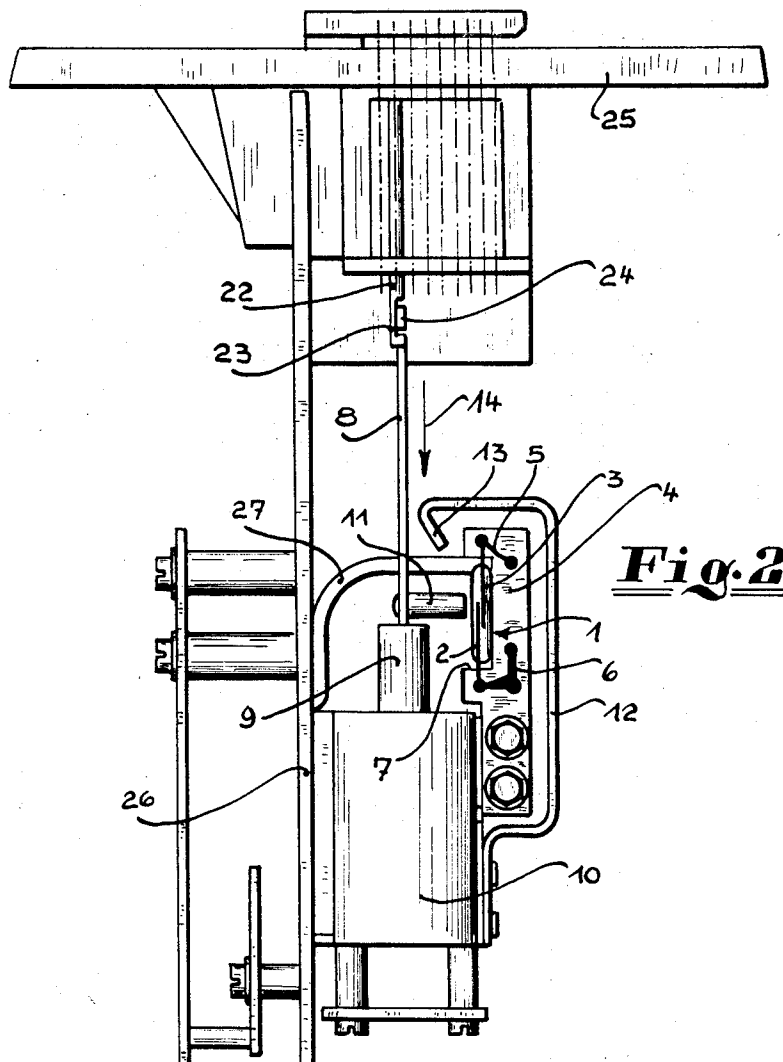
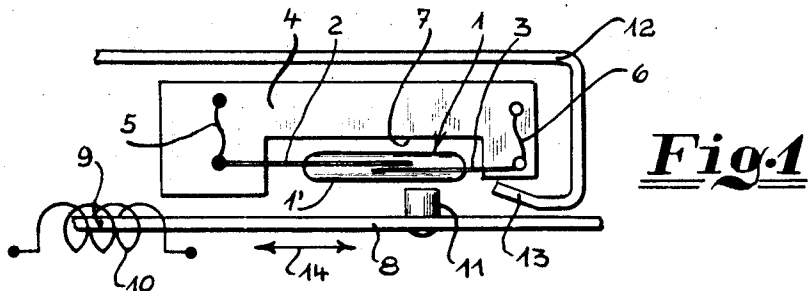


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ARRANGEMENT FOR SIGNALLING THE MOVEMENT AND/OR THE ATTRACTED
POSITION OF AN ARMATURE OF AN ELECTROMAGNET
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ARRANGEMENT FOR SIGNALLING THE MOVEMENT AND/OR THE ATTRACTED POSITION OF AN ARMATURE OF AN ELECTROMAGNET

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The present invention relates to an arrangement for signalling the movement and/or the attracted position of an armature of an electromagnet.

In various applications of electromagnets it is desirable to indicate the movement or the attracted end position of the armature thereof. Various arrangements are known for signalling the end position of the armature of an electromagnet and usually, such arrangements include switch means arranged with respect to the armature of the electromagnet in such a manner that the switch means are mechanically opened or closed when the armature moves to the active position thereof so that this position may be signalled by signalling means in circuit with the aforementioned switch means. Similar signals may be obtained by photoelectric means operated depending on the position of the armature of the electromagnet or a permanent magnet may be carried by the armature of the electromagnet movable with the latter and cooperating with a gas switch to open or close the latter when the contacts of the gas switch are subjected to the magnetic field produced by the permanent magnet carried by the armature. The term "gas switch" as used in this application is to be understood as a switch including a preferably elongated gas-tight envelope in which a pair of contact means, preferably in the form of resilient blades of magnetizable material having overlapping ends normally spaced from each other, are located, which, when subjected to a magnetic field, are magnetized so that the overlapping ends engage each other and close the switch circuit.

