Feb. 26, 1957 H. R. WARREN 2,783,346

HIGH-FREQUENCY HEATING APPLICATORS

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Fig. 1

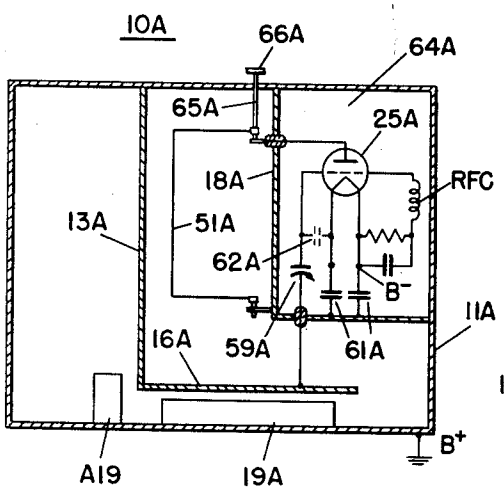


Fig. 2

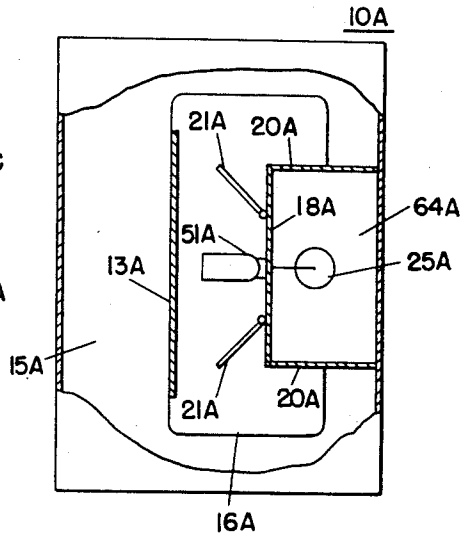


Fig. 10

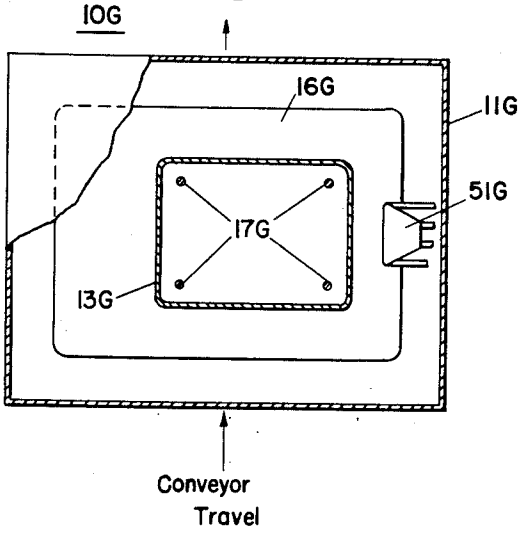
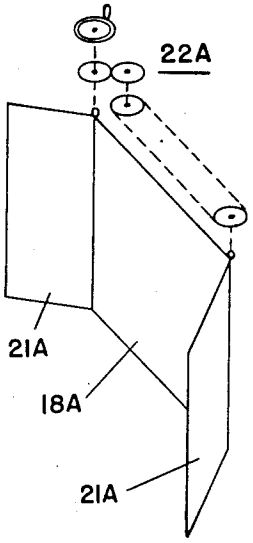


