KS-15532 RINGING MACHINES

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers KS-15532 L1 through L34 ringing machines.

1.02 This section is reissued to revise the asterisk (*) in paragraph 1.05 and add requirement for the maximum amount of pressure on the spring pack when the cam follower is on the uppermost part of the cam. This reissue does not affect the Equipment Test List.

1.03 The KS-15532 ringing machines consist of a 220-volt, single- or 3-phase, 60-Hz ac or 48-volt dc motor; a 20-Hz ac generator with a rated output of 1 ampere at 86 volts; a tone alternator providing two low-tone channels (600 Hz modulated by 120 Hz) and one high-tone channel (500 Hz); and an interrupter to provide various ringing and signaling interruptions. See Fig. 1 and 2.

1.04 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.

1.05 ***Asterisk (*):*** A requirement marked with an asterisk necessitates dismantling of the apparatus to check the requirement. If the apparatus is dismantled for other reasons, check these requirements while the parts are accessible. However, when a check for a requirement marked with an asterisk is included in the Equipment Test List, the interval between checks must not exceed the interval given in the ETL.

Warning: To avoid unexpected starting due to automatic transfer, disconnect the power supply to the ringing machine as covered in the appropriate section covering the ringing power plant in which the ringing machine is used.

2. REQUIREMENTS

2.01 ***Lubrication and Cleaning***

(a) ***High-Speed Shaft and Interrupter Shaft Bearings Equipped With Grease Fittings:*** The bearings shall be lubricated with 260-300P or KS-7471 grease before operation of the ringing machine at the time of installation, if the machine has been in storage for more than one year, and annually thereafter. If grease does not readily emerge from the drain hole during the grease lubrication procedure, a change from grease lubrication to oil lubrication will be required.

(b) ***High-Speed Shaft and Interrupter Shaft Bearings Equipped With Oil Lubrication Option:*** The oil lubrication option should be used to replace grease lubrication if grease becomes hardened in the bearing cavity and blocks the drain hole. When equipped for oil lubrication [see 3.01(b)], lubricate the bearing on a 6-month basis with three drops of KS-19139 L4 lubricant applied in each cup. Care should be taken not to use more oil than is specified.

(c) ***Interrupter Shaft Bearings Not Equipped With Grease Fittings:*** The interrupter shaft bearings not equipped with grease fittings shall be cleaned annually to prevent the buildup of foreign particles. To clean the bearing, apply two drops of KS-16326 L1 oil at each interrupter shaft bearing not equipped with grease fittings.

2.02 ***Freedom of Rotating Parts:*** The rotating parts shall rotate freely.

Gauge by feel.

To check this requirement, remove the snap-off end plate and insert the crank or the proper size Allen setscrew wrench into the end of the high-speed shaft. Rotate the shaft through several revolutions. The intermittent magnetic drag on the rotor during each revolution should not be mistaken for binding.

2.03 ***Direction of Rotation:*** The interrupter shaft shall rotate clockwise as viewed from the tone alternator end of the ringing machine.

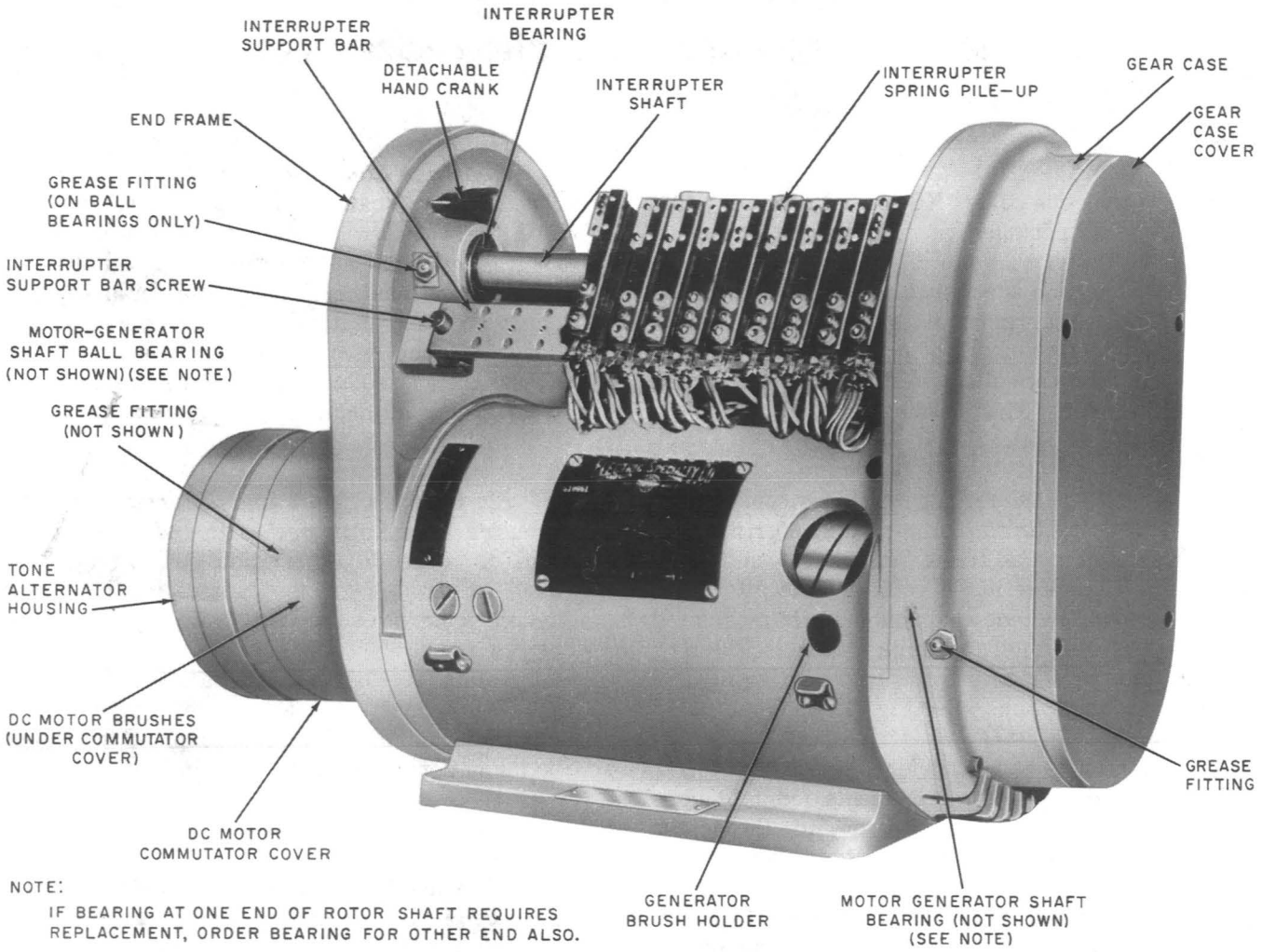

Fig. 1—KS-15532 DC Motor-Driven Ringing Machine-Interrupter Cover Removed-Tech Systems Company (formerly Electric Specialty Company)

Gauge by eye.

