



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**05.11.2014 Bulletin 2014/45**

(51) Int Cl.:  
**F04D 7/04 (2006.01)**

(21) Application number: **14166691.7**

(22) Date of filing: **30.04.2014**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**

(71) Applicant: **Redrock Machinery Limited**  
**Armagh BT60 2BL, Northern Ireland (GB)**

(72) Inventor: **Flynn, Frank**  
**Armagh BT60 2BL (IE)**

(74) Representative: **MacLachlan & Donaldson**  
**2b Clonskeagh Square**  
**Clonskeagh Road**  
**Dublin 14 (IE)**

(30) Priority: **30.04.2013 GB 201307779**

(54) **Improvements in and relating to slurry pumps**

(57) The invention relates to a slurry pump (100) comprising a cutting means mounted on the slurry pump, the cutting means being adapted to shear elongate material included in the slurry. The cutting means comprises at least two co-operating blades (51, 52, 68). Conveniently, the co-operating blades comprise a moveable blade member (48) and an associated fixed blade member (68). The slurry pump of the invention has the advantage that it is configured to shear elongate material included in the slurry and hence prevent the elongate material from becoming entangled in the slurry pump. In particular, the cutting means (51, 52, 71) is configured to prevent elongate material from entering into the impeller housing (90) of the slurry pump where it could become entangled in the impeller mechanism and prevent operation of the slurry pump.

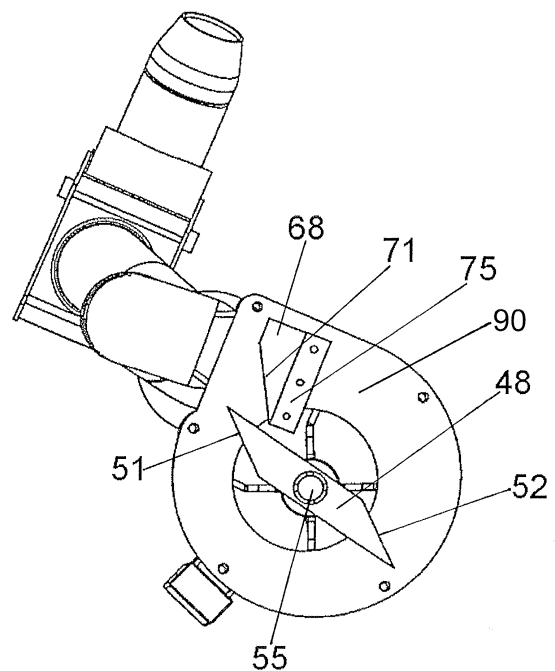


Figure 1

**Description**

[0001] The present invention relates to an improved slurry pump.

[0002] Slurry pumps are known for agitating the slurry of sewage and water in a slurry pit of the type provided under slatted housing for cattle. However, known slurry pumps can become blocked by some of the material that can be included with the slurry in the slurry pit; especially elongate material such as twine used to bind bales of straw or bales of hay; as well as longer strands of fodder which can be trodden on by cattle and pressed down between the slats of the slatted house and thereby unintentionally end up in the slurry pit. This elongate material can become entangled in known slurry pumps and can cause serious blockages to the pump and damage to the equipment.

[0003] The present invention seeks to alleviate the disadvantages associated with known slurry pumps.

[0004] The present invention accordingly provides a slurry pump comprising a cutting means mounted on the slurry pump, ideally, mounted on an external surface of the slurry pump, the cutting means being adapted to shear elongate material included in slurry.

[0005] Further preferred features of the slurry pump of the present invention are included in the appended claims.

[0006] The improved slurry pump of the present invention has the advantage that it is configured to shear elongate material that may be included in the slurry and hence prevent the elongate material from entering into the slurry pump and becoming entangled in the slurry pump operating parts. In particular, the cutting means is configured to cut the elongate material before it enters into the impeller housing, thereby preventing the elongate material from entering the impeller housing of the slurry pump and becoming entangled in the impeller mechanism and hindering or preventing operation of the slurry pump.

[0007] Preferably, the cutting means comprises at least two co-operating blades.

[0008] Conveniently, the co-operating blades comprise a moveable blade member and an associated fixed blade member.

[0009] Advantageously, the moveable blade member is adapted to turn in an arcuate manner. Most preferably, the moveable blade member is a rotatable blade member.

