

MOTOR-DRIVEN CHARGING GENERATORS REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers apparatus requirements and adjusting procedures for the following motor-generators.

KS-5123	KS-5137-03
KS-5123-01	KS-5145
KS-5123-02	KS-5145-01
KS-5123-03	KS-5146
KS-5123-04	KS-5146-01
KS-5123-05	KS-5419
KS-5123-06	KS-5442
KS-5135	KS-5550
KS-5135-01	KS-5550-01
KS-5137	KS-5668
KS-5137-01	KS-5668-01
KS-5137-02	

It may also be used for the 200-ampere, 65-volt motor-generators manufactured by the Hertner Electric Company previous to the manufacture of the KS-5668 sets.

1.02 This section is reissued to include information on motors formerly covered in Section 159-406-701; to remove the brush grades from Table A; to revise Fig. 1 and the title of this section; and to include information on conversion of brush holders and on noise and vibration of motor-generators.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein. Refer to Section 171-110-701 for commutator and brush maintenance, Section 171-110-802 for brush replacements, Section 155-512-801 for motor-generator replacement parts, and Section 171-110-801 for commutator resurfacing.

1.04 *Phi (ϕ)*: Requirements are marked with a phi when they are not required to be checked before turnover.

1.05 *Asterisk (*)*: Requirements are marked with an asterisk when to check for them would necessitate the dismantling or dismounting of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons, or its performance indicates that such a check is advisable.

1.06 *Brush-holder yoke position marks* designating the position of the yoke for best commutation are located on the yoke and on the frame of the generator. These marks are established by the manufacturer and, when the yoke is set with both marks in line, the brushes will usually be in the proper position for the best commutation.

1.07 Excessive brush pressure produces mechanical wear, and insufficient pressure results in damage to the equipment through pitting of the commutator and dusting of the brushes. The requirements, as specified herein, represent a practical balance between the two and should result in satisfactory commutation.

1.08 Normal operation may be defined as a condition in which the generator is carrying any load from no load to full load, with the output voltage within the limits stamped on the nameplate.

1.09 Successful commutation, for the purpose of this section, may be said to have been obtained if neither the brushes nor the commutator are burned or injured to the extent that abnormal maintenance is required. The presence of some visible sparking is not necessarily evidence of unsuccessful commutation.

