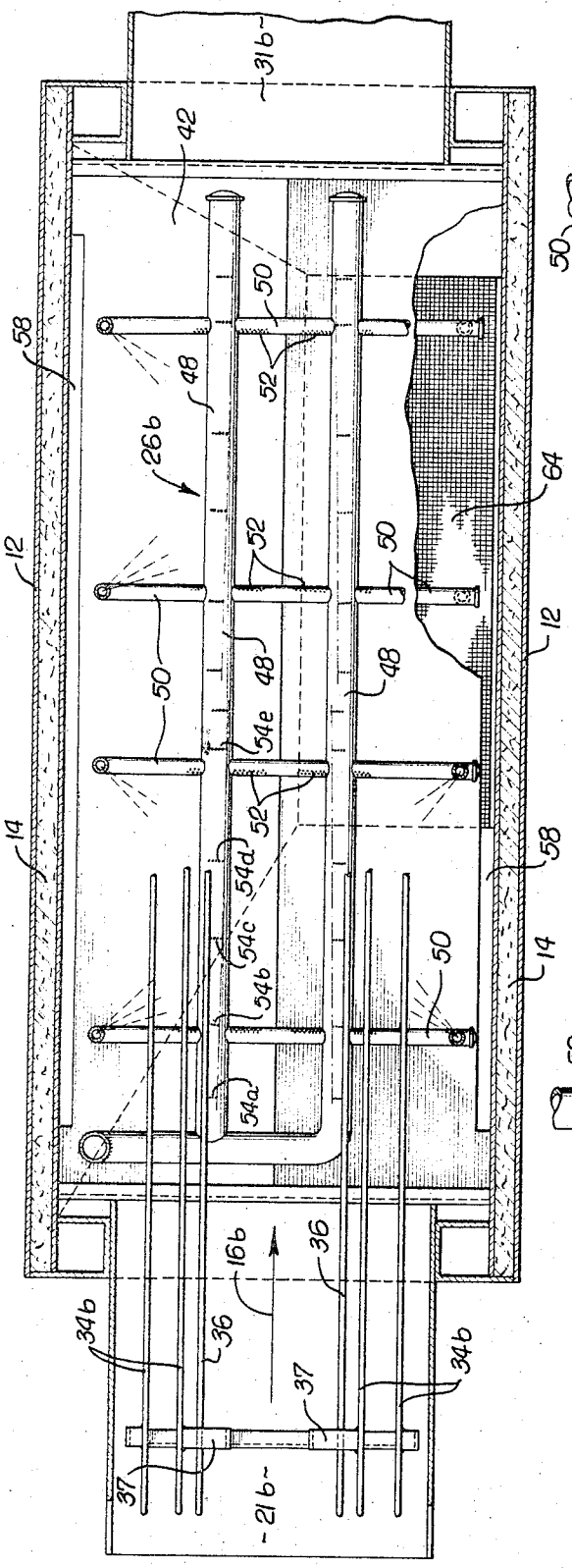


FIG. 2.