Fig. 2A



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Fig. 3

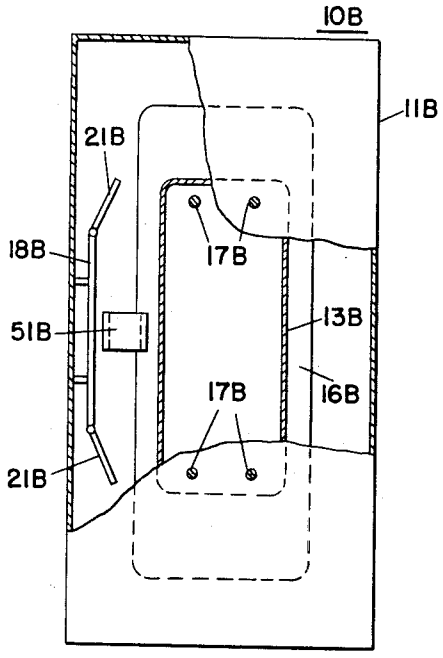


Fig. 5

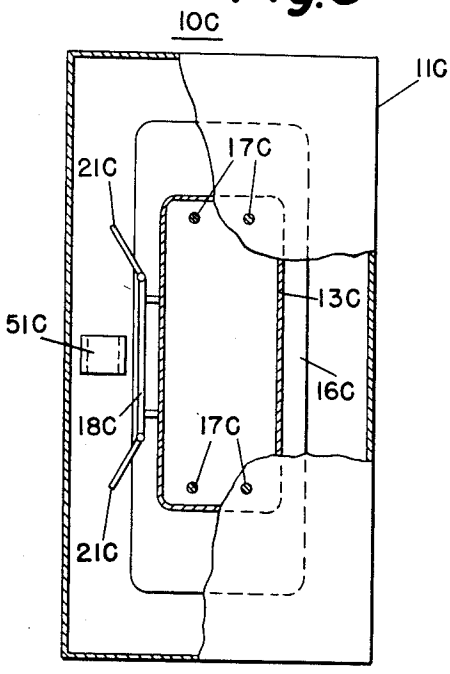


Fig. 4

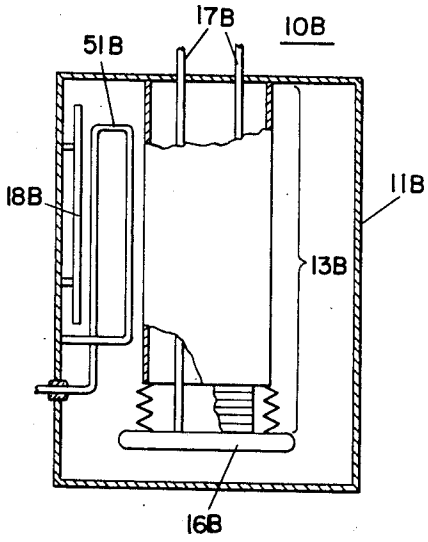
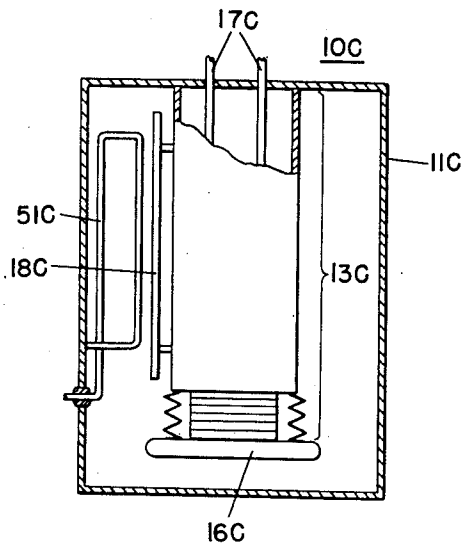


Fig. 6



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Fig. 7

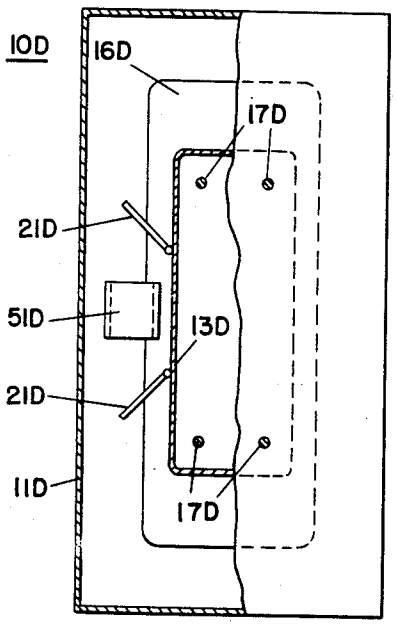


Fig. 8

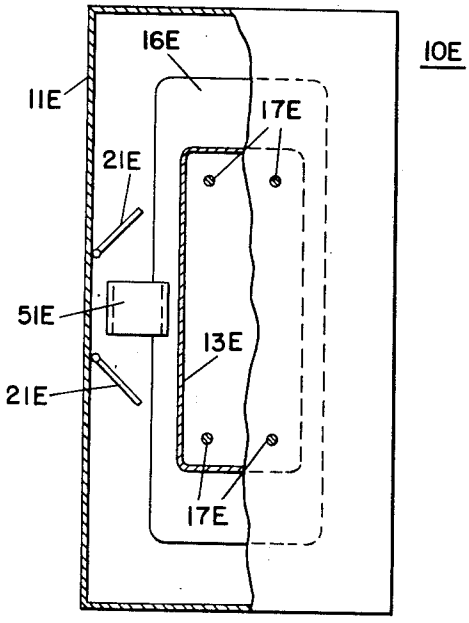
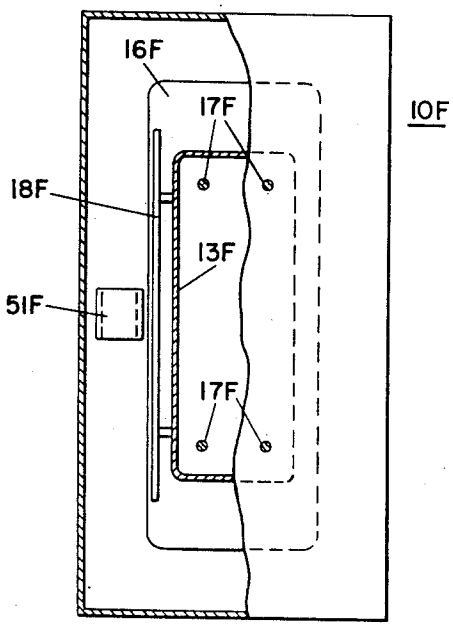


