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(54) MOVEMENT GROUP FOR MOVING AN OPERATING GROUP OF A WRAPPING APPARATUS

(57) A movement group (1) is disclosed that is arranged for moving an operating group (100), in particular a wrapping apparatus (1000), around a load (2), the movement group (1) comprising:
- a single annular support frame (3) arranged for supporting the operating group (100), the operating group (100) being configured to be slidable on the annular support frame (3) so as to follow a trajectory around a vertical wrapping axis (Y) for wrapping the load (2) with a film; the annular support frame (3) is rotatably stationary;
- a flexible dragging member (7) directly connected to and arranged for dragging the operating group (100) around the load (2);
- motor means (10) configured to advance the operating group (100) along the trajectory;
- a flexible driving member (11) connected to the, movable by the, motor means (10). The flexible dragging member (7) and the flexible driving member (11) are separated and spaced mutually apart from one another. The movement group (1) further comprises motion transmitting means (12) arranged for transmitting the motion from the flexible driving member (11) to the flexible dragging member (7).

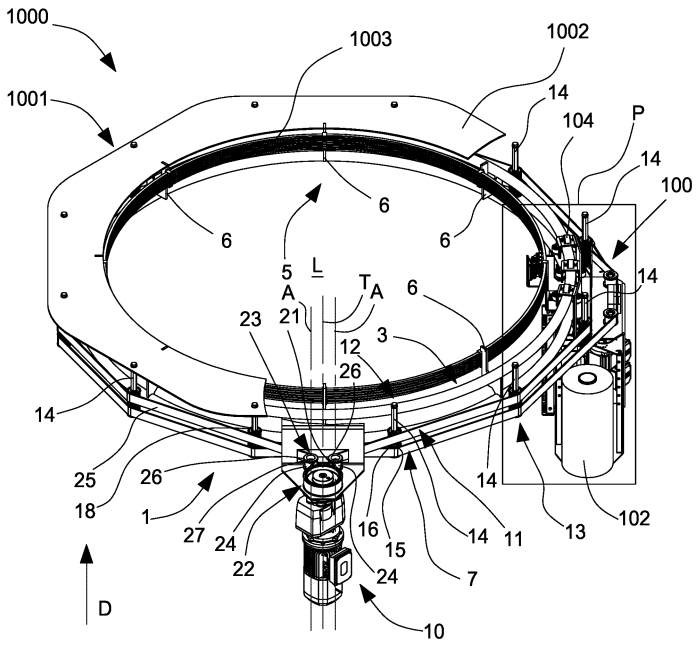

Fig. 3

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Description

Background of the invention

[0001] The invention relates to a movement group arranged for moving an operating group, such as a support and unwinding group of a reel or pre-stretching group, of a wrapping apparatus arranged for wrapping a film around a load for example located on a support (palletized load). In particular, the invention refers to a movement group intended to move the operating group around the load, for example along a trajectory around a vertical axis in order to perform works on the load.

[0002] The works that the operating group can perform on the load comprise, in particular, a wrapping operation during which the wrapping apparatus is intended to apply a set number of wrapping coils of film to the load.

[0003] Wrapping apparatuses of the rotating ring type are known from the prior art, each comprising a rotating ring that is rotatable around a vertical wrapping axis and a support and unwinding group connected stiffly to the rotating ring and arranged for supporting and unwinding a reel of a film, in particular a film of plastics, by a rotation around the load of the support and unwinding group moved by the rotating ring. The rotating ring and, consequently the support and unwinding group to which it is connected, is further movable by a motor along a vertical direction in order to be able to apply a set number of wrapping coils of film to the entire height of the load.

[0004] A drawback of the wrapping apparatuses of the rotating ring type is that the rotating ring, together with the components that it supports in rotation around the vertical wrapping axis, including the support and unwinding group and a drive device for rotating the rotating ring, can reach rather a high mass, for example about 500 kg. Further, the load imposed on the rotating ring is not distributed evenly because the support and unwinding group and the drive device are associated with determined zones of a perimeter of the rotating ring. What has been set out above shows that rotation of the rotating ring entails very high inertia moments and, therefore, very much power absorbed by the drive device. This therefore results in premature wear of the drive device.

[0005] From EP1319596 B1, an annular structure is known, mounted translateably vertically to two columns of a pallet wrapper, to which a support shelf is mounted movably. The shelf is mounted translateably to tracks of the annular structure by a series of rolling wheels and is fixed to a dragging ring that rotates restingly on bearings arranged circumferentially on the annular structure.

[0006] The dragging ring, together with the shelf, are rotated by a drive belt controlled by a motor, arranged fixed externally to the annular structure. In a groove of a bush, it is suitable for engaging a second dragging belt that wraps for a portion that is as wide as possible around the bush with the help of a belt tightener, and then adheres to a track that is integral with the annular structure. When the shelf is rotated by the motor around the annular structure, the second dragging belt, which is static with respect to the track, rotates the bush. The second dragging belt is thus used to transmit the motion to the bush that constitutes the motor-drive member of the dispensing device.

[0007] A drawback of the pallet wrapper disclosed by EP1319596 B1 is that rotating the dragging ring together with the shelf to which it is fixed entails very high inertia moments and, accordingly, as indicated above, very great power absorbed by the motor.

[0008] From EP2468635 A1, a wrapping machine is further known, of the type comprising a vertical fixed structure and moving means for moving along the vertical fixed structure an unwinding reel-holding group for unwinding at least one film reel supported there rotatably and with which to wrap goods grouped above a pallet. This wrapping machine comprises at least one horizontal frame having the shape of a polygonal ring with rounded corners. The horizontal frame is applied to the vertical moving means and is run peripherally by the reel-holding group to enter, from top to bottom, according to need, the goods to be wrapped completely with the film, said goods being arranged on a pallet positioned in the centre of the annular frame. The reel-holding group is moved on the annular frame by a superimposed double-strap dragging system one strap of which is motor-drive belt and the other of which is connected directly to the reel-holding group, which exploits the contact between the two belts to transfer the motion from the motor-drive belt to the driven belt. A closed loop flat belt is engaged both outside a plurality of smooth idling pulleys that are mounted in brackets and a drive pulley connected to an electric reduction gear and positioned therewith inside the perimeter of the annular frame. A second flat belt has an end fixed to the bracket with suitable screw means and is then completely superimposed on the motor-drive belt, except in the portion engaged in the drive pulley, until also the other end thereof is fixed to the bracket. In this manner, as the open belt is superimposed and in contact with the closed belt, the open belt is dragged and consequently moves the reel-holding group to which it is connected in the bracket.

[0009] A drawback of the wrapping machine of EP2468635 A1 is that the motor-drive belt drags by friction the belt connected directly to the reel-holding group, this causing great wear to both the belts because of the reciprocal rubbing, in particular when the belts come to the corners of the annular frame.

[0010] Another drawback of the wrapping machine of EP2468635 A1 is that it is not possible to move belts at high speeds owing to the changes in direction imposed on the arrangement of the belts of the corners of the annular frame which they engage.

[0011] A further drawback of the wrapping machine of EP2468635 A1 is that the belts, because they are arranged in superimposed contact, are moved at substantially the same angular speed, which is determined by the rotation speed of the motor-drive belt. In other words,

there is no independent adjustment between the speed of the motor-drive belt and of the driven belt, i.e. the speed directly connected to the reel-holding group.

