UNITED TECHNOLOGIES CARRIER

Commercial Division
Carrier Corporation

BULLETIN: CA-SB-19-D-67-36
DATE: 5/11/67
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SERVICE BULLETIN

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SUBJECT:

MEASURING AND ADJUSTING THRUST CLEARANCES, 19 D, A

PURPOSE: To forward a procedure for measuring and adjusting thrust clearance subsequent to replacement of internal bearing parts or as part of a routine maintenance check.

MACHINES AFFECTED: All 19D and 19DA hermetic machines.

PROCEDURE: PART I - MEASURING THRUST CLEARANCE

A. General

Figure 1 shows a cross section of a typical 19D11 thrust bearing and shaft assembly. Although this particular assembly is used in this instruction, the procedure to be followed in measuring thrust clearance is the same on all 19D and 19DA sizes including the design having a removable thrust disc and lock nut instead of the "integral" shaft and disc design as shown.

The desired thrust clearance is measurement "X" shown in Figure 1. This "X" clearance dimension is shown with the thrust in the normally loaded direction (toward the compressor inlet).

Referring to Figure 1, Dimension "Z" is the height of the roll pin, Item 11, extending above the journal bearing assembly, Item 4.

CAUTION: THE "Z" DIMENSION IS CRITICAL BECAUSE IF THE ROLL PIN HEIGHT IS TOO GREAT IT MAY BOTTOM IN ITS MATING HOLE IN THE THRUST SHOE, RESULTING IN A FALSE THRUST CLEARANCE READING AND IN OPERATION MAY CAUSE ONE THRUST SHOE TO TAKE ALL OF THE LOAD. IF PIN HEIGHT IS TOO LOW, THE THRUST SHOE MAY MOVE OUT OF PLACE AND BIND IN THE ASSEMBLY, CAUSING THE BEARING TO FAIL.

Table I summarizes these critical measurements.

Table 1

Machine Size	Thrust Clearance "X"	Height of Roll Pin "Z"
All 19D and 19DA	.008" - .014"	.156" - .166"

B. Measuring Thrust Clearance on the Bench

1. With the bearing assembly removed from the compressor, press the slinger (Item 3, Figure 1), tightly against the shaft shoulder "A" by one of the following methods.

Method (a)

Wedge several blades of a feeler gage tightly between the slinger, and the retaining ring, as illustrated in Figure 3.

Method (b)

Cut a piece of standard schedule 40 pipe to the dimensions given in Table 2 and hold it in place with the impeller nose piece as illustrated in Figure 4.

Table 2

Compressor Size	Size Pipe	Length
11	1 1/4"	4 1/4"
21	2"	5 1/2"
31	2 1/2"	6 1/2"

2. Attach a dial indicator as illustrated in Figure 3 and Figure 4.

3. Holding the bearing assembly as illustrated in Figures 3 and 4, move the assembly back and forth on the shaft in the thrust and counterthrust positions while reading the total thrust clearance "X" on the dial indicator.

C. Measuring Thrust Clearance With Bearing in Place

1. With bearing assembly and impeller installed in the machine, attach a magnetic base dial indicator as illustrated in Figure 5 (See Caution notes below).

CAUTION: WHEN CHECKING THRUST CLEARANCE WITH THE IMPELLER INSTALLED, THE DIAL INDICATOR BUTTON MUST CONTACT THE CENTER OF THE IMPELLER NOSE PIECE AS SHOWN IN FIGURE 5. THE DYNAFOISE DESIGN ALLOWS THE IMPELLER TO TILT AND MAY INTRODUCE ERRORS IN THRUST CLEARANCE READINGS IF THE DIAL INDICATOR IS PLACED ON THE CIRCUMFERENCE OF THE WHEEL.

WHEN CHECKING THRUST CLEARANCE WITH BEARING ASSEMBLY IN PLACE AND IMPELLER REMOVED, MAKE SURE THE SLINGER (ITEM 3, FIGURE 1) IS TIGHT AGAINST THE SHAFT SHOULDER "W" BY USING ONE OF THE TWO METHODS DESCRIBED IN PART I, PARAGRAPH 3.

