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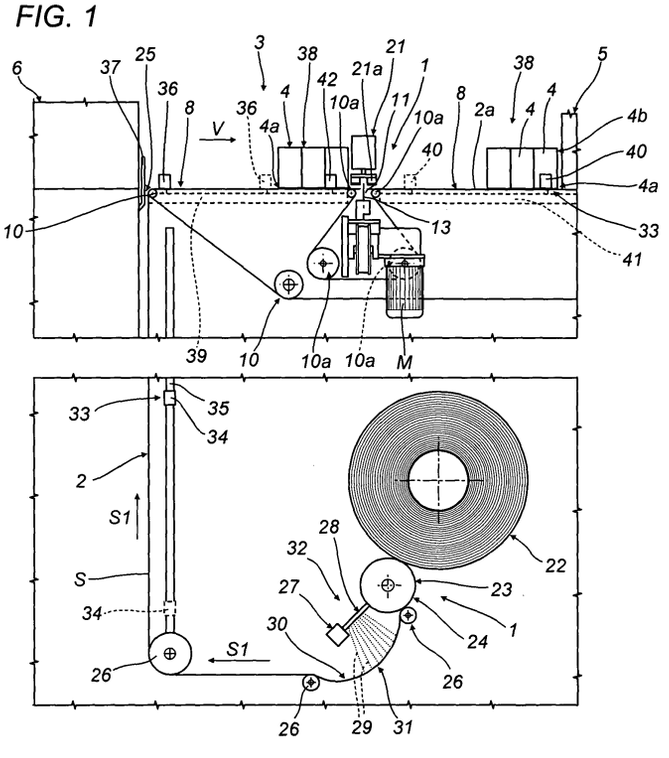
(54) A device for feeding and cutting film in machines for conditioning products

(57) A device for feeding and cutting a continuous film (2) to a station (5) for wrapping products (4) is applied to a conditioning machine or line (3) comprising a station (6) for positioning and feeding products (4) which are mobile, one after another and in a direction of feed (V), on a conveyor surface (7) along the machine (3) between the positioning station (6) and the wrapping station (5). The film (2) is located between the surface (7) and the base (4a) of the products (4), where they pass close to a first slot (25) in the conveyor surface (7), and the film (2) proceeds as one with the products (4) along the surface (7). The conditioning line (3) also comprises cutting means (13) for forming a piece (2a) of film (2), these means being located at the conveyor surface (7), downstream of the first slot (25) and upstream of the wrapping station (5) according to the direction of feed (V). The cutting means (13) operate at the gap between successive products (4).

FIG. 1



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Description

[0001] The present invention relates to a unit for feeding and cutting film on machines for conditioning products, in particular products which mainly have a cylindrical or prismatic shape which are wrapped with heat-shrink material.

[0002] At present automatic machines of the above-mentioned type have an operating line basically equipped with stations for positioning products and forming predetermined groups of said products, followed, further downstream according to a direction of feed of the products, by stations for wrapping the groups in plasticized wrappers.

[0003] The intermediate positioning and forming stations are therefore designed to form predetermined groups of products and to transport them towards the wrapping stations.

[0004] Once wrapped, the group of products leaves the station and, by means of a conveyor line, reaches a packaging station where said wrapping process is completed. The plasticized wrapper, preferably made of heat-shrink film, is heated so that it tightly adheres to the group of products.

[0005] The product wrapping stations therefore have a system for supplying the film, which normally comes from a special feed and cutting station located below the product conveyor surface.

[0006] Therefore, this station is connected to suitable conveyor devices for bringing the film to the product conveyor surface, where the wrapper is formed by wrapping the film around the products.

[0007] A construction solution for such a film feed and cutting station is described in patent EP-491666. Said solution involves a cutting unit with means for supporting and moving a knife consisting of a pair of chains, parallel and opposite one another, supporting the knife rigidly and on both sides, closed in a ring on a corresponding pair of gear wheels, one of which is motor-driven.

[0008] The pair of chains structured in this way allows continuous movement of the knife, through an almost oval path, cyclically bringing the knife into a position in which it makes contact with and cuts a piece of film.

[0009] In said solution, the cutting unit is located below the operating line where the products pass, and the conveyor devices comprise a motor-driven angled surface which, as indicated, supplies the wrapping station with film.

[0010] A second solution described in patent EP-581747, has a structure comprising a knife located immediately below the product conveyor surface and a set of film feed rollers located upstream of the knife relative to the direction of film feed.

[0011] To cut the film, the knife which extends transversally to the machine, is moved along a straight line, in both directions, basically acting like a guillotine on the film.

[0012] Said solutions were further modified to obtain effective "continuous cycle" operation in packaging and the machine is described in patent EP-839723.

