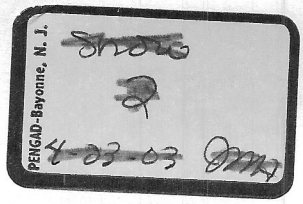

WESLEYAN COMPANY, INC.
FLUID DELIVERY SYSTEMS

presents

An Unsolicited Voluntary Proposal

for

THE UNITED STATES ARMY

Titled:

Fluid Intake Suction Tubing (FIST) Hydration System and

FLEX ^{C} Canteen for Mission-Oriented Protective Posture (MOPP)

Personnel in a Nuclear, Biological, Chemical (NBC) Environment

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Read and Understood –
Harriet Weiss
12/27/82.

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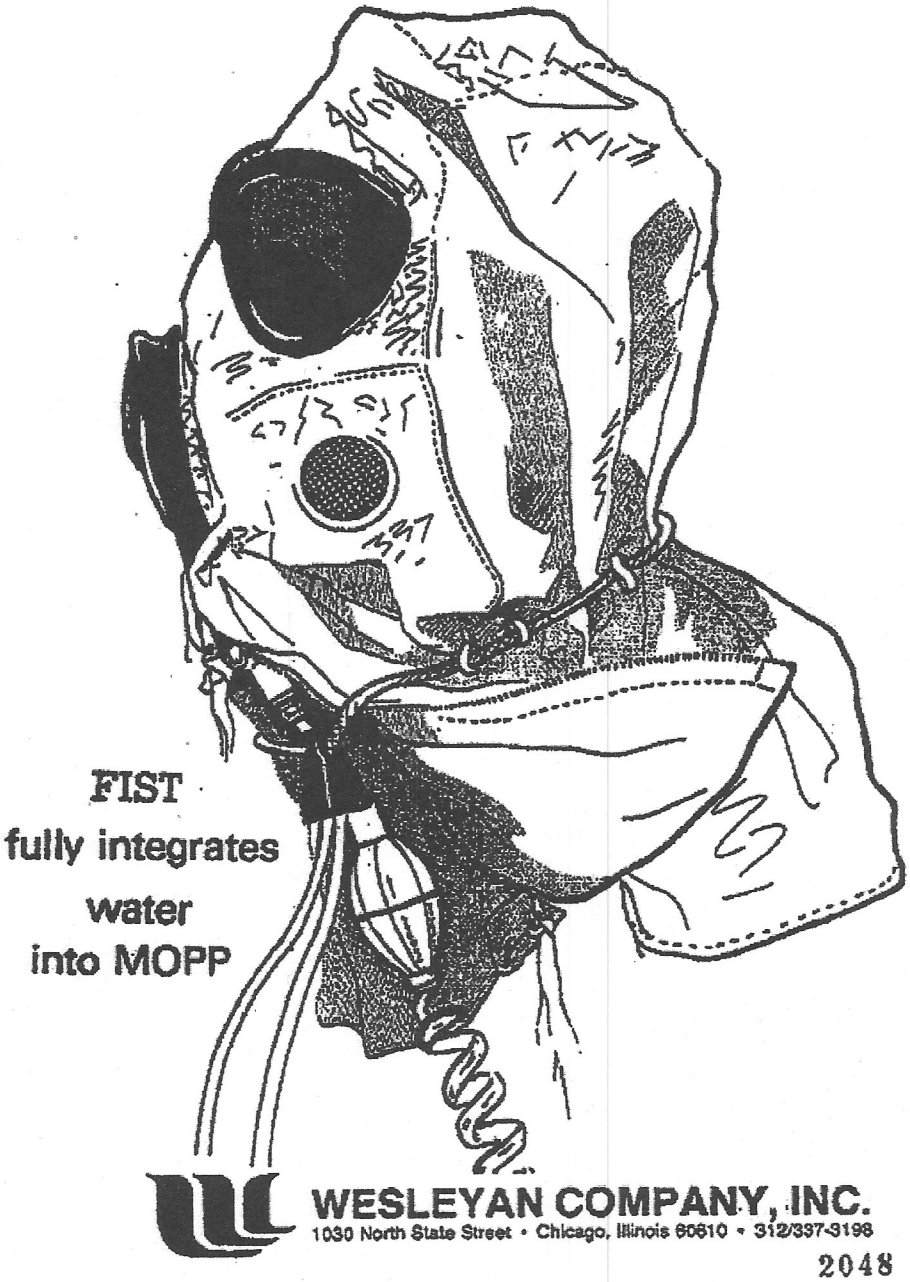

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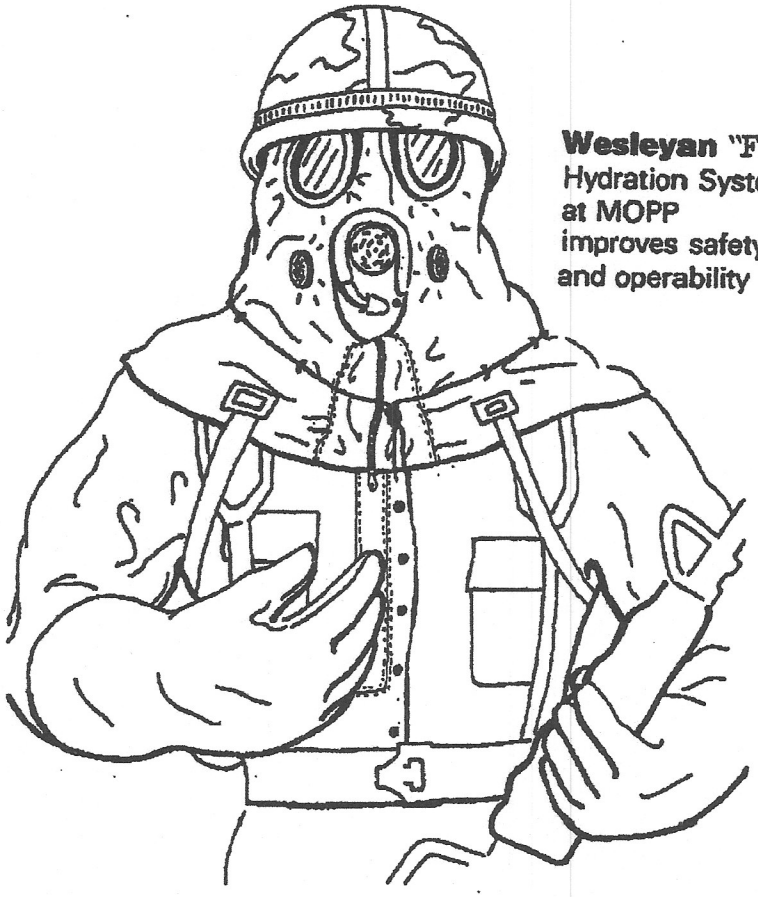

