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(54) **CARTRIDGE FOR A FEEDING DEVICE**

(57) A cartridge (1) in the form of a cylindrical container with external fixing ribs, a releasing unit (3) of the rear cartridge in the rear window (4) of the cartridge and a mechanism pressing the shell against the inner surface of the cartridge through the front window (5) of the cartridge (1). The front window (5) of the cartridge (1), together with the pressure plate unit (6), are placed inside the cartridge (1) within the cylindrical part of the shell loaded into this cartridge (1). At least two transverse rods (8) are affixed to the pressure plate (6), the ends of which are moving within slots (14) of side guides (12) affixed

onto the cartridge (1), on both sides of the front window (5), wherein the pair of ends (11) of each transverse rod (8) is moving within the pair of slots (14) of side guides (12). Each of the side guides (12) is located near the side edge of the front window (5) of the cartridge (1) and is placed on linear moving guide (13) provided with a return spring (18). Each of the slots (14) in the side guide (12) has a section running at an angle against the surface of cartridge (1), connected to a section parallel to the surface of that cartridge (1).

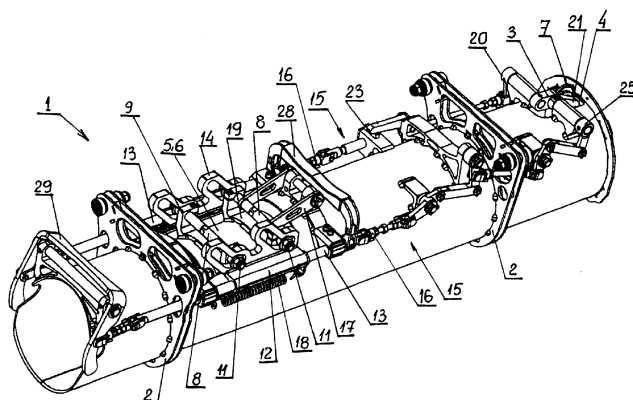


Fig. 1

Description

[0001] The subject of the invention is a cartridge for a device feeding cartridges from a location, from which the cartridge is moved axially to a cartridge compartment, intended in particular for a self-propelled mortar. In the case of such vehicles, an important task is to determine the location of the shell inside the cartridge without unnecessary clearance, especially in vehicles containing a set of cartridges transferred and loaded within a closed loop inside the vehicle.

[0002] Self-propelled vehicles usually contain a set of cartridges connected in parallel with each other inside the vehicle, in the form of a closed loop. Each of the cartridges is a container intended for being loaded with a shell, and moving together with the shell along a closed loop, feeding the shell onto a trough at a specific location, and the trough eventually feeds the shell into the shell compartment of the barrel of the self-propelled vehicle. Thus, a series of cartridges connected in parallel is moving in a closed circuit inside the vehicle, and after the shells are used, empty cartridges are re-filled with new shells, in order to feed the shells within a closed circuit, to the station loading the shell onto the trough. These operations are performed when the self-propelled vehicle is parked and require the position of each shell in each of the cartridges to be determined, with the cartridge compartment diameter being larger than the shell diameter in order to enable efficient shell placement in and collection from the cartridge. The variable diameter of used shells, all of which should be kept stationary inside the cartridges, is an additional factor to consider. The clearance of a shell inside the cartridge should be eliminated during motion of the self-propelled vehicle.

[0003] A solution known from the Polish patent disclosure no. PL 211723 provides a turret system for a self-propelled mortar, including a turret body, a mortar unit, a turret basket and a device feeding the ammunition into the shell compartment. The device contains an ammunition container and an automated feeding mechanism as a device feeding ammunition to the shell compartment. The ammunition container includes parallel segments connected into an endless chain, similar to a track chain. Each of the segment pairs of the container is provided with supporting rollers cooperating with guides located in the container body. A chain of container segments cooperates with a pair of chain wheels driven by a drive unit. A single container segment has the form of a pipe-shaped container provided with a releasing-locking mechanism operated using a drive unit of a pusher.

[0004] Another known solution is disclosed in the Polish patent disclosure no. PL 213077. According to this known solution, a segment of cylinder-shaped container elements with a flange, in particular of self-propelled mortar shells, containing a pipe-shaped cartridge for the stored elements with a cylindrical shape with a flange, contains a releasing-locking mechanism placed on the outer surface of the cartridge. The cartridge is provided

with a window, on which a shell pressing element connected with a hitch placed in a single side lever located on a spring-loaded axis is installed, wherein a ratchet is placed on one end of the single side lever axis, and a system of levers and hitches is installed on the other end of this axis. The ratchet is provided with a spring-loaded lock cooperating with a hitch and a lever affixed to a roller with a controlling element. The element pressing the shell against the inner wall of the cartridge is provided with a buffer. The hitch placed in a spring-loaded, single side lever, the hitch with a lever affixed to a roller with a controlling element and hitches of the system driving the element limiting motion of the shell case, have adjustable length.