Fig. 9



United States Patent Office 2,783,346 Patented Feb. 26, 1957

2,783,346

HIGH-FREQUENCY HEATING APPLICATORS

Henry R. Warren, Columbus, Ind., assignor to National Cylinder Gas Company, Chicago, Ill., a corporation of Delaware

Application March 26, 1954, Serial No. 419,072

16 Claims. (Cl. 219—10.55)

This invention relates to high-frequency heating and particularly to resonant applicators especially suited for rapid dielectric heating of large area loads, such as foam-rubber mattresses, wallboard panels, groups of said cores or plastic preforms, and the like.

This aplication, a continuation-in-part of my application Serial No. 138,628, filed January 14, 1950, and now abandoned in favor of my continuation-in-part application Serial No. 419,633, filed March 26, 1954, has claims directed to subject matter divided from my parent application Serial No. 138,628. My aforesaid applications contain a more detailed discussion, included herein by this reference, of the structural and operating characteristics of resonant applicators of the kind to which the present invention is particularly directed.

In general, such applicators comprise relatively large electrode structures electrically interconnected through conductive structure which at least in part has substantial inductance cooperative with capacity-means including the capacitance between said electrode structures to form a resonant circuit device, and a power transfer coupling loop disposed in position to be traversed by a high-frequency magnetic field encircling a part of said interconnecting conductive structure. More particularly, in the preferred form of such applicators, the interconnecting structure includes low-resistance conductive walls of a shielding enclosure which completes the resonant circuit of said device and serves to confine said magnetic field and also the electric field produced between said electrode structures, at least one of the electrode structures being electrically interconnected with wall structure of the enclosure through a leg or fin element which reentrantly projects into the enclosure and in which a substantial part of the inductance of the resonant applicator is concentrated, and the said coupling loop being arranged to be traversed by the magnetic field encircling the inwardly projecting leg or fin element. Such loop may serve to provide for excitation by an oscillator having the loop in its anode circuit.

In accordance with the present invention, the mutual inductance of the applicator and coupling loop is determined by conductive structure which controls the magnetic flux distribution or density in the vicinity of the coupling loop. Such conductive structure may, in whole or in part, be stationary to serve as a flux guide or it may, in whole or in part, be movable to serve as a flux gate.

In most cases, particularly when the applicator is the frequency-determining element of an oscillator system, it is preferable that the flux-controlling structure be constructed and arranged so as to obtain a flux distribution in the vicinity of the loop such that the mutual inductance will be in the supraoptimum range as taught and broadly claimed in my aforesaid parent applications and as hereinafter discussed in detail. More particularly, when in such cases the variation in mutual inductance is effected by movement of flux gate structure, or by variation of the effective area of the loop, or by both, such variation

should be entirely within the supraoptimum range for stabilization of the heating electrode voltage. On the other hand, when only flux guide structure is provided, the effective loop area may be variable to adjust the electrode voltage, as taught in my aforesaid parent applications, certain features of which teachings are more particularly set forth and claimed in my application Serial No. 419,074, filed March 26, 1954, as a divisional continuation-in-part of said application Serial No. 138,628. The flux guide structure is preferably used to define a limit of variation of mutual inductance which is entirely within the supraoptimum range.

The invention further resides in features of construction, combination and arrangement hereinafter described and claimed.

For a more detailed understanding of the invention and for illustration of various embodiments thereof, reference is made to the accompanying drawings, in which:

Fig. 1 is a sectional view of a resonant applicator and associated oscillator system;

Fig. 2 is a top plan view, in part broken away, of the applicator of Fig. 1;

Fig. 2A is a perspective schematic view of a flux-gate arrangement and operating mechanism therefor;

Figs. 3 and 4 are top plan and elevational views, in part broken away and partly in section, of a modification of the applicator of Figs. 1, 2;

Figs. 5 and 6 are top plan and elevational views, in part broken away and partly in section, of another modification; and

Figs. 7 to 10 are top plan views, in part broken away, of further modifications.

