



Oifig
Na
bPaitinní

The
Patents
Office

IE 2013/0153

ABSTRACT

A feed mixing and dispensing apparatus (1, 100,40) comprising at least one container (2) mountable on a transport means (3), the container (2) having a longitudinal axis (4), a transverse axis (5) and a vertical axis (6), a pair of opposite end walls (7), a pair of opposite side walls (8) and a base wall (9) and a top opening (10). The longitudinal axis (4) extends substantially parallel to the direction of travel of the container (2).

The transverse axis (5) is substantially perpendicular to the direction of the travel of the container (2). A mixing shaft (11) connected to a drive means is rotatably mounted inside the container (2) and comprises mixing members (12) for breaking up and mixing the feed. The mixing shaft (11) extends between the side walls (8) substantially perpendicular to the longitudinal axis (4) of the container (2). A feed discharge arrangement (14) is provided for discharging the mixed feed from the container (2). <Figure 16>

**TRUE COPY
AS
LODGED**

INT CL	(2011) A01K 5/00
A23N	17/00
B01F	7/00

1

**OPEN TO PUBLIC INSPECTION
UNDER SECTION 28 AND RULE 23
JNL No. 2243 of 4/12/2013**

IE 130153

AN ANIMAL FEED MIXING AND DISPENSING APPARATUS

The present invention relates to a feeder wagon for mixing and dispensing animal feed, such as, but not limited to silage, straw, hay or a mixture of any of these ingredients with grain, cereal or other feed additives or supplements which may be liquid or solid.

Known diet feeders comprise a downwardly tapered container having a vertical mixing auger installed in centre of the container. This type of diet feeder uses a feed outlet at the bottom of the container. Such position of the feed outlet is not always desirable or convenient and additional lifting augers are required to elevate the feed.

Other known diet feeders have a long cylindrical or semi-cylindrical container mounted on a chassis with the longitudinal axis of the container oriented parallel to the direction of towing and a mixing shaft with mixing paddles is mounted inside the container parallel to the longitudinal axis of the container. In such diet feeders, a feed outlet trough is usually mounted alongside the container, typically closer to the top of the container and the feed is elevated into the trough by the mixing shaft. A major drawback of such known diet feeders is that their diameter, i.e. the maximum dimension of the container transverse the longitudinal axis is limited, as it cannot be too large to enable normal towing or manoeuvring of the diet feeder. Accordingly, the mixing capacity of such a diet feeder is restricted.

The object of the present invention is to mitigate the above disadvantages and to provide a diet feeder in which the feed can be dispensed via an elevated chute and having a greater mixing capacity than known diet feeders.

Accordingly, the present invention provides a feed mixing and dispensing apparatus comprising at least one container mountable on a transport means, the container having a longitudinal axis, a transverse axis and a vertical axis, a pair of opposite end walls, a pair of opposite side walls and a base wall, the end walls, the side walls and the base wall defining an interior and a top opening of the container;

wherein the longitudinal axis of the container in use extends substantially parallel to the direction of travel of the container and the transverse axis is substantially perpendicular to the direction of the travel of the container;

the container comprising a mixing shaft rotatably mounted within the interior of the container, the mixing shaft being connected to a drive means;

wherein the mixing shaft extends between the side walls substantially perpendicular to the longitudinal axis of the container and comprises mixing members extending radially from the mixing shaft towards the end walls and the base wall of the container, the mixing members being configured to break up and mix the feed; and

wherein a feed discharge arrangement is provided in communication with the interior of the container for discharging the mixed feed from the container.

10 In one embodiment of the invention the base wall of the apparatus is arcuate in a vertical plane parallel to the longitudinal axis of the container, thereby allowing the mixing members to reach all regions of the base wall so that no feed remains unmixed.

In one embodiment of the invention the mixing members comprise a plurality of mixing paddles. Most preferably the mixing paddles comprise a pair of side arms extending radially from the mixing shaft and comprise a cross member connecting the side arms at an end distal from and substantially parallel to the mixing shaft.

20 In one embodiment of the invention the cross members comprise a plurality of spaced apart spokes extending radially from the cross member. Preferably the spokes are spaced in paired arrangement along the cross member. Most preferably the cross member comprises at least six pairs of spokes along the cross member.

25 In one embodiment of the invention the spokes are substantially planar and comprise a straight edge and a tapered edge. Preferably the tip of the spokes extend close to the interior end walls of the container so that no feed remains unmixed.

30 In a preferred embodiment of the invention the diameter of the mixing paddles extending radially from the mixing shaft is almost twice the length of the mixing shaft. The large diameter allows for large round or square bales or other feed material to be directly dropped into the apparatus for shredding and mixing. Consequently there is less requirement to manage the size input of material into the container and less time and effort required in loading the container.

In addition the large diameter mixing members allow the mixed feed to be discharged at higher discharge heights than conventional feeder machines. This is an advantage when the feed has to be conveyed across feeding barriers or the like.

- 5 The elongated mixing paddles with the paired spokes extending radially from the cross member retain the load within the mixer resulting in less abrasion and resistance to the interior of the container. Preferably the load is carried and tumbled within the container at a slow speed. Consequently less energy is required to rotate the mixing members resulting in a more economical and more environmentally friendly system. The elongated
10 mixing paddles also result in less mixing time being required than with conventional feeder mixers.

The elongated mixing paddles of the present invention also result in less damage to the fibre of the material being mixed and provide a better mix. No compression force is
15 applied to the mix material and the resultant feed mix is looser and fluffier. An increase in yield is also observed.

In one embodiment of the invention the side walls at the top opening of the container are flanged. The flanged sides help to contain the material loaded within the container while
20 mixing is in operation.

Preferably, the discharge arrangement in communication with the interior of the container for discharging the mixed feed from the container, is provided elevated from the base wall of the container. Ideally, the discharge arrangement is provided approximately midway
25 between the base wall and the top opening and, preferably, nearer the top opening than the base wall. The discharge arrangement is preferably provided at an end wall of the container and the discharge arrangement may be modified to discharge the feed at a side wall of the container and indeed at multiple locations around the perimeter of the container. Furthermore, a discharge arrangement can provided at each of the opposite
30 end walls of the container.

Ideally, the feed discharge arrangement comprises a trough having an open longitudinal side, the trough extending along an end wall of the container elevated from the base wall, the trough being arranged in communication with the interior of the container, preferably
35 by mounting the trough alongside the end wall so that the open side of the trough adjoins

the end wall for receiving the mixed feed from the container and a discharge auger rotatably mounted along the trough for transferring the feed along the trough to an outlet arrangement provided in the trough.

- 5 The outlet arrangement may be provided in the centre or at one or both ends of the trough. In the latter configuration, the discharge auger is preferably reversible in order to deliver the feed to either end of the trough. Preferably, the trough includes a section extending along a side wall of the container. The trough may also be provided with multiple outlet arrangements.

10

Ideally, the mixing shaft is mounted substantially horizontally.

15

Preferably, the distance between the end walls is greater than the distance between the side walls. The distance between the end walls may also be equal to the distance between the side walls.

20

Preferably, the height of the container is equal or greater than the width, i.e. the distance between the side walls. The height of the container may also be equal to the width, i.e. the distance between the side walls.

Preferably, the discharge auger is driven by a motor, such as, for example, an hydraulic motor.

25

Advantageously, the mixing members are adapted to function as cutting members for cutting bulky feed material into smaller portions.

30

In one embodiment of the invention the mixing shaft and the mixing members are mutually configured so that when the mixing shaft rotates in a first direction, the feed is retained in the interior of the container during mixing, whereas when the mixing shaft rotates in a second, opposite direction, the feed is transferred by the mixing members into the discharge arrangement.

35

In a preferred embodiment, the first direction is the direction of rotation wherein the mixing members near the discharge arrangement travel from the top opening to the base wall and the mixing members remote the discharge arrangement travel from the base wall to

the top opening, wherein the mixing members are configured so as to prevent the feed from getting into the discharge arrangement, whereas the second direction is the direction of rotation wherein the mixing members near the discharge arrangement travel from the base wall to the top opening and the mixing members remote the discharge arrangement travel from the top opening to the base wall, wherein the mixing members are configured so as to direct the feed into the discharge arrangement.

In one embodiment of the invention, the apparatus comprises two or more containers joined at their adjacent end walls. In such an embodiment, the mixing shafts of the containers may be driven by the same drive means, either simultaneously, or one mixing shaft at a time, or alternatively, the mixing shafts may each be driven by separate drive means. In one variation of this embodiment, one or each container comprises a discharge arrangement at the end wall of the container remote from the joined end walls. Alternatively or additionally, the discharge arrangement is provided between the adjoining end walls of the containers. The first and second directions of the mixing shafts of the adjacent containers are adapted accordingly, i.e. the mixing shafts of the adjacent containers rotate in opposite directions and operate as mirror images of each other for mixing and discharging the feed.

The provision of two or more containers as described above allows different types of feed to be processed, e.g. broken up, cut or mixed independently in the separate containers. Furthermore, it is possible to adapt adjacent containers so that in a first container the mixing shaft processes a batch of feed material in a first manner, for example, breaks up or cuts a batch of feed material and subsequently transfers the so processed feed material into the second container, preferably via the discharge arrangement, wherein the mixing shaft of the second container processes the feed material in a second manner, for example, mixes a previously broken up or cut feed material.

In one embodiment of the invention the mixing paddle comprises one or more elongate separator members which assist in pulling compacted or entangled fibrous feed material apart and mixing it with other feed ingredients. Also, the mixing paddle preferably includes a lifting member, preferably in the form of a strip of resilient flexible material, such as e.g. rubber to facilitate lifting of the feed material into the discharge arrangement while at the same time being gentle on the feed.

Preferably, the mixing shaft includes five mixing members evenly angularly spaced on the mixing shaft. Such a number of mixing members allows the feed material to be kept in constant motion during mixing thereby increasing the efficiency and quality of the mixing and reducing the power required to drive the mixing shaft. It will be however appreciated
5 that the invention is not limited to a particular number of mixing members.

Each mixing member preferably comprises at least one radially extending support member and, typically, a pair of support members longitudinally spaced along the shaft, and a horizontal beam supported by the support members and radially spaced from the
10 mixing shaft. In known diet feeders, because the mixing shaft is relatively long compared to the diameter of the mixing container of a known diet feeder, two or more flights of mixing paddles need to be provided, that is several mixing paddles are mounted along the length of the mixing shaft. Such an arrangement is necessary in known diet feeders because it is not practical to provide a single mixing paddle with a long horizontal beam
15 extending along the entire length of the mixing shaft as such a long mixing paddle, and in particular the horizontal beam of the mixing paddle, would be subjected to significant bending forces and may bend or break during mixing. In the apparatus of the present invention, due to the transverse orientation of the mixing shaft, a single flight of mixing paddles is sufficient because the length of a horizontal beam of such a mixing paddle is
20 restricted to the width, i.e. the distance between the side walls of the mixing container, and thus cannot be provided so long as to be subjected to dangerous bending forces during mixing.

Ideally, the lifting member is mounted on a mixing paddle in relation to a corresponding
25 separator member so that when a mixing paddle is positioned near the discharge arrangement the lifting member is positioned above the separator member and when the mixing paddle is positioned diametrically remote the discharge arrangement the lifting member is positioned below the separator member. Accordingly, when the mixing shaft rotates in the first direction, i.e. during mixing, a separator member of a mixing paddle
30 leads and strikes the feed first ahead of a corresponding lifting member, whereas the lifting member is deflected by the feed material backwards in relation to the direction of the rotation of the mixing shaft. This arrangement enables the separator members to break down and mix the feed material while at the same time preventing the feed from being pushed into the discharge arrangement. Conversely, when the mixing shaft rotates
35 in the second direction, i.e. during discharge, a lifting member of a mixing paddle leads

and contacts the feed first ahead of a corresponding separator member while at the same time the separator member supports the lifting member and prevents the lifting member from being deflected by the feed material backwards in relation to the direction of the rotation of the mixing shaft and as a result the lifting member pushes the feed material
5 towards and into the discharge arrangement.

Conveniently the drive means of the mixer shaft is configured to be coupled with and driven by a drive mechanism of the vehicle. Preferably, the drive means of the mixer shaft is coupled to the mixing shaft via a redirecting means which provides for the transfer
10 of rotation from an axis of a drive shaft of the drive means which is substantially parallel to the longitudinal axis of the container to the axis of the mixing shaft which is substantially transverse the longitudinal axis of the container. In one embodiment, the redirecting means comprises a gear arrangement, preferably a bevelled gear arrangement.

15 Preferably, a reversing mechanism, such as, for example, a reverse gearbox, is provided for changing the direction of rotation of the mixing shaft so that the mixing shaft can discharge the feed to discharge arrangements provided at opposite end walls of the container. In one embodiment, the reversing mechanism is provided as a single unit together with the redirecting means.

