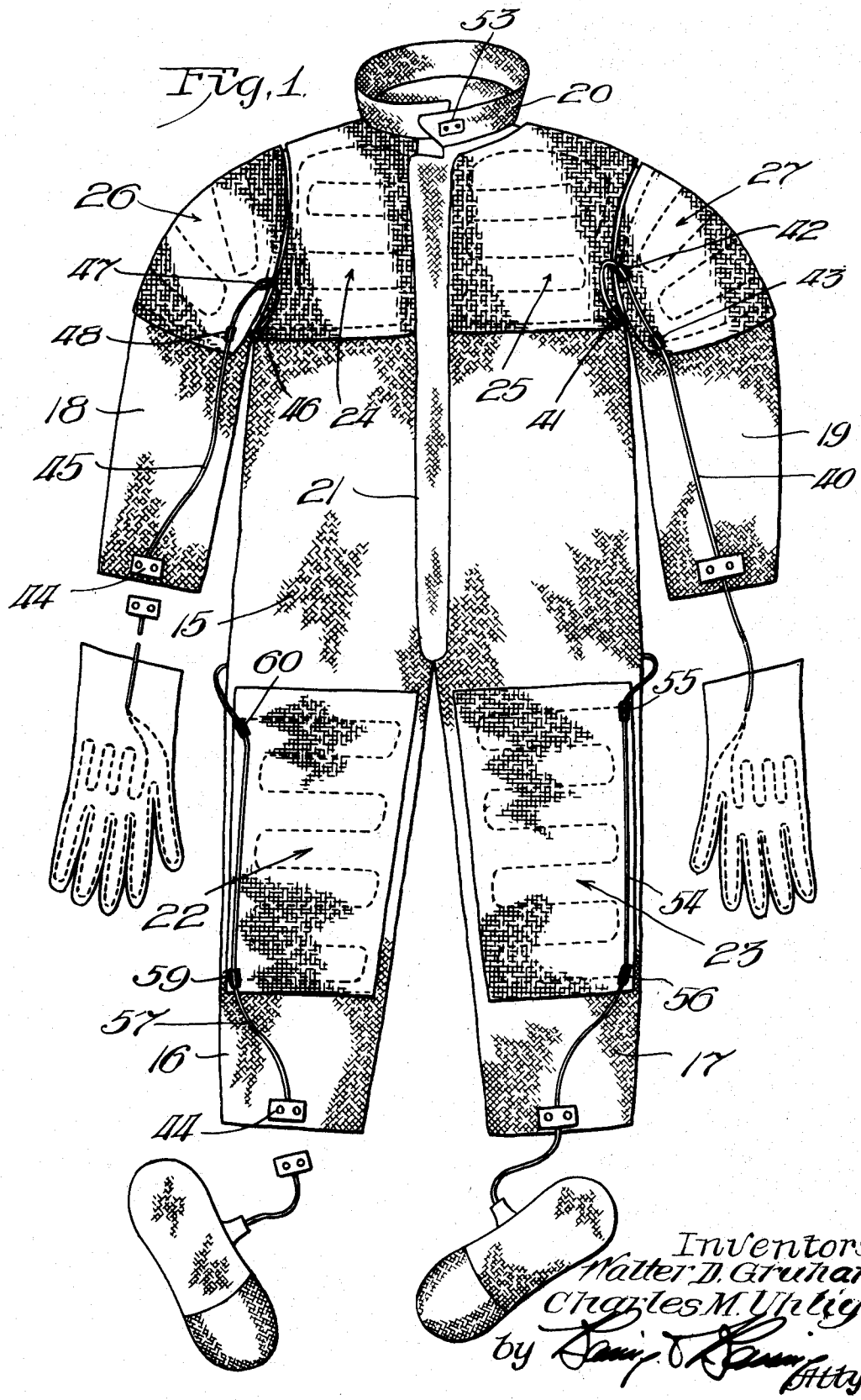
Nov. 13, 1928. 1,691,472

W. D. GRAHAM ET AL

ELECTRICALLY HEATED GARMENT

Filed June 25, 1925 6 Sheets-Sheet 1

Fig. 1.



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ELECTRICALLY HEATED GARMENT

Filed June 25, 1925

6 Sheets-Sheet 2

Fig. 2.

