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(54) **WRAPPING SYSTEM WITH EXTENSIBLE PLASTIC FILM AND RELATIVE IMPROVED RETAINING DEVICE**

(57) It is disclosed a wrapping method and arrangement for an item with extensible plastic film, comprising a driving ring which drives into rotation a support carriage of a spool (B) of extensible plastic film, on a circular path which wraps an item to be wrapped, at least a holding unit of the film being furthermore provided, equipped with a gripping device and a cutting device, wherein, from two

opposite sides of said circular path, a pair of holding units (10, 20) arranged on a same operating line transversal to the longitudinal development of the film is provided, each holding unit (10, 20) being provided with gripping devices (11, 21) and with cutting devices (12, 22) which can be brought mutually closer.

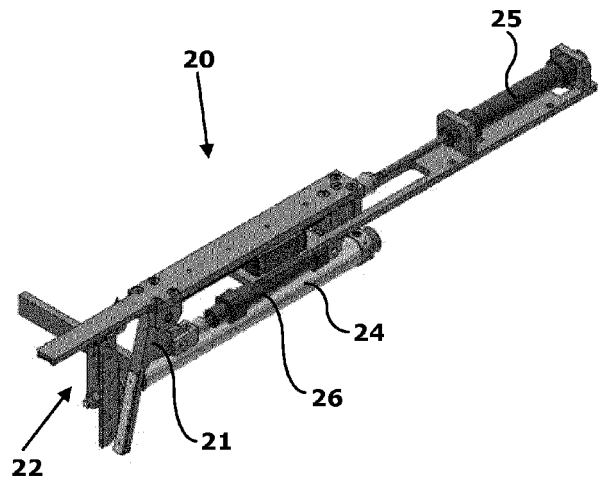
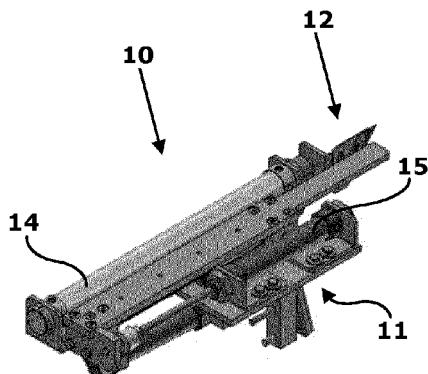


Fig. 2A

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Description

Field of the invention

[0001] The present invention relates to an extensible plastic film wrapping apparatus, in particular a wrapping apparatus and related gripping device for holding such a film.

Background art

[0002] The use of carrying out wrapping of items with a wrapping of thin plastic material film is known.

[0003] A first major distinction in this technological field is that relating to the used films, which may be of heat-shrinkable or extensible type.

[0004] The systems that use plastic heat-shrinkable material are relatively expensive, both for the cost of the plastic film itself, and for the cost of the system, which uses a shrink oven and therefore involves significant energy consumption.

[0005] Systems that use a thin film of extensible plastic material have greater savings both for the outlay cost of the film and because they do not involve an energy consumption comparable to those of use of an oven. In the following we will deal with the latter technology.

[0006] In particular, the application of a wrapping with extensible film is achieved with machines which wrap the items to be packaged with one or more spirals of a preferably prestretched extensible film. Wrapping takes place by defining a relative rotation of a plastic film spool around the item to be packaged, optionally moving the spool along a movement axis to determine wrapping turns distributed over a certain length. Wrapping can take place according to a vertical axis (for example in the traditional pallet-wrapping machines), along which the item to be packaged is upright, or according to a horizontal axis, along which the items to be packaged are fed. In the latter case, each item is fed to the wrapping station along a conveyor belt or a roller conveyor, which is stopped at this station, then is wrapped with the film and then delivered onto the conveyor belt of the packaging line.

[0007] According to the prior art, performing the wrapping with horizontal axis involves the use of a spool supporting carriage, which is moved along a circular guide, arranged in the wrapping station according to a vertical plane oriented perpendicular to the feeding line of the items and which encircles the conveyor belt. In the wrapping station, the item is supported only on cantilevered guide means (typically a shelf and any lateral containment rails) which connect the feed portion of the conveyor with a delivery portion. Thus, upon rotation of said spool supporting carriage, the film which unwinds from the relative spool, performs a wrapping which encircles the item and also said cantilevered guide means. Once the wrapping has been completed, the items is pushed towards the delivery line, pulling out the turns of extensible film

longitudinally from the cantilevered guide means: to this end, these guide means are shaped and designed in such a way as to favour the sliding and pulling out of the packaged item.

[0008] Critical stages of this packaging process are the initial and final ones, respectively, in which the film must be attached to the item and must then be cut to re-present it to the next item. For this purpose, a holding and cutting gripper is used, conventionally placed below the cantilevered guide means, mounted movable longitudinally to the rotation axis of the supporting carriage.

[0009] Wrapping systems provided with holding grippers are described for example in WO2015/121334 and WO2016/193875 - according to which the preamble of the appended main claim has been constructed - and also in US 4587796.

