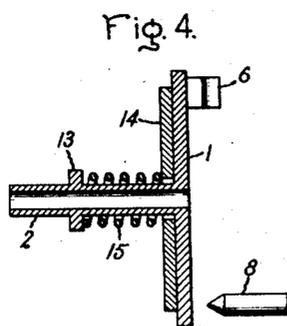
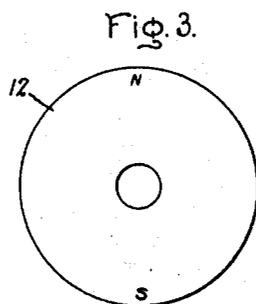
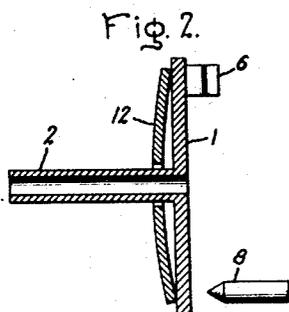
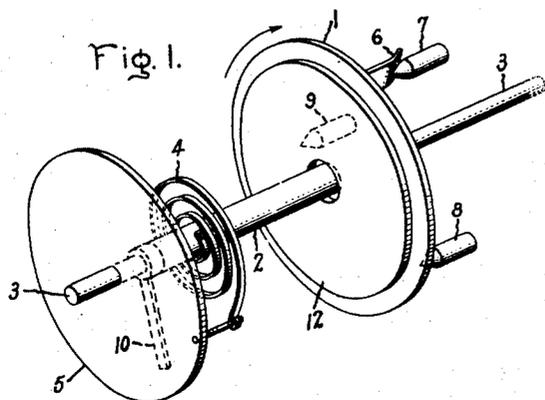


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F. B. WOESTEMEYER
FRICTION CONTACT DAMPER
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FRICION CONTACT DAMPER

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7 Claims. (Cl. 200—166)

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My invention relates generally to devices for the elimination of contact rebound in electrical contactors.

When an electrical switch or relay closes, as a result of force being exerted on a contact-carrying member, there is normally a tendency for the contacts to rebound and fly apart momentarily. This causes arcing at the contacts which may produce a weld at the contact points, causing them to stick. This phenomenon is commonly known as rebound freezing of the contacts and is a major source of failures of such units.

My invention is more particularly concerned with an electrical switch comprising a contactor carried on a rotating member or wheel. A number of contactors are fixed in position about the arc described by the rotating contactor in a manner to interrupt its path. Such a switch, along with its manner of operation, is described in my copending United States patent application No. 84,202, dated March 29, 1949, and entitled "Commutator Timing Mechanism," which application is assigned to the same assignee as the present invention. It has been found that when the rotating contactor strikes one of the fixed contactors, there is a momentary rebound which may cause arcing at the contacts with resulting uncertainty of operation.

Accordingly, it is an object of my invention to provide a new and improved device for reducing the rebound of a rotating contact so as to prevent freezing thereof.

Another object of my invention is to provide a device for exerting an increased pressure on a rotating contact after it strikes a fixed contact, thereby eliminating the possibility of contact rebound and a resulting momentary open circuit.

In accordance with my invention, I provide a friction disc which is coupled to a wheel carrying a rotating contact. When the rotating contact strikes a fixed contact, the friction disc continues its rotation for a short time interval, and through its coupling with the inertia wheel it increases the pressure at the contacts, thereby counteracting the tendency to rebound. The energy which would otherwise have gone into the rebound is thus dissipated in braking the friction disc.

For further objects and advantages and for a better understanding of the invention, attention is now directed to the following description and accompanying drawing, and also to the appended claims in which the features of the invention believed to be novel are more particularly pointed out.

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In the drawings,

Fig. 1 is a pictorial illustration of a rotating contact mechanism embodying my invention.

Fig. 2 is a sectional view of part of the mechanism of Fig. 1 with which my invention is more particularly concerned, comprising an inertia wheel and a magnetically retained friction disc.

Fig. 3 is a front elevation view of the friction disc shown in Figs. 1 and 2 and illustrating its magnetic characteristics.

Fig. 4 is a sectional view of another embodiment of my invention comprising a spring retained friction disc, which is adapted to operate in conjunction with the mechanism shown in Fig. 1.

Referring to Fig. 1, there is shown an inertia wheel 1 having an elongated hub 2 which is mounted to rotate freely on a shaft 3. A spiral spring 4 is fixed at one end to hub 2 and at the other end to a driving wheel 5 which is adapted to rotate and wind up the spring 4, thereby applying a torque to the hub 2. The inertia wheel 1 has affixed to its side, at a point near its rim, a contactor 6. A number of fixed contacts, of which three are shown in the drawing, namely, 7, 8 and 9, are disposed about the periphery of the inertia wheel in a manner to intercept the contactor 6 when the wheel rotates. The heads of the fixed contacts have conical points and these intercept a bent portion of the rotating contactor. A member 10 normally restrains the inertia wheel and the hub from sliding longitudinally along shaft 3.

When it is desired that the rotating contactor advance from one fixed contact to the next, member 10 is moved to the left. This permits the inertia wheel and the hub to slide along the shaft to the left by an amount sufficient to enable the bent portion of the rotating contactor to disengage itself from fixed contact 7. The spiral spring then accelerates the inertia wheel and member 10 returns the wheel to its previous longitudinal position on shaft 3 so that the rotating contactor is intercepted by the fixed contact 8 upon reaching its angular position.

