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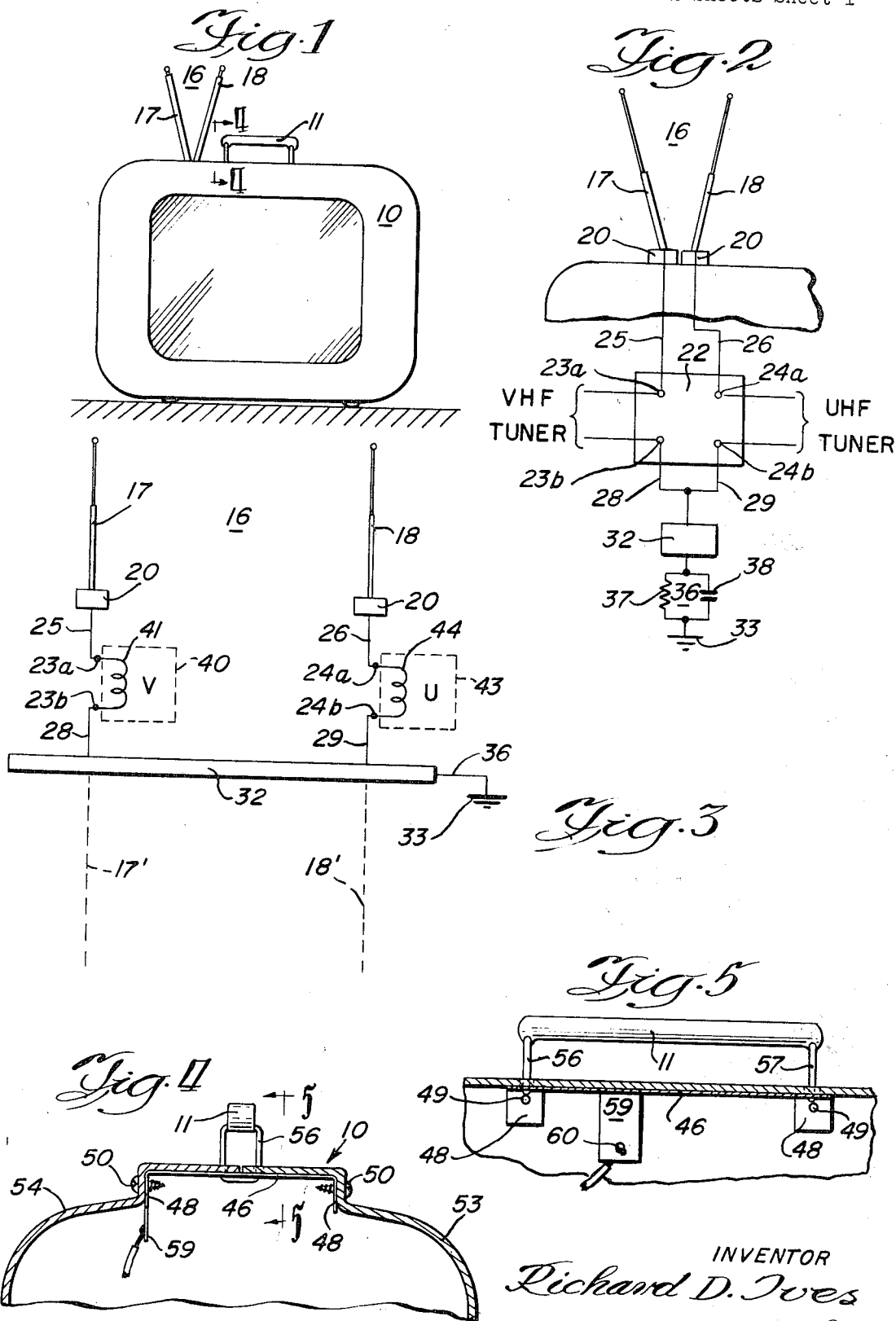
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SINGLE MONOPOLE ANTENNA FOR VHF AND UHF TELEVISION