20 In a preferred embodiment of the invention the container comprises a plurality of blades, preferably, serrated blades, mounted inside the container protruding inwardly from the end walls or from the base wall of the container.

25 The blades facilitate the separation of compacted or entangled fibrous feed material into looser and/or smaller portions thereby aiding in achieving a consistent mix. Ideally, the blades are movably arranged to be fully or partially retracted from the interior of the container via slots formed in the end walls or the base wall of the container. The blades can be arranged to rotate about respective pivot points. The blades are preferably
30 movable by a ram arrangement which can comprise a single ram for moving several blades or a plurality of rams for moving corresponding blades individually. The ram or the rams can be, for example, hydraulic or pneumatic rams. This function is beneficial in that it allows the distance the blades protrude into the container to be regulated depending on the material being mixed and also allows the blades to be retracted fully from interior of
35 the container when their use is not required, or is not desirable. The serrated knives may be

engaged for a certain period of time to break up items for example bales of straw or silage and then disengaged while normal mixing continues. It is important to be able to control the length that straw bales or baled silage or other feed material is cut so as to suit an animals digestive system.

5

Preferably in an apparatus of the invention comprising two or more containers joined at their adjacent end walls the hydraulically engageable blades may also be located at the front end of the apparatus.

10 In one embodiment of the invention the blades are electronically controlled to move from a working cutting position to a non-working position. The blades may be set on a timer for easier loading and management. This would be advantageous for a farmer to control their own ration mix depending on the type of animals to be fed.

15 In a further embodiment of the invention the container comprises a discharge arrangement near the base of the container and connected to the hydraulically controlled cutting blades. Preferably in this embodiment of the invention the hydraulically controlled cutting blades and discharge arrangement are located at the rear end of the container.

20 The discharge arrangement comprises a door which is movable very quickly between an open and shut state by a ram arrangement comprising at least two rams. The rams may be, for example, hydraulic or pneumatic rams. Mixed feed material may be discharged rapidly from the container onto the ground as the container is pulled in a forward direction.

25 Most preferably the discharge arrangement comprises means to prevent and/or minimise any dust raised when the feed is rapidly discharged.

Advantageously, the apparatus of the invention is mounted on a chassis and is connectable to a vehicle, such as for example a tractor.

30

In one embodiment of the invention the chassis comprises means to support the container and support the drive mechanism for mixing the feed in the container. Preferably, the container is mounted on load cell weighing points. Most preferably the container is mounted on 4 load cell weighing points. The weighing points enable the farmer to know

and adjust the percentage feed mixes that are required for different animals at different times.

5 In one embodiment of the invention the chassis comprises a short stub axle as the wheel axle cannot pass through the large mixing container. The short stub axle has to be able to sustain a lot of stress. The short stub axle comprises a special member going up from the stub to take the side strain. The member goes upwards at an angle and connects with a main load cell weighing point. This stabilizes the side load on the stub axle and prevents the stub axle from splaying out. The chassis does not come in contact with the container
10 except at the 4 load cell weighing points. The front of the chassis goes up at a right angle and takes the support or back strain imposed by the drawbar from another member reaching back to the stub member at the correct height level. The chassis of the present invention ensures that the optimum centre of gravity of the mixing and dispensing apparatus is achieved.

15

In one embodiment of the invention the chassis comprises means for conveying feed to where it is required. The conveying means preferably comprises a conveyor located substantially horizontally below an outlet on a discharge arrangement.

20 In one embodiment of the invention the conveying means is located below a central outlet arrangement in a trough extending along an end wall of the container and the conveying means runs substantially perpendicular to the direction of travel of the container. Preferably the chassis has means to move the conveyor hydraulically from side to side. Most preferably the chassis has hydraulically controlled side arms for moving the
25 conveyor from side to side. In this way the mixed feed may be delivered to either side of the apparatus as required.

Advantageously the chassis has increased manoeuvrability enabling the feed mixing and dispensing apparatus of the invention to be guided into awkward areas where other
30 conventional feeder machines would not be able to access.

The advantage of the apparatus of the present invention is that it allows to achieve a significantly greater height of the apparatus, compared to known diet feeders which are restricted in height because their height corresponds to the diameter of the longitudinally
35 rotating mixing rotor which in turn corresponds to the width (i.e. the dimension transverse

the direction of travel of the diet feeder) of the container and the width of the diet feeder is in turn restricted to a certain maximum width in order not to affect the manoeuvrability of the diet feeder. In the apparatus of the present invention, due to the transverse orientation of the mixing shaft, the width of the container can be kept within the required limits, while at the same time allowing the container to have a height significantly greater than the width thereby considerably increasing the mixing capacity of the container compared with known diet feeders.

Herein, the terms "rear", "front", "forwardly", "rearwardly" or the like are relative and are related to a longitudinal axis of the container coinciding with the direction of towing of the diet feeder. Whereas the terms "upper", "lower", "upwardly", "downwardly", "horizontal", "vertical" or the like are related to a ground surface on which the diet feeder is normally exploited.

The invention will now be described with reference to the accompanying drawings which exemplify embodiments of a diet feeder of the invention. In the drawings:

Figure 1 is a side view of a diet feeder of the invention mounted on a chassis;

Figure 2 is a side cross section of the diet feeder of Figure 1;

Figure 2a is an enlarged view of area X of Figure 2 showing a mixing attachment of the mixing shaft of the diet feeder;

Figure 2b is a plan view of the mixing attachment of Figure 2a;

Figure 3 is a front view of the diet feeder of Figures 1 and 2;

Figure 3a is an enlarged view of area Y of Figure 3 showing a pivot point of a movable blade of the diet feeder;

Figure 3b is an enlarged view of area Z of Figure 3 showing a drive connection of a discharge auger of the diet feeder;

Figure 4 is a rear view of the diet feeder of Figures 1 to 3;

Figure 5 is a rear view of the diet feeder of Figures 1 to 3 mounted on a chassis;

5 Figure 6 is a schematic plan of a drive connection of the mixing shaft of the diet feeder of Figures 1 to 5;

Figure 7 is a schematic plan of a drive connection of the discharge auger of the diet feeder of Figures 1 to 5;

10

Figure 8 is a schematic side view of a further embodiment of a diet feeder of the invention comprising a pair of containers for mixing and dispensing feed with dispensing augers provided at opposite sides of the two containers;

15

Figures 9 and 10 are schematic side views of a still further embodiment of a diet feeder of the invention comprising a pair of containers for mixing and dispensing feed with a common dispensing auger provided between the two containers;

20

Figure 11 is a schematic side view of a further embodiment of a diet feeder of the invention;

Figure 12 is a side cross sectional view of the diet feeder of Fig. 11;

25

Figure 13 is further schematic side view of the diet feeder of Fig. 11 with a discharge arrangement in its open position;

Figure 14 is schematic side view of the diet feeder of Fig. 11 with a discharge arrangement in its closed position;

30

Figure 15 is a schematic front view of the diet feeder of Fig. 11;

Figure 16 is a schematic rear view of the diet feeder of Fig. 11; and

Figure 17 is schematic side view of a chassis of the invention.

35

Referring initially to Figures 1 to 7 a feed mixing and dispensing apparatus of the invention is indicated generally at 1 comprises at least one container 2 mountable on a transport means, in the presently described embodiment, a chassis 3 connectable to a vehicle (not shown), such as a tractor. The container 2 has a longitudinal axis 4, a transverse axis 5 and a vertical axis 6, a pair of opposite end walls 7, a pair of opposite side walls 8 and a base wall 9. The end walls 7, the side walls 8 and the base wall 9 define an interior and a top opening 10 of the container 2.

The longitudinal axis 4 of the container 2 in use extends substantially parallel to the direction of travel of the container 2 on the chassis 3 and the transverse axis 5 is substantially perpendicular to the direction of the travel of the container 2.

The container 2 comprises a mixing shaft 11 rotatably mounted within the interior of the container 2. The mixing shaft 11 is connected to a drive means, which is preferably a drive mechanism of the vehicle via a redirecting means, presently, a bevelled gear arrangement 15, which provides for the transfer of rotation from an axis 35 of a drive shaft of the drive means which is substantially parallel to the longitudinal axis 4 of the container 2 to the axis 5 of the mixing shaft 11 which is substantially transverse the longitudinal axis 4 of the container 2.

The mixing shaft 11 extends substantially horizontally between the side walls 8 substantially perpendicular to the longitudinal axis 4 of the container and comprises mixing members 12 extending radially from the mixing shaft 11 to the end walls 7 and the base wall 9 of the container 2. The mixing members 12 are suitably configured to break up and mix the feed.

A feed discharge arrangement 14 is provided at an end wall 7 of the container 2 elevated from the base wall 9 of the container 2. The discharge arrangement 14 is arranged in communication with the interior of the container 2 for discharging the mixed feed from the container 2. In the embodiments described herein, the discharge arrangement 14 is provided approximately midway between the base wall 9 and the top opening 10. In other embodiments, the discharge arrangement 14 can be provided nearer the top opening 10 than the base wall 9, or nearer the base wall 9 than the top opening 10.

The feed discharge arrangement 14 comprises a trough 16 having an open longitudinal side 17. The trough 16 extends along an end wall 7 of the container elevated from the base wall 9, so that the open longitudinal side 17 is in communication with the interior of the container 2. The trough 16 is mounted alongside the end wall 7 so that the open side
5 17 of the trough 16 adjoins the end wall 7 for receiving the mixed feed from the interior of the container 2.

A discharge auger 18 is rotatably mounted along the trough 16 for transferring the feed along the trough 16 to an outlet opening 19 (Figure 7) provided at one or both ends of the
10 trough 16. In the latter configuration, the rotation of the discharge auger 18 is reversible in order to deliver the feed to either end of the trough 16. In other embodiments, the trough can include a section extending along a side wall 8 of the container 2 if required. The trough 16 can indeed be provided with outlet openings at multiple locations around the perimeter of the container 2.

15 When the mixing shaft 11 rotates in a first direction indicated by arrow A in Figure 2, whereby the mixing members 12 near the discharge arrangement 14 travel from the top opening 10 to the base wall 9 and the mixing members 12 remote the discharge arrangement 14 travel from the base wall 9 to the top opening 10, the feed is directed into
20 the trough 16 through the opening 17. When the mixing shaft 11 rotates in a second, opposite direction indicated by arrow B in Figure 2, whereby the mixing members 12 near the discharge arrangement 14 travel from the base wall 9 to the top opening 10 and the mixing members 12 remote the discharge arrangement 14 travel from the top opening 10 to the base wall 9, the feed is retained in the interior of the container 2 during mixing.

25 In the embodiments herein described, the base wall 9 is arcuate in a vertical plane parallel to the longitudinal axis 4 of the container 2. As a result, the mixing members 12 to reach all regions of the base wall 9 so that no feed remains unmixed.

30 Although the drawings show mixing shafts 11 comprising four mixing members 12, it is advantageous to provide the mixing shaft 11 with five mixing members 12 evenly angularly spaced on the mixing shaft 11. Such a number of mixing members 12 allows the feed material to be kept in constant motion during mixing thereby increasing the efficiency and quality of the mixing and reducing the power required to drive the mixing

shaft 11. It will be however appreciated that the invention is not limited to a particular number of mixing members 12.

5 The mixing members 12 comprise mixing paddles 20. The mixing paddle 20 includes one or more elongate separator members in the form of fingers 21 which assist in pulling compacted or entangled fibrous feed material apart and mixing it with other feed ingredients. The mixing paddle 20 also includes a lifting member 22 in the form of a strip of resilient flexible material, such as e.g. rubber to facilitate lifting of the feed material while at the same time not over-stressing the feed.

10

The lifting member 22 is mounted on a mixing paddle 20 in relation to a corresponding finger 21 so that when a mixing paddle 20 is positioned near the discharge trough 16 the lifting member 22 is positioned above the finger 21 and when the mixing paddle 20 is positioned diametrically remote the discharge trough 16 the lifting member 22 is
15 positioned below the finger 21. Accordingly, when the mixing shaft 11 rotates in the first direction, i.e. during mixing, a finger 21 of a mixing paddle 20 leads and strikes the feed first ahead of a corresponding lifting member 22, whereas the lifting member 22 is deflected by the feed material backwards in relation to the direction of the rotation of the mixing shaft 11. This arrangement enables the fingers 21 to break down and mix the
20 feed material while at the same time preventing the feed from being pushed into the discharge trough 16. Conversely, when the mixing shaft 11 rotates in the second direction, i.e. during discharge, a lifting member 22 of a mixing paddle 20 leads and contacts the feed first ahead of a finger 21 while at the same time the finger 21 supports the lifting member 22 and prevents the lifting member 22 from being deflected by the feed
25 material backwards in relation to the direction of the rotation of the mixing shaft 11 and as a result the lifting member 22 pushes the feed material towards and into the discharge trough 16.