[0012] Yet another drawback of the wrapping machine of EP2468635 A1 is that the drive pulley and the electric reduction gear are positioned inside the perimeter of the annular frame. As a result, the drive pulley and the electric reduction gear occupy a part of a work zone inside the annular frame in which, in use, the goods are arranged. This work zone can accordingly receive goods of reduced dimensions with respect to the total extent of the work zone, owing to the presence of the drive pulley and of the electric reduction gear.

[0013] The prior art leaves ample room for improvement.

[0014] Firstly, a movement group is desirable for moving an operating group that enables inertia moments to be obtained in use that are lower than those associated with prior-art movement groups.

[0015] Secondly, a movement group is desirable that reduces wear to the motion transmission members that are set up to transmit motion to the operating group.

[0016] Further, a movement group is desirable in which it is possible to decouple and adjust independently the rotation speed of a driven transmitting member and of a driving transmitting member.

Summary of the invention

[0017] An object of the present invention is to improve the movement groups for moving an operating group of a wrapping apparatus of known type.

[0018] Another object of the present invention is to make a movement group that moves an operating group of a wrapping apparatus along a trajectory around a vertical wrapping axis that entails moments of reduced inertia.

[0019] A further object of the present invention is to make a movement group provided with transmitting members with a long working life.

[0020] Yet another object of the present invention is to make a movement group of an operating group of a wrapping apparatus that is simple and cheap.

[0021] A further object of the present invention is to make a movement group that can receive a load of elevated dimensions internally.

[0022] The objects of the invention are achieved with a movement group of an operating group of a wrapping apparatus according to claim 1.

[0023] In one embodiment, a movement group arranged for moving an operating group, in particular of a wrapping apparatus, around a load, comprises:

- a single annular support frame arranged for supporting the operating group, the operating group being configured to be slidable on the annular support frame so as to follow a trajectory around a vertical wrapping axis for wrapping the load with a film; the annular support frame being rotatably stationary;
- a flexible dragging member directly connected to and arranged for dragging the operating group around the load;
- motor means configured to advance the operating group along the trajectory;
- a flexible driving member connected to, and movable by, the motor means.

The flexible dragging member and the flexible driving member are separated and spaced mutually apart from one another. The movement group further comprises motion transmitting means arranged for transmitting the motion from the flexible driving member to the flexible dragging member.

[0024] Owing to the invention, in particular owing to the presence of the motion transmitting means, it is possible to obtain a movement group for moving an operating group that moves the operating group along a trajectory around a vertical wrapping axis by using a driven flexible dragging member (i.e. connected to and arranged for dragging, the operating group around the load) and a flexible driving member spatially decoupled along a vertical direction. This spatial decoupling results in a plurality of constructional advantages, including the possibility of providing rotation speeds of the aforesaid members that are different from one another. This is obtained, in particular, by varying the transmission torque of revolving elements on which they are respectively engaged. Further, the spatial decoupling between the two members enables the wear process to be avoided that is due to reciprocal rubbing of the flexible dragging member and of the flexible driving member when arranged in contact, superimposed, as occurs in prior-art movement groups.

[0025] Further, owing to the fact that it is the operating group that slides on the annular support frame whilst the latter is rotatably stationary, i.e. does not rotate, the inertia moments are reduced with respect to those associated in use with the movement groups of the rotating ring wrapping apparatuses.

[0026] Such a movement group has moreover the advantage of being able to receive inside the ring-shaped supporting frame a load that has great overall dimensions and is not influenced by the presence of components of the movement group.

[0027] Also, the movement group according to the invention appears rather simple and easily installable in wrapping apparatuses that are already known that are provided with a ring-shaped supporting frame.

[0028] From what has been said above, it is clear that the movement group according to the invention is much more versatile than prior-art movement groups.

Short description of the drawings

[0029] The invention can be better understood and implemented with reference to the enclosed drawings, which illustrate an embodiment thereof by way of non-

limiting example, in which:

Figure 1 is a top view of a portion of a wrapping apparatus configured to wrap a film around a load comprising a movement group according to the invention, the movement group being arranged for moving an operating group of the wrapping apparatus;

Figure 2 is a front view of the portion of wrapping apparatus of Figure 1;

Figure 3 is a perspective view of the portion of wrapping apparatus of Figure 1;

Figure 4 is the enlarged detail P of Figure 3;

Figure 5 is a section taken along plane V-V of Figure 1;

Figure 6 is the enlarged detail Q of Figure 5.

Detailed description

[0030] With reference to the Figures, a movement group 1 according to the invention arranged for moving an operating group 100 around a load 2 (Figure 1), for example a load 2 arranged on a support like, for example, a pallet, or a support provided with roller or chain movements is illustrated.

[0031] The movement group 1 is suitable for being installed in a wrapping apparatus 1000 which is designed to wrap a film around the load 2 with a set number of wrapping coils during a wrapping cycle.

[0032] The film is made of an elastic material and/or plastics, for example can be an extendible film having elasticity that is such as to be able to be applied to and shaped around the load and, at the same time, such as to be able to keep together the latter stably. Further, the film can be, in particular, a microperforated film and/or a biodegradable film and/or a heat-sensitive film.

[0033] The wrapping apparatus 1000 is provided with the operating group 100 with which the movement group 1 according to the invention is associable.

[0034] The operating group 100 can comprise, in particular, a support and unwinding group 101 for supporting and unwinding a reel 102 of film by a rotation of the support and unwinding group 101 around the load 2 so as to apply a certain number of wrapping coils to the load 2.

[0035] The film unwound from the reel 102 can be stretched before being wrapped around the load 2 and diverted to the load 2 by one or more pre-stretching and diverting rollers, of known type, of the support and unwinding group 101.

[0036] The operating group 100 moved in use by the movement group 1 follows a trajectory around a vertical wrapping axis Y in particular for wrapping the load 2 with the film along a movement direction, for example an anticlockwise rotation direction. In particular, the movement group 1 is configured to move the operating group 100 so that the latter performs, for example, a rotation along a substantially circular trajectory around the vertical wrapping axis Y.

[0037] In this text, "vertical" or "substantially vertical" means an axis that is substantially vertical to the gravity-accelerating vector.

[0038] The wrapping apparatus 1000 comprises a fixed frame, which is not shown in the Figures, restable for example on a floor, and a main frame 1001 connected to the fixed frame and movably axially so that the main frame 1001 can be moved by alternating motion along a descent direction or an ascent direction, these directions being substantially parallel to a central axis C of the load 2 substantially coinciding with the, or parallel to the vertical wrapping axis Y. For example, the central axis C of the load 2 is an axis passing through the centre of gravity of the load 2.

[0039] With particular reference to Figures 1 and 3, the main frame 1001 comprises a protection casing 1002, one part of which has been removed in the Figures to be able to enable components of the movement group 1 (or of the wrapping apparatus 1000) to be shown.

[0040] As will be explained better below in the description, in order to apply a set number of wrapping coils of film to the load 2, the rotation of the operating group 100 is associated with a vertical movement of the operating group 100, i.e. along a direction substantially parallel to the vertical wrapping axis Y. For example, the operating group 100 can be connected to the main frame 1001 and moved together with the latter along a substantially vertical direction.

