July 5, 1949. R. P. ELLIS 2,475,226

MAGNETIC FASTENER

Filed Feb. 1, 1945

2 Sheets-Sheet 1

Fig. 1.

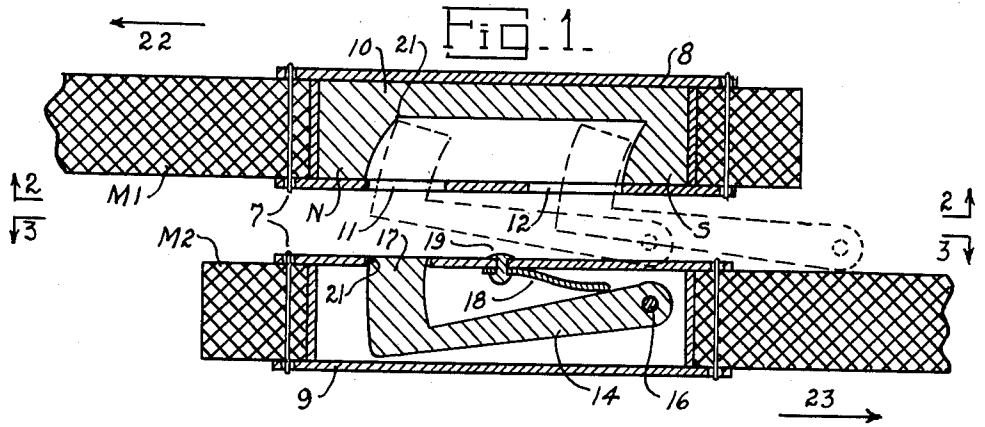
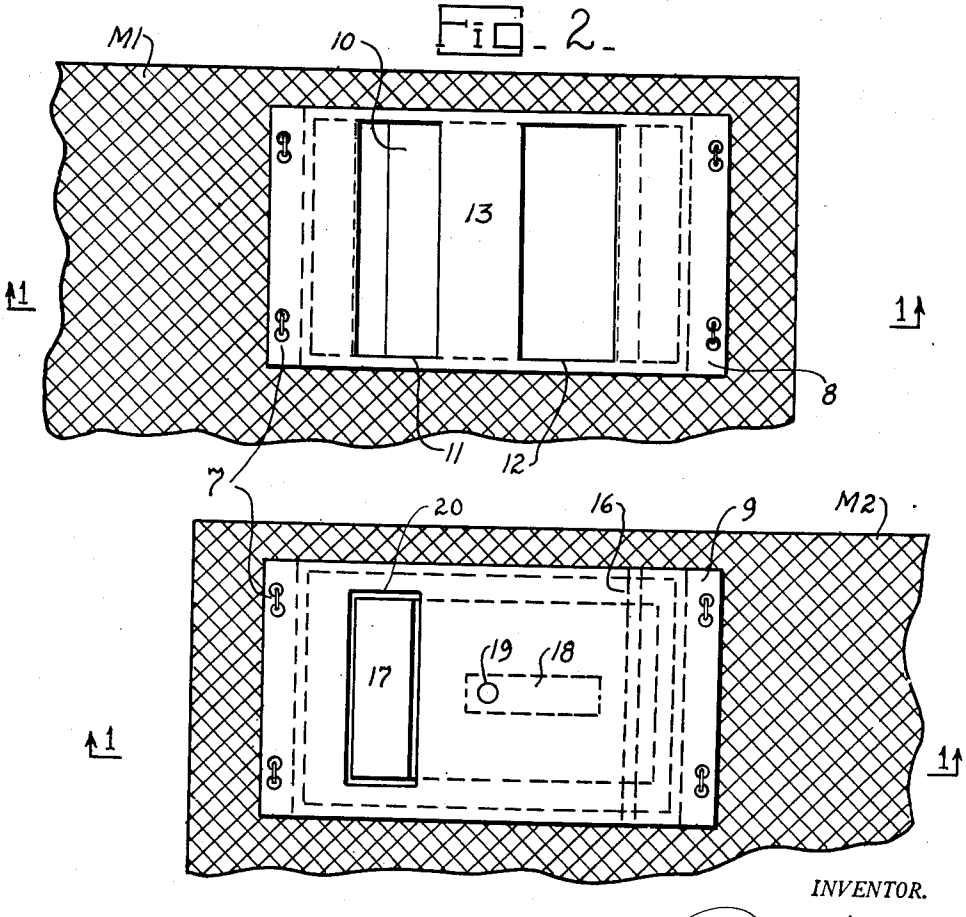


