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(54) **Compactor**

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Compacteur

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(56) References cited:

WO-A-93/01046	DE-U- 9 304 097
GB-A- 1 329 970	GB-A- 2 019 773
NL-A- 8 702 264	US-A- 3 659 427
US-A- 3 945 313	

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Description

This invention relates to a compactor, particularly of the kind used to compress waste material, such as cardboard, to form bales, which are then bound for sub-sequence transport.

Figure 1 shows a prior art arrangement comprising three compaction units 10 side-by-side in a row. Each unit has an open top and an interior compaction chamber 11. Arranged across the respective adjacent top sides of the units 10 are a pair of rails 12 (only one shown), on which is reciprocally arranged a rolling carriage 13. The carriage carries a tank 14 for hydraulic fluid, a motor 15 for supplying and exhausting pressurised hydraulic fluid and, below the tank and motor, a vibratory compactor plate 16 arranged to move down into the compactor chamber 11 of the unit 10 over which the carriage 13 is positioned at any one time. The downward movement of the plate 16 compresses waste material, such as cardboard 17, in the chamber. After the required compressive force has been applied, the plate is raised, by the force of hydraulic fluid, clear of the unit, and the carriage moves along its rails to be over the open top of the next unit, where the compression operation is repeated. The units at which the carriage is not positioned can, during this time, be charged through their respective open tops with waste material to be compressed.

Once a chamber 11 has the required amount of waste material therein, the upward movement of the plate 16 after final compression, is arranged to engage a mechanical mechanism within the chamber, which results in pivotal movement of a base of the unit 10 which forms a floor of the chamber. This tipping is usually carried out after a door of the unit is opened. The tipped bale can then be bound with steel strip or the like prior to final removal from the unit. Removal of the compressed bale would normally be very difficult without this tipping step.

The mechanical mechanism can take several forms, but generally its presence within the chamber provides drawbacks. Firstly it will be appreciated that space must normally be left between at least parts of the periphery of the compactor plate 16 and the internal walls of the chamber to allow the plate to clear the mechanism during normal up and down movement of the plate to compress fresh charges of waste material delivered to the chamber. This reduces the effective compressive area. Secondly this space allows waste material to reach the area above the plate 16 and possibly interfere with the components of the carriage. Thirdly the arrangement allows for tipping, and bale ejection, only at the unit over which the carriage is positioned, even though the compressed material in one or more other units may be ready for ejection.

US-A-3945313 discloses a baler for waste paper having a baling chamber for reception of the waste which is compacted in said chamber by downward movement of a ram. After baling, a bale removal door is

opened and a bale ejector means is manually actuated to tip the bale out of the bale removal door. The ejector means comprise a winch, cable and actuating arm at one side of the baler, and a pivotable rod-like body portion along a front edge thereof, the body portion being connected to the actuating arm at one end and to a bale ejector arm at its other end, the bale ejector arm fitting in a channel in the baling chamber floor so as to eject a bale out of the chamber when the winch is actuated to pivot the body portion.

An object of the invention is to provide a compactor which is improved as compared to said prior art.

According to the invention a compactor comprises a compaction chamber having a floor, inlet means for supplying to said chamber material to be compacted, in use, outlet means through which compacted material can pass from said chamber, in use, a compaction member moveable in said chamber to compress material supplied thereto, at least part of said floor being tip-pable, in use, so as to effect at least part of the passage of compacted material from the chamber, and means for effecting said tipping, said means and said compaction member being mechanically unconnected, characterized in that said means are disposed directly underneath said floor.

Advantageously the compaction member is moveable relative to a single hydraulic unit, the single unit, in use, supplying hydraulic fluid to operate the compaction member and also supplying hydraulic fluid to operate said means for effecting said tipping disposed underneath said floor.

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

Figure 1 shows a prior art arrangement of three compaction chambers with a selectively moveable common compaction member on a carriage which also carries the hydraulics for operating said member;

Figure 2 shows a similar arrangement including a compactor of the invention;

Figure 3 to 5 inclusive show respective alternative means for tipping a floor of a chamber of a compactor of the invention;

Figure 6 is a fragmentary front view of a door latch mechanism of the compactor; and

Figures 7A and 7B are enlarged views on section A-A of Figure 6 showing the closed and open positions of the latch of the compactor door respectively.

