



(11)

EP 1 724 231 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.11.2006 Bulletin 2006/47

(51) Int Cl.:
B66D 5/16^(2006.01) B66D 3/10^(2006.01)
B66D 1/06^(2006.01) B62D 43/04^(2006.01)
B66D 1/54^(2006.01)

(21) Application number: 05425342.2

(22) Date of filing: 19.05.2005

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

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(54) Winch system equipped with safety device

(57) A winch system (1) is disclosed comprising a supporting and housing structure (2) containing at least one drum (5) for winding and unwinding flexible connecting means (7), an end of such flexible connecting means (7) being connected to the drum (5) and an opposite end being adapted to be connected to a load, the drum (5) cooperating with an actuating handle (11) by interposing a mechanical coupling for winding and unwinding the

flexible connecting means (7) from the drum (5), such winch system (1) being further equipped with a safety device (3) adapted to block a sliding of the flexible connecting means (7) in case of breakage or malfunction of the winch system (1) and such actuating handle (11) is integral with a second rotating shaft (17) sliding along an axis X cooperating with the safety device (3) through an unlocking system for allowing an unwinding of the flexible connecting means from the drum (5).

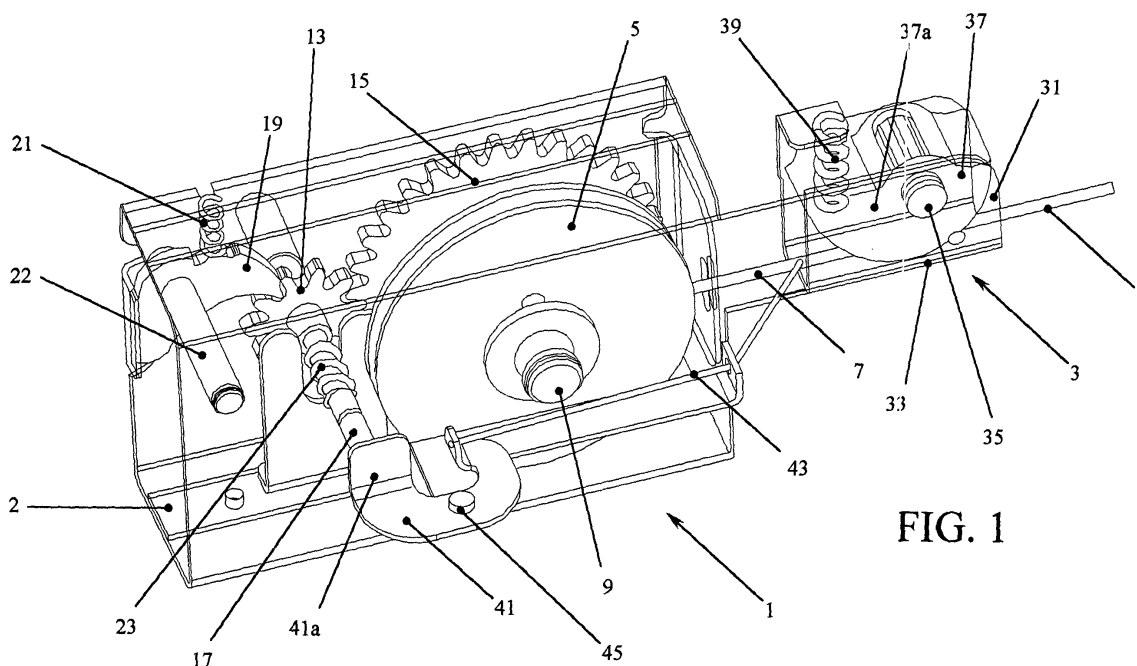


FIG. 1

Description

[0001] The present invention refers to a winch system equipped with a safety device, which can be used in particular for handling spare wheels of vehicles and trucks.

[0002] Motor vehicles are known in the art that provide for a housing for the spare wheel arranged below the vehicle flatbed: in order to make the operation of replacing the punctured tire easier, usually the spare wheel is connected through a cable to a winch, such winch being able to be manually actuated through a handle or electrically actuated through an electric motor by an operator in such a way as to be able to lower the spare wheel by unwinding the cable from the winch till it rests on the ground; then, one proceeds by disconnecting the cable and connecting it to the replaced tire; now, it is possible to wind the cable again through the winch in order to lift the tire and take it in the housing that was previously occupied by the spare wheel. It is obvious that the previous steps can be performed also for taking back the spare wheel in its housing after having used it.

[0003] Such systems however still have several inconveniences; the one which has to be solved by the present invention deals with the intrinsic safety and the reliability of known winch systems. In such systems, in fact, one of the most serious risks is that the winch, continuously subjected to the wheel weight to which it is connected and possibly due to a frequent use, can break, thereby allowing that the wheel connected therewith through the cable suddenly falls, seriously affecting the safety of the moving vehicle or the health of the operator that is possibly near the spare wheel housing, for example for taking care of the replacement of the punctured tire. Such problem is still more dramatic if a winch system has to be used for handling spare wheels of trucks: obviously, given the relevant weight of these wheels, such use would be extremely desirable in order to make much easier and less fatiguing the operations of replacing the damaged tire. Unfortunately, however, currently there are no known applications of winch systems to trucks or camions, because the efforts to which the winches are subjected in such context are such as to seriously impair their reliability and safety, even making their use strongly inadvisable if not even impossible.

