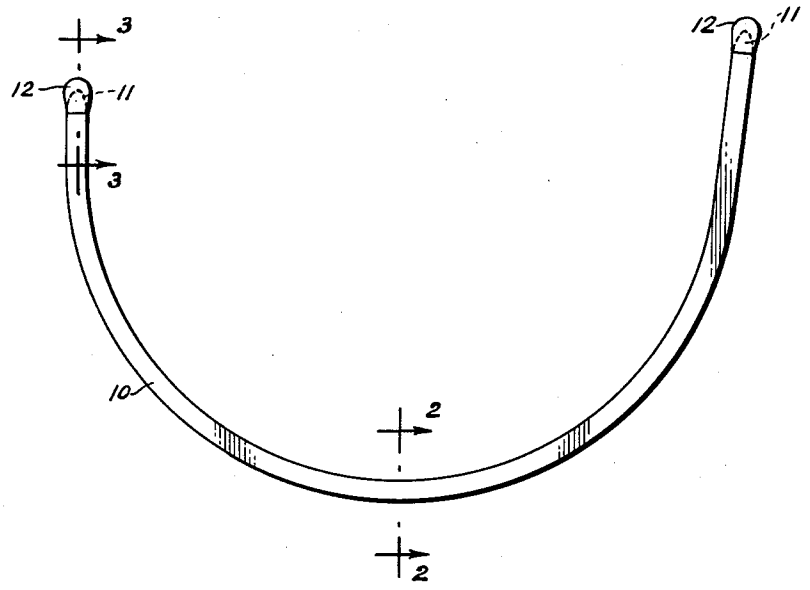
March 24, 1964 W. M. JONAS 3,126,007

WIRE FRAMES FOR BRASSIERES AND THE LIKE

Filed June 30, 1961

Fig. 1.



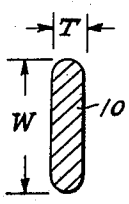


Fig. 2.

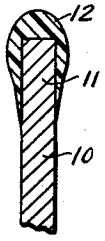


Fig. 3.

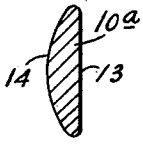


Fig. 4.

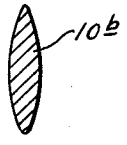


Fig. 5.

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3,126,007

WIRE FRAMES FOR BRASSIERES AND THE LIKE

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This invention relates to improvements in wire frames for use in brassieres or other garments, such as, dresses, undergarments, for example, slips, bathing suits and the like, having brassiere-like, breast supporting constructions.

It has previously been proposed, for example, in United States Letters Patent No. 1,798,274, issued March 31, 1931, to Helene Pons, to provide garments of the described character with arcuate resilient frames which extend along the peripheries or bases of the breast supporting pockets, and which are of substantially rectangular cross-section with the major axis or dimension of the latter extending radially with respect to the arcuate configuration of the wire frame, and with the smaller axis or dimension of the cross-section extending perpendicular or normal to the plane in which the arcuate wire frame normally tends to lie. Such a wire frame has relatively great lateral flexibility to conform comfortably to the contours of the wearer's body at the base of the supported breast and further has relatively smaller longitudinal flexibility or extensibility, that is, relatively greater resistance to extension of the distance between the ends of the arcuate wire frame, so as to provide maximum support for the associated breast pocket of the garment. Heretofore, as in United States Letters Patent No. 1,798,274, identified more fully above, as well as in United States Letters Patents No. 2,705,800, issued April 25, 1955, and No. 2,746,052, issued May 22, 1956, both to Marcus Schwartz, it has been proposed to form the wire frames of the described character of a spring steel, particularly a hypereutectoid steel which is cold drawn and heat treated so as to have a hardness which, on the Rockwell scale, is in the range between C42 and C49. Although rectangular cross-section wire frames formed of hypereutectoid or other steel having the above mentioned properties are endowed with the requisite lateral and longitudinal flexibilities for affording comfort and adequate support to the wearer, such steel wire frames nevertheless have certain serious disadvantages when embodied in garments of the described character.

