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POST-MORTEM EXAMINATION OF MK 28 COMPONENTS FROM THE PALOMARES, SPAIN ACCIDENT (CRD)

Introduction

This report is a compilation of post-mortem results on components returned to Sandia Corporation from the B52/KC135 aircraft refueling accident near Palomares, Spain on January 17, 1966. Information on this accident and subsequent weapon recovery operations is contained in Reference No. 1.

Material received was from two of the four weapons involved in the accident. The residue from the other two units was not available for post-mortem due to high explosive detonation on impact. Weapons involved in the accident were identified as follows:

Weapon No. 1 Serial No. 54327 (Land Impact)
Weapon No. 2 Serial No. 330448 (Land impact, high explosive detonation)
Weapon No. 3 Serial No. 434379 (Land impact, high explosive detonation)
Weapon No. 4 Serial No. 45345 (Water impact)

Initial inspection of weapon material returned to the AEC from this accident was performed at Pantex by Mason & Hanger and results are reported in Reference No. 2. Subsequently, components from Weapon No. 1 and Weapon No. 4 were returned to Sandia Corporation, Albuquerque, New Mexico for post-mortem by Department 2130. This material was received on June 6, 1966 and post-mortems were performed during the interval June 6 to August 10, 1966.

Results

The results of the post-mortem examinations are compiled under associated weapon below. Photographs, when warranted, are included in the Appendix.

WEAPON NUMBER 1, B28 SERIAL NUMBER 54327 (LAND IMPACT)

MC394B Remote Setting Baroswitch Serial Number AH7110B7 -- The MC394B was visually examined, X-rayed for damage, electrically and functionally tested, and disassembled for examination. No deficiencies were found.

MC820 Non-Remote Setting Baroswitch Serial Number AM1356L3 -- The MC820 was visually examined, X-rayed for damage, electrically and functionally tested, and disassembled for examination. No deficiencies were found.

MC880 Interconnecting Box Serial Number BBN8999I1 -- The MC880 was tested electrically for circuit resistance and insulation resistance using the PT307A Tester and the PT307-10 Tester Adapter. All electrical tests were satisfactory. A visual inspection showed the unit to be in good condition.

MC888 Arming-Safing Switch Assembly Serial Number AA2242G8 -- The MC888 was removed from the MC1100 Serial Number BBN90520A2 after test had been run on the firing set. A visual inspection showed that the unit was in good condition and there was no sign of dirt or corrosion.

An electrical test also showed that the unit would still perform the function for which it was designed. The tests were good in both the safe and arm positions. The unit is still intact as it was not disassembled for internal examination.

MC890A Neutron Generator Serial Numbers GBV447620L3 and GBV436630L3 -- A visual examination of both MC890A's revealed no discernible damage. There was no noticeable misalignment of the connector pins on the power and trigger connections. No difficulty was experienced when test cables were connected to these units.

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The adverse environmental conditions to which these units were subjected apparently had little or no effect on neutron output.

MC909 Pressure Switch Serial Numbers MAN0290F0 and MAN1062B1 -- These two MC909's were visually examined, X-rayed for damage, electrically and functionally tested and disassembled for examination. No deficiencies were found.

MC1100 X-Unit Serial Number BBN90520J4 -- Examination of this unit revealed that the MC888 Arming and Safing Switch was in the safe condition. The MC888 and MC880 were removed for further post mortem.

MC1108 Electric Detonator Serial Number BAP13813D2 -- This MC1108 was received at Sandia and delivered to Bldg. 904 in Area II. DOE (3)

The bridge-wire resistance read 4.85 ohms at the time it was assembled in the test fixture.

The test fixture consisted of a metal block for mounting the MC1108 and a witness plate. The MC1108 was detonated and the results were normal. Examination of the witness plate showed the results of the blast scored a depth of 0.123 inches into the one-inch plate. This is normal results for the MC1108 test.

MC1120 Single Pulse Generator Serial Number BBN6909A3 -- The MC1120 was received with one pullout rod withdrawn and bent. (See Appendix Figure 1.) No other deficiencies were evident. A spare pullout rod was inserted in lieu of the bent one.

Circuit resistance, hipot, output voltage, and polarity tests were performed in accordance with Paragraphs 6 and 7 of Quality Assurance Inspection Procedures, 310905, Issue E. All measurements were within specifications. The results of output voltage tests are compiled below:

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The MC1120 was then disassembled and inspected. No further damage was evident as a result of the shock environment caused by land impact.

MC1136 Ceramic Crystal Transducer Serial Numbers BBN11786F2, BBN11813F2, BBN11787F2 and BBN11811F2 -- The MC1136's were received still connected to a CF1650 Cable. A visual examination disclosed no deficiencies.

The MC1136/CF1650 Assembly was tested by impacting each MC1136 and monitoring output voltage through the CF1650. Results are compiled below:

The MC1136's were disconnected from the CF1650 Cable and each was subjected to an output voltage test. Results are compiled below:

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The MC1136's were then disassembled and interior subcomponents examined. No deficiencies were noted other than three small chips at ceramic edges, (see Appendix Figure 2) and minute bits of foreign material.

On the basis of this post-mortem examination the following conclusions are drawn:

1. The MC1136/CF1650 Assembly was capable of performing its design function in the "as received" condition.

2. The output voltage of each MC1136 was within specifications.

3. The only damage resulting from the impact environment was minor chips at edges of SA676 Polarized Ceramic Elements.

MC1262 Thermal Battery Pack Serial Numbers ET17050H2 and ET17052H2 -- Examination of these batteries revealed that they had not been fired. No further post-mortem was performed.

MC1316 Interconnecting Box Serial Number BBN1412H2 -- The MC1316 was visually checked and found to be in a satisfactory condition with the exception of pigtail P-17. The epoxy potting behind the connector had received a sharp blow resulting in the chipping of a small area of the potting. The damage is not severe enough to affect the connector function.

Circuit resistance and insulation resistance tests were performed on the MC1316 using the PT307A Tester and PT307-223 Tester Adapter. All tests were satisfactory with the exception of the circuit resistance check of circuit P1-T to P8-V. The resistance reading of this circuit while connected to the tester (PT307-223) was 0.161 ohm. Specification allows a maximum of 0.1 ohm. An open-set-up check of the circuit gave a reading of 0.0394 ohm which is well within specification.

It is believed that the cause for the variation in the resistance reading of circuit P1-T to P8-V was due to a connector interface problem rather than a defective circuit. The MC1316 would perform its function in the weapon system.

MC1352 Ready-Safe Switch Serial Number SAF1067J2 -- A visual inspection of the MC1352 was performed which showed the unit to be in good condition with no apparent damage.

Insulation resistance and circuit-resistance tests were performed. The MC1352 was found to be within production acceptance requirements for these two characteristics and was found to be stepping properly. Electrical testing verified that the unit was in the safe position when received at Sandia.

Based on the post-mortem examination, it is concluded that the MC1352 was still capable of performing its function in the weapon system.

MC1367 Interconnecting Box Serial Number BBN2073K2 -- A visual examination of the MC1367 showed it to be in a satisfactory condition with the exception of Pigtail P5. The four conductors of the pigtail had been severed directly behind the connector which was held to the pigtail by a small piece of the jacket material. (See Appendix Figure 3.)

Circuit resistance and insulation resistance tests were performed on the MC1367 using the PT307A Tester and PT307-224 Tester Adapter. All circuits checked satisfactory with the exception of P5-B to P1-A, P5-C to P3-N, P5-D to P6-C and P5-E to P11-S which gave open circuit indications and are all included in the severed P5 Pigtail. The damaged P5 Pigtail could have been caused by some object torn loose in the weapon at impact or possibly later by the disarming crew. The P5 connector mates with an MC1108 Electric Detonator.

The interconnecting box would not perform its function because of the broken P5 Pigtail.

MC1454 Fuse Pack Serial Number BBN1760J2 -- The MC1454 was visually inspected and found to be in a satisfactory condition. Circuit resistance and insulation resistance tests were performed using the PT307A Tester and PT307-228 Tester Adapter. Limiter circuit and fuse circuit resistance tests were made using the PT1101 and Diode forward voltage and reverse current tests were performed using the PT985 Tester and PT985-5 Adapter Cable. All tests were satisfactory.

It appears that the MC1454 would perform its function in the weapon system.

MC1456 Switch Pack Serial Number BBN1606J2 -- This unit was subjected to the nondestructive test requirements of PS311265. All tests results were within the specifications and a visual examination of the unit revealed no external damage.

MC1469 Sequential Timer Serial Number BAN2313A3 - Examination revealed that Channel 1 Explosive Motor, MC1320 had been activated. The unit was reset and given a functional test with satisfactory results. No mechanical damage was found during the examination.

MC1476 Pressure Port Serial Numbers BBN2051H2 and BBN2104H2 -- These two MC1476's were visually examined, X-rayed for damage, electrically and functionally tested and disassembled for examination. No deficiencies were found.

MC1531 Differential Pressure Inducer Serial Numbers BBP1601F2 and BBP1666F2 -- These two MC1531's were visually examined, X-rayed for damage, electrically and functionally tested, and disassembled for examination. The blue weather cap was missing on one of these units and the fence was half extended. This was apparently caused by the impact shock. No other deficiencies were detected on these units. Both units functioned satisfactorily when the SA631's were activated.

MC1615 Electrical Fuse Pack Serial Number BBN1584I2 -- The MC1615 was given a visual inspection and was found to be in good condition with no apparent damage. Insulation resistance and circuit resistance tests were performed in accordance with the requirements of PS311481. The component was found to be within production acceptance requirements for both characteristics and is capable of performing its function in the system.

MC1700 Explosive Switch Pack Serial Number BBN1703L2 -- The MC1700 was subjected to the nondestructive test requirements of PS311608. Three squib circuits and the monitor (N.C.) loops were open. However, since the monitor (N.C.) loop was closed prior to testing, the squib circuits must have been fired at some point in the test sequence. The monitor (N.O.) loops were closed. Visual examination of the unit revealed no external damage.

CF1504 Faired Electrical Cable Assembly Serial Number BBN8626K2 -- A visual inspection of the CF1504 was made with the following results:

1. Four scratches on the cable face spaced approximately 6, 14, 18½ and 24 inches from connector P1 end. Two of the scratches were approximately 1/32 inch deep.

2. Two gouges approximately 1/64 inch deep on face of cable approximately 5 inches from the P2 Connector end.

3. The two connectors P1 and P2 appear in good condition.

4. The cable markings are legible.

Circuit resistance and insulation resistance tests were performed using open-set-up method. All readings were within specification limits.

It appears that the cable would still perform its function.

CF1504 Faired Electrical Cable Assembly Serial Number BBN8623K2 -- A visual inspection of the CF1504 was made with the following results:

1. The cable was bent edgewise approximately 5 degrees at the connector P1 end.

2. An 1/8 inch deep gouge approximately 1-1/4 inches long was on the face of the cable 8 inches from the P1 Connector.

3. A heavy scrape mark 20 inches from Connector P2 and approximately 4-1/2 inches long.

4. Two gouges in the cable face approximately 1/16 inch deep and 9 inches from Connector P2 end.

5. The conductor strap was pulled loose for approximately 9 inches from its adhesive back in the bent area of the cable.

6. Connectors P1 and P2 appear in good condition.

7. The pins of Connector P1 do not appear bent.

8. The cable markings are legible.

A photograph of the bent end of the cable is shown in the Appendix Figure 4. Circuit resistance and insulation resistance tests were performed using open-set-up method. All readings were within specification limits.

Electrically the cable would perform its function. The mechanical damage to the cable would prevent proper installation.

CF1595 Special Purpose Electrical Cable Assembly -- A visual inspection of the CF1595 was made with the following results:

1. The clear vinyl jacket of the cable bore a light abrasive mark approximately 1-1/4 inches long and 3/8 inch wide. No cuts or breaks were observed.

2. The connectors appeared in good condition. No bent pins were noted.

3. The epoxy potting at the rear of the connector was undamaged.

4. The cable markings were legible.

Circuit resistance and insulation resistance tests were performed on the CF1595 using the PT307A Tester and PT307-183 Tester Adapter. The results were satisfactory.

