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(54) WRAPPING MACHINE FOR COVERING PALLETIZED LOADS

(57) Wrapping machine (1) for covering palletized loads (2) comprising a film-unwinding head (7) capable of moving around the palletized load (2) stationary on a pallet-supporting platform (4, 103, 107) along a substantially circular orbit; the film-unwinding head (7) comprising a load-bearing frame (15), a main reel-clamping member (16) that is structured so as to block a protective film reel (12) in an axially rotatable manner on the load-bearing frame (15), and a film-unwinding assembly (13) capable of progressively unwinding said first reel (12) and of letting the protective film (12') obtained by unwinding the reel (12) come out from the film-unwinding head (7); the film-unwinding assembly (13) comprising one or more traction rollers (24, 25) fixed in an axially rotatable manner on the load-bearing frame (15) side by side to one another and, for each traction roller (24, 25), at least one auxiliary idler pulley (28) that is arranged close to one of the two ends of the traction roller (24, 25) substantially coaxial to the traction roller (24, 25), and is capable of rotating freely about the rotation axis (24a, 25a) of the traction roller (24, 25) independently from the same traction roller (24, 25).

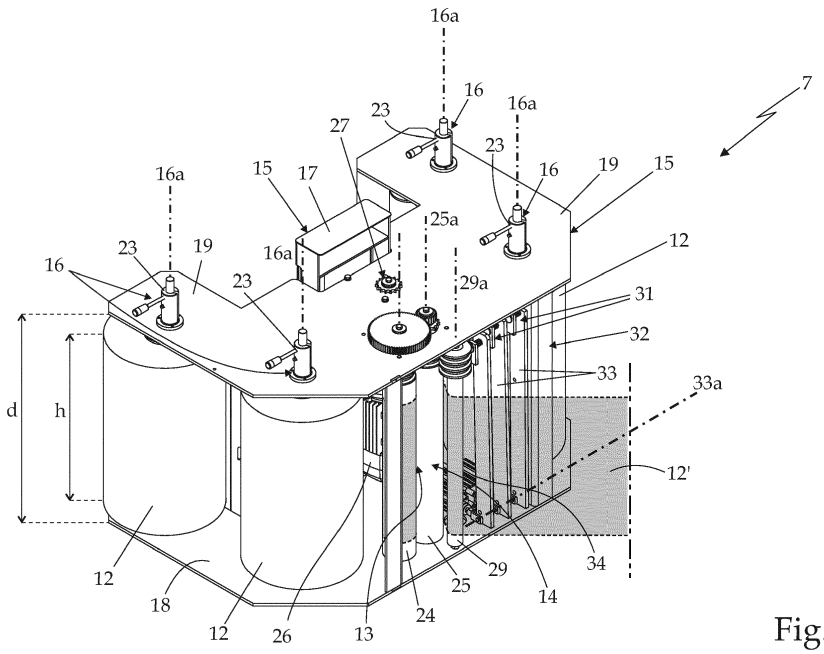

Fig. 2

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Description

[0001] The present invention relates to a wrapping machine for covering palletized loads.

[0002] More in detail, the present invention relates to a wrapping machine for wrapping palletized loads with protective film of a rotating platform type, to which the following description will make explicit reference without however losing in generality.

[0003] As known, a palletized load is made up of a series of orderly and compact layers of products such as boxes, jars, bottles, glass vases, cans, bags and the like, which are stacked one upon the other resting on a rectangular- or square- shaped pallet and are then wrapped with a protective film of plastic material (typically cellophane) so as to form, when packed, a single, easily transportable block.

[0004] The simpler wrapping machines currently on the market basically comprise: a ground-resting basement which is provided on the top with a rotatable horizontal pallet-supporting platform which is capable of rotating about a vertical rotation axis, and is structured so as to receive in abutment the palletized load to be wrapped with the protective film of plastic material; a load-bearing lateral column which cantilevered extends from the basement in vertical direction, next to the pallet-supporting platform; and finally a film-unwinding head which is slidingly mounted on the lateral column so as to move up and down parallel to the side of the palletized load stationary on the pallet-supporting platform, while the latter rotates slowly about the rotation axis of the pallet-supporting platform.

[0005] More in detail, the film-unwinding head is structured so as to accommodate therein a protective film reel of plastic material and is provided with a film-unwinding assembly which is capable of unwinding in a controlled manner the protective film reel and feed the resulting strip of protective film to the immediately-adjacent palletized load, so as to wrap the palletized load stationary on the pallet-supporting platform with a number of turns of protective film while the rotatable pallet-supporting platform slowly rotates on the ground-resting basement.

[0006] Unfortunately in the more modern and fast wrapping machines the depletion of the protective film reel generally occurs in less than one hour, thus the continuous functioning of the machine is subject to the permanent presence of an on-site attendant who must periodically load a new protective film reel inside the film-unwinding head.

[0007] In recent years, some manufacturers of wrapping machines with a rotatable pallet-supporting platform have thought of increasing the working range of this type of machine by producing film-unwinding heads capable of accommodating reels having a diameter twice or three times that of the reels normally used for these purposes. Unfortunately, the use of giant reels, traditionally called "jumbo", did not give the desired results because the giant reels have such great weight (nominal weight usually exceeds 20 kilograms) that the person in charge of supplying the wrapping machines needs the help of a pneumatic manipulator to be able to lift and place the reel in reasonable time inside the film-unwinding head, with the considerable increase of costs that follows.

[0008] Aims of the present invention is to provide a wrapping machine with rotatable pallet-supporting platform having a working range greater than that of the existing machines, without the disadvantages arising from the use of the giant reels.

[0009] In compliance with the above aims, according to the present invention there is provided a wrapping machine for covering palletized loads as defined in claim 1 and preferably, though not necessarily, in any of the dependent claims.

[0010] The present invention will be now described with reference to the accompanying drawings, which illustrate a non-limitative embodiment, wherein:

- Figure 1 is an isometric view of a wrapping machine for covering palletized loads realized according to the teachings of the present invention;
- Figures 2 and 3 are two isometric views, in enlarged scale and with parts removed for clarity, of the film-unwinding head of the wrapping machine shown in Figure 1;
- Figure 4 is an enlarged view, with parts removed for clarity, of a part of the film-unwinding head shown in Figure 2;
- Figure 5 is an enlarged view, with parts removed for clarity, of a part of the film-unwinding head shown in figure 3;
- Figure 6 is an isometric view of a second wrapping machine for covering palletized loads realized according to the teachings of the present invention; whereas
- Figure 7 is an isometric view of a third wrapping machine for covering palletized loads realized according to the teachings of the present invention.

[0011] With reference to Figure 1, number 1 indicates as a whole a wrapping machine for covering palletized loads and which is adapted to wrap in automated manner a preferably, though not necessarily, substantially parallelepiped-shaped, generic palletized load 2 with a series of turns of protective film made of plastic material or similar.

[0012] The wrapping machine 1 basically comprises: a basement 3 which is structured to stably rest on and preferably also to be rigidly anchored to the ground; a pallet-supporting platform 4, which is fixed to the basement 3 in a substantially horizontal position with the capability to rotate about a substantially vertical reference axis 4a, and is structured so as to receive in abutment the palletized load 2 to be wrapped with the protective film; and a preferably electrically- or hydraulically- operated, driving device 5 which is capable of rotating the pallet-supporting platform 4 about the rotation axis 4a.

[0013] Preferably, the rotatable pallet-supporting platform 4 moreover is substantially circular in shape, and is pivoted on basement 3 so as to be able to rotate about a rotation axis 4a arranged roughly at the center of the same pallet-supporting platform 4.

[0014] The pallet-supporting platform 4 and the corresponding driving device 5 are components already widely known in the field of wrapping machines and therefore won't be further described.

[0015] Again with reference to Figure 1, additionally the wrapping machine 1 also comprises a lateral load-bearing column 6 which is arranged in a substantially vertical position, at the side of the pallet-supporting platform 4; and a film-unwinding head 7 which is fixed to the lateral column 6 so as to face the rotatable pallet-supporting platform 4, and is structured so as to be able to supply a continuous strip of protective film to the palletized load 2 stationary on the adjacent pallet-supporting platform 4.

[0016] The film-unwinding head 7 is therefore movable with respect to the palletized load 2 stationary on the pallet-supporting platform 4 along a substantially circular orbit centered on rotation axis 4a of the pallet-supporting platform 4, and is capable of gradually winding the palletized load 2 stationary on the pallet-supporting platform 4 with a series of turns of protective film, while the pallet-supporting platform 4 slowly rotates on the basement 3 about rotation axis 4a.

[0017] In the example shown, in particular, the lateral column 6 is preferably fixed in rigid manner to the basement 3, and thus stands cantilevered from the basement 3 in a substantially vertical direction.

[0018] Preferably, the film-unwinding head 7 is moreover slidingly mounted on the lateral column 6 so as to move along the column 6, while remaining locally substantially parallel and faced to the side of the palletized load 2 stationary on the pallet-supporting platform 4; and the wrapping machine 1 additionally comprises a preferably electrically- or hydraulically-operated, second driving device 8 which is capable of moving the film-unwinding head 7 along the column 6 so as to vary, on command, the height of the film-unwinding head 7 with respect to the adjacent pallet-supporting platform 4.