2. Move the shaft back and forth alternately in the thrust and counterthrust position while reading thrust clearance "X" on the dial indicator.

PART II - ADJUSTING THRUST CLEARANCE

A. General

If measured thrust clearance determined in Part I is not within the tolerance given in Table 1, the clearance must be adjusted by changing the thickness of the adjusting pads. (Item 13, Figure 1).

The recommended method of selecting adjusting pads is to find the average thickness of the original pads and then apply the required change in thrust clearance to this average to determine the new average pad thicknesses. The purpose in working with average pad thicknesses rather than individual thicknesses is to eliminate the possibility of more than two different adjusting pad sizes being used in any one thrust assembly.

Adjusting pad kit, Part #19D23-841, is recommended. The adjusting pad kit does not require additional shims as the kit will contain enough various sizes to obtain proper clearance.

B. Procedure for Adjusting Thrust Clearance-- Refer to following examples 1 and 2 on pages 5 and 6.

1. Note and record the actual thrust clearance determined in Part I.

2. Determine how much the actual thrust clearance differs from the desired clearance of .011". (midway between .008" and .014".)

3. Referring to Figure 1, disassemble the bearing by removing Items 2, 3, 6, 5, 8, 9 and 1 in that order. This will expose the babbitted surfaces of the thrust shoes, Item 10. Remove the thrust shoes, Item 10, and leveling pads, Item 12, exposing the adjusting pads, Item 13. Figure 2 depicts a partially disassembled thrust bearing showing the relationship of the thrust shoes, leveling pads and adjusting pads to each other.

4. With the thrust shoes and leveling pads removed, remove the adjusting pads (and shims, if any) by inserting a wire in hole "H" located behind the pad.

5. Measure and record the thickness of each pad (and shims, if any) as it is removed from the assembly. Add the thicknesses recorded.

6. Divide the total thickness derived in Step 5 by six, to get the average thickness per pad.

7. If the actual thrust clearance (from Step 1) is greater than the maximum .014", add the amount of thickness difference (determined in Step 2) to the average thickness per pad (determined in Step 6).

If actual thrust clearance (from Step 1) is less than the minimum of .008", subtract the amount of thickness difference (determined in Step 2) from the average thickness per pad (determined in Step 6).

The thickness calculated in this step is the average adjusting pad thickness required to give an overall thrust clearance of .011".

8. Select the combination of adjusting pads whose average thickness is the closest possible to the required average thickness determined in Step 7.

Notice that the pad thicknesses in the adjusting pad kit, 19D23-841, (Table 3) are in .010" increments. Adjusting pads selected from the kit must be from no more than two different sizes and if two sizes are used, they must be within .010" thickness of each other.

Shim stock may be used to increase the thickness of the adjusting pads to the average thickness determined in Step 7.

CAUTION: IF SHIMS ARE USED THEY SHOULD BE CUT FROM STEEL OR STAINLESS STEEL SHIM STOCK ONLY. USE SHIMS UNDER ADJUSTING PADS ONLY, NEVER ABOVE.

Table 3
Parts Contained in Adjusting Pad Kit 19D23-841

Quantity	Thickness	Tolerance
6 each	.070"	$\pm$ .002"
6 each	.080"	"
6 each	.090"	"
6 each	.100"	"
6 each	.110"	"
6 each	.120"	"
6 each	.130"	"

CAUTION: DO NOT USE MORE THAN TWO DIFFERENT PAD THICKNESSES IN ONE THRUST ASSEMBLY. THE MAXIMUM DIFFERENCE BETWEEN THE THICKEST AND THE THINNEST PAD USED INCLUDING SHIMS MUST NOT EXCEED .014". WHEN HELD WITHIN THIS TOLERANCE, THE PADS MAY BE INSTALLED IN ANY ARRANGEMENT IN THE THRUST ASSEMBLY.

