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(54) **A recoil absorbing assembly for automatic weapons**

Eine Rücklaufeinheit für eine Schnellfeuerwaffe

Un appareil pour absorber le recul d'une arme automatique

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Description

[0001] The present invention relates to a recoil absorbing assembly for automatic weapons, and in particular an assembly in which the recoil energy is absorbed by means of spring and friction force.

[0002] A lot of solutions similar to the assembly mentioned above is known in the prior art. One typical example is presented by US-A 5,159,148 in which the friction force is effected by means of sliding guides comprising a bolt secured to the fixed cradle portion and protruding through a slot in the movable cradle portion and more than one such sliding guide are needed i.e. often three pairs at the longitudinal sides of the two cradle portions. Despite this fact and due to torsional movements, practice has also proved that the precision during firing is not satisfactorily involving that the actual targets are missed. Another secondary disadvantages are increased weight and manufacturing costs.

[0003] Known from prior art is also GB 1 386 823 A to D'Assault Avions, which relates to a shock-absorbing device for repeating firearms and discloses a recoil absorbing assembly according to the preamble of claim 1. The device makes use of a spring to store energy from the recoil movement, and use that energy to return the moving parts to their initial positions. Further, the device comprises an arrangement of frictional wedges arranged to enable a frictional force affecting movement of various parts of the shock-absorbing device.

[0004] The objects of the present invention are to remedy these disadvantages and these are achieved by the features of claim 1, i.e. a recoil absorbing assembly for automatic weapons secured to a weapon cradle having an fixed portion and a portion longitudinally movable thereto, the fixed cradle portion being rotatably mounted to a support, comprising a recoil absorbing spring and friction means arranged in connection with the cradle portions, wherein the friction means are including a main shaft provided with angled friction blocks and a movable bearing housing surrounding the main shaft and having free floating pistons as to cooperate with the friction blocks, the recoil absorbing spring being situated on the main shaft in elongation of the bearing housing, furthermore, to adapt the present recoil absorbing assembly to different types of automatic weapons and ammunitions, the main shaft is provided with means tuning the friction by pushing the friction blocks outward, the friction tuning means includes a shaft portion longitudinally movable using a tension sleeve arranged in an end of the main shaft opposite of the friction blocks.

[0005] To further increase the friction effect, the angled friction blocks are formed with inclined surfaces adjacent corresponding surface portions of the main shaft. Friction block surfaces opposite of the main shaft can be inclined vertically. Further, the free floating pistons can be situated in a manner forming an angle to the main shaft, preferentially 4° . The free floating pistons can be provided with friction increasing portions adjacent the friction

blocks, and spring biased against the friction blocks.

[0006] To enable unobstructed longitudinal movements relatively to the main shaft, the bearing housing is formed with bearings arranged at each end thereof and surrounding the main shaft. The bearings can be made from metal, preferentially bronze.

[0007] To secure the recoil absorbing assembly, the main shaft is connected to the fixed cradle portion, whereas the bearing housing is connected to the movable cradle portion by preferentially using brackets situated in each end of the main shaft and one end of the bearing housing, respectively.

[0008] The present recoil absorbing assembly allows for mounting and firing of automatic weapons such as heavy machine guns and 40mm automatic grenade launchers from the soft-mount. The recoil is absorbed by using spring force and decreasing/increasing friction which transfers the recoil energy into heat. Thereby, the precision during firing is increased and the weight of the unit including inter alia the recoil absorbing assembly and weapon cradle is reduced.

[0009] The recoil absorbing assembly according to the present invention consists of two main parts. A main shaft including the angled and adjustable friction blocks and its integrated tuning means. The main shaft also acts as a guide for the recoil spring. The second main part is the bearing housing which during recoil travels back and forth along the main shaft. When the assembly is in its forward i.e. extracted position, the recoil spring is preloaded and the forward position is hold by the friction force created by the two pistons thrusting against the friction blocks inside the main shaft. When the recoil of the weapon pushes the bearing housing rearwards the recoil spring is compressed and the friction force is slowly decreasing due to the angled friction blocks. On its return, the increasing friction force creates a "soft stop" of the assembly before it enters the physical end stop of the assembly.