2.04 ***Operating Noise and Vibration:*** The noise and vibration of the machine, while operating under normal conditions, shall not be excessive.

Gauge by sound and feel.

2.05 ***Condition of Motor Commutator and Collector Rings:*** The commutator and collector rings shall meet the applicable requirements covered in Section 171-110-701.

2.06 ***Condition of Brushes:*** The brushes shall meet the applicable requirements covered in Section 171-110-701.

2.07 ***Brush Length***

(a) ***Brushes in Tubular-Type Holders:*** The overall length of the brushes shall be a minimum of 3/8 inch.

Use the R-8550 steel scale.

(b) ***Brushes in Box-Type Holders:*** With the inner end of the brush in contact with the commutator or collector ring, the outer end shall

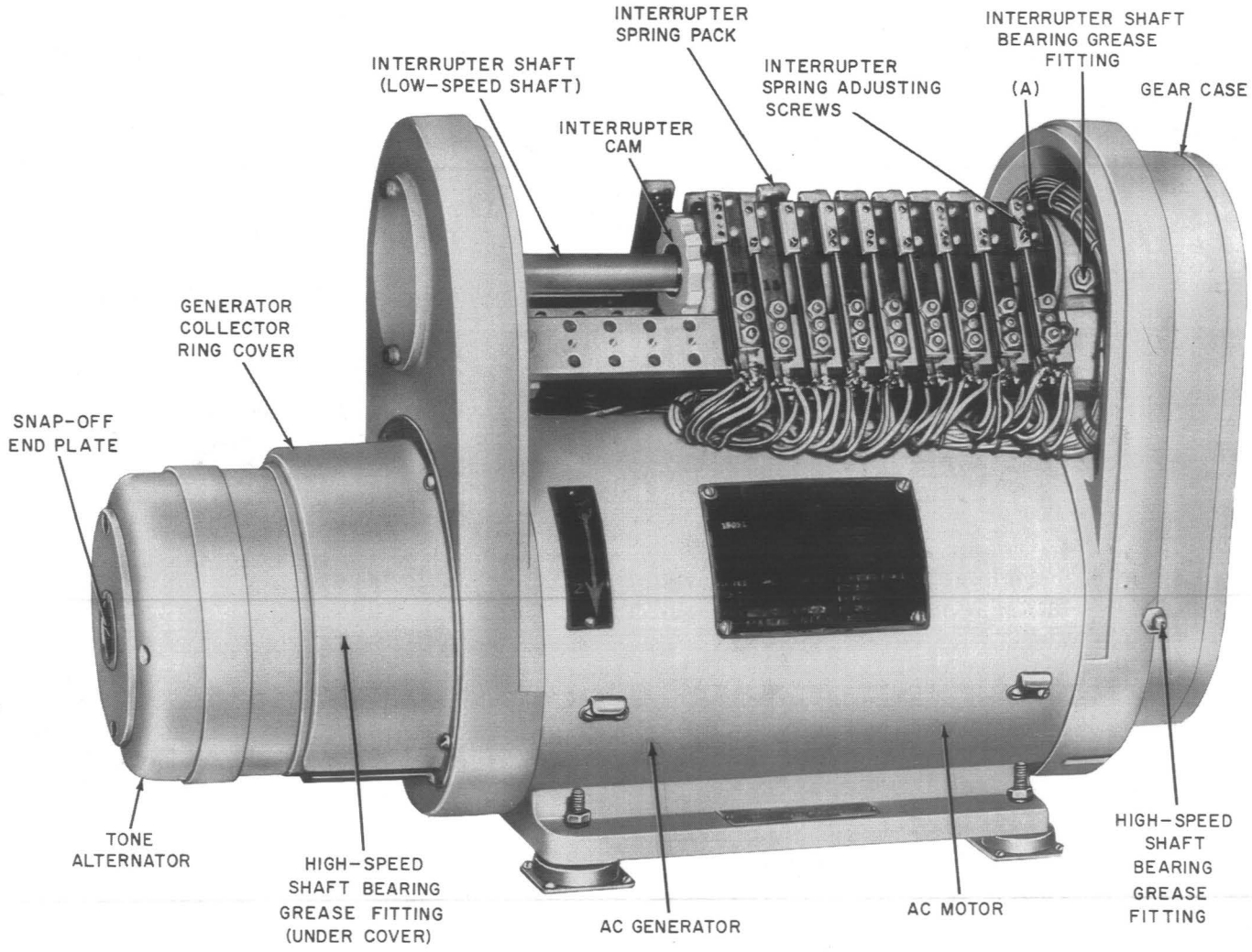

Fig. 2—KS-15532 AC Motor-Driven Ringing Machine-Interrupter Cover Removed-Tech Systems Company (formerly Electric Specialty Company)

extend a minimum of 1/16 inch beyond the outer end of the brush holder.

Use the R-8550 steel scale.

2.08 ***Motor Speed:*** With the input voltage and current within the limits specified on the nameplate and under all conditions of load, the motor speed shall be as follows:

- Minimum—1100 rpm

- Maximum—1215 rpm

Use the Boulin Instrument Corp, No. 5 tachometer or the KS-1894 stopwatch.

To check this requirement, remove the snap-off end plate with the 3-inch C screwdriver and apply the tachometer to the end of the high-speed shaft, if space permits. If there is insufficient space to use the tachometer, time ten revolutions of the low-speed shaft by observing the leading edge of the lobe on the No. 1 cam as it passes the end of the associated spring pack [Fig. 2(A)]. Use the KS-1894 stopwatch. Ten revolutions of the low-speed shaft correspond to 1200 revolutions of the high-speed shaft. Compute the rpm of the low-speed shaft

and multiply by 120 to determine the speed of the high-speed shaft.

*2.09 *AC Generator Output Voltage:* With the input voltage and current within the limits specified on the nameplate and under all conditions of load, the output of the generator shall be as follows:

- Minimum—84 volts
- Maximum—88 volts.

Use the KS-14510 volt-ohm-milliammeter.

To check this requirement, apply the volt-ohm-milliammeter leads across terminals A4 and A6 of the terminal strip to which the ringing machine is connected.

