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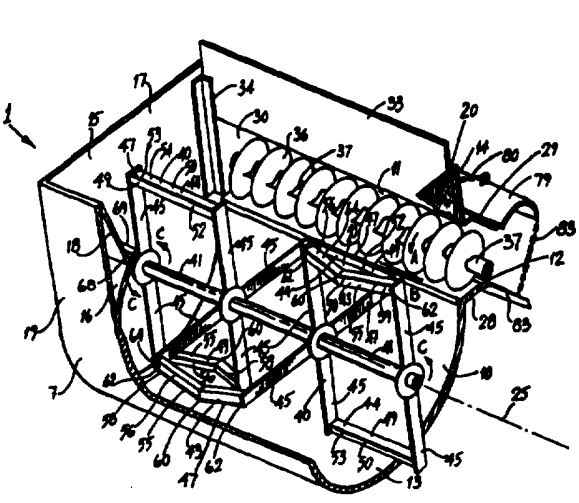

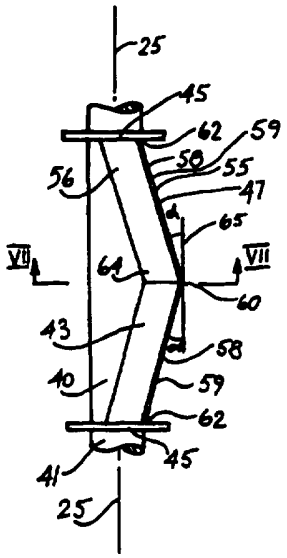

(57) Abstract

A mixer feeder wagon (1) for mixing and dispensing animal feed comprises a mixing compartment (10) and a dispensing compartment (11). A mixing rotor (40) rotatable in the mixing compartment (10) mixes animal feed therein, and urges the mixed animal feed into the dispensing compartment (11) where it is dispensed through a dispensing outlet (12) by a dispensing auger (36). The mixing rotor (40) is provided with first and second mixing paddles (43 and 44), respectively. Each first mixing paddle (43) is provided with a leading surface (59) which faces in the direction of motion of the mixing paddles (43), and extends from a leading portion (60) to rearwardly disposed trailing ends (62) for urging the material being mixed forwardly in the general direction of motion of the first mixing paddles (43) and endwardly in the general directions towards the trailing ends (62) of the first mixing paddles (43) for evenly distributing the ingredients throughout the animal feed during mixing.

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"Apparatus for mixing and dispensing material"

The present invention relates to apparatus for mixing and dispensing material, and in particular fibrous type material, typically, animal feed which may include silage, hay or straw and other ingredients. Needless to say, the invention is not limited to mixing and dispensing apparatus for animal feed.

Apparatus for mixing and dispensing animal feed, in general, are referred to as mixer feeder wagons. Typical mixer feeder wagons are disclosed in British Patent Specification No. GB-A-2,139,911 and European Patent Specification No. EP-A-0,427,483. Such mixer feeder wagons, in general, comprise a container which defines an elongated mixing compartment in which the animal feed is mixed and a dispensing compartment fed from the mixing compartment through which mixed animal feed is dispensed. The mixing compartment, in general, comprises a lower portion of substantially semi-circular transverse cross-section. A mixing rotor which comprises an elongated shaft having a plurality of longitudinally extending mixing paddles carried on radially extending support arms, which extend from the shaft is rotatably mounted in the mixing compartment. The rotational axis of the mixing rotor, in general, coincides with the axis of generation of the semi-circular portion of the mixing compartment. Typically, the dispensing compartment is an elongated compartment which extends longitudinally along one side of the mixing compartment. An auger is rotatably located in the dispensing compartment for urging animal feed along the dispensing compartment through a dispensing outlet. The mixing and dispensing compartments, in general, communicate through an elongated opening which is closable by a vertically extending, slidably mounted closure plate for separating the mixing and dispensing compartments during mixing of the animal feed.

The mixing paddles of the mixing rotor of such mixer feeder wagons, in general, extend in a generally longitudinal direction parallel to the rotational axis of the mixing rotor. Such mixer

feeder wagons, in general, have been found to be quite adequate when provided in sizes up to 14/16 cubic metre capacity. The axial length of the mixing compartment of such mixer feeder wagons, in general, would not exceed 4 metres. However, it has been found that where such mixer feeder wagons are provided in sizes greater than 14/16 cubic metres capacity, and typically of 20 cubic metre capacity, mixing of the animal feed may be inadequate. This is particularly so where a substantial proportion of the fodder is fibrous material, typically, silage. It has been found that the mixing achieved in such mixer feeder wagons is less than adequate. The mixing compartment of wagons of 20 cubic metre capacity, in general, would be of axial length of approximately 5 metres long, and larger capacity wagons may be of axial length up to 8 metres and even longer, and it has been found that the dispersion of ingredients throughout the animal feed along the entire length of the wagon is not always acceptable.

There is therefore a need for a mixer feeder wagon and apparatus for mixing and dispensing material which provides a more uniform mix of materials over a relatively wide range of mixing compartment sizes.

The present invention is directed towards providing such apparatus for mixing and dispensing material.

According to the invention, there is provided apparatus for mixing and dispensing fibrous material, the apparatus comprising a container defining a hollow interior region which forms an elongated mixing compartment of partly circular transverse cross-section defining a longitudinally extending main central axis which is co-axial with the axis of generation of the partly circular portion of the mixing compartment, a mixing rotor being rotatable in the mixing compartment about a rotational axis coinciding with the main central axis, the mixing rotor comprising at least one elongated mixing paddle having a leading surface facing in the general direction of motion of the mixing paddle,

wherein at least one of the mixing paddles is a first mixing paddle, and the leading surface of each first mixing paddle has a leading portion which is located intermediate a pair of longitudinally spaced apart trailing ends, the trailing ends being rearwardly disposed of the leading portion relative to the direction of motion of the mixing paddle, and the leading surface of each first mixing paddle extends from the leading portion to the respective trailing ends for urging material forwardly in the general direction of motion of the first mixing paddle and endwardly in respective general directions towards the trailing ends of the first mixing paddle.

Preferably, the leading portion of the leading surface of each first mixing paddle is located along the first mixing paddle substantially midway between the trailing ends.

Advantageously, the trailing ends of each first mixing paddle coincide with the respective opposite ends of the first mixing paddle.

In one aspect of the invention the leading surface of each first mixing paddle extends from the leading portion to each trailing end at an angle in the range of 3° to 45° relative to a line extending parallel to the main central axis. Preferably, the leading surface of each mixing paddle extends from the leading portion to each trailing end at an angle in the range of 10° to 30° relative to the line extending parallel to the main central axis. Advantageously, the leading surface of each first mixing paddle extends from the leading portion to each trailing end at an angle in the range of 10° to 20° relative to the line extending parallel to the main central axis. Ideally, the leading surface of each first mixing paddle extends from the leading portion to each trailing end at an angle of approximately 13° relative to the line extending parallel to the main central axis. In another aspect of the invention the mixing rotor comprises at least one second mixing paddle, each second mixing paddle having a leading

surface extending longitudinally and substantially parallel to the main central axis. Preferably, the first and second mixing paddles are arranged in pairs, one first mixing paddle and one second mixing paddle being provided in each pair, and the first and second mixing paddles of each pair being disposed about the rotational axis of the mixing rotor at approximately 180° intervals to each other. Advantageously, a plurality of pairs of first and second mixing paddles are provided, the pairs of mixing paddles being spaced apart longitudinally along the rotational axis of the mixing rotor, adjacent pairs of mixing paddles being oriented at approximately 90° to each other.