It appears that the cable would still perform its function.

CF1596 Special Purpose Electrical Cable Assembly (2 each) -- A visual inspection of both CF1596 Cables were made with the following results:

1. The exterior of both cables appeared in a satisfactory condition.

2. The P3 Connector sockets of both cables appeared clean. The P3A Connector Pins and outside barrel of one of these cables were coated with a thin film of dust.

3. No bent pins were found.

It appears that both cables would perform their function.

CF1650 Special Purpose Electrical Cable Assembly -- A visual check of the CF1650 showed it to be in a satisfactory condition. Circuit resistance and insulation resistance tests were performed on the CF1650 using the PT307A Tester and PT307-225 Tester Adapter. The results were satisfactory. A capacitance test of the cable using a General Radio, Type 740, Capacitance Test Bridge was satisfactory. A reading of 128 micro-microfarad was obtained where specifications allow a maximum of 175 microfarad.

It appears the CF1650 would perform its function in the weapon system.

WEAPON NUMBER 4, B28 SERIAL NUMBER 45345 (WATER IMPACT)

MC394B Remote Setting Baroswitch Serial Number W-AH2802K6 -- The MC394B was visually examined, X-rayed for damage, electrically and functionally tested, and disassembled for examination. The exterior of this unit was slightly rusty and had salt deposits on the surfaces and in the pressure ports. X-ray examination and subsequent interior visual examination disclosed that the bellows had been deformed excessively by water pressure. Attempts to perform contact-loop resistance tests on the elements were unsuccessful due to corrosion and deformation. Insulation resistance readings were in the order of 50 to 100 ohms. Functional tests of the pressure elements were also unsuccessful due to corrosion and deformation. An attempt was also made to operate the range setting mechanism. The synchros indicated a 5000 foot setting on the B-set indicator on the PT4A but the electrical setting motor would not change the altitude setting. Photographs of the interior of the MC394B are shown in the Appendix Figures 5 and 6. Water was found inside the unit when disassembled.

MC796 Thermal Battery Pack, Serial Number AA53654I8 -- Examination revealed that this unit had not been fired. No further post-mortem was performed.

MC820 Non-Remote Setting Baroswitch Serial Number AH1711B4 -- The MC820 was visually examined, X-rayed for damage, electrically and functionally tested, and disassembled for examination. The exterior was slightly rusty and had salt deposits on the exterior surfaces and in the pressure ports. X-rays and subsequent interior examination revealed that the pressure sensitive bellows had been deformed excessively by water pressure. (See Appendix Figure 7.) Contact-loop resistance tests and functional tests were unsuccessful due to this deformation and due to interior corrosion. Insulation resistance readings were on the order of 50 to 100 ohms. Interior view of setting mechanism of one element is shown in Figure 8 of the Appendix. Water was found in the unit when disassembled.

MC880 Interconnecting Box, Serial Number BBN9240J1 -- A visual inspection revealed the MC880 to have a residue of salt and mud on the case. The connectors were also dirty and showed signs of corrosion. An electrical test was performed using the PT307A Tester and the PT307-10 Tester Adapter. Of the 52 electrical circuits, 29 failed hi-pot. Continuity was satisfactory on all circuits. The 10K resistor was out of tolerance. The potting was removed from the unit to determine if water had entered and damaged the circuits. The printed circuit board showed no evidence of having been damaged by water.

The hi-pot failure of the 29 circuits was probably due to the dirty and corroded connectors as the printed circuit board which was covered with potting revealed no evidence of any damage.

MC888 Arming-Safing Switch Assembly Serial Number AA4647C9 -- The MC888 was removed from the MC1100 Serial Number BBN84352C2. A visual inspection of the MC888 showed connectors P1, P2 and P3 to be dirty and corroded with parts of the plating missing. The case which is of potting material was in good condition. The base to which the two MC808's are fastened was in good condition except the screws which showed signs of rusting.

An electrical test was performed for both circuit and insulation resistance with the MC888 in the safe position. In both cases the readings exceeded allowable tolerances. One of the MC808's would not step from the safe to the arm position, but after jarring several times, it started stepping. Both the circuit and insulation resistance was checked in the arm position and the readings obtained also exceeded allowable tolerances.

Both the MC808's were then disassembled and revealed drops of moisture in both the motor and switches in both units. The motor parts were rusty and dirty. The switch parts also showed signs of rusting and corrosion.

This MC888 would not perform its function when tested during post mortem.

MC890A Neutron Generator Serial Numbers GBV437665K3 and GBV437662K3 -- Both MC890A's showed evidence of salt and mud residue. Rusting had commenced in some areas. The trigger and power connectors of both units were corroded but there was no noticeable misalignment of the connector pins. No difficulty was experienced when test cables were connected to these Neutron Generators. MC890A GBV437665K3 was noted to have a large circular indentation (see Appendix Figure 9) on one side of the end opposite the power and trigger connectors. This indentation was apparently caused by pressure exerted by sea water which pushed the MC890A case into the foam spacer immediately below the Neutron Generator power supply module.

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The top and bottom were cut off of the small box to which the power and trigger connectors were secured. On both units, sea water had seeped into the box through the holes in the rivets used to secure the MC890A nameplate.

The adverse environmental conditions to which these units were subjected apparently had little or no effect on neutron output performance. The units produced nominally the same outputs as other MC890A's when tested at the same age.

MC909 Pressure Switch Serial Numbers MAN4972H2 and MAN5051H2 -- These MC909's were visually examined, X-rayed for damage, electrically and functionally tested and disassembled for examination. The exteriors of the units were slightly rusty and there were salt deposits on the surfaces and in the pressure ports. X-ray examination and subsequent interior visual examination disclosed that the pressure elements had been deformed excessively by the water pressure. Attempts to perform contact-loop resistance and functional tests were unsuccessful due to this deformation and internal corrosion. (See Appendix Figure 10.) Insulation resistance readings were on the order of 50 to 100 ohms. Water was found trapped inside the unit during disassembly.

MC1100 X-Unit Serial Number BBN84352C2 -- Examination of this unit revealed that the MC888 Arming-Safing Switch was in the safe condition. The MC888 and MC880 were removed for further post mortem.

MC1120 Single Pulse Generator Serial Number BBN6207B1 -- The MC1120 was received without pullout rods. Mud and corrosion were present on exterior surfaces and within holes where pullout rods are normally installed. Two spare pullout rods were installed. It was necessary to pound these in with a rubber mallet.

The MC1120 was then subjected to circuit resistance, hi-pot, output voltage, and polarity tests in accordance with Paragraphs 6 and 7 of Quality Assurance Test Instructions 310905, Issue E. The 25-microampere meter read full scale during all hi-pot tests. All output voltages were of the correct polarity. The results of output voltage tests are tabulated below.

All output voltages exceeded minimum specifications. The MC1120 cover was removed. The interior contained heavy deposits of mud and corrosion and approximately 1/4 inch of muddy water. (See Appendix Figure 11A.) The cover seal appeared to have been undamaged.

The MC1120 was then further disassembled. There was little or no evidence of leakage through the connector or connector O-ring seal. This is of little significance since the MC1120 interior was exposed through the pullout rod holes. All subcomponents were covered with mud and corrosion. (See Appendix Figures 11B and C.) MC841 Pulse Generator G1 was disassembled exposing more mud and corrosion. (See Appendix Figure 11D.)

MC1136 Ceramic Crystal Transducer Serial Numbers BBN15340D3, BBN15161D3, BBN15155D3, and BBN15158D3 -- The MC1136's were received still connected to a CF1650 Cable. A visual examination disclosed moderate corrosion on connectors and mud distributed generally on the exterior surfaces. Each MC1136 was impacted three times while monitoring for output voltage through the CF1650. No output was observed for any of the four MC1136's.

The CF1650 was then disconnected. Water was present in the connector interiors, as well as deposits of foreign materials and moderate corrosion. Each MC1136 was then individually tested for output voltage. Only one produced output below-specification. The connector of the failing MC1136 was brushed with contact cleaning fluid and the test repeated. This time the output voltage was within specifications. Results of these tests are compiled below:

MC1136 Output Voltage After Drying

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After a 24-hour drying period, the CF1650 was again connected to the MC1136's. Each MC1136 was again inspected and output voltages monitored through the CF1650. Results are compiled below:

MC1136/CF1650 Assembly Output Voltage After Drying

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All four MC1136's were then disassembled and interior subcomponents examined. One MC1136 contained no interior corrosion. One had only a trace of interior corrosion. Two (see Appendix Figure 12) had extensive interior corrosion.

On the basis of this post-mortem examination, it is concluded that:

1. The MC1136/CF1650 Assembly was not functional in the "as received" condition.

2. After drying connectors, the MC1136/CF1650 Assembly was functional, but the output voltage was seriously degraded.

3. After drying, all but one of the four MC1136's produced within-specification output voltages.

4. Two of the MC1136's showed extensive internal corrosion implying failure of seals.

MC1262 Thermal Battery Pack Serial Numbers ET20758C3 and ET20781C3 -- Examination of these batteries revealed that they had not been fired. No further post mortem was performed.

MC1316A Interconnecting Box Serial Number BBN1806C3 -- A visual check of the MC1316A revealed the following:

1. The cable jackets and case have a light mud and salt deposit.

2. Light to medium corrosion was active on 17 of the 24 connector locking rings and shells.

3. The pins and sockets of most of the connectors appeared in a relatively good condition. This could be attributed to a specified film of grease applied to the connector faces during weapon assembly.

4. Four of the female connectors had a light deposit of mud in the sockets.

5. All the component markings were legible.

Photographs of the unit as received are shown in Appendix Figure 13.

Circuit and insulation resistance tests were performed on the MC1316A using the PT307A Tester and PT307-223 Tester Adapter. Circuit resistance failures were indicated for circuits P2-N to J7-B, P10-M to P20-j and P1-U to P2-U with resistance readings of 0.101, 0.173 and 0.114 ohm, respectively. Specification allows a maximum of 0.100 ohm. Hi-pot failures were indicated for 65 of 144 circuits tested. The leakage currents varied from 15 to 200 microamperes. Specification allows a maximum leakage of 10 microamperes using a test voltage of 500 V dc.

Although marginal, the MC1316A still appears able to perform its function.

MC1352 Ready-Safe Switch Serial Number SAF1476B3 -- A visual inspection of the MC1352 was made with the following results:

1. [redacted] DOE b(3) (See Appendix Figure 14A.)

2. A piece was broken out of the case just above the indicator window. This damage appeared to be either the result of pressure on the unit or was caused by a blow on the outside of the case by some heavy object. No scars were visible in the broken area.

3. The inside of the switch wires, motors, gear train and switch decks were all coated with dried mud and salt deposits. (See Appendix Figure 14B.)

4. The J1 and J2 Connectors were both coated with rust which extended on to the case. (See Appendix Figure 14C.) The connector pins and inserts had been lubricated prior to assembly and were in good condition.

5. The outside of the case was coated with a thin film of dried mud.

Following visual inspection, the MC1352 was given circuit-resistance and insulation-resistance tests while in the safe position. Twelve of the circuits were found to be open. Circuits J1-j to J1-B, J1-j to J1-A, J1-a to J1-Z, J2-j to J2-B, J2-j to J2-A, and J2-W to J2-V were found to range in resistance from 0.028 to 0.071 ohm. The maximum allowable for production acceptance is 0.050 ohm.

All of the safe position circuits were found to have excessive leakage ranging from 10,000 to 60,000 ohms. The minimum allowable for production acceptance is 1 megohm.

Attempts were then made to step the unit using 28 volts dc but it would not operate. During the first and second trial about 100 milliamperes of current was observed to be flowing in the circuit. During later attempts no current flow was obtained indicating that the motor circuit had opened up. The MC1352 could not be operated mechanically.

All of the circuits used in the R (A) and R (G) positions were then examined and found to be open. Since the unit could not be tested any further electrically, it was disassembled with the following observations:

1. Water had entered the motor causing rust and corrosion. Salt and sand were present inside the motor. (See Appendix Figures 14D and 15A.)