[0019] With reference to Figure 1, preferably the wrapping machine 1 additionally comprises a film-catching clamp 9 which is located on the rotatable pallet-supporting platform 4, and is structured so as to selectively grasp and retain the flap of protective film coming out from the film-unwinding head 7.

[0020] Optionally the wrapping machine 1 is finally also provided with a welding head 10 which is preferably fixed to the end of a movable supporting arm 11 which is preferably, though not necessarily, fixed to the basement 3, and is structured to selectively bring the welding head 10 in abutment on the lateral side of the palletized load 2 stationary on the rotatable pallet-supporting platform 4, so that the welding head 10 can press the flap of protective film which is stretched between the film-unwinding head 7 and the palletized load 2, against the body of the same palletized load 2 stationary on the pallet-supporting platform 4, and then weld the same flap of protective film on the turns of protective film immediately below.

[0021] The driving device 8, the film-catching clamp 9, the welding head 10 and the movable supporting arm 11 are components which are already widely known in the field of wrapping machines and therefore won't be further described.

[0022] With reference to figures 1, 2 and 3, the film-unwinding head 7 is instead structured so as to accommodate inside itself a plurality of protective film reels 12 arranged side by side to one another, preferably each with its own longitudinal axis in a substantially vertical position, i.e. substantially parallel to the lateral column 6; and is moreover provided with a preferably electrically- or hydraulically- operated, motorized film-unwinding assembly 13 which is capable of unwinding, progressively and in a controlled manner, any one of the reels 12 located aboard of the film-unwinding head 7, and then feeding the protective film 12' obtained by unwinding the single reels 12 out of the film-unwinding head 7 through an opening or outlet passage 14.

[0023] More in detail, the film-unwinding head 7 comprises a load-bearing frame 15 which is cantilevered fixed to the lateral side of the column 6 directly facing the pallet-supporting platform 4, with the capability of sliding along the body of the column 6 from the top to the bottom; and a series of reel-clamping members 16 which are located on the load-bearing frame 15 side by side to one another, and are structured so as to selectively block on the load-bearing frame 15 each a single protective film reel 12, while allowing, at the same time, said reel 12 to freely rotate with respect to the frame 15 about a rotation axis 16a which is preferably locally substantially coincident with the longitudinal axis of the reel.

[0024] Preferably the rotation axis 16a of the reel is moreover arranged in a substantially vertical position.

[0025] In other words, each reel-clamping member 16 is preferably structured so as to block a protective film reel 12 on the load-bearing frame 15 in a stable, though easily releasable manner, while arranging the same reel 12 substantially coaxial with a reference axis 16a substantially vertical and while giving said reel 12 the possibility to freely rotate about said reference axis 16a.

[0026] With reference to figures 1, 2 and 3, in the example shown, in particular, the load-bearing frame 15 is preferably dimensioned so as to accommodate four protective film reels 12 arranged side by side to one another, with the longitudinal axis of each reel in a substantially vertical position.

[0027] Preferably the film-unwinding head 7 is moreover provided with four reel-clamping members 16 which are located on the load-bearing frame 15 side by side to one another, and each reel-clamping member 16 is structured so as to selectively block a single protective film reel 12 on the load-bearing frame 15, arranging said reel 12 substantially coaxial with a reference axis 16a locally

substantially vertical, and giving the same reel 12 the possibility to freely rotate with respect to the load-bearing frame 15 about said reference axis 16a.

[0028] More in detail, in the example shown the load-bearing frame 15 preferably comprises a central slide or track shoe 17 which is fixed in axially slidable manner to the lateral side of the column 6 directly facing the pallet-supporting platform 4, so as to move along the lateral column 6 parallel to the longitudinal axis 6a of the same column 6; and two protruding flat brackets 18 and 19 cantilevered extending from the central track show 17 towards the pallet-supporting platform 4, while remaining locally parallel and facing each other and preferably also substantially perpendicular to the longitudinal axis 6a of the column 6. Preferably the two protruding flat brackets 18 and 19 are therefore substantially parallel to the basement 3 and to the ground below.

[0029] The two horizontal flat brackets 18 and 19 are preferably also substantially U-shaped so as to partially encircle the lateral column 6, and are vertically spaced to one another so as to delimit/form a compartment adapted to receive a plurality of protective film reels 12 arranged side by side to one another (four reels 12 in the example shown), with the longitudinal axis of each reel 12 locally substantially perpendicular to the lying plane of brackets 18 and 19.

[0030] In other words, the distance d between the brackets 18 and 19 of load-bearing frame 15 is greater than the nominal height h of the single protective film reels 12.

[0031] With reference to Figures 2 and 3, the reel-clamping members 16 instead are preferably located on the load-bearing frame 15 substantially at the vertexes of a rectangle or of an isosceles trapezoid, so as to surround the side of the lateral column 6 directly facing the rotatable pallet-supporting platform 4.

[0032] Preferably each reel-clamping member 16 is moreover provided with two opposing movable jaws 20 and 21 which are arranged one on each protruding bracket 18, 19 of the load-bearing frame 15 so as to be reciprocally faced and locally substantially coaxial to axis 16a, and are overall structured so as to form a clamping device which is capable of grasping the core of the reel 12 and arranging said core substantially coaxial with the axis 16a. In addition the two movable jaws 20 and 21 are moreover structured so as to allow the reel 12 to freely rotate about the axis 16a.

[0033] With reference to Figures 2 and 3, in the example shown, in particular, the two movable jaws 20 and 21 are preferably made up of two self-centering chucks 20, 21 substantially ogival or truncated cone in shape and which cantilevered project from the brackets 18 and 19 while remaining coaxial with axis 16a, and are appropriately dimensioned so as to be able to fit into the two ends of the central tubular core (not shown) of the reel 12, placing the central tubular core of the reel 12 substantially coaxial with axis 16a.

[0034] The self-centering chuck 20 upwardly projecting from the lower flat bracket 18 is fixed in axially rotatable manner to the body of the lower flat bracket 18 so as to freely rotate about axis 16a. The self-centering chuck 21 downwardly projecting from the upper flat bracket 19, in turn, is fixed in axially rotatable and axially slidable manner to the body of the upper flat bracket 19 so as to freely rotate about axis 16a and simultaneously be capable of moving parallel to axis 16a to and from the lower flat bracket 18.

[0035] Preferably, the reel-clamping member 16 is additionally provided with an elastic element (not shown) structured to maintain, in elastic manner, the self-centering chuck 21 in a blocking position wherein the axial distance between the two self-centering chucks 20 and 21 assumes the minimum value; and a manually-operated drive mechanism 23 which is capable of axially moving the self-centering chuck 21 while overcoming, if present, the thrust of the elastic element, so as to block the self-centering chuck 21 in a release position wherein the axial distance between the two self-centering chucks 20 and 21 assumes the maximum value. Maximum value which is obviously greater than the nominal length of the central core (not shown) of the reel 12, i.e., the height h of the reel 12.

[0036] With reference to Figures 2, 3, 4 and 5, the film-unwinding assembly 13 is instead located on the load-bearing frame 15, between the reel-clamping members 16 and the outlet 14 from which the protective film 12' obtained by unwinding the reel 12 comes out, and comprises two traction rollers 24 and 25 which are fixed in axially rotatable manner to the load-bearing frame 15 of film-unwinding head 7 one next to the other; and an electric motor 26 or the like, which is preferably located on the load-bearing frame 15 close to the column 6, and is mechanically connected to the two traction rollers 24 and 25 preferably by means of a cascade of gears 27, of known type, so as to simultaneously rotate both traction rollers 24 and 25.

[0037] More in detail, the protective film 12' resulting from unwinding any of the reels 12 located on the edge of the film-unwinding head 7, is preferably wrapped in succession around both traction rollers 24 and 25 before coming out from the film-unwinding head 7, passing from a traction roller 24, 25 to the other at the gap between the two traction rollers 24 and 25.

[0038] Preferably, furthermore, the two traction rollers 24 and 25 and/or the cascade of gears 27 are suitably structured/ dimensioned so that the electric motor 26 can rotate the two traction rollers 24 and 25 with peripheral speeds slightly different to one another, so as to cause the stretching of the protective film 12' coming out from the film-unwinding head 7.

[0039] With reference to Figures 2 and 3, in the example shown, in particular, the two traction rollers 24 and 25 are preferably fixed in axially rotatable manner on the load-bearing frame 15, so that the respective rotation axes 24a and 25a are locally substantially parallel to the rotation axes 16a of the protective film reels 12 which are

retained in axially rotatable manner on the load-bearing frame 15 by the various reel-clamping members 16.

[0040] In other words, also rotation axes 24a and 25a of the two traction rollers 24 and 25 are preferably arranged in a substantially vertical position.

[0041] More in detail, in the example shown the two traction rollers 24 and 25 are interposed between the two horizontal flat brackets 18 and 19 of load-bearing frame 15, are locally substantially perpendicular to the horizontal flat brackets 18 and 19, and finally have the two axial ends pivoted in axially rotatable manner each on a respective bracket 18, 19 of the load-bearing frame 15.

[0042] Preferably, the peripheral surface of each traction roller 24, 25 is moreover covered with a layer of rubber or other slip-resistant elastomeric material.

