March 12, 1968 D. J. DADDONA, JR 3,372,443

MAGNETIC FASTENING MEANS

Filed Feb. 16, 1967

Fig. 1

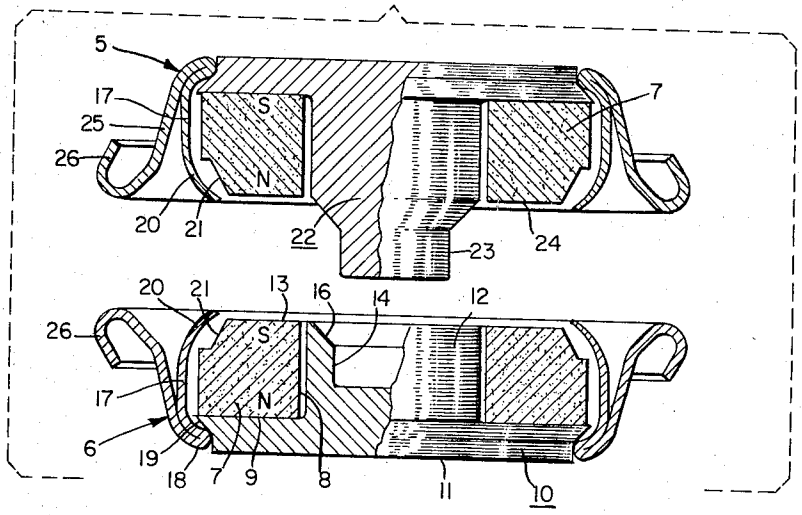
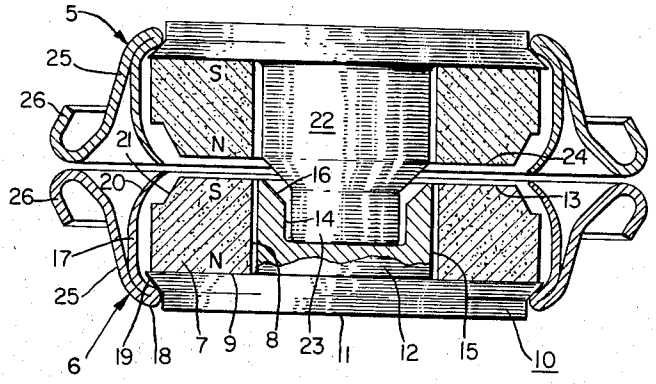


Fig. 2



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MAGNETIC FASTENING MEANS

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ABSTRACT OF THE DISCLOSURE

Improvements are provided in magnetic fasteners of the type used in the place of buttons on garments. The stud pin has a reduced diameter end which fits into a recess in the pin of the socket element, thus providing metal to metal lead-in surfaces and avoiding the inside beveled corner on the ceramic ferrite magnet. The socket pin extends through its magnet resulting in greater resistance to lateral stress and a more nearly continuous metal core for increased magnetic attraction of the fastener parts. The holder shells engage loosely around the magnets to eliminate breakage during assembly.

This invention relates to magnetic fastening means especially useful for garments to be worn by handicapped people. It is an improvement over the fastener disclosed in the pending application of John H. Humiston, S.N. 535,430, filed Mar. 18, 1966, now Patent No. 3,324,521. A still earlier form of magnetic button fasteners is shown in the patent to Brett, 3,141,216.

While the fasteners shown and described in the Humiston application have many desirable features, certain problems have been encountered in their manufacture and use. The annular magnets are made from powdered or granular ceramic ferrite material by a process of compression molding and sintering and it is difficult to obtain a good beveled inner corner around the hole in the magnet, which provided the lead-in surface for the stud pin into the socket. Any burr around such lead-in surface would tend to catch against the stud pin and interfere with putting the fastener elements together. Another problem encountered was breakage of the magnets when the holder shell was being clamped around the magnet and armature assembly.

In the fastener of the present invention the magnets have square inner corners, the pin of the socket element is extended to provide a metal lead-in surface around a central recess in the socket pin, and the stud pin has a projecting end portion of reduced diameter to fit into such recess. Also the holder shells are made to engage loosely around their magnets to prevent breakage while permitting adequate manufacture tolerances.

Other improved results will be hereinafter referred to, or will be apparent from the description of a specific embodiment of the invention shown in the accompanying drawings.

In these drawings:

FIG. 1 is a central vertical section, with parts shown in full, of the male and female fastener elements when separated; and

FIG. 2 is a central vertical section of the same elements fastened together.

