May 7, 1963 B. ROGGE 3,088,473

MUNITION CLEANING EQUIPMENT

Filed Oct. 17, 1962 2 Sheets-Sheet 1

Fig. 1

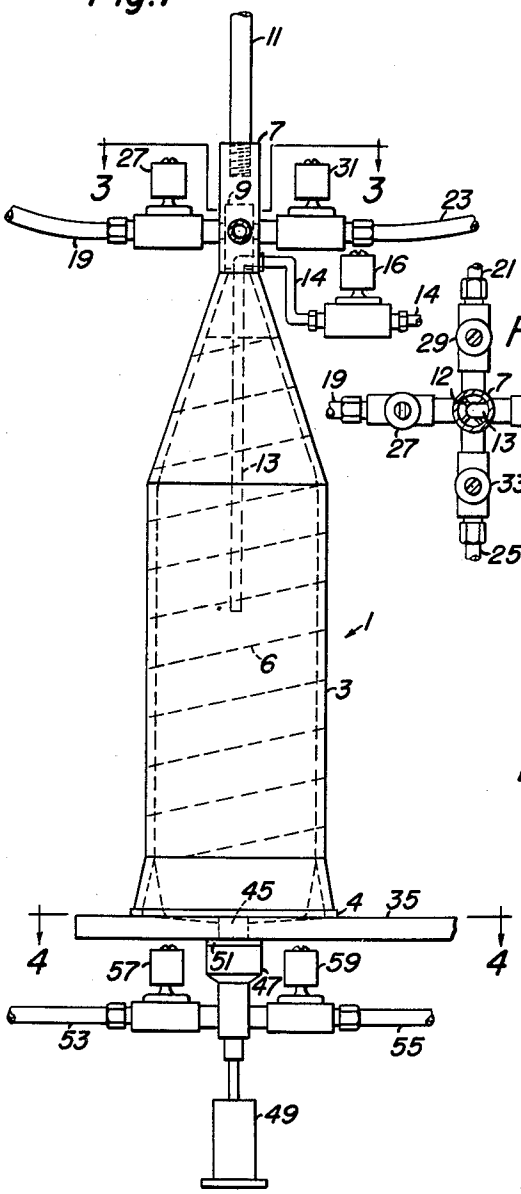



Fig. 2

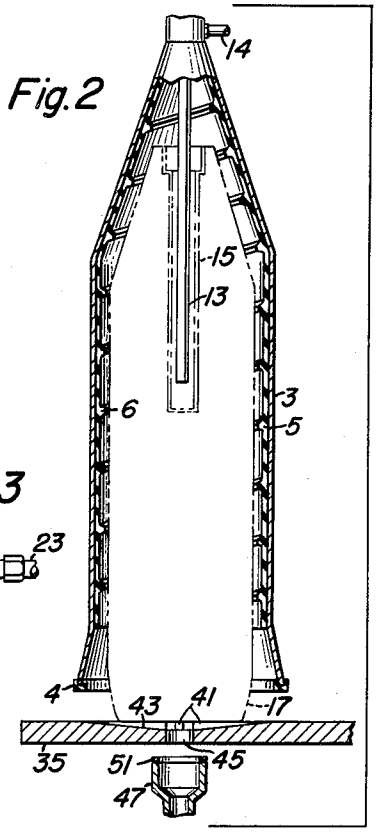
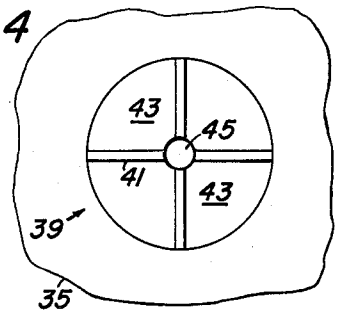



