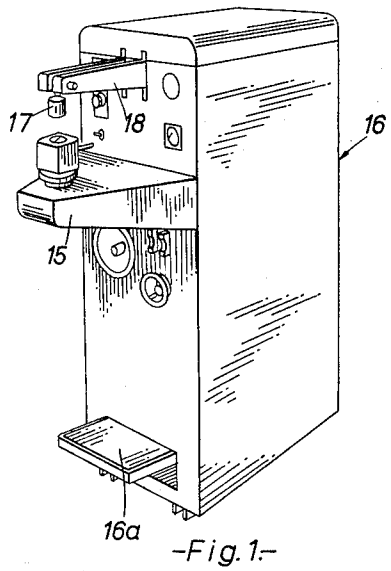
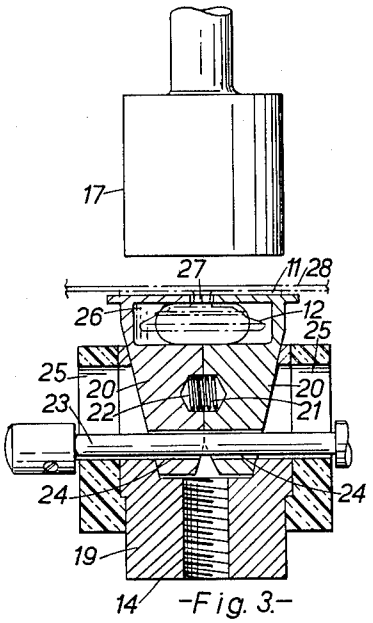
March 27, 1962 H. WHITE ETAL 3,027,293

