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Solid-State ac-to-dc Converter

An alternating current to direct current converter, in which solid-state ac-to-dc rectification circuitry, filter circuitry, a tuned transformer, ac chopper circuitry, and an automatic current-control network is used, has been developed. For this converter, a dc power source that will operate from a 115 V 60 cycle 3 ϕ line and provide a dc output of 15 to 22 V at a current level between zero and 400 A was designed. The size and weight of this power supply have been kept at a minimum in order that it could be handled easily.

In order to meet the requirements for an acceptable converter, a 40-pound power source with a simple circuit configuration in a package 17 by 12 by 24 inches, which operates from 5 to 100% load at a 72 to 94 input to output efficiency, was developed. Direct rectification of a 3 ϕ ac gave an efficient method for obtaining low-ripple dc with a minimum amount of filtering. Conversion of this dc to the desired voltage by a dc chopper operating at a 2-kc rate resulted in a much smaller and more efficient square-loop toroidal transformer. Half-wave rectification of the chopper made possible a usable dc waveform that required less filtering because of the operating frequency of the converter. Drive for the inverter was controlled automatically by a sensing system resulting in the converter and transformer being operated at a power level only as high as required by the load, and thus a higher overall efficiency. Also, much lower surge currents were possible when the converter switched.

This invention is novel in that it provides a compact, automatically controlled ac-to-dc converter capability. It has a drive-control system that maintains a high efficiency in addition to providing many useful side effects. The converter would be useful in industrial applications that require high current at medium voltage such as in arc welding and electroplating. Designers and manufacturers of commercial and industrial ac-to-dc power supplies should be interested in this information.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Headquarters
National Aeronautics
and Space Administration
Washington, D.C. 20546
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Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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