In the embodiment illustrated in Figs. 1 and 2, the reentrant resonant applicator **10**A comprises a housing **11**A of sheet metal, or the like, forming a tunnel with conductive walls. The heating electrode **16**A which may be of substantial length and width, is disposed within the tunnel in spaced relation to the wall structure thereof. This upper electrode hereinafter referred to as the "hot" electrode, is supported from and connected to the upper wall of the housing **11**A by a reentrantly extending conductive fin structure **13**A. The bottom wall of the tunnel may serve as the "cold" electrode **15**A. Alternatively, the lower electrode may be an auxiliary conductive member, movable or stationary, conductively connected or otherwise coupled to the tunnel wall structure. In such latter cases, the connection or coupling of the lower electrode to the wall structure may be effected through a second fin structure, or equivalent, as in certain of the constructions disclosed in my aforesaid parent applications.

In the illustrated construction, all, or practically all, of the inductance of the resonant applicator is concentrated in the conductive fin **13**A and all, or practically all, of the capacitance of the applicator is that between the electrodes **15**A, **16**A, so that the resonant frequency of the applicator is predominantly determined by the inductance of the fin and the capacitance between the electrodes. In the applicator as thus far described, the wall structure of housing **11**A serves as a path of very low resistance and very low reactance for the circulating current between the lower heating electrode **15**A and the upper end of fin **13**A.

Because of the low resistance of the fin, of the heating electrodes and of the wall structure, the unloaded Q of the applicator is very high. Because of their high-frequency, the circulating currents are practically confined to the inner surfaces of the applicator housing or tunnel and consequently all external surfaces are at ground potential and serve as a radio-frequency shield for the internal components which are at high radio-frequency po-

tential. As a result, the radiation losses are low, which minimizes radio interference and further contributes to high Q of the tunnel so making it uniquely suitable for dielectric load materials having very low power-factor, such as foam rubber, extruded rubber hose or gaskets, as well as for materials having high power factor, such as wood.

With this, as with other embodiments hereinafter described, either or both ends of the applicator housing may be provided with doors or covers which may be movable or removable for insertion or removal of work and which may be closed to minimize interference to sensitive radio-receiving equipment. Partial end closures, leaving an unobstructed path communicating with the interelectrode space for insertion or removal of work from either end of the housing or for continuous flow of work, may be provided in manner discussed in said parent applications. When the tunnel has end walls, partial or complete, the edges or sides of the fin inductor must be spaced therefrom to leave an unobstructed path about the fin inductor for the fin flux, or high-frequency magnetic field.

The resonant applicator 10A, like others hereinafter described, is inductively coupled to a high-frequency exciting source by a power-transfer loop 51A which is disposed within the tunnel and threaded by the high-frequency magnetic field or flux encircling the fin inductor 13A. The loop 51A is preferably and usually a single turn loop. This loop is adjustable, as by control knob 66A having an insulated shaft 65A, to vary its effective area normal to the flux lines, so to permit smooth variation of the mutual inductance of the resonant applicator and the coupling loop. For reasons later herein more fully discussed, the range of adjustment of mutual inductance, however effected, is preferably entirely in the "supraoptimum" range.

The fin structure 13A is offset laterally with respect to the applicator housing 11A to accommodate the shielding enclosure or compartment 64A which houses the oscillator tube 25A and associated circuit components. The loop 51A extends from shielding compartment 64A into the magnetic flux path of the fin structure 13A to couple the resonant applicator to the anode circuit of the tube.

The shielding compartment 64A also serves as a flux baffle or guide which produces a localized distortion of the magnetic field so as to increase the flux density in the vicinity of the coupling loop 51A and thereby increasing the mutual inductance for a given size loop. In effect, and as best shown in Fig. 2, the front and side walls 18A, 20A, 20A of compartment 64A serve as an inwardly recessed or concave side wall of housing 11A which constricts the flux path between the fin 13A and the wall from which loop 51A extends, thereby producing a concentration of the flux in the vicinity of the loop. Thus the mutual inductance is much greater than if housing 64A were exterior of housing 11A with loop 51A extending into the correspondingly greater flux space. If for any reason, it is desired to provide flux path restriction also on the other side of the fin or elsewhere within the housing, similar inwardly projecting baffle or guide structure may be there provided. Additionally, any of such structures may be provided with configurations such as to produce any desired contour of the flux path.

