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Publication number:

0 207 033
B1

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EUROPEAN PATENT SPECIFICATION

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Date of publication of the patent specification:
03.05.89

⑤

Int. Cl.⁴: **F41F 9/06**

⑥

Application number: **86850219.6**

⑦

Date of filing: **17.06.86**

⑧

Magazine for automatic artillery pieces.

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Priority: **19.06.85 SE 8503045**

⑫

Date of publication of application:
30.12.86 Bulletin 86/52

⑬

Publication of the grant of the patent:
03.05.89 Bulletin 89/18

⑭

Designated Contracting States:
CH DE FR IT LI SE

⑮

References cited:
DE-A- 2 027 586
DE-A- 3 111 514
GB-A- 1 138 286
US-A- 4 388 854

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EP 0 207 033 B1

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Description

TECHNICAL FIELD

The present invention relates to a compact, preferably gun-mounted, magazine for fully automatic artillery pieces, primarily anti-aircraft guns.

The magazine according to the present invention comprises a plurality of preferably vertical compartments for rounds of ammunition, the compartments being disposed in side-by-side parallel relationship and each accommodating a number of parallel superposed rounds, which may progressively be fed down to a discharge position specific to each compartment, whence the rounds are fed further towards the ramming position of the gun by means of a transverse feeding system common to all compartments by the intermediary of a transverse feeding channel which coincides with the mutually parallel discharge positions for all compartments, and the transverse feeding channel being, when the gun is fired, successively fed with new rounds at the same rate as rounds are fed into the gun, from that compartment which lies most distal from the ramming position of the gun and which has not yet been emptied.

The invention as such particularly relates to certain releasable round hoists for said vertical magazine compartments. Said round hoists keeping the feeding channel free from rounds from every magazine compartment except the most distal one still containing rounds and which is delivering new rounds to the feeding channel until it is emptied when the next compartment is activated.

THE STATE OF THE ART

A gun magazine of the same main type as the magazine according to the preamble of claim 1 is already known through GB-A 1 138 286.

A distinct advantage inherent in both these magazines is that they may, since the discharge positions for the different round compartments coincide with the transverse feeding channel, be directly loaded right up to the ramming position of the gun without a successive and time-consuming stepwise feeding of the rounds for successive replenishment of a separate feeding channel. This latter situation is, otherwise, the normal arrangement in gun magazines for large quantities of rounds. These are, moreover, often placed in the gun mounting instead of directly on the piece. As soon as calibres in excess of the very smallest gun calibres of about 20 mm come into question, the gun-mounted magazines seldom accommodate more than from 10 to 20 rounds. The magazine according to the present invention can, because it may be made so compact, be built for 100 rounds and more even in calibres of from 40–57 mm.

The previously-mentioned simultaneous loading of the compartments and transverse feeding channel is effected in that the compartments are filled and the transverse feeding channel is also automatically filled. In order that the rounds in those compartments which are not yet in turn to supply further

rounds to the transverse feeding channel during firing shall not disturb the round feeding operation along the transverse feeding channel, all compartments are provided with round hoists which are activated once the compartments have been filled. The round hoists then lift all rounds apart from the first in each compartment so that there is created a free channel between the first rounds located in the transverse feeding channel and remaining rounds.

The design according to GB-A 1 138 286, however, does not discuss the actual design and function of said round hoists but gives a very careful description of a somewhat delicate transverse feeding system. The present invention on the contrary particularly concerns with the design and function of said round hoists.

SUMMARY OF THE INVENTION

According to the characterizing portion of claim 1, said round hoists are provided with self-locking toggle mechanisms which are influenced by certain sensors disposed at each magazine compartment and which as soon as it is ascertained that no round is located in its section of the transverse feeding channel, activates the round hoist in the next compartment in the direction of feed so that the rounds located in this compartment are given free passage to the transverse feeding channel. The most distal compartment which, thus, is always to commence feeding rounds, has no round hoist. As a result of this arrangement, compartment after compartment will be successively emptied into the transverse feeding channel. For securing the round hoists in the raised position, use is made of self-locking toggle mechanisms of per se known type, and for the successive disengagement of these, use is made, according to the present invention, of compartment release blocks which are shiftable by the intermediary of the above-mentioned sensors and, when they have been shifted to the disengagement position, bridge the distance between the toggle mechanism and special triggering abutments which, on recoil of the gun, are shifted in a direction towards each respective toggle but which, without the triggering abutments as make-up pieces, do not reach all the way. This arrangement entails that the sensors only shift the compartment release blocks which possess slight natural mass, while release of the toggle mechanisms is catered for by the recoil of the gun.

Hence, activation of all round hoists is to be effected once the compartments have been filled. It may, therefore, be appropriate to provide the compartments with a common lid which is interconnected with a device which activates the round hoists when the lid is closed.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The nature of the present invention and its aspects will be more readily understood from the following brief description of the accompanying Drawings, and discussion relating thereto.

In the accompanying Drawings:

Fig. 1 is an oblique projection of an anti-aircraft gun with two gun-mounted round magazines, one on each side;

Fig. 2 shows, on a larger scale, a cross-section through one of these magazines;

Fig. 3 is a section taken along the line III-III in Fig. 2;

Fig. 4 shows, on a yet larger scale and with more details, parts of the sections A-A and B-B of Fig. 3;

Figs. 5a and 5b show, on the same scale and wealth of detail as Fig. 4, parts of the section C-C of Fig. 3, Fig. 5a illustrating the incorporated linkage system in the released position and Fig. 5b showing the same linkage system in the captive position; and

Figs. 6a and 6b illustrate the principle for the triggering and release function of the linkage system of Figs. 5a and b, Figure 6a illustrating the captive position and Fig. 6b the released position.