[0004] In general, similar problems to the previously-described ones occur in any other application in which the winch breakage or malfunction can make the load connected therewith through the cable fall; for example, the use of such systems can be provided in the building field to lift materials on scaffolds or in the nautical field, for example in order to haul a boat on a trolley; in such contexts, the accidental unwinding of the cable from the winch is prevented usually by ratchet gear means, typically realised as a pawl that on one side allows rotating the winch cable winding drum during the load traction or lifting operation, however preventing its opposite rotation without a suitable manual intervention that disengages it from the drum in order to allow it to freely rotate. Even

in those cases it is clear that the breakage or malfunction of the ratchet gear means or the portion of drum aimed to be engaged thereby would generate the unavoidable load fall.

[0005] Therefore, object of the present invention is solving the above prior art problems by providing a winch system equipped with a safety device that prevents the accidental fall of a load in case of breakage or malfunction of the winch system.

[0006] Another object of the present invention is providing a winch system equipped with a safety device that can be used in particular for handling spare wheels of motor vehicles or trucks, equipped with a safety device that prevents the fall of the wheel connected to the winch even in case of breakage or malfunction of the winch system itself.

[0007] The above and other objects and advantages of the invention, as will appear from the following description, are obtained by a winch system equipped with a safety device as disclosed in claim 1. Preferred embodiments and non-trivial variations of the present invention are the object of the dependent claims.

[0008] The present invention will be better described by some preferred embodiments thereof, provided as a non-limiting example, with reference to the enclosed drawings in which:

- FIG. 1 shows a perspective partially sectioned view of a preferred embodiment of the winch system equipped with safety device according to the present invention;
- FIG. 2 shows a plan view of the winch system equipped with safety device of FIG. 1;
- FIG. 3 shows a sectional view of the winch system equipped with safety device according to section line A-A in FIG. 2;
- FIG. 4 shows a perspective, partially sectioned view of an alternative embodiment of the winch system equipped with safety device according to the present invention;
- FIG. 5 shows a plan view of the winch system equipped with safety device of FIG. 4; and
- FIG. 6 shows a sectional view of the winch system equipped with safety device according to section line B-B in FIG. 5.

[0009] With reference to the Figures, it is possible to note that the present invention comprises a winch system 1 and a safety device 3; the winch system 1 is substantially known and comprises a supporting and housing structure 2 containing at least one drum 5 for winding and unwinding flexible connecting means 7, one end of which is connected to the drum 5 itself while the opposite end is adapted to be suitably connected to a load (not shown): depending on applications in which the winch system 1 is aimed and on the load weight, the flexible connecting means 7 can indifferently be a cable made of textile, synthetic or metallic material, a chain or any

other flexible means suitable for its needs. The rotation of drum 5, keyed onto a first rotating shaft 9, is driven by a mechanical coupling between an actuating handle 11 going out of the supporting and housing structure 2 and the rotating shaft 9; in the embodiments shown, the mechanical coupling is made of a driving gear 13 keyed onto a second rotating shaft 17 rotating integral with the actuating handle 11 and by a driven gear 15 keyed onto the first rotating shaft 9, the driving gear 13 preferably having a lower diameter and number of teeth than the driven gear 15 to guarantee a suitable ratio between power applied by an operator or an electric motor (not shown) on the actuating handle 11 and power transmitted to the drum 5. Alternatively, it is possible to provide that the first rotating shaft 9 is fixed and the drum 5, integral with the driven gear 15 rotates around the shaft itself, possibly by interposing ball or roller bearings or at least one bush made of self-lubricating plastic material.

[0010] In order to allow winding the flexible connecting means 7 avoiding that the load weight applied thereto tends to rotate the drum 5 along the reverse unwinding direction, the driving gear 13 cooperates with ratched gear means realised as at least one pawl 19 which, as known, during the rotation is adapted to be inserted, under the action of first elastic means such as a first spring 21 and rotating around a first rotation pin 22, between following pairs of teeth of the driving gear 13 and is equipped with a known outline adapted to allow a free rotation of the driving gear 13 itself in the winding direction around the drum 5 of the flexible connecting means 7, however preventing the reverse unwinding direction that would naturally occur under the load weight in case the power transmitted on the actuating handle 11 ceased or were not enough.

[0011] However, in order to allow, when necessary, to unwind the flexible connecting means 7 from the drum 5, it is provided that the second rotating shaft 17 is sliding along the direction of axis X shown in FIG. 2 and 6 in such a way that, by pushing it according to the direction designated by arrow F, the driving gear 13 is uncoupled from the driven gear 15 and the pawl 19 making the drum 5 idle. When the force applied along the direction of arrow F ceases, it is possible to provide that second elastic means such as a second spring 23, taken in compression against an abutment edge of the supporting and housing structure 2, take back the second rotating shaft 17 in its primitive position determining again the mechanical coupling between driving gear 13, driven gear 15 and pawl 19.

[0012] From everything that has been stated above, it is however clear that any breakage or malfunction at winch system 1 level that generates the idling of drum 5 (such as, for example, the breakage or malfunction of the ratched gear means, the lack or scarce mechanical coupling between driving gear 13 and driven gear 15 or the breakage of one of the two rotating shafts 9, 17) would determine the unavoidable fall of the load connected to the flexible connecting means 7. Consequently, in order

to solve such problems and the previously-described prior art problems, the winch system 1 is equipped with a safety device 3 adapted to prevent the load fall also when there is a breakage or a severe malfunction of the winch system 1 itself.

