

May 30, 1950

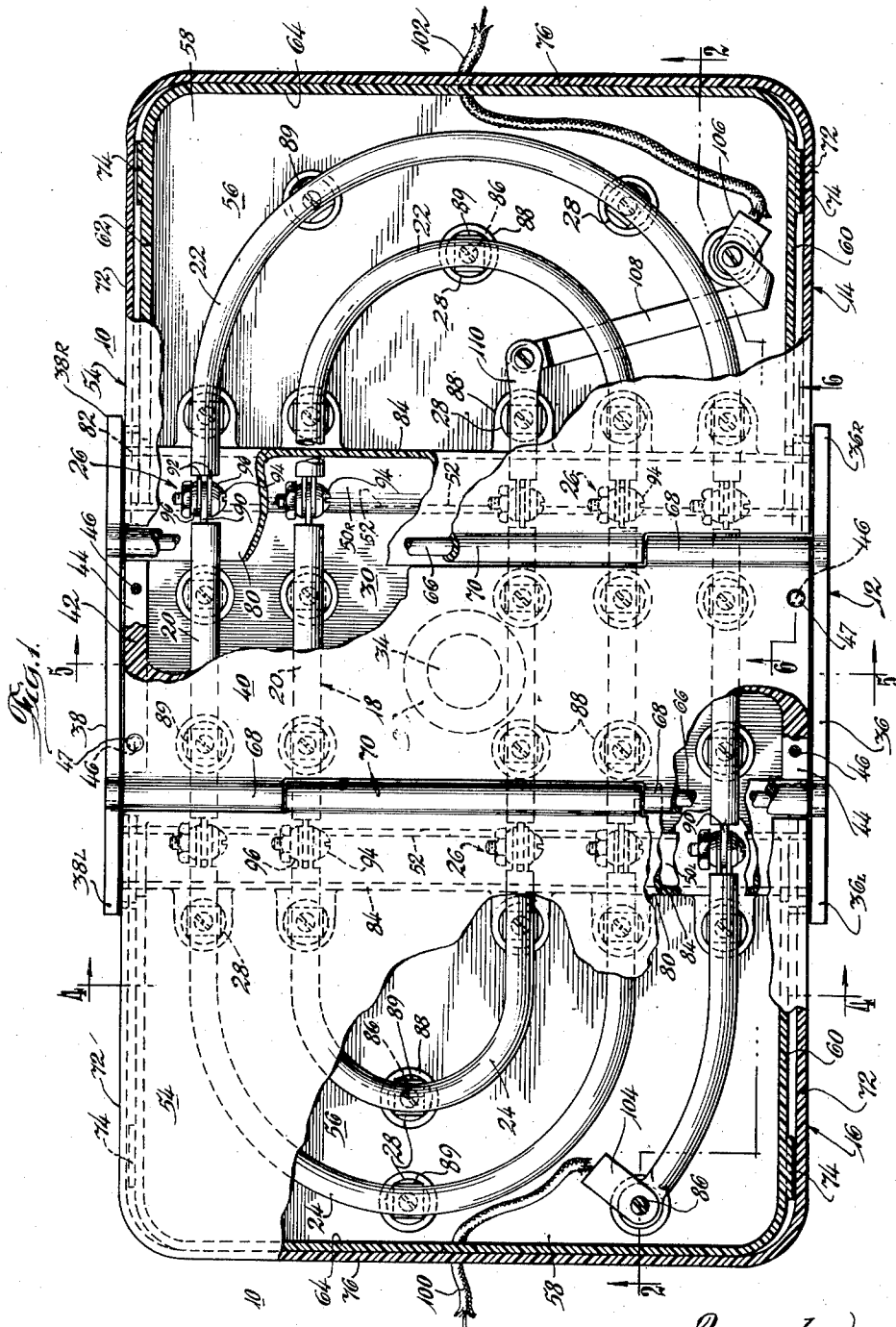
O. R. BOWERS

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HIGH-FREQUENCY DIATHERMY APPLICATOR

Filed Nov. 27, 1946

4 Sheets-Sheet 1



Inventor:  
**Oscar R. Bowers**  
By *Hinkle, Horton, Adlberg, Hausmann & Krupper*  
Attorneys.

