

Radar method using reference object's reflections

Background

Usually, different radar methods are used to detect and analyze objects. In known radar methods, the received echo signals (10) are preferably compared with the transmitted signal (5) in a receiving unit (7).

Problem

State-of-the-art radar methods suitable for determining distances between reflective objects (1) all have a common time or frequency base between the transmitter (3) and receiver (7), i.e. transmitter and receiver must work coherently (see Fig. 2), imposing constraints on system complexity and receiver linearity. In many cases, however, it is not the exact distance between transmitter and object that is sought, but the relative distance between individual reflective objects (2a, 2b).

Solution

The invention makes it possible to determine the relative distances between individual reflection objects (2a, 2b). In contrast to the known radar methods, there is no common time or frequency basis between transmitter and receiver (see Fig. 1). The receiver (7) is completely decoupled from the transmitter (3). The determination of distances or material properties between two or more reflective objects (2a and 2b) is done without including the transmitted signal (5). With this method, the two or more received signals (9a, 9b) are compared to each other by mixing them in a non-linear receiver (7). The product of the mixing provides information on distance or material properties if there is a divergence of modulation between the first and second signal received. This divergence may consist of a frequency difference, phase difference or even amplitude difference, depending on the selected modulation form of the transmitted signal (5). In conventional radars, however, this divergence exists between the transmitted signal (reference signal) (5) and the individual received signals (10), whereas in the new method the divergence exists between two or more signals received (9a, 9b) without including the transmitted signal (5).

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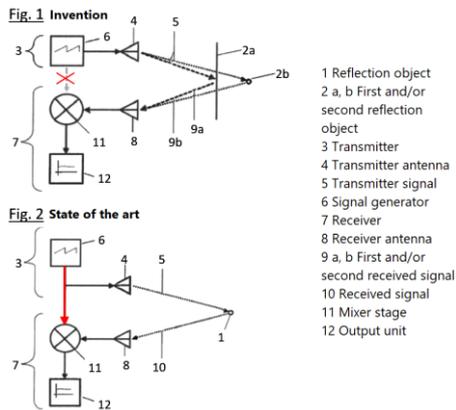
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Schematic drawing. Comparison of a structure according to the invention (Fig.1) and a structure according to the state of the art (Fig.2).

Advantages

- Reduced receiver complexity
- Independence of the receiving system from the transmitting system
- Strongly improved radar sensitivity

Application

The invention comprises a device or method for determining distances and material properties of objects as in

- production engineering (non-contact material analysis)
- medical technology (imaging localisation of organs, etc.)
- safety engineering (personal scanner, material scanner, letter scanner).