Fig. 2.



INVENTOR.

Robert P. Ellis

Fig. 3.

July 5, 1949. R. P. ELLIS 2,475,226

MAGNETIC FASTENER

Filed Feb. 1, 1945 2 Sheets-Sheet 2

Fig. 4.

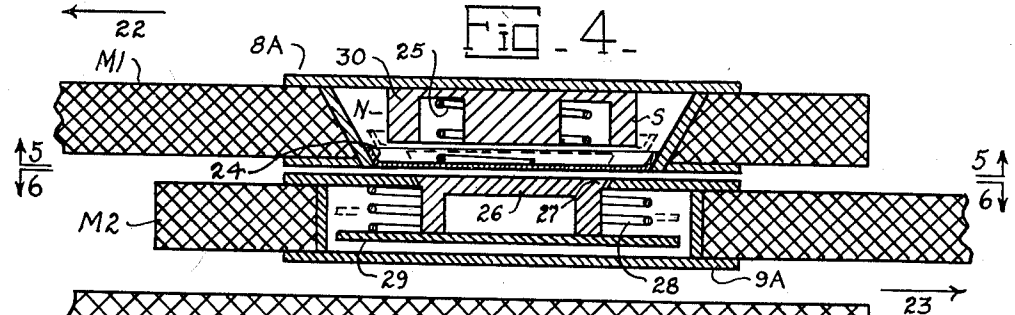


Fig. 5.

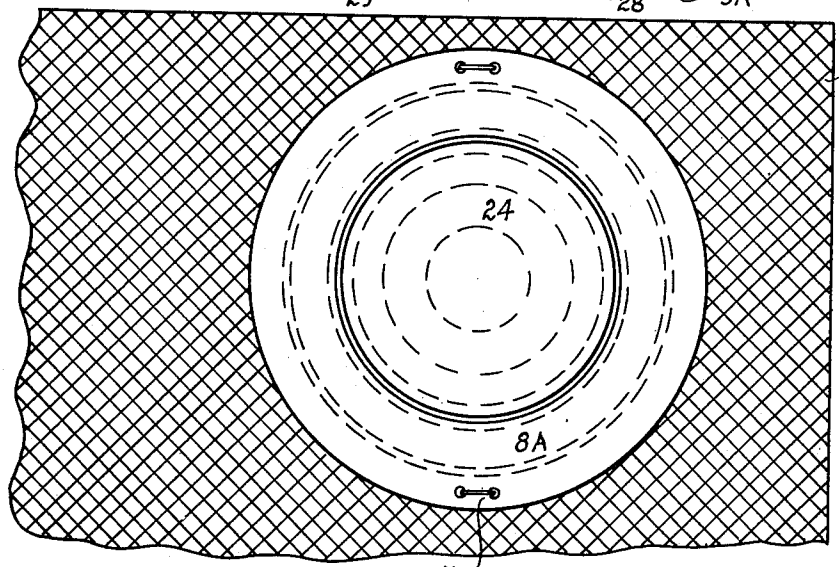
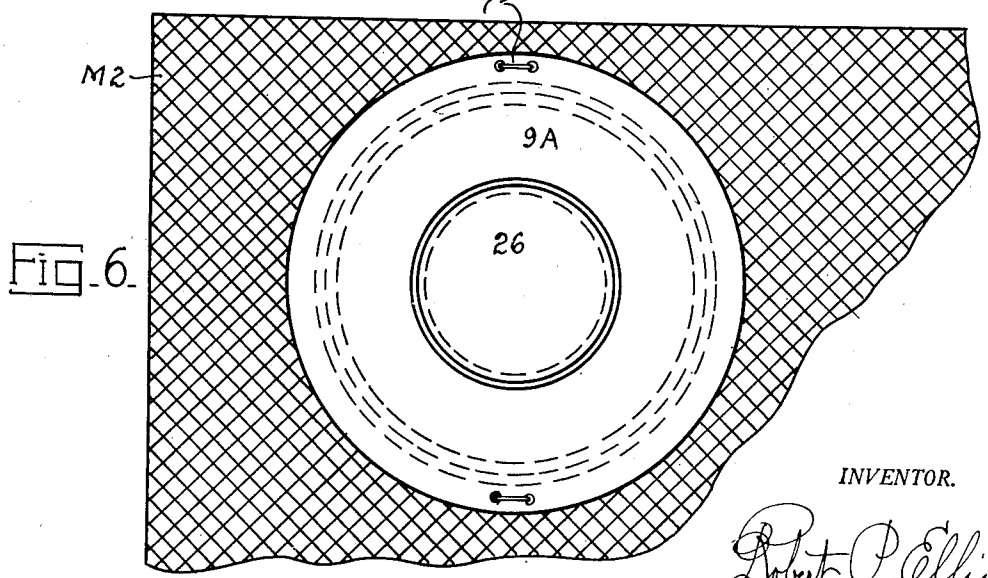


