Claims

1. Firearm analysis device for determining parameters as indicative of a firearm (7) which has fired a shot, comprising

a voltage generating unit (401) arranged to generate an alternating voltage (U_e) during a counterrecoil travel and/or recoil travel of a movable weapon part (120) during a firing operation,

characterized by:

- a signal processing unit (410) which is arranged to generate a measurement signal (IN_+) from the generated AC voltage (U_e) and to generate a reference signal (Vin) from the generated AC voltage (Ue),
- a signal evaluation unit (420), which is arranged to determine a first and a second time point (t701 - t705, t702 - t706) during the counterrecoil travel and/or recoil travel of the movable weapon part (120) on the basis of a comparison of the time curves of the measurement signal (IN+) and the reference signal (Vin), and
- a time determination unit (450) arranged to determine a time interval duration between the first and second time points (t701 - t705, t702 - t706).

2. A firearm analysis device according to Claim 1, whereby the voltage generating unit (401) of which comprises

at least two magnetic poles (113, 111); and

a coil (114);

wherein the at least two magnetic poles (113, 111) are arranged in succession in such a way as to move in a path which is relative to the coil (114) in response to firing a shot, whereby successive poles each having opposite polarizations to each other passing the coil (114) in succession so as to induce alternating voltages in the coil (114) during a recoil travel and counterrecoil travel respectively.

3. A firearm analysis device according to any one of the preceding claims, the signal evaluation unit (420) of which is arranged,

in order to determine the first time point (t701 - t705) according to when the measurement signal (IN_+) exceeds or falls below the reference signal (V_{in}) or a threshold derived therefrom, and

to determine the second time point (t702 - t706) according to when the measurement signal (IN_+) again exceeds or falls below the reference signal (V_{in}) or a threshold derived therefrom.

4. A firearm analysis device according to any one of the preceding claims, the signal evaluation unit (420) of which is arranged,

in order to determine the first time point (t701 - t705) and the second time point (t702 - t706) within the measurement signal (IN_+) of a single recoil travel or a single counterrecoil travel of the movable weapon part (120),

assigning to the first (t701 - t705) and the second time point (t702 - t706), on the basis of the measurement signal (IN_+), a corresponding first and a corresponding second position on a path along which the voltage generating unit (401) generates the AC voltage (U_e) underlying the measurement signal (IN_+), and

determining the speed of the movable weapon part (120) during recoil travel or counterrecoil travel from the time interval duration which is determined by the time determination unit (450) and the distance between the first and second positions.

5. A firearm analysis device according to any one of the preceding claims, the signal processing unit (410) of which provides a supply voltage (V_{cc}) based on the AC voltages (U_e) for the operation of the signal evaluation unit (420).

6. A firearm analysis device according to any one of the preceding claims, the signal processing unit (410) of which comprises a rectifier circuit for rectifying voltages with which it rectifies the reference signal (V_{in}) during its generation.

7. A firearm analysis device according to Claim 6, whose signal processing unit (410) is arranged to half-wave rectify the measurement signal (IN_+) by means of the rectifier circuit or parts thereof during its generation.

8. A firearm analysis device according to Claim 6 or 7, whereby the rectifier circuit of which is a voltage multiplier circuit, in particular a Delon circuit (600).

9. A firearm analysis device according to any one of the preceding claims, the signal evaluation unit (420) of which is arranged,

determining a time interval between two successive counterrecoil travels or recoil travels over the time interval duration which is determined by the time determination unit (450), the first time point (t706) corresponding to an end of the measurement signal (IN_+) generated during a counterrecoil travel and the second time point (t701) corresponding to a beginning of the measurement signal (IN_+) generated during a recoil travel following this counterrecoil travel, and

determining, on the basis of the time interval between two successive counterrecoil travels or recoil travels, whether a shot has been fired in continuous fire or single fire, determining that

the firing has occurred in continuous fire when the time interval between multiple pre-counterrecoil travels or multiple recoil travels is below a predetermined time interval limit, and

in all other cases, that the shot was fired in single fire.

10. A firearm analysis device of Claim 9, wherein the signal evaluation unit (420) thereof is adapted to determine firing rates whereby

it is based on the time interval limit value and/or at least one additional time interval limit value, at least a two-time interval is defined, to each of which a firing rate can be assigned, and

determines in which of these time interval intervals the time interval lies.

11. A firearm analysis device according to one of the preceding claims, whose signal evaluation unit (420) is set up to convert the measurement signal (IN_+) into a digital measurement signal (dIN_+) according to the following rule when a reference signal (V_{in}) is present:

if (measuring signal ≥ reference signal)

digital measuring signal = 1

else if (measuring signal ≤ U0)

digital measuring signal = 0

else

digital measuring signal = empty

where U0 ≤ minimum (reference signal).

12. A firearm analysis device according to any one of the preceding claims, the voltage generating unit (401) of which is arranged in such a way to generate a signal uniquely identifying the movable weapon part.

