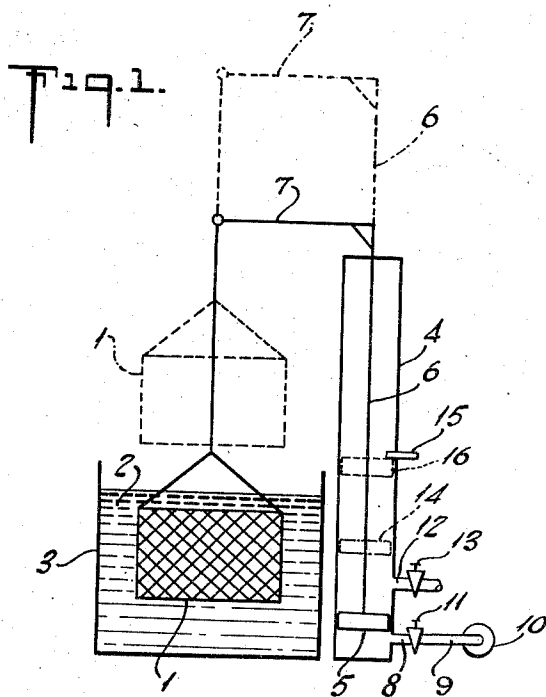
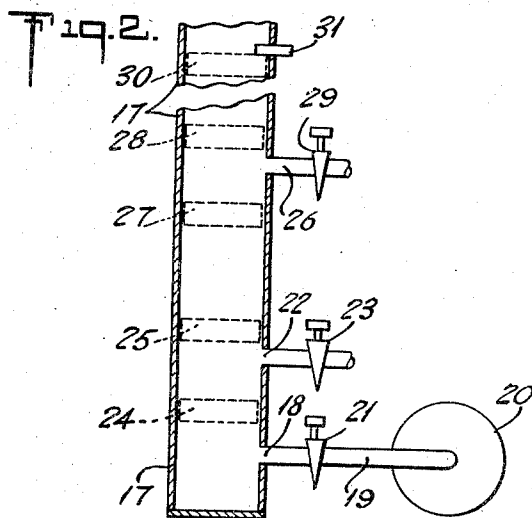


Oct. 28, 1958

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VERTICALLY RECIPROCATING WASHING APPARATUS
OPERATED BY COMPRESSED AIR
Filed Aug. 10, 1954

2,857,923



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VERTICALLY RECIPROCATING WASHING APPARATUS OPERATED BY COMPRESSED AIR

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Application August 10, 1954, Serial No. 448,914

4 Claims. (Cl. 134—141)

This invention relates to washing machines such as are used in industry for cleansing machined parts, castings and various types and kinds of metallic elements to rid them of greases, oils, chips, filings or other foreign matter. More particularly, the invention is concerned with that type of industrial washing machine in which the elements to be washed are supported in a tank and reciprocated vertically within a bath of suitable cleansing liquid.

The object of the invention is to provide a simple but effective way of pulsating the tray, basket or the like, which holds the elements to be washed, by means of compressed air.

The invention will be readily understood from the accompanying drawings, in which:

Fig. 1 is a diagrammatic view (not to scale) of one form of apparatus according to the invention; and

Fig. 2 diagrammatically illustrates a modification.

The washing apparatus per se forms no part of the present invention but, for purposes of illustration, is illustrated as consisting of a basket 1 suspended in a washing medium 2 in tank 3.

The invention is concerned rather with the actuating means by which the basket or the like is caused to pulsate or reciprocate rapidly up and down in the washing medium and it consists essentially of a cylinder 4 disposed vertically and having a piston 5 therein. The piston is diagrammatically illustrated as driving a vertical rod 6 having a cross arm 7 from which the basket 1 is suspended.

Adjacent its lower end the cylinder is provided with an air inlet port 8 having a connection 9 to a source 10 of compressed air, the connection 9 being indicated as controlled by a valve 11.

The cylinder is also provided with an upper port 12, preferably controlled by a valve 13 but, for the present, to be thought of as a port exhausting to atmosphere. The location or height of this port is so selected that it represents an intermediate point in the desired stroke of the piston, that is, a height representing an approximation of the mid-point of the stroke of the basket. As will be seen from the showing of Fig. 1, the upper or outlet port 12 is larger than the lower or inlet port 8. As stated above, the drawings are merely diagrammatic and not to scale but, in practice, the upper port is preferably several times as large as the lower port.

Upon opening valve 11 the piston is forced upwards and, as soon as it passes port 12, the space below the piston is vented to atmosphere. However, the momentum of the piston and its load tends to carry the piston somewhat beyond port 12. After it has come to rest and moved downward, port 12 is again passed and the cycle repeated, the piston pulsating rapidly between some such positions as those represented by the full line position and dotted line position 14 indicated in Fig. 1, thereby subjecting the contents of the basket to an effective washing action. Due to the fact that the piston is operated by a compressible medium (air), the descending piston, plus its basket load, operates actually to compress the air

trapped in the cylinder below the piston; that is, after the piston has closed port 12. In other words, the piston actually moves to a point below that port. In this connection, it is also to be recognized that, as the result of this extended movement of the piston, there is created within the cylinder a pressure greater than that incident to the entry of air through port 8. This, in turn, creates "free" potential energy, which, upon the upstroke of the piston, causes it to move higher than could the air supplied through port 8. A vital factor in this operation is that the weight of the basket load is utilized to compress the trapped air on the down stroke of the piston. Devices built in accordance herewith have been operated and do operate as described and produce an extraordinarily effective washing action, notwithstanding skepticism encountered that the apparatus would operate at all.