[0005] The shell compartment of self-propelled vehicles, but also of stationary objects, is fed with higher calibre shells, usually transferred inside cartridges adapted to the shell size. In this patent disclosure, the cartridge should be understood as a pipe-shaped case with its size adapted to the diameter of the shell and inside which the shell is moving. The inner diameter of a cylindrical cartridge must be, however, larger than the outer diameter of the shell in order to enable easy shell loading into the cartridge and unloading the cartridge. The required clearance between the inner diameter of the cylindrical cartridge and the outer diameter of the cylindrical shell is a source of vibrations and noise, inconvenient for the crew of the self-propelled vehicle, but also hazardous to materials exposed to vibrations because of material fatigue. The clearance in the place orthogonal to the symmetry axis of the cartridge, as well as clearance in the axial plane, are the source of noise and vibrations. The axial clearance is eliminated by locking the rear flange of the shell. Pressure plates cooperating with the front, conical part of the shell are used to eliminate the orthogonal clearance in the known solutions. A single pressure plate is provided with a lining and is usually installed on two concerted, parallel frames, and cooperates with the conical part of the shell through a cartridge window. The pressure exerted by the pressure plate against the front, conical part of the shell presses the shell both against the inner side surface of the cartridge, transversely to the longitudinal axis of the shell, as well as to the aforementioned rear lock, in the axial direction of the shell. The pressure is exerted by a compressing spring. This solution, however, is compatible only with a shell with a specific curvature of the front part. The pressure plate is located at a specific, fixed side of the cartridge, where a window for this pressure plate is also provided, usually in the top part of the cartridge wall.

[0006] A range of solution uses sets of parallel cartridges, in which each of the cartridges feeds a single shell into the shell compartment, and placed in individual cartridges connected into a closed loop endlessly driven by a chain. Individual cartridges feed the shells into the shell compartment, while empty cartridges are filled with new shells at another location within the closed loop. This means that each cartridge with a shell may be located in

the top section of the loop with the pressure plate at the top, and soon afterwards, the same cartridge may be located in the bottom section of the loop with the pressure plate at the bottom, or vice versa. While the pressure exerted by the pressure plate acting downwards on the conical surface of the shell is adequate to press the shell from above, in the bottom section of the loop, the pressure plate acting in this position must additionally overcome the weight of the shell while acting upwards. This enables the shell to be fixed in a clearly defined, required position despite vibrations of the system installed inside the vehicle.

[0007] In another solution, presented in the patent disclosure of the invention no. P.227213, the mechanism pressing against the front, conical part of the shell is provided with a pressure plate installed on an arm, within the front window of the cartridge. The working surface of the pressure plate is adapted to the shape of the surface of the front, conical part of the shell. The mechanism locking the rear flange of the shell and the compression mechanism acting on the front, conical part of the shell are concerted and controlled by an external actuator. The rotation axis of actuators of these mechanisms are parallel and pass through planes orthogonal to the symmetry axis of the cartridge. A fixed lock is installed on the rotation axis of the pressure plate arm, while a fixed ratchet cooperating in its working position with the lock is installed on the pressure plate arm.

[0008] The objective of the invention is to develop a novel feeding container cartridge solution including a shell locking and releasing mechanism, enabling shells of different length to be held inside the cartridge without the need to adapt the cartridge to the shell shape. This task was solved according to Claim 1 and to the subsequent Claims.

[0009] According to the invention, the cartridge for a feeding device is formed as a cylindrical container with internal diameter corresponding to the external diameter of the shell to be placed inside the cartridge. The cartridge is provided with external ribs, a mechanism releasing the rear shell flange through the rear window of the cartridge, and a compression mechanism pressing the shell against the inner surface of the cartridge through the front window of the cartridge, wherein the pressing mechanism is provided with a pressure plate within the front window of the cartridge, the working surface of which is adapted to the shape of the shell surface. The mechanism locking the rear flange of the shell and the compression mechanism acting on the front part of the shell are concerted and controlled by an external actuator. The rotation axis of the locking mechanism and of the compression mechanism are parallel and pass through planes orthogonal to the symmetry axis of the cartridge.

