

Sept. 10, 1957

R. W. MURPHY
METHOD AND APPARATUS FOR CLEANING MEMBERS
OF AN EXTRACTING MACHINE.

2,805,967

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3 Sheets-Sheet 1

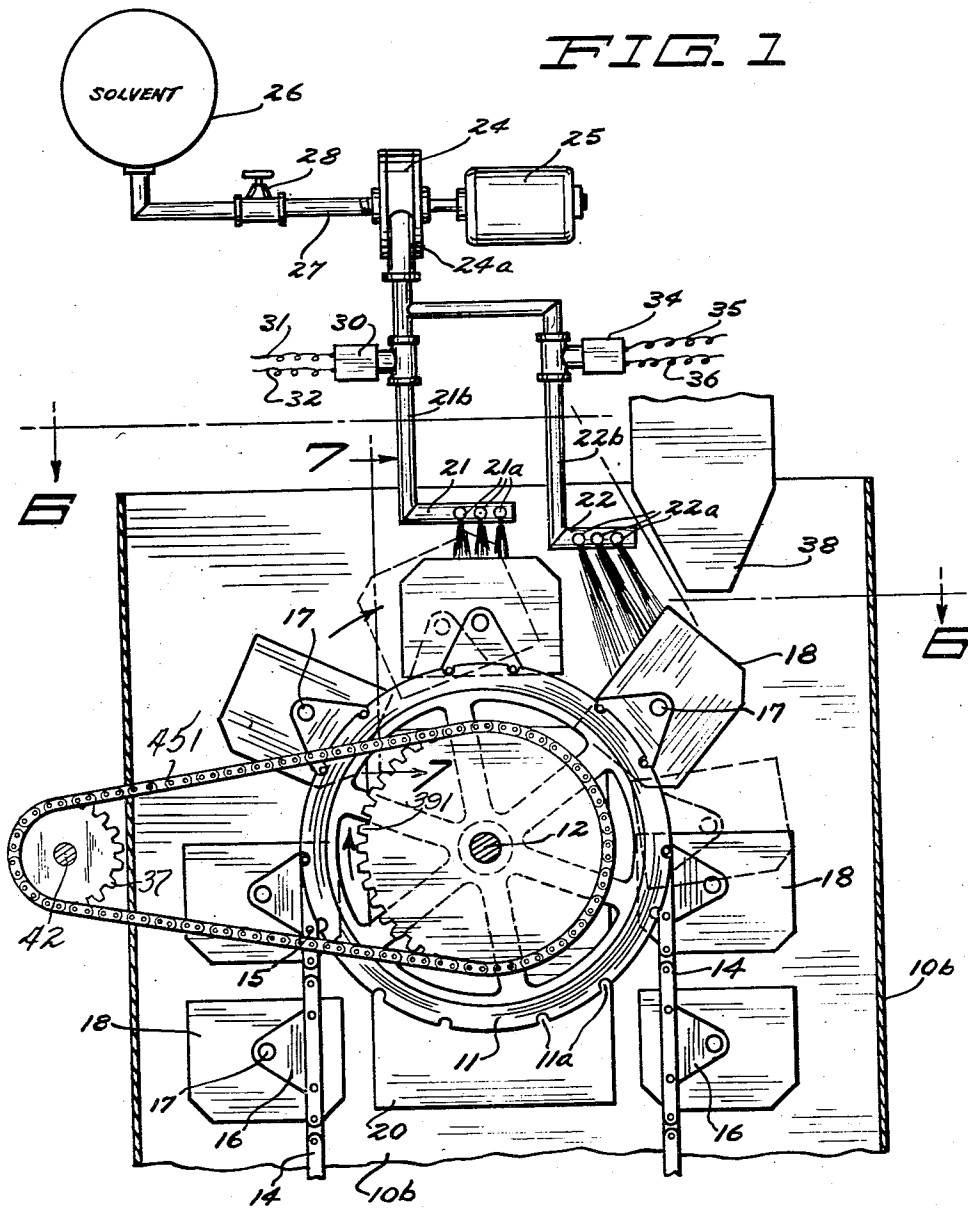
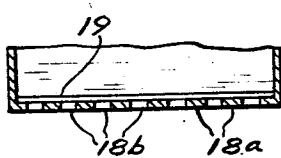


