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(54)

A MOTORIZED WINDER

(57)

A motorised winder (1) for aspiration of fumes, comprising a winding drum (10) rotatable about an axis of rotation (X) thereof and exhibiting a tubular skirt (11) for windingly receiving a flexible aspirating tube (100); a support element (20) fixable to a surface and configured for supporting at least the winding drum (10) in a rotatable manner about the axis of rotation (X); an electric actuator (30) having a tubular configuration, comprising a fixing portion (31) integrally connected with the support ele-

ment (20) and an actuating portion (32) rotatable relative to the fixing portion (31); transmission means (40) active between the actuating portion (32) of the electric actuator (30) and the drum (10); in which the actuating portion (32) of the electric actuator (30) exhibits an axis of rotation (M) coinciding with the axis of rotation (X) and wherein the electric actuator (30) is at least partly inserted internally of the drum (10).

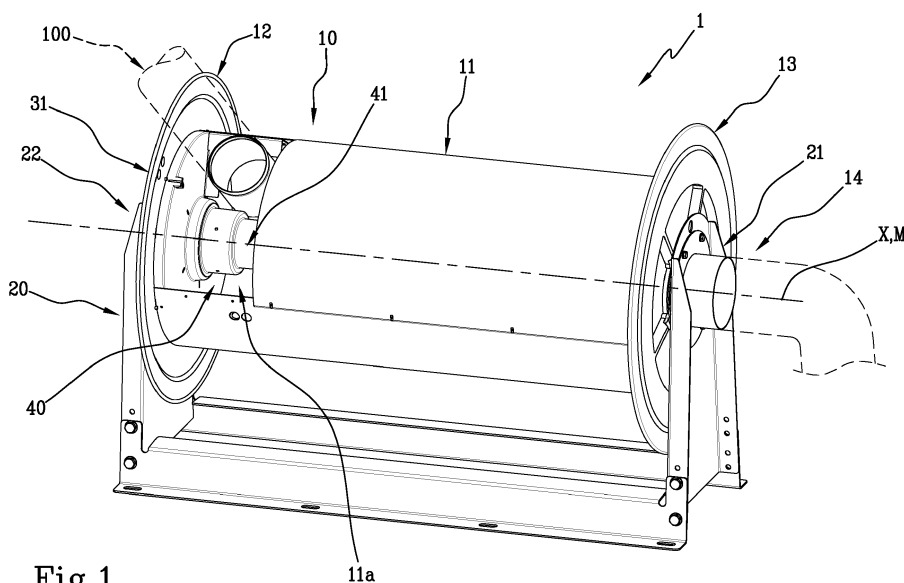


Fig.1

Description

[0001] The object of the present invention is a motorized winder for aspiration of fumes.

[0002] In particular, the present invention relates to a motorized winder for flexible tubes for aspiration of fumes.

[0003] The present invention relates to a motorized winder for flexible tubes for aspiration of fumes, in particular for fumes produced by internal-combustion engines and/or bench-tests for vehicles functioning in closed environments, such as, for example, a research and development laboratory or a mechanical workshop for repairing vehicles.

[0004] The prior art comprises known winding systems for motorized winding of flexible tubes for aspiration of fumes which are motorized using different methods. In general, the winding system is usually fixed to a wall or ceiling, or slidably mounted on channels for reducing, as far as possible, the dimensions and not obstructing a user, and is permanently connected to a suction plant configured for treating the fumes directly aspirated into the workplace via the flexible tube, which is unwound up to reaching an exhaust pipe of a functioning internal combustion engine.

[0005] It is emphasised that the architecture of the winding system is substantially identical for the known solutions and comprises a support element and a winding drum rotatably constrained to the support element. A winding drum is usually predisposed at an end thereof with a rotatable attachment for placing the flexible aspirating tube in fluid communication with the above-mentioned aspiration plant.

[0006] The prior art includes more evident differences in relation to the type of motorization of the winding drum. Note that non-motorized winding systems, or systems activated by means of a spring system, are not taken into consideration herein, as they are not of present interest, though motorized winding systems using an electric actuator are briefly described in the following.

[0007] In one from among the known solutions, the winding system of the flexible aspirating tube comprises an electric actuator which is external of the winding drum and is mechanically connected thereto by an angular relay between the drive shaft and the activating shaft of the same drum. In fact, the electric actuator comprises an electric motor and a gear reducer with an angular relay (generally 90 degrees) in order to position at least the electric motor laterally to the winding drum. Therefore, in the attempt to reduce the dimensions of the winding system as far as possible, the axle of the electric motor shaft is substantially "deviated" with respect to the axis of rotation of the drum by use, for example, of a conical gear reducer installed laterally to the winding drum.

[0008] In the prior art, the motorized winding systems suffer from some limitations and problems in use.

[0009] The known winding systems are particularly unwieldy and sometimes make installation thereof in spaces

not properly predisposed impossible.

[0010] In fact, in the case of a pre-existing mechanical workshop or a test laboratory, it is not always possible and/or easy to install a winding system of the flexible tube of known type. In other terms, considering that production companies of winding systems have a finite number of standardised systems for specific dimensions, available systems do not always have dimensions coinciding with the dimensions of the volume of the installation space.

[0011] An aim of the present invention is to obviate the drawbacks encountered in the prior art by providing a motorized winder for aspiration of fumes that is compact, easily-installable and which does not have further accessory dimensions beyond those of the support element complete with the winding drum.

[0012] In particular an aim of the present invention is to realise a motorized winder for aspiration of fumes that is easy to assemble/disassemble and therefore easy for performing scheduled and unscheduled maintenance for winding systems of this type.

[0013] A further aim of the present invention is to realise a motorized winder for aspiration of fumes that enables reducing costs and times of maintenance and further overall reducing the mechanical components, in particular the mechanical components most subject to wear and/or which require more frequent maintenance than others.

[0014] The dependent claims correspond to possible embodiments of the invention.

[0015] This description is provided with reference to the accompanying figures, which are also provided purely by way of illustrative and thus non-limiting example, in which:

- figure 1 is a perspective view of a motorised winder for aspiration of fumes according to the present invention;
- figure 2 is a perspective sectional view of the winder of figure 1;
- figure 3 is a front view of the winder of figure 1 with some parts hidden so as to make visible parts that would otherwise be hidden;
- figure 4 is a transversal sectional view of the winder of figure 1;
- figure 5 is a perspective sectional view of a motorised winder for aspiration of fumes in a second variant embodiment of the present invention;
- figure 6 is a perspective sectional view, with some parts removed to better illustrate others, of a motorised winder in a further variant embodiment of figure 5.

