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(54) A machine for packing products in envelopes

(57) The machine comprises: folder means forming a vertically-developing continuous tubular package (1); first welding organs acting on vertical edges of the continuous tubular package (1) for closing the package (1); a first station (S1), situated below the folder means, in which second welding organs (20) operate, with a horizontal motion performed transversal of the continuous tubular package (1), to define consecutive envelopes (10); a second station (S2), underlying the first station (S1), in which the cutting organs (30) operate, with a horizontal motion which is transversal of the continuous tubular package (1) to separate an envelope (10*) occupying a lowest position in a line of the envelopes (10); drawing organs (40), for gripping the lower flap (10A) of the lowest envelope (10*) in the line, at the second station (S2), for determining a descent by a step (P) of the line of envelopes (10) and the continuous tubular package (1), in phase relation with the inoperative positions of the first welding organs and the second welding organs (20) as well as the cutting organs (30).

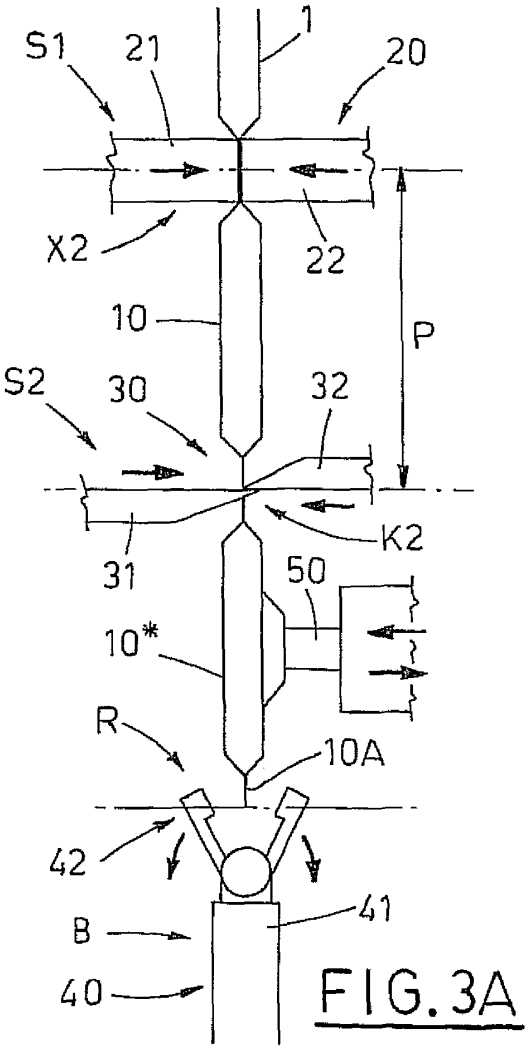


FIG. 3A

EP 2 014 555 A1

Description

[0001] The invention relates to the technical sector of automatic machines for packing loose products in envelopes made of soft materials, also known by experts in the sector as stick-packs.

[0002] By way of example, liquids are inserted into these envelopes, or moreor-less viscous liquid solutions, pastes, granular substances or powder substances, etc.

[0003] The above-mentioned machines, in a very widespread embodiment, similar among other things to machines for soft packages of greater dimensions, exhibit a vertical development with an exit of the full envelopes in the lower zone.

[0004] In the upper part of the machine, there is a specially-shaped folding organ which receives a continuous sheet unwinding from a reel and guides the sheet to progressively form a continuous tubular package, developing vertically in a downwards direction.

[0005] The tubular package is made to descend in a step-advancement, the step corresponding to the desired length of each single envelope, and is welded along the vertical edges, specially superposed, as well as transversally welded in accordance with the above-mentioned step, to divide the internal volume of an envelope from the internal volume of the overlying tubular package, in phase relation with the action of the dispensing means to insert, in each of the envelopes, a batched quantity of product.

[0006] In the machine, a sort of a string is produced, constituted in the upper part by the continuous tubular package and in the lower part by a certain number of full envelopes arranged in a line.

[0007] One by one the full envelopes reach the lowest position of the string and are cut off from the envelope located immediately above and sent towards the exit.

