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Hand-held gun

Abstract

A hand-held gun having a grip part and a breech part movably supported in a longitudinal direction thereon is disclosed. A breech spring arrangement urges breech part in its initial position relative to grip part. For this purpose, breech spring arrangement is supported between the breech part and grip part. Starting from the initial position, breech part can move against the closing force of breech spring arrangement into an abutment position in which it abuts against a buffer body. Starting from the abutment position, breech part can be moved under elastic compression of buffer body in the longitudinal direction into a retracted position. In the movement area between the abutment position and the retracted position, a compression force is applied by the compressed buffer body in addition to the closing force of the breech spring arrangement between the grip part and the breech part.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATION

(1) This patent application claims the benefit of German Patent Application No. 10 2023 100 897.8, filed Jan. 16, 2023.

TECHNICAL FIELD

(2) The invention refers to a hand-held gun. The hand-held gun can be a long weapon or a short weapon or handgun, particularly a pistol.

Background

(3) In hand-held guns, particularly pistols in a very compact construction, recoil forces can occur during firing, which can affect the marksmanship of the shooter. This is all the more so for hand-held guns that use ammunition with high penetrating power or comparable large caliber. Therefore, it is desirable to improve the construction of the hand-held gun that affects the marksmanship as little as possible.

(4) DE 10 2007 003 180 A1 describes a hand-held gun configured as grenade weapon comprising a barrel assembly and a frame assembly. Between the barrel assembly and the frame assembly a recoil damping arrangement is arranged. The recoil damping arrangement is supported on one hand on the barrel assembly and on the other hand on the frame assembly and comprises a guide sleeve for a firing pin. The guide sleeve is coaxially surrounded by a damping spring of the damping arrangement. The damping spring can be configured as elastomer spring.

(5) DE 10 2016 009 047 B3 and DE 10 2016 009 185 A1 comprise hand-held guns having hydraulic damping devices in which a hydraulic liquid is displaced out of a cylinder chamber into a balance chamber for damping a recoil.

(6) A rifle having a damping plate between a barrel and a shaft is described in DE 10 2018 129 083 A1.

(7) A self-loading pistol having a chamber spring arrangement enclosed by an elastomer sleeve is disclosed in DE 197 22 806 C1. When firing the chamber spring arrangement and the elastomer sleeve are compressed by a slide of the self-loading pistol. Due to compression of the elastomer sleeve, it gets into friction contact with the chamber spring arrangement on one hand and with an inner wall bore on the grip of the self-loading pistol on the other hand. Via this friction contact the forces transmitted by the slide can be supported extensively on the grip of the self-loading pistol.

SUMMARY

(8) Starting from the known prior art, it can be one object of the invention to improve damping of recoil forces during firing and concurrently to allow a compact configuration of the hand-held gun.

(9) This object is solved by means of the features of a hand-held gun as described herein.

(10) The handgun according to the present invention can be a long weapon or a short weapon, preferably a pistol. It can be a fully automatic or a semi-automatic hand-held gun.

(11) The hand-held gun has a grip part, which can comprise a grip for holding the hand-held gun. On the grip part a breech part is movably supported in a longitudinal direction, e.g. on a holding part of the grip part. The breech part can also be denoted as slide. It comprises a closing element that serves to close a chamber in an initial position. In a retracted position, the breech part is

distanced from the chamber in order to allow the removal of a cartridge case from the chamber and the supply of a cartridge into the chamber. By means of a breech spring arrangement acting between the grip part and the breech part, the breech part is urged or pretensioned into the initial position.

(12) An elastically deformable buffer body is arranged on the grip part. In the initial position of the breech part a longitudinal distance exists in longitudinal direction between the buffer body and the breech part, particularly a support part of the breech part. If during firing the breech part moves backward in longitudinal direction, this movement results first in a compression of the breech spring arrangement, the spring force of which counteracts the movement of the breech part. If the breech part has overcome the longitudinal distance to the buffer body, it gets into abutment with the buffer body. The further backward movement of the breech part results in an elastic compression of the buffer body, while the breech spring arrangement is further compressed. In this back movement section of the breech part relative to the grip part, the breech spring arrangement and the buffer body are connected in parallel to one another so-to-speak. This back movement section is limited by the retracted position of the breech part or adjoins the retracted position. In the retracted position the breech part is in the furthest backward moved position relative to the grip part.

(13) The recoil of the breech part is thus damped in a first movement phase of the breech part exclusively by the breech spring arrangement and during an adjoining additional movement phase by means of the breech spring arrangement as well as the damping element or buffer body. It has shown that the maximum occurring recoil force can be remarkably reduced thereby, preferably at least about 40% to 50% and further preferably about at least 60% to 70% and particularly about approximately 80% compared with a hand-held gun of similar construction, however, without buffer body. Due to the dimensioning and material selection of the buffer body, the desired damping can be very simply reached adapted to the hand-held gun.

(14) Preferably the buffer body is releasably attached on the grip part, e.g. in a force-fit and/or form-fit manner. The buffer body can be non-destructively exchangeably arranged on the grip part.

(15) Preferably the buffer body is a uniformly handable part that can consist from one or multiple materials.

(16) It is advantageous, if a frame part is arranged on the grip part, wherein the buffer body is supported in longitudinal direction on the frame part, if it is compressed by means of the breech part moving into the open position. Preferably the buffer body is in continuous contact with the frame part of the grip part. In an embodiment the buffer body is directly arranged in front of the frame part in longitudinal direction on the grip part and thereby continuously in contact with the frame part. The buffer body can be secured by means of the frame part against an undesired movement orthogonal to the longitudinal direction.

(17) In a preferred embodiment the buffer body has a stop plate for the breech part on its face side facing the breech part in longitudinal direction. The buffer body has in addition an elastomer element, which is deformable by forces applied by the breech part, wherein the elastomer element is arranged behind the stop plate and is supported on the back side, opposite the stop plate, on the grip part and/or frame part. The stop plate is rigid for the forces applied by the breech part, i.e. it does not elastically deform or only insignificantly compared with the elastic deformation of the elastomer element.

(18) The stop plate can consist of metal or a metallic alloy, for example.

