(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 193 497**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of the patent specification: **06.06.90**

(51) Int. Cl.[5]: **B61D 7/26**

(21) Application number: **86830029.4**

(22) Date of filing: **11.02.86**

(54) **Hopper car with multiple bins having separate discharge drives.**

(30) Priority: **12.02.85 IT 1947585**

(43) Date of publication of application:
03.09.86 Bulletin 86/36

(45) Publication of the grant of the patent:
06.06.90 Bulletin 90/23

(84) Designated Contracting States:
AT BE CH DE FR GB LI

(56) References cited:
DE-C- 160 913
DE-C- 491 984
FR-A- 529 809
FR-A- 2 289 381
IT-A- 1 161 127
US-A- 3 587 475

(73) Proprietor: **S.p.A. CASSEFORME METALLICHE E AFFINI S.A.C.M.A., Via XX Settembre, 24, I-20123 Milano(IT)**
Proprietor: **SAEM S.p.A., Via Guglielmo Saliceto, 8, Roma(IT)**

(72) Inventor: **Miniotto, Pietro, c/o S.A.C.M.A. Via XX Settembre, 24, Milano(IT)**
Inventor: **Rendo, Ugo, c/o SAEM Via Guglielmo Saliceto, 8, Roma(IT)**

(74) Representative: **Raimondi, Alfredo, Dott. Ing. Prof. et al, Studio Tecnico Consulenza Brevetti Piazzale Cadorna 15, I-20123 Milano(IT)**

EP 0 193 497 B1

Description

Bulk cargos such as coal, gravel, sand cargos and the like are normally transported by rail in hopper cars; such cars are usually fitted with two separate bins for loading, while the discharge of the materials contained therein is effected by gravity through two large side hatches for each bin, wherein the hatches are opened by drive means into dump pits.

Such dump pits, however, often do not present dimensions wide enough to collect the material discharged along the entire length of the car; therefore there is the need to effect separately the discharge of the bins of the car, separately opening the correspondent hatches.

For this purpose cars have been realized having separate release drives for each couple of hatches, but with these cars the operator must go round the car to reach the drive means from ground, because it is not possible to effect the complete operation from the control platform of the car.

The same owners of the present invention are owner of the Italian Patent No 1 161 127 in which a car has been provided, having independent drive means for the hatches which can be actuated from the control platform, but the car, however, cannot be operated from earth at both ends and it is also fitted with a complex mechanism for operating the opening devices.

A further requirement relates to the necessity, in case of improper functioning of the drive and transmission means, of avoiding the unintentional opening of a pair of hatches which are out of the discharge area at the same time of, or instead of the hatches whose opening has been operated.

From FR-A 2 289 381 a railway hopper car is known, corresponding to the first part of claim 1, with bilateral gravity discharge, comprising a container body having separate loading bins, each of these bins being provided with two openings on the opposite sides of the car, which may be closed by means of hatches hinged at their upper side, fitted with a plurality of locking hooks along the lower border; these hooks are fixedly carried by a shaft which is rotatively supported on the body of the car, which shaft can be rotated for unlocking the opening of the relative hatch by means of a mechanical transmission lever mechanism.

The operation for unlocking the hatch is effected operating the mechanism at the corner of the car near the hatch to be opened; this means that the operator has to walk around the car to open consecutively all the hatches for discharging the material contained in the car.

The safety against accidental openings of the hatches is granted by a spring loaded cam means, while no means is provided to signal the open position of the hatches.

US-A 3 587 475 discloses a hopper car having doors which open in the bottom of the car, which are operated for the opening by means of selector mechanisms; these mechanism, however, are located on the two sides of the car, so that the operator must go around the car to set the selector of the doors to be opened; the doors are opened by pulling chains and are closed by gravity, without locking means, and no means is provided signalling the opening of the doors.

The technical problems above cited are solved, as it will be apparent from the following description, by the present invention, which provides a railway hopper car with bilateral gravity discharge, comprising a container body formed by two or more consecutive, separate loading bins, each of these bins being provided with two openings on the opposite sides of the car, which may be closed by means of hatches hinged at their upper side, each of the hatches being fitted with a plurality of locking hooks along the lower border, the hooks being fixedly carried by a shaft which is rotatively supported on the body of the car; the shafts carrying the locking hooks relative to the hatches of each of the loading bins being arranged to rotate, at choice, for unlocking the opening of the hatches by means of mechanical transmission lever mechanisms, characterized in that the mechanisms comprise a reduction gear of the irreversible type which is hand-controlled by means of shanks accessible from ground which are directly connected to the reduction gear and, in addition, by means of a handwheel which may be connected to the reduction gear through a mechanical transmission comprising a selector capable of rotationally coupling to the handwheel the reduction gear corresponding to the couple of hatches whose opening has been selected; the locking hooks being provided with means apt to hinder the complete self-closing of the hatches by gravity; there being provided, moreover, means which may be actuated through the reduction gear, by means of the shanks or the handwheel, for the driven opening of the hatches and also means for signalling the opening of the selected couple of hatches, which are actuated by the mechanical transmission lever mechanisms.

In particular, the lever mechanisms comprise a rocker keyed to the output or slow shaft of the reduction gear, at the ends of which there are hinged the extremities of two connecting rods which are, at the opposited extremities, hinged to two arms joined to the shafts carrying the locking hooks, wherein the rotation in one direction of the rocking lever is transmitted to the arms through the connecting rods, so as to cause rotation of the shafts in the sense suitable to disengage the locking hooks from the hatches, and in the opposite sense so as to cause the clamp of the hatches by means of the locking hooks.

For a greater closure safety, when the locking hooks are in position of clamping the hatches, the axis of the rocker intersects the action axis of both the connecting rods or is laying beyond the axis, in the closing direction.

The handwheel may be connected, through the selector and possible transmission shafts, to every reduction gear actuating the couple of hatches of each separate bin of the car; therefore, it is possible, by this way, to operate the opening of the selected couple of hatches by means of the handwheel itself.

At least one of the locking hooks of each hatch is provided with a hindering foot which projects upwards, beyond the edge of the hooks, and interfers with the opening path of the hatches when the hooks are in a first rotation position apt to free the hatches, the foot being free to rotate in the sense of the opening and rotationally blocked in the opposite sense, being capable in such rotation position of the hooks of non hindering the hatches from a free opening and at the same time, however, hindering them from a total closure movement, whereas a further rotation of the shafts carrying the locking hooks bears the hindering foot, or feet, out of the movement path of the hatches, thereby making their closing possible.

The means for driving the opening of the hatches consist of shaped arms fixedly joined to the shafts which carry the locking hooks, having at their ends rollers suitable to act against sliding blocks linked to the flanks of the hatches when the shafts are rotated in the opening sense beyond the unlocking point of the locking hooks and the hindering feet.

The means signalling the opening of the hatches consist of two flags for each couple of hatches, which can rotate between a position enclosed in the side shape of the car and a position projecting from same; the flags being rotationally driven by connecting rods and cranks actuated by a staff hinged to a swivelling block which by gravity maintains the flags projecting out of the car shape, there being provided an arm joined rotationally to the rocker, suitable to act on the swivelling block when the rocker is rotated into the closing position, beyond the intersection position of its rotational axis with the action axes of the connecting rods.

Conveniently, the selector is formed by a bilateral clutch which is rotationally joined, through a chain transmission or the like, to the handwheel and may be rotationally coupled, through a control lever, either with a corresponding clutch carried by a transmission shaft connected to a reduction gear relative to a couple of hatches located remote from the handwheel, or to a transmission shaft connected to a reduction gear relative to a couple of hatches located adjacent to the car head carrying the handwheel; the transmission shafts being independently supported by self-lubricating bushes carried by separate supporting elements and both being fixed to the car structure, so that the possible seizing of a bush may not bring the non selected shaft into rotation.