[0008] In some embodiments the cut envelopes are released by force of gravity onto a slid or a conveyor belt which removes them; in other embodiments handling organs are included, for example of the pick and place type, or anthropomorphic organs, which remove each single cut envelope and deposits it in a predetermined downstream position.

[0009] In a first known-type machine of the above-described type, schematically illustrated in figures 1A, 1B, 1C, 1D, the step-advancement of the tubular package 1, the transversal welding of the package 1 for the definition of the package 10, and the shearing-off of the package 1 are performed by a single operating group G, in which the welding heads 21, 22, once locked on the tubular package 1, are translated downwards by a step P, thus also functioning as drawing organs; cutters 30, housed in the welding heads 21, 22, are activated in step relation with the bottom dead centre, for cutting off the envelope 10.

[0010] In the above-described machine, the cutter 30 must have saw-toothed blades which give a jagged cut (not illustrated), obtained by cutting the material of the envelopes 10.

[0011] Because of this, fragments of the above-cited material are produced, which sometimes can negatively affect the functionality of the welding heads 21, 22, with obvious drawbacks for the welding of the envelopes 10.

[0012] In another known-type machine, schematically illustrated in figures 2A, 2B, 2C, for realising straight cutting lines between one envelope 10 and another, the cutters 30 are positioned externally of the group G comprising the welding and drawing heads 21, 22; for a straight cut, a blade 31 has to work in opposition to a counterblade 32, which cannot be in direct contact with the welding heads 21, 22 in order to prevent deformations caused by the heat of the welding heads 21, 22, with the consequent possibility of malfunctioning.

[0013] In consequence of the above-mentioned constructional constraint, the cutting station ST is positioned below the welding heads 21, 22 by at least a step lower with respect to the bottom dead centre reached by the welding heads 21, 22 during the drawing.

[0014] In the above-mentioned machines, as described, the outlet station SU of the full envelopes 10 is in an inferior position, with a vertical development which depends on the size of the discharge organs of the envelopes 10; the consequent increase of size in terms of height, which the solution with the straight cutters incurs, has an effect on the positioning height of the folder and the further organs situated in the upper part of the machine, among which the product batching group.

[0015] Obviously this causes some problems for the operator as regards visual control of the functionality of the organs located higher up.

[0016] In practice, it is possible that only a single step P in addition for the staggering of the cutting station ST is not sufficient to contain the sizes of the various support and movement organs, if the minimum length of the envelopes which the machine can pack is particularly small, in which case the above-mentioned drawback is amplified.

[0017] As a further drawback, clearly visible in figure 2C, an operating condition comes about in which the welding heads and the cutters are open at the same time, such that considerable portion of the string of envelopes is left with no guide, and can oscillate out of control, causing malfunctioning or jamming in the machine.

[0018] The envelopes realised using the above machines are widely used in the food sector (for example for sugar sachets) and also in the cosmetic field, while they are not yet very widely used in the pharmaceutical field, although interest in them in that field is on the increase.

[0019] In accordance with the type of product to be contained, and the specific requests of the field of application, the characteristics of the material the envelopes are made of varies; in particular, for the pharmaceutical sector, the use of resistant materials is required, which must be nontoxic and which must guarantee a perfectly hermetic weld.

[0020] With these requirements, the use of a machine of the first type can give rise to two kinds of drawbacks:

the time in which the welding and drawing heads are in contact with the ends of the envelopes can be too long and can cause an unacceptable heating of the product with possible alterations thereof;

the material of the envelopes, if very strong, is not liable to cutting by sawtooth cutters.

[0021] The first of the drawbacks remains unchanged even with machines of the second type, while the other drawback is resolved at the cost of the drawbacks inherent in the conformation of the machine with straight cutters, to which reference was made previously.

[0022] The aim of the present invention is therefore to provide a machine for packing products in envelopes conformed such as to obviate the above-mentioned drawbacks, in particular to contain the size in terms of height and to be adaptable to sawtooth cutters or blade-counterblade cutters for either jagged or straight cuts.

[0023] A further aim of the invention consists in providing a machine in which the line of envelopes formed, before arriving in the cutting zone, is not excessively long such that the segment of the string which is momentarily lacking in a guide is as short as possible.