[0013] In the latter solution, the device for feeding and cutting film has a pair of counter-rotating rollers between which the film passes.

[0014] The first roller in the pair has a knife projecting radially from the roller, whilst the second roller has a radial groove housing the knife during a cutting rotation.

[0015] However, the above-mentioned machines have some disadvantages in particular due to the positioning, relative to the rest of the machine, of the many components in the station and the consequent architecture of the devices which supply film to the wrapping station.

[0016] Since they must satisfy high parameters for synchronization with product feed on the operating line, such devices have a rather complex structure. Said structure must also guarantee a continuous supply of film to the subsequent stations, usually pushing the film upwards, since, as already indicated, they are normally located below the conveyor surface.

[0017] The complexity of the devices therefore means that their cost is high, placing such machines in a niche in the market reserved for those with proportionate investment budgets.

[0018] The aim of the invention is, therefore, to overcome the aforementioned disadvantages, with a device for feeding and cutting film in a machine for conditioning products which has a simple and economical structure.

[0019] The technical features of the present invention, in accordance with the aforesaid aims, may be clearly inferred from the claims herein, in particular claim 1 and, preferably, from any of the claims directly or indirectly dependent on claim 1.

[0020] The advantages of the present invention are more clearly illustrated in the detailed description which follows, with reference to the accompanying drawings, which illustrate a preferred embodiment without limiting the scope of application, and in which:

- Figure 1 is a schematic side view with some parts cut away to better illustrate others of a machine for conditioning products comprising a device made according to the present invention;
- Figure 2 is a schematic front view with some parts in cross-section of a detail of the device made according to the present invention;
- Figure 3 is a schematic side view with some parts cut away to better illustrate others of a different embodiment of the device made according to the present invention;
- Figure 4 is a schematic top plan view with some parts cut away for greater clarity of a detail of the machine illustrated in Figure 1.

[0021] With reference to the accompanying drawings, and in particular with reference to Figure 1, the numeral 1 denotes a device for feeding and cutting a continuous

film 2 to a machine or line 3 for conditioning products 4.

[0022] In particular, said machine 3, in a generic standard configuration, comprises a station 5 for wrapping the products 4 and a station 6 for positioning and supplying the products 4 to the subsequent stations. Said stations 5 and 6 are basically of the known type and so are not described in further detail in this text.

[0023] The device 1 comprises a conveyor surface 7, mobile in a direction V of feed, supporting the products 4 which normally have a base 4a on which they rest.

[0024] In particular with reference to Figure 1, it can be seen how the device 1 comprises a single conveyor surface 7, formed by the upper branch 8 of a belt 9 wound in a loop about a plurality of rollers 10 of which at least one is a driving roller and the others are driven rollers.

[0025] In greater detail, it may also be seen that the device 1 comprises a set of rollers 10a arranged in such a way that, extending as it does, the upper branch 8 forms a transversal slot 11 in the surface 7, constituting a cutting line for the uses better described below. Said rollers 10a therefore form return means 10a.

[0026] In embodiments not illustrated, the slot 11 may be formed by a succession of two conveyor surfaces with the respective rear and front ends opposite and at a distance from one another.

[0027] As is also shown in Figure 4, at the conveyor surface 7, and precisely the slot 11, there is a knife 13 which is transversally mobile along the slot 11. Basically, in the embodiment illustrated the knife 13 cuts transversally relative to the surface 7 or, in any case, transversally to the direction V of feed of the products 4. In the particular embodiment illustrated, the knife 13 is "V"-shaped and has a double blade to allow the film to be cut in one direction and the other as it moves along the above-mentioned cutting line. Advantageously, in embodiments that are not illustrated, the knife 13 may have any shape and may even be substituted by a pair of knives, each with a single cutting edge and designed to cut the film 2 in one direction only, as described below.

[0028] In particular with reference to Figure 2, it can be seen that the knife 13 is supported by a bracket 14 rigidly connected to a support 15 engaging, by means of a counter-support 16, with a toothed belt 17 wound in a loop around a pair of pulleys 18, only one of which is visible in the accompanying drawings.

[0029] The pulley 18 is connected to a motor M for moving the belt 17, together with the knife 13, transversally to the surface 7, to form a piece 2a of film 2.

[0030] A sliding element 19 supports the counter-support 16 and is slidably connected to a guide 20, which is also consequently positioned transversally to the conveyor surface 7.