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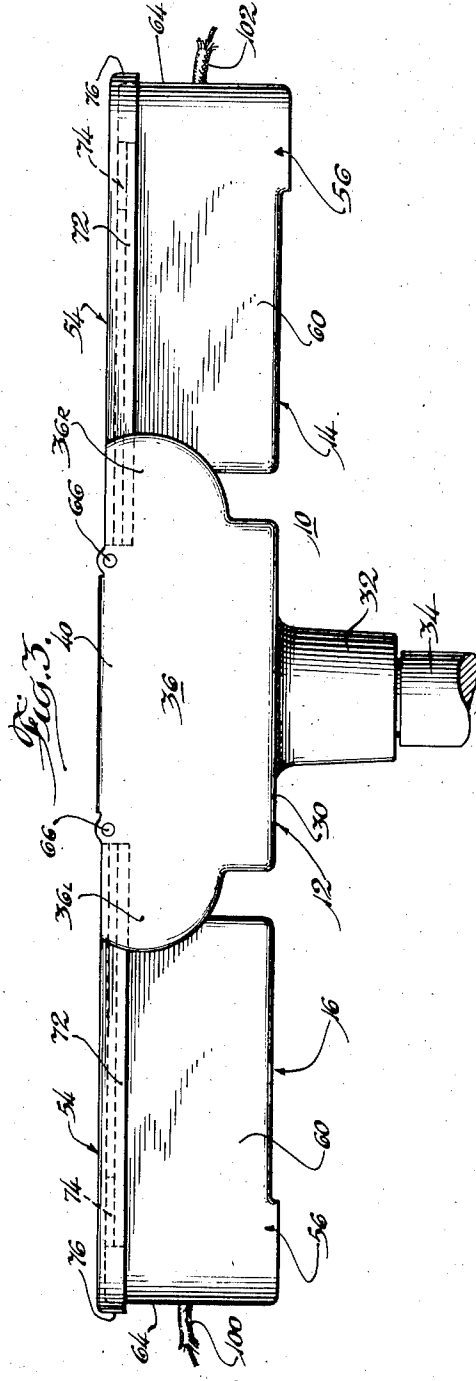
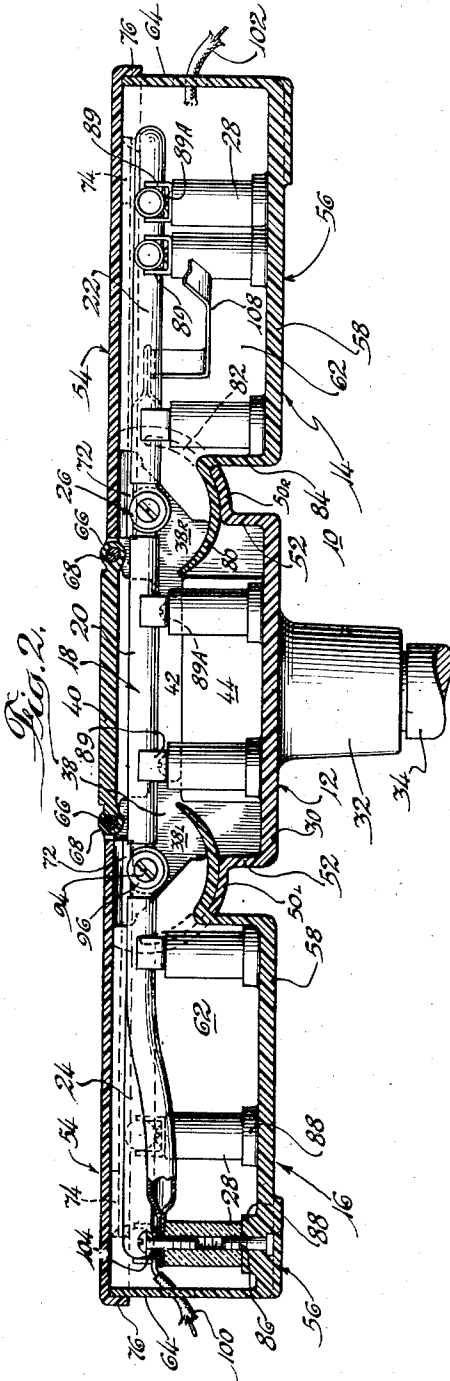
O. R. BOWERS

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HIGH-FREQUENCY DIATHERMY APPLICATOR

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4 Sheets-Sheet 2



Inventor:  
**Oscar R. Bowers**  
*By Hinkle, Horton, Ahlberg, Hansen & Wupper*  
 Attorneys.

