F. R. MARTIN & O. M. SHEPHERD.

MAGNETIC CLUTCH.

APPLICATION FILED FEB. 13, 1907.

959,569. Patented May 31, 1910.

FIG.3

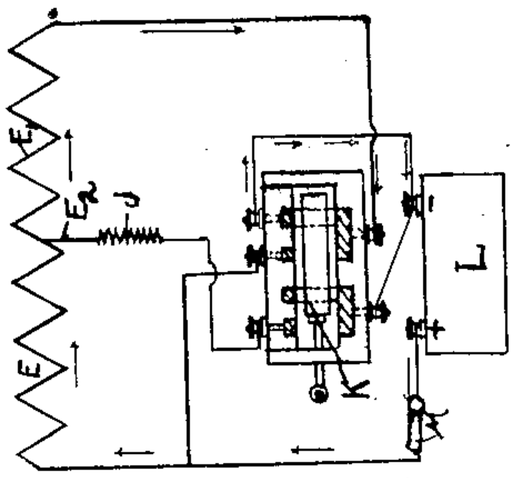
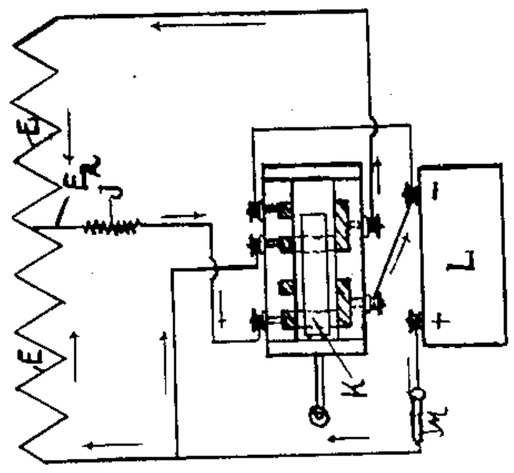


FIG.4.



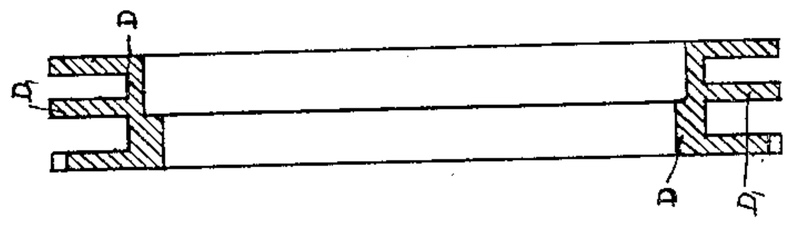


FIG.2.

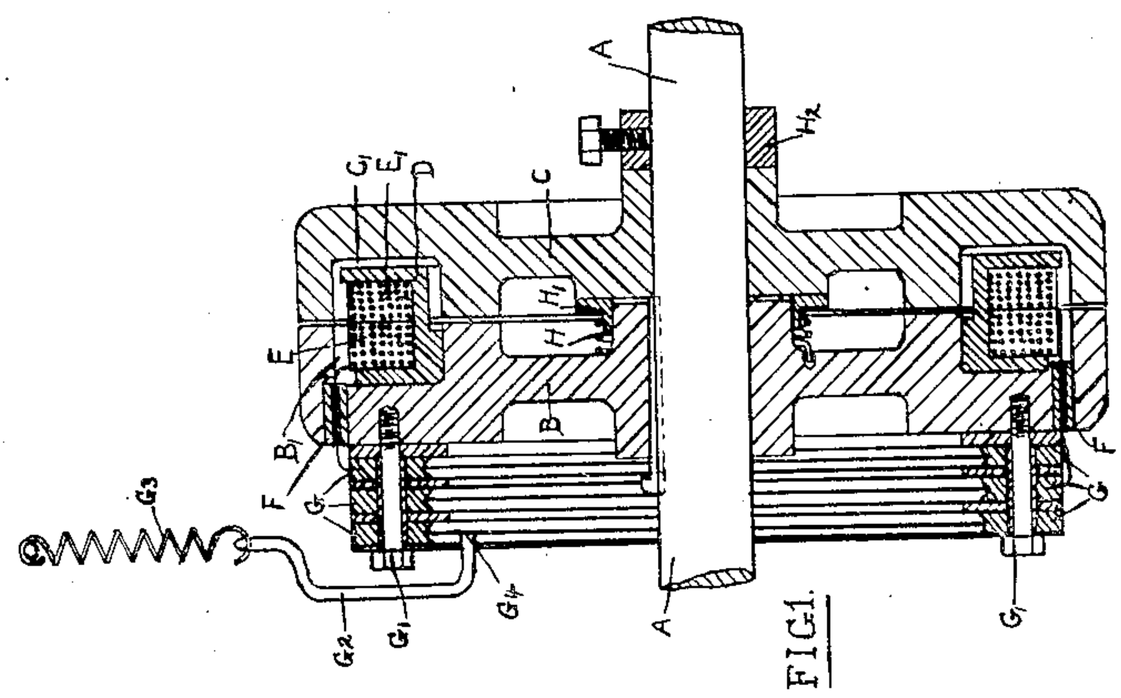


FIG.1.

