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(54) **LOW-VOLTAGE CONNECTION WITH SAFETY CIRCUIT AND METHOD FOR DETERMINING PROPER CONNECTION POLARITY**

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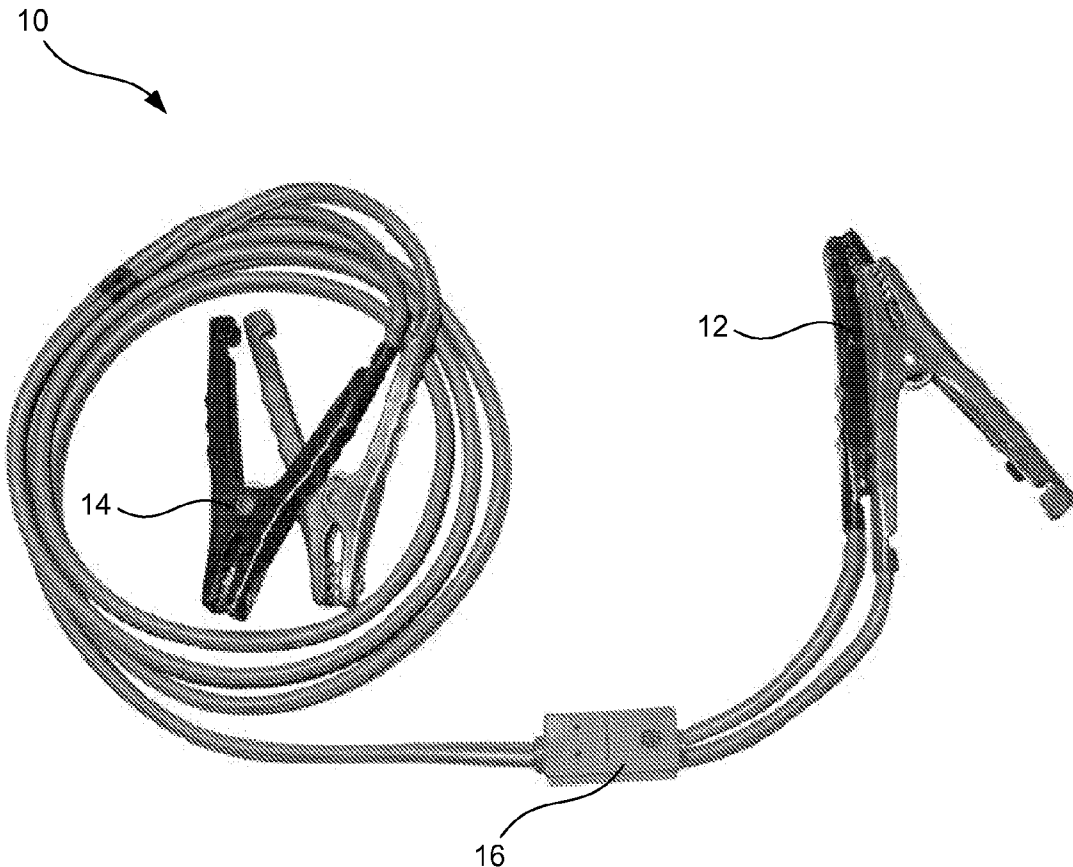
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- (52) **U.S. Cl.** **429/61**; 361/101; 361/93.9
- (57) **ABSTRACT**

A safety circuit for use in low-voltage systems improves safety of and additional features to low-voltage connections. When incorporated into a battery, the circuit leaves the battery disconnected from the low-voltage system until it determines that it is safe to make a connection. When the safety circuit determines that no unsafe conditions exist and that it is safe to connect the battery, the safety circuit may connect the battery by way of a "soft start" that provides a connection over a period of time that reduces or prevents inductive voltage spikes on the low-voltage system. A method is used for detection of proper polarity of the connections between the battery and the low-voltage system. When incorporated into a jumper cable, the safety circuit provides communication abilities, can provide test abilities, and improves connection safety and functionality, such as allowing transfer of power between low-voltage systems having different voltages.