BONDING OF ELEMENTS, SUCH AS BUTTONS, TO A FABRIC

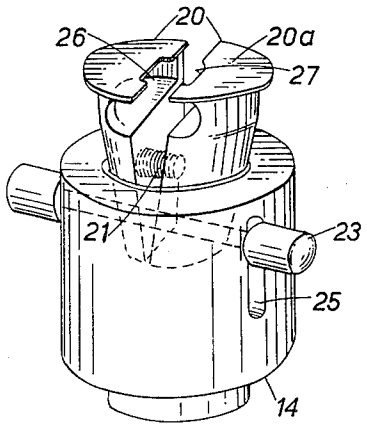
Filed March 14, 1958 2 Sheets-Sheet 1



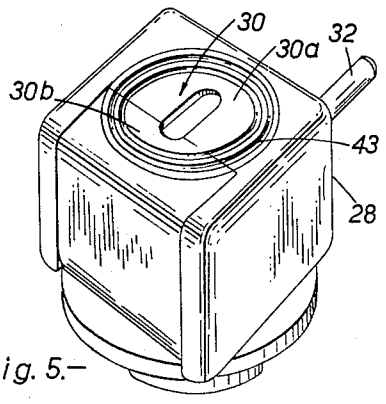
-Fig. 1.-



-Fig. 3.-



-Fig. 2.-



-Fig. 5.-

INVENTORS

Harold White + George Gee

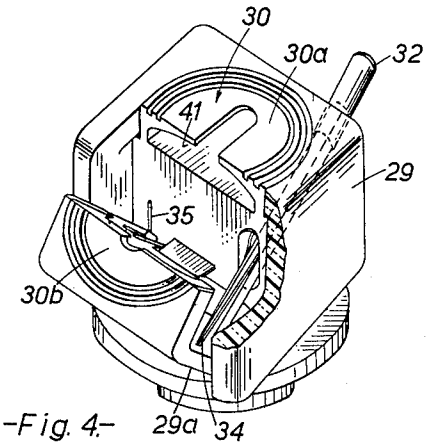
BY

ATTORNEY

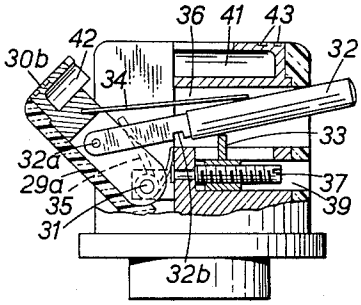
March 27, 1962 H. WHITE ETAL 3,027,293

BONDING OF ELEMENTS, SUCH AS BUTTONS, TO A FABRIC

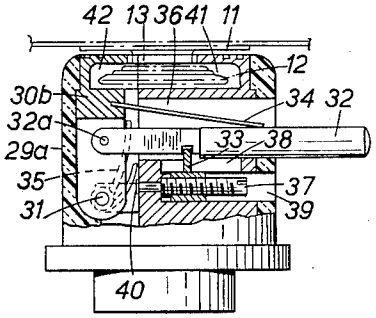
Filed March 14, 1958 2 Sheets-Sheet 2



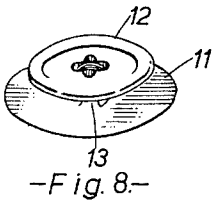
-Fig. 4.-



-Fig. 6.-



-Fig. 7.-



-Fig. 8.-

INVENTORS
Harold White + George Gee
BY
ATTORNEY

United States Patent Office 3,027,293
Patented Mar. 27, 1962

3,027,293

BONDING OF ELEMENTS, SUCH AS BUTTONS, TO A FABRIC

Harold White and George Gee, Hyde, England, assignors to James North & Sons Limited, Hyde, England, a British company

Filed Mar. 14, 1958, Ser. No. 721,561
9 Claims. (Cl. 156—583)

This invention concerns the bonding of elements, such as buttons, to a fabric.

Many flexible articles, especially articles of clothing, are now made from synthetic resins, instead, as hitherto, of rubber or the like, although the latter materials have not, of course, been entirely superseded. When making such articles it is frequently necessary to cause a smaller element, separately manufactured, to be attached thereto. As an example may be quoted the case of buttons. With such elements, two requirements must be met. Firstly, the attachment must be secure, and secondly, the operative part of such element must be as independently disposed as possible. Again, taking the case of a button, in the case of a textile fabric, the button is normally sewn in place with a strong thread, the nature of the fabric making this a fairly efficient method and allowing the two requirements aforesaid to be met. The thread however wears and is susceptible to attack by certain chemicals. Also if the fabric is then it may be necessary to provide reinforcement. In the case of thin rubber or synthetic resin fabrics, it is found that such a method of attachment is even less efficient, it taking less force to tear the yarn from its fabric anchorage. It has been usual, therefore, when dealing with these materials (especially when the fabric is made from polyvinyl chloride or from a thin textile fabric impregnated and/or coated with polyvinyl chloride) to make the button from the same basic material or a material which can be bonded by the application of heat and pressure to the basic material and to heat-bond it in place. For this purpose the button has been made with a parallel thin laminar portion attached thereto by a neck. Such a construction leads to difficulties because the button is attached to the fabric by placing one face of the laminar portion against the fabric, support being provided for the other face of the laminar portion, whilst the necessary heat and pressure is applied. Hitherto it has been usual to make the laminar portion of larger diameter than the button and to provide a die with a recess of diameter just clearance on the diameter of the button, and to sit the button upside down therein, supported by the annular edge of the laminar portion. The fabric is then brought into contact with the outer face of the laminar portion and a plain pressure-applying member brought down into contact, heat being provided, usually by high-frequency power. In the result the bonded area is a narrow annulus only. The operation may be performed in reverse, that is by supporting the fabric and pressing the button thereon, but the result is the same. Whilst this is a better method than sewing (and can in fact be used for ordinary fabrics by causing the button material to flow into the fabric) the flexing of the button in use tends to break down the edge of the weld or bond which weakens the connection and often results in the end in complete failure.

Such breaking down tends to occur more easily when the garment is subjected to extremes of climatic conditions. Furthermore, it is necessary to keep a careful check on the bonding carried out in the manner just described, since small inaccuracies in the operation can lead to weak area in the bonded region, and, because this is of small radial extent, serious weakening of the attachment is caused.

The object of the invention is to provide an improved method and means whereby an element, such as a button, comprising a laminar attachment portion and an operative portion spaced therefrom and attached thereto by a smaller neck (hereinafter referred to as "an element of the type described") may be secured to a fabric by a heat-bonding (hereinafter referred to as "welding") operation.

According to the present invention a method of welding an element of the type described to a fabric, consists of bringing the laminar attachment member into face contact with the fabric and applying the necessary pressure and heat for the welding operation, the pressure being applied over all or substantially all the area of the laminar portion not connected to the operative portion by the neck. Pressure may also be applied over that part of the area so connected as well.

Also according to the invention means whereby an element of the type described may be welded to a fabric includes a member having a support part adapted to engage all or substantially all the area of the back face of the laminar portion not connected to the operative portion by the neck, whereby the fabric may be brought into contact, under substantial pressure, with the corresponding area fo the front face of the laminar portion. In use, there will be provided means for causing another member to move so as to apply the necessary pressure to the fabric and laminar portion over said area, and means for generating the necessary heat for the welding operation. The support part for the laminar portion may also engage the operative portion in line with the neck.