[0010] In one embodiment, the slurry pump is configured for the moveable blade member to turn in a clockwise direction. It is of course to be understood that the moveable blade member can also be configured to turn in a counter clockwise (i.e. anticlockwise) direction.

[0011] In another embodiment, the moveable blade member is adapted to turn in an arcuate manner in a first direction (e.g. clockwise or anticlockwise) and to then turn in a second, opposite direction (e.g. anticlockwise or clockwise) such that, in use, there is turning of the moveable blade member in alternate directions, repeatedly. This embodiment of the pump is most advantageous to remove any elongate material which becomes entangled and this embodiment can be used to shear the elongate material in a convenient manner so as to unjam the slurry pump.

[0012] Preferably, the fixed blade member is mounted on the slurry pump, ideally mounted on the impeller housing. Further preferably, the moveable blade member is mounted on the shaft of the impeller of the slurry pump. Ideally, the fixed blade member is mounted at a location on the impeller housing such that in use, the arcuate movement of the moveable blade member defines a shearing plane which is parallel to the plane of the fixed blade member.

[0013] Preferably, the moveable blade member is spaced apart from the fixed blade member by an amount of from 1 mm to 12mm.

[0014] The fixed blade member is preferably provided at an upper position on the impeller housing of the slurry pump. In an alternative embodiment, the fixed blade may be provided at a lower position on the impeller housing.

[0015] Ideally, the rotatable blade comprises an elongate blade member having at least one cutting edge provided at at least one end of the elongate blade member.

[0016] Preferably, the elongate blade member comprises two cutting edges which are most preferably, provided opposed ends of the elongate blade member.

[0017] Preferably, the elongate blade member comprises two cutting edges which are most preferably, provided at opposed ends of the elongate blade member.

[0018] Conveniently, the elongate blade member is generally in the form of a parallelogram with the cutting edges defined by at least two opposed parallel sides.

[0019] In one embodiment of the slurry pump of the present invention, the cutting edge(s) of the moveable blade may be more sharp than the cutting edge of the fixed blade. Alternatively, the cutting edge(s) of the fixed blade may be more sharp than the cutting edge(s) of the fixed blade.

[0020] In another embodiment, the fixed blade on the slurry pump may have more than one cutting edge such as for instance, the fixed blade may comprise a double sided blade.

[0021] The slurry pump of the present invention will now be described more particularly with reference to the accompanying drawings in which are shown, by way of example only, one embodiment of the slurry pump of the present invention.

[0022] In the drawings:

## EP 2 799 715 A1

Figure 1 is a front view of the slurry pump showing a blade fixedly mounted on the slurry pump and a movable blade member rotatably mounted on the slurry pump;

Figure 2 is a first side view of the slurry pump; and

Figure 3 is a view from a second side of the slurry pump.

**[0023]** Referring now to the drawings, the improved slurry pump of the present invention is indicated generally by reference number 100. The slurry pump 100 comprises the following features which are indicated by the following reference numbers indicated in the table below:

| Reference numeral | Name of feature                  | Quantity included in the embodiment shown in the Figures |
|-------------------|----------------------------------|----------------------------------------------------------|
| 1                 | 7' Spine Assembly                | 1                                                        |
| 2                 | Linkage Frame                    | 1                                                        |
| 3                 | Gearbox                          | 1                                                        |
| 4                 | Bottom Box Bottom Plate          | 1                                                        |
| 5                 | 7' Drive Shaft                   | 1                                                        |
| 6                 | 40mm - 45mm Universal Joint      | 1                                                        |
| 7                 | 2½" Rubber Bearing               | 1                                                        |
| 8                 | Bottom Box Inspection Hatch      | 1                                                        |
| 9                 | Universal Joint Inspection Cover | 1                                                        |
| 10                | Jack Leg Pin                     | 2                                                        |
| 11                | Stand Assembly Pin               | 2                                                        |
| 12                | PTO Guard Assembly               | 1                                                        |
| 13                | Jack Leg                         | 2                                                        |
| 14                | Ram Box Pin                      | 1                                                        |
| 15                | Hydraulic Ram Box                | 1                                                        |
| 16                | Slurry Pump Hydraulic Ram        | 1                                                        |
| 17                | Cranked Quick Hitch              | 1                                                        |
| 18                | 12x8x50 Key                      | 2                                                        |
| 19                | Quick Hitch Latch                | 2                                                        |
| 20                | Rotor Assembly                   | 1                                                        |
| 21                | Diverter Spacer                  | 1                                                        |
| 22                | Diverter Box Cap Plate           | 1                                                        |
| 23                | Diverter Spindle                 | 1                                                        |
| 24                | Diverter                         | 1                                                        |
| 25                | Ram Pin                          | 1                                                        |
| 26                | Drive Shaft Bottom Guard         | 1                                                        |
| 27                | Diverter Position Bracket        | 1                                                        |
| 28                | Safety Frame                     | 1                                                        |
| 29                | Safety Grid                      | 1                                                        |
| 30                | Spout Spindle                    | 1                                                        |

