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(54) Benævnelse: **DOBBELT BUNDPLADE TIL KRAFTOVERFØRSEL TIL JORD TIL KØRETØJSMONTEREDE MORTÉRER**

(56) Fremdragne publikationer:
WO-A1-2016/020558
ES-U- 1 078 083
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DESCRIPTION

Object

[0001] The present invention relates to a dual mortar base plate capable of transferring to the ground the forces generated when firing a mortar in a mortar carrier vehicle in any direction, isolating the vehicle from said forces and facilitating the stowage thereof.

State of the Art

[0002] A self-driven mortar or mortar carrier vehicle (mortar carrier) is a weapon system comprising a mortar assembled in a vehicle like the one described in ES 1078083 U (ESTRELLA MOLINA, Julio), in US 20120024135 A1 (KOHNEN Norbert et al.), in US 20050241468 A1 (Borgwarth Dennis W. et al.), or in US 2818781 (Ruf Walter). The vehicle comprises a cargo area adapted for receiving the mortar.

[0003] In some cases, firing is performed with the mortar placed directly on the transport vehicle like in US 4791852 A (Fraud Michel et al.). This requires suitable reinforcement of the suspension and cargo parts of the transport vehicle, the inclusion of elastic devices for absorbing the recoil and the forces generated by firing the mortar on the vehicle (like in US 4791852, Fraud Michel et al.), and/or hydraulic jacks or supports for fixing the vehicle to the ground like in US 2818781 (Ruf Walter).

[0004] In other cases the mortar has two positions, a traveling position, i.e., the mortar is placed on the support plate to be transported while the vehicle is traveling; and a firing position, in which the mortar leaves the cargo area of the vehicle and is located in the firing position on the ground, as described in ES 1078083 U (ESTRELLA MOLINA, Julio) and in US 20120024135 A1 (KOHNEN Norbert et al.).

[0005] In this latter case (US 20120024135 A1), the mortar barrel is coupled to a base plate of the mortar and to a supporting device which in turn is coupled to the cargo area of the transport vehicle mechanically or by means of articulated arms. The plate or supporting device is coupled to the vehicle mechanically for positioning the mortar between a traveling position, in which the mortar is placed for transport with the vehicle, and a firing position, in which the mortar is located for firing a shell from outside of the vehicle.

[0006] The base plate of the mortar in its deployed position is a base plate of a part which is driven into the ground on which the mortar barrel is placed, like in US 20120024135 A1 (KOHNEN Norbert et al.), where it is necessary to prepare the ground below the base plate to bury or drive it into said ground. The base plate of the mortar is coupled to the vehicle mechanically or by means of articulated arms like in ES 2203810 T3 (WINTER UDO ING MAG

et al.), which causes a large part of the forces generated by firing the mortar to be transmitted to the vehicle.

[0007] As the aforementioned systems do not satisfactorily resolve the effect of the forces generated by firing the mortar on the vehicle, they must be provided with elements for absorbing recoil, hydraulic jacks, supports, or other elements for fixing the vehicle to the ground, structural reinforcements of the vehicle to withstand the transferred forces or accept that the necessary maintenance of the mortar carrier vehicle is more substantial or that the service life of the mortar carrier vehicle assembly is reduced as the entire assembly is subjected to the forces generated by all the firing of the mortar during operations.

[0008] The same applicant, NTGS, holds another patent, WO2016/020558 A, dated August 7, 2014, which also claims a "Base plate". As explained in the last paragraph of the brief explanation of this patent, "the baseplate comprises means for regulating both the angle of elevation of the mortar and its direction". It comprises a sliding element suitable for moving a mechanical arm, along a course of movement, from an idle position associated with a position of movement of the vehicle, to a working position associated with a position of shooting of the mortar. The mechanical arm contains two actuators with their respective motors and guides, one of which partially encompasses the shooting tube, and which also has a bar mechanically attached to it. Briefly, the first actuator sets the angle of elevation of the shooting tube and the second actuator positions the tube according to the angle of direction.

