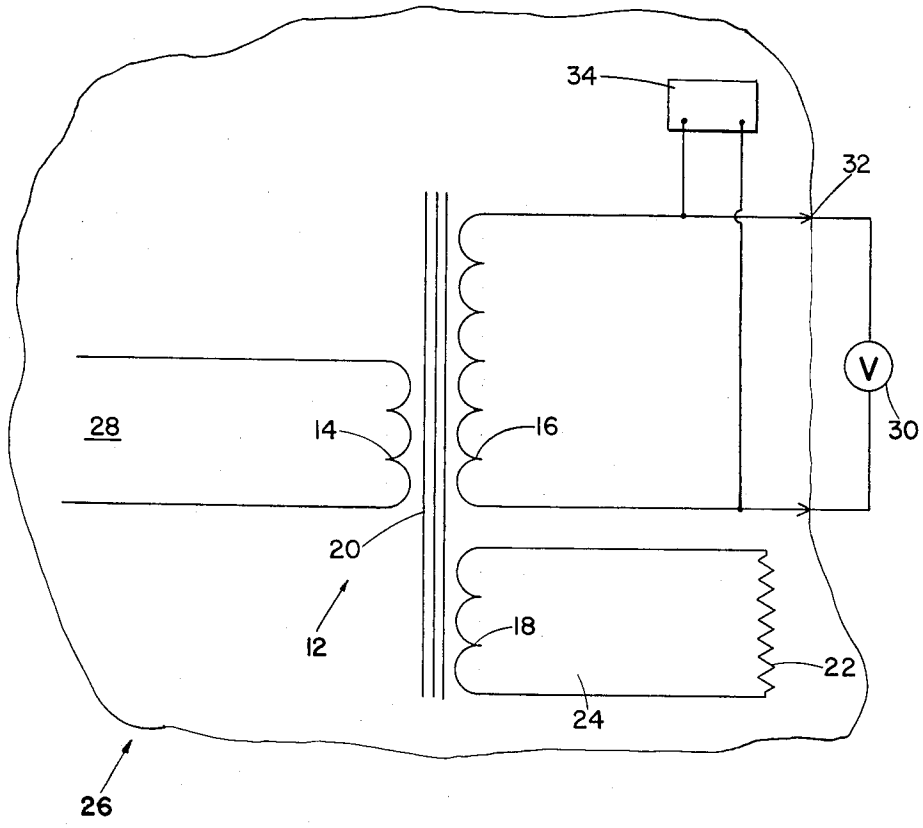
April 24, 1962 E. T. EUTERNECK 3,031,600

CURRENT TRANSFORMER SYSTEM

Filed Sept. 5, 1958



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United States Patent Office 3,031,600 Patented Apr. 24, 1962

3,031,600

CURRENT TRANSFORMER SYSTEM

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Filed Sept. 5, 1958, Ser. No. 759,369
1 Claim. (Cl. 317—14)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates to current transformers and more particularly to such transformers provided with tertiary coil devices for open secondary operation.

The primary windings of conventional current transformers are series connected in circuits in which current is to be determined. The current in a circuit including the secondary coil of the transformer and an ammeter in series therewith is proportionate to the primary circuit current. The ammeter may be calibrated directly to read the primary current.

The connections to the ammeter are permanent since the secondary circuit is required to counteract substantially the flux induced by the primary circuit, and magnetization of the core of such a transformer due to an open secondary circuit thereof, generates heat in the core at a rate greater than the heat dissipation rate of the core, to destroy the transformer by disrupting the heat balance thereof. A machine is in heat balance when the heat generated in the machine is limited by the heat dissipation thereof.

In unmanned electrical machines that travel from a launching site, such as missiles, the current in circuits of the missiles are monitored by instruments in remote areas until launch time when connections to the missiles are broken.

It is an object of my invention therefore to provide a transformer provided with a tertiary coil device for open secondary circuit operation.

Another object of my invention is to provide a transformer in which the potential of the secondary coil is proportionate to the current in the primary coil.