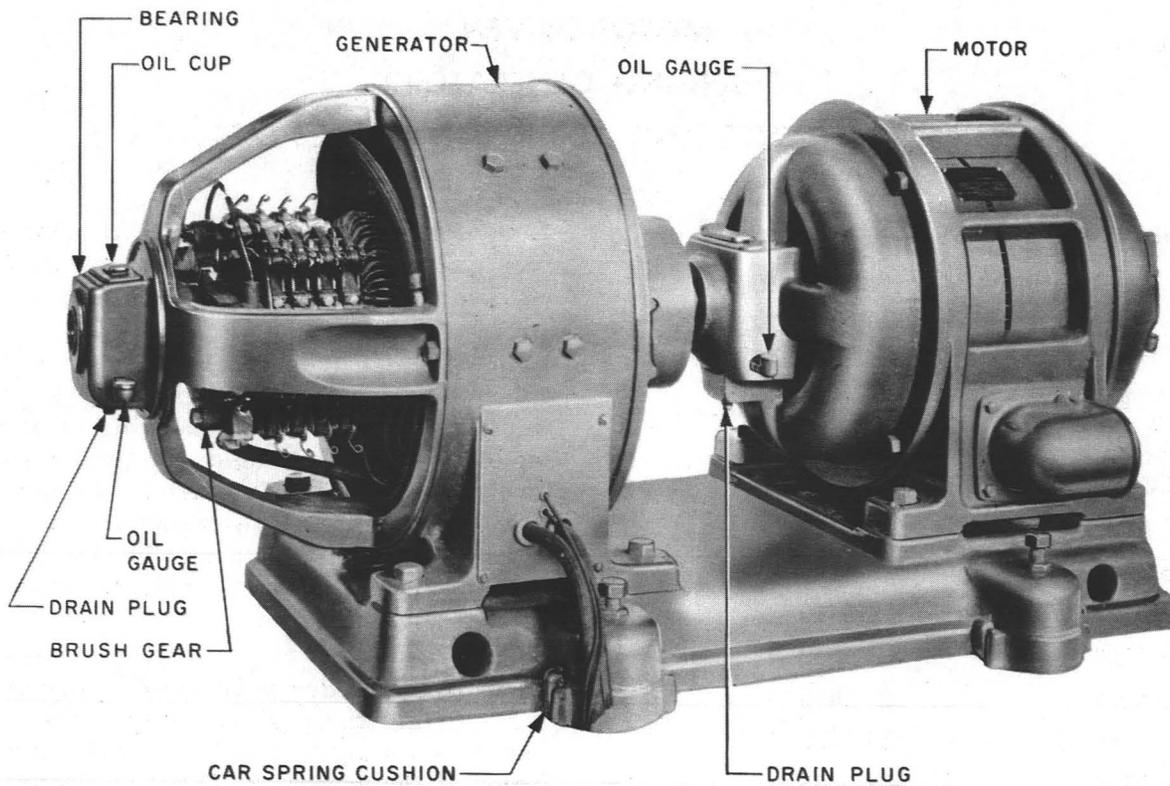


Fig. 1 - KS-5123 Motor-Generator — End-Shield-Type Generator Shown

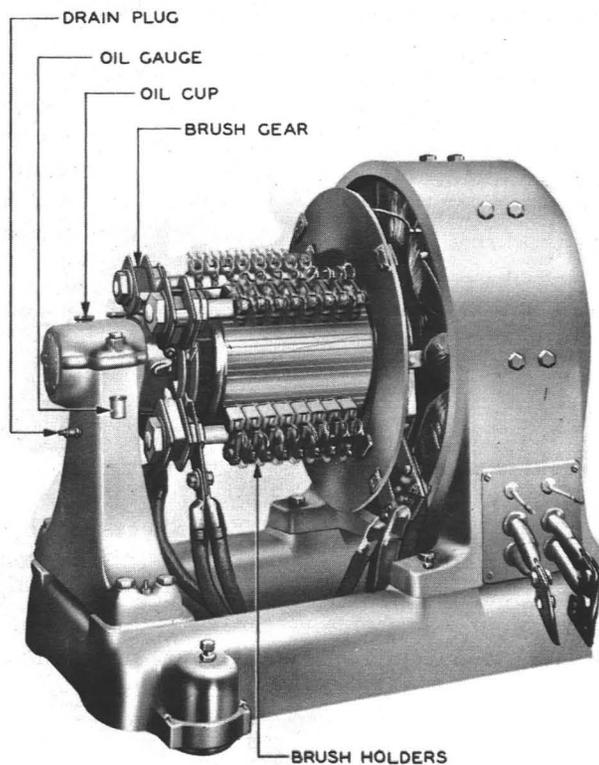


Fig. 2 - KS-5123 Pedestal-Type Generator

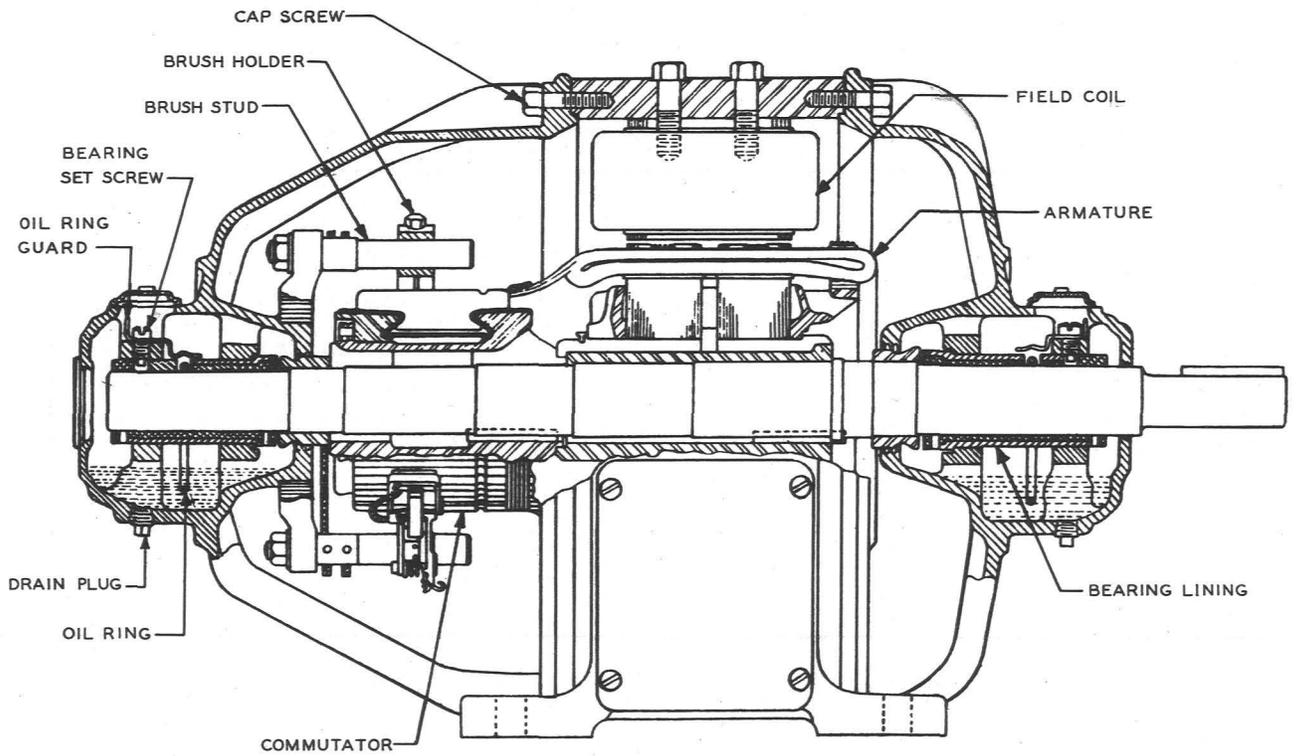


Fig. 3 - KS-5123 End-Shield-Type Generator - Cross Section

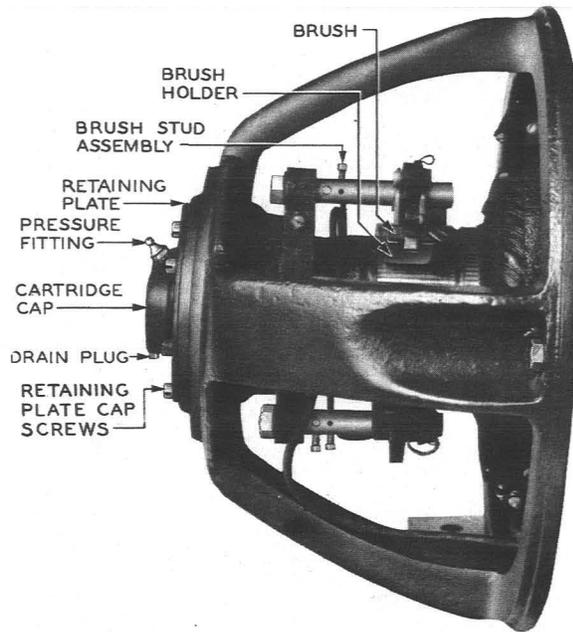


Fig. 4 - End Shield - Ball Bearing

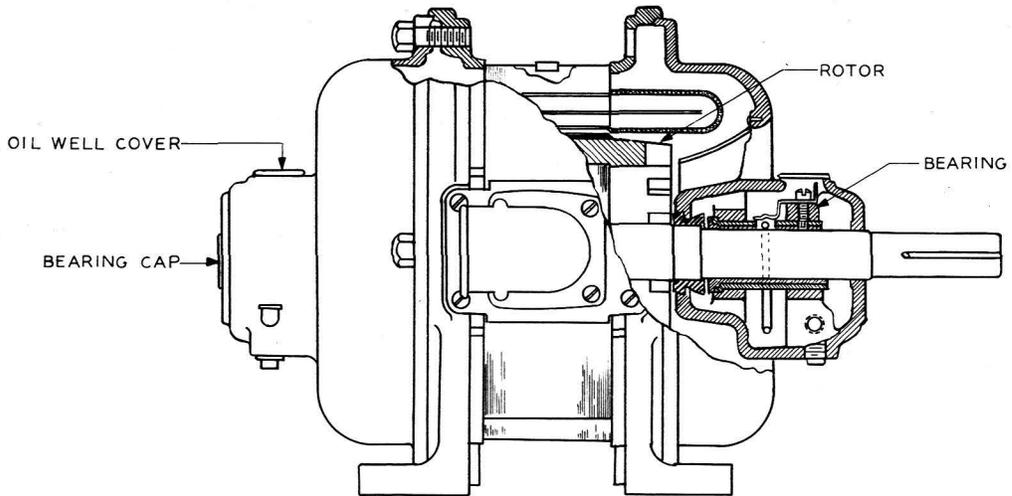


Fig. 5 – Sectional View of Typical Motor With Oil-Ring-Type Bearings

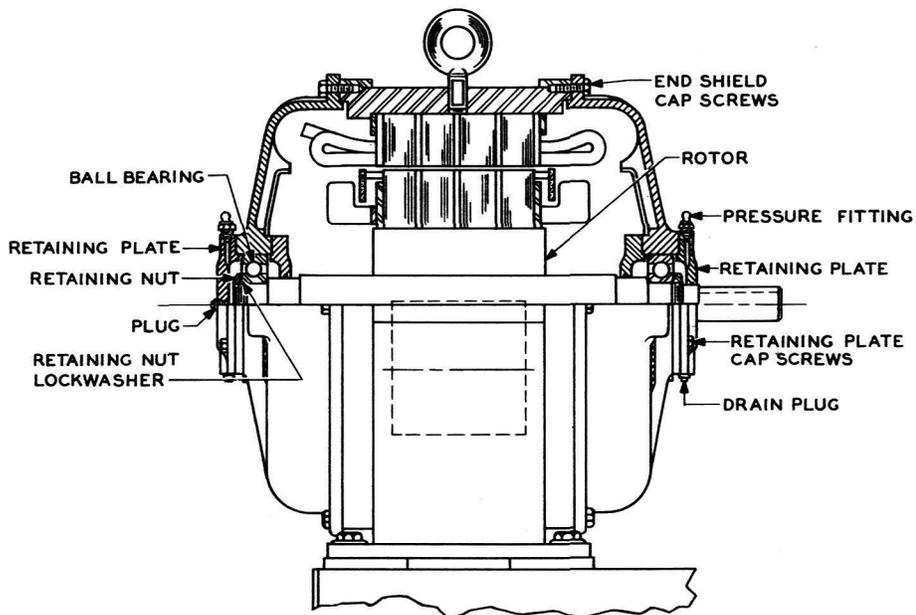


Fig. 6 – Sectional View of Typical Motor With Ball Bearings

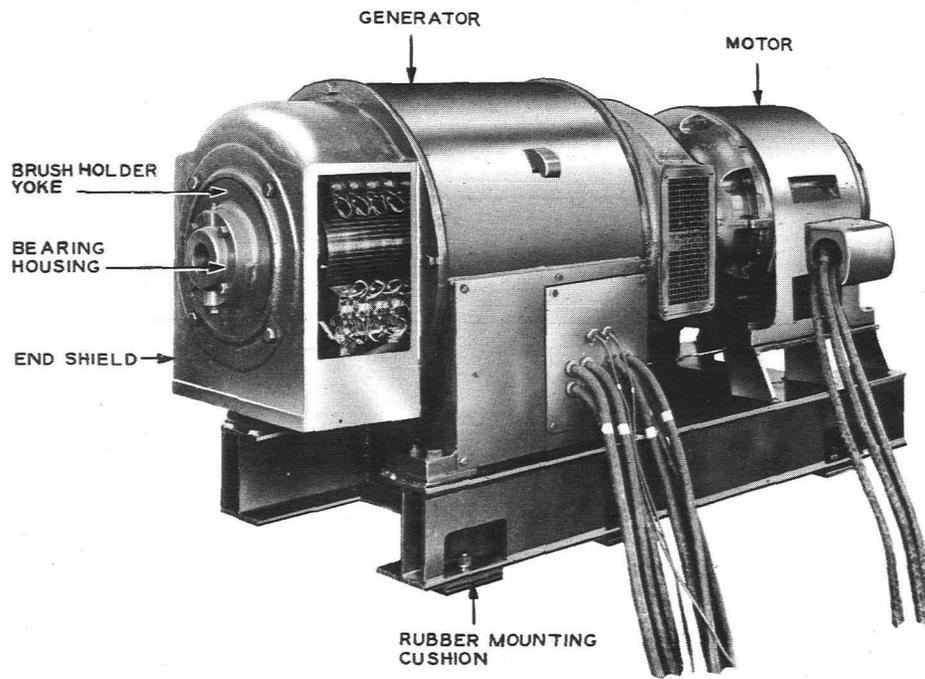


Fig. 7 - KS-5123-04 Motor-Generator

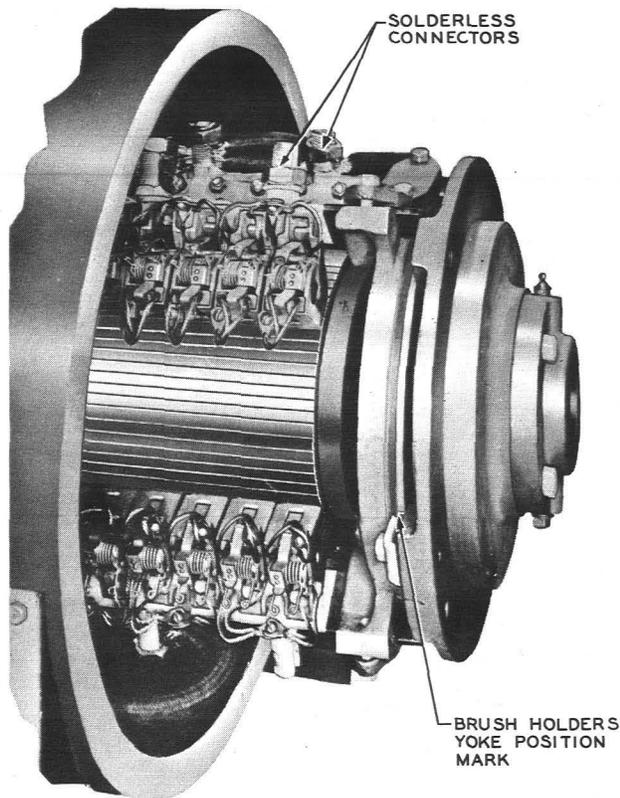


Fig. 8 - Brush Rigging, Yoke, and Bearing Housing - KS-5123-04 Type Shown

SECTION 155-512-701

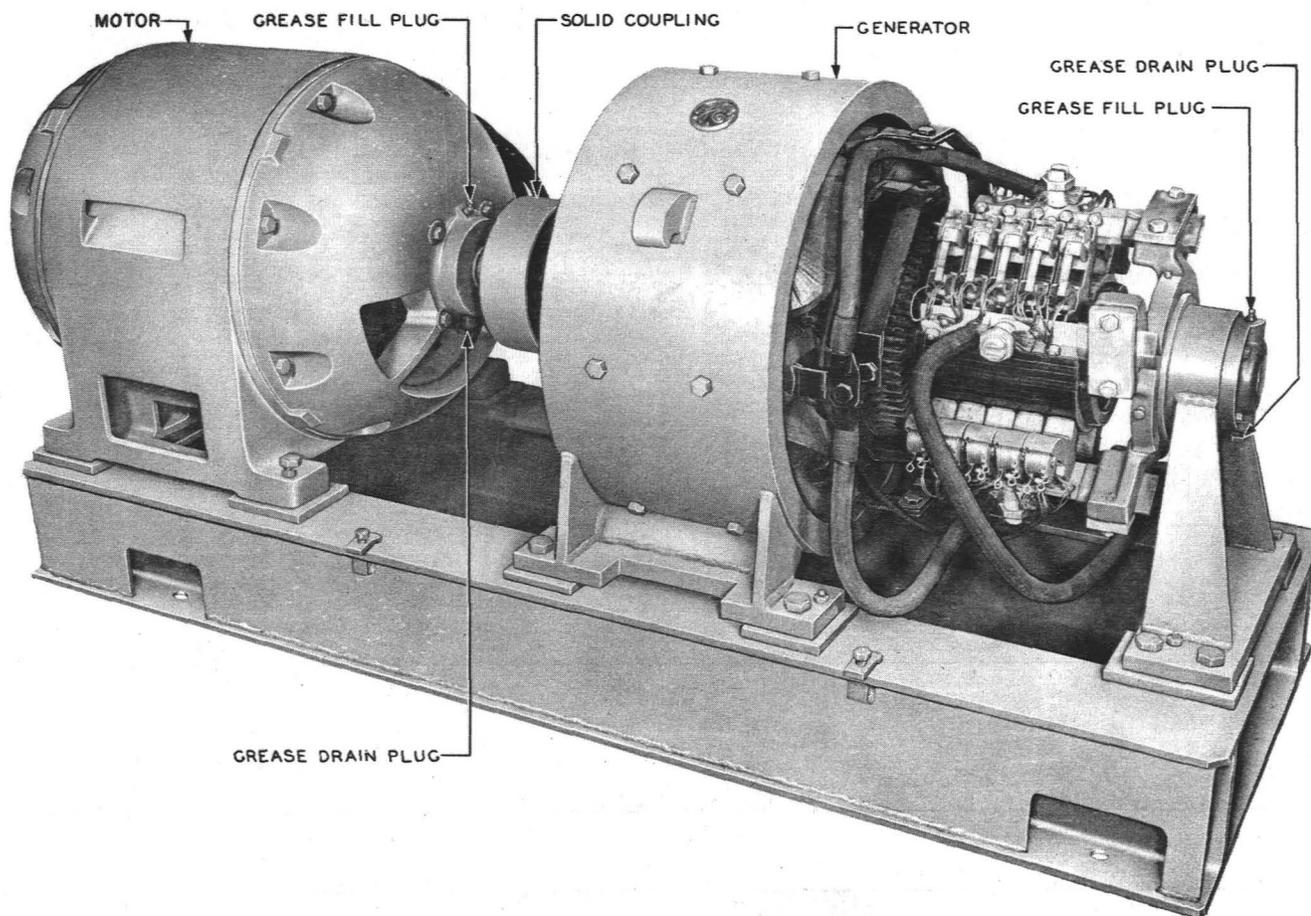


Fig. 9 - KS-5123-05 Motor-Generator — Open-Version Type Shown

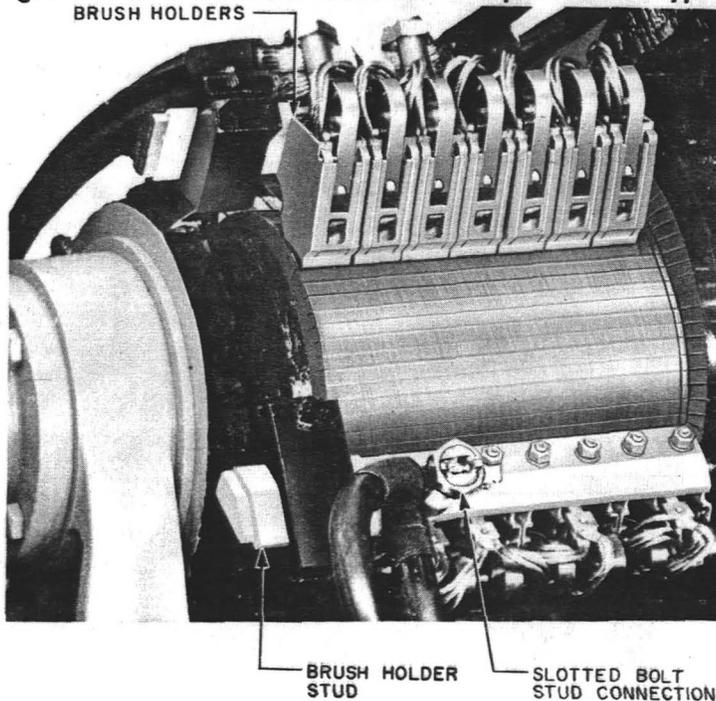


Fig. 10 - KS-5123-05 Generator — Pedestal-Type With Constant-Pressure Brush Holders Shown

