



(51) International Patent Classification:

B29C 63/00 (2006.01) H01M 50/202 (2021.01)
B29C 63/02 (2006.01) H01M 50/227 (2021.01)
B65B 11/28 (2006.01)

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(21) International Application Number:

PCT/IB2024/056060

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(22) International Filing Date:

21 June 2024 (21.06.2024)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(25) Filing Language:

Italian

(26) Publication Language:

English

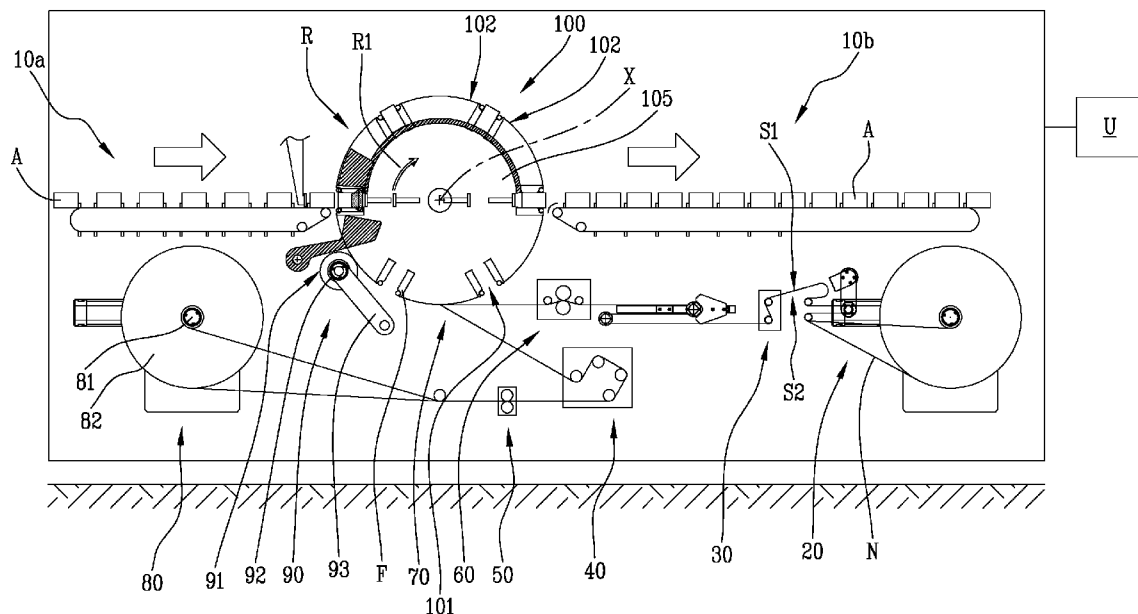
(30) Priority Data:

102023000012960 22 June 2023 (22.06.2023) IT

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(54) Title: MACHINE AND METHOD FOR COATING ARTICLES WITH AN ADHESIVE SHEET

Fig.1



(57) Abstract: A machine for covering articles with an adhesive sheet comprises a feed unit (20) for feeding a web (N) having an adhesive layer (S1) on a carrying layer (S2), a peeling device (70) configured to detach individual adhesive sheets (F) from the carrying layer (S2), a transfer conveyor (10a) for advancing a succession of articles (A), and a covering conveyor (R) configured to receive and hold each adhesive sheet (F) by its non-adhesive side and to apply it to an article (A). The covering conveyor (R) is disclosed as having pockets (101), over each of which an adhesive sheet (F) can be held, such that insertion of the articles (A) into the pockets (101) will initiate its folding around the article. The article (A) may be a battery for the automotive sector, and may have a rectangular parallelepiped shape.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

MACHINE AND METHOD FOR COATING ARTICLES WITH AN ADHESIVE SHEET

Technical field

- 5 This invention relates to the industrial packaging sector and relates to a machine and a method for covering articles with an adhesive sheet.

Background art

10 The term "articles" means generic products with a prismatic or polyhedral shape, in general therefore composed of flat side faces, even though the invention can be applied to articles with any shape. In a particular but non-limiting embodiment of the application, the term "articles" means batteries which can be used in the automotive sector.

15 In the sector of packaging articles with a generically box shape, the prior art teaches protecting these articles by applying a non-adhesive protective film.

The film generically has the aim of preserving the properties of the article and protecting the article from contact with the outside environment and/or with the outside atmosphere. Moreover, the film is typically configured to
20 be removed in a permanent manner before using the article. For example, in the cigarette sector, the protective wrapping film is designed to be easily removed by the end user. Once the packet has been opened, the film no longer has a protective function and is discarded. The temporary packaging of the cigarettes is mainly aimed at maintaining the freshness
25 and condition of the product until it is opened.

In this context, the articles are typically packaged using automated and mechanised systems. In particular, the non-adhesive films are wound completely around the respective article and stabilised by mutual sealing and/or gluing of flaps and folded edges of the film.

30 The Applicant has observed that for certain types of articles, such as, for

example, batteries which can be used in the automotive sector, the need is strongly felt for permanent protective coverings made of adhesive films which substantially but only partly cover the article, leaving uncovered predetermined portions of the article. The expression “substantial covering” means that the covering covers the majority of the outer surface of the article leaving predetermined smaller and/or localised portions uncovered. In other words, the covering provides a significant but not total coverage on the article. With reference in particular to the sector of batteries, the uncovered portions are typically the connecting electrodes, which need to be exposed in order to make the necessary electrical connections.

However, the Applicant has found that this type of adhesive covering cannot be applied in a satisfactory manner by means of the above-mentioned prior art automated and mechanised systems.

Firstly, using prior art packaging systems with a non-adhesive covering, this type of article would be covered entirely, also covering the above-mentioned portions of the article which should not be covered. Moreover, even if the covering were subsequently removed from said portions, the non-adhesive covering would lose its stability and could become detached, since every possible connection to the article is absent, thereby compromising its function of protecting the article.

Secondly, using the prior art packaging machines but with an adhesive covering there would be many system problems: the prior art machines are in fact designed and configured to operate and handle non-adhesive films. The replacement with adhesive films could cause problems of feeding, gluing or blocking of the films during the packaging process, causing mechanical malfunctions and production interruptions. Moreover, the replacement could cause contamination problems of the production line: the adhesive films could result in the release of adhesive or adhesive residues during the packaging process which would soil and deteriorate the work surfaces, the conveyors or the feed systems.

Lastly, since the prior art packing machines are configured for completely wrapping the article, it is evident that they should be subjected to a complete redesign in order to be suitable for covering products only partly covered.

5 For this reason, a prior art solution for covering these type of articles using an adhesive covering is that of covering the articles manually. However, this solution is obviously not very efficient and is not able to satisfy the current productivity requirements.

Moreover, manual processing involves the risk of human errors which can
10 lead to a high number of rejected parts, a low final quality standard and/or production delays.

There are also machines for applying discrete adhesive elements (labels, stamps or other) to packets, for example in the cigarette sector, which are fully automated and highly productive. However, they do not carry out a
15 covering of the article but only the application of a small adhesive piece which, therefore, results in a complement to appearance but not a covering of the article.

Disclosure of the invention

20 The Applicant has therefore found that by separating an adhesive sheet from a continuous web (the adhesive sheet having an extension such as to substantially cover the article) and holding the adhesive sheet at the non-adhesive side, it is possible to position the adhesive sheet at a covering station in which the adhesive sheet is progressively applied and
25 folded on the article in such a way that the adhesive side is applied on the article in stages.

This invention therefore relates, according to a first aspect, to a machine for covering articles with a prismatic or polyhedral shape with an adhesive sheet.

30 The machine comprises a feed unit for feeding a web formed at least partly from the overlay between an adhesive layer, having an adhesive

side and a non-adhesive side, and a carrying layer applied to the adhesive side of the adhesive layer.

The adhesive layer may be continuous or may be defined by a succession of discrete elements, applied adhesively to the carrying layer and detached from each other and defining individual adhesive sheets.

Preferably, the machine comprises a peeling device configured to detach individual adhesive sheets, defined by the adhesive layer, from the carrying layer. For this purpose, the carrying layer may be defined by a silicone web or other material suitable for promoting the detachment between the adhesive layer and the carrying layer.

Preferably, the machine comprises a transfer conveyor configured to advance a succession of articles to be covered towards a covering station. In that way, preferably, the article further downstream of the succession of articles is subjected each time to covering in the covering station.

Preferably, the machine comprises a covering conveyor, configured to receive the individual adhesive sheets detached by the peeling device, to transfer the individual adhesive sheets to the covering station and to apply each adhesive sheet to a respective article, received from the transfer conveyor, in the covering station.

The covering conveyor is also configured for holding each sheet at the non-adhesive side and for applying the sheet to an outer surface of the article, covering the article at least partly.

In other words, the covering conveyor is also configured to only hold the non-adhesive side of the adhesive sheet, leaving the adhesive side entirely free and facing the article to be covered.

This invention relates, according to a second aspect, to a method for covering articles with a prismatic or polyhedral shape with an adhesive sheet.

The method comprises a step of feeding a succession of articles to be covered, performed preferably by means of a transfer conveyor.

The machine comprises a further step of feeding a multilayer web formed

at least partly from the overlay between an adhesive layer, having an adhesive side and a non-adhesive side, and a carrying layer applied to the adhesive side of the adhesive layer, by means of a feed unit.

The adhesive layer may be continuous or may be defined by a succession
5 of discrete elements, applied adhesively to the carrying layer and detached from each other and defining individual adhesive sheets.

The method comprises a further step of detaching individual adhesive sheets, defined by the adhesive layer, from the carrying layer, preferably using a peeling device.

10 The method comprises a further step of holding each adhesive sheet at the non-adhesive side, preferably using a covering conveyor.

The method comprises a further step of applying the adhesive sheet to an outer surface of the respective article, covering at least partly said article, using the covering conveyor.

15 According to a preferred embodiment, the method is performed by the above-mentioned machine.

According to least one of the above mentioned aspects, this invention may also comprise at least one of the preferred features described below.

20 According to one aspect, the feed station may comprise an unwinding device provided with a shaft designed to support a roll of the web.

Preferably, the web is of the multilayer type and is formed at least partly from the overlay between an adhesive layer, having an adhesive side and a non-adhesive side, and a carrying layer applied to the adhesive side of the adhesive layer.

25 According to an example, the adhesive layer may be fed already pre-blanked or already divided into a succession of adhesive sheets applied to the supporting layer and separated and spaced from each other.

According to a further example, the adhesive layer is, on the other hand, not pre-blanked and is therefore continuous.

30 Preferably, irrespective of the shape of the adhesive layer, the carrying state is preferably continuous.

Preferably, the feed station comprises a tensioning device, located downstream of the unwinding device relative to the conveying path of the web.

Preferably, the feed station comprises a temporary accumulation device
5 for the web, located downstream of the tensioning device relative to the conveying path of the web. This makes it possible to uncouple the unwinding of the web from the roll with respect to the functional steps of peeling and folding.

If the web fed is of the non-pre-blanked type, the machine also preferably
10 comprises a blanking device positioned downstream of the feed unit relative to the conveying path of the web. In particular, the blanking device is configured to cut or slit the continuous adhesive layer of the web in such a way as to obtain a succession of individual adhesive sheets supported by the carrying layer. The blanking is executed in such a way that the slits
15 or cuts made on the adhesive layer allow the adhesive sheets to be peeled from the carrying layer.

Downstream of the feed station and, if present, downstream of the blanking device, the machine comprises the above-mentioned peeling device configured to detach individual adhesive sheets, defined by the
20 adhesive layer, from the carrying layer. The adhesive sheets are therefore transferred onto the covering conveyor.

Preferably, the blanking is performed by an edge peeling support about which the carrying layer is wound, preferably for an angle greater than 90° , in such a way that the adhesive sheets detach from the carrying layer and
25 are picked up and held by the covering conveyor.

Preferably, irrespective of the presence of the blanking device, the machine comprises a unit for recovering the carrying layer, and where there are residual portions of the first layer, positioned downstream of the peeling device relative to the conveying path of the web. At a functional
30 level, there can therefore be a step of collecting, in particular winding, the carrying web downstream of the detachment of the adhesive sheets from

the carrying layer. This allows effective feeding of the adhesive sheets and, at the same time, controllable pulling of the carrying web and therefore precise feeding of the adhesive sheets, as well as longitudinal and transversal control of them.

