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(71) Applicant : **Anagnostopoulos, Panagiotis A.**
P. Ralli 19
GR-177 78 Athens (GR)

(72) Inventor : **Anagnostopoulos, Panagiotis A.**
P. Ralli 19
GR-177 78 Athens (GR)

(54) Integrated system of refuse collection containers and automated refuse collection and disposal mechanism.

(57) The invention refers to an integrated system for refuse collection and disposal, which combines special type of refuse collection containers and automated mechanism for collecting the refuse from the refuse containers and disposing it, and is characterised by the automatic, i.e. without any assisting personnel or vehicle driver interference, unloading of the refuse container contents to the vehicle mobile container which approaches the refuse containers through extendable arms, unloading of the contents of the mobile container to the vehicle compression chamber and finally, compression and storage of the collected refuse.

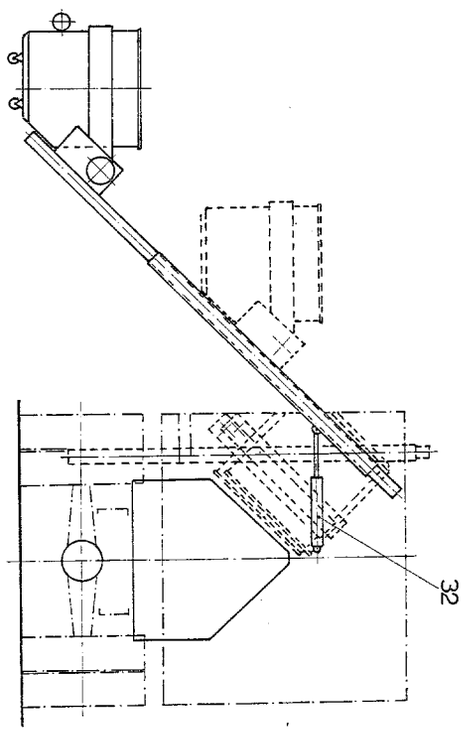

FIG. 11

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The invention refers to an integrated system for refuse collection and disposal, which combines special type of refuse collection containers and automated mechanism for collecting the refuse from the refuse containers and disposing it, and is characterised by the automatic, i.e. without any assisting personnel or vehicle driver interference, unloading of the refuse container contents to the vehicle mobile container which approaches the refuse containers through extendable arms, unloading of the contents of the mobile container to the vehicle compression chamber and finally, compression and storage of the collected refuse.

STATE-OF-THE-ART

Most of the existing refuse collection and disposal systems require the cooperation of assisting personnel with the vehicle driver. The main reason for that is the need to carry the refuse collection containers near the vehicle, at all areas where the containers are installed and for any type of containers, in conjunction with the automated collection mechanism which is used. For the most advanced systems which are currently employed, the selection of the type of collection containers depends on the type of vehicle which is used. The refuse collection containers usually have wheels or they can be pulled toward the vehicle on rails by the assisting personnel. Onboard the vehicle, a mechanism overturns and empties the container into the compression or shattering chamber and finally, it temporarily stores the remainder.

Examples of systems that do not require assisting personnel for their operation besides the vehicle driver, are shown in Figures (1), (2), (3) and (4).

These systems always require the use of containers of special type, weight and size. As a rule, they require special and careful manoeuvring from the vehicle driver, in order to approach the collection container at proper angle and distance, so that the collection mechanism can be employed properly. Subsequently, the vehicle driver operates the system i.e. through the collection mechanism, carries and overturns (or other) the container, unloading its contents through the appropriate opening to the vehicle storage compartment, and finally through the collection mechanism the containers are reinstalled to their original position.

A first automated system is shown in Figures (1) and (2). The vehicle collection mechanism of this system consists of two arms which are driven by a hydraulic system, so that they can be lowered down at the front or the driver cabin sides. Then the vehicle is driven so that it approaches the refuse collection container at the right angle and distance, in order for the arms to be inserted in the appropriate inlets at the sides of the container. Subsequently, the two arms are rotated about a horizontal axis which is perpendicular to the two arms, so that the container is lifted above the driver cabin and its contents are unloaded through an opening to the storage compartment of the vehicle. Finally, the collection mechanism reinstalls the empty container to its original position and the vehicle moves in the opposite direction so that the container can be released from the collection mechanism.

A second automated system is shown in Figure (3). According to this system, a special type and shape refuse collection container is employed, which is mostly used for certain type of refuse (glass bottles, papers etc.). Usually, these collection containers are designed as vertical cylinders and they have a certain extension on top that makes them easily accessible by the vehicle collection mechanism. The collection mechanism is placed at the end of a crane which is installed behind or at the sides of the driver cabin. The driver operates the crane in such a way, that the collection mechanism is anchored to the container extension. Subsequently, the crane directs the container over an appropriate opening at the top of the vehicle storage compartment, where the container is unloaded through a special mechanism (usually floor openings). Finally, through the crane mechanism, the container is reinstalled to its original place.

A third refuse collection and disposal automated system, which is supplied with a collection mechanism installed at the vehicle side, is shown in Figure (4). The vehicle stops near the refuse collection container and then the arms mechanism is extended until the arms are inserted into the appropriate container openings. Subsequently, the container is carried toward the vehicle and is overturned in order to unload its contents. Finally, the arms mechanism reinstalls the container to its original position. The above mechanism is similar to the one described in Figures (1) and (2) and it only differs in the sidewise action of the arms mechanism.

The main disadvantages of the state-of-the-art systems are the following:

1. They require significant amount of empty space around or over the collection container. For the first of the state-of-the-art systems certain space around the container is required for the vehicle approaching manoeuvres, while for the second system certain space over the container area is required for easy anchoring of the container to the collection mechanism. For the third system very careful and accurate approach to the container is required.
2. The second disadvantage of these systems is the requirement for numerous and accurate manoeuvres by the vehicle driver for the "automated" refuse collection and disposal. Extensive manoeuvring results to time delays and driver fatigue, hence these systems are not recommended for quick refuse collection and disposal (actually, few but large-size, refuse collection containers are

used by the residents of a particular area).

3. An additional disadvantage of these systems which relates to their use in urban areas, is the creation of traffic problems due to the required extensive manoeuvring.

4. Another disadvantage of these systems is the requirement for accuracy in the construction of the collection mechanism and the collection containers. As a result, only certain types of containers are used in conjunction with the previously mentioned vehicles.

Additionally, certain safety requirements are violated due to the use of the above systems for refuse collection and disposal, requirements which relate to the residents of the area, electricity distribution network, traffic lights etc.

5. Another disadvantage of the above systems and the systems that require assisting personnel results from the mobility of the containers. Clearly, the vehicle manoeuvring and the collection mechanism operation have to be adjusted for the occasional position of the container.

6. Finally, the placement of these containers at certain urban areas contributes in the aesthetic degradation of the particular area.

DISCLOSURE OF THE INVENTION

The proposed integrated system of refuse collection containers and automated refuse collection and disposal mechanism resolves any problems, such as the ones that were mentioned before as the disadvantages of the existing systems, therefore it can be used for refuse collection and disposal in densely populated urban areas. The proposed system consists of a number of collection containers which are (each one of them) placed on specially formed, heavy and fixed supporting bases, so that the containers cannot be relocated after each refuse disposal. The containers and their respective supporting bases are permanently installed and they are provided for aesthetic design and decoration.

The refuse collection and disposal mechanism is installed at the vehicle sides and a mobile container is attached to it. The contents of the fixed collection container are unloaded inside the mobile container, through a special mechanism, and the mobile container carries the refuse to the vehicle storage compartment. The mere contact of the mobile container with the collection container is sufficient, so that the mechanism for overturning and unloading of the collection container into the mobile one is activated. Subsequently, the collection container returns to its original position on the supporting base and the mobile container returns to the vehicle and unloads its contents into the compression chamber and finally, into the storage compartment. During the overturning and unloading of the collection container, the present system allows for the cleaning of the container with liquid detergents, which are sprayed by special sprinklers, which are installed on the mobile container. The mechanism which includes the mobile container and the system for overturning the collection container is installed at the vehicle side, behind the driver cabin, and it can be extended away from the vehicle until it reaches the collection container.

The system is operated by the driver alone and his only requirement is to stop the vehicle near the collection containers. Aside from this requirement, the extension of the mobile container mechanism, the activation of the overturning of the collection container mechanism, and the return of the extended mechanism, which will be described extensively later, are performed automatically by the use of limit proximity switches.

Advantages of the proposed system over the state-of-the-art are the following:

1. There is no requirement for significant amount of empty space, in order to allow the vehicle manoeuvring and system operation. All that is required is the vehicle positioning close to the collection container, so that the mobile container can be extended sufficiently in order to reach the collection container (this distance can be adjusted to approximately four meters, in order to be able to overcome difficulties arising from other vehicles parked at the road sides). For urban areas, such problems can be resolved by placement of the collection containers on the sidewalks. Moreover, the safety requirements are satisfied since there is no aerial transportation of the collection containers and the refuse unloading to the mobile container is done next to the collection containers.

2. The placement of the collection containers on fixed supporting bases eliminates the requirement for vehicle manoeuvring and system operation due to the container relocation. That results in more automation and fewer required manoeuvres, concequently, easier operation by the driver.

3. Another advantage that relates to the aesthetic contribution of the collection containers is the fact that the supporting base contributes to the beautification of the surrounding area.

4. The use of a mobile container provides the following advantages over the other systems:

* The present system is less time consuming, due to lack of transportation of the collection mechanism to and from the collection container.

* Only the mobile container is manufactured with high accuracy requirements for dimensions and weight, since it is the only part which is associated with the vehicle. No such requirements exist for high accuracy in the collection containers manufacturing, resulting

in significant reduction of manufacturing costs.

* The safety requirements are satisfied, since no transportation (especially aerial) of the collection containers toward the vehicle is required and the refuse unloading to the mobile container is done next to the collection containers, where the mobile container return to the vehicle is performed in a way that also satisfies the appropriate safety requirements.

5. Additional advantages of the system are the following:

* The collection container overturning mechanism can be applied to various types of containers and high accuracy in the vehicle positioning and manoeuvring is not required. Also the automation of the operation of the system results in minimisation of the driver work load and the refuse collection speed.

