A laundry system comprises a plurality of washing machines, a hydraulic compression-type extractor and a single extractor container with a shiftable bottom wall for holding successive wash loads to be extracted. Successive loads of loose wash are carried from the respective washing machines by a conveyor to a load-unload station whereat the wash is directed by a chute and pushed by a tamping ram into the container. The container is then shifted by an air cylinder into the extractor, the extractor is actuated to compress the wash, and the container is then returned to the load-unload station whereat an air-operated ram moves upwardly against the bottom wall of the container. A horizontal air cylinder is then actuated to shift the compressed load onto a second conveyor which carries it to a tumbling machine wherein the work is loosened and conditioned or dried. In a preferred embodiment the chute extends down the top edge of the container to direct the loose wash wholly thereinto, and is shifted laterally to a retracted position before the wash load is extracted and the container returned to the unload station. After the compressed wash load is raised to the top of the container, the chute is returned to its load position pushing the compressed wash load ahead thereof onto the second conveyor.

15 Claims, 10 Drawing Figures
LAUNDRY SYSTEM USING HYDRAULIC EXTRACTOR

An object of the invention is to provide an automatic system for receiving successive wash loads from a group of washing machines, extracting the water from the respective loads by a hydraulic extractor and then conveying the compressed loads successively to a tumbling machine.

Another object is to provide such a system comprising a single extractor container which receives the respective loads of loose wash, is shifted after receiving each load into an extractor and is then returned to its loading station whereat the compressed load is ejected and conveyed to the tumbler.

Another object is to guide the container on a track between its load-unload station and its extracting position by means of a guide track which permits the container to be raised against a press head during the extracting operation.

Another object is to provide a chute which directs the loose wash from an overhead conveyor into the container, and an automatic ram which tamps the loose wash through the chute into the container.

Another object is to provide such a chute which extends down to the top edge of the container, and is shifted sidewise on a track to clear the space above the container so that each compressed load can be ejected therefrom.

Another object is to return the chute to loading position immediately after each load is ejected, while causing the chute to push the ejected load sidewise onto a conveyor for transport to the tumbling machine.

Other objects and features reside in the novel construction and subcombinations by which the aforesaid objectives are carried out to provide a fully automated laundry system.

These and other objects and features of the invention will be apparent from the following description and the appended claims.

In the description of my invention, reference is had to the accompanying drawings, of which:

FIG. 1 is a side elevational view, partly in section on the line 1-1 of FIG. 2, showing one embodiment of the laundry system according to the invention;

FIG. 2 is a plan view of the embodiment shown in FIG. 1;

FIG. 3 is a horizontal view of a portion of this laundry system with parts in section on line 3-3 of FIG. 1;

FIG. 4 is a perspective view of the apparatus shown in FIG. 3;

FIG. 5 is a fractional exploded view, partly broken away, of the coupling box between the extractor container and the drive cylinder therefor;

FIG. 6 is a fractional sectional view of the extractor container in its unload position, on line 6-6 of FIG. 3;

FIG. 7 is an elevational view of a second embodiment of the invention as seen from the loading conveyor;

FIG. 8 is a fractional perspective view of this second embodiment;

FIG. 9 is a perspective view showing only the tamping mechanism of this second embodiment in unoperated position; and

FIG. 10 is a side elevational view showing the tamping mechanism in operating position.

The present laundry system comprises a plurality of washing machines 10, typically five machines in a row as shown in FIGS. 1 and 2, which are preferably of the slant-mounted type disclosed in the pending Miller et al application Ser. No. 267,485, filed June 29, 1972. Such washing machines have rotating drums 11 open at the top to receive loads of wash via overhead hoppers 12, and have doors 13 at the bottom which are swung open after each wash is completed to allow the loose wash to be ejected by the rotating drum. Each such loose wash is dumped into a loading conveyor 14 having a horizontal section 14a running alongside the row of washers. Beyond the washers the conveyor has an upwardly inclined section 14b which carries the successive loads to an elevated position above an unloading station 15. This is a load-unload position for a cylindrical extractor container 16 into which the individual loads are dumped via a chute 17 at the end of the conveyor. The container has a shiftable bottom plate 18 (FIG. 6) which permits each load to be thereafter ejected therefrom by a ram 19 moving up from the bottom of the container after the load has been extracted.