- 5 With reference to the transfer conveyor, it may be of the type with a conveyor belt, chain or motor-driven rollers. Irrespective of the type, the transfer conveyor is configured for feeding the succession of articles to be covered towards the covering station, and in particular towards the covering conveyor.
- 10 Preferably, the transfer conveyor is configured to feed the articles spaced from each other, in particular to allow the use of a pressing member operating in the covering station, or to space at least the article closest to the covering station in such a way as to allow the operation of the pressing member.
- 15 With reference to the covering conveyor, it is preferably configured to define at least a first covering step, wherein the adhesive sheet is applied in a U-shape to the article.

Preferably, the covering conveyor is configured to define a first covering step, in which the adhesive sheet is folded into a "U" shape around the article so as to have front edges and/or side edges protruding from the article, and a second covering step, after the first covering step, in which the front edges and/or the side edges are folded onto the article so as to complete the application of the adhesive sheet on the article. In other words, during the second covering step, the front edges and/or the side edges obtained by the U-shaped folding of the adhesive sheet are folded onto the article, completing application of the adhesive sheet on the article.

Functionally, the step of applying the adhesive sheet to an outer surface of the respective article therefore comprises at least a first covering step, wherein the adhesive sheet is applied in a "U" shape on the article, in particular in such a way as to adhere to a bottom portion and to side

portions of the article, preferably in such a way as to have front edges and/or side edges protruding relative to the article. This allows the edges of the article to be covered substantially entirely.

Structurally, the covering conveyor preferably has at least one pocket
5 movable along a covering path and, on opposite sides of the pocket and facing outwards (that is, towards the article to be covered in the covering station), respective retaining surfaces provided with pneumatic suction to support side portions of an adhesive sheet received from the peeling device in such a way that a central portion of the adhesive sheet is
10 positioned to cover the pocket so that the insertion of an article in the pocket determines an at least partial, and in particular into a "U" shape, wrapping of the adhesive sheet on said article. The length and/or width of the adhesive sheet greater than that of the article determines the formation of the above-mentioned front edges and/or side edges
15 protruding relative to the article.

At the functional level, the step of holding the adhesive sheet may therefore be performed by the pneumatic action exerted by a pair of suction surfaces of the covering conveyor: the suction surfaces are spaced from each other and positioned on opposite sides of a pocket of the
20 covering conveyor in such a way as to position the adhesive sheet with a respective central portion positioned to cover the pocket. This retaining action, applied on the non-adhesive side of the adhesive sheet, allows a stable and reliable blocking of the adhesive sheet on the covering conveyor.

Moreover, the step of applying the adhesive sheet to an outer surface of the respective article may be at least partly performed by inserting the article in the pocket whilst the adhesive sheet is positioned to cover the pocket in such a way as to make an at least partial wrapping, and in particular with U-shaped deformation, of the adhesive sheet on the article.
25
30 This allows an "automatic" wrapping of the adhesive sheet around the article and a consequent tensioning of the adhesive sheet during the U-

shaped wrapping around the article gradually being inserted in the pocket. According to one aspect, the machine may also comprise a pressing member positioned in the covering station and configured to determine or promote the entrance of an article, in particular carried by the transfer conveyor, inside the respective pocket. In other words, the insertion of the article inside the respective pocket may be promoted or achieved by means of a pressing member which engages an article positioned on the transfer conveyor. This optimises the reliability of the covering and the positioning control of the article.

10 Preferably, the covering path extends at least between a receiving position, wherein the pocket receives the respective adhesive sheet from the peeling device, an application position, wherein the pocket receives the article, and a release position, wherein the pocket releases the article covered with the adhesive sheet. In that way, a single conveyor performs the corresponding steps, thus increasing the production precision.

15 According to one aspect, the covering path is defined by a closed line. According to this embodiment, the covering conveyor comprises a plurality of pockets conveyed in succession along the covering path. In that way, a high production capacity is achieved thanks to the possibility of operating in sequence on several articles positioned in successive pockets.

In accordance with a particularly advantageous embodiment, the covering conveyor comprises a transfer wheel rotatable about a respective axis of rotation, wherein the seats are angularly equispaced about the axis. This results in a marked structural compactness.

25 According to an example, the step of applying the adhesive sheet to the outer surface of the respective article may be completed, after the at least partial wrapping, by folding at least one end flap of the adhesive sheet, extending in a cantilever fashion relative to the article, over the article using folding means. Structurally, in accordance with that example, the covering conveyor comprises folding means positioned along the covering path and configured to fold edges or end portions of the adhesive sheet on

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the article already applied (in particular in the shape of a “U”) to the article. The folding means may comprise first folding means, located on opposite sides of the covering path, for folding opposite side edges of the adhesive sheet on respective opposite surfaces of the article.

- 5 The folding means may also comprise second folding means configured to fold front edges, positioned side by side, of the adhesive sheet on a same front surface of the article (opposite the bottom surface on which the adhesive sheet was first applied to the article).

10 Preferably, the folding means are entirely or partly positioned in a stationary position relative to the covering path.

Alternatively, the folding means may be entirely or partly associated with the respective pockets and therefore integral with the respective pockets along the covering path.

15 According to an embodiment of the method, the article has a substantially parallelepiped shape having four lateral surfaces and two end surfaces.

According to this embodiment, the first covering step is performed to entirely cover three lateral surfaces of the article, leaving front flaps of the adhesive sheet positioned in a cantilever fashion beyond the fourth lateral surface and in such a way that the adhesive sheet has lateral flaps
20 positioned in a cantilever fashion beyond the end surfaces. The second step of covering is on the other hand carried out to fold the front edges onto the fourth lateral surface and to fold the side edges onto the respective end surface.

In particular, the front flaps can only partly cover the fourth lateral surface.

25 Irrespective of the shape of the front flaps, the lateral flaps can only partly cover the end surfaces.

According to a particularly advantageous application example of this invention, the article is a battery which can be used in the automotive sector, which has a substantially parallelepiped shape having the above-
30 mentioned four lateral surfaces and the above-mentioned two end surfaces. In particular, in that case the article is provided with electrodes

positioned on one of the lateral surfaces, and during the step of applying the adhesive sheet the electrodes are not covered with the adhesive sheet. In more detail, in that case the adhesive sheet is initially applied to the article at a lateral surface of the article opposite that on which the electrodes are present. The subsequent folding into a U shape occurs on the other two lateral surfaces, opposite one another. The subsequent folding of the flaps occurs on peripheral bands of the lateral surface carrying the electrodes and/or on the end surfaces of the article.

10 **Brief description of drawings**

Further features and advantages of the invention are more apparent in the non-limiting description which follows of a non-exclusive embodiment of a machine and a method for covering articles with a prismatic or polyhedral shape with an adhesive sheet.

15 The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment of it, in which:

- Figure 1 represents a schematic view of a machine for covering articles according to this invention;

- Figure 2 is a schematic perspective view of a portion of the machine of

20 Figure 1;

- Figure 3 is a schematic perspective view of a component of the machine of Figure 1;

- Figures 4A-4I schematically illustrate a sequence of operating steps of a portion of the machine of Figure 1;

25 - Figures 5A-5C schematically illustrate a sequence of operating steps of a component of the machine of Figure 1;

- Figures 6A-6F schematically illustrate a sequence of steps of a method for covering an article with an adhesive sheet according to this invention;

30 - Figure 7 is a schematic view of a component of the machine of Figure 1, in two different operating steps.

Detailed description of preferred embodiments of the invention

In the accompanying drawings, the numeral 1 denotes in its entirety a machine (shown schematically in Figure 1) for covering articles "A", in particular with a prismatic or polyhedral shape, with an adhesive sheet "F".

In this description, the term "articles" means generic products which require a substantial protective covering. Preferably, the term "articles" means batteries which can be used in the automobile sector, which have the shape of a rectangular parallelepiped.

Moreover, the expression "substantial covering" means that the covering (made with the adhesive sheet "F") covers most of the outer surface of the article "A", leaving predetermined smaller and/or localised portions uncovered. In other words, the covering provides a significant but not total coverage on the article "A". With reference in particular to the sector of batteries, the portions uncovered are at least the connecting electrodes, involved in the electrochemical reaction and in the flow of energy of the battery.

Also, the term "adhesive sheet" means a covering film made of plastic material having an adhesive side. The adhesive sheet may be made of a variety of materials depending on the specific requirements of the application. Preferably, the term "adhesive sheet" means an adhesive film made of Polyethylene (PE), Polypropylene (PP), Polychloride vinyl (PVC), Polyethylene terephthalate (PET) or the like. The adhesive sheet, especially when to be used for wrapping batteries, preferably has a thickness of between 0.010 mm and 0.1 mm, even more preferably between 0.02 mm and 0.05 mm.

In order to simplify the description, reference will be made below to a preferred embodiment of the machine 1, which is configured to operate on articles "A" substantially with a rectangular parallelepiped shape having four lateral surfaces and two end surfaces. In an identical manner, the description below refers to a preferred embodiment of the above-

mentioned method, which can be carried out for covering articles substantially in the shape of a rectangular parallelepiped having four lateral surfaces and two end surfaces. However, in accordance with the general nature of the invention, the machine 1 and the method may be
5 configured to operate on articles with a generically prismatic or polyhedral shape.

With reference to Figures 1 to 3, the machine 1 comprises a feed unit 20. The feed unit 20, illustrated in more detail in Figure 2, is configured for feeding a multilayer web "N" formed at least partly from the overlay
10 between an adhesive layer "S1", having an adhesive side and a non-adhesive side, and a carrying layer "S2" applied to the adhesive side of the adhesive layer "S1". Preferably, the web "N" is formed from the overlay between a continuous adhesive layer "S1", having the above-mentioned adhesive and non-adhesive sides, and from a carrying layer "S2", which is
15 also continuous. Still more preferably, the adhesive layer "S1" is not of the pre-blanked type.

The feed unit 20 comprises an unwinding device 21 provided with a shaft designed to support a roll "N0" of the web "N". Preferably, the unwinding device 21 is configured for unwinding the web "N" in a continuous fashion.
20 The feed unit 20 also comprises a tensioning device 22 located downstream of the unwinding device 21 relative to a conveying path of the web. The tensioning device 22 is configured for adjusting the tension of the web "N" during the unwinding with the unwinding device 21.

The feed unit 20 comprises a device 23 for temporary accumulation of the
25 web "N" located downstream of the tensioning device 22 relative to the conveying path of the web "N". As will be explained in more detail below, the temporary accumulation device 23 is configured to compensate for the speed differences of the feed unit 20 and the further devices or units of the machine 1 located downstream of the feed unit 20.

30 Downstream of the feed station 20 relative to the web "N" conveying path, there is a blanking device 60 illustrated in more detail in Figure 3 and

configured to cut or slit the continuous adhesive layer "S1" of the web "N" in such a way as to obtain a succession of individual adhesive sheets "F" supported by the carrying layer "S2". In other words, when a multilayer web "N" consisting of a continuous adhesive layer "S1" is fed, the web "N" is blanked by means of the above-mentioned blanking device 60, wherein the continuous adhesive layer "S1" is cut or slit so as to obtain a succession of individual adhesive sheets "F" supported by the carrying layer "S2".

If, on the other hand, a pre-blanked web "N" is fed, the blanking step may be omitted.

Structurally, the blanking device 60 comprises a pair of rollers 61, 62 one of which is provided with a cutting blade 63 configured for the above-mentioned action for cutting or slitting the adhesive layer "S1" in a regular fashion. The shape and extension of the cutting blade (only schematically illustrated in Figure 3) is a function of the shape and extension of the adhesive sheet to be formed. The cutting blade 63 preferably has shape and extension corresponding to the perimeter of the adhesive sheet to be obtained.

Downstream of the blanking device 60 relative to the conveying path of the web "N", there is a peeling device 70. The peeling device 70 is configured to detach the individual adhesive sheets "F", defined by the adhesive layer "S1", from the carrying layer "S2".

The peeling device 70 operates by diverting at a sharp angle, preferably by winding the web at an angle greater than 90°.

The adhesive sheets "F" detached are then fed to a covering station "R", and in particular to a covering conveyor 100 configured for applying each adhesive sheet "F" to a respective article "A" in a covering station "R". With regard to the carrying layer "S2" and any residual portions (blanking frames) of the adhesive layer "S1", they are, on the other hand, collected, in particular wrapped using a recovery unit 80 located downstream of the peeling device 70. Structurally, the recovery unit 80 of the carrying layer

“S2” comprises a support 81 for an accumulation roll 82. Preferably, the support 81 may be motor-driven to apply or promote the wrapping of the carrying layer “S2” and any residual portions of the adhesive layer “S1” transported by the carrying layer “S2”.