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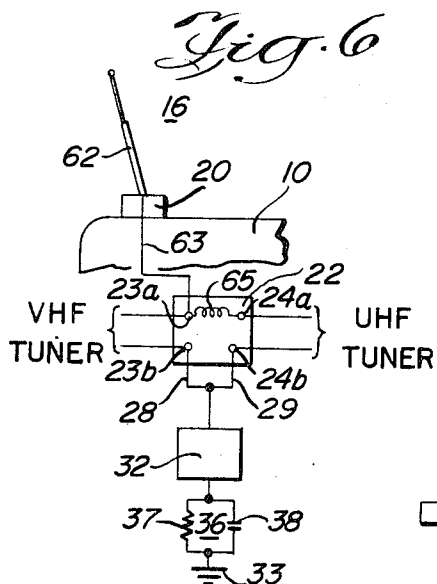
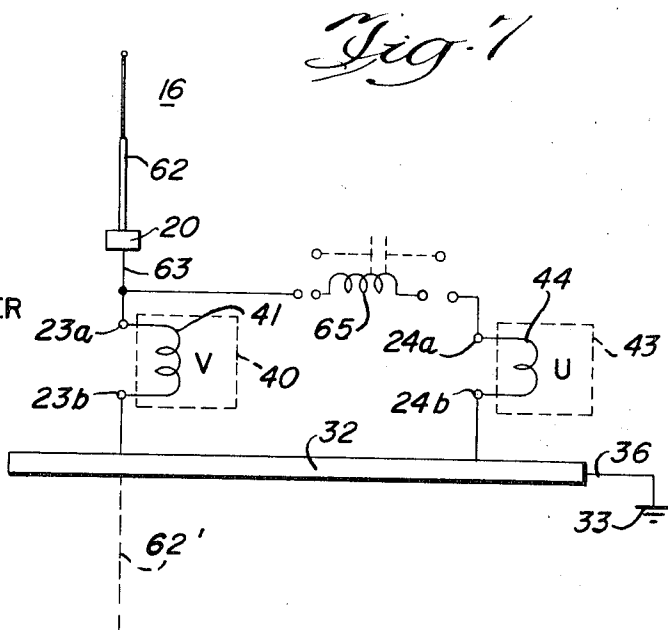
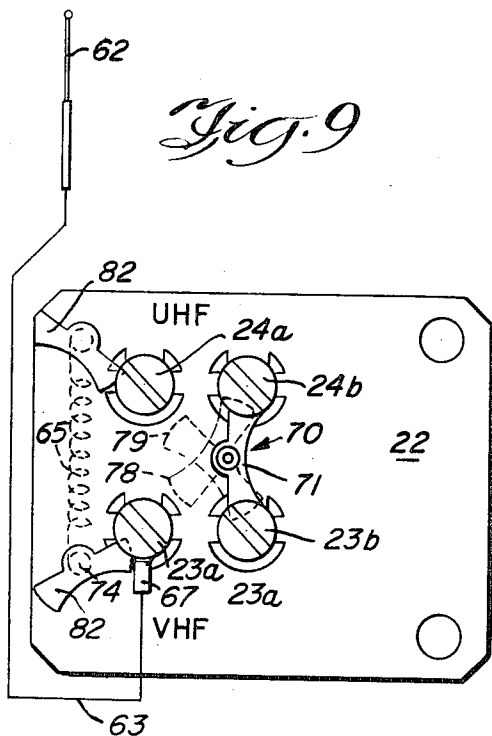
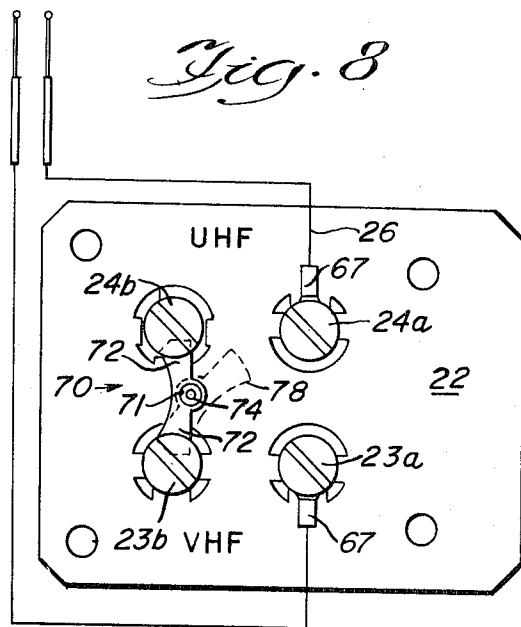


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ATTORNEYS



1

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SINGLE MONOPOLE ANTENNA FOR VHF AND UHF TELEVISION

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2 Claims

ABSTRACT OF THE DISCLOSURE

A monopole antenna mounted on a portable television receiver is coupled to both VHF and UHF television tuners. Reception of both VHF and UHF is achieved by either separate elongated antennas or a single elongated antenna and isolating means. A conductive body, which forms a portion of a mechanical support for a handle, provides a ground plane for the monopole antenna.

This invention relates to a monopole antenna system, and more particularly to a monopole antenna system for both VHF and UHF television signals, mounted on a housing for a television receiver.

