Inductive Charging System and Associated Load-Bearing Strap

FIELD OF THE INVENTION

The present invention relates generally to an inductive charging apparatus, specifically a series of coils, controllers, and a power supply embedded within a wearable load-bearing strap.

BACKGROUND OF THE INVENTION

In present times, individual users and always seeking a more convenient means of providing power to their electronic devices. With the advent of a wide variety of portable electronic devices, the need has grown even greater. With ever-larger screens, more powerful processors, and generally more demanding applications, the batteries of these devices are constantly in a struggle to meet the demands of the user. It is not uncommon for a device to drain its internal power supply fully within a single day of use, requiring a significant down-time and/or forcing a user to interrupt their activities to find a power source. If the user does find a power source, they now contend with a staggering variety of possible port standards, connector types, current ratings; any mismatch of these standards could prevent the device from charging properly or may even damage the device. To illustrate, there are over a dozen “Universal Serial Bus” (USB) sockets spread across three major generations since 1996, not all of which are compatible with each other. Hardly universal; and this does not address additional standards like Thunderbolt, NEMA, SAE, coaxial connectors, and a multitude of other competing hardware standards. Solutions known in the art involve carrying external “brick” power packs; batteries encased in a protective shell designed to be carried in conjunction with the device being charged. This solution is cumbersome, effectively doubling the size of most devices while still not addressing the compatibility issue. Some solutions involve

integrating these packs into wearable assemblies, but often use the same limiting connector set, or position a universal inductive charger out of direct reach of the user.

The present invention aims to offer a solution to this problem. The charging assembly described herein is a wearable series of straps, intended to be integrated into a backpack or similar product. Within these straps are positioned a series of inductive charging coils and an internal power supply. This assembly will wirelessly charge any device equipped to the Qi industry standard simply by placing the device in the pockets positioned along the straps. The Qi standard is nearly ubiquitous among major cell phone brands and can easily be retrofit to other devices with the installation of a thin conductive coil. The major drawback of known solutions, i.e. that the device had to be stored in inaccessible locations for charging, has been solved by placing the coils and storage pockets within easy reach of a user. The elastic pockets can fit a wide variety of devices, allowing them to be kept in proximity to the charging coils while also being easily accessible to the person wearing the straps.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the present invention.

FIG. **2** is an exploded view of the present invention

FIG. **3** is a right-side view of the present invention.

FIG. **4** is a diagram view of the electronic components of the present invention.

SUMMARY OF THE INVENTION

The present invention aims to provide the convenience of mobile device charging combined with a readily accessible storage and transport solution. Additionally, the present invention provides a means of wireless charging adhering to the “Qi” industry standard for inductive charging.

DETAIL DESCRIPTIONS OF THE INVENTION

All illustrations of the drawings are for the purpose of describing selected versions of the present invention and are not intended to limit the scope of any future claims related to the present invention.

In reference to FIGS. 1-4, the present invention is a wearable charging assembly. More specifically, the charging assembly provides a means to store and charge electronic devices using several induction coils as intended to provide a more convenient means of providing power to personal electronic devices.

The popularity of the smartphone has steadily increased the demand for a product like the charging assembly. With ever-larger screens, more powerful processors, and generally more demanding applications, the batteries of these personal devices are constantly in a struggle to meet the demands of the user. It is not uncommon for a device to deplete its internal power supply within a single day of use, requiring a significant down-time and forcing a user to interrupt their activities to find a power source. If the user does find a power source, they now face a staggering variety of possible port standards, connector types, and current ratings; any mismatch of these standards could prevent the device from charging properly or may even damage the device. To illustrate, there are over a dozen “Universal Serial Bus” (USB) sockets spread across three major generations since 1996, not all of which are compatible with each other. Hardly universal; and this does not address additional standards like Thunderbolt, NEMA, SAE, coaxial connectors, and a multitude of other competing hardware standards. Solutions known in the art involve carrying external “brick” power packs; batteries encased in a protective shell designed to be carried in conjunction with the device being charged. This solution is cumbersome, effectively doubling the size of most devices while still not addressing the compatibility issue. Some solutions involve integrating these packs into wearable assemblies, but often use the same limiting connector set, or position a universal inductive charger out of direct reach of the user.