A more detailed description is following, with reference to the accompanying drawings in which:

Figure 1 is an assembly view of a car equipped with the discharge drives of the hatches according to the invention,

Figure 2 is a plan schematic representation of the hatches,

Figure 3 is a view of a car end, having the hatches in the closed position,

Figure 4 shows the view of figure 3 having the hatches in the opening phase,

Figure 5 shows the control levers of the flags signalling the opening of the hatches,

Figure 6 is the view of figure 3 with the hatches in driven opening condition,

Figure 7 is a side view of the opening selector, partially in section,

Figure 8 shows the selector of figure 7 in a view from the top.

As shown in fig. 1, a hopper car is usually formed by a body 1 subdivided into two bins 2, 3 separated by a wall 4. Inside of the loading bins there is provided a prismatic element 5, whose contour is dash-lined in the figure, having two oblique surfaces suitable to convey the contained material towards the couples of hatches 6, 7, relative to the front bin 2 and the back bin 3 respectively, with reference to the control platform 8 of the car.

The hatches 6, 7 are hinged, adjacent to their upper side, to the body 1 of the car, as shown in figure 1 and their center of gravity is so provided that they may rest in closure position by effect of their own weight.

The clamp of the hatches 6,7 in the closure position capable of standing the thrust of the material contained in the car is assured by a plurality of locking hooks 9,9a, supported by shafts 10, located below the lower border of the hatches, at the two opposite sides of the car.

The opening of the hatches, for enabling to discharge the material contained in one of the two bins 2,3 of the car, is caused by the thrust of the material itself which flows along the oblique flanks of the inner prismatic element 5 when the shafts 10, carrying the locking hooks 9,9a relative to the couple of hatches whose opening has been selected, are rotated of an angle sufficient to disengage the hooks 9,9a from the border of the hatches (see fig. 3 and 4).

Rotation of the shafts 10 is achieved by means of a drive group, as illustrated in figure 2 in schematic form and partially visible in transparence in figure 1, wherein the drive group is represented by thick lines whereas the external shape of the car is represented by thin lines; it comprises a handwheel 11 connected through a chain 12 to a selector 13 suitable to select the pair of hatches, in the front or back side, which are to be opened.

The selector 13 may, in fact, connect the handwheel 11, through the gear wheels 15, 16 and a second transmission chain 17, to a shaft 18 that is in turn connected, through a bevel gears pair 19, to the input or quick shaft of a reduction gear 20 or to the cardanic transmission shaft 14, which is coupled, at the opposite end of the car, to a second bevel gears pair 19a and to a second reduction gear 20a.

The output shaft of the reduction gears 20 and 20a carries a rocker 21, at the ends of which are connected the shaped connecting rods 22, 23 which are pivoted at their end on the arms 24 joined to the shafts 10 carrying the hooks 9, 9a.

The rotation of the rocker 21 in the sense indicated by the arrow F of fig. 4, driven by the handwheel 11 via the selector 13 and the reduction gear 20 (or the reduction gear 20a relatively to the position of the selector) causes, therefore, through the con-

necting rods 22, 23, the rotation of the couple of shafts 10 selected and relative hooks 9, 9a until the lower border of the hatches 6 (or 7) disengages itself, the hatches becoming thus free to open under the thrust of the contained material, by rotating about their own axes, being restrained by opening limit rods 26, 27 which are hinged to each other.

The locking hooks 9, arranged in middle position along the border of the hatches 6, 7 are shaped as shown in the left side of figure 3; the end locking hooks 9a are shaped as illustrated in the right portion of figure 3 and also in figures 4 and 5, and exhibit a projecting part which carries a pivot 28 about which the hindering foot 29 may swivel, being fitted with a counterweight 30 and resting against the stop pin 31.

In the opening phase the hindering foot 29 does not represent an obstacle to the hatches movement as it is free to swivel about the pivot 28 under the thrust of the hatches themselves, as shown by dot-and-dash line in the right part of fig. 4; in the closing phase of the hatches, under the action of their own weight, when the thrust produced by the flowing material is lowering, the hindering feet 29 blocks the hatches themselves in partial opening position, as shown by a dot-and-dash line in the left part of fig. 4, because their rotation in the sense given by the thrust of the hatches in closing phase is blocked by the stop pins 31, so as to enable the total discharge of the car; the complete closing is therefore made possible by a further rotatation of the rocker 21 only, in the sense indicated by the arrow F of fig. 4, so as to bring the hindering foot 29 below the lower border of the hatches 6 (or 7).

The input shafts to the reduction gears 20, 20a are besides connected with the shanks 32 for operation from earth,
by which it is possible to carry out the operation of opening the hatches from earth; this operation is only possible when the selector 13 is in idle position, as the reduction gears 20, 20a are of the irreversible type, for example an endless screw, in order to prevent the handwheel 11 from being unvoluntarily brought into rotation by actuating the shanks 32, thus with danger of accident for a person casually staying on the platform in same moment.

The opening of the hatches is associated with a signal constituted by flags 33 which are projecting from the car shape, as shown in fig. 1 and 3, when the lever mechanisms for driving the hatches have been removed from their safety block position.

The closing position, in fact, wherein the hooks 9, 9a lock the hatches, as shown in fig. 3, presents the rotation axis of the rocker 21 placed on the action axis of the connecting rods 22, 23 coupling the corresponding linking axes of the connecting rod itself with the rocker 21 and the arms 24.

Such position, representing a dead point, is not stable and the complete closure is therefore achieved through a further rotation of the rocker 21, according to the arrows G, shown in fig. 5, bringing it beyond the dead point, thanks to the resilience of connecting rods 22, 23, into a firmly closed position.

The signalling flags 33 are carried by the supports 34 swivelling about the pivots 35; the supports 34 are also fitted with levers 36, one of which is connected with a staff 37, hinged to a heavy block 38, which is swivelling about the pivot 39. A connecting rod 140, curved for space reasons, joins the ends of the levers 36, thus enabling a joined movement of the two flags 33 at both sides of the car.

On the ouput shaft of reduction gears 20, 20a, besides the rocker 21, there is linked an arm 40 which carries a pin 41 suitable to come into contact with the pivot 42 of the block 38 when the rocker 21 is rotated into the position of fig. 3, i.e. corresponding to the dead point; in this phase, therefore, the flags 33 are still in opening position, as shown in figure.

Only a conclusive rotation of the rocker 21 together with the arm 40 rotationally joined to it, causes the pin 41 to act against the pivot 42, producing rotation of block 38 in the sense of the arrow H and, through the staff 37 and the connecting rod 140, rotation of the flags 33 into the closure position, as shown in figure 5.

In order to enable the opening of the hatches, also when there is no material to discharge, i.e. for maintenance servicing and the like, or when the thrust of the material contained in the car is not sufficient, the shafts 10 carry, in correspondence to the extremities of the hatches 6, 7, the shaped arms 43, having an end roller 44 suitable to act against the sliding blocks 45 linked to the flanks of the hatches 6, 7.

Then, going on with the opening movement, by rotating the rocker 21 in the sense indicated by the arrow F, the hatches are pushed into the opening position, as shown in figure 6, and firmly kept in this position.

In fig. 7 and 8 the selector 13 is illustrated in a preferred embodiment.

It comprises the gear wheel 15, joined to the front clutch 46, rotatively supported through the self-lubricating bushes 47 on the hollow support housing 48 linked to the car structure; inside of the hollow housing 48 the shaft 51 may rotate on the self-lubricating bushes 49, 50, the shaft 51 carrying at one end the keyed gear wheel 52 for coupling with handwheel 11, and at the other end the rotatively joined and axially moveable bilateral coupling element 53, on the front of which, at the opposite side with regard to the frontal clutch 46, there is located the frontal clutch 54 linked with the shaft 55.