FIG. 2

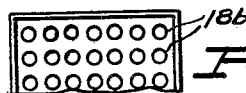


FIG. 3

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3 Sheets-Sheet 2

FIG. 4

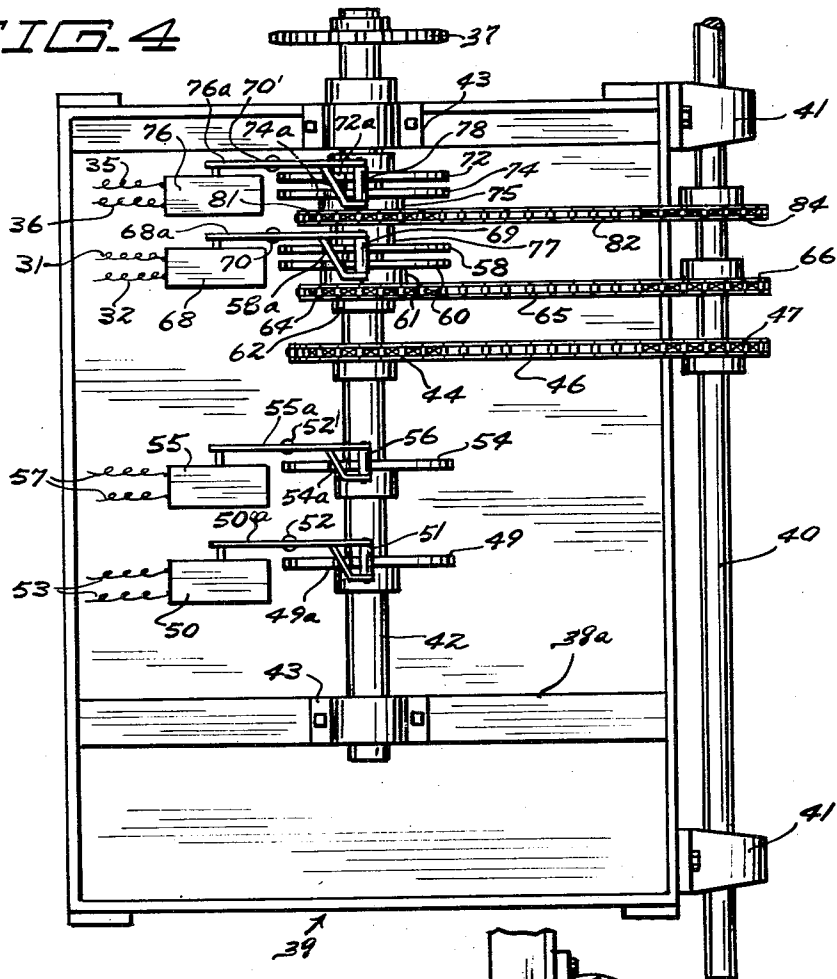
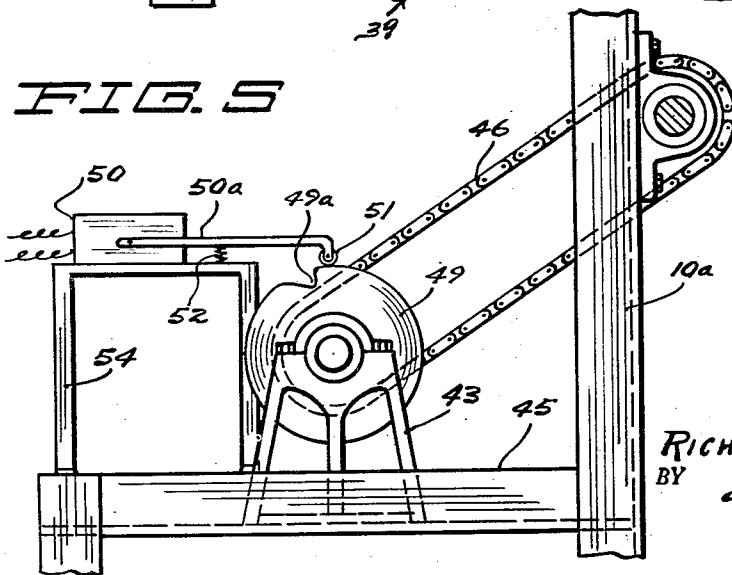