Wesleyan "FIST"™
Hydration System
at MOPP
improves safety
and operability

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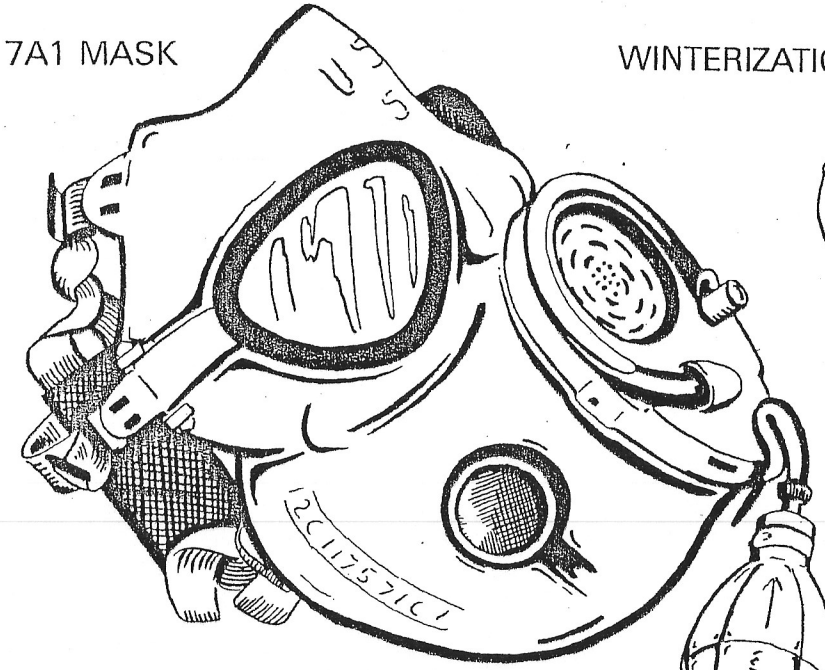
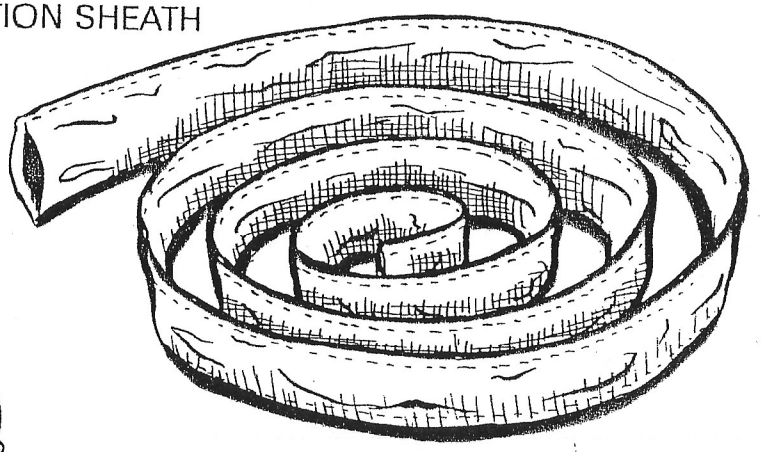
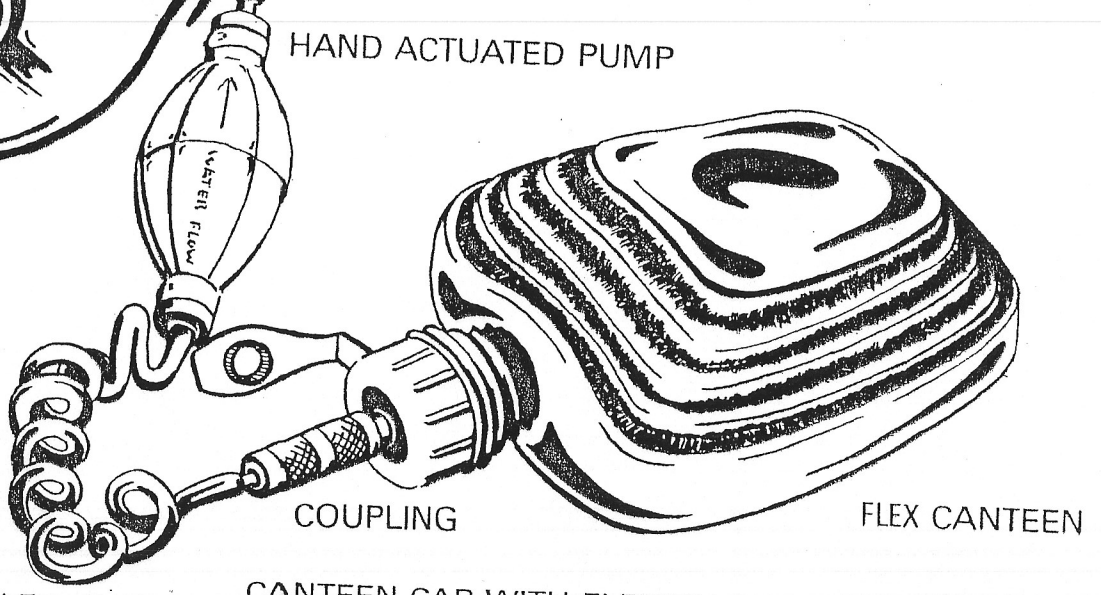
M17A1 MASK



WINTERIZATION SHEATH



HAND ACTUATED PUMP



Wesleyan's
Fluid Intake Suction Tubing (FIST) Hydration System with sheath and Flex Canteen

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COUPLING

FLEX CANTEEN

COILED FLEXIBLE CONDUIT

CANTEEN CAP WITH FLEXIBLE INTERNAL TUBING (NOT SHOWN)

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Unsolicited Voluntary Proposal
Titled:
Fluid Intake Suction Tubing (FIST) Hydration System and FLEX Canteen
for Mission-Oriented Protective Posture (MOPP) Personnel in a
Nuclear, Biological Chemical (NBC) Environment

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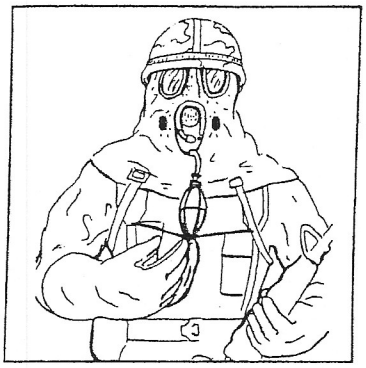
COMPARATIVE ANALYSIS OF THE MILITARY'S CURRENT HYDRATION PROCEDURE AT MISSION-ORIENTED PROTECTIVE POSTURE (MOPP)

vs.

THE WESLEYAN FLUID INTAKE SUCTION TUBING (FIST©) HYDRATION SYSTEM



Operating Factors	Military's Current "Hook-up" Method	Wesleyan FIST© Hydration System	FIST©'S Superior Qualities
Operating Procedure	Mask donned, canteen retrieved from belt, withdraws coupling half from cover pocket, flips open protective cover on cap, lift canteen and "hook-up" to drinking coupling, turn mask lever, blow to create positive pressure, drink water by oral suction, allow air to re-enter canteen, return lever, "unhook" from mask, close cap, stow canteen, return coupling half to pocket on mask.	Mask is donned, canteen retrieved, flip open protective cover on cap, plug coupling into cap, turn lever, squeeze pump bulb, drink, return lever.	Eliminates repetitive time consuming actions. Faster connection. Fully integrates water supply into MOPP.
Required "Hook-up Frequency	Hook-up method required for each drink, multiplied by the number of drinks within canteen.	Once	Reduces mission degradation. Saves time.
Required Decontamination Frequency	Could be necessary for each drink, multiplied by the number of drinks within canteen.	Once or not at all.	Reduces chemical casualities since fittings are not repetitively re-exposed to contamination possibilities.
Required Dexterity Level	Two hands needed for each hook-up.	One hand needed to open lever, then squeeze pump.	Eliminates "buddy system" for personal security when drinking.
Required Water Extraction Means	Oral suction by soldier draws water.	Hand actuated pump retrieves water by hydraulics.	Easier to obtain water. Saves valuable human energy.
Required Energy Consumption for Drinking	High energy consumption level to suck water against the canteen's internal negative pressure.	Immeasurable energy consumption to raise hand, open lever, and squeeze bulb.	Eliminates heat build-up generated by oral suction "work."
Required Drinking Posture	Inflexible posture mandatory since canteen must be raised and inverted above mask's drinking tube.	All positions possible.	Enhance personal safety. Creates comprehensive flexibility.

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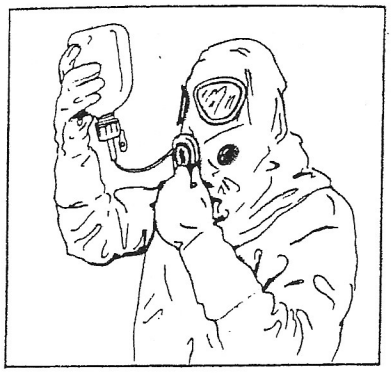
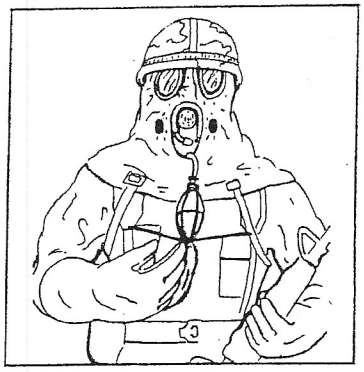
COMPARATIVE ANALYSIS OF THE MILITARY'S CURRENT HYDRATION PROCEDURE AT MISSION-ORIENTED PROTECTIVE POSTURE (MOPP)

vs.

