



(12) Patent specification

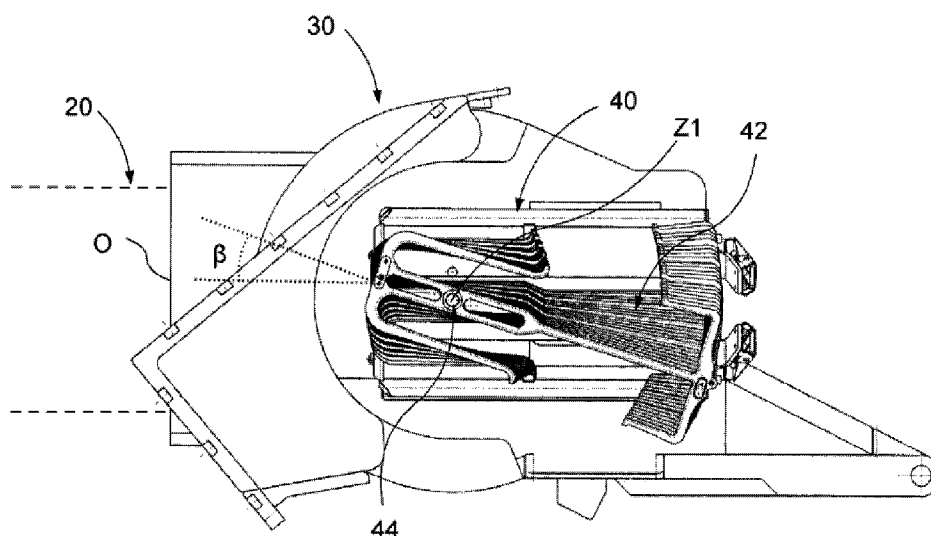
(10) SE 543 680 C2

(21) Patent application number:	1951170-8	(51) Int.Cl.:	
(45) Grant of patent:	2021-06-01	F41A 9/57	(2006.01)
(41) Available to the public:	2021-04-16		
(22) Filing date:	2019-10-15		
(24) Effective date:	2019-10-15		
(30) Priority data:	---		

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(54) Title:	ARRANGEMENT FOR FEEDING AMMUNITION TO A WEAPON
(56) Cited documents:	US 4416184 A · US 2009120271 A1
(57) Abstract:	

The present invention relates to an arrangement for feeding ammunition to a weapon (20). The weapon (20) is mounted to an elevation device (30) arranged to allow elevation movement of the weapon (20) about an elevation axis (Z1). The arrangement comprises a feeding chute (40) connected at one end to the weapon (20). The feeding chute (40) comprises a set of elements (42) assembled together in a stacked configuration. The set of elements (42) is arranged about a shaft (44) configured to be concentrically arranged relative to the elevation axis (Z1) so as to allow movement of individual elements of the set of elements (42) about said shaft (44) in connection to elevation movement of the weapon (20) about the elevation axis (Z1).

The invention also relates to a vehicle with an arrangement according to the present invention.



ABSTRACT

The present invention relates to an arrangement for feeding ammunition to a weapon (20). The weapon (20) is mounted to an elevation device (30) arranged to allow elevation movement of the weapon (20) about an elevation axis (Z1). The arrangement comprises a feeding chute (40) connected at one
5 end to the weapon (20). The feeding chute (40) comprises a set of elements (42) assembled together in a stacked configuration. The set of elements (42) is arranged about a shaft (44) configured to be concentrically arranged relative to the elevation axis (Z1) so as to allow movement of individual elements of
10 the set of elements (42) about said shaft (44) in connection to elevation movement of the weapon (20) about the elevation axis (Z1).

The invention also relates to a vehicle with an arrangement according to the present invention.

ARRANGEMENT FOR FEEDING AMMUNITION TO A WEAPON

TECHNICAL FIELD

The present invention relates to an arrangement for feeding ammunition to a
5 weapon. The present invention also relates to a vehicle.

BACKGROUND ART

Combat vehicles such as infantry fighting vehicles or tanks may be equipped
with a weapon system associated with a turret, wherein the weapon system
10 comprises a weapon attached to the turret. The ammunition is normally
configured to be fed to the weapon from an ammunition magazine via some
kind of flexible chute. Such a chute may be configured to provide both twisting
and bending abilities in order to facilitate feeding of ammunition to the weapon.
Space for weapon systems may be an issue, particularly for weapon systems
15 associated with a turret configured to house parts of the weapon system
including such flexible chutes requiring certain space.

There is thus a need to provide an arrangement for feeding ammunition to a
weapon.

20 OBJECTS OF THE INVENTION

An object of the present invention is to provide an arrangement for feeding
ammunition to a weapon which facilitates a compact solution.

Another object of the present invention is to provide a vehicle comprising such
an arrangement which facilitates a compact solution.

SUMMARY OF THE INVENTION

These and other objects, apparent from the following description, are achieved by an arrangement for feeding ammunition to a weapon and a vehicle as set out in the appended independent claims. Preferred embodiments of the arrangement are defined in appended dependent claims.

Specifically an object of the invention is achieved by an arrangement for feeding ammunition to a weapon. The weapon is mounted to an elevation device arranged to allow elevation movement of the weapon about an elevation axis. The arrangement comprises a feeding chute connected at one end to the weapon. The feeding chute comprises a set of elements assembled together in a stacked configuration. The set of elements is arranged about a shaft configured to be concentrically arranged relative to the elevation axis so as to allow movement of individual elements of the set of elements about said shaft in connection to elevation movement of the weapon about the elevation axis.

By thus providing such a feeding chute with elements arranged about a shaft concentrically arranged relative to the elevation axis a compact feeding chute may be obtained. This is due to the fact that the individual elements of the feeding chute hereby only need to be pivoted about the shaft, i.e. only in a plane essentially orthogonal to the elevation axis in order to feed the ammunition through the feeding chute to the weapon. This facilitates having the individual elements tightly stacked together. Thus, the distance between the individual elements may be short since there is no need to bend the elements relative to each other. This, further facilitates a feeding chute requiring low resistance in order to feed ammunition through the feeding chute within the entire elevation range of the weapon.

According to an embodiment of the arrangement, the feeding chute, at the end opposite to the end connected to the weapon, is configured to be fixedly attached to a guiding chute for guiding the ammunition from a magazine to the

feeding chute. Hereby feeding of ammunition from the end opposite to the end connected to the weapon, i.e. to the weapon, may be easily obtained independent of elevation angle of the weapon, in that the ammunition may be introduced to the feeding chute via e.g. a connected guiding chute being fixed.

- 5 According to an embodiment of the arrangement, the feeding chute comprises a first end element configured to be closest to the weapon, the first end element being configured to be pivoted about the shaft corresponding to the elevation movement of the weapon about the elevation axis. Hereby feeding of ammunition to the weapon may be easily obtained independent of elevation
10 angle of the weapon.

- According to an embodiment of the arrangement, the feeding chute comprises a second end element configured to be furthest away from the weapon, the second end element being configured to be essentially fixed so that it is at the same position independently of elevation angle of the weapon thus connected
15 to the feeding chute. Hereby feeding of ammunition from the end opposite to the end connected to the weapon, i.e. to the weapon, may be easily obtained independent of elevation angle of the weapon, in that the ammunition may be introduced to the feeding chute via e.g. a connected guiding chute being fixed.

- According to an embodiment of the arrangement, the elements of the set of
20 elements between the first end element and the second end element are gradually mutually displaceable. Hereby feeding of ammunition through the feeding chute may be efficiently obtained in that the individual elements may be mutually displaced based on elevation angle so as to allow ammunition to be fed through opening/openings of the feeding chute.

- 25 According to an embodiment the arrangement may comprise an element displacement control arrangement for controlling mutual displacement of the individual elements of the set of element of the feeding chute arranged in connection to a front side, i.e. the side facing in the firing direction of the weapon, or an opposite rear side of the feeding chute. According to an

embodiment of the arrangement, the element displacement control arrangement may comprise a spring member configured to be fixed to an end element and comprising a spring rod configured to run through the individual elements from one end element to an opposite end element and being
5 configured to control mutual displacement of the individual elements of the set of element of the feeding chute in connection to elevation movement of the weapon.

According to an embodiment of the arrangement, the individual elements movable about said shaft are configured to be rotated about the shaft a certain
10 angle relative to an adjacent element so as to allow feeding of ammunition through the feeding chute at all elevation angles of the elevation device. Hereby the rotation of the individual elements may advantageously be set to a maximum rotation angle so that the displacement relative to adjacent elements is such that ammunition may be fed through the feeding chute without
15 interruption and thus easily and efficiently obtained. The number of elements of the set of elements will thus be such that, with such a maximum rotation angle of individual elements, the feeding chute with the set of elements movably arranged about the shaft will facilitate feeding of ammunition through the feeding chute at all elevation angle of the weapon.

20 According to an embodiment the arrangement may comprise a track member arranged in connection to a front side, i.e. the side facing in the firing direction of the weapon, or an opposite rear side of the feeding chute configured to run through the set of elements so as to limit the rotation of the individual elements about the shaft. The track member is configured to be arranged on the opposite
25 side relative to the arrangement of the element displacement control arrangement. According to an embodiment the arrangement may comprise distance members arranged in connection to the track member and configured to hold the individual elements together in the axial direction, i.e. direction of the shaft, and limit the relative movement of the elements by means of the
30 track member.

According to an embodiment of the arrangement, the second end element furthest away from the weapon is configured to have an angle within a range between the maximum elevation angle and minimum elevation angle of the weapon.

- 5 Hereby the number of elements of the set of elements of the feeding chute may be minimized and thus optimizing the compactness of the feeding chute. This, since only half of the elevation angle is required for the feeding chute for elevation corresponding to rising of the weapon to the highest elevation angle and lowering to the lowest elevation angle. Elevation of the weapon, i.e. gun
10 barrel of the weapon, upwardly usually corresponds to an elevation angle substantially greater than the elevation angle for lowering the weapon. This means that, for a weapon in a horizontal position, given that the vehicle is in a horizontal position, the angle of the second end element has a certain upward direction in the forward direction of gun barrel of the weapon.
- 15 According to an embodiment of the arrangement, the set of elements are pivotably journaled about said shaft. Hereby easy and efficient rotation of individual element about the shaft is facilitated.

