June 10, 1941. F. F. LANGLEY 2,244,885

SNAP FASTENER ELEMENT AND ITS MANUFACTURE

Filed Dec. 29, 1938

Fig. 5

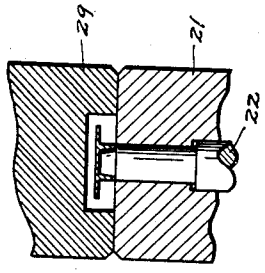



Fig. 4

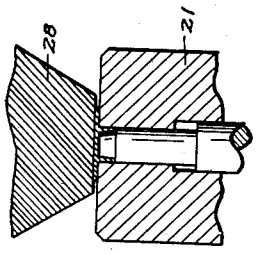



Fig. 3

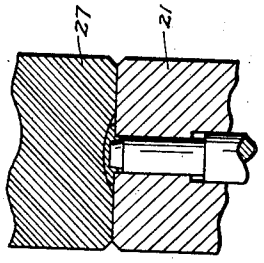



Fig. 2

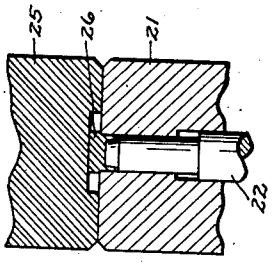



Fig. 1

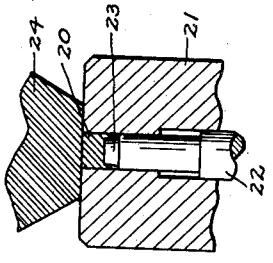



Fig. 9

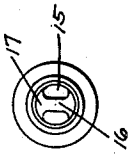



Fig. 10

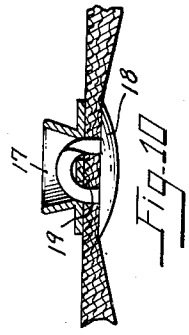



Fig. 8

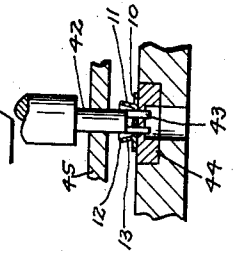



Fig. 7

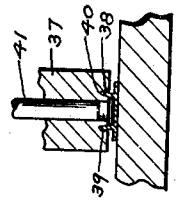
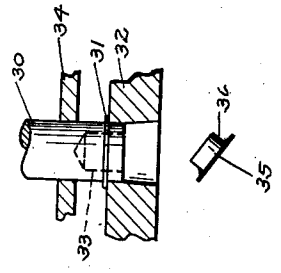



Fig. 6




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Patented June 10, 1941

2,244,885

# UNITED STATES PATENT OFFICE

2,244,885

## SNAP FASTENER ELEMENT AND ITS MANUFACTURE

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Application December 29, 1938, Serial No. 248,244

2 Claims. (Cl. 24—219)

This invention relates to snap fasteners and their manufacture, and among other objects aims to provide an inexpensive and improved stud element of a snap fastener of such character that it may be made in small sizes without impairment of its efficiency of operation or attachment.

The nature of the invention may be readily understood by reference to one embodiment of the invention illustrated in the accompanying drawing.

In said drawing:

Figs. 1 to 5, inclusive, are diagrammatic sectional elevations illustrating successive stages in the manufacture of a stud element blank from a solid rod or wire stock;

Fig. 6 is a sectional elevation through punching dies illustrating the trimming to size of the formed blank;

Fig. 7 is a sectional elevation of forming dies showing the formation of the stud head;

Fig. 8 is a sectional element through punching dies illustrating the piercing of the element to provide means of attachment;

Fig. 9 is a plan view of the completed stud element; and

Fig. 10 is a sectional view illustrating the method of attachment of the stud element to fabric by means of a double pronged fastener.

In general a snap fastener comprises separable stud and socket elements. The former is so-called because it carries a projecting stud having a slightly enlarged head adapted to enter the socket or recess of the socket element and to be resiliently engaged therein. Various means are provided in the socket element for resiliently engaging the head of the stud. One common device is a split ring carried in the socket and adapted to open slightly to permit the entry of the stud head and to close around the smaller stud neck below the head.

For various reasons, it has been difficult heretofore to provide small sized stud elements which operated efficiently or could be firmly or satisfactorily attached to the garment or other fabric. Reduction in size has impaired not only holding power of the snap fastener but the security of its attachment to the fabric.