[0013] Making therefore particular reference to FIG. 1, 2 and 3, it is possible to note that a preferred embodiment of the safety device 3 according to the present invention comprises a supporting block 31 equipped with a sliding portion 33 of the flexible connecting means 7 and with a third rotating shaft 35 around which a blocking cam 37 can rotate; an eccentric portion 37a of the blocking cam 37 is pushed against the sliding portion 33 by third elastic means, such as for example a third spring 39, in such a way as to squash against it the flexible connecting means 7: given the position of the eccentric portion 37a, when the flexible connecting means 7 are wound around the drum 5 (and therefore move according to the direction pointed out by arrow W in FIG. 3), the blocking cam 37 is taken to be lifted compressing the third spring 39 and allowing the movement of the flexible connecting means 7 themselves; when instead the flexible connecting means 7 are taken to move in an unwinding direction due to the load weight (and therefore according to the direction designated by arrow D in FIG. 3) the combined effect of the pressure of the third spring 39 pushing the blocking cam 37 towards the sliding portion 33 and the friction dragging of the eccentric portion 37a by the movement of the flexible connecting means 7 would generate the blocking of these latter ones against the sliding portion 33. In order to increase this blocking effect, it is possible to provide the eccentric portion 37a of the blocking cam 37 with a knurled or toothed outline 37b adapted to increase the friction with the flexible connecting means 7. Consequently, due to the safety device 3 according to the present invention, it is possible to lift the load through the winch system 1 without any obstacle, while in the above-described cases of breakage or malfunction, the blocking cam 37 takes care of preventing accidental load falls by promptly blocking the sliding of the flexible connecting means 7 according to the direction designated by arrow D.

[0014] In order to allow, however, when necessary, the unwinding of the flexible connecting means 7 from the drum 5, it is provided that the safety device 3 is equipped with an unlocking system; in such embodiment, the unlocking system provides that the blocking cam 37 is connected to a control linkage 41 through control means 43; the control linkage 41 is placed in such a way that, when the second rotating shaft 17 is pushed according to the direction designated by arrow F in order to uncouple the driving gear 13 from the driven gear 15 and the pawl 19 and make the drum 5 idle, an end 17a of the second rotating shaft 17 comes to cooperate with an abutment portion 41a of the control linkage 41 taking it in rotation around a second rotating pin 45; given the preferred C-shape of the control linkage 41, its rotation according to the direction designated by arrow C takes the control

means 43 in traction and makes the blocking cam 37 move away from the sliding portion 33, consequently allowing to unwind the flexible connecting means 7 from the drum 5 and their sliding through the safety device 3 according to the direction designated by arrow D.

[0015] When the force applied according to the direction of arrow F ceases, the second spring 23 takes back the second rotating shaft 17 into its primitive position determining again the mechanical coupling between driving gear 13, driven gear 15 and pawl 19 and the third spring 39 takes back the blocking cam 37 resting against the flexible connecting means 7 by pulling the control means 43 and consequently taking back the control linkage 41 into its starting position. In the preferred embodiment, the control means 43 are preferably a suitably-returned bowden cable: such arrangement allows to be able to place the safety device 3 even at a relevant distance from the winch system 1 by exploiting its flexibility features in order to easily by-pass possible obstacles along the laying path. It is however clear that it is provided to embed the safety device 3 to the winch system 1: in such case, the control means 43 could also be realised as a suitably-shaped rod or rigid bracket.

[0016] Referring instead to FIG. 4, 5 and 6, it is possible to note a winch system 1 equipped with an alternative embodiment of the safety device 3 comprising an opening 51 for passing the flexible connecting means whose internal outline is tapered, inside which a blocking pinch is adapted to slide, preferably shaped as an hollow tapered bush 53, inside which in turn the flexible connecting means slide coaxially therewith; the tapered bush 53 is composed of at least two flexible blades 53a that are suitably mutually spaced in order to allow passing and sliding therein the flexible connecting means during their winding on the drum 5 (and therefore according to the direction designated by arrow W in FIG. 6). When instead the flexible connecting means are accidentally taken to move along an unwinding direction due to breakages or malfunctions of the winch system 1 and the load weight (and therefore according to the direction designated by arrow D in FIG. 6), the movement of the flexible connecting means would frictionally drag the tapered bush 53 inside the opening 51 whose internal tapered outline would take the flexible blades 53a to progressively flex against the flexible connecting means till their sliding is blocked.

[0017] In order to allow, however, when necessary, the unwinding of the flexible connecting means from the drum 5, in this embodiment the unlocking system allows the tapered bush 53 to cooperate with a control kinematism 55 placed and shaped so that, when the second rotating shaft 17 is pushed according to the direction designated by arrow F for uncoupling the driving gear 13 from the driven gear 15 and the pawl 19 and making the drum 5 idle, an end 17a of the second rotating shaft 17 gets to cooperate with an abutment portion 55a of the control kinematism 55 taking this latter one coherently in rotation around a third rotating pin 57: the tapered bush

53 further cooperates with the control kinematism 55 in such a way that the rotation of this latter one takes a connecting portion 55b thereof to move tapered bush 53 away and to keep it suitably remote from the internal tapered outline of the opening 51 till the action of the force remains along the direction designated by arrow F on the second rotating shaft 17; in this way, the flexible connecting means can freely slide inside tapered bush 53 by unwinding from drum 5 under the load weight.

[0018] As previously described in its preferred variations, the winch system 1 equipped with safety device 3 can be used in any application in which any breakage or malfunction of the winch system 1 would generate the uncontrolled fall of the load. In particular, the present invention finds an advantageous application when handling the spare wheels of motor cars and particularly of trucks or camions that, given their extremely high weight, pose serious limits to the application of known winch systems, in terms both of reliability and safety.

