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Development of Second Generation Series Power Supply Module

Exceeding Battery-operated Power Supply

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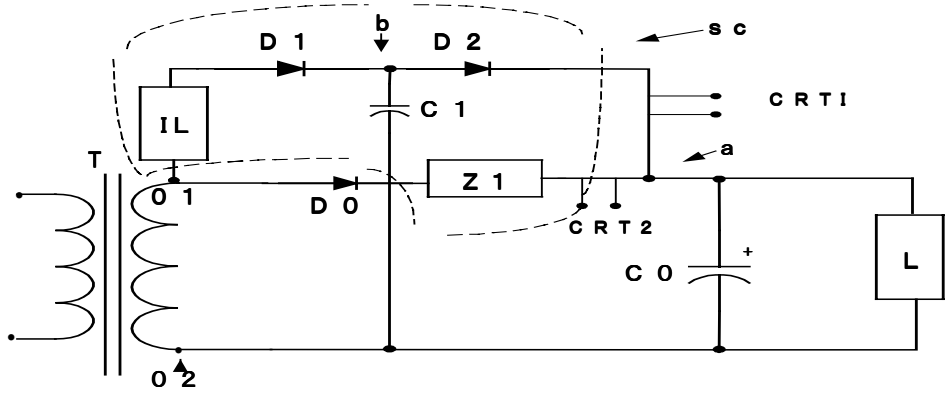
ABSTRACT

From the Fourier Analysis, by making analysis and arrangement of circuit constant of the Second Generation Series Power Supply which I have made technological announcement to AES2005, I have succeeded in the development of Power Supply Module which turns out to be ideal DC Power Supply with lower impedance exceeding battery-operated DC power supply.



1. EXPLANATION OF CIRCUIT:

The current in main circuit D0 flows to rectifying current C0 and L, but load current loss is generated due to transient phenomenon of C0 (When voltage is applied, internal resistance of C0 goes up from short-circuit condition.)

1.1. Function of Z1:

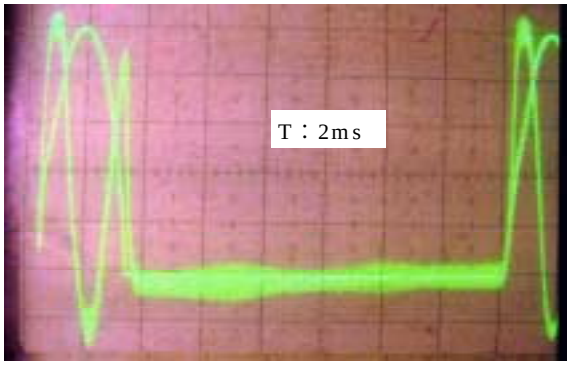
Sub-rectifying circuit (SC), which requires equal or more rectifying current than main circuit, functionsas impedance matching device to keep the balance of both circuits

1.2 Function of Sub-Rectifying Circuit (SC):

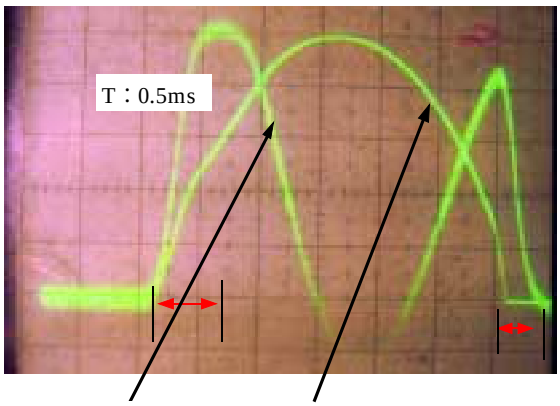
To complement carriers of short-circuit time zone of C0 at start time of Di rectifying current in main rectifying circuit, sub-rectifying circuit (SC) is required as essential condition to delay time to transfer the carriers from
C1 to C0, and also to delay start time of rectification in sub-rectifying D1 (Capacitor is capable of discharging
right at the start of recharging.).

1.3 Waveform Actually Measured

Rectifying Waveform D2 is the current waveform flowing from C1 into short-circuit condition of C0 at rectification start time of D0. Paradoxically, without this, load current does not function during the time when rectifying current of D0 flows into C0 with short-circuit condition for this area.



Time current is not flowing to load



D2,Rectifying Waveform **D0,Rectifying Waveform**

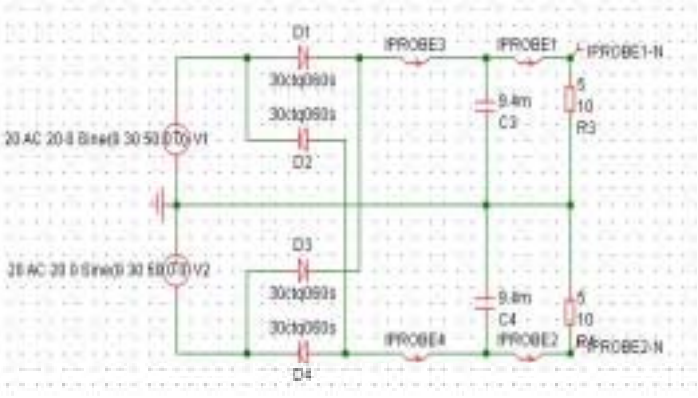
Current time zone for capacitor's transient phenomenon (Current flowing into C0 with short-circuit condition at every cycle.)