[0010] The cartridge according to the invention is characterised in that the front window of the cartridge, together with the pressure plate unit, are placed inside the cartridge within the area of the cylindrical part of the transferred shell, wherein at least two transverse rods are in-

stalled on the pressure plate, the ends of which can slide within slots of side guides installed on the cartridge, on both sides of the front window of the cartridge. The pair of ends of each transverse rod can slide within a pair of slots of the aforementioned side guides. Each of the side guides is located near the side edge of the front window of the cartridge and is placed within a linear moving guide provided with a return spring.

[0011] In a preferred solution according to the invention, each of the slots of the side guide has a section running at an angle against the cartridge surface, connected to a section parallel to the surface of that cartridge.

[0012] The ends of transverse rods, placed in slots of side guides, are preferably eccentric to these transverse rods.

[0013] The pressure plate unit may be preferably installed on the outer surface of the cartridge case, using swing arms.

[0014] The unit releasing the rear flange of the shell is preferably provided with a central, releasing swing lever with a controlling element on one side, and with levers on the other side of the rotation axis of this releasing swing lever.

[0015] In the preferred embodiment of the solution according to the invention, the controlling element of the releasing unit may be a rotating wheel installed on the end of the swing lever.

[0016] The rotation axis of the swing lever inside the releasing unit preferably runs parallel to the transverse rods in the compression plate unit, wherein the releasing swing lever is preferably provided with two rods controlling the lever units, controlling in turn the motion of side guides of the compressing plate unit.

[0017] Holes in ribs used to connect neighbouring cartridges contain sliding brass bushings.

[0018] In an embodiment of the invention, the pressure plate is placed parallel to the cylindrical part of the shell placed inside the cartridge. The pressure plate unit moves parallel to the shell during locking in this embodiment, within four guides, and cooperates with the cylindrical instead of the conical part of the shell, as is the case in solutions known in the art. This guarantees constant, full pressure against the cylindrical part of the shell inside the cartridge. In the solution according to the invention, the shell is always present in a clearly locked position. This results from the use of four guides of the pressure plate with variable slots in this embodiment. The described shape of guides and slots in these guides has been proposed. During axial motion, the guides move the pressure plate through the front window of the cartridge, until it contacts the cylindrical part of the shell and then fix the position of the pressure plate by introducing the ends of transverse rods of the pressure plates from the slanted parts to the parts of the slots parallel to the cartridge surface. This results in the shell being placed transversely inside the cartridge and ensures elimination of influence of vibrations of the self-propelled vehicle on the motion of shells against the cartridge.

[0019] Brass bushings were used in holes connecting individual cartridges into an endless chain in the embodiment of the invention, thus repair of worn holes in external ribs joining individual cartridges involves replacement of brass bushings only, instead of replacing full ribs or cartridges.

[0020] The object of the invention has been presented in an embodiment in the attached drawing, in which individual figures of the drawing represent as follows:

- Fig. 1 - a perspective view of the cartridge,
- Fig. 2 - the pressure plate unit,
- Fig. 3 - the releasing unit,
- Fig. 4 - a detail of a connection between two cartridges.

[0021] Fig. 1 presents the cartridge 1 of a feeding device. The cartridge 1 is formed as a cylindrical container with internal diameter corresponding to the external diameter of the shell to be placed inside this cartridge 1. The cartridge 1 has external fixing ribs 2, a releasing unit 3 of the rear shell flange through the rear window 4 of the cartridge 1.

[0022] The cartridge 1 has a mechanism pressing the shell against the inner surface of this cartridge 1. The shell is not shown in the attached figures. This is a known mortar shell, with a 120mm calibre in this embodiment. The cartridge 1 has a mechanism pressing the shell within the front window 5. The attached Fig. 1 and Fig. 4 present the pressure plate 6 placed within the front window 5.

[0023] The pressure plate 6 has a working surface adapted to the shape of the window 5 and formed according to the surface shape of the cylindrical part of the known mortar shell, not shown in the attached figures. The releasing unit 3 of the rear shell flange and the pressure plate unit 6 of the front part of the shell are concerted as described below, and controlled by a releasing wheel 7. The rotation axis of the locking mechanism and of the compression mechanism are parallel and pass through planes orthogonal to the symmetry axis of the cartridge 1.

[0024] The cartridge according to the invention is characterised in that the front window 5 of the cartridge 1, together with the pressure plate unit 6 are placed inside the cartridge 1, within the cylindrical part of the transferred shell. Fig. 1 shows that the cartridge has two windows: the front window 5 and the rear window 4. A moving pressure plate 6 is installed in the front window 5, generally moving within the window, in the direction orthogonal to the symmetry axis of the cartridge 1. In this embodiment, two transverse rods 8 placed in four holes 10 of two brackets 9 installed on the pressure plate 6 are installed on the pressure plate 6. The pressure plate 6 with brackets 9 and holes 10 is presented in Fig. 2.