[0024] A still further aim of the invention relates to the will to contain to a minimum the contact time of the welding heads with the envelopes, such as not to cause heating of the product and thus render the machine suitable also for use in the pharmaceutical sector.

[0025] The characteristics of the invention will emerge from the following description of a preferred embodiment of the machine, in agreement with what is set out in the appended claims and with the aid of the accompanying figures of the drawings, in which:

figures 1A, 1B, 1C and 1D schematically illustrate some organs of a first machine of known type, mentioned in the preamble hereto, in successive operating stages;

figures 2A, 2B and 2C schematically illustrate some organs of a second machine of known type, mentioned in the preamble hereto, in successive operating stages;

figures 3A, 3B and 3C schematically illustrate some organs of the machine of the invention in successive operating stages, alike to those illustrated for the known-type machines, in order to illustrate the differences thereto.

[0026] The machine of the present invention exhibits, in its entirety, a vertically-developing configuration, with the folder located high up and the outlet of the full envelopes in the lower zone, similarly to known-type machines.

[0027] For this reason of similarity no representation of overall views has been submitted, as well as those organs of the machine which, not being strictly pertinent to the invention, would not be of any benefit for the ends of the description thereof.

[0028] In figures 3A, 3B and 3C, relating to the present machine, a schematic illustration is made of only the zone in which the envelopes are formed and cut, as in figures 1A, 2B and 2C and 2A, 2B and 2C, which illustrate the corresponding zones of known machines, such that the advantages provided by the solution of the invention will be evident.

[0029] To facilitate a direct comparison between the known solutions and the present solution, the same numerical references have been used where possible.

[0030] In all the above-mentioned figures, 1 denotes a continuous tubular package, developing vertically from the top downwards, obtained starting from a continuous sheet unwinding from a reel and guided to fold upon itself by the folder means.

[0031] The vertical edges of the continuous tubular package 1 are superposed and stably joined by first welding organs, not illustrated as of known type; the package 1 is then moved downwards in steps P corresponding to the length of the envelopes 10 which are to be obtained, as described herein below.

[0032] The machine of the invention comprises a first station S1 below the folder, a second station S2 below the first station S1 and drawing organs 40, for the step-descent of the continuous tubular package 1.

[0033] Welding organs 20 are provided in the first station S1, which welding organs 20 act transversally of the continuous tubular package 1, defining consecutive envelopes 10; during operation, the action of the second welding organs 20 is to separate the internal volume of the underlying envelope 10, which in this way is sealed, from the internal volume of the overlying tubular package 1 and, at the same time, the bottom of the new envelope 10 being formed is closed.

[0034] Thus, along the vertical progression of the machine, the "string" as mentioned above is formed, constituted in the upper part by the continuous tubular package 1 and, in the lower part, by a certain numbers of full envelopes 10 arranged in a row; in the example shown in the figures, the number of envelopes 10 varies from one to two, apart from the one under formation, as specified herein below.

[0035] The second welding organs 20 are constituted, for example, by two opposite heat-welding heads 21, 22 which are horizontally mobile between an inoperative open position X1 and an operative closed position X2, by the action of actuator means (not illustrated), activated in phase relation with the pause of the continuous tubular package 1.

[0036] Before being closed, each envelope 10 receives a batched quantity of liquid product, in a paste form or granular form, or powder form, by means of

known dispensing means (not illustrated), partially inserted in the tubular package 1 in the zone comprised between the folder and the first welding organs.

[0037] The dispensing means are activated in phase relation with the closure of the heads 21, 22, such that the product introduced is located by force of gravity on the bottom of the envelope under formation.

[0038] Cutting organs 30 are located in the second station S2, which cutting organs 30 separate the envelope 10* which (in turn with the others) occupies the lowest position in the line, from the envelopes 10 located above the lowest one; the cutting operation, done in known way, is performed at about halfway up the heat-welded strip of the heads 21, 22.

[0039] The cutting organs 30 comprise, in a first example shown in the figures, cutters for straight cutting constituted by a blade 31 and a counter-blade 32, activated in opposition thereto, with a horizontal movement impressed by relative actuator means (not illustrated), between an inoperative open position K1 and an operative closed position K2, in phase relation with the pause of the continuous tubular package.