THE WESLEYAN FLUID INTAKE SUCTION TUBING (FIST©) HYDRATION SYSTEM





Operating Factors	Military's Current "Hook-up" Method	Proposed FIST© Hydration System	FIST©'S Superior Qualities
Required Vision Factors	Distracting vision requirement for "hook-ups."	Vision not required after initial "plug in."	Improves mission effectiveness. Simplifies night hydration practices. Reduces light discipline infractions.
Water Evacuation Period	Current standard is the removal of one (1) quart in a ten (10) minute period.	One (1) quart removed in 5 minutes.	50% faster for water evacuation. Reduces mission degredation.
Other Safety Features	Mask cover pocket protects coupling half from exposure to contamination.	FIST© acts as a "fail safe" measure since adaptive couplings could be made to attach FIST© to mask. If any FIST© equipment is defective, the FIST© is discarded and soldier reverts back to current system until he is refitted with another FIST© in decontamination areas.	Provides an alternative hydration system if defective.
Summary	Hook-up repetitive. Decontamination repetitive. Slow water evacuation. Vision always required. Oral suction necessary. High energy consumption needed. Two (2) hands always mandatory.	One connection. Only one contamination possible. 50% faster water evacuation than standard. Vision unneeded after connection. Simple pumping required. Lower energy consumption. One hand needed.	Easier to use. Reduces contamination possibilities. 50% faster water evacuation. Reduced vision requirements. Simplifies night hydration. Oral suction not required. Eliminates repetitive and distracting actions.
Conclusion	Needs improvement.	Provides improvement.	Saves lives. Reduces mission degradation, therefore, "more bang for the buck."

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INTRODUCTION TO THE PROPOSAL'S RATIONALE

THE EMINENT CHEMICAL WARFARE THREAT

"Our major concern is the disparity in Europe between modern mobile and highly capable Soviet long range theatre systems, and the older U.S. systems assigned for NATO. This concern is compounded by the even wider gap in chemical warfare (CW) capabilities."

General David C. Jones
Chief of Joint Chiefs of Staff
Military Posture for FY 1982.

Q. Are you worried about the Soviet chemical-warfare threat to the U.S. Army positions in Europe?

A. If I were a Soviet military commander, I would have great difficulty not recommending the use of chemical weapons in support of my operations. NATO simply does not have the means to retaliate with chemical weapons. Therefore, the military advantages that would accrue to the Soviet forces through their use is something I have to worry about a great deal.

General Frederick J. Kroesen
Commander in Chief
U.S. Army, Europe and Seventh Army
U.S. News and World Report
August 9, 1982

"Chemical-warfare may very well be the Army's most vulnerable area in the 1980s."

Lt. General Donald Keith
Deputy Chief of Staff for
Research and Development Acquisition
FY 1982 Department of Defense Budget Report

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CHEMICAL WEAPONS OVERVIEW

Chemical weapons are basically area weapons. They can travel around corners, diffuse throughout weeks, and seep into dugouts and fortifications. They offer a spectrum of physiological effects from mild, temporary narcosis to severe bodily damage and death. For the most part, the are colorless, odorless, and tasteless. The first indication of their use could be the appearance of casualties among military personnel. They are weapons of minimum destruction to physical facilities. They produce their effects on people, animals, and plants, but would leave homes, factories, and other installations untouched. Most CW-agents are relatively easy to produce in large quantities at moderate cost. Chemical weapons are regarded by many as being more humane than so-called conventional weapons that are based on the use of high explosives. Chemical warfare weapons are sometimes refered to as Tomorrow's Weapons, Silent Weapons, the Unseen Death, or the Invisible Death.

Chemical agents are classified in seven major categories as follows:

Nerve agents
Blister agents
Blood agents
Choking agents
Vomiting agents
Irritant agents
Incapaciting agents.

Another possible category, Toxins, is not included in the above list. The Toxins usually are produced by living micro-organisms and are arbitrarily classified as Biological Warfare (BW-) agents.

Probably the greatest, single threat, regardless of portal-of-entry, is the nerve agents. These agents function by inhibiting cholinesterase, a body enzyme, thereby causing victims to die by "overstimulation" of the nervous system.

THESE TERRIBLE REALITIES REQUIRE AMERICA'S MILITARY PERSONNEL TO BE MORE PREPARED FOR THE EVENTUALITY OF CHEMICAL WARFARE.

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AMERICA'S LIFE PRESERVATION PRIORITY

What price does the United States Army place on the safety of a soldier's life and his ability to successfully perform his mission? Since a life cannnot be duplicated, should not that value be priceless? Therefore, to maintain a credible defensive or retailatory military posture within the lethal realities of today's biological, and chemical warfare scenerios, it is within our national interest to save as many lives as possible by providing our military personnel with state of the art equipment. Examples of this equipment that have been funding priorities of the Reagan administration include the NBC protective mask, M8 chemical detectors, and the M51 collective protective shelter.

These defense systems, and others like them need to be operated by highly skilled service personnel. Their knowledge of how these systems operate is only one measure of whether their field missions will be successful. Another determinant of even greater importance is their ability to actually physically carry out their missions. No where is this of greater concern than with the soldier who is deployed to fight on a contaminated battlefield at Mission-Oriented Protective Posture (MOPP).

At MOPP, the soldier is encapsulated within the standard A chemical protective liner and over garment ensembles and, the M17 series NBC field protective masks, and hood. NARADCOM has determined that the useful life of the absorbent materials inside the clothing will last approximately six hours in a toxic environment. However, during this period, the soldier is operating within an "artificial environment." Artificial because he must breathe through filters and observe the conditions around him through the glass of his protective mask. Even his peripherial vision is obstructed by the confining nature of the M17 series. Moreover, his hearing and his speech is impeded. The M6AZ hood that he also wears is permeable, but it does not permit all of the soldier's built-up body heat to escape. This heat load increases when the soldier's own nervous system activates his sweat glands in response to the chaotic conditions of the frightening NBC battlefield. At this point, *the soldier is subjected to protracted physiological and psychological stresses caused by adoption of the protective posture.*

HIS RELIEF IS NOW IN THE FORM OF MISSION DEGRADATION AND THE FRUSTRATING DEFICIENCIES ASSOCIATED WITH THE CURRENT AND ANTIQUATED WATER DRINKING SYSTEM.

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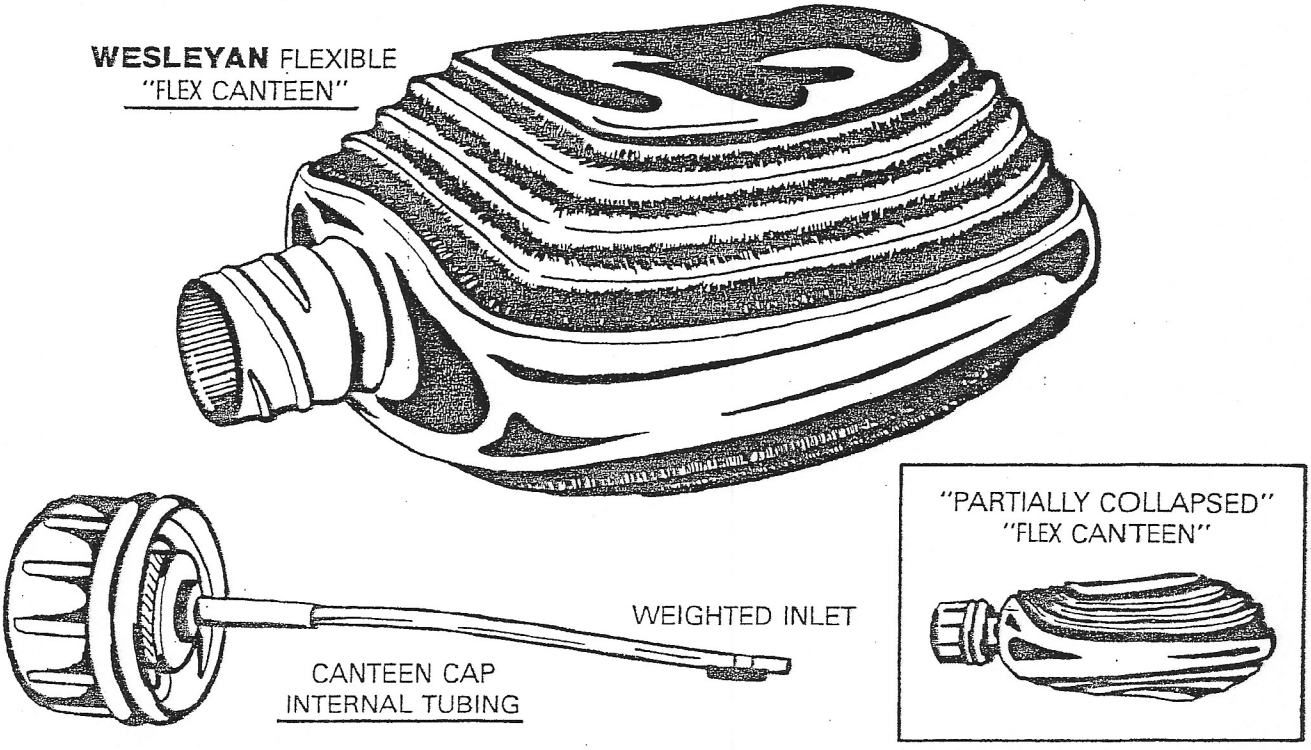
PATENT PENDING

Wesleyan "Flex" Canteen



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STATEMENT OF THE PROBLEM

THE CURRENT MILITARY PROCEDURE FOR DRINKING WATER IN AN NBC ENVIRONMENT IS NOT AS SAFE AND EFFICIENT A SYSTEM AS IT COULD BE.