2. The armature and gear train were frozen and would not rotate. (See Appendix Figures 15B and 15C.)

3. The switch wafers were covered with dirt and salt. (See Appendix Figure 15D.)

Material analysis of the gasket by Organization 1100 revealed gasket set was normal. A pinched area due to incorrect assembly would allow leakage.

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In addition, the switch wafers were so badly contaminated that satisfactory switch contact was very unlikely even if the switching could have been accomplished.

MC1367 Interconnecting Box Serial Number BBN1464H2 -- A visual inspection of the MC1367 was made with the following results:

1. The case and pigtail jackets had a light deposit of mud.

2. Several of the female connectors had mud in their sockets.

3. The pigtail connectors are spotted with mud and salt deposits. Some rust and corrosion was visible.

4. All markings were legible.

Two pigtail jackets were opened to determine if water had penetrated their interior. All appeared satisfactory.

A photograph of the MC1367 and one of its most contaminated connectors is shown in Appendix Figure 16.

Circuit resistance and insulation resistance tests were performed on the MC1367 using the PT307A Tester and the PT307-224 Tester Adapter. All circuit resistance readings were within the specified 0.10 ohm. Of the 60 circuits hi-potted, 30 gave failure indications ranging from 15 to 160 microamperes. Specification allows a maximum of 10 microampere leakage at a potential of 500 v dc.

Although marginal, the MC1367 still appears able to perform its function.

MC1454 Fuse Pack Serial Number BBN2491D3 -- A visual check of the MC1454 revealed the following:

1. The case had a light deposit of mud on outside.

2. Connectors J1 and J2 were rusty.

3. All connectors (J1, J2 and J3) were covered with light to medium deposits of mud.

4. All markings were legible.

Photographs of the MC1454 as received are shown in Appendix Figure 17.

Circuit resistance and insulation resistance tests were performed on the MC1454 using the PT307A Tester and PT307-228 Tester Adapter. Nine of the 24 circuits failed the circuit resistance test ranging from 0.039 to 0.077 ohm. Specification allows a maximum of 0.025 ohm. Circuits P1-d and P1-B failed the insulation resistance test with current leakage of 15 and 25 microamperes, respectively. Specification allows a maximum of 10 microamperes leakage. Limiter circuit and fuse circuit resistance tests were performed using the PT1101 and all checked satisfactory. Diode forward voltage and reverse current tests were made using the PT985 Tester and PT985-5 Adapter Cable. The results were satisfactory.

The three connectors of the MC1454 were flushed with a solvent and dried and retested for circuit resistance and insulation resistance. The results were satisfactory. The MC1454 was dissected to determine if any water had penetrated to its interior. No moisture was detected.

Considering the minor deviations from test specifications, it is believed the MC1454 would still perform its function.

MC1456 Switch Pack Serial Number BBN2250E3 -- This unit was subjected to the nondestructive test requirements of PS311265. All test results were within the specifications and a visual examination of the unit revealed no external damage.

MC1469 Sequential Timer Serial Number BAN2888C3 -- Examination revealed that both MC1320 Explosive Motors had been activated. The outer case was corroded and internal salt deposits could be seen in the windows. When the case was removed, extensive salt deposits and corrosive areas were found. Salt water had entered the case through the shaft opening for TB time setting knob. Galvanic action between dissimilar metals had occurred. Channel 1 fixed time interval printed circuit board came loose from the gear. The lands were coming loose and the board was blistered in four places on Channel 2 fixed time interval printed circuit board. All brass subcomponents had turned black. One production workmanship defect was found; the retaining ring for the TA Knob was not seated. Photographs of exterior and interior conditions are shown in the Appendix Figures 18, 19 and 20.

MC1474 Parachute Release Serial Number MBB15181K2-- Four plates that make up an MC1424 were received along with the four MC1108 Electric Detonators (BAP11266J1, BAP11267J1, BAP11268J1 and BAP11269J1) associated with the above unit. Plate Serial Number ABA1922G2 and plate Serial Number ABA2449J2 contained their unfired MDF with no apparent damage.

Plate Serial Number PCG0449J contained two damaged connectors; the connector at J6 was broken off level with the plate, the connector at J8 was broken off at its elbow. The connector holes at J5 and J9 were empty. All four plates contained mud and dirt on all surfaces but no further damage was found other than described above.

A single MC1108 was installed to one half of the MC1474 with the MDF intact. Prior to firing MC1108 Serial Number 11268, resistance reading was 4.72 ohms, and Serial Number 11269 also had a resistance reading of 4.74 ohms. Results from firing were good separation to the plates.

MC1108 Serial Number 11267 was fired with a witness block, and the depth scored was .131 inches, which is normal depth. The bridge-wire resistance read 4.36 ohms prior to firing.

MC1108 Serial Number 11266 failed to fire. The bridge-wire resistance read 4.58 ohms prior to the attempt to fire, and it read open immediately after.

The MC1108 was sent to the Division 1311 laboratory in Area II to be dissected. It was revealed that the bridge wire had burned without establishing full initiation. The cause was determined to be a fabrication fault that has been previously explored and corrective action taken. Except for this MC1108 it is concluded that there was no damage to these components that would have precluded their functioning as intended.

MC1476 Pressure Port Serial Numbers BBN3060D3 and BBN2942D3 -- These MC1476's were visually examined, X-rayed for damage, electrically and functionally tested and disassembled for examination.

Rust and salt deposits were found on the exterior surfaces and in the pressure ports. Bridge-wire resistance readings were within specifications. DOE b(3)

Disassembly revealed that water was still inside these units.

MC1531 Differential Pressure Inducer Serial Numbers BBP3150E3 and BBP3061E3 -- These MC1531's were visually examined, X-rayed for damage, electrically and functionally tested and disassembled for examination. The blue weather caps from both of these units were missing on receipt. Rust and salt deposits were found on the exterior surfaces and in the pressure ports. DOE b(3)

The two SA631's in MC1531, BBP3061D3 failed to extend the fence and one SA631 in MC1531, BBP3150E3 ruptured but the fence extended fully to the required length. The failure of the SA631's to extend the fence in BBP3061D3 was caused by swelling of the electroplate lubrication of the cans in which the bellows are contained. This swelling caused interference between the can and the base of the fence causing it to be frozen in place.

MC1615 Electrical Fuse Pack Serial Number BBN1680J2 -- The MC1615 was given a visual inspection and was found to be in good condition except for a small rust area and traces of mud on the connector coupling ring. (See Appendix Figure 21.) Insulation resistance and circuit resistance tests were performed in accordance with the requirements of PS311481. The component was found to be within production acceptance requirements for both characteristics.

Based on the results of the post-mortem examination, it is concluded that the MC1615 still retains its functionability.

MC1904 Pulse Duration Discriminator Serial Number BBN1346F4 -- During functional tests, the MC1904 would not operate and drew excessive input current. All internal circuitry failed when subjected to insulation resistance tests. This unit was saturated with sea water as evidenced by a 50 percent weight increase when compared with a normal unit. All attempts made to dry out the unit by removing the outside plastic case and subjecting to +165° and +225°F temperatures were unsuccessful. Removal of a portion of the potting material permitted a view of the MC824 Squibs which contained

broken glass windows and were full of water. No further attempts were made to post mortem this unit.

CF1504 Faired Electrical Cable Assembly Serial Number AA5780E0 -- A visual inspection of the CF1504 was made with the following results:

1. Light to heavy deposit of mud was over the entire length of the cable.

2. A medium deposit of mud was on the pins of the P1 Connector.

3. The P2 Connector had a heavy deposit of mud in the connector sockets and around the connector exterior.

4. The cable markings were legible.

Photographs of connectors P1 and P2 are shown in Appendix Figures 22A and B.

Circuit resistance and insulation resistance tests were performed using open-set-up methods. All circuit resistance readings fell within the specified 0.100 ohm maximum ranging from 0.031 ohm to 0.085 ohm. All circuits failed the 500 v dc hi-pot test ranging in values from 400 ohms to 5 kilohms insulation resistance breakdown. A minimum of 20 megohms is specified.

It appears that the hi-pot breakdown occurred in the contaminated connector matings and not in the conductor lengths throughout the cable. It is believed that CF1504 would not perform its function due to this defect.

CF1504 Faired Electrical Cable Assembly Serial Number AA5740D0 -- A visual inspection of the CF1504 was made with the following results:

1. A heavy deposit of mud was found around and inside the face of Connector P1.

2. A heavy deposit of mud was found on and around Connector P2. Fifty percent of its sockets were heavily contaminated.

3. Varying amounts of mud were over entire length of cable.

4. The cable markings were legible.

Photographs of Connectors P1 and P2 are shown in Appendix Figures 22C and D.

Circuit resistance and insulation resistance tests were performed using open-set-up method. All circuit resistance readings fell within the specified 0.100 ohm maximum ranging from 0.033 ohm to 0.062 ohm. All circuits failed the 500 v dc hi-pot test ranging in values from 400 ohms to 15 kilohms insulation resistance breakdown. A minimum of 20 megohms is specified.

It appears that the hi-pot breakdowns occurred in the contaminated connector matings and not in the conductor lengths throughout the cable. It is believed the CF1504 would not perform its function due to this defect.

CF1595 Special Purpose Electrical Cable Assembly -- A visual inspection of the CF1595 was made with the following results:

1. The clear vinyl jacket of the cable was filled with water.

2. The P1 Connector exterior and sockets were clean. A very light mud deposit was on the connector shell. No corrosion was detected.

3. The P1A Connector had a light mud deposit on the assembly ring, barrel and pins. The tips of the pins showed a light green color indicative of corrosion.

4. The epoxy potting at the rear of the connectors appeared undamaged.

5. The cable markings were legible.

A photograph of cable connectors is shown in the Appendix Figure 23A.

Circuit resistance and insulation resistance tests were performed on the CF1595 using the PT307A Tester and PT307-183 Tester Adapter. Three circuits failed the circuit resistance test; P1-B to P1A-B, P1-R to P1A-R and P1-d to P1A-d measuring 0.031, 0.031 and 0.049 ohm, respectively. Specifications allow a maximum of 0.020 ohm. Three circuits failed the insulation resistance test; P1A-D, P1A-J and P1A-L measuring 325, 175 and 320 microamperes, respectively. The maximum allowable leakage is 25 microamperes.

The CF1595 failed to meed its electrical requirements. However, it appears the cable would still perform its function.

CF1596 Special Purpose Electrical Cable Assemblies (2 each) -- A visual inspection of both CF1596's designated "W-1" and "W-2" was made with the following results:

W-1 1. The neoprene jacket appeared in good condition. A light deposit of mud covered the cable length.

2. The Connector P3 had a medium deposit of mud in the sockets and around its exterior. The epoxy potting behind the connectors appeared in good condition.

3. The Connector P3-A had spotted light deposits of mud over its exterior. Its four pins appeared relatively bright.

4. The cable gave no evidence of corrosion.

5. The cable markings were legible.

6. The cable jacket was opened to check for water penetration. None was found.

W-2 1. The neoprene jacket appeared in good condition. A light deposit of mud covered the cable length.

2. The P3 Connector had a medium deposit of mud over its its exterior and in the connector sockets.

3. The Connector P3A had a light depost of mud over its exterior. The male pins appeared relatively bright. Some corrosive action was visible on the barrel of the connector.

4. The cable markings were legible.

5. The cable jacket was opened to check for water penetration. None was found.

6. The epoxy potting behind both connectors appeared in good condition.

A photograph of the connectors of both cables appear in Appendix Figure 23B.

Circuit resistance and insulation resistance tests were performed using the PT307A Tester and PT307-183 Tester Adapter. Both cables checked satisfactory with the exception of cable "W-1" which had hi-pot failures for circuits P3A-A, P3A-B, P3A-C and P3A-D with leakage currents of 155, 140, 130 and 35 microamperes, respectively. Specifications allow a maximum leakage of 25 microamperes.

It appears that both cables would perform their function in the system.