Figure 2 shows, like Figure 1 an arrangement of three compaction units 18 arranged side-by-side, with there being a common compactor plate 19 carried by a reciprocally moveable carriage 20 on rails 21 (only one shown) at the respective sides of the open tops of the units 18, which have respective interior compaction chambers 18a.

As described in relation to the Figure 1 prior art arrangement, the carriage is selectively positioned over the top of one unit to constitute a compactor, in that in this state the plate 19 can be operated to move downwardly to compress/compact waste material in the compactor chamber, such as cardboard 17 previously described. After the compacting operation, the compactor plate 19 can be raised to its carriage which can then move on the rails 21 to be positioned over the top of a different one of the units as required.

As described with reference to Figure 1, the tank and motor for hydraulically operating the compactor plate are carried on the carriage and thus move with it. As also mentioned with that prior art arrangement, tipping of the floor is effected as the compactor plate rises after final compaction and mechanically engages a mechanism within the chamber. Set out above are the disadvantages of such a means of tipping the floor.

The compactor shown in Figure 2, for example the right hand unit and associated carriage, is able to overcome the disadvantages referred to.

In particular it will be noted that the hydraulic unit on the carriage in Figure 1, is now separated therefrom, being fixedly secured to a body of the middle unit as shown as 22, for example at the side of one of the rails at the top thereof. Hydraulic fluid flow can take place to and from this unit by a hose dragchain 23 connected between the unit and, for example, hydraulic piston and cylinder means for effecting reciprocable movement of a plate 19 in a vertical plane so that when the carriage is correctly positioned over the open top of one of the units 18, the plate can move down into the chamber of the unit to compact the cardboard and can then move again to its carriage which can then be moved to another unit.

It can also be seen, from Figure 2, that the means for tipping a floor of a compaction chamber are now no longer at least partly within the chamber itself. To this end the units have respective associated pipes 24 extending from the hydraulic unit 22, each pipe extending downwardly from the unit to the underneath thereof to allow actuation directly beneath the tippable floor 25 of a chamber of tipping means which are mechanically unconnected with the compactor plate. Indeed as will be discussed, the tipping operation could be independent of the hydraulic operation of the compactor plate, although normally some means would be arranged so that the tipping means are not actuated until the compactor plate is clear of the chamber, and the door of the compactor is open.

A first embodiment of such tipping means of a compactor of the invention is shown in Figure 3. At the bottom of a unit 18, directly beneath the floor 25, is disposed a hydraulic cylinder 26 with an extensible and retractable piston rod 27. In the embodiment shown the closed end of the cylinder is connected to a bracket 28 connected to a fixed part of the unit 18, and if required this connection can be pivotal. A pair of pipes 24 extend from the hydraulic unit 22 underneath the bottom of the compaction unit 18, and as can be seen in Figure 3, the

pipes are connected with the hydraulic cylinder 26 adjacent opposite ends thereof respectively. The piston rod is connected within the cylinder to a piston, and variable volume chambers are thus defined at opposite sides of this piston within the cylinder, the pipes 24 supplying and exhausting hydraulic fluid respectively to and from these variable volume chambers, so that in use the piston rod can be moved between extended and retracted positions relative to the cylinder.

Pivotaly connected to a further bracket 29 fixedly connected to the bottom of the unit 18 is a bell-crank lever 30 having a short foot part 31 pivotaly connected to the free end of the piston rod and a longer arm part 32 to the upwardly facing surface of which is connected a roller 33. The downwardly facing surface of the floor 25 is provided with a strip of material 34 along which the roller 33 can travel in use, as will be described.

