July 20, 1948. H. A. THURN 2,445,371

WASHING MACHINE CONVEYER

Filed June 12, 1944 8 Sheets-Sheet 1

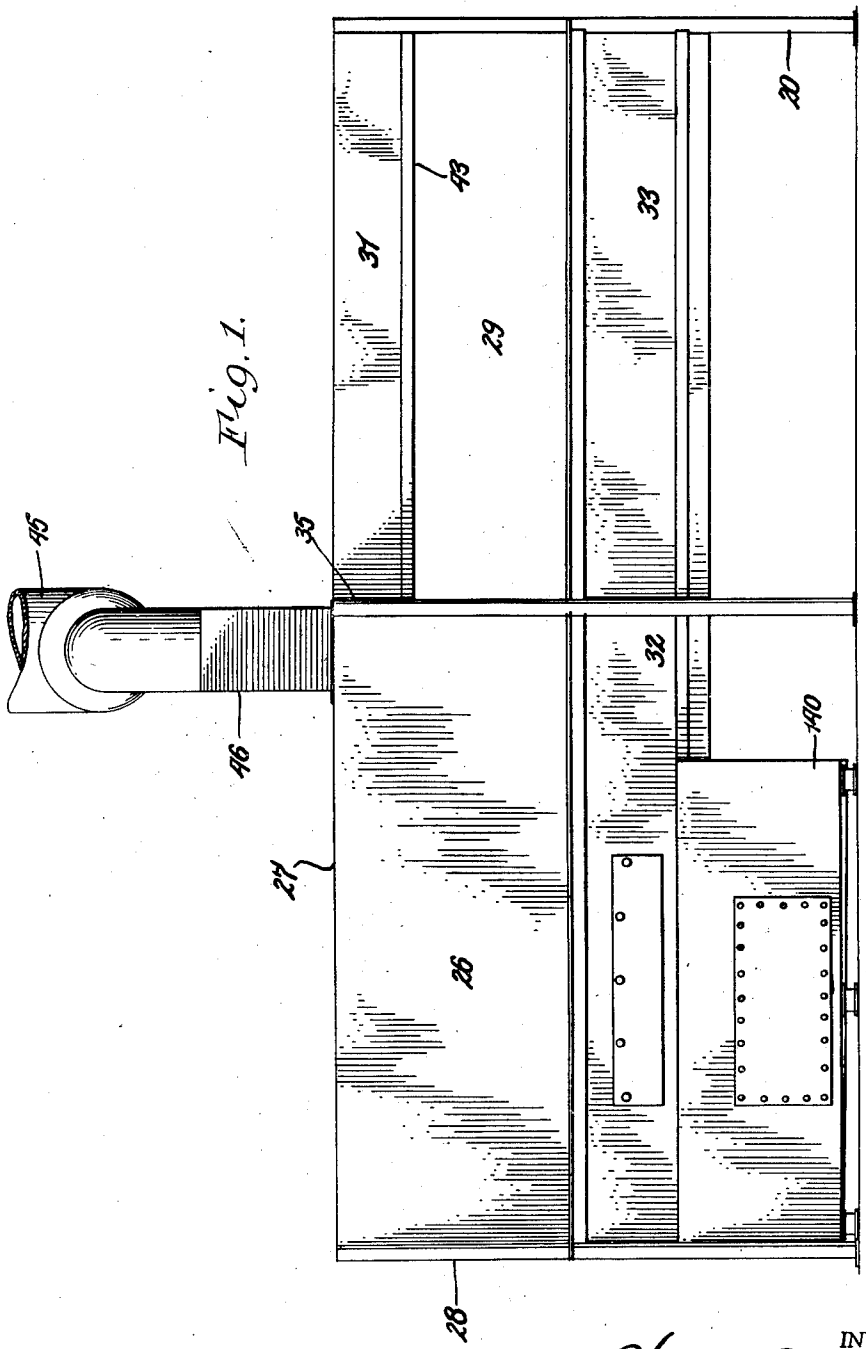


Fig. 1.

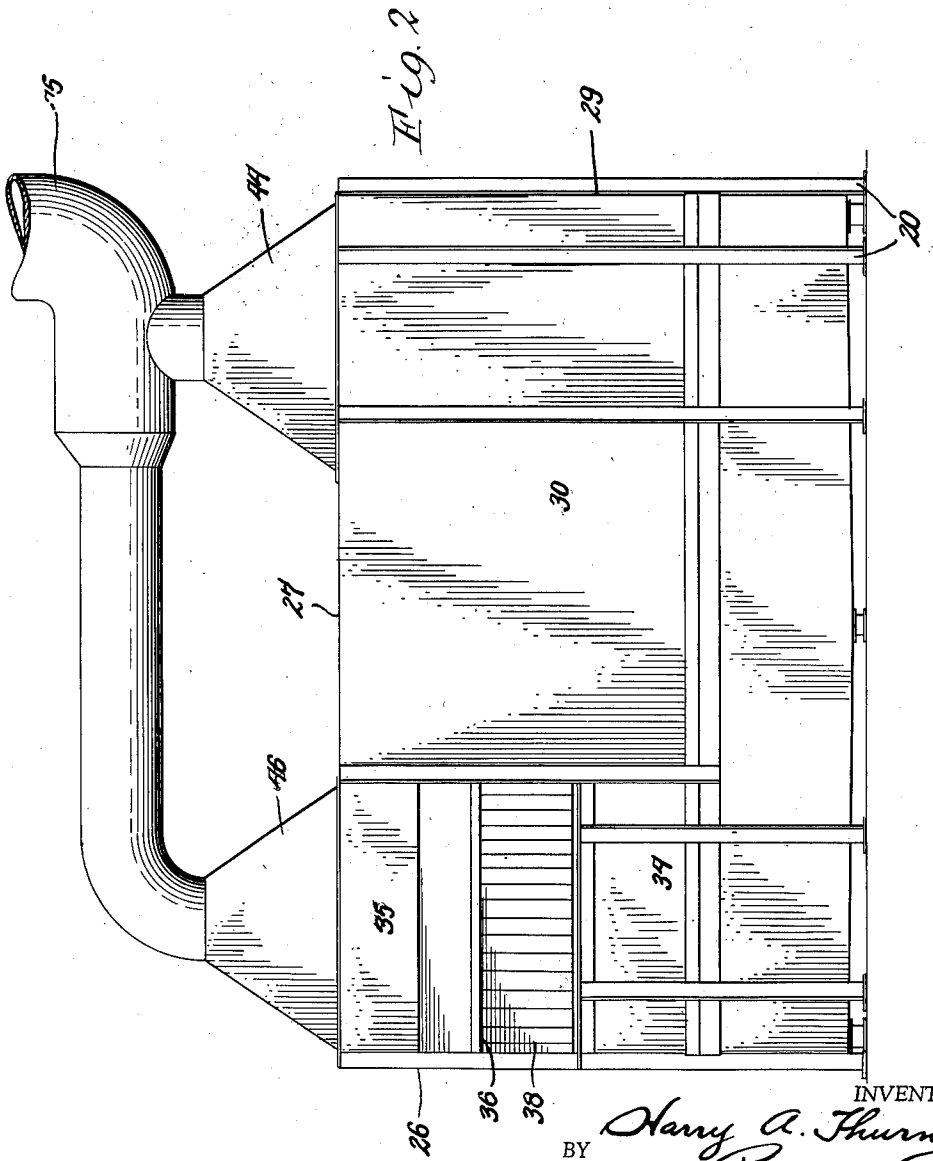
INVENTOR.
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Fig. 2



