Aug. 30, 1949. F. G. PURINTON 2,480,262

PLASTIC BUTTON WITH METAL TACK

Original Filed Jan. 16, 1945 2 Sheets-Sheet 1

Fig. 1.

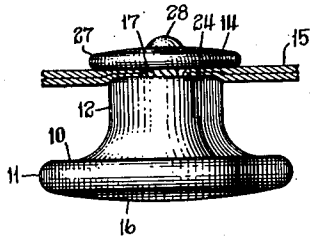


Fig. 2.

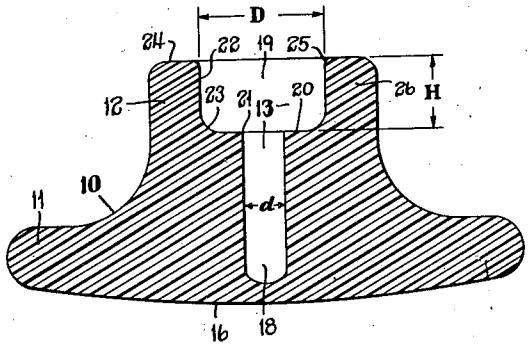


Fig. 3.

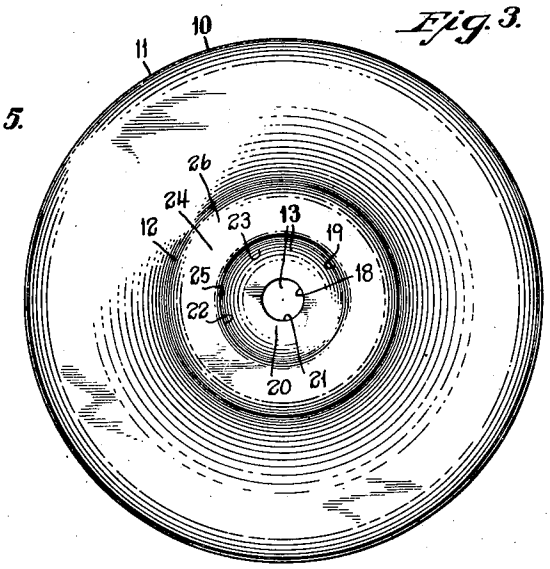


Fig. 5.

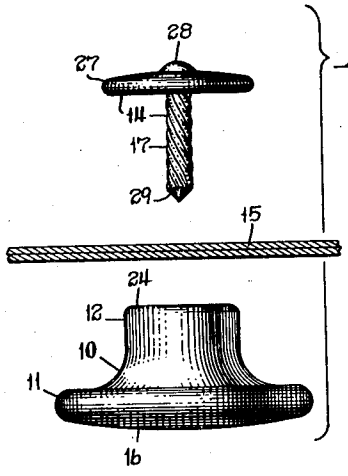


Fig. 8.

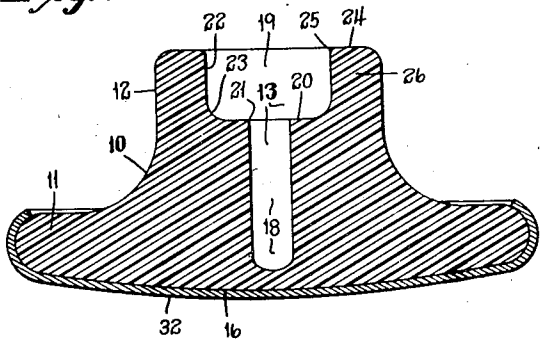
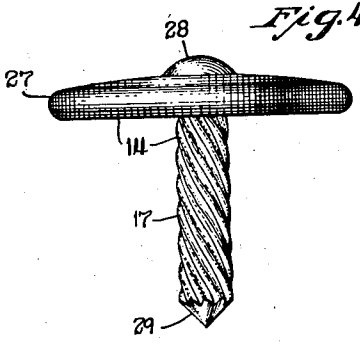


Fig. 4.



Inventor
Forrest G. Purinton
By
Seymour, Earle & Nichols
Attorneys

Aug. 30, 1949. F. G. PURINTON 2,480,262

PLASTIC BUTTON WITH METAL TACK

Original Filed Jan. 16, 1945 2 Sheets-Sheet 2

Fig. 6.