The invention will now be described further, by way of example, with reference to a method and means for welding polyvinyl chloride buttons onto a polyvinyl chloride fabric.

In the accompanying drawings,

FIG. 1 is a perspective view of a typical machine on which bonding operations of the type with which this invention is concerned may be carried out;

FIG. 2 is a perspective view of apparatus ready to receive a button for welding in accordance with the invention, to a fabric;

FIG. 3 is a sectional elevation of the apparatus of FIG. 2 with the button supported for the welding operation, a pressure member being also shown;

FIGS. 4 and 5 are perspective views of an alternative embodiment of the invention respectively in the open and in the closed position;

FIGS. 6 and 7 are, respectively sectional elevations corresponding to FIGS. 4 and 5, the button and fabric being shown in FIG. 7,

FIG. 8 is a perspective view of a button which may be welded to a fabric with the apparatus illustrated in the preceding figures.

The fabric may be wholly of plasticized polyvinyl chloride material which has been subsequently cured, or of a thin textile fabric coated or impregnated with such material. Each button (FIG. 8) has a parallel thin laminar attachment portion **11** one and one-eighth inches in diameter, an operative portion or button proper **12** of fifteen-sixteenths inches in diameter, and, connecting these coaxially together, a central neck **13**, three thirty-seconds of an inch long, with cross-sectional dimensions seven-sixteenths of an inch by three-sixteenths of an inch. Buttonholes and thread are simulated on the top surface of the button proper **12**.

The longitudinal direction of the neck is indicated on the outward face of the laminar portion **11** by a very small fin produced in the moulding process.

For carrying out the welding operation a die is provided having a lower part **14** adapted to be supported by the platen **15** of a press **16** equipped with high frequency

heating means and an upper part 17 adapted to be attached to the head 18 of the press.

The lower part consists of a bush 19 in which is located, in the taper bore thereof, a split frusto-conical receiver 20. The two halves of the receiver 20 are normally urged apart by a helical compression spring 21 the ends of which are disposed in recesses 22 in their inner walls. A lifter 23 passes through aligned clearance holes 24 in the halves of the receiver 20 and oppositely disposed vertical slots 25 in the wall of the bush 19 to extend out of the latter at each side. The position of the lifter 23 in the receiver 20 and the length of the slots 25 in the bush 19 are such that the receiver 20 may be moved to an upper release position in which the halves are separated (FIG. 2) by the spring 21, and to a lower closed position in which the halves are brought together by the interaction of their jointly frusto-conical outer surfaces, and the taper inside face of the bush (FIG. 3).

The upper, larger-diameter end 20*a* of the receiver 20 formed by the two halves when together is flat, but below this flat surface is machined away symmetrically about the split to form a space 26 adequate to accommodate the button proper 12 and to allow it to be introduced therein when the receiver 20 is in the release position. The separation of the halves of the receiver 20 when in this position is also arranged to be adequate to allow the neck 13 to pass therebetween and the halves are also machined in such a way that a slot 27 is formed in the closed position just adequate to accommodate the neck 13. Thus, the inner face of the laminar portion 11 is supported by the flat upper surface 20*a* of the receiver 20.

In use the die is positioned in the press 16, and by means of the lifter 23 the receiver 20 is raised to the release position (FIG. 2) and the button inserted as described. By means of the lifter 23 the receiver 20 is then brought to the closed position (FIG. 3) and the fabric 28 placed over the upwardly directed outer face of the laminar portion 11. The press 16 is then operated to give the necessary pressure and heat. The weld is found to extend over substantially all the area of the laminar portion 11, except that part which is in line with the neck 13. By increasing the heating period and suitably controlling its effect the weld may be caused to extend over the whole of the laminar portion 11. The same result may alternatively be achieved by providing support means beneath that part of the button in line with the neck.

The invention is, of course, not limited to the precise details of the die just described. For example, in one alternative construction the bush is dispensed with and the receiver may be in two or more parts which are hinged or connected together for separation, the extent of which is sufficient to enable the button to be introduced into position from the side or directly in position.

A die of hinged construction is illustrated in FIGS. 4, 5, 6 and 7.

Again a lower part 28 is provided which is adapted to be supported by the platen 15 of the press 16. The upper part is identical to the upper part 17 already described.

The lower part is generally cubical in shape, except for the bottom portion which is cylindrical to fit the platen 15. The cubical portion consists basically of a casing 29 of a durable material such as a suitable synthetic resin which accommodates a split cylindrical brass receiver 30, centrally disposed.