<u>CF1650 Special Purpose Electrical Cable Assembly</u> -- A visual inspection of the CF1650 was made with the following results:

1. All six connectors of this cable contained mud and salt deposit.

2. The assembly locking rings of Connectors P2 and P4 had brown rust stains. The faces of the two connector inserts were also stained brown.

3. The outside appearance of the epoxy junction block, the epoxy potting behind all the connectors and the neoprene jackets of all the pigtails appeared in good condition.

4. The jackets of all six pigtails were opened approximately 2 inches and examined for water penetration and found to be dry.

5. The cable markings were legible.

A photograph of the cables' six connectors is shown in Appendix Figure 23C.

Circuit resistance and insulation resistance tests were performed on the CF1650 using the PT307 Tester and PT307-225 Tester Adapter. The circuit resistance readings were all within specification limits. All circuits but two (P3-B and P3-F) failed the 500 v dc hi-pot test. Measurements varied from 20 kilohms to 12.5 megohms. A minimum of 20 megohms is specified.

The cable capacitance test was made using a General Radio Type 740 Capacitance Test Bridge. The cable failed this test.

It is believed the cable would fail to perform its function in the weapon system.

Distribution
1-3/29A - W. Lee Hancock, AEC-ALO
4-6/29A - Commander, FCDASA, Attn: FCOP-7
7-10/29A - Director of Nuclear Safety, Kirtland AFB
11-12/29A - H. J. Blackwell, AEC-AAO
13/29A - R. S. Farrell, GEXF, Attn: P. Kuhne
14/29A - R. F. Cell, BKC
15/29A - E. H. Eyster, LASL
16/29A - C. F. Bild, 1100
17/29A - L. A. Hopkins, 1300
18/29A - J. H. Findlay, 1400
19-20/29A - W. A. Gardner, 1500 ← [redacted]
21/29A - L. J. Heilman, 2100
22/29A - R. H. Schultz, 2120
23/29A - D. E. Murphy, 2126
24/29A - H. E. Lenander, 2500
25/29A - A. B. Machen, 7500
26/29A - L. Gutierrez, 8100
27/29A - Central Technical File, 3428-1
28/29A - Central Technical File, 8232
29/29A - A. P. Gruer, 2130

This is an exact copy:08/19/96:12331:csp
MS1371 R H Steele, 10105

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References

1. SRD Report, SC-DR-66-397, RS 3410/834, dtd August 1966, subject: B-52/KC-135 Collision Near Palomares, Spain (U)

2. SRD Report, RS 3415/6333, Prepared by Mason & Hanger - Silas Mason Co., Inc., dtd June 15, 1966, subject: Report of Examination of Mk 28 Accident Residue, Palomares, Spain

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APPENDIX

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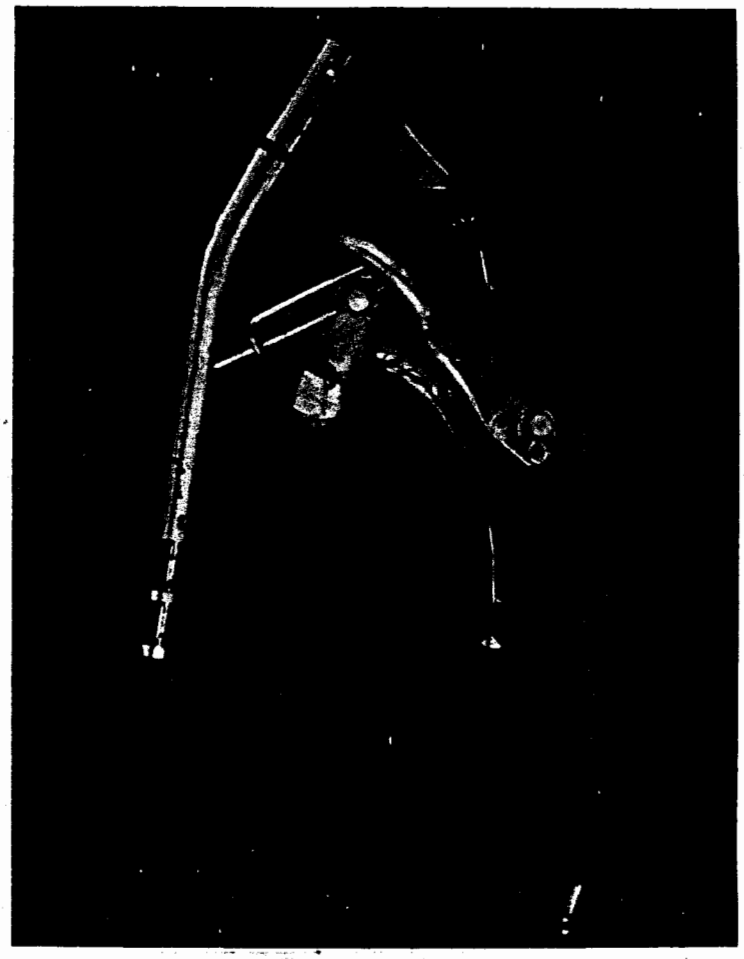
APPENDIX



Pullout Rod from MC1120
S/N BBN 6909A3

FIGURE 1

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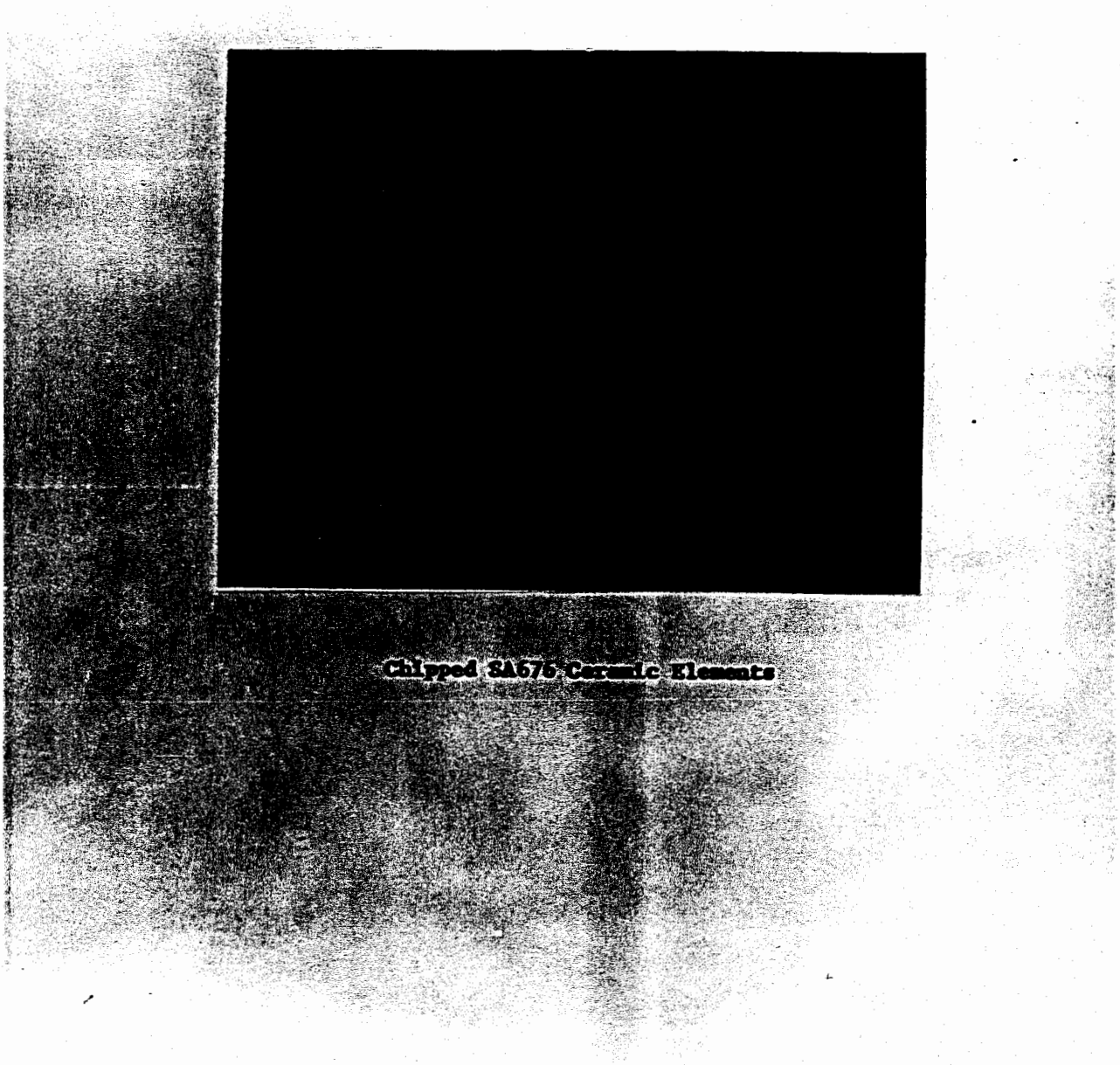

Chipped SA676 Ceramic Elements

FIGURE 2

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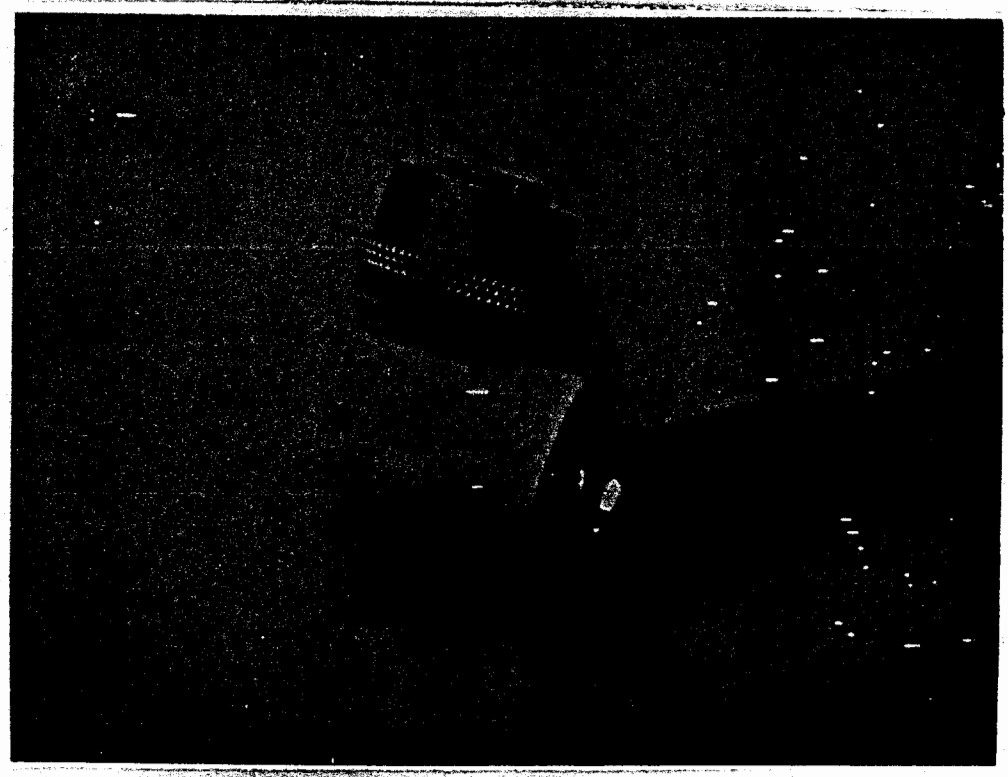