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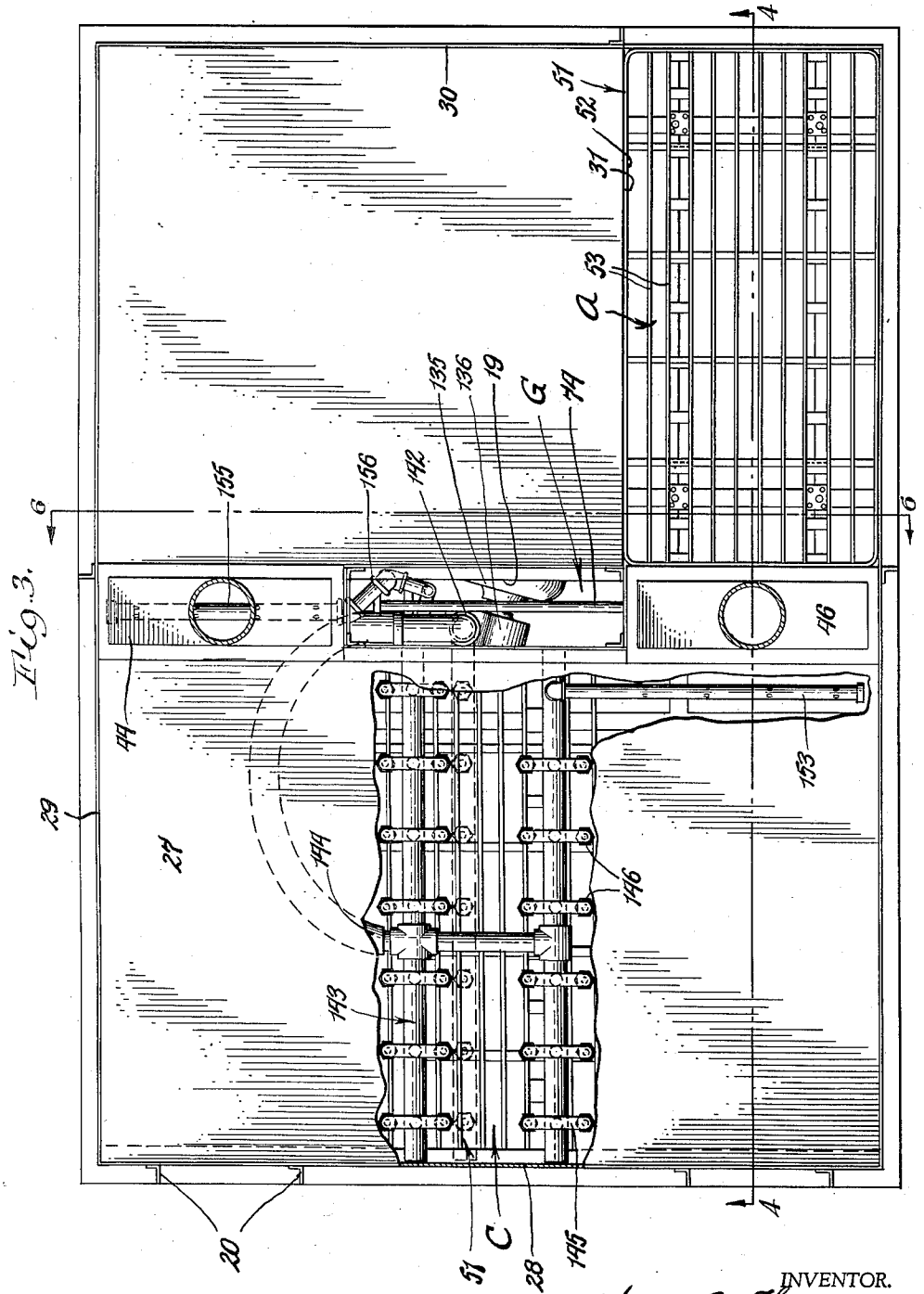


Fig. 3.

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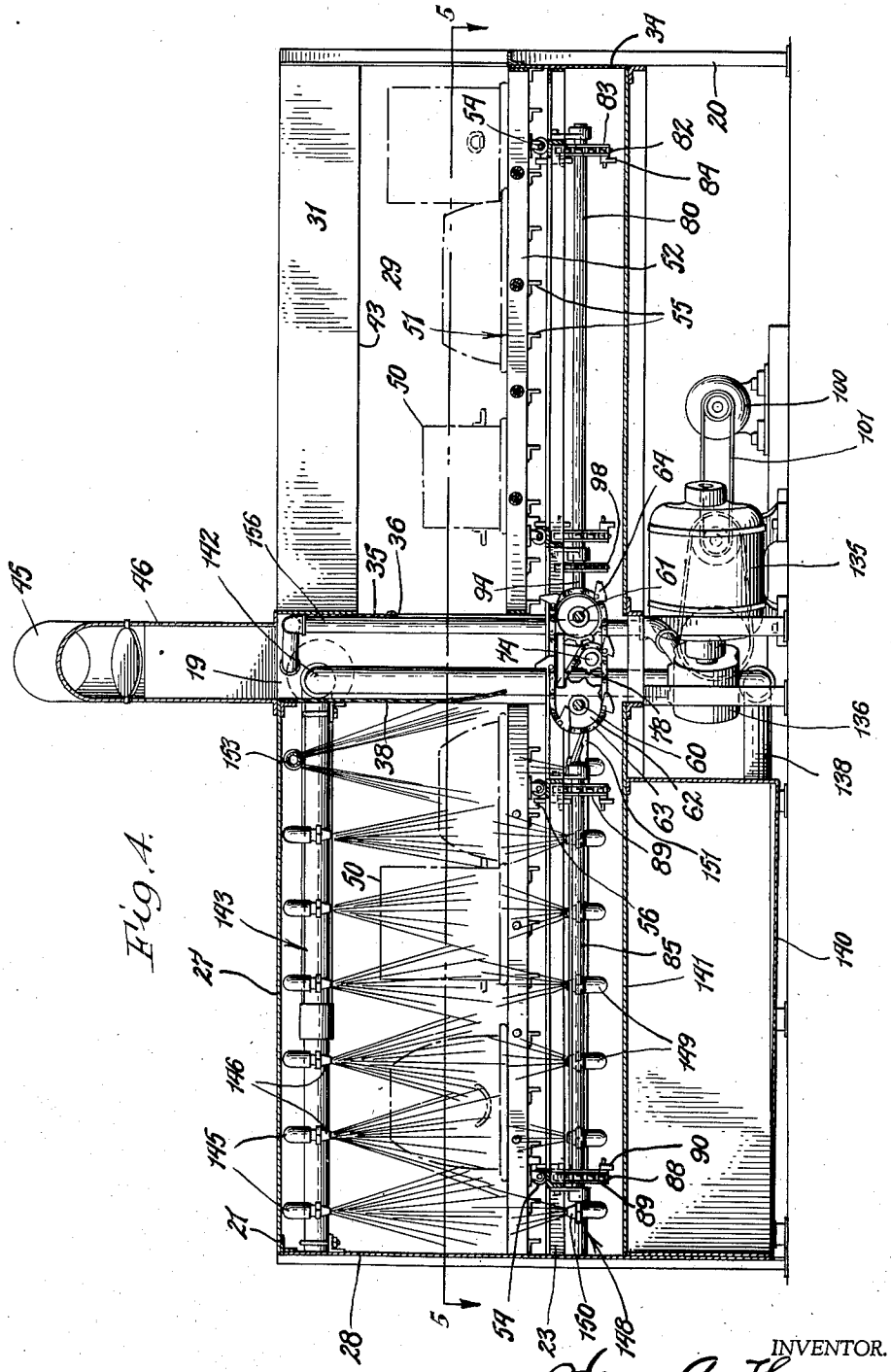


Fig. 4.