9. Reassemble bearing and rotate the shaft by hand. Be sure the bearing rotates freely and does not bind. If binding occurs, disassemble the thrust bearing and recheck for proper assembly procedure.

10. Reinstall the thrust bearing assembly and impeller in the compressor. Always double check thrust clearance after the impeller has been installed.

EXAMPLE 1 - IF MEASURED THRUST BEARING CLEARANCE IS GREATER THAN .014"

Step 1	Actual thrust clearance	.016"
Step 2	Actual thrust clearance	.016"
	Less desired thrust clearance	-.011"
	Difference between desired and actual thrust clearance	.005"
Steps 3 & 4	Disassemble the bearing and remove adjusting pads	
Step 5	Pad Thickness	.110"
	" "	.112"
	" "	.114"
	" "	.111"
	" "	.113"
	" "	.112"
	Total thickness	.672"
Step 6	Total thickness	.672"
	Divided by six pads	÷ 6
	Average pad thickness	.112"
Step 7	Average thickness per pad	.112"
	Plus difference between desired and actual thrust bearing clearance	+.005"
	New average adjusting pad thickness required to give overall thrust clearance of .011"	.117"
Step 8	Select pads from kit 19D23-841	

Answer:

Four pads @ .120"	.480"
Two pads @ .110"	.220"
Total	.700"

Average thickness per pad with this combination is .11666" (.700 ÷ 6 = .11666) and desired thickness from Step 7 is .117".

Steel or stainless steel shim stock can be added under the original shims to increase the thickness of each pad to the desired thickness determined in Step 7. Be sure to heed both CAUTION NOTES in Step 8 of the text.

EXAMPLE 2 - IF MEASURED THRUST CLEARANCE IS LESS THAN .008"

Step 1	Actual thrust clearance	.006"
Step 2	Desired thrust clearance	.011"
	Less actual thrust clearance	-.006"
	Difference between desired and actual thrust bearing clearance	.005"
Steps 3 & 4	Disassemble the bearing and remove adjusting pads	
Step 5	Pad Thickness	.112"
	" "	.115"
	" "	.102"
	" "	.108"
	" "	.105"
	" "	.106"
	Total thickness	.648"
Step 6	Total thickness	.648"
	Divided by six pads	÷ 6
	Average pad thickness	.108"
Step 7	Average thickness per pad	.108"
	Less difference between desired and actual thrust bearing clearance	-.005"
	New average adjusting pad thickness required to give overall thrust clearance of .011".	.103"
Step 8	Select pads from Kit 19D23-841	

Answer:

Four pads @ .100"	.400"
Two pads @ .110"	.220"
Total	.620"

Average pad thickness per pad with this combination is .10333 .... (.620 ÷ 6 = .10333) and desired thickness from Step 7 is .103".