The enhanced mutual inductance so obtained by increasing the flux density in the vicinity of loop 51A may be varied to adjust the potential of the heating electrode 16A by angular adjustment of loop 51A so to vary its effective area as presented to the flux lines. Alternatively, or in addition, for greater range of electrode-voltage control, the flux-guide afforded by front wall 18A of compartment 64A may be provided with angularly adjustable metal plates 21A (Fig. 2) which serve as flux gates and are operable to vary the ratio between the effective area of the loop and the cross-sectional area of the flux path in the vicinity of the loop. That cross-sectional area is the area subtended by the loop 51A between said inductance element 13A and the opposing wall structure 18A of the housing 10A. Increasing such ratio increases the mutual inductance between the loop and the applicator. The gates may be solid or perforate.

As gates 21A are swung from the position shown toward flux guide 18A, more and more of the available fin flux is directed through the area of loop 51A. The mutual inductance is thus increased so to effect a reduction in potential of electrode 16A—assuming the mutual inductance is in the supraoptimum range. Conversely, as gates 21A are swung toward fin 13A, there results a localized distortion of the flux path such that more and more of the magnetic flux is diverted from the loop area with consequent decrease in the mutual inductance coupling and increase of the heating electrode potential. The gates 21A are preferably ganged for adjustment in unison as by external mechanical coupling between actuating shafts extending through the top wall of housing 11A. Such arrangement, schematically illustrated by mechanism 22A, Fig. 2A, may also be used in subsequently described modifications.

For reasons fully discussed in my aforesaid parent applications, it is of particular advantage in dielectric heating to maintain the mutual inductance in the supraoptimum range throughout its variation by adjustment of loop 51A and/or the flux gates 21A. It suffices here to state that under such circumstance, the heating electrode voltage for a given setting of loop 51A and of the flux gates 21A does not excessively vary with change in loaded "Q" of the applicator as would otherwise occur (in absence of supraoptimum coupling) upon change of the electrical characteristics of a dielectric load during its heating or, in a conveyor-fed applicator, of change of the number of load objects moving between the heating electrodes.

Generally speaking, to obtain high-electrode voltages suited for heating of low power-factor loads, the resonant frequency of the anode-loop circuit should be higher than and non-harmonically related to the resonant frequency of the applicator, and consequently the size of the anode loop must be restricted to meet this requirement. On the other hand, to obtain supraoptimum coupling, the loop area must be sufficiently large to be traversed by a substantial percentage of the flux encircling the fin inductance. By use of flux guide 18A, or its equivalent, supraoptimum coupling may be obtained with a relatively small loop despite large resonator dimensions and other design considerations required for heating of large area loads.

The oscillator tube 25A is shown in Fig. 1 as included in a preferred oscillator system, more fully described and claimed in my aforesaid parent applications, wherein the frequency of oscillations produced by the oscillator system is predominantly determined by the resonant applicator which forms an element of such system. The tube 25A and the associated components comprise a high-frequency power supply means having a power-delivery circuit which includes the power-transfer loop disposed within the unobstructed path of the magnetic field encircling the inductance element 13A for a transfer of such high-frequency power to the power-receiving circuit comprising the resonant applicator 10A. Briefly, the grid-excitation voltage of oscillator tube 25A is derived from the heating-electrode voltage and in a manner insuring that the percentage relation between these voltages varies automatically with the heating load to stabilize the voltage of the heating electrode. Specifically, the grid of tube 25A may be connected to the heating electrode 16A by a capacitor 59A whose reactance usually is high relative to the reactance of the effective input

capacity of the tube exemplified by capacitor **62A**. The cathode of tube **25A**, so far as the generated oscillations are concerned, is grounded through the by-pass condensers **61A**.

The radio-frequency potential of the grid of tube **25A** is thus always a fraction of the radio-frequency potential-difference between the heating electrodes and is inversely proportional to the ratio of the total reactance of the series-connected capacitors **59A**, **62A** to the reactance of the effective input capacity **62A** of tube **25A**.

With loop **51A** and/or the flux gates **21A** adjusted to provide the desired radio-frequency voltage on heating electrode **16A**, or equivalent, and with capacitor **59A** pre-adjusted or preset for proper grid-excitation, the capacity **62A** has an effective value which, as fully explained in my aforesaid parent applications, inherently varies with applicator load so that the ratio of the reactances of the capacity voltage-divider **59A**, **62A** varies automatically with load and in proper sense to stabilize the grid-excitation.

With such preferred oscillator arrangement, including supraoptimum coupling, there is essentially uniform heating of the load regardless of variations in the load density (i. e., number of size of objects being heated), whereas otherwise the heating rate would vary greatly with load density causing arcing and excessive grid-excitation to occur at light loads. With the mutual inductance preadjusted to provide the desired heating-electrode voltage, and when both the potential-divider **59A**, **62A** and supraoptimum coupling are incorporated, the grid current remains practically constant over a wide range of load-circuit power-factors, so eliminating need for constant supervision by an operator, or by auxiliary controls, to insure safe and efficient operation of the oscillator tube as well as safe and uniform heating of the load.

