No. 701,290. Patented June 3, 1902.

H. W. BUCK.

MAGNETIC CLUTCH.

(Application filed May 26, 1900.)

(No Model.)

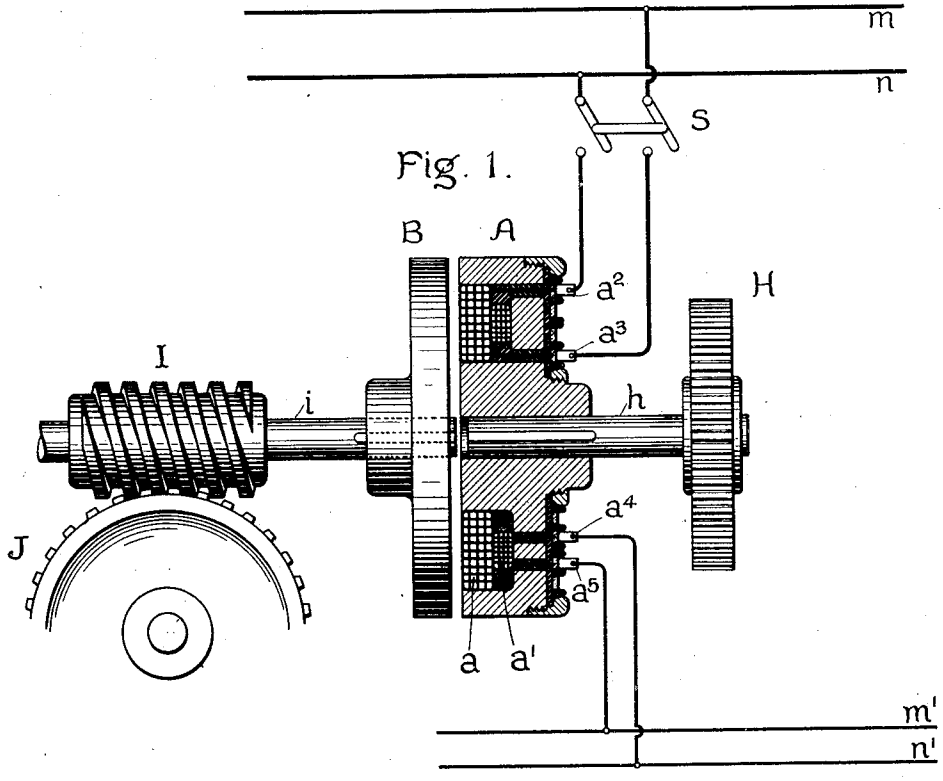
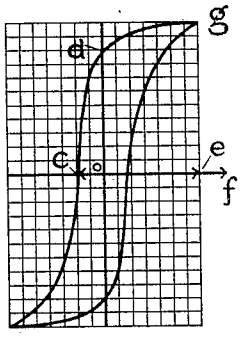


Fig. 1.

Fig. 2.



Witnesses:

Lewis C. Abell.

Benjamin B. Hull.

Inventor:
Harold W. Buck,
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HAROLD W. BUCK, OF SCHENECTADY, NEW YORK, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MAGNETIC CLUTCH.

SPECIFICATION forming part of Letters Patent No. 701,290, dated June 3, 1902.

Original application filed March 20, 1899, Serial No. 709,702. Divided and this application filed May 26, 1900. Serial No. 18,046. (No model.)

To all whom it may concern:

Be it known that I, HAROLD W. BUCK, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Magnetic Clutches, (Case No. 1,722,) of which the following is a specification.

My invention relates to magnetic clutches, and has for its object to so organize an electromagnetically-actuated clutch that it will be immediately released as soon as the circuit of the energizing-winding is opened.

This application (Case No. 1,722) is a division of my application, Serial No. 709,702, filed March 20, 1899.

In many applications involving the use of electromagnetic clutches—as, for example, in electric steering-gears, in which the rudder is operated through clutches controlled through electrical circuits made at the steering-wheel and broken at the rudder—it is essential for proper operation that the clutch shall release as soon as the controlling-circuit is broken. I found in practice, however, that clutches of the electromagnetic type are apt to stick when current is cut off from them, owing to what is sometimes called the "coercive force" of the metal. This effect I avoid, and thereby produce an extremely-reliable clutch capable of wide application by constantly exposing the metal of the clutch to a magnetomotive force equal (or substantially equal) and opposite to the coercive force of the metal—in other words, a magnetomotive force sufficient to instantly wipe out, when the ordinary excitation is removed, the remnant magnetism of the clutch.