OFFICIAL ARMY MOPP HYDRATION PROCEDURE

The steps the soldier must follow to drink water with the M171A mask in place as described in Army Field Manual 3-54 EL/2 on 2-49 and 2-50, ORDG. 1028 and 1029.

Manual Instructions

1. Fill your plastic water canteen before entering contaminated area.
2. Steady mask and withdraw drinking coupling half from cover pocket.
3. Let coupling hang free.
4. Get canteen from its cover. Flip open protective cover of cap and hold canteen in one palm near your mask.
5. Push couple half in and turn to connect it to cap.
6. Check that connections are tight.
7. If pin in cap is off center, insert coupling to angle to pick-up pin.
8. Turn and hold level all the way toward voicemitter.
9. Open your mouth and hold drinking mouth piece between your teeth.
10. Blow to create positive pressure.
11. If resistance is not felt, your drinking system leaks -- don't drink.
12. Replace mask as soon as conditions permit.
13. If system doesn't leak, raise and invert canteen.

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14. Keep lever turned and drink water from canteen by mouth generated sucking.

15. Do not tilt head back while drinking. Repeat this as required.

16. When finished, turn canteen upright and after several swallows allow air in mask to enter canteen.

17. Blow into mouthpiece.

18. Return lever to vertical position.

19. Pull coupling half from cap.

20. Close protective water cap cover.

21. Stow canteen.

22. Return coupling half to pocket and press hose into groove at side of voicemitter pouch.

Current Hydration Problems

1. Each time the soldier wants to drink water, he must put down his first line of defense (his weapon) or turn his attention away from his duties to start the water drinking process.

2. Since sunlight is very destructive to most biological agents in aerosol form, the most favorable conditions for the employment of biological agents is at night. After the alarm sounds and masks are donned, the soldier's vision will be impaired even further. Therefore, drinking water under the present repetitive system will become even more difficult, since little or no light will be available to aid in the soldier's canteen/mask hook-up procedure.

3. The present system requires the soldier to use the M13 decontamination kit to clean the canteen cap and the water spigot areas each time he hooks up to drink water in an area contaminated with a chemical agent that does not present a vapor hazard. The following chart focuses upon CW agents and their individual characteristics as life threatening water contaminants.

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Significant CW-Agent Water Contaminants

Group	Symbol	Agent	Formula	Freezing Point (°F)	Boiling Point (°F)	Odor
Nerve Agents	GA	Tabun	$CN(CH_3)_2\ NP(O)\ (OC_2H_5)$	-57	459	Sweetish; fruity
	GB	Sarin	$F(CH_3)_2\ CHOP(O)\ CH_3$	-70	297	Almost none
	GD	Soman	$F(CH_3)\ P(O)\ OCH(CH_3)\ C(CH_3)_3$	-94	333	Fruity
	VX	O-ethyl S-(2-diisopropyl-aminoethyl) methylphos-phonothioate		--	--	
Blister Agents	HD	Sulfur Mustard	$(ClCH_2CH_2)_2S$	58	442	Garlic-like
	HN-1	Nitrogen Mustard	$(ClCH_2CH_2)_2NC_2H_5$	-30	Decomposes	Faint fishy or musty
	HN-2	Nitrogen Mustard	$(ClCH_2CH_2)_2NCH_3$	-14	Decomposes	Fruity
	HN-3	Nitrogen Mustard	$N(CH_2CH_2Cl)_3$	39	Decomposes	None
Arsenicals	L	Lewisite	$ClCH{:}CHAsCl_2$	1	374	Geranium-like
	ED	Etyldichloroarsine	$C_2H_5AsCl_2$	-83	313	Fruity
	PD	Phenyldichloroarsine	$C_6H_5AsCl_2$	4	490	None
Blood Agents	AC	Hydrogen Cyanide	HCN	7	79	Peach kernels
	CK	Cyanogen Chloride	CNCl	22	59	Irritating
Incapacitating Agents	BZ	3-Quinuclidinyl Benzilate	--	--	--	--

— Not stated.

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Hydration System
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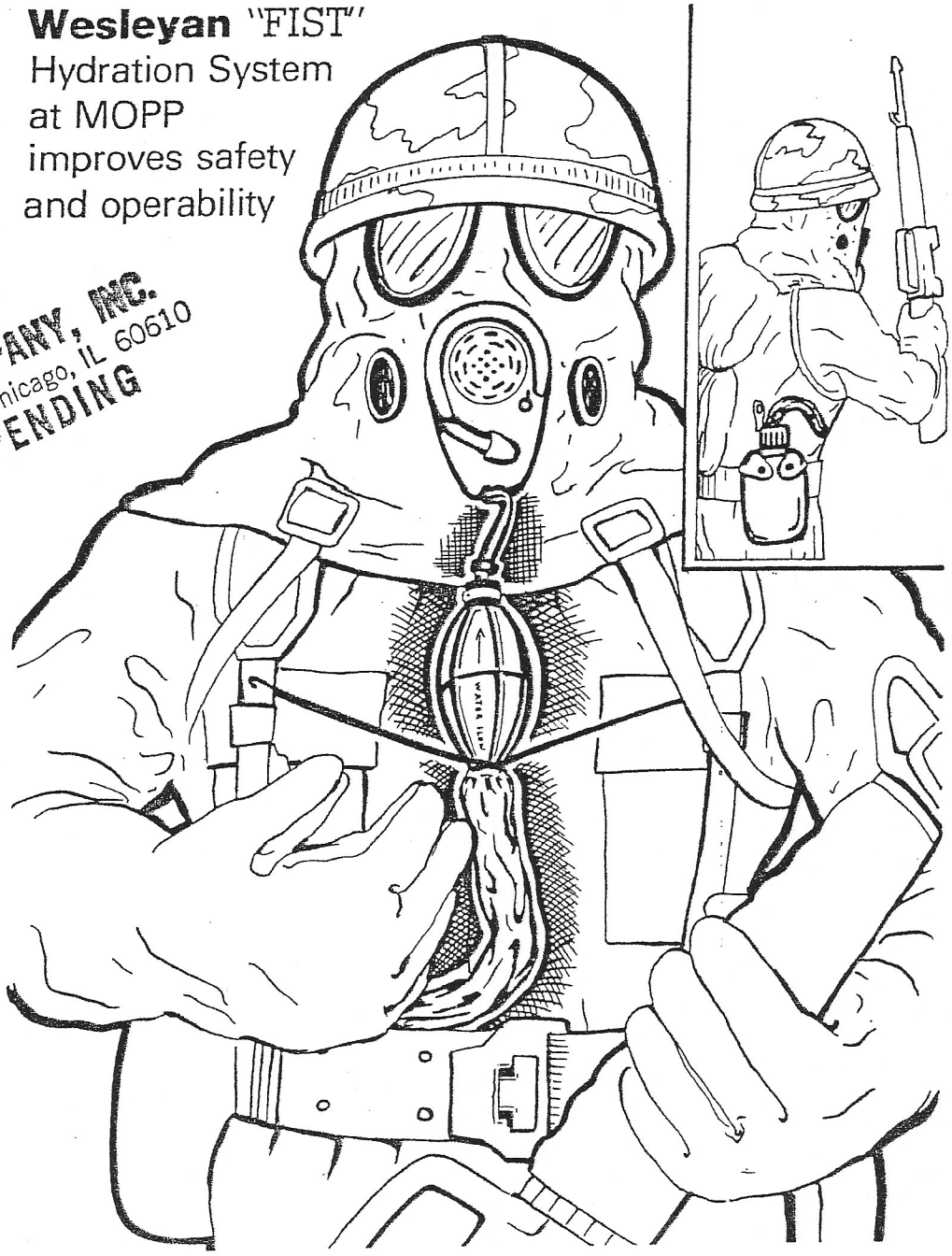

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Conventional Hydration System

WATER IS EXTRACTED BY GRAVITY AND ORAL SUCTION

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Analysis of CW Agents as Contaminants

a. Significant CW-agent water contaminant categories are: nerve agents (GA, GB, GD, and VX); blister agents (HD, HN-1, HN-2 and HN-3); arsenical (L, ED, and PD); blood agents (AC and CK); and an incapacitating agent (BZ).

b. Maximum Permissible Concentrations for CW-agents in water are: nerve agents -- 0.02 mg/l; blister agents -- 2.0 mg/l; arsenicals -- 2.0 mg/l (as arsenic); blood agents -- 20.0 mg/l; and the incapaciting agent -- 0.004 mg/l (provisional).

