May 12, 1964 M. A. FRENKEL ETAL 3,132,348

HAND COVERINGS

Filed Dec. 19, 1960

FIG. 1.

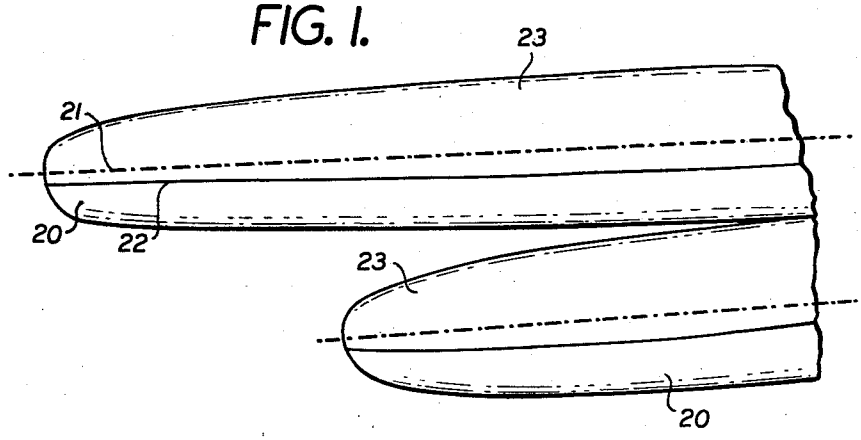


FIG. 2.

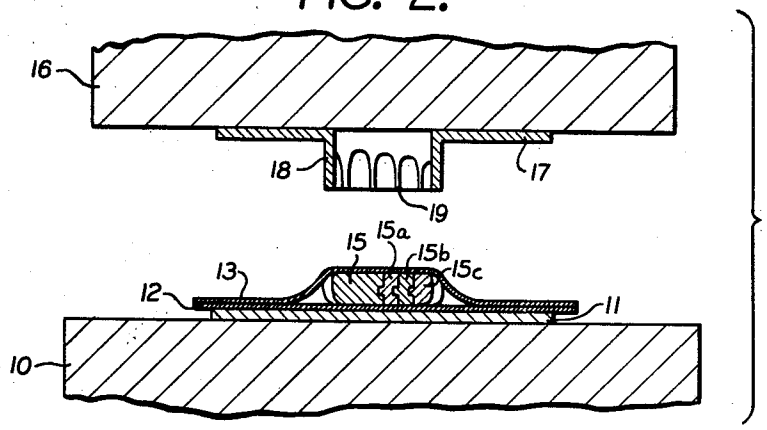


FIG. 3.

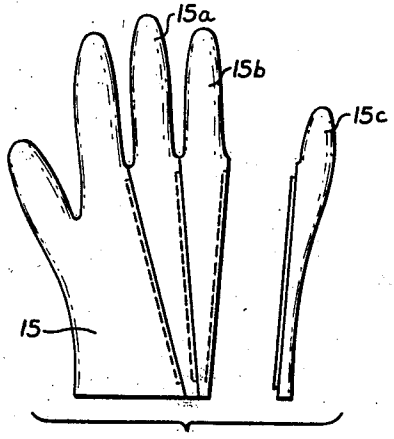
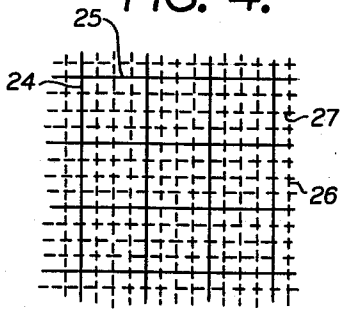


FIG. 4.



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United States Patent Office 3,132,348 Patented May 12, 1964

3,132,348

HAND COVERINGS

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Filed Dec. 19, 1960, Ser. No. 76,575
1 Claim. (Cl. 2—167)

This invention relates to an improved three-dimensional hand covering. More particularly, it relates to hand coverings, made from thermoplastic coated fabric or fabric comprised of a mixture of thermoplastic and non-thermoplastic yarns having dielectrically sealed seams between the palm and back portions thereof, and to the method of making these hand coverings. Also, it relates to hand coverings wherein either the palm portion or back portion is one of these thermoplastic-containing flexible materials and the other portion is ordinary hand covering fabric dielectrically sealed thereto. Our invention relates to various kinds of hand coverings including gloves, mittens, finger guards, etc.