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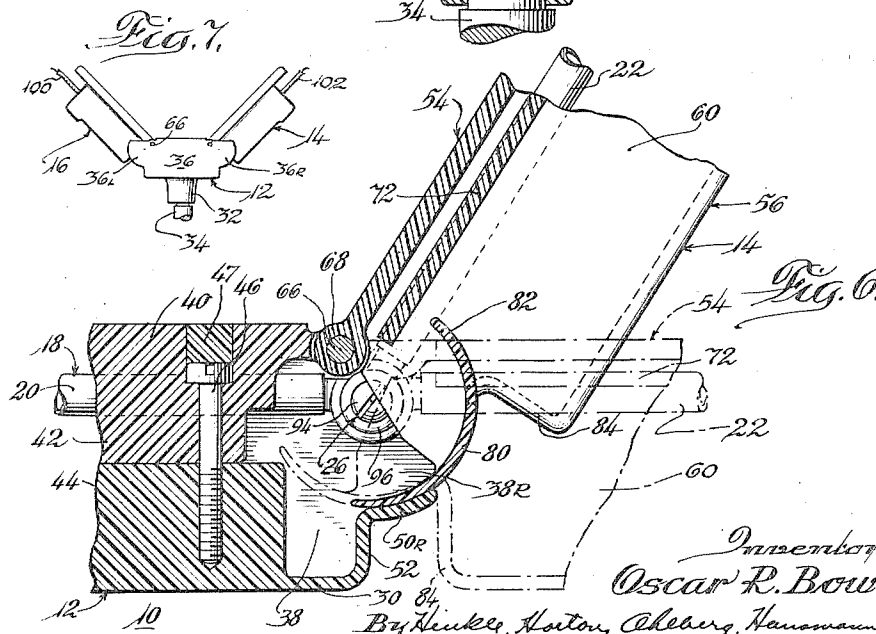
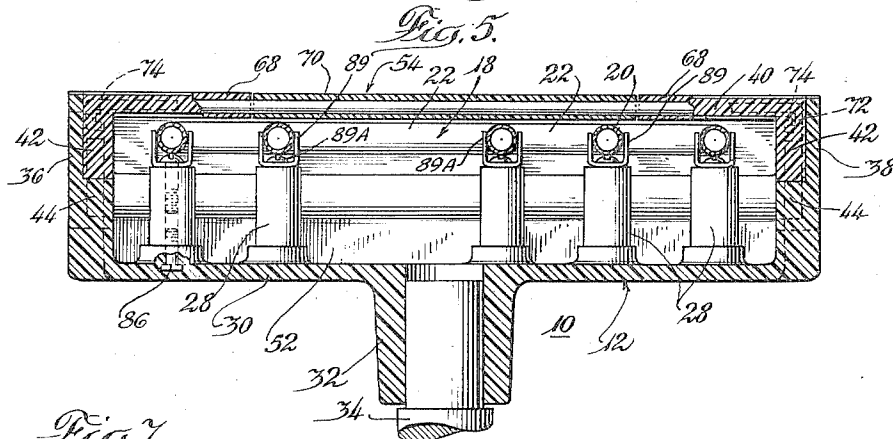
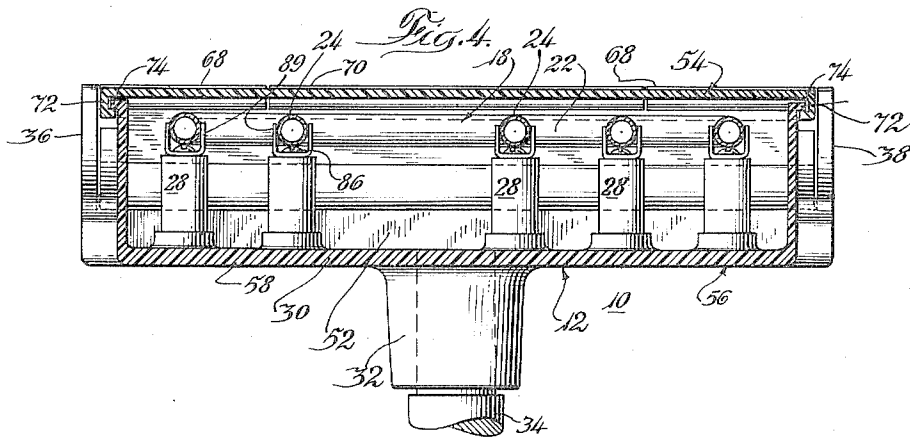
O. R. BOWERS