Shown in full in Figure 3 is the position of the bell-crank lever 30 when the floor 25 is in its untipped position, as is the case when the compaction chamber of unit 18 is being filled with cardboard for compression by the compactor plate 19. However, when sufficient cardboard has been compressed, actuation of a pressure and position switch takes place. A door of the chamber is then opened and the compressed material bound as will be described. Operation of a push button raises the plate clear of the chamber, preferably thereby actuating a limit switch as a safety feature. Continued operation or a second operation of the push button then effects tipping of the floor. Thus as mentioned, this final raising of the plate 19 allows actuation of the unit 22 to operate the cylinder 26 and piston rod 27 to tip the floor 25. Commencement of the tipping could however be quite independent of the movement of the plate 19, although it does of course need to be sufficiently clear when tipping commences.

As shown in full in Figure 3, the arm part 32 of the bell-crank lever 30 is horizontal in the normal position of the floor 25, with the roller 33 bearing on the material 34 towards its right hand end. In this position the piston rod 27 is extended, forcing the foot part 31 in a clockwise direction about its pivot. When it is wished to tip the floor about its pivot 35 arranged along one side of the floor, pressurised fluid is supplied to the left hand variable volume chamber of the cylinder 26, with fluid being exhausted from the right hand chamber. This causes retraction of the piston rod 27 and resultant pivoting of the lever 30 about its pivot as the foot part 31 is now moved anti-clockwise about said pivot by the retraction of the rod. The pivoting of the lever 30 results in the arm part 32 itself also moving anticlockwise, this producing a generally upwards force on the underside of the floor 25. The mechanical moments of the connections between the piston rod and the bell-crank lever are such that sufficient force is generated to tip the floor 25 by an angle of, for example, 45°, about its pivot 35 even though a considerable weight of cardboard is being exerted on it. As illustrated in Figure 3, the maximum tipped position of the floor 25 is reached when the rod

27 is fully retracted and the roller 33 has almost reached the opposite end of the track formed by the material 34.

This tipping is normally carried out after a door of a unit 18 is opened, and without this tipping it would be exceedingly difficult to extract a compressed mass of cardboard. Once tipping is complete, the ejection procedure of the compacted material, now bound by steel strip or the like, is completed by removal of the bale of cardboard from the chamber through the door of the unit 18.

During this tipping and ejection operation, the carriage would have been in operation at at least one other unit and it will thus be appreciated that one advantage of the invention is that this tipping can be carried out at one unit whilst compaction can be carried out at another, in that the tipping is now no longer mechanically linked to the compactor plate common to all the units. Once the ejection of a bale has been completed, the hydraulic fluid flow is reversed resulting in the extension of the piston rod, pivoting of the bell-crank lever in the clockwise direction and therefore removal of the tipping force on the floor, which itself thus automatically now returns under its own weight to its normal horizontal position.

It will be appreciated that another advantage of the arrangement of the invention is that the compaction chamber is clear of any obstructions related to the floor tipping mechanism so that no space needs to be left between the periphery of the plate 19 and the interior surfaces of the chamber. Thus not only is better compaction obtained, but the possibility of cardboard reaching the area above the plate is no longer possible. Of course with the present arrangement this would not be such a problem in that the hydraulic unit is now no longer disposed on the carriage immediately above the open top of a unit. It is still however advantageous to prevent cardboard reaching the area above the plate 19 where it might interfere with the wheels of the carriage which travel on the rails 21.

Figure 4 shows an alternative floor tipping arrangement in which the cylinder 26 is connected to the unit 18 somewhat nearer its side and the bell-crank lever 30 is replaced by a scissor or lazy-tongs linkage 36, one free end of which is pivotally attached to the free end of the piston rod 27 and the other end of which is again provided with a roller 33 for engagement against a track formed by a strip of material 34 on the underside of the floor 25. One end of an arm 37 of the linkage is pivotally connected to a depending bracket 38 connected to the unit 18, so that if the rod is extended the linkage is unfolded generating sufficient force as it does so to tip the floor 25 about its pivot 35 in the same way as with the Figure 3 embodiment. Reversal of hydraulic flow to the cylinder 26 will cause retraction of the piston rod and a folding down of the linkage 36 with consequent movement of the floor 25 to its horizontal position.

