

[54] **VOLTAGE CONVERTER**

[76] Inventor: **Donald R. Weaver**, 9710 N.E. 24th,
Bellevue, Wash. 98004

[22] Filed: **Apr. 19, 1973**

[21] Appl. No.: **352,639**

3,386,023	5/1968	Jepson et al.	307/66 X
3,389,323	6/1968	Jepson et al.	307/66 X
3,470,455	9/1969	Korda	323/22 SC X
3,517,259	6/1970	Dotto	339/208 X

Primary Examiner—William M. Shoop, Jr.
Attorney, Agent, or Firm—Cole & Jensen

[52] U.S. Cl. 307/150, 321/8, 307/151,
339/208, 339/209
[51] Int. Cl. **H02j 7/00**
[58] Field of Search 321/8; 307/64, 66, 125,
307/130, 149, 150, 151; 339/153, 208, 209

[56] **References Cited**

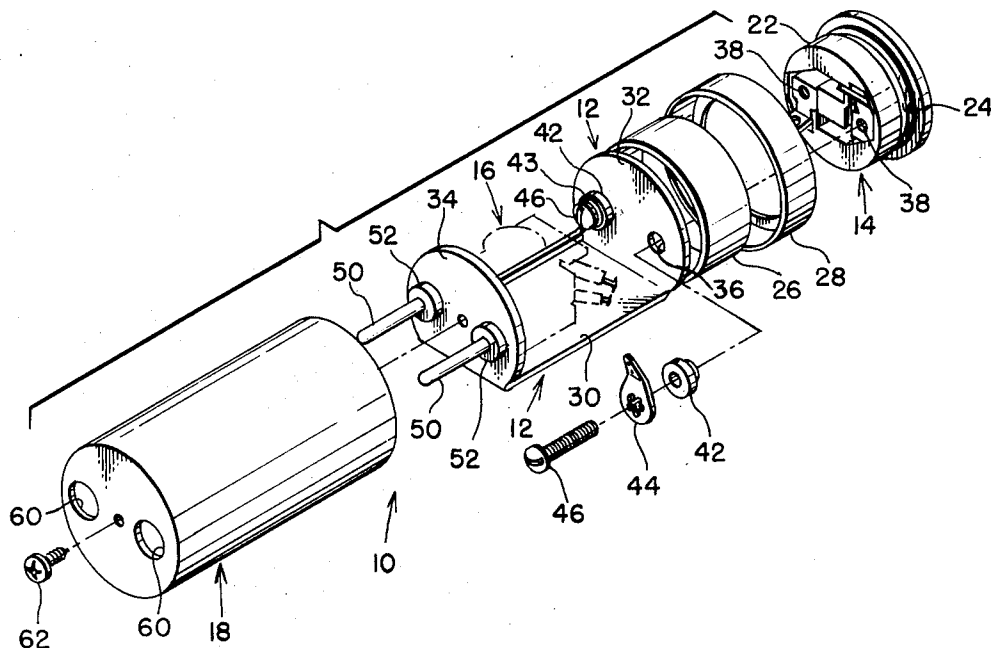
UNITED STATES PATENTS

3,331,013 7/1967 Cunningham 323/22

[57] **ABSTRACT**

Voltage converter primarily for travelers to transform 220/240 volts A.C. to 110/120 volts A.C. The device is constructed of all solid state electrical components. It is designed so that the mounting bracket for the components also acts as a heat sink. The device includes a resistance across the output terminals to allow its use with a wide variety of appliances.