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HIGH-FREQUENCY DIATHERMY APPLICATOR

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4 Sheets-Sheet 3



Inventor:  
Oscar R. Bowers  
By Hinkle, Norton, Albarg, Hansmann & Wipper  
Attorneys.

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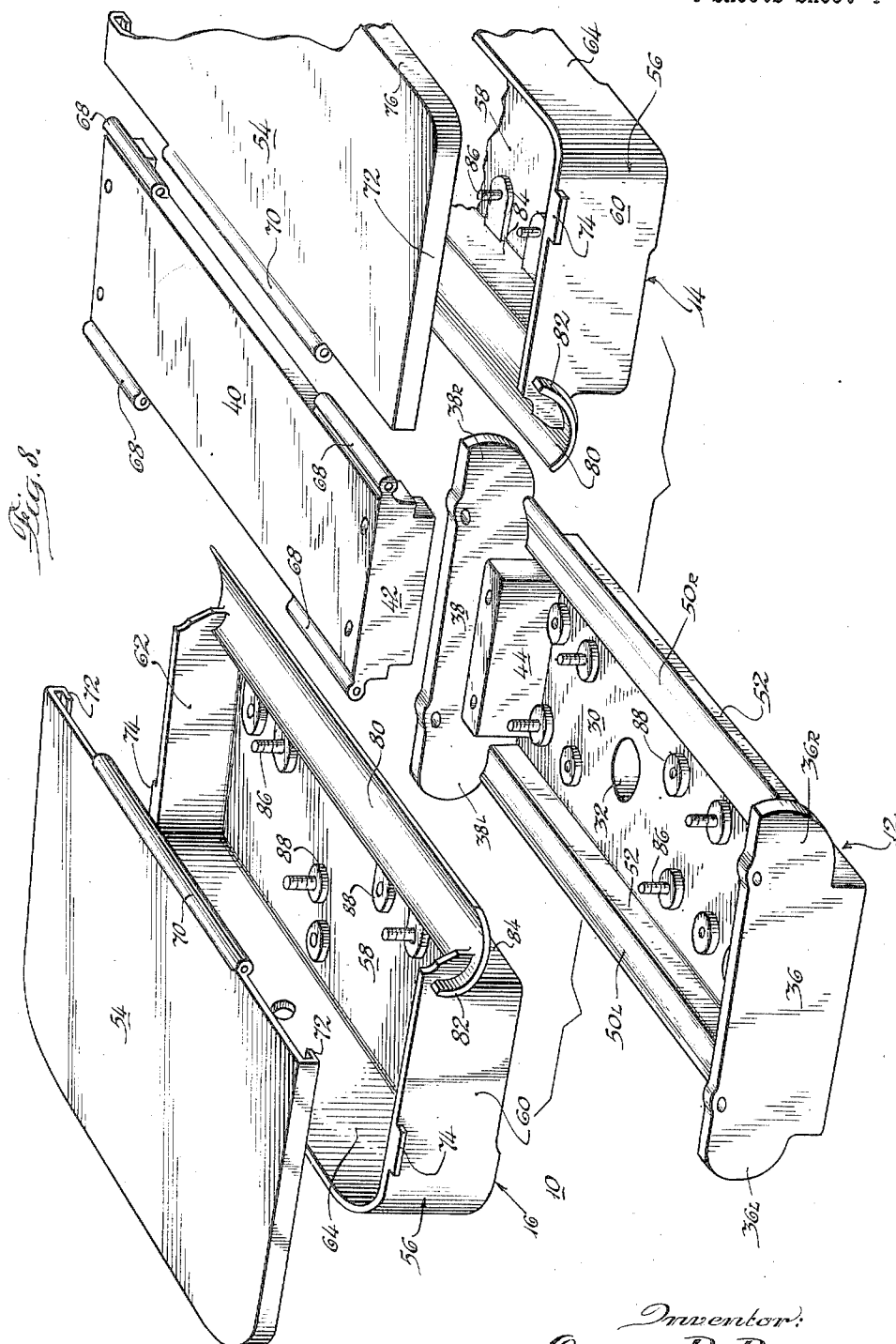
O. R. BOWERS

