(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 189 647**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **15.03.89**

(51) Int. Cl.[4]: **F 41 D 11/02**

(21) Application number: **85308515.7**

(22) Date of filing: **22.11.85**

(54) **Mechanical servo trigger mechanism for automatic guns.**

(30) Priority: **26.11.84 NO 844695**

(43) Date of publication of application:
06.08.86 Bulletin 86/32

(45) Publication of the grant of the patent:
15.03.89 Bulletin 89/11

(84) Designated Contracting States:
AT CH DE FR IT LI SE

(56) References cited:
CH-A- 509 563
DE-A-3 001 490
DE-C- 712 152

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Courier Press, Leamington Spa, England.

Description

The present invention relates to a device for use in a mechanical servo trigger mechanism in an automatic weapon, the device being adapted to be provided on the bottom of the weapon cradle and comprising a pressure member which moves the trigger of the weapon between a non-firing position and a firing position, and a spring biased triggering system arranged for actuating the pressure member and releasable by a further trigger, the triggering system being adjustable between single shot and automatic firing modes of operation.

There are various known embodiments of trigger mechanisms for automatic guns. However, they are usually provided with an electric or electrohydraulic drive requiring the presence of power supplies, which may create a problem, especially in the case of field guns and particularly in cases of long-lasting fire. Furthermore, servo trigger mechanisms of a mechanical kind as described in the preamble of claim 1 are known, but the known mechanisms have a relatively complicated structure comprising a series of precision mechanical members so that such mechanisms are sensitive and difficult to maintain.

It is an object of the present invention to provide a device of the type defined initially but that is more sturdy and reliable, and is easier to keep in good repair than the previously known mechanisms of the type. It is also an object to provide a design that has a simple structure and is therefore simple to maintain, and that is independent of the shape and mode of operation of the gun trigger.

According to the present invention, a device of the type defined initially is characterised in that the pressure member is mounted in a parallelogram linkage with a base frame and is liftable to a raised position by the action of a link means that is parallel with the parallelogram linkage and is biased to a raised position by spring biasing means, and in that the triggering system includes a spring biased trigger locking hook that is movable via a spring biased trigger rod mechanism, the locking hook being arranged for locking the said link means in a lowered position with its spring biasing means in a stressed condition, and an automatic locking means operable via an arm, said locking means being provided with a contact surface which, in the single shot mode, lies out of contact with the pressure member, and, in the automatic mode, lies in contact with the pressure member with the pressure member in its raised position.

The servo trigger mechanism is usually arranged below the weapon per se and it is, thus, essential that the overall height of the mechanism be not too large. The trigger force necessary for the trigger of automatic guns is also relatively high, e.g. approximately 100 kp. This means, in turn, that the servo trigger mechanism must be able to exert relatively high force and stand the necessary load in connection with said force as well. Consequently, all elements must be structured for exerting relatively large moments.

The servo trigger mechanism should be of such a kind as to be driven i.e. cocked by the recoil force of the gun after an initial cocking movement that has to be carried out manually or, e.g. with the aid of an external drive member.

With the use of a preferred device embodying the invention a mechanical servo trigger mechanism is achieved that is comprised of simple, sturdy elements that may easily be exchanged in case of a defect. The entire device is arranged on a common bottom frame which is shaped in such a manner by simple milling methods that bearings for links and points of attachment are easily accessible. The device is easily mounted in the cradle of the weapon directly below the gun and with the aid of a simple rod mechanism it may be set in a cocked condition by the recoil force of the gun. Furthermore, the device is constructed in such a manner that very few movements need be executed in connection with automatic firing and wear may be reduced to a minimum.

In the following the invention will be disclosed in more detail with reference to an embodiment shown in the drawings, wherein:

Figure 1 is a perspective view, seen from above, of the base plate of a device according to the invention with several shaft bearings indicated,

Figure 2 is a perspective view, seen at an angle from above and in the direction of the arrows at plane A-A in Figure 1,

Figure 3 is a perspective view with parts lying in front of the plane B-B being deleted, seen in the direction of the arrows,

Figure 4 is a perspective view with parts lying in front of the plane C-C being deleted, seen in the direction of the arrows,

Figure 5 is a perspective view with parts lying in front of the plane D-D being deleted, seen in the direction of the arrows, and

Figure 6 is a perspective view, seen from above, showing the arrangement for switching the trigger mechanism from single shots to automatic firing.