[0010] An example of a traditional gripper is shown in Fig. 1, which represents a perspective view of a gripper of the prior art. A straight gripper, with a holding axis arranged horizontally and aligned with the rotation axis of the film spool, has a fixed upper jaw 1 and a movable (pivoting) lower jaw 2 which has a scissor closure on the fixed jaw 1. The two jaws are arranged to cooperate in retaining a flap end of film and also to perform, in a position slightly downstream of the retaining line, a cut of the film (with a cutting blade which is not visible in Fig. 1). To this end, the straight gripper has a length equal to a substantial part of the width of the film and grasps the film from a side edge thereof.

[0011] Operationally, the initial flap end of the spool is held by the gripper - stationary in a fixed position - until at least a part of a first turn of film is formed around the item to be packaged, as the spool is displaced in rotation on the spool supporting carriage. In this movement, the film is partially wrapped around the item and tends to adhere to it naturally, stretched and closely fitted to the corners. When the spool supporting carriage reaches a position prior to possible interference with the gripper, the latter is retracted longitudinally to withdraw from underneath the carriage. Given the considerable size, in fact, the gripper must be moved away from its position before completing the first film turn, because afterwards it would no longer be possible to pull it out without compromising the packaging.

[0012] However, since the film is not attached well yet to the item to be packaged, the gripper moves away holding the initial flap with it, so as not to lose film tension, which film otherwise would tend to become loose, thus losing adherence to the item even before completion of a consolidation turn. In this process, as it can be imagined, the gripper pulls the film with it, which film collapses into a plastic material cord that remains tucked between the first turn and the item to be wrapped.

[0013] Though, on the one hand, this film cord portion is essential to ensure that the initial end of film is not released prematurely, on the other hand, however, it constitutes a side appendix of the packaging, which compromises the aesthetics and functionality of the packaging

itself.

[0014] To avoid this problem, the Applicant has already proposed alternative solutions, for example by using a temporary retaining device or an air suction retaining element which is easily removable from the packaging.

[0015] Although these alternative solutions have some advantages, the Applicant has found that the gripper system is still the most reliable.

Problem and summary of the invention

[0016] The underlying problem of the invention is therefore that of providing an apparatus and a wrapping method as above, which allows to achieve an efficient extensible film wrapping, still using a gripper retaining mechanism, but without the drawbacks described above.

[0017] This problem is solved through the features set out in essential terms in the appended main claim. The dependent claims describe preferred features of the invention.

[0018] In particular, according to a first aspect of the invention, a wrapping arrangement for an item, to be wrapped with extensible plastic film is provided, comprising a driving ring which drives into rotation a support carriage of a spool of extensible plastic film, on a circular path which wraps an item to be packaged, at least a holding unit of the film being furthermore provided, equipped with a gripping device and a cutting device, and further comprising, on two opposite sides of a plane on which said circular path develops, a pair of holding units arranged on a same operating line transversal to the longitudinal development of the film, each holding unit being provided with gripping devices and with cutting devices which can be brought mutually closer along said operating line.

[0019] In particular, said gripping devices and cutting devices are mounted longitudinally movable in opposite directions. Preferably, said gripping devices and cutting devices are mounted on guides and are moved backward and forward by respective first movement actuators.

[0020] According to a further aspect, second gripping actuators are also provided for mutually opening and closing pairs of jaws of said gripping devices.

[0021] Preferably, the first and second actuators are mounted so that said gripping devices may mutually move forward and backward both with said jaws closed and with said jaws open.

[0022] According to another aspect, said cutting devices are designated as complementary and have respective cutting means arranged on two parallel but offset planes.

[0023] According to a different aspect, a holding device is provided for a wrapping arrangement as described above, comprising a pair of holding units, opposite and arranged on a same operating line transverse to the longitudinal development of a wrapping film, each holding unit being provided with gripping devices and cutting devices which can be brought mutually closer along said

operating line.

[0024] According to yet another aspect, a method for wrapping an item is provided by using an arrangement as above, in which the following steps are provided:

5 providing a driving ring apt to drive into rotation a support carriage of a spool of extensible plastic film, on a circular path that wraps an item to be wrapped, arranging, from two opposite parts of a plane on which said circular path develops, a pair of holding units arranged on a same operating line transversal to the longitudinal development of the film, each holding unit being provided with gripping devices and cutting devices which can be brought mutually closer along said operating line, bringing said holding units closer together to grasp and retain respective flaps of opposite side edges of said extensible plastic film, performing at least one complete turn of said spool around the item on said circular path, opening said gripping devices and moving said holding units apart from each other.

[0025] Preferably, the method involves subsequently bringing said holding units closer together to grasp and retain respective flaps of opposite side edges of said extensible plastic film,

bringing said cutting devices mutually closer to bring respective cutting means to cut said film along a cutting line placed between said gripping devices and said item.