The container 2 comprises a plurality of blades 30, which are preferably serrated,
30 mounted inside the container 2 protruding inwardly from the end walls 7 or from the base wall 9 of the container 2. The blades 30 facilitate the separation of the compacted or entangled fibrous feed material into looser and/or smaller portions thereby aiding in achieving a consistent mix.

The blades 30 are movably arranged to be fully or partially retracted from the interior of the container 2 via slots (not indicated by a numeral) formed in the end walls 7 or the base wall 9 of the container 2. In the embodiments herein described, the blades are rotatable about pivot points 31 and are movable by rams 32, e.g. hydraulic rams. This function is
5 beneficial in that it allows the distance the blades 30 protrude into the container 2 to be regulated depending on the material being mixed and also allows the blades 30 to be retracted fully from interior of the container 2 when their use is not required, or is not desirable.

10 The container 2 is mounted on the chassis 3 via weight cells 40, which are preferably electronically controlled, to measure the weight of the feed material in the container 2.

The distance between the end walls 7 is equal or greater than the distance between the side walls 8, whereas the height of the container 2 is equal or greater than the width, i.e.
15 the distance between the side walls. This configuration is made possible due to the orientation of the mixing shaft 11 transverse the longitudinal axis 4 of the container 2, thereby enabling the container 2 to retain the width and the length within the known manoeuvrability limits whilst allowing the height of the container 2 to be increased compared to known diet feeders, thereby considerably increasing the mixing capacity of
20 the container 2.

The discharge auger 18 is driven by a motor, such as, for example, an hydraulic motor 50.

In an advantageous embodiment, the apparatus, indicated generally by reference numeral
25 100 in Figures 8, 9 and 10, comprises two containers 2 joined at their adjacent end walls 7. The mixing shafts 11 of the containers 2 can be driven by the same drive means, either simultaneously, or one mixing shaft 11 at a time, or alternatively, the mixing shafts 11 can each be driven by separate drive means. In one variation of this embodiment shown in Figure 8, each container 2 comprises a discharge arrangement 14 at the end
30 wall 7 of the container 2 remote the joined end walls 7. Alternatively, as shown in Figures 9 and 10, the discharge arrangement 14 is provided between the adjoining end walls 7 of the containers 2. The first and second directions of the mixing shafts 11 of the adjacent containers 2 are adapted accordingly, i.e. the mixing shafts 11 of the adjacent containers 2 rotate in opposite directions and operate as mirror images of each other for mixing and
35 discharging the feed. It will be appreciated that containers 2 of Figures 9 and 10 can also

have discharge troughs at their free end walls 7 and containers 2 of Figure 8 can have a discharge arrangement 14 provided between the adjoining end walls 7 of the containers 2.

Preferably, a reversing mechanism, such as, for example, a reverse gearbox (not shown), is provided for changing the direction of rotation of the mixing shaft 11 so that the mixing shaft 11 can discharge the feed to discharge arrangements provided at opposite end walls 7 of the container 2. The reversing mechanism can be required in a single container 2 having discharge arrangements provided at opposite end walls 7 or in a double or multiple container arrangements having discharge arrangements at free end walls 7 and at joined walls 7. In one embodiment, the reversing mechanism is provided as a single unit together with the redirecting means.

Referring now to Fig. 11 there is illustrated an extruding apparatus 40 according to another embodiment of the invention. The extruding apparatus 40 is substantially similar to the extruding apparatus 1 which has been described with reference to Figs. 1 to 5, and similar components are identified by the same reference numerals.

The feed mixing and dispensing apparatus 40 of the invention comprises at least one container 2 mountable on a chassis 41 connectable to a vehicle (not shown), such as a tractor. The container 2 has a pair of opposite end walls 7, a pair of opposite side walls 8 and a base wall 9. The end walls 7, the side walls 8 and the base wall 9 define an interior and a top opening 10 of the container 2.

In this embodiment of the invention the base wall of the apparatus is arcuate in a vertical plane parallel to the longitudinal axis of the container, thereby allowing the mixing members to reach all regions of the base wall so that no feed remains unmixed.

The container 2 comprises a mixing shaft 11 rotatably mounted within the interior of the container 2. The mixing shaft 11 is connected to a drive means 42 on the exterior of the container 2 as shown in particular in Fig. 13 which is connected to a drive mechanism of the vehicle.

The mixing shaft 11 extends substantially horizontally between the side walls 8 substantially perpendicular to the longitudinal axis of the container and comprises mixing paddles 43 extending radially from the mixing shaft 11 to the end walls 7 and the base

wall 9 of the container 2. The mixing paddles 43 are suitably configured to break up and mix the feed.

5 The mixing paddles comprise a pair of side arms 44 extending radially from the mixing shaft and comprise a cross member 45 connecting the side arms 44 at an end distal from and substantially parallel to the mixing shaft 11. The cross members 45 comprise a plurality of spaced apart spokes 46 extending radially from the cross member 45. Preferably the spokes 46 are spaced in paired arrangement along the cross member 45. Most preferably the cross member 45 comprises at least six pairs of spokes along the
10 cross member 45. The spokes are substantially planar and comprise a straight edge and a tapered edge.

The diameter of the mixing paddles 43 extending radially from the mixing shaft 11 is almost twice the length of the mixing shaft. The diameter of the mixing paddles may be 3
15 metres in length (roughly equivalent to 11ft) with the mixing shaft 11 around 6ft. The large diameter allows for large round or square bales to be directly dropped into the apparatus for shredding and mixing. Consequently there is less requirement to manage the size input of material into the container and less time and effort required in loading the container.

20 In one embodiment the mixing paddles 43 may include as shown in particular in Figure 15 a lifting member 60 in the form of a strip of resilient flexible material, such as e.g. rubber to facilitate lifting of the feed material into the discharge arrangement while at the same time not over-stressing the feed. The lifting member 60 is mounted along one half of cross
25 member 43. Each alternate paddle 43 has a lifting member 60 on different sides. The lifting member 60 in this embodiment operates substantially as hereinbefore described.

The container 2 comprises a plurality of blades 51, preferably, serrated blades, mounted inside the container 2 protruding inwardly from the end wall 7 of the container.

30 The blades 51 are movably arranged to be fully engaged (Figure 11) or retracted (Figure 12) from the interior of the container 2 via slots (not indicated by a numeral) formed in the end walls or the base wall of the container 2.

The blades 51 are movable by a ram arrangement 52 which in this embodiment comprises two rams for moving the blades 51 from a working to a non-working position. The blades 51 also comprise additional rams 53 which allow the depth of the blades to be altered when in a working position. This allows a farmer better control of the length that
5 straw bales, baled silage or other feed material is cut so as to suit an animal's digestive system. The blades 51 and ram arrangement 52 may also comprise a rapid discharge arrangement 54 connected to the hydraulically controlled cutting blades 51.

The discharge arrangement 54 comprises an opening which is movable very quickly
10 between an open and shut state by another ram arrangement 55 comprising at least two rams. Figure 13 shows a latch 56 released to allow mixed feed to be discharged rapidly from the container 2 onto the ground as the container 2 is moved in a forward direction. Figure 14 shows the latch 56 closed and the discharge arrangement 54 in its closed position.

15 A feed discharge arrangement 14 is provided at an end wall 7 of the container 2 elevated from the base wall 9 of the container 2. The discharge arrangement 14 is arranged in communication with the interior of the container 2 for discharging the mixed feed from the container 2. In the embodiment described herein, the discharge arrangement 14 is
20 provided nearer the top opening 10. As the mixing paddles are very large this means that the discharge arrangement 14 is quite high up and allows for easier delivery of feed over feeding barriers etc. In other embodiments, the discharge arrangement 14 may be provided approximately midway between the base wall 9 and the top opening 10 or nearer the base wall 9 than the top opening 10.

25 The feed discharge arrangement 14 comprises a trough 16 having an open longitudinal side 17. The trough 16 extends along an end wall 7 of the container so that the open longitudinal side 17 is in communication with the interior of the container 2. The trough 16 is mounted alongside the end wall 7 so that the open side 17 of the trough 16 adjoins
30 the end wall 7 for receiving the mixed feed from the interior of the container 2.

A discharge auger 18 is rotatably mounted along the trough 16 for transferring the feed along the trough 16 to an outlet opening 47 (Figure 15) provided in the centre of the trough 16. In this embodiment the chassis 41 comprises a conveyor located substantially
35 horizontally below the outlet opening 47.

The chassis 41 has side arms 49 to hydraulically move the conveyor 48 from side to side so that feed may be delivered to one side or the other as required.

- 5 Figure 17 shows the chassis of the invention in more detail. The chassis 41 comprises means to support the container 2 and support the drive mechanism for mixing the feed in the container as shown in Figs. 13 to 16. Preferably, the container is mounted on load cell weighing points (not indicated by a numeral in this instance). The chassis in this embodiment comprises a short stub axle 70 as the wheel axle cannot pass through the
- 10 large mixing container. The short stub axle has to be able to sustain a lot of stress. The short stub axle comprises a special member 71 going up from the stub 70 to take the side strain. The member goes upwards at an angle and connects with a main load cell weighing point. This stabilizes the side load on the stub axle and prevents the stub axle from splaying out. The chassis does not come in contact with the container except at the
- 15 4 load cell weighing points. The front of the chassis goes up at a right angle and takes the support or back strain imposed by the drawbar 72 from another member reaching back to the stub member at the correct height level.
- 20 The foregoing description of the preferred embodiments being provided merely for the purpose of illustration of the disclosure. Persons skilled in the art will appreciate that various modifications of the above-described embodiments not explicitly described herein are possible.

25

30

CLAIMS:

1. A feed mixing and dispensing apparatus comprising at least one container mountable on a transport means, the container having a longitudinal axis, a transverse axis and a vertical axis, a pair of opposite end walls, a pair of opposite side walls and a base wall, the end walls, the side walls and the base wall defining an interior and a top opening of the container;
- 5 wherein the longitudinal axis of the container in use extends substantially parallel to the direction of travel of the container and the transverse axis is substantially perpendicular to the direction of the travel of the container;
- 10 the container comprising a mixing shaft rotatably mounted within the interior of the container, the mixing shaft being connected to a drive means;
- wherein the mixing shaft extends between the side walls substantially perpendicular to the longitudinal axis of the container and comprises mixing members
- 15 extending radially from the mixing shaft towards the end walls and the base wall of the container, the mixing members being configured to break up and mix the feed; and
- wherein a feed discharge arrangement is provided in communication with the interior of the container for discharging the mixed feed from the container.
- 20 2. A feed mixing and dispensing apparatus as claimed in Claim 1, wherein the base wall of the apparatus is arcuate in a vertical plane parallel to the longitudinal axis of the container, thereby allowing the mixing members to reach all regions of the base wall so that no feed remains unmixed.
- 25 3. A feed mixing and dispensing apparatus as claimed in Claim 1 or Claim 2, wherein the side walls at the top opening of the container are flanged so as to help to contain the material loaded within the container while mixing is in operation.
- 30 4. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the discharge arrangement in communication with the interior of the container for discharging the mixed feed from the container, is provided elevated from the base wall of the container.

5. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the discharge arrangement is provided approximately midway between the base wall and the top opening.
- 5 6. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the discharge arrangement is provided nearer the top opening than the base wall.
7. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the discharge arrangement is provided at at least one end wall of the container.
- 10 8. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the discharge arrangement is provided at at least one side wall of the container.
9. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the discharge arrangement is provided at multiple locations around the perimeter of the container.
- 15 10. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the feed discharge arrangement comprises a trough having an open longitudinal side, the trough extending along an end wall of the container elevated from the base wall, the trough being arranged in communication with the interior of the container.
- 20 11. A feed mixing and dispensing apparatus as claimed in Claim 10, wherein the trough is mounted alongside the end wall so that the open side of the trough adjoins the end wall for receiving the mixed feed from the container and a discharge auger rotatably mounted along the trough for transferring the feed along the trough to an outlet arrangement provided in the trough.
- 25 12. A feed mixing and dispensing apparatus as claimed in Claim 11, wherein the outlet arrangement is provided in the centre or at one or both ends of the trough.
- 30 13. A feed mixing and dispensing apparatus as claimed in Claim 11 or Claim 12, wherein the trough is provided with multiple outlet arrangements.

14. A feed mixing and dispensing apparatus as claimed in any one of Claims 11 to 13, wherein the discharge auger is reversible.

15. A feed mixing and dispensing apparatus as claimed in any one of Claims 11 to 14,
5 wherein the discharge auger is driven by a motor, such as, for example, an hydraulic motor.