- According to an embodiment of the arrangement, the feeding chute comprises an upper channel for feeding ammunition and a lower channel for feeding
20 ammunition, said shaft being arranged between the upper and lower channel.

- According to an embodiment of the arrangement, the feeding chute, in connection to said one end of the feeding chute, comprises a fastening arrangement for attaching the feeding chute to the weapon. Hereby easy and efficient rotation, corresponding to the elevation movement of the weapon, of
25 the first end element of the feeding chute is facilitated.

According to an embodiment of the arrangement, the ammunition is configured to be guided from an essentially upright position in the magazine to an essentially lying position at the feeding chute via the guiding chute. This may

be a space efficient way of guiding ammunition to the feeding chute within a turret.

According to an embodiment of the arrangement, the arrangement is intended for a vehicle mounted weapon system, the weapon system S comprising the
5 weapon mounted to a turret via the elevation device.

According to an embodiment of the arrangement, the arrangement comprising the feeding chute, and the guiding channel to which the feeding chute is connected are configured to be arranged within said turret.

Specifically an object of the invention is achieved by a vehicle comprising an
10 arrangement for feeding ammunition from a magazine to a weapon of a weapon system mounted on the vehicle as set out herein.

According to an embodiment, the vehicle is a tracked vehicle. According to an embodiment the vehicle is a combat vehicle.

15 BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention reference is made to the following detailed description when read in conjunction with the accompanying drawings, wherein like reference characters refer to like parts throughout the several views, and in which:

20 Fig. 1 schematically illustrates a side view of a tracked vehicle according to an embodiment of the present disclosure;

Fig. 2 schematically illustrates a side view of a turret with a weapon system having a weapon according to an embodiment of the present disclosure;

Fig. 3a schematically illustrates a perspective view of a chute configuration
25 with a feeding chute in connection to an elevation device according to an embodiment of the present disclosure;

Fig. 3b schematically illustrates a perspective view of the chute configuration with ammunition and the elevation device in fig. 3a, ammunition being guided in the chute configuration;

Fig. 4a schematically illustrates another perspective view of the chute configuration with ammunition and the elevation device in fig. 3a;

Fig. 4b schematically illustrates a perspective view of the chute configuration with ammunition and the elevation device in fig. 4a, ammunition being guided in the chute configuration;

Fig. 5 schematically illustrates a side view of the feeding chute in connection to the elevation device according to an embodiment of the present disclosure;

Fig. 6 schematically illustrates a side view of the feeding chute in fig. 5;

Fig. 7a schematically illustrates a perspective view of the feeding chute in fig. 5;

Fig. 7b schematically illustrates a perspective view of the feeding chute in fig. 7a, ammunition being fed through the feeding chute;

Fig. 8 schematically illustrates a side view of the feeding chute in fig. 5;

Fig. 9a schematically illustrates a cross section A-A of the side view of the feeding chute in fig. 8;

Fig. 9b schematically illustrates a cross section B-B-A of the side view of the feeding chute in fig. 8; and

Fig. 9c schematically illustrates a cross section C-C of the side view of the feeding chute in fig. 8.

DETAILED DESCRIPTION

Fig. 1 schematically illustrates a side view of a tracked vehicle V according to an aspect of the present disclosure. The exemplified vehicle V is constituted by a combat vehicle. The tracked vehicle V comprises a vehicle body B, which according to an aspect of the present disclosure comprises the chassis of the vehicle V and bodywork.

The tracked vehicle V comprises a track assembly pair T1, T2 being suspendedly connected to the vehicle body B. The track assembly pair comprises a right track assembly T1 and a left track assembly T2 for driving the vehicle, each track assembly comprising a drive means driven endless track E arranged to run over a set of wheels W of the track assembly.

Even if the illustrated motor vehicle V is a tracked vehicle the motor vehicle V may according to other embodiments of the invention be constituted by a wheeled vehicle.

The vehicle V is equipped with a turret 10. The turret 10 is arranged on top of the vehicle V. The turret 10 is rotatable about an axis Y of rotation orthogonal to the longitudinal extension of the vehicle V and orthogonal to the transversal extension of the vehicle V.

The vehicle V is configured to be equipped with a weapon system S having a weapon 20. The weapon 20 is mounted to the turret 10. The weapon 20 of the weapon system S is thus allowed to rotate by means of rotating the turret 10 about the axis Y.

The weapon 20 is configured to be connected to an elevation device, e.g. a so called weapon cradle, connected to the turret 10. The elevation device may be an elevation device 30 illustrated in fig. 3a-b, 4a-b and fig. 5. The weapon 20 is configured to be raised and lowered, i.e. provide an elevation movement, about an elevation axis Z1, illustrated in fig. 1, by means of the elevation device. The weapon 20 comprises a gun barrel 22. The gun barrel 22 of the weapon 20 is configured to be raised and lowered, i.e. provide an elevation movement, about the elevation axis Z1.

Fig. 2 schematically illustrates a side view of the turret 10 with the weapon system S having a weapon 20 according to an embodiment of the present disclosure.

As mentioned above with reference to fig. 1, the weapon 20 is configured to
 5 be connected to an elevation device, e.g. an elevation device 30 illustrated in fig. 3a-b, 4a-b and 5. The weapon 20 is configured to be raised and lowered, i.e. provide an elevation movement, about an elevation axis Z1 by means of the elevation device, e.g. weapon cradle.

The weapon 20 is configured to be raised and lowered within an elevation
 10 angle α . The weapon 20 is configured to be raised from a position corresponding to the longitudinal extension of the vehicle V, i.e. a horizontal position when the vehicle is in a horizontal position, an angle α_1 , and lowered from that position an angle α_2 .

Fig. 3a and 4a schematically illustrates different perspective views of a chute
 15 configuration C with a feeding chute 40 in connection to an elevation device 30 according to an embodiment of the present disclosure, and fig. 3b and 4b corresponding views with ammunition guided in the chute configuration. The chute configuration or parts of the chute configuration may be comprised in the arrangement for feeding ammunition to a weapon according to the present
 20 disclosure.

The chute configuration C comprises a feeding chute 40. The arrangement for feeding ammunition to a weapon according to the present disclosure comprises the feeding chute 40. The feeding chute 40 comprises a set of elements 42 assembled together in a stacked configuration.

25 The set of elements 42 is arranged about a shaft 44, see fig. 4a, configured to be concentrically arranged relative to the elevation axis Z1 of the elevation device 30, see e.g. fig. 3a-b, so as to allow movement of individual elements of the set of elements 42 about said shaft 44 in connection to elevation movement of the weapon about the elevation axis Z1.

The feeding chute 40 is comprised in an arrangement for feeding ammunition to the weapon, the weapon not being shown in fig. 3a-b, 4a-b. The feeding chute 40 is configured to be connected at one end to the weapon. The end of the feeding chute configured to be connected to the weapon is faced towards
5 the elevation device 30. The feeding chute 40 is arranged in connection to the elevation device 30 so that the shaft 44 is coaxial relative to the elevation axis Z1. The feeding chute 40 is described in more detail below with reference to fig. 5, 6, 7a-b, 8 and 9a-c.

The chute configuration C comprises a guiding chute 50, 60 for guiding the
10 ammunition from an ammunition magazine M to the feeding chute 40. The ammunition magazine M is schematically illustrated in fig. 3a-b and 4a-b. The ammunition magazine may have any suitable configuration for housing ammunition.

The guiding chute 50, 60 comprises an intermediate chute 50 and an upright
15 chute 60. The intermediate chute 50 is configured to connect the upright chute 60 with the feeding chute 40.

The ammunition magazine M may be configured to house the ammunition A in an upright position. The ammunition magazine M may have two channels for guiding the ammunition A. This in order to facilitate having to different types
20 of ammunition.

The chute configuration C thus has two channels C1, C2 connecting to the channels of the ammunition magazine M, a first channel C1 connecting to a first channel of the magazine and a second channel connecting to a second channel of the magazine M.

25 The intermediate chute 50 has, according to this embodiment, a twisted configuration so as to guide the ammunition A from an essentially upright position in the magazine M and the upright chute 60 to an essentially lying position at the feeding chute 40.

The intermediate chute 50 comprises, according to this embodiment, a set of rods 51, 52, 53, 54, 55, 56 arranged to provide a twist and turn of the chute configuration C. The rods 51, 52, 53, 54, 55, 56 are supported by a pair of frame configurations 56, 57 arranged about rods, at a distance from each other.

The individual rounds of the ammunition A configured to be guided in the respective channel C1, C2 are linked together. Individual rounds of the ammunition A may also be denoted cartridges. The ammunition A configured to be provided in the magazine M and configured to be guided from the magazine via the chute configuration C to the weapon is in a linked-together state, where every single round is linked together.

The ammunition A may be in the form of an ammunition belt. The thus linked together ammunition A is configured to be moved by means of the weapon. Thus, the weapon comprises means for receiving ammunition and thus pulling the linked together ammunition A in connection to firing rounds. This may be obtained in any suitable manner by any suitable means, e.g. electrically and/or mechanically. The weapon may comprise any suitable ammunition mechanism, not shown.

The elevation device 30 may be configured to be connected to a bearing support member of a turret so as to facilitate said elevation movement by means of the elevation device 30.

The elevation device 30 is arranged to allow elevation movement of a weapon, e.g. a weapon 20 as described with reference to fig. 1 and 2. The elevation device 30 is arranged to allow elevation movement of a weapon about an elevation axis Z1.

The elevation device 30 is according to an aspect of the present disclosure configured to be attached to a turret, e.g. a turret 10 as described with reference to fig. 1 and 2, and thus configured to be rotated with the turret about the axis Y as illustrated in fig. 1 and fig. 2.