The container 16 is mounted on wheels comprising two front wheels 20a and one rear wheel 20b (FIGS. 3 and 4) which ride on a metal floor plate 21. The floor plate extends in line with the conveyor 14 and has side rails 22 at the sides, and the container has respective pairs of horizontal guide wheels 23 at the opposite sides thereof which engage the side rails to guide the container between its load-unload and extracting positions and to maintain it in a fixed orientation during the movement thereof. The two support wheels 20a are bracketed to the container near the side rails and the back support wheel 20b is bracketed to the container midway between the side rails with all support wheels directed to move parallel with the side rails.

The container 16 is moved between its load-unload position and an extracting position by an air cylinder 24 below the inclined section 14b of the conveyor (FIGS. 1, 3 and 4). This air cylinder is mounted on a frame 25 secured as by welding to an end of the metal floor plate 21. The air cylinder has a long piston rod 26 on the outer end of which is mounted a transverse metal end plate 27. Secured to this metal plate above the piston rod 26 in parallel relation to the piston rod is a guide rod 28 which slides in bearings 29 mounted on the frame 25 above the air cylinder as on brackets 30 which straddle the air cylinder. The guide rod serves to keep the end plate 27 vertically oriented during movement of the piston rod. Mounted on the far side of the end plate 27 is a block carrying a horizontal shaft 31 (FIG. 5) having coupling rollers 32 journalled on the end portions thereof. The block is positioned in a coupling box 34 welded to a lower side wall portion of the container with the guide rollers 32 locked between the front and back walls of the opposite side portions of the box. The box comprises a wide U-bracket 35 having upper and lower horizontal legs 32a and 32b extending away from the container and onto the lower leg 32b of which is mounted the rear support roller 20b above described. Welded between the corners of the upper and lower legs are vertical angle irons 36 in line with the coupling rollers 32 forming the front side wall portions of the box. When the air cylinder 24 is actuated outwardly the rollers 32 are pressed against the back wall of the U-bracket 35 to push the container in line with
the conveyor 14 from its load-unload position to the extracting position thereof within an extracting machine 37. When the air cylinder is retracted, the coupling rollers 32 engage the angle irons 36 to pull the container 16 back to its load-unload position. The height of the coupling box 34 is such as to permit the container 16 to be raised and lowered in the extracting machine while the upper piston rod 26 of the air cylinder 24 remains stationary.

A rectangular section 21a of the floor plate 21 in the extractor is separated from the outer section and movably mounted so that it can be raised by pneumatic means H1 at the top of the extractor through lift brackets L1 and rods L2 at the sides (FIGS. 1 and 2). Such movement is carried out at the beginning of an extracting operation to bring the upper edge of the container against a press head 38 at the top of the extracting chamber so that the wash in the container is confined therein during an extracting operation. During the upward movement of the container the coupling roller 32 rides from the upper to the lower part of the coupling box 34. After the container is abutted against the press head, a ram 39 in a central opening 40 of the floor section 21a is raised by hydraulic means H2 (FIG. 1) against the shiftable bottom plate 18 of the container to press the wash load against the press head 38 with a sufficient force to expel the bulk of the water content therefrom. After the load is so compressed, the ram 39 and floor section 21a are lowered, the former until it is totally removed from the container, whereupon the container is drawn back by the air cylinder to its load-unload position. Such extracting machines are well known in the art as shown, for example, by the Strike U.S. Pat. No. 2,549,344 dated Apr. 17, 1951.

When the container 16 is returned to the load-unload position it is locked to the stationary floor plate 21 against vertical displacement by means of interengaging latch members between the container and floor plate at both the front and back of the container (FIGS. 6 and 7). The latch members at the back of the container comprise a pair of right angle bars 41 having vertical members welded to the side wall of the container on lines parallel with the side guide flanges about midway between the center roller 20b and the front rollers 20a. The horizontal members 41a of these angle bars extend outwardly from the container at a level flush with the bottom edge thereof. As the container 16 is moved into its load-unload position, these horizontal members engage directly below a pair of offset latch members 42 secured to the bottom floor plate 21. At the front of the container there is another pair of right angle bars 43, similar to the bars 41, welded to the side wall of the container, and a set of coacting offset latch members 44 on the floor plate 21 similar to the latch members 42. These latch members 43-44 are in line respectively with the first pairs of latch members relative to the direction of travel of the container, but the angle bars 43 are set lower than the angle bars 41 as are likewise the coacting latch members 42 set lower than the latch members 43 so that the bars 41 at the back of the container will clear the latch members 44 on the floor as the container is wheeled into the extractor.