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HIGH-FREQUENCY DIATHERMY APPLICATOR

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4 Sheets-Sheet 4



Inventor:  
**Oscar R. Bowers**  
By *Thiele, Horton, Ahlberg, Hausmann & Krupper*  
Attorneys.

## UNITED STATES PATENT OFFICE

2,509,417

HIGH-FREQUENCY DIATHERMY  
APPLICATOROscar R. Bowers, Milton, Wis., assignor to The  
Burdick Corporation, Milton, Wis., a corpora-  
tion of Delaware

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4 Claims. (Cl. 128-405)

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The present invention relates to a high frequency diathermy applicator or, as it is sometimes called, an electrode which is particularly designed for use in diathermy treatment of individuals.

The primary object of the present invention is to provide a new and improved high frequency diathermy applicator.

A further object of the present invention is to provide a new and improved adjustable and highly efficient diathermy applicator.

A further and more specific object of the present invention is to provide an adjustable high frequency diathermy applicator comprising a sectionalized housing within which is mounted a single coil and which is so constructed and arranged that the diathermy effect is substantially evenly distributed over the face of the applicator and remains substantially uniform throughout the various positions of adjustment.

A further object of the present invention is to provide a new and improved therapeutic applicator of sectionalized construction wherein the several sections are hingedly secured relative to each other by the coil.

A further object of the present invention is to provide a new and improved high frequency applicator including a coil which is mounted close to the face of the applicator and is therefore most effective and, furthermore, wherein the heat generated in the applicator is conducted away from the inner face and to the back of the applicator, thereby minimizing the danger of burning the patient during treatment.

Other objects and advantages of the present invention will become apparent from the ensuing description of an embodiment, in the course of which reference is had to the accompanying drawings, in which:

Fig. 1 is a top plan view, partly broken away, illustrating an applicator constructed in accordance with the invention;

Fig. 2 is a longitudinal transverse cross sectional view taken along the staggered line 2-2 of Fig. 1;

Fig. 3 is a side elevational view of the applicator;

Fig. 4 is a transverse cross sectional view taken along the line 4-4 of Fig. 1;

Fig. 5 is another transverse cross sectional view taken along the line 5-5 of Fig. 1;

Fig. 6 is an enlarged fragmentary cross sectional view taken along the staggered line 6-6 of Fig. 1, illustrating the center and outer sections of the applicator at an angle with respect

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to each other instead of in line as illustrated in the preceding figures;

Fig. 7 is an end elevational view on a reduced scale illustrating the applicator in adjusted position to fit about a curved part of the body; and

Fig. 8 is an exploded view of the applicator illustrating the various parts of the sectionalized housing and omitting the coil and certain of its supporting structure (including certain screws which are molded into the housing sections).

The high frequency applicator illustrated in the drawings is indicated as a whole by reference character 10. It is characterized by its sectionalized construction and in the preferred embodiment of the invention illustrated, it includes a plurality of relatively movable sections comprising a center section 12 and end sections 14 and 16 which are of similar but opposite construction for attachment to opposite sides of the center section. These sections are made of some suitable insulating material, preferably Bakelite, and they may be constructed in any suitable manner, as by casting.

