



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
31.07.2024 Bulletin 2024/31

(21) Application number: **24154005.3**

(22) Date of filing: **25.01.2024**

(51) International Patent Classification (IPC):
B65H 49/34 (2006.01) **B65H 49/36** (2006.01)
B65H 54/553 (2006.01) **B65H 75/42** (2006.01)
B65H 75/44 (2006.01) **B66C 1/66** (2006.01)

(52) Cooperative Patent Classification (CPC):
B65H 49/36; B65H 49/34; B65H 54/553;
B65H 75/425; B65H 75/4486; B66C 1/66

(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 ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **26.01.2023 GB 202301145**

(71) Applicant: **Wox Agri Services Ltd**
Stannington, Morpeth NE61 6NQ (GB)

(72) Inventor: **WOX, Geoffrey**
MORPETH, NE61 1NQ (GB)

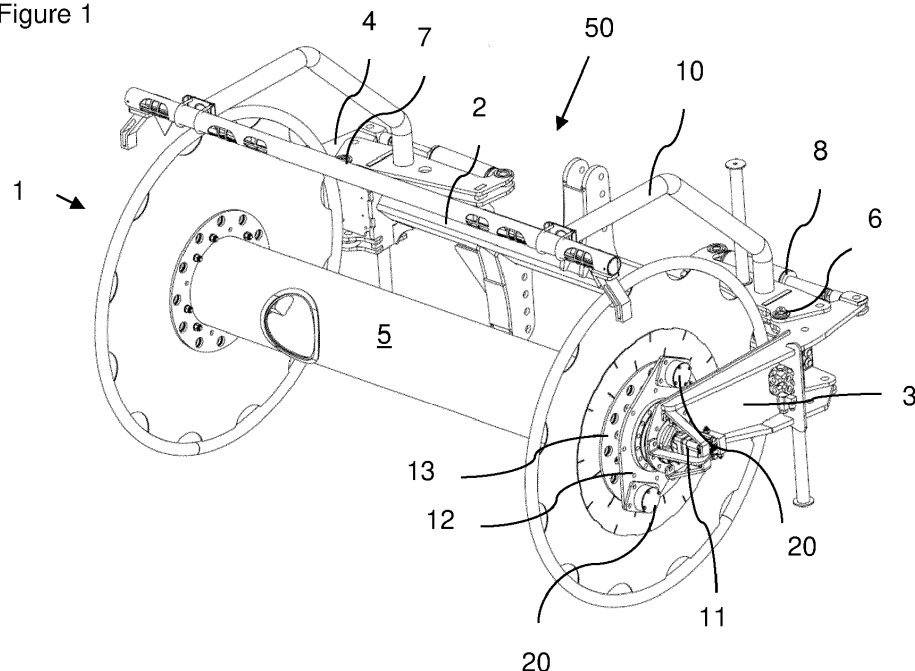
(74) Representative: **Loven, Keith James**
LOVEN Patents & Trademarks Limited
51 Wragby Road
Sudbrooke
Lincoln, Lincolnshire LN2 2QU (GB)

(54) **BOBBIN HANDLER**

(57) Disclosed herein is a device (1) for winding and unwinding flexible materials. The device (1) comprises a bobbin (5) and a handler (50). The bobbin handler (50) has two arms (3,4) moveably mounted to opposite ends of a support frame. The arms (3,4), are movable between a first position in which both arms (3, 4) are extended outwards of the support frame to a width greater than that of the bobbin, and a second position in which the

ends of the arms rotationally engage with the ends of the bobbin (5) through the central axis of the bobbin (5). The engagement between the ends of the bobbin and each respective arm (3,4) is defined by a male conical projection (30) and mutual circular recess (17a, 17b), and in the second position the male conical projections (30) are received within the respective recesses (17a, 17b).

Figure 1



Description

Field of the Invention

[0001] The present invention relates to a device for winding and unwinding flexible materials. More particularly the present invention relates to a device comprising a bobbin and a handler.

Background to the Invention

[0002] A bobbin or spool is generally known as a spindle or cylinder, with or without flanges, on which yarn, thread, wire, pipe, tape, film or other flexible material is wound. Bobbins are typically found in industrial textile machinery, as well as in sewing machines, fishing reels, tape measures, film rolls, cassette tapes, within electronic and electrical equipment, and for various other applications, such as in the agricultural industry for winding thereon various lengths of pipes.

[0003] A handler is generally recognised as the device which supports the bobbin and allows it to rotate. In some cases the handler can actually cause the rotation of the bobbin to wind or unwind the material onto the bobbin. The handler enables the bobbin to be moved from place to place.

[0004] In the field of agriculture, bobbins are used for lengths of pipes, such as slurry pipes, or for lengths of twine. When used for slurry pipes, it is conventional for the bobbins to be handled using a handler mounted on a tractor or other similar vehicle. This allows the bobbin to be transported about and the pipe accurately wound on or unwound from the bobbin. To do this handlers are constructed into a rigid 'U' shaped frameworks. Each arm of the 'U' shaped support has a sort of upward hook at each end which is designed to fit an axial projection on each side of the bobbin. The frame is constructed so that the distance between the hooks (which is fixed) is the same as the length of the bobbin between the axial projections at each opposite end of the bobbin. Then all the user has to do is drive the handler to the bobbin, lower the handler so that the hooks are below the level of the projections and then drive forward and lift the handler so that the projections engage with the hooks. The bobbins are thus supported for rotation by the handler.

[0005] To rotate the bobbins, traditionally one arm of the handler, has a motor. The motor has a cog on it, which either engages directly with a cog on the end of the bobbin, or requires a chain to be linked between said cog and the cog on the bobbin. Pulleys may alternatively be used.

[0006] There are a number of problems with these arrangements though. If the user does not sufficiently lower the handler, then the hooks are not lowered far enough and all they succeed in doing is knocking the projections and therefore the bobbin away from handler. This can damage the handler or the bobbin. Over time also and due to wear and weight of the pipe wound on the bobbin,

the interaction between the cogs/pulleys becomes ineffective, and the drive power is lost. Also when engaging and disengaging the bobbin, the cogs can smash into each other, without the bobbin being allowed to rotate.

5 This can damage the teeth on the cogs, again leading to ineffective rotation. Further, after picking up the bobbin the user is required to retain the bobbin within the arms of the frame, by covering the hooks in some way, perhaps by a guard or safety pin. This prevents injury or the bobbin falling out of the handler. Thus a secondary action on the part of the driver is required, which takes time. When the bobbin is required to be disengaged, then the driver has to get off the tractor again and release the guards/safety pins first, before lowering the handler. This all takes time. 10 Furthermore, the user of such bobbins and handlers, can only pick up the bobbins by approaching the bobbin from below with the handler. This again takes time as often the user is working blind and can't see for the correct placement of the hooks to engage the pins correctly. Consequently if too far left or right, the user has to lower the handler again, reverse, change direction, and approach the bobbin again from a different angle. All this takes time.