8 Claims, 5 Drawing Figures



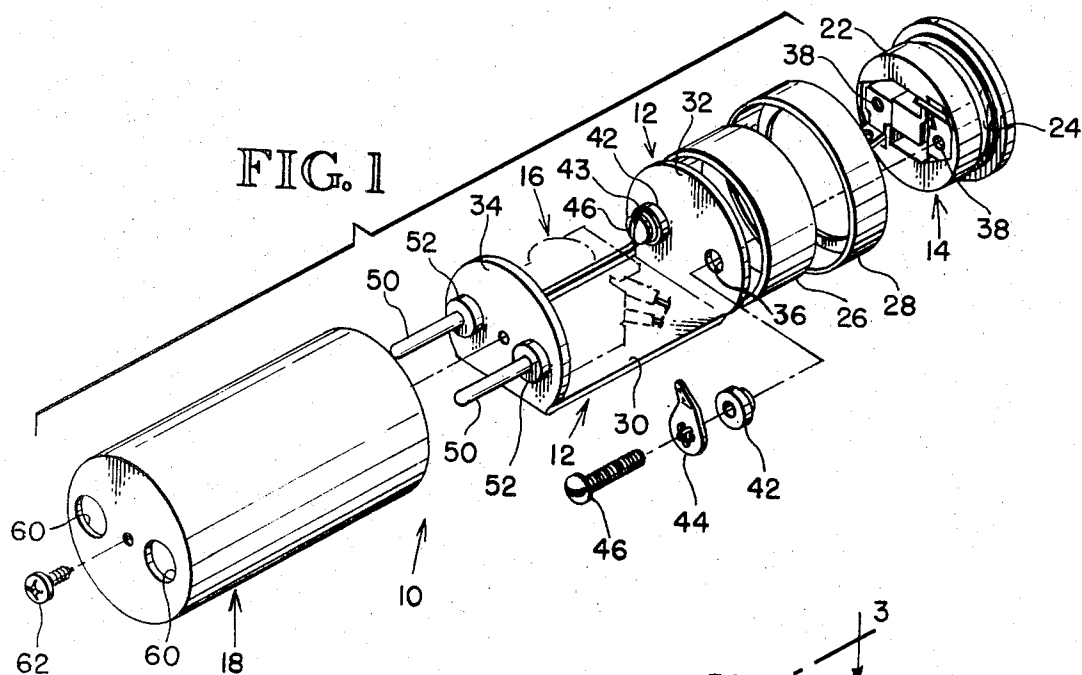


FIG. 2

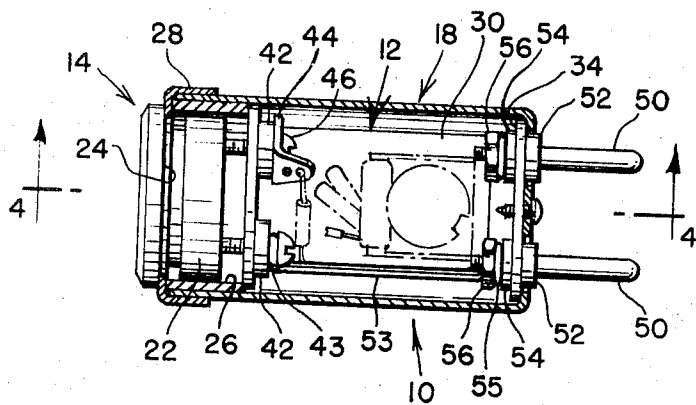
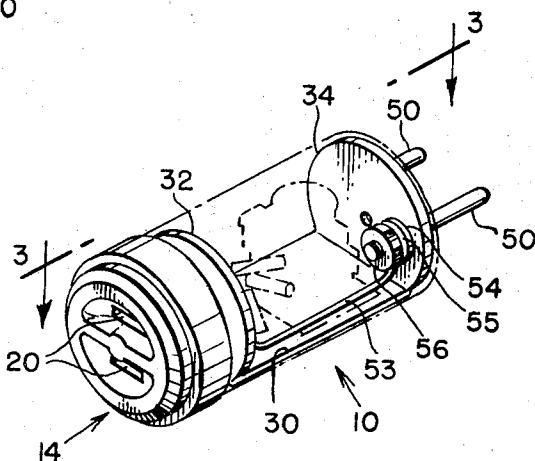