[0010] The integrated tuning assembly allows the operator to tune the friction force involving that the two friction blocks are pushed outwards. By tuning the friction force, an adaptation to the different weapons it is possible as to get maximum dampening effect and achieve reliability of the weapons also when firing at high elevations. The recoil spring is also having separate tuning means involving that its spring force needed can be set for the actual weapons.

[0011] Now, the present invention is to be discussed in detail with reference to preferred embodiment illustrated in the accompanying drawings, in which:

Fig. 1a-e show an recoil absorbing assembly in bottom and front perspective, vertical sectional, side perspective and horizontal sectional views, respectively, presented in a extended position;

Fig. 2a-c show the same assembly in bottom perspective, vertical and horizontal sectional views, respectively, presented in the compressed position;

Fig. 3 shows an exploded top perspective view of the same assembly; and

Fig. 4a-b show the assembly used for different types of automatic weapons in perspective views, seen from the left and right hand sides.

[0012] According to the present invention, the recoil absorbing assembly allows mounting and firing of automatic weapons such as heavy machine guns and 40mm automatic grenade launchers from the soft-mount. As illustrated in Fig. 4a-b, two different weapons are mounted in a weapon cradle having a fixed portion 1 and a portion 2 longitudinally movable thereto. The fixed cradle portion is rotatably mounted to a suitable support, not shown, by means of a pin connection 25, for instance. The fixed and movable cradle portions can be formed in any appropriate manner but these features are not part of the present invention and are not be discussed in detail herein as well as the others depicted in Fig. 4a-b.

[0013] As shown in Fig. 1-3, the present assembly includes a recoil absorbing spring 3 and friction means 4, 5 known per se and arranged in connection with the cradle portions. However, contrary to the prior art the present friction means include a main shaft 4 provided with angled friction blocks 6, 7 and a movable bearing housing 5 surrounding the main shaft and having free floating pistons 8, 9 as to cooperate with the friction blocks, whereas the recoil absorbing spring 3 being situated on the main shaft in elongation of the bearing housing; cf. Fig. 1e, for instance. The main shaft 4 is connected to the fixed cradle portion 1, whereas the bearing housing 5 is connected to the movable cradle portion 2 by preferentially using brackets 22, 23, 24 situated in each end of the main shaft and one end of the bearing housing, respectively, see Fig. 1a. It is understood that the brackets illustrated can be replaced by other suitable means.

[0014] The angled friction blocks 6, 7 are formed with inclined surfaces 12, 13 adjacent corresponding surface portions 14, 15 of the main shaft 4. The respective inclined surfaces and surface portions of the friction blocks and main shaft, respectively, are preferentially planar but this other configurations such as angled or curved are not excluded. The friction effect is increased by means of friction block surfaces 16, 17 opposite of the main shaft portion 10 being vertically inclined. The slope of these surfaces can be varied as to fit to different weapon and ammunition types.

[0015] Further, the main shaft 4 is provided with means 10, 11 tuning the friction by pushing the friction blocks 6, 7 outwards. These means could include a main shaft portion 10 longitudinally movable using a tension sleeve 11 arranged in an end of the main shaft 4 opposite of the friction blocks 6, 7. The shaft portion and tension sleeve are arranged in connection with a bore within the main shaft and are mutually rotatably using a ball bearing 26, for instance. These can be secured using appropriate means.

[0016] The movable bearing housing 5 is formed with bearings 18, 19 arranged at each end thereof and surrounding the main shaft 4, see Fig. 1c. These bearings are made from metal, preferentially bronze.

[0017] The free floating pistons 8, 9 arranged in the bearing housing 5 are situated in a manner forming an angle to the main shaft 4, preferentially 4°. The pistons are within apertures 26, 27 made therethrough and are communicating with corresponding apertures 28, 29 formed in the main shaft 4, whereby the friction blocks 6, 7 are pressed against the shaft portion 10. Additionally, the floating pistons are provided with friction increasing portions 20, 21 adjacent the friction blocks and are spring biased against these friction blocks. The floating pistons are preferentially biased using cup springs 30, 31 but other types of springs are also applicable.

