QUARTERLY REPORT

ON

RECONSTITUTED MICA

PAPER FOR CAPACITORS

Date of the Report 30 June 1960

FINAL REPORT

PERIOD: 1 April 1960 Through 30 June 1960

CONTRACT NO.: DA-36-039-SC-75959

ORDER NO.: 56395-PHILA-57-81

Industrial Mobilization Activity
United States Army Signal Supply Agency
Philadelphia, Pennsylvania.

Micamold

MICAMOLD ELECTRONICS MFG. CORP.

65 Gouverneur Street, Newark, New Jersey

Reconstituted Mica Paper

For Capacitors

Final Report

(Period: 1 April 1960 Through 30 June 1960)

Date of the Report: 30 June 1960

Object: To evaluate the Mechanical and Electrical characteristics of reconstituted mica paper and to determine the feasibility of employing it as a capacitor dielectric.

Signal Corps Contract Number: DA-36-039-SC-75959
Order Number: 56395-Phila-57-81

Approved by:

W. E. Rieman
Chief Engineer

Prepared by:

J. Bowser
Project Engineer

Micamold Electronics Manufacturing Corporation

TABLE OF CONTENTS

Abstract	Page 1
Purpose	Page 1
Discussion	Page 2
Compressibility of Reconstituted Natural Mica Paper, "Isomica" Type CI	Page 2
CM 30 3300 MMF	Page 3
CM 70 100 MMF	Page 6
CM 80 100 MMF	Page 20
CM 80 2000 MMF	Page 24
Conclusion	Page 28
Recommendation and Future Work	Page 28
Personnel	Page 30

Abstract:

Evaluation was made on reconstituted natural mica paper made by the following manufacturers:

1. Mica Insulator and Samica Corporation, Division and a subsidiary, respectively, of Minnesota Mining and Manufacturing Co.

0.0015 and 0.002 inch thick capacitor Isomica "type CI" was used to determine the feasibility of employing this material as a capacitor dielectric. In quarterly reports 1 through 11, inclusive, these materials were coded as manufacturer "C".

2. S-1253 Mica Mat insulation was supplied by the General Electric Company on a developmental basis and future commercial availability will depend on the degree of interest in and the applicability of this material. In quarterly reports 1 through 11, inclusive, this material was coded as manufacturer "E".

3. Farnum Manufacturing Co's. "Farnumica", coded in reports 1 through 11, inclusive as manufacturer "B".

4. Mica Coated Products Co. impregnated mica paper coded in reports 1 through 11, inclusive as manufacturer "G".

Pilot run quanities were made only with "Isomica" type CI reconstituted natural mica paper.

Purpose:

a. To evaluate the mechanical and electrical characteristics of reconstituted mica paper and to determine the feasibility

of employing it as a capacitor dielectric.

b. To prepare preproduction samples of reconstituted natural mica paper capacitors for qualification tests in accordance with Military specification Mil-C-5A covering mica dielectric capacitors.

c. To establish pilot facilities for the production of capacitors employing reconstituted natural mica as a dielectric.

Discussion:

The contract requires the production and test of a limited run of the following capacitors, per Mil-C-5A.

1. Capacitor	Type	CM-30-C	332 K	3300 MMF
2. Capacitor	Type	CM-70-C	101 J	100 MMF
3. Capacitor	Type	CM-80-C	101 J	100 MMF
4. Capacitor	Type	CM-80-C	202 J	2000 MMF

Compressibility:

"Isomica" type CI reconstituted natural mica paper versus natural Indian Ruby Muscovite mica.

1. There is no apparent change in thickness of natural mica under the heat compression cycle (described below).
2. "Isomica" type CI reconstituted natural mica paper, when subjected to a pressure of 1000 lbs. per square inch of active area and cured under pressure, for

seven hours at 570°F will appreciably decrease in thickness. After considerable experimentation, as shown in previous quarterly reports, it was found that a pressure of 1000 pounds per square inch (of active area) at temperature of 570°F for a period of seven hours yielded best results.

CM 30 3300MMF:

Sequence of operations

1. Slice "Isomica" in strips (2 9/32" x 12").
2. Punch "Isomica" to size (19/32 x 1 25/32, three gang).
3. Stack 12 pieces of reconstituted natural mica and 13 pieces of aluminum foil.
4. Compress three ganged section in pressing clamp.
5. Pre-heat for a period of 16 hours at 85°C.
6. Remove Mylar tape and natural backing mica.
7. Slice three ganged sections into individual sections (19/32 : 19/32).
8. Place individual sections between two flat metal plates, heat to a temperature of 570°F and apply pressure of 1000 pounds per square inch of active area (of one plate) per section for a period of seven hours.
9. Turn up aluminum foil.
10. Test individual sections for breakdown at 1500 VDC, capacitance and insulation resistance.
11. Match individual sections back to back.

12. Wrap lead tin foil around aluminum foil and clamp lead wire onto section.

13. Dry sections at (85°C for 16 hours).

14. Take capacity, power factor, insulation resistance and Q.

15. Mold in green alkyd.

16. Color code capacitors per Mil-C-5 character C.

17. Vacuum wax capacitors.

18. Check for breakdown at 1500 VDC, capacitance, insulation resistance and Q.

19. Test for qualification approval.

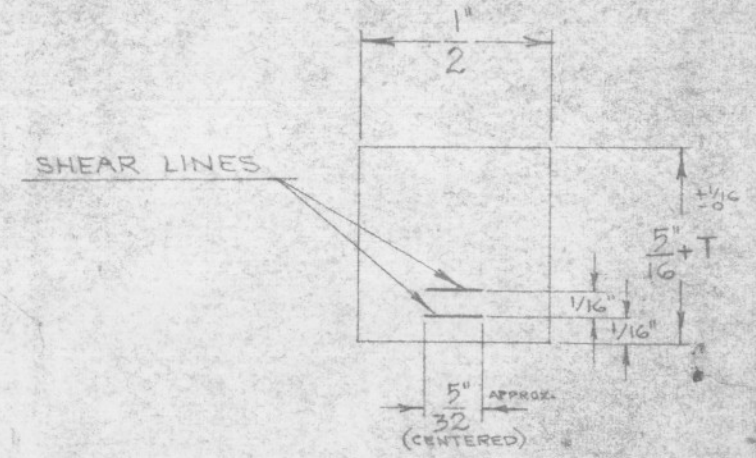
SEE NINTH QUARTERLY REPORT FOR QUALIFICATION TEST RESULTS

Materials required for the manufacture of CM 30 3300uufd using "Isomica" type CI reconstituted mica paper as the dielectric.

