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SEP 13 1961

CENTRAL RECORD FILE

INVENTORIED

SEP 14 1965

3428-3

SEP 1 9 1961
File No: P-19 TCG-BTS-1, TCG-NNT-1
T-17916
Completion Date 7-18-61
RS 7321/9795

TO FILE
CARD
FILE No. P-19
SB
Alpha

MR. R. B. FERRELL - W1, LASL

Re: Vibration of Gas Bottle (Nylock Inserts) (SRD)

Object of Test

This test was performed primarily to determine if Nylock inserts in the coupling ring would prevent motion of the ring under severe vibratory conditions.

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Summary of Results

The torque measurement methods were somewhat crude, but the Nylock seemed adequate up to 20G (102-2000-102 cps).

After 25G vibration (115-2000-115 cps) torque measurements were dangerously low. Generally, it was impossible to remove the bulk-head retainer with the wrench provided. It is believed that fretting corrosion of the fixture caused this difficulty.

Scribe and pencil marks made across mating parts of the assembly indicated no apparent motion of these parts relative to each other.

Authorization for Test

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This test was requested by W1, LASL, through Division 7115 in an ETO dated June 28, 1961. Messrs. R. B. Ferrill and M. E. Kenyon (W1,LASL) were the consultants.

Procedure

The gas reservoir and valve assembly were mounted on a flat plate vibration fixture. The center of this fixture was machined out on one side to the thickness of the service bulkhead. A "D" shaped hole simulated that in the weapon mounting.

A Snap-On Torqometer was used in conjunction with the supplied wrenches to torque the bulkhead retainer and coupling rings to 150 ft-lb and 125 ft-lb

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respectively. The assembly was then vibrated along an axis of the reservoir. The tightening and break-away torque of the coupling ring was measured, and attempts were made to measure the same quantities of the bulkhead retainer ring. The assembly was again made, and vibration performed along a second axis perpendicular to the first.

For the purpose of this test, the polar or longitudinal axis of the reservoir was arbitrarily designated as the "X" axis, and an axis normal to this as the "Y" axis. The "Y" axis, as so defined, is indefinite, but was along the same radial line in every instance.

Vibration was performed along each axis in turn from 10-2000-10 cps in one 30 minute sweep. A constant double displacement of 0.036 in. was maintained as the frequency was increased until this displacement resulted in the desired acceleration level. This acceleration level was then maintained to and from 2000 cps.

The accelerations and frequency ranges are listed below:

5G	50-2000-50 cps
10G	73-2000-73 cps
15G	88-2000-88 cps
20G	102-2000-102 cps
25G	115-2000-115 cps

After the 30 minutes of vibration along an axis the assembly was dismantled for inspection. A torqometer was used in combination with the supplied wrenches to check the torque of each ring. Both tightening and breakaway torque were measured insofar as possible.

During vibration at the 5 and 10G levels, the input accelerations along the axis of vibration were monitored along three orthogonal axis by means of accelerometers mounted on the flat plate. Response of the reservoir was monitored by three accelerometers mounted on the reservoir.

__Results__

The torque measurements after vibration at each level along each axis are listed in Table I. It will be noted that the same rings were used during vibration at the 5 and 10G levels. At other levels, a new set of rings was used for each input.

Table II indicates the frequencies of maximum response for the monitored accelerometers. It will be noted that the proper acceleration level was difficult to maintain at the worst frequency because of feed back from the fixture and assembly.

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Mr. R. B. Farrell - W1, LASL - 3 - T-17916
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Not shown in the Tables are such results as loosening of the positioning pins of the reservoir. These were eventually secured by treatment with Glyptal. Also not indicated in the Tables are the indications of rubbing of the bottle in its socket in the valve assembly and the severe fluttering of the lock ring. The rubbing, evidenced by slight marking on the reservoir after 5G vibration along the Y axis was not pronounced nor did it become serious.

Fig. 1 and 2 show the fretting corrosion of the vibration fixture. This corrosion undoubtedly contributed greatly to the difficulty of removal of the bulkhead ring. This is evidenced by the relative ease with which the bulkhead ring was removed after the fixture became impregnated with Moly-kote, at which time the whole assembly rotated in the D shaped hole.