5 Functionally, therefore, the feed unit 20 feeds the multilayer web “N”. If necessary, the web “N” is blanked by the blanking device 60, which forms a succession of adhesive sheets “F” from the adhesive layer “S1”, which are adhered to the carrying layer “S2” and supported by it. The web “N” is then peeled by the peeling device 70, which separates the individual
10 adhesive sheets “F” from the carrying layer “S2” and feeds them to the covering conveyor 100. The carrying layer “S2” and any residual portions of the adhesive layer “S1” are collected by the recovery unit 80.

The articles “A”, on the other hand, are fed to the covering station “R” by a transfer conveyor 10a. The transfer conveyor 10a is in particular
15 configured to advance a succession of articles “A” to be covered towards a covering station “R”.

The transfer conveyor 10a, of known structure, may be of the type with a conveyor belt, chain or motor-driven rollers. The particular type of transfer conveyor 10a is selected taking into account parameters such as
20 dimensions, weight, stability, configuration and other properties of the articles “A”, in order to guarantee an efficient and reliable transport, as well as an adequate support during the covering process. Preferably, the transfer conveyor 10a is configured for positioning the articles “A” spaced from each other at least at the covering station “R”.

25 In accordance with a particularly advantageous aspect of the invention, the machine 1 further comprises at least one web “N” adjustment device 30, 40, 50 for adjusting the position of the web “N” in such a way as to vary the position of each adhesive sheet “F” relative to the covering conveyor 100. In other words, the position of the web “N” is adjusted in
30 such a way as to vary the position of each adhesive sheet “F” relative to the covering conveyor 100.

More specifically, the machine 1 comprises at least one device 30, 40 for the lateral adjustment of the web "N" and/or at least one device 50 for the longitudinal adjustment of the web "N".

With reference to the at least one device 30, 40 for lateral adjustment of the web "N", it is configured to perform a lateral movement of the web "N",
5 in particular along the surface on which a respective stretch of the web "N" lies.

The at least one device 30, 40 for lateral adjustment of the web "N" may be located upstream of the peeling device 70 and/or downstream of the
10 peeling device 70.

Preferably, the machine 1 comprises a first device 30 for lateral adjustment of the web "N", illustrated in more detail in Figure 2, which is positioned upstream of the peeling station 70 and a second device 40 for lateral adjustment of the web "N", which is positioned downstream of the
15 peeling device 70. Preferably, the first and the second device 30, 40 for lateral adjustment of the web "N" can be operated independently of each other.

Structurally, each device 30, 40 for the lateral adjustment of the web "N" comprises at least one respective deflecting roller which produces a
20 variation of the feed direction of the web "N" and a respective translation mechanism acting on the at least one deflecting roller to perform an axial translation of the at least one deflecting roller. Preferably, each device 30, 40 for lateral adjustment of the web "N" comprises at least one respective pair of deflecting rollers to perform respective variations of the feed
25 direction. The translation mechanisms operate, preferably entirely, on the respective deflector rollers to produce an axial translation of the respective deflector rollers.

Alternatively, each device 30, 40 for lateral adjustment of the web "N" may comprise a support which can be translated laterally, configured to exert
30 an action for lateral movement of the web. This may be achieved by means of a supporting element, fixed or rotatable, which is laterally

movable and configured to perform a corresponding translation of the web. For this purpose, the supporting element may be provided with lateral protrusions or sides defining respective lateral stops for the web. This may therefore be done in addition to or alternatively to the embodiment by one
5 or more deflector rollers (for example, the deflector rollers may be provided with lateral protrusions defining abutment shoulders for respective side edges of the web).

Figure 2 shows a preferred embodiment of the first lateral adjustment device 30. The first lateral adjustment device 30 comprises a single pair of
10 deflector rollers 31, 32 and the above-mentioned translation mechanism 33. The second device 40 for the lateral adjustment of the web "N" comprises, on the other hand, two pairs of rollers.

Preferably, the devices 30, 40 for lateral adjustment of the web "N" do not operate on the peeling device 70 but upstream and/or downstream of it.

15 With reference to the at least one device for longitudinal adjustment 50 of the web "N", it is configured for producing a temporary acceleration or a temporary deceleration of the web "N", so as to vary the position of the front edge of each adhesive sheet "F" at the peeling device 70. The web "N" longitudinal adjustment device 50 is located downstream of the peeling
20 device 70. Preferably, the device 50 for longitudinal adjustment of the web "N" is interposed between the peeling device 70 and the support 81 for the accumulation roll 82 of the recovery unit 80 of the carrying layer "S2" and of the residual portions of the adhesive layer "S1". Structurally, the device for longitudinally adjusting 50 the web "N" may comprise a device for
25 pulling the web and/or a device for tensioning the web "N", for example one or more pairs of motor-driven pulling rollers.

Again with reference to the positional adjustment of the web "N", the machine 1 also comprises at least one sensor (not illustrated in the accompanying drawings) configured for detecting a longitudinal and/or
30 lateral positioning of the web "N" and/or of each adhesive sheet "F" on the carrying layer "S2" or on the above-mentioned covering conveyor 100

(each of the possible combinations of them can be provided), and a control unit "U" connected to the at least one sensor and to at least one of the adjustment devices 30, 40, 50 of the web "N". The control unit "U" is configured at least to control a positional adjustment of the adjustment
5 device 30, 40, 50 of the web "N" as a function of the longitudinal and/or lateral positioning detected, in particular as a function of the deviation between the positioning detected by the at least one sensor and a reference positioning.

Functionally, the longitudinal and/or lateral positioning of the web "N"
10 and/or of each adhesive sheet "F" on the carrying layer "S2" or on the covering conveyor 100 is therefore detected and, as a function of the detection, in particular as a function of the longitudinal and/or lateral positioning detected, a positional adjustment of the web "N" is carried out. In particular, the positional adjustment step of the web "N" is performed as
15 a function of the deviation between the positioning detected by the at least one sensor and a reference positioning.

Preferably, each longitudinal and/or lateral position sensor is an optical sensor, for example a video camera or a photocell, configured to detect a corresponding edge and/or a distinctive sign (marker) made on the web or
20 on each adhesive sheet.

According to a further particularly advantageous aspect of the invention, the machine 1 also comprises, between the peeling device 70 and the covering station "R", a removal device 90 associated with the covering conveyor 100 and configured to remove one or more adhesive sheets "F"
25 from the covering conveyor 100 in a controlled manner. In other words, there is a step of removing one or more adhesive sheets "F" from the covering conveyor 100, in a controlled manner, by means of the removal device 90, before the adhesive sheets "F" reach the covering station R. This removal is performed according to predetermined criteria and is
30 intended to prevent one or more adhesive sheets, in predetermined conditions, from reaching the covering station "R". The removal device is

illustrated in detail in Figure 7.

More in detail, the removal device 90 confronts the covering conveyor 100 and is configured to detach the adhesive sheets "F" from the covering conveyor 100 by direct interaction with the adhesive side of the adhesive sheets "F".

The removal device 90 is configured to detach the adhesive sheets "F" from the covering conveyor 100 during a step of moving the covering conveyor 100. In other words, the removal device 90 operates whilst the covering conveyor 100 is moving along the covering path "R1".

10 The structure of the removal device 90 is independent of the specific type of the covering conveyor 100.

In particular, the removal device 90 has an outer surface 91 intended to enter into contact with the adhesive sheets "F" to detach the adhesive sheets "F" from the covering conveyor 100.

15 Preferably, the removing step is actuated by an adhesive force exerted by direct contact between the removal device 90 and the adhesive side of the adhesive sheets "F". In particular, the step of removing is accomplished by detaching the adhesive sheets "F" from the covering conveyor 100 and moving them away therefrom, and then accumulating the adhesive sheets
20 "F" which have been detached.

The step of removing is carried out during a step of advancing the adhesive sheets "F" on the covering conveyor 100 between the peeling device 70 and the covering station "R".

The step of removing is accomplished by at least temporarily moving the outside surface 91 at a speed substantially equal to the advancing speed of the adhesive sheets "F" on the covering conveyor 100. In particular, the removal device 90 is configured in such a way that the outside surface is moved or movable, at least temporarily, at a speed substantially equal to the advancing speed of the adhesive sheets "F" on the covering conveyor
25 100.
30

Preferably, the outer surface 91 extends along a closed path. In particular,

the removal device 90 comprises a spool 92 for retaining and winding a plurality of adhesive sheets "F", in particular in such a way as to form a plurality of superposed layers. Moreover, the removal device 90 comprises a supporting roll (not illustrated) for retaining and winding a plurality of adhesive sheets "F", in particular in such a way as to form a plurality of superposed layers.

Preferably, the removal device 90 is movable relative to the covering conveyor 100 between a disengaged position, where the removal device 90 is away from the covering conveyor 100 to allow the adhesive sheets "F" to be transferred from the peeling device 70 to the covering station "R", and an engaged position, where the removal device 90 is close to and/or in contact with the covering conveyor 100 so the adhesive sheets "F" adhere to it. Figure 1 shows only the engaging configuration.

The two positions of the removal device 90 are illustrated in Figure 7: in particular, the engaging position is illustrated with a continuous line, whilst the disengaging position is illustrated with a dashed line.

In other words, the removing step is preceded by a step of moving the removal device 90 relative to the covering conveyor 100 from the disengaged position, where the removal device 90 is away from the covering conveyor 100 to allow the normal transfer of the adhesive sheets "F" from the peeling device 70 to the covering station "R", to the engaged position, where the removal device 90 is close to and/or in contact with the covering conveyor 100 to engage the adhesive sheets "F" and remove the adhesive sheets "F" from the covering conveyor 100.

The removing step being followed, after one or more adhesive sheets "F" have been removed, by a step of moving the removal device 90 relative to the covering conveyor 100 from the engaged position to the disengaged position. In other words, after completion of the removal, the removal device 90 is moved again from the engaging position to the disengaging position. For this purpose, the removal device 90 comprises movement means 93 to move the removal device 90 between the engaged and

disengaged positions in controlled manner. Preferably, the movement means 93 comprise a movement arm pivoted close to the covering conveyor 100 (or a generic movable support) and a relative drive unit or a relative actuator.

5 Again with reference to the removal of the adhesive sheets "F", the machine 1 also comprises at least one sensor (not illustrated in the accompanying drawings) configured for measuring one or more operating parameters of the machine 1. In particular, the parameters may comprise one or more between: integrity of the adhesive sheets "F", correct
10 positioning of the adhesive sheets "F" on the covering conveyor 100, transients of starting or stopping the machine 1 and presence or absence of the relative article "A" to be covered.

The at least one sensor is connected to the above-mentioned control unit "U", which is also programmed for activating or deactivating the removal of
15 one or more adhesive sheets "F" by the removal device 90 as a function of the one or more operating parameters of the machine 1. In other words, the control unit "U" is connected to the at least one sensor to activate or deactivate the removal of one or more sheets by the removal device 90 as a function of one or more of the operating parameters of the machine 1
20 detected by the at least one sensor.

Preferably, at least one piece of information obtained from at least one of these sensors is used both to perform the positional (lateral and/or longitudinal) adjustment of the web "N" and to activate the removal of one or more adhesive sheets from the covering conveyor "100". In particular,
25 the at least one piece of information is position information of each adhesive sheet "F" on the covering conveyor "100".

With reference to the covering conveyor 100, it is configured to receive the individual adhesive sheets "F" detached by the peeling device 70, to transfer the individual adhesive sheets "F" to the covering station (R) and
30 to apply each adhesive sheet "F" to a respective article "A", received from the transfer conveyor 10A, in the covering station "R".

In accordance with a particularly advantageous aspect of the invention, the covering conveyor 100 is configured to hold each adhesive sheet "F" by its non-adhesive side and to apply the adhesive sheet "F" to an outside surface of the article "A", to at least partly cover the article "A".

5 More specifically, as will be described in more detail below, the covering conveyor 100 is configured to define a first step of covering, in which the adhesive sheet "F" is folded into a "U" shape around the article "A" so as to have front edges and/or side edges protruding from the article "A", and a second step of covering, in which the front edges and/or the side edges
10 are folded onto the article "A" so as to complete the step of applying the adhesive sheet "F" to the article "A".

Structurally, the covering conveyor 100 has at least one pocket 101 which is movable along a covering path R1 and, on opposite sides of the pocket 101, respective retaining surfaces 102 provided with pneumatic suction to
15 support side portions of an adhesive sheet "F" received from the peeling device 70 in such a way that a central portion of the adhesive sheet "F" is positioned so it covers the pocket 101 so that inserting an article "A" into the pocket 101 causes a wrapping, at least partial, and in particular into a
20 "U" shape, of the adhesive sheet "F" on the article "A". In other words, the insertion of the article "A" in the respective pocket 101 determines the above-mentioned first covering step, wherein the adhesive sheet "F" is applied in a "U" shape on the article "A" so as to have front edges and/or side edges protruding relative to the article "A".

