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Revised	<u>25 Sept. 1972</u>		25mm Caseless Cartridge	
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IF AN ABNORMAL CONDITION IS NOTED DURING THIS OPERATION AND OTHER TECHNICAL PROCEDURES DO NOT SPECIFICALLY ADDRESS THE IRREGULARITY, OPERATOR WILL STOP WORK AT THE STATION AND REQUEST ASSISTANCE FROM THE FOREMAN OR AN ENGINEER.

SAFETY REQUIREMENTS

- This operation shall be performed in Bay See Below, Building 404.
- Bay Personnel and Explosive Limits shall be as follows:
 Personnel See Below Explosives See Below
- Compliance with General Safety Requirements, Pyrotechnic Operations, is required.

<u>Operator No.</u>	<u>Bay</u>	<u>Personnel</u>		
		<u>Operator</u>	<u>Transient</u>	
6.1 - Felting	1	16	8	330 Lbs., Class 2
6.2 - Dehydration	1	16	8	330 Lbs., Class 2
6.3 - Final Molding	6	1	3	6 Cases
6.4 - Trim	1	16	8	330 Lbs., Class 2
6.5 - Dipping	2	16	8	200 Lbs., Class 2
6.6 - Inspection	2	16	8	200 Lbs., Class 2

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SCOPE

This specification defines the equipment and procedures required to fabricate the outer shell for the 25mm Caseless Cartridge, BMS-17040.

DOCUMENTS

Outer Shell

Sugar Grove Formula, SGF-002

Stock Preparation, BPS-20001

TOOLS AND EQUIPMENT

Felting Tank Control Panel, STD 2005

Vacuum System

Compressed Air System

Vacuum Screen Outer Shell, T300116

Plastic Bag

Transfer Racks (Felt)

Scales, Shadowgraph, Type 4102

Drying Mold, Perform, STD 1859, Rev. E, TCO #5

Transfer Racks (Dehy)

Gloves

Compression Mold, Liner and Plug, STD 2013, TCO #3

Dehy Bags, T10368, Rev. C (1)

Transfer Rack (Shell)

Trim Fixture, STD 1923

Primer Hole Punch Press, STD 1841

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TOOLS AND EQUIPMENT (continued)

Covered Containers

Candling Fixture

30 Gallon Paint Pot

Funnel

Dip Tank, T60016

Basket for Dip Tank, T400141

Drain Table

Dip Area Ventilation System

Lightning Mixer, Model ARL

Control Panel for Final Case Press, STD 2042

MATERIALS

<u>Description</u>	<u>BMS NO.</u>
Felting Stock per BPS-20001	17029
Antifoam B Emulsion	19003
Ram 225 Mold Release	15004
Elvacite 2042	11002
Elvacite 2044	11003
Toluene	19008

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6.0 PROCEDURE

6.1 Felting Operation for the Outer Shell

6.1.1 Prepare the felting tank for operation by turning on the felting tank control panel (Ref. STD 2005). Position the switches as follows:

Panel Start Button - On	Screen Vac. - Auto
Circulating Pump - Off	Tank Vac. - Auto
Whitewater Pump - Off	Drop Out - Auto
Cam Box - Auto	Felting Stock - Off
Elevator - Auto	All Others - Off
Swing Arm - Auto	

Verify that the vacuum system and compressed air system are on. Set the felting timer at 20 ± 10 seconds, vacuum system at $23.5" \pm 1"$ hg. Turn mixer on in the felting supply tank and run for 10 minutes at 30 RPM. On the panel, turn the felting stock switch to auto position which will activate the felting stock supply pump thru the surge tank float switch. Immediately open the felting stock supply valve. When the stock reaches the full level in the surge tank, jog the circulating pump to pump water into the felting tank. Continue this until the stock begins to move over the weir in the felting tank. When this occurs, turn on circulating pump and leave it on. The controls will automatically fill the felting tank to the proper level. If start-up is required when the felting tank is already full, activate the panel as above except place the felting stock switch on auto and turn on the circulating pump. The felting tank should circulate for 10 minutes before starting the felting operation. During circulation start-up, choke down on the felting tank valve to regulate stock circulation flow at 80 GPM. Record data as noted in the M & IR.