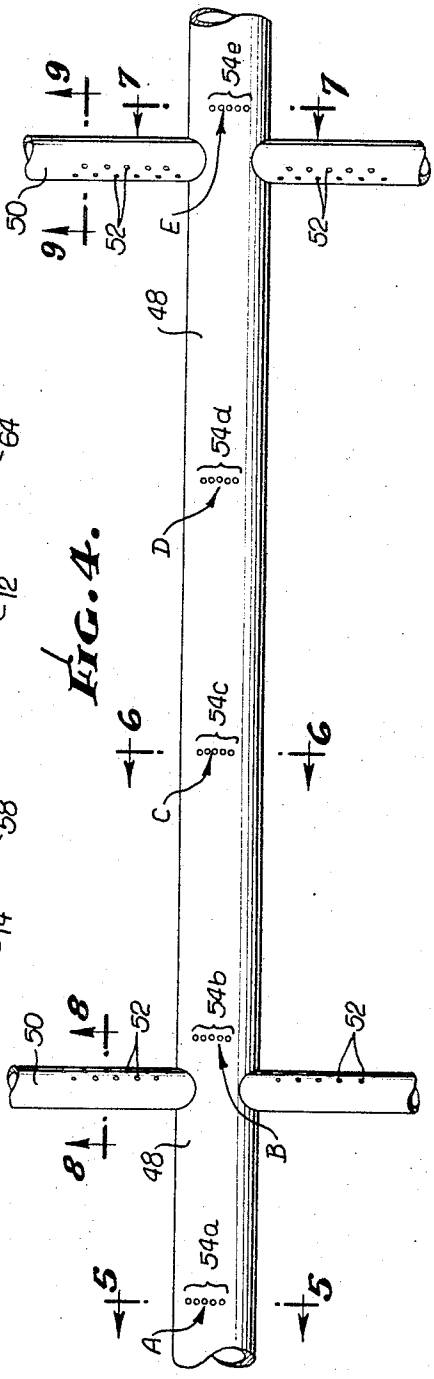


FIG. 4.

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CASE WASHER APPARATUS

Filed June 22, 1966 Sheet 3 of 3

FIG. 3.

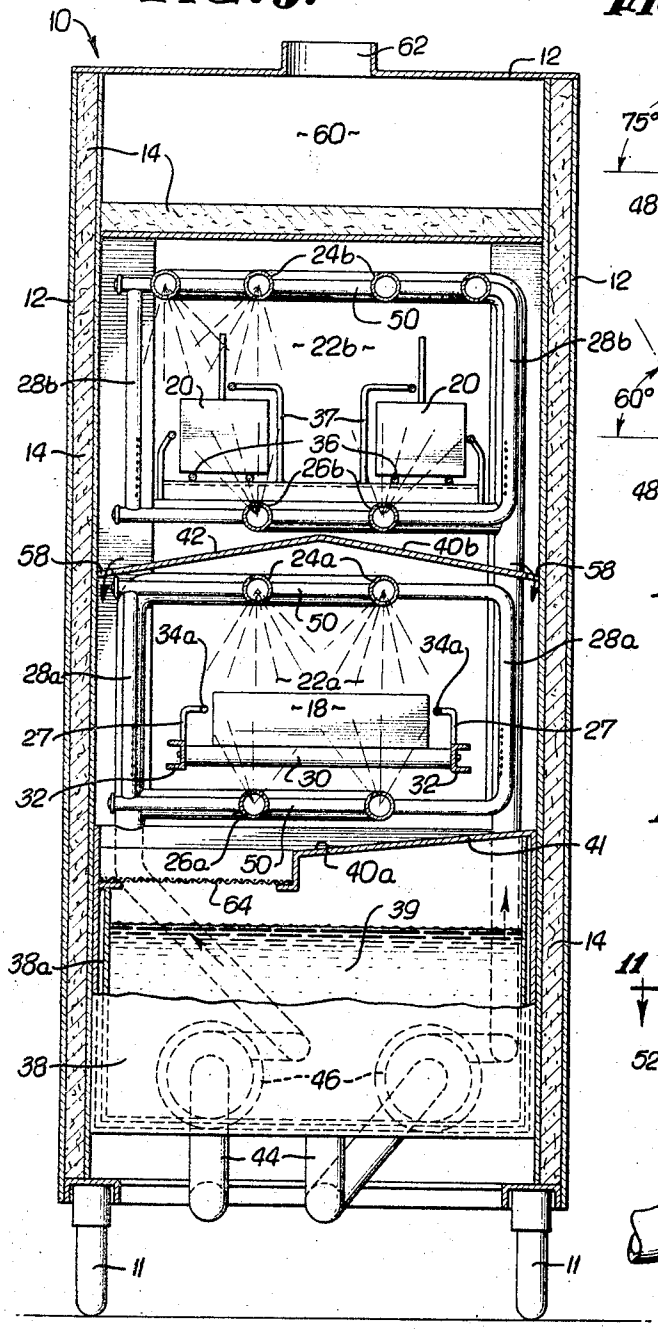


FIG. 5.

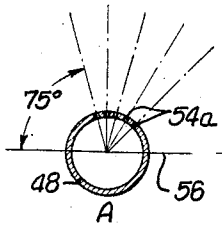


FIG. 6.