A yet still further alternative tipping means is shown in Figure 5, where the pipes 24 are connected to a hydraulically operated telescopic lifting jack 39 con-

nected to a bracket 40 fixedly secured to the underside of a unit 18. As will be appreciated, supply of pressurised hydraulic fluid along one of the pipes 24 will cause extension of the various hydraulic sections of the jack with an end finger 41 engaging a track 42 secured to an inner recessed surface at the underside of the floor 25, the finger 41 travelling along this track 42 as the jack sections are extended forcing the floor to pivot about its pivot axis 35 as with the embodiments of Figures 3 and 4. Again reversal of hydraulic flow results in the traction of the jack sections and the return of the floor to horizontal position.

It will be appreciated that although with the embodiments described, the whole of the floor 25 has been tipped, ejection of a compacted member may be possible by tipping only a part of the floor of the chamber. The mechanisms shown in Figures 3 to 5 are of course only examples of mechanisms which could be used.

It will thus be appreciated that by removing the mechanical connection between the floor tipping means and the compactor plate the prior art disadvantages are overcome and the compactor of the invention is more versatile both as a single waste press and also when conventionally used as part of row of units with a single compactor plate. As well as waste cardboard, other waste materials can be compacted, for example plastics materials.

Another problem with prior art compactors of the form shown in Figure 1, relates to the latch provided on the chamber door. The compaction process produces a very large force on said door and with known door latch arrangements it has proved very difficult in practice for operatives, particularly female operatives, to actuate the latch and open the door. Figures 6 and 7 show a solution for overcoming this problem.

Figure 6 shows a door 43 of the chamber of a unit 18 with the door frame being shown at 44. To the outside of the door at its non-hinged vertical edge is attached a latch pin holder 45 from the top and bottom of which extend lateral arms 46, 47 respectively from which extend respective cylindrical latch pins 48, 49, which face each other and have a central common axis along the vertical centre of the adjacent part of the frame 44, these pins being spaced forwardly of the surface of this part of the frame 44, as shown in Figures 7A and 7B. Secured to this vertical part of the frame 44, are a pair of spaced pivot blocks 50, and rotatably carried by said blocks is a latch bar 51. Between the blocks 50, the latch bar is generally of solid cylindrical form with a laterally extending handle 52. The latch bar 51 is of reduced diameter where it passes through the blocks 50, whereas its opposite ends 53 are of hollow cylindrical form, the hollow opening therein being of a diameter slightly greater than the external diameter of the pins 48, 49, with the latch bar 51 being arranged relative to the pins so that the axis of the pins and the hollows in said ends 53 respectively are coaxial.

However each of said ends 53 is cut away through an arc of 180°, the ends of this arc lying in the same

plane as that of the handle 52, as shown in Figures 7A and 7B. Moreover this cutting away extends axially inwards from each end to a position slightly below the respective free ends of the pins 48, 49 when these are arranged coaxially to the latch bar 51 as described. As can be seen from Figure 7A and 7B, the part formed by the cutting away faces the frame when the handle extends across the door 43, and faces away from the frame when the latch bar is rotated through 180° and the handle is thus clear of the door.

It is thus believed clear that with the handle shown in its full position in Figure 6, the door is held closed in that the pins 48, 49, are prevented from moving outwardly in the direction of door opening by the portions of the ends 53 which have not been cut away. Thus the force on the door is taken through the pins bearing on these parts of the ends 53 and thus on to the blocks 50 retaining the latch bar onto the frame. To open the door it is merely necessary for an operator manually to grasp the handle and thereby to rotate the latch bar 51 through 180° so as to move the handle clear of the door. This rotation of the latch bar causes the non-cut away portions of the ends 53 now to lie behind the pins 48, 49, as shown in Figure 7B, whereupon the internal pressure on the door will automatically cause the door now to swing open, to a degree where, if necessary, further manual opening can be accomplished. After bale ejection as described hereinbefore, the door can be pushed shut, with the pins 48, 49, passing through the cut away portions of the ends 53 to the position shown in Figure 7B, whereupon the door can again be latched by rotation through 180° of the handle 52 to the position shown in full in Figure 6.

Accordingly a simple yet convenient and effective latch is provided. It will be appreciated that the pins could instead be on the frame and the latch bar on the door and that only one pin and one latch bar end could be used. More than 180° of arc could be cut away, and opening could be by a minimum of 90° movement of the latch bar.