After the container reaches its locked load-unload position, the ram 19 centrally positioned at the load-unload position (FIGS. 1 and 8) is moved upwardly by pneumatic means H3 to raise the bottom plate 18 to the top edge of the container and thereby to raise the compressed wash load above the container. In the embodiment of the invention shown in FIGS. 1 to 4, the chute 17 is in the form of a cylindrical duct having the side thereof cut away facing the conveyor 14, and is fixedly mounted on the outer end of the conveyor section 14b. The bottom edge of the chute is spaced above the container 16 by at least the height of a compressed wash load so that the wash load will clear the chute when it is raised out of the container, and consequently by this distance from the container, an attendant is needed to pick up any loose items of wash which may become draped over the side of the container as it is dumped from the conveyor 14, and to stuff them into the container.

After a load of loose wash in the container is extracted and returned to the load-unload position, and the compressed wash load, or "cake" as it is sometimes referred to, is ejected from the container by the ram 19, this cake is pushed sidewise by an air cylinder 45 over a roller or rollers 46 and then further onto a conveyor 47. The air cylinder 45 is mounted on a frame 48 upstanding from the floor at the side of the load-unload position of the container, and the chute 17 is provided with a circular pusher plate 50 at the end thereof positioned to engage a compressed wash load at a central lower portion thereof to push the compressed wash load or cake into the conveyor. The advantage of a small circular pusher plate engaging the compressed wash load at a central lower portion thereof is that it does not tend to break up the cake as it is being pushed. The conveyor 47 transports the extracted work to a tumbler 51 whereat a shelf 52 at the end of the conveyor is movable into a bridging position to guide the work into the tumbler. By way of example, the tumbler is one which receives the load at its front end and which is afterwards tilted backwardly to eject the load at its rear end, as is described in the Curtis U.S. Pat. No. 3,382,587 dated May 14, 1968. Further, by way of example, the conveyor 47 may be parallel to the conveyor 14 and offset therefrom sufficiently to clear the extracting machine 37 as is shown in FIGS. 2, 3 and 4.

In a fully automatic embodiment shown in FIGS. 7-10, a chute 53 is used which extends downwardly nearly to the top edge of the container. This chute is preferably slightly smaller in diameter than the container so that no loose items of wash will become draped over the edge of the container when the wash is dumped into the chute. The chute 53 is cylindrical but has a wide side opening 54 extending down from the top to clear the end of the conveyor 14 as the chute is shifted laterally into a load position at the end of the conveyor, and has a wide lip 53a at the bottom of the side opening 54. To permit the chute to be so shifted to clear a space above the container for the ejection of a compressed wash load therefrom, it is mounted on a carriage 55 having support wheels 56 riding on tracks 57 at right angles to the direction of movement of the container between its load-unload and extracting positions. The carriage 55 has a wide front wall 58 (FIG. 8) provided with a circular pusher plate 59 which, as the chute is returned to load position, engages the lower part of the compressed wash load raised from the container to push the wash load sidewise onto a conveyor 60. The conveyor 60, shown by example as being at right angles to the conveyor 14 (FIGS. 7 and 8), carries the work to the tumbler 51. Movement of the chute be-
between load and retracted positions is effected by an air cylinder 62 (FIG. 7) at the far end of the track 57 and having a long piston rod 63 coupled at its outer end to the carriage 55. Thus, a single air cylinder serves to shift the chute between its load and retracted positions and also to push the compressed wash load sidewise onto the conveyor 60 as the chute is returned to load position.

In this automated embodiment there is a tamping mechanism 64 (FIGS. 7-10) provided to push the loose wash through the chute 53 into the container 16. This tamping mechanism is mounted on a frame 65 upstanding from the front of the extracting machine 37. The tamping mechanism comprises a lever 66 in the form of a U-channel having a narrower U-channel 66a mounted on the back side thereof. The lever is secured at its hub to a horizontal cross shaft 67 positioned off from the end of the conveyor 14 and pivoted in bearings 68 secured to a top horizontal member 69 of the frame 65. This lever is controlled by two air cylinders 70 having their base end walls pivoted on a cross rod 72 supported by intermediate upright struts of the frame 65 and having piston rods pivoted at the outer ends thereof to a cross rod 73 in the lever 66. The air cylinders are normally extended to hold the lever 66 in a nearly upright position. At the outer end of the lever 66 in a vertical plane at right angles to the shaft 67 is a cross arm secured to the lever 66 intermediate thereof. This cross arm is rigidified by braces 75 and 76 between the front and back ends thereof and the lever 66. The cross arm 74 is also of a U-channel form and has an air cylinder 77 mounted therein lengthwise thereof. The piston rod 78 of this air cylinder (FIG. 10) projects beyond the forward end wall of the cross arm and has a tamping plate 79 secured to the end thereof. This tamping plate is circular in shape but has a flat 79a to clear the end of the conveyor 14 as the tamping plate is swung down into the top portion of the chute 53, as will appear. A guide rod 80 secured also to the tamping plate 79 is parallel to the piston rod 78 and is guided in bearings 81 alongside the air cylinder 77 to hold the tamping plate from turning.