(continued)

| Reference numeral | Name of feature                                            | Quantity included in the embodiment shown in the Figures |
|-------------------|------------------------------------------------------------|----------------------------------------------------------|
| 31                | Sliding Collar                                             | 1                                                        |
| 32                | Spout Connecting Rod                                       | 1                                                        |
| 33                | Spindle/Swivel Bush                                        | 1                                                        |
| 34                | Swivel Bush                                                | 1                                                        |
| 35                | Spindle Locating Collar                                    | 1                                                        |
| 36                | Divertor Handle Connector                                  | 1                                                        |
| 37                |                                                            | 1                                                        |
| 38                | Spout Rotating Handle                                      | 1                                                        |
| 39                | Spout Height Adjusting Screw                               | 1                                                        |
| 40                | Screw Collar                                               | 1                                                        |
| 41                | Spout Adjusting Handle                                     | 1                                                        |
| 42                | Height Adjuster Handle Bush                                | 1                                                        |
| 43                |                                                            | 1                                                        |
| 44                | Spout Box                                                  | 1                                                        |
| 45                | Spout                                                      | 1                                                        |
| 46                | Bottom Spout Connecting Rod                                | 1                                                        |
| 47                | Rotor Bush                                                 | 1                                                        |
| 48                | Rotatable Blade Member                                     | 1                                                        |
| 49                | Rotor Plate                                                | 1                                                        |
| 50                | Rotor Plate 2                                              | 1                                                        |
| 51                | First Cutting Edge of Rotatable Blade Member 48            | 1                                                        |
| 52                | Second Cutting Edge of Rotatable Blade Member 48           | 1                                                        |
| 55                | Rotor Shaft                                                | 1                                                        |
| 68                | Fixed Blade Member (blade fixedly attached to slurry pump) | 1                                                        |
| 71                | Cutting Edge of Fixed Blade 68                             | 1                                                        |
| 90                | Impeller housing                                           | 1                                                        |

**[0024]** In particular, the slurry pump 100 comprises two co-operating blades. The slurry pump 100 comprises a first blade member 68 fixedly mounted on the slurry pump, and ideally, as in the preferred embodiment shown in the drawings, the first blade member is mounted on the impeller housing 90 of the slurry pump 100.

**[0025]** The first blade member 68 which is fixedly mounted on the slurry pump 100 is also referred to herein as the fixed blade.

**[0026]** As well as the fixed blade 68, the slurry pump 100 also comprises a second blade provided on blade member 48 which is rotatably mounted on the slurry pump 100. The blade member 48 which is rotatably mounted on the slurry pump 100, is also referred to herein as the rotatable blade.

**[0027]** The fixed blade 68 is provided at an upper position on the impeller housing 90 of slurry pump 100. In an alternative embodiment, the fixed blade may be provided at a lower position on the impeller housing 90.

**[0028]** In the embodiment shown in Figures 1, 2 and 3, the fixed blade member 68 includes a cutting edge 71 and the fixed blade member 68 is fixedly secured to the slurry pump 100 using suitable fixing means 75.

**[0029]** The rotatable blade member 48 is mounted on the rotatable shaft 55 so that the rotatable blade member rotates

when the shaft 55 rotates. The rotatable blade member 48 comprises a first cutting edge 51 and a second cutting edge 52. The rotatable blade member 48 is generally in the form of a parallelogram with two opposed sides of the blade member 48 defining the first and second cutting edges 51 and 52, respectively.

[0030] The embodiment of the slurry pump shown in the drawings is configured for the rotatable blade to rotate in a clockwise manner.