*2.10 *Tone Alternator Output Voltage:* With the input voltage and current within the limits specified on the nameplate, the output voltage of the tone alternator shall be as follows.

CHANNEL	NO LOAD (VOLTS)
Low Tone (Phase 1)	Max 3.3
Low Tone (Phase 2)	Max 3.3
High Tone	Max 9.9

Use the KS-14510 volt-ohm-milliammeter.

To check this requirement, apply the volt-ohm-milliammeter leads across terminals E10 and E13 (low tone, phase 1), terminals E6 and E9 (low tone, phase 2), and terminals E1 and E5 (high tone) of the terminal strip to which the ringing machine is connected.

2.11 *Motor Frame Temperature:* The temperature of the motor frame shall not exceed 90°C (194°F).

Use the R-1032, detail 1, thermometer.

To check this requirement, hold the bulb of the thermometer against the motor frame. Cover the portion of the bulb not in contact with the motor frame with the asbestos pad. Observe the maximum temperature reading.

Interrupter Requirements

*2.12 *Tightness of Spring Pack Mounting Screws:* The spring packs shall be securely mounted.

Gauge by feel.

*2.13 *Cleaning of Contacts:* The contacts shall be cleaned when necessary.

Gauge by eye.

*2.14 *Contact Alignment*

(a) *Point-Disc Contacts:* The point of contact shall fall entirely within the circumference of the opposing contact disc.

(b) *Bar Contacts:* The width of the contact surface of each contact bar shall fall entirely within the length of its mating bar.

Gauge by eye.

*2.15 *Contact Follow*

(a) There shall be visible follow of all contact springs after closure of the contacts.

Gauge by eye.

(b) ◗The maximum pressure on any spring pack measured when the cam follower is on the uppermost part of the cam shall not exceed 300 grams.

Use the 62B gauge to measure.

Note: This measurement shall be made after the timing adjustments have been made.◖

*2.16 *Timing Requirements*

(a) The timing of the normally open and normally closed contacts (see Fig. 3) adjacent to the cam shall be in accordance with the applicable timing chart in Fig. 4 through 18 and the tolerances covered in (b), unless otherwise specified on the job information.

(b) *Tolerances for Requirement (a)*

(1) Taking the closure of the normally open contacts in the No. 1 spring pack as occurring at 0 revolutions, the closing or opening of the contacts adjacent to the cam in other spring packs shall occur within ± 1 revolution from their point of closure or opening as shown in the applicable chart in Fig. 4 through 18.

(2) Contacts shall remain closed or open for not less than the smaller or more than the greater number of revolutions shown in the adjustment limit column of the applicable chart in Fig. 4 through 18.

Gauge by eye.

Check as covered in (e).

(c) ***Transfer Period:*** The interval between the opening of one pair of contacts and the closing of the associated pair of contacts in each transfer spring combination shall be as follows:

- Minimum—3/4 revolution of the high-speed shaft
- Maximum—1-1/2 revolutions of the high-speed shaft.

Gauge by eye.

(d) ***Sequence of Closure of Make Contacts (Spring Packs Having Two or More Make Combinations)***

(1) The make contacts adjacent to the cam shall close first.

(2) The make contacts adjacent to those covered in (1) shall close within 1/4 revolution of the high-speed shaft after closure of the contacts covered in (1).

(3) The make contacts adjacent to those covered in (2) shall close within 1/2 revolution of the high-speed shaft after closure of the contacts covered in (1).

Gauge by eye.

Check as covered in (e).

(e) To check the timing, proceed as follows.

(1) Make sure the power is disconnected from the ringing machine before turning the shaft with the crank or wrench as covered in (2).

(2) Initially, these ringing machines were provided with a crank which screwed into a threaded hole (right-hand thread) in the tone alternator end of the high-speed shaft. The end of the shaft on later ringing machines has a hexagonal hole into which is inserted an Allen wrench to serve as a crank.

(3) Check the timing by using the 81A test set or an indicating lamp connected across the contacts to indicate opening or closure of the contacts. Check the intervals by counting the number of revolutions of the high-speed shaft while turning it by hand with the crank or Allen wrench. The timing of each spring pack should be checked for a complete revolution of its associated cam.

Note 1: The timing of the spring contacts is expressed on the timing figures in revolutions of the high-speed shaft. It is desirable to use this shaft since it gives a close adjustment due to the gear reduction to the interrupter cam shaft.

Note 2: If bell tapping occurs in superimposed ringing circuits due to transients caused by interrupting the 20-Hz output at a peak portion of the cycle and the timing requirements are met, the timing adjustments shall be changed slightly within the requirements as covered in 3.15 through 3.16(2).

(f) ***Cam Follower Bottoming:*** There shall be no bottoming of the cam followers in the low dwell portions of the cams after all other interrupter and timing requirements have been met.

Gauge by eye.

2.17** ***Clearance: The clearance between current-carrying parts and metallic parts at ground potential shall be a minimum of 0.016 inch.

3. ADJUSTMENT PROCEDURES

3.001 *List of Tools, Gauges, and Materials*

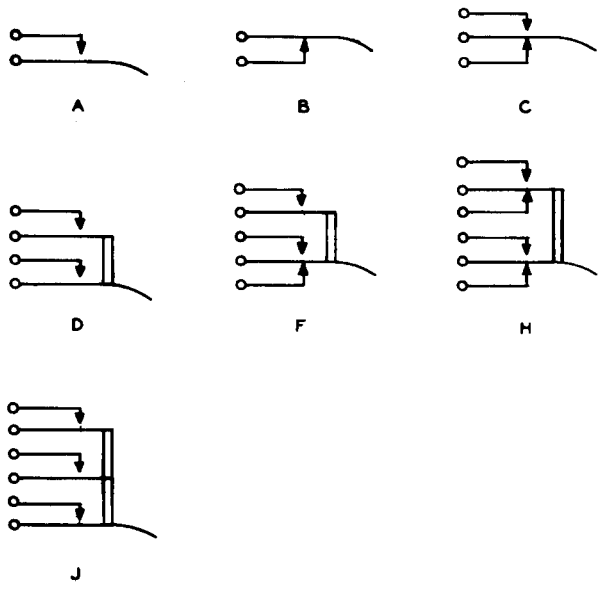

Fig. 3—Spring Pack Types

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT	ONE CYCLE=120 REVOLUTIONS OF THE HIGH SPEED SHAFT REVOLUTIONS 0 20 40 60 80 100 120
1	1	F	35-37	
2	1	C	35-37	
3	1	C	35-37	
4	1	C	17-19	
5	1	C	35-37	
6	1	C	17-19	
7	1	A	17-19	
8	1	C	26-28 | 8-10	
9	1	C	26-28 | 8-10	
10	1	C	26-28 | 8-10 | 26-28	112
11	1	C	4-6	
12	1	H	17-19	29, 89
13	1	A	9-10	
14	1	A	59-61	
15	1	A	35-37	55
16	1	A	17-19	
17	1	J	9-11	
18	1	J	5-6	
19				
20				
21				
22				
23				
24				
25	2&3	B	5-6	
26	2&3	B	3-4	