[0025] The ends 11 of transverse rods 8 of the pressure plate 6 are sliding within slots of side guides 12 installed on the cartridge 1, on both sides of the front window 5 of this cartridge 1. On the right and the left sides of the front

window 5 a single guide 12 is present, with two slots guiding the aforementioned ends 11 of transverse rods 8. Thus, in this embodiment, two ends 11 of each transverse rod 8 are guided in two guiding slots 14, namely in the left slot 14 and in the right slot 14.

[0026] Two guiding slots 14 are present in each of the side guides 12, the left and the right side guide. One pair of the guiding slots 14 in opposite guides 12 guides the ends 11 of one guiding rod 8, while the other pair of guiding slots 14 in opposite side guides 12 guides the ends 11 of the other guiding rod 8 of the pressure plate 6. Each of the side guides 12 is located near the side edge of the front window 5 of the cartridge 1 and is fixed within a linear guide 13 provided with a return spring. The linear guide 13 is placed on a longitudinal slipper 16. The left slipper 16 with the linear guide 13 is placed on the left side of the front window 5, while the second linear guide 13 is placed on the right longitudinal slipper 16, on the right side of the front window 5. The left and the right guide 13 return during loading and shifting of a shell from the cartridge 1 to a known trough, not shown in the figure, feeding individual known shells, not shown in the figure, to a known loading compartment.

[0027] The pair of side guides 12 moves together with the pair of linear guides 13.

[0028] As shown in Fig. 1, both linear guides 13 are driven by units of slippers and levers and move back and forth within holes of fixing ribs 2. This is shown in Fig. 1. In this embodiment, in the guiding slots 14 in the linear guides we can identify in both slots 14 two connected sections of a slot: one running diagonally upwards and the other one, closer to the cylindrical wall of the cartridge 1, running in parallel to the wall of this cartridge 1. This is shown in Fig. 1 and Fig. 4. Ends 11 of both transverse rods 8 parallel to each other are sliding in the aforementioned guiding slots 14. Both transverse rods 8 are connected with the pressure plate 6 via brackets 9. Thus, the pressure plate 6 is suspended on two transverse rods 8 in this embodiment. Fig. 1 shows that one of the rods 8 is fixed and can be tilted using fixing swing arms 17.

[0029] In a preferred embodiment of the invention, each of the guiding slots of the side guide has a section running at an angle against the surface of cartridge 1, connected to a section parallel to the surface of that cartridge 1. These two sections of slot 14 are connected in each of the cartridges 1 such that if the bracket 28 is pulled or if the handle 29 is pushed, the side guides move towards the releasing units, causing the ends 11 of rods 8 to enter the slanted part of guiding slots 14 and the rods 8 to raise together with the pressure plate 6, thus releasing the pressing unit fixing the cylindrical part of the shell inside cartridge 1. The motion of the pressure plate 6 is here generally orthogonal to the cylindrical surface of the shell (not shown) inside the cartridge 1. This motion actually takes place around the rotation axis of fixing arms 17, the ends of which move together with the rod 8 around an arc, but as a result of the use of the proposed design of the described drive unit, the pressure

plate 6 retains its position parallel to the cylindrical surface of the shell during its motion towards the shell surface and away from the shell surface, as was the objective of the invention. The slipper and lever units 15 on the right side and on the left side of the cartridge 1, shown in Fig. 1, contain known elements connecting kinematically the releasing unit 3 with the pressure plate 6 unit in order to synchronise the time at which the shell flange is locked by the releasing unit 3 and the time at which the shell position inside the cartridge is fixed by the pressure plate 6. On the other hand, in the position in which the shell is transferred from the cartridge to the trough feeding the shell compartment, not shown in the figure, the releasing unit 3 is released and the pressure plate 6 is raised simultaneously.

[0030] The slipper and lever units 17 use return springs 18, which cause the right and the left slipper units 15 to return to the closed position of the releasing unit 3 and of the pressure plate 6 once the releasing unit 3 is unlocked by raising the wheel 7 of the releasing unit 3 as a result of another shell being loaded into the cartridge 1. Once the cartridge is loaded, the wheel 7 of the releasing unit is lifted by the shell flange and both slipper and lever units 15 move the pressure plate 6 using the guiding slots 15 until it contacts the shell case, pressing the cylindrical body of the shell to the opposite wall of the cartridge 1, thus fixing the shell inside the cartridge 1. In the section of all four guiding slots 14 parallel to the surface of the cartridge 1, both pairs of slots 14 move at the ends 11 of transverse rods 8 in the parallel direction, locking the position of the pressure plate 6 such that it presses the shell against the opposite wall of the cartridge 1. This eliminates any possible slack of the pressure plate 6, the position of which was set by pressure exerted by the springs. In an embodiment of the invention, return springs 18 only set the position of the ends 11 of transverse rods 8 in sections of the guiding slots 14 parallel to the symmetry axis of the cartridge 1. Fig. 1 also shows the base 19, which is used to fix the brackets 9 of transverse rods 8 on the pressure plate 6.