[0007] Previous examples of devices for winding and unwinding are described in US5895197, NO2161355, 15 US5988555, US5033687 and US5312057.

[0008] There has now been devised a device which substantially overcomes and/or otherwise mitigates the above referenced and/or other disadvantages associated with the prior art.

20

Summary of the Invention

[0009] In an aspect of the invention there is provided a device as defined in claim 1.

25 **[0010]** The device according to the invention is advantageous because the movement of the arms from the first position to the second position allows the user to operate the handler and approach a bobbin to engage it from above or from the side or indeed, from below. This is beneficial where access to the bobbin may be restricted. The movement of the arms also has the benefit that if the handler is not lined up accurately with the bobbin it does not matter. For example if the handler approaches the bobbin from an offset direction laterally. In this instance, as the arms move from the first position to the second position, one arm will contact the respective side of the bobbin and engage with the bobbin first. As the arms are moveably powered, the contacted arm is then capable of pushing the bobbin sideways until the opposite arm engages fully. Engagement and disengagement of the bobbin is thus effected by moving of the arms from the first position to the second position and vice versa. There are no secondary actions on the part of the user and a surprising amount of time is saved. With the arms 35 constantly engaged with the bobbin by virtue of their moveability, there no chance that the drive member and drive receiver will either wear over time or become disengaged due to the weight of the bobbin with the pipe.

Even if the weight increases and there is flex in the arrangement the arms keep the pressure on the sides of the bobbin and drive member engaged effectively. Further to this, the conical projection and mutual recess that defines the connection between the bobbin and each arm has a number of advantages. The first is to allow for further error on the part of the user operating the handler when attempting to engage the bobbin. The use of the defined connection means that the engagement process of the arms with the bobbin is self-centering. This means that the central axis of the bobbin aligns itself coaxially with the ends of the arms. In other words, if the handler is too far aft or forward or up or down, or angled incorrectly then it does not matter. The projections and recesses will force the bobbin into the correct aligned engagement as the arms move from the first position to the second position. This again means that a surprising amount of time is saved in manipulating the bobbin. The second advantage is that it allows the handler to pick up the bobbin from the ground and the user of the handler to move it about as they please as in the second position the male conical projections are received within the respective recesses. Thus the handler supports the weight of the bobbin and the material wound thereon.

[0011] Preferably the device is mountable to a vehicle. This allows the bobbin to be transported from location to location.

[0012] Each arm may be movable between the first and second position by means of any actuator. This means that no manual powering of the arms is required. Powered in the context of the invention means of sufficient force to overcome the weight of the bobbin. The actuator may be electric, air powered, or other gas powered. Preferably, each arm is movable between the first and second position by means of an hydraulic actuator. This provides the necessary power required, easily and effectively, given most agricultural machines have hydraulic connections and devices already present. They also take up minimal space and weight.

[0013] Suitable examples of moveable mountings of the arms to the opposite ends of the support frame include but are not limited to scissor mounting, slide mounting, rail mounting, telescopic mounting, hinged mounting or cantilever mounting. Preferably the two arms are hingedly mounted to the opposite ends of the support frame, as this surprisingly provides the necessary strength with the least weight increase and greatest space saving.

[0014] The male conical projection between the arms and the bobbin may be formed on the respective end of the bobbin and extend outwards towards the respective arm. In such a scenario, each arm is formed with a circular recess to receive said projection in use. It will be recognised that whilst this is possible, it does mean that the width of the bobbin is substantially increased. Preferably therefore the male conical projection is formed on the part of each arm that rotationally engages with the bobbin and the circular recess is formed in each end of the bob-

bin, and in the second position the male conical projection of each arm is received within the respective recess of each end of the bobbin.

[0015] The drive member comprises at least one engagement pin and the drive receiver comprises a plate having at least one socket configured to receive the pin in use so as to mutually engage the drive member with the drive receiver. This effectively engages the drive member with the drive receiver and therefore the motor to the bobbin. Suitable motors include electric motors or hydraulic motors. The drive motor may be rotatably attached to the drive member directly or indirectly, that is to say by a direct drive or through a gear box. Thus the drive motor may be a geared motor. An example of a suitable geared motors includes but are not limited to epicyclic gear motors. Preferably the motor is an hydraulic motor. This has the benefit of producing the power required and the controllability and the ability to utilise 100% of the drive power.

[0016] It is advantageous to provide a plurality of sockets on the drive receiver for the at least one pin to engage with, and similarly it is advantageous to provide a plurality of pins on the drive member. This means that there is minimal rotation of the motor/drive member in use before the in engages with a respective socket. It also means that the force of rotation can be spread about the surface of the plat comprising the sockets. Thus there can be no tendency for the rotation force to be delivered unevenly to the bobbin during rotation.

[0017] To reduce wear on the plate, and allow the arms to reach their second position immediately, the pin is movable inwards and outwards of the drive member and is biased outwards of the drive member for engagement with the socket. Thus when the arms engage onto the side of the bobbin in the second position and the pin is not aligned with its respective socket, the plate pushes the pin inwards against the bias. As the motor rotates the pin moves around until it reaches a respective socket and at which point the bias pushes the pin outwards and into the socket. Thus there is a positive engagement of the pin or pins in the respective socket or sockets, and no chance of damage to the pin or pins or the drive mechanism as the bobbin is attached/engaged to the handler.

[0018] Preferably the support frame also supports a guide rail. This supports any material being wound onto the bobbin or off from the bobbin and assists with alignment of the material onto the bobbin.

[0019] The invention will now be described by way of example only and with reference to the accompanying drawings in which like references represent like parts.

Brief Description of the Drawings

[0020]

Figure 1 shows a front right perspective view of an embodiment of the device,

Figure 2 shows a right perspective view of the bobbin

of figure 1

Figure 3 shows a top plan view of the device of figure 1,

Figure 4 shows a front left perspective view of the device of figure 1,

Figure 5 shows a rear perspective view of the device of figure 1,

Figure 6 shows a front perspective view of the device of figure 1 with the arms in the first position,

Figure 7 shows a perspective view of the right hand arm of the device of figure 1 with the arm in the first position,

Figure 8 shows a cutaway cross section of the engagement pin of the device of figure 1, and

Figure 9 shows an exploded view of the right hand arm of the device of figure 1.