[0040] Alternatively it is possible to include the use of saw-tooth cutters such as the ones described in the preamble with reference to figures 1A, 1B, 1C and 1D.

[0041] The drawing organs 40 grip the lower flap 10A of the envelope 10* situated at the lower end of the line, when the envelope 10* is in the second station S2 in order to determine a descent by one step P of the line and the continuous tubular package 1, in phase relation with the inoperative open positions of the first and the second welding organs 20 as well as the cutting organs 30.

[0042] The drawings organs 40, in a preferred embodiment, comprise a vertically-mobile group 41, at a top of which pliers 42 are associated, jaws of which face upwards towards the lower flap 10A.

[0043] The group 41 and the pliers 42 are activated, in phase relation, by relative actuator means, not illustrated, which define, for the group 41, a run between a raised position A and a lowered position B and vice versa and, for the pliers 42, a closed gripping configuration C and an open release position R.

[0044] The raised position A is regulated such that the pliers 42 advance the cutting line T of the cutters 31, 32 to the second station S2, while the lowered position B is fixed at a level at which the run corresponds to the predetermined step P, i.e. the length of an envelope 10.

[0045] The functioning of the machine will now be described, explaining the operation of the illustrated and described organs.

[0046] Figure 3A illustrates the stage at which the tubular package 1 and the underlying consecutive envelopes 10 are paused, with the group 41 lowered in the relative position B and the pliers 42 open in the release configuration R.

[0047] The heat-welding heads 21, 22 present in the first station S1, are in the respective closed operating position X2 to complete the sealing of the immediately-underlying envelope 10 and realise the closing of the bottom of the overlying new envelope 10 under formation.

[0048] Contextually, the cutters 31, 32 are in the relative closing operating position K2 in order to cut the final envelope 10* of the line from the immediately-overlying one.

[0049] The last envelope 10*, once cut, can be gripped by sucker organs 50, associated to a known handler, such as is illustrated, or alternatively, can be left to fall towards a slide (not illustrated).

[0050] The above-described stage, when compared with the prior art, reveals that:

- with respect to the known technical solution of figure 1A, the cutting stage of the last envelope 10* is advanced (which in the solution of figure 1A will happen only afterwards - see figure 1C); the last envelope 10*, if sucker organs 50 are included, has a controlled position, differently to the other solution where it dangles with no guide;

- with respect to the known technical solution of figure 2A, there is a smaller number of envelopes (10) (one instead of two, for example) comprised between the heat-welding heads 21, 22 and the cutters 31, 32, thanks to the fact that in the invention these are both in a fixed vertical position, given that the descent of the string is performed by the drawing organs 40, differently to the other solution in which the welding heads 21, 22 themselves descend in the closed position (see figure 2B) in order to perform the descent.

[0051] Figure 3B illustrates the stage in which both the heat-welding heads 21, 22 and the cutters 31, 32 are open in the respective inoperative position K1, X1, while the group 41 has lifted into the raised position A and the pliers 42, in phase relation, have been closed in the gripping configuration C to grip the lower flap 10A of the last envelope 10*.

[0052] The above-described stage, if compared with the corresponding stages in the prior art, shows that:

- with respect to the known technical solutions of figures 1B, 2B there is an advancing of the stage of opening the heat-welding heads 21, 22, thus with less heat transmission to the contents of the envelopes 10; in the solution in which the cutters 30 are housed in the welding heads, indeed, a further closing time is required for the heads in order to enable the cutters 30 to perform their task, which is done only in the following stage illustrated in figure 1C.

[0053] Figure 3C illustrates the stage at which both the heat-welding heads 21, 22 and the cutters 31, 32 are still opening the respective inoperative position K1, X1 thereof, while the group 41 has descended into the lowered position B thereof, with the pliers 42 closed, drawing

downwards, by a step P, the last envelope 10* and the tubular package 1.

[0054] The above-described stage, if compared with the corresponding stages in the prior art, shows that:

with respect to the known technical solutions of figures 1D, 2C, the string is retained and guided by the drawing organs 40 instead of being free to oscillate out of control; in the solution of figure 2C, the length of the portion of string which is free is particularly high, with a greater risk of malfunctioning.