The charging assembly aims to offer a solution to this problem. The charging assembly described herein is a wearable series of straps, intended to be

integrated into a backpack or similar product. Within these straps are positioned a series of inductive charging coils and an internal power supply. The charging assembly will wirelessly charge any device equipped to the Qi industry standard simply by placing the device in the pockets positioned along the straps. The Qi standard is nearly ubiquitous among major cell phone brands and can easily be retrofit to other devices. The major drawback of known solutions, i.e. that the device had to be stored in inaccessible locations for charging, has been solved by placing the means for charging and means of storage within reach of a user.

The charging assembly comprises a plurality of straps, a plurality of housings, a plurality of controllers, and a plurality of leads.

The plurality of straps forms the main body of the charger assembly. More specifically, the straps are intended to rest over the shoulder(s) of a user, being permanently secured to an object positioned to the rear or sides of said user. This object may be of any description, but the ideal embodiment would be a backpack or similar container. Though the straps are ideally permanently attached to the object, the scope of the invention does include a removeable or retrofittable design such that the straps may be added to any other object that the user may desire. This invention discloses embodiments with a singular strap, or a plurality of straps of variable dimensions.

As depicted in FIG. **1**, a plurality of straps comprises a first textile, a cushion, a plurality of first chambers, a plurality of fasteners, and a plurality of pockets.

The first textile will ideally be in direct contact with the user. It forms the outermost layer of the strap, providing both shape and structure to the component. The first textile may be rigid, elastic, or both in different areas. This first textile also serves as a mounting surface for additional components along the length of the strap.

The cushion is a flexible layer within the first textile, inaccessible to the user. This layer serves to protect the more sensitive components, expand the dimensions of the strap, and enhance user comfort while the invention is in use. This cushion may comprise several different materials and material combinations and is not restricted to a uniform shape or dispersion.

The plurality of first chambers each further comprise a first seal. As depicted in FIG. **2**, these first chambers are positioned within the strap, beneath the first textile,

surrounded by cushion, and directly adjacent to a pocket. The chambers are intended to maintain a waterproof environment for the coils within. These chambers may be of any size or shape to accommodate a variety of coils and their associated hardware. The first seals provide a means for wires to penetrate the waterproof chamber walls without compromising the overall integrity of the chamber itself.

The plurality of fasteners may be positioned anywhere traversing the length of the strap. These fasteners may be described as cinches, buttons, buckles, or any other means of connecting the strap to any other belt, tether, or even to another similar strap in some embodiments. These fasteners may be of any material or design without departing from the original scope of the present invention; any means of securing an external object to the strap have been considered in other embodiments of the present invention.

As depicted in FIG. **1**, a plurality of pockets each further comprise a plurality of ribs and a second textile. These pockets may be positioned anywhere along the length of the strap, in any number or dimension. The pockets must be capable of securely holding an electronic device in proximity to active coils to facilitate charging. These pockets are not ideally sealed individually but may incorporate some method of fastener in alternative embodiments. The pockets are primary formed by the second textile; an expandable material suitable for containing sensitive electronic devices. This material may be flexible, rigid, or a combination of the two either in whole or in part. To maintain the position of the devices several elastic ribs traverse the length of the second textile, particularly around the open top. These ribs will provide uniform pressure on the device held within, preventing any slippage or unintended removal in the event of user motion or inversion.

As depicted in FIG. **3**, there is a container permanently fixed to the strap, comprising a third textile and a plurality of channels. This third textile is permanently fixed at one end to the strap, with several unobstructed channels leading from within the container to the interior of the strap. This third textile may be identical in construction to the first, or it may be of completely composition. No limits on this material are to be implied; any material that is capable of enclosing and supporting the controller assembly is considered acceptable in an embodiment. It should also be noted that is some

embodiments the container is positioned within the strap, rather than being formed as a separate component.

