March 17, 1959 H. REIFEL 2,878,337

MAGNETIC SWITCHES

Filed Oct. 14, 1957

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FIG. 1

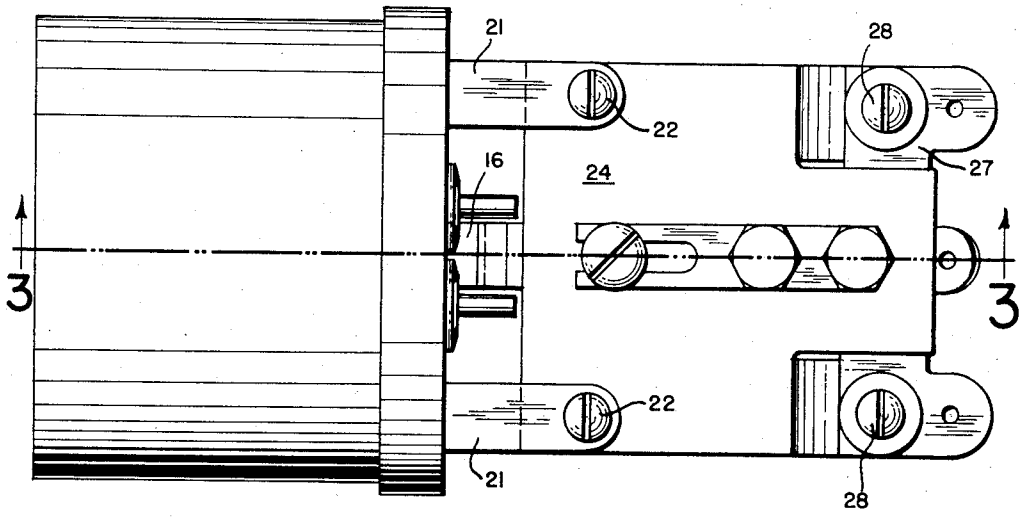

FIG. 2

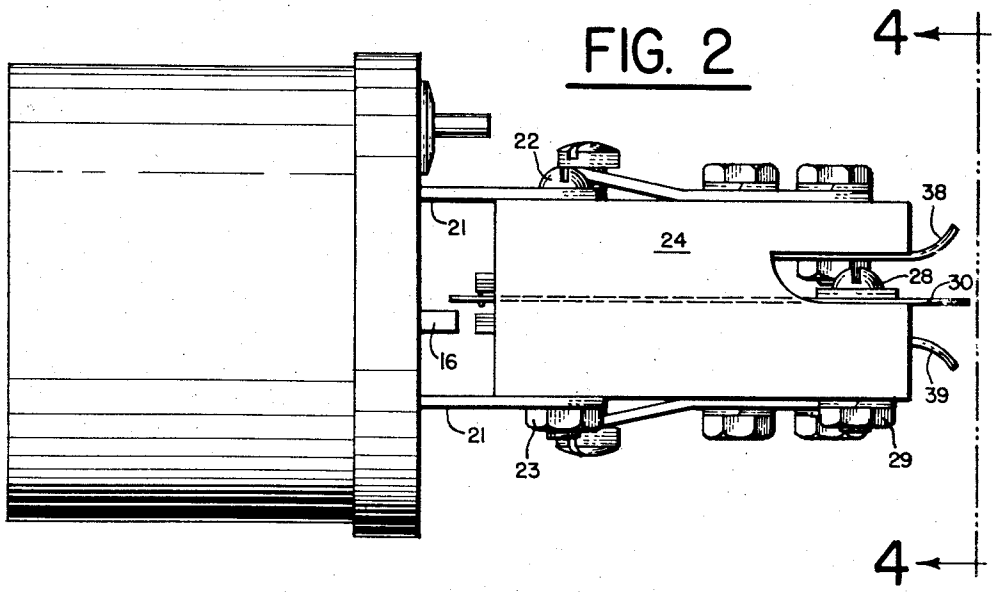

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FIG. 3

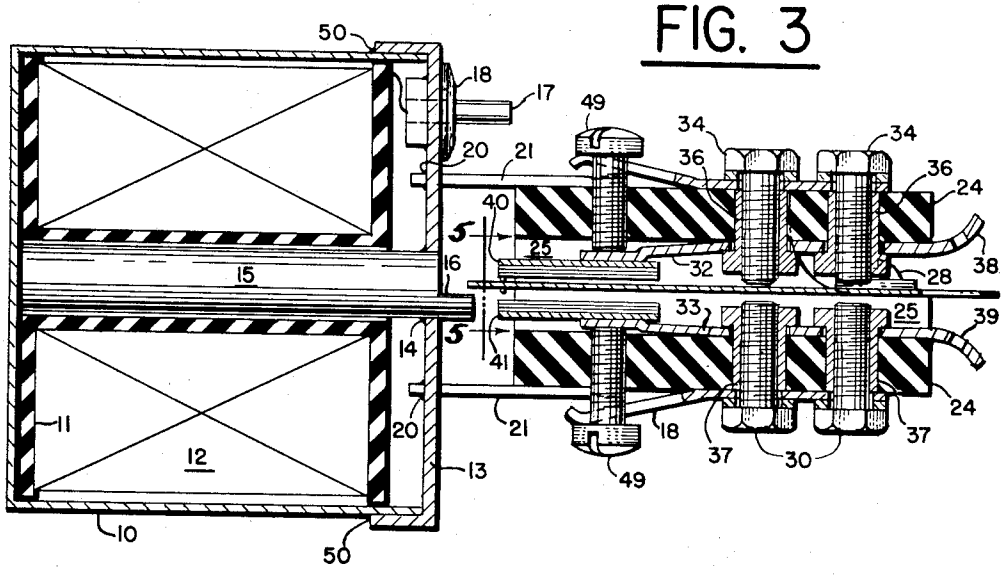
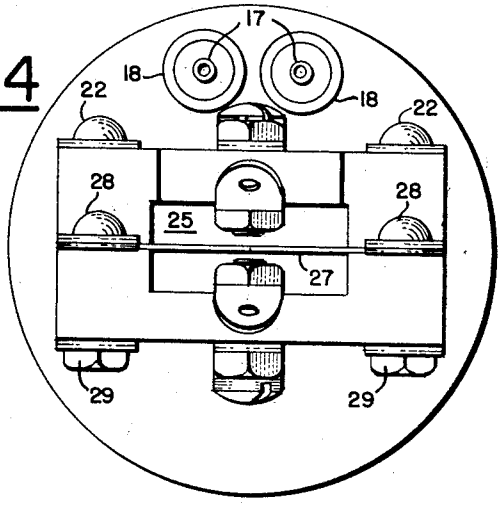


FIG. 4



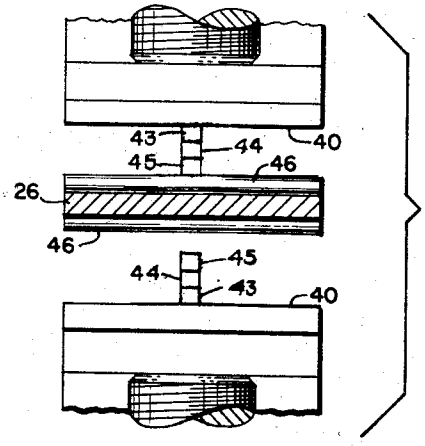


FIG. 5

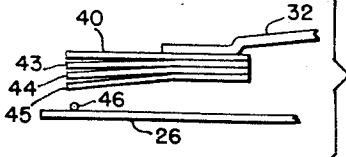


FIG. 6

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MAGNETIC SWITCHES

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Application October 14, 1957, Serial No. 689,792

2 Claims. (Cl. 200—90)

This invention relates to magnetic switches, and relates more particularly to magnetic relays capable of high speed operation.

In one embodiment of this invention, a reed of magnetizable metal is cantilever supported, and its free end overlaps a flattened extension of the pole piece of an electromagnet. The reed acts as a double-throw, single-pole switch, and carries a first contact which normally contacts a second contact for closing one circuit. When the electromagnet is energized, the free end of the reed is drawn towards the pole piece extension, causing the first and second contacts to be separated, and causing a third contact carried by the reed to contact a fourth contact for closing a second circuit.