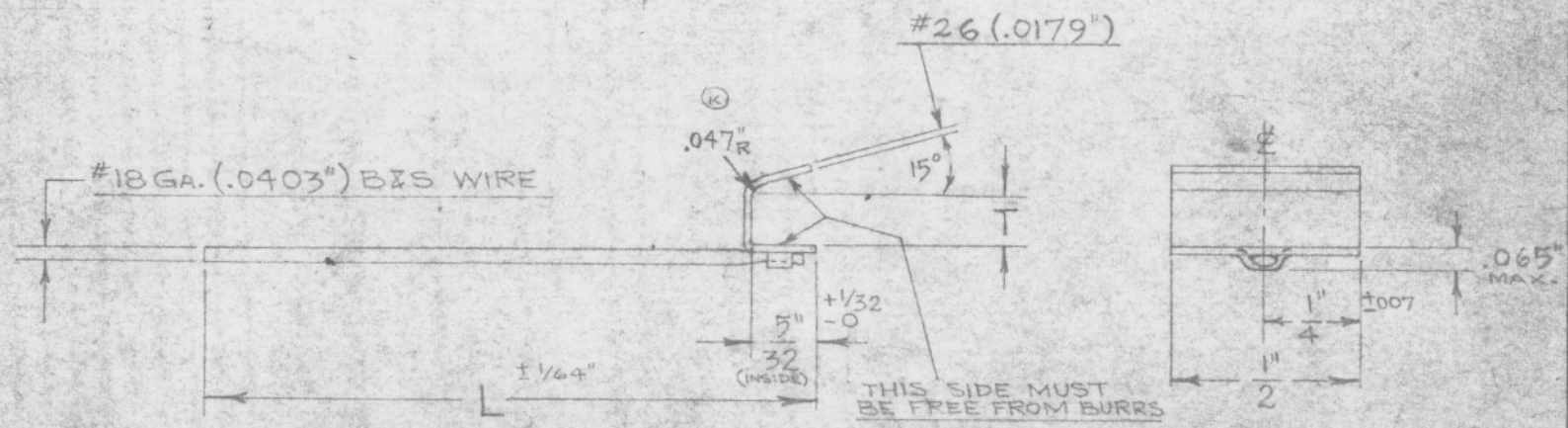
Material Description	Amount req. per 1000 condensers	Pieces req. per 1000 condensers
Reconstituted mica (.0015 x 2 9/32 x 12)	1.4 pounds	1000
Mylar tape (3/8" x 4 1/2")	375 feet	
Aluminum foil (.0005 x 2 9/32" x 1 25/32)	10.2 ounces	8,666
Lead tin foil (1/2" wide x .0005)	.5 ounces	
Wire Leads Pt. #5200-2		2,000
Green Alkyd #422 Plaskon Mfg.	12 pounds	

5200 DRAWING NO.	**CAUTION** - DO NOT SCALE DRAWING WORK TO DIMENSIONS	THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO		

PT. NO.		L	T	REMARKS
1		1 11/16"	.100"	WAS JUST 5200
2		1 11/16"	.062±010	
3		1 11/16"	.150"	
4		1 11/16"	.180"	



NOTE:
1. LUG AND WIRE MUST BE NEUTRALIZED FROM ACIDITY AND ALKALINITY.
(K) 2. MUST BE CAPABLE OF MEETING SOLDERABILITY REQUIREMENTS OF MICAMOLD SPECIFICATION NO. PS 1037



ISSUE	ALTERATION	ISSUE	ALTERATION
G	REDRAWN AND REDESIGNED ADDED PTS. 1 TO 4. SEE CN-1102 10-14-47	M.	ADDITIONS - 7-26-55
H	.058" MAX. DIM. WAS .050 +.000 -.005 PER SUP. REQ., SEE LETTER OF 4-13-48 IN FILES OF PURCH. DEPT. 4-16-48	N	-2 "T" LUGS ADD 11-1-55
I	ADDED TINNING CONTENT 11-26-48		
J	.065" MAX WAS .058" MAX. TO CONFORM WITH NEW SUPPLIER'S STANDARD. 11-17-49		
K	ADDED .047" R 3-9-50		
L	CHANGED "L" FROM 1 7/8" TO 1 11/32" 9-9-54		

5
6
10
1
LAB

MATERIAL AND TEMPER		
LUG: DEAD SOFT COPPER		
WIRE: (M) DEAD SOFT BRASS		
(SEE NOTE 2) (M)		
FINISH HOT TINNED		
DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)		
FRACTIONAL	DECIMALS	HOLES
± .010"	± .002"	±

MICAMOLD RADIO CORPORATION
BROOKLYN, NEW YORK

TYPE "W" LUG
FOR TYPES CM-30 & CM-45

SUPERSEDES ISSUE "F"			DATE 1-11-35
DRAWN	CHECKED	APPROVED	
SCALE			5200 DRAWING NO.

FORM 3L

— SEE REVERSE —

CM 70 100MMF

Sequence of operation

1. Slice strips to (3/4" x 1/2") (reconstituted natural mica).

2. Cut aluminum foil (1/4" width) into length of 14" for left side and 14 1/2" for right side.

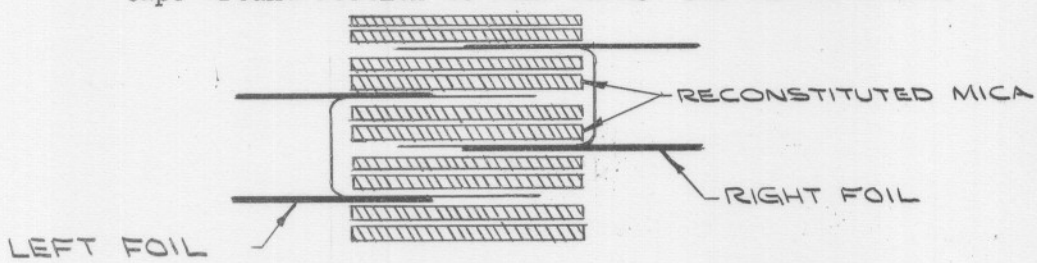
3. Slice copper foil into strips (3/4" x 6").

4. Slice strips into tabs (3/4" x 1/2").

5. Remove burrs from edge of copper tabs by using steel wool.

6. Spot weld aluminum foil onto copper tab (extend aluminum foil 3/8" over copper tabs).

7. Stack sections (20 active plates, 2 pieces of .002 reconstituted natural mica per plate) use four pieces for backing, two on each end of section. Place Mylar tape around section to hold firm. See sketch below.



8. Pre-heat sections in pressing clamp for (16 hours 85°C).

9. Remove Mylar tape.

10. Place sections into pressure jigs.

11. Press sections, make sure to maintain constant pressure especially during the first forty minutes, and the last forty minutes of the pressing cycle, (temperature is pre-set at 570°F).

12. Remove sections from pressure jigs.

13. The oxidation is removed from the copper tabs.

14. Copper tabs are then solder dipped using 25% resin and 75% alcohol flux.

15. Capacity, insulation resistance, power FACTOR, Q and breakdown voltage are taken and data recorded of each section.

16. Those sections passing the tests listed in #15 are matched for capcity and ten sections are soldered in series (using insulation between sections) and tinned copper tabs are soldered to the first and last sections.

17. The ten soldered cured sections are placed within a brass clamp and a screw (3032-19) is tightened so as to hold the sections under pressure.

18. Solder the tinned copper tabs to the terminal screws.

19. The unit is dried at (85°C for 16 hours).

20. The unit is then immersed into liquid wax, removed, allowed to dry at room temperature and redipped as many times as it takes to acquire a heavy coating of wax.

21. The unit is placed into a CM 70 case.

22. The units are then encapsulated with a high temperature wax compound.

23. Check for capacitance, insulation resistance, Q and voltage breakdown.

24. Marking per Mil-C-5 character C.

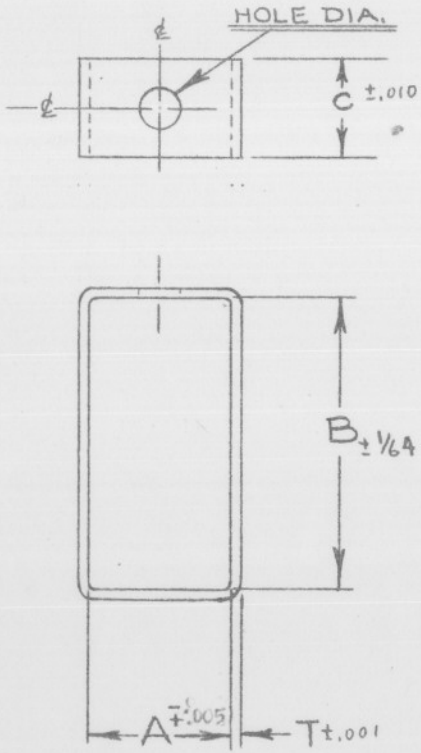
25. Test for qualification approval.

