

STVNT

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MEMORANDUM

To: ROGER BOSSERT
From: R.E. SIMS
Date: AUGUST 15, 1990
Subject: SOURCE OF DIMENSIONAL VARIATION IN 40CM CURING TOOLING

ANALYSIS OF TIME AFTER CURED COIL DIMENSIONAL DATA HAS REVEALED A SIGNIFICANT SOURCE OF VARIATION. BRIEFLY, IT APPEARS THAT THE "KEY" SECTION OF THE MOLD (THE "Y" SHAPED STEEL SECTION) CAN FLOAT IN THE KEYWAY SLOT AT THE BOTTOM OF THE CURING MOLD LAMINATIONS (SEE FIG 1). THIS FLOAT FROM LEFT TO RIGHT OF ABOUT .005" SHOWS ITSELF IN THE SIZING DATA AS COMPLEMENTARY VARIATIONS OF THE "A" SIDE AND "B" SIDE DIMENSIONS.

THE PRESENT SEQUENCE OF MANUFACTURING COILS CALLS FOR THE MANDREL PRESSURE TO BE SET TO 2000-3500 PUMP psi FIRST, THEN THE SIZING BAR PRESSURE IS SET TO 6500 PUMP psi. THIS SEQUENCE PROBABLY LOCKS - UP THE KEY BY FRICTION TO THE CURING TOOL LAMINATED OUTER MOLD. SINCE NO EFFORT IS MADE TO STRAIGHTEN THE KEY SECTIONS BEFORE THIS SEQUENCE, THEY ARE LOCKED - UP IN A RANDOM SERPENTINE MANNER WITH A .004" TO .005" DELTA.

THIS DELTA CLEARLY SHOWS UP WITH A LITTLE MANIPULATION OF THE GRAPHICAL DATA. IN FIG. 3 THE "B" SIDE (SECTION NUMBERS 13 TO 24 OF INNER COIL #111) HAS BEEN REPLOTTED FLIPPED LEFT TO RIGHT SO THAT THE "B" SECTION CURVE IS LAYING IN PARALLEL WITH THE "A" SECTION IN THE SAME PHYSICAL POSITIONS AS THEY ARE IN THE PHYSICAL COIL. NOTICE THAT IN GENERAL THE "A" AND "B" SIZES ARE COMPLEMENTARY TO EACH OTHER. FOR EXAMPLE, AT SECTION 4 OF "A" AND 20 OF "B" (SEE ARROW A) THE A SIDE IS .004" LARGER THAN THE STEEL MASTER AND THE B SIDE IS ABOUT THE SAME SIZE AS THE MASTER WHILE AT SECTIONS 10 AND 15 (ARROW B) THE OPPOSITE SITUATION EXISTS. A NEAR PERFECT COMPLEMENTARY SITUATION EXISTS BETWEEN THE 3-21 SECTION TO THE 12-13 SECTION.

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FIG. 3 SHOWS HOW WELL THIS COMPLEMENTARY SITUATION AGREES BY FLIPPING THE "B" SIDE CURVE IN THE HORIZONTAL AXIS TO PRODUCE A MIRROR CURVE LAYED ON TOP OF THE "A" SIDE CURVE. NOTE THE EXCELLENT AGREEMENT ACCEPT FOR THE LEFT END.

FIG. 4 SHOWS THE FIG. 1 CURVE WITH THE ADDITION OF A POINT BY POINT MEAN CURVE OF CURVES A AND B. THIS SUGGESTS THE RESULT IF WE COULD ELIMINATE THE FLOAT IN THE KEY TO KEY WAY FIT. THE DELTA IS LESS THAN .001".

FIG.5 SHOWS THE SAME RESULTS FOR INNER COIL #110. THE FLIP OF SIDE B AND MIRROR OF SIDE B ARE SHOWN AGAINST SIDE A. THE ERROR IS AGAIN NO MORE THAT ABOUT .001".