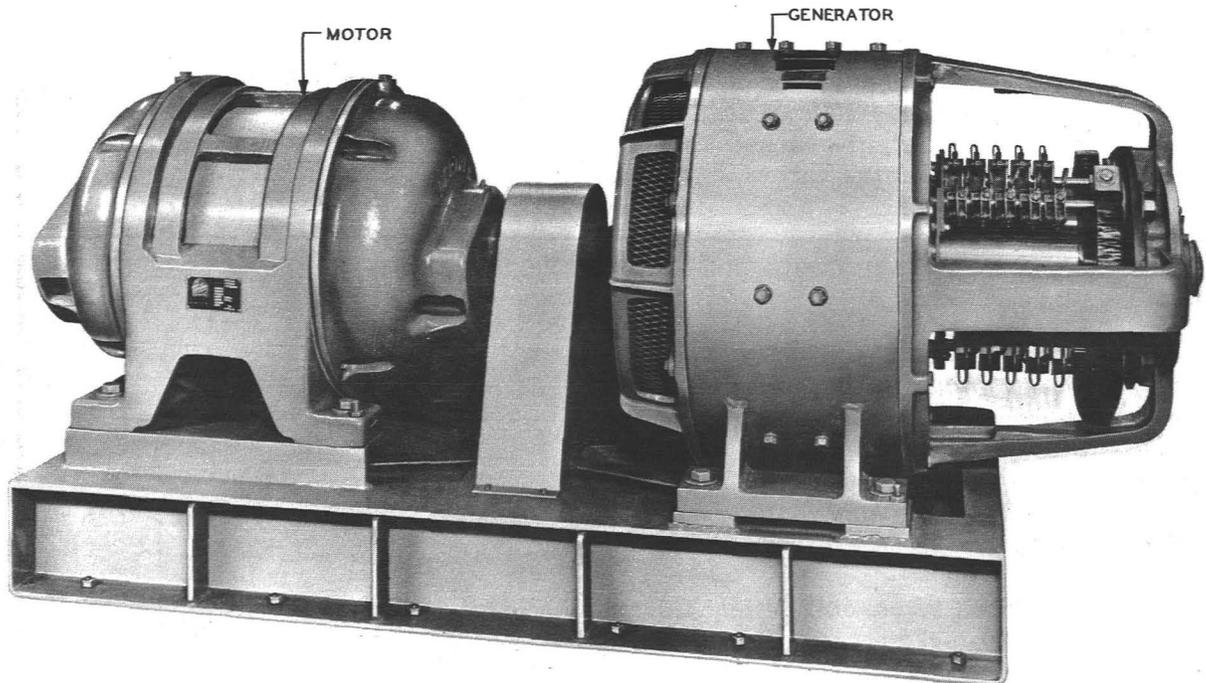


Fig. 11 - KS-5668-01 Motor-Generator

2. REQUIREMENTS

2.01 Lubrication

Oil Ring Bearings

(a) Oil ring bearings shall be lubricated with 220-260 S100 oil upon installation since machines having these bearings are shipped without oil. The oil level in the gauge shall be

Min 1/2 full

Max 3/4 full

Gauge by eye.

φ(b) Except as covered in (c), the oil shall be replaced with fresh oil every 2 years.

φ(c) In KS-5123 and KS-5137 type motors installed since the beginning of 1943 and still equipped with the original bearing linings, the oil shall be replaced with fresh oil annually.

(d) Oil rings shall turn and deliver oil to the shaft and bearings.

(e) Oil gauges shall be free from leaks; glass gauges, where provided, shall be free from cracks.

*(f) If dirt has entered a bearing chamber or heating is experienced, the bearing shall be flushed with flushing oil.

Waste-Packed Bearings

(g) Waste-packed bearings shall be lubricated with six or seven drops of 220-260 S100 oil at installation and every 3 months thereafter. Since operating conditions, including room temperature, vary widely, this interval or the amount of oil should be modified as required to obtain adequate but not excessive lubrication.

Ball Bearings

φ(h) Bearings equipped with grease pressure fittings and grease drain plugs shall be relubricated with 260-300P grease annually in service or after being dismantled. Normally, ball bearings shall not be lubricated when a machine is being put into service but, if it has been in storage for 2 or more years before being installed, they shall be lubricated.

(i) Bearings not equipped with pressure fittings shall be relubricated with 260-300P grease every 3 years in service.

Flexible Couplings

(j) All types of flexible couplings shall be examined after 30 days running to determine if bolts should be tightened and should be inspected every 2 years thereafter.

φ(k) Falk couplings, where provided, shall be cleaned and relubricated with 260-300P grease every 2 years.

Caution: The F-type Falk coupling that is equipped with a grease pressure fitting shall never be lubricated with a pressure gun. When the coupling is dismantled for the first time and cleaned in order to relubricate, the pressure fitting hole shall be sealed from the inside to prevent grease leakage.

***2.02 Voltage:** It shall be possible to manually adjust the voltage of a generator, at any temperature cold to hot, at any load, no load to the available office load not exceeding rated nameplate current (amperes), within the limits given below for the particular rating of the machine.

Use switchboard voltmeter.

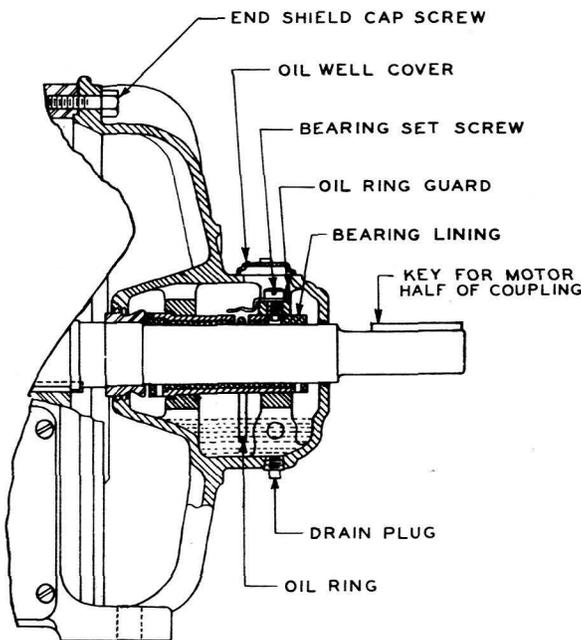


Fig. 12 – Oil Ring Bearing

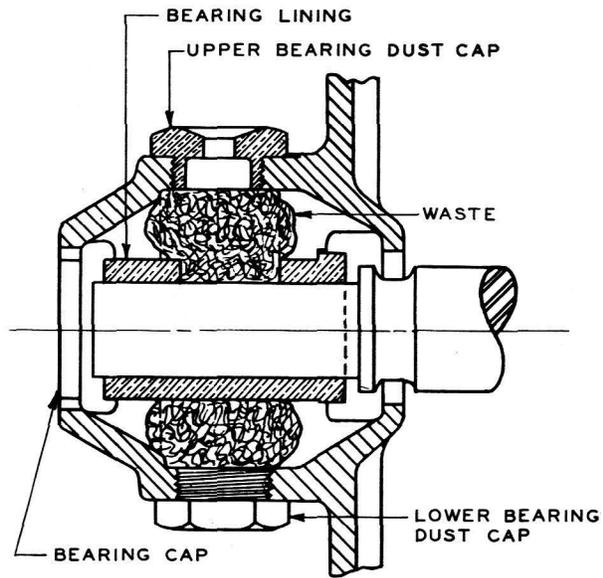


Fig. 13 – Waste-Packed Bearing

Generators for use on one voltage range include the following.

- 28-Volt Generators — 22 to 28 Volts
- 33-Volt Generators — 22 to 33 Volts
- 45-Volt Generators — 34 to 45 Volts
- 53-Volt Generators — 44 to 53 Volts
- 54-Volt Generators — 44 to 57 Volts
- 60-Volt Generators — 44 to 60 Volts
- 63-Volt Generators — 44 to 63 Volts
- 65-Volt Generators — 44 to 65 Volts
- 140-Volt Generators — 120 to 152 Volts
- 175-Volt Generators — 120 to 175 Volts
- 320-Volt Generators — 240 to 320 Volts

Reserve generators for use on two voltage ranges include the following.

- 63-Volt Generators — 22 to 33 and 44 to 63 Volts
- 53-Volt Generators — 22 to 28 and 44 to 53 Volts

Note: Where the generator is under control of a voltage regulator, the hand rheostat will not hold the voltage within specified limits under all conditions, no load to full load. In such a case, if the regulated volt-

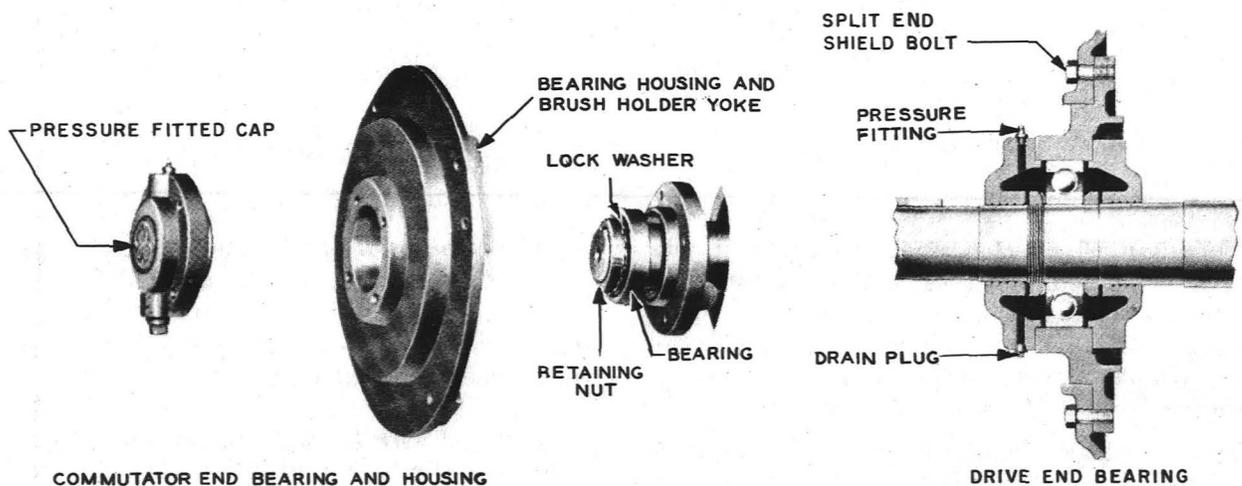


Fig. 14 – Drive-End Ball Bearing and Housing — Typical of CD-1000 Series

age under office load conditions is within specified limits, checks at other loads may be omitted.