Fig. 4—Lists 1, 1 & A, 2, and 2 & A Timing

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT	ONE CYCLE=120 REVOLUTIONS OF THE HIGH SPEED SHAFT REVOLUTIONS 0 20 40 60 80 100 120
1	1	F	35-37	
2	1	C	35-37	
3	1	C	35-37	
4	1	C	17-19	
5	1	C	35-37	
6	1	C	35-37	
7	1	C	35-37	
8	1	C	17-19	112
9	1	C	4-6	29, 89
10	1	F	9-10	17, 77
11	1	C	9-10	
12	1	H	17-19	
13	1	J	9-11	
14	1	J	5-6	
15	1	F	59-61	
16	1	A	26-28	115
17	1	D	17-19 | 26-28	
18	1	A	17-19	
19				
20				
21				
22				
23				
24				
25	2&3	B	5-6	
26	2&3	B	3-4	

Fig. 5—Lists 3, 3 & A, 4, 4 & A, 15, and 15 & A Timing

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT	ONE CYCLE=120 REVOLUTIONS OF THE HIGH SPEED SHAFT REVOLUTIONS 0 20 40 60 80 100 120
1	1	F	35-37	
2	1	C	35-37	
3	1	C	35-37	
4	1	C	17-19	
5	1	C	35-37	
6	1	C	35-37	
7	1	C	35-37	
8	1	C	17-19	112
9	1	C	4-6	29, 89
10	1	F	9-10	17, 77
11	1	C	9-10	
12	1	H	17-19	
13	1	J	9-11	
14	1	J	5-6	
15	1	F	59-61	
16	1	A	26-28	115
17	1	D	17-19 | 26-28	
18	1	A	17-19	
19				
20	1	F	26-28	
21	1	F	26-28	
22	1	F	26-28 | 8-10	
23	1	F	26-28 | 8-10	
24	1	F	26-28 | 8-10 | 26-28	
25	2&3	B	5-6	
26	2&3	B	3-4	

Fig. 6—Lists 5, 5 & A, 6, 6 & A, 16, and 16 & A Timing

Check as covered in (e).

TIMING NOTES:
1. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY OPEN CONTACTS ADJACENT TO THE CAM ARE CLOSED.
2. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY CLOSED CONTACTS ADJACENT TO THE CAM ARE OPEN.
3. THESE SPRINGS ARE FURNISHED ONLY ON MACHINES HAVING A DOUBLE LIST NUMBER, E.G., LIST 1 & A.

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35 - 37
2	1	C	35 - 37
3	1	C	35 - 37
4	1	C	17 - 19
5	1	C	35 - 37
6	1	C	35 - 37
7	1	C	35 - 37
8	1	C	17 - 19
9	1	C	4 - 6
10	1	F	9 - 10
11	1	C	9 - 10
12	1	H	17 - 19
13	1	J	9 - 11
14	1	J	5 - 6
15	1	F	59 - 61
16	1	A	26 - 28
17	1	D	17-19 | 26-28
18	1	A	17 - 19
19			
20	1	F	17 - 19
21	1	F	8 - 10
22	1	F	8 - 10
23	1	F	35-37 | 8-10
24	1	F	35-37 | 8-10
25	2&3	B	5 - 6
26	2&3	B	3 - 4

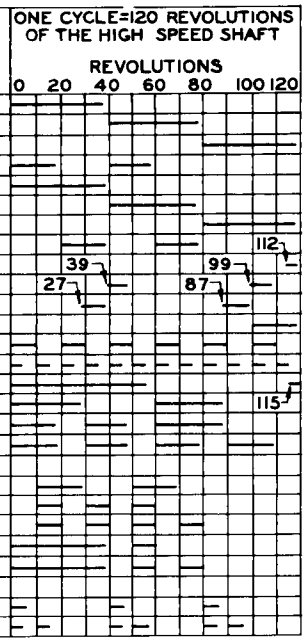

Fig. 7—Lists 7, 7 & A, 8, and 8 & A Timing

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35 - 37
2	1	C	35 - 37
3	1	C	35 - 37
4	1	C	17 - 19
5	1	C	35 - 37
6	1	C	35 - 37
7	1	C	35 - 37
8	1	C	17 - 19
9	1	C	4 - 6
10	1	F	9 - 10
11	1	C	9 - 10
12	1	H	17 - 19
13	1	J	9 - 11
14	1	J	5 - 6
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	2&3	B	5 - 6
26	2&3	B	3 - 4

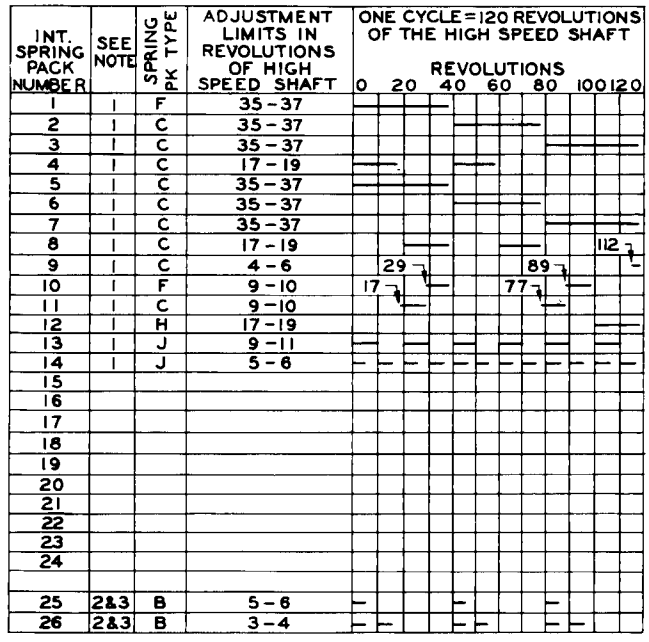

Fig. 9—Lists 11, 11 & A, 12, 12 & A, 17, and 17 & A Timing

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35 - 37
2	1	C	35 - 37
3	1	C	35 - 37
4	1	C	17 - 19
5	1	C	35 - 37
6	1	C	35 - 37
7	1	C	35 - 37
8	1	C	17 - 19
9	1	C	4 - 6
10	1	F	9 - 10
11	1	C	9 - 10
12	1	H	17 - 19
13	1	J	9 - 11
14	1	J	5 - 6
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	2&3	B	5 - 6
26	2&3	B	3 - 4