None of the plurality of channels will be visible externally, not will they interfere with the attachment of the upper end of the strap to an external object. The channels may be formed entirely out of the material of the third textile, or of additional material permanently fixed traversing the joint between the container and the strap. Their construction may comprise a single, large opening, or several smaller openings each permitting a lead to traverse the joint.

As depicted in FIG. **2**, a plurality of housings is permanently fixed within the strap and/or the container, each comprising a conduit and a second seal. In certain embodiments, there may be only one housing. These housings may be of variable thickness, material, and composition, according to the components they enclose. The housing(s) within the container is a semi-rigid protective structure containing the controllers. The conduit of this housing must be of suitable size and shape to allow leads to traverse the wall of the housing. The housing is also equipped with a second seal to prevent moisture from permeating the housing and damaging the electronics within. There must be a suitable number of both conduits and seals to allow provision of power to the coils and to allow the internal power supply to be recharged without compromising the housing. In the preferred embodiment of the charging assembly, there is only one housing enclosing all controllers and a power supply.

The controllers each comprise a means of a first contact, a second contact, and a third contact, and a plurality of coils. In additional embodiments of the invention, the first and second contacts may be replaced by a singular fourth contact. The contacts are mounted to a control board contained within the housing, ideally located within the container. This control board may be an individual printed circuit board or may be several smaller controllers. These boards are positioned within the housing specifically to avoid damage to their relatively fragile electronics; any features further securing them are to be considered within the original scope of the invention.

As depicted in FIG. **4**, the contacts are described as the means of connecting the controllers to any coils in the assembly, and to a power source. The first contact is a point for the first wire to be permanently attached to the controller. The second contact is a

point for the second wire to be permanently attached to the same controller, completing the circuit. The third contact is intended to facilitate connection to an external power supply; either for recharging of an onboard supply or for provision of power through the controller to the coils via the leads. The fourth contact may, in some embodiments, replace both the first and second contacts. This contact is intended to mate with the first terminator, either removably or permanently, by means of a USB-standard port. The type of port is not limited in this embodiment and may be of any design or description.

The plurality of coils each comprise a first receiver, a second receiver, and (in certain embodiments) a third receiver. As depicted in FIG. **2**, the coils are ideally located within the body of the strap, beneath the first textile within a first chamber. These coils are positioned in immediate proximity to the external pockets to facilitate wireless charging of the devices stored therein. There may be as many coils as necessary or desired to provide charging capability to a plurality of pockets, without limit to dimension or quantity.

The first receiver of a coil is intended to permanently connect to an end of the first wire (the opposite end of the first wire connected to the first contact of the controller). The second receiver is designed to connect to an end of the second wire (the opposite end connected to the second contact of the controller). As depicted in FIG. **2**, this arrangement will complete the circuit of the power supply, controller, first contact, first wire, first receiver, coil, second receiver, second wire, second contact, back to the controller and power supply. In an additional embodiment, the first receiver and second receiver may be replaced by a single third receiver. This third receiver is ideally of similar standards to the fourth contact but may be of any design such that it may connect the third wire to the coil via the second terminator. This arrangement will also complete the circuit between the coil and the controller/power supply.

As depicted in FIG. **2**, this plurality of leads comprises a first wire, a second wire, and a third wire. The first and second wires are described as of similar material to the coils but may be of any material or dimension without limitation. In an additional embodiment of this invention a third wire, comprising a first terminator and a second terminator, may replace both the first wire and the second wire. This third wire may connect to the fourth using the first terminator, providing a composite means of electrical

transmission. The third wire is ideally a USB-standard cable, with matching terminators. However, the cable may be of any type or description provided it contains at least two individual conductive paths.

Although the invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention.