[0031] Fig. 1 and Fig. 3 present the releasing unit 3, containing levers 20 of the releasing unit and the wheel 7 of the releasing unit connected with the lock 21 of the releasing unit in the rear window 4 of the cartridge 1. The lock 21 is fixed on its axis 22 on the rotation axis of the releasing unit, inside a bushing 23 fixed to the base 24 affixed to the body of the cartridge 1. The bushing 25 of the slipper and lever unit 15 is also installed on the lock axis 22. The slipper and lever unit 15 is connected via its arm 26 to the aforementioned bushing 23 concerted with the axis 22 of the lock 21 of the releasing unit. As the shell is introduced into the cartridge 1, the wheel 7 of the releasing unit is lifted by the shell flange, resulting in the cartridge being locked by the lock 21 once the shell is placed inside the cartridge 1. This locks the shell at the rear flange of its case. At the same time, operation of bushings 20, 25 shown in the figure drives both slipper and lever units 15 via arm 26, 27 installed on the bush-

ings, resulting in the shell being locked by the pressure plate 6. The bracket 28 of the cartridge 1 and the handle 29 of the releasing unit cooperate with both the right and the left slipper and lever units, designated as 15. The handle 29 enables the releasing unit to be released and the pressure plate 6 to be lifted, the shell to be released into the trough (not shown) and a new shell to be placed inside the cartridge 1.

[0032] In this embodiment, the ends 11 of transverse rods, placed in slots 14 of side guides 12, are eccentric to these transverse rods 8. This enables pressure of the pressure plate 6 to be adjusted, depending on any differences between shell diameters.

[0033] Holes in ribs used to connect neighbouring cartridges contain sliding brass bushings.

[0034] Fig. 1 shows the fixing ribs 2. In addition to fixing individual, functional units to the cartridge 1, the fixing ribs 2 are used to connect the neighbouring, parallel cartridges 1 into an endless chain. Fig. 4 presents a fragment of the connection between two cartridges 1 using connectors 30 in the form of connecting bolts. Individual cartridges 1 are connected in parallel and form a closed circuit, in which each and every individual cartridge 1 is filled with a shell in its loading position, and the shell is transferred via a known trough to the shell compartment of the vehicles in the unloading position. Cartridges 1 are guided within known guides and driven by a chain using toothed gears.

[0035] Individual cartridges 1 are connected with articulated connections using connectors 30 passing through holes in corners of the ribs 2. According to the invention, the holes in corners of the ribs 2 are provided with brass bushings 31. A hole in the corner of a rib 2 with a bushing 31 is presented in Fig. 4. Bushings 31 prevent wear of the hole edge. If the bushing 31 becomes worn, only said brass bushing 31 is replaced. Previously known solutions required the cartridge 1 to be replaced if the edge of this hole became worn.

[0036] The shell is placed inside the compartment of the cartridge 1 and pressing the releasing wheel 7 with its fixture, causing the lever unit to move the lock 21 and, through the right and the left slipper and lever units 15, a simultaneous drop of the pressure plate 6 and of the lock 21, which then locks on the fixture, fixing the shell in position. The motion of the pressure plate 6 is caused by the side guides 12 and limited in the locked position of the cartridge by the described shape of the guiding slot 14 in side guides 12. The position of transverse rods 8 defines the position of the pressure plate 6 within the front window 5 provided in the cartridge at the level of the cylindrical surface of the shell, ensuring the adequate pressure. It is possible to adjust the position of the pressure plate, if necessary, by rotating the transverse rods at the eccentric ends 11 of these rods 8. The shell can be unlocked within the cartridge by pulling on the bracket 28 or by pressing the handle 29, until the shell is unlocked.

List of references.