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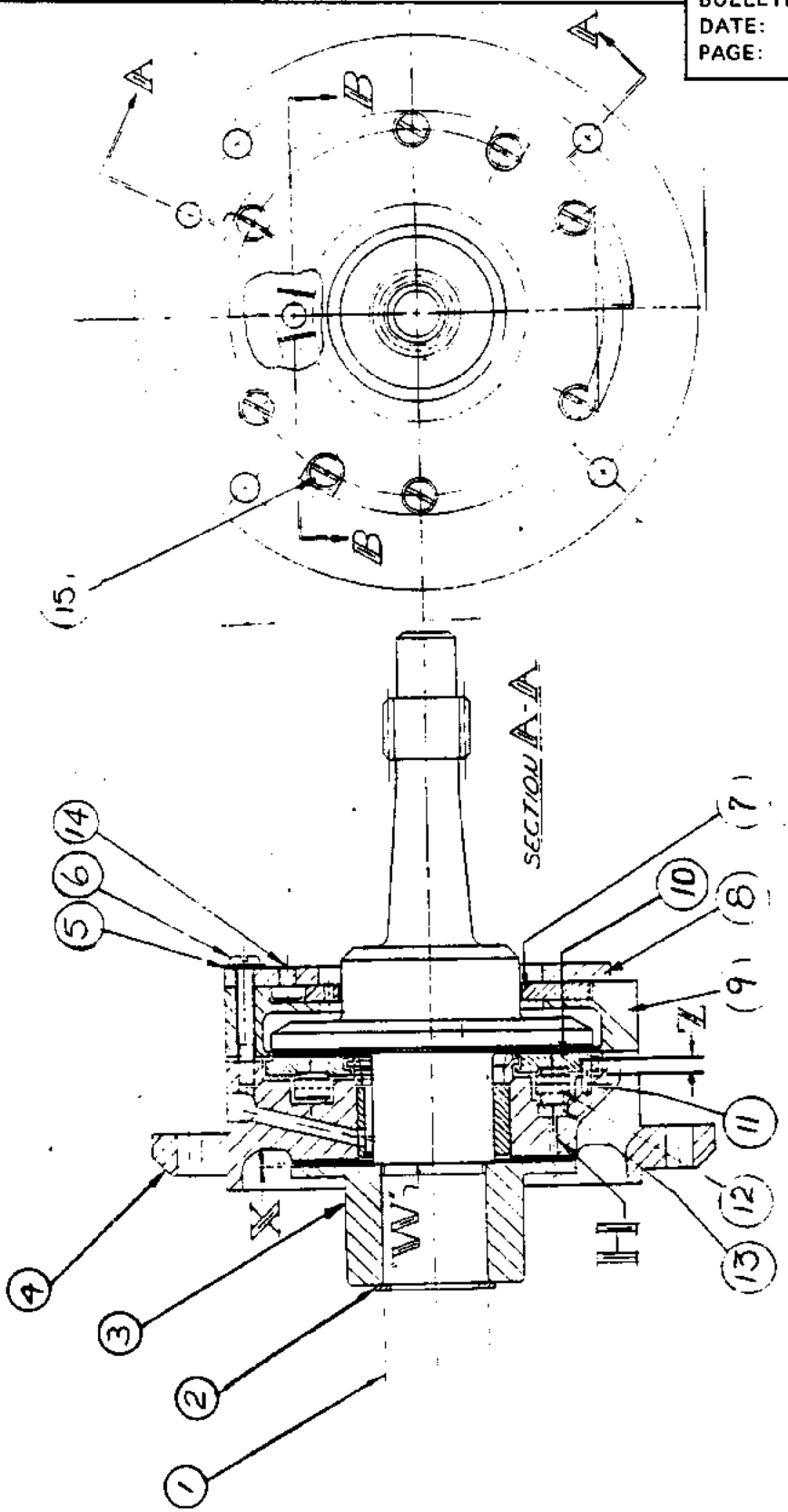

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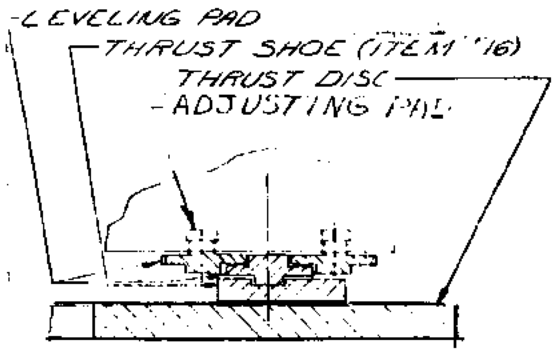

SECTION B-B

Item	Qty	Description	Item	Qty	Description
1	1	Shaft	9	1	Spacer Ring
2	1	Retaining Ring	10	6	Thrust Shoe
3	1	Slinger	11	12	Roll Pin
4	1	Bearing Assembly	12	12	Leveling Pad
5	8	Lockwasher	13	6	Adjusting Pad
6	6	Pan Head Screw	14	1	Cap Screw
7	1	Seal Ring	15	2	Pan Head Screw
8	1	Retainer			