Detailed Description of the Illustrated Embodiment

[0021] An example of the device is shown in figure 1. The device is generally designated 1 and comprises a handler generally designated 50 and a bobbin generally designed 5. The handler 50 comprises a support frame 2 having two arms 3, 4, one at each end of the support frame 2. Supported by the arms 3, 4 is a bobbin 5. Each arm 3, 4 is hinged to the support frame 2 at respective hinges 6 and 7. Two hydraulic rams 8 and 9 are mounted to the support frame 2 and each connects to a position on the respective arm 3, 4 just aft of the hinge 6, 7. Aft in this case means on the opposite side of the device 1 to the bobbin 5. A guide rail 10 is support by the frame 2 above the bobbin 5.

[0022] Each arm 3, 4 projects forward of the support frame 2 at generally right angles to the frame 2 when in the second position (which is that shown in figure 1, and figures 3-5). At the end of the arm 3 not connected to the support frame (i.e. the distal end) there is mounted a hydraulic motor 11. The motor 11 is fixed on the arm 3 so it cannot rotate with respect to the arm 3. The spindle 35 (not shown in figure 1, but clearly shown in figure 9) of the motor 11 extends through the arm 3 and is rotationally connected to the central gear (not shown) of an epicyclic gear box 36. The external gears (not shown) of the gear box 36 are coupled rotationally to the gear housing of the gear box 36 which is bolted to the drive member, which in this example is an oval shaped plate 12. Thus in use, the plate 12 rotates with respect to the arm 3 when the motor 11 is activated. The gearbox 36 changes the speed of rotation of the drive member with respect to the speed of rotation of the spindle 35 so as to deliver more control to the rotation of the bobbin eventually. In the second position, as shown in figure 1, the oval plate 12 engages with plate 13a which is a circular plate at the end of the bobbin 5. In this example there is a spacer plate (not shown) between the plate 12 and the plate 13a, but in other examples the two plates 12 and 13 contact each other directly.

[0023] The plate 13a is shown in figure 2 which shows

a right perspective view of the bobbin of figure 1. The bobbin 5 is made up of a hollow tube 14. Connected to each opposite end of the tube 14 is a wheel shaped member 15, 16. These members might otherwise be described as side flanges 15 and 16. Plate 13a is mounted to the centre of the member 15 on the outside surface. The plate 13a has a central opening 17a which allows access to the bore of the tube 14. The plate has twelve sockets 18a distributed evenly around the circumference of the plate 13a. The sockets 18a are openings in the plate 12, and actually align with corresponding openings made in the flange 15 as well. Thus the sockets 18a extend through both the plate 13a and the flange 15 of the bobbin 5. A similar plate to plate 13a referenced as 13b is mounted on the outside of flange 16 (see figure 4). Thus each end/side of the bobbin 5 is the same.

[0024] Returning to figure 1, the oval shaped plate 12 has mounted to it two pin housings 20. The pin housings 20, house pins 21 shown more closely in figures 7 and 8. The pins 21 extend outwards of the plate 12 (i.e. towards the bobbin 5) and will be described in greater detail later.

[0025] Figure 3 shows a plan view of the device 2. The arm 4 does not have mounted thereon a motor, and therefore does not have the equivalent of the plate 12.

[0026] A better view of the arm 4 can be seen in figure 4. This also shows the plate 13b which is the equivalent of plate 13a, but mounted to the opposite side of the bobbin in the same manner as plate 13a. The plate 13b again has twelve sockets numbered 18b in this case and a central opening which is equivalent to central opening 17a (covered by the arm in this case, but otherwise 17b). Thus each side/end of the bobbin 5 is the same. The inclusion of the plate 13b here on the bobbin is in case the bobbin is ever turned over and to allow the bobbin to be picked up from the opposite direction.

[0027] Figure 5 shows the rear of the device. In this example, the device is for agricultural use in handling slurry pipes. So a three point linkage 25 is provided on the support frame 2. Stands 26 are also present to support the device 1 when it is not being used.

[0028] In all of figures 1-5 it can be seen that the mountings of the motor 11, plate 12, plates 13a and 13b, openings/recesses 17a and 17b, tube 14, flanges 15, 16, and all other mountings at the ends of each arm 3, 4 are coaxial with the central axis of the bobbin 5. Thus, for example the plates 13a and 13b are mounted in the centre of flanges 15 and 16. Thus the length of each arm 3, 4 is just longer than the radius of the bobbin 5 to allow for unhindered rotation of the bobbin.

[0029] Figure 6 shows the device 1 in the first position. In this position the hydraulic rams 8, 9 have been retracted causing the arms 3, 4 to pivot outwards of the bobbin. This has exposed the conical projections 30a on the arm 3 and the similar conical projection 30b on arm 4. The projections 30a and 30b are at the end of each arm 3, 4. The conical projection 30a of the right arm 3 is shown more clearly in figure 7. The projection 30a is attached

at its base (the widest part) to the plate 12. It therefore rotates with plate 12. Projection 30b is attached at its base to a bearing 19 retained by the arm 4 so is freely rotatable.

[0030] Figure 8 shows the housing 20 for a pin 21. The housing 21 is a metal case within an opening 22 through which the pin extends. The pin 21 is movable within the inside of the housing 20 and is retained therein by a pin head 23 which is wider than the opening 22. An extension spring 24 is positioned in a recess 27 of the pin 21 and engages with the ends of the recess 27 and the end wall 28 of the housing. Thus the pin 21 is biased outwards of the opening 22. Each housing 20 is mounted to the plate 12 diametrically opposite one another and the pins 21 project through openings in the plate 12 (not shown). As can be seen in figure 7 the pins project outwards of the plate 12 in a biased manner.

[0031] In use of the device in this example, the device 1 may be mounted to the front or rear of a tractor using the three point linkage 25. The hydraulics connections powering the rams 8, 9 and the motor 11 are connected. The rams 8, 9 are actuated so the device adopts the first position as shown in figure 6. This moves the conical projections 30a, 30b to a position which is wider than the bobbin 5 (as in figure 6). The user then drives the tractor to approach the bobbin 5. In the approximate location, the user releases the rams 8, 9 and the arms 3, 4 move inwards towards the respective recesses 17a and 17b of the bobbin 5. Any miss alignment of the bobbin with respect to the arms is allowed for by the conical projections 30a and 30b, which bring the bobbin so that it is coaxial with the end of arms 3, 4 and the bobbin has a central axis which is generally parallel to the longitudinal axis of the support frame 2, as described above. This self-aligning feature greatly speeds up the attachment of the bobbin 5 to the handler 50. As the conical projection 30a enters the recess 17a, and projection 30b enters recess 17b, the ends of the pins 21 (which are only on the plate 12), if not immediately aligned with any of the sockets 18a will contact the surface of the plate 13a in the region between neighbouring sockets 18a. The pins 21 are therefore pushed inwards into the housing 20, allowing the arms 3, 4 to reach their final position, which is where the projections 30a, 30b are fully received within the respective recesses 17a, 17b, as shown in figures 1, and figures 3-5 and which is referred to as the second position. In this position, the weight of the bobbin 5 is supported by the conical projections 30a and 30b and therefore the arms 3, 4. However, before the user lifts the handler 50 the user must make sure that the pins 21 engage with/enter the sockets 18a. To do so, before lifting the bobbin 5, the user activates the motor 11 which rotates the plate 12 and therefore the pins 21. As soon as the pins 21 are aligned with the respective sockets 18a, they are allowed to spring outwards due to the bias and they enter the sockets 18a. The plate 12 is thereby locked with the plate 13. On the opposite side of the bobbin 5, the conical projection 30b engages with the recess 17b