Preferably, the machine 1 comprises a pushing member 11, located in the
25 covering station "R" and configured to cause or facilitate the insertion of an article "A", in particular carried by the transfer conveyor 10a, into the respective pocket 101. In other words, the insertion of the article "A" inside the respective pocket 101 is facilitated or accomplished using the pushing member 11, which acts preferably on the rear surface (opposite to the feed
30 direction) of the article "A".

With reference to the above-mentioned covering path "R1", it extends at

least between a receiving position, where the pocket 101 receives the respective adhesive sheet "F" from the peeling device 70, an application position, wherein the pocket 101 receives the article "A", and a releasing position, wherein the pocket 101 releases the article "A" covered with the adhesive sheet "F", as will be described in more detail below.

Preferably, the covering path "R1" is defined by a closed line and the covering conveyor 100 comprises a plurality of pockets 101 conveyed in succession along the covering path "R1".

Still more preferably, the covering conveyor 100 comprises a transfer wheel 105 rotatable about a respective axis of rotation "X" preferably horizontal. The seats 101 are angularly equispaced about the axis of rotation "X".

Again with reference to the first covering step, in accordance with a particularly advantageous aspect of this invention, the machine 1 comprises a pressing member 106 located in the covering station "R" and configured to engage a portion (in particular a central portion) of the adhesive sheet "F", held by the covering conveyor 100 in the application position, and to press the portion of the adhesive sheet "F" against a surface of the respective article "A".

More specifically, the pressing member 106 can be moved relative to the covering conveyor 100 according to a movement towards and away from the surface on which the adhesive sheet "F" lies. Preferably, the pressing member 106 is movable through or inside the pocket 101. Moreover, preferably, the pressing member 106 is movable in a radial direction relative to the axis of rotation "X" of the covering conveyor 100, in particular according to a translation movement.

The pressing member 106 is designed to press the adhesive sheet "F" directly on the article "A" at the infeed into the respective pocket 101 or when stationary in the proximity of the respective pocket 101.

Preferably, also, the pressing member 106 is angularly stationary about the axis of rotation "X". In other words, the pressing member 106 is

operatively positioned in a fixed position along the covering path "R1" of the pockets 101 of the covering conveyor 100.

According to an aspect, the pressing member 106 is configured to apply a compressive action whereby the contact area is progressively enlarged as the compressive thrust on the surface of the respective article "A" increases. Preferably, the at least one pressing member 106 comprises an elastic pad having a convex contact surface 106a so as to apply the compressive action, gradually increasing the area of contact with the article "A".

10 The increasing area of contact has the effect of preventing the inclusion of air bubbles between the adhesive sheet "F" and the outer surface of the article "A", thus guaranteeing a correct application on the entire contact surface.

Figures 5A-5C show an operating sequence of the first pressing member 106. In particular, the drawings illustrate a gradual increase in the area of contact 106a due to the gradual movement towards each other of the pressing member 106 and the article "A". In Figure 5A, the pressing member 106 is in contact on the surface of the article "A". In particular, the pressing member 106 and the article "A" are at a distance such that the contact surface 106a is minimal and the pressing member 106 is not substantially deformed. This corresponds to an instant of first mutual engagement between the pressing member 106 and the article "A". In Figure 5C, the pressing member 106 is pressed on the article "A" so as to deform the pressing member 106 and therefore increase the contact surface 106a. Preferably, the shape of the pressing member 106 is such as to define a compressive action which spreads from the centre of the surface of the article "A" towards the peripheral portions of the article.

According to a preferred embodiment, the pushing member 11 and the pressing member 106 operate in a coordinated fashion to optimise application of the adhesive sheet "F". Preferably, the pressing member 106 engages the adhesive sheet "F" whilst the latter is close to, but not in

contact with, the outer surface of the article "A" and pushes the respective portion of the adhesive sheet "F" against the article "A", preferably keeping the article "A" stationary.

Next, the article "A" pushed by the pushing member 11 is introduced into the pocket 101 for wrapping the adhesive sheet "F" in a "U" shape on the article "A". In this situation, the pressing member 106 may withdraw together with the feed movement of the article "A", performing the function of a counter-pusher, or it may withdraw before the article "A" is introduced into the pocket 101.

Again with reference to the first covering step, the machine 1 may comprise further pressing members configured to facilitate adhesion of the adhesive sheet "F" on the article "A". In particular, there is at least one pair of pressure rollers 107, located on opposite sides of the pocket 101, adjacent to the retaining suction surfaces 102, and configured to apply a compressive action on opposite lateral faces of the article "A" when the article "A" is inserted into the pocket 101, so as to cause the adhesive sheet "F" to adhere uniformly to the opposite lateral surfaces of the article "A".

Preferably, the pressure rollers 107 are made from an elastically deformable material and/or are subjected to pressure by elastic means which tends to push them towards each other.

The presence of the pressure rollers 107 guarantees a gradual compression of the area of contact between the adhesive sheet "F" and the outer surface of the article "A" which is generated each time during insertion of the article "A" in the pocket 101, preventing the inclusion of air bubbles between the adhesive sheet "F" and the outer surface of the article "A" and guaranteeing a correct application of the adhesive sheet "F" to the article "A".

Figures 4A-4D and Figures 6A-6C show in sequence the first step of covering the article "A".

In Figure 4A, the article "A" is fed by the transfer conveyor 10a towards the

covering station "R" and in particular in the proximity of the covering conveyor 100. During this step, the covering conveyor 100 stops so that the pocket 101 is at rest with respect to the covering path 'R1'. The article "A" faces the pocket 101 of the covering conveyor 100 by means of a
5 respective lateral face. The pocket 101 holds by suction a respective adhesive sheet "F" by the non-adhesive side. The central portion of the adhesive sheet "F" is positioned to cover the pocket 101. In this step, the pressing member 106 is moved away from the plane in which the adhesive sheet "F" lies. Preferably, the pressing member 106 is outside the pocket
10 101. After completion of this step, the article "A" is as shown in Figure 6A.

In Figure 4B, the article "A" is moved by the transfer conveyor 10a and/or by the pushing member 11 entering the pocket 101. The article "A" comes into contact with the adhesive side of the adhesive sheet "F". During this step, the pressing member 106 is moved close to the plane in which the
15 adhesive sheet "F" lies and in contact with the adhesive sheet "F" in such a way as to press the central portion of the adhesive sheet "F" against the lateral surface of the article "A". After completion of this step, the article "A" and the adhesive sheet "F" are as shown in Figure 6B.

In Figure 4C, the article "A" is inserted progressively inside the pocket 101.
20 The pressing member 106 (which in this mode operates as a counter-pusher) is compressed against the lateral surface of the article "A" operating the compressive force. The pair of pressure rollers 107, located on opposite sides of the pocket 101, in turn applies the compressive action on opposite lateral faces of the article "A", aimed at causing the adhesive
25 sheet "F" to adhere uniformly to the opposite lateral surfaces of the article "A".

In Figure 4D, the insertion of the article "A" in the pocket 101 is completed. The first step of covering the article "A" has therefore been completed. After completion of this step, the article "A" and the adhesive sheet "F" are
30 as shown in Figure 6C. In particular, the three lateral surfaces of the article "A" are entirely covered by the adhesive sheet "F". The front edges of the

adhesive sheet "F" positioned in a cantilever fashion beyond the fourth lateral surface and the lateral flaps of the adhesive sheet "F" are positioned in a cantilever fashion beyond the end surfaces. As shown in the accompanying drawings, the lateral flaps are positioned in a cantilever fashion relative to the respective pocket 101.

With reference to the second step of covering the article "A", the covering conveyor 100 comprises folding means 108, 110, 111, 120, 121 positioned along the covering path "R1" and configured to fold end portions or edges of the adhesive sheet "F" on the article "A". In other words, the folding means 108, 110, 111, 120, 121 are configured to perform the second covering step wherein the front edges and/or the side edges are folded on the article "A", completing the application of the adhesive sheet "F" on the article "A". The second folding step and a preferred embodiment of the folding means 108, 110, 111, 120, 121 are illustrated in Figures 4E-4I and Figures 6D-6F.

More specifically, the folding means 108, 110, 111, 120, 121 comprise first folding means 108, 110, 111, positioned on opposite sides of the covering path "R1" (only those positioned on one side are visible in the drawings) to fold opposite side edges of the adhesive sheet "F" onto respective opposite surfaces of the article "A", and second folding means 120, 121 configured to fold juxtaposed front edges of the adhesive sheet "F" onto a same front surface of the article "A". Preferably, the folding means 108, 110, 111, 120, 121 are positioned in a stationary position relative to the covering path "R1".

With reference to the first folding means 108, 110, 111, preferably they comprise a pair of first movable deflectors 108 (one per side), a pair of second movable deflectors 110 (one per side) and a pair of fixed deflectors 111 (one per side).

As illustrated in Figure 4E, each first movable deflector 108 is configured to perform the folding of a respective side edge, in particular positioned on the bottom of the pocket 101, on the respective end surface of the article

“A”. More specifically, each first movable deflector 108 has a tapered shape so as to engage firstly (with a relative front portion narrower than the article “A”) only the bottom side edge 210; 310 so as to fold it and return it on the respective end surface of the article “A” and secondly (with a relative second, rear portion, larger than the article “A”) for guiding the two corresponding parallel side edges 220, 230; 320, 330 folded outwards, therefore with a mutually divergent movement. After completion of this step, the article “A” and the adhesive sheet “F” are as shown in Figure 6D. Figures 4F-4G show in more detail one of the second movable deflector elements 110. The second movable deflector element 110 is configured to fold one of the two parallel side edges 230; 330 positioned on each end surface of the article “A”, and in particular the rear side edge 230; 330 relative to the direction of movement of the article “A” along the covering path “R1”, on the end surface. The movable deflector element 110 is configured to be moved to a position away from the pocket 101, and in particular to the article “A”, and a position for engaging with the respective lateral surface of the article “A”, whilst the pocket 101 is stopped relative to the covering path “R1”. In other words, during the folding operation performed by the movable deflector element 110, the covering conveyor 100 is stationary. Preferably, the movable deflector element 110 tilts between the two positions. Functionally, during the movement between the far position and the abutment position, each movable deflector element 110 engages and progressively folds one of the two parallel side edges 230; 330 so as to fold it on the respective end surface of the article “A”.

The other of the two parallel side edges 220; 320 located on each end surface of the article “A”, and in particular the front edge relative to the direction of movement of the article “A” along the covering path “R1”, is folded on the end surface of the article “A” by engaging a respective stationary deflector element 111 during the subsequent feeding of the covering conveyor 100 along the covering path “R1”. The stationary

deflector element 111 is therefore configured to gradually fold the respective front side edge 220, 320 of the adhesive sheet "F" on the respective end surface of the article "A". The stationary deflector element 111 is covering path "R1", preferably fixed. In other words, the stationary
5 deflector element 111 uses the movement of the pocket 101 moving along the covering path "R1" to complete the folding of the side edges of the sheet "F". After completion of the steps performed by the movable deflector elements 110 and by the stationary deflector elements 111, the article "A" and the adhesive sheet "F" are as shown in Figure 6E.

10 With reference to the second folding means 120, 121, preferably they comprise a first device 120 for pressing the front edges 400, positioned preferably in a stationary position along the covering path "R1" downstream of the first folding means 108, 110, 111, and a second device 121 for pressing the front edges, positioned downstream of the first
15 pressing device 120, along the covering path "R1".

Figure 4H shows in more detail the first pressing device 120. The first pressing device 120 comprises pressing elements 120a configured for folding a first pair of opposite front edges on the same lateral surface. In particular, the pressing elements 120a can be moved between a far
20 position and a near position. During this folding step, the pocket 101 is stopped relative to the covering path "R1". After completion of that step, the pocket 101 is moved by the covering conveyor 100 towards the second device 121 for pressing the front edges. The second device 121 for pressing the front edges has substantially the same structure and
25 function as the first device 120 for pressing the front edges. However, it is rotated by 90° relative to the first device 120 for pressing the front edges in order to fold a second pair of front edges 400. During this folding step, the pocket 101 is stationary relative to the covering path 'R1'.

Advantageously, as shown in Figures 4H-4I, close to these pressing
30 devices 120, 121, the covering conveyor 100 comprises a cam mechanism 125, stationary relative to the covering path 'R1' and configured to engage

the article 'A' running along the covering path 'R1' so as to make it come out partly from the respective pocket 101 in such a way as to facilitate the folding operations of the second covering step. After completion of the steps performed by the first and second devices 120, 121 for pressing the front edges, the article "A" and the adhesive sheet "F" are as shown in Figure 6F.

