Jan. 28, 1969 R. HALM 3,424,950

MAGNETIC MAKE AND BREAK IGNITER

Filed Sept. 21, 1964

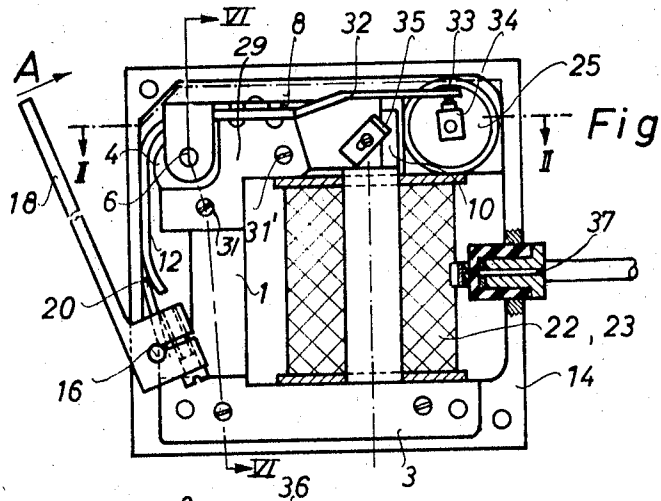


Fig. 1

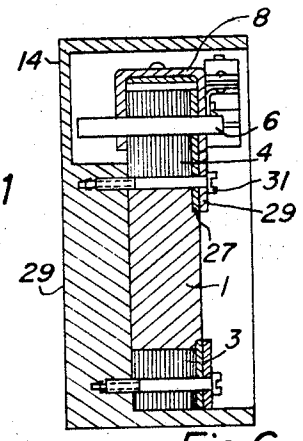


Fig. 6

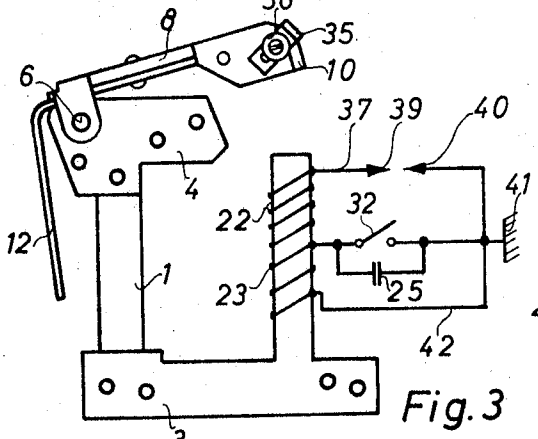


Fig. 3

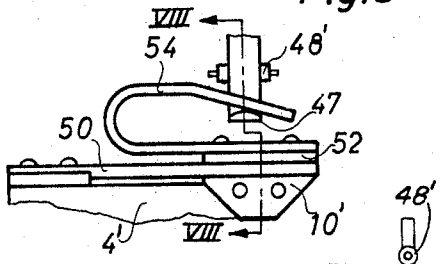


Fig. 5

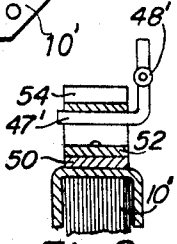


Fig. 8

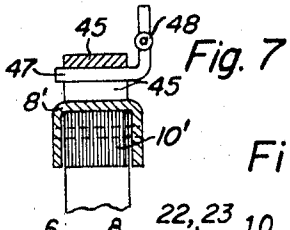


Fig. 7

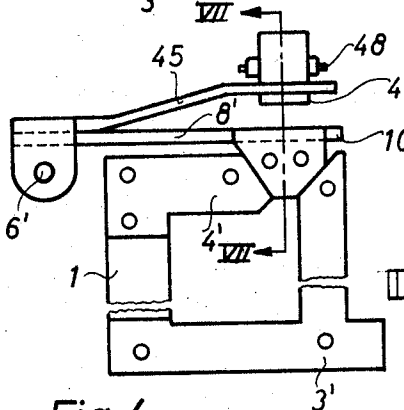


Fig. 4

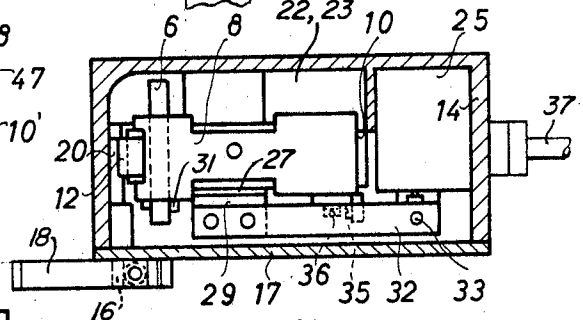


Fig. 2

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MAGNETIC MAKE AND BREAK IGNITER