(19) The elastomer element is preferably a monolithic body of natural rubber and/or synthetic rubber and/or another suitable elastomer material. For example, styrene-butadiene rubber (SBR) or a polyurethane material or ethylene-propylene-diene rubber (EPDM) or silicone rubber can be considered as elastomer material. In general, synthetic rubber of an arbitrary group (e.g. R, M, O, U, Q or T) can be used.

(20) Preferably the buffer body consists exclusively from one single stop plate and one single monolithic elastomer element. The stop plate and the elastomer element consist of different

materials.
(21) It is advantageous, if the buffer body comprises a longitudinal opening, which particularly extends entirely through the buffer body in longitudinal direction. The breech spring arrangement can extend in longitudinal direction through the longitudinal opening. The longitudinal opening can be surrounded by the buffer body in circumferential direction, so that the longitudinal opening is configured as through-hole. Preferably the longitudinal opening is open on one side orthogonal to the longitudinal direction, e.g. toward the top. In this configuration the buffer body has a U-shaped form with view in longitudinal direction or in a cross-sectional plane, which is orientated orthogonal to the longitudinal direction. The end surfaces of the buffer body facing upwards are preferably curved concavely or otherwise deepened or recessed, so that a clearance is created toward a virtual reference plane brought into contact from the top. Starting from a central area of the buffer body in longitudinal direction its height can increase toward the front and toward the back. The created clearance is available for displacing material of the elastomer element during compression of the buffer body. This configuration avoids that the compressed and thus deformed buffer body or the compressed and deformed elastomer element blocks or hinders the movement of a movably supported part, particularly the movement of the breech part.
(22) The breech spring arrangement can be supported on the grip part directly or indirectly via the frame part. The other end of the breech spring arrangement is supported on the breech part, preferably on a front end of the breech part. Preferably the breech spring arrangement is compressed in the initial position as well as in the retracted position of the breech part.
(23) In a preferred embodiment the breech spring arrangement or at least a component thereof serves as end stop that limits the maximum travel path of the breech part from its initial position into its retracted position and thus defines the retracted position. The breech spring arrangement comprises at least one breech spring, which can be particularly configured as helical spring. In the retracted position directly adjacent windings of the breech spring or one of the provided breech springs of the breech spring arrangement can abut against one another and can block a further compression of the breech spring arrangement in longitudinal direction. The completely compressed breech spring can be supported thereby directly or indirectly on the grip part or on the frame part in a rigid manner and in doing so, can block a further movement of the breech part in backward direction relative to the grip part. In this manner the retracted position can be defined. In the retracted position of the breech part the buffer body is maximally compressed. An exceeding elastic compression of the buffer body in longitudinal direction is avoided in this configuration by means of the breech spring arrangement.
(24) In addition, the hand-held gun can comprise a holding device by means of which a form-fit and/or force-fit connection between the buffer body and the grip piece can be established. Particularly, the holding device is configured to limit or avoid an upward relative movement of the buffer body relative to the grip part.
(25) The holding device can comprise at least one safety section or safety projection extending in longitudinal direction over a holding section of the buffer body. The safety section or safety projection can be arranged on the grip part and/or on the frame part and/or on the breech part and can be a monolithic component of the grip part or the frame part or the breech part. A holding section of the buffer body is assigned to each provided safety section or safety projection, extending over the assigned holding section.
(26) If at least one safety section or safety projection is provided on the grip part and/or the frame part, it can abut in each position of the breech part on the respectively assigned holding section of the buffer body. At least one additionally or alternatively provided safety section or safety projection on the breech part can only abut against the respectively assigned holding section of the buffer body, if the breech part is not in its initial position and has particularly sufficiently approached the retracted position, e.g. has overcome the longitudinal distance to the buffer body and gets into contact with the latter (abutment position).

(27) It is in addition advantageous, if the buffer body comprises at least one cavity. In the embodiment the at least one cavity is arranged in the elastically deformable component of the buffer body, particularly the elastomer element. An optionally provided stop plate can be arranged with distance to the at least one cavity in longitudinal direction. The at least one cavity forms a clearance in longitudinal direction with the buffer body being in the non-compressed initial condition. The clearance is free of solid materials and open to the surrounding atmosphere. The at least one cavity or clearance is thus filled with the fluid (particularly air) present in the surrounding atmosphere. If the hand-held gun is immersed in a liquid, the at least one cavity can fill with this liquid—at least until the hand-held gun is again removed from the liquid and the liquid can drain.
(28) The at least one cavity is configured to adjust the compression-path-dependent compression force of the buffer body, which the buffer body applies during compression between the grip part and the breech part. By means of the number of cavities and/or their depth orthogonal to the longitudinal direction and/or their width parallel to the longitudinal direction, the compression-path-dependent elastic compression force can be adjusted very precisely. In addition, due to the at least one cavity, undesired temperature-dependent changes of the compression-path-dependent elastic compression force can be avoided. Thus, a temperature compensation can be achieved.
(29) In a preferred embodiment the at least one cavity extends parallel to a transverse plane that is orientated orthogonal to the longitudinal direction. The at least one cavity can extend along an inner side or along an outer side of the buffer body and particularly the elastomer element. The at least one cavity can be open to the outer side or to the inner side of the buffer body. The inner side can thereby adjoin or limit the longitudinal opening extending through the buffer body while the outer side of the buffer body abuts against the grip part at least partly.
(30) It is advantageous, if the buffer body comprises multiple cavities arranged with distance to one another in longitudinal direction. The cavities can form one single group or multiple groups, which are preferably identically configured. Particularly, these cavities can be alternatingly open toward the inner side and the outer side, at least in one common group or related to multiple groups. In doing so, a kind of accordion-shaped profile or bellows profile can result for the buffer body.
(31) The elastomer element of the buffer body can comprise a longitudinal section having a predefined form and/or geometry. This longitudinal section can be provided exactly once between the stop plate and the back surface of the buffer body. Alternatively, this longitudinal section can be arranged multiple times adjoining one another in longitudinal direction between the stop plate and the back surface of the buffer body and form the elastomer element.
(32) Each cavity can have a groove-like shape, i.e. two flanks opposed to one another in longitudinal direction in the non-compressed initial condition of the buffer body, wherein the flanks are connected with each other by means of a groove bottom. The flanks and the groove bottom are formed by the material of the buffer body. On the side opposite the groove bottom, the cavity is open toward the environment.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) Advantageous embodiments of the invention are derived from the dependent claims, the description and the drawings. In the following preferred embodiments of the invention are discussed in detail based on the attached drawing. The drawing shows:
(2) FIG. **1** a partial illustration of an embodiment of a hand-held gun in a longitudinal section,
(3) FIG. **2** a perspective partial illustration of a grip part, a buffer body and a frame part in an explosion illustration,
(4) FIG. **3** a partial illustration of the grip part and as well as of the buffer element of FIG. **2** in a top view onto the grip part,