FIGURE 1

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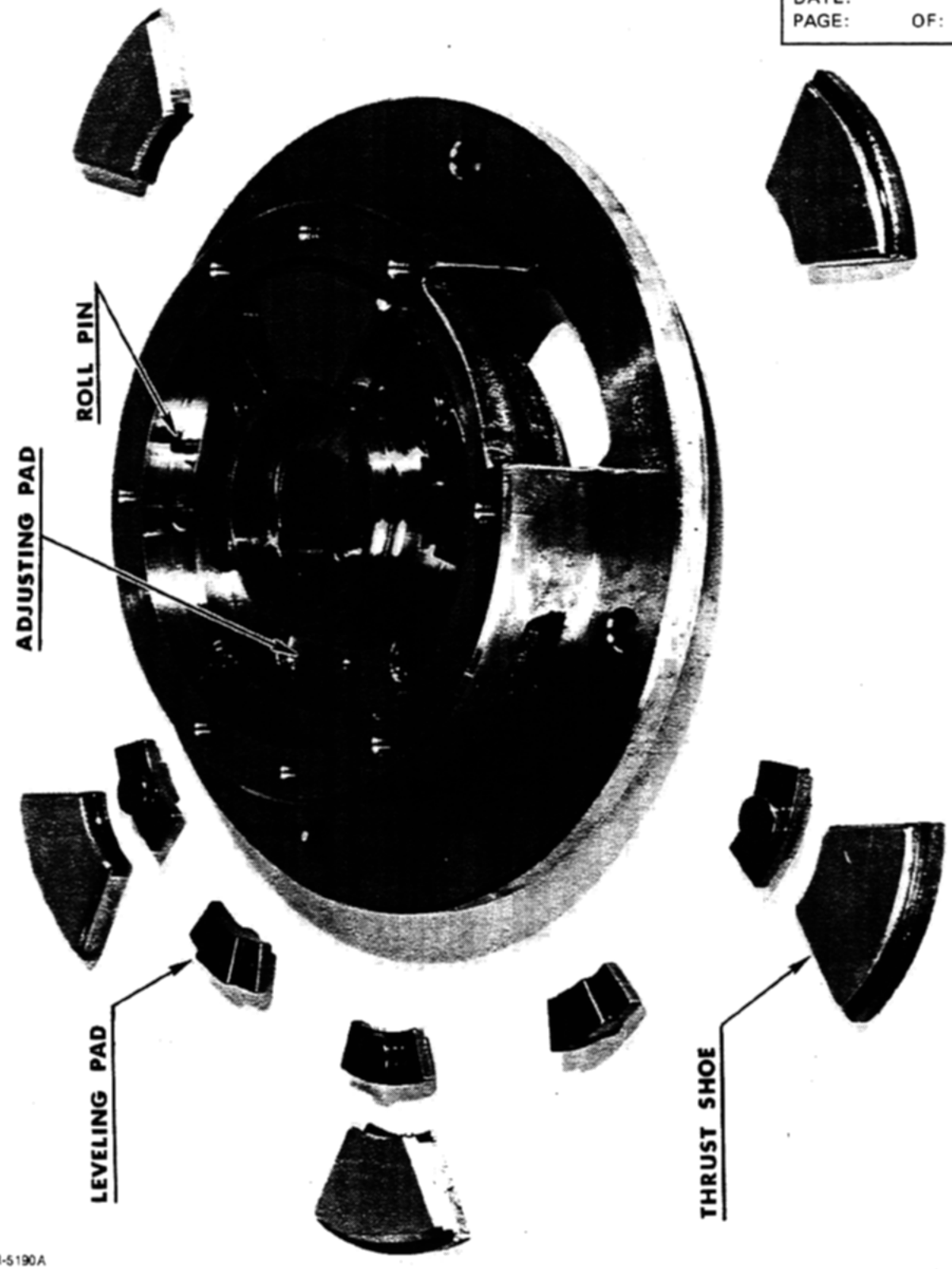