[0041] The movement group 1 comprises an annular support frame 3 arranged for supporting the operating group 100 during the movement of the latter around the vertical wrapping axis Y. In particular, the annular support frame 3 is configured to slidingly support the operating group 100. In use, in fact, the operating group 100 is configured to be slidable on the annular support frame 3 so as to follow a trajectory around the vertical wrapping axis Y for wrapping the load 2 with the film. The wrapping apparatus 1000 comprises a work zone L arranged inside the annular support frame 3 in which the load 2 is locatable to be subjected to processing by the operating group 100.

[0042] The annular support frame 3 is arranged inside the fixed frame.

[0043] The annular support frame 3 is rotatably stationary, i.e. does not rotate around the vertical wrapping axis Y.

[0044] In particular, there is just one annular support frame 3, i.e., in other words, the movement group 1 comprises a single annular support frame 3 that is rotatably stationary.

[0045] Owing to the fact that the annular support frame 3 does not rotate around the vertical wrapping axis Y, but it is the operating group 100 that slides on the annular support frame 3 to advance around the vertical wrapping axis Y, the inertia moments associated with the movement group 1 are rather reduced.

[0046] The annular support frame 3 is, in particular,

connected to the fixed frame and/or to the main frame 1001 so as so as to be able to be movable vertically so that the operating group 100 can apply a set number of wrapping coils of the film to a height of the load 2 whilst it is slided around the vertical wrapping axis Y on the annular support frame 3.

[0047] In other words, the annular support frame 3 is relatable axially with respect to the fixed frame.

[0048] For example, the annular support frame 3 can be connected stiffly to the main frame 1001 and be moved together with the latter vertically along the ascent or descent direction with respect to the load 2. Alternatively, for example when the main frame 1001 is not provided, the annular support frame 3 can be slidingly connected to the fixed frame.

[0049] The annular support frame 3 can comprise at least one annular tubular element 4 on which the operating group 100 is couplable.

[0050] The annular tubular element 4 can have, in particular, a substantially circular cross section.

[0051] In the embodiment illustrated in the Figures, the annular support frame 3 is provided with two annular tubular elements 4 arranged on one another, in particular reciprocally parallel and spaced vertically.

[0052] A plurality of support elements 5 for supporting the movement group 1 is connected to the annular tubular element 4 or to the annular tubular elements 4 (when a plurality of annular tubular elements 4 is provided), each support element 5 being arranged for supporting a plurality of electric tracks 1003 of the wrapping apparatus 1000.

[0053] Each electric track 1003 has an annular conformation and is arranged inside the annular support frame 3. The support elements 5 are distributed peripherally and inside the annular support frame 3. In particular, the support elements 5 can be mounted equidistant to the annular tubular element 4 or to the annular tubes 4. The electrical tracks 1003 thus run near an inner perimeter of the annular support frame 3 and are connected to the plurality of support elements 5 to be supported thereby.

[0054] When a plurality of annular tubular elements 4 is provided, the support elements 5 further have the object of stiffly connecting together the annular tubular elements 4.

[0055] The plurality of support elements 5 can be connected to the main frame 1001, in particular to the protection casing 1002. For example, an upper portion of each support element 5 can be connected, with connecting means of known type, to the protection casing 1002.

[0056] Each support element 5 can comprise, in particular, a bracket 6.

[0057] In use, the annular support frame 3 acts as a rail for the operating group 100. In fact, the operating group 100 comprises at least one carriage 103 provided with a plurality of idling rollers 104 arranged for sliding on the annular support frame 3, in particular on the tubular element/s 4 during rotation of the operating group 100 when moved by the movement group 1.

[0058] In the embodiment illustrated in the Figures, the carriage 103 comprises at least one support plate 105 shaped substantially as a C and arranged for grasping the tubular element/s 4. The plurality of idling rollers 104 is mounted to the at least one support plate 105.

[0059] In the embodiment of operating group 100 illustrated in the Figures, three support plates 105 are shown, but the number thereof can obviously change as required.

[0060] The movement group 1 further comprises a flexible dragging member 7 directly connected to the, and arranged for dragging the, operating group 100 around the load 2.

[0061] The flexible dragging member 7 can be chosen from a group comprising: a flat belt, a V-belt, a belt provided with grooves, a toothed belt, an articulated chain of roller type, an articulated chain of the Half link type.

[0062] The flexible dragging member 7 can be made so as to be elastic, i.e. after being subjected to an external force, like a force acting along a direction substantially perpendicular to the vertical wrapping axis, reacquires the initial shape when this external force ceases.

[0063] The flexible dragging member 7 is mounted closed in a loop, in particular outside the annular support frame 3.

[0064] The movement group 1 can further comprise a connecting element 8 arranged for connecting, in particular stiffly, the operating group 100 to the flexible dragging member 7. The connecting element 8 that connects directly the flexible dragging member 7 to the operating group 100 ensures that, in use, the flexible dragging member 7 and the operating group 100 move integrally around the vertical wrapping axis Y.

[0065] In other words, the flexible dragging member 7 is fixed to the operating group 100 so that they move integrally around the vertical wrapping axis Y.

[0066] The connecting element 8 can comprise a pair of clamps 9 between which the flexible dragging member 7 is clamped.

[0067] In particular, a portion of inner surface 17 of the flexible dragging member 7 and an outer surface portion 20 can be clamped between the clamps 9, the portion of inner surface 17 and the outer surface portion 20 being mutually opposite.

[0068] The portion of inner surface 17 faces, in particular, the work zone L. The portion of inner surface 17 is arranged at a lesser distance from the vertical wrapping axis Y with respect to the outer surface portion 20.

[0069] The connecting element 8 can be mounted to a frame element 106 of the operating group 100 to which the operating components of the operating group 100 can be mounted, like, for example, the reel 102.

[0070] The frame element 106 can be further connected to the at least one support plate 105.

[0071] The electrical tracks 1003 of the wrapping apparatus 1000 are configured to be contacted by a brush

element 107 of the operating group 100 connected to components of the operating group 100 that have to be supplied electrically. In use, the brush element 107 establishes a sliding contact on the electrical tracks 1003 to transmit an electric signal or electric energy from the electrical tracks 1003 to the components of the operating group 100 that need an electric supply.

[0072] The movement group 1 further comprises motor means 10 configured to advance the operating group 100 along the trajectory around the vertical wrapping axis Y.

[0073] The motor means 10 can comprise a motor, like, for example an electric motor.

[0074] In use, the motor means 10 is rotationally stationary, i.e. does not rotate around the vertical wrapping axis Y.

[0075] The motor means 100 can be connected to the main frame 1001, in particular to the protection casing 1002. For example, the motor means 10 can be connected to the protection casing 1002 by connecting means of known type, comprising, for example, a plate element 1004.

[0076] The movement group 1 further comprises a flexible driving member 11 connected to the, and movable by the, motor means 10.

[0077] The flexible driving member 11 can be chosen from a group comprising: a flat belt, a V-belt, a belt provided with grooves, a toothed belt, an articulated chain of roller type, an articulated chain of the Half link type.

[0078] The flexible driving member 11 can be made so as to be elastic.

[0079] The flexible driving member 11 is mounted closed in a loop, in particular outside the annular support frame 3.

[0080] The flexible dragging member 7 and the flexible driving member 11 are mounted so as to be separated and spaced mutually apart from one another.

[0081] The flexible dragging member 7 and the flexible driving member 11 are arranged, in particular, one above the other mutually spaced apart from one another vertically, i.e. in a vertical direction D substantially parallel to the vertical wrapping axis Y.