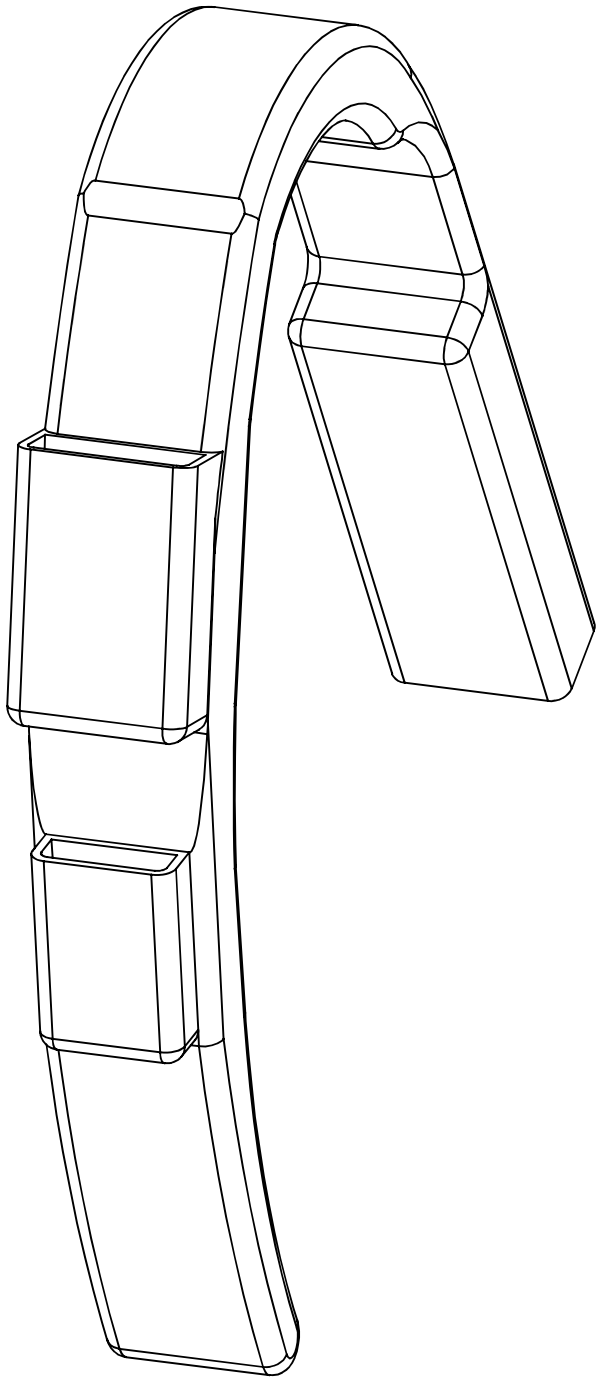

FIG. 1