The mechanical servo trigger mechanism is not shown in its entirety in the drawings. Instead those portions that are essential according to the invention are shown. The perspective view of Fig. 1 shows how different pivots and fixing points for the separate members of the mechanism of the device are arranged on a base plate 2 serving as a frame for the mechanism of the device. In Fig. 1, shaft mountings and fixing points for elements 3, 4, 7, 11, 14, 10 and 9 are indicated.

The device according to the invention will now be described with reference to the perspective illustrations in Fig. 2-5, and the perspective view in Fig. 6, the elements and their positioning being disclosed in connection with the operation of the device. The trigger 17 of the weapon is indicated is broken line in Figs. 2 and 3.

The element of the servo trigger mechanism

which acts on the gun trigger 17 is a pressure ramp 1. The ramp 1 is connected with the base plate 2 via a link connection having two link members 3 arranged mutually parallel to form a parallelogram linkage. The ramp 1 is liftable by the action of further link members 4 parallel with the link members 3. The link members 4 are parallel on common shafts, the uppermost of these shafts 4a being indicated in Figs. 2 and 3. The shaft 4a bears freely against one end of the ramp 1 as shown in Fig. 3. When the shaft 4a is free, the ramp 1 is pushed up into its raised position and maintained in this position by a spring 5 (indicated in Fig. 4) coupled to the shaft 4a. The spring 5 is shown in a compressed position in Fig. 4, i.e. a position in which the shaft 4a is held down as disclosed in more detail below.

The ramp 1 can be held in its raised position by engagement with a stop 7. The stop 7 is indicated most clearly in Fig. 3 in which it is seen in a disengaged position.

Before a first shot is fired, the ramp 1 is moved from its starting position, i.e. its raised position, to its lowered position, with the aid of a manual cocking arm of the weapon (not shown in the drawings), which may be of a conventional kind. This manual cocking arm is also lockable and, thus, acts as a safety means for the weapon. The cocking means may be alternatively another manual cocking mechanism or be electrically or hydraulically operated.

The lowered position of the ramp 1 is its cocked position.

After firing of the first shot the ramp 1 will automatically be moved to its cocked position by the action of a cocking rod 8 (Fig. 5) which is operated by the gun recoil. The cocking rod 8 is acted on by a member (not shown) on the weapon that is moved to the right in Fig. 5 due to recoil movement and, to compress the spring 5 (Fig. 4) via link members 4, itself acts on a roller 9 on these link members. The counteracting force exerted by roller 9 is resisted by a second roller 10 mounted on an arm that is rigidly attached to the base plate 2. The rod 8 has a chamfered portion at the end area between the two rollers 9 and 10. In the recoil movement of the rod 8, the link members 4 are rotated rearwards and the ramp 1 on the parallelogram link members 3 is moved into its lowered position, i.e. its cocked position.

The ramp 1 will remain in the cocked position due to the fact that the link members 4 are kept down by a trigger hook 11, friction and springs 15 and 20, the hook 11 being in engagement with the shaft 4a. This holding action is shown in Fig. 2.

When a single shot is to be fired, the trigger hook 11 is retracted by a trigger rod 12 provided with a trigger (not shown). The trigger rod 12 is located in a support 13 which in turn is mounted on a shaft 14. When its trigger is pulled, trigger rod 12 releases trigger hook 11 from the link shaft 4a. Trigger hook 11 is automatically moved forward by the spring force of a spring 20 shown in Fig. 2 to catch shaft 4a when the ramp 1 returns into its cocked position. Thus the trigger hook per se is moved back into a position in which it is engaged with the shaft 4a by the spring 20. The trigger rod 12 is moved forward by spring 15 when its trigger is released.

The device also comprises an automatic locking means in the form of the stop 7 indicated in Fig. 3. The stop 7 is used in connection with automatic firing and is operated by an arm 6. For the firing of single shots, the arm 6 is locked in its forward position, which is shown in Fig. 3. For automatic firing, the arm 6 is unlocked, the trigger rod 12 pulled back, and spring 15 pushes against the arm 6 (see Fig. 6). By the time that the ramp 1 reaches its raised position, the spring 15, acting through the arm 6, has turned the stop 7 to a position with a surface 18 of the stop 7 in contact with a surface 18′ on the ramp 1, which prevents the ramp 1 from falling down, the link members 4 being held in their lowered position by the trigger hook 11 after the firing of the first automatic shot. In this manner the gun trigger 17 is held in a permanent firing position without further movement of the ramp 1 and link members 4 and, thus, with reduced wear.

When the trigger on the trigger rod 12 is released, the trigger rod 12 re-engages the trigger hook 11, and a spring 16 provided in line with spring 15 will push arm 6 forward again and the stop 7 will be moved from its locking position of contact with the ramp surface 18′ into the disengaged position shown in Fig. 3. The ramp 1 will then fall down and firing stops.

