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That equalising pulses were not a panacea for interlacing difficulties was realised when the American system was stan-

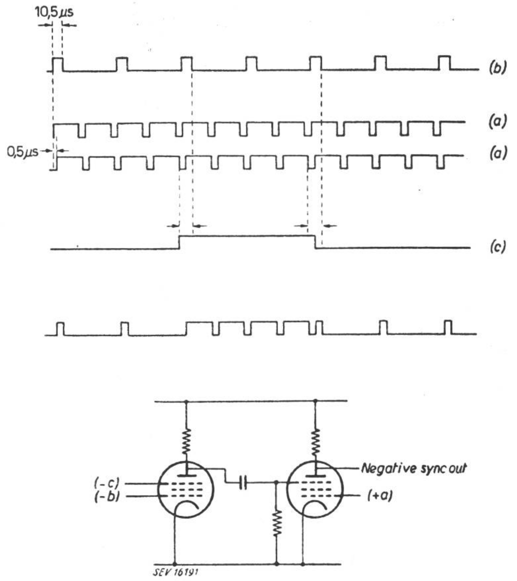

Fig. 2
Sync Wave-Form Generation

dardised. Also the complications introduced at the transmitter were not ignored. But the philosophy was that complications at the transmitter were well justified if it made for simplicity or flexibility of design at the receiver; no receiver, it was argued, would be any the worse for the presence of equalising pulses.

This last statement is no longer strictly true in view of the trend towards fly-wheel sync circuits. The presence of equalising pulses can, in fact, restrict flexibility of design in this case.

The extraordinary simplification of circuits at the transmitting end which results from abandoning the equalising pulse is shown in Fig. 2 which illustrates one method of arriving at the British standard sync waveform:

Looking at the finally desired waveform we note that it can be made up from the continuously running waveform (*a*) by quashing out certain parts. The required quashing waveform is shown as (*b*). As the leading edge of (*b*) is required to lead that of waveform (*a*), we sync it from primary waveform (*a'*) from which (*a*) is derived through a 0,5 μs delay line.

Waveform (*a*) when quashed with waveform (*b*) produces line sync pulses. To switch over to field sync we «quash the quash»; this latter quashing waveform is shown as (*c*). Waveform (*c*) is derived from a multivibrator which is controlled by two counting circuits. The first counts 405 pulses of waveform (*a*) and opens a gate. As soon as the gate is opened the second counter counts the required number of field pulses (8).

The very simple mixing process is shown schematically in the lower part of Fig. 2.

Conclusion

Equalising pulses would not appear to be justifiable on purely technical grounds.

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Contribution to discussion

By *C. G. Mayer*, London

Mr. Chairman, since Mr. Bedford has mentioned American television standards I would like to say a few words on this subject of negative versus positive modulation. We have discussed these questions together in the past, and both he and I have also discussed them with engineers on both sides of the Atlantic, with negative results — negative in the sense that since both sides have established standards they naturally endeavour to produce arguments to prove their own system the better. Having said this I will not take up the short time available in this discussion except to point out a new and important factor which affects one's choice in deciding on the sign of the modulation. I refer, of course, to the recent development of the system known as «Intercarrier Sound» which is only made possible by negative modulation of the picture combined with frequency modulated sound. Briefly, with negative modulation the carrier never drops to zero, so that the picture and sound signals can be amplified together in common intermediate and video amplifiers at the receiver. The two carriers beat together to produce a signal having the difference frequency — 4.5 Mc./s in the case of the U.S. standard. This beat frequency will be frequency modulated by virtue of the fm on the original sound carrier, and can be separated from the vision signal at the input to the picture tube by conventional treatment as an fm signal, and passed to the loudspeaker. We are rapidly gaining experience in America with this system, which not only offers real economies in receiver design (sound IF amplifier not needed) but also enables some of the shortcomings of conventional receivers to be overcome, principally in regard to stability, hum modulation, and microphonics of the local oscillator in the receiver. Since both carriers are influenced to the same extent the resultant beat frequency is free from these difficulties, and in fact, an «Intercarrier» receiver requires no fine tuning control. It was thought that the effect of phase or frequency modulation of the picture carrier at the transmitter would be serious, but tests have proved that transmitters having as much as ten degrees phase variation give excellent sound quality on properly designed receivers. In choosing negative modulation in the United States we cannot claim to have had the foresight that has made the development of this system possible, but it is a fortunate circumstance for which we are very grateful, just as we have also to be grateful now for 60 cycle power which enables us to obtain bright pictures free from flicker.