16. A feed mixing and dispensing apparatus as claimed in any one of Claims 10 to 15, wherein the trough includes a section extending along a side wall of the container.

10

17. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the mixing shaft is mounted substantially horizontally.

18. A feed mixing and dispensing apparatus as claimed in any preceding claim,
15 wherein the distance between the end walls is equal to or greater than the distance between the side walls.

19. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the height of the container is equal to or greater than the width, i.e. the distance
20 between the side walls.

20. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the mixing shaft and the mixing members are mutually configured so that when the mixing shaft rotates in a first direction, the feed is retained in the interior of the
25 container during mixing, whereas when the mixing shaft rotates in a second, opposite direction, the feed is transferred by the mixing members into the discharge arrangement.

21. A feed mixing and dispensing apparatus as claimed in Claim 20, wherein the first direction is the direction of rotation wherein the mixing members near the discharge
30 arrangement travel from the top opening to the base wall and the mixing members remote the discharge arrangement travel from the base wall to the top opening, wherein the mixing members are configured so as to prevent the feed from getting into the discharge arrangement, whereas the second direction is the direction of rotation wherein the mixing members near the discharge arrangement travel from the base wall to the top opening
35 and the mixing members remote the discharge arrangement travel from the top opening to

the base wall, wherein the mixing members are configured so as to direct the feed into the discharge arrangement.

22. A feed mixing and dispensing apparatus as claimed in any preceding claim,
5 wherein the apparatus comprises two or more containers joined at their adjacent end walls.

23. A feed mixing and dispensing apparatus as claimed in Claim 22, wherein the
10 mixing shafts of the containers are driven by the same drive means, either simultaneously, or one mixing shaft at a time.

24. A feed mixing and dispensing apparatus as claimed in Claim 22, wherein the
mixing shafts are each driven by separate drive means.

15 25. A feed mixing and dispensing apparatus as claimed in any one of Claims 22 to 24, wherein one or each container comprises a discharge arrangement at the end wall of the container remote from the joined end walls.

26. A feed mixing and dispensing apparatus as claimed in any one of Claims 22 to 25,
20 wherein the discharge arrangement is provided between the adjoining end walls of the containers.

27. A feed mixing and dispensing apparatus as claimed in any one of Claims 22 to 26
25 and in any one of Claims 20 and 21, wherein the first and second directions of the mixing shafts of the adjacent containers are adapted accordingly, i.e. the mixing shafts of the adjacent containers rotate in opposite directions and operate as mirror images of each other for mixing and discharging the feed.

28. A feed mixing and dispensing apparatus as claimed in any preceding claim,
30 wherein the mixing members comprise a plurality of mixing paddles.

29. A feed mixing and dispensing apparatus as claimed in Claim 28, wherein the
mixing paddles comprise a pair of side arms extending radially from the mixing shaft and
comprise a cross member connecting the side arms at an end distal from and
35 substantially parallel to the mixing shaft.

30. A feed mixing and dispensing apparatus as claimed in Claim 29, wherein the cross members comprise a plurality of spaced apart spokes extending radially from the cross member.

5

31. A feed mixing and dispensing apparatus as claimed in Claim 30, wherein the spokes are spaced in paired arrangement along the cross member.

32. A feed mixing and dispensing apparatus as claimed in Claim 30 or Claim 31,
10 wherein the cross member comprises at least six pairs of spokes along the cross member.

33. A feed mixing and dispensing apparatus as claimed in any one of Claims 30 to 32, wherein the spokes are substantially planar and comprise a straight edge and a tapered edge.

15

34. A feed mixing and dispensing apparatus as claimed in any one of Claims 30 to 33, wherein the tip of the spokes extends close to the interior end walls of the container so that no feed remains unmixed.

20 35. A feed mixing and dispensing apparatus as claimed in any one of Claims 28 to 34, wherein the diameter of the mixing paddles extending radially from the mixing shaft is almost twice the length of the mixing shaft.

36. A feed mixing and dispensing apparatus as claimed in any one of Claims 28 to 35,
25 wherein the or each mixing paddle comprises one or more elongate separator members which assist in pulling compacted or entangled fibrous feed material apart and mixing it with other feed ingredients.

37. A feed mixing and dispensing apparatus as claimed in any one of Claims 28 to 36,
30 wherein the or each mixing paddle includes a lifting member in the form of a strip of resilient flexible material, such as e.g. rubber to facilitate lifting of the feed material into the discharge arrangement while at the same time being gentle on the feed.

38. A feed mixing and dispensing apparatus as claimed in Claims 36 and Claim 37
35 and in any one of Claims 20 and 21, wherein the lifting member is mounted on a mixing

paddle in relation to a corresponding separator member so that when a mixing paddle is positioned near the discharge arrangement the lifting member is positioned above the separator member and when the mixing paddle is positioned diametrically remote the discharge arrangement the lifting member is positioned below the separator member, so that when the mixing shaft rotates in the first direction, i.e. during mixing, a separator member of a mixing paddle leads and strikes the feed first ahead of a corresponding lifting member, whereas the lifting member is deflected by the feed material backwards in relation to the direction of the rotation of the mixing shaft thereby enabling the separator members to break down and mix the feed material while at the same time preventing the feed from being pushed into the discharge arrangement; and when the mixing shaft rotates in the second direction, i.e. during discharge, a lifting member of a mixing paddle leads and contacts the feed first ahead of a corresponding separator member while at the same time the separator member supports the lifting member and prevents the lifting member from being deflected by the feed material backwards in relation to the direction of the rotation of the mixing shaft and as a result the lifting member pushes the feed material towards and into the discharge arrangement.

39. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the container comprises a plurality of blades mounted inside the container protruding inwardly from the end walls or from the base wall of the container, the blades being configured to facilitate the separation of compacted or entangled fibrous feed material into looser and/or smaller portions.

40. A feed mixing and dispensing apparatus as claimed in Claim 39, wherein the blades are movably arranged to be fully or partially retracted from the interior of the container via slots formed in the end walls or the base wall of the container.

41. A feed mixing and dispensing apparatus as claimed in Claim 40, wherein the blades are arranged to rotate about respective pivot points.

42. A feed mixing and dispensing apparatus as claimed in Claim 40 or Claim 41, wherein the blades are movable by a ram arrangement

43. A feed mixing and dispensing apparatus as claimed in Claim 42, wherein the ram arrangement comprises a single ram for moving several blades.

44. A feed mixing and dispensing apparatus as claimed in Claim 42, wherein the ram arrangement comprises a plurality of rams for moving corresponding blades individually.
- 5 45. A feed mixing and dispensing apparatus as claimed in any one of Claims 42 to 44, wherein the or each ram comprises a hydraulic or a pneumatic ram.
46. A feed mixing and dispensing apparatus as claimed in any one of Claims 39 to 45, wherein a regulating means is provided for regulating the distance the blades protrude
10 into the container depending on the material being mixed and also allows the blades to be retracted fully from interior of the container.
47. A feed mixing and dispensing apparatus as claimed in any one of Claims 39 to 46, wherein the blades are serrated blades.
- 15 48. A feed mixing and dispensing apparatus as claimed in any one of Claims 39 to 47, wherein the blades are located at the front end of the apparatus.
49. A feed mixing and dispensing apparatus as claimed in any one of Claims 39 to 48,
20 wherein the blades are electronically controlled to move from a working cutting position to a non-working position.
50. A feed mixing and dispensing apparatus as claimed in any one of Claims 39 to 49, wherein the blades are set on a timer for easier loading and management.
- 25 51. A feed mixing and dispensing apparatus as claimed in any one of Claims 39 to 50, wherein the container comprises a discharge arrangement near the base of the container and connected to the cutting blades.
- 30 52. A feed mixing and dispensing apparatus as claimed in Claim 51, wherein the cutting blades and discharge arrangement are located at the rear end of the container.
53. A feed mixing and dispensing apparatus as claimed in Claim 51 or Claim 52, wherein the discharge arrangement comprises a door which is movable very quickly
35 between an open and shut state by a ram arrangement comprising at least two rams, for

example, hydraulic or pneumatic rams, so that mixed feed material may be discharged rapidly from the container onto the ground as the container is pulled in a forward direction.

54. A feed mixing and dispensing apparatus as claimed in any one of Claims 51 to 53,
5 wherein the discharge arrangement comprises means to prevent and/or minimise any dust raised when the feed is rapidly discharged.

55. A feed mixing and dispensing apparatus as claimed in any preceding claim,
10 wherein the apparatus of the invention is mounted on a chassis and is connectable to a vehicle.

56. A feed mixing and dispensing apparatus as claimed in Claim 55, wherein the chassis comprises means to support the container and support the drive mechanism for mixing the feed in the container.

15 57. A feed mixing and dispensing apparatus as claimed in Claim 55 or Claim 56, wherein the chassis comprises a short stub axle.

58. A feed mixing and dispensing apparatus as claimed in Claim 57, wherein the short
20 stub axle comprises a special member going up from the stub to take the side strain.

59. A feed mixing and dispensing apparatus as claimed in Claim 58, wherein the member goes upwards at an angle and connects with a main load cell weighing point thereby stabilizing the side load on the stub axle and preventing the stub axle from
25 splaying out.

60. A feed mixing and dispensing apparatus as claimed in any one of Claims 55 to 59, wherein the container is mounted on four load cell weighing points.

30 61. A feed mixing and dispensing apparatus as claimed in Claim 60, wherein the chassis does not come in contact with the container except at the four load cell weighing points.

62. A feed mixing and dispensing apparatus as claimed in any one of Claims 55 to 61,
35 wherein the front of the chassis goes up at a right angle and takes the support or back

strain imposed by a drawbar from another member reaching back to the stub member at the correct height level thereby ensuring that the optimum centre of gravity of the mixing and dispensing apparatus is achieved.

5 63. A feed mixing and dispensing apparatus as claimed in any one of Claims 55 to 62, wherein the chassis comprises means for conveying feed to where it is required.

64. A feed mixing and dispensing apparatus as claimed in Claim 63, wherein the conveying means comprises a conveyor located substantially horizontally below an outlet
10 on a discharge arrangement.

65. A feed mixing and dispensing apparatus as claimed in Claim 63 or Claim 64, wherein the conveying means is located below a central outlet arrangement in a trough extending along an end wall of the container and the conveying means runs substantially
15 perpendicular to the direction of travel of the container.

66. A feed mixing and dispensing apparatus as claimed in any one of Claims 55 to 65, wherein the chassis has means, such as hydraulically controlled side arms, to move the conveyor hydraulically from side to side for delivering the mixed feed to either side of the
20 apparatus as required.

67. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the mixing members are adapted to function as cutting members for cutting bulky feed material into smaller portions.
25

68. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the drive means of the mixer shaft is configured to be coupled with and driven by a drive mechanism of a towing vehicle.

30 69. A feed mixing and dispensing apparatus as claimed in Claim 68, wherein the drive means of the mixer shaft is coupled to the mixing shaft via a redirecting means which provides for the transfer of rotation from an axis of a drive shaft of the drive means which is substantially parallel to the longitudinal axis of the container to the axis of the mixing shaft which is substantially transverse the longitudinal axis of the container.

70. A feed mixing and dispensing apparatus as claimed in Claim 69, wherein the redirecting means comprises a gear arrangement.

71. A feed mixing and dispensing apparatus as claimed in Claim 70, wherein the gear
5 arrangement comprises a bevelled gear arrangement.

72. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein a reversing mechanism is provided for changing the direction of rotation of the mixing shaft so that the mixing shaft can discharge the feed to discharge arrangements
10 provided at opposite end walls of the container.

73. A feed mixing and dispensing apparatus as claimed in Claim 72, wherein the reversing mechanism comprises a reverse gearbox.

74. A feed mixing and dispensing apparatus as claimed in Claim 72 or Claim 73 and in
15 any one of Claims 69 to 71, wherein the reversing mechanism is provided as a single unit together with the redirecting means.