The elevation device 30 comprises a ring shaped support member 32 for supporting the weapon. The ring shaped support member 32 has an opening O through which the weapon, i.e. the gun barrel of the weapon, is intended to be arranged. The opening O of the ring shaped support member 32 has an extension corresponding to the extension of the gun barrel when mounted to the ring shaped support member 32. The elevation axis Z1 is arranged in connection to the ring shaped support member 32. The elevation axis Z1 is orthogonal to the axial extension of the opening O and hence the axial extension of the gun barrel of the weapon.

10 The elevation device 30 with the ring shaped support member 32 with the opening O may be configured to be journaled in bearings for facilitating rotation of the weapon cradle 30 about the axis Z1 for elevation of the gun barrel of the weapon when supported by the elevation device 30.

15 The elevation device 30 may thus be configured to be connected to the turret via such bearings so as to facilitate rotation of the elevation device 30 relative to the turret, i.e. about the axis Z1.

Fig. 5 schematically illustrates a side view of the feeding chute 40 in connection to the elevation device 30 according to an embodiment of the present disclosure.

20 Here a portion of the weapon 20 is schematically illustrated extending from the opening O of the elevation device 30.

In fig. 5, the weapon is in a horizontal position, wherein the end of the feeding chute 40 connected to the weapon 20 including the element closest to the weapon also has a corresponding horizontal arrangement. The element of the set of elements 42 of the feeding chute 40 configured to be closest to the weapon 20 is below, with reference to fig. 6, 7a-b, 8 and 9a-c denoted first end element.

The element of the set of elements 42 of the feeding chute 40 furthest away from the weapon has a certain inclination with an angle β between the maximum elevation angle and minimum elevation angle of the weapon, see also fig. 2. The element of the set of elements 42 of the feeding chute 40
 5 configured to be furthest away from the weapon 20 is below, with reference to fig. 6, 7a-b, 8 and 9a-c denoted second end element.

Fig. 6 schematically illustrates a side view of the feeding chute in fig. 5 according to an embodiment of the present disclosure, fig. 7a schematically illustrates a perspective view of the feeding chute in fig. 5 and 6; Fig. 7b
 10 schematically illustrates a perspective view of the feeding chute in fig. 7a, ammunition being fed through the feeding chute.

Fig. 8 schematically illustrates a side view of the feeding chute in fig. 5. Fig. 9a schematically illustrates a cross section A-A of the side view of the feeding chute in fig. 8; fig. 9b schematically illustrates a cross section B-B of the side
 15 view of the feeding chute in fig. 8; and fig. 9c schematically illustrates a cross section C-C of the side view of the feeding chute in fig. 8.

The feeding chute 40 has a first side 40a and an opposite second side 40b, see fig. 6 and 8. The feeding chute 40 has a third side 40c and an opposite fourth side 40d, see fig. 6 and 8. The first side 40a and opposite second side
 20 40b are essentially perpendicular to the third side 40c and an opposite fourth side 40d, providing a rectangular configuration. The feeding chute has a connection side 40e for connection to the weapon and an opposite receiving side 40f, see fig. 9b. The connection side 40e and receiving side 40f are surrounded by the first side 40a, second side 40b, third side 40c and fourth
 25 side 40d, forming the feeding chute 40.

For the feeding chute 40, when connected to a weapon on a vehicle being in an essentially horizontal position, the first longitudinal side 40a is the upper side 40a, the opposite second longitudinal side 40b is the lower side 40b, the third side 40c is the front side 40c, i.e. directed in the direction of the gun barrel

of the weapon, i.e. shooting direction, and the fourth side 40d is the rear side 40d. The sides 40a, 40b, 40c, 40d, 40e and 40f will be referred to as if the feeding chute 40 is connected to a weapon on a vehicle, e.g. a vehicle V according to fig. 1.

- 5 The feeding chute 40 comprises said set of elements 42 assembled together in a stacked configuration. The set of elements 42 is arranged about a shaft 44 configured to be concentrically arranged relative to the elevation axis so as to allow movement of individual elements of the set of elements 42 about said shaft 44 in connection to elevation movement of the weapon 20 about the
10 elevation axis Z1, see e.g. fig. 5.

The individual elements of the feeding chute 40, when moved, are only pivoted about the shaft 44, i.e. only in a plane essentially orthogonal to the elevation axis. The individual elements are tightly stacked together, which is facilitated by the rotation of the individual elements of the set of element 42 in only one
15 plane.

According to an aspect of the present disclosure, the feeding chute 40 comprises an upper channel C1 for feeding ammunition and a lower channel C2 for feeding ammunition. The upper channel C1 may thus constitute a portion of the first channel C1 of the chute configuration C described with
20 reference to e.g. fig. 3a. The lower channel C2 may thus constitute a portion of the second channel C2 of the chute configuration C described with reference to e.g. fig. 3a.

According to an aspect of the present disclosure, the shaft 44 is arranged between the upper and lower channel. According to an aspect of the present
25 disclosure, the feeding chute 40 comprises an intermediate portion 40i configured to run between the upper channel C1 and lower channel C2. The intermediate portion 40i is configured to divide the feeding chute 40 into two channels C1, C2. The intermediate portion 40i thus has an extension

corresponding to the extension of the channels C1, C2. The shaft 44 is arranged to run through the intermediate portion 40i.

The upper channel C1 and the lower channel C2 has a shape essentially corresponding to the shape of the ammunition. The upper channel C1 and the lower channel C2 thus is narrower in connection to the short side 40c, i.e. the side 40c directed in the direction of the gun barrel of the weapon, see fig. 5 and fig. 6.

According to an aspect of the present disclosure, the feeding chute 40 comprises an upper opening O1 arranged at the upper side 40a so as to facilitate manual introduction into the weapon of an individual round of the linked-together ammunition from the upper channel C1, see fig. 8.

According to an aspect of the present disclosure, the feeding chute 40 comprises lower opening O2 arranged at the lower side 40b so as to facilitate manual introduction into the weapon of an individual round of the linked-together ammunition from the lower channel C2, see fig. 8.

The feeding chute according to the present disclosure may alternatively be configured with a single channel. The feeding chute according to the present disclosure may be configured with any suitable number of channels.

The individual elements of the feeding chute 40 are, according to an aspect of the present disclosure, formed in one piece.

The individual elements of the feeding chute 40 have a plate configuration. The individual elements of the feeding chute 40 may be denoted plate elements or plate members.

The individual elements of the feeding chute 40 have an upper side forming the upper side 40a of the feeding chute 40 when stacked together with the rest of the set of elements 42.

The individual elements of the feeding chute 40 have a lower side forming the lower side 40b of the feeding chute 40 when stacked together with the rest of the set of elements 42.

5 The individual elements of the feeding chute 40 have a front side forming the front side 40c of the feeding chute 40 when stacked together with the rest of the set of elements 42.

The individual elements of the feeding chute 40 have a rear side forming the rear side 40d of the feeding chute 40 when stacked together with the rest of the set of elements 42.

10 According to an aspect of the present disclosure, the feeding chute 40, in connection to said connection end 40e of the feeding chute 40, comprises a support frame 46 for supporting the set of elements 42 having an upper frame portion 46a arranged on the upper side 40a and a lower frame portion 46b arranged on the lower side 40b. The support frame 46 is configured to be
15 fixedly attached to the weapon.

According to an aspect of the present disclosure, the feeding chute 40, in connection to said connection end 40e of the feeding chute 40, comprises a fastening arrangement 47 for attaching the feeding chute 40 to the weapon.

20 The fastening arrangement 47 comprises a pair of locking members 47a, 47b for lockingly attach the feeding chute 40 to the weapon. The fastening arrangement 47 is attached to the support frame 46. The support frame 46 is here configured to be fixedly attached to the weapon by means of the fastening arrangement 47.

25 The feeding chute 40 is configured to be attached to the weapon by means of the fastening arrangement 47 so that the element closest to the weapon, below denoted first end element 42e1, is rotated about the shaft 44 corresponding to the elevation movement of the weapon. The feeding chute 40 may be attached to the weapon by means of any suitable fastening arrangement.

According to an aspect of the present disclosure, the feeding chute 40 comprises a first end element 42e1 configured to be closest to the weapon. The first end element 42e1 is arranged at the connection side 40c, see fig. 9b.

5 The first end element 42e1 is configured to be pivoted about the shaft 44 corresponding to the elevation movement of the weapon about the elevation axis. The first end element 42e1 is configured to be fixedly attached to the support frame 46.

According to an aspect of the present disclosure, the feeding chute 40 comprises a second end element 42e2 configured to be furthest away from the weapon. The second end element 42e2 is arranged at the receiving side 40f
10 opposite to the connection side 40e.

The second end element 42e2 is configured to be essentially fixed so that it is at the same position independently of elevation angle of the weapon thus connected to the feeding chute 40. The second end element 42e2 is configured
15 to be essentially fixed to the guiding chute, see e.g. fig. 3a, 4a, so that feeding of ammunition from the guiding chute may be easily obtained independent of elevation angle of the weapon. Thus, the second end element 42e2 is configured to be essentially fixed to the guiding chute so that the ammunition may be introduced to the feeding chute 40 via the connected guiding chute.

20 According to an aspect of the present disclosure, the elements of the set of elements 42 between the first end element 42e1 and the second end element 42e2 are gradually mutually displaceable. The individual elements are according to an embodiment configured to be mutually displaced based on elevation angle so as to allow ammunition to be fed through the channels C1,
25 C2 of the feeding chute 40.

According to an aspect of the present disclosure, the individual elements movable about said shaft 44 are configured to be rotated about the shaft a certain angle relative to an adjacent element so as to allow feeding of

ammunition through the feeding chute 40 at all elevation angles of the elevation device.

The rotation of the individual elements about said shaft 44 are, according to an aspect of the present disclosure, set to a maximum rotation angle so that
5 the displacement relative to adjacent elements is such that ammunition may be fed through the feeding chute 40 without interruption and thus easily and efficiently obtained.

The number of elements of the set of elements 42 are chosen such that, with such a maximum rotation angle of individual elements, the feeding chute 40
10 with the set of elements 42 movably arranged about the shaft 44 will facilitate feeding of ammunition through the feeding chute 40, i.e. through the channels C1, C2 of the feeding chute 40, at all elevation angles of the weapon.