FIG. 3

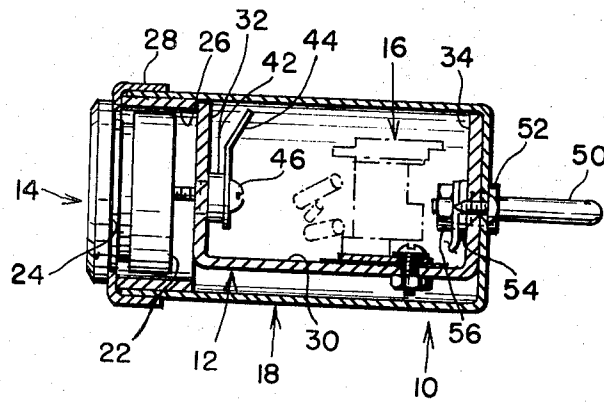


FIG. 4

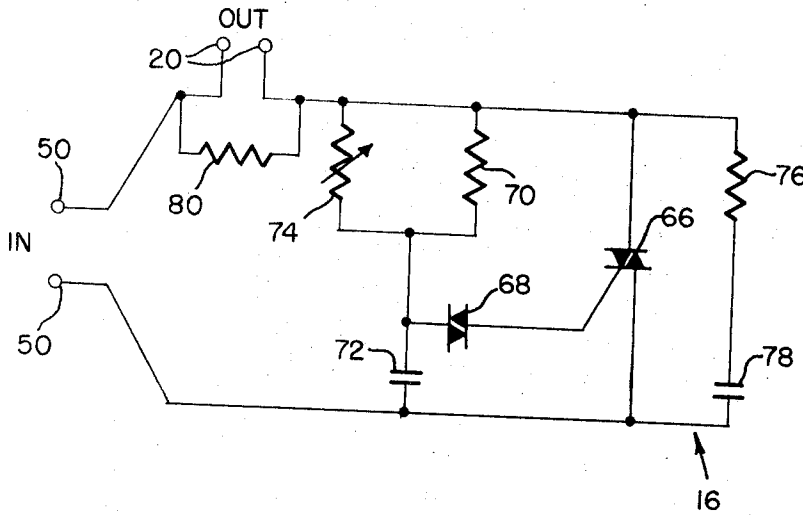


FIG. 5

VOLTAGE CONVERTER

BACKGROUND OF INVENTION

This invention relates generally to the field of voltage converters and more particularly to small, lightweight, easily portable voltage converters which can be used with a number of electrical appliances carried by tourists and travelers to foreign countries.

Those skilled in the art are well aware of the problems that travelers have had, particularly United States citizens traveling abroad, who have found that they cannot use the electrical appliances they have taken with them to foreign countries. A traveler from a country operating on a 110/120 volt system will find that his electrical appliances will not work properly in countries operating on 220/240 volt systems and in fact, will burn out if left plugged into the foreign outlet very long, such as, for example, a minute or two. Until recently the only solution to this problem was for an overseas traveler to take along a transformer. However, transformers are generally bulky, expensive and heavy, weighing in the area of 15 pounds and thus impractical. Most travelers would simply refuse to take along such an encumbrance in order to run travel oriented appliances.

Attempts have been made to provide travelers with light, reliable voltage converters but, for the most part they have not been successful due to the unreliability or their output, that is, variations in their voltage output over a short span of time. Also, prior art devices have been shown to have a very short life span.

SUMMARY OF INVENTION

The invention comprises a small diameter tubular housing on one end which contains a conventional United States style socket outlet. On the other end are pins spaced to fit continental wall sockets found in many countries of the world. A mounting bracket is located within the housing which acts as a support for the electrical components and circuitry but which also acts as a heat sink medium for transferring heat to the housing where it is conveniently dissipated. The circuit incorporates a resistance component across the output terminals for insuring that the circuit continues to draw holding current for the desired part of each half cycle.