FIGURE 2

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FIGURE 3

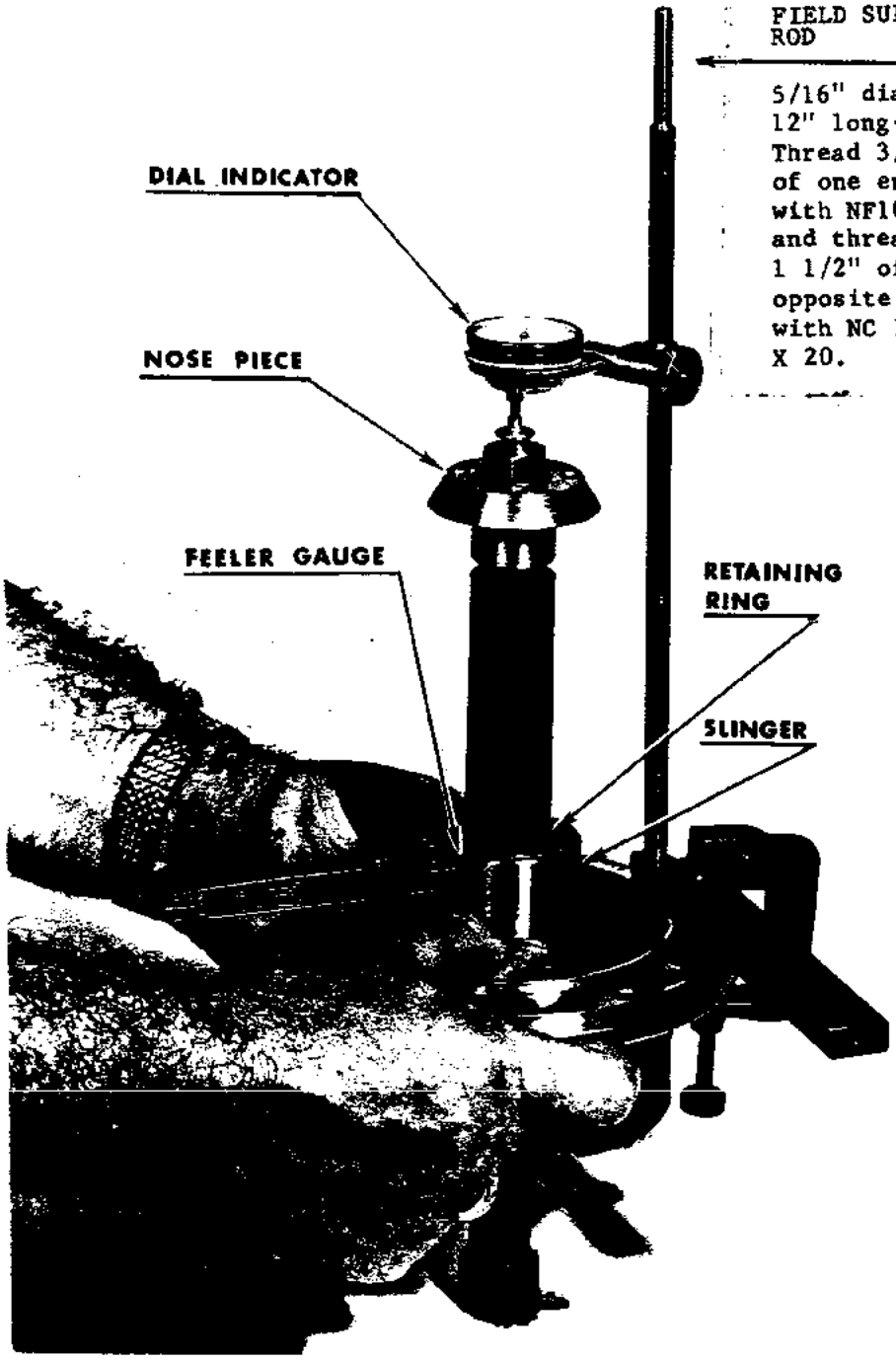

