

Magnetic Closure Device

This invention relates to a magnetic two-part closure device.

There have been proposed various closure devices of this type which utilize the attraction of a permanent magnet, but which are liable to disrupt the magnetic records of such items as magnetic recording tapes, bank cards, travel and telephone credit cards, identity cards with which the devices come into contact, through leakage of lines of magnetic force from the permanent magnet. The incidence of such disruption cannot easily be detected by visual examination of the item concerned.

The device according to the present invention seeks to obviate this risk of disruption of magnetic records by minimizing the leakage of lines of magnetic force from a permanent magnet used in the device and by preventing the magnetic polar surface of the magnet from being able to directly contact an item bearing a magnetic record.

According to the present invention there is provided a magnetic closure device having two parts adapted to be releasably magnetically engaged one with the other, one part comprising a magnet having a through-hole extending from one magnetic pole surface to the other, a first ferromagnetic plate on one magnetic pole surface of the magnet, a second ferromagnetic plate on the other magnetic pole surface of the magnet and having an opening therethrough in substantial register with the hole through the magnet, and a casing for said magnet and said plates which is formed of non-magnetic material and which is open to permit access to the hole through the magnet, the casing having a portion thereof in contact with the end face of the second plate and a

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rim projecting away from said second plate end face to define a shallow dished recess about said through hole and into which the other part of the closure device may be received; and the other part of the closure device being
5 adapted to seat in said recess and be located by said rim against lateral displacement, said other part comprising a third ferromagnetic plate adapted to be received in said recess to overlie said casing portion and the second
10 ferromagnetic plate, at least one of the first and third ferromagnetic plates carrying a ferromagnetic contact member whereby when the two parts of the closure device are brought into engagement the ferromagnetic contact member or members complete a magnetic circuit connecting the first and third ferromagnetic plates through the hole in the magnet.

15 In the closure device of the invention, the lines of magnetic force inherent to the magnet are converged at the second ferromagnetic plate rather than diverged externally of the magnet, and pass through the hole in the magnet, in order to maximize the attractive force thereof.

20 The rim of the casing serves to limit the approach of an article bearing a magnetic record to the second ferromagnetic plate, and thus to minimise the possibility of disruption of the magnetic record.

The rim of the casing may conveniently be formed from
25 a doubled over portion of the casing wall. For added protection of the device from damage, and to avoid the possibility of items bearing magnetic records from coming into direct contact with the second ferromagnetic plate, the casing preferably covers the end face of the second plate.

30 The ferromagnetic contact member or members may be arranged in various ways to allow a magnetic circuit to be completed when the two parts of the device are brought together. In one preferred arrangement, the first ferromagnetic plate carries a magnetic contact member
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which projects through the hole in the magnet so as to directly magnetically contact the third ferromagnetic plate when the two parts of the device are brought into engagement.

5 In another preferred arrangement, the third ferromagnetic plate carries a magnetic contact member adapted to enter the hole in the magnet so as to directly magnetically contact the first ferromagnetic plate when the two parts of the device are brought into engagement.

10 In a further preferred arrangement, both the first and the third ferromagnetic plates carry magnetic contact members, the contact member carried by the first plate projecting into the hole through the magnet and the contact member carried by the third plate being
15 adapted to enter the hole through the magnet so as to magnetically contact the contact member carried by the first plate when the two parts of the device are brought into engagement.

20 The device of the present invention may be used as a clasp or lock for bags, boxes, bands or chains and is expected to have wide application as a closure for handbags, suitcases, daypacks, purses and pouches, belts, shoulder bag straps, necklaces, pendants.

25 Embodiments of the present invention will now be described with reference to the accompanying drawings, in which:-

Fig. 1 is a sectional view of one part of a closure device of the present invention;

30 Fig. 2 is a perspective view of the two parts of a closure device disengaged;

Fig. 3 is an exploded perspective view of the device of Fig. 2;

Fig. 4 is a cross-sectional view of the device of Fig. 2; and

35 Figs. 5 to 17 are cross-sectional views of various alternative embodiments of the invention.

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In Fig. 1 one part 'a' of a closure device is shown in cross section. The part 'a' comprises a permanent magnet 1 having a through hole 1a. One magnetic pole surface of the magnet is provided with a ferromagnetic plate 2 which closes the hole 1a. A second ferromagnetic plate 3, having a hole 3a aligned with the hole 1a in the magnet is provided on the other magnetic pole surface. The plates 2 and 3 and the magnet 1 are secured together by means of a casing 4, made of a non-magnetic material.