Corresponding details have been given the same reference numerals in all figures.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the Drawings, the anti-aircraft gun 1 illustrated in Fig. 1 is provided with two gun-mounted magazines 2 and 3 respectively. A vertical gun feed channel 4 is disposed between the round magazines and may receive rounds from either one of the magazines 2 or 3 and feed these into the ramming position of the gun. The magazines may be filled with different types of ammunition and the choice of magazine may be directly related to the target in question by means of separate command devices. The magazines are provided with opening lids for replenishment with new rounds from above. The lid 5 on the magazine 2 is shown in the half-open position.

The round magazine 2 illustrated in section in Fig. 2 comprises six compartments I-VI containing a total of 54 rounds numbered in the sequence they are fed towards the gun. Rounds numbers 1 and 2 are missing from the number series in the figure, since these rounds are loaded direct in the gun feeding channel 4. The different compartments I-IV each have their discharge position which together form the transverse feeding channel 6 of the magazine. Rounds 3-8 are located in this transverse feeding channel. A transverse feeding device 7 of the step-wise advancement type runs along the bottom of the transverse feeding channel 6. This will not be discussed in detail in the body of this disclosure and on the Drawings, since it does not, in actual fact, form part of the present invention. Its construction may also be designed in a number of different ways. Its general function is based on the circumstance that, for each round discharged by the gun, it advances the rounds located in the feeding channel 6 one step nearer and into the feed channel 4 of the gun.

On loading of the gun 1, the lid 5 is opened at each respective magazine, whereafter each respective compartment is filled with at least one round so that

all discharge positions along the transverse feeding channel 6 are filled. Each compartment, apart from compartment I, which is, thus, the compartment most distal from the gun counting in the direction of feed of the transverse feeding channel 6, is provided with a round hoist generally designated 8. When the compartments are filled, these round hoists 8 must be in the disengaged position, i.e. they must leave the compartments completely free so that these may be filled completely right down even to each respective discharge position. Each compartment is further provided with a vertical feeder which guarantees uninterrupted feeding of the rounds along each respective compartment irrespective of the elevation of the gun. These vertical feeders are not shown on the Drawings since they do not form part of the present invention and are, moreover, of conventional construction. The vertical feeders may, for example, consist of hydraulically or spring-loaded feeding arms which act upon the uppermost round in each compartment. When the compartments have been filled with the desired number of rounds, rounds numbers 1 and 2 are placed in the gun feeding channel 4, whereafter the vertical feeders are activated.

Thereafter, the lid 5 of the magazine is closed. The lid is either directly interconnected with a special operating function or this function is activated separately. When the operating function is activated, the round hoists 8 - which, when the compartments were filled were in the disengaged position - are moved to the position illustrated in Figs. 2 and 4 where they lift all rounds in each compartment, apart from the rounds located in the discharge positions, a height sufficient to form a free channel between the rounds located along the transverse feeding channel 6 and the remaining rounds in the compartments. As has been pointed out above, compartment I has no round hoist. Hence, the rounds in this compartment enjoy free access to the discharge position of the compartment.

When the gun opens fire, the rounds are, thus, fed by the transverse feeder 7 successively along the transverse feeding channel 6 in the direction of the arrow b at the same time as the transverse feeding channel is replenished with fresh rounds, starting with compartment I. All compartments apart from compartment VI are, furthermore, provided with sensors generally designated 9 (see Fig. 4 and Figs. 6a and 6b). When the compartment which is currently in the process of feeding the transverse feeding channel 6 with fresh rounds is emptied, the sensors for the emptied compartment trigger the round hoist in the subsequent compartment, seen in the feeding direction, which, thus, assumes the role of supplying new rounds to the transverse feeding channel. The sensors 9 are placed in the bottom of the transverse feeding channel 6 where they are acted upon by the rounds advanced along this channel. The more detailed function of the sensors 9 will be discussed in depth below, together with other mechanical arrangements according to the present invention. However, the invention should not be considered as restricted to those arrangements and solutions illustrated on the Drawings. These are

rather to be considered as exemplifying preferred embodiments. The function of the round hoists 8 and the sensors 9 will primarily be apparent from Figs. 4-6.

When the compartments I-VI have been filled, the above-mentioned operating function for activating the round hoists is triggered.

This operating function may, for example, consist of a number of linkage arms which are interconnected with one another and with the lid, for example as follows. When it is closed, the lid 5 shifts a first link 10 from the position 10a to 10b and the arm 11 is thereby depressed the same distance about its shaft 15. A lock 12 and a spring buffer 13 are disposed on the arm 11. When the arm 11 is shifted, the lock 12 entrains the arm 14. However, when the arm 11 reaches the bottom position 10b, a fixed arrest 16 triggers the spring buffer 13 which, in its turn, triggers the lock 12 which releases its grip in the arm 14 which thereupon returns to its initial position under the action of a return buffer 17 disposed further ahead in the coupling chain. However, a number of things have happened before this position is reached. The arm 14 has a rear overhang 18 at which a link 19 is fixedly anchored. The link 19 is shifted in the direction of the arrow and, in its turn, shifts the links 20-24 in the direction of the arrows. The links 20, 21 and 22 are fixedly mounted on the same shaft and pivot as a unit. In its turn, the link 24 is fixedly mounted on the same shaft as the link 25 in Figs. 5a and b. In its turn, the link 25 is interconnected with the links 26 and 27.