***2.03 Capacity:** The generator shall be capable of supplying continuously the available office load, not exceeding rated machine load, with the voltage within the limits given in 2.02. Use switchboard instruments.

***2.04 Bearings**

(a) Bearing linings or ball bearings shall be free from excessive wear. If the motor-generator operates satisfactorily under available office load and the other requirements of this section are met, the bearings shall be considered to be in a satisfactory condition.

Note: Abnormal noise from a ball bearing is an indication of excessive wear. They are not, however, as quiet as sleeve-oiled bearings; therefore, by comparison, some noise is to be expected.

(b) The endplay shall be sufficient to permit the armature to run freely but shall not be sufficient to permit the brushes to override the commutator.

Gauge by eye.

2.05 Freedom of Rotating Parts: The armatures of motors and generators shall rotate freely in their bearings.

Gauge by feel.

***2.06** The *direction of rotation* of motor-driven generators shall be clockwise when viewed from the end of the generator opposite the drive.

Note: The direction of rotation of engine-driven generators is determined by the engine and is not reversible. In general, it will be counterclockwise when viewed as above.

***2.07 Airgap:** With the exception of the following generators

KS-5123-05
KS-5123-06
KS-5668-01
CD-1000 series frames

the airgap between the armature and the pole faces shall be

Min 0.025 inch

Use thickness gauge.

Note 1: A generator of one of the larger sizes, having an airgap approaching the minimum, is likely to have excessive noise and vibration. (See 2.08.)

Note 2: It is not practicable to measure the airgap of generators in the CD-1000 series frames. For that reason, reliance is placed upon increased noise and vibration to indicate that bearings are worn and in need of replacement. (See 3.08.)

SECTION 155-512-701

2.08 The *noise and vibration* of a motor-generator under any normal operating condition shall not be excessive at any load from no load to the available office load not exceeding rated nameplate current (amperes).

Gauge by sound and feel.

***2.09 Commutator**

(a) The KS-5668-01 L12 motor-generator sets having commutators with 110 bars are critical on commutator eccentricity and shall be carefully maintained to avoid, as much as is practicable, having the commutator eccentricity exceed 0.002 inch.

(b) Periodically check the clearance between the commutator and the lower edge of the brush holder, since there is a gradual in-

crease in this dimension due to the wearing of the commutator. (See 2.10.)

(c) Commutator diameters shall not be less than the minimum shown in Table A.

Use calipers and scale.

Note: Frame designations are stamped on the nameplate.

φ2.10 Commutation: Without altering the position of the brush-holder yoke, the generator shall commute successfully at any current between no load and the available office load, not exceeding rated nameplate current (amperes), at any voltage within the limits specified in 2.02 and with the machine at any temperature within the limits specified in 2.16.

Gauge by eye.

TABLE A

Γ KS-5123)

KS-5123-01) GENERATORS
KS-5123-02)

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB		BRUSH PRESSURE		GRAMS	
					MIN	OZ	LB	OZ	MIN	MAX
CD-115	22-28	1500	8-1/4	1-3/4	3	2	5	0	1559	2265
CD-123	22-28	1000	9-1/2	1-3/4	2	12	4	7	1245	1995
CD-55	22-33	75	3-7/8	1-3/8	1	0	1	8	450	680
B-254	22-33	75	3-15/16	3/4	1	14	2	13	855	1280
B-284	22-33	100	3-15/16	3/4	1	0	1	12	450	790
CD-65	22-33	100	4	1-3/8	1	0	1	12	450	790
CD-65	22-33	100	4	1-3/8	1	8	2	4	680	1020
CD-73	22-33	200	5	1-3/8	1	9	2	12	715	1245
CD-73	22-33	200	5	1-3/8	2	5	3	8	1060	1590
CD-85	22-33	400	5-11/16	1-3/8	1	14	2	13	855	1280
CD-103	22-33	600	7-1/4	1-3/4	3	2	5	0	1420	2265
CD-105	22-33	800	7-1/4	1-3/4	2	12	4	7	1245	1995
CD-113	22-33	1000	8-3/4	1-3/4	3	2	5	0	1420	2265
CD-115	22-33	1300	8-1/4	1-3/4	3	2	5	0	1559	2265
CD-123	44-53	500	9-1/2	1-3/4	2	12	4	7	1245	1995
CD-125	44-53	800	9-1/2	1-3/4	2	2	4	4	950	1905
CD-73	44-65	100	5	1-3/8	1	7	2	2	640	950
CD-85	44-65	200	5-11/16	1-3/8	1	8	2	4	680	1020
CD-95	44-65	300	6-3/16	1-1/2	1	8	2	10	680	1190
CD-103	44-65	400	7-1/4	1-3/4	2	12	4	7	1245	1995
CD-113	44-65	500	8-1/4	1-3/4	3	2	5	0	1420	2265
CD-115	44-65	750	8-3/4	1-3/4	3	8	5	10	1590	2540
CD-133	44-65	1200	10-7/8	1-3/4	3	8	5	10	1590	2540

TABLE A (cont)

KS-5123-03 GENERATORS			COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB OZ		BRUSH PRESSURE		GRAMS	
FRAME	VOLTS	AMP			MIN	MIN	MAX	MIN	MAX	MIN
B-284	22-33	100	3-15/16	3/4	1	0	1	12	450	790
CD-73	22-33	200	5	1-3/8	1	9	2	12	715	1245
CD-73	22-33	200	5	1-3/8	2	5	3	8	1060	1590
CD-85	22-33	400	5-11/16	1-3/8	1	8	2	10	680	1190
CD-103	22-33	600	7-1/4	1-3/4	3	2	5	0	1420	2265
CD-105	22-33	800	7-1/4	1-3/4	2	12	4	7	1245	1995
CD-73	44-65	100	5	1-1/2	1	4	2	3	565	1000
CD-85	44-65	200	5-11/16	1-1/2*	1	8	2	10	680	1190
CD-85	44-65	200	5-11/16	1-3/8**	1	8	2	4	680	1020
CD-103	44-65	400	7-1/4	1-3/4	2	12	4	7	1245	1995
CD-113	44-65	500	8-1/4	1-3/4	3	2	5	0	1420	2265
CD-115	44-65	750	8-3/4	1-3/4	3	8	5	10	1590	2540

**KS-5123-04 GENERATORS
WITH V-TYPE BRUSH HOLDERS**

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB	OZ	BRUSH PRESSURE LB	OZ	GRAMS MIN	GRAMS MAX
B-284	22-33	100	3-15/16	3/4	1	8	2	0	680	905
CD-67	22-33	200	4-3/16	1-1/2	2	5	3	2	1060	1420
CD-85	22-33	400	5-11/16	1-1/2	2	4	3	0	1020	1360
CD-1130Y	22-33	600	7-1/4	1-1/2	1	11	2	4	760	1020
CD-1133Y	22-33	800	7-1/4	1-1/2	1	11	2	4	760	1020
CD-1140Y	22-33	1000	7-1/4	1-1/2	1	11	2	4	760	1020
CD-1345Y	22-33	1500	9-1/2	1-1/2	2	4	3	0	1020	1360
CD-67	44-65	100	4-3/16	1-1/2	1	14	2	8	855	1130
CD-85	44-65	200	5-11/16	1-1/2	2	4	3	0	1020	1360
CD-1126Y	44-65	400	7-1/4	1-1/2	2	4	3	0	1020	1360
CD-1133Y	44-65	500	7-1/4	1-1/2	2	4	3	0	1020	1360
CD-1143Y	44-65	750	7-1/4	1-1/2	2	4	3	0	1020	1360
CD-1345Y	44-65	1200	9-1/2	1-1/2	2	4	3	0	1020	1360

**KS-5123-04 GENERATORS
WITH CONSTANT-PRESSURE
BRUSH HOLDERS**

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB	OZ	BRUSH PRESSURE LB	OZ	GRAMS MIN	GRAMS MAX
CD-1130Y	22-33	600	7-1/4	2-1/8	-	-	-	-	-	-
CD-1133Y	22-33	800	7-1/4	2-1/8	-	-	-	-	-	-
CD-1140Y	22-33	1000	7-1/4	2-1/8	-	-	-	-	-	-
CD-1345Y	22-33	1500	9-1/2	2-1/8	-	-	-	-	-	-
CD-1126Y	44-65	400	7-1/4	2-1/8	-	-	-	-	-	-
CD-1133Y	44-65	500	7-1/4	2-1/8	-	-	-	-	-	-
CD-1143Y	44-65	750	7-1/4	2-1/8	-	-	-	-	-	-
CD-1345Y	44-65	1200	9-1/2	2-1/8	-	-	-	-	-	-

* Brush width 1 inch, thickness 3/4 inch

** Brush width 1 inch, thickness 1/2 inch

TABLE A (cont)

**KS-5123-05 GENERATORS
WITH FORT WAYNE-TYPE
BRUSH HOLDERS**

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB		BRUSH PRESSURE		GRAMS	
					MIN	OZ	LB MAX	OZ MAX	MIN	MAX
CY-546	22-33	600	7-1/4	2-1/4	3	7	5	0	1559	2265
CY-548	22-33	800	7-1/4	2-1/4	3	8	5	0	1559	2265
CY-549	22-33	1000	7-1/4	2-1/4	3	7	5	0	1559	2254
CY-551	22-33	1500	9-1/2	2-1/2	4	5	6	4	1956	2830
CY-544	44-65	400	7-1/4	2	2	9	3	12	1162	1700
CY-545	44-65	500	7-1/4	2	2	9	3	12	1162	1700
CY-547	44-65	750	7-1/4	2-1/4	3	7	5	0	1559	2265
CY-550	44-65	1200	9-1/2	2-1/2	4	5	6	4	1956	2830

**KS-5123-05 GENERATORS
WITH CONSTANT-PRESSURE
BRUSH HOLDERS**

FRAME	VOLTS	AMP								
CY-546	22-33	500	7-1/2	2-1/4	-	-	-	-	-	-
CY-548	22-33	800	7-1/4	2-1/4	-	-	-	-	-	-
CY-549	22-33	1000	7-1/4	2-1/4	-	-	-	-	-	-
CY-551	22-33	1500	9-1/2	2-1/2	-	-	-	-	-	-
CY-699	22-23	1500	9-1/2	1-3/4	-	-	-	-	-	-
CY-544	44-65	400	7-1/4	2	-	-	-	-	-	-
CY-545	44-65	500	7-1/4	2	-	-	-	-	-	-
CY-547	44-65	750	7-1/4	2-1/4	-	-	-	-	-	-
CY-550	44-65	1200	9-1/2	2-1/2	-	-	-	-	-	-
CY-698	44-65	1200	9-1/2	1-3/4	-	-	-	-	-	-

**KS-5123-06 GENERATORS WITH
CONSTANT-PRESSURE BRUSH
HOLDERS**

FRAME	VOLTS	AMP								
CY-697	22-33	1500	10	1-3/4	-	-	-	-	-	-
↳ CY-696	44-63	1200	10	1-3/4	-	-	-	-	-	-

TABLE A (cont)

KS-5137)

KS-5137-01) GENERATORS

KS-5137-02)