The latch is intended for use with a compactor of the invention, but could be used independently thereof in any other suitable application.

Claims

1. A compactor comprising a compaction chamber (18a) having a floor (25), inlet means for supplying to said chamber material to be compacted, in use, outlet means through which compacted material can pass from said chamber, in use, a compaction member (19) moveable in said chamber to compress material supplied thereto, at least part of said floor being tippable, in use, so as to effect at least part of the passage of compacted material from the chamber, and means for effecting said tipping, said means for effecting said tipping (30: 36: 39) and said compaction member (19) being mechanically unconnected, characterized in that said means for

effecting said tipping (30: 36: 39) are disposed directly underneath said floor (25).

2. A compactor according to Claim 1, wherein said means for effecting said tipping include a member which is moveable between extended and retracted states, in use, by means of hydraulic fluid, and which in one of said states effects said tipping of said floor (25).
3. A compactor according to Claim 2, wherein said member is a piston rod (27).
4. A compactor according to Claim 3, wherein the piston rod (27) is connected to a pivotally mounted bell-crank lever (30) having means for engaging said floor.
5. A compactor according to Claim 3, wherein the piston rod (27) is connected to a pivotally mounted lazy-tongs linkage (36) having means for engaging said floor.
6. A compactor according to Claim 2, wherein said member is a telescopic lifting jack (39) having means for engaging said floor.
7. A compactor according to any one of Claims 2 to 6, wherein the compaction member (19) is moveable relative to a single hydraulic unit (22) which, in use, supplies hydraulic fluid to operate the compaction member and also supplies said hydraulic fluid to operate said means for effecting said tipping disposed underneath said floor.
8. A compactor according to Claim 7, wherein said single hydraulic unit (22) is fixed to part of a body defining said compaction chamber.
9. A compactor according to any one of the preceding claims, wherein said tipping of said floor is independent of the operation of said compaction member.

Patentansprüche

1. Verdichter, enthaltend eine Verdichtungskammer (18a) mit einem Boden (25), eine Einlaßeinrichtung zum Beschicken der Kammer von im Gebrauch zu verdichtendem Material, eine Auslaßeinrichtung, durch die sich das verdichtete Material im Gebrauch aus der Kammer bewegen kann, ein Verdichtungselement (19), das in der Kammer beweglich ist, um das ihr zugeführte Material zu komprimieren, wobei wenigstens ein Teil des Bodens im Gebrauch gekippt werden kann, um wenigstens einen Teil der Bewegung des verdichteten Materials aus der Kammer zu bewirken, sowie Einrichtungen, die das Kippen bewirken, wobei

diese Einrichtungen (30:36:39), die das Kippen bewirken, und das Verdichtungselement (19) mechanisch nicht verbunden sind, dadurch gekennzeichnet, daß diese Einrichtungen (30:36:39), die das Kippen bewirken, direkt unterhalb des Bodens (25) angeordnet sind.

2. Verdichter nach Anspruch 1, in dem die Einrichtungen, die das Kippen bewirken, ein Element enthalten, das im Gebrauch mittels Hydraulikfluids zwischen einem ausgefahrenen und einem eingefahrenen Zustand beweglich ist und das in einem der Zustände das Kippen des Bodens (25) bewirkt.
3. Verdichter nach Anspruch 2, in dem das Element eine Kolbenstange (27) ist.
4. Verdichter nach Anspruch 3, in dem die Kolbenstange (27) mit einem schwenkbar angebrachten Kniehebel (30) verbunden ist, der eine Einrichtung für den Eingriff mit dem Boden besitzt.
5. Verdichter nach Anspruch 3, in dem die Kolbenstange (27) mit einer schwenkbar angebrachten Scherenspreizvorrichtung (36) verbunden ist, die eine Einrichtung für den Eingriff mit dem Boden besitzt.
6. Verdichter nach Anspruch 2, in dem das Element ein Teleskophubstempel (39) ist, der eine Einrichtung für den Eingriff mit dem Boden besitzt.
7. Verdichter nach irgendeinem der Ansprüche 2 bis 6, in dem das Verdichtungselement (19) relativ zu einer einzelnen Hydraulikeinheit (22) beweglich ist, die im Gebrauch Hydraulikfluid zum Betreiben des Verdichtungselements und außerdem Hydraulikfluid zum Betreiben der unter dem Boden angeordneten Einrichtungen, die das Kippen bewirken, liefert.
8. Verdichter nach Anspruch 7, in dem die einzelne Hydraulikeinheit (22) an einem Teil des die Verdichtungskammer definierenden Körpers befestigt ist.
9. Verdichter nach irgendeinem der vorangehenden Ansprüche, in dem das Kippen des Bodens vom Betrieb des Verdichtungselements unabhängig ist.