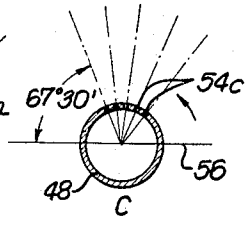


FIG. 7.

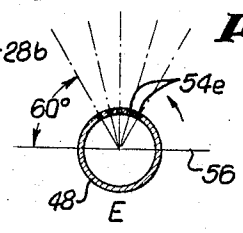


FIG. 8.



FIG. 9.



FIG. 10.

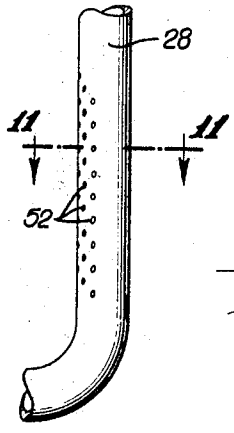
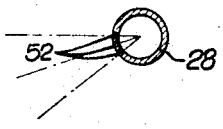


FIG. 11.



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United States Patent Office 3,426,773 Patented Feb. 11, 1969

3,426,773

CASE WASHER APPARATUS

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Filed June 22, 1966, Ser. No. 559,619
U.S. Cl. 134—148 11 Claims
Int. Cl. B67c 1/00; B08b 3/08, 9/08

ABSTRACT OF THE DISCLOSURE

A case washer of the recirculating type having a manifold for jetting cleaning solution against cases to be washed, said manifold being constructed to direct a plurality of cleaning solution spray patterns which vary transversely of the path of advancement of the cases through the washer.

This invention has to do with washer apparatus for the cleaning of cases and carriers, particularly plastic soda and beer cases and the interfitting six pack carriers sometimes associated with such cases. More particularly, the invention is concerned with case washer apparatus affording an increased number of different patterns of spray impingement along a normal wash cycle length to enable washing action of increased efficiency by providing between successive impingements both adequate cleaning solution dwell time on the case surfaces and adequate drainage time, so that scrubbing action from successive impingements is not masked by residual surface water.

The invention provides a case washer apparatus of the recirculating type having a manifold for jetting cleaning solution against cases to be washed, which manifold is constructed to direct a plurality of cleaning solution spray patterns which diverge transversely of the path of advancement of the cases through the apparatus and which patterns vary transversely of the path.

For many years bottled beverages such as soda and beer, have been distributed in cases of 12 or 24 units. These units have in the past been carried in wooden boxes which were seldom cleaned. The advent of new plastic materials, particularly rubber modified styrene polymers and olefin polymers, particularly high density polyethylenes, which combine attractive colors, low weight, high rigidity and greater durability than wood has provided bottlers with a case material of superior properties. Because of the generally light, more attractive coloration of these cases and their longer service life, cleaning of the cases between trips is now an important consideration. Many types of soil are encountered in normal use and despite the general inertness of these plastic surfaces to chemicals, a combination of case surface smoothness characteristics and material electrostatics makes soiling a common occurrence.

It is an object, accordingly, of the present invention to provide a case washer apparatus useful to remove stubborn soil from cases. It is a further object to provide apparatus which separately washes cases and interfitting six pack carriers, also of plastic, commonly used with soda cases. It is a further object to provide a case washer apparatus which over an ordinary length of cleaning path provides a varying pattern of spray thereby to increases cleaning stripes, that portion of case surface directly impinged by the cleaning solution jetted from the apparatus and greatly to reduce holidays or areas of non-impingement.

Accordingly, the invention provides a case washer apparatus comprising an elongated housing having a chamber therein, a sump in the bottom of the housing below the chamber, means for supporting a succession of cases for advancement through the chamber, means for pumping

cleaning solution from the sump and means for jetting the solution against the cases in spray patterns varying transversely of the path of advancement of the cases, wherein a particular embodiment of the jetting means includes a manifold provided with a plurality of jetting orifices arranged to spray streams which diverge transversely of the chamber, which jetting orifices are successively angularly displaced along the manifold at least about one degree.

