

PILOT WIRE DIFFERENTIAL PROTECTION APPARATUS FOR MULTI-END CIRCUIT
BASED ON PHASE COMPARISON PRINCIPLE

ABSTRACT

A pilot wire differential protection apparatus and method for a power transmission and distribution lines including three or more connecting ends. The apparatus comprises: three or more TRANSLAY relays, which are sequentially connected at the corresponding connecting ends of the power transmission and distribution lines, respectively. Summation transformers of the respective relays are connected to an a phase, a b phase, a c phase and a neutral point at the connecting ends of the corresponding protected circuits, and a pilot wire first connecting terminal and a pilot wire second connecting terminal of the respective relays (are connected with each other in parallel, respectively. Respective phase comparators compare corresponding phases of U_I and U_{II} so as to obtain a phase difference, U_I is a voltage at a secondary winding side of the relay of the phase comparator, U_{II} is a voltage at a auxiliary transformer side of the relay of the phase comparator. A false state in the lines is judged according to the phase difference $\text{Arg} \frac{\dot{U}_I}{U_{II}}$. At each of the connecting ends, a pilots padding resistor R_{pp} of the relay is adjusted so that $R_{pp} + R_w = k * R_o$ is satisfied, k is a set constant, R_w is a resistance on the pilot wire, and R_o is a linear impedance of the TRANSLAY relay. When $T_o < T_r$ or $T_o > T_r$, a value of k satisfies a condition of $-n * k - 1 < -1 < -(n * k + n) * T_o / T_r + n - 1$ or a condition of $-(n * k + n) * T_o / T_r + n - 1 < -1 < -n * k - 1$, respectively, T_o and T_r are number of turns of an operating winding and number of turns of a restraining winding in the relay, respectively.

ABSTRACT FIGURE: FIG 5