[0037]

1. Cartridge
2. Fixing rib
3. Releasing unit
4. Rear window
5. Front window
6. Pressure plate
7. Releasing wheel
8. Transverse rod
9. Bracket
10. Hole
11. Transverse rod end
12. Side guide
13. Linear guide
14. Guiding slot 15. Slipper and lever unit
16. Longitudinal slipper
17. Fixing arm
18. Return spring 19. Base
20. Releasing unit bushing
21. Releasing unit lock
22. Lock axis
23. Bushing
24. Bushing base
25. Lever unit bushing
26. Drive arm
27. Drive arm
28. Handle
29. Bracket
30. Connector
31. Brass bushing

Claims

1. Cartridge of a feeding device in the form of a cylindrical container with internal diameter corresponding to the external shell diameter, provided with external fixing ribs, a unit releasing the rear flange of a shell through the rear window of the cartridge and a mechanism pressing the shell against the internal surface of the cartridge through the front window (5) of the cartridge (1), wherein the pressing mechanism has a pressure plate within the front window of the cartridge, the working surface of which is adapted to the shape of the shell surface, wherein the mechanism locking the rear shell flange and the pressure mechanism acting on the front part of the shell are concerted and controlled by an actuator, while rotation axis of the drive element levers are parallel and pass through planes orthogonal to the symmetry axis of the cartridge, **characterised in that** the front window (5) of the cartridge (1) together with the pressure plate (6) unit are placed in the cartridge (1) in the cylindrical part of the shell loaded into this cartridge (1), wherein at least two transverse rods (8) are in-

stalled on the pressure plate (6), the ends of which are sliding in slots (14) of side guides (12) affixed on the cartridge (1), on both sides of the front window (5) of this cartridge (1), wherein the pair of ends (11) of every transverse rod (8) is sliding in the pair of slots (14) of side guides (12), wherein each side guide (12) is located near the side edge of the front edge (5) of the cartridge (1) and is placed on a movable linear guide (13) equipped with a return spring (18).

2. A cartridge according to Claim 1, **characterised in that** each of the slots (14) of the side guide (12) has a section running at an angle against the surface of cartridge (1), connected to a section parallel to the surface of that cartridge (1).

3. A cartridge according to Claim 1, **characterised in that** the ends (11) of transverse rods (8), placed in slots (14) of side guides (12), are eccentric to these transverse rods (8).

4. A cartridge according to Claim 1 or 2, **characterised in that** the pressure plate unit (6) is affixed on the outer surface of the cartridge (1) case using fixing swing arms (17).

5. A cartridge according to Claim 1, **characterised in that** the releasing unit (3) of the rear shell flange contains the central, swing lever of the releasing unit with a releasing wheel (7) on one side and with drive arms (26, 27) of the drive of the right and left slipper and lever units (15).

6. A cartridge according to Claim 5, **characterised in that** the releasing wheel (7) is fixed on and can rotate around the swing lever of the lock (21).

7. A cartridge according to Claim 5, **characterised in that** the rotation axis of the lock (21) lever inside the releasing unit (3) is parallel to the transverse rods (8) within the pressure plate unit (6), wherein the swing arm of the lock (21) within the releasing unit (3) contains rotating axes (22) controlling the slipper and lever units (15) controlling the movement of side guides (12) of the pressure plate unit (6).

8. A cartridge according to Claim 1, **characterised in that** the holes in ribs (2) connecting individual cartridges (1) contain brass bushings (31).