Finally, in regard to Mr. Bedford's remarks on the effects of interference on the picture, our experience — confirmed by others — is that subjectively white spots are certainly much more disturbing to the eye than the black specks obtained with negative modulation.

In view of the widespread interest in this subject I should be glad, Mr Chairman, if you would agree that these remarks be included in the record together with Mr. Bedford's expose.

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Apport à la discussion

Par *Y. L. Delbord*, Paris

Je voudrais présenter deux remarques:

La première remarque concerne un détail technique. Dans sa très intéressante communication Mr. Bedford a indiqué l'importance d'un double signal de synchronisation verticale, l'un provoquant le retour du spot vers le haut de l'image, l'autre marquant avec précision l'instant du commencement de l'analyse utile.

Dans ces conditions, l'intercalage des trames est en général absolument correct.

Plusieurs brevets ont été pris sur ces questions par des industriels français et quand, il y a un an, j'expliquais au regretté professeur Fischer l'importance de cette solution, il m'a fait remarquer que dès le début des expériences, un tel dispositif avait fonctionné sur le «Grossprojektor»; je souhaite que cette remarque constitue un modeste hommage à l'universalité des connaissances du professeur Fischer.

La deuxième remarque n'est pas du tout technique et je m'en excuse.

Quand le Comité International de Télévision a été créé les fondateurs espéraient que l'accord pouvait se faire sur des normes internationales. Pour cela il était nécessaire que des comités nationaux se constituent et il avait été précisé que des comités devaient être composés non de représentants de «corps constitués», je veux dire de représentants de Sociétés commerciales, de représentants de Services publics, de représentants de l'Administration, etc., mais de personnalités ayant une longue expérience de la télévision et qui, sans distinction d'origine: Laboratoires, industries, services publics, universités, etc., soient capables de faire abstraction de leurs intérêts particuliers et soient capables de discuter les problèmes de la télévision avec une honnêteté scientifique totale.

L'expérience a prouvé que cet idéal était difficile à atteindre et qu'il était à peu près impossible pour un ingénieur d'oublier ses intérêts personnels, les intérêts de son laboratoire, les intérêts de sa Compagnie, les intérêts de son pays, et c'est très naturel.

Je souhaiterais malgré tout qu'un nouvel effort soit fait et j'espère que bientôt nous apprendrons la création de tels comités techniques dans de nombreux pays et particulièrement aux Etats-Unis et en Grande-Bretagne.

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A Self-Oscillating Line-Deflection Circuit

By *J. Haantjes*, Eindhoven, Netherlands

621.397.331.2

The line-deflection circuit is one of the most interesting parts of a television receiver. This circuit has to deliver a current of saw-tooth wave-form in a coil. The fact that theoretically this should not require any energy, whereas most types of line time bases show a high energy consumption, has led to the problem how to design a line-deflection circuit with a low energy consumption.

Apart from this there is an earnest desire to build television receivers with a minimum of components in order to make them as inexpensive as possible. This last consideration had already led to the development of a self-oscillating line-deflection circuit such as was applied, for instance, in the German Einheitsempfänger [1] [1]) before the last war. The disadvantage of this circuit was that the energy consumption was high, viz. over 30 W. Moreover it appeared to be difficult to develop a sufficiently durable valve for this circuit, because the control grid of this valve, which in principle had to carry a high current, was very heavily loaded.