The shaft 55 is carried by the bush support 56 and is connected at its end with the cardanic shaft 14.

The bilateral coupling element 53 may be brought into the position of engagement with the frontal coupling 46 or with the frontal coupling 54, or maintained in a middle position, or "idle" position, through the lever 57 having three fixed stop positions which may be disengaged through the knob 58, as shown by dash-and-dot line in figure 7.

The selector 13 keeps the shaft 55 and the gear wheel 15 separated and independent; in this way, it is not possible that, in case of seizing of the self-lubricating bushes supporting the rotary elements, a

non selected couple of hatches is also brought into rotation, as it would occur if the gear 15 were supported by bushes placed directly on the shaft 51, in case of seizing and blocking of the bushes.

The opening limiting rods 26, hinged at one end of the car structure, present a curvilinear shape; such a shape serves to establish a free space between the car wall and the surface of the rod 26 which is substantially larger than the maximum size of the transported material; this to the aim of assuring that possible material deposited on the surface of the rods may not remain closed, during unloading, between the same and the car, thus hindering a complete closing movement of the hatches.

A curvilinear conformation, for the same above mentioned purpose, is provided for the arms 24 too, which, as they are also located in the area subject to material flowing, have not to be in condition of holding back some material against the car wall, what would hinder the hooks 9, 9a from their complete closing movement causing the clamp of the hatches.

Therefore, the opening mechanism according to the present invention proves to be especially safe and reliable, besides economically convenient, since the transmissions and selection of the hatches to be opened are carried out at high speed, upstream to the reduction gears and consequently with low driving torques.

The car structure may be built according to the known art; it has, therefore, not to be described here in detail.

Claims

1. A railway hopper car with separate bins having bilateral gravity discharge, comprising a container body formed by two or more consecutive, separate loading bins, each of these bins being provided with two openings on the opposite sides of the car, which may be closed by means of hatches hinged at their upper side, each of the hatches being fitted with a plurality of locking hooks along the lower border, the hooks being fixedly carried by a shaft which is rotatively supported on the body of the car; the shafts carrying the locking hooks relative to the hatches of each of the loading bins being arranged to rotate, at choice, for unlocking the opening of the hatches by means of mechanical transmission lever mechanisms, characterized in that the mechanisms comprise a reduction gear of the irreversible type which is hand-controlled by means of shanks accessible from ground which are directly connected to the reduction gear and, in addition, by means of a handwheel which may be connected to the reduction gear through a mechanical transmission comprising a selector capable of rotationally coupling to the handwheel the reduction gear corresponding to the couple of hatches whose opening has been selected; the locking hooks being provided with means apt to hinder the complete self-closing of the hatches by gravity; there being provided, moreover, means which may be actuated through the reduction gear, by means of the shanks or the handwheel, for the driven opening of the hatches and also means for signalling the opening of the selected couple of hatches, which are actuated by the mechanical transmission lever mechanisms.

2) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claim, characterized in that the lever mechanisms comprise a rocker keyed to the output or slow shaft of the reduction gear, at the ends of which there are hinged the extremities of two connecting rods which are, at the opposite extremities, hinged to two arms joined to the shafts carrying the locking hooks, wherein the rotation in one direction of the rocking lever is transmitted to the arms through the connecting rods, so as to cause rotation of the shafts in the sense suitable to disengage the locking hooks from the hatches, and in the opposite sense so as to cause the clamp of the hatches by means of the locking hooks.

3) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claims, characterized in that the axis of the rocker intersects the action axis of both the connecting rods or is laying beyond the axis, in the closing direction.

4) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claims, characterized in that the handwheel may be connected, through the selector and possible transmission shafts, to each reduction gear actuating the couple of hatches of each separate bin of the car.

5) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claims, characterized in that at least one of the locking hooks of each hatch is provided with a hindering foot which projects upwards, beyond the edge of the hooks, and interfers with the opening path of the hatches when the hooks are in a first rotation position apt to free the hatches, the foot being free to rotate in the sense of the opening and rotationally blocked in the opposite sense, being capable in such rotation position of the hooks of non hindering the hatches from a free opening and at the same time, however, hindering them from a total closure movment, whereas a further rotation of the shafts carrying the locking hooks bears the hindering foot, or feet, out of the movement path of the hatches, thereby making their closure possible.

6) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claims, characterized in that the means for driving the opening of the hatches consist of shaped arms fixedly joined to the shafts which carry the locking hooks, having at their ends rollers suitable to act against sliding blocks linked to the flanks of the hatches when the shafts are rotated in the opening sense beyond the unlocking point of the locking hooks and the hindering feet.

7) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claims, characterized in that the means signalling the opening of the hatches consist of two flags for each couple of hatches, which can rotate between a position enclosed in the side shape of the

car and a position projecting from same; the flags being rotationally driven by connecting rods and cranks actuated by a staff hinged to a swivelling block which by gravity maintains the flags projecting out of the car shape, there being provided an arm joined rotationally to the rocker, suitable to act on the swivelling block when the rocker is rotated into the closing position, beyond the intersection position of its rotational axis with the action axes of the connecting rods.

8) A railways hopper car with separate bins having bilateral gravity discharge according to the preceding claims, characterized in that the selector is formed by a bilateral clutch which is rotationally joined, through a chain transmission or the like, to the handwheel and may be rotationally coupled, through a control lever, either with a corresponding clutch carried by a transmission shaft connected to a reduction gear relative to a couple of hatches located remote from the handwheel, or to a transmission shaft connected to a reduction gear relative to a couple of hatches located adjacent to the car head carrying the handwheel; the transmission shafts being independently supported by self-lubricating bushes carried by separate supporting elements and both being fixed to the car structure, so that the possible seizing of a bush may not bring the non selected shaft into rotation.

Patentansprüche

1. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung, umfassend ein Behälter-Hauptteil, das von zwei oder mehr hintereinander angeordneten, getrennten Ladebehältern gebildet ist, von denen jeder auf den entgegengesetzten Wagenseiten mit zwei Öffnungen versehen ist, die mittels oben angelenkter Türen verschlossen werden können, wobei jede Tür am unteren Rand eine Vielzahl von Sperrhaken aufweist, die auf einer am Wagenhauptteil drehbar gelagerten Welle befestigt sind, wobei die Wellen, welche die den Türen jedes der Ladebehälter entsprechenden Sperrhaken tragen, so angeordnet sind, daß sie zum Freigeben der Öffnung der Türen mittels mechanischer Übertragungs-Hebelgetriebe nach Belieben gedreht werden können, dadurch gekennzeichnet, daß die Getriebe ein selbsthemmendes Untersetzungsgetriebe umfassen, das vom Boden her mittels mit dem Untersetzungsgetriebe direkt verbundener Stangen und außerdem mittels eines Handrades manuell betätigbar ist, das mit dem Untersetzungsgetriebe über eine mechanische Übertragungsleitung verbunden werden kann, die eine Wählvorrichtung umfaßt, welche das Handrad durch Drehen mit dem Untersetzungsgetriebe zu kuppeln vermag, das dem Türenpaar entspricht, dessen Öffnung gewählt wurde, wobei die Sperrhaken mit Mitteln versehen sind, welche das selbsttätige vollständige Schließen der Türen durch Schwerkraftwirkung zu verhindern vermögen, dabei ferner mittels der Stangen oder des Handrades über das Untersetzungsgetriebe betätigbare Einrichtungen zum angetriebenen Öffnen der Türen und auch Einrichtungen zum Anzeigen der Öffnung des gewählten Türenpaares vorgesehen sind, die durch das mechanische Übertragungs-Hebelgetriebe betätigt werden.

2. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß dem vorhergehenden Anspruch, dadurch gekennzeichnet, daß die Hebelgetriebe ein mit der Abtriebs- oder langsamlaufenden Welle des Untersetzungsgetriebes fest verbundenes Schwenkstück umfassen, an dessen Enden die Enden von zwei Verbindungsstangen angelenkt sind, welche an den entgegengesetzten Enden mit zwei Armen gelenkig verbunden sind, die mit den die Sperrhaken tragenden Wellen verbunden sind, wobei die Drehung des Schwenkhebels in einer Richtung über die Verbindungsstangen so auf die Arme übertragen wird, daß die Wellen in der Richtung gedreht werden, die zum Lösen der Sperrhaken von den Türen geeignet ist, und in der entgegengesetzten Richtung das Zudrücken der Türen mittels der Sperrhaken hervorruft.

3. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß die Achse des Schwenkstücks durch die Wirkungsachse beider Verbindungsstangen geht oder in Schließrichtung jenseits der Achse liegt.

4. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß das Handrad über die Wählvorrichtung und mögliche Übertragungswellen mit jedem das Türenpaar jedes getrennten Behälters des Wagens betätigenden Untersetzungsgetriebe verbunden werden kann.

5. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß von jeder Tür wenigstens einer der Sperrhaken mit einem Sperrstück versehen ist, das über den Rand des Hakens nach oben hinaus- und in die Öffnungsbahn der Türen hineinragt, wenn die Haken eine erste Drehstellung, in der sie die Türen freizugeben vermögen, einnehmen, wobei das Sperrstück in der Öffnungsrichtung frei drehbar und in der Gegenrichtung drehblockiert ist, dabei in dieser Drehstellung der Haken in der Lage ist, die Türen am freien Öffnen nicht zu behindern und doch zur gleichen Zeit an einer Bewegung in die vollständige Schließstellung zu hindern, wogegen durch Weiterdrehen der die Sperrhaken tragenden Wellen das Sperrstück oder die Sperrstücke aus der Bewegungsbahn der Türen herausbewegt werden und dadurch deren Schließen möglich machen.

6. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß die Einrichtung zum Antreiben der Öffnung der Türen aus Form-Armen besteht, die mit den die Sperrhaken tragenden Wellen fest verbunden sind, wobei sie an ihren Enden mit Rollen versehen sind, die gegen mit den Türflanken verbundene Schiebeblöcke zu wirken vermögen, wenn

die Wellen in der Öffnungsrichtung über den Punkt hinaus gedreht werden, in dem die Sperrhaken und das Sperrstück freigeben.

7. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß die Einrichtungen zum Anzeigen der Öffnung der Türen aus zwei Flaggen für jedes Türenpaar bestehen, die zwischen einer Stellung innerhalb des Seitenprofils vom Wagen und einer aus diesem herausragenden Stellung schwenkbar sind, wobei die Flaggen durch Verbindungsstangen und Kurbeln schwenkangetrieben werden, die mit einer Stange betätigt werden, welche an einen Schwenkblock angelenkt ist, der durch Schwerkraftwirkung die Flaggen in der aus dem Wagenprofil herausragenden Stellung hält, wobei mit dem Schwenkstück ein Arm drehbar verbunden ist, der auf den Schwenkblock zu wirken vermag, wenn das Schwenkstück in der Schließrichtung über den Schnittpunkt seiner Drehachse mit den Wirkungsachsen der Verbindungsstangen hinaus gedreht wird.

8. Eisenbahn-Trichterwagen mit getrennten Behältern mit beidseitiger Schwerkraft-Entladung gemäß den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß die Wählvorrichtung von einer zweiseitigen Kupplung gebildet ist, die über eine Kettenübertragungsleitung o.dgl. mit dem Handrad drehbar verbunden ist und über einen Steuerhebel entweder mit einer entsprechenden Kupplung auf einer Übertragungswelle, die mit einem einem dem Handrad fernen Türenpaar zugeordneten Untersetzungsgetriebe oder mit einer Übertragungswelle drehbar gekuppelt werden kann, die mit einem einem Türenpaar nahe dem das Handrad tragenden Wagenkopf zugeordneten Untersetzungsgetriebe verbunden werden kann, dabei die Übertragungswellen in von getrennten Tragelementen getragenen selbstschmierenden Hülsen gelagert sind, und beide am Wagenaufbau befestigt sind, so daß das mögliche Fressen einer Hülse nicht die nicht gewählte Welle in Drehung versetzt.

Revendications

1. Wagon-trémie pour chemin de fer comprenant des trémies séparées à déchargement bilatéral par gravité, comprenant une caisse de charge composée de deux ou plus de deux compartiments de chargement séparés successifs, chacun de ces compartiments étant muni de deux ouvertures situées sur les deux côtés opposés du wagon, qui peuvent être fermées à l'aide de portes qui sont articulées au niveau de leur bord supérieur, chacune des portes étant équipée d'une multitude de crochets de verrouillage le long de leur encadrement inférieur, les crochets étant montés solidairement sur un arbre qui est monté rotatif sur la caisse du wagon; les arbres qui portent les crochets de verrouillage des portes de chacun des compartiments de chargement étant agencés pour tourner sélectivement pour déverrouiller l'ouverture des portes, sous l'action de mécanismes à leviers de transmission mécaniques, caractérisé en ce que les mécanismes comprennent un réducteur du type irréversible qui est commandé à la main à l'aide d'arbres accessibles du sol, qui sont directement accouplés au réducteur et, en outre, à l'aide d'un volant qui peut être accouplé au réducteur par un mécanisme de transmission comprenant un sélecteur capable d'accoupler en rotation au volant le réducteur qui correspond à la paire de portes dont l'ouverture a été sélectionnée, les crochets de verrouillage étant munis de moyens capables d'interdire la fermeture spontanée totale des portes par gravité; cependant qu'il est prévu en outre des moyens qui peuvent être actionnés par l'intermédiaire du réducteur, à l'aide des arbres ou du volant pour déterminer l'ouverture commandée des portes, et ainsi que des moyens servant à signaler l'ouverture de la paire de portes sélectionnées, qui sont actionnés par les mécanismes à leviers de transmission mécaniques.

2. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon la revendication précédente, caractérisé en ce que les mécanismes à leviers comprennent un balancier claveté sur l'arbre de sortie ou arbre lent du réducteur, et aux extrémités duquel sont articulées les extrémités de deux bielles qui sont articulées à leurs extrémités opposées sur deux bras solidaires des arbres qui portent les crochets de verrouillage, dans lequel la rotation du balancier dans un sens est transmise aux bras par l'intermédiaire des bielles de façon à provoquer la rotation des arbres dans le sens approprié pour dégager les crochets de verrouillage des portes et dans le sens opposé pour provoquer le blocage des portes à l'aide des crochets de verrouillage.

3. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon les revendications précédentes, caractérisé en ce que l'axe du balancier coupe la droite d'action de chacune des bielles ou se trouve au-delà de cette droite dans le sens de la fermeture.

4. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon les revendications précédentes, caractérisé en ce que le volant peut être accouplé, par l'intermédiaire du sélecteur et éventuellement d'arbres de transmission, à chaque réducteur qui actionne la paire de portes de chacun des compartiments séparés du wagon.

5. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon les revendications précédentes, caractérisé en ce qu'au moins un des crochets de verrouillage de chaque porte est muni d'un pied d'interdiction qui fait saillie vers le haut, au-delà du bord des crochets, et qui se place sur la trajectoire d'ouverture des portes lorsque les crochets sont dans une première position de rotation adaptée pour libérer les portes, le pied étant libre de tourner dans le sens de l'ouverture et étant bloqué en rotation dans le sens opposé, de sorte que, dans cette position de rotation des crochets, il n'empêche pas les portes de s'ouvrir librement et, en même temps, de les empêcher de décrire leur trajectoire de fermeture complète, tandis qu'une rotation additionnelle des ar-

bres qui portent les crochets de verrouillage écarte le ou les pieds d'interdiction de la trajectoire des portes, en rendant ainsi leur fermeture possible.

6. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon les revendications précédentes, caractérisé en ce que les moyens qui commandent l'ouverture des portes sont composés de bras en forme fixés solidairement aux arbres qui portent les crochets de verrouillage, ces bras portant à leurs extrémités des galets appropriés pour agir sur des glissières montées sur les côtés des portes lorsqu'on fait tourner les arbres dans le sens de l'ouverture au-delà du point de déverrouillage des crochets de verrouillage et des pieds d'interdiction.

7. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon les revendications précédentes, caractérisé en ce que les moyens qui signalent l'ouverture des portes sont composés, pour chaque paire de portes, de deux drapeaux qui peuvent tourner entre une position située dans les limites du profil latéral du wagon et une position qui fait saillie en dehors de ce profil; les drapeaux étant entraînés en rotation par des bielles et des manivelles actionnées par une tringle qui est articulée sur un bloc pivotant qui maintient les drapeaux en saillie en dehors du profil du wagon par gravité, cependant qu'il est prévu un bras articulé sur le balancier, et approprié pour agir sur le bloc pivotant lorsque le balancier est conduit par rotation à sa position de fermeture au-delà de la position d'intersection entre son axe de rotation et les droites d'action des bielles.

8. Wagon-trémie de chemin de fer équipé de trémies séparées à déchargement bilatéral par gravité selon les revendications précédentes, caractérisé en ce que le sélecteur est formé d'un accouplement bilatéral qui est accouplé au volant en rotation par l'intermédiaire d'une transmission à chaîne ou analogue, et qui peut être accouplé en rotation, à l'aide d'un levier de commande, soit à un accouplement correspondant porté par un arbre de transmission relié à un réducteur associé à une paire de portes situées à grande distance du volant, soit à un arbre de transmission relié à un réducteur qui correspond à une paire de portes situées à proximité du bout du wagon qui porte le volant; les arbres de transmission étant supportés indépendamment l'un de l'autre par des bagues auto-lubrifiantes portées par des éléments supports séparés, et qui sont toutes deux fixées à la structure du wagon, de sorte que le grippage éventuel d'une bague ne risque pas de provoquer la rotation de l'arbre qui n'a pas été sélectionné.