In one aspect of the invention the leading surface of each mixing paddle extends substantially radially relative to the rotational axis of the mixing rotor. In another aspect of the invention each mixing paddle defines an outer peripheral edge, the radius of which from the rotational axis of the mixing rotor is less than the internal radius of the partly circular portion of the mixing compartment.

In a further aspect of the invention the mixing rotor comprises a rotor shaft which is rotatably carried in the mixing compartment, each mixing paddle being radially spaced apart from the rotor shaft and being carried on corresponding carrier arms extending radially from the rotor shaft.

Preferably, the partly circular portion of the mixing compartment is formed by an elongated longitudinally extending base of substantially semi-circular transverse cross-section.

Advantageously, a longitudinally extending side wall extending the length of the mixing compartment extends from the semi-circular base in a generally upward direction for defining one side of an open mouth to the mixing compartment. Preferably, the side wall is of arcuate transverse cross-section and of radius substantially similar to that of the base.

In one aspect of the invention an elongated blade extends longitudinally parallel to the central axis and extends from the side wall into the open mouth, the blade terminating in an elongated longitudinally extending leading edge for co-operating with each mixing paddle for breaking up masses of fibrous material. Preferably, the blade extends substantially tangentially from the side wall, and extends in a direction towards the leading surface of each mixing paddle as the mixing paddle is rotating and approaching the blade.

The advantages of the invention are many. It has been found that the provision of one or more first mixing paddles significantly improves the uniformity of distribution of the ingredients throughout the mixed materials. It has been found that the distribution of fibrous ingredients through the mixed materials is also relatively uniform. This is achieved by virtue of the fact that the leading surface of each first mixing paddle, as well as imparting a forward component of motion to the ingredients within the mixing compartment relative to the direction of motion of the mixing paddles also imparts a component of motion to the ingredients which is parallel to the main central axis of the mixing compartment. This latter component of motion which is parallel to the main central axis urges the ingredients towards one or other trailing end of the relevant first mixing paddle, depending on which part of the leading surface of the mixing paddle is imparting motion to the ingredients. In this way, as well as being moved forwardly in the direction of motion of the first mixing paddles, the ingredients are also moved in a general direction longitudinally along the mixing compartment parallel to the main central axis. This thus ensures a more even distribution of ingredients of the material being mixed over the entire length of the mixing compartment.

In general, it has been found that lower power is required to power the mixing rotor for mixing materials such as animal feed which contains fibrous ingredients, such as hay or silage, than

would be required by mixer feeder wagons known heretofore. It is believed that the reduction in power requirement is achieved by virtue of the fact that the ingredients by being urged with a component of motion parallel to the main central axis of the mixing compartment are urged endwardly from the first mixing paddles, thereby minimising any jamming or clogging of material in a forward direction relative to the direction of motion of the mixing paddles.

The provision of second mixing paddles has the added advantage that material which has been urged from the path of a first mixing paddle into the path of a second mixing paddle is mixed by the second mixing paddle in the location of the second mixing paddle with other materials in the mixing compartment.

The fact that the leading surface of each first mixing paddle extends from the leading portion of the leading surface to respective trailing ends of the leading surface avoids any danger of material being urged entirely towards one end of the mixing compartment.

Additionally, it has been found that where the fibrous ingredients are supplied to the apparatus in bulk form, typically, in the form of a bale of fibrous material, such as, for example, a large bale of silage, hay or straw, the provision of the first mixing paddles facilitates in breaking up of the bale and separating the fibrous material from the bale for mixing with other ingredients. This advantage is achieved by the co-operating action between the longitudinally extending blade adjacent the open mouth of the mixing compartment and the first and second mixing paddles, and in particular, the co-operating action between the longitudinal blade and the first mixing paddles. The first mixing paddles co-operate with the longitudinal blade with a scissors type cutting action for cutting long fibrous ingredients into relatively short lengths. This scissors type action between the first mixing paddles and the longitudinal blade also minimises the power

requirement required for cutting the fibrous material.

When the apparatus is provided with a mixing compartment of capacity of 14/16 cubic metres and greater, significantly improved results are achieved over and above known apparatus of similar capacities. In particular, it has been found that the ingredients of the mixed material are relatively evenly and uniformly distributed throughout the mixed material, even where the ingredients include fibrous ingredients a relatively uniform distribution of the ingredients is also achieved, and the uniformity of distribution of the ingredients is significantly improved over mixes which can be obtained from apparatus known heretofore of similarly relatively large capacities. These improvements in the distribution of the ingredients in the mixed materials and in the reduced power requirements are also achieved in apparatus of smaller capacities constructed according to the invention. Such smaller capacity apparatus may comprise a mixing compartment of capacity as low as 5 cubic metres, and even lower. The apparatus according to the invention is particularly suitable for mixing animal feeds which comprise fibrous ingredients, such as, for example, silage, straw, hay and the like.

The invention will be more clearly understood from the following description of a preferred embodiment thereof, which is given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of apparatus according to the invention for mixing and dispensing material,

Fig. 2 is a transverse cross-sectional end elevational view of the apparatus of Fig. 1,

Fig. 3 is a plan view of the apparatus of Fig. 1,

Fig. 4 is a cut-away perspective view of a portion of the

apparatus of Fig. 1,

Fig. 5 is an end elevational view of a detail of the apparatus of Fig. 1,

Fig. 6 is a plan view of the detail of Fig. 5,

Fig. 7 is a cross-sectional end elevational view of the detail of Fig. 5 on the line VII-VII of Fig. 6, and

Fig. 8 is an end elevational view similar to Fig. 5 of another detail of the apparatus of Fig. 1.

Referring to the drawings, there is illustrated apparatus according to the invention for mixing and dispensing fibrous material, in this case, a mixer feeder wagon which is indicated generally by the reference numeral 1 for mixing and dispensing animal feed. The general construction of the mixer feeder wagon 1 is substantially similar to the mixer feeder wagon disclosed in British Patent Specification No. GB-A-2,139,911, and only those parts of the mixer feeder wagon which are relevant to the invention will be described in detail. It will be assumed that the general construction of the mixer feeder wagon 1 will be well known to those skilled in the art from the disclosure in Specification No. GB-A-2,139,911.

The mixer feeder wagon 1 comprises a chassis 2 which is carried on ground engaging wheels 3. A forward portion of the chassis 2 terminates in a tow hitch 4 for hitching the mixer feeder wagon 1 to an agricultural tractor or any other suitable towing vehicle. A container 7 is carried on the chassis 2 through four load cells 8, one at each corner of the chassis 2, for weighing the contents of the container 7. The container 7 defines a hollow interior region which forms a mixing compartment 10 in which animal feed is mixed, and a dispensing compartment 11 fed from the mixing compartment 10 through which mixed animal feed is dispensed

through a dispensing outlet 12. The container 7 comprises an elongated longitudinally extending base 13 of substantially semi-circular transverse cross-section which extends between front and rear end walls 14 and 15, respectively, and forms a lower portion of the mixing compartment 10 of substantially semi-circular transverse cross-section. A longitudinally extending arcuate side wall 16 of radius similar to that of the base 13 extends upwardly from the base 13 and inwardly towards an upper open mouth 17 to the mixing compartment 10. A longitudinally extending, outwardly inclined side wall 18 extends from the side wall 16 and is supported by an upwardly extending side wall 19, both of which extend between the front and rear end walls 14 and 15, respectively. A side wall 20 extends between the front and rear end walls 14 and 15, and together with the base 13, the side wall 16 and the end walls 14 and 15 form the mixing compartment 10. The base 13 and side wall 16 define an axis of generation which coincides with a main central axis 25 of the mixing compartment 10.