[0082] In the embodiment of a movement group 1 shown in the Figures, the flexible dragging member 7 is mounted below the flexible driving member 11 with respect to the vertical direction D, but in one embodiment that is not shown, the flexible dragging member 7 can be above the flexible driving member 11 with respect to the vertical direction D.

[0083] The movement group 1 further comprises motion transmitting means 12 arranged for transmitting the motion from the flexible driving member 11 to the flexible dragging member 7.

[0084] As disclosed above, the flexible dragging member 7 and the flexible driving member 11 are mounted spatially separate and the flexible driving member 11 does not drag the flexible dragging member 7 by friction. In this manner, possible wear to the flexible dragging member 7 and the flexible driving member 11 through mutual rubbing is avoided.

[0085] The motion transmitting means 12 can comprise a first portion arranged for coupling with the flexible dragging member 7 and a second portion arranged for coupling with the flexible driving member 11.

[0086] The first portion and the second portion are mounted separately and spaced mutually apart from one another so that the flexible dragging member 7 and the flexible driving member 11 are in turn mounted separated and spaced mutually apart from one another.

[0087] Owing to the motion transmitting means 12, in use, the operating group 100, that, as said, is connected stiffly to the flexible dragging member 7, is dragged around the vertical wrapping axis Y when the flexible dragging member 7 is moved around the vertical wrapping axis Y by the flexible driving member 11 by means of the motion transmitting means 12.

[0088] The motion transmitting means 12 can comprise a plurality of motion transmitting devices 13 distributed peripherally and outside the annular support frame 3. The motion transmitting devices 13 can be (equally) spaced apart angularly.

[0089] In particular, the flexible dragging member 7 and the flexible driving member 11 are mounted closed in a loop on at least one part of the motion transmitting devices 13. In particular, the flexible dragging member 7 and the flexible driving member 11 are mounted stretched on at least one part of the motion transmitting devices 13. The flexible dragging member 7 and the flexible driving member 11 are mounted to the motion transmitting means 12, in particular to at least one part of the motion transmitting devices 13, such that they are arranged on top of one another spaced mutually apart from one another vertically, i.e. in the vertical direction D substantially parallel to the vertical wrapping axis Y.

[0090] Each motion transmitting device 13 can comprise a shaft element 14 extending along an axis of vertical extent V substantially parallel to the vertical wrapping axis Y.

[0091] The shaft element 14 can be shaped substantially as a pin.

[0092] Each motion transmitting device 13 can further comprise a first revolving transmission element 15 that is rotatable around a first vertical rotation axis R1 and provided with a first lateral revolving surface 16 on which it is configured to engage a portion of inner surface 17 of the flexible dragging member 7.

[0093] When the flexible dragging member 7 is moved, portions of inner surface 17 slide progressively on the first lateral revolving surfaces 16 of the motion transmitting devices 13.

[0094] The first lateral revolving surfaces 16 of the motion transmitting devices 13 on which inner surface portions 17 of the flexible dragging member 7 engage define the first portion of the motion transmitting means 12.

[0095] Each first revolving transmission element 15

can comprise a pulley that is each chosen from a group comprising: a flat pulley, a V pulley, a pulley provided with grooves, a toothed pulley, a conical pulley.

[0096] The first revolving transmission elements 15 can have a different configuration from one another. In particular, each configuration can comprise pulleys of different type.

[0097] Each motion transmitting device 13 can further comprise a second revolving transmission element 18 that is rotatable around a second vertical rotation axis R2 and is provided with a second lateral revolving surface 19 on which it is configured to engage a portion of inner surface 21 of the flexible driving member 11.

[0098] The second lateral revolving surfaces 19 of the motion transmitting devices 13 define the second portion of the motion transmitting means 12.

[0099] Each second revolving transmission element 18 can comprise a pulley that is each chosen from a group comprising: a flat pulley, a V pulley, a pulley provided with grooves, a toothed pulley, a conical pulley.

[0100] The second revolving transmission elements 18 can have a different configuration from one another. In particular, each configuration can comprise pulleys of different type.

[0101] The first revolving transmission element 15 and the second revolving transmission element 18 are, in particular, splined on the shaft element 14 spaced vertically apart in the vertical direction D, i.e. a direction substantially parallel to the vertical wrapping axis Y.

[0102] For example, the first revolving transmission element 15 and the second revolving transmission element 18 are joined with the shaft element 14 by interlocking.

[0103] The axis of vertical extent V of the shaft element 14 and/or the first rotation axis R1 of the first revolving transmission element 15 and/or the second rotation axis R2 of the second revolving transmission element 18 can be substantially coincident.

[0104] The arrangement of the axes of the first revolving transmission elements 15 (first axes of rotation R1), and/or of the second revolving transmission elements 18 (second axes of rotation R2) of different transmitting devices 13, can be different in the motion transmitting devices 13.

[0105] In the embodiment of movement group 1 shown in the Figures, in each motion transmitting device 13, the axis of vertical extent V of the shaft element 14, the first rotation axis R1 of the first revolving transmission element 15 and the second rotation axis R2 of the second revolving transmission element 18 substantially coincide.

[0106] The plurality of motion transmitting devices 13 of the motion transmitting means 12 can be connected to the main frame 1001, in particular to the protection casing 1002. For example, an upper portion of each shaft element 14 can be connected, with connecting means of known type, to the protection casing 1002.

[0107] The first revolving transmission element 15 and the second revolving transmission element 18 can have different dimensions. In particular, the corresponding pulleys can have diameters that are different from one another and/or are different in the various motion transmitting devices 13.

[0108] In this manner, and owing to the spatial decoupling of the first revolving transmission element 15 and of the second revolving transmission element 18, i.e. owing to the fact that the first revolving transmission element 15 and the second revolving transmission element 18 are separated and spaced mutually apart from one another, it is possible to adjust independently the rotation speed of the flexible dragging member 7 and of the flexible driving member 11. The movement group 1 according to the invention is therefore rather versatile.

[0109] The movement group 1 further comprises a driving rolling element 22 connected, in particular mounted, to the motor means 10 to be rotated by the latter around a rotation axis T of the driving rolling element 22.

[0110] The driving rolling element 22 can comprise an outer rolling surface on which the flexible driving member 11 is configured to engage, in particular a portion of inner surface 21 of the flexible driving member 11.

[0111] The driving rolling element 22 can comprise a pulley chosen from a group comprising: a flat pulley, a V pulley, a pulley provided with grooves, a toothed pulley, a conical pulley.

[0112] The driving rolling element 22 and the motor means 10 are mounted outside the annular support frame 3 to avoid occupying the work zone L arranged inside the annular support frame 3 and in which the load 2 is locatable.

[0113] Owing to the location of the movement group 1, in particular of the driving rolling element 22 and of the motor means 10, outside the work zone L, it is possible to receive inside the ring-shaped supporting frame 3 a load 2 with great overall dimensions and not influenced by the presence of components of the movement group 1.

[0114] The movement group 1 can further comprise at least one return and diverting rolling element 23 that is freely rotatable around a rotation axis A and comprises a rolling surface 24 configured to engage a portion of outer surface 25 of the flexible driving member 11.

[0115] The outer surface 25 of the flexible driving member 11 and the inner surface 21 of the flexible driving member 11 are mutually opposite.

[0116] The portion of inner surface 21 faces the work zone L.

[0117] The movement group 1 can comprise a plurality of return and diverting rolling elements 23 freely rotatable around a respective rotation axis A and each comprising a respective rolling surface 24 configured to engage a portion of outer surface 25 of the flexible driving member 11.