[0018] Although Fig. 1-3 illustrate more elements than discussed above, these shall only be considered as examples of supplementary accessories and not understood in a restrict manner. Moreover, it is noted that the exploded view in Fig. 3 is not including the bearings 18, 19 situated in each end of the bearing housing 5. The spring force of the recoil spring 3 can be adjusted to different types of weapons and ammunitions by means of appropriate means such as a set screw 32.

Claims

1. A recoil absorbing assembly for automatic weapons secured to a weapon cradle having a fixed portion (1) and a portion (2) movable longitudinally thereto, wherein the fixed cradle portion (1) is rotatably mounted to a support, and wherein said recoil absorbing assembly comprises a recoil absorbing spring (3) and friction means (4, 5) arranged in connection with the cradle portions, wherein, the friction means are including a main shaft (4) provided with angled friction blocks (6, 7) and a movable bearing housing (5) surrounding the main shaft, and wherein the recoil absorbing spring (3) is situated on the main shaft (4) in elongation of the bearing housing **characterized in** the bearing housing having free floating pistons (8, 9) arranged in the bearing housing (5) and spring biased against the friction blocks (6, 7), wherein the main shaft (4) is provided with means (10, 11) for tuning the friction by pushing the friction blocks (6, 7) outwards, and wherein the friction tuning means (10, 11) comprises a shaft portion (10) longitudinally movable using a tension sleeve (11) arranged in an end of the main shaft (4) opposite of the friction blocks (6, 7).
2. A recoil absorbing assembly according to any of the preceding claims, **characterized in that** the angled friction blocks (6, 7) are formed with inclined surfaces (12, 13) adjacent corresponding surface portions (14, 15) of the main shaft (4).

3. A recoil absorbing assembly according to claim 2, **characterized in** that friction block surfaces (16, 17) opposite of the main shaft portion (10) are inclined vertically.
4. A recoil absorbing assembly according to any of the preceding claims, **characterized in** that the movable bearing housing (5) is formed with bearings (18, 19) arranged at each end thereof and surrounding the main shaft (4).
5. A recoil absorbing assembly according to claim 4, **characterized in that** the bearings (18, 19) are made from metal, preferentially bronze.
6. A recoil absorbing assembly according to any of the preceding claims, **characterized in that** the free floating pistons (8, 9) are provided with friction increasing portions (20, 21) adjacent the friction blocks (6, 7).
7. A recoil absorbing assembly according to any of the preceding claims, **characterized in that** the main shaft (4) is connected to the fixed cradle portion (1), whereas the bearing housing (5) is connected to the movable cradle portion (2) by using brackets (22, 23, 24) situated in each end of the main shaft and one end of the bearing housing, respectively.

Patentansprüche

1. Rückstoßabsorbierende Anordnung für Schnellfeuerwaffen, befestigt an einer Waffenwiege, die einen fixierten Teil (1) und einen dazu längsbeweglichen Teil (2) aufweist, wobei der fixierte Wiegenteil (1) an einem Träger drehbar montiert ist, und wobei die rückstoßabsorbierende Anordnung eine rückstoßabsorbierende Feder (3) und Reibungsmittel (4, 5) umfasst, die im Zusammenhang mit den Wiegenteilen angeordnet sind, wobei die Reibungsmittel eine mit abgewinkelten Reibungsblöcken (6, 7) versehene Hauptwelle (4) und ein die Hauptwelle umgebendes bewegliches Lagergehäuse (5) aufweisen, und wobei die rückstoßabsorbierende Feder (3) an der Hauptwelle (4) in Verlängerung des Lagergehäuses angeordnet ist, **dadurch gekennzeichnet, dass** das Lagergehäuse freischwebende Kolben (8, 9) aufweist, die im Lagergehäuse (5) angeordnet und gegen die Reibungsblöcke (6, 7) federvorgespannt sind, wobei die Hauptwelle (4) mit Mitteln (10, 11) zum Abstimmen der Reibung durch Nach-außen-Schieben der Reibungsblöcke (6, 7) versehen ist, und wobei das Reibungsabstimmittel (10, 11) einen Wellenteil (10) umfasst, der unter Verwendung einer Spannhülse (11) längsbeweglich ist, die gegenüber den Reibungsblöcken (6, 7) an einem Ende der