The dispensing compartment 11 is formed by a partly cylindrical side wall 27 which extends between the front and rear end walls 14 and 15, respectively. Walls 28 and 29 extending between the front and rear end walls 14 and 15 extend from the side wall 27 to the base 13 and side wall 20, respectively for forming the dispensing compartment 11. The dispensing compartment 11 communicates with the mixing compartment 10 through a communicating opening 30 which is formed between the base 13 and the side wall 20 and extends between the end walls 14 and 15.

A closure means, namely, a closure plate 33 closes the communicating opening 30, and the closure plate 33 is slidable in tracks 34 on the end walls 14 and 15 from an upper open position illustrated in Fig. 4 with the mixing and dispensing compartments 10 and 11, respectively communicating through the communicating opening 30, to a lower closed position illustrated in Fig. 2 with the two compartments 10 and 11, respectively, isolated for

facilitating mixing of the ingredients of the animal feed in the mixing compartment 10. An hydraulic ram (not shown) is mounted on the side wall 20 for raising and lowering the closure plate 33 between the open and closed positions.

A dispensing auger 36 carried on an auger shaft 37 which is rotatably carried in bearings (not shown) in the end walls 14 and 15 is rotatable in the dispensing compartment 11 in the direction of the arrow A for urging mixed animal feed received from the mixing compartment 10 in the direction of the arrow B towards and through the dispensing outlet 12. This aspect of the mixer feeder wagon is not relevant to the invention, and will not be described in further detail.

Returning now to the mixing compartment 10, a mixing rotor 40 is rotatably mounted in the mixing compartment 10 for mixing the ingredients of the animal feed, and for urging the mixed feed through the communicating opening 30 into the dispensing compartment 11. The mixing rotor 40 comprises a rotor shaft 41 which is rotatably carried in bearing (not shown) in the end walls 14 and 15. The rotor shaft 41 defines the rotational axis of the mixing rotor 40, and the mixing rotor 40 is located in the mixing compartment 10 so that the rotational axis of the mixing rotor 40 coincides with the main central axis 25 of the mixing compartment 10. A drive transmission described below rotates the mixing rotor 40 in the direction of the arrow C.

Three first mixing paddles 43 and three second mixing paddles 44 for mixing animal feed in the mixing compartment 10 as the mixing rotor 40 rotates are carried by pairs of carrier arms 45 which extend radially from the rotor shaft 41. The first and second mixing paddles 43 and 44 extend substantially longitudinally in a general direction parallel to the main central axis 25. The first and second mixing paddles 43 and 44 are arranged in pairs along the rotor shaft 41, and the first and second mixing paddles 43 and 44 of each pair are spaced apart at 180° intervals around the

rotor shaft 41. The pairs of first and second mixing paddles 43 and 44 are arranged so that the first mixing paddle 43 of each pair is arranged at 90° around the rotor shaft 41 relative to the next adjacent first mixing paddle 43. The mixing paddles 43 and 44 define outer peripheral edges 47 which define the outer periphery of the mixing rotor 40. The radius of the peripheral edges 47 from the rotational axis of the mixing rotor 40 is slightly less than the radius of generation of the inner surfaces of the base 13 and side wall 16 of the mixing compartment 10 for providing clearance between the edges 47 and the inner surfaces of the base 13 and side wall 16. In this embodiment of the invention, the clearance between the edges 47 of the mixing paddles 43 and 44 and the inner surfaces of the base 13 and side wall 16 is approximately 20 mm.

Each second mixing paddle 44 is formed by a pair of angle iron members, namely, a leading angle iron member 49 and a trailing member 50. The leading angle iron member 49 of each second mixing paddle 44 defines a leading surface 52 which faces in the general direction of motion of the mixing paddles 43 and 44, and which extends longitudinally and radially relative to the rotational axis of the mixing rotor 40 for engaging and mixing the animal feed. The trailing angle iron member 50 is seam welded to the leading angle iron member 49 along longitudinally extending seams 53, and is arranged relative to the leading angle iron member 49 to form a trailing surface 54 which is bevelled, in other words, raked rearwardly inwardly relative to the leading surface 52. It has been found that this minimises the possibility of jamming of the fibrous material between the second mixing paddles 44 and the inner surface of the base 13 and side wall 16.

Each first mixing paddle 43 comprises a leading angle iron member 55 and a trailing angle iron member 56 which are welded together along longitudinally extending seams 58. The leading angle iron member 55 of each first mixing paddle 43 defines a leading surface 59 having a leading portion 60 and a pair of trailing ends 62,

which are disposed rearwardly of the leading portion 60 relative to the direction of motion of the first mixing paddles 43. The leading portion 60 of each first mixing paddle 43 is located midway between its respective trailing ends 62. The leading surface 59 of each first mixing paddle 43 faces in the general direction of motion of the first mixing paddles 43 and extends from the leading portion 60 to the respective trailing ends 62 for mixing and urging the animal feed forwardly in the direction of motion of the first mixing paddles 43 and also endwardly towards the trailing ends 62 as the mixing rotor 40 rotates. The imparting of motion to the animal feed in the two directions, namely, forwardly and endwardly relative to the direction of motion of the mixing rotor 40 has been found to significantly improve the mixing action of the mixing rotor 40 on the ingredients of the animal feed, and furthermore, it has been found provides a more even and uniform distribution of the ingredients, and in particular fibrous ingredients throughout the animal feed. The leading surface 59 of each first mixing paddle 43 extends rearwardly from the central leading portion 60 towards each trailing end 62 at an angle α of approximately 13° relative to a line 65 extending parallel to the rotational axis of the mixing rotor, see Fig. 6. The trailing angle iron member 56 of each first mixing paddle 43 defines a trailing surface 64 which is substantially similar to the trailing surface 54 of the second mixing paddles 44, and is rearwardly inwardly raked relative to the leading surface 59 of each first mixing paddle 43. The leading surfaces 59 and 52 of the first and second mixing paddles 43 and 44, respectively, extend substantially radially to the respective outer peripheral edges 47.

A longitudinally extending blade 68 extends from the side walls 16 between the end walls 14 and 15 and terminates in a leading edge 69 for co-operating with the first and second mixing paddles 43 and 44 for separating from a bale of fibrous material supported in the open mouth 17, fibrous material which has been ripped by the mixing paddles 43 and 44 from the bale. The blade 68 extends

substantially tangentially from the side wall 16 into the open mouth 17. A support member 70 extending transversely from the outwardly extending side wall 18 extends transversely across the open mouth 17 for supporting bales or blocks of silage material and also for co-operating with the mixing rotor 40 for breaking up the bales or blocks of silage material as will be described below. The support member 70 is located substantially halfway between the end walls 14 and 15. A mixer feeder wagon provided with support members substantially similar to the support member 70 is described in European Patent Specification No. EP-A-0,427,483.