[0031] It is of course to be understood that the slurry pump 100 can also be configured for rotation in a counter clockwise (i.e. anticlockwise) direction by mounting the fixedly mounted blade member 68 on the slurry pump 100 such that the cutting edge 71 thereof is facing in an opposite direction from that shown in Figure 1.

[0032] The fixedly mounted blade 68 is removable for maintenance. It is manufactured of hardened steel.

[0033] The rotatable blade member 48 is mounted spaced apart from the fixed blade member 68 by an amount of from 1mm to 12mm.

[0034] In use, any string or other elongate material to be cut is captured in the space between the fixed blade cutting edge 71 and the cutting edge 51 and 52 of the rotatable blade member 48. The fixed blade and the rotatable blades are configured to cooperate such that in use any elongate material which enters in the region of the blades is sheared by the rotatable blade cutting edges 51 or 52 as they rotate about the rotor shaft 55 or by the fixed blade 68. Thus elongate material is sheared before it can enter into the impeller housing of the slurry pump and hence clogging of the pump by such elongate material is advantageously prevented.

[0035] Various other embodiments are referenced in the description hereinabove.

[0036] It is to be understood that the invention is not limited to the specific details described herein which are given by way of example only and that various modifications and alterations are possible without departing from the scope of the invention as defined in the appended claims.

## Claims

1. A slurry pump comprising a cutting means mounted on the slurry pump, the cutting means being adapted to shear elongate material whereby, in use, the cutting means is configured to shear elongate material that is included in slurry and thereby prevent the elongate material from entering into the slurry pump and becoming entangled in an impeller of the slurry pump.
2. A slurry pump as claimed in Claim 1 wherein the cutting means is configured to prevent elongate material from entering into the impeller housing of the slurry pump wherein, in use, the elongate material could become entangled in the impeller and prevent operation of the slurry pump.
3. A slurry pump as claimed in Claim 1 or Claim 2 wherein the cutting means comprises at least two co-operating blades.
4. A slurry pump as claimed in Claim 3 wherein the co-operating blades comprise a moveable blade member and an associated fixed blade member; optionally wherein the fixed blade member may have more than one cutting edge; and further optionally, wherein the fixed blade member comprises a double sided blade.
5. A slurry pump as claimed in Claim 4 wherein the moveable blade member is adapted to turn in an arcuate manner; optionally wherein the moveable blade member is a rotatable blade member.
6. A slurry pump as claimed in Claim 4 or Claim 5 wherein the slurry pump is configured for the moveable blade member to turn in a clockwise direction or alternatively, to turn in a counter clockwise direction.
7. A slurry pump as Claimed in any one of Claims 4 to 6 wherein the moveable blade member is adapted to turn in an arcuate manner in a first direction (e.g. clockwise or anticlockwise) and to then turn in a second, opposite direction (e.g. anticlockwise or clockwise) such that, in use, the moveable blade member can turn in alternating directions.
8. A slurry pump as claimed in any one of claims 4 to 7 wherein the fixed blade member is mounted on an external surface of the impeller housing; optionally wherein the fixed blade member is provided at an upper position on the external surface of the impeller housing of the slurry pump or alternatively, wherein the fixed blade is provided at a lower position on the external surface of the impeller housing.
9. A slurry pump as claimed in any one of Claims 4 to 8 wherein the moveable blade member is mounted on the shaft of the impeller of the slurry pump.

## EP 2 799 715 A1

10. A slurry pump as claimed in Claim 8 or Claim 9 wherein the fixed blade member is mounted at a location on the impeller housing such that in use, the arcuate movement of the moveable blade member defines a shearing plane which is parallel to the plane of the fixed blade member.

5 11. A slurry pump as claimed in any one of claims 4 to 10 wherein the moveable blade member is spaced apart from the fixed blade member by a relatively small distance; optionally wherein said relatively small distance is from 1mm to 12mm.

10 12. A slurry pump as claimed in any one of claims 4 to 11 wherein the moveable blade comprises an elongate blade member having at least one cutting edge provided at at least one end of the elongate blade member.

13. A slurry pump as claimed in Claim 12 wherein the elongate blade member comprises two cutting edges which are provided at opposed ends of the elongate blade member.

15 14. A slurry pump as claimed in claim 12 or claim 13 wherein the elongate blade member is generally in the form of a parallelogram with the cutting edges defined by at least two opposed parallel sides.