Hauptwelle (4) angeordnet ist.

2. Rückstoßabsorbierende Anordnung nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die abgewinkelten Reibungsblöcke (6, 7) mit geneigten Oberflächen (12, 13) gebildet sind, die zu entsprechenden Oberflächenteilen (14, 15) der Hauptwelle (4) benachbart sind.
3. Rückstoßabsorbierende Anordnung nach Anspruch 2, **dadurch gekennzeichnet, dass** Reibungsblockoberflächen (16, 17) gegenüber dem Hauptwellenteil (10) vertikal geneigt sind.
4. Rückstoßabsorbierende Anordnung nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das bewegliche Lagergehäuse (5) mit Lagern (18, 19) gebildet ist, die an jedem Ende davon angeordnet sind und die Hauptwelle (4) umgeben.
5. Rückstoßabsorbierende Anordnung nach Anspruch 4, **dadurch gekennzeichnet, dass** die Lager (18, 19) aus Metall, bevorzugt Bronze, hergestellt sind.
6. Rückstoßabsorbierende Anordnung nach Anspruch 6, **dadurch gekennzeichnet, dass** die freischwebenden Kolben (8, 9) mit zu den Reibungsblöcken (6, 7) benachbarten reibungserhöhenden Teilen (20, 21) versehen sind.
7. Rückstoßabsorbierende Anordnung nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Hauptwelle (4) mit dem fixierten Wiegenteil (1) verbunden ist, während das Lagergehäuse (5) mit dem beweglichen Wiegenteil (2) durch Verwendung von Beschlägen (22, 23, 24) verbunden ist, welche an jedem Ende der Hauptwelle beziehungsweise einem Ende des Lagergehäuses angeordnet sind.

Revendications

1. Appareil pour absorber le recul d'une arme automatique fixée à un berceau d'arme comportant une partie fixe (1) et une partie (2) mobile longitudinalement à celle-ci, la partie de berceau fixe (1) étant montée à rotation à un support, et ledit appareil pour absorber le recul comprenant un ressort d'absorption du recul (3) et des moyens de friction (4, 5) disposés en liaison avec les parties de berceau, les moyens de friction comprenant un arbre principal (4) muni de blocs de friction en angle (6, 7) et un logement de palier mobile (5) entourant l'arbre principal, et le ressort d'absorption du recul (3) étant situé sur l'arbre principal (4) en élongation du logement de palier, **caractérisé en ce que** le logement de palier pré-

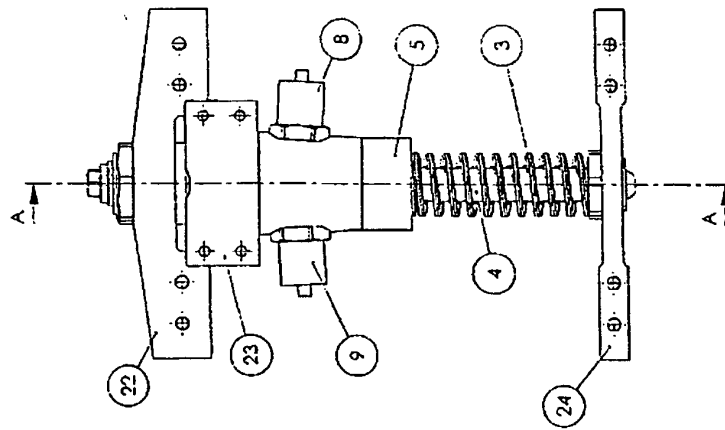
sente des pistons libres flottants (8, 9) arrangés dans le logement de palier (5) et sollicités par ressort contre les blocs de friction (6, 7),