SEE TENTH QUARTERLY REPORT FOR QUALIFICATION TEST RESULTS

Materials required for the manufacture of CM 70 100MMF using reconstituted mica paper as a dielectric.

Material Description	Amount Req. Per 1000 Condensers	Pieces Req. Per 1000 Condensers
Reconstituted Mica (.002 x 1/2" x 3/4")	31 pounds	440,000
Aluminum Foil (.0005 x 1/4" x 14 1/2")	7 ounces	2,000
Copper Foil (.002 x 3/4" x 1/4")	6.8 pounds	40,000
Lamicoid (.01 x 15/16" x 1/2")	297 feet	7,000
Lamicoid (.01 x 1 1/16" x 3/4")	380 feet	6,000
Lamicoid (.01 x 1 1/8 x 1/2)	87 feet	2,000
10-32 Square Head Screw #3032-19	10.5 pounds	1,000
Brass Clamp #3908-1	43.5 pounds	1,000
Brass Plate #3909-3	13.5 pounds	1,000
Copper Terminal (.005 x 1/4 x 2 1/2) #3107	2 pounds	2,000
Micamold CM 70 Case #5008	125 pounds	1,000
Brass Eyelet #3015-35	6.9 ounces	4,000
10-32 Brass Nut #3026-17	13.5 pounds	4,000
Washer #3223-34	8.5 pounds	6,000
Lock Washers #3027	13 ounces	2,000
Bakelite Varnish #3016-53	vary	
Neoprene Washers #4302-6	8 ounces	2,000
Wax Filled	50 pounds	

3908- DRAWING NO.	CAUTION - DO NOT SCALE DRAWING WORK TO DIMENSIONS	THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO		



PT. NO.		A	B	C	HOLE DIA.	T		PURCHASE PER NOTE	NO. PCS. PER FT.	#/M	USED ON	
1		.750"	1 1/2"	1/2"	.205"	.040"		1	24	33	3936 FIG 1	

PARTS MADE BY MICAMOLD

NOTE:- 1- PURCHASE AS 1½" O.D., .040" WALL, HALF HARD BRASS, ROUND SEAMLESS TUBING, IN 12 TO 16 FT. LENGTHS UNLESS IT CAN BE OBTAINED IN RECTANGULAR TUBING, AS PER DIMENSIONS ON DRAWING.

ISSUE	ALTERATION	ISSUE	ALTERATION
D	REDESIGNED CLAMP FRAME 3-16-43		
E	"A" WAS .760" 4-19-51		

MATERIAL AND TEMPER

FINISH

DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)

FRACTIONAL	DECIMALS	HOLES
±	±	± .002

MICAMOLD RADIO CORPORATION
BROOKLYN, NEW YORK

INTREGAL CLAMP FRAMES
FOR TRANSM. MICA, HIGH STABILITY)
(SEE 3936 FIG. 1, FOR ASSEMBLY)

SUPERSEDES 3908 ISSUE C — DATE 10-19-20

DRAWN L.R. — CHECKED — APPROVED

SCALE

3908- DRAWING NO.

2
10
INSP

FORM

— SEE REVERSE —

3909- DRAWING NO.	CAUTION - DO NOT SCALE DRAWING WORK TO DIMENSIONS	THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO	

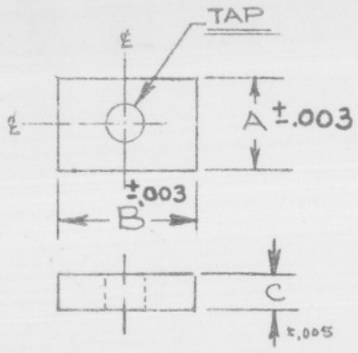


FIG. 1

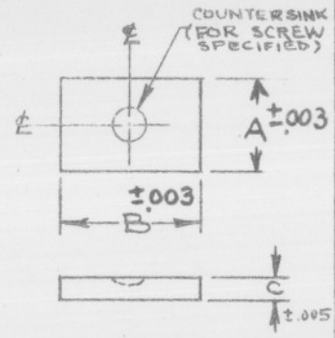


FIG. 3

PT. NO.	FIG.	A	B	C		TAP	MAKE C'T'SINK FOR	PIECES PER FT.	#/M	PURCHASE AS NOTE	USED ON
1	1	1/2"	11/16"	1/8"		10-32	—	16	19.7	1	3936 PKG
2	2	1/2"	11/16"	1/8"		—	—	16	19.7	1	3936 PKG
3	3	1/2"	11/16"	1/8"		—	10-32	16	19.7	1	3936 PKG

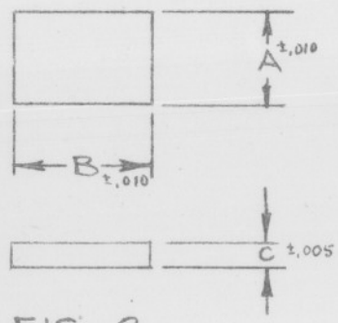


FIG. 2

PARTS MADE BY MICAMOLD.

NOTE: 1 - PURCHASE AS 1/2 HARD BRASS STRIPS. 1/8" x 11/16" IN 8' TO 12' LENGTHS.

ISSUE	ALTERATION	ISSUE	ALTERATION
A	REVISED BILL OF MAT. TABLE ADDED NOTES 1-2 1-19-43		
C	RE-DESIGNED FIG. 1 AND FIG 2 ADDED NOTE 3, REVISED NOTE 1, -2 "C" WAS 3/16" 3-16-45		
D	WAS PURCHASED IN 1/8 x 3/4" STOCK 3-18-43		
E	WAS PURCHASED IN 1/8 x 1/2 STOCK. 11-17-44		
F	-1 TO -3 "B" WAS 3/4" 4-18-51		

1
2
10

MATERIAL AND TEMPER

FINISH

DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)

FRACTIONAL	DECIMALS	HOLES
±	±	±.002

MICAMOLD RADIO CORPORATION
BROOKLYN, NEW YORK

END AND PRESSURE PLATES (FOR HIGH STAB. TRANS) (SEE ASSEMBLY 3936)

SUPERSEDES | DATE 10-19-42

DRAWN L.B. | CHECKED | APPROVED

SCALE

3909-
DRAWING NO.