[0009] On the other hand, the present application also deals with a mortar base plate for mortar carrying vehicles. However, while this is within the technical field of the invention, the technical problem it seeks to overcome is different.

[0010] As the last paragraph of the brief explanation of the invention explains, "the upper and lower base plate assembly allows for the rapid positioning and stowage of the mortar assembly, returning it to the position of movement of the vehicle by means of a lower base plate return system, located on the upper plate and having two positions, locked and released. The present application comprises a lower base plate attached to the lower end of the mortar tube by means of a ball-joint system. It comprises several self-centring shafts and an upper base plate comprising a number of truncated conical hoppers rigidly connected to the structure and by which it rests on the self-centring shafts of the lower base plate so that,after the mortar has been shot, the upper base plate and the vehicle move to the new position of the lower base plate. The two plates are connected by means of limiting cables passing through the inside of the self-centring shafts. These limiting cables are secured to the lower base plate by means of lower stops and to the hoppers on the upper base plate by upper stops. Therefore, it is quite clear that the technical problem to be resolved is different in WO2016/020558 A and in the present application. In addition, the technical characteristics of both solutions are based on very different components.

Summary

[0011] The present invention seeks to overcome one or more of the drawbacks in mortar carrier vehicles described above by means of a dual base plate transferring the forces caused by firing the mortar to the ground, reducing or eliminating those forces transferred to the vehicle, which does not need any type of preparation of the ground on which the base plate is seated and allows a fast stowage, as defined in the claims.

[0012] The base plate consists of two clearly distinguished parts, a top base plate (2) formed by a rectangular structure mechanically connected to and integral with the vehicle, and a rectangular bottom base plate (3) on which the mortar (1) is located. The top base plate (2) is attached to the bottom base plate (3) by means of several limiter cables (7) as can be seen in Figure 3.

[0013] The bottom base plate (3) consists of a planar plate with several self-centering shafts (6) integrally attached to its top face, and several metallic elements integrally attached to the bottom face of the planar plate and supporting the bottom base plate (3) on the ground. The bottom base plate has a surface noticeably larger than the base plates used in existing mortars and mortar carrier vehicles for better transfer to the ground of the forces generated in the firing of the mortar, and is preferably rectangular-shaped. The design of said bottom base plate (which is planar and has a large surface) allows the bottom base plate (3) to be placed directly on the ground while firing without needing to prepare the ground below the base plate or burying or driving it in said ground as occurs in existing mortars and mortar carrier vehicles.

[0014] The top base plate (2) is preferably a rectangular-shaped structure with several truncated cone shaped hoppers (4) integrally attached to the rectangular structure and a pressure-applying post (5) also integrally attached to the rectangular structure. The top base plate is placed on the bottom base plate (3), as shown in Figure 2. The top base plate (2) exerts pressure on the bottom base plate (3) (for example by using a drive exerting a force on the pressure-applying post) for the purpose of obtaining a higher transfer of the forces generated in the firing to the ground. The bottom base plate (3) is firmly supported on the ground as it is pressed through the top base plate (2) with the weight of the vehicle, as can be seen in Figure 1.

[0015] The assembly of the bottom and top base plates allows a fast positioning and stowage of the mortar assembly in the mortar carrier vehicle to return to the vehicle traveling position by means of a stowing system (8) for stowing the bottom base plate, located in the top plate and having two positions: the locked position as shown in Figure 3 and the released position, as shown in Figure 4.

Brief Description of the Drawings

[0016] A more detailed explanation of the invention is provided in the following description based on the attached drawings:

Figure 1 shows the dual base plate assembly and mortar in the deployed position outside of the mortar carrier vehicle, with the mortar located in the firing position.

Figure 2 shows a perspective view of the dual base plate assembly and its main elements: mortar barrel (1), top base plate (2), bottom base plate (3), hoppers (4) and pressure-applying post (5).