The feeding chute 40 comprises a track member 40t arranged in connection to the rear side 40d and configured to run through the set of elements 42 so
15 as to limit the rotation of the individual elements about the shaft 44. The track member 40t is arranged in connection to the intermediate portion 40i in connection to the rear side 40d.

The track member 40t is running in a direction essentially orthogonal to the extension of the shaft 44 and essentially orthogonal to the extension of the
20 intermediate portion 40i. The track member 40t is running in a direction essentially orthogonal to the extension of the shaft 44 and essentially orthogonal to the extension of the intermediate portion 40i so as to allow a certain rotation of the respective element of the set of elements 42 about the shaft 44. The track member 40t is running in a direction essentially orthogonal
25 to the extension of the shaft 44 and essentially orthogonal to the extension of the intermediate portion 40i so as to provide a limit of the rotation of the respective element of the set of elements 42 about the shaft 44.

The arrangement for feeding ammunition to a weapon according to the present disclosure may comprise such a track member arranged in connection to the

rear side, or alternatively the opposite front side, of the feeding chute 40 configured to run through the set of elements 42 so as to limit the rotation of the individual elements about the shaft.

- 5 The individual elements of the feeding chute 40 comprise a track member arranged in connection to the rear side of the individual elements, forming the track member 40t of the feeding chute 40 when stacked together with the rest of the set of elements 42. The track member 40t thus run through the respective element in a direction essentially parallel to the extension of the axial extension of the shaft 44.
- 10 The individual elements of the feeding chute 40 are linked together by means of distance members 48 arranged in connection to the track member 40t. The distance members 48 are configured to hold the individual elements together in the axial direction, i.e. direction of the shaft 44, and limit the relative movement of the elements by means of the track member 40.
- 15 According to an embodiment the arrangement feeding ammunition to a weapon according to the present disclosure may comprise distance members arranged in connection to the track member and configured to hold the individual elements together in the axial direction, i.e. direction of the shaft, and limit the relative movement of the elements by means of the track member.
- 20 The feeding chute 40 comprises an element displacement control arrangement 49 for controlling mutual displacement of the individual elements of the set of element 42 of the feeding chute 40, see fig. 8 and 9c. The element displacement control arrangement 49 is arranged in connection to the front side 40c. The element displacement control arrangement 49 is arranged in
- 25 connection to the intermediate portion 40i in connection to the front side 40c.

The element displacement control arrangement 49 comprises a spring member 49a. The spring member 49a is configured to be fixed to the second end element 42e2, shown in fig. 9c. The element displacement control arrangement 49 comprises a fixation member 49b for fixation of the spring

member 49a. The fixation member 49b is attached to the end of the second end element 42e2 by means of screw joints J1, J2, here a pair of screw joints J1, J2. The fixation member 49b has an extension running in a direction essentially orthogonal to the axial extension of the shaft 44 and essentially
 5 orthogonal to the extension of the intermediate portion 40i.

The spring member 49a comprises a fixation portion 49a-1 configured to be fixated by means of the fixation member 49b. The fixation portion 49a-1 of the spring member 49a has an extension corresponding to the extension of the fixation member 49b. The fixation portion 49a-1 of the spring member 49a is
 10 arranged between the screw joints J1, J2.

The spring member 49a comprises a spring rod 49a-2 configured to run through the individual elements from the second end element 42e2, where the fixation portion 49a-1 of the spring member 49ais fixated to and through the first end element 42e1, not shown in fig. 9c. The spring rod 49a-2 is configured
 15 to run through openings 49o of the individual elements.

The spring member 49ais configured to control mutual displacement of the individual elements of the set of element 42 of the feeding chute 40 in connection to elevation movement of the weapon. The spring rod 49a-2 of the spring member 49ais configured to control mutual displacement of the
 20 individual elements of the set of element 42 of the feeding chute 40 in connection to elevation movement of the weapon and thus movement of the individual elements about the shaft 44.

The spring rod 49a-2 of the spring member 49ais configured to bend in connection to elevation movement of the weapon and thus rotation of the
 25 individual elements about the shaft 44 so as to control mutual displacement of the individual elements of the set of elements 42 so that the displacement of individual elements relative to adjacent elements is essentially the same.

The openings 49o of the individual elements of the set of elements 42 are configured to provide space for bending of the spring rod 49a-2 in connection

to rotation of the individual elements about the shaft 44. The spring rod 49a-2 is configured to run through the individual elements comprising the first end element 42e1, not shown in fig. 9c, so as to allow axial movement in connection to bending of the spring rod 49a-2.

- 5 According to an embodiment the arrangement for feeding ammunition to a weapon according to the present disclosure may comprise such an element displacement control arrangement for controlling mutual displacement of the individual elements of the set of element of the feeding chute arranged in connection to a front side, i.e. the side facing in the firing direction of the
10 weapon, or an opposite rear side of the feeding chute. The element displacement control arrangement is configured to be arranged on the opposite side relative to the arrangement of the track member.

- According to an embodiment of the arrangement, the element displacement control arrangement may comprise a spring member configured to be fixed to
15 an end element and comprising a spring rod configured to run through the individual elements from one end element to an opposite end element and being configured to control mutual displacement of the individual elements of the set of element of the feeding chute in connection to elevation movement of the weapon.

- 20 The individual elements of the feeding chute 40 are configured to allow making the element integral with at least one other element so as to form the feeding chute 40.

- The individual elements of the feeding chute 40 comprise an opening for receiving the shaft 44 arranged in the intermediate portion 40i, forming the
25 surrounding of the shaft 44 for the feeding chute 40 when stacked together with the rest of the set of elements 42.

According to an aspect of the present disclosure, the second end element 42e2 furthest away from the weapon is configured to have an angle β within a range between the maximum elevation angle and minimum elevation angle of the

weapon, see fig. 5. The second end element 42e2 furthest away from the weapon is configured to have an angle β so that the number of elements of the set of elements 42 of the feeding chute 40 may be minimized and thus optimizing the compactness of the feeding chute 40.

- 5 According to an aspect of the present disclosure, the second end element 42e2 furthest away from the weapon is configured to have an angle β so that only essentially half of the elevation angle is required for the feeding chute for elevation corresponding to rising of the weapon to the highest elevation angle and lowering to the lowest elevation angle, see also fig. 2. Elevation of the
10 weapon, i.e. gun barrel of the weapon, upwardly usually corresponds to an elevation angle α_1 substantially greater than the elevation angle α_2 for lowering the weapon 20, see fig. 2.

- According to an aspect of the present disclosure, the second end element 42e2 furthest away from the weapon, for a weapon in a horizontal position, given
15 that the vehicle is in a horizontal position, is configured to have an angle β so that the second end element has a certain upward direction in the forward direction of gun barrel of the weapon.

- According to an embodiment of the arrangement, the set of elements are pivotably journalled about said shaft. Hereby easy and efficient rotation of
20 individual element about the shaft is facilitated.

- The foregoing description of the preferred embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to
25 practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated.

CLAIMS

1. An arrangement for feeding ammunition (A) to a weapon (20), the weapon (20) being mounted to an elevation device (30) arranged to allow elevation movement of the weapon (20) about an elevation axis (Z1), the arrangement
 - 5 comprising a feeding chute (40), the feeding chute (40) having a connection side (40e) for connecting the feeding chute (40) to the weapon (20) and an opposite receiving side (40f), the feeding chute having a front side (40c) essentially facing the firing direction of the weapon (20), when the feeding chute is connected to the weapon (20), and an opposite rear side (40d), the
 - 10 feeding chute (40) comprising a set of elements (42) assembled together in a stacked configuration, wherein the set of elements (42) is arranged about a shaft (44) configured to be concentrically arranged relative to the elevation axis (Z1) so as to allow movement of individual elements of the set of elements (42) about said shaft (44) in connection to elevation movement of the weapon (20) about the elevation axis (Z1), **characterized by** a track member (40t) arranged
 - 15 in connection to the front side (40c) or rear side (40d) of the feeding chute (40), the track member (40t) being configured to run through the set of elements (42) so as to limit rotation of the individual elements about the shaft (44).
 2. The arrangement according to claim 1, wherein the feeding chute (40), at
 - 20 the end opposite to the end connected to the weapon (20), is configured to be fixedly attached to a guiding chute (50, 60) for guiding the ammunition (A) from a magazine (M) to the feeding chute (40).
 3. The arrangement according to claim 1 or 2, wherein the feeding chute (40) comprises a first end element (42e1) configured to be closest to the weapon (20), the first end element being configured to be pivoted about the shaft (44) corresponding to the elevation movement of the weapon (20) about the elevation axis (Z1).
 - 25
 4. The arrangement according to claim 3, wherein the feeding chute (40) comprises a second end element (42e2) configured to be furthest away from

the weapon (20), the second end element (42e2) being configured to be essentially fixed so that it is at the same position independently of elevation angle of the weapon (20) thus connected to the feeding chute (40).

5 5. The arrangement according to claim 4, wherein the elements of the set of elements (42) between the first end element (42e1) and the second end element (42e2) are gradually mutually displaceable.

6. The arrangement according to claim 4 or 5, wherein the second end element (42e2) furthest away from the weapon (20) is configured to have an angle (β) within a range between the maximum elevation angle (α_1) and
10 minimum elevation angle (α_2) of the weapon (20).

7. The arrangement according to any of claims 1-6, wherein the individual elements movable about said shaft (44) are configured to be rotated about the shaft (44) a certain angle relative to an adjacent element so as to allow feeding of ammunition (A) through the feeding chute (40) at all elevation angles of the
15 elevation device (30).

8. The arrangement according to any of claims 1-7, wherein the set of elements (42) are pivotably journalled about said shaft (44).

9. The arrangement according to any of claims 1-8, wherein the feeding chute (40) comprises an upper channel for feeding ammunition (A) and a lower
20 channel for feeding ammunition (A), said shaft (44) being arranged between the upper and lower channel.