FIG. 5



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3 Sheets-Sheet 3

FIG. 6

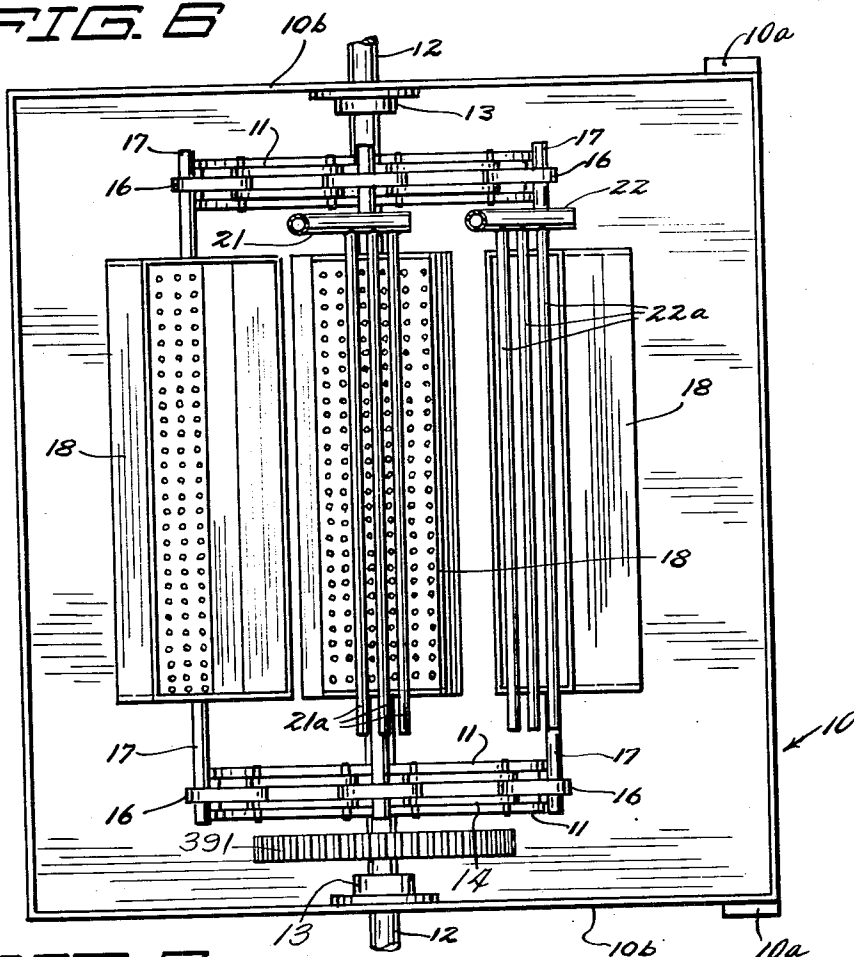
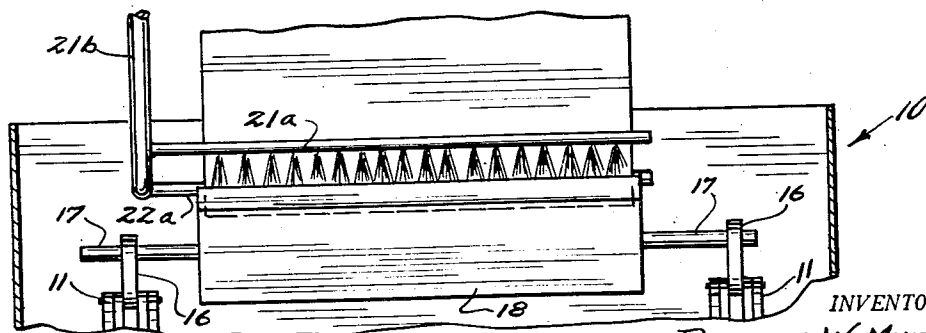