Figure 3 shows the dual base plate in the locked position of the stowing system for stowing the bottom base plate. The mortar barrel (1), the top base plate (2), the bottom base plate (3), the hoppers (4), the pressure-applying post (5), the self-centering shafts (6) of the bottom base plate, the limiter cables (7) joining the top base plate with the bottom base plate, the stowing system for stowing the bottom base plate (8) in the locked position, the upper stops (9), and the lower stops (10) can be observed.

Figure 4 shows the dual base plate in the released position of the stowing system for stowing the bottom base plate. The mortar barrel (1), the top base plate (2), the bottom base plate (3), the hoppers (4), the pressure-applying post (5), the self-centering shafts (6) of the bottom base plate, the limiter cables (7) joining the top base plate with the bottom base plate, the stowing system for stowing the bottom base plate (8) in the released position, the upper stops (9), and the lower stops (10) can be observed.

Figure 5 shows the dual base plate in the released position of the stowing system for stowing the bottom base plate right after the mortar has been fired. The mortar barrel (1), the top base plate (2), the bottom base plate (3) on the ground moved backwards due to the recoil of the mortar barrel during firing, the hoppers (4), the pressure-applying post (5), the self-centering shafts (6) of the bottom base plate, the limiter cables (7) joining the top base plate with the bottom base plate, the stowing system for stowing the bottom base plate (8) in the released position, the upper stops (9), and the lower stops (10) can be observed.

Figure 6 shows a top view of dual base plate right after the mortar has been fired. The mortar barrel (1), the top base plate (2), the bottom base plate (3) on the ground moved to the left due to recoil of the mortar barrel during firing, the hoppers (4), the pressure-applying post (5), and the upper stops (9) can be observed.

Figure 7 shows a top view of the dual base plate right after the mortar has been fired with a mortar barrel azimuth and elevation angle different from that of Figure 6.

Description

[0017] Figure 1 shows a dual mortar base plate used in a mortar carrier vehicle where a mortar (1) is mechanically coupled to a cargo area of a mortar carrier vehicle through an extendable mechanical arm or other means.

[0018] The mortar can adopt two positions, one is the traveling position which corresponds to the resting position of the mortar positioned in the cargo area of the mortar carrier vehicle for traveling with the vehicle; and a second work position corresponding to a firing position for the mortar (shown in Figure 1). In the firing position, the mortar (1) is supported directly on the bottom base plate (3) which in turn is supported against the ground, near the vehicle and outside same.

[0019] The pressure-applying post (5) has a mechanism, not included in this patent, which allows it to increase its length so that the dual base plate reaches the ground, presses against it, and raises the rear part of the vehicle. This force exerted by the pressure-applying post assures that the dual base plate is securely seated on the ground, with the surface of the ground being responsible for absorbing the recoil energy. Figure 1 shows the dual base plate seated on the ground after the force has been exerted on the pressure-applying post (5). It can be observed in Figure 1 how the rear part of the vehicle may be raised slightly above the level of the ground.

[0020] The bottom base plate (3) has a surface noticeably larger than standard mortar base plates and comprises mechanical elements located on the bottom surface of the bottom base plate, which are located on the ground and allow improving the transfer of the forces generated by firing the mortar to the ground. As a result of its design and the force exerted on the pressure-applying post (5), the bottom base plate (3) is firmly supported on the ground as it is pressed through the top base plate (2) with the weight of the vehicle, as observed in Figure 1.

[0021] The bottom edge of the bottom base plate (3) is provided with jagged edges to facilitate driving the plate into the ground.

[0022] The lower end of the mortar barrel (1) is mechanically assembled to the bottom base plate (3) by means of a ball and socket joint system.