In the drawings attached to this specification, Figure 1 shows a magnetic clutch embodying the principles of my invention, and Fig. 2 is an explanatory diagram.

Referring to Fig. 1, A and B represent the two members of an electromagnetic clutch of ordinary construction. In order to render the illustration more complete, I have shown the member A keyed to a driving-shaft h, having thereon a driving-gear H, and the member B arranged to slide along a driven shaft i without turning thereon, the said shaft having mounted thereon a worm I, engaging with a gear J, through which motion is transmitted to the driven part when the energizing-coil of the clutch is supplied with current. It is to be understood, however, that my invention relates solely to the clutch and has nothing to do with the connections to the driving and driven members. The member A has the usual energizing-winding, (indicated at a,) which winding may be of any desired type and is supplied with current from the mains m n through any suitable connections, such as the switch S and the brushes a^2 a^3 and their associated collecting-rings, as shown in the drawings. When the switch S is closed, the winding a will be supplied with current and the member B drawn into contact with the member A, thereby causing any motion of the shaft h to be transmitted to the shaft i. When the switch S is opened, the clutch should immediately release; but its members are liable to stick, due to the remnant magnetism which is retained by the coercive force of the metal. In order to remove this remnant magnetization and to prevent the clutch from sticking when it should be released, I provide an auxiliary demagnetizing-winding a', permanently connected in circuit with the mains m' n' through the brushes a^4 a^5 and their associated collecting-rings. The mains m' n' may be connected to any suitable source of current-supply; but in general the coil a' will be supplied with current from the same source as the coil a. The auxiliary winding a' is so proportioned that it produces a constant magnetomotive force opposed to the magnetomotive force produced by the winding a and sufficient to exactly counteract the coercive force of the metal when the circuit of the winding a is opened and reduce the magnetization to zero. The operation of the auxiliary winding will be rendered more clear from an inspection of the diagram in Fig. 2, which shows the hysteresis curve, or, as it is usually called, the "B A" curve of the clutches. If the energizing-winding of the clutch is proportioned so as to produce a magnetomotive force oe, the magnetism of the clutch will rise to the value represented by the line eq. If now this magneto-

motive force be removed, as by the opening of the circuit of the energizing-winding, the magnetism will fall to the value *od* and if the clutch is not jarred will tend to remain constant at that value, thus holding the two members of the clutch in contact with each other. In order to entirely remove the magnetism, I provide the auxiliary coil above mentioned, and I so proportion this coil that it constantly produces a counter magnetomotive force, which may be represented by the line *oc*, equal to the coercive force of the metal and sufficient to destroy the remnant magnetism, as is clear from the diagram. When the clutch has been once released, the small magnetomotive force *oc* will not be sufficient to cause the members to clutch again, as the magnetic circuit will be more open and the air-gap longer. The addition of the auxiliary winding of course renders necessary a slightly-larger energizing-winding than would otherwise be required—that is, the energizing-winding must generate a magnetomotive force *of* equal to the arithmetical sum of *oe* and *oc*.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electromagnetic clutch, the combination with an energizing-coil, of a normally excited demagnetizing-coil, such as to cause the clutch to release when the energizing-coil is deënergized.

2. In a clutch, the combination with a magnetizing-coil adapted to cause the clutch to operate when the coil is supplied with current, of a source of magnetomotive force substantially equal to the coercive force of the clutch, arranged to positively demagnetize the clutch when the main coil is deënergized.

3. In an electromagnetic clutch, the combination with metal forming a magnetic circuit, of a source of magnetomotive force acting on said circuit to operate the clutch, and an opposing and normally constantly acting source of magnetomotive force sufficient to neutralize the remnant magnetism and to cause the clutch to release when the first source of magnetomotive force ceases to act.

In witness whereof I have hereunto set my hand this 23d day of May, 1900.

HAROLD W. BUCK.

Witnesses:

BENJAMIN B. HULL,

MABEL E. JACOBSON.