FIG. 7



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1

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METHOD AND APPARATUS FOR CLEANING MEMBERS OF AN EXTRACTING MACHINE

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10 Claims. (Cl. 134—23)

This invention relates to a method and apparatus for directing a cleaning liquid against certain portions of perforated members or trays movable on a conveyor, which trays are adapted to carry material from which a material, such as an oil, is extracted by spraying fluid or liquid thereon while in said trays or other members. Such extracting machines are now in common use and one form thereof has a vertically moving endless conveyor comprising spaced trays which are carried around an endless member of said conveyor. The trays successively come into inverted position at the top of said conveyor and the material from which oil or other material has been extracted is dumped from said trays. It frequently happens that some of the material will adhere to the trays so that the trays are not entirely emptied. The trays have perforated bottoms which become clogged and the efficiency of the machine is thus reduced.

It is an object of this invention to provide a cleaning device for removing all of the material from said trays so that the trays will operate with maximum efficiency, and which device acts while said conveyor and trays are moving so that the conveyor does not have to stop.

It is also an object to provide a method which consists in directing a spray of fluid or liquid onto the moving perforated member of an extracting machine, to which member material is supplied, acted upon and then discharged therefrom, for cleaning said member between the time said member is emptied and again filled without stopping said machine.

It is another object of this invention to provide a spraying device on such a machine as above set forth, which device is disposed above said endless member and in position to direct liquid against the outer side of the bottom of the tray which is in inverted position at the upper end of said conveyor.

It is a further object of the invention to provide such a device as set forth in the preceding paragraph, together with automatic means for periodically operating said spraying device.

It is also an object of the invention to provide such a machine as above described, together with a second spraying device disposed above said endless member and laterally from the center thereof, said second spraying device being adapted to direct liquid into one of said trays and against the inner side of the bottom thereof for cleaning material therefrom.

It is still another object of the invention to provide such a machine as above described having a vertically moving endless conveyor with spaced trays secured thereto, together with a pair of spraying devices adapted to spray liquid onto said trays respectively when in different positions, together with automatic means for periodically operating both of said spraying devices.

It is more specifically an object of the invention to provide such a device as set forth in the preceding paragraph, said spraying devices being supplied with liquid under pressure through conduits, electrically actuated switches in said conduits respectively, valves operated by said

2

switches for turning on said sprays respectively, another pair of switches, electrical circuits including said switches for each of said spraying devices respectively, and cam means for actuating said last mentioned switches for closing said electrical circuits and opening said valves respectively for periodically actuating said spraying devices.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views, and in which:

Fig. 1 is a partial view in side elevation of a solvent extraction machine, certain parts being shown in vertical section;

Fig. 2 is a vertical transverse section through one of the trays used;

Fig. 3 is a top plan view of one of said trays;

Fig. 4 is a top plan view of a portion of said machine;

Fig. 5 is a view in side elevation of the parts shown in

Fig. 4;

Fig. 6 is a top plan view of some of the parts shown in Fig. 1; and

Fig. 7 is a partial view in side elevation of the parts shown in Fig. 1, some parts being shown in vertical section.