2. FOURIER ANALYSIS

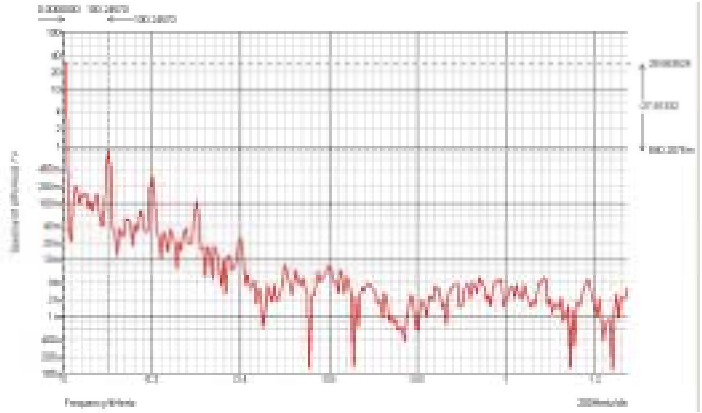
To verify the difference between the conventional series power supply and 2nd generation power supply, I have Paid attention to the noise level generated due to the loss in the current between ripple and ripple P-P.

2.1. The 1st and 2nd Generation Power Supply Circuit

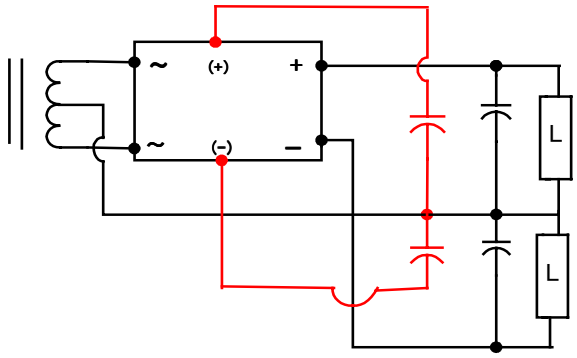
1st generation series power supply circuit



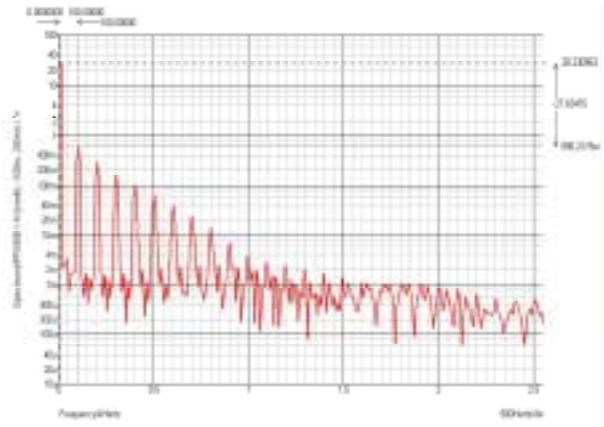
1st PsVoutSpec.jpg : Vout+1 spectrum



2nd generation of power supply circuit



2nd PsVoutSpec.jpg : Vout+1 spectrum



Explanation of
1stPsVoutSpec.jpg : Vout+1 Spectrum
2ndPsVoutSpec.jpg : Vout+1Spectrum

As a result of CP simulation, I have discovered occurrence of abnormal noise due to current loss between ripple P and P at the spectrum. In the conventional capacitor input power supply, the P to P noise level at the spectrum less than 100Hz shows 200mV. Whereas in the 2nd generation power supply, by optimizing the capacitor in the auxiliary circuit of 2nd generation power supply, the noise level drops to 1mV. In the conventional power supply, the noise level between ripple P to P and ripple Peak is not identifiable at the spectrum over 400Hz. Due to generation of the noise
caused by the current loss, even if the the fundamental tone of the audio-frequency signal is reproduced by amplifier, it is mixed with the noise at high frequency spectrum, and is impossible to separate the harmonics of a fundemental tone in theory. Therefore, it is impossible to reproduce the harmonics of a fundamental tone (natural tone) at high frequency spectrum. On the other hand, the second generation power supply makes it possible to accurately separate the noise level from ripple P up to 2.5KHz. It proves that there is no current loss between ripple P and P.

3. CONCLUSION

Converting all power supplies for audio system (CD, pre-amplifier, main amplifier) to the second generation series power supply enables to improve high frequency distortions in power supply circuit and to reproduce all of the lost audio-frequency signals, and also it enables to reproduce the harmonics of a fundamental tone (natural tone) and Hall tone.
Using for digital circuit power supply such as DA converter enables to reproduce accurate digital waveform and to improve brightness and resolution of digital image.