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CLEANING AND OTHER VEHICLES.

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Description

This invention relates to a self-propelled cleaning vehicle in accordance with the preamble of claim 1. Such a vehicle is used for cleaning roads and/or run-aways and/or pavements and/or carrying out industrial cleaning and sweeping operations. It comprises a suction gear including a suction nozzle with side brushes rotating about upwardly extending axes and serving to sweep matter laterally inwardly into the path of the vehicle.

Known cleaning vehicles (DE-A-2537004, FR-A-287553) are provided with a matter storage tank in which screening means separates water from solid matter deposited in the tank, and the water is re-injected into the nozzle or suction duct of the vehicle's cleaning assembly.

Shortcomings of the prior art cleaning vehicle relate to the maintenance of the screens. It will be understood that the wet matter deposited in the tank where the screen operates is extremely high in solid content and thus there is a considerable possibility for partial screen blockage to occur after a period of use of the vehicle. This leads to a maintenance requirement in relation to the screen, otherwise, the efficiency of the screen for separating liquid from the solid matter deposited in the tank inevitably falls. Equally however, on account of the inhospitable location of the screen itself, maintenance of same is not a task welcomed by an operator of such a machine, even though such may be recommended when the solid matter has been tipped from the tank, thereby giving access to the screens via the rear door in the tank.

An object of the present invention is to provide a cleaning vehicle in which maintenance of the screening means is rendered less arduous and/or demanding, or otherwise facilitated, or improved in relation to said prior art.

According to the present invention there is provided a cleaning vehicle as defined in the accompanying claims.

In a preferred embodiment, the screen of a water recirculation system in a cleaning vehicle is accessible from outside the matter storage tank, such access permitting removal and cleaning, and the access being provided by means of a separate sealable opening and an associated closure in said tank in the region of said screening means. In the case of a cleaning vehicle having a rear door permitting discharge of accumulated solid matter at intervals, the sealable access opening for the screening means allows cleaning of the screen independently of the opening for emptying the matter storage tank.

The associated closure for the access opening serves to collect screen water on the downstream side of the screen. For this purpose, the closure is a housing to which the screened water is delivered. The screened water enters the housing through said

opening in the tank which is sealed by the housing. Preferably the housing extends across the width of the vehicle defining a transversely extending channel; it serves to collect the screened water and deliver same laterally to a water storage tank at one side of the vehicle.

Quick attach/detach means is provided for the screen including spring clips location means and a manipulation handle on the screen.

Two screens may be arranged, one on each side of the matter storage tank.

An Embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which :

Fig. 1 shows a side elevation view of a cleaning vehicle illustrating recirculation of water through the vehicle, and showing also the fan assembly and an associated sound attenuation system;

Fig. 2 shows a plan view, in the direction indicated by arrow XVIII in Fig. 1 of the fan assembly and the sound attenuation duct;

Fig. 3 shows, on a larger scale, an elevation view of the front end of a matter storage tank seen in Fig. 1 the direction of viewing being indicated by arrows XIX - XIX in Fig. 1;

Fig. 4 shows a section through the front end of the tank of Fig. 3, the section being taken on the line XX - XX in Fig. 3 and

Fig. 5 shows, on a relatively large scale, a section through a portion of a screen for separating water from solid matter.

As shown in Fig. 1 of the drawings, suction duct 30 leads to tank 32, the duct terminating at 210 for deposition of matter in the tank.

Screening means 212 is provided for separating water from matter deposited in the tank. Below the screening means is provided a separated water tank 214 to store water separated by the screening means.

Recirculation means 216 is provided to deliver screened water from tank 214 to be mixed with the air stream containing matter (removed for example from a road surface) passing through duct 30. The recirculation means comprises a pump 218 delivering through hydraulic lines 220 to spray nozzles 222 and 224 located, respectively, at the lower and upper ends of duct 30. Thus, the separated water from tank 214 is re-injected into the suction duct for redeposition with the solid matter passing therethrough, in the tank 32.