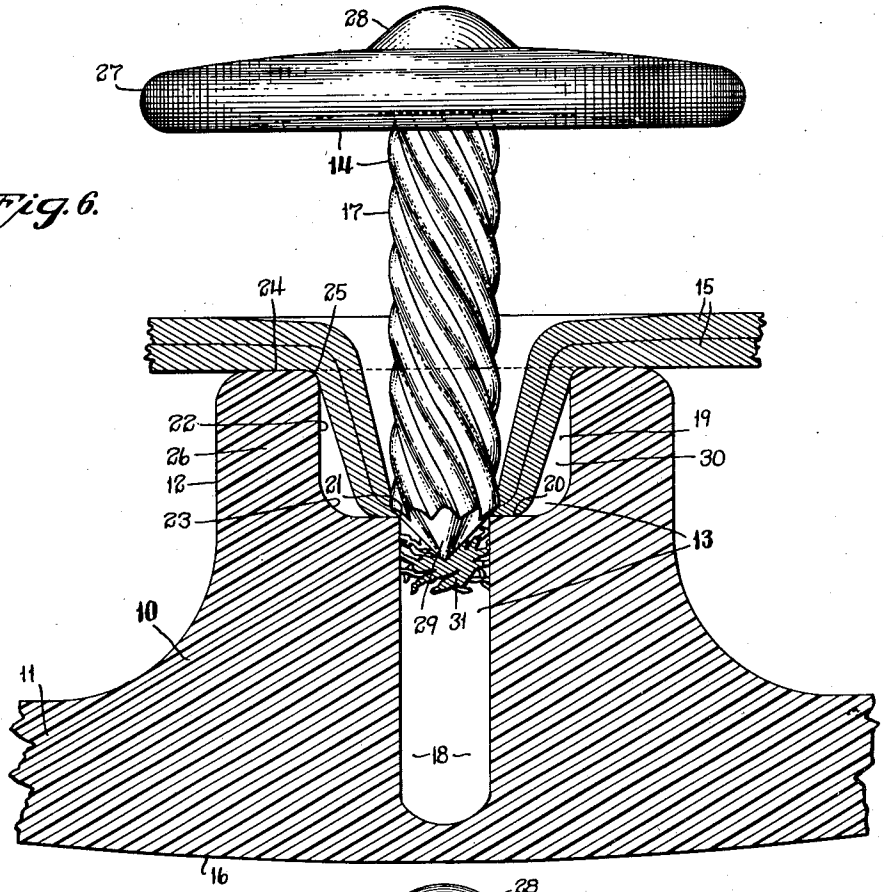
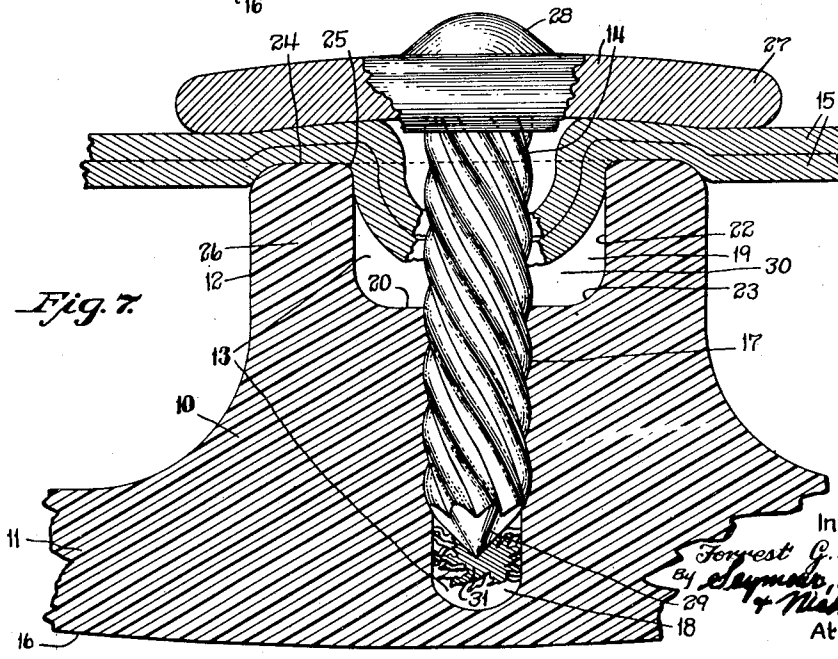


Fig. 7.