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Int. Cl. F23q 13/02

This invention relates to a magnetic make and break igniter, especially for gas burners, internal combustion rammers and the like, having an exciter magnet and line of force feed device, or external magnetic circuit, such feed device including a displaceable magnetic conductor member movable between a position in which the circuit aforesaid is closed and one in which the said circuit is broken.

The object of the present invention is to provide an improved form of magnetic make-and-break igniter.

According to the present invention a magnetic make-and-break igniter includes a magnet, a plurality of conductor members arranged collectively to define an external magnetic circuit to the magnet, one such member being movable between a first position in which the said magnetic circuit is complete and a second position in which said circuit is broken, a coil extendng around one of the said members, said member being fixed and the coil being non-movably mounted thereon, and a holding member positioned remotely of the coil and adapted positionally to control the movable member, the said movable member, during the breaking movement, moving through a like angle to the immediately adjacent portion of the holding member.

A high electrical efficiency of the magnet igniter may be obtained due to a high breaking speed. The coil is firmly mounted on a yoke of the lines of force feed device and mechanically secured thereon. It is therefore insensitive to shaking or jarring stresses.

The diameter of the coil can be kept relatively small.

In a further improvement of the invention the holding member is a pivot lever held firmly in a bearing. The feed piece mounted thereon is to be pivoted by the same angle as the lever during its breaking movement. This lever can be pivotable around a pivot peg and have a sufficient play in its bearing that the feed piece in the state of rest lies on the lines of force feed device in a statically determined manner and thereby has a full contact with its two contact surfaces on the lines of force feed device. The feed piece can be designed in free selection within wide bounds. At least one of the contact surfaces of the feed piece to be laid on the lines of force feed device and the complementary surface of the lines of force feed device can run at a slant to the direction of the lines of force run particularly at an angle of 45°. A slanting contact surface produces a larger transmission cross section and thereby a smaller transmission resistance for the power line. Also a portion of the lines of force feed device projecting from the coil can be separately secured which is of importance with a magnetic igniter under heavy mechanical stress. Furthermore, after a relatively small pivotal travel of the holding member on breaking of the lines of force feed piece a greater distance apart can be obtained on the breaking position adjacent the bearing with a slanted run of the contact surfaces than with a contact surface running at right angles to the lines of force.

The invention will now be described further, by way of example only, with reference to the accompanying drawings which illustrate a number of embodiments thereof and in which:

FIG. 1 is a plan view partly in section of a first embodiment of the invention, the cover having been removed;

FIG. 2 is a section taken along line II—II of FIG. 1 in the direction of the arrows;

FIG. 3 is a schematic side view of a part of the embodiment shown in FIG. 1;

FIG. 4 is a schematic side view showing the parts of a second embodiment which correspond to the parts shown in FIG. 3, the electrical circuit having been omitted;

FIG. 5 is a side view of a part of a third embodiment;

FIG. 6 is a cross section taken on line VI—VI of FIG. 1 in the direction of the arrows;

FIG. 7 is a cross section taken on line VII—VII of FIG. 4 in the direction of the arrows; and

FIG. 8 is a cross section taken on line VIII—VIII of FIG. 5 in the direction of the arrows.

Referring now to the drawings and in particular to FIGS. 1 to 3 thereof, a rod shaped permanent magnet **1** is disposed between two yokes **3** and **4** forming lines of force feed device, the yokes consisting of layers of initially insulated sheet metal positioned one upon another and held together by means of rivets. The two yokes **3** and **4** are each of substantially L-shaped form. A peg **6** extends through the yoke **4** and defines a bearing for a pivotal lever **8**, the said lever having a first bifurcated end region thereof which extends on either side of the yoke **4** and through which the peg **6** passes, and a second bifurcated end region remote from the pivotal axis and supporting a magnetic feed piece **10** of a laminated construction similar to that of the yokes **3** and **4**.