* The collection container washing capability of the system, at the time of the container unloading, practically eliminates the need for use of a separate vehicle just for washing the containers, which the other systems necessarily employ.

* The use of high-compression results in increase of the vehicle storage compartment capacity, resulting in employment by the present system of fewer vehicles than any other system (i.e. shattering).

* The use of two collection and disposal mechanisms, one for each vehicle side, for refuse collection from both sides of the road, results in greater flexibility in the vehicle usage and reduction of travelling distance.

MATERIALISATION OF INVENTION

A first materialisation of an integrated system for refuse collection and disposal, which combines collection containers and collection and disposal mechanism, follows:

* Collection container and supporting base

The refuse collection container is shown in Figures (5), (6) and (7). The actual container (1) has the shape of a quarter of a cylinder (or even rectangular) and it can be rotated through a shaft (2), which passes through the complete cylinder axis. This particular shaft is horizontal and is supported at its two edges through bearings (3), which are firmly installed on the supporting base. The normal position of the container requires that its two rectangular surfaces lie on a horizontal (4) and a vertical (5) plane. The vertical side (5) is opposite from the direction of the approaching vehicle and it is reinforced for bending loads. The reinforcements (6) are fabricated by the same material as this side. The other rectangular side (4) is horizontal, above the support base, and is covered by two lids (7), which cover the top of the container during the waiting periods.

Except from the two rectangular surfaces, which are not enclosed, the remaining container sides are enclosed by the supporting base (8), which has the shape of a hollow quarter of a cylinder. The two sides that have the shape of a 90° circular sector, carry on top of them shafts (9), which support each one of the lids. The shafts (9) carry at one end a bevel gear, which is assembled with the respective horizontal shaft (2) bevel gear. The horizontal shaft (2) axis coincides with the axis of rotation of the container. This way, if the container is rotated around axis (2), in the direction of the arrow B1, the shafts (9) which support the two lids that cover the top surface are forced to rotate in the direction of the arrow B2 (figure 5), through the bevel gear assembly. For rotation of the container (B1) at such an angle that the unloading of the contents is done easily by gravity acting alone, a rotation of over 180° of the lid axes (B2) is required. This way the lids do not become an obstacle during the unloading of the container contents into the mobile container. A special mechanism maintains the lids (7) released from the gear assembly, so that they can be easily opened by a user.

The supporting base where the collection container (1) is placed, as mentioned before, has the shape of a hollow quarter of a cylinder in order to match the shape of the container. However, on both circular sectors (base sides) two unleveled, hollow, rectangular areas (11) exist for the plantation of decorative plants.

According to a first materialisation, the supporting base (8) is made of reinforced concrete and is firmly anchored to the ground.

For unloading of the collection container (1), a single thrust of the lower end of the reinforced, rectangular, front side (5) is sufficient, in order for the container to be rotated about the fixed axis (2). The thrust can be applied anywhere at the lower end and the required thrust magnitude is relatively small due to the position of the rotation axis. Part of the weight of the container and its contents is carried by the shaft (2), and during rotation, the center of mass approaches the axis.

Hence, very few requirements concerning approach accuracy requirements are necessary, and the container overturning mechanism requires minimum accuracy concerning the point of application of the thrust, since the whole surface is available for it. The surface of the cylinder front side (container) is coated with elastic material, in order to obtain noiseless operation.

*** Mobile container and overturning mechanism, figures (8), (9), (10) & (11).**

The mobile container (12) is a rectangular container with only the top side open, and its sides are surrounded by a reinforcing ring (13), which ends at two extensions (14). The container can be rotated about axis (15) which passes through the extensions (14). The mobile container position with respect to the vehicle is such that the container rotation axis (15) is parallel to the vehicle longitudinal axis and the road surface. It is also parallel to the collection container rotation axis, in order to satisfy the approach angle requirement. Similarly, the front side (16) of the mobile container (12) is parallel to the front (vertical), rectangular side of the collection container, while the opposite side toward the disposal section is parallel to the vehicle side. The top side is open as it was mentioned before. The mobile container is supported on the carriage (17) through a shaft (15), which passes through the extensions of the supporting ring (14). Through the carriage the mobile container can approach or withdraw from and toward the vehicle. The mobile container is supported on wheels (18) and through them it is able to roll on the ground. The collection container overturning mechanism is attached on the vertical, front side of the mobile container.

The mechanism consists of parts that are described below:

From a horizontal shaft (19) supported through bearings (20) on the vertical surface. A sprocket (18) is installed at one end of the shaft and parallel to the side surfaces. The shaft axis (19) is parallel to the mobile container rotation axis during disposal. Two parallel arms (24), placed at a short distance from each other, are fixed on this shaft at one end, and at the other end, an elastic cylinder (25) is attached, which is supported between the two arms by a metal rod (26) which connects the arms ends.

Normally, the two arms (24) along with the cylinder (25) which is placed at the lower side and fixed between them, are in contact with the vertical, front side of the mobile container. If the two arms shaft (19) is rotated e.g. by rotation at the sprocket (21) end, the elastic cylinder is extended from the mobile container surface and applies a thrust on the collection container. The rotation of the sprocket (21) is performed through the system of chain (23), piston (27) and spring (28).

The chain (28) is assembled on the sprocket (21) and at one end it is attached to a spring (28) and at the other end it is attached to the piston rod (27). The piston cylinder and the other edge of the spring are fixed on the sidewise surface of the mobile container (12). When the arms (24) and the elastic cylinder (25) are in contact with the container surface (normal position), the spring (28) is unloaded and the piston pressure is low. When the piston (27) is loaded, the piston rod is pushed into the cylinder (27), the chain (23) rotates the sprocket (16) (hence the elastic cylinder (25) extends and overturns the collection container) and the spring (28) is extended and loaded. When the piston (27) is unloaded, the spring (26) tends to rewind, hence the sprocket (21) is rotated and the elastic cylinder (25) and the arms (24) return in contact with the front surface of the mobile container (12), which returns to the normal position.

The automatic activation of the piston (27) is done through a limit proximity switch, which is extended beyond the front surface and is pressed when the front surface approaches the corresponding front surface of the collection container. The limit proximity switch activates the hydraulic high pressure valve which loads the cylinder (27).

The mobile container approaches the collection container through the mechanism which is shown in figure (11). The same mechanism allows the approach of the mobile container to the disposal compartment and the unloading of its contents into the compression chamber, which is shown in figures (13) & (14).

This mechanism consists of two arms (29) which are fixed on the vehicle side on top and right behind the driver cabin. These two arms are hollow and two other arms (30) can slide inside them through a telescopic mechanism. The carriage (31) is firmly attached between the two sliding arms (30) and at their free ends, and between the carriage ends the mobile container is supported. Consequently, on each of the two sliding arms (30), the plates (31) that carry bearings for the mobile container support and rotation are firmly attached. This way, the two sliding arms (30) are able to carry the container. The two hollow arms (29) can rotate about a horizontal axis only, which lies on the uppermost corner of the vehicle side, through the action of two pistons (32). The two sliding arms (30) can slide into the hollow arms (29) through a mechanism consisting of sprockets and hydraulic motors.

The combination of the hollow arms (29) rotation and the inward and outward sliding of the arms (30) (and consequently of the container (16) which is attached to their ends), allows the placement of the container to any position at the vehicle side. During the application of the system, the vehicle stops near the side of the collection container, in such a manner that the mobile and the collection containers are approximately opposite from each other. The mechanism for the sliding arms (30) motion is activated and the mobile container (16) touches on the ground through the wheels (18), which are fixed on its bottom surface, as mentioned previously. Subsequently, the two pistons (32) push the hollow arms away from the vehicle surface, hence forcing the container to roll on the ground.

During rolling of the container (16), the arms (30)

sliding mechanism is released, so that the arms (30) keep extending as long as the container rolls, until the front surface of the mobile container touches the corresponding surface of the collection container, and the mechanism for the unloading of the collection container into the mobile container is activated. Subsequently, the procedure is reversed, i.e. the pistons (32) are compressed (inversely loaded), the hollow arms (29) approach the vehicle side and the mobile container (16) rolls toward the vehicle. Subsequently, the mechanism for the sliding of the arms (30) is activated and the container (16) is pulled onboard the vehicle.

For the completion of all this procedure, all that is required by the vehicle driver is the vehicle parking next to the collection container, just opposite and at the same height with the mobile container.

The remaining procedure for the approach and return of the mobile container is performed through limit proximity switches, after the driver initiates the process. The procedure is shown in figure (11). In this figure is shown that, upon initiation of the procedure the sliding arms mechanism is released and the mobile container makes contact with the ground. A limit proximity switch activates the pistons that control the motion of the hollow arms and another limit proximity switch stops their operation by activating the overturning mechanism. Following the end of the overturning process, the procedure is automatically reversed.

The activation of the pistons (32), the extension of the hollow arms (29) away from the vehicle and the subsequent release of the arms (30) or the container, at an angle with respect to the collection container, without contact with the ground, is also possible.

*** Unloading of the mobile container contents into the compression chamber**

The disposal mechanism is completed with the unloading of the container (16) contents into the compression chamber and their subsequent exit into the pressurised storage compartment. This is done with the following procedure:

The mobile container (16) shaft is firmly supported on the two extensions (14) of the reinforcing ring (13) (figure 10, parts 14 & 15). The mobile container can be rotated through bearings which are fixed on the carriage (17). The gears (33) which are attached to the ends of the shaft (15) (see figure 12) can be rotated via racks (34). The racks (34) are driven by the pistons (35). Two gears (33) and two pistons for each gear are required. The pistons and the racks are attached to the carriage plates (17) (see figure 10).

The compression chamber (figures 13 and 14), consists of a rectangular compartment which lies in the middle and extends along the longitudinal axis of the vehicle. The pressing surface (36) is at one side of the chamber and the storage compartment is at the other. The pressing surface (36) has the same rectangular shape with the chamber cross section and on the surface a triangular formation. The compression surface can move on four screws (37) from one edge of the chamber behind the driver cabin, toward the storage compartment at the other edge of the chamber. The compression surface can move along the four screws, compressing and pushing the refuse toward the storage compartment, via four rotating nuts (38) at the rear side of the compression surface (toward the driver cabin). The nuts are driven by a common chain, connected to a hydraulic motor.