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WASHING MACHINE CONVEYER

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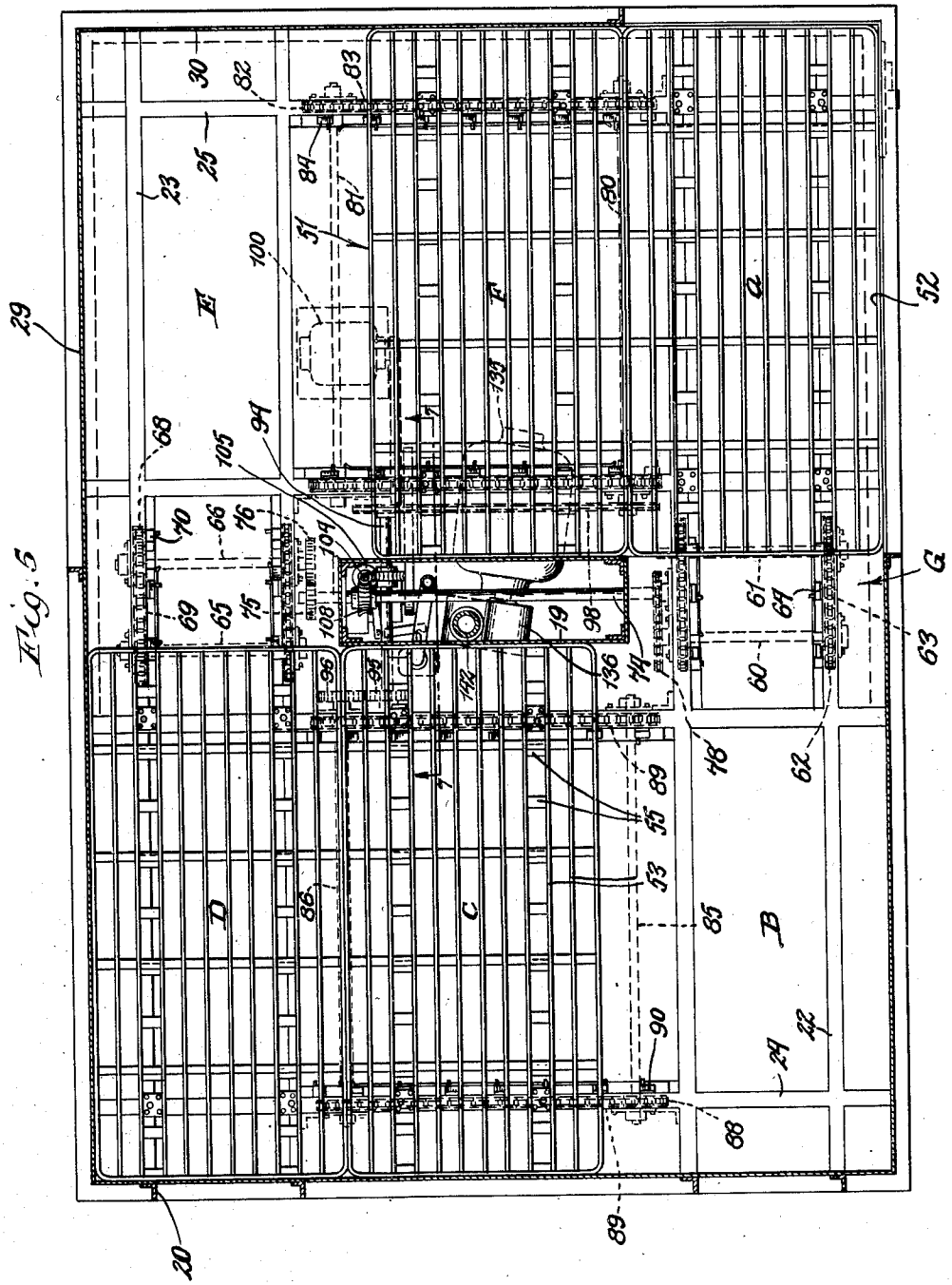


Fig. 5

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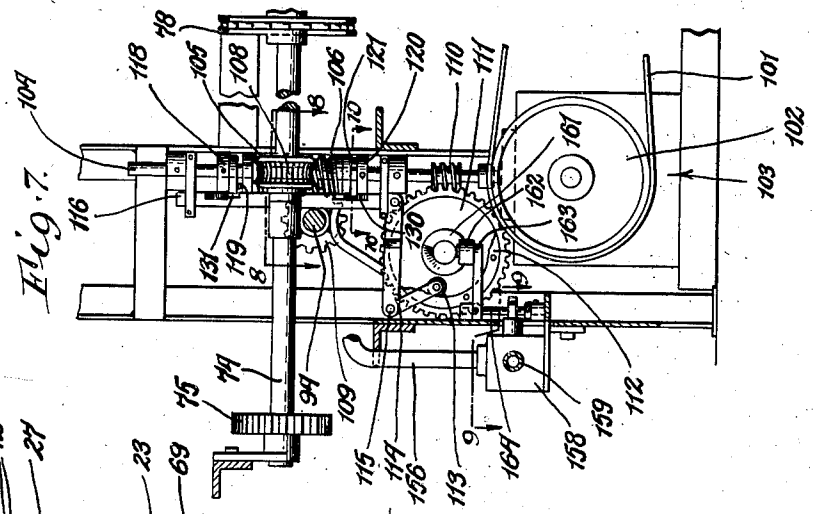


Fig. 7.

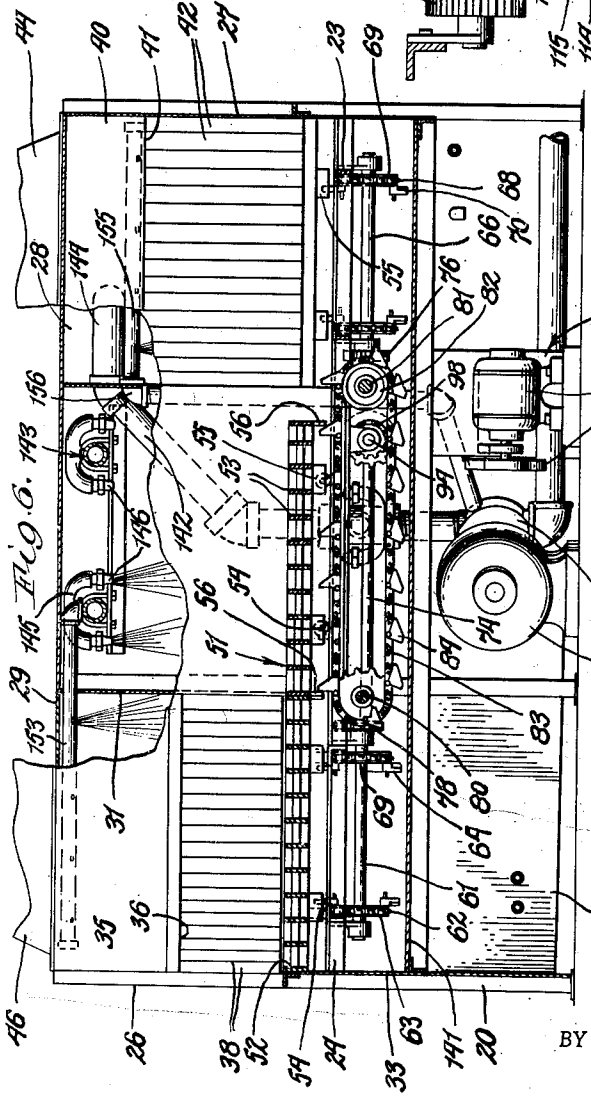


Fig. 6.

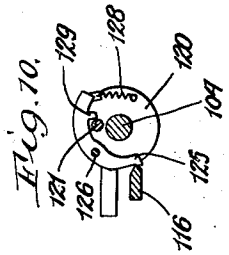


Fig. 10.

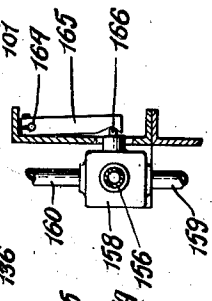


Fig. 9.

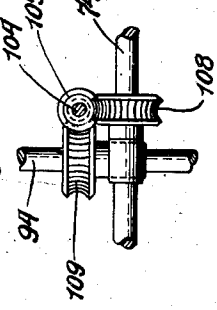


Fig. 8.