[0043] With reference to Figures 2, 3, 4 and 5, the film-unwinding assembly 13 moreover comprises, for each traction roller 24, 25, one or more auxiliary idler pulleys 28, which are arranged side by side to one another, close to one of the two ends of the traction roller 24, 25, coaxial with the traction roller 24, 25, and are capable of freely rotating about the rotation axis 24a, 25a of the same traction roller 24, 25 in a way completely independent to one another and from the traction roller 24, 25.

[0044] More in detail, the auxiliary pulleys 28 are preferably fitted in a free axially rotatable manner on the body of the traction roller 24, 25, side by side to one another substantially at one of the two ends of the same traction roller 24, 25, so that each auxiliary pulley 28 can rotate about the rotation axis 24a, 25a of the traction roller 24, 25 in a completely independent manner from the traction roller 24, 25 and from the other auxiliary idler pulleys 28, and also remain stationary with respect to the load-bearing frame 15 while the traction roller 24, 25 rotates about its rotation axis 24a, 25a.

[0045] Each auxiliary pulley 28 fitted on the traction roller 24, is moreover substantially coplanar with a respective auxiliary pulley 28 fitted on the traction roller 25.

[0046] In other words the auxiliary pulleys 28 which are fitted on the traction roller 24, are locally adjacent to the auxiliary pulleys 28 which are fitted on the traction roller 25.

[0047] Preferably the number of auxiliary idler pulleys 28 idly fitted on each roller tractor 24, 25 is also equal to, or possibly greater than, the number of protective film reels 12 that simultaneously can be housed in the film-unwinding head 7 decreased by one unit, i.e. equal to the number of reel-clamping members 16 located on the film-unwinding head 7 decreased by one unit.

[0048] In other words, the film-unwinding head 7 is provided with a main reel-clamping member 16 which is structured so as to selectively block a protective film reel 12 in axially rotatable manner on the load-bearing frame 15, and one or more additional reel-clamping members 16 which are arranged beside the main reel-clamping member 16, and are structured so as to each selectively block a respective protective film reel 12 in axially rotatable manner on the load-bearing frame 15; and the number of auxiliary idler pulleys 28 arranged coaxial to each traction roller 24, 25 is equal to or greater than the number of additional reel-clamping members 16 located on the film-unwinding head 7.

[0049] With reference to Figures 4 and 5, in the example shown, in particular, the film-unwinding assembly 13 is provided with six auxiliary idler pulleys 28 equally distributed on the two traction rollers 24 and 25.

[0050] Three auxiliary pulleys 28 are idly fitted on the traction roller 24, preferably at roller axial end which is pivoted in axially rotatable manner onto the upper horizontal plate 19 of load-bearing frame 15. Three auxiliary pulleys 28 are idly fitted on the traction roller 25, preferably at roller axial end which is pivoted in axially rotatable manner on the upper horizontal plate 19 of load-bearing frame 15.

[0051] With reference to Figures 2, 3, 4 and 5, preferably the film-unwinding head 7 furthermore comprises at least one front guide roller 29, which is fixed in axially rotatable manner on the load-bearing frame 15 roughly at the outlet 14 from which the protective films 12' obtained by unwinding the reels 12 come out, i.e. downstream from the film-unwinding assembly 13, so as to freely rotate about a rotation axis 29a which is preferably substantially parallel to rotation axes 24a and 25a of the two traction rollers 24 and 25 and/or substantially parallel to the longitudinal axis 6a of lateral column 6.

[0052] In addition, the film-unwinding head 7 is preferably also provided with one or more auxiliary idler pulleys 30, which are arranged side by side to one another, close to one of the two ends of guide roller 29, coaxial to the guide roller 29, and are capable of freely rotating about the rotation axis 29a of the same roller 29 in a completely independent manner to another and from the guide roller 29.

[0053] More in detail, the auxiliary idler pulleys 30 are preferably fitted in a free axially rotatable manner on the body of the guide roller 29, side by side to one another substantially at one of the two ends of the same guide roller 29, so as to be locally substantially coplanar to the auxiliary idler pulleys 28 fitted in free axially rotatable manner on the two traction rollers 24 and 25.

[0054] Similarly to auxiliary pulleys 28, each auxiliary pulley 30 is therefore capable of rotating about rotation axis 29a of the guide roller 29 in a completely independent manner from the guide roller 29 and from the other auxiliary pulleys 30, and also to remain stationary with respect to the load-bearing frame 15 while the guide roller 29 rotates about its rotation axis 29a.

[0055] Each auxiliary pulley 30 is also substantially coplanar to a respective auxiliary pulley 28 fitted on the traction roller 24, and to a respective auxiliary pulley 28 fitted on the traction roller 25.

[0056] Preferably the number of auxiliary idler pulleys 30 coaxial to the guide roller 29 is also equal to, or possibly greater than, the number of auxiliary idler pulleys 28 arranged coaxial to each traction roller 24, 25.

[0057] In other words, the number of auxiliary pulleys

30 idly fitted on the guide roller 29 is equal to, or possibly greater than, the number of protective film reels 12 that can be housed, at the same time, in the film-unwinding head 7 decreased by one unit, i.e. equal to or greater than the number of additional reel-clamping members 16 located on the film-unwinding head 7.

[0058] With reference to Figures 2 and 3, in the example shown, in particular, the rotation axis 29a of front guide roller 29 is preferably substantially parallel to both rotation axes 24a and 25a of the two traction rollers 24 and 25, and also to the reference axes 16a of the various reel-clamping members 16.

[0059] In other words, rotation axis 29a of front guide roller 29 is preferably also substantially parallel to the rotation axes 16a of the protective film reels 12 which are retained in free axially rotatable manner on the load-bearing frame 15 by the various reel-clamping members 16.

[0060] More in detail, in the example shown the front guide roller 29 is preferably interposed between the two horizontal flat brackets 18 and 19 of the load-bearing frame 15 beside the traction rollers 24 and 25, is locally substantially perpendicular to the horizontal flat brackets 18 and 19, and finally has the two axial ends each pivoted in free axially rotatable manner about a respective horizontal bracket 18, 19 of the frame 15.

[0061] In addition, in the example shown the film-unwinding head 7 is preferably provided with three auxiliary pulleys 30, which are fitted in an idle manner on the front guide roller 29 at the axial end thereof which is pivoted in axially rotatable manner on the upper horizontal plate 19 of the load-bearing frame 15.

[0062] With reference to Figures 2, 3 and 4, preferably the film-unwinding head 7 is also provided with a series of film-catching members 31, each of which is located on the load-bearing frame 15 substantially beside the outlet passage 14 from which the various protective films 12' obtained by unwinding the reels 12 come out, i.e. on the side of the film-unwinding head 7 directly facing the pallet-supporting platform 4, and is structured so as to grasp and retain in a stable, though easily releasable manner, the end of any one of said protective films 12'. The film-catching members 31 are located on a preferably electrically- or hydraulically-operated, movable supporting structure 32 which is located aboard of the load-bearing frame 15 and is structured so as to be able, on command and selectively, to temporarily move any of the film-catching members 31 present on the film-unwinding head 7 close to the pallet-supporting platform 4.

[0063] More in detail, the movable supporting structure 32 is preferably structured so as to temporarily move any of the film-catching members 31 of the film-unwinding head 7 close to the pallet-supporting platform 4, so as to allow the film-catching clamp 9 of the pallet-supporting platform 4 to grasp and retain the ends of the protective film 12' retained by the same film-catching member 31 of the film-unwinding head 7.

[0064] Preferably, the number of film-catching members 31 present on the film-unwinding head 7 is also equal to, or possibly greater than, the number of protective film reels 12 that can be housed, at the same time, in the film-unwinding head 7 decreased by one unit, i.e. equal to or greater than the number of the additional reel-clamping members 16 present on the film-unwinding head 7.

[0065] More in detail, the number of film-catching members 31 is preferably equal to the number of auxiliary pulleys 28 idly fitted on each of the two traction rollers 24 and 25.

[0066] With reference to Figures 2, 3 and 4, in the example shown, in particular, the movable supporting structure 32 preferably comprises a series of movable arms 33 which are arranged side by side to one another, on the side of the film-unwinding head 7 directly facing the pallet-supporting platform 4. Each movable arm 33 has a first end hinged to the load-bearing frame 15 so as to freely rotate with respect to frame 15 about a transverse rotation axis 33a, and has attached to the second end a small clip 31 which is structured so as to grasp and retain in a stable, though easily releasable manner, the end of any one of said protective films 12'.

[0067] The clips at the ends of the movable arms 33 forms the film-catching members 31 of the film-unwinding head 7.

[0068] The movable supporting structure 32 additionally comprises a number of preferably electrically- or hydraulically- operated, driving devices 34 each of which is structured so as to rotate, on command, a respective movable arm 33 about its rotation axis 33a, between - an extracted position in which the movable arm 33 juts out of the film-unwinding head 7, so as to arrange the corresponding clip 31 close to the pallet supporting station 4; and - a retracted position in which the movable arm 33 is adherent to the lateral side of the film-unwinding head 7, so as to arrange the corresponding clip 31 beside the outlet passage 14 from which the protective films 12' obtained by unwinding the various reels 12 come out.