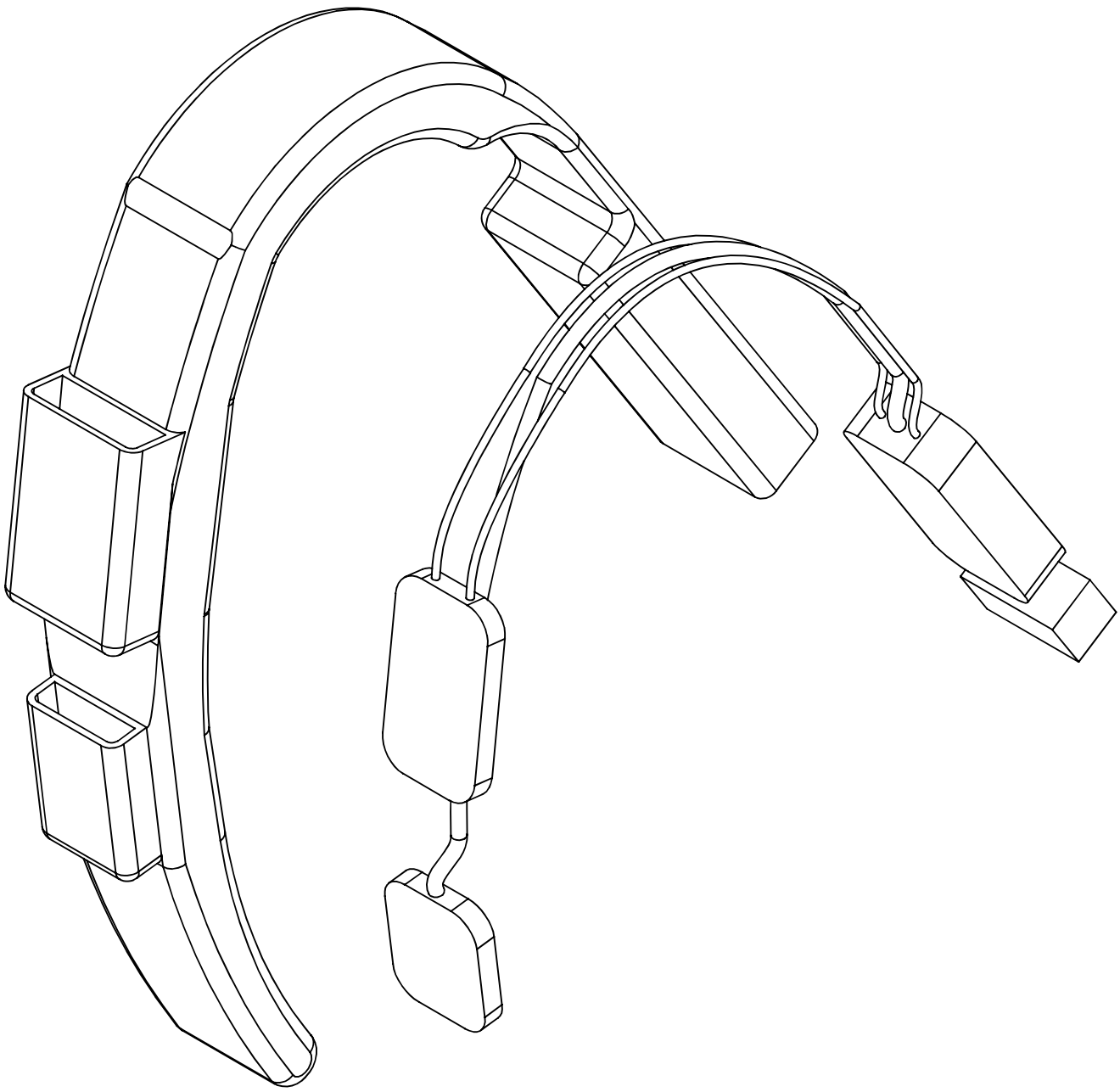

FIG. 2

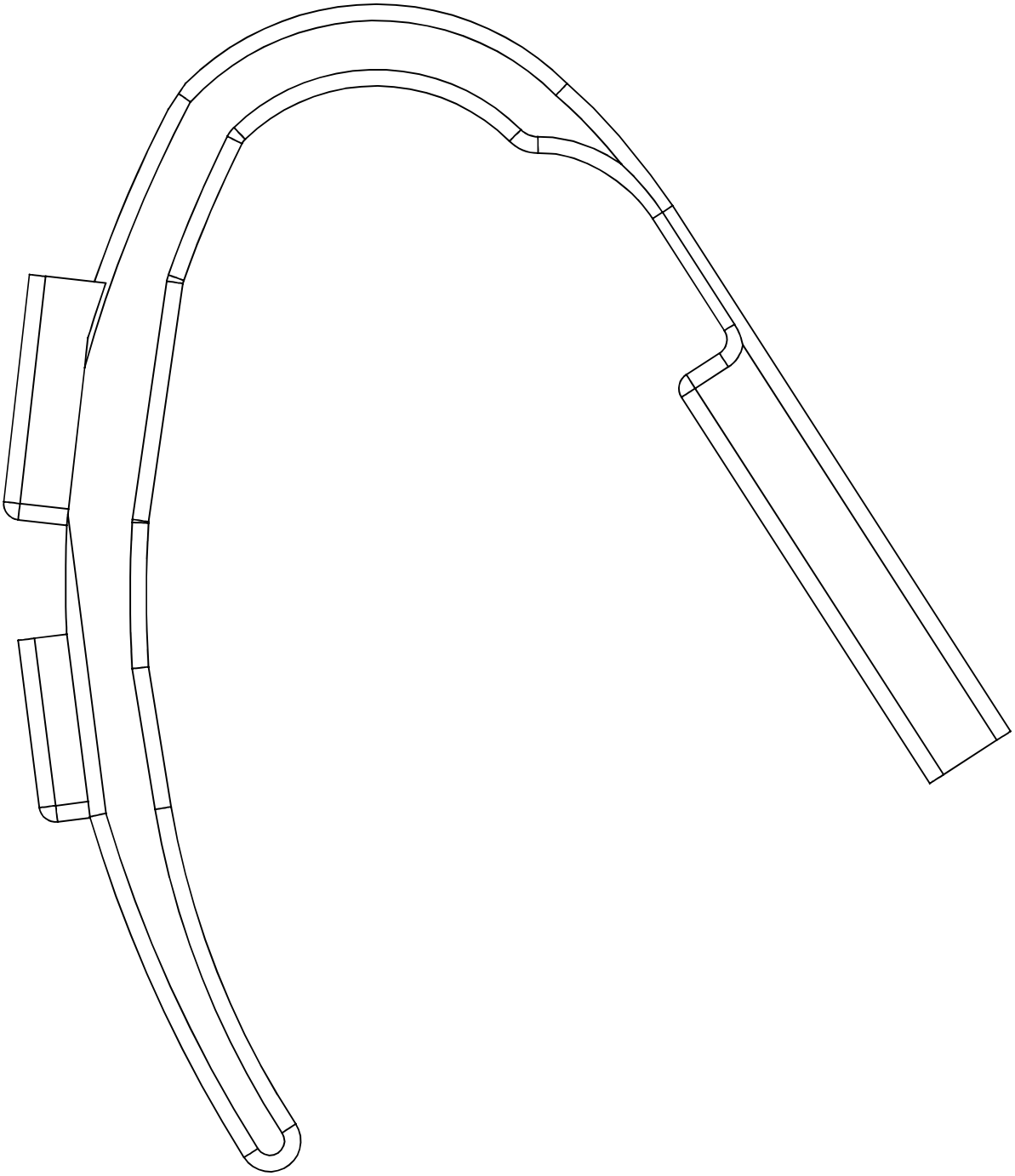