20 15. A slurry pump as claimed in any preceding claim wherein the cutting edge(s) of the moveable blade or the fixed blade is sharper than the cutting edge of the fixed blade or the moveable blade, respectively.

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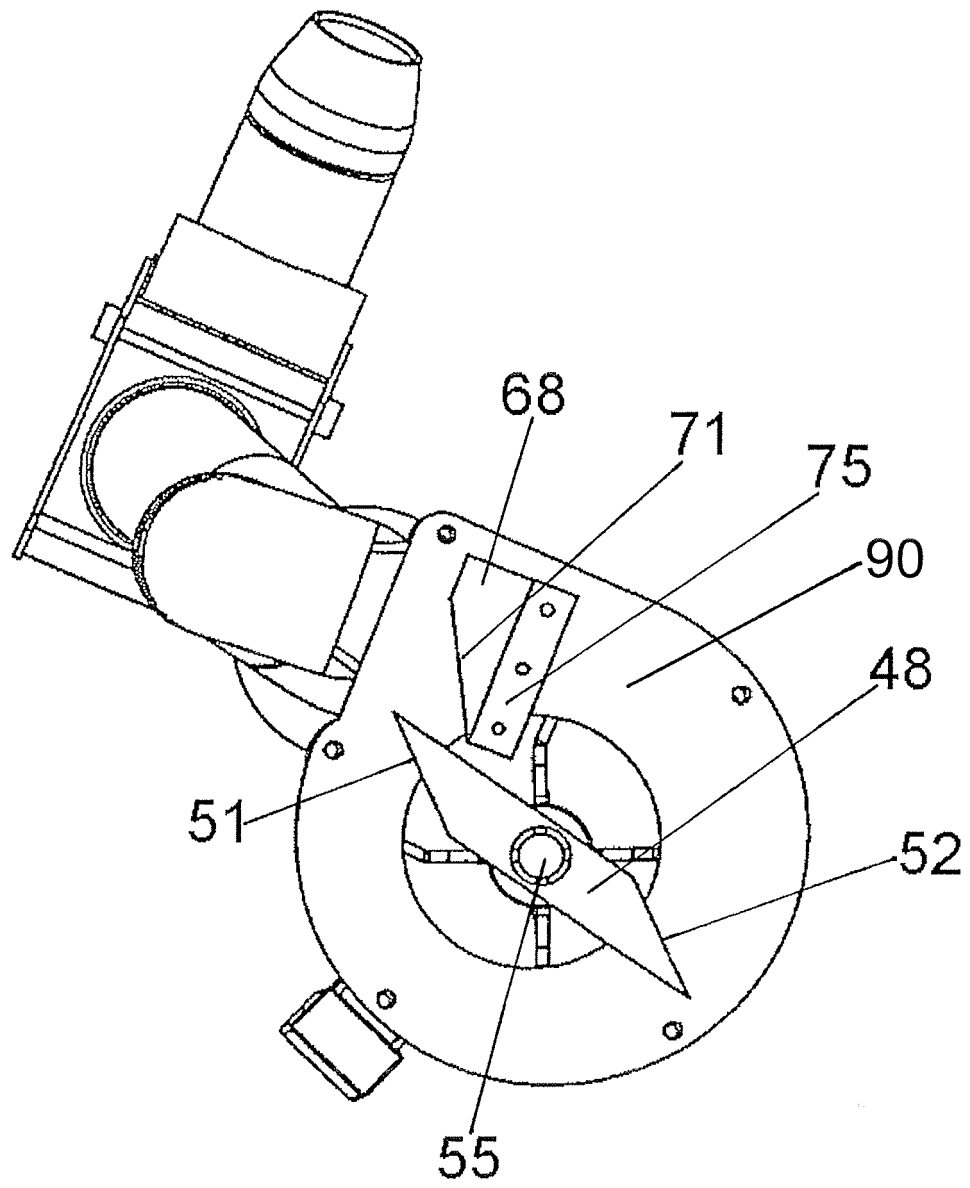