[0069] More in detail, with reference to Figures 2, 3 and 4, in the example shown the movable arms 33 of the movable supporting structure 32 are preferably arranged in a substantially vertical position, between the two protruding brackets 18 and 19 of load-bearing frame 15, so as to be locally substantially coplanar to one another. Each movable arm 33 has the lower end hinged on the lower bracket 18 of frame 15, close to the lateral edge of bracket 18 facing the pallet-supporting platform 4, so as to freely rotate about a horizontal rotation axis 33a locally substantially parallel to the lateral edge of the bracket 18, and preferably common to all movable arms 33; whereas the film-catching members 31 of the film-unwinding head 7 are preferably each fixed/arranged on the upper end of a respective movable arm 33.

[0070] Preferably, each movable arm 33 also has a nominal length rounding down the distance d between the two protruding brackets 18 and 19 of the load-bearing frame 15, so that the upper end of the movable arm 33 is substantially tangent to, or at least close to the, upper

bracket 19. In this way the film-catching members 31 of the film-unwinding head 7 are preferably horizontally aligned one after the other, immediately below the lateral edge of the upper bracket 19 facing the pallet-supporting platform 4.

[0071] The driving devices 34 of the movable supporting structure 32 are instead made up of a preferably electrically- or hydraulically- operated, series of linear actuators 34 each of which has one end integral with the lower bracket 18 of the load-bearing frame 15, and a second end integral with the body of the movable arm 33, so as to rotate on command its own movable arm 33 about the rotation axis 33a, between

- an upright position (see Figure 2) in which the movable arm 33 is vertically oriented so as to have its own clip 31 close to the upper bracket 18 of the load-bearing frame 15; and
- a lying position (see figure 3) in which the movable arm 33 is horizontally oriented so as to have its own clip 31 close to the pallet-supporting platform 4.

[0072] With reference to Figures 2 and 3, preferably the film-unwinding head 7 finally also comprises a series of auxiliary film-guiding rollers 35 which are fixed in axially rotatable manner on the load-bearing frame 15, upstream from the film-unwinding assembly 13, or between the film-unwinding assembly 13 and the reel-clamping member 16, so as to freely rotate about respective rotation axes preferably substantially parallel to the rotation axes 24a and 25a of the two traction rollers 24 and 25 and/or substantially parallel to the longitudinal axis 6a of the lateral column 6, and are suitably arranged so as to drive the protective films 12' which originate by unwinding the various reels 12 retained by the reel-clamping member 16 towards the traction rollers 24 and 25 of the film-unwinding assembly 13.

[0073] More in detail, in the example shown the auxiliary film-guiding roller 35 is preferably interposed between the two horizontal flat brackets 18 and 19 of the load-bearing frame 15, is locally substantially perpendicular to the horizontal flat brackets 18 and 19, and finally has the two axial ends pivoted in free axially rotatable manner each into a respective horizontal bracket 18, 19 of the frame 15.

[0074] In use, the person in charge of loading the wrapping machine 1 places the protective film reels 12 between the opposing movable jaws 20 and 21 of the various reel-clamping members 16, so as to fix each reel 12 to the load-bearing frame 15 with the capability to freely rotate about the reference axis 16a of the respective reel-clamping member 16.

[0075] Subsequently, the person in charge of loading the wrapping machine 1 manually unwinds the reel 12 retained in an axially rotatable manner by the main reel-clamping member 16, so as to obtain a strip of protective film 12' of a few meters in length, that the same person then manually wraps around any film-guiding roller/s 35, if provided, up to reach the film-unwinding assembly 13, and then, in sequence, wraps around the two tractor rollers 24 and 25 and around the front guide roller 29, until reaching the outlet opening or passage 14.

[0076] Once the strip of the protective film 12' comes out from the film-unwinding head 7 through the opening or passage 14, the person in charge of loading the wrapping machine 1 brings/ pulls the end of the protective film 12' up to the film-catching clamp 9 arranged on the rotatable pallet-supporting platform 4, and then firmly fixes the protective film 12' on the film-catching clamp 9.

[0077] Subsequently, the person in charge of loading the wrapping machine 1 manually unwinds the reel 12 retained in axially rotatable manner by each of the additional reel-clamping member 16, so as to obtain a strip of protective film 12' of a few meters of length, which is then thread-shaped twisted.

[0078] Subsequently, the same person manually winds the threadlike strip of protective film 12' around any film-guiding roller/s 35, if provided, up to reach the film-unwinding assembly 13, and then in sequence around one of the auxiliary pulleys 28 idly fitted on the traction roller 24, around one of the auxiliary pulleys 28 idly fitted on the traction roller 25, and finally around one of the auxiliary pulleys 30 idly fitted on the front guide roller 29, until reaching the outlet opening or passage 14.

[0079] Once the threadlike strip of protective film 12' comes out from the film-unwinding head 7 through the opening or passage 14, the person in charge of loading the wrapping machine 1 brings/pulls the end of the protective film 12' up to one of the film-catching members 31 arranged at the side of the outlet passage 14, on the side of the film-unwinding head 7 directly facing the pallet-supporting platform 4, and then firmly fixes the protective film 12' on the same film-catching members 31.

[0080] During the wrapping machine 1 operation, coinciding with the depletion of the reel 12 retained in rotatable manner by the main reel-clamping member 16, the wrapping machine 1 stops rotation of the pallet-supporting platform 4 while arranging the pallet film-catching clamp 9 in front of the film-unwinding head 7, and then operates the movable supporting structure 32 so as to bring one of the film-catching members 31 of the film-unwinding head 7 close to the pallet-supporting platform 4. All of this while the electric motor 26 continues to rotate the traction rollers 24 and 25.

[0081] The displacement/lowering of the film-catching members 31 towards the pallet-supporting platform 4 forces the threadlike strip of protective film 12' firstly to slide inside the auxiliary idler pulleys 28 and 30, and then to spontaneously slide outside of the groove of the various auxiliary pulleys 28 and 30 and the to stretch/spread on the tractor rollers 24 and 25 and on the front guide roller 29, thus occupying the position vacated by the strip of the protective film 12' originated by unwinding the reel 12 retained by the main reel-clamping member 16.

[0082] When the film-catching member 31 arrives close to the pallet-supporting platform 4, the wrapping

machine 1 actuates the film-catching clamp 9 so as to grasp and retain the end of the protective film 12' retained by the same film-catching member 31, and then operates the movable supporting structure 32 so as to return the same film-catching member 31 close to the side of the film-unwinding head 7, leaving the ends of the threadlike strip of protective film 12' attached to the film-catching clamp 9.

[0083] After the film-catching clamp 9 has stably grabbed the threadlike strip of protective film 12', the wrapping machine 1 starts again rotation of the pallet-supporting platform 4 about axis 4a, dragging therewith the strip of protective film 12' which completes the spreading on the tractor rollers 24 and 25 and on the front guide roller 29.

[0084] The advantages deriving from the possibility of housing a plurality of standard size protective film reels 12 (or weighing less than 20 kg), inside the film-unwinding head 7, are remarkable.

[0085] Firsly, the wrapping machine 1 is capable of operating continuously for a significantly longer time than the currently known machines, thus it does not require the permanent presence of an attendant on site, with the savings that this entails.

[0086] Furthermore, given that the film-unwinding head 7 houses protective film reels 12 of standard dimensions, the loading of the wrapping machine 1 can be done manually by a person, without the aid of machinery for lifting and handling the protective film reels 12, with the substantial economic benefits that this entails.

[0087] Finally it is clear that the wrapping machine 1 for covering palletized loads described above can be modified and varied without departing from the scope of the present invention.

[0088] For example, the electric motor 26 may be connected to only one of the two traction rollers 24 and 25 while the other is idle, or each traction roller 24, 25 can be rotated by its own electric motor 26.

[0089] In a different embodiment not shown, also, the film-unwinding head 7 may be devoid of the movable supporting structure 32, while the wrapping machine 1 can be provided with a movable gripping structure which is capable of grasping any protective film 12' temporarily retained by the film-catching members 31 on the lateral side of the film-unwinding head 7, and then pulling said protective film 12' close to the pallet-supporting platform 4.

[0090] In other words, the film-catching members 31 are immovably fixed on the left side of the film-unwinding head 7, and the wrapping machine 1 is provided with an articulated arm or other similar mobile structure, which is located on the basement 3 next to the pallet-supporting platform 4, or directly on the pallet-supporting platform 4, and is structured so as to be able to grasp any one of the protective films 12' retained by the film-catching members 31 on the lateral side of the film-unwinding head 7, and then to pull the end of the same protective film 12' up to the film-catching clamp 9 located on the pallet-supporting platform 4.

[0091] More in detail, this articulated arm is provided with a gripping head capable of stably grasping and retaining the ends of any of the protective films 12' retained by the film-catching members 31 on the lateral side of the film-unwinding head 7; and is structured so as to be able to place said gripping head close to any of the film-catching members 31 of the film-unwinding head 7 so as to grasp the corresponding protective film 12', and then to move the gripping head close to the film-catching clamp 9 of the pallet-supporting platform 4, so as to pull the end of the protective film 12' close to the film-catching clamp 9, which is then capable of stably grasping and retaining the same protective film 12'.