The adjustment from single shots to automatic firing is carried out by releasing locking means (not shown) for the arm 6. For single shots arm 6 is locked so far forwards that the stop 7 cannot lock the ramp 1 in its raised position.

Claims

1. A device for use in a mechanical servo trigger mechanism in an automatic weapon, the device being adapted to be provided on the bottom of the weapon cradle and comprising a pressure member (1) which moves the trigger (17) of the weapon between a non-firing position and a firing position, and a spring biased triggering system (11, 12, 6, 7) arranged for actuating the pressure member and releasable from a further trigger, the triggering system (11, 12, 6, 7) being adjustable between single shot and automatic firing modes of operation, characterised in that the pressure member (1) is mounted in a parallelogram linkage (3) with a base frame (2) and is liftable to a raised position by the action of a link means (4, 4a) that is parallel with the parallelogram linkage (3) and is biased to a raised position by spring biasing means (5), and in that the triggering system includes a spring biased trigger locking hook (11) that is movable via a spring biased trigger rod mechanism (12), the locking hook (11) being arranged for locking the said link means (4, 4a) in a lowered position with its spring biasing means (5) in a stressed condition, and an automatic locking means (7) operable via an arm (6), said

locking means (7) being provided with a contact surface (18) which, in the single shot mode, lies out of contact with the pressure member (1), and, in the automatic mode, lies in contact with the pressure member (1) with the pressure member (1) in its raised position.

2. A device according to claim 1, characterised in that a first roller (9) is provided on the said link means (4), that vertically above the first roller (9) a second roller (10) is provided and is rigidly secured to the base frame (2), and that in the space between the two rollers (9, 10) a rod (8) is provided having a chamfered portion adjacent the rollers (9, 10) and being at its end remote from the rollers (9, 10) in contact or connected with a recoiling portion of the weapon.

3. A device according to claim 1, characterised in that the base frame (2) is one piece and has upward projecting mounting blocks for shafts serving as pivots for elements of the linkage (3), the link means (4, 4a) and the triggering system (11, 12, 6, 7).

Patentansprüche

1. Servomechanik zum Abfeuern von automatischen Waffen, die auf dem Boden der Waffenwiege eingebaut werden kann und ein Druckglied (1), das den Auslöser (17) der Waffe zwischen einer Nichtfeuerstellung und einer Feuerstellung bewegt, und ein von einer Feder beaufschlagtes Auslösesystem (11, 12, 6, 7) enthält, das das Druckglied betätigt und von einem weiteren Auslöser auslösbar ist, wobei das Auslösesystem (11, 12, 6, 7) zwischen einer Einzelfeuerstellung und einer automatischen Feuerstellung einstellbar ist, dadurch gekennzeichnet, daß das Druckglied (1) in einer Parallelogrammverbindung (3) an einem Grundrahmen (2) angebracht und durch Betätigung von Gelenkteilen (4, 4a) in eine angehobene Stellung anhebbar ist, die parallel zu der Parallelogrammverbindung (3) liegt, und in eine angehobene Stellung durch unter Federdruck stehende Einrichtungen (5) gedrückt wird und daß das Auslösesystem einen unter Federdruck stehenden Verriegelungshaken (11), der mittels einer von einer Feder beaufschlagten Stange (12) verschiebbar ist, und eine selbsttätige Sperre (7), die über einen Arm (6) betätigbar ist, enthält, wobei der Verriegelungshaken (11) so ausgebildet ist, daß er die Gelenkteile (4, 4a) in einer abgesenkten Stellung verriegelt, in der ihre unter Federdruck stehenden Einrichtungen (5) gespannt sind und die Sperre mit einer Kontaktoberfläche (18) versehen ist, die in der Einzelfeuerstellung das Druckglied (1) nicht berührt und in der automatischen Feuerstellung an dem Druckglied (1) anliegt, während dieses in der angehobenen Stellung ist.

2. Servomechanik nach Anspruch 1, dadurch gekennzeichnet, daß an dem Gelenkteil (4) eine erste Rolle (9) vorgesehen ist, daß senkrecht über der ersten Rolle (9) eine zweite Rolle (10) angeordnet ist, die fest an dem Grundrahmen (2) angebracht ist, und daß in dem Raum zwischen den beiden Rollen (9, 10) eine Spannstange (8) vorgesehen ist, die im Bereich der Rollen (9, 10) einen abgeschrägten Abschnitt enthält und an ihrem den Rollen (9, 10) abgewandten Ende in Kontakt mit einem zurückfahrenden Abschnitt der Waffe oder mit diesem Abschnitt verbunden ist.

