Aug. 17, 1965 R. E. FARISON 3,200,835

CHEMICAL DISSOLVING AND DISPENSING MEANS

Filed Aug. 1, 1962 2 Sheets-Sheet 1

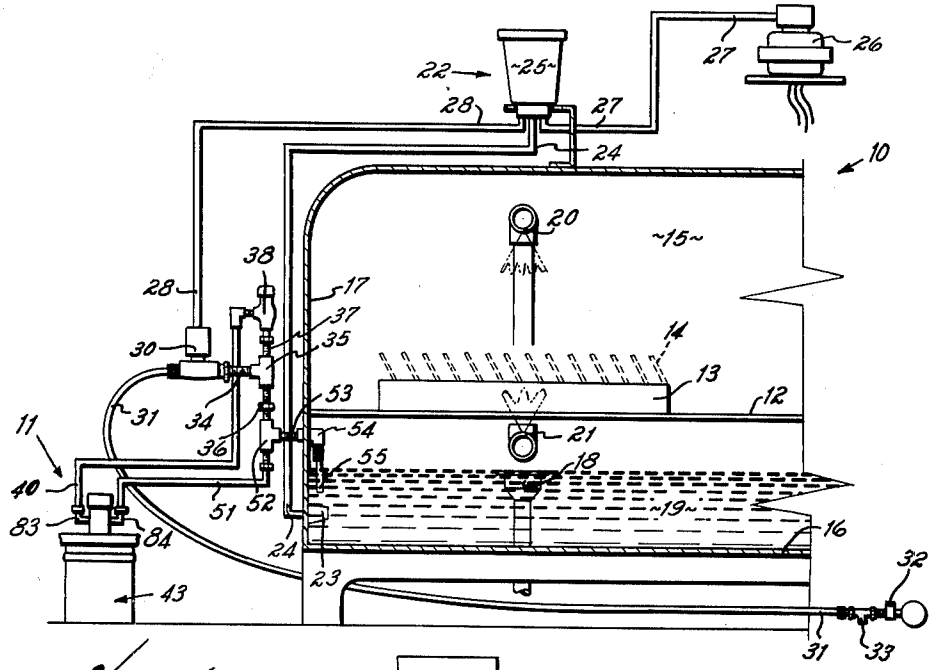

Fig. 1

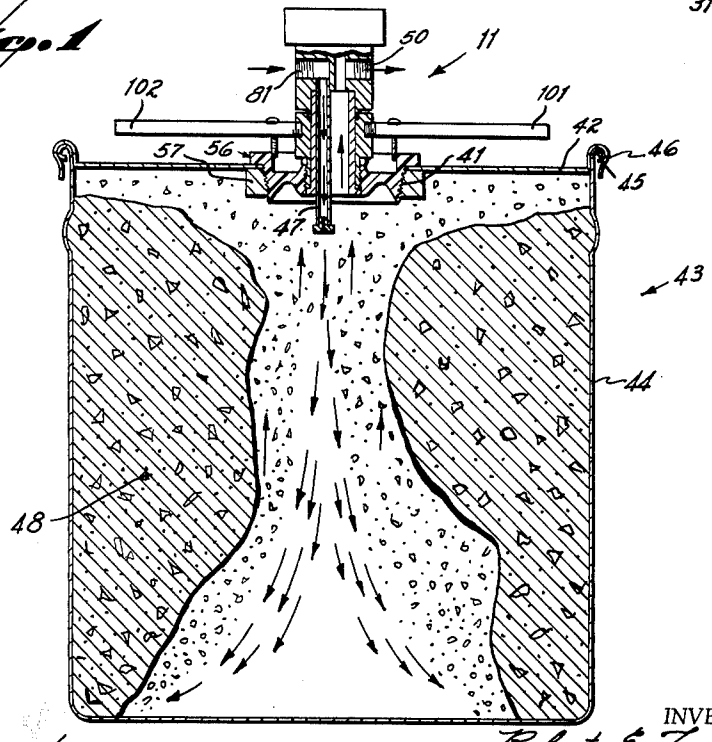

Fig. 2

INVENTOR.
Robert E. Farison
BY
Wood, Herron & Evans
ATTORNEYS

Aug. 17, 1965 R. E. FARISON 3,200,835

CHEMICAL DISSOLVING AND DISPENSING MEANS

Filed Aug. 1, 1962 2 Sheets-Sheet 2

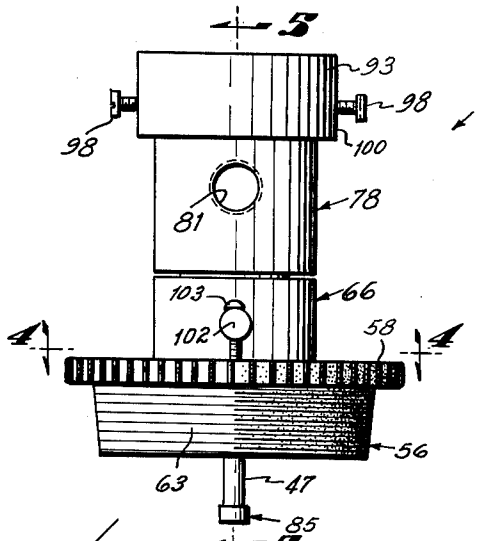

Fig. 3

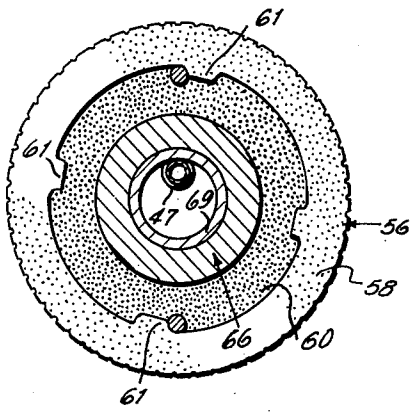

Fig. 4

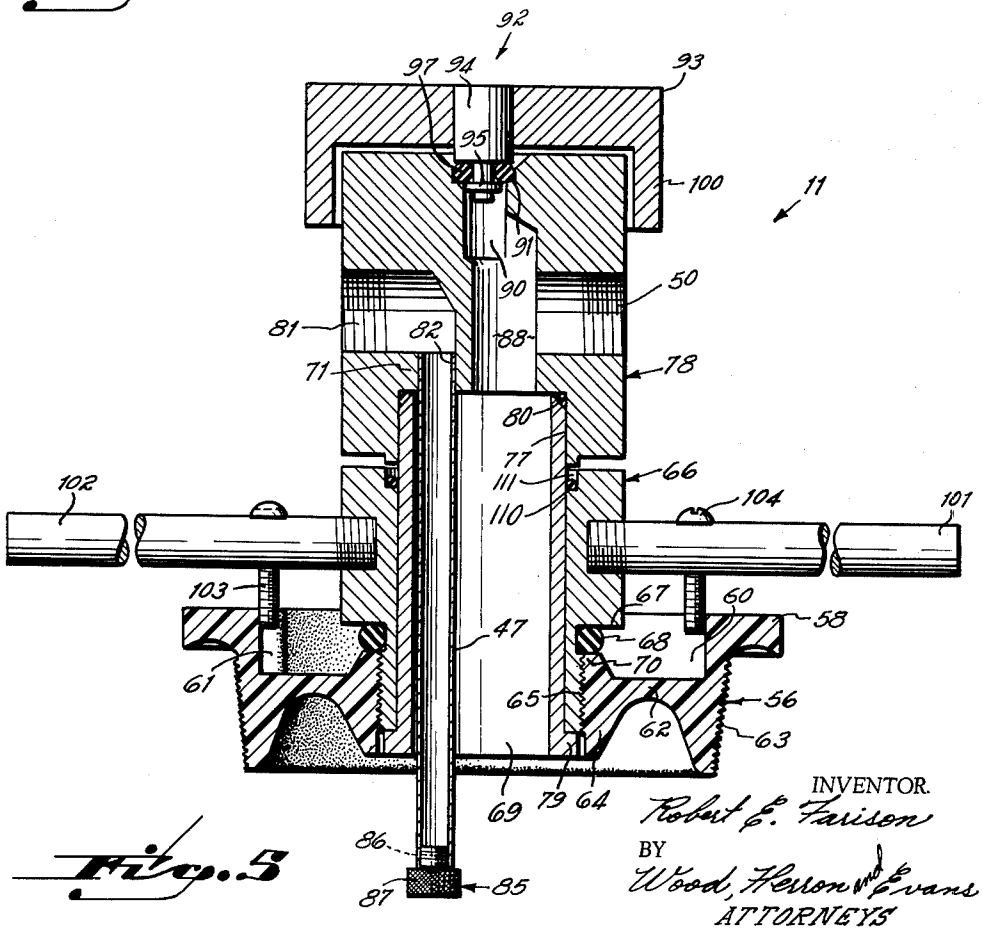

Fig. 5

INVENTOR.
Robert E. Farison
BY
Wood, Herron and Evans
ATTORNEYS

United States Patent Office 3,200,835 Patented Aug. 17, 1965

3,200,835

CHEMICAL DISSOLVING AND DISPENSING MEANS

Robert E. Farison, Cincinnati, Ohio, assignor, by mesne assignments, to W. R. Grace & Co., New York, N.Y., a corporation of Connecticut

Filed Aug. 1, 1962, Ser. No. 214,055
4 Claims. (Cl. 137—268)

The present invention relates to chemical feeders and is particularly directed to an apparatus for dissolving a granular or flake washing compound and feeding the compound to a dishwasher or other form of cleaning apparatus.

At the present time, it is the practice in connection with large commercial dishwashers of the type that are found in restaurants, for example, to utilize washing compounds in either a granular or flake form. Before the chemical compound can be used in the dishwashing machine, it must be dissolved and fed as a concentrated solution to the dishwasher sump or the like. The granular or flake dishwashing compound is supplied to the user in a large container, such as a drum. The user