Claims

1. Winch system (1) comprising a supporting and housing structure (2) containing at least one drum (5) for winding and unwinding flexible connecting means (7), an end of said flexible connecting means (7) being connected to said drum (5) and an opposite end being adapted to be connected to a load, said drum (5) cooperating with an actuating handle (11) by interposing a mechanical coupling for winding and unwinding said flexible connecting means (7) from said drum (5),
characterised in that it is equipped with a safety device (3) adapted to block a sliding of said flexible connecting means (7) in case of breakage or malfunction of said winch system (1) and **in that** said actuating handle (11) is integral with a second rotating shaft (17) sliding along an axis X cooperating with said safety device (3) through an unlocking system to allow unwinding said flexible connecting means from said drum (5).
2. Winch system (1) according to claim 1, **characterised in that** said mechanical coupling comprises a driving gear (13) keyed onto said second rotating shaft (17) cooperating with a driven gear (15) keyed on a first rotating shaft (9) of said drum (5).
3. Winch system (1) according to claim 2, **characterised in that** said driving gear (13) cooperates with ratchet gear means.
4. Winch system (1) according to claim 3, **characterised in that** said ratchet gear means are at least one pawl (19).
5. Winch system (1) according to claim 1, **character-**

- ised in that** said safety device (3) comprises a supporting block (31) equipped with a sliding portion (33) of said flexible connecting means (7) and with a third rotating shaft (35) around which a blocking cam (37) can rotate, an eccentric portion (37a) of said blocking cam (37) being pushed against said sliding portion (33) by third elastic means to push against said flexible connecting means (7) and block their sliding when said winch system (1) is malfunctioning or broken.
6. Winch system (1) according to claim 1 or 5, **characterised in that** said unlocking system comprises a control linkage (41) connected to said blocking cam (37) through control means (43), said control linkage (41) cooperating with said second rotating shaft (17) in order to move away said blocking cam (37) from said flexible connecting means (7) and allow an unwinding of said flexible connecting means (7) from said drum (5).
7. Winch system (1) according to claim 5, **characterised in that** said blocking cam (37) is equipped with a knurled outline (37b).
8. Winch system (1) according to claim 6, **characterised in that** said control means (43) are a bowden cable.
9. Winch system (1) according to claim 6, **characterised in that** said control means (43) are a rigid rod or bracket.
10. Winch system (1) according to claim 6, **characterised in that** said control linkage (41) is equipped with an abutment portion (41a) cooperating with an end (17a) of said second rotating shaft (17) for rotating said control linkage (41) around a second rotation pin (45).
11. Winch system (1) according to claim 1, **characterised in that** said safety device (3) comprises an opening (51) for passing said flexible connecting means (7) having an internal tapered outline inside which a blocking pinch is adapted to slide and is shaped as an hollow tapered bush (53) inside which said flexible connecting means (7) slide coaxially therewith, said tapered bush (53) being composed of at least two flexible blades (53a) that are suitably mutually spaced in order to allow a passage and a sliding of said flexible connecting means (7) during their winding onto said drum (5), said flexible blades (53a) being flexed against said flexible connecting means to block their sliding when said tapered bush (53) is dragged inside said internal tapered outline by said flexible connecting means (7) when said winch system (1) is malfunctioning or broken.
12. Winch system (1) according to claim 1 or 11, **characterised in that** said unlocking system comprises a control kinematism (55) cooperating with said tapered bush (53), said control kinematism rotating around a third rotation pin (57) under the action of said second rotating shaft (17) for keeping said tapered bush (53) remote from said internal tapered outline of said opening (51) and to allow an unwinding of said flexible connecting means (7) from said drum (5).