It is to be understood that all of the foregoing is also applicable to the modifications hereinafter described. For brevity, corresponding components are identified by the same reference numbers but with letter suffixes identifying the particular modification.

With the offset fin-electrode arrangement shown in Fig. 1, work objects A19, **19A**, of different heights may be heated without raising or lowering of the heating electrodes **16A**. However, for most uses, it is desirable, as shown in Figs. 3 to 10, that provision be made for varying the electrode spacing to accommodate work objects of different height or to vary the spacing between the work and the "hot" electrode.

Referring to Figs. 3 and 4, the "hot" electrode **16B** of resonant applicaton **10B** may be raised and lowered by rods **17B** which, as more fully described and claimed in my copending application Serial No. 419,070, filed March 26, 1954, are disposed within the hollow fin inductance **13B**. The rods **17B** may be moved vertically by any suitable mechanism.

In this modification, the flux-guide **18B** is an auxiliary conductive structure or plate supported by insulators between the coupling loop **51B** and the adjacent side wall of the applicator housing **11B**. The flux gates **21B** are pivotally mounted on flux-guide **18B** in the vicinity of the coupling loop and on opposite sides thereof for variably distorting the flux path so as to effect adjustment of the mutual inductance. As the flux gates **21B** are swung from the position shown (Fig. 3) toward the fin **13B**, more of the high-frequency magnetic flux of the fin is diverted from that region of the space between the flux-guide and the fin in which the coupling loop is disposed, so to decrease the mutual inductance. Conversely, as the flux gates **21B** are swung toward the supporting wall of housing **11B**, more of the total fin flux is concentrated through the loop space between flux-guide **18B** and fin **13B** so as to increase the mutual inductance.

In the modification shown in Figs. 5 and 6, the flux-guide **18C** is an auxiliary conductive structure or plate supported by insulators between the coupling loop **51C** and the fin structure **13C**. The flux gates **21C** are mounted on the flux-guide **18C** and are respectively on opposite sides of the coupling loop **51C**. As the flux gates **21C** are swung from the position shown (Fig. 5) toward the fin inductor **13C**, more of the high-frequency magnetic flux of the fin is directed into the space between the flux-guide **18C** and the adjacent wall of housing **11C** so to increase the mutual inductance of the applicator and the coupling loop. Conversely, as the flux gates are swung away from the fin **13C**, more of the flux is diverted from the coupling loop space and into the space between the flux-guide **18C** and the fin **13C** so to decrease the mutual inductance.

In the modification shown in Fig. 7, the flux gates **21D** are pivotally mounted on the fin structure **13D** on opposite sides of the coupling loop **51D**. As the flux gates **21D** are swung away from the position shown toward the fin **13D**, more of the fin flux traverses the coupling loop and so increases the mutual inductance. As the flux gates **21D** are swung away from the position shown toward the side wall of applicator housing **11D**, more of the fin flux is diverted from the coupling loop with consequent decrease of the mutual inductance.

In the modification shown in Fig. 8, the flux gates **21E** are pivotally mounted on a side wall of applicator housing **11E** in the vicinity of coupling loop **51E** and on opposite sides thereof. As the flux gates **21E** are moved away from the position shown toward the fin inductor **13E**, more of the high-frequency magnetic flux of the fin is diverted from the coupling loop so to decrease the mutual inductance. Conversely, as the flux gates **21E** are swung toward the applicator wall, more of the fin flux traverses the coupling loop **51E** so increasing the mutual inductance.

In the modification shown in Fig. 9, the flux-guide **18F** is supported by insulators between the coupling loop **51F** and fin inductor **13F** and is of such length that part of the total fin flux is always diverted into the space between the flux-guide **18F** and the fin **13F** correspondingly to reduce the value of mutual inductance otherwise existing between the resonant applicator and the coupling loop. By selection of the length of the flux-guide and/or its spacing from the fin, the percentage of fin flux diverted can be adjusted to obtain the desired mutual inductance without redesign or reconstruction of the loop, applicator housing and fin arrangement.

For variation of the mutual inductance, the effective loop area may be varied by any suitable arrangement including those disclosed in my aforesaid application Serial No. 419,074, and in my said parent applications or the cross-sectional area of the flux space between the fin structure and the opposite housing wall may be distorted or varied by flux gates mounted on the guide, generally as in Fig. 5, or upon the tunnel wall, generally as in Fig. 8. Either such expedient is effective to afford variation in the ratio between the effective area of the loop and the cross-sectional area of the flux space subtended by the loop. The last-named flux space is the space between the fin structure and the opposing wall structure (whether that wall structure be the housing wall **11D** of Fig. 7 or whether it be the compartment wall **18A** of Fig. 1), with upper and lower limits corresponding with those of the loop.