[0031] Opposite the knife 13 there is a pair of pneumatic pistons 21, visible in Figures 1 and 3, to hold the film 2 during the cutting operations, by means of a forked pad 21a which allows the knife 13 to pass. Advantageously, there may be any number of pistons 21 according to the machine 3 requirements and the size of the film 2 used to wrap the products 4. As described, said pistons 21 constitute presser means. With reference to Figure 1, it may be seen that in the case illustrated the film 2 is wound in a reel 22, located, in the particular configuration illustrated and by way of example only, below the surface 7.

[0032] A motor-driven roller 23 is positioned at a tangent to the reel 22 and forms, as described in more detail below, film 2 unwinding means 24.

[0033] During normal use, the film 2 unwound from the reel 22 according to an unwinding path S reaches the conveyor surface 7 through a slot 25 and is held on the surface 7 by the weight of the products 4.

[0034] Said unwinding path S is formed by a plurality of guide rollers 26 for the film 2. Three of these rollers 26 are illustrated, although advantageously there may be any number of them, according to the particular requirements of the machine 3.

[0035] The device 1 also comprises a sonar 27 and a unit 28 for the emission of fluid, normally compressed air 29, located downstream of the reel 22 according to the direction of unwinding S1, to prevent, as is clarified below, film 2 tensioning when the film 2 is unwound from the reel 22, by the unwinding means 24 and the products 4 are fed on the conveyor surface 7 downstream of the slot 25 since the products 4 pull the film 2, as described below.

[0036] In particular, the sonar 27 is designed to detect said tensioning and, by blowing an air jet 29, the device 28 can form a loop 30 in the film 2, so that it basically creates a film 2 reserve 31 along the unwinding path S.

[0037] The sonar 27 and the device 28 basically constitute safety means 32. In embodiments not illustrated, such safety means 32 may comprise other devices of a substantially known type, all designed to form a film 2 reserve 31.

[0038] The device 1 has sensor means 33 positioned along the film 2 unwinding path S to synchronize film 2 unwinding with product 4 feed. Said means 33 comprise a first photocell 34 aligned with the film 2, located upstream of the slot 25 according to the direction of unwinding S1.

[0039] As described below, the photocell 34 synchronizes product 4 feed with the film 2 if the latter has a printed motif to be positioned relative to the products 4 when they are wrapped in a piece 2a of film.

[0040] In particular, in these cases the film 2 has a reference element identifiable by the photocell 34, which may be the above-mentioned printed motif, a mark on the film 2 or any reference on the film 2. The photocell 34 is slidably connected to a guide 35 and is mobile between a first position, corresponding to a minimum size of the piece 2a of film 2 which will be used to wrap the products 4 and a second position, illustrated with a dashed line in Figure 1, corresponding to a maximum size of the piece 2a of film.

[0041] A second photocell 36 is located, at the con-

veyor surface 7, downstream of the slot 25 and upstream of the knife 13 according to the direction V of product 4 feed. This second photocell 36 operates in conjunction with a separator element 37 of the positioning and supply station 6 to form a group 38 of products 4, according to a substantially known method, not described in detail. The photocell 36 is mobile on a guide 39 between a position distanced from the knife 13 and a position substantially close to the knife 13, illustrated with a dashed line in Figure 1, so that it can form groups 38 consisting of a predetermined desired number of products (conditioning the groups of products).

[0042] The sensor means 33 also comprise a third photocell 40 located close to the conveyor surface 7, downstream of the knife 13 and upstream of the wrapping station 5, according to the direction V of feed, to establish the length of the piece 2a of film which will be used to wrap the group 38 of products 4 if the film 2 does not have any motif to be centred with the group 38 during wrapping. Hereinafter this type of film 2 is called "transparent".

[0043] The photocell 40 is also mobile on a respective guide 41, extending substantially parallel with the surface 7, between a minimum size position, illustrated with a dashed line in Figure 1, corresponding to a minimum measurement of the piece 2a of film 2 that will be used to wrap the products 4, and a maximum size position, corresponding to a maximum measurement of the piece 2a of film.

[0044] Finally, the device 1 comprises a fourth photocell 42 located immediately upstream of the knife 13 and designed to confirm alignment of the products 4 with the cutting line.

[0045] In particular with reference to Figure 3, it may be seen that the knife 13, together with the bracket 14, the support 15, the counter-support 16, the belt 17, the pulleys 18, the sliding element 19 and relative guide 20, the pneumatic pistons 21, the motor M and the return rollers 10a may be installed on a carriage 43, mobile at the same speed as the surface 7, along a respective guide 44 in the direction V of product feed, between a start of stroke position, where a cut in the film 2 begins, and an end of stroke position, not illustrated, where the cut ends.

[0046] As described below, this embodiment allows "continuous" use of the machine 3, that is to say without interruption in the supply of products 4 to the wrapping station 5.