[0016] With reference to accompanying figures 1 to 4, a perspective view of a motorised winder 1 for aspiration of fumes according to the present invention is illustrated.

[0017] According to the invention, the motorised winder 1 comprises a winding drum 10 rotatable about an axis of rotation X thereof and exhibiting a tubular skirt 11 for

windingly receiving a flexible aspirating tube 100.

[0018] The winding drum 10 comprises at least a first end wall 12 arranged at an axial end of the skirt 11. The drum 10 preferably comprises a first end wall 12 and a second end wall 13 and the skirt 11 is such as to extend from the first end wall 12 to the second end wall 13. In particular, the skirt 11 extends along the axis of rotation "X" between the first wall 12 and the second wall 13 mentioned in the foregoing.

[0019] The motorised winder 1 further comprises at least a support element 20 fixable to a surface and is configured for supporting at least the winding drum 10 in a rotatable manner about the axis of rotation X.

[0020] The support element 20 preferably comprises a fork structure exhibiting a first end flange 21 and a second end flange 22 configured so as to simultaneously support the winding drum 10 at both axial ends of the skirt 11.

[0021] At one of the above-mentioned flanges 21, 22, the drum 10 has connection means 14 to a pneumatic aspiration source, not illustrated in the accompanying figures.

[0022] The first end flange 21 preferably has a through opening 21 a and is couplable to the connection means 14 and thus to the pneumatic aspiration source, by means of a rotary fitting, not illustrated in detail in the accompanying figures.

[0023] According to the invention, and illustrated by way of example in accompanying figure 2, the motorised winder comprises an electric actuator 30 and transmission means 40 for drawing in motion at least the winding drum 10 in an operating functioning configuration of the motorised winder 1.

[0024] The electric actuator 30 has a preferably tubular configuration, comprising a fixing portion 31 integrally connected with the support element 20 and an actuating portion 32 rotatable relative to the fixing portion.

[0025] The fixing portion 31 of the electric actuator 30 is fixed to the support element 20, preferably by means of a form coupling, at the second end flange 22 by means of a fixing seating, not illustrated in detail. The fixing seating is preferably opposite the first end flange 21 which houses the connection means 14 to the pneumatic aspiration source.

[0026] The above-mentioned fixing seating is preferably defined by an opening formed on the second end flange 22 about the axis of rotation "X" of the drum 10, for allowing the extraction of the electric actuator 30 from said opening.

[0027] The fixing portion 31 of the electric actuator 30 is preferably arranged externally of the drum 10.

[0028] The actuating portion 32 of the electric actuator 30 has an axis of rotation "M" thereof, as illustrated, once more, in figure 2, included by way of non-limiting example.

[0029] The electric actuator 30 preferably exhibits a tubular configuration substantially extending along the axis of rotation "M" of the above-mentioned actuating por-

tion 32.

[0030] The electric actuator 30 preferably comprises an electric motor and a revolutions reducing group integrated in a tubular external shell.

[0031] In detail, the transmission means 40 are active between the actuating portion 32 of the electric actuator 30 and the winding drum 10 so as to draw the drum 10 in rotation about the axis of rotation "X".

[0032] In further detail, the axis of rotation "M" of the actuating portion 32 of the electric actuator 30 coincides with the axis of rotation "X" of the winding drum 10.

[0033] The electric actuator 30 is advantageously at least partially inserted in a reversible manner internally of the winding drum 10.

[0034] In particular, as mentioned in the foregoing, the fixing portion 31 of the electric actuator 30 is arranged externally of the drum 10 while the remaining part of the electrical actuator 30 is arranged internally of the drum 10.

[0035] In other terms, the electric actuator 30 is mechanically separable from the drum 10 by means of a complete disconnection of the electric actuator 30 from the motorized winder 1 actuated by means of a translation of the electric actuator 30 along the axis of rotation "X" of the winding drum 10.

[0036] According to the invention, in a solution that is not illustrated in the accompanying figures, the transmission means 40 comprise one or more connecting members arranged internally of the winding drum 10 and extending in a radial direction between the actuating portion 32 of the electric actuator 30 and the skirt 11 of the drum 10. By way of example, the transmission means 40 comprise a flange or a plurality of spokes fixed between an internal wall of the skirt 11 and the actuating portion 32.

[0037] Therefore the activation of the electric actuator 30 places the actuating portion 32 in rotation with respect to the axis "M", which coincides with the axis of rotation "X" of the drum 10, which in turn, via the transmission means 40 described in the foregoing, draws the winding drum 10 of the motorised winder 1 constrainedly in rotation.

[0038] According to the invention, in a preferred solution illustrated in accompanying figures 1-4, the transmission means 40 comprise a hollow central shaft 41 coaxial with the axis of rotation "X" of the drum 10 and extending between the actuating portion 32 of the electric actuator 30 and the end wall 12 of the winding drum 10 for mechanically connecting the actuating portion 32 with said end wall 12.

[0039] The hollow central shaft 41 is advantageously arranged internally of the winding drum 10. The hollow central shaft 41 is preferably arranged entirely internally of the winding drum 10.

[0040] The electric actuator 30 preferably has a length "L" in the direction of the axis of rotation "M" thereof which is identical to or smaller than the length of the hollow central shaft 41 and/or the winding drum 10.

[0041] In reference to accompanying figure 2, the hol-

low central shaft 41 preferably exhibits an access opening 41 a arranged at the first end wall 12 of the drum 10 and configured for allowing reversible insertion of the electric actuator 30.

[0042] At the opposite end of the hollow central shaft 41, it comprises a coupling portion 41 b fitted on the actuating portion 32 of the electric actuator 30 by means of a profiled coupling 32a suitable for transmission of a drive torque, as illustrated by way of non-limiting example in accompanying figure 4.

[0043] The profiled coupling 32a of the actuating portion 32 of the actuator 30 is preferably polygonal; therefore the respective coupling portion 41 b of the hollow central shaft 41 will have a shape that is suitable for the coupling with the polygonal shape.