When the air cylinders 70 are actuated their piston rods are drawn inwardly to pivot the lever 66 downwardly into a horizontal position and to swing the tamping plate into the upper part of the chute 53 with the piston rod 78 coming into alignment with the chute. This end position of the lever 66 is defined by an intermediate portion of the lever engaging fork 82 on the upper end of a strut 83 secured to the forward part of the frame 65 and by the lever 66 striking a tongue 84 intermediate the two arms of the fork. After the lever reaches this stop position, a horizontal latch rod 85 slidabley mounted between an offset frame member 86 on the strut and the adjacent side arm of the fork 82 is actuated laterally of the strut by an air cylinder 87 mounted on the far side of the offset frame member, the air cylinder 87 having a piston rod 88 extending through the offset frame member and secured to a plate 89 welded to the latch rod 85 between the frame member and the adjacent fork arm. By this actuation of the latch rod the same is moved through a slot 66b in the lever 66 and engaged at its outer end with an aperture in the other arm of the fork 82 to latch the lever 66 to the strut so that the lever 66 becomes anchored firmly in a horizontal position.

After the lever 66 is so latched, the air cylinder 77 is actuated to move the tamping plate 79 downwardly through the chute 53 whereby to tamp all of the loose wash through the chute into the container 16. After the tamping operation is completed, the air cylinder 77 is retracted to withdraw the tamping plate from the chute, the air cylinder 87 is retracted to unlatch the lever 66 from the strut 83, and the air cylinders 70 are extended to swing the lever 66 and tamping plate into their raised unoperated position.

In this automated system, a combination of electric circuits controlling the conveyor 14 and of air valves controlling the respective air cylinders and hydraulic lifters are operated in a predetermined sequence, as follows: (1) starting with the container 16 in its load-unload position and with the chute 53 in load position, the conveyor 14 is run for an interval until a wash load is dumped into the chute 53; (2) the tamping mechanism is actuated by the air cylinder 70 swinging the lever 66 down into horizontal position, the air cylinder 87 latching the lever 66 and the air cylinder 77 pressing the tamping head through the chute into the container 16, and thereupon these air cylinders are retracted in the reverse sequence to their start position; (3) the air cylinder 24 is actuated to shift the container 16 into the extracting machine 37 and the air cylinder 62 is actuated to shift the chute 53 to retracted position which may occur simultaneously or in sequence; (4) the pneumatic lifter H1 (FIG. 1) of the extracting machine is actuated to raise the support plate 21a to bring the top of the container 16 against the press head 38 and then the hydraulic lifter H2 is actuated to raise the ram 39 against the false bottom 18 to compress the wash load against the press head, and thereupon these lifters are retracted in the reverse sequence; (5) the air cylinder 24 is retracted to return the container to load-unload position; (6) the pneumatic lifter H3 is actuated to raise the ram 19 against the false bottom 18 whereby to raise the compressed wash load or "cake" to the top of the container; (7) the air cylinder 62 is actuated to return the chute 53 to load position, pushing the compressed wash load sidewise onto the conveyor 60 which then carries the wash load to the tumbler 51; and (8) the pneumatic lifter H4 for the ram 19 is retracted to start position. Thereupon the conveyor 14 is stepped ahead by another interval or intervals until another wash load is dumped through the chute 53 into the container 16 to start another cycle. As may be desired, the conveyor 60 and tumbler 51 may run continuously or may be timed to run for suitable durations starting at the time a compressed wash load is pushed onto the conveyor.