A clean water storage tank 226 is provided alongside tank 214 to store clean top-up water for a purpose to be described. The clean water tank 226 is of larger capacity than the separated water storage tank 214. In this embodiment the separated water tank is of capacity 150 litres and the top-up water tank 226 is of four times that capacity, namely 600 litres. During use, matter storage tank 32 holds, on average, about 300 litres of water in course of being screened from

the matter, at any one time.

Top-up means 228 comprises a pump 230 delivering through a conduit 232 to tank 214. Level sensing means such as a float 234 actuating a control 236 is provided to maintain the level of water in tank 214. Control 236 may itself incorporate a valve connected to line 232 to control discharge from pump 230 which runs continuously. Alternatively, control 236 may be arranged to energise the pump as and when required.

In Fig. 1, the return flow of screened water from tank 32 to separated water tank 214 is indicated at 238. The inward flow of water is pumped from tank 214 to nozzles 222 and 224, this flow proceeding through suction duct 30 and mixed with the air blast therein is indicated at 240. There is mixed with this flow an additional amount of water which may have been sprayed onto the surface 242 being swept from spray jets as indicated at 244 by brush spray bars 246 or by a general spray bar at the front of vehicle 10. This water enters the vehicle in the air stream drawn into nozzle 22, as indicated at 248 and proceeds through duct 30 intimately mixed with the air flow and (soon afterwards) with the water flow 240 from nozzles 222.

In this embodiment the water supply to spray bars 246 is provided by pump 230 (or a separate pump) delivering water from tank 226 of fresh water. The hydraulic line 254 delivering from pump 230 to spray bar 246 is shown purely diagrammatically in Fig. 1.

There is also shown in Fig. 1 an oil pump 256, an oil heat exchanger 258, and oil conduits 260 forming part of a hydraulic drive system for various functions of the vehicle, including the rotatable sweeping brushes of matter removal means 20 and/or the fan 500 (to be described later) which exhausts air from tank 32, and/or indeed the hydraulic drive for rear-wheels 12 of the vehicle. These hydraulic drives all generate heat and, in this embodiment, this heat is utilized to raise the temperature of the water in tank 226 to avoid problems of freezing occurring under winter sweeping conditions. The pump, conduits and heat exchanger are constructed in water-submersible form, and thus all effectively form heat exchangers to some extent, and the heat exchanger element 258 is specifically constructed for this purpose.

While it has been previously proposed to provide heat exchange facilities in the screened water tank of a cleaning vehicle of this kind, the above arrangement in which this water heating facility is provided in a previously unknown top-up tank enables a much greater degree of control to be exercised over this facility in terms of the regulated and predictable volume of water in the top-up tank.

As shown in Figs. 1 and 2 of the drawings, there is provided a fan assembly 500 to evacuate tank 32 and thereby to cause suction to be applied to suction duct 30. Fan assembly comprises a fan housing 502 in which a radial flow fan 504 is rotatable about an up-

wardly extending axis 506 to apply suction through a downwardly facing inlet opening 508 communicating with tank 32. The pressure side of the fan communicates with a fan outlet housing 510 leading to a sound attenuation duct 512.

Sound attenuation duct 512 comprises a generally linear receiving portion 514 connected to volute-shaped fan outlet housing 510, and a generally linear discharge portion 516, these portions being connected by a curved connecting portion 518. Receiving portion 514 has a slight upwardly-joggled duct portion 519. These three main portions of the sound attenuation duct 512 are of generally rectangular cross sectional shape.

Thus, receiving portion 514 of the sound attenuation duct 512 is connected to the pressure side of the fan. The discharge portion of the sound attenuation duct has an upwardly facing outlet 520, of generally square shape, with a smoothly curved and upwardly sloping air guide surface 522 below it to minimise turbulence as the air changes from a horizontal trajectory to a generally vertical one.