FIGURE 3

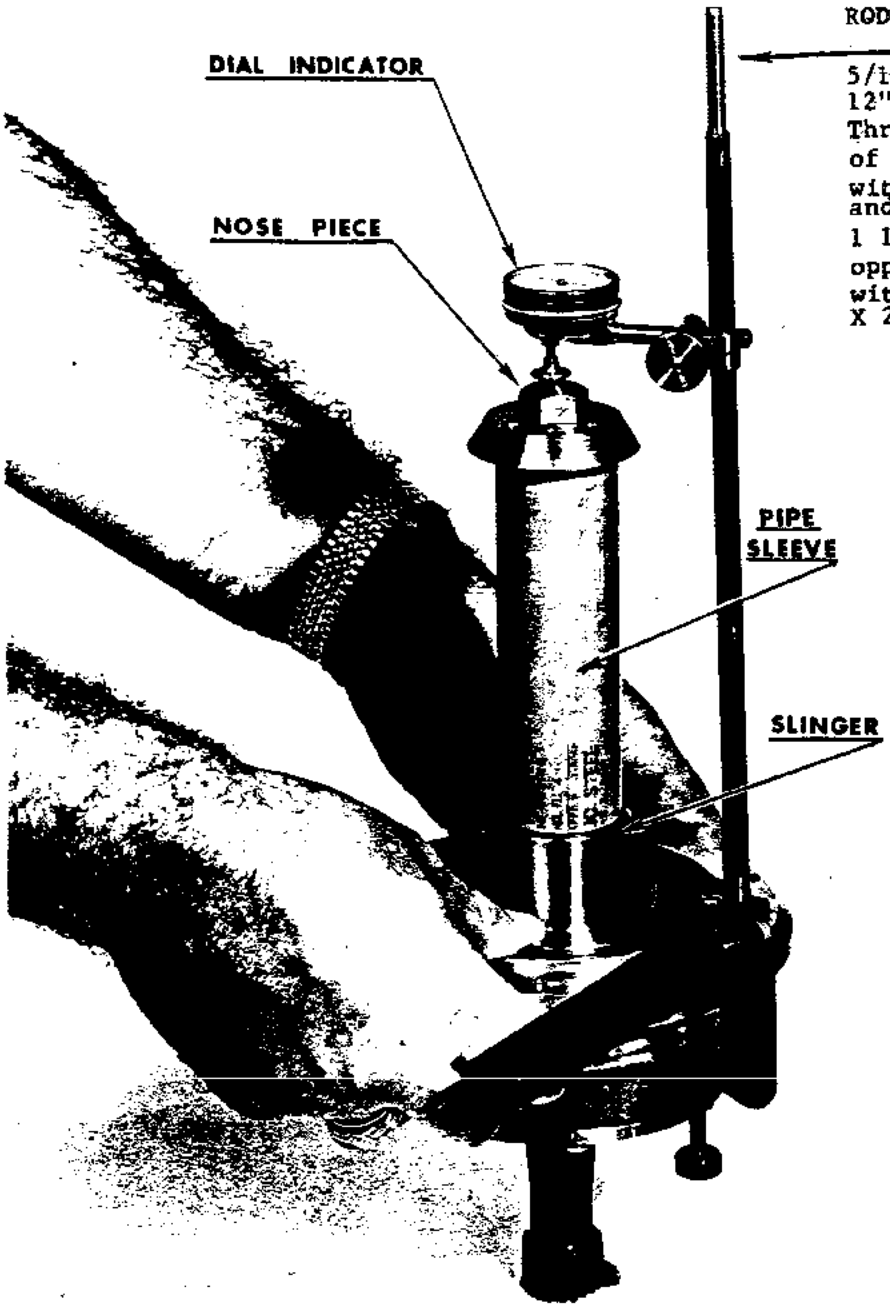

FIGURE 4

FIGURE 4