The embodiments of my invention herein particularly shown and described are intended to be illustrative and not necessarily limiting of my invention since the same are subject to changes and modifications without departure from the scope of my invention, which I endeavor to express according to the following claims:

I claim:

1. A laundry system comprising a plurality of washing machines, a single hydraulic compression-type extractor, an extractor container having an upwardly-shiftable bottom wall, a conveyor for transporting a loose load of wash from said washing machines to said container while the container is in a load-unload position, a chute for directing said loose load from the output of said conveyor into said container, power means
for shifting said container in a path from said load-unload position to an extractor position within said extractor, for actuating said extractor to compress said load, and for returning said container with the compressed load to its start position, a tumbler machine, a conveyor for transporting said compressed load from said container to said tumbler machine, and means operable when said container is returned to load-unload position for raising said compressed load out of said container and for shifting the same sidewise onto said last mentioned conveyor.

2. The laundry system set forth in claim 1 wherein said washing machines are of a slant-mounted type positioned along said first conveyor and each has a door at the lower end thereof openable to dump a wash load onto said first conveyor.

3. The laundry system set forth in claim 2 wherein said washing machines are mounted along a first horizontal portion of said first conveyor, and said first conveyor has a remaining portion in an upwardly-inclined direction to deliver each load to an upper level above said container.

4. The laundry system set forth in claim 1 wherein said container has front and back support wheels, and said system includes a track for guiding said container into and out of said extractor between said load-unload position and said extractor position.

5. The laundry system set forth in claim 4 including a frame freely mounted in relation to said track, an air cylinder secured to said frame having a piston rod in line with said track and of a length of the distance between said load-unload and extractor positions, and means coupling the outer end of said piston rod to said container for moving the container in either direction between said positions.

6. The laundry system set forth in claim 4 including horizontally interengagable locking means between said container and its support at said load-unload position for holding the container against upward displacement during an unloading operation, said interlocking means comprising first and second pairs of interengageable catch members at the front and back of said container in line with said track of which the front pair facing said extractor are engageable at a lower level than the back pair so that the catch member on the container of the back pair will clear the catch member on the floor of the first pair as the container is wheeled to its extracting position.

7. The laundry system set forth in claim 1 wherein the load-unload position of said container is one wherein the container is spaced below the output end of said first mentioned conveyor, and said chute is a vertical tube with a wide cutout at the top receiving the output end of said first conveyor.

8. The laundry system set forth in claim 7 wherein said chute is fixedly mounted in relation to said first conveyor and the bottom of the chute is spaced above said container when in said load-unload position by the height of said compressed load to enable the compressed load to be raised upwardly out of the container and to be then shifted sidewise therefrom.

9. The laundry system set forth in claim 7 wherein said chute extends downwardly to approximately the top of said container, including a carriage for said chute and a track for said carriage extending sidewise of the path of said container, and a second power means for shifting said chute to a retracted position off to the side of said container before the compressed load is raised out of the container.

10. The laundry system set forth in claim 9 wherein said carriage has a front wall engageable with said compressed load as the chute is returned to loading position for shifting the compressed load sidewise onto said second mentioned conveyor.

11. The laundry system set forth in claim 9 including a tamping ram operable downwardly through said chute when the chute is in loading position to press the loose items of the wash load into said container, means for retracting said chute before said wash load is extracted and said container returned to load-unload position, and means for retracting said tamping ram and thereupon pushing said container into said extractor and retracting said chute.

12. The laundry system set forth in claim 9 including an unloading ram operable upwardly against said bottom wall of said container to raise the compressed out of said container while the container is in unload position, means activating said second power means for returning said chute to load position while concurrently pushing said chute against said compressed load to shift the load onto said second conveyor and to return the chute into load position, and means for thereupon retracting said unloading ram.

13. The loading system set forth in claim 7 including a tamping mechanism having a ram operable downwardly through said chute when the chute is in loading position to press the loose items of a wash load into said container.

14. The laundry system set forth in claim 13 wherein said tamping mechanism includes a frame, a lever pivotally mounted at approximately the output of said first conveyor, means for mounting said tamping ram on said lever for movement at right angles thereto, a first power means for shifting said lever from an upright to an approximately horizontal position to bring said ram in line with said chute, and a second power means for thereupon actuating said ram downwardly to tamp said loose items through said chute into said container.

15. The laundry system set forth in claim 14 including a strut on said frame having an upper end portion engaging said lever when the lever reaches said horizontal position, and a third power means for latching said lever to said strut when the lever reaches said horizontal position.

* * * * *
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Inventor(s) John J. Miller

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

In the Abstract, line 13, the following text should be inserted after the word "container":

-- to raise the compressed load flush with the top edge of the container --.

Signed and sealed this 14th day of January 1975.

(SEAL)
Attest:
McCOY M. GIBSON JR. C. MARSHALL DANN
Attesting Officer Commissioner of Patents