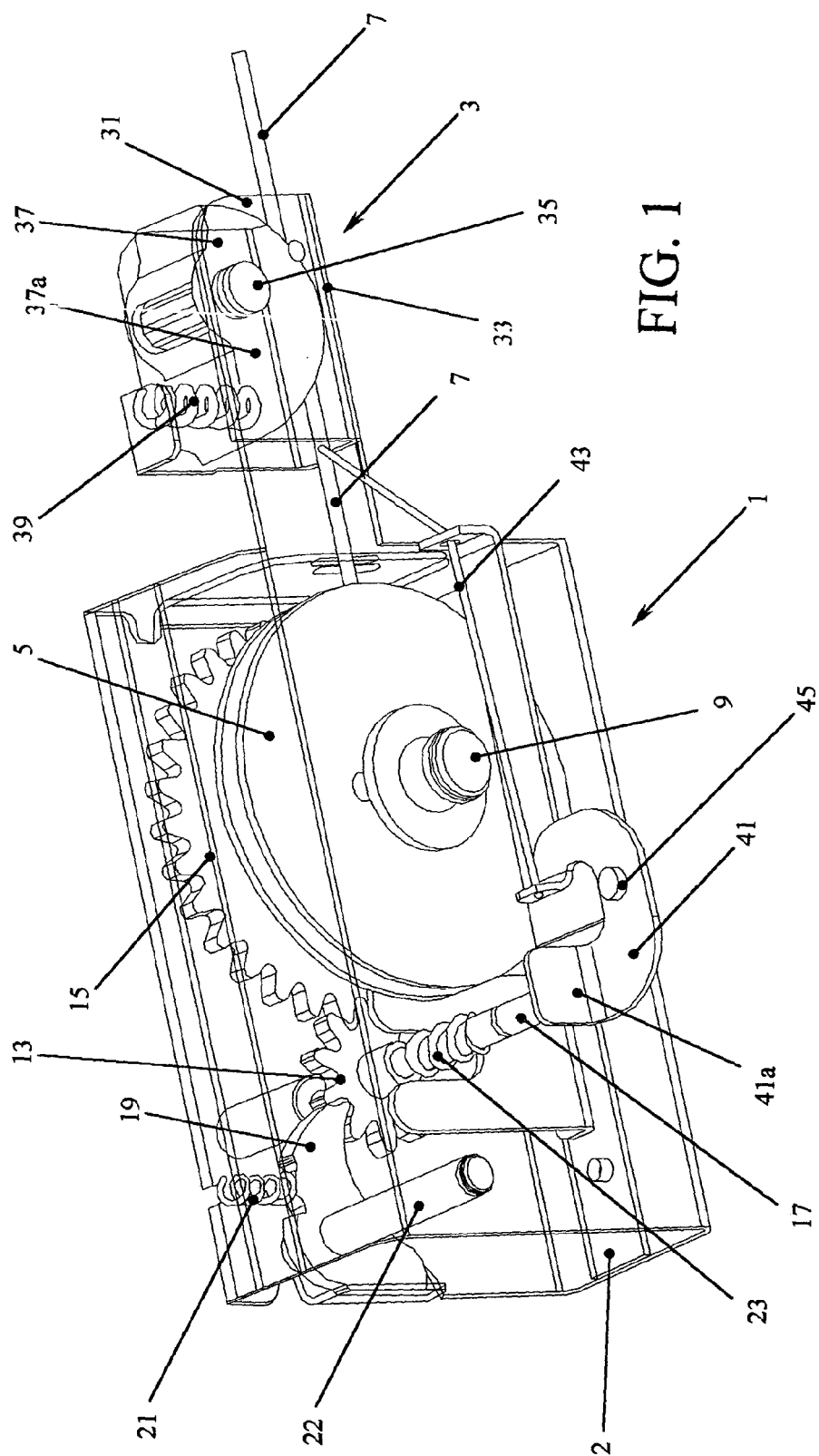


FIG. 1