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB		BRUSH PRESSURE		GRAMS	
					MIN	OZ	LB MAX	OZ MAX	MIN	MAX
BC-66*	120-175	1.5	2-3/32	3/8	-	-	-	-	-	-
BC-66**	120-175	1.5	3	3/8	-	-	-	-	-	-
BC-76	120-175	3	2-7/16	3/8	-	-	-	-	-	-
BC-33	120-175	5	2-1/2	5/8	0	15	1	8	425	680
BD-43	120-175	10	3	3/4	1	3	1	14	535	855
CD-55	120-175	15	3-7/8	3/4	0	15	1	10	425	750
		or 20								
CD-65	120-175	30	4	1-3/8	0	13	1	5	375	600
B-284	120-175	30	3-15/16	3/4	0	9	1	0	255	450
CD-73	120-175	40	4-1/16	1-1/2	0	15	1	10	425	750
CD-75	120-175	50	4-15/16	1-1/2	0	15	1	10	425	750
CD-83	120-165	100	5-11/16	1-1/2	1	0	1	12	450	790
CD-83	120-175	100	5-11/16	1-1/2	0	15	1	10	425	750
CD-93	120-165	150	6-3/16	1-1/2	1	4	2	3	565	1000
CD-93	120-175	150	6-3/16	1-1/2	1	0	1	12	450	790
CD-115	120-175	300	8-1/4	1-3/4	1	14	3	5	855	1495
CD-1137	120-165 120-175	300	7-1/4	1-1/2	1	2	2	0	500	905
BD-33	240-320	3	2-1/2	5/8	0	15	1	8	425	680
BD-43	240-320	5	3	3/4	1	3	1	14	535	855
CD-55	240-320	10	3-7/8	1-1/2	0	15	1	10	425	750
CD-65	240-320	15	4	1-3/8	0	13	1	5	375	600
CD-73	240-320	20	4-15/16	1-1/2	0	15	1	10	425	750
CD-75	240-320	30	4-1/16	1-1/2	0	15	1	10	425	750
CD-83	240-320	40	5-5/8	1-1/2	1	0	1	12	450	790
		or 50								

KS-5137-03 GENERATORS
WITH V-TYPE BRUSH HOLDERS

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB MIN	OZ	BRUSH PRESSURE LB MAX	OZ MAX	GRAMS MIN	GRAMS MAX
B-284	120-165	25	3-15/16	3/4	0	9	1	0	255	450
CD-75	120-165	50	4-15/16	1-1/2	0	15	1	10	425	750
CD-83	120-165	100	5-11/16	1-1/2	1	0	1	12	450	790
CD-93	120-165	150	6-3/16	1-1/2	1	4	2	3	565	1000
CD-1137	120-165	300	7-1/2	1-1/2	1	2	2	0	500	905

* Generators prior to 1939

** Generators installed 1939 or later

TABLE A (cont)

**KS-5137-03 GENERATORS
WITH CONSTANT-PRESSURE
BRUSH HOLDERS**

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB		BRUSH PRESSURE		GRAMS	
					MIN	OZ	LB MAX	OZ MAX	MIN	MAX
CD-1137	120-165	300	7-1/4	2-1/8	-	-	-	-	-	-

KS-5442 GENERATORS

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB	OZ	LB	OZ	GRAMS	GRAMS
					MIN		MAX	MAX	MIN	MAX
BC-66	120-140	1.5	2-3/32	7/16	-	-	-	-	-	-
BC-76	120-140	3	2-7/16	7/16	-	-	-	-	-	-
BD-33	120-140	5	2-1/2	5/8	0	15	1	8	425	680
BD-43	120-140	10	3	3/4	1	3	1	14	535	855
B-224	44-54	18.5	2-15/16	3/4	1	8	2	4	680	1020
CD-75	44-54	200	5	1-3/8	1	7	2	2	640	960

**KS-5550)
KS-5550-01) GENERATORS**

FRAME	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB	OZ	LB	OZ	GRAMS	GRAMS
					MIN		MAX	MAX	MIN	MAX
CD-85	22-53	200	5-11/16	1-1/2	1	8	2	10	680	1190

**PRE KS-5668 HERTNER
GENERATORS (65V-200A)**

9-1/4 7/8

KS-5668 GENERATORS

LIST	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB	OZ	LB	OZ	GRAMS	GRAMS
					MIN		MAX	MAX	MIN	MAX
1	22-33	100		1-1/4	1	9	2	3	715	1000
2	22-33	200		1-1/4	1	9	2	3	715	1000
3	22-33	400		1-1/4	1	14	2	10	855	1190
4	22-33	600		1-1/2	2	6	3	5	1065	1495
5	22-33	800	8-3/8	1-1/2	2	6	3	5	1065	1495
6	44-65	100		1-1/4	1	9	2	3	715	1000
7	44-65	200		1-1/4	1	9	2	3	715	1000
8	44-65	400	8-3/8	1-1/2	1	14	2	10	855	1190
9	44-65	500	8-3/8	1-1/2	1	14	2	10	855	1190
L 10	44-65	750	9-3/4	1-1/2	1	14	3	5	855	1495

TABLE A (cont)

KS-5668-01 GENERATORS

LIST	VOLTS	AMP	COMMUTATOR DIAMETER IN INCHES MIN	BRUSH LENGTH IN INCHES MIN	LB MIN	OZ	BRUSH PRESSURE		GRAMS	
							LB MAX	OZ	MIN	MAX
1	22-33	100	3-3/8	1-1/4	1	9	2	3	715	1000
2	22-33	200	4-1/8	1-1/4	1	9	2	3	715	1000
3,14	22-33	400	6-1/4	1-1/4	1	14	2	10	855	1190
4,15	22-33	600	7-1/8	1-1/2	2	6	3	5	1065	1495
5,16	22-33	800	8-3/8	1-1/2	2	6	3	5	1065	1495
8	44-63	100	4-1/8	1-1/4	1	9	2	3	715	1000
9	44-63	200	6-1/4	1-1/4	1	9	2	3	715	1000
10	44-63	400	8-3/8	1-1/2	1	14	2	10	855	1190
11	44-63	500	8-3/8	1-1/2	2	6	3	5	1065	1495
12	44-63	750	9-3/4	1-1/2	2	6	3	5	1065	1495

**MISCELLANEOUS GENERATORS
NOT COVERED ABOVE**

FRAME	VOLTS	
CD-85	22-28	5-11/16
BC-44	34-45	1-7/8
BC-66	34-45	3
CD-113	44-53	8-1/4
B-254	44-54	3-15/16
BC-76	44-54	2-7/16
BC-44	44-60	1-7/8
BC-66	44-60	3
B-224	44-65	2-15/16
B-204	120-140	2-7/16
BD-85	120-165	5-11/16
B-204	120-175	2-7/16
B-225	120-175	2-15/16
B-254	120-175	3-15/16
BC-74	120-175	3
B-254	240-320	3-15/16

φ2.11 *Brush Holders and Yokes*

(a) With the exception of the generators listed in (b), the clearance between the commutator and lower edge of the brush holder shall be

MIN	MAX
1/32 inch	1/8 inch

Use the R-8550 scale.

(b) The clearance between the commutator and lower edge of the brush holder on the generators listed below shall be

GENERATORS	MIN INCHES	MAX INCHES
KS-5123-04 L4, L5, L6, L10, L11, L12, and L13	1/32	3/32
KS-5123-06 L7, L13, L18, and L22	1/32	3/32
CD-1000 series frames	1/16	3/32

Use the R-8550 scale.

(c) Generators manufactured by Electric Products Company, as well as some old General Electric Company machines, are equipped with Baylis brush holders. For these holders, the angle between the brush holder slide surface and a line tangent to the commutator surface at the midpoint of the brush arc shall be as near as is practicable to 60 degrees. Baylis-type brush holders are also used in the generators manufactured by Hertner Electric Company. Here the angle between the brush holder slide surface and a line tangent to the commutator surface at the midpoint of the brush arc shall be

- Min 55 degrees
- Max 58 degrees

Use template.

(d) The brush-holder yoke of a generator having an end-shield bearing with a cast-iron yoke is held in place by a screw with a dowel point. The dowel shall register in its associated hole.

(e) The brush-holder yoke of a generator having an end-shield bearing with a Textolite or composition yoke shall be set so that the marks on the yoke and end shield are in line. Gauge by eye.

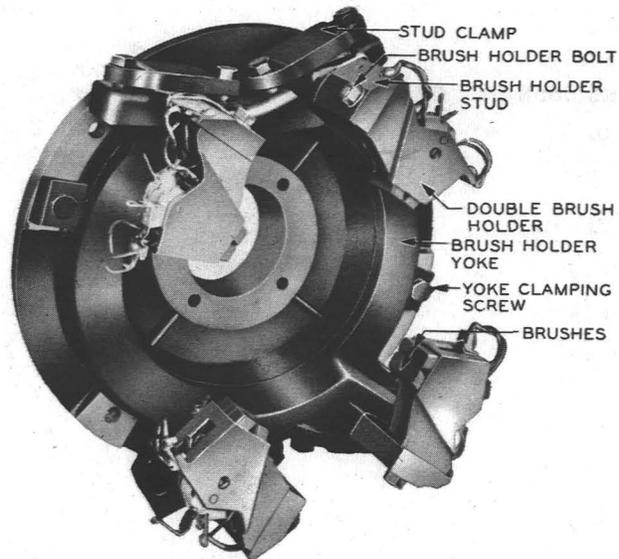


Fig. 15 — Brush Rigging — Double Brush Holders

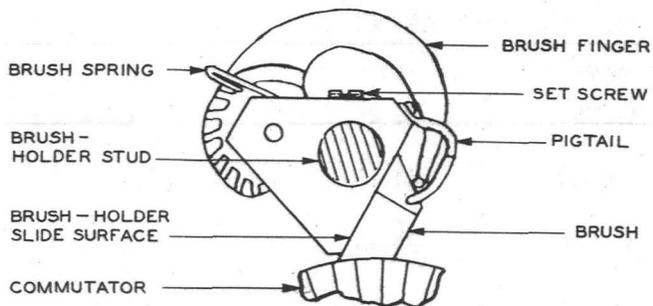


Fig. 16 — Baylis-Type Brush Holders

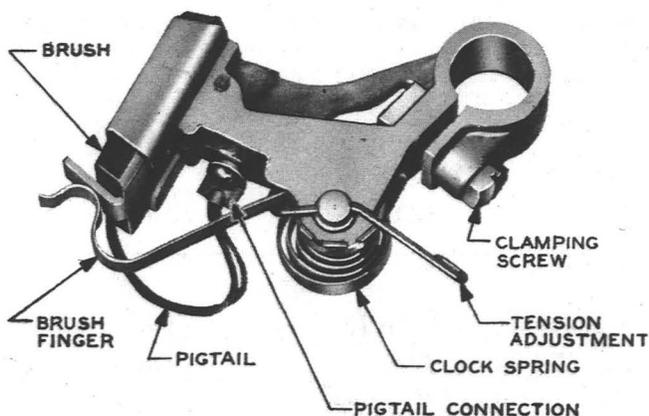


Fig. 17 — Brush Holder Used on Small General Electric Machines

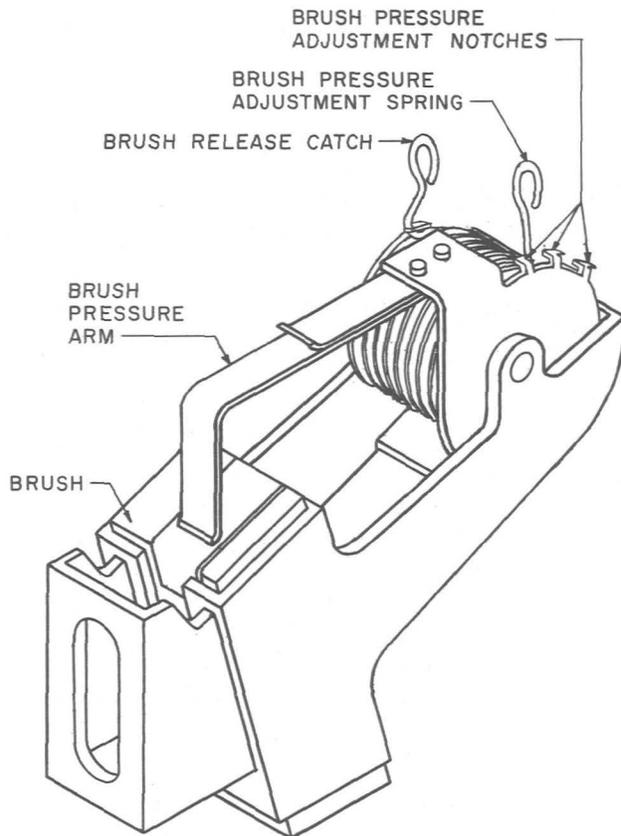


Fig. 18 - Fort Wayne-Type Brush Holder (used on earlier KS-5123-05 machines)

(f) A brush-holder yoke having double brush holders shall be set so that the chisel mark on the yoke lines up with the boss on the bearing housing.

