A magnetic loop doesn't move and only a new magnetic field newly emerging from below the photosphere fills the space blow it is filled with a magnetic field newly emerging from below the photosphere.

Similarly, the Eq. (1) can be written as:

\[
\frac{d}{dt} \left( IR_{\text{loop}} \left( \ln \frac{8 R_{\text{loop}}}{r_0} - \frac{7}{4} \right) \right) = -a_1 I R_{\text{loop}} - a_2 R_{\text{loop}} \frac{dR_{\text{loop}}}{dt}
\]

where

\[
a_1 = \frac{c^2}{2 \pi \sigma(T) r_0^3}, \quad a_2 = \frac{B_0 c}{2 \pi}
\]

Taking account of slow variation of the term \( \left( \ln \frac{8 R_{\text{loop}}}{r_0} - \frac{7}{4} \right) \), the Eq. (2) can be reduced to:

\[
\frac{d}{dt} \left( IR_{\text{loop}} \right) = -b_1 I R_{\text{loop}} - b_2 R_{\text{loop}} \frac{dR_{\text{loop}}}{dt}
\]

\[
b_1 = \frac{c^2}{2 \pi 9 \cdot 10^6 T^3 r_0^3} \left( \ln \frac{8 R_{\text{loop}}^0}{r_0} - \frac{7}{4} \right)^{-1}, \quad b_2 = \frac{B_0 c}{2 \pi} \left( \ln \frac{8 R_{\text{loop}}^0}{r_0} - \frac{7}{4} \right)
\]

Initial condition \( I(t=0) = 0 \) and \( R_{\text{loop}}(t) = R_{\text{loop}}^0 + a \ t \) the Eq. 2 can be solved analytically.