The drive transmission for rotating the mixing rotor 40 also rotates the dispensing auger 36, and is located on the front end wall 14 of the container 7, and receives drive from a power take-off shaft of the towing tractor. Referring to Fig. 1, the drive transmission comprises a sprocket 72 fast on the auger shaft 37 which is driven from a gearbox 73 by a drive chain 74. The gearbox 73 is mounted on the chassis 2. A drive chain 75 around sprockets 76 and 77 fast on the auger shaft 37 and rotor shaft 41 transmits drive from the auger shaft 37 to the rotor shaft 41 for rotating the mixing rotor 40. The sprockets are arranged to provide a gear ratio of approximately 10:1, and typically, the mixing rotor is rotated at a speed of approximately 10 revs per minute, while the auger 36 is rotated at a speed of approximately 100 revs per minute. A splined shaft 78 extending from the gear box 73 receives drive from a power take-off shaft of the tractor (not shown) to which the mixer feeder wagon 1 is hitched through a drive shaft (also not shown) for rotating the auger 36 and the mixing rotor 40 in the direction of the arrows A and C, respectively.

A door 79 closes the dispensing outlet 12 and is hingedly connected to the wall 29. A chain 80 connected between the door 79 and the closure plate 33 opens the door 79 on the closure plate 33 being raised into the open position. Closure of the closure plate 33 causes the door 79 to close. A chute 82 hingedly

connected to the wall 28 below the dispensing outlet 12 is connected to the door 79 by chains 83 so that on opening of the door 79 the chute 82 is raised (see Figs. 1 and 4) for directing animal feed from the dispensing outlet 12 into an animal feeding trough or the like.

In use, with the mixer feeder wagon 1 hitched to a tractor (not shown) and drive being transferred to the gearbox 73 through a drive shaft (not shown) from the power take-off shaft of the tractor the mixer feeder wagon 1 is ready for use. The closure plate 33 is lowered into the closed position and the mixing rotor 40 and dispensing auger 36 are rotated. Rotation of the dispensing auger 36 has no effect until the closure plate 33 is opened. With the mixing rotor 40 rotating in the direction of the arrow C, the ingredients of the animal feed to be mixed are delivered into the mixing compartment 10 through the open mouth 17. Typically, the ingredients of the animal feed are silage and other fodder, nutrients, feed supplements and additives. Typically, the silage is provided in large blocks or bales, and the blocks or bales are partly supported on the support member 70. As the mixing rotor 40 rotates, the action of the leading surfaces 59 and 52 of the first and second mixing paddles 43 and 44, respectively, on the silage which depends downwardly from the support member 70 causes part of the depending portions of silage to be ripped away from the block or bale of silage. As the ripped away portions of silage are engaged against the leading edge 69 of the blade 68, the co-operating action of the first and second mixing paddles 43 and 44 with the blade 68 separates the ripped away portions of silage from the bale or block, and also divides the ripped away portions into smaller portions. This action continues until the blocks or bales of silage material are completely broken up and substantially evenly distributed throughout the mixing compartment 10. The other ingredients of the animal feed may be delivered into the mixing compartment 10 at any appropriate time and are mixed in the mixing compartment 10 by the action of the mixing rotor 40. On the animal feed being

thoroughly mixed, and with the dispensing auger 36 rotating the closure plate 33 is opened. The first and second mixing paddles 43 and 44 urge the mixed animal feed into the dispensing compartment 11 through the communicating opening 30 where the action of the dispensing rotor 36 urges the feed along the dispensing compartment 11 in the direction of the arrow B and through the dispensing outlet 12. To enhance the dispensing action of the dispensing auger 36 for dispensing the animal feed through the dispensing outlet 12, it has been found desirable to provide the last few flights of the dispensing auger 36 adjacent the dispensing outlet 12 of opposite hand to those of the other flights of the dispensing auger 36.

While the first mixing paddles have been described as comprising leading and trailing angle iron members, in certain cases, it is envisaged that each first mixing paddle may be provided by a single angle iron member, and indeed, each first mixing paddle may in certain cases be provided by a longitudinally extending plate member which defines the leading surface which extends from a leading portion to the trailing ends.

It will of course be appreciated that while the mixing rotor has been described as being provided with three first mixing paddles and three second mixing paddles, any number of first and second mixing paddles may be provided, and indeed, in certain cases, only one first mixing paddle may be provided, and in other cases, the mixing rotor may be provided with mixing paddles, all of the type of the first mixing paddles, in other words, the mixing rotor would not include any second mixing paddles.

While the apparatus has been described as being a mixer feeder wagon, the apparatus may be provided in any other form, whether as a mobile wagon or a stationary apparatus. It will also of course be appreciated that the apparatus may be used for mixing any other materials besides animal feed.

It is envisaged in certain cases that the door which closes the dispensing outlet may be operated by means other than a chain connected to the closure plate, for example, the dispensing outlet door may be operable by an hydraulic ram or an hydraulic motor. Additionally, it will be appreciated that the chute from the dispensing outlet may be operable, likewise, by an hydraulic ram or an hydraulic motor, or by any other suitable means.

It is envisaged that in certain cases the support member extending into the open mouth for supporting a bale in the open mouth may be dispensed with.

CLAIMS

1. Apparatus for mixing and dispensing fibrous material, the apparatus (1) comprising a container (7) defining a hollow interior region which forms an elongated mixing compartment (10) of partly circular transverse cross-section defining a longitudinally extending main central axis (25) which is co-axial with the axis of generation of the partly circular portion (13) of the mixing compartment (10), a mixing rotor (40) being rotatable in the mixing compartment (10) about a rotational axis (25) coinciding with the main central axis (25), the mixing rotor (40) comprising at least one elongated mixing paddle (43,44) having a leading surface (59,52) facing in the general direction of motion of the mixing paddle (43,44), characterised in that at least one of the mixing paddles (43,44) is a first mixing paddle (43), and the leading surface (59) of each first mixing paddle (43) has a leading portion (60) which is located intermediate a pair of longitudinally spaced apart trailing ends (62), the trailing ends (62) being rearwardly disposed of the leading portion (60) relative to the direction of motion of the mixing paddle (43), and the leading surface (59) of each first mixing paddle (43) extends from the leading portion (60) to the respective trailing ends (62) for urging material forwardly in the general direction of motion of the first mixing paddle (43) and endwardly in respective general directions towards the trailing ends (62) of the first mixing paddle (43).

2. Apparatus as claimed in Claim 1 characterised in that the leading portion (60) of the leading surface (59) of each first mixing paddle (43) is located along the first mixing paddle (43) substantially midway between the trailing ends (62).

3. Apparatus as claimed in any preceding claim characterised in that the trailing ends (62) of each first mixing paddle (43) coincide with the respective opposite ends (62) of the first mixing paddle (43).

4. Apparatus as claimed in any preceding claim characterised in that the leading surface (59) of each first mixing paddle (43) extends from the leading portion (60) to each trailing end (62) at an angle (α) in the range of 3° to 45° relative to a line (65) extending parallel to the main central axis (25).

5. Apparatus as claimed in Claim 4 characterised in that the leading surface (59) of each mixing paddle (43) extends from the leading portion (60) to each trailing end (62) at an angle (α) in the range of 10° to 30° relative to the line (65) extending parallel to the main central axis (25).