(g) Solderless connectors, if any, shall not overheat.

Gauge by feel.

φ2.12 **Brush Length:** The length of the brushes, measured on the long face of the brush, shall be as specified in Table A.

φ2.13 **Brush Pressure**

(a) When other than constant-pressure brush holders are employed, the brush-holder springs shall be adjusted so that the brush pressure will be as specified in Table A.

Use spring balance or tension gauge as applicable.

Total pressures as specified in Table A are obtained by multiplying brush width by thickness by unit pressure. See Section 171-110-802 for brush dimensions.

(b) Constant-pressure brush holders have a coiled spring which exerts a constant pressure on the brush regardless of the extent of brush wear. They do not require adjustment for pressure, but should be checked each time that a brush is replaced to assure that the coil spring in the holder is bearing directly on the brush and is not entangled with the flexible copper leads.

Caution: On other than constant-pressure brush holders, to avoid exerting uneven pressure and causing uneven wear on the brushes, the pressure of the spring brush fingers or the brush-pressure arms shall be adjusted and then the fingers or arms shall be centrally located on the top of the brushes.

*2.14 **Brush Alignment** (see Section 171-110-701)

*2.15 **Brush Spacing:** The brushes shall be spaced evenly around the commutator so that the variation in the spacing between brushes on adjacent brush-holder studs shall be

Max 1/16 inch

Use scale.

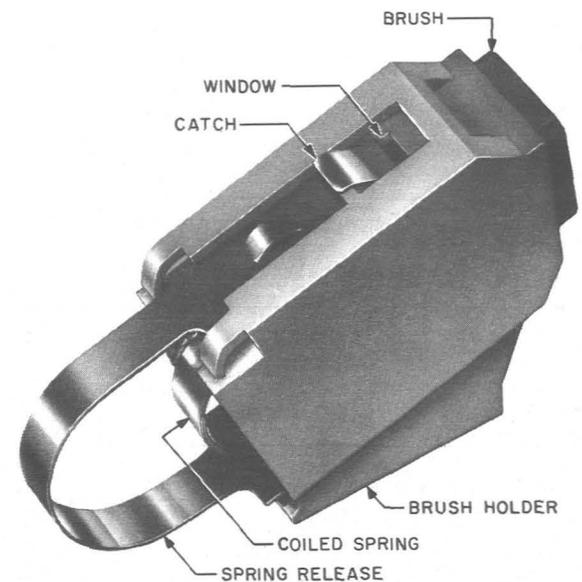


Fig. 19 - Constant-Pressure Brush Holders

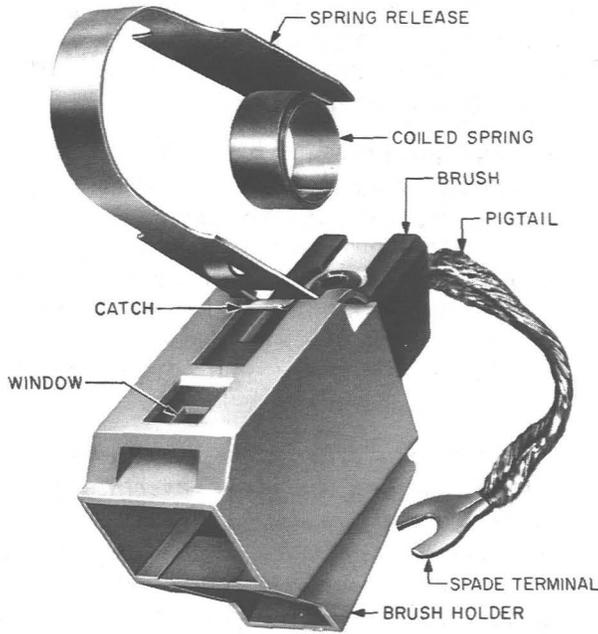


Fig. 20 - Constant-Pressure Brush Holder (open position)

Note: If the generator commutates successfully, it will not be necessary to check this requirement.

***2.16 Temperature**

- (a) The temperature of bearings, windings, and frames shall not exceed

	MAX
Bearings	80 C (176 F)
Windings and Frame	90 C (194 F)

This requirement need not be checked unless the temperature is thought to be excessive, in which case measure by thermometer.

- (b) Solderless connectors and wiring shall not get excessively hot.

Note: Vibration and movement may sometimes loosen the connections, thereby causing the wires, lugs, or slotted nuts to overheat.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-6320	Orange Stick
R-2512	8-Inch Adjustable Wrench
R-2969	Typewriter Brush
—	10-Inch Hand Bellows
—	Lincoln 5958 Grease Gun
—	Gem 1704 Oiler, 1/2 Pint
—	Commutator Polisher, Locally Prepared
—	3-Inch C Screwdriver (for clearing grease drain holes)
—	Stanley 2012 Screwdriver
—	Flat Hex. Wrenches With the Following Openings as Required
—	— 5/16, 3/8, 1/2, 9/16, 3/4, 7/8, 31/32, 1-1/16, 1-7/16, 1-5/8, or 1-13/16 Inches
—	Allen Setscrew Wrench Furnished With Falk Coupling

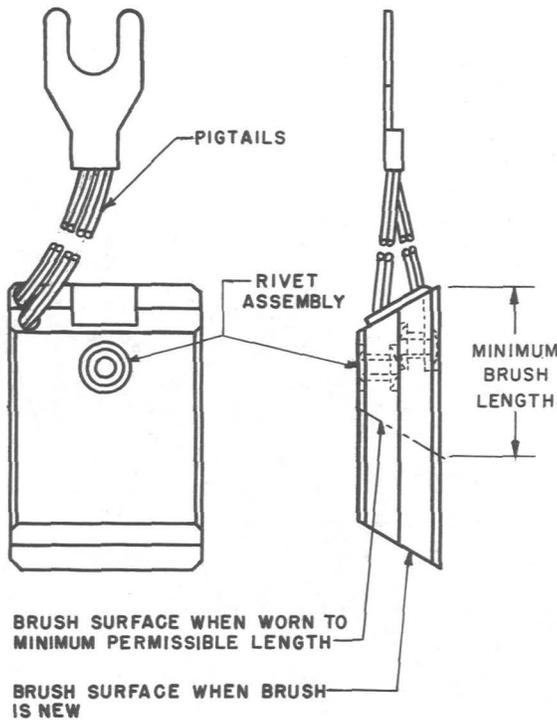


Fig. 21 - Dual Brushes — Pigtails Secured by Rivet

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
79B	Push-Pull Tension Gauge, 0-1000 Grams
KS-6909	Thickness Gauge Nest
R-1032, Detail 1	Thermometer, -5 to 150 C
R-2771	Spring Balance, 0 to 6 Pounds
R-8550	6-Inch Steel Scale
—	8-Inch Outside Calipers
—	Measuring Rule, 2 Feet
—	Type A or No. 5 Tachometer, Boulin Instrument Corp (or the replaced Jones 5B or Lyons Style A Speed Indicator)
MATERIALS	
KS-6824	Sealing Compound
KS-7860	Petroleum Spirits
KS-8372	Stabilized Trichloroethylene, 1-Pint Bottle
KS-14666	Cleaning Cloth
—	Abrasive Paper, Flint Extra Fine or 4/0 Garnet Pouncing Paper or 8/0 Paper
—	Felt Pad or Equivalent
—	Measure, 1 Quart, Funnel Attached
—	Grease, 260-300P
—	Oil, 220-260 S100
—	Oil, Flushing
—	Pail
—	Waste, Wool Yarn
—	Wooden Block
—	EPOXI-PATCH KIT 6C, Hysol Corp, or METALSET KIT A4, Smooth-On Mfg Co

3.002 When using petroleum spirits for cleaning purposes in the power room, provide as much ventilation as is practicable. After using the petroleum spirits, the commutators of all dc machines in the power room should be burnished

in accordance with approved procedures for the machines involved since the fumes from the petroleum spirits may soften commutator film and thus adversely affect commutation.

3.01 Lubrication (Reqt 2.01)

Oil Ring Bearings

(1) To add oil to an oil ring bearing, pour a little oil slowly into the bearing chamber, start the machine, and then shut it down while watching the rise in the gauge. This process is to be repeated until the proper level is indicated in the oil gauge. If the oil does not rise in the gauge, it is an indication that the passage to the gauge or the vent in the top of a glass gauge is blocked and should be cleaned. A small bare copper wire will be found to be advantageous in cleaning the passage. A quart measure with funnel attached may be found very convenient for adding the oil.

(2) To lubricate an oil ring bearing equipped with an oil gauge having a gasketed cover without provision for overflow, such as on the KS-5123-04 and the KS-5137-03 motors, stop the motor and add oil through the gauge until the proper level is indicated. For this purpose, use an oiler. Any spilled oil should be removed from the outside of the housing before the motor is started.

(3) To replace the oil in an oil ring bearing, remove the drain plug in the bottom of the bearing chamber and drain the old oil into a pail or other receptacle. Clean the drain plug and associated threads in the casting, coat the threads on the plug with sealing compound, and replace it. In removing or replacing the drain plug, be sure to use a wrench of the proper size so as not to damage the plug and do not turn the plug in too tightly as it may break the head off. The use of sealing compound should overcome the necessity of turning the plug in too tightly.

(4) If an oil ring is bent or damaged, it should be replaced. Since this will involve dismantling the machine, consult with supervision for repair schedule.

(5) If an oil gauge leaks, the oil should be drained from the bearing chamber into a pail or other receptacle by removing the drain plug at the bottom of the bearing cham-

ber. If the leak occurs at the point where the gauge is screwed into the machine casting, the gauge should be removed, the screw threads on the gauge and in the casting cleaned, the threads on the gauge coated with sealing compound, and the gauge replaced. After the gauge has been replaced, replace the drain plug under the procedure given in (3), and fill the bearing chamber to the proper level with lubricating oil.

(6) To flush a bearing chamber, drain out the old oil, replace the plug, fill the chamber with regular lubricating oil or flushing oil, and run the generator for several minutes. Stop the generator and, when it has come to rest, allow the oil to drain out. After the oil and dirt have been removed, replace the drain plug under the procedure given in (3) and fill the chamber with lubricating oil to the proper level.

Waste-Packed Bearings

(7) Before oiling a waste-packed bearing of the type equipped with an oil gauge, observe the amount of oil in the gauge and test for oil by pressing down on the waste with an orange stick (or screwdriver). If oil appears on the orange stick and there is more than a trace of oil in the gauge, the lubrication has been excessive and the amount of oil should be reduced or the interval between oilings lengthened. If, on the other hand, no oil appears on the orange stick and there is no oil in the gauge, the lubrication has been inadequate and the amount of oil should be increased or the interval between oilings shortened. Adequate lubrication will lie between these extremes.