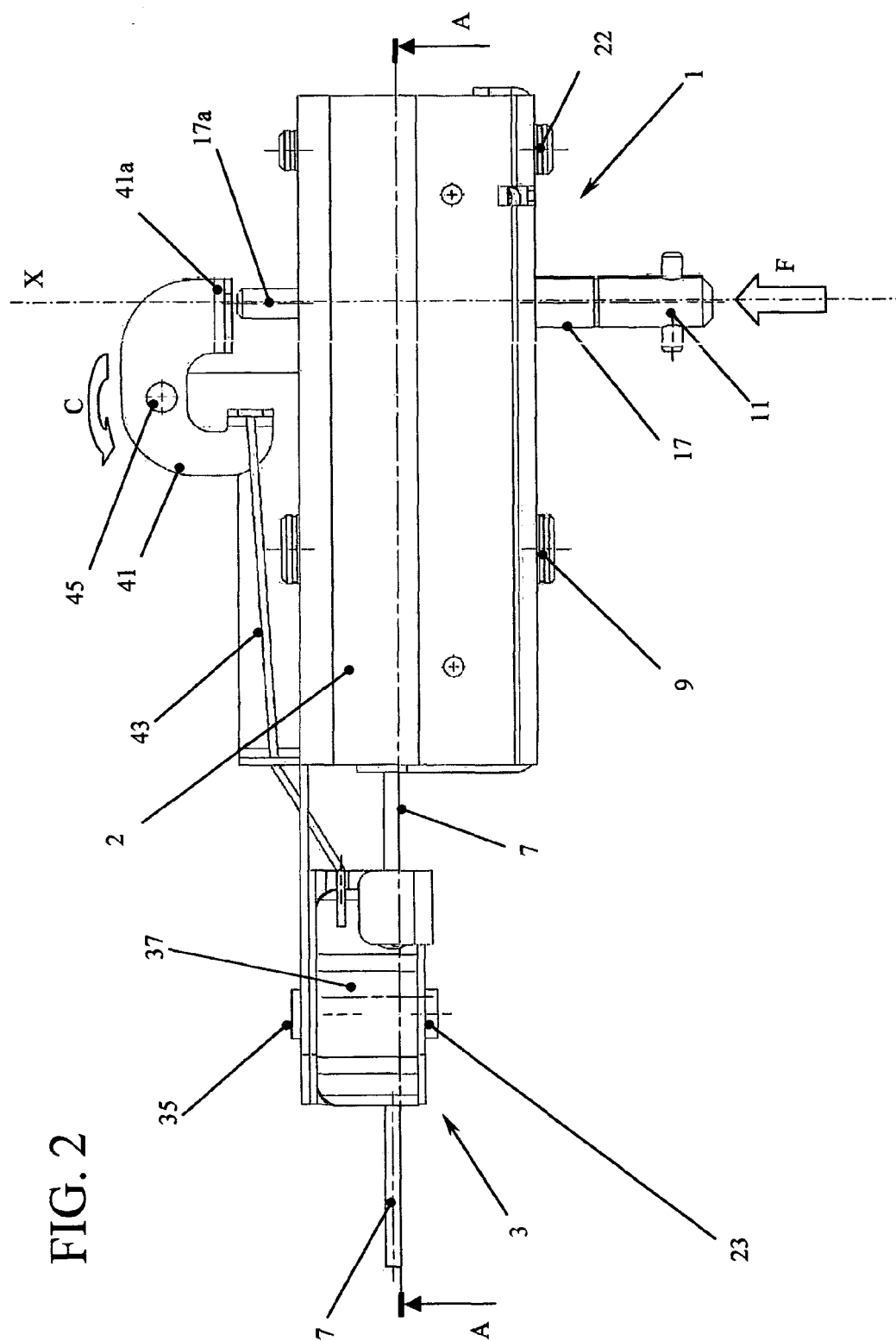


FIG. 2

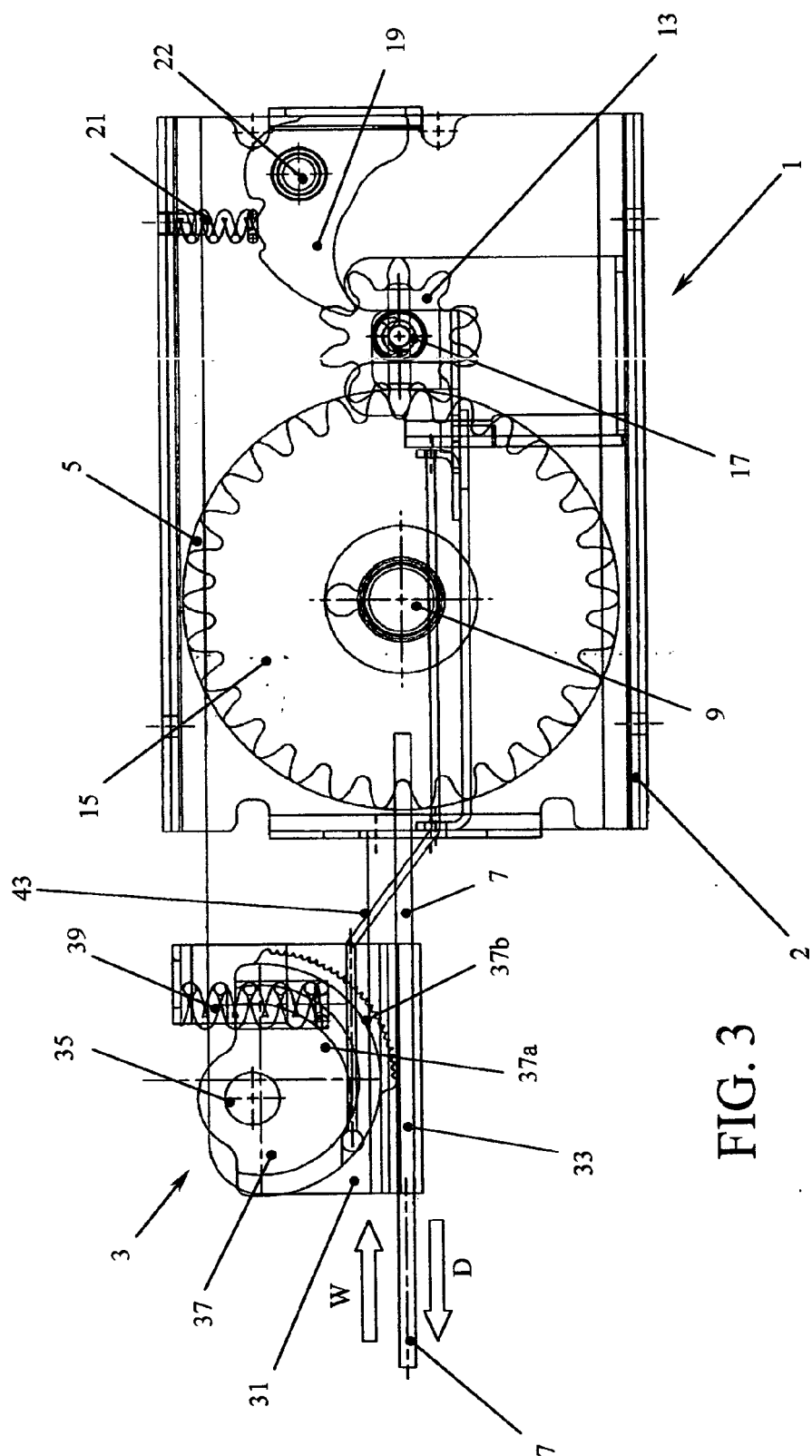