3. Servomechanik nach Anspruch 1, dadurch gekennzeichnet, daß der Grundrahmen (2) aus einem Stück besteht und nach oben vorstehende Befestigungsblöcke für Wellen enthält, die als Drehlager für die Elemente der Parallelogrammverbindung (3), der Gelenkteile (4, 4a) und des Auslösesystems (11, 12, 6, 7) dienen.

Revendications

1. Dispositif destiné à être utilisé dans un servomécanisme de détente dans une arme automatique, ce dispositif étant destiné à être prévu à la base du berceau de l'arme et comportant un organe de poussée (1) qui amène la détente (17) de l'arme dans une position non armée et une position de tir, un système de déclenchement (11, 12, 6, 7) sollicité par un ressort et agencé de manière à actionner l'organe de poussée et pouvant être dégagé d'une autre détente, le système de déclenchement (11, 12, 6, 7) pouvant être réglé entre des modes de fonctionnement correspondant à un tir coup-par-coup et à un tir automatique, caractérisé en ce que l'organe de poussée (1) est monté dans un dispositif de liaison en forme de parallélogramme (3) comportant un châssis de base (2) et peut être soulevé dans une position relevée sous l'action de moyens de liaison (4, 4a) qui sont parallèles au dispositif de liaison en forme de parallélogramme (3) et est sollicité dans une position relevée par des moyens de sollicitation à ressort (5), et en ce que le système de déclenchement comporte un crochet (11) de verrouillage de la détente, sollicité par un ressort et déplaçable au moyen d'un mécanisme formant tige de détente (12) sollicité par un ressort, le crochet de verrouillage (11) étant agencé de manière à verrouiller lesdits moyens de liaison (4, 4a) dans une position abaissée, leurs moyens de sollicitation en forme de ressort (5) étant à l'état bandé, et des moyens de verrouillage automatique (7) pouvant être actionnés par l'intermédiaire d'un bras (6), lesdits moyens de verrouillage (7) étant pourvus d'une surface de contact (18) qui, dans le mode de tir coup-par-coup, est écarté de l'organe de poussée (1) et, dans le mode automatique, est en contact avec cet organe de poussée (1) qui est dans sa position relevée.

2. Dispositif selon la revendication 1, caractérisé en ce qu'un premier galet (9) est prévu sur lesdits moyens de liaison (4), qu'un second galet (10) est prévu verticalement au-dessus du premier galet (9) et est fixé rigidement au châssis de base (2) et que dans l'espace situé entre les deux galets (9, 10) se trouve disposée une barre (8) comportant une partie biseautée au voisinage des galets (9, 10), alors qu'au niveau de son extrémité éloignée des galets (9, 10), elle est en contact avec ou raccordée à un organe de recul de l'arme.

3. Dispositif selon la revendication 1, caracté-

risé en ce que le châssis de base (2) est monobloc et comporte des blocs de support, qui font saillie vers le haut, pour des arbres utilisés comme pivots pour des éléments du dispositif de liaison (3), des moyens de liaison (4, 4a) et du système de déclenchement (11, 12, 6, 7).