Revendications

1. Compacteur comprenant une chambre de compactage (18a) comportant un plancher (25), un moyen d'admission pour amener dans ladite chambre du matériau devant être compacté en service, un moyen d'émission à travers lequel le matériau compacté peut sortir en service de ladite chambre, un élément de compactage (19) pouvant se déplacer dans ladite chambre pour comprimer le matériau

qui y est amené, au moins une partie dudit plancher pouvant être basculé en service, de sorte à établir au moins une partie du passage du matériau compacté sortant de la chambre, et des moyens pour assurer ledit basculement, lesdits moyens destinés à assurer ledit basculement (30: 36: 39) et ledit élément de compactage (19) n'étant pas connectés mécaniquement, caractérisé en ce que lesdits moyens destinés à assurer ledit basculement (30: 36: 39) sont agencés directement au-dessous dudit plancher (25).

2. Compacteur selon la revendication 1, dans lequel lesdits moyens destinés à assurer ledit basculement englobent un élément pouvant se déplacer en service entre des états d'extension et de retrait, par l'intermédiaire d'un fluide hydraulique, et assurant dans l'un desdits états ledit basculement dudit plancher (25).
3. Compacteur selon la revendication 2, dans lequel ledit élément est une tige de piston (27).
4. Compacteur selon la revendication 3, dans lequel la tige de piston (27) est connectée à un levier coudé monté par pivotement (30), comportant un moyen destiné à s'engager dans ledit plancher.
5. Compacteur selon la revendication 3, dans lequel la tige de piston (27) est connectée à un mécanisme de liaison à pinces, monté par pivotement (36), comportant un moyen destiné à s'engager dans ledit plancher.
6. Compacteur selon la revendication 2, dans lequel ledit élément est un vérin télescopique (39), comportant un moyen destiné à s'engager dans ledit plancher.
7. Compacteur selon l'une quelconque des revendications 2 à 6, dans lequel l'élément de compactage (19) peut se déplacer par rapport à une seule unité hydraulique (22), amenant en service du fluide hydraulique pour actionner l'élément de compactage et amenant également ledit fluide hydraulique pour actionner lesdits moyens destinés à assurer ledit basculement, agencés au-dessous dudit plancher.
8. Compacteur selon la revendication 7, dans lequel ladite seule unité hydraulique (22) est fixée à une partie d'un corps définissant ladite chambre de compactage.
9. Compacteur selon l'une quelconque des revendications précédentes, dans lequel ledit basculement dudit plancher est indépendant de l'actionnement dudit élément de compactage.