R. G. Hamilton

7321 Project Engineer: R. G. HAMILTON - 7321-5

Approved By: R. S. HOOPER - 7321-5

RGH:mw

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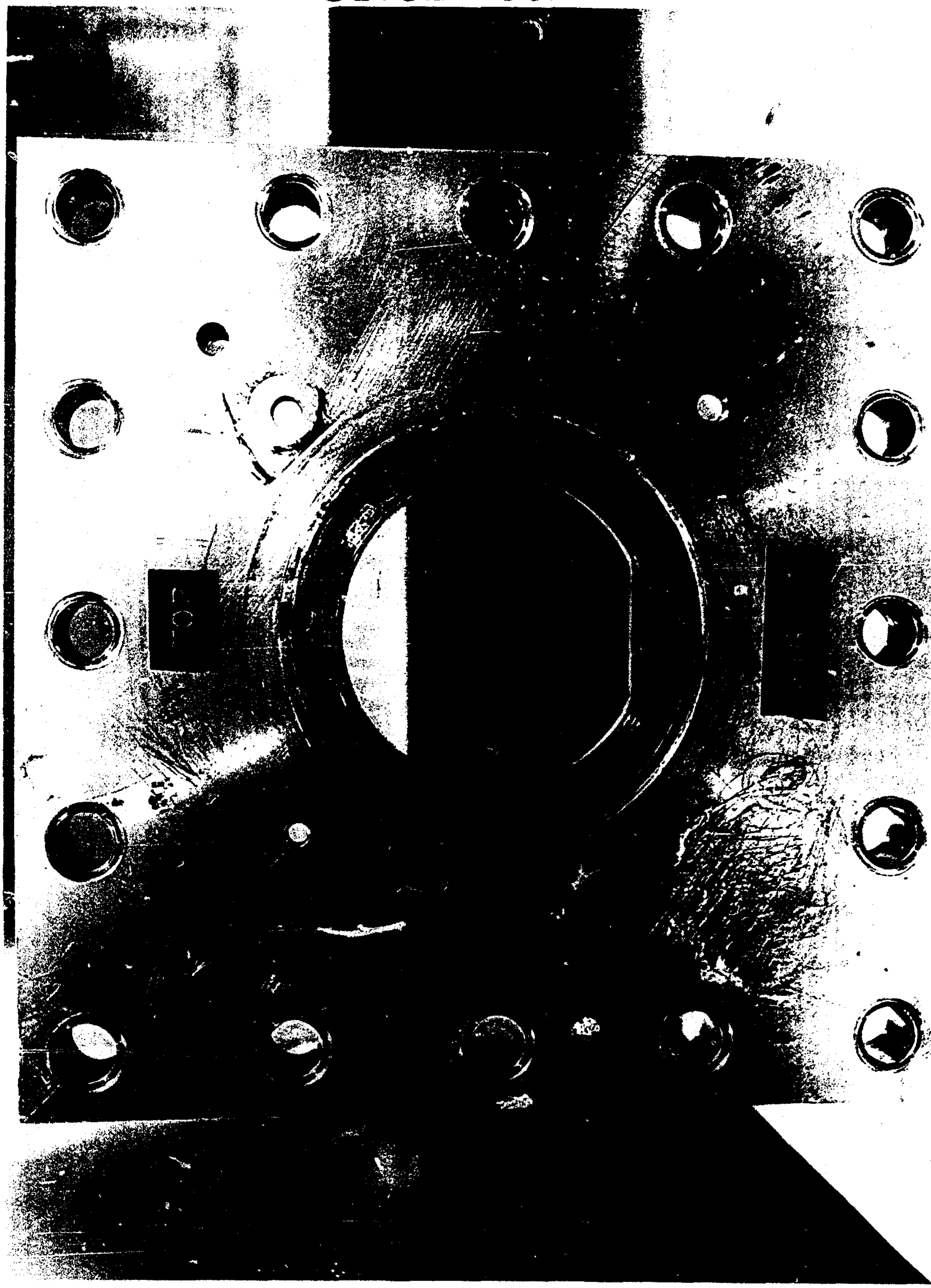