is then required to transfer the compound from the shipment container to another smaller container in which the material is dissolved in water and then either pumped or fed by gravity to the dishwashing apparatus. This transfer of detergent from the shipping container to the dissolving container is bothersome since it not only requires extra labor, but also the compound is often spilled with attendant mess and loss.

The principal object of the present invention is to provide a novel chemical feeder which is effective to dissolve a granular or flake compound in the shipping container and to feed the compound directly from that container to the point of use in the dishwashing machine or the like.

One of the principal advantages of this feeder is that it eliminates entirely the need for transferring granular material from one container to another.

Another object of the present invention is to provide a dispenser which is effective to maintain the same balance of dishwashing ingredients in the solution fed to the dishwashing machine as are present in the original granular or flake product.

A further object of the present invention is to provide a feeder which is effective to feed from a container all of the material in the container so that no loss occurs because of unused material remaining in the bottom of the drum or other container.

More particularly, one preferred form of feeding device embodying the principles of the present invention includes a head assembly mounted in a threaded opening in the cover of a watertight shipping container, such as a drum, can or the like. The head includes a tubular nozzle which is effective to form a high velocity jet stream of water which impinges upon the bed of material and creates a high rate of surface agitation. The feeder head also includes an outlet opening surrounding the tubular nozzle and of substantially greater cross sectional area.

The high velocity water stream causes the chemical bed to dissolve rapidly so that a concentrated solution of material is formed in the container. Since the container is watertight, pressure is built up in the container which causes this solution to be forced from the container and through suitable conduits to its point of use. As was indicated above, the nozzle orifice is small in relationship to the size of the discharge conduit; consequently the pressure built up in the container is limited to the magnitude necessary to feed the solution to the dishwasher machine. For example, the pressure in a container may be of the order of 2 p.s.i.

If the washing compound is heterogeneous mixture of solids, these solids dissolve in the same proportion as their proportion in the original compound. Thus, at all times the same proportion of ingredients is fed to the dishwasher as were originally mixed in the washing compound.

The present feeder head is constructed so that it may be threadably engaged in the shipping container lid without disengaging the connections of the feeder head to the fluid conduits joining the head to the washer and water supply. Thus, one of the advantages of the present feeder construction is that it can be quickly and readily connected to and disconnected from a shipping container without the use of any special tools.