FINALLY, FIG. 6 SHOWS A LONG 40CM INNER COIL WITH SIDE "A" FLIPPED AND MIRRORED ON TO SIDE B. THE TRENDS ARE VERY SIMILAR TO THE SHORT INNER COIL DATA. THE TWO DATA LINES ARE GENERALLY VERY PARALLEL. KEEP IN MIND THAT THE SECTION LENGTHS OF THE "A" SIDE AND "B" SIDE ARE MARKED IN BY HAND AND THE CORRESPONDINGLY NUMBERED SECTIONS RE NOT NECESSARILY PARALLEL TO EACH OTHER. I HAVE OBSERVED AS MUCH AS ONE FULL 3" SECTION OFFSET OF "A" TO "B".

EXPERIMENTS ARE NOW BEING PLANNED ON THE CURING OF THE NEXT FEW SHORT COILS TO EITHER ADD FOIL SHIMS TO THE KEY TO ELIMINATE MOST OF THE .005" FLOAT OR CHANGE THE PRESS CLOSING SEQUENCE TO SPECIFY LIGHTLY CLOSING THE OUTER SIZING BAR PRESSURE FIRST THEN APPLYING HEAVY MANDREL PRESSURE SECOND. THIS WOULD ALLOW THE SYMMETRICAL APPLICATION OF PRESSURE TO SIDES A AND B TO "CENTER" THE KEY BEFORE THE MANDREL PRESSURE LOCKS - UP THE KEY POSITION.

ASSUMING THAT THESE EXPERIMENTS SHOW THAT THIS PROBLEM IS CORRECTABLE BY ELIMINATING THE "FLOAT" THEN THIS WRITER SUGGESTS A FUTURE TOOL DESIGN IN WHICH INCREASING THE MANDREL PRESSURE WIDENS THE KEY SO THAT IT CENTERS ITSELF IN THE KEYWAY POSSIBLY BY SPLITTING THE "Y" SHAPED KEY INTO TWO HALF "Y"S.