After both of the covering steps have been completed, the article "A" is therefore covered by the adhesive sheet "F". In particular, the article "A" has three side surfaces completely covered by the adhesive sheet "F" whilst the fourth side surface and the two end surfaces are only partly covered. Preferably, if the article "A" is a battery, the fourth surface is defined by the surface having the above-mentioned electrodes.

At this point, the pocket 101 is again moved by the covering conveyor 100 along the covering path 'R1' so as to reach the above-mentioned release position, close to an unloading conveyor 10b. In this position, the article "A" already covered is unloaded on the unloading conveyor 10b and transported by it along an unloading path.

The invention achieves the above-mentioned aims by eliminating the drawbacks of the prior art: In this regard, it should be noted that the structure of the machine 1, as claimed and/or described, is able to guarantee the efficiency and production speed as well as being able to reduce the errors and guarantee a high quality standard of the finished product and, lastly, to reduce the production costs. This result is achieved thanks to the mechanisation and automation of the process for covering the articles, performed by the above-mentioned machine and the above-mentioned method.

CLAIMS

1. A machine (1) for covering articles "A" prismatic or polyhedral in shape with an adhesive sheet "F", comprising:

- 5 - a feed unit (20) for feeding a web (N) formed at least partly from the overlay between an adhesive layer (S1), having an adhesive side and a non-adhesive side, and a carrying layer (S2) applied to the adhesive side of the adhesive layer (S1);
- 10 - a peeling device (70) configured to detach individual adhesive sheets (F), defined by the adhesive layer (S1), from the carrying layer (S2);
- a transfer conveyor (10a) configured to advance a succession of articles (A) to be covered towards a covering station (R);
- a covering conveyor (100), configured to receive the individual adhesive sheets (F) detached by the peeling device (70), to
15 transfer the individual adhesive sheets (F) to the covering station (R) and to apply each adhesive sheet (F) to a respective article (A), received from the transfer conveyor (10A), in the covering station (R);

20 wherein the covering conveyor (100) is configured to hold each adhesive sheet (F) by its non-adhesive side and to apply the adhesive sheet (F) to an outside surface of the article (A), to at least partly cover the article (A).

25 2. The machine (1) according to claim 1, wherein the covering conveyor (100) is configured to define a first step of covering, in which the adhesive sheet (F) is folded into a U shape around the article (A) so as to have front edges and/or side edges protruding from the article (A), and a second step of covering, in which the front edges and/or the side edges are folded onto the article (A) so as to complete the step of applying the adhesive sheet (F) to the article (A).

30 3. The machine (1) according to claim 1 or 2, wherein the covering conveyor (100) has at least one pocket (101) which is movable along a covering path (R1) and, on opposite sides of the pocket (101), respective

retaining surfaces (102) provided with pneumatic suction to support side portions of an adhesive sheet (F) received from the peeling device (70) in such a way that a central portion of the adhesive sheet (F) is positioned so it covers the pocket (101) so that inserting an article (A) into the pocket
5 (101) causes the adhesive sheet (F) to be folded into a U shape to at least partly wrap the article (A).

4. The machine (1) according to claim 3, wherein the covering path (R1) extends at least between a receiving position, where the pocket (101) receives the respective adhesive sheet from the peeling device (70), an
10 application position, where the pocket (101) receives the article (A), and a releasing position, where the pocket (101) releases the article (A) covered with the adhesive sheet (F).

5. The machine (1) according to claim 3 or 4, wherein the covering path (R1) is defined by a closed line and wherein the covering conveyor (100)
15 comprises a plurality of pockets (101) conveyed in succession along the covering path (R1).

6. The machine (1) according to claim 4, wherein the covering conveyor (100) comprises a covering wheel (105) rotatable about a respective axis of rotation (X); the pockets (101) being angularly equispaced around the
20 axis of rotation (X).

7. The machine (1) according to any one of claims 3 to 6, further comprising a pushing member (11), located in the covering station (R) and configured to cause or facilitate the insertion of an article (A), in particular carried by the transfer conveyor (10a), into the respective pocket (101).

8. The machine (1) according to any one of the preceding claims, wherein
25 the covering conveyor (100) comprises folding means (108, 110, 111, 120, 121) disposed along the covering path (R1) and configured to fold end portions or edges of the adhesive sheet (F) round the article (A).

9. The machine (1) according to claim 8, wherein the folding means
30 comprise first folding means (108, 110, 111), disposed on opposite sides of the covering path (R1) to fold opposite side edges of the adhesive sheet

(F) onto respective opposite surfaces of the article (A), and second folding means (120, 121) configured to fold juxtaposed front edges of the adhesive sheet (F) onto the same front surface of the article (A).

10. The machine (1) according to claim 8 or 9, wherein the folding means (108, 110, 111, 120, 121) are disposed at a stationary position relative to the covering path (R1).

11. The machine (1) according to any one of the preceding claims, comprising a blanking device (60) disposed upstream of the peeling device (70) relative to a conveying path of the web (N) and configured to make a cut or slit in the continuous adhesive layer (S1) of the web (N) so as to obtain a succession of individual adhesive sheets (F) supported by the carrying layer (S2), and a recovering unit (80) for recovering the carrying layer (S2) and any residual portions of the first layer, located downstream of the peeling device (70) relative to the conveying path of the web (N).

12. The machine (1) according to any one of the preceding claims, wherein the feed unit (20) comprises an unwinding device (21) provided with a shaft for supporting a roll of the web (N), a tensioning device (22) located downstream of the unwinding device and a temporary accumulation device (23) for the web (N) located downstream of the tensioning device (22).

13. A method for covering articles (A) prismatic or polyhedral in shape with an adhesive sheet (F), in particular electric batteries, comprising the following steps:

- via a transfer conveyor (10a), advancing a succession of articles (A) to be covered;
- via a feed unit (20), feeding a multilayer web (N) formed at least partly from the overlay between an adhesive layer (S1), having an adhesive side and a non-adhesive side, and a carrying layer (S2) applied to the adhesive side of the adhesive layer (S1);
- via a peeling device (70), detaching individual adhesive sheets (F), defined by the adhesive layer (S1), from the carrying layer (S2);

- via a covering conveyor (100), holding each adhesive sheet (F) by its non-adhesive side;
- via the same covering conveyor (100), applying the adhesive sheet (F) to an outside surface of the article (A) to at least partly cover the article (A).

14. The method according to claim 13, wherein the step of applying the adhesive sheet (F) to an outside surface of the article (A) comprises a first step of covering, in which the adhesive sheet (F) is folded into a U shape around the article (A) so as to have front edges and/or side edges protruding from the article (A), and a second step of covering, in which the front edges and/or the side edges are folded round the article (A) so as to complete the step of applying the adhesive sheet (F) to the article (A).

15. The method according to claim 14, wherein the article is substantially in the shape of a parallelepiped having four lateral surfaces and two end surfaces, and wherein the first step of covering is carried out to fully cover three lateral surfaces of the article (A), leaving front edges of the adhesive sheet (F) jutting outward from the fourth lateral surface and in such a way that the side edges of the adhesive sheet (F) jut outward from the end surfaces; the second step of covering being carried out to fold the front edges onto the fourth lateral surface and to fold the side edges onto the respective end surface.

16. The method according to claim 15, wherein the front edges only partially cover the fourth lateral surface and/or wherein the side edges only partially cover the end surfaces.

17. The method according to any one of claims 13 to 16, wherein the step of holding the adhesive sheet (F) is carried out by the pneumatic action applied by a pair of retaining suction surfaces (102) of the covering conveyor (100), the retaining suction surfaces (102) being spaced from each other and disposed on opposite sides of a pocket (101) of the covering conveyor (100) to position the adhesive sheet (F) in such a way that its central portion covers the pocket (101); the step of applying the

adhesive sheet (F) to an outside surface of the article (A) being at least partly carried out by inserting the article (A) into the pocket (101) while the adhesive sheet (F) is positioned to cover the pocket (101) so as to at least partly wrap the article (A) by folding the adhesive sheet (F) into a U shape
5 round it.

18. The method according to claim 17, wherein the step of inserting the article (A) into the respective pocket (101) is facilitated or accomplished by a pushing member (11).

19. The method according to claim 17 or 18, wherein the step of applying
10 the adhesive sheet (F) to the outside surface of the respective article (A) is completed, after the step of at least partly wrapping, by folding at least one end edge of the adhesive sheet (F), which is jutting outward from the article (A), onto the selfsame article (A) via folding means (108, 110, 111, 120, 121).

20. The method according to any one of claims 13 to 19, wherein the step
15 of feeding involves feeding a web (N) formed from the overlay between a continuous adhesive layer (S1) and a carrying layer (S2) applied to the adhesive side of the adhesive layer (S1); the step of feeding comprising a sub-step of blanking the web (N), carried out by a blanking device (60), in
20 which a cut or slit is made in the continuous adhesive layer (S1) so as to obtain a succession of individual adhesive sheets (F) supported by the carrying layer (S2); the method comprising a step of collecting the carrying web (N), in particular by recovering it after detaching the adhesive sheets (F) from the carrying layer (S2).

21. The method according to claim 16, wherein the article (A) is a battery,
25 used or usable in the automotive sector and provided with electrodes disposed on one of the lateral surfaces, and wherein, in the step of applying the adhesive sheet (F), the electrodes are not covered with the adhesive sheet (F).