It is evident that garments of the described character are subjected to frequent launderings and, particularly in the case of bathing suits provided with steel wire frames, the latter may be subjected to repeated immersions in salt water. The existing steel wire frames are susceptible to rusting or corrosion when the garments embodying the same are repeatedly laundered or immersed in salt water. In order to resist rusting or corrosion, it has been the usual practice to conclude the manufacturing process of the existing steel wire frames with the application of a rust resistant coating which may be a metallic coating applied by electroplating or otherwise, or a baked enamel or other paint coating. However, such rust resistant coatings are frequently scratched or chipped either prior to being embodied in a garment or when subjected to flexing while part of the garment, so as to destroy the integrity of the resistance to rusting. Further, the application of the described rust resistant coatings represents a substantial item in the cost of manufacturing the existing steel wire frames.

It has also been found that the steel used for the wire frames is difficult to cut and, when cut, has the tendency to produce sharp burred edges which interfere with installation of the wires in the channels provided therefor

in a garment and which can cut through the fabric of the garment to injure the wearer.

Accordingly, the existing steel wire frames have the ends thereof formed with spherical terminals or are provided with separate rounded parts which are fixed thereon. In view of the hardness of the steel employed for the existing steel wire frames, the formation of spherical ends or terminals thereon is obviously a costly and difficult operation, whereas the attachment of rounded parts to the ends of each frame also substantially increases the manufacturing costs thereof.

It is a general object of the present invention to avoid the above mentioned disadvantages of the existing steel wire frames for brassieres or other garments, such as, dresses, slips, bathing suits and the like having brassiere-like breast supporting constructions.

A more specific object is to provide wire frames of the described character having the requisite relative lateral and longitudinal flexibilities for affording optimum comfort and support to the wearer, while being formed of a non-ferrous, non-corrosive metal so that such wire frames can be safely employed in garments subjected to repeated launderings or immersions in salt water without evidencing any tendency to rusting or corrosion, and without requiring the application of a rust resistant coating.

Another object is to provide wire frames of the described character formed of a non-ferrous, non-corrosive metal providing the requisite elasticity and hardness for performing the supporting functions of the wire frames, while facilitating the cutting of the wire frames from a continuous length of the wire.

A further object of the invention is to provide wire frames of the described character with improved rounded ends or tips formed of a tough plastic material which is impervious to detergents, salt water, or any other normally deteriorating substances with which the wire frame may come in contact during its manufacture or during use or laundering of the associated garment.

In accordance with an aspect of this invention, a wire frame for a brassiere or other garment of the described character is formed of a nickel-copper alloy containing from approximately 10% to 35% nickel and the balance copper, for example, the alloy known generally as nickel silver or German silver which contains approximately 15% nickel. The wire of such a frame is cold worked so as to have a tensile strength between approximately 150,000 and 180,000 p.s.i., and is given a substantially rectangular or elongated cross-section having its major axis or dimension extending radially with respect to the arc of the wire frame and with the ratio of the major and minor dimensions of such cross-section being in the range between approximately 4:1 and 5:1.

In order to provide rounded, generally tear-drop shaped tips on the ends of each wire frame, the ends of the frame are dipped in an epoxy resin containing a hardening agent and having superior thixotropic properties so that, when the ends of the wire frame are withdrawn from the resin, tear-drop shaped bodies of the resin adhere to the ends of the frame and retain such shape during the curing of the resin to form hard, tough end terminals or tips which are impervious to chemical or other agents coming in contact therewith during laundering or use of the garment having the wire frames associated therewith, or during further steps in the manufacturing process of the wire frames, for example, during the dipping of the frames in an acid brightening bath for restoring the natural bright color of the non-ferrous alloy following discoloration thereof during either heat treating of the wire or the curing of its end terminals.

The above, and other objects, features and advantages of the invention, will be apparent in the following detailed description of illustrative embodiments thereof

which is to be read in connection with the accompanying drawing forming a part hereof, and wherein:

FIG. 1 is an elevational view of a wire frame for brassieres and the like in accordance with the invention;

FIG. 2 is an enlarged sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken along the line 3—3 of FIG. 1; and

FIGS. 4 and 5 are sectional views similar to that of FIG. 2, but respectively showing other cross-sectional shapes that may be employed in wire frames embodying the invention.