It is the object of this invention to provide a three-dimensional hand covering having tight and strong seams.

A further object of our invention is to provide a three-dimensional hand covering having its back and palm portions dielectrically sealed in an area transversely displaced from the central plane between said portions in order to have the seams located in the finger or thumb crotches away from the point of stress.

Another object is to provide a method of making three-dimensional hand coverings which affords considerable savings in time and manufacturing costs.

These and other objects are accomplished by placing a substantially non-conductive form, the upper surface of said form having the spatial contour of a human hand, on a portion of flexible thermoplastic-containing material, stretching a second portion of said material over the form so that the form is disposed between said portions in a manner which allows the portions to make intimate contact with each other in the area adjacent to and extending outwardly from the vertical edge of the form, sealing the portions together along the vertical edge of the form by dielectric heating means, withdrawing the form, trimming off the excess material, and turning the inner surfaces outwardly to produce the three-dimensional fluid impervious hand covering.

For a better understanding of the nature of this invention, reference should be had to the following description when read in conjunction with the accompanying drawing, wherein:

FIG. 1 is a fragmentary side view of a thumb and finger slot portion of the hand covering.

FIG. 2 is a fragmentary cross-sectional view of the press and heat sealing apparatus with the hand covering assembly positioned therein.

FIG. 3 is a plan view of a non-conductive sectionalized form having the spatial contour of a human hand.

FIG. 4 is a fragmentary plan view on a larger scale of a woven fabric comprised of repetitive, spaced thermoplastic weft and warp strands.

In the particular embodiment of the invention illustrated in FIG. 2, a palm portion **12** and a back portion **13** of flexible material, which material may be thermoplastic coated fabric or fabric having thermoplastic yarn

repetitively spaced therein in both directions, or combinations of these materials or where the palm portion **12** is one of these thermoplastic-containing materials and the back portion **13** is ordinary hand covering fabric, are placed on a plate electrode **11** affixed to the lower platen member **10** of a press. A non-conductive form **15**, the marginal edge and upper surface of said form having the spacial contour of a human hand or part of such hand, which may be sectionalized as represented by reference numerals **15**, **15***a*, **15***b* and **15***c* as shown in FIGS. 2 and 3, may be inserted between the positioned palm portion **12** and back portion **13**. An upper and high frequency electrode **17** extends downwardly as a die ruling **18** from an upper platen **16** of the press.

The downwardly extended portion **18** of the upper electrode **17** has the shape of a human hand, i.e. it may have a thumb and individual finger slots if the finished hand covering is to be a glove, or a thumb slot and a slot for the four fingers if the hand covering is to be a mitten, or it may be solely a thumb or finger slot if the hand covering is to be a finger cot. The electrode **17** and its downwardly extended portion **18** may have finger slots **19**. Both the upper electrode **17**, **18** and **19** and the lower plate electrode may be made from a number of metals, preferably those metals having reasonably high conductivity, such as brass, bronze, etc., in order to reduce resistance losses. The upper and lower electrodes may be used in any of the various power-operated press welding equipment wherein said bottom electrode is fixed to a lower platen member **10** of the press as shown in FIG. 2 and the upper electrode **17** having a downwardly extended portion **18**, which portion is a metallic die ruling which is shaped in accordance with the contour of the hand covering to be welded, is moved vertically downwardly by pneumatic, hydraulic or mechanical means. Power is supplied to the electrodes by an R.F. generator capable of generating frequencies ranging from 10 mc./sec. to about 100 mc./sec. Frequencies of 18–20 mc./sec. have been found satisfactory for making most of the hand coverings, including those made from thermoplastic coated fabrics.

The extended portion **18** or die ruling of the upper electrode may be of sufficient depth to accommodate the non-conductive form **15** and two thicknesses or palm portion **12** and back portion **13** of the material to be sealed. Since the form **15** for a man-sized hand covering usually will have a depth of about ¾ inch, the depth of the die ruling generally will range from 1 inch to 1¼ inches and the thickness generally will range from .050 inch to .075 inch.