Fig. 6.



INVENTOR.

Robert P. Ellis

Patented July 5, 1949

2,475,226

UNITED STATES PATENT OFFICE

2,475,226

MAGNETIC FASTENER

Robert P. Ellis, York, Pa.

Application February 1, 1945, Serial No. 575,659

3 Claims. (Cl. 24—201)

1

This invention relates to magnetic fasteners and one of the principal objects of the invention is to provide certain improvements over my Patent No. 2,387,931.

Another object of the invention is the provision of a magnetic fastener in which both fastening elements may be operatively applied to the flexible material forming the closure element, flush with the surface of such flexible material.

A further object of the invention is the provision of a magnetic fastener which has no projecting parts and which has no visible detents, the entire face of each fastener element presenting a smooth appearance.

And a still further object of the invention is the provision of a magnetic fastener which will automatically lock itself by magnetic attraction when one part of the fastener is brought into close proximity to the co-operating part.

Other and further objects will appear in the specifications and will be specifically pointed out in the appended claims, reference being had to the accompanying drawings exemplifying the invention, and in which:

Fig. 1 is a cross sectional view of the two co-operating parts of one form of the fastener showing them attached to the margin of a flexible closure, taken on the lines 1—1 of Figs. 2 and 3.

Fig. 2 is a face view of the receptacle part of the fastener, taken on the line 2—2 of Fig. 1.

Fig. 3 is a face view of the plug part of the fastener, taken on the line 3—3 of Fig. 1.

Fig. 4 is a cross sectional view of the two co-operating parts of another form of fastener showing them attached to the margins of a flexible closure.

Fig. 5 is a face view of the receptacle part of the fastener taken on the line 5—5 of Fig. 4.

Fig. 6 is a face view of the plug part of the fastener taken on the line 6—6 of Fig. 4.

Referring to the drawings in which like letters and numerals of reference refer to similar parts throughout the several views, the character M1 denotes the margin of one of two oppositely disposed flexible closure flaps which may be the closing means for such articles as brief cases, shoes, garments, belts, etc., the character M2 denoting the opposite margin. To each opposite margin are attached, as by sewing at 7, co-operating magnetic fastening elements which register with each other when the margins M1 and M2 are brought into overlapping contact, each of these magnetic elements being preferably enclosed in a casing 8 and 9 respectively, these casings fitting into a hole or slot (not shown), cut into the flexible material of which the margins

2

are composed. These casings 8 and 9 may be constructed of one piece or several parts welded or brazed together as shown, the main requirement being that the operating faces contact each other.