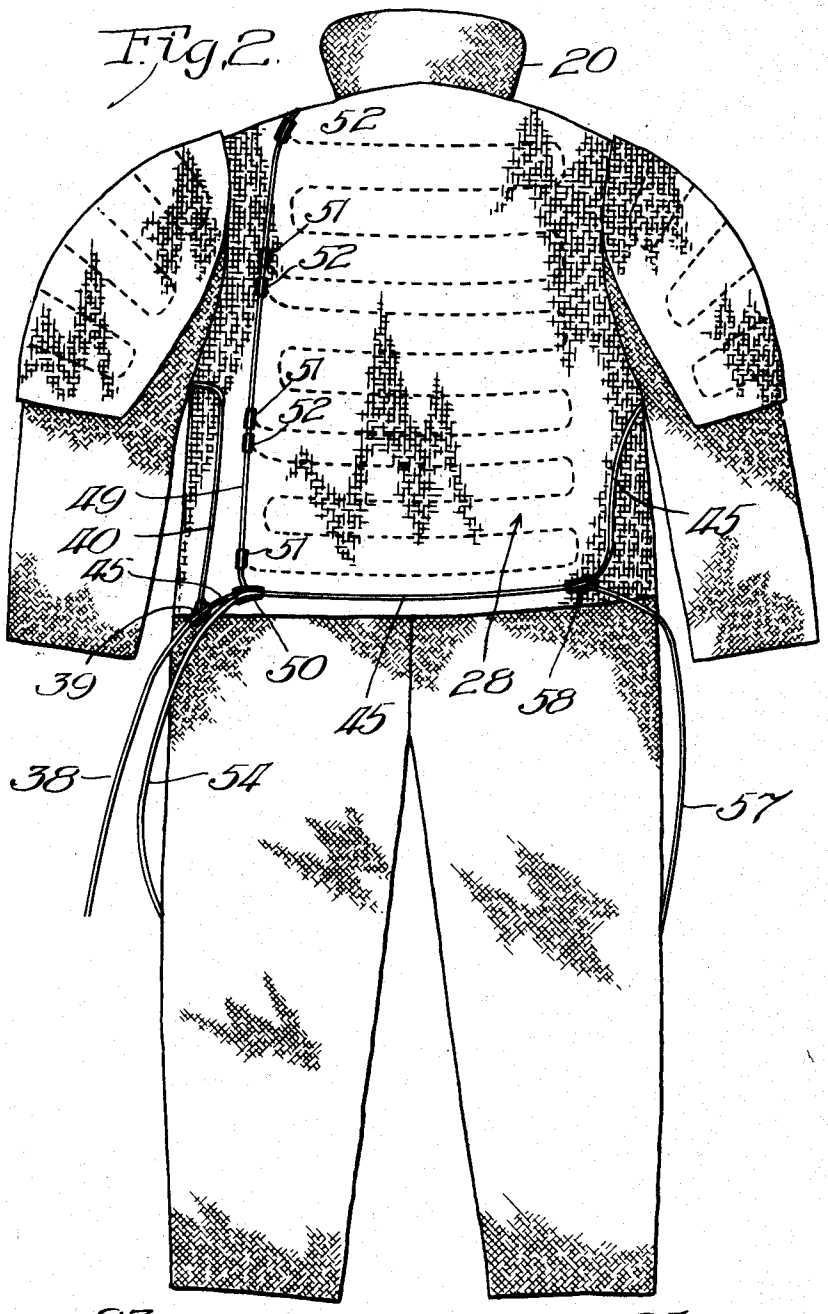
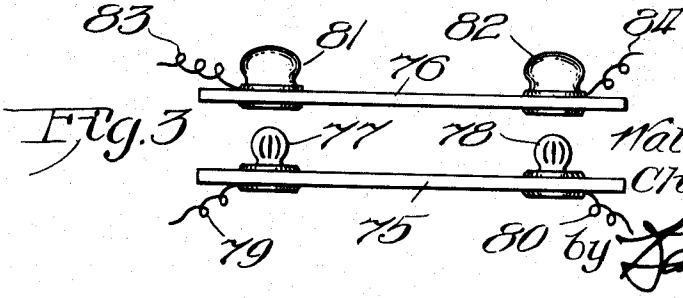


Fig. 3



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ELECTRICALLY HEATED GARMENT

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Fig. 4.