The invention will now be more fully described as to an illustrative embodiment thereof in conjunction with the attached drawings in which:

FIG. 1 is a side view in section of the case washer apparatus;

FIG. 2 is a view of the apparatus taken on line **2—2** in FIG. 1;

FIG. 3 is a view taken on line **3—3** in FIG. 1;

FIG. 4 is an enlarged fragmentary view of a horizontal manifold of the apparatus;

FIG. 5 is a cross sectional view of the horizontal manifold taken on line **5—5** in FIG. 4 showing a first spray stream angle;

FIG. 6 is a view like FIG. 5 showing a second counterclockwise rotated spray stream angle; taken on line **6—6** in FIG. 4;

FIG. 7 is also a view like FIG. 5 but taken on line **7—7** in FIG. 4 showing a further counterclockwise rotated spray stream angle;

FIG. 8 is further cross-sectional view of the horizontal manifold taken on line **8—8** in FIG. 4;

FIG. 9 is a view similar to FIG. 8 but taken on line **9—9** in FIG. 4;

FIG. 10 is an enlarged fragmentary view of the vertical manifold; and

FIG. 11 is a cross-sectional view taken on line **11—11** in FIG. 10.

Referring particularly to FIGS. 1, 2 and 3, the case washer is shown to comprise a generally rectangular structure, housing **10**, standing on feet **11** having walls **12** made of sheet metal or other suitable material and desirably provided wtih insulation **14** to minimize cleaning solution heat loss. Two parallel horizontal paths indicated at **16***a* and **16***b* are provided through the housing for travel of cases **18** and carriers **20** respectively, Paths **16***a* and **16***b* extend through chambers **22***a* and **22***b* in the housing. Within these chambers are arranged cleaning solution jetting devices including overlying horizontal manifolds **24***a* and **24***b*, underlying horizontal manifolds **26***a* and **26***b* and vertical manifolds **28***a* and **28***b*. A succession of cases **18** is urged by means not shown, such as by hand or by automatic conveying system across apron **21***a* into chamber **22***a* and along path **16***a*. The cases are supported during advancement along path **16***a* on track **30**, suitably rollers or sheet metal strips secured between supports **32** and spaced to allow spray streams therebetween. A rail **34***a* supported by member **27** on either side of the track **30** serves to guide the cases through the chamber. Case take-off, once through the washer, from apron **31***a* is by hand or automatic handling equipment (not shown).

Superimposed above chamber **22***a* is chamber **22***b*. Carriers **20** are urged across apron **21***b* onto path **16***b* within the chamber by means, not shown, such as by hand or by an automatic conveying system. The carriers are supported during advancement along path **16***b* on rails **36** on which the carriers are maintained by guide rails **34***b*, supported by member **37**, against lateral shifting as well as upward vertical movement from the force of cleaning solution impingement from manifold **26***b*.

Cleaning solution is maintained in sump **38**, a steam jacketed sheet metal tank in the bottom of housing **10** below the chambers **22***a* and **22***b*. Drain surfaces **40***a*

of tray **41** below the lower chamber and **40***b* on baffle **42** between chambers direct return flow of used cleaning solution to the sump for recirculating following reheating and recharging with detergent if necessary. The cleaning solution, heated to elevated temperatures by steam introduced into jacket **42** along line **43** is drawn from the sump along lines **44** and pumped along lines **45** by pump **46** to the manifolds where the cleaning solution is jetted, as hereinafter described.

As best shown in FIG. 2, the horizontal manifold **26***b*, which is typical of the horizontal manifolds of the present invention comprises longitudinally extending pipe sections **48** to underlie (or overlie) the path of advancement of the cases or carriers. Although a pair of pipe sections are shown, one or three or more pipe sections can be employed. Transverse pipe sections **50** are interconnected to longitudinal pipe sections to further distribute the cleaning solution. As best shown in FIG. 1, vertical manifolds **28***a* and **28***b* are also provided intercommunicating with the horizontal manifolds to impinge cleaning solution laterally on cases or carriers.

The manifolds in the present invention jet the pumped cleaning solution through a plurality of small orifices **52** which, in the vertical manifolds, are uniformly spaced in parallel rows for maximum drilling feasibility and which, in the horizontal manifold, particularly in the lonigtudinal pipe sections thereof are carefully arranged as to interval, pitch and drill angle to result in a predetermined pattern of spray streams for maximum effectiveness.