Within casing 8 is secured, as by a press fit, the U-shaped permanent magnet 10, the pole characteristics being denoted by the letters N and S respectively. The magnetic elements shown in Figs. 1, 2 and 3 are rectangular in form but it will be apparent that a wide variety of configurations may be equally operable. The pole faces N and S are covered by a portion of the thin nonmagnetic casing 8, this casing having two rectangular holes or openings 11 and 12 separated by the cross piece 13 between the magnet poles N and S as illustrated.

The casing 9 contains the armature 14 naturally composed of magnetic material such as iron, this armature being pivoted by the shaft 16 which bears into each side of casing 9. This armature 14 is preferably provided with a projection 17, the face of which is normally flush with the operating face of the casing 9 as illustrated, a small light spring 18 normally holding the armature down into the casing, the spring 18 being secured to the casing 9 by the rivet 19. The casing 9 has a rectangular hole 20, its edges close to the face of the projection 17, through which the projection 17 of the armature may extend beyond the operating face of the casing 9 when magnetically attracted by either the N or S poles of the magnet 10 as soon as the casings 8 and 9 are brought sufficiently close together as indicated by the dotted lines in Fig. 1. At one relative position of the casings 8 and 9, the armature projection 17 will enter hole 11 of casing 8 while at a slightly different position, the armature projection 17 may be caused to enter hole 12, thus enabling the margins M1 and M2 to provide either a tight or loose fit to the article as will be readily understood. When the N pole of the magnet 10 attracts armature projection 17, it does so through hole 11, the tip 21 of the armature projection progressively getting closer to actual contact with the pole piece N as it is drawn up to its fullest extent as indicated by the dotted lines, where it finally comes into direct contact with the inner part of the N pole, thus presenting maximum magnetic area of flux passage from the pole piece N to the projection 17, and is held in such position against tension of spring 18. In this position it will be evident that opposing strain on the margins M1 and M2 in the direction of arrows 22 and 23 respectively will only tend to hold the projection 17 still tighter mechanically and the magnetic

attraction between the N pole of magnet 10 and the armature projection 17 will prevent the disassociation from any light strain that may possibly occur in use in a direction perpendicular to said arrows, such as by the crimping of the flexible material. The S pole of the magnet will act in a similar manner, the sides of both magnetic pole pieces being so curved that the arc of the pivoted armature projection 17 will progressively bring it closer to physical contact with either pole piece as it is attracted through either hole 11 or 12. In order to loosen the armature 17 from magnetic contact with the pole piece, all that is necessary is to pass the finger along between the closed margins M1 and M2, forcefully separating them in a direction perpendicular to arrows 22 and 23.

In Figs. 4, 5 and 6 is illustrated a magnetic fastener having the same operational features as the preceding described fastener, with the added feature that, whereas there are openings 11 and 12 in the face of casing 8, in this herein to be described fastener, the opening is normally closed by a non-magnetic disc 24 which is tension held into the angularly contracting opening in ıe face of the casing 8A by the helical spring 25 as illustrated, thus presenting an absolutely flush and closed exterior face to casing 8A. Cooperating casing 9A has its armature 26 also normally flush with the face of casing 9A by virtue of its annular angular edge 27 being held against the angular edge of the hole in the casing 9A by means of the tension in helical spring 28 against the disc 29 which latter is attached, as by welding, to the under face of armature 26.