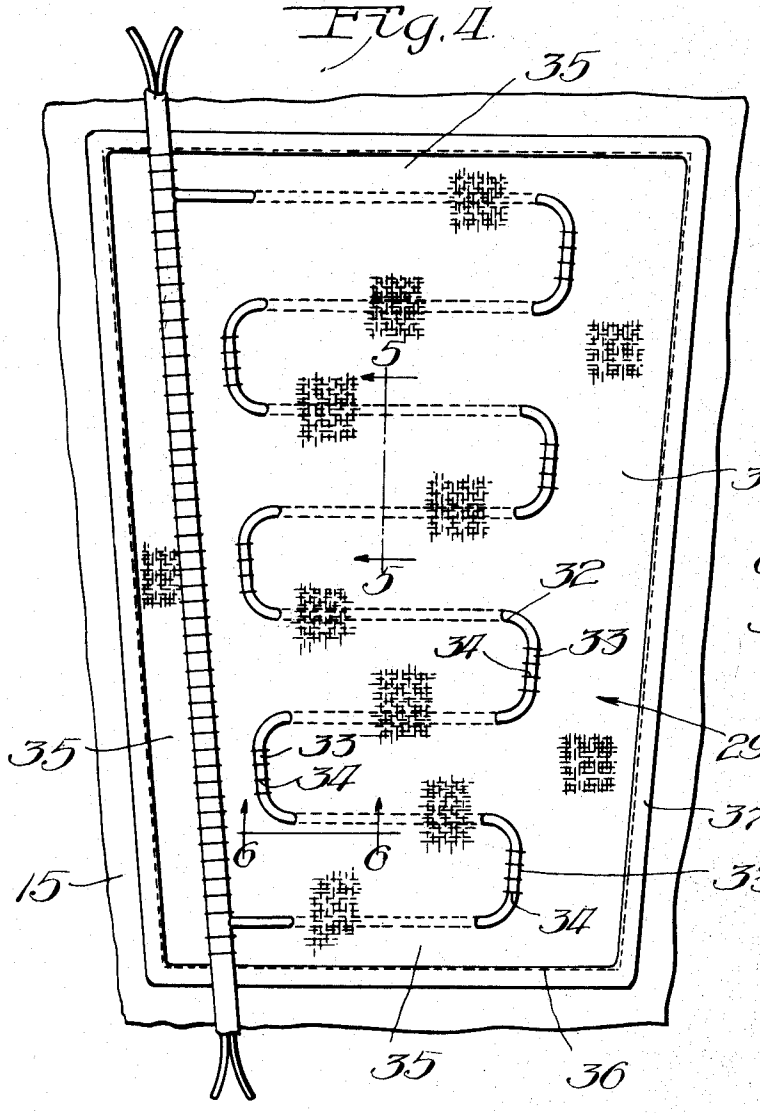


Fig. 5.

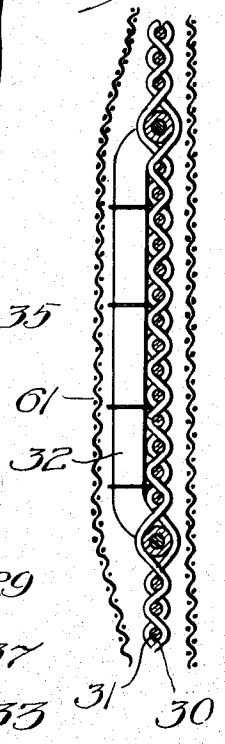
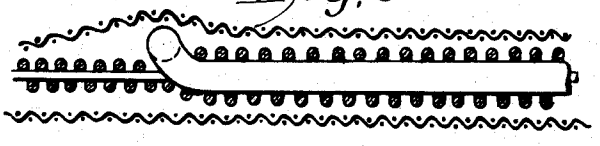


Fig. 6



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ELECTRICALLY HEATED GARMENT

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Fig. 7.

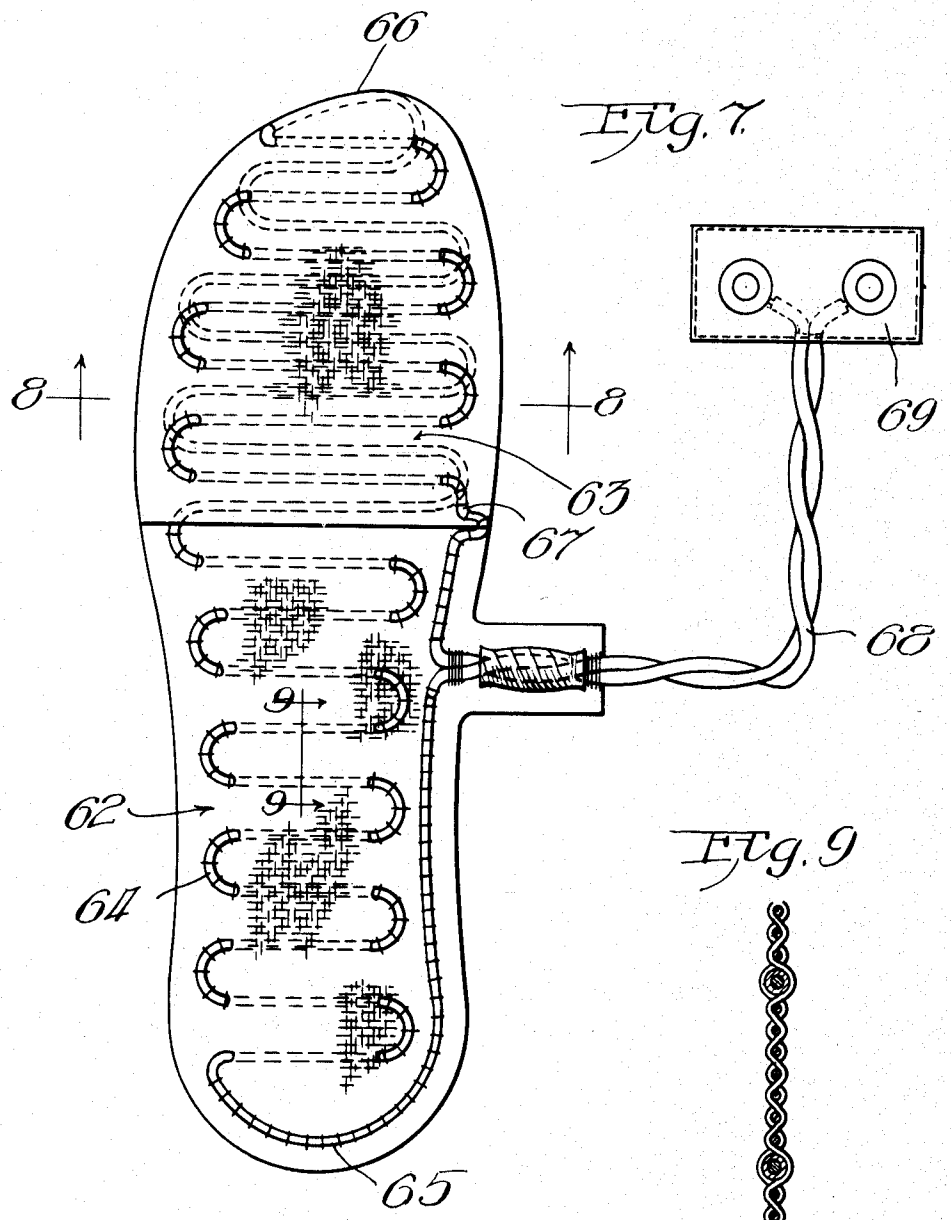
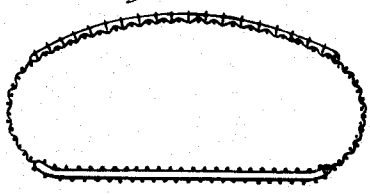