Referring to the drawings, a machine is shown comprising a frame 10, a portion of which is shown, including the vertical side members 10a and a housing 10b. An endless conveyor is shown comprising pulleys or sprockets 11 which are secured to a shaft 12 in spaced relation thereon, said shaft being journaled in bearings 13 secured to housing 10b. Said conveyor also includes endless members 14, such as chains or belts running over the pulleys or sprockets 11 respectively. In the embodiment of the invention shown, members 11 are shown as sprockets having circumferentially spaced recesses 11a in their peripheries in which pins 15 on the endless members 14 are adapted to enter. Member 14 is thus propelled about sprockets 11 and will move about similar sprockets (not shown) at the bottom of the conveyor. Secured to said endless members 14 and projecting therefrom in spaced relation are brackets 16. Shafts 17 are journaled in the brackets 16 and each shaft has secured thereto a tray 18. Trays 18 are shown in plan in Figs. 3 and 6 and in transverse vertical section in Fig. 2. The bottom 18a of each of said trays is provided with spaced perforations 18b. A screen 19 overlies the bottom 18a and is of a mesh having smaller openings than the openings 18b. While different screens could be used, in practice a screen having ten meshes to the inch has been used. The endless members 14 move around the members 11, as indicated by the arrow in Fig. 1, and the trays 18 move with members 14 and around the top of the rotatable members 11. When a tray 18 is at the top of the rotatable members 11, it is brought to inverted position, as shown in Fig. 1. The tray is oscillated to position with its open top upwardly and moves down the side of the conveyor. As the tray comes to inverted position, the material therein through which extracting or other liquid has been passed during the travel of said tray is dumped into a receptacle 20.

Disposed above the members 11 is a spraying device 21 which is disposed substantially centrally of the endless member 14. Said spraying device comprises a plurality of conduits 21a which extend across the length of the trays 18, and said conduits are connected to a supply conduit 21b. A second spraying device 22 is provided which also comprises a plurality of conduits 22a which extend across the tops of the trays 18 when in their upper positions. Conduits 22a are connected to a supply conduit 22b which is shown as connected to the supply conduit 21b. Conduit 21b is supplied with hexane or other suitable

cleaning liquid under pressure by a rotary pump 24 driven by an electrical motor 25. The liquid used is carried in a tank 26 and the inlet side of pump 24 is connected to said tank by a conduit 27. A shutoff valve 28 is disposed in conduit 27. The discharge conduit 24a of pump 24 is connected to conduit 21b.

A solenoid valve 30 is disposed in conduit 21b from which lead electrical conductors 31 and 32. A similar solenoid valve 34 is disposed in conduit 22b from which extend electrical conductors 35 and 36. When the trays 18 reach a position with the plane of their tops substantially horizontal, the material to be treated is supplied thereto from a hopper 38 carried on frame 10.

Referring to Figs. 4 and 5, a shaft 40 is shown. Shaft 40 is shown as carried in spaced bearings 41 secured to a frame 39. A second shaft 42 is journaled in bearings 43 supported on cross members or timbers 39a forming part of frame 39. Shaft 42 is driven through sprocket 37 from the drive mechanism that drives the conveyor comprising endless member 14 and the trays 18. A sprocket 391 is secured to shaft 12 and a chain 451 runs over said sprocket and over sprocket 37. It thus moves in synchronism with said endless member 14 and trays 18. A chain 46 runs over sprocket 44 and over another sprocket 47 secured to shaft 40, and shaft 49 is thus driven. A cam 49 is secured to shaft 42, the same being of plate-like form and having a recess 49a in its periphery. A switch 50 is provided, the same having an operating arm 50a having spaced portions in which is journaled a roller 51 disposed to engage the periphery of cam 49 and thus forming a cam follower. Arm 50a is urged toward cam 49 by a tensile coiled spring 52 secured to said arm at one end and at its other end secured to a bracket 54, which latter supports switch 50. Conductors 53 lead to a switch 68 to be later described.