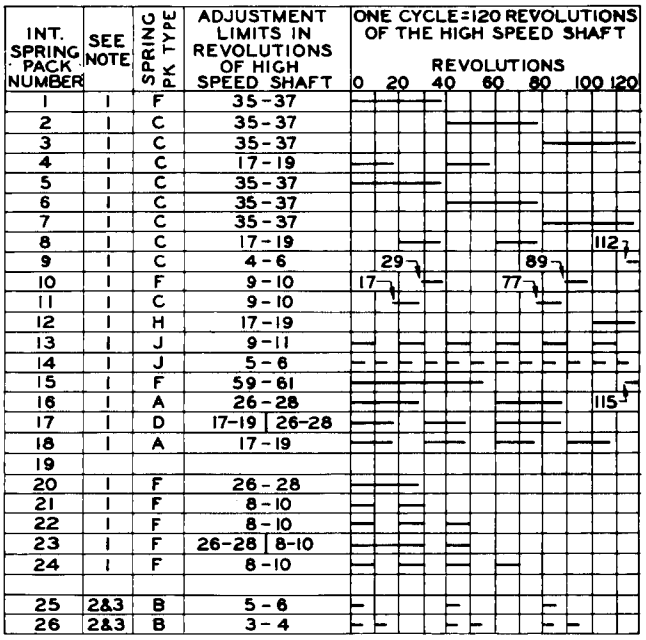

Fig. 8—Lists 9, 9 & A, 10, and 10 & A Timing

INT. SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35 - 37
2	1	C	35 - 37
3	1	C	35 - 37
4	1	C	17 - 19
5	1	C	35 - 37
6	1	C	35 - 37
7	1	C	35 - 37
8	1	C	17 - 19
9	1	C	17 - 19
10	1	C	17 - 19
11	1	C	17 - 19
12	1	H	17 - 19
13	1	J	9 - 11
14	1	J	5 - 6
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	2&3	B	5 - 6
26	2&3	B	3 - 4

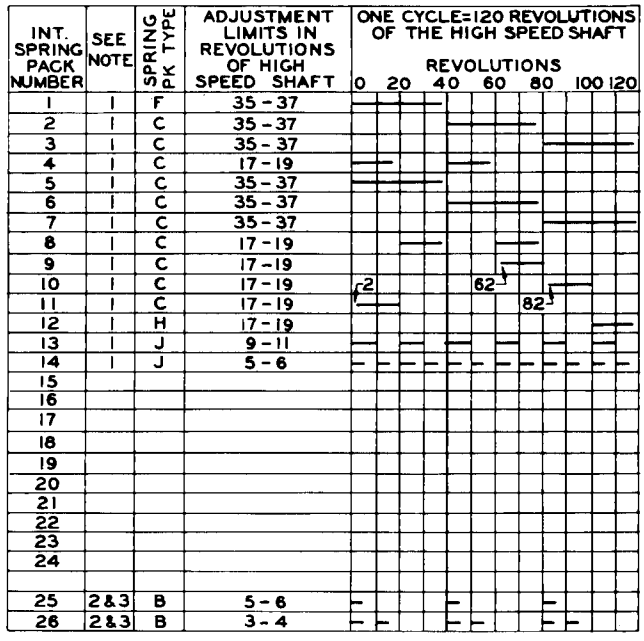

Fig. 10—Lists 13, 13 & A, 14, and 14 & A Timing

TIMING NOTES:
1. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY OPEN CONTACTS ADJACENT TO THE CAM ARE CLOSED.
2. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY CLOSED CONTACTS ADJACENT TO THE CAM ARE OPEN.
3. THESE SPRINGS ARE FURNISHED ONLY ON MACHINES HAVING A DOUBLE LIST NUMBER, E.G., LIST 1 & A.

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	35-37
5	1	C	35-37
6	1	C	35-37
7	1	C	17-19
8	1	C	17-19
9	1	C	17-19
10	1	C	4-6
11	1	F	9-10
12	1	C	9-10
13	1	J	9-11
14	1	J	5-6
15	1	F	59-61
16	1	A	26-28
17	1	D	17-19 | 26-28
18	1	A	17-19
19	1	A	35-37
20	1	A	17-19
21	1	F	26-28
22	1	F	26-28
23	1	F	26-28 | 8-10
24	1	F	26-28 | 8-10
25	1	F	26-28 | 8-10 | 26-28
26	2	B	5-6

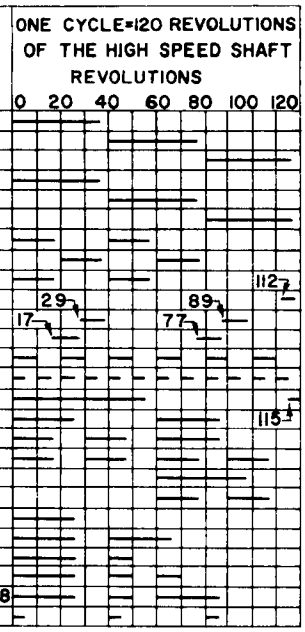

Fig. 11—List 18 Timing

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	17-19
5	1	C	35-37
6	1	C	35-37
7	1	C	35-37
8	1	C	17-19
9	1	C	4-6
10	1	F	9-10
11	1	C	9-10
12	1	H	17-19
13	1	J	9-11
14	1	J	5-6
15	1	F	59-61
16	1	A	26-28
17	1	D	17-19 | 26-28
18	1	A	17-19
19			
20			
21			
22			
23			
24			
25	2	B	5-6

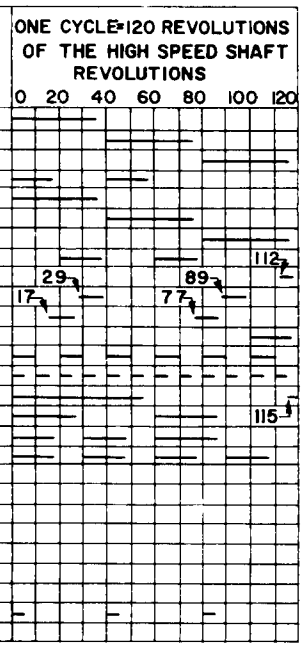

Fig. 13—Lists 21, 22, and 31 Timing

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	17-19
5	1	C	35-37
6	1	C	35-37
7	1	A	17-19
8	1	C	26-28 | 8-10
9	1	C	26-28 | 8-10
10	1	C	26-28 | 8-10 | 26-28
11	1	C	4-6
12	1	H	17-19
13	1	A	9-10
14	1	A	59-61
15	1	A	35-37
16	1	A	17-19
17	1	J	9-11
18	1	J	5-6
19			
20			
21			
22			
23			
24			
25	2	B	5-6