Brief description of the drawings

[0026] Further features and advantages of the invention will anyhow be more evident from the following detailed description of a preferred embodiment, given by mere way of nonlimiting example and illustrated in the accompanying drawings, wherein:

40 Fig. 1, as already seen, is a perspective view of a gripper holding device of the prior art;
Fig. 2A is a perspective view of the film holding device according to the invention;
Fig. 2B is a perspective view opposed to that of Fig. 2A, including an item to be packaged;
Fig. 2C is a front elevation view of the system of Fig. 2B, including a plastic film spool;
Figs. 3A-3C are side and perspective elevational views of the system of Fig. 2 in three different operational steps; and
Figs. 4A-4F are schematic side elevation views showing the system according to the invention in a sequence of different operational steps.

Detailed description of a preferred embodiment

[0027] An extensible film wrapping apparatus, with a horizontal wrapping axis, is described by way of example

in WO2015/121334, which is hereby incorporated as a reference.

[0028] A sequence of items to be wrapped runs along a horizontal conveyor line and travels to a wrapping station, stopping on a support shelf.

[0029] In the wrapping station, in a manner known per se, a driving ring is provided, which drives into rotation a carriage on which a support shaft of a spool B of extensible plastic film is installed. The driving ring is traditionally arranged on a vertical plane arranged substantially perpendicular to the conveying line for items.

[0030] The item or load C to be wrapped, when stationary on the support shelf S, is inside the circular path of that carriage, so that a plurality of film P turns can be wrapped around it.

[0031] Further details on this configuration will not be provided below, since it is widely known and, in itself, it is not the subject of the present application.

[0032] In order to overcome the drawbacks of the prior art, according to the invention, from the two parts of the plane on which the circular path of the spool B of plastic film P develops, a pair of holding units 10 and 20 are arranged opposite to one another on a same operating line transversal to the longitudinal development of the film.

[0033] Typically, the operating line is arranged at a height that is easily accessible to an operator, but in itself is not relevant to the operation of the system. Preferably, the two holding units 10 and 20 are located at a height immediately below the support shelf S of the item C to be wrapped, as shown in Figs. 2B and 2C.

[0034] Each holding unit 10 and 20 provides a gripping device 11 and 21 and a cutting device 12 and 22, both mounted movable longitudinally in opposite directions, so as to be mutually approached and moved away from each other.

[0035] Both the gripping devices 11, 21 and the cutting devices 12, 22 are mounted on guides and are moved backward and forward by respective actuators, for example, pneumatic actuators 14, 15, 24, 25.

[0036] Additional gripping actuators 16 and 26 are provided for mutually opening and closing pairs of jaws of the gripping devices 11 and 21.

[0037] The latter have a configuration similar to the traditional one, with a fixed jaw arranged on the horizontal plane and a movable jaw underneath, which abuts against the fixed jaw pivoting from below. The foot print of these clamping devices is however very small compared to the prior art, because they are provided for grasping a short flap of the side edge of the film, as shown in Fig. 4C.

[0038] The operation of the gripping devices 11 and 21 provides that they can move forward and backward reciprocally both with the jaws closed (tightened) and with the jaws open (released), by the intervention of the gripper feed actuators 15 and 25.

[0039] The cutting devices 12 and 22 of the two units 10 and 20 are designed as complementary, so as to ob-

tain a more effective cutting of the film P. In particular, as shown in the figures, they preferably have respective cutting means 17 and 27 with a cutting blade oriented respectively with an equal and opposite angle, for example 45° for the blade of the left unit and -45° for the blade of the right unit. In this way, the cutting action produced on one side has a component facing upwards which is balanced by a component of the opposing blade directed downwards.

[0040] The two cutting means 17 and 27 are preferably arranged on two parallel but slightly offset planes, so that the two blades can cross each other along their movement with a scissor effect (see Fig. 3C). The crossing between the blades takes place in the intermediate zone between the two holding units 10 and 20, in an end-of-stroke position of the actuators 14 and 24 of the cutting devices 12 and 22.

[0041] The operation of the system is described below with reference to Figs. 4A-4F.

[0042] At the end of a wrapping cycle of an item, a film P is laid (Fig. 4A) between a spool B and the item C, with the holding devices 10 and 20 completely spaced apart from each other so as not to interfere with the path of the spool B.

[0043] At this point, the gripping devices 11 and 21 with the open jaws are brought mutually closer until they intercept the area where the two lateral edges of the film are located. The gripping devices 11 and 21 are then clamped, lifting the lower jaw against the upper fixed jaw, so that the two gripping units 11 and 21 firmly grasp the respective opposite lateral edges of the film P (Fig. 4C). According to a qualifying aspect of the system of the invention, in this step the gripping devices 11 and 21 move away from each other, keeping the film tightly clamped in the jaws, so as to cause a slight stretching which extends the film transversely (Fig. 4D). In this state, the cutting means 17 and 27 are brought mutually closer, through the respective actuators 14 and 24, which efficiently cut through the stretched film, until they cross in the central area (Figs. 3C and 4F). The blades run along a line located between the gripping devices 11 and 21 and the wrapped item, so as to separate the film P from the item, but leaving the end flap of film coming from the respective spool clamped between the gripping devices 11 and 21 (Fig 2C).