The activation of the hydraulic motor is performed automatically, immediately after the mobile container has been unloaded into the compression chamber. For the present system, two mobile containers with their associated extension and overturn mechanisms are required, one for each vehicle side, in order to make possible the collection of refuse from both sides of the road. However, both containers are unloaded into the same compression chamber. The hollow arms are attached to a frame which is supported on the vehicle body.

The system is completed with a water tank and detergent solution, water and detergent solution pump, and flexible hose for spraying water and detergent from the mobile toward the collection container.

Water is sprayed for irrigation of the supporting base decorative plants and detergent solution is sprayed into the overturned or empty collection container for washing purposes. Due to the uniformity of the collection containers, the direction of the water and detergent spraying action is adjusted only once.

According to a second materialisation of the system, the collection and mobile containers overturning mechanism and the sliding arms mechanism, can be performed via electric or hydraulic motors.

Claims

1. Integrated system for refuse collection, disposal and compression, which combines special type of refuse collection containers and automated mechanism for collecting the refuse from the refuse containers, disposing and compressing it, and is characterised by the automatic, i.e. without any assisting personnel or vehicle driver interference, unloading of the refuse container contents to the vehicle mobile container which approaches the refuse containers through extendable arms, unloading of the contents of the mobile container to the vehicle compression chamber and finally, compression and storage of the collected refuse.

2. System as in claim 1, where each one of the collection containers is placed on a heavy, hooked

on the ground, specially formed supporting base, in order to prevent the containers from moving after each collection process.

3. Collection containers as in claim 2, where the collection containers and their respective supporting bases, consist a permanent area installation and contribute to aesthetic upgrade of the surrounding area.

4. System as in claim 1, where the collection container (1) (fig. 5, 6 & 7), has the shape of a quarter of a cylinder which can be rotated about an axis (2) via a shaft which passes through the axis of the complete cylinder, where this shaft is horizontal and is supported at its two ends on bearings (3) which are firmly attached to the supporting base, and where the collection container at its normal state has two free rectangular sides, one horizontal (4) and one vertical (5), where the vertical side of the quarter cylinder which is facing the vehicle approach side, is reinforced for bending (6) using the same material that the side is fabricated, and where the horizontal rectangular side of the quarter cylinder lies above the supporting base and is covered by two lids (7), which cover the top of the container.

5. Collection container as in claim 4 (fig. 5, 6 & 7), where besides the two rectangular sides the container is completely surrounded by the supporting base (8), which is formed as a hollow quarter of a cylinder, where the two sides are formed as 90° circular sectors and they carry on top shafts (9) which support each one of the two lids, where the two shafts (9) carry at the front end bevel gears assembled with corresponding bevel gears attached to the horizontal shaft (2), which coincides with the container axis of rotation, and where upon rotation of the container around axis (2), the shafts (9) which support the lids are forced to rotate through the bevel gear assembly for such an angle, so that the contents are unloaded easily, by gravity acting alone, and the lids are rotated more than 180° so that they do not consist an obstacle during the refuse collection procedure.

6. Collection containers as in claim 3, where the container supporting base has the shape of a hollow quarter of a cylinder in order to match perfectly the shape of the collection container, and where at the sides of the circular sectors two unleveled, hollow, rectangular areas (11) exist for plantation of decorative plants.

7. System as in claim 1, where for unloading the collected refuse to the appropriate vehicle compartment, an intermediate, mobile container is used, which is extended from the vehicle toward the collection container which is overturned and emptied, and finally unloads its contents into the appropriate vehicle compartment.

8. Method of disposal by use of an intermediate container as in claim 7, where the mobile container (12) (fig. 8, 9, 10 & 11) can be described as an open top rectangular container which is reinforced by a ring (13) ending at two extensions (14), and can be rotated about an imaginary axis which passes through the ring extensions (15), the container position relative to the vehicle being such that the container axis of rotation is parallel to the vehicle longitudinal axis, to the road level, and in order to satisfy the angle of approach requirement, parallel to the collection container axis of rotation, so that the front and the rear sides of the mobile container are parallel to the vertical, front, rectangular side of the collection container, and where the mobile container is attached via a shaft passing through the reinforcing ring extensions on a carriage (17) which extends, thus enabling the mobile container to approach the collection container and to return to the vehicle, rolling on the ground via the wheels (18).

9. Collection container as in claim 3, where a single thrust of the lower part of its reinforced, rectangular, front side is sufficient for the rotation of the container about a horizontal axis, where the thrust can be applied anywhere at the lower part of the container, and where a portion of the container and contents weight is carried by the axis of rotation.

10. Disposal method as in claim 7, where the collection container overturning and emptying mechanism is attached to the front side of the mobile container and consists of the following parts as described below (fig. 8, 9, 10 & 11):
    - horizontal shaft (19), which is attached on the container vertical surface through bearings (20), and which is parallel to the collection container axis of rotation, during the collection and disposal process,
    - sprocket (18) attached on one end of the shaft (19),
    - two parallel arms (24) placed a short distance from each other, and firmly attached to the shaft (19) at one end,
    - elastic cylinder (25) attached to the other end of the parallel arms via a metal rod (26), in such a way that normally the two arms and the cylinder which is attached between them remain in contact with the front, vertical surface of the mobile container,

where the overturning and emptying procedure consists of rotation of the two arms shaft (e.g. through the sprocket rotation) and subsequent extension of the elastic cylinder from the mobile container vertical surface, in order to apply the thrust to the collection container, where the sprocket rotation is performed through the system of chain (23), piston (27) and spring (28),
where the chain is assembled on the sprocket, and a spring and the piston rod are attached to the chain, where the piston cylinder and the spring other end are supported on the side surface of the mobile container,
where upon loading of the piston (27), the piston rod is pushed into the cylinder, the chain (23) rotates the sprocket (hence the elastic cylinder (25) extends and overturns the collection container) and the spring is extended and loaded, and upon unloading of the piston, the spring (26) tends to rewind (thus rotating the sprocket), the arms return in contact with the surface of the mobile container, and the container returns to the normal state,
where the piston activation is performed through a limit proximity switch, which extends beyond the mobile container front surface and is pressed when the mobile container front surface approaches the front surface of the collection container, where the limit proximity switch activates the high-pressure valve, which loads the cylinder.

11. Method as in claim 7, where the mobile container extension mechanism (fig. 10 & 11) consists of:
- two arms (29) which are installed at the vehicle side, on the upper section, just behind the driver cabin, where the arms are hollow and two other arms (30) can slide inside them through a telescopic mechanism,
- carriage installed at the ends and between the two sliding arms,
- plates (31) which carry the bearings which support and allow the rotation of the mobile container, where the two hollow arms are able to rotate about a horizontal axis which passes through the uppermost corner of the vehicle side, where the rotation of the hollow arms is performed via two pistons (32).

12. Method as in claim 7, where by the system design two mobile containers and two extension mechanisms are required, one for the left and one for the right side of the vehicle, for refuse collection and disposal from both sides of the road.

13. Method as in claim 7, where for the refuse collection procedure the vehicle stop near the collection container is required only, where the mobile container is approximately opposite the collection container, in order for the extension mechanism to extend the mobile container and the container wheels to touch on the ground and roll the container toward the collection container, where through the two pistons (32), the hollow arms are extended away from the vehicle side, and the sliding arms mechanism is released, so that as the container rolls, the sliding arms continue to slide until the front surface of the mobile container touches the front surface of the collection container, and the overturning mechanism is activated.

14. Method as in claim 7, where for the overturning and unloading of the mobile container, the shaft (15) is firmly attached on the two reinforcing ring extensions (fig. 10, parts 14 & 15) and it is supported on the carriage (17) through bearings (fig. 10) which allow its rotation, where for the shaft rotation, gears (33) installed at the shaft ends, are assembled with racks (34) which are moved by pistons (35) (fig. 12), where two pistons are required for each of the two gears, where pistons and racks are firmly attached on the carriage plates (17) (fig.10).

15. System as in claim 1, where the compression chamber (fig. 13 & 14) consists of a rectangular compartment which lies in the middle and extends along the longitudinal axis of the vehicle, where the storage compartment is at one side of the chamber and the pressing surface (36) is at the other, where the pressing surface (36) has the same rectangular shape with the chamber cross section and on the surface a triangular formation and it can move on four screws (37) from one edge of the chamber behind the driver cabin toward the storage compartment at the other edge of the chamber, where the compression surface can move along the four screws, compressing and pushing the refuse toward the storage compartment, via four rotating nuts (38) at the rear side of the compression surface (toward the driver cabin), where the nuts are driven by a common chain, connected to a hydraulic motor.

16. System as in claim 1, where water tanks and detergent solution tanks are required for spraying water and detergent from the mobile toward the collection container, with the aid of water and detergent solution pump and flexible hose, where water is sprayed for irrigation of the supporting base decorative plants and detergent solution is sprayed into the overturned or empty collection container for washing purposes.