[0055] From the above comparison the positive characteristics of the machine of the invention emerge, which fully attain the aims set in the preamble hereto, firstly as they enable the height of the machine to be contained, especially in comparison to the prior art of figures 2A, 2B and 2C, and enable the length of the string momentarily left unguided to be kept to a minimum.

[0056] A further positive characteristic of the machine relates to the versatility offered by the fact that it can be equipped with either saw-tooth cutters or blade-counter-blade cutters, respectively for jagged cuts or straight cuts, differently to the known solution of figures 1A, 1B, 1C and 1D.

[0057] A further characteristic, consequent to using a string drawing system which is separate from the welding heads, consists in obtaining a minimum contact time of the welding heads with the envelopes, thus preventing product heating and, therefore, rendering the machine perfectly suitable for use in the pharmaceutical sector.

[0058] The above-cited advantageous characteristics are obtained with a technical solution which is simpler with respect to the prior art, thanks to the fact that the welding heads and the cutters have to be activated only horizontally and only the cutters have to be vertically regulated according to the length of the envelopes.

[0059] The above is, however, provided by way of non-limiting example and therefore any variations in the form of the described organs are to be considered as falling within the ambit of protection of the invention, as described in the following claims.

Claims

1. A machine for packing products in envelopes, the machine being of a type which comprises: folder means, supplied in inlet with a continuous sheet unwinding from a reel, which folder means form, in outlet, a continuous tubular package (1) developing vertically from above in a downwards direction; means for lowering the continuous tubular package (1) in steps (P) corresponding to a length of one of the envelopes (10); first welding organs acting on superposed vertical edges of the continuous tubular package (1) for closing the continuous tubular package (1); second welding organs (20) acting transversally of the continuous tubular package (1) in order to separate an internal volume of an envelope (10), underlying the second welding organs (20), from an internal volume of the overlying continuous tubular package (1), and defining a succession of the envelopes (10) arranged in a line, proceeding in a downwards direction; dispensing means, activated in phase relation with the first and second welding organs, for introducing, in each of the envelopes (10), before closure thereof, a batched quantity of a product; cutting organs (30) for separating an envelope (10*) occupying a lowest position in the line, the machine being **characterised in that** it comprises: a first station (S1), situated below the folder means, in which second welding organs (20) operate, with a horizontal motion performed in phase relation with a pause of the continuous tubular package (1); a second station (S2), underlying the first station (S1), in which the cutting organs (30) operate, with a horizontal motion performed in phase relation with a pause of the continuous tubular package (1); drawing organs (40) identifying the means for descending, for gripping a lower flap (10A) of the lowest envelope (10*) in the line, at the second station (S2), for determining a descent by a step (P) of the line and the continuous tubular package (1), in phase relation with the inoperative positions of the first welding organs and the second welding organs (20) as well as of the cutting organs (30).

2. The machine of claim 1, **characterised in that** the cutting organs (30) comprise cutters for direct cutting, constituted by a blade (31) and a counter-blade (32), working in mutual opposition, with a horizontal motion impressed by actuator means therefor, between an inoperative open position (K1) and an operative closed position (K2), in phase relation with a pause of the continuous tubular package (1).

3. The machine of claim 1, **characterised in that** the cutting organs (30) comprise saw-tooth cutters for a jagged cut obtained by laceration of the material of the envelopes (10), which saw-tooth cutters are activated in a horizontal motion impressed by actuator means, between an inoperative open position and an operative closed position, in phase relation with a pause of the continuous tubular package (1).

4. The machine of claim 1, **characterised in that** the drawing organs (40) comprise a group (41), at a top of which group (41) pliers (42) are associated, jaws of which pliers face upwards, towards a lower flap (10A) of the envelope (10*) with the group (41) and the pliers (42) activated, in a phase relation, by relative actuator means, which define for the group (41) vertical runs between a raised position (A) and a lowered position (B) and for the pliers (42) a closed gripping configuration (C) and an open release position

(R).