Fig. 3




Fig. 4




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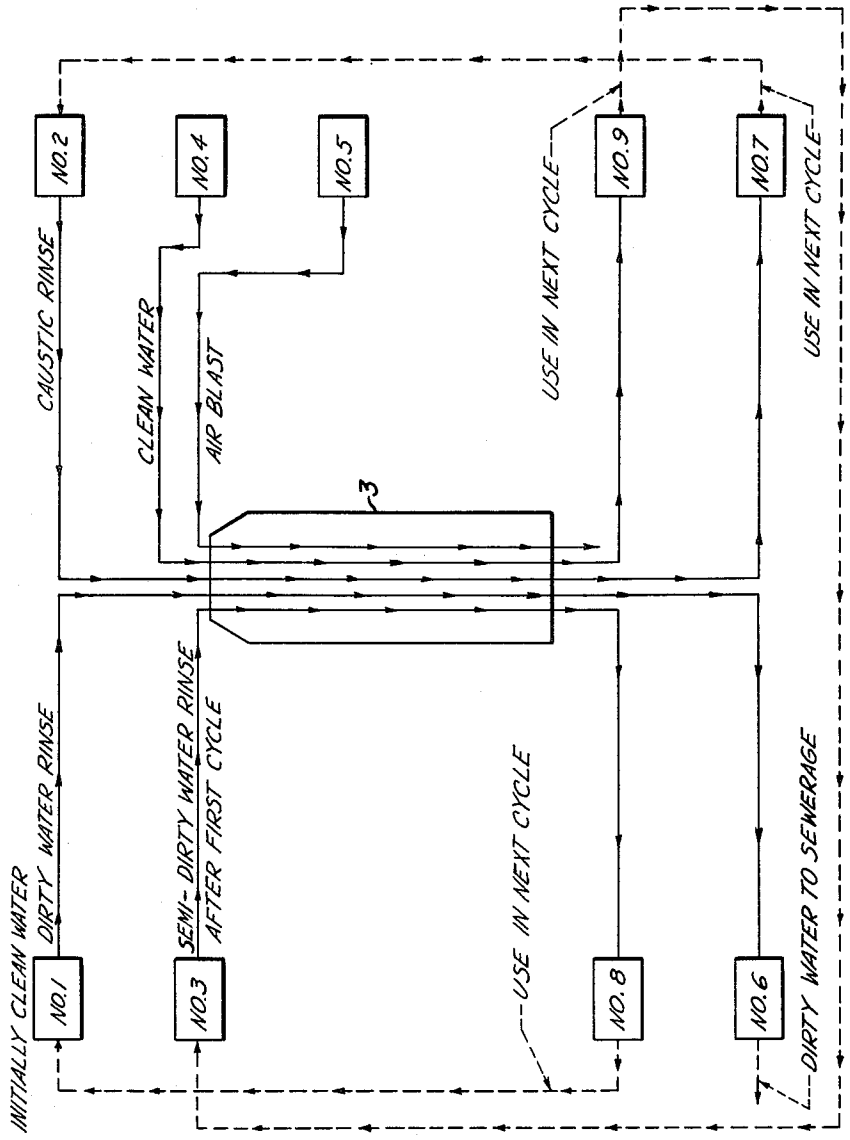



Fig.5

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# MUNITION CLEANING EQUIPMENT

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6 Claims. (Cl. 134—58)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to me of any royalty thereon.

This invention relates to apparatus for washing and cleaning chemical munitions, particularly of the artillery and rocket shell variety.

The present known methods of cleannig munitions of this type consists of passing the artillery or rocket projectiles (previously filled with liquid agents such as mustard gas of highly toxic phosphorus esters and closed with a burster tube or well) through an open sprayer type of equipment. This system has several disadvantages. It requires a considerable volume of cleaning fluid and water to bring about effective cleaning. The latter is even more true if the munitions are chemically contaminated. It should be quite apparent here that, the greater quantities of water utilized will put greater demands on the water resources and consequently on the sewerage or disposal system.

In the case of my invention, the water quantity utilized is approximately only 1/10 of the latter system with hardly any problem of disposal. The open spray type system utilizes lengthy conveyor structures to move munitions into spraying position where only relatively small percentage of the cleaning and rinsing solution is effectively utilized. Furthermore, since the munition in this case must travel a considerable distance under the spray heads, the system requires a great amount of equipment and floor space. It therefore can be easily seen that the open sprayer type cleaning equipment is not only costly but highly wasteful. My invention not only conserves cleaning fluid and water and affords more intense cleaning of the munitions, but it conserves a great amount of floor space since its size is a mere fraction of the presently used open spray cleaning systems.

It is the object of the invention to provide an ammunition cleaning apparatus of a character which eliminates the foregoing disadvantages through means of a novel turntable and hood arrangement.

Other objects and advantages of the invention will be apparent from the following specification and drawings in which:

FIG. 1 is a diagrammaticaly shown front elevation of my invention.

FIG. 2 is a fragmentary sectional view of the invention, showing the partially raised hood, the turntable, and the drain funnel.

FIG. 3 is a sectional view taken at section 3—3 showing the fluid feed lines.

FIG. 4 is a fragmentary plan view of the turntable taken at plane 4—4, showing the drain basin therein.

FIG. 5 is a flow diagram showing the relationship of the various tanks to the hood.