The above-mentioned arrangements known in the art have however the disadvantage that these arrangements will also signal the end position of the armature of the electromagnet when the armature is moved not by energizing the coil of the electromagnet but by any other means, for instance by extraneous mechanical forces.

It is an object of the present invention to provide for an arrangement for indicating movement of the attracted end position of an armature of an electromagnet only when the armature is moved to its end position by energizing the electromagnet.

It is an additional object of the present invention to provide for an arrangement of the aforementioned type which is constructed of relatively few and simple parts so that the arrangement may be produced at reasonable cost and will stand up trouble-free under extended use.

With these objects in view, the arrangement for indicating the active position of the armature of an electromagnet only when movement of the armature to the active position thereof is produced by energizing the electromagnet mainly comprises switch means having a pair of contact means movable between an open and a closed position and constructed to normally stay in one of said positions to move to the other of the positions thereof when subjected to an electric field, support means supporting the switch means, and an electromagnet having an armature movable in a given direction upon energizing of the electromagnet from a rest to an active position and a member of soft iron on the armature arranged so

that at least part of the magnetic field produced during energizing of the electromagnet passes through the member of soft iron to magnetize the latter, the armature and the soft iron member thereon being arranged relative to the switch means in such a manner that upon energizing of the electromagnet and movement of the armature from the rest to the active position thereof at least part of the magnetic field produced in the soft iron member acts, when the armature is in said active position, on the switch means to move the latter from the one to the other position thereof.

The switch means preferably comprises a gas switch including a gas-tight envelope and a pair of resilient blades of magnetizable material extending longitudinally through the envelope and having overlapping inner ends normally spaced from each other and movable into engaged position when the inner ends are subjected to a magnetic field.

The soft iron pole and the other components of the arrangement according to the present invention which cooperate to produce the magnetic field are arranged in such a manner that the switch means, respectively the gas switch are actuated only when movement of the armature and the soft iron member thereon is produced by energizing the electromagnet and when the soft iron member thus magnetized will reach a predetermined position relative to the switch means. The switch means will therefore not be actuated when the armature of the electromagnet and the soft iron member thereon will be moved to the aforementioned predetermined position relative to the switch means for instance by extraneous mechanical forces.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a schematic side view of the arrangement according to the present invention; and

FIG. 2 is a side view similar to FIG. 1 and illustrating an arrangement in which the armature of the electromagnet is connected to a punching device for instance for punching holes in a data card.

Referring now to the drawings, and more specifically to FIG. 1 of the same, it will be seen that the arrangement according to the present invention mainly comprises a gas switch 1 including a gas-tight envelope which may be either evacuated or be filled with an inert gas and a pair of resilient blades 2 and 3 of magnetizable material extending in longitudinal direction of the envelope and having inner overlapping ends normally spaced from each other, whereas end portions of the blades 2 and 3 which extend gas-tightly sealed through opposite ends of the envelope 1' are respectively connected at the outer ends thereof to conductor portions 5 and 6, which may for instance be constituted by printed circuit portions on an insulating plate 4. The gas switch 1 is preferably arranged in a substantially rectangular cut-out 7 extending inwardly from one longitudinal side edge of the rectangular plate 4 of insulating material. The extension 8 of the armature or core 9 of an electromagnet, the coil of which is indicated at 10, is arranged substantially parallel and adjacent to the longitudinal edge of the plate 4 at which the cut-out 7 is provided. The extension 8 carries a soft iron member 11 fixedly connected thereto, for instance by riveting or the like, projecting to one side of the extension 8 toward the gas switch 1. A shielding member 12 of magnetizable material, pref-

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erably soft iron, extends about the plate 4 as shown in FIG. 1 and the shielding member 12 has an extension 13 projecting into the space between the aforementioned edge of the plate 4 and the right end, as viewed in FIG. 1, of the extension 8 toward the blade 3 of the gas switch to concentrate the magnetic stray flux emanating from the soft iron member 11, when the latter is magnetized onto the blade 3 respectively on the overlapping ends of blades 2 and 3.

The above-described arrangement will operate as follows:

When the coil 10 of the electromagnet is energized by means of a source of electric current connected thereto, not shown in the drawing, the armature 9 is moved in the direction of the arrow 14 whereas when the coil 10 is deenergized the armature moves in the opposite direction, for instance under the influence of a spring, not shown in the drawing. The plate 4 and the gas switch 1 carried thereby are mounted on a frame or the like, not shown in FIG. 1, in such a manner that when the electromagnet is energized and the armature 9 as well as its extension 8 and the soft iron member 11 carried thereby moves in direction of the arrow 14 to an end position, the soft iron member will be located closely adjacent to the overlapping ends of the blades 2 and 3 of the gas switch so that the overlapping ends will be subjected to the influence of the magnetic field produced during energizing of the coil 10 in the armature 9, the extension 8 thereon and the soft iron member 11 carried thereby, so that the overlapping ends of the blades will be magnetized and moved to an engaged position, thereby closing a circuit in which the switch is located, which circuit includes a signalling device, not shown in the drawing, connected to the upper ends of the circuit portions 5 and 6 to produce, when the aforementioned circuit is closed, a signal indicating that the armature has moved to the active position thereof.