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FIGURE 1 - FRETTING CORROSION OF REVERSE SIDE OF FIXTURE

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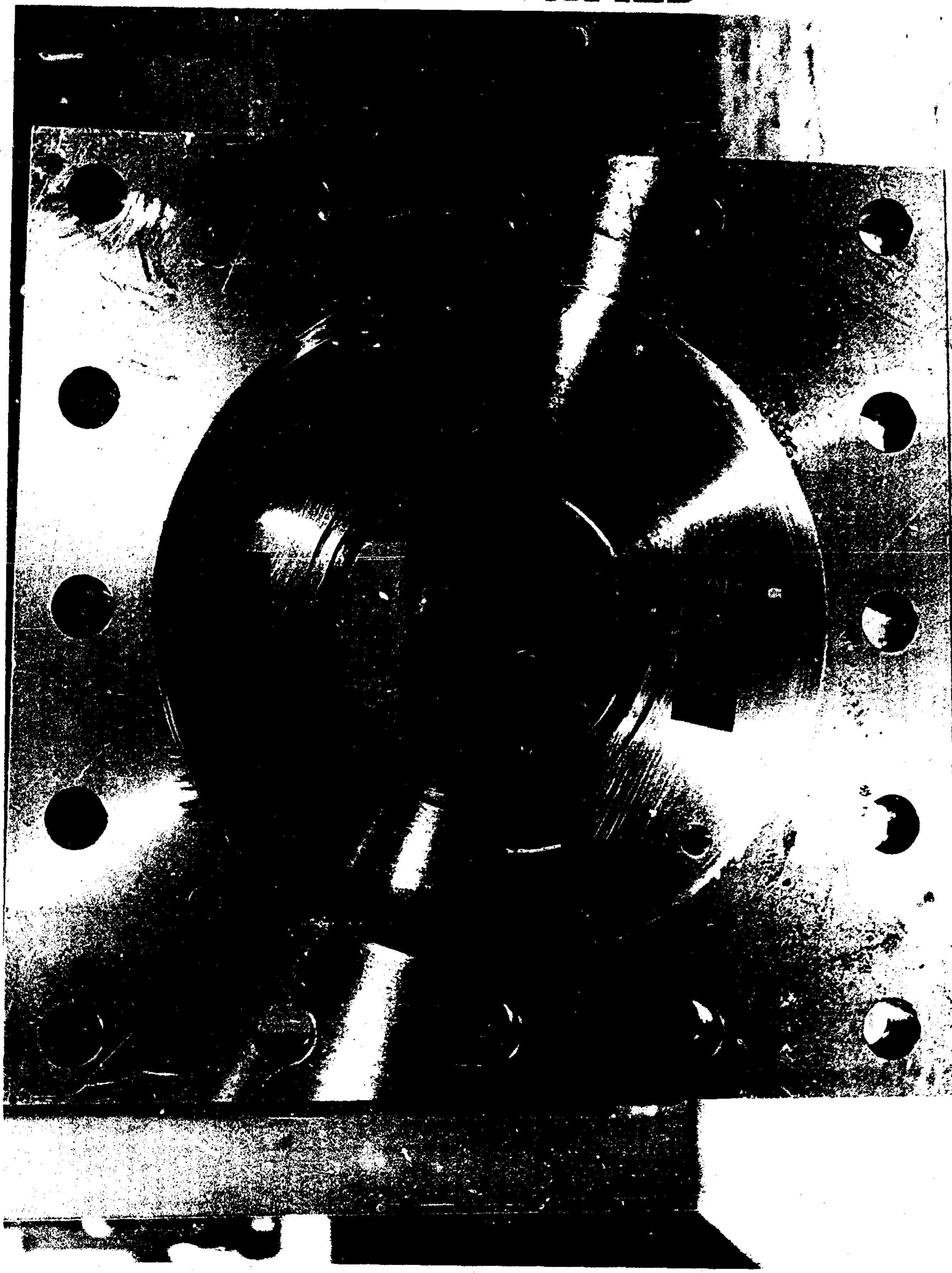

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FIGURE 2 - FRETTING CORROSION OF REVERSE SIDE OF FIXTURE

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TABLE I
TORQUE MEASUREMENTS FOLLOWING VIBRATION

Vib Time (Min.)		Coupling Ring Tighten	Coupling Ring Breakaway		Bulkhead Ring Tighten	Bulkhead Ring Breakaway
40	X	100	60	5G*	225	225
30	X	120	75		225	225
31	Y	140	120	10G*	225	225
32	X	100	80		225	Removed with Pipe Wrench
				15G (Moly-Kote on Thds. Bulkhead Ring)		
30	X	100	60			200
30	Y	120	105			200
				20G		
30	X	130	105		175	Not Removed
30	Y	150	250			Removed with Pipe Wrench
				25G (Excessive Moly-Kote - Migrated to Jig Surface)		
30	X	110	100		150	155
30	Y		20		**60	65

* Same set of rings used for vibration at both of these levels

** Bulkhead ring torqued to 160 ft-lb prior to vibration in this axis

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TABLE II

ACCELEROMETER READINGS (IN G) AT WORST FREQUENCIES

Frequency (cps)	X Input	X Response	Y Input	Y Response	Z Input	ZResponse
			5G Input X-Axis			
539	5.4	195.0	1.6	8.0	2.3	
544	5.2	28.5	1.14	18.0	0.55	
521	5.4	185.0	0.20	0.78	0.32	2.3
			10G Input X-Axis			
425	11.5	150.0	2.2	1.9	1.3	3.4
443	23.0	185.0	3.8	11.0	2.3	3.1
			5G Input Y-Axis			
293	6.8	44.0	5.0	53.0	1.35	16.8
			10G Input			
294	11.5	88.0	10.2	78.0	2.3	27.0
280	13.3	82.0	10.6	54.0	1.75	14.8
295	11.5	88.0	10.2	78.0	2.3	27.0

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