Witnesses
I. D. Root
E. Terry.

Inventors
Frederick Ripon Martin
Oswald Montagu Shepherd

UNITED STATES PATENT OFFICE.

FREDERICK RIPON MARTIN AND OSWALD MONTAGU SHEPHERD, OF LONDON, ENGLAND.

MAGNETIC CLUTCH.

959,569. Specification of Letters Patent. Patented May 31, 1910.

Application filed February 13, 1907. Serial No. 357,226.

To all whom it may concern:

Be it known that we, FREDERICK RIPON MARTIN, a subject of the King of Great Britain, and a resident of 24 Egerton Gardens, Ealing, London, England, and OSWALD MONTAGU SHEPHERD, a subject of the King of Great Britain, and a resident of Rutland House, Hanwell, London, England, have invented new and useful Improvements in Magnetic Clutches, of which the following is the specification.

In the use and manipulation of magnetic clutches, there is a difficulty arising from residual magnetism which greatly militates against promptness and efficiency.

The object of this invention is to provide for the immediate demagnetization of the clutch and thus insure its prompt and efficient action.

According to our invention we arrange in connection with the winding of the clutch a circuit which is normally inoperative, but which can when necessary be used to carry a current to and away from the coils in such a manner that the residual magnetism is instantly neutralized, and, instead of attraction, repulsion may occur. This circuit comprises a connection or lead, provided with suitable resistances, which is joined to the coil of the clutch about the middle of its length. This lead is capable of connection with the battery by means of an auxiliary switch which is normally open. This switch acts synchronously with the switch which is placed in the main circuit, the two switches being so arranged that when one is closed the other is open. In conjunction with the main switch is a subsidiary contact connected by a lead to the main return. A circuit is open through this subsidiary contact when the main circuit is broken by the opening of the main switch. When the clutch is in action, the current from the battery passes around the main circuit and through the entire length of the winding of the coil. When, however, it is desired to demagnetize and release the clutch, the main switch is opened to break the main circuit and by the auxiliary switch now closed the current is led to the coil at the middle of its length. (These two switches are now preferably embodied in the one apparatus.) Here the current divides. Part passes along half the winding and back to the battery in the same course as the ordinary exciting current, while the rest takes a course in the contrary direction and after leaving the winding of the clutch gets back to the return wire of the battery through the main line switch, which now closes the main circuit but opens a way to the battery return through the subsidiary contact and lead before named.

In practice we find it desirable to have the keeper or loose part of the clutch also recessed with an annular groove on its face, so that it may partly embrace the coil carried by the other part of the clutch and standing out somewhat from the face thereof.

Intermediate positions for the switches may be provided for use when the clutch requires to be neither operated nor demagnetized.

Referring to the drawings, which illustrate the preferred construction or embodiment of our invention, Figure 1 is a longitudinal section through the clutch. Fig. 2 is an alternative construction of the metal bobbin around which the coil is wound. Fig. 3 is a diagram illustrating the connections between the coil and the switch, the arrow indicating the passage of the current when the clutch is operative. Fig. 4 is a diagram showing the action when the current is reversed in half the coil and the clutch is released.

Similar letters of reference relate to similar parts in all the figures.

A indicates the driving shaft, on which is keyed the disk B formed of suitable magnetizable metal. Mounted loosely upon the same shaft A and concentrically with the disk B is a second disk C of the same or approximately the same diameter as the disk B. Each of the disks B C is provided with a groove or annular recess.

B_1 indicates the annular recess in the disk B, and C_1 the corresponding recess or groove in the disk C. These grooves face each other and are concentric as shown. The disk B is the driving member of the clutch, and C is the driven member. The latter may be connected in any suitable manner, for instance by a sleeve, to the mechanism by which the power is to be transmitted, for instance, a toothed wheel or chain wheel or a pulley. The disk B carries the metal bobbin D, which metal bobbin fits within the groove or annular recess B_1, in which groove the bobbin is secured by making it a tight fit

and forcing it into its position. E E_1 indicates the coil. This is wound in two portions E and E_1, each portion forming approximately half the total length of the coil and about half the total number of turns. But preferably the portion E_1 is just slightly the longer of the two. The wires from the coil are led through insulating tubes F fitted through the side wall of the disk B, and are connected on the outside to the collector rings G, by which connection is made to a source of electric energy. The collector rings G are bolted to the disk B by the bolts G_1. The collectors G_2, of which there may be one, two or more, are suspended by the springs G_3, and are provided with arc or segment-shaped blades G_4, which fit loosely in the U-shaped grooves in the collector rings G and are pressed into contact therewith by the springs.