In the modification shown in Fig. 10, the box fin inductor **13G** is offset with respect to the applicator housing **11G** so that the flux density is greater in that region of the flux space in which the loop is disposed than elsewhere around the fin. Thus for given dimensions of the loop, fin inductor and applicator housing, the mutual inductance is greater than for a more central location of the fin inductor. In this embodiment, the concentration of flux in the vicinity of the coupling loop is effected by relative location of conductive structures of the essential components of the applicator rather than by addition of auxiliary conductive structure.

As will be seen from the foregoing, by the provision of flux-guides, or flux-gates, or a combination of them, wide latitude in the determination or control of the flux density and contour of the flux path is afforded. Also such flux-controlling or determining elements may be comprised of portions of the structure of the applicator or by auxiliary conductive structure.

What is claimed is:

1. A resonant high-frequency heating device comprising conductive walls defining a reentrant resonator, metallic fin structure extending from a first of said walls and spaced from the other walls to provide the inductance of the resonator, an electrode disposed at and electrically connected to the free end of said fin structure in spaced relation to the resonator wall opposite said first wall to provide the capacitance of the resonator, a stationary coupling loop disposed in the resonator space which encircles said fin structure for exciting the resonator to create an electromagnetic field whose lines of flux will encircle the fin structure and link with the coupling loop, and means for modifying the mutual inductance of said loop and resonator comprising a stationary conductive plate structure substantially parallel to the fin structure and disposed in said space adjacent said coupling loop to serve as a flux guide to alter the concentration of magnetic flux linked by the coupling loop.

2. A resonant high-frequency heating device comprising conductive walls defining a reentrant resonator, metallic fin structure extending from a first of said walls and spaced from the other walls to provide the inductance of the resonator, an electrode disposed at and electrically connected to the free end of said fin structure in spaced relation to the tunnel wall opposite said first wall to provide the capacitance of said resonator, a stationary coupling loop disposed in the resonator space which encircles said fin structure, and means for modifying the mutual inductance of said loop and the resonator, said means comprising conductive plate structure disposed in said space adjacent said coupling loop and consisting in part of stationary plate structure substantially parallel to the fin structure to serve as a flux guide and in part consisting of structure movable to serve as a flux gate.

3. In a resonant high-frequency heating device, a reentrant resonator having conductive walls, a metallic fin structure extending from a first of said walls and spaced from the other walls to provide the inductance of said resonator, a heating electrode disposed at and electrically connected to the free end of said fin structure in spaced relation to the resonator wall opposite said first wall to provide the capacitance of said resonator, a stationary coupling loop disposed in the resonator space which encircles said fin structure for exciting the resonator to create an electromagnetic field whose lines of flux will encircle the fin structure and link with the coupling loop, and conductive plate structure for modifying the mutual inductance of said loop and the resonator comprising at least one movable plate element disposed in said resonator space adjacent said coupling loop to vary the percentage of total magnetic flux linked by the coupling loop.

4. A resonant high-frequency heating device comprising conductive walls defining a reentrant resonator, metallic fin structure extending from a first of said walls and spaced from the other walls to provide the inductance of the resonator, an electrode disposed at and electrically connected to the free end of said fin structure in spaced relation to the resonator wall opposite said first wall to provide the capacitance of the resonator, a coupling loop disposed in the resonator space which encircles said fin structure for exciting said resonator to create an electromagnetic field whose lines of flux will encircle said fin structure and link with said coupling loop, and means for modifying the mutual inductance of said loop and said resonator comprising conductive plate structure disposed in said space adjacent said coupling loop

to alter the concentration of magnetic flux linked by said coupling loop.

5. A resonant high-frequency heating device as in claim 4 in which the conductive plate structure is supported by the resonator wall between which wall and the fin structure said coupling loop is disposed.

6. A resonant high-frequency heating device as in claim 4 in which said conductive plate structure is at least in part movable variably to modify the mutual inductance of the loop and said resonator.

7. A resonant high-frequency heating device as in claim 4 in which said conductive plate structure extends substantially beyond the edges of said coupling loop and between said loop and an adjacent one of said walls to increase the percentage of total flux linked by the coupling loop.