Inventor
Forrest G. Purinton
By Seymour, Earle & Nichols
Attorneys

Patented Aug. 30, 1949

2,480,262

UNITED STATES PATENT OFFICE

2,480,262

PLASTIC BUTTON WITH METAL TACK

Forrest G. Purinton, Waterbury, Conn., assignor to The Patent Button Company, Waterbury, Conn., a corporation of Connecticut

Original application January 16, 1945, Serial No. 573,082. Divided and this application October 24, 1947, Serial No. 781,831

10 Claims. (Cl. 24—90)

1

The present invention relates in general to fasteners and more especially to an inexpensive molded plastic button of the type adapted to be secured to work clothes by means of a metal tack, this application being a continuation-in-part of my co-pending application Serial No. 573,082 filed January 16, 1945, now abandoned.

Heretofore, substantially all buttons used on work clothes such as, for example, overalls, coveralls, coats and the like are formed of metal and are firmly secured to the fabric by a metal tack, the tack being fastened thereto by driving the point of the tack against an anvil in the head of the button so as to upset the tack-point and thus wedge it tightly therein.

Molded plastic buttons have been used experimentally on work clothes, but have been commercially unsuccessful due primarily to the tendency of the buttons to burst during application to the fabric. This is especially true of buttons formed of an inexpensive but relatively-brittle plastic material such as phenol-formaldehyde. The application of such buttons experimentally to the fabric has been by means of a fastener of the type generally referred to as a "drive-screw" having a helically-grooved oversized shank adapted to make a force fit in the anchoring-socket of the button-hub. Inevitably, however, the resulting radial forces acting outwardly on the hub of the button have caused the latter to burst and, heretofore, the only remedy has been to use either metal ferrules for reinforcing the hubs of the buttons or a stronger but exorbitantly-expensive plastic material.

An object of the present invention is to provide an improved inexpensive molded plastic button which may be successfully fastened to a fabric by a metal tack.

A still further object of the invention is to provide an inexpensive molded plastic button having improved means to prevent the button from bursting when fastened to a fabric by a metal tack.

A still further object of the invention is to provide an inexpensive molded plastic button wherein the bursting effect on the hub of the button is minimized and the hub itself is reinforced against bursting so that the button may be manufactured and used successfully on a commercial scale.

A still further object of the invention is to provide an inexpensive molded plastic button wherein a clearance-recess is provided in the hub of the button to prevent the fabric from being pinched and to form a reinforced shearing-shoulder with which the shank of the tack may

2

coact to shear the fabric as the tack is forced into the anchoring-socket of the button.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed in any separate application.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a side elevation of the improved molded plastic button of this invention shown secured to a two-ply fabric by means of a metal tack;

Fig. 2 is an enlarged side elevation in section of the improved molded plastic button of Fig. 1;

Fig. 3 is an enlarged plan view of the back side of the button of Fig. 1;

Fig. 4 is an enlarged side elevation of the type of metal tack used to fasten the molded plastic button to a fabric;

Fig. 5 is an exploded view of the fastening elements shown in Fig. 1;

Fig. 6 is a side elevation partly in section of the improved molded plastic button, a two-ply fabric and a metal tack, all of which are greatly enlarged to better illustrate the coaction of the tack with the button in securing the latter to a fabric;

Fig. 7 is similar to Fig. 6 but shows the tack forced down into the anchoring-recess of the button and the two-ply fabric firmly gripped between the underside of the tack-head and the end of the button-hub; and

Fig. 8 is a side elevation in section of the molded plastic button provided with a metal front shell.