A further object of my invention is to provide such a transformer with a secondary coil having turns to determine the secondary potential of the transformer.

A still further object of my invention is to provide said tertiary coil device substantially as a short-circuited coil device.

An additional object of my invention is to provide such a transformer with a high impedance voltmeter in series connection with the secondary coil.

An added object of my invention is to provide such a voltmeter disposed to operate with substantially zero current.

Another object of my invention is to provide such a transformer with the heat balance required for open secondary coil operation.

In carrying out my invention, a transformer with a core is provided with primary, secondary and tertiary coils wound thereon and a member is electrically connected to the tertiary coil substantially to form a shorted coil device. The primary coil is disposed for series connection in a circuit in which current is to be measured, and the tertiary winding device is disposed substantially to counteract the flux induced by the primary winding. The potential of the secondary coil is proportionate to the current in the primary winding and the value of the potential is determined by the number of turns in the secondary winding.

A high impedance voltmeter is series connected to the secondary coil to determine the current in the primary

winding, and high impedance devices that operate on substantially zero current, such as telemetering apparatus, may be shunt connected to the secondary winding. The voltmeter is disposed to operate on low current for negligible increase in secondary voltage (less than 1%) responsive to separation of the voltmeter from the transformer. Such an increase is within the tolerance allowed for the circuit.

The increase in heat in the core is within the heat balance of the transformer, and the accuracy of the high impedance devices is undisturbed by the separation.

For more complete understanding, reference is directed to the following explanation and the accompanying drawing, the single figure of which illustrates one embodiment of my invention.

Accordingly, a transformer 12 is provided with primary, secondary and tertiary coils 14, 16 and 18 wound on a core 20 and a member 22 connected in series with coil 18 to form a device 24. Member 22 has a low resistance value so that device 24 is substantially a short circuit for counteracting flux induced in primary coil 14 when current is flowing in the primary coil.

A missile 26 includes a circuit 28, the current of which is required to be monitored from a remote control station from the time the missile is energized on the launching pad until take-off time.

Transformer 12 is disposed on the missile with primary 14 connected in series in circuit 28 and a high impedance voltmeter 30 in a remote station is series connected to secondary 16 through leads including connections 32. The connections are disposed for separation of voltmeter 30 from the missile at take-off thereof.

A high impedance device 34 of the missile such as telemetering apparatus may be shunt connected to secondary 16. Device 34 operates on substantially zero current and is calibrated to read current.

Device 24 is substantially a short-circuited coil disposed substantially to counteract the flux induced by primary 14, and secondary 16 is provided with a number of turns to produce a secondary potential required for metering. The secondary voltage is proportionate to the current of circuit 28 and voltmeter 30 may be calibrated for direct reading of the circuit 28 current.

Voltmeter 30 operates on substantially zero current and the secondary voltage increases less than 1% upon separation of voltmeter 30 from missile 26. The accuracy of device 34 is unaffected by the voltage increase and the gain in heat of transformer 12 responsive thereto is well within the heat balance of the transformer.

While the foregoing is a description of the preferred embodiment, the following claim is intended to include those modifications and variations that are within the spirit and scope of my invention.

I claim:

A transformer system comprising: a core type transformer; primary and secondary coils wound on said core, said secondary coil having a predetermined number of turns to provide a secondary potential required for metering; a high impedance telemetering device connected in shunt with said secondary winding, said high impedance telemetering device being able to operate on substantially zero current; a high impedance voltmeter connected in shunt with said secondary coil for determination of the value of current flow in said primary coil, said voltmeter being adapted to be disconnected from said secondary coil; a closed loop tertiary circuit connected on said core, said tertiary circuit having a low resistance value so that said tertiary circuit is substantially a short circuit for counteracting flux induced by said primary coil and for providing substantially zero current in said secondary coil whereby there is a negligible increase in secondary voltage for open secondary circuit

operation of said transformer responsive to separation of the voltmeter from the transformer.

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