(5) FIG. **4** a partial illustration of the grip part and an illustration of the buffer element of FIGS. **2** and **3** in a top view,
(6) FIG. **5** a perspective illustration and part of a breech part of the hand-held gun of FIG. **1**,
(7) FIG. **6** the grip part and the buffer element of FIGS. **2-4** in a perspective partial illustration,
(8) FIG. **7** the breech part, the grip part and the buffer element in a partial illustration in side view,
(9) FIGS. **8** and **9** the embodiment of the hand-held gun of FIG. **1** in different conditions after firing,
(10) FIG. **10** the hysteresis of the buffer element during compression and release in a schematic diagram,
(11) FIG. **11** the acceleration acting on the grip part of the hand-held gun dependent from the time in a schematic illustration in the embodiment of the hand-held gun according to the present invention as well as according to a common hand-held gun.
(12) FIGS. **12-14** one embodiment of a buffer element respectively of the hand-held gun according to the present invention in different illustrations,
(13) FIGS. **15** and **16** a top view on an embodiment of a buffer body respectively having a modified geometry for modification of the stiffness in longitudinal direction compared with the buffer body according to FIGS. **12-14**,
(14) FIG. **17** a schematic sectional illustration through an elastomer element of an embodiment of a buffer body in a sectional plane parallel to the longitudinal direction and
(15) FIG. **18** a perspective illustration of another embodiment of the buffer body.

DETAILED DESCRIPTION

(16) In FIG. **1** a longitudinal section of an embodiment of a hand-held gun **20** is depicted in a partial illustration. The embodiment is a short weapon, particularly a fully or semi-automatic short weapon, and a pistol according to the example. In modification to this the hand-held gun **20** could also be a long weapon.
(17) The hand-held gun **20** has a grip part **21** comprising a not illustrated grip by means of which the shooter can grip the hand-held gun **20**. The grip part **21** has, in addition, a holding part **22** (FIGS. **2** and **3**) for holding of additional components of the hand-held gun **20**, particularly a frame part **23**, a buffer body **24** as well as a breech spring arrangement **25**. The holding part **22** is bowl or trough-shaped and open to the top and to the front, as particularly apparent from FIGS. **2** and **3**. The holding part **22** has two side walls **26** that are opposed to one another with distance in a transverse direction Q and that extend in a longitudinal direction L. The two side walls **26** of holding part **22** limit a holding space **27** of holding part **22**. A bottom **29** of holding part **22** connects the two side walls **26** and limits the holding space **27** downwardly.
(18) Preferably buffer body **24** is supported in a tool-free releasable manner on frame part **23** and/or grip part **21**, particularly exclusively in a force-fit and/or form-fit manner.
(19) On the grip part **21** a non-illustrated magazine tunnel can be provided for locating a magazine therein. The magazine tunnel can be, e.g. inside the grip of grip part **21**.
(20) In the present application the expression “top”, “bottom”, “front” and “back” denote directions in which the hand-held gun is usually held during shooting. Thereby the shooting direction is toward the front. The holding part **22** of grip part **21** is in this position on top of a non-illustrated grip of grip part **21**.
(21) As particularly apparent from FIGS. **2** and **3**, buffer body **24** and frame part **23** are arranged inside holding space **27** and are held there in a form-fit and/or force-fit manner. In the embodiment a groove-shaped holding depression **28** is provided in the holding part **22** for this purpose, wherein the holding depression **28** is open toward the holding space **27** and expands the holding space **27** in this area. In the embodiment holding depression **28** extends in the side walls **26** as well as optionally additionally in the bottom **29** of holding part **22** connecting the side walls. The holding depression **28** extends completely along the side walls **26** toward the top, so that the buffer body **24** and the frame part **23** can be inserted from the top into the holding space **27** and can thereby at least

partly engage holding depression **28** in order to create a form-fit connection (compare FIGS. **2** and **3**).

(22) As particularly apparent from FIG. **3**, in the embodiment, buffer body **24** is arranged engaging into the holding depression **28** along its entire length. Contrary to this, frame part **23** only extends at a front end into the holding depression **28**. With view in longitudinal direction L, holding depression **28** is slightly longer than buffer body **24** in an installed initial condition in which it is not or only partly or slightly compressed in longitudinal direction L. If buffer body **24** is slightly compressed in longitudinal direction L in its installed initial condition, it can be arranged without play in longitudinal direction L between frame part **23** and the front end of holding depression **28** on holding part **22**. In its installed initial condition buffer body **24** can be only slightly compressed in longitudinal direction L compared to its completely non-compressed condition and particularly about less than 10% and further preferably less than 5% relative to its completely non-compressed length, in order to arrange it without play in longitudinal direction L between the front end of holding depression **28** and frame part **23**.

(23) The buffer body **24** is illustrated in more detail in FIGS. **4**, **6**, **7** and **12**-**16** and **18**. On its backside facing the frame part **23** it has a back surface **33**, which abuts against an abutment surface **34** of frame part **23** in the installed initial condition. In longitudinal direction L buffer body **24** is thus supported toward the back on frame part **23**.

(24) In order to avoid a relative movement between grip part **21** and frame part **23** in longitudinal direction L toward the back, frame part **23** comprises a flange-type front part **35**, which is configured to engage into holding depression **28** of holding part **22** and thus to establish a form-fit connection with grip part **21**. On the front part **35** of frame part **23**, abutment surface **34** for buffer body **24** and particularly the back surface **33** thereof is provided. According to the example, the front part **35** is monolithic component of frame part **23**. In the embodiment front part **35** has a shape that is angled multiple times and/or curved in an arc-shaped manner around an axis extending parallel to the longitudinal direction L and is approximately U-shaped according to the example.