10. The arrangement according to any of claims 1-9, wherein the feeding chute (40), in connection to said one end of the feeding chute (40), comprises a fastening arrangement for attaching the feeding chute (40) to the weapon (20).

25 11. The arrangement according to any of claims 2-10, wherein the ammunition (A) is configured to be guided from an essentially upright position in the magazine to an essentially lying position at the feeding chute via the guiding chute (50, 60).

12. The arrangement according to any of claims 1-11, wherein the arrangement is intended for a vehicle mounted weapon system (C), the weapon system (C) comprising the weapon (20) mounted to a turret (10) via the elevation device (30).

- 5 13. The arrangement according to claim 2, wherein the arrangement comprising the feeding chute (40), and the guiding chute (50, 60) to which the feeding chute (40) is connected are configured to be arranged within a turret (10) of a vehicle mounted weapon system (C) for which the arrangement is intended, the weapon system (C) comprising the weapon (20) mounted to a
10 turret (10) via the elevation device (30).

14. A vehicle (V) comprising an arrangement for feeding ammunition (A) from a magazine to a weapon (20) of a weapon system mounted on the vehicle according to any of claims 1-13.

15. A vehicle according to claim 14, wherein the vehicle is a tracked vehicle.

I följande bilaga finns en översättning av patentkraven till svenska. Observera att det är patentkravens lydelse på engelska som gäller.

A Swedish translation of the patent claims is enclosed. Please note that only the English claims have legal effect.

1. Ett arrangemang för att mata ammunition (A) till ett vapen (20), där vapnet (20) är monterat till en elevationsanordning (30) anordnad att tillåta elevationsrörelse hos vapnet (20) kring en elevationsaxel (Z1), där
5 arrangemanget innefattar en matningskanal (40), där matningskanalen (40) har en anslutningssida (40e) för att ansluta matningskanalen (40) till vapnet (20) och en motstående mottagningssida (40f), där matningskanalen (40) har en frontside (40c) som väsentligen är vänd mot avfyrningsriktningen hos vapnet (20), när matningskanalen (40) är förbunden med vapnet (20), och en
10 motstående baksida (40d), där matningskanalen (40) innefattar en uppsättning element (42) hopmonterade i en staplad konfiguration, varvid uppsättningen element (42) är anordnade kring en axel (44) i anslutning till elevationsrörelse hos vapnet (20) kring elevationsaxeln (Z1), **kännetecknat av** ett spårorgan (40t) anordnat i anslutning till frontsidan (40c) eller baksidan (40d) hos
15 matningskanalen (40), där spårorganet (40t) är konfigurerat att löpa genom uppsättningen element (42) för att begränsa rotation hos de individuella elementen kring axeln (44).
2. Arrangemanget enligt krav 1, varvid matningskanalen (40), vid änden motstående änden ansluten till vapnet (20), är konfigurerad att vara fixerat
20 förbunden med en guidekanal (50, 60) för att guida ammunitionen (A) från ett magasin (M) till matningskanalen (40).
3. Arrangemanget enligt krav 1 eller 2, varvid matningskanalen (40) innefattar ett första ändelement (42e1) konfigurerat att vara närmast vapnet (20), där det första ändelementet är konfigurerat att vridas kring axeln (44) motsvarande
25 elevationsrörelsen hos vapnet (20) kring elevationsaxeln (Z1).
4. Arrangemanget enligt krav 3, varvid matningskanalen (40) innefattar ett andra ändelement (42e2) konfigurerat att vara längst ifrån vapnet (20), där det andra ändelementet (42e2) är konfigurerat att vara väsentligen fixerat så att

det är vid samma position oberoende av elevationsvinkel hos vapnet (20) sålunda anslutet till matningskanalen (40).

5 5. Arrangemanget enligt krav 4, varvid elementen hos uppsättningen element (42) mellan det första ändelementet (42e1) och andra ändelementet (42e2) är gradvis ömsesidigt förskjutbara.

6. Arrangemanget enligt krav 4 eller 5, varvid det andra ändelementet (42e2) längst ifrån vapnet (20) är konfigurerat att ha en vinkel (β) inom ett avstånd mellan den maximala elevationsvinkeln (α_1) och minimala elevationsvinkeln (α_2) hos vapnet (20).

10 7. Arrangemanget enligt något av kraven 1-6, varvid de enskilda elementen rörliga kring nämnda axel (44) är konfigurerade att roteras kring axeln (44) en viss vinkel relativt ett närliggande element för att tillåta matning av ammunition (A) genom matningskanalen (40) vid alla elevationsvinklar hos elevationsanordningen (30).

15 8. Arrangemanget enligt något av kraven 1-7, varvid uppsättningen element (42) är vridbart lagrade kring nämnda axel (44).

9. Arrangemanget enligt något av kraven 1-8, varvid matningskanalen (40) innefattar en övre kanal för att mata ammunition (A) och en nedre kanal för att mata ammunition (A), där nämnda axel (44) är anordnad mellan den övre
20 kanalen och nedre kanalen.

10. Arrangemanget enligt något av kraven 1-9, varvid matningskanalen (40), i anslutning till nämnda ena ände hos matningskanalen (40), innefattar ett fästarrangemang för att ansluta matningskanalen (40) till vapnet (20).

25 11. Arrangemanget enligt något av kraven 2-10, varvid ammunitionen (A) är konfigurerad att guidas från en väsentligen upprätt position i magasinet till en väsentligen liggande position vid matningskanalen via guidningskanalen (50, 60).

12. Arrangemanget enligt något av kraven 1-11, varvid arrangemanget är avsett för ett fordonsmonterat vapensystem (C), där vapensystemet (C) innefattar vapnet (20) monterat till ett torn (10) via elevationsanordningen (30).
13. Arrangemanget enligt krav 2, varvid arrangemanget innefattande matningskanalen (40), och guidningskanalen (50, 60) till vilken matningskanalen (40) är ansluten är konfigurerat att vara anordnat i ett torn (10) hos ett fordonsmonterat vapensystem (C) för vilket arrangemanget är avsett, där vapensystemet (C) innefattar vapnet (20) monterat till ett torn (10) via elevationsanordningen (30).
- 10 14. Ett fordon (V) innefattande ett arrangemang för att mata ammunition (A) från ett magasin till ett vapen (20) hos ett vapensystem monterat på fordonet enligt något av kraven 1-13.
15. Ett fordon enligt krav 14, varvid fordonet är ett bandfordon.