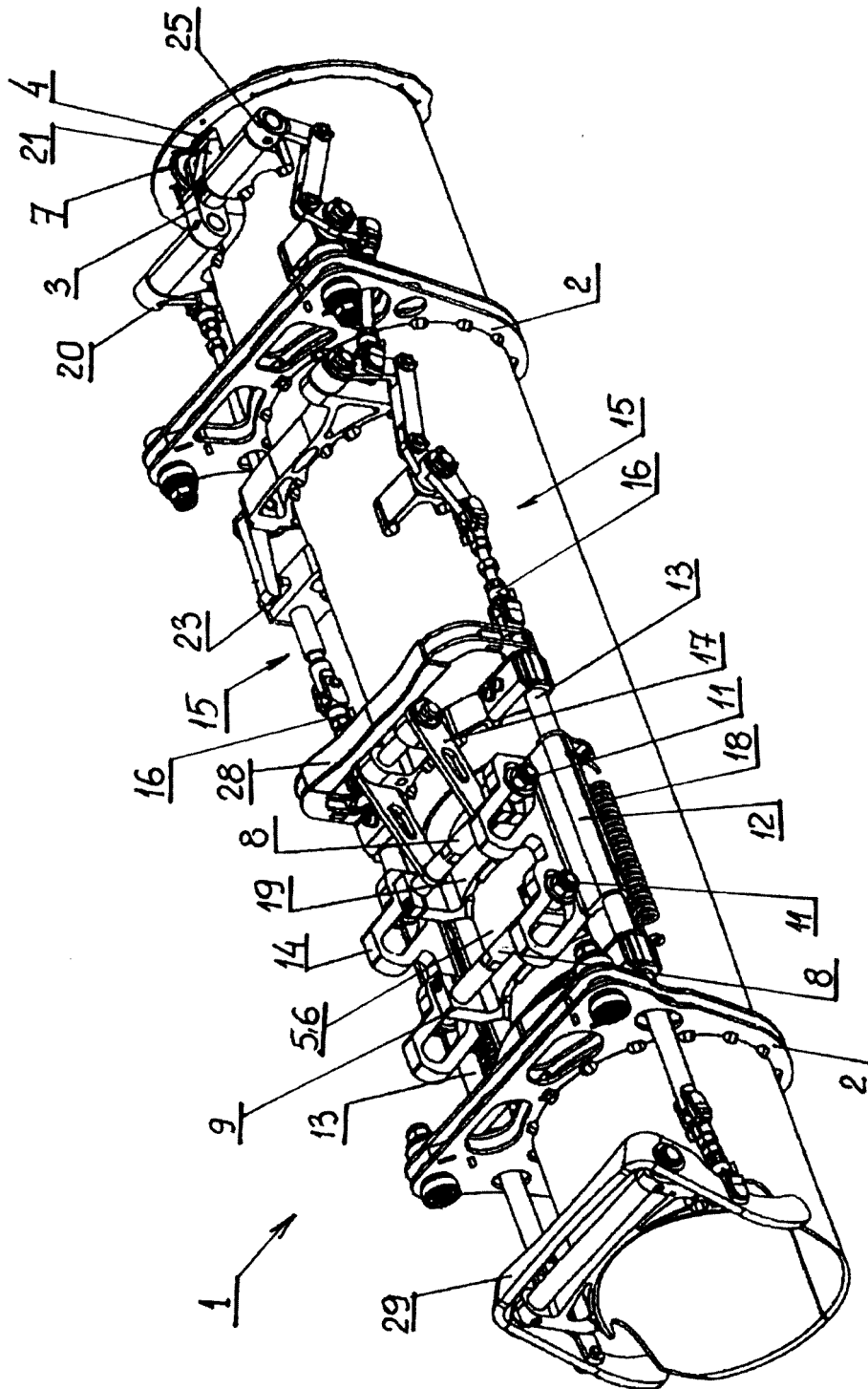


Fig.1

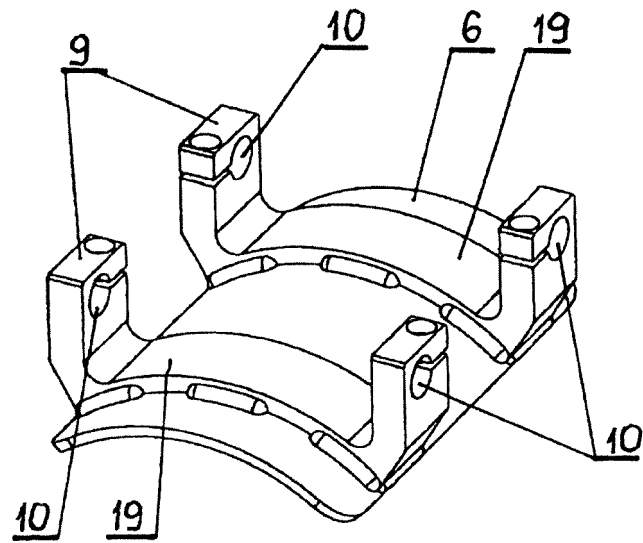


Fig. 2

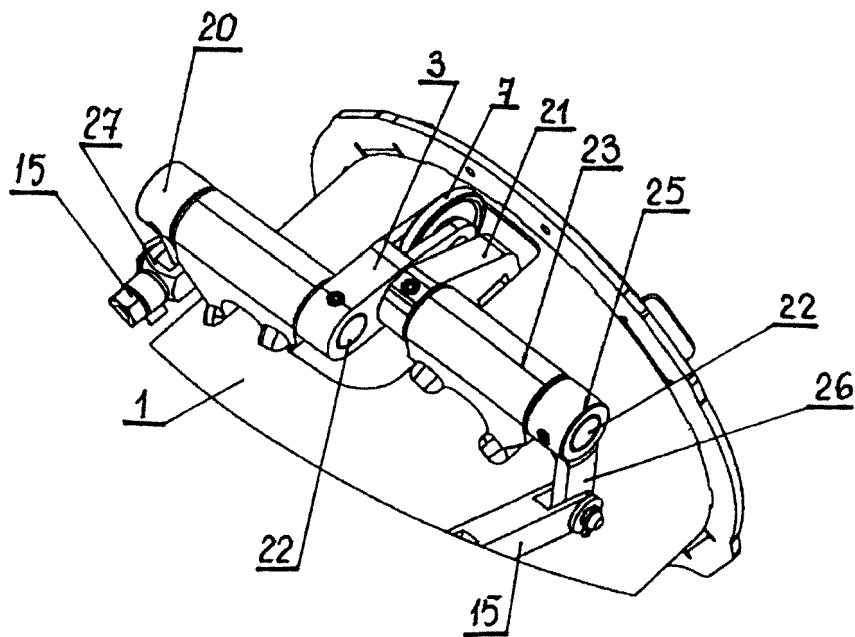


Fig. 3

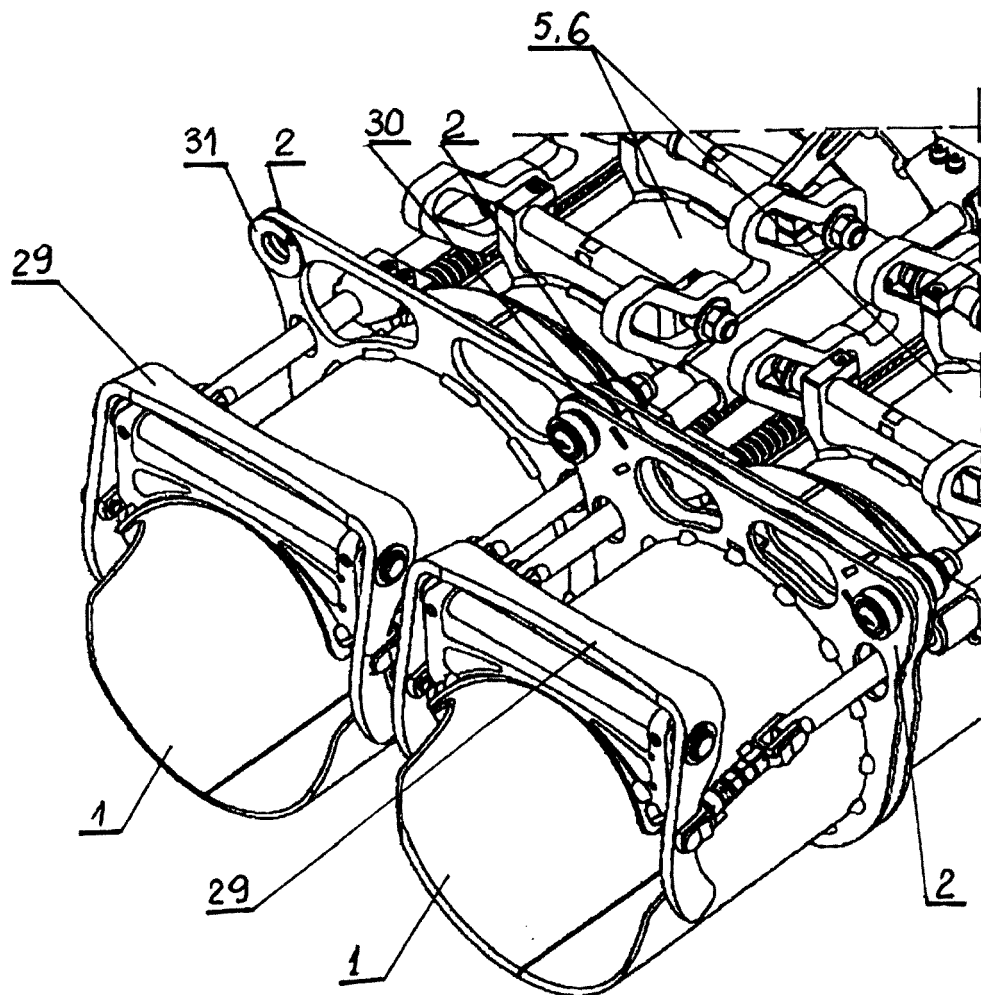


Fig. 4



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 46 0025

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	PL 213 077 B1 (HUTA STALOWA WOLA SPOLKA AKCYJNA [PL]) 31 January 2013 (2013-01-31) * paragraphs [0006], [0007]; figure 1 *	1-8	INV. F41A9/30 F41A9/04
A	FR 2 443 041 A1 (FRANCE ETAT) 27 June 1980 (1980-06-27) * the whole document *	1-8	
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			TECHNICAL FIELDS SEARCHED (IPC)
			F41A F42B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 November 2020	Examiner Lahousse, Alexandre
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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