POOR WATER DECONTAMINATION PRACTICES OR THE ABSENCE OF IT CAN TURN A SOLDIER INTO A CHEMICAL CASUALTY UNDER THE PRESENT DRINKING SYSTEM.

4. The present system requires the soldier to position himself in such a way as to receive fluids by gravity flow, perhaps forcing himself to uncover his position to the enemy, thereby, jeopardizing his own safety, the safety of his unit, and the completion of the mission.

5. The present system requires the soldier to obtain water by oral suction, which is both time and energy consuming. The current procedure requires the soldier to turn the canteen upright and, after several swallows, allow the air in the mask to enter the canteen; then he must blow into the mouth piece. This is psychologically frustrating in light of the other wartime factors that the soldier must contend with in an NBC environment.

THESE PROBLEMS WILL BE ELIMINATED WHEN THE ARMY ADOPTS THE PROPOSED WESLEYAN FIST HYDRATION SYSTEM AND FLEX CANTEEN.

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PROPOSED APPROACH

The Wesleyan Fluid Intake Suction Tubing (FIST) Hydration System and FLEX Canteen

Overview

The Wesleyan FIST Hydration System and FLEX Canteen is a human engineering, life enhancement system that allows MOPP personnel to drink water more safety and effortlessly. This hydration system is principally adaptable to the present M17A1 protective mask, field canteen, and special NBC water cap currently used by the Army. It consists of four working elements:

1. Couplings
2. Hand Actuated Pump
3. Coiled Flexible Tubing
4. Internal Canteen Cap Tubing

The FIST Hydration System operates on the principle of hydraulics. The soldier that needs the FIST Hydration System will find it already connected to the drinking tube coupling on the M17A1 protective mask. Once the soldier's mask has been put on, all he needs to do is plug the coupling that hangs at the end of the flexible coiled conduit into the NBC water canteen cap. This is a one time hook-up procedure for each full canteen of water. Then the soldier turns and holds the lever to open the hydration system, holding the mouth piece between his teeth. Next, he reaches below his mask's outlet valve, finds the hand actuated pump and sqeezes it until the water is retrieved from the canteen into his mouth. The soldier regulates the quantity of water (10 ML per squeeze) he receives by the number of fists he makes with the hand actuated pump. Hence, the name FIST Hydration System. When not in use, the complete FIST Hydration System is stored right where it will do the soldier the best good; inside the M17A1 mask. Since it is an extension of the mask itself, the system will not get lost. The entire system will not be a burdensome addition for the soldier to carry, since its dry weight is nominal.

(1) THE WESLEYAN FIST HYDRATION SYSTEM MAKES MOPP HYDRATIONS SIMPLIER THAN DRINKING CANTEEN WATER UNDER NORMAL CONDITIONS BECAUSE REPETITIVE MOVEMENTS ARE NOT NECESSARY.

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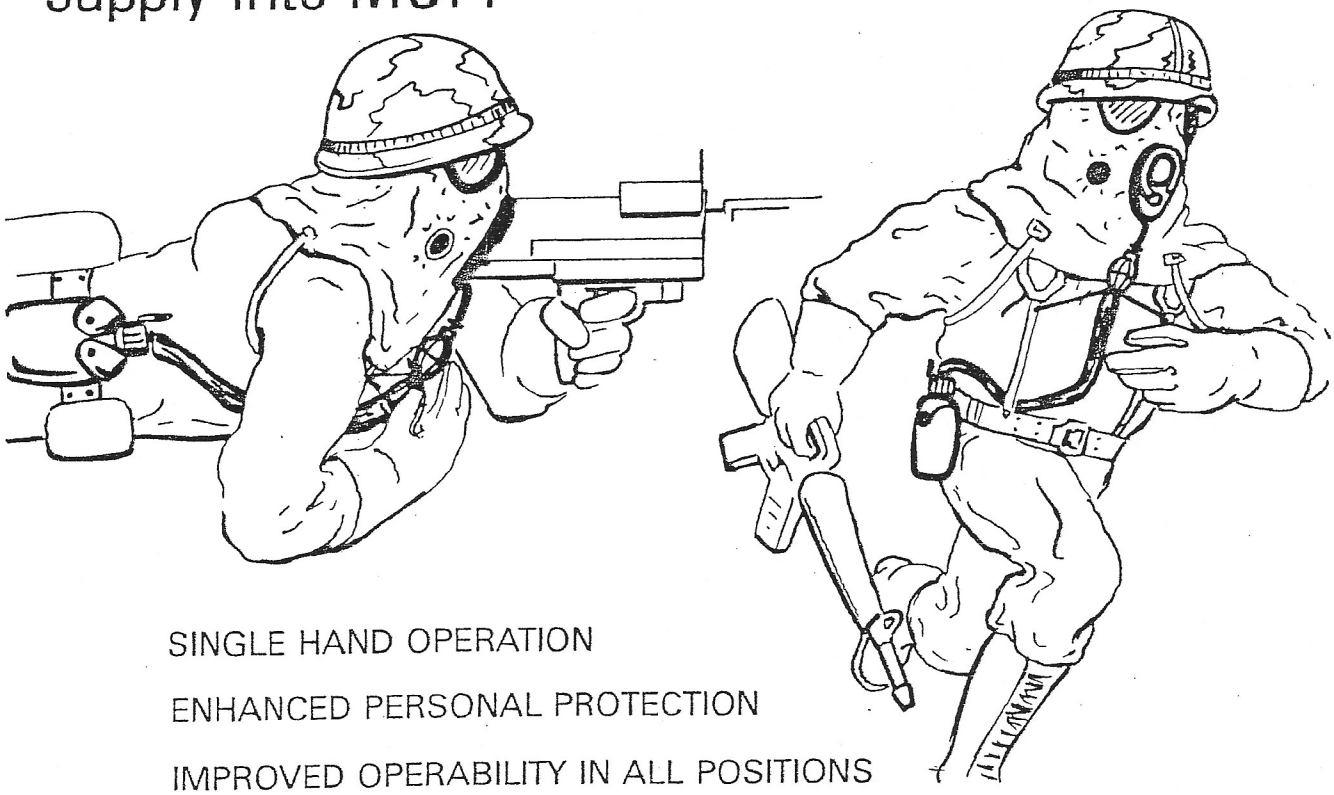
PATENT PENDING

Improved flexibility & mobility at MOPP

Wesleyan "FIST" fully integrates the water supply into MOPP



SINGLE HAND OPERATION

ENHANCED PERSONAL PROTECTION

IMPROVED OPERABILITY IN ALL POSITIONS

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ANALYSIS OF THE WESLEYAN FIST HYDRATION SYSTEM'S COMPONENTS

Each one of the elements of the Wesleyan FIST Hydration System have unique functions. Each one aids the soldier in drinking water more safely and effortlessly. The system's components are identified below.

1. Couplings

   These couplings are the M17A1 masks' drinking devices' current couplings. The restrictive protective mechanisms are the same type.

2. Hand Actuated Pump (Siphon)

   Inside the siphon is a check valve that prevents fluids from escaping the bulb once they have been retrieved from the canteen. This allows the soldier to drink without having to prime the system each time he uses it. Water is available each moment it is required.

3. Coiled Flexible Conduit with Sheath

   This insulated reinforced hose connects the siphon with the canteen coupling; the coupling that gets inserted into the top of the NBC canteen cap. Coiling provides the following benefits: 1) one size fits all; 2) extensions strap the tubing close to the body to prevent tanglements or pinches; 3) coiling reduces storage space demands. The sheath protects the hose from damage and winterizes it to prevent freezing.

4. Internal Canteen Cap Tubing

   Using the NBC canteen cap, the internal tubing is attached inside so that the tube's weighted and rests near the bottom of the filled canteen. When the FIST is operable, the fluids are drawn from the bottom of the canteen. If the soldier is in a position other than an upright one, the weighted tubing will gravitate along with the water to the canteen's lowest point. This will permit the soldier to pump nearly all of the water out of his canteen without the need to invert it for fluid removal.