(25) The buffer body **24** has a stop surface **36** for a breech part **37** of the hand-held gun **20** on its front side, which is opposite the back surface **33** in longitudinal direction L. The breech part **37** is movably supported in longitudinal direction L on the grip part **21**. The breech part **37** can also be denoted as slide.

(26) In the embodiment a support part **38** is provided on breech part **37**, which can be monolithic component of breech part **37**. The support part **38** projects from the bottom side of the breech part **37** downwardly according to the example. In the illustrated embodiment the support part **38** is arranged in the area of the front end of breech part **37** on which also a front side **39** of an aiming device can be present. The support part **38** is configured to engage into the holding space **27** and to move in the front section of holding space **27** holding space **27** in front of the frame part **23** or the buffer body **24** in longitudinal direction L when breech part **37** moves relative to the grip part **21** or the frame part **23**—for example for manual loading of the hand-held gun **20** or for fully automatic or semi-automatic loading after firing.

(27) In the embodiment support part **38** is round and particularly ring-shaped. On its back side it has a surface, which is here denoted as counter-stop surface **40**, facing the buffer body **24** and the stop surface **36** thereof. The counter-stop surface **40** is configured to get into contact with stop surface **36** in order to elastically compress buffer body **24**, which will be explained in detail in the following.

(28) The breech spring arrangement **25** is configured to urge breech part **37** relative to grip part **21** in an initial position I, which is illustrated in FIG. **1**. In the initial position I, a longitudinal distance is present in longitudinal direction L between stop surface **36** of buffer body **24** and counter-stop surface **40** of breech part **37** and, according to the example, the support part **38**. Starting from the initial position I, breech part **37** can be manually, or due to firing, moved backwards in longitudinal

direction L relative to grip part **21**. Thereby first the longitudinal distance is overcome until the abutment position II is reached in which stop surface **36** and counter-stop surface **40** get into contact (FIG. **8**). During a continued backward movement of breech part **37** it is moved from the abutment position II back to a retracted position III in which the relative movement of breech part **37** in the backward direction stops (FIG. **9**).

(29) A barrel **45** (FIGS. **1**, **8** and **9**) is also part of the hand-held gun **20**. A chamber **46** is present on the barrel **45**. In the initial position I a closing element of breech part **37**, which is not illustrated in detail, closes chamber **46** in backward direction. During ignition of the cartridge when firing, breech part **37** is accelerated backwards in longitudinal direction L relative to grip part **21** and is moved out of the initial position I back into the retracted position III.

(30) In the embodiment breech spring arrangement **25** has at least one breech spring and according to the example an outer breech spring **47** as well as an inner breech spring **48**. The at least one breech spring **47**, **48** surrounds a guide rod **49** of breech spring arrangement **25**. The guide rod **49** can be a massive body or a hollow body. On its front end, guide rod **49** forms a front stop **50** and forms a back stop **51** on its opposite back end. Between the front stop **50** and back stop **51**, guide rod **49** comprises a guide section **52**, which is surrounded by the at least one breech spring, according to the example the outer breech spring **47** and the inner breech spring **48**. The support part **38** surrounds the guide section **52** of guide rod **49**. With view in longitudinal direction L the at least one breech spring **47**, **48** is supported on one side on support part **38** and on the other side indirectly on the grip part **21** via back stop **51** and frame part **23**. In the initial position I, support part **38** abuts against front stop **50** according to the example.

(31) The guide rod **49** is supported with its back end, in the area of the back stop **51**, indirectly or directly on grip part **21** and according to the example on frame part **23**. In the installed condition the guide rod **49**, the frame part **23** and the grip part **21** form a unit relative to which breech part **37** can move between the initial position I and the retracted position III.

(32) In the embodiment of the breech spring arrangement **25** illustrated here, the outer breech spring **47** and the inner breech spring **48** form a telescopic spring arrangement in order to achieve a compact configuration in longitudinal direction L. In modification to this, also one single breech spring would be sufficient. It is in addition possible to provide more than two breech springs **47**, **48**.

(33) For supporting the outer breech spring **47** around the inner breech spring **48**, a guide sleeve **53** is present, which surrounds a longitudinal section of guide section **52** and inner breech spring **48**. In longitudinal direction L, guide sleeve **53** is shorter than guide section **52**, so that the guide sleeve **53** can move along the guide section **52** in longitudinal direction L. On its back end, guide sleeve **53** has a back flange **54** extending radially outwardly on which the outer breech spring **47** is supported with its back end. With its front end opposed thereto in longitudinal direction L, outer breech spring **47** is supported on support part **38** of breech part **37**.

(34) The guide sleeve **53** has in addition a radially inwardly projecting front flange **55** on which the inner breech spring **48** is supported with its front end. The inner breech spring **48** is supported with its back end, which is opposed to the front end in longitudinal direction L, on the back stop **51** of guide rod **49**. By means of the guide sleeve **53**, outer breech spring **47** and inner breech spring **48** are thus effective between breech part **37** and frame part **23** or grip part **21** and according to the example are connected in series. As explained, the number of used breech springs may vary.

(35) The function of the hand-held gun **20** described so far is subsequently explained with regard to FIGS. **8-11**.

(36) It is assumed that the breech part **37** is in the initial position I relative to grip part **21** and frame part **23**, which is illustrated in FIG. **1**. By means of the breech spring arrangement **25**, a closure force is applied between breech part **37** on one hand and frame part **23** or grip part **21** on the other hand, which maintains breech part **37** in the initial position I without external force application.

(37) In the initial position I the support part **38** of breech part **37** is arranged with longitudinal

distance from buffer body **24** in longitudinal direction L, wherein this longitudinal distance exists or is present between stop surface **36** of buffer body **24** and the assigned counter-stop surface **40** of support part **38** (FIG. **1**). It is now assumed that a shot is fired by means of the hand-held gun **20**. The explosion of the cartridge in the chamber **46** applies a recoil force via a non-illustrated closure element of breech part **37** onto breech part **37** so that breech part **37** is accelerated backwards in longitudinal direction L relative to grip part **21** and frame part **23**. Thereby support part **38** of breech part **37** moves along the guide section **52** of guide rod **49** and compresses the at least one breech spring **47**, **48**, i.e. according to the example the outer breech spring **47** as well as the inner breech spring **48** of breech spring arrangement **25**. The support part **38** moves closer to the buffer body **24**. In a partly compressed condition of the at least one breech spring **47**, **48** of breech spring arrangement **25** the stop surface **36** of buffer body **24** and counter-stop surface **40** of support part **38** get into contact in the abutment position II, in which buffer body **24** is still in its elastically non-compressed—or for installation reasons only partly compressed—initial condition (FIG. **8**). In the abutment position II, buffer body **24** is however not compressed in longitudinal direction L by means of breech part **37** or support part **38**.