Accordingly, it is among the many features, advantages and objects of the invention to provide a physically small, lightweight and inexpensive voltage converter for overseas travelers. The device is all solid state, not only for output reliability but for long life reliability. The invention has substantial capacity in that it can handle loads of up to 1,000 watts for such items as travel irons, hair dryers, hot hair combs, clothes steamers, coffee and tea brewers, contact lens or baby bottle sterilizers, electric razors, vacuum cleaners and others. The load resistance added enables the invention to be used with a wide variety of appliances.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an exploded view in perspective showing the major components and their locations within the invention;

FIG. 2 is a perspective view from the opposite end of FIG. 1 showing the device in its assembled state;

FIG. 3 is a top plan view with the housing cut away to show additional details of construction;

FIG. 4 is a cross-sectional view taken along the line 4-4 of FIG. 3 to show additional details of construction and

FIG. 5 is a schematic of the electrical circuit and components.

BRIEF DESCRIPTION OF PREFERRED EMBODIMENTS

The invention, generally designated by the number 10, is comprised of a mounting bracket, generally designated by the number 12, a single American style socket outlet 14, electrical circuitry and components generally designated by the number 16, continental type input pins 17, and housing 18. Socket outlet 14 has plug sockets 20 and a rear portion 22. In its assembled state a tubular spacer 26 and screws 46 hold socket 14 against housing lid 28 which has an opening therein dimensioned to receive socket 14. Thus by reference to FIGS. 3 and 4 it will be seen that the tubular spacer and screws secure socket 14 in the opening provided in lid 28.

Mounting bracket 12 has a main supporting body section 30 and upstanding rounded end sections 32 and 34. Outer end section 32 of the mounting bracket is provided with holes 36 which are aligned with threaded screw holes 38 in the rear of socket 14. Tubular spacer 26 is placed around socket 14, between outer end section 32 of the bracket and the inside ledge of housing lid 28. Insulator grommets 42 have a small diameter section which fits into holes 36 and an enlarged portion which electrically insulates wire connector 44 and screw 46 on one side from the bracket which is preferably made of a lightweight metal such as aluminum. Screw 46 extends through connector 44, insulator grommets 42, holes 36, in bracket end wall 32, into the threaded hole 38. On the other side of end wall 32 screw 46 extends through a buss wire loop 43, insulator grommets 42, holes 36 and into the threaded hole 38.

On the inner upright end wall 34 of bracket 12 it will be noted that there are mounted two spaced apart pins 50. Holes are provided in end wall 34 for receiving insulator grommets 52 shaped similarly to insulator grommets 42 on the other end wall. An additional insulating washer 54 is provided on the inside surface, again to electrically insulate pins 50 from the metal mounting bracket 12. Pins 50 have a threaded portion of reduced diameter thereby defining an off-set surface which abuts against insulator grommets 52. The threaded portion extends entirely through the grommets, the insulator washers on the inside, through the wire connections as for example loop 55 of buss wire 53 on one side to nuts 56. Obviously, pins 50 will be spaced to fit into Continental type wall outlets. Housing 18 is a light metal, light gage tubular cylinder open at one end and closed at the other. It will be noted that housing 18 is provided with openings 60 to accommodate grommet insulators 52 as shown best in FIG. 3. A small screw 62 attaches the housing to inner end wall 34 of mounting bracket 12.

Referring now to FIG. 5 it will be seen that the power to be converted is received through pins 50. The circuit is an efficient means for controlling the average power to the output load across socket 20. Control is accomplished by governing the phase angle of the A. C. wave, that is regulating the amount of time the circuit is energized so as to give a simulated 110/120 volt output. A