Referring now to the accompanying drawings in detail, the ammunition cleaning apparatus is designated generally by the reference character at 1. It embodies in its construction a substantially cylindrical metal hood or shell 3 which in operation is raised and lowered over a munition through means of a pneumatic operated cylinder (not shown). The upper end of this hood is cone shaped, and has fastened thereon a cylindrical metal retainer 7. The lower end of the hood is flared, and has mounted thereon a chemical resistant gas-



ket 4 made of neoprene, Teflon or a similar material. The hood on its interior is provided with a replaceable spacer or liner 5 (made of the same material as the gasket 4) having molded therein a spiral ledge 6. The general configuration of the spacer 5 is such that, when it is assembled inside of the hood 3, it can be cemented therein. The retainer 7 at its upper end has a thread-connected rod 11, which in turn is connected to the aforementioned pneumatic operated cylinder (not shown). The retainer 7 at its lower end has a bore or cavity 9 which is in communication with the hood 3. Centrally located inside of said cavity there is an integral web support 12 which retains a burster well blow-out tube 13. The tube at its upper end having a 90 degree bend projects through the wall of the retainer 7 where it is connected to a pressure line 14 having solenoid valve 16. The pressure line form here leads to an air pressure tank (shown as tank No. 5 in FIG. 5) which supplies pressure of approximately 80 p.s.i. The lower end, or the other portion of the tube 13 extends downwardly into a burster well 15 of a shell 17 (this occurs at the operation stage which will later be described). The retainer 7 has fluid feed lines 19, 21, 23, and 25 attached to it above the burster blow-out tube 13. These feed lines communicate or form fluid passageways from their supply tanks (indicated on the flow diagram of FIG. 5) through the solenoid valves 27, 29, 31, 33, into the cavity 9 and downwardly through the spiral spacer 5 of hood 3.

The lower portion of the cleaning apparatus generally shown at 1 comprises, a power driven, round metal turntable 35 (only a fragmentary view is shown). It has located near its outer periphery a plurality of evenly spaced drain basins generally shown at 39. Centrally located within each of the basins, there is an integral web support 41, concave surfaces or segments 43, and a drain hole 45. Stationed directly below the drain hole 45, there is a drain funnel 47 which is vertically adjusted through means of a pneumatic operated lift 49. This funnel at its upper diametrical edge has a chemical resistant gasket 51 made of neoprene, Teflon or a similar material which in operation of the apparatus provides a leak-proof seal between the funnel and the turntable. There are two fluid discharge lines 53 and 55 with their associated solenoid valves 57 and 59 connected to the stem of the funnel 47. In operation (as will later be described) the drain hole 45, the drain funnel 47, and the discharge lines 53, 55, create a series of pasageways which establish a complete communication through the whole cleaning apparatus generally shown at 1. It is to be noted here that, the two discharge lines 53, 55 are further branched off and diverted into their respective channels and tanks. This embodiment is not shown but is diagramatically indicated in the flow diagram of FIG. 5.

In operation, the munitions are placed in an upright position on the integral web supports 41 located within each of the basins shown at 39 on top of the turntable 35. The hood 3 containing the spacer 5 and the retainer 7 which embodies the blow-out tube 13 and the feed lines 19, 21, 23, 25, is then through means of the rod 11 of the pneumatic cylinder (not shown) lowered over the munition. Upon the downward movement of the hood 3, the blow-out tube 13 enters the burster well 15 of the munition or shell 17. The lower end of the hood makes contact with the turntable 35 and through means of the gasket 4 creates a leak-proof seal therein. At the lower portion of the cleaning apparatus generally shown at 1, the drain funnel 47 having the discharge lines 57, 59 is through means of the pneumatic operated lift 49 raised, until the funnel makes contact with the lower surface of the turntable 35. A leak-proof seal is created between the funnel and the turntable through means of

the gasket **51**. The cleaning apparatus thus described is now ready for the cleaning cycle to begin.

The operation now will be stage-by-stage described in connection with the flow diagram of FIG. 5.

*Stage No. 1.*—Initially clean water (but after the first cycle, dirty water pumped from tank No. 8) is introduced into the cleaning apparatus from tank No. **1**, through feed line **19**, open solenoid valve **27** into the hood **3**. The water at this point, due to the spiral ledge **6** of the spacer **5**, assumes a downward swirling motion which washes the munition and drains into the basin shown at **39**. From here the water drains through the hole **45**, funnel **47** and on through the discharge line **53**, open solenoid valve **57**, into sanitary tank No. **6** and out into a sewer for contaminated residues. This action completes stage No. **1** whereupon the aforementioned solenoid valves automatically close the flow through the aforementioned feed lines thereby readying the cleaning apparatus for stage No. **2**.

*Stage No. 2.*—Caustic rinse (i.e. 10% sodium hydroxide solution) is pumped into the cleaning apparatus from tank No. **2** on through feed line **21**, open solenoid valve **29** into the hood **3**. The rinse flowing through the apparatus in relatively the same manner as the previously described water of stage No. **1**, is directed through the discharge line **55**, open solenoid valve **59** into tank No. **7**. From here, the rinse is pumped back into tank No. **2** from where the rinse is reused again in the new cleaning cycle. This action completes stage No. **2**. The aforementioned solenoid valves automatically shut off the flow therein thus readying the cleaning apparatus for stage No. **3**.