The spring H serves the purpose of assisting to separate the disks B and C, when the clutch is not in operation. The spring rests on the one side against the sliding washer H_1, while the collar H_2 prevents the disk C from being forced by the spring too far away from the disk B.

In the section of the clutch, Fig. 1, the clutch is shown in its free or non-driving position with the disk members B and C apart. In Fig. 2 is shown another form of former or metal bobbin, in which a central or dividing web D_1 is provided to divide the channels or grooves for the two sections or portions of the coil winding.

Referring to Fig. 3, the arrows on the diagram show clearly the course taken by the current when the clutch is operating and the disks B C are in magnetic contact. E and E_1 diagrammatically represent the said two portions of the coil. J is the resistance. K is the switch. The diagrams show the connection of the wire E_2 midway in the coil E E_1. This wire E_2 may be connected to the collector rings or to the metal bobbin. The two ends of the coil are connected to the collector rings.

In Fig. 4 the arrows indicate the course of the current when it is reversed in that part of the coil E_1 which is within the annular recess in the disk C (Fig. 1). In this diagram, Fig. 4, both portions of the divided current pass by the wire E_2 and by way of the resistance J to the switch K, which is set in the required position as shown to permit of the passage of the current. L is the battery, preferably secondary; an ordinary ignition pattern of cell may be employed to operate the clutches of smaller size. M is a separate disconnecting switch.

When it is desired to operate the magnetic clutch, the switch is placed in the position shown in Fig. 3. The current is thus caused to pass through the coil from end to end, and a powerful magnetic action is induced within the metal of the disks B and C, causing them to attract and adhere to each other, and so transmit the driving power from the shaft A to the disk C. When it is desired to release the clutch and the switch is put into the position shown in Fig. 4, the current still passes through the part of the coil E, but the other half of the coil E_1 has its current passing through it in the opposite direction, and consequently the disk C is no longer attracted, but has a tendency to be repelled, and, owing to the recessed or grooved formation of the disks, the disk C will fall apart from the disk B, so releasing the clutch. The tendency to repel the disk C will be in accordance with the strength of the reversing current employed.

The clutch and other apparatus comprising our invention are applicable for transmitting power for many and various purposes, such as ordinary power or millshafting, or to convey power to machine tools and the like.

Owing to the simplicity and efficiency of this arrangement and construction, the recessed disks forming the main members of the clutch may be made in ordinary cast iron, although any suitable magnetizable kinds of iron or steel may be used.

We are aware that it has been before proposed to momentarily reverse the current in a clutch in order to demagnetize and effect the release of its armature.

What we claim as our invention and desire to secure by Letters Patent is—

1. A magnetic clutch including a wire equipped core, with the wire coiled in separate and continuous sections or coils and a lead wire connected thereto about midway of the wire of said sections or coils, and means for rapidly demagnetizing one coil or section thereof for releasing said clutch.

2. A magnetic clutch including a wire equipped core with the wire coiled in separate and contiguous sections or coils and a lead wire connected thereto about midway of the wire of said sections or coils, said core comprising a bobbin receiving said wire coils, and members containing said bobbin, one of said members being movable toward and away from the other.

3. A magnetic clutch including opposed members one being movable away from and toward the other and having annular meeting recesses, a bobbin arranged in said recesses, being tightly fitted in one recess and received loosely in the other recess, a wire-formed core in separate coils or sections arranged in said bobbin, and a lead wire connected to the wire of said coils about midway thereof.

4. In a magnetic clutch, magnetizable members having annular grooves, a coil in

the grooves, wire connected midway the coil for conveying the current through both portions of the coil.

5. A magnetic clutch including opposed clutch members, a shaft having one of said members loosely mounted thereon and having the other of said members keyed thereto, a resilient member arranged to aid the removal of one clutch member from the other, a bobbin arranged in annular recesses of said clutch members, being fitted tightly in one recess and loosely received by the other recess, a wire formed core in separate sections or coils arranged in said bobbin, and a lead wire connected to the wire of said coils about midway thereof.

6. A magnetic clutch comprising opposed clutch members, one being movable toward and away from the other, a wire equipped core with the wire coiled in separate sections, a lead wire connected thereto about midway of the wire of said coils or sections, and collector-rings having connection with the wire of said coils or sections.

7. A magnetic clutch comprising opposed clutch members, one member being movable toward and away from the other, a wire equipped core with the wire coiled in separate sections or coils, a lead wire connected thereto about midway of the wire of said coils or sections, collector-rings having connection with the wire of said coils and a switch for controlling the current to the clutch actuating coil.

In testimony whereof we have signed our names to this specification in the presence of the two subscribing witnesses.

FREDERICK RIPON MARTIN.
OSWALD MONTAGU SHEPHERD.

Witnesses:
I. D. Roots,
H. D. Jameson.