6. Apparatus as claimed in Claim 5 characterised in that the leading surface (59) of each first mixing paddle (43) extends from the leading portion (60) to each trailing end (62) at an angle (α) of approximately 13° relative to the line (65) extending parallel to the main central axis (25).

7. Apparatus as claimed in any preceding claim characterised in that the mixing rotor (40) comprises at least one second mixing paddle (44), each second mixing paddle (44) having a leading surface (52) extending longitudinally and substantially parallel to the main central axis (25).

8. Apparatus as claimed in Claim 7 characterised in that the first and second mixing paddles (43,44) are arranged in pairs, one first mixing paddle (43) and one second mixing paddle (44) being provided in each pair, and the first and second mixing paddles (43,44) of each pair being disposed about the rotational axis (25) of the mixing rotor (40) at approximately 180° intervals to each other.

9. Apparatus as claimed in Claim 8 characterised in that a plurality of pairs of first and second mixing paddles (43,44) are provided, the pairs of mixing paddles (43,44) being spaced apart longitudinally along the rotational axis (25) of the mixing rotor

(40), adjacent pairs of mixing paddles (43,44) being oriented at approximately 90° to each other.

10. Apparatus as claimed in any preceding claim characterised in that the leading surface (59,52) of each mixing paddle (43,44) extends substantially radially relative to the rotational axis (25) of the mixing rotor.

11. Apparatus as claimed in any preceding claim characterised in that each mixing paddle (43,44) defines an outer peripheral edge (47), the radius of which from the rotational axis (25) of the mixing rotor (40) is less than the internal radius of the partly circular portion (13) of the mixing compartment.

12. Apparatus as claimed in any preceding claim characterised in that the mixing rotor (40) comprises a rotor shaft (41) which is rotatably carried in the mixing compartment (10), each mixing paddle (43,44) being radially spaced apart from the rotor shaft (41) and being carried on corresponding carrier arms (45) extending radially from the rotor shaft (41).

13. Apparatus as claimed in any preceding claim characterised in that the partly circular portion (13) of the mixing compartment (10) is formed by an elongated longitudinally extending base (13) of substantially semi-circular transverse cross-section.

14. Apparatus as claimed in Claim 13 characterised in that a longitudinally extending side wall (16) extending the length of the mixing compartment (10) extends from the semi-circular base (13) in a generally upward direction for defining one side of an open mouth (17) to the mixing compartment (10).

15. Apparatus as claimed in Claim 14 characterised in that the side wall (16) is of arcuate transverse cross-section and of radius substantially similar to that of the base (13).

16. Apparatus as claimed in Claim 14 or 15 characterised in that an elongated blade (68) extends longitudinally parallel to the central axis and extends from the side wall (16) into the open mouth (17), the blade (68) terminating in an elongated longitudinally extending leading edge (69) for co-operating with each mixing paddle (43,44) for breaking up masses of fibrous material.

17. Apparatus as claimed in Claim 16 characterised in that the blade (68) extends substantially tangentially from the side wall (16), and extends in a direction towards the leading surface (59,52) of each mixing paddle (43,44) as the mixing paddle (43,44) is rotating and approaching the blade (68).

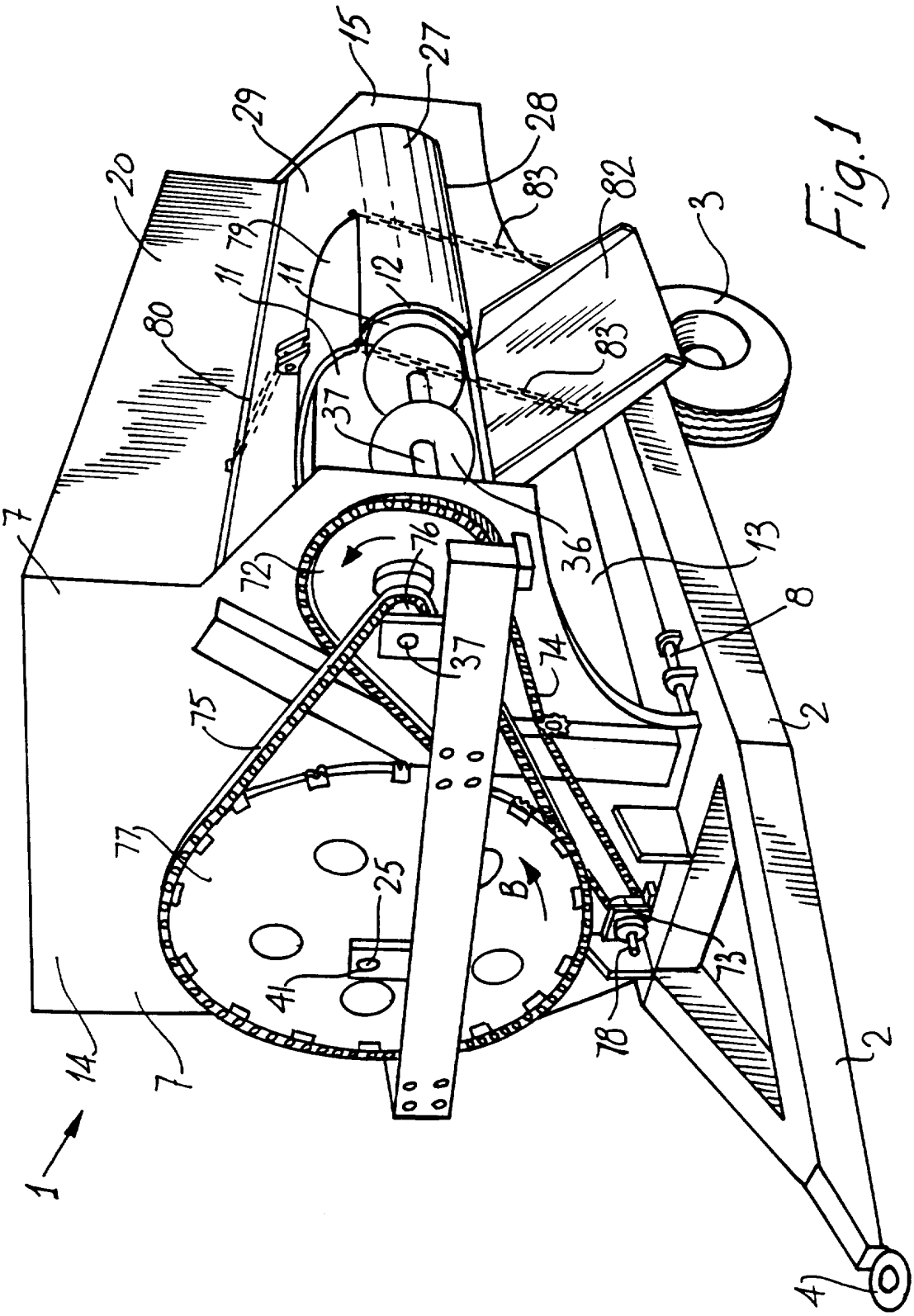
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Fig. 1