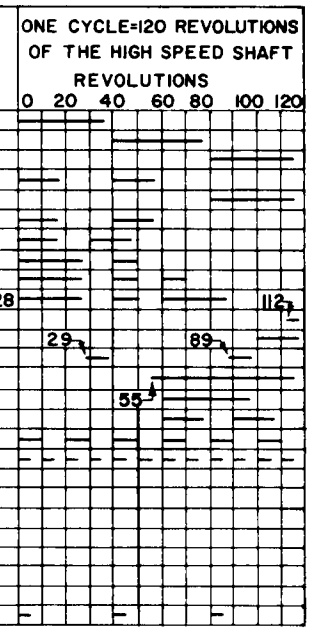

Fig. 12—Lists 19 and 20 Timing

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	17-19
5	1	C	35-37
6	1	C	35-37
7	1	C	35-37
8	1	C	17-19
9	1	C	4-6
10	1	F	9-10
11	1	C	9-10
12	1	H	17-19
13	1	J	9-11
14	1	J	5-6
15	1	F	59-61
16	1	A	26-28
17	1	D	17-19 | 26-28
18	1	A	17-19
19			
20	1	F	26-28
21	1	F	26-28
22	1	F	26-28 | 8-10
23	1	F	26-28 | 8-10
24	1	F	26-28 | 8-10 | 26-28
25	2	B	5-6

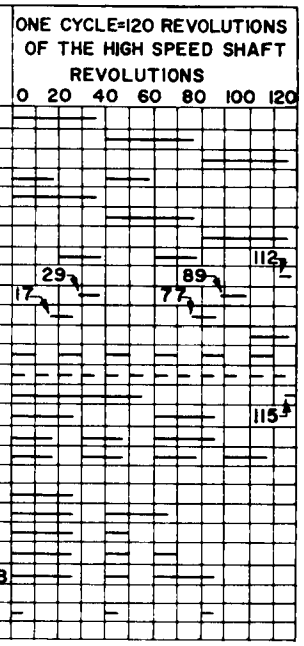

Fig. 14—Lists 23, 24, and 32 Timing

TIMING NOTES

1. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY OPEN CONTACTS ADJACENT TO THE CAM ARE CLOSED.
2. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY CLOSED CONTACTS ADJACENT TO THE CAM ARE OPEN.

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	17-19
5	1	C	35-37
6	1	C	35-37
7	1	C	35-37
8	1	C	17-19
9	1	C	4-6
10	1	F	9-10
11	1	C	9-10
12	1	H	17-19
13	1	J	9-11
14	1	J	5-6
15	1	F	59-61
16	1	A	26-28
17	1	D	17-19 | 26-28
18	1	A	17-19
19			
20	1	F	17-19
21	1	F	8-10
22	1	F	8-10
23	1	F	35-37 | 8-10
24	1	F	35-37 | 8-10
25	2	B	5-6

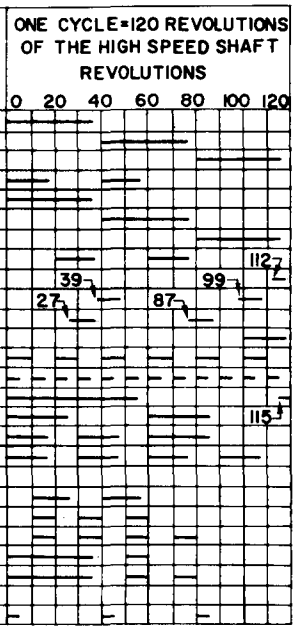

Fig. 15—Lists 25 and 26 Timing

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	17-19
5	1	C	35-37
6	1	C	35-37
7	1	C	35-37
8	1	C	17-19
9	1	C	4-6
10	1	F	9-10
11	1	C	9-10
12	1	H	17-19
13	1	J	9-11
14	1	J	5-6
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	2	B	5-6

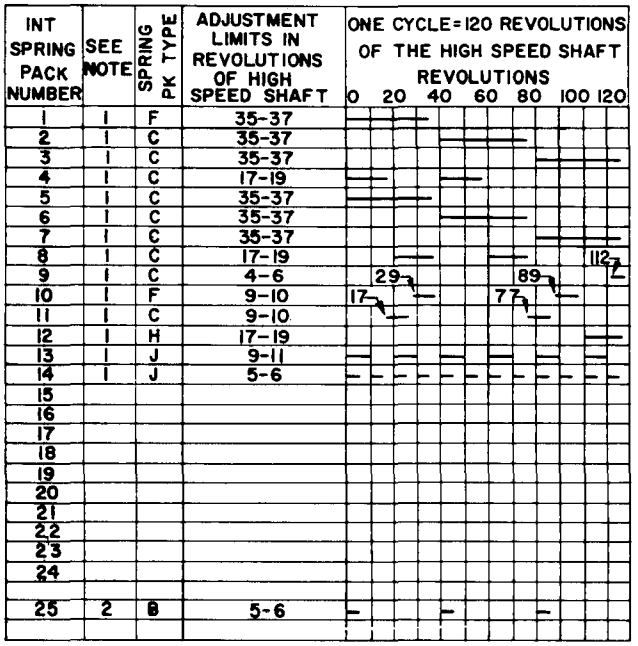

Fig. 17—Lists 29, 30, and 33 Timing

INT SPRING PACK NUMBER	SEE NOTE	SPRING PK TYPE	ADJUSTMENT LIMITS IN REVOLUTIONS OF HIGH SPEED SHAFT
1	1	F	35-37
2	1	C	35-37
3	1	C	35-37
4	1	C	17-19
5	1	C	35-37
6	1	C	35-37
7	1	C	35-37
8	1	C	17-19
9	1	C	4-6
10	1	F	9-10
11	1	C	9-10
12	1	H	17-19
13	1	J	9-11
14	1	J	5-6
15	1	F	59-61
16	1	A	26-28
17	1	D	17-19 | 26-28
18	1	A	17-19
19	1	A	35-37
20	1	A	17-19
21	1	F	26-28
22	1	F	26-28
23	1	F	26-28 | 8-10
24	1	F	26-28 | 8-10
25	1	F	26-28 | 8-10 | 26-28
26	2	B	5-6