From the above it will be evident that the circuit will not be closed when the armature 9 and the soft iron member 11 connected thereto are moved in direction of the arrow 14 to a position in which the member 11 is closely adjacent to the overlapping ends of the blades 2 and 3 without energizing the coil 10, for instance by mechanical forces, since in this case no magnetic field will be produced which acts on the overlapping ends of the blades 2 and 3 of the switch. Obviously, the switch will also not be closed when the coil 10 is energized and the armature 9 and the soft iron member connected thereto are prevented from moving from the position shown in FIG. 1 to a position shown in which the inner end of the member 11 is closely adjacent to the overlapping ends of the switch blades 2 and 3. The contacts of the switch will be closed only when the soft iron member 11 moves to a position closely adjacent the overlapping ends of the contact blades 2 and 3 and if this movement is produced by energizing the electromagnet which will result in the induction of a magnetic field in the soft iron member 11 so that closing of the switch is produced under the influence of the magnetic field.

The soft iron member 11 and the other elements of the above-described arrangement which produce during energizing of the electromagnet a magnetic field may also have different configuration than shown in FIG. 1, but these members have to be arranged in such a manner that by the magnetic field produced during energizing of the electromagnet and movement of the member 11 in close vicinity to the overlapping ends of the contact blades 2 and 3, the latter will be properly magnetized to cause closing of the switch.

FIG. 2 illustrates an arrangement as above described incorporated in an implement generally designated with 20, which may for instance comprise a device for punching holes in a data card. The extension 8 of the armature 9 of the electromagnet 10 is coupled at 23, 24 at its upper end to the lower end of a punching tool 22, sche-

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matically illustrated in FIG. 2, which serves during actuation to punch a data card placed on the table 25. The specific construction of the punching tool 22 does not form part of the present invention and therefore this tool is only schematically illustrated in FIG. 2. A bracket 26 extending downwardly from the table 25 carries fixedly connected thereto in any convenient manner the electromagnet 10 and an arm 27 connected to the bracket 26 at one end carries on its other end the plate 4 of insulating material which in turn carries the gas switch 1. When the electromagnet 10 is energized, by means not shown in FIG. 2, the punching tool 22 is actuated and the soft iron member 11 is moved to the position as shown in FIG. 2 so that the magnetic field produced in the soft iron member 11 during energizing of the electromagnet causes closing of the switch 1 and corresponding closing of a signalling circuit, not shown in FIG. 2, which indicates actuation of the punching tool. As clearly pointed out above, closing of the signalling circuit will not occur when the punching tool 22 and the members connected thereto are moved by extraneous mechanical forces without energizing the electromagnet and without producing a magnetic field in the soft iron member 11.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of arrangements for signalling the active position of the armature of an electromagnet differing from the types described above.

While the invention has been illustrated and described as embodied in an arrangement for signalling the active position of the armature of an electromagnet and an implement connected thereto, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In an arrangement of the character described, in combination, switch means having a pair of contact means movable between an open and a closed position and constructed to normally stay in one of said positions and to move to the other of said positions thereof when subjected to a magnetic field; support means supporting said switch means; and an electromagnet having an armature movable in a given direction from a rest position to an active position upon energizing the electromagnet, and a member of soft iron on said armature arranged so that at least part of the magnetic field produced during energizing said electromagnet passes through said member of soft iron to magnetize the latter, said armature and said soft iron member thereon arranged relative to said switch means in such a manner that upon energizing of said electromagnet and movement of said armature from said rest to said active position at least part of the magnetic field produced in said soft iron member acts, when said armature is in said active position, on said switch means to move the latter from said one to the other position thereof.

2. In an arrangement as defined in claim 1, wherein said switch means include a gas switch comprising a gas-tight envelope, a pair of contact means of magnetizable material in said envelope and having outer ends extending gas-tightly sealed through and beyond said envelope, said contact means being constructed to normally stay in an open position and movable from said open to a closed position when subjected to a magnetic field.

3. In an arrangement as defined in claim 2, wherein

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said envelope is elongated and said contact means comprises a pair of resilient blades of magnetizable material extending longitudinally through said elongated envelope, said blades having overlapping inner ends normally spaced from each other and movable to a position engaged with each other when said inner ends are subjected to a magnetic field.

4. In an arrangement as defined in claim 3, wherein said armature is movable between said rest and said active position in longitudinal direction of said envelope.

5. In an arrangement as defined in claim 4, wherein said armature is elongated and wherein said soft iron member projects to one side of said elongated armature toward said envelope and being when said armature is in the active position located closely adjacent to said overlapping inner ends of said blades.

6. In an arrangement as defined in claim 5, and including a shielding member of magnetizable material extend-

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ing at least partly about said envelope on the side thereof distant from said armature for shielding said switch means from magnetic fields different from that produced by said armature.

7. In an arrangement as defined in claim 6, wherein said shielding means has an end portion located adjacent the region occupied by said soft iron member when said armature is in said active position thereof.

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