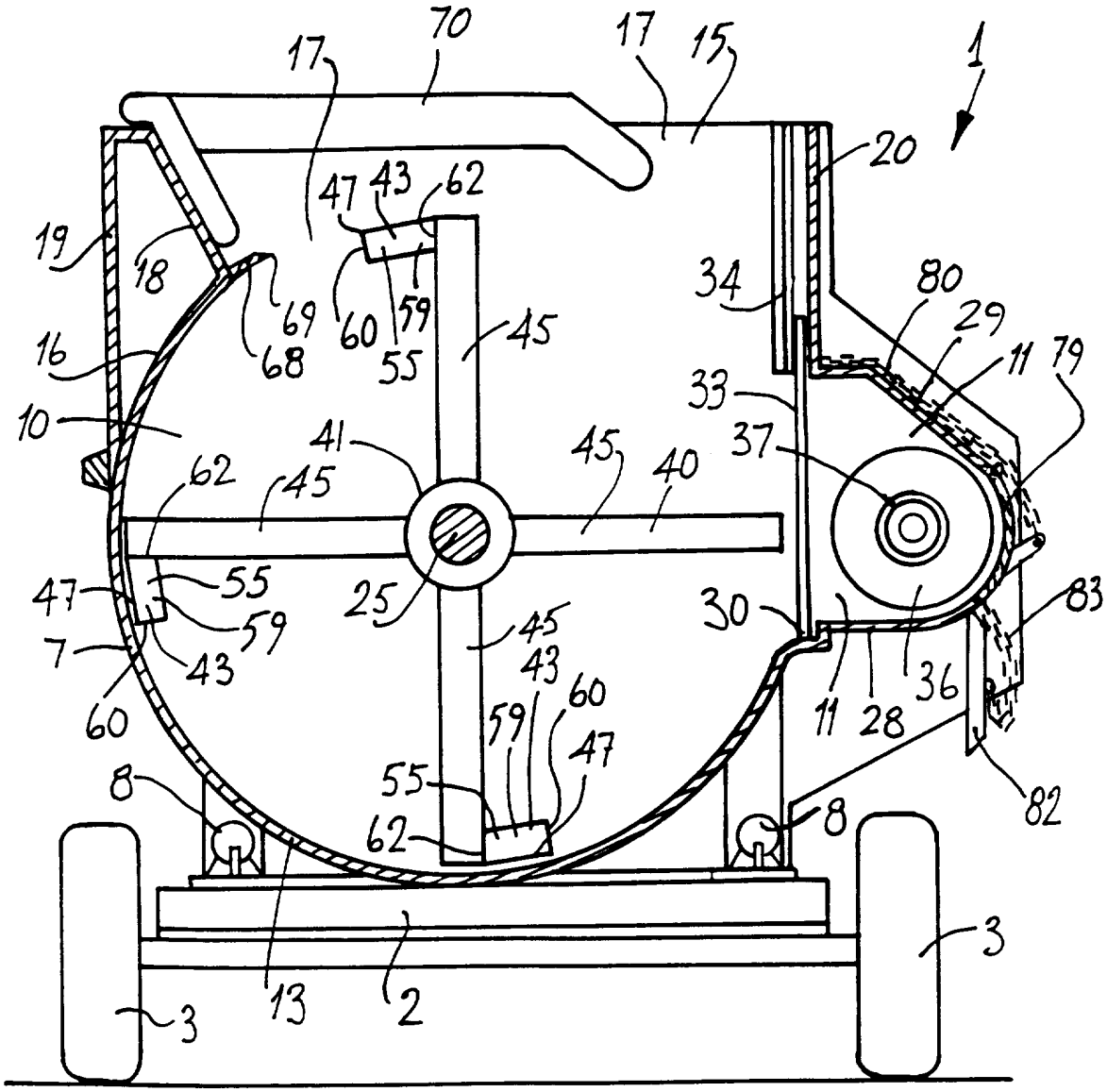
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Fig. 2

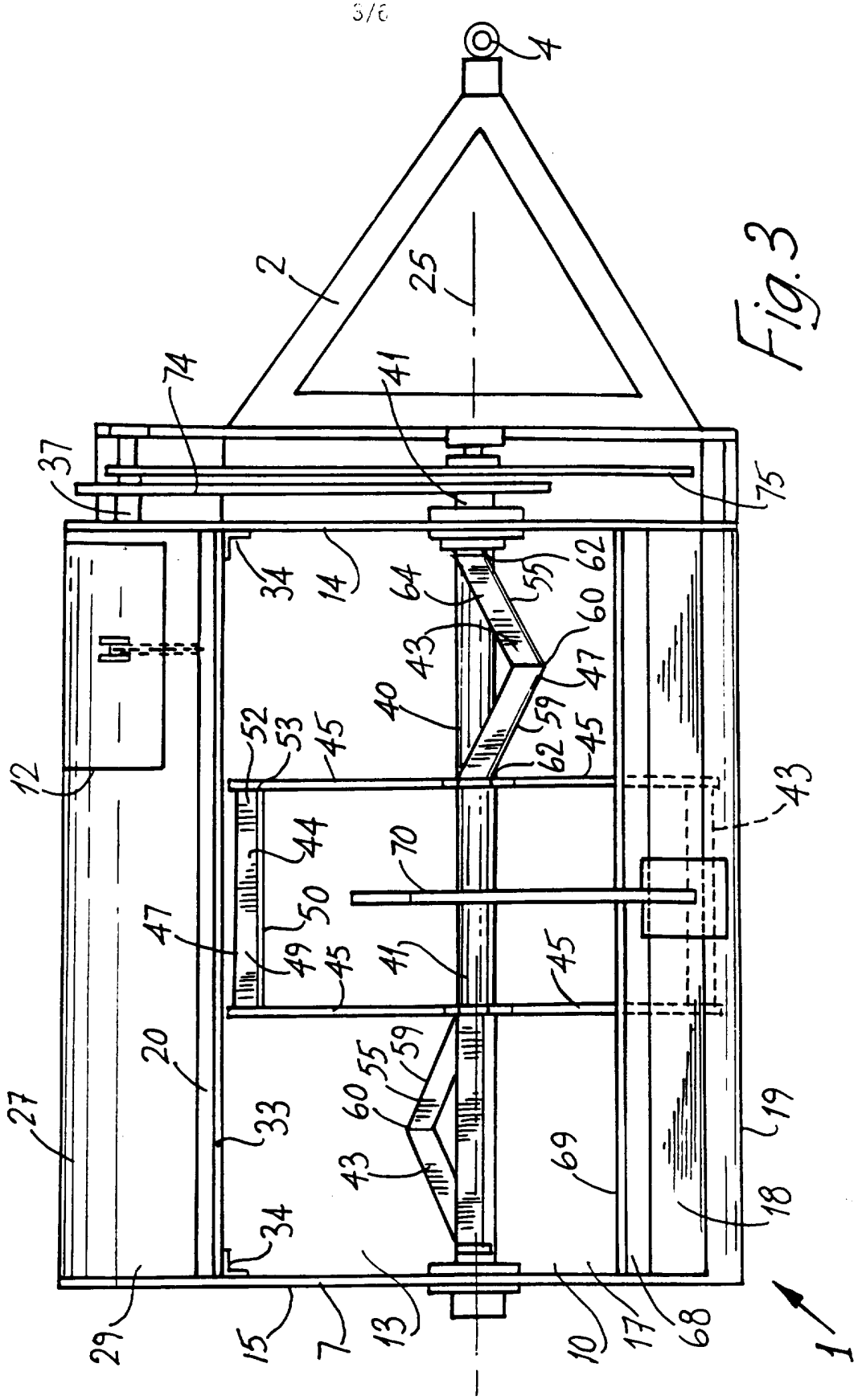
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Fig. 3