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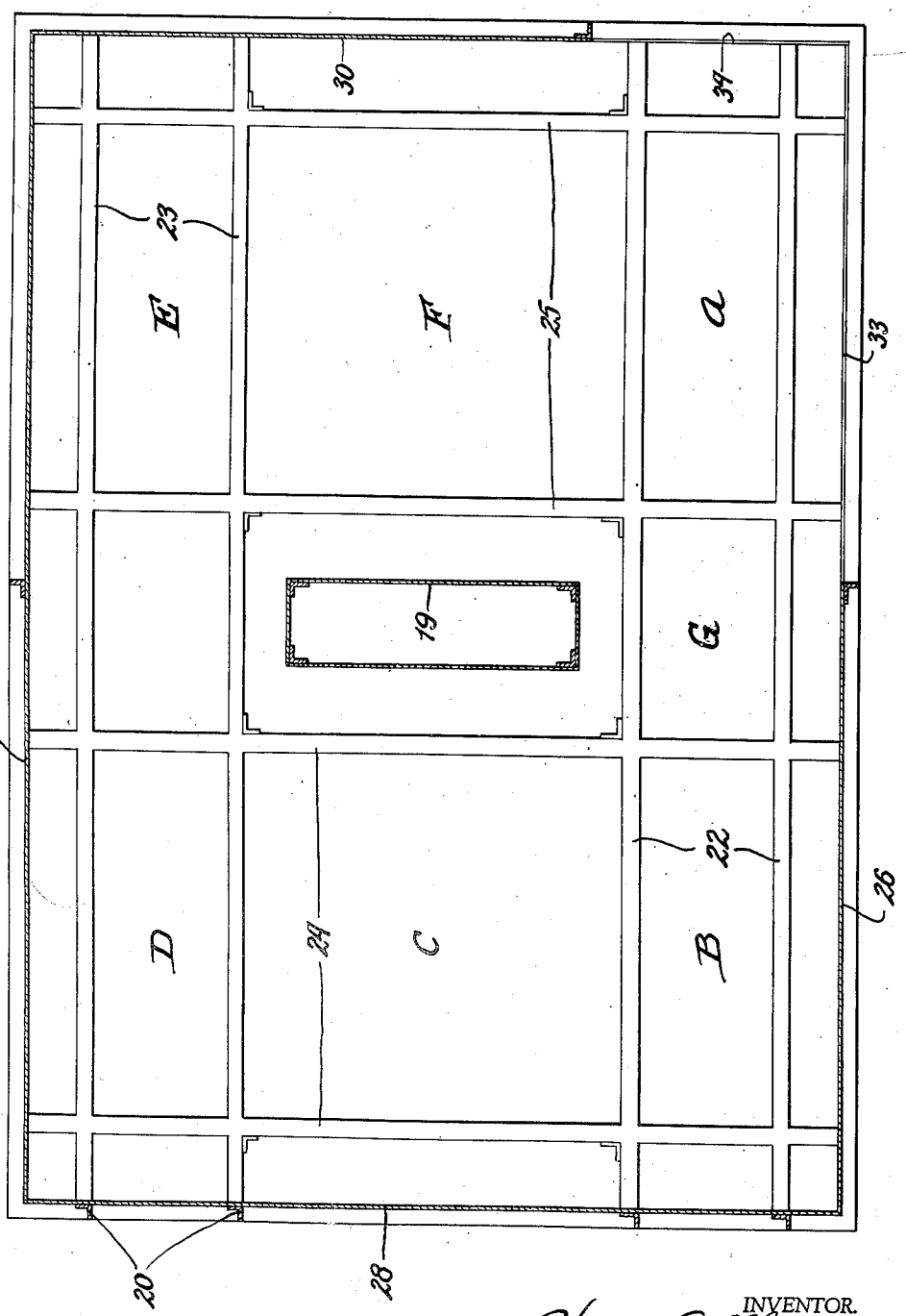


Fig. 11.

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Fig. 14.

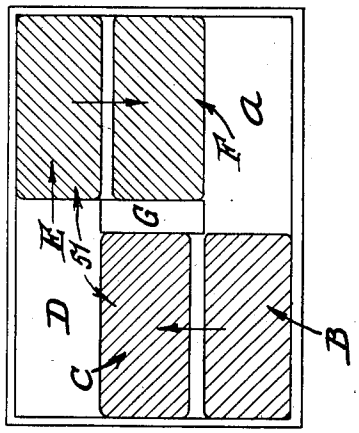


Fig. 13.

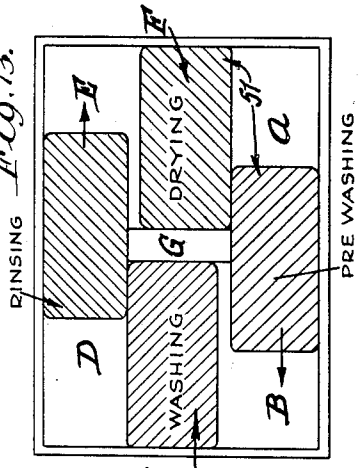


Fig. 12.

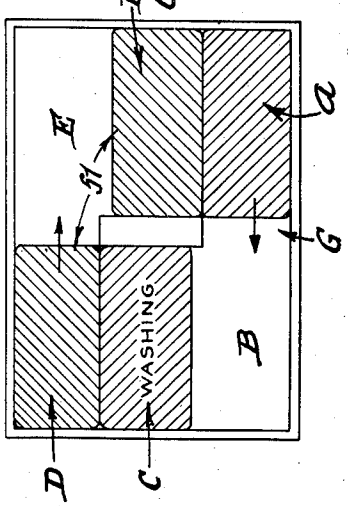
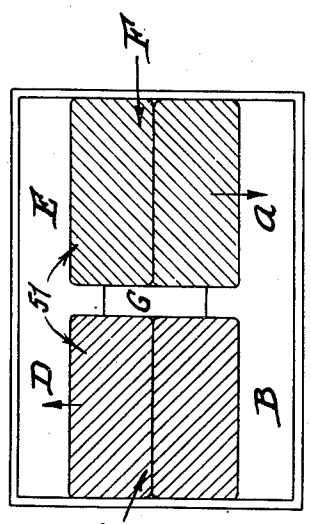


Fig. 15.



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UNITED STATES PATENT OFFICE

2,445,371

WASHING MACHINE CONVEYER

Harry A. Thurn, Warren, Pa., assignor to Harry S. Rapp, Warren, Pa.

Application June 12, 1944, Serial No. 539,877

5 Claims. (Cl. 198—19)

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This invention relates to a washing machine conveyer and more particularly to a conveyer for large containers or parts such as the large pans and kettles used in a bakery or large machine parts.

One of the principal objects is to provide a relatively small and compact washing machine conveyer of this character which is continuously fed with the containers or parts to be washed and continuously delivers the washed containers or parts and which will operate at high efficiency to thoroughly clean the containers or parts.

Another object is to provide such a washing machine conveyer which does not require the long chambers required in the usual straight way washer for subjecting the containers or parts to be washed for the neecssary length of washing time, the movement of the parts by the conveyer through the prewashing, washing, rinsing and drying zones being effected intermittently and in a time sequence which insures thorough washing in a very small space.

Another object is to provide such a washing machine conveyer which is loaded and unloaded at the same station thereby to facilitate these operations and to avoid the necessity of having separate operators for these purposes.

Another object is to provide such a washing machine conveyer and in which the driving and control parts are all centrally located in a rectangle about which the containers or parts being washed and dried are being moved.

Another object is to provide a simple and efficient conveyer mechanism for moving the containers or parts in the said rectangle and in the proper time sequence to clean the parts in the small space provided.

Other objects are to provide such a washing machine conveyer which is simple and inexpensive in construction and which will stand up under conditions of severe and constant use without getting out of order or requiring repairs.

In the accompanying drawings:

Fig. 1 is a front elevation of a washing machine embodying my invention.

Fig. 2 is a side elevation thereof.

Fig. 3 is a top plan view with a part of the top broken away.

Fig. 4 is a vertical transverse section taken generally on line 4—4, Fig. 3.

Fig. 5 is a horizontal central section taken generally on line 5—5, Fig. 4.

Fig. 6 is a fore-and-aft section taken on line 6—6, Fig. 3.

Fig. 7 is a fragmentary vertical section showing the mechanism at the center of the washer for driving the carriers for the parts in a rectangular path through the loading and unloading; prewashing; washing; rinsing and drying zones.

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Figs. 8, 9 and 10 are fragmentary horizontal sections taken on the correspondingly numbered lines of Fig. 7.

Fig. 11 is a horizontal section through the washer and showing in particular the tracks on which the carriers are moved in a rectangular path.

Figs. 12–15 are diagrammatic views illustrating the sequence of movement of the carriers in a rectangular path and through the loading and unloading, prewashing, washing, rinsing, and drying zones of the machine.

The washing machine comprises a rectangular frame including posts 20 which are supported on the floor, cross top frame members 21 connecting the upper ends of the posts, and, as best shown in Fig. 11, a pair of closely spaced front rails 22, a pair of parallel closely spaced rear rails 23, a pair of widely spaced side rails 24 and a pair of widely spaced side rails 25 on the opposite side of the frame, these rails crossing one another at right angles and having their upper surfaces arranged in the same general plane so that carriers are capable of being propelled in a rectangular path around the frame on these rails as hereinafter described.