Still another advantage of the present feeder is that it permits the shipping container to be placed on the floor or other out of the way position, thereby eliminating the need for having a large container mounted on top of the dishwasher where the container tends to interfere with the operation of the equipment.

Another advantage of the present feeder is that it is of simple construction and is trouble-free in operation.

A slightly modified form of feeder is contemplated for use with larger drums of material or with containers in which it is not feasible to provide a fluid-tight seal. In a modified type feeder, a feeder head is threadably mounted in an opening in the shipping container lid in the same manner as was explained previously. In the modified form of feeder, however, the rigid depending nozzle is replaced by an elongated flexible tube which carries a weighted nozzle member at its free end. This nozzle member normally rests on the bed of material as the bed of material dissolves. This modified nozzle is effective to provide a high agitation of the bed surface to the full depth of the container. As in the first described embodiment, an annular discharge conduit is provided surrounding the connection to the flexible tube. This discharge conduit is substantially larger than the outlet orifice or orifices in the nozzle member.

In the modified form of apparatus, no fluid pressure is built up in the container. Rather, the solvent is withdrawn from the container by a siphoning action. This siphoning action is produced in the feeder head by means of a nozzle through which a portion of the inlet water is diverted to form a jet stream. The discharge conduit from the drum terminates in a common chamber with the jet stream so that the jet stream is effective to produce a subatmospheric pressure at the terminus of the discharge conduit, whereby a concentrated solution of washing compound is forced from the shipping container into the discharge line. This solution is then brought into contact with the jet stream and is fed to the dishwashing machine.

These and other objects and advantages of the present invention will be more readily apparent from a consideration of the following detailed description of the drawings illustrating a preferred embodiment of the invention.

In the drawings:

FIGURE 1 is a front elevational view showing a dishwashing machine connected to a chemical feeding device constructed in accordance with the principles of the present invention.

FIGURE 2 is a vertical cross sectional view through a shipping container fitted with a feeding head of the present invention.

FIGURE 3 is a front elevational view of a preferred form of feeding head.

FIGURE 4 is a cross sectional view taken along line 4—4 of FIGURE 3.

FIGURE 5 is a cross sectional view taken along line 5—5 of FIGURE 3.

FIGURE 1 shows a conventional commercial dishwasher 10 provided with a chemical feeder 11 constructed in accordance with the principles of the present invention. It is to be understood that the details of construction of the dishwasher per se constitute no part of the present invention and that the present feeder can be utilized with many different types of dishwashing equipment. However, as is shown in FIGURE 1, one typical form of dishwasher with which the present detergent feeder can be used includes a table 12 for supporting racks 13 carrying a plurality of dishes 14. The space above table 12 constitutes a washing chamber 15, while the cabinet of the dishwasher includes a lower wall 16 and side walls 17 defining a water reservoir 19 beneath the table.

During normal operation of the dishwasher, the reservoir 19 is filled with a mixture of hot water and washing compound to the top of overflow 18. A suitable pump (not shown) has an inlet connected to the reservoir below the level of the liquid. This pump is effective to pump the wash solution under pressure to spray nozzles 20 and 21. These nozzles spray the solution onto the soiled dishes 14 held in racks 13. The solution draining from the dishes is returned to the reservoir from which it is recycled over the dishes.

The concentration of wash solution is automatically maintained at a pre-selected level by means of a control system indicated generally at 22 and including the present feeder. More particularly, control system 22 includes an electrode or sensor 23 effective to produce an electrical current which is correlated with the strength of the wash solution. This electrical head or sensor is connected through suitable electrical leads in cable 24 to a control head indicated at 25. This control head receives power from transformer 26 through leads in cable 27. Control head 25 is in turn effective to apply an electrical signal through leads in cable 28 to a solenoid valve 30 causing that valve to open whenever the concentration of wash solution in reservoir 19 drops below the desired level.