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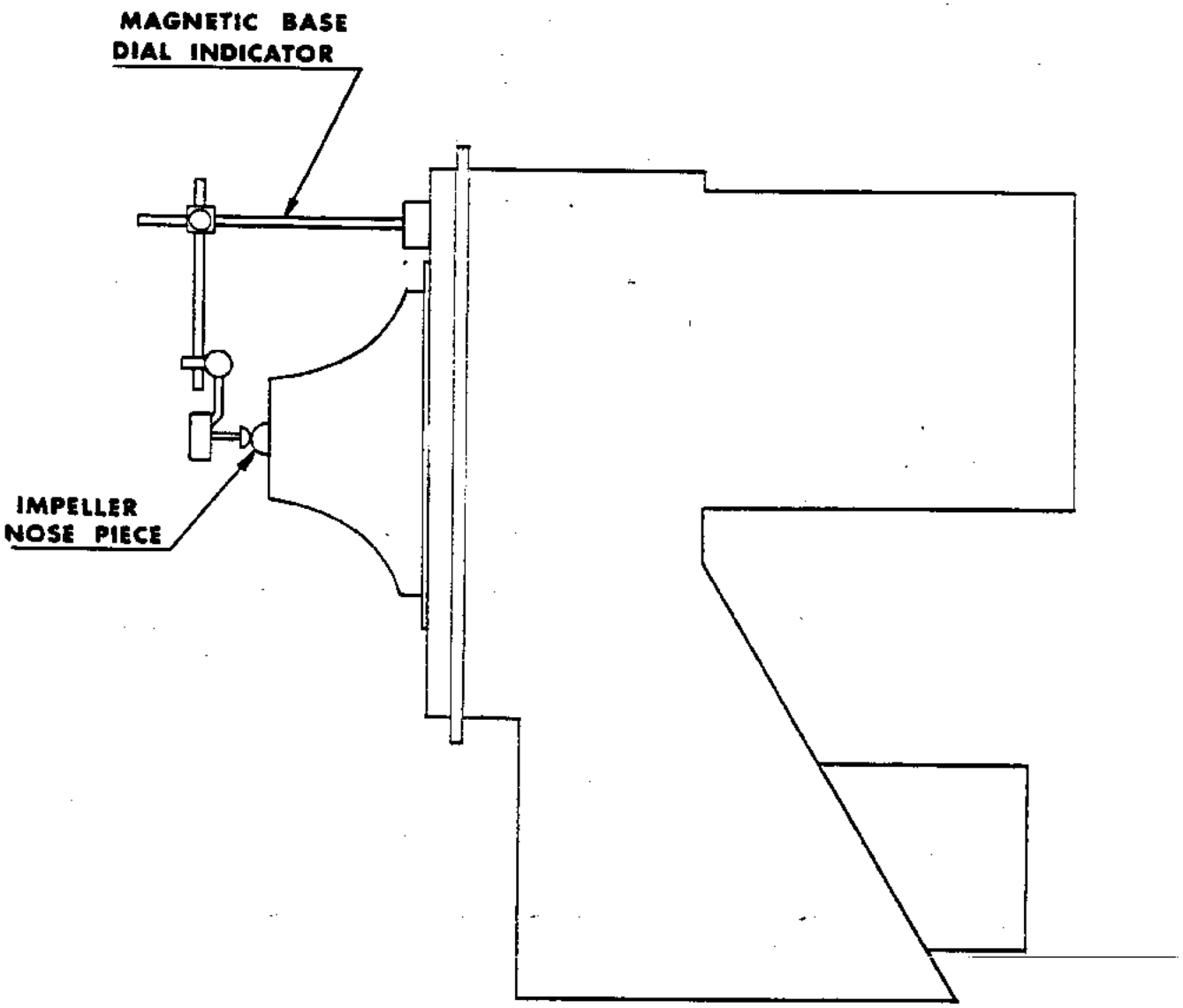

FIGURE 5