From the foregoing, it will be seen that the central axis 524 of the sound attenuation duct 512, which extends longitudinally of the duct through its three portions, also extends generally horizontally, and thus the air discharged from the pressure side of fan 504 likewise passes generally horizontally first away from the fan through portion 514, then through 180 degrees through connecting portion 518, and then towards the fan again through portion 516, followed by a smooth change of direction from horizontal to vertical as the air passes through outlet 520. The result is a relatively long path of the air from the fan before it reaches the outlet, with a direction change of 180 degrees in one plane followed by 90 degrees in another, after an initial upward shift at 519 in the generally horizontal trajectory. Sound attenuation materials may be secured to the walls of the duct. The net result is a very significant reduction in fan discharge noise, without significant reduction in fan efficiency.

Turning now to the arrangements for mounting and removing the screening means 212, reference is directed to Figs. 3 and 4 of the accompanying drawings. In Fig. 3, tank 32 is seen to be provided with connection means 262 for suction duct 30. Though not shown in Fig. 4, it can be seen from Fig. 1 that duct 30 continues to its end 210 within tank 32.

Screening means 212 comprises two rectangular screens 266, 268, one at each side of the central connection means 262.

Each of the screens 266, 268 is of wedge wire construction. That is to say, the screen consists of parallel elements of wedge or triangular-section metallic material, these being cross-reinforced by transverse supports at intervals. The effective screen size is defined by the space between the adjacent front edges of the screen elements. This is illustrated in

Fig. 5 in which four representative screen elements 268 are shown, and the "mesh size" is indicated at 270. The inner side (at which solid matter is retained) of the tank is identified at 272. In this embodiment, the mesh size is 1.5 mm. The range of useable mesh sizes is from 0.5 to 3.0 mm and preferably from 1.0 to 2.0 mm.

As shown in Fig. 4, screen 266 has a support frame 274 and is secured in position by location behind clips 276 by manipulation using handles 278, but is manually removable from its in-use position after releasing a water collection housing 280 by means of an over-centre action release handle 282. Housing 280 serves to collect screened water. The housing extends laterally across the width of the vehicle. Housing 280 defines a transversely-extending channel 284 serving to collect and deliver the screened water emerging from tank 32 through openings 281, 283 therein to tank 214 at one side of the vehicle (opposite the vehicle engine).

When housing 280 has been released, the screens 266 and 268 can be manually removed through the openings 281, 283 and the screens can then be cleaned, for example by back-washing with a hose. The screens are then replaced and the housing is closed.

Claims

1. A self-propelled cleaning vehicle comprising:

- a) a vehicle body;
- b) matter removal means positionable in working relation to a surface to be cleaned, to remove matter therefrom;
- c) a suction duct (30) operatively associated with said matter removal means to deliver said matter to a matter storage tank (32) having a closable aperture for emptying purposes;
- d) screening means (212) for separating water from matter deposited in said matter storage tank (32);
- e) a water storage tank (214) to store water separated by said screening means (212);
- f) recirculation means (216) to deliver screened water from said water storage tank (214) to be mixed with matter passing through said suction duct for re-deposition with the matter in the matter storage tank (32),
- g) said screening means (212) comprising a screen (206) and an associated support therefor to support same at a location separating a first region of said matter storage tank (32), on the upstream side of said screen (266), from a second region thereof on the downstream side thereof;

characterized in that

h) a separate sealable opening (281, 283) and an associated closure is provided in said matter storage tank (32) in the region of said screening means (212), said sealable opening (281, 283) providing access to said screening means (212) by an operator from outside the matter storage tank (32) and permitting removal of the screen (266, 268) from its support for cleaning.

2. A cleaning vehicle according to claim 1, in which two screens (266, 268) are arranged, one at each side of the matter storage tank (32).
3. A cleaning vehicle according to claim 1, characterized in that said associated closure is a housing (280) for collecting and delivering the screened water to the water storage tank (214).
4. A cleaning vehicle according to claim 3, characterized in that said housing (280) extends across the width of the vehicle defining a transversely extending channel.
5. A cleaning vehicle according to claim 1, characterized in that releasable securing means for said screen comprises quick attach/detach means therefor.