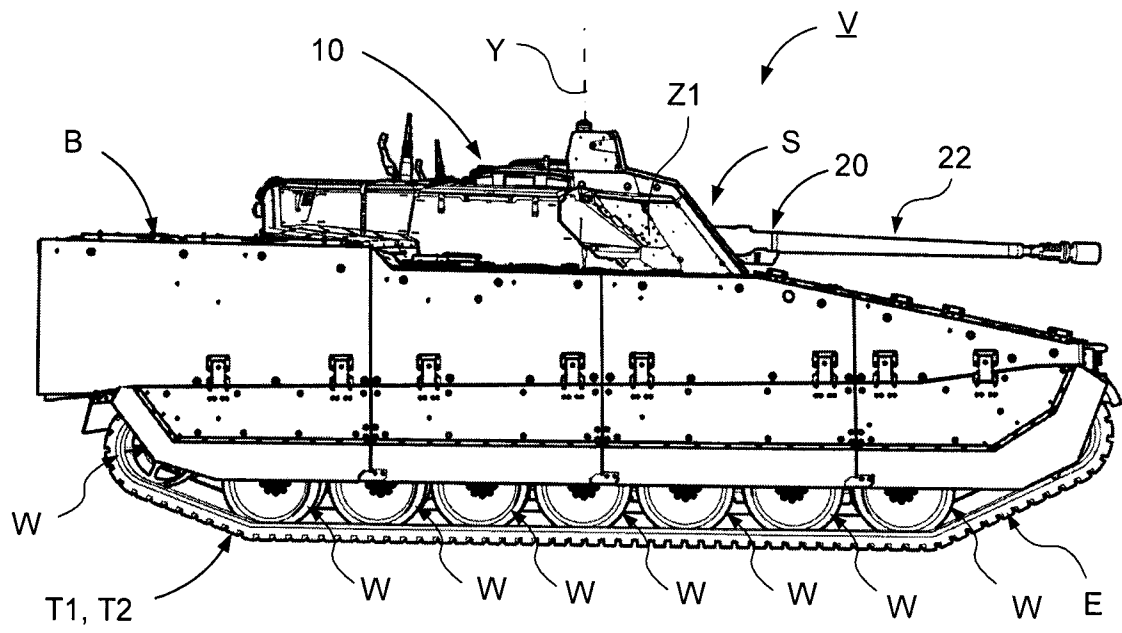


Fig. 1

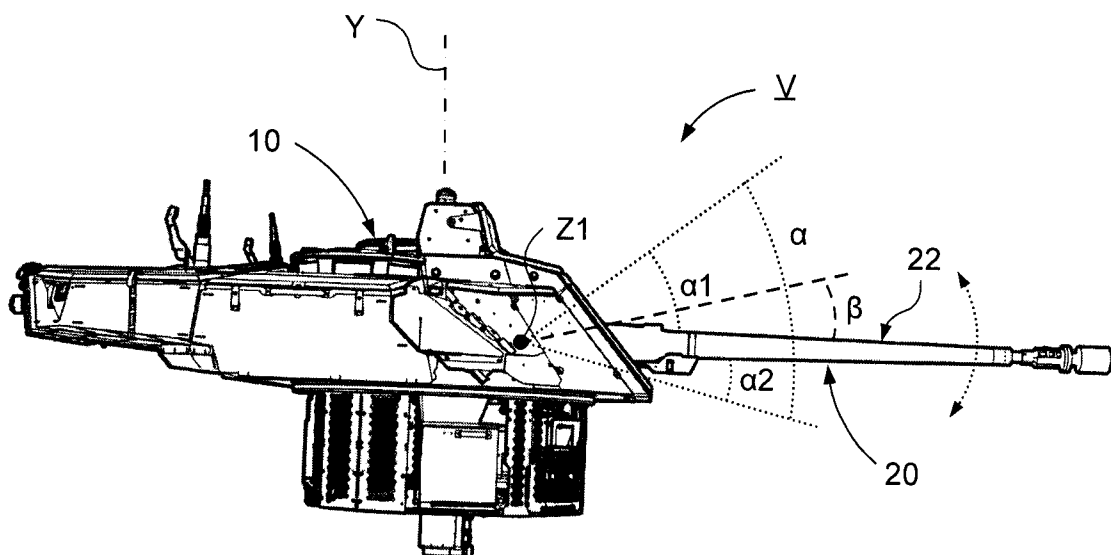


Fig. 2

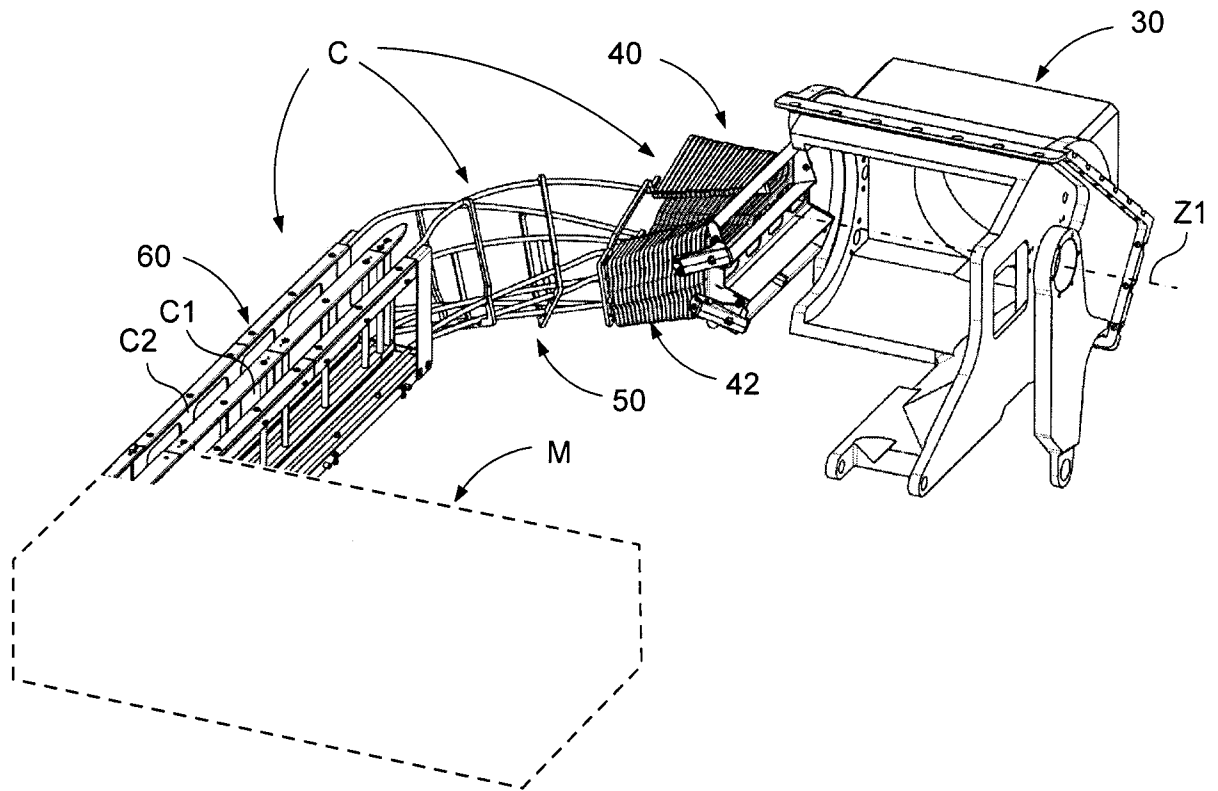


Fig. 3a

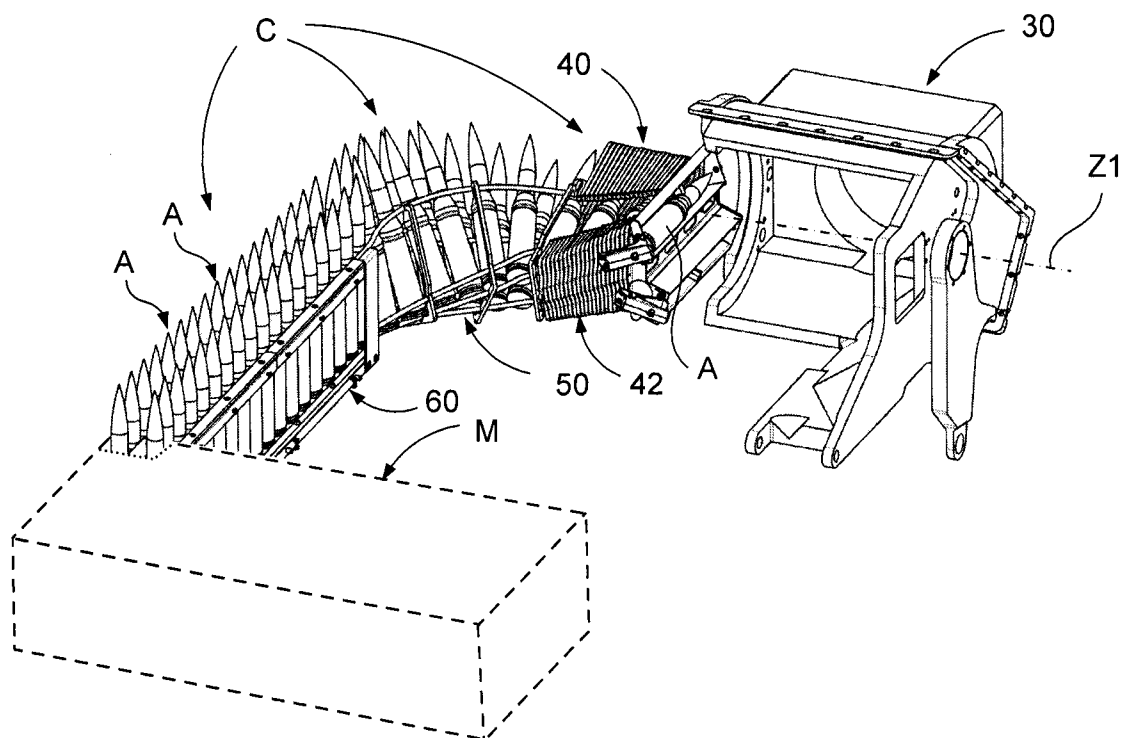


Fig. 3b

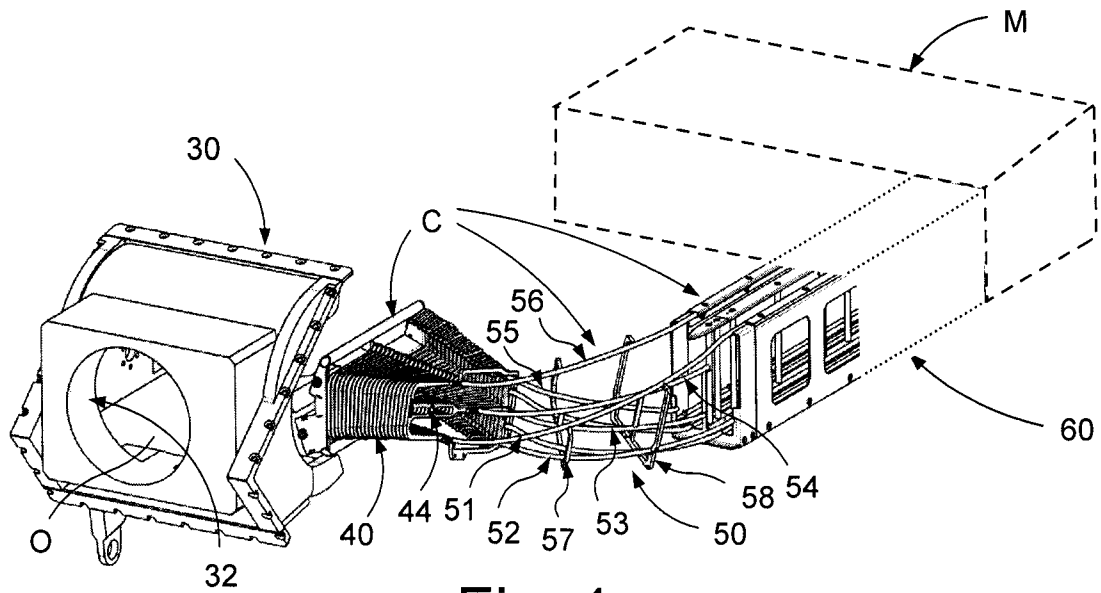