(38) Due to a continued movement of breech part **37** in longitudinal direction L in backward direction out of the abutment position II (FIG. **8**) in direction toward the retracted position III (FIG. **9**), buffer body **24** or at least an elastically deformable part thereof is elastically compressed. The compression force F exerted by buffer body **24** in its compressed condition depending on the compression distance s is schematically illustrated in FIG. **10** based on different hysteresis curves Hs, Hm, Hw. The compression force F acts in addition to the closure force of breech spring arrangement **25** between breech part **37** on one hand and frame part **23** or grip part **21** on the other hand. Between the abutment position II and the retracted position III of breech part **37** the buffer body **24** is thus effective in addition to the breech springs **47**, **48** and connected in parallel to the breech springs **47**, **48** so-to-speak. The breech part **37** is supported in the movement area between the abutment position II and the retracted position III via the breech spring arrangement **25** and additionally via buffer body **24** on frame part **23** or grip part **21**.

(39) If breech part **37** is further moved backwards in longitudinal direction L from the abutment position II in the retracted position III and thereby compresses buffer body **24** elastically, also breech springs **47**, **48** of breech spring arrangement **25** are further compressed. In the embodiment the windings of at least one of the two breech springs **47**, **48** and according to the example the outer breech spring **47** get into contact, if the retracted position III is reached (FIG. **9**). In this condition the outer breech spring **47** cannot be further compressed and therefore it forms a rigid block in the type of a sleeve, which cannot be further compressed in longitudinal direction. According to the example, the outer breech spring **47** defines the retracted position III in which a further relative movement of breech part **37** in longitudinal direction L backwardly relative to frame part **23** or grip part **21** is blocked.

(40) In the retracted position III, support part **38** is supported via the outer breech spring **47**, guide sleeve **53** and according to the example back flange **54** of guide sleeve **53** and via back stop **51** of guide rod **49** on frame part **23** and thus on grip part **21**. Due to the dimensions in longitudinal direction L of the completely compressed outer breech spring **47**, the maximum compression distance s.sub.max is predefined along which buffer body **24** is compressed (FIGS. **9** and **10**) starting from its initial condition (abutment position II of breech part **37** relative to grip part **21**).

(41) Due to the compression force F as well as the closing force of breech spring arrangement **25**, breech part **37** is subsequently moved starting from the retracted position III back into the initial position I.

(42) As can be seen in FIG. **10**, buffer body **24** comprises a hysteresis. The origin of the diagram illustrated in FIG. **10** illustrates the non-deformed or only slightly deformed initial condition of the buffer body **24**. At point P the buffer body **24** is maximally elastically deformed or maximally compressed. The schematically illustrated hysteresis curves Hs, Hm, Hw describe a compression

path K as well as a decompression path D, which is different from compression path K respectively. Along the compression path K from the initial condition (origin) up to the point P the resulting compression force F is larger than along the decompression path D from point P back to the origin or the initial condition in each of the individual hysteresis curves Hs, Hm, Hw. Dependent from the configuration and, for example, the shape and/or dimensioning of buffer body **24**, the hysteresis curve or compression path K and decompression path D can obtain a desired progress, whereby the stiffness of the buffer body **24** can be predefined depending on the application so-to-speak. Accordingly, different hysteresis curves can be set by means of the configuration of the buffer body **24**. In FIG. **10** only by way of example for illustration purposes three different hysteresis curves are shown: a hysteresis curve of medium stiffness Hm, characterizing a medium stiffness of buffer body **24** in longitudinal direction L; a hysteresis curve of higher stiffness Hs, characterizing a higher stiffness compared with the medium stiffness of buffer body **24** in longitudinal direction L; and a hysteresis curve of lower stiffness Hw, characterizing a lower stiffness compared with the medium stiffness of buffer body **24** in longitudinal direction L.

(43) In FIG. **11** an acceleration a acting on the grip part **21** after firing is schematically illustrated depending on time t. A first acceleration curve A**1** illustrates the acceleration a dependent from time t in the configuration of the hand-held gun **20** according to the invention, while the second acceleration curve A**2** illustrates the acceleration a occurring in an exemplary hand-held gun **20** without the buffer body **24** according to the invention depending on time t.

(44) At a first point in time t**1** a shot is fired. During a first phase up to a second point in time t**2** breech part **37** moves backwards without contact to buffer body **24** in longitudinal direction L. At a second point in time t**2** the abutment position II illustrated in FIG. **8** is reached and buffer body **24** begins to apply a compression force F between grip part **21** and breech part **37** in addition to the closing force of breech spring arrangement **25**. It is apparent that the maximum absolute value of acceleration a according to the first acceleration curve A**1** is remarkably lower after the second point in time t**2**, due to the present buffer body **24** than the maximum absolute value of acceleration a occurring in a common hand-held gun **20** without additional buffer body **24** (second acceleration curve A**2**). The maximum absolute value of the acceleration a**1**.sub.max of first acceleration curve A**1** occurring after the second point in time t**2** can be remarkably reduced according to the invention relative to the maximum absolute value of the acceleration a**2**.sub.max of the second acceleration curve A**2** (hand-held gun **20** without buffer body).

(45) With reference, particularly to FIGS. **12**-**18**, the configuration of buffer body **24** is explained in detail based on embodiments.

(46) In the illustrated embodiment the buffer body **24** comprises a stop plate **60** and an elastomer element **61**, which is elastically deformable in longitudinal direction L. With view in longitudinal direction L stop plate **60** is arranged in front of the elastomer element **61** and comprises the stop surface **36** of buffer body **24**. On the back side opposed to the stop plate **60**, the back surface **33** of buffer body **24** is present on the elastomer element **61**.