5. The machine of claim 4, **characterised in that** the raised position (A) is regulated such that the pliers (42) advance above the cutting line (T) of the cutting organs (30) at the second station (S2), and **in that** the lowered position (B) is fixed at a height such that the run corresponds to the predetermined step (P).

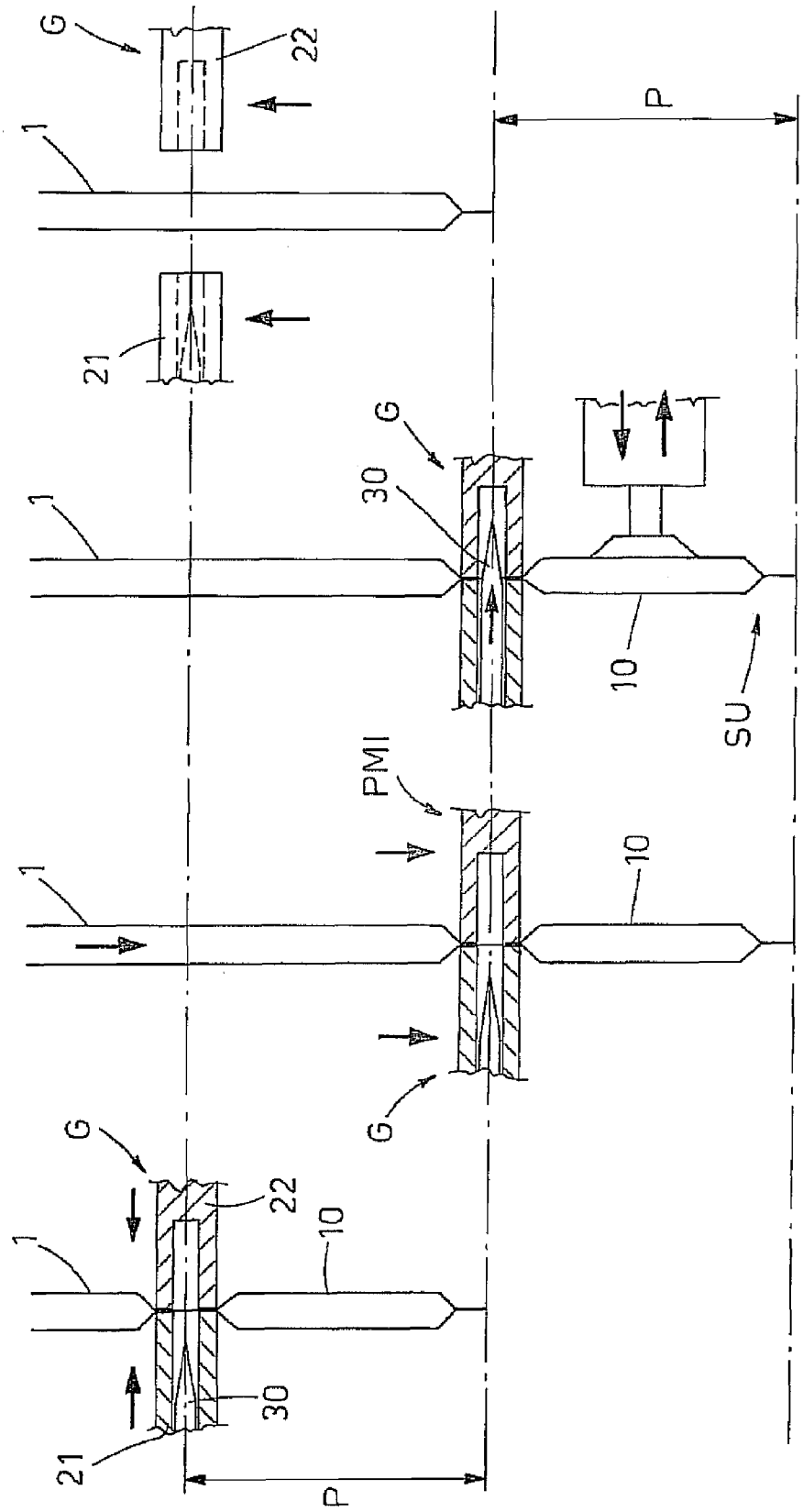


FIG.1A FIG.1B FIG.1C FIG.1D

(PRIOR ART)