FIG 1

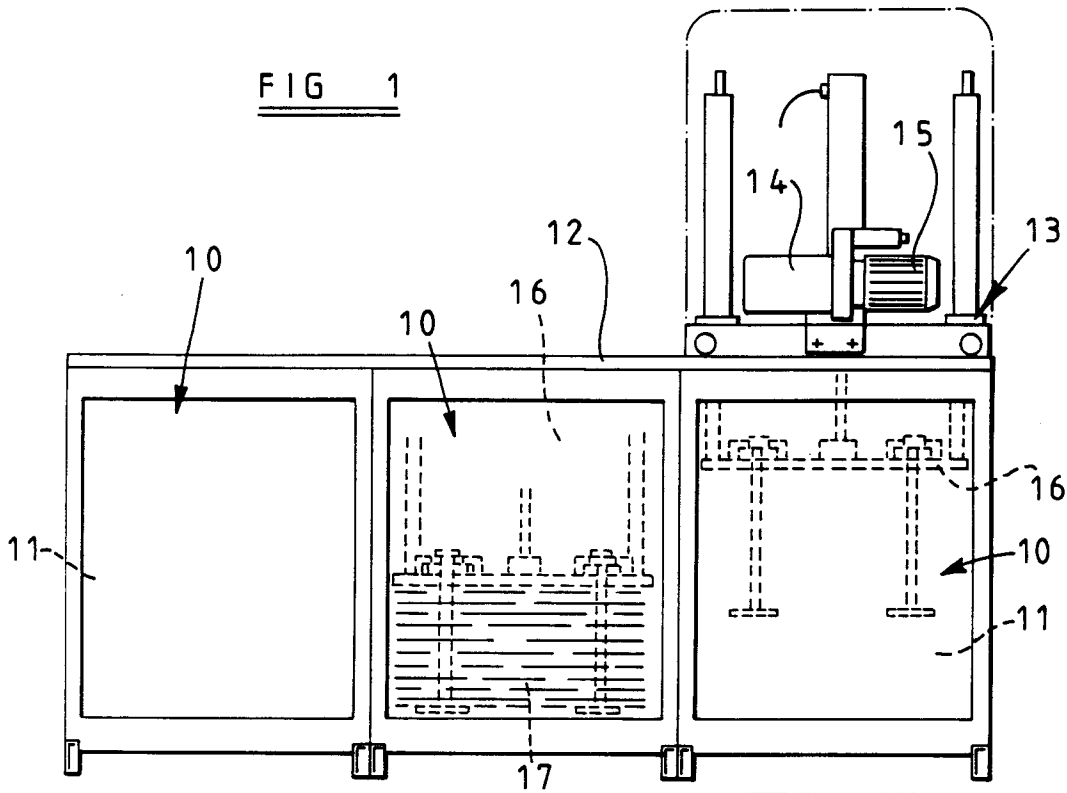


FIG 2

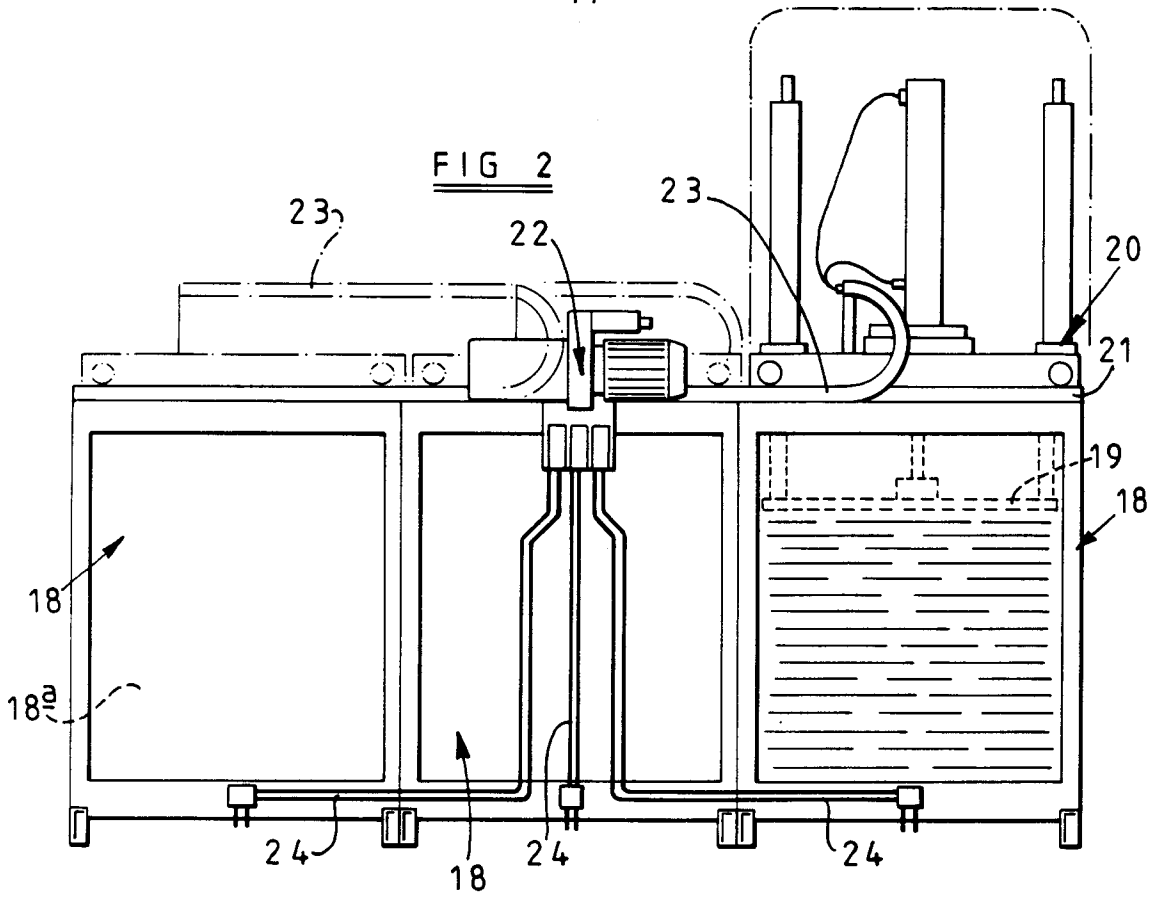