[0092] With reference to Figure 6, in a further embodiment of wrapping machine 1, the film-unwinding head 7 can be slidingly fixed to the vertical straight section of an inverted L-shaped supporting arm 101 which is hung in axially rotatable manner below a large gantry structure 102 which, in turn, is arranged astride of a fixed pallet-supporting platform 103 specifically structured for receiving in abutment the palletized load 2 to be wrapped with the protective film.

[0093] In this embodiment, the pallet-supporting platform 103 is therefore stationary with respect to the portal structure 102, and is preferably structured so as to be rigidly anchored to the ground.

[0094] The vertical rectilinear portion of supporting arm 101 is arranged vertically, next to the pallet-supporting platform 103; while the upper horizontal portion of the supporting arm 101 is pivoted on the horizontal crosspiece of the gantry structure 102, so that the entire supporting arm 101 can freely rotate below the gantry structure 102 about a substantially vertical, rotation axis 101a which is also locally parallel to and spaced apart from the vertical portion of the same supporting arm 101.

[0095] The vertical rectilinear portion of supporting arm 101 therefore moves underneath the horizontal crosspiece of the gantry structure 102, following a circular path centered on rotation axis 101a.

[0096] The pallet-supporting platform 103 is instead aligned with the rotation axis 101a of supporting arm 101, so that the film-unwinding head 7 moves around the palletized load stationary on the pallet-supporting platform 103, following a circular orbit which is substantially centered on the same pallet-supporting platform 103.

[0097] Obviously, the wrapping machine 1 is provided with a first, preferably electrically- or hydraulically- operated, driving system structured for driving into rotation the supporting arm 101 about rotation axis 101a; and a second, preferably electrically- or hydraulically- operated, driving system structured to move the film-unwinding head 7 along the rectilinear vertical portion of supporting arm 101, so as to vary the height of the film-unwinding head 7 with respect to the pallet-supporting platform 103.

[0098] In addition, with reference to Figure 6, in a further embodiment of the wrapping machine 1, the film-unwinding head 7 can be fixed/hanged cantilevered and

in eccentric position underneath a large annular load-bearing member which has a diameter preferably greater than 2-3 meters, and is fitted in axially rotatable manner inside an annular supporting structure 105, which is fixed in horizontal position to the vertical uprights of a gantry structure 106 which, in turn, is arranged astride of a fixed pallet-supporting platform 107 specifically structured for receiving in abutment the palletized load 2 to be wrapped with the protective film.

[0099] Also in this embodiment, the pallet-supporting platform 107 is therefore structured to stably rest and preferably also be rigidly anchored to the ground.

[0100] The film-unwinding head 7 is capable of moving underneath the annular supporting structure 105, along a circular orbit that is locally coaxial with the annular supporting structure 105; while the annular supporting structure 105 is fixed in a vertically slidable manner to the vertical uprights of the gantry structure 106, so as to vary its height from the pallet-supporting platform 107 below.

[0101] The pallet-supporting platform 107 is instead arranged below the annular supporting structure 105 substantially coaxial to the latter, so that the film-unwinding head 7 can move around the palletized load stationary on the pallet-supporting platform 107 following a circular orbit which is substantially centered on the pallet-supporting platform 107.

[0102] Obviously, also in this third embodiment the wrapping machine 1 is provided with a first, preferably electrically- or hydraulically- operated, driving structured for driving into rotation the annular load-bearing member inside the annular support structure 105; and a second, preferably electrically-or hydraulically- operated, driving system structured to move the annular support structure 105 along the vertical uprights of the portal structure 106, so as to vary the height of the annular support structure 105 with respect to the pallet-supporting platform 107 below.

Claims

1. Wrapping machine (1) for covering palletized loads (2) comprising a pallet-supporting platform (4, 103, 107) structured for receiving in abutment the palletized load (2) to be wrapped with the protective film, and a film-unwinding head (7) capable of moving around the palletized load (2) stationary on the pallet-supporting platform (4, 103, 107) along a substantially circular orbit;
the film-unwinding head (7) comprising a load-bearing frame (15), a main reel-clamping member (16) structured so as to be able to block a reel of protective film (12) in axially rotatable manner on the load-bearing frame (15), and a film-unwinding assembly (13) capable of progressively unwinding said first reel (12) and of feeding the protective film (12') obtained by unwinding the reel (12) out of the film-unwinding head (7);
the film-unwinding assembly (13) comprising one or more traction rollers (24, 25) fixed in axially rotatable manner on the load-bearing frame (15) side by side to one another, and a motor (26) adapted to rotate at least one of said traction rollers (24, 25);
the wrapping machine (1) being **characterised in that** the film-unwinding head (7) moreover comprises one or more supplementary reel-clamping members (16) each of which is structured so as to be able to block a respective reel of protective film (12) in axially rotatable manner on the load-bearing frame (15), and **in that** the film-unwinding assembly (13) comprises, for each traction roller (24, 25), one or more first auxiliary idler pulleys (28) located close to one of the two ends of the traction roller (24, 25), substantially coaxial to the traction roller (24, 25), and are capable of rotating freely about the rotation axis (24a, 25a) of the traction roller (24, 25) independently from one another and from the same traction roller (24, 25).

2. Wrapping machine according to claim 1, **characterised in that** said first auxiliary idler pulleys (28) are fitted in axially rotatable manner on the body of the traction roller (24, 25), side by side to one another substantially at one of the two ends of the same traction roller (24, 25).

3. Wrapping machine according to claim 1 or 2, **characterised in that** the number of first auxiliary idler pulleys (28) arranged coaxial to each traction roller (24, 25) is greater than or equal to the number of supplementary reel-clamping members (16) present on the film-unwinding head (7).

4. Wrapping machine according to any one of the preceding claims, **characterised in that** the film-unwinding head (7) is moreover provided with one or more film-catching members (31) which are located on the load-bearing frame (15) substantially at the side of the outlet (14) from which the protective films (12') obtained by unwinding of the reels (12) come out, and are structured so as to be able to each grasp and retain the end of a protective film (12').

5. Wrapping machine according to claim 4, **characterised in that** the film-unwinding head (7) is moreover provided with movable supporting means (32) which are capable of moving any one of said film-catching members (31) close to the pallet-supporting platform (4).

6. Wrapping machine according to claim 4, **characterised by** also comprising a movable gripping structure which is capable of grasping any one of the protective films (12') temporarily retained by the film-catching members (31) of the film-unwinding head (7), and then pulling said protective film (12') close

to the pallet-supporting platform (4).

7. Wrapping machine according to claim 4, 5 or 6, **characterised in that** the number of film-catching members (31) is greater than or equal to the number of supplementary reel-clamping members (16) present on the film-unwinding head (7).

8. Wrapping machine according to any one of the preceding claims, **characterised in that** the film-unwinding head (7) moreover comprises at least one guide roller (29) which is fixed in axially rotatable manner on the load-bearing frame (15) approximately at the outlet (14) from which the protective films (12') obtained by unwinding the reels (12) come out from the film-unwinding head (7).

9. Wrapping machine according to claim 8, **characterised in that** the rotation axis (29a) of said guide roller (29) is substantially parallel to the rotation axes (24a, 25a) of the traction rollers (24,25) of the film-unwinding assembly (13).

10. Wrapping machine according to claim 8 or 9, **characterised in that** the film-unwinding head (7) moreover comprises one or more second auxiliary idler pulleys (30) which are located close to one of the two ends of the guide roller (29), substantially coaxial to the guide roller (29), and are capable of rotating freely about the rotation axis (29a) of the same guide roller (29) in a completely independent manner from one another and from the guide roller (29).

11. Wrapping machine according to claim 10, **characterised in that** said second auxiliary idler pulleys (30) are fitted in freely axially rotatable manner on the body of the guide roller (29), side by side to one another substantially at one of the two ends of the same guide roller (29).

12. Wrapping machine according to claim 10 or 11, **characterised in that** said second auxiliary idler pulleys (30) are locally substantially coplanar to said first auxiliary idler pulleys (28).

13. Wrapping machine according to claim 10, 11 or 12, **characterised in that** the number of second auxiliary idler pulleys (30), is greater than or equal to the number of first auxiliary idler pulleys (28) arranged coaxial to each traction roller (24, 25).

14. Wrapping machine according to any one of the preceding claims, **characterised in that** the film-unwinding assembly (13) comprises two traction rollers (24, 25) which are fixed in axially rotatable manner on the load-bearing frame (15) so as to be locally substantially parallel; and the motor (26) is mechanically connected to both traction rollers (24, 25) so as rotate the two traction rollers (24, 25) with different peripheral speeds.

15. Wrapping machine according to any one of the preceding claims, **characterised in that** the film-unwinding head (7) is fixed in vertically slidable manner on a supporting structure (6, 101) that flanks the pallet-supporting platform (4,103); the wrapping machine (1) being also provided with driving means (8) capable of moving the film-unwinding head (7) along said support structure (6, 101), so as to move the film-unwinding head (7) parallel to the side of the palletized load (2) stationary on the pallet-supporting platform (4, 103).

16. Wrapping machine according to claim 15, **characterised in that** the supporting structure (101) is movable around the pallet-supporting platform (4, 103) along a substantially circular orbit.