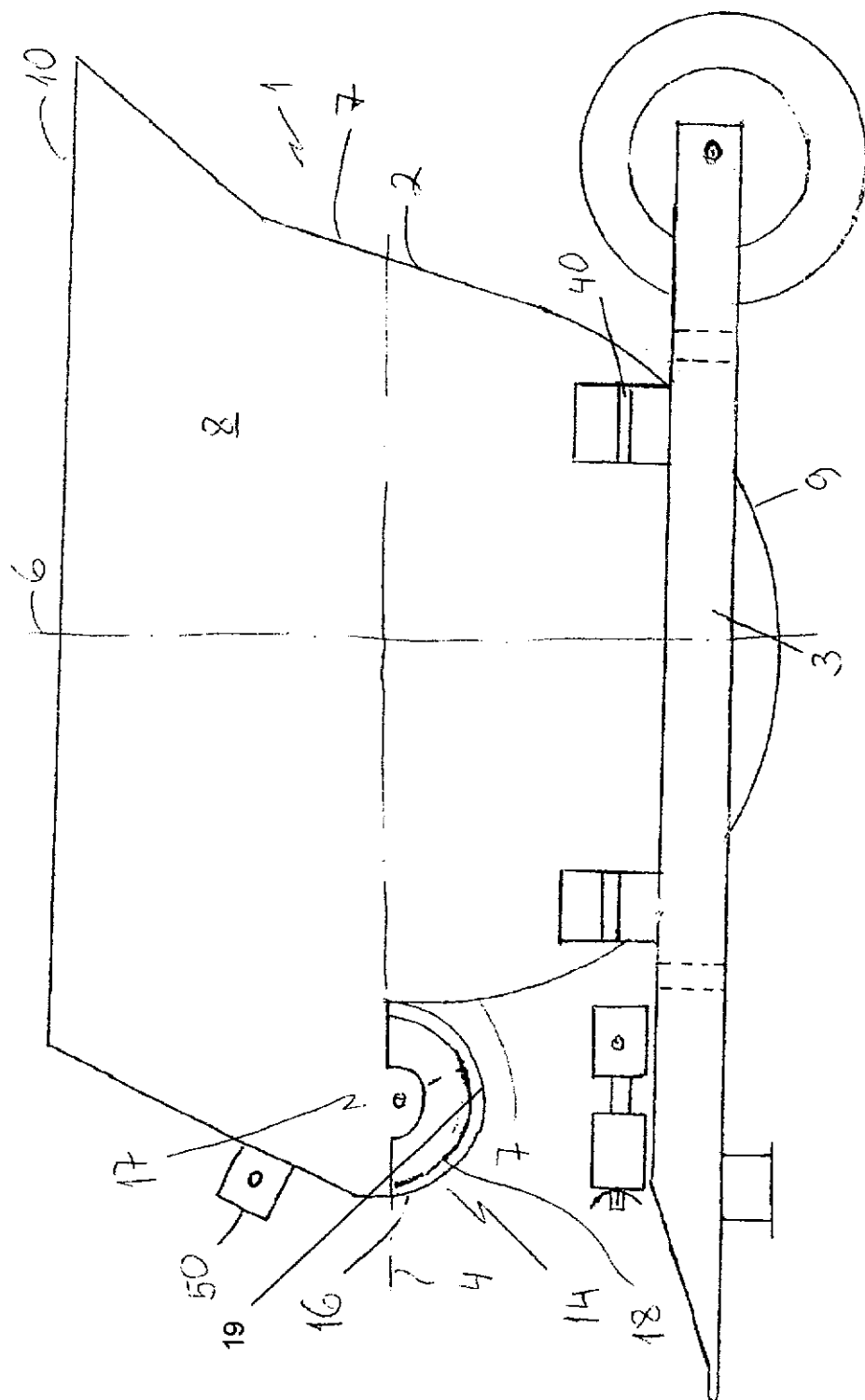
75. A feed mixing and dispensing apparatus as claimed in any preceding claim,
20 wherein the mixing shaft includes five mixing members evenly angularly spaced on the mixing shaft.

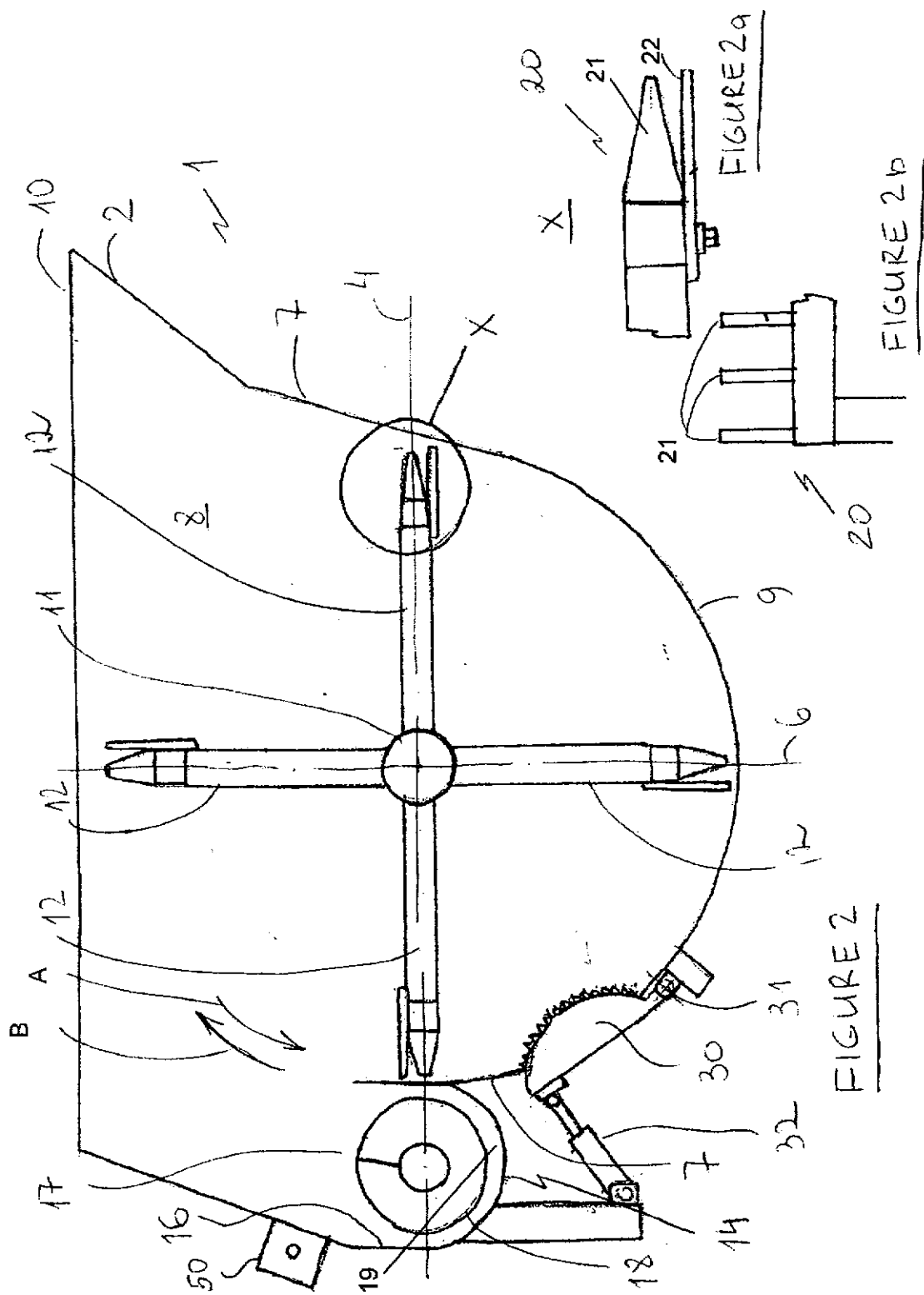
76. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein each mixing member comprises at least a pair of support members longitudinally
25 spaced along the shaft, and a horizontal beam supported by the support members and radially spaced from the mixing shaft.

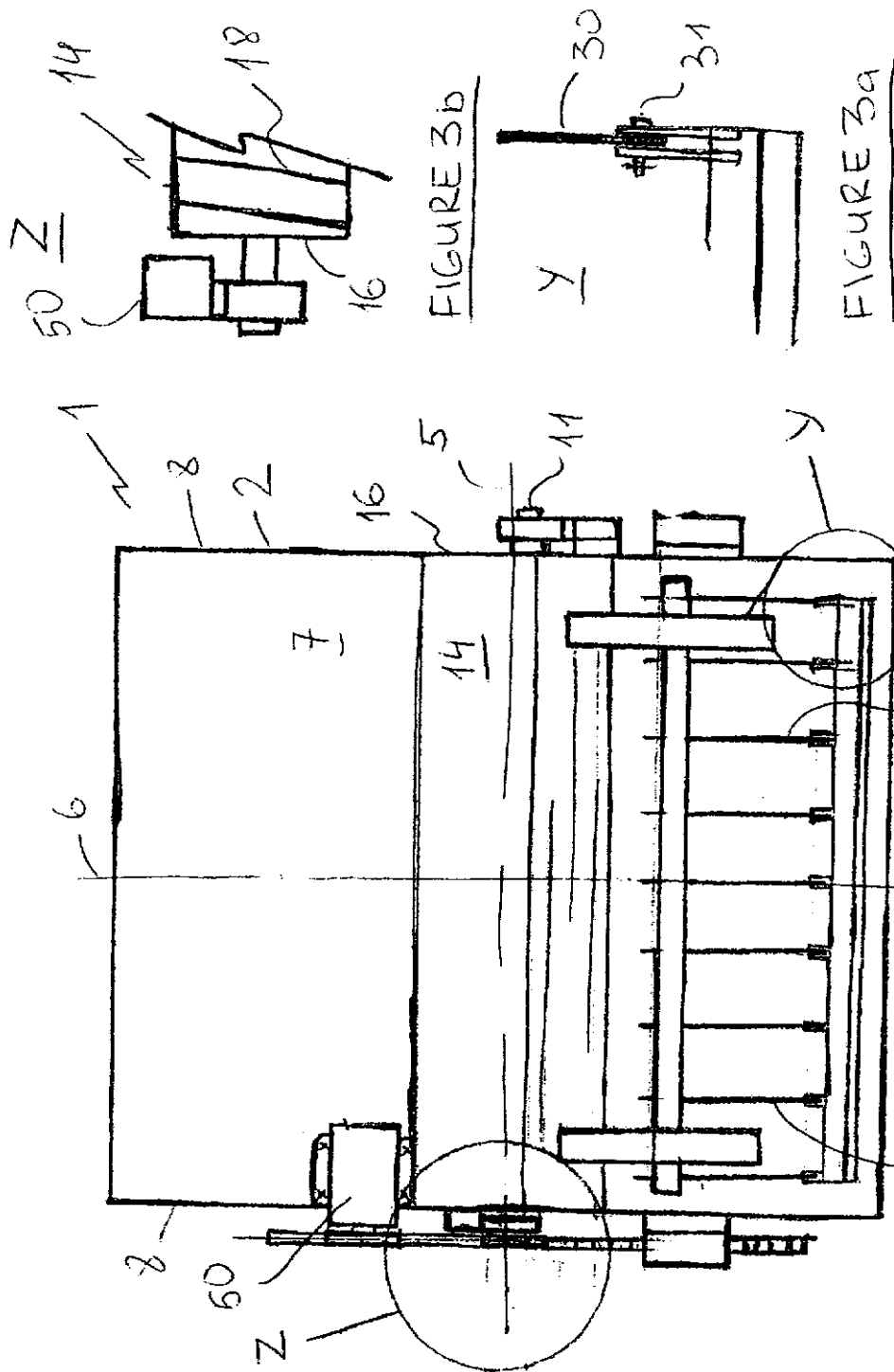
77. A feed mixing and dispensing apparatus as claimed in any preceding claim, wherein the mixing members are adapted to function as cutting members.