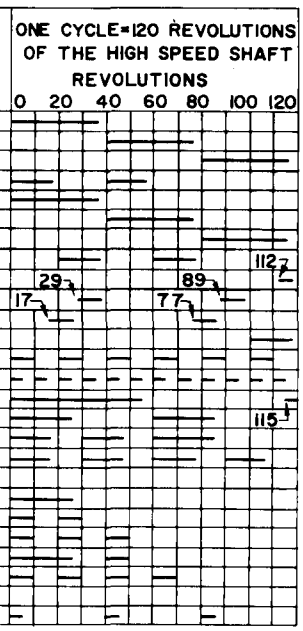

Fig. 16—Lists 27 and 28 Timing

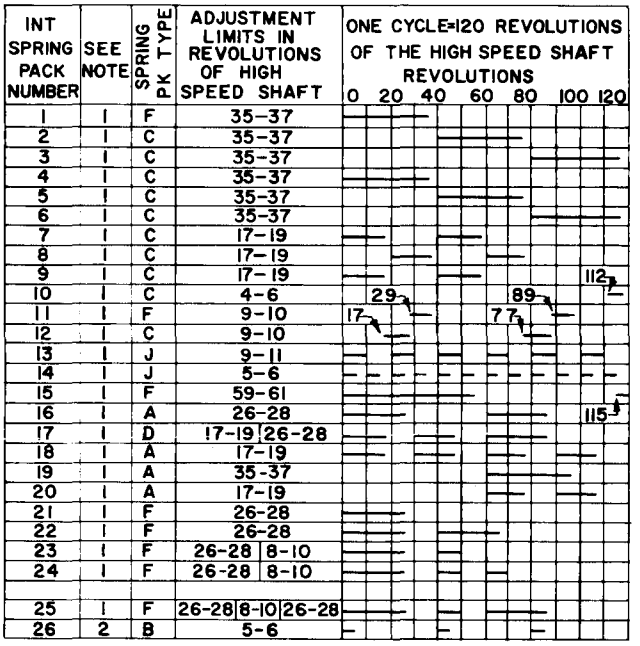

Fig. 18—List 34 Timing

TIMING NOTES:

1. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY OPEN CONTACTS ADJACENT TO THE CAM ARE CLOSED.
2. THE TIMING INTERVAL SHOWN IS THE PERIOD DURING WHICH THE NORMALLY CLOSED CONTACTS ADJACENT TO THE CAM ARE OPEN.

CODE OR SPEC NO. TOOLS	DESCRIPTION
62B	◗Gauge◖
81A	Test Set
373D	Contact Burnisher Holder
374A	Burnisher
534G	Spring Adjuster
KS-6320	Orange Stick
R-1542	6-Inch Single-End Adjustable Wrench
R-2485	5/32-Inch Allen Wrench
R-2670	3/32-Inch Allen Wrench
R-2671	1/8-Inch Allen Wrench
R-2812	3/16-Inch Allen Wrench
R-2959	1/16-Inch Allen Wrench
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
—	Grease Gun, Lincoln Engineering Co, No. 5958
GAUGES	
KS-14510	Volt-Ohm-Milliammeter
KS-1894	Decimal Stopwatch
R-1032	Thermometer (−5 to 150°C)
R-8550	6-Inch Steel Scale
—	Tachometer, No. 5, Boulin Instrument Corp
KS-14666	Cleaning Cloth
—	Asbestos Pad
KS-7860	Petroleum Spirits
—	260-300P ◗or KS-7471 Grease◖
KS-16326	Medium Petroleum Oil
KS-19139	L4 Lubricant (Available as PQ Lubricant—B8 from American Oil and Supply Co., Newark, New Jersey
KS-19519	Penetrating Oil

3.002 Care should be exercised when using petroleum spirits in power rooms where there are dc machines, since commutation may be adversely affected by softening of commutator film by the fumes. To avoid the need for burnishing the commutators of dc machines after doing any cleaning called for in this section; provide adequate ventilation, use the absolute minimum amount of petroleum spirits required for the cleaning operation, and keep the container closed when not in use.

3.01 ***Lubrication and Cleaning:*** (Reqt 2.01)

(a) ***High-Speed Shaft and Interrupter Shaft Bearings Equipped With Grease Fittings:*** To lubricate these bearings proceed as follows.

(1) Referring to Fig. 19, remove the grease drain plugs using the proper size Allen setscrew wrench, and remove as much of the old grease as possible from the drain hole using the KS-6320 orange stick.

(2) Wipe the grease fitting with a clean KS-14666 cloth to avoid forcing dirt into the bearing.

(3) Hold the grease gun firmly with the nozzle on the grease fitting and pump the 260-300P ◗or KS-7471◖ grease into the fitting. Fresh grease, forced into the cavity through the inlet hole, is intended to circulate around the bearing balls and to force old grease out of the drain hole. No grease should emerge from the shaft seal.

Note: If grease ***does not*** readily emerge from the drain hole or if grease appears on the shaft at the seal, proceed to (b). If grease appears at the drain hole, continue with (4).

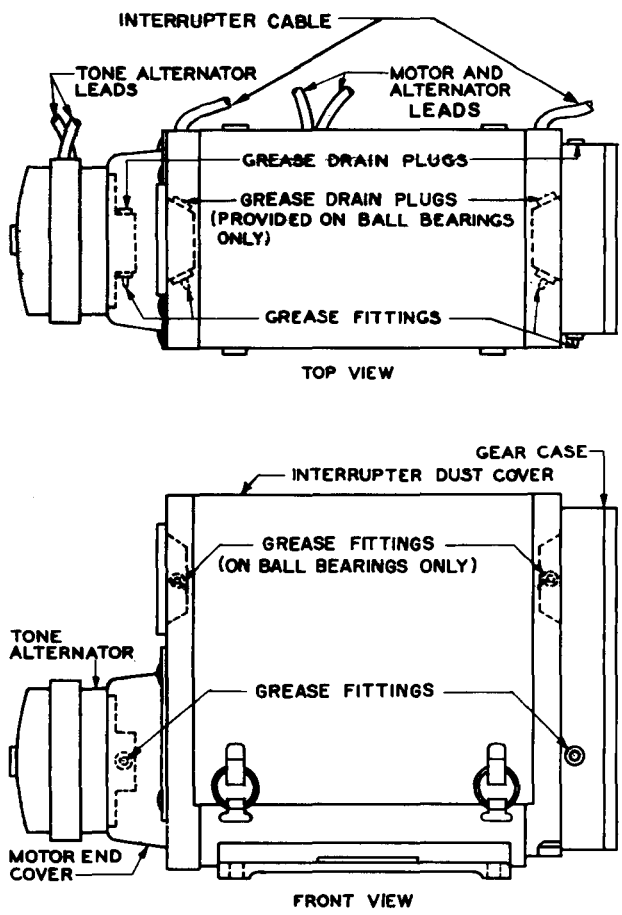

Fig. 19—KS-15532 Ringing Machine View Showing Lubrication Points

(4) When grease appears at the drain hole, stop pumping grease.