17. Wrapping machine according to any one of claims 1 to 14, **characterised in that** the film-unwinding head (7) is mounted movably on an annular supporting structure (105) arranged in a substantially horizontal position, above the pallet-supporting platform (107); the film-unwinding head (7) being capable of moving on the annular supporting structure (105) along a substantially circular orbit that surrounds the pallet-supporting platform (107); the annular supporting structure (105) instead being movable in vertical direction so as to be able to vary the height from the pallet-supporting platform (107) below.

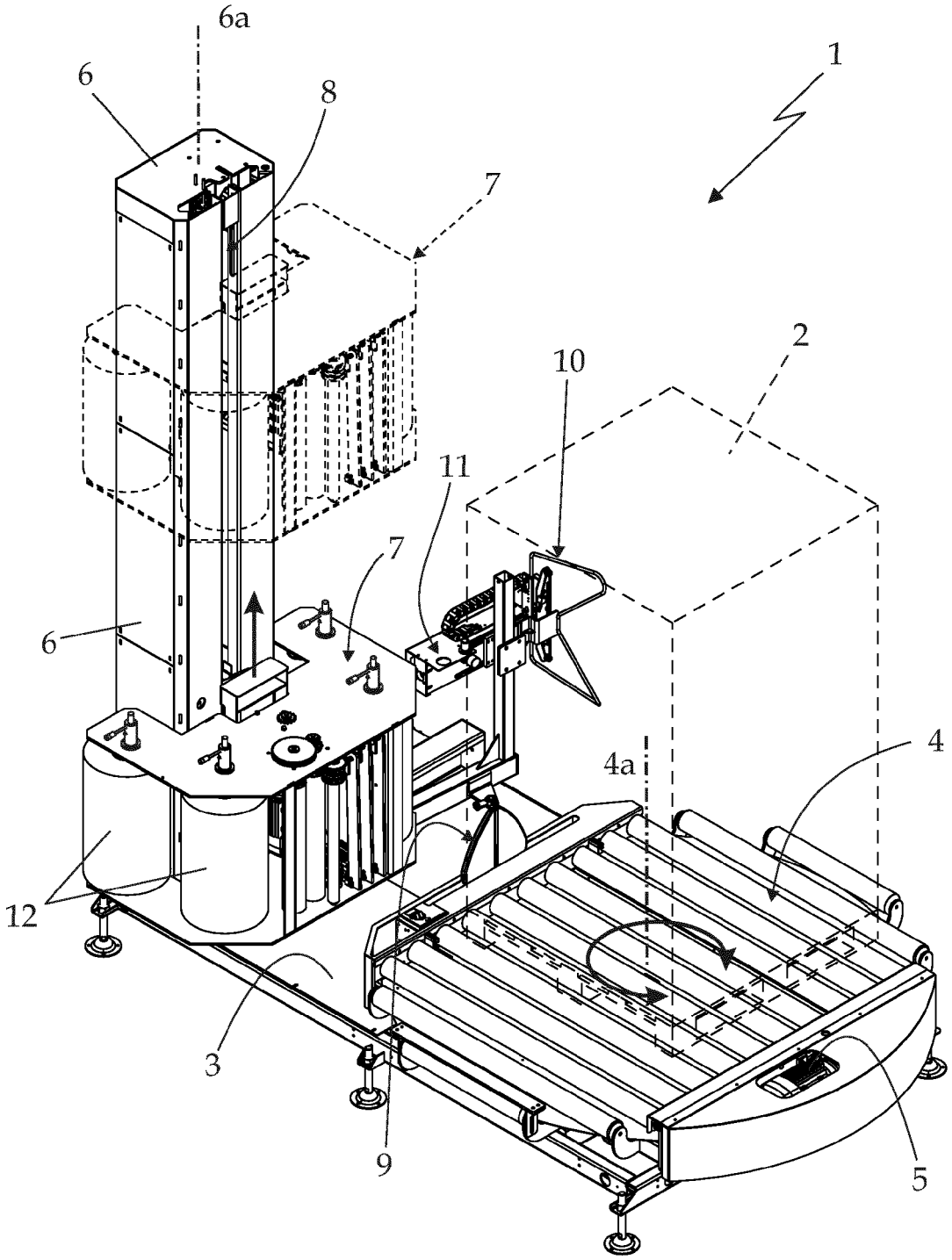
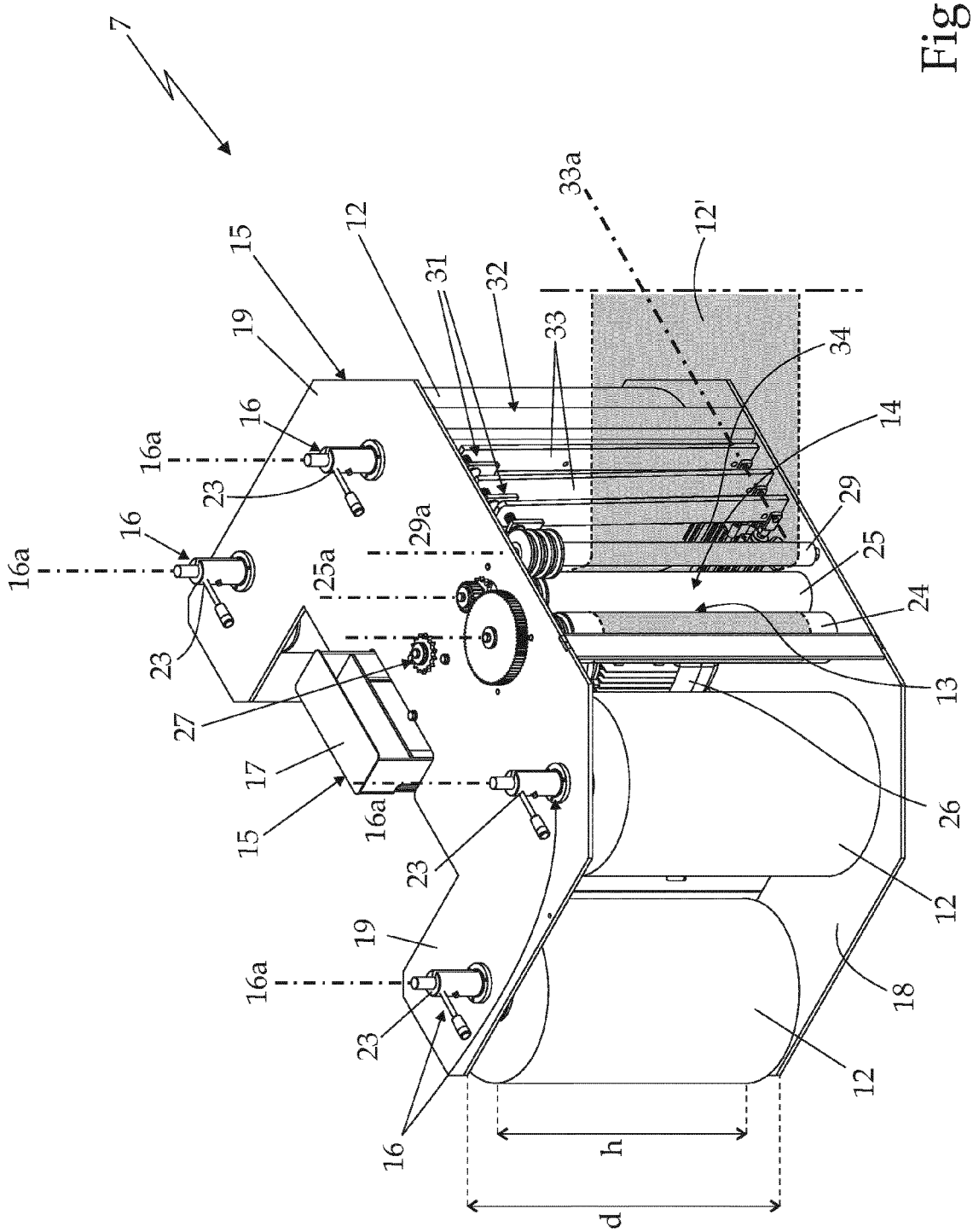


Fig. 1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12'
12
15
31
32
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34
16
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16a
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Fig. 2