[0044] The hollow shaft 41 advantageously has an internal diameter that is substantially identical to the diameter of the dimension of the actuating portion 32 of the electric actuator 30 for facilitating engagement or removal of the electric actuator 30 while maintaining the actuator 30 and the hollow shaft 41 substantially aligned, so that the coupling between the actuating portion 32 and the respective coupling portion 41 b of the hollow central shaft 41 is simpler and easier.

[0045] With reference to the connection means 14 to the pneumatic aspiration source, they comprise a connecting hose 14a internal of the drum 11, illustrated in accompanying figure 3, and having a first end connected to a respective suction opening 11a formed on the skirt 11, and a second end opposite the first one and arranged coaxially to the axis of rotation "X" of the winding drum 10 at the axial end of the skirt 11 opposite the electric actuator 30 (practically at the first end flange 21 of the support element 20).

[0046] In particular, the electric actuator 30 and/or the transmission means 40 exhibit an axial dimension "X" that is long enough not to interfere with the second end of the connecting hose 14a.

[0047] As mentioned in the foregoing, the first end flange 21 and the second end flange 22 are configured for simultaneously supporting said winding drum 10.

[0048] In fact, according to the invention, the first end flange 21 and the second end flange 22 each exhibit an axial expansion 21 b and 22a oriented inwardly of the drum 10 and defining a rotatable support for a respective side of the drum 10.

[0049] In the case of the support solution described in the foregoing, the winding drum 10 is constantly supported by the end flanges 21 and 22 independently of the presence or not of the electric actuator 30 in the motorised winder 1.

[0050] The electric actuator 30 is advantageously engageable/disengageable to and from the motorised winder 1 with the winding drum 10 stably supported at the axial ends thereof by the support element 20, facilitating the eventual replacement/maintenance operation of the electric actuator 30.

[0051] In a different solution with respect to what is

described in the foregoing, the electric actuator 30 defines a swivel pin for rotatably supporting the winding drum 10 relative to the second end flange 22.

[0052] The electric actuator 30 is advantageously engageable/disengageable to and from the motorised winder 1 with the winding drum 10 supported only at an axial end thereof by the first end flange 21 of the support element 20, thus facilitating the eventual replacement/maintenance operation of the drum 10 of the motorised winder 1.

[0053] With reference to figure 5, a variant of the motorised winder of figures 1-4 is represented.

[0054] It can in fact occur that it becomes necessary, for reasons of size or the dimensioning of the plant in which the winder is installed or the dimensioning of the components mounted on the winder, to construct a winder having modest dimensions.

[0055] In other words, there might be design requirements which mean the drum 10 has to have a longitudinal dimension, measurable as an extension of the axis of rotation X, that is very modest.

[0056] In this circumstance the location of the electric actuator 30, coaxial to the axis of rotation X of the drum 10, makes the application of the connection means 14 to an aspiration source difficult.

[0057] In reference to figure 3, which illustrates the application of the electric actuator 30 to winders 1 of standard dimensions, it can be observed that the electric actuator is installed on the first wall 12 of the drum 10, while the connection means 14 to the aspiration source is applied on the second wall 13 of the drum 10, and a connecting hose 14a is applied internally of the drum 10, terminating on the suction opening 11 a realised on the skirt 11.

[0058] In this configuration, i.e. with the project dimensions and the sizes of the components as illustrated in figure 3, the electric actuator 30 does not obstruct the connection means 14 and the connecting hose 14a.

[0059] As the longitudinal dimension of the drum progressively diminishes, i.e. as the axis of rotation X progressively shortens, the electric actuator 30 obstructs the connection of the connection means 14 and the arrangement of the connecting hose 14a.

[0060] For this reason, figure 5 illustrates a drum 10 sealedly closed internally of the first and second walls 12, 13 and provided with at least a circular opening 11 a having a diameter substantially identical to the transversal diameter of the flexible tube 100.

[0061] Said drum is realised by a skirt 11 coupled to the first and second walls 12, 13 so as to realise a closed chamber C communicating with the outside only via the circular opening 11 a.

[0062] The coupling between the skirt 11 and the walls 12, 13 might be made in any way, for example using threaded connection means or by gluing, or electro welding, as long as the sealed condition of the chamber defined by the coupling is respected.

[0063] The circular opening 11 a, preferably realised

following the coupling of the skirt 11 with the walls 12, 13, will have a counter-shaped contour with respect to the transversal section of the flexible tube 100.

[0064] In this configuration the winder 1 will internally contain only the electric actuator 30 as the connection to the aspiration source is enabled for the sealed chamber realised between the skirt 11 and the walls 12, 13.

[0065] Still with reference to figure 5, a separator wall 42 can be included internally of the skirt 11.

[0066] Said separator wall 42, solidly connected to the internal wall of the skirt 11, has the function of limiting the volume of the closed chamber C defined by the skirt 11 and the first and second walls 12, 13.

[0067] In other words the skirt 11 has at least a separator wall 42 for limiting, in collaboration with one of the walls 12, 13 to which it is contiguous, the internal volume thereof.

[0068] With reference to figure 6, a second variant of the winder of figure 5 is illustrated, preferable for very large drums, i.e. having very large longitudinal extensions, and thus a very long axis of rotation X.

[0069] In these circumstances, though the system can support the co-existence of the electric actuator 30 coaxial to and internal of the drum 10 with the connecting hose 14a defining, the skirt 11, internally thereof a large free volume, the solution of figure 6 is preferable for winders serving two repair/testing stations for motor vehicles, i.e. two car lifts.

[0070] When it is necessary for the flexible tube 100 to serve two exhaust pipes present on a same automobile, or relative to two automobiles contiguous to one another and located on two distinct car lifts, it is necessary to use two winders, or apply to the flexible hose 100 an accessory, a branch, which enables splitting the flexible tube into two suction outlets so as to be installable on two exhaust pipes.

[0071] While the use of two winders obviously involves a duplicating of the purchase costs, installation and maintenance, the accessory for the splitting of the flexible tube is not popular on the market as it is not practical.

[0072] The winder of figure 6 illustrates a drum 10 comprising a skirt 11 sealedly closed on the first and second wall 12 and 13 with a first opening 11 a and a second opening 11 b. Said first and second opening 11 a, 11b are longitudinally opposite and have a circular section.