Referring to the drawings, the improved button of this invention is indicated generally at 10 and comprises a head 11 having an integral rearwardly-projecting hub 12 provided with a concentric hub-aperture indicated generally at 13. The button is formed of a plastic material and more particularly of a thermosetting plastic such as, for example, phenol-formaldehyde, urea-formaldehyde or melamine-formaldehyde, all of which plastics are capable of repeatedly withstanding the mechanical abrasion, the action of caustics and the elevated temperatures encountered in washing and ironing work clothes. Moreover, for the manufacture profitably of a molded plastic button, an inexpensive plastic is used, that is to say, one having a cheap filler material such as wood flour as distinguished from cellulose fiber fillers and the like which add greatly to the cost of the plastic. Although the above-named

thermosetting plastics have these required characteristics, they are nevertheless relatively brittle and break easily when subjected to a sharp blow such as is encountered in driving a metal tack into the hub-aperture 13 of the button, and hence the button 10 is characterized by an improved construction of its hub-aperture 13 whereby the tack, indicated generally at 14, including a portion of the fabric 15, may be driven into the hub-aperture without bursting the button.

Referring particularly to Figs. 2, 6 and 7, the concentric aperture 13 of the hub 12 intersects the rear end of the hub and extends downwardly or forwardly therein to a point in the head 11 of the button sufficiently rearwardly of its front face 16 to obviate weakening or fracturing the latter, and of sufficient depth to more than accommodate the full length of the shank 17 of the tack 14 when the latter is driven down into its fastening position therein, as shown especially well in Fig. 7. More particularly, the lower portion of the concentric aperture 13 comprises a substantially-cylindrical bore or tack-anchoring socket 18, while the upper portion of the concentric aperture 13 comprises a concentric substantially-cup-shaped recess 19 of relatively-large diameter. The diameter *d* of the track-anchoring socket 18 may vary depending on the size of the button, but for the standard twenty-seven-ligne button is of the order of fifty-seven thousandths inch (0.057''), which dimension is substantially fifteen thousandths inch (0.015'') less than the outside diameter of the shank 17 of the tack, for the purpose hereinafter described. The cup-shaped recess 19 comprises a substantially-flat bottom 20 which is shown as being at substantially right angles to the longitudinal axis of the aperture 13 and which intersects the upper or rear end of the tack-anchoring socket 18, the line of intersection between the bottom 20 of the recess and the upper end of the socket 18 constituting a sharp circular edge 21, hereinafter referred to as a "shearing-edge" or "shearing-shoulder". Although the bottom 20 of the cup-shaped recess is shown as a substantially-flat surface at substantially right angles to the longitudinal axis of the aperture 13, it may not necessarily constitute a planar surface nor be at right angles to the longitudinal axis of the aperture. It is essential, however, that its circular line of intersection with the upper end of the socket form the aforesaid sharp shearing-shoulder 21. The flat bottom 20 of the recess is adapted to be blended at its outer edge into the side walls 22 of the cup-shaped recess by an annular concave surface or radius 23. The side walls 22 of the recess are substantially cylindrical surfaces of revolution extending upwardly or rearwardly at substantially right angles to the bottom of the recess, the upper edge of the recess 19 intersecting the rear face 24 of the button-hub and forming a circular smoothly-rounded rim 25 therewith.