Fig. 9

Fig. 8



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ELECTRICALLY HEATED GARMENT

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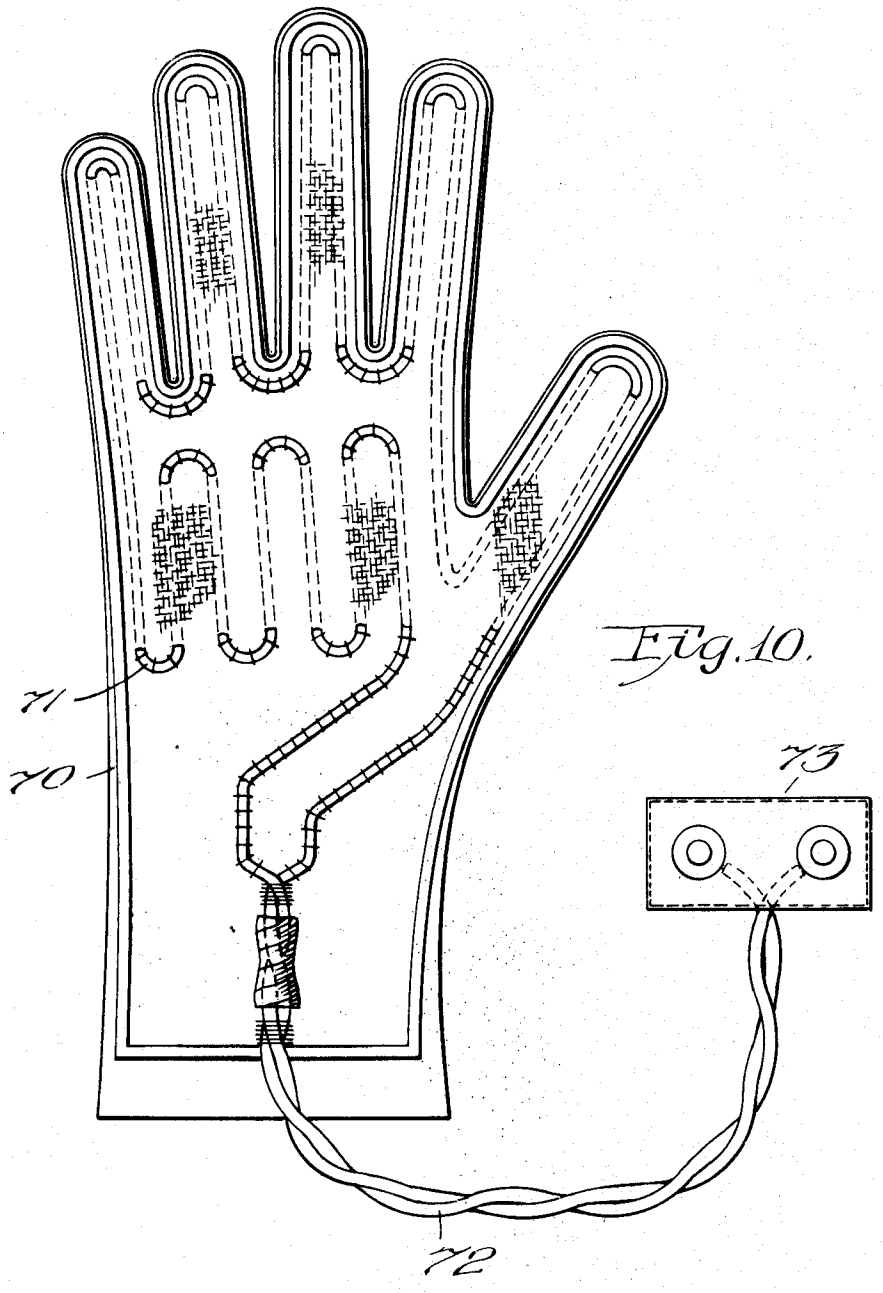