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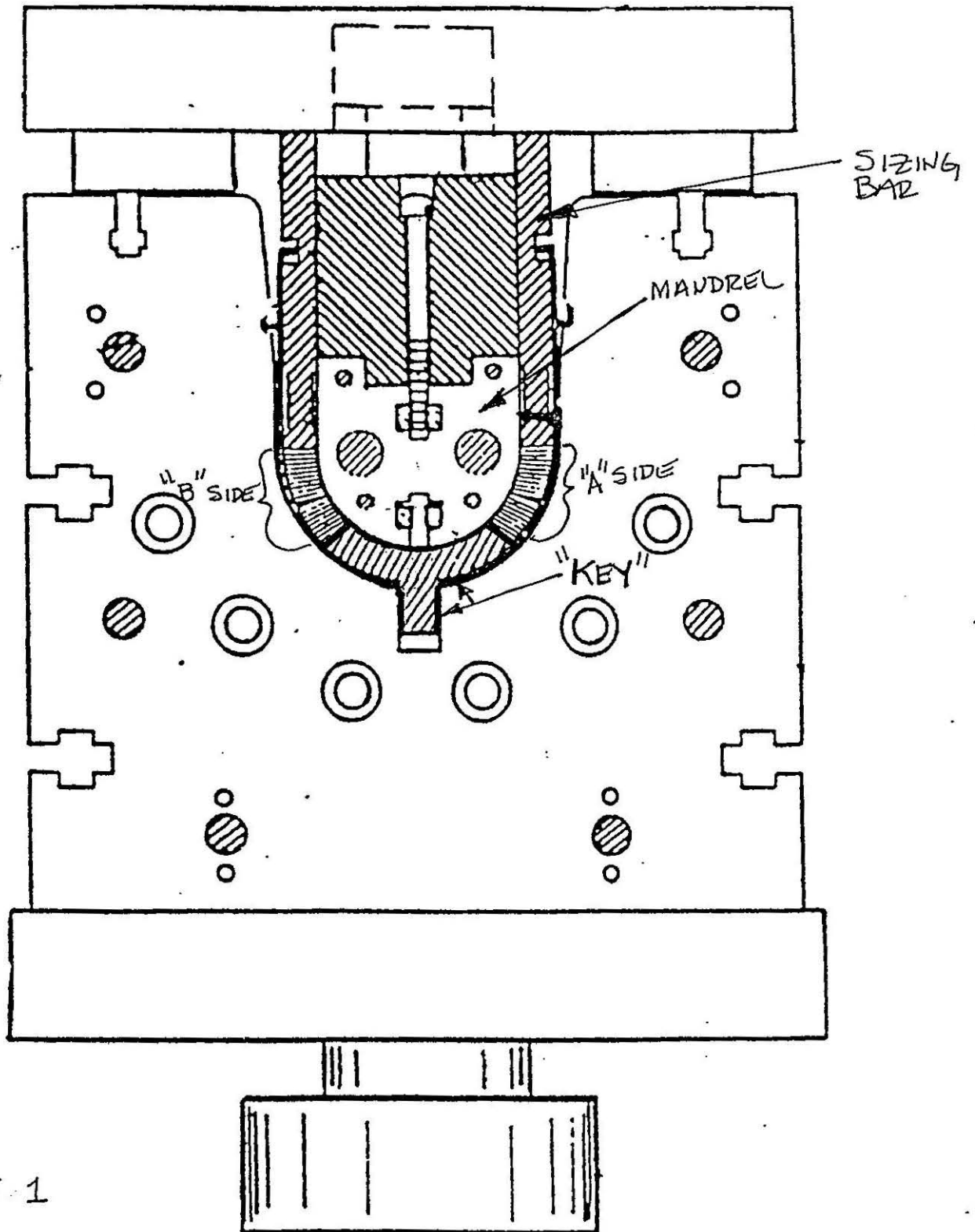
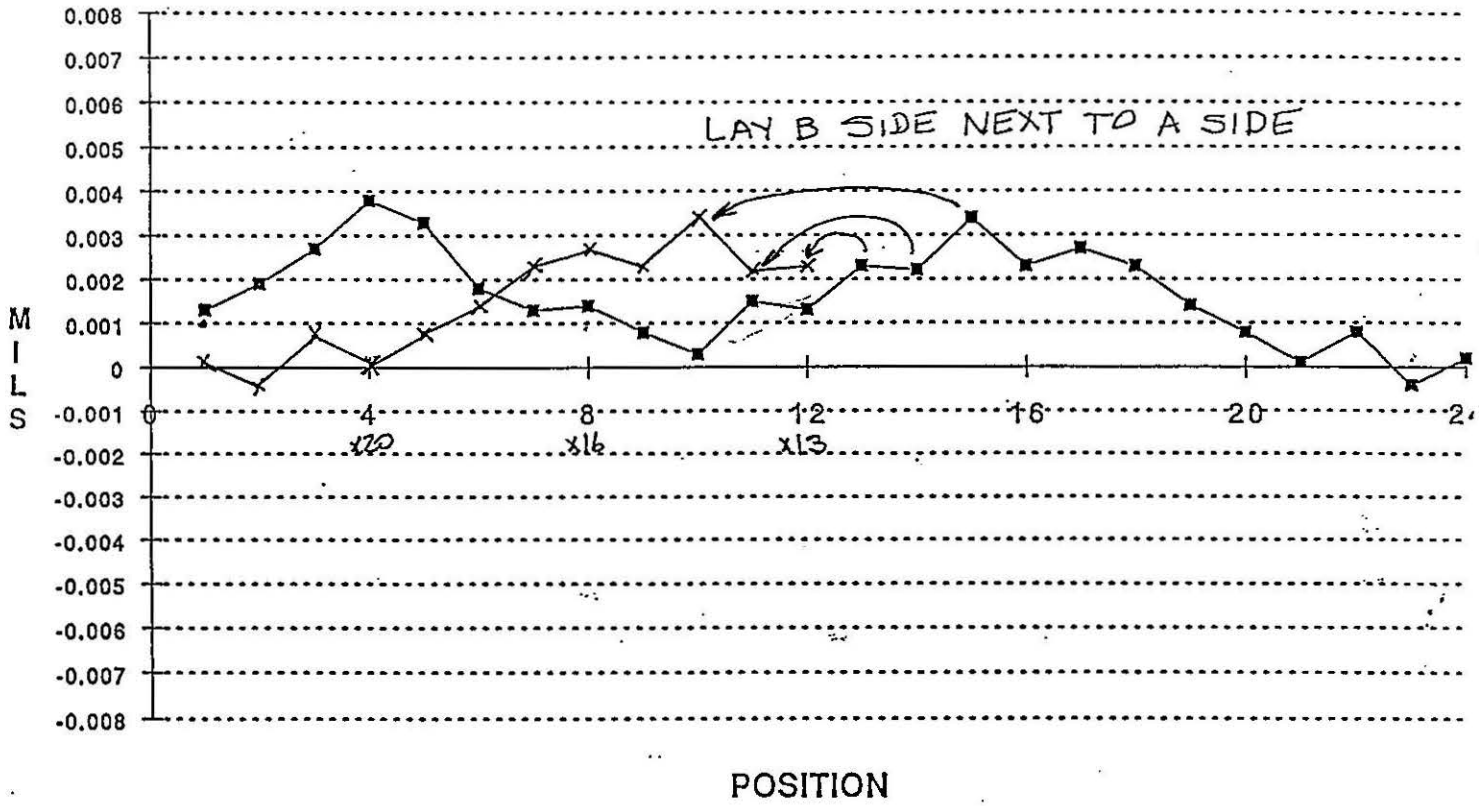