In accordance with one of the features of the present invention, a single plural convolution high frequency tubular coil 18 is housed within the multiple section housing. This coil contains but a relatively few convolutions or turns and these are distributed over the greater portion of the applicator, thereby to provide a uniform distribution of the diathermy current. In accordance with another of the features of the invention, the coil is utilized hingedly to support the sections of the applicator relative to each other. Accordingly, the coil is divided into center, right and left, as viewed in Fig. 1, sections 20, 22, and 24. The sections are joined by electrically conductive hinges, illustrated by the reference character 26 and the specific construction of which will be described in greater detail hereinafter.

In accordance with still another feature of the present invention, the coil 18 is supported near the face of the applicator in order that it be located as close as possible to the patient and be most effective in use. In order to make this possible, the heat generated in the coil by electrical losses is conducted away from the patient and coil to the outer or back side of the applicator by the coil supports 28 which are secured (as will be described shortly) to the outer side of the various housing sections.

The construction of the individual housing sections will now be described. The center section 12 includes a bottom wall 30, the lower side of which has projecting from it an integral boss

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32 recessed for the reception of an applicator holder 34, which may be part of the diathermy apparatus.

The center section includes also end walls 36 and 38 and a separable cover 40 having downwardly extending lugs 42 adapted to set upon bosses 44 extending inwardly from the end walls 36 and 38. The lugs and bosses are of a height such that when the applicator is flat, as illustrated in Fig. 2, the cover 40 is substantially at the same elevation as the covers of the end sections. The cover of the center section 12 is adapted detachably to be secured to the bottom wall 30 of the section in suitable manner, such as by the screws 46, passing through the cover and its downwardly extending lugs 42 into the bosses 44, and covered by plugs 47 (see Fig. 6).

In order to maintain the housing closed in the various positions of angular adjustment of the applicator, the end walls of the center section are provided with wings 36L and 36R and 38L and 38R and arcuate flanges 50R and 50L are connected to the bottom by short upright portions 52, as best illustrated in Figs. 2 and 8. The wings and flanges cooperate with portions of the end sections to keep the housing closed for the various positions of adjustment as will appear shortly. The flanges 50 interconnect the wings 36R and 38R and the wings 36L and 38L, which also terminate in arcuate portions following the arc of the flanges.

The end sections 14 and 16 are alike in construction and therefore only one, the right one 14, will be described in detail and the same reference characters applied to both to illustrate the like parts. The end section includes a top or cover 54 movably mounted, for a purpose which will appear shortly, relative to the cooperating housing member 56 having a back 58, side walls 60 and 62 and an end wall 64. The cover 54 is hingedly secured to the cover 40 of the center section by a hinge pin 66 (see Figs. 1 and 6) adapted to pass through the hinge pin receiving portions 68 in the center cover 40 and 70 in the end cover 54.

In the illustrated embodiment of the invention, the cover 54 is guided relative to the outer part 60 by the downwardly extending and intumed side flanges 72 in the cover, which slidably receive guide lugs 74 at the upper edge near the tops of the walls 60 and 62. The cover also has a downwardly extending flange 76 at its end, which is not intumed but which does serve more completely to close the housing.

The coil carrying portion of the end section moves pivotally about the hinges 26 which are, as best illustrated in Figs. 2 and 6, located somewhat below and to one side of the hinge pin 66. As the end section is moved angularly, the cover moves pivotally about the axis defined by the hinge pin while the remainder moves about an axis defined by the hinges. Inasmuch as these two axes are displaced, it is necessary for the cover to move relative to the other part and this is the reason for the use of the above-described construction permitting such relative movement.

In order to maintain the housing closed in the various positions of adjustment, the outer section is also provided with an arcuate flange 80 cooperating with the flange 50. The flange 80 is provided with arcuate extensions 82 which serve to close the space between the wings 36R and 38R, the end sections being preferably made somewhat narrower than the center section. The respective flanges 80 are also located somewhat

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above the respective bottoms 58 and in effect constitute flanges extending from the respective vertical walls 84 extending upwardly from the respective bottoms 58. It may be mentioned that the flanges 50 and 80 have their respective centers of rotation at the respective axes of the hinges 26.