The non-conductive form **15** disposed between the palm portion **12** and back portion **13** of flexible material is mated with the contoured die ruling **18**. The upper platen of the press containing the upper electrode **17** and contoured die ruling **18** are lowered slowly to check the alignment of the form **15** in relation to the contoured die ruling **18**. The press is then closed, thereby stretching the upper or back portion **13** of flexible material over the form **15** and causing said upper portion **13** to be pressed tightly against the lower or palm portion **12** of flexible material in the area between the die ruling **18** and the lower plate electrode **11**. The pressure on the piston of the press will range anywhere from 20–125 p.s.i. depending on the material being sealed or welded, e.g. the thickness of the backing. The R.F. power is

switched on for a preset period of time, generally about 1–10 seconds depending on the characteristics of the flexible material being dielectrically sealed. A generator output of from 1–5 kw. will suffice for most sealing operations; supported thermoplastics require approximately the same as non-supported.

It has been found that no cooling time is required, i.e. the upper press member **16** may be raised and the fabricated material immediately removed. The form **15** may be withdrawn from between the sealed portions, the excess material is trimmed off, and the inner surfaces of the hand covering are turned outwardly so that the high frequency welded seams are on the inside of the finished hand covering.

The form **15** may be made from any substantially non-conductive material, such as wood, resins, rubbers, and mixtures of such materials. Any relatively non-conductive material will be satisfactory providing it is rigid or has a sufficient degree of consistency to hold up the upper portion or back portion of the flexible material when positioned in the press. Furthermore, it is possible to use an air inflatable form of rubbery material; thus enabling the form **15** to be easily withdrawn from the finished article. It is preferable to use a sectionalized non-conductive rigid form as illustrated in FIG. 3, wherein the sections are shown by **15**, **15***a*, **15***b* and **15***c*. This enables removal from the dielectrically sealed hand covering with maximum ease and without any damage to the seams. Because of the additional strength and non-stretch characteristics of most thermoplastic coated fabric, fabric composed of repetitive, spaced thermoplastic strands interlaced with non-thermoplastic strands, and ordinary hand covering fabric use of a sectionalized non-conductive rigid form is increasingly important.

The hand covering of this invention may be made from fabrics coated with the various weldable thermoplastics, such as polyvinyl chloride, polyvinylidene chloride, copolymers of vinylidene chloride and vinyl chloride (tradename "Saran"), ethyl cellulose, cellulose acetate, cellulose acetate butyrate, etc., including the non-continuous or breathable coated fabrics. When coated fabrics are employed for both portions of the hand covering of this invention the coated surfaces of the palm portion **12** and back portion **13** should be placed on the lower plate electrode **11** in a manner which allows the coated surfaces of these portions to make intimate contact with each other in the area adjacent to and extending outwardly from the vertical edges of the non-conductive form **15**, which, when employed, is disposed between said portions. After making the seal with dielectric heating means, the excess material extending outwardly from said seal is trimmed off with a scissors or some other suitable cutting means. The inner surfaces of the hand covering are turned outwardly so that the seams are on the inside and so that when coated fabric is employed, e.g. polyvinyl chloride coated cotton fleece jersey, the fabric surface also is on the inside of the finished hand covering. Hand coverings thus fabricated from coated fabrics have an inseparable lining, i.e. the linings can't pull out of the outer shell as in common lined items, for added comfort and perspiration absorption.

Although it is desirable in fabricating most types of hand coverings from coated fabrics to place the thermoplastic surfaces of said fabrics face to face and not back to face or back to back, the coated fabrics can be sealed or welded both back to face and back to back depending on the thickness and porosity of the base or support fabric, i.e. the fabric must be porous enough to allow the thermoplastic coating to penetrate and flow through the fabric under pressure. Also, it is possible to make a three-dimensional hand covering from coated fabric or a fabric comprised of repetitive, spaced thermoplastic strands interlaced with non-thermoplastic strands, or from portions of the two materials. Furthermore, materials containing different thermoplastics may be utilized

for the palm and back portions. When the hand coverings are fabricated from flexible materials containing different thermoplastics, it is essential to reach the temperature of flow for the highest melting thermoplastic in order to get adequate bonding between said different thermoplastics. It should be noted that heat sealing, or more particularly impulse sealing, is not satisfactory because a thermoplastic such as the preferred polyvinyl chloride or "vinyl" will ignite and burn before its melting point is reached.

