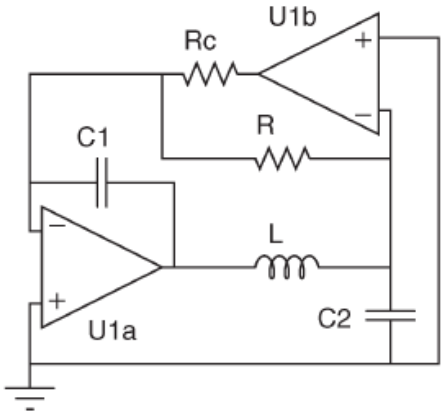

(a)

IV. CLC CASE

The circuit for the CLC case is given in Fig. 3(a). Here, L-$C2$ forms the second-order passive integrator. To avoid the nonlinear and hysteresis effects of core saturation, an air-core inductor was employed. The inductor used in the test circuit was quite compact, measuring 1.5 cm tall by 1.1 cm in diameter. The series resistance of the inductor RL was included in the model. The circuit parameters are given by

$$A = R_L/L + 1/RC_2 \tag{8}$$

$$B = (1 + R_L/R)/LC_2 \tag{9}$$

$$C = 1/RC_1LC_2. \tag{10}$$

The circuit was constructed with $C1 = 4.7$ nF, $C2 = 1$ μF, $L = 0.1$ H, $RL = 105$ Ω, $RC = 475$ kΩ, and R variable from 68k to 168k (a precision 100k potentiometer was used in series with a fixed 68k resistor). Note that for the inductor used, RL/L dominates A, whereas RL/R can be neglected in B, so that the parameters A and B can be treated as constants. However, RL has a strong effect on the eigenvalues, and as RL decreases, the real part σ of the complex conjugate pair increases. For inductors with different series resistance, the component values will need to be adjusted to achieve bounded chaos. For the given components, $A = 1.15E3$ s-1, $B = 1.08E7$ s-2, and C ranges between about 2.9E10 and 1.4E10 s-3.