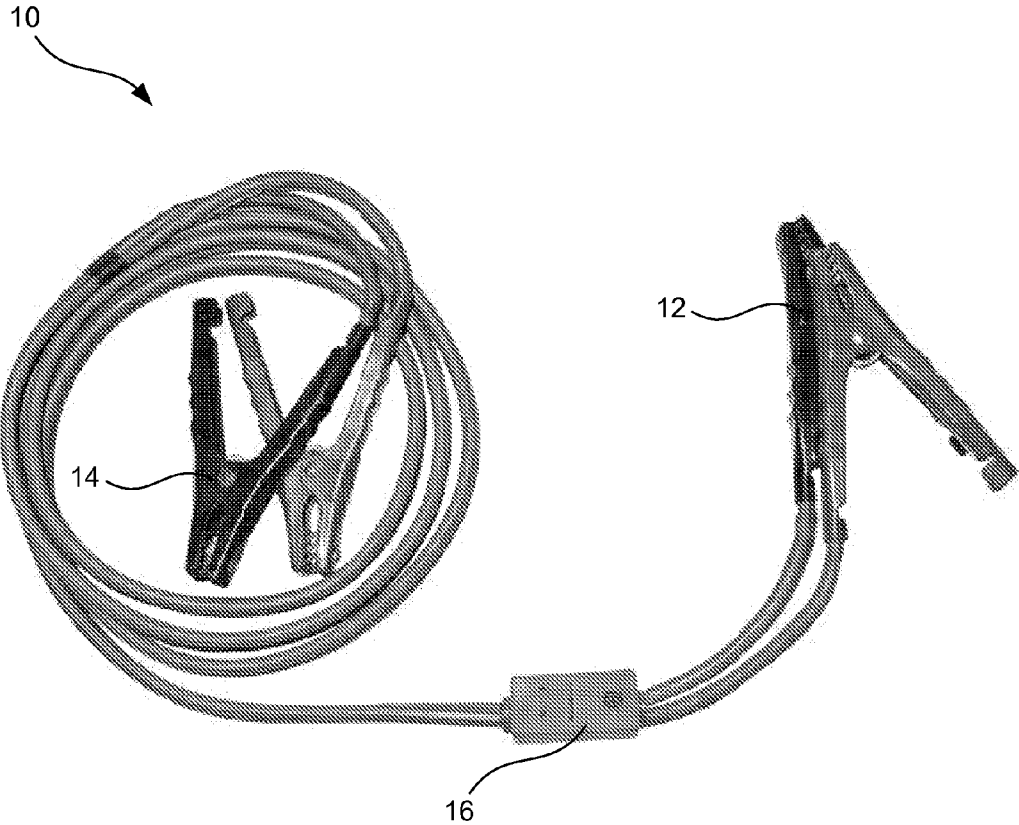


FIG. 1

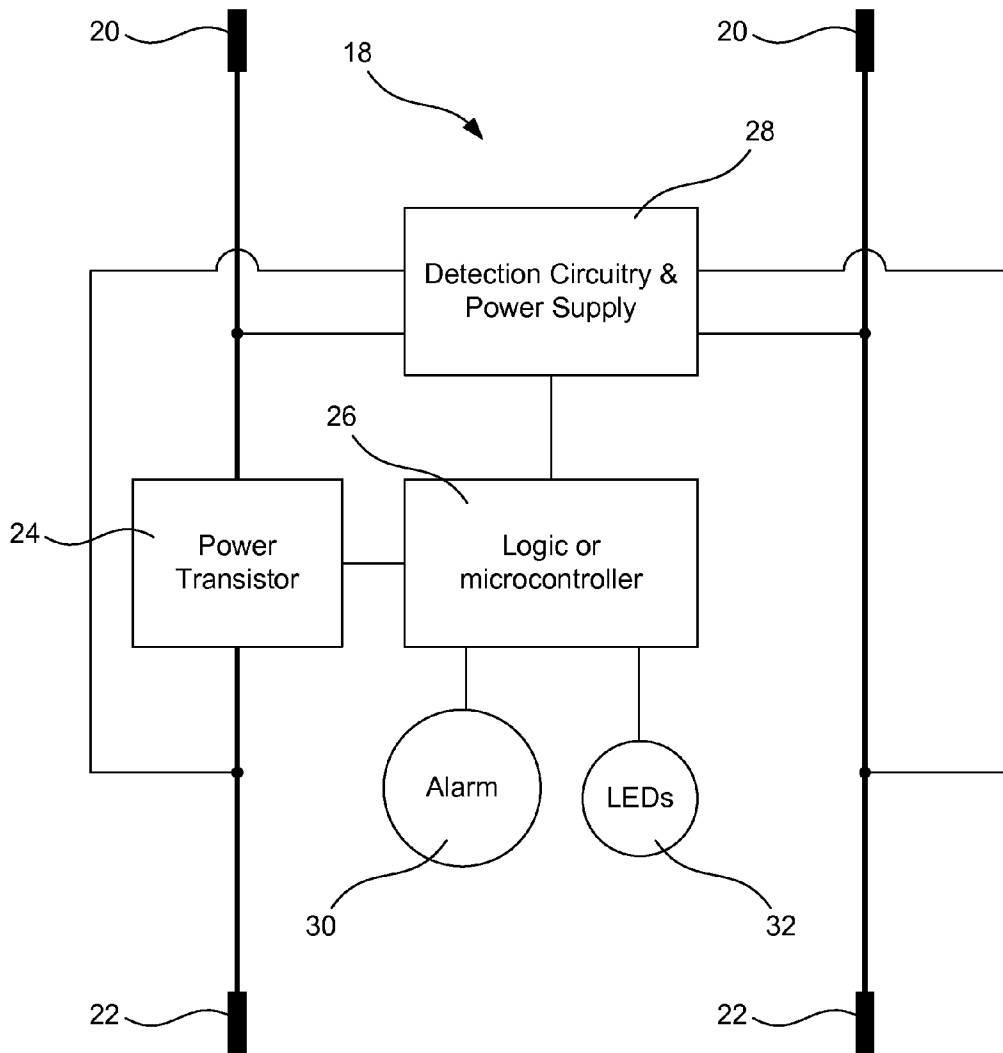