Fig. 4a

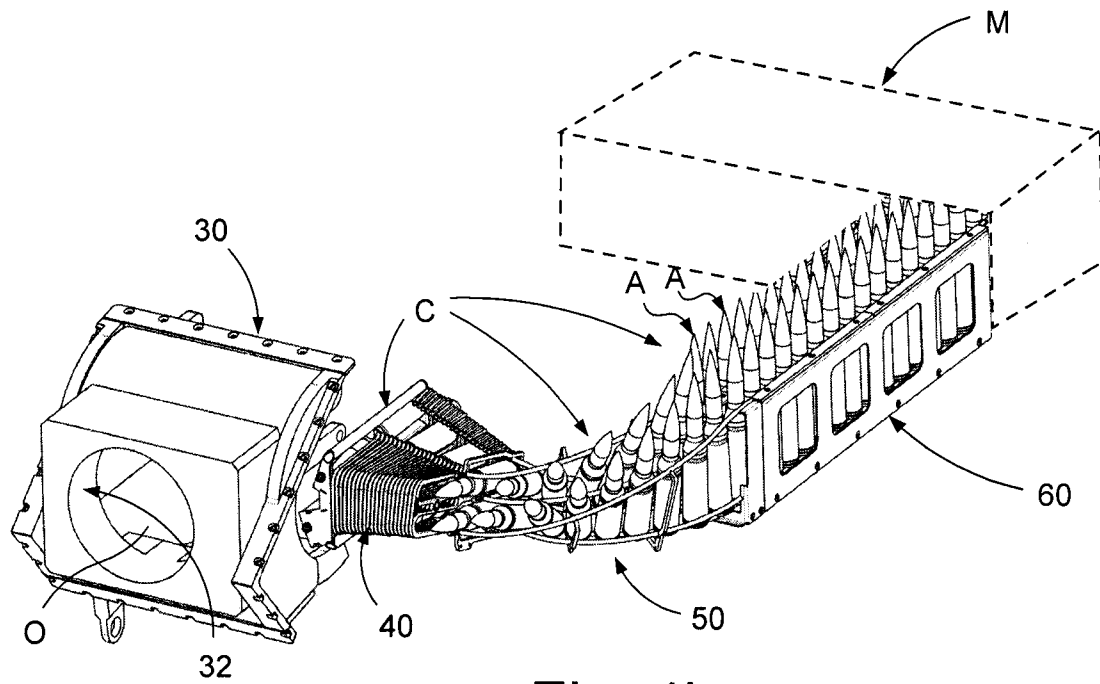


Fig. 4b

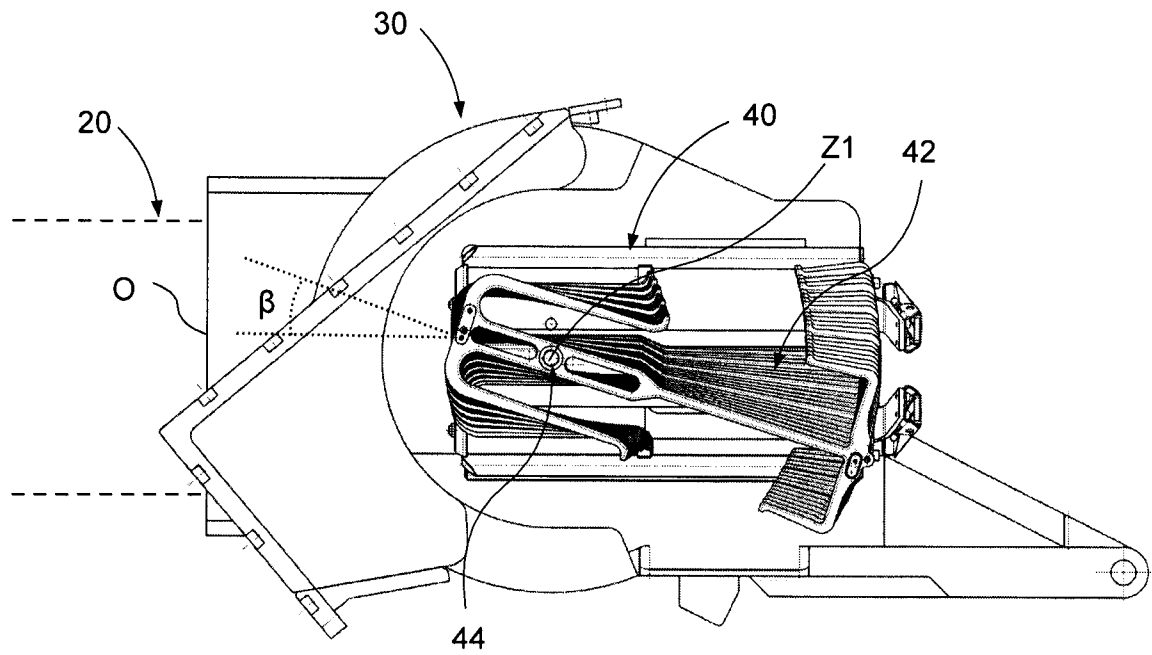


Fig. 5

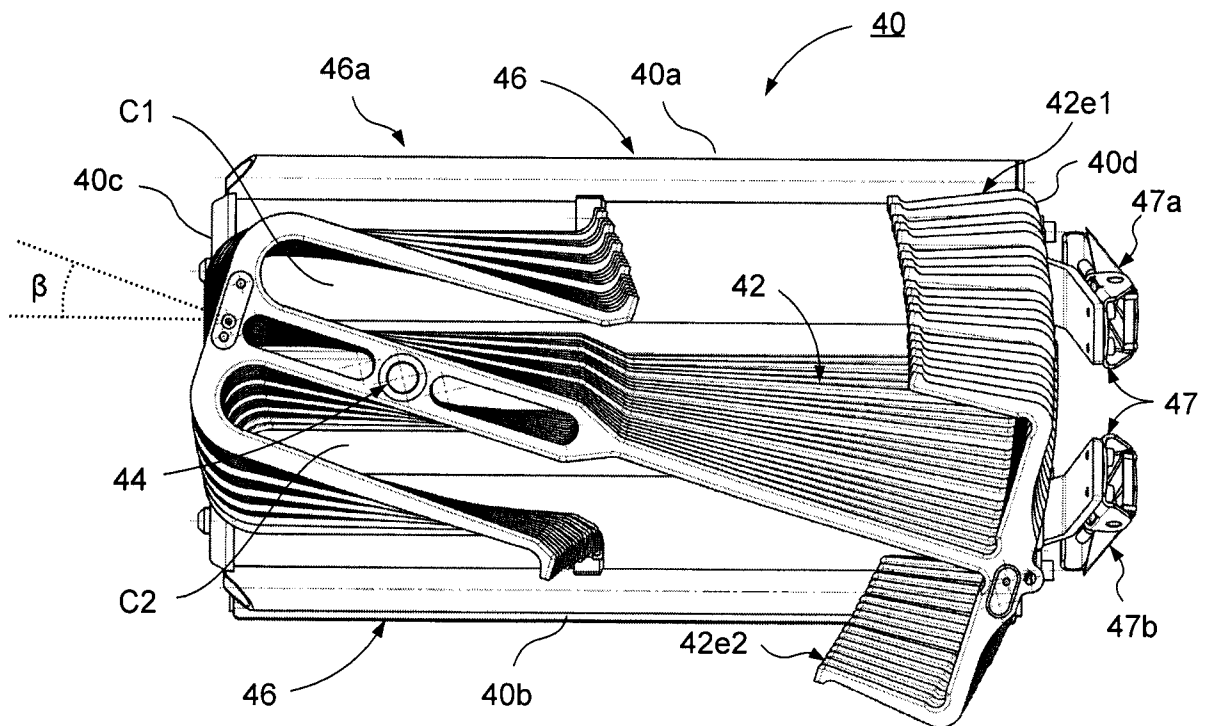


Fig. 6

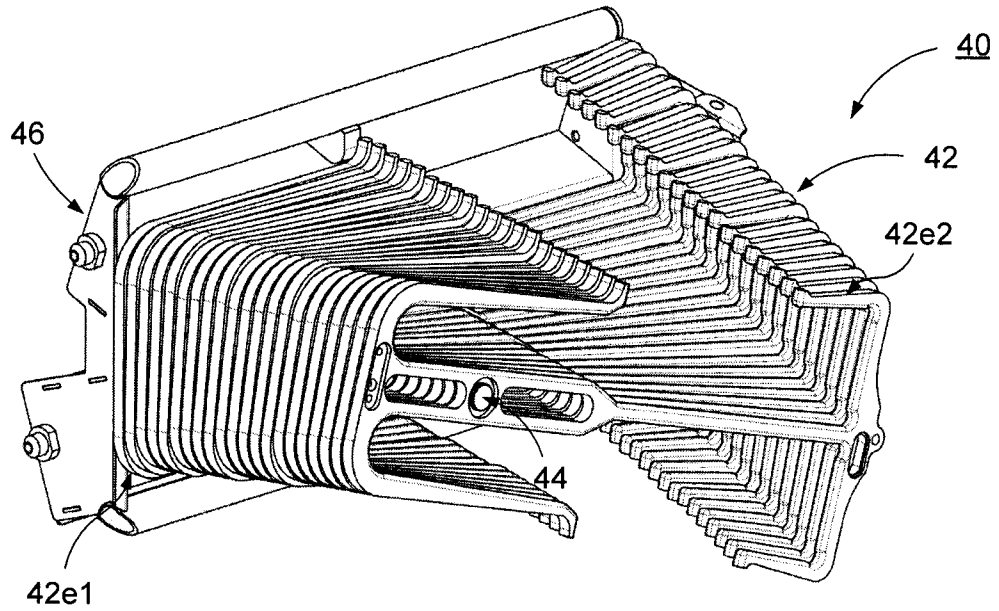


Fig. 7a