The apparatus as described so far would suffer from excessive rebound when the rotating contactor strikes the fixed contacts. In accordance with my invention, this is prevented by a magnetized steel disc 12 which is mounted about hub 2 in proximity to the inertia wheel. The hole through the center of the disc is of a greater diameter than that of hub 2 so that the disc is not restrained by the hub from rotating.

Referring to Figs. 2 and 3, the disc is bent into an open C shape and magnetized along a diam-

ter which coincides with the plane of maximum bending. This insures that the poles of the magnetic field in the disc coincide with the points of contact of the disc with the inertia wheel, thereby assuring maximum contact friction. In practice, the magnetized disc is made of a permanently magnetizable alloy and the inertia wheel is made of mild steel. This combination provides a permanent magnetism in the disc and a low residual magnetism in the inertia wheel. Thus, there is always maximum attraction between the disc and the wheel, and there is no possibility of a permanent magnetism being established in the inertia wheel so as to lock the disc in one fixed position with respect to the inertia wheel.

In operation, the magnetic attraction of the disc and wheel causes sufficient friction at the contact points so that the disc accelerates at the same rate as the wheel when it begins to rotate. When the rotating contactor 6 strikes a fixed contact, such as contact 7, the wheel stops very suddenly and has a tendency to rebound and reverse its direction of rotation. However, the coupling between the disc and wheel is insufficient to stop the disc's rotation as quickly, and it continues to rotate for a short interval of time, meanwhile exerting a torque on the wheel. This additional torque is sufficient to substantially eliminate the rebound of the contacts, thereby preventing arcing through a momentary open circuit. The torque exerted on the wheel by the disc is largely the result of friction at the contact faces, although some of it is due to induced currents caused by magnetic interlinking.

In an actual construction of a rotating contact mechanism, similar to that illustrated in Fig. 1, it was found that without the friction disc the rebound interval of the contacts was 0.010 second. In other words, immediately after striking a fixed contact, the rotating contactor would rebound, and an open circuit would occur which would last for the above mentioned time interval. With the addition of a friction disc as described, the contact rebound interval was reduced to a maximum of 0.001 second with no rebound apparent most of the time.

Referring to Fig. 4, there is shown another embodiment of my invention comprising the inertia wheel 1, of which the hub 2 has been modified by the addition of a shoulder 13. The magnetic friction disc 12 is replaced by a flat unmagnetized friction disc 14, and a spiral spring 15 abutting on the shoulder 13 presses the disc against the inertia wheel. In this embodiment, the spiral spring creates the pressure between the friction disc and the inertia wheel, and the friction damping occurs in a similar fashion to that in the embodiment illustrated in Fig. 2.

While certain specific embodiments have been shown and described, it will, of course, be understood that various modifications may be made without departing from the invention. The appended claims are, therefore, intended to cover any such modifications within the true spirit and scope of the invention.

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

1. A friction contact damper adapted to eliminate rebound of a moving contactor carried by a rotating member upon engagement with a fixed contactor, comprising a friction member pivoting with said rotating member, means for providing a slidable coupling between said members whereby said friction disc acquires a rota-

tional inertia, said inertia, upon engagement of said contactors being of sufficient value to overcome said coupling to permit rotation of said friction member relative to said rotating member.

2. A friction contactor adapted to eliminate rebound of a moving contactor carried by a rotating member upon engagement with another contactor, comprising a friction disc pivoting with said member, means for providing friction coupling between said disc and said member whereby said disc acquires a rotational inertia, said inertia, upon engagement of said contactors being of sufficient value to overcome said coupling to permit rotation of said friction member relative to said rotating member.

3. A friction contact damper adapted to eliminate rebound of a contactor carried by a rotating member upon striking a fixed contactor comprising means for exerting a positive pressure on said rotating contactor in the direction of its travel after striking said fixed contactor, said means comprising a permanently magnetized friction disc pivotably mounted on said member, said rotating member being made of magnetizable material to provide a frictional coupling with said friction disc due to magnetic attraction therebetween, said friction disc having a given rotational inertia in said direction of travel to overcome said frictional coupling upon striking of said contactors to continue rotating in said direction of travel.

4. A friction contact damper adapted to eliminate rebound of a moving contactor upon striking a fixed contactor comprising means for exerting a torque on said moving contactor in the direction of its travel after striking said fixed contactor, said means comprising a friction disc pivoting with said member, a spring for pressing said disc against said member to provide frictional coupling therewith, said frictional disc having a given rotational inertia in said direction of travel to overcome said frictional coupling upon striking of said contactors to continue rotating in said direction of travel.

5. An electrical switch comprising a contactor carried by a rotating wheel, a fixed contact located around the arc described by said contactor, in a manner to engage said contactor, a friction disc mounted coaxially with said wheel and in close proximity thereto, said wheel and disc being made, one of permanently magnetized material, and the other of a magnetizable material whereby said disc is maintained in contact with said wheel due to magnetic attraction to develop a rotational inertia, said inertia upon engagement of said contactor and contact being of sufficient value to overcome said attraction to permit rotation of said disc relative to said wheel.

6. An arrangement for eliminating rebound of a moving contactor carried by a rotating member upon striking another contactor comprising a friction member, friction coupling means for rotationally driving said friction member with said rotating member without slipping whereby said friction member acquires a given rotational inertia in the direction of its travel, said inertia, upon said contactors striking one another being sufficient to reduce the degree of said frictional contact to cause slipping and said friction member continues to rotate in said direction of travel relative to said rotating member.

7. In combination, a moving contactor carried by a moving member for engaging another contactor, a friction member, means for coupling said members whereby said friction member ac-

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quires an inertia, said inertia, upon engagement of said contactors being of sufficient value to overcome said coupling to a degree permitting movement of said friction member relative to said moving member.

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