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HOW AND WHY THE WESLEYAN FIST HYDRATION SYSTEM WORKS

A technical feasibility study was conducted on the Wesleyan FIST Hydration System under the direction of Professor Martin Ger, Ph.D., civil engineering at the prestigious Illinois Institute of Technology. The system's components described hereinabove were used in the experiments detailed below.

EXPERIMENTS

Performance Experiments

There were two goals of these experiments. The first goal was to determine the Wesleyan hand actuated pump characteristics and, thus, the minimum pressure up to which the pump is operable. The second goal was to obtain the percentage of usable volume of the canteen.

Two sets of experiments were run. The first series of experiments were run with an air tightened rigid glass container whereas the standard field canteen was used for the second series.

Experiments with rigid container

At several different initial water levels with the glass container of known volume, water is pumped out. The volume at which pumping gets hard and the volume at which pumping becomes virtually impossible were recorded. Then these data were reduced to determine corresponding chamber pressures and to relate the usable volume of water to initial water content as described below.

In Figure 1, the various volumes and their relationships are illustrated.

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12/27/82.

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V_t = total volume
V_1 = volume of initial air pocket within the container at atmospheric pressure.
V_u = usable volume; the volume greater than which becomes very hard to pump out
V_3 = the maximum volume of water that can be pumped out
V_w = initial volume of water

Using the gas law,

$$p\,V = R\,T$$

where p = pressure
V = volume
R = gas constant for air
T = temperature,

the pressure within the rigid container can be related to atmospheric pressure and to the volume of initial air pocket:

$$p\,V = p_o\,V_1$$

where p_o = atmospheric pressure. For example, at the instant pumping gets hard, the pressure within the rigid container is

$$P_u = \frac{p_o\,V_1}{V_2}$$

where $V_2 = V_1 + V_u$, and

P_u = the pressure below which pumping is very hard.

Similarly, the instant at which pumping gets virtually impossible, the pressure within the glass container becomes

$$p_f = \frac{p_o\,V_1}{V_3}$$

where Pf = the lower limit of operable pressure range.

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Results of the experiments are summarized in Table 1.

TABLE 1

V_t	V_w	V_1	V_2	V_u	V_3	Po	Pu	Pf	V_u/V_t (%)	Remarks
130	100	30	67	37	80	14.7	6.58	5.51	28.5	
130	105	25	55	30	65	14.7	6.68	5.65	23.1	
130	95	35	78	43	92	14.7	6.60	5.59	33.1	
130	90	45	99	54	118	14.7	6.68	5.60	41.5	
130	80	55	121	66	--	14.7	6.68	--	50.8	
130	70	60	--	70	--	14.7	--	00	53.8	no hardship
130	50	85	--	50	--	14.7	--	--	38.4	no hardship

(Note: volumes are in ml and pressures are in psia)

Experiments with standard field canteen

Irrespective of the initial volume of air pocket at atmospheric pressure within the canteen, as soon as the Wesleyan FIST begins pumping water, the canteen starts to deform (literally collapses). In other words, the pressure inside the canteen is retained atmospheric or nearly atmospheric at all times. Therefore, the usable volume of water is within the range of 90-95% of the available volume of the canteen.

Rate Experiments

In this set of experiments, it is aimed to obtain a relationship between the pressure within the container and the volume of water pumped out at each squeeze under this pressure. The same set up that is used for the first series of performance experiments is used. The results of the experiments are presented in graphical form, on the following page.

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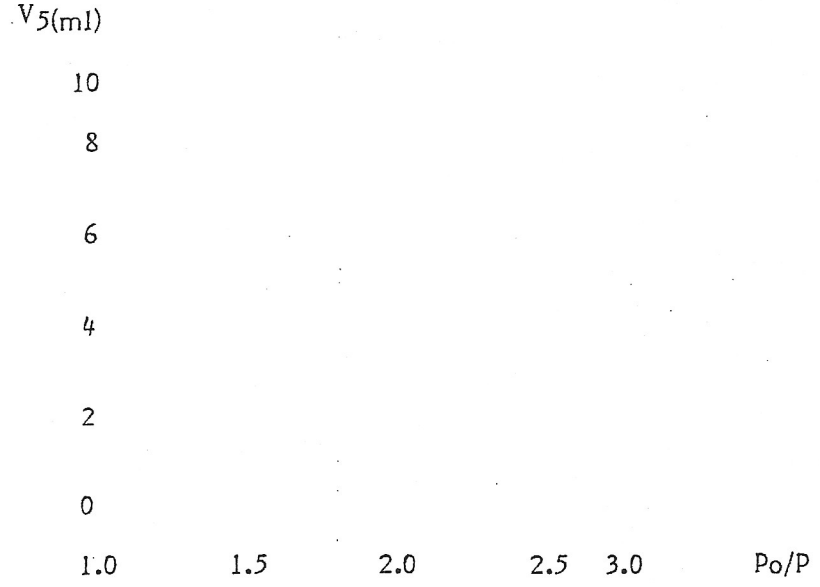

It is also observed that as long as pressure within the container is greate than Pu, a constant rate of approximately 10 ml/squeeze can be pumped 20 t 25 times a minute, using the Wesleyan hand activated pumping mechanism.

3. DISCUSSION OF RESULTS

This study of the results of the first series of performance experiments the rigid container reveals the fact that after pumping a certain volume water, V_u, operating the pump becomes very difficult. Continued pumping water out of the rigid container brings out a state where pumping becom virtually impossible. The results of rate experiments, which also confirm these observations, show a sudden decrease in the amount of volume of wate that can be pumped out by one squeeze, V_s, when the pressure within the rigi container is about p_u. V_s diminishes very rapidly to zero as the pressur approaches to p_f.

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THEREFORE A RIGID CONTAINER ELIMINATES THE EFFECTIVENESS OF THE WESLEYAN FIST HYDRATION SYSTEM.

The results of the second series of performance experiments reveals the fact that pumping water with the Wesleyan FIST hand actuated mechanism allows 95% of the canteen water to be evacuated at a reliable constant rate of 10ml/squeeze. Noting that the pump can be squeezed 20 to 25 times per minute, a reliable rate of 200-250ml/minute water evacuation capability is possible. Therefore, the standard one (1) quart (approximately 1000ml) sized field canteen can be depleted in approximately five minutes by the field soldier or 50% faster than the current depletion standards.

However, since the Wesleyan. FIST's hand actuated pumping mechanism preserves the standard canteens' internal chamber at or about atmospheric pressure during its operation, the elastic plastic wall of the canteen will immediately deform and collapse. Repeated collapse of the canteen may cause an unpredicated failure in the field, thereby jeopardizing the soldier's life.

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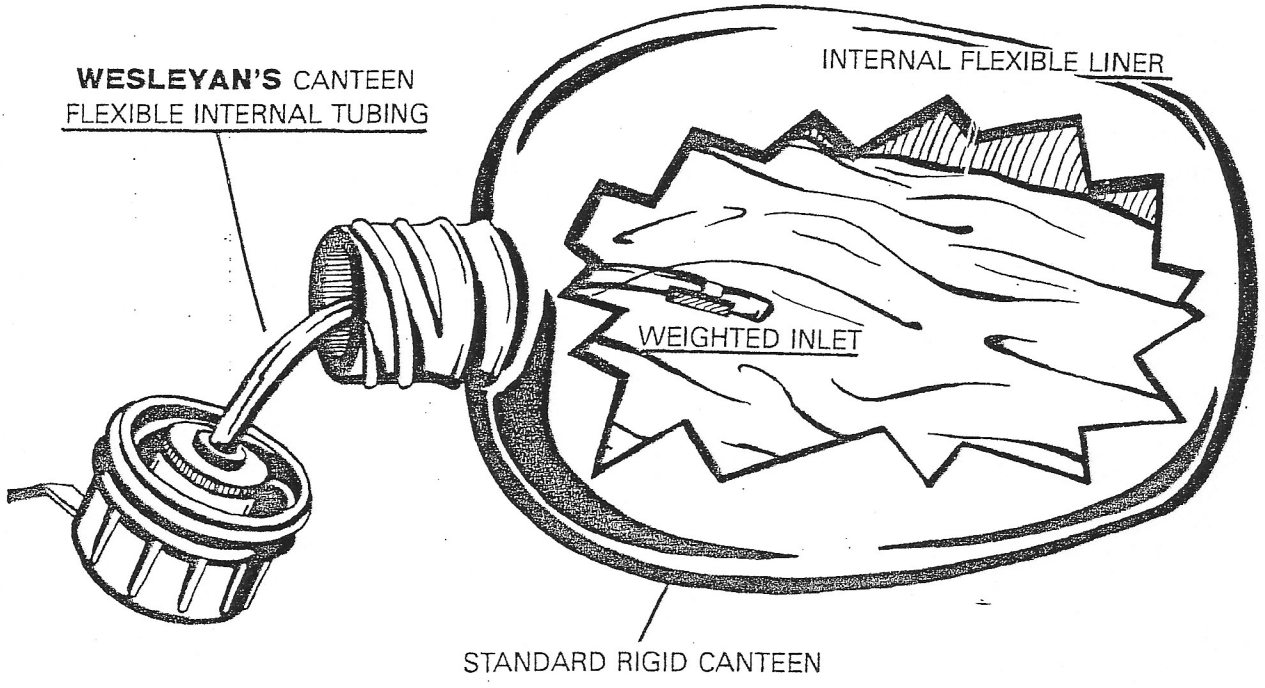
Conventional Canteen with Liner