The depth H of the cup-shaped recess 19 bears a predetermined relationship to the diameter *d* of the anchoring-recess 18, for it has been discovered that in order to prevent the hub of the button from bursting as the tack and accompanying fabric are driven down into the aperture 13, the bottom of the cup-shaped recess—and more particularly its shearing-shoulder 21—must be at a sufficient distance below the rear or upper end 24 of the hub both to stretch the fabric prior to the entry of the tack into the anchoring-socket of the aperture so as to facilitate shearing the threads of the fabric on the shearing-shoulder 21 of the recess, and to reinforce the shearing-edge against the bursting force which acts outwardly radially thereon as the shank of the tack enters the anchoring-socket, the latter objective being accomplished by providing a relatively-large volume of material both rearwardly and forwardly of the shearing-shoulder 21. The reinforcing material forwardly of the shearing-edge comprises the major portion of the body of the button, while the reinforcing material rearwardly of the shearing-edge 21 comprises the relatively-thick-walled annulus or cuff 26 formed at the end of the hub by the cup-shaped recess 19. For a molded plastic button of the size and having the physical characteristics hereinabove described, it has been found that the shearing-shoulder 21 should be located forwardly of the rear end of the hub a distance H not less than one-half the diameter of the anchoring-socket 18. Thus, where the diameter of the latter is fifty-seven thousandths inch (0.057''), then the minimum distance H should be substantially twenty-nine thousandths inch (0.029''). Although this ratio would hold for all sizes of buttons formed of the types of plastics hereinabove described, and having the relative proportions shown in the drawings, it will be understood that this ratio might differ for buttons molded of one of the stronger but more expensive plastics. Moreover, the distance H is a factor of the gripping force with which the shank 17 of the tack holds in the anchoring-socket 18 of the hub, the gripping force being relatively large when the area of the wall of the socket 18 is large, and proportionately less for a decrease in the wall area of the socket. In the present embodiment, the distance H may be a maximum of two and one-half times the diameter *d* of the socket 18. In this connection, it should be pointed out that the tack 14 comprises a head 27 provided with a teat 28 and a helically-fluted shank 17 terminating at its lower end in a conical self-centering point 29. When the head of the button is engaged and forced downwardly by a button-seating tool, the tack rotates about its teat 28, and since the diameter of the hub-socket 18 is substantially fifteen thousandths inch (0.015'') less than the land diameter of the shank, the helical lands of the shank actually thread themselves into the wall of the recess (see Fig. 7) to form an extremely strong grip. For use in work clothes, such as overalls, the holding force of the tack is of from about 175 to about 250 pounds.

An additional characteristic feature of the cup-shaped recess is its diameter D which, as shown herein, may be as great as substantially three times the diameter *d* of the socket 18. This construction will insure adequate thickness for the walls 26 of the shearing-shoulder reinforcing-cuff and, at the same time provide an annular clearance-space 30 between the shank of the tack and the side walls 22 of the clearance-recess 19, the width of which is sufficient to permit a laminated fabric 15 of the maximum thickness occurring in work clothes to be pulled down into the clearance-space without being pinched between the shank and the walls of the clearance-recess. The latter is an essential requirement in the construction of the molded button since to permit the fabric to be pinched as the tack and fabric are driven down into the cup-shaped recess 19 would set up a radially-acting bursting force within the recess with disastrous results.

The improved molded plastic button 10 may be

regarded as a stock button adapted to be manufactured in large quantities and kept in storage pending orders from buyers, at which time the stock button may be modified to meet the requirements of the individual buyer. These modifications must consist, for example, of dyeing the stock buttons a characteristic color, forming an intaglio motif in the face thereof, or applying a metal face-plate or shield 32 over the face of the button as exemplified in Fig. 8.

Referring now to Figs. 5, 6 and 7, the operation of securing the stock button 10 to a laminated fabric by the metal tack is as follows. The fabric 15 is inserted between the rear end of the button-hub 12 and the end 29 of the shank of the tack, in the manner indicated in Fig. 5, whereupon the fabric is seated against the rear face 24 of the hub and the tack 14 pressed down into engagement with the fabric with the shank of the tack in axial alignment with the clearance-recess and anchoring-socket of the button. As the tack moves down into the clearance-recess, its conical end 29 engages and initially draws the fabric 15 down into the clearance-recess thereby stretching the fabric over the rounded rim 25 of the clearance-recess and forcing the portion of the fabric engaged by the conical point of the tack down into engagement with the shearing-shoulder 21 of the recess. It will be noted that due to the depth H and diameter D of the cup-shaped clearance-recess, the stretched portion of the fabric lying within the clearance-space 30, between the walls of the recess and the shank of the tack, is under no compression radially, and hence transmits no radial bursting force to the hub of the button. Moreover, inasmuch as the fabric is stretched severely over the conical point 29 of the tack, it is thinned at its point of contact with the shearing-shoulder 21 of the recess, as shown especially well in Fig. 6, and hence as the conical end 29 of the rotating tack-shank, and more especially its base, coacts with the shearing-shoulder 21 of the recess, the threads of the fabric are readily sheared off. It will be observed that the shearing-base of the conical point 29 coincides with the lower end of the tack-shank and is scalloped by intersection of the helical flutes of the shank therewith, and hence a ragged unsymmetrical wad 31, comprising a loose bunch of fibers, is cut from the fabric and forced down into the anchoring-recess 18 by the conical end of the tack. It is conceivable—although impracticable due to the absence of the self-centering point—to form a flat blanking face on the lower end of the shank to blank out a smoothly-rounded disk from the fabric, but, in any event, coaction of the lower end of the tack-shank with the shearing-shoulder 21 of the clearance-recess cuts through the stretched fabric and is to be distinguished from a pinching-off action such as occurs in a button having no sharp shearing-shoulder and which sets up radially-acting bursting forces. Following the shearing through of the fabric, the stretched portion thereof in the cup-shaped recess is relieved and tends to draw upwardly or rearwardly in the recess, free of the walls thereof and of the shank of the rotating tack. The latter continues to thread its way down into the anchoring-socket 18 of the button, pushing the wad 31 down into the lower end thereof until the tack reaches its fastening position. The latter is indicated in Fig. 7 wherein the laminated fabric 15 is severely pinched between the rear face 24 of the hub and the underside of the head 27 of the tack. The