(8) Before oiling a waste-packed bearing of the type equipped with upper and lower dust caps, remove the lower cap, observe the condition of the waste at that point, and test the waste through the upper cap as in (7). If oil appears on the orange stick and more than a few drops runs out of the bearing, the lubrication has been excessive and the amount of oil should be reduced or the interval between oilings increased. If, on the other hand, the waste at the bottom of the bearing has little or no oil in it and the orange stick shows no oil, the lubrication has been less than adequate and the amount of oil should be in-

creased or the interval between oilings shortened. Adequate lubrication will be indicated by oil showing on the orange stick and by the waste at the bottom of the bearing appearing to be well saturated. If the bearing runs dry, the waste next to the shaft may glaze. Any glazed waste should be replaced.

Ball Bearings

(9) Where the ball-bearing housing is equipped with both a pressure fitting and a drain plug, proceed as follows with the machine stopped.

(a) Wipe off the pressure fitting with a clean cloth to avoid forcing dirt into the bearing chamber; place a pan under the drain hole to catch excess grease.

(b) Remove the drain plug and scoop out as much of the old grease from the drain hole as it is possible to reach with an orange stick. This should remove old coagulated grease and permit pressure relief as the new grease is forced in.

(c) While pumping new grease into the pressure fitting, watch the drain hole and the shaft adjacent to the bearing housing carefully. Stop greasing when grease appears at the drain hole or if grease oozes out along the shaft before it appears at the drain hole. If grease does ooze along the shaft before it comes out of the drain hole, remove the pressure fitting to relieve the grease pressure. With a clean cloth, wipe off any grease that may have oozed along the shaft.

Note: In any case, do not pump more than one full gun (approximately 5 ounces) into the bearing chamber even if grease does not appear at the drain hole or shaft.

(d) Start and run the machine until hot. (This may take several hours.) This will expand the grease and force the excess grease out of the drain hole (or pressure fitting hole if this fitting was removed). After the grease has expanded fully and stopped coming out, stop the machine and scoop out as much grease from the drain hole (or pressure fitting hole) as it is possible to reach with an orange stick. Replace the drain plug (and pressure fitting if removed).

(10) To relubricate a ball bearing which is not equipped with a drain, stop the machine and remove the plate covering the bearing. With a clean cloth and an orange stick, remove all grease from the accessible side. Apply fresh grease around the balls, filling the space between the inner and outer ball rings flush with the sides of the rings. Make no attempt to force grease into the spaces between the balls. Fill the bearing chamber about one-third full of grease and replace the plate.

Flexible Couplings

(11) To lubricate a type C *Falk flexible coupling* (see Fig. 22), remove the cap screws which fasten the C cover to the driving A hub with the Allen wrench (provided with the flexible coupling) and slip the cover back clear of the driven B hub. Locate the open end of the gridmember, pry it loose with a screwdriver, and remove it completely. Clean out all old grease from the gridmember, from the teeth on the hubs, from between the hub end faces, and from the cover by scrubbing with a typewriter brush dipped in petroleum spirits. Inspect the paper gasket if one is provided. If it is damaged, replace it with a new one in accordance with Section 155-512-801.

Note: Older couplings were not provided with gaskets. If desired, a gasket can be made up. It consists of a flat paper ring approximately 1/4 inch wide, fitting against the flange of the driving A hub, inside the bolt line.

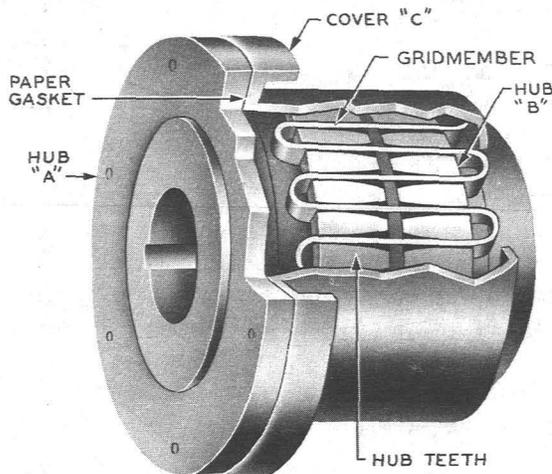


Fig. 22 – Type C Falk Coupling Assembly

(12) A moderate amount of wear of the teeth on the hubs (for example, not exceeding approximately 50 per cent of their thickness) will ordinarily not necessitate replacement of a hub unless operation of the set after relubricating is unsatisfactory because of noise or excessive endplay. Replacement of a hub is a major operation and should be discussed with the supplier since it requires special tools for the removal of the hub, followed by the shrinking of the new hub on the shaft by preheating.

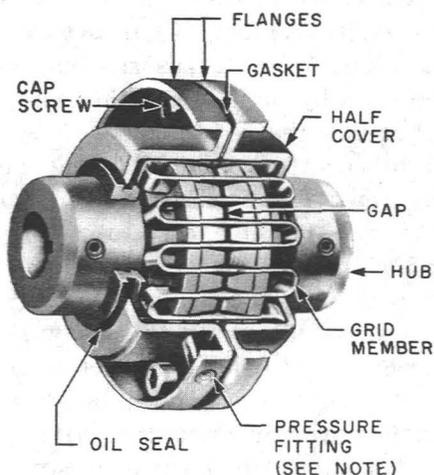
(13) Fill all the slots between the teeth with ball-bearing grease; also, force as much grease as possible down into the gap between the coupling hub end faces. This is essential since, if only the slots are filled, a portion of the grease is squeezed out when the gridmember is inserted. Later, when centrifugal force caused by rotation of the coupling takes effect, most of the little amount of grease remaining in contact with the teeth after inserting the gridmember is thrown into the cover, leaving the teeth practically dry. If the gap is filled, however, not only will the space above the teeth be completely filled, but also the spaces around the teeth and gridmember because of the action of centrifugal force which throws the lubricant outward from the gap.

(14) Examine the gridmember and, if it is not badly worn, re-use it; if it is worn to a sharp edge, replace it in accordance with Section 155-512-801. Insert the gridmember in the slots by hand. Pack the spaces between and around the gridmember loops with as much lubricant as possible, filling the coupling to the limit. This is essential for proper functioning. Scrape off excess lubricant from the top of the gridmember convolutions. Draw the cover over the driven hub and pull up flush. Some excess lubricant will be pushed ahead of the cover into the space between the cover and the flange of the A hub. (See Fig. 22.) Back the cover off enough to allow the insertion of a small steel scale or similar implement and scrape off the excess lubricant so that, when the cover is finally adjusted, there will be no layer of grease to keep it from seating properly on the hub flange. Draw the cover up again and fasten in place with the cap screws. Wipe off excess lubricant.

(15) Examine the coupling after the first few hours of running to see whether the lubricant is leaking out. If there is no leakage or if it stops soon, lubrication of the coupling should be satisfactory. If it comes out between the cover and the flange of the driving hub, tighten the cap screws; if this is not effective, replace the gasket in accordance with Section 155-512-801. Some of the surplus grease may work out along the shaft past the inner edge of the cover during the first few times the machine is run and after it is stopped. If this continues until an amount believed to be more than the surplus applied has escaped, pull back the cover and examine the grease as to quantity and consistency, that is, whether oil has separated out; repack if necessary.

(16) To lubricate a type F Falk flexible coupling (see Fig. 23), remove the cap screws that fasten the two half covers and slide the covers back over the hubs to expose the hub teeth and gridmember. Follow the applicable instructions contained in (13) to (15), inclusive, for cleaning and relubricating before rejoining the two half covers and replacing fastening screws and nuts.

(17) On the earlier vintage coupling, the half covers have a grease pressure fitting in the flanges. This fitting should not be used for



NOTE: PRESSURE FITTINGS WERE FURNISHED ON SOME EARLY VINTAGE TYPE "F" COUPLINGS. THESE FITTINGS SHOULD NOT BE USED FOR LUBRICATION.

Fig. 23 - Type F Falk Coupling Assembly

lubricating the coupling. If the coupling should begin to leak oil before the regular inspection and lubrication period, the following procedure shall be followed to seal off the pressure fitting. It shall also be followed the first time the coupling is dismantled for inspection and relubrication.

(a) Clean out the pressure fitting holes from the inside using trichloroethylene and a clean cloth. The holes should be cleaned as thoroughly as possible. The holes should then be filled flush to the inner surface of the half covers with epoxy resin compound. The outer end of the pressure fitting shall also be sealed off by filling the fitting hole with compound flush to the outer surface of the flange. The compound shall be permitted 24 hours to set and cure before the half covers are reassembled and the machine put back into operation.

(18) The epoxy resin compound is mixed on the job, following the instruction contained in either the EPOXI-PATCH KIT 6C or the METALSET KIT A4. In separate tubes similar to toothpaste tubes, these kits furnish resin and hardener that can be mixed on a flat surface of discardable nature by squeezing out equal lengths from each tube and mixing with a spatula furnished in the kit.

Caution: Do not allow skin contact with unset and uncured compound. If contact should occur, wash immediately with hot water and soap.

3.02 Voltage (Req't 2.02)

(1) Vary the voltage of the generator by manually operating the handwheel of the associated rheostat. If the voltage cannot be adjusted within the proper limits, examine the rheostat for possible injury and replace or repair if necessary. Examine the generator windings for possible trouble or loose connections and repair or replace. If the voltage is still outside the limits, check the driving agent for the proper speed and correct if necessary. If the voltage remains outside the limits after the above checks, it may be necessary to replace the generator.

(2) If, *at installation* or after the internal connections have been repaired, the generator fails to build up voltage or builds up in the

wrong direction, the field may be reversed. In this case, with the machine stopped, raise the brushes, place paper between the brushes and the commutator for insulation, and operate the rheostats to the "all resistance in" position. Block the circuit breaker contactor operated and momentarily close the charging switch to "flash" the field. If this does not clear the trouble, verify circuit continuity through the rheostat resistance and contacts and examine the rheostat for possible injury. Compare the speed of the machine with the rated speed given on the nameplate.

3.03 Capacity (Reqt 2.03)

- (1) To determine the output of a generator, observe the current and voltage at a time when the office load is at a maximum.

3.04 Bearings (Reqt 2.04)

(1) Ball bearings, in general, are noisier than sleeve bearings. If there is some question about the condition of the bearing because of its noisy operation, or if its performance is in doubt, proceed as outlined in (a) and (b).

(a) Shut the machine down and remove the generator brushes. Run the machine to its rated speed. Shut the machine down and, while it is coasting to a stop, determine if the noise ceases before the machine comes to a stop. If the noise ceases before the machine comes to a stop, the bearing has not been damaged. If noise does not cease, but merely decreases in frequency, the bearing is damaged and should be replaced.

(b) Rotate the armature by hand to check for freedom of rotation. If there is no binding, the bearing is operating under normal conditions. If there is a restriction of movement, such as binding and dragging, the machine may not be properly installed or the units may not be properly aligned. In such a case, consult the supervisor regarding further investigation.

Caution: Never attempt to silence a noisy ball bearing by pressure lubrication.

High pressure within the bearing chamber may result in overheating, carbonization of the lubricant, and damage to the bearings.

3.05 Freedom of Rotating Parts (Reqt 2.05)

- (1) Examine the motor-generator and remove any foreign objects which would prevent rotation. Also check to see that all bolts are firm. Tighten if necessary. Examine the generator for binding brushes or worn bearings, and adjust or replace if necessary.

3.06 Direction of Rotation (Reqt 2.06)

- (1) If a generator driven by a 3-phase motor rotates in the wrong direction, interchange two of the three leads connecting the motor to the power service. If in the case of incorrect rotation the drive is other than a 3-phase motor, refer to the supervisor.