A feature of this invention is that bouncing of the reed is prevented by damping action of contacts. In one embodiment of this invention, this is accomplished by placing on each contact side of the reed, three small wires which are superimposed in an aligned row and cantilever supported. The free ends of the wires extend past a contact wire on the reed which extends at a right angle to the three wires. The free ends of the three wires separate when spaced from their associated contact wire on the reed, and when the free end of the reed is moved towards the three wires, the associatd contact wire it carries touches the adjacent one of the three wires which then moves against the next adjacent one of the three wires which then moves against the other of the three wires, the resistance offered to this movement by the wires absorbing the shock of contact, and preventing bouncing of the reed.

Another feature of this invention resides in supporting a magnetic pole piece, a coil around the pole piece, and a shield can around the coil from one side of a cover for the shield can, and in supporting a block of electrical insulation from the other side of the shield can cover, with the block supporting a magnetic reed and its associated contacts.

An object of this invention is to restrain the bouncing of a contact closing reed of a magnetic switch.

Another object of this invention is to simplify and to reduce the cost of manufacture of high speed relays.

This invention will now be described with reference to the annexed drawings, of which:

Fig. 1 is a plan view of a relay embodying this invention;

Fig. 2 is a side elevation of the relay;

Fig. 3 is a section along the line 3—3 of Fig. 1;

Fig. 4 is a view of one end of the relay, looking along the line 4—4 of Fig. 2;

Fig. 5 is an enlarged view of the contact wires on the reed of the relay, and of the cooperating contacts, and is taken along the line 5—5 of Fig. 3, and

Fig. 6 is a side view of the reed at its free end, and of the associated contact wires, and shows in an exaggerated manner how the free ends of the contact wires at one side of the reed are spaced apart when the reed and the associated contact wire it carries is spaced from the free ends of the wires.

A cylindrical, metal, shield can **10** contains a spool **11** of electrical insulation on which is wound a coil **12**. The can has a closed and an open end. A metal, cylindrical cover **13** having a closed end, has an open end fitted around the open end of the can **10**, the inner diameter of the cylindrical portion of the cover **13** being the same as the outer diameter of the can. The cover **13** has extending centrally therethrough and attached thereto as by solder **14**, one end of a pole piece **15** of the coil **12**, which pole piece extends through the open center of the spool **11** when the cover is in position on the open end of the can **10**. The pole piece **15** has a partic-cylindrical extension **16** which extends from the cover **13**, the pole piece and its extension extending from opposite sides of the closed end of the cover. The pole piece extension **16** has a flattened upper surface.

The coil **12** has ends attached to terminal pins **17** around which extends insulators **18** which are fitted in openings in the closed end of the cover **13**.

The closed end of the cover **13** has extending therethrough and secured thereto as by solder **20**, the inner ends of four metal straps **21** which extend outwardly from the side of the closed end of the cover **13** that the pole piece extension extends from. The outer ends of the straps **21** are secured by screws **22** and nuts **23** to a block **24** of electrical insulation which has an inner end spaced from the closed end of the can cover **13**.

The block **24** has a longitudinally extending, rectangular-shaped passage **25** therethrough, within which extends a reed **26** of magnetic spring metal which has a wide outer portion **27** attached by screws **28** and nuts **29** to reduced thickness portions of the block **24** which are formed by cutting away upper end portions of the block on opposite sides of a central upper portion of the block at its outer end. The outer portion **27** of the reed has electrical terminal extensions **30** which extend outwardly from the screws **28**.

Extending within the passage **25** above and below the reed **26** are contact supporting arms **32** of spring metal which are secured to the block **24** by bolts **34** and nuts **36**. The outer ends of the arms **32** are formed as electrical terminals **38**. The inner portions of the arms **32** are curved inwardly towards the reed **26** and have flattened inner ends which have attached to the inner sides thereof contact supporting strips **40** of spring metal. To the inner surface of each of the strips **40** is attached as by spot welding, the outer end of a wire **43**. The outer end of a similar wire **44** is attached as by spot welding to the outer end of the wire **43**. The outer end of a similar wire **45** is attached as by spot welding to the outer end of the wire **44**. The wires **43**, **44** and **45** are superimposed in an aligned row as shown by Figs. 3, 5 and 6 of the drawings. Each side of the reed **26** has attached thereto as by spot welding, a metal wire **46**, the axis of which extends at a right angle to the plane containing the axes of the wires **43**, **44** and **45**.