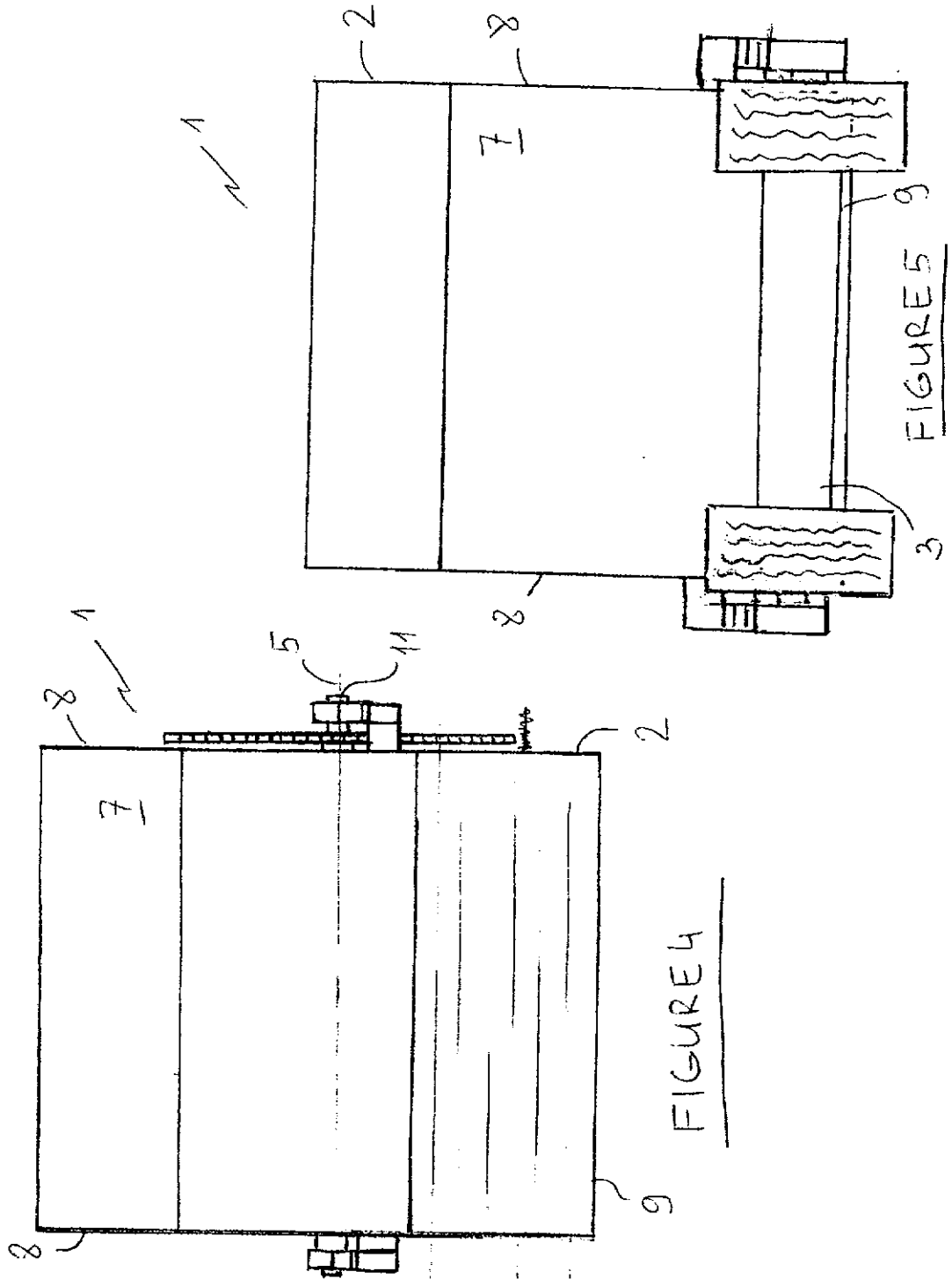
30

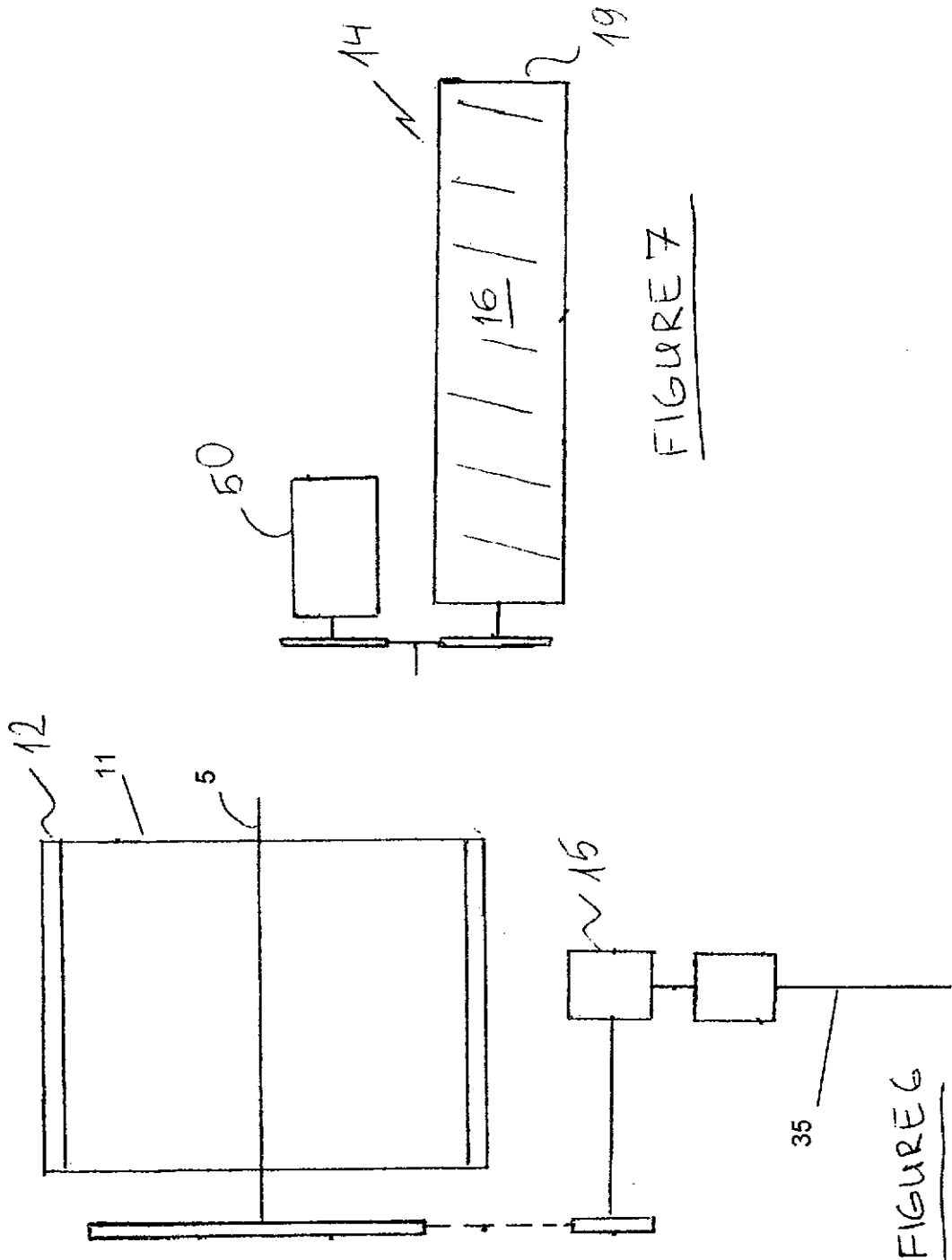
78. A feed mixing and dispensing apparatus substantially in accordance with any of the embodiments as herein described with reference to and/or as shown in the accompanying drawings.