Pigtail
MC1367 S/N BBN2073K2

FIGURE 3

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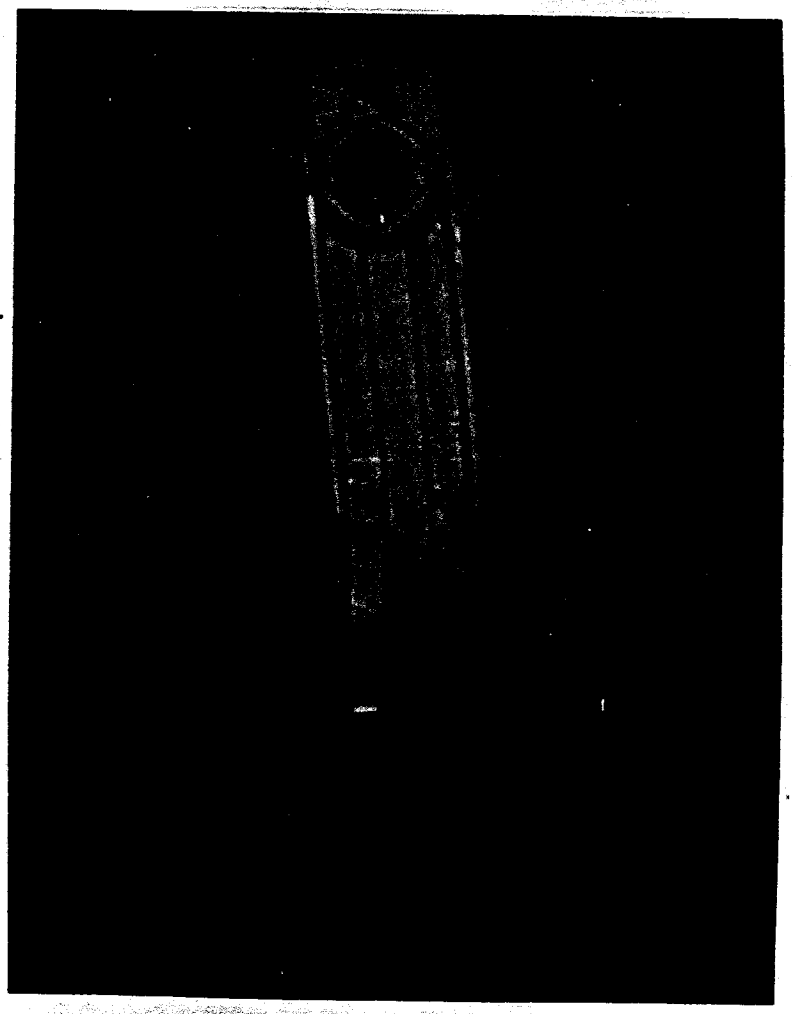

CF1504 S/N BBN8623K2

Figure 4

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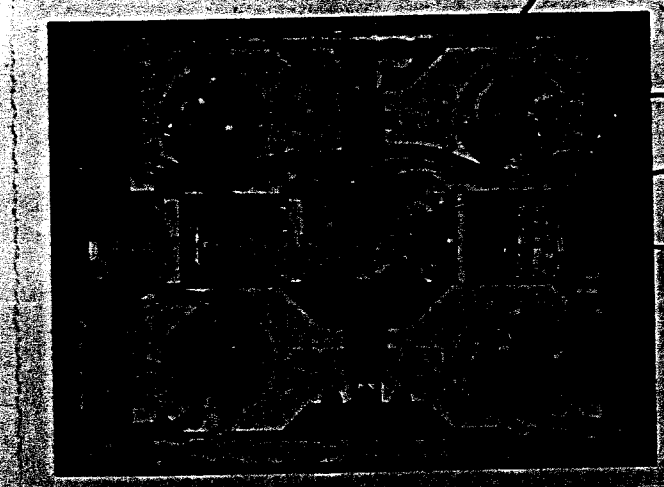

Salt Encrusted Interior of [illegible]

Salt Encrusted Gears of Baro Setting Motor and Associated Gear Train

FIGURE 5

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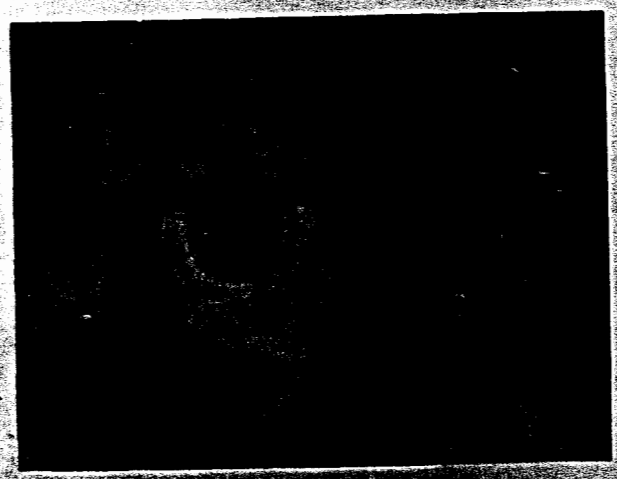
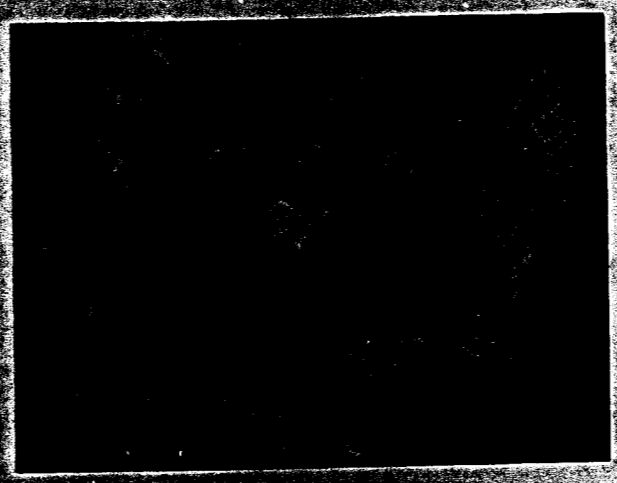


Limit Switches of Baro Setting System

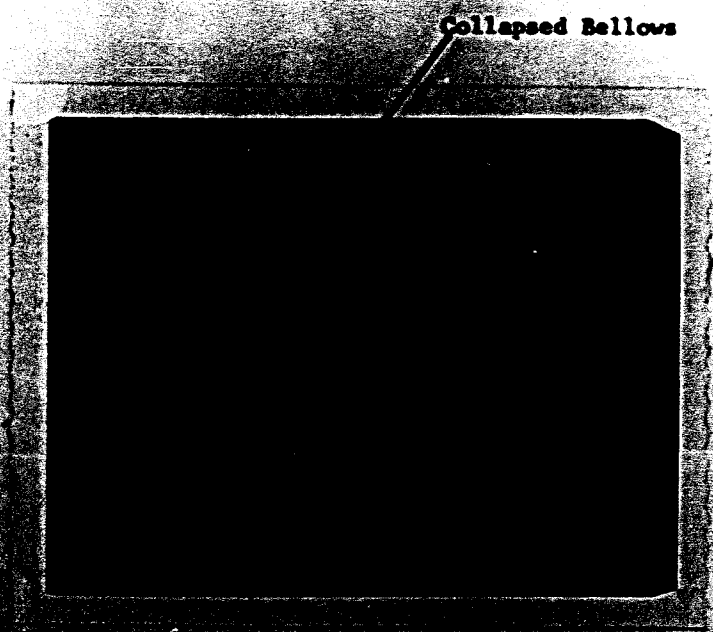


Corrosion and Rust on One of the BSE Electrical Terminals

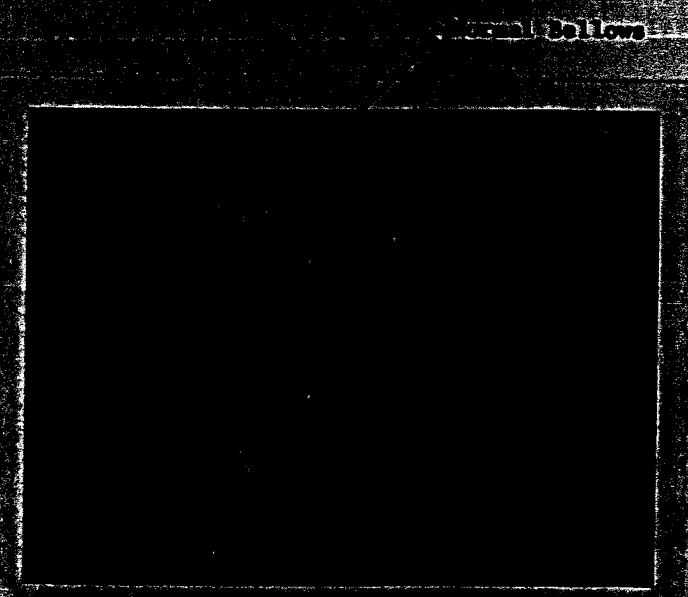
FIGURE 6

RS 2121/86

APPENDIX



[illegible] Showing the Collapsed [illegible] Element (See [illegible] normal BSE)



MC520 [illegible]

FIGURE 7

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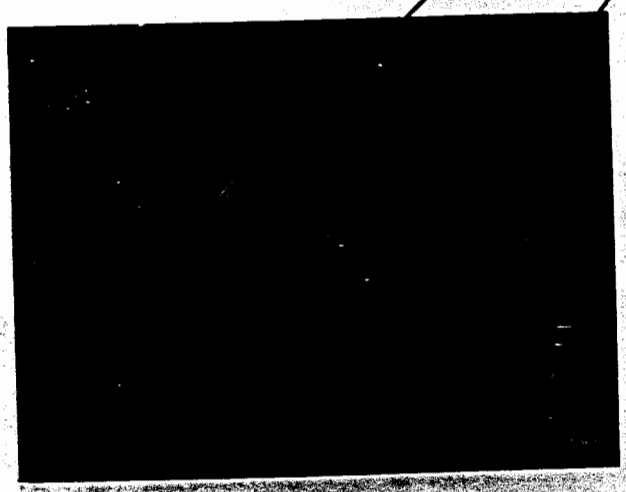
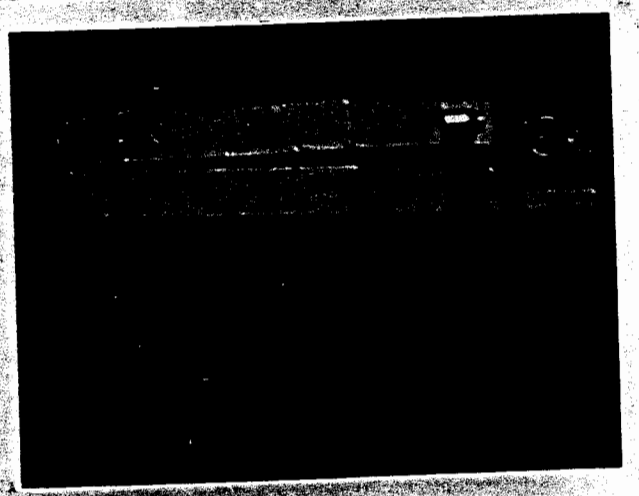
APPENDIX



MC820 BSE Setting Mechanism Showing Rust and Salt Accumulation



MC820 BSE Setting Mechanism For Comparison With Above

FIGURE 8

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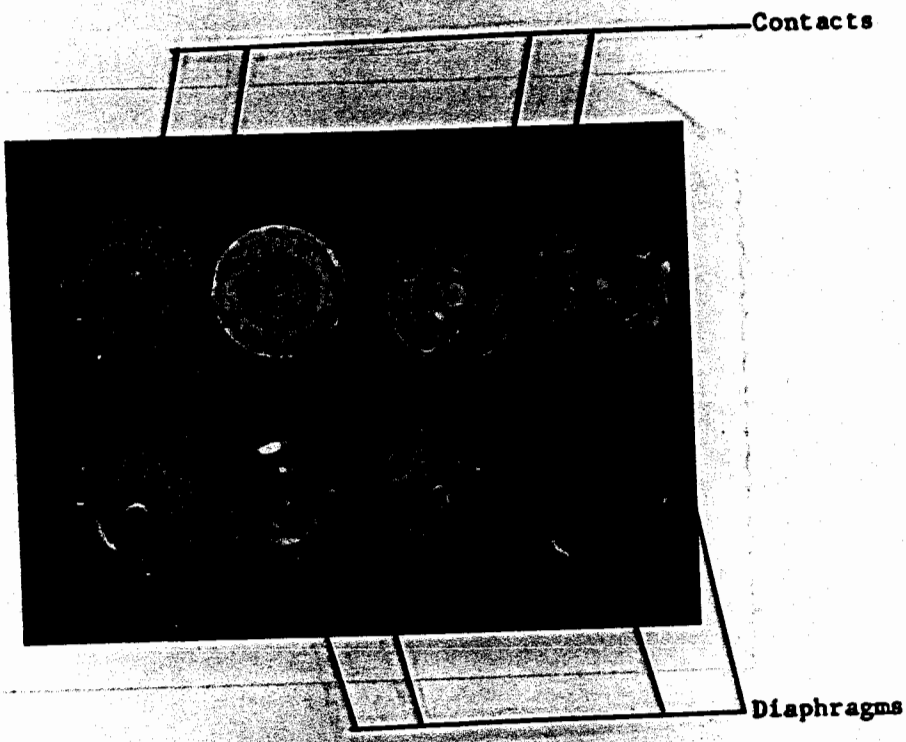
APPENDIX