Fig.1

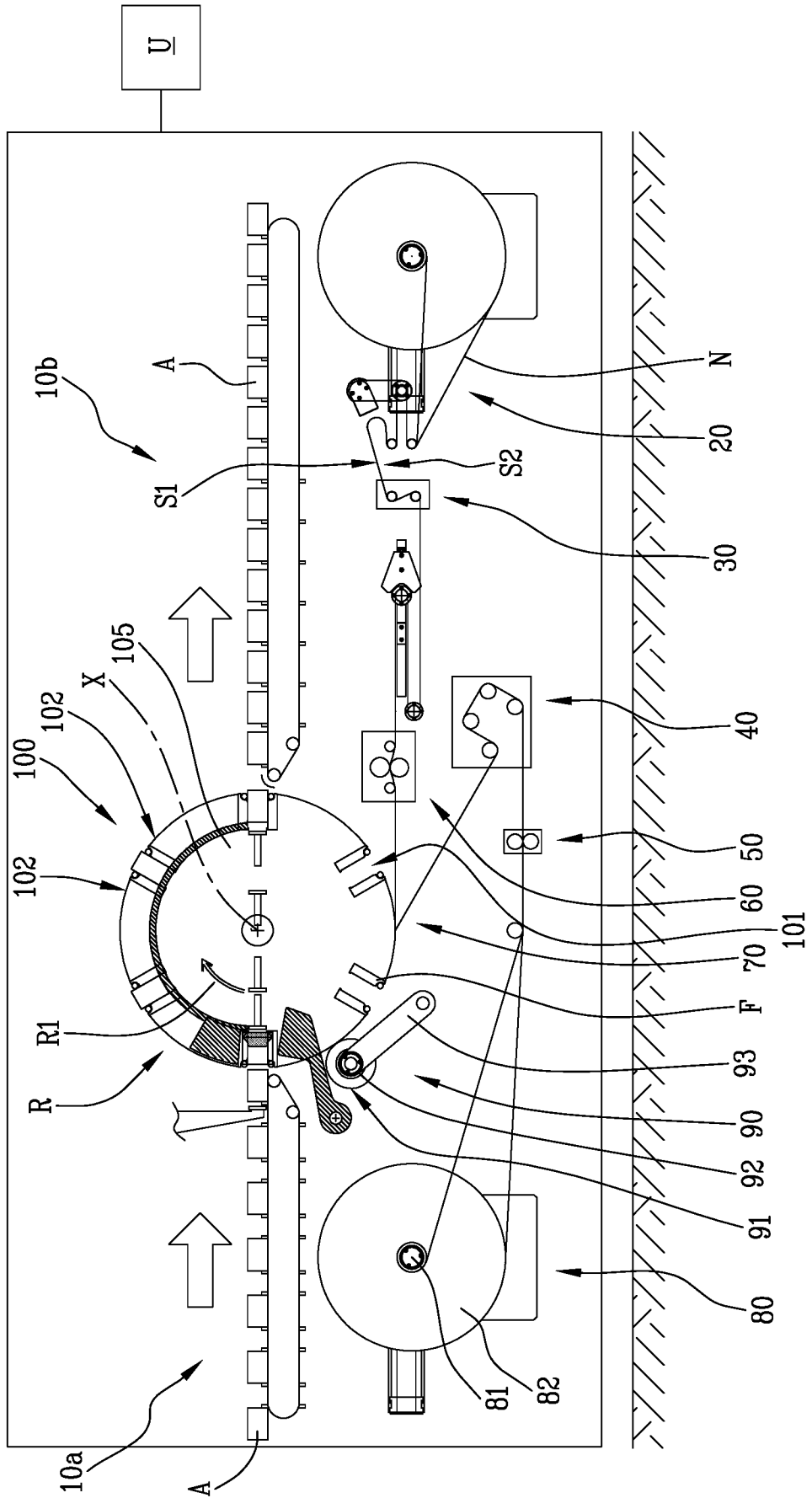


Fig.2

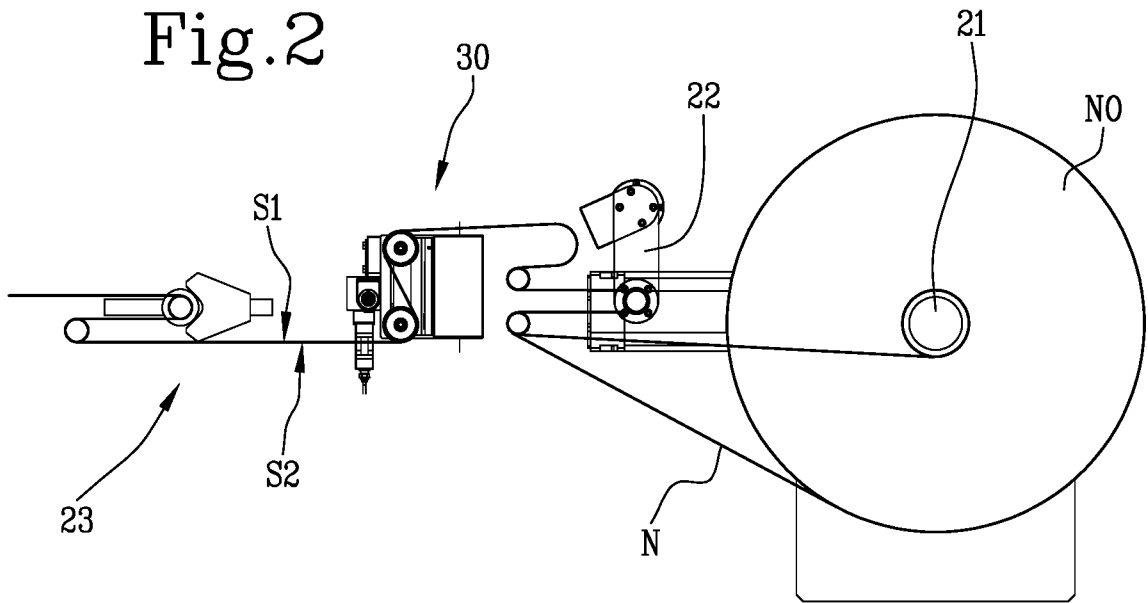


Fig.3

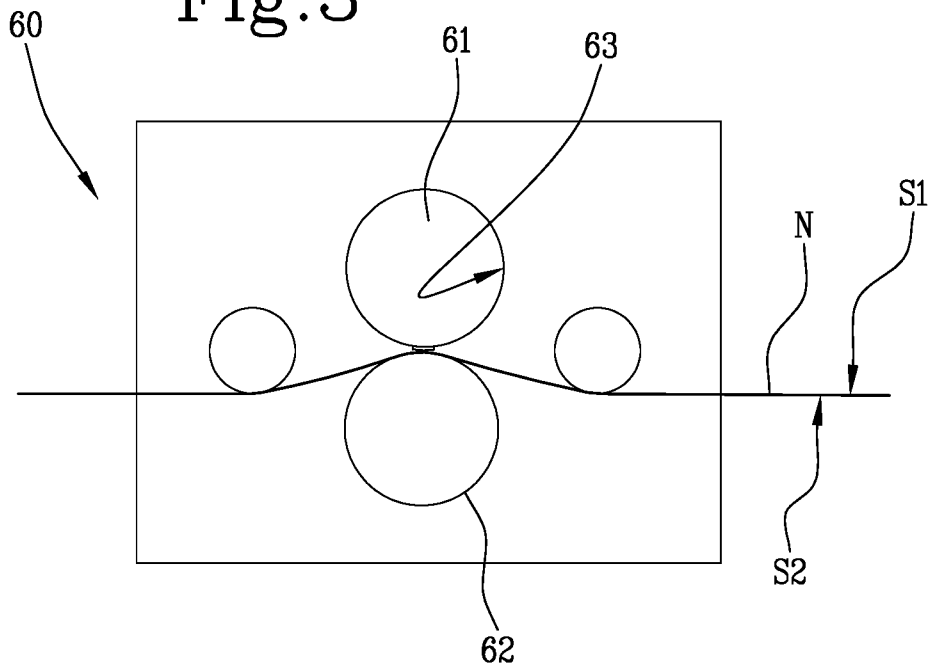


Fig. 4B

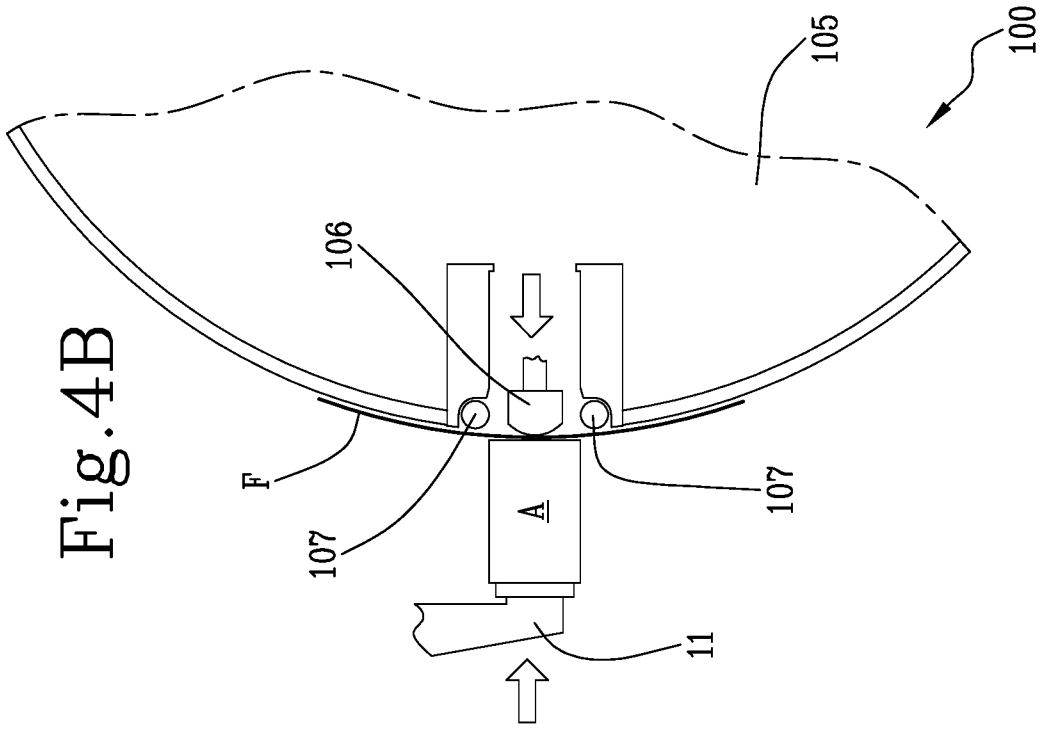


Fig. 4A

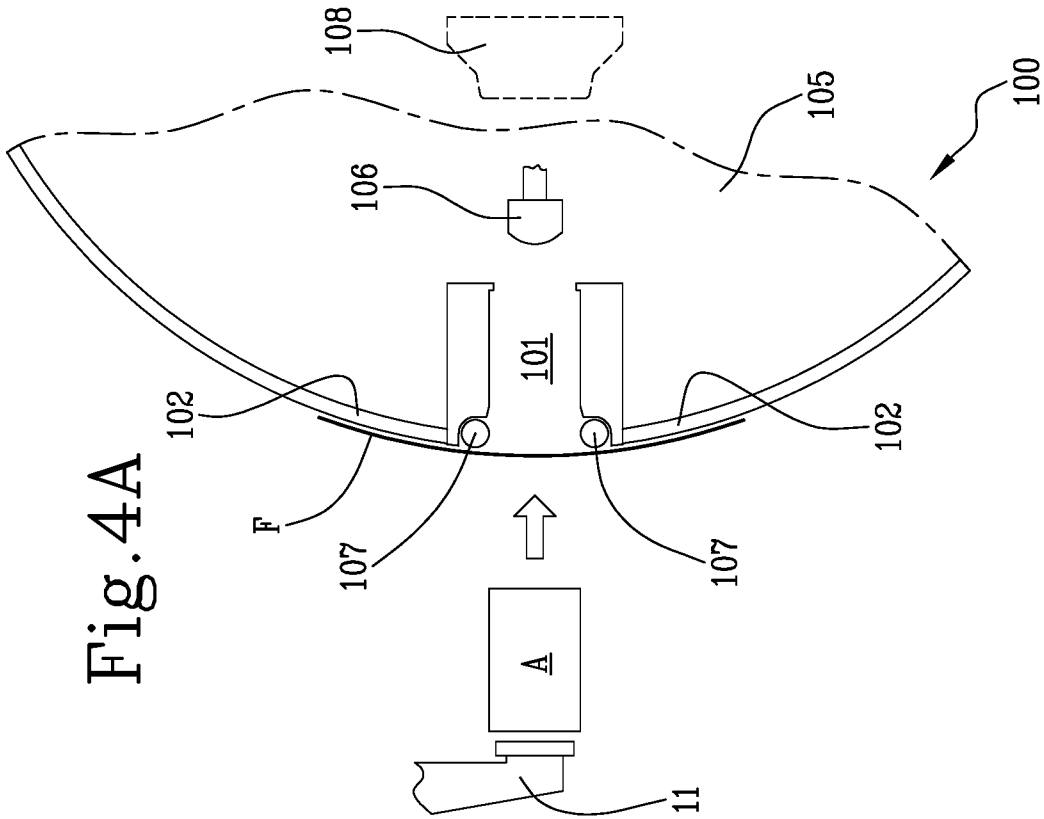