The receiver 30 is split along a chord which lies parallel to one side of the casing 29 and divides the diametrical line which bisects it in the ratio of 3:1. The larger part of the receiver 30*a* is rigidly secured in the casing 29 by means of screws (not shown) whilst the smaller part 30*b* is likewise held rigidly to the adjacent wall 29*a* of the casing 29. This wall 29*a* and the smaller part of the receiver 30*b* are pivotally secured to the larger part of the receiver 30*a* and the casing 29 by means of the hinge connexion 31.

The piovtal movement of the one part relative to the other is controlled by a handle 32 and adjustable detent 33, and two springs 34, 35.

The spring 35 has a helical part accommodated in a recess in the small part 30*b* of the receiver 30 and wound around the pin of the hinge 31. Its two ends abut the respective faces of the two parts of the receiver 30 (all but the upper portion of the smaller part 30*b* of the receiver 30 is cut back slightly to accommodate the spring 35 and allow for adjustment) and the nature of the spring 35 is such that it urges the smaller part 30*b* of the receiver 30 away from the other part thereof.

One end of the handle 32 is pivotally connected by a pin 32*a* within the smaller part 30*b* of the receiver 30 and extends through a slot 36 in the larger part 30*a*. The slot 36 is of such depth that the handle on continued opening movement of the two parts of the receiver 30 will eventually lie diagonally thereacross and limit the opening movement (see FIG. 6).

The underside of the handle 32 has a notch 32*b* therein and this notch, on continued closing movement of the two parts of the receiver 30, is adapted to be engaged by the detent 33, the leaf spring 34 extending from the inner wall of the part 30*b* of the receiver 30 and abutting the top surface of the handle 32 to ensure that the detent 33 will engage the notch 32*b* automatically. The detent itself is in the form of a nut from which extends a notch engaging formation. The nut is carried on a screw 37 within a hole 39 parallel to and immediately beneath the slot 36 for the handle 32. A connecting slot 38 between the two allows the position of the notch-engaging formation within the handle slot 36 to be varied by turning the screw 37 which is itself held immovable longitudinally of the hole, whilst able to rotate, by a plug 40 (or riveted end).

The larger portion 30*a* of the receiver 30 is machined away to form a slot 41 of inverted T-shape, and the smaller portion has a recess 42, so that when the two parts are closed together a button may be supported for welding. The button proper 12 will be within the space defined by the lower part of the slot 41, and the recess 42, whilst the neck 13 will extend through the upper part of the slot 41. Clearly, it is a simple matter to position the button ready for closure of the receiver 30, when the latter is open (FIGS. 4 and 6).

The upper surface of the receiver has two annular grooves 43 machined therein near the periphery thereof so positioned that corresponding ridges are formed in the welded button. This improves the finish (particularly by accommodating button material which would otherwise flow out to form a ragged edge during the welding operation) effect and strength of the join.

In use the die parts are positioned in the press 16, and by lifting the handle 32 against the spring 34, the detent 33 becomes disengaged from the notch 32*b* and the smaller part 30*b* of the receiver 30 flies open under the influence of spring 35. The button is then inserted as previously indicated. It is then possible, merely by finger pressure to close the receiver 30, and it will stay closed because detent 33 will re-engage the notch 32*b*. Adjustment is provided for the detent 33 because it is important that the two parts of the receiver 30 should close accurately to avoid unsightly finning on the button, and such closing will be affected by wear and render adjustment necessary. Such adjustment is achieved merely by turning the screw supporting the detent 33 with a screw driver.

It is possible, especially with hinged constructions to avoid the necessity for direct manual operation of the receiver by arranging for the necessary movement to be under control of a handle or pedal 16*a* for operating the press. In such a case the hands would be left free to insert the button and apply the fabric whilst operation of

the handle or pedal would effect, by means of a suitable linkage, successively, on release, opening of the press and of the receiver, and successively, on operation, closing of the receiver, closing of the press, and energisation of the heating means under a time-controlled cycle. A time-lag between successive operations would be necessary (for example between closing of the receiver and closing of the press), to enable the fabric to be positioned.

In another modification the receiver need not necessarily be in more than one piece. It could be in one piece, in this case provision being made for introduction of the button proper and the neck from the side, and a retaining member being used for locating the button firmly in position for the welding operation.