FIGURE 1

SHORT INNER COIL *111



✓ FIG. 2

SHORT INNER COIL *111

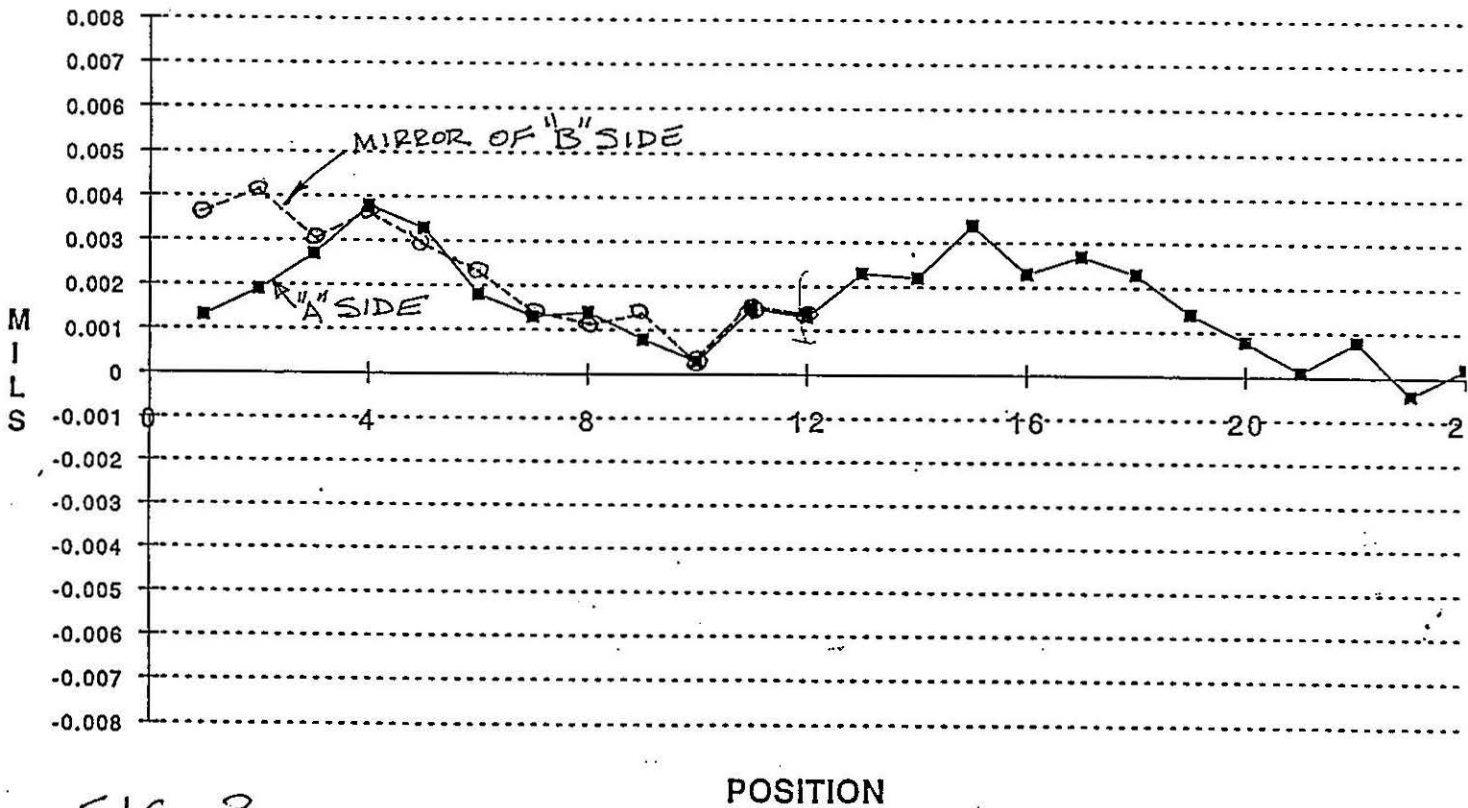