Fig. 4C

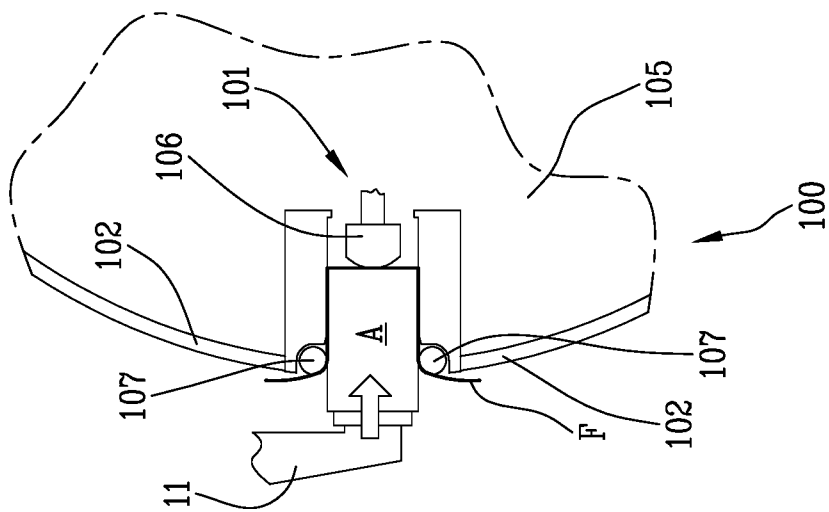


Fig. 4D

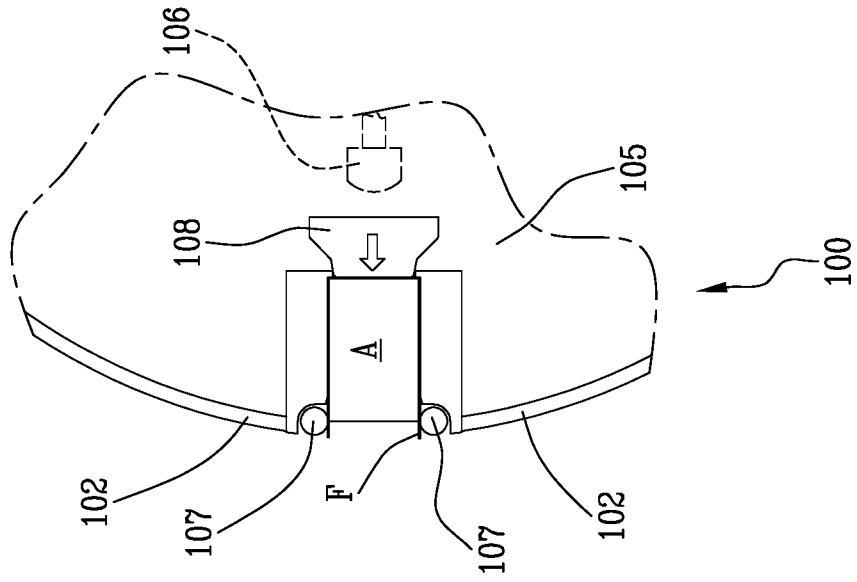
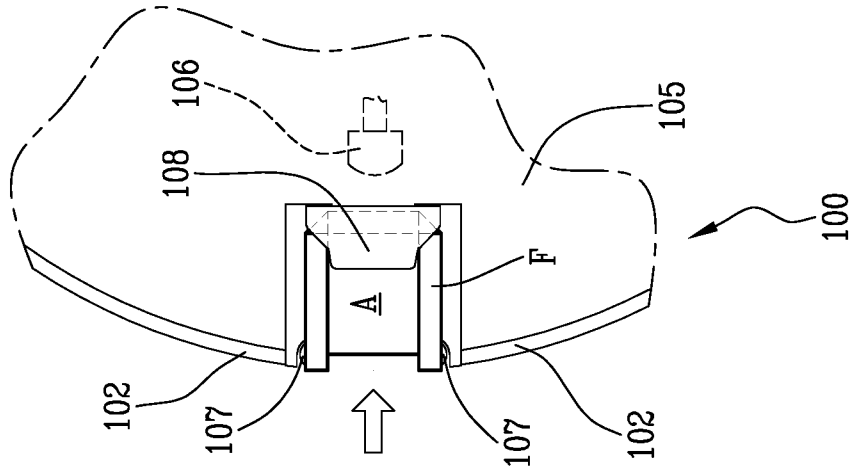


Fig. 4E



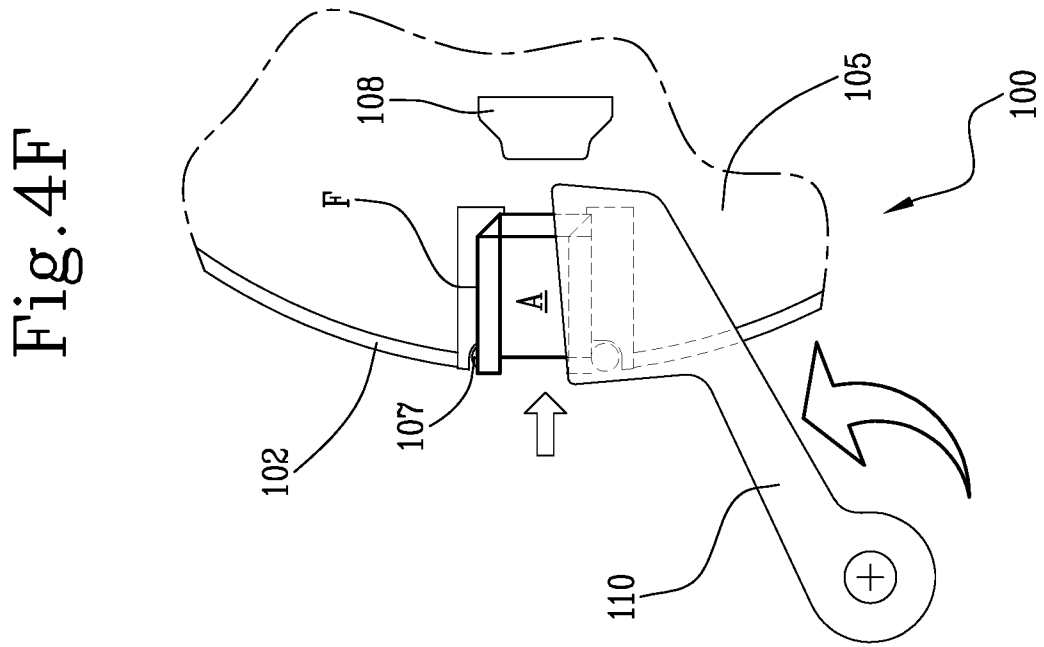
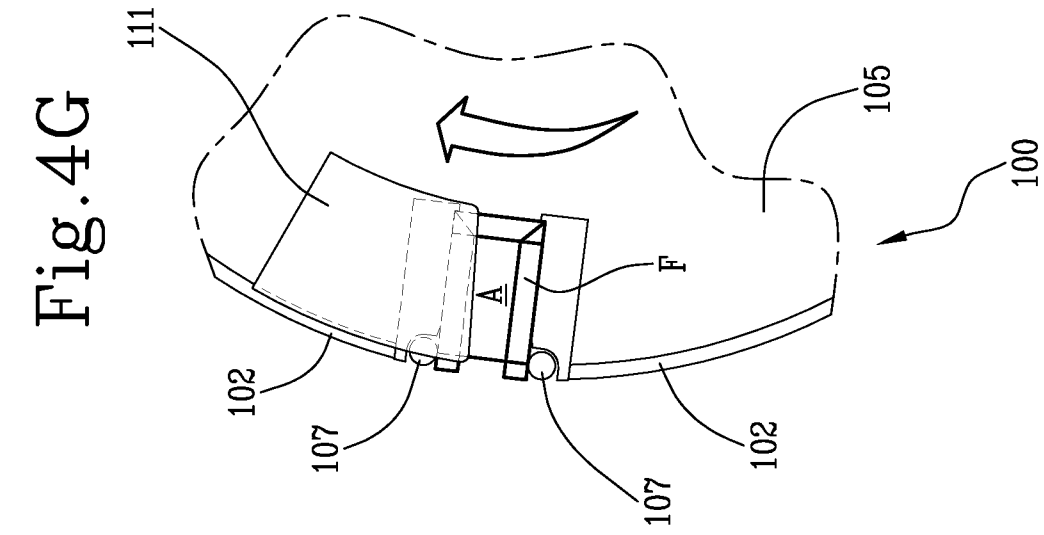