[0073] Said first opening 11 a is designed to sealedly couple with a flexible tube 100 and said second opening 11 b is designed to couple with a second flexible tube 100'.

[0074] In this configuration, when unwinding from the winder 1 of figure 6, the operator directly avails of two flexible tubes 100, 100' connectable to two respective exhaust pipes.

[0075] The present invention achieves the intended aims.

[0076] The first advantage of the present invention is the drastic reduction of the dimensions of the motorised winder 1.

[0077] In fact the application of the actuator 30, of the tubular motor type, internally of the drum, makes the system more compact and therefore also more versatile during installation.

[0078] The reduction of the dimensions also reflects positively on the shipping costs, as the packaging requires only a surface that is substantially identical to that of the winder and must not, as in previous cases, be over-dimensioned so as to be able to accommodate all the elements of the prior art that are located externally of the drum (motor, gear reducer, control unit, etc.).

[0079] A second advantage of the present invention is the reduction of weights due to the presence of the very compact and light motorized actuator.

[0080] The tubular motor lightens the system and thus realises a much lighter winder that is consequently easily transportable along the sliding guides in cases of installation of the winder on channels.

[0081] The locating of the tubular motor in axis with the drum enables an ease of mounting and further an ease of operation in the maintenance interventions. This means a reduction in costs and the maintenance times with a simplified structure that allows easy accessibility to components with respect to what is available in the prior art.

[0082] Thanks to the tubular motor, the reduction in the number of components, in comparison with the prior art systems provided with at least a motor, reducer and transmission, improves the overall reliability of the system and reduces servicing costs, as fewer scheduled maintenance operations are required, and unexpected faults in the system are less probable.

[0083] With respect to the motorized systems of the prior art, the system is compact and structurally simple.

Claims

1. A motorized winder (1) for aspiration of fumes comprising:

- a winding drum (10) rotatable about an axis of rotation (X) and exhibiting a tubular skirt (11) for windingly receiving a flexible tube for aspirating (100), said drum (10) exhibiting connection means (14) to a pneumatic aspirating source;
- at least a support element (20) which can be fixed to a surface and is configured to support said winding drum (10) rotatably about said axis of rotation (X);
- an electric actuator (30) having a tubular configuration, comprising a fixing portion (31) solidly connected with the support element (20) and an actuating portion (32) that is rotatable relative to the fixing portion (31);
- transmission means (40) active between the actuating portion (32) of the electric actuator (30) and the drum (10) for driving the drum (10) in

rotation about said axis of rotation (X);

wherein the actuating portion (32) of the electric actuator (30) exhibits an axis of rotation (M) coinciding with the axis of rotation (X) of the drum (10), and wherein the electric actuator (30) is at least partially reversibly inserted internally of the winding drum (10).

2. The winder (1) according to claim 1, wherein said transmission means (40) comprises one or more connecting members arranged internally of the winding drum (10) and extending in a radial direction between the actuating portion (32) of the electric actuator (30) and said skirt (11) of the drum (10).
3. The winder (1) according to claim 1, wherein the drum (10) exhibits at least a first end wall (12) arranged at an axial end of the skirt (11) and wherein said transmission means (40) comprise a hollow central shaft (41) coaxial with said axis of rotation (X) of the drum (10) and extending between the actuating portion (32) of the electric actuator (30) and said first end wall (12) for mechanically connecting the actuating portion (32) of the electric actuator (30) with said first end wall (12), said hollow central shaft (41) being arranged entirely internally of the winding drum (10).
4. The winder (1) according to claim 3, wherein said hollow central shaft (41) exhibits an access opening (41 a) arranged at said first end wall (12) and configured for enabling reversible insertion of said electric actuator (30).
5. The winder (1) according to claim 3 or 4, wherein the hollow central shaft (41) comprises a coupling portion (41 b) fitted on the actuating portion (32) of the electric actuator (30) by way of a shaped coupling (32a), preferably polygonal, suitable for transmission of a drive torque.
6. The winder (1) according to one or more of claims 1-5, wherein the fixing end (31) of the electric actuator (30) is fixed to the support element (20) and is arranged externally of the drum (10) while the remaining part of the electric actuator (30) is arranged internally of the drum (10).
7. The winder (1) according to one or more of claims 1-6, wherein said connection means (14) to the pneumatic aspirating source comprise a connecting hose (14a) arranged internally of the drum (10) and having a first end connected to a respective suction opening (11 a) formed on the skirt (11), and a second end opposite the first end and arranged coaxially to the axis of rotation (X) of the winding drum (10) at the axial end of the skirt (11) opposite the electric

actuator (30), and wherein the electric actuator (30) and/or the transmission means (40) exhibit an axial dimension such as not to interfere with said second end of the connecting hose (14a).

8. The winder (1) according to one or more of the preceding claims, wherein said support element (20) comprises a fork structure exhibiting a first end flange (21) and a second end flange (22), which first end flange (21) and second end flange (22) are configured so as to simultaneously support said winding drum (10) at both axial ends of the skirt (11), and wherein each of said end flanges (21, 22) exhibits an axial expansion (21 b, 22a) oriented internally of the drum (10) and defining a rotatable support for a respective side of the drum (10).
9. The winder (1) according to claim 8, wherein a first (21) of said end flanges (21, 22) exhibits a through opening (21 a) that is coupleable to said connection means (14) and to the pneumatic source, preferably via a rotary fitting, and wherein the other end flange (22) exhibits a fixing seating for said fixing portion of the electric actuator (30).
10. The winder (1) according to claim 9, wherein said fixing seating is defined by an opening afforded on the second end flange (22) about the axis of rotation (X) of the drum (10), for enabling extraction of the electric actuator (30) from said opening, preferably said opening of said flange (22) being a through opening.
11. The winder (1) according to one or more of the preceding claims from 1 to 7, wherein said support element (20) comprises a fork structure exhibiting a first end flange (21) and a second end flange (22), which first end flange (21) and second end flange (22) are configured so as to simultaneously support said winding drum (10) at both axial ends of the skirt (11), and wherein said electric actuator (30) defines a swivel pin able to rotatably support the drum (10) relative to a respective end flange of said end flanges (21, 22).
12. The winder (1) according to one or more of the preceding claims, wherein the electric actuator (30) is mechanically separable from the drum (10) by means of a complete disconnection of said electric actuator (30) from said motorized winder (1) implemented by means of a translation of said electric actuator (30) along the axis of rotation (X) of the winding drum (10).
13. The winder (1) according to claim 1, wherein the drum (10) provided with first and second walls (12, 13), defines a closed chamber internally thereof, which at the inlet thereof is in communication with

the connection means (14) of the aspirating source; said closed chamber being defined by a sealed coupling of the skirt (11) with the first and second walls (12, 13) and resulting in fluid communication with the outside via an opening (11 a).