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WESLEYAN COMPANY OFFERS TWO SOLUTIONS TO THE PROBLEM OF MATERIAL FATIGUE

SOLUTION 1

Insert a flexible disposable liner inside the canteen prior to filing it with water so that the liner deflates, not the canteen wall. The shell of the canteen's internal structure would provide physical support until water was pumped out by the FIST mechanism. The use of the disposable liner preserves the principal structural integrity of the canteen, but structural modification to the current canteen would be necessary under Solution 1 to allow trapped air to escape between the liner and the interior wall of the canteen when the liner is being filled with water. A reclosable plug could compensate for this need.

Consider this solution in an NBC battle scenerio. The alarm sounds, masks are donned and the FIST is plugged into the soldier's existing canteen water supply; the internal liner personally placed within the canteen prior to alarm. At decontamination locations, the soldier is refitted with a clean canteen, liner in place. Where vapor dangers exist, closed canteens would be fitted and ready to use prior to distribution, as advised by the NBC Defense Manual.

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SOLUTION 2

Upredictable material fatigue can be eliminated by modifying the presen structural design of the canteen. A new "bellows" style canteen design woul compensate for the pressure against the walls of the canteen allowing the walls t contract or flex toward the canteen's center when the FIST is in operation.

This new canteen, the Wesleyan FLEX canteen would not require the soldier in the field to use liners at anytime. It would also reduce logistical costs an problems because it could be compressed to ship overseas. It would also reduce valuable uncontaminated storage space requirements on the NBC battle field.

THE WESLEYAN FLEX CANTEEN IS THE BEST SOLUTION OF THE TWO OFFERED FOR COMBATING MATERIAL FATIGUE BECAUSE IT IS EASIER TO USE, FASTER TO USE AND SAFER TO USE THAN LINERS. THE COST TO RETOOL THE PRESENT CANTEEN INTO THE WESLEYAN FLEX CANTEEN WILL PAY FOR ITSELF IN REDUCED SHIPPING AND STORAGE COSTS ALONE, WHEN COMPARED WITH THE PRESENT CANTEEN OR THE MODIFIED CANTEEN REQUIRING THE ADDED EXPENSE OF LINERS.

THE NEW WESLEYAN FLEX CANTEEN TRULY SATISFIES THE MODERN SOLDIERS' COMPLEX HYDRATION NEEDS WHEN USED WITH THE WESLEYAN FIST [C] HYDRATION SYSTEM.

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ANALYSIS OF THE BENEFITS OF THE FIST HYDRATION SYSTEM

1. Water is easier for the soldier to obtain while in MOPP by using one hand and pumping it inside his mouth. The current system forces the soldier to draw water by energy consuming oral suction and two hands are always needed.

2. The FIST Hydration System will reduce the chances of a soldier becoming a chemical casualty because only hook-up is required for each full canteen. Under the current system, each hook-up that is required for drinking water may also require the laborious procedure of decontaminating the canteen cap, threads, and, or spigot. This practice is dangerous, time-consuming, and a tedious frustration that is a contributing factor to mission degradation.

3. The FIST Hydration System will reduce the possibility of heat casualties under MOPP because water will be available anytime the canteen is supplied.

4. The FIST Hydration System is more "fail safe" than the current system because the couplings are interchangeable and, if the system is found to be defective in the field at anytime, the system can be discarded and the soldier can revert back to the current hook-up hydration system until he can be refitted with a new FIST system.

5. The FIST Hydration System will reduce the possibility of soldiers becoming the targets of threat forces' gunfire because the FIST Hydration System permits the soldier more flexibility. The soldier can drink water in any position without the need to retrieve his canteen, decontaminate, hook-up the couplings, and invert the canteen to ensure gravity flow.

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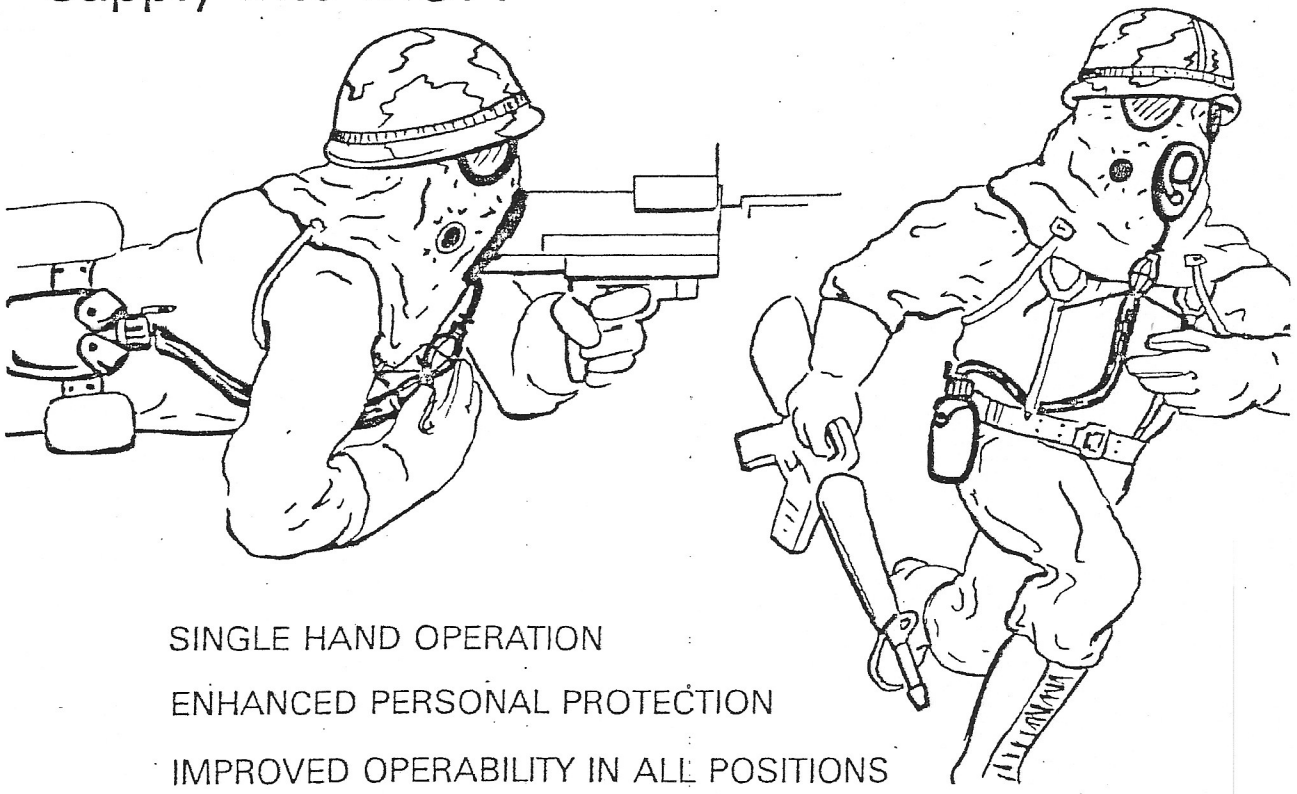
Improved flexibility & mobility at MOPP

Wesleyan "FIST" fully integrates the water supply into MOPP



SINGLE HAND OPERATION

ENHANCED PERSONAL PROTECTION

IMPROVED OPERABILITY IN ALL POSITIONS

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CONCLUSION

Wesleyan Company's FIST and FLEX portable liquid storage and delivery Hydration System provides improved, simple and efficacious means for performing the functions outlined hereinabove, while overcoming the dangerous life threatening shortcomings and deficiences of the current hydration system's attempts to handle such problems in an NBC environment.

With a current FY '83 Army budget of $14.4 billion dollars for personnel costs of the 781,000 on active duty troops, the average annual appropriated cost per man is approximately $18,375. Add the cost of each soldier's training, weapon, or his apportioned share of the cost of the weapon system he helps to operate and the real U.S. investment in one soldier is staggering.