(47) In the preferred embodiment described here, buffer body **24** comprises only two components, namely stop plate **60** as well as elastomer element **61**. It can therefore consist of only two different materials, namely a material of stop plate **60** that is not elastically deformable by the occurring forces and a material of elastomer element **61** elastically deformable in longitudinal direction. For example, a metallic alloy can be used as material for stop plate **60**, e.g. a steel alloy. The elastomer can comprise natural rubber and/or synthetic rubber from an arbitrary group, e.g. Styrene-butadiene rubber (SBR), ethylene-propylene-diene rubber (EPDM), silicone rubber (SI), etc. The elastomer element **61** can be a massive, compact body having comparably low porosity or can be a porous foam body.

(48) The stop plate **60** and the elastomer element **61** are non-releasably connected with one another by substance bond and/or by an adhesive joint. For example, the elastomer element **61** can be

formed on the stop plate **60** during and due to the production of buffer body **24**, e.g. by means of a molding process. The connection between the elastomer element **61** and stop plate **60** can be established during hardening of the elastomer material.

(49) The buffer body **24** has a longitudinal opening **62** extending in longitudinal direction L entirely through buffer body **24**. The breech spring arrangement **25** extends through the longitudinal opening **62**. According to the example, longitudinal opening **62** is open to the top. Thereby, buffer body **24** has a trough-shaped or U-shaped form with view in longitudinal direction L or in cross-section orthogonal to the longitudinal direction L. It can extend starting from a right side end **63** in an arc-shaped and particularly circular arc-shaped manner toward a left side end **64** around an axis, which is orientated parallel to the longitudinal direction L. Between the right side end **63** and the left side end **64** buffer body **24** can comprise a constant cross-section (apart from tapers or chamfers directly adjoining the ends **63**, **64**). This cross-section can have a suitable generally arbitrary form or geometry according to the desired stiffness of the elastomer element **61** and thus buffer body **24**.

(50) The buffer body **24** has an inner side **65** limiting the longitudinal opening **62** and an outer side **66** facing away from the inner side **65**. Due to the shaping of inner side **65** and/or outer side **66**, a thickness of buffer body **24**, particularly the elastomer element **61**, can be measured orthogonal to an axis—around which the buffer body **24** curves from the right side end **63** to the left side end **64**—extending parallel to the longitudinal direction L. This thickness of the elastomer element **61** can be constant in longitudinal direction L between stop plate **60** and back surface **33** or can vary, as in the preferred embodiment illustrated here.

(51) As particularly apparent from FIGS. **12**, **13**, **18** and FIG. **4**, the end surfaces provided on the right side end **63** and the left side end **64** are not straight with view in longitudinal direction, but are concavely domed. Starting from a center area of buffer body **24** in the longitudinal direction L, the height on the right side end **63** as well as the left side end **64** increases in longitudinal direction L toward the front and toward the back. Thereby a clearance for displacement of material of elastomer element **61** during compression of buffer body **24** is provided. It can be achieved that the compressed and thus deformed buffer body **24** or the deformed elastomer element **61** does not block movably supported parts, particularly not the movement of breech part **37**.

(52) In the preferred embodiment buffer body **24** and particularly elastomer element **61** comprises at least one and preferably multiple cavities **67**. The cavities **67** serve to define the stiffness of elastomer element **61** in longitudinal direction L according to the application. Due to the number and/or the form and/or the size of the cavities **67**, a desired hysteresis curve Hs, Hm, Hw with higher or lower stiffness can be set. By means of the cavities **67**, in addition a temperature-dependent variation of the hysteresis curve Hs, Hm, Hw can be reduced.

(53) In the embodiment illustrated in FIGS. **12-17** one single group having three cavities **67** is provided. FIG. **18** shows another embodiment having a longer buffer body **24** comprising more than three cavities **67** and according to the example, nine cavities **67**, which are arranged in three identically configured groups of cavities **67**. According to the example, cavities **67** are either open to the inner side **65** or to the outer side **66** and thus form groove-shaped cavities **67**. The cavities can be grouped in a manner so that each group comprises at least one cavity open to the inner side **65** and at least one cavity open to the outer side **66**. Within each group the cavities **67**, which are open to the inner side **65** and which are open to the outer side **66**, are arranged alternatingly in longitudinal direction L adjacent to one another. In this manner the elastomer element **61** obtains a shape having a meandering form or accordion-like or bellows-like form.

(54) In the embodiment each group has three cavities **67**. The number of cavities **67** of an individual group and/or the number of provided groups can vary.

(55) The embodiment according to FIGS. **12-17** shows an elastomer element **61** that has one single longitudinal section having one single group of three cavities **67**, according to the example. The embodiment shown in FIG. **18** has multiple and according to the example, three of such

longitudinal sections, which respectively have the same geometry or shape. By lining up of multiple identical longitudinal sections of the elastomer element **61** and/or enlargement of the length of elastomer element **61**, the stiffness of buffer body **24** in longitudinal direction can be reduced.

(56) Each of the cavities **67** extends arc-shaped along the elastomer element **61** from the right side end **63** up to the left side end **64**. The cavities **67** are open on the right side end **63** and on the left side end **64** according to the example. As explained, they are additionally or alternatively either open to the inner side **65** or to the outer side **66** and thus groove-shaped.

(57) By defining the shape and/or the size and/or the number and/or the distance in longitudinal direction L of cavities **67**, the stiffness of elastomer element **61** and thus buffer body **24** in longitudinal direction L can be defined depending on the application.

(58) For determination of the stiffness different parameters of the form or geometry of the buffer body **24** and particularly the elastomer element **61** can be varied, as schematically illustrated based on FIG. **17**. FIG. **17** shows a sectional image of the elastomer element **61** in a sectional plane parallel to the longitudinal direction L (e.g. orthogonal to the transverse direction Q) in a schematic principle illustration). The stiffness of the elastomer element **61** in longitudinal direction L can at least be varied or predefined by one or multiple of the following parameters: a depth di of the at least one cavity **67** open to the inner side **65**; a depth da of at least one cavity **67** open to the outer side **66**; a distance x between two directly adjacent cavities **67**, which are open to the same side **65** or **66**; a width wi in longitudinal direction L of at least one cavity **67** open to the inner side **65**; a width wa in longitudinal direction L of at least one cavity **67** open to the outer side **66**; a thickness of the elastomer element **61** measured in a sectional plane orthogonal to the inner side **65** and/or the outer side **66** through the elastomer element **61**.