FIG. 2

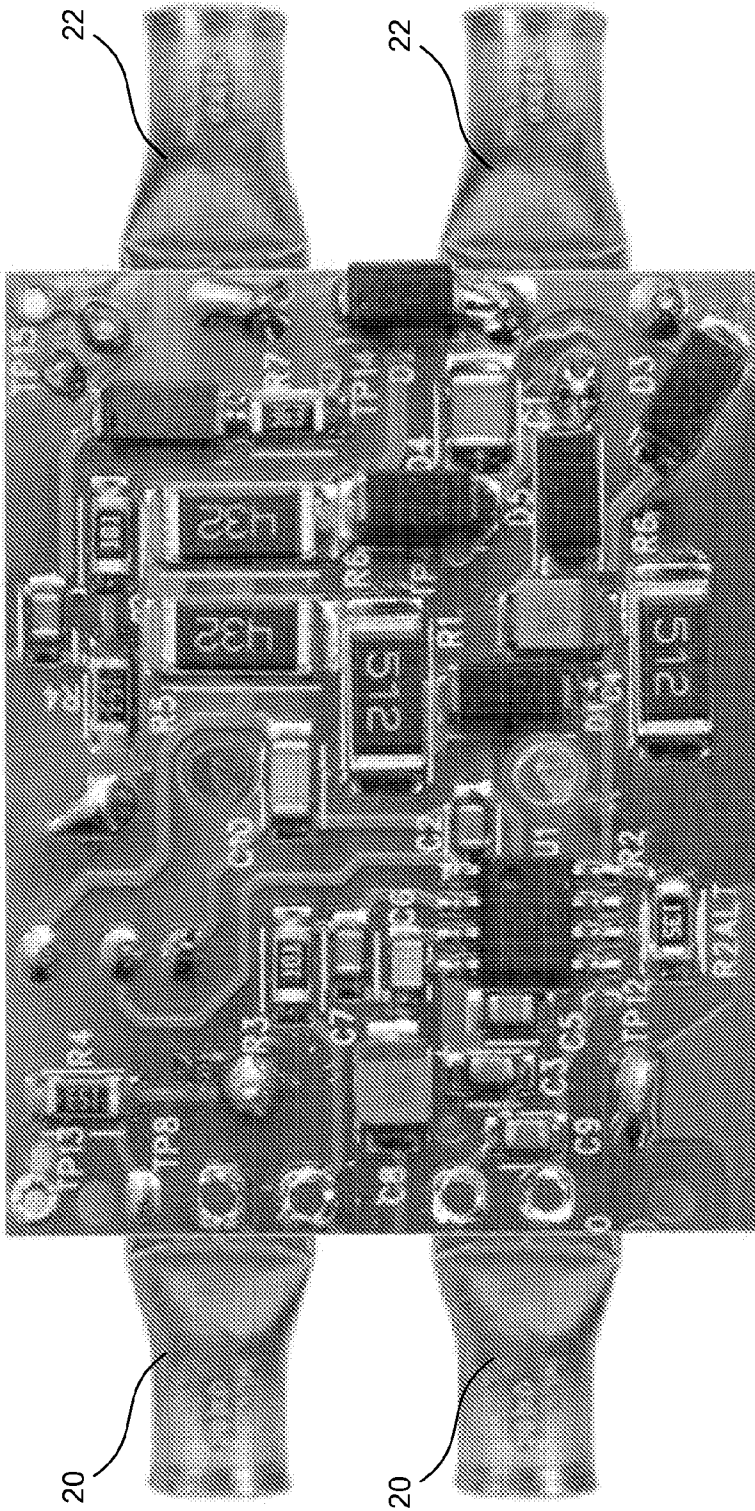
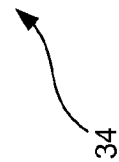