The round hoist disposed in each compartment apart from compartment I is constructed in exactly the same way, for which the reason the component parts therein have the same reference numerals.

When the linkage system 24-27 is activated in the direction of the arrows, the angled arm 28 is shifted at the same time and, in its turn, acts upon the link 29 which in turn acts on a cranked link 30 which is journaled about a shaft 31 and is pivotally connected with the link 29 at its one arm 32 and with a second cranked link 34 at its other arm 33. The second cranked link 34 is, in its turn, connected, at its other end, to the pivot arm 33 which is fixedly retained on the same shaft as the previously-mentioned round hoist 8. When the entire link arm system now moves in the direction of the arrows on activation of the currently contemplated operating function, the second arm 33 of the cranked link 30 and the second cranked link 34 proper will be moved over to their captive toggled position shown in Figs. 5b and 6a. At this point, the round hoist 8 assumes the position illustrated in Figs. 2, 4 and 6a where the remaining rounds are lifted so that the rounds located in the transverse feeding channel will be given free passage. It should be observed that the link 29 is connected to the angled arm 28 by the intermediary of a slotted groove 29a which permits the link system 24-26 to return to its initial position when the lock 12 is triggered. The slotted groove 29a also permits securing of the toggle mechanism 31-33-34 without influencing the link system 24-28.

The successive release of the round hoists 8 of

the compartments according as the compartments are emptied will be apparent from Figs. 6a and 6b, from which certain other details have been omitted. As will be apparent from Fig. 6a, the rounds are biased towards the discharge position of each compartment (apart from in the last compartment) by the spring-loaded sensing arm 9 (the spring = 36).

When the sensing arm 9 is no longer loaded by a round, in other words when the compartment has been emptied, the sensing arm shifts the link 37 in the direction of the arrow. On this movement, a compartment release block 38 is shifted from the first position beyond the toggle mechanism 31-33-34 to a second position where the compartment release block 38 bridges the distance between the tripping point of the toggle mechanism, i.e. the point which trips the lock if it is actuated in the right direction, and a tripping abutment 39 (only included on Figs. 6a and 6b) which is interactive with the gun recoil and, for each discharge recoil, passes the above-mentioned point but itself does not reach the critical point on the toggle mechanism. The result will thus be that the round hoist 8 will be released on the first recoil once the compartment release block 38 has been shifted to its second position. In order further to speed up the compartment release function, the round hoist 8 may be provided with a release spring (35, not shown on the Drawings) which actuates the round hoist 8 in the release direction.

The round hoists in all compartments function in the above-described manner and the system thus guarantees a reliable feed function until all compartments have been emptied.

Claims

1. A compact, preferably gun-mounted round magazine (2) for fully-automatic artillery pieces, primarily anti-aircraft guns, comprising a plurality of preferably vertical round compartments (I-IV) disposed in mutually parallel side-by-side relationship, and each accommodating a plurality of parallel superposed rounds which may successively be fed down towards a discharge position specific for each compartment, from which discharge position the rounds are fed further towards the ramming position of the gun by a separate transverse feeding system (7) which is common for all compartments, by the intermediary of a transverse feeding channel (6) which coincides with the parallel discharge positions disposed in side-by-side relationship for the different compartments, and all compartments apart from the most distal compartment (1), seen in the direction of feed of the transverse feeding system, being provided with round hoists (8) which, in the activated position, lift all rounds in each respective compartment apart from that round which lies in each respective discharge position, above the transverse feeding channel (6) so that the rounds disposed therein are disengaged and free from other rounds until the compartment immediately beyond the compartment in question has been emptied, when the round hoist (8) in this compartment is released, so that the rounds in the compartment enjoy free access to the transverse feeding channel (6) said

round hoists (8) at each respective compartment being interconnected each with their sensing device (9) disposed on a level with the discharge position for that compartment which, in the direction of feed of the transverse feeding channel, lies immediately ahead of that compartment to which the round hoist (8) relates, and said sensing devices being actuated to a first position by possible rounds located in each respective discharge position in order, when said sensing devices are no longer loaded by any round, to be moved by means of integral spring force (36), to a second position where they, in their turn, activate the release of the round hoists interconnected therewith characterized in that each respective round hoist (8) is secured in the raised position by means of a toggle securing mechanism (31-33-34), which is released by the first recoil of the gun after that the sensing device (9) interconnected with said round hoist has been moved to its second unbiased position where it bridges the distance between a point of the toggle mechanism and a trip abutment (39) moveable in the unlocking direction of the toggle mechanism on recoil of the gun but which by itself does not reach the toggle mechanism.

2. A magazine according to claim 1 characterized in that said sensing device, on being shifted to its second unbiased position displaces a compartment release block (38) from a first position beyond said toggle mechanism to a second position where the compartment release block (38) bridges the distance between said point on the toggle mechanism and the trip abutment (39).

