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REMARKS

FROM NAME OR TITLE R.W. Pettengill — DATE 27 July 54

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DD FORM 94 REPLACES NME FORM 94, 1 FEB 49, WHICH MAY BE USED. 16—56269—3 GPO
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● File

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Dr. Ing. Rudolf Hell

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 super-imposition 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 unauthorized 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

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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
(asugeblendet).

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
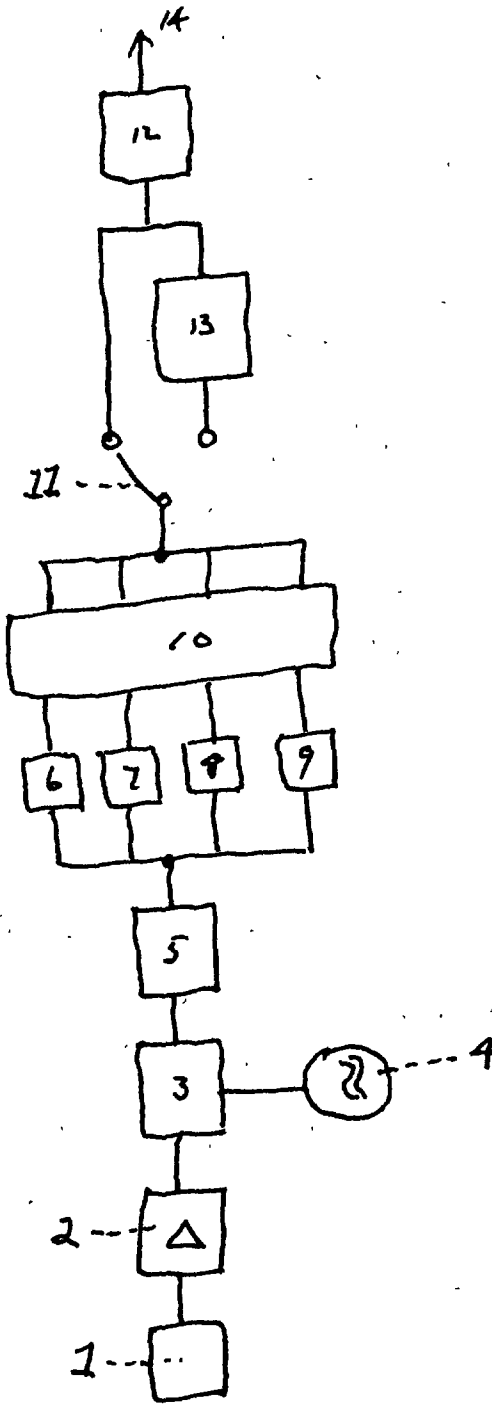antenna and so to the receiving station.

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Patent claims.

1. Method for secret transmission of messages, in particular
for the secret transmission of pictures, characterized 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, characterized by the fact
that the partial frequency ranges are scrambled according to a key.

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

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