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14. The winder (1) according to claim 13, wherein the skirt (11) interposed between the first and second walls (12, 13) is preferably a tubular-shaped single piece.

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15. The winder (1) according to claim 13, wherein the opening (11 a) has a counter-shaped contour defining a male-female form coupling with the flexible tube (100) with which it is couplable.

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16. The winder (1) according to claim 13, wherein the skirt (11) exhibits a first and a second opening (11 a, 11 b) each couplable to a respective flexible tube (100, 100').

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17. The winder (1) according to claim 13, wherein said closed chamber, defined by the coupling between the skirt (11) and the first and second walls (12, 13), facilitates a fluid communication between the aspirating source and flexible tube (100) without any connection hoses being interposed there-between.

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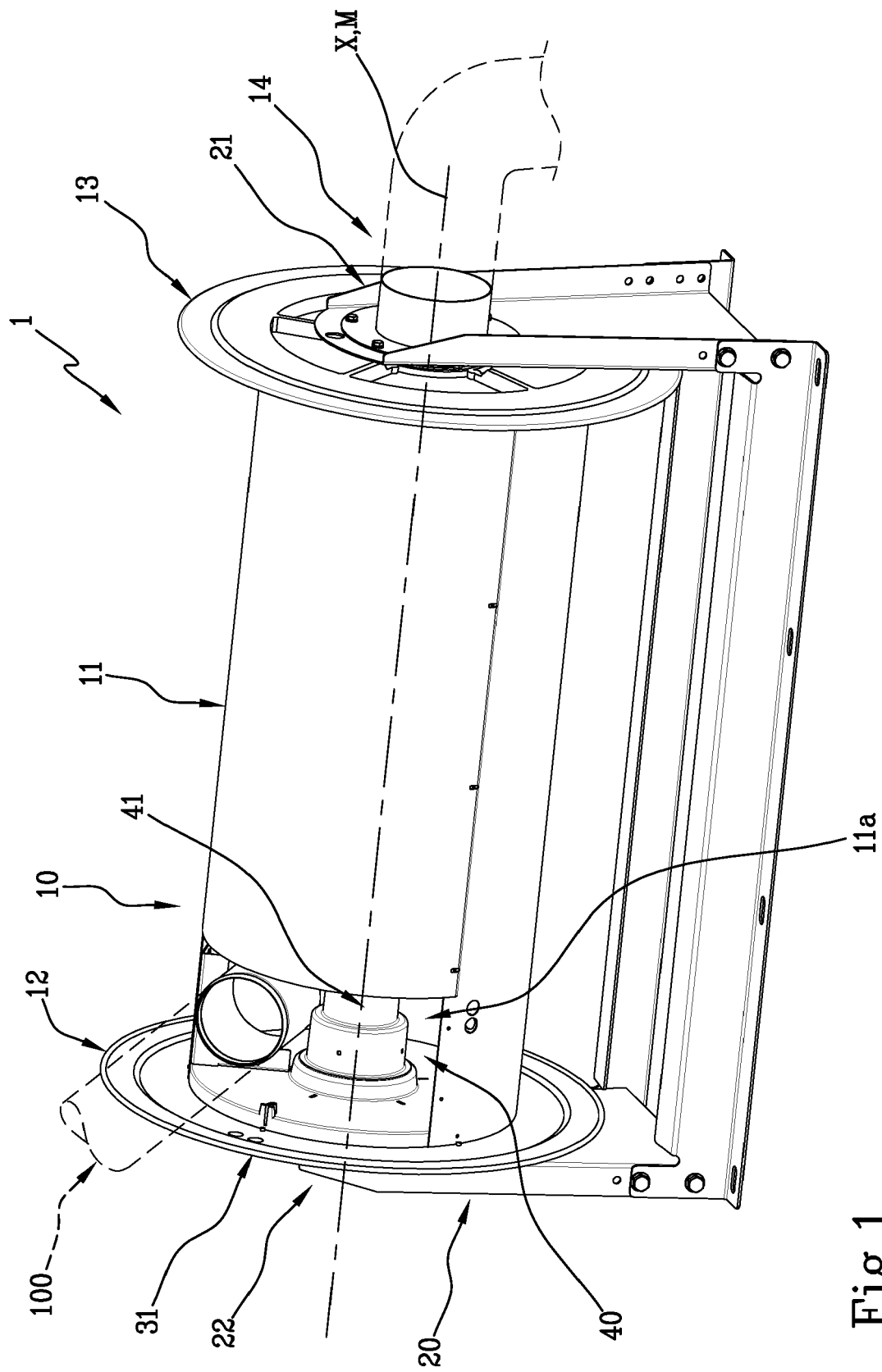
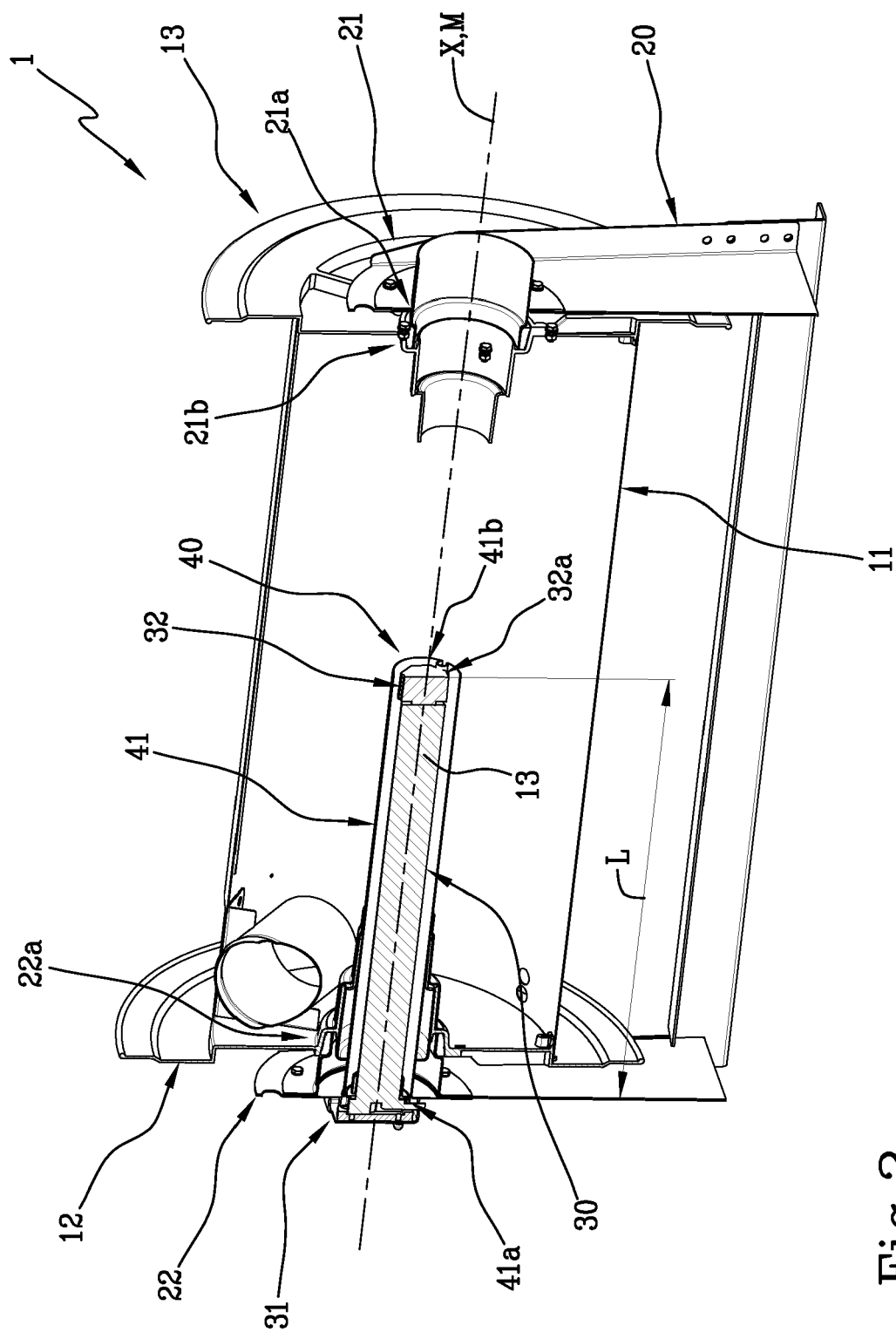