(59) The width wi, wa and the depth di, da can be average values or maximum values for the widths wi, wa or depths di, da of the cavity **67**. In addition or alternatively, also other parameters can be varied that define the geometry and the shape, for example.

(60) In FIGS. **14-16** three embodiments of the buffer body **24** are illustrated by way of example in which the cavities **67** have different depths with view orthogonal to the longitudinal direction. Relative to the outer side **66**, the cavities **67** open to the outer side **66** have a maximum first depth d**1** in the embodiment according to FIG. **14**, a maximum second depth d**2** in the embodiment according to FIG. **15**, which is less than the first depth d**1** and in the embodiment according to FIG. **16**, a maximum third depth d**3**, which is less than the first depth d**1**, but larger than the second depth d**2**. In addition or as an alternative, the at least one cavity **67** open to the inner side **65** can vary in analog manner in the embodiments. Thereby the stiffness of buffer body **24** in longitudinal direction L is smaller in the embodiment according to FIG. **14** as in the embodiment according to FIG. **16** and is greater in the embodiment according to FIG. **15** than in the embodiment according to FIG. **16**.

(61) At this point it is indicated again that the geometry, the number and the spatial arrangement of the cavities **67** can vary and the illustration of the preferred embodiments is only exemplary. It is also possible to configure the elastomer element **61** of buffer body **24**, so that the inner side **65** and/or the outer side **66** is free from cavities **67** and/or projections or does not comprise corrugations. In such an embodiment elastomer element **61** can comprise, for example, a rectangular or trapezoid-shaped cross-section area.

(62) In order to avoid a relative movement of buffer body **24** to the top out of the holding space **27** relative to grip part **21**, as an option a holding device **70** can be provided. By means of the holding device **70**, for example, a continuous form-fit connection or at least a form-fit connection in time phases can be established between buffer body **24** and the grip part **21** and/or the frame part **23** and/or the breech part **37**.

(63) For this purpose, holding device **70** can comprise a safety section or safety projection **71**, which extends over a holding section **72** on buffer body **24**, as exemplarily illustrated in FIG. **4**. For

forming the holding section **72**, the length of increases in the area of its back surface **33** with view from top to bottom. According to the example, on frame part **23** a safety section or safety projection **71** is formed, which extends over this holding section **72** of buffer body **24**, i.e. the safety section or safety projection **71** is arranged above the holding section **72** in direction to the top and is preferably continuously in abutment with holding section **72**.

(64) The part of the back surface **33** provided on holding section **72** can be inclined under an angle relative to the longitudinal direction, which is different from a right angle. The part of the back surface **33** adjoining the right side end **63** and the left side end **64** is preferably orientated orthogonal to the longitudinal direction L. Therefore, the back surface **33** of buffer body **24** has a bent or angled location at the transition to the holding section **72**. The abutment surface **34** of frame part **23** matches the form of the back surface **33**, so that a continuous two-dimensional contact between the back surface **33** and the abutment surface **34** is achieved.

(65) In addition or as an alternative, the safety section or safety projection **71** could also be provided on the grip part **21**. In addition or as an alternative, it is also possible to arrange the safety section or safety projection **71** of holding device **70** at any other location of frame part **23** or grip part **21** at which it at least partly extends over buffer body **24** and can secure it thereby against an upward movement. For example, the at least one safety projection **71** could be realized in form of a pin or mandrel, which engages into a respective safety depression (e.g. safety hole) on the buffer body **24**.

(66) In the embodiment in addition, a holding section **72** comprising a safety surface **73** on the two ends of stop surface **36** and particularly at their upper ends is part of the holding device **70**, as particularly apparent from FIGS. **4**, **7**, **12**, **13** and **18**. The safety surface **73** can be a planar surface or a curved surface. Preferably the safety surface **73** is convexly curved and can have a constant radius of curvature around an axis extending parallel to the transverse direction Q. In any case, safety surface **73** does not extend entirely orthogonal to the longitudinal direction L.

(67) On the support part **38** a surface section **74** is provided on a safety section or a safety projection **71**, the orientation and geometry of which can substantially correspond to the safety surface **73** or safety surfaces **73** of buffer body **24**. In the movement area of breech part **37** from the abutment position II to the retracted position III, the surface section **74** abuts against the at least one safety surface **73** of buffer body **24** and maintains buffer body **24** in this manner inside holding space **27** or urges buffer body **24** downward to the bottom **29** of holding part **22**.

(68) In the embodiment according to the invention, the buffer body **24** is secured against a movement in upward direction by means of holding device **70** in the area of its front side by breech part **37** or its support part **38** and in the area of its back side by frame part **23**. In doing so, it is avoided that buffer body **24** carries out an undesired upward compensation movement, but rather compresses in a defined manner in longitudinal direction L, so that the desired compression force F depending on the compression distance s is achieved.

(69) The surface section **74** of support part **38** can project over buffer body **24** and in the embodiment stop plate **60** in the area of safety surface **73** and therefore also forms a safety projection **71**, wherein the area of buffer body **24** and according to the example, stop plate **60** provided with safety surface **73** forms a holding section **72** of buffer body **24**. Different to the safety projection **71** of frame part **23**, support part **38** of breech part **37** extends over buffer body **24** only in a movement area of breech part **37** relative to the grip part **21** from the abutment position II to the retracted position III, but however not if breech part **37** is located between abutment position II and the initial position I. The securing effect against movement to the top of buffer body **24** by means of breech part **37** or support part **38** occurs in time phases only, if buffer body **24** is in fact in an at least partly compressed condition.

(70) The invention refers to a hand-held gun **20** having a grip part **21** and a breech part **37** movably supported in longitudinal direction on grip part **21**. A breech spring arrangement **25** urges breech part **37** in its initial position I relative to grip part **21**. For this purpose, breech spring arrangement

25 is supported directly or indirectly between breech part **37** and grip part **21**. Starting from the initial position I, breech part **37** can move against the closing force of breech spring arrangement **25** into an abutment position II in which it abuts against a buffer body **24**. Starting from the abutment position II, breech part **37** can be moved under elastic compression of buffer body **24** in longitudinal direction L into a retracted position III. In the movement area between the abutment position II and the retracted position III, a compression force F of the preferably in longitudinal direction L and particularly exclusively in longitudinal direction L compressed buffer body **24** applies in addition to the closing force of the breech spring arrangement **25** between the grip part **21** and the breech part **37**.

