Oct. 1, 1935. J. M. CLARK ET AL 2,016,240

BUTTON MANUFACTURE

Filed Feb. 2, 1933

Fig. 6.

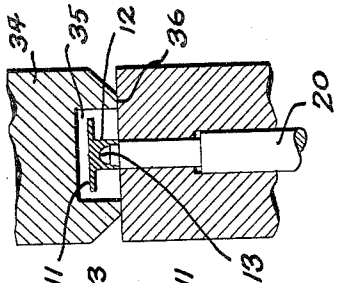


Fig. 5.

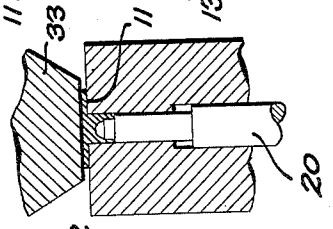


Fig. 4.

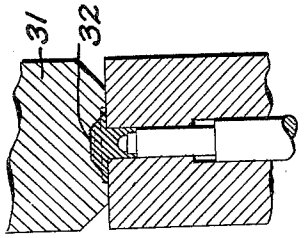


Fig. 3.

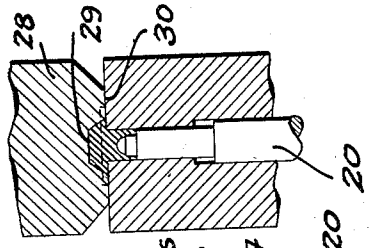


Fig. 2.

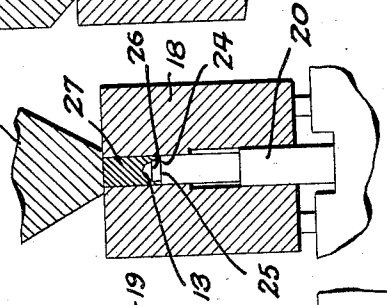


Fig. 1.

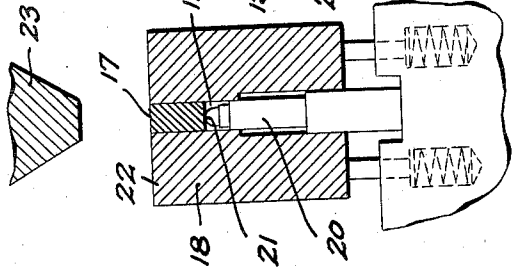


Fig. 12.

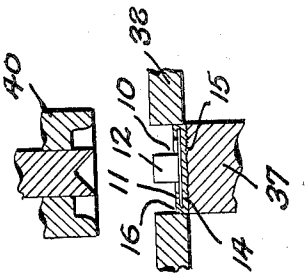


Fig. 11.

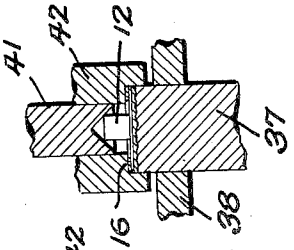


Fig. 10.

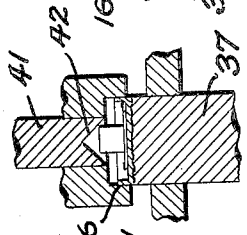


Fig. 9.

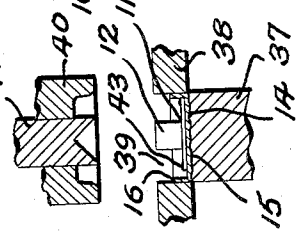


Fig. 7.

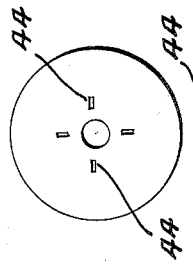
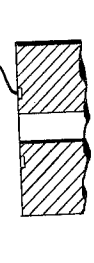


Fig. 8.



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Atty.

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2,016,240

UNITED STATES PATENT OFFICE

2,016,240

BUTTON MANUFACTURE

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Application February 2, 1933, Serial No. 654,902

9 Claims. (Cl. 79—3)

This invention relates to button manufacture, and among other objects aims to provide a cheap metal button of improved superficial accuracy.

The nature of the invention may be readily understood by reference to one illustrative method of manufacture embodying the invention and diagrammatically illustrated in the accompanying drawing.