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6.0 PROCEDURE (continued)

6.1.2 Inspection and Lot Control

6.1.2.1 Verify stock flow at 80 GPM and record on the M & IR.

6.1.2.2 Record Batch Data on the M & IR as specified.

6.1.3 Activate the start cycle switch on the control panel. The system will automatically submerge, felt two parts, and rise out of the felting tank to complete the cycle. Immediately place a plastic bag over the two parts to dewater the felts, taking care not to wrinkle the parts excessively. Remove the plastic bag.

6.1.3.1 Carefully remove each felt from the felting head. Wet felt weights shall be specified by Engineering to obtain the dry weight shells desired. Advisory: Check weight hourly to verify proper weights. Dry weight shall be $23\frac{1}{2} \pm 1\frac{1}{2}$ grams after dip. If the weight is out of spec., notify the foreman. The foreman will adjust the time and vacuum, within the limits specified in operation 6.1.1 of the BPS, to obtain the correct weight. Place the correct weight felts in the transfer rack. Place incorrect weight felts in the water filled waste can. Keep count of scrapped felts during the day's production and at the end of the day, record the number on the M & IR. Also record on the M & IR the number of correct weight felts pulled for the day's production. Repeat 6.1.3 and 6.1.3.1 for continuous production.

6.1.3.2 Inspect and record data as noted on the M & IR.

6.1.3.3 The operator should monitor the felting stock for evidence of foaming action. If this occurs, notify the foreman, who will authorize the addition of anti-foam agent (BMS-19003), not to exceed three (3) grams in the felting tank for one day's production.

6.1.3.4 One day's production of felted parts shall be assigned a sub-lot number, which will maintain that identity throughout the subsequent fabrication and inspection operations. The sub-lot number will be assigned by the Q.C. floor inspectors.

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6.0 PROCEDURE (continued)

6.1.4 Transfer parts from the felting operation to the dehydration operation. This operation shall be performed within 15 minutes maximum of the felting operation.

6.1.5 Obtain one sample of felted cases for every 4 hours of production and analyze for NC content.

6.2 Set-up the dehydration process by verifying that steam, vacuum, air and electrical supply is on at the press. Turn on steam to the mold and let it heat up to $235^{\circ} \pm 5^{\circ}\text{F}$. Set air regulator for dehy bag at 80 ± 5 psi; set press cycle time at 45 ± 3 seconds; set pressure cycle at 36 ± 3 seconds; apply Ram 225 mold release to female. Felts processed thru this operation shall be "dehy'd" within 15 minutes maximum after the felting operation.

6.2.1 Install the felted part from operation 6.1.3.1 into the dehy mold, base down. Open the vacuum valve slightly to help pull the part into the mold. When the part bottoms out, turn on full vacuum, then activate the press controls. The press will automatically cycle and retract. Close the vacuum valve and remove the part from the mold. Place them in the transfer rack. Repeat this operation for continuous production. Apply Ram 225 mold release each 2nd cycle.

6.2.2 Inspect and verify the above operations as noted in the M & IR and record results.

6.2.3 Check the mold temperature every two (2) hours and record in the M & IR.

6.2.4 Clean the mold and dehy bag as required to make good parts.

6.2.5 Do not allow scrap parts or debris to accumulate on the hot mold surfaces. All scrap should be placed under water immediately.

6.2.6 Keep a count on all scrap parts accumulated during a day's production and record on the M & IR.

6.2.7 Accelerated drying of shells for sample purposes may be performed in an in-operative dehy mold. Place the shell into the mold, turn on the vacuum, and dry for 10 ± 1 minutes. Release the vacuum and remove the shell.