Fig. 10.

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ELECTRICALLY HEATED GARMENT

Filed June 25, 1925 6 Sheets-Sheet 6

Fig. 11.

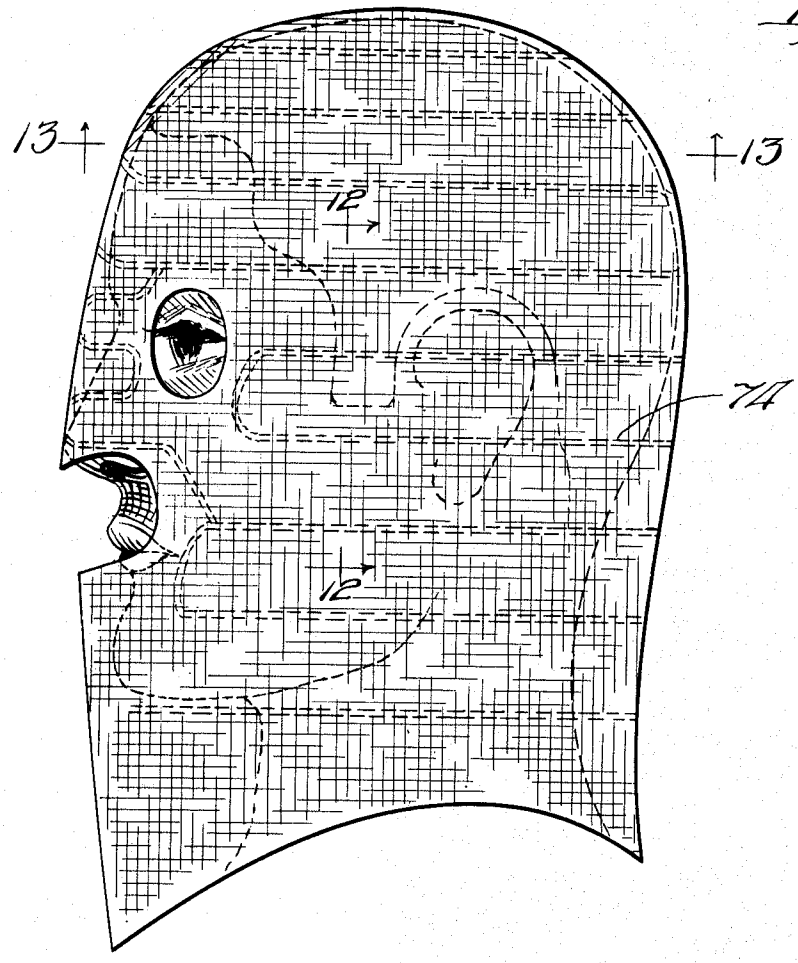


Fig. 12.

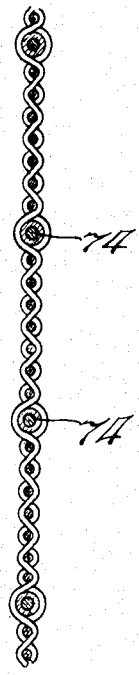
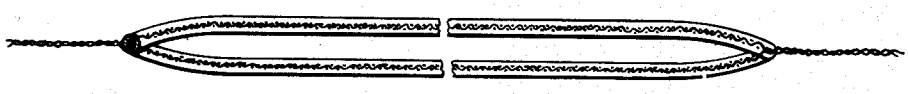


Fig. 13.



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UNITED STATES PATENT OFFICE.

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ELECTRICALLY-HEATED GARMENT.

Application filed June 25, 1925. Serial No. 39,421.

The invention has to do with improvements in electrically heated garments. It has to do especially with improvements in electrically heated garments intended for the use of aviators, and other persons engaged in the driving or control of vehicles generally such as automobiles, trucks, etc., but it will presently appear that the features of the invention are equally well adapted for other classes of service.