[0118] Each rotation axis A can be arranged at a distance from the wrapping vertical axis Y greater than each axis of vertical extent V of the shaft elements 14.

[0119] The at least one or each return and diverting rolling element 23 can each comprise a pulley that is each chosen from a group comprising: a flat pulley, a V pulley, a pulley provided with grooves, a toothed pulley, a conical pulley.

[0120] The at least one or each return and diverting rolling element 23 can comprise, in particular, a first return and diverting rolling element 26 and a second return and diverting rolling element 27 so positioned with respect to the driving rolling element 22 that the flexible driving member 11 advances, near the driving rolling element 22, with a path having a substantially omega Ω plan shape.

[0121] The movement group 1 can further comprise at least one rolling return and spacing element 28 that is freely rotatable around a rotation axis B and comprises a rolling spacing surface 29 configured to engage a portion of inner surface 17 of the flexible dragging member 7.

[0122] The movement group 1 can comprise a plurality of return and spacing elements 28 each of which is freely rotatable around a respective rotation axis B and comprises a respective rolling spacing surface 29 configured to engage a portion of inner surface 17 of the flexible dragging member 7.

[0123] The rotation axis B of each rolling return and spacing element 28 can be arranged at a distance from the wrapping vertical axis Y greater than each axis of vertical extent V of the shaft elements 14.

[0124] The at least one or each rolling return and spacing element 28 is connected, in particular mounted, to the operating group 100. For example, the at least one or each rolling return and spacing element 28 is mounted to the frame element 106.

[0125] The at least one or each rolling return and spacing element 28 enables a portion of the flexible dragging member 7 to be spaced apart (spaced apart portion 30) from the vertical wrapping axis Y, near the zones in which the return and spacing elements 28 are located, i.e. near the operating group 100. The spaced apart portion 30 is spaced apart from the remaining portions of flexible dragging member 7. Owing to the spaced apart portion 30, it is avoided that components of the operating group 100 of large dimensions can hit the motion transmitting devices 13 when the operating group 100 is dragged by the flexible dragging member 7.

[0126] The flexible dragging member 7 can therefore not engage one or more of the first lateral revolving surfaces 16 when the spaced apart portion 30 reaches these first lateral revolving surfaces 16. In other words, the flexible dragging member 7 can be mounted closed in a loop on a part of the dragging devices 13, i.e. on only one part of the first lateral revolving surfaces 16. The first lateral revolving surfaces 16 which the flexible dragging member 7 engages vary during the movement of the operating group 100, i.e. on the basis of the positioning of the spaced apart portion 30 (and thus of the operating group 100).

[0127] The flexible driving member 11 can be mounted closed in a loop on all the dragging devices 13, i.e. on all the second lateral revolving surfaces 19.

[0128] Each rolling return and spacing element 28 can comprise a pulley that is each chosen from a group comprising: a flat pulley, a V pulley, a pulley provided with grooves, a toothed pulley, a conical pulley.

[0129] In one embodiment, like that illustrated in the Figures, the movement group 1 can comprise a first rolling return and spacing element 31 and a second rolling return and spacing element 32 mounted near and respectively upstream and downstream of the connecting element 8 with respect to the movement direction of the operating group 100 to enable the operating group 100 to be spaced apart from the motion transmitting means 12.

[0130] In use, in one example of operation, when a process has to be performed on the load 2 by the operating group 100, like a wrapping cycle of the load 2 with a wrapping film in order to apply a set number of wrapping coils of film to the load 2, the motor means 10 is driven, in particular rotated. This rotates the driving rolling element 22 around the rotation axis T thereof. Owing to the connection between the driving rolling element 22 and the flexible driving member 11, which flexible conducting member 11 is mounted with a portion of inner surface 21 thereof in contact engagement with the outer rolling surface of the driving rolling element 22, the flexible driving member 11 is moved.

[0131] Alternatively, the flexible driving member 11 can be moved by direct contact with the motor means 10.

[0132] In turn, the flexible driving member 11 rotates around the respective second vertical rotation axes R2 the second transmission rolling elements 18 which the flexible driving member 11 engages.

[0133] Owing to the shape of the transmitting devices 13, i.e. owing to the fact that each second rolling transmission element 18 and a respective first rolling transmission element 15 are splined on a respective shaft element 14, the rotation of the second transmission rolling elements 18 around the second vertical rotation axes R2 involves a resulting rotation of the first rolling transmission elements 15 around the respective first vertical rotation axes R1.

[0134] In turn, the first rolling transmission elements 15 transmit motion to the flexible dragging member 7 which the flexible dragging member 7 engages.

[0135] The flexible dragging member 7 accordingly drags, in particular rotationally, the operating group 100 to which it is stiffly connected. In this manner, the movement group 1 moves the operating group 100 around the vertical wrapping axis Y.

[0136] Owing to the fact that the movement group 1 does not have movable structures except for the operating group 100, which moves integrally with the flexible dragging member 7 to which it is directly connected, heavy moving masses are not present in the movement group 1 and therefore great inertia moments are not present. From what has been set out above, it is clear

that all the previously mentioned set objects are met.

[0137] What has been described and shown in the attached drawings, has been provided to illustrate the innovative features of the movement group 1.

[0138] Variations on and/or additions to what has been disclosed and illustrated in the attached drawings are possible.

Claims

1. Movement group (1) arranged for moving an operating group (100), in particular of a wrapping apparatus (1000), around a load (2), said movement group (1) comprising:

   - a single annular support frame (3) arranged for supporting said operating group (100), said operating group (100) being configured to be slidable on said annular support frame (3) so as to follow a trajectory around a vertical wrapping axis(Y) for wrapping said load (2) with a film; said annular support frame (3) being rotatably stationary;
   - a flexible dragging member (7) directly connected to and arranged for dragging, said operating group (100) around said load (2);
   - motor means (10) configured to advance said operating group (100) along said trajectory;
   - a flexible driving member (11) connected to, movable by, said motor means (10);

   said flexible dragging member (7) and said flexible driving member (11) being separated and spaced mutually apart from one another;

   said movement group (1) further comprising motion transmitting means (12) arranged for transmitting the motion from said flexible driving member (11) to said flexible dragging member (7).

2. Movement group (1) according to claim 1, wherein said motion transmitting means (12) comprises a first portion (16) arranged for coupling with said flexible dragging member (7) and a second portion (19) arranged for coupling with said flexible driving member (11), said first portion (16) and said second portion (19) being mounted separately and spaced mutually apart from one another.

3. Movement group (1) according to claim 1 or 2, wherein said motion transmitting means (12) comprises a plurality of motion transmitting devices (13) distributed peripherally and outside said annular support frame (3), said flexible dragging member (7) and said flexible driving member (11) being mounted closed in a loop on at least one part of said motion transmitting devices (13) such that said flexible dragging member (7) and said flexible driving member (11) are arranged on top of one another spaced mutually apart from one another vertically.

4. Movement group (1) according to claim 3, wherein each of said motion transmitting devices (13) comprises:

   - a shaft element (14) extending along an axis of vertical extent (V) substantially parallel to said vertical wrapping axis(Y);
   - a first revolving transmission element (15) that is rotatable around a first vertical rotation axis (R1) and provided with a first lateral revolving surface (16) on which a portion of inner surface (17) of said flexible dragging member (7) is configured to engage; and
   - a second revolving transmission element (18) that is rotatable around a second vertical rotation axis (R2) and provided with a second lateral revolving surface (19) on which a portion of inner surface (21) of said flexible driving member (11) is configured to engage; said first revolving transmission element (15) and said second revolving transmission element (18) being splined on said vertically spaced shaft element (14).