FIG. 3



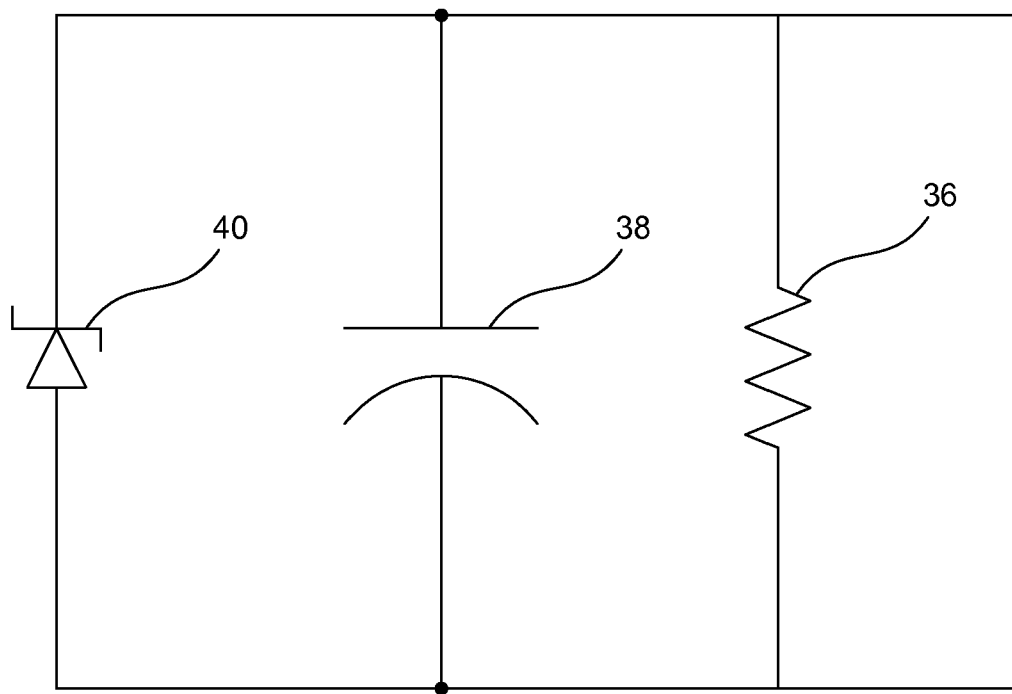


FIG. 4

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