[0023] The top base plate (2) and the bottom base plate (3) are attached and the movement thereof is limited by limiter cables (7). The limiter cable (7) is secured to the hoppers (4) of the top base plate by means of an upper stop (9), as shown in Figure 4. The limiter cable (7) is secured to the bottom base plate (3) by means of a lower stop (10), as shown in Figure 4. The limiter cables (7) pass through the inside of the self-centering shafts (6) of the bottom base plate (3), as shown in Figure 4.

[0024] Once the dual base plate is located on the ground, the stowing system (8) for stowing the bottom base plate is actuated such that it transitions from the locked position (Figure 3) to the released position (Figure 4).

[0025] The top base plate (2) is supported on the bottom base plate (3) at several (three or more) points by means of truncated cone shaped hoppers (4) of a given angle so that after firing, the vehicle moves slightly to the new position of the bottom base plate. These conical

supports or hoppers (4) allow the bottom base plate (3) to move at any strike angle upon firing the mortar within the limits allowed by the length of the limiter cables (7), as shown in Figure 5. As can be observed, the self-centering shafts (6) move inside the hoppers (4) within the limits allowed by the limiter cables (7), the upper stops (9), and the lower stops (10).

[0026] The forces generated by the recoil of the mortar barrel (1) during firing are transferred to the ground through the bottom base plate (3), which may cause the bottom base plate (3) to move a short distance to the side in any direction on the ground, as observed in Figure 5. This allows isolating the top base plate (2) and the mortar carrier vehicle from the forces generated by the firing, at the same time limiting the stress to which the mortar carrier vehicle assembly and the elements attaching the mortar to said vehicle are subjected.

[0027] Moments after firing, the force exerted (weight of the vehicle) on the top base plate (2) makes the top base plate (and with it the vehicle to which it is integrally attached) move until it is located again on the bottom base plate (3), i.e., it returns to the position of Figure 4 by means of the hoppers (4) sliding on the self-centering shafts (6) until the central axis of the hoppers (4) is aligned with the self-centering shafts (6).

[0028] To enable the mortar barrel (1) to fire in any direction without having to move the vehicle, the hoppers (4) have a truncated cone shape, whereby allowing the self-centering shafts (6) to move in the mortar thrust direction, as can be seen in Figure 6 (the mortar fires with a strike angle of zero), and in Figure 7, where the mortar fires with a strike angle of 60°.

[0029] Once the firing of the mortar on the ground has ended, to initiate stowage of the mortar, the stowing system (8) for stowing the bottom base plate is actuated such that it transitions from the released position (Figure 4) to the locked position (Figure 3). Then the force exerted by the pressure-applying post (5) on the dual base plate (for example through a drive no contemplated herein) is eliminated. At that time force is no longer being exerted on the dual base plate by the mortar carrier vehicle and stowage of the assembly can be initiated to transition to the transport position of the vehicle which corresponds to a resting position of the mortar positioned in the cargo area of the mortar carrier vehicle for traveling with the vehicle.

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

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- US4791852A [0003] [0003]
- ES2203810T3 [0006]
- WO2016020558A [0008] [0010]

PATENTKRAV

1. Omnidirektionel, dobbelt bundplade til mortértransportkøretøjer med en bevægelsesposition og en affyringsposition, og som indbefatter et mortérløb (1) og en understøttende anordning koblet til køretøjet, **kendetegnet ved**

- en nedre bundplade (3), hvorpå mortéren er konfigureret til at blive placeret, hvilken nedre bundplade omfatter en plan plade med adskillige selvcentrerende aksler (6), der er integreret fastgjort til den plane plades øvre flade, og adskillige metalelementer, der er integreret fastgjort til den plane plades nedre flade, og som understøtter den nedre bundplade på jorden,
- en øvre bundplade (2), der er konfigureret til at blive koblet til køretøjet, hvilken øvre bundplade omfatter en struktur med adskillige keglestubformede tragte (4), der er integreret fastgjort til strukturen, og en trykudøvende post (5), der er integreret fastgjort til den øvre bundplades struktur ved dens nedre ende og til et lastområde af et mortértransportkøretøj,
- forbindelsesmidler mellem den øvre bundplade og den nedre bundplade, hvilke forbindelsesmidler omfatter begrænsningskabler (7), øvre stop (9) og nedre stop (10), hvilke begrænsningskabler er fastgjort til den øvre bundplades tragte ved hjælp af et øvre stop og til den nedre bundplade ved hjælp af et nedre stop, hvilke begrænsningskabler er konfigureret til at passere gennem det indvendige af den nedre bundplades selvcentrerende aksler og gøre det muligt for den øvre bundplade og den nedre bundplade at blive fastgjort og at få bevægelse deraf begrænset.