in the same way, but the conical projection on arm 4 is just rotationally mounted by a bearing 19 to the arm 4 and not driven in any way. So said projection 30b acts as a supporting bearing for the bobbin 5. On the arm 3, once the pins 21 are engaged into the sockets 18a, and on arm 4 once the projection 30b is fully engaged into the recess 17b, the user is then free to lift the handler 50, which lifts the bobbin 5 and they can move it where ever they like. Further activation of the motor 11 causes the bobbin 5 to rotate, either winding or unwinding the material on the bobbin, preferably over the guide rail 10 to allow for accurate winding and unwinding of the material onto and off the bobbin 5. Even if the bobbin 5 and/or arms 3, 4 flex the motor 11 will continue to drive the bobbin 5 due to the positive biased engagement of the pins 21 into their respective sockets 18a. Furthermore, due to the housings 20 being mounted diametrically opposite one another, the pins 21 engage with the plate 13 diametrically opposite one another, which means the force from the motor 11 is distributed evenly through the bobbin 5. There is no chance therefore of any twisting force caused by the motor 11. When the bobbin 5 is required to be taken out of the handler 50, the user lowers the handler 50 so that the bobbin touches the ground. They then move the arms 3, 4 from the second position to the first position by the reverse motion of the hydraulic rams 8, 9 and then the user can drive the handler away from the bobbin easily.

[0032] The example provided herein with respect to Figures 1- 8 is for an agricultural device 1 where the handler 50 and a bobbin 5 are used to move slurry pipes. Thus slurry pipes are wound onto and off the bobbin 5 in use. It will be appreciated that the device 1 may also be used for manipulating (i.e. winding and unwinding, and transporting from place to place) wire, cable, other forms of pipe, fibre, or other long sections of material such as flexible continuous matting of the type used to stabilise ground spaces for vehicular access and as used in industry and the military, or such as netting, for example of the type used to protect ground plants such as brassicas from insects.

[0033] In another example of the invention, which is not illustrated, the device 1 is substantially as described above, except that the bobbin has extending from each of its ends coaxial with the central axis a conical male projection. This is instead of and similar to the projection 30 from the arms 3 and 4. The projections from the bobbin covers the openings/recesses 17a and 17b. In the plate 12 on the arm 3, instead of the projection, there is an central circular recess also coaxial with the axis of the motor and the bobbin. At the end of the arm 4, there is a plate with a central circular recess. The plate is rotationally mounted to the end of the arm using bearing 19. In use when in the second position, which is when the arms 3,4 are engaged with the sides of the bobbin, the projections on the bobbin are received within the respective recesses within the plate 12 on arm 3 and on the arm 4.

[0034] In another example of the invention, not illus-

trated, the device is substantially the same as above, except that instead of the arms being hingedly connected to the ends of the support bar, the support bar has slidably mounted within each of its ends an extension bar. This extension bar is supported by the internal structure of the support bar and can slide in and out of the end of the support bar as required. Movement of the extension bars in and out is effected by hydraulic rams which are mounted internal of the support bar, or engage with the extension bar externally through an opening in the support bar. The free ends of each extension bar have welded thereto the arms 3, 4. Alternatively the arms 3, 4 and the respective extension bar may be a single piece of material. The arms 3, 4 are thus fixed in the first and second position at generally right angles to the support bar. Thus in actuating the rams, instead of the arms rotating with respect to the support bar in moving from the first position to the second position, their angle does not change, but the effect is the same, which is move the extension bars outwards or inwards to increase or decrease the separation of the ends of the arms to allow the bobbin therebetween.

Claims

1. A device for winding and unwinding flexible materials, the device comprising a bobbin (5) and a handler (50), the bobbin (5) having two opposite ends, the handler (50) comprising a longitudinal support frame (2) with two arms (3,4) moveably mounted to opposite ends of the support frame (2), each arm (3,4) having an end distal from the mounting to the support frame (2), the arms (3,4) being movably powered between a first position in which both arms are extended outwards of the support frame (2) to a width greater than that of the bobbin (5), and a second position in which the ends of the arms (3,4) rotationally engage with the ends of the bobbin (5) through the central axis of the bobbin (5), a drive motor (11) being mounted to the end of at least one of the arms (3,4), the drive motor (11) having rotatably attached thereto a drive member (12) which mutually engages with a drive receiver (13) on the respective end of the bobbin (5), and wherein actuation of the drive motor (11) with the arms (3,4) in the second position causes the bobbin (5) to rotate, the engagement between the ends of the bobbin (5) and each respective arm (3,4) being defined by a male conical projection (30a, 30b) and mutual circular recess (17a, 17b), and in the second position the male conical projections are received within the respective recesses, the device being **characterised in that** the drive member (12) comprises at least one engagement pin (21) and the drive receiver comprises a plate having at least one socket (18) configured to receive the pin (21) in use so as to mutually engage the drive member (12) with the drive receiver (13) and wherein the pin (21) is movable inwards and outwards of the

drive member (12) and is biased outwards of the drive member (12) for engagement with the socket (18).

2. A device according to claim 1, wherein the device is mountable to a vehicle.
3. A device according to claim 1 or claim 2, wherein each arm (3,4) is movable between the first and second position by means of an hydraulic actuator (8,9).
4. A device according to any preceding claim, wherein the two arms are hingedly mounted to the opposite ends of the support frame (2).
5. A device according to any preceding claim, wherein the male conical projection is formed on the part of each arm that rotationally engages with the bobbin (5) and the circular recess is formed in each end of the bobbin (5), and in the second position the male conical projection of each arm is received within the respective recess of each end of the bobbin (5).