As outlined above, cleaning of difficultly washable surfaces such as molded olefin polymer surfaces which carry tenacious soils imposes special requirements on washing apparatus. Wash cycles, over any reasonable length of path where streams are impinged in an unvarying sequence, provide too little dwell time between successive impingements for effective cleaning. Moreover on upward facing horizontal surfaces, excess retained solution can impede the scrubbing action otherwise imparted by the direct contact of the high velocity spray stream and the bare surface of the case or carrier.

Accordingly, this invention provides spray stream patterns and spray cycle intervals which enable both adequate dwell time for removal of soil from plastic surfaces and adequate drainage time on ventral surfaces to permit impingement of subsequent streams directly onto the soiled case surface.

The basic means for thus controlling dwell interval and facilitating scrubbing action on cases is the horizontal manifold **26***b*. Referring to FIGS. 4, 5, 6 and 7, this manifold is ported at A, B, C, D and E with ranks of five apertures **54** which jet the cleaning solution. It will be noted that the midpoint of each rank shifts with respect to the axis of the pipe **48** in proceeding from rank A through ranks B, C and D to rank E. The effect of this shift on spray pattern dispersion angle is seen in FIGS. 5, 6 and 7. Rank A (FIG. 5), having apertures **54***a* each spaced 15 degrees apart, has its leftmost aperture 75° from the horizontal **56**. In rank C (FIG. 6) the aperture pattern is rotated 7°30′ counterclockwise so that the leftmost aperture **54***c* is 67°30′ from the horizontal. In rank E (FIG. 7), the pattern is rotated an additional 7°30′ counterclockwise, so that the leftmost aperture **54***e* is 60° from the horizontal. The intermediate ranks B and D are at intermediate angular displacement. Following rank E the cycle is repeated or extended depending on the interval required in the washing problem.

Referring now to FIG. 3, the spray pattern interrelationship is illustrated. It will be noted the adjacent longitudinal members **48** are spaced and/or ported to jet not quite intersecting spray streams and preferably to impinge jets onto contiguous portions of the case or carrier surface. In this manner the cleaning zones or stripes are coterminous and no uncleaned zones or holidays remain after a wash cycle.

To illustrate the advantageous arrangement of jets in accordance with the present invention over previous proposals an array of **25** jets will be considered. In the prior art these jets are arranged uniformly in five ranks of five files ranks being transverse to the manifold longitudinal axis and files being parallel to the longitudinal axis. With this rectilinear arrangement, each rank of jets will impinge only replicate stripes of cleaning solution on the case advancing therepast since the path of advancement of the case is along the lonigtudinal axis of the manifold and the case extends constantly equidistantly from the sides thereof. Replication of cleaning strips by successive ranks over a single cycle is avoided in the present invention by successive ranks being rotationally indexed e.g. by an incremental radial angle Y_I, and distances between ranks being selected so as to have, in a preferred embodiment, no duplication of jet angle and consequently no duplicationof a cleaning stripe within a cycle. In a 25 jet array, then, the present invention provides 25 different, closely spaced and parallel cleaning stripes rather than only 5 replicated cleaning stripes. The holidays between lines of impingement of individual jets then are reduced to ⅕ those occurring with replicating patterns.

The jets can be variously arranged to afford these benefits. As illustrated in the drawing, vertical ranks of, preferably, equal size jets are spaced along the manifold pipe, preferably but not necessarily equidistantly for the length of one cycle L_c on the manifold pipe.

Optionally, the ranks can be rotated to an angle R less than 90°. The effect of such rotation is to provide greater distances between adjacent jets to facilitate fabrication but to retain the multiplicity of cleaning stripes.

Further rotating of the ranks, ultimately to files, can be accomplished, but in so rotating, the width of holidays narrows only until a certain angle, R_{crit}, is reached and then the holidays increase in width until the undesirable prior art pattern is reached. Rotation of ranks, therefore, should be no greater than the angle R_{crit}. At this angle the ranke are alined to define a continuous, helical line of jets.