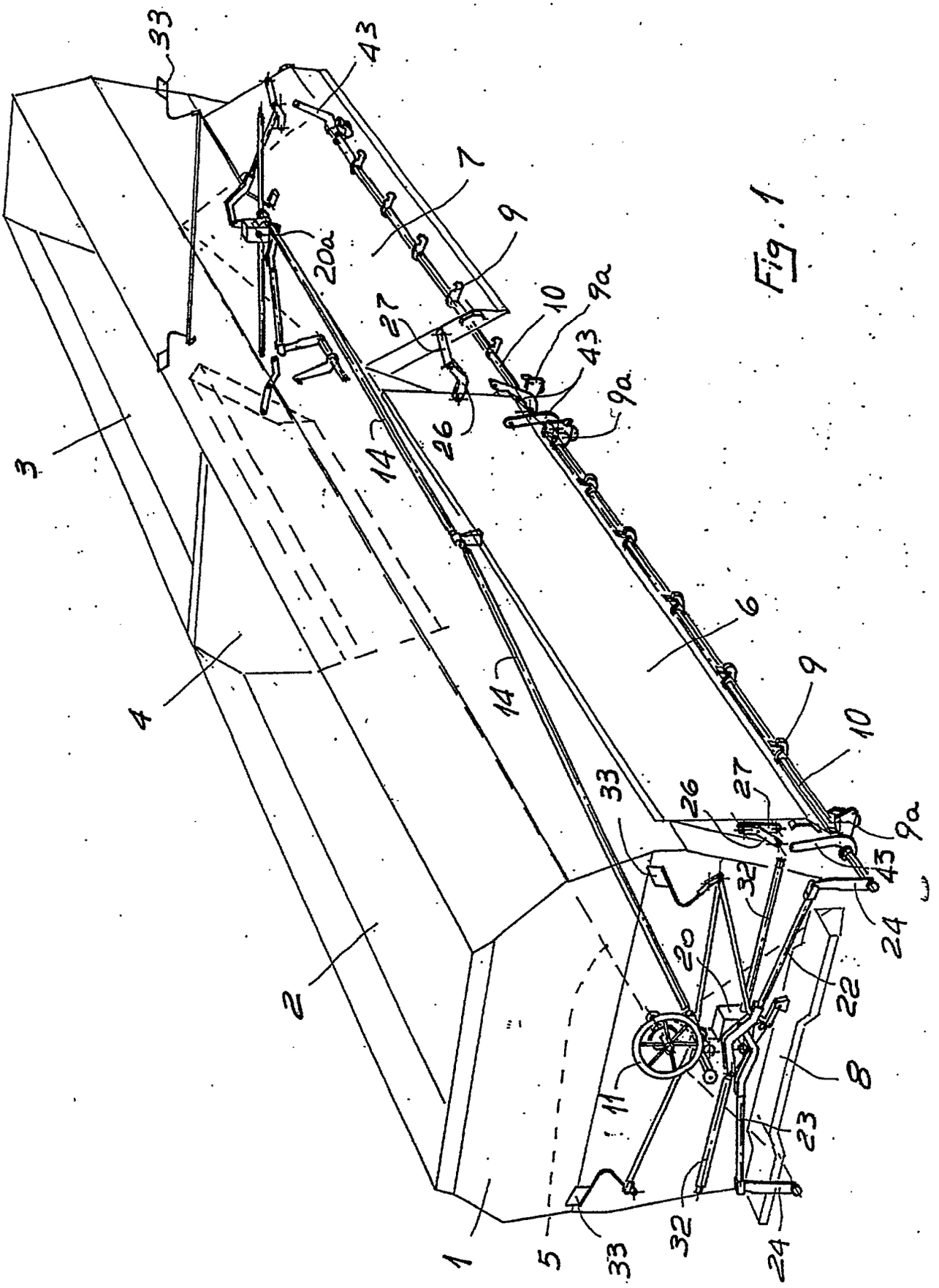

Fig. 1

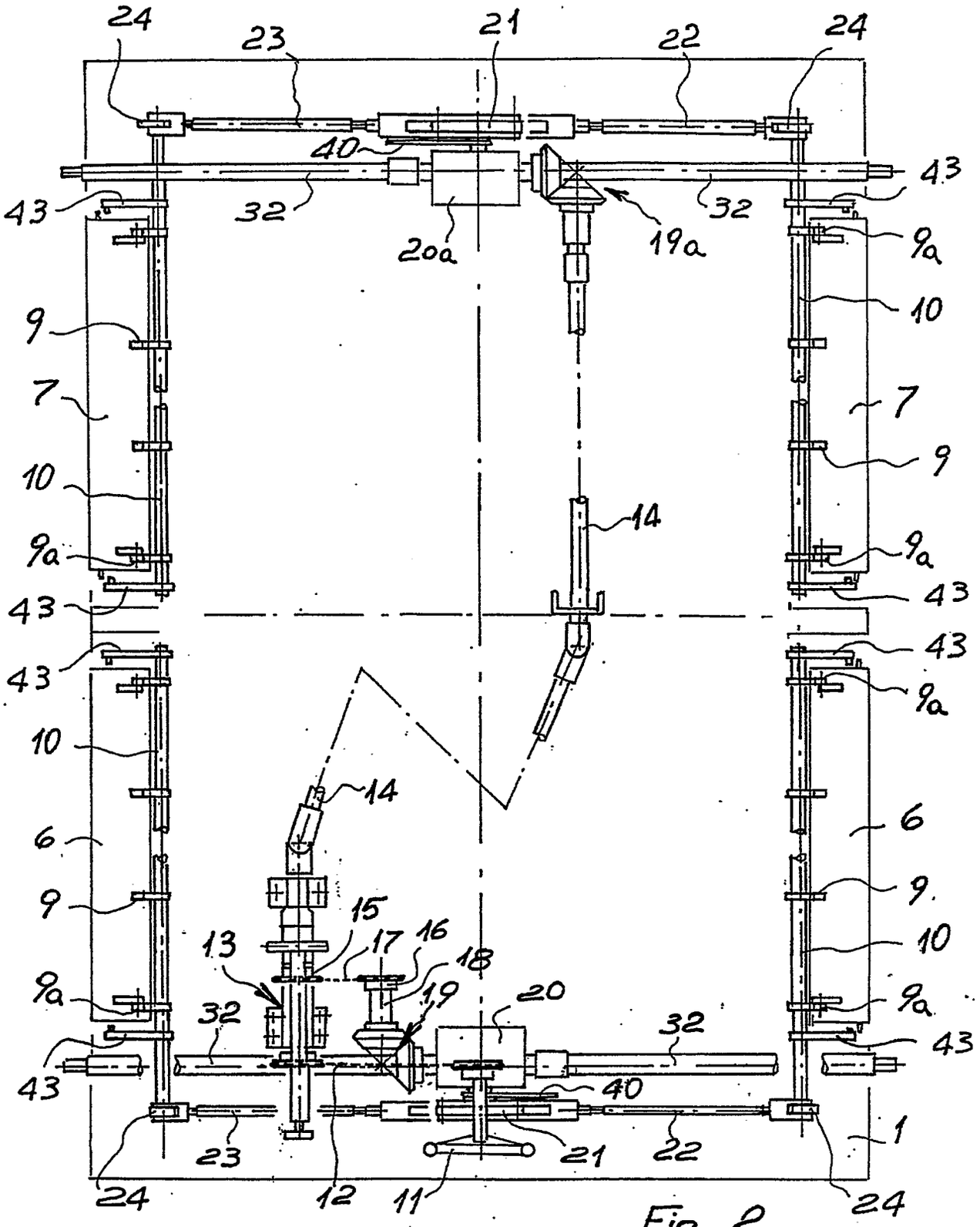
24
23
21
22
24
40
43
43
32
32
20a
19a
9a
9
10
7
7
9
10
14
9a
9a
43
43
43
43
9a
10
14
6
6
9
9
15
17
16
18
13
19
20
9a
32
32
9a
43
43
40
1
23
21
22
24
12
11
24

Fig. 2

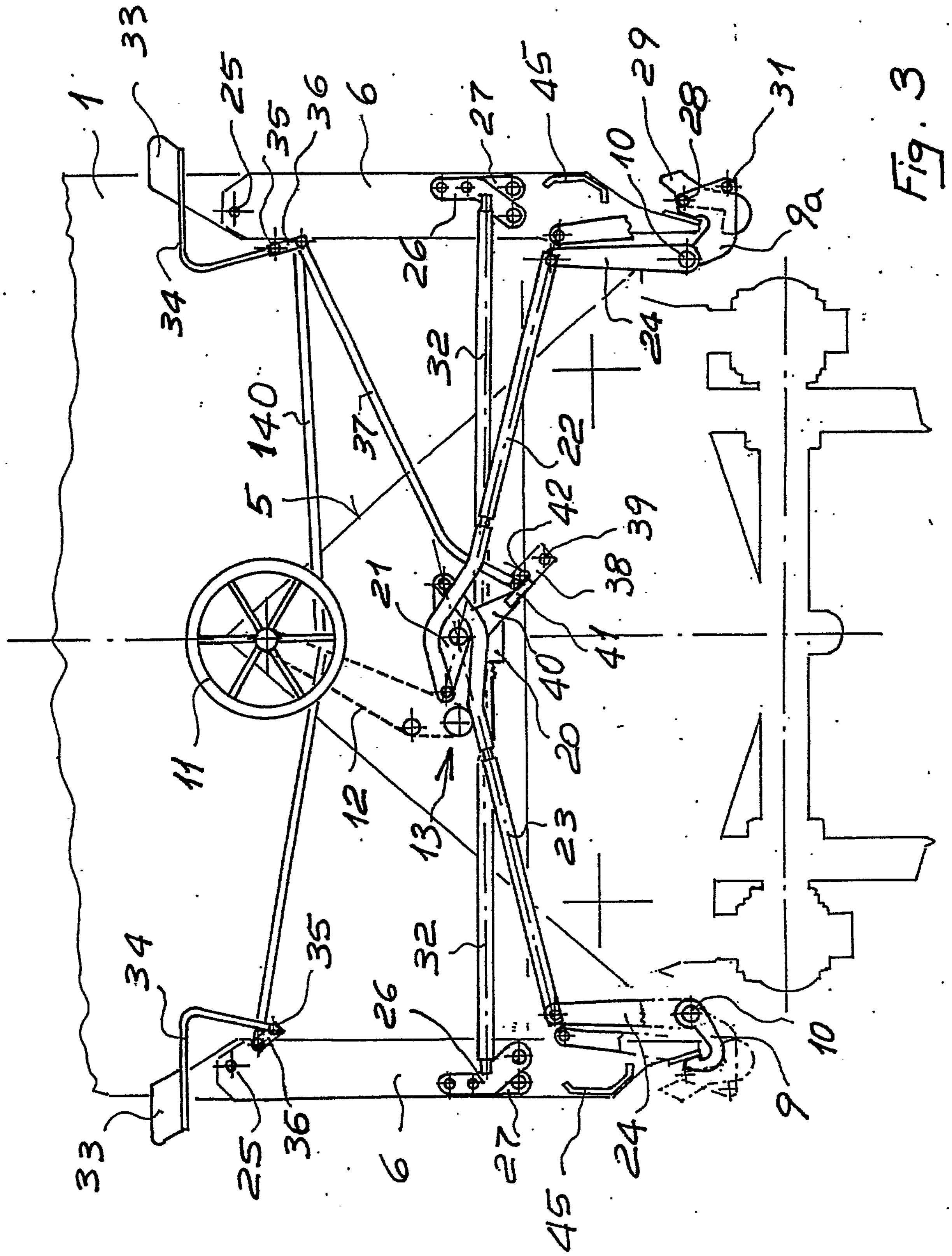
1
5
6
9
9a
10
11
12
13
20
21
22
23
24
25
26
27
28
29
31
32
33
34
35
36
37
38
39
40
41
42
45
140