Fig. 4I

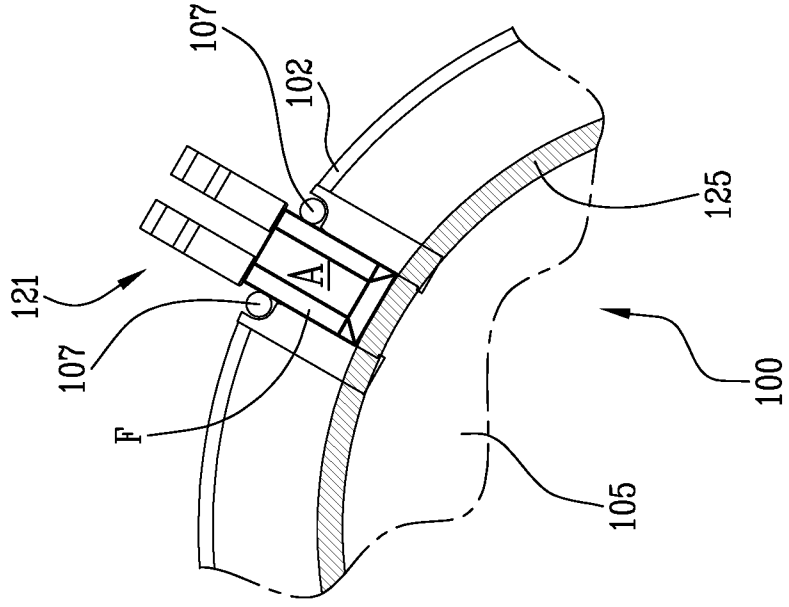


Fig. 4H

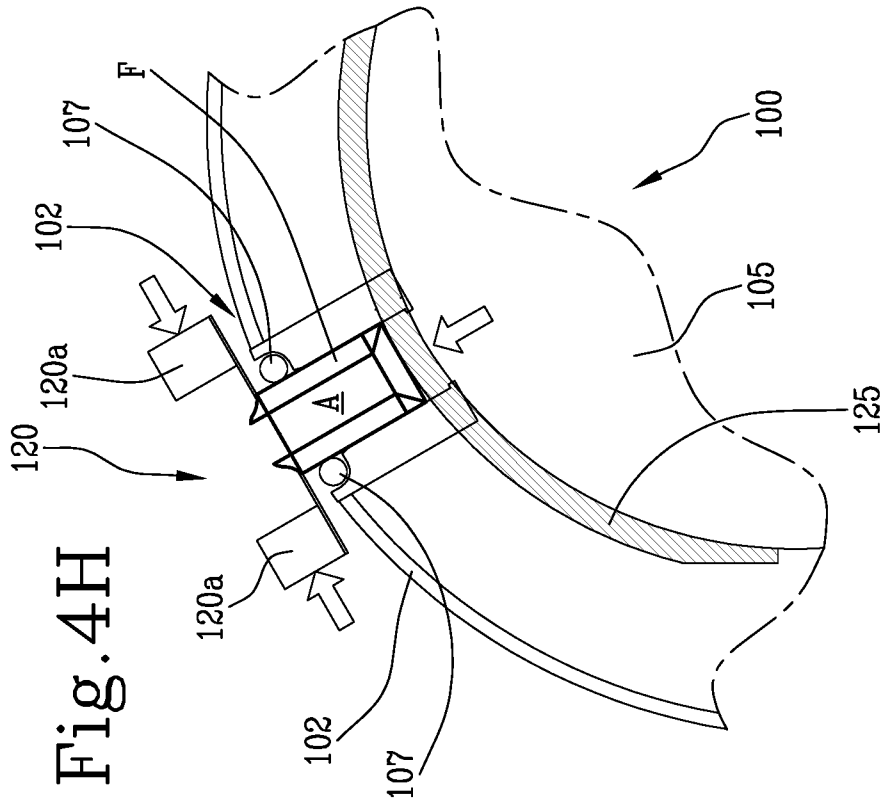


Fig. 5A

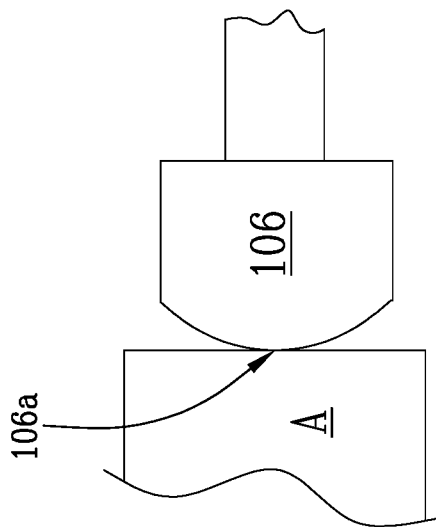


Fig. 5B

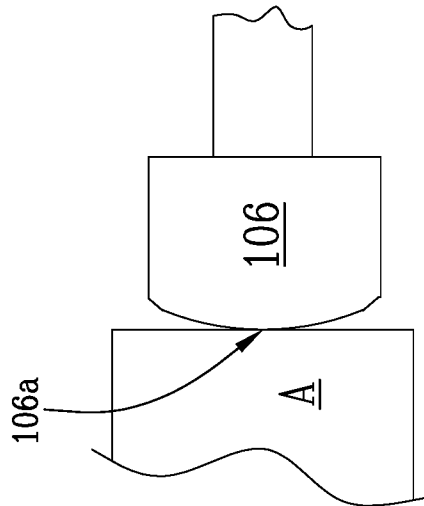


Fig. 5C

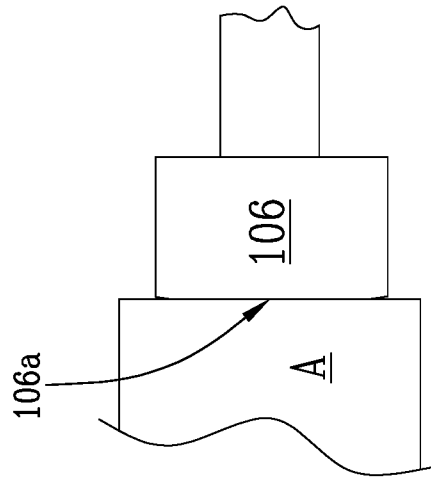


Fig.6A

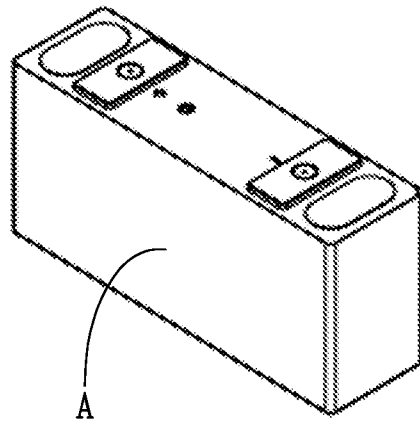


Fig.6B

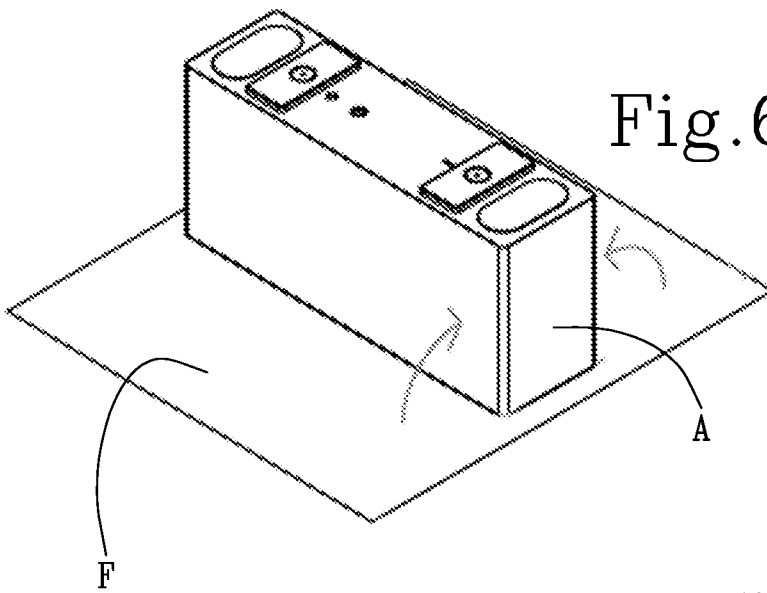
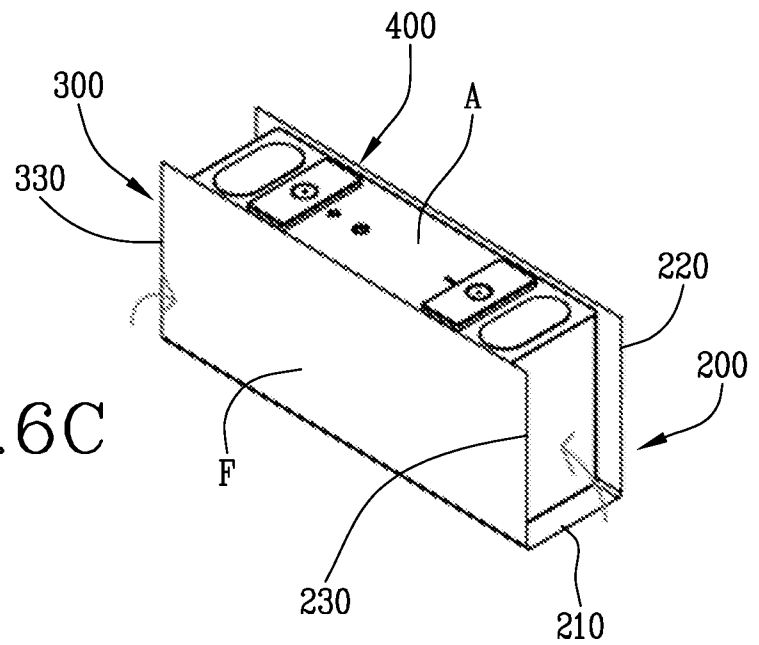


Fig.6C



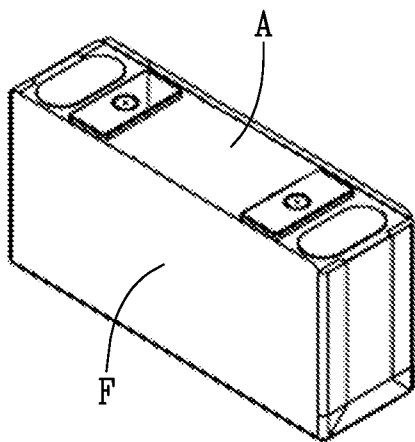
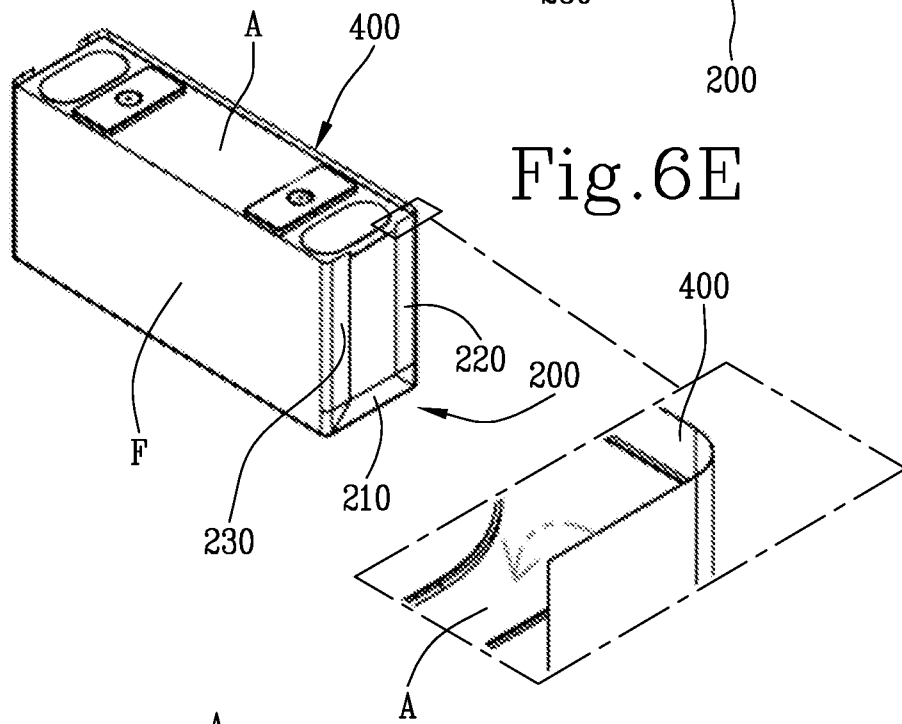
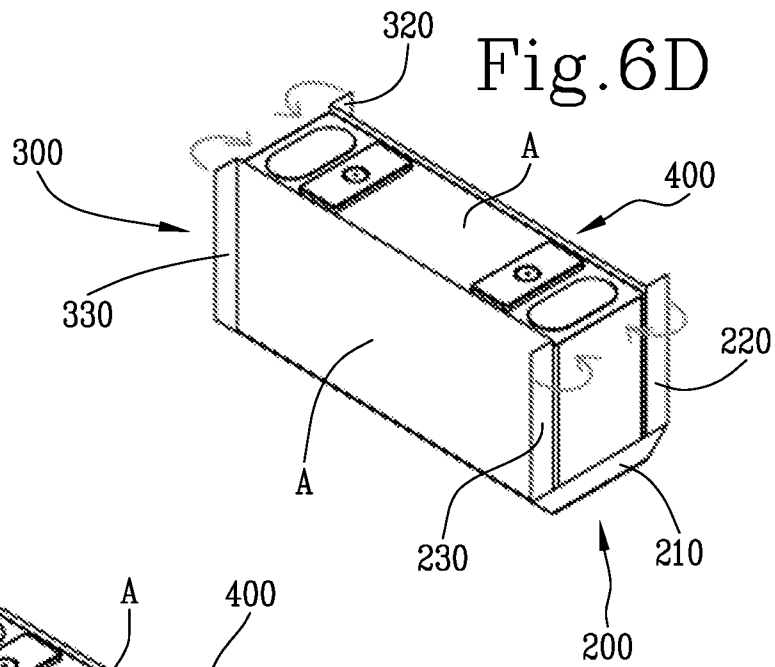
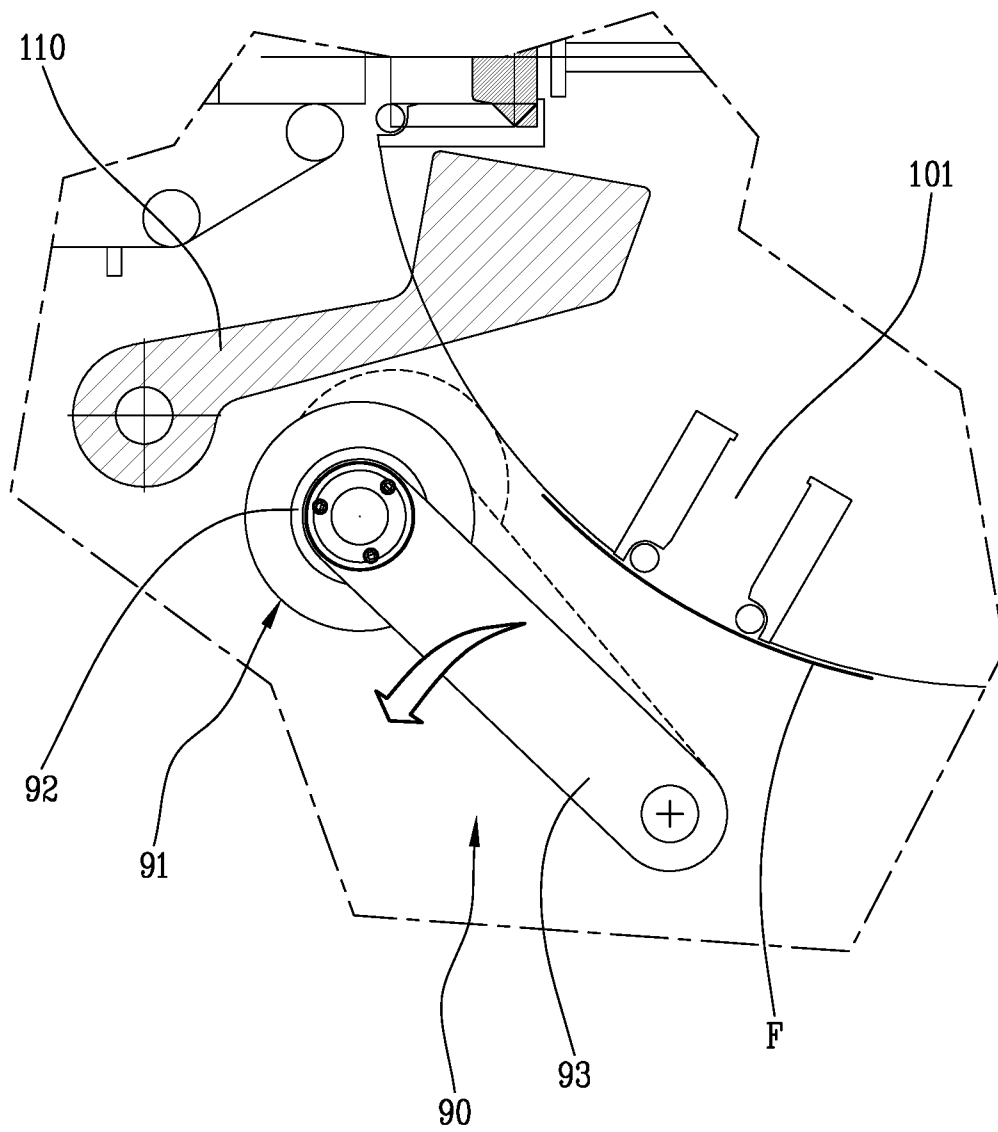


Fig. 6F

Fig.7



INTERNATIONAL SEARCH REPORT

International application No PCT/IB2024/056060

A. CLASSIFICATION OF SUBJECT MATTER

INV. B29C63/00 B29C63/02 B65B11/28
 ADD. H01M50/202 H01M50/227

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B29C H01M B65B B65C B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004/000369 A1 (PITUCH THOMAS [US] ET AL) 1 January 2004 (2004-01-01) see figs. 1, 4 -----	1-21
A	US 5 904 804 A (KOU DA MINORU [JP] ET AL) 18 May 1999 (1999-05-18) see fig.6A -----	1-21
X	EP 0 654 409 A1 (GD SPA [IT]) 24 May 1995 (1995-05-24) whole document, esp. figs.1-4 -----	1,3-8, 10-13, 17,18,20
A	US 6 438 927 B1 (FOCKE HEINZ [DE] ET AL) 27 August 2002 (2002-08-27) see fig.1 -----	1-21
	- / - -	

Further documents are listed in the continuation of Box C.

See patent family annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

19 July 2024

Date of mailing of the international search report

31/07/2024

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Patmanathan, Nithi

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/056060

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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