— SEE REVERSE —

3107
DRAWING NO.

CAUTION - DO NOT SCALE DRAWING
WORK TO DIMENSIONS

THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO

PT. NO.	W	T	MATERIAL	APPROX. SPOOL SIZE	LBS. PER SQ. INCH	REMARKS
1	1/8"	.0025"	DEAD SOFT	6" O.D.-15 oz.	.00080	
2	1/4"	.0025"	—	6" O.D.-30 oz.	.00080	
3	3/8"	.0025"	—	6" O.D.-45 oz.	.00080	
4	1/2"	.0025"	DEAD SOFT	6" O.D.-60 oz.	.00080	
5	1/4"	.025	SOFT	13" O.D.-6.5#	.0080	
6	1/4"	.0015"	DEAD SOFT		.000555	
7	1/2"	.002"	—		.000625	
8	1"	.002"			.000625	
9	5/8"	.0015"			.000555	
10	1/4"	.005"	—		.00160	
11	3/4"	.002"	DEAD SOFT		.000625	
12	1/2"	.007"	HARD		.002222	
13	5/8"	.007"			.002222	
14	3/8"	.005"	DEAD SOFT		.00160	
15	5/8"	.005"	—		.00160	
16	3/4"	.005"			.00160	
17	7/8"	.005"			.00160	
18	3/16"	.0025"		6" O.D. 23 oz.	.0008	
19	1 1/4"	.001"				
20	1/2"	.0015"			.000555	
21	1/8"	.0015"			.000555	
22	1/4"	.020"			.0064	
23	3/4"	.0015"			.000555	
24	3/16"	.0015"			.000555	
25	1/16"	.0015"			.000555	
26	3/32"	.0015"			.000555	
27	5/32"	.002"			.000625	
28	3/16"	.002"			.000625	
29	1/8"	.005"	—		.00160	BARE-GRAIN MUST RUN LENGTHWISE.

ISSUE	ALTERATION	ISSUE	ALTERATION
AA	REDRAWN SO AS TO BE MORE LEGIBLE 6-6-60		

1-7-8 10(2) INSP LAB.

MATERIAL AND TEMPER: TINNED COPPER (EXCEPT WHERE NOTED IN "REMARKS" COLUMN)

FINISH

DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)

FRACTIONAL	DECIMALS	HOLES
± .010"	± .0003"	±

MICAMOLD ELECTRONICS MFG. CORP.
BROOKLYN, NEW YORK

COPPER FOIL

SUPERSEDES ISSUE Z

DATE 11-18-35

DRAWN	CHECKED	APPROVED
P.G.		

SCALE

3107
DRAWING NO.

FORM 3L

— SEE REVERSE —

Eugene Dietzgen Co., Inc., New York, N. Y. No. 167 Bristol Tracing Cloth

3026 SH 1 DRAWING NO.	**CAUTION** - DO NOT SCALE DRAWING WORK TO DIMENSIONS	THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO		

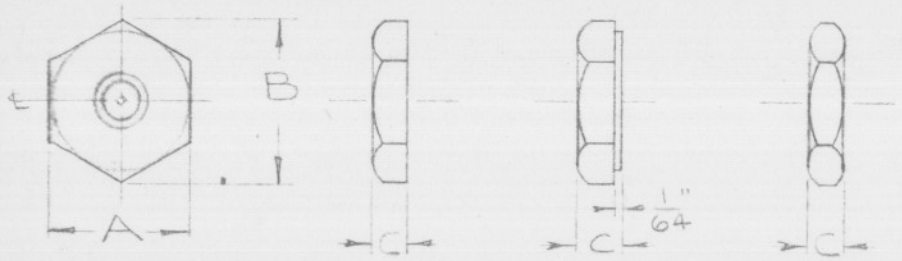


FIG. 1 FIG. 2 FIG. 3

* AN 341-6

NOTES:
1- ALL THREADS SHALL BE IN ACCORDANCE WITH A.S.A. STANDARD.
2- MAKE THREADS AT MAXIMUM PITCH DIAMETER (TO ALLOW FOR FINISH).
3- TO BE CADMIUM COATED AND IRIDITE AS PER SPEC 72 55 TABLE 2. CERTIFICATE OF COMPLIANCE MUST ACCOMPANY EACH SHIPMENT.
4- FINISH COPPER FLASH UNDERCOAT .0001" MIN. ELECTRO TIN FINISH .0005" MIN.
5- PURCHASE SPECIFICATION PS 1038 APPLIES TO THESE ITEMS. (ALL)
6- MAY SUBSTITUTE 1/4" FOR C DIM.

PT. NO.	FIG	A	B	C		THREAD	MAT.	FINISH
1	1	3/8	7/16	1/8		10-24 NC-2	STEEL	CAD. PL.
2	2	13/16	1 1/16	13/64		3/4-16 NF-2	"	" "
3	2	1 1/8	1 5/16	13/64		7/8-9 NC-2	"	" "
4	1	1/4	9/32	3/32		4-36 NS-2	"	" "
5	3	1/4	9/32	3/32		4 40 NC-2	"	" "
6	2	3/4	7/8	13/64		5/8-18 NF-2	"	" "
7	2	1 1/8	1 5/16	13/64		7/8-16 NS-2	"	" "
8	1	5/16	11/32	7/64		6-32 NC-2	"	" "
9	1	11/32	3/8	1/8		8-32 NC-2	"	" "
10	1	SAME AS - 4					"	" "
11	1	1/4	9/32	3/32		4-40 NC-2	"	" "
12	1	1/4	9/32	3/32		4-40 NC-2	BRASS	SEE NOTE 4
13	1	7/16	31/64	5/32		1/4-20 NC 2	"	" "
14	3	5/16	23/64	3/32		10-32 NF-2	"	" "
15	3	3/8	7/16	1/8		10-32 NF-2	"	" "
16	3	1/2		1/8		14-24 NF 2	"	" "
17	1	3/8	7/16	1/8		10-32 NF-2	"	NI PL.
18	1	5/16	23/64	7/64		6-32 NC-2	STEEL	CD PL. ELECTRO TIN
19	1	SAME AS - 9					"	CAD. PL.
20	1	7/16	31/64	3/16		1/4-20 NC-2	BRASS	SEE NOTE 4
21		DO NOT USE						

PT NO	FIG	A	B	C		THREAD	MAT	FINISH
22	3	5/16	23/64	7/64		10-32 NF-2	STEEL	CAD. PL.
23	3	7/16	31/64	1/8		5/16-24 NF-2	BRASS	SEE NOTE 4
24	3	5/16	23/64	7/64		8-32 NC-2	"	" " "
25	1	1"		13/64		7/8-16 NS 2	ALUMIN	
26	3	5/16	23/64	7/64	*	6-32 NC-2	BRASS	SEE NOTE 4
27	3	7/16	31/64	5/32		12-24 NC-2	"	" " "
28	1	1"	1 9/64	7/32		3/4-16 NF-2	"	" " "
29	1	5/8	47/64	5/16		3/8-16 NC-2	"	" " "
30	2	15/16	1 1/16	13/64		3/4-16 NF-2	"	" " "
31	1	11/32	3/8	1/8		8-32 NC-2	"	" " "
32	3	5/16	11/32	7/64		6-32 NC-2	"	" " "
33	3	11/16	51/64	1/8		1/2-28	ALUMIN	
34	2	3/4		5/16		1/2-20 NF-2	BRASS	SEE NOTE 4
35	2	15/16	1 1/16	13/64		3/4-16 NC-2	ALUMIN	
36	1	1"		13/64		7/8-16 NS-2	STEEL	SEE NOTE 3
37	1	5/8	47/64	5/16		3/8-16 UNC-2A	BRASS	SEE NOTES 4 & 6
38	3	7/8	1	1/8		5/8-24 NC-2	"	SEE NOTE 4
39	2	7/8	1"	7/64		3/4-20 NEF	"	" "
40						AN 316C4R		
41	3	5/16		3/32		1/4-28 NF-2	BRASS	NICKEL PLATE
42	3	13/16		1/8		1/2-20 UNF 2A	"	SEE NOTE 4

ISSUE	ALTERATION	ISSUE	ALTERATION
BG	REDRAWN SO AS TO BE MORE LEGIBLE 7-7-52		

T(3) 1 8 10(4) LAB INSP. NO(D)

MATERIAL AND TEMPER

FINISH

DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)

FRACTIONAL	DECIMALS	HOLES
± .005	± .003	±

MICAMOLD ELECTRONICS MFG. CORP.
~~BROOKLYN, NEW YORK~~ NEWARK, N.J.