Solenoid valve 30 is connected in a hot water inlet line 31. This line includes a manually operated on-off valve 32 and a drain plug 33. The outlet side of solenoid valve 30 is connected through a short nipple 34 to a T connector 35. The lower outlet of the T member is connected to a plugged nipple 36; consequently fluid cannot flow downwardly through T 35, rather fluid must flow upwardly through nipple 37 and siphon breaker 38 to inlet line 40 of feeding head 11.

Head assembly 11, as shown in FIGURE 2, is threadably mounted in an opening 41 formed in cover 42 of shipping container 43. As is shown in FIGURE 2, the shipping container is in the form of a generally cylindrical metal can 44. While the exact capacity of this container is not critical, one preferred size for use with a head of the type shown in FIGURE 2 is a five or six gallon capacity. One form of can 44 includes a beaded upper edge 45 which receives a downwardly turned scaling flange 46 formed on the periphery of lid 42 so that a substantially fluid tight seal is contained between these members. Alternatively, can 44 can have a lid permanently secured in place as by means of welding or the like.

Essentially the construction of head assembly 11 is such that fluid enters the head from inlet line 40. The entering fluid is directed downwardly through nozzle tube 47 where a high velocity jet stream is formed which impinges upon the surface of the solid chemical washing compound bed 48. Thus, a relatively strong solution of washing compound is formed. This concentrated solution is forced by the fluid pressure developed within container 43 through an outlet opening 50 to line 51. As is shown in FIGURE 1, outlet line 51 is connected through a T 52 and nipple 53 and elbow 54 to a depending discharge tube 55. The outlet end of this tube is disposed a distance beneath the surface of the compound solution within reservoir 19.

In operation, whenever the electric sensor 23 detects that the strength of the solution in reservoir 19 has dropped below a selected level, an electrical signal is applied from head 25 to solenoid valve 30. This valve thus opens so that water is fed under pressure to the feeding head 11. The concentrated washing solution formed in container 43 is fed from the container through outlet line 51 to the reservoir 19. As soon as the concentration level in the reservoir reaches the proper level, solenoid valve 30 is closed to stop the feeding action of washing compound from shipping container 43 to the reservoir.

The details of construction of feed head 11 are best shown in FIGURES 3, 4 and 5. As is there shown, the feeding head 11 comprises a threaded plug member 56 preferably formed of a suitable corrosion resistant plastic such as "polyethylene," "nylon" or the like. This plug is adapted to threadably engage a threaded ring member 57 which is welded or otherwise secured to the undersurface of cover 42 of shipping container 43. It is to be understood that in actual use shipping container 43 is filled at the plant with a granular or flake chemical washing compound. After the container is filled, cover 42 is snapped over bead 45 to form a fluid tight seal with can 44. When the container is shipped a suitable cap or plug member is threaded into ring 57 to provide a closure for the lid.

Plug 56 of the feeding assembly includes an outwardly extending radial flange 58 formed on the upper portion of the plug. A groove, or depression 60, is formed in the plug interiorly of flange 58. A plurality of radial abutments 61 extend inwardly from the inner face of flange 58 toward the center of the plug. Plug 56 further includes a web section 62 which connects an outer peripheral threaded skirt portion 63 with a central annular boss portion 64 having a threaded opening 65. A swivel support member 66 threadably engages boss section 64 and extends upwardly from the plug. This swivel section 66 includes a lower shoulder 67 which abuts an O-ring 68 disposed between shoulder 67 and opposing shoulder 70 formed on annular body section 64. This O-ring provides a fluid tight seal between plug member 56 and swivel support member 66.

A swivel tube 69 extends upwardly through and is rotatably journalled within a central bore formed in support member 66. A seal is provided between support member 66 and tube 69 by means of an O-ring 110. This O-ring is mounted in an annular recess 111 formed in member 66. Tube 69 includes a radially extending flange 79 formed along its lower edge. This flange abuts the lower end of support member 66 and prevents upward withdrawal of tube 69 through the support member.

The upper end of tube 69 is disposed within a downwardly facing circular bore 77 formed in swivel body member 78. A tube 69 is press fit within bore 77 or is rigidly secured to that member in any suitable manner. An O-ring 80 is compressed between the upper end of tube 69 and the opposite lower wall of body member 78 to insure a fluid tight seal between these members. An O-ring seal 110 is provided between the support member 66 and the tube 69.