FIG 3

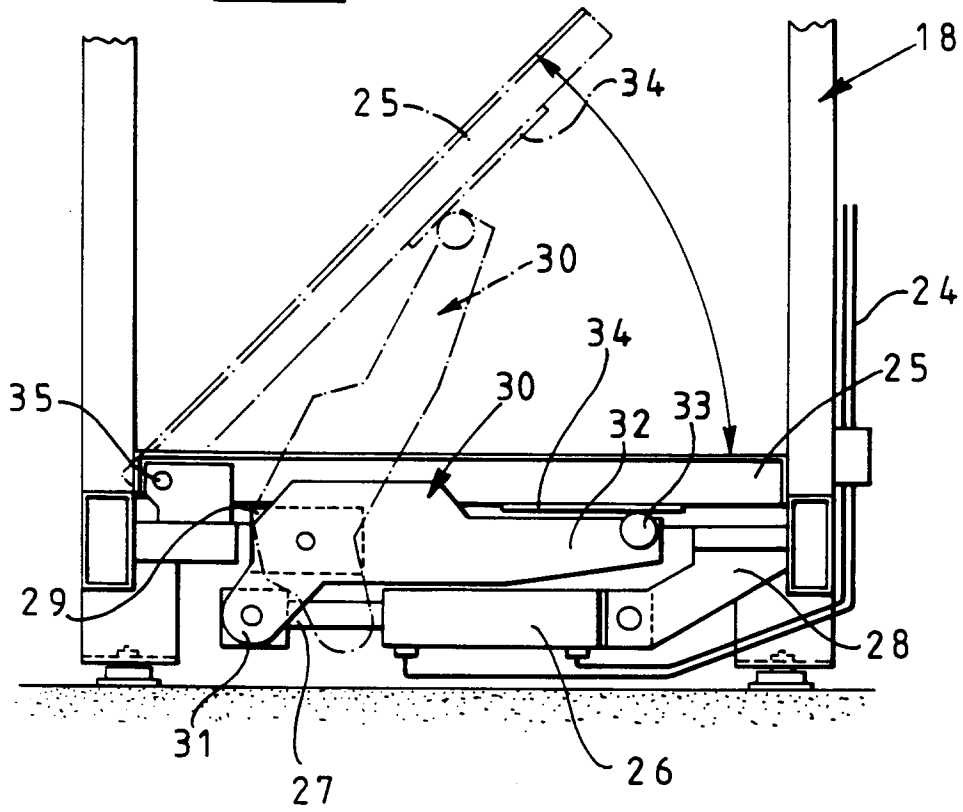


FIG 4