Thermoplastic coated fabric or fabric containing thermoplastic strands interlaced with non-thermoplastic strands can be used as one portion of the hand covering and ordinary hand covering fabric as the other portion providing the latter has adequate porosity, i.e. enough to allow the thermoplastic to penetrate said fabric and form a tight seal when the portions are exposed to high frequency alternating fields. By ordinary hand covering fabrics we mean any of the materials commonly used to make gloves and mittens for home and industrial use including fabrics made from natural fibers and fabrics made from synthetic fibers, which synthetic fibers are not capable of being dielectrically welded, whether woven or knitted.

Hand coverings may be obtained by dielectrically sealing portions of a fabric made by weaving or knitting thermoplastic yarns or strands in among non-thermoplastic yarns or strands. In order to obtain a strong dielectric seal between portions of such material without utilizing a strip of thermoplastic film for this purpose, such material must contain repetitive spaced thermoplastic strands, such as "vinyl," interlaced among the non-thermoplastic strands. As an example and referring now to FIG. 4, in an 80 squares woven fabric, if every fourth yarn in both the warp **24** and the woof **25**, are of dielectrically sealable thermoplastic whereas the remaining yarns running both directions **26** and **27** are of natural or non-thermoplastic, and if one portion of such fabric is laid on top of another at random (in comparison with the fineness of the weave, laying two pieces of fabric suitable for gloves or other products would mean that the way the yarns of the top and bottom fabric touch would be at random) and said pieces of fabric are dielectrically sealed along the desired lines, there are sealed points of contact in the range of 15 to 40 points per inch which equals very fine stitching. Thus, the seams of articles made from such fabric have excellent strength. The advantages of hand coverings made from material having spaced, repetitive thermoplastic yarns interlaced with them and extending in the other direction is apparent to the glove maker, e.g. such hand coverings are breathable by comparison with those made from thermoplastic film. One of the major disadvantages to the thermoplastic films is that they are continuous films and do not breathe, and therefore are very uncomfortable. The seams of hand coverings made in this way are exceptionally strong by comparison to sewn seams.

The hand coverings of this invention may have a fullness imparted to the back which gives rise to their three-dimensional characteristics. Furthermore, as shown in FIG. 1 the marginal edges of the palm portion **20** and back portion **23** are dielectrically sealed in an area **22** traversely displaced from the central plane **21** between the palm portion **20** and back portion **23** and preferably closer to the palm than the back. The seam, therefore, in the thumb crotch of mittens and in the thumb crotch and finger crotches of gloves is moved away from the point of stress, viz., the center plane **21** of the hand covering. When the thumb slot of a mitten or glove is flexed the stress is not on the seam, thus increasing the useful life of a fluid impervious hand covering and the wearing comfort of any glove or mit, i.e. the mit fits wearer's thumb because of this seaming arrangement.

The following data indicate the strength of the dielectrically sealed seam of polyvinyl chloride coated fabrics

and a sewed seam of these same fabrics, using a thread that is used to sew cotton gloves:

Material	Tensile Strength (Scott Tester) Pounds/inch of Width		Remarks
1. Polyvinyl chloride calendered on woven cotton base fabric.[a]	Dielectrically sealed	25	Material tore, seam O.K.
		21	
		23	
	Sewed	8	Seam tore.
		12	
		8	
2. Polyvinyl chloride film laminated to knit cotton jersey.	Dielectrically sealed	8	Material tore, seam O.K.
		6	
		6½	
	Sewed	6½	Seam tore.
		7	
		8½	
3. Polyvinyl chloride calendered on knit cotton jersey.	Dielectrically sealed	12	Material tore, seam O.K.
		11	
		11	
	Sewed	9	Seam tore.
		9	
		6	

[a] "Naugahyde" registered trademark of the United States Rubber Company.

These data were obtained from one inch widths of material. None of the seams failed on the dielectrically sealed specimens, rather, the polyvinyl chloride coating pulled away from the cloth backing in another area.

Although certain specific embodiments of the invention have been particularly shown and described, it will be understood that the invention is capable of further modification and no limitations are intended other than those imposed by the claim hereinafter set forth.

Having thus described our invention, what we claim and desire to protect by Letters Patent is:

A three-dimensional hand covering of a flexible at least partially thermoplastic material comprising palm and back portions, said portions being dielectrically heat sealed to form a seam transversely displaced from the central plane between the palm and back portions, said sealed portions forming an aperture for insertion of a hand and said seam extending along the periphery of the hand covering from one edge of said aperture to the other edge of said aperture at a location away from the points of maximum stress which occur at said central plane.

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