MC890A S/N GBV437665K3

FIGURE 9

APPENDIX



Pressure Switch Elements from the MC909's Showing Corrosion and Salt Deposits on the Contacts and Deformed Diaphragms

FIGURE 10

APPENDIX

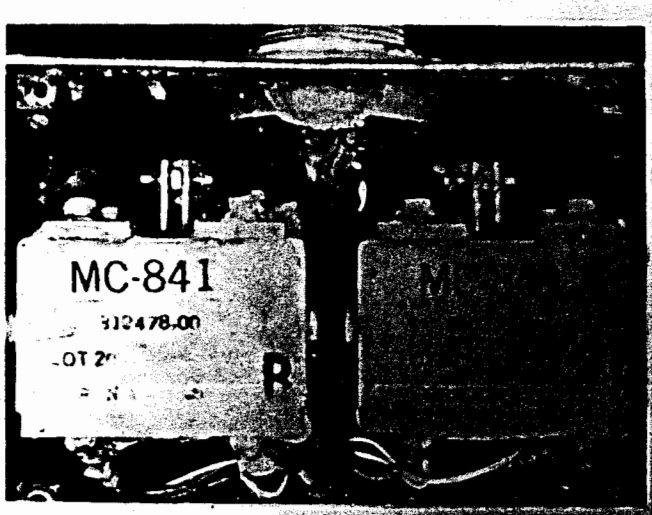


FIGURE 11A

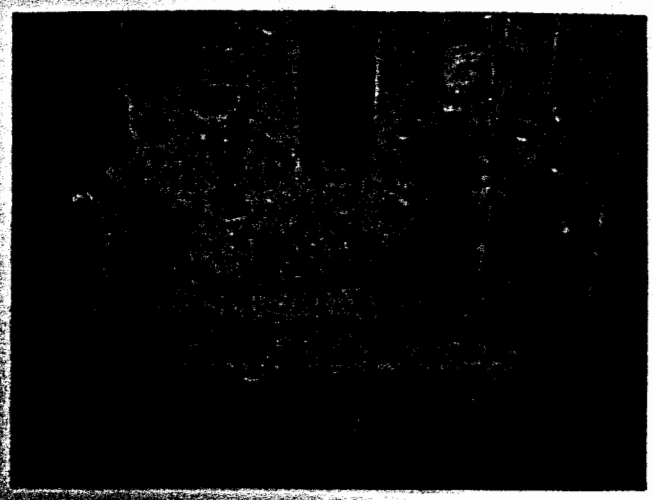


FIGURE 11B

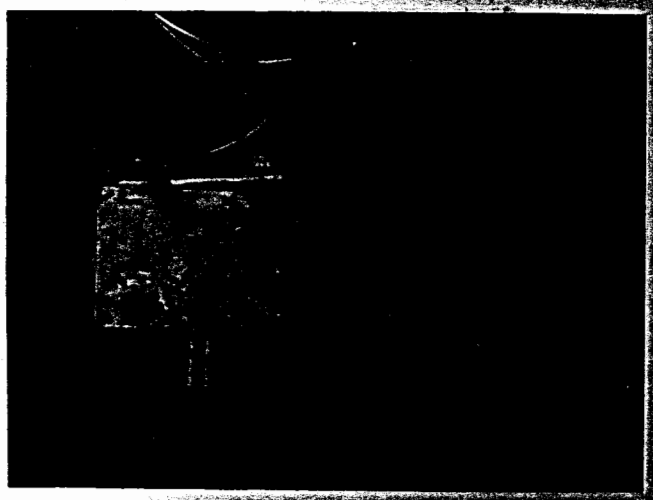


FIGURE 11C

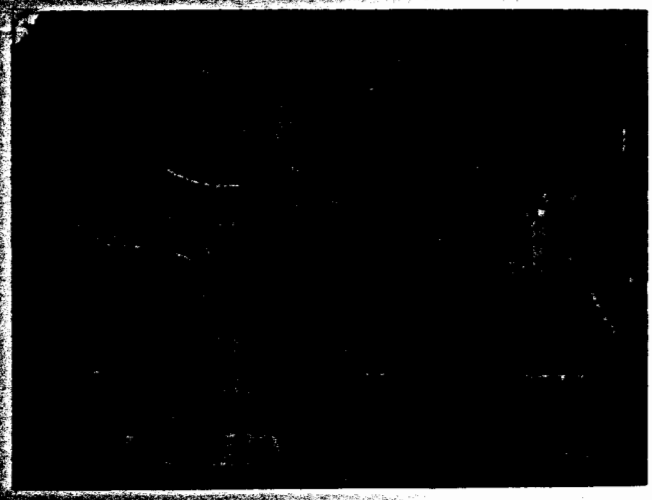
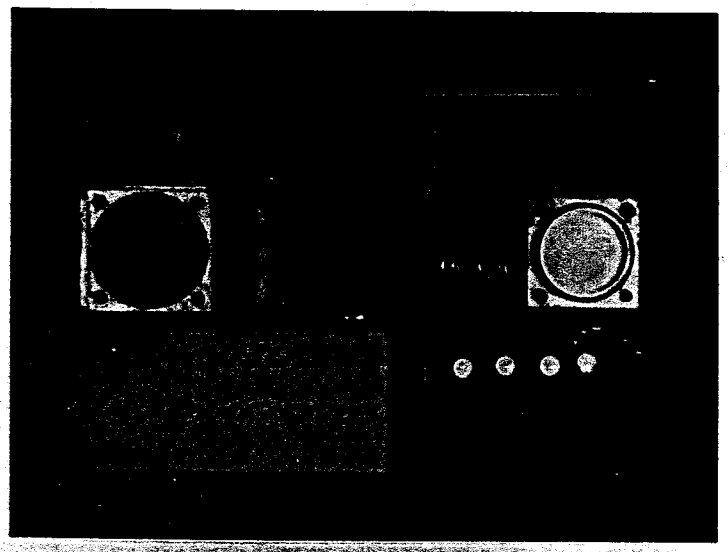


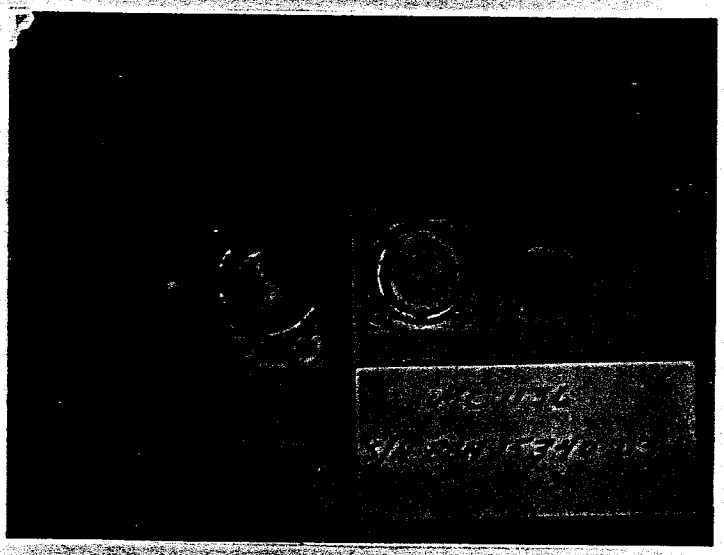
FIGURE 11D

MC1120 S/N BBM 6207B1

FIGURE 11

APPENDIX





MC1136 S/N BBN15155D3 & BBN15340D3

FIGURE 12

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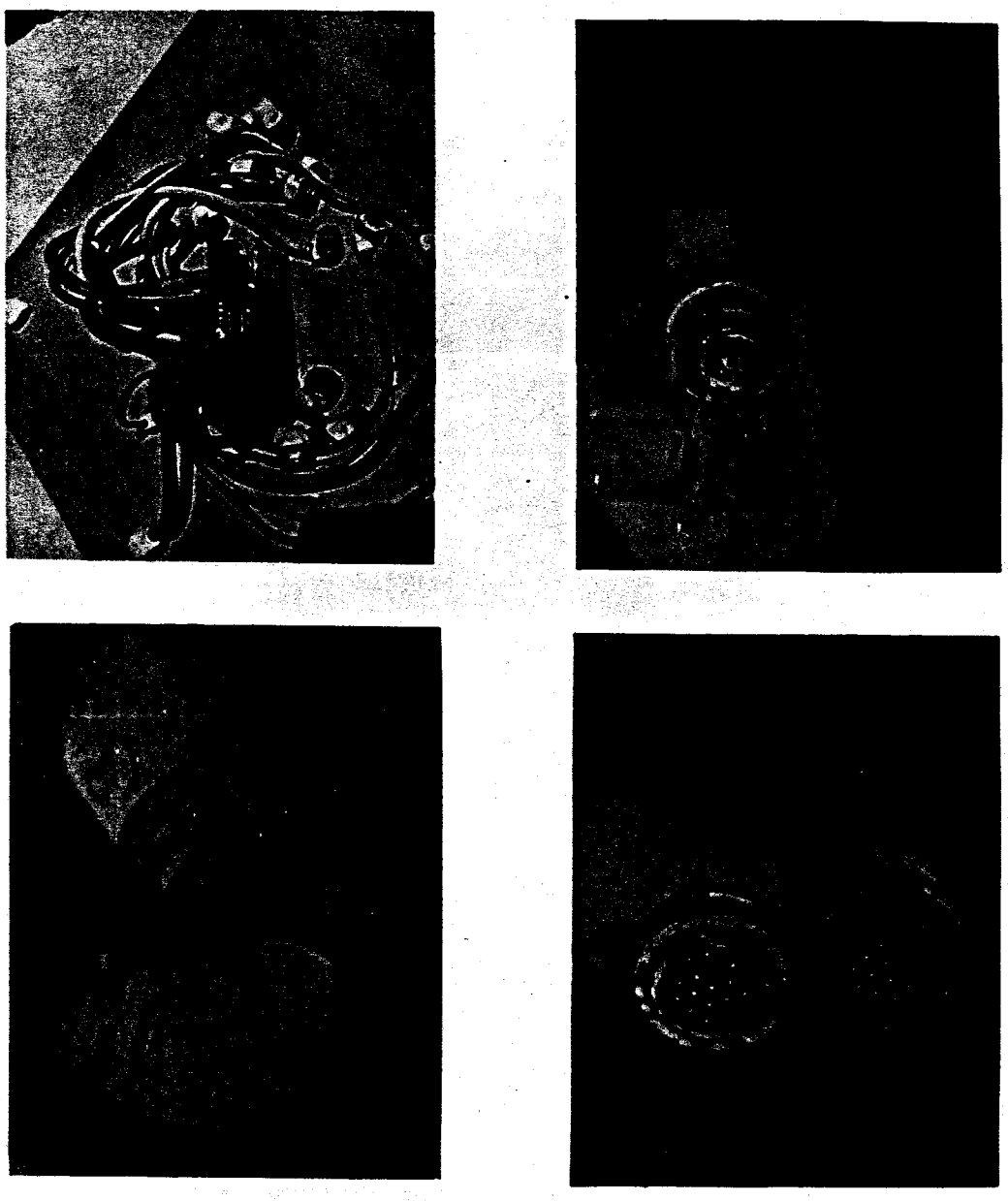