3. A magazine as claimed in any one of claims 1 and 2, characterized in that the round hoists (8) in all compartments are interconnected with a lid (5) common to all compartments, in such a manner that the round hoist is moved to the secured raised position when the lid is closed.

Patentansprüche

1. Kompaktes, vorzugsweise von einem Geschütz getragenes Geschossmagazin (2) für vollautomatische Artilleriegeschütze, insb. Luftabwehrkanonen, mit einer Vielzahl von vorzugsweise vertikalen Geschosskammern (I-IV), die in zueinander paralleler Ausrichtung nebeneinander angeordnet sind und je eine Vielzahl von parallel übereinander liegenden Geschossen aufnehmen, die nacheinander nach unten zu einer jeder Kammer zugeordneten Entnahmeposition bewegt werden können, von der aus die Geschosse weiter zur Ansetzposition des Geschützes gefördert werden mittels eines separaten Querfördersystems (7), welches allen Kammern gemeinsam ist, über einen Querförderkanal (6), der mit den parallelen, nebeneinander liegenden Entnahmepositionen der verschiedenen Kammern übereinstimmt, wobei alle Kammern mit Ausnahme der am weitesten entfernten Kammer (1), in Förderrichtung des Querfördersystems betrachtet, mit Geschosshern (8) versehen sind, die in aktivierter Stellung alle Geschosse in der jeweiligen Kammer, außer dem in der jeweiligen Entnahmeposition liegenden Geschos, über den Querförderkanal (6) anheben, so daß die darin befindlichen Geschosse von den an-

deren Geschossen entlastet und frei sind, bis die unmittelbar jenseits der betrachteten Kammer liegende Kammer geleert worden ist, wenn der Geschosheber (8) in dieser Kammer freigegeben wird, so daß die Geschosse in der Kammer freien Zugang zu dem Querförderkanal (6) haben, und wobei die Geschosheber (6) einer jeweiligen Kammer alle mit einer zugehörigen Fühlvorrichtung (9) verbunden sind, die in Höhe der Entnahmeposition derjenigen Kammer angeordnet ist, die in der Förderrichtung des Querförderkanals unmittelbar vor der Kammer liegt, die den zugehörigen Geschosheber (8) aufweist, und wobei die Fühlvorrichtungen durch eventuell in der jeweiligen Entnahmeposition befindliche Geschosse in eine erste Stellung gebracht werden, damit sie, wenn die Fühlvorrichtungen nicht mehr von einem Geschos belastet sind, durch eine zugeordnete Federkraft (8) in eine zweite Position bewegt werden, wo sie ihrerseits die Auslösung der damit verbundenen Geschosheber bewirken, dadurch gekennzeichnet, daß jeder zugehörige Geschosheber (8) in der angehobenen Position durch einen Kniehebel-Sicherheitsmechanismus (31, 33, 34) gesichert ist, der vom ersten Rückstoß des Geschützes ausgelöst wird, nachdem die mit dem betreffenden Geschosheber verbundene Fühlvorrichtung (9) in ihre zweite, unbelastete Position bewegt wurde, in der sie den Abstand zwischen einem Punkt des Kniehebelmechanismus und einem Auslöseanschlag (39) überbrückt, der beim Rückstoß des Geschützes in die Entriegelungsrichtung des Kniehebelmechanismus beweglich ist, selbst aber den Kniehebelmechanismus nicht erreicht.

2. Magazin nach Anspruch 1, dadurch gekennzeichnet, daß die Fühlvorrichtung bei Verschiebung in ihre zweite unbelastete Position einen Kammerfreigabeblock (38) aus einer ersten Stellung jenseits des Kniehebelmechanismus in eine zweite Stellung verschiebt, in der der Kammerfreigabeblock (38) den Abstand zwischen dem Punkt des Kniehebelmechanismus und dem Auslöseanschlag (39) überbrückt.

3. Magazin nach einem der Ansprüche 1 und 2, dadurch gekennzeichnet, daß die Geschosheber (8) in allen Kammern mit einem allen Kammern gemeinsamen Deckel (5) verbunden sind derart, daß der Geschosheber in die gesicherte, obere Position bewegt wird, wenn der Deckel geschlossen wird.

Revendications

1. Magasin (2) à munitions compact, de préférence monté sur un canon, destiné aux pièces d'artillerie entièrement automatiques, principalement aux canons anti-aériens, ce magasin comprenant plusieurs compartiments pour munitions, de préférence verticaux (I à VI), disposés parallèlement côte à côte et logeant chacun plusieurs munitions superposées parallèlement qui peuvent être transportées successivement vers le bas en direction d'un emplacement de décharge particulier à chaque compartiment, d'où les munitions sont transportées plus loin, en direction de l'emplacement de chargement du canon, au moyen d'un dispositif (7) de transport transversal séparé, qui est commun à tous les