The casing 4 is generally cup-shaped and is provided with claws 4a at the periphery thereof. The casing 4 has an opening in its base, defined by a collar 4b' and claws 4b. The collar 4b' and claws 4b enter the hole 3a and abut against the side walls thereof. The parts mentioned above are assembled by successively placing the plate 3, the magnet 1 and the plate 2 within the casing 4, and by bending the claws 4a toward the free surface of the plate 2.

An extension 4c of the casing 4 defines the rim of a shallow dished recess on the base of the casing. The extension 4c comprises a doubled over portion of the casing wall. The base of the recess containing the collar 4b contacts the end face of the plate 3 and retains the plate against the adjacent pole surface of the magnet 1. The rim 4c projects forwardly from the recess base and away from the plate 3.

A ferromagnetic contact member in the form of a stud 2a is provided within the hole 1a of the part 'a' described above. The stud 2a is fastened to the plate 2 by inserting a pin provided on the stud through the plate and a washer 6 lying adjacent the plate, and then crushing the tip 2a' of the pin against the washer 6.

The lines of magnetic force of the magnet 1 are generated as illustrated by dot-and-chain lines in Fig. 1 and do not diverge externally of the part 'a'. By

providing the ferromagnetic plates 2 and 3 on the magnetic pole surfaces of the magnet 1, all the lines of magnetic force of the magnet are made to converge to the plates 2 and 3. The converged magnetic force lines are
5 constrained to form a closed circuit via the stud 2a which provides a path of least magnetic resistance between the plates 2 and 3.

This provision of the plates 2 and 3 thus avoids excessive leakage of the lines of magnetic force outside
10 the part 'a' and thereby avoids the disadvantages associated with the leakage of magnetic force lines in the prior art devices as discussed above. Furthermore, since the magnet 1 and plates 2 and 3 are housed in a casing made of non-magnetic materials, the possibility
15 of magnetic tapes or cards coming into direct contact with the magnet 1 or the plates 2 and 3 is also avoided.

The approach of magnetic articles to the sides of the part 'a' is limited to a distance equal to the
20 thickness of the wall of the casing 4 thereby minimising disruption of the magnetic records contained therein by such approach.

The rim 4c on the casing 4 limits the separation of an approaching magnetic article from the
25 adjacent magnetic pole surface to a distance 'y' which is greater than the thickness of the casing wall, thereby providing an additional safeguard in the region of the magnetic pole surface where magnetic disturbance is most likely to occur. The rim 4c has the further
30 advantage that it effectively prevents a magnetic article such as a tape, shown at 'x' in Fig. 1, from falling into the shallow recess about the hole 1a where the magnetic force lines are exposed, so as to further prevent the
35 destruction of the magnetic record.

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The other part 'b' of the closure device comprises a ferromagnetic plate 5 and a ferromagnetic contact member in the form of a stud 5a. As shown in Fig. 4, the part 'b' is assembled by inserting a pin provided on the stud 5a through the plate 5 and a washer 6 lying adjacent the plate, and then crushing the tip 5a' of the pin against the washer 6. The plate 5 of the part 'b' of the device is dimensioned to be received in the shallow recess defined by the rim 4c of the part 'a' to overlie the base portion of the recess and the ferromagnetic plate 3. On insertion of plate 5 into the recess the studs 2a and 5a will come into contact through the hole 1a and 3a and complete the magnetic circuit. In this closed or engaged position of the device the rim 4c prevents the lateral displacement of the part 'b', thereby preventing unexpected disengagement of the device by the exertion of lateral forces.

The washer 6 has depending legs 6a for attachment as illustrated in Fig. 15 to a material such as leather 7. The legs extend through the material 7 and a washer 8 and are bent thereagainst.