2. Omnidirektionel, dobbelt bundplade til mortértransportkøretøjer ifølge krav 1, **kendetegnet ved, at** de keglestubformede tragte (4) og de selvcentrerende aksler (6) danner repositioneringsmidler, hvilke keglestubformede tragte har en given vinkel, hvor den øvre bundplade (2) derefter understøttes på den nedre bundplades selvcentrerende aksler ved tre eller flere punkter, således, efter affyring, at den øvre bundplade og køretøjet bevæges mod den nedre bundplades (3) nye position.

3. Omnidirektionel, dobbelt bundplade til mortértransportkøretøjer ifølge krav 1, **kendetegnet ved** anbringelsesmidler (8) til immobilisering af den nedre bundplade (3) mod den øvre bundplade (2), hvilke anbringelsesmidler omfatter kabler, fjedre eller aktuatorer, der er konfigureret til at blive aktiveret samtidigt som anbringelse af den dobbelte bundplade.

4. Omnidirektionel, dobbelt bundplade til mortértransportkøretøjer ifølge krav 1, **kendetegnet ved, at** den nedre ende af motérrøret (1) er mekanisk samlet med bundpladen (3) ved hjælp af et kugleledssystem.

DRAWINGS

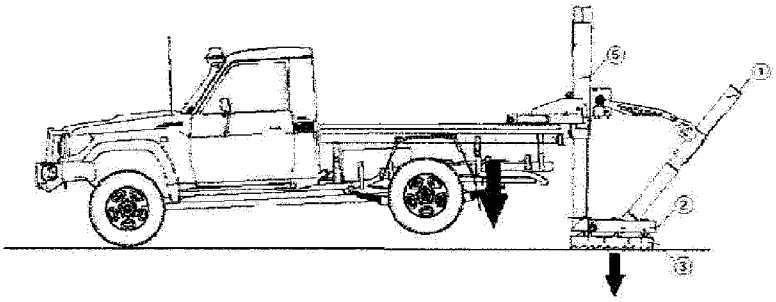


Fig 1

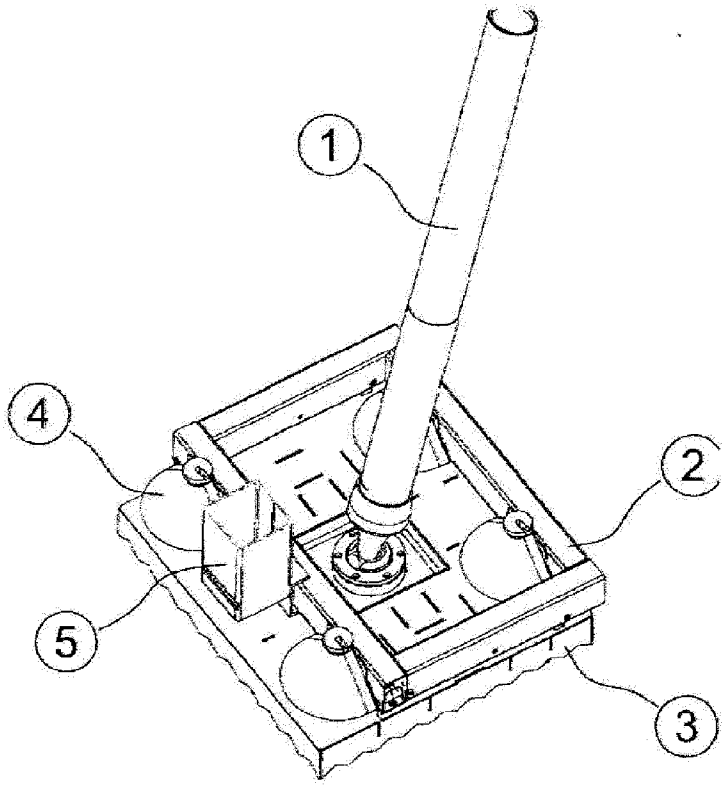


Fig 2

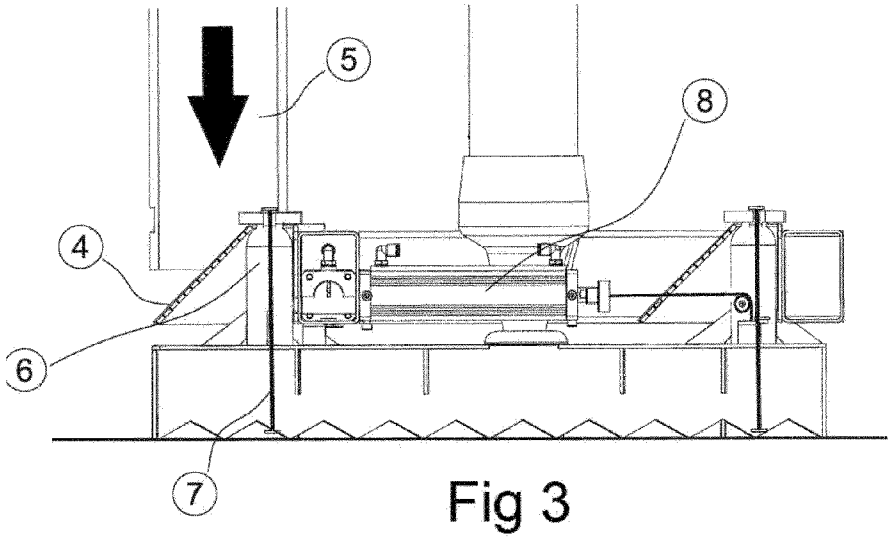


Fig 3

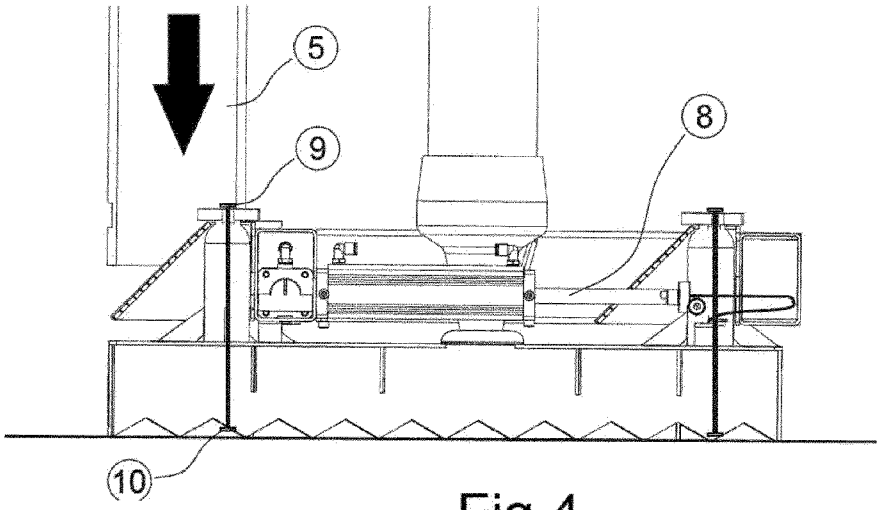


Fig 4

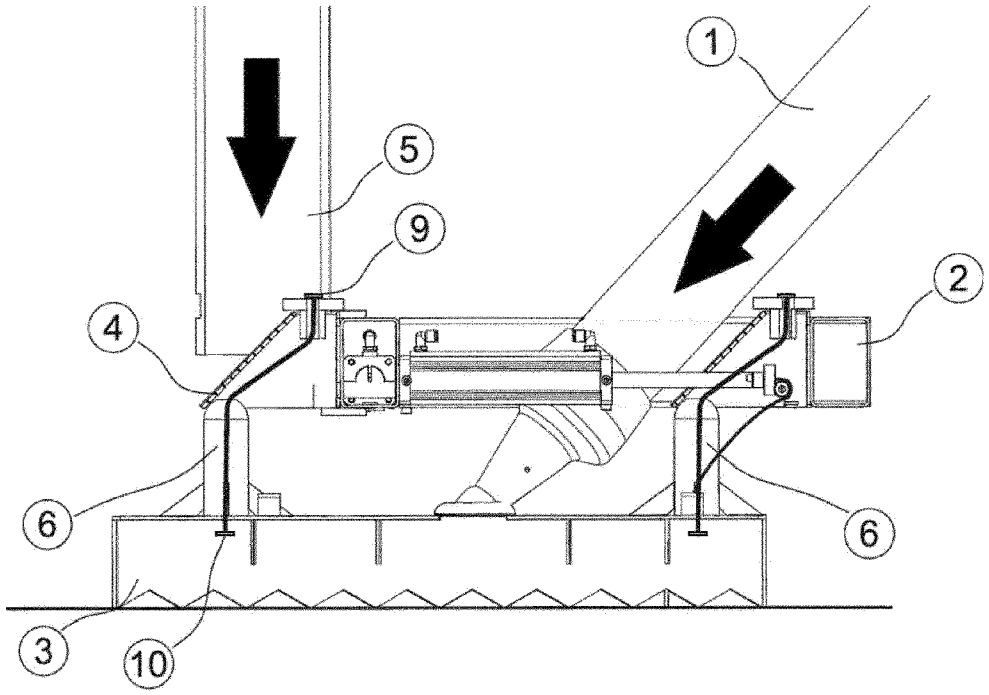


Fig 5

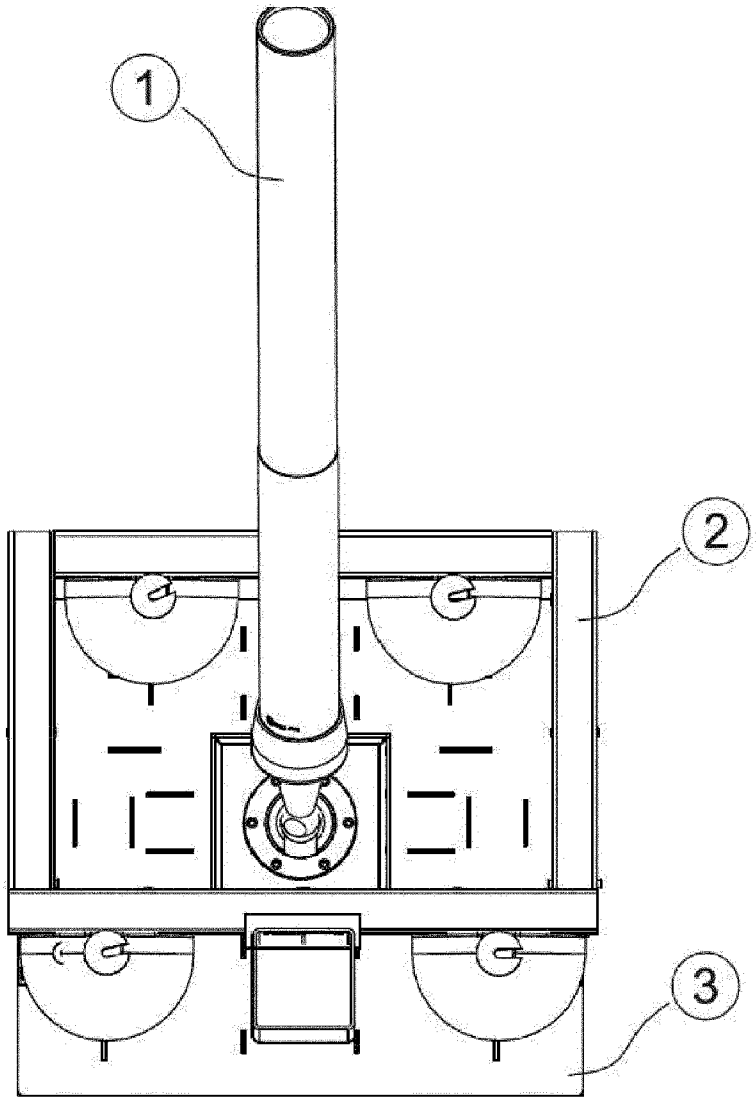


Fig 6

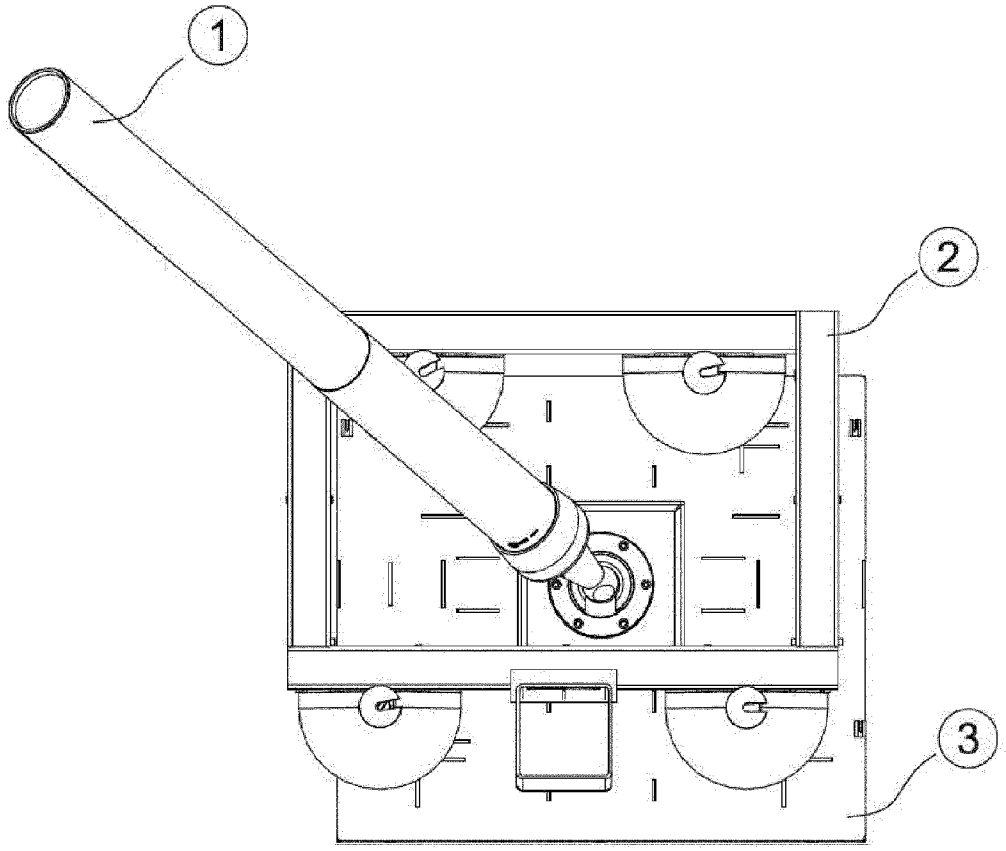


Fig 7