l'arbre principal (4) étant pourvu de moyens (10, 11) de syntonisation à friction (/pour ajuster la friction) en poussant les blocs de friction (6, 7) vers l'extérieur, et

le moyen de syntonisation à friction (10, 11) comprenant une portion d'arbre (10) longitudinalement mobile en utilisant un manchon de tension (11) arrangé dans une extrémité de l'arbre principale (4) en face des blocs de friction (6, 7).

2. Appareil pour absorber le recul selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les blocs de friction en angle (6, 7) sont pourvus de surfaces inclinées (12, 13) adjacentes à des portions de surface correspondantes (14, 15) de l'arbre principal (4).
3. Appareil pour absorber le recul selon la revendication 2, **caractérisé en ce que** des surfaces du bloc de friction (16, 17) en face de la partie de l'arbre principal (10) sont inclinées verticalement.
4. Appareil pour absorber le recul selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le logement de palier mobile (5) est pourvu de paliers (18, 19) disposés à chaque extrémité de celui-ci et entourant l'arbre principal (4).
5. Appareil pour absorber le recul selon la revendication 4, **caractérisé en ce que** les paliers (18, 19) sont faits de métal, de préférence de bronze.
6. Appareil pour absorber le recul selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les pistons flottants libres (8, 9) sont pourvus de parties d'accroissement du friction (20, 21) adjacents aux blocs de friction (6, 7).
7. Appareil pour absorber le recul selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'arbre principal (4) est relié à la partie de berceau fixe (1), tandis que le logement de palier (5) est relié à la partie de berceau mobile (2) à l'aide de crochets (22, 23, 24) situés respectivement à chaque extrémité de l'arbre principal et à une extrémité du logement de palier.