Body member 78 is of generally cylindrical shape and includes a transverse radial inlet port 81 and a transverse radial outlet port 50. These ports are preferably threaded to receive fittings 83 and 84 respectively connected to inlet line 40 and outlet line 51.

Inlet port 81 communicates with a vertical bore 82 formed in a transverse wall 71 of body member 78. A jet tube 47 is press fit or otherwise rigidly secured in bore 82. This tube passes downwardly through the central bore of tube 69 and extends below plug 56. The lower end of tube 47 is threaded to receive a jet nozzle member 85. Member 85 includes a small orifice 86 for forming a high velocity jet and a knurled head portion

87 by means of which the member 85 can be grasped as it is threaded into the end of the jet tube.

Orifice 86 is of a relatively small size, e.g., 1/16 inch so that a jet stream of sufficiently high velocity is formed to dissolve rapidly the solid chemical bed 48.

The orifice 86 is also sized relative to the line pressure, and the outlet line so that the rate at which water is allowed to enter container 43 is restricted to limit pressure build up in the container. More particularly the orifice is sized so that no appreciable excess pressure is built up over that required to expel the concentrated solution from container 43 to its point of use.

Outlet port 50 communicates with an enlarged vertical bore 88. This bore in turn opens into the bore of tube 69. Thus, an outlet passageway is provided from container through the bore in tube 69, vertical bore 88 and outlet port 50 to line 51. Vertical bore 88 is also connected to a small bore 90 surrounded by a seat 91 of pressure relief assembly 92. This pressure relief assembly includes a weighted cap or head member 93 fitted with a depending center pin or stem 94. The lower end of this stem is provided with a radial flange 95 spaced from the lower end of the enlarged upper section of the stem. An O-ring 97 surrounds the pin above flange 95 and normally seats against annular seat 91. The cap 93 thus normally rests upon seat 91 and a fluid tight seal is formed by O-ring 97. Under normal operation this pin prevents an escape of the fluid through bore 90. The cap is loosely held in place by bolts 98. These bolts pass inwardly through enlarged bores formed in a peripheral skirt 100 of the cap member and threadably engage suitable openings in body 78. The bores formed in the skirt are diametrically opposed to one another and are substantially larger than bolts 98 so that the top can tilt and an appreciable amount of play is provided which permits O-ring 97 to become disengaged from seat 91. If the pressure within the container should exceed a predetermined amount, for example 2 p.s.i., the cap is lifted and O-ring 97 is shifted from its seat allowing fluid to escape through bore 90 to relieve the excess pressure in the container. It will readily be appreciated that the pressure at which the relief valve opens is determined by the relationship between the weight of the cap 93 to the cross sectional area of bore 90.

In addition to these elements, feeder assembly 11 includes two arms 101 and 102. These arms are threadably joined to swivel support member 66 and extend outwardly from that member beyond the periphery of cap 56. Each of the swivel arms carries a depending bolt 103 and 104 extending downwardly into the annular recess 60 formed in cap 56.

After the feeding assembly 11 has been installed, body 78 is rigidly positioned because it is connected to inlet lines 40 and 51. However, swivel support 66 is rotatable relative to the body. This swivel support can be turned by means of arms 101 and 102. These arms also are effective to turn plug member 56 since the depending bolts 103 and 104 are shifted into engagement with abutments 61. Thus, the plug can be tightened down into fluid tight engagement with the lead 42 without the necessity of disconnecting either line 40 or line 51.

In operation, when solenoid valve 30 is open and hot water enters inlet port 81 from line 40, the water flows downwardly through tubing 47 and a high velocity stream flows outwardly from orifice 86. This stream effectively agitates the liquid in contact with the surface of the solid chemical bed 48 causing the solids in that bed to go into solution. Even if the washing compound comprises a heterogenous mixture of solids, the solid phase dissolves evenly so that the total material dissolved is in proportion to its proportion in the original compound. This occurs because the liquid-solid interface adjusts itself automatically so that a greater area of the less soluble components is exposed to the liquid phase, whereby the solution rate is in proper proportion for each ingredient of the compound. Moreover, any included liquid ingredients, such as wetting agents which often have limited solubility are also released in their true proportion.