It is often desirable in television receivers, and especially portable receivers, to provide a built-in antenna system which can be used when an external antenna is not readily available. Such an antenna system should be broad-band, allowing both VHF and UHF reception, for example, from 54 to 216 megacycles and from 470 to 890 megacycles respectively.

Most television tuners require balanced input circuits, such as those of dipole antennas, for proper operation. The use of built-in dipole antennas with small portable television receivers is, however, often impractical. Such antennas are more expensive and more difficult to adjust for different channels than are monopole antennas. Furthermore, dipole antennas have undesirable bi-directional pick-up properties.

A principal object of this invention is to provide an improved monopole antenna system for both VHF and UHF reception.

Another object of this invention is to provide an antenna system for a television receiver in which a conductive body, preferably located within the housing for the television receiver, forms a ground plane for a monopole antenna.

One feature of this invention is the provision of an antenna system, in accordance with one embodiment of the invention, using individual monopole antennas for VHF and UHF reception, in which each monopole antenna can be adjusted individually to give optimum performance on a given channel.

Another feature of this invention is the provision of an antenna system, in accordance with another embodiment of the invention, using a single monopole antenna for both VHF and UHF reception, the length of the antenna being adjustable to give optimum performance on any VHF or UHF channel.

Yet another feature of this invention is the provision of a monopole antenna system mounted on a housing for a portable television receiver, utilizing a metal plate which forms a portion of a mechanical support for a carrying handle as a ground plane for both the VHF and UHF monopole antennas.

Still a further feature of this invention is the provision of a novel shorting bar especially adapted for use on a terminal board for connecting either built-in or external antennas to the television tuners. This shorting bar is pivotally mounted to the terminal board and allows the bar to be rotated from a shorting position in which each

2

end of the bar abuts a terminal to a nonshorting position in which only one end of the bar abuts a terminal.

Further features and advantages of this invention will become apparent from the following specification and from the drawings, in which:

FIG. 1 is an elevation of a television set embodying one form of the invention;

FIG. 2 is a diagrammatic illustration, partially in schematic form, showing in more detail the embodiment of the invention of FIG. 1;

FIG. 3 is a diagram showing the equivalent circuit of the antenna system of FIG. 2;

FIG. 4 is a sectional view taken along the lines 4—4 of FIG. 1, and illustrating the carrying handle and supporting structure in more detail;

FIG. 5 is a sectional view taken along lines 5—5 of FIG. 4;

FIG. 6 is a diagrammatic illustration, similar to FIG. 2, of another embodiment of the invention;

FIG. 7 is a diagram showing the equivalent circuit of the antenna system of FIG. 6;

FIG. 8 is an elevation of a terminal board with a novel shorting element mounted thereon, especially adapted for connecting the antenna system illustrated in FIG. 2 to a receiver; and

FIG. 9 is a front view of a terminal board, with several novel shorting elements mounted thereon, especially adapted for connecting the antenna system illustrated in FIG. 6 to a receiver.

While illustrative embodiments of the invention have been shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms, and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be pointed out in the appended claims.

A housing 10 for a television receiver having a carrying handle 11 is shown in FIG. 1. The receiver is illustrative of a wide variety of "portable" television receivers that can be carried by means of handle 11. The housing 10 consists of a shell formed from molded plastic or other suitable electrical insulating materials.

The television receiver illustrated is especially adapted to be easily transported between a variety of viewing locations. To complement this portable use and eliminate the necessity of an external antenna system, a new and improved monopole antenna system 16 is mounted on housing 10. Antenna 16 comprised, in one embodiment of the invention, a pair of elongated antenna elements 17, 18 that are preferably formed from telescoping conductive sections whose over-all length may be adjusted for optimum reception.

In FIG. 2, the antenna system 16 of FIG. 1 is illustrated in more detail. The elongated elements 17, 18 can be located anywhere on housing 10, as may be desired, the only requirement being that element 17 must be electrically insulated from element 18. Each element is mounted by means of a base structure 20 to housing 10. Base 20 may, for example, be comprised of a pivoted ball and socket that allows the telescoped element to be adjusted to and held at any desired angle above the housing 10.

The television receiver has associated therewith a terminal board 22 having a pair 23a and 23b of terminals for connection to a VHF tuner and a pair of terminals 24a and 24b for connection to a UHF tuner. Electrical leads 25 and 26 connect elements 17 and 18 respectively to terminals 23a and 24a. Terminals 24a, 24b are connected by means of leads 28 and 29 to a body of conductive material 32.