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6.0 PROCEDURE (continued)

6.3 Set-up the final molding process by verifying that steam, air, water, and electrical systems are on at the press. Before turning on the steam, verify that the water drowning system is functioning and record in the M & IR. Turn on the steam and allow the mold to heat up to $280^{\circ} \pm 5^{\circ}\text{F}$. Set the press cycle timer, STD 2042, and operate the press and observe travel to verify that the press closed time will $20 +5 -0$ seconds. Apply Ram 225 mold release to the female mold after mold heats up and after every 2nd press cycle when in continuous operation. The operator is required to wear gloves for the final molding process. Set the air regulators for 50 psi for the 12" cylinder press and at 100 psi for the 8" cylinder presses. Cycle press and verify the slow travel controls are working before the ram enters the mold. Record data as required in the M & IR.

6.3.1 Shells to be molded shall be conditioned minimum 24 and maximum 72 hours at $70^{\circ} \pm 2^{\circ}\text{F}$ and $50\% \pm 2\%$ R.H. before final pressing. Record on the M.& IR the conditioning time and conditions.

6.3.2 Place the pressed shell into the primer hole punch press, STD 1841. Move the shell into position, punch it, and retract. Remove the shell.

6.3.3 Place the shell on the male ram and seat firmly against the bottom of the ram, but do not use undue force. Exit the bay. Activate the press cycle control. In the event that due to malfunction it is required that the press cycle be reversed, activate the EMERGENCY STOP switch. When the press cycle is complete, the press will stroke upwards and stop. Do not enter the bay until the shell has cleared the female mold. Remove the shell and place it in the transfer rack. Repeat this operation for continuous production being sure to apply Ram 225 mold release to the female every 2nd cycle.

6.3.4 If the part does not come out of the mold on the ram, enter the bay and remove it by hand. If the part sticks and will not come out, turn off the steam to the press and allow it to cool for 15 minutes minimum. Exit the bay and activate the water drowning system for two (2) minutes. Turn off the water. Enter the bay and remove the part and all pieces from the mold. Flush out the mold with running water. Inspect the mold to verify cleanliness. Reactivate the mold by turning on the steam and allowing it to heat up to $280^{\circ} \pm 5^{\circ}\text{F}$. Apply mold

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6.0 PROCEDURE (continued)

release and continue standard pressing operations. Record on the M & IR the time any mold sticking occurs.

6.3.5 Clean the mold as required to press good parts.

6.3.6 Perform inspection of the operation as noted in the M & IR and record results in the M & IR.

6.3.7 Place sub-lot number on base of each case.

6.4 Dipping Operation

As soon as 50 molded shells from operation 6.3 are completed (less than 50, if required to complete an M & IR sub-lot quantity), move them to the dip area for immediate dipping.

6.4.1 Prepare 26.5 gallons of 4% dipping solution per the following formulation (SGF-002):

BMS-11002	Elvacite 2042	1740 Grams
BMS-11003	Elvacite 2044	1740 Grams
BMS-19008	Toluene	26.5 Gallons

Record the mix number, lot number, and amounts of each raw material on the dip solution M & IR. Record the mix number used for dipping on the fabrication M & IR.

6.4.1.1 Pour the 26.5 gallons of toluene (BMS-19008) into the 30 gallon paint pot. Place the lid on the pot, dog it down, and start the agitator at slow speed.

6.4.1.2 Remove the fill plug in the lid of the paint pot, place the funnel in the hole and slowly pour the pre-weighed Elvacite 2042 (BMS-11002) into the agitating solvent. Remove the funnel, replace the plug, and tighten it. Continue agitating for 15 ± 2 minutes. Record mix time in the M & IR.

6.4.1.3 Repeat operation 6.4.1.2 except add the Elvacite 2044 (BMS-11003) mix for 30 ± 5 minutes. Record the mix time in the M & IR.