These rails traverse six equal sized rectangular stations or sections which cover the greater part of the horizontal area of the rectangular casing and are elongated transversely of the frame. As viewed from the front of the machine, the station A at the front right and traversed by the rails 22 and 25 is the loading and unloading station; the station B at the front left and traversed by the rails 22 and 24 is the prewashing station; the station C at the left center and traversed only by the rails 24 is the washing station; the station D at the rear left and traversed by the rails 24, 23 is the rinsing station; the station E at the rear right and traversed by the rails 23, 25 is the first drying station; and the station F at the right center and traversed only by the rails 25 is the second drying station. At the center of the machine, a space, indicated at G, is left between the row of stations B, C and D at the left hand side of the machine and the row of stations A, F and E at the right hand side of the machine, this space accommodating the piping and operating mechanism housed within a central stack 19 between the ends of the stations C and F and extending downwardly from the top of the machine to below

the trackage 22—25, as best shown in Figs. 5, 6 and 11.

Of these stations all but the loading and unloading station A are covered by roof or top panels 27, as best shown in Fig. 3, these panels being suitably supported by the cross top frame members 21. The front side of the prewashing station B is closed by a front panel 26 which extends up to the adjacent top panel 27. The left hand ends of the prewashing, washing and rinsing stations B, C and D are closed by a left side panel 28 which extends up to the adjacent top panel 27. The rear of the frame is enclosed by a rear panel 29 which extends up to the adjacent top panel 27. The right hand sides of the drying stations E and F are closed by a right side panel 30 which extends up to the adjacent top panel 27. Between the loading and unloading station A and the second drying station F a transverse panel 31 extends down to form a hood for the drying stations, and additional panels 32, 33 and 34 are preferably provided below the trackage 22—25 at the front of the machine and at the right hand end of the loading and unloading station A so as to conceal and protect the operating mechanism arranged under this trackage.

As best shown in Figs. 2 and 4 a fore-and-aft central partition 35 extends between the front panel 26 and the central stack 19 and downwardly from the top panel 27 a distance sufficient to enclose the upper part of the prewashing station B and provide an opening 36 for transferring the articles to be washed from the loading and unloading station A to the prewashing station B. his partition is arranged between the loading and unloading station A and the fore-and-aft space G at the center of the machine, and behind this partition is arranged a curtain of flexible strips 38 which hang down from the casing in any suitable manner. A vertical partition 40 is arranged at the rear of the machine in rear of the stack 19 and between the rinsing station D and the central space G, the bottom edge of this partition 40 being sufficiently high to provide an opening 41 for the passage of the articles being washed from the rinsing station D to the first drying station E and this opening being closed by a curtain of hanging strips 42 past which the articles can brush while so being transferred.

In order to draw air through the enclosure surrounding the drying stations E and F, this air being drawn in through the open front 43 thereof, a hood 44 is mounted on top of the washing machine and is connected at its upper end with a suction duct 45. The lower end of this hood is open to the interior of the casing above the rear end of the space G and thereby draws air from the chamber surrounding the drying stations E and F. Similarly to draw the hot moist air from the loading and unloading station A and thereby render the job of loading and unloading more comfortable, a second hood 46 is mounted on top of the casing and is likewise connected with the suction duct 45. The lower end of this hood is open to the space G at the front end of the machine and the depending panel 35 insures that the air is drawn from around the zone of operation at the loading and unloading station A so as to keep it comfortable at this station.

The containers or parts, indicated generally at 50, to be washed are placed at the loading and unloading station A upon carriers indicated generally at 51 and which are provided with casters to follow the trackage 22—25 in traversing a rectangular path through the several stations A—F. For this purpose each of the carriers 51 is in the form of a rectangular frame 52 the ends of each of which are connected by a series of longitudinal bars 53 so that the carriers are each in the form of an open grid to permit washing fluid to be sprayed upon the containers 50 from above and below. Each of these carriers is supported on four casters 54 which are spaced, in a direction lengthwise of the carrier, a distance equal to the spacing of the tracks 24 or 25, and are spaced, in a direction transversely of the carrier, a distance equal to the spacing of the tracks 22 or 23. It will therefore be seen that each carrier can move lengthwise with its casters following, say, the tracks 22. When the carrier reaches the end of this track, the carrier is in position to be moved sidewise with its casters following the rails of the track 24. When the carrier reaches the end of this track 24 the carrier is in position to be moved endwise with its casters following the rails of the tracks 23, this right angle movement of the carrier being repeated at each corner of the washer and over the track 25 until the carrier returns to the position on the track 22 first assumed. It will therefore be seen that each carrier 51 is permitted to move in a rectangular path around the side of the rectangular frame of the washing machine, the carriers moving longitudinally along the front and rear sides of the main frame and transversely along the left and right sides of the main frame. It will also be seen that the carriers can progressively move through the stations A, B, C, D, E and F, the carriers being approximately equal in size to these stations.

To move the carriers longitudinally each carrier is provided with two longtudinal rows of depending angle brackets 55, the brackets of each row being equally spaced, as best shown in Fig. 4. To move the carriers transversely each carrier is provided with a pair of depending ears 56 at each of its ends, as best shown in Figs. 6 and 4. The brackets 55 are engaged by upstanding fingers provided on endless conveyers traveling transversely of the washing machine and the ears 56 are engaged by endless conveyers traveling fore-and-aft of the main frame.

For this purpose, at the front of the machine, and on opposite sides of the space G, is journaled a pair of shafts 60 and 61, these shafts extending fore-and-aft and being arranged under the central part of the track 22. Sprockets 62, arranged under the rails 22, are fast to each end of each of these pair of shafts, and each pair of these sprockets 62 carries a chain 63. Each of these chains carries a series of spaced fingers 64 which project upwardly from its upper stretch and above the rails 22. The chains 63 are spaced so that their fingers are in position to engage the foremost pair of angle brackets 55 of the carrier 51 in the station A, as best shown in Fig. 4, and thereafter successively engage each of its angle brackets 55 to convey the carrier across the front of the main frame to the station B, the sprockets 62 traveling counterclockwise, as viewed in Fig. 4, for this purpose so that its upper stretch moves from the station A toward the station B.

Similarly, at the rear of the machine, and on opposite sides of the space G, is journaled a pair of shafts 65 and 66, these shafts extending fore-and-aft and being arranged under the central part of the track 23. Sprockets 68, arranged under the rails 23, are fast to each end of each of these pair of shafts, and each pair of these sprockets carries a chain 69. Each of these chains carries a series of spaced fingers 70 which

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project upwardly from its upper stretch and above the rails 23. The chains 69 are spaced so that their fingers are in position to engage the foremost pair of angle brackets 55 of the carrier 51 in the station D and thereafter successively engage each of its angle brackets 55 to convey the carrier across the rear of the main frame to the station E, the upper stretch of the chains 69 traveling to the right, as viewed in Fig. 5, for this purpose.

To so move the pairs of chains 63 and 69 in opposite directions, a fore-and-aft drive shaft 74 is journaled centrally of the main frame below the trackage 22—25 and at its rear end carries a gear 75 meshing with a gear 76 fast to the shaft 66 of the rear conveyer, as shown in Fig. 5, and at its front end carries a sprocket carrying a drive chain 78 fast to a sprocket on the shaft 60 of the front conveyer. Since the shaft 60 of the front conveyer is arranged on the opposite side of the center of the machine from the shaft 66, it will be seen that rotating the drive shaft 74 will move the pairs of conveyer chains 63 and 69 in opposite directions.

To move the carriers transversely from the rear of the machine to the front at the right side of the machine, a pair of shafts 80 and 81 is journaled, these shafts being arranged transversely and under opposite ends of the track 25. As best shown in Figs. 4–6, sprockets 82, arranged under the rails 25, are fast to each end of each of these pair of shafts, and each pair of these sprockets 82 carries a chain 83. Each of these chains carries a series of spaced fingers 84 which project upwardly from its upper stretch and above the rails 25. The chains 83 are spaced so that their fingers are in position to engage the foremost pair of ears 56 of the carrier 51 in the station E, as best shown in Fig. 6, to convey the carrier 51 forwardly along the track 25 and thereafter to engage the rearmost pair of ears 56 of this carrier thereby to convey this carrier along the track 25 from the station E through the station F and to the station A, the sprockets 82 traveling counterclockwise, as viewed in Fig. 6, for this purpose, so that the upper stretch of the conveyer chain 83 moves forwardly from the station E toward the station A.