(5) Wipe the area around the drain hole with a clean KS-14666 cloth to remove excess grease.

(6) Reinstall drain plug.

(b) ***High-Speed Shaft and Interrupter Shaft Bearings Equipped With Oil Lubrication Option:*** If the high speed shaft and interrupter shaft bearings are presently equipped with oil lubrication cups, proceed to (12). To install oil lubrication cups, proceed as follows.

Note: Oil lubrication should be substituted for grease lubrication if grease ***does not*** emerge from the drain hole during grease lubrication. If old grease ***does*** emerge from the drain hole during grease lubrication, ***do not*** change to oil lubrication.

(1) Remove grease fitting and drain hole plug.

(2) Remove as much of the old grease as possible from the inlet and drain hole using the KS-6320 orange stick.

(3) Install oil cup (Gits No. 01222, Style L, 1/8—27 NPT or equivalent) in place of the grease fitting.

(4) Put about 12 drops of KS-19519 penetrating oil in each oil cup.

(5) Start the machine and run until hot, allowing the KS-19519 oil to soften and expand the old grease for about 2 hours.

(6) Remove the oil cup and remove softened grease with the KS-6320 orange stick.

(7) Remove grease from the shaft and from surfaces adjacent to the drain hole using a clean KS-14666 cloth.

(8) Repeat (3), (4), (5), (6), and (7).

(9) Reinstall oil cup.

(10) Replace drain plug.

(11) Put about 12 drops of KS-19139 L4 lubricant in each oil cup.

(12) Relubricate with KS-19139 L4 on a six-month basis using three drops in each oil cup.

Note: Care should be taken not to use more oil than is specified.

(c) ***Interrupter Shaft Bearings Not Equipped With Grease Fittings:*** Clean the interrupter shaft bearings not equipped with grease fittings by applying two drops of KS-16326 L1 oil at each bearing annually. Wipe off any excess oil.

3.02 ***Freedom of Rotating Parts (Reqt 2.02)***

(a) Failure to meet the requirement may be due to worn bearings or gears.

(b) Replace worn parts as covered in Section 163-720-801.

3.03 ***Direction of Rotation (Reqt 2.03):*** If the requirement is not met, check the power supply connections. If the ringing machine is properly connected, refer the matter to the supervisor.

3.04 ***Operating Noise and Vibration (Reqt 2.04):*** If the requirement is not met, check for tightness of all bolts and screws. Tighten bolts and screws if necessary. If this does not correct the trouble, the bearings may require replacement. Replace the bearings, if necessary, as covered in Section 163-720-801.

3.05 ***Condition of Motor Commutator and Collector Rings (Reqt 2.05):*** Section 171-110-701 covers procedures for maintaining the commutator and collector rings.

3.06 ***Condition of Brushes (Reqt 2.06):*** Section 171-110-701 covers procedures for maintaining the brushes.

3.07 ***Brush Length (Reqt 2.07):*** If the requirement is not met, replace the brushes as covered in Section 171-110-701.

3.08 ***Motor Speed (Reqt 2.08):*** If the requirement is not met, check requirements 2.01 through 2.07, and requirement 2.11. If these requirements are met and the speed is still outside the specified limits, refer the matter to the supervisor.

3.09 ***AC Generator Output Voltage (Reqt 2.09):*** If these requirements are not met, check requirement 2.08. If this requirement is met, refer the matter to the supervisor.

3.10 ***Tone Alternator Output Voltage (Reqt 2.10):*** If these requirements are not met, check requirement 2.08. If this requirement is met, refer the matter to the supervisor.

3.11 ***Motor Frame Temperature (Reqt 2.11):*** If the temperature exceeds the specified limits, check requirements 2.01 through 2.08. If these requirements are met, refer the matter to the supervisor.

Interrupter Procedures

3.12 ***Tightness of Spring Pack Mounting Screws (Reqt 2.12):*** Securely tighten the spring back mounting screws using the proper size Allen setscrew wrench. Check requirements 2.15 and 2.16 after tightening the screws.

3.13 ***Cleaning of Contacts (Reqt 2.13)***

(a) To clean the contacts, burnish them as covered in (b), using the 374A contact burnisher blade inserted in the 373D burnisher holder.

(b) Using the crank or the proper size Allen setscrew wrench, rotate the high-speed shaft until the contacts to be cleaned are closed. Insert the burnisher blade between the contacts and move it back and forth three or four times.

(c) Check requirements 2.15 and 2.16 after burnishing the contacts.

3.14 ***Contact Alignment (Reqt 2.14):*** If the requirement is not met, adjust the contact springs using the 534G spring adjuster as required to bring the contacts into alignment.

3.15 ***Contact Follow (Reqt 2.15):*** If these requirements are not met, check requirement 2.08. If this requirement is met, refer the matter to the supervisor.

3.16 ***Timing Requirements (Reqt 2.16)***

(a) If these requirements are not met, reposition the springs by turning their associated adjusted screws as required. Use the proper size Allen setscrew wrench to make the adjustments.

(b) ***Adjustment to Eliminate Bell Tapping on Associated Selective Party Lines With Superimposed Ringing***

(1) With the machine operating, connect the KS-14510 volt-ohm-milliammeter, or equivalent, between the operating spring of the No. 3 spring pack and frame ground. Use the 60-volt dc scale of the meter and connect the positive lead of the meter to ground.

(2) Note whether a positive (down scale) transient greater than 5 volts occurs at

the end of the 20-Hz ON period. If this occurs, adjust the break spring (uppermost screw on the spring pack) until the transient disappears or diminishes to less than 5 volts. Use the proper size Allen setscrew wrench to make this adjustment.

(3) After making the adjustment covered in (2), stop the machine and check the contact follow and timing requirements. These requirements must be met.

(4) Also adjust the No. 5 spring pack as covered in (1) through (3), but connect the negative lead of the meter to ground.

3.17 ***Clearance (Reqt 2.17):*** If the requirement is not met, space and adjust current-carrying parts as necessary.