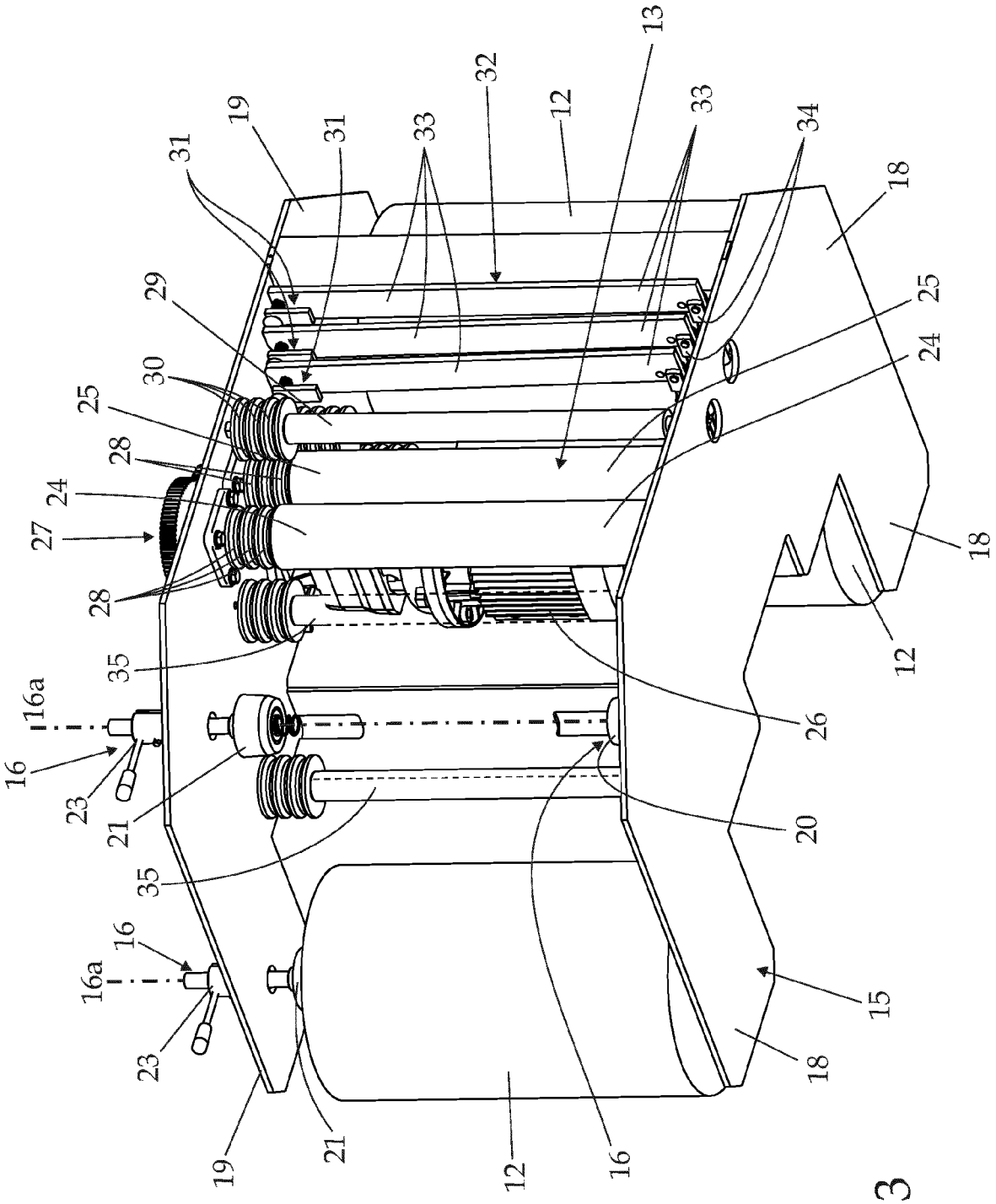
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Fig. 3

