Patents

Transmission Line Spacer Damper Device MOD2
US Patent 5, 721,393
AR®Spacer Damper

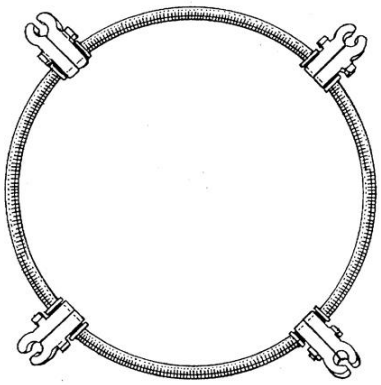

FIG. 1

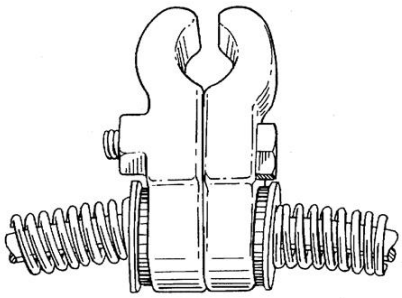

FIG. 2

TRANSMISSION LINE SPACER
DAMPER DEVICE MOD-II
UNITED STATES PATENT 5,721,393
FEBRUARY 24, 1998

ABSTRACT
A spacer damper for providing proper separation and effective vibration damping of subconductors includes a structural hoop about which two or more clamps are positioned at equal intervals. The clamps allow attachment of the spacer damper to the subconductors and are separated by springs about the hoop and between the clamps. The hoop and subconductors are positioned substantially in the same plane to reduce corona effects. Additionally, a suspension clamp is securable to an insulator of a tower to support a subconductor.

BACKGROUND OF THE INVENTION
Transmission lines that are used to transmit electrical energy are often characterized as, high voltage lines, extra high voltage (EHV) lines, and ultra high voltage (UHV) lines. The voltage levels in each category are approximately, under 300 kilovolts (kV), 300kV to 500kV, and over 500kV, respectively. Transmission lines that are in the category of EHV and UHV are referred to as bulk power transmission lines, meaning that power is transferred along the lines from a generating point to a distribution point over great distances which can be as much as several hundred miles. Another feature of such power delivery is that total power is in the range of hundreds of megawatts delivered to the distribution point or load point. It is not uncommon to see several transmission lines, consisting of the three phase conductors each, passing over a common right-of-way from the generating point to the load point. These lines may be located in open

farmlands, or hilly terrain, or up and down a mountainside. In any case the uninterrupted delivery of power to the load point is a primary concern. Economy of delivers is also a major concern in the design of the line. One way of achieving economical design at the EHV and UHV voltages is to cause the conductors to be bundled. A bundled conductor differs from a single conductor because two or more conductors are tied together by devices known as spacers, or spacer-dampers. These devices are designed to keep the individual wires in a bundle separated by a fixed distance, usually 18 inches. The spacing of the spacer devices from each along the line is about 200 feet. Hence, a line having a span of 1000 feet will have four spacers, or spacer-dampers along its span length. Since there are three phases in a circuit, a single span of 1000 feet will have twelve spacers or spacer-dampers. Therefore, there are approximately fifty spacer units per mile, or five thousand spacer units per 100 miles of line.

Modern spacers are called spacer-dampers because they combine the function of spacing the bundle with the damping of the vibration of the individual wires in the bundle. The individual wires are called subconductors. A typical 500kV line will have three subconductors per phase in the shape an inverted equilateral triangle (inverted delta) with 18 inches separating each subconductor. Other lines may have only two subconductors and these are also separated by spacer-dampers at 18 inches, usually in a horizontal plane. Other higher voltage lines may have four subconductors in a square box arrangement separated at 18 inch intervals. A typical voltage in the case of two subconductors is 345kV, while typical voltage in the case of four subconductors is 765kV.

There are as many different ways to design spacer-damper devices as there are manufacturers that make them. Competitive cost is always a major concern. Long life in service over a period of twenty years or more is a major concern as well. Most especially, it is desired to provide a spacer-damper that performs effectively to dampen vibration of the subconductors without damaging the individual wires. Another factor which is very important is to provide a device that is easy and quick to install on the line. This usually means that a quick-acting, positive-locking bolt or clip is needed. This is especially needed when the spacer-damper units are to be contracted on the basis of lowest cost.

SUMMARY OF THE INVENTION

The present invention spacer damper device (i) provides the necessary spacing of subconductors from each other while allowing the subconductors to vibrate without causing damage to the subconductors, and (ii) reduces corona effects when spacing two high voltage subconductors apart (above 500kV). In order to reduce corona effects, the present invention provides a spacer-damper device for spanning two subconductors from each other that includes a hoop formed of rigid material, with first and second articulating clamps spaced along the hoop approximately opposite to each other for gripping the two subconductors in such a manner that the hoop and subconductors are positioned substantially along the same plane. The clamps are capable of sliding along the hoop and rotating about the hoop. First and second springs about the hoop and between the clamps separate the clamps along the hoop.

In preferred embodiments, the hoop and the subconductors lie along a horizontal plane with the subconductors being spaced about 22 inches apart. Rotation of each clamp is resisted by friction forces on the clamp provided by positioning washers about the hoop between each clamp and spring. Lateral movement of each subconductor is dampened by rotation of the corresponding clamp about the hoop with the rotation of the corresponding clamp being resisted by the friction forces exerted on the corresponding clamp. Longitudinal movement of each subconductor is dampened by a sliding action of the corresponding clamp about the hoop. The sliding of the corresponding clamp is resisted by the springs spaced between the clamps. Longitudinal movement of the subconductors can be in directions tangential to the hoop or along the circumference of the hoop.

The present invention also provides a clamp for gripping a subconductor. This clamp includes a clamp body comprising a mounting portion. The clamp arm terminates in a cradle which receives the subconductor. A keeper traps the subconductor within the cradle. First and second bolts are employed for securing the keeper against the subconductor. The bolts pass through the mounting portion of the clamp body.

In preferred embodiment, the present invention clamp is employed on a spacer-damper device. In another preferred embodiment, the present invention clamp is a suspension clamp for supporting a subconductor that is hung from an insulator of a tower.

In preferred embodiments of the present invention suspension clamp, the clamp arm is J-shaped which provides an entry way to the cradle on a side of the clamp body opposite to the clamp arm. This enables the subconductor to be slipped into the cradle during installation. The simple design of the present

invention suspension clamp allow subconductors to be hung from electrical towers more easily and in less time than with prior art suspension clamps.