Similarly, at the left hand side of the machine, is journaled a pair of shafts 85 and 86, these shafts being arranged transversely and under opposite ends of the track 24. Sprockets 88, arranged under the rails 24, are fast to each end of each of these pair of shafts, and each pair of these sprockets carries a chain 89. Each of these chains 89 carries a series of fingers 90 which project upwardly from its upper stretch and above the rails 24. The chains 89 are spaced so that their fingers are in position to engage the foremost pair of ears 56 of the carrier 51 in the station B to convey this carrier rearwardly along the track 24 and thereafter to engage the trailing pair of ears 56 of this carrier thereby to convey this carrier along the track 24 from the station B through the station C and to the station D, the upper stretch of the conveyer chain moving rearwardly from the station B to the station D for this purpose.

To so move the pairs of conveyer chains 83 and 89 in opposite directions, a transverse shaft 94 is journaled in the frame of the machine below the trackage 22—25 and at its left hand end carries a gear 95 meshing with a gear 96 fast to the shaft 86 of the left hand conveyer, as shown in Fig. 5, and at its right hand end carries a sprocket carrying a drive chain 98 fast to a sprocket on the shaft 80 of the right hand conveyer. Since the shaft 80 of the right hand conveyer is in the front part of the machine and the shaft 86 is in the rear part of the machine, it will be seen that rotating the drive shaft 94 will move the pairs of conveyer chains 83 and 89 in opposite directions.

In order to convey the carriers 51 successively through the stations A—F, the transverse conveyers 63, 69 are operated in alternation with the fore-and-aft conveyers 83, 89, that is, one set of conveyers is held stationary while the other set of conveyers is moving and vice versa. By this means the carriers 51 are first transferred from row to row of the stations and then moved along these rows as hereinafter described.

For this purpose an electric motor 100 is mounted within the casing under the trackage 22—25 and through a belt 101 drives the pulley 102 of a speed reducer 103, as best shown in Fig. 7. This speed reducer drives an upright shaft 104. This upright shaft 104 extends up through the stack 19, as shown in Fig. 5, and adjacent the cross-over of the shafts 74 and 94 for the transverse and fore-and-aft conveyers 63, 69 and 83, 89 respectively.

As best shown in Fig. 7, two free running worms 105 and 106 are loosely mounted on the vertical driven shaft 104 from the speed reducer 103. One of these worms 105 meshes with a worm wheel 108 fast to the shaft 74 which drives the transverse conveyers 63, 69 and the other worm 106 meshes with a worm wheel 109 fast to the shaft 94 which drives the fore-and-aft conveyers 83, 89. A worm 110 is fast to this vertical driven shaft 104 and meshes with a worm wheel 111 having, say, sixty-four teeth, this worm wheel being mounted for rotation about a horizontal axis in any suitable manner. On one side of this worm wheel 111 is secured a crescent shaped cam 112 forming a salient face projecting toward the axis of the worm wheel and which is engaged by a roller 113 at the free end of a depending arm of a bell crank lever 114 pivoted at 115 to swing in a vertical plane. The other arm of this bell crank lever projects horizontally toward the vertical shaft 104 and its free end is pivoted to the lower end of a kick out bar 116 which is guided for reciprocating movement along this shaft 104 in any suitable manner.

Above the worm 105 a collar 118 is fast to the vertical shaft 104 and carries a pin 119 which extends downwardly toward the upper end of the worm 105 which is loose on the shaft 104. Similarly below the worm 106 a collar 120 is fast to the shaft 104 and carries a pin 121 which projects upwardly toward the lower end of the worm 106 which is also loose on the shaft 104. As best shown in Fig. 10, the worm 106 carries a curved pawl 125 which is pivoted thereon, as at 126, and also carries a spring 128 which urges a tooth 129 into the path of the pin 121 on the adjacent collar 120. When the tooth 129 is so arranged in the path of the pin 121, as shown in Fig. 10, a driving connection is established between the collar 120 and the worm 106 so as to rotate this worm with the shaft 104. One end of the pawl 125 projects toward the kick out bar 116 which is provided with a slot 130 having an inclined side. When this slot 130 is in register with the pawl 125 the spring 128 holds the pawl 125 in the path of the pin 121 so that a driving connection is established between the vertical shaft 104 and the worm 106. When, however, the slot 130 of the

kick out bar 116 is moved out of register with the pawl 125, the bar swings the pawl so that its finger 129 is moved out of the path of the pin 121 each time it approaches this pin so that the driving connection between the vertical shaft 104 and the worm 106 is broken.

A similar pawl (not shown) is mounted on the worm 105 to engage the pin 119 of the collar 118 and is similarly controlled by an upper slot 131 in the kick out bar 116. This top slot 131 is in position to similarly allow the top pawl to engage the pin 119 to establish a driving connection between the drive shaft 104 and the worm 105, this thereby driving the transverse conveyer chains 63, 69 so as to move the carriers 51 transversely of the machine. During this period the worm 105 rotates, say, twenty revolutions and the worm wheel 111 advances twenty teeth. At the end of these twenty teeth the cam 112 on the worm wheel 111 releases the bell crank lever 114 to permit the kick out bar 116 to drop. This moves the upper slot 131 out of register with the upper pawl and this upper pawl is moved out of the path of the pin 119 so as to break the drive between the shaft 104 and the worm 105 and hence stop the conveyer chains 63, 69.

The kick out bar 116 continues its downward movement to bring its lower slot 130 into register with the lower pawl 125, this permitting the pawl 125 to engage the pin 121 of the worm 106 and establish a drive between the shaft 104 and the worm 106 and thereby drive the fore-and-aft conveyers 83, 89. This transfer of the kick out bar 116 takes up, say, two teeth on the assumed sixty-four tooth worm wheel 111 which has now moved twenty-two teeth.

The drive through the lower worm 106 is continued for, say forty revolutions which moves the carriers 51 fore-and-aft the required distance, and uses forty teeth of the worm wheel 111. At this time the cam 112 on the worm wheel 111 actuates the bell crank lever 114 to lift the kick out bar 116 and thereby move the slot 130 out of engagement with the lower pawl 125 and disengage this pawl from the pin 121 and break the drive to the lower worm 106 and the conveyer chains 83, 89. This upward movement of the kick out bar 116 consumes two more teeth of the sixty-four teeth worm wheel 111 thereby utilizing all of the assumed sixty-four teeth of this worm wheel and bringing the upper slot 131 into register with the upper pawl to repeat the cycle.

Sprays are provided to prewash, wash and rinse the containers or other articles passing through the prewashing, washing and rinsing stations B, C and D. To provide the water for the prewashing and washing, an electric motor 135 (Fig. 4) drives a pump 136 the inlet 138 of which connects with a tank 140, the spray water for the prewashing and washing operation flowing into this tank from a drain pan 141 arranged under the trackage at the prewashing, washing and rinsing stations B, C and D. The outlet of this pump connects with a vertical pipe 142 the upper end of which connects with an overhead spray manifold 143 by means of a flexible tube 144 (Fig. 3). This overhead spray manifold is shown as being H-shaped in plan, each side having a series of branch pipes 145 carrying a series of downwardly directed spray nozzles 146. This manifold is arranged at the washing station C above the containers or articles 50 on the carrier 51 therein and thereby sprays the bottoms of the inverted containers. To simultaneously spray the inside of the containers 50 from their undersides, a similar spray manifold 148 is arranged under the trackage at the washing station C and has its side pipes provided with branch pipes 149 carrying a series of upwardly directed spray nozzles 150. These nozzles spray upwardly through the open or grill like carriers and thereby serve to wash the insides of the passing containers. This lower manifold is supplied with water from the vertical pipe 142 from the pump 136 by a branch pipe 151. It will be seen that the pump 136 serves to recirculate the wash water from the tank 140 through the overhead and inverted spray nozzles 146 and 150, respectively, this water impinging against the bottoms and insides of the inverted vessels 50 in the washing chamber A and falling to the drain shelf 141 to be returned to the tank 140. This water is normally heated and contains a suitable detergent.

A branch spray pipe 153 (Figs. 3 and 4) leads from the upper overhead manifold 143 across the prewashing station B immediately behind the curtain 35. The sprays from this spray pipe 153 are directed downwardly and serve to wash off loose material from the bottoms of the inverted containers as they enter this prewashing station B. This spray water also collects in the tank 140 and is recirculated by the pump 136.