button is thus fastened securely to the fabric and is capable of withstanding a straight pull of between about 175 and 250 pounds.

To reiterate, due to coaction of the base-portion of the conical end 29 of the rotating tack-shank with the sharp shearing-shoulder 21 of the clearance-recess, the fabric is sheared through, whereby any outwardly-acting radial bursting force set up at the shearing-shoulder of the recess by the fabric, is reduced to a minimum, if not eliminated entirely. Moreover, such outwardly-acting radial bursting force as is set up at the shearing-edge 21 by coaction therewith of the conical end 29 of the shank, is easily resisted by the reinforcing-cuff 26 of the hub to effectively prevent the later from bursting.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a high-walled cup-shaped recess concentric with the anchoring-socket and arranged both to intersect the outer end thereof and to provide an annular clearance-space between the shank of said tack and the high walls of said cup-shaped recess, the width of said annular clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; and an annular sharp square shoulder formed at the point of intersection of said cup-shaped recess with the outer end of said anchoring-socket constituting a cutting-edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket.

2. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a high-walled cup-shaped recess concentric with the anchoring-socket and arranged both to intersect the outer end thereof and to provide an annular clearance-space between the shank of said tack and the high walls of said cup-shaped recess, the width of said clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; and an annular sharp square shoulder formed at the point of intersection of said cup-shaped recess with the outer end of said anchoring-socket constituting a cutting-edge with which the stem of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket, said cutting-shoulder being located in said hub at a distance from

the outer end of said hub such that the fabric drawn into said recess by said tack will be stretched between the outer end of said hub and said cutting-shoulder before being sheared by coaction of said tack-shank with said cutting-shoulder.

3. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a high-walled cup-shaped recess concentric with the anchoring-socket and arranged both to intersect the outer end thereof and to provide an annular clearance-space between the shank of said tack and the high walls of said cup-shaped recess, the width of said annular clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; an annular rounded rim at the outer end of said hub; and an annular sharp square shoulder formed at the point of intersection of said cup-shaped recess with the outer end of said anchoring-socket, said sharp square shoulder being located in said hub at a distance from its rounded rim that bears a predetermined relationship to the diameter of said socket and constituting a cutting edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket.

4. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a high-walled cup-shaped recess concentric with the anchoring-socket and being provided with a flat bottom substantially at right angles to the longitudinal axis of said socket, said cup-shaped recess being arranged both to intersect the outer end of said socket and to provide an annular clearance-space between the shank of said tack and the high walls of said cup-shaped recess, the width of said annular clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; an annular rounded rim at the outer end of said hub; and an annular sharp square shoulder formed at the point of intersection of the flat bottom of said cup-shaped recess with the outer end of said anchoring-socket, said sharp square shoulder being located in said hub at a distance from its rounded rim that bears a predetermined relationship to the diameter of said socket and constituting a cutting-edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket.

5. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a high-walled cup-shaped recess concentric with the anchoring-socket and arranged both to intersect the outer end thereof and to provide an annular clearance-space between the shank of said tack and the high walls of said cup-shaped recess, the width of said clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; and an annular sharp square shoulder formed at the point of intersection of said cup-shaped recess with the outer end of said anchoring-socket, said sharp square shoulder being located forwardly of the outer end of said cup-shaped recess a distance not less than one-half the diameter of said socket and constituting a cutting edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket.

6. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a high-walled cup-shaped recess concentric with the anchoring-socket and arranged both to intersect the outer end thereof and to provide an annular clearance-space between the shank of said tack and the high walls of said cup-shaped recess, the width of said clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; an annular sharp square shoulder formed at the point of intersection of said cup-shaped recess with the outer end of said anchoring-socket constituting a cutting edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket; and an annular rounded shoulder at the point of intersection of the outer end of said cup-shaped recess with the outer end of said hub over which said fabric is stretched as it is engaged and drawn down into said cup-shaped recess by the shank of said tack prior to shearing the threads thereof.

7. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a cup-shaped recess provided with high substantially-cylindrical walls concentric with the anchoring-socket and arranged to intersect the outer end thereof thereby to provide an annular reinforcing cuff rearwardly of the outer end of said socket, and an annular clearance-space between the shank of said tack and the inner walls of said cuff, the width of said annular clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-recess by said tack thereby to prevent pinching of said fabric; an annular sharp square shoulder formed at the point of intersection of said cup-shaped recess with the outer end of said anchoring-socket constituting a cutting edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket; and an

annular rounded shoulder at the outer end of said cuff over which said fabric is stretched as it is engaged and drawn down into said cup-shaped recess by the shank of said tack prior to shearing the threads thereof, said cutting-edge being located forwardly of the annular rounded shoulder of said cuff a distance not less than one-half the diameter of said socket.

8. In a molded plastic button having a head and a hub provided with an anchoring-socket extending axially thereof adapted to receive a fabric-holding tack the shank of which is of uniform and greater over-all diameter than the inside diameter of said socket so as to firmly grip the walls thereof and thereby fasten the plastic button firmly to a fabric of predetermined thickness, said hub having a cylindrical cup-shaped recess concentric with the anchoring-socket and provided with a flat bottom substantially at right angles to the longitudinal axis of said socket and an annular concave radius blending the outer edge of said flat bottom with the substantially-vertical side walls of said recess, said recess being arranged both to intersect the outer end of said socket and to provide an annular clearance-space between the shank of said tack and the walls of said cup-shaped recess, the width of said annular clearance-space being at least equal to the predetermined thickness of the fabric drawn into said clearance-space by said tack thereby to prevent pinching of said fabric; an annular rounded rim at the outer end of said cup-shaped recess; and an annular sharp square shoulder formed at the point of intersection of the flat bottom of said cup-shaped recess with the outer end of said anchoring-socket, said sharp square shoulder being located in said hub at a distance from the rounded rim of said recess a distance not less than one-half the diameter of said socket and constituting a cutting-edge with which the shank of said tack coacts to shear the threads of said fabric as said tack forces said fabric into said socket.

9. A molded plastic twenty-seven ligne button having an integral hub provided with an anchoring-socket adapted to receive the shank of a fastener whose diameter is slightly larger than the diameter of the anchoring-socket, the outer free end of said hub being provided with a central depression registering with said anchoring socket, the diameter of the depression being slightly larger than the diameter of the anchoring-socket and the depth of the depression being not less than twenty-nine thousandths inch (0.029") and not more than one hundred and fifty thousandths inch (0.150").

10. A molded plastic twenty-seven ligne button having an integral hub provided with a centrally-located anchoring-socket adapted to receive the shank of an oversized tack-fastener, the outer free end of the hub being provided with a depression extending substantially sixty thousandths inch (0.060") below the outer free end of the hub and simulating a counterbore, the walls of the hub above the lower surface of the counterbore being constructed to provide sufficient mass of material to prevent the splitting of the hub during the attaching operation.

FORREST G. PURINTON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
691,743	Capewell	Jan. 28, 1902
2,299,494	Purinton	Oct. 20, 1942