Figure 1

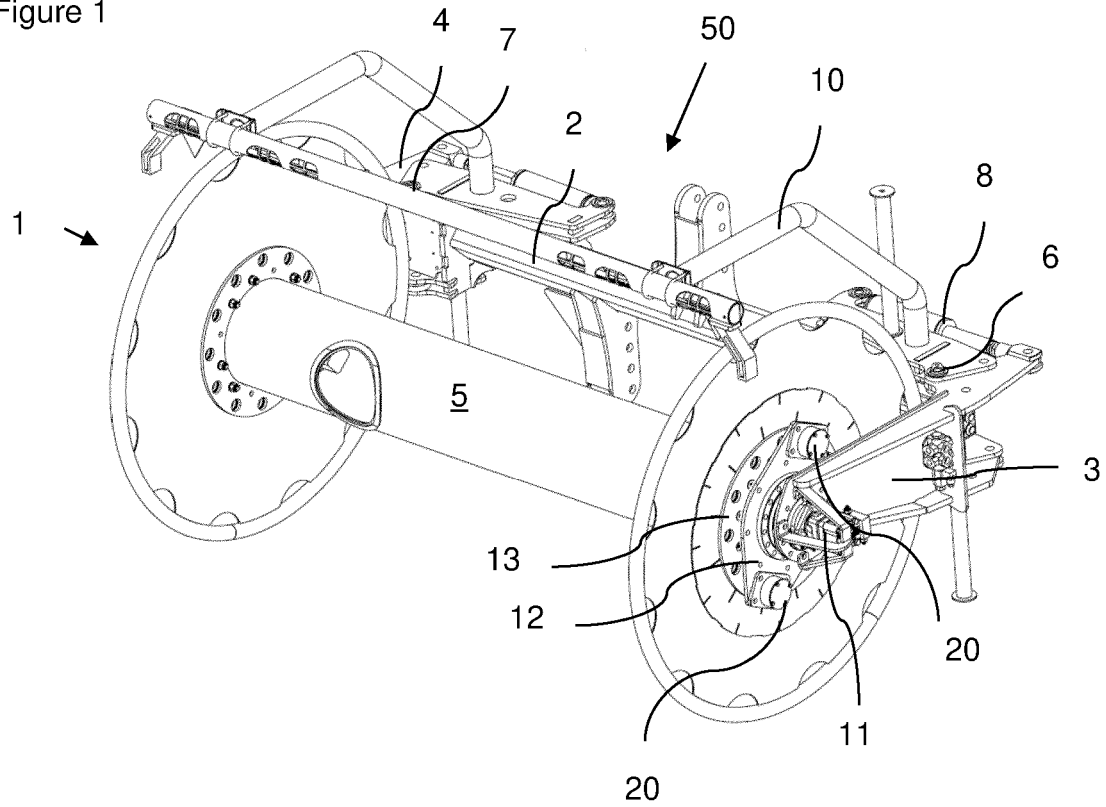


Figure 2

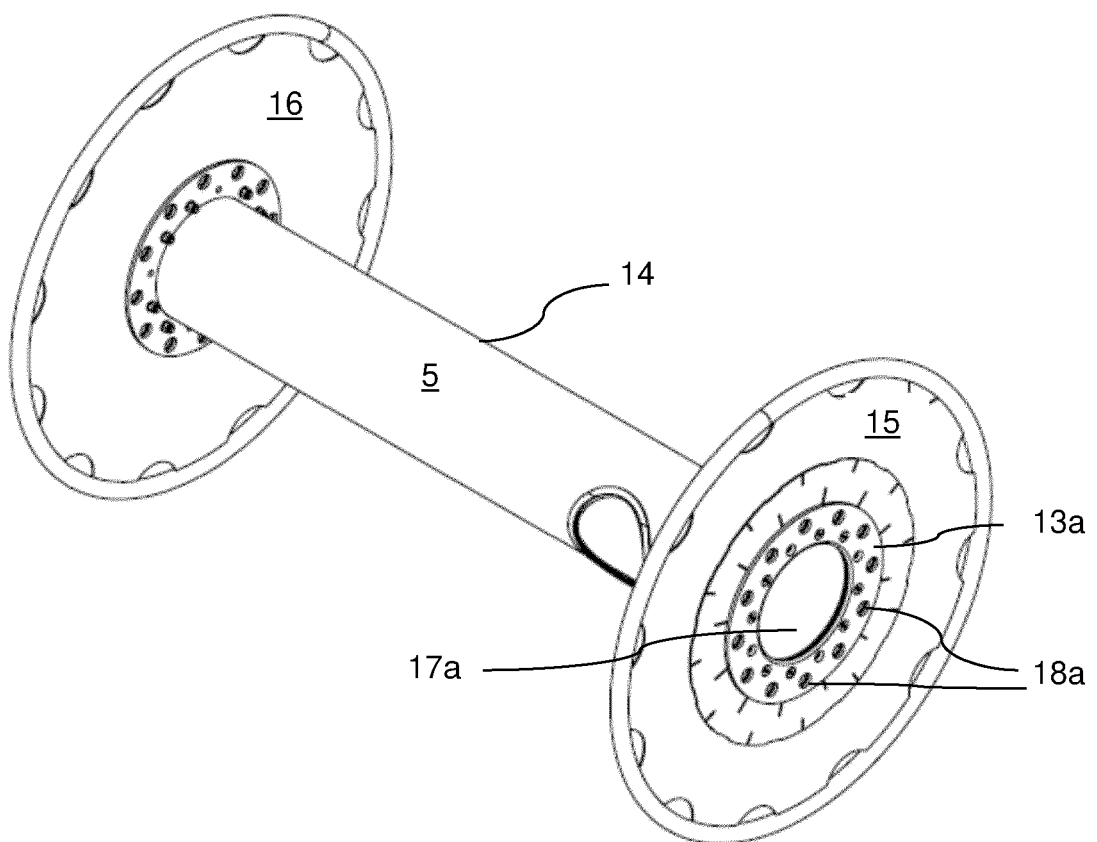


Figure 3

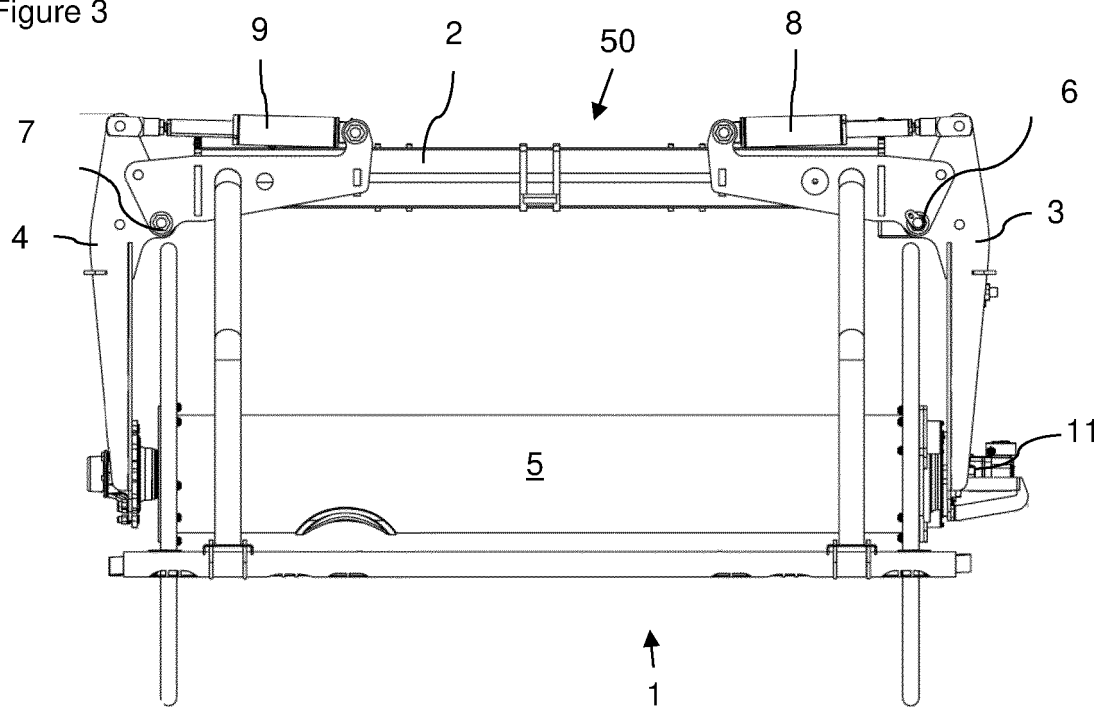


Figure 4

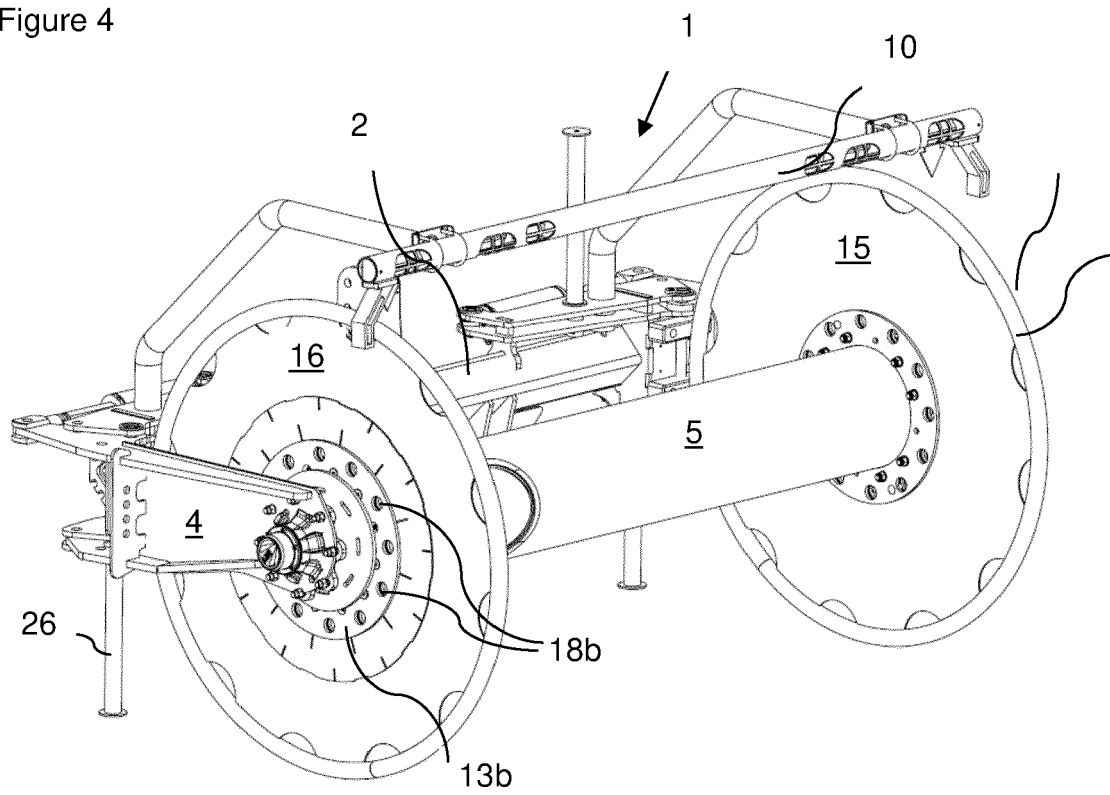


Figure 5

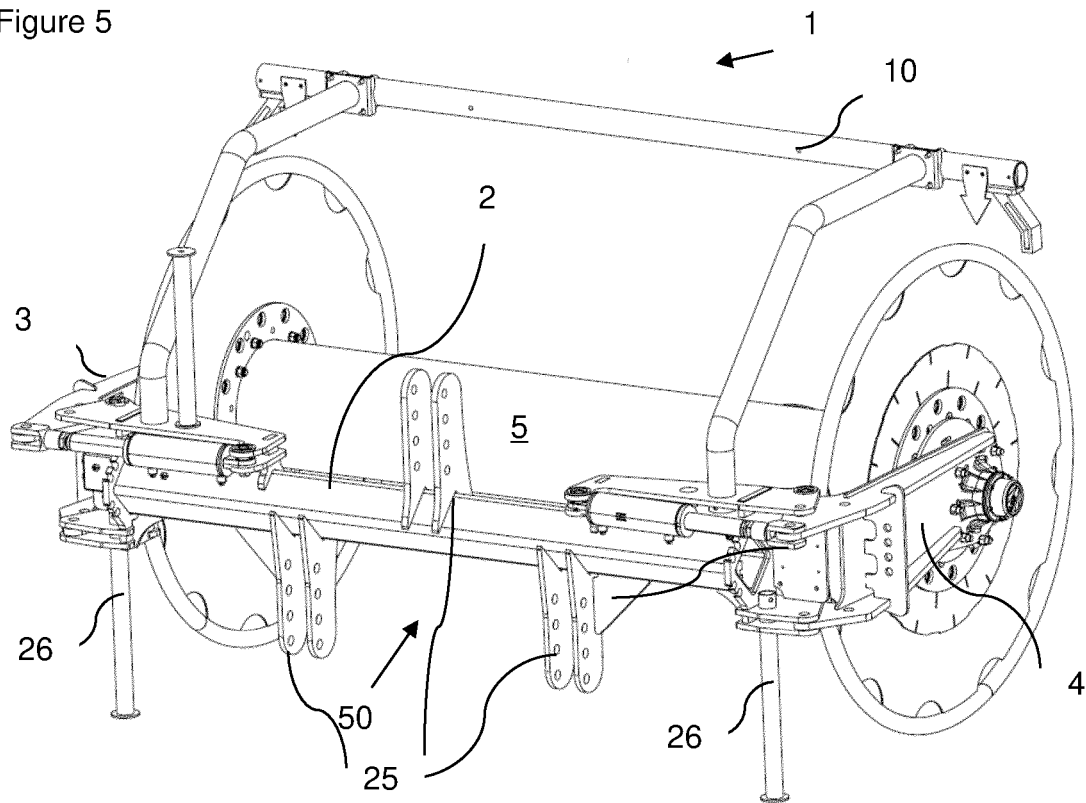


Figure 6

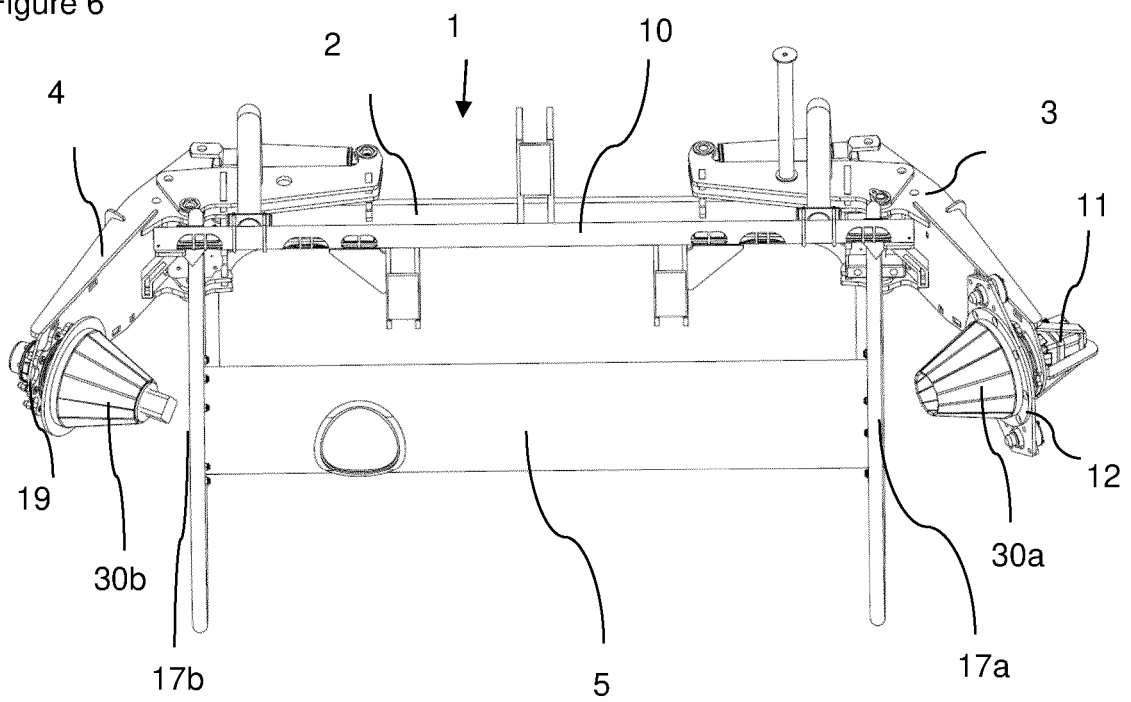


Figure 7

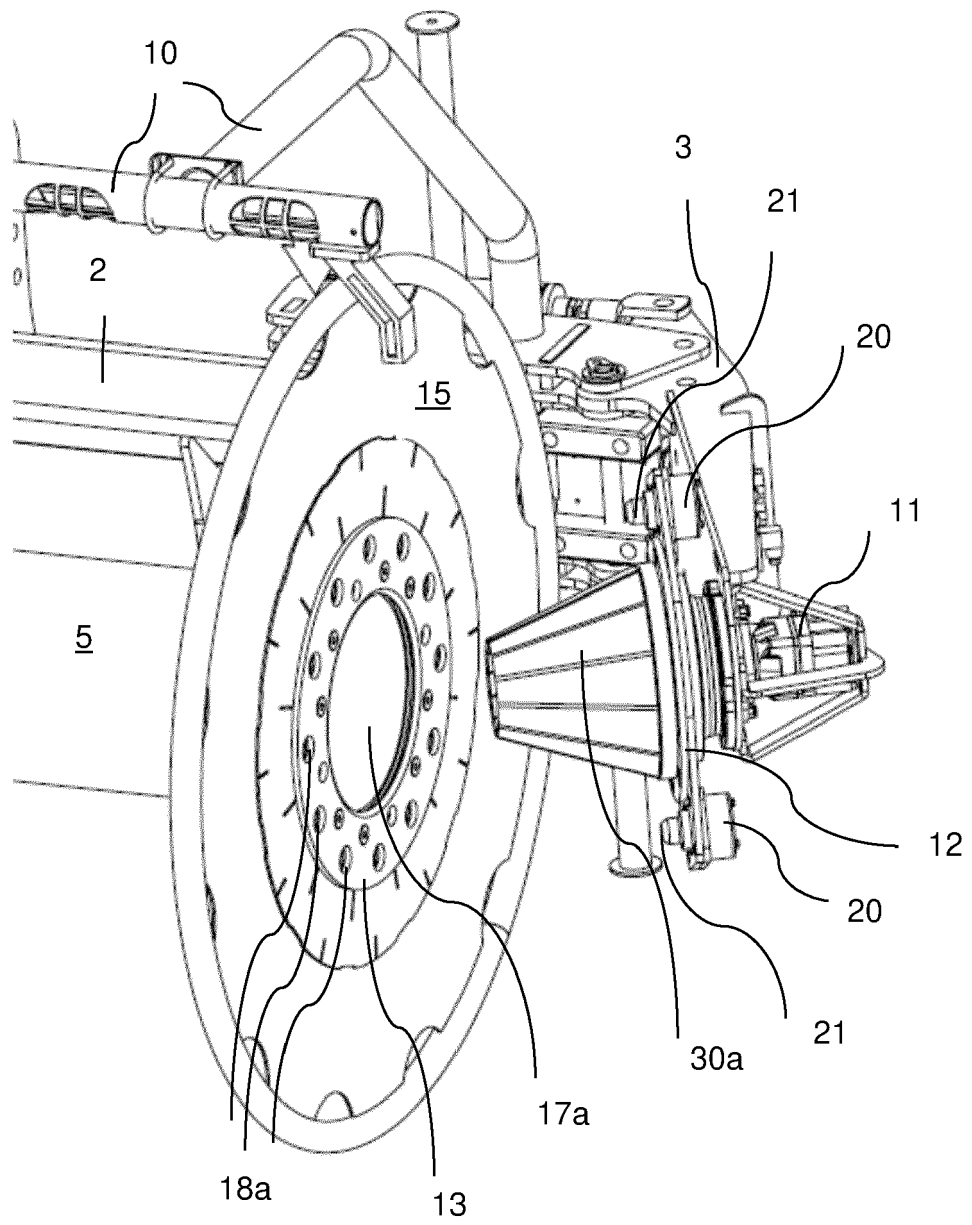


Figure 8

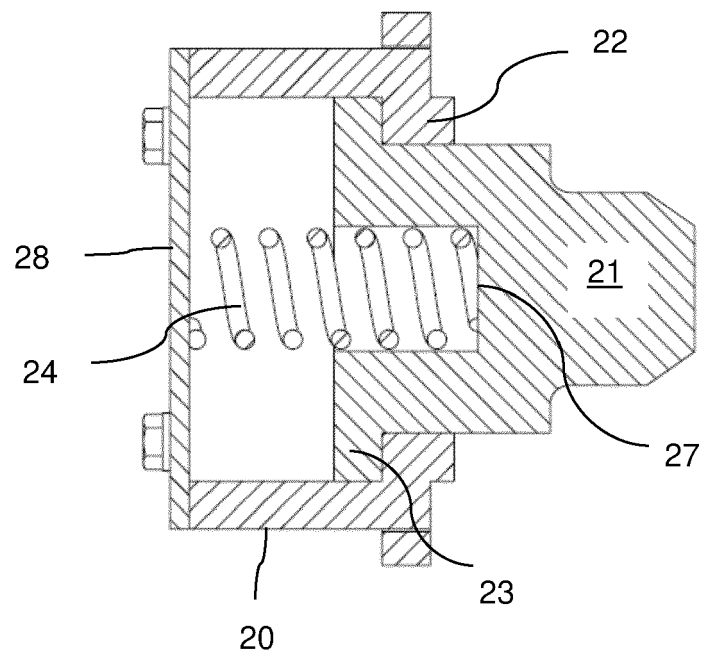
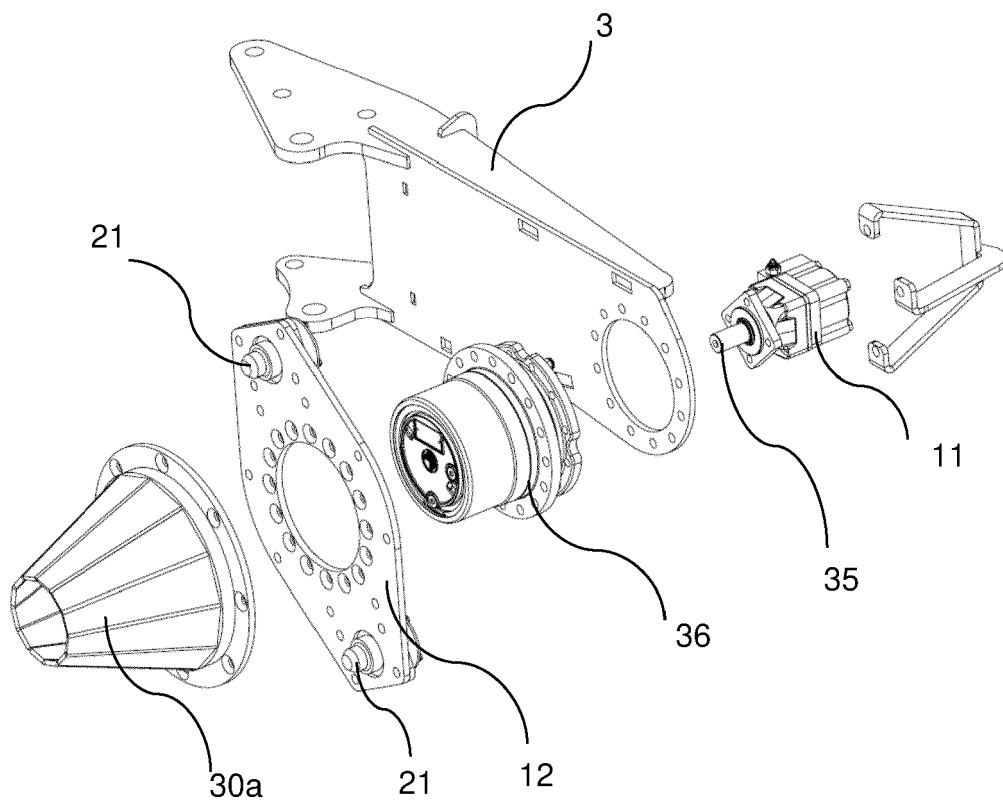


Figure 9