FIG. 3

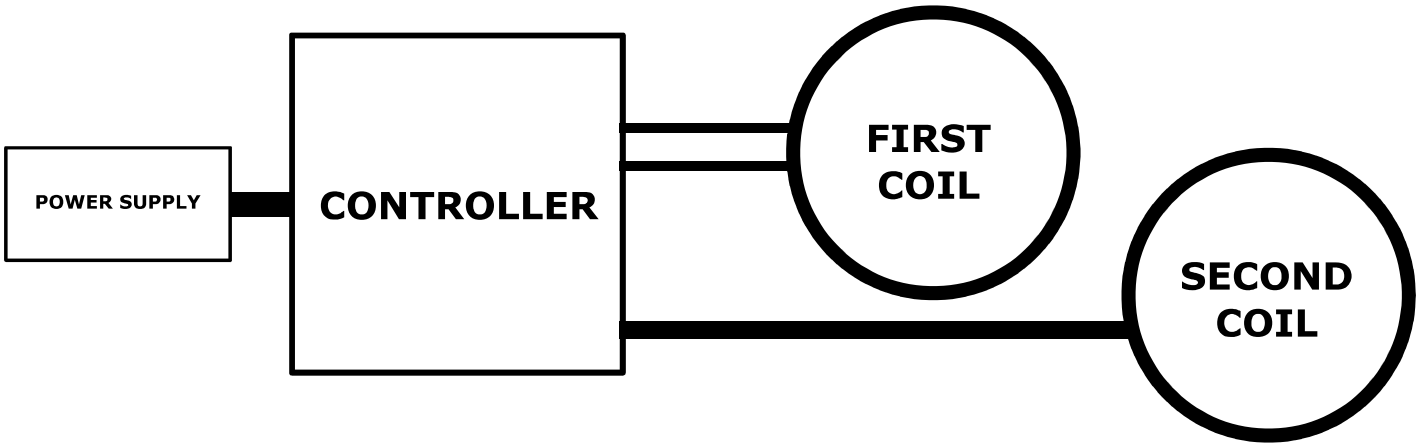

FIG. 4