5. Movement group (1) according to claim 4, wherein in each motion transmitting device (13), said axis of vertical extent (V) of said shaft element (14), said first rotation axis (R1) of said first revolving transmission element (15) and said second rotation axis (R2) of said second revolving transmission element (18) substantially coincide.

6. Movement group (1) according to any one of the preceding claims, and further comprising a driving rolling element (22) connected to said motor means (10) to be rotated by the latter around a rotation axis (T), said driving rolling element (22) comprising an outer rolling surface on which a portion of inner surface (17) of said flexible driving member (11) is configured to engage.

7. Movement group (1) according to claim 6, wherein said driving rolling element (22) and said motor means (10) are mounted outside said annular support frame (3) so as to avoid occupying a work zone (L) arranged inside said annular support frame (3) in which said load (2) is locatable.

8. Movement group (1) according to any one of claims 4 to 7, as claim 6 is appended to claim 4 or 5, and is further freely rotatable comprising at least one return and diverting rolling element (23, 26) around a rotation axis (A) and comprising a rolling surface (24) configured to engage a portion of outer surface (25) of said flexible driving member (11), said rotation axis (A) being arranged at a distance from said wrapping

vertical axis (Y) that is greater than each axis of vertical extent (V) of said shaft elements (14).

9. Movement group (1) according to claim 8, and comprising at least one further return and diverting rolling element (23, 27), said return and diverting rolling element (23, 26) and said further return and diverting rolling element (23, 27) being positioned with respect to said driving rolling element (22) such that said flexible driving member (11) advances near said driving rolling element (22), with a path having a substantially omega Ω plan shape.

10. Movement group (1) according to any one of claims 4 to 9 as claim 6 is appended to claim 4 or 5, and further comprising at least one rolling return and spacing element (28, 31) that is freely rotatable around a rotation axis (B) and comprising a rolling spacing surface (29) configured to engage a portion of inner surface (17) of said flexible dragging member (7), said rotation axis (B) of said rolling return and spacing element (28) being arranged at a distance from said wrapping vertical axis (Y) greater than each axis of vertical extent (V) of said shaft elements (14) to enable said operating group (100) to be spaced apart from said motion transmitting means (12).

11. Movement group (1) according to claim 10, and further comprising a connecting element (8) arranged for connecting stiffly said operating group (100) to said flexible dragging member (7) and at least one further rolling return and spacing element (28, 32), said at least one rolling return and spacing element (28, 31) and said at least one further rolling return and spacing element (28, 32) being mounted near and, respectively, upstream and downstream of said connecting element (8) with respect to a movement direction of said operating group (100).

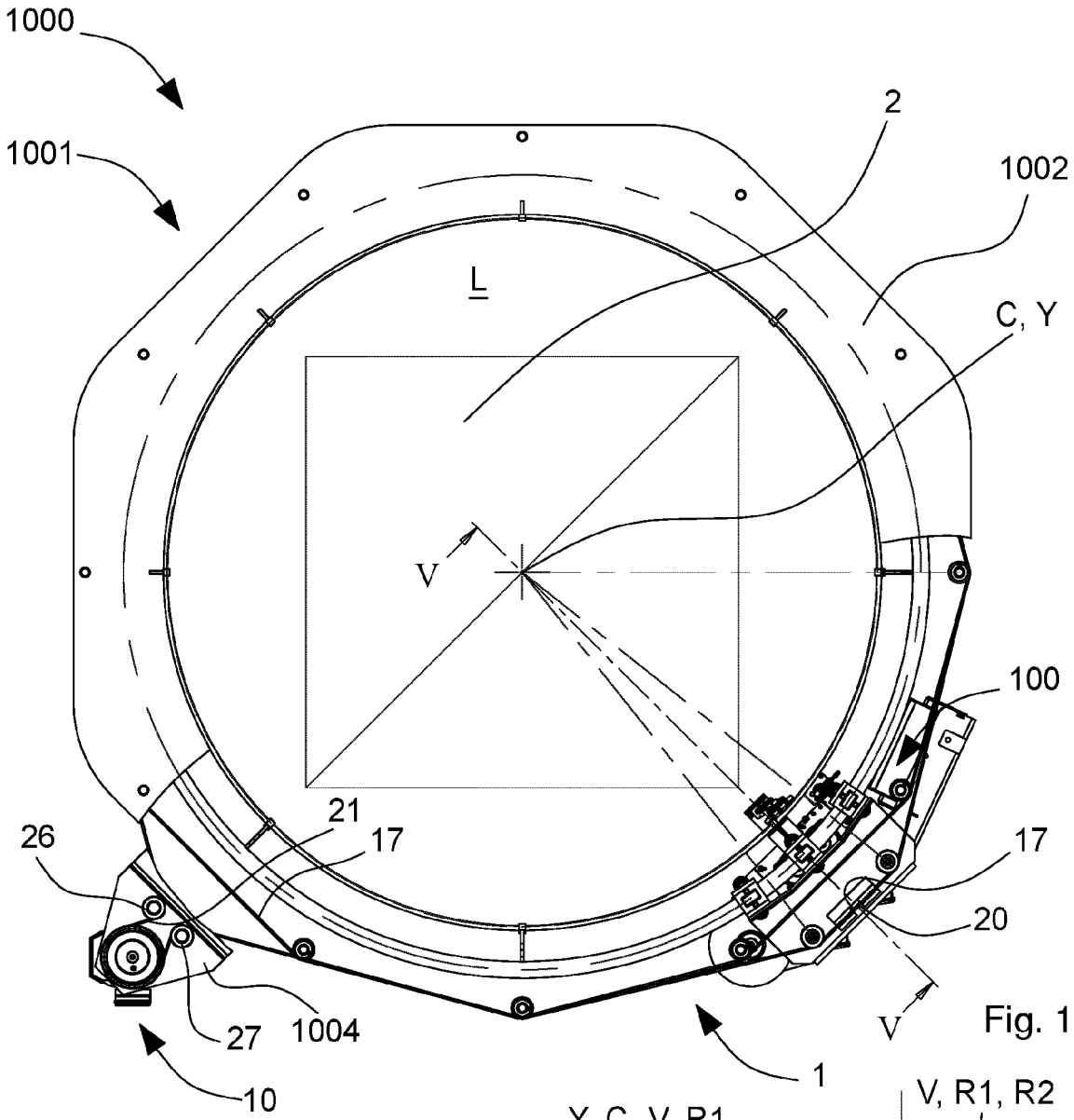
12. Movement group (1) according to any one of the preceding claims, wherein said flexible dragging member (7) and said flexible driving member (11) are each chosen from a group comprising: a flat belt, a V-belt, a belt provided with grooves, a toothed belt, an articulated chain of roller type, an articulated chain of the Half link type.

13. Movement group (1) according to any one of the preceding claims, wherein each first revolving transmission element (15), each second revolving transmission element (18), said driving rolling element (22), said at least one return and diverting rolling element (23, 26), said at least one further return and diverting rolling element (23, 27), said at least one rolling return and spacing element (28, 31) and said at least one further rolling return and spacing element (28, 32) can comprise a pulley, each pulley being chosen from a group comprising: a flat pulley, a V pulley, a pulley provided with grooves, a toothed pulley, a conical pulley.