A second cam 54 is secured to shaft 42, the same being similar to cam 49 and also having a recess 54a therein similar to recess 49a in cam 49. A switch 55 is provided, the same having an operating arm 55a having portions in which is journaled a roller 56 engaging cam 54. Arm 55a will be urged toward cam 54 by a resilient means, such as a tensile coiled spring 52' similar to spring 52. Conductors 57 extend from switch 55 and will be connected to a switch 76 to be later described.

A cam 58 is secured to shaft 42, the same being of substantially circular plate-like form similar to cam 49, the same having a recess 58a therein similar to recess 49a. Adjacent cam 58 is another cam 60 carried on a member 61 journaled on shaft 42 and supported by a collar 62. A sprocket 64 is secured to member 61 over which runs a chain 65 also running over a sprocket 66 secured to shaft 40. A switch 68 is provided, the same having an operating arm 68a having spaced portions in which is journaled a roller 69, the same engaging cams 58 and 60 and being urged into contact with said cam by a resilient means, such as a tensile coiled spring 70 similar to spring 52. Conductors 31 and 32 which extend from switch 68 are connected to a solenoid valve 30.

Another cam 72 is secured to shaft 42, the same being of substantially circular plate-like form and having a recess 72a therein similar to recess 49a in cam 49. Another cam 74 is secured to a member 75 journaled on shaft 42. Member 75 is supported upon a collar 77 secured to shaft 42. Cam 74 also has a recess 74a therein similar to the recess 49a in cam 49. Member 75 is rotated by a sprocket 81 secured thereto, and a chain 82 runs over sprocket 81 and over another sprocket 84 secured to shaft 40. A switch 76 is provided having an operating arm 76a, which arm has spaced portions in which is journaled a roller 78 adapted to engage the peripheries of cams 72 and 74. Rollers 78 and arm 76a are urged toward cams 72 and 74 by a resilient means, such as a tensile coiled spring 70' similar to spring 52. Conductors 35 and 36 extend from switch 76 to solenoid valve 34. Switch 50, switch 68, the solenoid valve 30

and motor 25 are in series in one circuit. Switch 55, switch 76, solenoid valve 34 and motor 25 are in series in another circuit.

In operation, the material from which the oil or other material are to be extracted will be supplied to the trays 18 as they move down one side of the conveyor and their upper ends come under the opening in hopper 38. As the trays travel with the endless member 14, the extracting liquid is sprayed therein so that the material extracted will pass through the bottom of the trays and be collected at the bottom of housing 10b. When a tray reaches the position at the top of the conveyor and over rotatable member 11, it, as stated, comes into inverted position. The various cams shown in Fig. 4 are continuously driven. When cam 49 moves to position in which roller 51 can enter recess 49a, switch 50 will be operated and the first mentioned circuit above will be broken. When cam 54 comes into position for roller 56 to enter the recess 54a, switch 55 will be actuated and said second mentioned circuit will be broken. Cams 49 and 54, as shown, make one revolution with each revolution of shaft 42. Cams 58 and 60 will be driven at different speeds and the relative movement of these cams can be determined by having sprockets 64 which will have a smaller or greater number of teeth than the sprocket 66. The teeth in sprockets 64 and 66 can be varied. The cams are driven so that after a certain number of revolutions of shaft 42 the recesses 72a and 74a therein will come into register. At this time roller 69 will enter said recesses and switch 68 will be actuated. When switch 68 is so actuated a circuit will be closed through solenoid valve 30 and said valve will be opened. The first mentioned circuit above mentioned will now be closed. Motor 25 and pump 24 are now driven, valve 30 is open and sprays of cleaning fluid will be forced through the spraying device 21 and through the holes in the conduits 21a. The said holes are arranged so that a forcible spray is directed against the outer side of the bottom of the tray, as seen in Fig. 1. The spray from pipes 21a will thoroughly cleanse the bottom of the tray and this fluid will pass through the openings 18b in the bottom of the tray and through the screen 19 so that any material still in the tray will be substantially washed therefrom. The spraying will continue until switch 50 is opened by cam 49. The circuit through switches 50, 68, valve 30 and motor 25 is now broken. Motor 25 stops and valve 30 closes so that spray device 21 ceases to operate. When shaft 42 has made a certain number of revolutions the recesses in cams 72 and 74 will be brought into register or alignment and roller 78 will drop into said recesses, thus moving arm 76a and operating switch 76. When switch 76 is thus operated and closed, a circuit is closed through switch 55, the solenoid valve 34 and motor 25. Valve 34 will now be opened, pump 24 driven and a forcible spray of liquid will be directed from pipes 22a into the tray at the right of the conveyor and adjacent the uppermost tray, as shown in Fig. 1. This spray is directed to the inside of the tray 18 and the inner walls and the inside of the bottom of the tray will be thoroughly washed and any material still adhering to the tray will be removed therefrom. The spraying will continue until switch 55 is opened by cam 54. Said last mentioned circuit will now be opened and motor 25 will stop, valve 34 will close and spray device 22 will cease to operate. As stated, cams 49 and 54 act to stop motor 25 and pump 24 at each revolution of shaft 42. Cams 49 and 54 will operate switches 50 and 55 respectively some time after switches 68 and 86 are respectively operated. Switches 68 and 76 are held closed, as by a relay, until the circuits are broken by switches 50 and 55 respectively.