[0044] At the end of the cut, the two blades 12 and 22 are withdrawn towards the starting position and the free flap of film remains joined to the item (due to its own elasticity), while the other end coming from the spool B remains held by the two opposite gripping devices 11 and 21. In this state, the spool B can be brought into rotation around a new item to be wrapped, laying at least one film turn, even partially against the two opposite gripping devices. Since the clamping devices are of small size - since they are intended to grip only a short flap of film and not the whole film width as in the prior art - the opening movement of the jaws, at least to the extent sufficient to release the film, can take place in any case even

if an extensible film turn has been placed on it. Therefore, after laying at least one film turn, which thus remains well locked on the load, the two grippers can be opened to free the film end, which thus remains well stretched and captured under the first wrapping turn. Once the jaws have been opened, the two grippers can be moved away from each other until they return to the initial condition.

[0045] As can be understood from the above description, the system of the invention perfectly achieves the purposes stated in the introduction. In fact, the two opposite holding units allow to effectively manage the gripping and cutting of the film; working from opposite sides laterally, the film is always kept well stretched and the formation of the unwanted cord of the prior art is prevented; moreover, since the holding effect occurs only on a small part of the edge of the film and the cutting operation takes place with separate, longitudinally movable means, the footprint of the grippers is minimal and they can hold the film even below the first turn (e.g. between the shelf and the first turn, as in Fig. 2C), without the wrapping being compromised during the release step.

[0046] It is understood, however, that the invention is not to be considered as limited by the particular arrangement illustrated above, which represents an exemplary embodiment, but different variants are possible, all within the reach of a person skilled in the art, without departing from the scope of the invention itself, as defined by the following claims.

Claims

1. Wrapping arrangement for an item to be wrapped with extensible plastic film, comprising a driving ring which drives into rotation a support carriage of a spool (B) of extensible plastic film (P), on a circular path which wraps an item to be wrapped, at least a holding unit of the film being furthermore provided, equipped with a gripping device and a cutting device, **characterised in that** it comprises, on two opposite sides of a plane on which said circular path develops, a pair of holding units (10, 20) arranged on a same operating line transversal to the longitudinal development of the film, each holding unit (10, 20) being provided with gripping devices (11, 21) and with cutting devices (12, 22) apt to be brought mutually closer along said operating line.
2. Arrangement as in 1, wherein said gripping devices (11, 21) and cutting devices (12, 22) are mounted longitudinally movable in opposite directions.
3. Arrangement as in 2, wherein said gripping devices (11, 21) and cutting devices (12, 22) are mounted on guides and are moved backward and forward by respective first movement actuators (14, 15, 24, 25).
4. Arrangement as in 3, wherein further second grip-

ping actuators (16, 26) are provided for mutually opening and closing pairs of jaws of said gripping devices (11, 21).

5. Arrangement as in 4, wherein said first and second actuators (14, 24, 15, 25, 16, 26) are mounted so that said gripping devices (11, 21) can mutually move forward and backward both with said jaws closed and with said jaws open.
6. Arrangement as in any one of the preceding claims, wherein said cutting devices (12, 22) are designed as complementary and have respective cutting means (17, 27) arranged on two parallel but offset planes.
7. Holding device for a wrapping arrangement as in any one of the preceding claims, comprising at least a film holding unit provided with a gripping device and with a cutting device, **characterised in that** it comprises a pair of holding units (10, 20), opposite and arranged on a same operating line transversal to the longitudinal development of a packaging film, each holding unit (10, 20) being provided with gripping devices (11, 21) and with cutting devices (12, 22) which can be brought mutually closer along said operating line.
8. Method for wrapping on item using an arrangement as in any one of claims 1 to 6, wherein the following steps are provided:
 - arranging a driving ring apt to drive into rotation a support carriage of a spool (B) of extensible plastic film (P), on a circular path that wraps an item to be wrapped,
 - arranging, from two opposite parts of a plane on which said circular path develops, a pair of holding units (10, 20) arranged on a same operating line transversal to the longitudinal development of the film, each holding unit (10, 20) being provided with gripping devices (11, 21) and cutting devices (12, 22) apt to be brought mutually closer along said operating line,
 - bringing said holding units (10, 20) closer together to grasp and hold respective flaps of opposite side edges of said extensible plastic film (P), performing at least one complete turn of said spool (B) around the item on said circular path, opening said gripping devices (11, 21) and moving said holding units away from each other.
9. Method for wrapping as in claim 8, which subsequently provides bringing said holding units (10, 20) mutually closer so as to grasp and hold respective flaps of opposite side edges of said extensible plastic film (P), bringing said cutting devices (12, 22) mutually closer

so as to lead respective cutting means (17, 27) to cut said film (P) along a cutting line located between said gripping devices (11, 21) and said item.