compartiments en passant par un couloir (6) de transport transversal, qui coïncide avec les emplacements parallèles de décharge disposés côte à côte et destinés aux différents compartiments, et tous les compartiments, à l'exception du compartiment (1) le plus éloigné, lorsqu'on regarde dans le sens de transport du dispositif de transport transversal, étant munis de dispositifs (8) de relevage de munitions, qui, lorsqu'ils sont en position armée, soulèvent toutes les munitions présentes dans chacun des compartiments respectifs, à l'exception de la munition qui se trouve dans chaque emplacement de décharge respectif, au-dessus du couloir (6) de transport transversal, de façon telle que les munitions qui s'y trouvent ne sont plus en contact avec les autres munitions et en sont séparées jusqu'à ce que le compartiment situé immédiatement au-delà du compartiment considéré ait été vidé, ce qui libère ou dégage le dispositif (8) de relevage de ce compartiment, de telle façon que les munitions qui se trouvent dans le compartiment disposent d'un libre accès au couloir (6) de transport transversal, lesdits dispositifs (8) de relevage de munitions de chaque compartiment respectif étant chacun interconnectés avec leur dispositif détecteur (9) disposé au niveau de l'emplacement de décharge du compartiment qui, vu dans la direction de transport du couloir de transport transversal, est situé immédiatement en avant du compartiment auquel est affecté le dispositif (8) de relevage, et lesdits dispositifs détecteurs étant actionnés jusqu'à une première position par d'éventuelles munitions se trouvant dans chaque emplacement de décharge respectif afin, lorsque lesdits dispositifs détecteurs ne sont plus sous la charge d'une munition quelconque, d'être déplacés grâce à la force d'un ressort (36) intégré jusqu'à une seconde position où à leur tour, ils activent la libération des dispositifs de relevage auxquels ils sont reliés, magasin caractérisé en ce que chaque dispositif (8) de relevage respectif est maintenu de façon sûre en position relevée, au moyen d'un mécanisme de fixation à genouillère (31, 33, 34), qui est libéré par le premier recul du canon après que le dispositif détecteur (9) relié audit dispositif de relevage de munitions ait été déplacé jusqu'à sa seconde position dans laquelle il ne se trouve pas poussé et dans laquelle il forme un pont couvrant la distance séparant un point du mécanisme à genouillère d'une butée (39) de déclenchement susceptible de se déplacer dans le sens du déblocage du mécanisme à genouillère lors du recul du canon, mais qui n'atteint pas de lui-même le mécanisme à genouillère.

2. Magasin selon la revendication 1, caractérisé en ce que ledit dispositif détecteur, lorsqu'il est déplacé jusqu'à sa seconde position dans laquelle il n'est pas poussé, déplace un bloc (38) de libération de compartiment, en faisant passer ce bloc d'une première position, située au-delà dudit mécanisme à genouillère, à une seconde position, dans laquelle le bloc (39) de libération de compartiment forme un pont couvrant la distance séparant ledit point du mécanisme à genouillère de ladite butée (39) de déclenchement.

3. Magasin selon l'une quelconque des revendications

1 et 2, caractérisé en ce que les dispositifs (8) de relevage de munitions de tous les compartiments sont reliés à un couvercle (5) commun à tous les compartiments, d'une manière telle que le dispositif de relevage de munitions est déplacé à la position relevée fixe lorsque le couvercle est fermé.