EUROPEAN SEARCH REPORT

Application Number

EP 24 15 4005

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 897 073 A (MCVAUGH ARTHUR K [US]) 27 April 1999 (1999-04-27) * column 10, line 56 - column 11, line 37; figures 9, 10 * -----	1-5	INV. B65H49/34 B65H49/36 B65H54/553 B65H75/42 B65H75/44 B66C1/66
A,D	US 5 895 197 A (MC VAUGH ARTHUR KENNETH [US]) 20 April 1999 (1999-04-20) * figures 3, 4, 6 * -----	1-5	
A	US 2015/158692 A1 (REYNOLDS FREDERICK J [US] ET AL) 11 June 2015 (2015-06-11) * paragraphs [0041] - [0043]; figures 2-4, 8, 9 * -----	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H B66F B66C
The present search report has been drawn up for all claims			

1

EPO FORM 1503 03.82 (P04C01)

Place of search	Date of completion of the search	Examiner
The Hague	5 June 2024	Pussemier, Bart
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

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

EP 24 15 4005

5 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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-06-2024

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	US 5897073 A	27-04-1999	NONE	

15	US 5895197 A	20-04-1999	CA 2235715 A1	30-11-1998
			US 5895197 A	20-04-1999

	US 2015158692 A1	11-06-2015	CA 2872980 A1	06-06-2015
			US 2015158692 A1	11-06-2015
20	-----			
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5895197 A [0007]
- NO 2161355 [0007]
- US 5988555 A [0007]
- US 5033687 A [0007]
- US 5312057 A [0007]