In the position of the parts shown in FIG. 1, the permanent magnet **1**, the lines of force feed device **3, 4** and the magnetic feed piece **10** form a closed magnetic circuit. An angled spring **12** is secured to the pivot lever **8**, the free end of the spring extending longitudinally of the permanent magnet **1**. A pivot pin **16** is provided on a housing **14**, the said pin extending through a cover **17** of such housing. The housing **14** and the cover **17** are of non-magnetic material. An operating lever **18** is clamped to the outer end of the pivot pin **16**, whilst the inner end of the pin carries a lever **20** of a non-magnetic material lying in abutment with the end of the spring **12**. A double coil **22, 23** is wrapped around an integral extension to the yoke **3**. A condenser **25** is positioned in one corner of the housing **14**. A contact carrier **29** is secured to the yoke **4** by means of screws **31** and **31**[1]. An insulating piece **27** is disposed between the carrier and the yoke. The contact carrier **29** has a leaf spring **32** mounted thereon and the remote end of the spring **32** carries a contact **33** arranged to co-operate with a contact **34** mounted on the condenser. A lifter member **35** is secured to the pivot lever **8** adjacent the feed piece **10** by a screw **36**, the member **35** having a longitudinal hole for adjustment purposes. An insulated lead **37** is secured to the housing **14** and is connected with the coil **22** and leads to an electrode **39** of a sparking plug whose other electrode **40** is connected to ground. The switch as defined by leaf spring **32** lies between the point of connection of the two coils **22** and **23** and the ground **41**, the condenser **25** being in parallel with the switch **32**. The end of the coil **23** is connected with the ground **41** by a feed line **42**. The make-and-break magnet igniter is actuated by pivoting the actuating lever **18** in the direction of the arrow A (FIG. 1) whereby the spring **12** is tensioned and exerts increasing breaking force on the feed piece **10**. As soon as the breaking power exerted by the spring **12** on the feed piece **10** exceeds the magnetic attraction between the magnet and the feed piece, the feed piece **10** is lifted from the two yokes **3** and **4** by pivoting of the lever **8** around the pin **6**. After overcoming the attraction of the magnet the feed piece is removed practically without friction well away from both yokes **3** and **4**

(FIG. 3). During the breaking movement of the feed piece **10**, the breaking member **35** bears against the leaf spring **32** and lifts the contact **33** from the contact **34** on the condenser **25**. By this the electrical tension produced in the electromagnetic system causes a spark between the electrodes **39** and **40**. Due to the high breaking speed of the lines of force feed piece **10** a stronger spark is produced each time. If, after the production of the spark the actuating lever **18** is released then due to the magnet attraction in the lines of force feed device **3**, **4**, the feed piece **10** returns to its initial position shown in FIG. 1 wherefor a new breaking action can be initiated. The return movement of the feed piece **10** into its position of rest can be aided by a return spring, not shown.

The second embodiment according to FIG. 4 likewise has a permanent magnet **1** and yokes 3^1, 4^1 which in each case have a different angle at the points of contact with the feed device 10^1 as compared with the first embodiment. With an angular construction of the end of the yoke 3^1 adjacent the coil, the position thereof projecting from the coil (not shown) can still be secured to the housing. The points of contact running at an angle particularly at 45° to the longitudinal direction of the portion of the yoke will produce a large contact surface and therewith a small transmission resistance for the lines of force so that here a more powerful magnetic flux builds up than under otherwise equal conditions. The pivot lever 8^1 is mounted outside the yoke 4^1 and has a spring **45** on its upper side, an angled actuating lever engaging the free end of the spring, the actuating lever **47** being pivotally mounted as at **48**. The pivot pin 6^1 of the actuating lever 8^1 is secured in the housing. The movement between the pivot pin 6^1 and the pivot bearing 8^1 can be so great that an automatic correct location of the feed piece 10^1 to give maximum surface contact between the feed piece 10^1 and the yokes 3^1 and 4^1, is achieved.