The male and female fastener elements generally indicated by the numerals **5** and **6** respectively, are adapted for attachment to overlapping flaps of a garment or the like, by pronged rings (not shown) of the kind commonly used for attaching metal snap fasteners. Each female element has an annular magnet **7** of generally cylindrical shape with an axial hole **8**. Against the outer end face **9** of the magnet is mounted an armature **10** of magnetic material such as soft iron or steel. Projecting axially from

the disc-shaped base **11** of the armature into the hole **8** of the magnet, is a socket pin **12**. This pin preferably extends substantially through the hole **8** to the inner face **13** of the magnet **7**, and has a large open-ended recess **14** surrounded by a cylindrical wall **15**. A lead-in surface **16** around the inside upper edge of the wall **15** provides what may be called a flared mouth at the free end of the socket pin so as better to guide into place the stud pin to be described.

A holder shell for the magnet and its armature has an inner wall **17** with an outer edge **18** turned inwardly to bear against the beveled surface **19** of the armature base **11** and an inner section **20** of the wall **17** is bent over the beveled outer corner **21** of the magnet. Preferably the inner curved section **20** of the wall **17** is not made to bear against the magnet tightly so that there is a certain amount of looseness to take care of reasonable tolerances without breakage of the magnet.

The construction involving the male fastener elements is generally the same as that which has already been described, and corresponding numerals are used where they apply. The stud pin **22** of the male element, however, is much longer than the pin **12** and projects through and beyond its magnet **7**. It has a reduced diameter free end portion **23** to co-operate with the inclined lead-in surface **16** of the socket pin, so that when the parts are brought together with the opposed end surfaces **13** and **24** of the magnets of the female and male elements, respectively, somewhat close together, the stud pin will snap into place even though the elements are not in exact alignment. It will be understood that the magnets are so arranged that the ends which come into juxtaposition are of opposite polarities, as indicated by the letters N and S.

It will also be seen in FIG. 2 that the length of the pin **22** combined with the length of pin **12** to the bottom of recess **14** is greater than the combined axial dimension or length of the two magnets so that the end of pin **22** will abut the pin **12**. There is left a clearance between the magnets in the closed position so as to insure the coming together of the pins **12** and **22**. This is in the area of greatest magnetic flux and produces the greatest holding power when the fastener elements are engaged. Also the cylindrical wall extending through the magnet of the female element and surrounding the end **23** of the stud pin provides a more nearly continuous core of magnetic material to allow better concentration of the magnetic flux. The pin **22** projecting into the recess provides metal to metal contact to resist transverse stresses.

Joined to the inner wall **17** of the holder shell by the U-bend at the outer edge **18**, is the outer wall **25** which flares outwardly and curls over around its outer edge to form the prong-retaining channel **26**. The extent in the axial direction of both the inner and outer walls is substantially the same.

To attach each of the fastener elements to a garment flap a prong ring as commonly used in snap fasteners pierces through the garment material and has its prongs clinched in the channel **26**.

What I claim is:

1. Magnetic fastening means with male and female fastener elements each of which has

(a) a permanent magnet of generally cylindrical shape with an axial hole therethrough each having end surfaces of opposite polarity;

(b) an armature of magnetic material with a disc-shaped base bearing against an end face of the magnet;

(c) a holder shell engaging around the peripheries of said magnet and said base to hold them together;

(d) a stud pin on the armature of said male element projecting axially from the armature base through and a substantial distance beyond its magnet, said

stud pin having a reduced diameter free end portion; and

(e) a socket pin on the armature of the female element projecting axially from the armature base and extending through at least the major portion of the hole in the magnet of the female element and having an open ended recess adapted to receive said reduced diameter free end portion of said stud pin when the fastener elements are brought together with the north pole end of one magnet facing the south pole end of the other magnet.

2. Magnetic fastening means as defined in claim 1 wherein said open ended recess has an outward flare at the free end of said socket pin to provide a lead-in surface for said stud pin.

3. Magnetic fastening means as defined in claim 2 the length of said socket pin is substantially the same as the axial length of the hole in the magnet of the female element.

4. Magnetic fastening means as defined in claim 1 wherein each of said magnets consist of ceramic ferrite material and the inside corners around the hole are substantially square.

5. Magnetic fastening means as defined in claim 1 further characterized by a loose fitting of each holder shell against the magnet.

References Cited

UNITED STATES PATENTS

3,141,216	7/1964	Brett.
3,324,521	6/1968	Humiston.

FOREIGN PATENTS

1,111,697	3/1956	France.

BERNARD A. GELAK, *Primary Examiner.*