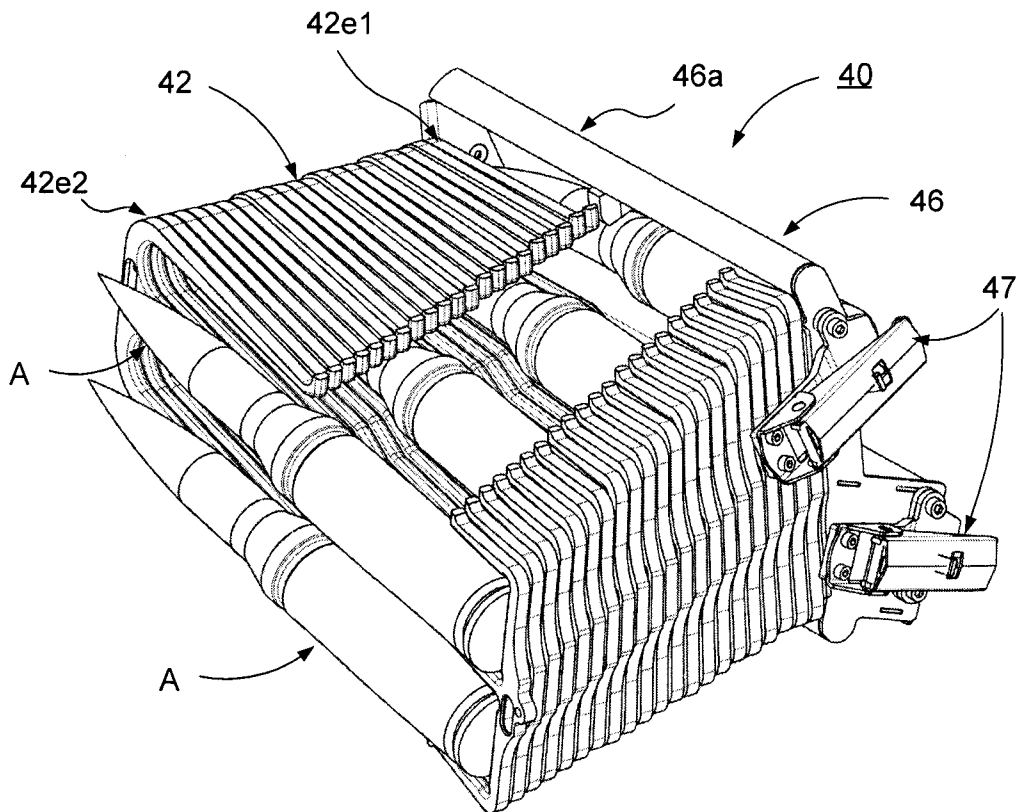


Fig. 7b

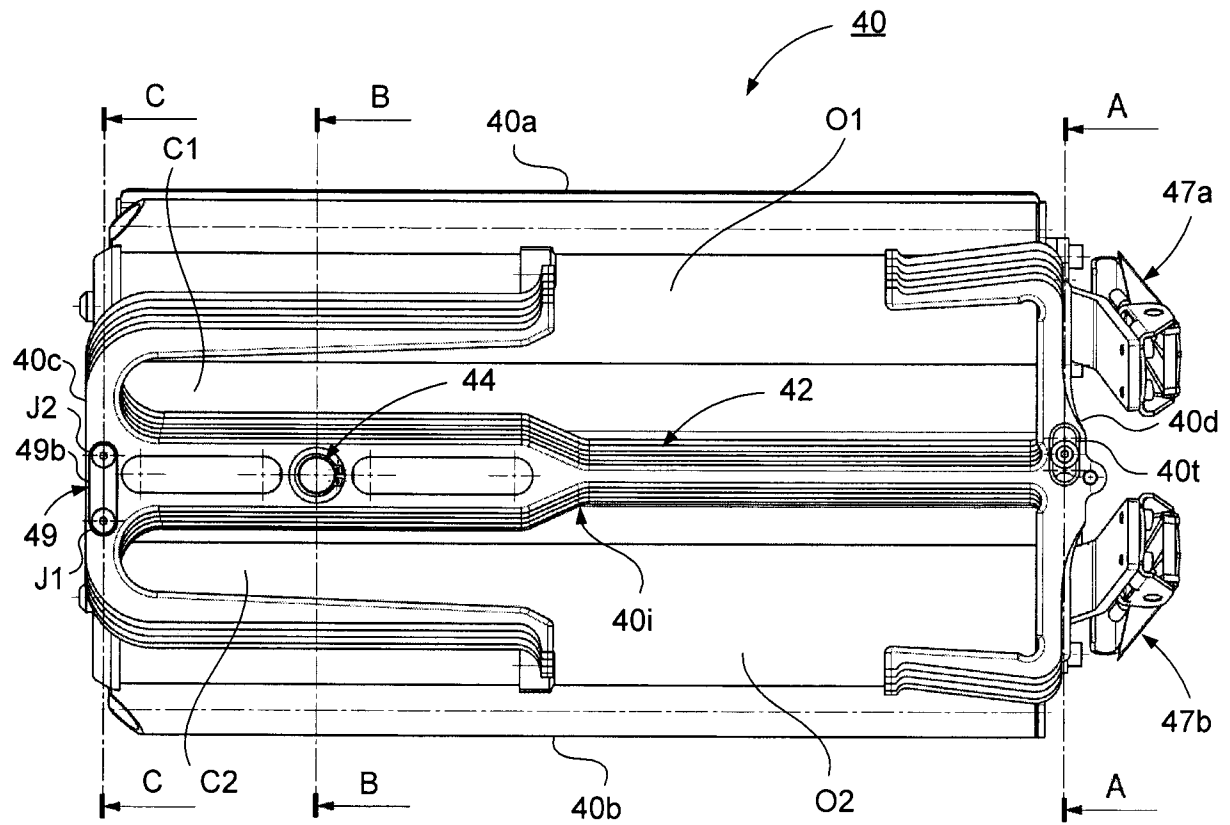


Fig. 8

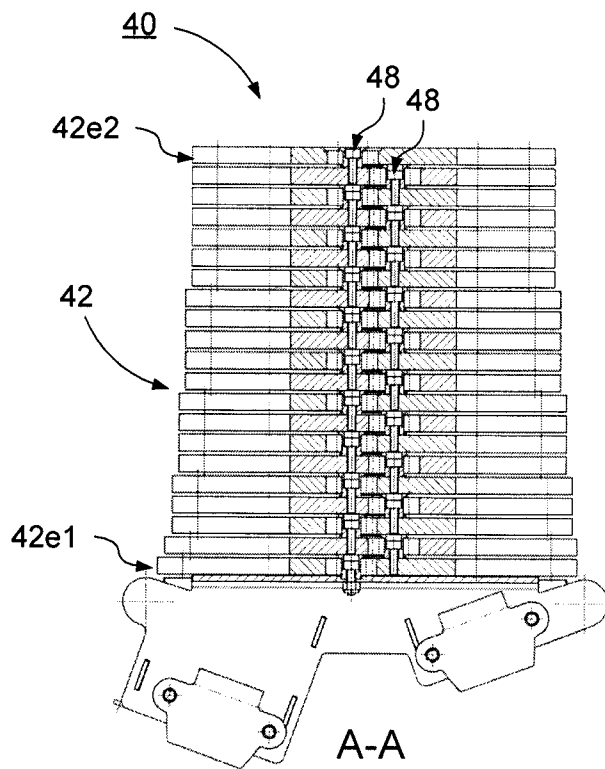


Fig. 9a

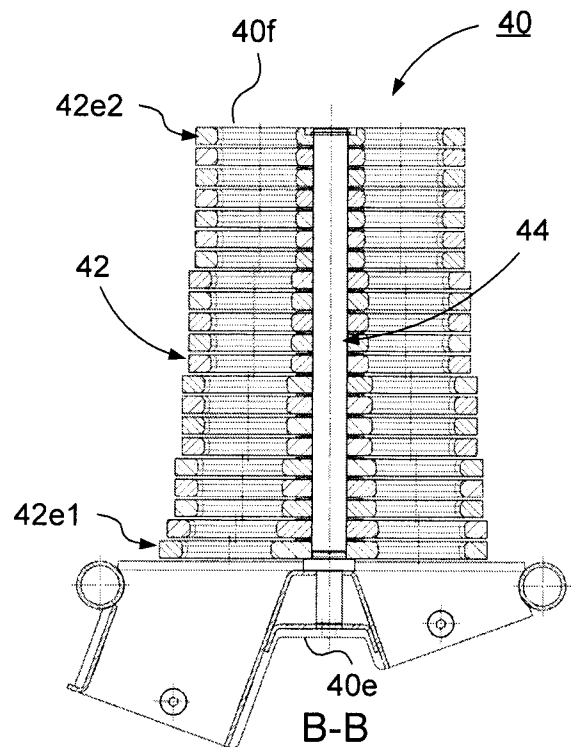


Fig. 9b

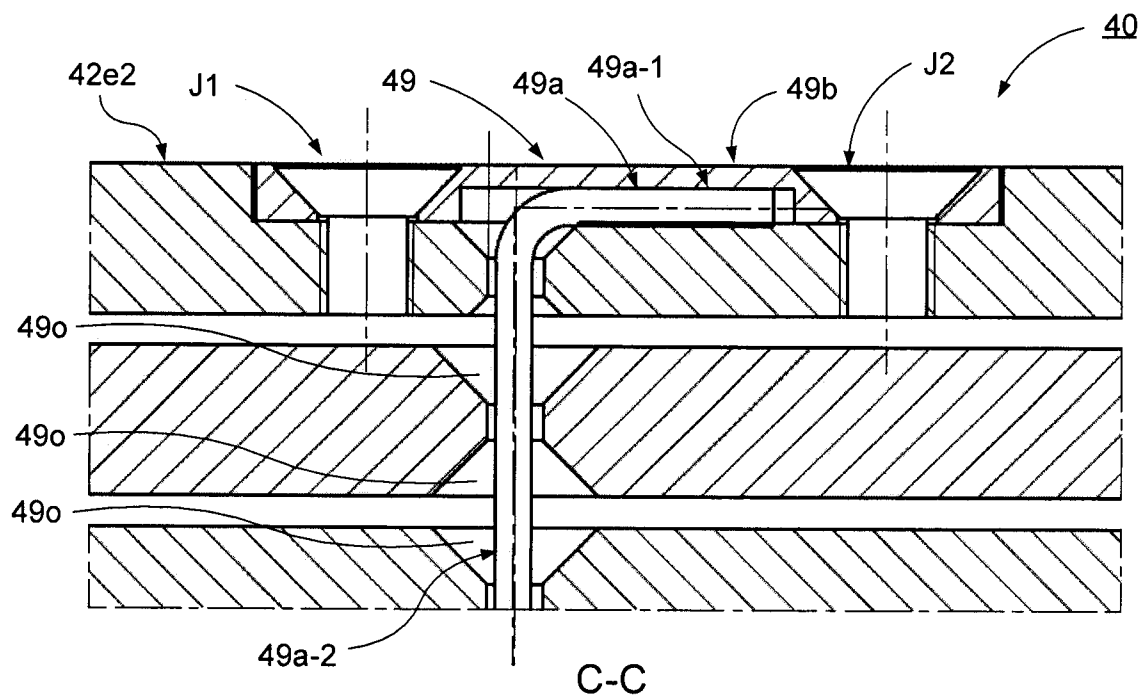


Fig. 9c