Fig. 1a



SECTION B-B

SECTION A-A

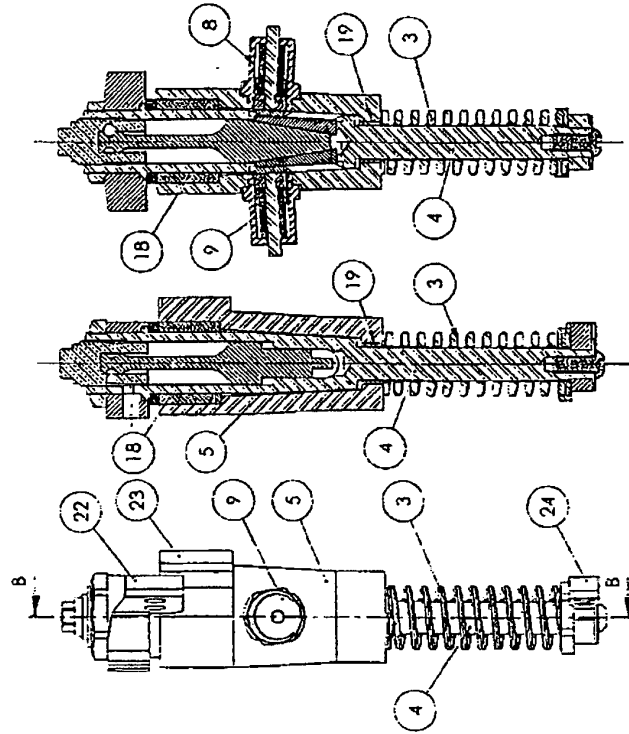


Fig. 1b

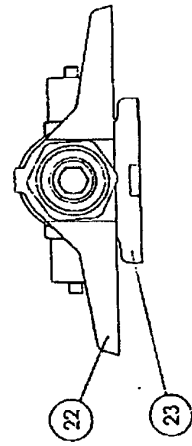


Fig. 1c

Fig. 1d

Fig. 1e

SECTION B-B

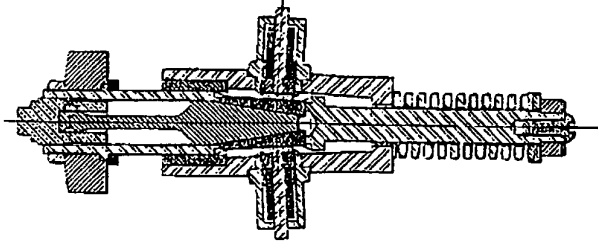


Fig. 2c

SECTION A-A

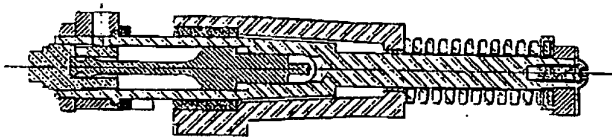
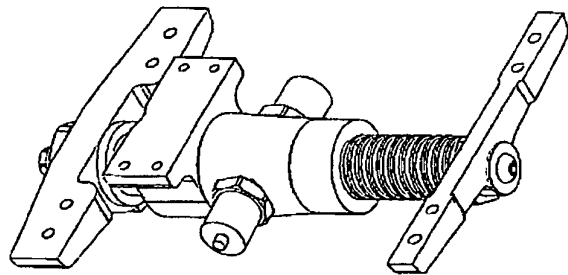