One of the objects of the invention is to provide a garment of such construction and arrangement that it will not seriously interfere with the required freedom of movement and action of the wearer, but will allow him full freedom of movement, so that his ability to control the vehicle will not be obstructed.

Another object of the invention is to provide a garment of such arrangement that those portions of the body which are chiefly exposed to cold or which are most subject to numbness therefrom may be most advantageously protected and warmed. In this connection, it is an object to provide a complete garment having means for locally heating it in those parts which most require such attention.

Still a further object in connection with the above is to make provision for the local heating of the desired portions of the garment by the use of individual heating pads which are self contained and are locally applied to the desired portions of the garment.

A further object in connection with the foregoing is to establish each of these pads as a unit having the electrical conductor or conductors woven thereinto in such a way, however, that there is established a border portion which is substantially unobstructed by electric wires and through which may be passed the sewing or stitching to attach the same to the body of the garment.

A further object of the invention is to make provision for supplying the electric current to all of the pads of the garment from a common source so as to simplify the arrangement, the different pads being preferably connected in parallel relation, so that the division or subtraction of one or more pads to the circuit will not interfere with the proper operation of the pads already connected up.

A further object is to provide a main garment intended to cover the major portion of the body, together with one or more detachable unit garments for other portions of the body, such as the hands, feet, and head. These detachable units are in themselves self-contained garments provided with suitable heating units, and means are provided for instantaneously and easily connecting or disconnecting these garments from the main garment. In this way, the unity of supply of electric current from a common source is maintained, but the supplemental garments may be removed and disconnected without complication and at the instantaneous desire of the wearer.

Other objects and uses of the invention will appear from a detailed description of the drawings, which consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings:

Figure 1 shows a front elevation of a garment embodying the features of the present invention, the same being turned inside out so as to better illustrate the pads on the front side of the garment, and the inside lining being removed so as to better illustrate the various pads and electrical connections to them. In Fig. 1 we have also illustrated a pair of gauntlets and a pair of foot pads associated with the garment, one gauntlet and one foot pad being connected up to the electric circuit and the other gauntlet and foot pad being disconnected.

Fig. 2 shows a back view corresponding to Fig. 1, the gauntlets and foot pads being removed;

Fig. 3 shows a fragmentary elevation of one of the buttoning connectors such as may be used in connection with the foot pads, gauntlets, or head gear, the covering being removed and the two sections being separated from each other;

Fig. 4 shows a fragmentary face view of a portion of the inside of the garment, the lining being removed, so as to illustrate one of the heating pad elements;

Fig. 5 shows a fragmentary section on the line 5—5 of Fig. 4, looking in the direction of the arrows, but on greatly exaggerated scale;

Fig. 6 shows a fragmentary section on the line 6—6 of Fig. 4, looking in the direction of the arrows, but on greatly exaggerated scale;

Fig. 7 shows a body face view of a foot

pad embodying the features of the present invention, the linings being removed therefrom, and the connecting wire and terminal being illustrated;

Fig. 8 shows a cross section on the line 8—8 of Fig. 7, looking in the direction of the arrows, the lining being removed;

Fig. 9 shows a fragmentary section on the line 9—9 of Fig. 7, looking in the direction of the arrows, but on greatly enlarged scale;

Fig. 10 shows a face view of a gauntlet embodying the features of the present invention, the terminal coupling being shown in connection therewith;

Fig. 11 shows a side elevation of a head gear embodying the features of the present invention, the outside lining being removed;

Fig. 12 shows a cross section on the line 12—12 of Fig. 11, looking in the direction of the arrows, but with the garment turned inside out, the weave being illustrated more or less diagrammatically; and

Fig. 13 shows a fragmentary section on the line 13—13 of Fig. 11, looking in the direction of the arrows, but on greatly exaggerated scale.

Referring first to Figs. 1 to 6 inclusive, the garment therein illustrated is shown as turned inside out, since the heating elements or pads are preferably attached to the inside surface of the garment proper. This garment is woven of a suitable fabric such as gaberdine, khaki, etc., and is preferably made as a single garment including the body portion 15, the legs 16 and 17, the sleeves 18 and 19, and the neck band 20. The garment is preferably slitted down the center of the front of the body, as shown at 21, and means are provided for fastening the same at this point after the garment is in place on the wearer. Any suitable attaching means such as buttons or snaps may be used for this purpose. If desired, also the open ends of the legs and sleeve may be provided with draw laces or rubber bands or the like for closing them, or they may be slit for a short distance so as to facilitate application to the wearer. In the latter case, the slit portions may be provided with buttons or snaps or other connecting means for closing these parts when in place on the wearer.

We secure to suitable portions of the garment a series of individual heating pads which are provided with electric conductors through which the heating current is passed. These pads are preferably placed against the inside face of the garment so as to bring them as close as possible to the body of the wearer, and also to more effectively heat insulate them against loss of heat outwardly. By placing these pads against the inside face of the garment there becomes available the entire thickness of the garment material itself to insulate against such loss of heat.