FIG. 3

Short Inner Coil #111

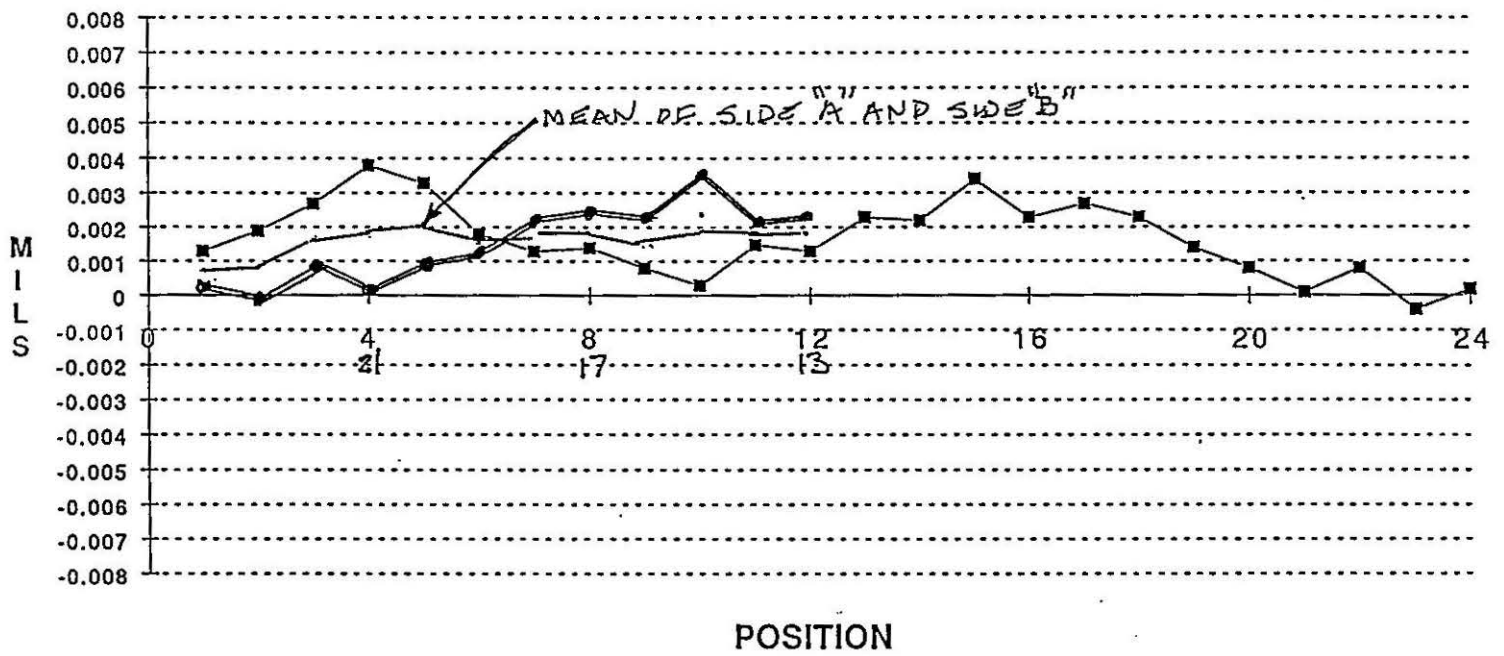


FIG. 4

SHORT COIL #110 (INNER)