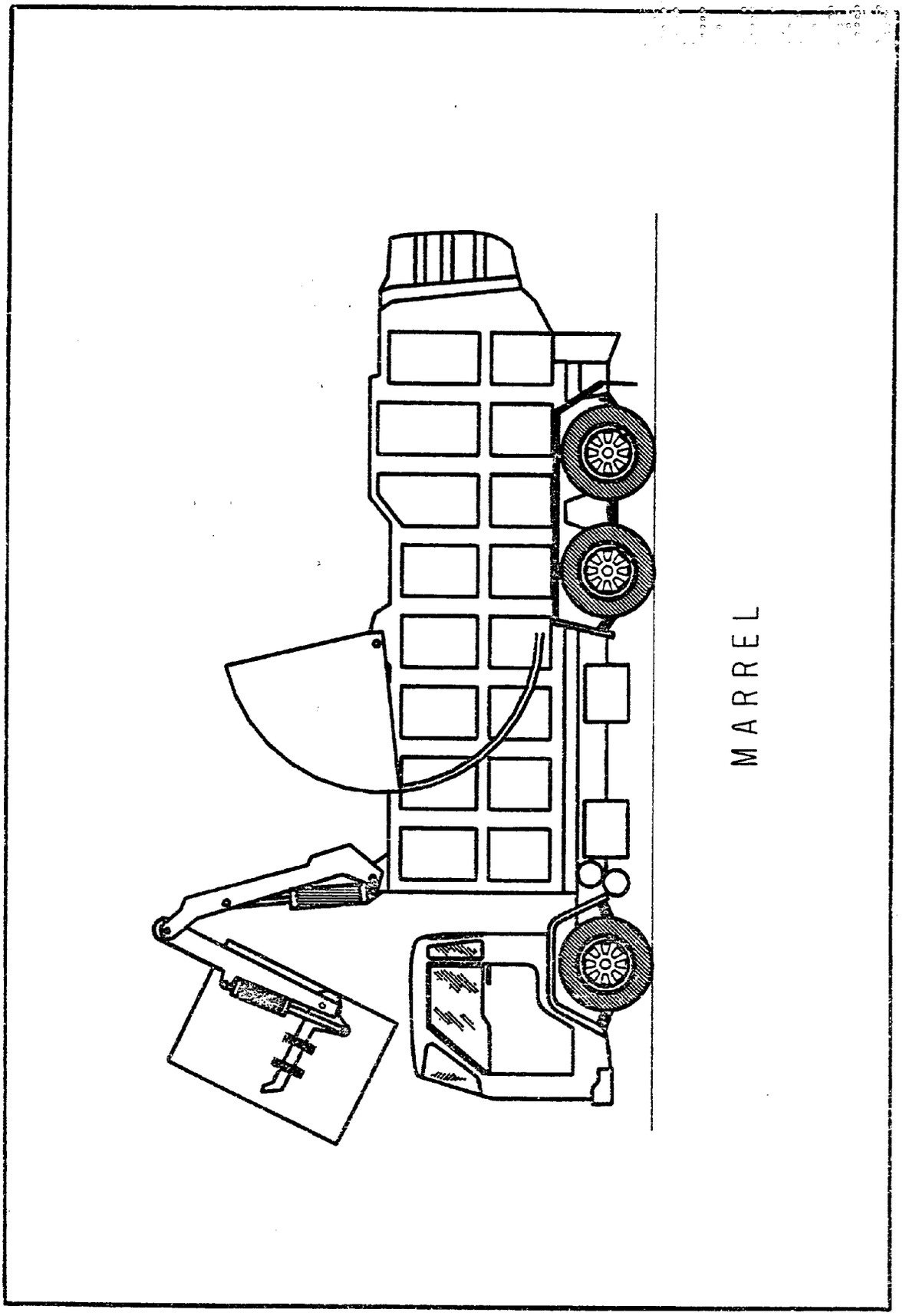

FIG. 1

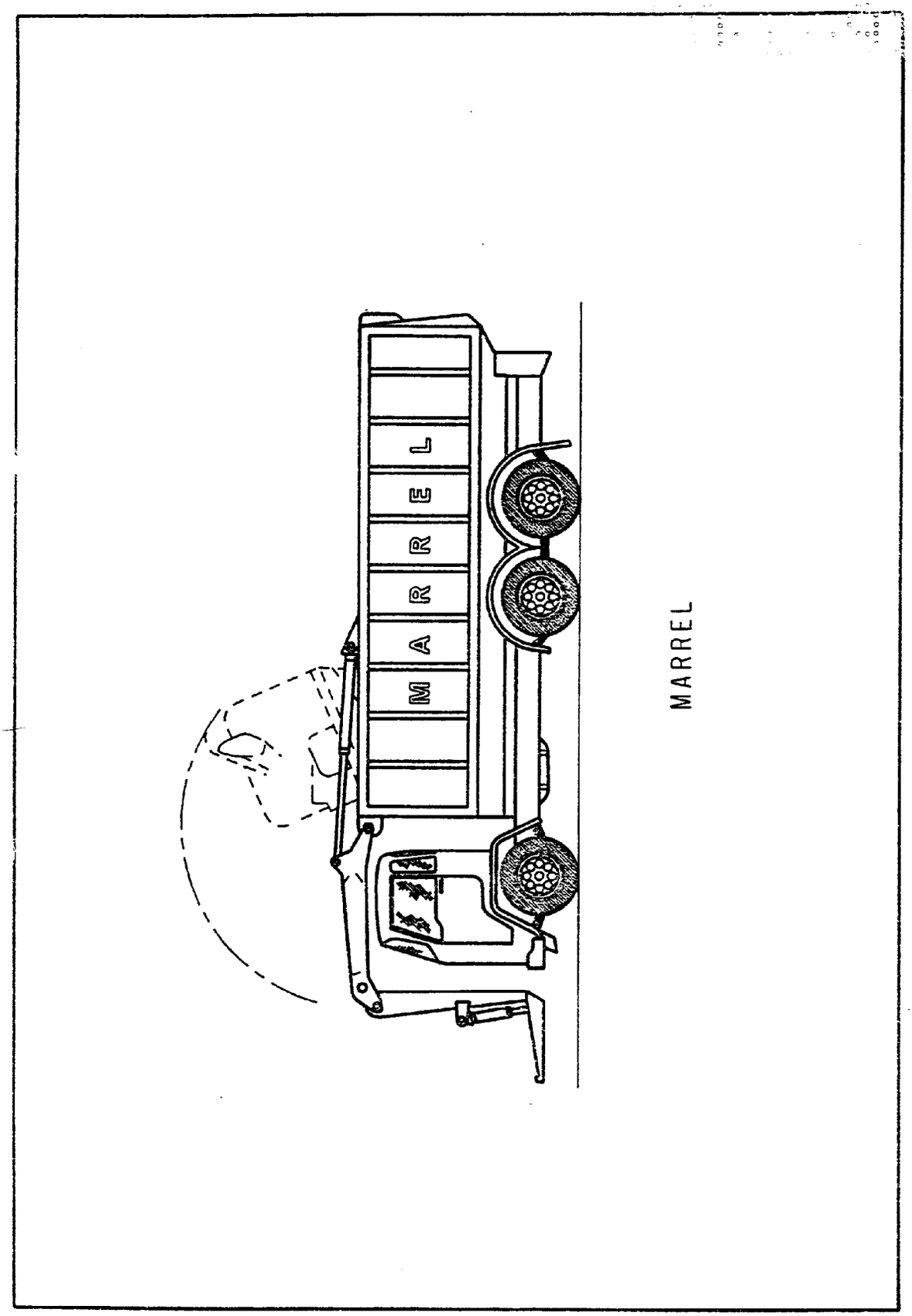

FIG. 2

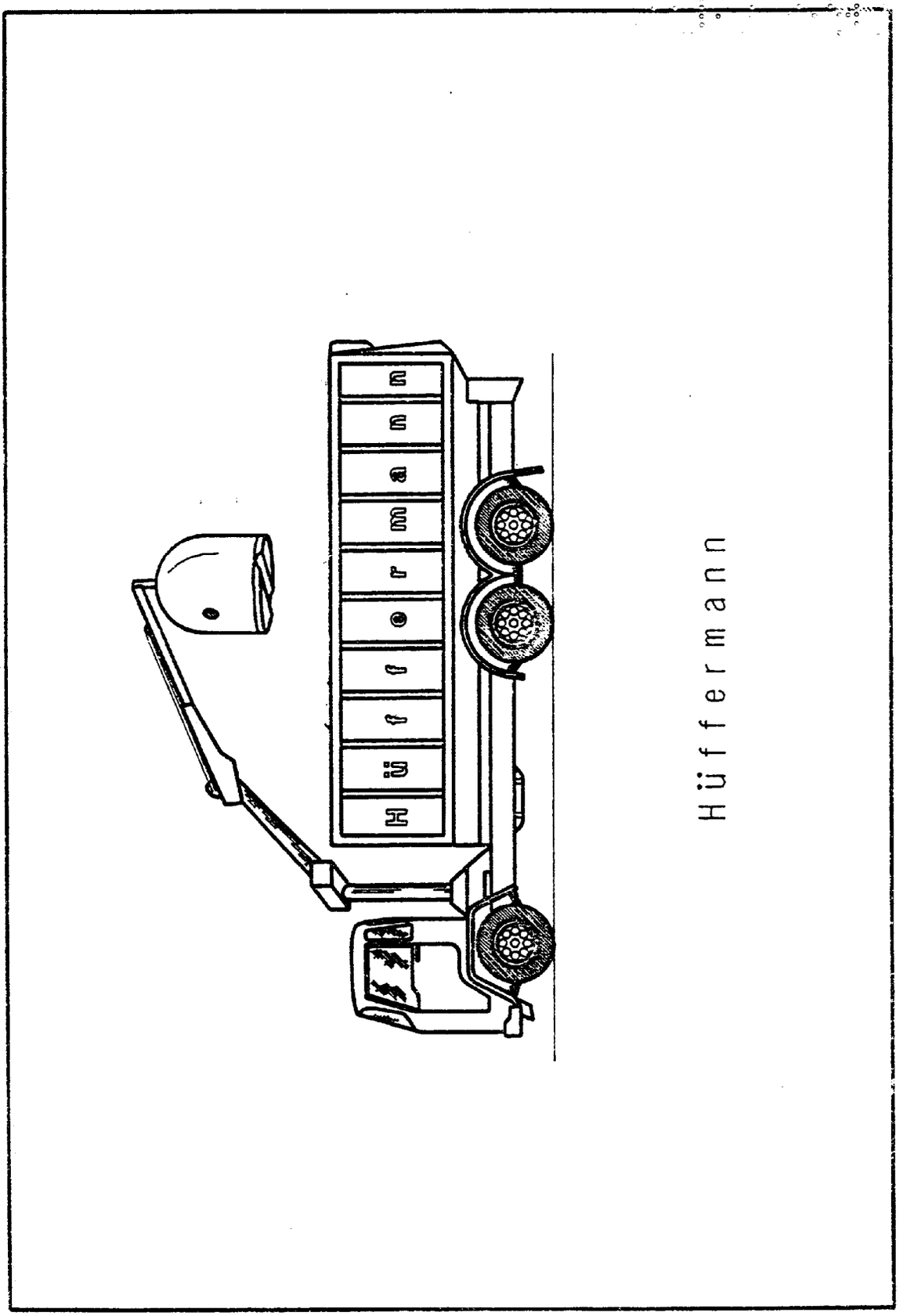

FIG. 3

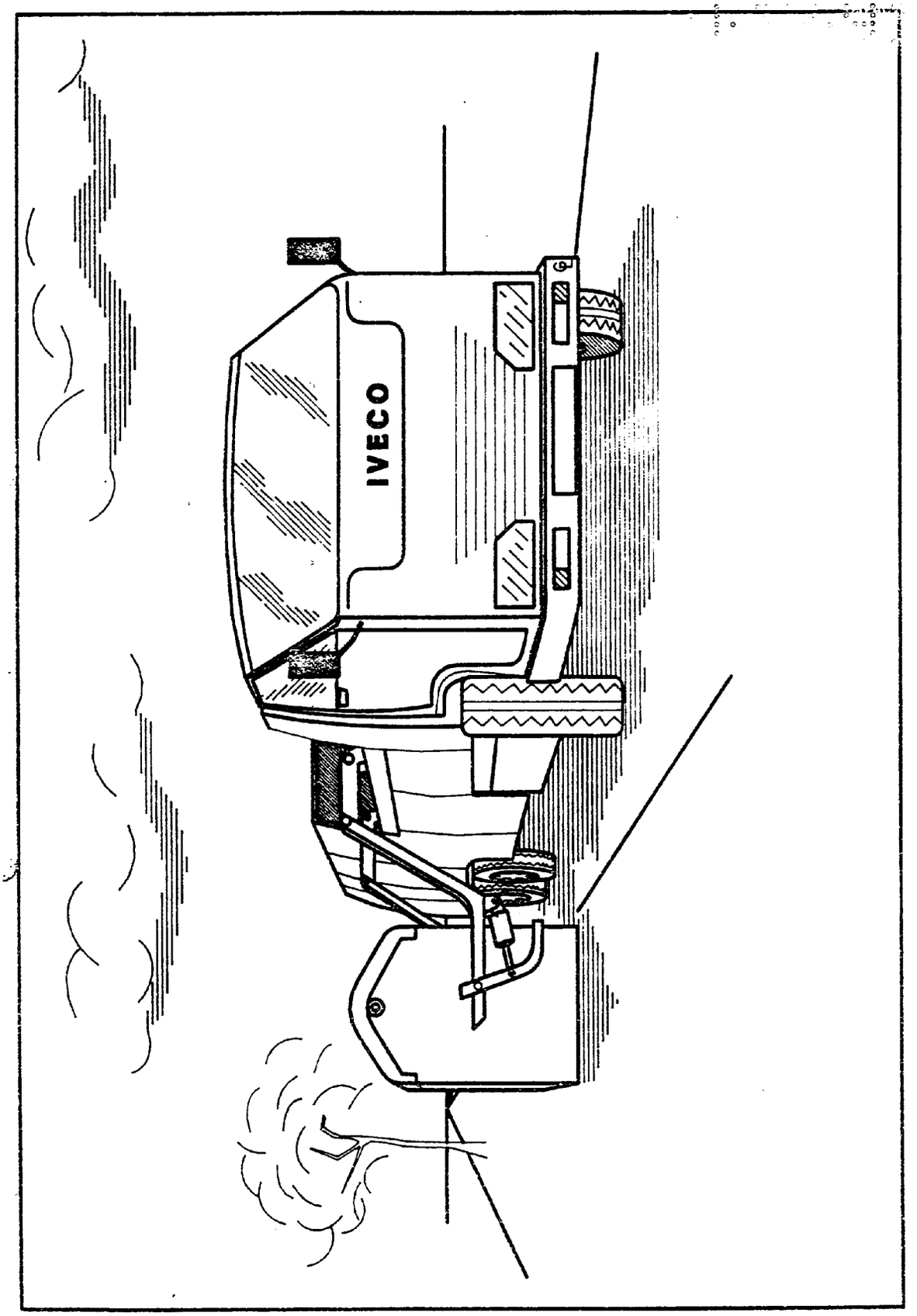

FIG. 4

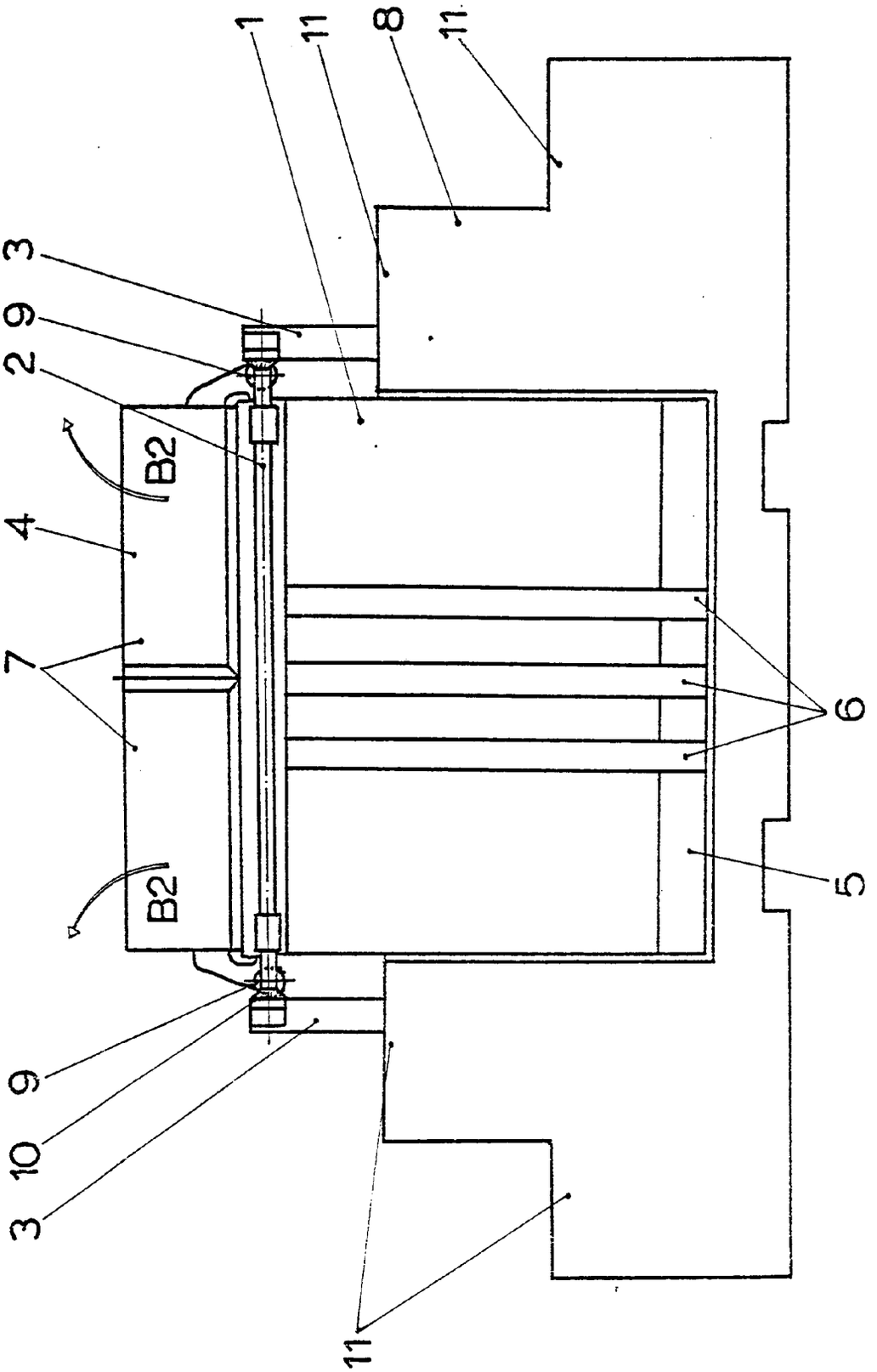

FIG. 5

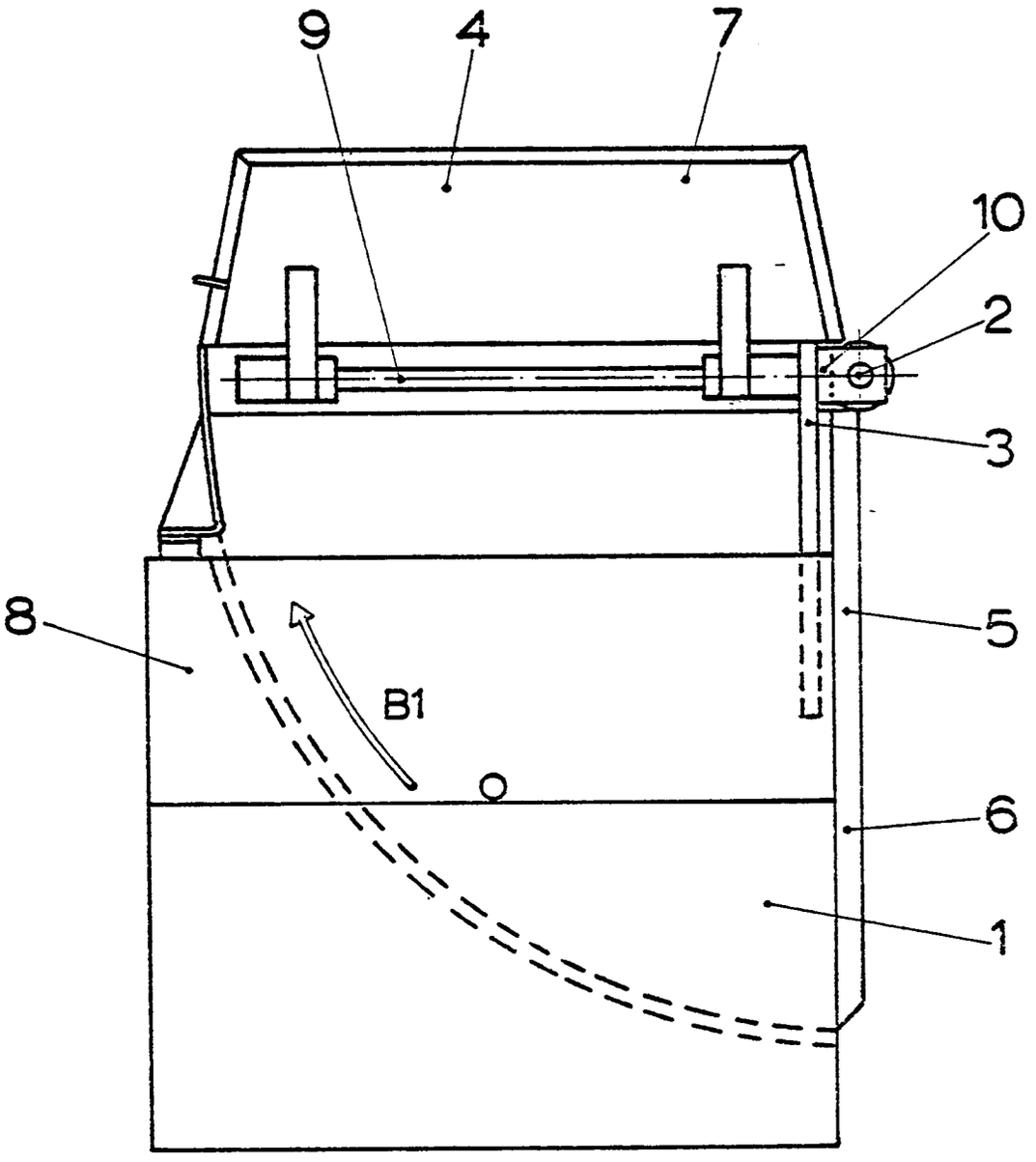