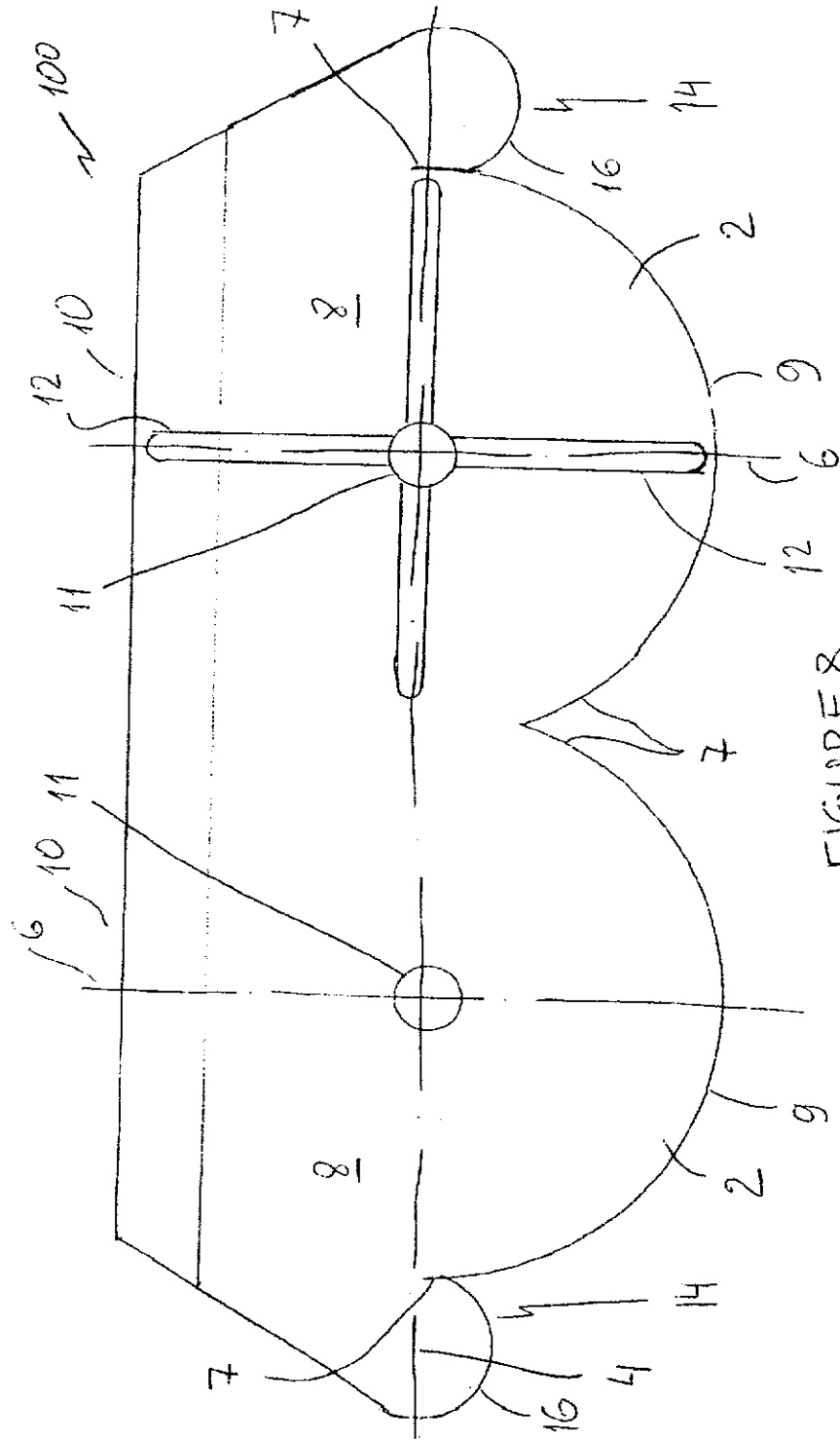








6/15



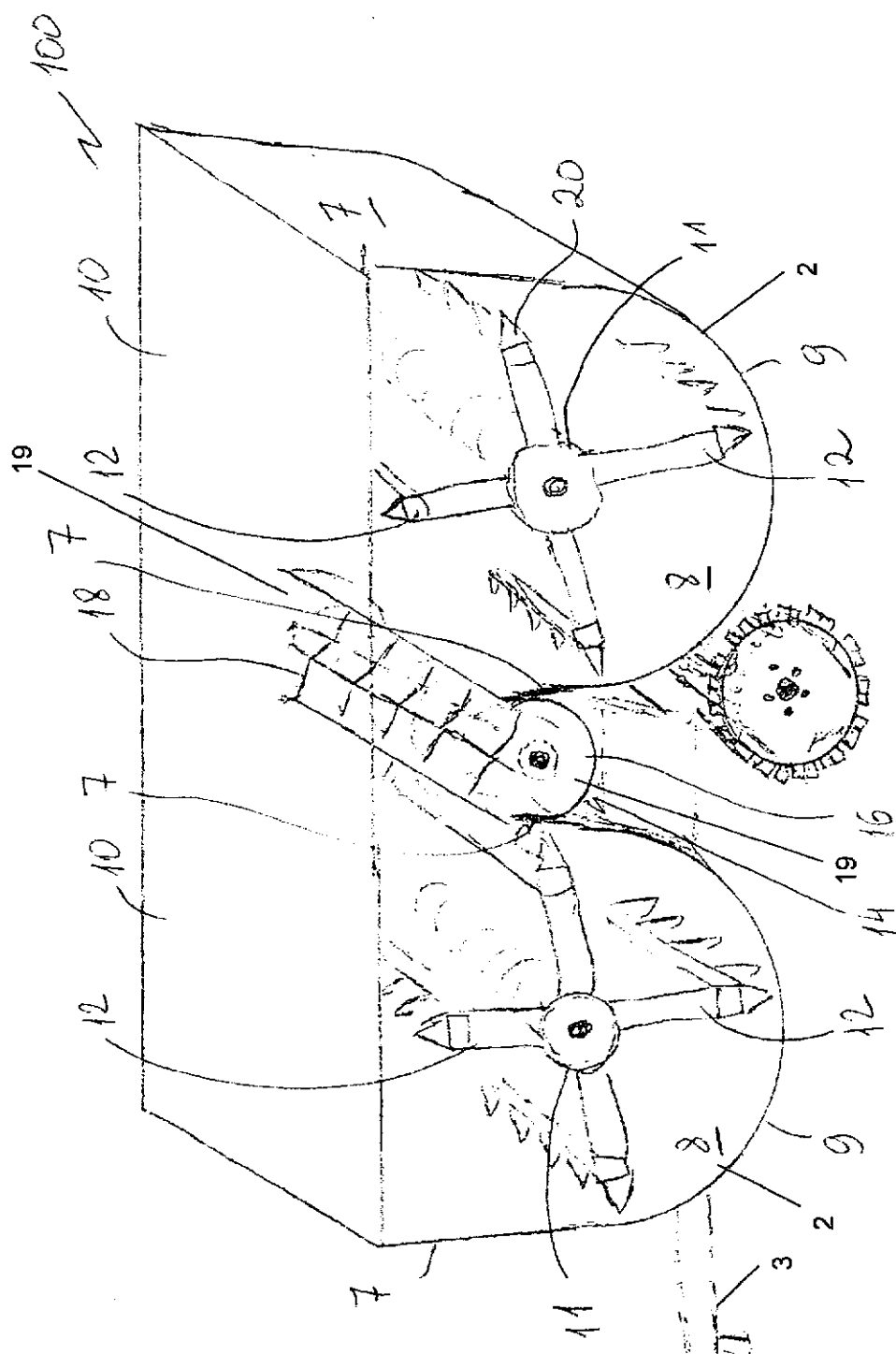


FIGURE 9

8/15

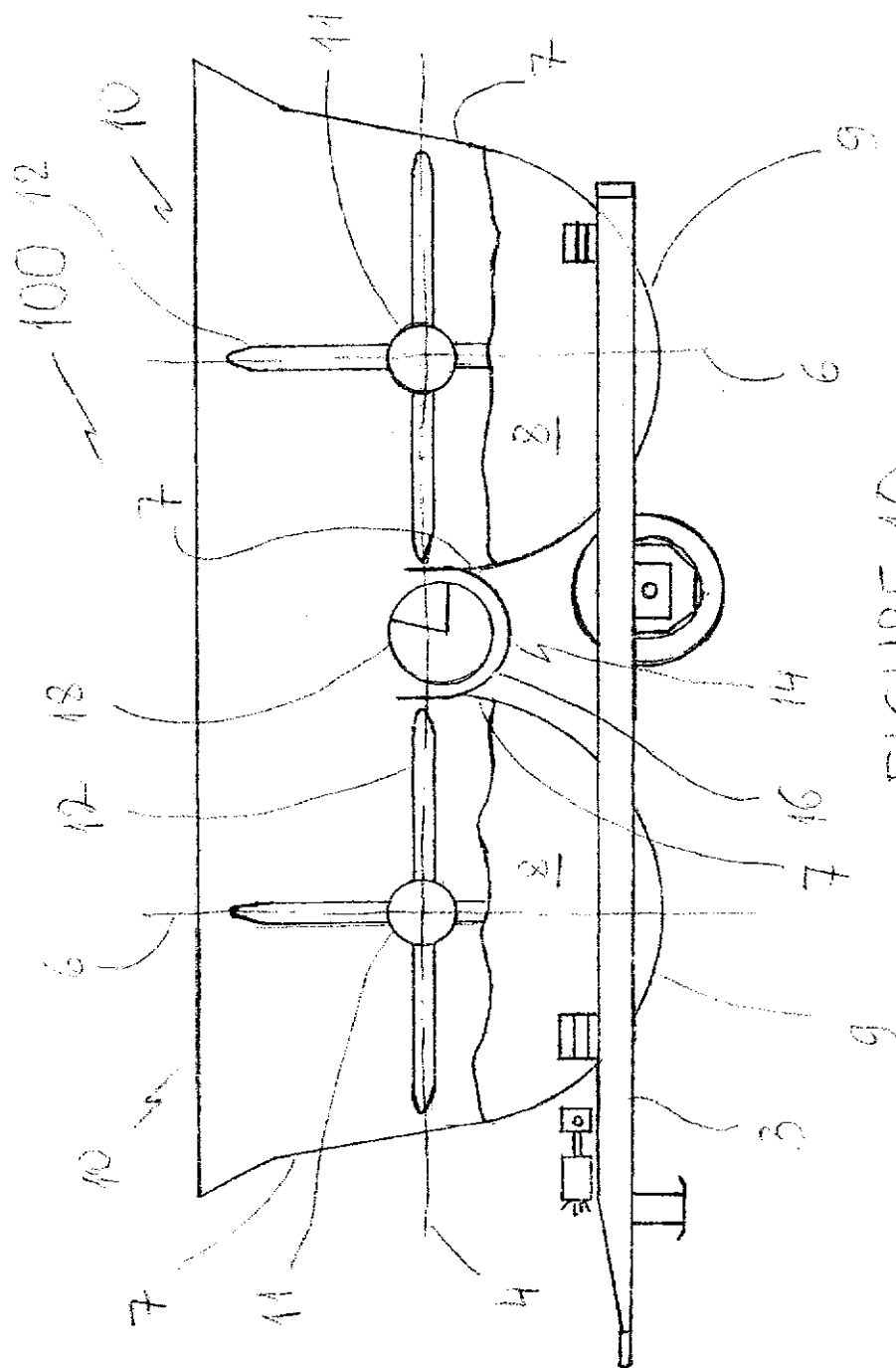


FIGURE 10

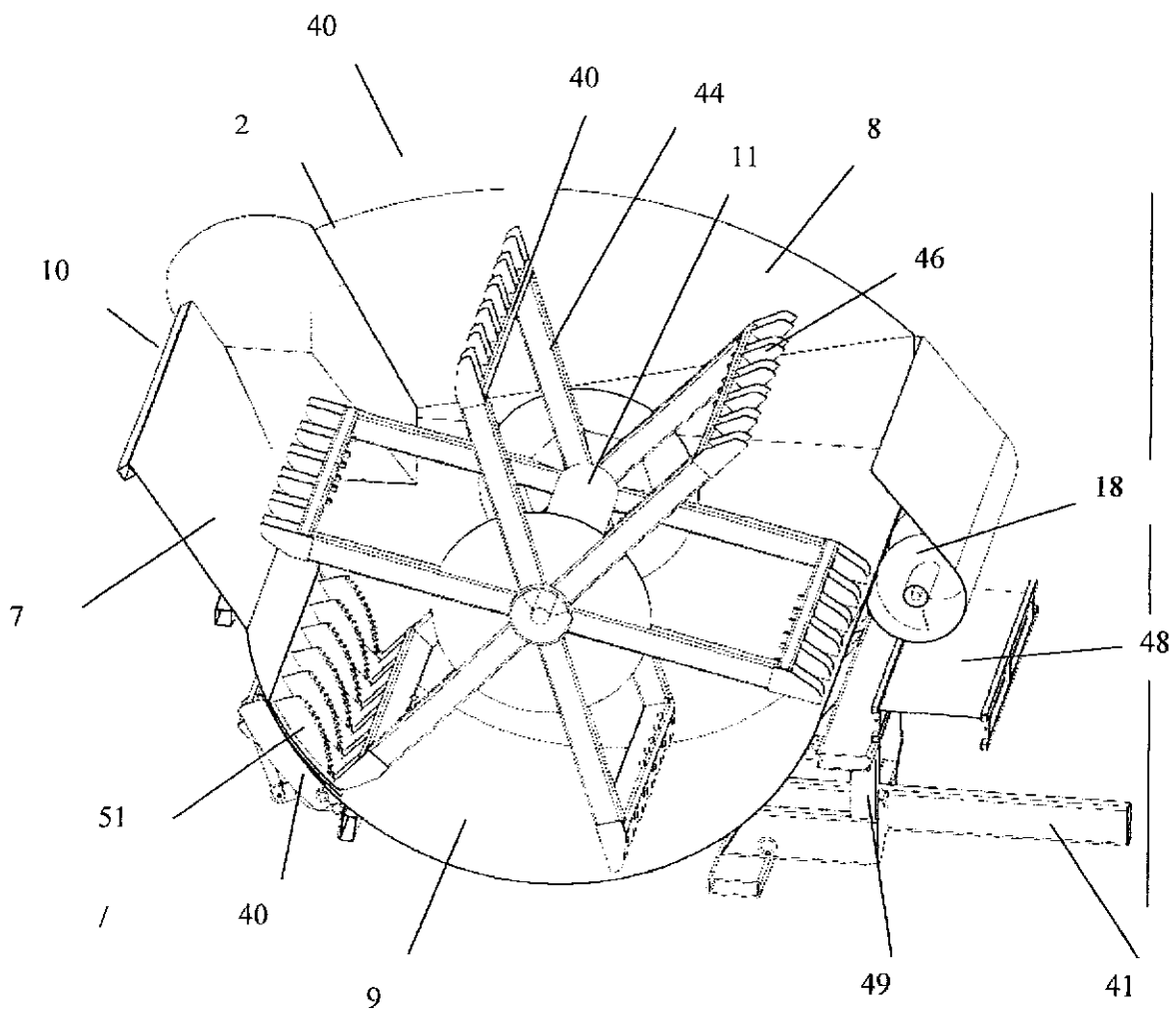


Fig. 11

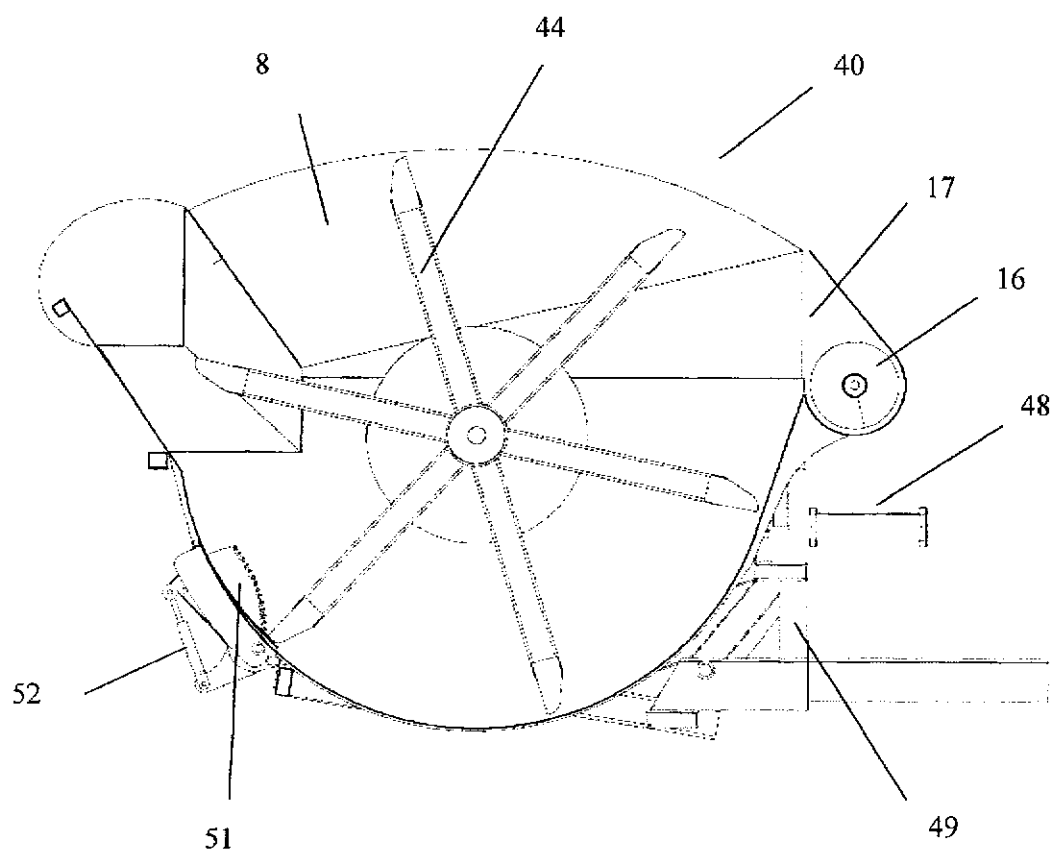