Fig. 3

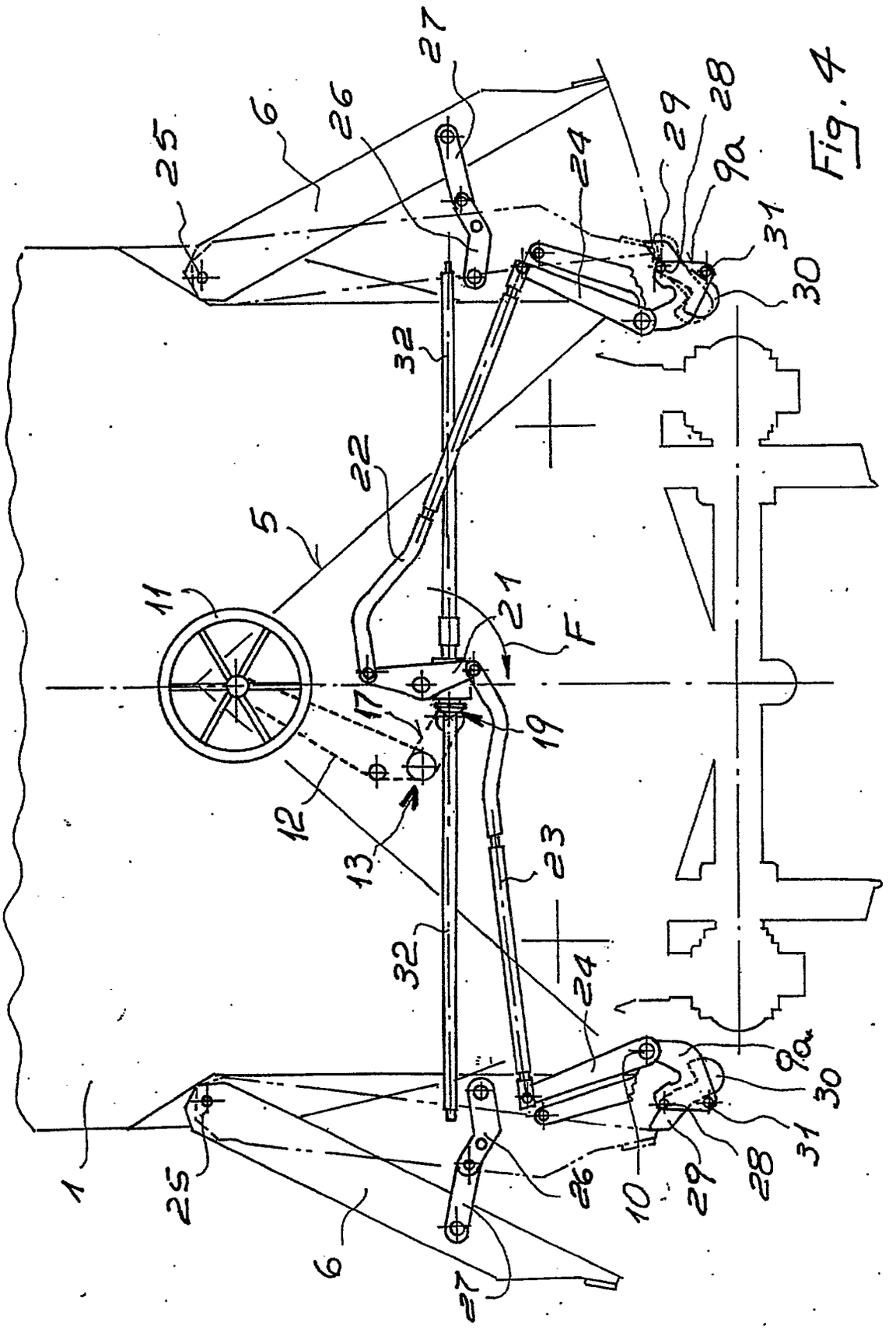

Fig. 4

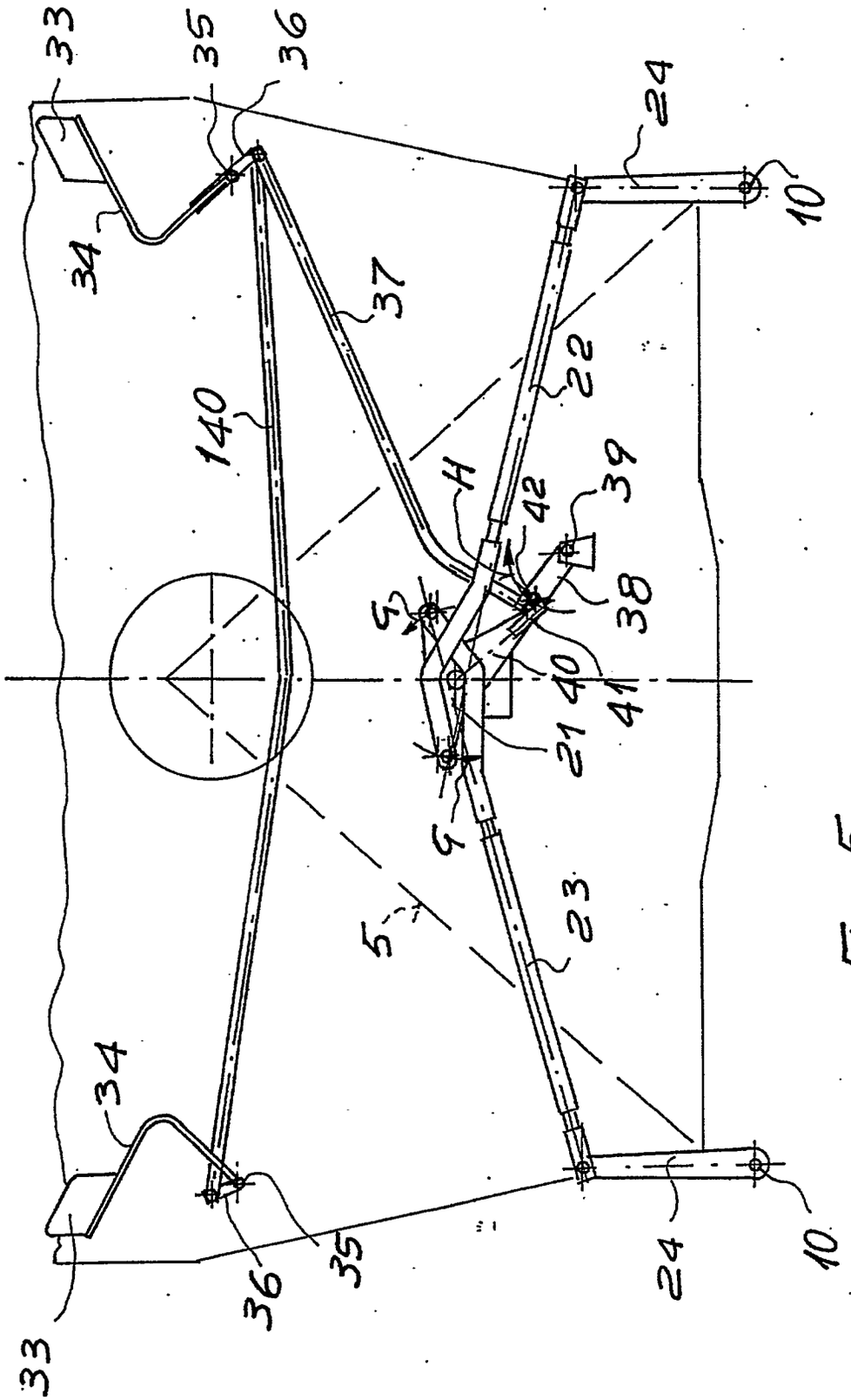

Fig. 5

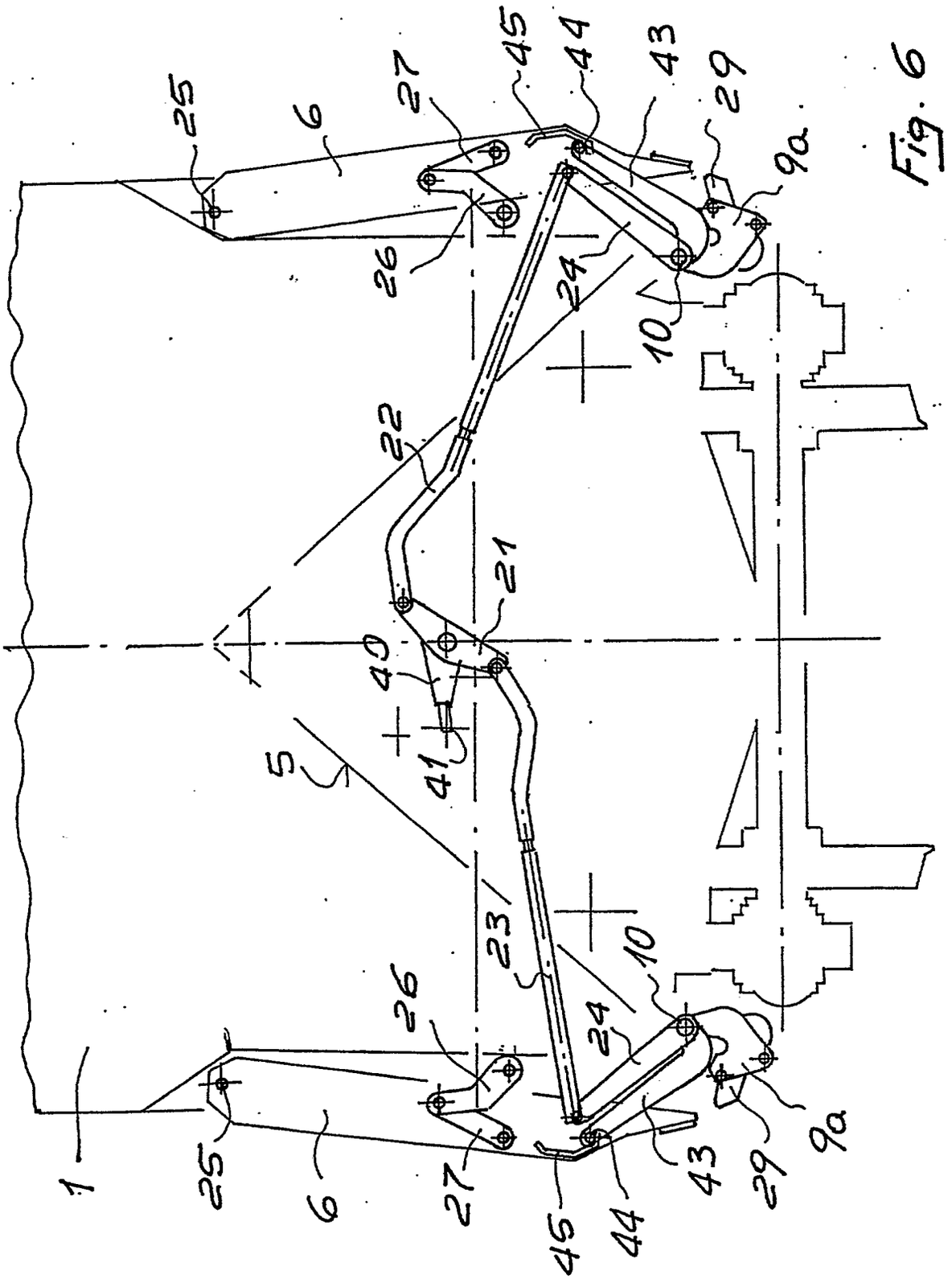

Fig. 6