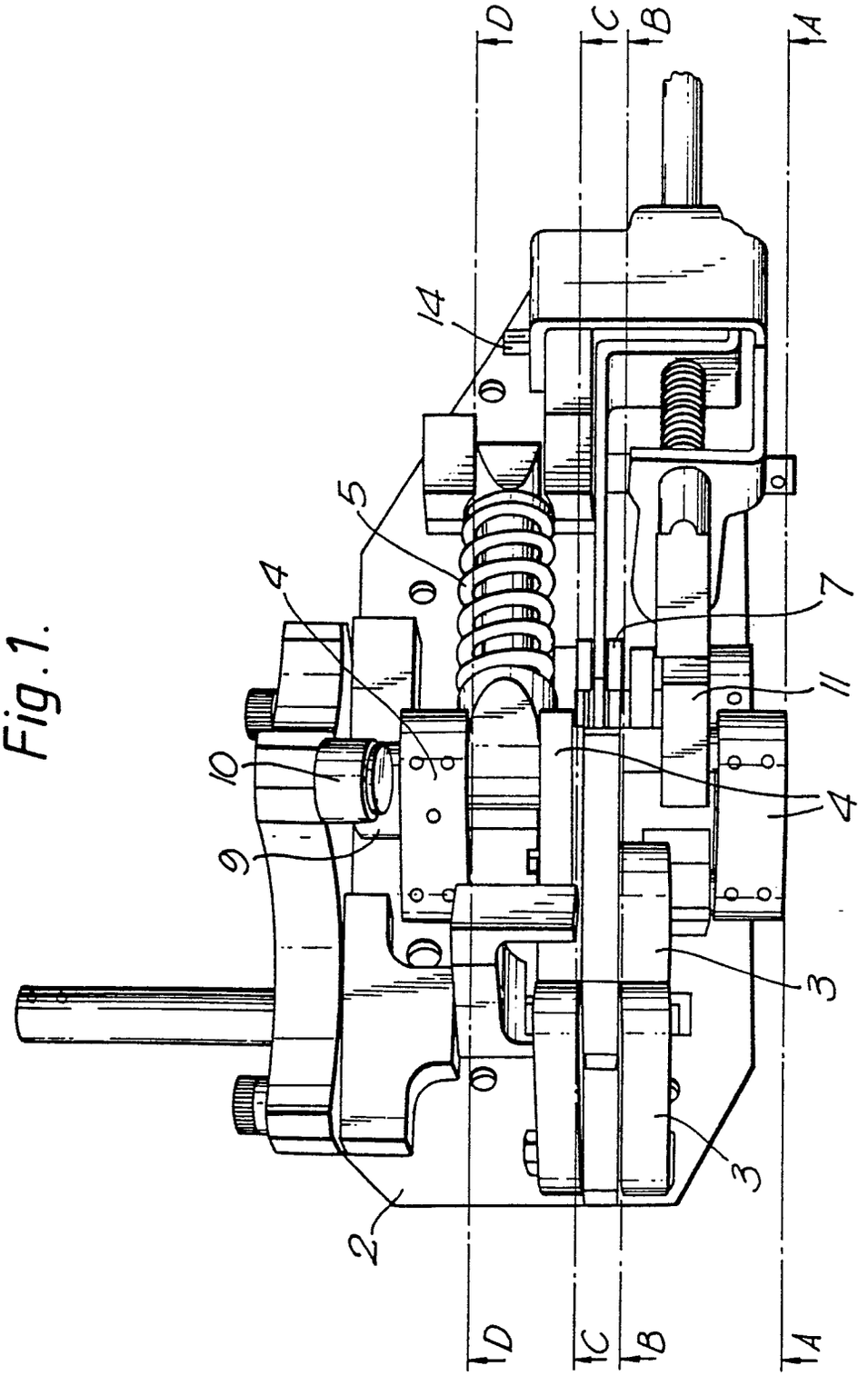


Fig. 1.