[0047] Obviously, if knife 13 movement along paths not completely perpendicular to the surface 7 is required, different speeds V1 and V2 may be calculated, respectively for the carriage 43 and the surface 7 again to allow a transversal cut, but with different speeds and, therefore, machine 3 productivity.

[0048] Similarly (see Figures 3 and 4), second presser means 100 may be used, acting on the film 2, downstream of the first slot 25 relative to the direction V of feed, so that the film 2 can be held in place even when there are no products 4 on the surface 7, for example for size change-overs in the groups of products 4 to be formed. These second presser 100 may consist, for example, of pistons 101 with end pads 102 which make contact with the film 2.

[0049] In practice, starting with a generic operating configuration, at the positioning station 6 outfeed, the respective bases 4a of the products 4 make contact with the film as it reaches the conveyor surface 7 as they pass over the slot 25.

[0050] The film 2 below is unwound from the reel 22 by the roller 23 and above, at the surface 7 level, is held and pulled by the products 4 resting on the surface 7.

[0051] To avoid unwanted film 2 tensioning after product 4 feed on the surface 7, each time it detects such tensioning, the sonar 27 activates the device 28, which, by blowing on the film 2 unwound from the reel 22, creates the reserve 31 in the form of the loop 30.

[0052] If the film 2 has a printed motif on it, which must be suitably centred relative to the products 4 when packaging is complete, the photocell 34 synchronizes film 2 unwinding with product 4 feed on the surface 7.

[0053] Simultaneously, the photocell 36 dedicated to sizing the groups 38, activates the separator element 37 to form the group 38 with which the printed film 2 size unwound from the reel 22 is associated. In normal operating conditions, the group 38 stops in front of the cutting line and the photocell 42 confirms that alignment has been achieved.

[0054] In particular with reference to Figure 4, the products 4 are fed beyond the cutting line, still pulling the continuous film 2, until they reach a position where the trailing section 2b of film 2 which will form the piece 2a of film after the cut, between the front 4b of the products 4 and the cutting line, is long enough to wrap the group 38 (advantageously the trailing section 2b is longer than the perimeter of the group of products 4 in the side view in Figure 1). Once the products 4 are positioned, the pistons 21 block the film relative to the knife 13 which cuts the film 2, moving transversally to the surface 7, forming the piece 2a of film. If the knife 13 is of the type with two blades, it will make the cut in direction T1 and, for the next group 38 of products, a cut in the film 2 in direction T2, without having to return to a starting position at the end of each cut.

[0055] The products 4 together with the piece 2a of film are then fed towards the wrapping station 5, where a plasticized wrapper is formed around the group 38 of products using known methods that are therefore not described.

[0056] If the film 2 is transparent, to form the piece 2a of film the photocell 40 will check the distance between the products 4 and the cutting line, and the film 2 is cut when the trailing section 2b of film 2 is long enough to wrap the group 38.

[0057] In the device illustrated in Figure 3, the film 2 is cut during a carriage 43 movement in the direction V of product feed. The carriage will move at a speed equal

to that of the surface 7 so that the cutting line is relatively stationary relative to the products 4 and to the film 2 to be cut. The movement of the carriage will also be such that it allows carriage 43 repositioning in the start of stroke position when a new group 38 of products 4 arrives, pulling the film 2, close to the cutting line.

[0058] The entire operation of the machine 3 is regulated by a control unit, not illustrated, which processes the signals arriving from the photocells described. The many adjustments and size variations may be simply performed by changing the position of the photocells or, in a more complex way, by operating on the machine 3 software programming.

[0059] The invention fulfils the preset aims. Positioning the knife at the conveyor surface, downstream of the slot from which the film arrives and upstream of the wrapping station according to the direction of product feed on the conveyor surface, the structure of the machine can be significantly simplified, since the film, simply unwound from the reel, is basically pulled towards the cutting line by the products themselves.

[0060] Moreover, the positioning of the photocells described allows the use of both printed film and transparent film and product size change-overs are simple to perform by manually positioning the photocells.

[0061] The invention described is suitable for evident industrial applications. It may be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted by technically equivalent elements.

Claims

1. A device for feeding and cutting a continuous film (2) to a station (5) for wrapping products (4) in a conditioning machine or line (3) comprising a product (4) positioning and feed station (6), the products (4) being mobile, one after another and in a direction (V) of feed, on at least one conveyor surface (7) along the machine (3) between the positioning station (6) and the wrapping station (5), the film (2) being located between the surface (7) and the base (4a) of the products (4), where the products pass close to a first slot (25) in the conveyor surface (7) and proceeding as one with the products (4) along the surface (7), the device being **characterised in that** it comprises cutting means (13) for forming a piece (2a) of film (2), the cutting means being located at the conveyor surface (7), downstream of the first slot (25) and upstream of the wrapping station (5) according to the direction (V) of feed, the cutting means (13) operating at the gap between successive products (4).

