A magnetic igniter has a magnet and an armature which, in the closed position, closes the magnetic flux circuit; in the open position, the armature interrupts the magnetic flux circuit; a resilient operating member is connected to the armature, and extends from the magnet at an angle, and adjusting means are operative to pretension the operating member by reducing said angle.
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PERMANENT MAGNETIC FLUX CIRCUIT AND AN ACTUATING MEMBER WITH ADJUSTING MEANS

CROSS REFERENCE TO RELATED APPLICATIONS:

Reference is had to my co-pending application entitled "Lighter With Metal Casing" assigned to the assignee of record of the instant application, Ser. No. 222,940, filed on Feb. 2, 1972, and to my application entitled "Magnetic Igniter" assigned to the assignee of record of the instant application, Ser. No. 220,817, filed on Jan. 26, 1972.

BACKGROUND OF THE INVENTION

The invention relates to magnetic igniters, and relates more particularly to magnetic igniters of the type that have a magnetic flux circuit including a magnet that has two poles and an armature that is movable between a closed, circuit making, position and, respectively, an open circuit breaking position at an angle to the closed position; and an operating member is provided for moving the armature from the closed position to the open position. The operating member is actuable by an actuating means. The operating member is actuated by the actuating means exerting a pressure onto the operating member.

The actuating means may, for instance, be a torsion rod, reference being had to U.S. Pat. No. 3,610,793, dated Oct. 5, 1971, of G. Steuernagel et al., that is bent near its lower end at an angle, facilitating the actuation of the operating member. In the inactive rest position of the actuating means, for example the aforesaid torsion rod, the operating member should be pre-tensioned, at least lightly, to retain the actuating means in the aforesaid inactive or rest position.

For a multitude of reasons, including the provision of reasonable tolerance values, it has been found difficult to impart reliably such a pre-tension to the operating member, sufficiently for reliably carrying out the retention of the actuating means in the rest position.

SUMMARY OF THE INVENTION

It is accordingly among the principal objects of the invention to provide a magnetic igniter with adjustment means for reliably pre-tensioning adjustably the operating member.

It is a further object of the invention to provide such a magnetic igniter that can suitably be pre-tensioned irrespective of whether or not the tolerances all fall into one or the other end section of the tolerance spectrum.

A further object of the invention is to provide such a magnetic igniter that can be so adjusted that the actuating means and the operating member are in proper position relative to each other.

Other objects of the invention will in part be obvious and will in part appear hereinafter. With the above and other objects of the invention in view, the invention consists in the novel construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, certain embodiments of the same being illustrated in the accompanying drawings and described in the specification.

BROADLY SPEAKING, the instant invention provides for adjusting means near the operating member operable to pre-tension adjustably the operating member.

In accordance with a preferred embodiment, the adjusting means include a fixed leaf spring and a screw. The leaf spring may at least partially overlap the elongated operating member, and may, like the operating member, be secured to the armature, and the screw may be in threaded engagement with the leaf spring and be in contact with the operating member to pre-tension the operating member.

In accordance with another embodiment, the actuating means may be connected to the wall of the housing that receives the magnetic igniter, for instance the housing of the aforesaid pocket lighter. For a better understanding of the construction and purpose of magnetic igniters for lighters, reference is had to U.S. Pat. No. 3,612,736, dated Oct. 12, 1971, of G. Steuernagel et al.

Referring to the last described embodiment, the screw may be threaded into the aforesaid wall of the housing of the pocket lighter, and the screw be adjustable from the exterior of the housing, pre-tensioning the operating member inside the housing.

The instant invention offers the advantage of optimum adjustment of the operating member in simple and expeditious manner. The instant invention furthermore offers the advantage that the tolerances may be increased, thereby reducing the amount of waste and the attendant costs.

BRIEF DESCRIPTION OF THE DRAWING:

For a fuller understanding of the nature and objects of the invention, reference is had to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of a magnetic flux circuit with adjustment means, in accordance with an embodiment of the invention;

FIG. 2 is a fragmentary elevational view, partly in section, of a magnetic igniter with modified adjustment means including a fragment of the wall of a housing that receives the magnetic igniter;

FIG. 3 is a sectional view of the embodiment of the invention as shown in FIG. 1; and

FIG. 4 is a perspective view of the embodiment of FIG. 1 showing the open position of the magnetic flux circuit of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

In carrying the invention into effect in the embodiments which have been selected for illustration in the accompanying drawing, and for description in this specification, and referring now particularly to FIGS. 1 to 4, there is provided a magnetic igniter system that includes a magnetic flux circuit comprising a permanent magnet 1 which has a soft iron core 2 for a coil 19 and an armature 3. The magnet 1 and core 2 form a U-shaped structure with two poles, and the poles have upper surfaces 4 and 5, respectively. Sparking electrodes 18 of the igniter are connected to the igniter coil 19 in a conventional manner (FIG. 4).

The armature, in the closed position shown in FIGS. 1 and 2, extends throughout the entire width of the U-shape, and covers the upper pole surfaces 4 and 5 with corresponding surface portions 6 and 7 which form a part of the inner surface 3a of the armature 3.