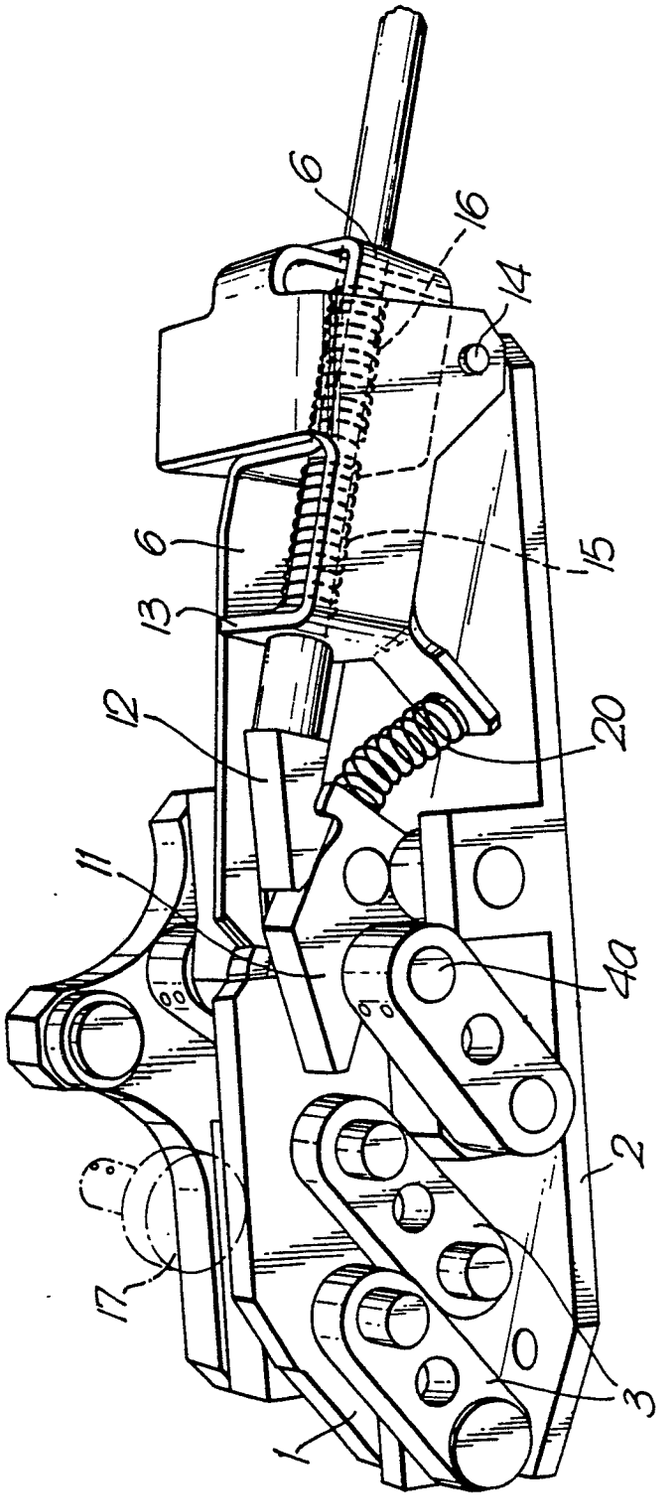


Fig.2.

Fig.3.