Valve 13 serves an important auxiliary function in that it enables the self-same compressed air apparatus, if desired, to be applied to lift the basket clear out of the washing medium after the washing has been completed. For this purpose, it is simply necessary to close valve 13, thereby causing the piston to continue its upward travel after it has passed port 12. Suitable stop means (indicated at 15) are provided for arresting the upward movement of the piston at whatever height is appropriate for the particular installation.

As will be understood, the piston will be maintained in its upper position (marked 16 in Fig. 1) so long as valve 13 remains closed and valve 11 open. When valve 13 is reopened the space below the piston is again vented to atmosphere, the piston descends to a point below port 12 and, thereupon, the above-described pulsating cycle is resumed.

Referring now to the arrangement of Fig. 2 (the washing apparatus itself being omitted) the cylinder 17, as above, is provided with a lower or inlet port 18 having a connection 19 to a compressed air source 20 controlled by valve 21. It also has an exhaust port 22 subject to control by a valve 23. To this extent the apparatus is adapted to function as above described; that is, with valve 23 open and compressed air admitted to the cylinder by way of port 18, the piston pulsates between positions such as 24, 25 above and below the exhaust port 22.

In this instance, an additional exhaust port 26 is provided higher up the cylinder so that, by simply closing valve 23, the air admitted through port 18 will raise the piston to and cause it to pulsate in the neighborhood of the upper port 26, as between the positions 27, 28.

This modified arrangement, with as many controlled exhaust ports as may be desirable, is adaptable to various needs. As illustrated, for example, the lower of the two exhaust ports may be at a height suitable for the washing operation (as in Fig. 1) and the upper exhaust port may be at such a height that the washed articles may be pulsed out of or above the liquid level so as to shake off a great deal of the washing liquid otherwise remaining on them.

As in the Fig. 1 arrangement, the exhaust port 26 may be provided with a control valve 29 so that, when it and valve 23 are both closed, the piston may be caused to move upward to a higher position 30 as determined by a stop 31 set at or adjusted to any desired position. In such an arrangement the piston can then be lowered and caused to resume its pulsating cycle above and below port 26, or above and below port 22, simply by opening valve 29 or valve 23.

As will be understood, of course, the port sizes and the pressure of the air supplied from the source 10 or 20 is determined in relation to the total weight and friction load of the piston and its associated parts and to the type of reciprocation required, it being perfectly feasible to

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achieve speeds anywhere from a few strokes per minute up to several hundred.

In the light of the foregoing exemplification of the principles of the invention, the following is claimed:

1. An industrial washing machine comprising the combination with a tank containing washing liquid and a support for a load of objects to be reciprocated vertically in the liquid, of a vertically disposed cylinder, a piston therein, connections therefrom to the load support and a source of compressed air, said cylinder having an inlet port adjacent its lower end connected to the compressed air source and an upper port exhausting to atmosphere, the said upper port being larger than the lower port and disposed in the cylinder wall at a height representing an intermediate point in the desired stroke of the piston.

2. An industrial washing machine comprising the combination with a tank containing washing liquid and a support for a load of objects to be reciprocated vertically in the liquid, of a vertically disposed cylinder, a piston therein, connections therefrom to the load support and a source of compressed air, said cylinder having an inlet port adjacent its lower end only connected to the compressed air source and a larger upper port disposed in the cylinder wall at a height representing an intermediate point in the desired stroke of the piston, a manual valve for closing the upper port and thereby permitting the piston to continue to rise under the influence of the compressed air admitted to the said inlet port to a point where the load of objects is above the liquid and stop means for arresting the upward movement of the piston at said point.

3. An industrial washing machine comprising the combination with a tank containing washing liquid and a support for a load of objects to be reciprocated vertically in the liquid, of a vertically disposed cylinder, a piston

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therein, connections therefrom to the load support and a source of compressed air, said cylinder having an inlet port adjacent its lower end connected to the compressed air source and upper ports exhausting to atmosphere and valves for individually closing said upper ports, the upper ports being larger than the lower port and located at different heights in the cylinder wall representing intermediate points in different desired strokes of the piston.

4. An industrial washing machine comprising the combination with a tank containing washing liquid and a support for a load of objects to be reciprocated vertically in the liquid, of a vertically disposed cylinder, a piston therein, connections therefrom to the load support and a source of compressed air, said cylinder having an inlet port adjacent its lower end connected to the compressed air source and upper ports exhausting to atmosphere, valves for individually closing said upper ports, the upper ports being larger than the lower port and located at different heights in the cylinder wall representing intermediate points in different desired strokes of the piston and stop means for arresting the upward movement of the piston when both of said valves are closed.

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