Referring to the drawing in detail, and initially to FIGS. 1, 2 and 3 thereof, it will be seen that a wire frame for a brassiere, dress, slip or other undergarment, bathing suit and the like having breast supporting pockets or constructions includes an elongated arcuate, wire body 10 formed of a non-ferrous, non-corrosive metal alloy, preferably an alloy of nickel and copper containing from approximately 10% to 35% nickel, with the balance of the alloy being copper. In a preferred embodiment of this invention, the body 10 of the wire frame is formed of a nickel-copper alloy containing approximately 15% to 18% of nickel, that is, an alloy that is commonly known as "nickel silver" or "German silver."

The above mentioned non-ferrous alloys are non-rusting, and otherwise non-corrosive, so that wire frames formed of such alloys may be included in garments of the described character which are subjected to repeated launderings or even to repeated immersions in salt water, as when embodied in a bathing suit, without rusting or corroding. Thus, the manufacturing operations previously employed for providing rust-resistant coatings on the existing steel wire frames may be eliminated while further improving the rust-resisting properties of the wire frame, as the previously applied rust-resistant paint or electro-plated coatings were susceptible to scratching, chipping or cracking and therefore did not efficiently or reliably resist rusting of the underlying steel.

It had previously been assumed that the elasticity and srtength of a wire required for use in a brassiere frame could be attained only in a hardened steel wire, more specifically, a hypereutectoid steel wire as referred to in the Schwartz patents identified more fully above. However, it has now been found that the above mentioned nickel-copper alloys may be cold worked, for example, by repeated rolling operations performed thereon, so as to provide a tensile strength in the range between approximately 150,000 and 180,000 p.s.i. When such a cold rolled nickel-copper alloy wire is heat treated at a temperature of approximately 450° F. to 600° F. for relieving the stresses therein after the cold working of the wire, and is embodied in a frame having the proportions of cross-sectional dimensions referred to hereinafter, there are achieved the desired relatively great lateral flexibility for easy conformation to the contour of the wearer's body, and the relatively small longitudinal flexibility or extensibility required for adequate support of the breast pocket of the garment.

As shown particularly in FIG. 2 of the drawing, the non-ferrous wire body 10 of the brassiere frame embodying the present invention may have a substantially rectangular cross-section arranged with the major dimension or width W of the cross-section extending radially with respect to the arc or curvature of the wire body as viewed in FIG. 1 and being approximately 4 to 5 times greater than the thickness or minor dimension T of the cross-section extending normal or perpendicular to the plane in which the arcuate wire frame normally lies. As a particular example of a brassiere frame embodying this invention, it may be mentioned that the wire body 10 thereof can have a width W of approximately .125 inch, while the thickness T of the cross-section is between approximately .025 and .035 inch.

In producing the wire frames embodying the invention,

a nickel-copper alloy wire having a round cross-section of suitable diameter may be initially cold rolled, while in the form of a continuous coil of the wire, so as to obtain the cross-sectional configuration of FIG. 2, whereupon suitable individual lengths of wire are cut from the continuous coil. It has been found that the described nickel-copper alloy wire has superior cutting properties, in that the ends of the individual lengths of wire cut from the coil are smooth and do not present the sharp burrs that are necessarily obtained when a hypereutectoid or other steel wire is similarly cut. Each length of the non-ferrous wire is bent or curved into the arcuate shape or contour shown in FIG. 1, wherein the arc of the curvature lies in a flat plane containing the major axis or width W of the substantially rectangular cross-section. After forming of the wire into the arcuate configuration, the wire bodies 10 are heat treated, as described above, so as to relieve the stresses therein.