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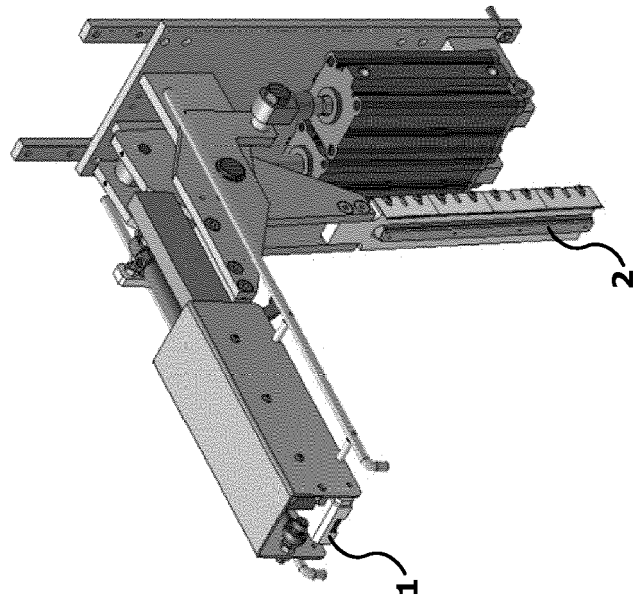


Fig. 1

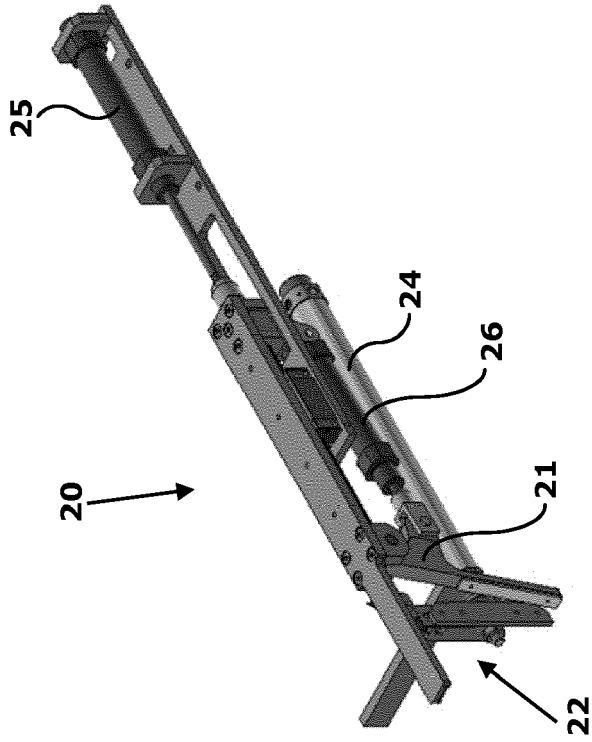
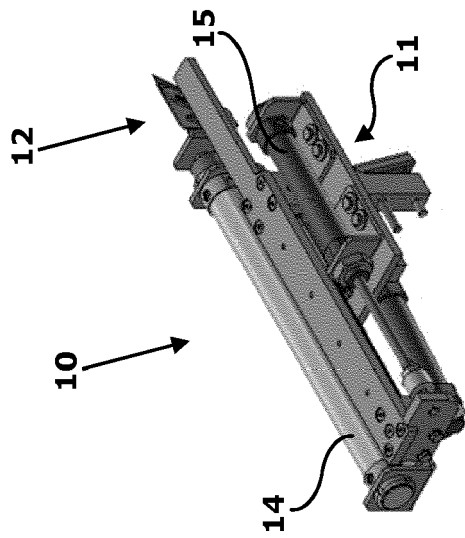
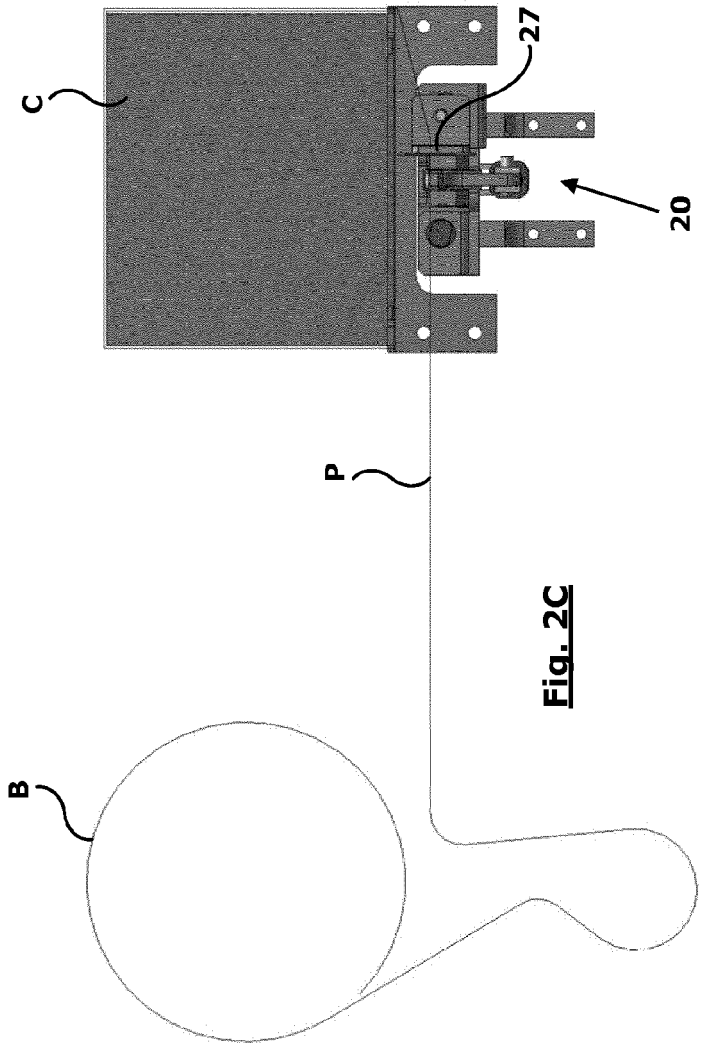
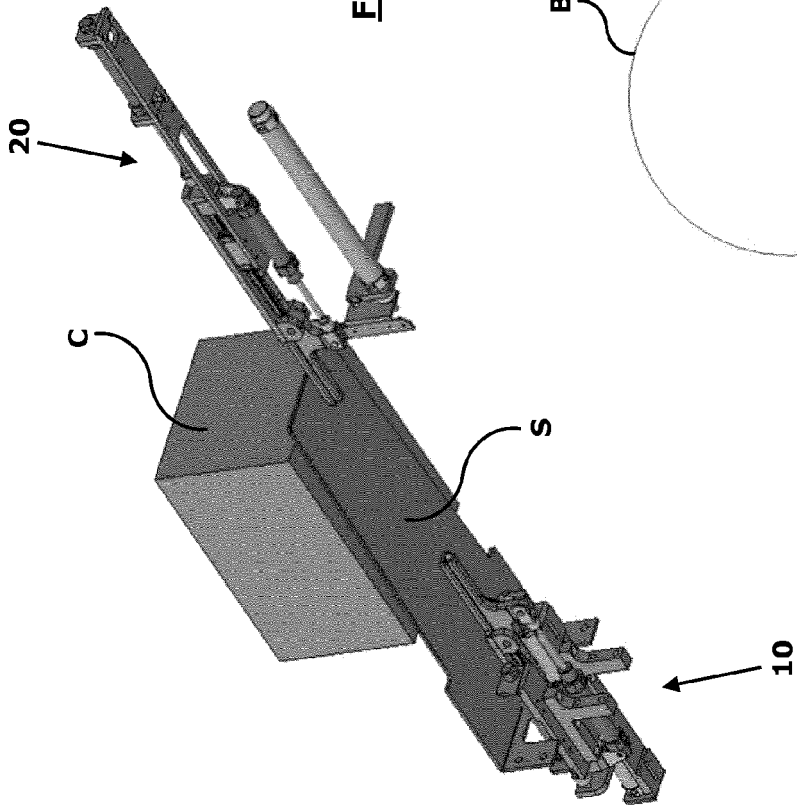