When both casings 8A and 9A are brought into close proximity to each other, the magnetic force inherent in permanent magnet 30 will attract iron armature 26 against tension of spring 28, the magnetic lines of force penetrating non-magnetic disc 24 and force this disc closely against the magnet face as shown by the dotted lines and the armature 26 closely against the outer face of disc 24 as also illustrated by dotted lines, the armature 26 entering the opening in the face of casing 8A and being held there. Any stress applied to the margins M1 and M2 in the direction of arrows 22 and 23, which corresponds to stress when the article is in use, will therefore simply cause the annular angular projection 27 of the armature 26 to catch into the annular angular opening in the casing 8A as will be readily understood, thus preventing disassociation of the magnetic elements. The elements may be separated in the manner previously described. It will be apparent that, instead of using armature 26, a permanent magnet may be substituted in much the same manner as in my Patent No. 2,397,931 previously mentioned herein, this arrangement providing greater magnetic attractive force, if so desired. Whether or not the casings 8 and 9 extend all the way through the margin M1 and M2 is irrelevant to the operation of my fastener.

From the foregoing description it will be apparent that I have evolved a magnetic fastener which will automatically lock the two parts of the fastener together mechanically as soon as they are brought into magnetic attractive distance to each other but which parts may be easily separated by an adept action of the finger in the right direction, a fastener which will have extremely neat appearance as it may be made and used with a flush face and incidentally prevent dirt from entering the otherwise open apertures necessary for the magnetic locking mechanism. This magnetic fastener may be used to secure together the margins of any article having flexible flaps or closure elements and such margins will be held in close association with each other owing to the flush relation between the fastener parts and the margins; there being also no protruding projections as exist in such other fasteners as buttons, clasps, buckles, etc., which mar the appearance and limit the usefulness of the article. The use of my fastener on an article will permit quicker and more convenient closing and opening the flaps than any other so far devised, only one hand being required in the operation.

Various changes may be made in the embodiment of the invention hereinabove specifically described without departing from or sacrificing the advantages of the invention as defined in the appended claims.

I claim:

1. A magnetic fastener comprising two separate cup-shaped casings, means for attaching each of said casings to an oppositely disposed flexible closure flap, means for causing the open end of each of said cup-shaped casings to contact each other when said flexible closure flaps are placed in closed relation, two magnetically attractive members, one of said mutually magnetically attractive members being recessed within one of said cup-shaped casings, and the other magnetically attractive member covering the opening in the other cup-shaped casing, said last named magnetically attractive member being adapted to project beyond its casing into the opening in the other cup-shaped casing in order to insure against lateral movement of the said casings.

2. A magnetic fastener comprising two separate cup-shaped casings, means for attaching each of said casings to an oppositely disposed flexible closure flap, means for causing the open end of each of said cup-shaped casings to contact each other when said flexible closure flaps are placed in closed relation, two mutually magnetically attractive members, the inner sides of one of said cup-shaped casings being inclined to a larger diameter at its base and having one of said magnetically attractive members attached therein in a recessed position, the other cup-shaped casing containing the other magnetically attractive member, the outer face of said magnetically attractive member being held flush with the rim of its cup-shaped casing by an inwardly tensioned spring, and an outward flare on the outer edge of said last named magnetically attractive member, said last named magnetically attractive member being adapted to project beyond its casing against the action of said spring into the opening in the other cup-shaped casing through magnetic attraction in order to insure against lateral movement of said casings.

3. A magnetic fastener as in claim 1, the said cup-shaped casing provided with said recessed magnetically attractive member being provided with a non-magnetic closure element within the opening thereof, said closure element being normally held flush with the rim of said cup-shaped casing by a spring within said casing, said closure element being capable of being depressed within said casing by the projecting action of the magnetically attractive member in the opposite casing.

ROBERT P. ELLIS.

(References on following page)

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
547,360	Rutty	Oct. 1, 1895
1,198,227	Hinchey	Sept. 12, 1916
2,288,688	Dubilier	July 7, 1942
2,319,292	Boggs	May 18, 1943

FOREIGN PATENTS

Number	Country	Date
758,855	France	Nov. 7, 1933