Fig.1



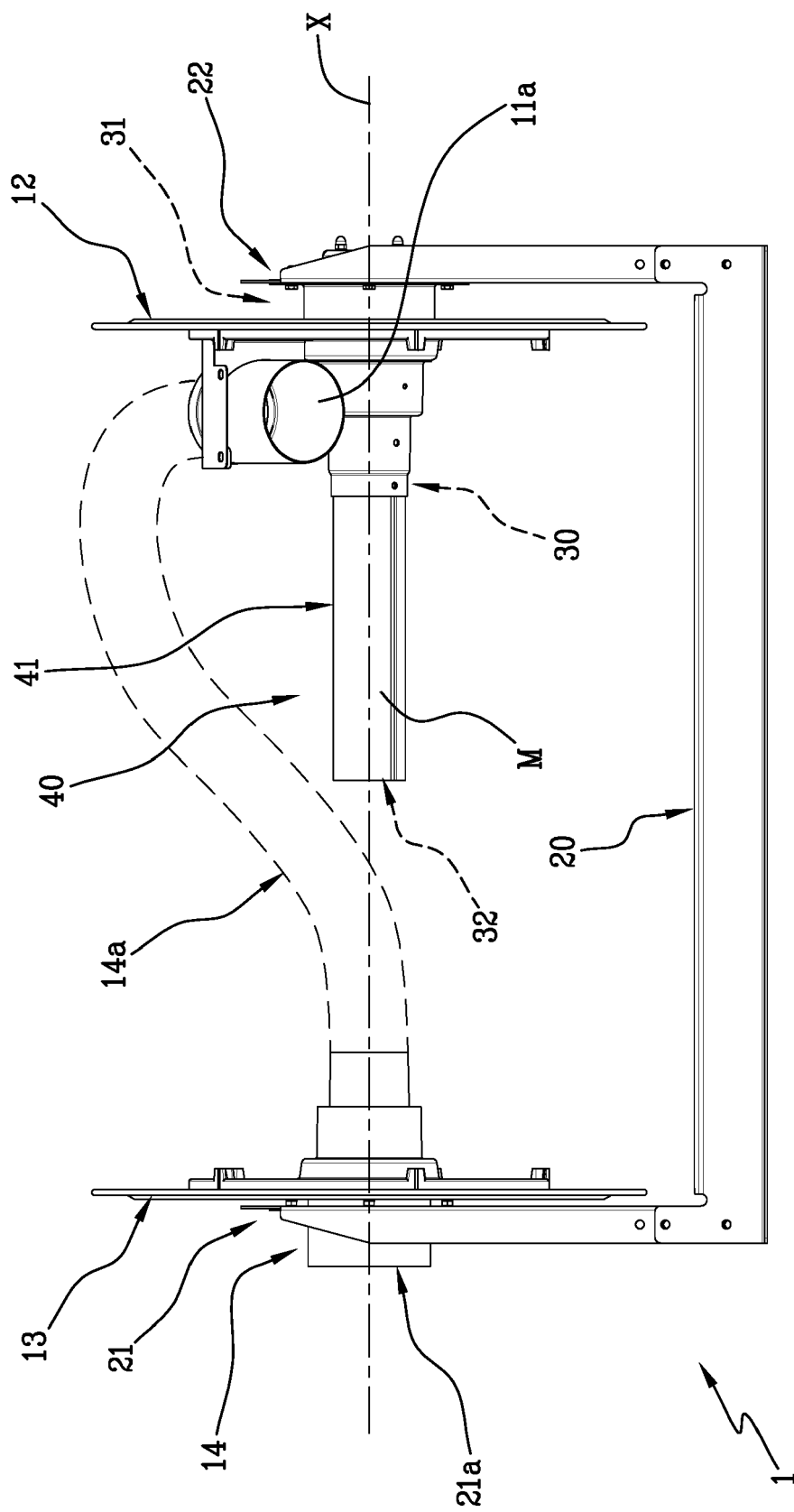


Fig. 3

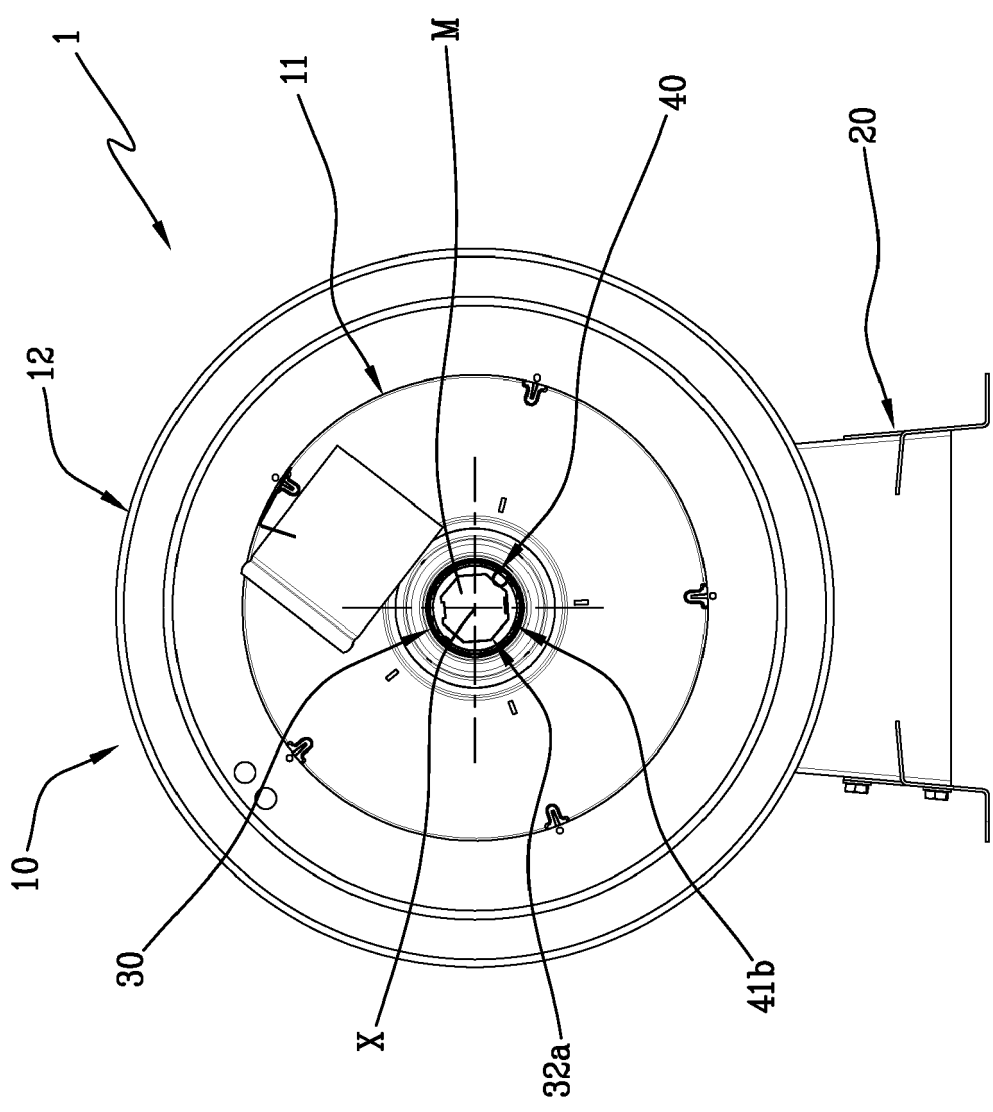


Fig.4

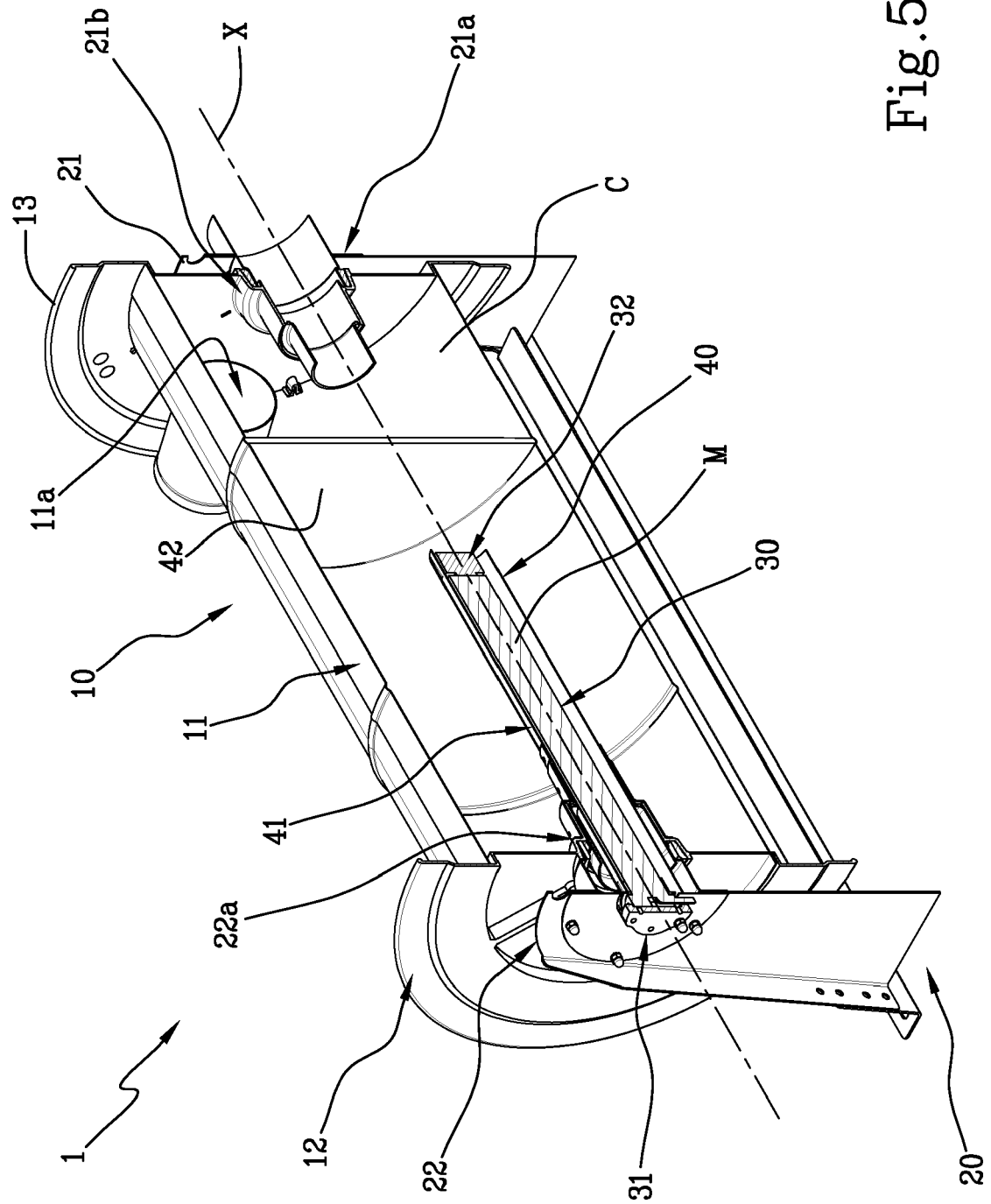


Fig. 5

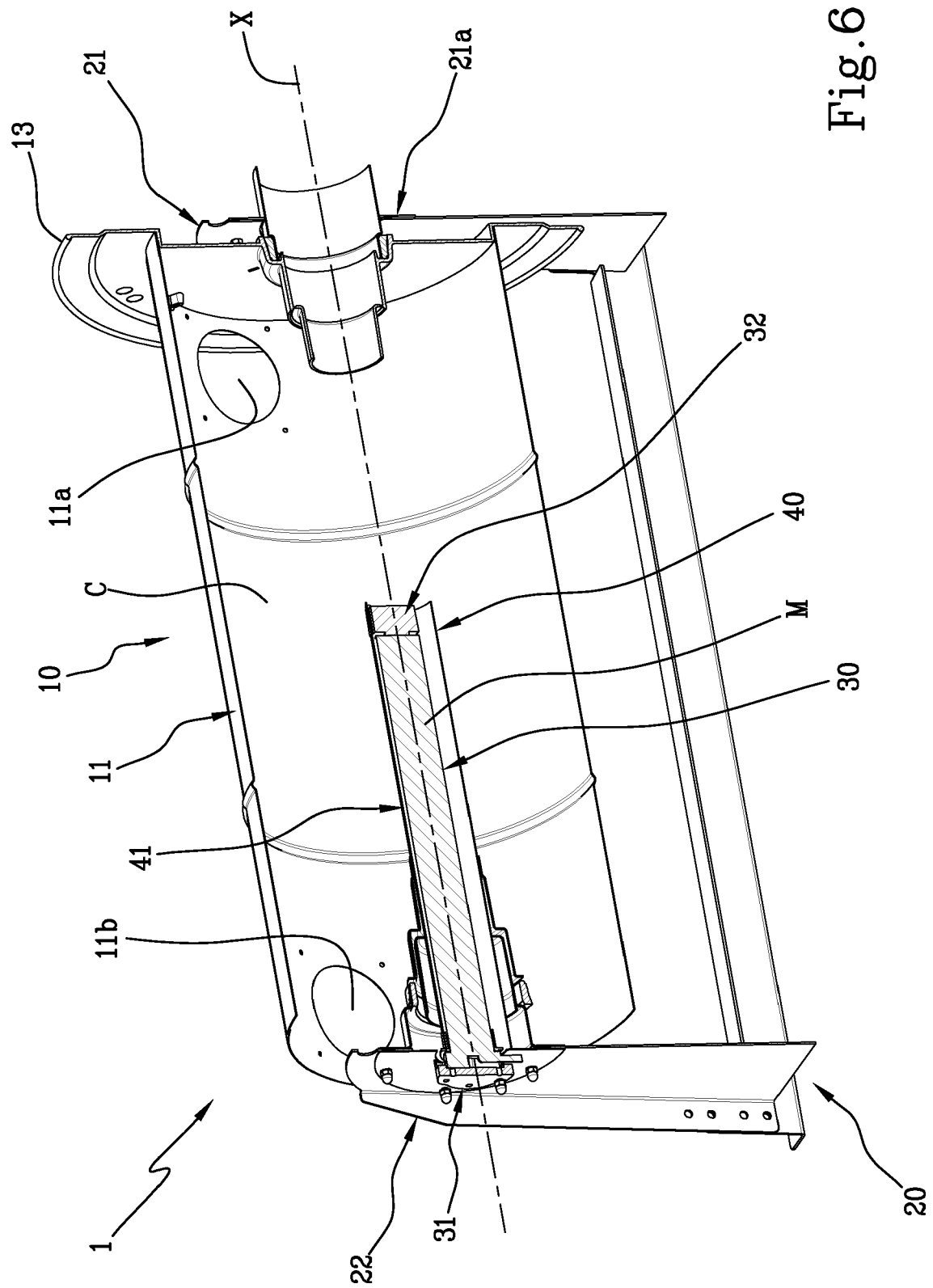


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 3639

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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 A	WO 2014/201233 A1 (GRACO MINNESOTA INC [US]) 18 December 2014 (2014-12-18) * page 1, line 27 - page 4, line 25; figures 1-4 *	1-5,12 6-11, 13-17	INV. B65H75/44
X	US 6 802 336 B1 (HOLMQUIST MICHAEL W [US]) 12 October 2004 (2004-10-12) * the whole document *	1-4,6,7, 11,12	
X	US 8 336 800 B1 (LOPEZ JOHN D [US]) 25 December 2012 (2012-12-25) * column 2, line 65 - column 3, line 49; figures 1,2,4 *	1,6-10	
X	WO 2015/051413 A1 (RAPID SPRAY PTY LTD [AU]) 16 April 2015 (2015-04-16) * paragraphs [0051] - [0063]; figures 1-3 *	1,6,11, 12	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 September 2017	Examiner 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			

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EPO FORM 1503 03/82 (P04C01)

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

EP 17 17 3639

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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