LIST OF REFERENCE SIGNS

(71) **20** hand-held gun **21** grip part **22** holding part **23** frame part **24** buffer body **25** breech spring arrangement **26** sidewall of support part **27** holding space **28** holding depression **29** bottom of support part **33** back surface of buffer body **34** abutment surface of frame part **35** front part of frame part **36** stop surface of buffer body **37** breech part **38** support part **39** front sight **40** counter-stop surface of support part **45** barrel **46** chamber **47** outer breech spring **48** inner breech spring **49** guide rod **50** front stop **51** back stop **52** guide section **53** guide sleeve **54** back flange **55** front flange **60** stop plate **61** elastomer element **62** longitudinal opening **63** right side end of buffer body **64** left side end of buffer body **65** inner side of buffer body **66** outer side of buffer body **67** cavity **70** holding device **71** safety projection **72** holding section **73** safety surface **74** surface section I initial position II abutment position III retracted position a acceleration A**1** first acceleration curve a**1**.sub.max maximum absolute value of acceleration of first acceleration curve A**2** second acceleration curve a**2**.sub.max maximum absolute value of acceleration of second acceleration curve D decompression path d**1** first depth d**2** second depth d**3** third depth da depth of cavity open to outer side di depth of cavity open to inner side F compression force K compression path L longitudinal direction P point Q transverse direction s compression distance s.sub.max maximum compression distance t time t**1** first point in time t**2** second point in time wa width of cavity open to outer side wi width of cavity open to inner side x distance between two cavities in longitudinal direction open to outer side or inner side in each case

Claims

1. A hand-held gun (**20**) comprising: a grip part (**21**); a breech part (**37**) movably supported on the grip part (**21**) in a longitudinal direction (L) between an initial position (I) and a retracted position (III); a breech spring arrangement (**25**) configured to urge the breech part (**37**) in the initial position (I); and an elastically deformable buffer body (**24**) arranged on the grip part (**21**), wherein a longitudinal distance is present in the longitudinal direction (L) between the buffer body (**24**) and the breech part (**37**) in the initial position (I) of the breech part (**37**), and wherein the breech part (**37**) elastically compresses the buffer body (**24**) in the retracted position (III) of the breech part (**37**); wherein the buffer body (**24**) is u-shaped and defines a longitudinal opening (**62**) through which the breech spring arrangement (**25**) extends at least partly, wherein the longitudinal opening (**62**) is open in a vertical direction orthogonal to the longitudinal direction.

2. The hand-held gun according to claim 1, wherein a frame part (**23**) is arranged on the grip part (**21**), wherein the buffer body (**24**) is indirectly supported on the grip part (**21**) via the frame part (**23**).

3. The hand-held gun according to claim 1, wherein the buffer body (**24**) comprises a rigid stop plate (**60**) for the breech part (**37**) and an elastically deformable elastomer element (**61**).

4. The hand-held gun according to claim 1, wherein the breech spring arrangement (**25**) is supported with one end thereof indirectly or directly on the grip part (**21**) and with an other end indirectly or directly on the breech part (**37**).

5. The hand-held gun according to claim 1, wherein the breech spring arrangement (**25**) comprises

at least one breech spring (**47**, **48**).
6. The hand-held gun according to claim 5, wherein the at least one breech spring (**47**, **48**) is configured to limit the elastic compression of the buffer body (**24**) in longitudinal direction (L).
7. The hand-held gun according to claim 1, further comprising a holder (**70**) configured to establish a form-fit and/or force-fit connection between the buffer body (**24**) and the grip part (**21**) and/or a frame part (**23**) arranged on the grip part (**21**).
8. The hand-held gun according to claim 7, wherein the holder (**70**) is configured to counteract a relative movement of the buffer body (**24**) relative to the grip part (**21**) and/or the frame part (**23**) in an upward direction transverse to the longitudinal direction.
9. The hand-held gun according to claim 7, wherein the holder (**70**) comprises at least one safety projection (**71**) disposed on the grip part (**21**) and/or the frame part (**23**) and/or the breech part (**37**), wherein the at least one safety projection (**71**) extends in the longitudinal direction and over a holding section (**72**) of the buffer body (**24**).
10. The hand-held gun according to claim 1, wherein the buffer body (**24**) comprises at least one cavity (**67**) which forms a clearance in a non-compressed initial condition of the buffer body (**24**), wherein the clearance is configured to be compressed in the longitudinal direction (L).
11. The hand-held gun according to claim 10, wherein the at least one cavity (**67**) extends parallel to a transverse plane, wherein the transverse plane is oriented orthogonal to the longitudinal direction (L).
12. The hand-held gun according to claim 10, wherein the at least one cavity (**67**) is groove-shaped.
13. The hand-held gun according to claim 10, wherein the at least one cavity (**67**) is open to an outer side (**66**) or to an inner side (**65**) of the buffer body (**24**).
14. The hand-held gun according to claim 10, wherein the at least one cavity comprises multiple cavities (**67**) arranged with distance between one another in the longitudinal direction (L).
15. A hand-held gun (**20**) comprising: a grip part (**21**); a breech part (**37**) movably supported on the grip part (**21**) in a longitudinal direction (L) between an initial position (I) and a retracted position (III); a breech spring arrangement (**25**) configured to urge the breech part (**37**) in the initial position (I); and an elastically deformable buffer body (**24**) arranged on the grip part (**21**), wherein a longitudinal distance is present in the longitudinal direction (L) between the buffer body (**24**) and the breech part (**37**) in the initial position (I) of the breech part (**37**), and wherein the breech part (**37**) elastically compresses the buffer body (**24**) in the retracted position (III) of the breech part (**37**); wherein the buffer body (**24**) comprises at least one cavity (**67**) which forms a clearance in a non-compressed initial condition of the buffer body (**24**), wherein the clearance is configured to be compressed in the longitudinal direction (L); wherein the at least one cavity comprises multiple cavities (**67**) arranged with distance between one another in the longitudinal direction (L); wherein the multiple cavities (**67**) form one or more groups and the cavities (**67**) of the multiple cavities within each group are alternatingly open to an outer side (**66**) and to an inner side (**65**) of the buffer body (**24**).