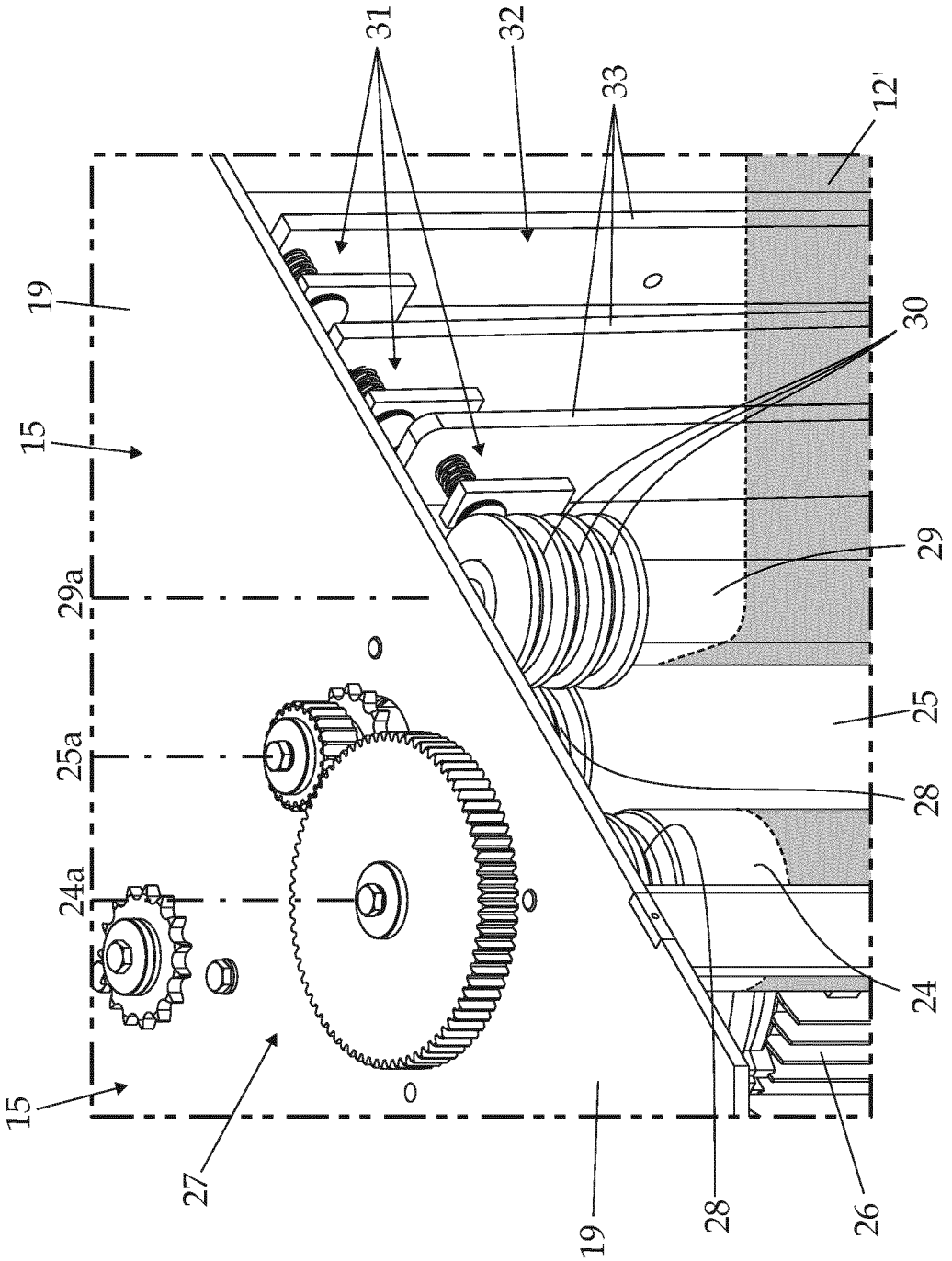

Fig. 4

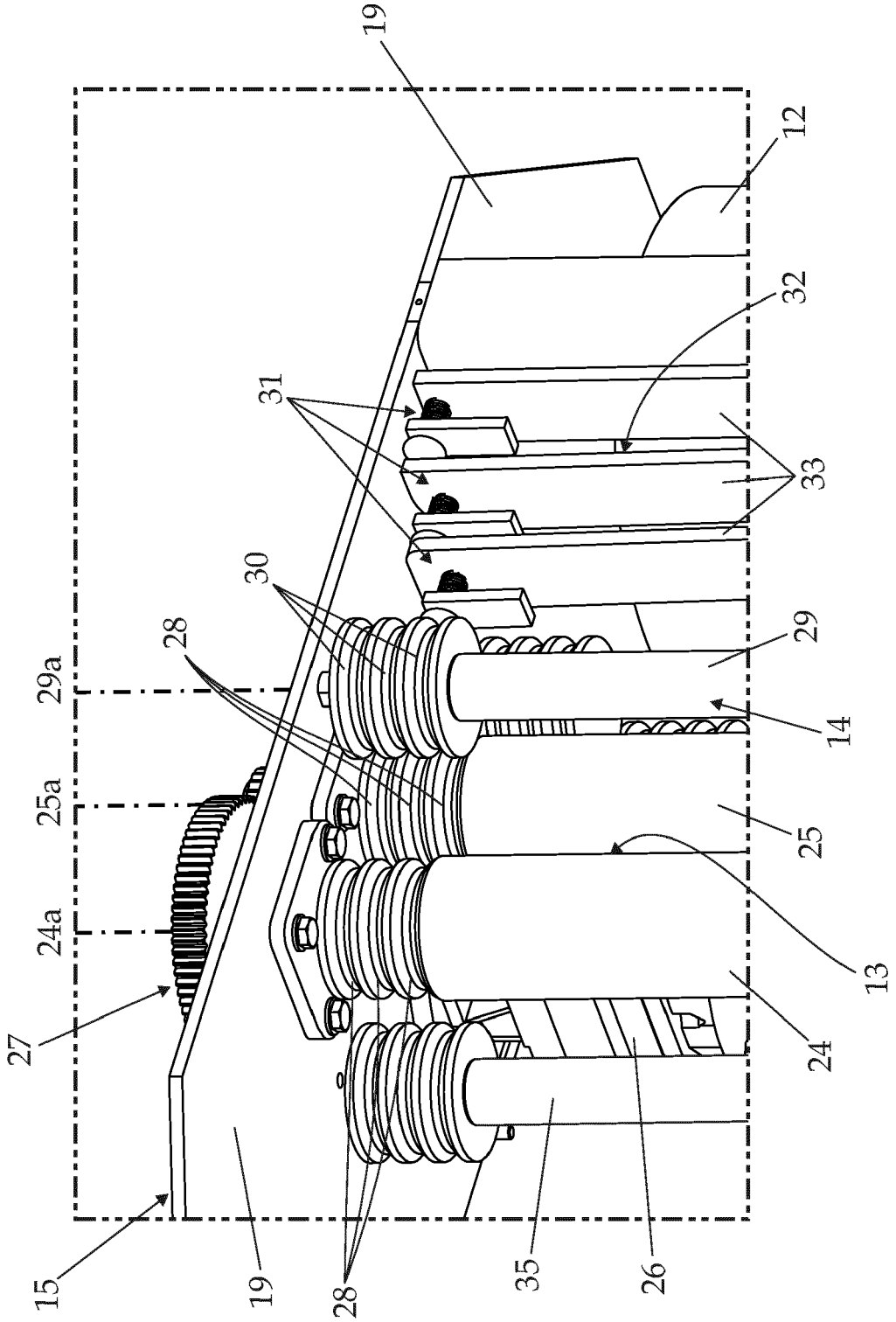

Fig. 5

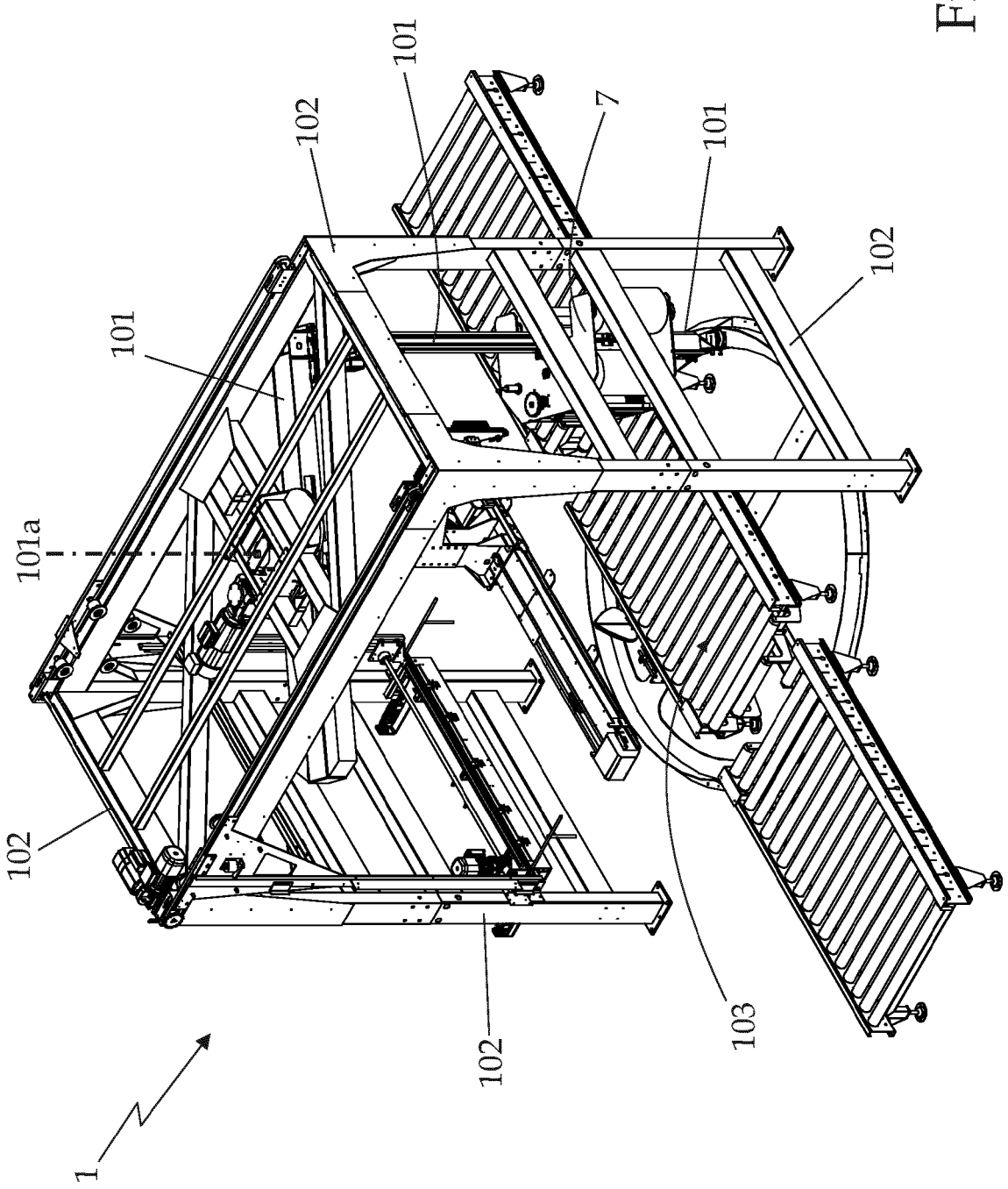

Fig. 6

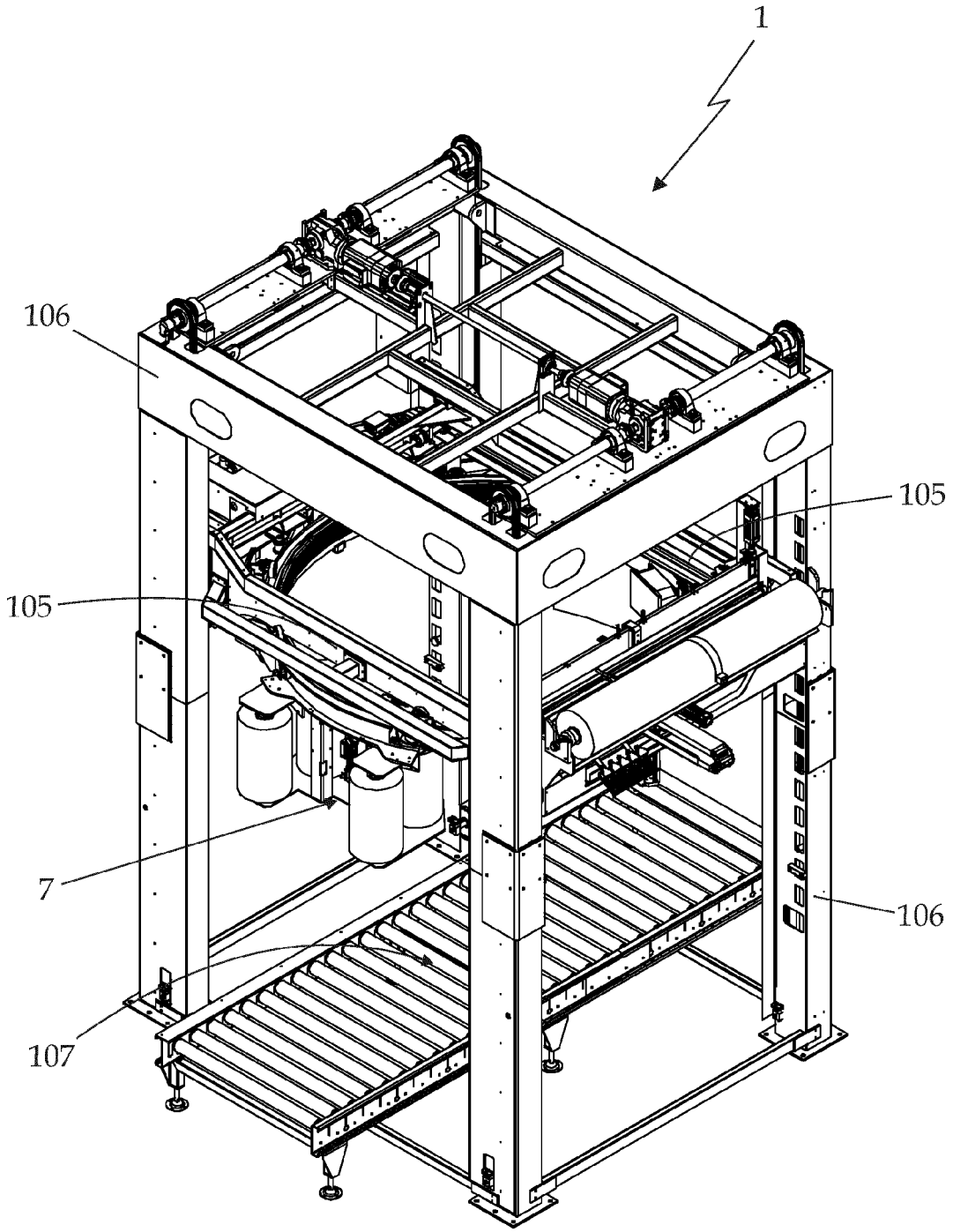

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 5957

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 097 323 B1 (AETNA GROUP SPA [IT]) 6 June 2012 (2012-06-06) * paragraph [0001]; figures 1-22 *	1-17	INV. B65B11/02 B65B11/04 B65H19/10 B65H19/12
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B65B
B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 May 2015	Paetzke, Uwe

CATEGORY OF CITED DOCUMENTS

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21-05-2015

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