The illustrative stud element may be made in small sizes without sacrifice of holding power or security of attachment. Its method of manufacture (from solid stock as distinguished from sheet metal) insures low cost and accuracy and uniformity of product. The stud element comprises a base 10 having projecting therefrom an annular stud 11 comprising a terminal head 12 and a subjacent neck 13 of a diameter slightly less than the external diameter of the head. The base is centrally perforated for reception of an attaching element. In the present instance, the fastener is designed for attachment by a double pronged fastener and is formed with a pair of perforations 15 (to receive the respective fastener prongs) to provide an intervening bar 16 about which the fastener prongs may be bent or curled (see Fig. 9). The central recess 17 inside the annular stud is open to the exterior and is adapted to receive a die for upsetting the fastener prongs and bending or curling them firmly over and upon the central bar in the attaching operation. This method of attachment not only firmly clamps the cloth between the base of the stud element and the head 18 of the fastener but embraces a strip of cloth 19 between the fastener prongs to provide additional security against tearing the fastener loose from the cloth.

The annular shape of the stud also provides a head of maximum circumference (for a given size of fastener) for engagement in the socket element. Although the relatively large stud head provides a large surface to be gripped in the socket element (thereby providing adequate holding power), it may nevertheless be easily separated from the socket by a tilting operation which withdraws one edge of the head in advance of the other.

The stud element is formed from solid stock (in this instance blanks of rod or wire stock) by a succession of cold upsetting operations. The thickness and strength of the various parts is not, therefore, limited (as in studs made from sheet metal) on the thickness of the stock from which it is made. For a stud element having an external head diameter of approximately $\frac{5}{16}$ of an inch, soft steel wire stock of ¼ inch diameter may be employed. The carbon content of the steel should be low, approximately five hundredths to fifteen hundredths of one per cent.

Preferably the stud portion of the element is formed or substantially formed before formation of the base of the element. Simultaneous formation of base and stud is not advisable inasmuch as the metal will not flow with equal readiness into the stud. It will take the path of least resistance and flow into the base. In the meanwhile the stud end of the blank will be hardened by the upsetting blows, thereby making it very difficult practically to force the metal to flow to form the stud.

One method of forming the element is illus-

trated in Figs. 1 to 5, which show successive stages in the formation of the stud blank. According to this method, the blank 20 (Fig. 1) is confined in a die 21 during the formation of the stud element so as to prevent substantial lateral spread of the blank. Only a very short length of the blank is allowed to project above die 21 wherein it is supported upon a die plunger 22 (movable in die 21) whose upper end 23 has the contour of the interior of the stud space. The short projecting portion of the blank is then struck by the die 24 to force the blank over the plunger 22 and thereby to form or partly form the stud element of the blank. So little of the blank need project above die 21 for this purpose that it cannot flow laterally.

Upon withdrawal of die 24, plunger 22 is slightly elevated to cause a portion of the blank to project above the die; thereupon, as indicated in Fig. 2, this projecting portion is engaged by a header 25 to cause the metal to flow laterally as at 26. Upon completion of this operation, the blank is successively further projected from die 21 and the projecting portion still further flattened by successively acting headers 27 and 28 (Figs. 3 and 4). Thus by successive projecting and flattening of the metal, as illustrated in Figs. 2, 3 and 4, a thin base of substantial diameter is formed without danger of splitting or cracking the metal as might occur if the full amount of metal were initially exposed to one or more heading blows. Successive projection of the blank also insures the complete formation of the stud.

After formation as aforesaid, the blank is stripped from die 21. In the present instance this is effected by forcing die 21 downwardly by a stripping tool 29 (whose face is recessed to clear the blank ) while supporting die 22 (Fig. 5). This method of stripping seems to minimize the stress on die 22.

In the present instance the volume of metal in the completed stud element is equivalent to that in a blank whose length is less than the diameter of the wire stock. Since it is difficult by ordinary automatic devices to orient and feed blanks whose length is less than their diameter, the feeding operation may be greatly simplified by employing blanks which are longer than their diameter and subsequently trimming off the excess. In the present instance blanks of .260 inch in length ( i. e. longer than their diameter) are employed and the surplus metal is carried into the base of the stud element, thereby forming a base which is substantially larger in diameter than that required for the completed article.