As the carriers 51 and the pans or vessels 50 thereon leave the rinsing chamber D, they are rinsed with fresh water. To economize in the use of fresh water these rinsing sprays are operative only when the carriers leave the station D i. e., when the transverse conveyers 63, 69 are operative. For this purpose, a spray pipe 155 (Figs. 3 and 6) extends across the rinsing station D adjacent the partition 40, this spray pipe directing sprays of rinse water against the vessels 50 being conveyed out of this rinsing station D. This overhead spray pipe 155 connects with a pipe 156 leading to a valve 158 (Figs. 7 and 9) supplied by hot and cold water through pipes 159 and 160. The sixty-four tooth worm wheel 111 carries a face cam 161 engaged by the roller 162 at the end of an arm 163. This arm is fast to a vertical rock shaft 164 which is journaled on the machine frame and carries a second arm 165 which presses against an operating plunger 166 of the valve 158. The cam 161 is synchronized with the timing worm wheel 111 so that the valve 158 is turned on when the transverse carriers 63, 69 are operative.

In the operation of the washing machine the washing and prewashing sprays are continuously operative, the wash water, preferably heated and containing a suitable detergent, being withdrawn from the tank 140 by the pump 136 (Fig. 4) and being discharged through the pipe 142 to the overhead spray manifold 143 and lower spray manifold 148 which extend along the washing station C. From the manifolds this water is directed by the nozzles 146 and 150 against the insides and outsides of the inverted vessels 50 on the carrier in the washing station C. This wash water is directed by the drain pan 141 into the tank 140 to be again recirculated.

At the same time water is supplied to the overhead pipe 153 extending across one end of the prewashing chamber B, this water spraying down upon the vessels as they enter this washing station B and serving to remove any loose pieces of material on the containers.

Fresh water is also supplied through the valve 158 (Figs. 7 and 9) and line 156 to the overhead spray pipe 155 (Fig. 6) which extends across the

outlet end of the rinsing chamber D; these sprays serving to rinse the vessels leaving the rinsing chamber and this spray water being under automatic control as hereinafter described. The rectangular carriers 51 are moved in a rectangular path to successively traverse the several stations A, B, C, D, E and F within the casing. For this purpose each carrier is provided with four swivel casters 54 which follow the rectangular trackage shown in Fig. 11, the fore-and-aft tracks 24, 25 being spaced equal to the distance between the casters lengthwise of each carrier 51 and the transverse tracks 22, 23 being spaced a distance equal to the spacing of the casters transversely of each carrier.

To move each carrier sidewise fore-and-aft of the casing along the tracks 24, 25 the four endless conveyer chains 83, 89 are arranged each under one of the fore-and-aft tracks 24, 25 and are provided with fingers 84, 90 which project upwardly from the upper stretch of these conveyer chains, as best shown in Fig. 6, and engage ears 56 projecting downwardly from each of the carriers 51 in line with these fingers. It will be seen that by these endless fore-and-aft conveyers 89 the carrier in the station B will be picked up by the fingers 84 engaging the ears 56 at the leading side of this carrier and convey this carrier fore-and-aft through the stations C and D, the carrier being deposited in the station D. In this movement the casters 54 of the carrier ride along the rails 24. Similarly, the ears at the leading edge of the carrier arranged in station E are picked up by the fingers 84 of the endless conveyer chains 83 and conveyed through the station F to be deposited in the station A, the casters of these carriers riding along the rails 25.

To move the conveyers transversely of the machine from the station A to the station B, a pair of front transverse conveyer chains 63 are provided, these chains being arranged under the tracks 22 and having fingers 64 which project upwardly from the upper stretch of these conveyer chains. These fingers are in position to engage the leading pair of angle bars 55 of the carrier arranged in the station A, as best shown in Fig. 4, and successively engage the angle bars 54 so as to convey this carrier across the front of the machine to the station B. In this movement the casters 54 of this carrier ride on the rails 22. Similarly, in the rear of the machine transverse conveyer chains 69 are arranged under the rails 23 and are provided with fingers 70 projecting upwardly from their upper stretches. These fingers are in position to engage the leading pair of angle brackets 55 of the carrier arranged in the station D and to successively engage the angle bars 55 of this carrier so as to convey it from the station D, across the rear of the machine, to the station E. In this movement the casters 54 of these carriers ride on the rails 23.

The fore-and-aft conveyers 83, 89 and transverse conveyers 63, 69 are driven in alternation to effect the movement of the carriers, as illustrated in the diagrammatic views, Figs. 12–15. In these views the machine is shown as having the six stations A—F, as described, and four carriers 51, the carriers being indicated by section lining in these figures. However, it will be appreciated that the machine could have more carriers, such as six carriers, it being, however, necessary that the machine be provided with two stations in excess of the number of carriers.

Referring to Fig. 12, it will be noted that a carrier is arranged in the loading and unloading station A; the washing station C; the rinsing station D and the second drying station F, the prewashing station B and the first rinsing station E being empty. In this position of the carriers the transverse conveyer chains 63, 69 are starting to move, the fingers of these chains picking up the foremost of the angle bars 55 on these carriers and successively engaging these angle bars so as to convey the two carriers at the front and the rear of the machine toward the prewashing station B and first drying station E, as illustrated in Fig. 13. During this movement of the carriers the operator is loading the articles 50 to be washed upon the carrier leaving the station A. Also during this movement this carrier leaving the station A is passing under the prewashing spray pipe 153 at the entering end of the prewashing station B so that the containers on this carrier are subjected to an initial spraying action which serves to remove any loose material from the articles being washed. Also during this movement the valve 158 (Figs. 7 and 9) is open so that fresh rinsing water is supplied through the pipe 156 to the overhead spray pipe 155 (Fig. 6), at the leaving end of the station D, the articles on the carrier moving out of the rinsing station D being thereby rinsed by the sprays issuing from this overhead spray pipe 155. While the carriers, as illustrated in Figs. 12 and 13, are so moving transversely of the machine from the stations A and D the containers 50 or other articles being washed brush aside the curtains 38 and 42 which extend over the entrance to the prewashing station B and the exit from the rinsing station D.

When, as illustrated at Fig. 14, these carriers 51 moving from the stations A and D fully enter the stations E and B, the transverse conveyers 63, 69 are rendered inoperative and the fore-and-aft conveyers 83, 89 rendered operative. The fingers 84, 90 of these fore-and-aft conveyers 83, 89 thereby engage the depending ears 56 (Fig. 6) of all of the carriers 51 and move the two carriers on the right hand side of the machine, as a group, toward the loading and unloading station A and the carriers at the left hand side of the machine, as a group, toward the station D. This movement of these carriers is illustrated in Figs. 14 and 15. During this movement the carrier which had just passed into the prewashing station B and also subjected to the prewashing sprays is brought into the washing station C. While entering this washing station C the articles 50 on this carrier are subjected to the washing action of the sprays issuing from the nozzles of the overhead manifold 143 and the manifold 148 arranged under the trackage at the washing station. By this means each article is subjected to washing action as soon as its carrier starts to enter the washing station C. Similarly, the carrier previously in this washing station C and being displaced toward the rinsing station D is subjected to washing action as it leaves the washing station C. On the right hand side of the machine the carriers in the first and second drying stations E and F, while moving forwardly, as illustrated in Figs. 14 and 15, are being subjected to a draft of drying air, this air being withdrawn from the paneling over these drying stations through the hood 44 (Fig. 2) which connects with the exhaust duct 45. While the carrier previously in the second drying station F is entering the loading and unloading station A it can, of course, be unloaded by the operator.

When the leading carrier of the right hand group being conveyed forwardly toward the load-

ing and unloading station A enters this loading and unloading station, the left hand group of carriers will have fully entered the rinsing station D and the washing station C. This brings the carriers back to the position originally assumed as illustrated in Fig. 12, the cycle being repeated. It will be particularly noted that while the front and rear carriers are moving transversely, as illustrated in Figs. 12 and 13, from the stations A and D to the stations B and E respectively, the carriers in the washing station C and in the second drying station F are held stationary. During this entire period therefore the containers on this stationary carrier in the washing station C are subjected to the full washing effect of the sprays from the spray manifolds 143 and 150 arranged above and below this washing station.

Similarly, the carrier so detained in the second drying station F is subjected to a long drying period. It will also be noted that during the entire operation air is being withdrawn through the hood 45 (Fig. 2) from above the loading and unloading station A, thereby rendering it comfortable for the operator to perform the work of continuously loading and unloading the carriers at this station.