Fig. 2b

Fig. 2a



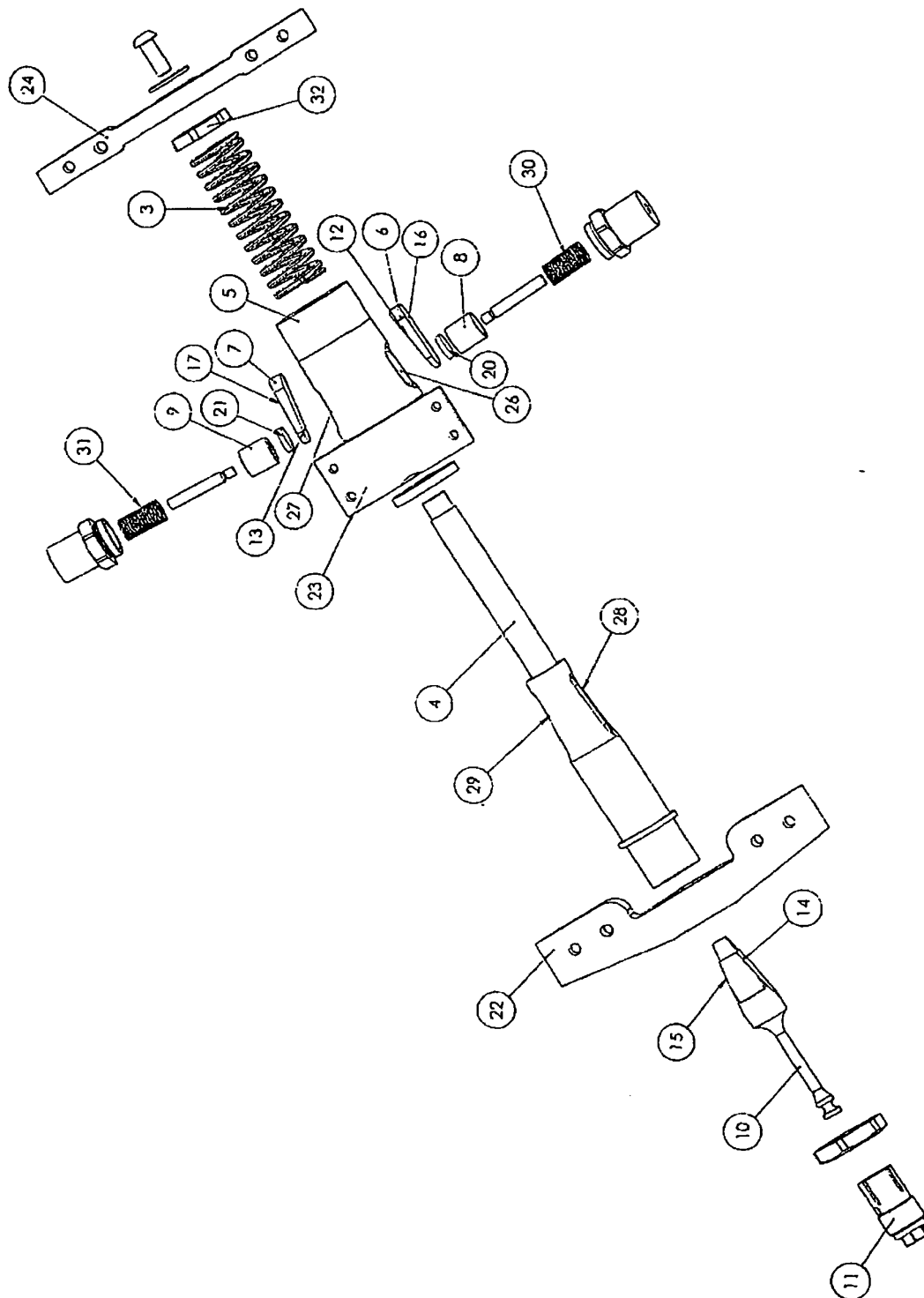


Fig. 3

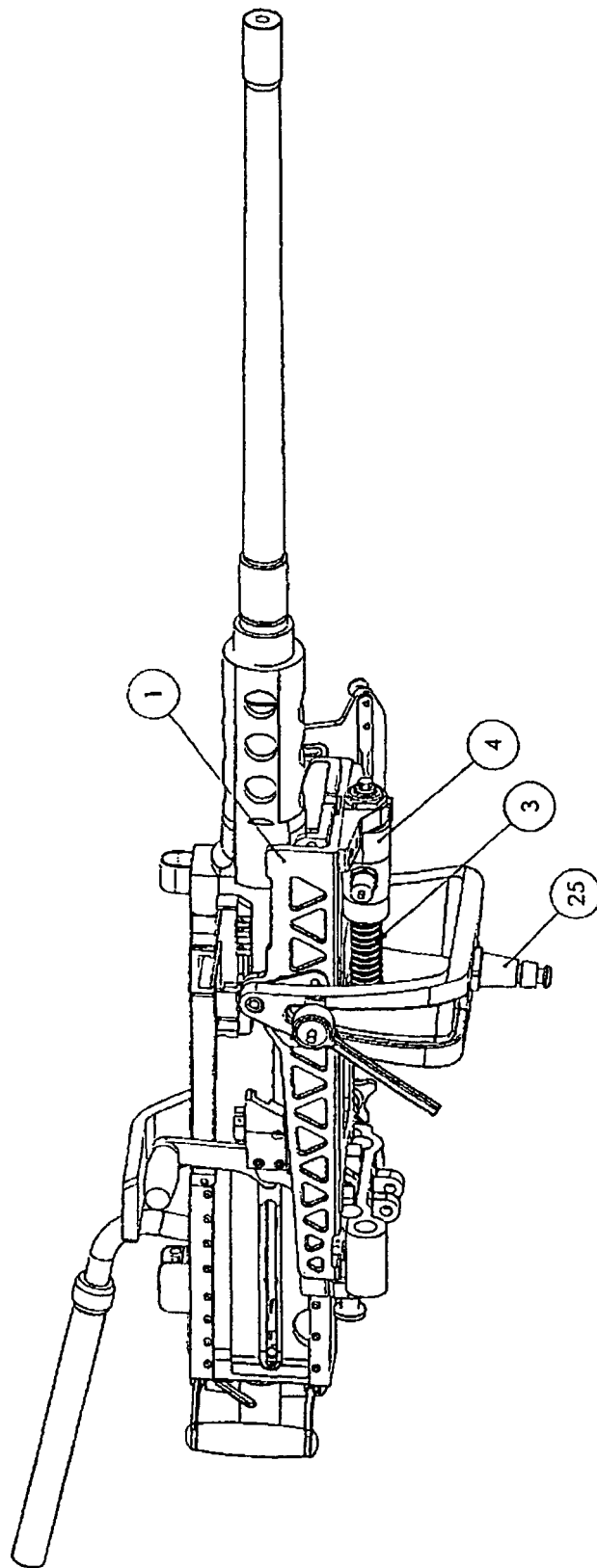


Fig. 4a