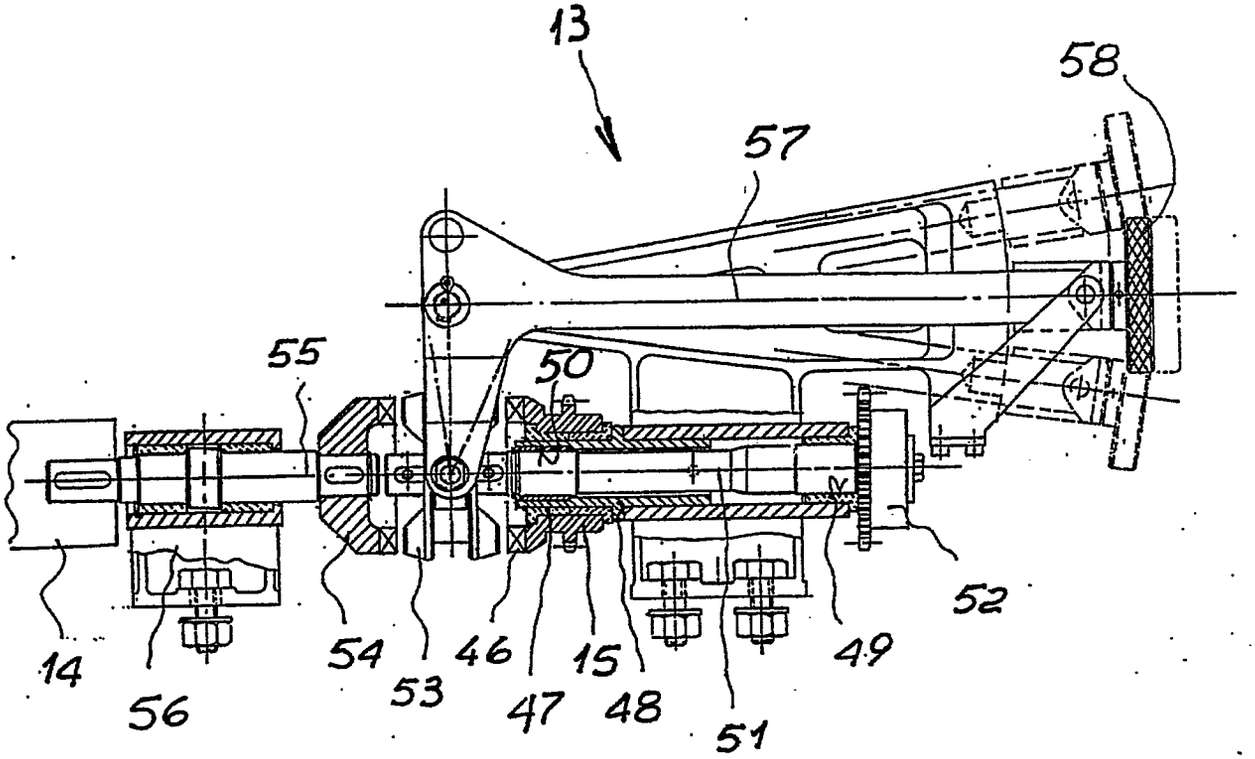
13
58
57
55
50
52
14
54
46
15
49
56
53
47
48
51

Fig. 7

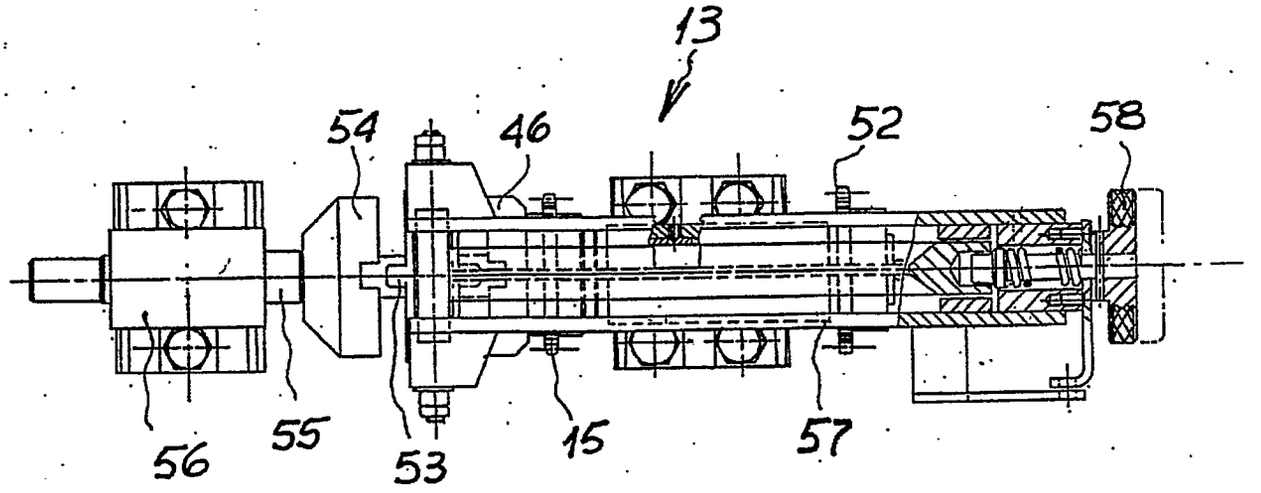
13
54
46
52
58
56
55
53
15
57

Fig. 8