A further embodiment of the invention is shown in part in FIG. 5. In the arrangement of FIG. 5 the piece 10^1 is secured to the yoke 4^1 by means of a leaf spring **50**. A substantially U-shaped spring **54** is secured to the end of leaf spring **50**, an intermediate piece **52** being disposed therebetween. An angle-shaped actuating lever 47^1 engages the said spring **54**, and is movably mounted at 48^1. During the breaking process by actuation of the lever 47^1, the leaf spring **50** is bent away from the yoke 4^1. It is possible to construct the leaf spring **50** in such a way that in the position shown in FIG. 5 it is pre-stressed.

What I claim is:

1. A magnetic make-and-break igniter, comprising; a housing for said igniter, a permanent magnet, an armature extending from each end of said magnet into closely adjacent spaced disposition, a contact member engageable with the free ends of said armatures and movable between a first position in which said contact member engages each of the armatures to complete a magnetic circuit defined by said permanent magnet, armatures and contact member, and a second position wherein said contact member is in non-contacting relationship with at least one of said armatures thereby breaking said magnetic circuit, a pivoted lever mounted to one of said armatures to a remote end of which said contact member is secured, a spring secured to the pivoted lever to urge the contact member towards said second position, an actuating member to move said spring and urge said contact member in said second position, an electrical coil wrapped around a part of one of said armatures and immovably fixed thereto, a pair of electrodes forming a spark gap an electrically connected to said coil whereby a spark is generated across said spark electrodes when said contact member is moved into said second position.

2. A break-off magneto ignition device, especially for gas burners, combustion rams, and similar devices with a closable and openable, essentially rectangular magnetic circuit, comprising; a housing for said ignition device, a bar-shaped permanent magnet and a plurality of armatures for conducting the magnetic lines of force to form a closed magnetic circuit, one of said armatures carrying at least one electrical coil, another of said armatures being pivoted to bridge a gap formed between two armatures for the magnetic lines of force adjoining each other, said pivoted armature extending in a rest position approximately parallel to a fixed armature forming a side of the rectangular magnetic circuit, said pivoted armature, in its operative position, being separated from the magnetic circuit in two places, spark electrodes electrically connected to said electrical coil, said electrical coil being wrapped around the fixed armature, an operating lever, and a repeater spring engaging the pivoted armature and said operating lever to provide the energy for moving the pivoted armature from its rest position to an operative state whereby an electric spark is produced across said spark electrodes.

3. A break-off magneto ignition device, according to claim **2**, in which a bearing is provided for supporting the pivoted armature, said bearing being located within the area of the side of the rectangle having the pivoted feed piece for the magnetic lines of force engaging the repeater, said spring being mounted on said bearing to engage said pivoted armature at its pivoted end.

4. A break-off magneto ignition device, according to claim **2**, in which a bearing is provided for the pivoted armature attached to the fixed armature for the magnetic lines of force and which lies in the longitudinal direction of the pivoted armature for the magnetic lines of force, said bearing carrying said spring, and said spring having an arm extending approximately perpendicular in relation to the pivoted armature.

5. A break-off magneto ignition device, according to claim **2**, wherein said fixed armature includes an angled end portion forming a side of said gap.

6. A break-off magneto ignition device, according to claim **2**, wherein said electrical coil includes a primary coil and a secondary coil connected to said spark electrodes, and further comprising a switch and a condenser connected across said switch, said switch being connected in parallel to said spark electrodes and being closed when said pivoted armature is in said rest position, and the pivoted armature having an operating element for opening said switch when said pivoted armature is moved into its operative position.

7. A break-off magneto ignition device, according to claim **6**, in which a contact spring is provided mounted to and extending from said pivoted armature, said contact spring including on its free end a contact section, a contact element, said contact section and said contact element forming said switch, said switch closes automatically and is to be opened by the operating element.

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VOLODYMYR Y. MAYEWSKY, *Primary Examiner.*

U.S. Cl. X.R.

317—81, 97; 123—149; 315—218; 310—66, 69, 70, 152; 322—91