Figure 1

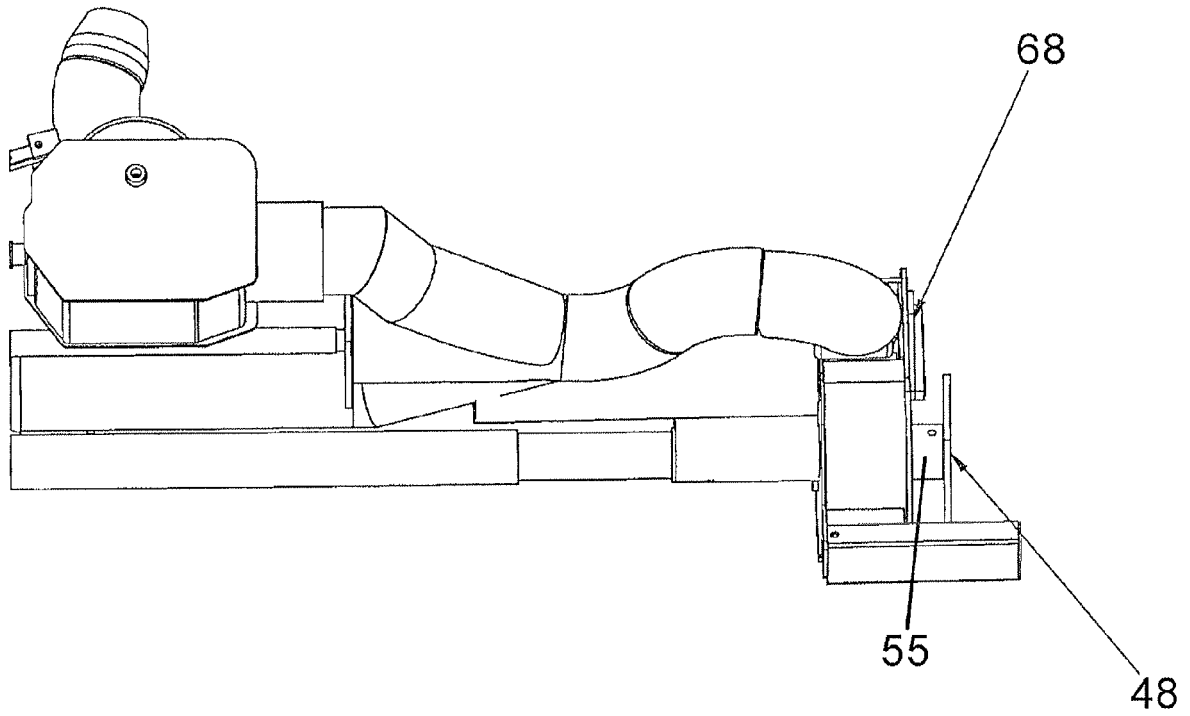


Figure 2

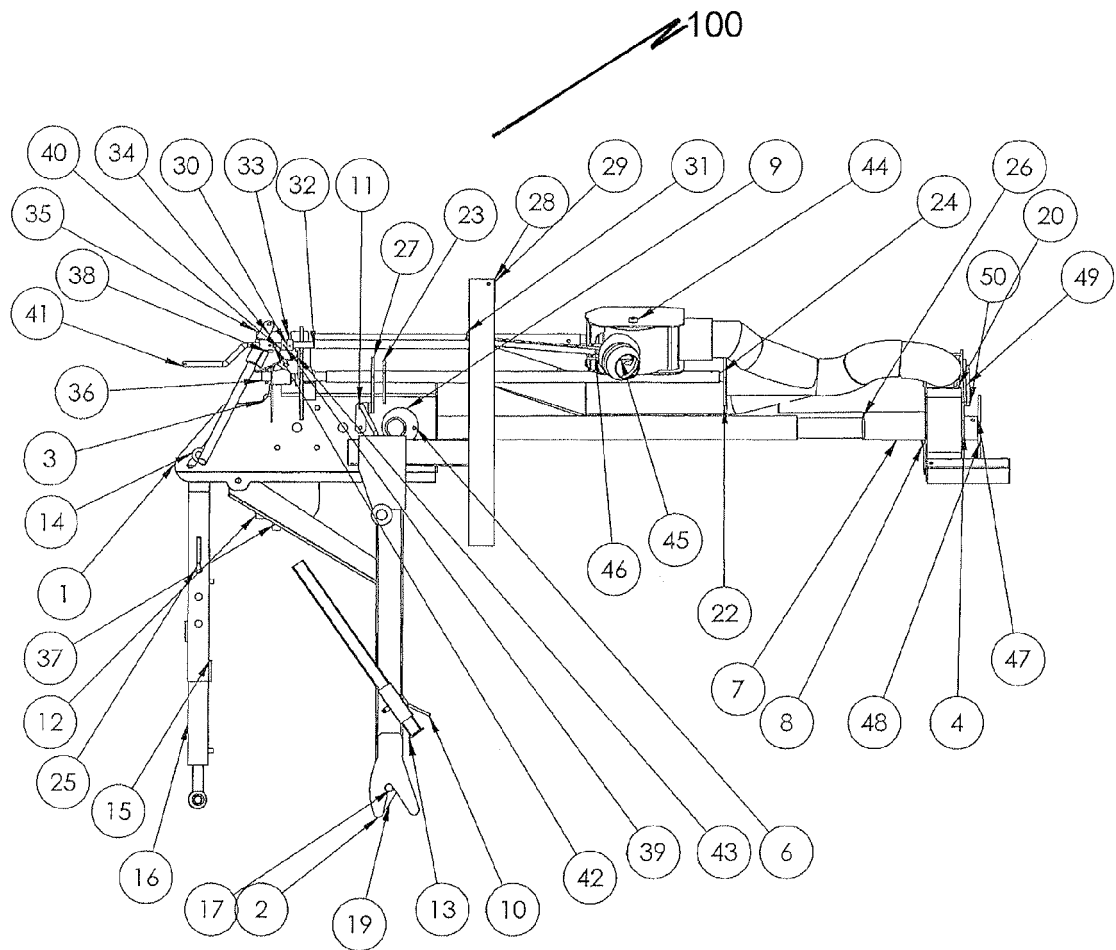


Figure 3



## EUROPEAN SEARCH REPORT

Application Number  
EP 14 16 6691

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                        |                                                                                                                             |                                                                                                                                                                                                                                                                                    |                                         |                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------------|
| Category                                                                                                                                                                                                                   | Citation of document with indication, where appropriate, of relevant passages                                               | Relevant to claim                                                                                                                                                                                                                                                                  | CLASSIFICATION OF THE APPLICATION (IPC) |                                    |
| X                                                                                                                                                                                                                          | US 3 155 330 A (OTTO HOLZ ET AL)<br>3 November 1964 (1964-11-03)                                                            | 1-6,8-15                                                                                                                                                                                                                                                                           | INV.<br>F04D7/04                        |                                    |
| Y                                                                                                                                                                                                                          | * column 2, line 20 - line 40; figures 1,2 *                                                                                | 7                                                                                                                                                                                                                                                                                  |                                         |                                    |
|                                                                                                                                                                                                                            | * column 2, line 41 - line 59; figure 3 *                                                                                   |                                                                                                                                                                                                                                                                                    |                                         |                                    |
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| A                                                                                                                                                                                                                          | * paragraph [0023] - paragraph [0026];<br>figures 1,3,5 *                                                                   | 7                                                                                                                                                                                                                                                                                  |                                         |                                    |
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| A                                                                                                                                                                                                                          | * page 14, line 4 - line 10; figure 1 *                                                                                     | 1                                                                                                                                                                                                                                                                                  |                                         | F04D                               |
