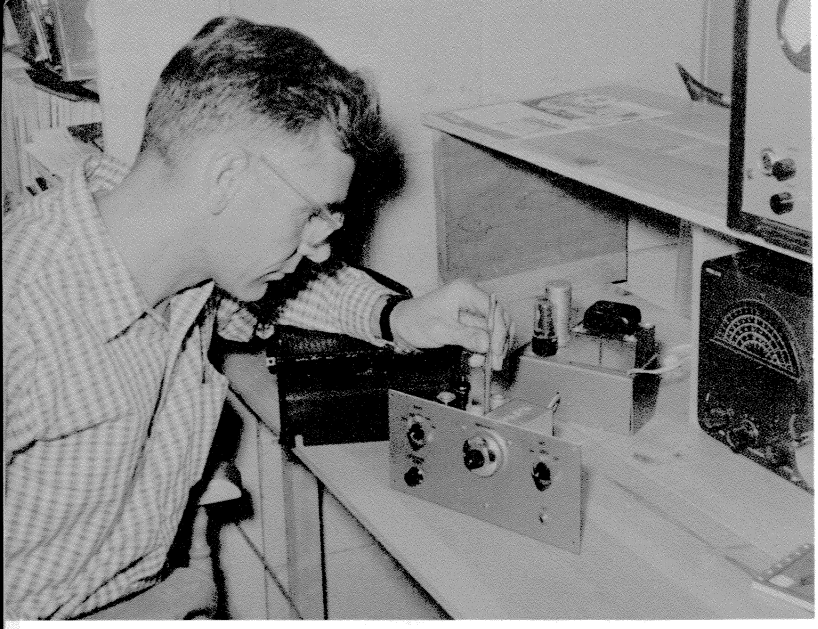

INDUCTIVE TUNING FOR HIGH-C RF OSCILLATORS

By Jack Najork — K9ODE

K9ODE TUNES UP HIS VFO EXCITER after completing construction. Exciter is housed in perforated metal cabinet under Jack's left elbow. Corner of home-built transmitter appears on shelf above station receiver at right. Jack Najork was first licensed as W2HNH in 1934 and became K9ODE in 1958. He operates mostly on CW, with some voice operating on double sideband and 144 megacycles.

K9ODE is District Sales Manager in Chicago for General Electric's Communication Products Department, which manufactures and sells G. E.'s famous Progress Line two-way mobile radio. He formerly was located in Syracuse, N. Y., where he was an engineer on electronic test equipment, and later a field engineer for the radio and television receiver department. Jack has written a number of articles describing his home-built equipment for amateur radio and other electronics publications.

THE ADVANTAGES of inductive tuning in high stability oscillators (VFO's) have long been recognized by manufacturers of radio equipment. Unfortunately, the construction of a precision, high stability variable inductance is beyond the capabilities of the average radio amateur, and he has had to be content with capacitive tuning for his home built VFO. These VFO's are capable of excellent stability, but such stability is achieved only through meticulous attention to mechanical as well as electrical construction.

The pros and cons of the most popular types of capacitance-tuned oscillators — the Clapp and the high "C" Colpitts — have been exhaustively discussed in the amateur journals in recent years. The Clapp circuit is capable of excellent stability but mechanical problems of anchoring down the large, high "Q" inductance, together with variations in output over wide frequency changes remain bugaboos.

The high "C" Colpitts does away with the inductance mounting problem because the required coil is small and can be made mechanically sturdy. Large values of voltage divider capacities are required, however, and these, in turn, call for the use of extremely large values of tuning capacitances to cover the lower frequency bands. Such tuning capacitors are generally available only as replacement two or three section broadcast types, which are not designed for precision tuning. The flimsy construction and large mass of such units again lead to mechanical stability problems.

In addition, this large amount of capacity is extremely sensitive to humidity changes because the major portion of the dielectric is air. A gentle breath into the tuning capacitor of the high "C" VFO can cause a frequency shift of several hundred cycles. While the average ham doesn't make a practice of breathing into his VFO, changes in the humidity content of the shack can cause short-term instability, particularly on "muggy" summer days.

The majority of high stability VFO's require some degree of temperature compensation and here again, the capacitively tuned oscillator is at a disadvantage because perfect compensation can be obtained at only one setting of the tuning capacitor. This problem is minimized in the inductively tuned circuit because the amount of capacity in the circuit remains fixed.

Most of the above mentioned problems are licked in this VFO exciter through use of an inductively tuned high "C" Colpitts oscillator tuned with a Mallory "Inductuner."

Amateurs with a background in television will recognize the Inductuner as the front-end tuning device used in many TV receivers manufactured ten years or so back. The tuner was manufactured in two, three and four section units and was used to provide continuous tuning of the TV and FM spectrum from 54 to 220 Mc. Each section of the tuner consists of a spirally wound, silver plated inductance firmly imbedded in low-loss plastic.

A silver plated slider driven by the tuning shaft rides along the inductance under tension. The excellent high frequency electrical and mechanical characteristics of this tuner make it ideal for use in a VFO and enable relatively simple construction of a tuned circuit which results in superb stability.

At first glance it would seem this VHF tuner could not possibly have enough inductive range to be useful at the lower frequencies at which VFO's generally operate. The high "C" Colpitts circuit, however, requires very little inductance, even in the two megacycle range. Each section of the Inductuner has a maximum inductance of approximately .8 microhenries and in the circuit shown one section of the tuner is used in conjunction with a fixed inductance and fixed capacitors to cover the 1.75-2.0 Mc. range. By properly proportioning the fixed inductance and capacitors the desired range is made to occupy almost the complete six turn tuning spread of the Inductuner as shown in Fig. 1.

Some form of turn counting type dial is required for the Inductuner. The dial shown in the photographs is a Model 1320 series Microdial manufactured by Borg Corporation, Janesville, Wisconsin. This dial has provisions for ten turns broken down into 100 divisions per turn, and while it was designed for *Micropots*, it works fine in this application.

The two section Inductuner in the unit shown in the pictures was salvaged from an old TV booster. Most TV receivers employing this unit were equipped with the three section unit and some scrounging in the back rooms and basements of TV service shops should turn up this little gem. It may also be available on the surplus market. While only one section is used in this particular design there is no reason why two or more sections cannot be connected in series or parallel to provide more

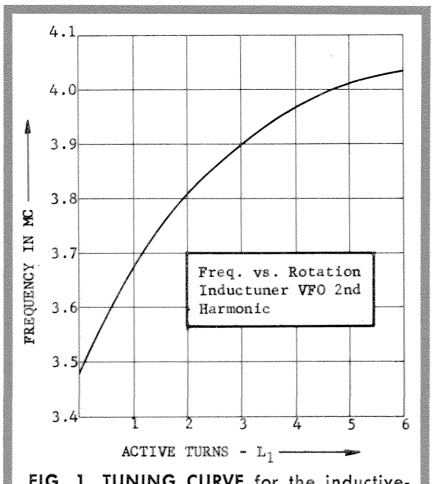

FIG. 1. TUNING CURVE for the inductive-tuned oscillator as constructed by K9ODE.