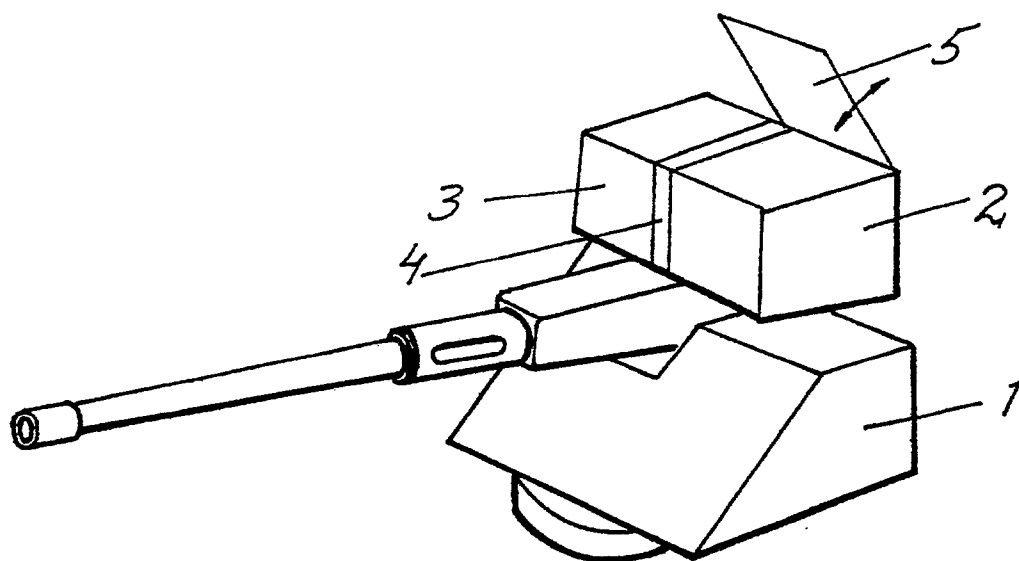


Fig. 1

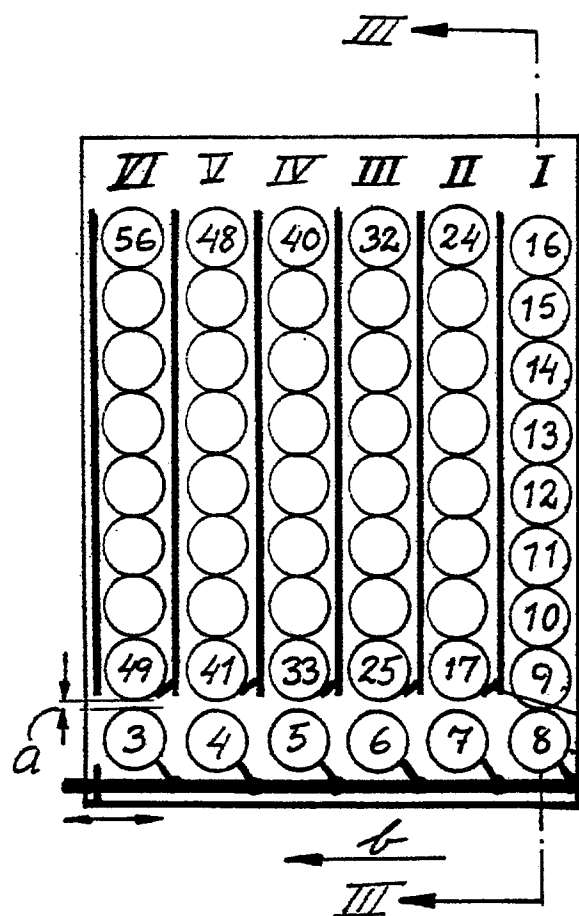


Fig. 2

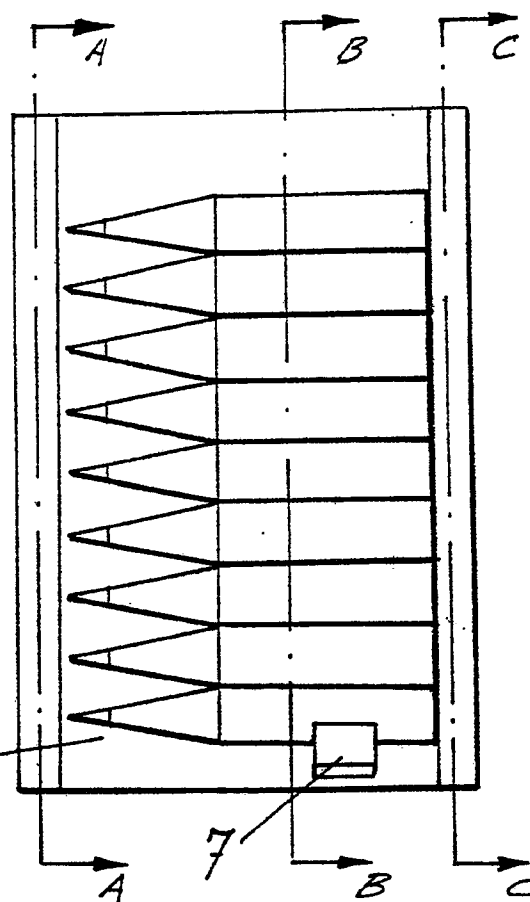