I Spring back to register First

IN THE UNCERTAINTY OF THE CHAOTIC CONDITIONS OF NBC WARFARE, UNDER PROTRACTED PHYSIOLOGICAL AND PSYCHOLOGICAL STRESS CAUSED BY THE ADOPTION OF PROTECTIVE POSTURE, SHOULD NOT THIS COUNTRY'S INVESTMENT IN LIFE, FOR THE PRESERVATION OF PEACE, BE EQUIPPED WITH THE WESLEYAN FIST AND FLEX LIFE ENHANCEMENT HYDRATION SYSTEM RIGHT NOW?

All caps all bold all underlined

I request your consideration and direction as to how I may enter into contract coverage to test and qualify the Wesleyan FIST® and FLEX® Hydration System and produce an operational quantity for field TEST.

Sincerely,
WESLEYAN Company, Incorporated

WESLEY C. SCHNEIDER
President

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APPENDIX

i Synopsis of the History of Chemical Warfare

ii U.S. Policy on Employment of NBC Force

iii Significant Chemical Warfare Agent Water Contaminants -- A substance Category Analysis

iv Text of Technical Feasibility Report on FIST Hydration System, Illinois Institute of Technology, Dr. M. Ger, PH.D., Civil Engineering

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UNITED STATES POLICY
EMPLOYMENT OF NUCLEAR WEAPONS AND BIOLOGICAL AND CHEMICAL AGENTS

NUCLEAR WEAPONS

"LAST RESORT"

- U.S. use of these weapons will be considered only after all conventional means of warfare have been severely tested and found inadequate, or in response to the threat's first use.
- The authority to order or approve the use of nuclear weapons by U.S. Armed Forces rests with the President of the United States.

BIOLOGICAL AGENTS

NO USE

- The U.S. will not use biological agents, including toxins and all other methods of biological warfare, under any circumstances.
- U.S. biological research will be strictly limited to defensive measures.

CHEMICAL AGENTS

NO FIRST USE

- Lethal or incapaciting chemical agents will not be used first by U.S. Armed Forces.
- The right is reserved to retaliate, using lethal or incapacitating chemical agents, against an enemy force which has used them on U.S. Forces.
- The authority to order or approve the first retaliatory chemical strike rests with the President of the United States.
- Risk to civilian populations is to be avoided to the maximum extent possible.

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Synopsis of the

HISTORY OF CHEMICAL WARFARE

Chemical warfare is the intentional use of toxic gases, liquids, or solids to produce casualties. Chemical warfare has been used intermittently throughout history. The more important milestone events are as follows:

1200 B.C. -- Burning pitch pots used by Aeneas in defense of Troy.

428 B.C. -- At the siege of Plataea by the Spartans, wood saturated with pitch and sulfur was burned under the walls of the city to harass and suffocate the occupants.

1456 -- An attack on Belgrade by the Turks was routed by the release of poison gas formed by burning dried rags containing a noxious chemical.

1700s -- North American Indians reportedly prepared a poisonous gas by heating a mixture of fish oil and poison ivy.

1899 -- Hague Convention. Prohibited "use of projectiles, the sole object of which is the diffusion of asphyxiating or deleterious gases."

1915 (22 April) -- Beginning of a new era in chemical warfare. The Germans successfully used chlorine at Ypres, Belgium, against the Allied Forces. This initiated a series of gas attacks with various agents over a period of many months by the Germans, French, British, Americans and Russians. All told, 34 different types of chemicals were developed and used. The most important were:

- Chlorine (Cl_2)
- Phosgene (CG)
- Mustard (H)
- Chlorpicrin (PS)
- Diphenylaminechloroarsine (DM)
- Brombenzylcyanide (BBC)

1925 -- Geneva Conference. Condemnation of toxic agents in war. Signed by the U.S. Delegation but not ratified by the U.S. Senate.

1936 -- Italians used mustard gas against the Ethiopians.

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1937-1943 — A large number of small-scale gas attacks were made by the Japanese against the Chinese.

1940s; WWII -- Little, if any, chemical warfare used. However, World War II marked the advent of the nitrogen mustards and the nerve gases. Development of the nerve gases was truly a major event in the technology of chemical warfare. In the late 1930s, a German Chemist, Gerhard Schraader, in search of better insecticides, discovered three extremely powerful anticholinesterase organic phosphates. They were name Tabun, Sarin, and Soman. Germany produced a large stockpile of munitions containing these three agents. However, for abstruse and unknown reasons, they were never used. Today Tabun, Sarin, and Soman are known as GA, GB, and GD, respectively.

1960s -- The United States in Southeast Asia reportedly used riot-control agents of the lacrimator type:

Chloracetophenone (CN)
Diphenylaminechloroarsine (DM)
O-chloro, benzylmalononitrile (CS)

In addition, U.S. Forces reportedly used certain defoliants or herbicides (sometimes called plant hormones or growth regulators):

1967 (10, 17, 18 May) -- The United Arab Republic dropped toxic gas (believed to be mustard) on Yemeni villages.

1970 (15 July) -- Department of the Army Circular 1-27. "Consistent with the President's renunciation of the first use of lethal and incapacitating chemical agents, the object of the U.S. Chemical Warfare (CW) Program will be to deter the use of chemical agents by other nations and to provide a retaliatory capability should deterrence fail."

1980s - Laos, Cambodia, Afganistan.

Afghanistan

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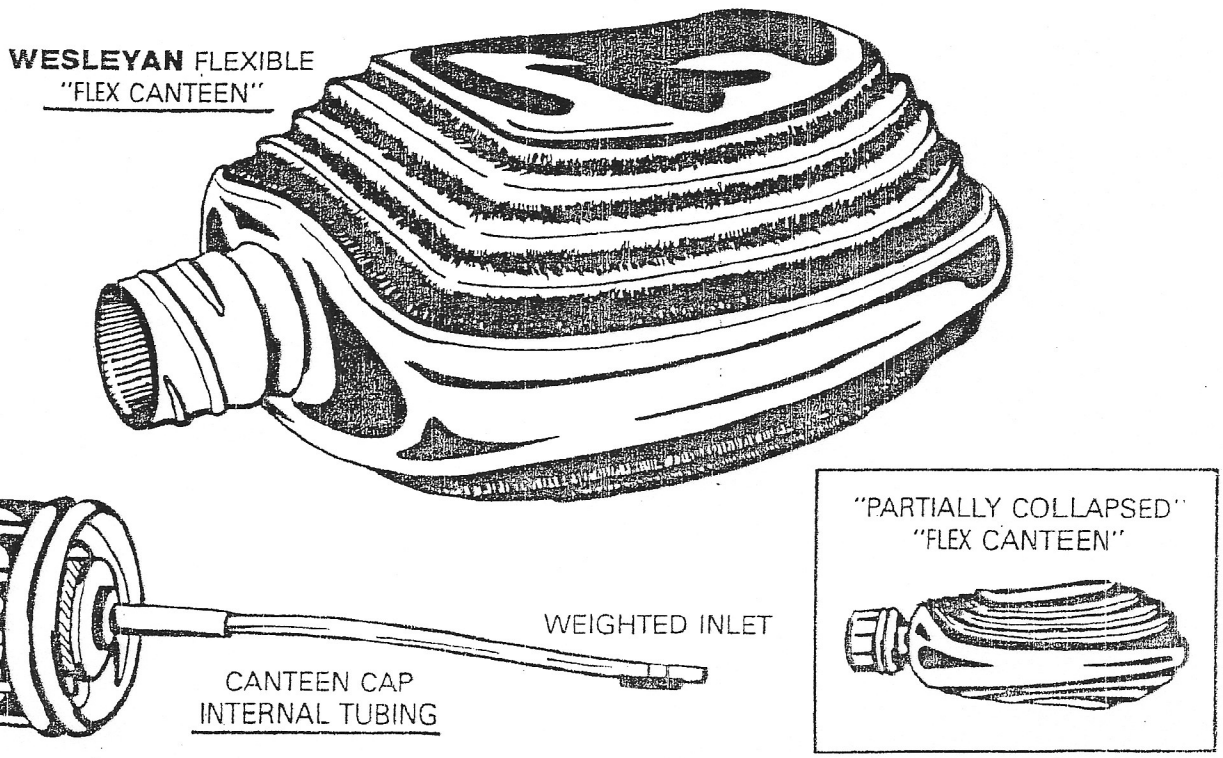
Wesleyan "Flex" Canteen



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