2. The device according to claim 1, **characterised in that** it comprises return means (10a) forming a second slot (11) in the conveyor surface (7) for the passage of a knife (13), transversally mobile relative to the conveyor surface (7), and forming the cutting means (13).

3. The device according to claim 1, **characterised in that** it comprises return means (10a) forming a second slot (11) in the conveyor surface (7) for the passage of a knife (13), transversally mobile relative to the direction (V) of feed and forming the cutting means (13).

4. The device according to claim 2 or 3, **characterised in that** it comprises presser means (21) located at the cutting means (13), on opposite sides of the cutting means (13), to block and hold the film (2) relative to the cutting means (13) for formation of the piece (2a) of film.

5. The device according to claim 4, **characterised in that** at least the cutting means (13), the return means (10a) and the presser means (21) are mobile along the direction (V) of feed, parallel with the conveyor surface (7) and simultaneously with the products (4) and the film (2), from a start of stroke position, where a cut in the film (2) begins, to an end of stroke position, where the cut finishes.

6. The device according to claim 4, **characterised in that** at least the cutting means (13), the return means (10a) and the presser means (21) are mobile along the direction (V) of feed, parallel with the conveyor surface (7) and with a speed (V1) different to the speed (V2) of the products (4) and of the film (2), from a start of stroke position, where a cut in the film (2) begins, to an end of stroke position, where the cut finishes.

7. The device according to claim 5 or 6, **characterised in that** it comprises a carriage (43), supporting the cutting means (13), the return means (10a) and the presser means (21), and a first guide (44) extending along the machine (3), the carriage (43) being slidably connected to the guide (44).

8. The device according to any of the claims from 4 to 7, **characterised in that** the presser means (21) comprise at least one pneumatic piston (21) designed to control at least one pair of forkshaped pads (21a).

9. The device according to claim 1, **characterised in that** at the surface (7) there are second presser means (100) acting on the film (2), downstream of the slot (N) relative to the direction (V) of feed, and designed to allow the film (2) to be held in the absence of the products (4) on the surface (7).

10. The device according to any of the claims from 1 to 9, including a reel (22) supporting the film (2) and means (24) for unwinding the film (2) from the reel (22), **characterised in that** it comprises safety means (32), located downstream of the reel (22) according to a direction (S1) of film (2) unwinding, to prevent film (2) tensioning when the film is unwound simultaneously with feeding of the products (4) on the conveyor surface (7), downstream of the first slot (25), the products pulling the film (2) along the surface (7).

11. The device according to claim 10, **characterised in that** the safety means (32) comprise at least a first unit (28) designed to form a reserve (31) of film (2) downstream of the reel (22) according to the direction (S1) of unwinding.

12. The device according to claim 11, **characterised in that** the first unit (28) operates by emitting fluid to create a loop (30) in the film (2), the loop (30) forming the reserve (31).

13. The device according to any of the claims from 10 to 12, **characterised in that** the safety means (32) comprise a sonar (27) opposite the film (2), for detecting film (2) tensioning.

14. The device according to any of the foregoing claims from 1 to 13, **characterised in that** it comprises sensor means (33) located along a film (2) unwinding path (S) designed to operate in conjunction with, respectively, the positioning and feed station (6), to form a group (38) of products (4), and with the cutting means (13) and the conveyor surface (7), to form the piece (2a) of film.

15. The device according to claim 14, in which the film (2) has a reference element in predetermined sequences, **characterised in that** the sensor means (33) comprise at least a first photocell (34) for identifying the reference element, aligned with the film (2), located upstream of the first slot (25), according to a direction (S1) of film (2) unwinding (2), for checking synchronization between the film (2) and the size of the products (4) in transit, close to the first slot (25) so as to allow centring of the film (2) and the group (38) of products (4).

16. The device according to claim 15, **characterised in that** the first photocell (34) is mobile along a second guide (35), extending parallel with the film (2), between a first position, corresponding to a minimum size of the piece (2a) of film and a second position, corresponding to a maximum size of the piece (2a) of film.

17. The device according to any of the claims from 14 to 16, **characterised in that** the sensor means (33) comprise a second photocell (36) located at the conveyor surface (7), downstream of the first slot (25) and upstream of the cutting means (13) according to a direction (V) of feed, forming the size of the group (38) of products (4) on the conveyor surface (7), operating in conjunction with a separator element (37) of the positioning and feed station (6).

18. The device according to claim 17, **characterised in that** the second photocell (36) is mobile on a third guide (39) between a position distanced from the cutting means (13) and a position close to the cutting means (13) forming respective sizes.