In said drawing:

Fig. 1 is a diagrammatic sectional elevation of the button forming dies preceding the initial forming operation;

Fig. 2 is a similar view showing the dies upon completion of the initial forming operation;

Figs. 3, 4, and 5 show the relation of the dies upon the completion of successive button forming operations;

Fig. 6 shows the operation of ejecting the formed button from the dies;

Figs. 7 and 8 are plan and sectional views respectively of the die block showing the depressions in the face of the die block by means of which teeth may be formed on the under face of the button head;

Fig. 9 is a sectional elevation more or less diagrammatic in character showing the initial operation for applying a covering shell to the button and centering the button shank relative thereto;

Fig. 10 is a similar view showing the position of the dies just preceding the centering and shell crimping operation;

Fig. 11 is a similar view showing the button shank centered relative to the shell and the latter crimped around the edge of the button head; and

Fig. 12 is a similar view showing the dies separated upon completion of the operation and just prior to the ejection of the button from the dies.

The illustrative button comprises a solid body 10 consisting of a relatively thin head 11 and a round cylindrical shank 12 in the end of which is formed a die recess or cup 13 for bending or upsetting the fastener prongs by means of which the button is secured to a garment. The head of the button is here shown finished by a thin metal shell 14 preferably of rust-proofed or non-corrosive sheet metal appropriately embossed as at 15 on its face for purposes of decoration or otherwise. The shell is secured to the button head by margins 16 which are crimped to the edge of the button head by curling the same around said edge into gripping contact with the under face of the button head.

Metal buttons of this character are generally attached by automatic attaching machines which operate with great rapidity. The button may be attached with either single or double prong fasteners whose prongs penetrate the fabric and are upset or bent by the curved die cup. Uniformity and accuracy of external dimensions and proportions are important particularly when the button is attached by automatic machines. Inaccurate buttons cause much difficulty and delay since they are responsible for many interruptions of the high speed attaching machines. Since low attaching costs as well as low button costs are of prime importance (in the manufacture of overalls, workmen's clothing and children's play-suits), accuracy and uniformity of the buttons is just as essential as their cheapness. The illustrative button embodies both characteristics.

The button is inexpensively made by forming its body from a solid, soft steel rod or wire blank whose length is sufficient to provide an adequate volume of metal for the head and shank. The rod may advantageously be about one-quarter of an inch in diameter and have a carbon content of approximately .05 to .15 of 1%. The diameter of the wire blank is substantially the diameter of the shank of the finished button. The length of the blank is made appropriate to the desired diameter of the head 11 of the finished button. In other words, the diameter of the button head may be governed largely by the selected initial length of the button blank without materially altering the character of the forming operations or of the mechanical devices employed therein.

The button is advantageously formed by successive operations on the cylindrical blank 17 which flatten a portion of one end of the blank to provide the button head and form a curved recess in the other end of the blank to serve as the die cup 13. The operations upon the blank serve to compact the surface of the die cup and increase its hardness. When attached by single prong fasteners the mouth of the die cup is restricted so that after the fastener prong has been upset inside the die it cannot be withdrawn. For attachment by double prong fasteners, the die cup is advantageously provided with a transverse bar around which the fasteners are bent from opposite sides by the action of the curved surface of the die cup. With both forms of attachment the steel surface of the die cup is itself adequately hard to bend over or upset the heaviest fastener prong.

The bottom is here formed by confining the intermediate portion of the blank against lateral

expansion and striking the ends of the blank to form the die cup and flatten the head. The head forming operations are preferably designed to effect a gradual and uniform flattening or spreading of successive increments of the blank thereby minimizing the danger of splitting or cracking the edge of the head and securing a thinner and more nearly circular button head. The foregoing operations may advantageously be performed by holding the blank in a die block 18 having a central bore 19 only slightly larger than the diameter of the blank. The blank is supported upon a tool in the form of a die pin 20 whose upper end 21 is shaped to form the die cup 13 in the end of the blank. The die pin 20 is appropriately supported relative to the die block to position the blank properly relative to the die block or more particularly relative to the upper surface 22 of the die block during the forming operation.