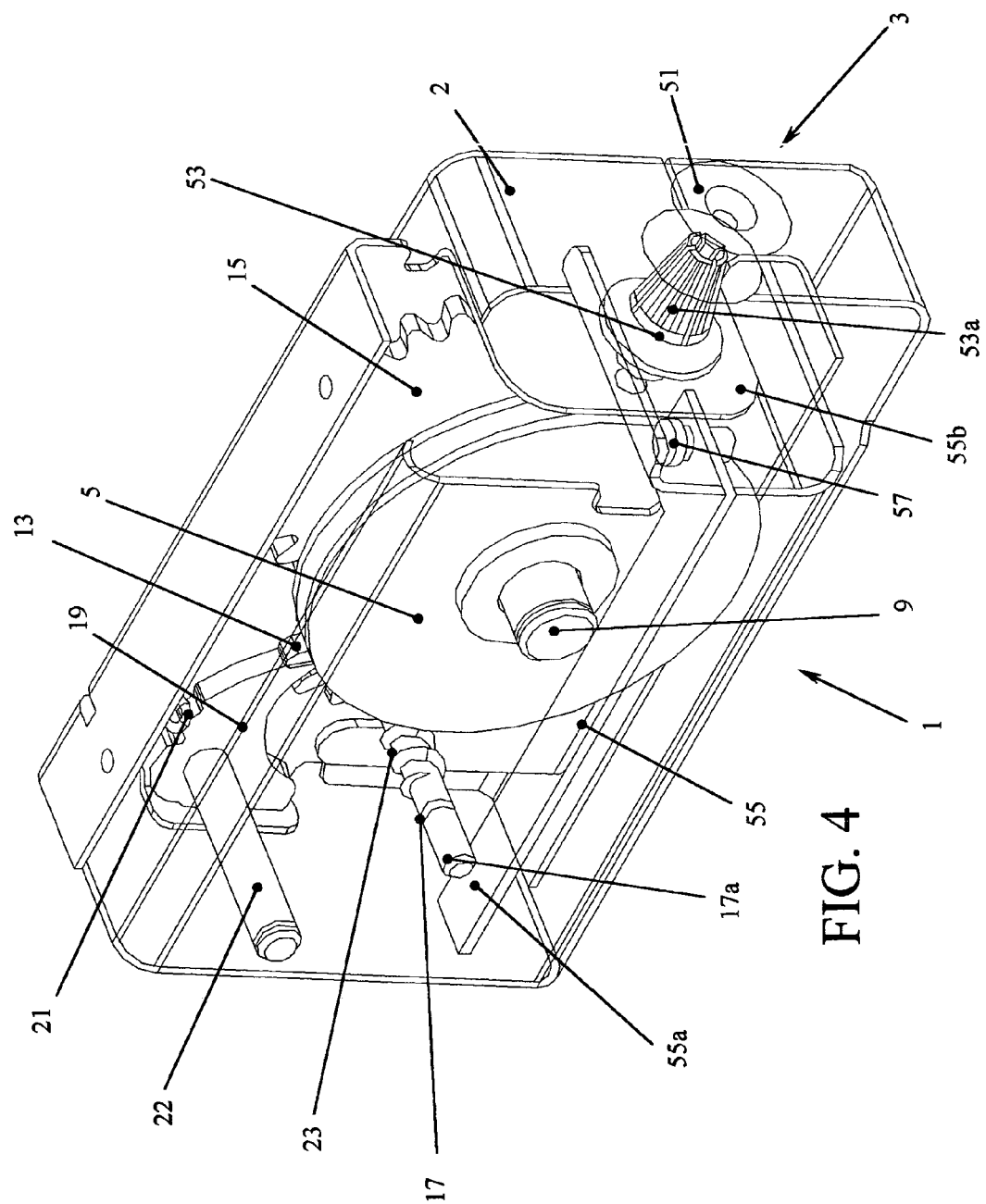