19. The device according to claim 14, in which the film (2) is of the transparent type, **characterised in that** the sensor means (33) comprise a third photocell (40) located close to the conveyor surface (7), downstream of the cutting means (13) and upstream of the wrapping station (5) according to the direction (V) of feed, to establish a length, that is to say the size, of the piece (2a) of film for wrapping the group (38).

20. The device according to claim 19, **characterised in that** the third photocell (40) is mobile on a fourth guide (41), extending parallel with the film (2), between a minimum size position, corresponding to a minimum size of the piece (2a) of film and a maximum size position, corresponding to a maximum size of the piece (2a) of film.

21. The device according to any of the claims from 1 to 20, **characterised in that** it comprises a fourth photocell (42) located immediately upstream of the cutting means (13) according to the direction (V) of feed, for checking alignment of the products (4) and the film (2) with the cutting means (13).

FIG. 1

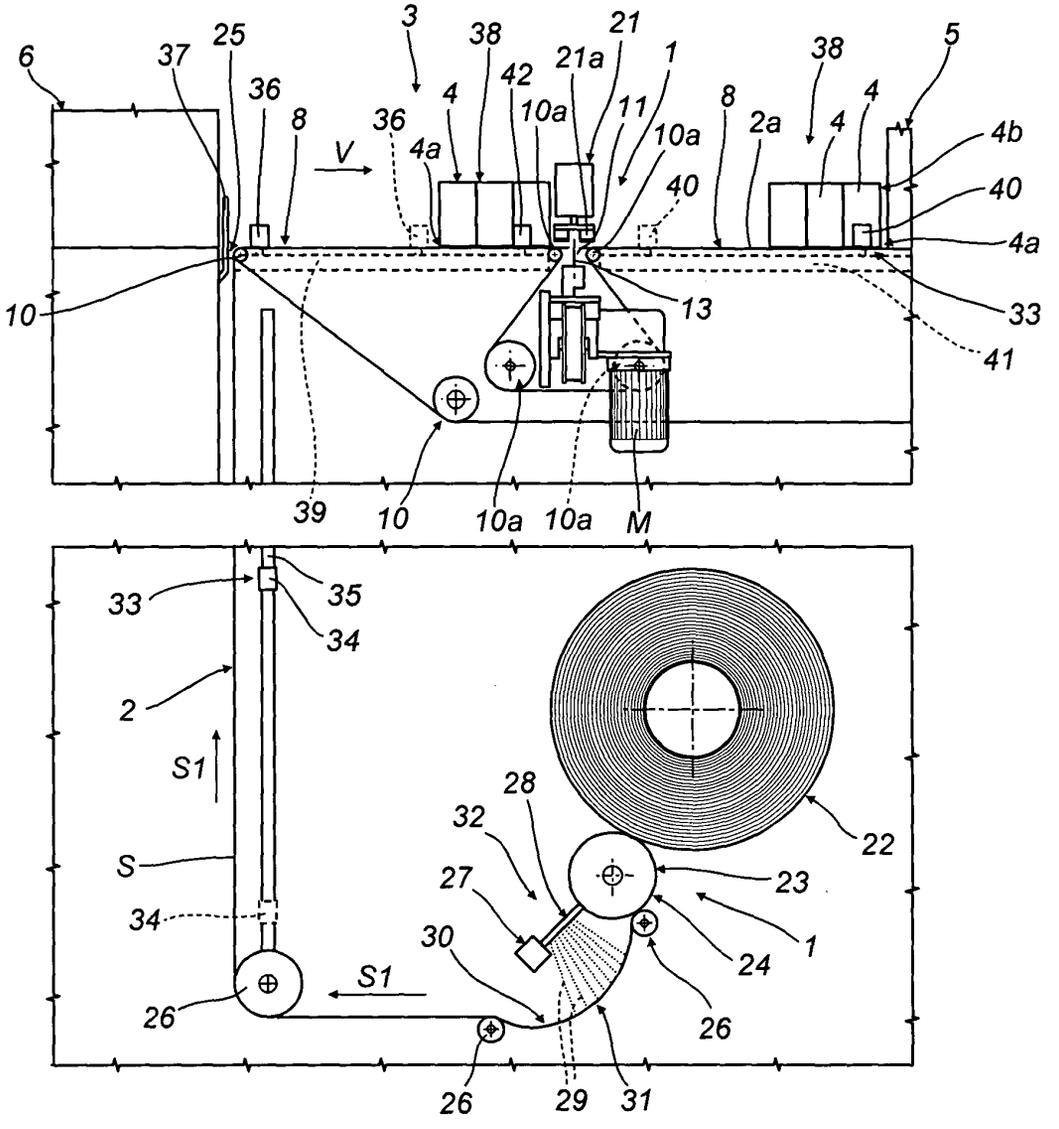
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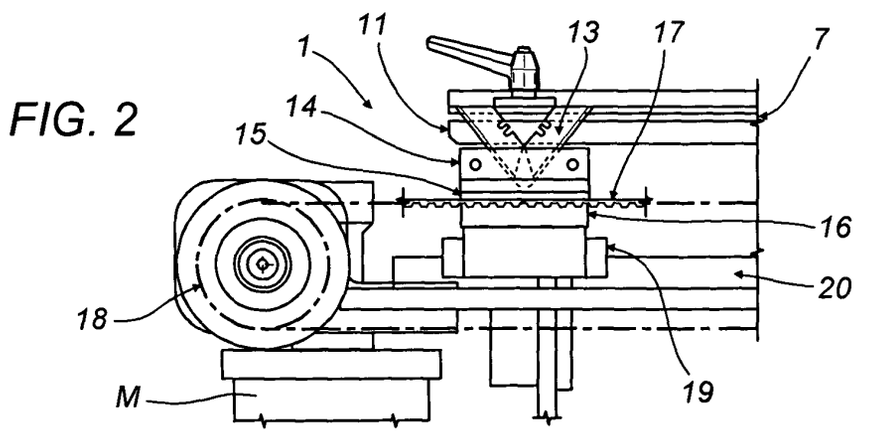
FIG. 2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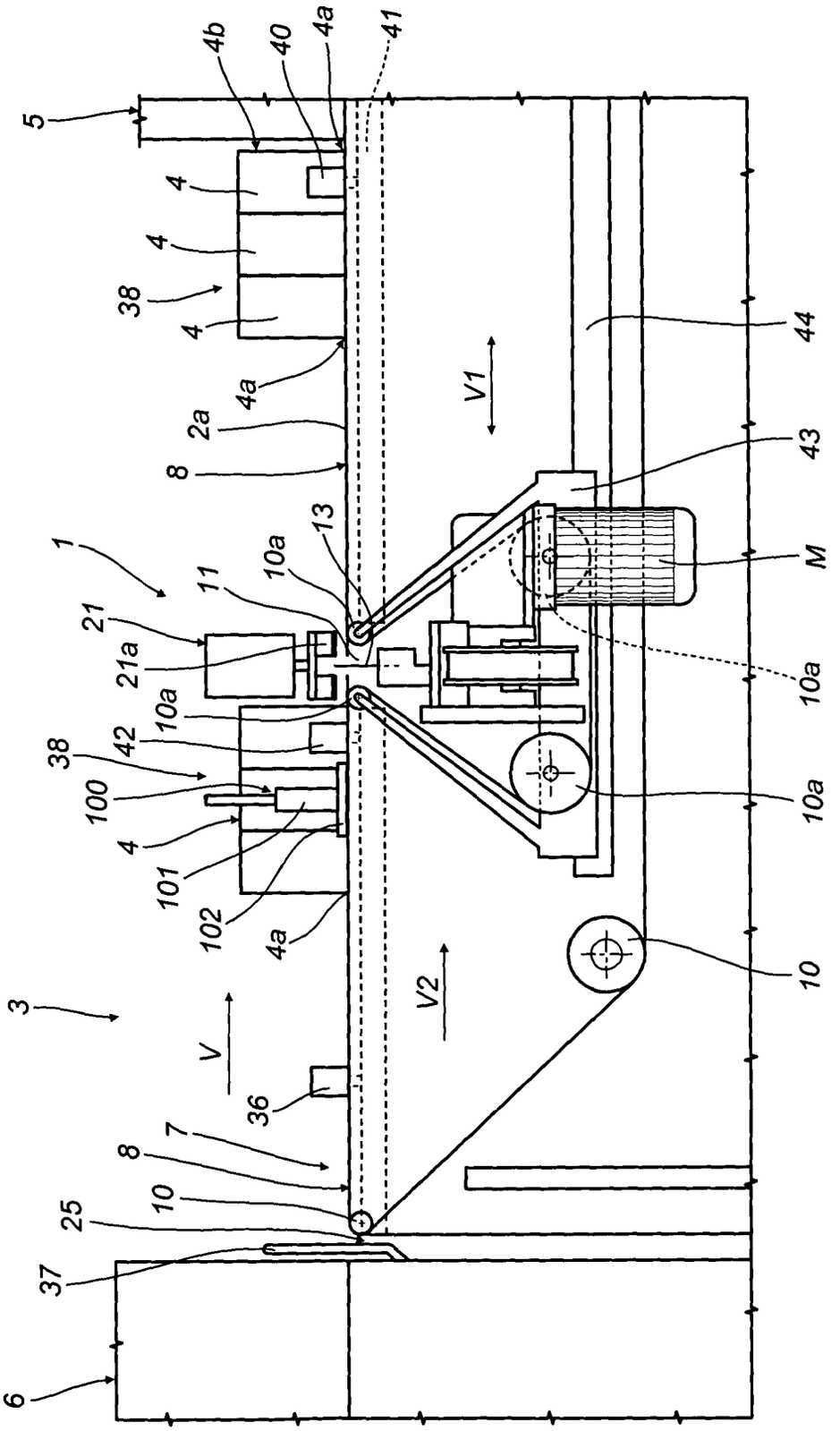
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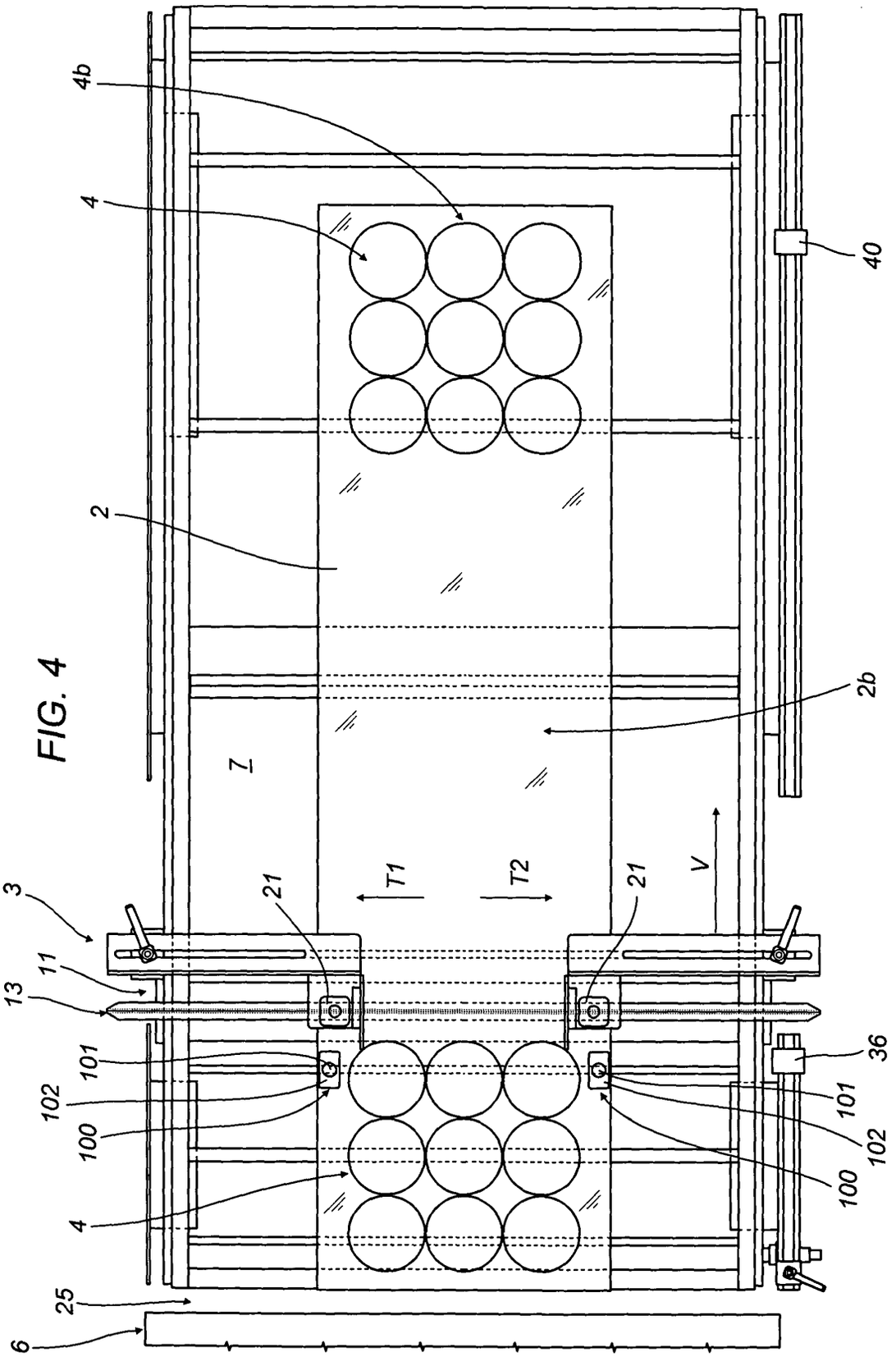

FIG. 4