In the particular arrangement illustrated, we have shown pads 22 and 23 placed in proper position to warm the knees and upper portions of the legs; pads 24 and 25 in position to warm the breasts and upper front portions of the body; pads 26 and 27 over the shoulders, and a large pad 28 over the major portion of the back of the garment. Each of these pads is preferably made as an independent self-contained unit, for which purpose it comprises a section of fabric having the desired electric heating wires incorporated therewith. These wires are preferably woven directly into the body of the fabric of the pad in accordance with the general principle covered by Letters Patent of the United States No. 1,436,384 issued November 21, 1922, and No. 1,456,223, issued May 22, 1923. Furthermore, these pads are preferably so woven as to establish perfectly continuous and uninterrupted border fabric portions which are entirely free and clear of wires and through which the necessary sewing may be conveniently passed to attach the pads to the body of the garment proper.

Referring to Figs. 4, 5 and 6, we have illustrated one such pad, the same being designated generally by the numeral 29. It includes the warp and woof threads 30 and 31 which are suitably woven together, together with the heat conductor 32 which is woven back and forth in the body of the fabric. This conductor in its cross connections 33 lies against the face of the fabric to which it may be secured by independent stitches 34, if desired.

Around the marginal portion of the pad is a continuous border 35 into which the wire does not enter, so that said border portion may be readily connected to the fabric 15 of the garment by a continuous line of stitching such as 36, either unprotected or protected by a tape or the like 37 as illustrated in Fig. 4.

It will be understood that the illustration and description of the pad 29 is merely illustrative of the general arrangement of the different pads, and that each pad incorporates more or less the general principles explained. The different pads are naturally made of suitable shapes and sizes to best serve their functions at their selected locations, and it is deemed unnecessary, therefore, to describe the different pads in great detail. It will be noted, however, that the pads 22 and 23 for the knees and upper portions of the legs are somewhat tapered in width, that the pads 26 and 27 for the shoulders are preferably cupped, that the pads 24 and 25 are preferably of relatively small size for the breasts, and that the pad 28 is preferably of large size for the back. All of the foregoing pads are supplied with

electric current in any convenient manner preferably by connections which will place them in parallel with each other. For this purpose, we preferably make use of electric cables having two conductors, since such cable is readily attached to the garment and establishes both sides of the circuit. We have, therefore, illustrated a cable 38 through which the current for the entire garment is supplied. The same preferably goes to the leg 39 at which a branch cable 40 is carried up along the back and around beneath the arm pit to the front side of the garment where it is connected to the breast pad 25 by a connection 41. It is then carried on over to the sleeve 19 and preferably reaches down the full length of said sleeve to the cuff thereof. At suitable points such as 42 and 43 the terminals of the shoulder pad 27 are connected to this cable.

At the cuff of the sleeve 19 the wires of the cable 40 are connected to the two buttons of a connector 44 similar to the connector 44 on the sleeve 18, the construction of which will be explained presently.

At the point 39 there is a cable 45 having its wires connected to the supply cable 38, said cable preferably being carried across the back and up at the other side and beneath the arm pit of the sleeve 18. Said cable then being carried down over said sleeve 18 to the connector 44 already referred to. The two wires of this cable are connected to the terminals of said connector.

This cable 45 supplies current to the pad 24 by suitable connections at the point 46, and also supplies current to the shoulder pad 26 by the connections 47 and 48.

The back pad 28 is supplied by a cable 49 which reaches from the cable 45 at the junction point 50 upward along one side of the back, as shown in Fig. 2. The different circuits of the back pad 28 are connected to the wires of the cable 49 at the different points 51 and 52, as shown in Fig. 2. This cable 49 is preferably carried on up over the shoulder and around the collar 20 to a terminal connector 53, as indicated in Fig. 1.

Reaching from the cable 45 at the junction point 50 downwardly is a branch cable 54 which reaches down at one side of the leg 17 to an angle thereof where its wires connect to another terminal plug similar to that already referred to. The wires of the pad 23 are connected to this cable 54 at the points 55 and 56. Another cable 57 has its wires connected to the wires of the cable 45 at the point 58, said cable 57 reaching down and around the leg 16 to the lower end thereof where its wires connect to the terminals of another terminal plug 44. The pad 22 is connected to the wires of the cable 57 at the points 59 and 60.

From the foregoing it will be evident that upon supplying current to the cable 38 current will also be supplied to all of the different pads in parallel, and furthermore that current will be available at the terminal plugs of both cuffs, the collar and both ankles.