MACHINE SCREW NUTS

SUPERSEDES ISSUE BF			DATE 5-27-41
DRAWN P.G.	CHECKED	APPROVED	3026 SH 1
SCALE N.T.S.			DRAWING NO.

FORM 3L — SEE REVERSE —

Eugene Dietzgen Co., Inc., New York, N. Y. No 107 Bristol Tracing Paper

3027 Sh 4

DRAWING NO.

CAUTION - DO NOT SCALE DRAWING

WORK TO DIMENSIONS

THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO

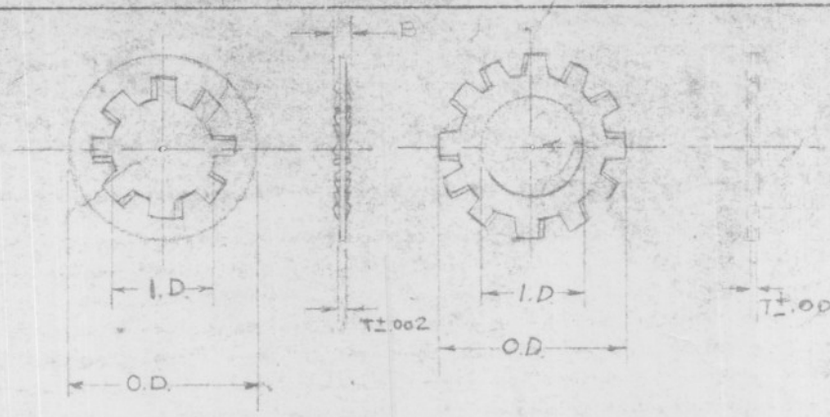


FIG 1 FIG 2

PT NO	FIG	NOM SIZE	I.D	O.D.	B	T	MATERIAL	FINISH	EQUIVAL.
1	1	#10	.200	13/32	3/64	.025	STEEL	CD. PL.	SHAKEPROOF 1210-
2	1	7/8	.870	1 3/8	.072	.025 .032	"	HOT-TINNED	SHAKEPROOF 1234-
3	2	3/4	.781	1 1/4	.088	.040	"	OXIDIZED	SHAKEPROOF 1132-2
4	2	#4	.116	9/32	.038	.018	"	"	SHAKEPROOF 1104
5	1	#4	.116	1/4	.030	.014	"	"	SHAKEPROOF 1204
6	1	5/8		1 1/16		.045	"	CD PL	SHAKEPROOF 1229
7	1	1/4		1/2		.024	"	OXIDIZED	SHAKEPROOF 1214
8	1	#4	.116	1/4	.036	.014	PHOS. BRZ		SHAKEPROOF 1904
9	1	3/4	.785	1 1/4	.077	.025	STEEL	OXIDIZED	SHAKEPROOF 1232-2
10	1	#8		21/64		.018	"	CAD. PL.	SHAKEPROOF 1208
11	1	1/4		15/32		.025	PHOS. BRZ	CAD. PL.	SHAKEPROOF 1914-00
12	1	#10	.200	3/8	3/64	.022	PHOS. BRZ	HOT-TINNED	SHAKEPROOF 1910
13	1	#6	.145	9/32		.018	STEEL	OXIDIZED	SHAKEPROOF 1206
14	1	3/4	.785	1 1/4	.077	.025	STEEL	CD PL.	
15	1	#10	.320"	7/16"		.022	PHOS. BRZ	CD. PL.	SHAKEPROOF 1918-02
16	1	1/4		1/2"		.024	STEEL	CD. PL.	SHAKEPROOF 1214
17	1	#10	.200	3/8	3/64	.022	PHOS. BRZ	ELECT. TIN'D	SHAKEPROOF 1910
18	1	3/8	.390"	11/16"		.022	PHOS. BRZ	ELECT. TIN'D	SHAKEPROOF 1920-01
19	1	#6	.145	9/32		.018	STEEL	CAD. PL.	SHAKEPROOF 1206
20	1	1/2	.520	7/8		.040	"	"	SHAKEPROOF 1224-06
21	1	1/2	.520	25/32	.065	.035	"	"	SHAKEPROOF 1224-07
22	1	3/4	.785	1 1/4.	.077	.025	PHOS BRZ	CD. PL.	SHAKEPROOF 1932-03
23	1	7/8	.894	1.386		.025	PHOS. BRZ	CD. PL.	SHAKEPROOF 1934-01
24	1	7/8	.894	1.386		.025	PHOS. BRZ	HOT TIN	SHAKEPROOF 1934-01
25	1	#8		.330		.020	PHOS. BRZ	CAD PL.	SHAKEPROOF 1908-00
26	1	7/8	.894	1.386		.025	PHOS. BRZ	HOT-TIN'D	SHAKEPROOF 1934-00
27	1	3/4	.785	1 1/4	.077	.050	PHOS BRZ	HOT-TIN'D	SHAKEPROOF 1932-00
28	1	1/2	.519	.630		.022	PHOS BRZ	HOT-TIN	Shakeproof 1924-02
29	1	5/8	.650	1.062		.045	PHOS BRZ	HOT-TIN	1928-00
30	1	SAME AS USA	SPEC	3027-2 72-53	EXCEPT TABLE	TO BE 2 TYPE	CADMIUM COATED (INCLUDES BRONZE IRIDITE)		
31	1	SAME AS PER	SPEC	3027-2 72-53	EXCEPT TABLE	TO BE TYPE 2	NICKEL PLATED		
32		AN 935-416L							
33		AN 936-B8B							
34	1	7/16	476	.600		.018	PHOS BRZ	HOT-TIN	SHAKEPROOF 1922-01
35	1	7/16	.455	3/4		1/32	PHOS BRZ	CAD. PLATED	SHAKEPROOF 1922-00
36									
37									

To Be Used in Tag well

ISSUE	ALTERATION
AE	REVISED AND REDRAWN 12-8-47
AF	ADDED 12-9-47
AG	ADDED 12-9-47
AH	ADDED-2 9-11-55
AJ	ADDED 6-15-55
AK	ADDED 8-29-55
AL	ADDED 11-22-55
AM	
AN	7-17-56
AO	3-13-57
AP	CHGE 25 Finish 7-23-57

ISSUE	ALTERATION

MATERIAL AND TEMPER

FINISH

DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)