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6.0 PROCEDURE (continued)

- 6.4.2 Drain the dip tank of previous dipping solution and close the drain. Place the transfer hose from the mix pot into the dip tank; close the lid to hold the hose in place without crimping it. Stop the agitator in the mix pot; open the valve to the transfer hose. Slowly turn the mix pot air regulator to pressurize the tank thereby transferring the solution to the dip tank. Do not pressurize above 5 psi. The solution should fill the dip tank to approximately 9½" deep. When the mix is transferred, close the transfer valve, remove the hose, depressurize the mix pot, close and clamp the lid on the dip tank.
- 6.4.3 Place the 50 molded shells from operation 6.3 onto the dip basket rods, open end down. Open the lid on the dip tank, place the loaded basket into the tank, agitate the mix between the cases with stick to remove air bubbles from cases, and close the lid. Leave the parts in for 10.0 ± .25 minutes. Open the lid, raise the basket over the tank, allow to drain for 2.0 ± .5 minutes. Record time in solution, drain time, basket number, and dip solution number on the M & IR
- 6.4.4 Remove the shells from the basket and place them in the dry trays, open end down. Do not allow them to touch each other. Move the dry trays to the drying area and air dry for a period of 12 hours at ambient.
- 6.4.5 All dip solution mixing, dipping, draining, and drying shall be done in a forced ventilation area. All spills shall be cleaned up immediately. Draining from the dip tank shall be put in an approved covered container and removed from the area to the assigned area for disposal pickup.
- 6.4.6 The dip solution shall be changed after each 16 dip operations. The lid on the dip tank shall be kept closed at all times except when required to insert and remove parts.

6.5 Trimming Operation

After the molded shells are dipped (operation 6.4) and air dried the required time, move them to the trim area for trimming.

- 6.5.1 Place the molded shell from operation 6.4.4 onto the trim mandrel.

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6.0 PROCEDURE (continued)

Place the mandrel into the head stock boss and turn the mandrel to engage the mandrel drive pin. Activate the tail stock and lock the assembly. Close the shield. Turn on the motor and activate the trim control. After shell is trimmed, cut the motor. After the mandrel stops rotating, remove the assembly by reverse procedure of installation. Remove the part from the mandrel and place it in a covered container. Repeat this operation for continuous production.

6.5.2 Inspections shall be made every two (2) hours to verify lengths. Results will be recorded in the M & IR. Dimensions are as follows: Length to be 5.965 minimum.

6.5.3 Offal and trim dust shall be kept to a minimum around the above operations. Pot all scrap into a water filled pyro waste container. Keep the area wet; wash down with water at the end of each shift.

6.5.4 Parts brought to the above operations shall be in covered containers, 100 per container. They shall be immediately put back into the containers after processing.

6.6 Inspection (Production)

6.6.1 Immediately after trimming (operation 6.5) shells shall be candled 100% and evaluated against a standard as specified jointly by the Project Engineer and Q.C. Engineer. The standard will be so identified and kept at the operation during all production times. Place good and rejected parts in appropriate containers.

6.6.2 Weigh the accepted parts on shadow-graph scale to verify the required weight of 24 +1 -2 grams. Place good and rejected parts in appropriate containers.

6.6.3 Move accepted parts to deburr station and deburr trimmed end of cases.

6.6.4 Rejected parts shall be written up on DMR for disposition per Q.C. Procedures. They shall be moved to the Q.C. hold area and held until proper disposition has been made. Record the data as required on the M & IR.

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6.0 PROCEDURE (continued)

6.6.5 After deburr, all accepted shells are moved to conditioning for a minimum of 12 hours at $70^{\circ} \pm 2^{\circ}\text{F}$ and $50\% \pm 2\%$ R.H. before presenting to final inspection. Tensile, crush, and NC samples shall be pulled before conditioning.

6.7 Inspection (Q.C.)

6.7.1 Transfer shells to the inspection area for buy-off.

6.7.2 Inspect per applicable procedures, record the results, and attach copy to the M & IR.

6.8 Transfer the completed shells to the finished goods crib. On the M & IR, record the number of accepted shells in the sub-lot, the number of rejected and for what reasons, and date of completion and transfer of the sub-lot.

6.9 Accountability

All of the shells which make up one sub-lot shall move thru the different operations as a unit, and shall not be separated, except where scrap occurs or where they are removed from the lot because of defects. The M & IR shall stay with the sub-lot at all times until final acceptance by Quality Control.