Engineering considerations determine the number of jets per cycle (assumed to be equal in size) and this number, N_c, is generally in the range of 10–170. The number of cycles and the radial angle Y_c, of coverage by the complete cycle is similarly determined by engineering factors. In general, Y_c will be in the range of 10–170°. The radial index angle, Y_I, then between banks is determined from the relation

$$Y_I = \frac{Y_c}{N_c - 1}$$

and is generally in the range of 1–10° and preferably 2–3°.

For a given number of jets per cycle the number of ranks, B, and the number of files, J, can be factored out. In factoring $N_c = BJ$, the closest pair of values for B and J, preferably equal values, is selected. For example in Mathematical Tables, 7th Ed., Chemical Rubber Publishing Co. (1941) pp. 208–215, prime numbers between 10 and 170 are shown to be widely spaced with never two adjacent. Should, in a particular instance, the N_c following from engineering requirements be a prime, unfactorable number, N_c can be altered, e.g. ±5 to a conveniently factorable value without unduly affecting the unit performance.

To illustrate there follows four specific examples in which a computation for various values of N_c was made for values of N_c of

Example 1	25
Example 2	24
Example 3	32
Example 4	96

assuming the manifold length, L_c, to be 36 inches and its O.D., D, to be 1.5 inches and R_{crit} thus to be

$$R_{crit}=\text{arccot}\frac{114.6L_c}{Y_c\cdot D}=\text{arccot}\frac{2750}{Y_c}$$

Optional solutions where possible are indicated in each example by lower case letters.

EXAMPLE 1

$N_c=BJ=25$	5×5
Y_c	72°
Y_I	3°
B	5
J	5
$Y_J=BY_I$	15
$Y_B=(J-1)Y_J$	60
$(B-1)Y_I$	12
$Y_B+(B-1)Y_I=Y_c$	72
R_{crit}	1.5°
Pitch angle	88.5°

EXAMPLE 2

$N_c=BJ=24$	$2^3.3$
Y_c	46°
Y_I	2°

	a	b	c	d	e	f	g
B (ranks)	1	2	3	4	6	8	12
J (files)	24	12	8	6	4	3	2
$Y_J=BY_I$	2	4	6	8	12	16	24
$Y_B=(J-1)Y_J$	46	44	42	40	36	32	24
$(B-1)Y_I$	0	2	4	6	10	14	22
$Y_B+(B-1)Y_I=Y_c$	46	46	46	46	46	46	46

$R_{crit}=.96°$.
Pitch angle=89.04°.

EXAMPLE 3

$N_c=BJ=32$	2^5
Y_c	93°
Y_I	3°

	a	b	c	d	e
B (ranks)	1	2	4	8	16
J (files)	32	16	8	4	2
$Y_J=BY_I$	3	6	12	24	48
$Y_B=(J-1)Y_J$	93	90	84	72	48
$(B-1)Y_I$	0	3	9	21	45
$Y_B+(B-1)Y_I=Y_c$	93	93	93	93	93

$R_{crit}=1.94°$.
Pitch angle=88.06°.

EXAMPLE 4

$N_c=BJ=96$	$2^5.3$
Y_c	95°
Y_I	1°

	a	b	c	d	e	f	g	h	i	j	k	l
B (ranks)	1	2	3	4	6	8	12	16	24	32	48	96
J (files)	96	48	32	24	16	12	8	6	4	3	2	1
Y_J	1	2	3	4	6	8	12	16	24	32	48	96
Y_B	95	94	93	92	90	88	84	80	72	64	48	0
$(B-1)Y_I$	0	1	2	3	5	7	11	15	23	31	47	95
$Y_B+(B-1)Y_I=Y_c$	95	95	95	95	95	95	95	95	95	95	95	95

$R_{crit}=1.98°$.
Pitch angle=88.02°.

The lateral portions of the horizontal manifold **24** or **26***a* and *b*, namely pipes **50** are provided with angularly displaced jets **52** aimed at the cases or carriers as can be seen in FIGS. 4, 8 and 9 to provide additional cleaning solution impingement.