FRACTIONAL ± DECIMAL ± HOLES ±

← SEE REVERSE →

LOCK WASHERS

MICAMOLD RADIO CORPORATION
BROOKLYN, NEW YORK

SUPERSEDES

DRAWN WJH CHECKED APPROVED

SCALE

DATE 12-1-54

DRAWING NO. 3027 Sh 4

FORM 34

Page 17

Page 17

4302 DRAWING NO.	CAUTION - DO NOT SCALE DRAWING WORK TO DIMENSIONS	THIS PRINT SUPERSEDES ALL PRINTS ISSUED PRIOR TO		

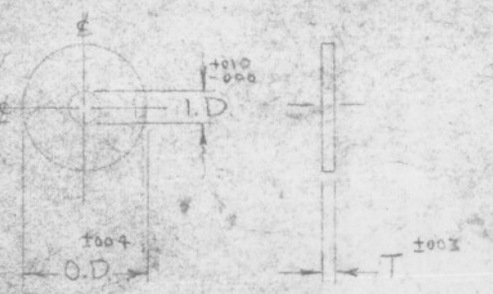


FIG. 1

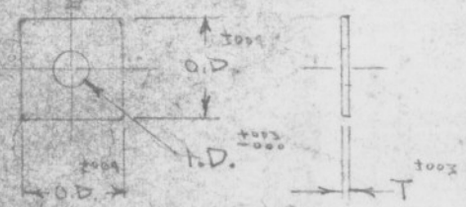


FIG. 2

PT. NO.	Fig.	O.D.	I.D.	T	REMARKS
1	1	1/2"	.150"	1/8"	
2	1	5/8"	.190"	1/8"	ID TOL is ±.010 TOL. ON "T" IS ±.010
3	1	1 1/32"	.253"	1/8"	TOL. ON "T" IS ±.010
4	1	1 11/32"	.853"	1/16"	TOL ON ID ±.010, ON OD ±.015
5	1	19/32"	.375"	1/16"	TOL. ON "T" IS ±.010
6	1	13/32"	.156"	1/32"	BLACK
7	1	3/4"	.452"	1/16"	TOL. ON "T" IS ±.010
8	1	19/32"	.406"	1/32"	
9	1	1.460"	1.203"	1/8"	
10	1	5/8"	.190"	1/16"	TOL. ON "T" IS ±.010
11	1	5/8	.220	1/16"	
12	1	7/16	.150	1/16"	
13	1	.250	.125	1/16	
14	1	1 5/32	.775	1/16	
15	1	3/4	.190	1/8	
16	1	.235	.135	1/32	
17	1	3/4	.150	1/8	TOL. OF THICKNESS MUST BE ±.005

(6) INSULATION RESISTANCE MUST BE 25000 MEGOHMS MINIMUM.

NOTE: MUST PASS NAVY OXYGEN BOMB TEST.
MUST WITHSTAND SUBJECTION TO 70 HOURS IN GULF 3.03 OIL AT 125°C

ISSUE	ALTERATION		ISSUE	ALTERATION	
A	ADDED -2	3-13-51	O	[illegible]	
B	WAS SK 1596	3-15-51	P	INCREASED TOL OF -2	2-2-55
C	ADDED DUROMETER	3-16-51	Q	ADDED -15	2-28-55
D	ADDED -3, -4	3-27-51	R	ADDED 16	8-25-55
E	ADDED -5	5-28-51	S	ADDED NOTE TO -17	5-9-56
F	ADDED -6	5-31-51			
G	ADDED NOTE	8-13-51			
H	ADDED -7	11-8-51			
I	ADDED -8	1-18-52	T	THICKNESS OF -7 WAS 1/32	6-11-56
J	-2 WAS 1/8 -7 WAS 1/16 TH. -8 WAS 1/16 THICK.	1-21-52			
K	ADDED -9	2-25-52			
L	ADDED -10, -2 WAS 1/16	4-4-52	U	Changed Durometer WAS 60	12-6-56
M	ADDED -11	4-7-52			
N	ADDED -12	7-22-52	V	Changed PT 5, 7 & T WAS 3/64	12-7-56
O	ADDED -13	8-5-54			
P	ADDED -14	10-22-54	W	ADDED MAT.	2-8-57

(2) 10 INSP

X - REVISED -5 + -7 4-12-57
Y - ADD TOL FOR "T" 1-22-58

MATERIAL AND TEMPER: Neoprene or Buna-N DUROMETER 60 To 70

FINISH

DIMENSIONAL TOLERANCES (UNLESS OTHERWISE SPECIFIED)

FRACTIONAL	DECIMALS	HOLES
+	+	+
−	−	−

MICAMOLD RADIO CORPORATION
BROOKLYN, NEW YORK

NEOPRENE WASHER

SUPERSEDES

DRAWN	CHECKED	APPROVED
[illegible]	[illegible]	[illegible]

SCALE

DATE 2-2-51

4302
DRAWING NO.

FORM SL 16 10-22-54

— SEE REVERSE —

Page 79

CM 80 100MMF

Sequence of operation

1. Slice strips to (1 1/8 x 1 1/8) reconstituted natural mica.

2. Cut aluminum foil (.0005 x 1/8 width) into length of (12").

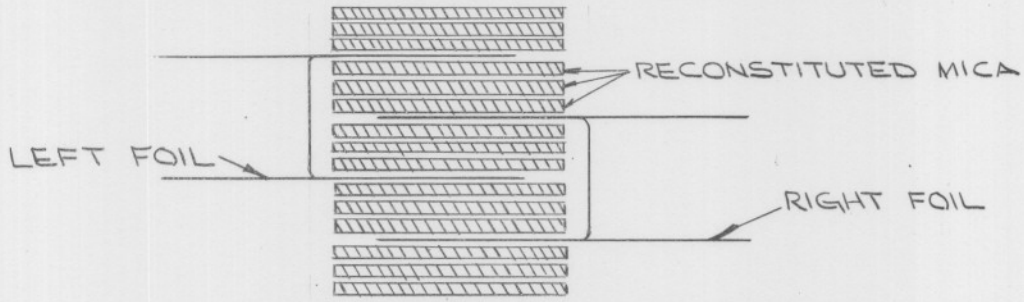
3. Slice copper foil (.002 thick) into strips (1 1/4" x 6").

4. Slice copper strips into tabs (1 1/4" x 7/8").

5. Remove burrs from the edge of the copper tabs.

6. Spot weld aluminum foil onto copper tabs (extend aluminum foil 9/16 over copper tab).

7. Stack sections (11 active plates, 3 pieces of .002 reconstituted natural mica per plate). Place Mylar tape around section to hold firm. See sketch below.



8. Pre-heat sections in pressing clamp (85°C for 16 hours).

9. Remove Mylar tape.

10. Place sections onto pressure jig.

11. Press sections for seven hours, 1000 lb/square inch of active area being sure to maintain constant pressure especially during the first forty minutes and the last forty minutes of the pressing cycle (temperature is pre-set at 570°F).

12. Remove sections from pressure jig.

13. Oxidation is removed from copper tabs.

14. Copper tabs are then soldered dipped using 25% resin and 75% alcohol flux.

15. Dry sections in oven at (85°C for 16 hours).

16. Capacity, insulation resistance, dissipation factor, Q and breakdown voltage are taken and data recorded of each section.

17. Those sections passing the test listed in #16 are matched for capacity and eighteen are soldered in series (using insulation between sections). A (.002 x 1" x 3 1/2") copper tab is soldered to the end section.

18. The section is placed into a CM 80 case and a suitable spring clamp holds the section firm and makes contact to one end bell. The copper tab is connected to the other end bell. (See drawing on page 23).