In Fig. 6 the trimming off of the surplus metal from the base is illustrated. In this instance the blank formed, as previously described, is engaged by punch 30 which shears off the annular surplus metal in conjunction with cooperating die 32. Punch 30 is centrally recessed as indicated at 33 to receive the stud portion of the fastener and center it relatively to the punch. The severed blank falls through the die 32 and the scrap 31 may be moved by a blast of air upon retraction of the punch from which it is stripped by the stripper plate 34. The diameter of the base of the completed stud element may vary considerably. For small fasteners the base is made as small as may be consistent with secure attachment to the cloth. The cloth is efficiently gripped when the diameter of the base is approximately that of the head 18 of the attaching fastener.

In the resulting blank 35 (see Fig. 6) the sides 36 of the stud are cylindrical, having taken the configuration of the bore in die 21. The enlarged stud head is advantageously formed simply by flaring these sides outwardly. Fig. 7 illustrates one method of thus forming the enlarged stud head. The stud is here engaged by a die 37 having an inner annular portion 38 externally tapered so as to flare the stud walls outwardly. The subjacent side walls of smaller diameter then constitute the neck of the stud. Preferably the outer edge 39 of the end of the stud is rounded or tapered inwardly to facilitate entry into the socket element. This rounding may advantageously be effected simultaneously with the flaring operation by forming the die with a curved surface 40 which not only inwardly rounds or tapers the extremity of the head but smooths off the rough edges of the stud.

Upon completion of the head forming operation, die 37 is withdrawn and a stripper pin 41 operating in a central bore of the die serves to strip the blank from the die.

Fastener bar 16 and the adjacent openings 15 are advantageously formed in the base of the stud element by punching die plunger 42 carrying a pair of spaced punching pins 43 which cooperate with a complementary stationary die 44. A completed stud element is stripped from the punching pins by a stripper plate 45 upon the return movement of plunger 42.

The stud elements may advantageously be automatically attached to garments or the like by an automatic machine of the type shown in Clark Patent No. 1,793,970, the stud elements being employed instead of buttons in the machine of the aforesaid patent. A machine of this type may be adapted to attach stud elements simply by providing a supply hopper and raceway shaped to feed the stud elements down the raceway to the attaching machine with the base of the stud element lowermost. The attaching apparatus functions to orient the bar 16 in the fastener so that in attaching position it will be straddled by the prongs of the attaching fastener.

Smaller sizes of stud elements may be made by the use of wire stock of smaller diameter. Notwithstanding their small size, the portions subject to stress may be made much stronger than those of stud elements fabricated from sheet metal. Indeed, reduction in size does not require reduction in strength of the various parts of the element. For example, the walls of the stud portion may be made quite thick and strong despite the small diameter of the stud itself. Moreover, the walls of the stud portion may be tapered to provide greater thickness at their base without resulting clumsiness. The central portion of the base of the stud element and particularly the bar 16 may also be made thick and strong, yet its edges may be thin when great strength is not required. Unlike stud elements made from sheet metal, the thickness of the various parts of the stud elements may be given varied strengths and thicknesses, depending solely upon the stresses imposed thereon. This is particularly important in small sized elements where fabrication from sheet metal (which must be quite thin for small sizes) results in articles which are not sufficiently durable for many purposes.

Obviously the invention is not limited to the details of the illustrative embodiment of the invention herein illustrated and described since these may be variously modified. Moreover it is not indispensable that all features of the in-

vention be used conjointly since various features may be used in different combinations and subcombinations.

Having described my invention, I claim:

1. As an article of manufacture, a small sized snap fastener stud element for garments and the like comprising a base and stud portion integral throughout and made of solid metal stock, said stud portion not substantially exceeding $\frac{5}{16}$ of an inch in external diameter and being in the form of a solid annular flange outwardly flared and thicker at its base than at its head, said stud element being substantially stronger than a sheet metal stud element of the same size, said base having a marginal rim extending beyond said stud and having a pair of spaced holes therein inside said stud to provide an intervening bar integral with said base to receive the prongs of an attaching fastener, the metal forming said bar being substantially thicker than the metal at the margin of said base.

2. As an article of manufacture, a small sized snap fastener stud element for garments and the like comprising a base and stud portion of solid metal stock, said stud portion not substantially exceeding $\frac{5}{16}$ of an inch in external diameter and being in the form of a solid annular flange outwardly flared and thicker at its base than at its head, the rim of said outwardly flared flange being inwardly rounded, said stud element being substantially stronger than a sheet metal stud element of the same size, said base having a marginal rim extending beyond said stud and having a pair of spaced holes therein inside said stud to provide an intervening bar integral with said base to receive the prongs of an attaching fastener.

FRANK F. LANGLEY.