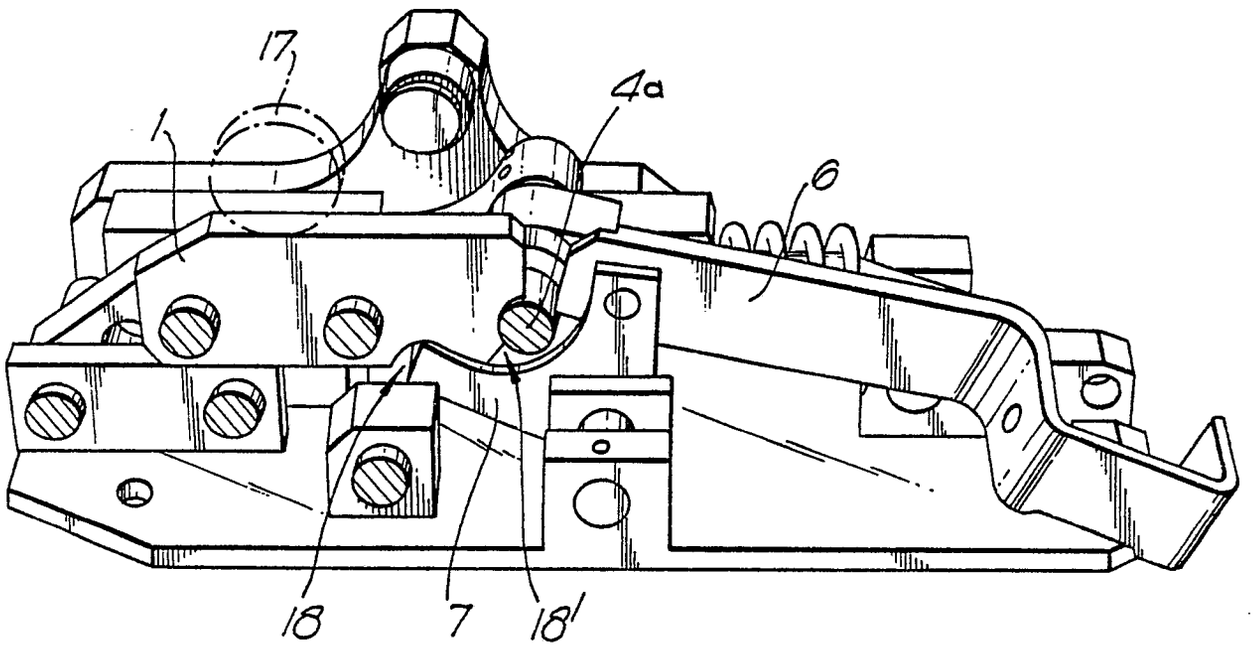
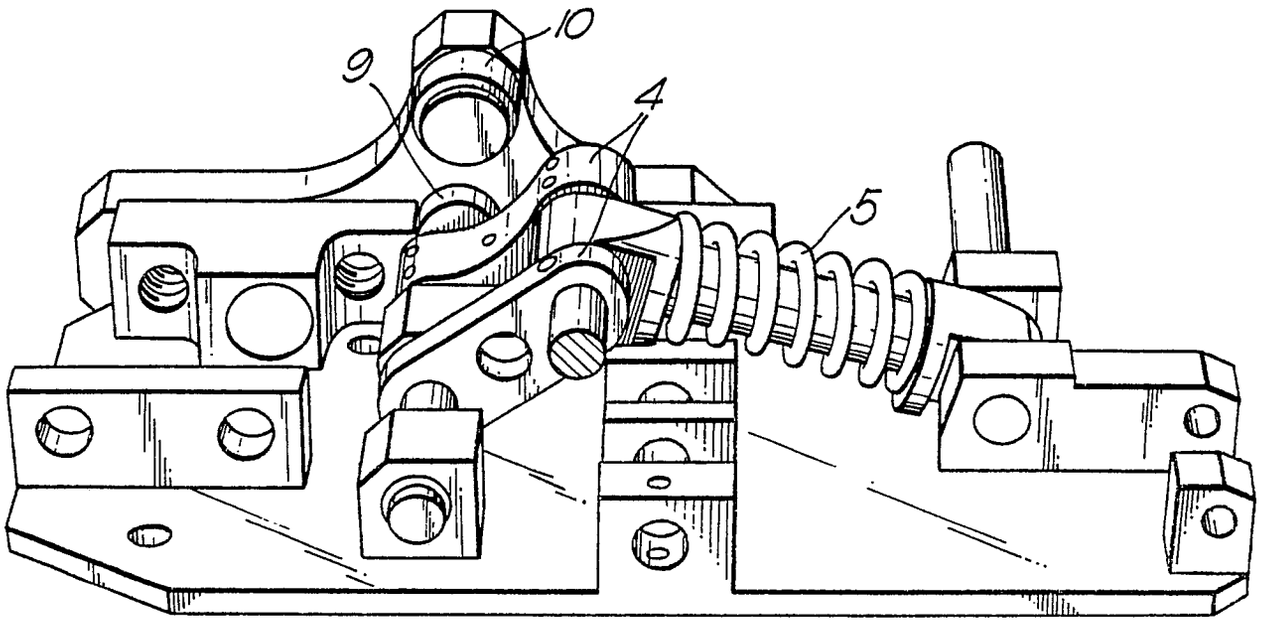