3

4

Body 32 is connected to a ground reference potential 33 by coupling means 36. The ground potential 33 may, for example, be the chassis of the television receiver. In many portable television receivers, one side of the AC power cord is connected to the chassis, creating a "hot chassis" television receiver. In such receivers, coupling means 36 may take the form of a resistor 37 and a capacitor 38, which serve to isolate body 32 and the other elements electrically connected thereto from the hot chassis, preventing the application of the AC line voltage to these elements. If the ground reference potential 33 is established by means of a chassis or other part of a television receiver that is not "hot," coupling means 36 may take the alternate form of an electrical lead for directly connecting body 32 to ground 33.

The body of conductive material 32 may be located anywhere adjacent the elements 17, 18. In the preferred form of this invention, the body 32 is generally contained within the housing 10 and is located under or adjacent the monopole antenna system 16. In one exemplary embodiment of this invention, body 32 is comprised of a metal plate that additionally forms a portion of a mechanical support for handle 11, as will be disclosed in more detail hereinafter.

The purpose of the body of conductive material 32 is illustrated in FIG. 3, which shows an equivalent circuit of the schematic illustrated in FIG. 2. The terminals 23 are connected to a VHF tuner 40 that has an input coil 41 that requires a balanced antenna input. Similarly, terminals 24 are connected to a UHF tuner 43 having an input coil 44 that requires a balanced antenna input. Such tuners are well known in the art and will not be described in detail herein.

The body of conductive material 32 forms a reflective ground plane for the monopole antenna system. Thus, for VHF reception, body 32 forms an electrical image 17' of monopole element 17. The image 17' is effectively connected through lead 28 to terminal 23b of VHF tuner 40. Thus, tuner 40 will see a balanced input, formed from monopole element 17 and its image 17'.

In a similar manner, body 32 forms an electrical image 18' of monopole element 18. Image 18' is effectively connected to terminal 24b of UHF tuner 43. Since monopole element 18 is connected to the other terminal 24a of tuner 43, input coil 44 will see a balanced input. The single body 32 thus forms images of both monopole elements, allowing the elements 17, 18 to be individually adjusted for optimum reception of the particular channel being received by each of the tuners 40, 43.

In an exemplary embodiment of this invention, body 32 is formed from a metal plate 46 that is additionally a portion of a mechanical support for the handle 11, as seen in FIGS. 4 and 5. The metal plate 46 has projecting ears 48 with apertures 49 therein for receiving self-threading screws 50.

The housing 10 illustrated is comprised of a front shell 53 and a back shell 54 formed from molded plastic sections. The two halves of the housing, i.e., shells 53 and 54, are mechanically held together by tightening the screws 50 to draw the shells against the ears 48 of plate 46.

The plate 46 also serves as a support for end rings 56, 57 which connect the molded plastic handle 11 to the top of housing 10. These rings extend through a slot in plastic housing 10 and through apertures in the metal plate 46. The bottom sections of the rings are inwardly turned to securely connect the handle 11 to the housing 10.

In order to connect plate 46 in the antenna system, a projection 59 is provided with an aperture 60 therein for making electrical contact with the other elements of the monopole antenna, as leads 28, 29, and 36. Other alternate means for electrically connecting plate 46 to the circuit could, of course, be used.

In FIG. 6, another embodiment of the monopole an-

tenna system 16 is illustrated, utilizing a single elongated antenna element 62 mounted on the housing 10. Element 62 is connected by lead 63 to VHF terminal 23a. An inductor 65 is connected between terminal 23a and UHF terminal 24a.

The operation of this antenna system will be described in connection with FIG. 7, which shows an equivalent circuit of the single monopole antenna. Body 32 forms an image 62' of elongated element 62, as previously described. The image 62' is effectively connected through leads 28 and 29 to terminals 23b and 24b of the tuners.

At VHF frequencies, inductor 65 has a high impedance which isolates terminal 23a from terminal 24a. Therefore, input coil 41 of VHF tuner 40 sees a balanced input, formed by image 62' and element 62.

Inductor 65 has a distributed capacitance, as indicated by the dotted lines in FIG. 7. At UHF frequencies the stray capacitance causes inductor 65 to have a low impedance, thereby coupling terminal 23a to terminal 24b. Furthermore, input coil 41 of VHF tuner 40 has a high impedance at UHF frequencies. As a result, UHF tuner 43 sees a balanced input at UHF frequencies, formed by element 62 and its image 62'.

The single elongated element 62 forms a broadband antenna for both VHF and UHF reception, and it can be adjusted in length to provide optimum performance on any VHF or UHF channel.