8. A resonant high-frequency heating device comprising conductive walls defining a reentrant resonator, metallic fin structure extending from a first of said walls and spaced from the other walls to provide the inductance of the resonator, an electrode supported by and connected to the free end of said fin structure in spaced relation to the resonator wall opposite said first wall to provide the capacitance of the resonator, a stationary coupling loop disposed in the resonator space which encircles said fin structure for exciting the resonator to create an electromagnetic field whose lines of flux will encircle the fin structure and link with the coupling loop, and means for modifying the mutual inductance of said loop and the resonator comprising conductive plate structure disposed in said space adjacent said coupling loop and between said coupling loop and a wall of said resonator to alter the concentration of magnetic flux linked by said coupling loop.

9. A resonant high-frequency heating device as in claim 8 in which the conductive plate structure is at least in part movable to alter the concentration of magnetic flux linked by the coupling loop and thereby modify the mutual inductance of the loop and the resonator.

10. In a high-frequency dielectric heating system, the combination of a power-receiving circuit comprising a resonant applicator having conductive wall structure forming an electrically conductive housing and having therein capacitance and inductance structures respectively including spaced electrodes of extended area for the heating of dielectric work disposed in the electric field between the electrodes and an inductance element projecting into the interior of said housing in spaced relation with said wall structure to provide for the magnetic field encircling said inductance element an unobstructed path around the lengthwise thereof, one of said electrodes being formed by or electrically connected to adjacent wall structure of said housing, a second of said electrodes being electrically connected to the inwardly projecting end of said inductance element in spaced relation to all wall structure of said housing and being electrically connected with said wall structure through said inductance element, and means including at least portions of said wall structure electrically interconnecting said capacitance and inductance structures to complete said power-receiving circuit and affording a high unloaded Q thereof, high-frequency power-supply means having a power-delivery circuit, a power-transfer loop included in said power-delivery circuit and disposed within the unobstructed path of said magnetic field encircling said inductance element to provide a loop area of lesser size than the area subtended by the loop between said inductance element and the opposing wall structure of said housing, and means for modifying the mutual inductance between said power-delivery and power-receiving circuits comprising conductive plate structure disposed in said space adjacent said coupling loop for distorting the path of said magnetic field in determination of the ratio of the magnetic field linking said coupling loop and the magnetic field which does not link said coupling loop.

11. The system of claim 10 in which said conductive

plate structure is at least in part movable with the movable part operable to vary the degree of localized distortion of said magnetic field to change said ratio.

12. The system of claim 10 in which said conductive plate structure includes a stationary portion and a movable portion, and in which said movable portion is operable to vary the degree of localized distortion of the magnetic field in the vicinity of said loop and in which said stationary portion limits said variation to a predetermined range.

13. The system of claim 10 in which said conductive plate structure has a stationary portion and a movable portion, said stationary portion distorting said path of said magnetic field to establish a value of said ratio which maintains said mutual inductance coupling substantially entirely within the supraoptimum range for all positions of said movable portion and in which said movable portion is adjustable for varying said ratio and said mutual inductance coupling within said supraoptimum range.

14. The system of claim 10 in which said electrically conductive housing has therein a conductive walled compartment which itself forms the said conductive plate structure for distorting the path of the magnetic field to predetermine said ratio of the magnetic field linking said coupling loop and the magnetic field which does not link said coupling loop.

15. The system of claim 14 wherein components of said high-frequency power-supply means are disposed in said compartment and said coupling loop extends from said compartment into the space surrounding said inductance element and in which said magnetic field is produced.

16. In a high-frequency dielectric heating system, the combination of a power-receiving circuit comprising a resonant applicator having conductive wall structure forming an electrically conductive housing and having therein capacitance and inductance structures respectively

including spaced electrodes of extended area for the heating of dielectric work disposed in the electric field between the electrodes and an inductance element projecting into the interior of said housing in spaced relation with said wall structure to provide for the magnetic field encircling said inductance element an unobstructed path around the lengthwise thereof, one of said electrodes being formed by or electrically connected to adjacent wall structure of said housing, a second of said electrodes being electrically connected to the inwardly projecting end of said inductance element in spaced relation to all wall structure of said housing and being electrically connected with said wall structure through said inductance element, and means including at least portions of said wall structure electrically interconnecting said capacitance and inductance structures to complete said power-receiving circuit and affording a high unloaded Q thereof, high-frequency power-supply means having a power-delivery circuit, a power-transfer loop included in said power-delivery circuit and disposed within the unobstructed path of said magnetic field encircling said inductance element to provide a loop area of lesser size than the area subtended by the loop between said inductance element and the opposing wall structure of said housing, said inductance element being asymmetrically disposed with respect to said housing so as to produce a restriction in the space occupied by said magnetic field in the vicinity of said loop to predetermine the ratio of the magnetic field linking said coupling loop and the magnetic field which does not link said coupling loop.

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