Fig. 2A





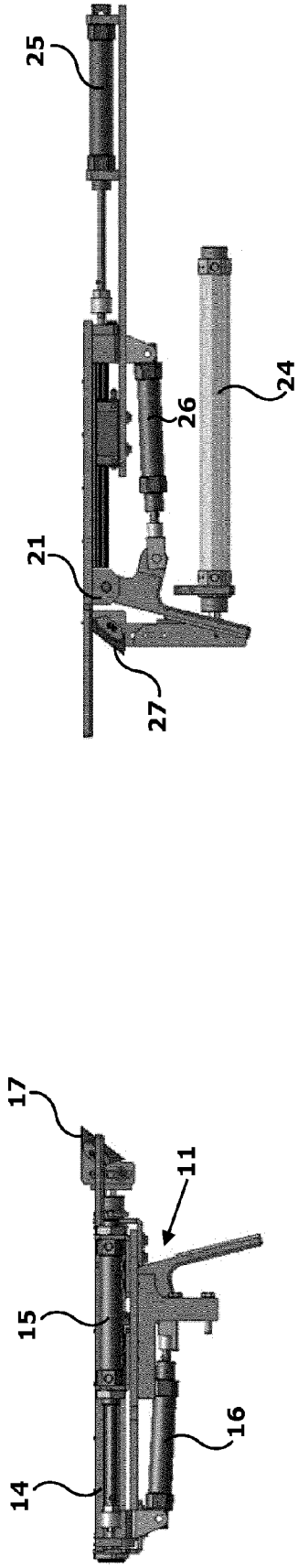


Fig. 3A

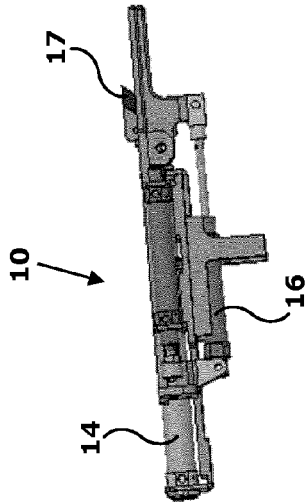
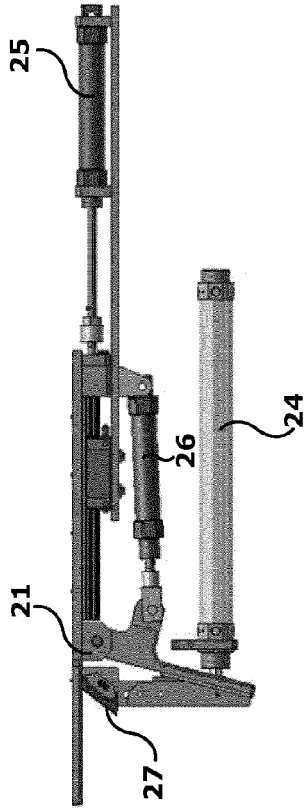