Patentansprüche

1. Reinigungsfahrzeug mit Selbstantrieb, umfassend:

- a) eine Fahrzeugkarosserie;
- b) Mittel zur Substanzenbeseitigung, das im arbeitsfähigen Abstand zur reinigenden Oberfläche positionierbar ist, um von dieser Substanzen zu beseitigen;
- c) ein Absaugröhrensystem (30), das mit dem Mittel zur Substanzenbeseitigung wirksam verbunden ist, um die Substanzen zu einem Sammelbehälter (32) zu befördern, der eine verschließbare Öffnung für Entleerungszwecke aufweist;
- d) Siebeinrichtung (212), um Wasser von den Substanzen abzuscheiden, die sich in dem Sammelbehälter (32) für Substanzen abgesetzt haben;
- e) einen Wasserauffangbehälter (214), um Wasser aufzufangen, das durch die Siebeinrichtung (212) abgeschieden wurde.
- f) Rückführeinrichtung (216), um abgeschiedenes Wasser aus dem Wasserauffangbehälter (214) zu befördern, das mit Substanzen

- gemischt werden soll, die durch das Absaugröhrensystem geleitet werden, um sich erneut mit den Substanzen in dem Substanzsammelbehälter (32) abzusetzen,
- g) wobei die Siebeinrichtung (212) ein Sieb (266) und einen damit verbundenen Halter umfaßt, um dieselbe an einer Stelle zu halten, an der ein erster Bereich des Sammelbehälters (32) für Substanzen auf der Oberseite des Siebes (266) abgeschieden wird, wobei von einem zweiten Bereich des Behälters an der Unterseite des Siebes abgeschieden wird; dadurch gekennzeichnet, daß
- h) eine getrennte, abdichtbare Öffnung (281, 283) und ein damit verbundener Verschuß in dem Sammelbehälter (32) für Substanzen in dem Bereich der Siebeinrichtung (212) zur Verfügung gestellt wird, wobei die abdichtbare Öffnung (281, 283) einen Zugang zu der Siebeinrichtung (212) für einen Bediener von außerhalb des Sammelbehälters (32) für Substanzen zur Verfügung stellt und eine Entnahme des Siebes (266, 268) aus ihrer Halterung zum Reinigen ermöglicht.
2. Reinigungsfahrzeug nach Anspruch 1, in dem zwei Siebe (266, 268) angeordnet sind, wobei sich jeweils eines an jeder Seite des Substanzsammelbehälters (32) befindet.
3. Reinigungsfahrzeug nach Anspruch 1, dadurch gekennzeichnet, daß der zugehörige Verschuß ein Gehäuse (280) ist, um das abgeschiedene Wasser zu sammeln und zu dem Wasserauffangbehälter (214) zu befördern.
4. Reinigungsfahrzeug nach Anspruch 3, dadurch gekennzeichnet, daß das Gehäuse (280) sich über die Breite des Fahrzeuges erstreckt, wodurch ein querverlaufender Kanal definiert wird.
5. Reinigungsfahrzeug nach Anspruch 1, dadurch gekennzeichnet, daß ein lösbares Sicherungsmittel für das Sieb eine schnelle Befestigungs/Löseeinrichtung dafür umfaßt.
- Revendications**
1. Véhicule de nettoyage automateur comprenant :
- a) une caisse de véhicule;
- b) un moyen d'enlèvement de matières pouvant être placé en relation de travail avec une surface à nettoyer, de manière à en enlever des matières;
- c) une conduite aspirante (30) associée opérationnellement audit moyen d'enlèvement de matières pour délivrer lesdites matières à un réservoir de stockage de matières (32) comprenant une ouverture pouvant être fermée à des fins de vidage;
- d) un moyen de tamisage (212) afin de séparer l'eau des matières déposées dans ledit réservoir de stockage de matières (32);
- e) un réservoir de stockage d'eau (214) pour stocker l'eau séparée par ledit moyen de tamisage (212);
- f) un moyen de mise en circulation (216) pour délivrer l'eau tamisée provenant dudit réservoir de stockage d'eau (214) à des fins de mélange avec les matières passant par ladite conduite aspirante pour redéposition avec les matières dans le réservoir de stockage de matières (32),
- g) ledit moyen de tamisage (212) comprenant un tamis (206) et son support associé pour le maintenir à un endroit séparant une première zone dudit réservoir de stockage de matières (32), sur le côté en amont dudit tamis (266), d'une seconde zone de ce réservoir à son côté en aval;
- caractérisé en ce que
- h) une ouverture séparée pouvant être fermée de façon hermétique (281, 282) et une fermeture associée sont fournies dans ledit réservoir de stockage de matières (32) dans la zone dudit moyen de tamisage (212), ladite ouverture pouvant être fermée de façon hermétique (281, 283) permettant à un opérateur d'accéder audit moyen de tamisage (212) depuis l'extérieur du réservoir de stockage de matières (32) et permettant d'enlever le tamis (266, 268) de son support à des fins de nettoyage.
2. Véhicule de nettoyage selon la revendication 1, dans lequel deux tamis (266, 268) sont disposés, un tamis étant placé à chaque côté du réservoir de stockage de matières (32).
3. Véhicule de nettoyage selon la revendication 1, caractérisé en ce que ladite fermeture associée est un logement (280) pour recueillir et délivrer l'eau tamisée au réservoir de stockage d'eau (214).
4. Véhicule de nettoyage selon la revendication 3, caractérisé en ce que ledit logement (280) s'étend sur la largeur du véhicule définissant un canal s'étendant dans le sens transversal.
5. Véhicule de nettoyage selon la revendication 1, caractérisé en ce que