In the embodiment shown in Fig. 5 the stud 2a is omitted and the stud 5a of the part 'b' is of a length to contact directly with the surface of the plate 2 at the bottom of the hole 1a for completion of the magnetic circuit. In the embodiment shown in Fig. 6, the stud 5a is omitted and the stud 2a is of a length to contact directly with the plate 5.

Figs. 7 to 13 illustrate various attachment means for the closure devices described above.

In the embodiment shown in Fig. 7, a caulking tube 9 of a flute type is attached to the parts 'a' and 'b' either by welding or by using claw 4a, to allow attachment of the parts to leather or other materials.

In the embodiment shown in Fig. 8 the attachment means comprises a caulking tube 9 of a flute type provided with a rounded end, and is used in the manner as

shown in Fig. 16. In the embodiment illustrated in Fig. 9 the caulking tube 12 in the form of a fluted pipe is attached to a part of the closure device by a washer 12a formed with a collar. The diverging end of the pipe is engaged within the collar and the washer 12 is attached to the part 'a' or 'b' by the same method of crushing the tip of the pin provided on stud 2a or 5a as described above. A fluted caulking tube 11 is provided so as to be inserted into the tube 12 and then flattened for engagement as shown in Fig. 17.

In the embodiments shown in Figs. 10 to 12, the pins 2a" and 5a" provided on the studs 2a and 5a are screw threaded or otherwise ridged, so as to be able to be attached to leather or other materials by screwing (Fig. 10), fixing with a nut (Fig. 11), or hammering-in (Fig. 12).

In the embodiment shown in Fig. 13 the pins 2a" and 5a" taper to a fine point for attachment to leather and other materials by pressing therein.



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Claims

1. A magnetic closure device having two parts adapted to be releasably magnetically engaged one with the other, one part comprising a magnet having a through hole extending from one magnetic pole surface to the other, a first
5 ferromagnetic plate on one magnetic pole surface of the magnet, a second ferromagnetic plate on the other magnetic pole surface of the magnet and having an opening there-through in substantial register with the hole through the
10 magnet, and a casing for said magnet and said plates which is formed of non-magnetic material and which is open to permit access to the hole through the magnet, the casing having a portion thereof in contact with the end face of the second plate and a rim projecting away from said
15 second plate end face to define a shallow dished recess about said through hole and into which the other part of the closure device is receivable and the other part of the closure device being adapted to seat in said recess and be located to said rim against lateral displacement,
20 said other part comprising a third ferromagnetic plate adapted to be received in said recess to overlies said casing portion and the second ferromagnetic plate, at least one of the first and third ferromagnetic plates carrying a ferromagnetic contact member whereby when the
25 two parts of the closure device are brought into engagement the ferromagnetic contact member or members complete a magnetic circuit connecting the first and third ferromagnetic plates through the hole in the magnet.
2. A magnetic closure device according to Claim 1, in
30 which the rim comprises a doubled over portion of the casing wall.

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3. A magnetic closure device according to Claim 1 or 2, in which the casing completely covers the end face of the second ferromagnetic plate.
 4. A magnetic closure device according to any of
5 Claims 1 to 3, in which the first ferromagnetic plate carries a magnetic contact member which projects through the hole in the magnet so as to directly magnetically contact the third ferromagnetic plate when the two parts of the device are brought into engagement.
 - 10 5. A magnetic closure device according to any of Claims 1 to 3, in which the third ferromagnetic plate carries a magnetic contact member adapted to enter the hole in the magnet so as to directly magnetically
15 contact the first ferromagnetic plate when the two parts of the device are brought into engagement.
 6. A magnetic closure device according to any of Claims 1 to 3, in which both the first and the third
20 ferromagnetic plates carry magnetic contact members, the contact member carried by the first plate projecting into the hole through the magnet and the contact member carried by the third plate being adapted to enter the hole through the magnet so as to magnetically contact the contact member carried by the first plate when the two parts of the device are brought into engagement.
 - 25 7. A magnetic closure device substantially as herein-described with reference to and as shown in Figs. 1 to 4 or any one of Figs. 5 to 17 of the accompanying drawings.
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