MC1316A S/N BBN1806C3

FIGURE 13

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APPENDIX

DOE b(3)

FIGURE 14A

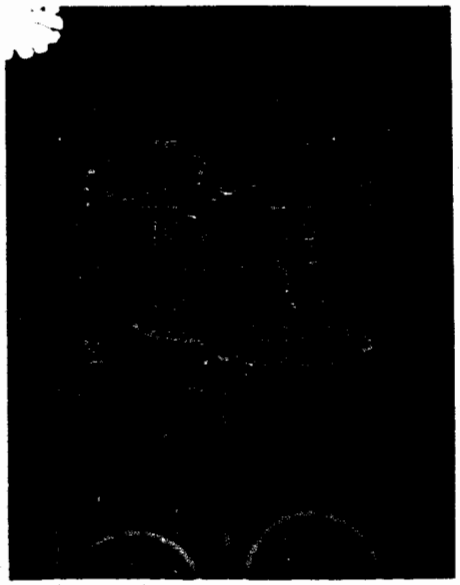

FIGURE 14B

FIGURE 14C

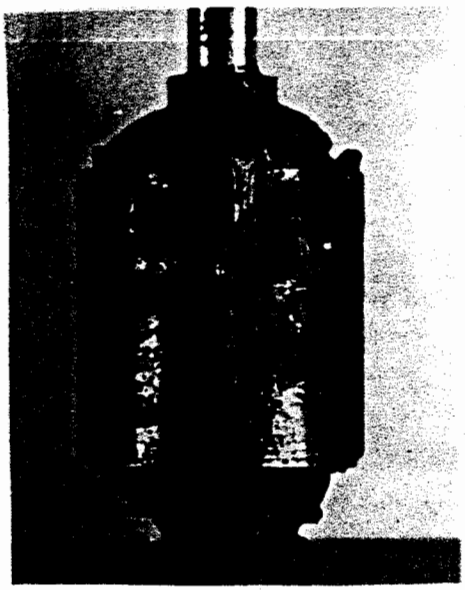

FIGURE 14D

MC1352 SAF 1476B3

FIGURE 14

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APPENDIX

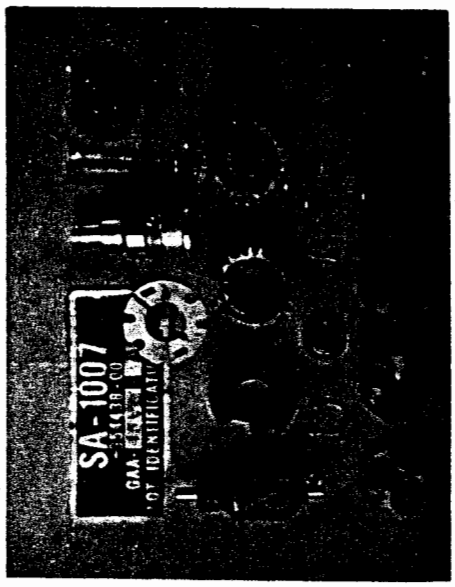

FIGURE 15A

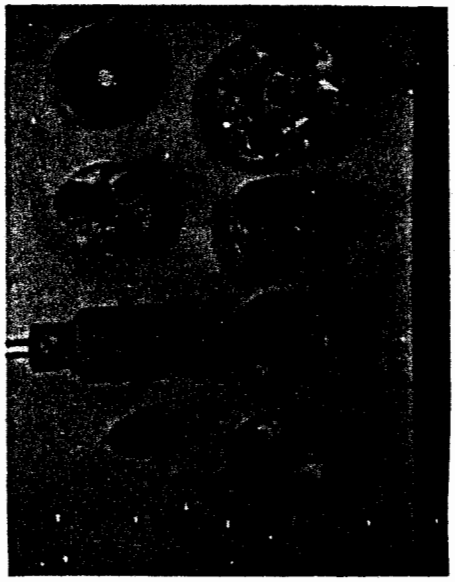

FIGURE 15B

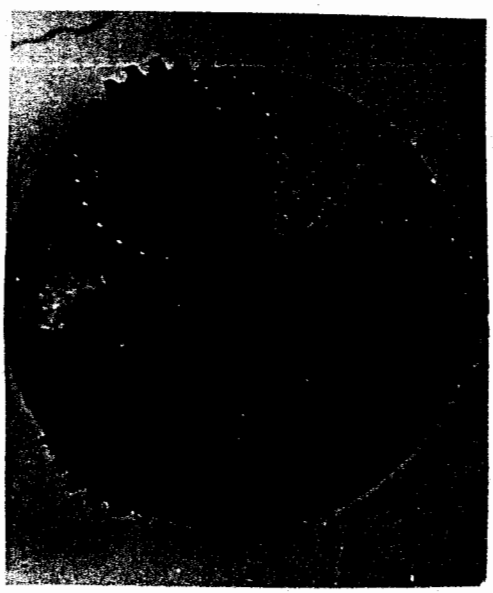

FIGURE 15C

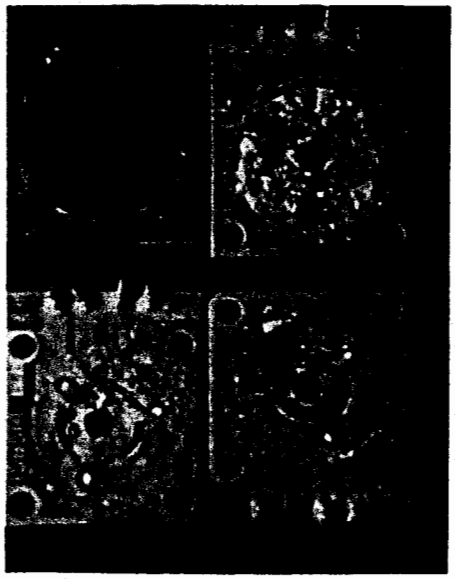

FIGURE 15D

MC1352 SAF 1476B3

FIGURE 15

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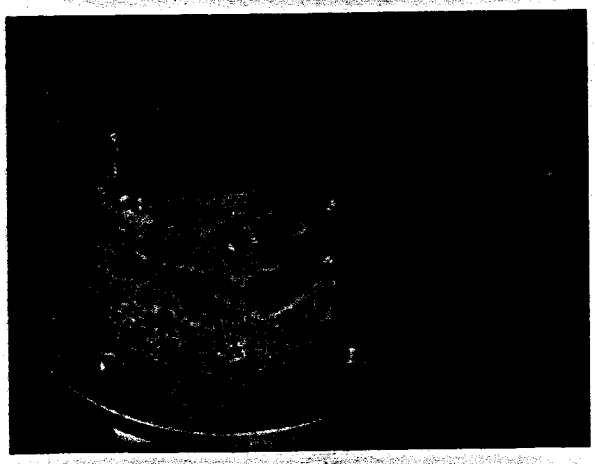
APPENDIX



MC1367 S/N BBN1464H2

FIGURE 16

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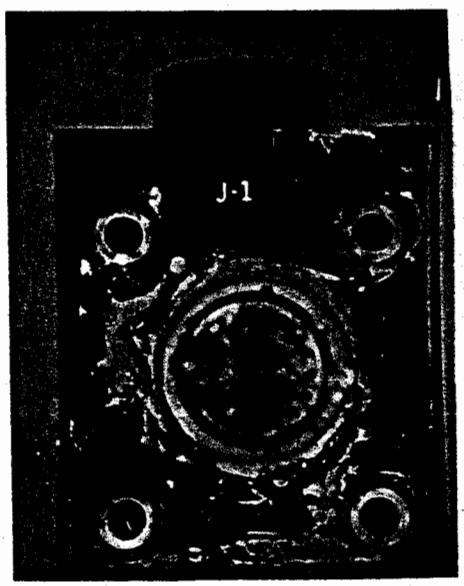
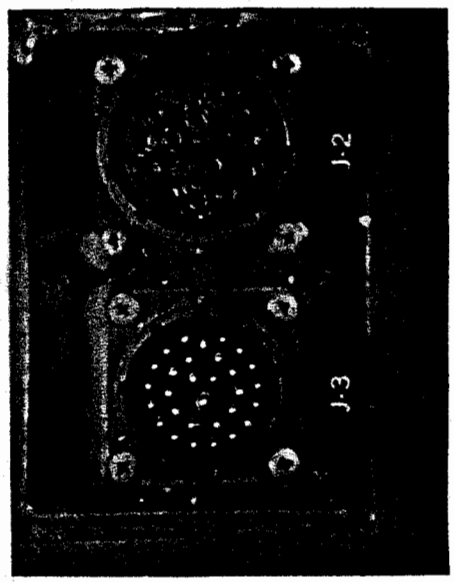
APPENDIX





MC1454 S/N BBN2491D3

FIGURE 17

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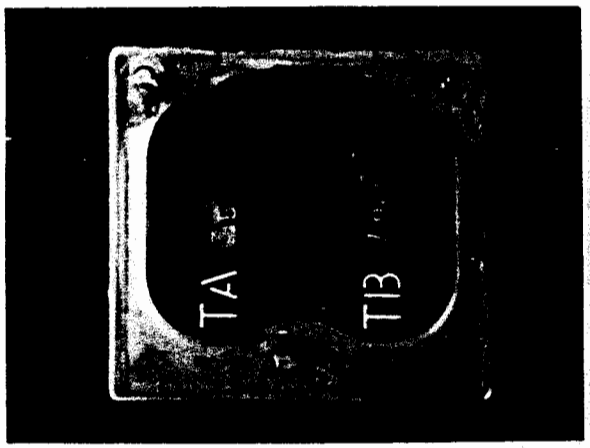
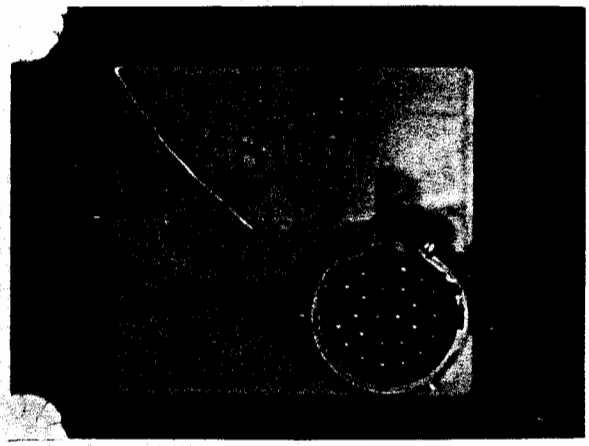
APPENDIX



Top Cover



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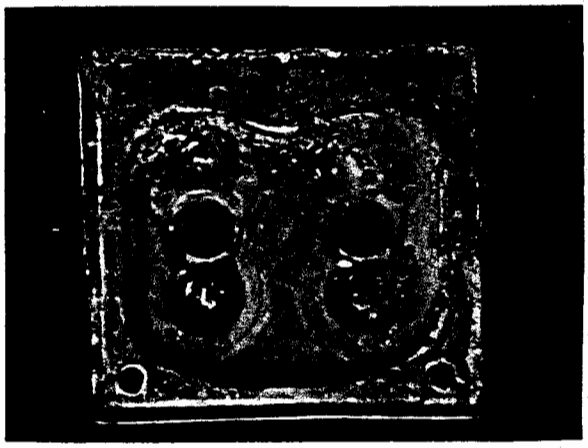
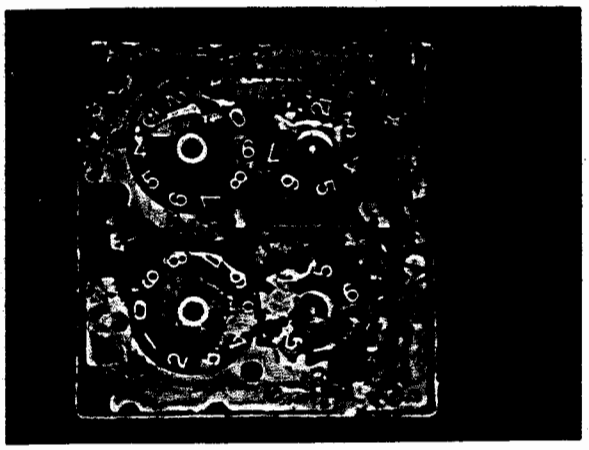