un moyen d'assujettissement libérable
pour ledit tamis comprend un moyen pour son at-
tachement/détachement rapide.

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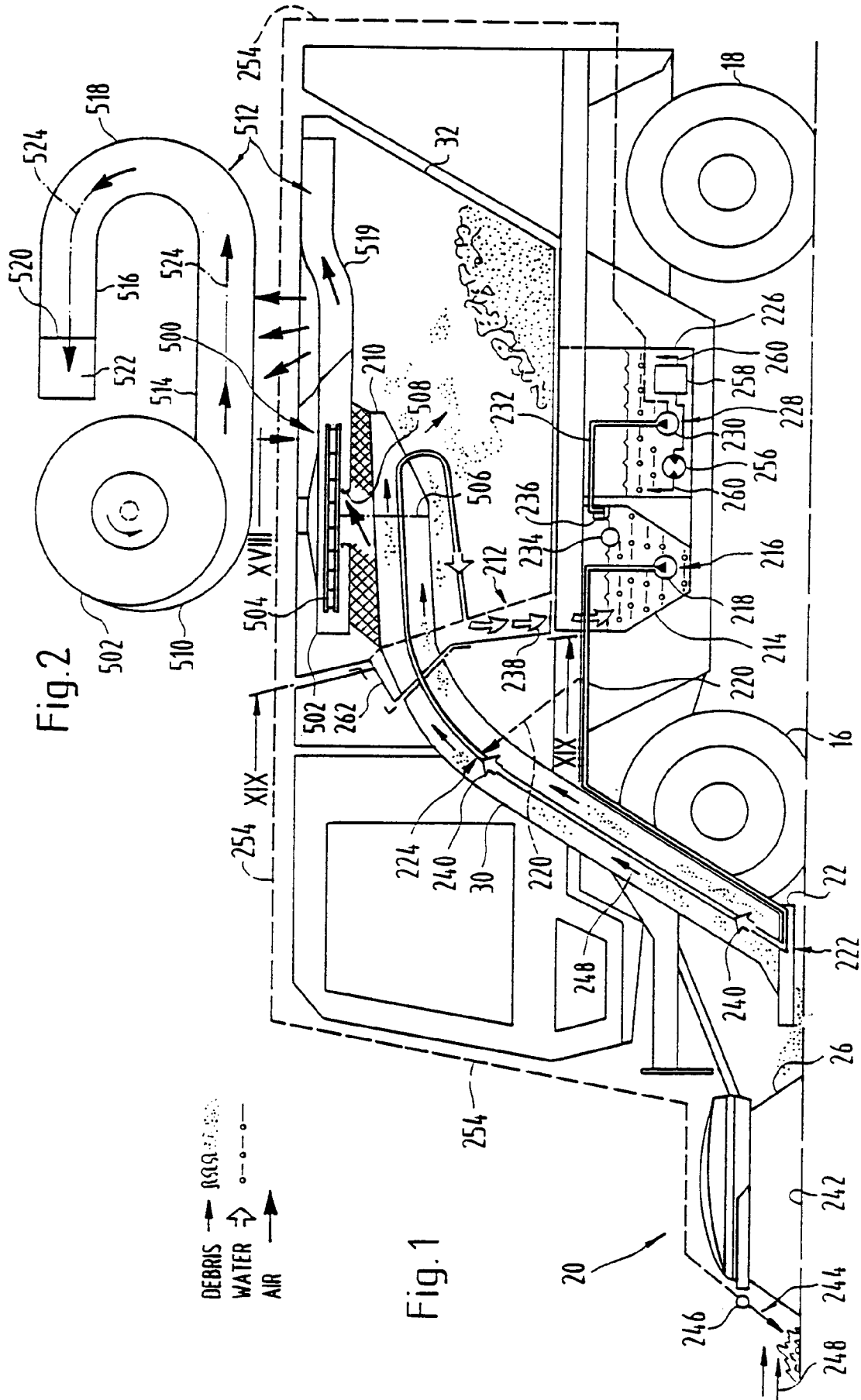
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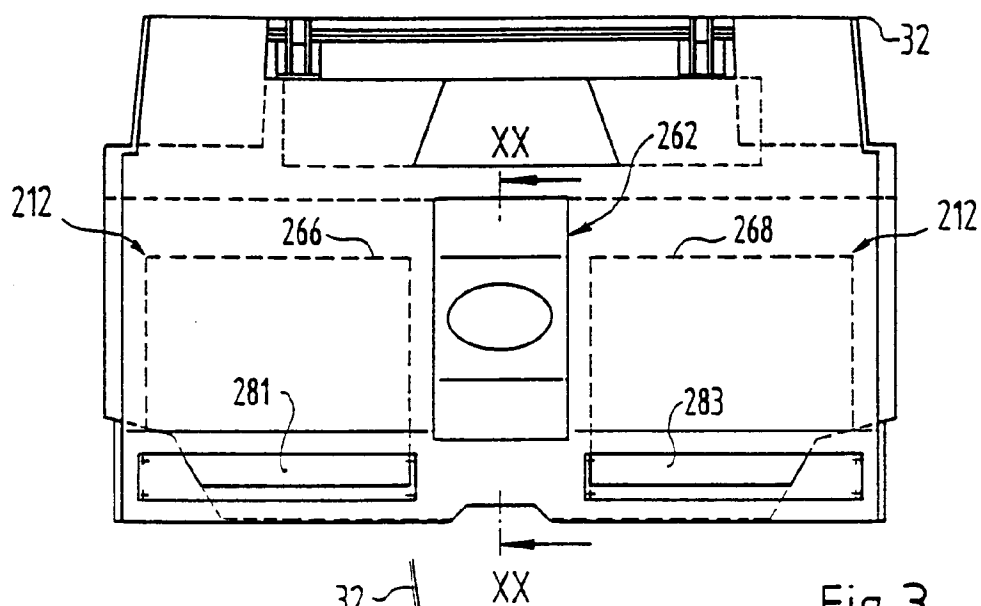