bi-directional thyristor or triac 66 determines when the circuit is energized. Other components determine when the triac will be triggered during the positive and negative half cycles. A bilateral trigger diode or diac 68 breaks down or conducts at a particular voltage. When diac 68 breaks down triac 66 is then triggered on thus connecting input power from pins 50 to output socket 20. Resistor 70 and capacitor 72 together with variable resistor 74 determine when diac 68 conducts. Resistance 76 and capacitor 78 are in the circuit for protection of triac 66 when inductive loads are plugged into socket 20. It will be appreciated by those skilled in the art that triac 66 is triggered part way through each half cycle and that it remains on as long as there is sufficient holding current in the circuit. The circuit is energized for only a predetermined portion of each half cycle, that is as stated above, total power is averaged to produce a simulated 110/120 volt output. Resistor 80 is included to assist in smoothing out fluctuations in the operation of motor devices such as a razor motor. The purpose is to add a load across the output terminals to insure flow of sufficient holding current through the triac to hold it on during the desired or predetermined period for circuit conduction. The resistance value of resistor 80 is not critical although a 50K to 250K ohm range has been found to be preferred.

It will also be appreciated by those skilled in the art that the triac generates heat, for instance in a situation in which a travel iron drawing 500 to 600 watts is connected to the device. The heat is dissipated by transferring from the bracket to the cannister type housing and then to the atmosphere. It will be appreciated that the tubular spacer 26 between the housing lid 28 and outer end wall 32 of the bracket permits the blades of a plug to be fully seated in the socket and yet be sufficiently spaced from the bracket 12 so that no electrical contact is made. It is to be understood that rivets or other fastening means may be used in place of the screws and nuts described above.

What is claimed is:

1. Voltage converter, comprising:

- a. a mounting bracket including a support section and inner and outer bracket end wall sections at the ends thereof,
- b. a pair of electrical output sockets secured by attachment means to the outer surface of said outer end wall section of said bracket, said sockets being spaced from said outer end wall section by a spacer and said attachment means being electrically conductive and insulated from said bracket,
- c. a pair of electrical input pins mounted in and electrically insulated from said inner end wall section,
- d. an electrical circuit mounted on said bracket including all solid state electrical components for converting the voltage input from said pins to the desired voltage output at said sockets, and
- e. a housing having an open end and a closed end for being detachably secured to the inner end wall section of said bracket for transfer of heat from said bracket to said housing and said housing including

a cover attached to said sockets for substantially completely enclosing said bracket and electrical circuit means.

2. The voltage converter according to claim 1 and wherein said cover is provided with an opening therein to receive said sockets and wherein an annular wall is defined around said opening.

3. The voltage converter of claim 2 and wherein said spacer is a cylindrical member disposed between the inside of said annular wall in said cover and said outer end wall section.

4. The voltage converter according to claim 3 and wherein said electrical circuit includes a resistance across the terminals of said output sockets so as to provide holding current for said circuit and to permit the use of a wide variety of appliances with said converter.

5. Voltage converter, comprising:

- a. a mounting bracket means including a generally rectangular support section and inner and outer bracket end wall sections extending from opposite ends of said support section generally at right angles thereto, said end wall sections being generally rounded so that said bracket means can be received in a cylindrical type housing,
- b. electrical output socket means secured by attachment means to the outer surface of said outer end wall section of said bracket, said socket means being spaced from said outer end wall section by spacer means and said attachment means being electrically conductive and insulated from said bracket means,
- c. electrical input pin means mounted in and electrically insulated from said inner end wall section,
- d. electrical circuit means mounted on said bracket including all solid state electrical components for converting the voltage input from said pin means to the desired voltage output at said socket means, and
- e. a housing means having an open end and a closed end for being detachably secured to the inner end wall section of said bracket for transfer of heat from said bracket to said housing and said housing including cover means attached to said socket means for substantially completely enclosing said bracket and electrical circuit means.

6. The voltage converter according to claim 5 and wherein said cover means is provided with an opening therein to receive said socket means and wherein an annular wall is defined around said opening.

7. The voltage converter of claim 6 and wherein said spacer means is a cylindrical member disposed between the inside of said annular wall in said cover means and said outer end wall section.

8. The voltage converter according to claim 7 and wherein said electrical circuit means includes a resistance across the terminals of said output socket means so as to provide circuit means and to permit the use of a wide variety of appliances with said converter.

* * * * *