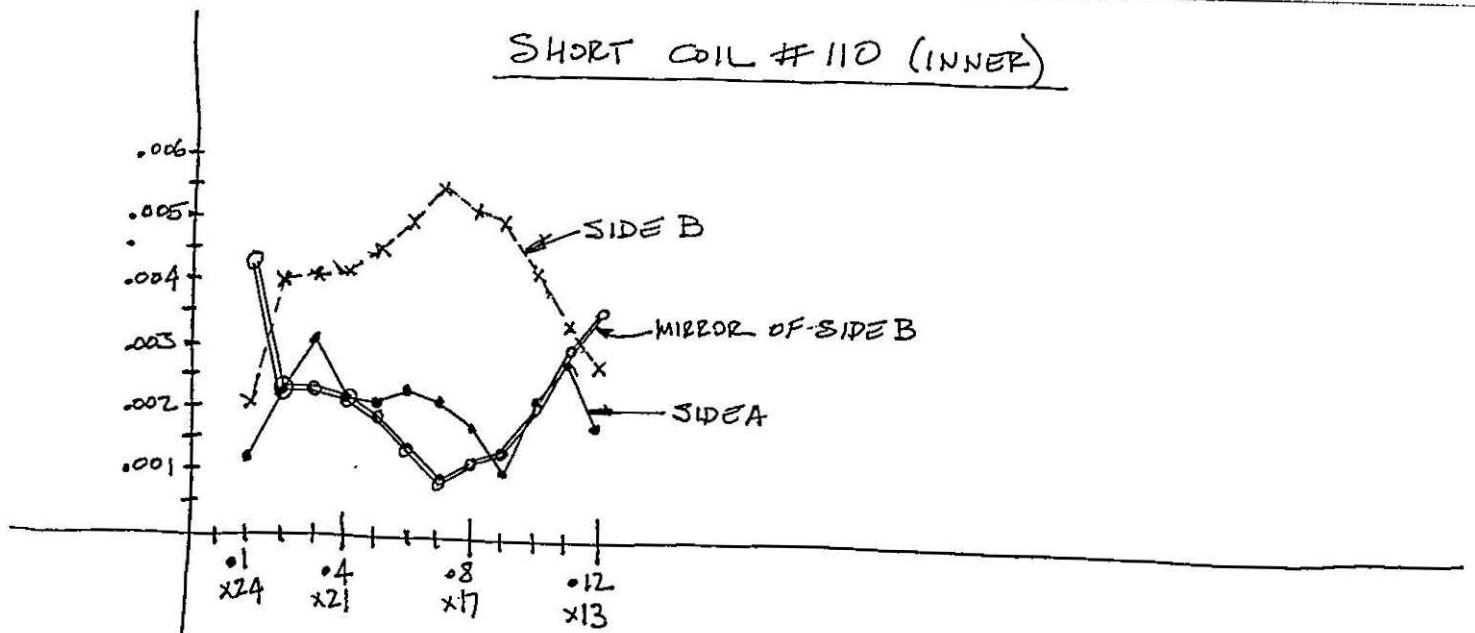


FIG. 5

SIDE B

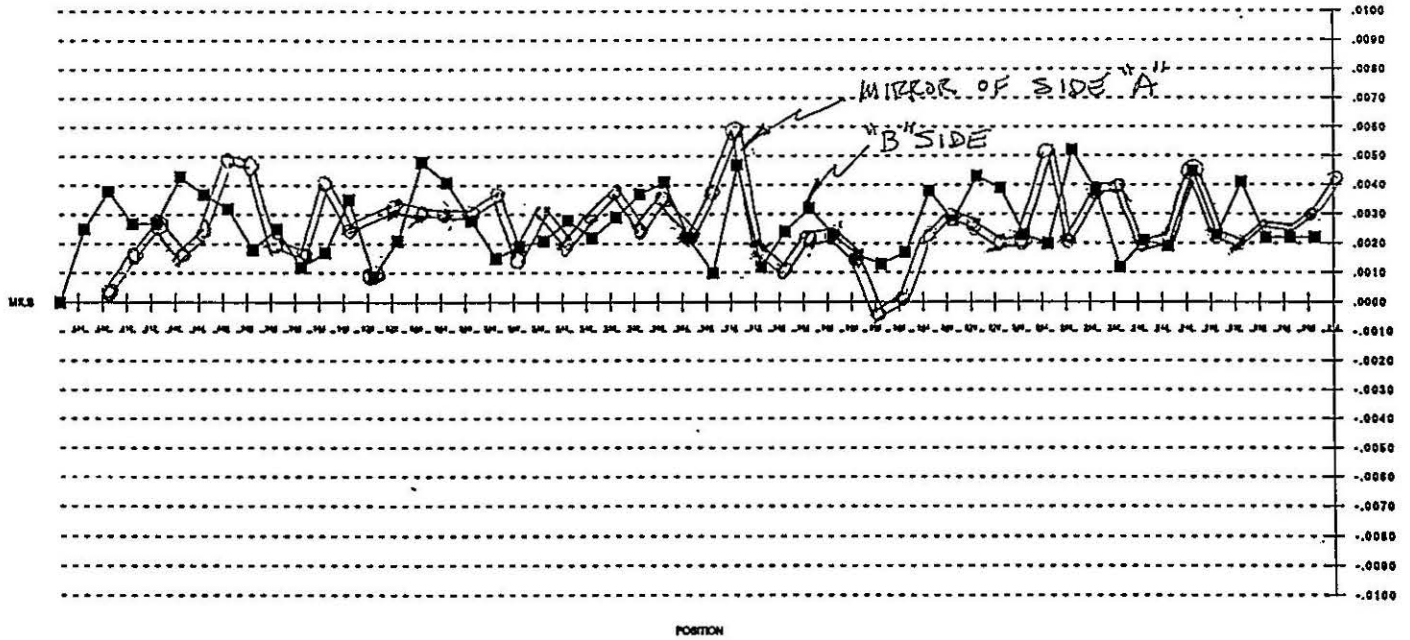