Attached to the upper and lower sides of the block **24** by the bolts **34** and nuts **36** are straps **48** of spring metal which have slotted inner ends through which extend screws **49** which are threaded into the block **24**, and the inner ends of which contact the flattened inner end portions of the arms **32**. The screws **49** can be adjusted to vary the position of each set of contact wires **43**—**45** relative to the adjacent wire **46** on the reed **26**.

The reed **26** is substantially axially aligned with the pole piece **15**, and its inner end extends over the flattened surface of the pole piece extension **16**. Normally, when the coil **12** is not energized, the inner end of the reed is spaced from the extension **16**, the upper contact wire **45** is in contact with the upper contact wire **46**,

and the lower contact wire **45** is spaced from the lower contact wire **46** as shown by Figs. 3 and 5.

When the coil **12** is energized by flowing direct current through it, the pole piece extension **16** attracts the free, inner end of the reed **26** towards it, causing the upper contact wire **46** on the reed to move away from the upper contact wire **45**, and causing the lower contact wire **46** on the reed to move against the lower contact wire **45**. When the current flow through the coil is discontinued, the reed **26** returns to its normal position with its upper contact wire **46** in contact with the upper contact wire **45**. The relay thus acts as a single-pole, double-throw switch.

The inner ends of the contact wires of each set of wires **43—45** separate as is shown in exaggerated fashion by Fig. 6 when the adjacent contact wire **46** on the reed is spaced from a wire **45**, this resulting from the wires **43—45** being cantilever supported at their outer ends, their inner, free ends being free to move apart. The wires **43—45** may be bent somewhat as shown by Fig. 6 so that when pressure against their ends is removed, their resiliency will cause them to resume their bent positions.

When a contact wire **46** on the reed moves against a wire **45**, the latter moves against an adjacent wire **44** which moves against an adjacent wire **43** which moves against an adjacent strip **40** which is deflected outwardly as the reed continues to move towards it. Thus, the shock resulting from a contact wire **46** on the reed striking an adjacent contact wire **45** is absorbed by the flexure of the adjacent wires **43—45** and the adjacent strip **40** so that the usual bouncing and resulting erratic switch closing is eliminated or greatly reduced.

In assembling the relay, the pole piece **15** and the supporting straps **21** of the block **24** are attached to the can cover **13**. The block **24** with its contact mechanism is attached to the straps **21**. The spool **11** with the coil **12** therearound is placed on the pole piece **15** and the ends of the coil are connected to the terminal pins **17**. The shield can **10** is then placed around the spool and

coil with its open end within the open end of the can cover **13**. Solder is then applied at **50** around the open end of the cover **13** and to the adjacent outer surface of the can **10**, hermetically sealing the coil **12** within the can **10**.

What is claimed is:

1. A magnetic switch comprising a cylindrical, metal, coil-shield can having an open end and a closed end, a metal cover for said open end of said can, a magnetic pole piece attached to said cover and extending from one side of the center thereof into said can along the axis thereof, a magnetic coil within said can around said pole piece, said pole piece having an extension with a flat portion extending from the other side of said cover, a plurality of metal straps attached to said cover and extending from said other side thereof, a block of electrical insulation attached to said straps, said block having a passage therethrough aligned with said pole piece, a reed of magnetic spring metal extending within said passage and cantilever supported from said block, the free end of said reed extending over said flat portion of said pole piece extension, said coil when energized by the flow of current therethrough, magnetizing said pole piece and causing said free end of said reed to be moved towards said extension, first contact means on said reed adjacent said free end, and second contact means arranged to be contacted by said first contact means when said free end of said reed is moved towards said extension.

2. A magnetic switch as claimed in claim 1 in which said pole piece is cylindrical, and in which said extension is parti-cylindrical.

References Cited in the file of this patent

UNITED STATES PATENTS

1,769,279	True	July 1, 1930
2,497,547	Hastings	Feb. 14, 1950
2,758,173	Riley	Aug. 7, 1956