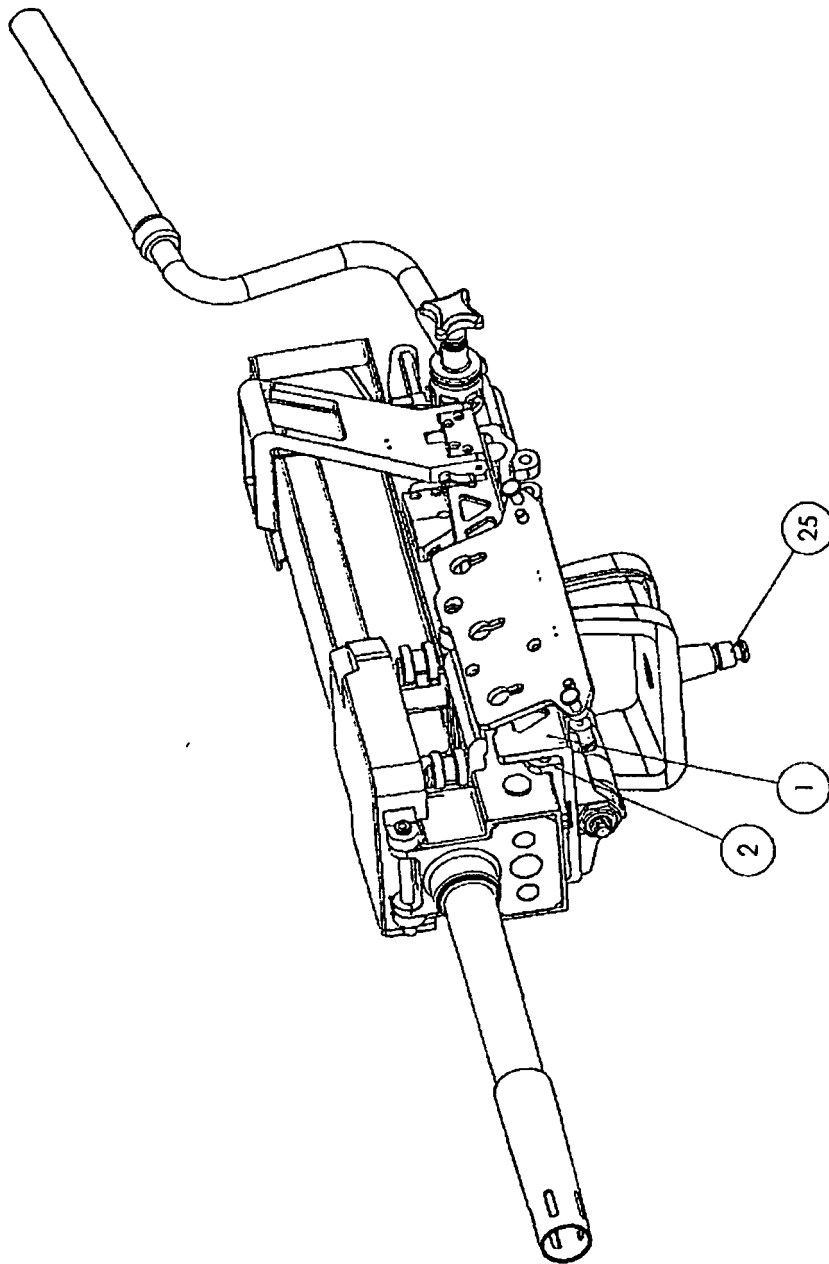


Fig. 4b

REFERENCES CITED IN THE DESCRIPTION

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