|                                                                                                                                                                                                                            | * page 6, line 30 - line 32 *                                                                                               |                                                                                                                                                                                                                                                                                    |                                         |                                    |
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|                                                                                                                                                                                                                            | * column 3, line 66 - column 4, line 23;<br>figure 2 *                                                                      |                                                                                                                                                                                                                                                                                    |                                         |                                    |
|                                                                                                                                                                                                                            | * page 6, line 30 - line 41 *                                                                                               |                                                                                                                                                                                                                                                                                    |                                         |                                    |
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| A                                                                                                                                                                                                                          | * column 6, line 28 - column 7, line 17;<br>figures 2,4 *                                                                   | 7                                                                                                                                                                                                                                                                                  |                                         |                                    |
| The present search report has been drawn up for all claims                                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                                                                                    |                                         |                                    |
| Place of search<br>Munich                                                                                                                                                                                                  |                                                                                                                             | Date of completion of the search<br>26 September 2014                                                                                                                                                                                                                              | Examiner<br>Di Giorgio, F               |                                    |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                                |                                                                                                                             | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or<br>after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding<br>document |                                         |                                    |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another<br>document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                             |                                                                                                                                                                                                                                                                                    |                                         |                                    |

EPO FORM 1503 (03.02.2014) (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 16 6691

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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26-09-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82