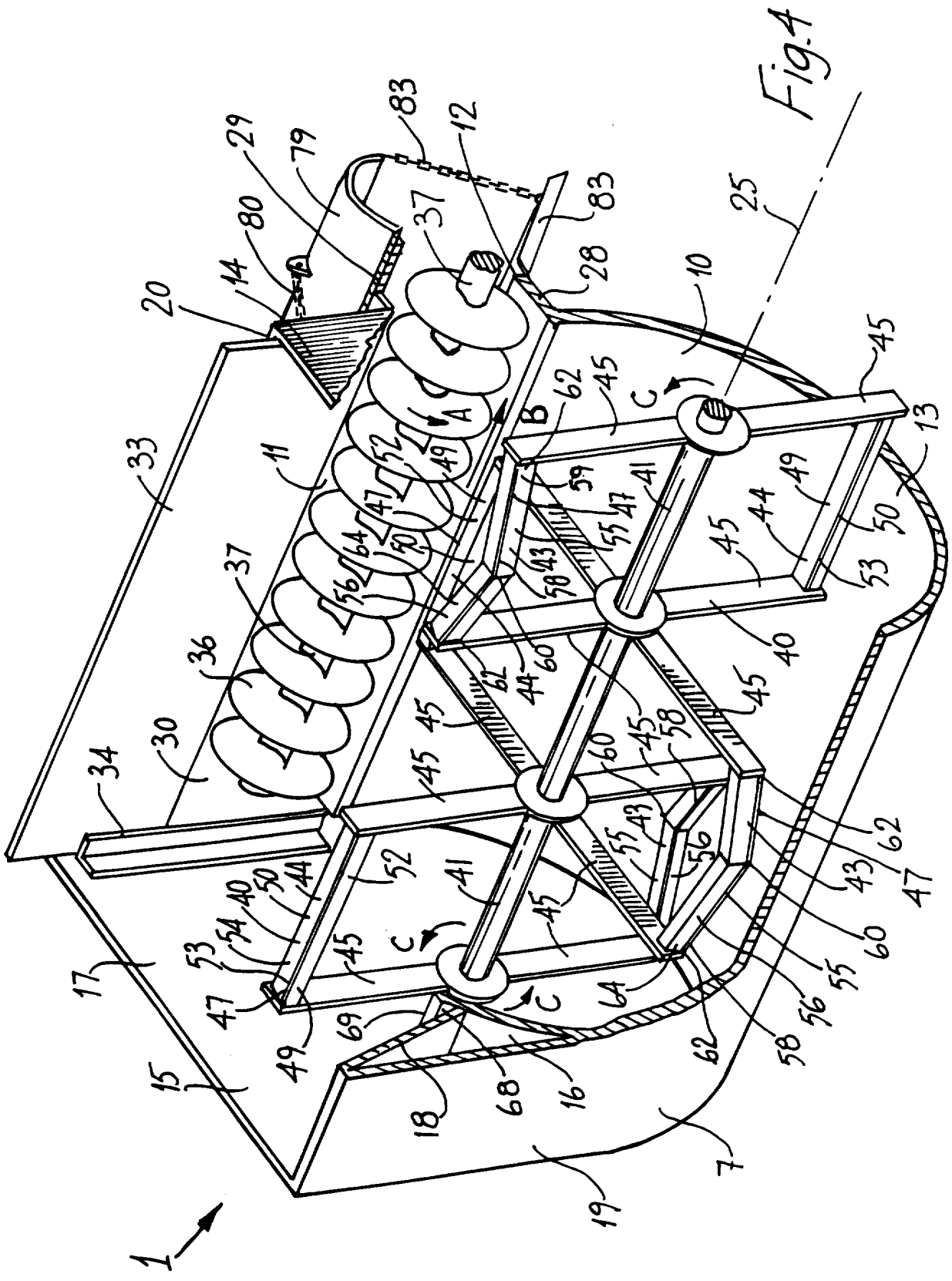

Fig.4

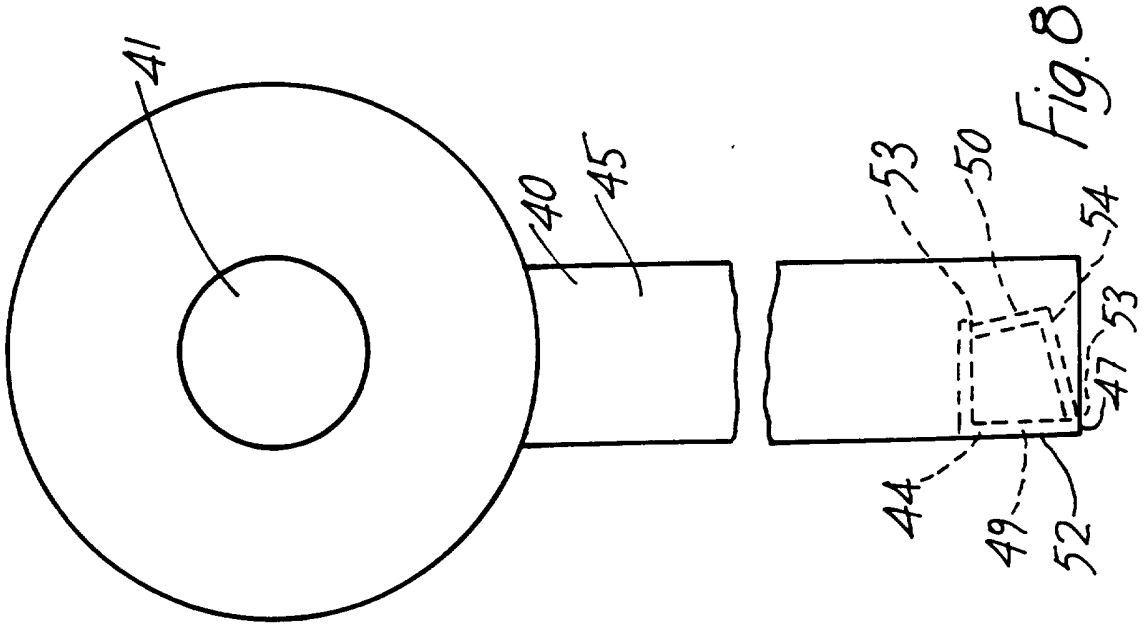
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Fig. 8