Fig. 3B



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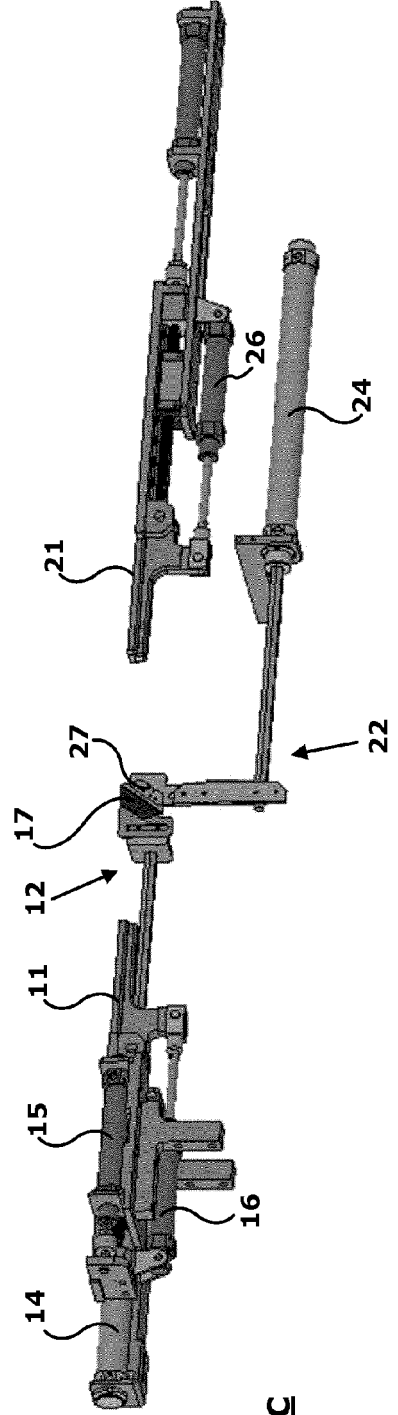
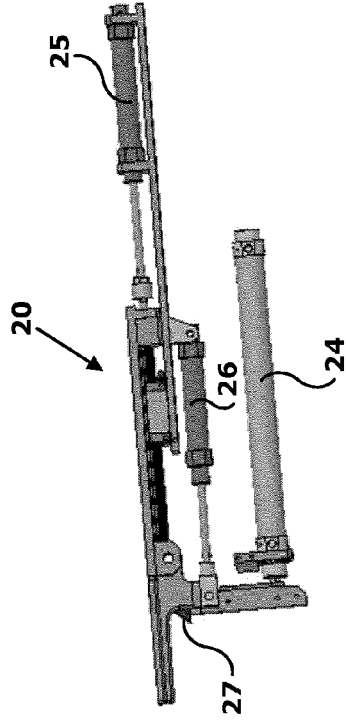