As stated, the sprockets 64 and 66 and 81 and 84 can be regulated to give the desired interval between the operations of the spraying devices. In one operation in practice, sprocket 64 was used with twenty teeth, and

5

sprocket 66 with twenty-four teeth. At the same time sprocket 81 was used with twenty-two teeth and sprocket 84 with twenty-four teeth. With this ratio the spraying device 21 would operate with each 11 revolutions of shaft 42, and spraying device 22 would operate with each 5 revolutions of shaft 42. With said machine in practice as stated, a tray 18 passed the top of the conveyor in one revolution of shaft 42 so that spraying device 21 would operate on every 5th tray, and spraying device 22 would operate on each 11th tray.

From the above description it will be seen that I have provided a comparatively simple and yet very efficient apparatus for washing and cleaning the trays on a solvent extraction machine. The spraying is done automatically and the intervals of spraying are automatically determined by the machine.

It is within the scope of this invention to use different fluids in spray devices 21 and 22. With some materials a deposit of very fine material is made on the perforated members or trays. It is desirable to use a fluid which will act chemically on such material, such as acetone.

In accordance with this invention the cleaning of the perforated members or trays is done without stopping the machine or the movement of the trays or other perforated members. In some machines the material is carried on an endless perforated member in pockets or otherwise.

The device has been amply demonstrated in actual practice and found to be very successful and efficient.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the apparatus and in the steps and sequence of steps of the method without departing from the scope of applicant's invention, which, generally stated, consists in a method and apparatus capable of carrying out the objects above set forth, such as disclosed and defined in the appended claims.

What is claimed is:

1. A cleaning device for an extracting machine having in combination, a conveyor comprising an upper rotatable member, an endless member running over said member, spaced trays secured to said endless member, said trays having open tops and perforated bottoms, said endless member moving said trays to inverted position at the top of said endless member, a spraying device above the top of said endless member and trays, means for operating said device for directing a spray of liquid against the outer side of the perforated bottom of a tray while in and adjacent said inverted position and means for directing a spray against the inside of said tray when a short distance past said inverted position.

2. The structure set forth in claim 1, and cam actuated means for periodically actuating said last mentioned means.

3. A cleaning device for an extracting machine having in combination, a conveyor comprising an upper rotatable member, an endless member running over said member, spaced trays carrying material therein pivotally secured to said endless member, said trays having open tops and perforated bottoms, said endless member moving said trays to inverted position at the top of said endless member for discharging said material and to a position with their bottoms inclined to the horizontal adjacent said top, a spraying device above said endless member at one side of the axis of said upper rotatable member, and means for operating said device for directing liquid into and against the inner side of one of said trays when the latter is in said inclined position adjacent the top of said endless member.

