MEMO ROUTING SLIP

NEVER USE FOR APPROVALS, DISAPPROVALS, CONCURRENCES, OR SIMILAR ACTIONS.

	NAME OR TITLE / ORGANIZATION AND LOCATION	INITIALS / DATE		
1	NAME OR TITLE Mr. W.F. Friedman	INITIALS		CIRCULATE
	ORGANIZATION AND LOCATION NSA OOT	DATE		COORDINATION
2				FILE
				INFORMATION
3	[redacted] [illegible]			NECESSARY ACTION
				NOTE AND RETURN
4				SEE ME
				SIGNATURE

REMARKS You may be glad to see what [illegible] is up to.

FROM NAME OR TITLE R.W. Pettengill	DATE 27 July 54
ORGANIZATION AND LOCATION NSA 18K1	TELEPHONE 60 685

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Hell, Dr

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Kiel,6.8.1952.

Method for the Secret Transmission of Messages.

In the transmission of messages it is frequently necessary to maintain secrecy, whether it be language, a picture, or Morse characters. This matter is of special importance in the case of wireless transmission. Numerous methods are known for secret transmission of messages:

In telegraphic operations for instance the use of cipher machines for the encipherment of the text is the most effective means. In telephonic operations with amplitude modulation the carrier frequency is modulated or a side band reversal or side band transposition is undertaken. Often the message is made unintelligible by superimposition of interfering frequencies. Finally the voice frequency band may be broken up into several frequency ranges (sub-bands) which are transposed and used to modulate the carrier frequency. In this way the side bands appear interchanged. In facsimile secrecy is achieved by systematic change of the synchronism of the picture drums at the sending and receiving stations which causes a distortion of the image. In so doing the image amplitudes are preserved, only the position of the image elements with respect to one another is changed. It has also been proposed to transmit the image elements alternately as positive and negative. In regard to unauthorised decipherment of the secret message, the methods of speech encipherment working with transposition of the frequency sub-bands is safest. These methods however all use amplitude modulation and do not make use of the great transmission advantages of frequency modulation. Secret facsimile on the other hand uses no frequency transpositions, despite their success in speech encipherment.

According to the underlying idea of this invention a piece of information, i.e. language or a picture, is first frequency modulated and then the methods of influencing frequency familiar from direct speech encipherment are employed. For this purpose the frequency modulated carrier is broken up within the range of the frequency lift (Frequenzhub) into partial frequency ranges (sub-bands) and these partial ranges are enciphered. For instance, the partial ranges can be interchanged according to a key in continuous fashion using well known means. After encipherment, the sub-bands are again united into a frequency band are either transmitted directly

to the receiver or are transformed into an amplitude modulated band to render unauthorized decipherment more difficult and then transmitted. Transmission may be over wires or by wireless. At the receiving end the same operations follow in reverse order, whereby the message is again deciphered.

The use of frequency modulated sub-bands has, in addition to the familiar advantages of frequency modulation, in particular less sensitivity to interference, the advantage that the amplitudes of the sub-bands are equally great and constant at the time of encipherment so that the interchange is more readily accomplished. This method is especially favorable for secret facsimile transmission. In contrast to methods known hitherto for secret facsimile, the amplitude itself, which represents the content of the picture, is treated with a secure encipherment process in the round about way of frequency modulation, whereby the amplitude of the frequency modulated sub-bands remains constant in spite of varying picture amplitudes. Since it is also possible to sketch the picture dot by dot in the receiver, the times of the substitution of the sub-bands can be placed between the recording of the picture elements and thus be blanked out (ausgeblendet).

In the illustration is shown a block wiring diagram of the encipherment procedure in principle. From a source 1 the message frequency band (language or picture) comes via the amplifier 2 to a modulator 3, in which its frequency modulates the carrier frequency supplied by oscillator 4. Filter 5 is permeable only for the range of the frequency lift (Frequenzhub) of the carrier waves and cuts away the original message frequency band.

The frequency band which is permitted to pass is broken up into four sub-bands, let us say, by four filters 6, 7, 8, and 9, which are interchanged in familiar fashion in key stage 10. After encipherment, the sub-bands are again combined to form a frequency band and come via selector switch 11 directly into sender stage 12. Switch 11 can be so thrown that the frequency band composed of the transposed sub-bands is transformed in arrangement 13 into amplitude modulation and only then reaches the sending stage 12. From here the modulated carrier is conducted to the line 14 or to an antenna and so to the receiving station.

Patent claims.

1. Method for secret transmission of messages, in particular for the secret transmission of pictures, characterised by the fact that the frequency band of a carrier wave, which is frequency modulated with the message, is broken up into several sub-bands and these sub-bands are enciphered.

2. Method according to Claim 1, characterised by the fact that the partial frequency ranges are scrambled according to a key.

3. Method according to Claims 1 and 2, characterised by the fact that the enciphered partial frequency ranges are combined into a frequency band and transmitted.

4. Method according to Claims 1 - 3, characterised by the fact that the frequency band made up of enciphered partial frequency bands is transformed before transmission into an amplitude modified carrier.