14. Wrapping apparatus(1000) arranged for wrapping a film around a load comprising a main frame (1001), a movement group (1) according to any one of claims 1 to 13, and an operating group (100) connected stiffly to a flexible dragging member (7) of said movement group (1) to be dragged around a vertical wrapping axis (Y) when said flexible dragging member (7) is moved around said vertical wrapping axis (Y) by a flexible driving member (11) by means of motion transmitting means (12) of said movement group (1), wherein a plurality of motion transmitting devices (13) of said movement group (1) and a single annular support frame (3) arranged for supporting said operating group (100) are connected to said main frame (1001).

15. Wrapping apparatus (1) according to claim 14, wherein said operating group (100) comprises a support and unwinding group (101) for supporting and unwinding a reel (102) of said film by rotating said support and unwinding group (101) around said load (2) so as to apply a certain number of wrapping coils to said load (2), said support and unwinding group (101) comprising a carriage (103) provided with a plurality of idling rollers (104) arranged for sliding on said annular support frame (3) during said rotation.

16. Wrapping apparatus (1)according to claim 14 or 15, and further comprising a fixed frame, said annular support frame (3) being rotatably stationary and being connected to said fixed frame so as to be able to be movable along a substantially vertical direction so that the operating group (100) can apply a set number of wrapping coils of said film to a height of said load (2).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1001
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V
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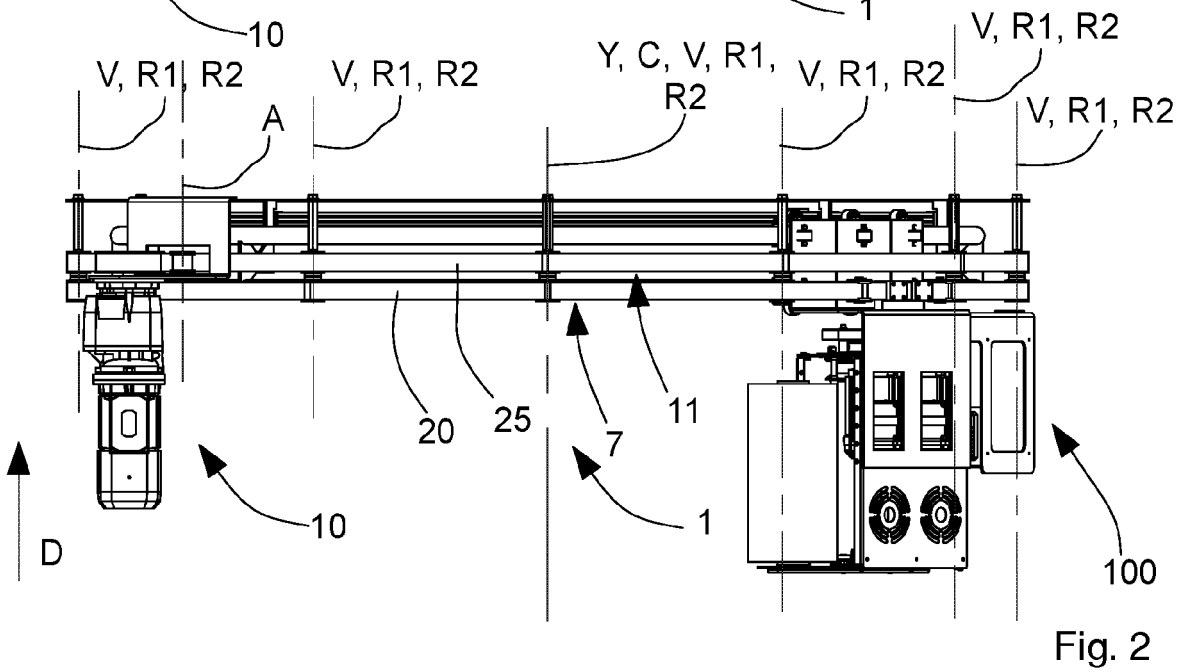
1004
V
10
1

Fig. 1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V, R1, R2
Y, C, V, R1, R2
V, R1, R2
V, R1, R2
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A
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7
11
10
1
D
100

Fig. 2

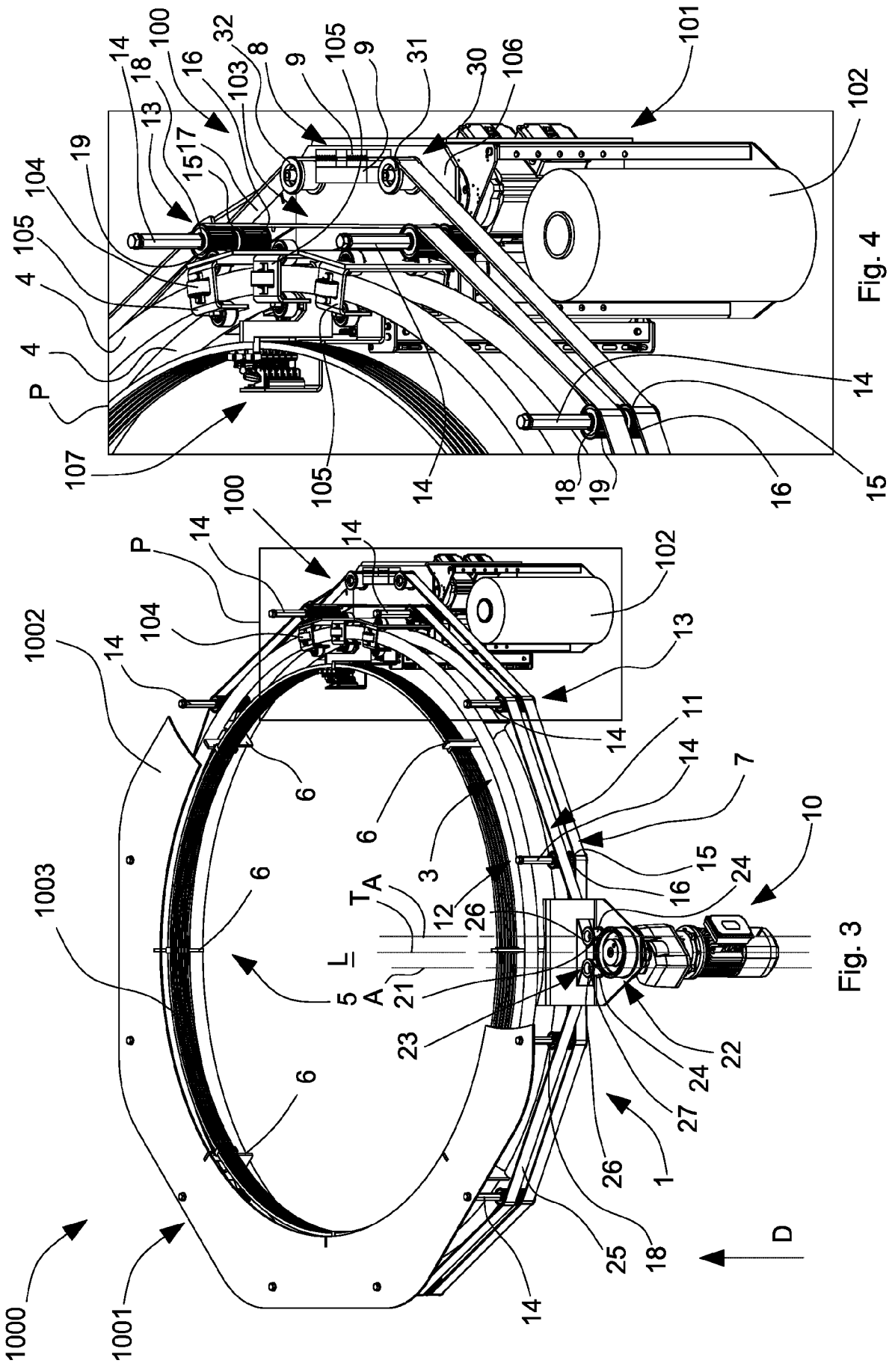
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Fig. 3