The fore-and-aft conveyer chains 83, 89 are provided with a common shaft 94 (Fig. 5) which drives these pairs of chains in opposite directions to effect the fore-and-aft movement of the carriers 51 as just described. Similarly, the transverse conveyers 63, 69 have a common drive shaft 74 which drives these pairs of conveyer chains in opposite directions to effect the movement of the carriers 51, as just described. These shafts 74 and 94 cross each other and in order to provide for the alternate rotation of these shafts to effect the alternate operation of the fore-and-aft and transverse conveyer chains as just described, the drive illustrated in Figs. 7–10 is provided. Thus, the vertical shaft 104 is continuously driven from the reducer 103 and carries a loose worm 105 meshing with a worm wheel 108 on the transverse conveyer shaft 74 and also carriers a loose worm 106 which meshes with a worm wheel 109 fast to the fore-and-aft conveyer shaft 94. This shaft 104 also carriers a worm 110 which meshes with a large timing worm wheel 111, this timing worm wheel carrying an arcuate cam 112 which operates to lift the upper arm of the bell crank lever 114 and hold it in this elevated position. This bell crank lever raises and lowers a kick out bar 116 which alternately moves the pawls 125 to alternately establish a drive between the shaft 104 and the worms 105, 106 loosely mounted thereon. The length of the arcuate cam 112 is, of course, proportioned to provide the time sequence necessary to effect the movement of the carriers illustrated diagrammatically in Figs. 12–15.

The timing worm wheel 111 also carries a face cam 161 (Fig. 7) which, through the rock arm 163, rock shaft 164 and arm 165 serves to open and close the rinse water valve 158. This cam is, of course, timed so that the valve is open only while the carrier 51 in the rinsing station D is leaving the station, as illustrated in Figs. 12 and 13. This effects an economy in rinse water.

From the foregoing it will be seen that the present invention provides a very compact washing machine conveyer adapted for large pans, containers or machine parts and in which the compactness is primarily achieved by the sequence of movement of the carriers in a rectangular path, as illustrated diagrammatically in Figs. 12–15. It will also be seen that each carrier is stopped for a comparatively long length of time at the washing station C so as to effect thorough washing action, it also being pointed out that this washing action continues as each carrier enters this washing station C and as it leaves this washing station. It will further be seen that by the provision of the fore-and-aft space G between the right and left hand rows of stations, the drive mechanism can all be centrally located, as well as the necessary piping for the sprays.

While the machine has been illustrated as having six stations with four carriers, it will be seen that it could be enlarged to have eight stations with six carriers or ten stations with eight carriers, etc. it being essential that the number of stations exceed the number of carriers by two.

I claim as my invention:

1. In a washing machine, a conveyor for a plurality of carriers, comprising a rectangular frame providing two parallel rows of stations along its opposite sides with the number of stations in both rows exceeding the number of carriers by two, said carriers being arranged in two equal groups in said rows, a unidirectional rotary conveyer under each of said rows, a plurality of members on each of said pair of conveyers and engaging the carrier at the lead end of each conveyer and releasing the carrier at the trailing end of each conveyer, means for driving said unidirectional rotary conveyers in opposite directions for simultaneously moving said groups in opposite directions along said rows to the opposite ends thereof, means for thereafter stopping said unidirectional rotary conveyor, means for thereafter moving the advance carrier of each row into the adjacent empty station of the other row to be subsequently moved by said unidirectional rotary conveyors along said other row, and means for thereafter again driving said conveyors whereby said carriers traverse an endless generally rectangular path.

2. In a washing machine, a conveyor for a plurality of carriers, comprising a rectangular frame providing two parallel rows of stations along its opposite sides with the number of stations in both rows exceeding the number of carriers by two, said carriers being arranged in two equal groups in said rows, a unidirectional rotary conveyer under each of said rows, a plurality of members on each of said pair of conveyers and engaging the carrier at the lead end of each conveyer and releasing the carrier at the trailing end of each conveyer, means for driving said unidirectional rotary conveyers in opposite directions for simultaneously moving said groups in opposite directions along said rows to the opposite ends thereof, a second pair of unidirectional rotary conveyers arranged at right angles to said first pair of unidirectional rotary conveyers and arranged under the corresponding ends of said rows at the opposite ends of said frame, a plurality of members on each of said second pair of unidirectional rotary conveyers and engaging the advance carrier of each row and transferring it to and releasing it in the empty station of the other row, and means for alternately driving said first and second pair of unidirectional rotary conveyers in timed relation to the movement of said carriers and with the conveyers of each pair traveling in opposite directions to each other whereby said carriers traverse an endless generally rectangular path around said frame.

3. In a washing machine, a conveyor for a plurality of carriers, comprising a rectangular frame

providing two parallel rows of stations along its opposite sides with the number of stations in both rows exceeding the number of carriers by two, a rectangular track carried by said frame and comprising two pairs of rails extending along opposite sides of said frame and another two pairs of rails extending along the other sides of said frame at right angles to said first pairs of rails, the upper surfaces of said rails being generally in the same plane, four casters in rectangular arrangement extending downwardly from each of said carriers within the confines thereof, said casters being spaced in one direction to ride on said first pairs of rails and being spaced in a direction at right angles to said first direction to ride on said another two pairs of rails, said carriers being arranged in two groups in said rows on said first pairs of rails, means for simultaneously moving said groups in opposite directions along said rows to the opposite ends thereof, and means for thereafter moving the advance carrier of each row into the adjacent empty station of the other row to be subsequently moved by said first means along said other row whereby said carriers traverse an endless generally rectangular path on said rails.

4. In a washing machine, a conveyor for a plurality of carriers, comprising a rectangular frame providing two parallel rows of stations along its opposite sides with the number of stations in both rows exceeding the number of carriers by two, a rectangular track carried by said frame and comprising two pairs of rails extending along opposite sides of said frame and another two pairs of rails extending along the other sides of said frame at right angles to said first pairs of rails, the upper surfaces of said rails being generally in the same plane, casters extending downwardly from each of said carriers, said casters being spaced in one direction to ride on said first pairs of rails and being spaced in a direction at right angles to said first direction to ride on said another two pairs of rails, said carriers being arranged in two groups in said rows on said first pairs of rails, a unidirectional rotary conveyor having a stretch arranged adjacent and parallel with each pair of said first pairs of rails, fingers projecting from said stretches and arranged to engage the groups of carriers on said first pairs of rails, means for driving said unidirectional rotary conveyors in opposite directions to simultaneously move said groups in opposite directions along said rows to the opposite ends thereof, a second unidirectional rotary conveyor having a stretch arranged adjacent and parallel with each pair of said another two pairs of rails, fingers projecting from said last stretches and arranged to engage the advance carrier of each of said rows, and means for driving said last unidirectional rotary conveyors in directions opposite to each other to move the advance carrier of each row into the adjacent empty station of the other row to be subsequently moved by said first conveyors along said other row whereby said carriers traverse an endless generally rectangular path.

5. In a washing machine a conveyor for a plurality of carriers, comprising a rectangular frame providing two parallel rows of stations along its opposite sides with the number of stations in both rows exceeding the number of carrier by two, a rectangular track carried by said frame and comprising two pairs of rails extending along opposite sides of said frame and another two pairs of rails extending along the other sides of said frame at right angles to said first pairs of rails, the upper surfaces of said rails being generally in the same plane, casters extending downwardly from each of said carriers, said casters being spaced in one direction to ride on said first pairs of rails and being spaced in a direction at right angles to said first direction to ride on said another two pairs of rails, said carriers being arranged in two groups in said rows on said first pairs of rails, a unidirectional rotary conveyor having a stretch arranged adjacent and parallel with each pair of said first pairs of rails, fingers projecting from said stretches and arranged to engage the groups of carriers on said first pairs of rails, means for driving said unidirectional rotary conveyors in opposite directions to simultaneously move said groups in opposite directions along said rows to the opposite ends thereof, a second unidirectional rotary conveyor having a stretch arranged adjacent and parallel with each pair of said another two pairs of rails, fingers projecting from said last stretches and arranged to engage the advance carrier of each of said rows, and means for driving said last unidirectional rotary conveyors in opposite directions to move the advance carrier of each row into the adjacent empty station of the other row to be subsequently moved by said first unidirectional rotary conveyors along said other row whereby said carriers traverse an endless generally rectangular path, said driving means for said first and last unidirectional rotary conveyors including drive shafts which cross each other at the center of said frame and means at the crossover of said shafts for alternately driving one shaft and then the other in timed relation to the movement of said carriers.

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