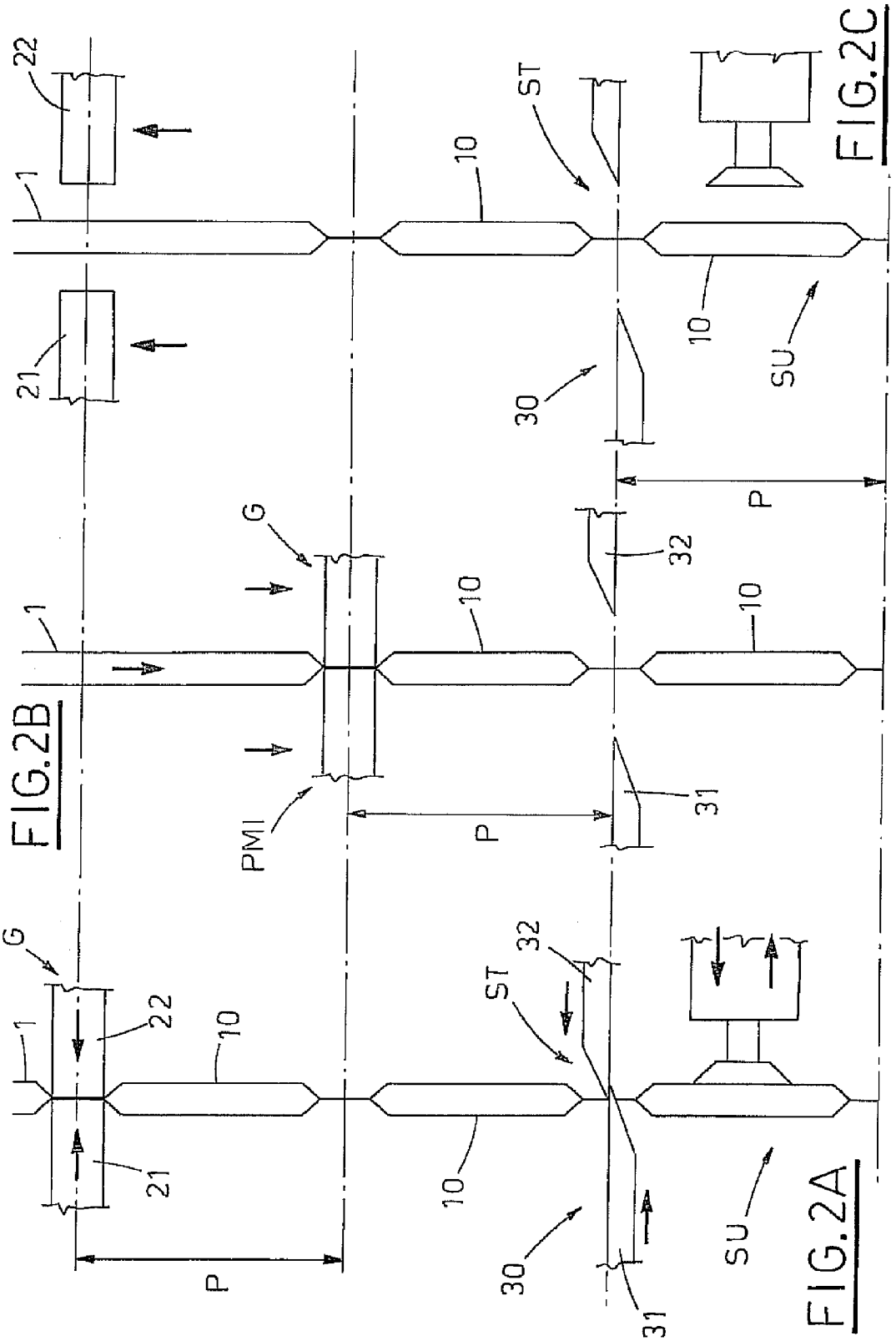
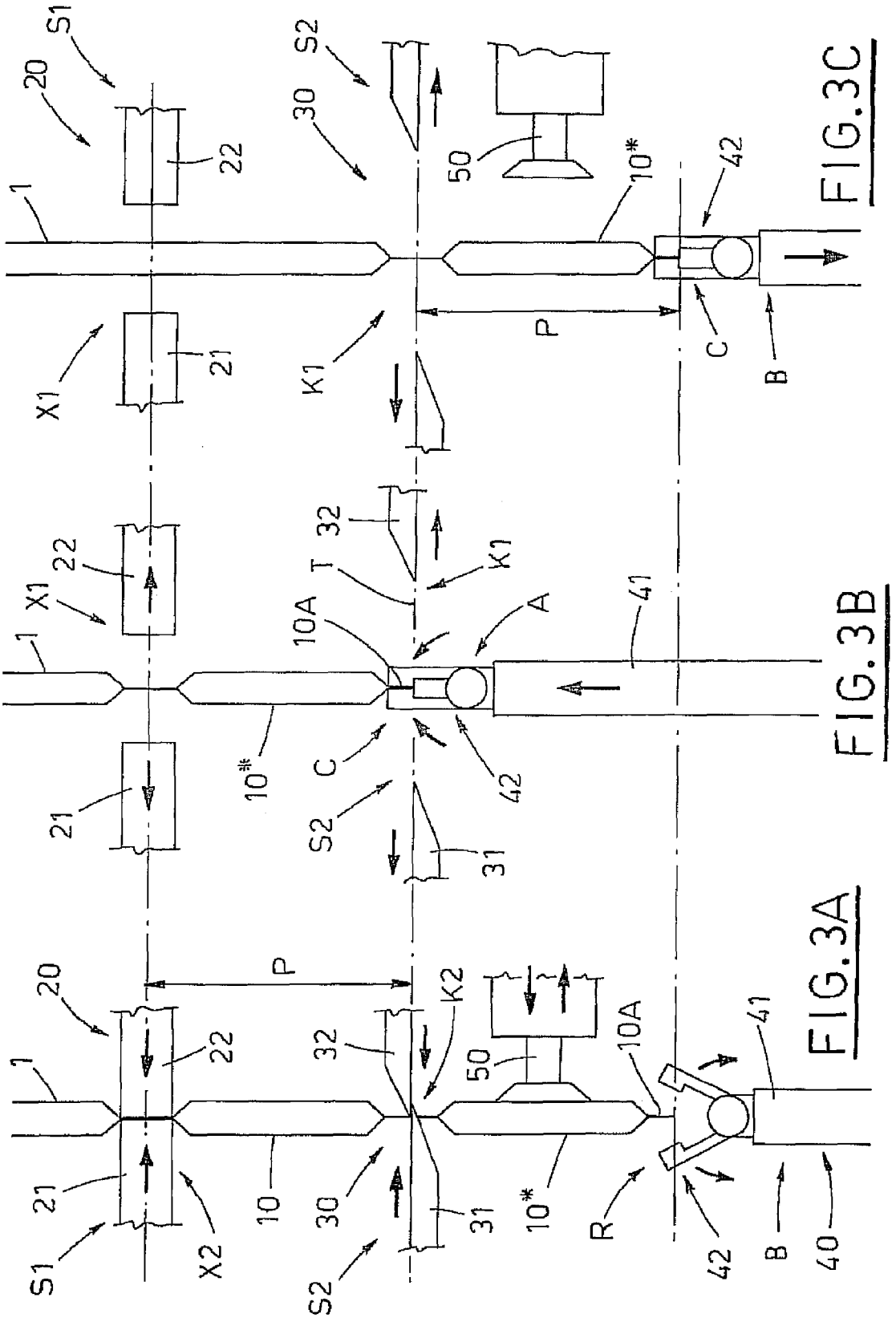


FIG.2C

FIG.2B

FIG.2A

(PRIOR ART)


S1
20
22
1
X1
21
S2
30
50
10*
42
P
K1
C
B
FIG.3C
32
T
K1
22
X1
1
10A
A
41
10*
C
42
21
S2
31
FIG.3B
P
20
K2
1
22
32
50
10A
41
21
10
30
31
10*
R
S1
X2
S2
42
B
40
FIG.3A

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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 9514

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			TECHNICAL FIELDS SEARCHED (IPC) B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 September 2008	Vigilante, Marco

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