Preferably a suitable layer of finishing cloth such as silk or the like is placed over all of the inside faces of the garment so as to protect the pads and give the completed garment a more finished condition. This cloth layer is indicated at 61 in Fig. 5. Of course, as already explained, the said layer has not been illustrated in Figs. 1 and 2 notwithstanding the fact that both of said figures show the garment turned inside out. The application of this lining layer is an expedient which will be well understood in the art and is not believed to require further discussion for this reason. It may be stated, however, that when applied it should not interfere with proper connection of supplemental heating elements to the various terminal plugs referred to.

Referring particularly to Figs. 7, 8 and 9, we have therein illustrated a heating pad for the foot, in the form of a slipper or sandal intended to be slipped onto the foot before the shoe or boot is drawn into place. This sandal preferably includes the sole portion 62 together with an "upper" 63 which, however, conveniently covers only the toe portion of the foot. A heating wire 64 is woven back and forth through both the sole and upper portions. In so doing it is preferred that this wire be woven back and forth in the fabric of the sandal, so that one terminal is adjacent to the heel thereof, as shown at 65. The wire then weaves back and forth through the sole to the toe 66 where it passes up into the fabric of the "upper" and weaves back and forth through the same to the point 67. At this point said wire is preferably carried down to the sole, and along the same to a point close to the other terminal portion of the wire. The cable 68 is connected to this heating element and to a pad 69 having suitable terminals for connection to the terminal plug of the ankle portion of the garment.

As a matter of convenience, in weaving, the sandal is conveniently woven in a manner similar to the method used in weaving bags. For this purpose, the weave commences at the toe 66, the wire itself being woven into the fabric. At the commencement of this operation, the end portions of the wire are left sufficiently long to take care of the upper and sole respectively. As the weave progresses back and forth the upper and the sole are thus woven together and with the wire preferably woven into both sections, this operation continuing until the rear end of the upper is reached. At that point the warp threads and wire of the upper are dropped and the weaving continues

using only the threads and wire for the sole. After the sole has been completed the terminal portions of the wire can be sewed onto the surface of the pad so as to bring them close together, as indicated in Fig. 7.

Referring next to Fig. 10, we have therein illustrated a gauntlet of convenient shape having applied to its back surface a heating pad 70. This heating pad is preferably formed to closely correspond to the back of the hand and the backs of the individual fingers. The wire 71 is woven up and down so as to make a number of passes over the back of the hand, and is also carried around the edges of the respective fingers and thumb, as clearly indicated in Fig. 10. The end portions of the wire are conveniently sewed to surfaces of the heating pad in such a manner as to bring them closely together. A cable 72 is connected to said end portions and to a terminal plug 73.

In Figs. 11, 12 and 13, we have illustrated a side elevation of a head gear which is provided with suitable heating wires, together with cross sections at the points indicated in Fig. 11. These figures are more or less diagrammatic and they illustrate a heating pad, the surfaces of which may be protected and finished by suitable layers of cloth. For example, the outside surface may be provided by a layer of woolen cloth or fur, whereas the inside surface may be protected by a layer of silk or satin. The heating wire 74 is woven into this heating unit in convenient fashion, so as to supply a suitable amount of heating effect to the different parts of the head, and it is deemed unnecessary to explain the same in detail.

The terminal connections for the different supplemental units such as sandals, gauntlets, etc., may be connected to the one garment, but will depend largely upon the wishes of the designer and manufacturer, and in Fig. 3, we have illustrated a very convenient form of arrangement. As shown in this figure, there are the companion pads 75 and 76. The pad 75 is provided with the upstanding buttons 77 and 78 to which the terminal wires 79 and 80 of the cable are connected, and the pad 76 is provided with the cap buttons 81 and 82 to which the wires 83 and 84 of the supplemental garment are connected. By snapping the pad 76 down onto the pad 75 the two wires 83 and 84 are simultaneously connected to the wires 79 and 80 respectively so as to establish the complete connections.

If desired, the bottom and top faces of the pad 75 and 76 may be protected by suitable coverings such as layers of cloth or the like, but we did not illustrate the same since they will be well understood and appreciated in the art.

Reference particularly to Fig. 1 will instantly show the very convenient manner in which the different supplemental units can be connected to the main garment. In this figure one gauntlet and one sandal are connected to their respective garment terminals, and the other gauntlet and sandal are shown close to the main garment, but unconnected.

While we have herein shown and described only certain embodiments of the features of our present invention, still we do not intend to limit ourselves to the same, except as we may do so in the claim.

We claim:

As a new article of manufacture a garment for the purpose specified comprising a woven garment adapted to cover the body, legs and arms of the wearer, and a series of separate individual, self-contained, heating pads, permanently secured to the inside face of said garment at points for the individual protection and heating of selected portions of the body of the wearer, each of said pads having a border portion which is substantially free of heating wires and adapted to receive the attaching threads whereby said pad is attached to the garment, each pad being suitably shaped and conforming to the body of the wearer at the point to be heated, each individual pad being provided with suitable electrical conductors for heating current, and a series of conductors on the garment serving for the supply of current to various pads, substantially as described.

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