13. A firearm analysis device according to Claim 11 or 12, the signal evaluation unit (420) of which is set up to determine, on the basis of the sequence of signal sections in which the digital measurement signal (dIN_+) is "1" or "0", whether the measurement signal (IN_+) is based on a counterrecoil or a backward travel of the movable weapon part (120).

14. A firearm analysis device according to any one of the preceding claims, comprising an acceleration sensor by means of which the acceleration of the counterrecoil travel and/or recoil travel of the movable firearm part (120) can be determined.

15. A firearm comprising a firearm analysis device according to any one of the preceding claims.

16. Method for determining parameters indicative of a firearm (7) from a shot which has been discharged, comprising:

- Detection of alternating voltages (U_e) generated during a counterrecoil travel and/or recoil travel of the movable weapon part (120) during a firing operation;

characterized by:

- Providing at least one measurement signal (IN_+) which is based on the generated AC voltages (U_e);
- Providing a reference signal (Vin) which is based on the generated AC voltage (Ue);

- Determining at least first and second time points (t701 -, t706) of counterrecoil travel and/or recoil travel of the movable weapon part (120) from a comparison between the measurement signal (IN+) and the reference signal (Vin); and,
- Determining at least one time interval duration between the first and second time points (t701 - t705, t702 - t706).

17. Method according to Claim 16, further comprising,

determining the first time point (t701 - t706), based on a time at which the measurement signal (IN_+) exceeds or falls below the reference signal (V_{in}) or a threshold derived therefrom, and

determining a second time point (t701 - t706), based on a time point at which the measurement signal (IN_+) again exceeds or falls below the reference signal (V_{in}) or a threshold derived therefrom after the first time point (t701 - t706).

18. Method according to Claim 17, further comprising,

determining the first and second time points (t701 - t705, t702 - t706) within the measurement signal (IN_+) of a single recoil travel and/or a single counterrecoil travel of the movable weapon part (120), and

determining the speed of counterrecoil travel and/or recoil travel of the movable weapon part (120) by means of the previously determined time interval duration between the first and the second time points (t701 - t705, t702 - t706) and the length of the path along which the AC voltage (U_e) underlying the measurement signal (IN_+) is generated.

19. Method according to Claim 18, further comprising,

determining at least one further first point in time and at least one further second point in time within the measurement signal (IN_+) of the recoil travel or counterrecoil travel of the movable weapon part (120), and

determining the respective speeds of the movable weapon member (120) during at least two successive time periods which have been defined by the first and second time points and by the, at least, one further first time point and the, at least, one further second time point, and

determining the acceleration of the movable weapon part (120) during its recoil travel or counterrecoil travel from the determined speeds and a time interval between the, at least, two successive time intervals.

20. Method according to any one of the preceding method claims, in which a signal based on the AC voltages (U_e) is rectified in order to generate the reference signal (V_{in}).

21. Method according to any of the preceding method claims, in which a signal based on the AC voltages (U_e) is half-wave rectified in order to generate the measurement signal (IN_+).

22. Method according to Claim 20, wherein a signal based on the AC voltages (U_e) is added in order to generate the reference signal (V_{in}).

23. Method according to any one of the preceding method claims, further comprising:

determining the end of a measurement signal (IN_+) which is generated during a counterrecoil travel as the first time point (t706) and the beginning of a measurement signal (IN_+) generated during a recoil travel following this counterrecoil travel as the second time point (t701);

determining the time interval between a plurality of counterrecoil travels or a plurality of recoil travels of the movable weapon member (120) based on the time interval duration; and

determining that the firing occurred in continuous fire when the firearm can be fired in continuous fire, multiple counterrecoil travels and recoil travels have been detected, and the time interval duration is below a time interval threshold, and otherwise that the firing occurred in single fire.

24. Method according to Claim 23, further comprising

defining at least two time spacing intervals, for which each of which a firing rate is assignable, on the basis of the time spacing limit value and/or at least one further time spacing limit value; and

determining the shot rate according to which time interval the time interval duration is in.

25. Method according to any of the preceding method claims, comprising:

generating a digital measurement signal (dIN_+) from the measurement signal (IN_+) when the reference signal (V_{in}) is present according to the following rule:

if (measuring signal ≥ reference signal)
digital measuring signal = 1
else if (measuring signal ≤ U0)
digital measuring signal = 0
else
digital measuring signal = empty

where U0 ≤ minimum (reference signal).

26. Method according to Claim 25, comprising:

determining the first time point (t701a) after when the digital measurement signal (dIN_+) alters from "0" or "empty" to "1", and the second time point (t701b) after when the digital measurement signal (dIN_+) alters from "1" or "empty" to "0".

27. Method according to Claim 25 or 26, comprising:

determining, on the basis of the sequence of signal sections (710-718) in which the digital measurement signal (dIN_+) is uninterruptedly "1" or "0", for whether the measurement signal (IN_+) is based on a counterrecoil travel or a recoil travel of the movable weapon part (120).