As here shown the initial forming operation on the blank (see Figs. 1 and 2) consists in striking the blank with a die or header 23 which serves to force the lower end of the blank 17 over the end of the die pin to form the die cup. At the beginning of this operation the blank is preferably supported with its upper end substantially flush with the top surface 22 of the die block (see Fig. 1). Thus the blank is supported during this operation against any lateral expansion, except the slight expansion which would be permitted by the small clearance between the blank and the bore 19 in the die block. The bore is preferably only sufficiently larger than the diameter of the blank to allow the latter to be readily inserted therein. During the foregoing described operation the die block 18 is advantageously supported to yield or travel down with the header as the latter forces the blank down over the pin 20 (see Figs. 1 and 2). Thus substantially the entire energy of the header is devoted to the formation of the die cup when the die cup may be most easily formed and when conditions are otherwise most favorable for its formation, that is, before the metal at the lower end of the blank has been substantially hardened by subsequent heading operations which also substantially absorb the energy of the header. While the die cup is very substantially formed during this operation, it is not essential that it be entirely completed, since formation to exact dimensions may occur during subsequent operations. While it is not so important where the button is to be attached by single prong fasteners, that the die cup be formed to exact depth relative to the rim 24 or end of the button shank, the pin 20 is advantageously so formed (see Fig. 2) that the die cup may be formed to the aforesaid exact dimensions for buttons attached by double prong fasteners. In the latter case, the bar around which the fastener prongs are bent should preferably occupy a definite relationship to the bottom of the die cup. For that purpose the end of the pin 20 is shouldered at 25 to form a definite rim which is square relative to the axis of the button shank, and is also shouldered at 26 to provide a seat for the bar (if one be applied) which is located at a predetermined distance from the bottom of the die cup.

The partially formed blank 27 is then subjected to a further forming operation (see Fig. 3) wherein the blank is projected a portion of its length from its enclosing die block so as to subject the projecting portion to a head forming operation. The blank is caused to project from the die by elevating the die pin 20 relative to the die block, as appears in Fig. 3, the degree of elevation determining the volume of metal exposed to the head forming operation. As here shown the reciprocating header 28 is formed on its under face with a conical or tapered depression 29 of slightly greater volume than the exposed volume of the blank to be subjected to the head forming operation. The excess of volume of the depression 29 need not be great, merely enough to avoid formation of "flash." The particular conformation of the depression need not be truly conical but it should be tapering and of circular cross section,—for example it may be somewhat spherical in shape. The engagement of the header with the projecting portion of the blank gives the extremity of the head a tapered form. The foregoing head forming operation is completed as shown in Fig. 3 when the die block resists further downward movement of the header 28. The rim 30 of the header advantageously serves to engage the upper face of the die block to strip it down from the blank in the event the block has been elevated (through the sticking of the blank in the die) when the die pin 20 is elevated as aforesaid. In the latter event the rim 30 of the header first strikes the face of the die block forcing it down against its support, and in thus stripping the die block down, brings the blank into engagement with the conical depression 29 to commence the forming of the head.

Successive head forming operations are performed wherein the blank is successively projected farther and farther out of the die block until the entire volume of metal to be formed into the button head, is exposed. In the present instance, three successive head forming operations are performed. The second is illustrated in Fig. 4 wherein the blank is projected farther from the die block by elevating the die pin as aforesaid. The header 31 is generally similar to the header 28 except that the depression 32 which engages the blank is shallower, thus effecting a greater flattening of the head (see Fig. 4). The bottom of the depression is tapered or conical in form and preferably has the same contour as the bottom of the depression 29 in header 28 and consequently is shaped to fit the end of the blank and center it exactly axially relative to the dies. As many similar, successive head forming operations are performed as is necessary to secure the gradual flattening of the button head into a circular shape concentric with the axis of the shank, without splitting or cracking.

The final head forming operation, here illustrated in Fig. 5, is performed by header 33 having a flat face which completely flattens the button head. In this operation the die pin 20 is given its final elevation relative to the die block, thus determining the length of the button shank as well as the diameter of the button head.

It will be noted that in the illustrative head forming process, the button head is not marginally restrained. Thus it is not necessary to provide for "flash" as is the case where an effort is made to mold or shape the button head by dies which completely surround it. This is particularly advantageous here where the button head is formed cold from steel, which does not readily flow. To produce a more nearly round and uniform button head and to make the same thinner to reduce the weight of the button, the blank, as explained above, is intially given a conformation which makes it self-centering in the die so that the blow of the heading die will be delivered

absolutely centrally or axially of the blank and the blank will therefore tend to flatten uniformly with a round contour. The result is that the button heads are not only more truly round but are more uniform in diameter; and the clearance between the button head and shell margin (to allow for variations in button diameter) may therefore be made relatively less. Where no shell is affixed the button head will be more truly round than otherwise, and will therefore have a better appearance. The centering of the blank as aforesaid, securing as it does a more uniform distribution of metal relative to the axis of the button, permits the formation of a relatively thinner button head (about .02 of an inch in thickness) without substantial distortion of the button head into an "out of round" shape, and therefore enables the manufacture of a light weight button though of solid steel.