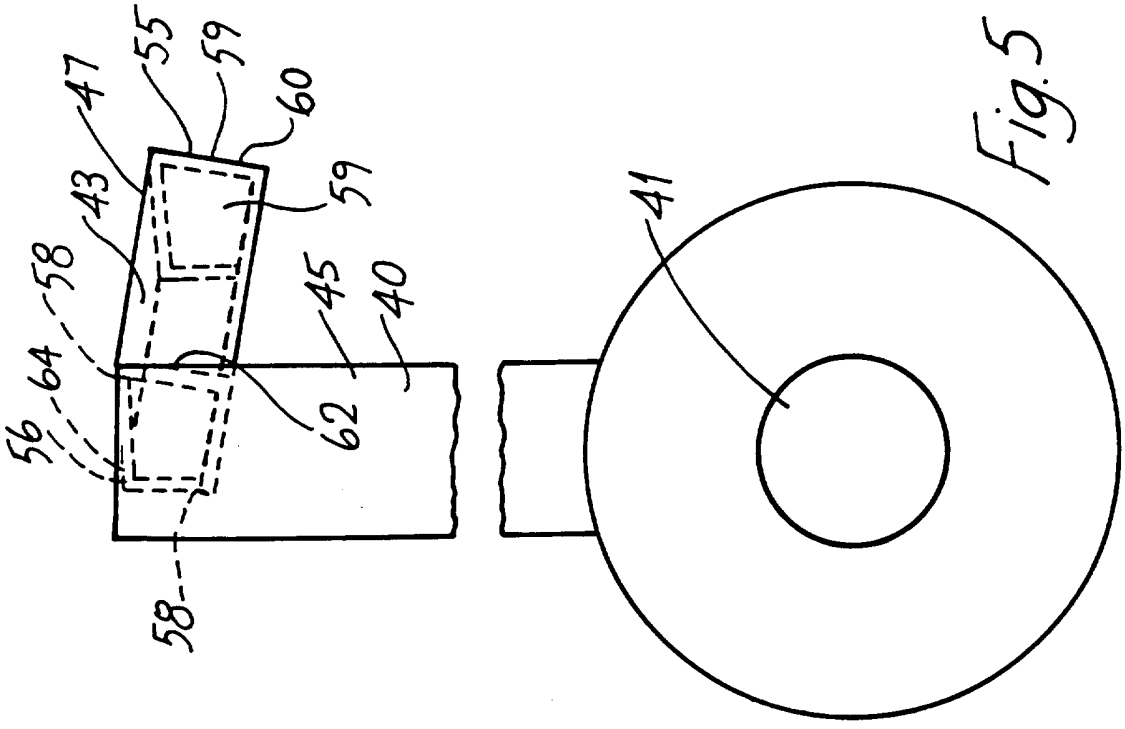
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Fig. 5

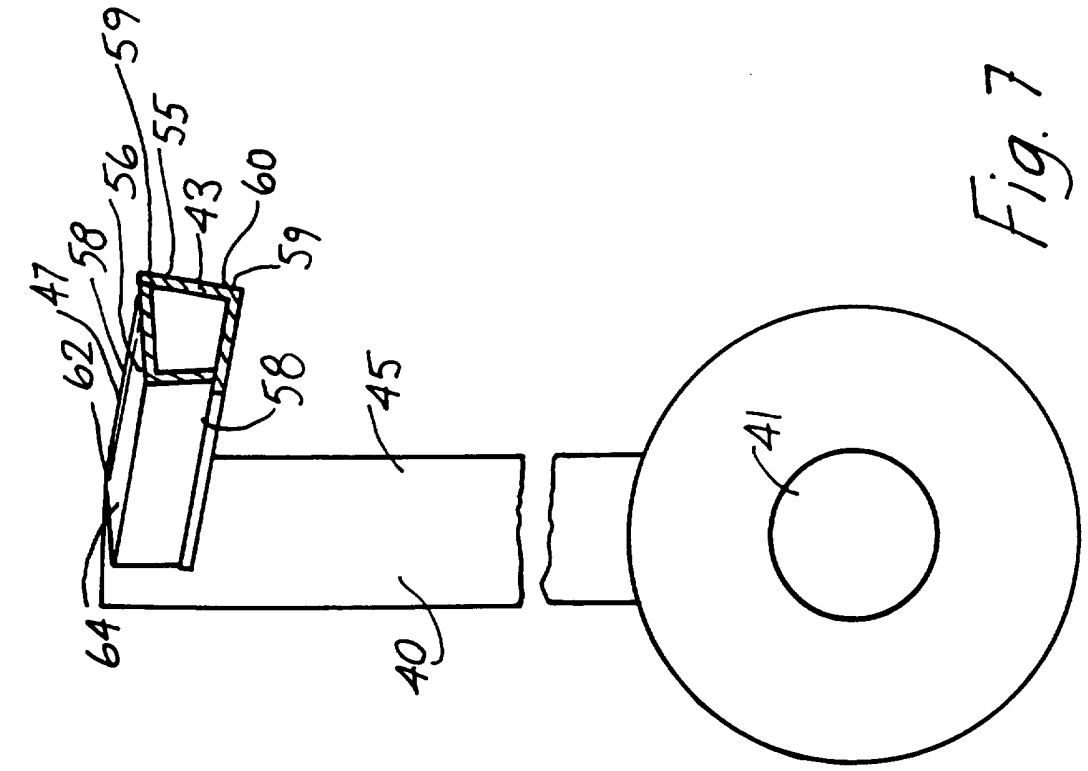
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Fig. 7

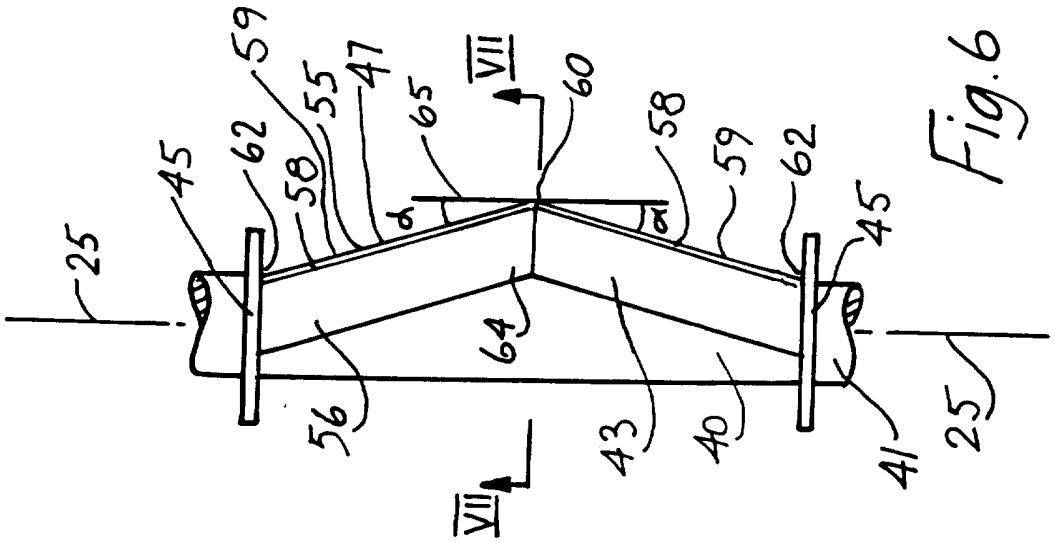
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Fig. 6

INTERNATIONAL SEARCH REPORT

Inter ional Application No
PCT/IE 95/00046

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01K5/00 A01F29/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01K A01F A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB,A,2 229 618 (LUPTON) 3 October 1990 see page 4, paragraph 9 - page 12; figures 1-9	1,10-15
Y A	EP,A,0 029 095 (HOOPMAN) 27 May 1981 see page 6, line 6 - page 12; figures 1-6	1 9-17
Y A	FR,A,1 079 885 (AUROUZE) 3 December 1954 see the whole document	1 2,3,10, 16,17
A	EP,A,0 392 871 (SALFORD ENGIN. LTD.) 17 October 1990	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
5 January 1996	22. 01. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Vermander, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. ...nal Application No
PCT/IE 95/00046

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-2229618	03-10-90	NONE	
EP-A-29095	27-05-81	DE-A- 2937637	02-04-81
FR-A-1079885	03-12-54	NONE	
EP-A-392871	17-10-90	NONE	