Fig. 3

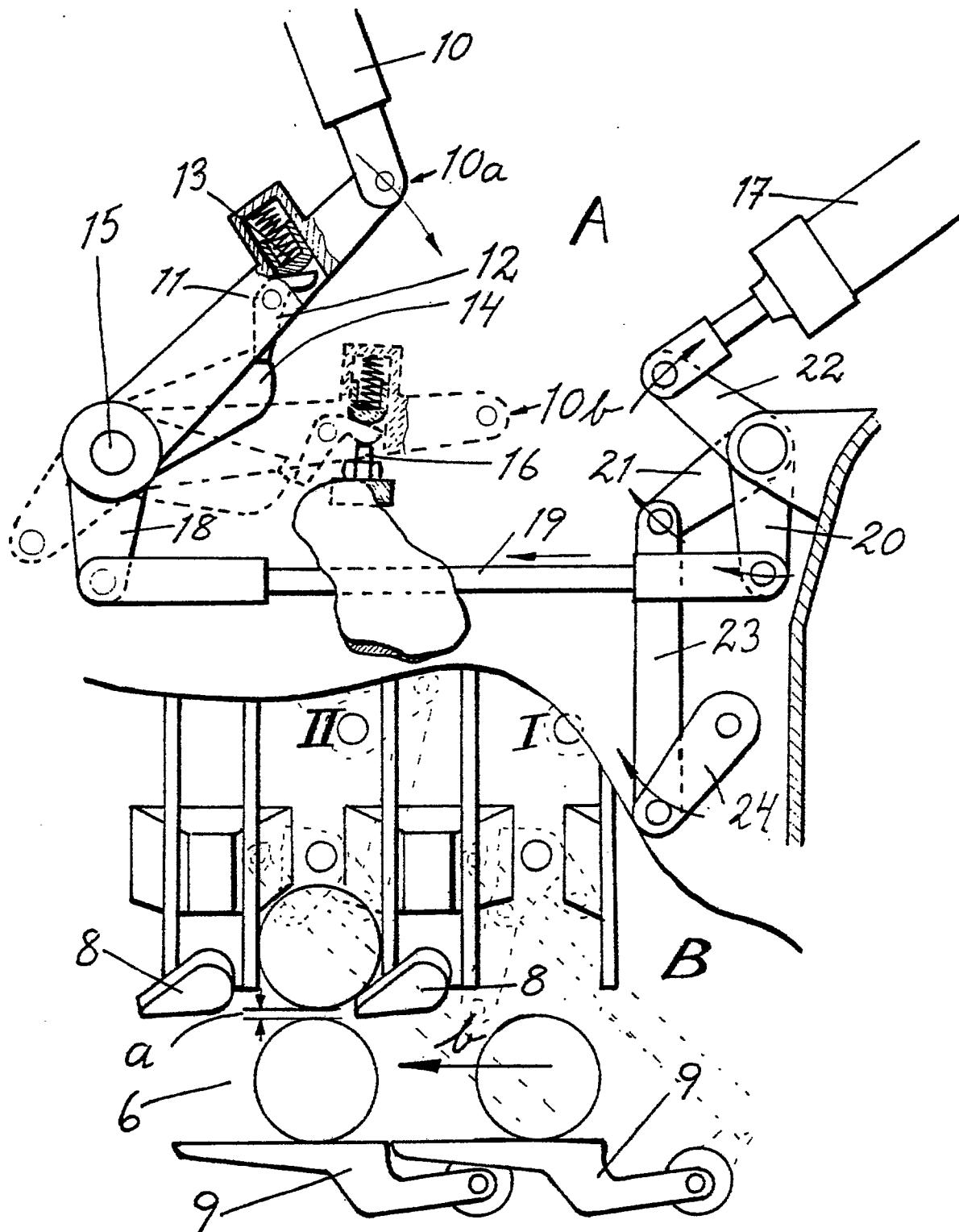


Fig. 4

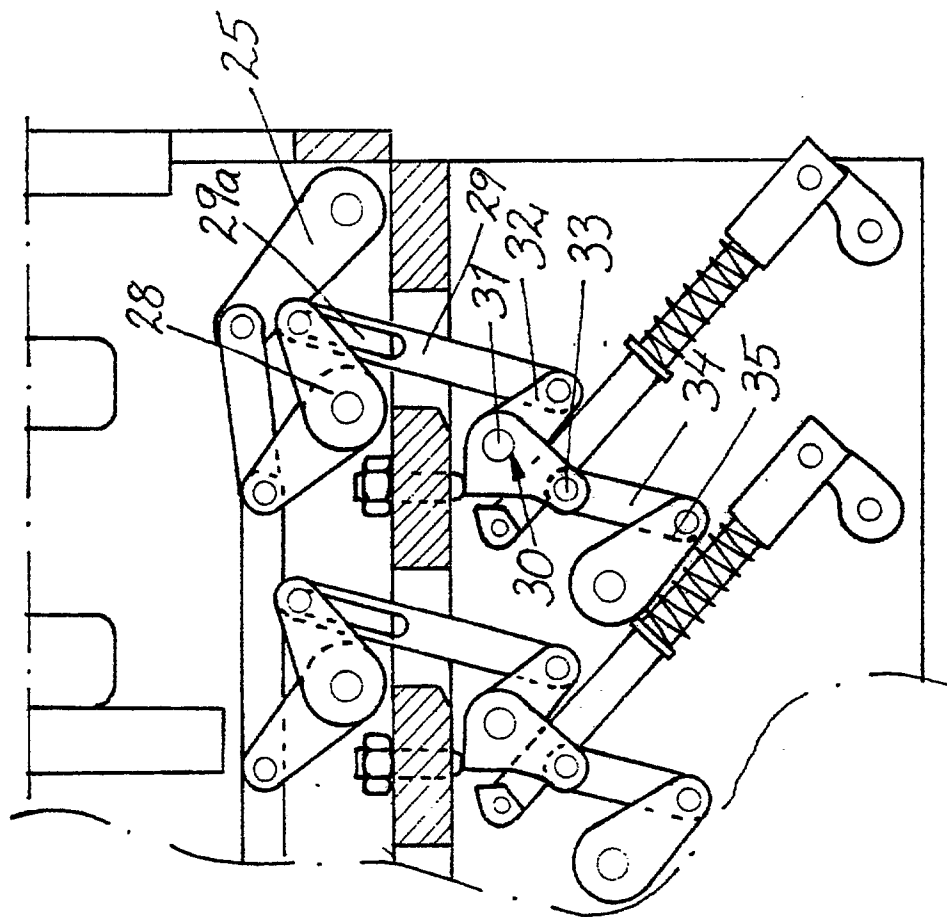


Fig. 5b