Inside Top Cover



Setting Indicators & Top Plates

MC1469 S/N BAN 2888C3

FIGURE 18

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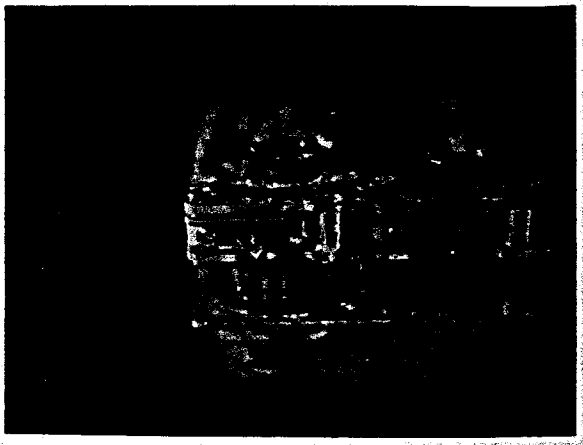
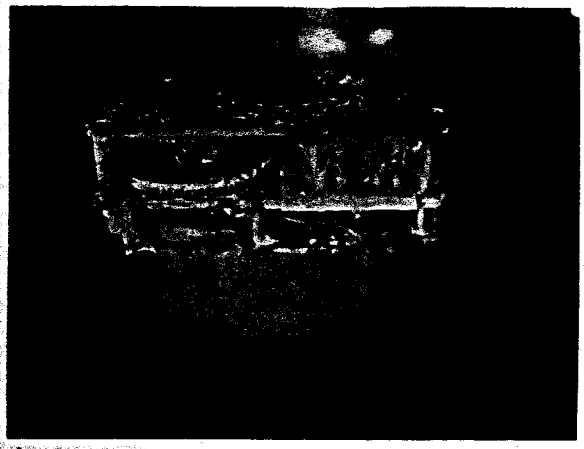
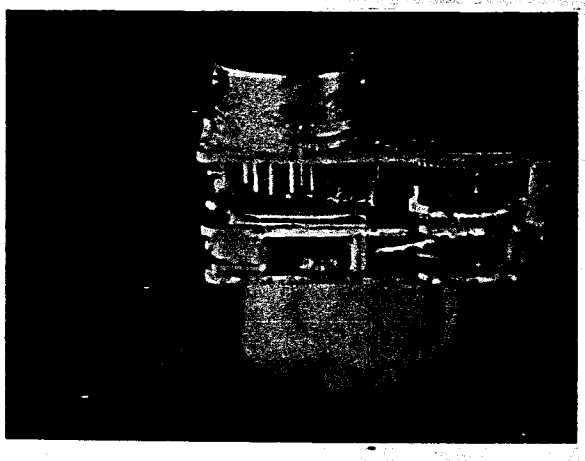
APPENDIX



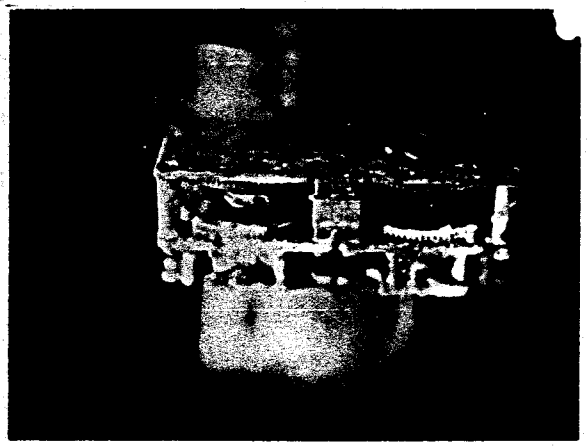
Escapement Side



Explosive Motor Side



Connector Side



TA-TB Side

MC1469 S/N BAN 2888C3

FIGURE 19

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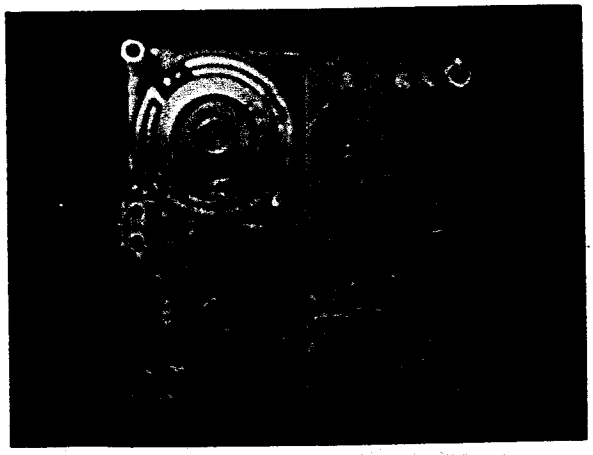
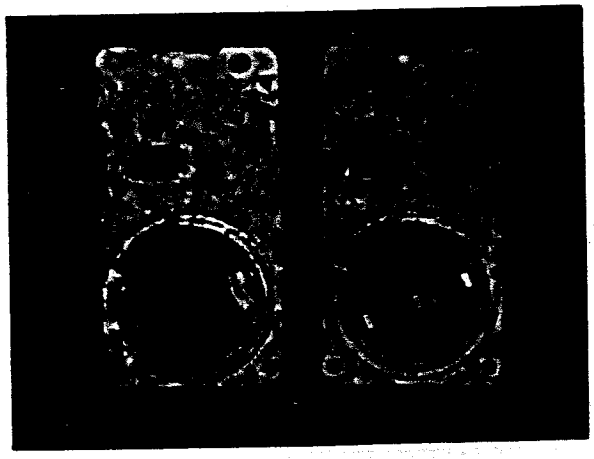
APPENDIX



TA Boards



TB Boards

MC1469 S/N BAN 2888C3

FIGURE 20

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RS 2/31/86

APPENDIX

[redacted]

MC1615 S/N BBN 1680J2

FIGURE 21

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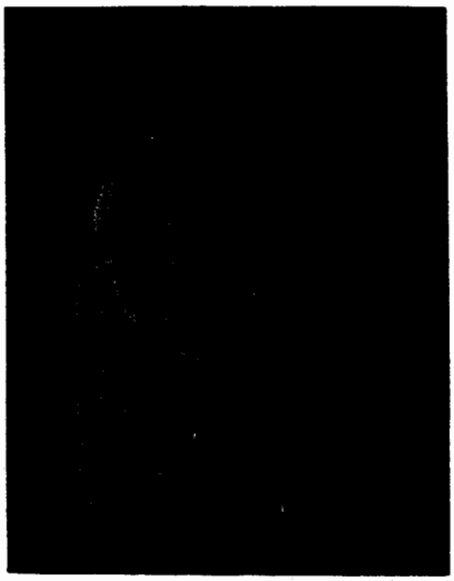
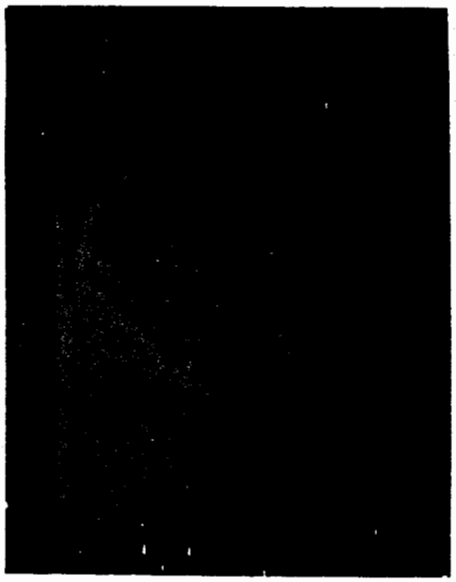
RS 2131/66

APPENDIX

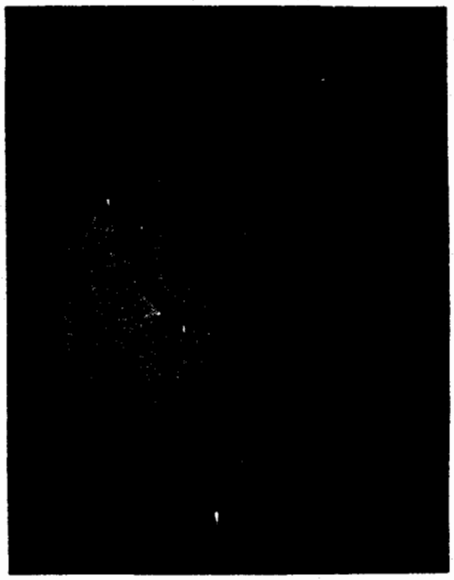
CF 1504 S/N AA 5780 EO (P1)
Figure 22A



CF 1504 S/N AA 5780 EO (P2)
Figure 22B



CF 1504 S/N AA 5740 DO (P1)
Figure 22C



CF 1504 S/N AA 5740 DO (P2)
Figure 22D

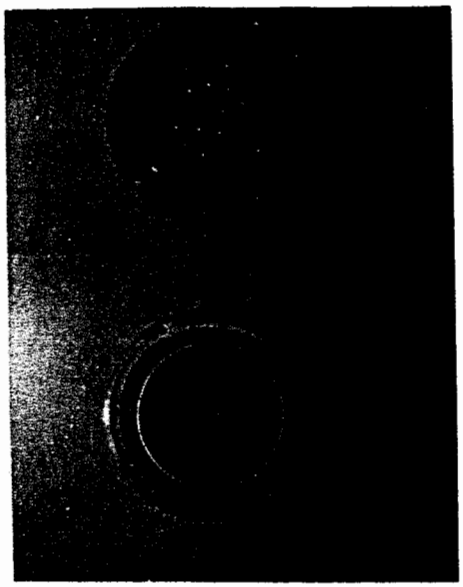
FIGURE 22

UNCLASSIFIED

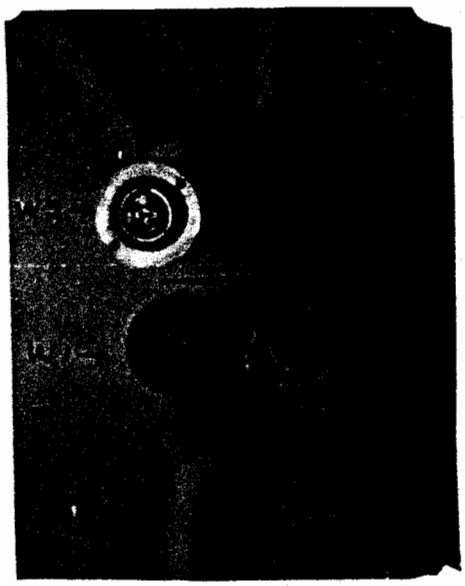
[redacted] UNCLASSIFIED

RS 2 13.1/86

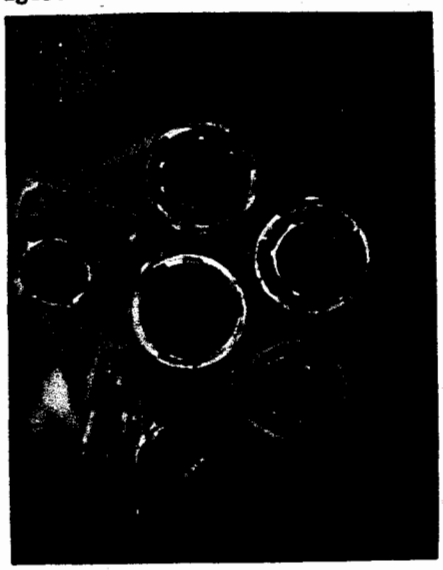
APPENDIX



CF 1595 - Figure 23A



CF 1596 - Figure 23B



CF 1650 - Figure 23C

FIGURE 23

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