When cutting the individual lengths of wire from the continuous coil thereof, the ends of each length are preferably given rounded edges, as shown in broken lines at 11 on FIG. 1, and, in accordance with the present invention, such ends 11 of wire body 10 are further provided with generally tear-drop shaped plastic tips or end terminals 12 (FIGS. 1 and 3) which facilitate the insertion of the wire frame into the channel or pocket normally provided therefor in the brassiere or other garment, and further to avoid tearing of the garment by the ends of the wire frame, or discomfort to the wearer as a result of pressure exerted against the body by the ends of the wire frame.

In accordance with the present invention, the plastic tips 12 are provided on the ends 11 of each wire body 10 by dipping such ends 11 into a liquid supply of pigmented epoxy resin containing a hardening agent, such as, epichlorhydrin-bis-phenol A containing 1 part of a polyamide curing agent for each 5 parts, by weight, of the resin. During this dipping operation, the wire frame is supported with its ends 11 extending vertically downward so that, upon withdrawal of the ends 11 from the liquid supply of resin, the latter adheres to the ends of the wire body in the form of tear-drop shaped accumulations. Following withdrawal of the ends of the wire frame from the liquid supply of resin, the frame is passed through a curing oven, at a temperature of approximately 300° F. to 400° F. for a period of approximately 20 to 35 minutes, to effect hardening of the accumulations of epoxy resin on the ends 11 so as to form the hard, tough tips 12. By reason of the excellent thixotropic properties of the above mentioned epoxy resin, the accumulations of the latter on the ends 11 retain the wet tear-drop shape during the setting thereof in the curing oven, even though the wire frame may be angularly displaced from a position in which its ends extend vertically downward so that gravity would normally tend to displace the still soft accumulations of resin from the illustrated positions symmetrical with the ends of the wire frame.

After the plastic tips 12 have been applied in the manner described above, the completed brassiere frame may be immersed for approximately 30 seconds in a brightening bath, for example, as aqueous solution of sulfuric acid and sodium dichromate, in the proportions of approximately five gallons of water, one pound of sulfuric acid and one-half pound of sodium dichromate. This bath is merely intended to restore the attractive bright, silvery appearance of the nickel-copper alloy which may be discolored as a result of the heat treating of the wire and the heat curing of the resin tips. In this connection, it is important to note that the described epoxy resin employed for the tips 12 is impervious to the acid brightening bath, whereas other thermosetting plastic resins may be affected by the acid brightening bath which must follow the application of the tips 12 in order to

eliminate discoloration resulting from the heating applied to cure the plastic of the tips.

Although the wire body 10 of the wire frame illustrated in FIG. 1 has a substantially rectangular cross-section, as illustrated in FIG. 2, it is to be noted that the wire body may have other cross-sectional shapes which are substantially flattened in the plane of curvature of the wire body and have a major dimension or width that is four to five times greater than the minor dimension of the cross-section. Thus, as shown in FIG. 4, the wire body 10*a* may have a cross-sectional shape which is substantially elongated in the direction of the radius of curvature of the wire body and which has one flat surface 13 and an opposed curved or convex surface 14, or, as shown in FIG. 5, the wire body 10*b* may have an elongated oval cross-sectional shape.

Although illustrative embodiments of the invention have been described in detail herein with reference to the accompanying drawing, it is to be noted that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. An arcuate brassiere frame of a non-ferrous cold-rolled, nickel-copper alloy wire containing approximately 10% to 35% nickel which wire is heat treated at a temperature of 450 to 600° F. and has a tensile strength of 150,000 to 180,000 p.s.i. and a flattened cross-section with its major dimension extending radially with respect to the curvature of the arcuate frame and being from 4 to 5 times greater than the minor dimension of said flattened cross-section so as to be easily flexible out of the plane of said curvature while avoiding excessive permanent deformation by reason of such flexing.

2. An arcuate brassiere frame as in claim 1; further having rounded tips of epoxy resin at the opposite ends thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,048,238	Weeks	July 21, 1936
2,637,041	Bachmann	May 5, 1953
2,705,800	Schwartz	Apr. 12, 1955
2,731,640	Garson	Jan. 24, 1956
3,067,750	Schwartz	Dec. 11, 1962

OTHER REFERENCES

Metals Handbook, 1948 edition, published by The American Society of Metals (pages 925 and 1198 relied upon).