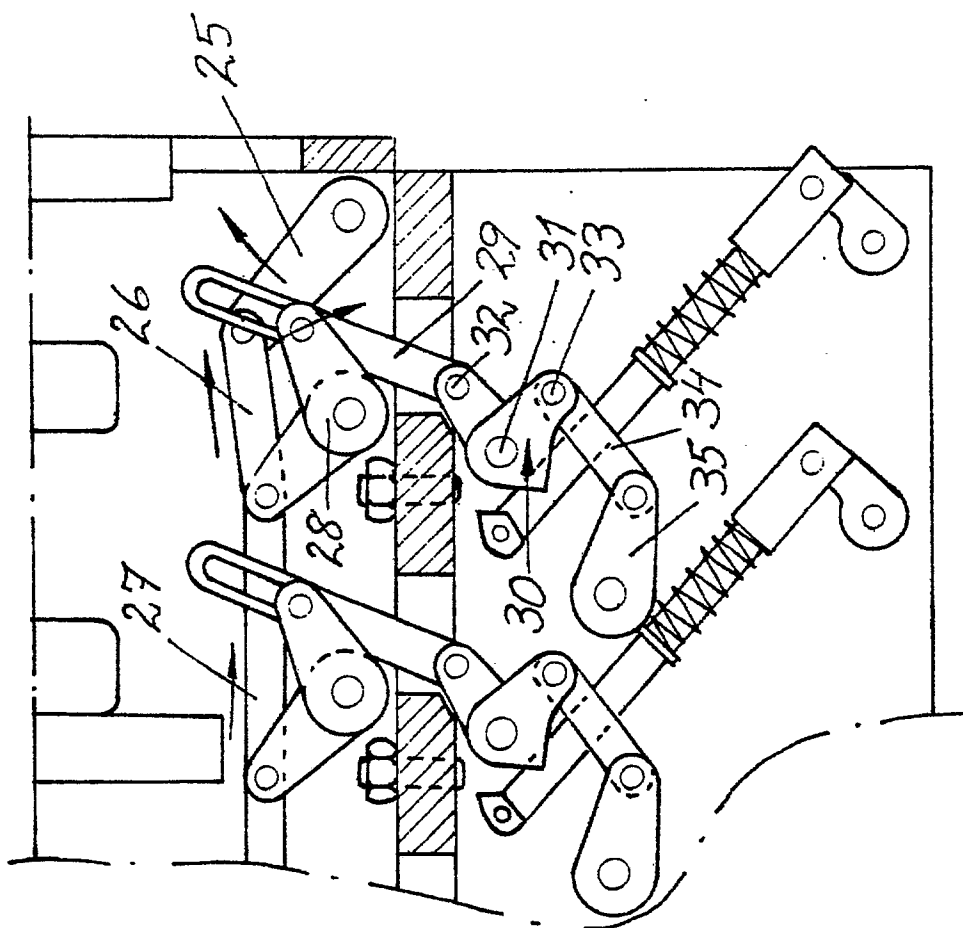


Fig. 5a

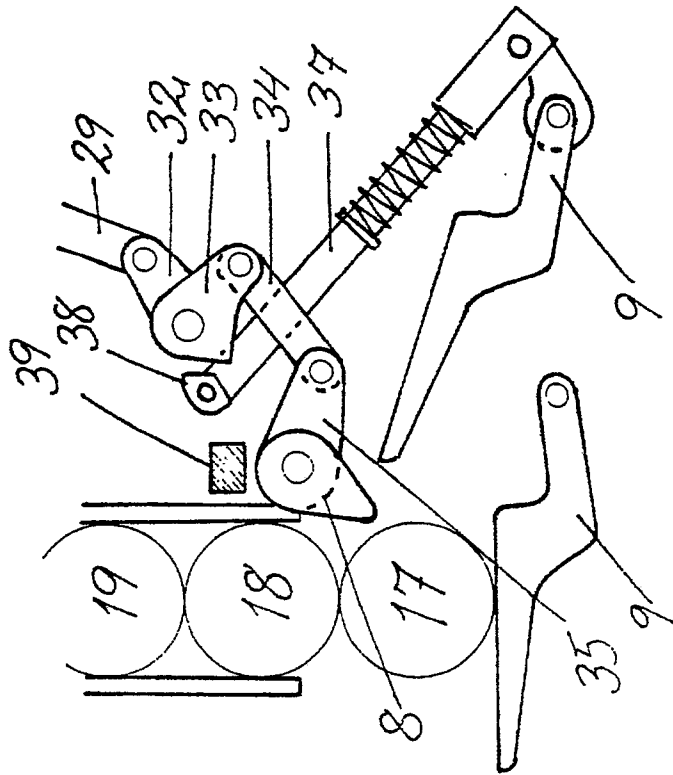


Fig. 6b

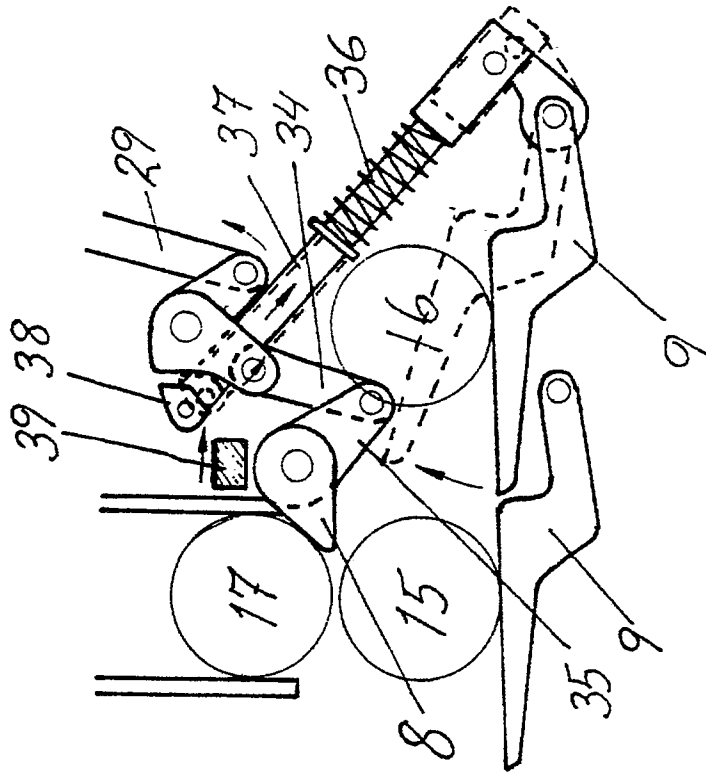


Fig. 6a