Fig.3

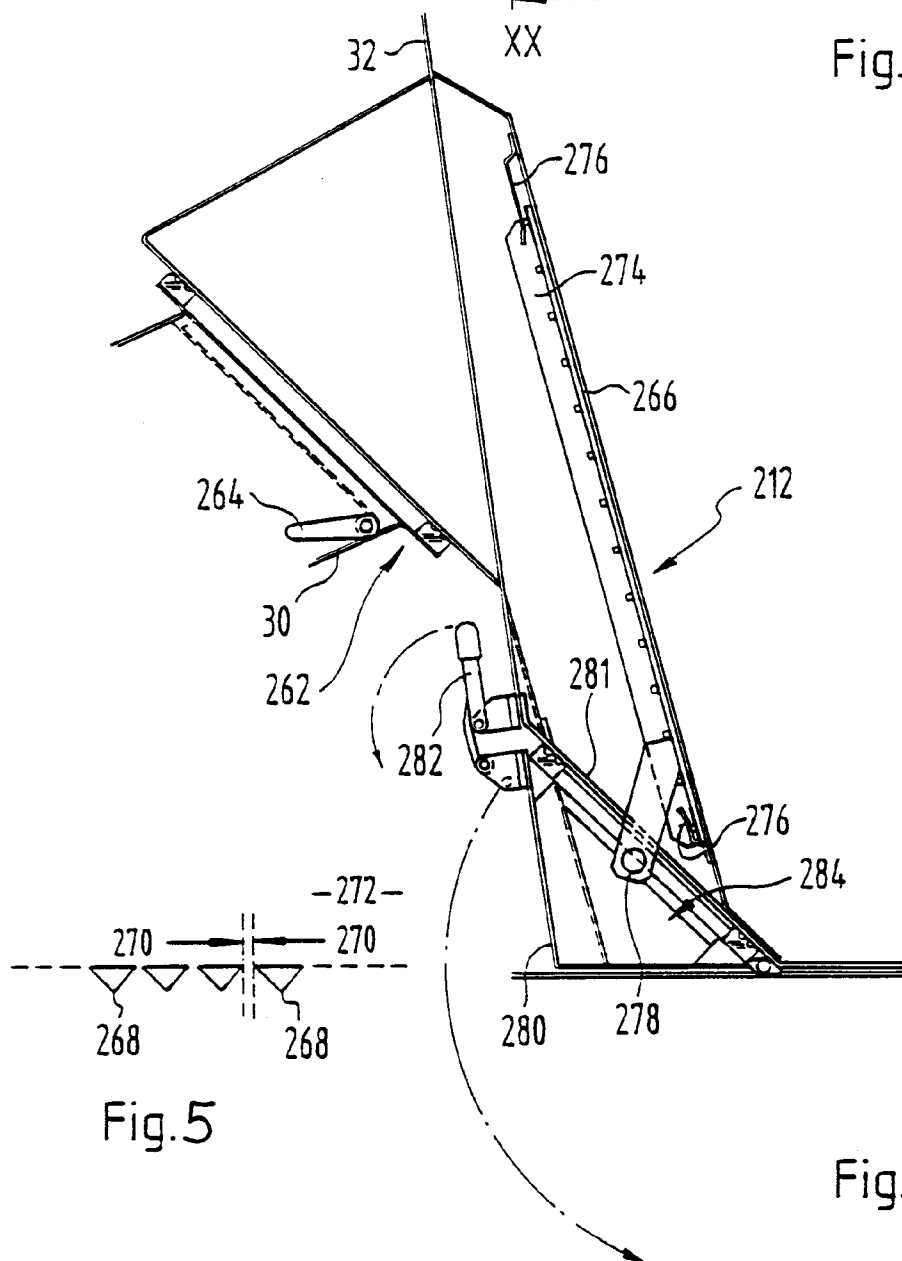


Fig.5

Fig. 4