FIG. 3



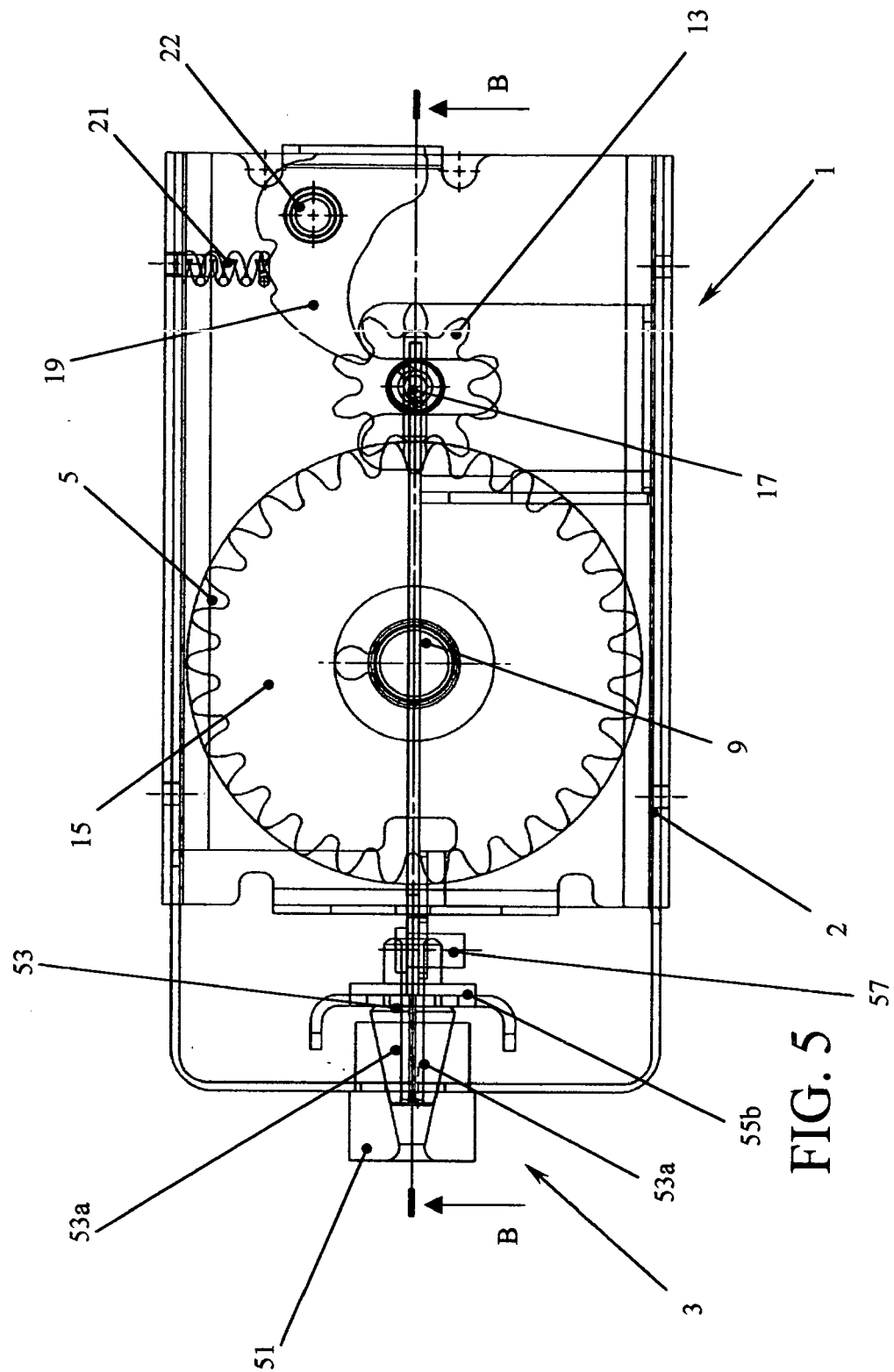


FIG. 5

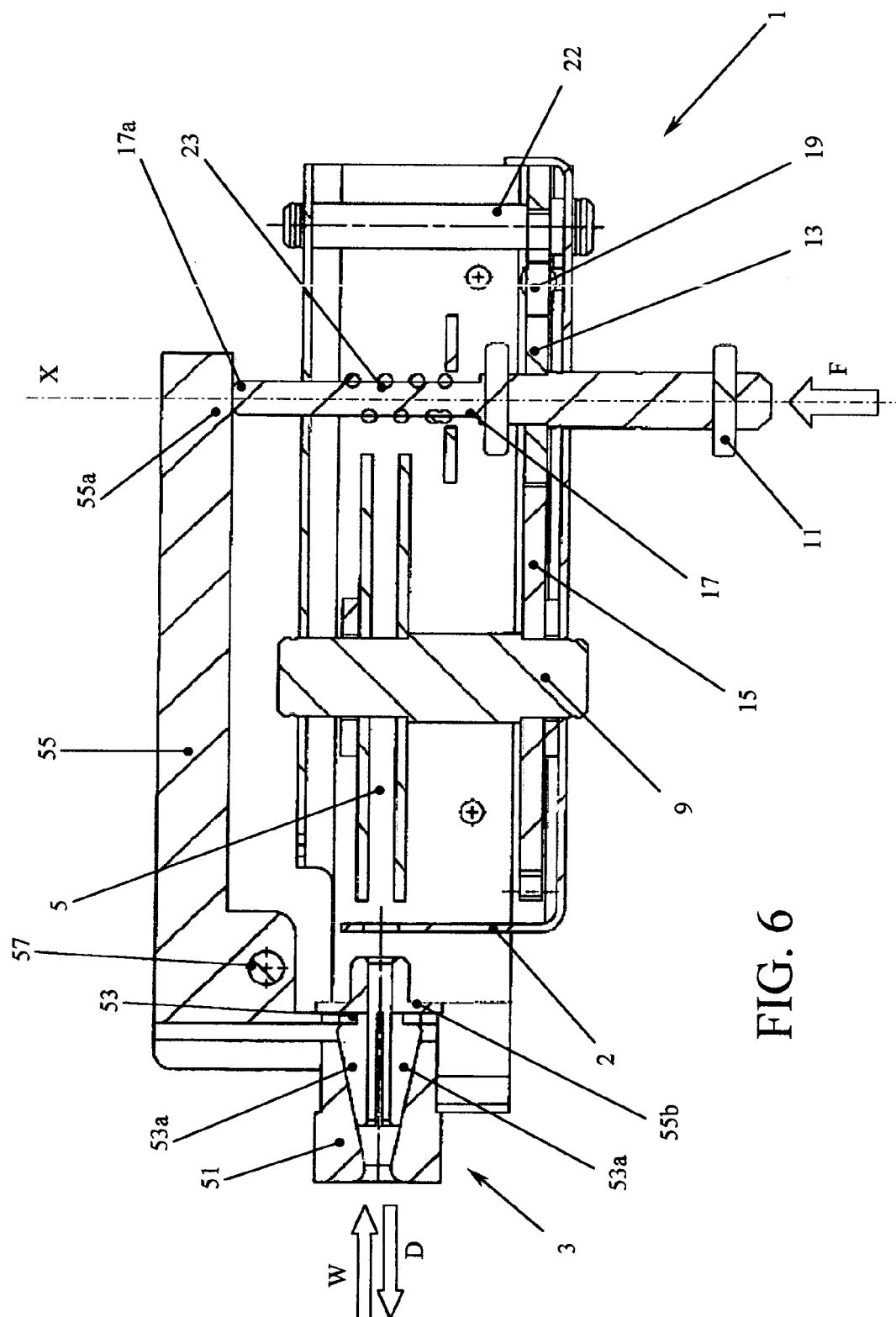


FIG. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5342

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 2 922 623 A (SIMMONS HORACE B) 26 January 1960 (1960-01-26) * figures 1,2,6,7 * * column 3, line 42 - column 4, line 39 * -----	1,11,12	B66D5/16 B66D3/10 B66D1/06 B62D43/04 B66D1/54
A	GB 2 235 916 A (JORIS * MAES; PAUL * JOUGLEUX) 20 March 1991 (1991-03-20) * figure 4 * * page 3, line 27 - line 31 * * page 4, line 16 - line 21 * -----	1,2	
A	FR 2 557 866 A (TRACTEL SA) 12 July 1985 (1985-07-12) * figure 1 * * page 2, line 25 - line 38 * * page 3, line 7 - line 22 * -----	1,2	
A	FR 2 813 299 A (MGI COUTIER) 1 March 2002 (2002-03-01) * figures * -----	1	
A	US 4 566 674 A (EBEY ET AL) 28 January 1986 (1986-01-28) * figures * -----	1	
A	DE 34 42 138 A (RHEIN-GETRIEBE G.M.B.H.) 22 May 1986 (1986-05-22) * page 4; figure * -----	1	
A	DE 34 33 562 A (GFA-ANTRIEBSTECHNIK G.M.B.H.) 22 May 1986 (1986-05-22) * figures 1,2 * * page 7, line 5 - line 20 * -----	1	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 September 2005	Examiner Guthmuller, J
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EPO FORM 1503 03.82 (P04C01)

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

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28-09-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2922623	A	26-01-1960	NONE	
GB 2235916	A	20-03-1991	BE 1002595 A6 FR 2650580 A3	02-04-1991 08-02-1991
FR 2557866	A	12-07-1985	NONE	
FR 2813299	A	01-03-2002	NONE	
US 4566674	A	28-01-1986	NONE	
DE 3442138	A	22-05-1986	NONE	
DE 3433562	A	22-05-1986	NONE	