4. A cleaning device for an extracting machine having in combination, a conveyor comprising an upper rotatable member, an endless member running over said member, spaced trays secured to said endless member, said trays having open tops and perforated bottoms, said endless member moving said trays to inverted position at the

6

top of said endless member, a spraying device above the top of said endless member and trays, a shaft driven in synchronism with the movement of said endless member, a cam on said shaft, a second shaft driven from said first mentioned shaft, a cam on said second shaft adjacent said first mentioned cam, said cams having recesses in their peripheries adapted to periodically come into alignment, means for operating said spraying device, an electrical switch having an actuating arm carrying a follower engaging said cams so that when said recesses come into alignment said follower will enter said recesses and said switch will be actuated, an electrical circuit including said switch, and means operated by said circuit for actuating said means for operating said spray.

5. A cleaning device for an extracting machine having in combination, a conveyor comprising an upper rotatable member, an endless member running over said member, spaced trays secured to said endless member, said trays having open tops and perforated bottoms, said trays being in inverted position at the top of said endless member, a spraying device above the top of said endless member and trays, a second spraying device above said endless member and at one side of the axis of said upper rotatable member, means for operating said first mentioned spraying device, means for operating said second spraying device, a solenoid valve for controlling said first mentioned means, a second solenoid valve for controlling said third mentioned means, a pair of cams driven in synchronism with the movement of said endless member, a switch actuated periodically by said cams, an electrical circuit including said first mentioned valve and switch adapted to be closed by said switch for actuating said means for operating said first mentioned spraying device, a second pair of cams, a second switch adapted to be periodically operated by said second pair of cams and an electrical circuit including said second valve and second switch closed when said second switch is actuated to actuate said means for operating said second spraying device.

6. The structure set forth in claim 5, a cam, a third switch actuated by said cam for breaking said first mentioned circuit, a second cam, a fourth switch actuated by said second cam for breaking said second circuit.

7. The method of cleaning a material carrying perforated pivotally mounted swinging tray of an extracting machine into which tray material is successively placed and upon which a fluid is sprayed, said material being then discharged while said tray is in motion, which consists in directing a spray of fluid against the exterior of the perforated portion of said substantially empty tray, subsequently spraying fluid against the inner side of said tray at the perforated portion thereof and while it has moved to a different position and between the time said material is discharged from said tray and again placed in said tray.

8. A cleaning device for the trays of an extracting machine having in combination, a conveyor comprising an upper rotatable member, an endless member running over said member, spaced trays swingingly secured to said endless member, said trays having open tops and perforated bottoms, said conveyor bringing said trays to inverted position at the top of said endless member, a spraying device above said endless member for spraying fluid against the exterior of said perforated bottom of said tray, said trays moving to another position on said conveyor with their open tops being in an inclined upwardly directed position, a second spraying device for spraying fluid against the inner side of said perforated bottom of said tray while in said latter position.

9. The method of handling trays having perforated bottoms and adapted to carry material from which another material is to be extracted which consists in attaching said trays in depending swinging position to a vertically movable conveyor running over a revoluble member at its upper end, placing material from which a

substance is to be extracted in said trays while in upright position, moving said trays upwardly at one side of said conveyor in an upright position, moving said trays around the top of said conveyor so that said trays are in inverted position at the top of said conveyor, dumping said material from said trays when at said top, directing a spray of fluid against the perforated bottom of said inverted tray and moving said trays downwardly at the other side of said conveyor in upright position, said trays being moved through the atmosphere throughout their movement.

10. The method set forth in claim 9, with the additional step of directing a second spray of fluid against the inside of said tray while in inclined position and when it has moved beyond said top position.

5

10

15

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