Fig.4.



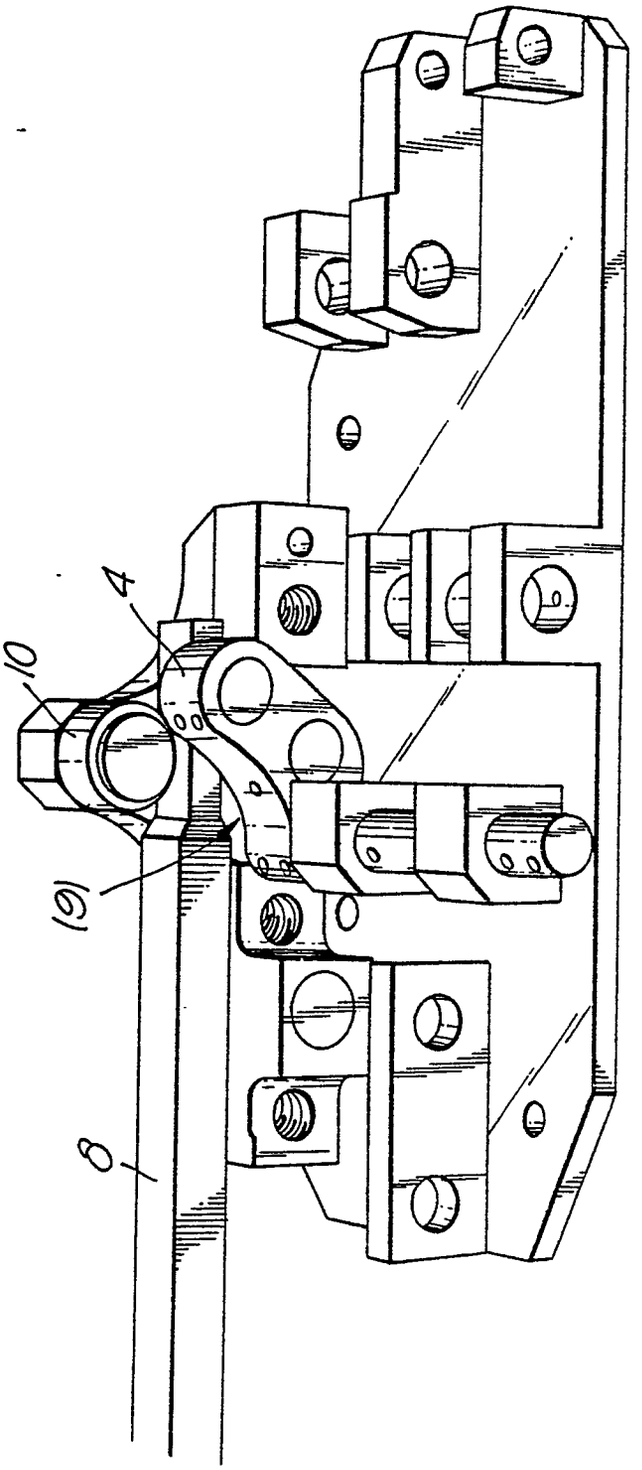


Fig.5.

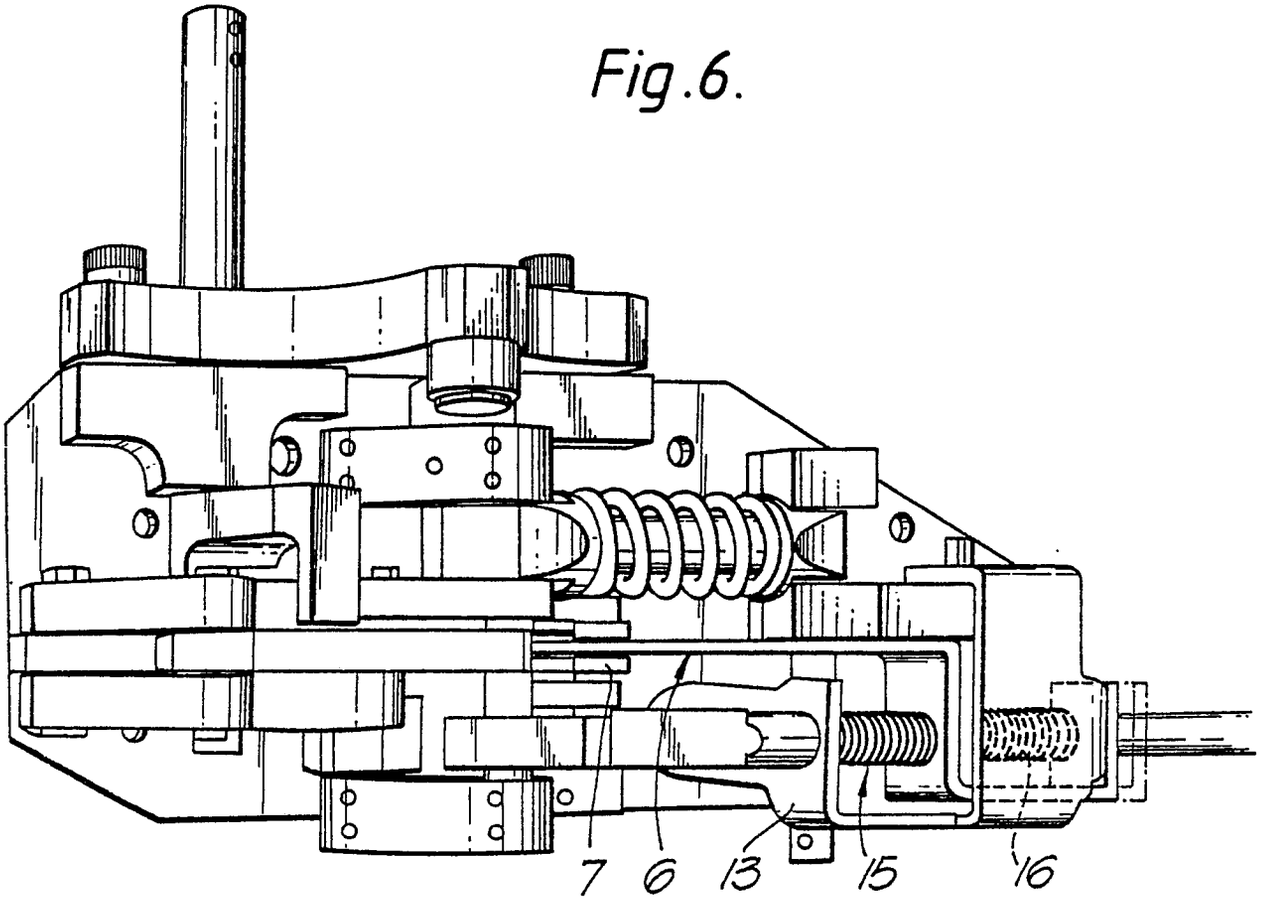



Fig.6.