The liquid solution accumulates within container 44 and produces a low pressure head, limited by the small size of nozzle 86 relative to the size of effluent conduit 51. This pressure, however, is sufficient to force the concentrated solution upwardly through tube 69 and outwardly through bore 88 and port 50. This solution is then forced by pressure through line 51, fittings 52 and 54 and discharge conduit 55 communicating with the reservoir 19. Feeding of solution from container 44 can be continued in this manner until all of the solid material is removed from the container.

From the above disclosure of the general principles of the present invention and the above description of a preferred embodiment, those skilled in the art will readily appreciate the many modifications by which the invention is susceptible. Therefore, I wish to be limited only by the scope of the following claims.

Having described my invention, I claim:

1. A chemical feeder head adapted to be threaded into a lid of a watertight shipping container, said head comprising a plug having a threaded periphery and an enlarged central opening, a swivel support member threadably engaging the opening in said plug and having an enlarged vertical bore therethrough, a swivel tube disposed within said vertical bore and being rotatably journalled therein, a body member fixedly mounted upon the upper end of said swivel tube, said body member having tranverse inlet and outlet ports, a depending nozzle tube carried by said body and extending downwardly through the bore in said swivel tube, a restricted orifice for forming a high velocity jet formed in the lower end of said depending tube, said body member having a bore interconnecting said discharge port and the center opening of said swivel tube.

2. A chemical feeder head adapted to be threaded into a lid of a watertight shipping container, said head comprising a plug having a threaded periphery and an enlarged central opening, a swivel support member threadably engaging the opening in said plug and having an enlarged vertical bore therethrough, a swivel tube disposed within said vertical bore and being rotatably journalled therein, a body member fixedly mounted upon the upper end of said swivel tube, said body member having transverse inlet and outlet ports, a depending nozzle tube carried by said body and extending downwardly through the bore in said swivel tube, a restricted orifice for forming a high velocity jet formed in the lower end of said depending tube, said body member having a bore interconnecting said discharge port and the center opening of said swivel tube, the cross sectional area of said discharge port being substantially greater than the cross sectional area of said orifice.

3. A chemical feeder head adapted to be threaded into a lid of a watertight shipping container, said head comprising a plug having a threaded periphery and an enlarged central opening, a swivel support member threadably engaging the opening in said plug and having an enlarged vertical bore therethrough, a swivel tube disposed within said vertical bore and being rotatably journalled therein, a body member fixedly mounted upon the upper end of said swivel tube, said body member having transverse inlet and outlet ports, a depending nozzle tube carried by said body and extending downwardly through the bore in said swivel tube, a restricted orifice for forming a high velocity jet formed in the lower end of said depending tube, said body member having a bore interconnecting said discharge port and the center opening of said swivel tube, and handle means carried by said support member for rotating said swivel support member relative to said body member.

4. A chemical feeder head adapted to be threaded into

a lid of a watertight shipping container, said head comprising a plug having a threaded periphery and an enlarged central opening, a swivel support member threadably engaging the opening in said plug and having an enlarged vertical bore therethrough, a swivel tube disposed within said vertical bore and being rotatably journalled therein, a body member fixedly mounted upon the upper end of said swivel tube, said body member having transverse inlet and outlet ports, a depending nozzle tube carried by said body and extending downwardly through the bore in said swivel tube, a restricted orifice for forming a high velocity jet formed in the lower end of said depending tube, said body member having a bore interconnecting said discharge port and the center opening of

said swivel tube, and pressure responsive relief valve means interconnected with said discharge port.

References Cited by the Examiner

UNITED STATES PATENTS

1,765,062	6/30	Draper	220—60
1,930,500	10/33	Archibald	23—272.7
2,113,203	4/38	Straubel	137—268
2,624,619	1/53	Fletcher et al.	23—272.8
2,982,971	5/61	Garaway	4—172
3,060,956	10/62	Menzie	137—205.5

M. CARY NELSON, *Primary Examiner.*