Vertical manifolds **28***a* and **28***b* are positioned throughout the chamber to jet cleaning solution against the sides of the cases (and carriers, if a two level apparatus). The arrangement of jetting apertures **52** in the vertical manifold is not critical, with any convenient arrangement offering a multiplicity of jetting streams which diverge to give a plurality of scrubbing impingements on the sides of the case able to be used. A typical vertical manifold **28** is shown in FIG. 10 with apertures **52**, arranged as shown in FIG. 11.

In operation of the apparatus, sump **38** is partly filled with aqueous detergent cleaning solution **39**. Steam is introduced into the sump jacket **42** along line **43** to heat the water to suitable temperature, e.g. 140° F. Pumps **46** pump the cleaning solution through the jetting system including vertical manifolds **28***a* and *b* longitudinal horizontal manifold pipes **48** and lateral horizontal manifold pipes **50**. As clearly shown in FIGS. 1 and 3, cleaning solution is directed at the underside and topside of the cases **18** and carriers **20** from the horizontal manifold pipes. Similarly, cleaning solution is jetted from the vertical manifolds onto the case sides. Jetted solution in the superposed second chamber **22***b* falls from the carrier surfaces onto baffle **42** supported between the upper and lower chambers to prevent used cleaning solution from falling on the cases below and to divert the solution through clearances **58** to the sump. It will be noted no insulation is used in the baffle; this enables good heat transfer between the chambers and thus warmer, more effective cleaning solution. Steam rising from the cleaning solution is collected in vapor space **60** and vented to the atmosphere through stack **62**.

Used solution from the superposed chambers cascades down the interiors of walls **12** and with used solution from the lower chamber is collected on tray **41** and returned to the sump through screen **64** where solid matter is separated. In the sump the cleaning solution is reheated or recharged as necessary for recirculation to the jetting devices.

I claim:

1. Case washer apparatus comprising an elongated housing having a chamber therein, a sump in the bottom of the housing below the chamber, means supporting a succession of cases for advancement along a longitudinally extending path through the chamber, means for pumping cleaning solution from the sump and means for jetting the solution against the cases, successive jetting means being relatively angularly disposed to at least about 1° and not less than a predetermined critical angle whereby spray patterns are successively varied transversely of the path of advancement of the cases.

2. Case washer as claimed in claim **1** in which the means for jetting the cleaning solution comprises a manifold overlying the path.

3. Case washer as claimed in claim **2** in which a plurality of manifolds overlie the path to jet streams of cleaning solution defining a multiplicity of cleaning stripes on the case surface.

4. Case washer as claimed in claim **2** in which an additional manifold is provided underlying the path.

5. Case washer as claimed in claim **1** including also a superposed second chamber housing means for advancing a succession of carriers through the second chamber and means for pumping cleaning solution from the sump and means for jetting the solution against the carriers.

6. Case washer as claimed in claim **1** in which the cleaning solution impinged on the cases drains into the sump for recirculation.

7. Case washer as claimed in claim **6** in which the means for jetting the cleaning solution comprises a manifold overlying the path.

8. Case washer as claimed in claim **7** in which a plurality of manifolds is provided each having a plurality of jetting orifices arranged to spray streams which define a multiplicity of contiguous stripes on the case vertical surfaces.

9. Case washer as claimed in claim **8** in which the jetting orifices are grouped into a series of ranks and successively are progressively angularly displaced between 1°

and 3° to vary the spray pattern of the cleaning solution transversely of the chamber along the path of case advancement.

10. Case washer as claimed in claim **8** including also a superposed second chamber having therein means for supporting a succession of carriers for advancement through the chamber and means for pumping cleaning solution from the sump and means for jetting the solution against the carriers.

11. Case washer as claimed in claim **10** including also guide means along the carrier path to retain the carriers on said path against the force of impinging cleaning solution.

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ROBERT L. BLEUTGE, *Primary Examiner.*

U.S. Cl. X.R.

134—152, 165, 199

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,426,773 February 11, 1969

Raymond A. Yatuni

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 44, "disposed" should read -- displaced --; line 45, cancel "not".

Signed and sealed this 24th day of March 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents