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ENGINEERING DATA TRANSMITTAL

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1	1	Cog.Eng. B.J. Makenas <i>[Signature]</i> 3/7/97 HQ-40	Distribution Attached	2	
1	1	Cog. Mgr. R.P. Omberg <i>[Signature]</i> 3/7/97 HQ-40			
		QA			
		Safety			
		Env.			

18. *[Signature]*
B.J. Makenas 3/7/97

Signature of EDT Originator Date

19.

Authorized Representative Date for Receiving Organization

20. *[Signature]*
R.P. Omberg 3/7/97

Cognizant Manager Date Design Authority/

21. DOE APPROVAL (if required)
Ctrl. No.

☐ Approved
☐ Approved w/comments
☐ Disapproved w/comments

CANISTER CHOICES FOR SAMPLING OF FUEL AND SLUDGE FROM K WEST BASIN CANISTERS (SECOND CHARACTERIZATION CAMPAIGN)

B. J. Makenas, D. J. Trimble, A. L. Pitner, R. B. Baker,
and L. A. Lawrence
Duke Engineering and Services Hanford, Inc., Richland, WA 99352
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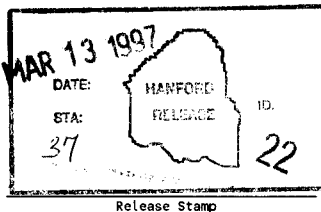
Key Words: K Basin, Sludge, N Reactor Fuel, Characterization

Abstract: The Characterization of Spent Nuclear Fuel in the sealed K West canisters involves four steps, (1) sampling of gas/liquid, (2) "Lift-and-Look" visual examinations of fuel elements, (3) sampling of canister sludge, and (4) retrieving fuel for hot cell examinations. This document indicates the choices of particular canisters that were examined during the second characterization campaign in the Hanford K West Basin.

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Chris Killian 3-11-97
Release Approval Date



Approved for Public Release

**CANISTER CHOICES FOR SAMPLING OF FUEL AND SLUDGE FROM K WEST BASIN
CANISTERS (SECOND CHARACTERIZATION CAMPAIGN)**

B. J. Makenas, D. J. Trimble, A. L. Pitner, R. B. Baker,
and L. A. Lawrence

Duke Engineering and Services Hanford, Inc.

March 1997

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**CANISTER CHOICES FOR SAMPLING OF FUEL AND SLUDGE FROM K WEST BASIN
CANISTERS (SECOND CHARACTERIZATION CAMPAIGN)**

SUMMARY

The water-filled Hanford K West Basin houses over 3,000 sealed canisters containing N Reactor Spent Nuclear Fuel (SNF). During late CY 1996 and early 1997 a characterization campaign was conducted in the K West Basin. It included the following steps:

- A. Sampling of gas and liquid from approximately 50 sealed K West canisters. Note: Each canister presents two barrels to be sampled.
- B. Measurement of sludge depth in roughly 20 canisters using ultrasonic techniques concurrently with visual examination of selected elements from canisters.
- C. Retrieval of sludge samples from nine canister barrels.
- D. Retrieval of 15 fuel elements for shipment to hot cell examination facilities.

Steps A, C, and D, listed above, were planned and initiated through the issuance of formal Data Quality Objectives (DQO) documents. Specific canisters to be sampled or opened were specified through recommendation letters issued by the SNF Characterization group with concurrence from the K Basin Operations group. The purpose of this document is to collect these letters as evidence of the initial efforts to satisfy the goals set forth in the DQO process. Each of the following appendices, A through D, is a recommendation letter corresponding to the steps listed above. Applicable precursor DQO documents are referenced in each letter.

A P P E N D I X A

RECOMMENDED CANISTERS FOR GAS AND LIQUID SAMPLING

**Westinghouse
Hanford Company****Internal
Memo**

From: Spent Nuclear Fuel Evaluations
 Phone: 376-5447 HO-40
 Date: August 7, 1996
 Subject: CANISTER CHOICES FOR GAS/LIQUID SAMPLING

To: R. P. Omberg HO-40

cc: J. Abrefah, PNNL	P7-34	P. J. MacFarlan	HO-40
R. B. Baker	HO-40	C. T. Miller	X3-72
G. Baston, MACTEC	R3-82	G. L. Miller	T6-06
D. W. Bergmann	R3-86	K. R. Morris	X3-67
A. E. Bridges	HO-40	K. L. Pearce	R3-48
J. C. Fulton	R3-11	J. Shuen, RL	S7-41
E. W. Gerber	R3-86	D. W. Siddoway	X3-71
R. A. Harris	HO-40	J. A. Swenson	R3-11
J. J. Jernberg	X3-85	BJM File/LB	HO-40
L. A. Lawrence	HO-40	DJT File/LB	HO-40
S. C. Marschman, PNNL	P7-34		

Attached is a list of recommended canisters for the second gas/liquid sampling campaign in K West Basin. The two tables presented in the attachment are for MK I and MK II canisters respectively. Included are 50 prime candidates plus eight alternates. Various candidates contain MK IA fuel, MK IV fuel, chips, D Grade fuel, known broken elements, water in-leakage (i.e., broken locking bars), and/or gas filled traps (suggesting corrosion). Based on a review of the current data base, an attempt was made to span a variety of encapsulation times and fuel burnups.

B. J. Makenas

B. J. Makenas

D. J. Trimble

D. J. Trimble

jmn

Attachment

CONCURRENCE:

C. T. Miller
 C. T. Miller
 K Basins Operations

8/9/96
 Date

Reference: B.J.Makenas, D.J.Trimble and D.W.Bergman, "Data Quality Objectives for Gas and Liquid Samples from Sealed K West Basin Canisters (second campaign), HNF-SD-SNF-DQO-006, Rev.0, August 1996.

MK I CANISTERS																				
Cube	Canister S.N.	Key	type	Fuel mode(s)	No. of Assys	BROKEN FUEL	ENCAPSULATION		%Pu240											
							DATE	YEARS												
0748	2600	13525	MIA	A-	14		May-82	14.3	13.0											
0754*	2775	13525	MIA	AM	14		May-82	14.3	13.0											
1484	2554	12942	MIA	AM	14		Apr-82	14.4	12.6											
1630	2660	13016	MIA	AM	14		Apr-82	14.4	12.8											
2661	1730	12480	MIA	AM	14		Aug-81	15.1	13.3											
2804*	1820	12480	MIA	AM	14		Aug-81	15.1	13.3											
2810*	1869	12480	MIA	AM	14		Aug-81	15.1	13.3											
2828	1556X	12480	MIA	AM	14		Aug-81	15.1	13.3											
2913	161	10832	MIA	AM	14		Feb-81	15.6	12.5											
2923	2667	13371	MIA	AM	14		Apr-82	14.4	12.5											
3617*	1162	12127	MIA	AM	14		Jul-81	15.2	13.7											
3619	1164	12127	MIA	AM	14		Jul-81	15.2	13.7											
3839	1497X	11979	MIA	AM + AT	7 + 7	1 outer	Jul-81	15.2	13.7											
4245	1226	11897	MIA	AF + AM	3 + 11	1 inner	Jun-81	15.3	13.8											
4443	709X	11806	MIA	AM	14		Jun-81	15.3	13.3											
4459	102X	11806	MIA	AM	14		Feb-81	15.6	13.3											
4463	200X	11806	MIA	AM	14		Feb-81	15.6	13.3											
4608	111	12852	MIV	BE	14		Mar-81	15.5	12.8											
4612	316	12852	MIV	BE	14		Mar-81	15.5	12.8											
4613*	315	12852	MIV	BE	14		Mar-81	15.5	12.8											
4614	318	12852	MIV	BE	14		Mar-81	15.5	12.8											
5006*	760	13015	MIV	BC	14		May-81	15.3	12.7											
5060	710	12942	MIV	BE	14		May-81	15.3	12.7											
5309	1619	13017	MIV	BE	14		Sep-81	15.0	11.0											
5366	943X	12852	MIV	BE	14	pieces	Sep-81	15.0	11.0											
5369	1740	12852	MIV	BE	14	some	Sep-81	15.0	12.8											
5370	1560	12852	MIV	BE	14	some	Sep-81	15.0	12.8											
5373	1860	13015	NAT	7E	14	inners&outers	Sep-81	15.0	11.8											
5753	9010	13372	MIV	BS	14	inners&outers	Sep-81	15.0	12.8											
5850	9020	13524	MIV	BA + BE + IIS	11 + 1 + 2		Mar-82	14.5	12.4											
5943	2800	13524	MIV	BE	14		Mar-82	14.5	12.5											
* = backup candidate																				

[illegible]

A P P E N D I X B

RECOMMENDED CANISTERS FOR SLUDGE DEPTH MEASUREMENTS AND VISUAL EXAMINATIONS

**DE&S Hanford, Inc.
A Duke Engineering & Services Company****Internal
Memo**

From: Spent Nuclear Fuel Evaluations
Phone: 376-5447 H0-40
Date: October 25, 1996
Subject: RECOMMENDED K WEST BASIN CANISTERS FOR ULTRASONIC SLUDGE DEPTH
MEASUREMENTS AND FUEL ELEMENT VISUAL EXAMINATIONS

To: R. P. Omberg H0-40
cc: Distribution

Attached is a list of recommended canisters for the fuel element visual examination campaign in K West Basin. Canister sludge depth will also be determined via ultrasonic techniques. The two tables presented in the attachment are for MK I and MK II canisters respectively. Included are 23 prime candidates. Various candidates contain MK IA fuel, MK IV fuel, chips, D Grade fuel, known broken elements, water in-leakage (i.e., broken locking bars), and/or gas filled traps (suggesting corrosion).

Liquid samples have already been obtained for all of the listed canisters. It is anticipated that a review of visual examination data will be performed after 10 canisters are inspected to ensure that element handling does not prejudice future attempts to obtain sludge samples. Canisters listed in the attached tables are prioritized to facilitate this review and Cs contents (furnished by Dennis Trimble) are included. Archive pictures of several candidate canisters have been obtained by Al Pitner and Wendell Briggs from as-loaded records (circa 1981 through 1983) and are attached for future comparisons to the new visual data.



B. J. Makenas

jmn

Attachment

CONCURRENCE:


J. R. Gregory
K Basins Operations

10-25-96
Date

ATTACHMENT

**Consisting of 7 pages,
including cover page**

MK I CANISTERS

Cube	Canister S.N.	Key	Fuel		Number of Assemblies	Broken Fuel	Encapsulation		% ²⁴⁰ Pu	Pitner Photo.	Priority	mCi/Barrel	
			Type	Model(s)			Date	Years				M	U
1630	2660	13016	MIA	AM	14		Apr-82	14.4	12.8		2	3517	177
2913	161	10832	MIA	AM	14		Feb-81	15.6	12.5		2	1254	562
2923	2667	13371	MIA	AM	14		Apr-82	14.4	12.5		3	5787	1010
3619	1164	12127	MIA	AM	14		Jul-81	15.2	13.7		3	2018	622
3839	1497X	11979	MIA	AM+AT	7+7	1 Outer	Jul-81	15.2	13.7	X	2	418	5093
4245	1226	11897	MIA	AF+AM	3+11	1 Inner	Jun-81	15.3	13.8		2	1164	157
4459	102X	11806	MIA	AM	14		Feb-81	15.6	13.3		3	646	460
4613	315	12852	MIA	BE	14		Mar-81	15.5	12.8		1	123	148
5366	943X	12852	MIV	BE	14	Some	Sep-81	15.0	12.8	X	3	571	1106
5370	1560	12852	MIV	BE	14	Inners & Outers	Sep-81	15.0	12.8		3	187	1560
5373	1860	13015	NAT	7E	14	Inners & Outers	Sep-81	15.0	11.8		2	284	1111

1 = Perform First M = Marked Barrel U = Unmarked Barrel

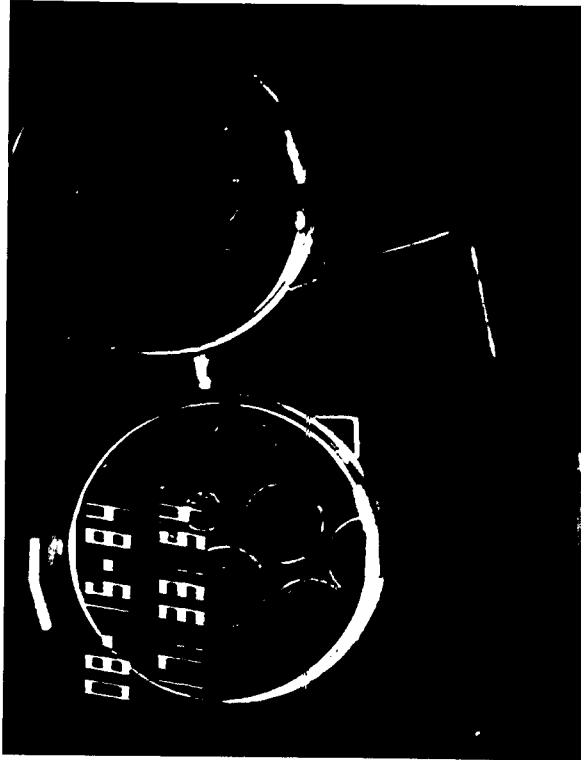
MARK II CANISTERS

Cube	Canister S.N.	Key	Fuel		Number of Assemblies	Grade	Broken Fuel	Encapsulation			Gas Trap Level (in.)		Locking Bars	Photo. ^{240}Pu	Priority	mCi/Barrel	
			Type	Model(s)				Date	Years		M	U				M	U
0719	1265X		MIA	AM	14		1 Inner	Oct-82	13.9					12.6	3	465	728
2233	6889		MIA	AM+AT	2+1 Inner		Chips	Dec-89	6.7		1.6	15.0		10.4	2	870	45
3545	7913		MIA	AM	14		2 Outer	Oct-84	11.9		2.4	0.9		10.3	3	358	1127
3740	6743		MIA	AM	14			Sep-84	12.0		3.1	16.8	B,U	13.24	X	935	?
4511	5744		MIA	AM	14		1 Inner	Jul-84	12.2		3.4	2.2		12.9	2	840	1320
4557	6513		MIA	AM	14		1 Outer	Jul-84	12.2		1.7	2.9		13.2	X	4419	1671
5424	1512		MIV	BE	14			Mar-83	13.5		1.9	2.2		11.58	3	932	221
5427	91		MIV	BE	14			Mar-83	13.5		3.2	2.9		11.58	3	770	661
5625	6214		MIV	BE	14		D				7.4	15.8		16.9	1	122	125
5652	6603		MIV	BE	14		D				1.9	16.6	C,U	17.0	3	766	204
6014	6768		MIV	BE+BS	6+1 Inner		Chips	Feb-88	8.5		1.5	2.2		9.7	3	2582	?
6016	5903		MIV	BC+BE+BS	1 Out+4+1 Out		Chips	Feb-88	8.5		0.9	0.4		9.7	3	4688	4141

S.N. = Serial Number, C = Cracked, B = Broken, BE = Broken End, M = Marked Barrel, U = Unmarked Barrel, 1 = Perform First









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A P P E N D I X C

RECOMMENDED CANISTERS FOR SLUDGE SAMPLING

**DE&S Hanford, Inc.
A Duke Engineering & Services Company**

**Internal
Memo**

From: Spent Nuclear Fuel Evaluations
Phone: 376-5109 HO-40
Date: December 6, 1996
Subject: RECOMMENDED K WEST BASIN CANISTERS FOR SLUDGE SAMPLING

To: R. P. Omberg HO-40

cc: Distribution

Attachment 1 provides a list of the nine recommended canister barrels for sludge sampling in the K West Basin. This recommendation was developed considering results from (1) the recent analyses of samples of liquid from selected sealed canisters, (2) the sludge depth data determined by ultrasonic techniques, and (3) the recent visual examination of fuel elements. D. J. Trimble provided major support in integrating the results of the liquid sampling results and the general parameters involved. A. L. Pitner and W. A. Briggs provided initial evaluation of the visual examination video tape data (i.e., 72 tapes covering examination of 48 canister barrels of spent fuel).

The data were reviewed by A. L. Pitner, D. J. Trimble, B. J. Makenas, and R. B. Baker to develop this recommendation consistent with objectives of K West sludge characterization. The parameters considered included cesium-137 activity in the liquid taken from the sealed canisters, calculated sludge volume in the barrels based on ultrasonic measurements of depth, the observed evidence of sludge volume based on visual examinations of fuel elements, canister type (e.g., Mark I, Mark II, aluminum, stainless steel, etc.), fuel condition (e.g., age, burnup, number of breaches, and reactions), and fuel type (e.g., Mark IA, Mark IV, D Grade, etc.). Attachment 2 summarizes some of the primary parameters.

As a contingent, Attachment 1 also includes a selected backup canister barrel that should be sampled if major problems are encountered with the nine recommended samples.

R.B. Baker

R. B. Baker

jmm

Attachment

CONCURRENCE:

J.R. Gregory
J. R. Gregory
K Basins Operations

12/6/96
Date

Reference: B.J. Makenas, K.L. Pearce and R.B. Baker, "Data Quality Objectives for K West Basin Canister Sludge Sampling", WHC-SD-SNF-DQO-012, Rev. 0, December 1996.

ATTACHMENT 1

RECOMMENDED K WEST BASIN CANISTER BARRELS FOR SLUDGE SAMPLING

0091 Marked Barrel
1164 Marked Barrel
1512 Marked Barrel (New Lid Number 2246)
1860 Unmarked Barrel
2660 Marked Barrel
2667 Marked Barrel
6513 Marked Barrel
6603 Marked Barrel
6743 Unmarked Barrel

Backup Canister Choice: 5744 Marked Barrel

ATTACHMENT 2

SELECTED PARAMETERS FOR CANISTER BARRELS RECOMMENDED FOR SLUDGE SAMPLING

CANISTER			Cs137 (Ci/barrel)	SLUDGE			FUEL				before encapsulated (yrs)	after encapsulated (yrs)
barrel	type	material		depth (inch)	volume (L)	qualitative observation	damage rating (number of elements)			type		
							minor	major	very major			
0091M	MK II	S.S.	0.77	2.5	0.79	good	7	1	1	MK IA	0.5	13.5
1164M	MK I	S.S.	2.02	3.1	1.01	moderate	1	1	2	MK IA	3.8	15.2
1512M	MK II	S.S.	0.93	0.7	0.22	good	3	0	1	MK IV	0.5	13.5
1860U	MK I	Alum.	1.11	0.8	0.21	good	2	2	1	MK IV	1.3	15.0
2660M	MK I	S.S.	3.5	1.3	0.41	good	0	1	1	MK IA	1.9	14.3
2667M	MK I	S.S.	5.79	0.6	0.21	good	1	0	1	MK IA	0.9	14.4
6513M	MK II	S.S.	4.42	0.8	0.27	good	2	0	2	MK IA	9.4	12.2
6603M	MK II	S.S.	0.77	1.9	0.61	good	4	1	1	MK IV	unknown (D grade)	
6743U	MK II	S.S.	no data	1.4	0.46	good	1	0	2	MK IA	9.9	12.0

A P P E N D I X D

RECOMMENDED CANISTERS TO SUPPLY ELEMENTS FOR HOT CELL EXAMINATIONS

DE&S Hanford, Inc.
A Duke Engineering & Services Company

Internal
Memo

From: Spent Nuclear Fuel Evaluations
Phone: 376-5447 HO-40
Date: January 15, 1997
Subject: RECOMMENDED K WEST BASIN CANISTERS FOR FUEL ELEMENT RETRIEVAL
(SECOND CAMPAIGN)

To: R. P. Omberg HO-40

cc: Distribution

Reference: L. A. Lawrence, B. J. Makenas, and D. W. Bergmann,
"Data Quality Objectives for the Second K West
Fuel Examinations," HNF-SD-SNF-DQO-011, Rev. 0,
dated January 1997.

The 15 elements listed in Table 1 are recommended to be shipped from K West Basin to 327 Building hot cells for examination. These elements will satisfy the requirements specified in the reference. Elements representing categories such as top and/or bottom failures, severe damage, mid-element cracks, complete break, and unusual coatings have been included. These will feed whole-element drying, thermogravimetric analyses, coating scraping, and visual examinations.

Also specified in Table 1 are number of backup choices in case difficulties are encountered during canister or element handling. Top view pictures of each candidate canister (as seen during the recent visual examination campaign) are attached to aid in element identification.



B. J. Makenas



L. A. Lawrence

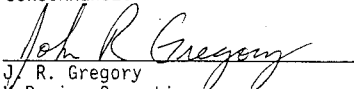


A. L. Pitner

jmn

Attachment

CONCURRENCE:



J. R. Gregory
K Basins Operations

1/16/97
Date

Table 1. Fuel Elements to be Shipped to Hot Cells for the Second K West Basin Fuel Retrieval Campaign.

Canister Number	Location	Element ¹ Number	Canister Type	Requirement ²	Fuel Type	Fuel Model Code
Prime Candidates						
161M ³	2913	2	MK I	Coating	MK IA	AM
2667U ³	2923	3	MK I	Coating	MK IA	AM
5744U	4511	4	MK II	Broken top end	MK IA	AM
6743M	3740	6	MK II	Broken top end	MK IA	AM
6603M	5652	5	MK II	Broken bottom end	MK IV	BE
7913M	3545	6	MK II	Broken bottom end	MK IA	AM
6743U	3740	6	MK II	Cladding peal	MK IA	AM
7913U	3545	4	MK II	Cladding peal	MK IA	AM
1164M	3619	5	MK I	Mid-element cracks	MK IA	AM
6743U	3740	2	MK II	Mid-element cracks	MK IA	AM
1164U	3619	1	MK I	Mid-element cracks	MK IA	AM
2660M	1630-1730	6	MK I	Severely damaged	MK IA	AM
6513U	4557	6	MK II	Severely damaged	MK IA	AM
6513M	4557	1	MK II	Severely damaged	MK IA	AM
0309M ⁴	5370	6	MK I	Broken in half	MK IV	BE
Backup Candidates						
1497M ³	3839	4	MK I	Backup coating with top rupture	MK IA	AM or AT
5744M ³	4511	6	MK II	Backup coating with top and bottom rupture	MK IA	AM
7913U	3545	5	MK II	Backup broken bottom	MK IA	AM
1164M	3619	2	MK I	Backup top and bottom rupture	MK IA	AM
0309U ⁴	5370	6	MK I	Backup clean break	MK IV	BE

¹CW from trunion with element closest to trunion designated as Number 1.²Backup elements with coincident top and bottom ruptures may be substituted for cladding peal, top or bottom rupture, mid-element cracking, or severely damaged categories.³Canisters containing primary elements for brushing.⁴Formerly canister 1560 prior to lid replacement.

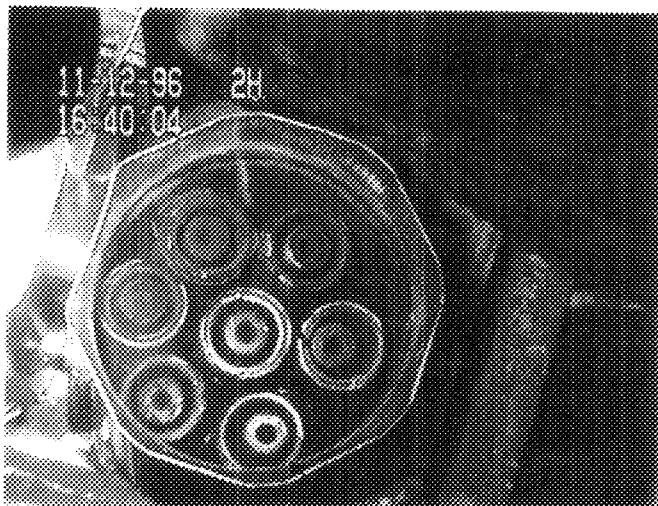
ATTACHMENT

List and Photographs of Candidate Canisters

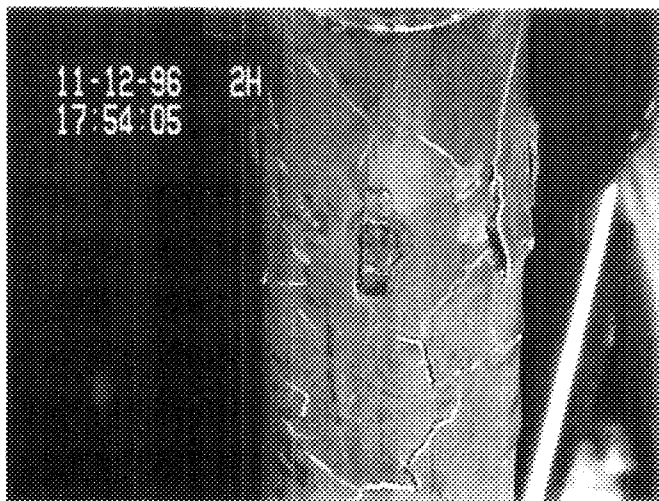
**Consisting of 22 pages,
including cover page**

1164 M -- No. 5

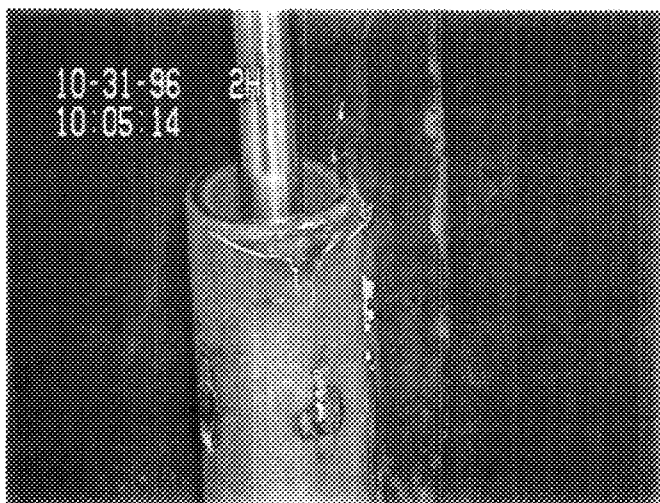
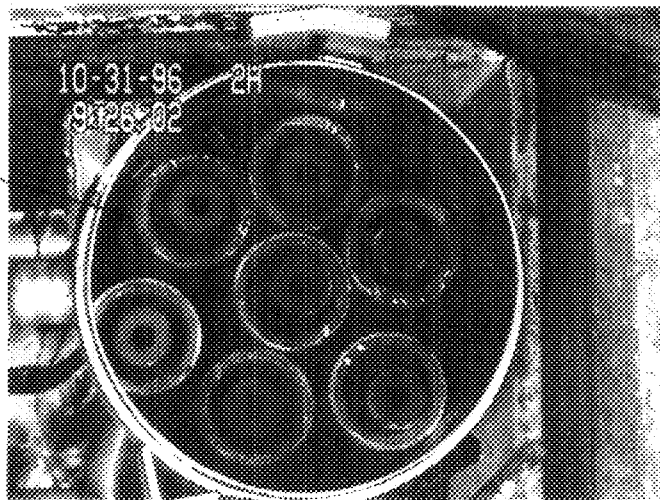
Gas
Trap
Missing



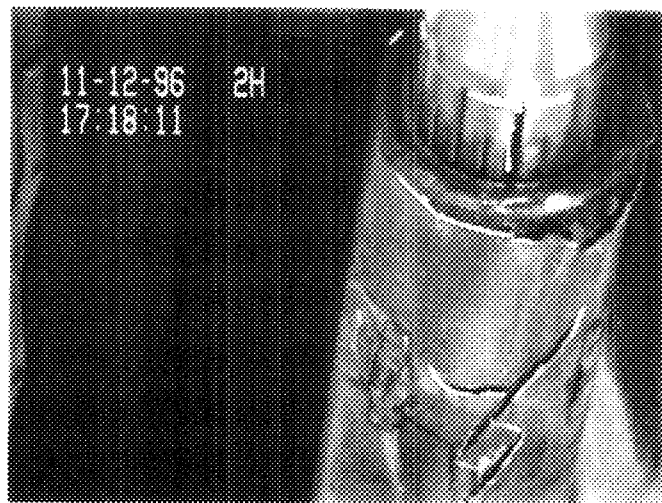
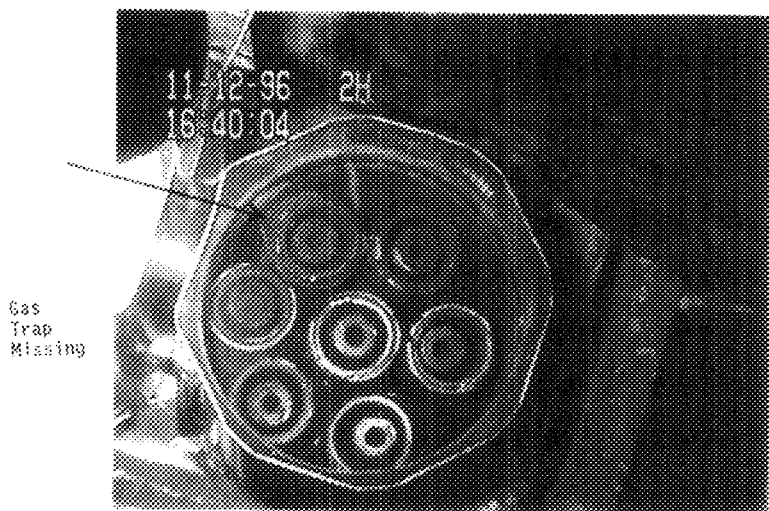
Stuck Inner



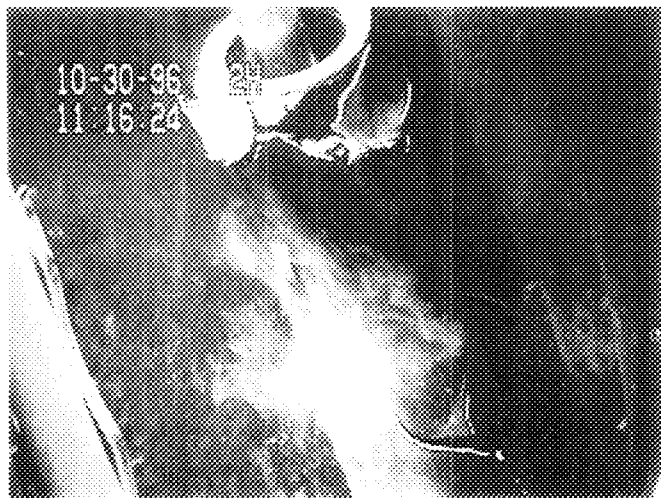
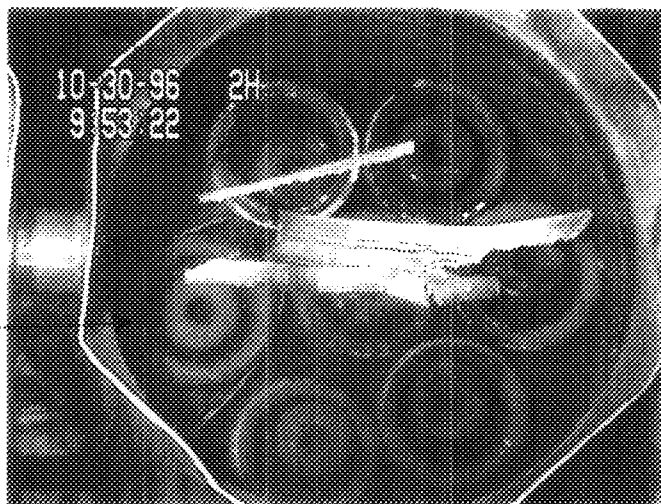
6743 U -- No. 2



1164 M -- No. 2

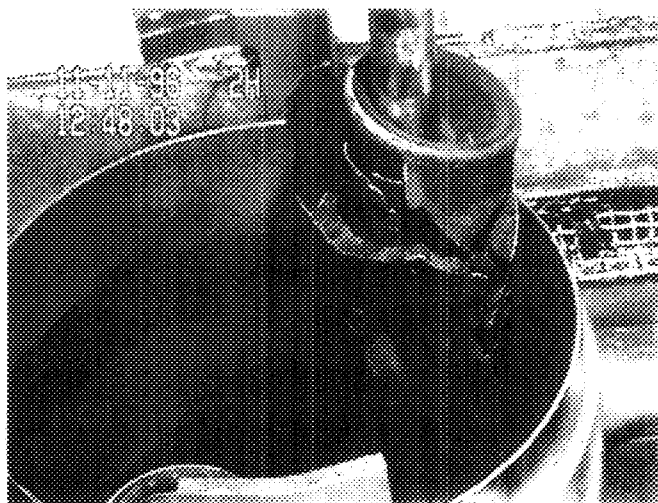
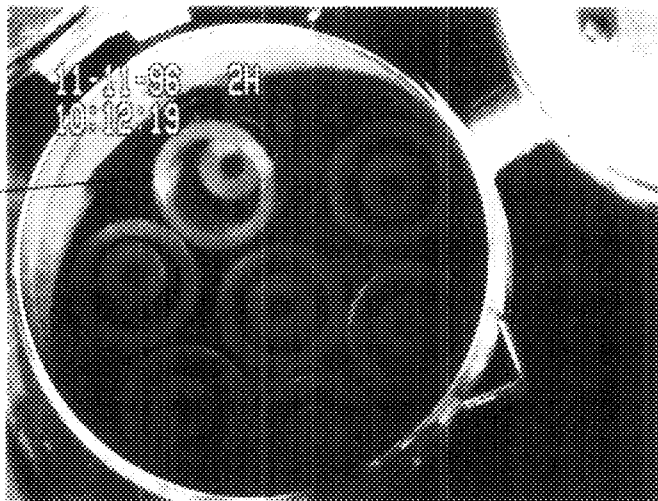


2660 M -- No. 6

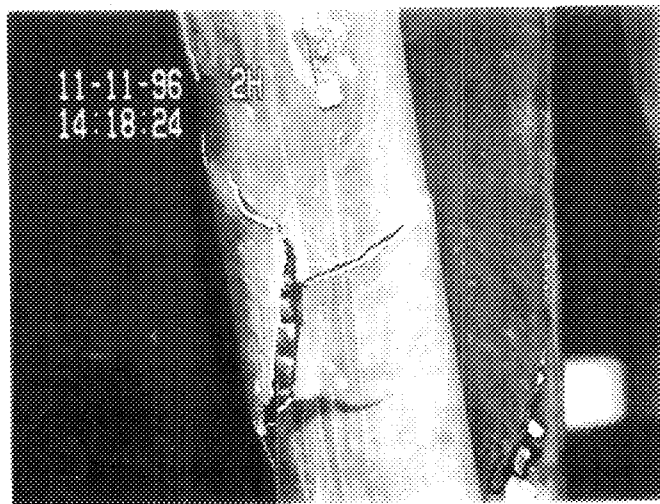
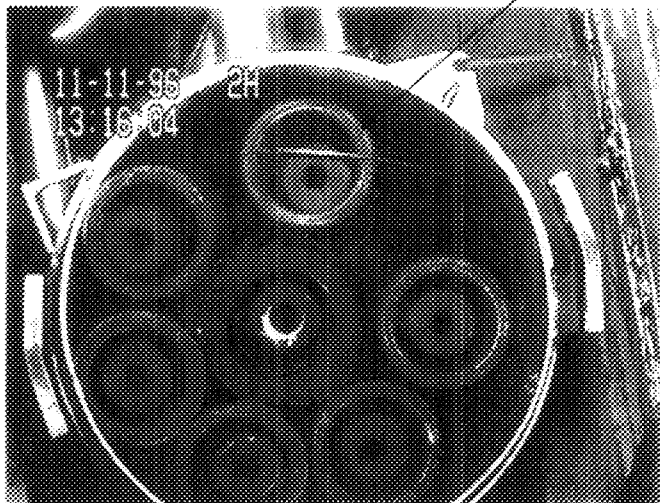


6513 U -- No. 6

Stuck inner

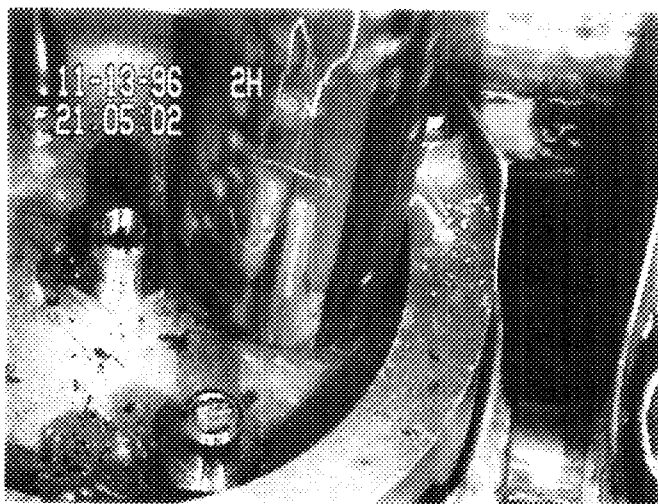
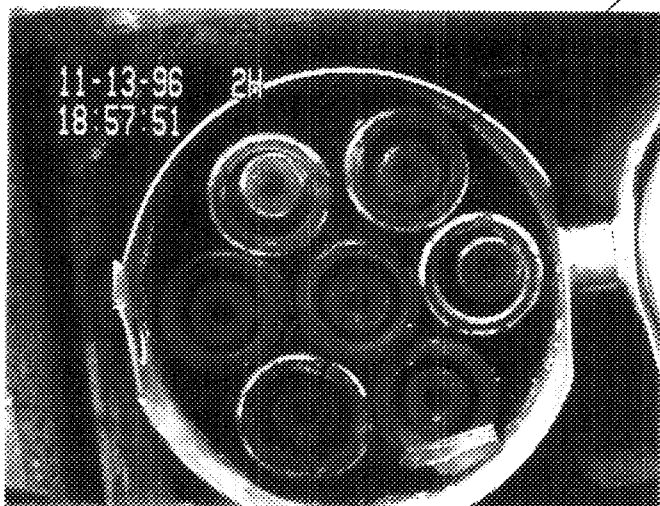


6513 M -- No. 1



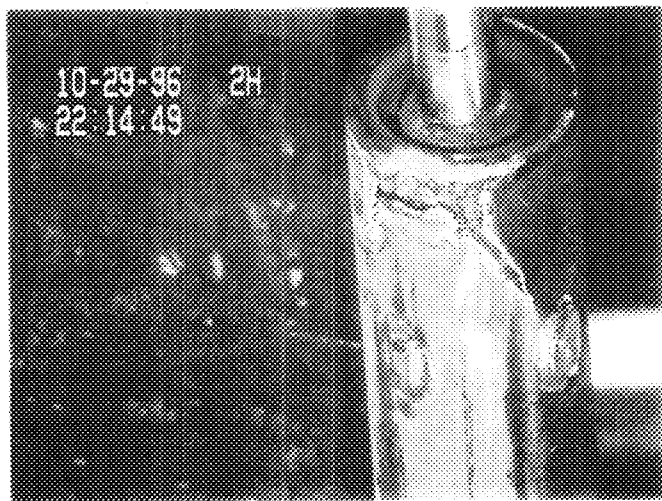
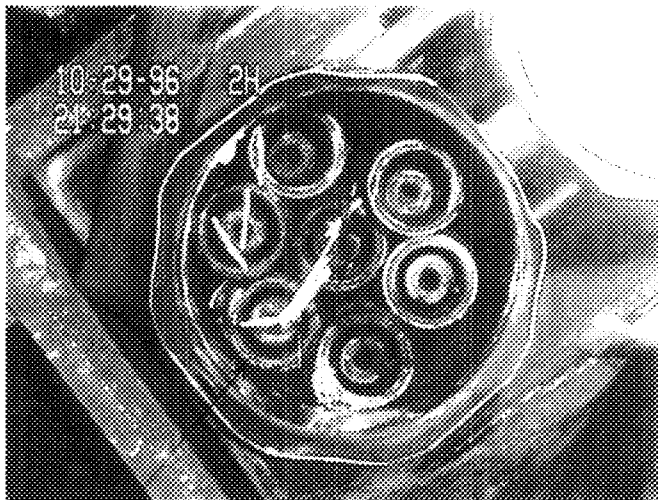
0309 M (1560 M) -- No. 6

Difficult
Lid
Replacement

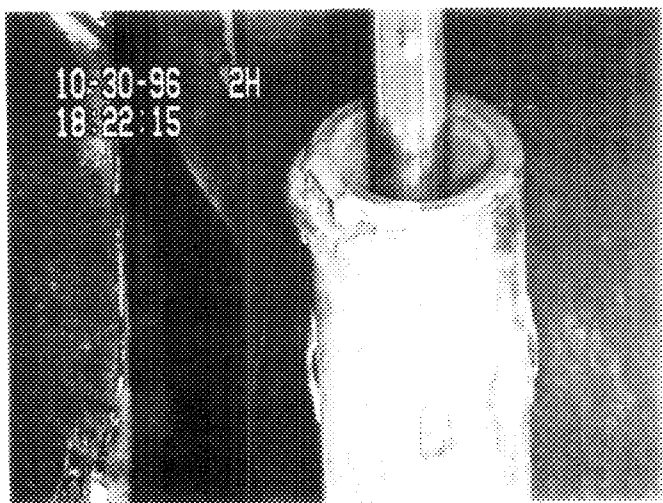
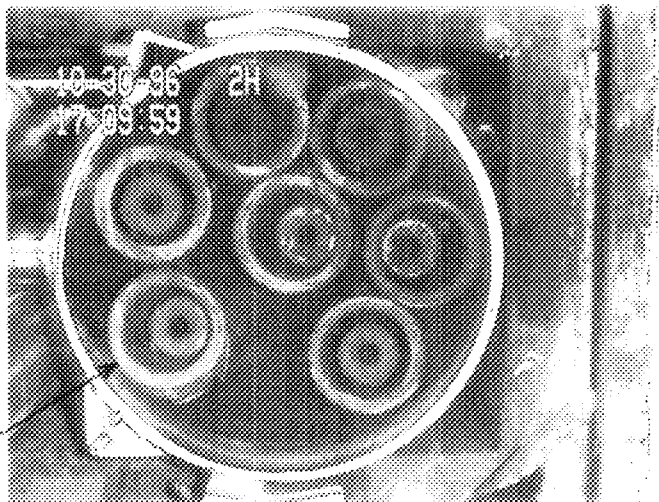


Broken
Halfway
Down

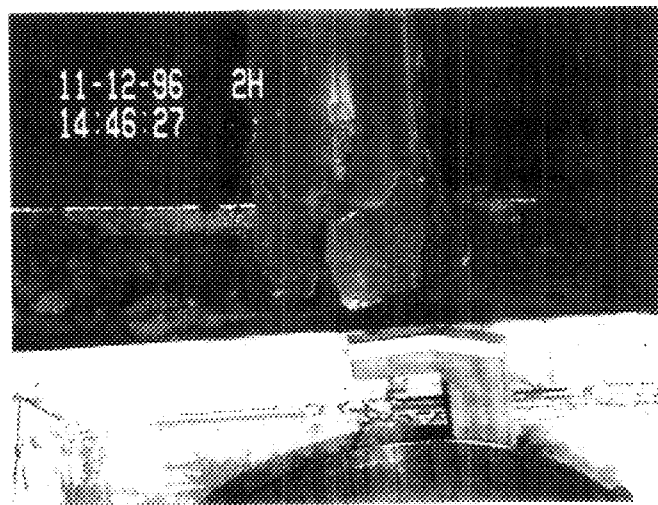
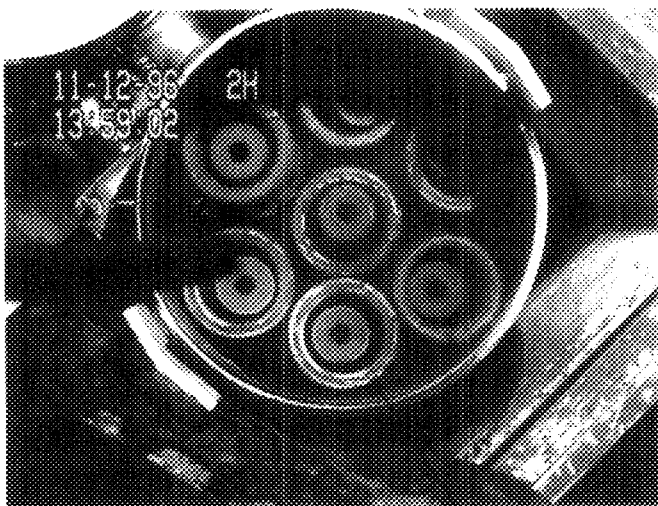
1497 M -- No. 4



5744 M -- No. 6

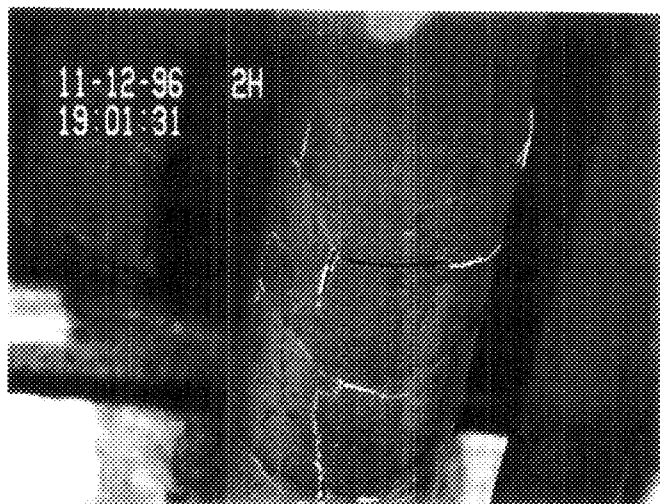
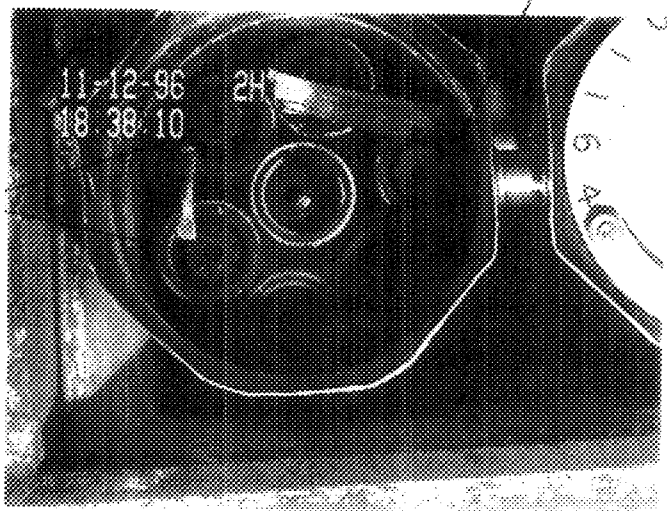


7913 U -- No. 6

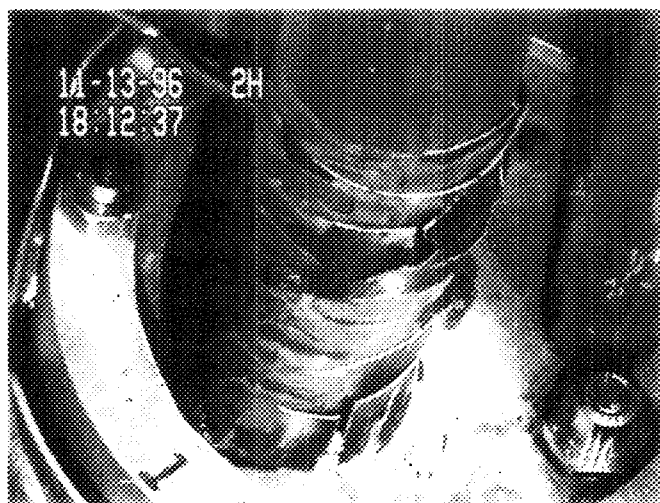
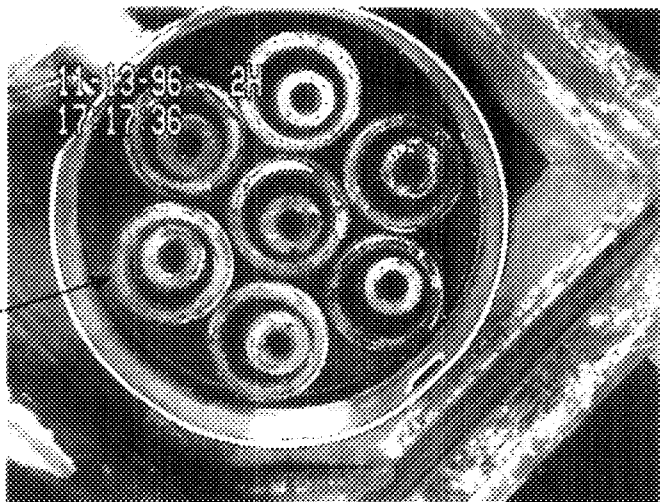


1164 U ~ No. 1

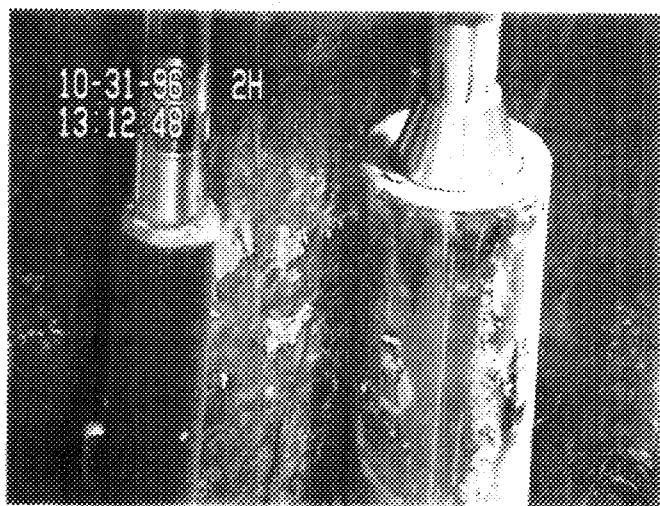
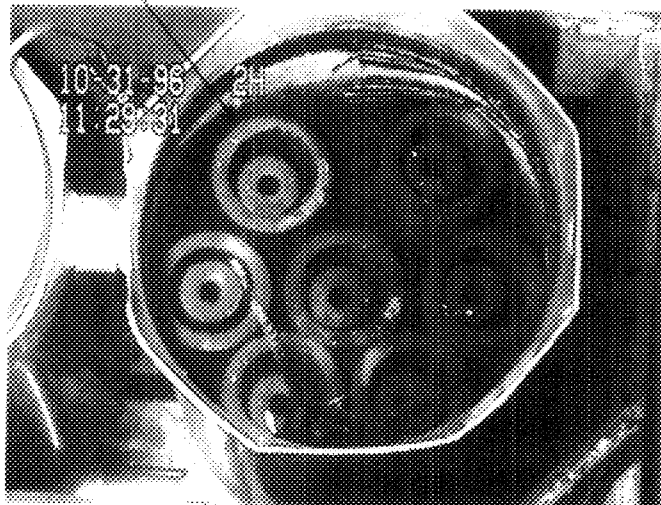
Switched



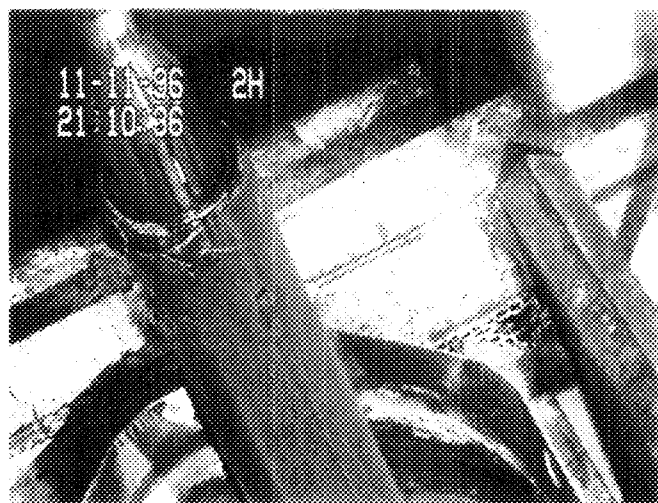
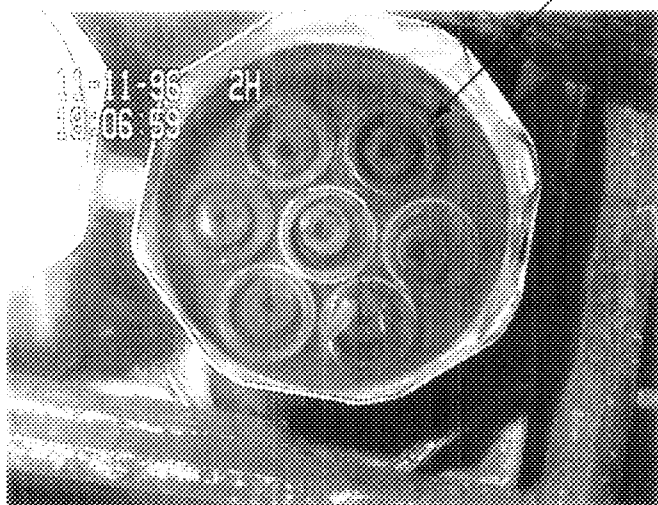
0309 U (1660 U) -- No. 6



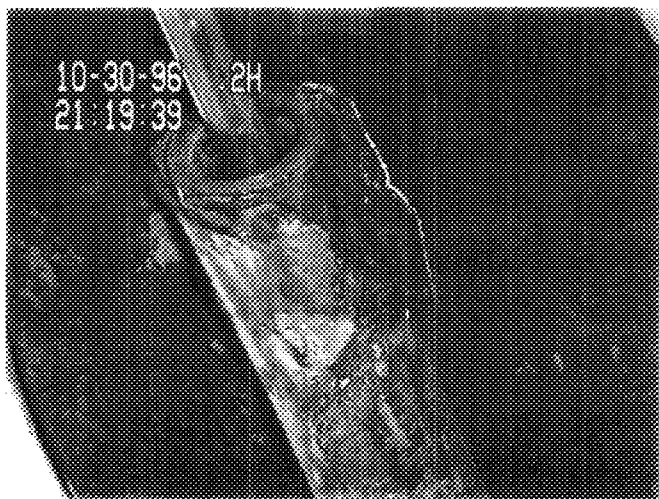
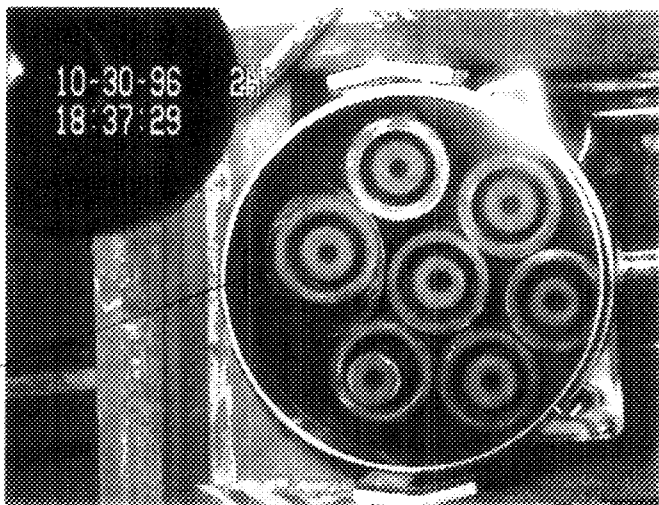
0161 M - No. 2



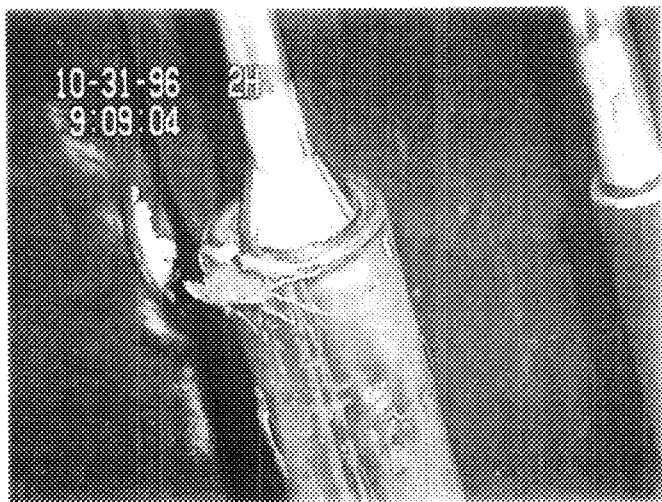
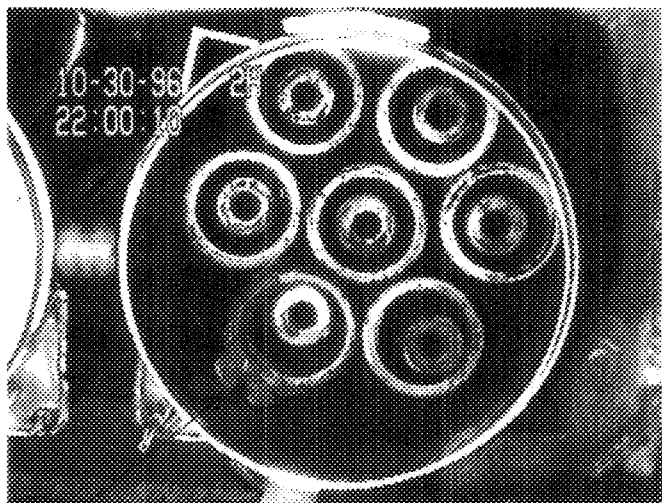
2667 U — No. 3



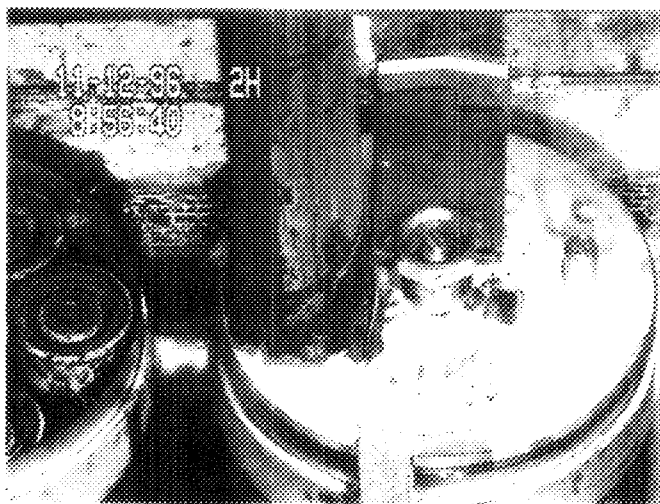
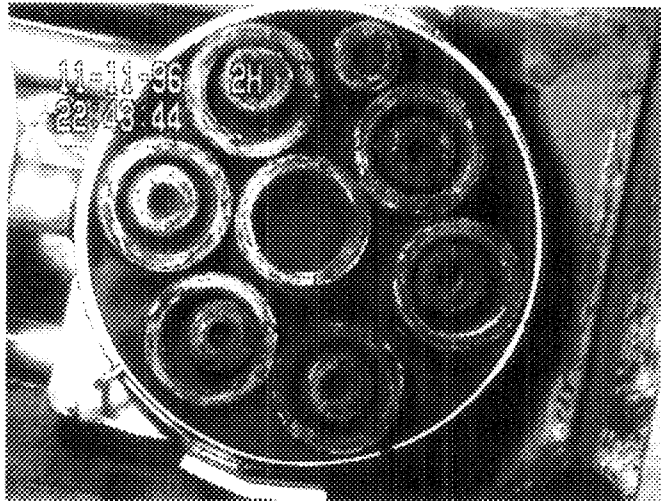
6744 U -- No. 4



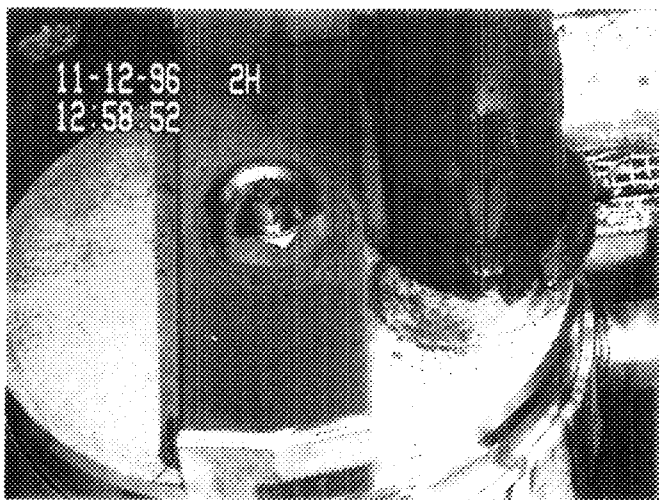
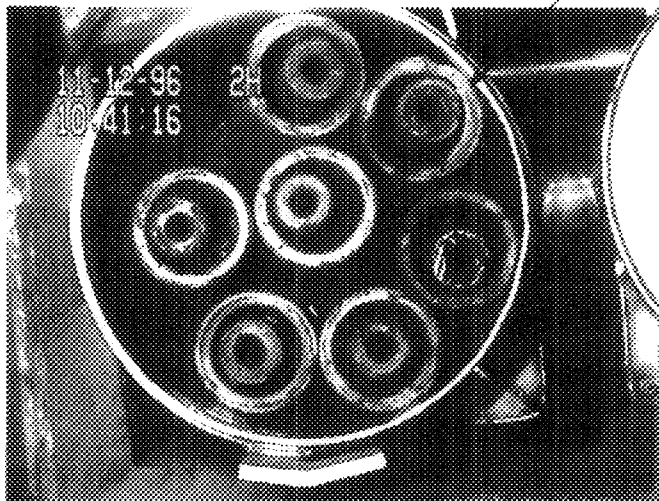
6743 M -- No. 6



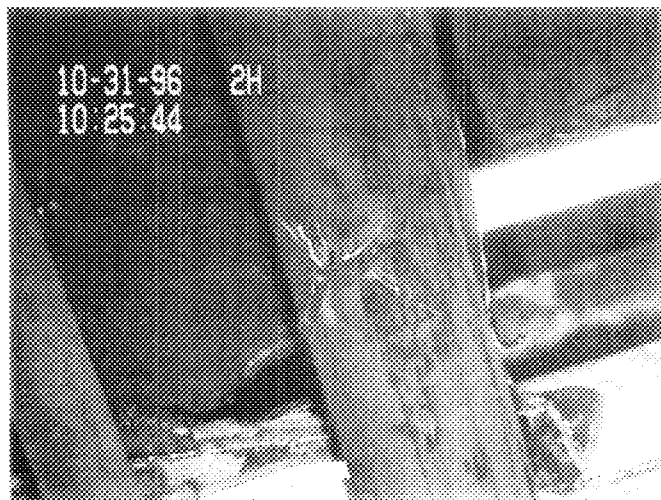
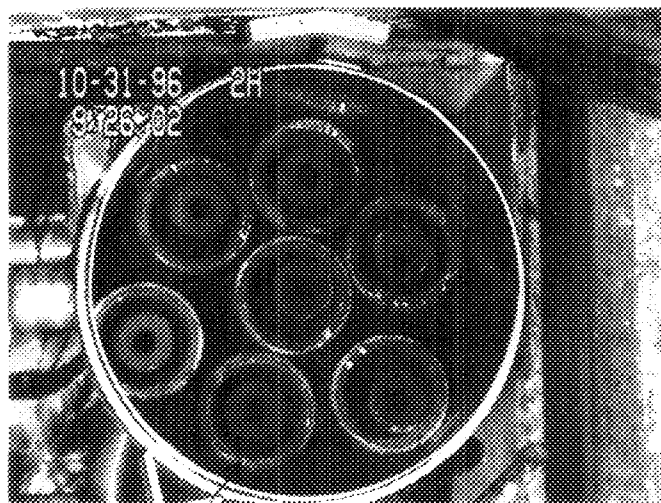
6603 M -- No. 5



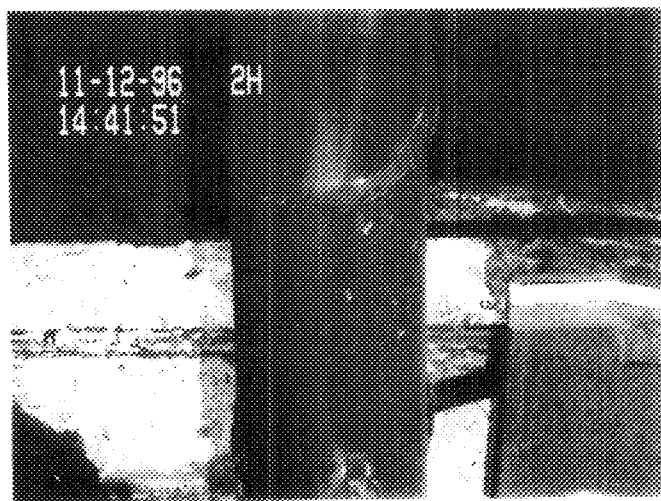
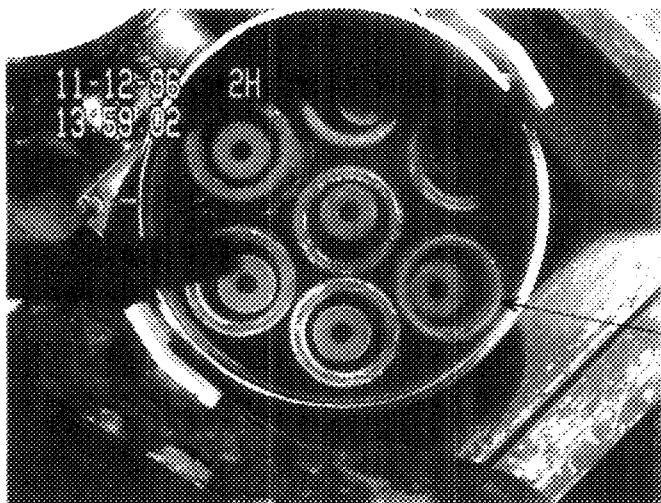
7913 M -- No. 6



6743 U -- No. 6



7913 U -- No. 4



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