FIG. 6 INNER LONG COIL 1003

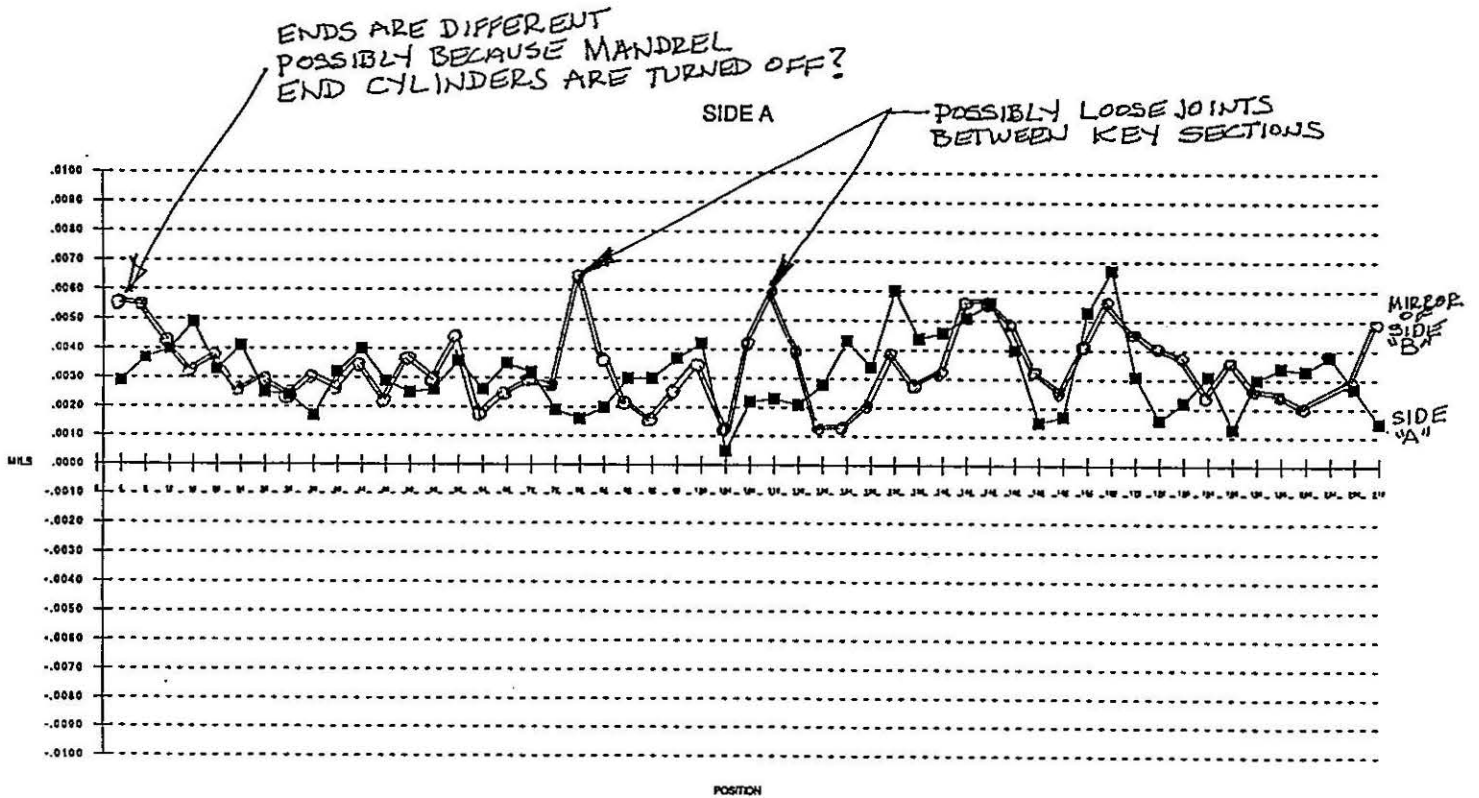


FIG. 7 INNER LONG COIL 1004