If the blank be not centered as aforesaid, a greater amount of metal may be pressed out on one side of the center than on the other, and the head will to that extent be "out of round". The centering of the blank is relatively more important during the initial head forming operations than after the head has been more completely flattened. In the latter case, lack of absolute centering could not result in any substantial shifting of the metal to produce an "out of round" conformation of the button head.

Variation in head diameters is obtained by varying the length of the blank or the length exposed to the headers. For a larger diameter head than that here shown, it would of course be necessary to employ headers with larger concave recesses to avoid the formation of "flash".

The finished button may be readily ejected from the die block by further elevating the die pin **20** and consequently the die block (since the button shank has been expanded sufficiently to stick in the bore **19** of the die block), and pressing down the die block while supporting only the die pin **20**. This may be readily effected by a reciprocating tool **34** having an enlarged recess **35** in its face to receive the button when the projections **36** on the header have depressed the die block sufficiently to strip it from the button shank.

Because of slight variations in the button head, which generally result from variations in the characteristics of the steel from which the blanks are formed, a slight clearance is allowed between the margin of the button head and the margin **19** of the shell. In practice the shell is of a standard diameter, (31 line, 27 line, etc.) and the button head is made sufficiently smaller to insure that within the variation in head formation, none will be too large to prevent the button shank to be located centrally of the shell. Upon applying the shell, the button shanks are preferably centered relative to the shell, so that in the completed button the shank will be exactly concentric to the shell regardless of variations in button head. This centering is particularly advantageous in buttons where the head is either off-center or is sufficiently smaller than the interior diameter of the shell to make possible an off-center attachment of the shell.

As here shown (see Figs. 9 to 12), the button after being placed in a shell **14** is centered by concentric dies which engage the shell and button shank respectively. In the present instance the shell rests upon a vertically reciprocating die **37** operating through a plate or table **38**, the opening **39** in which serves to center the shell exactly in the die. Thereupon the shell is engaged by a closing die **40** with which moves a shank centering tool **41** located exactly concentric or coaxial with the die **37** and the centered shell thereon. In the present instance the shell closing operation is effected by moving dies **37** and **40** together (see Fig. 10). Before the margins **16** of the shell are crimped upon the back of the button, the shank of the button is engaged by the centering tool **41** (as shown in Figs. 9 and 10 wherein the amount of clearance and eccentricity is somewhat exaggerated for purposes of illustration), and the tapered depression **42** therein engages the button shank and shifts the latter over to a position exactly concentric with the shell (see Fig. 11). Thereupon the closing tool **40** firmly crimps the margins **16** of the shell against the back of the button. The centering tool **41** is advantageously resiliently carried relative to closing tool **40** to permit the latter to advance to complete the closing operation after forward movement of the centering tool has been arrested by engagement with the button shank. After the completion of the closing operation the dies are separated to permit the removal of the button (see Fig. 12).

To insure that the shell will be tightly fixed on the button head against any relative rotation thereon (which may be objectionable in some instances) the under face of the button head may be provided with small teeth or projections **43** (four in number in the present case), located adjacent the rim of the head where they will engage the crimped over margins of the shell. The teeth may be relatively small since only a slight irregularity on the back of the button head will be sufficient to prevent any rotation of the shell. The teeth may be advantageously formed in the button head by forming corresponding depressions **44** in the face of the die block (see Figs. 7 and 8) in which the metal on the back of the head will be pressed when the button head has been flattened to a diameter which carries the metal into the region of the depressions **44**. This generally occurs upon the final flattening operation (see Fig. 5).

Where the button is not intended to be covered with a shell, but is simply finished by appropriate plating or coating, it is obviously unnecessary to form teeth on the under face of the button head.

This application is a continuation in part of Patent No. 1,920,497 dated August 1, 1933.

Obviously the invention is not limited to the details of the illustrative embodiment of the invention herein shown and described, since these may be variously modified. Moreover it is not indispensable that all features of the invention be used conjointly since various features may be used to advantage in different combinations and subcombinations.