As previously indicated it is not essential for the element and fabric to be of similar material. A button, for example, may be of thermoplastic material whilst the fabric may be a woven textile fabric. In the welding operation the button material may be caused to fuse and run into the interstices of the fabric, or a small additional piece of thermoplastic material may be provided to assist in the formation of the join.

We have found that buttons welded by the method and with the apparatus described hereinbefore are not subject to the disadvantages referred to. In many cases twice the force was needed to pull the button away from the fabric than when welded by the known method referred to, and the effect of temperature extremes was reduced considerably. In cases where the base fabric was suitable for sewing (e.g. consisting of an impregnated and/or coated textile fabric) the force needed was in many cases three times that needed to pull away a conventional button sewn on in known manner.

What we claim is:

1. Apparatus for fusing buttons to fusible fabrics comprising a base, a two-part receiver mounted on said base, the parts of said receiver being relatively movable into and out of contact with each other, the upper end of said receiver parts having flat faces, cooperating recesses at the contact area of said parts on said faces defining a slot for accommodating the neck of said button, spaces below said faces for clamping said button when said parts are in contact, a press for applying heat and pressure to said flat faces, said press having a movable and a fixed platen, said base fixed in one of said platens, the other platen having a flat face adapted to contact said flat faces.

2. Apparatus for fusing buttons to fusible fabrics comprising a base, a two-part receiver mounted on said base, the parts of said receiver being relatively movable into and out of contact, the upper end of said receiver parts having flat faces, cooperating recesses at the contact area of said parts on said faces defining a slot for accommodating the neck of a button, spaces below said faces for clamping said button when said parts are in contact, and means for applying heat and pressure to said flat faces, and further characterized in that one of said parts is fixed in said base and the other is pivoted in said base.

3. Apparatus according to claim 1 wherein a spring is interposed between said parts to bias said parts apart.

4. Apparatus according to claim 1 characterized in that said receiver is frusto-conical and is mounted in said base in contact with a conical recess therein, and means for shifting said receiver in said base for separating or closing said parts.

5. Apparatus according to claim 1 characterized in that said receiver is frusto-conical and is mounted in said base in contact with a conical recess therein, a spring between said parts for biasing said parts from each other, and means for shifting said receiver in said base for separating or closing said parts.

6. Apparatus according to claim 1 characterized in that said receiver is frusto-conical and is mounted in said base in contact with a conical recess therein, and means for shifting said receiver in said base for separating or closing said parts comprising a lifter passing through said parts and through slots in said base.

7. Means as claimed in claim 1 in which said receiver is of frusto-conical form, and is split diametrally, and further including resilient means urging the two halves of the receiver apart, a bush having a complementarily tapered bore in which said receiver is carried, and means whereby the receiver may be moved outwardly of the bush so that the halves thereof automatically separate under the influence of the resilient means whereupon the element may be introduced and then inwardly of the bush so that the halves are brought firmly together to support the element ready for the welding operation.

8. Means for fusing buttons to fusible fabrics comprising a base, a two-part receiver mounted on said base, the parts of said receiver being relatively movable into and out of contact, the upper end of said receiver parts having flat faces, cooperating recesses at the contact area of said parts on said faces defining a slot for accommodating the neck of a button, spaces below said faces for clamping said button when said parts are in contact, and means for applying heat and pressure to said flat faces, and further comprising resilient means urging the two parts of the receiver apart, detent means adapted automatically to engage on closure of the two parts, and quick release means for said detent means.

9. Means as claimed in claim 8 in which said detent means and quick release means comprise a handle, pivotally attached to the hinged part of the receiver and passing through a slot in the other part of the receiver, an adjustable detent disposed in the body of the other part of the receiver so as to protrude into said slot, a notch in said handle with which said detent can engage to hold the receiver parts in the closed position, and a spring adapted to urge the handle towards said detent, whereby on closure of the receiver parts the detent automatically engages to hold said receiver parts in the closed position and so that by finger pressure the handle may be released whereupon the parts may fly apart under the influence of the resilient means to facilitate loading of the element.

References Cited in the file of this patent

UNITED STATES PATENTS

289,502	Buell	Dec. 4, 1883
781,277	Fahey	Jan. 31, 1905
866,788	Holstein	Sept. 24, 1907
2,393,140	Bugg	Jan. 15, 1946
2,470,963	Weyl	May 24, 1949
2,654,135	Grizzard et al.	Oct. 6, 1953
2,695,651	Farkas et al.	Nov. 30, 1954
2,723,477	Markus	Nov. 15, 1955
2,811,365	Larson	Oct. 29, 1957
2,824,595	Lehre	Feb. 25, 1958