The coil is rigidly supported near the top of the applicator by the coil supports 28, to which reference has already been made. These supports are preferably made of heat conducting insulating material and are secured to the back walls of the individual sections by screws 86 molded with the bosses 88 extending away from the wall, as best illustrated in Fig. 2. The coil is secured to the coil supports in suitable manner. Preferably, a coil receiving generally U-shaped bracket 89 is secured to the top of each support. This can conveniently be done by means of a screw 89A, as again best illustrated in Fig. 2. The coil is suitably secured to the brackets as by brazing.

The coil hinges 26 include tongues 90 at the opposite ends of the center coil sections 20 and the groove defining members 92 at the adjacent ends of the coil sections 22 and 24. Each hinge includes also a screw bolt 94 passing through apertures in the tongue and groove-defining portions of the coil and good contact is provided by the generally concavo convex washers 96.

High frequency current is supplied to the coil through the leads 100 and 102, (which may be covered with requisite insulation—not shown) the former of which is connected to a terminal 104 connected in turn to the outer end of the coil, as best illustrated in Fig. 1. The lead 102 is connected to a terminal 106, which is connected by a downwardly extending bus or strap 108 to a terminal 110 connected to the inner end of the coil, which is located near the center of the right coil section 22.

In operation, high frequency current is supplied to the applicator through the leads 100 and 102 from the diathermy apparatus. The applicator is placed over that portion of the patient's body which it is desired to treat. If the portion is relatively flat, such as the back of the patient, the applicator will be adjusted to be substantially flat as it is illustrated in Fig. 3. If the portion of the body to be treated is rounded, such as the arm or leg or head of the patient, the sections of the applicator are adjusted to conform to the nature of the portion of the body being treated. One position of adjustment has been illustrated in Fig. 7.

One of the advantages of the applicator is that it is readily adjusted and the use of a single coil having its convolutions distributed over the area of the applicator insures substantially even distribution of the diathermy effect over the applicator. Furthermore, the effect remains substantially uniform throughout the various positions of adjustment. This is a considerable advantage, especially in the treatment of various portions of the face, as in the treatment of sinus conditions.

Even though the coil is located near the face of the applicator, i. e., that portion of it closest the patient, the patient will not be harmed by the heat generated in the coil. This results in the fact that the heat is conducted toward the back of the applicator through the coil supports 28.

Another advantage of the applicator is its complete closure in all positions of adjustment so that neither the patient nor the operator can come into contact with the coil.

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While but a single embodiment of the invention has been illustrated and described in detail, it should be understood that the specific details thereof are not intended to be limitative of the invention except in so far as set forth in the accompanying claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A high frequency diathermy applicator comprising a sectionalized housing, the sections being hinged together for relative movement and each having a face of application, and a high frequency conductor within said housing arranged in the form of a single spiral having a portion substantially uniformly distributed in each section and all parts of the conductor constituting each portion being equidistant from the face of the associated section.

2. A high frequency diathermy applicator comprising a housing consisting of a plurality of separate sections, each section having side and back walls and an open face and the sections being hingedly secured together in side by side relation by hinges back of the open faces thereof, a high frequency coil contained within said housing, said coil having portions distributed in each of the sections, covers individual to each housing section to enclose the coil and form the front face of the applicator, the cover of one housing section being fixed thereto whereas the covers of the other housing sections are slidable relative to their associated sections, and hinges interconnecting the covers of the several housing sections.

3. A high frequency diathermy applicator comprising a plurality of separate sections having back and side walls and being secured together by section hinges in side by side relation to define a flexible sectionalized housing having an open

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face, the axis of hinging being spaced back from said open face, a high frequency coil having portions contained in each of the several sections, and covers enclosing the coil and forming the face of the applicator, the cover of at least one housing section being fixed thereto while the covers of the other housing sections are slidable with respect to their associated section, the sliding attachment of the covers to the sections accommodating the changing total face length of the housing incident to the folding and unfolding of the housing on the section hinges.

4. A high frequency diathermy applicator, comprising a sectionalized housing having the sections hinged together for relative movement toward and away from each other, and a single multi-convolution spiral electro-inductive coil having only a portion of each convolution located in each housing section so that each convolution is completed by coil portions in all housing sections.

OSCAR R. BOWERS.

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