Later on L. R. Malling [2] published a paper in which he described a self-oscillating line-deflection circuit employing a combination of a triode and a diode. However, owing to the precautions he had to take to obtain good linearity, the energy consumption was again high. Moreover the energy needed for synchronization was very high, which also has to be considered as a serious drawback.

In this paper it will be explained how it has been found possible to design a self-oscillating line-deflection circuit with good linearity and a short fly-back time while being easily synchronized and needing only a rather small energy supply.

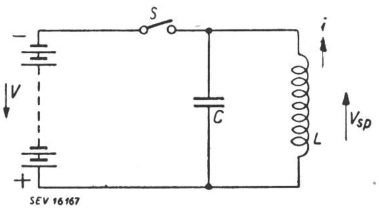

Fig. 1
Ideal circuit for generating linear saw-tooth currents in a coil

First attention will be drawn to an ideal way to generate a saw-tooth current in a coil. The network is indicated in fig. 1. It consists of a coil and a small capacitor in parallel, which are over a switch connected to a battery. When the switch is closed a current will start to flow in the coil, increasing linearly with time. When after some time the switch is opened a certain amount of energy will have been stored in the circuit. Consequently sinusoidal oscillations will start in the resonance frequency of the circuit. After slightly more than a half-cycle of oscillation there will be a situation where the current in the coil has reversed its direction and where the voltage on the condenser is again the same as that on the battery. When at this moment the switch is closed again the current of the coil will charge the battery, whilst the rate of change of the current will be the same as before the switch was opened. Fig. 2 shows the shape of the current in the coil and the shape of the voltage on the circuit. If the opening and closing of the switch is repeated at the right moments a periodical saw-tooth current will flow in the coil without any energy consumption, since the coil will periodically deliver all the stored energy back to the battery.

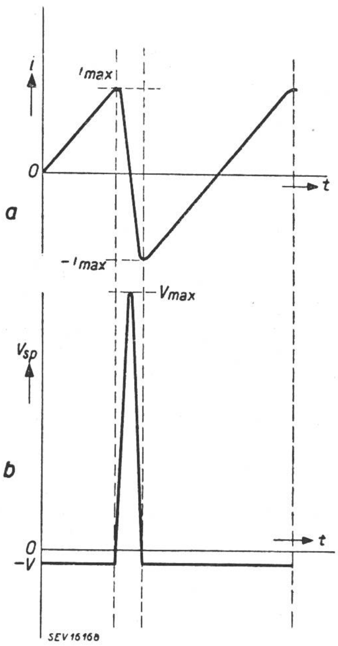

Fig. 2
Wave shape of current and voltage of the coil in the ideal circuit

The difficulty in trying to build a circuit working on this principle lies in the switch. This switch has to carry current in both directions with a low internal resistance and it will of course be necessary that the switch works automatically.

One might try to realise the switch by means of a combination of a triode and a diode, as indicated in fig. 3. The triode will be able to pass current in one direction while the diode passes it in the opposite direction. In order to make the switch self-operating some kind of feedback would be necessary from the anode of the triode to the control grid. As a small internal resistance is needed the triode will have to work in the region of positive grid voltages, thus in the region of grid currents. The internal resistance can be sufficiently low in this region of current take over between anode and grid, but it is preferable to avoid grid currents, for the reasons already mentioned.

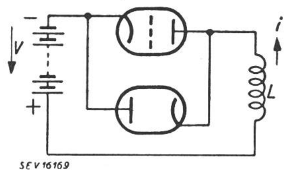

Fig. 3
Circuit in which the switch is realized by a combination of a triode and a diode

In order to avoid these difficulties the triode has been replaced by a tetrode. The circuit is given in fig. 4. The anode current of the tetrode is fed into the primary of a transformer. The tension on the secondary is applied to the control grid in such a sense that a decrease of the voltage on the anode will cause an increase of the voltage on the control grid. To avoid grid currents a capacitor and a resistor are inserted in the grid circuit. The screen grid is connected to a certain fixed positive

[1]) Bibliography at the end of this paper.