A resilient operating member 8 is secured to an end surface 10 of the armature 3, for instance by means of a screw 9 or a rivet, or by other suitable conventional means.
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The end surface 10 of the armature 3 may, as indicated in FIG. 1, be at least partially inclined, or, as shown in FIG. 2, be at right angles to the direction of elongation of the armature 3. The angle that is formed between the armature 3 and the operating member 8 is built in accordance with the necessary requirements for moving the armature through its angular stroke from its closed position shown in FIGS. 1 and 2 to the open, circuit breaking position (not shown), at an angle to the closed position; thus, the aforesaid angle, which is termed the "operating angle" depends from the size of the angular stroke of the armature between its closed and open positions.

The armature 3 and the operating member 8, in both views are tiltably supported, and hence borne, at the apex 12 of the said operating angle, on the uppermost edge of the magnet 1, which edge, among all the edges of the magnet poles 1 and 2, is closest to the operating member 8. The aforesaid edge is disposed at right angles to the direction of elongation of the armature 3, and in the direction of the end surface 10, and functions as a fulcrum edge 3b for the armature 3 and the operating member 8. The core 2, the magnet 1 and the armature 3 are held together by the electromagnet force of the permanent magnet 1.

In the embodiment of FIG. 1, the operating member 8 is secured to the end surface 10 of the armature 3.

Adjusting means are provided which, in the embodiment of FIG. 1, include a leaf spring 11 that is also secured to the end surface 10 of the armature 3, and a screw 13 which is threaded in a threaded hole 13a that is disposed near the free end of the leaf spring 11. The screw 13 bears with its tip against the outer surface of the operating member 8, and upon turning the screw, the operating member 8 can be adjustably pre-tensioned.

In the modification of FIG. 2, the actuating means include a portion of the wall 14 of the housing, for instance a pocket lighter housing, that receives on its interior the magnetic igniter including the magnet 1, the armature 3 and the operating member 8. It also receives actuating means on its interior, for instance a torsion rod 17. The housing wall 14 has a bore 15 that includes a threaded hole 16 in which there is engaged a screw 13. The end of the screw 13 engages the outer surface of the operating member 8; likewise, the torsion rod 17 engages the outer surface of the operating member 8. The screw 13 serves to pre-tension the operating member 8 for proper engagement, in the inactive position, with the end of the torsion rod 17. The depth of the bore 15 is so arranged as to be in accord with the needed adjustment range of the screw 13.

In FIG. 1, the arrow P indicates the direction in which the actuating means will exert its force against the outer surface of the operating member 8. Upon the actuation of the operating member, for instance the free end of the torsion rod 17, in the direction "P" (FIG. 1), this will bring about a movement of the armature 3 from its closed position (shown in FIGS. 1, 2) to the open position at an angle thereto, thereby causing a breaking of the magnetic flux circuit.

OPERATION

From the foregoing, the operation will be easily understood by the skilled. The operator will adjust the pre-tension of the operating member 8 by turning the screw 13.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent is as follows:

1. In an electromagnetic igniter, a combination comprising, a permanent magnetic flux circuit including a permanent magnet, an L-shaped soft iron core and an armature; said magnet and said core forming a U-shaped magnetic structure with two poles-having upper surfaces arranged in a plane; the upper pole surface of the magnet forming with an adjacent outer side surface of said magnet an angle of substantially 90° thus defining a tilting edge; the armature extending throughout the entire width of the U-shaped structure and covering the upper pole surfaces with corresponding surface portions which form a part of the inner surface of the armature; said armature being mounted tiltably about said edge between a magnetic flux closing position in which it bridges said upper pole surfaces and, respectively, a magnetic flux opening position in which it is inclined relative to said plane; a resilient, energy storing, operating member being attached to the end surface of said armature in the region of tilting; said operating member having a lever portion forming with armature an apex abutting against said edge; said lever portion and said inner armature surface forming an operating angle ranging from about 95° to about 115° in the magnetic flux closing position of the armature, whereby upon actuation of said lever portion overcoming the magnetic attraction force exerted against the armature by the U-shaped magnetic structure in the flux closing position, the armature will be tilted about said edge from the flux closing position toward the flux opening position; and adjusting means including a threaded screw operable to preset adjustably the angular position of said operating member with respect to said permanent magnet, thereby pre-setting the angular stroke of said armature.

2. In a magnetic igniter, as claimed in claim 1, said operating member being connected with one end portion to said armature and having its other end portion free, and being movable resiliently angularly relative to said permanent magnet, said adjusting means pre-tensioning said operating member angularly relative to said armature.

3. In a magnetic igniter, as claimed in claim 1, said adjusting means including a leaf spring, said crew being in threaded engagement with said leaf spring, and operable to be in contact with said operating member, and being operative to pre-tension said operating member adjustably.

4. In a magnetic igniter, as claimed in claim 3, said operating member and leaf spring being secured each one end to said armature and being in partial angularly superposed position, said leaf spring having near its free end a threaded hole engaging said screw.
5. In a magnetic igniter, as claimed in claim 1, and a wall forming a part of the housing receiving said igniter in its interior, said threaded screw being connected to said housing and actutable from the exterior of said housing.

6. In a magnetic igniter, as claimed in claim 5, said threaded screw being in threaded engagement with said wall and in contact with said operating member and being operative to pre-tension said operating member and thereby said armature against said magnetic force.