*Stage No. 3.*—Initially clean water (but after the first cycle, dirty water pumped from tank No. **9**) is pumped into the cleaning apparatus from tank No. **3** through feed lines **23**, into the hood **3**. The water rinse flowing through the hood over the munition is channelled into the discharge line **23**, open solenoid valve **31**, and into tank No. **1**. The rinse here, is reused again in the new cleaning cycle which then will start with dirty water rinse. This action completes stage No. **3**. The aforementioned solenoid valves automatically shut off the flow through the lines thereby readying the cleaning apparatus for stage No. **4**.

*Stage No. 4.*—Clean water is pumped into the cleaning apparatus from tank No. **4**, through feed line **25**, into the hood **3**. The water cleaning the munition is directed at the bottom through the discharge line **53**, open solenoid valve **57**, into tank No. **9**. From here the water is pumped into tank No. **3** for future reuse in the new cleaning cycle. This action completes stage No. **4**. The aforementioned solenoid valves automatically shut off the flow through the lines thereby readying the cleaning apparatus for stage No. **5**.

*Stage No. 5.*—Air of 80 p.s.i. is introduced into the cleaning apparatus from pressure tank No. **5**, through pressure line **14**, open solenoid valve **16** into the hood **3**. From here the air is directed downwardly through the blow-out tube **13** into the burster well **15**. The air which blows out the water and water vapor from this burster well, is then discharged through the lines **53** and **55** and blows out the remaining fluids from there. This action completes stage No. **5**. The aforementioned solenoid valve automatically shuts off the pressure line. The hood **3** is then completely raised to clear the munition. The turntable **35** is automatically rotated by an electric motor and gearing (which are not shown since they are conventional) to bring into cleaning position a new munition which now will be ready for the new cleaning cycle. The vacated places on the turntable are periodically replenished by the operator with munitions to be cleaned. The electrical control means for the solenoid valves is not shown or described since it is not within the scope of my invention. Conventional cam actuated electrical switches of the type found in Patent 2,634,735 may be used as the electrical control means for my apparatus.

It is to be understood that tanks Nos. **1**, **2**, **3**, **4**, **7**, **8**, and **9** have fluid pumps associated with them which are not shown since they are conventional.

Although there has been described what is considered the preferred manner of carrying out the invention, it is to be understood that the same is merely illustrative and modifications may be made without departing from the scope of the invention.

I claim:

1. Apparatus for cleaning cylindrical chemical munitions comprising:
   - (*a*) Turntable means for holding said munitions having a plurality of drain basins near the outer periphery thereof;
   - (*b*) Hood means removably mounted above said turntable means and over said drain basins;
   - (*c*) Drain means removably mounted beneath said turntable means on the axis of said hood means;
   - (*d*) Separate elevation means connected to the top of said hood means and to the bottom of said drain means;
   - (*e*) Means to rotate said turntable means;
   - (*f*) Automatic fluid supply means connected to the top of said hood means to supply wash water, caustic rinse, and compressed air whereby said munitions are automatically washed and dried when moved into operative relationship with said hood means and drain means;
   - (*g*) Automatic control means operatively associated with said apparatus to automatically control the sequence of events.

2. Apparatus as set forth in claim 1 in which the hood means comprises an outer cylindrical shell and an inner liner having an internal spiral ledge.

3. Apparatus as set forth in claim 2 in which the automatic fluid supply means comprises a downwardly extending burster well blow-out tube.

4. Apparatus for cleaning cylindrical chemical munitions having a burster well comprising:
   - (*a*) Turntable means for holding said munitions during the cleaning operation having a plurality of drain basins equally spaced near the outer periphery thereof;
   - (*b*) A cylindrical hood removably mounted above said turntable means and on the axis of said drain basins;
   - (*c*) Drain means removably mounted below said turntable means on the axis of said drain basins;
   - (*d*) Separate elevation means connected to the top of said hood means and to the bottom of said drain means;
   - (*e*) Means to rotate said turntable means;
   - (*f*) Automatic fluid supply means connected to the top of said hood means to supply wash water, caustic rinse, and compressed air to said munition when in operative position;
   - (*g*) Automatic electric control means operatively associated with said apparatus to automatically control the sequence of events.

5. Apparatus as set forth in claim 4 in which said cylindrical hood comprises an outer shell and an inner liner having an internal spiral ledge.

6. Apparatus as set forth in claim 5 in which the automatic fluid supply means comprises a downwardly extending tube adapted to blow-out said burster well with compressed air.

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