FIG. 6

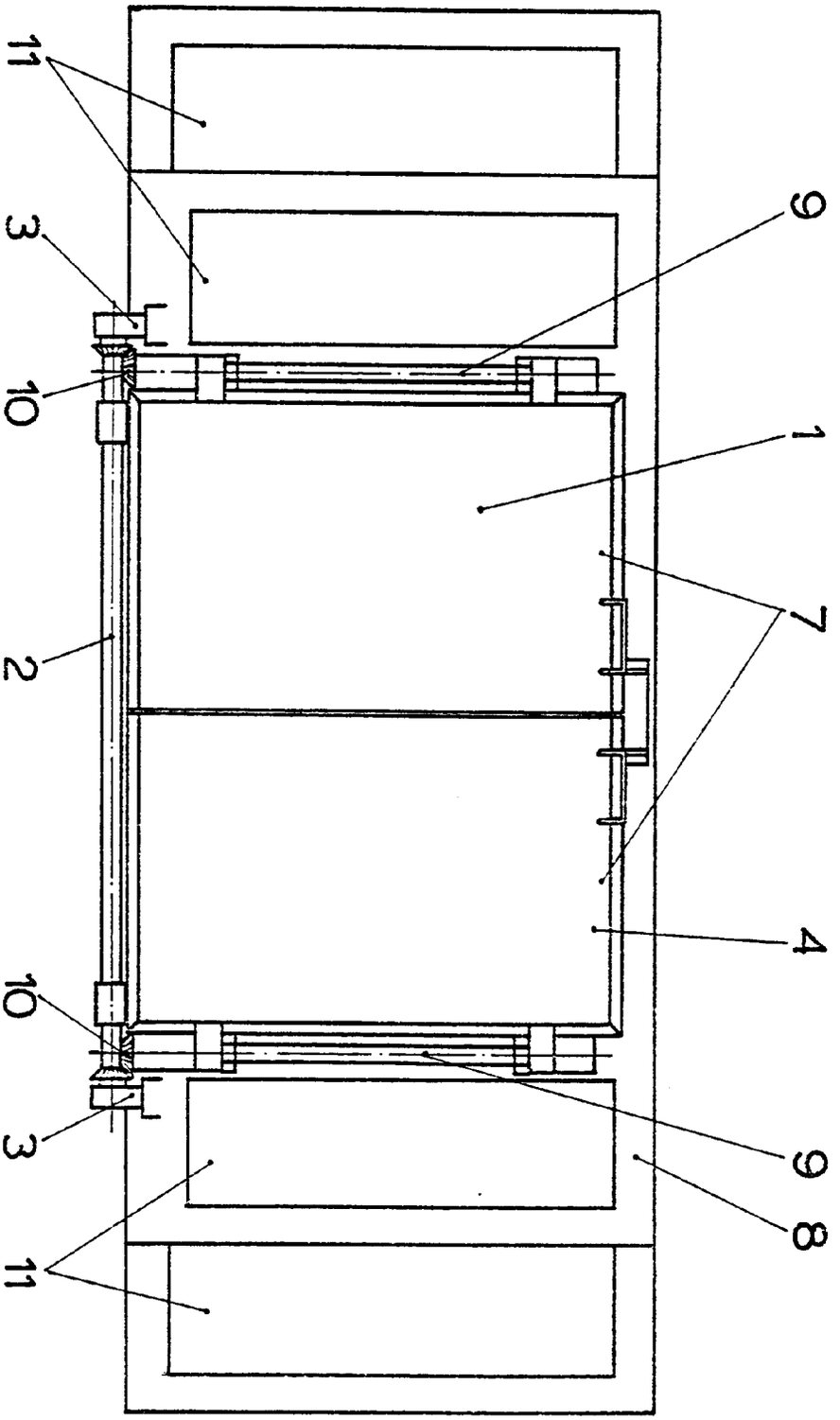

FIG. 7

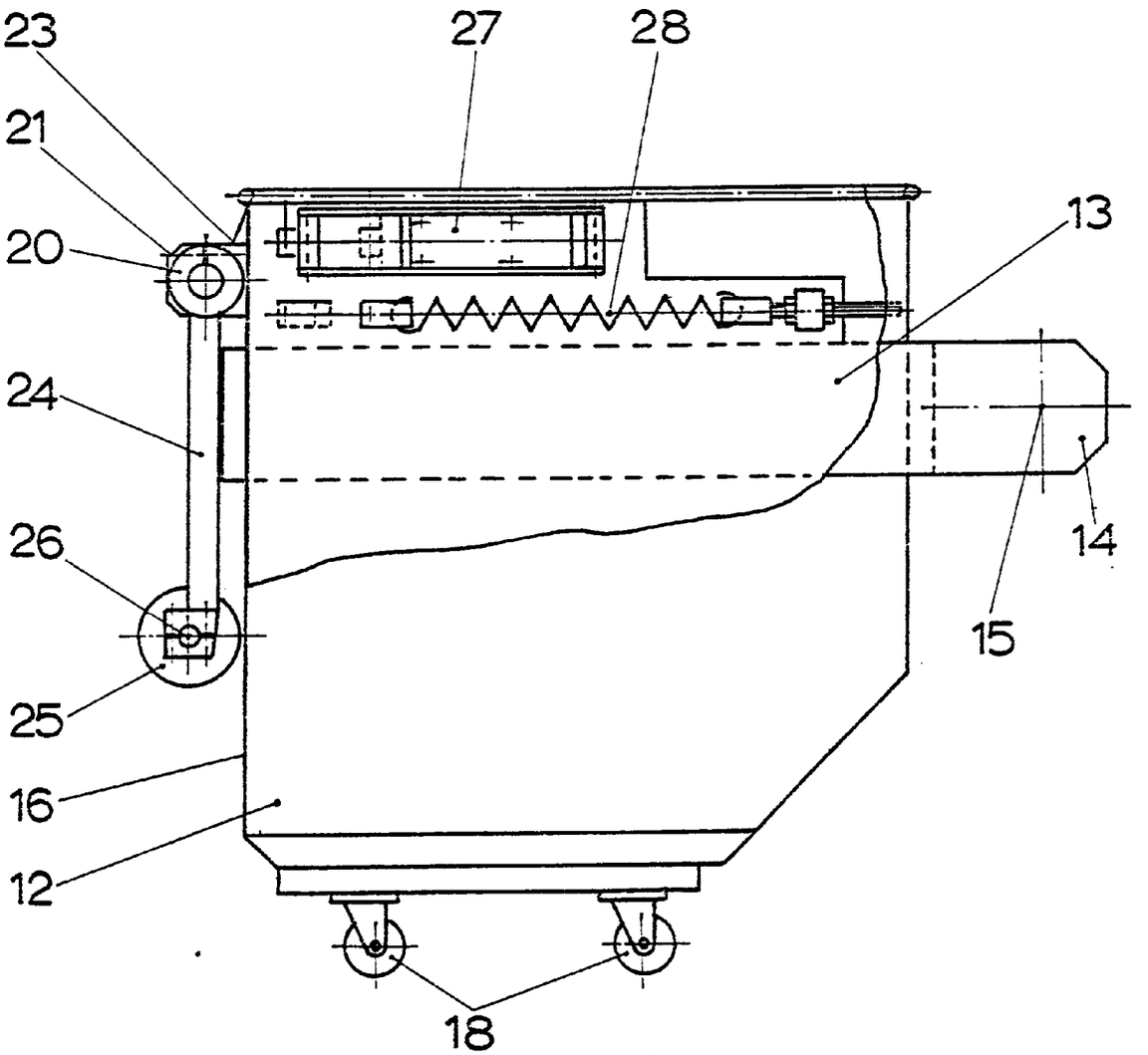

FIG. 8

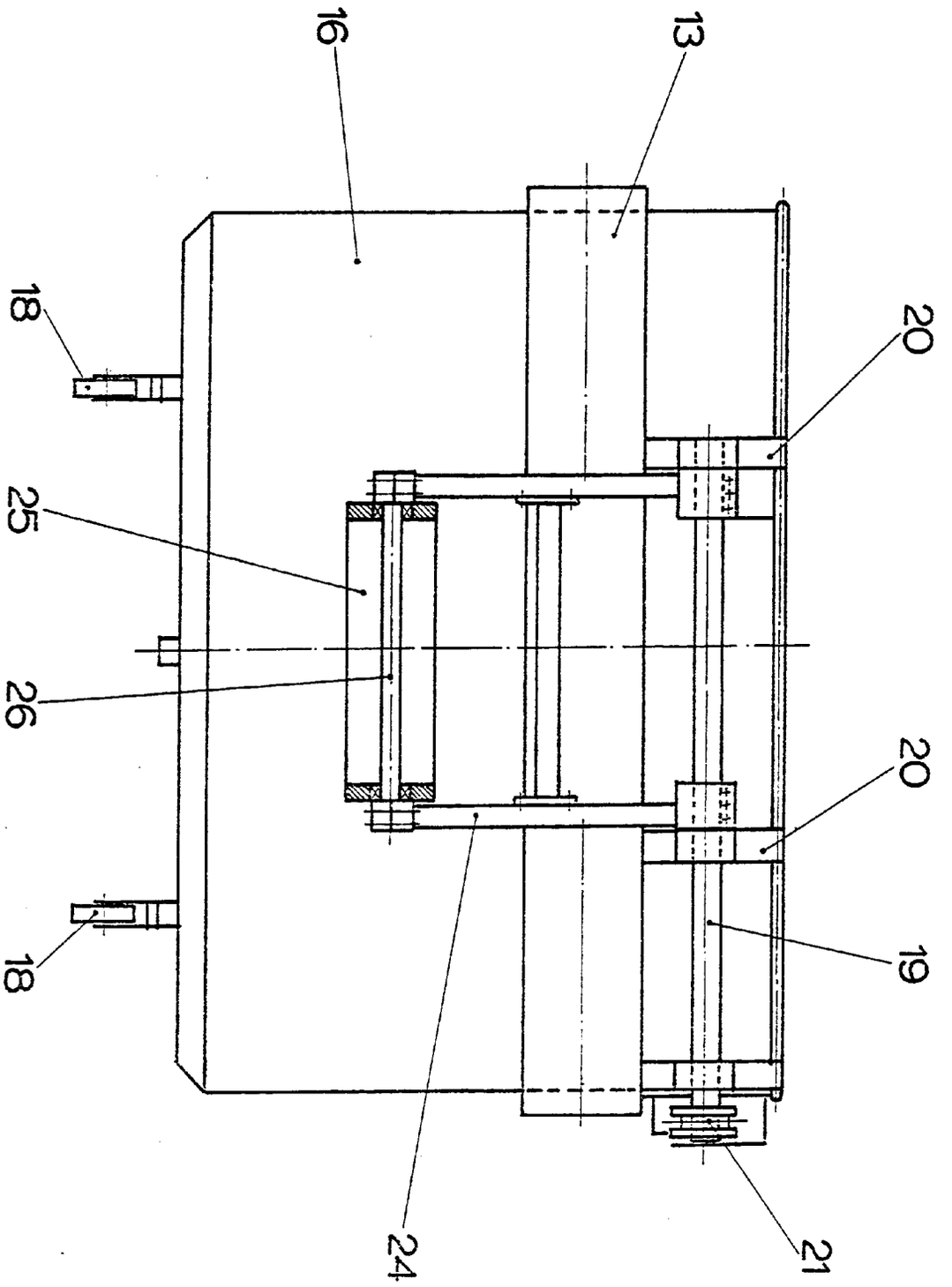

FIG. 9

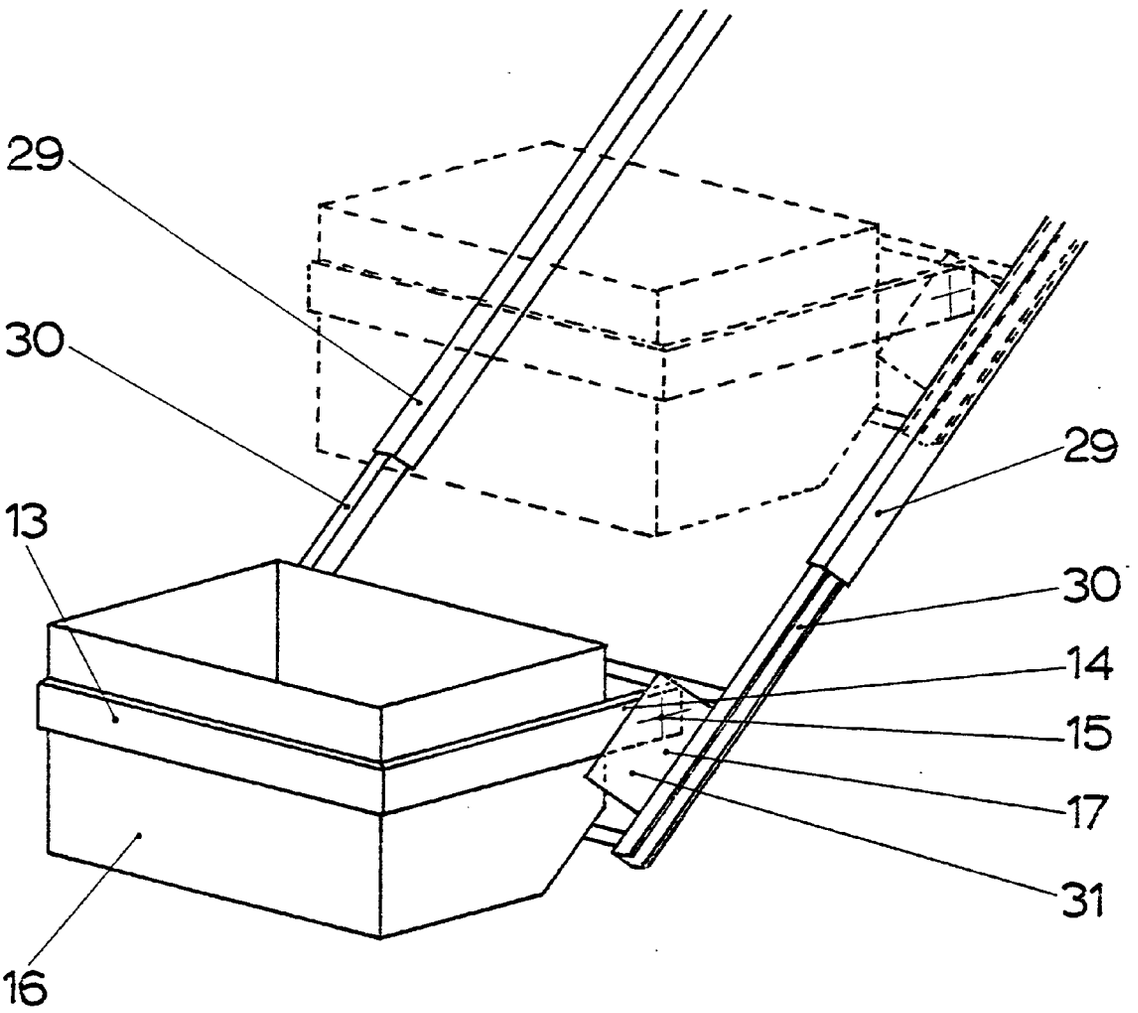

FIG. 10

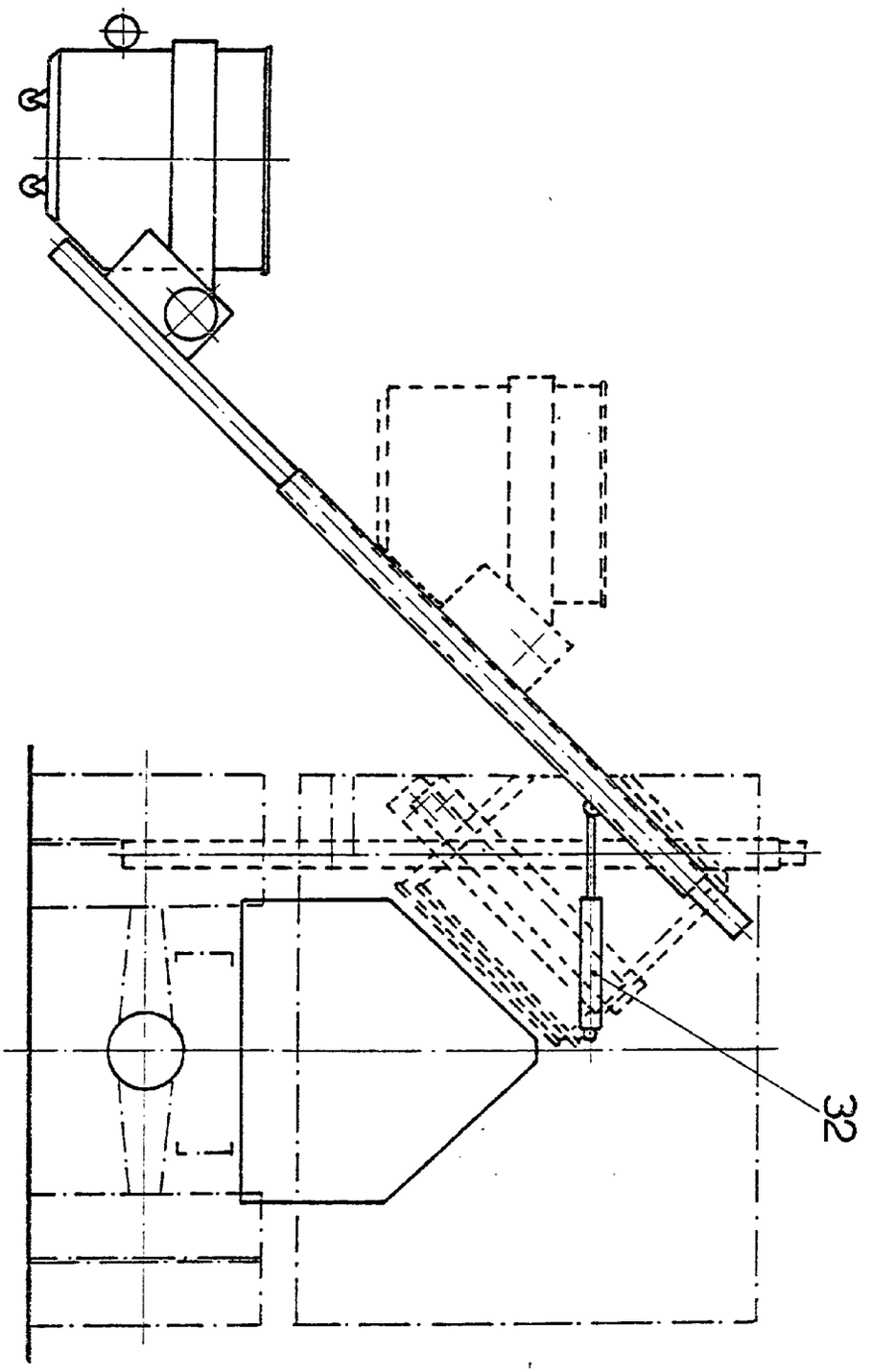

FIG. 11