Fig. 4

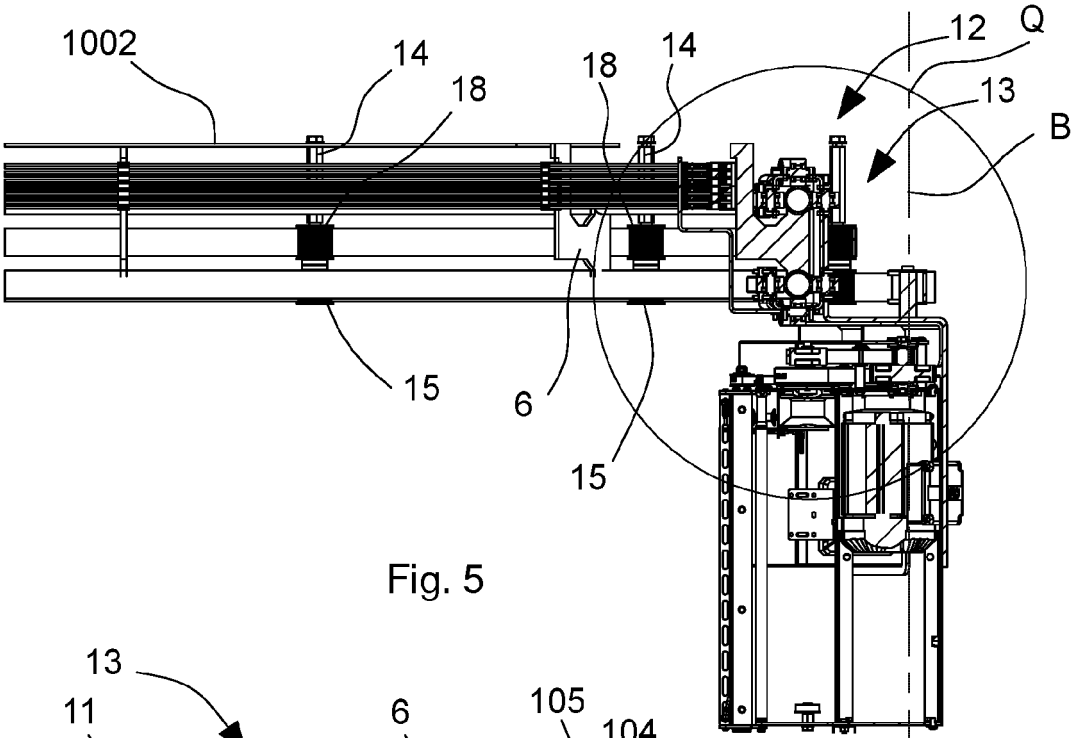
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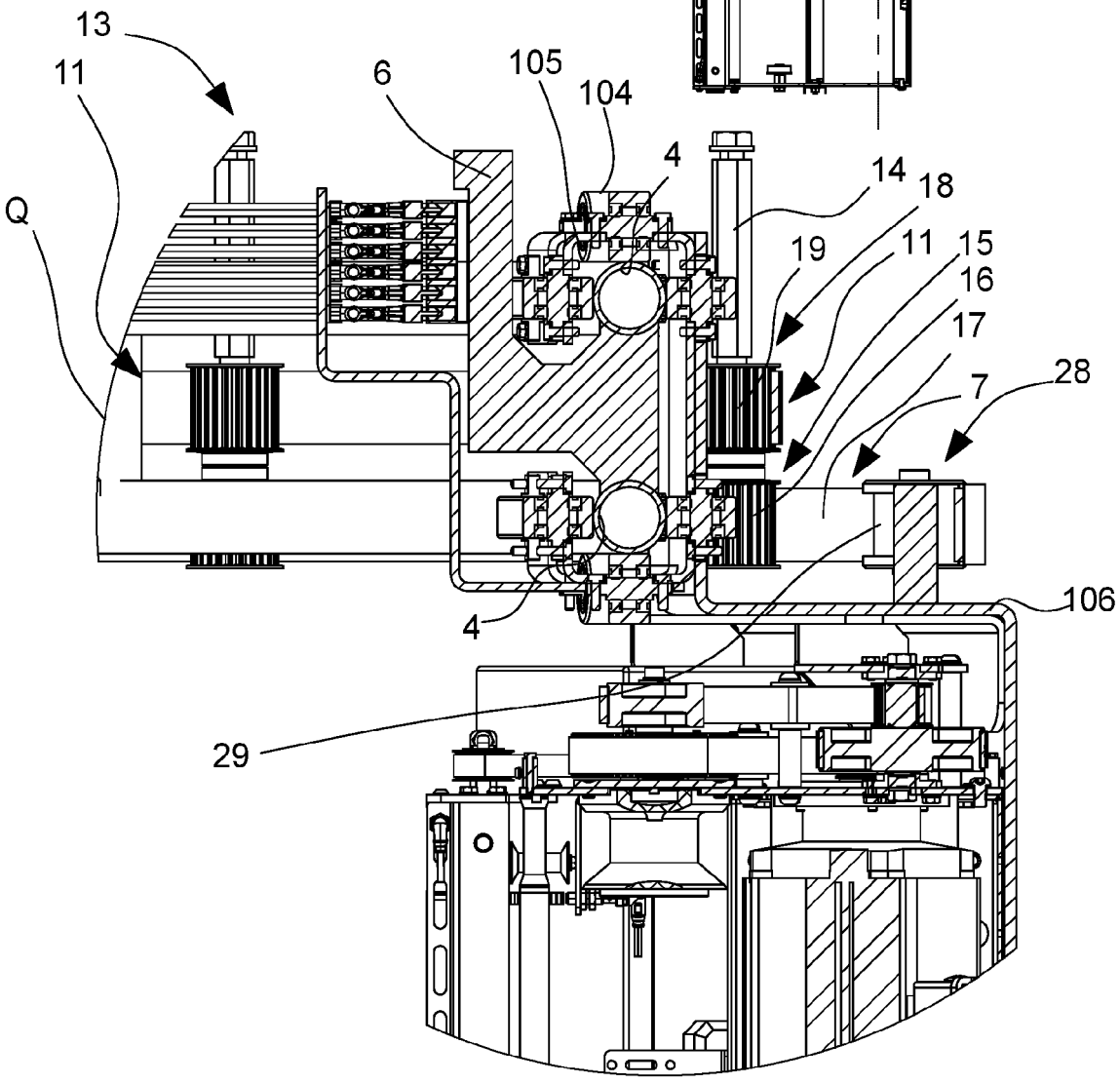
Fig. 5


13
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104
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Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 24 19 0531

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 January 2025	Damiani, Alberto

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07-01-2025

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