3.07 Airgap (Reqt 2.07)

- (1) With the armature of the generator in any position, measure the airgap between the armature and each pole face with a thickness gauge. Particular care should be taken in measuring the airgap between the armature and the pole faces mounted in the lower half of the generator frame, since this is where it is most likely to be less than the allowable minimum. Rotate the armature approximately a quarter of a turn and repeat the above. Check should be made with the armature in at least four different positions.

Caution: Where the associated motor is arranged to start automatically, remove the supply fuses before attempting to measure the airgap.

- (2) If the airgap is too small, the matter should be referred to the supervisor, since new bearings should be installed.

3.08 Noise and Vibration (Reqt 2.08)

- (1) Where excessive noise and vibration are present, see that all bolts are drawn up firmly.
- (2) If the set is supported by coil springs, these springs may be adjusted, where required, by loosening the locknut on the adjusting screw of the spring in question and turning the screw in or out as found best by trial. The locknut should be tightened when the adjustment is complete.

(3) If the set is supported by rubber mounting cushions, the cushions may be adjusted, where required, by adding or removing shims, where provided.

(4) Noise and vibration may be caused by worn bearings. If this is found to be the case, the bearings should be replaced and the alignment checked and adjusted if necessary.

(5) Noise and vibration may be due to misalignment caused by setting the machines on compressible floor coverings such as linoleum or asphalt tiles.

(6) If the noise and vibration continue to be excessive after the above adjustments have been made, refer the matter to the supervisor since the motor-generator may have to be replaced. The supplier or his approved representative should be consulted.

3.09 Commutator (Reqt 2.09)

(1) See Section 171-110-701 for commutator care.

Note 1: For commutators in CD-1000 series frames, where it is not practicable to apply the commutator polisher "end on," it may be applied with the stick at an acute angle to the shaft so as to bring the face of the canvas pad into contact with the commutator.

Note 2: When it is known that the machines are to operate at light loads for a week or more, as sometimes occurs especially during the installation period, remove some of the brushes from the commutator in accordance with Section 171-110-701. This is to avoid loss of commutating film.

Note 3: Because of the difficulties involved in turning down the commutators of machines with CD-1000 series frames while mounted in their respective machines, it is recommended that, when it becomes necessary to turn down a commutator, the armature be removed and sent to a suitably equipped shop. Make a mark across the coupling so as to insure replacement as originally assembled and preserve the dynamic balance.

(2) When the commutator reaches the minimum diameter specified, the machine should be taken down and the armature returned to the shop for the installation of a new commutator or a complete new armature should be installed. For measuring the diameter of a commutator, use the 6-inch scale or the 2-foot rule and the 2-inch calipers where applicable. For commutators which cannot be measured by these calipers, obtain others locally.

3.10 Commutation (Reqt 2.10)

(1) If the commutation is not satisfactory, see that 2.07, 2.09, and 2.11 to 2.15, inclusive, are met. With the above conditions met, the commutation should be satisfactory. See Section 171-110-701.

(2) The factory marking for the setting of the brush-holder yoke will usually give the best commutation over the complete load range, and this setting should be changed as a last recourse only after all other requirements of this section have been met. If the charging amperes of the generator swing over a wide range with the battery voltage approximately constant and with no change in the speed of the driving agent, it is an indication that it may be possible to improve the operation of the machine by shifting the yoke slightly.

3.11 Brush Holders and Yokes (Reqt 2.11)

(1) To adjust the clearance between the lower edge of a box-type brush holder and the commutator, where the brush-holder yoke is not slotted, loosen the brush-holder clamping screw and rotate the brush holder on its stud as required. After an adjustment, be sure the clamping screw is tightened firmly. If the brush-holder yoke is slotted, proceed in accordance with (3) except that, with box-type brush holders, the brush angle is not so critical. After adjusting a brush holder, check the brush for fit and sand in, if necessary, in accordance with 3.13.

(2) To adjust the clearance between the lower edge of a double brush holder and the commutator, loosen the brush-holder bolt and slide the holder up or down as required.

(3) To adjust the distance between a Baylis-type brush holder and commutator, loosen the hexagonal nuts holding the brush-holder stud in place in the brush-holder yoke. Slide the stud in the slotted holes of the yoke as found necessary. Inasmuch as the brush angle is very critical, any adjustment of distance of the brush holder from the commutator should be made by sliding the brush stud up or down in the slots without turning the brush holders on the studs or the studs themselves. Check the angle after adjusting the clearance.

(4) To set a Baylis-type brush holder at the correct angle, cut a guide template as described below. Reproduce Fig. 24 on a piece of stiff cardboard, making the radius of the arc equal to the radius of the commutator. The radius is one-half of the diameter, which may be obtained by measurement, or the minimum diameter shown in 2.09(c) may be used. Draw a radius and, where it crosses the arc (point A), draw a line AC at a right angle to it. This will be tangent to the arc. From point A, measure 2 inches along this line and draw another line BD at a right angle. Measure along this line 3-1/2 inches for a General Electric or Electric Products machine and mark the point B. For a Hertner Electric machine, measure 3 inches. Draw the line AB. In the first case, this line will be at an angle of 60 degrees to the tangent and, in the second, at an angle of 56-1/2 degrees. Draw another line EF parallel to, and to the left of, the line AB at a distance from it equal to one-half the thickness of the brush. Cut the template as shown and, first loosening the setscrew which holds the brush holder to its stud, place the template against the commutator surface and the slide surface of the brush holder, rotating the holder to obtain the required angle. Tighten the setscrew firmly.

(5) In adjusting the clearance of any type of brush holder, it is desirable to work toward the minimum limit. If desired, a gauge instead of a scale may be used to measure the clearance between the brush holder and commutator.

(6) To adjust a brush-holder yoke, loosen the locknut or clamping screws, shift the yoke as necessary, and retighten. If the yoke is held

in position on the housing by a setscrew or dowel, this locking device should be loosened before shifting the yoke position and then tightened firmly at the close of the adjustment.

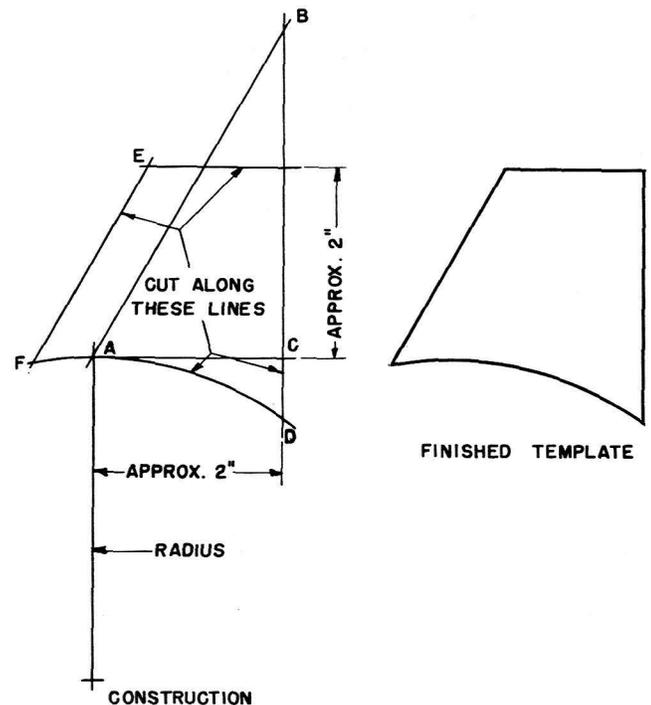


Fig. 24 - Template for Setting Baylis-Type Brush Holder

(7) Solderless connectors may eventually loosen because of the conductor contracting and expanding with temperature variations and vibrations. With the machine shut down, periodically tighten the connector until no further take-up is obtained. If this fails to clear the trouble, it may be necessary to remove the end shield of some types of machines in order to obtain easy access to the connector. Before removing the end shield, it will be necessary to support the armature by inserting wooden wedges between it and each of the lower main field poles. These wedges should be of hard wood and approximately 0.2 inch thick, 1/2 inch or more wide, and of convenient length. Insert a wedge at the edge of the pole, parallel to the shaft, and move it toward the center until it fits snugly.

3.12 Brush Length (Reqt 2.12)

- (1) Replace any short brushes.

3.13 Brush Pressure (Reqt 2.13)

- (1) See Section 171-110-701 for adjustment.

In machines where some of the brush holders are covered by the frame and are not accessible for a brush-pressure measurement, check by feel that the pressure on these brushes is approximately the same as those measured by a gauge or see that the brush pressure spring is in the same brush-holder notch as those adjusted by gauge.

Note: For generators having requirements not exceeding 1000 grams, the use of the 79B tension gauge is recommended in preference to the spring balance.

- (2) For brushes in KS-5123-04 machines and in CD-1000 series frames, the pressure will be satisfactory if the setting of all brush-pressure springs is made to correspond with that of one which has been adjusted per Section 171-110-701.

- (3) For setting the brush pressure on the Fort Wayne-type brush holders, first set the brush release catch (see Fig. 18) and then set the adjustment spring in the proper notch to obtain the required brush pressure. In releasing the brush pressure, the sequence of operation is reversed. First disengage and release the adjustment spring, then disengage the brush release catch. The above sequence should be carefully observed in order to prevent the spring from binding.

- (4) Where poor commutation has been experienced due to difficulty in maintaining proper brush pressure, a change to the constant-pressure brush holder is recommended. Conversions shall be made in accordance with P.E.M. 7601 for General Electric Company motor-generators and P.E.M. 8323 for Hertenner motor-generators.

3.14 Brush Alignment (Reqt 2.14)

- (1) To realign a brush in a box-type or Baylis-type brush holder, loosen the clamping screw and shift the brush holder along the

brush-holder stud. Tighten the clamping screw. After changing the position of a brush holder, check to see that the brush holder has the proper clearance from the commutator and that the brush fits properly. With Baylis-type brush holders, check the angle also.

- (2) To realign the brushes in a double brush holder, loosen the screws clamping the brush stud to the brush yoke and shift the brush stud as necessary.

3.15 Brush Spacing (Reqt 2.15)

- (1) If the spacing is uneven, it may be adjusted by rotating the brush holder on the stud, by loosening the nut on the brush holder stud and shifting the stud, or by a combination of these two adjustments until the brushes make contact with the commutator at the desired point. Tighten the brush-holder stud nut and clamping nuts on the brush holders; refit the brushes. Any adjustment of the brush holder will necessitate a check of the brush alignment, brush-holder clearances, and in the case of Baylis type, the angle, in accordance with 2.11(b).

Note: To check the position of the brushes for spacing, slip a piece of paper between the brush and the commutator and mark the outline of the toes of the brushes.

- (2) On generators with tubular-type or double brush holders, no adjustment of the brush spacing is possible.

3.16 Temperature (Reqt 2.16)

- (1) The temperature of the bearings should be taken in one of two ways outlined as follows, with the machine running. One method (for bearings having oil rings) is to place the bulb of a thermometer in the lubricating oil of the bearing for at least 5 minutes if the oilwell opening is large enough to permit this, taking care that the thermometer does not strike the shaft or interfere with the proper operation of the oil ring. This method is to be preferred but, where the bearing con-

struction makes it impractical, the second method may be used.

(2) The second method is to hold the bulb of the thermometer against the hottest spot on the outside of the bearing housing as near as possible to where the bearing is located, covering that part of the bulb which is not in contact with the housing with a piece of felt or the equivalent, and observing the highest temperature indicated.

(3) The windings and machine frame may be measured for temperature in a similar manner, with the generator stopped if required for safety.

(4) If the temperature exceeds the specified limits, see that the other requirements are met. If these requirements are met and the temperature is still outside the specified limits, refer the matter to the supervisor since the generator may have to be replaced.