In FIGS. 8 and 9, terminal board 22 is illustrated in more detail. The individual terminals 23, 24 are formed from screw-like connectors. Leads 25, 26 and 63 have lugs 67 connected thereto which slip under the screw-like terminals in order to connect the antenna system to the television receiver. A portion of each terminal (not shown), which projects through and in back of the terminal board 22, is coupled to the VHF and UHF tuners in the television receiver, in a manner well known in the art. When it is desired to use the monopole antenna system, terminals 23b and 24b must be electrically connected together and thereafter connected to body 32.

For this purpose, a novel shorting element 70 is provided. Shorting element 70 can be rotated from the shorting position illustrated to a nonshorting position, as illustrated by the dotted lines, which prevents the element from being accidentally rotated to another position.

Element 70 is comprised of an elongated strip of conductive material, as metal, having a mid-portion 71 and enlarged end portions 72, as shown in FIG. 8. The strip is pivotally mounted to board 22 by means of a rivet-like assembly 74 that passes through an aperture in mid-portion 71 and an aperture in the board 22. A lead can be attached to rivet 74, for connecting strip 70 to body 32, thereby coupling terminals 23b and 24b to the ground plane when the element is located in its shorting position. The rivet 74 is not located at the center point of mid-portion 71, but is located off center as illustrated. In a similar manner, the aperture in board 22 is offset from the center line between the two terminals.

The shorting element 70 can be rotated from a shorting to a nonshorting position, and can be securely located against movement in each position. In the shorting position illustrated, the terminals are screwed down against the shorting strip, locking the strip against accidental movement.

When an external antenna is to be connected in place of the built-in monopole antenna system, the terminals are screwed off the strip, allowing element 70 to be rotated. Element 70 can be rotated counterclockwise to the position 78 illustrated in FIG. 8. In this position, one end 72 of element 70 abuts terminal 23b, while the other end 72 is spaced from the upper terminal 24b. Terminal 23b is screwed down against strip 70, thus securely locking the bar in a nonshorting position. Strip 70 can also be rotated in a clockwise direction to a nonshorting

5

position (not illustrated in FIG. 8) in which one end 72 abuts terminal 24b.

In FIG. 9, the dotted lines 78 illustrate the nonshorting position of strip 70 when rotated counterclockwise, and the dotted lines 79 illustrate the other nonshorting position of strip 70 when rotated clockwise from the shorting position. Thus, either of the terminals 23b or 24b can be used to lock element 70 in a nonshorting position.

The screw type connectors are merely illustrative of one specific construction for terminals 23, 24, and many equivalent forms are possible. For example, the terminals could take the form of spring loaded members, or could be simple electrical tie posts in which the abutment of one end of strip 70 against the post would frictionally hold the element in the desired position.

Inductor 65 is mounted behind terminal board 22, as shown by the dotted lines in FIG. 9. The inductor is connected between terminals 23a and 24a by rotatable strips 82. These strips are identical to strips 70, allowing all the rotatable elements on board 22 to be economically manufactured as the same part. Of course, for the purpose illustrated, strip 82 may take any alternate form which would allow inductor 65 to be disconnected from either one or both of the terminals 23a and 24a. It will be apparent that element 70 may be used wherever it is desired to provide a shorting strip having a nonshorting position, and element 70 is not to be limited to use in a television receiver.

I claim:

1. In a television receiver including a molded plastic housing having a carrying handle, terminals for connection to a VHF antenna, and terminals for connection to a UHF antenna, a broadband antenna, comprising: elongated antenna means extending outwardly from the housing and mounted thereto; means electrically connecting said elongated antenna means with a VHF and a UHF terminal; a metal plate, mounted adjacent and generally inside the plastic housing, said plate being a portion of a mechanical support for said handle; means coupling said plate to the other of the VHF and UHF terminals, said plate and said elongated antenna means

6

forming a broadband antenna for VHF and UHF reception.

2. In a television receiver having a housing composed of insulating material, first and second terminals for connection to a VHF antenna, and first and second terminals for connection to a UHF antenna, individual monopole antennas for VHF and UHF reception, comprising: a first telescoping conductive element for VHF reception; a second telescoping conductive element for UHF reception; means for mounting the first and second elements on the housing; circuit means independently electrically connecting the first element to the first VHF terminal and the second element to the first UHF terminal; means establishing a ground reference potential; a metal plate, mounted inside the housing, said plate forming a portion of a mechanical support for a self-contained handle connected to the housing; means coupling the plate to the ground reference potential; means electrically connecting the second VHF and UHF terminals to said plate, the plate forming a ground plane for said first and second elements, providing two individual monopole antennas for VHF and UHF reception.

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ELI LIEBERMAN, Primary Examiner

U.S. Cl. X.R.

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