Having described the invention, what is claimed is:

1. The method of making solid metal buttons from a rod-like blank which is characterized by successively striking the blank on the end which is to form the button head while confining against lateral expansion that portion of the blank which is to form the button shank and initially giving the said end a tapered shape, striking the tapered end with a die having a correspondingly tapered depression therein to center the blank thereby to cause the metal to spread substantially uniformly whereby the button head may be made thin without substantially distorting it, applying a shell to the button head, centering the button shank

concentric with the shell, and then crimping the shell over the button head.

2. The method of making a thin head button which is characterized by striking the ends of a rod-like soft steel blank while confining the intermediate portion of the blank against lateral spread to taper the end of the blank which is to form the button head, then exposing a greater portion of said tapered end and striking the latter with a die having a correspondingly tapered recess therein to spread the metal laterally to form a button head, said tapered end serving to center the blank in the recess in the die to produce a symmetrical flattening of the head, and then crimping a shell over the head of the button while centering its shank concentric to the shell.

3. A button making mechanism of the character described comprising in combination a button shank centering device, a shell holder concentric with said shank centering device, means for placing a button in operative relation to said centering device, means for actuating said centering device to engage the button shank and center it relative to a shell, and cooperating dies engaging said shell and the shell margins to crimp the shell margin over the button head edge concentric with the button shank, whereby the edge of the finished button head is concentric with the button shank.

4. The method of making a solid button having a thin head which is characterized by successively striking the ends of a rod-like cold steel blank of substantially the diameter of the shank of the button while confining the intermediate portion of the blank against lateral spread, forming a tapering portion on the head end of the blank and successively exposing greater lengths of the head end of the blank and successively flattening the same concentrically with dies having the central portion thereof formed with concavities to fit the tapered end of the blank thereby successively centering the tapered end of the blank relatively to the shank to cause the head to flatten concentrically, then striking the head end of the blank to form a substantially flat head, said centering and flattening operations being continued until the final thickness of the head is about two hundredths of an inch.

5. The method of making a solid button having a thin head which is characterized by successively striking the ends of a rod-like cold steel blank of substantially the diameter of the shank of the button while confining the intermediate portion of the blank against lateral spread, simultaneously forming a die cavity in one end of the blank and a tapering portion on the head end of the blank and successively exposing greater lengths of the head end of the blank and successively flattening the same concentrically with dies having the central portion thereof formed with concavities to fit the tapered end of the blank thereby successively centering the tapered end of the blank relatively to the die to cause the head to flatten concentrically, then striking the head end of the blank to form a substantially flat head, said centering and flattening operations being continued until the final thickness of the head is about two hundredths of an inch and its diameter is over twice the diameter of the original blank.

6. The method of making a solid button having a thin head which is characterized by successively striking the ends of a rod-like cold steel blank of substantially the diameter of the shank of the button while confining the intermediate portion of the blank against lateral spread, simultaneously forming a die cavity in one end of the blank and a tapering portion on the head end of the blank and successively exposing greater lengths of the head end of the blank and successively flattening the same concentrically with dies having the central portion thereof formed with concavities to fit the tapered end of the blank thereby successively centering the tapered end of the blank relatively to the die to cause the head to flatten concentrically, then striking the head end of the blank to form a substantially flat head.

7. Apparatus of the character described comprising in combination, a button shank centering device including a holder for engaging the button shank independently of the button head, a shell holder having means for holding a shell which is internally sufficiently larger than the button head to accommodate eccentricities in the button head, dies associated with said shank centering device and shell holder for turning over the rim of the shell into gripping engagement with the back of the button head, and means for moving said dies together to crimp the shell whereby said shell is held centered over the button head independently of the rim of the head.

8. Apparatus of the character described comprising in combination a die block having a central bore for receiving a blank, a die pin operating in said bore to carry the blank, means for supporting said pin to control the length of blank projecting from the die block, a pair of dies adapted to act successively on exposed portions of the blank and each having a tapering concavity therein adapted to be positioned concentric with said bore, the central portions of said concavities being the same, the first die being adapted to taper the end of blank whereby the same will center itself in the tapered concavity in the second die.

9. The method of making solid metal buttons having a shank and a head covered with a shell which is characterized by applying to the button head a shell which is internally sufficiently larger than the head of the button to accommodate normal eccentricities of the button head, locating the shell in a predetermined position, engaging the shank of the button and centering said shank relative to said predetermined position and to said shell in such predetermined position, said centering being effected independently of the button head, and then crimping the margin of the shell over the rim of the button head.

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