Fig. 3C

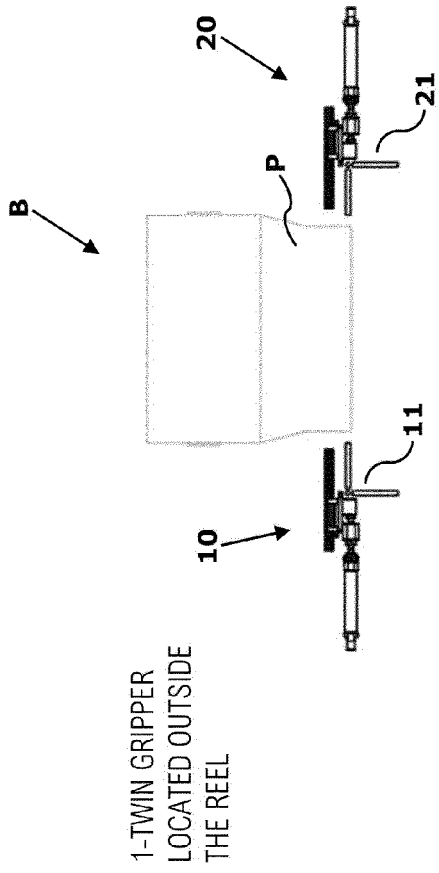


Fig. 4A

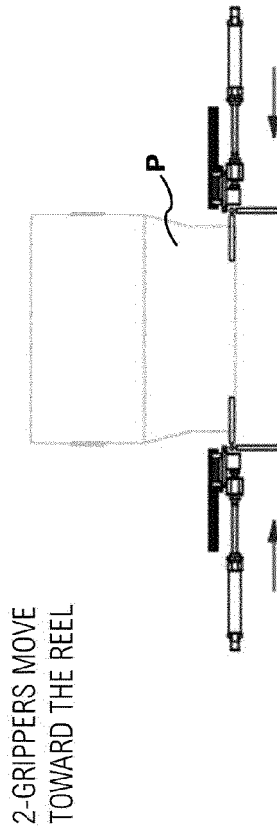


Fig. 4B

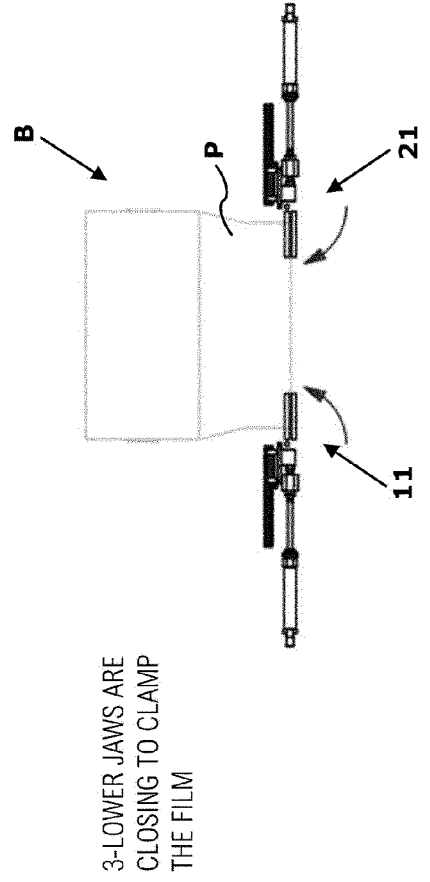


Fig. 4C

Fig. 4D

4-SHORT STROKE TO
PUT UNDER TENSION
THE FILM

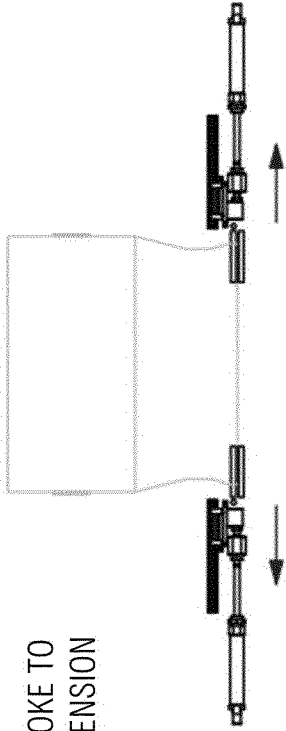


Fig. 4E

5-DOUBLE CUT DEVICES
LOCATED OUTSIDE THE
REEL

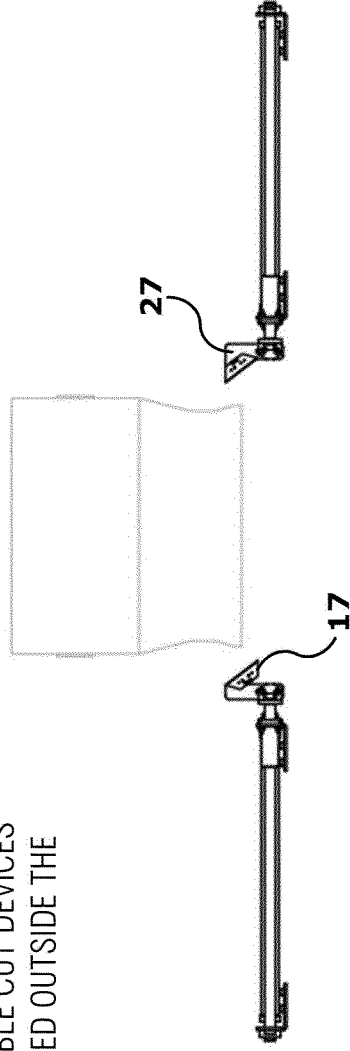
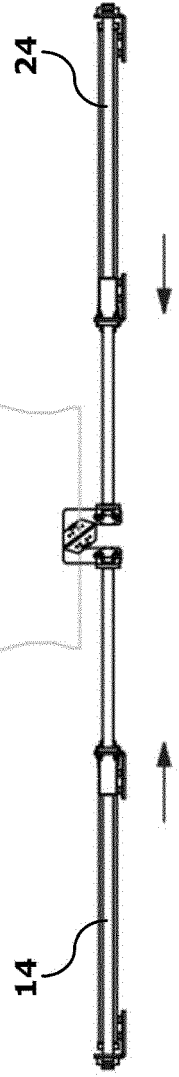


Fig. 4F

6-DOUBLE CUT
DEVICES MOVING
INWARDLY





EUROPEAN SEARCH REPORT

Application Number
EP 18 18 1207

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 31 August 2018	Examiner Ngo Si Xuyen, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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