Fig. 12

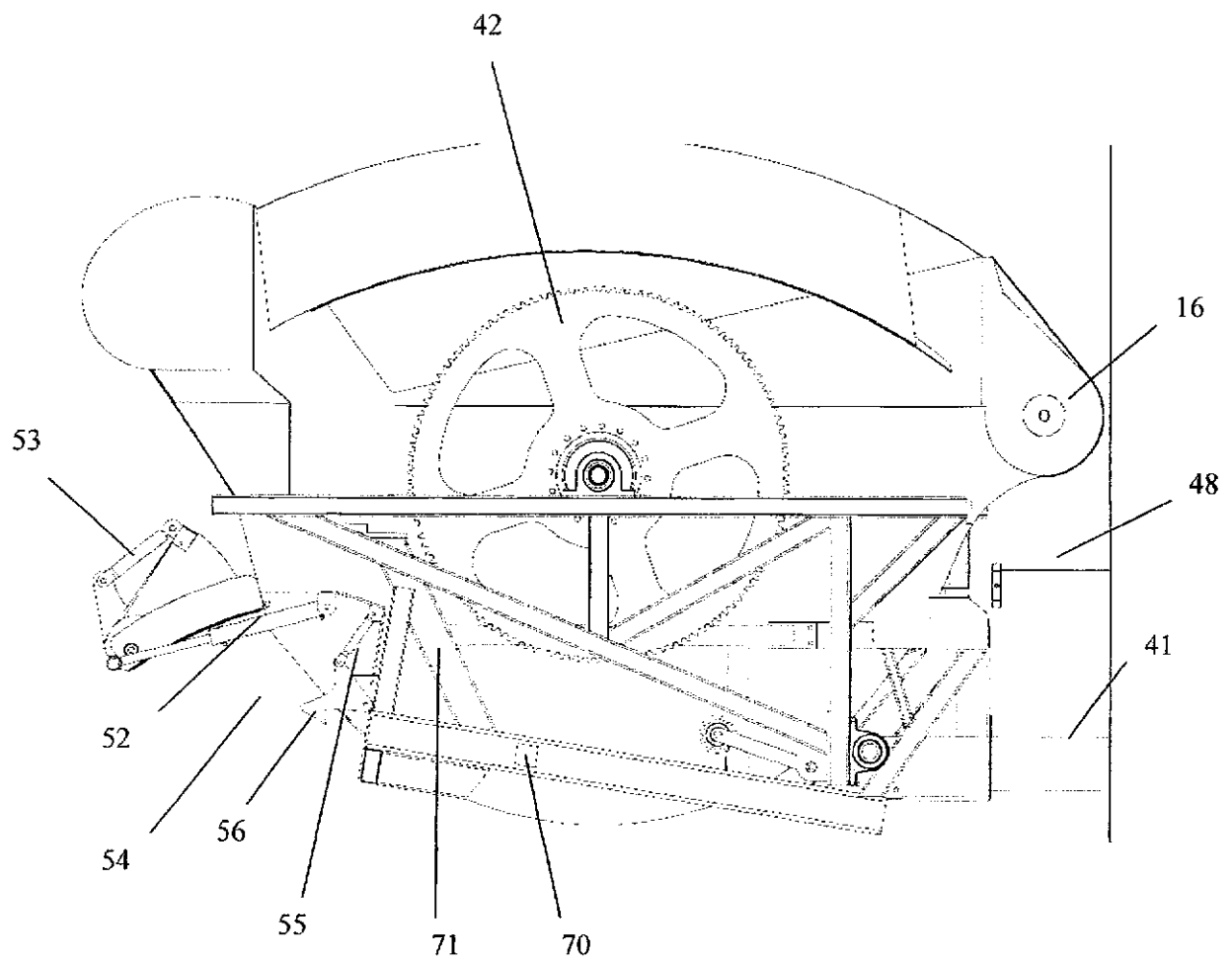


Fig. 13

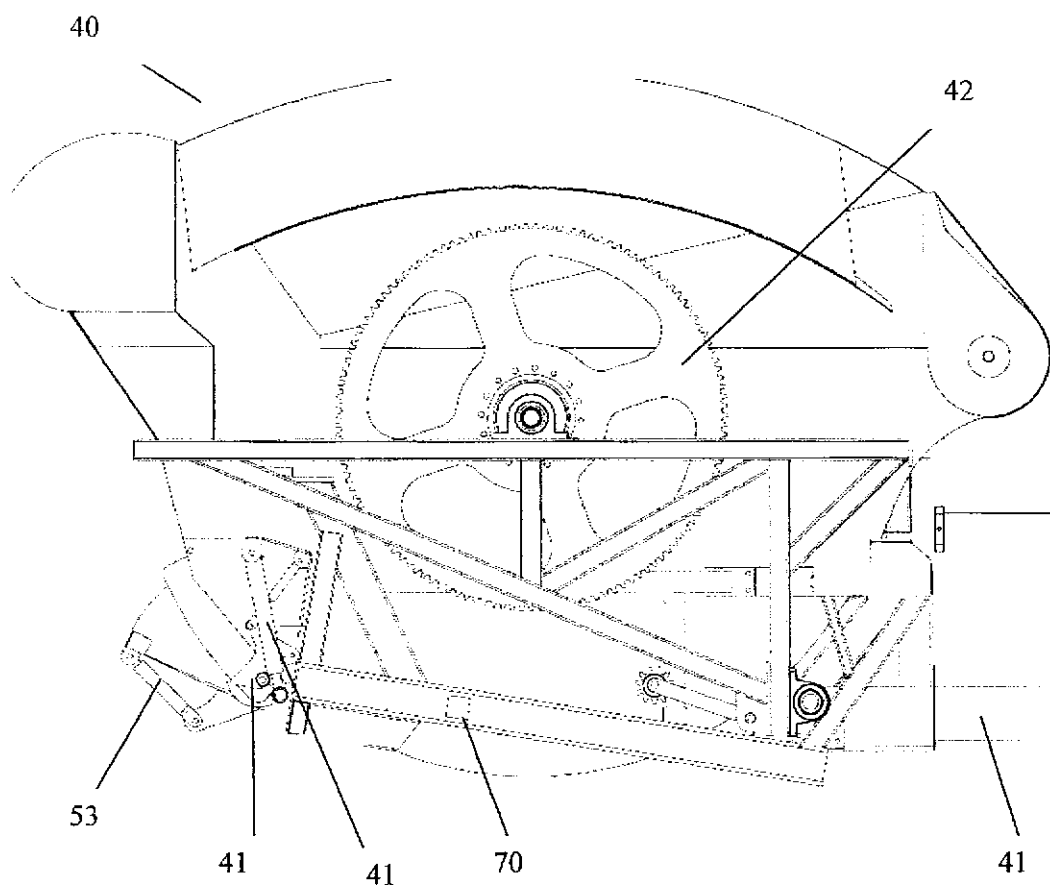


Fig. 14

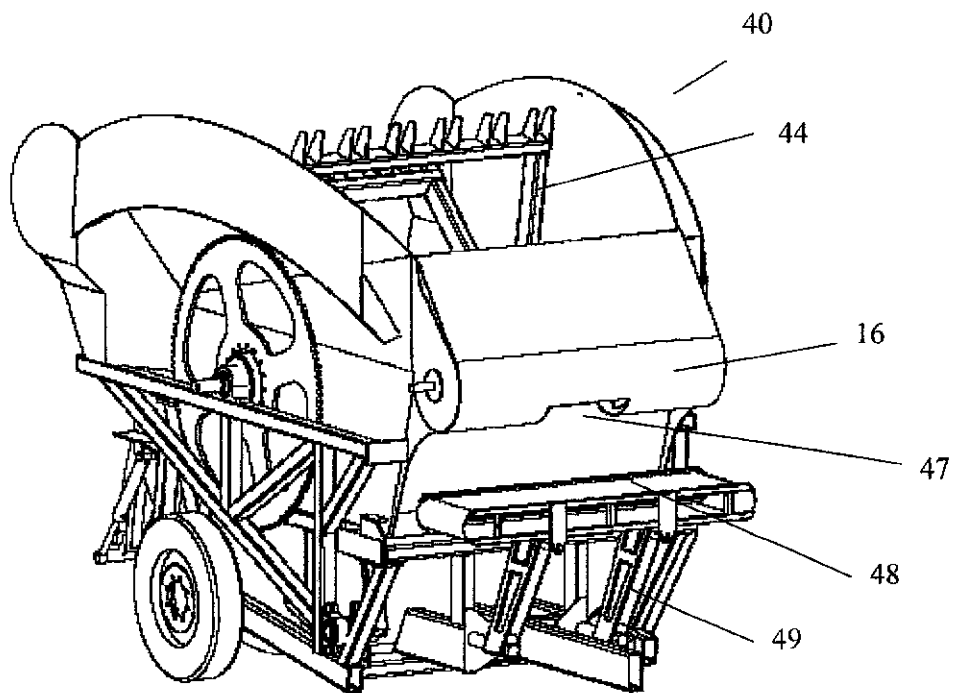


Fig. 15

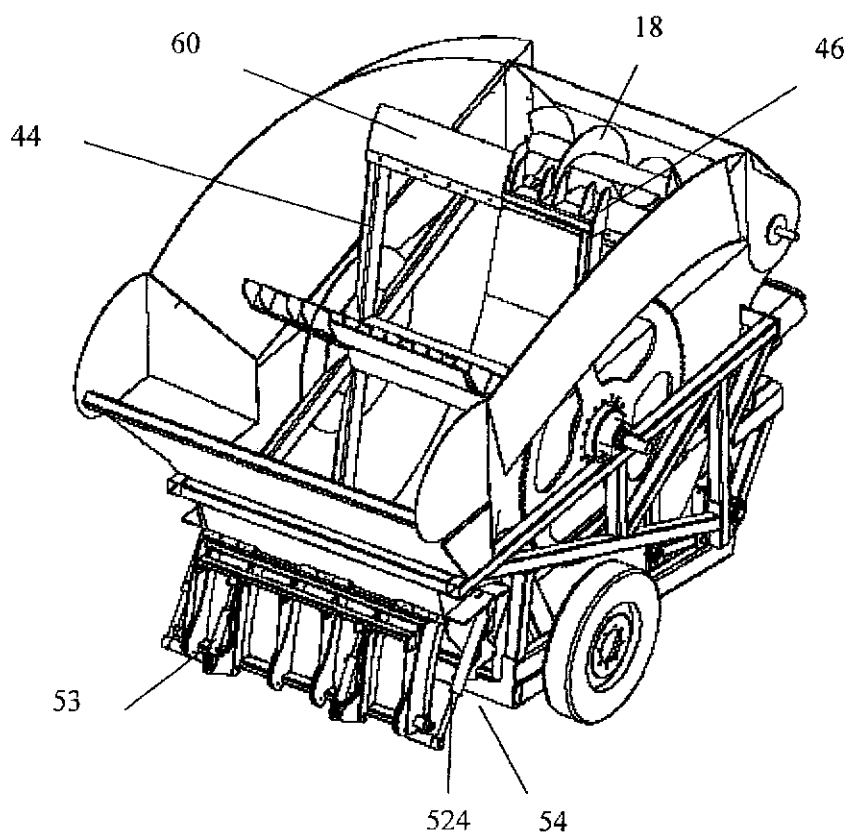


Fig. 16

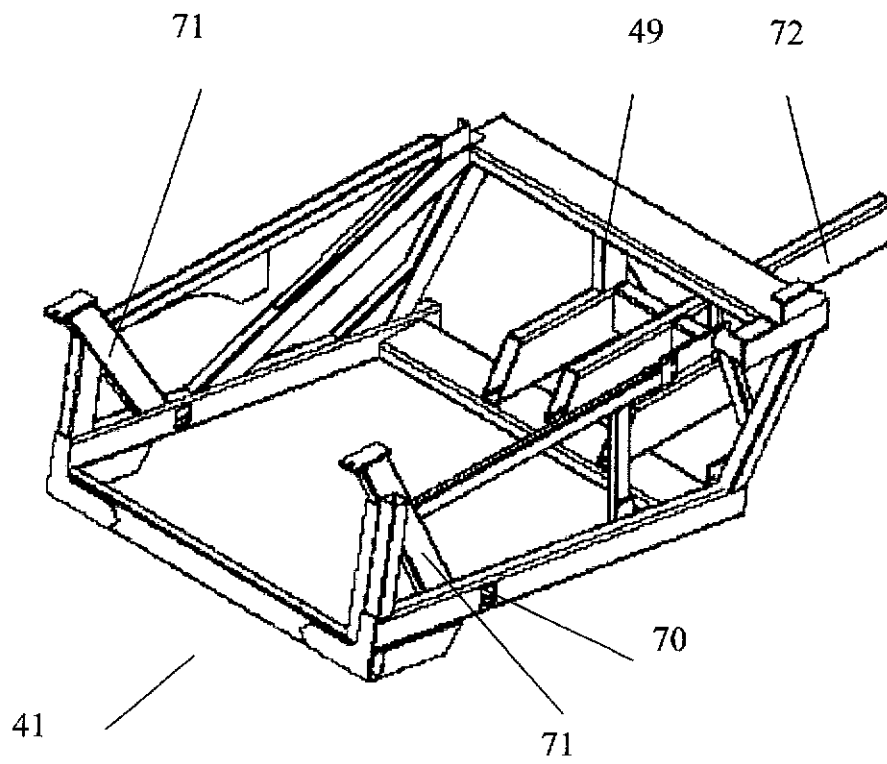


Fig. 17