19. The assembled unit is dried at (85°C for 16 hours) and filled with a high temperature black insulation compound.

20. Marking per Mil-C-5 character C.

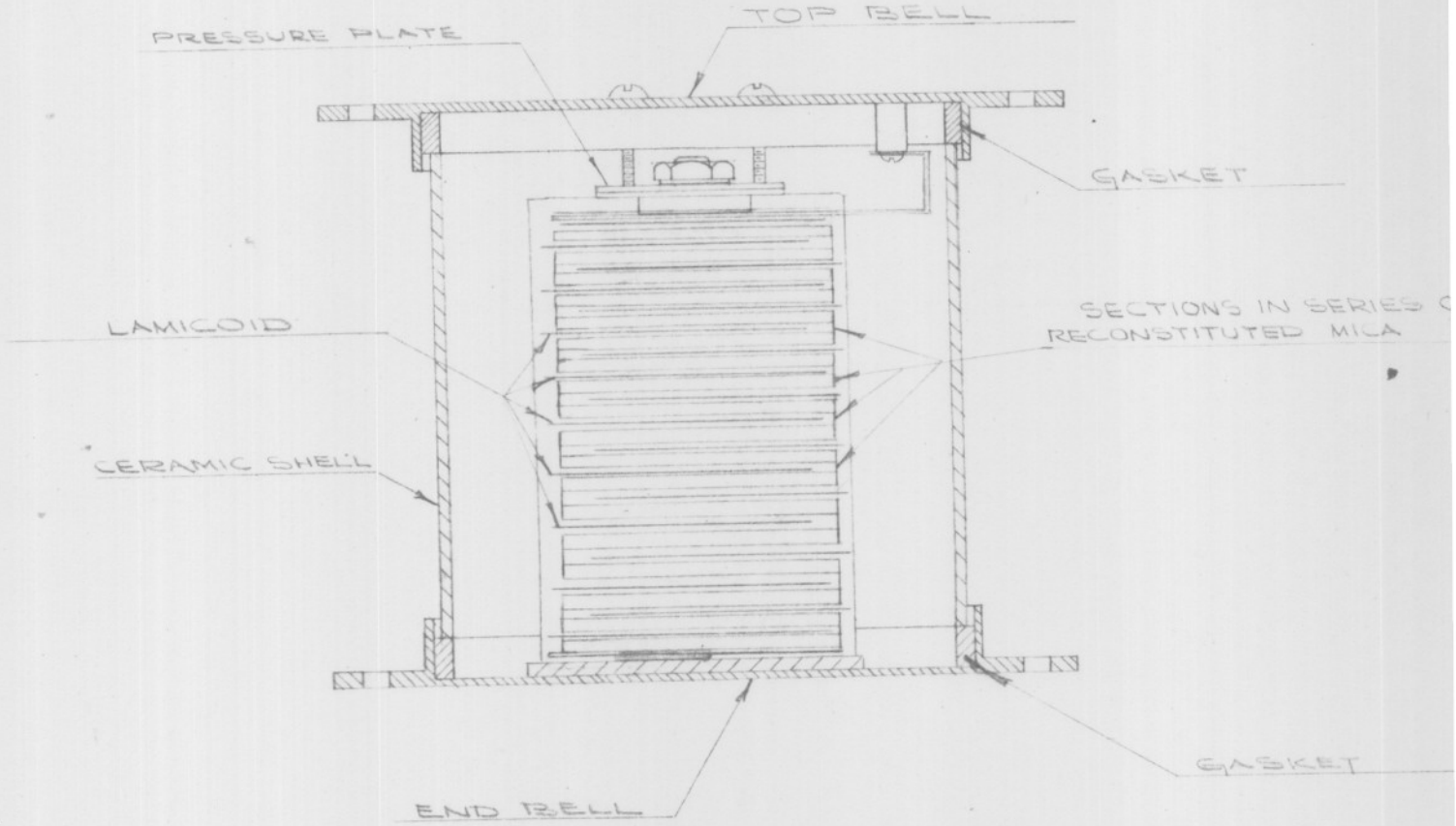
21. Test for qualification approval.

SEE ELEVENTH QUARTERLY REPORT FOR QUALIFICATION TEST RESULTS

Materials required for the manufacture of CM 80 100 MMF using reconstituted mica paper as a dielectric.

Material Description	Amount Required per 1000 condensers	Pieces Required per 1000 condensers
Reconstituted mica (.002 x 1 1/8 x 1 1/8)	150 pounds	666,000
Aluminum foil (.0005 x 7/8 x 12")	1.4 pounds	2,000
Copper foil (.002 x 7/8 x 1 1/4)	68 pounds	72,000
Lamicoid (.01 x 1 1/4 x 2")	500 feet	3,000
Lamicoid (.01 x 1 3/16 x 1 1/2)	2800 feet	22,000
Copper foil (.002 x 1 7/8 x 3 1/2)	3 pounds	1,000
CM 80 case Assembly		1,000
Wax filled	Vary	

CM80 100MMFD



CM 80 2000 MMF

Sequence of operation

1. Slice strips into (1 3/16" x 1 1/4") reconstituted mica.

2. Cut aluminum foil (15/16" width) into length of 54 1/4").

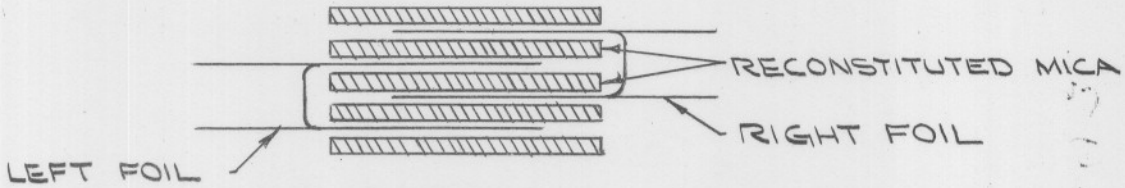
3. Slice copper foil (.002 thick) into strips (15/16" x 6").

4. Slice copper strips into tabs (15/16" x 1 1/4").

5. Remove burrs from edge of copper tabs.

6. Spot weld aluminum foil onto copper tabs (extend aluminum foil 5/8" over copper tab.)

7. Stack section (47 active plate, ~~one~~ two .002 reconstituted mica per plate). Place Mylar tape around section to hold firm. See sketch below.



8. Pre-heat sections in pressure clamp at (85°C for 16 hours).

9. Remove Mylar tape.

10. Place sections onto pressing jig.

11. Press sections at 1000 lb/sq inch of active area, making sure to maintain constant pressure especially during the first forty minutes and the last forty minutes of the pressing cycle. (Temperature at 570°F.)

12. Remove sections from pressing jig.

13. Oxidation is removed from copper tabs.

14. Copper tabs are then solder dipped using 25% resin and 75% alcohol flux.

15. Dry sections in oven at (85°C for 16 hours).

16. Capacity, insulation resistance, dissipation factor, Q and breakdown voltage are taken and data recorded of each section.

17. Those sections passing the test listed in #16 are matched for capacity, and 13 soldered in series (using insulation between sections). A (.002 x 15/16" x 3 1/2") copper tab is soldered to the last section.

18. The section is placed into a CM 80 case and a suitable spring clamp holds the sections firm and makes contact to one end bell. The copper tab is connected to the other end bell. (See the drawing on page 27).