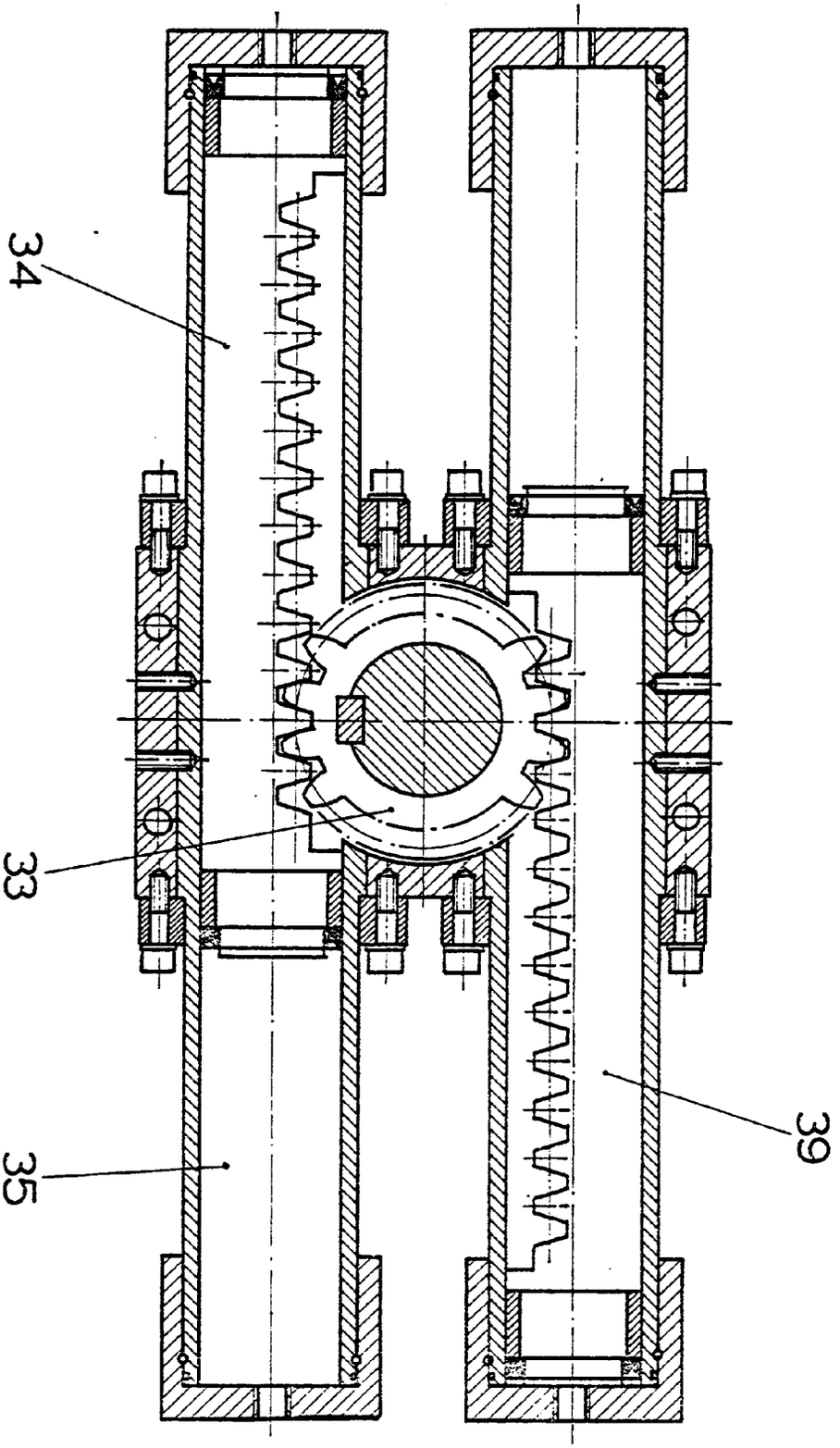

FIG. 12

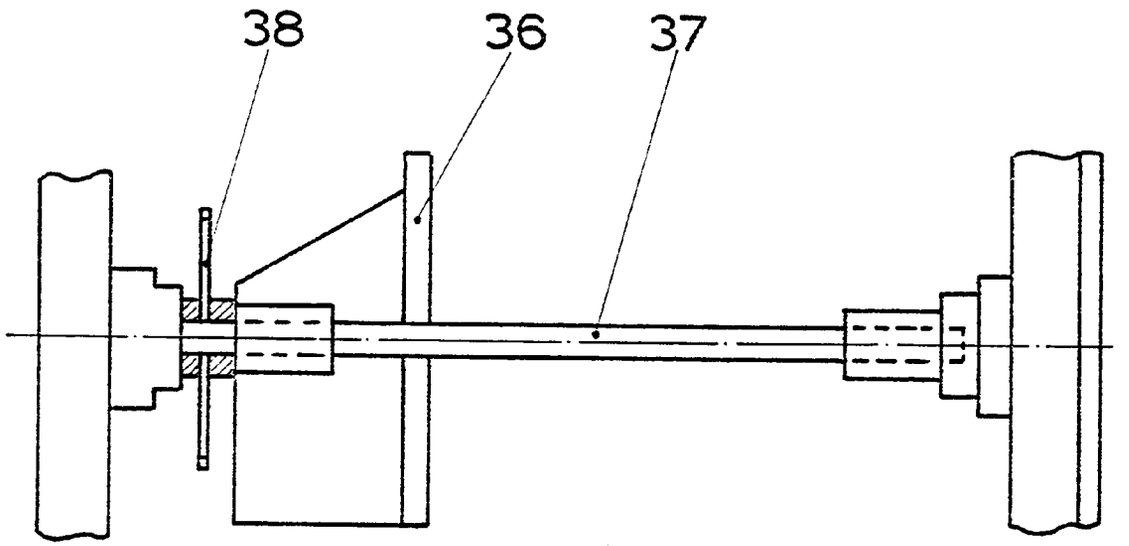

FIG. 13

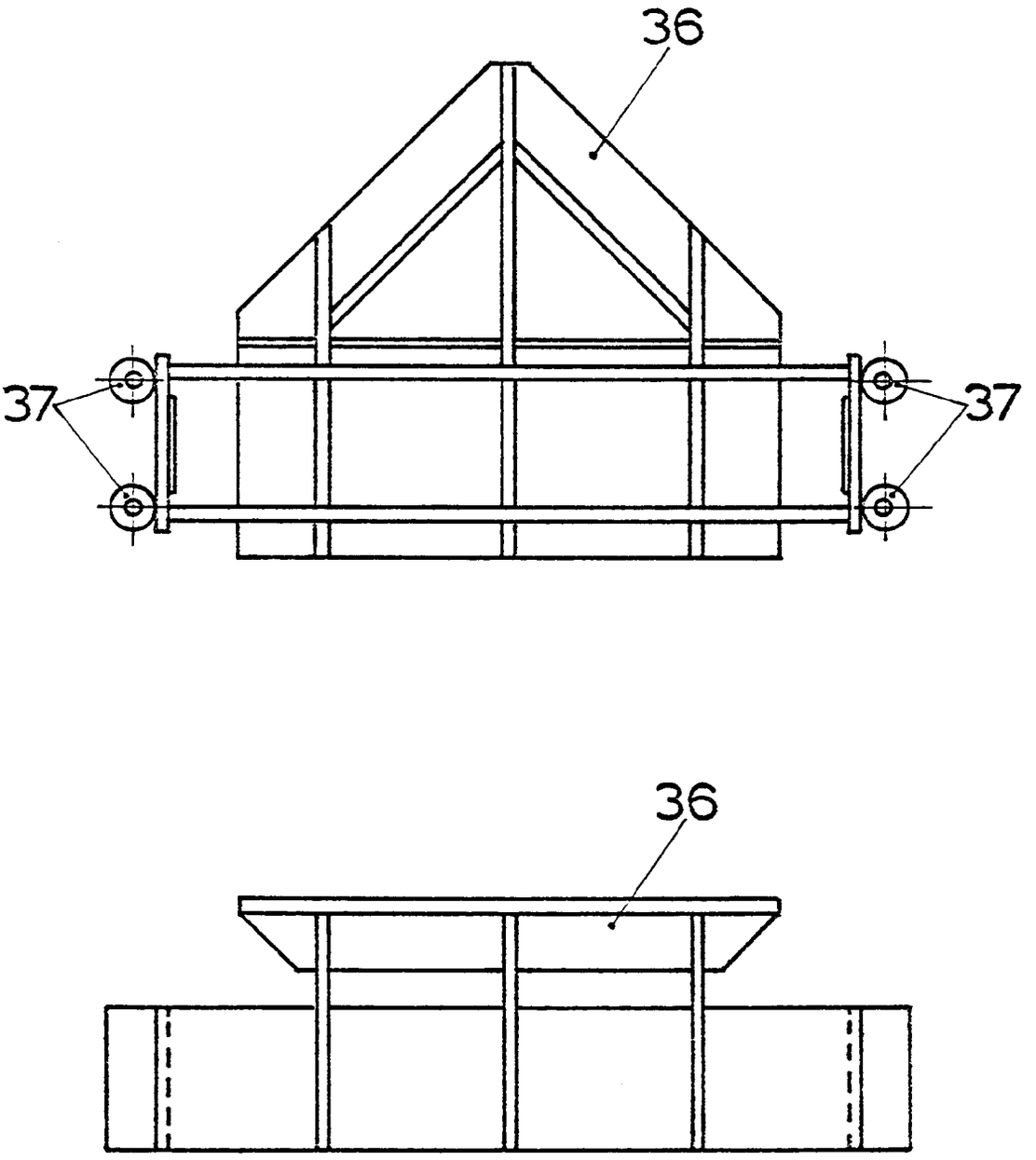

FIG. 14

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 60 0014

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
P,A	EP-A-0 405 345 (EDGAR) * figure 14 * ---	1	B65F3/08 B65F3/02 B65F3/20
A	US-A-3 576 265 (DE CORDOVA ET AL.) * column 1, line 24 - line 42; figures 1-3,7 * ---	1	B65F7/00 B65F1/12 B65F1/14
A	US-A-2 084 656 (ROTTEE) * page 3, right column, line 10 - line 47; figure 9 * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 APRIL 1992	MARTINEZ NAVAR

CATEGORY OF CITED DOCUMENTS

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E : earlier patent document, but published on, or after the filing date
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