19. The assembled unit is dried at (85°C for 16 hours) and filled with a high temperature black insulation compound.

20. Marking per MIL C-5 character C.

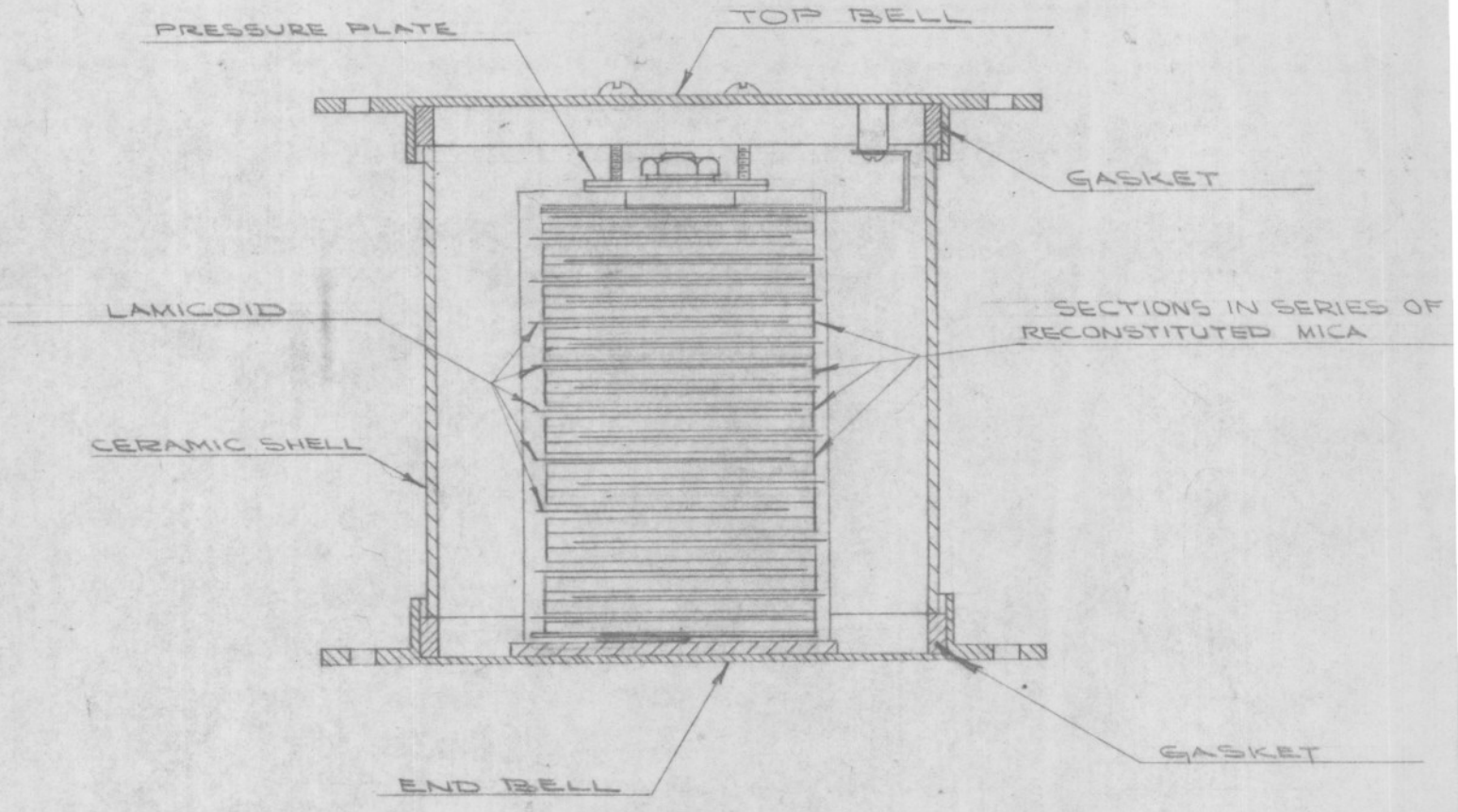
21. Test for qualification approval.

SEE ELEVENTH QUARTERLY REPORT FOR QUALIFICATION TEST RESULTS

Material required for the manufacturer of CM 80 2000 MMF using reconstituted mica paper as a dielectric.

Material description	Amount required per 1000 condensers	Pieces required per 1000 condensers
Reconstituted mica (.002 x 1 3/16" x 1 1/4")	180 pounds	663,000
Aluminum foil (.005 x 15/16" x 1 1/4")	4.6 pounds	2,000
Copper foil (.002 x 15/16" x 1 1/2")	50 pounds	52,000
Lamicoid (.01 x 1 1/4" x 2")	340 feet	2,000
Lamicoid (.01 x 1 1/4" x 1 5/8")	2175 feet	15,000
Copper foil (.002 x 15/16" x 3 1/2")	3.2 pounds	1,000
CM 80 case Assembly		1,000
Wax filled	vary	

CM80 2000 MMFD



Conclusions:

All of the pilot run quanities described below were made with CI reconstituted natural mica paper, "Isomica" type.

The fifty CM 30 3300MMF capacitors met all the requirements when tested per Table V of Mil-C-5A.

The fifteen CM 70 100MMF capacitors met all the requirements when tested per Table V of Mil-C-5A.

The eight CM 80 100MMF capacitors did not meet all the requirements shown in Table V of Mil-C-5A.

They failed temperature Rise Test and immersion. If the requirement for temperature rise is changed to 2 amp. at 1MC., 2.7 amp. at 3MC., .91 amp. at .3MC. and .27 amp. at .1MC. they will pass the temperature Rise Tests as noted in Table 1 of the Eleventh Quarterly Report.

The CM 80 2000MMF did not pass the Mil-C-5A specification. It is not feasible to make the 2000MMF 10,000 V.P. capacitor using "Isomica" type CI reconstituted natural mica paper (.002" thick) as a dielectric. The reasons are stated in quarterly report number 11.

Recommendation and Future Work:

It is recommended that work on methods of assembly be investigated to reduce temperature rise, also better methods of sealing should be investigated

so as to pass immersion cycling on CM 80 100MMF and CM 80 2000MMF capacitors.

Future work on silvering of mica paper is indicated. In order to accomplish this the mica paper should be improved and a special silvering compound developed for this purpose. Vacuum deposition of silver on mica paper mat may be possible.

IDENTIFICATION OF PERSONNEL

FIRST & SECOND QUARTER

J. SIPOVIC	PROJECT ENGINEER
A. LUNCHICK	PROJECT ADMINISTRATOR

THIRD QUARTER

J. SIPOVIC	PROJECT ENGINEER
W. SHEA	LABORATORY TECHNICIAN
R. KONZELMAN	LABORATORY TECHNICIAN
A. LUNCHICK	PROJECT ADMINISTRATOR

FOURTH QUARTER

J. SIPOVIC	PROJECT ENGINEER
W. SHEA	LABORATORY TECHNICIAN
A. LUNCHICK	PROJECT ADMINISTRATOR

FIFTH, SIXTH & SEVENTH QUARTER

J. SIPOVIC	PROJECT ENGINEER
W. SHEA	LABORATORY TECHNICIAN
S. KLEIN	PROJECT ADMINISTRATOR

EIGHTH QUARTER

W. SHEA	PROJECT ENGINEER
S. KLEIN	PROJECT ADMINISTRATOR
M. RODICSKY	LABORATORY ASSISTANT

NINTH & TENTH QUARTER

J. BOWSER	PROJECT ENGINEER
S. KLEIN	PROJECT ADMINISTRATOR
M. RODICSKY	LABORATORY ASSISTANT
S. KENDI	LABORATORY ASSISTANT

ELEVENTH QUARTER

H. BRANDI	CHIEF ENVIROMENTAL LAB.
H. HEGAL	LABORATORY TECHNICIAN
A. RIVERIA	LABORATORY TECHNICIAN
J. BOWSER	PROJECT ENGINEER & ADMINISTRATOR
M. RODICSKY	LABORATORY ASSISTANT
S. KENDI	LABORATORY ASSISTANT